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NOV. 1987

**PASCO COUNTY, FLORIDA
SOLID WASTE RESOURCE RECOVERY FACILITY
APPLICATION FOR POWER PLANT SITE CERTIFICATION**

VOLUME I - APPLICATION

ORIGINAL

PASCO COUNTY, FLORIDA
SOLID WASTE RESOURCE RECOVERY FACILITY
APPLICATION FOR
POWER PLANT SITE CERTIFICATION



SUBMITTED BY
THE PASCO COUNTY
BOARD OF COUNTY COMMISSIONERS

NOVEMBER 1987

PREPARED BY
CAMP DRESSER & MCKEE INC.

*environmental engineers, scientists,
planners & management consultants*

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CAMP DRESSER & McKEE INC.



Pasco County Utilities Division
7536 State Street
New Port Richey, Florida 33553
(813) 847-8145

November 6, 1987

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

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

RE: Application for Power Plant Site Certification
Pasco County Resource Recovery Facility

Dear Mr. Oven:

Enclosed is Pasco County's application for an Electrical Power Plant Siting Certification submitted pursuant to Florida Department of Environmental Regulation Chapter 17-17 FAC and FDER Form 17-1.211(1).

Pasco County and its engineering consultant, Camp Dresser & McKee Inc., look forward to working with you, your staff, and other agencies with review responsibility.

We anticipate that the information contained herein provides all that is necessary to allow a thorough evaluation of our application. However, if you find that additional data or clarification is required, do not hesitate to contact us at your earliest convenience.

Also enclosed is our check for \$25,000.00 to cover the application fee.

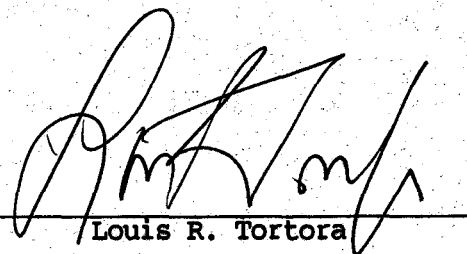
Sincerely,

George Ellsworth
Resource Recovery Manager

dmc
PAS7C.6/18

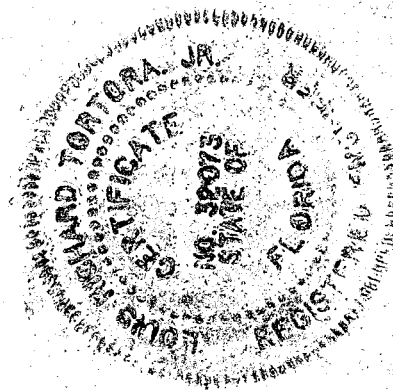
Mr. Hamilton Oven, P.E.
November 6, 1987
Page 2

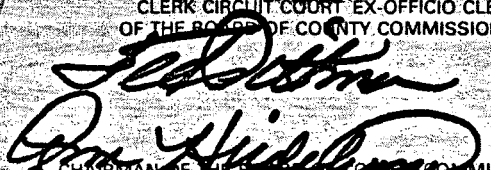
ENGINEER SUBMITTING APPLICATION:


Louis R. Tortora

FLORIDA REGISTRATION NUMBER:

0032073



WARRANT PAYABLE AT First Union National Bank of Florida Dade City, Florida		BOARD OF COUNTY COMMISSIONERS PASCO COUNTY DADE CITY, FLORIDA PAYING ACCOUNT		63-579 831	CHECK NO 00160627 160627
VOID IF NOT CASHED WITHIN 90 DAYS					
TWENTY-FIVE THOUSAND DOLLARS NO CENTS					
PAY TO THE ORDER OF FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION 3900 COMMONWEALTH BLVD TALLAHASSEE, FL 32303		DATE CHECK AMOUNT 11-10-87 ****25,000.00			
		CLERK CIRCUIT COURT EX-OFFICIO CLERK OF THE BOARD OF COUNTY COMMISSIONERS			
		 CHAIRMAN OF THE BOARD OF COUNTY COMMISSIONERS			

APPLICANT INFORMATION

Applicant's Official Name: Pasco County

Address: Pasco County Government Center
7530 Little Road
New Port Richey, Florida 33553

Business Entity: County Government
Name and Title of Business Head: Ann Hildebrand, Chairman
Pasco County Board of County
Commissioners

Name, Title and Address of
Representative Responsible
for Obtaining Certification: George Ellsworth, Manager
Resource Recovery Project

Site Location: County - Pasco

Nearest Incorporated City - Port Richey

Latitude and Longitude: 28° 22' 05"N
82° 33' 30"W

Township and Range: T24S, R17E;
Sections 24, 25,
and 26

Nameplate Generating Capacity
of Proposed Facility: 22 megawatts initially
29 megawatts ultimate

REMARKS: The sole purpose of the proposed resource recovery facility is to dispose of solid waste and recover energy and possibly materials. This proposed facility will afford Pasco County a method of solid waste disposal which will substitute for the present landfilling operations. Pasco County does not operate, maintain or construct facilities for the purpose of electric generation; and does not distribute electrical energy generated at facilities operated by others.

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ABBREVIATIONS

AADT	Average Annual Daily Traffic
ADT	Average Daily Traffic
BOD	Biological Oxygen Demand
CEC	Cation Exchange Capacity
CLU	Critical Level Volume
COD	Chemical Oxygen Demand
CY	Cubic Yards
dBA	Decibels (A-Weighted Scale)
FGD	Flue Gas Desulfurization
GPD	Gallons Per Day
GPM	Gallons Per Minute
KWH	Kilowatt Hour
LOS	Level of Service
MGD	Million Gallons Per Day
MSL	Mean Sea Level
MSW	Municipal Solid Waste
PFU	Plaque Forming Units
PPM	Parts Per Million
PVC	Polyvinyl Chloride
SPT	Standard Penetration Test Boring
TPD	Tons Per Day
VPD	Vehicles Per Day
WWTP	Wastewater Treatment Plant
BEBR	Bureau of Economic and Business Research
CUP	Consumptive Use Permit
DER	Department of Environmental Regulation
DRI	Development of Regional Impact
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FAC	Florida Administration Code
FDOT	Florida Department of Transportation
FEMA	Federal Emergency Management Agency
FGFWFC	Florida Game and Freshwater Fish Commission

ABBREVIATIONS
(Continued)

FNAI	Florida National Areas Inventory
FPC	Florida Power Corporation
FWS	U.S. Fish and Wildlife Services
NPDES	National Pollution Discharge Elimination System
PCBOCC	Pasco County Board of County Commissioners
PSD	Prevention of Significant Deterioration
SCS	Soil Conservation Service
SR	State Road
SWFMWD	Southwest Florida Water Management District
USDA	United States Department of Agriculture
USGS	United States Geological Survey

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

For nearly seven years, Pasco County has been investigating alternative methods for long-term solid waste disposal. The county began its investigation in 1980, after the State of Florida enacted legislation (Chapter 403.706 Florida Statutes) requiring the county to submit resource recovery and management plans. The current solid waste disposal method—sanitary landfilling—is becoming inadequate as a primary disposal method, due to environmental and siting constraints. Land areas in the county which are environmentally and economically suitable for sanitary landfilling are quickly diminishing, and ground and surface water resources are threatened by sanitary landfilling of solid waste. There has been much interest in the resource recovery concept of solid waste disposal, because this method can: (1) reduce the volume of solid waste which must be landfilled, (2) reduce the threat of contamination of water resources, and (3) allow the recovery of energy and recyclable materials. Studies commissioned by the county since 1980 have concluded that a mass-burn, resource recovery system is the most prudent long-term primary solid waste disposal method for Pasco County.

SITE LOCATION

Site selection was made by the county in the fall of 1985, after review of a detailed study prepared by the county's consulting engineers. The site is located in northwest Pasco County, near the county's waste generation centroid. The site consists of 751 acres on Hays Road, approximately 2.5 miles north of SR 52, on land owned by the county. Existing Florida Power Corporation transmission lines cross the site.

PURPOSE OF THE PROPOSED FACILITY

The primary purpose of the facility is to dispose of the municipal solid waste generated within Pasco County. Noncombustibles and inert ash residue from the plant's combustion process will be disposed of at a co-located sanitary landfill/ashfill. The power derived from the combustion of refuse

will be sold to Florida Power Corporation. The revenues from the sale of energy will help offset the operating costs of the facility. The proposed project has received an affirmative determination of need from the Florida Public Service Commission.

FACILITY DESCRIPTION

The proposed project will be a mass-burn resource recovery facility with an initial continuous design rated processing capacity of 900 tons per day of municipal solid waste. In anticipation of future disposal needs, Pasco County is seeking certification for an ultimate site electrical generating capacity of approximately 29 megawatts (gross), fueled by 1,200 tons per day of municipal solid waste. Pasco County will contract with a full-service vendor to design, construct, and operate the plant for 20 years.

APPLICATION OVERVIEW

Pursuant to Section 403.505, Florida Statutes, Pasco County is applying for certification of a solid waste energy recovery facility. This application has been prepared in accordance with the Florida Department of Environmental Regulation (FDER) Chapter 17-17 Rules and follows the format prescribed in FDER Form 17-1.211(1), FAC (Instruction Guide for Certification Application: Electrical Power Plant Site, Associated Facilities, and Associated Transmission Lines).

The application encompasses four volumes:

Volume I (Application) - contains the Applicant Information sheet, Sections 1.0 through 9.0 of the application, and the list of references.

Volume II (Appendices) - contains Section 10.0, the appendices of the application. In addition to the appendices required by the FDER Instruction Guide, seven other appendices are included to supplement Volume I.

Volume III (Air Quality) - contains information concerning the Prevention of Significant Deterioration (PSD) determination and the Best Available Control Technology (BACT) determination.

Volume IV (Landfill/Ashfill) - contains information concerning the construction/operations of the landfill/ashfill, and the geotechnical investigation report.

PRINCIPAL FINDINGS

The proposed facility will be designed and operated to meet all applicable federal, state and county standards. As planned, the facility will have a minimal impact on the surrounding environment. The analyses in this application support the following conclusions:

- Air Quality - As discussed in Volume III - Air Quality, the combustion process for the facility will be environmentally sound. As required by the PSD permitting process, an air pollution control technology evaluation and air quality impact assessment were conducted. The control technology evaluation considered energy, environmental and economic criteria and proposed a dry scrubber and baghouse as the Best Available Control Technology for the Pasco County resource recovery facility. The air quality impacts assessment compared the predicted air quality impacts from the proposed facility to the Florida and National Ambient Air Quality Standards and the PSD Class I and Class II increments. These analyses demonstrated that the predicted impacts of the proposed facility are at less than significant levels and will not cause or contribute to an exceedance of the air quality standards or increments.
- Surface Water and Groundwater - As discussed in Sections 4.2 and 5.1.4, all plant process water will be drawn from the Hudson Subregional Wastewater Treatment Plant, and all

wastewater discharged from the solid waste resource recovery facility will go directly to this wastewater treatment plant. Potable water will be used in small quantities in the personnel areas of the plant and for boiler make-up purposes. All plant water will be recycled, with no discharge to surface or groundwater. Runoff from vegetated areas, paved areas, and rooftops will be collected in onsite stormwater retention/detention basins. Refuse storage and ash/residue handling operations will be covered, to protect them from precipitation and runoff. As discussed in Section 4.3, there will be no influence on groundwater quality as a result of the planned construction dewatering activity.

- Noise - As discussed in Section 5.7, noise levels at the closest residence will increase by only 1.0 to 3.0 dBA above existing and modeled noise levels during operation of the resource recovery facility. This increase is not perceptible to the human ear.
- Plant and Animal Communities - During more than 50 observer hours of site surveying, there were no direct observations or other evidence of species listed as threatened or endangered by the U.S. Fish and Wildlife Service (FWS) or the Florida Game and Fresh Water Fish Commission (FGFWFC). There are no National Wildlife Refuges or critical habitats located within 5 miles of the project site, according to the FWS. The Florida Natural Areas Inventory stated that currently there are no occurrences of special elements (i.e., plants and animals) for this site. A population of Gopher Tortoises has been found on the site. As a Species of Special Concern with FGFWFC, the welfare and future survival of Gopher Tortoises on this property will be given careful attention. See Section 4.4.1 for more information on this issue.
- Archaeological Sites and Historic Preservation Areas - As discussed in Section 5.10, there are no known historic or

prehistoric resources within the project site boundaries, according to the Division of Historical Resources. As it is planned, the project will not impact any historic or prehistoric cultural resources.

- 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 the appropriate preparation and design will be performed.
- Traffic - As discussed in Section 5.9.4, the solid waste resource recovery facility will increase daily traffic by approximately 1 percent on SR 52 and 24 percent on Hays Road. The high percentage increase on Hays Road is a result of the very low current traffic volumes on Hays Road. The traffic analysis shows that no capacity problems will be caused by this additional traffic. Current levels of service on these roads will not change as a result of expected traffic increases.
- Land Use and Zoning - On December 19, 1986, the Pasco County Zoning Administration determined that the selected site for the resource recovery facility and landfill/ashfill is exempt from the provisions of the county's zoning ordinance, Ordinance No. 75-21, as amended. The project is considered an acceptable development, undertaken for the promotion of the public health, safety, and general welfare, and is therefore exempt. After reviewing the goals and objectives of the Solid Waste and Resource Recovery Element, the Pasco County Planning Director has determined that the proposed resource recovery facility is consistent with the goals and objectives of the Pasco County Comprehensive Land Use Plan.

- Aesthetics - As discussed in Section 3.2, there will be some visual impact associated with the facility. The design of the facility will be aesthetically pleasing and architecturally compatible with the surrounding area. Due to the natural buffer surrounding the site, the major portion of the facility will be obscured from view from most offsite vantage points.

**1.0 NEED FOR POWER AND THE
PROPOSED FACILITIES**

1.0 NEED FOR POWER AND THE PROPOSED FACILITIES

1.1 LOCAL/REGIONAL BENEFITS

The purpose of the proposed resource recovery facility is to dispose of the solid waste generated within Pasco County. The decision to build a resource recovery facility was made after several years of investigation by the county of alternatives to landfilling of solid waste. Landfilling of municipal solid waste in Pasco County is inadequate for two primary reasons: (1) there is a shortage of land which is suitable for landfilling, and (2) the landfilling of putrescible garbage poses a potential long-term threat to the quality of the area's groundwater. Water quality is a significant concern, since three major well fields in Pasco County (Cross Bar Ranch, Cypress Creek, and Starkey) supply water to major metropolitan areas in Pinellas County, Hillsborough County, and Pasco County.

After evaluating the alternatives, the county determined that the best alternative for disposal of municipal solid waste in Pasco County is combustion of the waste in a resource recovery facility, followed by landfilling of the ash residue. Combustion of municipal solid waste in Pasco County will reduce the volume of waste which must be landfilled by up to 70 percent. This reduced volume will extend the life of the co-located landfill/ashfill by 3 times. The ash from the combustion process will require less landfill space than noncombusted waste, and will generate no methane gas. Thus, by disposing of its solid waste through combustion and landfilling, Pasco County will conserve land, preserve the natural environment, and protect water quality.

Combustion of solid waste has the secondary benefit of electricity generation. The electric power which may be derived from combustion of Pasco County's solid waste can stabilize, or possibly reduce the rapidly escalating cost of solid waste disposal. The electricity generated by combustion of 900 tons per day of municipal solid waste--the initial

capacity of the proposed facility—can eliminate the need for 352,000 barrels of oil per year for electric energy generation.

1.2 BENEFITS TO THE STATE

In Chapter 84-198, Laws of Florida (1984), the Florida Legislature has declared that "It is critical to encourage energy conservation in order to protect the health, prosperity, and general welfare of this State and its citizens." The Legislature has further declared that the "combustion of solid waste by small power production facilities for the production of electricity not only represents conservation efforts well-directed towards that goal, but also represents an environmentally preferred alternative to conventional solid waste disposal in this State." In Section 403.702 of the Florida Statutes, the Florida Resource Recovery and Management Act declares that "the purpose of this act is to promote the application of resource recovery systems which preserve and enhance the quality of air, water and land resources."

In a letter inviting local officials to attend a workshop on the topic of resource recovery in Florida (1985), former Governor and current U.S. Senator Bob Graham wrote: "Programs which result in the substitution of resource recovery alternatives to direct landfilling are vital to the protection of Florida's fragile environment. The utilization of municipal solid waste as a safe and abundant renewable energy resource represents a positive economic opportunity for many Florida communities.... Recent technological advances have made resource recovery a viable option for small, growing populations as well as large urban areas. Experience in Florida indicates that resource recovery can reduce landfill area requirements by up to 70 percent, and at the same time produce valuable electricity and thermal energy for use or sale."

Pasco County's proposed solid waste disposal program pursues the state's policy of resource recovery as a long-term solid waste disposal solution. The proven mass-burn technology will provide a reliable and economical solution for Pasco County's long-term solid waste disposal needs.

The county's proposed system is also consistent with the Florida State Comprehensive Plan (FS, 1985). The plan states the following goals and policies regarding energy and waste:

Energy Goal:

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

Policies (Objectives):

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

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

Waste Management Goal:

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

Policies (Objectives):

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

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

1.3 FEDERAL ENERGY REGULATORY COMMISSION ORDER

On September 26, 1986, the Pasco County Board of County Commissioners filed an application with the Federal Energy Regulatory Commission (FERC) for certification of its proposed resource recovery facility as a small power production facility pursuant to Section 292.207 of the commission's regulations and Section 201 of the Public Utility Regulatory Policy Act of 1978 (PURPA). Notice of the application was published in the Federal Register on October 16, 1986. On December 4, 1986, FERC granted the county's application for certification of its resource recovery project as a qualifying small power production facility. A copy of the final order is included in Appendix 10.1.7.

1.4 PUBLIC SERVICE COMMISSION ORDER

On February 24, 1987, the Pasco County Board of County Commissioners filed a petition with the Florida Public Service Commission (PSC) for a determination of need for a 29-megawatt solid waste fired cogeneration power plant. The PSC determined that Pasco County's proposed facility meets the relevant criteria for a determination of need under Section 403.519, Florida Statutes. Although it is a small facility, the Public Service Commission concluded that the 29-megawatt plant will contribute to the electric system reliability and integrity in peninsular Florida. A copy of the final order is included in Appendix 10.1.7.

SECTION 2

2.0 SITE AND VICINITY CHARACTERIZATION

2.0 SITE AND VICINITY CHARACTERIZATION

2.1 SITE AND ASSOCIATED FACILITIES DELINEATION

2.1.1 SITE LOCATION

The project site is located on a 751-acre tract owned by Pasco County, Florida, in the northwestern portion of the county (see Figure 2-1). The site, shown on Figure 2-2, is bounded on the west and south by Hays Road, on the east by Shady Hills Road, and on the north by Bluebird Lane. The property is bisected by a 295-foot wide Florida Power Corporation transmission line easement and right-of-way which runs roughly north/south through the site. The boundary survey is shown on Figure 2-3, and the legal description, deed and condemnation notice are provided in Appendix 10.6.

2.1.2 EXISTING USES

Abutting and adjacent properties are shown in Figure 2-4. All land abutting the site is under private ownership. Abutting properties east and west of the site consist primarily of vacant grassland and small cattle farms. A portion of the west boundary abutts the county-owned site for a proposed Class III landfill. To the north and south, abutting properties are rural areas containing pockets of low density, residential areas. Properties abutting to the southeast were once tree farms, but are no longer managed. Florida Power Corporation's Hudson substation occupies 6.24 acres of land abutting the south property line and the Florida Power Corporation easement. A complete list of landowners with property abutting the project site may be found in Appendix 10.6.

The project site encompasses unimproved grassland, planted pine areas, and isolated ponds. Wooded areas are scattered throughout the site, while wetland areas are found mainly in the southwest section of the property. There are no buildings on the property. Figure 2-5 illustrates the existing condition of the site and surrounding area.

2.1.3 SITE MODIFICATION

As presented in the General Site Development Plan (Figure 2-6), the resource recovery facility has been situated in the southeast corner of the site. The site layout provides a short entrance from Hays Road, but a sufficient vegetation buffer zone to block the view of the facility from the road.

The facility structures will account for less than 0.5 percent of the site acreage. The ashfill/landfill will use 26 percent of the site. Over 60 percent of the site will remain unused. Table 2-1 summarizes the proposed land uses.

2.1.4 100-YEAR FLOOD ZONE

A very small portion of the project site is within the flood zone, however, no portion of the site to be used as a landfill/ashfill or resource recovery facility is located in the 100-year flood zone as defined by the Federal Emergency Management Agency. The 100-year flood zone in the vicinity of the project site is shown on Figure 2-7.

2.2 SOCIO-POLITICAL ENVIRONMENT

2.2.1 GOVERNMENTAL JURISDICTIONS

Within a 5-mile radius of the proposed facility, the area is unincorporated. The nearest incorporated areas, Port Richey and Weeki Wachee, are located 10 miles from the site.

In order to identify local, regional, state and federal areas of concern, the agencies listed in Table 2-2 were contacted. Information provided by each agency is summarized in the table.

The Florida Natural Areas Inventory provided a list of special plants and animals. A special element is any component of the natural environment, such as an animal or plant species, that is limited in abundance, range or habitat. Known occurrences of special elements have been recorded in the

TABLE 2-1
LAND USE BREAKDOWN OF PROJECT SITE

Proposed Use	Land Use Breakdown	
	Acres	Percentage of Site
Structures	3.0	0.4
Roadways and Parking	11.0	1.5
Open Areas/Buffer Zone	491.0	65.3
Retention Basins	51.0	6.8
Landfill/Ashfill Area	<u>195.0</u>	<u>26.0</u>
TOTAL	751.0	100.0

TABLE 2-2

GOVERNMENTAL JURISDICTIONS INFORMATION SOURCES
(CONTINUED)

Agency/Department Contacted	Information Provided	Areas Within 5 Miles of Project Site
Department of State; Division of Historical Resources	- State Archaeological Lands or Landmark Zones	No
Department of Natural Resources; Florida Natural Areas Inventory	- Special Plants and Animals	Yes
<u>FEDERAL</u>		
National Oceanic and Atmospheric Administration (NOAA); National Marine Fisheries Service (NMFS); Environmental Assessment Branch, and Protected Species Management Branch	- Marine Sanctuaries	No
	- Estuarine Sanctuaries	No
	- National Seashores	No
Fish and Wildlife Service	- Critical Habitats of Endangered Species	No
	- Wildlife Refuges	No
	- Wildlife Areas	No
	- Memorials NPS	No
	- Monuments NPS	No
	- Marine Sanctuaries	No
	- Estuarine Sanctuaries	No
	- Rare Areas	No
	- Wild and Scenic Rivers	No
	- Military Lands	No
	- Endangered and Threatened Species	No

area, but only two of the recorded elements are located within 5 miles of the site. Piedmont joint-grass is found 5-1/2 miles northwest of the site, and Bald Eagles have been sighted 3-1/2 miles east and 6 miles west of the site.

Other protected species are the Blackbanded Sunfish and the Leitheuser's cave crayfish. The Blackbanded Sunfish is located 7 miles south of the site, and the Leitheuser's cave crayfish is found 4 miles north and also 6 miles west of the site. An ecological survey of the site revealed that the Little Blue Heron and the Snowy Egret periodically use the wetlands as resting areas. These birds are listed as species of special concern. Also found onsite were two reptiles of special concern, the Gopher Tortoise and the Gopher Frog. The classifications of these species are listed in Table 2-3.

Information on threatened and endangered species was also received from the U.S. Fish and Wildlife Service. No protected species were found to exist on the site. However, the Eastern Indigo Snake may inhabit the site (see Section 2.3.6 for more information). The following federally listed threatened and endangered species have a range that includes the area of the project site:

- Red-cockaded Woodpecker
- Bald Eagle
- Wood Stork
- Eastern Indigo Snake

The range description is very general and cannot be used to determine whether these endangered and threatened species actually inhabit the 5-mile study area. No direct observations or other evidence of the species listed were observed during the more than 50 hours of site surveying. Appendix 10.10 contains the range descriptions and other information concerning these species.

The U.S. Fish and Wildlife Service and the Florida Department of Natural Resources have confirmed that there are no wildlife refuges, state parks or

TABLE 2-3

SPECIAL ELEMENT CLASSIFICATIONS
PASCO COUNTY RESOURCE RECOVERY SITE

Plant, Animal or Habitat	Classification	
	Florida Natural Areas Inventory	Federal/State Legal Status
Piedmont Joint-grass	FNAI G1	C2/-
Bald Eagle	FNAI G3	LE/LE
Blackbanded Sunfish	FNAI G5	S3/-
Leitheuser's Cave Crayfish	FNAI G2	S2/-
Aquatic Caves	FNAI G3	S2/-
Little Blue Heron	FNAI G5	-/LS
Snowy Egret	FNAI G5	-/LS
Gopher Tortoise	FNAI G2	C2/LS
Gopher Frog	FNAI G5	C2/LS

LEGEND:

FNAI G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences or less than 1,000 individuals) or because of extreme vulnerability to extinction due to some natural or man-made factor.

FNAI G2/S2 = Imperiled globally because of rarity (6 to 20 occurrences or less than 3,000 individuals) or because of vulnerability to extinction due to some biological or man-made factor.

FNAI G3/S3 = Either very rare and local throughout its range (21 to 100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction because of other factors.

FNAI G5 = Demonstrably secure globally.

LE = Listed as Endangered Species in the List of Endangered and Threatened Wildlife and Plants under the provisions of the Endangered Species Act. An "Endangered Species" is defined as any species which is in danger of extinction throughout all or a significant portion of its range.

TABLE 2-3 (Continued)

SPECIAL ELEMENT CLASSIFICATIONS
PASCO COUNTY RESOURCE RECOVERY SITE

LEGEND:

- LS = Listed as Species of Special Concern which warrants special protection, recognition, or consideration. This species may become a Threatened Species unless appropriate protective or management techniques are initiated or maintained.
- C2 = Candidate Species, Category 2. Taxa for which information now in the possession of the U.S. Fish and Wildlife Service indicates that proposing to list the species as endangered or threatened is possibly appropriate, but for which conclusive data on biological vulnerability and threat(s) are not currently available to support proposed rules at this time.
-

SOURCE: Florida Department of Natural Resources, The Nature Conservancy. August 20, 1986. Florida Natural Areas Inventory. Data Request Reply for Pasco County Landfill/Ashfill Site, Pasco County.

state forests within a 5-mile radius of the project site. However, two county parks are located within the 5-mile radius—Shady Hills Park, and the proposed Concourse Park (see Section 2.2.5).

According to information provided by the Historic Preservation Committee of Pasco County, there are nine recorded prehistoric sites (Indian mounds and campsites) in the 5-mile project area. However, the Florida Division of Historical Resources has stated that the proposed resource recovery project poses no threat to the prehistoric sites.

Other than county parks and the prehistoric sites, there are no government jurisdictional lands in the 5-mile study area. Figure 2-8 depicts the prehistoric sites and county parks in relation to the site. As required by the Instruction Guide for Certification Application, Figure 2-9 depicts governmental jurisdictions within a 1-mile radius of the project site.

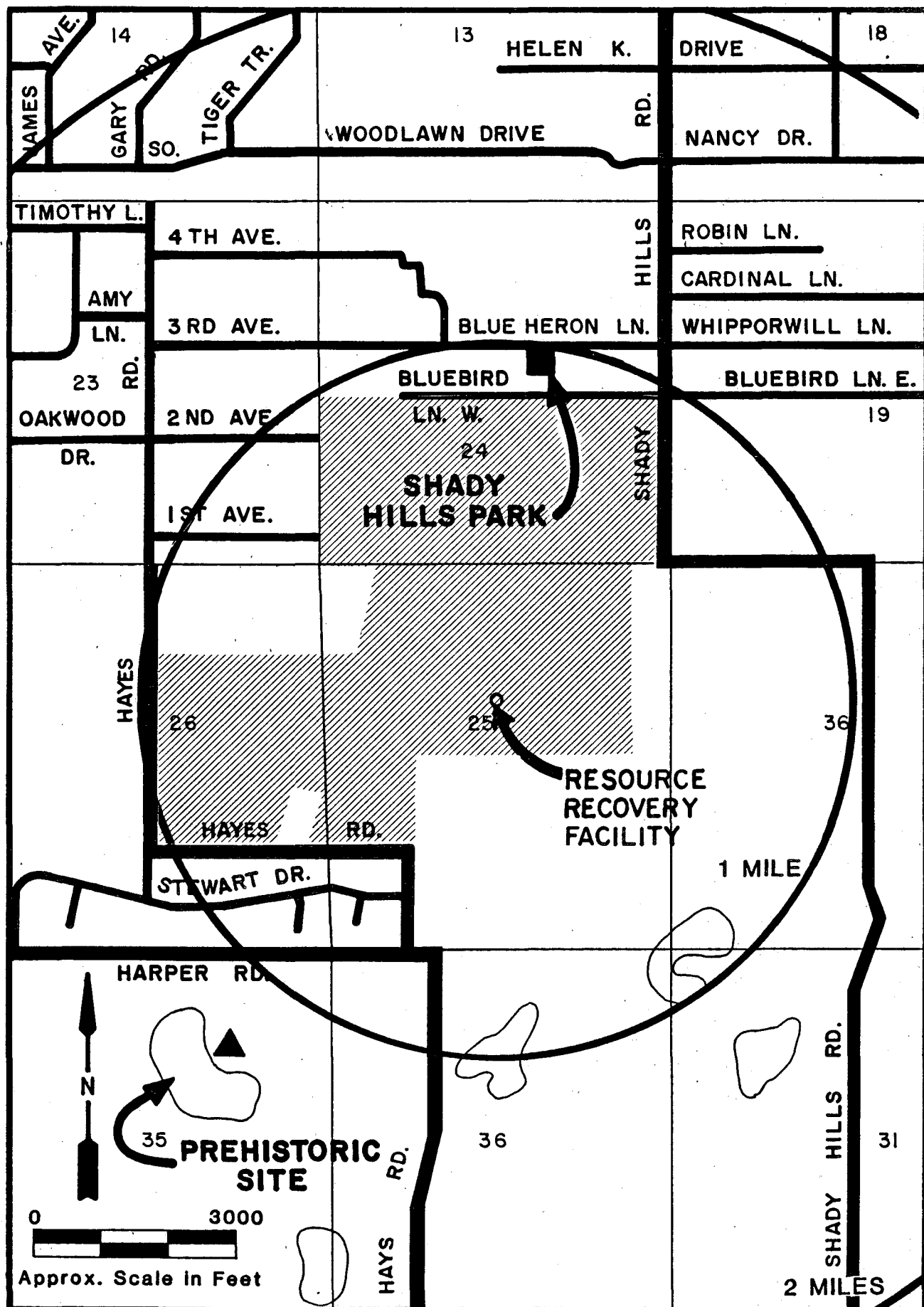
2.2.2 ZONING AND LAND USE PLANS

The text below summarizes zoning and land use regulations as they apply to the resource recovery project.

The Pasco County Comprehensive Plan, adopted on February 2, 1982, is the official statement of the Pasco County Board of County Commissioners on the desirable future physical environment of the community. The plan includes goals, objectives, policies and recommendations for controlled growth.

The Pasco County Comprehensive Plan provides a guidance framework for the management of privately-owned lands and public facilities. Applicable sections of the plan pertaining to the proposed facility are the Future Land Use Element, and the Solid Waste and Resource Recovery Element.

The Comprehensive Plan governs development in the unincorporated areas of Pasco County, which includes the resource recovery site location. The Comprehensive Plan comprises the following elements.



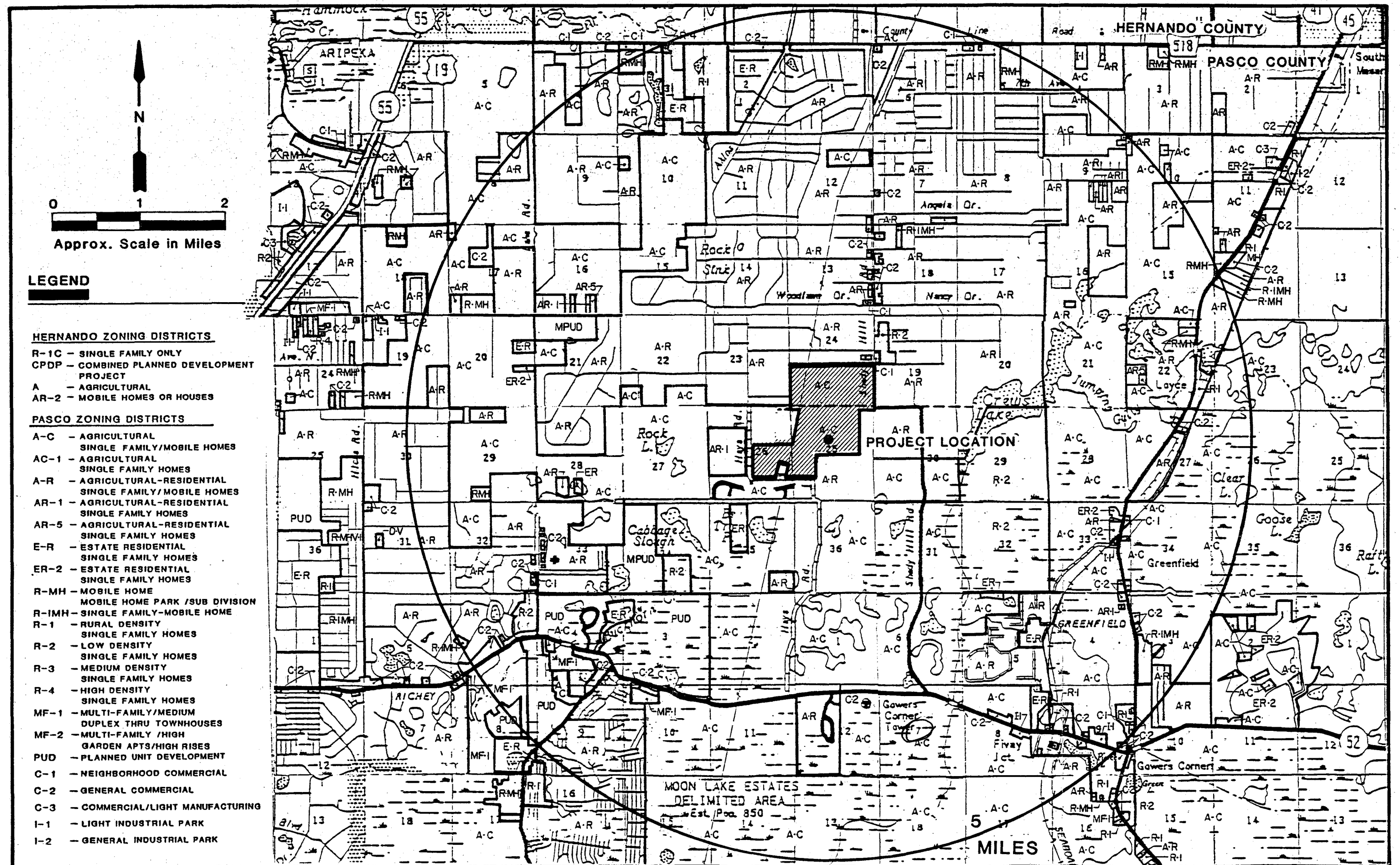
Pasco County Resource Recovery Program Government
Jurisdictions Map - 1 Mile Radius Detail

- Economic Assumptions
- Intergovernmental Coordination
- Future Land Use
- Traffic Circulation
- Bus, Rail, Airports, and Related Facilities
- Sanitary Sewer
- Housing
- Solid Waste and Resource Recovery
- Water
- Drainage
- Utilities
- Recreation and Open Space
- Conservation/Coastal Zone Protection

In the existing Comprehensive Plan, compliance of the proposed facility is to be guided by the Solid Waste and Resource Recovery Element. The design, construction and operation of the facility will match the goals, objectives, policies and recommendations of this element. The goal of the Solid Waste and Resource Recovery Element is to "dispose of the county's domestic and industrial waste in the safest and least expensive manner."

To attain this goal, the county adopted the following objectives.

1. To examine effects of landfill and solid waste resource recovery on the environment.
2. To assure that hazardous and/or infectious wastes are properly identified and disposed.
3. To assure that wastewater, sludge, and industrial wastes are properly identified and disposed.
4. To involve county residents in recycling efforts.



Pasco County Resource Recovery Program
5-Mile Area Zoning Map

5. To ensure that all future landfills or waste resource operations will have minimal adverse affects on the citizens of the county.
6. To research the feasibility of resource recovery.
7. To provide solid waste disposal service within the economic means of Pasco County residents.
8. To conform with the existing federal and state requirements.

A primary objective stated in the Solid Waste Resource Recovery Element is "to ensure that all future landfills or waste operations will have minimal adverse effects on the citizens of the county." In terms of safety, resource recovery is the preferred alternative. With resource recovery, the potential for damage to valuable surface water and groundwater resources is significantly reduced. When compared to landfilling of solid waste, resource recovery has been advocated by the State of Florida as the preferred method of solid waste disposal.

Objective No. 6 is to research the feasibility of resource recovery. The county has complied with this objective by retaining consulting engineers to prepare a study. Regarding objective No. 7, preliminary research has shown that resource recovery is within the economic means of Pasco County residents. The Florida Department of Environmental Regulation required 17 counties—including Pasco County—to investigate the feasibility of a resource recovery program.

After reviewing the goals and objectives of the Solid Waste and Resource Recovery Element, the Pasco County Planning Director has determined that the resource recovery facility would be consistent with the goals and objectives of the Pasco County Comprehensive Plan (a copy of the determination is provided in Appendix 10.2). Although the Pasco County Comprehensive Plan does provide guidelines for the various elements of future land use, the plan does not contain a land use map. It does not address or identify future land uses for specific land parcels in Pasco

County. Pasco County is currently preparing a more detailed comprehensive plan that is expected to be complete in December of 1987. Land use compliance procedures for the resource recovery project are being coordinated with the development of the new comprehensive plan. The new plan will contain a land use map that will clearly identify the project site for resource recovery.

The Pasco County Zoning Regulations outline the land use districts in the unincorporated area of Pasco County, and regulate development in those districts. Figure 2-10 shows the zoning for the 5-mile radius area around the project site. Almost exclusively, zoning in the study area is A-C (Agricultural District) or A-R (Agricultural-Residential District). The zoning of the site for the proposed resource recovery facility and landfill/ashfill is A-C. A-C zoning is designed to preserve rural and open lands with agricultural value. The minimum allowed lot size is 10 acres. A-R zoning establishes districts of relatively large land tracts to accommodate those individuals who desire an estate type living environment. The intent is to curtail urban development in areas lacking sufficient facilities. The minimum allowed lot size is 1 acre. The primary use is commercial farming and agricultural (citrus groves and livestock grazing). A complete list of zoning ordinance descriptions for the 5-mile radius area is provided in Appendix 10.2.

Under Section 2 of Pasco County Ordinance No. 75-21 (approved by the Board of County Commissioners on February 2, 1982), development and other activities conducted by Pasco County are exempt from the provisions of the Pasco County Zoning Ordinance. On June 16, 1987 the Pasco County Zoning Administrator determined that the selected site for the resource recovery facility and landfill/ashfill is acceptable development undertaken for the promotion of the public health, safety, and general welfare and is therefore exempt from the provisions of the zoning ordinance (Ordinance No. 75-21, as amended).

A chronological list of major events leading to the land use zoning exemption is provided in Table 2-4. Appendix 10.2 provides descriptions of

TABLE 2-4

CHRONOLOGY OF MAJOR EVENTS
LEADING TO LAND USE AND ZONING CONFORMANCE

Date	Event
12/5/86	Written request for zoning interpretation sent to Pasco County's Zoning Administrator, Ken Baginski, by the Pasco County Solid Waste Department.
12/19/86	Zoning Administrator reviews request; decides that the Pasco County Resource Recovery project is exempt from zoning.
2/04/87	Request from DRI Coordinator to the Department of Community Affairs for DRI status of proposed project.
2/11/87	Department of Community Affairs determines that DRI process is not necessary.
2/13/87	Pasco County Planning Director determines that Development Review Procedure is not necessary until after a detailed plan of construction is developed.
3/10/87	Pasco County Planning Department determines the Resource Recovery project is consistent with the goals and objectives of the Comprehensive Land Use Plan.
6/16/87	Zoning Administrator determines that the resource recovery project—as a county project for the public welfare—is exempt from zoning.

each zoning category, correspondence involved with the zoning procedures and a copy of the applicable portions of Ordinance No. 75-21.

2.2.3 DEMOGRAPHY AND ONGOING LAND USE

Existing Population

The populations of cities within Pasco County are shown below.

<u>Area</u>	<u>1985 Estimated Population</u>
Unincorporated County	204,496
Dade City	5,608
New Port Richey	12,558
Port Richey	2,529
Saint Leo	955
San Antonio	650
Zephyrhills	<u>6,476</u>

TOTAL	233,272
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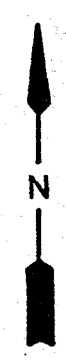
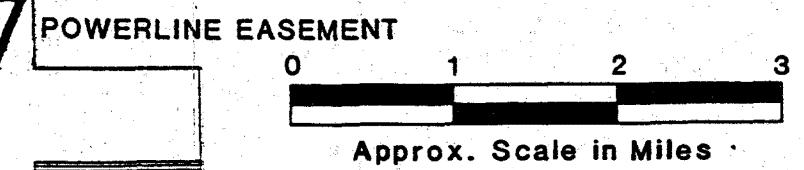
Estimated population Within 5-Mile Radius of Project Site	18,600
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None of the cities are located within a 5-mile radius of the project site. The population within the 5-mile radius was approximated using the 1980 census tracts and applying a 20 percent growth factor. The growth factor was calculated for the 5-mile radius area by analyzing overall county population growth for 1980 through 1985, as compiled by the Bureau of Economic and Business Research at the University of Florida.

Existing Land Use Within 5-Mile Radius of Project Site

Existing land use within a 5-mile radius of the site is shown in Figure 2-11. According to the Existing Land Use Map (Pasco County, 1985), land

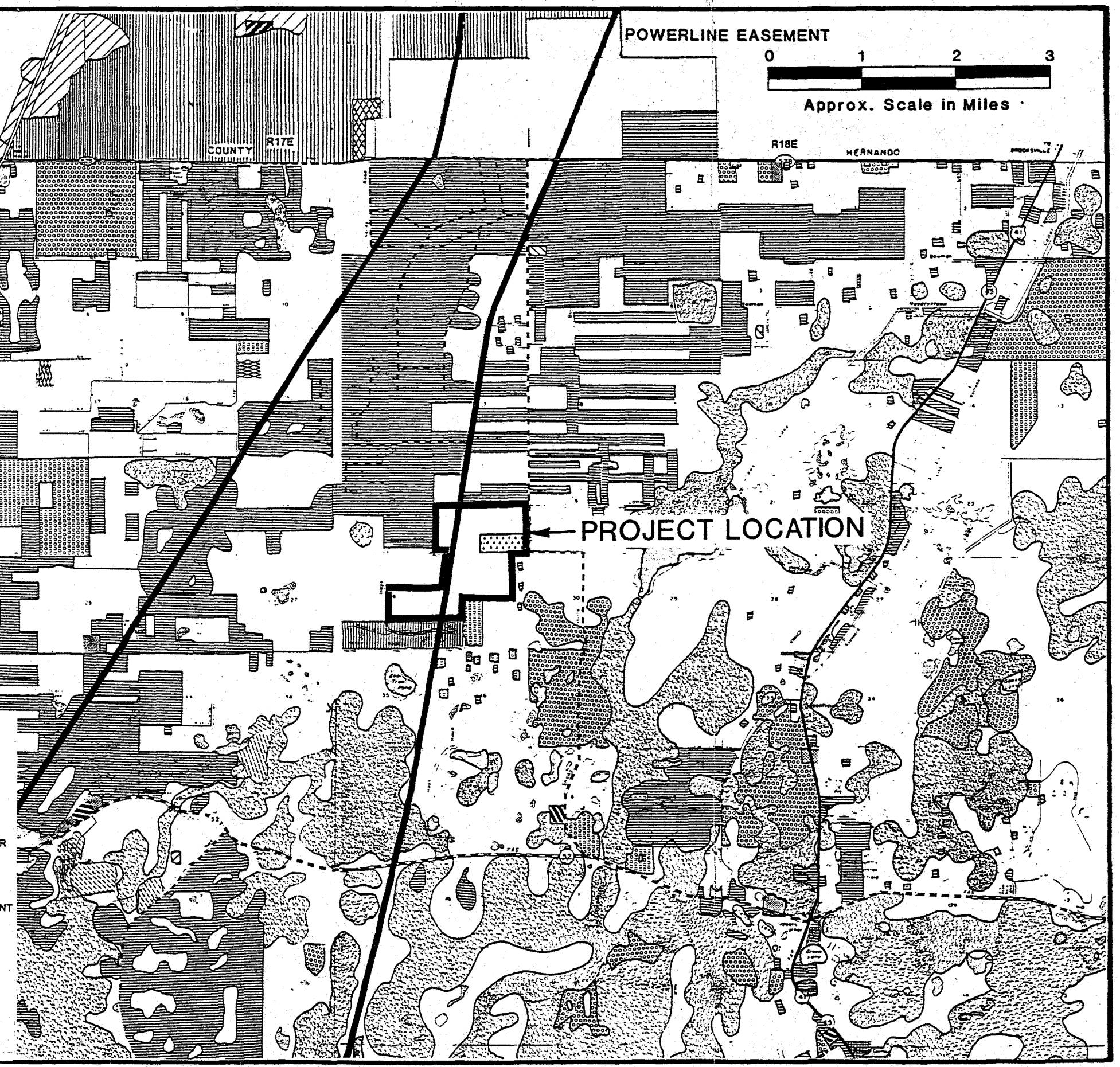
SOURCE:
Pasco County Planning Department 1985



EXISTING LAND USE

PASCO COUNTY GROWTH MANAGEMENT PLAN 1985

LOW DENSITY RURAL	COMMERCIAL	GOVERNMENT USE	VEGETATIVE COVER
MEDIUM DENSITY SINGLE FAMILY	OFFICE/PROFESSIONAL/INSTITUTIONAL	UTILITIES	AGRI-GRAZE/VACANT
HIGH DENSITY MULTI-FAMILY	LIGHT INDUSTRIAL	AGRI-TIMBER	WATER
MOBILE HOME	INDUSTRIAL	ACTIVE AGRICULTURE/ORCHARD	



Pasco County Resource Recovery Program
Existing Land Use Map

uses in the area include low-density rural, vacant graze land, medium-density single family, and agri-timber. The site consists of vacant graze land and planted pine trees.

Beyond the northern portion of the site, there are two types of land use. Two-thirds of the land is low-density rural, and one-third is vacant agricultural. There are no industrial buildings north of the site.

Beyond the eastern portion of the site, land use is predominantly low-lying, vacant agricultural and vegetated cover. Northeast and northwest of the site, there are several small pockets of low-density residential areas. Near the intersection of Shady Hills Road and SR 52, there is one commercial building; and at the intersection of US 41 and SR 52, there is a small industrial building.

Directly south of the project site, along Hays Road, land use is designated medium-density single family. This area is part of the Highlands planned unit development. Based on recent visits to the area, the property is at approximately 50 percent of buildout, and would be more accurately described as a low-density rural area. The majority of land south of the site is wetlands and low-lying vacant graze land.

Development west of the site is mainly low-density residential, but there is also a small area of industrial and commercial properties. Directly west of the site and approximately 4 miles from the site, there is a section of land used for office space. There are also two pockets of high-density multi-family housing.

Projected land use in a 5-mile area of the project is not expected to change rapidly in the near future. Industrial and commercial growth in the area has been slow. Housing development shows the most promise for future growth, especially north of the site where construction has been steady. Population increase in the 5-mile study area is average in comparison to growth in other parts of the county.

2.2.4 EASEMENTS, TITLE, AGENCY WORKS

Construction of the project will not require any easements or titles from government agencies.

2.2.5 REGIONAL SCENIC, CULTURAL AND NATURAL LANDMARKS

The research performed for Section 2.2.1 Governmental Jurisdictions revealed that the following areas of cultural interest exist within 5 miles of the project site:

- Two county parks
- Nine prehistoric sites

The two county parks are Shady Hills Park and Concourse Park. Shady Hills Park is located on Blue Heron Lane, an unsurfaced road which is north of the project site. The park consists of a community center building, three baseball diamonds, and a playground. A football field will be added to the park during 1987. The proposed Concourse Park will be located at the intersection of Hays Road and SR 52 which is approximately 2.5 miles south of the site. Construction of the facility is expected to begin soon. The park will contain a nature center and trails, a picnic area, an auditorium, an athletic field, and tennis courts.

2.2.6 ARCHAEOLOGICAL AND HISTORIC SITES

The Florida Department of State, Division of Historical Resources was supplied with all pertinent information concerning the site so that an archaeological review could be performed. Following their investigation, the Division of Historical Resources determined that "no significant archaeological and/or historical sites are recorded for or considered likely to be present within the project area." The response was summarized with the following statement: "...the proposed project will have no effect on any sites listed...and may proceed without further involvement with this agency."

2.2.7 SOCIOECONOMICS AND PUBLIC SERVICES

Social and Economic Characteristics

Current Population. Table 2-5 shows the 1980 census population counts for the census tracts which are either partially or wholly within 5 miles of the project site. The area within a 5-mile radius of the project site encompasses census tracts in both Pasco and Hernando Counties. Included are a majority of tract Nos. 312, and 318, and small portions of tract Nos. 313, 317, and 319 in Pasco County; and portions of Hernando County census tract Nos. 87, 100U, 104 and 105. These census tracts are illustrated on Figure 2-12.

The Pasco County resource recovery project site is located within census tract No. 318 in Pasco County. The 1980 census population count for this tract was 8,705. The total 1980 census population of the additional census tracts located partially or wholly within 5 miles of the project site was 28,637.

The total area of the census tracts which are partially within the 5-mile radius of the project is considerably larger than the area actually inside the 5-mile radius.

Projected Population. Projected population for Pasco County through the year 2000 is shown in Table 2-6. The expected population for the year 2000 is 356,418. This projection reflects an increase of 53 percent over the 1985 estimate.

According to the Bureau of Economic and Business Research (BEBR) at the University of Florida (April 1985), of the 67 counties in Florida, Pasco and Hernando Counties are among the fastest growing, and have increased in population more than 150 percent during the period from 1970 to 1980. In comparison, the BEBR reports that the State of Florida population grew by 43.5 percent, and the United States population grew by only 11.45 percent during the same period.

TABLE 2-5

1980 CENSUS TRACT POPULATION^a
PASCO AND HERNANDO COUNTIES

Pasco County		Hernando County	
Census Tract No.	Population	Census Tract No.	Population
312	6,817	87	1,213
313	2,553	100U	764
317	3,323	104	1,571
318	8,705	105	660
319	<u>3,031</u>		
Subtotals	24,429		4,208
TOTAL PASCO AND HERNANDO COUNTIES ^a		28,637	

^a Includes only census tracts partially or wholly within 5 miles of project site.

SOURCES: Hernando County Planning Department. May 7, 1986.
Preliminary Projections. Brooksville, Florida.

Pasco County Planning Department. June 12, 1981.
1980 Census Tracts. New Port Richey, Florida.

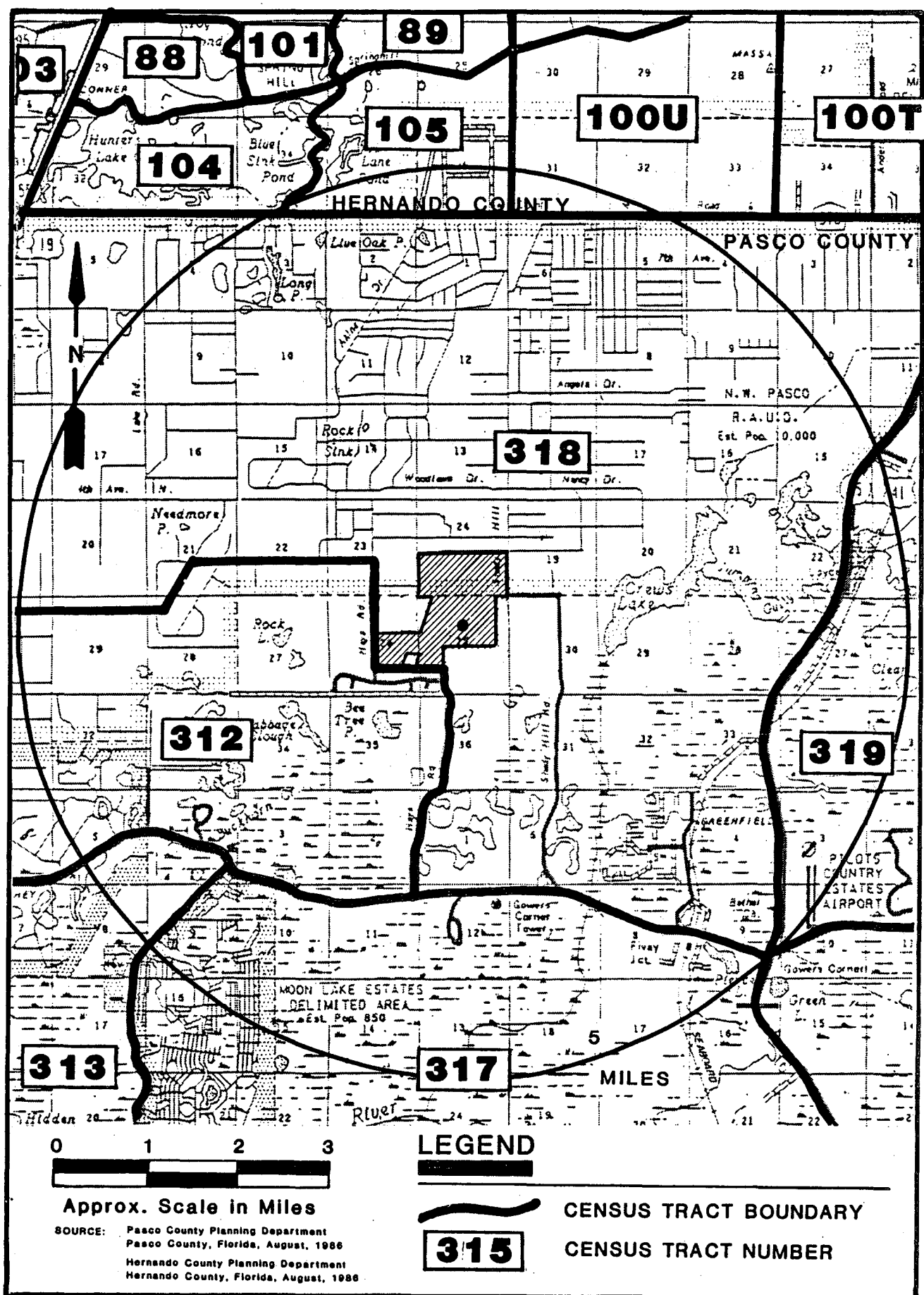


FIGURE 2-12

TABLE 2-6

PROJECTED POPULATION
PASCO COUNTY

	Estimate April 1985	Projections					
		1990	1995	2000	2005	2010	2020
<u>PASCO</u>	233,272						
Low		265,200	286,600	303,000	311,000	309,200	296,400
Medium		279,100	318,400	356,400	388,700	412,200	456,000
High		293,100	350,300	409,900	466,500	515,300	615,500

SOURCE: University of Florida. April 1986. Population Studies Bulletin No. 76. Projections of Florida Population by County, 1985-2020. Bureau of Economic and Business Research. Gainesville, Florida.

Labor Force. The average labor force in Pasco County increased approximately 37 percent during the period from 1980 to August of 1986. This percentage represents 26,681 new workers. During the same period, employment increased approximately 39 percent, representing 26,361 new jobs in the area. Increased employment in the area resulted in a 21 percent decrease in the county's annual average unemployment rate, from 6.6 percent in 1980 to a 5.2 percent average for the first eight months of 1986. Pasco County labor force statistics are shown in Table 2-7.

Employment by Occupation

Employment statistics by occupation are not available for the Pasco County area.

Employment by Industrial Sector. During the last six years in the private sector, the majority of workers in Pasco County have been employed in the retail trade and service industries. The smallest number of jobs was provided by the wholesale trade and agricultural industries. Table 2-8 shows quarterly employment figures for 1985 and the first quarter of 1986 by industrial sector. Table 2-9 shows average monthly employment by industrial sector for the years 1980 through 1984.

Baseline Employment Projections

Baseline employment projections are not available for the Pasco County area.

General Income Characteristics

The average household income for the five census tracts within the 5-mile study area ranges from \$13,438 for census tract 312 to \$19,742 for census tract 319. In census tract 312, 38.2 percent of the households earn less than \$10,000 per year, while only 1.4 percent earn more than \$40,000 per year. The other four tracts follow a similar trend. The general household income statistics are shown in Table 2-10.

TABLE 2-7
LABOR FORCE STATISTICS
PASCO COUNTY

	1980	1981	Annual Average		1984	1985	Average Through August 1986	Percent Change 1980 to August 1986
			1982	1983				
Labor Force	71,685	78,556	82,820	88,032	92,636	95,608	98,366	+37
Employment	66,919	72,825	76,051	80,851	86,740	90,572	93,280	+39
Unemployment	4,766	5,731	6,769	7,181	5,896	5,036	5,086	+7
Unemployment Rate (%)	6.6	7.3	8.2	8.2	6.4	5.3	5.2	-21

SOURCE: Florida Department of Labor and Employment Security. 1986 monthly releases for Florida counties. Labor Force Summary, 1980 to 1985 Annual Averages, and average through August 1986. Bureau of Labor Market Information. Tallahassee, Florida.

TABLE 2-8

EMPLOYMENT BY INDUSTRIAL SECTOR
PASCO COUNTY

Industrial Sector	End of Quarter Employment				
	1st Qtr 1985	2nd Qtr 1985	3rd Qtr 1985	4th Qtr 1985	1st Qtr 1986
<u>PRIVATE INDUSTRY</u>					
Agriculture, Forestry & Fishery	2,114	1,479	1,457	2,065	2,521
Contract Construction	5,154	5,218	5,192	4,996	4,988
Manufacturing	4,107	3,571	3,669	3,599	3,897
Transportation, Communications, & Public Utilities	2,029	2,053	2,148	2,149	2,116
Wholesale Trade	1,164	1,091	1,093	1,112	1,031
Retail Trade	13,212	12,836	12,788	14,362	14,412
Finance, Insurance & Real Estate	2,819	2,819	2,880	2,897	2,925
Services	11,528	11,130	11,143	11,304	11,806
Nonclassifiable	48	19	5	—	—
<u>GOVERNMENT</u>					
Federal	453	472	481	503	507
State	425	436	447	482	698
Local	5,681	5,742	5,748	6,054	6,003

SOURCE: Florida Department of Labor and Employment Security. 10/23/85; 1/23/86; 4/19/86; 7/19/86; 9/6/86. Quarterly County Report[s] on Employment and Wages Covered Under the Florida Unemployment Compensation Law. Pasco County, Florida. Edited ES-202. Bureau of Research and Information. Tallahassee, Florida.

TABLE 2-9

AVERAGE MONTHLY EMPLOYMENT BY INDUSTRIAL SECTOR
PASCO COUNTY

Industrial Sector	1980	1981	1982	1983	1984
<u>PRIVATE INDUSTRY</u>					
Agriculture, Forestry & Fishery	2,743	2,455	2,496	2,386	1,927
Contract Construction	3,434	3,533	3,012	3,992	4,780
Manufacturing	3,121	3,006	2,975	3,173	3,666
Transportation, Communications, & Public Utilities	1,541	1,652	1,677	1,770	1,815
Wholesale Trade	743	923	848	919	1,018
Retail Trade	8,772	9,552	10,751	11,017	11,960
Finance, Insurance & Real Estate	1,928	2,112	2,138	2,302	2,575
Services	5,823	7,087	8,483	9,771	10,602
Other Private	79	7	13	30	38
<u>GOVERNMENT</u>					
Federal	394	380	399	416	439
State	282	309	325	359	388
Local	6,027	5,558	5,104	5,011	5,212

SOURCES: Florida Department of Labor and Employment Security. 1980; 1981; 1982; 1983; 1984. Employment and Payrolls of Workers Covered by the Florida Unemployment Compensation Law and Unemployment Compensation for Federal Employees. Pasco County, Florida. Division of Labor, Employment and Training. Tallahassee, Florida.

Florida Department of Labor and Employment Security. 10/23/85; 1/23/86; 4/19/86; 7/19/86. Quarterly County Report[s] on Employment and Wages Covered Under the Florida Unemployment Compensation Law. Pasco County, Florida. Edited ES-202. Bureau of Research and Information. Tallahassee, Florida.

TABLE 2-10
 AVERAGE HOUSEHOLD INCOME BY CENSUS TRACT
 PASCO COUNTY
 1980 U.S. CENSUS

Census Tracts	Average Household Income, 1979	Number of Households	Percentage of Households With Income			
			Under \$10,000	\$10,000- \$19,999	\$20,000- \$39,999	\$40,000- and over
312	\$ 13,438	2,494	38.2	41.4	19.0	1.4
313	16,768	989	42.7	29.2	22.5	5.6
317	16,833	1,216	29.5	44.0	20.8	4.9
318	14,631	2,714	39.0	36.6	22.0	2.4
319	<u>19,742</u>	<u>1,063</u>	<u>35.9</u>	<u>32.0</u>	<u>23.3</u>	<u>8.7</u>
Totals		8,476	37.0	38.0	21.0	4.0

SOURCE: 1980 U.S. Census via St. Petersburg Times, Research Department

Source of Income. As shown in Table 2-11, income in Pasco County during the period from 1979 to 1984 was generated primarily from wages and salaries.

Average Wages and Salaries. Table 2-12 shows Pasco County's total annual payroll by industrial sector for the years 1980 through 1985. As shown in the table, the retail trades provided the majority of Pasco County's wages and salaries in 1980. However, since 1981, the service industries have provided the largest share, totalling approximately 30 percent of total annual payroll. Retail trades have provided the second largest share during the same period, contributing approximately 23 percent of total annual payroll. Table 2-13 shows average salary income in Pasco County by industrial sector for 1985.

Baseline Income Projections. Baseline income projections are not available for the Pasco County area.

Existing Housing Stock. Housing statistics are shown in Table 2-14. Census tract 317 has the lowest proportion of occupied housing with 78 percent, while census tract 319 has the highest proportion with 92 percent.

Housing Costs. The average housing values for those census tracts partially or wholly within 5 miles of the site are shown in Table 2-14.

Housing. University of Florida BEBR housing estimates (February 1986) as of April 1, 1985 showed 4,444,889 permanent resident, occupied households in Florida. Of this total, Pasco County accounts for 100,186 households, and Hernando County contributes 27,711. In comparison, the number of Pasco County households in April of 1980 was estimated at 81,346, and in Hernando County, estimated households totaled 17,735. These figures indicate a 23 percent increase in Pasco County households, and a 56 percent increase in Hernando County households over a 5-year period. The housing occupancy and type for Pasco County are shown in Table 2-14.

Building Activity. Single-family housing units represented the largest proportion of building activity in Pasco County during 1985. Table 2-15

TABLE 2-11

PERSONAL INCOME AND DERIVATION OF TOTAL PERSONAL INCOME
PASCO COUNTY

Item	(thousands of dollars)					
	1979	1980	1981	1982	1983	1984
<u>TOTAL PERSONAL INCOME</u>						
Non-farm	1,162,361	1,418,092	1,703,036	1,891,523	2,084,402	2,324,776
Farm	32,558	34,301	31,889	30,982	29,117	30,544
Per Capita Personal Income	6,479	7,372	8,378	8,869	9,392	10,463
<u>DERIVATION OF TOTAL PERSONAL INCOME</u>						
Total Earnings by Place of Work	397,095	472,326	534,548	587,944	682,399	775,956
Less: Personal Contributions for Soc. Sec.	23,634	28,177	34,910	40,191	46,571	53,922
Plus: Residence Adjustment	186,194	192,039	210,392	213,429	193,515	197,320
Net Earnings	559,655	636,188	710,030	761,182	829,343	919,354
Plus: Dividends, Interest & Rent	308,485	405,907	530,773	584,622	647,407	755,256
Plus: Transfer Payments	326,779	410,298	494,122	576,701	636,769	680,710
<u>COMPONENTS OF EARNINGS</u>						
Wages & Salaries	295,270	364,025	421,957	465,763	536,949	607,058
Other Labor Income	29,919	33,842	39,655	47,360	57,544	66,682
Proprietors' Income	71,906	74,459	72,936	74,821	87,906	102,216

SOURCE: Florida Department of Labor and Employment Security. April 1986. Personal Income by Major Source and Earnings by Major Industry. Pasco County, Florida. Regional Economic Information System. Bureau of Economic Analysis. Tallahassee, Florida.

TABLE 2-12

TOTAL ANNUAL PAYROLL BY INDUSTRIAL SECTOR
PASCO COUNTY

Industrial Sector	(thousands of dollars)					
	1980	1981	1982	1983	1984	1985
<u>PRIVATE INDUSTRY</u>						
Agric., Forestry & Fishery	\$19,183	\$20,476	\$20,331	\$20,890	\$18,722	\$18,532
Contract Construction	40,337	43,626	38,666	52,856	65,924	76,557
Manufacturing	37,622	39,118	41,094	45,968	54,277	58,548
Trans., Comm., & Pub. Util.	23,885	27,889	30,173	33,357	34,858	40,598
Wholesale Trade	9,181	11,518	11,529	12,931	15,131	17,758
Retail Trade	67,716	77,874	90,155	99,704	112,668	127,052
Finance, Ins. & Real Estate	21,784	25,195	26,846	30,984	36,768	42,548
Services	61,755	85,700	113,477	137,287	153,730	163,918
Other Private	508	103	243	478	485	136
<u>GOVERNMENT</u>						
Federal	\$7,086	\$8,267	\$8,657	\$9,500	\$10,686	\$12,130
State	3,225	3,772	4,237	4,760	5,167	5,833
Local	6	60,916	64,239	69,581	79,437	87,908

SOURCES: Florida Department of Labor and Employment Security. 1980; 1981; 1982; 1983; 1984. Employment and Payrolls of Workers Covered by the Florida Unemployment Compensation Law and Unemployment Compensation for Federal Employees. Pasco County, Florida. Division of Labor, Employment and Training. Tallahassee, Florida.

Florida Department of Labor and Employment Security. 10/23/85; 1/23/86; 4/19/86; 7/19/86. Quarterly County Report[s] on Employment and Wages Covered Under the Florida Unemployment Compensation Law. Pasco County, Florida. Edited ES-202. Bureau of Research and Information. Tallahassee, Florida.

TABLE 2-13

AVERAGE SALARY INCOME BY INDUSTRIAL SECTOR FOR 1985
PASCO COUNTY

Industrial Sector	Average Monthly Employment	Total Annual Payroll (rounded to nearest hundred thousand)	Average Annual Salary
<u>PRIVATE INDUSTRY</u>			
Agric., Forestry & Fishery	1,771	\$ 18,532,000	\$ 10,464
Contract Construction	5,154	76,557,000	14,854
Manufacturing	3,770	58,548,000	15,530
Trans., Comm., & Pub. Util.	2,073	40,598,000	19,584
Wholesale Trade	1,109	17,758,000	16,013
Retail Trade	13,125	127,052,000	9,680
Finance, Ins. & Real Estate	2,833	42,548,000	15,019
Services	11,229	163,918,000	14,598
Other Private	35	136,000	3,886
<u>GOVERNMENT</u>			
Federal	476	12,130,000	25,483
State	442	5,833,000	13,197
Local	5,491	87,908,000	16,009

SOURCE: Florida Department of Labor and Employment Security. 10/23/85; 1/23/86; 4/19/86; 7/19/86. Quarterly County Report[s] on Employment and Wages Covered Under the Florida Unemployment Compensation Law. Pasco County, Florida. Edited ES-202. Bureau of Research and Information. Tallahassee, Florida.

TABLE 2-14

PASCO COUNTY HOUSING
AVERAGE VALUE, HOUSING OCCUPANCY, AND TYPE

Tract	Percent Occupied	Year- Round Housing Units	Occupied Housing Units (Year-Round Units)			Units in Structure (Year-Round Housing)				Vacant Housing Units (Year-Round Housing)				Average Value
			Total Occupied	Owner Occupied	Renter Occupied	One Unit	2 to 9 Units	10+ Units	Mobile Home	Total	for Sale	for Rent	Other Vacancy	
312	86	2,865	2,453	2,129	324	1,643	76	21	1,125	412	62	33	317	\$47,000
313	83	1,219	1,011	932	79	957	41	1	220	208	6	20	182	52,298
317	78	1,573	1,225	1,117	108	1,235	34	3	301	348	21	36	291	50,909
318	86	3,247	2,789	2,370	419	1,969	107	5	1,166	458	68	131	259	42,085
319	92	1,155	1,063	871	192	687	57	1	410	92	12	15	65	48,278

SOURCE: St. Petersburg Times and Evening Independent, Research Department Computer Report, Housing Occupancy and Type, 1980 Census Tape; and Average Value housing tables.

TABLE 2-15
BUILDING PERMITS BY TYPE, CALENDAR YEAR 1985
PASCO COUNTY

Type of Unit	Number of Permits Issued
<u>RESIDENTIAL:</u>	
1-Family House	2,413
2-Family Buildings	92
3- and 4-Family Buildings	233
5- or more Family Buildings	1,650
Moved or Relocated	19
Mobile Homes	1,981
Nonhousekeeping Residential:	
Motels	1
Hotels	0
Other Shelter	0
<u>NONRESIDENTIAL:</u>	
Amusement & Recreational	52
Churches & Religious	4
Industrial Buildings	268
Parking Garages	2
Residential Garages & Carports	883
Service Station & Repair	24
Hospital & Institutional	19
Offices, Banks, & Professional	187
Public Works & Utilities	6
Schools & Educational	2
Stores & Other Mercantile	123
Other Nonresidential Structures	2,339
Additions, Alterations & Conversions:	
Housekeeping Residential	6,179
All other	82
Demolition	12
Miscellaneous	3,545
TOTAL	20,555

SOURCE: Pasco County Building Department. Analysis of Building Permits. Calendar year 1985. Central Permitting, Land O' Lakes, New Port Richey, Dade City. New Port Richey, Florida.

shows the number of building permits issued by the county for both residential and nonresidential structures during 1985. According to the Pasco County Planning Department, new housing developments within a 5-mile radius of the project site will occur primarily south of the site.

Area Public Service and Utilities

Education. Schools within the 5-mile area of the project site include:

<u>High Schools</u>	<u>Junior High Schools</u>	<u>Elementary Schools</u>
Hudson High	Proposed New Middle School	Moon Lake Elementary
		Northwest Elementary
		Shady Hills Elementary

None of these schools are within one mile of the project site.

Transportation. The site is bounded on the west and partially on the south by Hays Road. North of the site, Bluebird Lane runs parallel to the property boundary line. On the east side of the site, Shady Hills Road abuts the north half of the site. For more information, see Section 2.3.9, Other Environmental Features; and Section 5.9, Other Plant Operation Effects.

Fire Fighting Facilities. The project site is within the area served by Pasco County Station #20 at No. 4 Little Ranch Road. This station is located 2 miles north of the site.

Police Protection. The site is in the Adam 5 sector of Pasco County. The sheriff's headquarters is located at 8700 Citizens Drive, New Port Richie.

Recreation Facilities. As addressed in Section 2.2.1, Governmental Jurisdictions, Shady Hills Park is located slightly north of the site, and Concourse Park is 2 miles south of the site.

Electricity and Gas. There is a 295-foot Florida Power Corporation easement which bisects the site and runs roughly north/south. The Florida

Power Corporation Hudson Substation is situated along the south property line of the site. Figure 2-3, Boundary Survey shows details of this easement. There are no gas pipelines in service in west Pasco County.

Water Supply Facilities. Potable water service to the site will be provided by an onsite well that will also be used as a backup process water source.

Due to the rural nature of the area, there have been few water quality analyses done in the vicinity of the proposed Pasco County landfill/ashfill. Water quality testing at the Cross Bar Ranch Well Field 5 miles east of the site indicates the surficial and upper Floridan aquifers contain calcium bicarbonate type water that meets Florida water quality standards for municipal supply (Florida Administrative Code Chapter 17-22). The water quality within the upper Floridan aquifer is uniform. Salinity begins to increase at a depth of 960 feet near the contact with the middle confining unit (Hutchinson, 1985).

Table 2-16 shows the groundwater quality found within the Cross Bar Ranch Well Field. Water quality samples are taken bimonthly at the SR 52 monitor well (lat 28°20'09", long 82°37'38") near Hudson (1.6 miles west of SR 587) by U.S. Geological Survey personnel. The monitor well is approximately 5 miles south/southwest of the landfill/ashfill site. The Floridan aquifer monitor well is cased to 59 feet with a total depth of 73 feet. The water quality appears to be excellent.

Shallow and deep aquifer background water quality is being monitored onsite by four well pairs. Each well pair consists of a 2-inch diameter well (shallow) and a 4-inch diameter well (deep). Table 2-17 lists the laboratory results of the first samples taken on May 7, 1987, at monitoring well 4MW3.

All parameters analyzed for well 4MW3 showed results below the maximum concentration limits (MCL). However, the level of mercury (Hg) detected

TABLE 2-16

CHEMICAL ANALYSES OF GROUNDWATER IN THE CROSS BAR RANCH WELL FIELD

Hydrologic Unit	Surficial _a Aquifer	Upper Floridan _b Aquifer	Middle Confining _c Unit
Depth of well (feet)	25	688	1,260
Depth of casing (feet)	22	146	1,235
Date of sample	78/79	12/14/82	8/9/79
Bicarbonate (mg/L)	72	227	396
Chloride (mg/L)	8	11.1	7,250
Sulfate (mg/L)	4	1.7	3,920
Calcium (mg/L)	13	71.5	848
Magnesium (mg/L)	6	2.7	462
Sodium (mg/L) ^d	8	70	4,800
Iron (mg/L)	2	.2	15
Dissolved solids (mg/L)	85	215	18,930

PRODUCTION WELLS

Well	Dissolved Solids Concentration _e (mg/L)	Well	Dissolved Solids Concentration _e (mg/L)
CB-1	219	CB-10	197
CB-2	219	CB-11	188
CB-3	219	CB-12	190
CB-4	221	CB-13	190
CB-5	226	CB-14	204
CB-6	201	CB-15	225
CB-7	190	CB-16A	181
CB-8	202	CB-17	193
CB-9	210		

^a Estimated from partial analyses of samples from 14 wells.

SOURCE: Leggette, Brashears, and Graham, Inc. 1979. Appendix VII, Table 5.

^b Average of samples from 17 production wells reported by the West Coast Regional Water Supply Authority in the December 1982 monthly report for Cross Bar Ranch well field.

^c Sample from deep monitor well B-1.

SOURCE: Leggette, Brashears, and Graham, Inc. 1980. Appendix V, Table 5.

^d Sodium concentrations were estimated as residual of the ionic balance:
 $(\text{HCO}_3 + \text{Cl} + \text{SO}_4) - (\text{Mg} + \text{Ca}) = \text{Na}.$

^e Data for wells sampled on 10/27/81 supplied by the West Coast Regional Water Supply Authority.

TABLE 2-17

MONITOR WELL 4MW3
WATER QUALITY

Date & Time Collected 5/7/87, 11:50 A.M.
 Date & Time Received 5/7/87
 Collector Joan Hallgren of Thornton Laboratories, Inc.
 pH 7.38
 Conductivity (umhos/cm) 270
 Temperature, °C 22

Drinking Water Chemical Analysis					
Laboratory ID #84147					
Primary Standards					
Parameter	MCL(a)	Result(b)	Parameter	MCL(a)	Result(b)
<u>Inorganics</u>			<u>Organics</u>		
Arsenic (As)	0.05	<0.005	Endrin	0.0002	<0.0001
Barium (Ba)	1.0	<0.03	Lindane	0.004	<0.0002
Cadmium (Cd)	0.01	<0.002	Methoxychlor	0.1	<0.005
Chromium (Cr)	0.05	<0.005	Toxaphene	0.005	<0.001
Lead (Pb)	0.05	<0.01	2, 4-D	0.1	<0.02
Mercury (Hg)	0.002	0.0016	2, 4, 5-TP	0.01	<0.002
Nitrate (N)	10	0.05	Trihalomethanes		
Selenium (Se)	0.01	<0.005	Chloroform	—	<0.01
Silver (Ag)	0.05	0.007	Bromodichloromethane	—	<0.001
Sodium (Na)	160	2.9	Dibromochloromethane	—	<0.001
Fluoride (F)		<0.1	Bromoform	—	<0.001
Turbidity		1.2	Total THM	0.10	<0.001
Radionuclides			Microbiological		
Gross Alpha		1.2+/-0.7	Total Coliform		
			MPN/100cc	1	<3
<u>Secondary Standards</u>					
Calcium (Ca)	—	58	Corrosivity		
Chloride (Cl)	250	8.3	Total Hardness	—	150
Color (Pt-Co			Total		
Units)	15	2	Alkalinity (c)	—	134
Copper (Cu)	1	<0.005	N.C.H. (c)	—	16
Foaming Agents	0.5	<0.02	Bicarbonate (HCO ₃)	—	163
Hydrogen Sulfide	—	0.82	Carbon Dioxide (CO ₂)	—	2.6
Iron (Fe)	0.3	0.095	Bicarbonate (c)	—	134
Magnesium (Mg)	—	1.4	Carbonate (c)	—	-0-
Manganese (Mn)	0.05	0.013	Hydroxide (c)	—	-0-
Odor (Threshold					
Units)	3	-0-	pH Value	—	7.6
pH Value	6.5 min.	8.0	Saturation Index	<-0.2	
Sulfate (SO ₄)	250	2.6		>+0.2	0.4

TABLE 2-17 (Continued)

MONITOR WELL 4MW3
WATER QUALITY

Drinking Water Chemical Analysis					
Laboratory ID #84147					
<u>Secondary Standards</u>					
Parameter	MCL(a)	Result(b)	Parameter	MCL(a)	Result(b)
Total Dissolved Solids	500	176	Stability Index		7.2
Zinc (Zn)		<0.005	Interpretation		Scale Forming

Analysis	Result, ug/L	Detection Limit ug/L
Trichloroethylene	BDL*	1
Tetrachloroethylene	BDL	1
Carbon Tetrachloride	BDL	1
Vinyl Chloride	BDL	1
1,1,1-Trichloroethane	BDL	1
1,2-Dichloroethane	BDL	1
Benzene	BDL	1
Ethylene Dibromide	BDL	0.02

*Below Detection Limit

Analysis according to approved methods listed in Chapter 17-22.

- (a) Quality standards, Chapter 17-22, 104 FAC.
- (b) All results are expressed as mg/L except as noted.
- (c) Results expressed as mg/L CaCO_3 .

SOURCE: Thornton Laboratories, Inc. 1145 East Class Street, Tampa, Florida 33601-2880.
Marine, Analytical and Environmental Services.

was only 0.0002 milligram below the MCL. Though the recorded level is considered safe for drinking, the presence of mercury in the groundwater was investigated further.

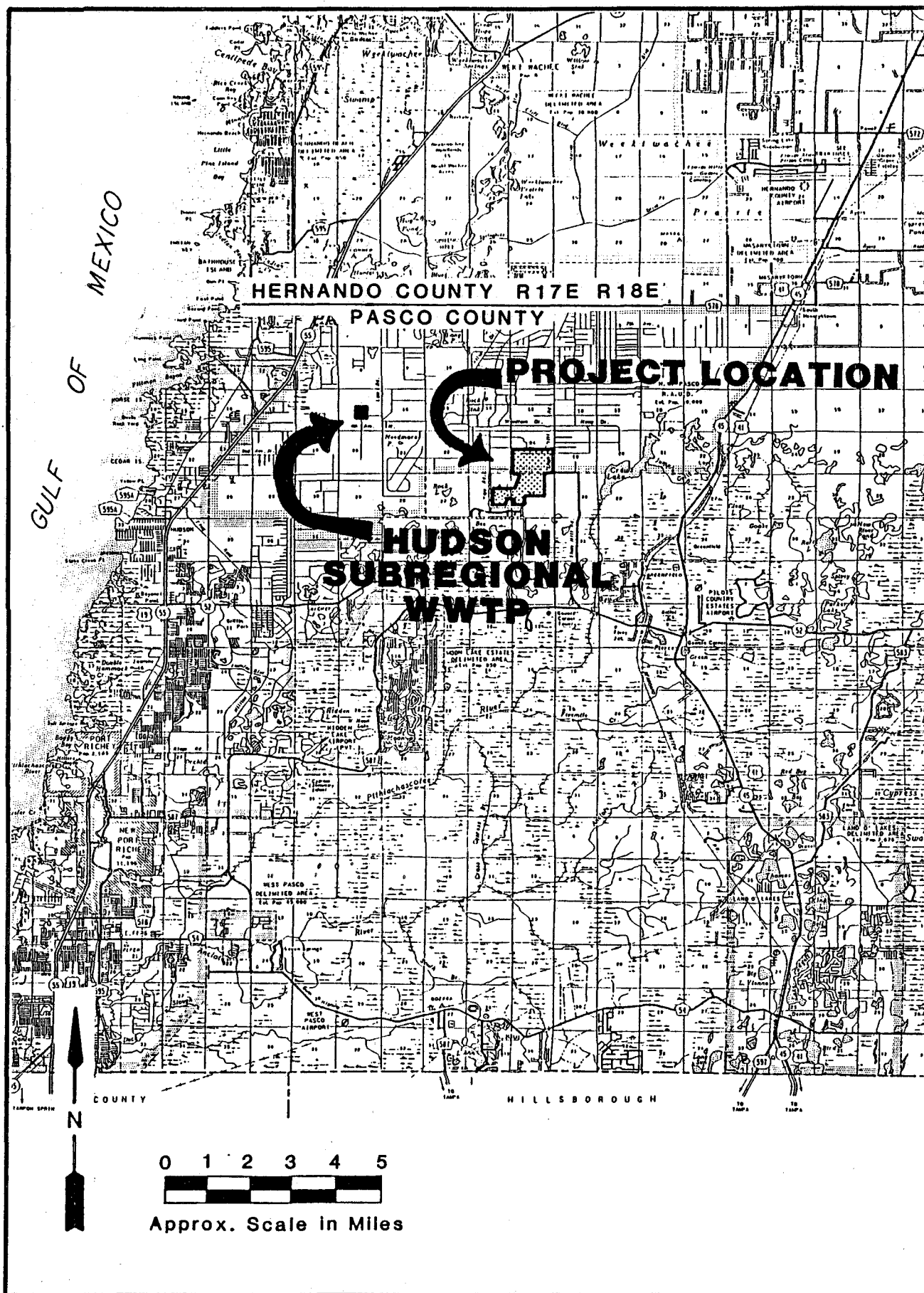
A second sampling was taken on October 7, 1987, at all monitor wells onsite and at a residential site near the east property line.

The results of the second analysis showed insignificant levels of mercury for well 4MW3 as well as all other wells tested. Copies of the test results are provided in Appendix 10.5.

There is no evidence of any pollution source within one mile of the proposed landfill/ashfill. The water supply well at the landfill/ashfill will be tested for primary and secondary water quality standards when it is completed.

Treated wastewater from the future Hudson Subregional Wastewater Treatment Plant (WWTP) will be used for the cooling water requirements of the project. Construction of the 9-mgd facility is scheduled to begin in January 1988, and the plant is expected to be on-line before start-up of the resource recovery facility. Construction will be divided into three phases. Phase II and Phase III are scheduled to start-up in 1994 and 2003, respectively. The first phase will have a flow capacity of 3.0 mgd; the second and third phases will each add 3.0 mgd capacity. In addition, a one-mgd capacity well will be installed on the site and will be used as a backup water supply.

Sewage Treatment Facilities. The Hudson Subregional WWTP will receive the cooling water, service water, and sanitary water from the resource recovery facility. The final design of the wastewater treatment plant is complete. Construction is scheduled to begin in November of 1987, following a 6-month review and bidding period. Completion of phase one construction is expected during the last 6 months of 1989. The location of the treatment plant is shown on Figure 2-13.



Pasco County Resource Recovery Program
Location of Nearest Treatment Facility

Solid Waste Disposal. Pasco County currently generates an estimated 660 tons per day (tpd) of solid waste, or approximately 240,000 tons per year. This quantity is expected to increase to approximately 1,160 tpd, or 425,000 tons per year in the year 2010.

The East Pasco County Landfill is the only active sanitary landfill serving Pasco County. The landfill is located in the eastern portion of Pasco County, east of Dade City, and is owned and operated by Pasco County (see Figure 2-14). The East Pasco County Landfill receives approximately 460 tpd of solid waste.

Solid waste collection in Pasco County is performed by several private collection firms which hold licenses under the Pasco County solid waste ordinance. Residents also haul their own wastes to the landfill. There are two private transfer stations operating in the county.

During recent years, Pasco County has considered alternatives to sanitary landfilling. There has been an interest in solid waste disposal with emphasis on the concept of resource recovery. The siting problems and environmental dangers associated with sanitary landfilling in Pasco County stimulated the development of an alternative primary disposal method—a resource recovery system.

In addition to providing power from the combustion of refuse, a resource recovery system reduces the volume of refuse material to be landfilled, and prolongs the life of the site. By selecting resource recovery, the county is protecting its groundwater and surface water resources, while providing a means of long-term solid waste disposal.

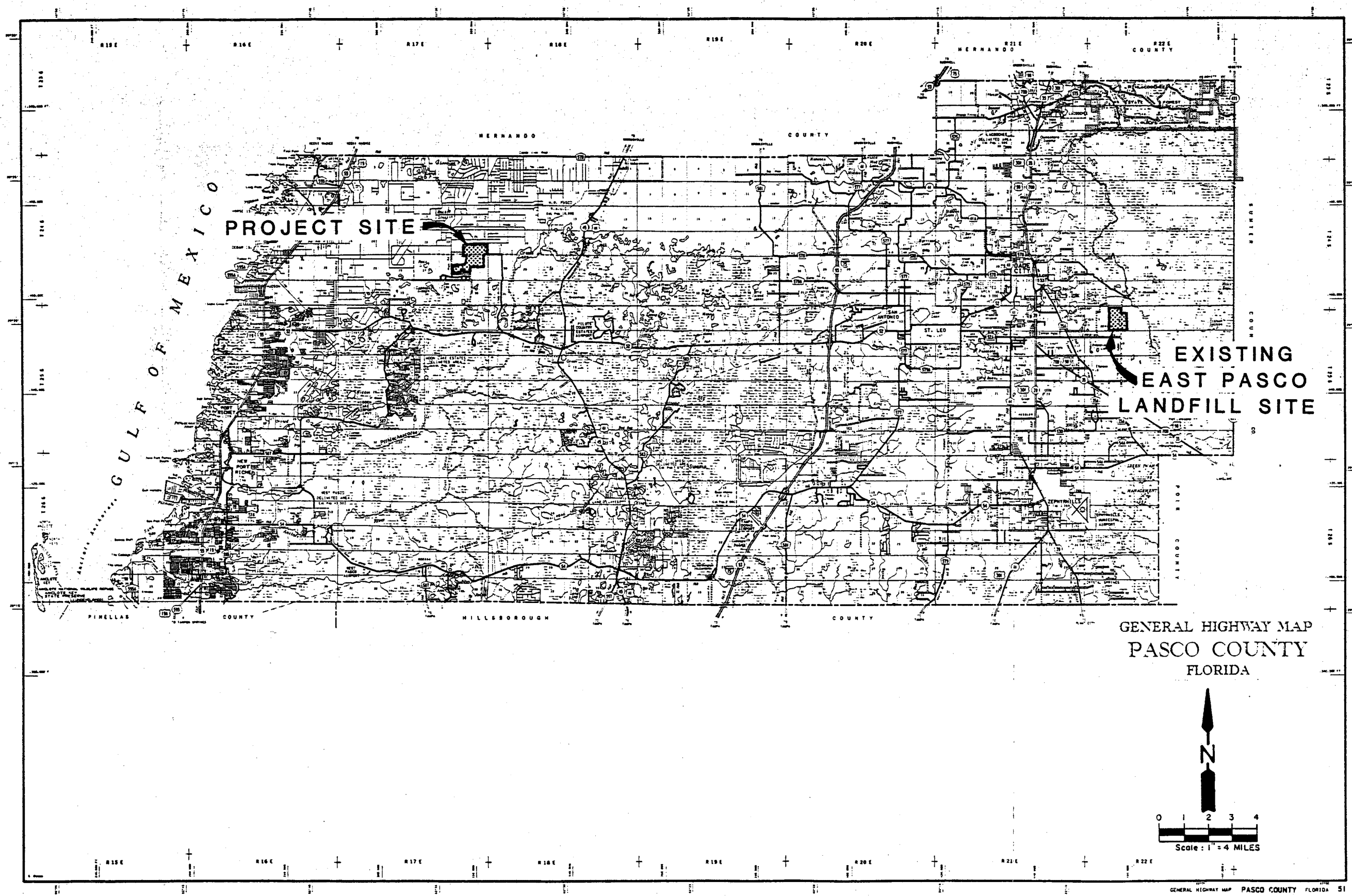
2.3 BIO-PHYSICAL ENVIRONMENT

2.3.1 GEOHYDROLOGY

The following subsections describe the major geologic features of the site. The geotechnical studies performed to determine the structural and

Image Quality

As you review the next group of images, Please note that the original documents were of poor quality.



Pasco County Resource Recovery Program
Existing Landfill Location

FIGURE 2-14

environmental suitability of the site are also discussed, including identification and justification of the sampling pattern, sampling method, and analytic techniques.

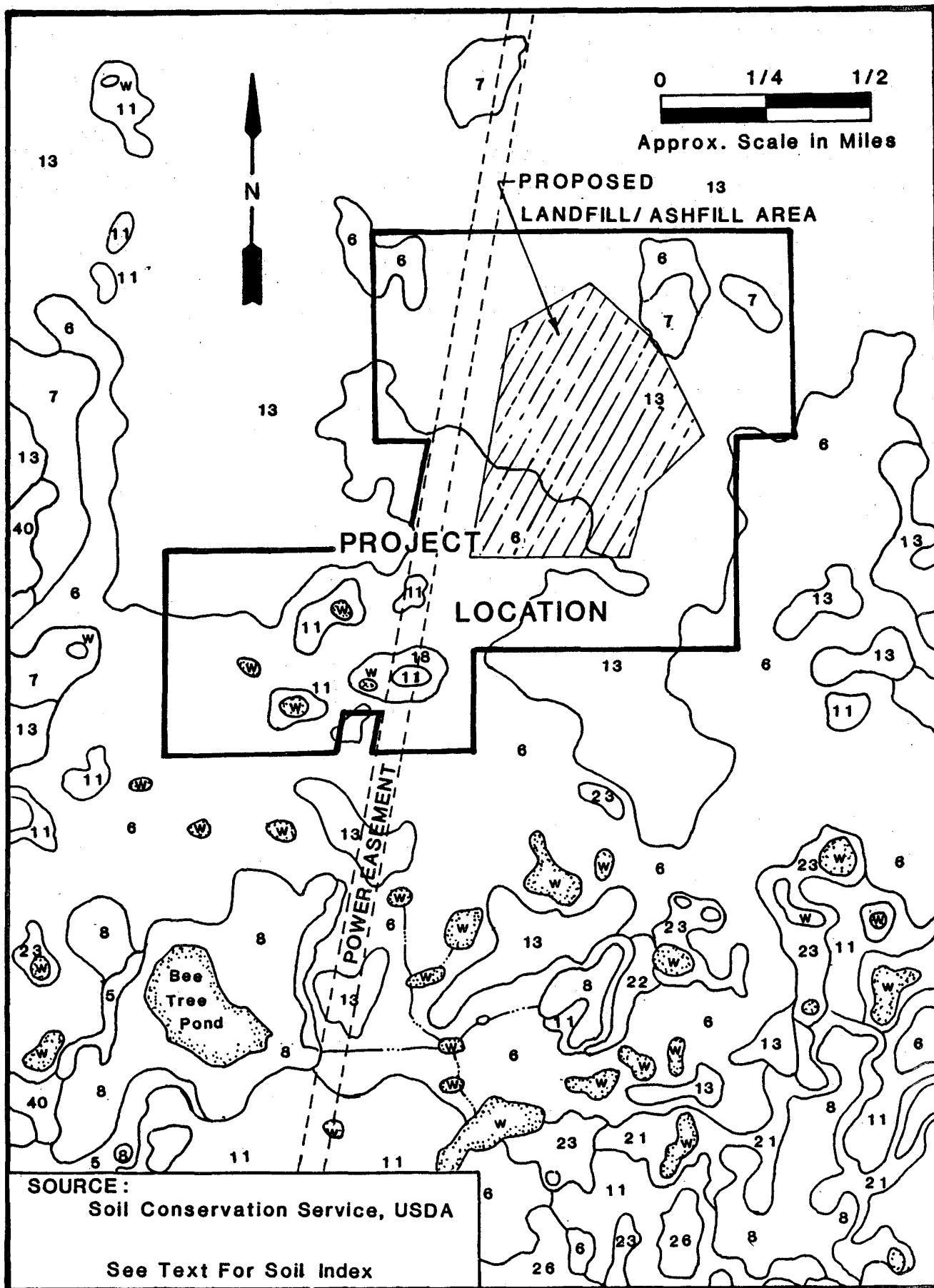
The facility will not incorporate holding or cooling ponds, ash ponds, exposed flue gas desulfurization sludge or coal piles, or any other potential contamination sources.

Geologic Description of the Site

The United States Department of Agriculture (USDA) Soil Conservation Service (SCS) Soil Survey of Pasco County, Florida defines two major surficial soil types on the site: (13) Candler fine sand and (6) Tavares sand. A delineation of soil types onsite and adjacent to the site appears on Figure 2-15.

INDEX TO FIGURE 2-15 SOILS MAP

5	Myakka fine sand
6	Tavares sand
7	Sparr fine sand
8	Sellers mucky loamy fine sand
11	Adamsville fine sand
13	Candler fine sand
18	Electra variant fine sand
21	Smyrna fine sand
22	Basinger fine sand
23	Basinger fine sand, depressional
26	Narcoossee fine sand
40	Paisly fine sand



Pasco County Resource Recovery Program
Soils Map

FIGURE 2-15

Approximately one half of the soil onsite is Candler fine sand, nearly level to gently sloping, and excessively drained. Flooding in this soil is almost non-existent. Permeability is very rapid in the upper 50 inches of the soil ($K_v \Rightarrow 20$ in/hr) and rapid below 50 inches ($K_v = 6-20$ in/hr). The water table is deeper than 6 feet below the surface throughout the year.

Soils in the central portion of the site are primarily Tavares sand. This soil is nearly level to gently sloping and moderately well drained. The soil is sand to a depth of 80 inches or more. Flooding in this soil is rare. The water table is at a depth of 40 to 60 inches for 6 to 12 months of the year, and below 60 inches during very dry periods. Permeability is very rapid throughout the depth of the soil ($K_v \Rightarrow 20$ in/hr).

Adamsville fine sand is found in the wetland areas on the site. This nearly level, somewhat poorly drained soil is on low broad flats that are less than 2 feet higher in elevation than the adjacent sloughs. Under natural conditions, the water table is at a depth of 20 to 40 inches for 2 to 6 months of the year, but it may rise to within 20 inches of the surface for less than 2 weeks during very wet seasons. The water table recedes to a depth of more than 40 inches during dry periods. In this soil, available water capacity is low to very low. Permeability is rapid ($K_v = 6-20$ in/hr).

In the Phase 1 Geotechnical/Hydrogeologic Summary Report prepared by Jammal & Associates (1986), it was concluded that several areas on the site contain material that is considered suitable for daily cover. The report stated that it would be necessary to obtain clayey material from offsite for use as final cover. According to the Jammal report, the majority of clay materials outside the landfill/ashfill area are highly plastic and, if used for final cover, these materials may crack during drying and compaction. Suitable offsite material will be used for the final cover.

The project site is situated in a relatively flat section of the Pamlico Terrace of the Gulf Coastal Lowlands physiographic province with greater relief to the east and northeast. Numerous lakes and ponds are present south of the site, and the relatively large, linear Crews Lake is located

about 1.5 miles east of the site. The physiographic setting is further discussed in Section 2.1 of the Jammal & Associates summary report (1987) (Appendix 10.9).

The study area stratigraphy was prepared using several published sources for reference. Site stratigraphy is summarized on Figure 2-16 and Table 2-18. The table includes series names, stratigraphic units, hydrogeologic units, approximate thicknesses, and hydrogeologic characteristics. The information provided is a summary of well data collected from many areas throughout Pasco and Hernando Counties. The formation thicknesses and depths are consistent in the two counties, with the exception of the coastal areas from Hudson, in Pasco County, to Bayport, in Hernando County, where the upper formations are thin. The principal formations in Pasco County are a series of limestones and dolostones mantled by relatively thin sand and clay deposits (15 to 100 feet thick).

The shallow and intermediate depth geologic units expected to be beneath the study area range in age from Recent to Eocene, and include (youngest to oldest): surficial sands and clay, the Hawthorn Formation, the Tampa Limestone, the Suwannee Limestone, the Ocala Limestone, and the Avon Park Formation.

The uppermost geologic deposit, the Hawthorn Formation, includes all deposits of Miocene age which are younger than the Tampa Limestone. The surficial sands and clays are undifferentiated, with the lower portion of the deposits generally assigned to the Hawthorn Formation. The Hawthorn Formation in this area consists predominantly of green to blue sandy clay and clayey sand. The top of the Hawthorn Formation is generally encountered between 30 and 50 feet below ground surface in the area; however, it is relatively thin and may be absent in some sections of northern Pasco County.

Beneath the Hawthorn Formation in the Pasco County area lies the Tampa Limestone. The Tampa Limestone is commonly a hard, dense, gray, white or tan sandy limestone which is generally fossiliferous, although some parts

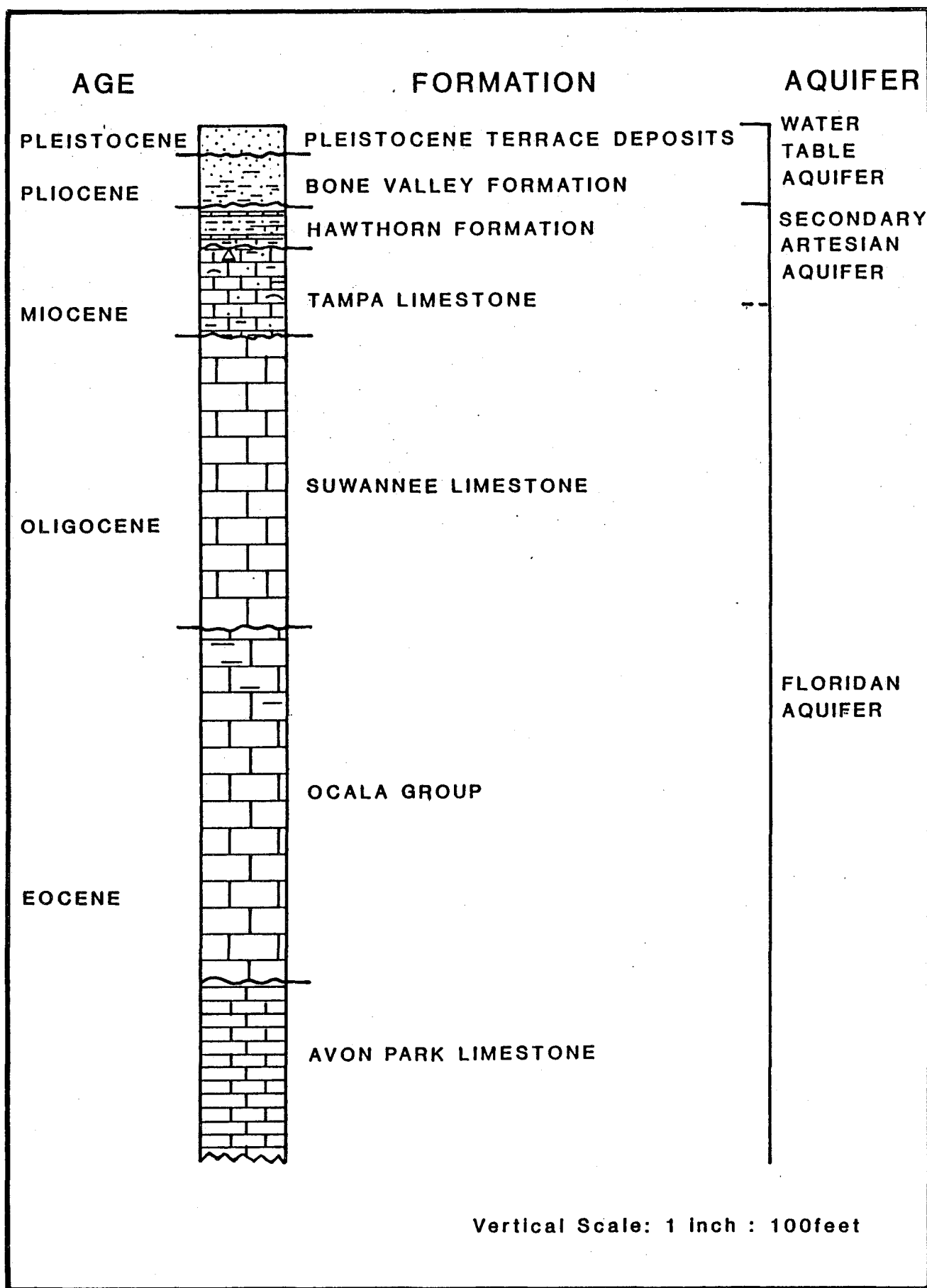


TABLE 2-18

HYDROGEOLOGIC FRAMEWORK

Series	Stratigraphic Unit	Hydrogeologic Unit	Approximate Thickness (feet)	Lithology and Hydrogeologic Characteristics	Average Depth Below Surface (feet)
Holocene Pleistocene Pliocene	Surficial sand and clay	Surficial aquifer	60	Marine and non-marine unconsolidated quartz sand, clay, and shells. Wells yield less than 20 gal./min. Excellent water quality. Unit is cased off in production wells.	30
Miocene	Hawthorn Formation	Upper confining unit	30	Clay with traces of sand and silt. Retards downward movement of water	70
	Tampa Limestone		70	from the surficial to Upper Floridan aquifer.	130
Oligocene	Suwannee Limestone	Upper Floridan aquifer	220	Limestone and dolomite. Production wells yield up to 3,000 gal./min.	260
Eocene	Ocala Limestone		300	Water quality is good. Upper 600 feet are tapped by production wells. Water levels are affected by regional pumping for irrigation and municipal supply.	500
	Avon Park Formation				
		Middle confining unit	300	Limestone and dolomite with intergranular gypsum and anhydrite. Extremely low permeability. Water quality is poor.	1,200

SOURCE: Florida Department of Natural Resources. 1972. Bulletin No. 54. Part I, Suwannee Limestone in Hernando and Pasco Counties, Florida. Part II, Petrography of the Suwannee Limestone. Tallahassee, Florida.

are crystalline and dolomitic. It is estimated that the depth to this formation in the vicinity of the project site is 50 to 70 feet below ground level.

The Suwannee Limestone includes all deposits of Oligocene age. The upper part of the Suwannee is generally a cream-white to tan, soft to hard, granular, porous limestone with some beds of crystalline and dolomitic limestone. The lower part of the Suwannee is generally tan to gray, is more crystalline and/or dolomitic, contains fewer fossils, and is generally harder. Most domestic and many irrigation wells produce from the lower Suwannee Limestone.

The Ocala Formation is of Eocene age and consists of highly fossiliferous, soft, chalky cream, tan, and grayish-tan limestone in the upper portion. The lower portion is similar to the upper, except that it contains beds of brown to tan hard crystalline dolomite and dolomitic limestone.

The Avon Park Limestone, generally found at depths greater than 600 feet, is of Eocene age. Lithologically, it ranges from white to tan coquinooid or granular soft limestone to dark brown, hard, crystalline dolomite. Most of this formation is dolomitized to some degree and is very fossiliferous, containing bryozoans, coral, echinoids, mollusks, and foraminifera. It is generally more than 200 feet thick in Pasco County.

Detailed Site Lithologic Description

The information in this section was developed primarily from borings completed onsite as part of the geotechnical investigation for the Pasco County landfill/ashfill and resource recovery program. The following geotechnical studies were commissioned by the county:

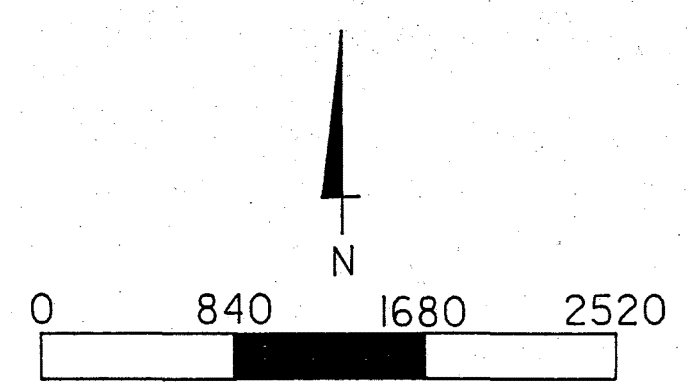
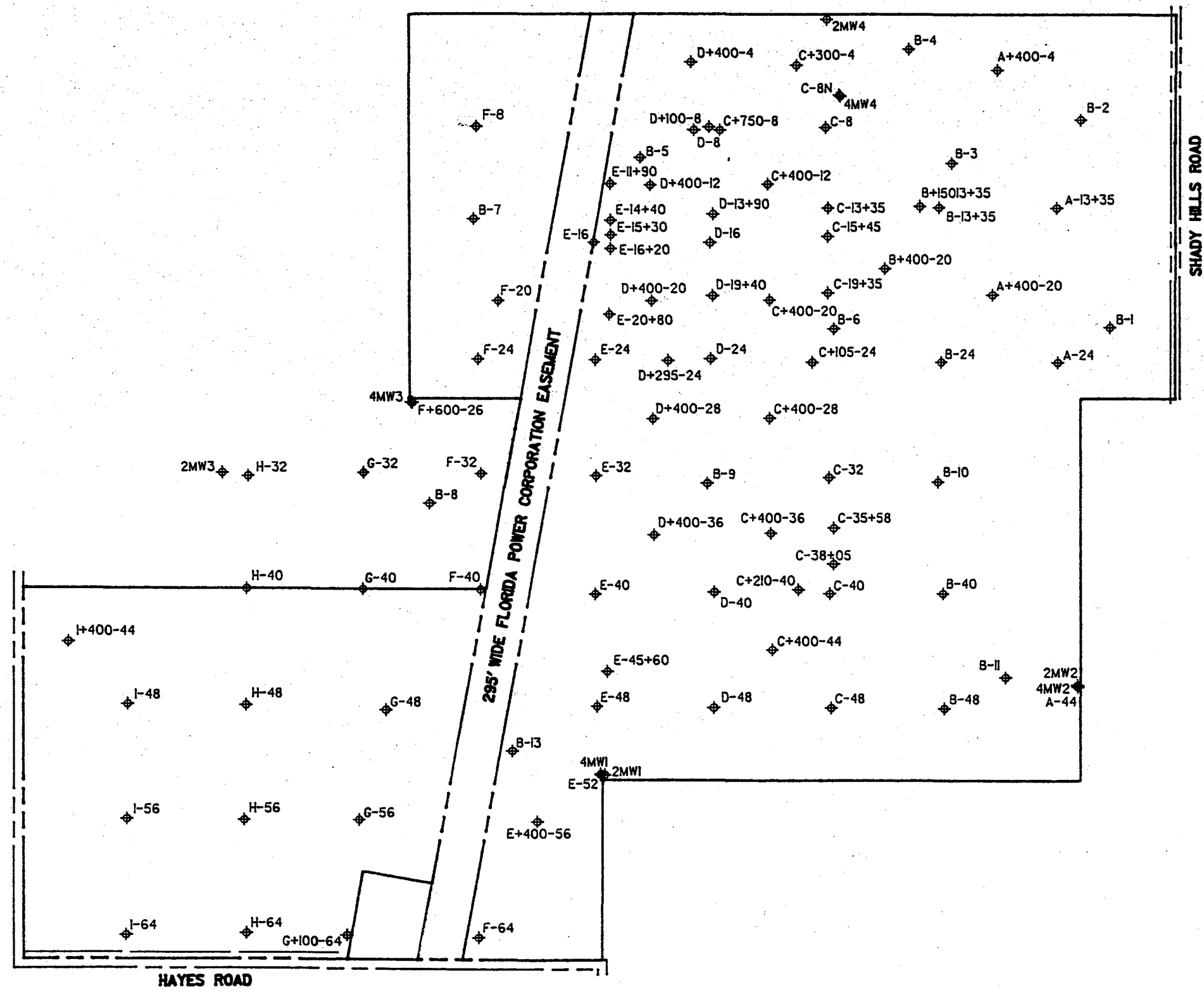
- Jammal & Associates, Inc. August 17, 1985. Results of Preliminary Site-specific Evaluations, Four (4) Potential Sanitary Landfill Sites, Pasco County, Florida.

- Jammal & Associates, Inc. August 22, 1986. Phase 1 Geotechnical/Hydrogeologic Summary Report, Proposed Pasco County Landfill—Hays Road Site, Pasco County, Florida.
- Jammal & Associates, Inc. April 17, 1987a. Summary Report, Geotechnical/Hydrogeologic Study, Proposed Class I Sanitary/Ash Landfill Site—Hays Road, Pasco County, Florida.
- Jammal & Associates, Inc. May 29, 1987. Preliminary Foundation and Soil Study, Proposed Resource Recovery Plant Facility—Hays Road Site, Pasco County, Florida.

The Jammal & Associates (1985) report contains general soil and hydrogeologic information and was used as support for the site selection study (CDM, 1985). For the site selection study, 13 standard penetration test (SPT) borings were advanced to the limestone level over the project site.

Upon selection of the Hays Road site, Jammal & Associates was asked to perform additional analyses. The Jammal & Associates (1986) phase 1 report is a preliminary geotechnical investigation of the project site. The major purpose of the phase 1 report was to identify the most suitable areas on the site for location of the sanitary landfill/ashfill. The report also identifies suitable onsite areas from which to acquire daily sand cover and final clay cover material, and identifies favorable areas for disposal of stormwater runoff.

Phase 1 testing included 57 SPT borings. Borings were performed in a grid pattern at a spacing of 800 feet, as recommended by Jammal & Associates—soils consulting engineers. Near the center of the site, intensified drilling decreased the spacing to 400 feet. The drilling pattern, shown in Figure 2-17, was selected to provide sufficient information to produce accurate subsurface cross-sections and substrata models. Soil samples were obtained from all areas of the site. Soil tests included:



Pasco County Resource Recovery Program
Standard Penetration Test Borings

FIGURE 2-17

- Minus No. 200 sieve washes
- Sieve analyses
- Liquid and plastic limit tests
- Natural moisture content analyses

To identify the favorable areas onsite for the landfill, four parameters were used:

1. The boring sample showed at least 5 feet of continuous clayey semi-confining unit material.
2. The boring sample was in general conformity with the trend of neighboring soil stratigraphy.
3. The boring sample lacked significant evidence of internal soil erosion in the overburden soils.
4. The boring sample was free of significant subsurface irregularities. A typical sample was sand over clay over limestone.

In selecting the favorable area of the site, depressional areas were also avoided. Within the area designated as "favorable," a smaller portion was designated as "most favorable." This area has the same qualifications as the favorable area, however, it offers more consistency in the conditions listed above. For example, the clay semi-confining layer is substantially thicker than 5 feet, and fewer subsurface anomalies are present. Based on the data gathered, it was the opinion of Jammal & Associates that only minimal excavating should occur on the site. Construction of facilities should be primarily above present grades.

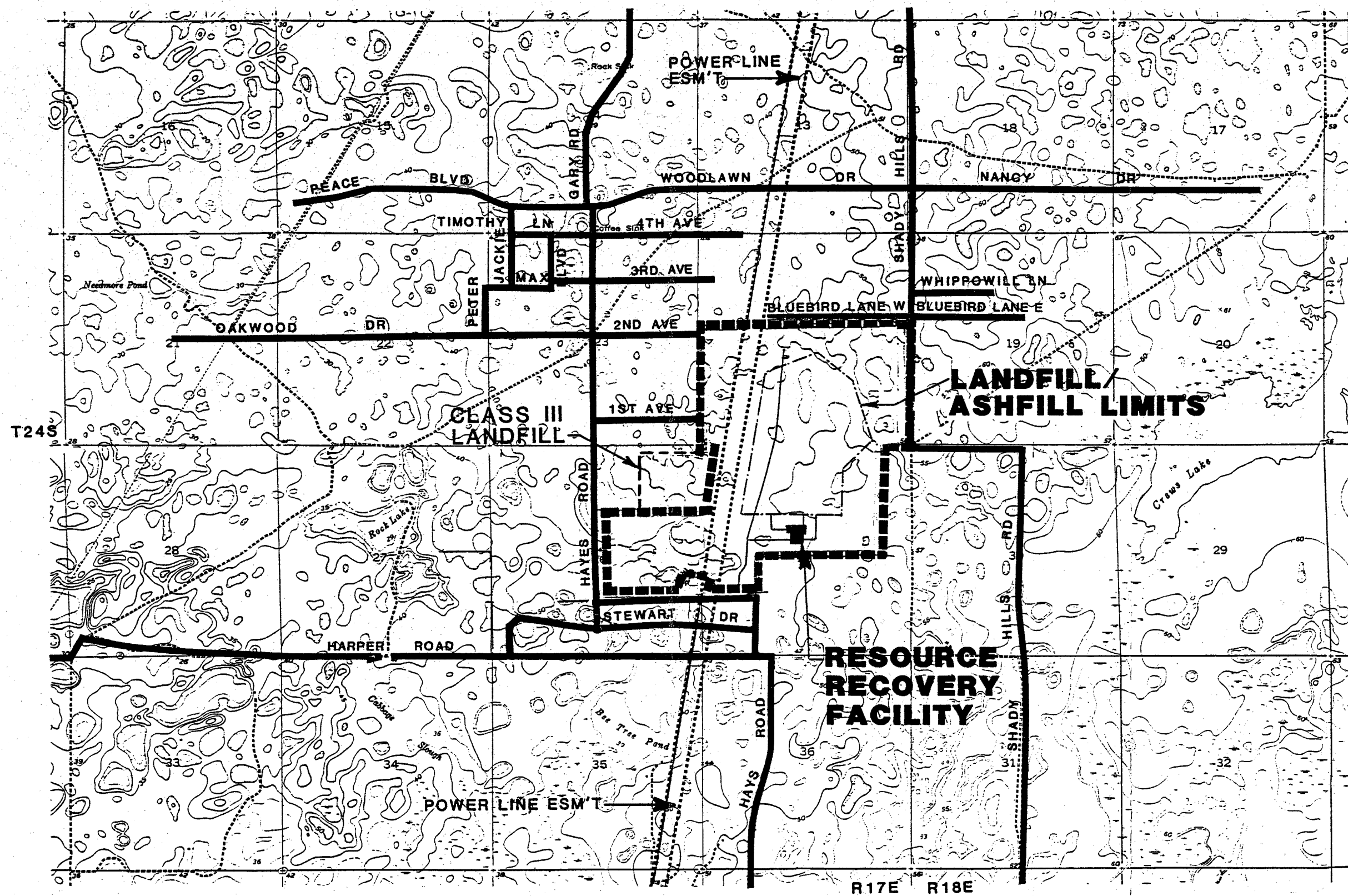
The Jammal & Associates (1987a) summary report describes field and laboratory testing which addresses the topographic, geologic and hydrogeologic conditions at the site. The report includes descriptions of the drilling procedures, installation of monitoring wells, ground penetrating radar survey, and consolidation and permeability tests.

As part of the Jammal & Associates summary report, ground penetrating radar (GPR) was used to study the geology. In areas where the GPR readings were ambiguous, SPT borings were drilled. Of the 18 borings, 7 showed typical soil stratigraphies (sand over clay over limestone) and no conditions that could be interpreted as anomalies. The remaining 11 borings revealed some small zones of loose clayey material or weathered limestone. These areas were interpreted by Jammal & Associates as minor anomalies that should not adversely impact the proposed landfill/ashfill. At least 5 feet of intact clay was encountered over the limestone in all borings. The borings showed that the areas are not major anomalies. Four SPT borings were drilled to limestone to be used as monitoring wells. The subsurface data obtained during field exploration are presented in the logs which accompany the Jammal summary report. A cross section was developed using these logs and the logs contained in the Jammal & Associates 1986 phase 1 report. The cross section is shown in Figure 2-18. Figure 2-19 shows a more comprehensive cross section of the geologic formations of the site and the surrounding area.

Generally, the soils over the project site consist of varying thicknesses of sandy material overlying clayey material of varying thicknesses and consistency. These layers overlies either significantly weathered upper limestone material with clay, or more intact weathered limestone materials.

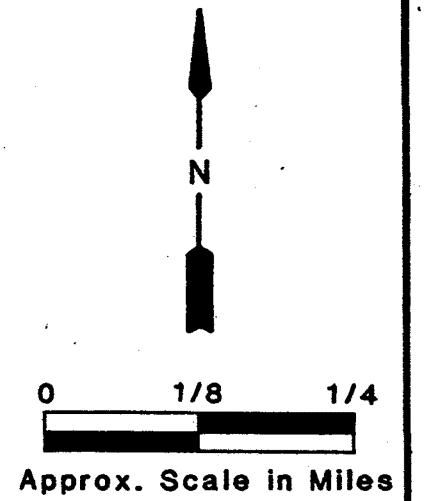
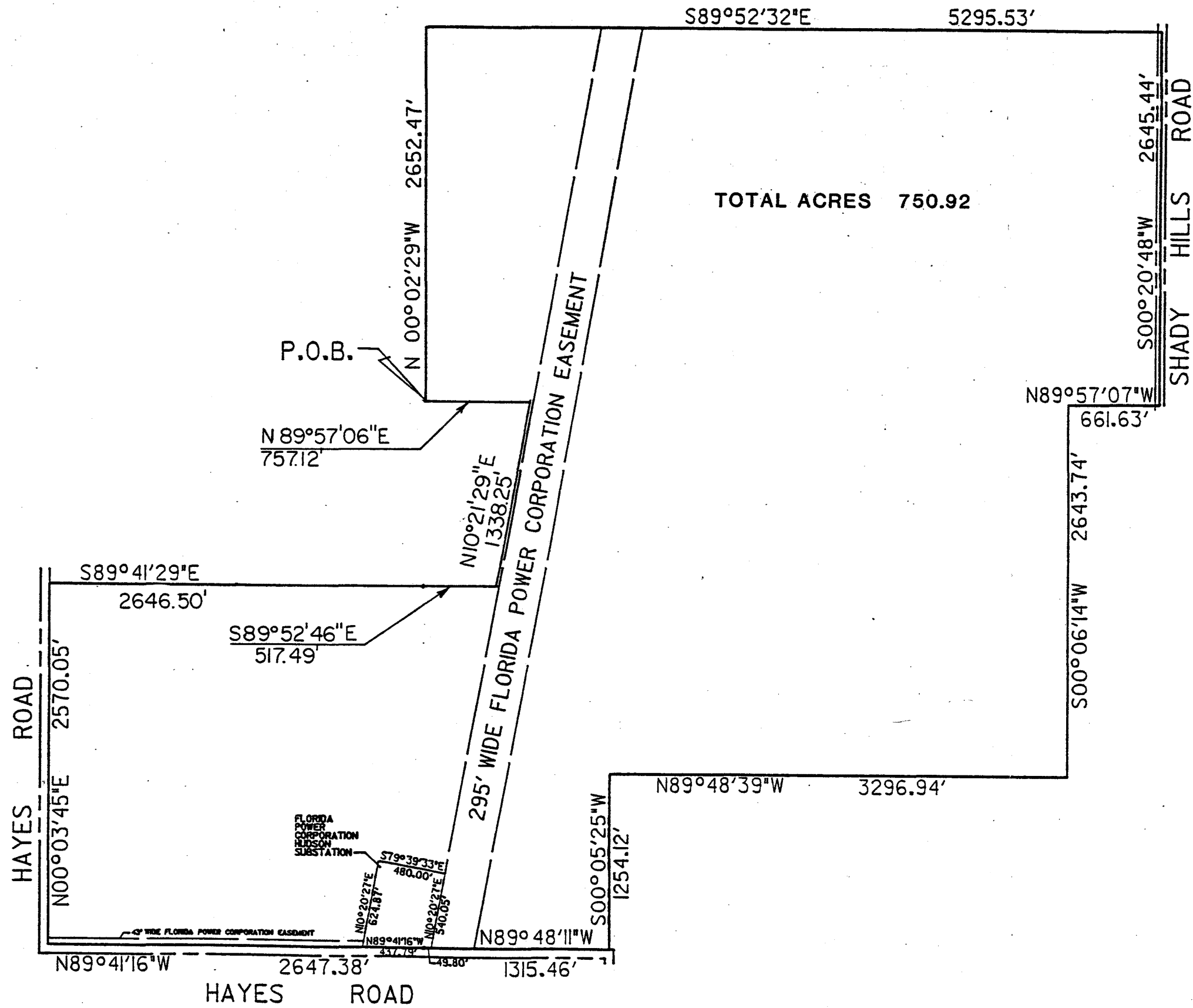
The sand materials generally contain less than 10 percent fines passing the No. 200 sieve, and color varies from tan to dark brown. The sandy materials vary considerably in thickness and in depth. The thickness varies from as little as 1 to 2 feet, to as deep as 70 to 90 feet. In general, the sands vary in relative density from loose to medium dense.

Beneath the sandy materials are plastic clayey materials. The clayey materials are the major components of the semi-confining unit which underlies the project site. The plasticity of these materials varies significantly from moderately to highly plastic. The consistency of the cohesive materials varies from stiff to very stiff. The thickness of the semi-confining unit varies over the construction area from 5 to 15 feet.

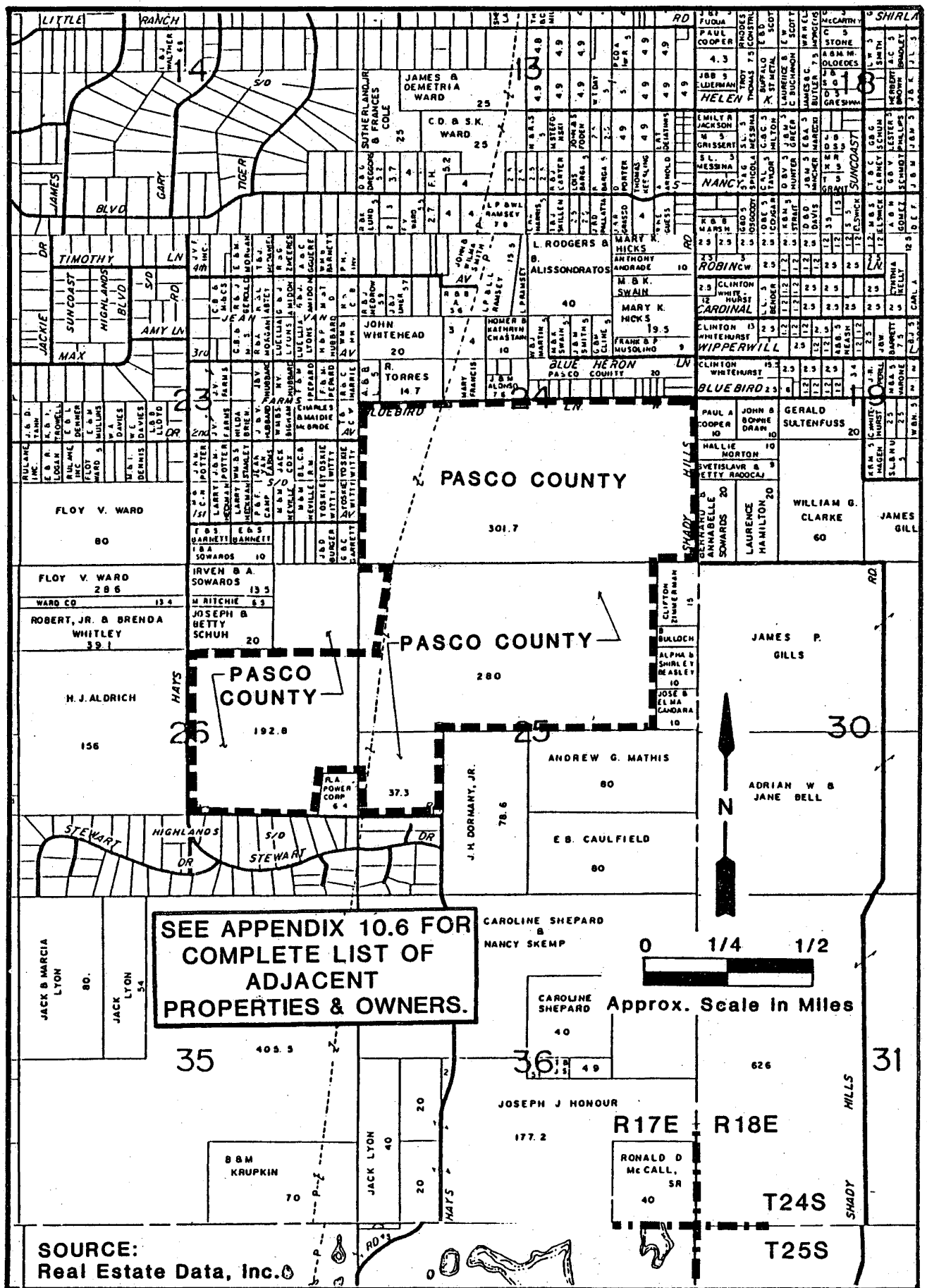


Pasco County Resource Recovery Program
Site Location

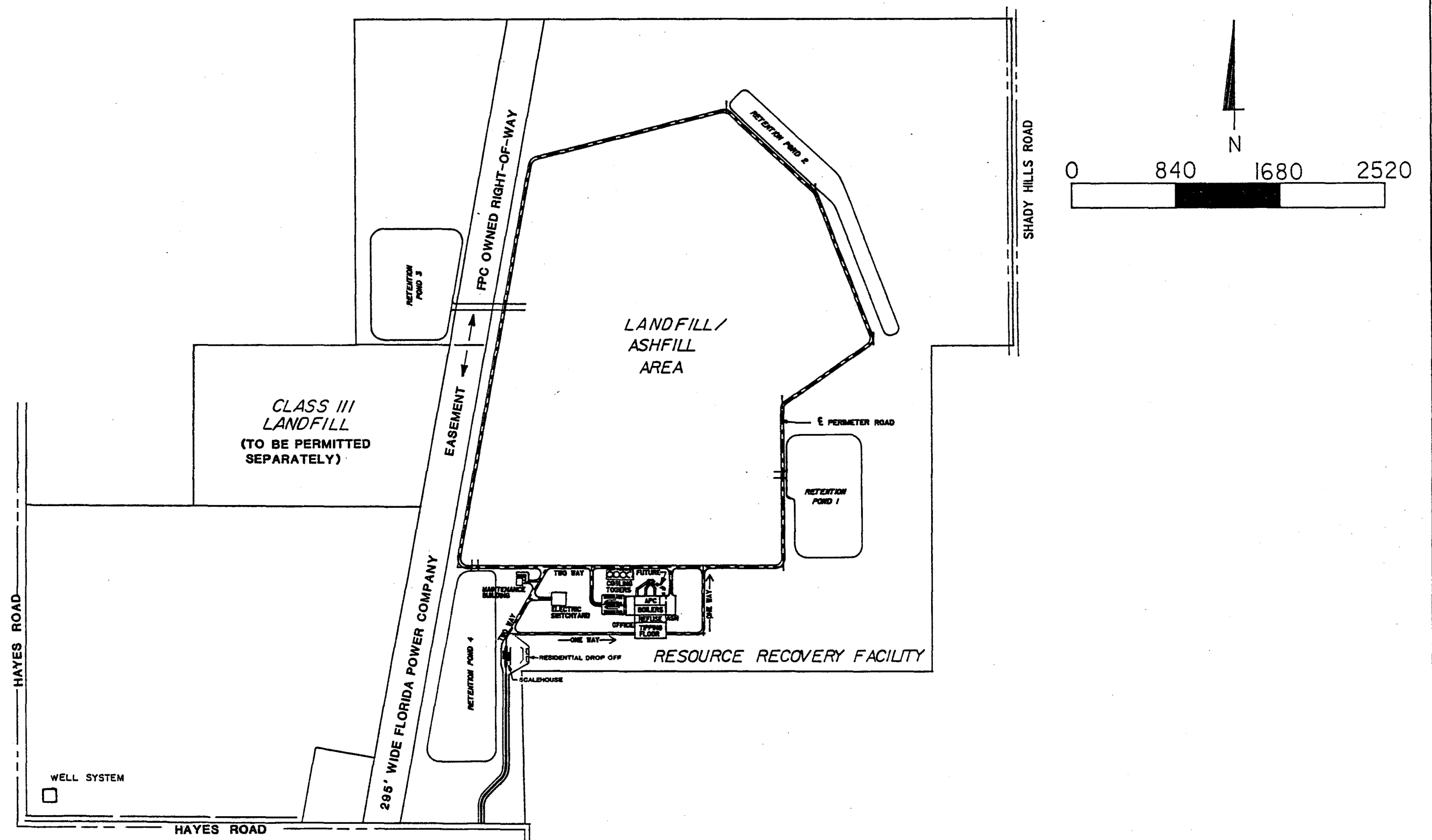
FIGURE 2-2



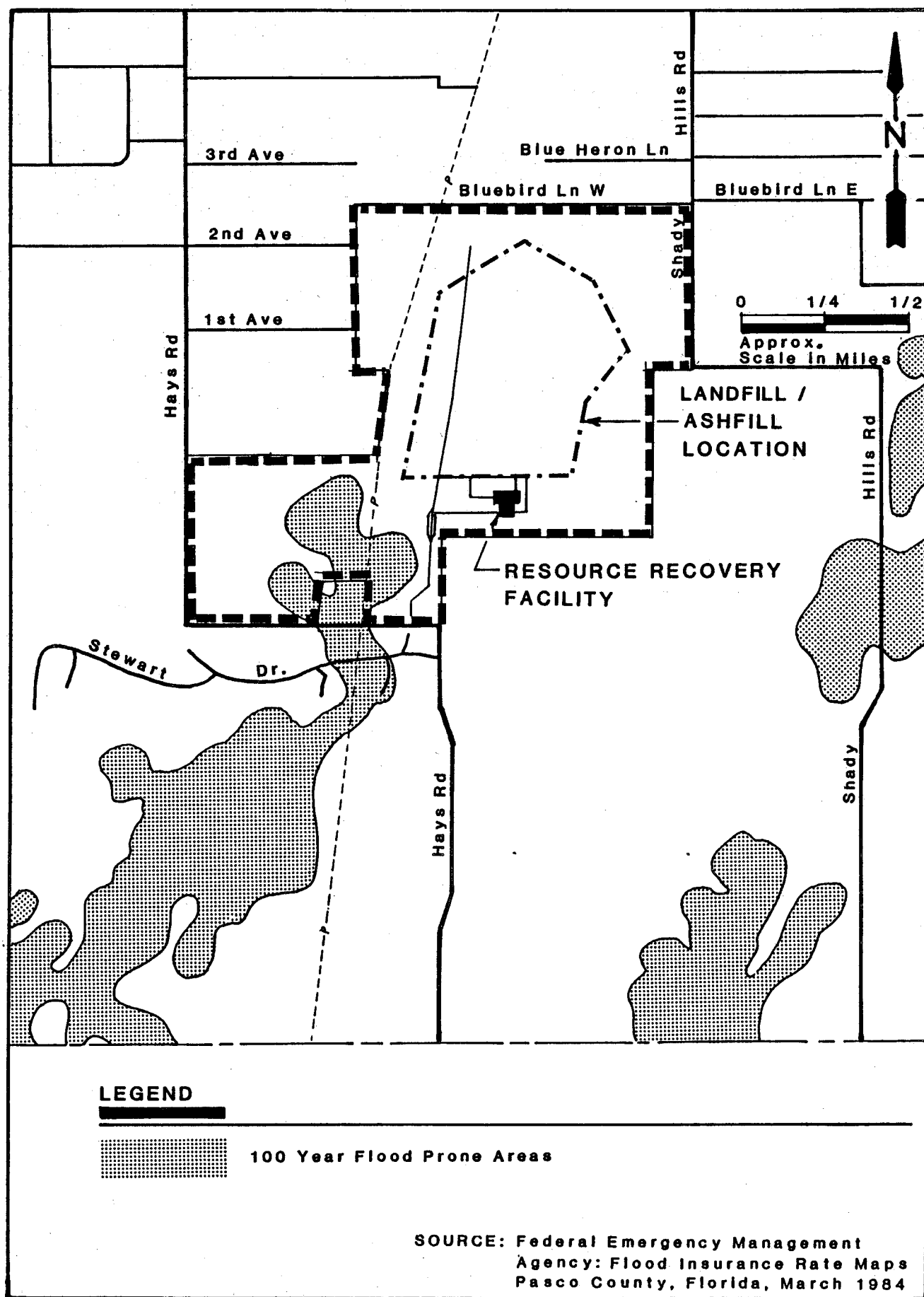
Pasco County Resource Recovery Program
Boundary Survey



OVERSIZE
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Pasco County Resource Recovery Program
Site Layout

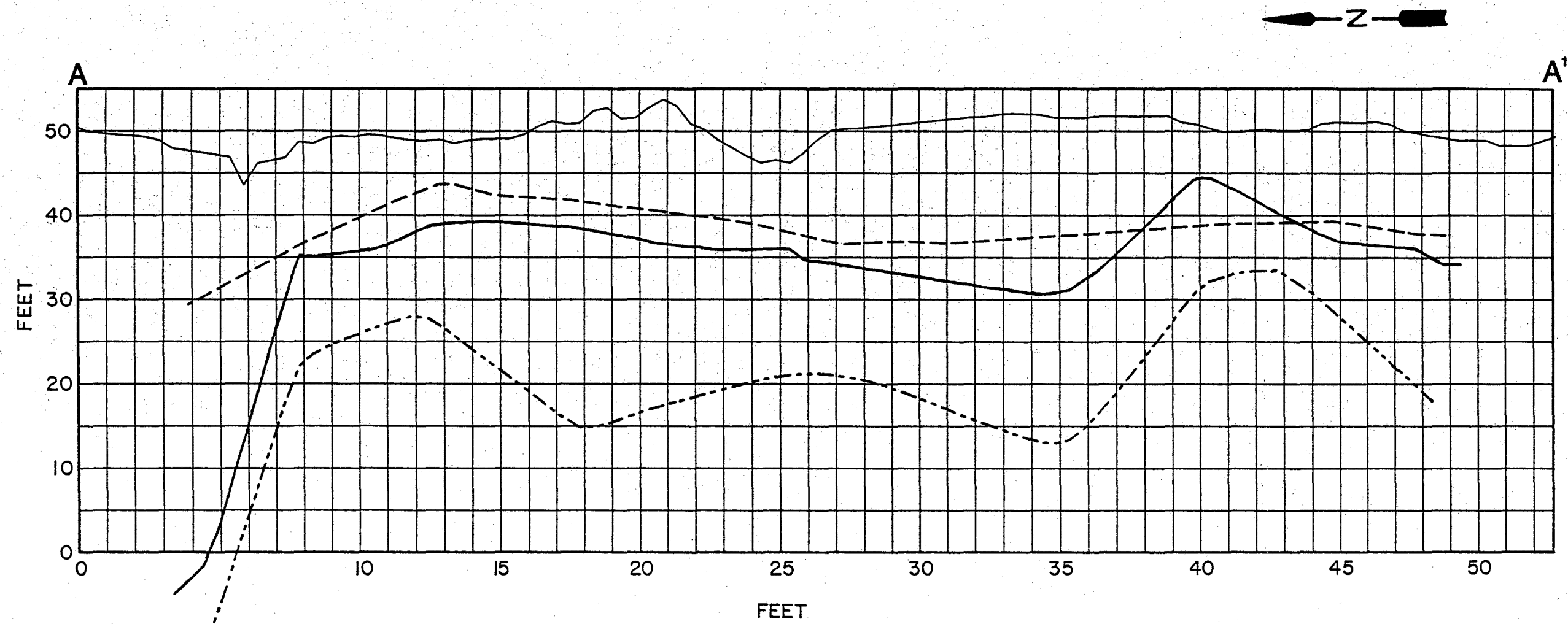


Pasco County Resource Recovery Program
100 Year Flood Prone Areas

TABLE 2-2

GOVERNMENTAL JURISDICTIONS INFORMATION SOURCES

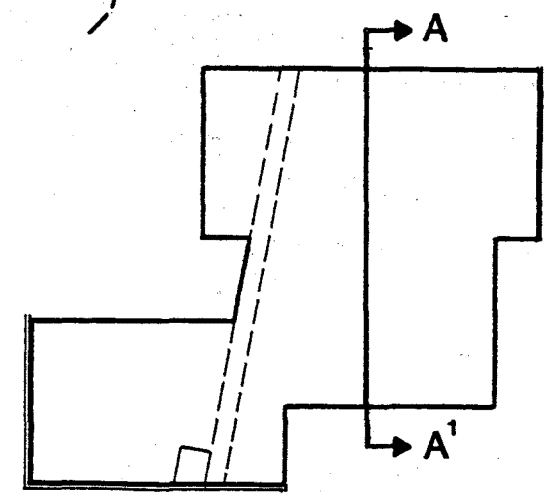
Agency/Department Contacted	Information Provided	Areas Within 5 Miles of Project Site
<u>LOCAL/REGIONAL</u>		
Pasco County Historic Preservation Committee	- List of Historic and Prehistoric Places	Yes
Pasco County County Parks and Recreation Department	- County Parks	Yes
Pasco County Planning Department	- Indian Reservations	No
Tampa Bay Regional Planning Council	- Areas of Concern	No
<u>STATE OF FLORIDA</u>		
Department of Environ- mental Regulation; Office of Coastal Management	- State Parks	No
	- State Forests	No
	- Game Management Areas	No
	- Areas of Critical State Concern	No
	- Conservation and Recreation Areas	No
	- Aquatic Preserves	No
	- Outstanding Florida Waters	No
	- Scenic and Wild Rivers	No
Game and Fresh Water Fish Commission	- Military Lands	No
	- Game Management Areas	No
Department of Natural Resources; Department of Park Lands and Development	- State Parks	No
Department of Agriculture and Consumer Services; Division of Forestry	- State Forests	No
Department of Community Affairs; Bureau of Land and Water Management	- Areas of Critical State Concern	No
Department of Natural Resources; Bureau of State Lands	- Conservation and Recreation Lands	No
	- Scenic and Wild Rivers	No
	- Save Our Rivers Lands	No
	- Aquatic Preserves	No



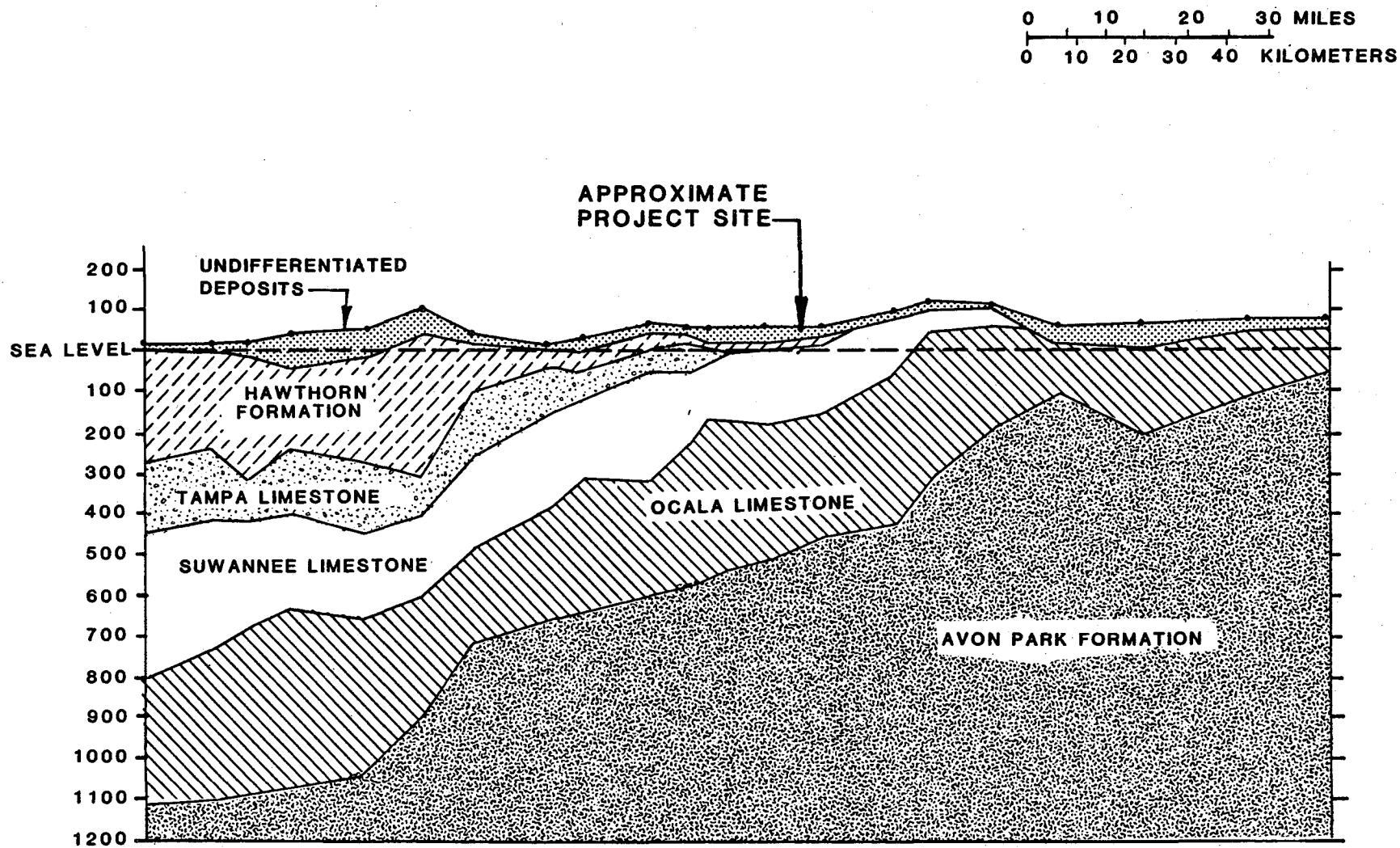
SECTION A-A'

LEGEND

- EXISTING GROUND SURFACE
- - - GROUNDWATER
- CLAY SURFACE
- ... LIMESTONE SURFACE



Pasco County Resource Recovery Program
North-South Site Specific Geologic Cross Section A-A



Pasco County Resource Recovery Program
North-South Geologic Cross-Section

Beneath the clayey materials, weathered limestone with traces of clay is encountered. The material was classified as white to light brown calcareous silty clay over light gray weathered limestone. In general, the weathered limestone overlaid more competent limestone. The consistency and integrity of the limestone material improved considerably with increasing depth of rock.

Geologic Maps

Sheets 5 through 11 of the Jammal & Associates summary report (provided in Volume IV) show soil profiles of the borings performed during the site selection, and geotechnical studies. It is easy to see the top of the confining clay unit in the soil profiles of the site. A fracture trace/lineament map of the site vicinity is included in Appendix D (Sheet 3) of the Jammal & Associates summary report. In their review of aerial photographs and U.S. Geological Survey 7-1/2 minute quadrangle maps, Jammal & Associates did not note a direct relationship between land surface depressions and other geomorphic features in the proposed landfill/ashfill area.

Bearing Strength and Settlement

The preliminary foundation study performed by Jammal & Associates (May, 1987b) recommends several types of foundations for the resource recovery facility. A shallow foundation is recommended for areas of the facility that carry low loads or have a moderate sensitivity to settlement. Three types of foundations were suggested as suitable for the site. They are a mat system, a rigid strip system, and a shallow spread footing system. In conjunction with these foundations, suggested compaction techniques are given. To decrease initial settling, loose zones and soft clay areas would be compacted. Suggested techniques are vibro replacement (gravel) or dynamic compaction, followed by vibratory surface compaction. The maximum allowable bearing pressure is estimated at 3,000 to 4,000 pounds per square foot.

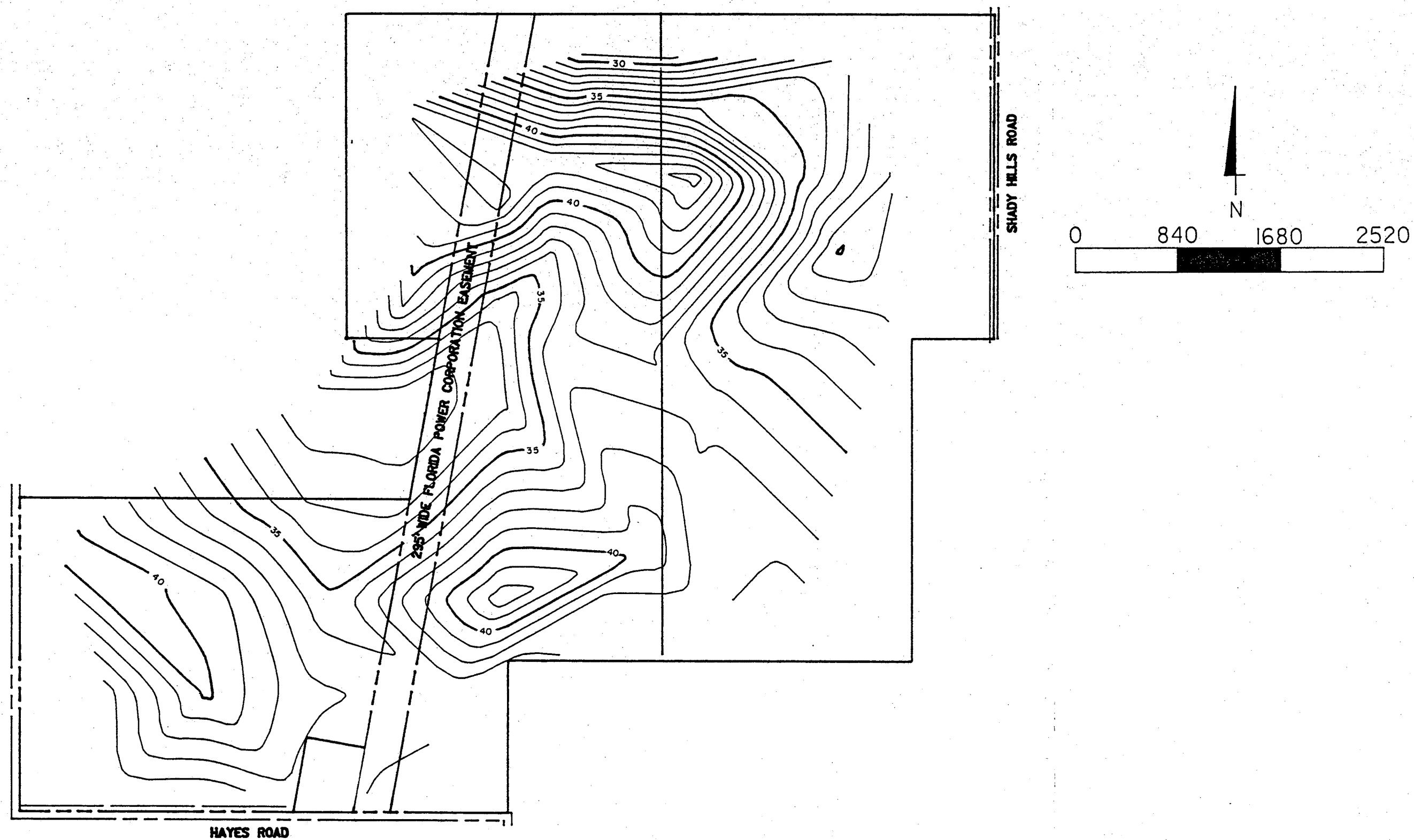
Jammal & Associates, Inc. recommends a deep foundation for the portions of the facility which have high loads or strict settlement tolerances. To reduce subsidence risk, steel end bearing piles should be driven to varying depths until competent limestone is encountered. All piles should be test loaded. The bearing load per pile suggested by Jammal & Associates is 45 to 70 tons. For areas with constantly changing loads such as the refuse pit and tipping floor, the soils should be preloaded for two to three months until sufficient consolidation has occurred.

Landfill/ashfill settlement considerations are discussed in Section 5.4 of the Jammal & Associates summary report (1987a). Consolidation test results are recorded on Plates 9 through 16 and settlement estimates are shown on Sheet 1 in Appendix B of the report. Total settlement of the landfill/ashfill under the maximum landfill height of 100 feet is anticipated to be 13 to 15 inches. Under the height of 75 feet, distortion plus consolidation is estimated to be 11 to 13 inches. Total settlement at the toe of the slope is estimated at 2 to 3 inches. The critical area for differential settlement is between the toe and the high point of the 1V:4H slope (330 feet). The maximum differential settlements over this distance should be 10 to 12 inches. Given a tolerance of 10 percent material elongation, the liner can withstand a 12 inch deflection if the radius is equal to or greater than 2.2 feet. The 330-foot radius between the toe and the high point of the slope is much greater than 2.2 feet, thus the liner settlement design is very conservative.

2.3.2 SUBSURFACE HYDROLOGY

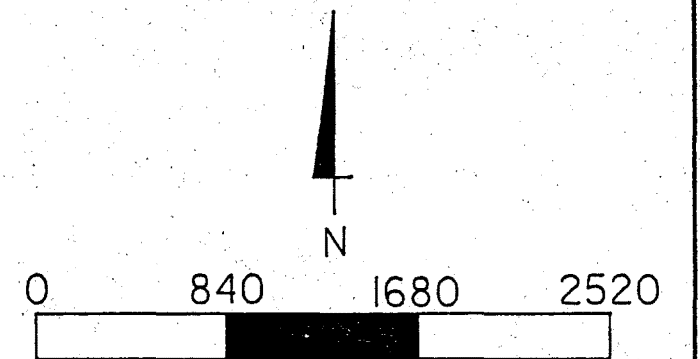
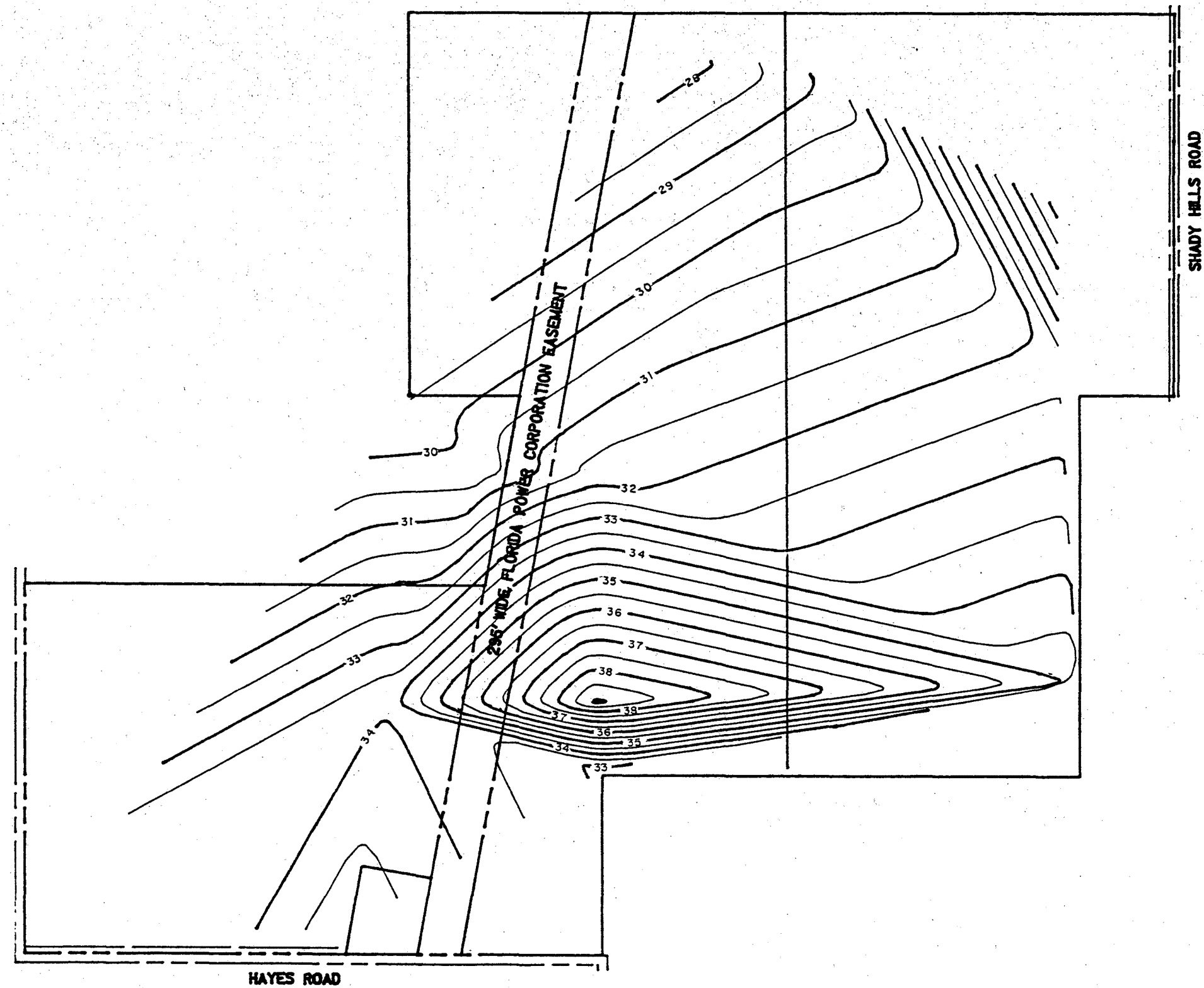
Subsurface Hydrologic Data for the Site

The condition of the surficial aquifer is discussed in Sections 4.2 and 5.3 of the Jammal & Associates summary report (1987a). Figure 2-20 of this permit application shows water depths at the end of the wet season (September 6, 1986), and Figure 2-21 shows water depth during the dryer period (November 1, 1986).



Pasco County Resource Recovery Program
 Site Surficial Water Table-September 6, 1986

FIGURE 2-20



Pasco County Resource Recovery Program
Site Surficial Water Table- November 1, 1986

FIGURE 2-21

The September 6, 1986 depths to the water table ranged from less than 0.5 foot in a low-lying portion of the site, to over 20 feet in one of the higher areas. The average elevation of the groundwater surface was about +36.5 feet mean sea level (msl) on September 6, 1986. The elevation ranged from a low of +28.8 feet msl in C+300-4, located in the extreme northern portion of the project site, to a high of +44.4 feet msl in C-13+35, located in the north/central area. (See Figure 2-17 for exact locations.) The highs are marked by elevations of the water surface greater than +40 feet msl. Two saddle configurations of the groundwater surface (shown in Figure 2-20) separate the localized highs as well as areas of lower elevations in the west/central and northeast portions of the site. A general trend of declining water levels was apparent in 12 piezometers in November of 1986.

Groundwater movement within the site is essentially radial from the three local groundwater highs to adjacent areas of lower water surface elevations. The groundwater in the largest portion of the site drains toward the area of low groundwater elevations in the central portion of the area, and west toward the Florida Power Corporation easement. In the eastern portion of the site, groundwater apparently moves from the two major highs in the northern and southern areas toward a depression in the groundwater surface in the northeast section of the site. The extreme northern and southern sections appear to drain offsite.

The surficial sand aquifer intercepts and stores excess precipitation. It is relatively thin or non-existent in portions of the project site. With the top of the clay representing the base of the surficial aquifer, the water table aquifer was generally 5 feet thick or less when measurements were taken in September of 1986. Because September typically represents the end of the rainy season when groundwater elevations are highest, the surficial aquifer in this portion of the site may not be perennial.

Water level measurements taken in November of 1986 (Table 4, Jammal & Associates, 1987a) indicate that elevations of the potentiometric surface of the Floridan aquifer ranged from +29.2 to +34.5 feet msl. These measured values are consistent with recent potentiometric surface maps for the area

published by the U.S. Geological Survey and Southwest Florida Water Management District (SWFWMD) (Plate 2, Appendix B, Jammal & Associates, 1987a). These maps suggest a typical end-of-wet-season elevation of about +30 to +35 feet msl for the site and vicinity. The available aquifer maps indicate higher potentiometric surface elevations in the southeastern part of the site. The hydraulic gradient is toward lower elevations in the northwest and west.

The proposed Pasco County landfill/ashfill site is apparently a good recharge area for the Floridan aquifer. The lack of a well-defined surface drainage network in an area of abundant rainfall is evidence of groundwater recharge potential. Apparently, the primary surface drainage mechanism is internal to the groundwater system which conveys water to discharge areas along the coast of the Gulf of Mexico. Assuming uniform distribution of rainfall across the site, the most effective recharge areas to the Floridan aquifer within the project site are identified by the depressions in the water table surface (shown in Figures 2-20 and 2-21).

Although the semi-confining unit over the landfill/ashfill site is consistently present, it is somewhat leaky. This is based on the shallow groundwater conditions of the site, and the significant iron staining and small zones of secondary permeability discovered within intact, highly plastic, clayey samples. In most of the landfill/ashfill area, slow vertical movement through the semi-confining unit is occurring through the small inconsistencies and vertical, circuitous paths in the clay layers. The test borings did not show any significant signs of weathering of the semi-confining unit, or direct areas of recharge through breaches in the semi-confining unit over the landfill/ashfill area.

The results of the vertical permeability tests on Shelby tube samples of the semi-confining unit clayey materials are presented on the consolidation test result curves (see Sheets 5 through 11, and Appendix B, Jammal & Associates, 1987a). The vertical permeability of the semi-confining unit clayey materials varies from a high of approximately 2.3×10^{-4} centimeters per second, to a low of 1.2×10^{-8} centimeters per second. The variability is attributable to the fine secondary seams of sand which allow seepage.

Based on the data collected, the average vertical permeability of the semi-confining unit clayey materials is approximately 7.2×10^{-5} centimeters per second.

Karst Hydrogeology

An assessment of sinkhole potential in the proposed landfill/ashfill area is presented in the Jammal & Associates summary report (1987a) in Sections 2.4, 5.5 and 5.9 (see Appendix 10.9).

Although numerous sinkholes and other karst-related features exist within the Hays Road site and vicinity, the SPT borings did not encounter significant voids in the underlying limestones.

The topographic map of the site indicates numerous, small surface depressions within the project site. Two distinct types, or forms of depressions are noted: small, rounded depressions with relatively steep slopes, mainly in the southwest corner of the site; and very shallow, gently sloping depressions occurring primarily in the interior portion of the site. Most of the land surface depressions within the site are of the shallow, gently sloping type. These depressions are generally very shallow, perhaps an average of 2 to 3 feet deep, and relatively broad, ranging up to several acres in area.

Sinkholes formed by catastrophic collapse of caverns in the limestone are considered uncommon in the Hays Road area. Two factors indicate that the formation of surface depressions in the area is a slow, ongoing process which is directly related to solution activity at the limestone surface: the relatively thin overburden covering the limestone formations, and the apparent small head difference between the water table and potentiometric surface of the Floridan aquifer. Sinkholes of this type tend to develop slowly over long periods of time and are typically 1 to 3 feet deep near the center, and 10 to 20 feet or more in diameter. The potential is very low at the site for catastrophic, short-period failure sinkholes.

Within the proposed landfill/ashfill area, a linear relationship between land surface depressions and other geomorphic features was not indicated by Jammal & Associates (1987a) during review of aerial photographs and U.S. Geological Survey 7-1/2 minute quadrangle maps. Other major lineament features were not observed in the immediate vicinity of the proposed landfill/ashfill as shown on Sheet 3 of Appendix D in the Jammal & Associates summary report (1987a) (see Appendix 10.9 of this permit application).

2.3.3 SITE WATER BUDGET AND AREA USES

The data in Table 2-19 show the general hydrologic conditions at the construction site. This table includes information on rainfall, temperature, estimated evapotranspiration, evaporation, runoff and groundwater recharge, as requested by Section 2.3.3 of the Instruction Guide for Certification Application. The information provided was extracted from Climatological Data for Florida published by the National Oceanographic and Atmospheric Administration, Department of Commerce. Data from the two closest weather stations are provided—Saint Leo and Brooksville. The Saint Leo station collects climatological data as well as hourly precipitation data. The worst case scenario was developed using the maximum precipitation from the two stations to compute runoff potential. The predicted monthly runoff is provided in Table 2-19.

The monthly evapotranspiration was computed using the Blaney-Criddle formula which describes a linear relationship between evapotranspiration and mean air temperature. The general equation for the calculation of evapotranspiration (ET) is given as follows:

$$ET(p) = CL(d) T$$

where:

$$ET(p) = \text{evapotranspiration potential,}$$

$$C = \text{monthly "consumptive use" crop and location coefficient,}$$

$$L(d) = \text{day length factor, and}$$

$$T = \text{mean monthly air temperature.}$$

TABLE 2-19
HYDROLOGICAL DATA REPRESENTATIVE OF THE PROJECT SITE

Month	Monthly Mean Precipitation		Monthly Mean Temperature St. Leo (Degrees F)	Monthly Mean Percentage of Daylight Hours /Year	Monthly Evaporation Potential (inches)	Runoff Potential Groundwater Recharge	
	Brooksville	St. Leo				0.4 in./ month	2.5 in. month
January	2.87	2.60	59.9	7.40	3.32	-	-
February	3.59	3.65	61.2	7.07	3.25	-	-
March	4.20	4.19	66.6	8.37	4.18	-	-
April	2.26	2.75	71.8	8.67	4.67	-	-
May	4.37	4.78	77.0	9.46	5.46	-	-
June	6.66	6.89	80.5	9.39	5.67	0.82	-
July	7.69	8.05	81.7	9.58	5.87	1.78	-
August	8.66	7.62	81.9	9.17	5.63	1.59	-
September	6.54	6.23	80.4	8.32	5.02	0.81	-
October	2.49	2.52	74.0	8.02	4.45	-	-
November	2.02	2.21	67.0	7.28	3.66	-	-
December	<u>2.70</u>	<u>2.44</u>	61.4	7.27	3.35	-	-
	54.05	53.93					

SOURCE: NOAA - Climatological Data Annual Summary - 1985.

For the purposes of this analysis, the crop was considered to be a pasture grass with a coefficient of 0.75. There are no surface water bodies within the project development area, thus, there is no evaporation from a free water surface.

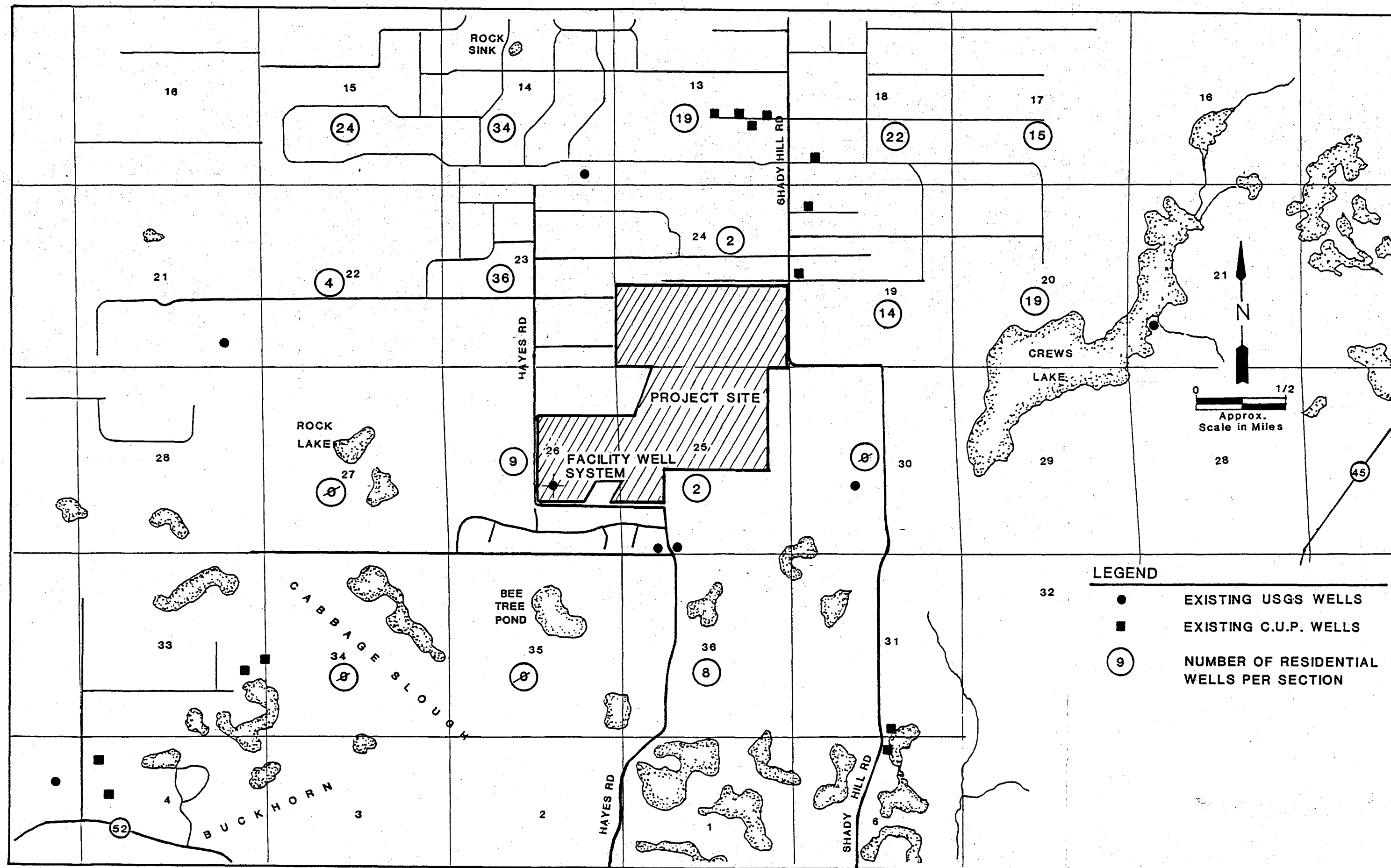
Table 2-19 indicates that under average conditions the maximum runoff will occur, as expected, during the rainy season. The rainy season normally spans the summer months of July and August. Localized climatological conditions may provide additional opportunities for runoff on the site.

Major water uses in the area may be categorized as domestic, industrial, irrigation, and public water supply. SWFWMD has provided a well construction permit list for all wells with diameters greater than 2 inches within a 5-mile radius of the project. A complete list of the information provided by SWFWMD is provided in Appendix 10.8 of this permit application. The information provided includes the use, location, diameter, case depth, well depth, and static water level. SWFWMD has also provided a list of the consumptive use permits (CUPs) which have been issued in the project area. A CUP is required for all wells with diameters greater than 4 inches. Figure 2-22 illustrates the approximate location of the wells in relationship to the project site.

2.3.4 SURFICIAL HYDROLOGY

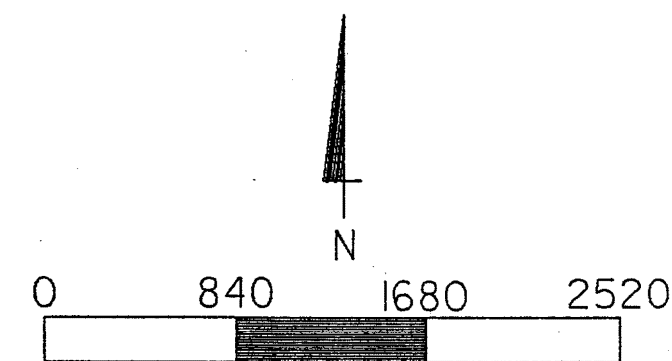
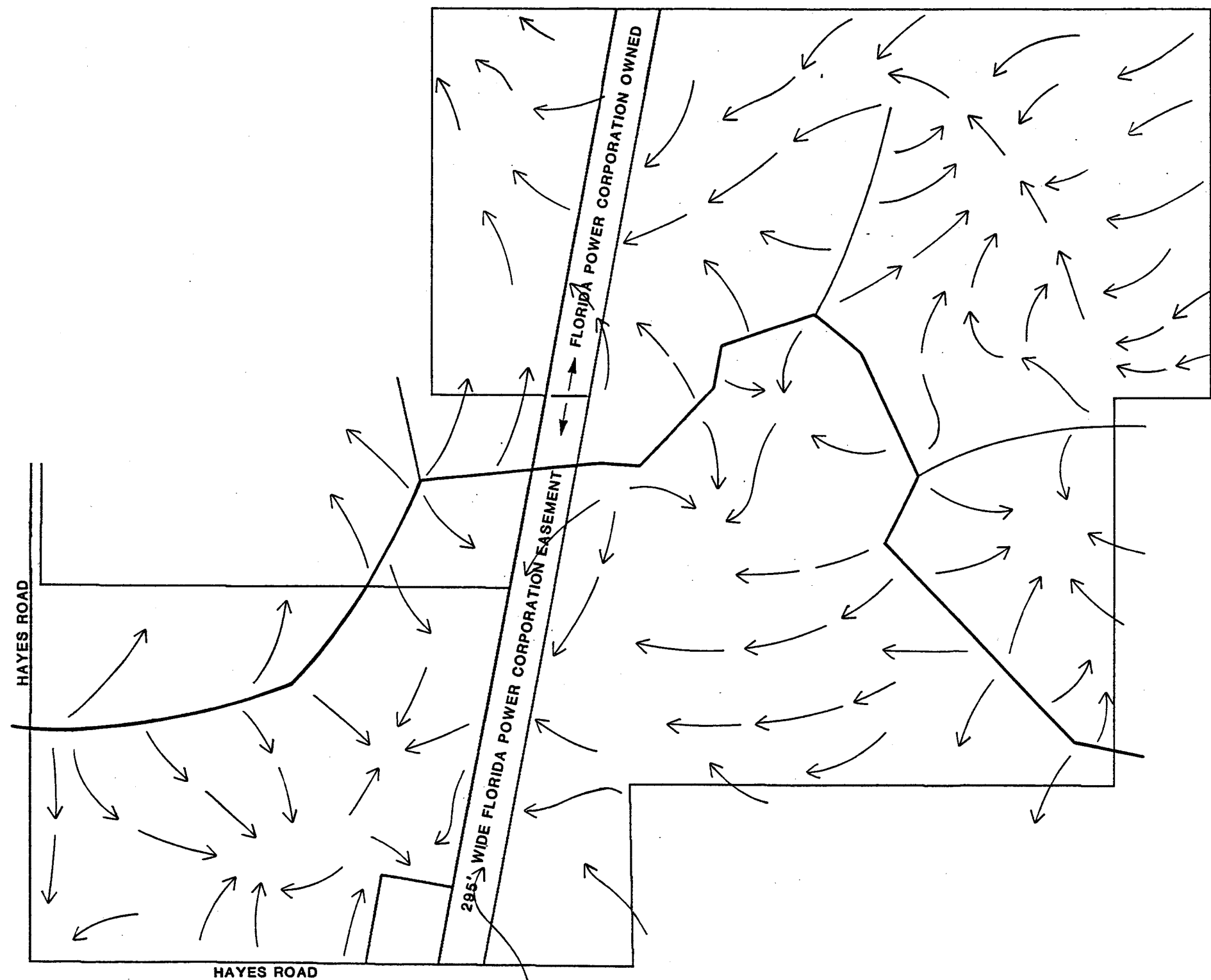
Hydrologic Characterization

The proposed project site has no surface water bodies within the construction area. Several small limestone solution sinkhole related depression areas are located west of the power line easement that bisects the property, but these do not lie within an area where construction is planned. None of these surface water bodies has been designated with a specific water classification under Section 17-3 of the Florida Administrative Code (FAC). The existing surface water runoff flows westerly, primarily to two of these surface depression areas. This flow occurs downgradient, generally via sheet flow. The existing surface water flow patterns are shown on Figure 2-23. The stormwater management system



Pasco County Resource Recovery Program
Vicinity Well Locations

FIGURE 2-22



Pasco County Resource Recovery Program
Predevelopment Surface Water Flow Patterns

will retain this general flow regime whenever possible, to allow development of the project with minimal disruption to the environment.

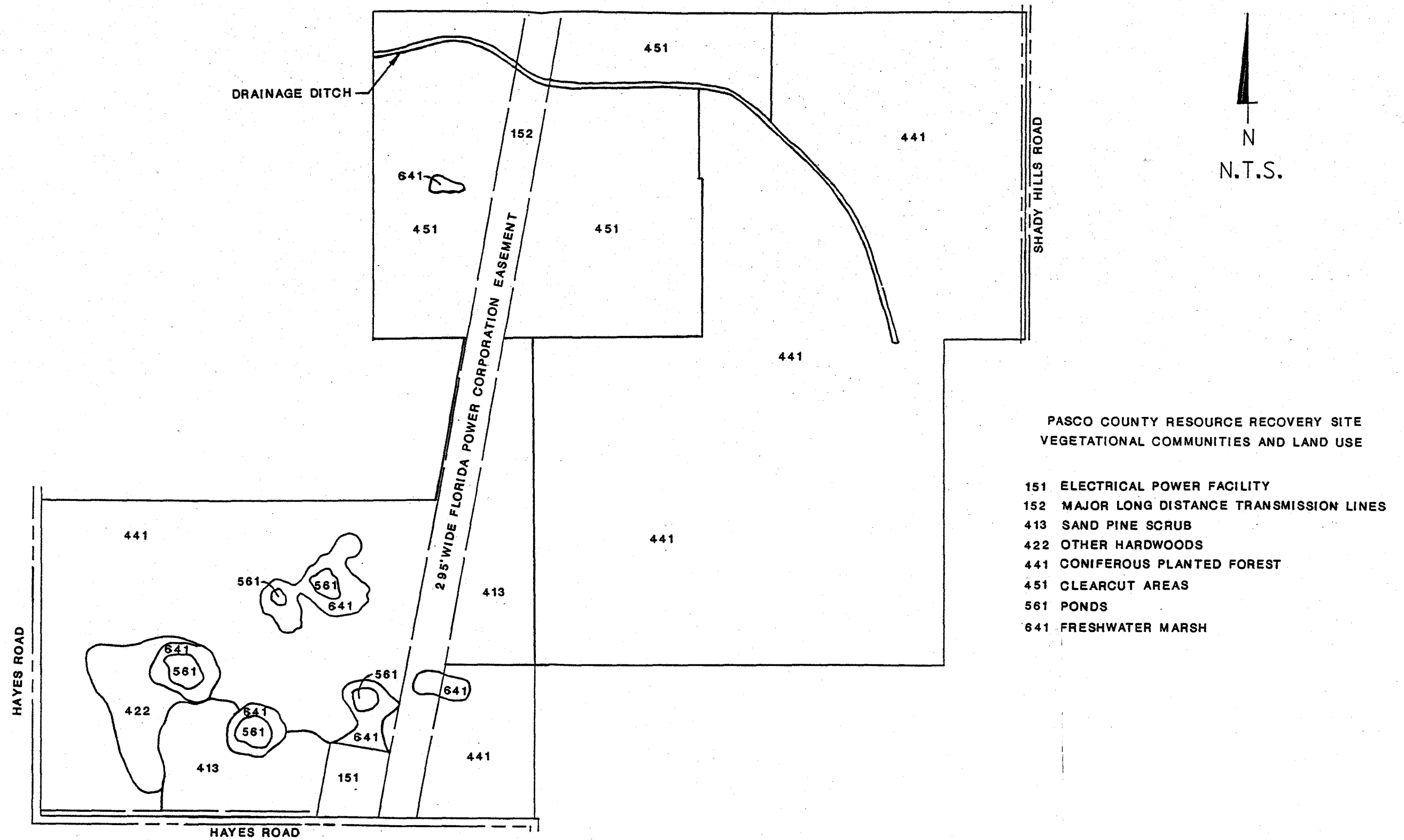
Measurement Programs

This section describes the programs and methods that will be used to measure the background physical and chemical parameters of the surface water bodies that will be affected during construction and/or operation of the facility. As stated previously, the stormwater management system will use the natural drainage features of the site whenever possible. In accordance with Chapter 17-25, FAC, the first 0.5 inch of stormwater runoff will be retained and treated using retention/detention ponds. The ponds will allow for percolation of the captured runoff within 72 hours. SWFWMD has determined that the site exhibits volume sensitivity. That is, increased volumes of runoff from the site are not permitted. Although it has been determined that there is virtually no surface runoff from the site, the retention/detention ponds 1, 2, and 3 were sized to retain all flow from the 25-year rainfall event. Pond 4 was sized to retain all of the flow from the developed area and the first 0.5 inch of runoff from the offsite drainage area that co-mingles with onsite flows. See Figure 2-6 for pond sizes and locations.

2.3.5 VEGETATION/LAND USE

Eight land use and vegetation types have been identified on the Pasco County resource recovery site, as depicted on Figure 2-24. These types have been classified to Level III of the Florida Land Use and Cover Classification System, and include Electrical Power Facility (151), Major Long Distance Transmission Lines (152), Sand Pine Scrub (413), Other Hardwoods (422), Coniferous Planted Forest (441), Clear-cut Areas (451), Ponds (561), and Freshwater Marsh (641).

This 751-acre site has been previously clear-cut (probably several times) and used as a coniferous tree farm over most of its area. The most recent clear cutting occurred in 1986. Therefore, a limited variety of vegetational communities occur on this property. The majority of the property is



PASCO COUNTY RESOURCE RECOVERY PROGRAM
Vegetational Communities and Land Use

still planted in rows of Slash Pine (Pinus elliottii) and some Sand Pine (Pinus clausa). Within these older planted areas an understory community of Turkey Oak (Quercus laevis), Myrtle Oak (Quercus myrtifolia), and Wax Myrtle (Myrica cerifera) are establishing themselves. In addition, Saw Palmetto (Serenoa repens), and Yucca (Yucca sp.) occur sporadically throughout the site, although not in large numbers. Dog Fennel (Eupatorium capillifolium), Joe-Pye-Weed (Eupatorium purpureum), Broomsedge (Andropogon virginicus) Three-awn Grass (Aristida sp.) and other grasses are common components of the herbaceous vegetation.

A substantial part of the northern half of the property has been clear-cut within the last three years, and left without replanting to regrow naturally. There are brush piles and tree stumps scattered about. Various native grasses, Dog Fennel, Horseweed (Erigeron canadensis), Broomsedge, and Sand Pine seedlings are taking over this clear-cut area.

The site has also been altered by construction of a drainage ditch. This ditch runs in an east/west curve through the northern half of the site into Crews Lake, east of the property. It was built during the 1950s for flood control. The ditch is currently dry and does not appear to be functioning. It has been reinvaded with native grasses and herbs, and shows no indication of recent water flow.

The property is composed of primarily uplands, with a few low, wetland areas. All except one of the wetland areas are located in the southwestern corner of the property. One small wetland also occurs in the northwest clear-cut area. These are all very small, isolated wetlands, and appear to be of karst type origin. Some of these wetlands possess small permanent areas of open water surrounded by marsh-type vegetation. The emergent and floating plant species of the ponds are minimal and include Spatterdock (Nuphar luteum), Duckweed (Lemna sp.), and Maidencane (Panicum hemitomon). Additional marsh-type vegetation which exists between the upland forest and the pond ecosystem includes Buttonbush (Cephalanthus occidentalis), Switchgrass (Panicum virgatum), Rushes (Juncus sp.), Beak Rushes (Rhynchospora sp.), and Spikerushes (Eleocharis sp.).

There is a small area of hardwoods in the southwest section of the property, slightly west of one of the larger wetland areas. The overstory species in this hardwood is almost exclusively Live Oak (Quercus virginiana). The Live Oak are all older, large trees. Spanish Moss (Tillandsia usneoides) and other epiphytic plants (i.e., Bunchmoss (Tillandsia recurvata, etc.) occur plentifully in this plant community. The understory is sparse, and is heavily shaded and covered by a leaf layer. Understory trees/shrubs such as Groundsel-tree (Baccharis halimifolia), and Wax Myrtle occur sporadically.

One small Sand Pine Scrub community exists along Hays Road on the south side of the property, and another abuts the east side of the transmission line toward the center of the site. Young Sand Pines, Dog Fennel, Broomsedge, Myrtle Oak, Saw Palmetto, and various grasses dominate these systems. Both of these parcels were part of the planted coniferous forest at one time in the past. Tree stumps and small piles of dried brush remain scattered about at these locations. The Sand Pine Scrub community appears to be establishing itself in these vacated areas.

A 295-foot wide transmission line bisects the site in a north/south direction. This area is cleared periodically for access. Regular clearing favors grasses and opportunistic species such as Dog Fennel, Horsetweed, Broomsedge, Goosefoot (Chenopodium ambrosioides) and Paspalum (Paspalum sp.).

2.3.6 ECOLOGY

No other evidence of U.S. Fish and Wildlife Service (FWS) or Florida Game and Fresh Water Fish Commission (FGFWFC) threatened or endangered species was observed during more than 50 hours of observation on the site. There are no National Wildlife Refuges or critical habitats located within 5 miles of the project site, according to the FWS; and the Florida Natural Areas Inventory stated that there are no occurrences of special elements on this site (i.e., plants and animals).

Table 2-20 lists the wildlife species observed or expected to occur on this site, based on habitat types. Two bird species which are identified as Species of Special Concern by FGFWFC may occasionally use the wetland communities. These are the Little Blue Heron (Egretta caerulea) and the Snowy Egret (Egretta thula). During 50 hours of observation at the site, a Little Blue Heron was observed once in one of the wetlands. These species are closely associated with wetland habitats. The small wetlands present on this property would not constitute permanent habitat for these species, but may be used periodically as foraging areas. The Species of Special Concern status indicates a species that is not in immediate danger of extinction, but which could eventually become Threatened or Endangered.

Some bird species which may use the site during migration may not have been present during the site survey period. However, the migratory species which might use this site on a temporal basis, based on avian range charts and habitat types, have been included in the listing.

One Sandhill Crane (Grus canadensis), a species listed as Threatened by both the FWS and the FGFWFC, was observed flying over the site during one of the field surveys. No Sandhill Cranes were observed using the site. The Pasco County resource recovery property does not contain the type of habitat which is preferred by Sandhill Cranes. These birds generally congregate in marshy grasslands, prairies and grainfields. Such habitat does occur within about 5 miles of the site where a small group of approximately 6 of these birds has been observed. The one Sandhill Crane that was sighted flying over this site was probably a member of this group, flying from one feeding site to another.

Of the reptilian fauna likely to be found inhabiting this site, two are Species of Special Concern with FGFWFC (Gopher Tortoise - Gopherus polyphemus, and Gopher Frog - Rana areolata aesopus); and one is listed as Threatened with FWS (Eastern Indigo Snake - Drymarchon corias couperi).

The skeletal remains of a Gopher Tortoise and 24 burrows were found on the property. Of the 24 burrows, 13 showed signs of activity. Burrows have been recorded as active, inactive, or abandoned based on the following

TABLE 2-20

WILDLIFE OBSERVED OR EXPECTED TO OCCUR^a ON
THE PASCO COUNTY RESOURCE RECOVERY SITE

<u>Scientific Name</u>	<u>Common Name</u>
BIRDS	
Accipiter straitus	Sharp-shinned Hawk ^c
Agelaius phoeniceus	Red-winged Blackbird ^b
Anas discors	Blue-winged Teal ^{b, c}
Anas platyrhynchos	Mallard ^b
Ardea herodias	Great Blue Heron ^b
Bubo virginianus	Great Horned Owl
Bubulcus ibis	Cattle Egret ^b
Buteo jamaicensis	Red-tailed Hawk ^b
Butorides striatus	Green Heron
Capella gallinago	Common Snipe ^{b, c}
Cardinalis cardinalis	Cardinal ^b
Casmerodius albus	Great Egret
Cathartes aura	Turkey Vulture ^b
Catharus guttatus	Hermit Thrush ^c
Centurus carolinus	Red-bellied Woodpecker ^b
Colaptes auratus	Common Flicker ^b
Colinus virginianus	Bobwhite Quail ^b
Columbina passerina	Ground Dove ^b
Coragyps atratus	Black Vulture
Corvus brachyrhynchos	Common Crow ^b
Cyanocitta cristata	Blue Jay ^b
Dendroica coronata	Yellow-rumped Warbler ^c
Dendroica dominica	Yellow-throated Warbler
Dendroica palmarum	Palm Warbler ^{b, c}
Dendroica pinus	Pine Warbler ^b
Dumetella carolinensis	Gray Catbird
Egretta caerulea	Little Blue Heron ^{b, c}

TABLE 2-20 (CONTINUED)

WILDLIFE OBSERVED OR EXPECTED TO OCCUR^a ON
THE PASCO COUNTY RESOURCE RECOVERY SITE
(CONTINUED)

SCIENTIFIC NAME	COMMON NAME
<i>Egretta thula</i>	Snowy Egret ^d
<i>Falco sparverius</i>	American Kestrel ^b
<i>Fulica americana</i>	American Coot ^b
<i>Gallinula chloropus</i>	Common Gallinule ^b
<i>Geothlypis trichas</i>	Yellowthroat
<i>Grus canadensis</i>	Sandhill Crane ^{b, e, f}
<i>Iridoprocne bicolor</i>	Tree Swallow ^{b, c}
<i>Lanius ludovicianus</i>	Loggerhead Shrike ^b
<i>Meleagris gallopavo</i>	Turkey
<i>Melospiza georgiana</i>	Swamp Sparrow ^c
<i>Melospiza melodia</i>	Song Sparrow ^c
<i>Mimus polyglottos</i>	Mockingbird ^b
<i>Passer domesticus</i>	House Sparrow
<i>Picoides pubescens</i>	Downy Woodpecker ^b
<i>Picoides villosus</i>	Hairy Woodpecker
<i>Pipilo erythrophthalmus</i>	Rufous-sided Towhee ^b
<i>Podilymbus podiceps</i>	Pied-billed Grebe
<i>Poliioptila caerulea</i>	Blue-gray Gnatcatcher
<i>Quiscalus major</i>	Boat-tailed Grackle ^b
<i>Quiscalus quiscula</i>	Common Grackle ^b
<i>Sitta carolinensis</i>	White-breasted Nuthatch
<i>Sitta pusilla</i>	Brown-headed Nuthatch
<i>Spizella passerina</i>	Chipping Sparrow ^c
<i>Sturnus vulgaris</i>	Starling
<i>Toxostoma rufum</i>	Brown Thrasher
<i>Turdus migratorius</i>	American Robin ^{b, c}
<i>Vireo solitarius</i>	Solitary Vireo ^c

TABLE 2-20 (Continued)

WILDLIFE OBSERVED OR EXPECTED TO OCCUR^a ON
THE PASCO COUNTY RESOURCE RECOVERY SITE
(continued)

<u>Scientific Name</u>	<u>Common Name</u>
<i>Zenaida macroura</i>	Mourning Dove ^b
<i>Zonotrichia albicollis</i>	White-throated Sparrow ^{b, c}
MAMMALS	
<i>Blarina brevicauda</i>	Shorttail Shrew
<i>Dasypus novemcinctus</i>	Armadillo
<i>Didelphis marsupialis</i>	Opossum ^b
<i>Mephitis mephitis</i>	Striped Skunk
<i>Neofiber alleni</i>	Round-tailed Muskrat ^b
<i>Odocoileus virginianus</i>	Whitetail Deer ^b
<i>Oryzomys palustris</i>	Rice Rat
<i>Peromyscus gossypinus</i>	Cotton Mouse
<i>Procyon lotor</i>	Raccoon ^b
<i>Reithrodontomys humilis</i>	Eastern Harvest Mouse ^b
<i>Scalopus aquaticus</i>	Eastern Mole ^b
<i>Sigmodon hispidus</i>	Hispid Cotton Rat
<i>Sylvilagus floridanus</i>	Eastern Cottontail
REPTILES/AMPHIBIANS	
<i>Anolis carolinensis</i>	Green Anole
<i>Bufo quercicus</i>	Oak Toad
<i>Bufo terrestris</i>	Southern Toad
<i>Coluber constrictor priapus</i>	Southern Black Racer ^b
<i>Crotalus adamanteus</i>	Eastern Diamondback Rattlesnake
<i>Deirochelys reticularia</i>	Chicken Turtle ^b

TABLE 2-20 (Continued)

WILDLIFE OBSERVED OR EXPECTED TO OCCUR^a ON
THE PASCO COUNTY RESOURCE RECOVERY SITE
(continued)

<u>Scientific Name</u>	<u>Common Name</u>
<i>Drymarchon corais couperi</i>	Eastern Indigo Snake ^{e, f}
<i>Elaphe guttata guttata</i>	Corn Snake
<i>Eumeces egregius onocrepis</i>	Peninsula Mole Skink
<i>Gopherus polyphemus</i>	Gopher Tortoise ^{b, d}
<i>Heterodon platyrhinos</i>	Eastern Hognose Snake
<i>Masticophis flagellum flagellum</i>	Eastern Coachwhip Snake
<i>Pseudoeccris nigrita verrucosa</i>	Florida Chorus Frog ^b
<i>Rana areolata aesopus</i>	Florida Gopher Frog ^d
<i>Rana ultricularia</i>	Southern Leopard Frog
<i>Sceloporus undulatus undulatus</i>	Southern Fence Lizard ^b
<i>Terrapene carolina bauri</i>	Florida Box Turtle
<i>Thamnophis sirtalis sirtalis</i>	Eastern Garter Snake

^a Based on range charts and existing habitat types found on the property.

^b Direct sighting of the animal or their sign (tracks, feces, vocalizations, burrow spoils, etc.)

^c Migratory species. These species may potentially use the site seasonally or on a stop-over basis.

^d Species of Special Concern - Florida Game and Fresh Water Fish Commission

^e Threatened - U.S. Fish and Wildlife Service

^f Threatened - Florida Game and Fresh Water Fish Commission

criteria: active - soil at mouth recently disturbed; inactive - soil undisturbed but burrows appear maintained; abandoned - washed in or covered with debris. Refer to Figure 2-25 for approximate burrow locations onsite.

All burrows except two were found on the east side of the transmission line which bisects the site. The most prolific area for Gopher Tortoises appeared to be in the small Sand Pine Scrub community which abuts the transmission line. In this area, 8 burrows were found, and 6 appeared to be active. This is also the location where the skeletal remains of a Gopher Tortoise were found. Several burrows—5 inactive or abandoned, and 6 active—were scattered throughout the planted Slash Pine forest east of the Sand Pine Scrub community. Two burrows—1 active and 1 abandoned—were found on the south border of the clear-cut area in the north section of the property. An abandoned burrow was found in the far northeast corner of the site, and 1 inactive and 1 abandoned burrow were found in the southwest section of the property.

Although the Gopher Frog was not sighted on the property, it is a commensal species of the Gopher Tortoise, sharing their burrows for protection. With the existence of Gopher Tortoises, the potential is increased for the occurrence of Gopher Frogs on this site.

The Eastern Indigo Snake is another commensal species of the Gopher Tortoise. This species will also use the Gopher Tortoise burrows for shelter. No Eastern Indigo Snakes were sighted on the property, but this species is known to exist in similar habitat types.

The mammals on this site which can be considered game animals are the Whitetailed Deer (Odocoileus virginiana) and the Eastern Cottontail (Sylvilagus floridanus). Furbearers include: Opossum (Didelphis marsupialis), Raccoon (Procyon lotor), Striped Skunk (Mephitis mephitis) and Round-tailed Muskrat (Neofiber alleni).



GOPHER TORTOISE (GOPHERUS POLYPHEMUS)
BURROW LOCATIONS

- - ACTIVE
- ▲ - INACTIVE
- - ABANDONED
- ⊙ - SKELETAL REMAINS

PASCO COUNTY RESOURCE RECOVERY PROGRAM
Gopher Tortoise Burrow Locations

Species-Environmental Relationships

There are no species present which are endemic or unique to this site. The species and habitats on this site are ubiquitous and typical of Pasco County and west central Florida.

Based on a visual evaluation of the site during various field surveys, the abundance and variety of species onsite are less than optimal. This is due to the altered state of the property and the highly monospecific plant community on the site. The primarily mature planted coniferous areas offer few habitat niches and ecotonal areas which are prime habitat for wildlife. There is also little understory or shrub growth to provide cover and nesting sites.

Factors which have impacted the general habitat value of the site include its use as a tree farm, the clear-cutting of large areas, and the construction of a flood control drainage ditch. The site has suffered extensive disturbances and exists in an artificially created state. Before this man-made disturbance, the habitat value of this property to wildlife was undoubtedly much higher.

A population of Gopher Tortoises has been found on this site. As a Species of Special Concern with FGFWFC, the welfare and future survival of this species on the project site will be given careful attention. See Section 4.4.1 for further discussion of this issue.

Pre-existing Stresses

Pre-existing environmental stresses from sources such as pollutants are not significant at the Pasco County resource recovery site. The impacts at this site are the result of man's alteration of the land for purposes of drainage, tree farming, and clear-cutting.

Measurement Programs

Plant species were surveyed using aerial photographs and a series of onsite visits. These surveys were conducted from October 1986 to March 1987. For each plant community type identified, an onsite visit was made. Random walking surveys were taken, specimens collected, and a species list compiled. Dominance was estimated visually. Total observer hours for this survey exceeded 50 hours. The manuals used as ecological and taxonomic guides are listed in the reference section at the end of this permit application.

Wildlife surveys were also conducted between October 1986 and March 1987. Observations were made on foot and from vehicles. Random walkover surveys were made of all habitat types on the site. Species were identified by direct observation, song or call, scats, tracks, burrows or nest sites, and skeletal remains. More than 50 observer hours were spent completing this study. The manuals used as ecological and taxonomic guides are listed in the reference section at the end of this permit application.

2.3.7 METEOROLOGY AND AMBIENT AIR QUALITY

Meteorology

The Pasco County resource recovery facility will be located in Pasco County, on the west coast of south central Florida. The climate of this region is influenced by the surrounding waters, since no part of Florida is more than 70 miles from salt water. Interior topography ranges from 100 to 200 feet above msl. Summers are long, warm and relatively humid. Summer temperatures are similar throughout the state. Winters are mild, punctuated by periods of cool to cold air. Temperatures in the northern part of the state average 13°F cooler than in the south. The winds are influenced by the easterly winds, particularly in the south. Elsewhere land/sea breeze effects and convectional forces inland make prevailing winds erratic. Rainfall is distributed throughout the year with the 4-month period from June to September receiving slightly more rain. Precipitation is usually in the form of local showers and thundershowers.

Occasionally, tropical storms produce substantial amounts of rain over large areas. Climatological data from the Tampa International Airport is presented in Table 2-21.

Atmospheric Dispersion

Atmospheric factors which aggravate pollution rarely occur at any specific location in Florida. Air is usually sufficiently unstable to disperse pollutants, as demonstrated by the frequent convective development. The easterly winds sweep across the peninsula, particularly in the south. Five years of sequential meteorological data were used (1970 to 1974) for the air quality model analysis contained in the PSD permit application (see Volume III - Air Quality). The parameters which describe the dispersion characteristics are wind speed, wind direction, atmospheric stability, and mixing heights.

Wind speed data for the 5-year period have been organized into 6 wind speed categories, distributed over the 16 wind direction sectors, and displayed in a wind rose plot showing average, seasonal, and diurnal variations. The frequency of occurrence of a particular wind speed class in a particular wind direction as plotted on the wind rose is proportional to the size of the telescope segment. As shown in Figure 2-26, the prevailing wind direction is from the east. Wind speeds of 1 to 5 miles per second (2 to 11 miles per hour) occur most frequently from this direction. Other wind direction maxima are the east/northeast and the west. Wind speeds in the 5 to 8 miles per second (11 to 18 miles per hour) class most frequently come from the west. Figure 2-27 shows the location of the site and prevailing wind direction relative to surrounding communities. Seasonal wind patterns are displayed on Figure 2-28. Spring and summer seasons are strongly influenced by winds from the east and west, with lighter winds more likely from the east, and stronger winds more likely from the west. During the summer, winds are more likely to come from the southeastern quadrant than any other quadrant. During the fall and winter seasons, westerly winds diminish significantly. Winds from the northeastern quadrant dominate in the fall. The distribution of wind speeds in the winter is more uniform, but a strong easterly component in the wind direction is apparent.

TABLE 2-21

NORMALS MEANS AND EXTREMES TAMPA INTERNATIONAL AIRPORT

TAMPA, FL

INTERNATIONAL AIRPORT

EASTERN

27° 58' N

82° 32' W

19 FT

Month	Temperatures °F						Normal Degree days Base 65 °F		Precipitation in inches						Relative humidity pct				Wind				Pct of possible sunshine	Mean sky cover, tenths, sunrise to sunset	Mean number of days						Average station pressure mb.																																																																				
	Normal			Extremes					Water equivalent						Snow, ice pellets				Fastest mile						Sunrise to sunset						Temperatures °F																																																																				
	Daily maximum	Daily minimum	Monthly	Record highest	Year	Record lowest			Year	Heating	Cooling	Normal	Maximum monthly	Year	Minimum monthly	Year	Maximum in 24 hrs	Year	Maximum monthly	Year	Hour	Hour			Hour	Hour	Mean speed m.p.h.	Prevailing direction	Speed m.p.h.	Direction	Year	Precipitation .01 inch or more	Snow, ice pellets 1.0 inch or more	Thunderstorms	Heavy fog, visibility 1/2 mile or less	(b) 80° and above	32° and below	37° and below	0° and below	Elev. feet m.s.l.																																																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
(a)	70.0	49.5	59.8	84	1975	22	1981	228	66	2.17	8.02	1948	1	1950	3.29	1953	0.2	1977	0.2	1977	65	86	59	73	8.6	N	35	29	1959	65	5.6	10	10	11	6	0	1	6	0	0	2	0	1019.9																																																								
F	71.0	50.4	60.6	86	1971	24	1958	186	68	3.04	7.95	1943	0.21	1950	3.68	1981	1	1951	1	1951	83	86	56	69	9.4	E	50	32	1954	66	5.5	9	9	10	7	0	2	3	0	0	1	0	1019.1																																																								
M	76.2	56.1	66.2	91	1949	29	1980	87	124	3.46	12.64	1959	0.06	1956	5.20	1960	1	1960	1	1960	83	86	55	67	9.7	S	43	29	1956	71	5.5	10	10	11	7	0	3	3	0	0	0	0	1017.5																																																								
A	81.6	61.1	71.6	93	1975	40	1971	0	202	1.82	6.59	1957	1	1981	1.75	1951	0.0		0.0		82	87	51	61	9.5	ENE	37	29	1961	75	5.0	11	11	11	8	5	0	3	1	1	0	0	0	1017.2																																																							
M	87.1	67.2	77.1	98	1975	49	1971	0	375	3.38	17.64	1979	0.17	1973	11.64	1979	0.0		0.0		82	86	53	62	8.9	E	46	36	1958	75	5.2	10	12	9	6	0	6	1	7	0	0	0	1015.5																																																								
J	89.5	72.3	80.9	98	1977	61	1972	0	477	5.29	13.75	1974	1.66	1951	5.53	1974	0.0		0.0		84	87	60	69	8.2	E	67	31	1964	67	6.2	5	14	11	12	0	14	0	15	0	0	0	1316.1																																																								
J	90.0	74.2	82.2	97	1964	63	1970	0	533	7.35	20.59	1960	1.65	1981	12.11	1960	0.0		0.0		85	88	63	73	7.4	E	58	32	1963	62	6.7	2	16	13	16	0	21	0	20	0	0	0	1017.6																																																								
A	96.3	74.2	82.2	98	1975	67	1973	0	533	7.64	16.59	1949	2.35	1952	5.37	1949	0.0		0.0		87	91	65	74	7.2	ENE	38	11	1961	60	6.7	3	16	12	17	0	21	0	20	0	0	0	1017.3																																																								
S	98.5	72.8	80.9	96	1972	57	1981	0	477	6.23	13.98	1979	1.28	1972	4.67	1950	0.0		0.0		86	91	62	75	8.0	ENE	56	34	1960	60	6.5	4	14	12	13	0	12	0	14	0	0	0	1015.3																																																								
O	83.7	65.1	74.5	94	1959	40	1964	0	295	2.34	7.36	1952	0.16	1979	2.54	1968	0.0		0.0		85	88	57	71	8.7	NNE	38	02	1953	64	5.2	11	11	9	7	0	5	1	2	0	0	0	1016.6																																																								
N	76.9	56.4	66.7	90	1971	23	1970	65	116	1.87	6.12	1963	1	1960	6.22	1963	0.0		0.0		86	88	57	74	8.5	NNE	40	29	1963	65	5.0	12	9	9	6	0	1	3	0	0	0	0	1018.6																																																								
E	71.6	50.9	61.3	86	1978	18	1962	173	58	2.14	6.66	1950	0.21	1956	3.28	1969	0.0		0.0		85	88	59	74	8.7	N	45	36	1953	62	5.6	10	9	12	7	0	1	4	0	0	1	0	1019.8																																																								
YE	81.4	62.5	72.0	98	JUN 1977	18	DEC 1962	739	3324	46.73	20.59	JUL 1960	1	APR 1981	12.11	JUL 1960	0.2	JAN 1977	0.2	JAN 1977	84	88	58	70	8.6	E	67	31	JUN 1964	66	5.7	97	141	127	107	0	67	23	77	0	4	0	1017.5																																																								

NOTE: NORMAL COOLING DEGREE DATA PUBLISHED IN THE
1982 ANNUAL WERE FOR THE 1951-1960 PERIOD.

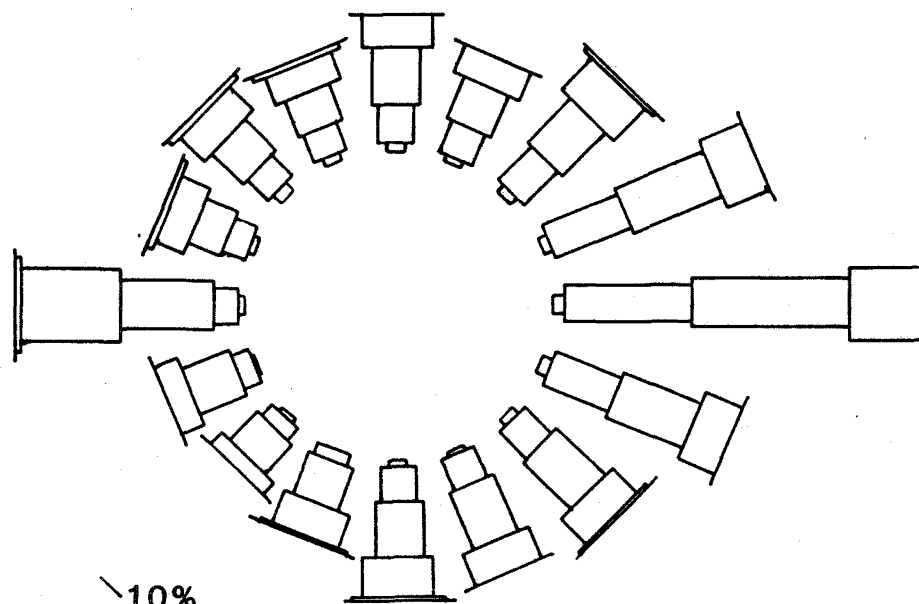
NORMALS, MEANS, AND EXTREMES TABLE NOTE(S):

- (a) Length of record, years, through the current year unless otherwise noted, based on January data.
(b) 70° and above at Alaskan stations.
* Less than one half.
T Trace.
BLANK entries denote missing or unreported data.

NORMALS - Based on record for the 1951-1980 period.
MEANS - Length of record in (a) is for complete data years.
EXTREMES - Length of record in (a) may be for other than complete or consecutive data years. Date is the most recent in cases of multiple occurrence.
WIND DIRECTION - Numerals indicate tens of degrees clockwise from true north. 00 indicates calm.
FASTEST MILE WIND - Speed is fastest observed 1-minute value when direction is in tens of degrees.

Means and extremes above are from existing and comparable exposures. Annual extremes have been exceeded at other sites in the locality as follows:
Wind
Fastest Mile: 84 in Sep. 1935.

WIND SPEED AND DIRECTION ROSE



WIND SPEED CLASS (mps)

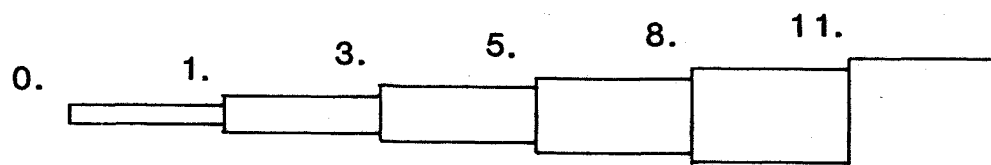
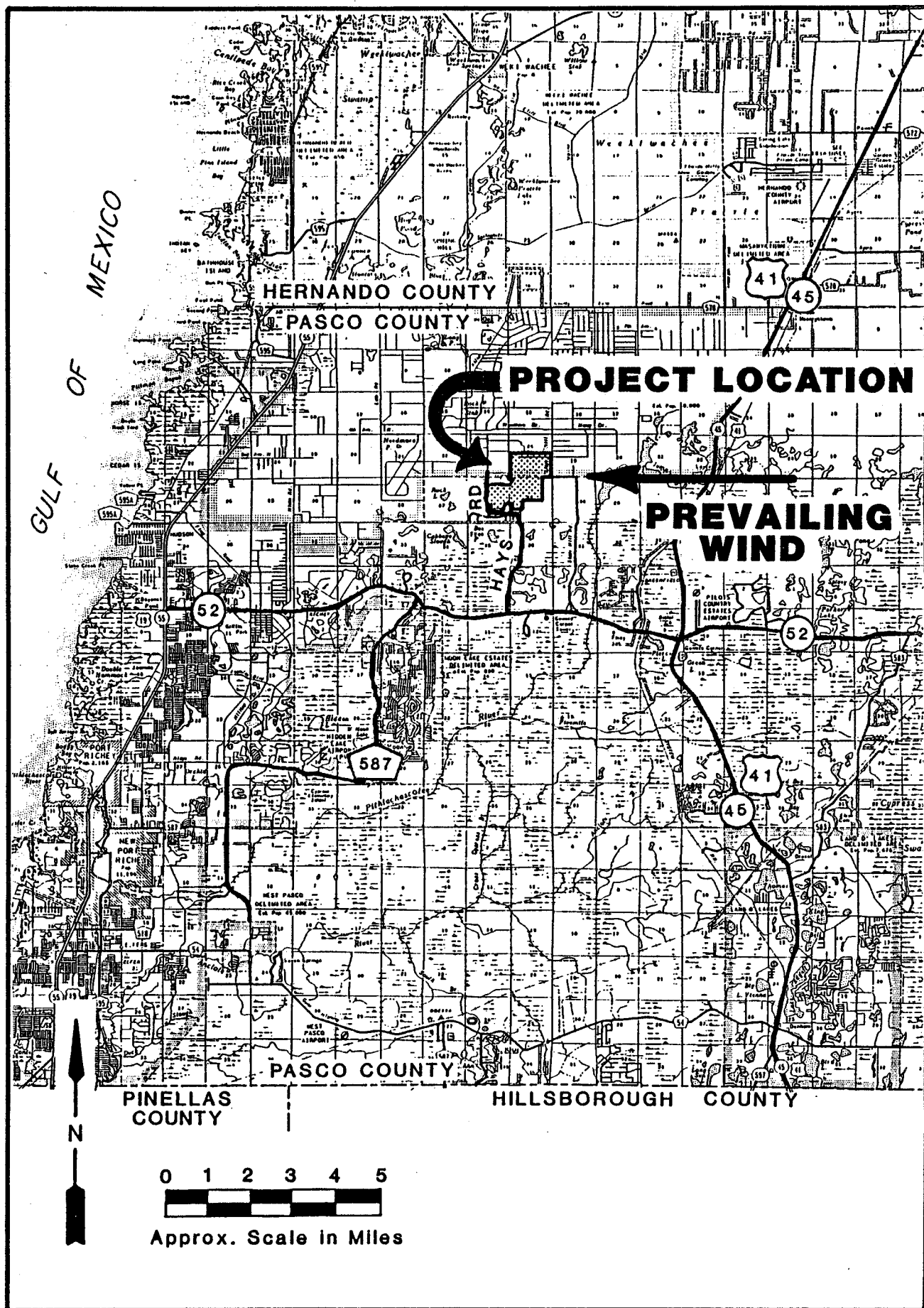


FIGURE 2-26

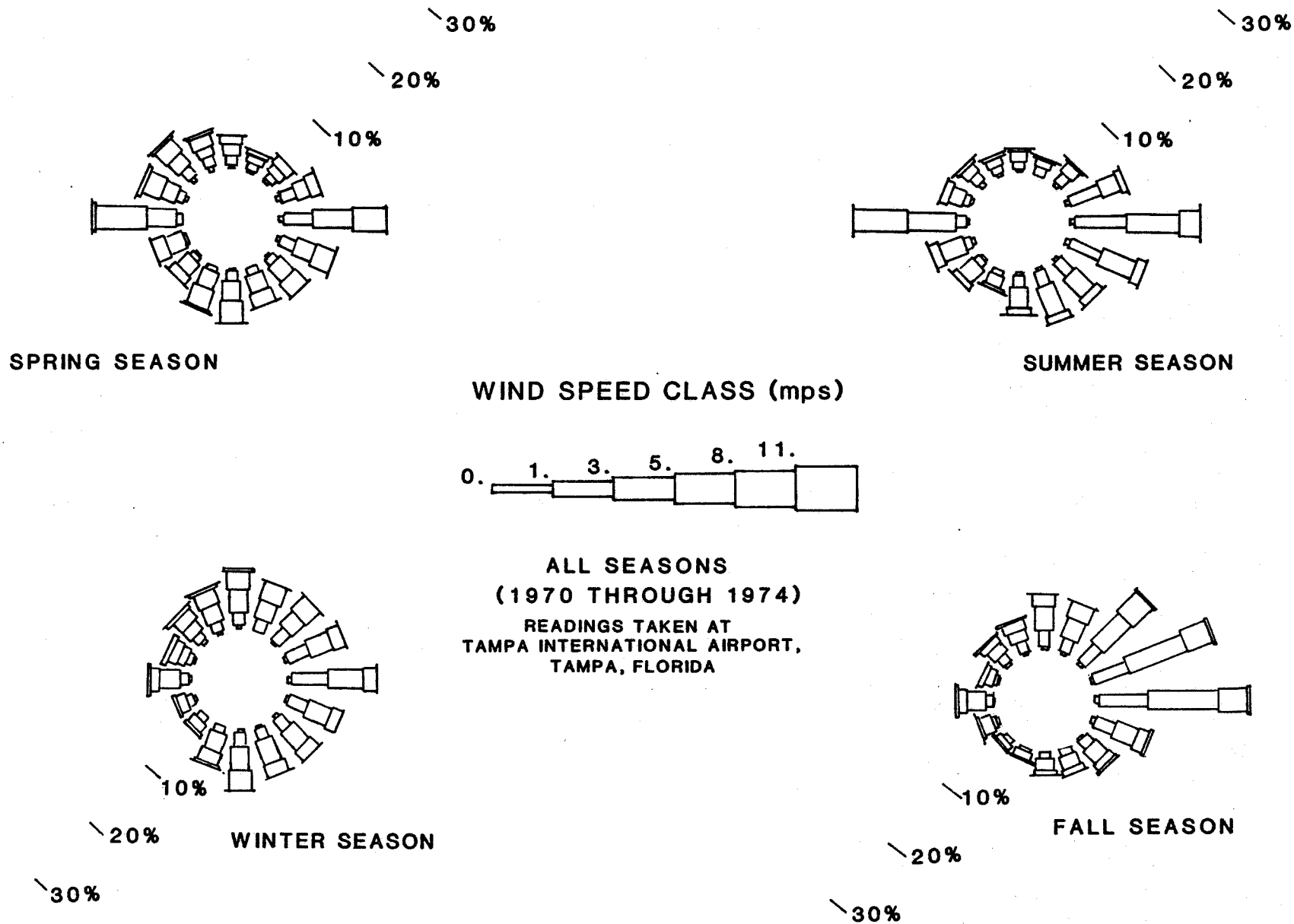
READINGS TAKEN AT TAMPA INTERNATIONAL AIRPORT, TAMPA, FLORIDA

Pasco County Resource Recovery Program
Annual Wind Rose (1970-1974)



Pasco County Resource Recovery Program
Area Map With Prevailing Wind Direction
(1970-1974)

FIGURE 2-27



Diurnal wind direction roses are presented in Attachment B of Volume III - Air Quality. In the combined diurnal wind direction distribution, the west direction and the south/southwest through west/southwest directions show a diurnal pattern. This pattern shows a maximum frequency of occurrence during the early afternoon and a minimum frequency during the early morning hours. The sectors to the south/southwest to west/southwest are influenced by Old Tampa Bay, located near the airport. The western sector shows the influence of the Gulf of Mexico, although the airport is several kilometers inland. Since the magnitude of the western sector is much larger than the southwestern sectors, the Gulf of Mexico influence has a greater effect than the Old Tampa Bay area on the regional wind pattern, although the bay is much closer.

The spring and summer diurnal wind roses show not only the daily land/sea breeze effects, but also the seasonal variation as the westerly direction exceeds 30 percent during the summer. The strong east/southeast to south sectors show the movement of warmer air northward across the state.

Virtually no land/sea breeze pattern is evident during the fall and winter. The fall is strongly influenced by winds coming from the northeast, as cool air begins to move southward. During the winter, no clear diurnal pattern is evident, but an easterly component to the general seasonal pattern is shown.

The wind speeds and directions for the 5 years of meteorological data are stratified by the stability Classes A through F in Attachment B of Volume III - Air Quality, where Class A stability is unstable, and Class F is stable. Classes A and B represent the most unstable categories. Each of these cases occurs approximately 5 percent of the time, since mixing is promoted which, in turn, promotes a more stable atmosphere. Class A stability occurs during the day when skies are clear and the incoming solar radiation is strong—conditions which are more likely during the summer. Tampa meteorological data show that Class A stability is strongly associated with light easterly winds. Class B stability occurs during the day when the incoming solar radiation is moderate, conditions typical of partly cloudy days, or during the fall when sunlight is less direct. Class

B conditions are more frequently associated with moderate westerly winds. During the day when the cloud cover is more complete or the incoming solar radiation is slight, Class C—slightly unstable—conditions occur. Winds associated with this case are most likely moderate to strong westerly winds. Neutral stability Class D occurs during overcast conditions during the day or night, or when speeds are strong and the stability category is most likely to occur. These conditions are most frequently associated with easterly and westerly winds. Classes E and F represent the slightly stable and stable conditions. These conditions occur at night when the sky is partly cloudy or clear. The slightly unstable case is associated with moderate easterly winds. The stable case is associated with light easterly winds.

Mixing height is the height above the surface through which vigorous vertical mixing occurs. Although the mixing height varies throughout the day, the morning and afternoon values presented in Table 2-22 represent the average minimum and maximum heights, respectively. Certain atmospheric conditions make the calculation of mixing height difficult. These conditions include periods of marked cold air advection, significant precipitation, and missing wind speed or temperature data. These periods were not included in the calculation of the average mixing heights presented.

Ambient Air Quality

Pollutants subject to Prevention of Significant Deterioration review (PSD), and emitted at "significant levels" are subject to ambient air quality monitoring [FAC 17-2.500(5)(f)], to define background concentrations. These ambient levels are then used as a basis for establishing whether the proposed emissions contribute to the violation of ambient air quality standards. The pollutants subject to this monitoring provision are the criteria pollutants for which ambient standards have been set by the Florida Department of Environmental Regulation, and other noncriteria pollutants subject to PSD. The significant emission levels and proposed emission levels for these pollutants are listed in Table 2-23.

TABLE 2-22

HOLTZWORTH MIXING HEIGHTS FOR THE TAMPA AREA

Period	Morning (meters)	Afternoon (meters)
Annual	493	1359
Spring	503	1523
Summer	656	1460
Fall	419	1401
Winter	394	1052

SOURCE: Holtzworth, G.C. January 1972. Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution Throughout the Contiguous United States. U.S. Environmental Protection Agency AP-101.

TABLE 2-23

COMPARISON OF SIGNIFICANT EMISSION RATES
AND FACILITY POTENTIAL EMISSIONS

Pollutants	Significant ^a Emission Rates (tons/year)	Potential ^b to Emit (tons/year)
Particulate matter		
(Total suspended particulate)	25	68
(Inhalable particulate, PM ₁₀)	15	68
Carbon monoxide (Annual)	100	103
Nitrogen oxides	40	1,351
Sulfur dioxide	40	471
Ozone (VOCs)	40	44
Lead	0.6	3.4
Beryllium	0.0004	0.000285
Mercury	0.1	3.07
Inorganic Arsenic	—	1.91 x 10 ⁻²
Fluorides	3	17
Sulfuric acid mist	7	75
Vinyl chloride	1	— ^c
Asbestos	0.007	— ^c
Total reduced sulfur (including H ₂ S)	10	— ^c
Reduced sulfur (including H ₂ S)	10	— ^c
Hydrogen sulfide	10	— ^c
Hydrogen chloride ^d	—	267
Dioxin (as 2,3,7,8 TCDD toxic equiv.) ^d	—	7.45 x 10 ⁻⁶

^a FAC 17.2 Part V Table 500.2 or 40 CFR 52.21 (b)(23)(i).^b Emission estimates at 100 percent system capacity and availability.^c Emissions of these pollutants are negligible.^d Not a PSD regulated pollutant.

Sources may be exempt from air quality monitoring if the impact of a given pollutant falls below the de minimis monitoring concentration [FAC 17-2.500(3)(e)]. The air quality impact analysis was done using sequential meteorological data. From this analysis, the highest, second-highest concentrations were compared to the appropriate de minimis concentration (Table 2-24). Less than de minimis levels were predicted for each of the PSD regulated pollutants emitted from the facility.

There are numerous State and Local Air Monitoring Stations (SLAMS) and National Air Monitoring Stations (NAMS) operating in counties abutting Pasco County. A majority of the monitors used to develop criteria pollutant background concentrations for the Pasco County site are located in Hillsborough and Pinellas Counties, toward the south and southeast. Background concentrations display an inherent conservatism due to urban emissions influencing these monitoring sites, but not the proposed site.

There are no ambient air monitoring stations within 10 kilometers of the Pasco County resource recovery facility site. The proposed site is an area generally free from impacts of other major point and area sources. The low density of industry within 25 kilometers of the proposed site suggests that there is an associated low probability of impact on air quality by such sources near the Pasco County site. Regional background concentrations for several pollutants were developed from available monitoring data from the surrounding counties (see Table 2-25). Most of the monitors for total suspended particulates and sulfur dioxide are sited near major electric utilities. Monitors for nitrogen dioxide, lead, and carbon monoxide are located in congested urban areas. Therefore, the estimates of background concentrations for the proposed site, as shown in Table 2-26, are conservative because they are based on monitors that are influenced by major point and area pollution sources. Additional information about the development of the background concentrations is presented in Section 5.0 of the PSD permit application (see Volume III - Air Quality).

TABLE 2-24

COMPARISON OF PREDICTED CONCENTRATIONS TO SIGNIFICANT
IMPACT AND DE MINIMIS MONITORING LEVELS(ug/m³)

Pollutant Level	Averaging Time	Rank ^b	Maximum Predicted Concentration	Significant Impact Level	De Minimis Monitoring
Sulfur Dioxide	Annual	H	0.36	1	—
	24-hour	HSB	2.99	5	13
	3-hour	HSB	11.43	25	—
Particulate Matter	Annual	H	0.10	1	—
	24-hour	HSB	0.87	5	10
Nitrogen Dioxide	Annual	H	1.03	1	14
Carbon Monoxide	8-hour	HSB	7.75	500	575
	1-hour	HSB	20.0	2,000	—
Lead ^a	24-hour	HSB	0.09	—	0.1 ^a
Mercury	24-hour	HSB	0.0225	—	0.25
Beryllium	24-hour	HSB	2.9x10 ⁻⁶	—	5.0x10 ⁻⁴
Fluoride	24-hour	HSB	0.0124	—	0.25

^aThe de minimis monitoring level for lead is a quarterly averaged value. The 24-hour average concentration was substituted as a conservative estimate of the quarterly value.

^bAbbreviations: H = Highest concentration
HSB = Highest, second-highest concentration

TABLE 2-25

AMBIENT SULFUR DIOXIDE MONITORING DATA USED TO DERIVE BACKGROUND CONCENTRATIONS
FOR PROPOSED PASCO COUNTY RESOURCE RECOVERY FACILITY DISPERSION MODELING STUDY

1984, 1985, 1986 Monitored Concentrations ($\mu\text{g}/\text{m}^3$)

County	Address	SAROAD No.	Monitor Reference Letter	3-Hour Avg. HSH	24-Hour Avg. HSH	Annual+ H	Monitoring Location Relative to Pasco RRF Site++	
							Distance (km)	Azimuth (degrees)
Hillsborough	Apollo Beach/Apollo Beach	1800084G02*	A	548,521,397	97,85,91	13,13,13	69.3	167.7
	5012 Causeway, Tampa	1800095G02	B	(456),376,360	(103),83,84	15,21,22	52.2	163.3
	Coast Grd. Sta., Davis Is.	4360035G02	C	393,287,350	82,67,77	19,14,20	50.3	168.8
	Ballast. Pt. Prk, Interbay Blvd.	4360053G02	D	383,265,340	69,69,84	16,15,20	54.3	172.5
	HCEPC OFC., Ybor City	4360052G01*	E	474,303,467	127,82,133	16,14,(26)	47.1	166.0
	Big Bend Road, Hillsb.	1800021G02*	F	437,637,475	82,134,99	13,15,16	67.2	163.5
Citrus	Crystal Rvr./Curtis Tool Co.	0580002F02	G	261,212,x	59,48,x	12,x,x	64.2	355.2
	Crystal Rvr./Twin Rvr. Marina	0580003J02	H	114,144,104	23,36,17	5,4,3	58.2	357.9
	East of FPC Plt./Crystal River	0580005J02	I	310,323,176	59,77,36	7,6,6	73.7	354.4
Pinellas	Pinellas Prk./11500 43rd Av.	3620002G05	J	266,258,202	71,61,75	10,10,11	57.5	193.7
	Derby Lane 10100 San Mar., St. Petersburg	3980023G02*	K	406,362,497	95,85,121	16,16,19	56.7	187.0
	303A Anclotte Rd., Tarpon Springs	4380001G02	L	96,92,122	28,30,28	5,6,6	31.2	223.6
	Brooker Creek Prk., Tarpon Springs	4380002G03	M	196,135,211	44,29,50	8,7,8	34.2	204.6

Data Source: Florida air quality statistical reports for 1984, 1985, and 1986 (Florida BAQM, Air Monitoring and Analysis Section)

Abbreviations: H = Highest
HSH = Highest, Second-Highest

Symbols: + = Arithmetic mean
* = Monitor impacted by local industry/utilities; not representative of general air quality
x = Less than 75% annual data collection efficiency
() = Selected ambient background SO₂ concentration (for given averaging period) proposed for Pasco Site
++ = Pasco Site stack coordinates are approximately 347.12 UTM-East, 3139.23 UTM-North

TABLE 2-26

PROPOSED BACKGROUND CONCENTRATIONS OF CRITERIA POLLUTANTS
FOR THE PASCO COUNTY RESOURCE RECOVERY FACILITY SITE*
(ug/m³)

Pollutant	Averaging Periods					
	1-Hour	3-Hour	8-Hour	24-Hour	Quarterly	Annual
SO ₂	—	456 ^a (35%)	—	103 ^a (28%)	—	26 ^b (43%)
TSP	—	—	—	87 ^c (58%)	—	43 ^c (73%)
PM ₁₀	—	—	—	87 ^g (58%)	—	45 ^g (90%)
NO ₂	—	—	—	—	—	39 ^h (39%)
Pb	—	—	—	—	0.4 ^e (27%)	—
CO	5,153 ^f (13%)	—	1,145 ^f (11%)	—	—	—
O ₃	222 ^h (94%)	—	—	—	—	—

Symbols:

H = Highest concentration

HSH = Highest, second-highest concentration

() = Number in parentheses denotes percentage of FAAQS consumed. PM₁₀ is compared to the NAAQS.Superscripts:

*Selection based on 1984-1986 ambient monitoring data.

^aHSH, SAROAD No. 1800-095-G02, 1984; 5012 Causeway, Tampa, Hillsborough County.^bHighest Arithmetic Mean, SAROAD No. 4360-052-G01, 1986; HCEPC OFC, Ybor City, Hillsborough County.^cSee Table 5-6 in PSD permit application (Volume III - Air Quality).^dSAROAD No. 4360-052-G01 1986; HCEPC OFC, Ybor City, Hillsborough County; Highest annual arithmetic mean for a continuous monitor with >75% data capture for 1986.^eSAROAD No. 1800-082-G02, 1986; County Maintenance Barn #82, Orient Road, Hillsborough County; Highest 3-month average concentration for 1986.^fAssumed 4.5 ppm (1-hour) and 1 ppm (8-hour) backgrounds based on data from the Florida Indirect Source Modeling Interim Guideline.^gAssumed that the TSP background concentrations are entirely PM₁₀.^hSAROAD No. 4360-035-G02, 1986; Coast Guard Station, Davis Island, Tampa, Hillsborough County.

Measurement Programs

Florida has been monitoring air quality since 1962 when the Department of Health began monitoring particulate matter at Miami International Airport. In January 1972, Florida submitted a plan to the U.S. Environmental Protection Agency (EPA) for establishing an air quality surveillance system in accordance with EPA regulations published in Section 420.17 of 42 CFR Part 420. The surveillance system established as a result of that plan consists of 204 stations.

Sampler location is determined by the monitoring objectives and siting criteria contained in 40 CFR 58 Appendix D, Network Design for State and Local Air Monitoring Stations. Continuous samplers run 24 hours per day. Manual samplers run for 24 hours every 6th day. Missing values are carefully documented and makeup days may be required in manual networks to ensure that reporting requirements are met. The measurement method for each pollutant is listed in Table 2-27. Each sampler is calibrated on a regular basis. Calibration standards are referenced to the National Bureau of Standards - Standard Reference Materials (NBS-SRM). Calibrations are performed at least once each quarter to test the instrument over its full operating range. Final unadjusted calibrations are performed prior to maintenance, before instrument shutdown, when biweekly span checks exceed ± 15 percent error, and after an air quality exceedance. Confidence limits of precision and accuracy are assigned to all measurements with federally approved reference or equivalent methods/monitors. EPA's audit covers facilities, equipment, procedures, documentation, and personnel.

2.3.8 NOISE

A technical noise analysis was performed for the proposed resource recovery facility. The noise study and related correspondence are contained in Appendix 10.12 (see Volume II). The study explains the methodologies used in estimating the operational impacts of the facility and the results of the analysis. Ambient noise levels were measured at four locations in the

TABLE 2-27

AIR POLLUTION MEASUREMENT METHODS

Parameter	Method or Reference
Carbon Monoxide	Title 40 Code of Federal Regulations (40 CFR), Part 50, Appendix C Beckman Model 866; EPA No. RFCA-0876-12
Dust (Microscopy)	EPC - Nikon Polarization Microscope
Dustfall	Journal of Air Pollution Control Association July 66, Vol. 16, No. 7
Nitrogen Dioxide: Bubbler	EPA No. EON-1277-026 page 62971 Federal Registry Vol. 42
Continuous	40 CFR, Part 50, Appendix F 1. Monitor Labs Model 8440; EPA No. RFNA-0677-021 2. Bendix Model 8101-B Analyzer
Ozone	40 CFR, Part 50 Appendix D 1. Bendix Model 30002; EPA No. RFOA-0176-007 2. Dasibi Model 1003 AH; EPA No. EQQA-0577-019
Sulfur Dioxide: Bubbler	40 CFR, Part 50, Appendix A
Continuous	1. Thermo Electron Model 43; EPA No. QSA-0276-009 2. Philips Model PW9755; EPA No. EQSA-0676-010
Suspended Particulate: Total	40 CFR, Part 50, Appendix B
Sulfates	EPC - Turbidimetric Method
Lead	40 CFR, Part 50, Appendix G

SOURCE: Florida Department of Environmental Regulation. 1984. Florida National Air Monitoring Stations and State and Local Air Monitoring Station Network Description.

site vicinity to establish baseline conditions during day and night periods. The selection of the monitoring locations was based on the following criteria:

- Land use or zoning—specifically, an area with a significant residential population or commercial use;
- Local noise ordinances—governmental agencies have established local noise levels which may not be exceeded; and
- Sensitive receptors—concentrations of individuals who may be sensitive to an increase in noise level (i.e., hospitals, schools, nursing homes).

Based on the criteria detailed above, monitoring stations were placed around the site as shown in Figure 2-29. In some cases, a monitoring station was used to assess ambient sound levels at more than one sensitive receptor. Table 2-28 lists the sensitive receptors selected.

Noise levels were measured every two hours, on one day, for a 20-minute period at each site. Noise levels were measured with a Type 2 sound level meter at a height of approximately 5 feet. During each 20-minute period, 40 readings were taken from which a 1-hour equivalent continuous sound level in decibels was calculated (L_{eq}). Hourly values for these readings are presented in Table 2-29.

Noise impacts for the proposed facility were estimated using typical sound levels from other resource recovery facility operations and truck traffic. These predicted impacts were combined with existing noise levels to estimate total cumulative impact.

Pasco County has a noise ordinance which is contained in Section 16-3/4-29 of the Pasco County Code. According to this ordinance:

No noise shall be created in an industrial zone which exceeds those levels given below, as measured on the adjacent property line.

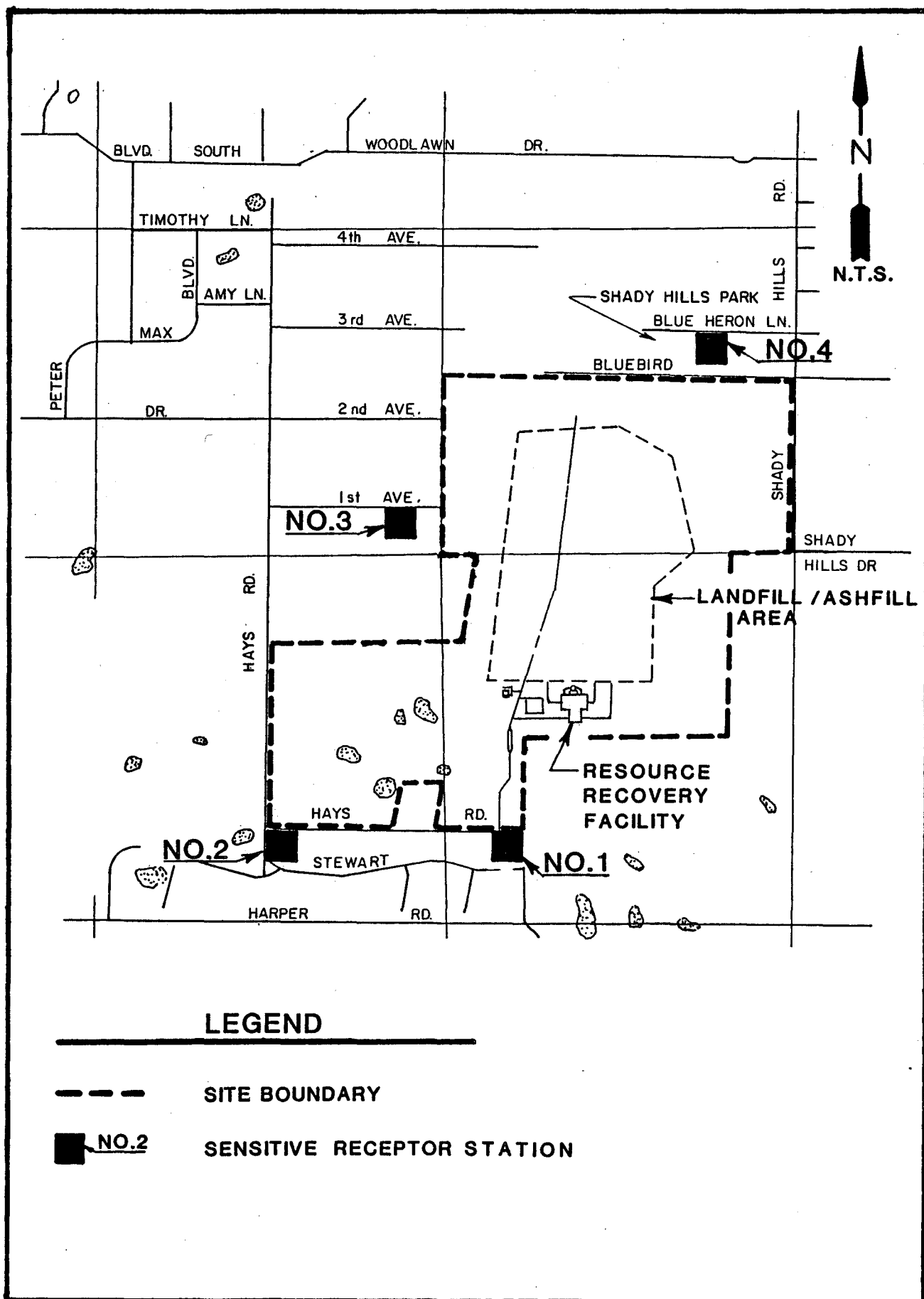


FIGURE 2-29

TABLE 2-28

SENSITIVE RECEPTORS
NOISE MONITORING PROGRAM

Monitoring Station Number	Sensitive Receptor	Comments
1	Residence	Assess impacts to resident closest to site entrance
2	Residence	Assess impacts to residents southwest of the site
3	Residence	Assess impacts to residents northwest of the site
4	County Park	Assess impacts to participants of park activities

TABLE 2-29
HOURLY L_{eq} VALUES BY STATION

Hour	Station			
	MS-1	MS-2	MS-3	MS-4
0	42	54	47	30
3	33	41	32	43
5	40	42	36	46
7	51	52	46	54
9	45	46	48	51
10	49	50	50	47
12	50	48	48	52
13	54	54	49	48
15	55	45	51	50
18	51	50	58	58
20	53	54	50	55
22	55	50	36	44

MAXIMUM NOISE LEVELS PERMITTED IN
INDUSTRIAL ZONE

Adjoining Commercial
District
(No Time Limit)

72 dBA

Adjoining Residential District

7:00 am-6:00 pm

Monday - Saturday

66 dBA

6:00 pm-7:00 am

Monday - Saturday
and all hours of
Sunday

55 dBA

In cases of impulsive noises, the noise levels mentioned above shall be increased by ten (10) dBA (as measured on a sound level meter) during the hours of 7:00 am to 6:00 pm, Monday through Saturday, but shall not exceed the levels mentioned above during the period from 6:00 pm to 7:00 am, Monday through Saturday and all day Sunday.

This ordinance applies to both adjoining commercial districts as well as adjoining residential districts. Table 2-30 compares predicted resource recovery facility noise impacts and existing background noise to county standards.

The predicted noise impacts are small in comparison to existing background noise. The resource recovery facility is expected to have a minimal impact on existing noise levels throughout the study area. A more detailed discussion of the noise monitoring program, and calculations of predicted impacts are contained in Appendix 10.12.

2.3.9 OTHER ENVIRONMENTAL FEATURES

Existing Traffic Condition

The traffic generated by the resource recovery facility will travel primarily on Hays Road and SR 52. Hays Road is a 24-foot wide, 2-lane roadway with limited shoulder room for emergency parking. It is owned and maintained by Pasco County. Hays Road runs in a north/south direction and links the project site with SR 52. In January of 1986, Hays Road was

TABLE 2-30
RESOURCE RECOVERY FACILITY NOISE IMPACTS

Station	Background Level (dBA) 24-hour	Night Only ^a	Expected Facility Level (dBA)	Combined Level (dBA)	County Standard ^b	dBA Change
1	51	—	48	53	55	2
	—	51	48	53	55	2
2	51	—	40	51	55	0
	—	51	40	51	55	0
3	50	—	43	51	55	1
	—	51	43	52	55	1
4	52	—	39	52	55	0
	—	53	39	53	55	0

^a 6 pm - 7 am per Pasco County Code.

^b The most restrictive standard for Sundays and nighttime was used for comparison.

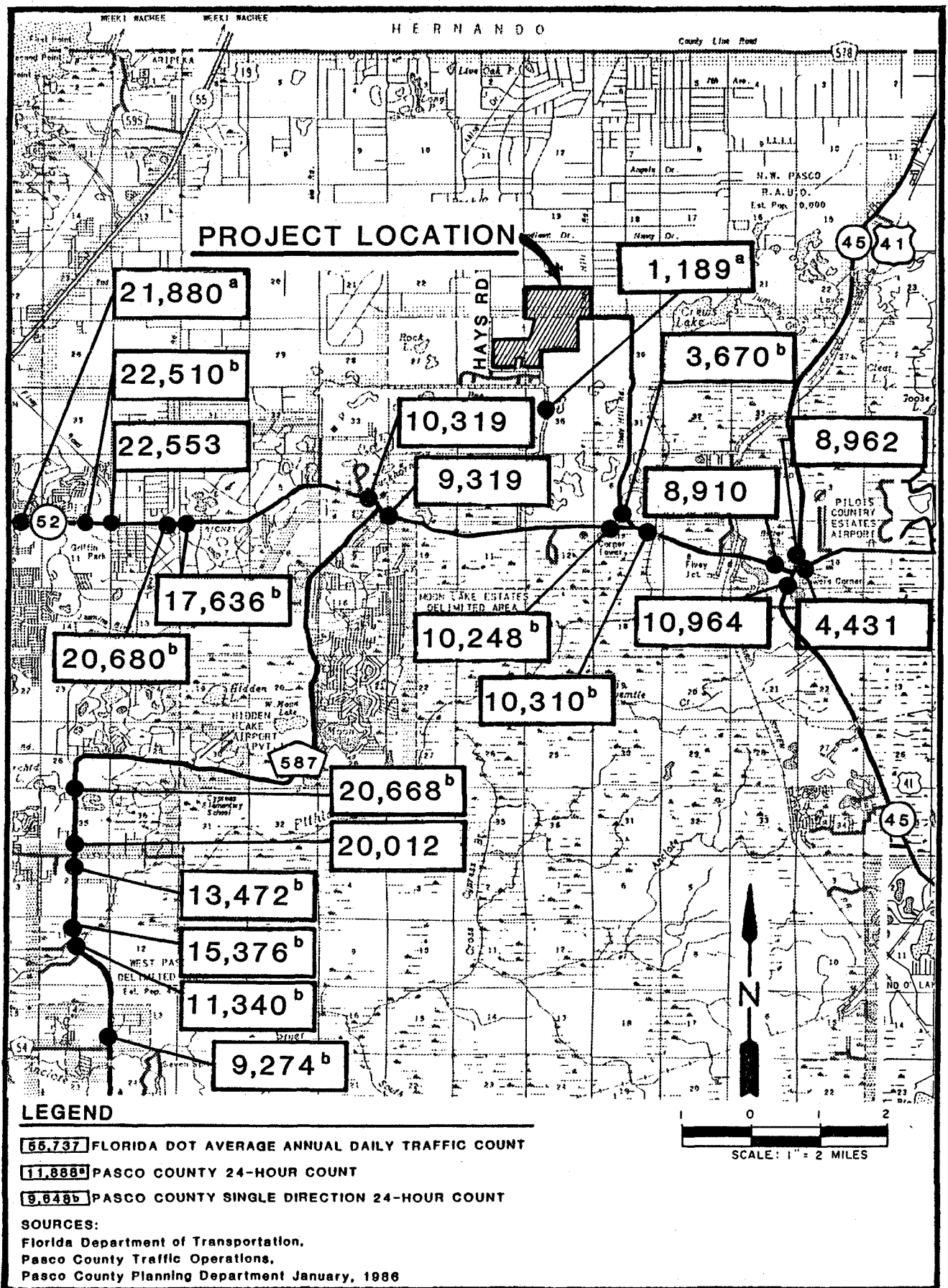
resurfaced from the intersection of Hays Road and SR 52, to the intersection of Hays Road and Harper Road (1,000 feet south of the site).

SR 52 is a major east/west roadway which traverses Pasco County from US 19 to Dade City. It is a 24-foot wide, 2-lane road with 8-foot unpaved shoulders. Major intersecting roads along SR 52 that will be impacted by the project are Moon Lake Road (587), Shady Hills Road, and US 41. Figure 2-30 shows the road network for the project area and the existing traffic flows. At the major intersections, the average annual daily traffic count is given. As shown on the figure, traffic counts increase considerably traveling west on SR 52.

Future Road Construction

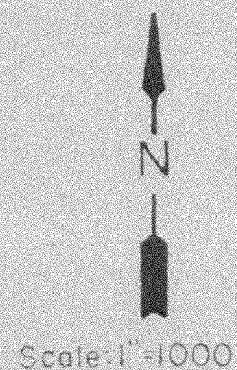
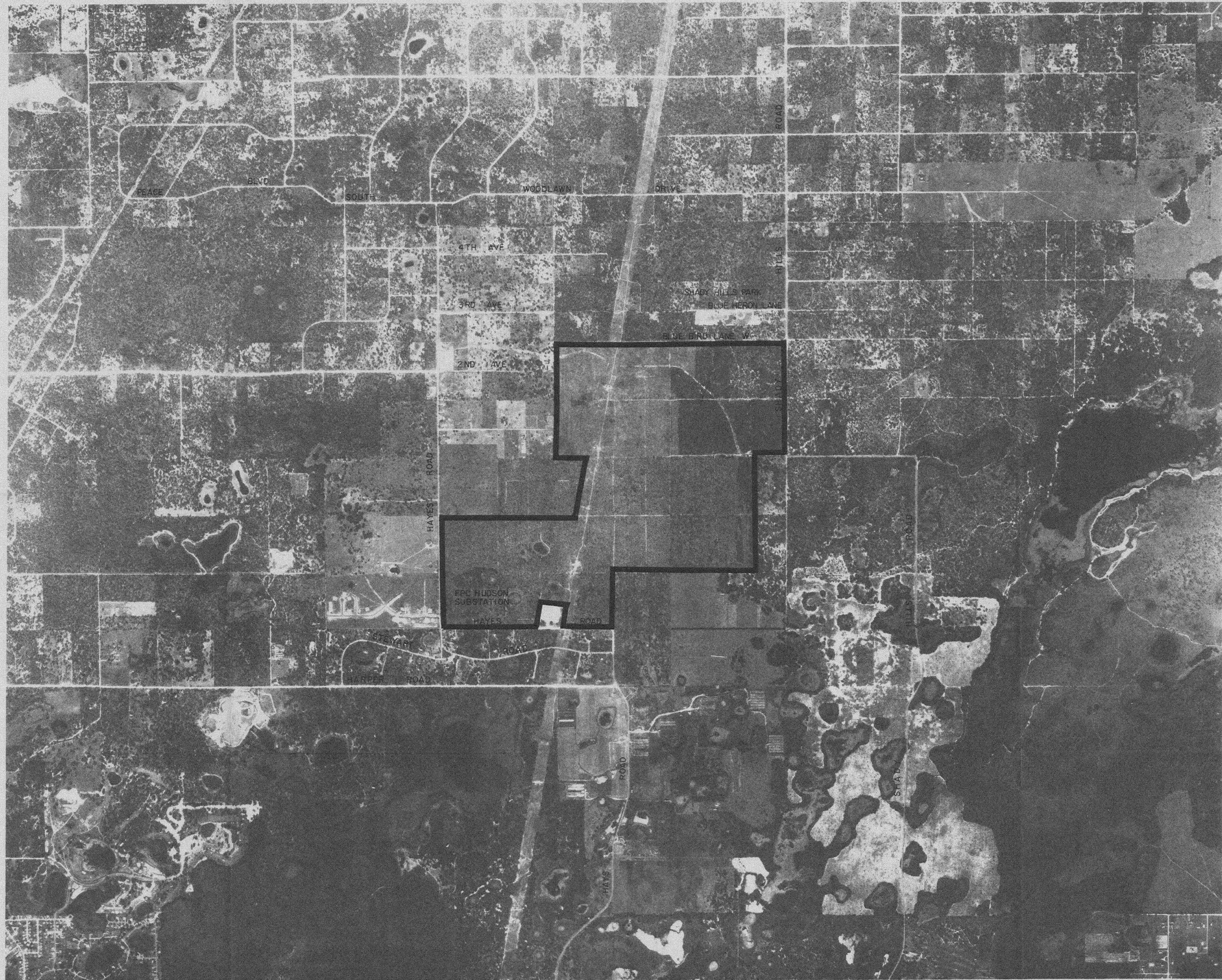
Plans are underway to renovate SR 52. Beginning at US 19 and continuing to Moon Lake Road (587), SR 52 will be widened to 6 lanes, with curb and gutters. Commencing at Moon Lake Road and concluding at I-75, SR 52 will become 4 lanes. Preliminary design calls for a 52-foot median, 12-foot lanes, and 10-foot shoulders (4 feet paved). Construction will be performed in phases. The first phase, US 19 to Moon Lake Road, is to be completed by 1995. No completion dates have been set for the remaining phases, but the estimated project completion date is the year 2000.

Preliminary planning has begun for a north/south freeway crossing Pasco County. Two of the three proposed alternative corridors run adjacent to the Florida Power Corporation easement which crosses the site boundaries. The proposed freeway is known as the North Suncoast Corridor. It will be 4 lanes wide, and is expected to carry heavy traffic volumes. At present, it is likely that an interchange will be used to cross SR 52. The project completion date is estimated to be in the year 2010. The corridor alternatives are still being evaluated and no selection has been made.



Pasco County Resource Recovery Program
 Pasco County 1985 Traffic Counts

FIGURE 2-30



NOTE:
AERIAL BY HAMRICK
AERIAL SURVEYS, INC.,
1986

PASCO COUNTY - HAYS ROAD SOLID WASTE DISPOSAL FACILITY PERMIT DRAWINGS

CDM

SITE LOCATION
PASCO COUNTY, FLORIDA

PROJECT NO.
6104-03-LF

FIGURE 2-5

SECTION 3

3.0 THE PLANT AND DIRECTLY ASSOCIATED FACILITIES

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3.1 BACKGROUND

Pasco County wishes to implement its own resource recovery facility to serve the solid waste disposal needs of its growing incorporated and unincorporated areas. Interest in the concept of resource recovery has been stimulated in the county by an increased awareness of the environmental and siting problems associated with landfill disposal methods.

The decision to build a resource recovery facility in Pasco County was made after six years of investigation by the county. Preliminary planning began in 1980 when dwindling suitable land space and tightening regulations caused the county to consider alternative solid waste disposal methods. Also at this time, the Florida Department of Environmental Regulation (FDER) required 17 counties, including Pasco County, to investigate the feasibility of a resource recovery program.

In the 1984 election for the Pasco County Board of County Commissioners, the public voted on the resource recovery issue. The stated issue of the vote was: "Shall the Board of County Commissioners issue a nontax-supported revenue bond for the purpose of financing a resource recovery system to dispose of solid waste instead of developing long-term sanitary landfills?" The public was overwhelmingly in favor of resource recovery. The official count was 68,485 "yes" votes and 21,416 "no" votes.

3.1.1 SOLID WASTE COLLECTION

Under the current system, the county does not have full control of solid waste collection in its unincorporated areas. Residential waste is collected twice each week, with more frequent collection as necessary for commercial waste. According to occupational license data, the current collection system serves 68 percent of the county's population. The existing East Pasco County Landfill receives about 65 percent of the solid waste generated in the county, or approximately 460 tons of solid waste

daily, six days per week. The balance of the county's solid waste is either disposed of illegally, onsite, or transferred to facilities outside Pasco County. Pasco County is developing a solid waste flow control program to guarantee that future solid waste quantities will be directed to the resource recovery facility. Extensions to the East Pasco County Landfill will be constructed to keep the landfill operating until the resource recovery facility goes on-line.

Site selection by Pasco County came after review of a detailed study prepared by the county's consulting engineers (CDM, October 1985). In the study, a specific siting methodology was used to evaluate the suitability of candidate sites. A five-step process was used for selection. The first two steps eliminated areas that were either unacceptable or marginal. This elimination was accomplished by applying negative siting criteria such as flood potential, well field impacts, airport proximity, urban development and presence of water bodies. Environmentally sensitive areas were avoided, such as cypress forests, wildlife management areas, and high water table areas. Preliminary sites were identified in the third step by comparing land availability and ownership characteristics. Sites were selected for further consideration if they offered sufficient land space to accommodate both a resource recovery facility and a sanitary landfill. The sites were compared using positive siting criteria to determine which of the final four potential sites was best. Each site was evaluated for propensity to sinkhole formation, hydrologic conditions, and relative cost. The preferred site was selected based on these criteria and additional information received during two Board of County Commissioners meetings and four public meetings.

In the fall of 1985, the Board of County Commissioners approved the landfill site recommended by the county's consulting engineers. The site is located in northwest Pasco County, near the county's waste generation centroid. The site offers a good access road, generous land space and a buffer zone.

On February 12, 1985, the Pasco County Board of County Commissioners executed a contract with Camp Dresser & McKee Inc. for development of a resource recovery program. The stated objective of that contract is:

Development and implementation of a county-wide resource recovery program, ancillary facilities and a landfill/ashfill.

Shortly after the contract was approved, a management team was organized to guide this project to completion. The management team includes the consultant team (engineers, legal and financial advisors), and Pasco County staff and decision-makers.

Commercial-scale resource recovery began in the United States in the late 1960s, but European countries have been recovering energy from solid waste for more than 30 years. Denmark converts 70 percent of its solid waste to energy, Switzerland converts 40 percent, and Sweden converts 30 percent. Currently, the United States converts less than 2 percent of its solid waste to energy, but this quantity is expected to increase to 10 percent during the early 1990s. More and more communities in the United States are building resource recovery facilities; the technology is tested and proven effective.

3.1.2 PROPOSED FACILITIES

After evaluating several technologies, the county has found that its current and foreseeable needs would be best served by a facility which uses the mass-burn technology for combustion of solid waste. This process recovers heat energy in the form of steam, and converts that steam energy into electricity which can be sold. The primary facilities proposed for the 751-acre Pasco County site include a mass-burn resource recovery facility and a sanitary landfill/ashfill. Ancillary facilities will include truck scales and a scale house for weighing incoming refuse, an ash handling building, cooling tower, switchyard, and maintenance facility for landfill equipment.

The facility will most likely be owned by the county, and operated by a full-service contractor under contract to the county. This full-service

contractor would provide design, construction, start-up, acceptance testing, and 20 years of continuous operation and maintenance. Pasco County will identify an appropriate contractor through the Request for Proposal (RFP) procurement process.

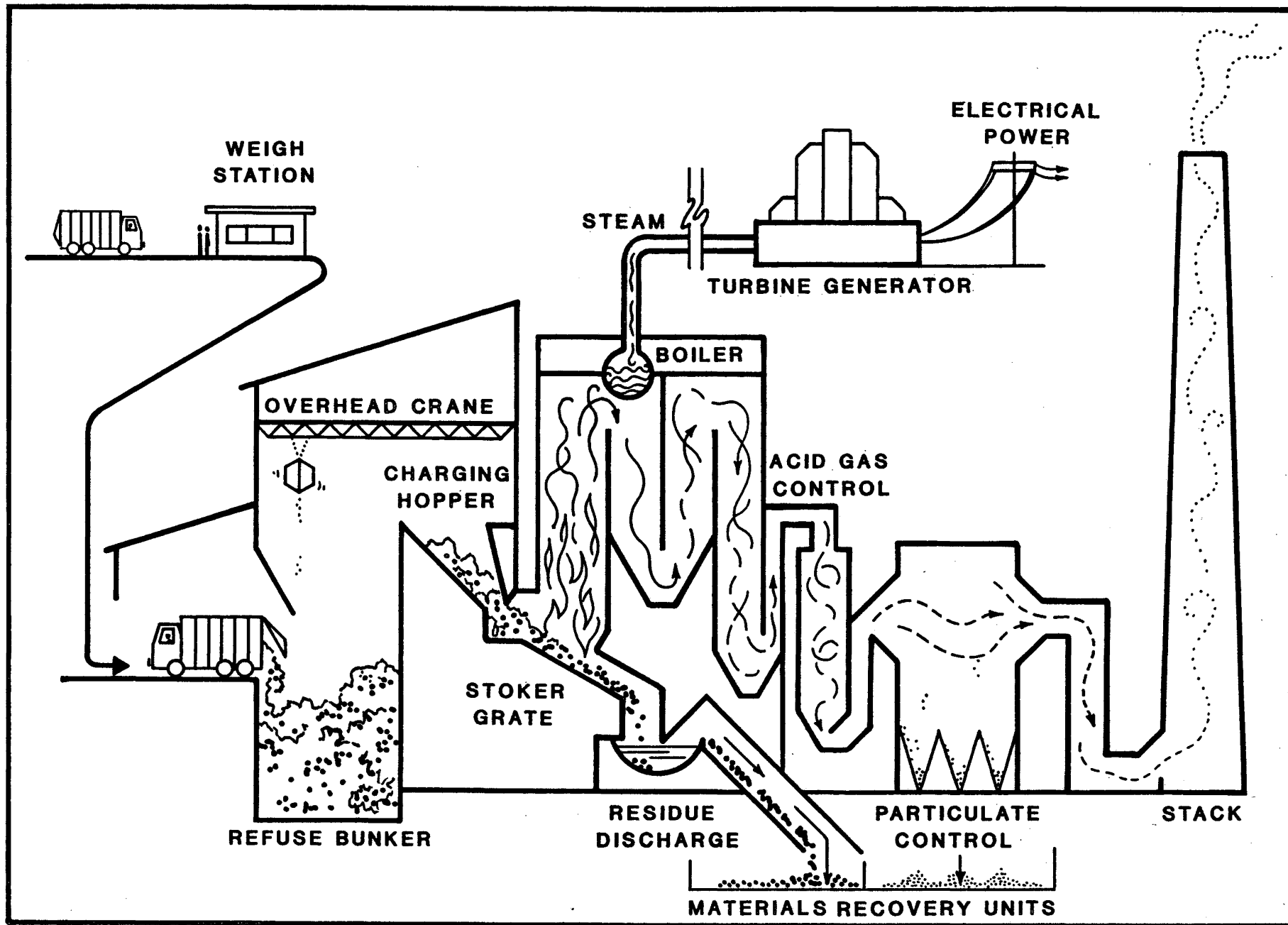
Resource Recovery Facility

The proposed resource recovery facility will have a maximum design rated capacity of 1,200 tons per day (tpd). However, its initial continuous design rated capacity will be 900 tpd, using 3 combustion/steam generation units with a continuous design rated capacity of 300 tpd each. Each boiler unit will operate independently. Therefore, it will be possible to shut down one unit at a time for maintenance and inspection. The addition of a fourth boiler unit is contingent on the demand placed on the facility.

Initial project construction will include a tipping area and refuse storage pit sized to handle 1,200 tpd (continuous design rated capacity). The emissions stack will be equipped with four flues. The project will have one steam turbine generator which will generate electricity (approximately 22 megawatts). Power lines from the project's electrical switchyard will connect with the Florida Power Corporation (FPC) Hudson substation via the powerline easement which crosses the project site. Revenues from energy sales may be shared by the county and contractor during the life of the operating contract.

Since the proposed facility will use mass-burn technology, there will be no preprocessing of wastes at the facility prior to combustion. A schematic diagram of a typical resource recovery facility is presented in Figure 3-1. Municipal solid waste will be truck-delivered to the facility and ash residue will be removed by the same mode of transport. The solid waste will be placed in the refuse bunker directly from transfer trailers and packer trucks inside the building. All waste will be stored inside the building, so that no waste is visible from the outside. Two overhead cranes will mix the waste in the bunker and load the charging hoppers as required.

FIGURE 3-1



Pasco County Resource Recovery Program
Schematic of Typical Resource Recovery Facility

The facility will be equipped with baghouses for particulate removal. Acid gas dry scrubbers will also be used. A dry scrubber and a fabric filter (baghouse) will be furnished for each combustion train. Bottom ash from the furnace and flyash from the emission control system will be mixed before removal from the facility. Ash from the combustion of solid waste will comprise 10 percent of the volume, and 25 percent of the weight of the municipal solid waste processed by the facility. The ash will be quenched with water to approximately 20 to 30 percent moisture before transport to the landfill/ashfill.

3.2 SITE LAYOUT

The general site development plan (Figure 2-6) shows the conceptual building layout and landfill/ashfill perimeter on the site. The landfill/ashfill boundary and all structures will be set back a minimum of 100 feet from all property lines and adjacent roadways. The resource recovery facility and the landfill/ashfill will share a common entrance and scale house. A one-way loop used to access the resource recovery facility will provide organized routing of all truck traffic. An access road through the landfill/ashfill area will be used to transport the ash.

Due to shallow groundwater conditions, the landfill/ashfill will be constructed at grade. All structures will be constructed at grade, except the refuse bunker, which will be built 5 to 7 feet below grade. The natural site drainage is toward the southwest. Site grading will repeat existing drainage patterns wherever possible. The retention basins for landfill/ashfill drainage are positioned to make use of natural drainage, so that extensive grading for drainage channels will be minimized. However, substantial site grading will be required to construct a resource recovery facility with raised level vehicle access. The maximum height for site fill will occur at the elevated tipping floor (28 feet). The slopes will be 4:1 (or 14°). Revegetation will be used to minimize erosion and siltation.

Roadway grades on facility access roads will not exceed 4 percent, to minimize gear shifting by trucks and its associated noise. Maximum roadway

grades of 5 percent are suggested for facility egress. Grading for the landfill/ashfill will consist of 4:1 side slopes for the perimeter and 3 percent grading (or 2°) slope for the final cover.

The roadways will be designed with a minimum turning radius of 50 feet to accommodate truck traffic. The entrance road will be divided and the remainder of the road system will be one-way. A 12-foot lane width will be used for 2-lane roads, and an 18-foot width will be used for one-way roads.

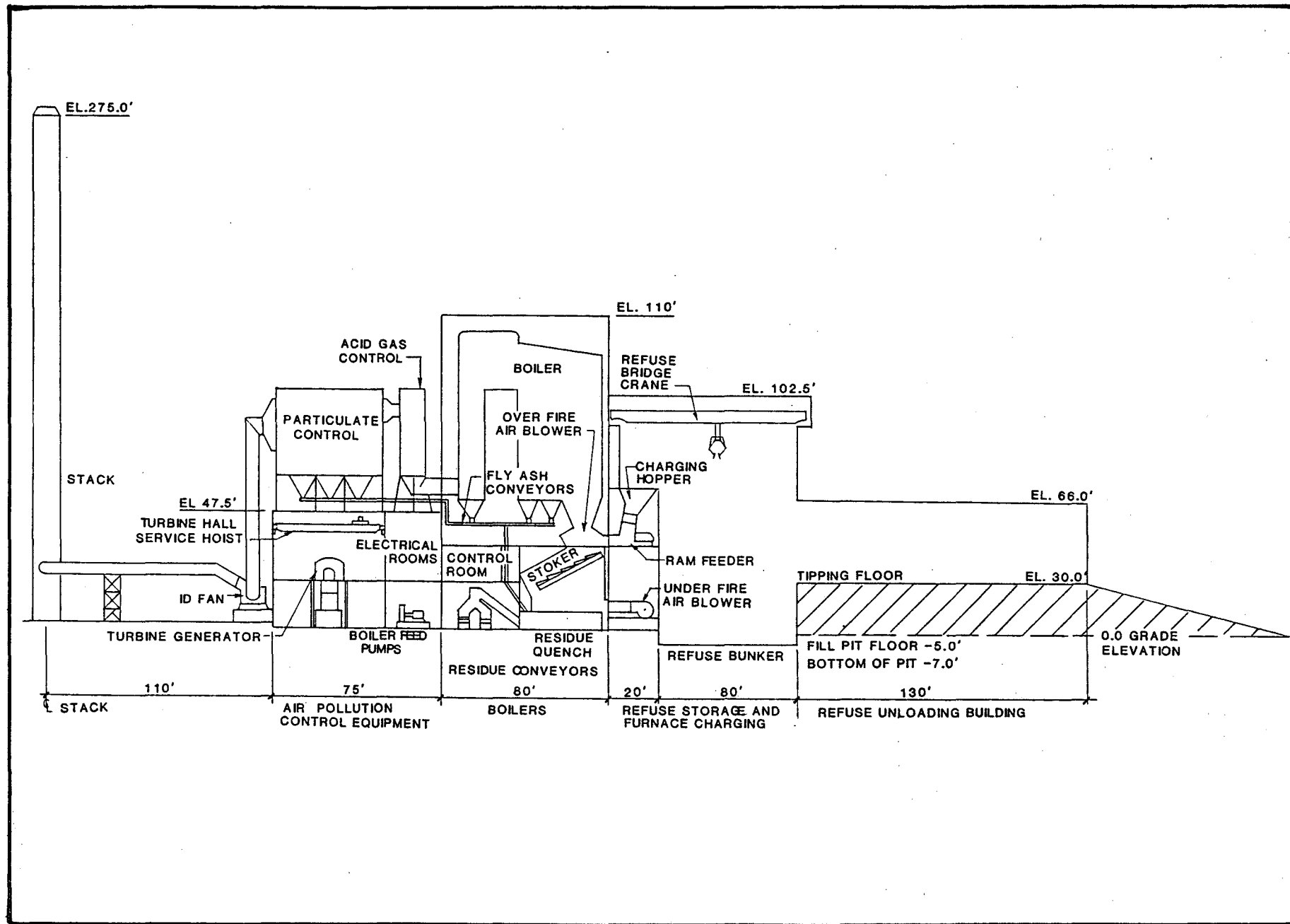
Parking spaces have been provided to accommodate the work force, potential visitors, and shift overlaps. Automobile parking will be separated from truck circulation to minimize potential conflicts. The roadway design speed will be 30 miles per hour; however, posted speeds will be lower.

In the area surrounding the resource recovery facility, extensive landscaping is not necessary. The area is surrounded by planted trees, and the site has a dense, 1,500-foot buffer zone along Hays Road and Shady Hills Road.

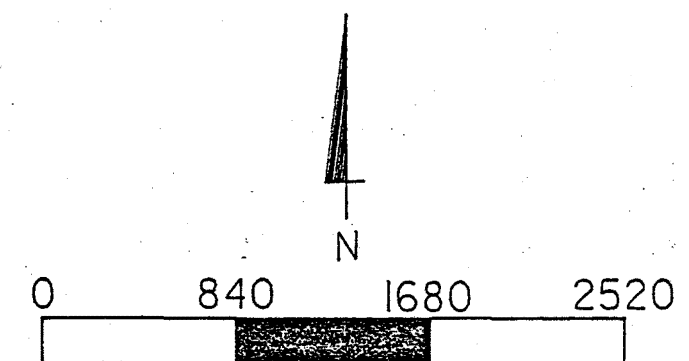
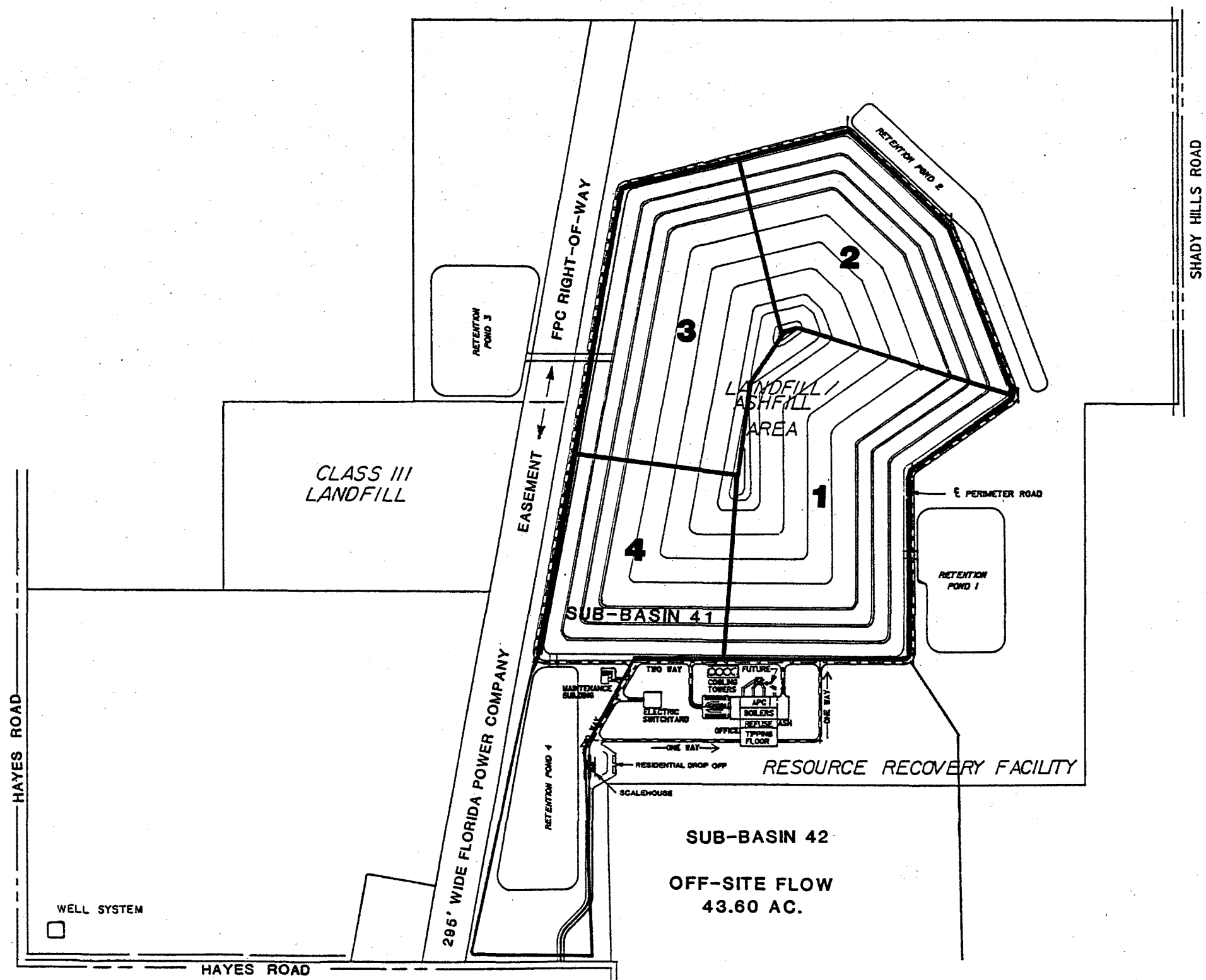
3.2.1 BUILDING DIMENSIONS

The proposed resource recovery facility consists of two contiguous buildings, the administration building and the processing building (see Figure 2-6). The administration building is approximately 30 feet high, 110 feet long and 30 feet wide. Offices will be located along the west side of the processing building. The processing building is rectangular, measuring approximately 310 feet by 260 feet. It varies in height depending on the processing function housed in each portion of the building. On the tipping floor side, the building is about 60 feet high to accommodate refuse unloading activities. North of the tipping floor, the building height increases to about 100 feet to house refuse storage and furnace charging accoutrements. Continuing northward across the building, the height increases to 110 feet over the boilers. The air pollution control system will not be enclosed. The facility profile is shown on Figure 3-2. The dimensions provided on Figure 3-2 are approximations. The exact facility dimensions will be designed by the selected contractor.

FIGURE 3-2



Pasco County Resource Recovery Program
Facility Profile



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Pasco County Resource Recovery Program
 Drainage Basin Delineations

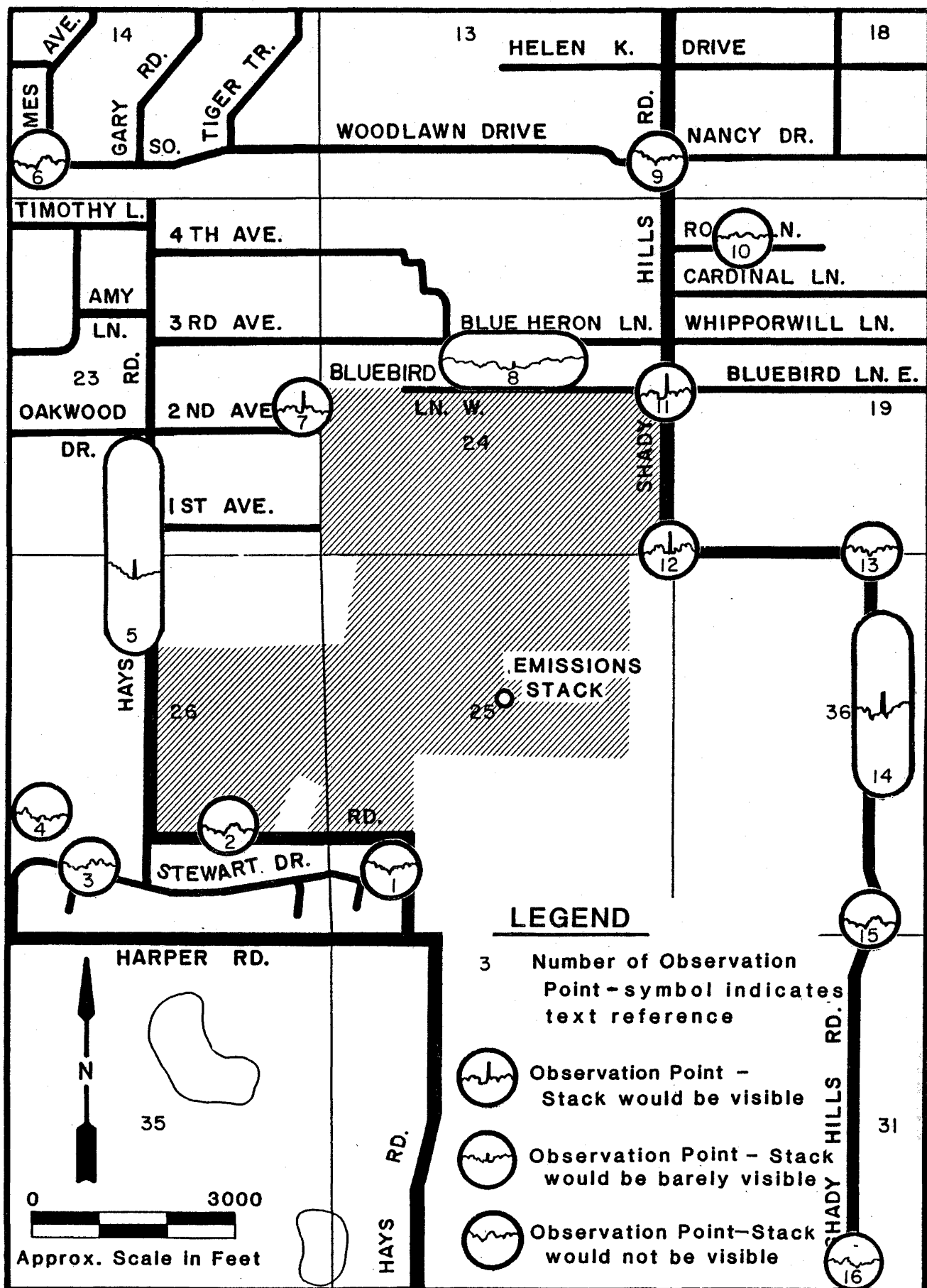
This building configuration provides a stepped appearance which helps reduce the visual impact of the structure by modifying its mass. This will be most apparent when the structure is viewed from the east and west.

3.2.2 VISUAL IMPACT

A preliminary study was performed to determine the visual impact of the facility on residences in the area. Since the emissions stack is the tallest structure of the facility, its height of 275 feet was chosen for study purposes.

To simulate the emissions stack, three weather balloons were elevated 275 feet above the proposed location of the stack. Observations were made in residential areas at varying distances and directions from the facility location. Figure 3-3 shows the observation points and the degree of visibility at each point. The visibility of the balloons was dependent upon the distance of the observation point from the balloons, and the proximity of obstructions such as trees, poles and buildings. The combination of three weather balloons, each having a 5-foot diameter, is approximately the width of the proposed emission stack. Thus, it was assumed that observations made during the study could be applied to the proposed structure.

Visibility at observation points 1 through 4 south and southwest of the facility site was completely obstructed by trees. At observation point 7, northwest of the facility site, the open fields allowed a clear view of the balloons. There was a range of visibility along Hays Road (observation point 5). At distances of more than two miles (e.g., at point 6), the balloons were not visible, even in areas with few obstructions. At observation point 8, located in Shady Hills Park, the view of the balloons was partially obstructed. From point 8, the top of the proposed emissions stack will be slightly below the tree line, and will be visible from certain angles through the trees. Points 9 and 10, located north of the facility site, afforded no view of the balloons. East of the facility, six observations were made along Shady Hills Road. Two of the six observation



Pasco County Resource Recovery Project
Visual Impact Study

points (11 and 12) provided a view of the balloons. In addition, a 1/2-mile portion of Shady Hills Road (point 14) allowed a view of the balloons.

The tallest portion of the resource recovery building will be 165 feet below the top of the emission stack. The building will not be visible from most observation points. At observation point 7 (Figure 3-3) the building may be partially visible.

3.3 FUEL

3.3.1 FUEL FEED STREAM

The resource recovery facility will obtain its fuel feed stream from municipal solid waste collected in Pasco County. The term "municipal solid waste" applies to all of the solid waste generated within Pasco County, except hazardous and pathogenic wastes and sludges. Since this waste is heterogeneous, characteristics such as heating value, moisture content and ash content of the waste will vary. However, Pasco County's solid waste may be classified according to the following general characteristics and sources of generation:

- Residential Wastes. Mixed domestic household wastes (including yard wastes) generated by individuals or families in single or multiple family dwellings.
- Commercial Wastes. Wastes generated by the commercial and retail sector of the county. The physical characteristics of these wastes are similar to residential wastes, consisting primarily of combustible materials in the form of paper and food wastes from offices, restaurants and retail establishments.
- Institutional Wastes. Wastes generated by hospitals, schools, and churches. These wastes have characteristics similar to residential and commercial wastes. Any wastes

classified as infectious by federal and state regulations will be excluded.

- Industrial Wastes. Wastes generated by industrial process and manufacturing operations, excluding any wastes classified as hazardous or infectious by federal and state regulations. These wastes also include general housekeeping and support activity wastes associated with industry.

All calculations, analyses and performance data for the resource recovery facility have been based on the as-fired solid waste higher heat value of 4,800 Btu per pound, with a 21 percent moisture content by weight. Table 3-1 presents the as-received reference solid waste composition, and Table 3-2 lists the reference waste ultimate analysis to be used.

3.3.2 FUEL STORAGE

The resource recovery facility will be equipped with an automatic weighing station to weigh and record the quantity of solid waste delivered. The waste will be delivered in standard, municipal type, packer vehicles, open-bodied dump trucks, and transfer trailers with capacities up to 110 cubic yards. The facility will receive solid waste deliveries 6 days per week, 52 weeks per year.

The Pasco County resource recovery facility will include a totally enclosed tipping floor with 12 tipping bays, each 15 feet wide. Backup barriers will be provided at each tipping bay to prevent vehicles from backing into the solid waste storage pit. The storage of the delivered solid waste will be in a completely enclosed storage pit with the floor elevation below the tipping floor. The pit will be sized for a minimum storage capacity of three days (i.e., 3,600 tons of solid waste at a density of 450 pounds per cubic yard).

During design of the refuse pit capacity, scheduled maintenance and unscheduled breakdowns were considered. The projected annual processing time, considering downtime, is 85 percent. This estimate is based on

TABLE 3-1
REFERENCE SOLID WASTE COMPOSITION

Waste Category	Nominal Percentage By Weight
Combustibles	60
Moisture	21
Non-combustibles	<u>19</u>
TOTAL	100

TABLE 3-2
REFERENCE SOLID WASTE ULTIMATE ANALYSIS

Component	Nominal Percentage By Weight
Moisture	20.70
Total Inert	19.22
Carbon	27.40
Hydrogen	3.88
Oxygen	27.50
Nitrogen	0.70
Chlorine	0.46
Sulfur	<u>0.13</u>
TOTAL	100.00
Higher Heating Value (HHV)	4,800 Btu/lb

operating experience at similar facilities. Two alternative processing configurations were considered for the facility to achieve a maximum design rated capacity of 1,200 tpd: three 400-tpd capacity units, or four 300-tpd capacity units. Pasco County selected the four unit alternative for several reasons. Since the initial design rated capacity will be approximately 900 tpd, the county may defer some capital expenditure by using only three 300-tpd units until a fourth processing unit is needed during a future expansion period. The flexibility of the four unit configuration is more practical for matching yearly waste volume increases, and with four units, less processing capacity is lost during breakdowns.

The primary purpose of three-day pit capacity is to assure adequate onsite storage for refuse over a three-day weekend. However, the excess pit capacity could be used to store incoming refuse when the facility is down for scheduled or unscheduled maintenance. In this manner, the need to bypass waste directly to the landfill is minimized.

Three examples have been prepared to illustrate the waste processing capabilities of the plant with one or more units out of operation. The examples are based on the following assumptions.

- The plant operates 24 hours per day, 7 days per week.
- The plant will ultimately receive approximately 8,400 tons of waste per week (1,530 tpd, Monday through Friday, and 763 tons on Saturday).
- The plant will have four units ultimately; each unit will have a design capacity of 300 tpd.
- The refuse pit will have a waterline storage capacity of approximately 16,000 cubic yards. An additional 8,000 cubic yards of storage above the waterline storage is available when waste is stored against the pit sidewalls. The ultimate capacity of the pit is 24,000 cubic yards. (Based on a density of 450 pounds per cubic yard, the pit will store 3,600 to 5,400 tons of waste).

Example One - Three Unit Operation

One unit shuts down due to mechanical failure at 6:00 a.m. on Monday. The remaining two units are capable of operating at 100 percent of their capacity. At the time of breakdown, the pit contains 600 tons (normal minimum 1/2 day storage reserve).

<u>Time/Day</u>	<u>Received (tons)</u>	<u>Processed (tons)</u>	<u>Waste in Pit (tons)</u>
6:00 a.m. Mon. (Week 1)	1,530	900	600
			<u>+630</u>
6:00 a.m. Tues.	1,530	900	1,230
			<u>+630</u>
6:00 a.m. Wed.	1,530	900	1,860
			<u>+630</u>
6:00 a.m. Thurs.	1,530	900	2,490
			<u>+630</u>
6:00 a.m. Fri.	1,530	900	3,120
			<u>+630</u>
6:00 a.m. Sat.	765	900	3,750
			<u>-135</u>
6:00 a.m. Sun.	0	900	3,615
			<u>-900</u>
6:00 a.m. Mon. (Week 2)	1,530	900	2,715
			<u>+630</u>
6:00 a.m. Tues.	1,530	900	3,345
			<u>+630</u>
6:00 a.m. Wed.	1,530	900	3,975
			<u>+630</u>
6:00 a.m. Thurs.	1,530	900	4,605
			<u>+630</u>
6:00 a.m. Fri.	1,530	900	5,235
			<u>+630</u>
6:00 a.m. Sat.			5,865

The pit will be filled to capacity in the midafternoon of the second Friday. The total reserve time for this situation is 12 days.

Example Two - Two Unit Operation

At 6:00 a.m. on Monday, two units shut down due to mechanical failure. The remaining units continue to process waste at 100 percent of their capacity.

<u>Time/Day</u>	<u>Received (tons)</u>	<u>Processed (tons)</u>	<u>Waste in Pit (tons)</u>
6:00 a.m. Mon	1,530	600	600
			<u>+930</u>
6:00 a.m. Tues.	1,530	600	1,530
			<u>+930</u>
6:00 a.m. Wed.	1,530	600	2,460
			<u>+930</u>
6:00 a.m. Thurs.	1,530	600	3,390
			<u>+930</u>
6:00 a.m. Fri.	1,530	600	4,320
			<u>+930</u>
6:00 a.m. Sat.	765	600	5,250
			<u>+165</u>
6:00 a.m. Sun.	0	600	5,415

The pit will be filled to capacity at some time during the late afternoon on Saturday. Since no waste is delivered on Sunday, the total reserve time in this example is 7 days.

Example Three - Alternative to Example One

At 6:00 a.m. on Saturday of week 1 in example one, a second unit shuts down due to mechanical failure. The remaining units continue to process waste at 100 percent of their nameplate capacity.

<u>Time/Day</u>	<u>Received (tons)</u>	<u>Processed (tons)</u>	<u>Waste in Pit (tons)</u>
6:00 a.m. Sat. (Week 1)	765	600	3,750
			<u>+135</u>
6:00 a.m. Sun.	0	600	3,885
			<u>-600</u>
6:00 a.m. Mon. (Week 2)	1,530	600	3,285
			<u>+930</u>
6:00 a.m. Tues.	1,530	600	4,215
			<u>+930</u>
6:00 a.m. Wed.	1,530	600	5,145
			<u>+930</u>
6:00 a.m. Thurs.	1,530	600	6,075

The pit will be filled to capacity at some time during Wednesday of week 2. The total reserve time in this situation is 10 days.

These three scenarios show that the plant will continue to receive the entire waste stream without any bypass to the landfill or other facility for 12 days in Example One); for 7 days when two units fail simultaneously (Example Two); or for 10 days when two units fail in a staggered manner (Example Three). Incoming refuse will never be delivered or stored outside the enclosed pit area or diverted to the adjacent landfill during these periods.

As discussed above, the facility will consist of four independent process trains. Common elements such as waste feed cranes, ash conveyors, and boiler feedwater systems will have redundant capabilities. The facility will have a condenser capable of wasting all of the facility's steam if the turbine generator is being serviced or is inoperable.

The refuse bunker and tipping floor area will use a negative air pressure ventilation system. The underfire and overfire fans which provide the incinerator with the air supply will draw all the necessary air from the

refuse bunker and tipping floor area. Vents installed on the walls opposite the fans will induce a cross flow ventilation. The dust particles and fumes generated in the area will be directed to the incinerator, thus odors outside the refuse bunker and tipping floor area will be eliminated.

Two overhead solid waste handling cranes will be installed to charge the combustion units and the rotary shear, and maintain the solid waste storage area. The cranes will be of the travelling bridge type, employing a polyp type grapple. Each crane will be capable of meeting the solid waste handling requirements of the entire facility.

3.4 AIR EMISSIONS AND CONTROLS

3.4.1 AIR EMISSION TYPES AND SOURCES

As noted previously, the proposed resource recovery facility is a new facility that will be located in Pasco County. At ultimate size, the facility will contain four boilers, each with a rated capacity of 300 tpd of municipal solid waste for a total of 1,200 tpd. The flue from each of the boilers will be encased in a single stack. The refuse bunker will be enclosed and under negative pressure, since combustion air will be taken from this area. There will be no onsite storage of either refuse or residue except within controlled areas. Loading and unloading of trucks will take place within the residue storage building. Trucks entering and leaving the site will be covered and will travel on paved roads. Minor sources of particulate emission include the ash handling area and the lime silo. Air vented from these areas will be minimized by a particulate control device. Thus, the stack will be the only major source of emissions from the facility.

A complete description of stack emissions is contained in Section 3.0 of the Prevention of Significant Deterioration (PSD) permit application (See Volume III - Air Quality). An emission inventory for the proposed facility is contained in Table 3-3 of the PSD. A complete FDER Form 17-1.202 (1), "Application to Operate/Construct Air Pollution Sources" may be found in the front of Volume III - Air Quality.

3.4.2 AIR EMISSION CONTROLS

Air pollution control technologies proposed to control particulate matter and trace metals are: electrostatic precipitator (ESP), fabric filtration system (baghouse), and wet Venturi scrubber. The technologies proposed to control SO_2 and acid gases (H_2SO_4 , HCl , and HF) include: dry scrubber/ESP and dry scrubber/fabric filter. These systems and their operating characteristics are fully described in the Best Available Control Technology/Lowest Achievable Emission Rate analysis in Section 4.0 of the PSD permit application (see Volume III - Air Quality).

3.4.3 BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

The BACT analysis is presented in Section 4.0 of the Prevention of Significant Deterioration permit application. The analysis evaluates the environmental, economic, and energy aspects of alternative control techniques and methods. For all of the criteria pollutants, Pasco County is designated as being in attainment of the National Ambient Air Quality Standards (or unclassified), and hence subject to BACT. Based on a review of various air pollution control alternatives, a dry scrubber and baghouse are proposed as BACT for the Pasco County resource recovery facility for all pollutants subject to PSD review. The dry scrubber will be designed to achieve an emission limit of 100 parts per million on a dry volume basis (ppmdv) at 7 percent O_2 or 90 percent reduction for SO_2 ; and 100 ppmdv at 7 percent O_2 or 90 percent reduction for HCl . The baghouse will be designed to achieve an outlet grain loading of 0.015 grains per dry standard cubic foot corrected to 12 percent CO_2 (gr/dscf @ 12% CO_2). A complete discussion of the BACT selection process is presented in Section 4.0 of the Prevention of Significant Deterioration permit application (contained in Volume III - Air Quality).

3.4.4 DESIGN DATA FOR CONTROL EQUIPMENT

Design data for control equipment are not available because a furnace/boiler supplier has not been selected yet. Typical design

parameters for mass-burn resource recovery facilities were used in the BACT analysis and are presented in Section 4.0 of Volume III - Air Quality.

3.4.5 DESIGN PHILOSOPHY

The proposed control technologies—dry scrubber and baghouse—are designed to neutralize acid gas emissions and capture particulate matter entrained in the flue gas from the furnace/boiler. The particulate matter is collected in a dry form to avoid wastewater disposal, corrosion, and stack gas reheat problems.

3.5 PLANT WATER USE

During normal operation of the resource recovery facility, all plant process cooling water will be drawn from the future Hudson Subregional Wastewater Treatment Plant (WWTP) and all wastewater discharge will go directly to the WWTP. The Hudson plant will be located 6 miles west of the site. Potable water provided by an onsite well will be used in small quantities for boiler makeup, equipment cleaning, and the personnel areas of the plant (e.g., washrooms, locker room). No plant water will be discharged directly to surface or groundwater bodies. The quantities of water used and discharged as presented in this section are approximate and subject to change pending selection of a specific contractor. Alternative sources of water are discussed in Section 8.0.

A quantitative water use diagram is provided in Figure 3-4. The figure shows estimated quantities of water flow to and from the various plant water systems, including the heat dissipation system, sanitary wastewater system, potable water systems, air pollution control system and steam generation system. The estimates shown in Figure 3-4 are conservative. For example, it is possible to supplement water demands for the dry scrubbers with cooling water blowdown, thereby reducing "raw" water requirements. This has been performed in several other facilities. Also, cooling water blowdown can be used for residue quench. Overall, the maximum water use for the facility when processing 900 tpd is estimated at 720,000 gallons per day.

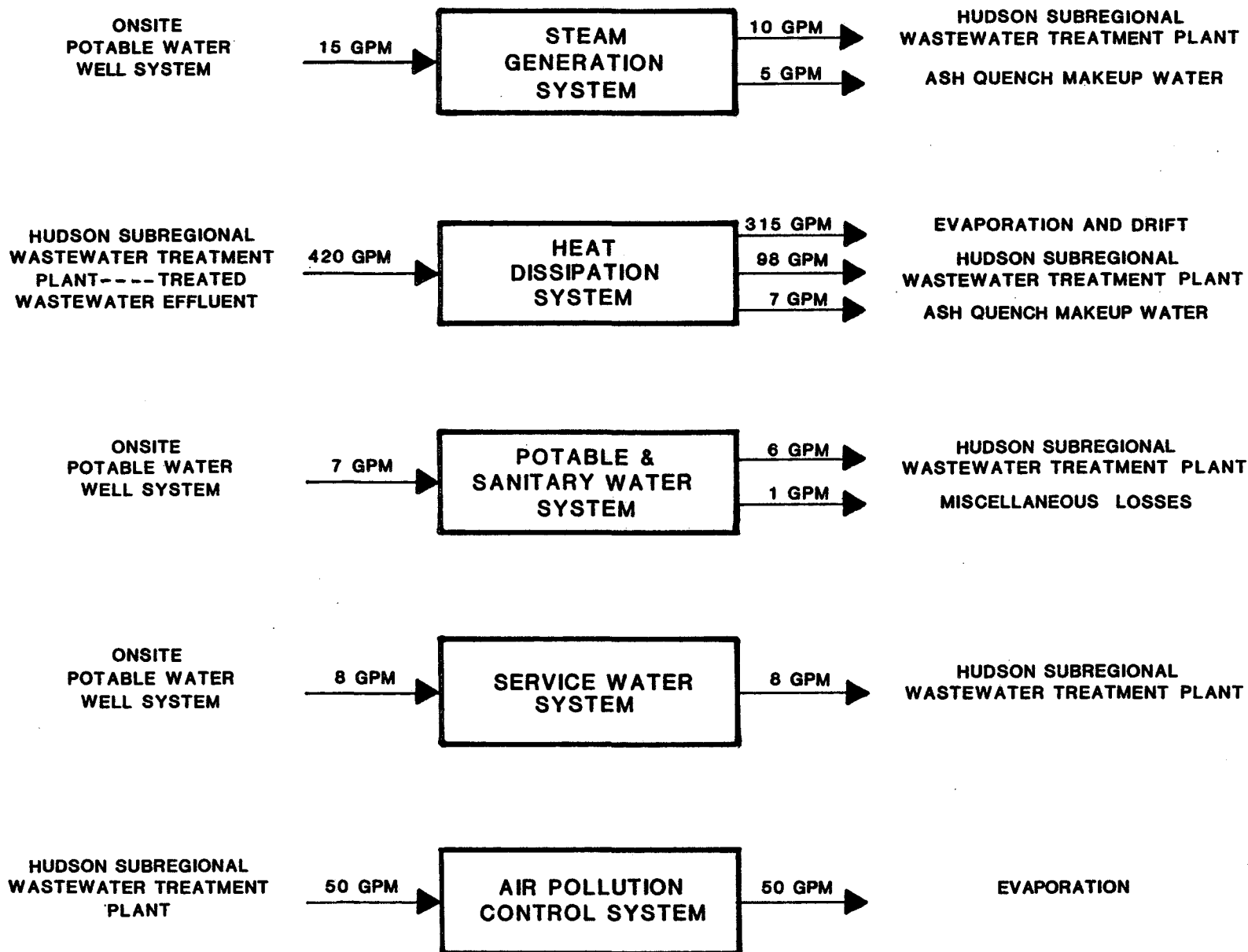


FIGURE 3-4

3.5.1 HEAT DISSIPATION SYSTEM

System Design

Cooling water will be used in a closed loop system which employs water cooled condensers to condense the low pressure stream discharged from the turbine. Cooling water will circulate through the condensers and waste heat will be dissipated from the condenser cooling water by passage through a wet mechanical draft cooling tower.

The cooling tower system has adequate design capacity to provide heat rejection capability required to condense the low pressure steam exhausted from the turbine when all plant boilers are operating at full, rated design capacity. If the steam turbine generator is out of service at any time when the boilers are producing high pressure steam, a separate, bypass condenser will be used to accept the full, rated design capacity of high pressure steam from the plant boilers and condense the steam. The cooling tower system will also provide for heat rejection in the event that full condensing of high pressure steam is required. Through the use of the bypass condenser system, plant refuse processing capacity will not be diminished during periods of full or partial turbine generator outage.

Consumptive water use will primarily be losses from the cooling tower system and dry scrubbers in the form of evaporation and drift. The average water loss due to evaporation from these two units will be 0.52 million gallons per day (mgd). Any other water discharged from the plant will be discharged by pipeline directly to the Hudson Subregional WWTP.

The location of the cooling tower system is shown on the Site Development Plan (Figure 2-6). The cooling tower blowdown will be directed to the residue quench tank, along with boiler blowdown and the boiler demineralization backflush water. The average water loss from the boiler will be 0.02 mgd. During normal operation, water will be removed from the residue quench tank only in such quantity as required in the wet ash. Any water discharged from the residue quench tank during shutdown or cleanout will be piped directly to the Hudson Subregional WWTP.

The cooling water from the condenser will be pumped to the cooling tower system where it will be cooled by evaporation. Heat removed from the cooling water will be transferred to the atmosphere due to evaporation. Cooling ponds will not be used in the system.

No conventional water intake structure will be needed in the resource recovery plant system, since all water will be taken by pipeline from the WWTP. Similarly, no water will be discharged from the resource recovery plant system, except by pipeline to the WWTP, where it will be treated for reuse.

Source of Cooling Water

All cooling tower makeup water will be obtained through a direct pipeline link with the Hudson Subregional WWTP. Cooling water will consist of approximately 0.70 to 0.95 mgd of effluent from the treatment plant, treated to the quality required by standards for land application. The first phase of the plant will process more than three times the amount of reclaimed water needed by the resource recovery facility. Table 3-3 lists the projected quality of water received from the treatment plant.

Dilution System

Since all process water intake and discharge will be part of a closed loop water circulation system between the resource recovery plant and the WWTP, no dilution of the process water will occur, other than mixing with incoming WWTP flows. All discharge wastewaters will meet the pretreatment standards of the Pasco County Utilities Division. The WWTP will treat all water prior to discharge. No resource recovery plant outfall will be used.

Blowdown and Trash Disposal

Liquid flows from blowdown systems will come from three locations:

- 1) blowdown from the boiler drums, 2) blowdown from the cooling towers, and
- 3) blowdown from the boiler feedwater demineralizers. All blowdown flows

TABLE 3-3

PROJECTED EFFLUENT QUALITY
AT HUDSON SUBREGIONAL WASTEWATER TREATMENT PLANT

Parameter	Anticipated Average Concentration (mg/l)
BOD	<20
Total Suspended Solids	<20
Fecal Coliform	Not Detectable
Chlorine Residual (ppm)	2.0
pH	6.5-8.5
Calcium Hardness	80
Magnesium Hardness	10
Sulfates	30

SOURCE: Pasco County Utilities Department. June, 1987.

will be collected in the blowdown tank and either discharged to the residue quencher/discharge, or pretreated and returned to the Hudson Subregional WWTP.

Since no intake structures are required, no intake structure trash disposal will be required.

Injection Wells

No injection wells are included in the overall design of the facility.

3.5.2 DOMESTIC/SANITARY WASTEWATER

Sanitary waste flows will be generated within the plant only in the personnel service areas (e.g., washrooms).

The plant will employ approximately 54 people for normal operation, with fluctuating staff increases from time to time as contractors and other specialty staff are retained for task-specific work. Visitors are expected at the plant, but an accurate estimate of the number of persons has not yet been made.

The liquid (sanitary) waste stream produced by personnel within the facility will be insignificant (approximately 5,000 to 7,500 gallons per day) compared to the total facility water consumption. This flow is made less significant by the fact that it is piped directly to the Hudson Subregional WWTP which is treating a much larger sanitary flow.

3.5.3 POTABLE WATER SYSTEMS

Two wells will serve as a potable water supply and backup source of cooling water. The onsite wells will have a 1.0-mgd and 0.05-mgd capacity. The potable well will use a chlorinator and pneumatic tank to store the water and provide constant pressure against the varying flow. See section 2.2.7 for more information (Area Public Service and Utilities).

3.5.4 PROCESS WATER SYSTEMS

The process water source will be 0.70 to 0.95 mgd of effluent from the Hudson Subregional WWTP. Table 3-3 shows the projected quality of the WWTP effluent. The resource recovery facility will use the effluent for cooling purposes and will discharge about 0.18 mgd back to the WWTP. A 1.0-mgd capacity onsite well will be used as a backup source of cooling water. Blowdown from the energy recovery facility will be sent to the WWTP, or the ash quench system for eventual disposal in the landfill.

3.6 CHEMICAL AND BIOCIDES WASTE

Both anti-corrosion and anti-fouling agents will be used at the facility in the boilers and in the cooling tower. Blowdown will be treated at the WWTP. The exact flow diagram of the chemical waste system will be developed by the selected contractor. There are no discharges from chemical processing, water treatment or waste piles that may enter the local environment as a result of plant operation.

3.7 SOLID AND HAZARDOUS WASTES

3.7.1 SOLID WASTES (INCLUDING ASH)

The residues of combustion will consist of noncombustible by-products, fly ash and siftings. The residue removal system will be designed to remove these materials from the combustion system for disposal. The bottom ash and siftings from the combustion units will be water quenched and dewatered. Redundant capacity for the main residue conveyors will be provided. Fly ash removal conveyors will be supplied to transport fly ash from the boilers, dry scrubbers and bag house to the residue water quenches. Provisions will be made for separate removal of fly ash if required in the future.

The residue removal system will consist of an enclosed building with an open truck loading area and two loading bays. The system will incorporate a bifurcated chute to serve the two loading bays. Residue will be hauled

from the facility by truck to the co-located landfill/ashfill. The residue to be disposed of at the landfill/ashfill will meet all local, state and federal regulations which govern such disposal. The residue will contain no more than 4 percent combustible material by dry weight content, and no more than 0.75 percent putrescible material by dry weight content.

No other solid wastes will be produced under normal facility operating conditions except for minute amounts of solid waste, primarily office and lunchroom trash. Since the plant is a facility for the processing of solid waste, the facility will dispose of its own trash. It is anticipated that ferrous materials will be recovered from the residue.

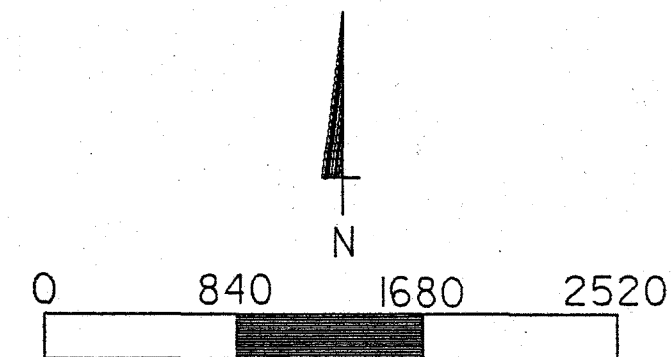
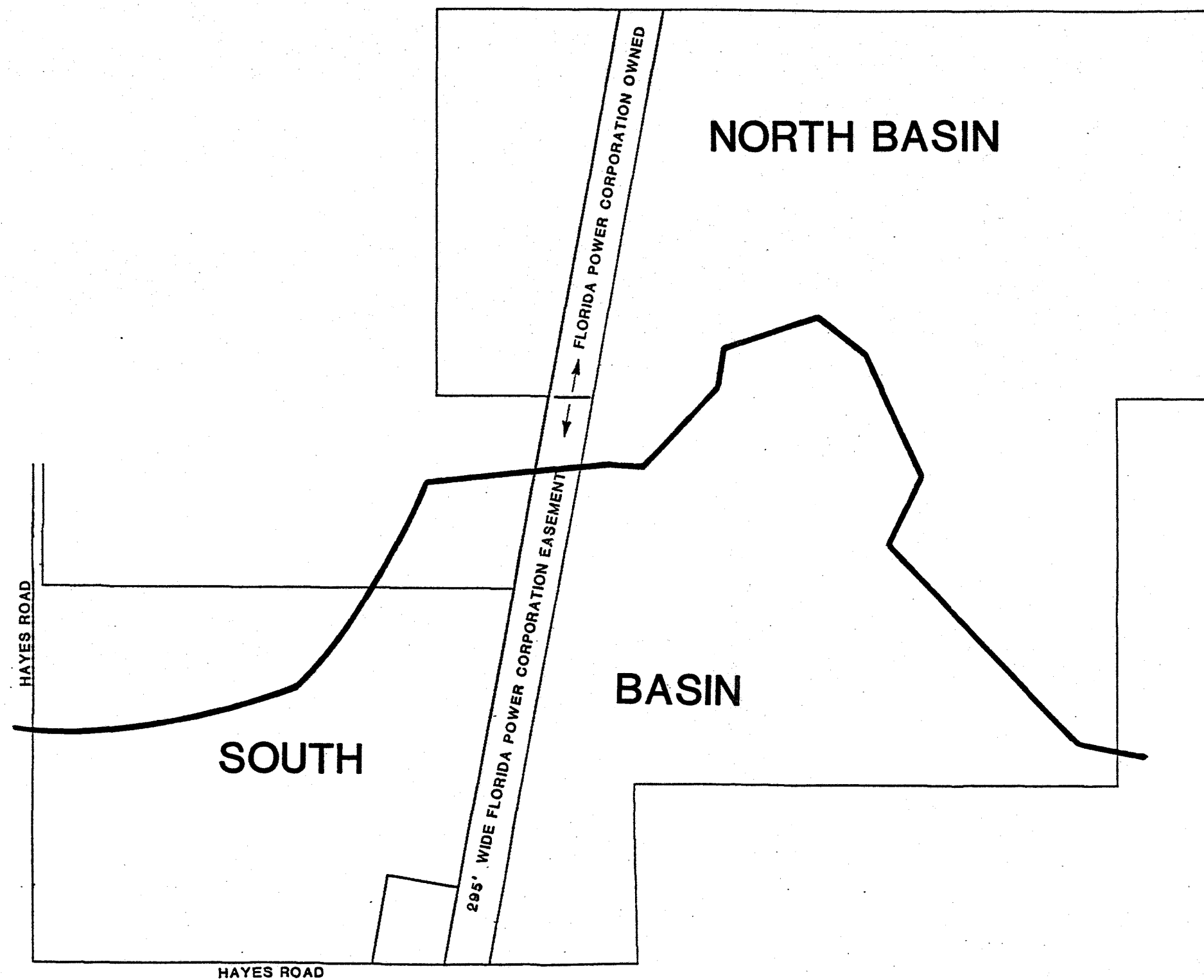
3.7.2 HAZARDOUS WASTES

No hazardous wastes will be generated onsite, nor will any be accepted for processing with the solid waste; therefore, there will be no hazardous waste disposal. Section 5.4.2 describes the procedures that will be followed if any apparently hazardous materials are identified by the crane operators or scale house personnel.

3.8 ONSITE DRAINAGE SYSTEM

The stormwater management system for the resource recovery facility and the landfill/ashfill is designed to use as much of the natural drainage patterns as possible. This includes the use of the existing ground plane depression areas to which stormwater flow will be directed. The natural drainage basins have been delineated on Figure 3-5. The future developed site grading is shown in Exhibit 1 of Volume IV - Landfill/Ashfill. The drainage area of each basin is:

<u>Basin</u>	<u>Area (Acres)</u>
1	69.95
2	46.57
3	53.00
4	148.32



Four retention/detention ponds are proposed to serve the developed site. Ponds 1, 2, and 3 will serve the landfill/ashfill area exclusively. Pond 4 will provide treatment and storage for Basin 4 of the landfill/ashfill, the entire resource recovery site, and some offsite flows which co-mingle with onsite flows (see Figure 3-6). Assuming a 25-year, 24-hour storm, stormwater calculations indicate that only Ponds 3 and 4 will experience positive discharge. Ponds 3 and 4 will release 7.1 cubic feet per second and 30.8 cubic feet per second, respectively. Stormwater runoff that overflows the ponds will travel essentially along the natural drainage paths that exist on the site to the depressional areas west of the power line easement. Ponds 1 and 2 will retain the entire volume of runoff. The details of the drainage system computation are provided in Appendix 10.11.

It is proposed that the stormwater management system should be constructed in phases to coincide with the development of the landfill/ashfill area. Ponds 1, 2 and 4 will be constructed prior to any development on the site. This will ensure that the resource recovery site and the first phase of the landfill/ashfill will have stormwater treatment capability from the start of their construction. All prudent measures will be taken to control wind and water erosion during construction on all portions of the site.

It is proposed that all stormwater transmission to the retention/detention areas occur through grassed swales beginning at the base of the landfill/ashfill slopes. These swales will drain to the retention/detention ponds through relatively short culvert pipe sections placed under the access road. Upon closure of the landfill/ashfill, the culvert/pipes will be removed and the swales will be connected directly to the ponds.

As previously stated, the Southwest Florida Water Management District (SWFWMD) has jurisdiction over the control of stormwater runoff from the site. Their basic criteria deal with quality (Chapter 17-25, Florida Administrative Code), and quantity [40D-4 (SWFWMD)]. These regulations require the capture and treatment of runoff from the first 1 inch of rainfall or 1/2 inch over the entire developed site. There are also regulations regarding peak flow from the site. Generally, the regulations

require that the postdevelopment peak rate of flow from the 25-year, 24-hour design storm must not exceed the predevelopment runoff rate from the same storm. From the analysis described in Appendix 10.11, it has been determined that the volumes of retention for the ponds are:

<u>Pond Number</u>	<u>Pond Volume (acre-ft)</u>	<u>Post-Development Less Predevelopment Volume Runoff For 25-Year 24-Hour Storm (acre-ft)</u>
1	52.8	33.5
2	39.3	24.8
3	38.5	26.2
4	41.5	19.4

These volumes show the available storage quantity and the required retention of post-volume minus pre-volume. It should be noted that Ponds 1, 2, and 3 not only meet the requirements of 40D-4 (SWFWMD), but also provide enough capacity to hold the entire volume of runoff from a 25-year, 24-hour storm in their respective basins.

It is proposed that the system will serve the site for storms up to and including 25-year, 24-hour storm events. Precipitation events of greater magnitude will flow through the system with outfall occurring at different stages for each pond.

3.9 MATERIALS HANDLING

No heavy equipment such as large cranes, or plant components such as boilers will be transported to the site, unloaded, stored, or moved around the site during normal operation or maintenance of the facility. The room in which the steam turbogenerator is housed will have an overhead crane for maintenance of the turbogenerator.

Lime for the acid gas dry scrubber will be delivered weekly and will be pneumatically transferred from the trucks to an onsite storage silo (130 ton capacity). The lime will be pumped in a slurry form to the scrubber unit; approximately 18 tons will be used each day. Lime and ash residue will be hauled on a daily basis to the co-located landfill/ashfill area.

3.10 ASSOCIATED FACILITIES

The 751-acre site to be occupied by the resource recovery facility will also be occupied by a sanitary landfill/ashfill. The landfill/ashfill will cover 195 acres in the center portion of the site (see Figure 2-6). The volume capacity of the landfill/ashfill is approximately 19.5 million cubic yards, and it is expected to have a service life of more than 30 years.

The landfill/ashfill will incorporate a double liner leachate collection system. The system consists of two layers of sand divided by two impermeable liners made of high density polyethylene. The two layers will contain leachate collection pipes spaced 100 feet apart and set at a slope of 0.5 percent. Each collection pipe will be placed in a trench with 2 percent side slopes. The drainlines will be surrounded with a layer of crushed stone and wrapped in a geotextile fabric to prevent clogging. The drainlines will feed into a leachate header system located along the perimeter of the landfill/ashfill. The leachate header will also have a slope of 0.5 percent and will guide the leachate to storage tanks. Figure 3-7 shows a cross-sectional detail of the leachate collection system.

The landfill/ashfill will be divided into 15 cells. Each cell will be approximately 400 feet wide and 1,100 feet long. Municipal solid waste and ash will be placed separately. The north half of the landfill/ashfill will receive municipal solid waste, and the south half will receive ash. An above ground high-density polyethylene liner will be used to separate the two materials at the boundary line between the two areas.

Initially, the landfill/ashfill will receive approximately 190 tpd of ash and 135 tpd of nonprocessible solids. Ash and municipal solid waste will be distributed in 10-foot layers and covered daily with a 0.5-foot layer of sand. Since each cell covers a small area of the landfill/ashfill, the leachate system will be installed in phases as new cells are opened. During the early stages of landfill/ashfill operation, this will prevent unnecessary collection of runoff that has not contacted the ash and solid waste material.

Construction of the landfill/ashfill will begin with a 24-foot wide road and 48-foot wide swale that will follow the perimeter of the landfill/ashfill. The bottom of the landfill/ashfill will remain above 48 feet msl to maintain the landfill/ashfill 5 to 20 feet above the groundwater level. The outer berm of the landfill/ashfill will have a 4:1 horizontal/vertical slope and will use three 10-foot wide terraces spaced 20 to 30 feet apart in elevation. These terraces will be designed to reduce runoff velocity and prevent excessive erosion. Above the third terrace the slope will reduce to 3 percent. The total height of the landfill/ashfill is expected to be 100 feet.

PERMEABILITY
OF CLEAN SAND
GREATER THAN
 1×10^{-3} cm/sec

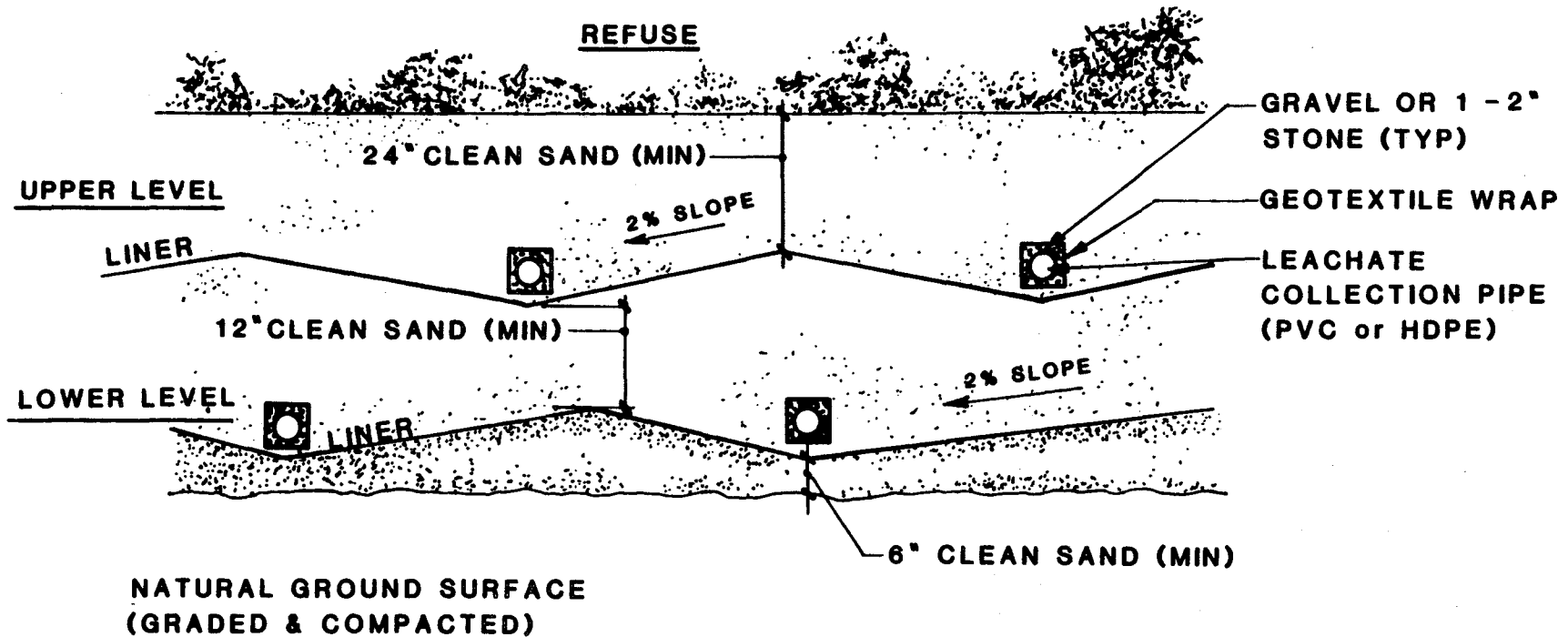


FIGURE 3-7

**4.0 ENVIRONMENTAL EFFECTS OF SITE PREPARATION,
AND PLANT AND ASSOCIATED FACILITIES CONSTRUCTION**

4.0 ENVIRONMENTAL EFFECTS OF SITE PREPARATION, AND PLANT AND ASSOCIATED FACILITIES CONSTRUCTION

An overview of anticipated construction activities is provided as a preface to discussion of the effects of site preparation and construction.

The duration of field construction for the Pasco County resource recovery facility will be approximately 24 months. This 24-month construction period will follow 6 months of final process, civil, and structural design procedures and major equipment design and purchase. Approximately 6 months of personnel training, equipment testing and calibration will be provided when construction is complete. The entire design, construction and shakedown schedule will extend for approximately 36 months, from award of contract to full plant operation.

The principal construction phases will include site preparation (site clearing and preparation, excavation, pile driving and backfilling), construction of the facility (foundations, building and process equipment erection, electrical and mechanical systems installation, instrumentation), and finalization (road construction and paving, final grading, painting, landscaping and cleanup). Completion of final construction activities may extend into the shakedown period. The estimated time required to complete field construction activities is shown on Figure 4-1.

The initial phase of construction will involve the clearing of trees and stumps, and preparation of the site access road. This activity will be followed by construction of the retention basins, topsoil removal and grading of the landfill/ashfill area, and installation of the liner and leachate collection system. When the leachate collection system is in place, construction of the cells and landfill/ashfill containment berms will commence. The scale house will be constructed first, so that municipal solid waste can be accepted as soon as possible. A bypass road will be constructed to reduce the possibility of damage from heavy construction vehicles passing over the installed scales.

SITE PREPARATION

- Site Cleaning and Access Road
- Topsoil Removal
- Retention Basins

ASHFILL CONSTRUCTION

- Grading
- Liner and Leachate Collection Installation
- Construction of Ashfill Berms
- Scalehouse Installation

FACILITY CONSTRUCTION

- Fill for Tipping Floor
- Dewatering for Bunker^I
- Pile Installation^{II}
- Refuse Bunker
- Boiler House
- Power House
- Administration and Residue Building
- Switch Yard
- Stack
- Cooling Tower
- Tipping Room

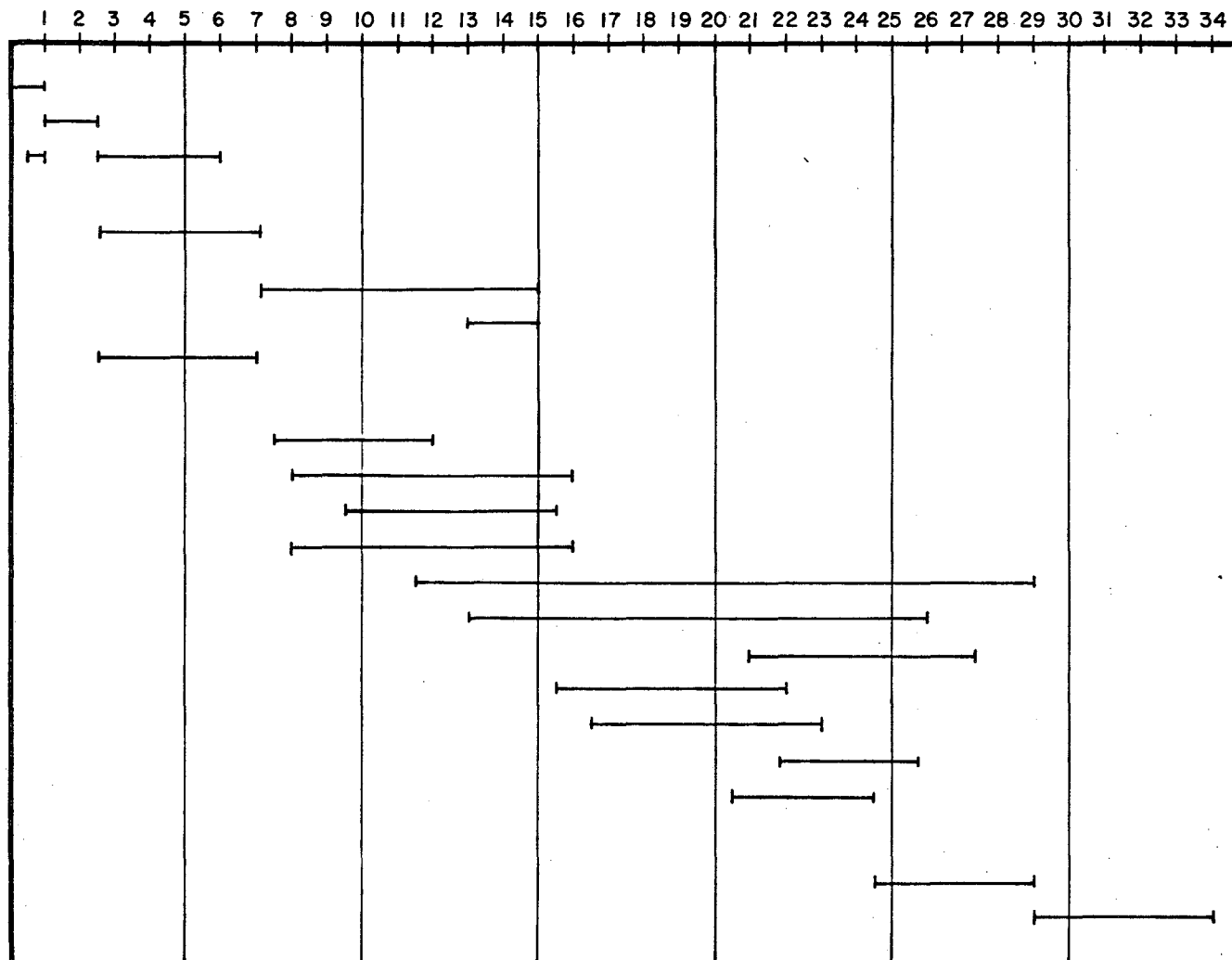
FINALIZATION

- Landscaping and Access Road
- Start-up and Acceptance Testing

^I If necessary

^{II} Includes capping of piles and backfill.

MONTHS



Upon completion of the scale house, dewatering procedures for refuse bunker excavation will begin, if necessary. Refuse bunker excavation will commence when the groundwater has dropped to an appropriate level. After initial excavation, sheet pile driving will begin for further excavation of the refuse bunker. Dewatering will continue until the concrete walls for the refuse bunker have been placed and cured to an elevation above the existing groundwater level. Dewatering is not expected to continue beyond a period of 4 months.

Permanent and temporary drainage structures will be built during various phases of construction to control surface water runoff. The surface runoff collected in these drainage ditches will be directed to retention basins. For this reason, all retention basins will be constructed in the early stages of construction. The water withdrawn during dewatering will be routed to the south retention pond to control site runoff during construction. This water will also be used for dust control, when necessary. There will be no discharge to any surface water bodies or overland flow, therefore, a National Pollutant Discharge Elimination System (NPDES) permit is not required.

Erosion will be controlled by various methods depending on the extent and type of excavation and grading. During construction, exposed areas will be left bare for as little time as practical. Due to the general flat topography of the site, minimal erosion is anticipated during construction. The greatest potential for erosion will be on the side slopes of the elevated tipping floor area. When erosion control is necessary, typical methods will be used, such as sodding, netting or mulch seeding.

The placement of backfill will take place concurrent with excavation activities. Backfill will be required for the landfill/ashfill base, the containment berms of the landfill/ashfill cells and boundary, and the elevation of the tipping floor and its associated access ramps. Backfill material will be obtained from the suitable material excavated from the retention ponds and building foundations. An onsite borrow pit will be used if additional fill is required. By using onsite, excavated material, truck traffic during this period of construction will be reduced.

Based on preliminary subsurface explorations, geotechnical engineers have recommended the use of piles for heavily loaded foundations (stack, boiler and powerhouse). For lighter foundation loads, a shallow foundation may be used (administrative and residue house, cooling towers and switchyard). Foundation pile installation activities for the entire resource recovery facility will begin in approximately the 16th week of field construction. Pile installation will continue for approximately 22 weeks.

It is estimated that the placement of concrete for pile caps, slabs and walls will begin in the 26th week and continue for a 15-month period. This phase of construction is expected to peak between the 30th and 45th weeks of field construction. During this 15-week period, it is expected that an average of approximately 50 cubic yards of concrete will be placed per day, 5 days per week. Approximately seven trucks will be required each day (assuming 8 cubic yards per truckload) to transport concrete to the site.

The erection of steel superstructures for onsite facilities is expected to commence during the 50th week of construction and continue for a period of approximately 20 weeks. These steel superstructures will range in height from about 50 to 110 feet above existing ground elevation, and will cover an estimated area of 2.5 acres.

As shown on Figure 4-1, the longest construction time will be required for installation of major equipment such as: boilers, grate system, air pollution control devices, turbine generators, cooling towers, steam and process piping. In most cases, the installation of this equipment will begin as the steel superstructure of each building nears completion. Major equipment installation is expected to span a period of 65 weeks. This activity will begin in approximately the 58th week and will continue until the end of the plant construction.

Finalization of the resource recovery facility construction will involve such activities as paving of the access road, painting and general landscaping. Activities which are not critical to the start-up of the facility, such as painting and landscaping, are expected to continue into the shakedown period of facility implementation.

The final activity of the construction schedule is facility start-up and acceptance testing. The facility will be tested under various operating conditions and monitored to determine if the facility complies with environmental, capacity, and energy standards. Start-up and acceptance testing will be performed by the facility's operating staff and various specialists and regulatory personnel.

During routine construction activities, it is anticipated that six to ten pieces of major equipment will be operating on the site. This average equipment requirement will vary with the phases of construction. The very early and final stages of construction will typically have reduced equipment requirements. The largest quantity of equipment will be operating on the site during the peak construction period—from the 12th to the 56th week.

The specific equipment that will be used during construction will depend on the general contractor chosen to construct the resource recovery facility. The general contractor may choose to rent specialized equipment during various phases of construction. When rented equipment is used for a particular phase of construction, the general contractor typically will complete all activities requiring this rented equipment in one stage, rather than staggering the work.

Table 4-1 lists typical equipment that will be used during construction of the resource recovery facility. This equipment list does not include the vehicles needed to haul concrete, or the general traffic associated with the work force entering and leaving the site.

4.1 LAND IMPACT

4.1.1 GENERAL CONSTRUCTION IMPACTS

Impact on Solid Waste Generation and Disposal

During construction of the resource recovery facility, a variety of solid wastes will be generated, including vegetation matter, wood, paper

TABLE 4-1
ESTIMATE OF
CONSTRUCTION EQUIPMENT REQUIREMENTS

Equipment	Estimated Quantity	Equipment	Estimated
<u>EARTHMOVING</u>		<u>IMPACT</u>	
Dozers	2	Pneumatic Tools	10
Front End Loader	2	Jack Hammers	2
Backhoe	2		
Scraper	1	<u>MISCELLANEOUS</u>	
Trucks	7	Vibrators	3
Grader	1	Pumps	6
Paver	1	Compressors	2
		Generator	2
<u>MATERIAL HANDLING</u>		Welders	4
Cranes	4	Saws	3
Derrick	1		
Pile Driver	1		
Concrete Pump	1		
Fork Lift	1		

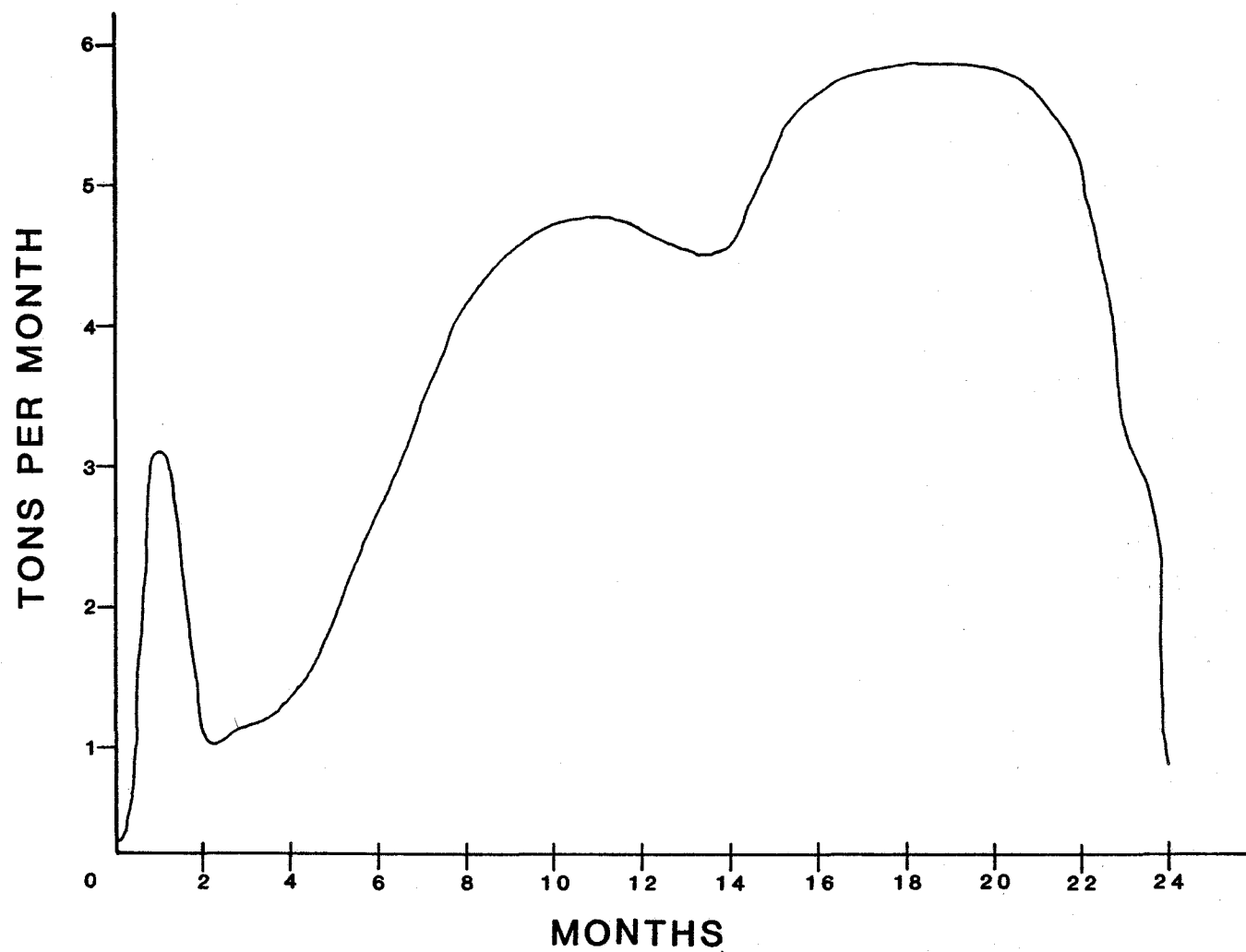
products, concrete, scrap metal and lumber, and miscellaneous oils and fluids required for equipment operation. These wastes must be disposed of periodically for the duration of construction.

Site clearing procedures will generate debris such as vegetation matter and wood. Approximately 250 acres of scattered trees and associated vegetative ground cover will be removed before plant construction begins. Slash, wood debris, and any other nonmarketable material generated during the removal of trees will go to the adjacent Class III landfill. It may be possible to sell the removed trees.

Small quantities of waste oils and solvents may be generated onsite during equipment maintenance and various construction activities. Waste oil will be generated at a rate of about one drum (55-gallon barrel) every two to three months. Typically, fewer waste solvents would be generated than waste oils, except during certain phases of equipment installation. For example, installation of piping and electrical systems could generate twice as much solvent as oil. Drums of waste oils and solvents will be stored on pallets within a bermed area. They will be properly labelled and covered with a weatherproof canvas or plastic drop cloth. Neither waste oils nor solvents will be stored onsite for longer than 90 days. Transport and disposal of these wastes will be handled by properly licensed contractors.

For the duration of plant construction, it is estimated that approximately 100 tons of solid waste will be generated (see Figure 4-2). Whenever practical, recoverable materials, such as metal and oils, will be removed from this waste stream. It is anticipated that roll-off containers will be used to collect and haul non-recyclable materials to the county landfill. The pattern of waste generation will correspond to the type and level of activities occurring on the construction site. An initial peak is associated with site preparation and clearing. After site preparation activities, waste generation will drop, until construction and installation begin. Higher generation rates will coincide with construction and installation.

FIGURE 4-2



Pasco County Resource Recovery Program
Estimated Solid Waste Generated During Construction

Staging, Material Laydown, and Work Force Parking Areas

The staging, materials laydown, storage and work force parking areas must be assigned to locations where construction activities are minimal. In order to preserve trees and vegetation for use as a buffer zone, the material laydown and parking areas will be located within the perimeter road loop. Two areas west of the resource recovery facility are suited as material laydown areas, since they have sufficient space, and are near the site entrance. Staging, as well as additional material laydown area, will be assigned to an area adjacent to the main facility. This will keep stage work as close to the actual facility construction area as possible. General work force parking and a construction office will be located in the northwest corner of the resource recovery site, adjacent to the access road. By locating this area near the entrance, traffic interference with major construction activities is minimized.

Land Disturbance

A detailed discussion of the construction activities that will disturb existing terrain was presented in the introduction to Section 4.0. At least four major construction activities will disturb existing terrain. These activities are listed below.

1. Initial site clearing and construction of access road.
2. Phased construction of landfill/ashfill and retention basins.
3. Excavation for refuse bunker.
4. Fill placement for tipping floor and landfill/ashfill containment berm.

It should be noted that all four of these terrain-disturbing activities are typical for this type of construction project.

4.1.2 ROADS

The project site will be accessed from Hays Road which is a county road. The only roads to be constructed are those which will be on the site and used to support facility functions. In conjunction with the project, a proposal has been submitted to the county to pave the unsurfaced portions of Hays Road near the site entrance. If accepted, this road construction will be included in the resource recovery budget.

4.1.3 FLOOD ZONES

This section of the application does not apply to this project. None of the structures planned as part of this project will be within the 100-year flood zone. Refer to Figure 2-7 for information on the limits of the 100-year flood zone in the vicinity of the site.

4.1.4 TOPOGRAPHY AND SOILS

The site topography will be altered by the proposed project. As construction progresses, an increasing area of the site will be covered with impervious surfaces such as roads, buildings, and landfill/ashfill liner. When initial construction is complete, the site will have 60 acres of impervious surface. Approximately 10 acres will be covered by the first cell of the landfill/ashfill which incorporates a double liner leachate collection system. The remaining 50 acres will be covered by roads, parking lots and buildings. Additional cells of the landfill/ashfill will be lined, as needed. When it is fully lined, the landfill/ashfill will cover 195 acres.

The major modification to subsurface conditions will result from construction of the landfill/ashfill, the installation of piles for the resource recovery facility, and the dewatering and excavation for construction of the refuse bunker. The leachate control system will prevent infiltration of water into the groundwater below the landfill/ashfill. The reduction of water entering the ground below the landfill/ashfill will detour water circulation from the ground surface to

the limestone. Load-bearing piles will be installed underneath the areas of the main resource recovery structure which will bear the heaviest loads (e.g., the boiler and the stack). The exact number, type, spacing and length of the piles has not yet been defined. This information will be developed with final design.

The creation of impervious surfaces will change the site drainage features and percolation rates. The hydrologic analysis summarized in Appendix 10.11 indicates that the construction of 260 acres of impervious surface in the site area will result in a 300 percent increase in the rate of peak discharge from the site. The majority of the additional runoff will be from the 195-acre landfill/ashfill area. The creation of impervious surfaces will increase the total volume of runoff by approximately 180 percent. Four retention basins will be constructed. They will cover a total of 51 acres and will have an average depth of 4 feet.

Construction of the retention basins is scheduled so that any excess, potentially sediment-laden runoff generated during construction will be diverted to the southernmost basin.

Certain mitigative measures will be taken by the developer to control soil erosion and air pollutants during construction. These measures are described below.

- Designated haul routes will be used onsite to channel main traffic over a path which can be stabilized.
- Dirt will be cleaned off Hays Road adjacent to the site on a midweekly basis.
- Selective clearing will be used whenever possible, to allow natural seeding to stabilize the disturbed soil and berms, and to minimize wind erosion.
- All dirt roads will be watered as needed.

- Asphalt roads will be developed as soon as practical.
- Clearing of land within the development will be staged to minimize the amount of land exposed to windy conditions.

Planned construction activities and modifications to the site's drainage features should not result in any direct or indirect subsidence or sinkhole problems. Drainage retention and infiltration will occur in natural low-lying areas with low probability of future subsidence. Planned backfilling will increase the load on soils and could result in some minor settlement due to surcharging. Proper soils analysis will ensure that no detrimental settlement occurs.

The bearing capacity of various portions of the site will be improved with the use of piles to support heavy structures and associated components. No long-term problems are associated with this change in site subsurface conditions.

The construction activities which will affect the site's topography will have minimal aesthetic impact. The dense buffer zone along the site border will limit visual impacts to the construction of the upper portions of the buildings and the emissions stack. The visual impact study (described in Section 3.2.2) revealed that the emissions stack and buildings are not visible from distances of more than two miles. In many areas within one mile of the facility, obstructions block the view of the stack partially or entirely.

4.2 IMPACT ON SURFACE WATER BODIES AND USES

4.2.1 IMPACT ASSESSMENT

Of the major activities described in the Instruction Guide (FDER Form 17-1.211(1)) which could have an impact on surface water bodies and uses, none will be associated with this project. No construction activities will occur in or near any surface water bodies. There are no proposed intake or

discharge structures planned for the boiler cooling water. The required cooling water will be obtained from the Hudson Subregional Wastewater Treatment Plant (WWTP).

It is proposed that the stormwater facilities (retention/detention ponds) should be constructed before any construction activity begins. Thus, ponds 1 and 4 will be constructed immediately, and ponds 2 and 3 will be constructed when construction activity reaches their areas. This will ensure that the surface water runoff generated on the site during construction will be captured and adequately treated. It is expected that construction on the site will have minimal impacts, if any, on the surface water bodies.

4.2.2 MEASURING AND MONITORING PROGRAMS

Since there are no surface water bodies located within the project construction site and the natural overland flow patterns will be maintained whenever practical, a monitoring program is not necessary.

4.3 GROUNDWATER IMPACTS

4.3.1 IMPACT ASSESSMENT

The onsite surficial aquifer varies in thickness depending upon seasonal precipitation patterns and varying depths to the confining clay layer. During the wet season, the surficial aquifer varies from 2 to 5 feet in thickness. In the dry season, the surficial aquifer disappears in some areas and shrinks to between 1 and 3 feet thick in other areas.

The refuse pit is the only structure that will require excavation and possible dewatering. Construction should have a minimal effect on the surficial aquifer and will not impact the Floridan aquifer. During the dry season, dewatering should not be necessary. During the wet season, a wellpoint system may be necessary for a period of less than four months.

Dewatering will cause only temporary aquifer drawdown, since discharge will be routed to the nearest retention/detention pond, and recharge will be nearly 100 percent.

In the area of the leachate liner system, no rainfall recharge will be available to the surficial aquifer, except from lateral downgradient flow. Because the surficial aquifer is relatively thin in this area, it may dry up beneath most of the lined area.

The recovered water used for process cooling, and the leachate in the leachate collection system will not come in contact with the surficial aquifer. A discussion of the impacts on groundwater at the site may be found in Section 5.3 of this permit application.

4.3.2 MEASURING AND MONITORING PROGRAMS

Since construction activities will have minimal impact on the surficial aquifer, a separate monitoring program is not needed. The normal measuring and monitoring procedures outlined in the groundwater monitoring plan (see Appendix 10.5) will be followed during the construction period.

4.4 ECOLOGICAL IMPACTS

4.4.1 IMPACT ASSESSMENT

The impacts to fish and wildlife populations caused by construction of the Pasco County resource recovery facility will be minimal. This site is not an area of unique plant associations or habitat types. This is a pre-disturbed site which has been vegetationally altered and clearcut several times. The site contains primarily planted coniferous trees and recently clearcut areas. Species diversity and composition on the site should not undergo any major alterations due to the large conservation area which will surround the plant site and the landfill/ashfill. Any fauna displaced by construction can move to adequate habitat adjacent to the developed portion of the property without serious detriment.

The plant site and landfill/ashfill area will occupy 200 to 300 acres of the 751-acre site. The facilities will be centered on the site east of the powerline easement on land that is currently planted forest or clearcut. The area encompassed by the resource recovery plant and landfill/ashfill will be altered. In the short-term, the acreage taken by these facilities will be lost. However, the project has a definite life span, and some of this lost acreage will be restored to its original condition when the project is completed and the closed facility is put to other uses. The surrounding land and all property west of the powerline easement (where all the wetland areas are located) will not be developed and will serve as buffer and conservation areas.

When construction begins, the resident wildlife populations will relocate to the available habitats which surround the plant site. The 400- to 500-acre buffer area surrounding the facility will function as a refuge where displaced species may reestablish themselves. Since the wetland areas will not be developed or altered, the present diversity of the wetland communities onsite will not be impacted.

As a Species of Special Concern, the resident population of Gopher Tortoises (Gopherus polyphemus) will be provided for as required by the Florida Game and Fresh Water Fish Commission which has jurisdiction over this issue. The Florida Department of Environmental Regulation, and the Florida Game and Fresh Water Fish Commission have been contacted to discuss acceptable methods of dealing with this species. Current Florida Game and Fresh Water Fish Commission protocol (June 1986) suggests relocating the Gopher Tortoises if it is not possible to avoid burrow areas. Pursuant to Rules 39-25.02 and 39-27.02 of the Wildlife Code of the State of Florida (Title 39 FAC), a request for a Gopher Tortoise capture, relocation, and release permit will be submitted to the Florida Game and Fresh Water Fish Commission if necessary.

The size of the Gopher Tortoise colony is assumed to be 10 to 15 individuals, based on the number of burrows which have been located on the site. If relocation is required, all displaced Gopher Tortoises will be

moved with care to a site of similar habitat value which will be suited to their continued survival. Within the approximate 500 acres of the property that will not be developed, there are comparable habitats into which the displaced Gopher Tortoises may be relocated.

4.4.2 MEASURING AND MONITORING PROGRAMS

The monitoring program for ecological conditions is discussed in Section 2.3.6.

4.5 AIR IMPACT

4.5.1 EMISSION RATES

Construction activities may cause localized, short-term, adverse air quality impacts. Potential impacts include:

- Fugitive dust emissions from land clearing and site preparation activities, and
- Mobile source emissions from construction equipment at the construction site.

Although emissions will continue throughout all phases of construction, the greatest impact from fugitive dust emissions will occur during the site preparation phase when the largest amount of soil surface will be exposed. The greatest impact from the mobile sources will occur during the facility construction phase when most of the equipment will be onsite.

Trucks carrying fill and concrete will travel on the site access road during construction. This road is currently unpaved, and may be a source of particulate emission. Several mitigating measures may be used to reduce these particulate emissions. Routine watering of the roadway would reduce roadway emissions by approximately 50 percent. A watering truck is usually onsite for various other activities. This truck could be partially dedicated to roadway watering, or an additional truck could be provided for

this purpose. Surface treatment with penetrating chemicals could provide up to a 50 percent reduction in particulate emissions, depending on the frequency of application. The application of penetrating chemicals is more costly than routine watering, but fewer applications are required when chemicals are used. The costs of reducing roadway particulate emissions using these methods would include the expenses of purchasing and mixing chemicals, and the expense of using a watering truck or other vehicle. Soil stabilization may also be used to reduce roadway particulate emissions. Soil stabilization is performed when the roadway is developed, and can achieve a 50 percent emission reduction by binding up surface soil. Emissions can be reduced further by spreading oil or penetrating chemicals over the stabilized area. The advantage of soil stabilization is that the roadway becomes more drivable.

Paving can reduce roadway particulate emissions by nearly 85 percent. Road paving can be accomplished by soil compaction and addition of base coarse material, or by soil stabilization with an asphalt cap.

Good construction practice requires a developed access road when extensive truck traffic is necessary. Because the access road must be able to handle heavy trucks eventually on this site, it should be built at least to base coarse level, or it will require improvement during construction. Thus, paving of this roadway would be cost-effective and is the recommended method for reducing particulate emissions.

General site emissions--particulate emissions across open and active construction areas--are best controlled by a comprehensive watering program which can reduce emissions by 50 percent. Other methods used to control emissions are not practical because soil is usually in a state of transition during construction. An excessive amount of penetrating chemicals would be required, and binding agents would be continually broken up. Since a watering truck is available onsite for other construction activities, use of this truck for site watering should not impose a significant cost.

Particulate emissions in completed cut and fill areas can be reduced by 65 to 80 percent using vegetation or chemical binders. Since these areas are not active and would not receive traffic, vegetation can grow undisturbed and chemical binders need only infrequent applications. Embankments brought up to grade and no longer subject to construction activity should be immediately landscaped or vegetated. Till piles or embankments requiring future activity should be treated with a binder.

Good site maintenance should be practiced. Most site maintenance practices are not costly, and the extra effort they require is usually outweighed by the benefits they offer.

4.6 IMPACT ON HUMAN POPULATIONS

The construction of this project will result in both positive and negative effects on the local and regional population. Positive effects will result from the creation of jobs, and the generation of tax revenues from the purchase of construction materials (see Section 7.0). Negative effects will result principally from construction activities.

4.6.1 SENSITIVE RECEPTORS

Sensitive receptors are individuals or organizations/institutions located close enough to the project site to be potentially affected by construction impacts. A comprehensive review of the land use and demographic features of the area surrounding the site is presented in Section 2.2. As indicated in Section 2.2, major land uses adjacent to the site include vacant grazeland and low-to-medium density residential areas.

The closest sensitive receptor to the project site is a single-family residence located on Hays Road near the proposed site entrance. The residence is about 200 to 250 feet south of the site, and almost directly across from the entrance road to the facility. The residence is located approximately 2,000 feet from the proposed resource recovery facility.

Another sensitive receptor is the residential area of Hays Road located southwest of the site. This area is located approximately 4,000 to 5,000 feet from the proposed facility and stack location. A third sensitive receptor is a light density residential area located 4,000 feet northwest of the proposed facility. The fourth sensitive receptor, Shady Hills Park, is located 500 feet north of the project site property line, and approximately one mile from the proposed stack location. The county-owned park is used for sports and various social activities. The facility has three baseball diamonds, a playground, and a civic center, and the addition of a football field is planned.

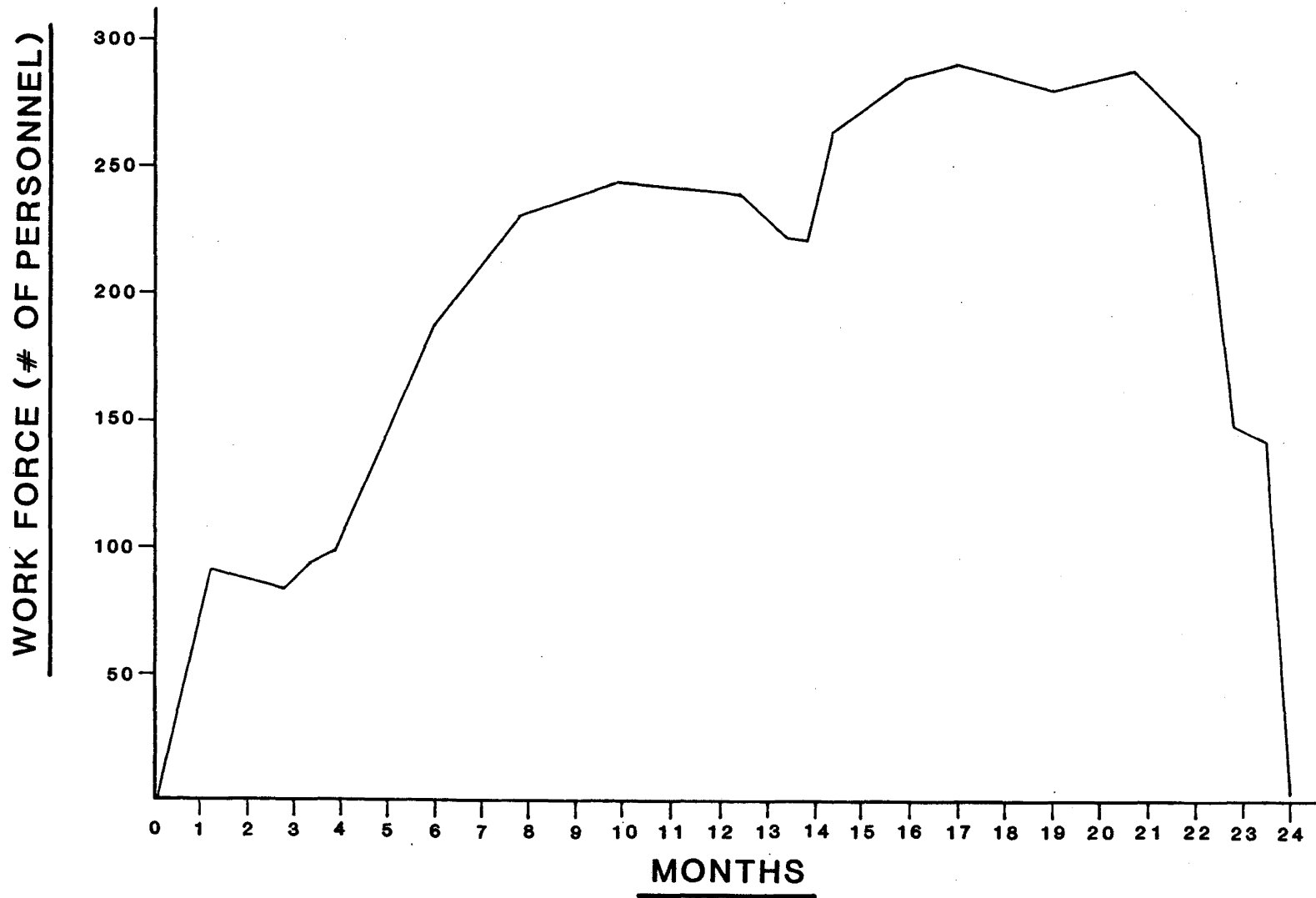
4.6.2 WORK FORCE

During construction of the resource recovery facility, the day-to-day work force is expected to average between 150 and 200 people. The initial phase of construction (site clearing, development of access road and excavation of the retention basins) will require a work force of less than 100, while peak phases will require approximately 300 persons. From the 8th to the 22nd month of the construction schedule, the work force should average between 250 and 280 personnel. Throughout the course of the project, a total of approximately 1,000 workers will be employed. Figure 4-3 shows estimated work force requirements during facility construction.

Work Shifts

The majority of activities required for the construction of the resource recovery facility will take place on an 8-hours-per-day shift, 5 days per week. Dewatering of the refuse bunker excavation—which will not exceed a period of four months—is expected to require 24-hours-per-day operation of the dewatering pumps. The placement of concrete for the refuse bunker will require a period of continuous pour. The requirements for 24-hours-per-day concrete placement will be determined based on final design and the method of construction to be used. All the remaining construction activities outlined on Figure 4-1 will be conducted during 8-hour-per-day shifts.

FIGURE 4-3



Pasco County Resource Recovery Program
Estimated Work Force Requirements During Construction

Work Force Revenues

Operation of the facility and landfill/ashfill will require approximately 5 administrative staff, 40 operations and 9 maintenance personnel. Since the county intends to hire locally whenever possible, the payroll generated from these newly hired staff will be a major benefit to the area. An estimated annual payroll of \$3 million will put \$40 million in present worth dollars into the local economy over a 20-year period.

On a short-term basis, the plant construction will provide the benefits of a \$120 million construction project in the area. This will provide jobs for local construction labor, and will contribute to the local economy through the purchase of construction materials and services. Direct economic benefits will be generated in the region by site preparation, construction of the resource recovery facility, and the manufacture of the equipment and other capital goods installed at the facility. Indirect economic benefits will also occur. These benefits include increased sales and jobs in industries supplying the construction firms, or in retail establishments which sell goods or services to construction workers.

Work Force Availability

Most of the work force for this project will be provided by the available labor pool in Pasco County and adjacent counties. No major relocation of construction workers and families is anticipated. Therefore, no impact on available housing, schools or other community support assets is expected.

4.6.3 TRAFFIC ASSOCIATED WITH CONSTRUCTION

Construction of the Pasco County resource recovery facility will have a slight impact on the level of traffic at the intersection of SR 52 and Hays Road. This traffic impact will be caused by the vehicles which will travel to and from the construction site each day for the duration of construction. The four general categories of traffic include general work force vehicles, vehicles delivering construction equipment, and vehicles delivering construction materials and equipment for installation.

Traffic associated with the general work force is expected to have the greatest impact on the intersection of SR 52 and Hays Road. This daily traffic volume, consisting mainly of passenger vehicles, will closely follow the work force requirements for the construction of the plant. The estimated number of vehicles expected under this general category was determined by assuming that 70 percent of the work force will drive to the site and the remaining 30 percent will be passengers. These vehicles will typically travel to the site early each work day and will exit following completion of the day's construction activities. Minimal construction worker traffic is anticipated during the hours of construction activity.

The traffic resulting from the delivery of construction equipment to the site is expected to have minimal impact over the duration of construction. The majority of this equipment will be brought to the site during the site preparation phase of construction. The derrick and cranes will be delivered to the site before the building phase of construction. This equipment will remain onsite until construction activities associated with its use are complete.

The greatest increase in truck traffic during project construction will be caused by the transport of construction materials to the site, including concrete, structural steel, pavement and miscellaneous building materials. The traffic impact from the transport of concrete to the site during the peak phase of concrete placement will generate the highest level of traffic entering and exiting the site, with the exception of work force traffic.

Truck traffic associated with construction activities will typically occur between the hours of 8 am and 5 pm. Minor peaks in truck traffic volume from construction activities can be expected for about an hour during mid-morning and for another hour starting after lunch. At other times during the day, truck traffic should be generated at a uniform rate.

As indicated, truck traffic will reach its peak during concrete placement. During large pours, concrete will be placed at 20 to 30 cubic yards per hour. When this occurs, the average truck traffic volume should be about

three to five truck trips per hour, with daily peaks of about six to eight trips per hour. Recent traffic counts for Hays Road show that traffic flow is well below the capacity for Level of Service A (LOS-A = free flowing condition). The additional truck traffic will not lower the level of service on Hays Road.

The hauling of major equipment for installation is not expected to generate a significant level of traffic.

Of the four general categories of construction traffic, commuting workers have the greatest potential for creating adverse traffic effects. The daily volume from this source is the greatest of all categories considered. The maximum number of construction workers expected will be about 300 on any one day. With an allowance for car pooling, absenteeism, and other modes of transport, it is expected that 70 percent of the work force will have vehicles. Therefore, it is expected that during maximum construction periods, 210 vehicles will be contributed to local roadways by commuting construction workers in both the morning and afternoon peak traffic periods. Existing traffic on Hays Road is only 16 percent of the maximum daily traffic flow allowed for an LOS-A rating, according to the Florida Department of Transportation. The addition of 210 vehicles during peak traffic hours will raise the peak hourly traffic volume to 120 vehicles per hour. This increase will bring traffic flow to only 21 percent of the maximum daily traffic flow allowed for an LOS-A rating. The available roadway capacity will not be significantly affected, therefore, a free flowing condition will continue.

4.7 IMPACT ON LANDMARKS AND SENSITIVE AREAS

Construction of the facility will not impact the county parks in the area. The proposed concourse park will be located at the intersection of Hays Road and SR 52. Studies of traffic noise (Appendix 10.12) and volume flow (Section 5.9) show insignificant impacts at this intersection. Traffic noise will increase by less than 3 decibels and the level of service will

remain at LOS-A. Shady Hill Park is located one mile north of the construction area. Construction noise will not be discernable at the park, and traffic flow will not be affected.

4.8 IMPACT ON ARCHAEOLOGICAL AND HISTORIC SITES

None of the prehistoric sites discussed in Section 2.5 and shown on Figure 2-8 will be impacted by the construction of the project. An archaeological and historical review of the site was conducted by the State Division of Historical Resources in July of 1986. The review concluded that no significant sites are recorded for the project area. The review also explained that the nature of the proposed project will not affect any of the recorded sites in the area.

Based on the historical survey and the Division of Historical Resources (DHR) correspondence, no impacts on archaeological or historic sites are expected due to construction activities. If a possible archaeological site is unearthed during construction, officials of DHR will be contacted to determine the significance of the discovery.

4.9 SPECIAL FEATURES

This section discusses all special features associated with site preparation and plant and associated facilities construction that may influence the environment and ecological systems of the site and adjacent areas. These features may include site dewatering for landfill/ashfill construction, as well as the generation of solid and liquid waste as a result of construction activities.

During construction, solid and liquid wastes will be generated. This waste may consist of discarded packaging materials, refuse produced by construction workers, earth spoils, sanitary wastes, or waste oils. Earth spoils will be transferred to the adjacent Class III landfill. Sanitary wastes and waste oils will be handled by the appropriate licensed haulers. The aesthetic and ecological integrity of the site will be maintained.

4.10 BENEFITS FROM CONSTRUCTION

Two important benefits from construction of the proposed resource recovery facility are employment of construction workers in the area, and personal income generated by work force revenues. For the duration of construction, the benefits of a \$120 million construction project will be felt in the local economy and labor market as construction-related materials and services are purchased, and jobs are created. Approximately 300 construction workers will be employed during the peak of activity. The services of more than 50 local subcontractors will be required to complete the project. Throughout the course of the project, a total of approximately 1,000 workers will be employed. A significant amount of materials and hardware supplies such as concrete, steel, piping, grass, etc., will be purchased from companies in the area. In addition, positive indirect impacts will be felt by industries and retail establishments which supply goods and services to the project work force. Long-term benefits include the safe disposal of municipal solid waste which will ensure protection of the county's groundwater supply, and continued employment opportunities for the area. Section 7.0, Economic and Social Effects of Plant Construction and Operation, provides further analysis of social and economic benefits arising from plant construction.

4.11 VARIANCES

No variances from any standards or guidelines are anticipated.

SECTION 5

5.0 EFFECTS OF PLANT OPERATION

5.0 EFFECTS OF PLANT OPERATION

This section describes (1) the interaction of the resource recovery facilities with the environment, and (2) Pasco County's plans for monitoring the environmental impacts of plant operation. In the discussion which follows, irreversible or unavoidable environmental effects are distinguished from those which are unavoidable, but temporary, or suitable for later amelioration. Mitigation actions are described when applicable. The impacts of facility operations are quantified whenever possible, and the source of each impact is identified. The relationship between short-term and long-term effects is also discussed.

5.1 EFFECTS OF THE OPERATION OF THE HEAT DISSIPATION SYSTEM

As described in Section 3.0, cooling towers will be used onsite. There will be no thermal discharges, therefore, 316 demonstrations are not applicable.

5.1.1 TEMPERATURE EFFECT ON RECEIVING BODY OF WATER

This section is not applicable to the project, since evaporative cooling towers will be used. All effluent from the resource recovery facility will be sent to the Hudson Subregional Wastewater Treatment Plant (WWTP) which will be designed to handle the appropriate quantity of facility discharges.

5.1.2 EFFECTS ON AQUATIC LIFE

This section does not apply to this project. All effluent from the resource recovery facility will be sent via pipelines to the Hudson Subregional WWTP. There will be no discharges to the surface water or groundwater. There will be no thermal effects or any other effects on the aquatic life in the area.

5.1.3 BIOLOGICAL EFFECTS OF MODIFIED CIRCULATION

The resource recovery facility will use wastewater plant effluent supplied by the Hudson Subregional WWTP. Therefore, no water body will be directly affected by the resource recovery facility cooling water demand or discharge.

5.1.4 EFFECTS OF OFFSTREAM COOLING

The cooling towers of the proposed facility will use an average 800,000 gallons per day (gpd) of treated effluent from the Hudson Subregional WWTP as makeup water—water used to "make up" for water lost to evaporation. The WWTP will provide secondary treatment of the influent wastewater followed by filtration and high-level disinfection. This level of treatment will ensure the provision of a high quality reclaimed water which is suitable for reuse in the proposed facility's cooling towers. Chlorination of the reclaimed water stream will be provided in conformance with Chapter 17-6 of the Florida Administrative Code: 1.0 mg/L total chlorine residual after 15 minutes contact time at maximum daily flow, or after 30 minutes contact time at average daily flow—whichever provides a higher level of public health protection.

During the cooling process, approximately 0.015 percent of the makeup water is lost as droplets in the exhaust (cooling water "drift"). Therefore, approximately 120 gpd would be lost as drift. The drift will be of approximately the same quality as the treated wastewater used as makeup water. Once the droplets of water composing the drift are vented from the tower, they are carried away from the facility. The distance traveled is dependent on the size of the droplets formed. Aerosol particles or droplets larger than 600 microns in diameter (approximately 70 percent of the drift mass) would settle within 400 feet of the tower. Smaller particles would be carried farther (Furlong, 1974). At the proposed resource recovery facility, the nearest residential area is more than 2,500 feet south of the tower, with trees in between as buffer. Thus, almost all particles or droplets will settle out, or will be diluted before reaching a residential area. In addition, prevailing winds are from the east, so the drift will

be moved primarily west of the site, where the closest residential area is more than a mile away.

To determine if viruses and bacteria could be emitted from the proposed resource recovery facility cooling tower, a computerized literature search was conducted to identify all data available on this topic. Two data bases were searched and a combined total of more than 7,500 journals, books, reports, conference proceedings and research papers were accessed—a total of approximately 100,000 records. Only a small number of articles and reports were found that specifically address the use of treated wastewater as cooling tower makeup water, and these studies were conducted at large power plants rather than resource recovery facilities. The results of these few studies are discussed in the following paragraphs.

Levels of total bacteria have been measured directly at the exit vent from a cooling tower which uses secondary effluent by Adams, et al (1980). These results are not completely comparable to the proposed facility because a lower level of wastewater treatment was provided, and treated wastewater was held in a cooling tower basin prior to use. Such holding can allow the regrowth of organisms. Both of these factors could result in higher counts of bacteria than would be expected at the proposed Pasco County facility. As measured by Adams, et al (1980), total bacteria counts exiting the vent of a cooling tower on four occasions ranged from 299 to 1,220 particles/m³.

Rogozen, et al (1981), sampled emissions from two cooling towers which used municipal wastewater from the Burbank Water Reclamation Plant as makeup water. This plant treats wastewater to a level close to that which will occur at the Pasco County resource recovery facility. One of these towers, the Burbank Olive 1, was also sampled by Adams, et al. The Rogozen work attempted to sample stack emissions isokinetically (air enters the sampler at the same velocity as it leaves the stack). At the Olive 1 tower, the exit velocity was 10.4 meters per second and the total volume of air sampled was 770 cubic meters. No fecal coliform or fecal streptococci bacteria were detected. Total coliform bacteria were greater than or equal to 1.6 most probable number (MPN) of organisms/m³. E. coliphage were

enumerated at 0.07 plaque forming units (PFU)/m³. At the Magnolia 4 tower, which also used wastewater from the Burbank plant, no bacteria or viruses were detected during isokinetic sampling.

To determine the potential health impacts of aerosolization of virus particles, virus levels in cooling tower intake waters were monitored. This is the technique most commonly used to measure virus aerosolization, particularly in Florida. It is reasoned that, if no viruses are detected in the intake water, none will be found in the tower drift. This type of virus analysis has been conducted on chlorinated effluents from both pilot and full-scale treatment plants in central Florida and the Tampa Bay area.

The proposed Hudson Subregional WWTP will provide advanced wastewater treatment. Advanced wastewater treatment (AWT) processes can produce substantial viral reduction beyond conventional secondary treatment. Dryden et al (1979) found that suitable combinations of AWT processes could achieve overall reductions of up to 99.6 percent of viruses.

Studies of virus inactivation using chlorine have shown almost complete inactivation of viruses in AWT effluents. Dryden et al studied the use of chlorine for inactivation of AWT effluents seeded with poliovirus type 1. After 2 hours of contact with a final combined chlorine residual of 4.9 to 5.4 mg/L, an inactivation rate of 99.9 to 99.99 percent was achieved. Many field tests and pilot plant studies substantiate these results.

Virus testing was conducted during a 3-day period at the Sand Lake Road pilot wastewater treatment facility (Wellings, 1983a). The pilot plant employed a shallow bed dual media automatic backwash filter with pre- and post-chlorination, alum, and alum plus polymer. While the influent wastewater contained from 262 to 397 PFU/l, chlorinated effluent (free chlorine residuals from trace to 1.7 parts per million) contained no detectable virus. However, the automatic backwash unit was not employed during the testing, so only a shallow bed dual media filter was actually tested—an optimal situation for virus removal.

At the McCleod Road wastewater treatment plant, sampling was conducted from June 21 to June 27, 1983 (Wellings, 1983b). Influent densities ranged from greater than 383 PFU/liter to greater than 593 PFU/liter. Again, no viruses were detected in the chlorinated effluent. As shown in Table 5-1, virological sampling at three full-scale facilities in St. Petersburg showed virus levels from non-detectable to 0.0070 PFU/liter.

The drift emanating from the proposed Pasco County facility will not present a virological health hazard to residents of nearby areas. The Pinellas and Hillsborough resource recovery facilities are using a similar cooling system and there have been no reported problems. To assure the absence of viruses in the makeup water of the proposed project, a monitoring program will be instituted as described in the following section.

5.1.5 MEASUREMENT PROGRAM

Samples of influent and chlorinated effluent will be collected daily for one week during compliance testing. Sufficient sample volumes will be collected to allow the accurate qualification of virus particles. Samples will be analyzed for total bacteria, total and fecal coliform bacteria, fecal streptococci and total virus particles (as plaque forming units). Analysis techniques specified in Standard Methods for the Examination of Water and Wastewater (APHA, 1982) and the U.S. Environmental Protection Agency will be followed.

When construction of both facilities is complete, monthly sampling of the circulating cooling waters will be conducted. This program will be undertaken for the first year of operation to assure that no viruses are detected. These samples will also be analyzed for the indicator bacteria mentioned above.

TABLE 5-1

RESULTS OF VIROLOGICAL TESTING
CITY OF ST. PETERSBURG
(PLAQUE FORMING UNITS PER LITER)

	Wastewater Treatment Plants		
	Northeast	Northwest	Southwest
<u>1985</u>			
August	0	0	0.0027
September	0	0	0
October	0	0	0
November	0	0	0.0027
December	0	0	0.0070
<u>1986</u>			
January	0	0	0
February	0	0	0
March	0	0	0
April	0	0	0
May	0	0	0
June	0	0	0
July	0	0	0

SOURCE: Department of Public Utilities, City of St. Petersburg, June 2, 1987.

5.2 EFFECTS OF CHEMICAL AND BIOCIDAL DISCHARGES

5.2.1 INDUSTRIAL WASTEWATER DISCHARGES

There will be no industrial discharges to surface waters from the operation of the resource recovery facility. Effluent from the resource recovery facility will go directly to the Hudson Subregional WWTP. All applicable local, state and federal discharge regulations and water quality standards for industrial wastewater will be satisfied, including chemical and biocidal wastes, and oil and grease. The Hudson Subregional WWTP will be designed for Class I reliability to safeguard against plant upsets.

Impact of Blowdown and Waste Discharges on the WWTP

Effluent discharges from the resource recovery facility will consist primarily of sanitary wastes generated by the facility's employees. The effluent will also include cooling tower and boiler blowdown, and washwater drained from the refuse bunker and ash handling system. Blowdown is the wastewater collected from the bottom of boilers and cooling towers.

The quantity of blowdown from the facility is expected to be minimal since blowdown may be reused in the ash for residue quenching. The quality of cooling tower and boiler blowdown will be dependent upon both the influent water quality (supplied by the Hudson Subregional WWTP) and the maximum contaminant concentration tolerable in the recirculating loops. In general, the concentration of solids leaving the cooling tower and boiler loops as blowdown water will be magnified due to evaporation. Washwater drained from the refuse bunker and ash handling system and discharged from the resource recovery facility may exhibit high BOD and COD levels, and may contain both organic and inorganic suspended and dissolved solids. Wastewater discharges from the resource recovery facility to the WWTP must meet maximum concentration restrictions required by Pasco County (see Table 5-2). In the event that discharge exceeds maximum allowable concentrations, pretreatment of these fluids will be provided.

TABLE 5-2

MAXIMUM CONCENTRATIONS AND RESTRICTIONS
FOR RESOURCE RECOVERY FACILITY WASTEWATER

Material Characteristic	Maximum Allowable Concentration/Value	
Arsenic as AS	0.05	ppm
Barium as Ba	5.0	ppm
Boron as B	1.0	ppm
Cadmium as Cd	0.02	ppm
Chromium as Cr ⁺⁶	1.0	ppm
Chromium (total)	3.0	ppm
Copper as Cu	2.0	ppm
Phenols	0.5	ppm
Lead as Pb	0.1	ppm
Manganese as Mn	1.0	ppm
Mercury as Hg	0.005	ppm
Nickel as Ni	1.0	ppm
Iron	25.0	ppm
Selenium as Se	0.02	ppm
Silver as Ag	0.01	ppm
Zinc as Zn	3.0	ppm
pH	5.5 -	8.5
Temperature	104°F	
Suspended Solids	210.0	ppm
BOD	210.0	ppm

The total combinations of the above cannot exceed 10 mg/L.

All of the following shall be excluded from the treatment works unless certain conditions of pretreatment concentrations and volumes have been especially described and approved by the county:

Antimony	Tin
Beryllium	Uranyl ion
Bismuth	Rhenium
Cobalt	Strontium
Molybdenum	Tellurium

Cyanides or cyanogen compounds capable of liberating hydrocyanic gas on acidification in excess of 1 mg/L by weight as CN are prohibited.

The maximum TDS is 5,000 mg/L.

Because the WWTP will be designed to treat wastewater generated by a variety of potential sources including industries, landfill leachate, septage, and grease wastes, resource recovery discharges will not adversely impact the operation or effectiveness of the plant. In addition, because the quantity of wastewater discharge from the resource recovery facility will be less than 3 percent of the total wastewater flow treated at the WWTP, the high concentration of dissolved solids which may be present in the effluent will be diluted before treatment.

Impact of WWTP Effluent on the Resource Recovery Facility and Other Reuse

The concentration of dissolved solids in the WWTP effluent will be acceptable for cooling process water at the resource recovery facility, and possibly some industrial reuse applications.

5.2.2 COOLING TOWER BLOWDOWN

The Hudson Subregional WWTP will be permitted and operational prior to the construction of the resource recovery facility. Cooling tower blowdown will be diluted with the wastewater flow from the resource recovery facility and will be transmitted via pipeline to the Hudson Subregional WWTP. It is planned that treated domestic wastewater from the Hudson Subregional WWTP will be used as cooling water for the facility. The ultimate capacity of the Hudson Subregional WWTP (projected average daily flow is 9.0 mgd) will be much greater than the total water demand of the resource recovery facility (1 mgd). Consequently, reuse of treated wastewater effluent at the resource recovery facility will not be the sole means of WWTP effluent disposal. Alternative methods of effluent disposal will include rapid infiltration basins, and land irrigation.

5.2.3 MEASUREMENT PROGRAMS

There will be periodic monitoring of the resource recovery facility discharges to the WWTP. As noted previously, the maximum concentrations and restrictions for the discharge were shown on Table 5-2. The frequency of monitoring of wastewater discharge has not been established.

5.3 IMPACTS ON WATER SUPPLIES

5.3.1 SURFACE WATER

The proposed facility will obtain its process water from treated wastewater. Cooling tower blowdown and other plant industrial and sanitary wastewater will be transmitted to the planned Hudson Subregional WWTP, and this plant will start up before the resource recovery facility begins operation. Therefore, there are no long-term impacts to surface water associated with the operation of the proposed resource recovery facility.

5.3.2 GROUNDWATER

Rain which infiltrates ash or solid waste will be caught by the leachate collection system and contained for treatment and disposal. Runoff water from areas with final cover will be diverted to retention/detention ponds for evaporation or percolation. The runoff water will not contact the ash or solid waste.

The well which will tap the Floridan aquifer for potable water, boiler makeup water and backup cooling tower water will have a maximum withdrawal rate of about 950,000 gpd when cooling water is needed. Under normal operations, withdrawals for potable water and boiler makeup will be about 40,000 gpd. The well will be located in the southwestern corner of the site.

To illustrate the worst case impact on the potable water supply and neighboring wells, a computer program (SWSTLKY) was used to simulate drawdown at specific distances in a leaky confined aquifer under steady-state conditions (University of Florida, 1986). To simulate the maximum drawdown that would be expected in the area, the low end transmissivity for 40,000 gpd (range 40,000-130,000 gpd/ft) and a relatively low leakance of 0.0005 (range 0.005-0.0005) were used (Jammal & Associates, 1987). The worst case of pumping 950,000 gpd (125,700 ft³/d) continuously was also used. Table 5-3 is a reproduction of the computer

TABLE 5-3

DRAWDOWN DUE TO ONSITE PUMPING IN A
SEMI-CONFINED AQUIFER UNDER STEADY-STATE CONDITIONS

Radial Distance From Well (ft)	Drawdown (ft)
1	4.7
10	3.5
100	2.3
1,000	1.2
5,280	0.4
7,920	0.3
10,000	0.2

SOURCE: University of Florida, 1986.

printout which shows that under long-term (steady-state) pumping, the drawdown at 1,000 feet from the well would be 1.16 feet, and at 10,000 feet drawdown would be about 0.18 foot. The nearest Consumptive Use Permit is for the Parkside Cafe, located in Shady Hills, about 1.5 miles (7,920 feet) north of the well. The maximum drawdown interference for a well at this location would be 0.25 foot. Figure 5-1 shows the location of the facility well and the estimated drawdown effects on the vicinity well. The drawdown calculations assume all facility water is provided by the onsite well. This would be a rare case. Under normal operation, no drawdown will be experienced by neighboring wells.

It is highly unlikely that landfill/ashfill leachate could escape into the Floridan aquifer through breaks in the double liner system, and penetrate the 5- to 10-foot clay confining layer at the site. However, for this hypothetical situation, the distance that such a leachate plume could travel was calculated. A travel time of 5 years was chosen, to provide a 5-year zone of protection. This standard is used in the proposed G-I rule (Chapter 17-3.021, Florida Administrative Code) which has been adopted by the Florida Department of Environmental Regulation (this rule is not yet in effect).

The average linear velocity (seepage velocity) for the Floridan aquifer was calculated using the following formula (Freeze and Cherry, 1979; Fetter, 1980).

$$\bar{v} = \frac{-Kdh}{ndl} \quad K = \frac{T}{b}$$

where:

$\bar{v}$ = average linear velocity (ft/day)

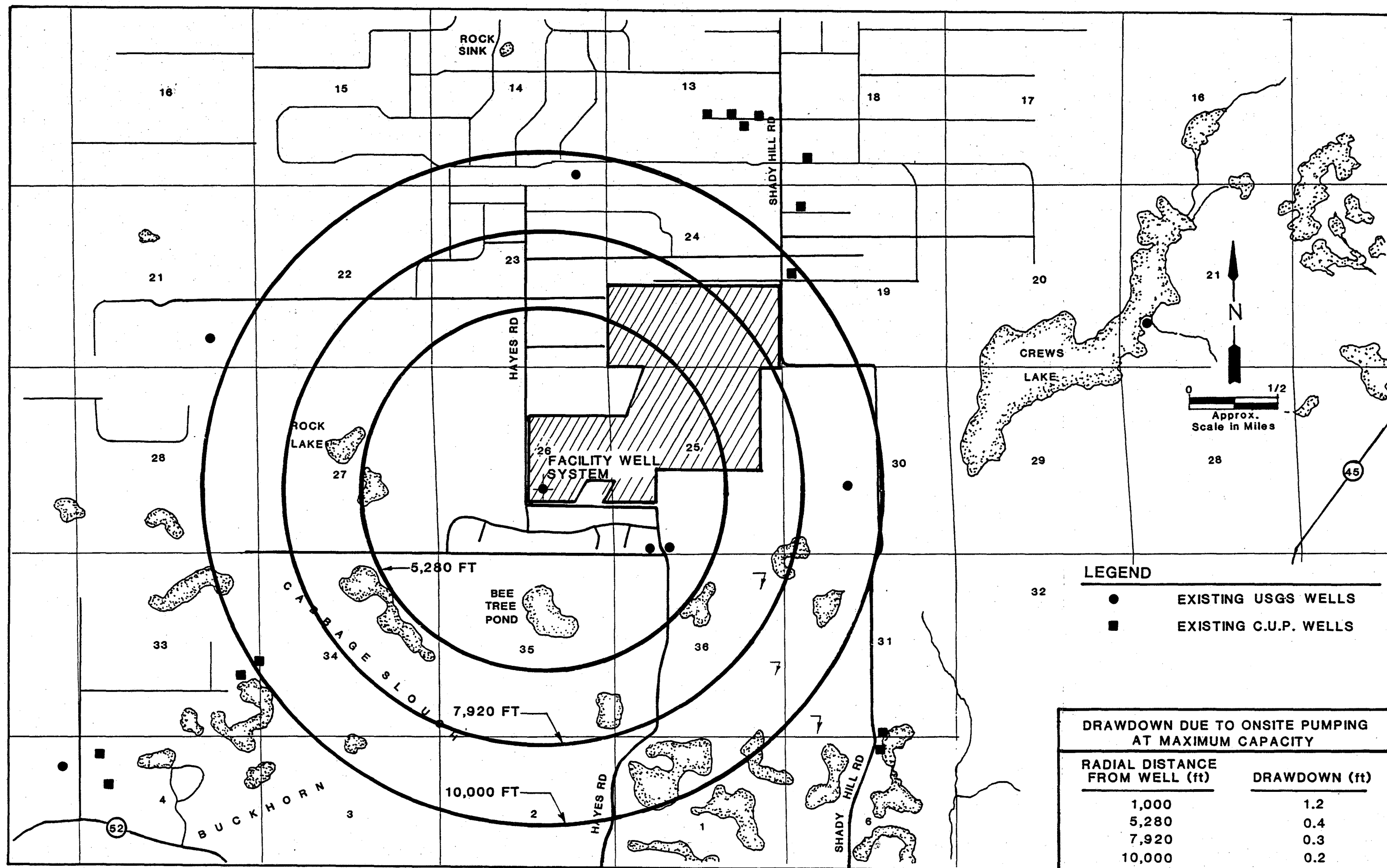
K = hydraulic conductivity (ft/day)

$\frac{dh}{dl}$ = hydraulic gradient (ft/day)

n = effective porosity

T = transmissivity (ft²/day)

b = thickness of aquifer (ft)



Pasco County Resource Recovery Program
Drawdown Effects on Neighboring Wells

FIGURE 5-1

The nearest pump test sites were 5 miles to the east at the Cross Bar Ranch well field where transmissivity values ranged from 50,000 to 115,000 ft²/day (Hutchinson, 1985, Figure 5). Jammal & Associates (1987) state that the transmissivity in this area is highly variable; varying from about 40,000 to 130,000 ft²/d. A transmissivity of 150,000 ft²/day is used in calculations for the Hays Road site for the worst case determination.

The hydraulic gradient of the Floridan aquifer determined from the potentiometric surface (water level) in the monitor wells at the site was 1 foot in 826 feet from readings taken on November 13, 1986 (Jammal & Associates, 1987, Table 4). This compares favorably with the gradient interpreted from U.S. Geological Survey potentiometric surface maps for the area. The direction of groundwater flow in the upper Floridan aquifer at the site is to the northwest.

No values for the effective porosity of the upper Floridan aquifer in the vicinity of the site could be found. An effective porosity of 0.05 for the Floridan aquifer is used in the G-1 Rule as adopted by the Florida Department of Environmental Regulation. The thickness of the upper Floridan aquifer in the vicinity of the site is estimated to be approximately 800 feet (Ryder, 1985, Figure 10). Therefore:

$$K = \frac{T}{b} = \frac{150,000}{800} = 187.5 \text{ ft/day}$$

and:

$$\bar{v} = \frac{-Kdh}{ndI} = \frac{187.5}{.05 \times 826} = 4.54 \text{ ft/day}$$

The maximum travel of a theoretical leachate plume in 1 year (365 days) would be 1,657 feet. The 5-year travel time of the plume would be 8,285 feet from the entry point of the leachate plume into the Floridan aquifer to the northwest. Five years would provide adequate time to detect, monitor the travel and concentration, model, and take appropriate corrective action to mitigate or clean up a pollution plume.

The concrete refuse storage bunker will be completely sealed to prevent leachate from escaping to the surrounding soil and groundwater, and to prevent groundwater from seeping into the bunker. The refuse storage bunker will be sloped to allow collection and removal of any liquids which may accumulate on the bottom. Collected leachate will be discharged to the Hudson Subregional WWTP. Considering these plans, no impacts associated with storage bunker leachate on ground and surface water quality, and on terrestrial and aquatic environments are expected.

The surficial aquifer water level varies seasonably, but usually ranges in elevation from 34 to 38 feet. The refuse bunker will be constructed so that its base will be below the water level in the surficial aquifer. Thus, the bunker will be surrounded/immersed in groundwater. To prevent water penetration into the bunker, the below ground portion of the refuse bunker will be sealed by multiple coats of a synthetic neoprene compound. In the highly unlikely event of a crack or failure in the bunker's watertight impermeable seal, there would be no leakage out of the bunker. The higher pressure of the water outside the bunker would force water to flow into the bunker. It is extremely unlikely that there would be any adverse impacts or contamination. If such contamination did occur, any impacts to the surficial groundwater system (i.e., surficial sands and confining clay units) would be minimized by the adsorptive capacity of subsurface materials which have relatively higher proportions of clays. The subsurface materials exhibit a high cation exchange capacity (CEC) which would tend to bind up or adsorb a higher proportion of contaminants and thus retard their migration within the groundwater matrix.

The direction of regional groundwater flow in the Floridan aquifer is generally toward the northwest. However, the direction of flow within the surficial aquifer will be more variable, and dependent upon topography, drainage, elevation of the water table, and the influence of groundwater pumping within the vicinity. Accordingly, the probable direction of surficial groundwater flow is expected to be generally toward the northwest corner of the site. Any accidental release of chemical contaminants from the facility to the groundwater at the site is not expected to result in any significant impact to groundwater quality of the Floridan aquifer for three primary reasons:

1. The bottom of the refuse bunker will lie within the surficial materials (sand, clayey sand), and any release of chemical contamination would be confined to these surficial materials and would not affect the Floridan aquifer.
2. The Floridan aquifer and the surficial aquifer are separated by a clay confining unit of relatively low permeability which generally has a thickness of more than 5 feet across the site. All indications are that this unit is continuous and possibly thicker in the vicinity of the landfill/ashfill site (see Section 2.3.1 for discussion). This would provide an effective barrier between the surficial material and the Floridan aquifer.
3. The potentiometric surface of the Floridan aquifer lies generally within this confining unit, which means that a contaminated plume would be prevented from downward vertical migration into the Floridan by the upward vertical component of hydrostatic head exerted by the confined Floridan aquifer. Once a contaminant plume has descended to an equilibrium level above or within the confining unit, further plume movement would generally be restricted to lateral migration with little or no vertical mixing within the lithologic matrix.

5.3.3 DRINKING WATER

This section is not applicable to the Pasco County project. No discharges to drinking water sources are anticipated. Accidental releases of leachate or other contaminants to groundwater are addressed in Section 5.3.2. There will be limited withdrawal of groundwater subject to Consumptive Use Permit conditions.

5.3.4 LEACHATE AND RUNOFF

Runoff collected in the stormwater retention/detention basins following startup of the facility operations will be collected from vegetated areas, paved surfaces, and roof tops. All refuse or residue storage areas will be enclosed so that no runoff will occur from these surfaces. Groundwater and surface water quality is thereby protected from these materials.

Leachate from the active portion of the landfill/ashfill will be captured by the leachate collection system and reapplied on the working face or treated at the Hudson Subregional WWTP. Runoff from the inactive portion of the landfill/ashfill will be collected in the stormwater retention ponds. Under no circumstances will runoff from material storage piles, ash piles, or refuse piles contact surface water or groundwater.

The ashfill/landfill will be used to dispose of the noncombustible material from the resource recovery plant. The design features were discussed in Section 3.10. The ashfill/landfill has been designed using state-of-the-art construction methods which include double underliners, leachate collection/treatment, monitoring, etc. The operation of the landfill will be in accordance with the operation procedure directives outlined previously and will serve to virtually eliminate the possibility of runoff contamination from landfill/ashfill operations. Therefore, it is expected that the ground and surface water quality will be protected from the effects of runoff from the proposed facilities.

5.3.5 GROUNDWATER MODELING AND MONITORING

In Section 5.3.2 analytical methods were described for determining the maximum distance that a leachate plume could travel. A simple groundwater computer model was used to predict the maximum drawdown from the potable water well under a worst case scenario. In the event that pollution from the landfill/ashfill is detected in the monitor well system, a more sophisticated modeling effort would be appropriate, such as a two-dimensional solute transport model. An extensive amount of data would be

required to successfully model the movement of a pollution plume in the Floridan aquifer. This data is not currently available.

The groundwater monitoring procedure for the site is provided in Appendix 10.5 of this report.

5.4 SOLID/HAZARDOUS WASTE DISPOSAL IMPACTS

5.4.1 SOLID WASTE

This section discusses impacts not yet discussed in Sections 5.2 or 5.3 which are imposed by the disposal of solid wastes on the site. This section also describes the potential benefits to be gained from the incineration of solid wastes.

Section 2.2.7 described the existing Pasco County solid waste management system. Existing and future quantities of solid waste generated in the county were also presented.

The proposed resource recovery facility will have a net beneficial impact on solid waste disposal in Pasco County. The estimated processible solid waste quantities expected to be delivered annually to the resource recovery facility through the year 2010 are shown in Table 5-4. If these quantities of solid waste were to be landfilled rather than burned, they would require about 480,000 cubic yards of landfill space (including cover) in 1987; increasing annually to about 850,000 cubic yards of landfill space in 2010. Instead, by achieving a 70 percent volume reduction through burning, the ash residue to be landfilled would require only about 144,000 cubic yards of landfill space in 1987; increasing ultimately to about 255,000 cubic yards of landfill space in 2010. Therefore, the potential savings in landfill capacity is considerable (about 13.5 million cubic yards over a 24-year period). The prolonged life of the landfill will decelerate the need for future landfill sites in Pasco County (landfill volume calculations based on 1,000 lb/cy³).

TABLE 5-4

ESTIMATED ANNUAL QUANTITIES OF
PROCESSIBLE WASTE FOR PASCO COUNTY
(THOUSANDS OF TONS PER YEAR)

Year	Tons
1987	240
1988	248
1989	256
1990	264
1991	272
1992	279
1993	287
1994	295
1995	303
1996	311
1997	319
1998	327
1999	335
2000	343
2001	351
2002	359
2003	367
2004	375
2005	383
2006	391
2007	399
2008	407
2009	415
2010	425
TOTAL	7,951

A materials recovery system is expected to be incorporated in the facility. A magnetic belt for ferrous removal, associated conveying systems, enclosed ferrous storage area and enclosed loading area will be provided. Landfill savings capacity has been calculated assuming no ferrous material recovery.

5.4.2 HAZARDOUS WASTE

This section is not applicable to the proposed Pasco County project, since there will be no handling or disposal of hazardous wastes at this facility. The facility will accept only municipal solid waste which includes residential, commercial, and non-hazardous industrial wastes (e.g., office and packaging wastes). Public and private users of the facility will be informed of these limitations. Signs will be posted at the weigh station to indicate what wastes are accepted at the facility. Additionally, routine visual inspections by weigh station personnel will monitor the types of wastes received. The crane operator will visually inspect waste in the bunker while he is mixing. This will allow the detection of large potentially hazardous materials such as drums or gas cylinders. A chemical and toxicity analysis of the combined ash residue (including both combustion residue and air pollution control device residues) will be conducted after operations begin, to verify that the ash is not toxic or hazardous.

It will be the responsibility of the facility operator to confirm that the ash residue is classified as non-hazardous according to the regulations of the U.S. Environmental Protection Agency (EPA) and the Florida Department of Environmental Regulation (FDER). Experience at similar facilities has shown that the mixed bottom and fly ash can pass EPA toxicity tests (i.e., it is considered a non-hazardous waste material). This waste material is suitable for disposal in a Class I permitted sanitary landfill.

A chemical analysis of the combustion residue will be conducted after operations begin to ensure compatibility for disposal in a sanitary landfill.

5.5 SANITARY AND OTHER WASTE DISCHARGES

Solid waste generated by plant operations (employee refuse, packing material, etc.) will be collected from receptacles located throughout the plant and fed into the main solid waste stream for processing. Materials not suitable for incorporation in the solid waste stream will be separated for offsite disposal at an appropriate facility. All sanitary wastewater will be collected and discharged to the Hudson Subregional WWTP. Therefore, no impacts associated with sanitary and other waste discharges are anticipated during plant operations.

5.6 AIR QUALITY IMPACTS

5.6.1 IMPACT ASSESSMENT

The air quality modeling analysis was conducted in three phases:

1. Screening analysis--This analysis identified the boiler operating condition which has the greatest air quality impact and defined the pollutants and downwind locations which have potential for concentrations greater than the significant impact limits. The screening model runs were made using the Industrial Source Complex-Short Term (ISCST) dispersion model and 48 worst case meteorological conditions.
2. Refined modeling analysis--The refined modeling analysis was conducted using the worst case furnace/boiler operating condition and receptor grid defined in the screening analysis. The refined modeling analysis identified the maximum ground level impacts for the pollutants emitted from the facility. The refined modeling was completed using ISCST and five years (1970 to 1974) of Tampa International Airport surface and upper air meteorological data.

3. Additional Class I area impact analysis—This analysis was performed for only sulfur dioxide and total suspended particulates. The emission inventory used in this analysis consisted of the sources in the Florida Crushed Stone permit application. Each phase of the modeling analysis was discussed with and approved by FDER. A detailed discussion of the air impacts is contained in Section 6.0, Prevention of Significant Deterioration (PSD) (see Volume III - Air Quality).

The air quality standards are not violated until a receptor exceeds the standard twice in any given year. The highest value of the second highest concentrations (HSH) is chosen from the potential impacts, additional source impacts, and the monitoring data to allow for a single short-term violation (24 hours or less). Naturally, a single annual average is calculated for each receptor, so the highest annual concentrations were used for comparison.

A comparison of the predicted SO₂ impacts to the PSD increment is shown in Table 5-5. The impacts for SO₂ and TSP did not exceed the significant impact limits. Therefore, the increment for these periods did not have to include other PSD sources. As shown on Table 5-5, the proposed source will consume less than 4 percent of the total increment.

A comparison of the potential impacts to the Florida Ambient Air Quality Standards (FAAQS) is made in Table 5-6 and Figure 5-2. As with the increment evaluation, 3-hour and 24-hour SO₂ were evaluated along with other major SO₂ sources, including the PSD sources. The HSH concentrations from the additional sources were added to the HSH monitored background concentration. This approach is used to estimate the maximum possible impact. Ozone is not directly emitted from the facility, but is formed in the atmosphere as a secondary pollutant. Non-methane hydrocarbons are considered a precursor to ozone formation.

TABLE 5-5

COMPARISON OF PREDICTED IMPACTS
TO PSD CLASS II INCREMENTS
PASCO COUNTY RESOURCE RECOVERY FACILITY

Pollutant	Averaging Time	Rank	Ground-Level Concentration (ug/m ³)	PSD Class II Increment	Impacts as % of Increment
SO ₂	Annual	H	0.36	20	1.8
	24-Hour	HSB	2.99	91	3.3
	3-Hour	HSB	11.53	512	2.3
TSP	Annual	H	0.05	19	0.3
	24-Hour	HSB	0.43	37	1.2

Abbreviations:

H = highest
 HSB = highest, second-highest
 PSD = Prevention of Significant Deterioration

TABLE 5-6

SUMMARY OF THE ISCST PREDICTED CRITERIA POLLUTANT CONCENTRATIONS FROM
PROPOSED PASCO COUNTY RESOURCE RECOVERY FACILITY EMISSIONS
FOR MODELING PERIOD 1970 - 1974

Pollutant	Averaging Period	Rank	Period	Location		Facility Impact (ug/m ³)	Ambient Background (ug/m ³)	Total Impact (ug/m ³)	FAAQS/NAAQS (ug/m ³)	Total as Percent of FAAQS
			(Year/Date/End Hour)	Dist (km)	Dir (deg)					
Sulfur Dioxide	3-hour	H	1970/119/12	1.2	70	13.2	456	469.2	1300	36.1
		HSH	1970/99/15	1.17	75	11.5	456	467.5	1300	36.0
	24-hour	H	1972/242/24	1.7	90	3.44	103	106.4	260	40.9
		HSH	1972/180/24	2.0	90	2.98	103	106.0	260	40.8
	Annual	H	1971/NA/NA	2.0	90	0.356	26	25.4	60	44.0
Particulate Matter ^(c)	24-hour	H	1972/242/24	1.7	90	0.497	87 (87)	87.5 (87.5)	150 ^a (150 ^b)	58.3 (58.3)
		HSH	1972/180/24	2.0	90	0.431	87 (87)	87.4 (87.4)	150 (150)	58.3 (58.3)
	Annual	H	1971/NA/NA	2.0	90	0.0515	43 (45)	43.1 (45.1)	60 ^a (50 ^b)	71.8 (90.8)
Nitrogen Dioxide	Annual	H	1971/NA/NA	2.0	90	1.03	39	40.0	100	40.0
Carbon Monoxide	1-hour	H	171/237/11	0.7	70	57.6	5153	5210.6	40,000	13.0
		HSH	172/222/11	0.7	90	35.2	5153	5188.2	40,000	13.0
	8-hour	H	141/129/16	1.6	90	3.77	1145	1148.8	10,000	11.5
		HSH	171/220/16	1.4	90	3.42	1145	1148.4	10,000	11.5
Lead ^(d)	3-month	H	1972/242/24	1.7	90	0.248	0.4	0.65	1.5	43.3

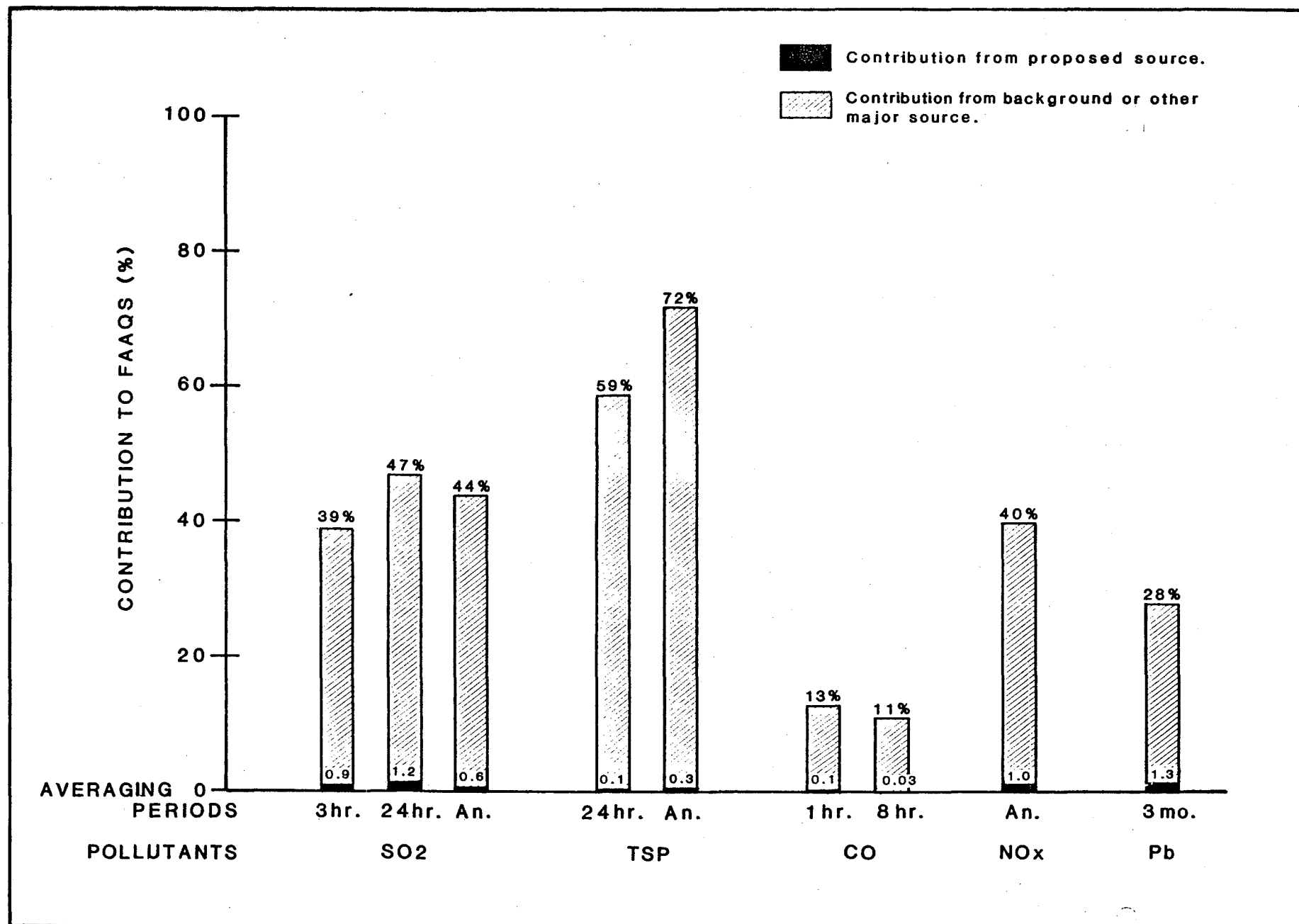
(a) FAAQS for particulate matter expressed as total suspended particulate (TSP).

(b) NAAQS primary and secondary standard for particulate expressed as PM₁₀.

(c) Facility impact for particulate matter equals impact for PM₁₀. Numbers in parentheses denote PM₁₀ concentrations. Numbers without parentheses denote total particulate concentrations.

(d) The 24-hour average concentration was substituted for the quarterly average concentration.

FIGURE 5-2



Pasco County Resource Recovery Program
Air Quality Impact Compared to FAAQS

As Figure 5-2 shows, the impact of the facility is small compared to the existing background concentrations. The 24-hour SO₂ concentration has the greatest impact, contributing 1.2 percent of the standard. The 24-hour average concentration for lead was used for a conservative estimate of the 3-month average lead concentration. All other pollutants contribute less than 1.0 percent.

The impact of the facility was also evaluated regarding visibility, soils, and vegetation. The visibility of the plume was examined with respect to the Chassahowitzka, Cedar Key and Anclote National Wilderness Areas, and the Withlacoochee State Forest. Using a worst case screening analysis defined by Latimer, et al (1980), no visibility degradation is predicted. The predicted maximum annual concentration is well below the thresholds which are injurious to soils and plants. For a detailed analysis of those air quality issues, see Section 7.0 of the PSD (Volume III - Air Quality).

5.6.2 MONITORING PROGRAM

No post-construction ambient air monitoring plan is proposed for the Pasco County resource recovery facility. The monitoring network operated by FDER is sufficient to monitor ambient air quality levels in the vicinity of the site. However, a continuous in-stack monitoring program will be operated for opacity, and oxygen or carbon dioxide concentrations. The equipment will be installed, calibrated and maintained in accordance with FAC 17-2.710 and 40 CFR 51, Appendix P. Compliance testing will also be conducted for pollutants with emission limiting standards in accordance with FAC 17-2.700 and 40 CFR 60. This testing will include, but will not be limited to, testing for particulate emissions.

5.7 NOISE

A technical noise analysis was performed for the proposed resource recovery facility. This noise study is contained in Appendix 10.12. The study explains the methodologies used in estimating the operational impacts of the facility and the results of the analysis. Ambient noise levels were measured at four locations in the site vicinity to establish baseline conditions during day and night periods.

Equipment noise levels were attenuated and combined with the ambient noise levels at each monitoring site. The results show that facility noise levels will not cause a discernible impact (a dBA increase of more than 3 dBA) at any of the monitoring stations (see Table 5-7).

Table 5-7 compares the expected facility noise level at each monitoring station to the county standard. The facility noise levels are predicted to be lower than both the daytime standard and the nighttime standard.

Traffic noise was determined using the noise prediction model, STAMINA (FHWA, 1982). Using this model, traffic noise levels were compared with and without facility traffic. In both the existing and future cases, the sound level increase due to facility traffic was less than 1 dBA. The results of the modeling are shown in Table 5-8.

5.8 CHANGES IN NON-AQUATIC SPECIES POPULATIONS

5.8.1 IMPACTS

The impact of this facility on non-aquatic species populations was discussed in Section 4.4.1.

5.8.2 MONITORING

The monitoring program for ecological conditions is discussed in Section 2.3.6.

5.9 OTHER PLANT OPERATION EFFECTS

5.9.1 TRAFFIC GENERATION OF PROPOSED ACTION

The impact of project operations on traffic flow was analyzed, considering vehicles required for refuse delivery, facility employees, and administrative personnel.

TABLE 5-7
FACILITY IMPACTS

Station	Background Level (dBA) 24-hour	Night Only ^a	Expected Facility Level (dBA)	Combined Level (dBA)	County Standard ^b	dBA Change
1	51	—	48	53	55	2
	—	51	48	53	55	2
2	50	51	40	51	55	0
	—	51	40	51	55	0
3	50	—	43	51	55	1
	—	51	43	52	55	1
4	52	—	39	52	55	0
	—	53	39	53	55	0

^a 6 pm - 7 am per Pasco County Code.

^b The most restrictive standard for Sundays and nighttime was used for comparison.

TABLE 5-8

NOISE LEVEL ATTENUATION FROM ROADWAYS

	Distance (feet)	Without Facility				With Facility			
		Daytime		Nighttime		Daytime		Nighttime	
		Average	Peak	Average	Peak	Average	Peak	Average	Peak
Existing	50	68.2	69.6	61.7	65.7	68.9	70.2	61.7	65.8
	100	63.7	65.0	57.1	61.2	64.4	65.6	57.2	61.3
	150	61.0	62.3	54.5	58.5	61.7	63.0	54.5	58.6
	200	59.0	60.4	52.6	56.6	59.8	61.1	52.6	56.7
	250	57.6	59.0	51.1	55.1	58.3	59.6	51.1	55.2
	300	56.4	57.7	49.9	53.9	57.1	58.4	49.9	54.0
	400	54.5	55.5	47.9	52.0	55.1	56.4	48.0	52.0
	500	53.0	54.3	46.4	50.5	53.6	54.9	46.5	50.5
	750	50.2	51.5	43.6	47.7	50.8	52.1	43.7	47.7
1000	48.1	49.4	41.6	45.6	48.8	50.1	41.6	45.7	
Future (2010)	50	70.1	71.4	63.3	67.5	70.8	72.1	63.4	67.6
	100	65.6	66.8	58.8	63.0	66.3	67.5	58.8	63.0
	150	62.9	64.2	56.1	60.3	63.6	64.9	56.2	60.4
	200	61.0	62.2	54.2	58.4	61.7	63.0	54.2	58.5
	250	59.5	60.8	52.7	56.9	60.2	61.5	52.8	57.0
	300	58.3	59.5	51.5	55.7	59.0	60.3	51.5	55.8
	400	56.4	57.6	49.6	53.8	57.1	58.3	49.6	53.8
	500	54.8	56.1	48.0	52.3	55.6	56.8	48.1	52.3
	750	52.0	53.3	45.2	49.5	52.8	54.0	45.3	49.5
1000	50.0	51.3	43.2	47.4	50.7	52.0	43.3	47.5	

Truck Traffic Generation

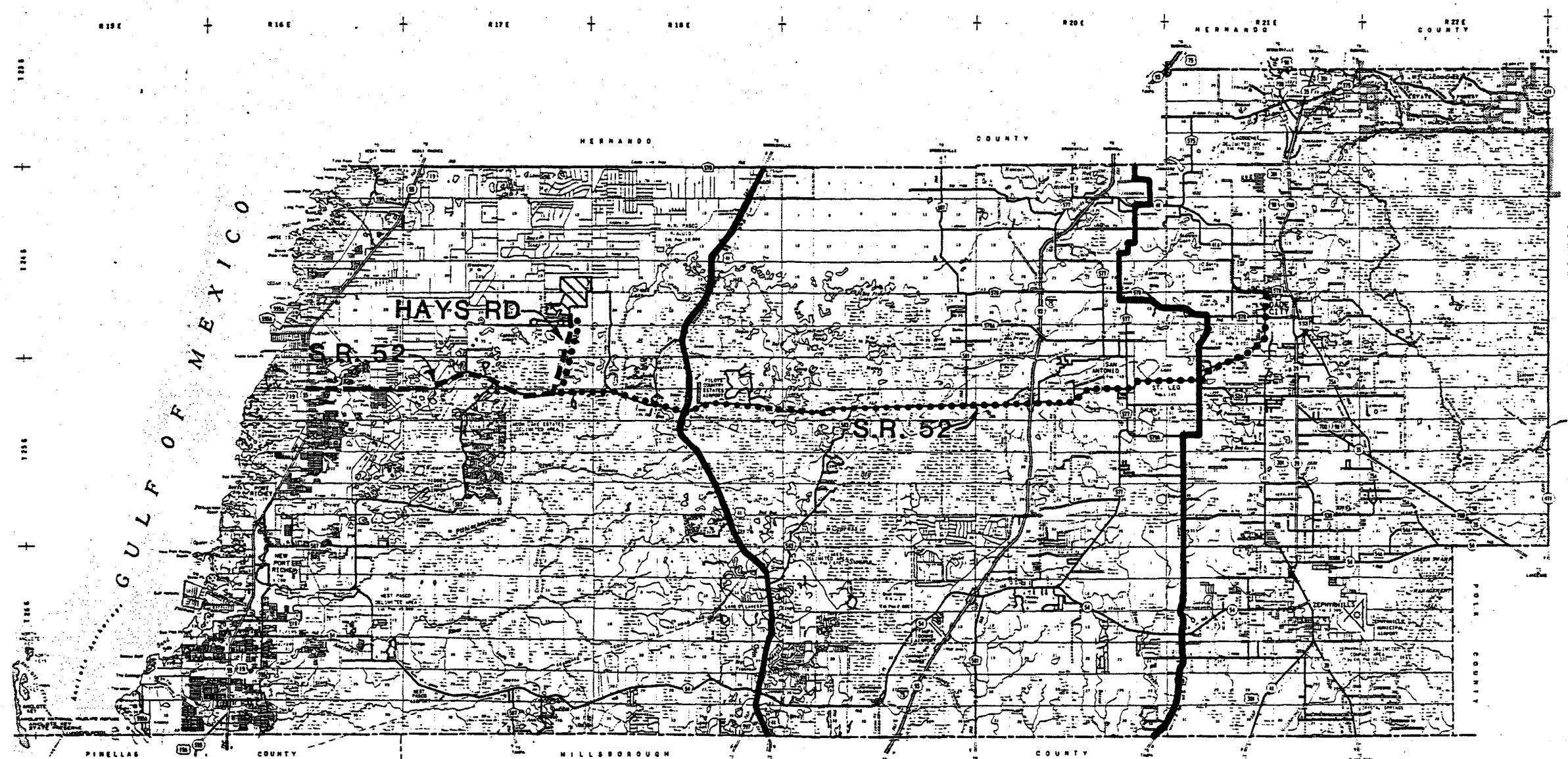
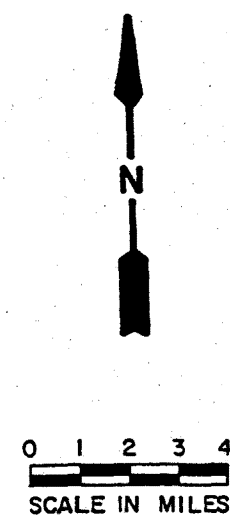
Three solid waste generation planning regions were defined for this transportation analysis. The three solid waste generation regions are east Pasco County, central Pasco County, and west Pasco County. The general limits of these designated wastesheds are shown in Figure 5-3. On a total county basis, the approximate waste quantities generated within these regions in 1985 was 71 percent from the west region, 9 percent from the central region, and 20 percent from the east region. (Pasco County Resource Recovery Study, CDM, November 1985, pg. 3-8.)

Transport of waste from all regions and local areas will be by packer truck with an assumed 6 to 8 tons capacity. This will account for an ultimate 170 packer truck deliveries per day. It should be noted that modern packer trucks typically have an 8 to 10 ton capacity. Therefore, this analysis is conservative if the majority of packer trucks carry larger loads. It is planned that the facility will receive refuse six days per week.

Based on the projected annual quantities of municipal solid waste listed in Table 5-4, initial operations will require about 95 packer trucks to deliver refuse each day. Each year the number of trucks will increase as the county's population and solid waste generation increases.

For the year 2010, the estimated total number of trips for trucks entering and leaving the resource recovery facility site is 340 (170 packer trucks x 2). This volume of traffic would occur during each of the typical five work days. On Saturdays the volume will be considerably lower, and on Sundays and holidays there will be no truck traffic.

The site is accessed from Hays Road. Hays Road intersects with SR 52 approximately 2 miles south of the site entrance. Truck traffic from all regions is expected to travel on SR 52 and turn north on Hays Road to the site entrance.



WEST PASCO

CENTRAL PASCO

EAST PASCO

LEGEND

 Solid Waste Generation Planning Area Boundaries

 Pasco County Resource Recovery Facility Site

 Route No. 1

 Route No. 2

Pasco County Resource Recovery Program
Solid Waste Generation Planning Areas and Traffic Routes

Other Vehicle Traffic Generation

The majority of the traffic at the site will be generated by refuse delivery vehicles. However, there will be other traffic associated with the proposed site use that should be considered. This other traffic includes commuting employees and miscellaneous routine traffic associated with the operation and maintenance of the proposed resource recovery facility and the landfill/ashfill.

It is expected that a total of 54 full-time employees will operate the resource recovery facility and landfill/ashfill (45 and 9, respectively). The resource recovery facility will operate with a three-shift cycle. The day shift will account for approximately 60 percent of the staff while the other two shifts will each require only 20 percent of the work force. Most of the employees will probably commute using their own automobiles. With allowances for routine absenteeism (illness, vacation, etc.), it is estimated that commuting employees will generate 108 vehicle trips per day.

The miscellaneous routine traffic associated with the operation and maintenance of the proposed resource recovery facility and the landfill/ashfill will probably generate an average of 14 vehicle trips per day. Most of this traffic will be associated with administrative functions, deliveries, and visitor activities. Some of the traffic will include truck traffic. For example, the resource recovery facility requires truck delivery of chemicals for the dry scrubber and other processes. At this stage of project planning, it is not possible to estimate the volume or frequency of miscellaneous routine traffic. However, as previously indicated, routine traffic will account for a minimal number of trucks per week.

Total Trip Generation

In the year 2010, at the time of maximum activity, the proposed resource recovery facility and the landfill/ashfill will generate 462 vehicle trips over the course of a typical 24-hour weekday period. Of this total, 340 trips will be associated with refuse delivery, 108 trips will be made by commuting employees, and 14 trips will be for routine support activities.

5.9.2 IMPACTED ROADWAYS

The segments of roadway discussed in the following text and shown in Figure 5-3 were selected for analysis because of their direct link to the project site, and the likelihood of their use by most of the project-generated traffic. Section 2.3.9 discusses the important roadway segments and intersections near the site.

5.9.3 TIME AND ROADWAY DISTRIBUTION OF PROJECT TRAFFIC

A comparison of average daily trips (ADT) and total capacity of a roadway provides a general indication of the traffic impacts to be expected from a proposed project. A traffic analysis which includes the time distribution of expected impacts is even more useful. This is especially true when the time distribution of project traffic can be used for mitigating project impacts. For example, many developments cause major increases in traffic volume during typical peak traffic periods. This can create major changes in the level of service during these peak traffic periods. The Pasco County resource recovery project has the potential to increase the ADT on local roadways. However, the impact of this traffic increase will be offset, since the peaking patterns will be completely different than the current peak traffic hours. During those times of the day when the traffic is highest on the adjacent roadway, the resource recovery facility will generate little or no traffic.

The time distribution of traffic to be generated by the proposed project was analyzed using a two-step procedure. First, each of the individual categories of traffic was defined and its schedule pattern was estimated on an hourly basis. Second, all of the traffic volume predicted to occur during the same hour was added together. This provided an hourly distribution of expected traffic volume generated by the proposed project.

The categories of project traffic used in this transportation analysis are:

- Solid Waste Packer Trucks
- Administrative and Support Vehicles
- Commuting Employee Vehicles

The principal hours of facility operation associated with the generation of truck traffic will be between 8:00 am and 5:00 pm. It is possible that the facility may be opened at 7:00 am to accept commercial wastes. From 7:00 am to 8:00 am, it is expected that traffic volume will be low.

Based on observations at existing solid waste management facilities, and a review of the operational features and typical collection activities of packer trucks, a pattern of peak and low traffic volumes can be established. During the first hour of operation, the facility will experience its first minor volume peak as private carriers deliver waste from their early morning hour collection activities (usually from commercial establishments). The facility's major peak volume of packer truck traffic will occur at approximately 10:00 am, as most of the trucks that collect from residential generators arrive with their first load of the day. The next peak occurs about mid-afternoon, around 2:00 pm, as residential packer trucks arrive with their second load.

The distribution of administrative and support vehicles is relatively even throughout the facility's business day (8:00 am to 5:00 pm). Since the facility will operate 24 hours per day, there will be three shifts of employees. However, most of the management and maintenance staff will work the daytime shift, therefore, this shift will have the largest work force. For planning purposes, the three shift schedules for the resource recovery facility were established as follows.

First Shift - 7:00 am to 4:00 pm

Second Shift - 3:00 pm to Midnight

Third Shift - 11:00 pm to 8:00 am

The landfill/ashfill schedule will be 7:00 am to 6:00 pm.

It is assumed that the commuting traffic generated by these shift schedules will occur during the half hour before and after the starting and ending time of each shift. Using this assumption, it was possible to create a composite hourly distribution of traffic to be generated by the proposed project. The results of this traffic distribution analysis are shown on Table 5-9. The table shows that the period of maximum traffic occurs in the morning at approximately 10:00 am, with other peaks occurring at 8:00 to 9:00 am, and 2:00 to 3:00 pm.

After the time distribution of project-related traffic was established, the next step was to review the expected travel patterns of this traffic on local roadways. A general review was presented in a previous section on the origin of the project traffic, along with a discussion of the roadways to be used. In this section, the project traffic is assigned to specific road segments that have a high probability of use by each of the traffic categories. In projecting the expected truck travel patterns, two routes have been developed. These routes are shown on Figure 5-3.

Route No. 1

Route No. 1 assumes that the truck traffic originating from the county's west region will travel east on SR 52 and turn north on Hays Road to the facility entrance.

Route No. 2

This route assumes that the truck traffic originating from the county's central and east regions will travel west on SR 52 and turn north on Hays Road to the facility entrance.

Roadway Capacity Analysis

Route No. 1. As shown in Table 5-10, Route No. 1 will initially add 201 vehicle trips to SR 52 during weekdays between the hours of 6 am and 5 pm. Table 5-11 shows that the proposed project will ultimately add 306 vehicle

TABLE 5-9

HOURLY DISTRIBUTION OF INCREASED TRAFFIC VOLUME
FOR YEAR 2010 VEHICLE TRIPS

Time Period	Administration and Support	Commuting Employees	Packer Trucks	Total
0001-0100	0	12	0	12
0100-0200	0	0	0	0
0200-0300	0	0	0	0
0300-0400	0	0	0	0
0400-0500	0	0	0	0
0500-0600	0	0	0	0
0600-0700	0	30	0	30
0700-0800 ^{a, b}	0	0	0	0
0800-0900	1	12	44	57
0900-1000	2	0	31	33
1000-1100 ^c	2	0	65	67
1100-1200	1	0	30	31
1200-1300	1	0	24	25
1300-1400	2	0	46	48
1400-1500 ^c	2	12	56	70
1500-1600	1	0	44	45
1600-1700	2	21	0	23
1700-1800 ^{a, b}	0	0	0	0
1800-1900	0	9	0	9
1900-2000	0	0	0	0
2000-2100	0	0	0	0
2100-2200	0	0	0	0
2200-2300	0	12	0	12
2300-2400	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
	14	108	340	462

^a It is possible that some traffic volume would occur during these periods. During the early hour period some traffic could be generated by employees arriving late for the first shift or some private packers arriving before the normal scheduled opening of the facility.

^b Existing peak traffic volume hours.

^c Estimated facility peak traffic volume hours.

TABLE 5-10

INITIAL TRAFFIC VOLUME INCREASES ON
CRITICAL ROADWAY SEGMENTS

Time	Truck Traffic	Commuting Employees	Administration and Support	Total Trips
<u>ROUTE NO. 1</u>				
0600-0700	0	23	0	23
0700-0800	0	0	0	0
0800-0900	18	9	1	28
0900-1000	11	0	2	13
1000-1100	27	0	2	29
1100-1200	11	0	1	12
1200-1300	8	0	0	8
1300-1400	18	0	1	19
1400-1500	23	9	2	34
1500-1600	17	0	0	17
1600-1700	<u>0</u>	<u>16</u>	<u>2</u>	<u>18</u>
TOTAL	133	57	11	201
<u>ROUTE NO. 2</u>				
0600-0700	0	7	0	7
0700-0800	0	0	0	0
0800-0900	7	3	0	10
0900-1000	6	0	0	6
1000-1100	9	0	1	10
1100-1200	6	0	0	6
1200-1300	5	0	0	5
1300-1400	8	0	1	9
1400-1500	8	3	0	11
1500-1600	6	0	1	7
1600-1700	<u>0</u>	<u>5</u>	<u>0</u>	<u>5</u>
TOTAL	55	18	3	76

TABLE 5-11
YEAR 2010 TRAFFIC VOLUME INCREASES ON
CRITICAL ROADWAY SEGMENTS

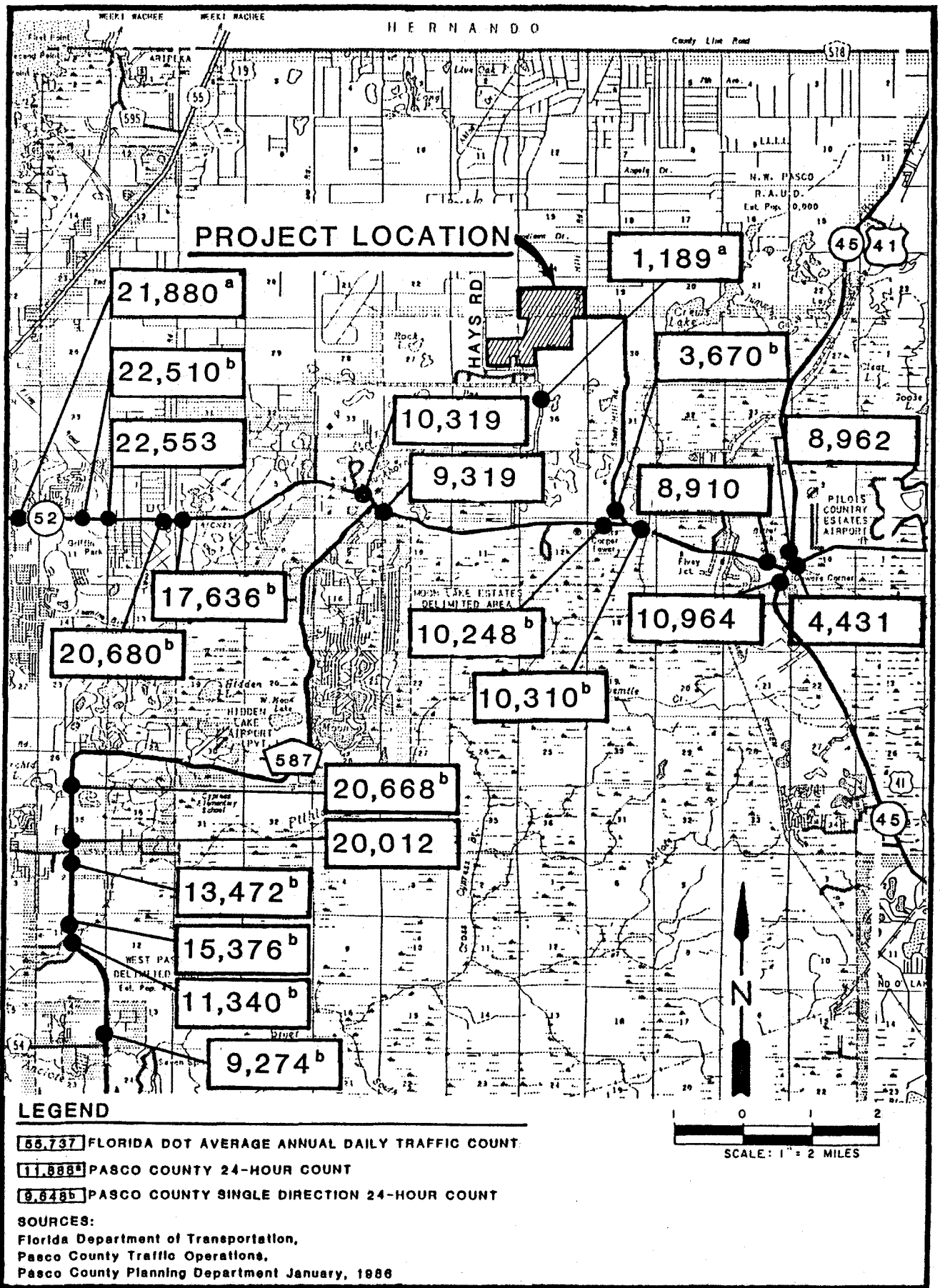
Time	Truck Traffic	Commuting Employees	Administration and Support	Total Trips
<u>ROUTE NO. 1</u>				
0600-0700	0	23	0	23
0700-0800	0	0	0	0
0800-0900	31	0	1	41
0900-1000	20	0	2	22
1000-1100	49	0	2	51
1100-1200	19	0	1	20
1200-1300	14	0	0	14
1300-1400	32	0	1	33
1400-1500	42	9	2	53
1500-1600	31	0	0	31
1600-1700	<u>0</u>	<u>16</u>	<u>2</u>	<u>18</u>
TOTAL	238	57	11	306
<u>ROUTE NO. 2</u>				
0600-0700	0	7	0	7
0700-0800	0	0	0	0
0800-0900	13	3	0	16
0900-1000	11	0	0	11
1000-1100	16	0	1	17
1100-1200	11	0	0	11
1200-1300	10	0	0	10
1300-1400	14	0	1	15
1400-1500	14	3	0	17
1500-1600	13	0	1	14
1600-1700	<u>0</u>	<u>5</u>	<u>0</u>	<u>5</u>
TOTAL	102	18	3	123

trips to Route No. 1 during the same time period. This is based upon 71 percent of all waste in Pasco County being generated in the west region, and 75 percent of the administration and facility employees commuting from this region.

As shown in Figure 5-4, the western segment of SR 52 carries a daily traffic volume of 22,000 vehicles per day (vpd). According to the FDOT General Highway Capacities Table (February, 1986), this volume exceeds the maximum level (15,700 vpd) for the road to operate at an LOS-E. As a result of the existing traffic volumes, this roadway is operating at LOS-F. This condition was confirmed by the Pasco County Engineering Department. A summary of the impact of the proposed project on this route is presented in Table 5-12. The table compares the traffic generated by the proposed project to the existing ADT and the traffic predicted to occur by the year 2010. The project traffic impact on Route 1 is estimated to be less than 1 percent.

Although the predicted increase of 0.9 percent is small, any increase should be reviewed for potential consequences. As discussed in Section 2.3.9, the western segment of SR 52 will be widened from 2 to 6 lanes by 1995. At that time, the level of service will improve to LOS-C, with a capacity of 42,700 vehicles. As shown in Table 5-12, the estimated future traffic volume for Route 1 is 34,458 vpd. An additional 8,240 vpd would be required for the level of service to lower to LOS-D. The predicted 0.9 percent increase from project traffic (306 vpd) will not affect the level of service in this situation.

Before renovation of SR 52, traffic conditions will be congested. Peak hourly traffic counts taken by the Pasco County Traffic Operations Department show that peak hours are 7:00 am to 8:00 am, and 5:00 pm to 6:00 pm. As discussed previously in this section, the peak traffic from the proposed project will occur in mid-morning (10:00 am) and mid-afternoon (2:00 pm). Thus, as shown in Table 5-9, minimal levels of project-related traffic will occur during the periods of maximum traffic volume on SR 52. Operation of the Pasco County facility will have very little impact on peak hour traffic.



Pasco County Resource Recovery Program
 Pasco County 1985 Traffic Counts

TABLE 5-12

PREDICTED CHANGES IN AVERAGE DAILY TRAFFIC VOLUMES

	Roadway ADT	Proposed Project ADT	Percent Increase from Project
ROUTE NO. 1 - SR 52 WEST OF HAYS ROAD			
Present	22,553	201	0.9
Future	34,458	306	0.9
ROUTE NO. 2 - SR 52 EAST OF HAYS ROAD			
Present	10,310	76	0.7
Future	15,752	123	0.8
HAYS ROAD			
Present	1,189	277	23.3
Future	1,810	429	23.7

ADT = Average Daily Traffic

According to FDOT, approximately 4 percent of the vehicles in urban areas are trucks. Based on this assumption, truck traffic along Route No. 1 was calculated. Truck traffic will increase to approximately 6 percent of the vehicles due to the additional truck traffic from this project.

Route No. 2. The segment of SR 52 east of US 41 handles only moderate amounts of traffic. Traffic volumes along this segment are between 4,000 and 5,000 vehicles per day. The level of service varies from LOS-A to LOS-B. Current traffic volumes account for 63 percent of the roadway LOS-B capacity. As shown on Table 5-12, the maximum number of additional vehicle trips per day by the proposed project is 123. These additional trips will increase the traffic volume by less than 1 percent. This small increase is not expected to affect the normal flow of traffic along this route. In addition, this segment of SR 52 is to be widened from 2 to 4 lanes within the next 13 years. For this reason, the level of service on this road should remain at LOS-B or higher.

Truck traffic from the proposed project will increase the percentage of truck traffic by 1 percent. On roads where trucks must make frequent stops, additional truck traffic can slow traffic flow significantly. However, on roads such as the east segment of SR 52 where there are no stop lights, a 1 percent increase in truck traffic will have little effect on normal traffic flow. The widening of SR 52 to 4 lanes will further aid traffic flow by allowing faster moving vehicles to pass more easily.

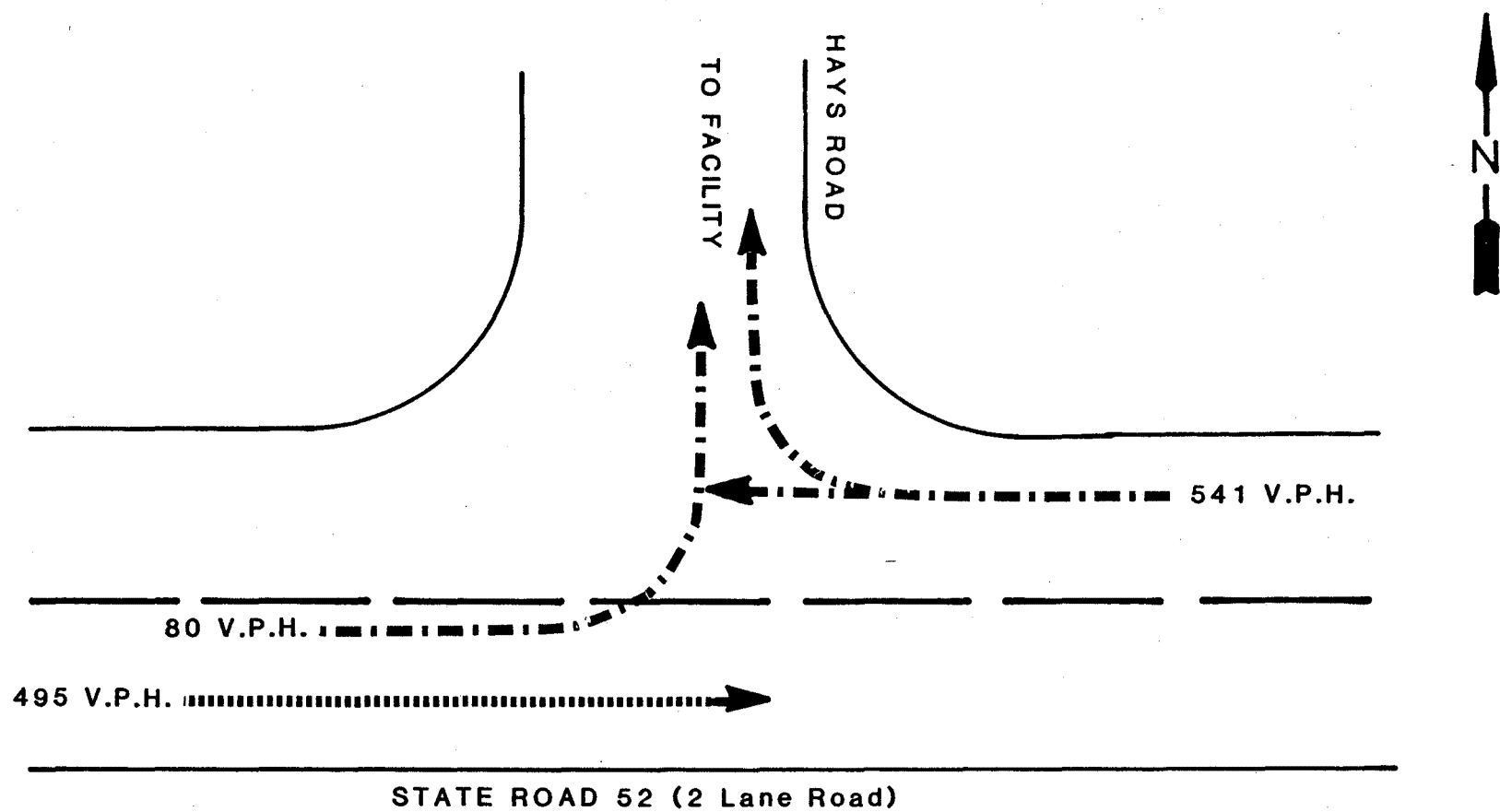
To prevent long distance hauling by numerous packer trucks, the county is considering the establishment of a transfer station in the east region. Transfer trailers carry a capacity of 18 to 20 tons and would reduce the number of truck trips from the east region by two-thirds. The use of a transfer station would decrease the impact of the proposed project traffic. Due to the operational features of the transfer station, the traffic volume would be equally distributed over a long period of time.

The Critical Intersection in this traffic impact study is at SR 52 and Hays Road. Route No. 1 and Route No. 2 meet at this intersection and will add a combined facility traffic flow of 429 vehicles per day for the year 2010.

In predicting the condition of traffic movement at this intersection, the Critical Level Volume (CLV) was determined. The CLV is an indicator of intersection capacity and is defined as the traffic count of the most flow constricting situation at an intersection. In this three-way intersection, the CLV is the highest total of a lane volume and its opposing left-turn volume. As shown in Figure 5-5, the CLV consists of peak hourly westbound traffic and the portion of the peak hourly eastbound traffic turning left onto Hays Road. The CLV for the year 2010 is 621 vehicles per hour. Referring to Table 5-13, a CLV of 621 indicates that LOS-A will be maintained at this intersection. The additional traffic due to facility operations will not significantly impact this intersection.

The combination of traffic flow from Routes 1 and 2 will add 429 project related vehicles per day to Hays Road. As shown in Table 5-12, the project will ultimately increase the traffic volume on Hays Road by 23.7 percent. Despite the significant increase in traffic volume, the level of service on Hays Road will remain unchanged. According to FDOT, the maximum daily traffic flow that qualifies for a Level of Service A rating on a collector road is 3,900 vehicles per day. Hays Road is a 2-lane, 24-foot wide, collector road that is newly paved and has no stoplights. Currently, Hays Road has an average daily traffic flow of 1,190 vehicles per day, which is only 30 percent of the maximum LOS-A traffic volume. The future estimate for the combined normal and project-related traffic on Hays Road is 2,239 ADT which is 57 percent of the maximum LOS-A traffic volume. The traffic volume will be well below the LOS-A capacity for Hays Road.

The peak hours of normal traffic flow on Hays Road are 6:00 am to 7:00 am and 5:00 pm to 6:00 pm. The maximum levels of project-related traffic will occur at 10:00 am and 2:00 pm. The differences in peaking characteristics between normal flow and project-related flow will mitigate the impact of the additional traffic. Traffic operation on Hays Road will remain free flowing.



WESTBOUND TRAFFIC AT PEAK HOUR	541 V.P.H.
LEFT TURNING EASTBOUND TRAFFIC AT PEAK HOUR	80 V.P.H.
CRITICAL LANE VOLUME	621 V.P.H.

TABLE 5-13
INTERSECTION CAPACITY BY LEVEL OF SERVICE

Level of Service	Range of Capacity (vph)	
	Low	High
A	—	900
B	901	1,050
C	1,051	1,200
D	1,201	1,350
E	1,351	1,500
F	(Special Case)	1,500

SOURCE: Sossilan, Arthur B. et al. TRB, 1978. Quick Response Urban Travel Estimation Technician and Transferable Parameters Users Guide. Washington, D.C. Page 143.

vph = vehicles per hour

5.10 ARCHAEOLOGICAL SITES

The Department of State, Division of Historical Resources was supplied with all pertinent information concerning the site so that an archaeological review could be performed. Following their investigation, the Division of Historical Resources determined that "no significant archaeological and/or historical sites are recorded for or considered likely to be present within the project area." The response was summarized with the following statement: "...the proposed project will have no effect on any sites listed...and may proceed without further involvement with this agency."

In the event that a discovery is made during operation of the facilities, qualified officials will be asked to identify the discovery and develop a plan for preservation.

5.11 RESOURCES COMMITTED

Numerous natural and human resources will be consumed, converted or made unavailable for future use if the proposed action is implemented.

The resources used in the construction of the plant will be committed to this project. Some building materials will be irretrievably used in construction of the resource recovery facility or irreversibly committed to the plant. Certain lumber products and concrete structures will be committed, as well as glass, ceramics, paint, insulation and paving materials. In addition to the materials consumed during construction, the energy and human labor expended could not be retrieved. However, this type of commitment of resources is typical for major capital intensive projects. Financial commitments include dedication of bond issue funds or other sources of construction funds. As with the commitment of labor and materials, the financial requirements for a major capital project are very typical.

The combustion process chemically alters many of the compounds within the waste stream. Many of the heat releasing reactions, practically speaking, are irreversible. Therefore, the materials consumed in the combustion process are permanently lost. This, however, is considered a positive reuse of a material for the generation of energy which otherwise would have been buried in a landfill. The facility will generate 3.7 billion kilowatt hours of electricity during a 20-year life. In addition to the revenue earned on the electricity sold to the power company, the energy production translates into a \$127 million reduction on oil expenditures over 20 years. The processing of 1,200 tons per day of municipal solid waste in a resource recovery facility could also conserve approximately 113,000 tons per year of coal, and offer the potential for recovery of reusable materials.

5.12 VARIANCES

It is not anticipated that variances from applicable standards will be sought as part of the site certification process.



6.0 TRANSMISSION LINES AND OTHER LINEAR FACILITIES

6.0 TRANSMISSION LINES AND OTHER LINEAR FACILITIES

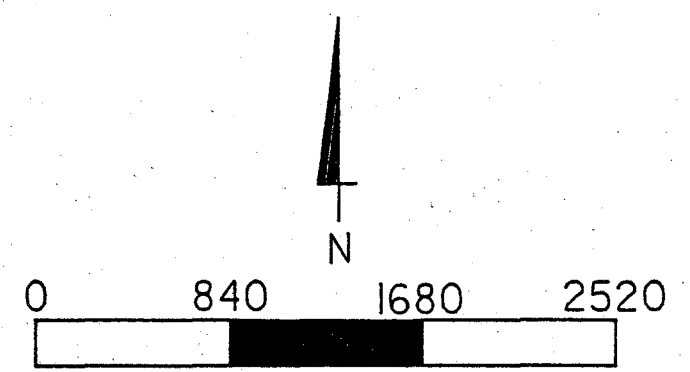
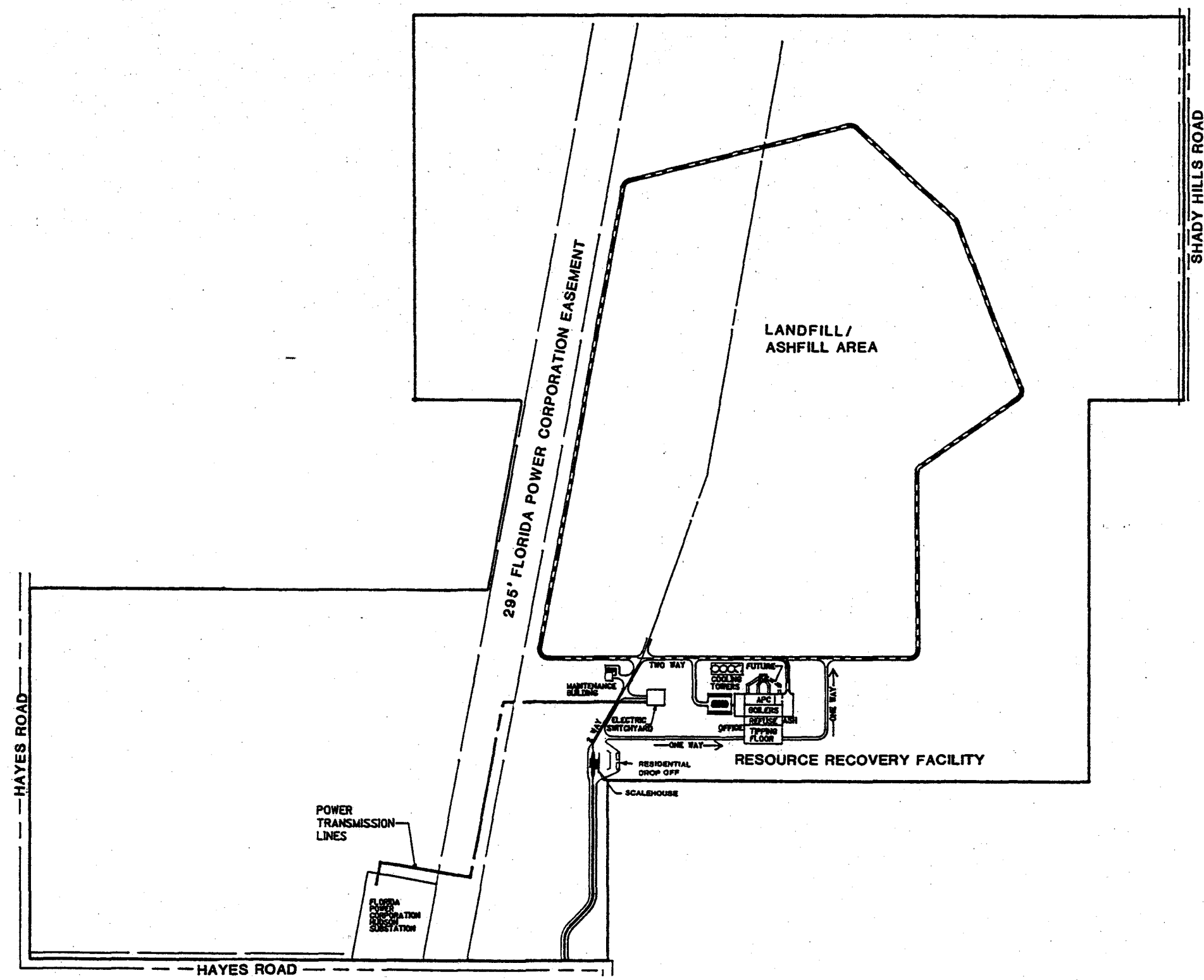
This section discusses the power transmission, and effluent and wastewater pipelines that will service the Pasco County resource recovery facility.

6.1 TRANSMISSION LINES

The power generated at the resource recovery facility will be transmitted west, over the site property to the Florida Power Corporation (FPC) easement that bisects the site. The easement is 295 feet wide and contains power transmission lines. The new transmission line will travel approximately 1,600 feet south within the FPC easement, to the FPC Hudson substation. The route is shown on Figure 6-1. The substation and easement are located in the immediate area of the facility; however, the environmental features of the transmission corridor do not coincide with the site features described in Section 2.0 of this application. The easement has been stripped of trees and all other shrubs and bushes to provide clearance for the transmission lines and access to vehicles. The proposed transmission route does not cross any natural surface water or wetlands.

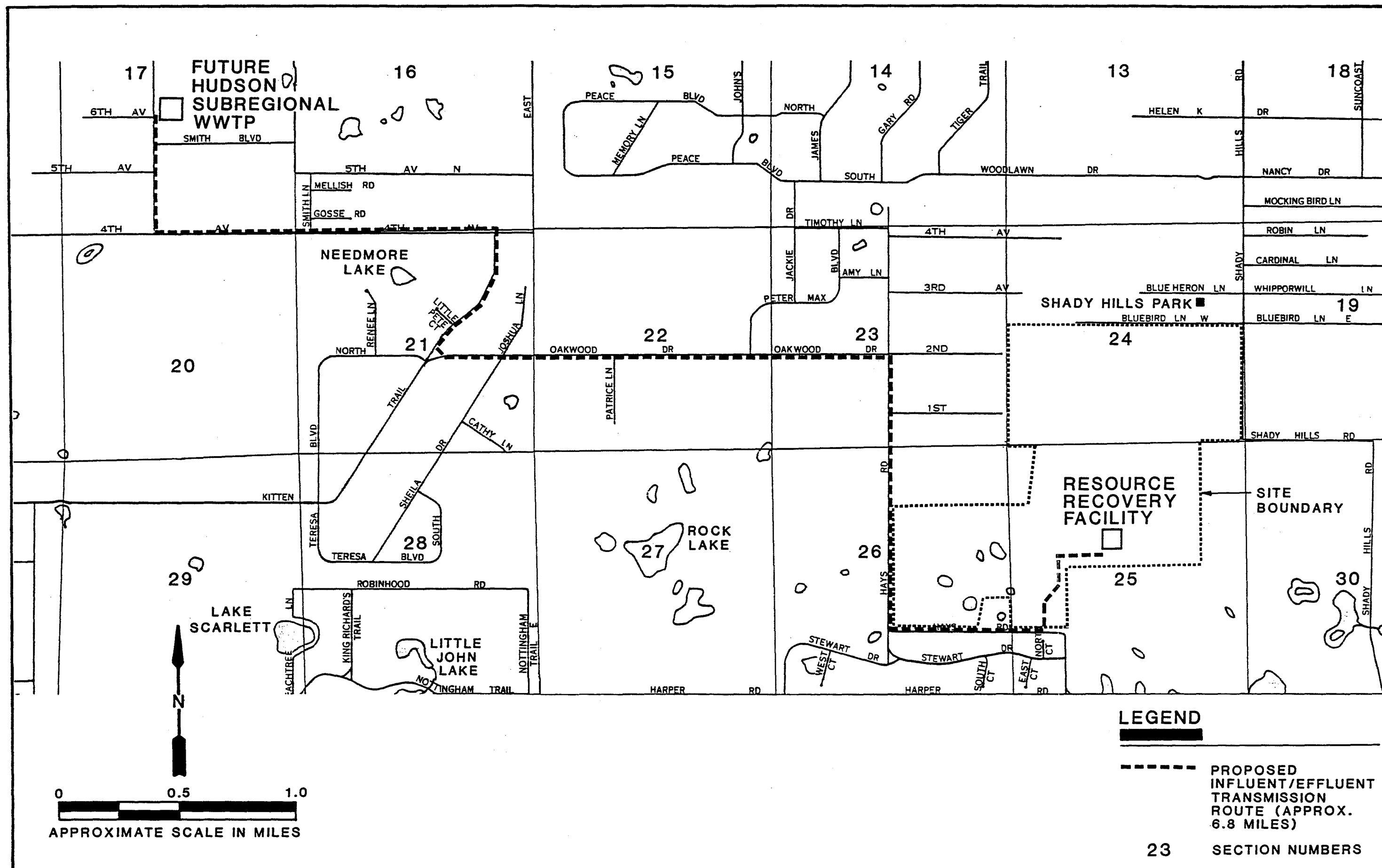
6.2 ASSOCIATED LINEAR FACILITIES

A set of pipelines will extend beyond the site boundary. The pipelines will consist of two lines to be laid in a common trench. One line is a 10-inch diameter pipeline designed to ultimately carry 1 mgd of reclaimed water from the Hudson Subregional Wastewater Treatment Plant (WWTP) to the resource recovery facility. This reclaimed water is to be used as process water. The pipeline is sized to transmit adequate water for the ultimate design size of the facility, 1,200 tons per day. The other line is a 6-inch diameter pipeline that will carry 250,000 gallons per day (gpd) of wastewater from the resource recovery facility to the Hudson Subregional WWTP.



Pasco County Resource Recovery Program
Proposed Power Transmission Route

The proposed route is 6.8 miles long and avoids major intersections and water bodies. Since the route lies within the county road right-of-way, the pipelines will not disrupt scenic, cultural or natural landmarks. The lines will not alter the land use, vegetation, or ecology of the area, and will have no impact on water bodies or wetlands. The proposed routes of the pipelines are shown on Figure 6-2.



**Pasco County Resource Recovery Program
Proposed Influent/Effluent Transmission Route**

SECTION 7

7.0 ECONOMIC AND SOCIAL EFFECTS OF PLANT
CONSTRUCTION AND OPERATION

7.0 ECONOMIC AND SOCIAL EFFECTS OF PLANT CONSTRUCTION AND OPERATION

The following benefits will accrue to the county as a result of the resource recovery project. The project will:

- Provide an ecologically sound and economical method for disposal of solid waste;
- Decrease the potential threat to groundwater from a sanitary landfill;
- Decrease the amount of land which would be required for landfilling of solid waste;
- Recover energy from combustion of the solid waste;
- Generate revenue from sale of the energy which will help defray the costs of disposal;
- Reduce the need to consume other energy sources such as gas, oil and coal; and
- Stabilize or reduce future disposal cost escalation.

It is difficult to quantify the economic and, in particular, the social ramifications of construction and operation of a resource recovery facility. The discussion below addresses cost and benefit items which are readily quantifiable (such as worker earnings), and the qualitative costs and benefits of the proposed project.

7.1 SOCIOECONOMIC BENEFITS

Land disposal of solid waste is becoming increasingly difficult in Pasco County. Permitting of additional landfills has been constrained by a decrease in suitable land area, public resistance, and more stringent

environmental regulation. Because of these restrictions on landfilling, county officials view resource recovery as a more efficient method of solid waste disposal.

Although a resource recovery system of disposal is more costly than landfilling initially, such a system may become less expensive than landfilling if the prices of real estate and energy continue to escalate and/or if additional environmental regulations are placed on landfill design or operations. In addition, resource recovery is an ecologically sound method of waste disposal and the county's new facility will be designed so that it is aesthetically pleasing.

With all units installed, the facility will have a continuous design-rated capacity of 1,200 tons per day (tpd), although initially, its design-rated capacity will be 900 tpd of solid waste. Some noncombustible materials will be transported directly to the ashfill. However, of the 900 to 1,200 tpd to be processed by the facility, less than 40 percent (containing less than 0.4 percent putrescible debris) will require landfilling. This significant decrease in waste tonnage corresponds to a 70 percent reduction in waste volume. Consequently, the annual space requirement for landfilling will be reduced by approximately 70 percent. With the implementation of the resource recovery system, the estimated life of the landfill will exceed 30 years.

Another benefit to be derived from resource recovery is the reduced potential for damage to valuable surface water and groundwater resources. Landfilling of unprocessed garbage can result in water resource contamination by organic materials which leach out of the disposed waste. In contrast, materials processed by resource recovery consist of burned-out matter which is discharged from the grate and fly ash which are relatively inert (i.e., contain less than 4 percent putrescible material).

A third benefit of the resource recovery program is the generation of a minimum of 182 million kilowatt hours (kWh) of electricity per year or 3.7 billion kWh over the life of the facility (based on an average 352,000 tons per year over a 20-year period, and 520 kWh/ton net output). This energy

production corresponds to a decrease in the use of imported crude oil by 352,000 barrels per year (or a minimum of 7.0 million barrels over the life of the facility). At the relatively low 1987 oil prices (\$18/barrel), the decreased dependence on crude oil translates into a reduction of about \$6.3 million per year in spending or \$127 million over 20 years. Because inflation was not considered in this calculation, this sum is very conservative. If oil prices rise in the future, the savings will be much greater.

Benefits to the local economy will result from the hiring of local residents for plant operations. A staff of approximately 54 will be required for operation of the facilities (including 5 administrative, 40 operations, and 9 maintenance positions). An annual payroll of approximately \$3 million will contribute \$40 million (in present worth dollars) to the local economy over a 20-year period. The economic stimulus offered by the project will generate about 25 percent of the employees' annual income (\$0.75 million) in retail sales. An estimated additional \$1 million in personal income will be received by local residents. A total of \$4.75 million in estimated annual economic benefits for Pasco County will be realized as a direct result of this facility.

Benefits will accrue from facility construction, as well. For the duration of construction, the benefits of a \$120 million construction project will be felt in the local economy and labor market as construction-related materials and services are purchased, and jobs are created. Over 300 construction workers will be employed during the peak of activity. The services of more than 50 local subcontractors will be required to complete the project. Throughout the course of construction, approximately 1,000 workers will be employed. A significant amount of materials and hardware supplies such as concrete, structural steel, glass, piping, fittings, landscape vegetation, etc., will be purchased from companies in the area. In addition, positive indirect impacts will be felt by industries and retail establishments which supply goods and services to the project work force.

The regional economic impact of the construction project can be estimated by applying a regional multiplier to involved industries. The regional multiplier measures the direct input of monies to an industry and the effects of changes in household income and the resulting changes in local consumption expenditures. The selected industry sectors are:

- Contractors: General Building, Heavy and Special Trade
- Stone and Glass Products
- Fabricated Metal Products
- Machinery
- Electrical Equipment and Supplies
- Services

Each industry receives a percentage of the total project cost over the duration of the project. The product of the industry's percentage and the regional multiplier provides an estimate of the change in total gross output in the region for that industry. Table 7-1 shows the total gross output for the project and the estimated economic impact for each industry sector.

A social benefit will be provided by the public education/visitor's center that will be constructed at the site. Tours of the resource recovery facility and information on state-of-the-art resource recovery will be available to all visitors.

7.2 SOCIOECONOMIC COSTS

This section describes the costs of constructing and operating the resource recovery facility in Pasco County over a 20-year period.

Construction of the facilities will require approximately 200 to 300 acres of the 751 acres of land on the resource recovery site. Although the proposed site is owned by Pasco County, the 751 acres must be considered a cost of obtaining the facility, since this land will not be available for other uses. The land was purchased at a price of \$3,200/acre, which amounts to \$2.4 million for the entire 751 acres.

TABLE 7-1
REGIONAL ECONOMIC IMPACT

Industry Sector	Regional Multiplier ^a	Input (millions)	Gross Output (millions)
Contractors	2.79	\$ 24.0	\$ 67.0
Stone and Glass Products	3.00	12.0	36.0
Fabricated Metal Products	2.25	18.0	40.5
Machinery	2.38	36.0	85.7
Electrical Equipment and Supplies	2.59	24.0	62.2
Services	3.00	<u>6.0</u>	<u>18.0</u>
Totals		120.0	309.4

^a SOURCE: United States Water Resources Council. January 1977.
Guideline 5 Regional Multiplier. Washington, D.C.

The costs of site preparation; access roads; facility construction; utility extensions; and legal, administrative, and financing costs (excluding capitalized interest during construction and various reserve accounts) are estimated at approximately \$120 million. The county will finance these costs by issuing revenue bonds. Since the bonds have not yet been issued, a breakdown of cost plus interest is not available. The following are the best available approximations of cost (subject to change during final negotiations and bond sale):

Contractor Cost	\$120 million
Permits and Fees	2 million
Additional County Costs	<u>10 million</u>
TOTAL CAPITAL COSTS	\$132 million
TOTAL BOND ISSUE	\$197.5 million

The operator of the facility will receive an annual operating and maintenance fee of approximately \$6 million from the county (based on 204,000 tons/year and 1987 costs). Operating and maintenance costs are not fixed, however, and these costs will be adjusted periodically during the life of the operating agreement in accordance with selected price indices.

An evaluation of costs during a 20-year financing period was prepared to quantify the estimated cost/benefit of plant construction, and to provide a basis for comparison with continued landfilling of solid waste. Items included in construction and maintenance were tipping fees (user's fees), bonding costs, energy revenues, and general overhead and maintenance.

It should also be noted that by the end of the 20-year financing period, Pasco County will have purchased the resource recovery facility. At the end of these 20 years, the plant may be worth as much as 50 percent of the new facility, assuming proper maintenance over this period. There are also unquantifiable factors which may be considered, such as the decreased risk of resource contamination which can be translated into economic benefits. Ecological/environmental losses will be minimal and are therefore not cited

as costs of the project (e.g., displacement of wildlife, habitat disruption, or deterioration of aesthetic and scenic values).

Traffic volume will increase on Hays Road when the facility begins operation. However, as discussed in Section 5.9, the level of service on Hays Road will remain at Level of Service A (LOS-A). During the facility construction phase, there will also be a traffic increase associated with construction vehicles on Hays Road. As discussed in Section 4.6, the increased traffic flow will not cause a roadway capacity problem.

8.0 SITE AND PLANT DESIGN ALTERNATIVES

8.0 SITE AND PLANT DESIGN ALTERNATIVES

Many factors were evaluated during the planning of the Pasco County resource recovery project. These factors include alternative sites, solid waste management methods, ownership and financing, and facility size and boiler configuration. This section discusses the factors of site selection and alternative sources of water.

8.1 SITE ALTERNATIVES

In the fall of 1985, the Pasco County Board of County Commissioners approved the site recommended by the county's consulting engineers. The site is located in northwest Pasco County, near the county's waste generation centroid. The site offers a good access road, a large area of land, and buffer zone.

Site selection by Pasco County was made after preparation of the Pasco County Sanitary Landfill Resource Recovery Study by Camp Dresser & McKee, in October of 1985. For this study, a specific siting methodology was developed to evaluate the suitability of candidate sites. A five-step process was used for selection. The first two steps eliminated areas that were either unacceptable or marginal. This elimination was accomplished by applying negative siting criteria such as flood potential, well field impacts, airport proximity, urban development, and presence of water bodies. Environmentally sensitive areas such as wetlands, state parks, and wilderness refuges were eliminated, as well as areas with shallow groundwater tables (less than 5 feet from the surface). Over 90 percent of the land in Pasco County was eliminated from further consideration during the first two steps.

Using this method of elimination, nine preliminary sites were selected. During the third step, alternative site selections were narrowed further by comparing land availability and ownership restrictions. Land ownership by a small number of individuals was desirable. Land costs are typically lower on large parcels and such parcels are easier to obtain. Sites with sufficient land space to accommodate both the resource recovery facility

and the sanitary landfill/ashfill were selected for further consideration. Therefore, a minimum area of 400 acres was used to qualify the remaining alternative sites. The sites were then compared using detailed siting criteria to determine which of the final four potential sites was best.

An evaluation of each site was made on the basis of possible sinkhole formation. Conditions which could cause contamination of major potable water supplies were reviewed. Finally, the relative costs of the sites were compared. Cost considerations included proximity to waste generation centroids and utilities, site access, and mitigation of aesthetic impacts.

Although each of the four candidate sites could have been developed for the facility, the study indicated that the Hays Road site could be developed with the lowest relative cost and the fewest negative impacts.

8.2 ALTERNATIVE WATER SOURCE

The county is committed to build the Hudson Subregional Wastewater Treatment Plant (WWTP) at a location 6 miles west of the resource recovery facility. This plant will satisfy all of the process water needs of the resource recovery facility. If for any reason this need cannot be met (i.e., the wastewater treatment plant is not constructed or the pipeline construction is delayed), the county will provide an alternative source of process water. The supply would be provided by an onsite well capable of pumping 1.0 million gallons per day (mgd).

Potable water will be supplied by a second water well that is also onsite. It will have a capacity of 0.05 mgd. A pneumatic storage tank connected to a chlorination system will be used for the potable water supply. If this supply were discontinued due to contamination or depletion, the county would construct a pipeline from an existing water main.

SECTION 9

9.0 COORDINATION

9.0 COORDINATION

Development of the Pasco County resource recovery project has required coordination with numerous federal, state, regional, county and local government agencies. Information was obtained through meetings, phone calls and correspondence between Camp Dresser & McKee and representatives from these agencies.

As required by the Instruction Guide for Certification Application, a list has been provided of the government agencies and individuals who were contacted during preparation of this permit application (see Table 9-1).

TABLE 9-1
CORRESPONDENCE

Agency	Contact	Date	Subject
Pasco County Public Works and Utilities	William Munz	1/16/87	Letter: Pipeline Cost Estimates
	William Munz	2/3/87	Phone: Industrial Wastewater Pretreatment Standards
	William Munz	2/10/87	Phone: Transmission Planning
Pasco County Planning Department	Cindy Cashon	1/6/86	Letter: Adjacent and abutting properties
	Cindy Cashon	7/18/86	Phone: Zoning Ordinances
	Cindy Cashon	8/11/86	Phone: Census Tracts
	Cindy Cashon	9/15/86	Meeting: Land Use and Zoning Information
	Doug Uden	9/26/86	Letter: Demographic Information
	Cindy Cashon	11/17/86	Phone: Indian Reservation
Pasco County Environmental Health	Elliot Gregos	6/24/86	Phone: Public Service Wells
		7/24/86	
Pasco County Traffic Operations	Robert Reck	1/6/87	Phone: Traffic Impact Analysis
	Robert Reck	2/9/87	Phone: Traffic Impact Analysis
	Robert Reck	3/3/87	Letter: Traffic Counts
Pasco County Office of County Attorney	Ben Harrill	10/15/86	Letter: Land Use Compliance
	Edward Helvenston	10/17/86	Letter: Deed and Order of Taking
Pasco County Supervisor of Elections		4/21/87	Phone: 1984 Election on RR

TABLE 9-1 (Continued)

CORRESPONDENCE

Agency	Contact	Date	Subject
Hernando County Planning Department	John Allen	9/15/86	Meeting: Demographic Information
Tampa Bay Regional Planning Council	--	11/19/86	Phone: Governmental Jurisdictions
Pasco County Historic Preservation Committee	--	10/20/86	Phone: Historic Sites
Pasco County Department of Solid Waste	Bob Tietz	9/15/86	Meeting: Water Supply System
	Bob Tietz	9/22/86	Letter: Water Supply and Zoning Information
Pasco County Parks and Recreation	Rick Buckman Chuck Bellrose	12/1/86	Phone: County Park Locations
Pasco County Shady Hills Park	Ken Stay	12/1/86	Phone: County Park Locations
Pasco County Health Department	Kenneth J. Swann	8/1/86	Letter: Public Water Supplies
Southwest Florida Water Management District	Randy Bolen	7/22/86	Phone: Surface Water Storage
	David Moore	8/1/86	Phone: Well Locations
	Charles Miller	8/1/86	Phone: Surface Water
	John Post	8/1/86	Phone: Surface Water
	Sandy Semegen	8/4/86	Phone: Residential Wells
	Sandy Semegen	8/12/86	Letter: Well Permit Listing
	Dave Slonema	12/18/86	Letter: Consumptive Use Permit
			Capacities

TABLE 9-1 (Continued)

CORRESPONDENCE

Agency	Contact	Date	Subject
Florida Department of Transportation-Bartow	Joseph Crawford	2/4/87	Phone: Level of Service
	Greg Czerepak	12/10/86	Phone: Traffic Counts
	Greg Czerepak	1/20/87	Letter: Highway
Florida Department of Labor and Employment Security	Charles Martel	10/14/86	Letter: Occupation Information
Florida Department of State, Division of Records and Archives, Bureau of Historic Preservation	Mike Wisenbaker	7/22/86	Phone: Archaeological Review
Florida Game and Freshwater Fish Commission	Brian Milsap	7/22/86	Phone: Endangered Species
	Brian Milsap	8/4/86	Phone: Endangered Species
	Steve A. Martin	10/7/86	Letter: Governmental Jurisdiction
Florida Department of State, Division of Historical Resources	Louis Tesar	7/30/86	Letter: Archaeological Review
	Laura Kammerer	9/19/86	Letter: Archaeological Review
Florida Department of Environmental Regulation	Ken Huntington	1/27/87	Letter: Outstanding Florida Waters
Florida Department of Community Affairs	Wendy Lovett	9/16/86	Letters: Areas of Critical State Concern
Department of Natural Resources, Florida Bureau of Geology	Kenneth Campbell	10/7/86	Letter: Geological Data
Department of Natural Resources, Florida Natural Area Inventory	Katie Nesmith	8/5/86	Phone: Endangered Species

TABLE 9-1 (Continued)

CORRESPONDENCE

Agency	Contact	Date	Subject
	Brian Barnett	8/19/86	Phone: Special Plants and Animals
	Katie Nesmith	8/20/86	Letter: Endangered Species
Department of Natural Resources, Park Lands and Development	Al Gregory	8/19/86	Phone: Governmental Jurisdictions
Department of Agriculture and Consumer Services, Division of Forestry	—	10/15/86	Phone: State Forests
Department of Community Affairs, Bureau of Land and Water Management	—	9/22/86	Phone: Areas of Critical State Concern
U.S. Department of Transportation, Federal Aviation Administration	Tom Hickery	12/3/86	Phone: Emission Stack Construction
	Tom Hickery	12/19/86	Letter: Marking and Lighting Regulations
U.S. Department of the Interior, Fish and Wildlife Service	David J. Wesley	9/19/86	Letter: Endangered Species
U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Habitat Conservation Division	Edwin Keppner	9/17/86	Letter: Governmental Jurisdiction
National Climatic Data Center	—	1/20/87	Phone: Prevailing Winds

10.0 APPENDICES

10.0 APPENDICES

The appendices to this permit application are included in Volume II. The information concerning the Prevention of Significant Deterioration determination is contained in Volume III - Air Quality. The information concerning the construction/operations of the Pasco County Hays Road Class I Sanitary Landfill/Ashfill, and the associated geotechnical/hydrologic study, are contained in Volume IV - Landfill/Ashfill.

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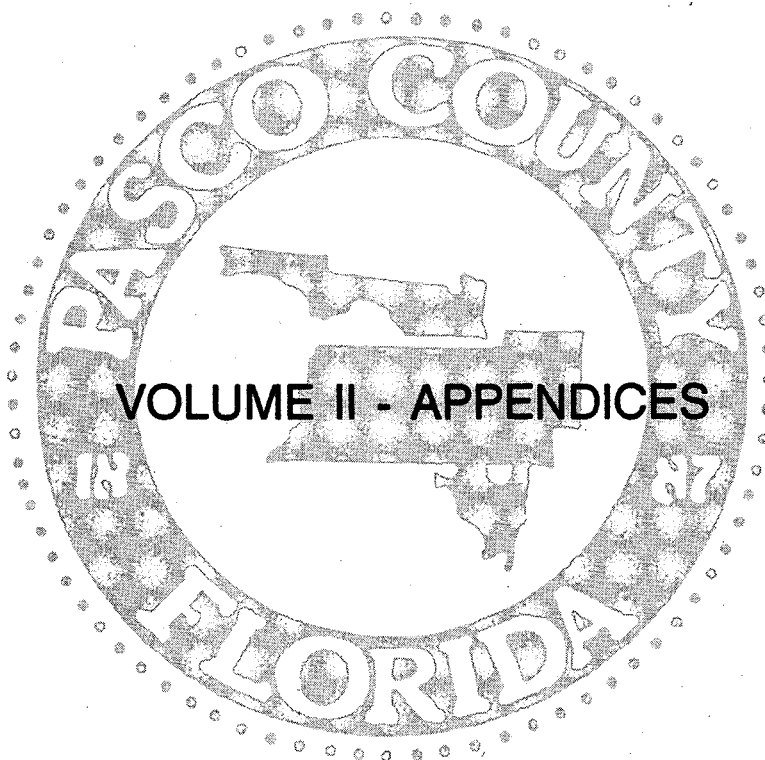
NOV. 1987

**PASCO COUNTY, FLORIDA
SOLID WASTE RESOURCE RECOVERY FACILITY
APPLICATION FOR POWER PLANT SITE CERTIFICATION**

VOLUME II - APPENDICES

ORIGINAL

PASCO COUNTY, FLORIDA
SOLID WASTE RESOURCE RECOVERY FACILITY
APPLICATION FOR
POWER PLANT SITE CERTIFICATION



SUBMITTED BY
THE PASCO COUNTY
BOARD OF COUNTY COMMISSIONERS

NOVEMBER 1987

PREPARED BY
CAMP DRESSER & MCKEE INC.

*environmental engineers, scientists,
planners & management consultants*

CDM

PASCO COUNTY, FLORIDA
SOLID WASTE RESOURCE RECOVERY FACILITY
APPLICATION FOR
POWER PLANT SITE CERTIFICATION



SUBMITTED BY
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NOVEMBER 1987

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PASCO COUNTY, FLORIDA

SOLID WASTE RESOURCE RECOVERY FACILITY
APPLICATION FOR POWER PLANT SITE CERTIFICATION

VOLUME II - APPENDICES

SECTION 10.0 APPENDICES

- 10.1 Federal Permit Applications or Approvals
 - 10.1.1 316 Demonstrations
 - 10.1.2 NPDES Application/Permit
 - 10.1.3 Hazardous Waste Disposal Application/Permits
 - 10.1.4 Section 10 or 404 Application/Permits
 - 10.1.5 Prevention of Significant Deterioration
Application/Permits (Included in Volume III - Air Quality)
 - 10.1.6 Coastal Zone Management Certifications
 - 10.1.7 Federal Energy Regulatory Commission Order
Public Service Commission Order
- 10.2 Zoning Descriptions, Correspondence, and Ordinance
No. 75-21, Article XXVII
- 10.3 Land Use Plan Descriptions
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- 10.5 Monitoring Programs
- 10.6 Site and Adjacent Area Property Ownership
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- 10.12 Noise Technical Analysis

APPENDIX 10.1

APPENDIX 10.1

FEDERAL PERMIT APPLICATIONS OR APPROVALS

APPENDIX 10.1.1

316 DEMONSTRATIONS

Demonstrations pursuant to Section 316 (a) and (b)
of the Clean Water Act are not applicable to this project.

APPENDIX 10.1.2

NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM APPLICATION/PERMIT

All wastewater will be discharged to
the Hudson Subregional Wastewater Treatment Plant.

No process or non-process wastewater of any type
will be discharged to surface waters. Permits pursuant
to the NPDES are not applicable to this project.

APPENDIX 10.1.3

HAZARDOUS WASTE DISPOSAL APPLICATION/PERMITS

There are no hazardous waste disposal application/permits pursuant to the Resource Recovery and Conservation Act that are applicable to this project. No hazardous waste will be accepted, stored, or disposed of at the resource recovery facility.

APPENDIX 10.1.4

SECTION 10 OR 404 APPLICATION/PERMITS

No permits pursuant to Section 10 of the Rivers and Harbors Act or Section 404 of the Clean Water Act are applicable to this project.

APPENDIX 10.1.5

PSD APPLICATION/PERMITS

The Prevention of Significant Deterioration (PSD) determination pursuant to the Clean Air Act is included in the Air Quality section of this Application for Power Plant Site Certification (Volume III - Air Quality).

APPENDIX 10.1.6
COASTAL ZONE MANAGEMENT CERTIFICATIONS

APPENDIX 10.1.6
COASTAL ZONE MANAGEMENT CERTIFICATIONS

According to Florida Coastal Management Program (FCMP) Federal Consistency Evaluation Procedures (15 CFR 930.50), all federal permits for which there are no analogous state permits require certification of compliance with the FCMP.

The only federal permit applicable to the proposed project for which no analogous state permit exists is the U.S. Department of Transportation Federal Aviation Administration (FAA) stack height permit (SS.14 CFR 77). In accordance with the requirements of the Federal Consistency Evaluation Procedures, the permit application must be accompanied by a consistency certification. The certification package includes:

- a written and pictorial description of the project;
- a signed (by the applicant) statement of the proposed project's consistency with the FCMP; and
- an assessment of the probable project impacts with respect to relevant FCMP statutes.

As specified in 15 CFR 930.58, the certification package and permit application must be sent to the appropriate federal agency (FAA), and ten copies must be submitted to the Federal Consistency Coordinator of the Florida State Planning and Development Clearinghouse, FDER. Copies of the permit application(s) and certification(s) are included in this appendix.

FDER evaluation commences upon receipt of the consistency certification and application(s). The state's consistency response will be made to the applicant "at the earliest practicable time." If there is no state objection within six months following commencement of evaluation, the applicant must presume consistency (15 CFR 930.63).

If the state agrees with the applicant's consistency certification, the federal agency may grant the permit to the applicant. If the state objects

to the certification, objections must describe how the proposed project is inconsistent and alternative measures (if any) which would allow the project to be conducted in a manner consistent with the CMP (15 CFR 930.64).



Pasco County Utilities Division
7536 State Street
New Port Richey, Florida 33553
(813) 847-8145

88167
October 28, 1987

State Planning & Development Clearinghouse
Office of Planning and Budgeting
Executive Office of the Governor
The Capital
Tallahassee, Florida 32301
Attn: Richard Smith, DER Federal Consistency Coordinator

RE: Pasco County Resource Recovery Facility
FAA-Coastal Zone
Management Certification

Dear Mr. Smith:

According to Florida Coastal Management Program (FCMP) Federal Consistency Evaluation Procedures (15 CFR 930.50), all federal permits for which there are no analogous state permits require certification of compliance with the FCMP.

A federal permit applicable to the proposed project for which no analogous state permit exists is the U.S. Department of Transportation Federal Aviation Administration (FAA) stack height permit (SS.14 CRF 77). In accordance with the requirements of the Federal Consistency Evaluation Procedures, this permit application must be accompanied by a consistency certification. The certification package includes:

- a written and pictorial description of the project;
- a signed statement (by the applicant) of the proposed project's consistency with the FCMP; and
- an assessment of the probable project impacts with respect to relevant FCMP statutes.

As specified in 15 CFR 930.58, the certification package and permit application (FAA Form 7460.1) must be sent to the appropriate federal agency (FAA) and ten (10) copies must be submitted to the Federal

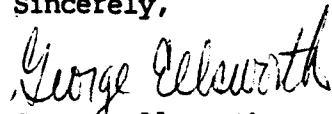
Mr. Richard Smith
October 28, 1987
Page Two

Consistency Coordinator of the Florida State Planning and Development Clearinghouse, DER. Copies of the permit application and certification are enclosed. Under separate cover, the certification package and permit application has been sent to the FAA Regional Office in Atlanta for their review.

As required by your office, Pasco County is submitting the enclosed FAA permit application and the consistency certification package for the County's Resource Recovery Facility.

If, after reviewing these materials, you have questions or require additional information, please contact this office at (813) 847-8145.

Sincerely,

A handwritten signature in cursive script that reads "George Ellsworth".

George Ellsworth
Resource Recovery Manager

bb
LOT7C.4/26

FAA

FLORIDA COASTAL ZONE MANAGEMENT CERTIFICATION

DESCRIPTION OF THE PROJECT

BACKGROUND INFORMATION

Pasco County is currently seeking proposals from qualified firms and organizations for the design, construction, startup, acceptance testing, operation and maintenance of a solid waste resource recovery and electrical generating facility to serve the county. The contractor will provide a full-service arrangement, including design, construction, acceptance testing, and 20 years of continuous operation, for a "mass-burn" type resource recovery facility with a continuous design rated capacity of 900 tons per day using three combustion/steam generation units each with a continuous design rated capacity of 300 tons per day. Additionally, the layout of the project will be such as to allow the addition of a fourth combustion/steam generation unit. Initial project construction shall include a tipping area refuse storage pit sized to handle 3,600 tons, and the stack shall have four (4) flues. The project will have one steam turbine-generator which shall generate electricity to be delivered for sale to Florida Power Corporation (FPC). Power lines from the project's electrical switchyard will connect at FPC substation which abuts the south boundary of the project site. Revenues from energy sales will be shared by the county and contractor over the life of the operating contract.

The project will be located on a site (Hays Road) that has been selected by the county. The county has purchased the property. Upon review, the planning department has determined that the project is consistent with the Pasco County Comprehensive Land Use Plan. The zoning administrator has determined that the project is exempt from county zoning ordinances.

PROCESS DESCRIPTION

Since the proposed facility will utilize mass-burn technology, there will be no preprocessing of wastes at the facility prior to combustion (except for some limited size reduction of oversized items). A schematic diagram of a typical resource recovery facility is presented in Figure 1. Municipal solid waste will be truck-delivered to the facility and ash

residue removed by the same mode of transport. Municipal solid waste will be dumped into the refuse bunker directly from packer trucks inside the building. All waste will be stored inside the building, so no waste will be visible from the outside. Two overhead cranes will mix the waste and load the charging hoppers.

The facility will be equipped with a fabric filter removal system (bag house). A bag house is a pollution control device that removes small particles from exhaust gases by trapping the particles in bag-shaped filters. An acid gas dry scrubber will also be used. Bottom ash from the furnace and flyash from the emission control system will be mixed before removal from the facility. Ash from the combustion of solid waste will comprise 10 percent of the volume and 25 percent of the weight of the municipal solid waste processed by the facility. The ash will be quenched with water to about 20 percent moisture before transport to the ashfill.

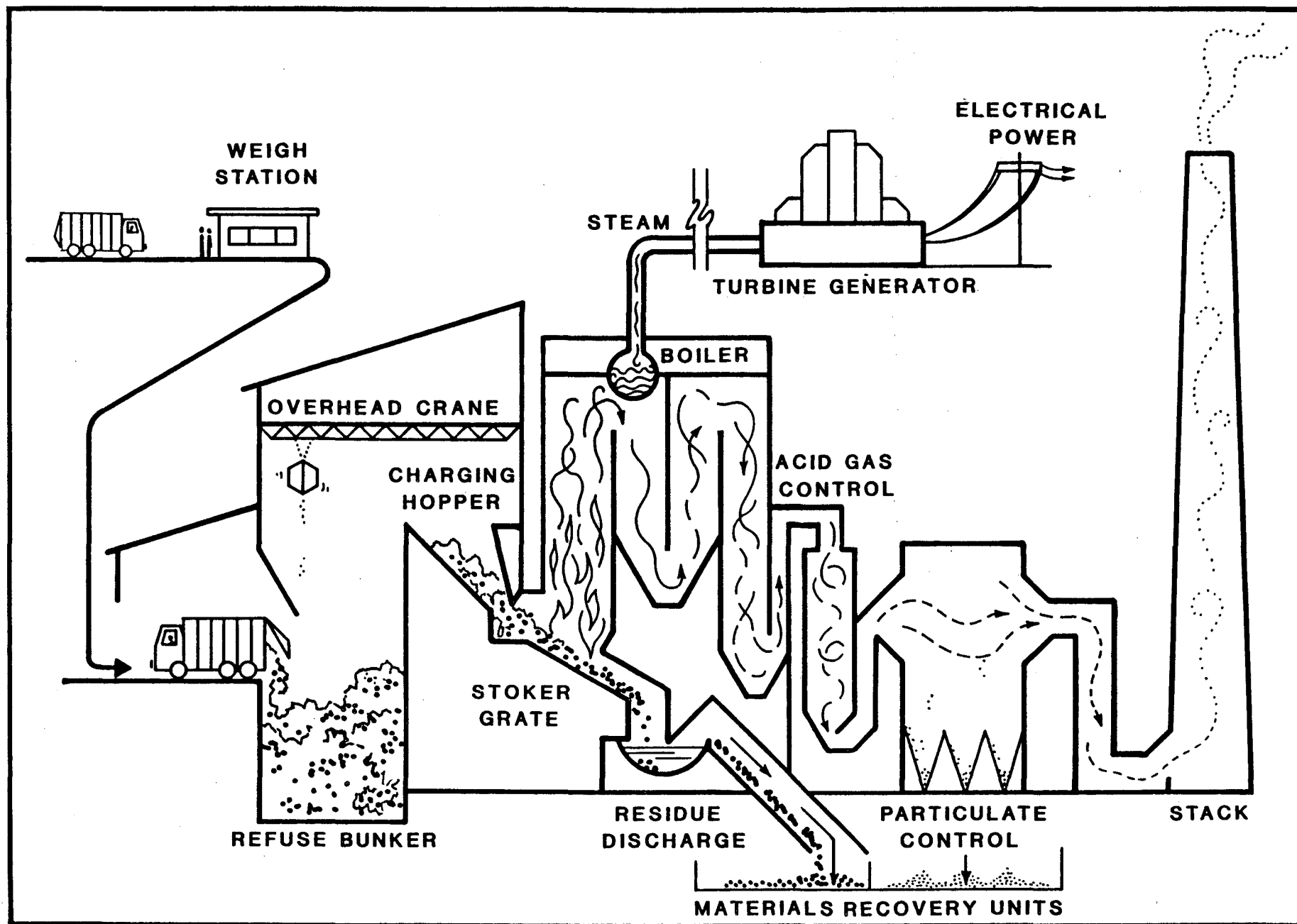
The 751-acre site to be occupied by the resource recovery facility will also be occupied by a sanitary ashfill. The ashfill will cover 195 acres in the center portion of the site. The volume capacity of the ashfill is approximately 19.5 million cubic yards, and it is expected to have a service life of more than 40 years.

PROJECT CERTIFICATION

Florida has adopted legislation, the Florida Electrical Power Plant Siting Act (Florida Statutes, Chapters 403.501 - 403.517), as amended, through Chapter 17-17 of the Florida Administrative Code (FAC) "to provide efficient, centralized review of the needs for increased electrical power generation and the effects of generator-related activities on human health and the environment and ecology of the lands and waters within the state." The Florida Department of Environmental Regulation (FDER) implements this Act.

This Act provides for a certification process which is a "one stop" centralized permitting procedure. Under the Act, the county may elect to obtain each required permit separately, or to file an application for

FIGURE 1



Pasco County Resource Recovery Program
Schematic of Typical Resource Recovery Facility

certification which would expedite the review and coordinate the permit application process.

The county is pursuing Site Certification under the Florida Electrical Power Plant Siting Act. The county has submitted a "Plan of Study for Completion of the Application for Certification of Proposed Electrical Power Generating Plant Site", and will file the "Application for Power Plant Site Certification" in November 1987.

Once the site is certified by the state, no other state permits will be required for the project. Although the rated continuous design capacity of the project will be 900 tons per day, site certification is being sought for an ultimate continuous design rated capacity of 1,200 tons per day (generating about 29 megawatts), since it is anticipated that the county will expand the project in the future.

ASSESSMENT OF PROBABLE PROJECT IMPACTS

As stipulated under 15 CFR 930.58, an assessment of the probable project effects on the coastal zone was conducted in relation to the relevant statutes comprising the Florida Coastal Management Program (FCMP).

The most applicable statute is Chapter 403 (Environmental Control) Part I (Pollution Control), Part II (Electrical Power Plant Siting), and Part IV (Resource Recovery and Management). The air and water pollution concerns under Part I of Chapter 403 will be addressed by obtaining the appropriate facility permits and using pollution control measures to abate impacts from facility construction and operations. Facility boilers will be equipped with fabric filters for particulate air emission control. Air construction and operating permits will be obtained through the Power Plant Siting Act process in accordance with requirements established in the Prevention of Significant Air Quality Deterioration (PSD) regulations and the regulations governing New Source Review for Nonattainment Areas (NSRNA).

A subregional wastewater treatment plant will treat process water from the facility. Effluent quality will be responsive to needs for cooling water at the facility and will meet FDER requirements for land application (disposal) by spray irrigation.

Chapter 267 (Archives, History and Records Management) of the FCMP statutes is also relevant to the proposed project. The Division of Archives, History and Records Management (DAHRM) has reviewed the project tract for archaeological and historical sites and concluded that no significant cultural resources would be affected by the proposed project.

Chapter 373 (Water Resources) also applies to the proposed resource recovery project. The Southwest Florida Water Management District is to review the project for water resources impacts. Consumptive use of water is anticipated; therefore, permits for such use apply. Monitoring wells will be installed to provide an early warning system for groundwater contamination, and stormwater management practices will be employed to mitigate water resources impacts from runoff.

A Power Plant Siting Act (PPSA) application is being filed with FDER. This application will present information discussing the conditions resulting from construction, and the anticipated impacts from facility operation in order to provide assurance that all applicable state, regional and local standards are met, and that the project will be consistent with the FCMP.

CONSISTENCY CERTIFICATION

The proposed activity complies with Florida's Coastal Management Program and will be conducted in a manner consistent with that program.


George Ellsworth
Pasco County
Resource Recovery Manager

**NOTICE OF PROPOSED CONSTRUCTION
OR ALTERATION AS SUBMITTED
TO THE FEDERAL AVIATION ADMINISTRATION**



Pasco County Utilities Division
7536 State Street
New Port Richey, Florida 33553
(813) 847-8145

October 28, 1987

Chief of Air Traffic Division
Federal Aviation Administration
ASO-Southern Region
3400 Norman Berry Drive
P.O. Box 20636
Atlanta, Georgia 30320
Attn: ASO-530

Gentlemen:

Pursuant to Federal Aviation Regulations, Part 77.13, Subchapter B, Pasco County is hereby notifying the Federal Aviation Administration of the proposed construction of a solid waste resource recovery facility to serve the county. Attached please find one executed set (four copies) of FAA Form 7460-1, "Notice of Proposed Construction or Alteration."

As specified in the Federal Consistency Evaluation Procedures (15 CFR 930.50) all federal permits for which there are not analogous state permits require certification of compliance with the Federal Coastal Zone Management Program. The Federal Aviation Administration "Stack Height Permit" has no analogous State of Florida permit. Therefore, in accordance with the requirements of the Federal Consistency Evaluation Procedures, this permit application is accompanied by an "FAA Florida Coastal Zone Management Certification." As specified in 15 CFR 930.58, ten (10) copies of FAA Form 7460-1 and the "FAA Florida Coastal Zone Management Certification" have been sent under separate cover to the Federal Consistency Coordinator of the Florida State Planning and Development Clearinghouse, DER.

We trust that the information will meet the notification requirements of stack construction. Please contact this office at (813) 847-8145 if you have any questions.

Sincerely,

George Ellsworth
Resource Recovery Manager

bb
LOT7C.4/27

NOTICE OF PROPOSED CONSTRUCTION OR ALTERATION			Aeronautical Study Number	
Nature of Proposal Type: ☒ New Construction ☐ Alteration B. Class: ☒ Permanent ☐ Temporary (Duration _____ months) C. Work Schedule Dates: Beginning <u>1-90</u> End <u>1-91</u>			2. Complete Description of Structure A. Include effective radiated power and assigned frequency of all existing, proposed or modified AM, FM, or TV broadcast stations utilizing this structure. B. Include size and configuration of power transmission lines and their supporting towers in the vicinity of FAA facilities and public airports. C. Include information showing site orientation, dimensions, and construction materials of the proposed structure. The resource recovery facility will consist of three 300 tons per day combustion units and appropriate control devices. The units will be housed in one building and a 275' stack will be used for air quality purposes.	
3A. Name and address of individual, company, corporation, etc. proposing the construction or alteration. (Number, Street, City, State and Zip Code) (813) <u>847-8145</u> area code Telephone Number TO Pasco County 7530 Little Road New Port Richey, FL 33553			(if more space is required, continue on a separate sheet.)	
3B. Name, address and telephone number of proponent's representative if different than 3 above.				
4. Location of Structure A. Coordinates (To nearest second): 82° 33' 30" Latitude, 28° 22' 05" Longitude B. Nearest City, Town and State: Port Richey, FL C. Name of nearest airport, heliport, flightpark, or seaplane base: Pilot Country Estate Airport (1) Distance to nearest point of nearest runway: 17.2 Miles, 7.5 miles (2) Direction to nearest runway: southwest, southeast			5. Height and Elevation (Complete to the nearest foot) A. Elevation of site above mean sea level: 50' B. Height of Structure including all appurtenances and lighting (if any) above ground, or water if so situated: 275' C. Overall height above mean sea level (A + B): 325'	
Description of location of site with respect to highways, streets, airports, prominent terrain features, existing structures, etc. Attach a U.S. Geological Survey quadrangle map or equivalent showing the relationship of construction site to nearest airport(s). (if more space is required, continue on a separate sheet of paper and attach to this notice.) The proposed site is bounded by Hays Road to the south and the west, and Shady Hills Road to the east. A Florida Power Corporation transmission easement runs north-south through the site. SR 52 is located 4 miles south of the site at the Intersection of Hays Road and SR 52.				
Notice is required by Part 77 of the Federal Aviation Regulations (14 C.F.R. Part 77) pursuant to Section 1101 of the Federal Aviation Act of 1958, as amended (49 U.S.C. 1101). Persons who knowingly and willingly violate the Notice requirements of Part 77 are subject to a fine (criminal penalty) of not more than \$500 for the first offense and not more than \$2,000 for subsequent offenses, pursuant to Section 902(a) of the Federal Aviation Act of 1958, as amended (49 U.S.C. 1472(a)).				
I HEREBY CERTIFY that all of the above statements made by me are true, complete, and correct to the best of my knowledge. In addition, I agree to obstruction mark and/or light the structure in accordance with established marking & lighting standards if necessary.				
Date 10-20-87	Typed Name/Title of Person Filing Notice George Ellsworth, Env. Manager		Signature <i>George Ellsworth</i>	
FOR FAA USE ONLY FAA will either return this form or issue a separate acknowledgement.				
The Proposal: ☐ Does not require a notice to FAA. ☐ Is not identified as an obstruction under any standard of FAR, Part 77, Subpart C, and would not be a hazard to air navigation. ☐ Is identified as an obstruction under the standards of FAR, Part 77, Subpart C, but would not be a hazard to air navigation. ☐ Should be obstruction: ☐ MARKED, ☐ lighted per FAA Advisory Circular 70/7460-1, Chapter(s) _____ ☐ Obstruction marking and lighting are not necessary.			Supplemental Notice of Construction FAA Form 7460-2 is required any time the project is abandoned, or ☐ At least 48 hours before the start of construction; ☐ Within five days after the construction reaches its greatest height. This determination expires on _____ unless: (a) extended, revised or terminated by the issuing office; (b) the construction is subject to the licensing authority of the Federal Communications Commission and an application for a construction permit is made to the FCC on or before the above expiration date. In such case the determination expires on the date prescribed by the FCC for completion of construction, or on the date the FCC denies the application. NOTE: Request for extension of the effective period of this determination must be postmarked or delivered to the issuing office at least 15 days prior to the expiration date. If the structure is subject to the licensing authority of the FCC, a copy of this determination will be sent to that Agency.	
Remarks:			Remarks:	
Issued by	Signature		Date	

APPENDIX 10.1.7

FEDERAL ENERGY REGULATORY COMMISSION ORDER
GRANTING APPLICATION FOR CERTIFICATION
AS A QUALIFYING SMALL POWER PRODUCTION FACILITY

PUBLIC SERVICE COMMISSION ORDER
GRANTING DETERMINATION OF NEED FOR AN
ELECTRICAL POWER PLANT

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Pasco County Board of County Commissioners	)	
	)	
Small Power Production and Cogeneration Facilities	)	Docket No. QF86-1096-000
-- Qualifying Status	)	

ORDER GRANTING APPLICATION FOR CERTIFICATION
AS A QUALIFYING SMALL POWER PRODUCTION FACILITY

(Issued December 4, 1986)

On September 26, 1986, Pasco County Board of County Commissioners (Applicant), of New Port Richey, Florida, filed an application with the Federal Energy Regulatory Commission (Commission) for certification of a facility as a qualifying small power production facility pursuant to § 292.207 of the Commission's regulations. 1/ Notice of the application was published in the Federal Register on October 16, 1986. 2/ Supplemental information was filed on October 27, 1986. No protests or petitions to intervene have been filed.

The small power production facility will be located in Pasco County, Florida. The facility will consist of waterwall steam generators and a turbine-generator. The net electric power production capacity will be 29 megawatts. The primary energy source will be biomass in the form of municipal solid waste. Natural gas or oil may be used for start-up purposes. However,

1/ Section 292.207 (b)(5) of the Commission's regulations requires the Commission to issue an order granting or denying an application for qualifying status, tolling the time for issuance of an order, or setting the matter for hearing within 90 days of the filing of the application.

2/ 51 Fed. Reg. 33851 (1986)

PROPERTY OF PUBLIC REFERENCE

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Docket No. QF86-1096-000

such fossil fuels uses will not exceed one (1%) percent of the total energy input to the facility during any calendar year. Installation date will be on or after March, 1988. Applicant owns no other facility which is located within one mile of the proposed facility and which uses the same energy source. The facility thus meets the criteria set out in § 292.204 of the Commission's regulations.

No electric utility, electric utility holding company, or any combination thereof has any ownership interest in the facility. The facility thus satisfies the criteria set forth in § 292.206 of the Commission's regulations.

It is found that:

The small power production facility, as described in the application submitted by Pasco County Board of County Commissioners, meets the requirements established in § 292.203(a) of the Commission's regulations regarding qualification as a small power production facility.

It is ordered:

The application for certification of qualifying status filed on September 26, 1986 and completed on October 27, 1986, by Pasco County Board of County Commissioners pursuant to § 292.207 of the Commission's regulations and section 3(17)(C) of the

Docket No. QF86-1096-000

Federal Power Act, as amended by section 201 of the Public Utility Regulatory Policies Act of 1978, is hereby granted provided that the facility operates in the manner described in the application. 3/

Authority to act on this matter is delegated to the Director, Division of Interconnection and Systems Analysis pursuant to § 375.308 of the Commission's regulations.

Edward J. Fowlkes

Edward J. Fowlkes, Director
Division of Interconnection
and Systems Analysis

3/ Certification as a qualifying facility serves only to establish eligibility for benefits provided by the Public Utility Regulatory Policies Act of 1978, as implemented by the Commission's regulations, 18 CFR Part 292. It does not relieve a facility of any other requirements of local, State or Federal law, including those regarding siting, construction, operation, licensing and pollution abatement. Certification does not establish any property rights, resolve competing claims for a site, or authorize construction.

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Petition of Pasco County for) DOCKET NO. 870193-EG
determination of need for a solid) ORDER NO. 17752
waste-fired cogeneration power plant.) ISSUED: 6-26-87
_____)

The following Commissioners participated in the disposition of this matter:

KATIE NICHOLS, Chairman
GERALD L. GUNTER
JOHN T. HERNDON
MICHAEL MCK. WILSON

ORDER GRANTING DETERMINATION OF NEED

BY THE COMMISSION:

Under the Florida Electric Power Plant Siting Act (Chapter 403, Florida Statutes) this Commission is empowered to make a determination of need for any electric power plant for which an applicant seeks certification under the act. As set out in Section 403.508(3), Florida Statutes, that affirmative determination of need by the Commission is a condition precedent to the conduct of the certification hearing.

On February 24, 1987, we received the petition of Pasco County, Florida, for a determination of need for a 29 megawatt (MW) solid waste-fired cogeneration power plant. The petition states that the facility will have an in-service date of January, 1991, and will operate initially with a single 22 MW generator. At maximum capacity of 29 MW the facility will use up to 1,200 tons per day of municipal solid waste as fuel. Power produced by the facility will be sold to Florida Power Corporation.

Section 403.519, Florida Statutes, designates this Commission as the exclusive forum for determination of need and sets out the criteria which shall be considered in making such a determination. They are:

- (1) The need for electric system reliability and integrity;
- (2) The need for adequate electricity at a reasonable cost;
- (3) The cost-effectiveness of the proposed plant, i.e., whether the proposed plant is the most cost-effective alternative available; and
- (4) Conservation measures taken that are reasonably available to the applicant which might mitigate the need for the proposed plant.

Section 403.519 also provides that the Commission may consider such other matters as it deems relevant in making its determination of need.

We have reviewed Pasco County's application in the light of the criteria established by the statute. It is our conclusion that Pasco County's plant meets the relevant criteria for a determination of need under Section 403.519.

DOCUMENT NUMBER-DATE

05677 JUN 26 1987

PSC-RECORDS/REPORTING

RECEIVED JUL 01 1987

Pasco County's 29 MW plant, although small, will make some contribution to electric system reliability and integrity in Peninsular Florida. We project that without the addition of qualifying facilities or power plants before the summer of 1993, peninsular Florida will have total available capacity of 32,318 MWs with an expectant coincident firm peak demand of 25,138 MWs. This equates to a reserve margin of 28 percent. The contribution of Pasco County's facility to this reserve margin would only be one one-hundredth of one percent. Clearly, this is a small amount; yet it is a positive contribution.

Applying the second and third criteria enumerated in Section 403.519 is somewhat problematical. In order to determine whether the facility would help meet the need for adequate electricity at a reasonable cost and whether the proposed plant is the most cost-effective alternative available, it is necessary to consider the cost to Florida ratepayers of the facility's output and the terms and conditions under which that output would be provided to the power grid. Pasco County has not signed a standard offer or negotiated contract with an electric utility for the purchase of its facility's output. Thus, based on the current state of affairs, we would be unable to make the economic judgement necessary to determine if the second and third criteria of reasonable cost and cost-effectiveness have been met. However, Pasco County has made a commitment to the Commission that the facility's output, when the plant becomes operational, will be supplied in accordance with applicable Commission rules and Florida Statutes. This commitment means that the upper limit on the sale of Pasco County's generative output would be the standard offer amount as determined under the Commission's formula or such other formula as may be appropriate under existing rules and statutes at the time a contract with the utility is signed by Pasco County. With this commitment from Pasco County we find that the electricity produced by the solid waste facility will be priced on a cost-effective basis and supplied at reasonable cost, as will be judged by the Commission's standards in effect at the time.

Inasmuch as Pasco County's facility will serve the dual purpose of waste disposal and production of electricity we do not believe that conservation of electrical energy is directly at issue in this case. We, therefore, make no specific finding on this statutory criteria nor do we find it necessary to apply any other specific criteria in making our determination of need.

Now, therefore, in consideration of the above, it is

ORDERED by the Florida Public Service Commission that the petition of Pasco County for a determination of need for its proposed 29 megawatt solid waste-fired generating facility is hereby granted as set forth in the body of this order. It is further

ORDERED that this docket be closed.

By ORDER of the Florida Public Service Commission,
this 26th day of June, 1987.

STEVE TRIBBLE, Director
Division of Records and Reporting

(S E A L)

by: Kay Flynn
Chief, Bureau of Records

DES

APPENDIX 10.2

APPENDIX 10.2

**ZONING DESCRIPTIONS,
CORRESPONDENCE REGARDING ZONING PROCEDURES,
AND ORDINANCE NO. 75-21, ARTICLE XXVII**

ZONING DESCRIPTIONS

ARTICLE V. A-C AGRICULTURAL DISTRICT

Section 5.1. Purpose.

The purpose of the A-C Agricultural District is to preserve the rural and open character of various lands within Pasco County. These lands are agricultural lands; site of vital natural water resource functions; areas with highly productive natural plant and animal communities; and areas with valuable topographic and/or subsurface features all of which are necessary to sustain and enhance the quality of life in Pasco County. Those uses will be allowed which are compatible with these overall objectives.

Section 5.2. Permitted uses.

A. *Principal uses.*

1. Agriculture, general farming and horticulture; to include: animal food lots, the commercial hatching or raising of poultry, the production of eggs, and the raising of hogs, pasturage of animals such as cattle and horses, citrus groves (as well as other fruits), forestry, plant nurseries, sheds, stables, barns, truck farms, fish hatcheries, fish pools, and other structures devoted to the on-site, farm uses. Additional structures to house the owner or operator of the property, his family, hired workers and guests may include the following: home dwelling, guest house (for non-paying visitors) and workers' quarters (mobile or fixed foundation type).
2. Dwellings: single-family detached dwellings, and single-family mobile homes on individual lots where they are securely anchored as required by the Pasco County Building Code.
3. Home occupations.
4. Temporary roadside stands used on a seasonal basis for the sale of fruits, vegetables and other agriculturally related products.
5. Public and private parks and playgrounds.

6. Mineral extraction activities including, but not limiting to, the mining or extraction of limestone, clays, sands, natural gases, oil, and organic soils subject to all local, state and federal regulations.
7. Noncommercial boat slips, piers and houses or private docking facilities with the approval of the various state and/or federal agencies where mandatory.
8. Noncommercial recreation facilities including parks, playgrounds and camps for youths and adults.
9. Duplexes.
10. Reserved.
11. Residential treatment and care facilities subject to a minimum site area of ten (10) acres and the provisions of sections 23.3 and 23.10 of this ordinance.

(b) *Accessory uses.*

1. Private garages and parking areas.
2. Private swimming pools and cabanas in accordance with supplemental regulations, section 23.5
3. Signs in accordance with supplemental regulations, section 23.6.
4. Other accessory uses customarily incidental to a permitted principal use. (Ord. No. 85-02, § 2, 2-19-85)

Section 5.3. Special exemption uses.

A. Country clubs and golf courses.

B. Private gun clubs and firing ranges shall be permitted on twenty-five-acre or larger tracts of land provided that the board of adjustment after due process can determine that it will not cause a nuisance or hazard to existing local land use activities.

C. Public buildings and public utility facilities; to include the following: county, state, or federal structures and uses, water pumping plants, transmission lines for gas, electric and telephones, broadcasting or transmission towers and stations. and

other conforming uses which do not cause an undue nuisance or adversely affect existing structures, uses and residents.

D. Storage, and repair facilities for essential public services.

E. Aircraft landing fields, subject to approval by the Federal Aviation Administration and compliance with appropriate state and local laws.

F. Cemeteries, mausoleums, and crematoriums.

G. Animal hospitals or veterinarian clinics, and dog kennels.

H. Sanitary landfills subject to all local, state, and federal regulations.

I. Accessory uses customarily incidental to a permitted special exception use upon approval by the board of adjustment.

Section 5.4. Area, density and lot width requirements.

A. *Single-family detached dwellings, mobile homes and duplexes:*

1. Minimum lot area ten (10) acres.
2. Maximum possible gross density 0.10 (nonfarm) dwelling units, per acre except duplexes, 0.20 dwelling units per acre.
3. Minimum lot width two hundred fifty (250) feet.

B. *All other uses:* No minimum lot areas are required subject to meeting minimum yard and coverage regulations.

Section 5.5. Coverage regulations.

All buildings including accessory buildings shall not cover more than fifteen (15) per cent of the total lot area, and the minimum living space per unit shall not be less than four hundred forty (440) square feet.

Section 5.6. Yard regulations.

A. The following minimum building line setbacks measured from the property lines are required in yard areas listed below unless otherwise specified.

1. Front—Fifty (50) feet.

2. Side—Twenty-five (25) feet.

3. Rear—Fifty (50) feet.

B. Front setbacks from existing or planned centerlines of rights-of-way of public thoroughfares shall be required if the setbacks in A are less than the following:

1. Major and minor arterials—One hundred seventy-five (175) feet from the centerline.

2. Collector streets—Eighty-five (85) feet from the centerline.

3. Local streets—Seventy-five (75) feet from the centerline.

Section 5.7. Height regulations.

Building height, thirty-five (35) feet maximum; however, no dwelling shall be less than ten (10) feet in height. For exceptions, see supplemental regulations, section 23.1.

Section 5.8. Off-street parking regulations.

A minimum of two (2) off-street parking spaces shall be provided per dwelling unit. Parking for other permitted or special exception uses shall be provided in accordance with the off-street parking regulations, Article XXII.

ARTICLE VI. A-R AGRICULTURAL-RESIDENTIAL DISTRICT

Section 6.1. Purpose.

The purpose of the A-R Agricultural-Residential District is to allow the development of relatively large tracts of land to accommodate those individuals who desire a rural or estate type living environment; to curtail urban development in areas which lack facilities, until such time as those facilities are available; and to promote conservation of rural environments through limiting the intensity of development.

Section 6.2. Permitted uses.

A. *Principal uses.*

1. Commercial farming and agricultural activities such as citrus groves (as well as other fruits), forestry, plant nurseries, sheds, stables, barns, truck farms, fish pools, and other structures devoted to the on-site agricultural uses. In addition, animal feed lots, hatching and raising of poultry, production of eggs, raising of livestock (hogs, horses, cattle, sheep, etc.) shall require minimum of five (5) acres and shall be required to maintain a one-hundred-foot separation between dwellings existing on adjacent parcel of land at the time the commercial agricultural activity commenced. However, the required separation shall not be less than fifty (50) feet from any property line.
2. General farming pursuits of such extent as to supply the occupant's personal needs.
3. Dwellings: single-family detached dwellings and single-family mobile homes on individual lots where they are securely anchored as required by the Pasco County Building Code.
4. Noncommercial boat slips, piers and houses, or private docking facilities with the approval of the various state and/or federal agencies where mandatory.
5. Maintaining livestock for the occupant's use or need only, not to exceed three (3) grazing animals per acre minimum, exclusive of area required for other uses.

6. Swine shall be considered for the purpose of this section as grazing animals. However, they shall not exceed one (1) per acre minimum, exclusive of area required for other uses.
7. Maintaining small animals and fowl for the occupant's use or need only, not to exceed a ratio of twenty (20) per acre.

B. Accessory uses.

1. Private garages and parking areas.
2. Private swimming pools and cabanas in accordance with supplemental regulations, section 23.5.
3. Signs in accordance with supplemental regulations, section 23.6.
4. Other accessory uses customarily incidental to a permitted principal use.

Section 6.2.1. Conditional uses.

A. Residential treatment and care facilities subject to the provisions of sections 23.3 and 23.10 of this ordinance. (Ord. No. 85-02, § 6, 2-19-85)

Section 6.3. Special exception uses.

- A. Duplexes.
- B. Home occupations.
- C. Day nurseries.
- D. Public and private right-of-way for utilities.
- E. Public and private substations for utilities.
- F. Schools.
- G. Public or private parks, playgrounds and recreation areas.
- H. Churches and church schools.
- I. Golf courses, provided the clubhouse and other structures are located over one hundred fifty (150) feet from an abutting lot or parcel.

J. Private gun clubs and firing ranges shall be permitted on twenty-five-acre or larger tracts of land provided that the board of adjustment after due process can determine that it will not cause a nuisance or hazard to existing local land use activities.

K. Storage, and repair facilities for essential services.

L. Convalescent homes.

M. Aircraft landing fields, subject to approval by the Federal Aviation Administration and compliance with appropriate state laws.

N. Animal hospitals or veterinarian clinics, and dog kennels.

O. Travel trailer parks subject to the requirements set forth in the supplemental regulations, section 23.16.

P. Accessory uses customarily incidental to a permitted special exception use upon approval by the board of adjustment.

Section 6.4. Area density and lot width requirements.

A. Single-family detached dwellings and mobile homes:

1. Minimum lot area one (1) acre.
2. Maximum possible gross density one (1) dwelling unit per acre, except duplexes two (2) dwelling units per acre.
3. Minimum lot width one hundred fifty (150) feet.

B. *All other uses:* No minimum lot areas are required subject to meeting minimum yard and coverage regulations.

Section 6.5. Coverage regulations.

All buildings, including accessory buildings, shall not cover more than twenty-five (25) per cent of the total lot area and the minimum living space per unit shall not be less than four hundred forty (440) square feet.

Section 6.6. Yard regulations.

A. The following minimum building line setbacks measured from the property lines are required in yard areas listed below unless otherwise specified.

1. Front—Fifty (50) feet.
2. Side—Twenty-five (25) feet.
3. Rear—Fifty (50) feet.

B. Front setbacks from existing or planned rights-of-way of public thoroughfares shall be required if the setbacks in A are less than the following:

1. Major and minor arterials—One hundred seventy-five (175) feet from the centerline of right-of-way.
2. Collector streets—Eighty-five (85) feet from the centerline of right-of-way.
3. Local streets—Seventy-five (75) feet from the centerline of right-of-way.

Section 6.7. Height regulations.

Building height, thirty-five (35) feet maximum; however, no dwelling shall be less than ten (10) feet in height. For exemptions, see supplemental regulations, section 23.1.

Section 6.8. Off-street parking regulations.

A minimum of two (2) off-street parking spaces shall be provided per dwelling unit. Parking for other permitted or special exception uses shall be provided in accordance with the off-street parking regulations, Article XXII.

ARTICLE V-A. AC-1 AGRICULTURAL DISTRICT

Section 5A.1. Purpose.

The purpose of the AC-1 Agricultural District is to preserve the rural and open character of various lands within Pasco County and to provide for permanent residential housing in conjunction with agricultural and open space uses. These lands are agricultural lands; site of vital natural water resource functions; areas with highly productive natural plant and animal communities; and areas with valuable topographic and/or subsurface features all of which are necessary to sustain and enhance the quality of life in Pasco County. Those uses will be allowed which are compatible with these overall objectives. (Ord. No. 77-04, § 1, 12-21-76)

Supp. No. 41

796.40.4

Section 5A.2. Permitted uses.**A. *Principal uses.***

1. Agriculture, general farming and horticulture; to include: animal feed lots, the commercial hatching or raising of poultry, the production of eggs, and the raising of hogs, pasturage of animals such as cattle and horses, citrus groves (as well as other fruits), forestry, plant nurseries, sheds, stables, barns, truck farms, fish hatcheries, fish pools, and other structures devoted to the on-site, farm uses. Additional structures to house the owner or operator of the property, his family, hired workers and guests may include the following: Home dwelling, guesthouse (for nonpaying visitors) and workers' quarters (fixed foundation type only).
2. Dwellings: Single-family detached dwellings.
3. Home occupations.
4. Temporary roadside stands used on a seasonable basis for the sale of fruits, vegetables and other agriculturally related products.
5. Public and private parks and playgrounds.
6. Mineral extraction activities including but not limiting to the mining or extraction of limestone, clays, sands, natural gases, oil, and organic soils subject to all local, state and federal regulations.
7. Noncommercial boat slips, piers and houses or private docking facilities with the approval of the various state and/or federal agencies where mandatory.
8. Noncommercial recreation facilities including parks, playgrounds and camps for youths and adults.
9. Duplexes.
10. Public and quasi-public buildings and facilities; to include the following: County, state or federal structures and uses, churches, civic organizations, and schools.

B. Accessory uses.

1. Private garages and parking areas.
2. Private swimming pools and cabanas in accordance with supplemental regulations, section 23.5.
3. Signs in accordance with supplemental regulations, section 23.6.
4. Other accessory uses customarily incidental to a permitted principal use. (Ord. No. 77-04, § 1, 12-21-76)

Section 5A.3. Special exception uses.**A. Country clubs and golf courses.**

B. Private gun clubs and firing ranges shall be permitted on twenty-five-acre or larger tracts of land provided that the board of adjustment after due process can determine that it will not cause a nuisance or hazard to existing local land use activities.

C. Public and private utility facilities; to include the following: County, state, or federal structures and uses, water pumping plants, transmission lines for gas, electric and telephones, broadcasting or transmission towers and stations, and other conforming uses which do not cause an undue nuisance or adversely affect existing structures, uses and residents.

D. Storage, and repair facilities for essential public services.

E. Aircraft landing fields, subject to approval by the Federal Aviation Administration and compliance with appropriate State and local laws.

F. Cemeteries, mausoleums, and crematoriums.

G. Animal hospitals or veterinarian clinics, and dog kennels.

H. Sanitary landfills subject to all local, state, and federal regulations.

I. Accessory uses customarily incidental to a permitted special exception use upon approval by the board of adjustment.

J. Farm feed and supplies establishments. The following criteria and requirements shall apply to all farm feed and supplies establishments:

1. Feed for livestock, poultry and pets;
2. Animal health products;
3. Lawn and garden supplies;
4. Fertilizer, insecticides, pesticides;
5. Leather goods and tack;
6. Fenceposts and supplies to be enclosed in an opaque buffer;
7. No equipment such as lawn mowers, tractors and accessories shall be stored or repaired on this site;
8. There shall be a minimum fifty-foot setback from all property lines for the building and storage areas;
9. Site and development plan shall be submitted as per section 23.10. (Ord. No. 77-04, § 1, 12-21-76; Ord. No. 80-05, § 1, 4-22-80)

Section 5A.4. Area, density and lot width requirements.

A. *Single-family detached dwellings.*

1. Minimum lot area ten (10) acres.
2. Maximum possible gross density 0.10 (nonfarm) dwelling units, per acres, except duplexes, 0.20 dwelling units per acre.
3. Minimum lot width two hundred fifty (250) feet.

B. *All other uses.* No minimum lot areas are required subject to meeting minimum yard and coverage regulations. (Ord. No. 77-04, § 1, 12-21-76)

Section 5A.5. Coverage regulations.

All buildings including accessory buildings shall not cover more than fifteen per cent (15%) of the total lot area, and the minimum living space per unit shall not be less than four hundred forty (440) square feet. (Ord. No. 77-04, § 1, 12-21-76)

Section 5A.6. Yard regulations.

A. The following minimum building line setbacks measured from the property lines are required in yard areas listed below unless otherwise specified:

1. Front—Fifty (50) feet.
2. Side—Twenty-five (25) feet.
3. Rear—Fifty (50) feet.

B. Front setbacks from existing or planned centerlines of rights-of-way of public thoroughfares shall be required if the setbacks in A are less than the following:

1. Major and minor arterials—One hundred seventy-five (175) feet from the centerline.
2. Collector streets—Eighty-five (85) feet from the centerline.
3. Local streets—Seventy-five (75) feet from the centerline. (Ord. No. 77-04, § 1, 12-21-76)

Section 5A.7. Height regulations.

Building height, thirty-five (35) feet maximum; however, no dwelling shall be less than ten (10) feet in height. For exceptions see supplemental regulations, section 23.1. (Ord. No. 77-04, § 1, 12-21-76)

Section 5A.8. Off-street parking regulations.

A minimum of two (2) off-street parking spaces shall be provided per dwelling unit. Parking for other permitted or special exception uses shall be provided in accordance with the off-street parking regulations, Article XXII. (Ord. No. 77-04, § 1, 12-21-76)

ARTICLE VI-A. AR-1 AGRICULTURAL-RESIDENTIAL DISTRICT

Section 6A.1. Purpose.

The purpose of the AR-1 Agricultural-Residential Single-Family District is to allow the development of relatively large tracts of land to accommodate those individuals who desire a rural or estate type living environment; to curtail urban development in areas which lack facilities, until such time as those facilities are available; and to promote conservation or

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greenbelting of rural environments through limiting the intensity and types of residential development. (Ord. No. 77-04, § 1, 12-21-76)

Section 6A.2. Permitted uses.

A. *Principal uses.*

1. Commercial farming and agricultural activities such as citrus groves (as well as other fruits), forestry, plant nurseries, sheds, stables, barns, truck farms, fish pools, and other structures devoted to the on-site agricultural uses. In addition animal feed lots, hatching and raising of poultry, production of eggs, raising of livestock (hogs, horses, cattle, sheep, etc.) shall require minimum of five (5) acres and shall be required to maintain a one hundred-foot separation between dwellings existing on adjacent parcel of land at the time the commercial agricultural activity commenced. However, the required separation shall not be less than fifty (50) feet from any property line.
2. General farming pursuits of such extent as to supply the occupant's personal needs.
3. Dwellings: Single-family detached dwellings on individual lots.
4. Noncommercial boat slips, piers and houses, or private docking facilities with the approval of the various state and/or federal agencies where mandatory.
5. Maintaining livestock for the occupant's use or need only, not to exceed three (3) grazing animals per acre minimum exclusive of area required for other uses.
6. Swine shall be considered for the purpose of this section as grazing animals. However, they shall not exceed one per acre minimum exclusive of area required for other uses.
7. Maintaining small animals and fowl for the occupant's use or need only, not to exceed a ratio of twenty (20) per acre.

8. Public and quasi-public buildings and facilities; to include the following: County, state or federal structures and uses, churches, civic organizations, and schools.

B. *Accessory uses.*

1. Private garages and parking areas.
2. Private swimming pools and cabanas in accordance with supplemental regulations, section 23.5.
3. Signs in accordance with supplemental regulations, section 23.6.
4. Other accessory uses customarily incidental to a permitted principal use. (Ord. No. 77-04, § 1, 12-21-76)

Section 6A.3. Special exception uses.

A. Home occupations.

B. Day nurseries.

C. Public and private right-of-way for utilities.

D. Public and private substations for utilities.

E. Duplexes.

F. Public or private parks, playgrounds and recreation areas.

G. Golf courses, provided the clubhouse and other structures are located over one hundred fifty (150) feet from an abutting lot or parcel.

H. Private gun clubs and firing ranges shall be permitted on twenty-five-acre or larger tracts of land provided that the board of adjustment after due process can determine that it will not cause a nuisance or hazard to existing local land use activities.

I. Storage, and repair facilities for essential services.

J. Convalescent homes.

K. Aircraft landing fields, subject to approval by the Federal Aviation Administration and compliance with appropriate state laws.

L. Animal hospitals or veterinarian clinics, and dog kennels.

M. Travel trailer parks subject to the requirements set forth in the Supplemental Regulation, Section 23.16, and travel trailer or recreational vehicle subdivisions subject to the requirements set forth in the Supplemental Regulations, Section 23.16-A and the Pasco County Subdivision Ordinance. Lots within travel trailer and/or recreational vehicle subdivisions shall be utilized for temporary, seasonal occupancy only. In no event shall such lots be occupied as permanent residences.

N. Farm feed and supplies establishments. The following criteria and requirements shall apply to all farm feed and supplies establishments:

1. Feed for livestock, poultry and pets;
2. Animal health products;
3. Lawn and garden supplies;
4. Fertilizer, insecticides, pesticides;
5. Leather goods and tack;
6. Fence posts and supplies to be enclosed in an opaque buffer;
7. No equipment such as lawn mowers, tractors and accessories shall be stored or repaired on this site;
8. There shall be a minimum fifty-foot setback from all property lines for the building and storage areas;
9. Site and development plan shall be submitted as per section 23.10. (Ord. No. 77-04, § 1, 12-21-76; Ord. No. 80-05, § 1, 4-22-80; Ord. No. 84-05, § 2, 4-3-84)

Section 6A.4. Area, density and lot width requirements.

A. *Single-family detached dwellings.*

1. Minimum lot area one acre.
2. Maximum possible gross density one dwelling unit per acre, except duplexes, two (2) dwelling units per acre.
3. Minimum lot width one hundred fifty (150) feet.

B. *All other uses.* No minimum lot areas are required subject to meeting minimum yard and coverage regulations. (Ord. No. 77-04, § 1, 12-21-76)

Section 6A.5. Coverage regulations.

All buildings including accessory buildings shall not cover more than twenty-five per cent (25%) of the total lot area, and the minimum living space per unit shall not be less than four hundred forty (440) square feet. (Ord. No. 77-04, § 1, 12-21-76)

Section 6A.6. Yard regulations.

A. The following minimum building line setbacks measured from the property lines are required in yard areas listed below unless otherwise specified:

1. Front—Fifty (50) feet.
2. Side—Twenty-five (25) feet.
3. Rear—Fifty (50) feet.

B. Front setbacks from existing or planned rights-of-way of public thoroughfares shall be required if the setbacks in A are less than the following:

1. Major and minor arterials—One hundred seventy-five (175) feet from the centerline of right-of-way.
2. Collector streets—Eighty-five (85) feet from the centerline of right-of-way.
3. Local streets—Seventy-five (75) feet from the centerline of right-of-way. (Ord. No. 77-04, § 1, 12-21-76)

Section 6A.7. Height regulations.

Building height, thirty-five (35) feet maximum; however, no dwelling shall be less than ten (10) feet in height. For exceptions see supplemental regulations, section 23.1. (Ord. No. 77-04, § 1, 12-21-76)

Section 6A.8. Off-street parking regulations.

A minimum of two (2) off-street parking spaces shall be provided per dwelling unit. Parking for other permitted or

special exception uses shall be provided in accordance with the off-street parking regulations, Article XXII. (Ord. No. 77-04, § 1, 12-21-76)

ARTICLE XI. R-2 LOW DENSITY RESIDENTIAL DISTRICT

Section 11.1. Purpose.

The purpose of the R-2 Low Density Residential District is to provide for the orderly expansion of low density residential development in those areas where public services are most readily available; and to exclude uses not compatible with such low density residential development. Further, it is

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the purpose of the Low Density Residential District to provide areas for planned unit developments at densities and in a manner compatible with the low density residential development.

Section 11.2. Permitted uses.

(a) *Principal uses:*

- (1) Dwellings: Single-family detached dwellings.
- (2) Noncommercial boat slips, piers and houses or private docking facilities with the approval of the various state and/or federal agencies where mandatory.

(b) *Accessory uses:*

- (1) Private garages and parking areas.
- (2) Private swimming pools and cabanas in accordance with Supplemental Regulations, section 23.5.
- (3) Signs in accordance with Supplemental Regulations, section 23.6.
- (4) Other accessory uses customarily incidental to a permitted principal use.

Section 11.2.1. Conditional uses.

- (a) Residential treatment and care facilities subject to the provisions of sections 23.3 and 23.10 of this ordinance. (Ord. No. 85-02, § 8, 2-19-85)

Section 11.3. Special exception uses.

The following uses are permitted as special exceptions after compliance with all applicable requirements and approval of the board of adjustment:

- (A) Single-family cluster development subject to the requirements set forth in the Cluster Development Regulations in Article XXI.
- (B) Duplexes.

- (C) Home occupations.
- (D) Public or private utility, electrical, gas, telephone, water or sewage and railroad right-of-way.
- (E) Public or private utility substations, provided there be no storage of trucks or materials on the site.
- (F) Schools and day nurseries.
- (G) Public and private parks, playgrounds and recreation areas.

- (H) Churches and church schools.
- (I) Golf courses, provided the clubhouse and other structures are located over one hundred fifty (150) feet from an abutting lot or parcel.
- (J) Professional services such as medical, dental, legal, and engineering excluding the storage or parking of heavy equipment.
- (K) Accessory uses customarily incidental to a permitted special exception use upon approval of the board of adjustment.

Section 11.4. Area, density and lot width requirements.

(a) *Single-family detached dwellings:*

- (1) Minimum lot area, nine thousand five hundred (9,500) square feet.
- (2) Maximum possible gross density, four and six tenths (4.6) dwelling units per acre, except duplexes, nine and two tenths (9.2) dwelling units per acre.
- (3) Minimum lot width, eighty (80) feet.
- (4) Minimum lot depth, one hundred (100) feet.

(b) *Cluster development:*

- (1) Subject to the requirements set forth in the Cluster Development Regulations in Article XXI.

(c) *All other uses:* No minimum lot areas are required subject to meeting minimum yard coverage and off-street parking regulations.

Section 11.5. Coverage regulations.

All buildings including accessory buildings shall not cover more than thirty-five (35) per cent of the total lot area, and the minimum living space per unit shall not be less than one thousand (1,000) square feet.

Section 11.6. Yard regulations.

(A) The following minimum building line setbacks measured from the property lines are required in yard areas listed below unless otherwise specified:

(1) Front:

- (a) From major or minor arterials—Thirty-five (35) feet.
- (b) From collector or local street—Twenty-five (25) feet.

(2) Side—Ten (10) feet.

(3) Rear—Twenty-five (25) feet.

(B) Front setbacks from existing or planned centerlines or rights-of-way of public thoroughfares shall be required if the setbacks in (A) are less than the following:

- (1) Major and minor arterials—One hundred thirty-five (135) feet from centerline.
- (2) Collector streets—Sixty (60) feet from centerline.
- (3) Local streets—Fifty (50) feet from centerline.

Section 11.7. Height regulations.

Building height—Thirty-five (35) feet maximum; however, no dwelling shall be less than ten (10) feet in height. For exceptions see Supplemental Regulations, section 23.1.

Section 11.8. Off-street parking regulations.

A minimum of two (2) off-street parking spaces per dwelling unit shall be provided. Parking for other permitted or special exception uses shall be provided in accordance with the Off-Street Parking Regulations, Article XXII.

ARTICLE X. R-1 RURAL DENSITY RESIDENTIAL DISTRICT

Section 10.1. Purpose.

The purpose of the R-1 Rural Density Residential District is to serve as a transitional area between primarily agricultural areas and suburban development. Further it is the purpose of the Rural Density Residential District to allow for the development of low density planned unit developments of sufficient size to function as neighborhood units with all services and facilities necessary to this development form being supplied.

Section 10.2. Permitted uses.

(a) *Principal uses:*

- (1) Dwellings: Single-family detached dwellings.**

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(2) Noncommercial boat slips, piers and houses, or private docking facilities with the approval of the various state and/or federal agencies where mandatory.

(b) *Accessory uses:*

(1) Private garages and parking areas.

(2) Private swimming pools and cabanas in accordance with Supplemental Regulations, section 23.5.

(3) Signs in accordance with Supplemental Regulations, section 23.6.

(4) Other accessory uses customarily incidental to a permitted principal use.

Section 10.2.1. Conditional uses,

(a) Residential treatment and care facilities subject to the provisions of sections 23.3 and 23.10 of this ordinance. (Ord. No. 85-02, § 7, 2-19-85)

Section 10.3. Special exception uses.

(a) Single-family cluster developments subject to the requirements set forth in the Cluster Development Regulations in Article XXI.

(b) Duplexes.

(c) Home occupations.

(d) Public and private right-of-way for utilities.

(e) Public and private substations for utilities.

(f) Schools and day nursery.

(g) Public or private parks, playgrounds and recreation areas.

(h) Schools.

(i) Churches and church schools.

(j) Golf courses, provided the clubhouse and other structures are located over one hundred fifty (150) feet from an abutting lot or parcel.

(k) Professional services such as medical, dental, legal, and engineering excluding the storage or parking of heavy equipment.

(l) Accessory uses customarily incidental to a permitted special exception use upon approval by the board of adjustment.

Section 10.4. Area, density and lot width requirements.

(a) Single-family detached dwellings:

(1) Minimum lot area, twenty thousand (20,000) square feet.

(2) Maximum possible gross density, two (2) dwelling units per acre, except duplexes, four (4) dwelling units per acre.

(3) Minimum lot width, one hundred (100) feet.

(4) Minimum lot depth, one hundred fifty (150) feet.

(b) Cluster development:

(1) Subject to the requirements set forth in the Cluster Development Regulations in Article XXI.

(c) All other uses: No minimum lot areas required subject to meeting minimum yard and coverage regulations.

Section 10.5. Coverage regulations.

All buildings including accessory buildings shall not cover more than thirty-five (35) per cent of the total lot area, and the minimum living space per unit shall not be less than twelve hundred (1,200) square feet.

Section 10.6. Yard regulations.

(A) The following minimum building line setbacks measured from the property lines are required in yard areas listed below unless otherwise specified:

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(1) Front:

(a) From major and minor arterials—Fifty (50) feet.

(b) From collector or local streets—Thirty (30) feet.

(2) Side—Fifteen (15) feet.

(3) Rear—Forty (40) feet.

(B) Front setbacks from existing or planned centerlines of rights-of-way of public thoroughfares shall be required if the setbacks in (A) are less than the following:

(1) Major and minor arterials—One hundred fifty (150) feet from centerline.

(2) Collector streets—Sixty-five (65) feet from centerline.

(3) Local streets—Fifty-five (55) feet from centerline.

Section 10.7. Height regulations.

Building height—Thirty-five (35) feet maximum; however, no dwelling shall be less than ten (10) feet in height. For exceptions see Supplemental Regulations, section 23.1.

Section 10.8. Off-street parking regulations.

A minimum of two (2) off-street parking spaces per dwelling unit shall be provided. Parking for other permitted or special exception uses shall be provided in accordance with the Off-Street Parking Regulations, Article XXII.

ARTICLE XVII. C-1 NEIGHBORHOOD COMMERCIAL DISTRICT

Section 17.1. Purpose.

The purpose of the C-1 Neighborhood Commercial District is to provide and require a unified and organized arrangement of buildings, service and parking areas together with adequate circulation and open space, in a manner so as to provide and constitute an efficient, safe, convenient and attractive shopping area to serve neighborhood shopping needs.

Section 17.2. Permitted uses.

(A) *Principal uses:*

- (1) Retail sales for local or neighborhood needs to the following limited extent and when such business is conducted entirely within a building:
 - (a) The sale of baked goods and pastries, candy and confectioneries, dairy and ice cream, groceries and meats, fruit and vegetables.
 - (b) The sale of books, magazines, newspapers, tobacco, drugs, gifts and stationary.
 - (c) Eating places, lunchrooms, restaurants and cafeterias and places for the sale and consumption of soft drinks, juices and ice cream, but excluding places providing dancing or entertainment.
 - (d) Service establishments including barber and beauty shops, custom tailor shops, laundry agencies, self-service laundries, shoe repair, dry cleaning, pressing or tailoring shops and florist retail outlets in which only non-

explosive and noninflammable solvents and materials are used and where no work is done on the premises for retail outlets elsewhere.

- (2) Financial institutions and professional offices provided such uses are intended to serve primarily the adjacent residential areas.
 - (3) Public service facilities such as police and fire stations.
 - (4) Essential service installations (as defined in this zoning ordinance) essential to the adequate distribution of service, provided it shall not include a business facility, repair facility, storage of materials outside a structure, storage of a vehicle or housing or quarters for an installation or repair crew. The installation shall be subject to approval by the board of adjustment with respect to use, design, yard area, setback and height.
 - (5) Parking lots and parking garages.
 - (6) Medical, veterinary, dental, photographic or similar laboratories, and clinics or hospitals.
 - (7) Other uses which are similar or compatible to the permitted uses.
 - (8) Residential treatment and care facilities subject to the provisions of sections 23.3 and 23.10 of this ordinance.
 - (9) Multifamily dwelling when located above at least one (1) story of C-1, commercial uses and subject to the minimum living space per unit and parking requirements, and density limitations applicable to the MF-1 zoning district.
- (B) *Accessory uses:*
- (1) Accessory uses customarily incidental to a permitted principal use.
 - (2) Signs in accordance with Supplemental Regulations, section 23.6. (Ord. No. 85-02, § 3, 2-19-85; Ord. No. 86-12, § 2, 3-4-86)

Section 17.2.1. Conditional uses.

(A) The sale or consumption of alcoholic beverages within alcoholic beverage business establishments as defined in this ordinance and as permitted under county, state and federal regulations provided:

- (1) No such sale or consumption of alcoholic beverages may occur or be conducted within one thousand (1,000) feet of any school, church, place of worship, or public park, as measured from the structure used as a proprietor's place of business to the nearest property line of the school, church, place of worship, or public park.
- (2) The sale or consumption of alcoholic beverages complies with conditional use standards set forth in section 25.3(A)(3) of this ordinance and has been approved by the Pasco County board of county commissioners in accordance with said section.
- (3) The premises or building in which the alcoholic beverage sales or consumption are to be conducted or occur shall not be used as an adult entertainment establishment. (Ord. No. 79-09, § 2, 8-7-79; Ord. No. 80-32, § 3, 11-4-80; Ord. No. 85-10, § 2, 6-11-85)

Section 17.3. Special exception uses.

(A) Vehicle service stations, repair garages and washing uses provided:

- (a) No structure principal or accessory is located closer than thirty (30) feet to a residential district.
- (b) No street entrance or exit for vehicles and no portion or equipment of such service station or other drive-in uses shall be located:
 - (1) Within two hundred (200) feet of a street entrance or exit of any school, park or playground conducted for and attended by children.
 - (2) Within one hundred (100) feet of any hospital, church or library.

(3) Within seventy-five (75) feet of a lot in a residential district as established in this zoning ordinance.

(B) Public buildings and public utility facilities; to include the following: County, state or federal structures and uses, churches, civic organizations, and schools.

(C) Establishments providing dancing or entertainment.

(D) Fraternal clubs, lodges, and social and recreational clubs.

(E) Animal hospital or veterinary clinic provided that any such use shall be conducted wholly within a completely enclosed building; except for fenced kennel areas and further provided that no such use shall be located closer than one thousand five hundred (1,500) feet to a residential district. The boarding of animals shall be prohibited except where necessary for treatment.

(F) Public utility substations and relay facilities, and other conforming uses which do not cause an undue nuisance or adversely affect existing structures, uses and residents.

(G) One single-family unit which is accessory to a permitted commercial use in C-1 and located on the same lot.

(H) Adult entertainment establishments provided:

- (1) No such establishment may be located within one thousand (1,000) feet of any school, church, house of worship or public recreational area.
- (2) No such establishment may be located within one thousand (1,000) feet of any other adult entertainment establishment, bar, hotel or motel.
- (3) No such establishment may be located within one thousand (1,000) feet of any area zoned AR, AR-1, AR-5, ER, ER-2, R-MH, R-1MH, R-1, R-2, R-3, R-4, MF-1, MF-2 or PUD.
- (4) Advertisements and displays which depict "specified sexual activities" or "specified anatomical areas" shall not be visible from any point outside the property boundaries.

- (5) No alcoholic beverages, including beer or wine, are served and/or consumed on premises.
- (6) All films or live performances involving "specified sexual activities" or the exposure of "specified anatomical areas" must take place within enclosed buildings, and live performers must remain at least three (3) feet away from customers or patrons at all times while performing within such a building.
- (I) Mini-warehousing and storage units:
 - (1) The development shall be limited to dead storage only and excludes sales and offices.
 - (2) A landscaped strip, twenty (20) feet in width, shall be provided along all street frontages and along borders where subject property abuts any residential zoning district.
 - (3) Fencing shall be required around the perimeter of the project; minimum six (6) feet in height, either decorative concrete block or chain-link fence with slats.
 - (4) All outdoor storage yards shall be screened from view of surrounding properties.
 - (5) One (1) office space and living quarters for a manager shall be permitted.
 - (6) The complete development plan shall also be submitted as per section 23.10. (Ord. No. 77-12, §2, 3-1-77; Ord. No. 79-09, § 3, 1-9-80; Ord. No. 80-06, § I, 4-22-80; Ord. No. 80-32, § 4, 11-4-80; Ord. No. 86-12, § 1, 3-4-86)

Section 17.4. Area and lot width regulations.

(a) Neighborhood commercial stores:

- (1) Minimum lot area, ten thousand (10,000) square feet.
- (2) Minimum lot width, one hundred (100) feet.

(b) Site development plan shall be provided for all commercial buildings in accordance with Supplemental Regulations, section 23.10. (Ord. No. 86-03. § 2, 2-18-86)

Section 17.5. Coverage regulations.

(a) *Lot coverage*: All buildings, including accessory buildings shall not cover more than fifty (50) per cent of one (1) lot.

(b) *Landscape area*: The minimum landscape area shall not be less than ten (10) per cent of the total lot area.

Section 17.6. Yard regulations.

(A) The following minimum building line setbacks measured from the property lines are required in yard areas listed below unless otherwise specified:

(1) Front:

(a) From major or minor arterial—Fifty (50) feet.

(b) From collector or local street—Thirty (30) feet.

(2) Side—A side depth of thirty (30) feet per side from residential districts, no side yard shall be required where two (2) or more commercial districts or an industrial and commercial district adjoin side by side; however, in no case shall common walls be permitted between properties of separate ownership. In the case of such a series of adjoining structures on lots of single and separate ownership abutting and paralleling a public right-of-way, a passage of at least twenty (20) feet in width shall be provided at grade levels at intervals not more than four hundred (400) feet apart where required for public access from adjacent residential areas or for the safety of the public.

(3) Rear—Twenty-five (25) feet. (Ord. No. 86-04, § 2, 2-18-86; Ord. No. 86-14, § 1, 3-19-86)

Section 17.7. Height regulations.

The maximum building height for commercial uses shall be thirty-five (35) feet maximum. (Ord. No. 86-07, § 1, 2-18-86)

Section 17.8. Off-street parking regulations.

Parking shall be supplied in accordance with the Off-Street Parking Regulations, Article XXII.

Section 17.9. Buffer requirements.

Buffering shall be required in accordance with the supplemental regulations, section 23.3.

ARTICLE XIV. MF-1 MULTIPLE-FAMILY MEDIUM DENSITY DISTRICT

Section 14.1. Purpose.

The purpose of the MF-1 Multiple-Family Medium Density District is to provide for medium density family residential areas with adequate open areas where it is desirable to encourage such type of development. Because of the higher than average concentrations of persons and vehicles, this district is situated where it can properly be served by public and commercial services and have convenient access to thoroughfares and collector streets. Site area requirements reflect the relative need for open space of the various types of residences based on expected density of use.

Section 14.2. Permitted uses.

(a) *Principal uses:*

- (1) Multi-family dwellings.**

(b) *Accessory uses:*

- (1) Private garages and parking areas.**
- (2) Private swimming pools and cabanas in accordance with Supplemental Regulations, section 23.5.**
- (3) Signs in accordance with Supplemental Regulations, section 23.6.**
- (4) Other accessory uses customarily incidental to a permitted principal use.**

Section 14.2.1. Conditional uses.

- (a) Residential treatment and care facilities subject to the provisions of sections 23.3 and 23.10 of this ordinance. (Ord. No. 85-02, § 11, 2-19-85)**

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Section 14.3. Special exception uses.

The following uses are permitted as special exceptions after compliance with all applicable requirements and approval of the board of adjustment:

- (a) Public and private utility right-of-way.
- (b) Public and private utility substations.
- (c) Schools.
- (d) Marinas.
- (e) Public and private parks, playgrounds and recreation areas.
- (f) Churches.
- (g) Golf courses.
- (h) Cemeteries.
- (i) Hospitals, clinics, restoriums, governmental buildings and private clubhouses.
- (j) Professional services such as medical, dental, legal and engineering excluding the parking and storage of heavy equipment.
- (k) Accessory uses customarily incidental to a permitted special exception use upon approval by the board of adjustment.

Section 14.4. Area, density and lot width requirements.

- (a) *Two-family or duplex dwellings:*

(1) Minimum lot area, nine thousand (9,000) square feet per two-unit structure.

(2) Minimum lot width, eighty (80) feet.

(3) Minimum lot depth, one hundred (100) feet.

(b) *Other multiple family:*

(1) Minimum lot area, fifteen thousand (15,000) square feet.

(2) Minimum lot width, one hundred (100) feet.

(3) Minimum lot depth, one hundred (100) feet.

(c) *All other uses (including townhouses):* No minimum lot area are required subject to meeting minimum yard, coverage and off-street parking regulations.

(d) *Maximum possible gross density,* twelve (12) dwelling units per acre.

(e) *Site development plan* shall be provided for all multiple-family areas in accordance with Supplemental Regulations, section 23.12.

Section 14.5. Coverage regulations.

All buildings including accessory buildings shall not cover more than forty (40) percent of the total lot area. The minimum living space per unit shall be two hundred and fifty (250) square feet provided that the average minimum living space per unit of all units within the entire project shall not be less than five hundred (500) square feet. (Ord. No. 85-09, § 1, 5-7-85)

Section 14.6. Yard regulations.

(A) *Two-family, triplex and quadraplex.*

(1) The following minimum building line setbacks measured from the property lines are required in yard areas listed below unless otherwise specified:

(a) *Front:*

1. From major or minor arterials—Thirty-five (35) feet.

2. From collector or local street—Twenty-five (25) feet.
 - (b) Side—Ten (10) feet.
 - (c) Rear—Twenty (20) feet.
- (2) Front setbacks from existing or planned centerlines of rights-of-way of public thoroughfares shall be required if the setbacks in (1) are less than the following:
 - (a) Major and minor arterials—One hundred thirty-five (135) feet from centerline.
 - (b) Collector streets—Sixty (60) feet from centerline.
 - (c) Local streets—Fifty (50) feet from centerline.
- (B) Multiple family, townhouses and all nonresidential uses:
 - (1) The following minimum building line setbacks measured from the property lines are required in yard areas listed below unless otherwise specified:
 - (a) Front:
 1. From major or minor arterial—Thirty-five (35) feet.
 2. From collector or local street—Twenty-five (25) feet.
 - (b) Side—Ten (10) feet.
 - (c) Rear—Twenty (20) feet.
 - (2) Front setbacks from existing or planned centerlines of rights-of-way of public thoroughfares shall be required if the setbacks in (1) are less than the following:
 - (a) Major and minor arterials—One hundred thirty-five (135) feet from centerline.
 - (b) Collector streets—Sixty (60) feet from the centerline.
 - (c) Local streets—Fifty (50) feet from centerline.
- (C) All structures shall be separated by not less than fifteen (15) feet.

Section 14.7. Building height regulations.

Building height—Forty-five (45) feet maximum, but not to exceed three (3) stories. For exceptions see Supplemental Supp. No. 42

Regulations, section 23.1. No dwelling shall be less than ten (10) feet in height.

Section 14.8. Off-street parking regulations.

A minimum of one and one-half (1½) off-street parking spaces per dwelling unit shall be provided. Parking for other permitted or special exception uses shall be provided in accordance with the Off-Street Parking Regulations, Article XXII. (Ord. No. 85-09, § 2, 5-7-85)

Section 14.9. Guarantee of completion prior to occupancy.

Before an occupancy permit as required by Pasco County Ordinance 73-23 for any structure is issued, the board of county commissioners shall require the completion of all utilities, roads, and drainage improvements for that particular structure. The appropriate department head shall certify that the necessary utilities and improvements are complete before an occupancy permit is issued.

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**ARTICLE XVI. PLANNED UNIT DEVELOPMENT
DISTRICT**

Section 16.1. Purpose.

The purposes of the planned Unit Development District are:

- (a) To encourage innovations in residential development and renewal so that the growing demand for housing

in Pasco County may be met by greater variety in type, design and layout of dwellings and by the conversion and more efficient use of open space and recreational areas;

- (b) To provide greater opportunities for better housing and recreation for all who are or will be residents of the county;
- (c) To encourage a more efficient use of land and public services and to reflect changes in the technology of land development so that the economies so secured may inure to the benefit of those who need homes;
- (d) To encourage more flexible land development which will respect and conserve natural resources such as streams, lakes, floodplains, groundwater, wooded areas, steeply sloped areas, and areas of unusual beauty or importance to the natural ecosystem;
- (e) And, in aid of these purposes, to provide a procedure which can relate the type, design and layout of residential development to the particular site and the particular demand for housing existing at the time of development in a manner consistent with the preservation of the property values within existing residential areas, and to assure that the increased flexibility of regulations over land development established hereby is carried out pursuant to sound, expeditious and fair administrative standards and procedures;
- (f) To encourage more efficient, flexible and controlled industrial, commercial and other development under the planned unit development concept. (Ord. No. 80-11, § 1, 7-22-80)

Section 16.2. Eligibility.

An application for a planned unit development rezoning shall not be approved unless the following conditions are met:

- (a) The tract proposed for said development can be served adequately and economically by the county or

developer with public facilities and services as are necessary for the health, safety and welfare of the residents.

- (b) The proposed development is found by the Pasco County Board of County Commissioners to be consistent with the county and other acceptable regional comprehensive plans. (Ord. No. 80-11, § 1, 7-22-80)

Section 16.2.1. Planned unit development standards and definition.

A large-scale project constructed by a single owner or group of owners acting jointly and involving a related group of uses planned, developed and regulated as an entity. Such developments can be compactly arranged individual and/or multifamily dwelling units grouped in or around common open spaces, together with public and semipublic uses and recreation facilities provided they are functionally integrated so that the character of the development conforms to the purpose and intent of this zoning ordinance. Such developments shall include the necessary covenants or other legal provisions and financial programs as will ensure conformity to achievements of the comprehensive development plan.

- (a) *Usable open space*: An area devoted to outdoor recreational space greenery and/or services for household activities which are normally carried on outdoors. The area is accessible and available to all occupants of the dwellings. It does not include streets or roadways open to vehicular traffic or individual parking spaces or loading space.
- (b) *Common areas*: The land areas set aside for joint recreational (active or passive), aesthetic or density requirement purposes.
- (c) *Total developed area*: The total acreage of the planned unit development.
- (d) *Net land area*: The total acreage of the planned unit development, including both common areas and

developable lots minus street right-of-way and utility easements.

- (e) *Net lot area*: The net land area divided by the total number of lots developed.
- (f) *Average lot area*: The actual size of the building lot, calculated by subtracting the street rights-of-way, utility easements and common areas from the total developed area, then dividing this remainder into the total number of lots to be developed. (Ord. No. 80-11, § 1, 7-22-80)

Section 16.3. Permitted uses.

The following uses shall be permitted individually, or in combination, in a planned unit development district:

- (a) Single-family dwellings.
- (b) Multiple-family dwellings.
- (c) Parks, playgrounds, schools, churches, and other related community facilities.
- (d) Appurtenant personal service centers which are defined for this section as establishments which provide personal services primarily to the residents of the planned unit development, such as barbershops, beauty parlors, laundry or cleaning stores and shoe repair.
- (e) Appurtenant retail convenience centers which are defined for this section as neighborhood establishments which sell goods and products primarily to the residents of the planned unit development.
- (f) Marinas which provide launching, docking, wet storage of boats.
- (g) Recreational facilities and structures.
- (h) Golf courses, which may be calculated as recreational open space as is hereinafter required, provided the clubhouse and other structures are located over one hundred fifty (150) feet from any dwelling structure.

- (i) Professional services such as medical, dental, legal and engineering excluding the parking and storage of heavy equipment.
- (j) Public or private utility substation, lift station and other accessory uses, provided there is no open storage of trucks or materials on the site.
- (k) Light industrial provided that the industrial site is a minimum of forty (40) acres in size. (Ord. No. 80-11, § 1, 7-22-80)

Section 16.4. Development standards.

(A) Density and area requirements for residential planned unit developments.

- (1) The general allowable gross density for a planned unit development should be that applicable to the specific district in which the proposed planned unit development is located. In those cases where a planned unit development is located in more than one district, the district which comprises the largest area within the proposed planned unit development site shall be considered as the specified district for purposes of density. Any plan that does not propose to increase the number of dwelling units per acre otherwise permitted on the property under the regulations shall be prima facie qualified for preliminary approval insofar as intensity of use is concerned. Fifty (50) per cent of water areas within a planned unit residential development may count as land area in calculating the number of dwelling units per acre, but in no case shall counted water area exceed twenty-five (25) per cent of the total site area. A plan may provide for a greater number of dwelling units per acre than would be permitted by the regulations otherwise applicable to the site, but if the density or intensity of land use exceeds by more than twenty-five (25) per cent that permitted by the regulations otherwise applicable to the site, the landowner has the burden to show that such excess

will not have an undue and adverse impact on existing public facilities, on the reasonable enjoyment of neighboring property, and on the health, safety and welfare of the future residents of the project. However, the maximum allowable gross density for any planned unit development shall not exceed eight (8) units per acre. The board, in determining the reasonableness of the increase in the authorized dwelling units per acre, may recognize that increased density may be compensated for by additional, private amenities and by increased efficiency in public services to be achieved by:

- (a) The amount, location and proposed use of common open space, and
- (b) The location, design and type of dwelling units.

The board shall, in its determination, also consider that the physical characteristics of the area make increased densities appropriate in the particular location.

- (2) The amount and location of common open space shall be consistent with the declared function of the common open space as set forth in the application for a planned unit residential development, and there shall be such provisions for the ownership and maintenance of the common open space as reasonable to insure its continuity and conservation. In the event that the common open space is permitted to deteriorate or is not maintained in a condition consistent with the best interests of the entire county then and in such event the county shall take those remedial steps as provided for in section 8.5 of the Pasco County Subdivision Ordinance.
- (3) The plan shall contain such proposed covenants, easements and other provisions relating to the bulk, location and density of such residential units, nonresidential uses and public facilities as are necessary for the welfare of the planned unit residential development and are not inconsistent with

the best interests of the entire county. Said covenants, easements and other provisions, if part of the plan as finally approved, may be modified, removed or revised only after an additional review by the zoning administrator.

- (4) No more than five (5) per cent of the total gross acreage of the site plan shall be allowed for commercial development unless a market analysis shows to the satisfaction of the official reviewing agencies that additional commercial development would be needed to serve the local residents of the area.

- (5) The minimum site area for a planned unit development shall be thirty (30) acres.

(B) Design, bulk and location standards:

(1) Site design:

- (a) All sites shall be designed with regard to the topography and natural features of the site.
- (b) Variations in setbacks shall be allowed for housing types other than single-family detached except where cluster-type designs are used.
- (c) Land uses near the periphery of the planned unit development shall be planned so as to be compatible with neighboring areas.

(2) Living area requirements:

- (a) The minimum living space per unit shall not be less than that required in the specific district.

(3) Tree conservation and erosion control:

- (a) Existing trees shall be preserved in accordance with Pasco County's Tree Ordinance (73-27).
- (b) The development shall be designed and programmed so as to minimize earthmoving, erosion, tree clearance and the destruction of natural amenities.

(4) Streets:

- (a) Public dedicated streets shall be designed in accordance with Pasco County's Subdivision Ordinance (74-09).**
- (b) Variances or variations from the standards for the construction of streets set forth in the Pasco County Subdivision Ordinance may be reviewed by the board of county commissioners and the planning commission during the public hearing held on any application for planned unit development zoning. The variance procedures requiring notice to adjacent property owners, as set forth in the Pasco County Subdivision Ordinance, need not be followed, where the planned unit development application is before the board of county commissioners as part of a public hearing. When such variations from the subdivision ordinance are considered by the board at a PUD public hearing, it shall not be necessary for a formal variance application to be filed under the Pasco County Subdivision Ordinance. Such variance may be requested as part of the application for PUD zoning.**

(5) Parking:

- (a) There shall be two (2) off-street parking spaces for each dwelling unit provided in compliance with the Off-Street Parking Regulations, Article XXI, and the further requirements below.**
- (b) Parking for commercial uses shall be provided as required in the Off-Street Parking Regulations, Article XXII.**
- (c) Parking lots shall be arranged so as to prevent through traffic to other parking lots.**
- (d) A parking plan will be required for all parking areas other than residential areas. All parking lots shall be landscaped in accordance with Supplemental Regulations, section 23.5.**

(6) Lighting:

- (a) All off-street parking lots shall be adequately lighted. All such lighting shall be arranged so as to direct light away from adjoining residences.

(7) Street signs and street lighting:

- (a) All streets and areas of high pedestrian use shall be adequately lighted, according to modern recommended street light engineering standards.
- (b) The character, size and shape of all outdoor signs shall be in conformity with the provisions of the residential district in which the planned unit development was rezoned. Signs for commercial uses shall conform to the requirements for signs in the C-1 Neighborhood Commercial District.

(8) Supplemental nonresidential facilities:

- (a) Shopping areas and recreational facilities within a planned unit development shall be located so as to minimize noise and traffic and to ensure compatibility with nearby residential areas.
- (b) Refuse stations and sewage treatment facilities shall be designed with suitable screening and located where convenient for trash removal, and not offensive to nearby residential areas.
- (c) Adequate lighting shall be provided as per plans approved by the appropriate utility company and the county engineer for outdoor areas used after dark. Approved lighting fixtures must be provided for walkways, to identify steps, ramps, and signs. Lighting shall be designed and located so as not to shine directly into nearby residences.
- (d) Industrial uses shall comply with the standards set forth in sections 19.3, 19.4, 19.6, 19.7, 19.8 and 19.9 of the Pasco County Zoning Ordinance.

(9) Utilities:

- (a)** Underground utilities will be encouraged where possible. (Ord. No. 80-11, § 1, 7-22-80; Ord. No. 82-31, § 1, 12-21-82)

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cleaning, pressing or tailoring shops and florist retail outlets in which only nonexplosive and noninflammable solvents and materials are used and where no work is done on the premises for retail outlets elsewhere.

- (2) Financial institutions and professional offices provided such uses are intended to serve primarily the adjacent residential areas.
- (3) Public service facilities such as police and fire stations.
- (4) Essential service installations (as defined in this zoning ordinance) essential to the adequate distribution of service, provided it shall not include a business facility, repair facility, storage of materials outside a structure, storage of a vehicle or housing or quarters for an installation or repair crew. The installation shall be subject to approval by the board of adjustment with respect to use, design, yard area, setback and height.
- (5) Parking lots and parking garages.
- (6) Medical, veterinary, dental, photographic or similar laboratories, and clinics or hospitals.
- (7) Other uses which are similar or compatible to the permitted uses.

(B) *Accessory uses:*

- (1) Accessory uses customarily incidental to a permitted principal use.
- (2) Signs in accordance with Supplemental Regulations, section 23.8.

Section 17.2.1. Conditional uses.

(A) Alcoholic beverage sales as permitted under county, state and federal regulations provided:

- (1) No such sale of alcoholic beverages may occur or be conducted within one thousand (1,000) feet of any

plan presented for review constitutes a substantial change to the original master PUD approval. If the zoning officer determines that such a substantial change exists, he shall inform the board of county commissioners by memorandum to the board. If the board of county commissioners determines, based upon such memorandum, that a substantial change exists, it shall initiate appropriate notice and hearing for the purpose of reviewing and taking action upon such change. (Ord. No. 80-11, § 1, 7-22-80; Ord. No. 81-05, § 2, 3-3-81)

Section 16.13. Grandfather clause.

All properties labeled planned unit development and placed in the PUD District on the official zoning map at the time of adoption of this ordinance shall be classified under this article according to the density indicated on the plans previously approved by the board of county commissioners and filed in the Pasco County clerk of the circuit court's office as of the date of adoption of this section. Those residential developments of regional impact which have

which case, the commission shall be deemed to have recommended denial. In the event the landowner does not, within said period, notify the planning commission of his refusal to accept all said conditions, the approval, with all said conditions, shall stand as recommended. (Ord. No. 80-11, § 1, 7-22-80)

Section 16.10. Status of plan after tentative approval.

Recommended approval of an application by the planning commission shall not qualify a plan of the planned unit development for recording nor authorize development or the issuance of any building permits. (Ord. No. 80-11, § 1, 7-22-80)

Section 16.11. Findings of board after hearing.

The board of county commissioners upon receipt of the recommendation of the planning commission shall hold a public hearing with due process in accordance with section 25.2 of this ordinance. Said public hearing shall be held at the next regular meeting of the board scheduled after receipt of the planning commissions' recommendations. The board shall make a determination with regard to the application within thirty (30) days of the date of the public hearing. Where approval has been granted, the same shall be noted on the zoning map maintained in the office of the zoning administrator. In the event that a plan, or section thereof, is given final approval and thereafter the landowner shall abandon part or all of said plan and shall so notify the board in writing or shall fail to commence the planned unit residential development within a three-year period of time after preliminary approval has been granted, the area given preliminary approval shall revert to its original zoning classification status at the time the original approval was granted. For the purposes of this ordinance, the notation of the planning commission's recommendation on the staff report shall be sufficient to satisfy the requirements of a planning commission recommendation as set forth above. If any conditions are imposed by the planning commission,

procedures and substantive requirements of this ordinance, the master PUD plan approval, and the conditions imposed upon the master PUD approval shall constitute development regulations on the land and shall be binding upon the successors in interest to the applicant unless such approval is revoked or otherwise modified by the board of county commissioners. (Ord. No. 80-11, § 1, 7-22-80; Ord. No. 81-05, § 1, 3-3-81)

Section 16.6. Standards for location and management of open space.

(a) The open space shall be located so as to be consistent with the objectives set forth in the application for the planned unit development. Where possible, it shall be designed as a contiguous area easily accessible to the residents, and preserving natural features.

(b) There shall be provisions which insure that the open space land shall continue as such and be properly maintained. The developer shall either (a) dedicate such land to public use if the county or another public agency had indicated it will accept such dedication, (b) retain ownership and responsibility for maintenance of such open space land, or (c) provide for and establish one (1) or more organizations for the ownership and maintenance of all common open space. In the case of (c) above, each organization shall be a nonprofit homeowners corporation, unless the developer demonstrates that a community open space trust is a more appropriate form of organization.

(c) All requirements for the location and management of open space shall be in accordance with section 8.5 of the Pasco County Subdivision Ordinance. (Ord. No. 80-11, § 1, 7-22-80)

Section 16.7. Application for zoning approval.

(a) The application for zoning approval shall include a preliminary plan for the area covered by the application.

Pasco County Subdivision Ordinance [appendix B]. Other proposed development shall comply with the review and informational requirements of section 23.10 of the Pasco County Zoning Ordinance pertaining to detailed site plans. As minimum requirements, such preliminary plans or site plans shall include:

- c. Enclosed boundary survey of the total site; enclosed boundary survey of the phase to be developed within the total site and of all lands to be held as open space or community facilities.
- d. Location of all buildings, structures, parking spaces, roads, paths and walks, drainage facilities, landscaping, easements, streetlights and signs, hydrants and other fire control equipment and all other features to be provided on the ground surface of the site.
- e. Floor elevations for all buildings and structures for both residential and nonresidential use.
- f. The location of all underground utilities and their appurtenances.
- g. Existing and proposed contours at a minimum of two-foot intervals and the limit of clearing and grading of all lands to be cleared.

Any site or preliminary plan for any phase of, increment of, or for the entire PUD site shall be consistent with and conform to the conditions of approval set forth in the master PUD plan approval in addition to all other requirements imposed by relevant county ordinances and regulations governing the development of land and construction of buildings and structures. Further, if a preliminary plan or site plan for fifteen (15) per cent of the total area subject to master PUD plan approval is not submitted within a three-year period after such approval, the board may void such approval, after appropriate notice and hearing, and initiate proceedings to

- (8) The adequacy of useful open space to serve the proposed PUD site and phases or increments thereof;
- (9) The timing or sequence of phasing for purposes of assuring the adequacy of available improvements and facilities, both public and private.

Conditions imposed upon an approved master PUD plan shall constitute the standards and guidelines against which the development of the PUD site, or any increment or phase thereof, shall be reviewed.

- (d) *Master PUD plan approval procedures:* After the applicant has filed his proposed master PUD plan, and the appropriate reviewing staff has prepared recommendations, proposed findings, and proposed conditions for approval (if applicable), the following procedures shall be employed in obtaining final action by the board of county commissioners:

- (1) The provisions of sections 16.8 and 16.9 of the Pasco County Zoning Ordinance, providing for a hearing and recommendation by the planning commission, shall be followed. The recommendation of the planning commission shall maintain the same status as set forth in section 16.10 of that ordinance.
- (2) After the completion of the planning commission hearing and recommendation process, the board of county commissioners shall hold a public hearing in a manner set forth in section 16.11 of the Pasco County Zoning Ordinance.
- (3) In the final written action taken by the board of county commissioners with regard to the application for master PUD plan approval, the board may impose conditions, as authorized in subparagraphs (b) and (c) above.

- (e) *Effect of master PUD plan approval:* If a master PUD plan is recommended for approval, and the board of county commissioners concurs with such recommendation, a written master development plan approval

nance [appendix B], as adopted by reference in the provisions of section 16.7 of this ordinance.

(b) *Reviewing staff authority:* The appropriate county staff shall review all information submitted in a master PUD plan and:

- (1) Evaluate the impact of the proposed development upon public improvements, surrounding land uses in the neighborhood and subregion, and significant environmental features in the surrounding neighborhood and subregion;
- (2) Determine the degree to which the proposed development is consistent with adopted comprehensive plans or elements thereof;
- (3) Determine the adequacy of the existing public services and facilities serving the proposed development, including transportation systems, utilities, fire and police protection;
- (4) Determine the potential expansion of such public services and facilities necessary to accommodate the proposed development.

Based upon its evaluation of the factors set forth above, the county staff shall prepare a recommendation of approval or denial, recommended findings, and suggest conditions which should be imposed upon a proposed master PUD plan, or increment thereof, recommended for approval in accordance with the factors and criteria set forth in subparagraph (c) below.

(c) *Conditions of approval:* May be imposed upon any approved master PUD plan. Such conditions shall be recommended for the purposes of assuring consistency with adopted comprehensive plans or elements thereof; offsetting or minimizing impacts upon public improvements, surrounding land uses, and significant environmental features; and assuring the adequacy of public services and facilities which will specifically serve the proposed PUD development. Such conditions may relate to:

ARTICLE VIII. R-MH MOBILE HOME DISTRICT

Section 8.1. Purpose.

The purpose of an R-MH Mobile Home District is to provide for the development of areas for individual mobile homes, parks and subdivisions for residents desiring the unique environments characteristic of mobile living. Further it is the purpose of this district to provide for these areas the community services necessary for their orderly development.

Section 8.2. Definition.

Those areas developed under single ownership for purposes of rental shall be considered mobile home parks and shall be subject to minimum site requirements. Individual lots or parcels which are developed for the purpose of sales shall be considered individual sites unless they are divided into three (3) parcels or more in which case they become subdivisions.

Section 8.3. Establishment procedure.

New or revised mobile home subdivisions shall be required to comply with all provisions of the Pasco County Subdivision Regulations. Developers of mobile home parks shall file an application using the appropriate zoning amendment form supplemented with a legal description of the property to be included, a sketch plan showing the intended overall development plan, a description of the means by which the open space restrictions shall be applied, and a description of the manner in which water and sewer facilities shall be provided.

The zoning administrator after receipt of the application shall submit said application to the development review committee for review and comment.

The committee shall have thirty (30) days to review and comment on the site plan unless it is determined that supplemental information is necessary in which case they shall have thirty (30) days from time of receipt of such supplemental information to present said review and comments.

After receipt of the committee review the zoning administrator shall take the appropriate action, based on the application's conformance to the stated objectives and regulations of this ordinance. The applicant shall be notified in writing of the administrator's action and in the case of rejection shall be notified of the reasons for said rejections. The de-

cision of the administrator may be appealed by the applicant or a group of local residents through the procedure provided in paragraph 163.250 of the Florida Interlocal Cooperation Act of 1969.

Section 8.4. Permitted uses.

Upon designation of an area for use as a mobile home park or subdivision, the following permitted uses shall be allowed: Mobile homes and accessory or support facilities customarily incidental to the operation of the facility. This would include such things as laundry facilities to serve the residents, recreational facilities, and maintenance facilities (completely contained in enclosed structures), necessary to serve the facility.

Section 8.5. Development standards for district.

Mobile home parks and subdivisions may be developed as permitted by this district and in accordance with the following requirements:

(A) R-MH Urban District:

- (1) Minimum site area of ten (10) acres.
- (2) Minimum lot area of four thousand (4,000) square feet
- (3) Maximum possible gross density eight and eight-tenths (8.8) dwelling units per acre.
- (4) Mobile homes shall be separated from each other and other structures by at least fifteen (15) feet.
- (5) (a) A setback of fifteen (15) feet in width from all property lines of parcels of different use except for public streets shall be provided and maintained in each mobile home park. Such setback shall not be considered to be part of an abutting mobile home space nor shall said setback be used as part of the recreation area.

(b) Front setbacks from existing or planned centerlines of rights-of-way of public thoroughfares shall be required if the setbacks in (a) are less than the following:

1. Major and minor arterials—One hundred forty-five (145) feet from the centerline.
2. Collector streets—Seventy (70) feet from the centerline.
3. Local streets—Forty-five (45) feet from the centerline.

(B) The development of recreational and open space areas shall be in accordance with the requirements established in the Pasco County Subdivision regulations, however, in no case shall any part of such recreation area be less than ten thousand (10,000) square feet.

(C) Each mobile home shall have a living area of at least four hundred forty (440) square feet.

Section 8.6. Park streets and roads.

Roadways or streets within a mobile home park may be private but the following requirements shall apply:

- (a) Internal collector streets shall be thirty (30) feet in width, with a minimum of twenty-four (24) feet of paved surface.
- (b) Internal minor streets shall be twenty-five (25) feet in width, with a minimum of twenty (20) feet of paved surface.

Section 8.7. Buffering requirements.

Buffering shall be required in accordance with the Supplemental Regulations, section 23.5.

Section 8.8. Site and development plan.

A site and development plan shall be required in accordance with the Supplemental Regulations, section 23.12.

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Section 8.9. Other regulations.

The mobile home park shall be subject to the sign, off-street parking and building height regulations appropriate to the specific use in the specific district in which the mobile home park is rezoned.

Section 8.10. Reserved.

Editor's note—Former § 8.10, which had pertained to mobile home parks and subdivisions existing at the time of passage of the zoning ordinance, was repealed by § 4 of Ord. No. 84-04, enacted March 20, 1984. Said § 4 provided that, "All vested rights or 'grandfather' claims or requests shall be governed by the standards and procedures set forth in Paragraph III of the General Implementation Procedures of the Pasco County Comprehensive Plan."

ARTICLE VII. E-R ESTATE-RESIDENTIAL DISTRICT

Section 7.1. Purpose.

The purpose of the E-R Estate-Residential District is to serve as a transitional area between primarily agricultural areas and suburban development. Further, it is the purpose of the Estate-Residential District to allow the establishment of estate residential areas including the raising of livestock, and agriculture on limited acreage for the primary use of the resident.

Section 7.2. Permitted uses.

(a) *Principal uses:*

- (1) Dwellings: Single-family detached dwellings.
- (2) General farming and agricultural pursuits of such extent as to supply the occupant's personal needs.

- (3) Maintaining livestock for the occupant's use or need only, not to exceed three (3) grazing animals per one acre minimum exclusive of area required for other uses.
 - (4) Swine shall be considered for the purposes of this section as grazing animals. However, they shall not exceed one per acre minimum exclusive of area required for other uses.
 - (5) Maintaining small animals and fowl for the occupant's use or need only, not to exceed a ratio of twenty (20) per acre.
 - (6) Noncommercial boat slips, piers and houses, or private docking facilities with the approval of the various state and/or federal agencies where mandatory.
- (b) *Accessory uses:*
- (1) Private garages and parking areas.
 - (2) Private swimming pools and cabanas in accordance with Supplemental Regulations, section 23.7.
 - (3) Signs in accordance with Supplemental Regulations, section 23.8.
 - (4) Other accessory uses customarily incidental to a permitted principal use.

Section 7.3. Special exception uses.

- (a) Duplexes.
- (b) Home occupations.
- (c) Day nurseries.
- (d) Public and private right-of-way for utilities.
- (e) Public and private substations for utilities.
- (f) Schools.
- (g) Public or private parks, playgrounds and recreation areas.

(h) Churches and church schools.

(i) Sports clubs or activities such as hunting, fishing, riding and country clubs exclusive of outdoor firing ranges. Riding stables shall require a minimum of one acre per three (3) grazing animals.

(j) Golf courses, provided the clubhouse and other structures are located over one hundred fifty (150) feet from an abutting lot or parcel.

(k) Professional services such as medical, dental, legal, and engineering excluding the storage or parking of heavy equipment.

(l) Accessory uses customarily incidental to a permitted special exception use upon approval by the board of adjustment.

Section 7.4. Area, density and lot width requirements.

(a) *Single-family detached dwellings:*

(1) Minimum lot area, one acre.

(2) Maximum possible gross density, one dwelling unit per acre, except duplexes, two (2) dwelling units per acre.

(3) Minimum lot width, one hundred fifty (150) feet.

(b) *All other uses:* No minimum lot areas are required subject to meeting minimum yard and coverage regulations. Except where animals or fowl are permitted there shall be a minimum of a one hundred-foot separation between dwellings on adjacent property and any stables, feed pens, fowl coop or other animal shelters. However, the required separation shall in no case be less than fifty (50) feet from any property line.

Section 7.5. Coverage regulations.

All buildings including accessory buildings shall not cover more than thirty-five (35) per cent of the total lot area, and

the minimum living space per unit shall not be less than one thousand (1,000) square feet.

Section 7.6. Yard Regulations.

(a) The following minimum building line setbacks measured from the property lines are required in yard areas listed below unless otherwise specified:

- (1) Front—Fifty (50) feet.
- (2) Side—Twenty-five (25) feet.
- (3) Rear—Fifty (50) feet.

(b) Front setbacks from existing or planned rights-of-way of public thoroughfares shall be required if the setbacks in (a) are less than the following:

- (1) Major and minor arterials—One hundred seventy-five (175) feet from the centerline of right-of-way.
- (2) Collector streets—Eighty-five (85) feet from the centerline of right-of-way.
- (3) Local streets—Seventy-five (75) feet from the centerline of right-of-way.

Section 7.7. Height regulations.

Building height—Thirty-five (35) feet maximum; however, no dwelling shall be less than ten (10) feet in height. For exceptions see Supplemental Regulations, Section 23.1.

Section 7.8. Off-street parking regulations.

A minimum of two (2) off-street parking spaces per dwelling unit shall be provided. Parking for other than permitted or special exception uses shall be provided in accordance with the Off-Street Parking Regulations, Article XXII.

ARTICLE XVIII-A. C-3 COMMERCIAL/LIGHT MANUFACTURING DISTRICT*

Section 18-A.1. Purpose.

The purpose of the C-3 Commercial/Light Manufacturing District is to provide for the development of business uses on suitable lands, and recognize that certain commercial and manufacturing uses are compatible and can be intermingled with each other and surrounding dissimilar uses, and to provide standards and guidelines for the selection of qualified businesses. The district is primarily intended for business characterized by low land coverage, absence of objectionable external effects with adequate setbacks, attractive building design and properly landscaped sites and parking areas. (Ord. No. 80-09, § 1, 6-24-80)

Section 18-A.2. Permitted uses.

(a) *Principal Uses:*

- (1) Businesses with related offices and showrooms, which manufacture, assemble, process, package, store and/or distribute small unit products such as optical devices, tool and die manufactures, electronic equipment, precision instruments and toys.
- (2) Warehouses and wholesale distribution centers, including related offices and showrooms, but not to include highway freight transportation and warehousing and wholesale or retail of gasoline or liquefied petroleum gases (propane).

*Editor's note—Although Ord. No. 80-09, adopted June 24, 1980, added art. XVIII-A to the zoning ordinance, the internal numbering of the sections was 18.1—18.8. In order to avoid confusion with the sections of existing art. XVIII, the editor has renumbered the sections of art. XVIII-A as 18-A.1—18-A.8.

- (3) Professional and administrative offices.
- (4) Printing, publishing, engraving and related reproductive processes.
- (5) Research laboratories.
- (6) Schools for business or industrial training.
- (7) Restaurants, except drive-in restaurants.
- (8) Radio or TV station, including studios, offices, excluding broadcasting towers.
- (9) Businesses for retail sales conducted entirely within an enclosed structure such as:
 - a. The sale of baked goods and pastries, candy and confectioneries, dairy and ice cream, groceries and meats, fruit and vegetables.
 - b. The sale of books, magazines, newspapers, tobacco, drugs, gifts and stationery.
 - c. Eating places, lunchrooms, restaurants and cafeterias and places for the sale and consumption of soft drinks, juices and ice cream, but excluding places providing dancing or entertainment.
 - d. Service establishments, including barber and beauty shops, custom tailor shops, laundry agencies, self-service laundries, shoe repair, dry cleaning, pressing or tailoring shops and florist retail outlets in which only nonexplosive and nonflammable solvents and materials are used and where no work is done on the premises for retail outlets elsewhere.
- (10) Financial institutions (banks, etc.).
- (11) Public service facilities such as police, fire stations and post office.
- (12) Medical, dental, photographic or similar laboratories and clinics or hospitals.
- (13) Parking lots and parking garages.

- (14) Machine shops (small operations).
- (15) Data processing services.
- (16) Other uses which are similar or compatible to the permitted uses.
- (17) Residential treatment and care facilities subject to the provisions of sections 23.3 and 23.10 of this ordinance.
- (b) *Accessory Uses:*
 - (1) Accessory uses customarily incidental to a permitted use.
 - (2) Signs in accordance with supplemental regulations, section 23.6. (Ord. No. 80-09, § 1, 6-24-80; Ord. No. 85-02, § 5, 2-19-85)

Section 18-A.3. Conditional uses.

(a) The sale or consumption of alcoholic beverages within alcoholic beverage business establishments as defined in this ordinance and as permitted under county, state and federal regulations provided:

- (1) No such sale or consumption of alcoholic beverages may occur or be conducted within one thousand (1,000) feet of any school, church, place of worship, or public park, as measured from the structure used as a proprietor's place of business to the nearest property line of the school, church, place of worship, or public park.
- (2) The sale or consumption of alcoholic beverages complies with conditional use standards set forth in section 25.3(A)(3) of this ordinance and has been approved by the Pasco County board of county commissioners in accordance with said section.
- (3) The premises or building in which the alcoholic beverage sales or consumption are to be conducted or occur shall not be used as an adult entertainment establishment. (Ord. No. 80-09, § 1, 6-24-80; Ord. No. 85-10, § 4, 6-11-85)

Section 18-A.4. Special exception uses.

- (a) Communication towers.
- (b) Helicopter landing areas.
- (c) Public utility substations and relay facilities, and other conforming uses within the confines of an enclosed building which do not cause an undue nuisance or adversely affect existing structures, uses or residents. (Ord. No. 80-09, § 1, 6-24-80)

Section 18-A.5. Area and lot width regulations.

(1) Minimum lot size is twenty thousand (20,000) square feet.

(2) Minimum lot width, one hundred (100) feet.

(3) Buffering along any lot line adjoining property not zoned agricultural, commercial, or industrial shall be in accordance with the supplemental regulations, section 23.3.

(4) At least ten (10) percent of the total lot area shall be landscaped; and, in all events, all lot area not paved or used for buildings shall be landscaped; and those portions intended for future developments shall be seeded.

(5) Off-street parking shall be provided in accordance with the off-street parking regulations in article XXII.

(6) Site development plan shall be provided in accordance with supplemental regulations, section 23.10. (Ord. No. 80-09, § 1, 6-24-80)

Section 18-A.6. Yard regulations.

The following minimum building line setback shall be:

(1) Seventy-five (75) feet from any adjoining property not zoned commercial or industrial, side or rear.

(2) Side, seven and five-tenths (7.5) feet each side.

(3) Front setback requirements shall be:

a. Eighty (80) feet from the right-of-way or property line from a major or minor arterial street.

b. Fifty (50) feet from the right-of-way or property line from a collector or local street.

(4) Rear setback requirements shall be fifteen (15) feet from the rear lot line, except as prescribed in (1) above. (Ord. No. 80-09, § 1, 6-24-80)

Section 18-A.7. Height regulations.

The maximum building height in this classification shall be four (4) stories or sixty (60) feet maximum. (Ord. No. 80-09, § 1, 6-24-80)

Section 18-A.8. Special requirements.

(1) All lighting or illumination shall be arranged so as not to shine directly upon or cause glare upon adjacent residential property.

(2) All operations shall be conducted completely within a building or enclosed structure.

(3) No storage of fuel, raw materials or products of any kind shall be allowed outside a completely enclosed building or structure.

(4) All waste materials being stored pending removal shall be in suitable containers. No open storage of any type of waste material shall be allowed.

(5) No business activity shall:

(a) Emit obnoxious, toxic or corrosive dust, dirt, fly ash, fumes, vapors or gases which can cause any damage to human health, animals, vegetation or other forms of property, or which can cause any soiling or staining of persons or property at any point beyond the lot line of such business;

(b) Discharge smoke of a consistency which will resist the passage of sunlight beyond the property line;

(c) Emit any obnoxious odor, noise or sound perceptible beyond the lot boundaries;

(d) Produce any electromagnetic radiation or radioactive emission injurious to humans, animals or vegetation;

- (e) Discharge any potentially dangerous effluent from plant operations into local surface or subsurface drainage courses or body of water. (Ord. No. 80-09, § 1, 6-24-80)

ARTICLE XVIII. C-2 GENERAL COMMERCIAL DISTRICT

Section 18.1. Purpose.

The purpose of the C-2 General Commercial District is to provide for the orderly development of those uses necessary to meet the community and regional needs for general goods and services as well as those of a social, cultural and civic nature; and to exclude uses not compatible with such activities.

Section 18.2. Permitted uses.

(a) *Principal uses:*

- (1) Unless otherwise provided in this ordinance, all permitted and special exception uses in the C-1 District, except adult entertainment activities and conditional uses.
- (2) Amusement parks.
- (3) Automobile parts—New or secondhand, from enclosed buildings only and provided there is no outside display of parts or tires.
- (4) Automobile show and salesrooms, including display of automobiles for the purpose of sale by dealer, provided that automobile show and salesrooms may have limited service departments incidental thereto, provided such work is carried on altogether within the building. Open display and storage of automobiles is permitted; provided, however, that those automobiles for service are within fenced areas as required in supplemental regulations, section 23.3.

- (5) Automobile and trailer sales—used and immediately driveable, not including wrecked cars.
- (6) Automobile washing and painting—including steam cleaning in enclosed buildings only.
- (7) Bakery stores—retail only. Baking permitted on premises.
- (8) Barbeque stands and pits.
- (9) Bicycle stores and repair shops.
- (10) Billiard rooms and pool rooms.
- (11) Boat sales lot.
- (12) Bowling alleys within a building—shall not be located closer than one thousand five hundred (1,500) feet to any residential district unless such building is so constructed as to prevent the emission of odors, sounds and/or vibrations.
- (13) Cabinet and carpentry shops—light-neighborhood type.
- (14) Dancing halls or dancing academies—provided no alcoholic beverages of any type are served. Shall not be located within five hundred (500) feet of any residential district unless such building is so constructed as to prevent the emission of odors, sound and/or vibrations.
- (15) Dressed poultry and seafood stores—retail.
- (16) Dry cleaning.
- (17) Electric appliances and fixture stores and repair shops—all repairs to be done inside of building.
- (18) Exterminating products—where the materials or ingredients are stored, mixed or packaged, but not manufactured.
- (19) Food distribution, wholesale—provided no outside storage.

- (20) Garage or mechanical service.
- (21) Hat cleaning and blocking.
- (22) Laundries—hand and self-service.
- (23) Lawn mowers—rental, sales and service.
- (24) Lumber yards.
- (25) Motorcycle sales and repairs.
- (26) Mortuaries or funeral homes.
- (27) Music, radio and television stores and repair shops.
- (28) Pawn shops.
- (29) Plumber shops—materials to be stored in properly sight-screened areas.
- (30) Pottery—designed for yard ornaments, retail sales only.
- (31) Secondhand stores.
- (32) Sign painting shops.
- (33) Swimming pools (commercial, public).
- (34) Theater, drive-in—provided no intoxicating beverages of any type are served.
- (35) Warehousing and general storage—including sales, office.
- (36) Printing shops and publishing plants (newspapers, periodicals, books and related uses).
- (37) Residential treatment and care facilities subject to the provisions of sections 23.3 and 23.10 of this ordinance.
- (38) Other uses which are similar or compatible to the permitted uses.

(b) *Accessory uses:*

- (1) Accessory uses customarily incidental to a permitted use.

- (2) Signs in accordance with Supplemental Regulations, section 23.8. (Ord. No. 77-12, § 3, 3-1-77; Ord. No. 78-24, § 1, 10-17-78; Ord. No. 85-02, § 4, 2-19-85; Ord. No. 85-03, § 1, 3-5-85; Ord. No. 86-02, § 1, 2-11-86)

Section 18.2.1. Conditional uses.

(a) The sale or consumption of alcoholic beverages within alcoholic beverage business establishments as defined in this ordinance and as permitted under county, state and federal regulations provided:

- (1) No such sale or consumption of alcoholic beverages may occur or be conducted within one thousand (1,000) feet of any school, church, place of worship or public park, as measured from the structure used as a proprietor's place of business to the nearest property line of the school, church, place of worship or public park.
- (2) The sale or consumption of alcoholic beverages complies with conditional use standards set forth in section 25.3(A)(3) of this ordinance and has been approved by Pasco County board of county commissioners in accordance with said section.
- (3) The premises or building in which the alcoholic beverage sales or consumption are to be conducted or occur shall not be used as an adult entertainment establishment. (Ord. No. 79-09, § 4, 8-7-79; Ord. No. 80-32, § 5, 11-4-80; Ord. No. 85-10, § 3, 6-11-85)

Section 18.3. Special exception uses.

- (a) Hotels.
- (b) Motels.
- (c) Travel trailer parks subject to the requirements set forth in the Supplemental Regulations, section 23.18.
- (d) One single-family unit which is accessory to a permitted commercial use in C-2 and located on the same lot.

(e) Multi-family dwelling when located above at least one story of C-2 commercial uses with each unit having a minimum living area of six hundred and fifty (650) square feet.

(f) Adult entertainment establishments provided:

- (1) No such establishment may be located within one thousand (1,000) feet of any school, church, house of worship or public recreational area.
- (2) No such establishment may be located within one thousand (1,000) feet of any other adult entertainment establishment, bar, hotel or motel.
- (3) No such establishment may be located within one thousand (1,000) feet of any area zoned AR, AR-1, AR-5, ER, ER-2, R-MH, R-1MH, R-1, R-2, R-3, R-4, MF-1, MF-2 or PUD.
- (4) Advertisements and displays which depict "specified sexual activities" or "specified anatomical areas" shall not be visible from any point outside the property boundaries.
- (5) No alcoholic beverages, including beer or wine, are served and/or consumed on premises.
- (6) All films or live performances involving "specified sexual activities" or the exposure of "specified anatomical areas" must take place within enclosed buildings, and live performers must remain at least three (3) feet away from customers or patrons at all times while performing within such a building.

(g) Marinas or any marine or aquatic related commercial land use, either principal or accessory, which involves the exercise of public or private rights to the use of natural or artificial, navigable or nonnavigable water bodies. (Ord. No. 77-12. § 4, 3-1-77; Ord. No. 80-32. § 6, 11-4-80; Ord. No. 85-03. § 3, 3-5-85)

Section 18.4. Area and lot width regulations.

(a) *General commercial stores:*

- (1) Minimum lot area, twenty thousand (20,000) square feet.
- (2) Minimum lot width, one hundred (100) feet.

(b) *Site development plan* shall be provided for all commercial buildings in accordance with Supplemental Regulations, section 23.10. (Ord. No. 86-03, § 1, 2-18-86)

Section 18.5. Coverage regulations.

(a) *Lot coverage*: All buildings, including accessory buildings shall not cover more than fifty (50) per cent of the lot.

(b) *Landscape area*: The minimum landscape area shall not be less than ten (10) per cent of the total lot area.

Section 18.6. Yard regulations.

(A) The following minimum building line setbacks measured from property lines are required in yard areas listed below unless otherwise specified:

(1) Front:

(a) From major or minor arterial—Eighty (80) feet.

(b) From collector or local street—Fifty (50) feet.

(2) Side—A side yard depth of thirty (30) feet per side from residential districts, no side yard shall be required where two (2) or more commercial districts or an industrial and commercial district adjoin side to side; however, in no case shall common walls be permitted between properties of separate ownership. In the case of such a series of adjoining structures on lots of single and separate ownership abutting and paralleling a public right-of-way, a passage of at least twenty (20) feet in width shall be provided at grade level at intervals not more than four hundred (400) feet apart where required for public access from adjacent residential areas or for the safety of the public.

(3) Rear—Thirty (30) feet, provided that where two (2) commercial uses or districts abut rear to rear, eighteen (18) feet. (Ord. No. 86-04, § 1, 2-18-86; Ord. No. 86-05, § 1, 2-18-86; Ord. No. 86-14, § 2, 3-19-86)

Section 18.7. Height regulations.

The maximum building height for commercial uses shall be sixty (60) feet maximum. (Ord. No. 86-07, § 2, 2-18-86)

Section 18.8. Off-street parking regulations.

Parking shall be provided in accordance with the Off-Street Parking Regulations in Article XXII.

Section 18.9. Buffer requirements.

Buffering shall be required in accordance with the Supplemental Regulations, section 23.5.

**CORRESPONDENCE REGARDING
ZONING PROCEDURES**

PASCO COUNTY, FLORIDA
INTER-OFFICE MEMORANDUM

TO: Kenneth W. Baginski
Zoning Administrator

DATE: 12/5/86

FILE: UT87-71

SUBJECT: Interpretation of Section 2, Pasco
County Ordinance No. 82-04, with
Regard to the Proposed Resource
Recovery and Ashfill Facilities

FROM: Robert J. Tietz
Environmental Manager

REFERENCES:

The current zoning of the site for the proposed resource recovery facility and ashfill is A-C. Under Section 2 of Pasco County Ordinance No. 82-04 approved by the Board of County Commissioners February 2, 1982, development and other activities conducted by Pasco County are exempt from the provisions of the Pasco County Zoning Ordinance. In view of the fact that the development of the proposed facilities is being conducted by Pasco County, either directly or via a County contractor, it appears that Ordinance No. 82-04 is applicable and the intended activities are exempt from zoning provisions.

Under Article XXVIII, Pasco County Zoning Ordinance, you, as the Zoning Administrator, are charged with the responsibility for interpreting the Ordinance and making the County's official decision with respect to the County's exempt status on this project.

If you disagree with my understanding of our zoning provisions, please indicate what, if any, zoning changes are necessary for the County to develop the site for the intended resource recovery and ashfill activities. A site location map is attached for your convenience.

RJT/g12/04/04:1

Attachment

cc: Dan Strobebridge, CDM, Tampa
David Dee, P.A.
John J. Gallagher, County Administrator
J. Benjamin Harrill, County Attorney
William G. Munz, Public Works & Utilities Director

PASCO COUNTY, FLORIDA
INTER-OFFICE MEMORANDUM

TO: Robert J. Tietz
Environmental Manager

DATE: 12/19/86

FILE: PL87-241

Kenneth W. Baginski
FROM: Kenneth W. Baginski
Zoning Administrator

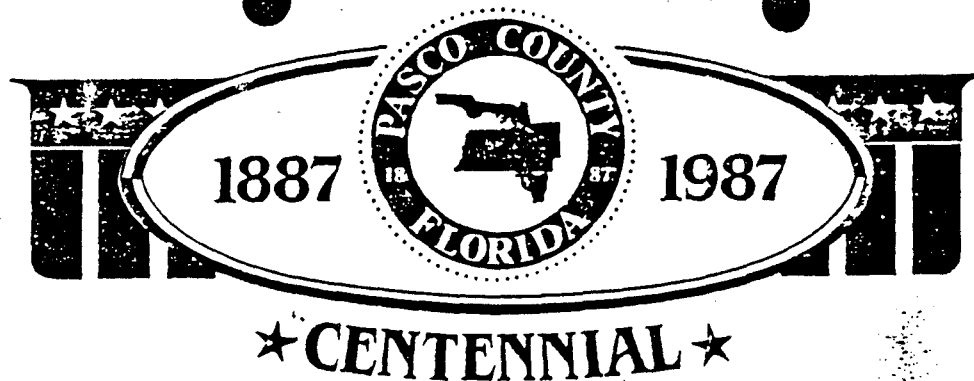
SUBJECT: Article XXVIII - Proposed Resource
Recovery and Ashfill Facilities

REFERENCES: UT87-71

Per your request, I have reviewed the applicable sections of the Zoning Ordinance, specifically Article XXVIII. It is my determination that if the appropriate agencies of the County have determined that a development or an activity, to be conducted by Pasco County, is undertaken for the promotion of the public health, safety, morals or general welfare, that development or activity is exempt from the provisions of Ordinance No. 75-21 as amended.

KWB/pm

cc: Dan Strobbridge, CDM, Tampa
David Dee, P.A.
John J. Gallagher, County Administrator
J. Benjamin Harrill, County Attorney
William G. Munz, Public Works & Utilities Director



DADE CITY
NEW PORT RICHEY

(904) 521-4274
(813) 847-8132

PLANNING DEPARTMENT
PASCO COUNTY GOVT. CENTER
7530 LITTLE ROAD
NEW PORT RICHEY, FL 33553

February 4, 1987

Mr. Ed Lehman
Dept. of Community Affairs
2571 Executive Center Circle East
Tallahassee, FL 32301

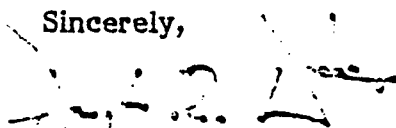
RE: Pasco County Resource Recovery Facilities

Dear Mr. Lehman:

Pasco County is in the process of implementing a resource recovery facility and ancillary ash/nonprocessable waste landfill facility to serve the long term waste management needs of the County. I have been asked whether a binding letter of interpretation (BLI) should be obtained from your office. After looking at Chapter 27F-2.014, Florida Administrative Code, I cannot find any thresholds for such a facility, which I would then assume means that a BLI is not necessary. The facility would be on approximately five acres of land and would produce 29 megawatts of power (of which 23 to 24 megawatts would be sold to Florida Power). An existing, major Florida Power transmission line and substation adjoin the proposed County landfill property. The landfill property would consist of a total of 800 acres, with approximately 10 to 15 acres being used per year. It is my understanding that the landfill/excavation would be extremely shallow (only 3 to 4 feet in depth), and that fill will not be removed from the site.

Your assistance on this matter would be appreciated. If you need any more information, please feel free to contact me.

Sincerely,


Douglas R. Uden
Senior Planner

DRU/c12/22/09



STATE OF FLORIDA
DEPARTMENT OF COMMUNITY AFFAIRS

2571 EXECUTIVE CENTER CIRCLE, EAST • TALLAHASSEE, FLORIDA 32399

BOB MARTINEZ

Governor

February 11, 1987

THOMAS G. PELHAM

Secretary

Mr. Douglas R. Uden
Planning Department
Pasco County Government Center
7530 Little Road
New Port Richey, Florida 33553

FEB 11 1987

PLANNING DEPT.

Dear Mr. Uden:

Your letter of 4 February 1987, addressed to Mr. Ed Lehman, has been referred to me. You asked whether a binding letter of interpretation should be obtained before Pasco County constructs a resource recovery facility and ancillary waste landfill.

As we discussed by telephone on February 10, it is my understanding, from discussions with other Pasco County officials, that the county intends to seek state certification of its proposed site through the process established by the Florida Electrical Power Plant Siting Act (ss. 403.501-403.517, Florida Statutes). Section 403.511 of the act states that "such certification shall be in lieu of any license, permit, certificate, or similar document required by any agency pursuant to... chapter 380". In other words, if the resource recovery facility goes through the chapter 403 site certification process, it need not also go through the DRI process.

I hope this clears up any confusion or uncertainty over the need for a binding letter of interpretation.

Sincerely,

Paul Darst

Paul Darst
Environmental Administrator

PD:ahp

CARON, FIELDS, WARD, EMMANUEL, SMITH, CUTLER & KENT, P. A.

ATTORNEYS AT LAW

ONE HARBOUR PLACE
P. O. BOX 3239
TAMPA, FLORIDA 33601
(813) 223-7000

CNA BUILDING
P. O. BOX 1171
ORLANDO, FLORIDA 32802
(305) 849-0300

200 EAST GOVERNMENT ST.
P. O. BOX 12426
PENSACOLA, FLORIDA 32562
(904) 434-0142

FIRST FLORIDA BANK BUILDING
P. O. DRAWER 190
TALLAHASSEE, FLORIDA 32302
(904) 224-1585

FLORIDA NATIONAL BANK TOWER
P. O. BOX 4700
JACKSONVILLE, FLORIDA 32201
(904) 354-1600

PLEASE REPLY TO:

February 13, 1987

Tallahassee

Samuel Steffey II
Planning Director
Planning Department
Pasco County Government Center
7530 Little Road
New Port Richey, Florida 33553

RE: Pasco County Resource Recovery Facility

Dear Sam:

Thank you for meeting with Dan Strobbridge and me last Friday. In accordance with our discussion, I prepared a formal request (attached) for the Planning Department to evaluate the proposed resource recovery facility. I believe the request is self-explanatory; however, please feel free to call me if you have any questions.

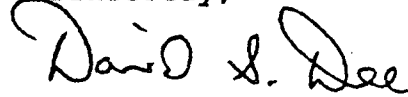
As a result of our discussion with you, it is my understanding that the proposed resource recovery project does not need to be reviewed by the Pasco County Development Review Committee (DRC), pursuant to Ordinance No. 86-15, at this time. The DRC review is not required until a project has a detailed plan of construction and site development. It would be premature to conduct the DRC review at this time because Pasco County does not yet have a vendor and thus cannot create a detailed site plan. The County may conduct its DRC review process after the vendor is selected and the plan of development is created.

It also is my understanding that the Pasco County New Development Fair Share Contribution for Road Improvements Ordinance, Ordinance No. 86-18, does not apply to this project. Section IX.A.4. of the ordinance specifically exempts the construction of publicly owned governmental buildings from the provisions of the ordinance. The County did not intend to apply the Ordinance to County projects such as the resource recovery facility.

Mr. Samuel Steffey II
Page Two
February 13, 1987

I sincerely appreciate your willingness to meet with Dan Strobbridge and I on such short notice. Thank you for your cooperation and assistance.

Sincerely,

A handwritten signature in cursive script that reads "David S. Dee". The signature is written in dark ink and is positioned above the printed name.

David S. Dee

cc: John Gallagher
Ben Harrill
Dan Strobbridge

DSD/vc:STEFFEY-2

PASCO COUNTY, FLORIDA
INTER-OFFICE MEMORANDUM

MAR 12 1987

TO: John J. Gallagher
County Administrator

DATE: 3/10/87

FILE: PL87-438

FROM: 
Frederick J. Lowndes
Chief Planner

SUBJECT: Pasco County Resource Recovery
Facility

REFERENCES:

The County's Comprehensive Plan, adopted on February 2, 1982, provided a Solid Waste and Resource Recovery Element.

The goal is to dispose of the County's domestic and industrial waste in the safest and least expensive manner. To obtain this goal the County adopted the following objectives:

1. To examine effects of landfill and solid waste resource recovery on the environment.
2. To assure that hazardous and/or infectious wastes are properly identified and disposed of.
3. To assure that wastewater, sludge, and industrial wastes are properly identified and disposed.
4. To involve County residents in recycling efforts.
5. To insure that all future landfills or waste resource operations will have minimal adverse affects on the citizens of the County.
6. To research the feasibility of resource recovery.
7. To provide solid waste disposal service within the economic means of Pasco County residents.
8. To conform with the existing Federal and State requirements.

It is my determination, after reviewing the goals and objectives of the Solid Waste and Resource Recovery Element of the Comprehensive Plan, that the implementation of a Resource Recovery Facility would be consistent to the goal and objectives. I submit the following to support my decision:

The County's Resource Recovery Study, prepared by Camp, Dresser & McKee, has determined that a resource recovery facility would have the least effect on the environment. The site recommended by the consulting engineers was determined to have minimal adverse affects on the citizens of the County.

John J. Gallagher
March 10, 1987

Objective number six is to research the feasibility of resource recovery. The County has complied with this objective by obtaining the consulting engineers to prepare a study. It is felt that implementing a resource recovery facility is within the economic means of Pasco County residents. The Florida Department of Environmental Regulations required 17 counties, which included Pasco County, to investigate the feasibility of a resource recovery program.

As to whether the Resource Recovery Facility would be consistent with the existing zoning of the site, let me bring to your attention memorandum PL87-241 dated 12/19/86 from Kenneth W. Baginski to Robert Tietz. In this memorandum Mr. Baginski has determined that if the appropriate agencies of the County have determined that a development or an activity, to be conducted by Pasco County, is undertaken for the promotion of the public health, safety, morals or general welfare, that development or activity is exempt from the provisions of Ordinance #75-21 as amended.

FJL/ca

Attachments: Memorandum PL87-241
Copy of letter from David S. Dee, dated 2/13/87

cc: Ben Harrill
Dan Strobridge /
David S. Dee

PASCO COUNTY
ORDINANCE NO. 75-21
ARTICLE XXVII, AS AMENDED

Section 2. Pasco County Ordinance No. 75-21, Article XXVII, as amended, is hereby amended as follows:

ARTICLE XXVII

PROVISIONS OF ZONING REGULATIONS DECLARED TO BE MINIMUM OR MAXIMUM REQUIREMENTS

In their interpretation and application, the provisions of these zoning regulations shall be held to be minimum or maximum requirements, as the case may be, adopted for the promotion of the public health, safety, morals, or general welfare. Whenever the requirements of these zoning regulations are at a variance with the requirements of any governmentally adopted statute, rule, regulation, ordinance, or code, the most restrictive or that imposing the higher standards, shall govern, provided that development and other activities conducted by Pasco County shall be exempt from the provisions of Ordinance No. 75-21, as amended.

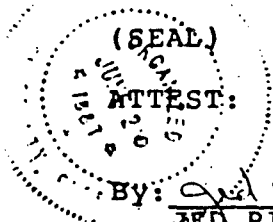
Section 3. SEVERABILITY - It is declared to be the intent of the Board of County Commissioners of Pasco County, Florida, that if any section, subsection, sentence, clause or provision of this Ordinance is held invalid, the remainder of the Ordinance shall be construed as not having contained said section, subsection, sentence, clause or provision, and shall not be affected by such holding.

Section 4. EFFECTIVE DATE - A certified copy of this Ordinance shall be filed in the Office of the Secretary of State by the Clerk to the Board within ten (10) days after adoption of this Ordinance, and shall take effect upon receipt of official acknow-

ledgment from that office.

DONE AND RESOLVED this 2nd day of February,

1982



BOARD OF COUNTY COMMISSIONERS
OF PASCO COUNTY, FLORIDA

By: Barry M. Doyle
BARRY M. DOYLE, Chairman

APPROVED AS TO FORM AND LEGALITY
Office of the County Attorney

By: [Signature]
Attorney

March 9, 1982

Sherry Dugan

APPENDIX 10.3

APPENDIX 10.3
LAND USE PLAN DESCRIPTIONS

Land Use Plan Descriptions
are provided in Section 2.2.3
of Volume I - Application.

APPENDIX 10.4

APPENDIX 10.4

EXISTING STATE PERMITS OR APPROVALS

The residue from the resource recovery facility, nonprocessible items and solid waste bypass will be transported and disposed at the co-located landfill/ashfill. The applicable state permits for the construction and operation of the Class I Ashfill are provided in Volume IV - Landfill/Ashfill.

Potable water will be provided by an onsite well. A second well will act as a backup source of process water. The Consumptive Use Permits are provided in this section.

APPENDIX 10.4.1

**SOUTHWEST FLORIDA WATER
MANAGEMENT DISTRICT**

CONSUMPTIVE USE PERMIT



**SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
CONSUMPTIVE USE PERMIT APPLICATION**

2379 Broad Street
Brooksville, Florida 33512-9712
Phone 904-796-7211

GENERAL INSTRUCTIONS, PLEASE READ BEFORE PROCEEDING.

- PURPOSE:** This application is for obtaining a permit, permit modification, or permit renewal from the Southwest Florida Water Management District (SWFWMD) for the consumptive use of ground or surface water, or both, and is required in accordance with Chapter 40D-2, Florida Administrative Code. This application and attached supplemental form(s) are to be completed in detail in order to facilitate a comprehensive evaluation of your water requirements. Insufficient information will delay application processing. Supplemental form(s) are a part of this application when attached. Assistance with this application can be obtained by calling (904) 796-7211, Brooksville, Florida; (813) 985-7481, Tampa, Florida; or (813) 533-6972, Bartow, Florida. A fee of \$10.00 is required for application processing.
- APPLICANT:** Enter the name in which the Consumptive Use Permit (CUP) will be issued. Identify applicant as an individual, partnership, corporation or other legal entity. If there is more than one owner, name the one on whose property the withdrawal point(s) are located. A permit may be issued to a lessee if a copy of the lease is furnished. In the case of a verbal lease agreement, the owner's signature on the application will be sufficient.
- LOCAL CONTACT:** Enter the name of an individual who has knowledge of the property and the application and who may be contacted for any additional information needed, if other than the applicant.
- OWNER:** Enter the name and address of the owner(s) of the property if other than applicant.
- PROPERTY:** Include only the contiguous acreage covered by this application. A SEPARATE APPLICATION MUST BE COMPLETED FOR EACH NON-CONTIGUOUS TRACT OF LAND.

ANSWER ALL QUESTIONS. DO NOT USE PENCIL.

Date _____

1. **APPLICANT** Pasco County
7536 State Street, New Port Richey, FL 33553 (813 847-8145)
Address, City, State, Zip Code Telephone w/area code
2. **LOCAL CONTACT** Chris Gabel - Camp Dresser & McKee Inc. (813 530-9984)
Name, Telephone number - if other than applicant
3. **OWNER** _____
Name, Address - if other than applicant
4. **PROPERTY** Section 24, 25, 26 T24S, R17E Pasco County
Section(s), Township(s), Range(s) County
Acres: owned 750.6 leased _____ serviced* _____ total 750.6

*An applicant (other than Public Supply) delivering water to another property owner must include a signed statement of that arrangement. Copies of all written agreements and/or contracts must be attached.

5. TYPE OF APPLICATION: new X renewal _____ modification _____ current CUP No. _____

6. CLASSIFICATION OF USE: (Estimate percentages of total supply).

Attractions (public parks, etc.)	_____	%
Domestic	_____	%
Essential services (fires, hospitals, etc.)	_____	%
Industrial	_____	%
Irrigation	_____	%
Lawns	_____	%
Livestock	_____	%
Mining	_____	%
Perishable food processing	_____	%
Power	_____	%
Recreational	100	%
Total	100	%

7. COMPLETE SUPPLEMENTAL INFORMATION FORM(S): Complete the enclosed form(s) applicable to your major water use category (Public Supply, Industrial, Agriculture) and attach as part of this application.

8. LIST OF ADJACENT PROPERTY OWNERS FOR GROUND WATER WITHDRAWALS:

- If the total average daily withdrawal (pumpage) for all wells on the property is less than 100,000 gallons per day (gpd) it is not necessary to list adjacent property owners.
- Complete part c. below if your average daily withdrawal is 100,000 gpd or more, and this application is for a (1) new use, (2) modification of an existing permit, (3) renewal of an expired permit, or (4) renewal of an existing permit with increased quantities.
- List below the name and mailing address of all current owners of real property whose property is located within the distances prescribed below, according to withdrawal quantities:

For withdrawals of:
100,000 - 499,999 gpd

All property owners within 660' of the well, or within 100' of your property boundary.

500,000 - 999,999 gpd

All property owners within 1,320' of the well, or within 200' of your property boundary.

1,000,000 or more gpd

All property owners within 2,640' of the well, or all property owners within 400' of your property boundary.

Name

Address

See Attached

All Notices Will Be Made By SWFWMD. If additional space is needed, add a separate sheet.

9. LIST OF ADJACENT PROPERTY OWNERS FOR SURFACE WATER WITHDRAWALS:

a. Complete parts b. and/or c. below, if the described situation applies, and this application is for a (1) new use, (2) modification of an existing permit, (3) renewal of an expired permit, or (4) renewal of an existing permit with increased quantities.

b. If your withdrawal is from a lake or other impoundment with a surface area of:

Less than 80 acres

List below all owners on the lake or impoundment

Over 80 acres

List below all owners in either direction 660' from point where applicant's property intersects the shoreline

c. If your withdrawal is from a stream and if the total daily average pumpage is:

Less than 5,000,000 gpd

List below all owners 660' upstream and 1,320' downstream from your property boundaries at the shoreline

5,000,000 or more gpd

List below all owners 1,320' upstream and 2,640' downstream from the withdrawal point(s)

Name

Address

Not Applicable

All Notices Will Be Made By SWFWMD. If additional space is needed, add a separate sheet.

10. **PROPERTY LOCATION MAPS:** Property location maps are contained on pages 4 and 5 of this application. Instructions for completing the maps are on each page. If your property cannot be located on either attached map, submit a separate map locating (1) property boundaries, (2) all wells (active and inactive), (3) all surface withdrawals, and (4) all discharge points. Boundary lines, withdrawal and discharge points should be referenced to section, township, and range, or latitude and longitude. Use a scale of not less than 1 inch to 2,000 feet. Special requirements for industrial applications are contained in paragraph 4 of the Industrial Supplemental Form.

I hereby certify that the information as contained in this application including all attachments is true and accurate and based upon the best information available and further that the undersigned has the legal authority to execute this application.

SIGNATURE OF APPLICANT

SIGNATURE OF OWNER

Have you signed application and included \$10 fee?

THANK YOU

CONSERVE WATER TODAY FOR TOMORROW

INDUSTRIAL
Supplemental Information Form

Answer all questions. If a question is not applicable, state N/A. If there are public supply or agriculture wells located on your property, complete the appropriate supplemental form. This form must be completed for an initial permit, permit modification, or permit renewal. This form provides the basic information for evaluation of your application.

1. APPLICANT Pasco County
(same as shown on CUP application form)

2. OPERATION Refuse-to-Energy onsite
(brief description of operation and product produced)

Well to be used as backup source of cooling water.

3. ATTACH A WATER BALANCE, based on requested average daily withdrawals, showing the amount of water going into and coming out of each step in your process. Include all causes of water loss, and final disposition of water.

4. PROPERTY LOCATION MAP: The appropriate property location map on pages 4 or 5 may be used to locate your property. Locate all (1) wells (active and inactive), (2) surface withdrawals, (3) meters/gauges, (4) monitor sites, and (5) final discharge points, as applicable. If application is for water use in (1) phosphate mining, (2) beneficiation, (3) chemical processing, (4) rock mining, (5) sand mining, (6) power generation, this information should also be plotted on aerial photography, with a minimum scale of 1 inch to 2,000 feet. Aerial maps will be requested separately for any other industrial uses, if required. (2) There are no surface withdrawals.

5. TOTAL REQUESTED WITHDRAWAL:
average daily (gpd) 900,000 maximum daily (gpd) 1,100,000

6. WATER SUPPLY: Withdrawal points must agree with those shown on property location map.

a. GROUND WATER WITHDRAWALS: Include all wells both active and inactive (existing and proposed, standby, capped, etc.).

Well ID number	Well Dia. size	Well depth casing/total	Beg. W/D Date	Pump Cap. (gpm)	Withdrawal (gpd) average	maximum	Metered Yes/No	Use if more than one. list percent each
1	10"	150/250	Jan. 1991	700	720,000	1,000,000	Yes	-

b. SURFACE WITHDRAWALS:

Source Name and Intake Diameter	Beg. W/D Date	Pump Cap. (gpm)	Withdrawal Information		Metered Yes/No	Use if more than one, list percent each
average	maximum					
None						

7. WITHDRAWAL DATE: (to be) initiated 1991 (Jan.) most recent date of use .

8. PRODUCTION RATE: Presently 0 Projected 720,000 gpd as of 1991.

9. SOURCE OF POTABLE WATER SUPPLY Daily Work Population:

10. METHOD OF DISPOSAL:

Evaporation (cooling tower)	<u>100</u>	%	
Individual septic tank	<u> </u>	%	
Spray irrigation	<u> </u>	%	
Percolation and ponding	<u> </u>	%	Pond acreage: <u> </u>
Off-site discharge	<u> </u>	%	discharges to: <u> </u>
Total	<u>100</u>	%	

Are there any DER/NPDES discharge permits?
Number and type of Permit.

No

11. LIST OF ADJACENT PROPERTY OWNERS: If applicable, complete Items 8 and/or 9, Pages 2 and 3 of the CUP application form.



**SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
CONSUMPTIVE USE PERMIT APPLICATION**

2379 Broad Street
Brooksville, Florida 33512-9712
Phone 904-796-7211

GENERAL INSTRUCTIONS, PLEASE READ BEFORE PROCEEDING.

- PURPOSE:** This application is for obtaining a permit, permit modification, or permit renewal from the Southwest Florida Water Management District (SWFWMD) for the consumptive use of ground or surface water, or both, and is required in accordance with Chapter 40D-2, Florida Administrative Code. This application and attached supplemental form(s) are to be completed in detail in order to facilitate a comprehensive evaluation of your water requirements. Insufficient information will delay application processing. Supplemental form(s) are a part of this application when attached. Assistance with this application can be obtained by calling (904) 796-7211, Brooksville, Florida; (813) 985-7481, Tampa, Florida; or (813) 533-6972, Bartow, Florida. A fee of \$10.00 is required for application processing.
- APPLICANT:** Enter the name in which the Consumptive Use Permit (CUP) will be issued. Identify applicant as an individual, partnership, corporation or other legal entity. If there is more than one owner, name the one on whose property the withdrawal point(s) are located. A permit may be issued to a lessee if a copy of the lease is furnished. In the case of a verbal lease agreement, the owner's signature on the application will be sufficient.
- LOCAL CONTACT:** Enter the name of an individual who has knowledge of the property and the application and who may be contacted for any additional information needed, if other than the applicant.
- OWNER:** Enter the name and address of the owner(s) of the property if other than applicant.
- PROPERTY:** Include only the contiguous acreage covered by this application. A SEPARATE APPLICATION MUST BE COMPLETED FOR EACH NON-CONTIGUOUS TRACT OF LAND.

ANSWER ALL QUESTIONS. DO NOT USE PENCIL.

Date _____

1. **APPLICANT** Pasco County
7536 State Street, New Port Richey, FL 33553 (813 847-8145)
Address, City, State, Zip Code Telephone w/area code
2. **LOCAL CONTACT** Chris Gabel - Camp Dresser & McKee Inc. (813 530-9984)
Name, Telephone number - if other than applicant
3. **OWNER** _____
Name, Address - if other than applicant
4. **PROPERTY** Section 24, 25, 26 T24S, R17E Pasco County
Section(s), Township(s), Range(s) County
Acres: owned 750.6 leased _____ serviced* _____ total 750.6

*An applicant (other than Public Supply) delivering water to another property owner must include a signed statement of that arrangement. Copies of all written agreements and/or contracts must be attached.

5. TYPE OF APPLICATION: new X renewal _____ modification _____ current CUP No. _____

6. CLASSIFICATION OF USE: (Estimate percentages of total supply).

Attractions (public parks, etc.)	_____	%
Domestic	100	%
Essential services (fires, hospitals, etc.)	_____	%
Industrial	_____	%
Irrigation	_____	%
Lawns	_____	%
Livestock	_____	%
Mining	_____	%
Perishable food processing	_____	%
Power	_____	%
Recreational	_____	%
Total	100	%

7. COMPLETE SUPPLEMENTAL INFORMATION FORM(S): Complete the enclosed form(s) applicable to your major water use category (Public Supply, Industrial, Agriculture) and attach as part of this application.

8. LIST OF ADJACENT PROPERTY OWNERS FOR GROUND WATER WITHDRAWALS:

- If the total average daily withdrawal (pumpage) for all wells on the property is less than 100,000 gallons per day (gpd) it is not necessary to list adjacent property owners.
- Complete part c. below if your average daily withdrawal is 100,000 gpd or more, and this application is for a (1) new use, (2) modification of an existing permit, (3) renewal of an expired permit, or (4) renewal of an existing permit with increased quantities.
- List below the name and mailing address of all current owners of real property whose property is located within the distances prescribed below, according to withdrawal quantities:

For withdrawals of:

100,000 - 499,999 gpd

All property owners within 660' of the well, or within 100' of your property boundary.

500,000 - 999,999 gpd

All property owners within 1,320' of the well, or within 200' of your property boundary.

1,000,000 or more gpd

All property owners within 2,640' of the well, or all property owners within 400' of your property boundary.

Name

Address

See Attached

All Notices Will Be Made By SWFWMD. If additional space is needed, add a separate sheet.

9. LIST OF ADJACENT PROPERTY OWNERS FOR SURFACE WATER WITHDRAWALS:

a. Complete parts b. and/or c. below, if the described situation applies, and this application is for a (1) new use, (2) modification of an existing permit, (3) renewal of an expired permit, or (4) renewal of an existing permit with increased quantities.

b. If your withdrawal is from a lake or other impoundment with a surface area of:

Less than 80 acres

List below all owners on the lake or impoundment

Over 80 acres

List below all owners in either direction 660' from point where applicant's property intersects the shoreline

c. If your withdrawal is from a stream and if the total daily average pumpage is:

Less than 5,000,000 gpd

List below all owners 660' upstream and 1,320' downstream from your property boundaries at the shoreline

5,000,000 or more gpd

List below all owners 1,320' upstream and 2,640' downstream from the withdrawal point(s)

Name
Not Applicable

Address

All Notices Will Be Made By SWFWMD. If additional space is needed, add a separate sheet.

10. **PROPERTY LOCATION MAPS:** Property location maps are contained on pages 4 and 5 of this application. Instructions for completing the maps are on each page. If your property cannot be located on either attached map, submit a separate map locating (1) property boundaries, (2) all wells (active and inactive), (3) all surface withdrawals, and (4) all discharge points. Boundary lines, withdrawal and discharge points should be referenced to section, township, and range, or latitude and longitude. Use a scale of not less than 1 inch to 2,000 feet. Special requirements for industrial applications are contained in paragraph 4 of the Industrial Supplemental Form.

I hereby certify that the information as contained in this application including all attachments is true and accurate and based upon the best information available and further that the undersigned has the legal authority to execute this application.

SIGNATURE OF APPLICANT

SIGNATURE OF OWNER

Have you signed application and included \$10 fee?

THANK YOU

CONSERVE WATER TODAY FOR TOMORROW

PUBLIC SUPPLY
Supplemental Information Form

Answer all questions. If a question is not applicable, enter N/A. If there are industrial or agricultural wells located on your property, complete the appropriate supplemental form. This form must be completed for an initial permit, permit modification, or permit renewal. This form provides the basic information for evaluation of your application.

1. APPLICANT Pasco County
(same as shown on CUP application)

2. CONSULTANT Camp Dresser & McKee Inc. (813 530-9984)
(name and telephone number)

3. PROVIDES SERVICE TO: Onsite Employees for Resource Recovery Facility

4. METHOD OF SEWAGE DISPOSAL:

Individual Septic Tank	_____	%
Spray Irrigation	_____	%
Percolation Pond	_____	%
Off-site discharge	<u>100</u>	%
Off-site discharge to	<u>Hudson Subregional WWTP</u>	
Reject water (desalination)	_____	%
Other _____	_____	%
Total	<u>100</u>	%

5. FLOW METERS:

Well nos. metered separately _____ Well nos. metered jointly _____
Other (describe) _____

6. WATER USE:	Present	Projected 6 Years	Projected 10 Years
Total water demand (gpd)	<u>40,000</u>	<u>40,000</u>	<u>40,000</u>
Residential Connections	<u>N/A</u>	_____	_____
Commercial Connections	<u>N/A</u>	_____	_____
Industrial Connections	<u>N/A</u>	_____	_____
Total Connections	_____	_____	_____
Population	_____	_____	_____
Per Capita Use (gpd/person)	_____	_____	_____
Acres Owned	_____	_____	_____
Acres Serviced	_____	_____	_____

7. **WATER SUPPLY:** Withdrawal points must agree with those shown on property location map.

2. GROUND WATER WITHDRAWALS: Include all wells both active and inactive (existing and proposed, standby, capped, etc.).

[illegible]

b. SURFACE WATER WITHDRAWALS:

Source Name and Intake Diameter	Beginning	Pump Cap. (gpm)	Withdrawal Rates (gpd)		Use standby, capped, etc.
	With- drawal Date		Average	Maximum	

Additional sheets may be added if necessary.

8. TOTAL REQUESTED WITHDRAWAL: average daily (gpd) 40,000 maximum daily (gpd) 50,000 .

LIST OF ADJACENT PROPERTY OWNERS: Complete Items 8 and/or 9, Pages 2 and 3 of the CUP application form, unless a waiver is requested. See information below. See Attached

NOTE: YOU MAY BE GRANTED A WAIVER FROM SUBMITTING THE REQUIRED ADJACENT PROPERTY OWNERS WHICH ARE SERVICED BY THIS CUP. IF A WAIVER OF AFFIDAVIT IS REQUESTED, COMPLETE THE FOLLOWING.

- a. Number of owners affected by waiver if the distance from the well criteria is used:
a) Individual property owners _____ b) Commercial or other property owners _____
- b. Number of owners affected by waiver if the distance from the property boundary criteria is used:
a) Individual property owners _____ b) Commercial or other property owners _____
- c. Are all affected property owners serviced by the CUP for which this application is being made? yes _____ no _____. If you answered no to number 3, provide a separate list of all affected owners (name and mailing address) not serviced by this CUP.

ATTACHMENT

4. Property Location Map

1. There are currently no wells onsite. The proposed location of the resource recovery well is shown on Figure 2-24 of Volume I.
2. There is no surface withdrawal onsite and there is none proposed for the project.
3. The resource recovery well will use a flow meter.
4. Monitoring wells are shown on Sheet 7 of Attachment 1, Volume IV.
5. The final discharge point will be the resource recovery facility where the water will be used in the cooling process and the dry scrubber process. The location of the facility is shown on Figure 2-6 of Volume I.

8. List of Property Owners Adjacent to Groundwater Withdrawals

1. A list of vicinity resident well owners is provided in Appendix 10.8 of Volume II.
2. A list of adjacent and abutting property owners and addresses is provided in Appendix 10.6 of Volume II.

APPENDIX 10.5

APPENDIX 10.5

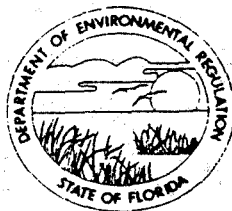
MONITORING PROGRAMS

This Appendix is a supplement for
Sections 4.3.2 and 5.3.5 of the main text.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

NORTHWEST DISTRICT
BRANCH OFFICE

WIN TOWERS OFFICE BUILDING
300 BLAIR STONE ROAD
ALLAHASSEE, FLORIDA 32301



BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

APPLICATION FOR MONITORING PLAN APPROVAL
(Existing Sources)

INSTRUCTIONS: Submit four copies of this application and four copies of supporting information such as laboratory reports, maps and other documents to the appropriate District Office.

PART I - General Information

In compliance with Florida Administrative Code Rule 17-4.245(6)(c)2., the undersigned installation owner applies for approval from the Department for the monitoring criteria on the following property owned by:

Pasco County

Corporation or Owner's Name

Hays Road Landfill Monitoring Wells

Permit No.

Installation Name

SIC Code

Nearest City: Port Richey

Street Address

City

Zip County

82°33'30"N 28°22'05"W
Latitude Longitude

1/4 1/4 1/4 of 24,25,26 T24S R17E
Section, Township, Range

OWNER OR AUTHORIZED REPRESENTATIVE (If representative, attach letter of authorization.)

Pasco County

Name and Official Title (Print or Type)

7530 Little Road, New Port Richey, Florida 33553

(813) 847-6132

Street

City

State Zip

Telephone Number

Signature: George W. Ellsworth

Date: _____

PART II - Content of Monitoring Plan

Pursuant to Rule 17-4.245(6)(d), the plan shall contain findings, recommendations and plans for ground water monitoring derived from site specific information. For the type of information to be considered in the development and assessment of the plan, see page two of this form. In any case, the following items must be included:

1. Location(s) of proposed well(s) to sample natural unaffected background water quality and the intermediate and compliance well(s) in the down gradient direction.
2. Construction details of the monitor well(s), including type of casing material, diameter of casing, depth of casing and location of screens.
3. A water sampling and chemical analysis procedure which can determine the natural unaffected background quality of the ground water, and the quality of the receiving ground water in the downgradient intermediate and compliance wells.

The following information is the type generally required for detailed assessment of the most complex plans, with less complex cases not needing this degree of evaluation:

1. Hydrogeological, physical and chemical data for the site, including:
 - a. Direction and rate of ground water flow, and background ground water quality;
 - b. Porosity, horizontal and vertical permeability for the aquifer(s) and the depth to, and lithology of, the first confining bed(s);
 - c. Vertical permeability, thickness, and extent of any confining beds;
 - d. Topography, soil information and surface water drainage systems surrounding the site;
2. Waste disposal rate and frequency, chemical composition, method of discharge, pond volume, spray-field dimension, or other applicable site specific information;
3. Toxicity of waste;
4. Present and anticipated wastewater volume, seepage rate to the receiving ground water, physical, chemical, microbiological (whichever is applicable) characteristics of the leachate;
5. Disposal system water balance;
6. Present and reasonably expected future pollution sources located within one mile radius of the site;
7. Inventory depth, construction details, and cones of depression of water supply wells and monitor wells located within one mile radius of the site or potentially affected by the discharge;
8. Site specific economic and feasibility considerations;
9. Chronological information on water levels in the monitor wells and water quality data on water supplies collected from the water supply and monitor wells;
10. Type and number of waste disposal facilities within the installation;
11. Chronological information on surface water flows and water quality upstream and downstream from the site;
12. Construction and operation details of disposal facilities;
13. History of construction and land development in the vicinity of the site.

A monitoring program instituted under some other state, federal, or local government regulation or permit may be substituted (or referenced if contained in an existing department permit) if such program is in substantial compliance with Part II.

APPLICATION FOR MONITORING
PLAN APPROVAL
(SUPPLEMENT)

FOR THE

HAYS ROAD LANDFILL
PASCO COUNTY, FLORIDA

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1.0 INTRODUCTION

1.1 BACKGROUND

The existing landfill serving the western part of Pasco County is near capacity. Favorable portions of the Hays Road Site (Figure 2-6 of Volume 1) are being developed into a Class I sanitary/ash landfill to serve the future needs of Western Pasco County. A resource recovery plant is being constructed in the southern portion of the site. It is anticipated that both raw refuse and ash from the resource recovery plant will be disposed at the lined landfill. The landfill height is anticipated to be about 75 feet.

1.2 PURPOSE AND SCOPE

This report is in support of an Application for Monitoring Plan Approval [DER Form 17-1.216(1)] for the Hays Road Class I Landfill site. Chapter 2.424(b), Florida Administrative Code (FAC), requires groundwater monitoring for facilities which discharge to the groundwater. The information requested is presented in a configuration and numbering system similar to page 2 of the form. The majority of information is contained in the Geotechnical and Hydrogeologic Investigation Proposed Landfill Site - Hays Road, Pasco County, Florida by Jammal & Associates (April 1987 contained in Volume IV of this permit application) and the answers are referenced thereto.

2.0 HYDROGEOLOGY

2.1 HYDROGEOLOGIC FRAMEWORK

The principal formations in Pasco County are a series of limestones and dolostones mantled by relatively thin sand and clay deposits. The surficial sands and clays are undifferentiated with the lower portion of the deposits generally assigned to the Hawthorn Formation. The Hawthorn Formation, which is generally composed of clays, sand and dolosilt, is relatively thin in the eastern part of the county and may be absent in some areas, particularly in the northern part of Pasco County.

The uppermost limestone in northwest Pasco County is the Tampa Limestone, or in areas where not present, the Suwannee Limestone. Most domestic and many irrigation wells produce from the lower Suwannee Limestone. The Ocala Group and the Avon Park Formation are composed of limestone and dolostone with dolostone becoming more prevailing with depth. Most large production wells produce from the lower Ocala Group and/or the dolostone of the Avon Park Formation.

In general, the soil materials at the Hays Road site consist of a varying thickness of sand (less than 10% fines) overlying clayey materials also of varying thickness and consistency, which in turn overlie either significantly weathered limestone with clay or more intact weathered limestone. The preferred area for the landfill shows at least 5 feet of intact and nearly continuous clayey semi-confining unit material separating the surficial aquifer from the limestone of the Floridan aquifer. Detailed site specific information is contained in Chapters 4 and 5 of the Jammal report (April, 1987), contained in Volume IV of this permit application.

2.2 AQUIFER SYSTEMS

Two distinct water-bearing geologic units, or aquifer systems, capable of supplying economical quantities of water to wells, occur in the western portion of Pasco County. The uppermost of the two is the surficial aquifer system, comprised of the permeable portions of the unconsolidated deposits

overlying the limestones. The limestone formations form the deeper Floridan aquifer, an artesian and sometimes unconfined aquifer system which underlies most of central Florida.

The surficial aquifer system is apparently relatively thin in western Pasco County and may be absent or discontinuous in some areas. The transmissivity, or ability to transmit water, of the water table aquifer is dependent upon the permeability of the aquifer deposits and the saturated thickness. In areas where the surficial sand deposits are thin, the transmissivity of the unit typically is comparatively less than in areas where the deposits are thicker. The surficial aquifer system in western Pasco County is seldom used for a water supply source primarily because the deeper Floridan aquifer supplies greater quantities of higher quality water to wells.

The surficial or water table aquifer system is recharged primarily by precipitation and subsequent infiltration to the saturated zone. Water is discharged from the aquifer by evapotranspiration, seepage to lakes and streams and by vertical leakance to underlying aquifers.

The top of the Floridan aquifer system in Pasco County is represented by either the Miocene Tampa Limestone or where absent, the Oligocene Suwannee Limestone. The top of the Floridan aquifer occurs at an altitude of near mean sea level (msl) in northwest Pasco County. The aquifer becomes progressively more deeply buried beneath the surficial clastic deposits southward.

The Suwannee Limestone is a very permeable, productive zone of the Floridan aquifer. Most domestic and many irrigation wells produce from the lower part of the Suwannee Limestone. The Ocala Group is highly permeable over much of the area and yields large quantities of water to wells. The underlying Avon Park Formation contains a fractured, cavernous zone near the top which yields large quantities of water to wells.

Groundwater flow in the Floridan aquifer system in Pasco County moves generally westward toward the Gulf of Mexico from the "Pasco High" centered in the eastern part of the county. The "Pasco High" represents an area of

highest altitude in the vicinity of the potentiometric surface of the Floridan aquifer.

Based on available publications, the transmissivity of the Floridan aquifer in this area of Pasco County is highly variable; varying from about 40,000 to 130,000 ft.²/day. The natural leakance rate through the semi-confining clayey unit in this area of Pasco County varies from about 5×10^{-3} to 5×10^{-4} /day⁻¹.

3.0 DISPOSAL SYSTEM ASSESSMENT

The following information is presented in the same numerical order as the items contained on page 2 of the Application for Monitoring Plan Approval.

1. Hydrogeological, physical and chemical data for the site.
 - a. The altitude of the surficial aquifer is shown at the end of the wet season for September 6, 1986, and for the dryer period of November 13, 1986 in Figures 2-20 and 2-21, respectively (Volume I). The direction of groundwater flow is from the higher water table elevations toward lower water table elevations. Groundwater conditions in the surficial aquifer are discussed in Section 4.2 of the Jammal & Associates report (April, 1987), contained in Volume IV of this permit application. It appears that the water table is from 5 to 18 feet below land surface in the favorable landfill area with the water table being 10 to 12 feet below present surface over the majority of the above area.

The lowest measured points on the water table surface occurred along the north and northeast margin of the site. Water table elevations of less than +30 feet above msl were measured in wells in these areas. Geologic data, discussed above, suggests that the clay deposits covering the limestone may be missing in areas along the northern site boundary.

Water levels in wells at the site indicate that the water table surface above the Hawthorn clay deposits ranged in altitude from about +30 to +40 feet above msl. Based on the potentiometric surface maps of the underlying Floridan aquifer prepared by SWFWMD (Plate 2, Appendix A, Jammal & Associates, April 1987, Volume IV), the difference in head between the Floridan and overlying water table aquifer is relatively small, approximately 5 feet on an average.

No tests of the surficial aquifer at the site were performed. The upper fine sands are expected to have a permeability of about 10 to 20 feet/day.

The average linear velocity (seepage velocity) for the Floridan aquifer was calculated using the following formula (Freeze and Cherry, 1979; Fetter, 1980).

$$v = \frac{-Kdh}{ndl} \quad K = \frac{T}{b}$$

where:

v = average linear velocity (ft/day)

K = hydraulic conductivity (ft/day)

$\frac{dh}{dl}$

= hydraulic gradient (ft/day)

n = effective porosity

T = transmissivity (ft²/day)

b = thickness of aquifer (ft)

The steepest hydraulic gradient perpendicular to the September 6, 1986 groundwater contours was about 1 foot decline in 50 feet. Assuming an effective porosity of $N = 0.20$, the average linear velocity is:

$$v = \frac{20}{0.20} \frac{1}{50} = 2 \text{ feet/day}$$

The hydraulic gradient of the Floridan aquifer determined from the potentiometric surface (water level) in the monitor wells at the site was 1 foot in 826 feet from readings taken on November 13, 1986 (Jammal & Associates, April 1987, Table 4, Volume IV). This compares favorably with the gradient interpreted from USGS potentiometric surface maps for the

area. The direction of groundwater flow in the upper Floridan aquifer at the site is to the northwest.

The nearest pump test sites were 5 miles to the east at the Cross Bar Ranch Well Field where transmissivity values ranged from 50,000 to 115,000 ft²/day (Hutchinson, 1985, Figure 5). Jammal & Associates (April 1987, Volume IV) state that the transmissivity in this area is highly variable, varying from about 40,000 to 130,000 ft²/day. A transmissivity of 150,000 ft²/day is used in calculations for the Hays Road site for a worst case velocity determination.

No values for the effective porosity of the upper Floridan aquifer in the vicinity of the site could be found. An effective porosity of 0.05 for the Floridan aquifer is used in the G-1 Rule as adopted by the Florida Department of Environmental Regulation. The thickness of the upper Floridan aquifer in the vicinity of the site is estimated to be about 800 feet (Ryder, 1985, Figure 10). Therefore:

$$K = b = \frac{T}{b} = \frac{150,000}{800} = 187.5 \text{ ft/day}$$

and:

$$v = \frac{-Kdh}{ndl} = \frac{187.5}{.05 \times 826} = 4.54 \text{ ft/day}$$

Water quality analyses have been performed for the onsite monitor wells. The results of the analyses (Appendix A) show no violation of primary and secondary drinking water standards (Chapter 17-22.104, FAC). The surficial aquifer water may be slightly acidic, high in dissolved iron, and have a high color.

- b. See Item 1.a. above for available information on aquifer porosity and permeability.

The top of the first semi-confining unit is very irregular. The clay to sandy clay of strata 8 and 9, and the more clayey portions of the clayey sand of strata 7 make up the semi-confining unit (Sections 5.2 and 5.7, Jammal & Associates, April 1987, Volume IV).

- c. The clayey semi-confining unit was present and fairly consistent in physical properties in the area classified as favorable (proposed area to be landfilled). The highly plastic clays of strata 8 and 9 are considered essentially impermeable to vertical movement of water. However, there appear to be minor inconsistencies and seams of secondary seepage that allow some vertical movement of groundwater.

The thickness in the favorable area varies from 5 to 15 feet with a thickness of 6 to 8 feet in most instances. The average vertical permeability is approximately 7.2×10^{-5} cm/sec.

- d. The project site is situated in a relatively flat section of the Pamlico Terrace of the Gulf Coastal Lowlands physiographic province with greater relief to the east and northeast. Numerous lakes and ponds are found south of the site and the relatively large/linear Crews Lake is located about 1.5 miles to the east of the site. The topography and physiographic settings are further discussed in Sections 1.3 and 2.1, respectively, of the Jammal & Associates report (April 1987, Volume IV).

Section 3.1 of the Jammal & Associates report (April 1987, Volume IV) discusses the test drilling program during evaluation of the Hays Road site. The results of the soil borings are presented as soil profiles on Sheets 5 through 11 and discussed in Section 4.1.

In the northern portion of the project site, a relict drainage ditch 5 to 8 feet deep is present. It appears to have been dry for a considerable length of time.

The Hays Road site has no surface water bodies within the landfill construction area. Several small limestone-solution, sinkhole related depression areas are located west of the power line easement that bisects the property and do not lie within an area where construction is planned.

There is no distinct drainage pattern, since the surface material is generally very permeable and most rainfall infiltrates directly into the sandy soil. The existing surface water runoff flows toward closed shallow depressions. The overland flow occurs downgradient, generally via sheet flow. It is envisioned that the stormwater management system will, to the greatest extent possible, retain this general flow regime. This will permit the development of the project with a minimal amount of disruption to the existing environment.

2. Pasco County currently generates an estimated 660 tons per day of solid waste, or approximately 240,000 tons per year. This is expected to increase to approximately 1,160 tons per day or 425,000 tons per year in the year 2010. The East Pasco Sanitary Landfill, east of Dade City, is the only active sanitary landfill site presently serving Pasco County. The Hays Road Landfill will serve the 70% of the population that lives in western Pasco County. See Section 3.7.1 of Volume I for further information on the types and quantities of solid waste.
3. Hazardous wastes, as defined by the U.S. Environmental Protection Agency (EPA) and identified by FDER in Chapter 17-30, FAC, are not permitted to be disposed at the landfill. The small amounts of solvents and household chemicals contained in typical community solid

wastes are not hazardous because they form such a tiny fraction of the total mass of wastes. The overall toxicity of the solid waste should be low.

4. The characteristics of the leachate generated are not known. The indicator parameters selected for the groundwater quality analyses should detect any leachate reaching the groundwater by water quality changes.

The volume of water infiltrating the landfilled solid waste area is discussed in the following paragraph (Item 5).

5. Disposal System Water Balance. Site Water Budget and Area Uses are discussed in Section 2.3.3 of Volume I. Water infiltrating the solid waste/ash landfilled area will be intercepted by the leachate collection system for treatment and disposal.
6. There are no known existing or expected future pollution sources located within one mile of the site.
7. Information on wells located within one mile of the site is located in Section 2.3.3 of Volume I and Appendix 10.8 of this volume.
8. The Hays Road site was recommended for the construction of a new sanitary landfill for the following reasons:
 - A sanitary landfill at this location should not have any adverse environmental impacts and can be constructed and operated to minimize any impacts upon adjacent land use.
 - A sanitary landfill can be constructed at this site with very minimal potential impacts to groundwater quality.
 - The Hays Road site has a lower annual disposal cost (between \$3.00 to \$6.00 per ton) than the East Pasco landfill site, primarily because of the higher transportation cost associated with the East Pasco site.

9. Groundwater conditions are described in Section 4.2 of the Jammal & Associates summary report (April 1987, Volume IV). Measurements are given on Table 3, and groundwater elevation contour maps are included on Sheets 12 and 13. All of the monitor wells can be used to obtain background water quality, as the landfill facility is not in operation. See Item 1.a. above for background water quality data.
10. The waste disposal facilities will consist of an electrical power generating plant which will burn solid waste as fuel and a sanitary landfill co-located at the site. The lined landfill will be utilized for disposal of incinerator residue and bypass solid waste.
11. There are no streams or other surface water flows present at the site.
12. The design, construction and operation plans of the solid waste resource recovery facility, and the sanitary landfill are contained in Appendix 10.6 of this volume.
13. The immediate surrounding land use at the Hays Road site is primarily non-residential, with chicken and tree farms and undeveloped lands on the southern and eastern site boundaries. There is sparse mobile home development on the western and northern boundaries along First Avenue and Bluebird Lane, respectively. The Shady Hills Civic Association recreational complex is located north of the site. A Florida Power Corporation 230 KV transmission line passes through and a substation is located in a residential development north of the site. The natural barriers present on the site, and the access to the site by Hays Road will minimize contact with nearby residents.

4.0 MONITOR WELL SYSTEM

4.1 LOCATION OF MONITOR WELLS

A series of four monitor well clusters have been installed at selected locations around the perimeter of the site as illustrated in Figure 4-1. Each monitor well cluster consists of a surficial aquifer well and a Floridan aquifer well. The surficial monitor wells are designated 2MW1 to 2MW4 while the Floridan monitor wells are designated 4MW1 to 4MW4.

It is recommended that three additional monitor well clusters be constructed in locations which are shown as monitor well clusters 5, 6 and 7 as shown in Figure 4-1. These monitor wells would be used as compliance wells. The background water quality monitor wells would be monitor well 2MW1 for the surficial aquifer and 4MW1 for the Floridan aquifer. The remaining surficial aquifer monitor wells 2MW2 to 2MW4 and Floridan aquifer monitor wells 4MW2 to 4MW4 will be used as compliance wells.

4.2 MONITOR WELL CONSTRUCTION

The surficial aquifer monitor wells are installed generally just above the semi-confining clayey materials. In general, the casings of the deep monitor wells were set and grouted several feet into competent limestone and then an open hole for monitoring the Floridan aquifer was drilled into the limestone.

The well construction details for each of the shallow and deep monitor wells are included in Appendix E, on Plates 1 through 5 of the Jammal & Associates report (April 1987, Volume IV of this application). Sections 3.3 and 6.2 of the Jammal & Associates report (April 1987) contain further information on monitor well construction.

When construction of the groundwater monitoring system is complete, the following information will be submitted to the Florida Department of Environmental Regulation for all groundwater monitoring wells:

Well identification

Latitude/longitude

Aquifer monitored

Screen type and slot size

Screen length

Elevation at top of pipe

Elevation at land surface

Elevation at top and bottom

of construction zone (screen)

Driller's log

Total depth of well

Casing diameter

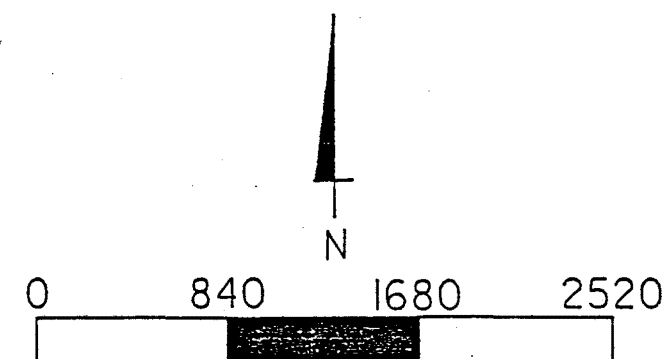
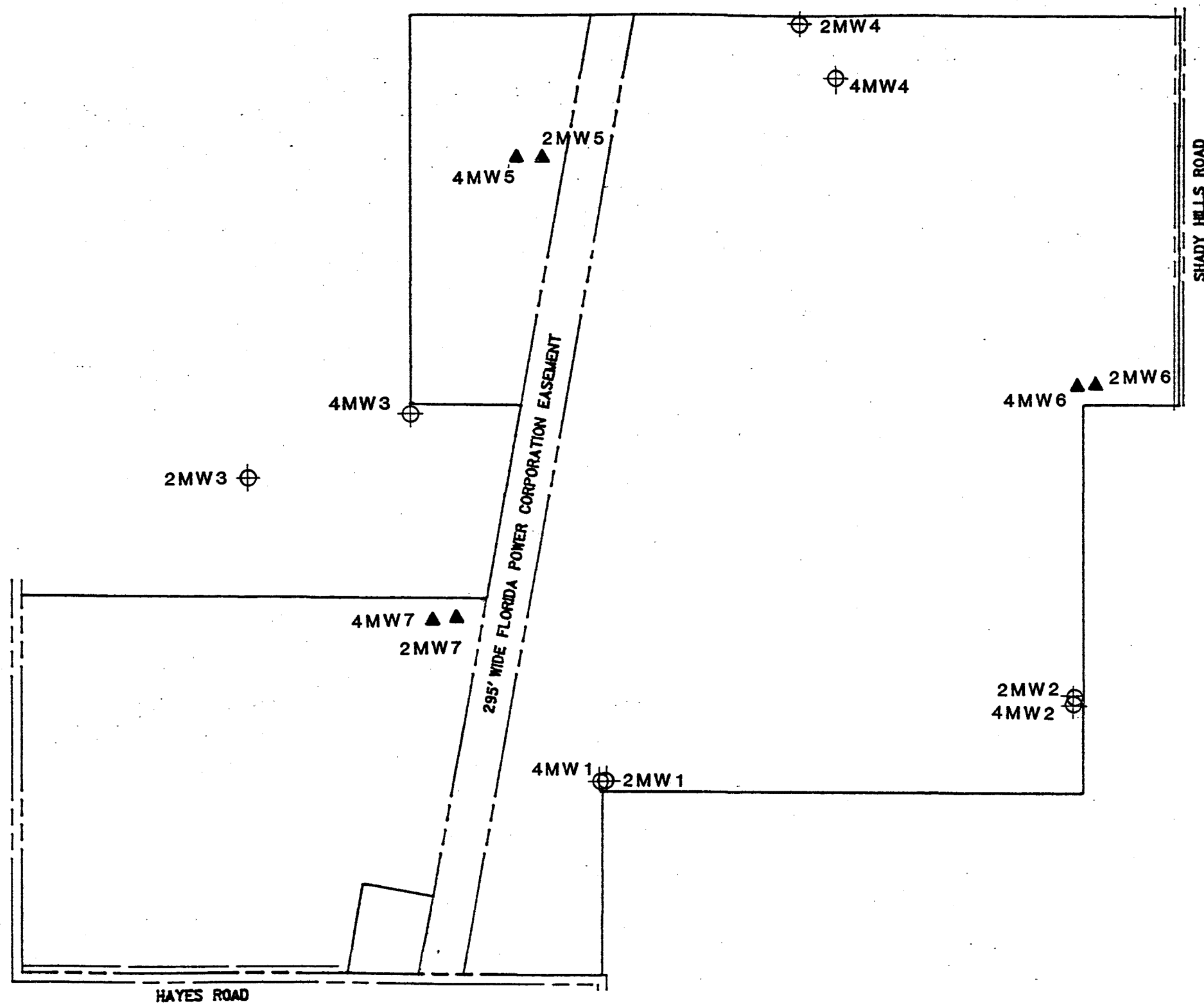
Casing type and length

Direction of groundwater flow
in screened zone

Well construction

permit numbers

Site map showing well location



LEGEND

⊕ EXISTING MONITOR WELL

▲ PROPOSED MONITOR WELL

Pasco County Resource Recovery Program
Monitor Wells

FIGURE 4-1

5.0 GROUNDWATER MONITORING

5.1 SAMPLING PROCEDURES

Upon completion of construction, all new monitor wells will be sampled for the Primary and Secondary Drinking Water parameters included in Chapter 17-22, Florida Administrative Code, Public Drinking Water Systems. The specific parameters to be considered are the Primary [17-22.104(1)] and Secondary [17-22.104(2)] Drinking Water Standards listed in Part II, Quality Standards, Analytical Methods, Sampling.

All groundwater monitor wells will be sampled quarterly at a minimum for the indicator parameters determined from initial water quality analyses. However, additional sample(s) and parameter(s) may be required during the permit period based upon the results or trends of the indicator parameter analyses. Also water levels (ft. msl) will be reported.

Samples from the monitor wells will be taken after a minimum of 3 to 5 well volumes of water have been removed and temperature and conductivity have stabilized. Water samples must be drawn from the aquifer since water which has been stationary and exposed to the atmosphere within the casing will not have the same chemistry as that in the aquifer. The field testing, sample collection and preservation and laboratory testing, including quality control procedures, will comply with Chapter 17-4.246 and 17-3.401, FAC.

Approved methods as published by FDER or as published in Standard Methods, ASTM or EPA methods shall be used. Approved methods for chemical analyses are summarized in the Federal Register, December 1, 1976 (41FR52780), except that turbidity will be measured by the Nephelometric Method.

The groundwater monitoring analyses will be reported on FDER form 17-1.215(2), Quarterly Report on Ground Water Monitoring. The results will be submitted to FDER no later than the fifteenth (15th) day of the month immediately following the end of the sampling period.

If a monitor well becomes damaged or inoperable, FDER will be notified immediately and a detailed written report will follow within fourteen (14) days indicating the problem that has occurred and remedial measures that have been taken to prevent recurrence. All monitoring well design and replacement will be approved by FDER before installation.

6.0 BIBLIOGRAPHY

Fetter, C.W., Jr., 1980. Applied Hydrogeology. Charles E. Merrill Publishing Co. Columbus, Ohio.

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Hutchinson, C.B. 1985. Hydrogeology of the Cross Bar Ranch Well-Field Area and Projected Impact of Pumping, Pasco County, Florida. U.S. Geological Survey Water Resources Investigations Report 85-4001.

Jammal & Associates, Inc. April 17, 1987. Summary Report, Geotechnical/Hydrogeologic Study, Proposed Class I Sanitary/Ash Landfill Site—Hays Road, Pasco County, Florida.

Ryder, P.D. 1985. Hydrology of the Floridan Aquifer System in West-Central Florida. U.S. Geological Survey Open File Report 84-611.

APPENDIX A
WATER QUALITY DATA

FIRST SAMPLING

Image Quality

As you review the next group of images, Please note that the original documents were of poor quality.

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TELEPHONE (813) 223-9702
P.O. BOX 2880

June 5, 1997

Laboratory Number 660052

For Jammal & Assoc. Inc.
6313 Benjamin Rd. Suite 101
Tampa, FL 33614

Attention R. Mortensen

Project Pasco County Landfill
Sample Site 4MWC
Date & Time Collected 5/7/87, 11:50 am
Date & Time Received 5/7/87
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.38
Conductivity (umhos/cm) 270
Temperature, °C 22

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #84147

SECONDARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
Calcium (Ca)	--	58	CORROSIVITY		
Chloride (Cl)	250	8.3	Total Hardness (c)	--	150
Color (Pt-Co Units)	15	2	Total Alkalinity (c)	--	134
Copper (Cu)	1	<0.005	N.C.H. (c)	--	16
Foaming Agents	0.5	<0.02	Bicarbonate (HCO ₃)	--	163
Hydrogen Sulfide	--	0.82	Carbon Dioxide (CO ₂)	--	2.5
Iron (Fe)	0.3	0.095	Bicarbonate (c)	--	134
Magnesium (Mg)	--	1.4	Carbonate (c)	--	-0-
Manganese (Mn)	0.05	0.013	Hydroxide (c)	--	-0-
Odor (Threshold Units)	3	-0-	pH Value	--	7.6
pH Value	6.5 Min.	8.0	Saturation Index	<-0.2	
Sulfate (SO ₄)	250	2.6		>+0.2	0.4
Total Dissolved Solids	500	176	Stability Index		7.2
Zinc (Zn)		<0.005	Interpretation		Scale Forming

Analysis performed by approved methods listed in Chapter 17-22.

a. Quality Assurance, Chapter 17-22.104 F.A.C.

b. All results expressed as mg/L except as noted.

c. Results expressed as mg/L CaCO₃.

THORNTON LABORATORIES, INC.

Paul R. Haultz

THORNTON LABORATORIES, INC.

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June 5, 1987

Laboratory Number 660052

For Jammal & Assoc. Inc.
6313 Benjamin Rd. Suite 101
Tampa, FL 33614

Attention R. Mortensen

Project Pasco County Landfill
Sample Site 4MW3
Date & Time Collected 5/7/87, 11:50 am
Date & Time Received 5/7/87
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.38
Conductivity (umhos/cm) 270
Temperature, °C 22

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #B4147

PRIMARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
INORGANICS			ORGANICS		
Arsenic (As)	0.05	<0.005	Endrin	0.0002	<0.0001
Barium (Ba)	1.0	<0.03	Lindane	0.004	<0.0002
Cadmium (Cd)	0.01	<0.002	Methoxychlor	0.1	<0.005
Chromium (Cr)	0.05	<0.005	Toxaphene	0.005	<0.001
Lead (Pb)	0.05	<0.01	2,4-D	0.1	<0.02
Mercury (Hg)	0.002	0.0016	2,4,5-TP	0.01	<0.002
Nitrate (N)	10	0.05	TRIHALOMETHANES		
Selenium (Se)	0.01	<0.005	Chloroform	--	<0.001
Silver (Ag)	0.05	0.007	Bromodichloromethane	--	<0.001
Sodium (Na)	160	2.9	Dibromochloromethane	--	<0.001
Fluoride (F)		<0.1	Bromoform	--	<0.001
Turbidity		1.2	Total THM	0.10	<0.001
RADIONUCLIDES			MICROBIOLOGICAL		
Gross Alpha		1.2+/-0.7	Total Coliform MPN/100cc	1	<3

Analysis performed by approved methods listed in Chapter 17-22.

- Quality Standards, Chapter 17-22.104 F.A.C.
- All results are expressed as mg/L except as noted.
- At 95% Confidence Limits.

THORNTON LABORATORIES, INC.

Paul R. Hantley

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June 5, 1967

Laboratory Number 560052

For Jammal & Assoc. Inc.
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Tampa, FL 33614

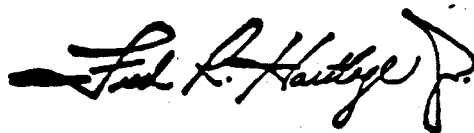
Attention R. Mortensen

Project Pasco County Landfill
Sample Site 4MW3
Date & Time Collected 5/7/87, 11:50 am
Date & Time Received 5/7/87
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.38
Conductivity (umhos/cm) 270
Temperature, °C 22DRINKING WATER CHEMICAL ANALYSIS
LABORATORY ID#84147

ANALYSIS	RESULT, ug/L	DETECTION LIMIT, ug/L
TRICHLOROETHYLENE	BDL*	1
TETRACHLOROETHYLENE	BDL	1
CARBON TETRACHLORIDE	BDL	1
VINYL CHLORIDE	BDL	1
1,1,1-TRICHLOROETHANE	BDL	1
1,2-DICHLOROETHANE	BDL	1
BENZENE	BDL	1
ETHYLENE DIBROMIDE	BDL	0.02

*Below Detection Limit

THORNTON LABORATORIES, INC.



SECOND SAMPLING

THORNTON LABORATORIES, INC.TWX 810 876-9134
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P.O. BOX 2880

October 7, 1987

Laboratory Number 667568

For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Site Pasco County Resource Recovery Site
Location Pasco County
Sample Site 4 MW-3
Date & Time Collected 9/9/87, 8:50 am
Date & Time Received 9/9/87, 5:30 pm
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.3
Temperature °C 22
Conductivity (umhos/cm) 260

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #84147

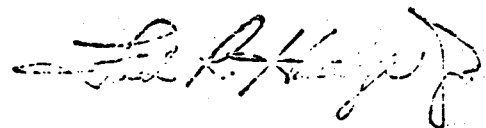
PRIMARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
INORGANICS			ORGANICS		
Arsenic (As)	0.05	<0.005	Endrin	0.0002	<0.0001
Barium (Ba)	1.0	0.11	Lindane	0.004	<0.0002
Cadmium (Cd)	0.01	<0.002	Methoxyvchlor	0.1	<0.005
Chromium (Cr)	0.05	<0.005	Toxaphene	0.005	<0.001
Lead (Pb)	0.05	<0.01	2,4-D	0.1	<0.02
Mercury (Hg)	0.002	<0.0002	2,4,5-TF	0.01	<0.002
Nitrate (N)	10	3.8	TRIHALOMETHANES		
Selenium (Se)	0.01	<0.005	Chloroform	--	<0.001
Silver (Ag)	0.05	<0.005	Bromodichloromethane	--	<0.001
Sodium (Na)	160	3.0	Dibromochloromethane	--	<0.001
Fluoride (F)	1.6	<0.1	Bromoform	--	<0.001
Turbidity (NTU)	1	3.0	Total THM	0.10	<0.001
RADIONUCLIDES (c)			MICROBIOLOGICAL		
Gross Alpha, pCi/L		1.8±1.4	Total Coliform/100cc 1		<3

Analysis according to approved methods listed in Chapter 17-22.

- Quality Standards, Chapter 17-22.104 F.A.C.
- All results are expressed as mg/L except as noted.
- At 95% Confidence Limits.

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October 7, 1987

Laboratory Number 667568

For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Site Pasco County Resource Recovery Site
Location Pasco County
Sample Site 4 MW-3
Date & Time Collected 9/9/87, 8:50 am
Date & Time Received 9/9/87, 5:30 pm
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.3
Temperature °C 22
Conductivity (umhos/cm) 260

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #84147

SECONDARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
Calcium (Ca)	--	52	CORROSIVITY		
Chloride (Cl)	250	5.6	Total Hardness (c)	--	132
Color (Pt-Co Units)	15	2	Total Alkalinity (c)	--	145
Copper (Cu)	1	<0.005	N.C.H. (c)	--	-0-
Foaming Agents	0.5	<0.02	Bicarbonate (HCO ₃)	--	177
Hydrogen Sulfide	--	0.12	Carbon Dioxide (CO ₂)	--	17
Iron (Fe)	0.3	0.27	Bicarbonate (c)	--	145
Magnesium (Mg)	--	0.24	Carbonate (c)	--	-0-
Manganese (Mn)	0.05	0.006	Hydroxide (c)	--	-0-
Odor (Threshold Units)	3	-0-	pHs Value	--	7.5
pH Value	6.5 Min.	7.5	Saturation Index	<-0.2	
Sulfate (SO ₄)	250	5.9		>+0.2	-0.2
Total Dissolved Solids	500	142	Stability Index		7.7
Zinc (Zn)	5	0.009	Interpretation		Stable

Analysis according to approved methods listed in Chapter 17-22.

a. Quality Standards, Chapter 17-22.104 F.A.C.

b. All results are expressed as mg/L except as noted.

c. Results expressed as mg/L CaCO₃.

THORNTON LABORATORIES, INC.

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P.O. BOX 2880

October 7, 1987

Laboratory Number 667568
For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624
Attention C. Gable
Marks 4 MW-3

DRINKING WATER CHEMICAL ANALYSIS
LABORATORY ID#84147

ANALYSIS	RESULT. ug/L	DETECTION LIMIT. ug/L	MCL (a)
TRICHLOROETHYLENE	BDL*	1	3
TETRACHLOROETHYLENE	BDL	1	3
CARBON TETRACHLORIDE	BDL	1	3
VINYL CHLORIDE	BDL	1	1
1,1,1-TRICHLOROETHANE	BDL	1	200
1,2-DICHLOROETHANE	BDL	1	3
BENZENE	BDL	1	1
ETHYLENE DIBROMIDE	BDL	0.02	0.02

Analysis according to approved methods listed in Chapter 17-22.
(a) Maximum Contaminant Levels, Chapter 17-22.104 (1) (g)

*Below Detection Limit

THORNTON LABORATORIES, INC.

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1145 EAST CASS STREET

TAMPA, FLORIDA 33601 - 2880

MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICES

TWX 810 876-9134
THORNT LAB TPATELEPHONE (813) 223-9702
P.O. BOX 2880

October 7, 1987

Laboratory Number 667476

For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Site Pasco County Resource Recovery Site
Location Pasco County
Sample Site 4 MW-1
Date & Time Collected 9/8/87, 6:20 pm
Date & Time Received 9/9/87, 07:00
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.4
Temperature °C 24
Conductivity (umhos/cm) 200

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #84147

PRIMARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
INORGANICS			ORGANICS		
Arsenic (As)	0.05	<0.005	Endrin	0.0002	<0.0001
Barium (Ba)	1.0	<0.03	Lindane	0.004	<0.0002
Cadmium (Cd)	0.01	<0.002	Methoxychlor	0.1	<0.005
Chromium (Cr)	0.05	<0.005	Toxaphene	0.005	<0.001
Lead (Pb)	0.05	<0.01	2,4-D	0.1	<0.02
Mercury (Hg)	0.002	<0.0002	2,4,5-TP	0.01	<0.002
Nitrate (N)	10	0.10	TRIHALOMETHANES		
Selenium (Se)	0.01	<0.005	Chloroform	--	<0.001
Silver (Ag)	0.05	<0.005	Bromodichloromethane	--	<0.001
Sodium (Na)	160	2.6	Dibromochloromethane	--	<0.001
Fluoride (F)	1.6	<0.1	Bromoform	--	<0.001
Turbidity (NTU)	1	1.4	Total THM	0.10	<0.001
RADIONUCLIDES(c)			MICROBIOLOGICAL		
Gross Alpha, pCi/L		2.2±1.0	Total Coliform/100cc 1		<3

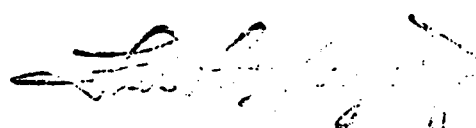
Analysis according to approved methods listed in Chapter 17-22.

a. Quality Standards, Chapter 17-22.104 F.A.C.

b. All results are expressed as mg/L except as noted.

c. At 95% Confidence Limits.

THORNTON LABORATORIES, INC.



THORNTON LABORATORIES, INC.

1148 EAST CASS STREET

TAMPA, FLORIDA 33601 - 2880

MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICES

TWX 810 876-9134

THORNT LAB TPA

TELEPHONE (813) 223-9702

P.O. BOX 2880

October 7, 1987

Laboratory Number 667476

For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Site Pasco County Resource Recovery Site
Location Pasco County
Sample Site 4 MW-1
Date & Time Collected 9/8/87, 6:20 pm
Date & Time Received 9/9/87, 07:00
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.4
Temperature °C 24
Conductivity (umhos/cm) 200

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #84147

SECONDARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
Calcium (Ca)	--	36	CORROSIVITY		
Chloride (Cl)	250	3.8	Total Hardness (c)	--	93
Color (Pt-Co Units)	15	5	Total Alkalinity (c)	--	100
Copper (Cu)	1	<0.005	N.C.H. (c)	--	-0-
Foaming Agents	0.5	<0.02	Bicarbonate (HCO ₃)	--	122
Hydrogen Sulfide	--	0.24	Carbon Dioxide (CO ₂)	--	5.5
Iron (Fe)	0.3	0.13	Bicarbonate (c)	--	100
Magnesium (Mg)	--	0.88	Carbonate (c)	--	-0-
Manganese (Mn)	0.05	<0.005	Hydroxide (c)	--	-0-
Odor (Threshold Units)	3	-0-	pHs Value	--	7.8
pH Value	6.5 Min.	7.7	Saturation Index	<-0.2	
Sulfate (SO ₄)	250	6.1		>+0.2	-0.4
Total Dissolved Solids	500	136	Stability Index		8.2
Zinc (Zn)	5	<0.005	Interpretation		Corrosive

Analysis according to approved methods listed in Chapter 17-22.

a. Quality Standards, Chapter 17-22.104 F.A.C.

b. All results are expressed as mg/L except as noted.

c. Results expressed as mg/L CaCO₃.

THORNTON LABORATORIES, INC.

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1145 EAST CASS STREET

TAMPA, FLORIDA 33601 - 2880

MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICES

TELEPHONE (813) 223-9702

P.O. BOX 2880

TWX 810 876-9134

THORNT LAB TPA

October 7, 1987

Laboratory Number 667476

For
Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Marks 4 MW-1

DRINKING WATER CHEMICAL ANALYSIS
LABORATORY ID#84147

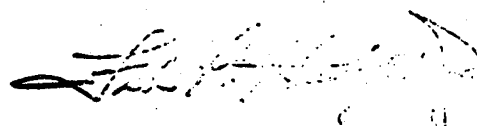
ANALYSIS	RESULT, ug/L	DETECTION LIMIT, ug/L	MCL (a)
TRICHLOROETHYLENE	BDL*	1	3
TETRACHLOROETHYLENE	BDL	1	3
CARBON TETRACHLORIDE	BDL	1	3
VINYL CHLORIDE	BDL	1	1
1,1,1-TRICHLOROETHANE	BDL	1	200
1,2-DICHLOROETHANE	BDL	1	3
BENZENE	BDL	1	1
ETHYLENE DIBROMIDE	BDL	0.02	0.02

Analysis according to approved methods listed in Chapter 17-22.

(a) Maximum Contaminant Levels, Chapter 17-22.104 (1) (g).

*Below Detection Limit

THORNTON LABORATORIES, INC.



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THORNT LAB TPA

THORNTON LABORATORIES, INC.
1146 EAST CASS STREET
TAMPA, FLORIDA 33601 - 2880
MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICES

TELEPHONE (813) 223-9702
P.O. BOX 2880

October 7, 1987

Laboratory Number 667477

For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Site Pasco County Resource Recovery Site
Location Pasco County
Sample Site 4 MW-2
Date & Time Collected 9/8/87, 2:30 pm
Date & Time Received 9/9/87, 07:00
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.7
Temperature °C 24
Conductivity (umhos/cm) 170

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #84147

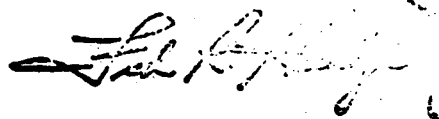
PRIMARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
INORGANICS			ORGANICS		
Arsenic (As)	0.05	<0.005	Endrin	0.0002	<0.0001
Barium (Ba)	1.0	<0.03	Lindane	0.004	<0.0002
Cadmium (Cd)	0.01	<0.002	Methoxychlor	0.1	<0.005
Chromium (Cr)	0.05	<0.005	Toxaphene	0.005	<0.001
Lead (Pb)	0.05	<0.01	2,4-D	0.1	<0.02
Mercury (Hg)	0.002	<0.0002	2,4,5-TP	0.01	<0.002
Nitrate (N)	10	0.19	TRIHALOMETHANES		
Selenium (Se)	0.01	<0.005	Chloroform	--	<0.001
Silver (Ag)	0.05	<0.005	Bromodichloromethane	--	<0.001
Sodium (Na)	160	2.2	Dibromochloromethane	--	<0.001
Fluoride (F)	1.6	<0.1	Bromoform	--	<0.001
Turbidity (NTU)	1	0.91	Total THM	0.10	<0.001
RADIONUCLIDES (c)			MICROBIOLOGICAL		
Gross Alpha, pCi/L		1.6±0.9	Total Coliform/100cc	1	<3

Analysis according to approved methods listed in Chapter 17-22.

- Quality Standards, Chapter 17-22.104 F.A.C.
- All results are expressed as mg/L except as noted.
- At 95% Confidence Limits.

THORNTON LABORATORIES, INC.



THORNTON LABORATORIES, INC.TWX 810 876-8134
THORNT LAB TPA1145 EAST CASS STREET
TAMPA, FLORIDA 33601 - 2880
MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICESTELEPHONE (813) 223-9702
P.O. BOX 2880

October 7, 1987

Laboratory Number 667477

For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Site Pasco County Resource Recovery Site
Location Pasco County
Sample Site 4 MW-2
Date & Time Collected 9/8/87, 2:30 pm
Date & Time Received 9/9/87, 07:00
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.7
Temperature °C 24
Conductivity (umhos/cm) 170

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #84147

SECONDARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
Calcium (Ca)	--	31	CORROSIVITY		
Chloride (Cl)	250	4.8	Total Hardness (c)	--	80
Color (Pt-Co Units)	15	-0-	Total Alkalinity (c)	--	86
Copper (Cu)	1	<0.005	N.C.H. (c)	--	-0-
Foaming Agents	0.5	<0.02	Bicarbonate (HCO ₃)	--	105
Hydrogen Sulfide	--	0.24	Carbon Dioxide (CO ₂)	--	3.0
Iron (Fe)	0.3	0.046	Bicarbonate (c)	--	86
Magnesium (Mg)	--	0.72	Carbonate (c)	--	-0-
Manganese (Mn)	0.05	<0.005	Hydroxide (c)	--	-0-
Odor (Threshold Units)	3	-0-	pHs Value	--	7.9
pH Value	6.5 Min.	7.8	Saturation Index	<-0.2	
Sulfate (SO ₄)	250	7.1		>+0.2	-0.2
Total Dissolved Solids	500	88	Stability Index		8.1
Zinc (Zn)	5	<0.005	Interpretation		Stable

Analysis according to approved methods listed in Chapter 17-22.

a. Quality Standards, Chapter 17-22.104 F.A.C.

b. All results are expressed as mg/L except as noted.

c. Results expressed as mg/L CaCO₃.

THORNTON LABORATORIES, INC.

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THORNT LAB TPA1145 EAST CASS STREET
TAMPA, FLORIDA 33601 - 2880
MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICESTELEPHONE (813) 223-9702
P.O. BOX 2880

October 7, 1987

Laboratory Number 667477
For Camp. Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624
Attention C. Gable
Marks 4 MW-2

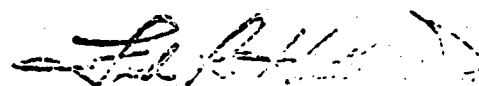
DRINKING WATER CHEMICAL ANALYSIS
LABORATORY ID#B4147

ANALYSIS	RESULT, ug/L	DETECTION LIMIT, ug/L	MCL (a)
TRICHLOROETHYLENE	BDL*	1	3
TETRACHLOROETHYLENE	BDL	1	3
CARBON TETRACHLORIDE	BDL	1	3
VINYL CHLORIDE	BDL	1	1
1,1,1-TRICHLOROETHANE	BDL	1	200
1,2-DICHLOROETHANE	BDL	1	3
BENZENE	BDL	1	1
ETHYLENE DIBROMIDE	BDL	0.02	0.02

Analysis according to approved methods listed in Chapter 17-22.
(a) Maximum Contaminant Levels, Chapter 17-22.104 (1) (a).

*Below Detection Limit

THORNTON LABORATORIES, INC.



THORNTON LABORATORIES, INC.TWX 810 876-9134
THORNT LAB TPA1145 EAST CASS STREET
TAMPA, FLORIDA 33601 - 2880
MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICESTELEPHONE (813) 223-9702
P.O. BOX 2880

October 7, 1987

Laboratory Number 667475

For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Site Pasco County Resource Recovery Site
Location Pasco County
Sample Site 2 MW-2
Date & Time Collected 9/8/87, 4:10 pm
Date & Time Received 9/9/87, 07:00
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 6.5
Temperature °C 25
Conductivity (umhos/cm) 54

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #84147

PRIMARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
INORGANICS			ORGANICS		
Arsenic (As)	0.05	<0.005	Endrin	0.0002	<0.0001
Barium (Ba)	1.0	<0.03	Lindane	0.004	<0.0002
Cadmium (Cd)	0.01	<0.002	Methoxychlor	0.1	<0.005
Chromium (Cr)	0.05	0.006	Toxaphene	0.005	<0.001
Lead (Pb)	0.05	<0.01	2,4-D	0.1	<0.02
Mercury (Hg)	0.002	<0.0002	2,4,5-TP	0.01	<0.002
Nitrate (N)	10	0.12	TRIHALOMETHANES		
Selenium (Se)	0.01	<0.005	Chloroform	--	<0.001
Silver (Ag)	0.05	<0.005	Bromodichloromethane	--	<0.001
Sodium (Na)	160	9.0	Dibromochloromethane	--	<0.001
Fluoride (F)	1.6	<0.1	Bromoform	--	<0.001
Turbidity (NTU)	1	165	Total THM	0.10	<0.001
RADIONUCLIDES (c)			MICROBIOLOGICAL		
Gross Alpha, pCi/L		12.7±4.1	Total Coliform/100cc 1		<3

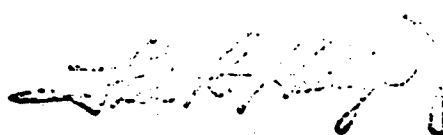
Analysis according to approved methods listed in Chapter 17-22.

a. Quality Standards, Chapter 17-22.104 F.A.C.

b. All results are expressed as mg/L except as noted.

c. At 95% Confidence Limits.

THORNTON LABORATORIES, INC.



THORNTON LABORATORIES, INC.

TWX 810 876-9134
THORNT LAB TPA

1146 EAST CASS STREET
TAMPA, FLORIDA 33601 - 2880
MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICES

TELEPHONE (813) 223-9702
P.O. BOX 2880

October 7, 1987

Laboratory Number 667475

For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Site Pasco County Resource Recovery Site
Location Pasco County
Sample Site 2 MW-2
Date & Time Collected 9/8/87, 4:10 pm
Date & Time Received 9/9/87, 07:00
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 6.5
Temperature °C 25
Conductivity (umhos/cm) 54

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #84147

SECONDARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
Calcium (Ca)	--	4.9	CORROSIVITY		
Chloride (Cl)	250	5.0	Total Hardness (c)	--	16
Color (Pt-Co Units)	15	3	Total Alkalinity (c)	--	37
Copper (Cu)	1	0.012	N.C.H. (c)	--	-0-
Foaming Agents	0.5	<0.02	Bicarbonate (HCO ₃)	--	45
Hydrogen Sulfide	--	0.28	Carbon Dioxide (CO ₂)	--	21
Iron (Fe)	0.3	5.2	Bicarbonate (c)	--	37
Magnesium (Mg)	--	0.91	Carbonate (c)	--	-0-
Manganese (Mn)	0.05	0.14	Hydroxide (c)	--	-0-
Odor (Threshold Units)	3	-0-	pHs Value	--	9.1
pH Value	6.5 Min.	6.9	Saturation Index	<-0.2	
Sulfate (SO ₄)	250	9.2		>+0.2	-2.6
Total Dissolved Solids	500	142	Stability Index		11.7
Zinc (Zn)	5	0.024	Interpretation		Corrosive

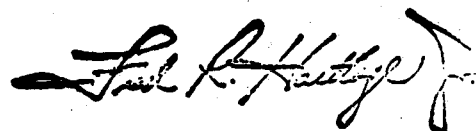
Analysis according to approved methods listed in Chapter 17-22.

a. Quality Standards, Chapter 17-22.104 F.A.C.

b. All results are expressed as mg/L except as noted.

c. Results expressed as mg/L CaCO₃.

THORNTON LABORATORIES, INC.



THORNTON LABORATORIES, INC.TWX 810 876-9134
THORNT LAB TPA1145 EAST CASS STREET
TAMPA, FLORIDA 33601 - 2880
MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICESTELEPHONE (813) 223-9702
P.O. BOX 2880

October 7, 1987

Laboratory Number 667475
For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624
Attention C. Gable
Marks 2 MW-2

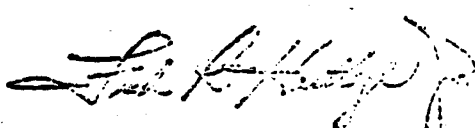
DRINKING WATER CHEMICAL ANALYSIS
LABORATORY ID#84147

ANALYSIS	RESULT, ug/L	DETECTION LIMIT, ug/L	MCL(a)
TRICHLOROETHYLENE	BDL*	1	3
TETRACHLOROETHYLENE	BDL	1	3
CARBON TETRACHLORIDE	BDL	1	3
VINYL CHLORIDE	BDL	1	1
1,1,1-TRICHLOROETHANE	BDL	1	200
1,2-DICHLOROETHANE	BDL	1	3
BENZENE	BDL	1	1
ETHYLENE DIBROMIDE	BDL	0.02	0.02

Analysis according to approved methods listed in Chapter 17-22.
(a) Maximum Contaminant Levels, Chapter 17-22.104 (1) (g).

*Below Detection Limit

THORNTON LABORATORIES, INC.



THORNTON LABORATORIES, INC.TWX 810 876-9134
THORNT LAB TPA1145 EAST CASS STREET
TAMPA, FLORIDA 33601 - 2880
MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICESTELEPHONE (813) 223-9702
P.O. BOX 2880

October 7, 1987

Laboratory Number 667629

For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Site Pasco County Resource Recovery Site
Location Pasco County
Sample Site 4 MW-4
Date & Time Collected 9/10/87, 12:45 pm
Date & Time Received 9/10/87, 15:45
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.5
Temperature °C 22
Conductivity (umhos/cm) 260

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #84147

PRIMARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
INORGANICS			ORGANICS		
Arsenic (As)	0.05	<0.005	Endrin	0.0002	<0.0001
Barium (Ba)	1.0	0.09	Lindane	0.004	<0.0002
Cadmium (Cd)	0.01	<0.002	Methoxychlor	0.1	<0.005
Chromium (Cr)	0.05	<0.005	Toxaphene	0.005	<0.001
Lead (Pb)	0.05	<0.01	2,4-D	0.1	<0.02
Mercury (Hg)	0.002	0.0003	2,4,5-TP	0.01	<0.002
Nitrate (N)	10	0.17	TRIHALOMETHANES		
Selenium (Se)	0.01	<0.005	Chloroform	--	<0.001
Silver (Ag)	0.05	<0.005	Bromodichloromethane	--	<0.001
Sodium (Na)	160	2.8	Dibromochloromethane	--	<0.001
Fluoride (F)	1.6	<0.1	Bromoform	--	<0.001
Turbidity (NTU)	1	12	Total THM	0.10	<0.001
RADIONUCLIDES (c)			MICROBIOLOGICAL		
Gross Alpha, pCi/L		6.6±2.3	Total Coliform/100cc	1	<3

Analysis according to approved methods listed in Chapter 17-22.

a. Quality Standards, Chapter 17-22.104 F.A.C.

b. All results are expressed as mg/L except as noted.

c. At 95% Confidence Limits.

THORNTON LABORATORIES, INC.

THORNTON LABORATORIES, INC.

1146 EAST CASS STREET

TAMPA, FLORIDA 33601 - 2880

MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICES

TWX 810 876-9134
THORNT LAB TPATELEPHONE (813) 223-9702
P.O. BOX 2880

October 7, 1987

Laboratory Number 667629

For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Site Pasco County Resource Recovery Site
Location Pasco County
Sample Site 4 MW-4
Date & Time Collected 9/10/87, 12:45 pm
Date & Time Received 9/9/87, 15:45
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.5
Temperature °C 22
Conductivity (umhos/cm) 260**DRINKING WATER CHEMICAL ANALYSIS**

Laboratory ID #84147

SECONDARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
Calcium (Ca)	--	52	CORROSIVITY		
Chloride (Cl)	250	6.0	Total Hardness(c)	--	130
Color(Pt-Co Units)	15	-0-	Total Alkalinity(c)	--	123
Copper (Cu)	1	<0.005	N.C.H. (c)	--	7
Foaming Agents	0.5	<0.02	Bicarbonate (HCO ₃)	--	150
Hydrogen Sulfide	--	0.16	Carbon Dioxide (CO ₂)	--	5.5
Iron (Fe)	0.3	0.19	Bicarbonate (c)	--	123
Magnesium (Mg)	--	<0.2	Carbonate (c)	--	-0-
Manganese (Mn)	0.05	<0.005	Hydroxide (c)	--	-0-
Odor(Threshold Units)	3	-0-	pHs Value	--	7.6
pH Value	6.5 Min.	7.8	Saturation Index	<-0.2	
Sulfate (SO ₄)	250	6.8		>+0.2	-0.1
Total Dissolved Solids	500	134	Stability Index		7.7
Zinc (Zn)	5	<0.005	Interpretation		Stable

Analysis according to approved methods listed in Chapter 17-22.

a. Quality Standards, Chapter 17-22.104 F.A.C.

b. All results are expressed as mg/L except as noted.

c. Results expressed as mg/L CaCO₃.

THORNTON LABORATORIES, INC.

THORNTON LABORATORIES, INC.

1146 EAST CASS STREET

TAMPA, FLORIDA 33601 - 2880

MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICES

TWX 810 876-9134

THORNT LAB TPA

TELEPHONE (813) 223-9702

P.O. BOX 2880

October 7, 1987

Laboratory Number 667629
For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624
Attention C. Gable
Marks 4 MW-4

DRINKING WATER CHEMICAL ANALYSIS
LABORATORY ID#84147

ANALYSIS	RESULT, ug/L	DETECTION LIMIT, ug/L	MCL (a)
TRICHLOROETHYLENE	BDL*	1	3
TETRACHLOROETHYLENE	BDL	1	3
CARBON TETRACHLORIDE	BDL	1	3
VINYL CHLORIDE	BDL	1	1
1,1,1-TRICHLOROETHANE	BDL	1	200
1,2-DICHLOROETHANE	BDL	1	3
BENZENE	BDL	1	1
ETHYLENE DIBROMIDE	BDL	0.02	0.02

Analysis according to approved methods listed in Chapter 17-22.

(a) Maximum Contaminant Levels, Chapter 17-22.104 (1) (g).

*Below Detection Limit

THORNTON LABORATORIES, INC.

THORNTON LABORATORIES, INC.TWX 810 876-9134
THORNT LAB TPA1146 EAST CASS STREET
TAMPA, FLORIDA 33601 - 2880
MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICESTELEPHONE (813) 223-9702
P.O. BOX 2880

October 7, 1987

Laboratory Number 667474

For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Site Pasco County Resource Recovery Site
Location Pasco County
Sample Site B&B Ranch, Robert Whitley Well
Date & Time Collected 9/8/87, 10:20 am
Date & Time Received 9/9/87, 07:00
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.3
Temperature °C 23
Conductivity (umhos/cm) 350

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #84147

PRIMARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
INORGANICS			ORGANICS		
Arsenic (As)	0.05	<0.005	Endrin	0.0002	<0.0001
Barium (Ba)	1.0	<0.03	Lindane	0.004	<0.0002
Cadmium (Cd)	0.01	<0.002	Methoxychlor	0.1	<0.005
Chromium (Cr)	0.05	<0.005	Toxaphene	0.005	<0.001
Lead (Pb)	0.05	<0.01	2,4-D	0.1	<0.02
Mercury (Hg)	0.002	<0.0002	2,4,5-TF	0.01	<0.002
Nitrate (N)	10	0.37	TRIHALOMETHANES		
Selenium (Se)	0.01	<0.005	Chloroform	--	<0.001
Silver (Ag)	0.05	<0.005	Bromodichloromethane	--	<0.001
Sodium (Na)	160	4.0	Dibromochloromethane	--	<0.001
Fluoride (F)	1.6	<0.1	Bromoform	--	<0.001
Turbidity (NTU)	1	0.72	Total THM	0.10	<0.001
RADIONUCLIDES (c)			MICROBIOLOGICAL		
Gross Alpha, pCi/L		1.3±0.9	Total Coliform/100cc	1	<3

Analysis according to approved methods listed in Chapter 17-22.

a. Quality Standards, Chapter 17-22.104 F.A.C.

b. All results are expressed as mg/L except as noted.

c. At 95% Confidence Limits.

THORNTON LABORATORIES, INC.

THORNTON LABORATORIES, INC.TWX 810 876-9134
THORNT LAB TPA1145 EAST CASS STREET
TAMPA, FLORIDA 33601 - 2880
MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICESTELEPHONE (813) 223-9702
P.O. BOX 2880

October 7, 1987

Laboratory Number 667474

For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Site Pasco County Resource Recovery Site
Location Pasco County
Sample Site B&B Ranch. Robert Whitley Well
Date & Time Collected 9/8/87, 10:20 am
Date & Time Received 9/9/87, 07:00
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.3
Temperature °C 23
Conductivity (umhos/cm) 350

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #84147

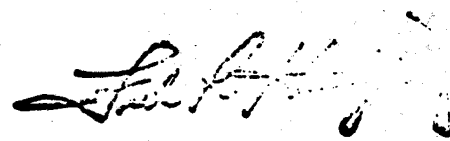
SECONDARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
Calcium (Ca)	--	57	CORROSIVITY		
Chloride (Cl)	250	6.7	Total Hardness (c)	--	147
Color (Pt-Co Units)	15	3	Total Alkalinity (c)	--	157
Copper (Cu)	1	0.011	N.C.H. (c)	--	-0-
Foaming Agents	0.5	<0.02	Bicarbonate (HCO ₃)	--	191
Hydrogen Sulfide	--	0.20	Carbon Dioxide (CO ₂)	--	14
Iron (Fe)	0.3	0.049	Bicarbonate (c)	--	157
Magnesium (Mg)	--	1.3	Carbonate (c)	--	-0-
Manganese (Mn)	0.05	0.005	Hydroxide (c)	--	-0-
Odor (Threshold Units)	3	-0-	pHs Value	--	7.4
pH Value	6.5 Min.	7.6	Saturation Index	<-0.2	
Sulfate (SO ₄)	250	8.1		>+0.2	-0.1
Total Dissolved Solids	500	210	Stability Index		7.5
Zinc (Zn)	5	0.042	Interpretation		Stable

Analysis according to approved methods listed in Chapter 17-22.

- Quality Standards, Chapter 17-22.104 F.A.C.
- All results are expressed as mg/L except as noted.
- Results expressed as mg/L CaCO₃.

THORNTON LABORATORIES, INC.



THORNTON LABORATORIES, INC.

1145 EAST CASS STREET

TAMPA, FLORIDA 33601 - 2880

MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICES

TELEPHONE (813) 223-9702

P.O. BOX 2880

TWX 810 876-9134

THORNT LAB TPA

October 7, 1987

Laboratory Number 667474

For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Marks B&B Ranch. Robert Whitley Well

**DRINKING WATER CHEMICAL ANALYSIS
LABORATORY ID#84147**

ANALYSIS	RESULT, ug/L	DETECTION LIMIT, ug/L	MCL (a)
TRICHLOROETHYLENE	BDL*	1	3
TETRACHLOROETHYLENE	BDL	1	3
CARBON TETRACHLORIDE	BDL	1	3
VINYL CHLORIDE	BDL	1	1
1,1,1-TRICHLOROETHANE	BDL	1	200
1,2-DICHLOROETHANE	BDL	1	3
BENZENE	BDL	1	1
ETHYLENE DIBROMIDE	BDL	0.02	0.02

Analysis according to approved methods listed in Chapter 17-22.

(a) Maximum Contaminant Levels, Chapter 17-22.104 (1) (g).

*Below Detection Limit

THORNTON LABORATORIES, INC.

APPENDIX 10.6

APPENDIX 10.6

**SITE AND ADJACENT AREA
PROPERTY OWNERSHIP**

APPENDIX 10.6.1

DEED FOR PROPERTY SURVEY OF 810-ACRE TRACT, PURCHASE AGREEMENT

59 Acres of the property have been designated for a Class III landfill to be permitted separately (see Figure 2-6 of Volume I). The remaining 751 acres are dedicated to this project.

REC 17.00
ST 2358.50
SUB
LST
TOT 4375.50

14.50
250 Chas. County Attorney - 115-002
1,871,685.47

(6)

WARRANTY DEED

THIS WARRANTY DEED made this 17th day of December, 1985, by RICHU GROVES PARTNERSHIP, a Florida general partnership and RICHARD M. CLEWIS, III, hereinafter collectively called the Grantor, to PASCO COUNTY, a political subdivision, of the State of Florida, whose post office address is Pasco County Courthouse, Dade City, Florida, hereinafter called the Grantee:

WITNESSETH: That the Grantor for and in consideration of the sum of \$10.00 and other valuable considerations, receipt whereof is hereby acknowledged, hereby grants, bargains, sells, aliens, remises, releases, conveys and confirms unto the Grantee all that certain land situate in Pasco County, Florida, more particularly described in Exhibit A attached hereto and incorporated herein by reference.

TOGETHER with all the tenements, hereditaments and appurtenances thereto belonging or in anywise appertaining.

TO HAVE AND TO HOLD, the same in fee simple forever.

AND the Grantor hereby covenants with said Grantee that the Grantor is lawfully seized of said land in fee simple; that the Grantor has good right and lawful authority to sell and convey said land; that the Grantor hereby fully warrants the title to said land and will defend the same against the lawful claims of all persons whomsoever; and that said land is free of all encumbrances, except taxes accruing subsequent to December 31, 1985 and subsequent years, zoning, restrictions, prohibitions and other requirements imposed by governmental authority and those matters set forth in Exhibit B attached hereto and incorporated herein by reference.

IN WITNESS WHEREOF, the said Grantor has signed and sealed these presents the day and year first above written.

Witnesses:

[Signature]
[Signature]
As to Richard M. Clewis,
III

[Signature]
RICHARD M. CLEWIS, III

[Signature]
[Signature]
As to Carlisle K. Clewis,
General Partner of Richu
Groves Partnership

RICHU GROVES PARTNERSHIP
By: [Signature]
CARLISLE K. CLEWIS, General
Partner of Richu Groves
Partnership

This Instrument prepared by:

Stephen L. Kussner, Esquire
Shackleford, Farrior, Stallings &
Evans, Professional Association
Post Office Box 3324
Tampa, Florida 33601

R

RECORD VERIFIED
DEC 30 1985
PASCO COUNTY CLERK
M. Hernandez

O.R. 1470 PG 0012

FILED FOR RECORD
DEC 30 6 41 PM '85
PASCO COUNTY CLERK

207347

STATE OF FLORIDA

COUNTY OF Hillsborough

The foregoing instrument was acknowledged before me this 17th day of December, 1985, by CARLISLE K. CLEWIS, general partner on behalf of RICHU GROVES PARTNERSHIP, a Florida partnership.

Juanita A. Pura
Notary Public, State of
Florida at Large

Notary Public, State of Florida
My Commission Expires Oct. 6, 1989
Bonded thru Tary Firm - Insurance Inc.

My Commission Expires:

10-6-89

STATE OF FLORIDA

COUNTY OF Hillsborough

The foregoing instrument was acknowledged before me this 17th day of December, 1985 by RICHARD M. CLEWIS, III.

Juanita A. Pura
Notary Public, State of
Florida at Large

Notary Public, State of Florida
My Commission Expires Oct. 5, 1989
Bonded thru Tary Firm - Insurance Inc.

My Commission Expires:

10-6-89

0680K

EXHIBIT A

PARCEL ONE

A portion of the Northeast $\frac{1}{4}$ of the Northeast $\frac{1}{4}$ of Section 26 and a portion of the Northwest $\frac{1}{4}$ of the Northwest $\frac{1}{4}$ of Section 25, Township 24, Range 17 East, Pasco County, Florida. Beginning at the Northwest corner of Section 25 and running thence; North $89^{\circ}52'05''$ East along the North line of Section 25, 906.48 feet to the center line of a Florida Power Corporation right-of-way; thence South $10^{\circ}10'31''$ West along the center line of said Florida Power Corporation right-of-way, 1338.58 feet; thence South $89^{\circ}56'36''$ West, 665.99 feet to the West line of Section 25 and the East line of Section 26; thence South $00^{\circ}10'29''$ East along the West line of Section 25 and the East line of Section 26, 658.05 feet; thence North $89^{\circ}51'58''$ West, 2647.92 feet to the East right-of-way line of Hayes Road; thence North $00^{\circ}07'03''$ West along the East right-of-way line of Hayes Road, 657.81 feet; thence South $89^{\circ}52'17''$ East, 1323.63 feet; thence North $00^{\circ}08'46''$ West, 1315.86 feet to the North line of Section 26; thence South $89^{\circ}52'53''$ East along the North line of Section 26, 1322.98 feet to the Northwest corner of Section 25 and the point of beginning. Containing 103.73 acres, more or less and subject to a Florida Power Corporation right-of-way along the most easterly line.

PARCEL TWO

A portion of Sections 25 and 26, Township 24 South, Range 17 East, Pasco County, Florida. Beginning at a point on the North line of Section 25, said point being South $89^{\circ}52'05''$ West along the North line of Section 25, 661.37 feet from the Northeast corner of said Section 25. Running thence; South $00^{\circ}04'08''$ East, 2644.31 feet to the South line of the North $\frac{1}{4}$ of Section 25; thence North $89^{\circ}58'53''$ West along the South line of the North $\frac{1}{4}$ of Section 25, 3296.71 feet; thence South $00^{\circ}05'03''$ East, 1254.08 feet to the North right-of-way line of Hayes Road; thence North $89^{\circ}58'20''$ West along the North right-of-way line of Hayes Road, 1265.79 feet to the Easterly line of lands of Florida Power Corporation; thence North $10^{\circ}10'31''$ East along the Easterly line of lands of Florida Power Corporation, 540.00 feet; thence North $79^{\circ}49'29''$ West along the Northerly line of lands of Florida Power Corporation, 480.00 feet; thence South $10^{\circ}10'31''$ West along the Westerly line of lands of Florida Power Corporation, 625.07 feet to the North right-of-way line of Hayes Road; thence North $89^{\circ}51'51''$ West along the North right-of-way line of Hayes Road, 2209.35 feet to the West line of the East $\frac{1}{4}$ of Section 26; thence North $00^{\circ}07'03''$ West along the West line of the East $\frac{1}{4}$ of Section 26 and the East right-of-way line of Hayes Road, 1911.82 feet; thence South $89^{\circ}51'58''$ East, 2647.92 feet to the East line of Section 26 and the West line of Section 25; thence North $00^{\circ}10'29''$ West along the East line of Section 26 and the West line of Section 25, 658.05 feet; thence North $89^{\circ}56'36''$ East, 665.99 feet to the center line of the Florida Power Corporation right-of-way; thence North $10^{\circ}10'31''$ East along the center line of the Florida Power Corporation right-of-way, 1338.58 feet to the North line of Section 25; thence North $89^{\circ}52'05''$ East along the North line of Section 25, 3709.87 feet to the point of beginning. Containing 403.34 acres more or less and subject to a 295 foot wide Florida Power Corporation right-of-way and a Florida Power Corporation easement along the North right-of-way line of Hayes Road as described in O.R. Book 1067, Page 1379 of the Public Records of Pasco County, Florida.

EXHIBIT B

1. Oil, gas, mineral oil and coal reservation conditions and requirements as set forth in Deed Book 156, Page 461; waiver of surface rights recorded in Official Records Book 779, Page 1431, and instruments of conveyance, assignment and transfer recorded in Official Records Book 1266, Page 1258, all of the Public Records of Pasco County, Florida.
2. Easement granted to Florida Power Corporation recorded in Official Records Book 281, Page 111, of the Public Records of Pasco County, Florida.
3. Supplemental easement granted to Florida Power Corporation recorded in Official Records Book 1067, Page 1373, of the Public Records of Pasco County, Florida.
4. Guying easement granted to Florida Power Corporation by instrument recorded in Official Records Book 1067, Page 1380, of the Public Records of Pasco County, Florida.
5. Easement granted to Florida Power Corporation recorded in Official Records Book 1067, Page 1376, of the Public Records of Pasco County, Florida.

200006 10 2443 12-30-85 2105
14:00
RECORDING 1 14.50
01 00 40
DOC STAMPS 1 9358.50
01 00 41
10 CASH TOTAL 1 9373.00

200006 30 2444 12-30-85 2105
14:01
9 AUTH
GOV CHG RECORD 1 2.50
21 10 40 115002 ACCT
30 CHARGES TOTAL 1 2.50

O.R. 1470 PG 0015

N/C

FILED FOR RECORD
PASCO COUNTY, Florida

SEP 3 2 14 PM '86

IN THE CIRCUIT COURT OF THE SIXTH JUDICIAL CIRCUIT
OF THE STATE OF FLORIDA, IN AND FOR PASCO COUNTY

PASCO COUNTY, a political
subdivision of the State
of Florida,

Petitioner,

vs.

Case No. 86-2053CA
Division "H"

SUMNER A. WILLIAMS, as Sole
remaining Trustee under the
Adelaide S. Bolling Revocable
Trust; S. A. WILLIAMS CORPORA-
TION, a Florida corporation;
and MIKE OLSON, as Tax Collector
for Pasco County, Florida,

Defendants.

EMINENT DOMAIN

FILED FOR RECORD
PASCO COUNTY, Florida
SEP 8 4 23 PM '86

275646

ORDER OF TAKING

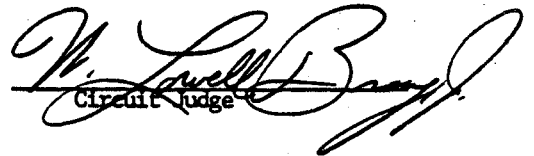
THIS CAUSE coming on to be heard by the Court, it appearing that proper notice was first given to all the defendants, and to all persons having or claiming any equity, lien, title, or other interest in or to the real property described in the Petition, that the Petitioner would apply to this Court on the 25th day of August, 1986, for an Order of Taking, and the Court being fully advised in the premises, upon consideration, it is therefore,

ADJUDGED:

1. That the Court has jurisdiction of the subject matter of and the parties to this cause.
2. That the pleadings in this cause are sufficient, and the Petitioner is properly exercising its delegated authority.
3. That fee simple title to the property specified in Exhibit A, attached hereto and incorporated herein by reference, shall vest in the Petitioner upon payment of the deposit hereinafter specified into the Registry of the Court.
4. That the deposit of money will secure the persons lawfully entitled to the compensation which will be ultimately determined by final judgment of this Court.
5. That the deposit does not reflect the fair market value, if any, of timber and mineral deposits on the property, which will be ultimately determined by final judgment of this Court.

6. That the sum of money to be deposited in the Registry of the Court within twenty (20) days of the entry of this Order shall be in the amount of One Million One Hundred Fifty-Two Thousand Three Hundred (\$1,152,300.00) Dollars.
7. That on deposit as set forth above and without further notice or Order of this Court the Petitioner shall be entitled to possession of the property described in the Petition.

DONE AND ORDERED this 29th day of August, 1986, in Chambers, New Port Richey, Pasco County, Florida.


Circuit Judge

Copies to:

Mark P. Buell, Esq.
Edward B. Helvenston, Esq.
H. Clyde Hobby, Esq.
James G. Murphy, Jr., Esq.

RECORD VERIFIED
JED PITTMAN
Clerk Circuit Court, Pasco County
By CLAY

EXHIBIT "A"

The southeast 1/4 of Section 24, Township 24 South, Range 17 East subject to an easement over and across the east 33 feet of said property as heretofore conveyed to the County of Pasco, Florida for road right-of-way purposes.

A N D

The southwest 1/4 of Section 24, Township 24 South, Range 17 East, less a 295' foot wide strip of land extending through the SW 1/4 of said Section, being more particularly described as follows:

From a concrete monument marking the southwest corner of Section 24, Township 24 South, Range 17 East, run N. 89° 52' 06" E along the south boundary of said Section 24, 756.69 feet to the point of beginning; thence N 10° 10' 31" E., 2693.54 feet to a point on the north boundary of the SW 1/4 of Section 24, Township 24 South, Range 17 East that is N. 89° 56' 24" E., 1242.84 feet from the northwest corner of said SW 1/4, thence N. 89° 56' 24" E. along said north boundary, 299.75 feet to a point that is S. 89° 56' 24" W., 1097.79 feet from the northeast corner of said SW 1/4; thence S. 10° 10' 31" W., 2693.16 to a point on the south boundary of the SW 1/4 of Section 24, Township 24 South, Range 17 East that is S. 89° 52' 06" W., 1575.26 feet from the southeast corner of said SW 1/4; thence S. 89° 52' 06" W., 299.83 feet to the point of beginning.

EXHIBIT "A"

EXHIBIT "A"

The southeast 1/4 of Section 24, Township 24 South, Range 17 East subject to an easement over and across the east 33 feet of said property as heretofore conveyed to the County of Pasco, Florida for road right-of-way purposes.

AND

The southwest 1/4 of Section 24, Township 24 South, Range 17 East, less a 295' foot wide strip of land extending through the SW 1/4 of said Section, being more particularly described as follows:

From a concrete monument marking the southwest corner of Section 24, Township 24 South, Range 17 East, run N. 89° 52' 06" E along the south boundary of said Section 24, 756.69 feet to the point of beginning; thence N. 10° 10' 31" E., 2693.54 feet to a point on the north boundary of the SW 1/4 of Section 24, Township 24 South, Range 17 East that is N. 89° 56' 24" E., 1242.84 feet from the northwest corner of said SW 1/4, thence N. 89° 56' 24" E. along said north boundary, 299.75 feet to a point that is S. 89° 56' 24" W., 1097.79 feet from the northeast corner of said SW 1/4; thence S. 10° 10' 31" W., 2693.16 to a point on the south boundary of the SW 1/4 of Section 24, Township 24 South, Range 17 East that is S. 89° 52' 06" W., 1575.26 feet from the southeast corner of said SW 1/4; thence S. 89° 52' 06" W., 299.83 feet to the point of beginning.

STATE OF FLORIDA
COUNTY OF PASCO

THIS IS TO CERTIFY THAT THE FOREGOING IS A
TRUE AND CORRECT COPY OF THE DOCUMENT ON FILE
OF PUBLIC RECORD IN THIS OFFICE. WITNESS MY
HAND AND OFFICIAL SEAL THIS 15th DAY OF

SEPTEMBER 1986

JOSEPH P. PITTMAN, CLERK OF CIRCUIT COURT

Margaret K. Peoples D.C.

EXHIBIT "A"

RECORDED
AND INDEXED

SEP 3 2 14 PM '86

FILED FOR RECORD
Pasco County, Florida

O.R. 1535 PG 0428

10.02
Charge to
County Attorney
115-032

IN THE CIRCUIT COURT OF THE SIXTH JUDICIAL CIRCUIT
IN AND FOR PASCO COUNTY, FLORIDA

PASCO COUNTY, a political
subdivision of the State
of Florida,

Petitioner,

vs.

Case No. 86-2053 CA
Division "H"

SUMNER A. WILLIAMS, as sole
remaining Trustee under the
ADELAIDE S. BOLLING Revocable
Trust; S. A. WILLIAMS CORPORA-
TION, a Florida corporation,
and MIKE OLSON, as Tax Collector
for Pasco County, Florida,

Defendants.

278153
FILED FOR NO
CLERK OF THE CIRCUIT COURT
SEP 16 6 23 PM '86

CERTIFICATE OF CLERK

The undersigned Clerk of the above-entitled Court hereby certifies that the sum of One Million One Hundred Fifty-Two Thousand Three Hundred Dollars (\$1,152,300.00) as specified in the Order of Taking of August 29, 1986 relating to the property described in Exhibit "A" attached hereto and incorporated herein by reference, was paid into the Registry of this Court by Pasco County on September 10, 1986.

WITNESS MY HAND AND OFFICIAL SEAL on this 11th day of September, A.D., 1986.

RECORD VERIFIED

JED PITTMAN

Clerk Circuit Court

M. Hernandez

JED PITTMAN,

CLERK OF THE CIRCUIT COURT OF FLORIDA
IN AND FOR THE COUNTY OF PASCO

R County ATTORNEY
N.P.R.

By *J. P. Richey*
Deputy Clerk

[SEAL]

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that a copy of the above Certificate of Deposit has been furnished by regular U. S. Mail to JAMES G. MURPHY, JR., ESQ., P. O. Box 3324, Tampa, FL 33601, EDWARD B. HELVENSTON, ESQ., Assistant County Attorney, Pasco County Government Center, 7530 Little Road, New Port Richey, FL 33553 and H. CLYDE HOBBY, ESQ., 6917 County Road 54, New Port Richey, FL 33552, this 11th day of September, 1986.

STATE OF FLORIDA
COUNTY OF PASCO

I HEREBY CERTIFY THAT THE FOREGOING IS A
TRUE AND CORRECT COPY OF THE DOCUMENT ON FILE
OR OF THE PROCEEDINGS IN THIS OFFICE. WITNESS MY
HAND AND SEAL OF OFFICE THIS 11 DAY OF
SEPTEMBER 1986

JED PITTMAN, CLERK OF CIRCUIT COURT

J. P. Richey
Deputy Clerk

O.R. 1537 PG 1596

A BOUNDARY SURVEY
OF LAND
ENCOMPASSING THE PROPOSED

PASCO COUNTY LANDFILL AREA (WEST)

LYING AND BEING IN TOWNSHIP 24 SOUTH, RANGE 17 EAST,
PASCO COUNTY, FLORIDA.

BEING THE SOUTH ONE-HALF OF SECTION 24,
THE NORTH ONE-HALF OF SECTION 25, LESS THE EAST
ONE-EIGHTH, MORE OR LESS; THE NORTHWEST
ONE-QUARTER OF THE SOUTHWEST ONE-QUARTER OF
SECTION 25, LYING NORTH OF HAYES ROAD,
MORE OR LESS.

THE NORTH THREE-QUARTERS OF THE EAST ONE-HALF
OF SECTION 26, LYING NORTH AND EAST OF
HAYES ROAD, MORE OR LESS; LESS THE
NORTHWEST ONE-QUARTER OF THE NORTHEAST
QUARTER OF SAID SECTION 26 AND SUBJECT
TO RIGHTS-OF-WAY AND EASEMENTS OF RECORD,
BEING MORE PARTICULARLY DESCRIBED AS:

BEGINNING AT THE SOUTHWEST CORNER OF SECTION 24, TOWNSHIP 24 SOUTH, RANGE 17 EAST, PASCO COUNTY, FLORIDA, RUN
N 00°02'29" W ALONG THE WEST BOUNDARY OF SAID SECTION 24 FOR 2,652.47 FEET TO THE WEST QUARTER CORNER SAID
SECTION; THENCE S 89°52'32" E ALONG THE EAST-WEST CENTER LINE OF SAID SECTION 24 FOR 5,295.53 FEET TO THE EAST
QUARTER CORNER OF SAID SECTION; THENCE S 00°20'48" W ALONG THE EAST BOUNDARY OF SAID SECTION 24 FOR 2,645.44
FEET TO THE SOUTHEAST CORNER OF SAID SECTION 24; THENCE N 89°57'07" W ALONG THE SOUTH BOUNDARY OF SAID SECTION
24 FOR 661.63 FEET; THENCE S 00°06'14" W FOR 2,643.74 FEET; THENCE N 89°48'39" W ALONG THE EAST-WEST CENTER
LINE OF SECTION 25 FOR 3,296.94 FEET; THENCE S 00°05'25" W FOR 1,254.12 FEET TO THE NORTH RIGHT-OF-WAY OF HAYES
ROAD; THENCE N 89°48'11" W FOR 1,315.46' ALONG SAID NORTH RIGHT-OF-WAY TO THE INTERSECTION WITH THE WEST BOUNDARY
OF SECTION 25; CONTINUE THENCE ALONG SAID NORTH RIGHT-OF-WAY OF HAYES ROAD N 89°41'16" W FOR 2,647.38 FEET TO
THE POINT OF INTERSECTION WITH THE EASTERLY RIGHT-OF-WAY OF SAID HAYES ROAD AT ROAD TURN TO THE NORTH, BOTH
RIGHTS-OF-WAYS BEING 66 FEET WIDE. RUN THENCE N 00°03'45" E ALONG AFORESAID EASTERLY RIGHT-OF-WAY FOR 2,570.05
FEET TO THE INTERSECTION, MORE OR LESS, WITH THE SOUTH BOUNDARY OF THE NORTHWEST ONE-QUARTER OF THE NORTHEAST
ONE-QUARTER OF SAID SECTION 25; THENCE S 89°41'29" E FOR 1,323.59 FEET; THENCE N 00°01'28" E FOR 1,315.54' TO
THE NORTH BOUNDARY OF SAID SECTION 25; THENCE N 89°42'39" E FOR 1,323.33 FEET TO THE POINT OF BEGINNING.

LESS, THAT CERTAIN PARCEL CONTAINING 18.24 ACRES, MORE OR LESS, FOR A 295 FOOT WIDE RIGHT-OF-WAY FOR FLORIDA
POWER CORPORATION LYING IN THE SOUTH ONE-HALF OF SAID SECTION 24 DESCRIBED IN O.R. BOOK 284, PAGE 705, PUBLIC
RECORDS OF PASCO COUNTY, FLORIDA, AND

LESS, THAT CERTAIN PARCEL CONTAINING 6.42 ACRES, MORE OR LESS, FOR FLORIDA POWER CORPORATION SUBSTATION LYING IN
SAID SECTIONS 25 AND 26 ADJOINING HAYES ROAD AS DESCRIBED IN O.R. BOOK 1068, PAGE 1339, PUBLIC RECORDS OF PASCO
COUNTY, FLORIDA, AND

SUBJECT TO A RIGHT-OF-WAY FOR SHADY HILLS ROAD BEING THE EAST 33 FEET OF SAID SECTION 24 ACCORDING TO O.R. BOOK
51, PAGE 450, PUBLIC RECORDS OF PASCO COUNTY, FLORIDA, AND

SUBJECT TO AN EASEMENT FOR A 295 FOOT WIDE RIGHT-OF-WAY FOR FLORIDA POWER CORPORATION ACROSS THE NORTH THREE-
QUARTERS OF THE WEST ONE-HALF OF SAID SECTION 25 AS DESCRIBED IN O.R. BOOK 281, PAGES 111-115, PUBLIC RECORDS
OF PASCO COUNTY, FLORIDA, AND

SUBJECT TO AN EASEMENT 43 FEET WIDE ALONG THE NORTH RIGHT-OF-WAY OF HAYES IN SAID SECTION 26 AS DESCRIBED IN
O.R. BOOK 1067, PAGES 1373-1381, PUBLIC RECORDS OF PASCO COUNTY, FLORIDA, AND

OTHER EASEMENTS, RESTRICTIONS OR RIGHTS-OF-WAY OF RECORD.

CONTAINING 810.26 ACRES, MORE OR LESS,

THE ABOVE DESCRIPTION ENCOMPASSES ALL OF THE LANDS DESCRIBED IN DEEDS OF RECORD FROM THIS COMPOSITE PARCEL IS
SURVEYED AND ABOVE REDESCRIBED VIZ;

O.R. BOOK 1470, PAGES 0012-0015; O.R. BOOK 284, PAGE 705; O.R. BOOK 81, PAGES 383 & 385; O.R. BOOK 1068,
PAGE 1339, ALL RECORDED IN THE PUBLIC RECORDS OF PASCO COUNTY, FLORIDA.

APPENDIX 10.6.2

**COMPLETE LIST OF ABUTTING
AND ADJACENT PROPERTY OWNERS**

PASCO COUNTY BUILDING PERMITS DATE: 09/15/86
NAME AND ADDRESS FOR PROPERTY ID: 24 24 17 0000 00900 0010
SC TP RG SUBD BLOCK LOT

NAME 1: LAMBOUSIS ANTON & BESSIE NAME 2:
ST LN1: 29 VETERANS PLAZA ST LN2:
CITY: BERGENFIELD STATE: NJ ZIP: 07621

-----LEGAL DESCRIPTION FOR PROPERTY-----
W1/2 OF W1/2 OF S1/2 OF SW1/4 OF NW1/4
RB 1078 PG 1337

PASCO COUNTY BUILDING PERMITS DATE: 09/15/86
NAME AND ADDRESS FOR PROPERTY ID: 24 24 17 0000 00900 0000
SC TP RG SUBD BLOCK LOT

NAME 1: PETERS RAY E & MARIE E NAME 2:
ST LN1: 540 HAYS RD ST LN2:
CITY: SPRING HILL STATE: FL ZIP: 33526

-----LEGAL DESCRIPTION FOR PROPERTY-----
E3/4 OF S1/2 OF SW1/4 OF NW1/4 LESS A FLORIDA POWER CORP R/W
DESC AS COM AT W1/4 COR OF SEC TH N89DG 56' 24"E TO WLY R/W
OF FLORIDA POWER CORP 1242.82 FT FOR A POB TH N10DG 10' 31"E
432.53 FT TH S00DG 07' 46"E 425.64 FT TH S89DG 56' 24"W
77.37 FT TO POB OR 1388 PG 1596

PASCO COUNTY BUILDING PERMITS DATE: 09/15/86
NAME AND ADDRESS FOR PROPERTY ID: 24 24 17 0000 00400 0000
SC TP RG SUBD BLOCK LOT

NAME 1: FLORIDA POWER CORP NAME 2:
ST LN1: P O BOX 14042 ST LN2:
CITY: ST PETERSBURG STATE: FL ZIP: 33733

-----LEGAL DESCRIPTION FOR PROPERTY-----
A 295 FT WIDE STRIP OF LAND EXTENDING THRU W
1/2 OF SEC 24 CONTAINING APPROX 36,71
ACS AS PER RB 284 PG 618, RB
285 PG 62, RB 284 PGS 171 708, 705 24 24 17

PASCO COUNTY BUILDING PERMITS DATE: 09/15/86
NAME AND ADDRESS FOR PROPERTY ID: 24 24 17 0000 01000 0000
SC TP RG SUBD BLOCK LOT

NAME 1: FRANCIS MARY NAME 2: 2011 SUNSET LN
ST LN1: LUTZ FL 33549 ST LN2:
CITY: STATE: ZIP: 33549

-----LEGAL DESCRIPTION FOR PROPERTY-----
SW 1/4 OF SE 1/4 OF NW 1/4 1/4 EXC RD, EXC BEG SW
COR TH E 222.40 FT TH N 10 DEG 10 MIN
31 SEC E 673.31 FT TH W 342.84 FT TH S 662.66 FT
TO BEG

PASCO COUNTY BUILDING PERMITS DATE: 09/15/86
NAME AND ADDRESS FOR PROPERTY ID: 24 24 17 0000 00100 0010
SC TP RG SUBD BLOCK LOT

NAME 1: ALONSO MARIA C NAME 2:
ST LN1: 3012 E POWHATAN ST LN2:
CITY: TAMPA STATE: FL ZIP: 33610

-----LEGAL DESCRIPTION FOR PROPERTY-----
SE 1/4 OF SE 1/4 OF NW 1/4 EXC S 210 FT OF N 235 FT OF W 420
FT THEREOF & EXC S 25 FT FOR RD

PASCO COUNTY BUILDING PERMITS DATE: 09/15/86
NAME AND ADDRESS FOR PROPERTY ID: 24 24 17 0000 00200 0015
SC TP RG SUBD BLOCK LOT

NAME 1: HANSEN GARY A & JANET Y NAME 2:
ST LN1: 1713 BLUEBIRD LN-B ST LN2:
CITY: SPRING HILL STATE: FL ZIP: 33526

-----LEGAL DESCRIPTION FOR PROPERTY-----
WEST 150.00 FT OF SOUTH 1/2 OF SOUTH1/4 OF NE1/4, SUBJECT TO
EASEMENT FOR INGRESS & EGRESS ACROSS SOUTH 25.00 FT THEREOF
OR 1476 PG 26

PASCO COUNTY BUILDING PERMITS DATE: 09/15/86
NAME AND ADDRESS FOR PROPERTY ID: 24 24 17 0000 00200 0030
SC TP RG SUBD BLOCK LOT

NAME 1: FREEMAN JEAN M & NAME 2: HANSEN GRAY A & JANET Y
ST LN1: 1717 S BLUEBIRD LN ST LN2:
CITY: SPRING HILL STATE: FL ZIP: 33526

-----LEGAL DESCRIPTION FOR PROPERTY-----
EAST 150.00 FT OF WEST 300.00 FT OF SOUTH1/2 OF SOUTH1/4 OF
NE1/4, SUBJECT TO EASEMENT FOR INGRESS & EGRESS ACROSS SOUTH
25.00 FT THEREOF OR 1500 PG 1306

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 24 24 17 0000 00200 0013
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: ROSS WILLARD B & GAIL B
NAME 2:
ST LN1: P O BOX 11072
ST LN2:
CITY: SPRING HILL
STATE: FL ZIP: 33526
-----LEGAL DESCRIPTION FOR PROPERTY-----
EAST 150.00 FT OF WEST 1950.00 FT OF S 1/2 OF S 1/4 OF NE 1/4 OF
SEC 24 OR 1424 PG 1352

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 24 24 17 0000 00200 0011
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: HENDERSON RAYMOND & DOROTHY
NAME 2:
ST LN1: RT 5 BOX 1728
ST LN2:
CITY: SPRING HILL
STATE: FL ZIP: 33526
-----LEGAL DESCRIPTION FOR PROPERTY-----
E 150 FT OF W 2100 FT OF S 1/2 OF S 1/4 OF NE 1/4
OR 963 RG 277

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 24 24 17 0000 00200 0012
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: HENDERSON RAYMOND & DOROTHY
NAME 2:
ST LN1: RT 5 BOX 1728
ST LN2:
CITY: SPRING HILL
STATE: FL ZIP: 33526
-----LEGAL DESCRIPTION FOR PROPERTY-----
E 150 FT OF W 2250 FT OF S 1/2 OF S 1/4 OF NE 1/4
OR 963 PG 277

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 24 24 17 0000 00200 0018
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: KENT HAROLD L
NAME 2: RT 5 BOX 562
ST LN1: LUTZ FL
ST LN2:
CITY:
STATE: FL ZIP: 33549
-----LEGAL DESCRIPTION FOR PROPERTY-----
S 165 FT OF E 394 FT OF S 1/2 OF S 1/4 OF NE 1/4
RB 678 PG 404

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 23 24 17 0030 00000 0250
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: HARRIE ROBERT EUGENE &
NAME 2: CATHERINE
ST LN1: 522 HAYS RD
ST LN2: BROOKSVILLE FL
CITY:
STATE: FL ZIP: 33512
-----LEGAL DESCRIPTION FOR PROPERTY-----
JEAN VAN FARMS UNREC LOT 25 E 1/2 OF SE 1/4 OF SE 1/4 OF
NE 1/4 EXC N 31.50 FT RB 1029 PG 1249

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 23 24 17 0030 00000 0400
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: WEIGAND THOMAS &
NAME 2: CAROL H
ST LN1: 394 HAYS RD
ST LN2:
CITY: SPRING HILL
STATE: FL ZIP: 33526
-----LEGAL DESCRIPTION FOR PROPERTY-----
JEAN VAN FARMS UNREC LOT 40 E 1/2 OF NE 1/4 OF NE 1/4 OF
SE 1/4 EXC S 31.50 FT RB 930 PG 891

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 23 24 17 0030 00000 0410
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: WITTY YOSHIE
NAME 2:
ST LN1: 640 HAYS RD
ST LN2:
CITY: BROOKSVILLE
STATE: FL ZIP: 33526
-----LEGAL DESCRIPTION FOR PROPERTY-----
JEAN VAN FARMS UNREC LOTS 41 42 55 & 56 E 1/2 OF SE 1/4 OF
NE 1/4 OF SE 1/4 EXC N 31.50 FT & W 1/2 OF SE 1/4 OF NE 1/4
OF SE 1/4 EXC N 31.50 FT & W 1/2 OF NE 1/4 OF SE 1/4 OF SE
1/4 EXC S 31.50 FT & E 1/2 OF NE 1/4 OF SE 1/4 OF SE 1/4
EXC S 31.50 FT

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 23 24 17 0030 00000 0570
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: GARRETT GLEN A & CAROLYN R
NAME 2:
ST LN1: 646 HAYS RD
ST LN2:
CITY: BROOKSVILLE
STATE: FL ZIP: 33512
-----LEGAL DESCRIPTION FOR PROPERTY-----
JEAN VAN FARMS UNREC PLAT TRACT 57 DESC AS EAST 1/2 OF
SE 1/4 OF SE 1/4 OF SE 1/4 SUBJECT TO EASEMENT OVER NORTH
31.50 FT THEREOF OR 1021 PG 1696
OR 1507 PG 816

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 24 24 17 0000 00200 0020
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: FREEMAN JEAN
ST LN1: 1717-S BLUEBIRD LN
CITY: SPRING HILL
NAME 2:
ST LN2:
STATE: FL ZIP: 33526
-----LEGAL DESCRIPTION FOR PROPERTY-----
EAST 150.00 FT OF WEST 450.00 FT OF SOUTH 1/2 OF SOUTH 1/4 OF
NE 1/4, SUBJECT TO EASEMENT FOR INGRESS & EGRESS ACROSS SOUTH
25.00 FT THEREOF OR 1102 PG 643

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 24 24 17 0000 00200 0017
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: STRAQUADINE DOMINIC
ST LN1: P O BOX 11164
CITY: SPRING HILL
NAME 2:
ST LN2:
STATE: FL ZIP: 33526
-----LEGAL DESCRIPTION FOR PROPERTY-----
E 300 FT OF W 750 FT OF S 1/2 OF S 1/4 OF NE 1/4 OF SEC 24 AKA
LOTS 4 & 5 RB 952 PG 1698
RB 960 PG 1022

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 24 24 17 0000 00200 001A
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: MCTEAGUE HELEN
ST LN1: P O BOX 11055
CITY: SPRING HILL
NAME 2:
ST LN2:
STATE: FL ZIP: 33526
-----LEGAL DESCRIPTION FOR PROPERTY-----
EAST 150.00 FT OF WEST 900.00 FT OF SOUTH 1/2 OF SOUTH 1/4 OF
NE 1/4, SUBJECT TO EASEMENT FOR INGRESS & EGRESS ACROSS SOUTH
25.00 FT THEREOF OR 1106 PG 192
OR 1503 PG 1158

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 24 24 17 0000 00200 0019
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: MCTEAGUE HELEN
ST LN1: P O BOX 11055
CITY: SPRING HILL
NAME 2:
ST LN2:
STATE: FL ZIP: 33526
-----LEGAL DESCRIPTION FOR PROPERTY-----
EAST 150.00 FT OF WEST 1050.00 FT OF SOUTH 1/2 OF SOUTH 1/4 OF
NE 1/4, SUBJECT TO EASEMENT FOR INGRESS & EGRESS ACROSS SOUTH
25.00 FT THEREOF OR 1474 PG 1142

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 24 24 17 0000 00200 0016
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: FAY RICHARD W &
ST LN1: PO BOX 161
CITY:
NAME 2: MABEL M
ST LN2: LAND O LAKES FL
STATE: FL ZIP: 33539
-----LEGAL DESCRIPTION FOR PROPERTY-----
E 150 FT OF W 1200 FT OF S 1/2 OF S 1/4 OF NE 1/4
RB 1045 PG 55

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 24 24 17 0000 00200 0010
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: OSBORNE W ALLEN & MARGARET
ST LN1: 3508 EUCLID AVE
CITY: TAMPA
NAME 2:
ST LN2:
STATE: FL ZIP: 33629
-----LEGAL DESCRIPTION FOR PROPERTY-----
EAST 150.00 FT OF WEST 1500.00 FT OF SOUTH 1/2 OF SOUTH 1/4 OF
NE 1/4 SUBJECT TO INGRESS & EGRESS EASEMENT OVER SOUTH
25.00 FT THEREOF OR 1494 PG 808

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 24 24 17 0000 00200 0040
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: COIANA GINO & PATRICIA
ST LN1: BLUEBIRD LN
CITY: SPRING HILL
NAME 2:
ST LN2:
STATE: FL ZIP: 33526
-----LEGAL DESCRIPTION FOR PROPERTY-----
EAST 150.00 FT OF WEST 1800.00 FT OF S 1/2 OF S 1/4 OF NE 1/4 OF
SEC 24 OR 1444 PG 1007

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 25 24 17 0000 00100 0020
SC TP RG SUBD BLOCK LOT
NAME 1: ZIMMERMAN F CLIFTON
ST LN1: ST PETERSBURG FL
CITY: STATE: ZIP: 33713
NAME 2: 4275 20TH AVE N
ST LN2: 33713
NEXT-FUNCTION: LD
DATE: 09/15/86
-----LEGAL DESCRIPTION FOR PROPERTY-----
E1/2 OF NE1/4 OF NE1/4 OF SEC OR 712 PG 173
OR 1230 PG 1455

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 25 24 17 0000 00100 0000
SC TP RG SUBD BLOCK LOT
NAME 1: BEASLEY ALPHA Y & SHIRLEY M
ST LN1: TAMPA FL
CITY: STATE: ZIP: 33612
NAME 2: 1409 TERMINO DR
ST LN2: 33612
NEXT-FUNCTION: LD
DATE: 09/15/86
-----LEGAL DESCRIPTION FOR PROPERTY-----
NE1/4 OF SE1/4 OF NE1/4 RB 933 PG 1947

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 25 24 17 0000 00100 0030
SC TP RG SUBD BLOCK LOT
NAME 1: GANDARA JOSE L & ELMA L
ST LN1: P O BOX 11033
CITY: SPRING HILL
STATE: FL ZIP: 33526
NAME 2:
ST LN2:
NEXT-FUNCTION: LD
DATE: 09/15/86
-----LEGAL DESCRIPTION FOR PROPERTY-----
SE 1/4 OF SE 1/4 OF NE 1/4 OR 1174 PG 2

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 25 24 17 0000 00100 0010
SC TP RG SUBD BLOCK LOT
NAME 1: MATHIS ANDREW G
ST LN1: TAMPA FL
CITY: STATE: ZIP: 33618
NAME 2: 3010 SABAL RD
ST LN2: 33618
NEXT-FUNCTION: LD
DATE: 09/15/86
-----LEGAL DESCRIPTION FOR PROPERTY-----
N 1/2 OF SE 1/4 25 24 17 80 AC
RB 887 PG 1218

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 25 24 17 0000 00300 0000
SC TP RG SUBD BLOCK LOT
NAME 1: DORMANY FAMILY REV TRUST
ST LN1: 14624 LAKE MAGDALENE CIR
CITY: TAMPA
STATE: FL ZIP: 33613
NAME 2: AGREEMENT
ST LN2:
NEXT-FUNCTION: LD
DATE: 09/15/86
-----LEGAL DESCRIPTION FOR PROPERTY-----
E1/2 OF SW1/4 RIGHTS & 1/2 INTEREST IN MINERAL
OR 1424 PG 1586

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 25 24 17 0010 00001 0100
SC TP RG SUBD BLOCK LOT
NAME 1: FIVECOAT CLAYTON A
ST LN1: 1380 HAYS RD
CITY: SPRING HILL
STATE: FL ZIP: 33526
NAME 2:
ST LN2:
NEXT-FUNCTION: LD
DATE: 09/15/86
-----LEGAL DESCRIPTION FOR PROPERTY-----
HIGHLANDS UNREC PLAT LOT 1010 DSCB AS COM AT SW COR OF SEC
TH RUN N89DG46'58"E 1316.10 FT TH N00DG18'33"W 1320.18 FT TH
S89DG46'30"W 565 FT TO POB TH S00DG18'33"E 220 FT TO A PT ON
CRV WITH CENTRAL ANGLE OF 85DG 47'30" RAD 50 FT TANGENT DIST
OF 46.46 FT & CHD S46DG47'38"W 68.07 FT TH ALG SAID CRV AN
ARC DIST OF 74.87 FT TH N06DG 06'03"W 556 FT TH N09DG54'46"E
230 FT TH N89DG46'30"E 563.55 FT TO POB
OR 813 PG 38

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 26 24 17 0010 00000 9980
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: JAMES B E &
ST LN1: 12419 MORGAN DR
CITY: HUDSON
NAME 2: NODA MARY
ST LN2:
STATE: FL ZIP: 33562
-----LEGAL DESCRIPTION FOR PROPERTY-----
HIGHLANDS UNREC PLAT LOT 998 DSCB AS COM SE COR SEC TH S89
DG 53MIN 02"W 50.41FT TH N09 DG 54MIN 46"E 1340.83FT TH
S89DG 46MIN 30"W 187.90FT TH S89DG 53' 15"W 2478.53 FT FOR
POB TH S00DG 24' 37"E 249.86 FT TH S89DG 53' 15"W 145.08 FT
TH N00DG 24' 37"W 249.86 FT TH N89DG 52' 15"E 145.08 FT TO
POB OR 1394 PG 67

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 26 24 17 0010 00000 9981
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: CROMAN ROBERT LEONARD JR &
ST LN1: 1300 HAYS RD
CITY: SPRING HILL
NAME 2: SUE ELLEN
ST LN2:
STATE: FL ZIP: 33526
-----LEGAL DESCRIPTION FOR PROPERTY-----
HIGHLANDS UNREC PLAT POR LOTS 998 & 999 DSCB AS COM SE COR
OF SEC TH S89DG 53' 02"W 50.41 FT TH N09DG 54' 46"E 1340.83
FT TH S89DG 46' 30"W 187.90 FT TH S89DG 53' 15"W 2279.25 FT
FOR POB TH S12DG 10' 33"W 266.46 FT TH N85DG 51' 39"W
141.65 FT TH N00DG 24' 37"W 249.86 FT TH N89DG 53' 15"E
199.28 FT TO POB OR 1195 PG 1424

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 26 24 17 0010 00000 9991
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: CREED DAVID A & BRENDA J
ST LN1: 1310 HAYES RD
CITY: SPRING HILL
NAME 2:
ST LN2:
STATE: FL ZIP: 33526
-----LEGAL DESCRIPTION FOR PROPERTY-----
HIGHLANDS UNREC PLAT POR LOTS 998 & 999 DSCB AS COM SE COR
OF SEC TH S89DG 53' 02"W 50.41 FT TH N09DG 54' 46"E 1340.83
FT TH S89DG 46' 30"W 187.90 FT TH S89DG 53' 15"W 2096.00 FT
FOR POB TH S19DG 54' 27"W 288.28 FT TH N85DG 51' 39"W
141.65 FT TH N12DG 10' 33"E 266.46 FT TH N89DG 53' 15"E
183.25 FT TO POB OR 1188 PG 924

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 26 24 17 0010 00000 9970
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: MOORE RAYMOND A SR & NANCY L
ST LN1: 250 HARPER LN
CITY: BROOKSVILLE
NAME 2:
ST LN2:
STATE: FL ZIP: 33512
-----LEGAL DESCRIPTION FOR PROPERTY-----
HIGHLANDS UNREC PLAT TRACT 997 DESC AS COM AT SW COR OF SEC
TH N00DG 29' 51"W 1320.34 FT TH N89DG 53' 15"E 2227.45 FT
TO POB TH CONT N89DG 53' 15"E 395.00 FT TH S00DG 24' 37"E
240.00 FT TH WEST 460.82 FT TH N15DG 00' 00"E 247.65 FT TO
POB OR 1503 PG 156

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 26 24 17 0000 00400 0000
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: ALDRICH H J
ST LN1: 1240 HAYS RD
CITY: BROOKSVILLE
NAME 2:
ST LN2:
STATE: FL ZIP: 33526
-----LEGAL DESCRIPTION FOR PROPERTY-----
S 1/2 OF NW 1/4 & N 1/2 OF SW 1/4 EXC E 66FT & EXC POR DESC AS
COM SE COR OF SW 1/4 THN00DG07' 46"W 1320.03FT THN89DG53' 01"W
66 FT TO POB TH N89DG 53' 01"W 2282.64FT THN00DG06' 59"W 35.4FT
THS89DG53' 01"E 9.18FT THCVNWRAD 25FTCHD N45DG06' 59"E 35.36FT TH
S89DG53' 01"E 60FT THCVNERAD25FT CHDS44DG53' 01"E 35.36FT THS89DG
53' 01"E 290FT TH N00DG 06' 59"E 300FT TH N89DG40' 11"E 150FT TH
N57DG15' 08"E 31.98FT THS36DG53' 48"E 192.7FT TH S40DG 05' 52"E
167.22FT THN51DG36' 59"E 252.58 FT TH CVNWRAD25FTCHD N06DG 36'
59"E 35.36FT THN51DG36' 59"E 60FT THCVNERAD25FTCHD S83DG 23' 01"E
35.36FT THS40DG49' 18"E 60.05FT THCVSERAD25FTCHD S03DG 54' 27"W
36.99FT THCVSE RAD 596.4FT CHD S53DG30' 14"E 201.02FT TH N23DG
16' 56"E 285.34FT THS60DG18' 00"E 90FT THS89DG53' 01"E 160.55FT TH
S01DG47' 12"W 138.77FT TH S89DG 53' 01"E 345.9FT THN00DG 06' 59"E
2.32FT THS89DG53' 01"E 289.62FT TH S00DG07' 46"E 504.4FT TO POB
OR 1055 PG 195 OR 1343 PG 1348 & 1349

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 26 24 17 0000 00500 0010
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: WHITLEY ROBERT D JR &
ST LN1: P O BOX 5067
CITY: HUDSON
NAME 2: BRENDA PATRICK
ST LN2:
STATE: FL ZIP: 33567
-----LEGAL DESCRIPTION FOR PROPERTY-----
S 1/2 OF N 1/2 OF NW 1/4 EXC E 66 FT FOR RD ROW
OR 1027 PG 1679 OR 1110 PG 1167

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 25 24 17 0010 00001 011B
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: SWAN JAMES ALLEN & MARGARET L NAME 2:
ST LN1: P O BOX 1041 ST LN2:
CITY: NEW PORT RICHEY STATE: FL ZIP: 33552
-----LEGAL DESCRIPTION FOR PROPERTY-----
HIGHLANDS UNREC PLAT POR LOT 1011 AKA 1011-B DSCB AS COM
SW COR SEC TH N89DG 46MIN 58"E 1316.10 FT TH N00DG 18MIN 33"W
1050.18 FT TH S89DG 46MIN 30"W 396.40 FT FOR POB TH S89DG 46
MIN 30"W 118.60 FT TH CV L RAD 50 FT CHD N45DG 16MIN 02"W
70.76 FT TH N00DG 18MIN 33"W 220 FT TH N89DG 46MIN 30"E
160.81 FT TH S00DG 18MIN 33"E 270 FT TO POB
OR 1114 PG 5

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 25 24 17 0010 00001 0110
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: RAMSEY JOSE & VIVIAN NAME 2:
ST LN1: 1390 HAYS RD ST LN2:
CITY: SPRINGHILL STATE: FL ZIP: 33526
-----LEGAL DESCRIPTION FOR PROPERTY-----
HIGHLANDS UNREC PLAT E POR LOT 1011 DSCB AS COM SW COR SEC 25
TH N89DG 46MIN 58"E 1316.10FT TH N00DG 18MIN 33"W 1050.18FT
FOR POB TH S89DG 46MIN 30"W 396.40FT TH N00DG 18MIN 33"W
270 FT TH N89DG 46MIN 30"E 396.40FT TH S00DG 18MIN 33"E
270 FT TO POB OR 1114 PG 1
OR 1114 PG 5

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 26 24 17 0000 00100 0010
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: FLORIDA POWER CORP NAME 2:
ST LN1: P O BOX 14042 ST LN2:
CITY: ST PETERSBURG STATE: FL ZIP: 33733
-----LEGAL DESCRIPTION FOR PROPERTY-----
COM SE COR OF SE 1/4 SEC 26 TH N 0 DG 01 MIN 09" W ALG E BDY
SE 1/4 1319.85 FT TO SE COR OF NE 1/4 OF SE 1/4 & SW COR OF
NW 1/4 OF SW 1/4 SEC 25 CONT N 0 DG 01 MIN 09" W 66 FT TO
PT ON N ROW LN HAYES RD FOR POB TH S 89 DG 56 MIN 54" E
ALG N ROW LN 66 FT FROM & // WITH S BDY OF NW 1/4 49.84 FT
TO PT ON WLY ROW LN FLORIDA POWER TRANSMISSION LN ROW TH
N 10 DG 12 MIN 21" E 540 FT TH N 79 DG 47 MIN 39" W 480 FT
TH S 10 DG 12 MIN 21" W 480 FT FROM & // WITH WLY ROW LN
625.06 FT TO PT ON N ROW LN HAYES RD TH S 89 DG 49 MIN 52"
E ALG ROW LN 66 FT FROM & // WITH S BDY NE 1/4 OF SE 1/4
437.64 FT TO POB OR 1068 PG 1339

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 26 24 17 0010 00001 0000
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: BERIO ULYSSES D & NAME 2: VICTORIA
ST LN1: 6116 QUEBEC PL ST LN2: BERWYN HEIGHTS MD 20740
CITY: ZIP: 20740
-----LEGAL DESCRIPTION FOR PROPERTY-----
HIGHLANDS UNREC PLAT LOT 1000 DESC AS COM SE COR SEC 26 TH
S89DG 53MIN02"W 50.41 FT TH N 09DG 54MIN 46"E 1340.83 FT
TH S89DG 46MIN 30"W 187.90 FT TH S89DG 53MIN 15"W 1902.00 FT
FOR POB TH S12DG 03MIN 17"W 640.86 FT TO A PT ON A CV RAD
1975.00 FT CHD BRG & DISTANCE OF N75DG 10MIN 40"W 190.72 FT
TH N72DG 24MIN 37"W 79.93 FT TH ALG ARC OF CV 190.79 FT TH
N 19DG 54MIN 27"E 588.58 FT TH N89DG 53MIN 15"E 194.00 FT TO
POB OR 814 PG 554

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 26 24 17 0010 00001 0010
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: CLARK ELEANOR NAME 2:
ST LN1: P O BOX 943 ST LN2:
CITY: LAND O LAKES STATE: FL ZIP: 33539
-----LEGAL DESCRIPTION FOR PROPERTY-----
HIGHLANDS UNREC PLAT LOT 1001
DSCB AS COM SE COR SEC 26 TH S89DG 02MIN 02"W 50.41 FT TH
N09DG 54MIN 46"E 1340.83 FT TH S89DG 53MIN 15"W 1722 FT FOR
POB TH S04DG 19MIN 27"W 665.01 FT TH CV R RAD 1975.00 FT CHD
N81DG 48MIN 38"W 266.27 FT TH N12DG 03MIN 17"E 640.86 FT TH
N89DG 53MIN 15"E 100.00 FT TO POB
OR 1152 PG 1251

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 26 24 17 0010 00001 0020
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: JASKULSKI SHIRLEY
ST LN1: 1316 HAYS RD
CITY: HUDSON
NAME 2:
ST LN2:
STATE: FL ZIP: 33562
-----LEGAL DESCRIPTION FOR PROPERTY-----
HIGHLANDS UNREC PLAT LOT 1002
COR OF SEC 26 TH S89DG 53' 02°W 50.41 FT TH N09DG 54'
46°E 1340.83 FT TH S89DG 46' 30°W 187.90 FT TH S89DG 53'
15°W 1552.00 FT TO POB TH S03DG 07' 58°E 669.01 FT TH
ALG ARC OF CURVE 257.04 FT RAD 1975.00 FT CHD BRG N89DG 24'
15°W 256.86 FT TH N04DG 19' 27°E 666.91 FT TH N89DG 53'
15°E 170.00 FT TO POB OR 1505 PG 1777

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 26 24 17 0010 00001 0030
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: LEMANSKI DONALD M & BARBARA J
ST LN1: 1320 HAYS RD
CITY: SPRING HILL
NAME 2:
ST LN2:
STATE: FL ZIP: 33526
-----LEGAL DESCRIPTION FOR PROPERTY-----
HIGHLANDS UNREC PLAT LOT 1003
COM SE COR TH S 89 DG 53 MIN 2 ' W 50.41 FT TH N 9 DG 54 MIN
46° E 1340.83 FT TH S 89 DG 46 MIN 30° W 187.90 FT TH S 89 DG
53 MIN 15° W 1378 FT TO POB TH S 10 DG 39 MIN 33° E 648.42 FT
TO PT ON CV HAVING CNT ANG OF 7 DG 31 MIN 35° RAD 1975 FT
TAN DIST OF 129.91 FT CHD & DIST OF S 83 DG 6 MIN 15° W &
259.25 FT TH ALG CV ARC DIST 259.44 FT TH N 3 DG 7 MIN 58°
W 669.01 FT TH N 89 DG 53 MIN 15° E 174 FT TO POB
RB 887 PG 1272

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 26 24 17 0010 00001 0040
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: SINK ROBERT C & CARYL J
ST LN1: 7853 NIAGRA AVE
CITY: TAMPA
NAME 2:
ST LN2:
STATE: FL ZIP: 33617
-----LEGAL DESCRIPTION FOR PROPERTY-----
HIGHLANDS UNREC PLAT LOT 1004
RB 590 PG 675

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 26 24 17 0010 00001 0050
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: SINK ROBERT C & CARYL J
ST LN1: 8986 GILFORD RD
CITY: SEVILLE
NAME 2:
ST LN2:
STATE: OH ZIP: 44273
-----LEGAL DESCRIPTION FOR PROPERTY-----
HIGHLANDS UNREC PLAT LOT 1005
RB 590 PG 675

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 26 24 17 0010 00001 0060
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: BLALOCK MARTA T L
ST LN1: FAYETTEVILLE NC
CITY:
NAME 2: 6410 NEW CASTLE RD
ST LN2:
STATE: ZIP: 28303
-----LEGAL DESCRIPTION FOR PROPERTY-----
HIGHLANDS UNREC PLAT LOT 1006
RB 602 PG 656

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 26 24 17 0010 00001 0070
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: BLALOCK MARIA T L
ST LN1: FAYETTEVILLE NC
CITY:
NAME 2: 6410 NEW CASTLE RD
ST LN2:
STATE: ZIP: 28303
-----LEGAL DESCRIPTION FOR PROPERTY-----
HIGHLANDS UNREC PLAT LOT 1007
RB 602 PG 656

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 26 24 17 0010 00001 0080
SC TP RG SUBD BLOCK LOT
NEXT-FUNCTION: LD
DATE: 09/15/86
NAME 1: BLALOCK MARIA T L
ST LN1: 6410 NEWCASTLE RD
CITY: FAYETTEVILLE
NAME 2:
ST LN2:
STATE: NC ZIP: 28303
-----LEGAL DESCRIPTION FOR PROPERTY-----
HIGHLANDS UNREC PLAT LOT 1008
RUN S89DG53'02°W 50.41 FT TH DSCB AS COM AT SE COR SEC TH
SAID LINE ON A CRV WITH N09DG54'46°E 927.18 FT TO POB
RAD OF 1025 FT TANGENT DIST OF CENTRAL ANGLE OF 17DG00'05"
303.04 FT TH ALG SAID CRV ARC 153.20 FT CHD S89DG53'46°W
00°W 411.53 FT TH N89DG53'15°E DIST OF 304.15 FT TH N09DG37'
FT TH S09DG54'46°W 413.65 FT 248 FT TH N89DG46'30°E 187.90
TO POB OR 599 PG 177

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 26 24 17 0000 00300 0000
SC TP RG SUBD BLOCK LOT
NAME 1: SCHUH JOS & PEGGY ANN
ST LN1: WOODLAND HILLS CA
CITY: STATE: ZIP: 91364
NAME 2: 21361 RIOS ST
ST LN2: 91364
NEXT-FUNCTION: LD
DATE: 09/15/86
-----LEGAL DESCRIPTION FOR PROPERTY-----
S 1/2 OF NW 1/4 OF NE 1/4 26 24 17 20 AC

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 26 24 17 0000 00200 0010
SC TP RG SUBD BLOCK LOT
NAME 1: RITCHIE MARTIN C & CAIE
ST LN1: WINSTED CT 06098
CITY: STATE: ZIP: 06098
NAME 2: 420 MAIN ST
ST LN2:
NEXT-FUNCTION: LD
DATE: 09/15/86
-----LEGAL DESCRIPTION FOR PROPERTY-----
S 211 FT OF N 1/2 OF NW 1/4 OF NE 1/4
RB 702 PG 252

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 26 24 17 0000 00200 0000
SC TP RG SUBD BLOCK LOT
NAME 1: SOWARDS IRVIN THOMAS &
ST LN1: 16802 LIVINGSTON AVE
CITY: STATE: ZIP: 33549
NAME 2: ANNE Q
ST LN2: LUTZ FL 33549
NEXT-FUNCTION: LD
DATE: 09/15/86
-----LEGAL DESCRIPTION FOR PROPERTY-----
N 1/2 OF NW 1/4 OF NE 1/4 EXC S 211 FT

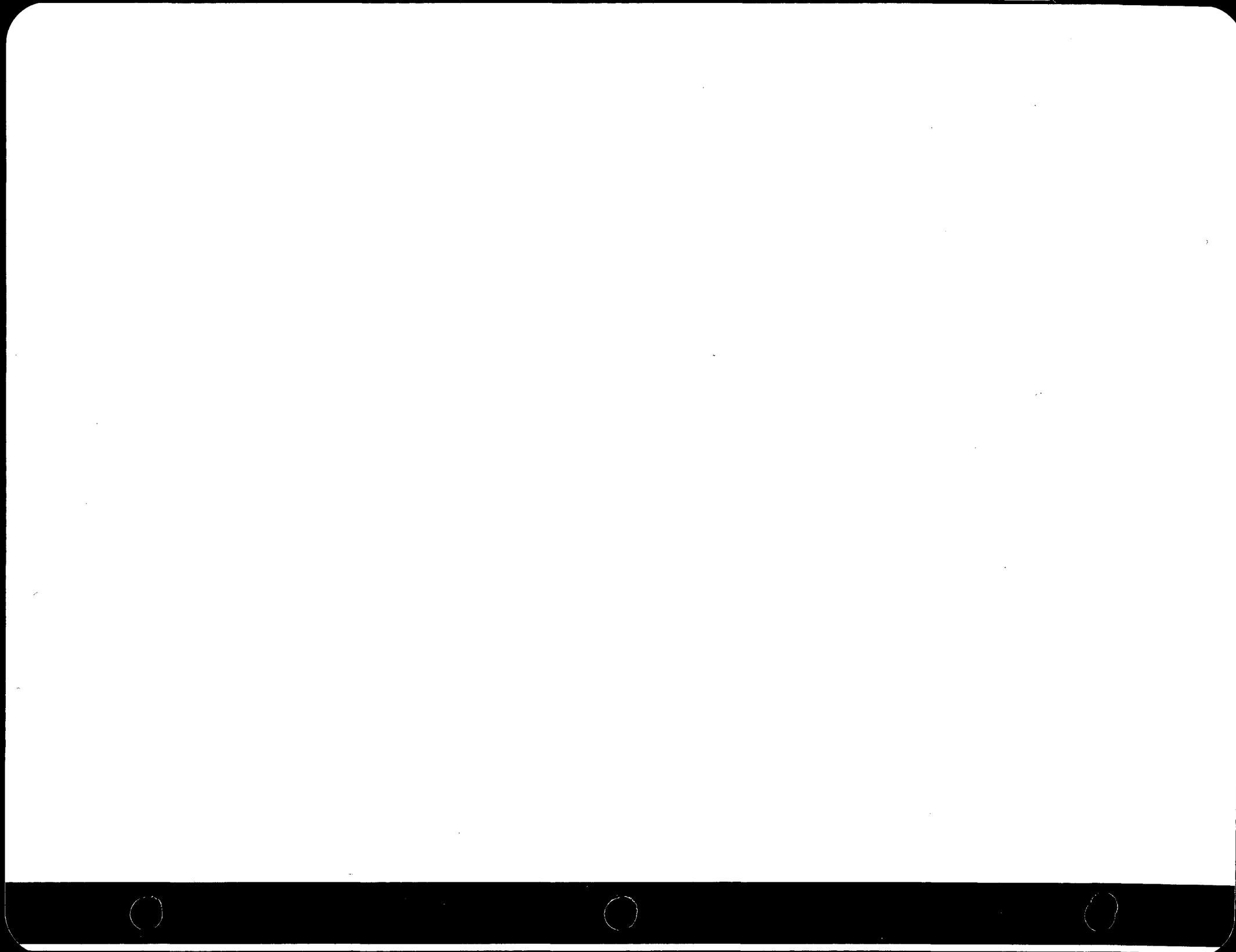
PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 19 24 18 0000 00400 0000
SC TP RG SUBD BLOCK LOT
NAME 1: CLENTON WHITEHURST FOUNDATION
ST LN1: P O BOX 546
CITY: DADE CITY STATE: FL ZIP: 33525
NAME 2: WHITEHURST SAMYNA C TRUSTEE
ST LN2:
NEXT-FUNCTION: LD
DATE: 09/15/86
-----LEGAL DESCRIPTION FOR PROPERTY-----
S 1/2 OF SW 1/4 OF NW 1/4 EXC
NW 1/4 & EXC E 1/2 OF NE 1/4
OR 1267 PG 1901
OR 822 PG 750
SE 1/4 OF SE 1/4 OF SW 1/4 OF
SE 1/4 OF SW 1/4 OF NW 1/4
OR 1001 PG 1806
OR 1516 PG 1030

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 19 24 18 0000 00600 0050
SC TP RG SUBD BLOCK LOT
NAME 1: MORTON HALLIE A
ST LN1: 1690 SHADY HILLS RD RT 5
CITY: BROOKSVILLE STATE: FL ZIP: 33526
NAME 2:
ST LN2:
NEXT-FUNCTION: LD
DATE: 09/15/86
-----LEGAL DESCRIPTION FOR PROPERTY-----
N 1/2 OF S 1/2 OF NW 1/4 OF SW 1/4
RB 1024 PG 544

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 19 24 18 0000 00600 0041
SC TP RG SUBD BLOCK LOT
NAME 1: SOMMER JACOB & ANNA
ST LN1: LAKE PEEKSKILL NY 10537
CITY: STATE: ZIP: 10537
NAME 2: BOX 16
ST LN2:
NEXT-FUNCTION: LD
DATE: 09/15/86
-----LEGAL DESCRIPTION FOR PROPERTY-----
THAT PT OF S 1/2 OF S 1/2 OF NW 1/4 OF SW 1/4 COM AT SW
COR OF NW 1/4 OF SW 1/4 TH E 25 FT TO PT LYING ON E RT/WY
LINE OF SHADYHILLS RD & POB TH E 310.70 FT TH N 140.18 FT
TH W 310.70 FT TH S 140.23 FT TO POB
RB 725 PG 688

PASCO COUNTY BUILDING PERMITS
NAME AND ADDRESS FOR PROPERTY ID: 19 24 18 0000 00600 0030
SC TP RG SUBD BLOCK LOT
NAME 1: SOWARDS BERNARD M &
ST LN1: P O BOX 864
CITY: LAND O LAKES STATE: FL ZIP: 33539
NAME 2: ANNABELLE
ST LN2:
NEXT-FUNCTION: LD
DATE: 09/15/86
-----LEGAL DESCRIPTION FOR PROPERTY-----
W 1/2 OF SW 1/4 OF SW 1/4 EXC RD R/W ON S & ON W
OR 1240 PG 615

APPENDIX 10.7



APPENDIX 10.7

**CORRESPONDENCE FROM STATE AND
FEDERAL AGENCIES**



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET
ATLANTA, GEORGIA 30365

JUL 09 1987

REF: 4WM-FP

Chris Gabel
Camp, Dresser, & McKee
1321 U.S. 19 South
Suite 100B
Clearwater, Florida 34624

JUL 13 1987

RE: Application to discharge wastewater to U.S. Waters

Dear Mr. Gabel:

Please find enclosed the application for a National Pollutant Discharge Elimination System (NPDES) permit to discharge wastewater to waters of the United States. The completed application should be sent to the following address:

United States Environmental Protection Agency
South Area Permits Unit
Facilities Performance Branch
Water Management Division
345 Courtland Street, N.E.
Atlanta, Georgia 30365

Please complete Forms 1 and 2E. The instructions for the Form 2E indicate that it should not be used for discharges from publicly owned treatment works and that it should not be used for stormwater runoff. However, the Form 2E is the most appropriate form for the discharges you described in our conversations of July 8, 1987. In regard to stormwater runoff, please include a narrative description of the drainage area, treatment system, if any, and the receiving stream.

If you have questions or comments, please contact me at the above address or by calling 404/347-3012.

Sincerely yours,

S. Darlene Vincent

S. Darlene Vincent
Environmental Engineer
South Area Permits Unit
Facilities Performance Branch
Water Management Division

Enclosure: Form 2E

FLORIDA NATURAL AREAS INVENTORY

254 East Sixth Avenue • Tallahassee, Florida 32303 • (904) 224-8207

August 20, 1986

Chris Gable
Camp, Dresser & McKee
1321 U.S. 19 South, Suite 601
Clearwater, FL 33546

DATA REQUEST REPLY

Pasco County Landfill Site, Pasco Co.

T24S R17E Secs 24S2,25N2,26E2
U.S.G.S. 7.5 minute quad Port Richey NE, Fivay Junction

Information on known occurrences of Special Plants, Special Animals, and exemplary Natural Communities. We currently have no occurrences of special elements for this site in our data base. All records given are known occurrences located within an approximate 5 mile radius of the site.

Special Plants

Possible:

Coelorachis tuberculosa, Piedmont joint-grass (FNAI G1G3?/S3; Federal-C2) is known to be northwest of the site.

Special Animals

Possible:

Haliaeetus leucocephalus, bald eagle (FNAI G3/S2S3; Federal-Endangered; State-Threatened) is known to the east and west of the site.

Enneacanthus chaetodon, backbanded sunfish (FNAI G3/S3).

Procambarus leitheuseri, Leitheuser's cave crayfish (FNAI G2/S2).

Natural Communities

Aquatic Caves, with the crayfish listed above, are known to be nearby. This possible landfill could have detrimental impacts on the invertebrate fauna of the nearby aquatic caves.

The quantity and quality of data collected by the Florida Natural Areas Inventory are dependent on the research and observations of many individuals and organizations. In most cases, this information is not the result of comprehensive or site-specific field surveys; many natural areas in Florida have never been thoroughly

The Nature Conservancy and the Florida Department of Natural Resources

100% recycled paper

Chris Gable
August 20, 1986
Page Two

surveyed, and new species of plants and animals are still being discovered. For these reasons, the FNAI cannot provide a definitive statement on the presence, absence, or condition of biological elements in any part of Florida. Florida Natural Areas Inventory reports summarize the existing information known to FNAI at the time of the request regarding the biological elements or locations in question. They should never be regarded as final statements on the elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments.

Information provided by this data base may not be published without prior written notification to the Florida Natural Areas Inventory and FNAI must be credited as an information source in these publications. FNAI data may not be resold for profit.

Sincerely,



Katy NeSmith
Data Manager

encls.

CF-121

2808245,2808235



United States Department of the Interior
FISH AND WILDLIFE SERVICE
ENDANGERED SPECIES FIELD STATION
2747 ART MUSEUM DRIVE
JACKSONVILLE, FLORIDA 32207

SEP 24 1986

September 19, 1986

Mr. Chris J. Gabel
Camp, Dresser & McKee Inc.
1321 US 19 South, Suite 601
Clearwater, Florida 33546

Dear Mr. Gabel:

We have received your letter of September 10, 1986, requesting information on threatened and endangered species that may exist on the proposed Pasco County Resource Recovery Center.

Based on the information provided, your project falls within the range of the following federally listed threatened and endangered species:

Red-cockaded woodpecker
Bald eagle
Wood stork
Eastern indigo snake

There are no National Wildlife Refuges or critical habitats located within 5 miles of the project site.

To assist you, I have enclosed information sheets on each of the listed species. If you have questions, please contact Mr. Don Palmer or Ms. Linda Walker at this office.

Sincerely yours,

David J. Wesley
Field Supervisor

Enclosures (4)



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Habitat Conservation Division
3500 Delwood Beach Road
Panama City, Florida 32407-7499

September 17, 1986 F/SER113:BB

SEP 22
Mr. Chris J. Gabel
Camp, Dresser, & McKee, Inc.
1321 U.S. 19 South, Suite 601
Clearwater, Florida 33546

Dear Mr. Gabel:

In response to your request for identification of environmentally sensitive areas that may be impacted by your project, the National Marine Fisheries Service offers the following remarks:

We are primarily concerned about adverse impacts to fishery resources that would result from projects occurring in wetlands. Wetlands of interest to us would include vegetated and non-vegetated subtidal, vegetated intertidal and supratidal wetlands, as well as hardwood swamps and vegetated riverbanks that are connected to, in this case, the Gulf of Mexico by a riverine system.

The five-mile project radius of your proposed project would not directly impact any tidally influenced wetlands. However, we would consider any development along the Pithlachascotee River to be of concern in relation to downstream fishery resources.

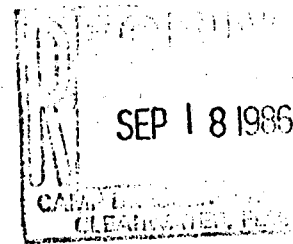
Thank you for the opportunity to comment on resources for which we are responsible at this early stage of your project development.

If you have any questions, please contact our Panama City Area Office at 904-234-5061.

Sincerely yours,

Edwin J. Keppner, Ph.D.
Area Supervisor





**STATE OF FLORIDA
DEPARTMENT OF COMMUNITY AFFAIRS**

2571 EXECUTIVE CENTER CIRCLE, EAST • TALLAHASSEE, FLORIDA 32301

BOB GRAHAM
Governor

TOM LEWIS, JR.
Secretary

September 16, 1986

Mr. Chris J. Gabel
Camp Dresser & McKee, Inc.
1321 U.S. 19 South, Suite 601
Clearwater, Florida 33546

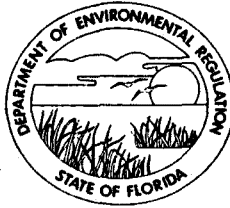
Dear Mr. Gabel:

I received your letter of September 10, 1986 requesting information about Areas of Critical State Concern. You are particularly interested in the area specified on the map of Pasco County, Florida which was included with your letter.

This map indicated an area in northwestern Pasco County within a circle with a radius of 5 miles. This circle lies generally north of State Road 52 and west of U.S. Highway 41 with the center of the circle at the northwest corner of section 25 in Township 24 South, Range 17 East. There are no designated Areas of Critical State Concern (ACSC) within this circle or in any part of Pasco County. The nearest ACSC is the Green Swamp ACSC which lies entirely in Lake and Polk Counties.

The northern part of the circle includes a small portion of Hernando County. All of Hernando County is subject to an Agreement signed by Hernando County and the Department of Community Affairs pursuant to Chapter 380, Florida Statutes. Pasco County is not subject to this Agreement. The Agreement addresses growth management issues with particular regard to environmentally sensitive areas. If you need additional information on the Agreement with Hernando County, please contact Ms. Wendy Lovett at 904-488-9210.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION



SOUTHWEST DISTRICT

7601 HIGHWAY 301 NORTH
TAMPA, FLORIDA 33610

813-985-7402
SunCom - 570-8000

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

DR. RICHARD D. GARRITY
DISTRICT MANAGER

January 27, 1987

Chris Gabel
Camp Dresser & McKee Inc.
1321 U.S. 19 South / Suite 601

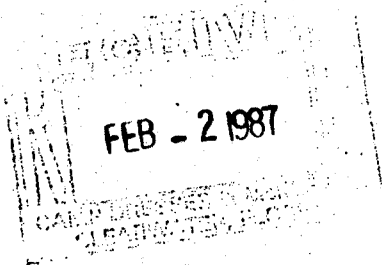
Dear Mr. Gabel:

With your letter dated 9/10/86, you requested our assistance in identifying a variety of environmentally related topics in connection with planning the location of the Pasco County Resource Center. The only issue that I can address is the question regarding outstanding Florida Waters. For the Hays Road Site, there are no outstanding Florida Waters within a five mile radius.

Sincerely

Ken Huntington
Dredge & Fill Inspector

KE/15



FLORIDA GAME AND FRESH WATER FISH COMMISSION

WILLIAM G. BOSTICK, JR.
Chairman, Winter Haven

MRS. GILBERT W. HUMPHREY
Vice-Chairman, Miccosukee

THOMAS L. HIRES, SR.
Lake Wales

C. TOM RAINEY, D.V.M.
Miami

J.H. BAROCO
Pensacola

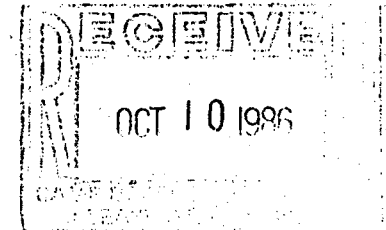
ROBERT M. BRANTLY, Executive Director
ALLAN L. EGBERT, Ph.D., Assistant Executive Director



SOUTH REGION
3900 Drane Field Rd.
Lakeland, Florida 33803
(813) 644-9269
1-800-282-8002

October 7, 1986

Mr. Chris J. Gabel
Camp Dresser & McKee, Inc.
1321 U.S. 19, South, Suite 601
Clearwater, FL 33546



Dear Mr. Gabel:

The Florida Game and Fresh Water Fish Commission does not recognize or actively manage any properties as wildlife management areas, refuges, or wildlife and environmental areas within the five mile radius of the proposed project site as described in your letter of 10 September 1986.

Please feel free to contact me for additional information you may require.

Respectfully,

Steven A. Martin
Regional Biologist

SAM/vm



SEP 22 1986

FLORIDA DEPARTMENT OF STATE

George Firestone
Secretary of State

DIVISION OF HISTORICAL RESOURCES

R.A. Gray Building

Tallahassee, Florida 32399-0205
(904) 488-1480

September 19, 1986

Chris J. Gabel
Camp Dresser & McKee Inc.
1321 U.S. 19 South, Suite 601
Clearwater, Florida 33546

Dear Chris:

I am responding to your September letter to Michael Wisenbaker regarding information on Pasco County and your project area. Enclosed is your map, on which I have plotted the archaeological sites that are located within the five mile radius indicated. These locations are generalized, and sites are not actually this large. I did inspect the Hernando County map for recorded sites; none were indicated on our map.

The volume of incoming information means that the plotted site locations are several months behind the actual number in Pasco County. Also, I emphasize that areas on the map showing no known recorded sites, should not be interpreted as areas without cultural resources-- in most cases, they are merely places which have not been examined by professional archaeologists.

Some general information about the nine sites, all prehistoric, located in the five mile radius indicating site number, cultural period and site type:

8 PA 33	Archaic	quarry
8 PA 34	Weeden Island I&II	campsite
8 PA 35	Archaic	flint chipping station
8 PA 37	Post-Archaic (?)	campsite
8 PA 38	Archaic	campsite
8 PA 39	Archaic	quarry
8 PA 40	(?)	campsite
8 PA 41	Post-Archaic	lithic workshop
8 PA 185	Archaic	campsite

Please contact Michael Wisenbaker, who normally handles project-specific inquiries, or me if we can assist you further.

Enclosure

Sincerely,

Laura A. Kammerer



FLORIDA DEPARTMENT OF STATE

George Firestone
Secretary of State

DIVISION OF HISTORICAL RESOURCES

R.A. Gray Building

Tallahassee, Florida 32301-8020

(904) 488-1480

July 30, 1986

In Reply Refer to:

Mike Wisenbaker
Historic Sites Specialist
(904) 487-2333

Mr. Chris J. Gabel
Camp Dresser and McKee Inc.
1321 U.S. 19 South, Suite 601
Clearwater, Florida 33546

RE: Your Letter of July 22, 1986
Cultural Resource Assessment Request
Pasco County Landfill Archaeological Review located in portions of
Sections 24, 25 and 26 in T24S-R17E, Pasco County, Florida

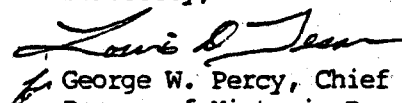
Dear Mr. Gabel:

In accordance with the provisions of the applicable local ordinance ___ and/or Sections 253.77, 267.061, 380.06, 380.061 and 403.918(2)(a)6, Florida Statutes, and implementing state regulations, and/or in accordance with the provisions of the National Historic Preservation Act of 1966 (Public Law 89-665) as amended and related federal laws and their implementing procedures for federally involved projects ☒, we have reviewed the above cited project(s) to determine its(their) effect on significant archaeological and historical sites and properties.

A review of the Florida Master Site File indicates that no significant archaeological and/or historical sites are recorded for or considered likely to be present within the project area(s) ☒. Because of the project(s) nature it is considered unlikely that any such sites will be affected. Therefore, it is the opinion of this office that the proposed project(s) will have no effect on any sites listed, or eligible for listing, in the National Register of Historic Places, or otherwise of national, state or local significance. The project(s) is(are) consistent also with Florida's historic preservation laws and concerns, and may proceed without further involvement with this agency.

If you have any questions concerning our comments, please do not hesitate to contact us. Your interest and cooperation in helping to protect Florida's archaeological and historic resources are appreciated.

Sincerely,



George W. Percy, Chief
Bureau of Historic Preservation and
State Historic Preservation Officer

GWP/efk
Enclosure ()

APPENDIX 10.8
GROUNDWATER WELL INVENTORY

RDB0355

PERMIT SUMMARY FOR YEAR 00 THRU 99

PAGE 1

BY: COUNTY: BASIN: S:34 - 36 T:24 P:17 DEPTH: DIAMETER: METHOD: USE: CASE DEPTH:

PERMIT	S T U	DRILL U L I C N S	B A S I N T	C O U N T Y	LOCATION QQQ S T R	D I C A	CASE DEPTH	WELL DEPTH	H M G R B T O N A H U B G T R S D	S M L T A E P C H I S	C L R U L	A O O F	USER-ID	LOT	M	OWNER NAME		
354444	C	2074	A	15	101	0	0	342417	2	56	70	0	P	0	000000	NO	GOGNIA, MR.	
354995	C	2074	A	15	101	0	0	342417	2	81	95	0	P	0	000000	NO	VAN HORN HOMES	
354907	C	2100	A	15	101	0	0	342417	2	28	30	0	C	13	000000	NO	AARON, JAMES A.	
356241	C	2100	A	15	101	0	0	342417	2	0	26	0	C	12	000000	NO	CARINI, ALBERT	
360442	C	1525	A	15	101	0	0	342417	2	12	19	0	C	12	000000	NO	ALFIERI, THOMAS	
372554	C	1525	A	15	101	0	0	342417	2	32	33	0	C	15	000000	NO	SWANSON	
407407	C	2837	A	15	101	0	0	342417	2	22	30	N	0	C	21	000000	NO	LABELL, LEO
362168	C	1040	A	15	053	0	0	342417	3	63	85	0	C	30	000000	NO	COOPER, ROYAL	
414629	I	2364	A	15	101	0	0	342417	4	79	120	N	0	C	4	0000	NO	DCA HOMES
415053	I	2364	A	15	101	0	0	342417	4	72	120	N	0	C	4	0000	NO	DCA HOMES
414681	I	1841	B	15	101	0	0	342417	4	40	150	Y	16	T	17	0000	NO	THE SALVATION ARMY
394715	C	1340	D	15	101	0	0	342417	2	60	100	N	0	C	20	000000	NO	MOBLEY, HUGH E
317073	E	0000	D	15	101	0	0	342417	3	34	50	0	C	6	000000	NO	G CONSTANTI	
335087	E	1121	D	15	101	0	0	342417	3	29	45	0	C	18	000000	NO	FIMIANI D	
327970	E	1533	D	15	101	0	0	342417	4	40	60	0	C	12	000000	NO	B ARTER	
394570	C	1040	D	15	101	0	0	342417	4	98	98	N	0	C	0	000000	NO	THOMAS, DONALD R
409435	C	1040	D	15	101	0	0	342417	4	63	100	N	0	C	15	000000	NO	THOMAS, DONALD R
416013	I	2364	D	15	101	0	0	342417	4	84	125	N	0	C	24	0000	NO	THOMAS, DARRELL & MOLLEY
314129	H	0000	D	15	101	0	0	352417	3	30	91	N	0	C	17	000000	NO	E SCARBOROUGH
385629	C	1555	A	15	101	0	0	362417	2	40	40	N	0	C	10	LOT-82	NO	MASS, HERBERT H.
336959	E	1696	A	15	101	0	0	362417	4	35	100	0	C	0	000000	NO	NEWBORN GUS	
349017	C	1696	A	15	101	0	0	362417	4	73	100	0	C	6	000000	NO	NEWBORN GROVES	
304358	E	1000	A	15	101	0	1	362417	6									
320877	E	0000	D	15	101	0	0	362417	3	60	90	0	C	0	000000	NO	J POWELL	
343170	E	1056	D	15	101	0	0	36241										

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**SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
WELL CONSTRUCTION PERMITTING
PERMIT SUMMARY FOR YEAR 00 THRU 99**

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BY: COUNTY: BASIN: S:34 - 36 T:24 R:17 DEPTH: DIAMETER: METHOD: USE: CASE DEPTH:

S	T	A	D	C	O	B	E	M	S	P	H	I	S	L
U	L	I	C	N	T	Q	R	G	E	T	A	T	R	I
PERMIT	S	NUMBR	E	N	Y	LOCATION	Q	RS	D	C	P	R	F	USER-ID
						STR	DEPTH	WELL	DEPTH	TR	TEE	AO	UL	LOT
														OWNER NAME
304354	E	0000	L	15	101	0 1 362417	4							
304355	E	0000	L	15	101	0 1 362417	4							
304356	E	0000	L	15	101	0 1 362417	4							
304357	E	0000	L	15	101	0 1 362417	4							
332768	E	1817	L	15	101	0 0 362417	4	70	214	0 C	9			NO CAL MAINE
337758	E	1696	L	15	101	0 0 362417	4	84	135	0 C	10			NO CALMAINE FM
340489	E	1696	L	15	101	0 0 362417	4	63	115	0 C	0			NO CAL MAI NE
303211	E	0000	L	15	101	0 1 362417	6							
304359	E	0000	L	15	101	0 1 362417	6							
303212	H	0000	V	15	101	0 1 362417	6							

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
WELL CONSTRUCTION PERMITTING

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PERMIT SUMMARY FOR YEAR 00 THRU 99

BY: COUNTY: BASIN: S:22 - 27 T:24 R:17 DEPTH:

DIAMETER: METHOD: USE: CASE DEPTH:

PERMIT	S	T	A	U	L	I	C	N	S	I	T	Y	Q	S	T	R	D	I	C	A	W	E	L	L	U	B	G	O	I	R	L	A	O	O	L	U	S	F	USER-ID	LOT	H	OWNER NAME
362978	C	15	25	A	15	101	0	0	222417	2	21	26	0	C	10	000000	NO	PEACOCK, JOHN F.																								
354734	C	10	40	D	15	101	0	0	222417	2	42	73	0	C	23	000000	NO	PETERSON, JOHN F.																								
355235	C	15	33	D	15	101	0	0	222417	2	47	53	0	C	15	000000	NO	VUONO, JOHN																								
388552	C	22	37	D	15	101	0	0	222417	2	42	65	N	0	C	20	000000	NO	BETTY, TERRY																							
408221	C	10	36	D	15	101	0	0	222417	2	57	66	N	0	C	11	000000	NO	MITCHELL, BETTY																							
310649	E	00	00	D	15	101	0	0	222417	3	70	90	0	C	17	000000	NO	R EAST																								
312976	E	00	00	D	15	101	0	0	222417	3	31	45	0	C	0	000000	NO	R B KNAPP																								
313726	E	00	00	D	15	101	0	0	222417	3	81	92	0	J	20	000000	NO	WM SEEGER																								
317120	E	00	00	D	15	101	4	3	222417	3	35	57	0	C	18	000000	NO	B NOLAN																								
317392	E	00	00	D	15	101	1	3	222417	3	42	87	0	C	0	000000	NO	J P DESLIN																								
317393	E	00	00	D	15	101	4	3	222417	3	61	100	0	C	17	000000	NO	R PATTEESON																								
317486	E	00	00	D	15	101	4	3	222417	3	61	86	0	C	31	000000	NO	J BONNER																								
317921	E	00	00	D	15	101	0	0	222417	3	51	87	0	C	0	000000	NO	R P COFFIN																								
317923	E	00	00	D	15	101	0	0	222417	3	61	100	0	C	27	000000	NO	J DULAR																								
318049	E	00	00	D	15	101	0	0	222417	3	51	87	0	C	22	000000	NO	L L SIZEMOR																								
318267	E	00	00	D	15	101	0	0	222417	3	42	79	0	C	31	000000	NO	R W CORKERY																								
318330	E	00	00	D	15	101	0	0	222417	3	51	82	0	C	30	000000	NO	A MULLINS																								
318331	E	00	00	D	15	101	0	0	222417	3	52	78	0	C	30	000000	NO	M LEDUC																								
318552	E	00	00	D	15	101	0	0	222417	3	51	100	0	C	24	000000	NO	M MILLER																								
319044	E	00	00	D	15	101	0	0	222417	3	52	74	0	C	23	000000	NO	C LITTLE																								
319215	E	00	00	D	15	101	0	0	222417	3	52	80	0	C	18	000000	NO	L RDBILLARD																								
319547	E	00	00	D	15	101	0	0	222417	3	42	90	0	C	27	000000	NO	W C GREEN																								
319548	E	00	00	D	15	101	0	0	222417	3	91	118	0	C	39	000000	NO	S GOSS JR																								
319794	E	00	00	D	15	101	0	0	222417	3	91	131	0	C	37	000000	NO	F HOLY																								
320197	E	00	00	D	15	101	0	0	222417	3	63	105	0	C	50	000000	NO	B E HOLMEY																								
320301	E	00	00	D	15	101	0	0	222417	3	41	41	0	C	32	000000	NO	MARG AULD																								
320975	E	00	00	D	15	101	1	2	222417	3	52	52	0	C	21	000000	NO	J STEVENSON																								
321002	E	00	00	D	15	101	1	3	222417	3	50	80	0	C	25	000000	NO	W CHRISTOPH																								
321101	E	00	00	D	15	101	3	4	222417	3	62	62	0	C	30	000000	NO	MCCULLY																								
321578	E	00	00	D	15	101	0	3	222417	3	63	80	0	C	28	000000	NO	W SEEGAN																								
321692	E	00	00	D	15	101	2	1	222417	3	31	55	0	C	18	000000	NO	DEESE																								
322928	E	00	00	D	15	101	0	0	222417	3	52	70	0	C	22	000000	NO	WAYNE WHITT																								
323910	E	00	00	D	15	101	0	0	222417	3	52	73	0	C	36	000000	NO	R LOTOSKI																								
324312	E	00	00	D	15	101	0	0	222417	3	52	72	0	C	37	000000	NO	J L GREEN																								
324568	E	00	00	D	15	101	0	0	222417	3	54	76	0	C	36	000000	NO	A HERMAN																								
324741	E	00	00	D	15	101	0	0	222417	3	42	65	0	C	0	000000	NO	A JOHNSON																								
325119	E	00	00	D	15	101	0	0	222417	3	42	72	0	C	0	000000	NO	L LOFFOON																								
325391	E	00	00	D	15	101	0	0	222417	3	42	62	0	C	0	000000	NO	W S COMBE																								
325542	E	00	00	D	15	101	0	0	222417	3	42	68	0	C	0	000000	NO	A RODI																								

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

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WELL CONSTRUCTION PERMITTING

PERMIT SUMMARY FOR YEAR 00 THRU 99

RDB0055

BY: COUNTY:

BASIN: S:22 - 27 T:24 R:17 DEPTH:

DIAMETER: METHOD: USE: CASE DEPTH:

PERMIT	S	T	A	U	L	I	C	N	S	I	T	LOCATION	D	I	CASE	WELL	U	B	G	O	IRL	A	O	O	L	USER-ID	LOT	H	OWNER NAME	
												QQQ	S	T	R	A	DEPH	DEPH	T	RS	D	C	P	R	N	F				
326530	E	00	00	D	15	101	0	0	222417	3	73	83	0	C	26	000000	NO	DAVID HALL												
326589	E	00	00	D	15	101	0	0	222417	3	42	70	0	C	18	000000	NO	M J SLOAN												
326590	E	00	00	D	15	101	0	0	222417	3	42	66	0	C	15	000000	NO	R M TANNER												
327132	E	00	00	D	15	101	0	0	222417	3	98	110	0	C	41	000000	NO	M GEHRKE												
327308	E	00	00	D	15	101	0	0	222417	3	42	60	0	C	8	000000	NO	C R DAVIS												
327395	E	00	00	D	15	053	0	0	222417	3	63	70	0	C	35	000000	NO	M L BAIN												
327640	E	00	00	D	15	101	0	0	222417	3	42	60	0	C	20	000000	NO	C BALES												
327760	E	00	00	D	15	101	0	0	222417	3	65	76	0	C	33	000000	NO	G FOLSOM												
327761	E	00	00	D	15	101	0	0	222417	3	49	65	0	C	17	000000	NO	D CORBON												
328287	E	00	00	D	15	101	0	0	222417	3	63	63	0	C	42	000000	NO	M GOFF												
328406	E	00	00	D	15	101	0	0	222417	3	50	61	0	C	15	000000	NO	J COOMBS												
328570	E	00	00	D	15	101	0	0	222417	3	52	70	0	C	20	000000	NO	D M SMITH												
329852	E	00	00	D	15	101	0	0	222417	3	41	60	0	C	20	000000	NO	J LUMPKIN												
313282	E	00	00	D	15	101	0	0	222417	4	40	80	0	C	18	000000	NO	G P NOLEN												
315057	E	00	00	D	15	101	0	0	222417	4	66	68	0	C	21	000000	NO	DONALD DEAN												
319321	E	00	00	D	15	101	0	0	222417	4	52	52	0	C	24	000000	NO	J FISH												
325431	E	00	00	D	15	101	0	0	222417	4	55	70	0	C	0	000000	NO	J WALGREY												
325432	E	00	00	D	15	101	0	0	222417	4	52	68	0	C	0	000000	NO	J WALGRAY												
327269	E	00	00	D	15	101	0	0	222417	4	12	77	0	C	12	000000	NO	RAY MILLER												
331811	E	15	33	D	15	101	0	0	222417	4	21	40	0	C	12	000000	NO	GIANAKAS												
334138	E	10	40	D	15	101	0	0	222417	4	100	155	0	C	18	000000	NO	RICHARDSON												
344395	C	15	33	D	15	101	0	0	222417	4	71	84	0	C	16	000000	NO	GIDCOMB, O.												
345196	C	15	33	D	15	101	0	0	222417	4	21	31	0	C	15	000000	NO	SANDERSON, LEE												
348451	C	18	41	D	15	101	0	0	222417	4	104	125	0	C	12	000000	NO	LEWIS, BARBARA A.												
356273	C	18	41	D	15	101	0	0	222417	4	146	190	0	C	28	000000	NO	HAYES, ELMER												
381365	C	15	33	D	15	101	0	0	222417	4	68	86	N	C	11	LOT-03	NO	GORDEN, RUSSELL												
327498	E	00	00	D	15	101	0	0	222417	6	63	75	0	C	28	000000	NO	R MOSKINS												
321392	E	00	00	T	15	101	3	4	222417	3	50	50	0	C	28	000000	NO	C BERMENDER												
390868	C	18	41	A	15	101	0	0	232417	4	31	60	N	O	T	2	000000	NO	BUDDY GOODWIN INC											
349301	C	19	04	D	15	101	0	0	232417	2	0	75	0	C	31	000000	NO	HOUSE, HARRY												
351067	C	10	94	D	15	101	0	0	232417	2	139	302	0	R	16	000000	NO	STANLEY, BILL D.												
351371	C	19	04	D	15	101	3	1	232417	2	0	110	0	C	28	000000	NO	WRIGHT, WAYNE D.												
355099	C	15	33	D	15	101	0	0	232417	2	46	49	0	C	23	000000	NO	CASSER, KEN												
361535	C	19	04	D	15	101	0	0	232417	2	50	55	0	C	25	000000	NO	HENDERSON, JERRY A.												
361571	N	15	87	D	15	101	0	0	232417	2	***	CANCELLED	***					GOLANDS, NICK												
369677	C	21	70	D	15	101	0	0	232417	2	40	45	N	O	C	22	000000	NO	HEMHIS, TIMOTHY L.											
369678	C	21	00	D	15	101	0	0	232417	2	0	80	N	O	C	25	000000	NO	BAUER, GENE											
312338	E	00	00	D	15	101	0	0	232417	3	40	98	0	C	0	000000	NO	J C FARMER												
313579	E	00	00	D	15	101	0	0	232417	3	61	97	0	J	18	000000	NO	M J EDWARDS												

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
WELL CONSTRUCTION PERMITTING

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PERMIT SUMMARY FOR YEAR 00 THRU 99

FY: COUNTY: BASIN: S:22 - 27 T:24 R:17 DEPTH:

DIAMETER: METHOD: USE: CASE DEPTH:

PERMIT	S T A T E D RILL U LICH S N U M B R	E	D	B	O U N T Y	C O U N T Y	LOCATION	Q Q Q	S	T	R	D I C A S E	WELL D E P T H	U B G O	T R S	D C	M S W L S T A E P C H I S O N A M T E C L R U A O O L P R N F	USER-ID	LOT	H	OWNER NAME
314619	E	0000	D	15	101	0	0	232417	3	60	112	0	C	46	000000	NO	D D CANALE				
315290	E	0000	D	15	101	0	0	232417	3	60	74	0	C	20	000000	NO	DHILANI				
317052	E	0000	D	15	101	0	0	232417	3	62	66	0	C	18	000000	NO	M G BROCK				
318583	E	0000	D	15	101	0	0	232417	3	28	36	0	C	12	000000	NO	M J VESTUTO				
322187	E	0000	D	15	101	0	0	232417	3	81	142	0	C	0	000000	NO	J HEWITT				
323152	E	1056	D	15	101	0	0	232417	3	60	110	0	C	28	000000	NO	D HILL				
324843	E	1121	D	15	101	0	0	232417	3	100	100	0	C	17	000000	NO	L C KENNEDY				
324944	E	1037	D	15	101	0	0	232417	3	63	96	0	C	0	000000	NO	M TAYLOR				
327906	E	1121	D	15	101	0	0	232417	3	63	70	0	C	12	000000	NO	K R FRENCH				
330316	E	1056	D	15	101	0	0	232417	3	52	118	0	C	19	000000	NO	R STAFFORD				
330611	E	1056	D	15	101	0	0	232417	3	88	105	0	C	17	000000	NO	C VANCUYK				
394533	E	1179	D	15	101	0	0	232417	3						000000	NO	MCDANIELS, THOMAS				
395392	C	1649	D	15	101	0	0	232417	3	0	0	0		0	000000	NO	LITTLE, JAMES E				
308889	E	0000	D	15	101	0	0	232417	4	61	112	0	C	12	000000	NO					
310354	E	0000	D	15	101	0	0	232417	4	31	51	0	C	0	000000	NO	E POTTER				
312468	E	0000	D	15	101	0	1	232417	4	60	113	0	R	18	000000	NO	R A LONG				
312598	E	0000	D	15	101	0	0	232417	4	94	133	0	R	26	000000	NO	R HARRIS				
315245	E	0000	D	15	101	0	0	232417	4	205	210	0	C	22	000000	NO	WILEY KING				
315971	E	0000	D	15	101	0	0	232417	4	90	90	0	C	25	000000	NO	M HOPPER				
317431	E	0002	D	15	101	1	2	232417	4	31	85	0	C	16	000000	NO	C FREEMAN				
318909	E	0000	D	15	101	0	0	232417	4	60	105	0	C	0	000000	NO	J T BICKEL				
321075	E	0000	D	15	101	0	0	232417	4	81	150	0	C	23	000000	NO	F COLONGE				
321076	E	0000	D	15	101	2	2	232417	4	81	140	0	C	22	000000	NO	J GRANBERGY				
321483	E	1037	D	15	101	2	1	232417	4	52	84	0	C	18	000000	NO	RAYMON WITT				
322070	E	1056	D	15	101	0	0	232417	4	65	115	0	C	0	000000	NO	J SEUFERT				
323534	E	1024	D	15	101	0	0	232417	4	88	115	0	R	25	000000	NO	T DINASCO				
324297	E	1056	D	15	101	0	0	232417	4	92	140	0	C	24	000000	NO	R M KNEES				
329437	E	1696	D	15	101	0	0	232417	4	46	101	0	C	30	000000	NO	C SINGLETON				
338982	E	1056	D	15	101	0	0	232417	4	40	107	0	C	11	000000	NO	PHILLIPS, J				
343330	C	1841	D	15	101	0	0	232417	4	63	92	0	C	18	000000	NO	LOGAN, R. L.				
362645	C	2180	D	15	101	0	0	232417	4	40	50	0	C	29	000000	NO	WOOLMES, TOM				
363463	N	1587	D	15	101	0	0	232417	4	***	CANCELLED	***					CASSUL, KEN				
368152	C	1841	D	15	101	0	0	232417	4	94	102	0	C	29	000000	NO	DRANKWALTER, M.				
372217	C	2092	D	15	101	0	0	232417	4	0	114	0	C	30	000000	NO	ACTTERHAUF, MEL				
378212	C	1056	D	16	101	2	1	232417	4	70	130	N	C	15	000000	NO	SPARKS, DAVID C.				
380674	C	2035	D	15	101	0	0	232417	4	94	145	N	C	12	000000	NO	WOODS, BILLIE D.				
390021	C	1056	D	15	101	0	0	232417	4	113	150	N	C	16	000000	NO	GLOVER, MILDRED				
402449	C	2364	D	15	101	0	0	232417	4	72	81	N	C	16	LOT B	NO	PAYNE, MICHAEL				
403666	C	2800	D	15	101	0	0	232417	4	73	88	N	C	23	000000	NO	DOLCE, ANTHONY				

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

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WELL CONSTRUCTION PERMITTING

PERMIT SUMMARY FOR YEAR 00 THRU 99

RDB0055

BY: COUNTY:

BASIN: S:22 - 27 T:24 R:17 DEPTH:

DIAMETER: METHOD: USE: CASE DEPTH:

PERMIT	S	T	A	U	L	I	C	N	S	T	T	LOCATION	D	I	CASE	WELL	U	B	G	O	IRL	A	O	O	L	USER-ID	LOT	H	OWNER NAME
	DRILL	U	S	N	Y	Q	Q	Q	S	T	R	A	DEPTH	DEPTH	T	R	S	D	C	P	R	N	F						
407482	C	28	00	D	15	101	0	0	2324	17	4	42	53	N	0	C	11								000000	NO		CILIENTO, MARIO	
407483	C	28	00	D	15	101	0	0	2324	17	4	84	100	N	0	C	10								000000	NO		CILIENTO, MARIO	
304563	E	00	00	A	15	101	0	0	2424	17	10																		
383950	C	10	56	B	15	101	3	1	2424	17	4	65	125	Y	5	C	12								000000	NO		SAYLOR, BONNIE	
361995	C	20	57	D	15	101	0	0	2424	17	2	93	90		0	C	40								000000	NO		PERKS, E.	
363365	C	20	92	D	15	101	0	0	2424	17	2	56	61		0	C	18								000000	NO		NIX, CLYDE E.	
368921	C	10	40	D	15	101	0	0	2424	17	2	84	94		0	C	0								000000	NO		FISHER, DEBORAH L.	
371431	C	10	94	D	15	101	0	0	2424	17	2	109	272		0	R	30								000000	NO		STONE, DAVID M. & GEORGETTE	
373488	C	21	77	D	15	101	0	0	2424	17	2	82	50	N	0	C	0								000000	NO		COTEREAUE, WALTER	
392806	C	10	40	D	15	101	0	0	2424	17	2	90	110	N	0	C	18								000000	NO		SEHL, DANIEL M	
392976	C	10	40	D	15	101	0	0	2424	17	2	120	140	N	0	C	18								L 480A	NO		PANTALLERESCO, MARIO J	
319034	E	00	00	D	15	101	1	2	2424	17	3	165	165		0	C	0								000000	NO		M WILLIAMSO	
329333	E	00	00	D	15	101	0	0	2424	17	3	85	103		0	C	18								000000	NO		F DUNCAN	
332395	E	00	00	D	15	101	0	0	2424	17	3	42	60		0	C	18								000000	NO		L S CLARK	
319033	E	00	00	D	15	101	1	2	2424	17	4	165	176		0	C	0								000000	NO		M A WILLIAM	
324615	E	10	56	D	14	101	0	0	2424	17	4	246	270		0	C	29								000000	NO		C SELETOS	
325322	E	10	56	D	15	101	0	0	2424	17	4	60	122		0	C	20								000000	NO		K GILLETTE	
327653	E	00	00	D	15	101	0	0	2424	17	4	42	90		0	C	25								000000	NO		L ANDERSON	
367733	C	15	33	D	15	101	0	0	2424	17	4	42	51		0	C	30								000000	NO		MASTELLER, J.	
370707	C	18	41	D	15	101	0	0	2424	17	4																		
374817	C	10	56	D	15	101	2	4	2424	17	4	0	125	N	0	C	24								000000	NO		BUTLER, JIM	
375282	C	18	43	D	15	101	0	0	2424	17	4	50	110	N	0	C	0								000000	NO		ALLSTATE HOMES	
388643	C	18	41	D	15	101	0	0	2424	17	4	63	108	N	0	C	12								L TRA	NO		WHITEHEAD, JOHN F.	
400152	E	15	33	D	15	101	0	0	2424	17	4	87	106	N	0	C	18								000000	NO		FLANAGAN HOMES	
411339	C	23	64	D	15	101	0	0	2424	17	4	42	47	N	0	C	19								000000	NO		HAMILTON, THEODORE	
372365	C	20	57	A	15	101	0	0	2524	17	4	42	80		0	C	15								000000	NO		PETERS, RAY E	
306110	C	10	94	D	15	101	0	0	2524	17	4	78	110		0	R	12								000000	NO		CAUFIELD, B.	
373186	N	10	37	D	15	101	0	0	2524	17	4	***	CANCELLED	***												000000	NO		DORMANY, JIM
379431	C	10	56	D	15	101	3	3	2524	17	4	110	185	N	0	C	10								000000	NO		GANDARA, JOSE L.	
414967	I	20	57	A	15	101	0	0	2624	17	4	30	33	N	0	C	18								000000	NO		VAN WERT, BRUCE	
377328	C	20	92	D	15	101	0	0	2624	17	2	30	38	N	0	C	5								000000	NO		B & I BAIT FARM	
383754	N	21	77	D	15	101	0	0	2624	17	2	***	CANCELLED	***												000000	NO		CREED, DAVID A.
414259	I	10	36	D	15	101	0	0	2624	17	2																		
414263	I	10	36	D	15	101	0	0	2624	17	2																		
308235	E	00	65	D	15	101	3	2	2624	17	3	30	45		0	C	30								000000	NO		WESTFALL, EFFIE	
308440	E	00	65	D	15	101	4	3	2624	17	3	40	120		0	C	18								000000	NO		LANDAL, GAYLORD	
308551	E	00	65	D	15	101	1	2	2624	17	3	76	102		0	C	19								000000	NO		LANDAL, GAYLOPD	
308757	E	00	65	D	15	101	1	2	2624	17	3	50	63		0	C	40								000000	NO		H M BROXSON	
308848	E	00	65	D	15	101	3	2	2624	17	3	34	43		0	C	9								000000	NO		R DUNCAS	
																										000000	NO		J RENEW
																										000000	NO		M H HITCHUA
																										000000	NO		D A TOOKEY

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
WELL CONSTRUCTION PERMITTING

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PERMIT SUMMARY FOR YEAR 00 THRU 99

FY: COUNTY: BASIN: S:22 - 27 T:24 R:17 DEPTH:

DIAMETER: METHOD: USE: CASE DEPTH:

PERMIT	S	T	A	DRILL	U	R	C	LOCATION	D	I	CASE	WELL	U	M	S	S	SWL	S	L	OWNER NAME
	NUMBR	E	N	Y	Q00	S	T	R	A	DEPH	DEPH	T	R	S	D	C	P	R	N	F
309636	E	0965	D	15	101	2	2	262417	3	56	56	0	C	18	000000	NO	L CHEEK			
313829	E	7000	D	15	101	0	0	262417	3	76	97	0	C	12	000000	NO	C LARISEY			
317580	E	0000	D	15	101	0	0	262417	3	80	95	0	R	7	000000	NO	T BROWN			
317681	E	3300	D	15	101	0	0	262417	3	50	85	0		9	000000	NO	R THOMAS JR			
318332	E	0000	D	15	101	0	0	262417	3	63	97	0	C	0	000000	NO	G JAMES			
326383	E	1056	D	15	101	0	0	262417	3	52	120	0	C	13	000000	NO	L WHIDDEN			
309458	E	0065	D	15	101	3	2	262417	4	60	130	0	C	32	000000	NO	M ROGERS			
312437	E	0000	D	15	101	0	0	262417	4	40	104	0	C	12	000000	NO	D L VICKERS			
312513	E	0000	D	15	101	0	0	262417	4	50	97	0	C	12	000000	NO	E CORLEY			
318944	E	7000	D	15	101	0	0	262417	4	40	110	0	C	0	000000	NO	C D WARD			
342508	E	1696	D	15	101	0	0	262417	4	126	180	0	C	10	000000	NO	WHITE, T			
343601	E	1056	D	15	101	3	3	262417	4						000000	NO	ALLSTATE MO			
358281	C	1696	D	15	101	0	0	262417	4	63	105	0	C	27	000000	NO	RUBIN, GEORGE			
373078	C	2092	D	15	101	0	0	262417	4	56	88	N	C	7	LOT-01	NO	CARMAN JR., ROBERT			
391248	C	2092	D	15	101	0	0	262417	4	107	131	N	C	12	T 68	NO	LANDABL, GAYLORD			
368875	C	1151	D	15	101	0	0	272417	2	35	45	0	C	0	700000	NO	WHITTINGTON, BETTY J.			
379609	N	2177	D	15	101	1	1	272417	2	***	CANCELLED ***						MILLER, DAN			
388959	C	1151	D	15	101	0	0	272417	2	37	91	0	C	0	000000	NO	BAILLIE, SUSAN			
394367	E	1151	D	15	101	0	0	272417	2	63	70	N	C	0	#85	NO	BAILLIE, SUSAN			
397177	E	1151	D	15	101	0	0	272417	2	84	102	N	C	0	LOT 42	NO	STILES, JUDY			
311050	E	0000	D	15	101	0	0	272417	3	72	91	0	J	19	000000	NO	M SPENCER			
311051	E	0000	D	15	101	3	3	272417	3	31	54	0	T	21	000000	NO	A CIRELLA			
311639	E	7000	D	15	101	0	0	272417	3	79	98	0	C	15	000000	NO	QUELLETTE			
312313	E	7000	D	15	101	4	3	272417	3	225	328	0	J	14	000000	NO	S F KAVALLIK			
313544	E	7000	D	15	101	0	0	272417	3	121	145	0	J	30	000000	NO	S KAVALLISKA			
309373	E	0000	D	15	101	0	0	272417	4	42	99	0	C	15	000000	NO	J HALL			
320133	E	1040	D	15	101	0	0	272417	4	77	140	0	J	18	000000	NO	P C DELPINO			
338787	E	1696	D	15	101	0	0	272417	4	84	115	0	C	20	000000	NO	HCHANIC, T			
415435	I	2120	D	15	101	0	0	272417	4	95	111	N	C	25	0000	NO	DUNCAN, CHARLES H			

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PERMIT SUMMARY FOR YEAR 00 THRU 99

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BY: COUNTY:

BAS-IN: 5:13 - 15 T:24 R:17 DEPTH:

DIAMETER: METHOD: USE: CASE DEPTH:

PERMIT	S T U	DRILL U	S LICEN	E	B A	C O	U N	T	LOCATION	D I	CASE	WELL	G R	E TAE	S P	C H	I R	S U	L I	T	H	OWNER NAME
					N	N	N	N	Q S T R	A	DEPH	DEPH	T R S	D C	P A O	C L R	I O F					
416885	I	1533	A	15	101	0	0	132417	4													WILSON, A
366935	C	1525	D	15	101	0	0	132417	2	52	74		O C	40					000000	NO		BONZALEZ
371623	C	1605	D	15	101	0	0	132417	2	36	39		O C	30					000000	NO		DEWITT, KEITH
305402	C	1056	D	15	101	2	2	132417	3										000000	NO		LOWRY, JERRY W
305645	C	1076	D	15	101	0	0	132417	3	127	132		O C	0					000000	NO		COLE, THOMAS
336367	E	3000	D	15	101	4	4	132417	3	42	115		O R	25					000000	NO		G PETERSON
307943	E	0000	D	15	101	0	0	132417	3	81	107		O C	17					000000	NO		C E MICKLES
311208	E	0000	D	15	101	0	0	132417	3	50	85		O C	0					000000	NO		S ACERRA
316086	E	3000	D	15	101	0	0	132417	3	84	104		O C	21					000000	NO		P BOWLES
316100	E	3000	D	15	101	0	0	132417	3	94	110		O C	19					000000	NO		V HIRS
317274	E	3000	D	15	101	0	0	132417	3	92	130		O C	0					000000	NO		R BURKE
320474	E	3000	D	15	101	0	0	132417	3	84	110		O C	30					000000	NO		L MCGUIRE
321200	E	0000	D	15	101	0	0	132417	3										000000	NO		L MCGUIRE
321908	H	1037	D	15	101	3	2	132417	3	42	90		O C	32					000000	NO		C BOHON
323280	E	1094	D	15	101	0	0	132417	3	57	100		O R	0					000000	NO		M DAVIDSON
330259	E	1121	D	15	101	0	0	132417	3	45	68		O C	19					000000	NO		D E LOCKE
331444	E	1251	D	15	101	0	0	132417	3	45	100		O C	38					000000	NO		RUTY
370655	C	1436	D	15	101	0	0	132417	3	63	110	N	O C	50					000000	NO		MORAGUES, CAROLYN
304913	C	1232	D	15	101	4	3	132417	4	31	97		O C	15					000000	NO		SAMON, JERRY EDWARD
306981	E	0000	D	15	101	0	0	132417	4	73	124		O C	0					000000	NO		
311771	E	0000	D	15	101	3	4	132417	4	63	105		O C	35					000000	NO		A STRICKLIN

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
WELL CONSTRUCTION PERMITTING

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PERMIT SUMMARY FOR YEAR 00 THRU 99

FY: COUNTY: BASIN: S:13 - 15 T:24 R:17 DEPTH:

DIAMETER: METHOD: USE: CASE DEPTH:

PERMIT	S T A T U S U L I C N S I T Y	C O U N T Y	Q Q Q	S T R	D I A M E T E R	C A S E	W E L L	U B G O	M E T H O D	S W L	S P C	H I S	L I T	OWNER NAME	
384539	C	1841	D	15 101 0 0	132417	4	115	145	N	0	C	2	L-5932	NO	HOUBLER, PAUL
390501	C	2364	D	15 101 0 0	132417	4	63	85	N	0	C	18	000000	NO	KEPPEL, L E
392084	C	1533	D	15 101 0 0	132417	4	33	36	N	0	C	12	000000	NO	KERR, KENNETH
410944	C	2364	D	15 101 0 0	132417	4	84	110	N	0	C	22	000000	NO	BARADLAY, TIROR
350046	C	1974	A	15 101 0 0	142417	2	0	65	0	C	16	000000	NO	STOKES, LARRY	
324174	E	1232	A	15 101 0 0	142417	4	37	75	0	C	31	000000	NO	BIBLE BAPT	
343113	E	1986	D	15 101 1 3	142417	2									BRITTS, L
357440	C	1533	D	15 101 0 0	142417	2	53	68	0	C	23	000000	NO	JORDAN, ROBERT	
368018	N	2177	D	15 101 0 0	142417	2	*** CANCELLED ***								COIGREAVE, WALTER
406248	C	2092	D	15 101 0 0	142417	2	37	44	N	0	C	20	LOT 24	NO	ANGELSON, JOE
415856	E	2870	D	15 101 0 0	142417	2									ANGELSON, JOSEPH
308413	E	3012	D	15 101 0 0	142417	3	84	120	0	C	0	000000	NO	M RAULERSON	
311289	E	3000	D	15 101 0 0	142417	3	94	108	0	C	13	000000	NO	A STATLER	
312239	E	3000	D	15 101 0 0	142417	3	50	95	0	C	0	000000	NO	A FABRIZI	
313696	E	0000	D	15 101 0 0	142417	3	70	105	0	C	18	000000	NO	D E ESTOCAD	
314687	E	0000	D	15 101 0 0	142417	3	30	103	0	C	17	000000	NO	R JANDZINIS	
317355	E	7000	D	15 101 0 0	142417	3	62	90	0	C	18	000000	NO	H HUTCHINSON	
320513	E	0000	D	15 101 0 0	142417	3	51	120	0	C	22	000000	NO	R WILLIAMS	
321387	E	1037	D	15 101 2 2	142417	3	40	65	0	C	15	000000	NO	J WATTS	
321532	E	1037	D	15 101 4 3	142417	3	44	80	0	C	24	000000	NO	M H TRACER	
324070	E	1037	D	15 101 0 0	142417	3	42	97	0	C	31	000000	NO	JAMES JONES	
325469	E	1037	D	15 101 0 0	142417	3	45	50	0	C	0	000000	NO	C NIX	
326933	E	1271	D	15 101 0 0	142417	3	76	115	0	C	32	000000	NO	C SIKES	
309300	H	0000	D	15 101 0 0	142417	4	60	108	0	C	22	000000	NO	R E LANE SR	
316169	E	0000	D	15 101 0 0	142417	4	40	100	0	C	20	000000	NO	R MOORE	
322285	E	1436	D	15 101 0 0	142417	4	56	56	0	C	12	000000	NO	J SANT	
325144	E	1056	D	15 101 0 0	142417	4	61	170	0	C	25	000000	NO	D BURROUGH	
328938	E	1356	D	15 101 0 0	142417	4	46	120	0	C	46	000000	NO	J S RUSSELL	
337946	E	1696	D	15 101 0 0	142417	4	84	90	0	C	8	000000	NO	AYLOR, D	
341890	E	1696	D	15 101 0 0	142417	4	66	105	0	C	15	000000	NO	RILEY, D	
347171	C	1817	D	15 101 0 0	142417	4	40	130	0	C	31	000000	NO	ALLEY, CLIFFORD	
348688	C	1696	D	15 101 0 0	142417	4	50	73	0	C	17	000000	NO	TOOHEY, MICHAEL	
350314	C	1696	D	15 101 0 0	142417	4	63	105	0	C	20	000000	NO	NICKLE	
363007	N	2159	D	15 101 0 0	142417	4	*** CANCELLED ***								MORLEY, ARNOLD
368577	C	2159	D	15 101 0 0	142417	4	52	115	0	C	30	000000	NO	HANSON, MRS.	
370019	C	1533	D	15 101 0 0	142417	4	64	71	0	C	20	000000	NO	BONCZKIEWICZ, STAN	
375414	C	1056	D	15 101 4 2	142417	4	76	140	N	0	C	25	000000	NO	GELTM, KEN
377364	C	2177	D	15 101 0 0	142417	4	100	110	N	0	C	0	000000	NO	HENLEY, EDWARD
377365	C	2177	D	15 101 0 0	142417	4	55	65	N	0	C	0	L-1281	NO	REDDING, HELEN

RDH0055

WELL CONSTRUCTION PERMITTING

PERMIT SUMMARY FOR YEAR 00 THRU 99

PERMIT SUMMARY FOR YEAR 00 THRU 99
PY: COUNTY: HASIN: S:13 - 15 T:24 R:17 DEPTH:

DIAMETER: METHOD: USE: CASE DEPTH:

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PERMIT	S T A T E D RILL U L T I C N S	C O U N T Y	B A S I C I N F O	LOCATION	D I A M E T E R	C A S E D E P T H	W E L L D E P T H	M H T R S	S W L T A T E T E E I P L	S P C H I S C L R U L	USER-ID	LOT	H	OWNER NAME
377470	C	1056	D	15 101 4	4	142417	4	52	140 N	O R	16	000000	NO	TOOLE, DAYLON
379684	C	2075	D	15 101 0	0	142417	4	84	115 N	O C	18	000000	NO	KRAUS, NORMAN
379685	C	2075	D	15 101 0	0	142417	4	45	100 N	O R	10	000000	NO	MCCOY, EDNA
381395	C	1525	D	15 101 0	0	142417	4	46	55 N	O C	16	000000	NO	DEVINCENT, WILLIAM
381396	C	1525	D	15 101 0	0	142417	4	46	60 N	O C	16	000000	NO	DEVINCENT, WILLIAM
381696	C	2075	D	15 101 0	0	142417	4	45	140 Y	36 R	16	000000	NO	HICKLE, JAMES E NORMA
388208	C	2075	D	15 101 0	0	142417	4	45	100 N	O C	11	000000	NO	TIBERII, JOSEPH
400227	C	1841	D	15 101 0	0	142417	4	122	195 N	O C	18	LOT 38	NO	KYTE, RUTH
405421	C	1040	D	15 101 0	0	142417	4	98	135 N	O C	21	LOT7+8	NO	TAYLOR, BETTY
407275	C	1056	D	15 101 3	1	142417	4	63	138 N	O C	20	000000	NO	ALLSTATE HOMES
409345	E	2801	D	15 101 0	0	142417	4	46	65 N	O C	25	L 4860	NO	VIRGILIO, VICTOR E
414674	N	2092	D	15 101 0	0	142417	4	***	CANCELLED	***				THOMAS, E
360956	C	1525	A	15 101 0	0	152417	2	17	22	O C	11	000000	NO	GILBERTI, FRANK J.
337025	E	1841	A	15 101 0	0	152417	4	130	147	O C	18	000000	NO	MOULTEN B
391857	C	2092	A	15 101 0	0	152417	4	100	121 N	O C	10	LOT 25	NO	ROACH, STEVE
405431	C	1715	A	15 101 0	0	152417	4	73	100 Y	4 P	0	000000	NO	TRAPNELL, VANCE
352029	C	1151	D	15 101 0	0	152417	2	46	57	O C	26	000000	NO	WELLS, GENE T.
352030	C	1151	D	15 101 0	0	152417	2	63	80	O C	27	000000	NO	BARGA, BEN E.
353335	C	1151	D	15 101 0	0	152417	2	46	56	O C	0	000000	NO	DIEHL, CLARK
357302	C	1525	D	15 101 0	0	152417	2	68	74	O C	30	000000	NO	BOSSE, THOMAS
393115	C	2092	D	15 101 0	0	152417	2	26	38 N	O C	4	LOT 3	NO	SUMMERS, WILLIAM
312150	E	0000	D	15 101 0	0	152417	3	41	98	O C	22	000000	NO	D L RENAND
312931	E	0000	D	15 101 4	3	152417	3	61	95	O C	20	000000	NO	D J EXUM
312932	E	0000	D	15 101 1	2	152417	3	81	115	O C	22	000000	NO	E E EXUM
313716	E	0000	D	15 101 0	0	152417	3	40	50	O C	8	000000	NO	J C BEAUV J
315794	E	0000	D	15 101 0	0	152417	3	50	100	O C	21	000000	NO	R SMITH
316598	E	0000	D	15 101 0	0	152417	3	41	61	O C	19	000000	NO	D BROCK
317460	E	0000	D	15 101 0	0	152417	3	50	123	O C	21	000000	NO	C MCINTIRE
319256	E	0000	D	15 101 0	0	152417	3	58	85	O C	26	000000	NO	ALL STATE H
320233	E	1037	D	15 101 1	2	152417	3	30	52	O C	21	000000	NO	J DAVIS
323														

PDH0355

**SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
WELL CONSTRUCTION PERMITTING**

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PERMIT SUMMARY FOR YEAR 00 THRU 99

BY: COUNTY: BASIN: S:13 - 15 T:24 R:17 DEPTH:

DIAMETER: METHOD: USE: CASE DEPTH:

PERMIT	S T U S	A DRILL U L I C E N S	B A S I N T Y	C O U N T Y	LOCATION QQQ S T R	D I C A S E W E L L D F P H D E P H	G B T O N A M U B G O T R S D	H E T A E A T V T E E C	S P C H I S L P R N	L I T H	OWNER NAME
322146	E	1356	D	15	101	0 0 152417	4 42 120	O C 22	000000	NO	T GONZALES
326682	E	0000	D	15	101	0 0 152417	4 47 192	O C 18	000000	NO	D M CUMMILLS
337739	E	1841	D	15	101	0 0 152417	4 176 198	O C 34	000000	NO	COCKIN, J
339496	F	1841	D	15	057	0 0 152417	4 65 130	O C 30	000000	NO	ALLISON, H
382189	C	1040	D	15	101	0 0 152417	4 53 88	N O C 0	000000	NO	SUMMERS, ETHEL M.
386421	C	1340	D	15	101	0 0 152417	4 187 170	N O C 16	000000	NO	VERNING SR., KENNETH M.
386952	C	2392	D	15	101	0 0 152417	4 99 111	N O C 17	000000	NO	TRACIS BEACH, MAUREEN
396355	C	1056	D	15	101	0 0 152417	4 52 120	N O C 12	000000	NO	DAVIS, LAURENCE
399346	C	2364	D	15	101	0 0 152417	4 72 85	N O C 21	000000	NO	MURROW, DAVID C
400022	C	1356	D	15	101	3 1 152417	4 73 136	N 84 C 13	000000	NO	KERR, MAX
404928	C	1841	D	15	101	0 0 152417	4 47 85	N O T 15	LOT 90	NO	SAMUELS, F
406350	C	1356	D	15	101	1 1 152417	4 52 90	N O C 20	000000	NO	ALLSTATE HOMES
406416	C	2364	D	15	101	0 0 152417	4 79 137	N O C 21	000000	NO	WILLIAMS, NEORA
408536	N	2092	D	15	101	0 0 152417	4 *** CANCELLED ***				CAUKINS, JOHN
409159	E	2364	D	15	101	0 0 152417	4 63 96	N O C 22	000000	NO	BOYETTE, ED
416037	I	2092	D	15	101	0 0 152417	4				COCKIN, JOHN
312152	E	0000	L	15	101	3 4 152417	4 160 180	O C 22	000000	NO	J W JOHNSON
311591	E	0000	M	15	101	0 0 152417	3 74 80	O C 0	000000	NO	M DEES

DATE 8/05/86 22:52:12

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

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WELL CONSTRUCTION PERMITTING

PERMIT SUMMARY FOR YEAR 00 THRU 99

RDB0055

BY: COUNTY:

BASIN: S:29 - 31 T:24 R:18 DEPTH:

DIAMETER: METHOD: USE: CASE DEPTH:

PERMIT	S	T	A	DRILL	U	LICN	S	I	T	LOCATION	Q	S	T	R	A	DEPTH	WELL	U	B	G	O	IRL	A	O	O	L	USER-ID	LOT	H	OWNER NAME
313031	E	0000	D	15	101	0	0	292418	3	91	115	0	C	28												000000	NO		BEN LEON	
335735	E	1056	D	15	101	0	0	292418	3	42	90	0	C	37												000000	NO		P KIDWELL	
358711	E	0000	D	15	101	0	0	302418	2																					FELICIANO, ALBERTO
359346	E	0000	D	15	101	0	0	302418	2																					HEAVILIAN, WALTER A.
377911	C	1525	D	15	101	0	0	302418	2																					FIRST WESLEYAN CHURCH
308067	E	0065	D	15	101	0	0	302418	3	40	137	0	C	36												000000	NO		D E LAMOTTE	
308094	E	0065	D	15	101	0	0	302418	3	40	113	0	C	34												000000	NO			C B CRONAN
306154	E	0065	D	15	101	3	4	302418	3	90	95	0	C	30												000000	NO			C A HINES
331262	E	1328	D	15	101	0	0	302418	3	63	85	0	D	18												000000	NO			S STOKES
307105	E	0065	D	15	101	4	3	302418	4	102	160	0	C	52												000000	NO			
307106	E	0065	D	15	101	3	1	302418	4	63	160	0	C	22												000000	NO			
314989	E	0000	D	15	101	0	0	302418	4	50	136	0	C	26												000000	NO			R L VELEZ
315719	E	0000	D	15	101	3	4	312418	3	30	38	0	C	10												000000	NO			H D JONES
312718	E	0000	D	15	101	0	0	312418	3	60	150	0		0												000000	NO			J STALTER
313654	E	0000	D	15	101	4	3	312418	3	126	180	0	C	29												000000	NO			M CADLE
313698	E	0000	D	15	101	0	0	312418	3	40	93	0	C	18												000000	NO			E BRATTEN
314454	E	0000	D	15	101	0	0	312418	3	60	108	0	C	55												000000	NO			DR WHITEHUR
322762	E	0000	D	15	101	0	0	312418	3	68	68	0	C	28												000000	NO			T HOLMAN
323532	E	1056	D	15	101	0	0	312418	3	70	105	0	C	10												000000	NO			S HILL GARA
325097	E	1056	D	15	101	0	0	312418	3	70	105	0	C	10												000000	NO			S HILL GARA
310911	E	0065	D	15	101	1	2	312418	4	50	147	0	C	12												000000	NO			EDGAR COLLI
314529	E	0000	D	15	101	0	0	312418	4	62	120	0	C	37												000000	NO			M C JACOBSE
337935	E	1056	D	15	101	0	0	312418	4	52	100	0	C	0												000000	NO			MARRERO, L
383620	C	1817	D	15	101	0	0	312418	4	63	120	N	0	C	24												000000	NO		JENNINGS, CURTIS & CHARLISS

DATE 8/75/86 22:42:40

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
WELL CONSTRUCTION PERMITTING

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R080055

PERMIT SUMMARY FOR YEAR 00 THRU 99

BY: COUNTY: BASIN: S:17 - 20 T:24 R:18 DEPTH:

DIAMETER: METHOD: USE: CASE DEPTH:

PERMIT	S	T	U	L	I	C	N	Y	Q	Q	S	T	R	A	D	E	P	H	T	R	S	D	C	P	R	N	F	USER-ID	LOT	H	OWNER NAME
316192	E	0000	A	15	101	0	0	172418	4	59	100	0	C	40	000000	NO	J MEALS														
384458	C	1525	A	15	101	0	0	172418	4	84	86	N	0	C	43	000000	NO	DETERLINE, WILLIAM L.													
405094	C	2451	A	15	101	0	0	172418	4	63	93	N	0	C	35	000000	NO	PRONTO, BILL													
352707	E	0000	D	15	101	0	0	172418	2																						ANDERSON, SHERMAN
357867	C	1525	D	15	101	0	0	172418	2	55	57	C	C	25	000000	NO	GALITO, WM.														
371669	N	1533	D	15	101	0	0	172418	2	*** CANCELLED ***																					TYLER, M.
392086	C	1533	D	15	101	0	0	172418	2	68	78	N	0	C	14	000000	NO	BARNETT, EVERETT L JR													
305774	C	1232	D	15	101	0	0	172418	3	50	110	0	C	24	000000	NO	BOLGER, ROBERT														
306980	E	0000	D	15	101	0	0	172418	3	41	87	0	C	27	000000	NO	D E FULFORD														
307274	E	0000	D	15	101	3	2	172418	3	80	116	0	C	31	000000	NO	D MANISCALC														
307319	E	0000	D	15	101	4	3	172418	3	70	111	0	C	30	000000	NO	L LEAF														
307398	E	0000	D	15	101	0	0	172418	3	191	219	0	C	32	000000	NO	W A MEALS														
307533	E	0000	D	15	101	0	0	172418	3	70	87	0	C	21	000000	NO	W T HARTL														
307534	E	0000	D	15	101	0	0	172418	3	50	100	0	C	21	000000	NO	L HANBU														
307616	E	0000	D	15	101	2	1	172418	3	90	117	0	C	35	000000	NO	R EAT														
307620	E	0000	D	15	101	2	2	172418	3	61	85	0		29	000000	NO	D E LAHAT														
307952	E	0000	D	15	101	0	0	172418	3	30	80	0	C	28	000000	NO	D WALKER														
308275	E	0000	D	15	101	0	0	172418	3	50	100	0	C	0	000000	NO	C LOCKEY														
308490	E	0000	D	15	101	1	2	172418	3	50	108	0	C	34	000000	NO	C H WHITE														
308583	E	0078	D	15	101	0	0	172418	3	74	118	0	C	31	000000	NO	R H SMITH														
308595	E	0000	D	15	101	0	0	172418	3	60	90	0	C	42	000000	NO	ALICE FINAN														
308596	E	0000	D	15	101	0	0	172418	3	84	124	0	C	19	000000	NO	A E DUNCAN														
311948	E	0000	D	15	101	0	0	172418	3	193	248	0	C	48	000000	NO	ED STONE														
312315	E	0000	D	15	101	0	0	172418	3	40	110	0	C	23	000000	NO	D KLEIN														
312512	E	0000	D	15	101	0	0	172418	3	40	96	0	C	0	000000	NO	K L BAILEY														
314712	E	0002	D	15	101	0	0	172418	3	41	136	0	C	35	000000	NO	G W PARSON														
323739	E	1037	D	15	101	0	0	172418	3	42	97	0	C	36	000000	NO	EDW LEARY														
324842	E	1346	D	15	101	0	0	172418	3	63	90	0	C	34	000000	NO	L W PETERS														
308114	E	0000	D	15	101	0	0	172418	4	50	105	0	C	34	000000	NO															
312850	E	0000	D	15	101	0	0	172418	4	60	112	0	C	39	000000	NO	E J PASETTE														
324028	E	1056	D	15	101	0	0	172418	4	60	135	0	C	42	000000	NO	THOMAS KING														
324155	E	0000	D	15	101	0	0	172418	4	70	160	0	C	36	000000	NO	N I BLAKE														
324391	E	1056	D	15	101	0	0	172418	4	70	127	0	C	45	000000	NO	L HAYLOCK														
338684	E	1696	D	15	101	0	0	172418	4	50	90	0	C	25	000000	NO	BROOKS, P														
352735	C	1533	D	15	101	0	0	172418	4	68	84	0	C	34	000000	NO	PETERSON JR, ROBERT B.														
357435	C	1696	D	15	101	0	0	172418	4	63	103	0	C	30	000000	NO	HOGAN, LINDA														
368741	C	2159	D	15	101	0	0	172418	4	84	120	0	C	38	000000	NO	HERNANDEZ, ARNOLDO														
379011	N	2159	D	15	101	0	0	172418	4	*** CANCELLED ***																					MODEL, RAYMOND E.
381361	C	2392	D	15	101	0	0	172418	4	63	81	N	0	C	32	TRT-38	NO	THOMAS, ARTHUR													

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

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WELL CONSTRUCTION PERMITTING
PERMIT SUMMARY FOR YEAR 80 THRU 99

BY: COUNTY: BASIN: S:17 - 20 T:24 R:18 DEPTH: DIAMETER: METHOD: USE: CASE DEPTH:

PERMIT	S	T	U	L	C	N	Y	Q	S	T	R	A	D	E	P	H	T	R	S	D	C	P	R	N	F	USER-ID	LOT	H	OWNER NAME
386494	C	1056	D	15	101	1	4	172418	4	51	100	N	0	C	22											000000	NO		TALONE, GENE
389141	C	1841	D	15	101	0	0	172418	4	63	130	N	0	C	45											000000	NO		MOCH, ALFRED J
391859	C	2092	D	15	101	0	0	172418	4	42	60	N	0	C	26											000000	NO		JOLLY, WILLIAM
403473	C	1533	D	15	101	0	0	172418	4	84	105	N	0	C	14											000000	NO		CLARK, K
407078	C	2364	D	15	101	0	0	172418	4	84	110	N	0	C	37											000000	NO		WILLIAMS, DORIS L
414483	I	2392	B	15	101	0	0	182418	4																				CREATIVE DESIGN
407082	C	2501	D	15	101	0	0	182418	2	104	120	N	0	C	37											LOT 28	NO		HOUSE, DUANE
407107	C	2802	D	15	101	0	0	182418	2	99	99	N	0	C	38											LOT 19	NO		TRANMELL, CALVIN
305295	C	1056	D	15	101	0	0	182418	3	52	95		0	C	35											000000	NO		NOETHEN, ROBERT W
305656	C	1436	D	15	101	0	0	182418	3	53	83		0	C	25											000000	NO		WHITE, EARL W
306547	E	0000	D	15	053	0	0	182418	3	100	145		0	C	27											000000	NO		R L AYRES
306549	E	0000	D	15	101	0	0	182418	3	91	110		0	C	25											000000	NO		D M STEINRU
306634	E	0000	D	15	101	0	0	182418	3	81	97		0	C	28											000000	NO		D BANKS
306844	E	0000	D	15	101	1	4	182418	3	50	102		0	C	30											000000	NO		J P HILLYER
306927	E	0000	D	15	101	0	0	182418	3	41	88		0	C	27											000000	NO		R BRADY
307157	E	0000	D	15	101	0	0	182418	3	61	110		0	C	32											000000	NO		D CARTER
308635	E	0000	D	15	101	0	0	182418	3	42	62		0	C	33											000000	NO		P JEFFERSON
309081	E	0000	D	15	101	0	0	182418	3	50	111		0	C	0											000000	NO		C GILLEY
310808	E	0000	D	15	101	0	0	182418	3	60	90		0	C	15											000000	NO		R HALL
310967	E	0000	D	15	101	0	0	182418	3	70	103		0	C	21											000000	NO		J DONOVON
311100	E	0000	D	15	101	0	0	182418	3	125	145		0	C	33											000000	NO		T CANNELLA
311128	E	0000	D	15	101	0	0	182418	3	125	130		0	C	18											000000	NO		C M GARTON
311305	E	0000	D	15	101	0	0	182418	3	40	80		0	C	0											000000	NO		H LINDSAY
311734	E	0000	D	15	101	0	0	182418	3	68	100		0	C	0											000000	NO		DAVID SAYLO
311757	E	0000	D	15	101	0	0	182418	3	42	80		0	C	19											000000	NO		A J LAMPEL
312186	E	0000	D	15	101	0	0	182418	3	40	92		0	C	0											000000	NO		RANSEY
312237	E	0000	D	15	101	0	0	182418	3	50	98		0	C	0											000000	NO		B ONEAL
314511	E	0000	D	15	101	0	0	182418	3	40	105		0	C	20											000000	NO		B CASTLEBER
317265	E	0000	D	15	101	0	0	182418	3	90	142		0	C	20											000000	NO		A BRANNEN
317315	E	0000	D	15	101	0	0	182418	3	110	164		0	C	24											000000	NO		T THOMAS
318460	E	0000	D	15	101	0	0	182418	3	60	128		0	C	30											000000	NO		J RAINES
319349	E	0000	D	15	101	0	0	182418	3	84	105		0	J	32											000000	NO		E KRAFT
319936	E	0000	D	15	101	0	0	182418	3	71	125		0	C	32											000000	NO		R STRINRICK
320837	E	1037	D	15	101	1	1	182418	3	40	65		0	C	31											000000	NO		SHADY H B C
323971	E	1121	D	15	101	0	0	182418	3	74	95		0	C	28											000000	NO		S F KENNEDY
324313	E	0000	D	15	101	0	0	182418	3	73	86		0	C	0											000000	NO		T THOMPSON
324398	E	1436	D	15	101	0	0	182418	3	42	90		0	C	21											000000	NO		T MCDANIELS
324570	E	0000	D	15	101	0	0	182418	3	42	55		0	C	35											000000	NO		G LEATHERS
324972	E	1121	D	15	101	0	0	182418	3	47	65		0	C	14											000000	NO		HARRY RIEGE

DATE 8/05/86 22:42:40

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
WELL CONSTRUCTION PERMITTING

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RDB0055

PERMIT SUMMARY FOR YEAR 00 THRU 99

BY: COUNTY: BASIN: S:17 - 20 T:24 R:18 DEPTH:

DIAMETER: METHOD: USE: CASE DEPTH:

PERMIT	S	T	A	U	L	I	C	N	Y	Q	S	T	R	D	A	D	P	H	D	E	P	H	T	R	S	D	C	P	R	N	F	USER-ID	LOT	H	OWNER NAME
	DRILL	U	L	I	C	N	Y	Q	S	T	R	D	A	D	P	H	D	E	P	H	T	R	S	D	C	P	R	N	F						
326071	E	0000	D	15	101	0	0	182418	3	41	60	0	C	25																000000		NO	S SORIA		
326072	E	0000	D	15	101	0	0	182418	3	63	82	0	C	38																000000		NO	N WELLS		
326213	E	1121	D	15	101	0	0	182418	3	87	87	0	C	0																000000		NO	M HOWARD		
327113	E	0000	D	15	101	0	0	182418	3	63	80	0	C	43																000000		NO	WASILEWSKI		
329132	E	0000	D	15	101	0	0	182418	3	42	66	0	C	31																000000		NO	L E AASENG		
310913	E	0000	D	15	101	0	0	182418	4	52	140	0	C	24																000000		NO	R WADDELL		
342700	E	1699	D	15	101	0	0	182418	4																										
343137	E	1841	D	15	101	0	0	182418	4	41	85	0	C	39																000000		NO	GILLETTE,B		
348262	N	1056	D	15	101	0	0	182418	4	***																									
349580	N	1040	D	15	101	0	0	182418	4	***																									
353529	N	1696	D	15	101	0	0	182418	4	***																									
369866	C	2160	D	15	101	0	0	182418	4	110	130	0	C	42																000000		NO	TRUNDLE,F		
372311	C	2132	D	15	101	0	0	182418	4	63	110	0	C	38																000000		NO	HILLER, JOHN P.		
375524	C	1056	D	15	101	3	3	182418	4	55	120	N	0	C	0															000000		NO	DAVIS, DAVID E.		
390451	C	1056	D	15	101	2	4	182418	4	0	130	N	0	C	31															000000		NO	DAVIS, DAVID E.		
390660	C	2169	D	15	101	0	0	182418	4	122	122	N	0	C	37															000000		NO	ROYCE, KEVIN		
390858	N	2074	D	15	101	0	0	182418	4	***																									
391717	C	2263	D	15	101	0	0	182418	4	84	120	N	0	C	0															000000		NO	DAVIS, DAVID E.		
391718	C	2263	D	15	101	0	0	182418	4	84	115	N	0	C	0															000000		NO	DAVIS, DAVID E.		
392973	C	1056	D	15	101	0	0	182418	4	63	140	N	0	C	36															000000		NO	ROYCE, KEVIN		
396807	C	1841	D	15	101	0	0	182418	4	95	140	N	0	C	27															LOT163		NO	DAVIS, DAVID E.		
397353	C	2092	D	15	101	0	0	182418	4	58	70	N	0	C	28															000000		NO	DAVIS, DAVID E.		
405619	E	1533	D	15	101	0	0	182418	4	70	90	0	C	28																000000		NO	DAVIS, DAVID E.		
411678	C	1056	D	15	101	3	2	182418	4	77	165	N	0	C	37															000000		NO	DAVIS, DAVID E.		
411779	C	1533	D	15	101	0	0	182418	4	105	125	N	0	C	39															000000		NO	DAVIS, DAVID E.		
412263	E	2800	D	15	101	0	0	182418	4																										
415227	I	2405	D	15	101	1	1	182418	4	74	175	N	0	C	39															0000		NO	DAVIS, DAVID E.		
336498	E	1016	A	15	101	0	0	192418	4	100	180	0	C	26																000000		NO	DAVIS, DAVID E.		
355305	N	1587	A	15	101	0	0	192418	4	***																									
376431	C	1525	A	15	101	0	0	192418	4	139	450	N	0	C	30															000000		NO	DAVIS, DAVID E.		
365840	C	2177	D	15	101	0	0	192418	2	88	91	0	C	0																000000		NO	DAVIS, DAVID E.		
379193	N	2177	D	15	101	0	0	192418	2	***																									
399298	C	2800	D	15	101	0	0	192418	2	42	68	N	0	C	32															000000		NO	DAVIS, DAVID E.		
404523	E	0000	D	15	101	4	4	192418	2																										
375611	C	1232	D	15	101	1	4	192418	3	40	86	0	C	33																000000		NO	DAVIS, DAVID E.		
305845	C	1436	D	15	101	4	3	192418	3	51	88	0	C	40																000000		NO	DAVIS, DAVID E.		
307439	E	0000	D	15	101	0	0	192418	3	48	86	0	C	0																000000		NO	DAVIS, DAVID E.		
307440	E	0000	D	15	101	0	0	192418	3	71	96	0	C	0																000000		NO	DAVIS, DAVID E.		
307902	E	0000	D	15	101	2	3	192418	3	100	147	0	C	30																000000		NO	DAVIS, DAVID E.		

DATE 8/05/86 22:42:40

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
WELL CONSTRUCTION PERMITTING

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R080055

PERMIT SUMMARY FOR YEAR 00 THRU 99

BY: COUNTY:

BASIN: S:17 - 20 T:24 R:18 DEPTH:

DIAMETER: METHOD: USE: CASE DEPTH:

PERMIT	S	T	A	U	L	I	C	N	S	I	T	Y	Q	S	T	R	A	D	E	P	H	T	R	S	D	C	P	R	N	F	USER-ID	LOT	H	OWNER NAME
307971	E	0000	D	15	101	4	3	1924	18	3	43	102	0	C	44	000000	NO	E M PAYCER																
308008	E	0000	D	15	101	0	0	1924	18	3	60	85	0	C	33	000000	NO	L E RYALS																
308439	E	0000	D	15	101	0	0	1924	18	3	60	111	0	C	0	000000	NO	HELEN MADDO																
308553	E	0000	D	15	101	0	0	1924	18	3	50	110	0	C	18	000000	NO	L C HOUSELL																
309080	E	0000	D	15	101	0	0	1924	18	3	50	100	0	C	0	000000	NO	P C WITT																
311605	E	0000	D	15	101	0	0	1924	18	3	61	80	0	C	18	000000	NO	C STRICKLAN																
311606	E	0000	D	15	101	0	0	1924	18	3	72	90	0	C	25	000000	NO	M CHILES																
311607	E	0000	D	15	101	0	0	1924	18	3	24	65	0	C	18	000000	NO	H L VANCE																
312729	E	0000	D	15	101	0	0	1924	18	3	81	105	0	C	25	000000	NO	J D ALDERMA																
313262	H	0000	D	15	101	0	0	1924	18	3	60	85	0	C	10	000000	NO	J C BEAVER																
314786	E	0000	D	15	101	0	0	1924	18	3	53	87	0	C	31	000000	NO	E REMON																
316685	E	0000	D	15	101	0	0	1924	18	3	42	85	0	J	33	000000	NO	M HOSEY																
318117	E	0000	D	15	101	0	0	1924	18	3	60	90	0	J	39	000000	NO	D LONES																
318118	E	0000	D	15	101	0	0	1924	18	3	49	90	0	J	39	000000	NO	M RESNINDO																
320321	E	0000	D	15	101	0	0	1924	18	3	41	110	0	C	26	000000	NO	J L HUGHES																
326963	E	0000	D	15	017	0	0	1924	18	3	42	50	0	C	10	000000	NO	M HOULE																
328555	E	0000	D	15	101	0	0	1924	18	3	60	80	0	C	10	000000	NO	M C CONNER																
395304	N	1056	D	15	017	0	0	1924	18	3	***	CANCELLED	***					CARTER, ROY																
395652	N	0012	D	15	017	0	0	1924	18	3	***	CANCELLED	***					BARRETT, JOHN A																
308438	E	0000	D	15	101	0	0	1924	18	4	64	121	0	C	0	000000	NO																	
310342	E	0000	D	15	101	0	0	1924	18	4	49	96	0	C	17	000000	NO	D WOODRUFF																
313580	E	0000	D	15	101	4	1	1924	18	4	51	72	0	J	39	000000	NO	L DAVIS																
314688	E	0000	D	15	101	0	0	1924	18	4	120	167	0	C	39	000000	NO	J POST																
316530	E	0000	D	15	101	0	0	1924	18	4	50	102	0	C	34	000000	NO	E USHERWOOD																
318435	E	0000	D	15	101	0	0	1924	18	4	100	120	0	C	37	000000	NO	P E WHISLER																
322693	E	0000	D	15	101	1	2	1924	18	4	72	72	0	C	8	000000	NO	E MYERS																
330661	E	1388	D	15	101	0	0	1924	18	4	133	200	0	C	42	000000	NO	R HINKLE																
334240	E	1696	D	15	101	0	0	1924	18	4	49	105	0	C	38	000000	NO	VERLIN E																
334283	E	1756	D	15	101	0	0	1924	18	4	61	115	0	C	29	000000	NO	KIEGEL D																
337484	E	1696	D	19	101	2	4	1924	18	4	63	105	0	C	33	000000	NO	MCNUTT																
338354	E	1498	D	15	101	0	0	1924	18	4	66	95	0	R	48	000000	NO	CERJES,R																
340346	E	1056	D	15	101	0	0	1924	18	4	107	170	0	C	35	000000	NO	EADY,R V																
350731	C	1696	D	15	101	0	0	1924	18	4	105	150	0	C	45	000000	NO	HAYES, WILLIAM C.																
353630	C	1696	D	15	101	0	0	1924	18	4	71	110	0	C	40	000000	NO	ROACH, TIM																
354835	C	1533	D	15	101	0	0	1924	18	4								SPAULDING, G.																
359063	C	1699	D	15	101	0	0	1924	18	4	79	110	0	C	46	000000	NO	DRAIN, JOHN M.																
362955	C	1056	D	15	101	3	4	1924	18	4	50	125	0	C	55	000000	NO	HINKLE, CHARLES																
367750	C	2159	D	15	101	0	0	1924	18	4	67	100	0	C	51	000000	NO	WAHLE, WARREN																
369860	C	1817	D	15	101	2	3	1924	18	4	80	126	0	C	0	000000	NO	COLSTON, BRANT S.																

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RDB0055

PERMIT SUMMARY FOR YEAR 00 THRU 99

BY: COUNTY: BASIN: S:17 - 20 T:24 R:18 DEPTH: DIAMETER: METHOD: USE: CASE DEPTH:

PERMIT	S T A T U S	C O U N T Y	DRILL U S L I C N S	U S E R N O	LOCATION QQQ S T R	D I T A D E P H	C A S E W E L L D E P H	G R O N A H U B S D	M E T A E A T V T E E I R L C	S P C H C L A O P P	I R O N F	S U L F	USER-ID	LOT	H	OWNER NAME	
384752	C	1056	D	15	101	3 1	192418	4	102	145	N	0	T	29	000000	NO	KELLY, ROBERT
387451	C	1056	D	15	101	2 1	192418	4	44	115	N	0	C	31	000000	NO	SCOTT, JIM
390531	C	2263	D	15	101	0 0	192418	4	105	150	N	0	C	0	000000	NO	NICHOLS, WILLIAM
405621	E	1533	D	15	101	0 0	192418	4	84	93	N	0	C	36	000000	NO	PEAL, HEBERT
406154	C	2092	D	15	101	0 0	192418	4	96	118	N	0	C	36	LOT 20	NO	MORTIN, CAROL
314920	E	0000	D	15	101	0 0	192418	4	40	91	N	0	C	16	000000	NO	T HENDERSON
373752	C	1525	A	15	101	0 0	202418	4	40	60	N	0	C	40	LOT-28	NO	NEUBAUER, STEVEN C.
342601	E	0000	D	15	101	0 0	202418	2									VEOMANS, R
364911	C	2177	D	15	101	0 0	202418	2	53	58		0	C	0	000000	NO	BRYANT, WILLIAM
365446	C	2177	D	15	101	0 0	202418	2	66	74		0	C	0	000000	NO	DAWKINS, BENNY L.
365447	C	2177	D	15	101	0 0	202418	2	45	45		0	C	0	000000	NO	STAMER, DEBBIE
366961	C	2177	D	15	101	3 4	202418	2	50	62		0	C	0	000000	NO	SPENCER, ELMER
368715	C	1151	D	15	101	0 0	202418	2	58	86		0	C	0	000000	NO	GREEN, SAUNDRA
369550	C	2177	D	15	101	0 0	202418	2	52	65		0	C	0	000000	NO	GOUGHF, GEORGE
370216	N	2177	D	15	101	0 0	202418	2	*** CANCELLED ***								POTTER, R. H. & D. E.
376640	C	2092	D	15	101	0 0	202418	2	38	45	N	0	C	29	000000	NO	WILLIAMS, WILLIAM H.
380433	C	2092	D	15	101	0 0	202418	2	65	71	N	0	C	31	000000	NO	WILLIAMS, WILLIAM H.
311069	E	0000	D	15	101	0 0	202418	3	40	107		0	C	24	000000	NO	E B EXURN
311309	E	0000	D	15	101	0 0	202418	3	52	106		0	C	33	000000	NO	S MEDDLE
317108	E	0000	D	15	101	0 0	202418	3	72	83		0	C	36	000000	NO	E MORTON
319822	E	0000	D	15	101	0 0	202418	3	80	100		0	C	0	000000	NO	LCHWERTFEG
324994	E	1037	D	15	101	0 0	202418	3	63	107		0	C	0	000000	NO	J HOLLIMAN
323782	E	1056	D	15	101	0 0	202418	4	50	115		0	C	29	000000	NO	R HURRY
329988	E	1696	D	15	101	0 0	202418	4	37	95		0	C	27	000000	NO	L JOERGENSE
346756	E	1699	D	15	057	0 0	202418	4									SEGREST, MIKE
358702	C	2103	D	15	101	0 0	202418	4	42	130		0	C	0	000000	NO	TAYLOR, DELEON
368362	C	2071	D	15	101	0 0	202418	4	84	171	N	0	C	41	000000	NO	CRUMPLER, LES
370031	C	2177	D	15	101	0 0	202418	4	52	61		0	C	0	000000	NO	ROACH, DOROTHEA C.
381622	C	1533	D														

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

REPORT NUMBER 01-099

PAGE 3
DATE 06/12/22

PERMIT NUM	STAT	NAME	ADDRESS	CITY	ST	ZIP
03761 01	P	PASCO COUNTY UTILITIES DEPT	7536 STATE ST	NEW PORT RICHEY	FL	33553

RASIN	COUNTY
COASTAL RIVERS	PASCO

PERMITTED AVG	PERMITTED MAX	NUM USES	NUM GWD PTS	NUM SVD PTS	TOT-ACRES	SEC/TWNSHP/RGE	EXPIRE DATE
550,000	1,100,000	1	2	0	2,560.0	04 25 17	92/05/02

WD TYPE	W/LAT	W/LONG	SOURCE NAME	DIAMETER	WD PER AVG	WD PER MAX	W/D DESCRIPTION
WD#001	G	282042	823657 #16	8	435,000	870,000	PUBLIC SUPPLY
WD#002	G	282032	823656 #17	6	115,000	230,000	PUBLIC SUPPLY
USE CODE	USE DESCRIPTION	USE PUMPAGE	USE ACRES				

USE#01	026	ON-SITE PERCOLATION & PONDING	550,000	0.0	
WELL NUM	STIP CODE	FPEC CODE	DUE DATE	NEXT DUE	DESCRIPTION

000	073	06	84/11	00/00	DISTRICT RESERVES RIGHT TO COLLECT SAMPLES
000	082	72	92/11	00/00	MINIMUM AQUIFER LEVEL MAY BE SET
000	097	06	84/11	00/00	WATER CONSERVATION METHODS
000	115	72	92/11	00/00	REPORT ALTERNATIVE SOURCE OF SUPPLY & DEVELOPMENT
000	175	03	84/11	87/02	REVIEW PERMIT STIPULATIONS AND PROJECTED SCHEDULE
000	423	06	84/11	87/05	WATER QUALITY ANALYSES PERFORMED BY DISTRICT SPECS
001	005	01	84/07	87/01	METER PUMPAGE-READ AND SUBMIT MONTHLY
001	038	01	84/07	87/01	CHLORIDE ANALYSIS MONTHLY, SUBMIT MONTHLY
002	005	01	84/07	87/01	METER PUMPAGE-READ AND SUBMIT MONTHLY

REPORT NUMBER 41-099

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

PAGE 6
DATE 8/12/22

PERMIT NUM STAT NAME

ADDRESS

CITY

ST ZIP

07672 00 P MEADOW OAKS GOLF-COUNTRY CLUB TR 13314 WYNN RANCH RD

HUDSON

FL 33562

PASIN

COUNTY

COASTAL RIVERS

PASCO

PERMITTED AVG	PERMITTED MAX	NUM USES	NUM GWD PTS	NUM SWD PTS	TOT-ACRES	SEC/TWNSHP/RGE	EXPIRE DATE
217,000	413,000	1	1	1	403.0	33 24 17	90/08/01

WD TYPE	W/LAT	W/LONG	SOURCE NAME	DIAMETER	WD PER AVG	WD PER MAX	W/D DESCRIPTION
WD#001	G	282103	823607 #14	6	90,000	324,000	RECREATION
WD#002	S	282104	823602 SPRETTY NORTH, LAKE #15	8	217,000	413,000	IRRIGATION
	USE CODE	USE DESCRIPTION		USE PUMPAGE	USE ACRES		

USE#01	105	GOLF COURSE	217,000	60.0	
WELL NUM	STIP CODE	FREQ CODE	DUE DATE	NEXT DUE	DESCRIPTION

000	073	06	84/11	00/00	DISTRICT RESERVES RIGHT TO COLLECT SAMPLES
000	082	72	90/11	00/00	MINIMUM AQUIFER LEVEL MAY BE SET
000	097	06	84/11	00/00	WATER CONSERVATION METHODS
000	423	06	84/11	87/05	WATER QUALITY ANALYSES PERFORMED BY DISTRICT SPECS
001	005	01	84/12	87/01	METER PUMPAGE-READ AND SUBMIT MONTHLY
001	038	01	84/12	87/01	CHLORIDE ANALYSIS MONTHLY, SUBMIT MONTHLY

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

PAGE 5
DATE 86/12/22

REPORT NUMBER 41-099

PERMIT NUM STAT NAME

ADDRESS

CITY

ST ZIP

06821 01 P QUAIL RIDGE GOLF & COUNTRY CLUB 1600 SHADY HILLS RD

SPRING HILL

FL 33526

BASIN

COUNTY

COASTAL RIVERS

PASCO

PERMITTED AVG	PERMITTED MAX	NUM USES	NUM GWD PTS	NUM SWD PTS	TOT-ACRES	SEC/TWNSHP/RGE	EXPIRE DATE
167,000	252,000	1	2	0	181.0	06 25 18	86/08/04

WD TYPE	W/LAT	W/LONG	SOURCE NAME	DIAMETER	WD PER AVG	WD PER MAX	W/D DESCRIPTION
WD#001	G	282040	823233 #12	4	24,000	36,000	IRRIGATION
WD#002	G	282039	823233 #13	8	143,000	216,000	IRRIGATION
USE CODE		USE DESCRIPTION		USE PUMPAGE	USE ACRES		

USE#01	105	GOLF COURSE				167,000	50.0
WELL NUM	STIP CODE	FREQ CODE	DUE DATE	NEXT DUE	DESCRIPTION		

000	073	06	85/11	00/00	DISTRICT RESERVES RIGHT TO COLLECT SAMPLES
000	082	72	88/11	00/00	MINIMUM AQUIFER LEVEL MAY BE SET
000	097	06	85/11	00/00	WATER CONSERVATION METHODS
001	005	01	85/09	87/01	METER PUMPAGE-READ AND SUBMIT MONTHLY
002	005	01	85/09	87/01	METER PUMPAGE-READ AND SUBMIT MONTHLY

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

PAGE 4
DATE 06/12/22

REPORT NUMBER 41-099

PERMIT NUM STAT NAME

ADDRESS

CITY

ST ZIP

04038 01 P PASCO CO MUNI FIRE SERVICE UNIT

530 SUNSET RD

NEW PORT RICHEY

FL 33552

BASIN

COUNTY

COASTAL RIVERS

PASCO

PERMITTED AVG	PERMITTED MAX	NUM USES	NUM GWD PTS	NUM SMD PTS	TOT-ACRES	SEC/TWNSHP/RGE	EXPIRE DATE
5,000	15,000	1	1	0	5.0	13 24 17	94/04/04

WD TYPE	W/LAT	W/LONG	SOURCE NAME	DIAMETER	WD PER AVG	WD PER MAX	W/D DESCRIPTION
WD#001	6	282347	823310 #5	6	5.000	15.000	ESSENTIAL SERVICES
	USE CODE	USE DESCRIPTION		USE PUMPAGE	USE ACRES		

USE#01 001 ESSENTIAL SERVICES

WELL NUM	STIP CODE	FREQ CODE	DUE DATE	NEXT DUE	DESCRIPTION
----------	-----------	-----------	----------	----------	-------------

5.000

0.0

000	073	06	84/05	00/00	DISTRICT RESERVES RIGHT TO COLLECT SAMPLES
000	082	72	94/05	00/00	MINIMUM AQUIFER LEVEL MAY BE SET
000	095	06	84/05	00/00	DISTRICT RESERVES RIGHT TO REQUIRE PUMPAGE RECORDS
000	097	06	84/05	00/00	WATER CONSERVATION METHODS

APPENDIX 10.9

RESOURCE RECOVERY FACILITY SOILS AND GEOTECHNICAL INFORMATION

Soils and geotechnical information related to the landfill/ashfill is contained in Volume IV, Attachment 2.

PRELIMINARY FOUNDATION AND
SOIL STUDY
PROPOSED RESOURCE RECOVERY
PLANT FACILITY-HAYS ROAD SITE
PASCO COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

MEMBER

Associated Soil and Foundation Engineers, Inc.
American Consulting Engineers Council
National Society of Professional Engineers
Florida Institute of Consulting Engineers
American Society for Testing and Materials
American Concrete Institute

6313 Benjamin Road, Suite 101, Tampa, Florida 33614 ■ Telephone (813) 886-1075

JAMMAL & ASSOCIATES, INC. Consulting Engineers

May 29, 1987
Project No. 86-30743

TO: Camp, Dresser & McKee, Inc.
One Tampa City Center, Suite 1750
Tampa, Florida 33602

Attention: Mr. Bob Hauser, P.E.

SUBJECT: Preliminary Foundation and Soil Study
Proposed Resource Recovery Plant Facility
Hays Road Site
Pasco County, Florida

Dear Mr. Hauser:

In accordance with our proposal to you dated March 13, 1987, we have completed the preliminary foundation and soils study for the above referenced resource recovery plant facility at the Hays Road site in Pasco County, Florida.

The following summary report presents the results of our study including our preliminary evaluation of the soil and groundwater conditions encountered at the site and our subsequent discussions, evaluations, foundation alternatives, and conclusions. We have very much appreciated this opportunity to perform this study and to work with you during the preliminary phase of this significant project.

Camp, Dresser & McKee, Inc.
Project No. 86-30743
Page 2

If you have any questions about the enclosed report or if we can be of further service to you or Pasco County, please do not hesitate to give us a call.

Sincerely,

JAMMAL & ASSOCIATES, INC.

Richard A. Mortensen
Richard A. Mortensen, P.E. *de*
Vice President

RAM/JRM/nh
1567M

Attachments: Sheets 1 and 2

John R. Marquardt
John R. Marquardt, P.E. *de*
Senior Project Engineer

PURPOSE AND SCOPE

The objective of this preliminary study was to obtain general information concerning subsurface conditions over the proposed plant site in order to provide preliminary engineering estimates and discussions in each of the following areas:

1. Evaluate the feasibility of the site to support the anticipated Resource Recovery Plant structures.
2. Discuss the soil and rock conditions and potential subsurface capabilities and limitations.
3. Discuss preliminary foundation system alternatives for the various structures, including shallow spread foundations, end bearing and friction piling, and drilled caisson systems. Provide some preliminary foundation design data and discussion.
4. Discuss some potential foundation construction considerations and problems.
5. Discuss, on a preliminary basis, the potential for future sinkhole activity in the immediate area of the proposed facility.
6. Provide some guidelines that should be considered during the final level geotechnical study in the structure areas, considering the results of the preliminary investigation (i.e. recommended boring depths, boring spacing and frequency, sampling considerations, physical testing, etc.).

The scope of work for this study included the following:

1. Collect and review relevant available site data gathered during our other geotechnical work at the Hays Road site.
2. Perform five (5) deep Standard Penetration Test (SPT) borings to depths of approximately 50 to 70 feet.

3. Visually classify collected soil samples and conduct a limited program of laboratory testing.
4. Perform geotechnical engineering studies and analyses in order to develop preliminary recommendations in each of the pertinent areas previously discussed.
5. Prepare a formal engineering report which summarizes the course of the study pursued, the field and laboratory data generated, subsurface soil and groundwater conditions encountered, and our engineering evaluations and recommendations in each of the pertinent topic areas.

PROJECT AND SITE DESCRIPTION

The proposed resource recovery plant will be located along the south side of the proposed Pasco County Hays Road Class I landfill site, at the approximate location indicated on Sheet 1. Sheet 1 is aerial topographic map prepared by Camp, Dresser & McKee, Inc. with surveying support from Atwood Associates, Inc. The proposed resource recovery plant is located approximately in the vicinity of the five (5) Standard Penetration Test (SPT) borings shown illustrated on Sheet 1.

The site is presently undeveloped and was formerly part of a pine tree farm.

It is our understanding based on our familiarity with similar projects, the data provided by Camp, Dresser & McKee, Inc., and the conceptual facility layout plan developed by Camp, Dresser & McKee, Inc. (illustrated on Sheet 2), that the resource recovery plant facility will be a significant size structure comparable to the Hillsborough County Resource Recovery Plant. The approximate configuration/layout of the various parts of the structure are illustrated on Sheet 2.



We understand based on conversations with Mr. Dan Strobridge with Camp, Dresser & McKee, Inc. that the refuse pit will have a heavy distributed floor load of approximately 3,000 to 4,000 psf spread over a large area. A large and high ramp, up to a height of approximately 30 feet, will be required to reach the refuse bunker pit. We understand that much of the equipment and building frame for the structure will be susceptible to small differential settlements; therefore, differential settlement will be a major foundation design criteria. A steel frame structure is anticipated, rigidly tied together, with heavy loadings. A large exhaust or vent stack will be located in the vicinity of boring RR-1 as shown on Sheet 2. The exact height of this stack and the loading information is unknown at this time. Also, because the facility is in a very preliminary stage at this time, isolated structure column loadings and individual strip footing loadings for various parts of the facility are unknown. We have assumed for this study that all of the loadings will be relatively heavy considering the proposed structure. In any event, both shallow and deep foundation system alternatives will be discussed later in the report.

Based on the furnished topographic data on Sheet 1, the project site in the vicinity of the proposed resource recovery plant varies only slightly in ground elevation. Ground surface elevations vary from approximately +48 ft. MSL on the south side to approximately +51 ft. MSL on the north side of the proposed site. At this time, preliminary finished floor slab elevations have not yet been decided.

FIELD TESTING

The field investigation for this study was conducted between April 16 and April 20, 1987. Five (5) deep Standard Penetration Test (SPT) borings were performed over the proposed plant site at the approximate locations indicated on Sheets 1 and 2. The borings were positioned in the field by a geologist from the Tampa office of Jammal & Associates, Inc. using approximate tape distances and estimated right angles based on an aerial photograph of the property. Boring coordinate locations shown on Sheet 1 were estimated and not actually surveyed. Boring locations should be considered approximate.



The SPT boring procedure was conducted in general accordance with ASTM D-1586. Closely spaced soil sampling using a 1-3/8 inch I.D. split-barrel sampler was performed in the upper 10 feet with successive sampling at 5 foot intervals used thereafter. The number of successive blows required to drive the sampler into the soil constitutes the test result commonly referred to as the "N"-value. The "N"-value has been empirically correlated with various soil properties and is considered to be indicative of the relative density of cohesionless soils and the consistency of cohesive soils. The recovered split-barrel soil samples were visually classified in the field with representative samples collected and transported to our Tampa Bay Regional Office.

LABORATORY TESTING

The recovered soil samples were visually classified and stratified in the laboratory by the project engineer using the Unified Soil Classification system. Several soil samples were selected for wash gradation to measure the percent passing the U.S. No. 200 sieve, or the silt and clay fines content. The amount of silt and clay in a soil affects its engineering properties, and will provide a general basis for evaluation of the site soil improvement techniques to be discussed later. The laboratory testing data is presented on the soil boring profiles on Sheet 2.

GENERALIZED SUBSURFACE CONDITIONS

The results of the preliminary investigation program including the stratification profile and some pertinent exploration information are graphically presented on Sheet 2. A legend describing the soil strata, which was developed for our other work at the site, is also included on Sheet 2. Soil stratification was based on review of recovered soil samples and interpretation of field boring logs by a geotechnical engineer. The stratification lines represent the approximate boundaries between soil types and the actual transition may be gradual. Minor variations not considered important to our engineering evaluations may have been abbreviated or omitted for clarity.



The test borings indicated a soil stratigraphy similar to that found during our previous work at the Hays Road site. Four (4) of the borings (RR-1 through RR-4) encountered fine sands (mostly light brown to brown fine sand, Stratum 4) from the ground surface to depths ranging from about 13 to 27 feet. The sandy soils were loose near the ground surface, becoming medium dense with depth. These sands generally have less than 5 percent fines passing the No. 200 Sieve.

Sandy clay to clay (Strata 8 and 9) was penetrated below the sands. Limestone seams (Stratum 11) appeared in the clay with increasing depth in borings RR-1 and RR-2. Fairly continuous limestone was indicated below the clay, beginning at a depth of about 25 feet in boring RR-4. Clay with a pocket of sand was discovered in the lower depths in boring RR-3; this boring just entered limestone before being completed. Based on SPT "N" values, the clayey soils appear moderately preconsolidated and are generally stiff to very stiff. A few soft clay pockets were evident just above the limestone. The limestone was generally highly weathered and variable in hardness, as is typical of west Pasco County.

Boring RR-5 was an exception to the above pattern, remaining in fine sands throughout the depth penetrated (50 feet). The deeper sands in this boring were dense to very dense.

Because the five (5) borings were sealed with cement grout upon completion, a stabilized groundwater level could not be obtained. Based on the results of nearby previous test borings for the landfill, the normal groundwater level is generally on the order of 10 to 11 feet deep, or approximately near elevation +38 to +40 feet MSL.

PRELIMINARY FOUNDATION SYSTEM EVALUATION

With the exception of loose surficial sands within the upper 5 feet of the soil profile, and occasional soft clayey soils discovered near the soil/limestone interface, the five (5) borings have indicated rather competent soil materials. However, the deeper stratigraphy appears variable; a solid or competent continuous limestone present at a uniform depth was not found at the site. Also, based on previous soil boring data



collected over the landfill, significant soil stratigraphy variation is possible within short distances at the Hays Road site. Some evidence of this significant deviation from the typical stratigraphy is evident by boring RR-5; however this boring showed competent conditions.

Two positive items are noteworthy; the uniformity and relative density of the upper sands (primarily Stratum 4), and the generally favorable stiffness or moderately preconsolidated nature of the lower semi-confining bed clays overlying the limestone. Also, the general lack of drilling related indicators of recent subsurface activity relating to sinkhole processes is a favorable factor. However, this issue will deserve significant future attention, because of the local area and the anticipated tight differential settlement criteria and associated risks with small foundation movements.

Because the various parts of the structure have not been preliminarily designed and the structure types, column layout, loading data, fill heights, etc. are not known, we are presenting below some discussion relative to various foundation system alternatives considering the discovered and future anticipated soil conditions. Because of the complexity of this type structure, a combination of several types of foundation systems are anticipated due to the variability in loading conditions and differential settlement tolerances.

For the lighter structures or portions of the structure that are less settlement sensitive, and/or for portions of the structure with moderate to low loadings over large areas, one foundation system alternative would be to treat or improve loose zones within the upper fine sand strata and soft areas in the lower clays, then utilize a mat, individual spread shallow footings, or rigid strip foundation systems, as appropriate. With proper site improvement, allowable net bearing pressures on the order of 3,000 to 4,000 psf are possible with adequate analysis and test boring support.

Methods of improving the sandy soils to depths of 5 to 7 feet would include heavy vibratory surface compaction. Overexcavation and compaction in lifts would be effective for somewhat greater depths, on the order of 8 to 12 feet. To improve sands to depths of 20 to 30 feet, methods would include



dynamic compaction and/or vibro-replacement. Both of these deep improvements methods are performed by local specialty subcontractors. Depending upon the actual loading conditions, differential settlement tolerance and future site specific SPT boring results, deeper sand improvement, in addition to heavy surface compaction, may not be necessary, based on the borings we performed. However, because these deep improvement procedures are successful on Stratum 4 type sand materials, considering the small risks relating to ground subsidence due to sinkhole activity, one of these methods could make shallow foundations feasible, while at the same time mitigating some sinkhole related subsidence risks. One of these procedures may be necessary over large loaded areas or large floor slabs to reduce the risks of future subsidence from sinkhole activity.

Dynamic compaction involves dropping a large weight from a crane on a grid pattern (at least at column locations). The weight and height of drop are adjusted according to the desired depth of effect. The other deep sand improvement technique is referred to as vibro-replacement. This procedure is similar to deep vibrating compaction processes conducted in clean sandy soils, but instead employs gravel as a backfill to form "stone columns" in the ground. To make the stone columns, a cylindrical vibratory probe is used to form a hole, while also densifying sandy materials that may be present. Gravel is then introduced and compacted as the vibrator is withdrawn. The amount of gravel backfill and energy demand of the vibrator is recorded as an indication of the effectiveness of the process. Both deep sand improvement techniques should prove feasible and favorable at this site because of the low fines content in the sands of the predominate soil, Stratum 4. Based on our experience at the Hays Road site, some future test borings may show loose sand conditions to greater depths, even though our five (5) borings did not.

Regarding isolated zones of soft clays over the limestone, some preloading and/or surcharging with the required structural fill and/or additional fill weight may be necessary depending on site specific test borings, the size of the loaded area, the sustained loadings, and differential settlement tolerances. Again, although our five (5) test borings showed generally favorable preconsolidated clays that would not require preloading or surcharging, with the exception of a soft clay zone at 20 feet in boring RR-4, other soft clay zones are likely

in future site specific test borings. As a minimum, preloading should be considered as being necessary to deal with isolated soft clays that go undetected. Therefore, it should be anticipated, that preloading in the 30 foot high fill area in the vicinity of the refuse pit will be necessary. A preload period of 2 to 3 months for this area should be anticipated.

Because the upper sands appear, in general, medium dense and the lower clays somewhat preconsolidated, it is our opinion that shallow foundation systems and mats will prove feasible after the above soil improvements for some structure components, assuming the structure is adequately test drilled as discussed later. Nonetheless, due primarily to the loading conditions and settlement tolerance of the heavy and more rigid portions of the structure, and the future potential for some subsequent test borings showing conditions unacceptable for shallow foundations, we feel that some deep foundations will be necessary for portions and possibly a majority of the structure. If not for any other reason, deep foundations end bearing on competent limestone should reduce, to tolerable levels, the ground subsidence risks associated with the ravelling/erosion type sinkhole processes, as discussed later. Depending upon the presence and depth of indicators of ravelling/erosion sinkhole processes in future test borings, deep foundation systems end-bearing on limestone may be dictated and necessary for all major components of the structure, unless extensive subsurface grouting is considered with shallow foundations. Depending upon the floor slab loadings and the size of large uniformly loaded areas, some subsurface grouting may be necessary under floor slab areas if ravelled conditions are discovered in future test borings.

Regarding deep foundation systems, end bearing piling would be quite variable in length due to the differences in soil/rock conditions and the lack of a consistent and reliable end bearing layer, as revealed by our five (5) borings. Our borings indicate the limestone at the site contains local hard layers, and is generally weak and interbedded with clays. This is typical of the Hays Road site. Accordingly, driven end-bearing piling may achieve the driving criteria (blowcounts) on thin hard lenses of rock, but pile groups bearing on such conditions may be incapable of supporting service loads. A test boring at each pile group should be required to assess penetration requirements and the need for special installation techniques (predrilling, pile tip or driving shoe, etc.).



Many types of piling are used locally, including driven displacement piles such as prestressed, precast concrete and steel pipe; non-displacement driven piling such as steel H piles; and cast-in-place piling such as augercast and drilled shafts or caissons. Pile foundations to be considered should be pile types that can be readily spliced and adapted to variable depths and high driving stresses. Steel piling, such as closed-end concrete-filled steel pipe piles or steel H piles, that can be easily field cut and welded and driven with higher energies, should be initially considered. Pile driving tips or shoes to penetrate through weak rock should also be anticipated.

Concrete piles do not appear appropriate for this project unless extensive test boring data is collected to justify their usage. Augercast piles may prove too low capacity to be of economical use on this project. Augercast piles or caissons can also be adjusted to soil conditions. However, we feel that caissons would not be appropriate for this project, unless column boring data proves consistent competent limestone over the site at a reasonable depth (within 30 to 40 feet of finished grade); this is unlikely.

Considering the suspect nature and variability of the end-bearing strata, relatively low allowable loads for deep foundation systems should initially be considered. Depending on the pile type or element and many other factors, preliminary allowable individual end-bearing piling loadings should be considered on the order of 45 to 70 tons.

ASSESSMENT OF SITE SINKHOLE POTENTIAL

The principal mechanism for sinkhole related processes at this site is ravelling/erosion of the overburden soils into the voids and cavities within the limestone. The limestone in this area is commonly filled with voids, solution passages, etc., that can accept downward migration of overburden soils under the proper hydrogeologic conditions. The geologic and hydrogeologic conditions of the area and the site are conducive or susceptible to erosion type sinkhole activity. A downward hydraulic gradient that can promote ravelling and erosion of overburden soils into the limestone is present at the site. However, this is common over much of Pasco County. Small isolated ground slumping or subsidence to amounts not noticeable to the unaided



eye (on the order of a few inches to several inches), resulting from the propagation of the ravelling process upward into shallow foundation influence zones is a major consideration for this project. Deep rock or roof collapse sinkhole activity is not an issue at this site, as this type of sinkhole activity is remote in this area of Florida. Deep test boring data will, however, need to address both types of sinkhole potential.

The five (5) test borings performed for this study did not indicate significant active sinkhole related subsurface conditions, such as large zones of loose, ravelled soils or loss of significant drilling fluid circulation above the limerock surface. However, based on our experience at the Hays Road site, future test borings in the structure area could produce isolated areas of ravelling/erosion sinkhole related concerns. This should be anticipated and the implications and risks must be addressed prior to selecting a foundation system. While we believe the overall susceptibility of the site to isolated ground subsidence relating to ravelling/erosion sinkhole activity is low, a sinkhole related subsurface condition or some sizeable zone(s) of loose ravelled soils may be discovered in future test boring work within the building area.

Because of the type and size of the structure being considered, the rigid nature of the structure, and the anticipated differential settlement criteria, we recommend that the majority of the structure components, including the foundation systems, be designed to minimize the risks of sinkhole related ground subsidence. At this time, the final risks have not been defined. Again, while the issue of sinkhole collapse is remote, some slight ground slumping or subsidence several inches to a foot, related to sinkhole/erosion processes over an isolated area (with this size structure) is a small possibility. Because of this, we feel that all major column locations should be test drilled to competent end-bearing materials so this issue can be prudently addressed. Upon the outcome of a comprehensive test boring program, final foundation systems and site preparation recommendations compatible with the assessed risks can be selected.



As a separate issue, end bearing piling on competent limestone or into very dense sand, previously test drilled, should reduce the small risks relating to subsidence due to erosion/ravelling sinkhole processes. End bearing piling alone will be necessary to accommodate heavy structural column loads, thus, the sinkhole risks are minimized at no significant additional costs; pile foundations were dictated for loading reasons. If shallow foundations or a mat foundation proves feasible for some portions of the structure using conventional analyses and the site subsoil improvements as previously discussed, and the site specific test boring data shows suitable conditions under a column or loaded area, then sinkhole related concerns could be handled again without additional treatment or costs. If future test borings show marginal or suspect conditions in a location selected for shallow or mat foundations, then either end-bearing piling could be considered, or deep subsurface grouting to stabilize the loosen/ravelled zone could be considered as a additional expense to offset sinkhole related risks. At this time, if some shallow foundations prove feasible for some portions of the structure, then some subsurface grouting should be anticipated, whether it is necessary to just offset sinkhole related risks, or whether it is necessary to make a marginal area suitable for shallow foundations. A preventative subsurface grouting program is common for major structures when sinkhole risks arise.

Wells and retention areas should not be located near any of the structures, as downward groundwater flow may promote or aggravate sinkhole related processes.

FUTURE GEOTECHNICAL STUDY

The intent of our exploration program was to provide the design/build contractor with some preliminary or general subsurface information and foundation design discussions. A final level geotechnical study must be undertaken, which, when combined with structural information, can be used to generate specific foundation recommendations for the planned construction.

With this in mind, we recommend that the final level geotechnical study include deep SPT borings on the order of 60

to 75 feet deep spaced no more than approximately 100 feet apart, with other SPT borings at specific settlement sensitive locations or localized heavy loads. SPT borings should extend into the limestone until at least 10 to 15 feet of suitable end-bearing or competent limestone is penetrated. All the boring locations should be set by a surveyor. We recommend and feel that undisturbed Shelby tube sampling of the clays and laboratory consolidation testing will be necessary to evaluate consolidation settlements and assess the need for preloading and/or surcharging. A local geotechnical consultant, familiar with the site and soil conditions should be retained by the design/build contractor.

It would be best to perform the final level study after a preliminary column layout is generated, such that test borings can be performed at all major column locations; this is the desirable scenerio. An adequate geotechnical exploration program with prudent analyses can provide the framework for the most suitable and economical foundation system for the structure. Because this is a major structure the geotechnical input will be vital to the cost of foundation system. Prudent sinkhole related risk assessments and foundation system options which can be costed-out can be developed for review by the owner.

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APPENDIX 10.10

APPENDIX 10.10

ECOLOGY

CDM

environmental engineers, scientists,
planners, & management consultants

CAMP DRESSER & McKEE INC.

555 Winderley Place
Maitland, Florida 32751
305 660-2552

March 17, 1987

Dr. Lawrence Olson
Biology Section DER
2600 Blair Stone Road
Tallahassee, Florida 32301

Re: Pasco County Resource Recovery Site
Gopher Tortoise Issue

Dear Mr. Olson:

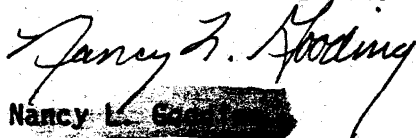
As you have been informed, gopher tortoises were found to occur on the Pasco County Resource Recovery site. From my telephone conversation with you on March 16, 1987 it is our understanding that gopher tortoises which inhabit a proposed construction site have, in the past, been successfully moved to another location.

It is our understanding that DER policy would accept the relocating of these animals to an onsite area of comparable habitat. If this would not be acceptable please notify us, otherwise we will presume this is an option which may be further investigated and pursued.

Thank you for your time and assistance in this matter.

Sincerely,

CAMP DRESSER & McKEE INC.


Nancy L. Stodding

NLG:db

cc: Daniel Strobridge

File: 6104-02-PT

Scientific Name	Common Name	Designated status ¹			
		FGFWFC ²	FDA ³	USFWS ⁴	CITES ⁵
VERTEBRATES					
Fish					
<i>Acipenser brevirostrum</i>	Shortnose sturgeon	E		E	I
<i>Acipenser oxyrinchus</i>	Atlantic sturgeon	SCC		UR2	II
<i>Ammocrypta asprella</i>	Crystal darter	T		UR2	
<i>Centropomus undecimalis</i>	Common snook	SCC			
<i>Cyprinodon variegatus hubbsi</i>	Lake Eustis pupfish	SCC			
<i>Etheostoma histrio</i>	Harlequin darter	SSC			
<i>Etheostoma okaloosae</i>	Okaloosa darter	E		E	
<i>Etheostoma olmstedi maculatiiceps</i>	Southern tessellated darter	SSC			
<i>Fundulus jenkinsi</i>	Saltmarsh topminnow	SSC			
<i>Menidia conchorum</i>	Key Silverside	T			
<i>Micropterus notius</i>	Suwannee bass	SSC			
<i>Micropterus</i> sp. (undescribed)	Shoal bass	SSC			
<i>Notropis callitaenia</i>	Bluestripe shiner	T		UR2	
<i>Notropis</i> sp. (undescribed)	Blackmouth shiner	T			
<i>Rivulus marmoratus</i>	Rivulus	SSC			
<i>Starksia starcki</i>	Key blenny	SSC			
Amphibians and Reptiles					
<i>Alligator mississippiensis</i>	American alligator	SSC		T (S/A)	II
<i>Ambystoma cingulatum</i>	Flatwoods salamander			UR2	
<i>Caretta caretta caretta</i>	Atlantic loggerhead turtle	T		T	I
<i>Chelonia mydas mydas</i>	Atlantic green turtle	E		E	I
<i>Chrysemys concinna suwanniensis</i>	Suwannee cooter	SSC		UR5	
<i>Crocodylus acutus</i>	American crocodile	E		E	I
<i>Dermochelys coriacea</i>	Leatherback turtle	E		E	I
<i>Diadophis punctatus acricus</i>	Big Pine Key ringneck snake	T		UR2	
<i>Drymarchon corais couperi</i>	Eastern indigo snake	T		T	
<i>Elaphe guttata guttata</i>	Red rat snake	SSC*			
<i>Eretmochelys imbricata imbricata</i>	Atlantic hawksbill turtle	E		E	I
<i>Eumeces egregius egregius</i>	Florida keys mole skink	SSC		UR2	
<i>Eumeces egregius lividus</i>	Blue-tailed mole skink	T		UR2	
<i>Gopherus polyphemus</i>	Gopher turtle	SSC		UR2	
<i>Graptemys barbouri</i>	Barbour's map turtle	SSC		UR2	
<i>Haideotriton wallacei</i>	Georgia blind salamander			UR2	
<i>Hyla andersonii</i>	Pine Barrens treefrog	SSC			
<i>Kinosternon bauri bauri</i>	Key mud turtle	E		UR2	
<i>Lepidochelys kempi</i>	Atlantic ridley turtle	E		E	I
<i>Macrolemys temmincki</i>	Alligator snapping turtle	SSC		UR2	
<i>Neoseps reynoldsi</i>	Sand skink	T		UR2	
<i>Nerodia fasciata taeniata</i>	Atlantic salt marsh water snake	T		T	
<i>Pituophis melanoleucus mugitus</i>	Florida pine snake	SSC		UR2	
<i>Pseudobranchius striatus lustricolus</i>	Gulf hammock dwarf siren			UR2	
<i>Rana areolata</i>	Gopher frog	SSC		UR2	
<i>Rana okaloosae</i>	Bog frog	SSC			
<i>Scilosoma extenuatum</i>	Short-tailed snake	T		UR2	
<i>Storeria dekayi victa</i>	Florida brown snake	T*			
<i>Tantilla oolitica</i>	Miami black-headed snake	T		UR2	
	or rimrock crowned snake				
<i>Thamnophis sauritus sackeni</i>	Florida ribbon snake	T*			

*Applicable to lower keys only

Scientific Name	Common Name	FGFWFC ²	Designated status ¹ FDA ³	USFWS ⁴	CITES ⁵
Birds					
<i>Aimophila aestivalis</i>	Bachman's sparrow			UR2	
<i>Aiaia ajaja</i>	Roseate spoonbill	SSC			
<i>Ammodramus maritimus junciculus</i>	Wakulla seaside sparrow	SSC		UR2	
<i>Ammodramus maritimus mirabilis</i>	Cape Sable seaside sparrow	E		E	
<i>Ammodramus maritimus nigriscens</i>	Dusky seaside sparrow	E		E	
<i>Ammodramus maritimus pelonotus</i>	Smyrna seaside sparrow			UR2	
<i>Ammodramus maritimus peninsulae</i>	Scott's seaside sparrow	SSC			
<i>Ammodramus savannarum floridanus</i>	Florida grasshopper sparrow	E		UR2	
<i>Aphelocoma coerulescens coerulescens</i>	Florida scrub jay	T		UR2	
<i>Aramus guarauna</i>	Limpkin	SSC			
<i>Aquila chrysaetos</i>	Golden eagle				II
<i>Athene cunicularia</i>	Burrowing owl	SSC			
<i>Buteo swainsoni</i>	Swainson's hawk			UR2	
<i>Campephilus principalis</i>	Ivory-billed woodpecker	E		E	
<i>Charadrius alexandrinus tenuirostris</i>	Southeastern snowy plover	T		UR2	
<i>Charadrius melodus</i>	Piping plover	T		UR1	
<i>Circus cyaneus</i>	Marsh hawk or American harrier				II
<i>Cistothorus palustris griseus</i>	Worthington's marsh wren	SSC			
<i>Cistothorus palustris marianae</i>	Marian's marsh wren	SSC			
<i>Columba leucocephala</i>	White-crowned pigeon	T		UR2	
<i>Dendroica dominica stoddardi</i>	Stoddard's yellow-throated warbler			UR2	
<i>Dendroica kirtlandii</i>	Kirtland's warbler	E		E	
<i>Egretta caerulea</i>	Little blue heron	SSC			
<i>Egretta rufescens</i>	Reddish egret	SSC		UR2	
<i>Egretta thula</i>	Snowy egret	SSC			
<i>Egretta tricolor</i>	Tricolored heron or Louisiana heron	SSC			
<i>Elanoides forficatus</i>	Swallow-tailed kite			UR2	
<i>Falco columbarius</i>	Pigeon hawk or merlin				II
<i>Falco peregrinus tundrius</i>	Arctic peregrine falcon	E		T	I
<i>Falco sparverius paulus</i>	Southeastern kestrel	T		UR2	II
<i>Falco sparverius sparverius</i>	Eastern kestrel				II
<i>Grus canadensis pratensis</i>	Florida sandhill crane	T			II
<i>Haematopus palliatus</i>	American oystercatcher	SSC			
<i>Haliaeetus leucocephalus</i>	Bald eagle	T		E	I
<i>Lanius ludovicianus migrans</i>	Migrant loggerhead shrike			UR2	
<i>Mycteria americana</i>	Wood stork	E		E	
<i>Pandion haliaetus</i>	Osprey				II
<i>Pelecanus occidentalis</i>	Brown pelican	SSC			
<i>Picoides borealis</i>	Red-cockaded woodpecker	T		E	
<i>Polyborus plancus</i>	Crested caracara	T		UR2	
<i>Rallus longirostris insularum</i>	Mangrove clapper rail			UR2	
<i>Rostrhamus sociabilis</i>	Snail kite	E		E	
<i>Sterna antillarum</i>	Least tern	T			
<i>Sterna dougallii</i>	Roseate tern	T		UR2	
<i>Vermivora bachmanii</i>	Bachman's warbler	E		E	
Mammals					
<i>Balaena glacialis</i>	Right whale	E		E	I
<i>Balaenoptera borealis</i>	Sei whale	E		E	II
<i>Balaenoptera physalus</i>	Finback whale	E		E	II

Scientific Name	Common Name	FGFWFC ²	Designated status ¹ FDA ³	USFWS ⁴	CITES ⁵
<i>Blarina carolinensis shermani</i>	Sherman's short-tailed shrew	SSC		UR2	
<i>Felis concolor coryi</i>	Florida panther	E		E	I
<i>Geomys pinetis goffi</i>	Goff's pocket gopher	E		UR2	
<i>Lutra canadensis</i>	River otter				II
<i>Lynx rufus</i>	Bobcat				II
<i>Megaptera novaeangliae</i>	Humpback whale	E		E	I
<i>Microtus pennsylvanicus dukecampbelli</i>	Saltmarsh vole	SSC			
<i>Mustela vison evergladensis</i>	Everglades mink	T		UR2	
<i>Myotis grisescens</i>	Gray bat	E		E	
<i>Myotis sodalis</i>	Indiana bat	E		E	
<i>Neotoma floridana smalli</i>	Key Largo woodrat	E		E	
<i>Odocoileus virginianus clavium</i>	Key deer	T		E	
<i>Oryzomys argentatus</i>	Silver rice rat	E		UR2	
<i>Oryzomys palustris sanibeli</i>	Sanibel Island rice rat	SSC		UR2	
<i>Peromyscus floridanus</i>	Florida mouse	SSC		UR2	
<i>Peromyscus gossypinus allapaticola</i>	Key Largo cotton mouse	E		E	
<i>Peromyscus gossypinus restrictus</i>	Chadwick Beach cotton mouse	SSC			
<i>Peromyscus polionotus allophrys</i>	Choctawhatchee beach mouse	T		E	
<i>Peromyscus polionotus decoloratus</i>	Pallid beach mouse	E		UR3	
<i>Peromyscus polionotus trissyllepsis</i>	Perdido Key beach mouse	T		E	
<i>Physeter catodon</i>	Sperm whale	E		E	
<i>Procyon lotor auspicatus</i>	Key Vaca raccoon	T		UR2	
<i>Sciurus niger avicennia</i>	Mangrove fox squirrel	T		UR2	
<i>Sciurus niger shermani</i>	Sherman's fox squirrel	SSC		UR2	
<i>Sorex longirostris eionis</i>	Homosassa shrew	SSC		UR2	
<i>Tamias striatus</i>	Eastern chipmunk	SSC			
<i>Trichechus manatus latirostris</i>	West Indian manatee	E		E	I
<i>Ursus americanus floridanus</i>	Florida black bear	T*		UR2	

*Not applicable in Baker and Columbia counties and Apalachicola National Forest

FLORIDA NATURAL AREAS INVENTORY

254 East Sixth Avenue • Tallahassee, Florida 32303 • (904) 224-8207

August 20, 1986

Chris Gable
Camp, Dresser & McKee
1321 U.S. 19 South, Suite 601
Clearwater, FL 33546

DATA REQUEST REPLY

Pasco County Landfill Site, Pasco Co.

T24S R17E Secs 24S2,25N2,26E2
U.S.G.S. 7.5 minute quad Port Richey NE, Fivay Junction

Information on known occurrences of Special Plants, Special Animals, and exemplary Natural Communities. We currently have no occurrences of special elements for this site in our data base. All records given are known occurrences located within an approximate 5 mile radius of the site.

Special Plants

Possible:

Coelorachis tuberculosa, Piedmont joint-grass (FNAI G1G37/S3; Federal-C2) is known to be northwest of the site.

Special Animals

Possible:

Haliaeetus leucocephalus, bald eagle (FNAI G3/S2S3; Federal-Endangered; State-Threatened) is known to the east and west of the site.

Enneacanthus chaetodon, backbanded sunfish (FNAI G3/S3).

Procambarus leitheuseri, Leitheuser's cave crayfish (FNAI G2/S2).

Natural Communities

Aquatic Caves, with the crayfish listed above, are known to be nearby. This possible landfill could have detrimental impacts on the invertebrate fauna of the nearby aquatic caves.

The quantity and quality of data collected by the Florida Natural Areas Inventory are dependent on the research and observations of many individuals and organizations. In most cases, this information is not the result of comprehensive or site-specific field surveys; many natural areas in Florida have never been thoroughly

The Nature Conservancy and the Florida Department of Natural Resources

100% recycled paper

Chris Gable
August 20, 1986
Page Two

surveyed, and new species of plants and animals are still being discovered. For these reasons, the FNAI cannot provide a definitive statement on the presence, absence, or condition of biological elements in any part of Florida. Florida Natural Areas Inventory reports summarize the existing information known to FNAI at the time of the request regarding the biological elements or locations in question. They should never be regarded as final statements on the elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments.

Information provided by this data base may not be published without prior written notification to the Florida Natural Areas Inventory and FNAI must be credited as an information source in these publications. FNAI data may not be resold for profit.

Sincerely,



Katy NeSmith
Data Manager

encls.

CF-121

2808245,2808235



United States Department of the Interior

FISH AND WILDLIFE SERVICE
ENDANGERED SPECIES FIELD STATION
2747 ART MUSEUM DRIVE
JACKSONVILLE, FLORIDA 32207

September 19, 1986

SEP 24 1986

OFFICE OF THE SECRETARY
CLEARWATER, FLA.

Mr. Chris J. Gabel
Camp, Dresser & McKee Inc.
1321 US 19 South, Suite 601
Clearwater, Florida 33546

Dear Mr. Gabel:

We have received your letter of September 10, 1986, requesting information on threatened and endangered species that may exist on the proposed Pasco County Resource Recovery Center.

Based on the information provided, your project falls within the range of the following federally listed threatened and endangered species:

Red-cockaded woodpecker
Bald eagle
Wood stork
Eastern indigo snake

There are no National Wildlife Refuges or critical habitats located within 5 miles of the project site.

To assist you, I have enclosed information sheets on each of the listed species. If you have questions, please contact Mr. Don Palmer or Ms. Linda Walker at this office.

Sincerely yours,

David J. Wesley
Field Supervisor

Enclosures (4)

FLORIDA NATURAL AREAS INVENTORY

Element Rank Explanations

An element is any exemplary or rare component of the natural environment, such as a species, plant community, bird rookery, spring, sinkhole, cave or other ecological feature. An element occurrence (EO) is a single extant habitat which sustains or otherwise contributes to the survival of a population or a distinct, self-sustaining example of a particular element. The major function of the Florida Natural Areas Inventory is to define the state's elements of natural diversity, then collect information about each element occurrence.

The Florida Natural Areas Inventory assigns 3 ranks for each element. The global element rank is based on an element's worldwide status; the state element rank is based on the status of the element in Florida. Element ranks are based on many factors, the most important ones being estimated number of element occurrences (EOs), estimated abundance (number of individuals for species; area for natural communities), range, estimated adequately protected EOs, relative threat of destruction, and ecological fragility.

Global Element Rank (priority)

- G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of extreme vulnerability to extinction due to some natural or man-made factor.
- G2 = Imperiled globally because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some biological or man-made factor.
- G3 = Either very rare and local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction because of other factors.
- G4 = apparently secure globally (may be rare in parts of range)
- G5 = demonstrably secure globally
- GU = possibly in peril range-wide, more information needed
- GH = of historical occurrence throughout range, may be rediscovered (e.g., ivory-billed woodpecker)
- GX = believed to be extinct throughout range
- G#? = Tentative rank (e.g., G2?)
- G#G# = range of rank; insufficient data to assign specific global rank (e.g., G2G3)
- G#T# = rank of taxonomic subgroup such as subspecies or variety; numbers have same definition as above (e.g., G3T1)
- G#Q = rank of questionable species - ranked as species but questionable whether it is species or subspecies; numbers have same definition as above (e.g., G2Q)
- G#T#Q = same as above, but validity as subspecies or variety is questioned.
- U = unranked (temporary)

State Element Rank (priority) definition parallels global element rank: substitute "S" for "G" in above global ranks, and "in state" for "globally" in above global rank definitions.

Additional state element ranks:

- SA = accidental in Florida, i.e., not part of the established biota
- SE = an exotic species established in state; may be native elsewhere in North America

FEDERAL/STATE LEGAL STATUS

FEDERAL

- LE = Listed as Endangered Species in the List of Endangered and Threatened Wildlife and Plants under the provisions of the Endangered Species Act. An "Endangered Species" is defined as any species which is in danger of extinction throughout all or a significant portion of its range.
- PE = Proposed for addition to the List of Endangered and Threatened Wildlife and Plants as Endangered Species.
- LT = Listed as Threatened Species. A "Threatened Species" is defined as any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
- PT = Proposed for listing as Threatened Species.
- C1 = Candidate Species for addition to the List of Endangered and Threatened Wildlife and Plants, Category 1. Taxa for which the U.S. Fish and Wildlife Service currently has substantial information on hand to support the biological appropriateness of proposing to list the species as endangered or threatened.
- C2 = Candidate Species, Category 2. Taxa for which information now in possession of the U.S. Fish and Wildlife Service indicates that proposing to list the species as endangered or threatened is possibly appropriate, but for which conclusive data on biological vulnerability and threat(s) are not currently available to support proposed rules at this time.
- 3A = Candidate Species, Category 3A. Taxa which are no longer being considered for listing as endangered or threatened because of persuasive evidence of extinction.
- 3B = Candidate Species, Category 3B. Taxa which are no longer being considered for listing as endangered or threatened because the names do not represent taxa meeting the Endangered Species Act's definition of "species".
- 3C = Candidate Species, Category 3C. Taxa that have proven to be more abundant or widespread than was previously believed and/or those that are not subject to any identifiable threat.
- AC = Agency Concern. Species which are not currently listed or candidates, but which are a matter of concern to the U.S. Fish and Wildlife Service.
- N = Not currently listed, nor currently being considered for addition to the List of Endangered and Threatened Wildlife and Plants.

STATE

Animals

- LE** = Listed as Endangered Species by the Florida Game and Fresh Water Fish Commission. An endangered species is defined as a species, subspecies, or isolated population which is resident in Florida during a substantial portion of its life cycle and so few or depleted in number or so restricted in range of habitat due to any man-made or natural factors that it is in immediate danger of extinction or extirpation from the State, or which may attain such a status within the immediate future unless it or its habitat are fully protected and managed in such a way as to enhance its survival potential; or migratory or occasional in Florida and included as endangered on the United States Endangered and Threatened Species List. This definition does not include species occurring peripherally in Florida while common or under no threat outside the State.
- LT** = Listed as Threatened Species by the Florida Game and Fresh Water Fish Commission. A Threatened Species is defined as a species, subspecies, or isolated population which is resident in Florida during a substantial portion of its life cycle and which is acutely vulnerable to environmental alteration, declining in number at a rapid rate, or whose range or habitat is declining in area at a rapid rate due to any man-made or natural factors and as a consequence is destined or very likely to become an endangered species within the foreseeable and predictable future unless appropriate protective measures or management techniques are initiated or maintained; or migratory or occasional in Florida and included as threatened on the United States Endangered and Threatened Species List. This definition does not include species occurring peripherally in Florida while common or under no threat outside the State.
- LS** = Listed as Species of Special Concern by the Florida Game and Fresh Water Fish Commission. A Species of Special Concern is defined as a species, subspecies, or isolated population which warrants special protection, recognition, or consideration because it occurs disjunctly or continuously in Florida and has a unique and significant vulnerability to habitat modification, environmental alteration, human disturbance, or substantial human exploitation which, in the foreseeable and predictable future, may result in its becoming a threatened species unless appropriate protective or management techniques are initiated or maintained; may already meet certain criteria for consideration as a threatened species but for which conclusive data are limited or lacking; may occupy such an unusually vital and essential ecological niche that should it decline significantly in numbers or distribution other species would be adversely affected to a significant degree; or has not sufficiently recovered from past population depletion.

N = Not currently listed, nor currently being considered for listing.

Plants

- LE** = Listed as Endangered Plants in the Preservation of Native Flora of Florida Act. "Endangered Plants" means species of plants native to the state that are in imminent danger of extinction within the state, the survival of which is unlikely if the causes of a decline in the number of plants continue, and includes all species determined to be endangered or threatened pursuant to the Federal Endangered Species Act of 1973, as amended.
- PE** = Proposed by the Florida Department of Agriculture as Endangered Plants.
- LT** = Listed as Threatened Plants in the Preservation of Native Flora of Florida Act. "Threatened plants" means species native to the state that are in rapid decline in the number of plants within the state, but which have not so decreased in such number as to cause them to be endangered.
- PT** = Proposed by the Florida Department of Agriculture for listing as Threatened Plants.
- CE** = Listed as a Commercially Exploited Plant in the Preservation of Native Flora of Florida Act. "Commercially exploited plants" means species native to the state which are subject to being removed in significant numbers from native habitats in the state and sold or transported for sale.
- PC** = Proposed by the Florida Department of Agriculture for listing as Commercially Exploited Plants.
- N** = Not currently listed, nor currently being considered for listing.

FLORIDA NATURAL AREAS INVENTORY

SPECIAL PLANTS LIST

MARCH 1986

GLOBAL/STATE RANK			FED/ST STATUS	NAME	COMMON NAME	GLOBAL/STATE RANK			FED/ST STATUS	NAME	COMMON NAME
G4	S1	N	LE	ACACIA CHORIOPHYLLA	TAMARINDILLO	U	S1	N	LE	CAMPYLOCENTRUM PACHYRRHIZUM	LEAFLESS ORCHID
G5	S3	N	LE	ACROSTICHUM AUREUM	GOLDFN LEATHER FERN	U	S1	N	LE	CAMPYLONEURUM ANGUSTIFOLIUM	NARROW STRAP FERN
G5	S1	N	LT	ACTAEA PACHYPODA	BANERERRY	GU	SU	C2	N	CANNA PERTUSA	TATTERED CANNA
G5	S3S4	N	LT	ADIANTUM CAPILLIS-VENERIS	VENUS'-HAIR FERN	G2?	S2	C2	N	CAREX BALTZELLII	BALTZELL'S SEDGE
GU	S1	N	LE	ADIANTUM MELANOLEUCUM	FRAGRANT MAIDENHAIR FERN	G1G3	S2	C2	N	CAREX CHAPMANII	CHAPMAN'S SEDGE
G5TUQ	SU	C2	N	AGALINIS PURPUKEA VAR CARTERI	CARTER'S LARGE PURPLE FALSE-FOXGLOVE	G1G2	S1S2	C1	LE	CASSIA KEYENSIS	BIG PINE PARTRIDGE PEA
GHQ	SH	C2	N	AGALINIS STENOPHYLLA	NARROW-LEAVED FALSE-FOXGLOVE	U	S1	N	LE	CATESBAFA PARVIFLORA	SMALL-FLOWERED LILY-THORN
G3	S2	C2	N	AGRIMONIA INCISA	INCISED GROOVE-BUR	U	S1	N	LE	CATOPBIS BERTERONIANA	POWDERY CATOPBIS
G1	S1	LE	LE	AMORPHA CREMULATA	A LEAD PLANT	U	S1	N	LT	CATOPBIS NUTANS	NUDDING CATOPBIS
U	S1	N	N	AMYRIS BALSAMIFERA	BALSAH TORCHWOOD	U	S1	N	LE	CELTIS IGUANAEA	IGUANA HACKBERRY
G3	S3	3C	N	ANDROPOGON ARCTATUS	PINE-WOODS BLUESTEM	U	S1	N	LE	CELTIS PALLIDA	SPINY HACKBERRY
GU	S2	N	N	ANEMONE BERLANDIERI	TEXAS ANEMONE	G2?	S1S3	C2	N	CENTROSEMA ARENICULA	SAND BUTTERFLY PEA
G5	S1	N	LT	ANEMONELLA THALICTROIDES	RUE-ANEMONE	GUT1	S1	LE	LE	CEREUS ERIOPHORUS VAR FRAGRANS	FRAGRANT WOOLY CACTUS
G5T1	S1	C2	LE	AQUILEGIA CANADENSIS VAR AUSTRALIS	MARIANNA COLUMBINE	G2G3	S2S3	C2	LE	CEREUS GRACILIS	PRICKLY-APPLE
G2	S2	C2	N	ARGYTHAMNIA BLODGETTII	BLODGETT'S WILD-MERCURY	G1	S1	LE	LE	CEREUS ROBINII	TREE CACTUS
GUGE	SE?	C1	LE	ARISTIDA FLORIDANA	KEYS WIRE-GRASS	G2	S2	C2	N	CHAMAESYCE CUMULICOLA	SAND-DUNE SPURGE
G2	S1	C2	N	ARISTIDA SIMPLICIFLORA	SOUTHERN THREE-AWNEED GRASS	G2?T2	S2	LE	N	CHAMAESYCE DELTOIDEA SSP DELTOIDEA	DELTOID SPURGE
G2G3	S3	N	LE	ASCLEPIAS CURTISSII	CURTIS MILKWEED	G2?T1	S1	C1	N	CHAMAESYCE DELTOIDEA SSP SERPYLLUM	WEDGE SPURGE
G2	S2	C2	LT	ASCLEPIAS VIRIDULA	SOUTHERN MILKWEED	G2T1	S1	C1	N	CHAMAESYCE PORTERIANA VAR KEYENSIS	PORTER'S HAIRY-PODDED SPURGE
G1	S1	PT	LE	ASIMINA TETRAHERA	FOUR-PETAL PAUPAW	G2T2	S2	C1	N	CHAMAESYCE PORTERIANA VAR PORTERIANA	PORTER'S BROAD-LEAVED SPURGE
U	S2	N	LE	ASPLENIUM AURITUM	AURICLED SPLEENWORT	G2T2	S2	C1	N	CHAMAESYCE PORTERIANA VAR SCOPARIA	PORTER'S BROOM SPURGE
U	S1S2	N	LT	ASPLENIUM DENTATUM	SLENDER SPLEENWORT	U	S2	N	LT	CHEILANTHES MICROPHYLLA	SOUTHERN LIP FERN
G2	S1S2	C2	LT	ASPLENIUM HETERORESILIENS	WAGNER'S SPLEENWORT	G2	S2	PE	LE	CHIONANTHUS PYGMAEUS	PYCHMY FRINGE-TREE
G4	S1	N	LE	ASPLENIUM MONANTHES		G1	S1	LE	LE	CHRYSOPSIS FLORIDANA	FLORIDA GOLDEN-ASTER
G1G3?	SU	C2	LT	ASPLENIUM PLENUM	DWARF SPLEENWORT	G3G5T2	S2	C1	LE	CHRYSOPSIS COSSYPINA SSP CRUISEANA	CRUISE'S GOLDEN-ASTER
U	S1	N	LE	ASPLENIUM PUMILUM	BIRD'S NEST SPLEENWORT	G4G5	S3?	N	N	CLEMATIS CATESBYANA	A VIRGIN'S BOWER
U	S1	N	LE	ASPLENIUM SERRATUM	PLUMOSE ASTER	G3	S3	C1	LT	CLITORIA FRAGRANS	PIGEON-WING
G2Q	S2	3B	N	ASTER PLUMOSUS	PINE-WOODS ASTER	U	S1	N	LE	CLUSIA ROSEA	A BALSAM APPLE
G1	S1	C2	LT	ASTER SPINULOSUS	APALACHICOLA RIVER ASTER	G3G4	S3	N	LC	COCCOTHRINAX ARGENTATA	SILVER PALM
G5?T2Q	S1S3	N	N	ASTER VININEUS VAR VININEUS	HAIRY WILD-INDIGO	G1G3?	S3	C2	N	COELORACHIS TUBERCULOSA	PIEDMONT JOINT-GRASS
G2	S2	C2	LT	BAPTISIA HIRSUTA	APALACHICOLA WILD-INDIGO	U	S1S2	N	N	COLUBRINA CUBENSIS	COLUBRINA
G3	S2	3C	LT	BAPTISIA MEGACARPA	SCARE-WEED	G1G2Q	S1S2	C1	LT	COMMELINA GIGAS	CLIMBING DAYFLOWER
G2G3	S2S3	C2	LT	BAPTISIA SIMPLICIFOLIA	SINKHOLE FERN	G2	S2	C2	N	CONRADINA BREVIFOLIA	SHORT-LEAVED ROSEMARY
G5?	S1	N	LE	BLECHNUM OCCIDENTALE	FLORIDA BONANIA	G1G2	S1S2	C2	LT	CONRADINA GLABRA	APALACHICOLA ROSEMARY
G3	S3	C1	LE	BONANIA GRANDIFLORA	WINTER GRAPEFERN	G3	S3	C2	N	CONRADINA GRANDIFLORA	LARGE-FLOWERED ROSEMARY
U	S1	N	LT	BOTRYCHIUM LUNARIODES	LITTLE STRONGBACK	G3G5	S2S3	N	LE	CORDIA SEBESTENA	GEIGER TREE
U	S1	N	N	BOURRERIA CASSINIFOLIA		G5	S2	N	LT	CORNUS ALTERNIFOLIA	PAGODA DOGWOOD
U	S1	N	N	BOURRERIA SUCCULENTA VAR REVOLUTA	SPIDER ORCHID	G2G3	S2	C2	LE	CROONIA PAUCIFLORA	CROONIA
GU	SHS1	C2	LT	BRASSIA CAUDATA	FLYR'S BRICKELL-BUSH	U	S2	N	N	CROSSOPETALUM ILICIFOLIUM	CHRISTMAS BERRY
G1G3?	S2	C2	LT	BRICKELLIA CORDIFOLIA	FLORIDA THOROUGHWORT	G2?	S2S3	C2	N	CROTON ELLIOTTII	ELLIOTT'S CROTON
G1G3?	S1S2	C2	N	BRICKELLIA MOSIERI	BRICKELL-BUSH	G5	S2S3	N	LT	CRYPTOTAENIA CANADENSIS	HONEWORT
U	S1	N	LE	BULBOPHYLLUM PACHYRHACHIS	RAT-TAIL ORCHID	G2Q	S2	3C	N	CTENIUM FLORIDANUM	FLORIDA TOOTHACHE GRASS
G4G5	S2	N	LT	BUMELIA LYCIOIDES	PANHANDLE BUCKTHORN	G1	S1	C2	LE	CUCURBITA OKEECHOBEEENSIS	OKEECHOBEE GOURD
U	S1	N	LE	BURMANNIA FLAVA	FAKAHATCHEE BURMANNIA	U	S1	N	LE	CUPANIA GLABRA	CUPANIA
G2?	S2	C2	LT	CACALIA DIVERSIFOLIA	VARIABLE-LEAVED INDIAN-PLANTAIN	G2?	S2	C2	N	CUPHEA ASPERA	TROPICAL WAXWEED
G3	S3	C1	LT	CALAMINTHA ASHEI	ASHE'S SAVORY	G5	S2	N	N	CYNOCLOSSUM VIRGINIANUM	WILD COMFREY
G2	S2	C2	N	CALAMINTHA DENTATA	BASIL	U	S1	N	LE	CYRTOPODIUM PUNCTATUM	COW-HORN ORCHID
G1	S1	C2	N	CALAMOVILFA CURTISSII	CURTISS' SANDGRASS	G1	S1	PE	LE	DEERINGOTHAMNUS PULCHELLUS	A SQUIRREL-BANANA
G4G5	S2	N	LT	CALLIRHOE PAPAVER	POPPY MALLOW	G1	S1	PE	LE	DEERINGOTHAMNUS RUGELII	YELLOW SQUIRREL-BANANA
G1	S1	C2	LE	CAMPANULA ROBINIAE	BROOKSVILLE BELLFLOWER	U	S1	N	LE	DENNSTAEDTIA BIPINNATA	CUPLET FERN

FLORIDA NAT. AL AREAS INVENTORY

SPECIAL PLANTS LIST

MARCH 1986

GLOBAL/STATE			FED/ST	NAME	COMMON NAME	GLOBAL/STATE			FED/ST	NAME	COMMON NAME
RANK			STATUS			RANK			STATUS		
G1	S1	LE	LE	DICERANDRA CORNUTISSIMA	LONGSPURRED BALM	U	S2	N	LT	HIPPOMANE MANCINELLA	MANCHINEEL
G1	S1	LE	LE	DICERANDRA FRUTESCENS	SCRUB BALM	G5	S1	N	LT	HYDRANGEA ARBORESCENS	WILD HYDRANGEA
G1	S1	LE	LE	DICERANDRA IMMACULATA	LAKELA'S MINT	G3	S1Q	C2	N	HYMENOCALLIS CORUNARIA	STREAM-BANK SPIDERLILY
U	S2	N	N	DICHROMENA FLORIDENSIS	FLORIDA WHITE-TOP SEDGE	U	S2S3	3C	N	HYMENOCALLIS LATIFOLIA	BROAD-LEAVED SPIDERLILY
G17	S1	C2	N	DIGITARIA FLORIDANA	FLORIDA CRABGRASS	G2	S1	N	LT	HYPELATE TRIFOLIATA	INKWOOD
G17	S1	C2	N	DIGITARIA GRACILLIMA	LONGLEAF CRABGRASS	G2	S2	PE	LE	HYPERICUM CUMULICOLA	HIGHLANDS SCRUB HYPERICUM
G17	S1	C2	N	DIGITARIA PAUCIFLORA	FEW-FLOWERED CRABGRASS	G1	S1	C1	LT	HYPERICUM EDISONIANUM	EDISON'S ASCYRUM
G5	S37	N	N	DIRCA PALUSTRIS	LEATHERWOOD	G2	S2	C2	LE	HYPERICUM LISSOPHLEUS	SMOOTH-BARKED ST.
G5	S3	N	LT	DROSERIA INTERMEDIA	WATER SUNDEW						JOHN'S-WORT
G5	SX7	N	N	ELEOCHARIS ROSTELLATA	BEAKED SPIKE-RUSH	G3	S2	C2	LT	ILEX AMELANCHIER	SERVICEBERRY HOLLY
U	S1	N	LE	ELTROPECTRIS CALCARATA	SPURRED NEOTTIA	U	S2	N	LT	ILEX KRUGIANA	KRUG'S HOLLY
GUT2	S2	C2	N	ELYTRARIA CAROLINENSIS VAR ANGUSTIFOLIA	NARROW-LEAVED CARULINA SCALYSTEM	CUT3	S3	3C	N	ILEX OPACA VAR ARENICOLA	SCRUB HOLLY
G1G3	S1	C2	LE	ENCYCLIA BOOTHIANA	DOLLAR ORCHID	G3G5	S3	N	LT	ILICIIUM FLORIDANUM	FLORIDA ANISE
U	S1	N	LE	ENCYCLIA PYGMAEA	DWARF EPIDENDRUM	G1	S1	C2	LT	ILICIIUM PARVIFLORUM	STAR-ANISE
U	S1	N	LE	EPIDENDRUM ACUNAE	ACUNA'S EPIDENDRUM	U	S2	N	LE	IONOPSIS UTRICULARIODES	DELICATE IONOPSIS
U	S2	N	LT	EPIDENDRUM NOCTURNUM	NIGHT-SCENT ORCHID	G5	S1	N	N	ISOPYRUM BTERNATUM	FALSE RUE-ANEMONE
G5	S2	N	LE	EPIGAEA REPENS	TRAILING ARBUTUS	G2	S2	C2	LE	JACQUEMONTIA CURTISSII	PINELAND JACQUEMONTIA
G2	S2	C2	LT	ERAGROSTIS TRACYI	SANIBEL LOVEGRASS	G1	S1	C2	LE	JACQUEMONTIA RECLINATA	BEACH JACQUEMONTIA
G27T2Q	S1S2	C2	N	ERIOCHLOA MICHAXII VAR SIMPSONII	A CUPGRASS	G3G5	S3	N	LT	JACQUINIA KEYENSIS	JOEWOOD
G3Q	S3	C2	L1	ERIOGONUM FLORIDANUM	SCRUB BUCKWHEAT	G37	S1	3C	N	JUNCUS GYMNOCARPUS	COVILLE'S RUSH
U	S2S3	N	LT	ERODEA LITTORALIS	BEACH-CREEPER	G1G2	S1S2	C1	LE	JUSTICIA COOLEYI	COOLEY'S JUSTICIA
G2	S2	PE	N	ERYNCIUM CUNEIFOLIUM	WEDGE-LEAVED BUTTON-SNAKE ROOTS	G27	S2	C2	N	JUSTICIA CRASSIFOLIA	THICK-LEAVED WATER-WILLOW
G3G5	S2	N	LT	ERYTHRONIUM UMBILICATUM	DIMPLED DOGTOOTH VIOLET	G5	S3	N	LT	KALMIA LATIFOLIA	MOUNTAIN LAUREL
G4G5	S3S4	N	LT	EUGENIA CONFUSA	TROPICAL IRONWOOD	G1G37Q	S1	C2	N	KOSTELETZKYA SMILACIFOLIA	SOUTHERN SEA-SHORE MALLOW
U	S1	N	LE	EUGENIA RHOMBEA	RED STOPPER	G3	S3	C2	N	LECHEA CERNUA	NODDING PINWEED
G5	S2	N	N	EUDONYMUS ATROPURPUREUS	PIEDMONT STRAWBERRYBUSH	G2	S2	C2	N	LECHEA DIVARICATA	PINE PINWEED
U	S27	N	N	EUPHORBIA COMMUTATA	WOOD SPURGE	G1	S1	C2	N	LECHEA LAKELAE	LAKELA'S PINWEED
G1	S1	LT	LE	EUPHORBIA GARDNERI	GARBER'S SPURGE	G3G4	S3	3C	LT	LEITNERIA FLORIDANA	CORKWOOD
G1	S1	C2	N	EUPHORBIA TELEPHIODES	TELEPHUS SPURGE	G1G3	S1	C2	LE	LEPANTHOPSIS MELANANTHA	TINY ORCHID
G271T3	S1	C1	N	FORESTIERA SEGREGATA VAR PINETORUM	FLORIDA PINEWOOD PRIVET	G3	S3	C1	LE	LIATRIS OHLINGERAE	FLORIDA GAY-FEATHER
G2	S2	C2	N	GALACTIA PINETORUM	PINELAND MILK PEA	G2	S2	C2	LE	LIATRIS PROVINCIALIS	GODFREY'S BLAZING STAR
G1	S1	LE	N	GALACTIA SMALLII	SMALL'S MILKPEA	U	S1	C2	LE	LICARIA TRIANDRA	GULF LICARIA
G27	S2	C2	LE	GENTIANA PENNELLIANA	WIREGRASS GENTIAN	G3G5	S27	C2	N	LILAEOPSIS CAROLINENSIS	CAROLINA LILAEOPSIS
G1G2	S1S2	C2	N	GLANDULARIA MARITIMA	COASTAL Vervain	U	S2	N	LT	LILIIUM CATESBAEI	PINE LILY
G17	S1	C1	N	GLANDULARIA TAMPAENSIS	TAMPA Vervain	G1	S1	C2	LE	LILIIUM IRIDOLLAE	PANHANDLE LILY
G5	S2	N	LT	GOODYERA PUBESCENS	DOWNY RATTLESNAKE PLANTAIN	U	S1S2	N	N	LILIIUM MICHAUXII	CAROLINA LILY
G4G5	S37	N	LE	GOSSYPIUM HIRSUTUM	WILD COTTON	G5	S1	N	N	LILIIUM SUPERBUM	TURK'S CAP LILY
U	S2	N	LE	GUAIACUM SANCTUM	LIGNUM-VITAE	G2	S1	PE	N	LINDERA MELISSIFOLIA	SPICEBUSH
U	S1	N	LE	GUZMANIA MONOSTACHIA	FUCH'S BROHELIA	G1G2	S1S2	C2	LE	LINUM ARENICOLA	SAND FLAX
G17	S1	C2	N	GYNOPOGON FLORIDANUS	A BEARDGRASS	G271	S1	C1	N	LINUM CARTERI VAR CARTERI	CARTER'S SMALL-FLOWERED FLAX
G1	S1	LE	LE	HARPEROCALLIS FLAVA	HARPER'S BEAUTY	G272	S2	C1	N	LINUM CARTERI VAR SMALLII	CARTER'S LARGE-FLOWERED FLAX
G2G3	S2S3	C2	LT	HARTWRIGHTIA FLORIDANA	HARTWRIGHTIA	G57TU	S17	C2	N	LINUM SULCATUM VAR HARPERI	HARPER'S CROOKED-YELLOW FLAX
U	S1	C1	LE	HEDEOMA GRAVEOLENS	HOCK PENNYROYAL	G2	S2	C2	LT	LINUM WESTII	WEST'S FLAX
G571Q	S1	C2	N	HEDYOTIS NIGRICANS VAR PULVINATA	NARROW-LEAVED BLUET	G4G5	S2	3C	LT	LITSEA AESTIVALIS	POND-SPICE
G2	S2	C2	N	HELIANTHUS CARNOSUS	LAKE-SIDE SUNFLOWER	G1G3Q	S1S3	N	N	LUDWIGIA SPATHULIFOLIA	A LUDWIGIA
G57T2	S2	C1	N	HELIANTHUS DEBILIS SBP VESTITUS	HAIRY CUCUMBER-LEAF SUNFLOWER	G1	S1	PE	LE	LUPINUS ARIDORUM	BECKNER'S LUPINE
GUT1T3	S1S3	C2	N	HELIOTROPIMUM POLYPHYLLUM VAR HORIZONTALE	PROSTRATE MANY-LEAVED TURNSOLE	G2	S2	C2	LT	LUPINUS WESTIANUS	GULFCOAST LUPINE
G5	S2	N	LE	HEPATICA AMERICANA	LIVERLEAF	G2	S1	N	LE	LYCOPodium DICHOTOMUM	HANGING CLUB MOSS
G5	S3	N	LT	HEXASTYLIS ARIFOLIA	HEARTLEAF	G1	S1	C2	N	LYTHRUM CURTISSII	CURTIS'S LYTHRUM
						G2G3	S2S3	C2	N	LYTHRUM FLAGELLARE	LOWLAND LYTHRUM
						G1	S1	C2	LE	MACBRIDEA ALBA	WHITE BIRDS-IN-A-NEST
						G5	S2	N	LT	MAGNOLIA ACUMINATA	CUCUMBER-TREE
						G2	S2	C2	LE	MAGNOLIA ASHEI	ASHE'S MAGNOLIA
						G3G5	S2	N	LE	MAGNOLIA PYRAMIDATA	PYRAMID MAGNOLIA

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GLOBAL/STATE RANK	FED/ST STATUS	NAME	COMMON NAME	
C1G2	S1S2	C2 LT	SPHENOSTIGMA COELESTINUM	BARTRAM'S IXIA
C1	S1	C2 LE	SPIGELIA GENTIANOIDES	GENTIAN PINKROOT
C1G2	S1S2	C2 LE	SPIGELIA LOGANIOLIDS	PINK-ROOT
C4T1T2	S2	C2 LT	SPIRANTHES LANCEOLATA VAR PALUDICOLA	A LADIES'-TRESSES
C1G3?	S1S2	C2 LE	SPIRANTHES POLYANTHA	GREEN LADIES'-TRESSES
CUT1	S1	C2 N	STACHYS HYSSOPIFOLIA VAR LYTHROIDES	TALLAHASSEE HEDGE-NETTLE
C5	S1	N LT	STAPHYLEA TRIFOLIA	BLADDER-NUT
C4G5	S3	N LE	STEWARTIA MALACODENDRON	SILKY CAMELLIA
C4G5T1	S1	C2 N	STILLINGIA SYLVATICA SSP TENUIS	A QUEEN'S DELIGHT
U	S2	N LE	STRUMPFIA MARITIMA	PRIDE-OF-BIG-PINE
C3G5	S3	N LE	BURIANA MARITIMA	BAY CEDAR
C2	S2	C1 LE	TAXUS FLORIDANA	FLORIDA YEW
C1GHQ	S1SH	C2 LT	TECTARIA AMESIANA	AMES' HALBERD FERN
C2?	S1	N LE	TECTARIA CORIANDRIFOLIA	HATTIE BAUER HALBERD FERN
C1Q	S1	C1 N	TEPHROSIA ANGUSTISSIMA	A DEVIL'S SHOESTRING
C1G3?	S1	C2 N	TEPHROSIA MOHRII	PINELAND HOARY-PEA
C3G5	S3	N LT	TETRAZYGIA BICOLOR	TETRAZYGIA
C1	S1	C1 N	THALICTRUM COOLEYI	COOLEY'S MEADOWRUE
CXQ	SX	N LT	THELYPTERIS MACILENTA	EDWARD'S MAIDEN FERN
U	S2	N LC	THRINAX FLORIDANA	FLORIDA THATCH PALM
U	S1	N LC	THRINAX MICROCARPA	BRITTLE THATCH PALM
C3G5	S3	N LT	TILLANDSIA FLEXUOSA	BANDED WILD-PINE
U	S2	N LE	TILLANDSIA PRUINOSA	FUZZY-WUZZY AIR-PLANT
C1	S1	LE LE	TORREYA TAXIFOLIA	FLORIDA TORREYA
C2	S2	C2 N	TRAGIA SAXICOLA	TRAGIA
C2	S2	N LE	TRILLIUM LANCIFOLIUM	LANCE-LEAVED WAKE-ROBIN
C1	S1	C2 LT	TRIPHORA CRAIGHEADII	CRAIGHEAD'S NODDING-CAPS
CH	SH	C2 LT	TRIPHORA LATIFOLIA	BROAD-LEAVED NODDING-CAPS
C2	S2	C1 N	TRIPSACUM FLORIDANUM	FLORIDA GAMA GRASS
U	S1	N LE	TROPIDIA POLYSTACHYA	YOUNG-PALM ORCHID
C4?	S1	N N	ULMUS CRASSIFOLIA	CEDAR ELM
U	S1	N N	UVULARIA FLORIDANA	FLORIDA MERRYBELLS
U	S2	N LE	VANILLA BARBELLATA	WORM-VINE ORCHID
C1G3	S1	N LT	VANILLA MEXICANA	SCENTLESS VANILLA
C4	S2	3C LE	VERATRUM WOODII	FALSE HELLEBORE
C2	S2	C2 LT	VERBESINA CHAPMANII	CHAPMAN'S CROWNBEARD
C2	S2	C1 N	VERBESINA HETEROPHYLLA	VARIABLE-LEAF CROWNBEARD
C1	S1	C1 LE	VICIA OCALENSIS	OCALA VETCH
U	S1	N LE	VIOLA HASTATA	HALBERD-LEAVED YELLOW VIOLET
C1	S1	PE LE	WAREA AMPLEXIFOLIA	CLASPING WAREA
C1	S1	PE LE	WAREA CARTERI	CARTER'S WAREA
C3G5	S2	C2 N	XYRIS DRUMMONDII	DRUMMOND'S YELLOW-EYED GRASS
C2?	S2	C2 N	XYRIS ISOETIFOLIA	QUILLWORT YELLOW-EYED GRASS
C2	S2	C2 LE	XYRIS LUNGISEPALA	KARST POND XYRIS
C1	S1	C2 LT	XYRIS SCABRIFOLIA	HARPER'S YELLOW-EYED GRASS
U	S1	N LE	ZANTHOXYLUM FLAVUM	YELLOWHEART, SATINWOOD
U	S2	3C LE	ZEPHYRANTHES SIMPSONII	ZEPHYR LILY
C1GH	S1SH	C1 LE	ZIZIA LATIFOLIA	BRISTOL GOLDEN-ALEXANDERS

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FISHES

C5	S3	N N	ACANTHARCHUS POMOTIS	MUD SUNFISH
C3	SA	LE LE	ACIPENSER BREVIROSTRUM	SHORTNOSE STURGEON
C3	S2	C2 LS	ACIPENSER OXYRHYNCHUS	ATLANTIC STURGEON
C5	S3	N N	ACONOSTOMUS MONTICOLA	MOUNTAIN MULLET
C3	S1	C2 LT	AMMOCRYPTA ASPRELLA	CRYSTAL DARTER
C5	SU	N N	AMMOCRYPTA ASPRELLA	RIVER GOBY
C5	S2	N N	BAIRDIELLA SANCTAELUCIAE	STRIPED CROAKER
C5T2	S2	N LS	CYPRINODON VARIEGATUS	LAKE EUSTIS PUFFISH
			HUBBSI	
C5T2Q	S2	N N	CYPRINODON VARIEGATUS POP 1	FLORIDA KEYS SHEEPSHEAD
				MINNOW
C3	S3	N N	ENNEACANTHUS CHALTUDON	BLACKBANDED SUNFISH
C4	S1	N LS	ETHEOSTOMA HISTRIO	HARLEQUIN DARTER
C2	S2	LE LE	ETHEOSTOMA OKALOOSAE	OKALOOSA DARTER
C5	S1	N LS	ETHEOSTOMA OLIMSTED	TESSELLATED DARTER
C5	S2	N N	ETHEOSTOMA PARVIFINNE	GOLDSTRIPE DARTER
C5	S2	N N	ETHEOSTOMA PROELIARE	CYPRESS DARTER
C5T4	S3	N N	FUNDULUS GRANDIS SAGUANUS	SOUTHERN GULF KILLIFISH
C3	S2	N LS	FUNDULUS JENKINSI	SALT MARSH TOPMINNOW
C5T2Q	S2	N N	FUNDULUS SIMILIS SSP 1	FLORIDA KEYS SOUTHERN
				LONGNOSE KILLIFISH
C3	S3	N N	GAMBUSIA RHIZOPHORAE	MANGROVE GAMBUSIA
C3?	S3?	N N	GOBIONELLUS STICHATUKUS	SPUTTLE Goby
C5?	S2	N N	HYBOGNATHUS MAYI	CYPRESS MINNOW
C5	S2	N N	HYBOSIS AESTIVALIS	SPECKLED CHUB
C4	S3	N N	ICTALURUS BRUNNUS	SNAIL BULLHEAD
C3	S3	N N	ICTALURUS SERRACANTHUS	SPOTTED BULLHEAD
C5	S3	N LS	LEPIDOSTEUS SPATULA	ALLIGATOR GAR
C5T2Q	S2	N N	LUCANIA PARVA POP 1	FLORIDA KEYS RAINWATER
				KILLIFISH
C2Q	S2	N LT	MENIDIA CONCHORUM	KEY SILVERSIDE
C2C3	S2S3	N LS	MICROPTERUS NOTIUS	SUWANNEE BASS
C2	S1	N LS	MICROPTERUS SP 1	SHOAL BASS
C4	S1	N LS	MOXOSTOMA CARINATUM	RIVER REDHORSE
C2	S2	N N	MOXOSTOMA SP 1	GREYFIN REDHORSE
C2	S1	C2 LT	NOTROPIS CALLITAFNIA	BLUESTRIPE SHINER
C5	S4	N N	NOTROPIS CUMINGSAE	DUSKY SHINER
C3	S2	N N	NOTROPIS LEEDSI	OHOOPEE (=BANNERFIN)
				SHINER
C1	S1	C2 LT	NOTROPIS SP 2	BLACKMOUTH SHINER
C4	S4	N N	NOTROPIS MELAKA	BLUINOSE SHINER
C3	S1S2	N N	NOTROPIS ZONISTIVS	BANDFIN SHINER
C5	S3	N N	OOSTETHUS BRACHYURUS	OPOSSUM PIPEFISH
C5	S1	N N	PERCINA QUACHITAL	SADDLEBACK DARTER
C5	SA	N N	PETROMYZON MARINUS	SEA LAMPREY
C5T2Q	S2	N N	POECILIA LATIPINNA POP 1	FLORIDA KEYS SAILFIN
				MOLLY
C5	S2	N LS	RIVULUS MARMORATUS	RIVULUS
C1	S1	N LS	STARKSIA STARCKI	KEY BLENNY
C5	S3	N N	UMBRA PYGMAEA	EASTERN MUDMINNOW

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AMPHIBIANS

C5	S3?	N N	AMBYSTOMA TIGRINUM	TIGER SALAMANDER
C3	S3	N N	AMPHIUMA PHOLETER	ONE-TOED AMPHIUMA
C5	S1	N N	DESMOGNATHUS MONTICOLA	SEAL SALAMANDER
C2	S2	C2 N	HAIDEOTRITON WALLACI	GEORGIA BLIND SALAMANDER
C5	S2	N N	HEMIDACTYLUM SCUTATUM	FOUR-TOED SALAMANDER
C4	S3	AC LS	HYLA ANDERSONII	PINE BARRENS TREEFROG
C3	S3	N N	NOTOPHTHALMUS PERSTRIATUS	STRIPED NEWT
C5T1T2	S1S2	C2 N	PSEUDOBANCHUS STRIATUS	GULF HAMMOCK DWARF BIREN
			LUSTRICOLUS	
C5	S3	C2 LS	RANA ARIOLATA	GOPHER FROG
C2	S2	N LS	RANA OKALOOSAE	FLORIDA BOG FROG
C5	S2?	N N	RANA VIRGATIPES	CARPENTER FROG
C4C5	S1	N N	STEREOCHILUS MARGINATUS	MANY-LINED SALAMANDER

REPTILES

C5	S2	N N	ACKISTRODON CONTORTRIX	COPPERHEAD
C5	S4	LT LS	ALLIGATOR MISSISSIPPIENSIS	AMERICAN ALLIGATOR
C3	S2	LT LT	CARETTA CARETTA	LOGGERHEAD
C3	S2	LE LE	CHELONIA MYDAS	GREEN TURTLE
C5	S3?	N N	CLEMmys GUTTATA	SPOTTED TURTLE
C2?	S1S2	LE LE	CROCODYLUS ACUTUS	AMERICAN CROCODILE
C5	S3	N N	CROTALUS HORRIDUS	CANEBAKE RATTLESNAKE
C3	S2	LE LE	DERMOCHELYS CORIACEA	LEATHERBACK TURTLE
C5T1	S1	C2 LT	DIADOPHIS PUNCTATUS ACRICUS	BIG PINK KEY RINGNECK SNAKE
C4T3	S3	LT LT	DRYMARCON CORAIB COUPERI	EASTERN INDIGO SNAKE
C5T2Q	S2	N LS	ELAPHE GUTTATA POP 1	LOWER KEYS RED RAT SNAKE
C3?	S1	LE LE	ERETMOCHELYS IMBRICATA	HAWKSBILL
C5	S3	N N	EUMECES ANTHRACINUS	COAL SKINK
C4T2	S2	C2 LS	EUMECES EGREGIUS EGREGIUS	FLORIDA KEYS MOLE SKINK
C4T1	S1	N N	EUMECES EGREGIUS INSULARIS	CEDAR KEYS MOLE SKINK
C4T2	S2	C2 LT	EUMECES EGREGIUS LIVIDUS	BLUE-TAILED MULE SKINK
C2	S2	C2 LS	GOPHERUS POLYPHEMUS	GOPHER TORTOISE
C2	S2	C2 LS	GRAPTEMYS BARBOURII	BARBOUR'S MAP TURTLE
C4?	S2	N LS	GRAPTEMYS PULCHRA	ALABAMA MAP TURTLE
C5T2Q	S1S2	C2 LE	KINOSTERNON BAURII BAURII	KEY MUD TURTLE
C5	S2S3	N N	LAMPROPELTIS CALLIGASTER	MOLE SNAKE
C5T2	S2	N N	LAMPROPELTIS GETULUS GUINI	APALACHICOLA COMMON KINGSNAKE
C1	S1	LE LE	LEPIDOCHELYS KEMPII	ATLANTIC RIDLEY
C3?	S3?	C2 LS	MACROCHELYS TEMMINCKII	ALLIGATOR SNAPPING TURTLE
C5T2?	S2?	N N	MALACOLEMYS TERRAPIN	MANGROVE TERRAPIN
			RHIZOPHORARUM	
C2	S2	C2 LT	NEOSEPS REYNOLDSI	SAND SKINK
C5T3	S3?	N N	NERODIA FASCIATA CLARKII	GULF SALT MARSH WATERSNAKE
C5T1Q	S1	LT LT	NERODIA FASCIATA TALNIATA	ATLANTIC SALT MARSH WATERSNAKE

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G1	SU	C2 N		PSEUDENYS ALABAMENSIS	ALABAMA RED-BELLIED TURTLE	G5T4	S3	N LS		DENDROICA PETECHIA GUNDLACHI	CUBAN YELLOW WARBLER
G5T3	S3	3C LS		PSEUDENYS CONCINNA SUWANNIENSIS	SUWANNIE COOTER	GX	SX	N N		ECTOPISTES MIGRATORIUS	PASSENGER PIGEON
G3	S3	C2 N		SCELOPORUS WOODI	FLORIDA SCRUB LIZARD	G5	S4	N LS		EGRETIA CAERULEA	LITTLE BLUE HERON
G3	S3	C2 LT		STILOSONA EXTENUATUM	SHORT-TAILED SNAKE	G4	S2	C2 LB		EGRETIA RUFESCENS	REDDISH EGRET
G5T1Q	S1	N LT		STORERIA DEKAYI PUP 1	LOWER KEYS BROWN SNAKE	G5	S4	N LS		EGRETIA THULA	SNOWY EGRET
G1G2Q	S1S2	C2 LT		TANTILLA DOLITICA	RIM ROCK CROWNED SNAKE	G5	S4	N LS		EGRETIA TRICOLOR	TRICOLORED HERON
G5T1Q	S1	N LT		THAMNOPHIS SAURITUS PUP 1	LOWER KEYS RIBBON SNAKE	G5	S1S3	N N		ELANUS CAERULEUS	BLACK-SHOULDERED KITE
G5T4?	S2?	N N		TRIONYX MUTICUS CALVATUS	GULF COAST SMOOTH SOFTSHELL	G5	S4	N N		EUDOCIMUS ALBUS	WHITE IBIS
						G4	SU	N N		FALCO COLUMBARIUS	MERLIN
						G3	S2	LT LE		FALCO PEREGRINUS	PEREGRINE FALCON
						G5T3T4	S3?	C2 LT		FALCO SPARVERIUS PAULUS	SOUTHEASTERN AMERICAN KESTREL
BIRDS						G5	S1	N N		FREGATA MAGNIFICENS	MAGNIFICENT FRIGATEBIRD
						G3	SX	N N		GEOTRYGON CHRYSIA	KEY WEST QUAIL-DOVE
G4	S3?	N N		ACCIPITER COOPERII	COOPER'S HAWK	G1	SX	LE N		GRUS AMERICANA	WHOOPIING CRANE
G5	S2S3	N LS		AJAJA AJAJA	ROSEATE SPOONBILL	G5T2T3	S2S3	N LT		GRUS CANADENSIS PRATENSIS	FLORIDA SANDHILL CRANE
G4T3	S1	N N		AMMODRAMUS MARITIMUS FISHERI	LOUISIANA SEASIDE SPARROW	G5	S3	N LS		HAEMATOPUS PALLIATUS	AMERICAN OYSTERCATCHER
G4T2	S2	C2 LS		AMMODRAMUS MARITIMUS JUNCICOLUS	WAKULLA SEASIDE SPARROW	G3	S2S3	LE LT		HALIAETUS LEUCICEPHALUS	BALD EAGLE
G4T1	S1	LE LE		AMMODRAMUS MARITIMUS MIRABILIS	CAPE SABLE SEASIDE SPARROW	G5	S1	N N		HELMITHEROS VERNIVORUS	WORM-EATING WARBLER
G4TX	SX	LE LE		AMMODRAMUS MARITIMUS NIGRESCENS	DUSKY SEASIDE SPARROW	G5	S4	N N		IXOBRYCHUS EXILIS	LEAST BITTERN
G4T2Q	S2?	C2 N		AMMODRAMUS MARITIMUS PELOMOTUS	SHYRNA SEASIDE SPARROW	G5	S3?	N N		LATERALLUS JAMAICENSIS	BLACK RAIL
G4T2	S2	N LS		AMMODRAMUS MARITIMUS PENINSULAE	SCOTT'S SEASIDE SPARROW	G5	S2	LE LE		MYCTERIA AMERICANA	WOOD STORK
G4T1T2	S1S2	PE LE		AMMODRAMUS SAVANNARUM FLORIDANUS	FLORIDA GRASSHOPPER SPARROW	G5	S3?	N N		NYCTICORAX NYCTICORAX	BLACK-CROWNED NIGHT-HERON
G5	S1	N N		ANOUS STOLIDUS	BROWN NODDY	G5	S3?	N N		NYCTICORAX VIOLACEUS	YELLOW-CROWNED NIGHT-HERON
G5T3	S3	PT LT		APHELOCOMA COERULESCENS COERULESCENS	FLORIDA SCRUB JAY	G5	S3S4	N N		PANDION HALIAETUS	OSPREY
G5	S3	N LS		ARANEUS GUARAUNA	LIMPKIN	G5	S3	AC LS		PELECANUS OCCIDENTALIS	BROWN PELICAN
G5T2	S2	N N		ARDEA HERODIAS OCCIDENTALIS	GREAT WHITE HERON	G2	S2	LE LT		PICOIDES BOHEALIS	RED-COCKADED WOODPECKER
G5T3	S3	N LS		ATHENE CUNICULARIA FLORIDANA	FLORIDA BUCKWING OWL	G5	S3?	N N		PICOIDES VILLOUS	HAIRY WOODPECKER
G4?	S3	N N		BUTEO BRACHYURUS	SHORT-TAILED HAWK	G5	S2	N N		PLEGADIS FALCINILLUS	GLOSSY IBIS
GH	SX	LE LE		CAMPEPHILUS PRINCIPALIS	IVORY-BILLED WOODPECKER	G5	S2	C2 LT		POLYBORUS PLANCUS	CRESTED CARACARA
G5	S4	N N		CASHERODIUS ALBUS	GREAT EGRET	G5T3	S3	C2 N		RALLUS LONGIROSTRIS INSULARUM	MANGROVE CLAPPER RAIL
G4?	S2	C2 LT		CHARADRIUS ALEXANDRINUS	SNOWY PLOVER	G5T3?	S3?	N N		RALLUS LONGIROSTRIS SCOTTII	FLORIDA CLAPPER RAIL
G2	S2	LT LT		CHARADRIUS MELODUS	PIPING PLOVER	G5	S1S2	N N		RECURVIRASTRA AMERICANA	AMERICAN AVOCET
G4	S3	N N		CHORDEILES GUNDLACHII	ANTILLEAN NIGHTHAWK	G4?	S1	LE LE		ROSTRHAMUS SOCIABILIS PLUMBEUS	FLORIDA SNAIL KITE
G5T3	S2	N LS		CISTOTHORUS PALUSTRIS CRISEUS	WORTHINGTON'S MARSH WREN	G5	S3	N N		RYNCHOPS NIGER	BLACK SKIMMER
G5T3	S3?	N LS		CISTOTHORUS PALUSTRIS MARIANAE	MARIAN'S MARSH WREN	G5	S3	N N		SEIURUS MOTACILLA	LOUISIANA WATERTHRUSH
G5	S3	N N		COCCYZUS MINOR	MANGROVE CUCKOO	G5	S3	N N		SETOPHAGA RUTICILLA	AMERICAN REDSTART
G3	S2	C2 LT		COLUMBA LEUCOCEPHALA	WHITE-CROWNED PIGEON	G5	S2	N N		SITTA CAROLINENSIS	WHITE-BREASTED NUTHATCH
GX	SX	N N		CONURUPHIS CAROLINENSIS	CAROLINA PARAKEET	G4	S3	N LT		STERNA ANTILLARUM	LEAST TERN
G5T3	S3	N N		DENDROICA DISCOLOR	FLORIDA PRAIRIE WARBLER	G5	S2?	N N		STERNA CASPIA	CASPIAN TERN
				PALUDICOLA		G3	S1	C1 LT		STERNA DOUGALLII	ROSEATE TERN
G5T3Q	S2S3	C2 N		DENDROICA DOMINICA STODDARDI	STODDARD'S YELLOW-THROATED WARBLER	G5	S1	N N		STERNA FUSCATA	SUOTY TERN
G1	S1	LE LE		DENDROICA KIRTLANDII	KIRTLAND'S WARBLER	G5	S3	N N		STERNA MAXIMA	ROYAL TERN
						G4?	S2	N N		STERNA SANDVICENSIS	SANDWICH TERN
						GH	SH	LE LE		VERMIVORA BACHMANII	BACHMAN'S WARBLER
						G5	S3	N N		VIREO ALTILOQUUS	BLACK-WHISKERED VIREO
						G4?	SX	N N		ZENAIDA AURITA	ZENAIDA DOVE

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MAMMALS			
C4	8X	LE N	BISON BISON
C5T1	81	C2 L8	BLARINA BREVICAUDA SHERMANI
C4	8X	LE N	CANIS LUPUS
CH	8X	LE N	CANIS RUFUS
G5	83	N N	EPTESICUS FUSCUS
C5T2T	82T	C2 N	EUMOPS GLAUCINUS FLORIDANUS
C4T1	81	LE LE	FELIS CONCOLOR CORYI
C5THQ	8H	3A LE	GEOMYS PINETIS COFFI
G5	8U	LE N	LASIURUS CINEREUS
C5T1	81	C2 L8	MICROTUS PENNSYLVANICUS
CH	8H	LE N	DUKECAMPBELLI
C5T4	83T	N N	MONACHUS TROPICALIS
C5T3	83T	C2 N	MUSTELA FRENATA OLIVACEA
C5T2T	82T	C2 LT	MUSTELA FRENATA PININSULAE
C5T3	83	C2 N	MUSTELA VISON EVERGLADENSIS
C5T5	83	N N	MUSTELA VISON LUTENSIS
C2	81	LE LE	MUSTELA VISON MINK
G5	8H	N N	MYOTIS CRIBESCENS
G3	8H	LE LF	MYOTIS KEENII
C3T	83T	C2 N	MYOTIS SODALIS
C5T1	81	LE LE	NEOFIBER ALLENI
C5T1	81	LE LT	NEOTOMA FLORIDANA SMALLI
C2Q	82	C1 LE	ODOCOILEUS VIRGINIANUS
C5T1	81	C2 N	CLAVIUM
C5T1	81	C2 N	ORYZOMYS ARGENTATUS
C5T1	81	C2 L8	ORYZOMYS PALUSTRIS
C5T1	81	LE LE	PLANIROSTRIS
C5T1	81	C2 N	ORYZOMYS PALUSTRIS SANIBEL I
C5T1	81	C2 L8	PEROMYSCUS GOSSYPINUS
C5T1	81	C2 N	ALLAPATICOLA
C5T1	81	C2 L8	PEROMYSCUS GOSSYPINUS
C5T1	81	C2 L8	ANASTASIA
C5T1	81	LE LT	PEROMYSCUS GOSSYPINUS
C5T1	81	3A LE	RESTRICTUS
C5T1	81	LE LT	PEROMYSCUS POLIONOTUS
C5T1	81	3A LE	ALLOPHRYX
C5T1	81	LE LT	PEROMYSCUS POLIONOTUS
C4	83T	C2 N	DECOLORATUS
C3	83	C2 L8	PEROMYSCUS POLIONOTUS
C5T2T	82T	C2 LT	TRISSYLLEPSIS
C5T2	82	C2 LT	PLECOTUS RAFINESQUII
C5T3	83	C2 L8	PODOMYS FLORIDANUS
C5T2	82	C2 LT	PROCYON LOTOR AUSPICATUS
C5T3	83	C2 L8	SCIURUS NIGER AVICENNIA
C5T2	82	3C N	SCIURUS NIGER SHERMANI
C5T1T2	81T2	C2 N	SIGMODON HISPIDUS EXSPUTUS
C5T1	81	C2 L8	SIGMODON HISPIDUS
C5T4	84	N N	INSULICOLA
			BOREX LONGIROSTRIS LIONIS
			BOREX LONGIROSTRIS
			LONGIROSTRIS

GLOBAL/STATE RANK	FED/ST STATUS	NAME	COMMON NAME
G5	81	N L8	TAMIAS STRIATUS
C2T	82T	LE LE	TRICHECHUS MANATUS
C5T3	83	C2 LT	URBUS AMERICANUS FLORIDANUS
			EASTERN CHIPMUNK
			WEST INDIAN MANATEE
			FLORIDA BLACK BEAR

FLORIDA NATURAL AREAS INVENTORY

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GLOBAL/STATE RANK	FED/ST STATUS	NAME	COMMON NAME
PORIFERA			
U	U	C2 N	DOSILIA PALMERI
U	U	C2 N	EPHYDRIA SUBTILIS
			OKLAHAMA SPONGE
			KISSIMEE SPONGE

CNIDARIA: ANTHOZOA

U	U	N N	ACROPORA CERVICORNIS	STAGHORN CORAL
U	U	N N	ACROPORA PALMATA	ELKHORN CORAL
U	U	N N	ACROPORA PROLIFERA	STAGHORN CORAL
U	U	N N	AGARICIA AGARICITES	LETTUCE CORAL
U	U	N N	COLPOPHYLLIA NATANS	GIANT BRAIN CORAL
U	U	N N	DENDROCYRA CYLINDRUS	PILLAR CORAL
U	U	N N	DIPLORIA CLIVOSA	BRAIN CORAL
U	U	N N	DIPLORIA LABYRINTHIFORMIS	BRAIN CORAL
U	U	N N	DIPLORIA STRIGOSA	BRAIN CORAL
U	U	N N	EUSMILIA FASTIGIATA	FLOWER CORAL
U	U	N N	MEANDRINA MEANDRITES	BRAIN CORAL
U	U	N N	MONTASTREA ANNULARIS	SMALL STAR CORAL
U	U	N N	MONTASTREA CAVERNOSA	LARGE STAR CORAL
U	U	N N	MUSSA ANGULOSA	LARGE FLOWER CORAL
U	U	N N	SIDERASTREA SIDEREA	STARLET CORAL

MOLLUSCA: GASTROPODA

U	U	N N	AMNICOLA SP 1	BLUE SPRING APHAOSTRACON
G1	S1	C2 N	APHAOSTRACON ASTHENES	LOOSE-COILED SNAIL
G1	S1	N N	APHAOSTRACON CHALAROCYRUS	WEKIWA SPRING
G1	S1	C2 N	APHAOSTRACON MONAS	APHAOSTRACON
G1	S1	C2 N	APHAOSTRACON PYCNUS	THICK-SHELLED
G1	S1	N N	APHAOSTRACON THEIOCRENETUS	APHAOSTRACON
G1	S1	C2 N	APHAOSTRACON XYNOELICTUS	SULFUR SPRING
G1	S1	C2 N	CINCINNATIA HELICOGYRA	APHAOSTRACON
G1	S1	C2 N	CINCINNATIA MICA	HELICOID SPRING SNAIL
G1	S1	C2 N	CINCINNATIA MONROENSIS	SAND GRAIN SNAIL
G1	S1	C2 N	CINCINNATIA PARVA	ENTERPRISE SPRING SNAIL
G1	S1	C2 N	CINCINNATIA PONDEROSA	BLUE SPRING SNAIL
G1	S1	C2 N	CINCINNATIA VANHYNINGI	PONDEROSA SPRING SNAIL
G1	S1	C2 N	CINCINNATIA WEKIWA	SEMINOLE SPRING SNAIL
U	U	N N	DRYMAEUS MULTILINEATUS FORM	WEKIWA SPRING SNAIL
U	U	N N	ELIMIA ALBANYENSIS	WIDE-BANDED FOREST SNAIL
G2	S2	N N	ELIMIA CLENCHI	CLENCH'S ELIMIA

GLOBAL/STATE RANK		FED/ST STATUS	NAME	COMMON NAME
U	S2	N L8	LIGUUS FASCIATUS MATECUMBENSIS	FLORIDA TREE SNAIL
U	S1	N L8	LIGUUS FASCIATUS SEPTENTRIONALIS	FLORIDA TREE SNAIL
U	S1	N L8	LIGUUS FASCIATUS SOLIDUS	FLORIDA TREE SNAIL
G3	S3	N N	ORTHALICUS FLORIDENSIS	BANDED TREE SNAIL
G2T2	S2	N N	ORTHALICUS RESES MESODRYAS	FLORIDA KEYS TREE SNAIL
G2T1	S1	LT LT	ORTHALICUS RESES RESES	STOCK ISLAND TREE SNAIL
U	U	G2 N	VERTIGO NEBARDI	

MOLLUSCA: BIVALVIA

U	U	C2 N	ALASHIDONTA WRIGHTIANA	A MUSSEL
G2	S2	N N	LAMPSILIS HADDLETONI	HADDLETON'S LAMPSILID
				CLAM
G3?	S3?	N N	PANOPEA BITRUNCATA	ATLANTIC GEODUCK
G2	S2	N N	PTYCHOBRANCHUS JONESI	JONES' LAMPSILID CLAM
G2	S2	C2 N	VILLOSA CHOCTAWENSIS	ATHEARN'S VILLOSA

ARACHNIDA: AMBLYPYGI

U	U	N N	PARAPHRYNUS RAPTOR	DUSKY-HANDED TAILLESS WHIP SCORPION
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ARACHNIDA: ARANEAE

U	U	C2 N	CEGONIA IRVINGI	KEY GNAPHOSID SPIDER
U	U	C2 N	CYCLOCOSMIA TORREYA	TORREYA TRAP-DOOR SPIDER
U	U	N N	EUSTALA ELEUTHRA	ORB WEAVER
U	U	N N	GEOLYCOSA XERA	MCCRONE'S BURROWING WOLF SPIDER
U	U	N N	HABROCESTUM PARVULUM	JUMPING SPIDER
U	U	N N	LATRODECTUS BISHOPI	RED WIDOW SPIDER
U	U	C2 N	LYCOSA ERICETICOLA	ROSEMARY WOLF SPIDER
U	U	N N	PHIDIPPUS XERUS	JUMPING SPIDER
U	U	C2 N	SOSIPPUS PLACIDUS	LAKE PLACID FUNNEL WOLF SPIDER
U	U	N N	SPHODROS ABBOTI	PURSE-WEB SPIDER
U	U	N N	UMMIDIA SP 1	

MALACOSTRACA: DECAPODA

G4	S364	N N	ARATUS PISONII	MANGROVE CRAB
G2	S2	N N	CAMBARUS CRYPTODYTES	DOUGHERTY PLAIN CAVE CRAYFISH

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SPECIAL INVERTEBRATES LIST

GLOBAL/STATE RANK	FED/ST STATUS	NAME	COMMON NAME	GLOBAL/STATE RANK	FED/ST STATUS	NAME	COMMON NAME
U	U	N N	COLPOCEPHALUM OCCIDENTALIS	U	U	C2 N	ATAENIUS WOODRUFFI
U	U	N N	COLPOCEPHALUM POLYBURI				WOODRUFF'S ATAENIUS DUNG
U	U	N N	COLPOCEPHALUM SCALARIFORME	U	U	N N	BOLBOCEROSOMA HAMATUM
U	U	N N	COLPOCEPHALUM SPINEUM	U	U	C2 N	COPRIS GOPHERI
U	U	N N	CRASPEDORRHYNCHUS HALIETI				SCARAB BEETLE
U	U	N N	CRASPEDORRHYNCHUS OBSCURUS	U	U	N N	COPRIS HOWDENI
U	U	N N	DEGEERIELLA DISCOCEPHALUS	U	U	N N	COTINIS SP 1
U	U	N N	DEGEERIELLA RUFA CARRUTHI	U	U	N N	CREMASTHOCEILUS
U	U	N N	ESTHIUPTERUM BREVICEPHALUM				SQUAMULOSUS
U	U	N N	FALCOLIPEURUS JOSEPHI	U	U	C2 N	CYCLOCEPHALA MIAMIENSIS
U	U	N N	FALCOLIPEURUS				MIAMI ROUNDHEAD SCARAB
U	U	N N	QUADRIGUTTATUS				BEETLE
U	U	N N	FELICOLA SP 1	U	U	C2 N	DESMOPACHRIA CENCHRAMIS
U	U	N N	FREGATIELLA AURIFASCIATA	U	U	N N	DIPLOTAXIS RUFA
U	U	N N	GRUINENOPON CANADENSE	U	U	N N	EUCANTHUS ALUTACEUS
U	U	N N	HELEONOMUS ASSINILIS	U	U	C2 N	GRONOCARUS MULTISPINOSUS
U	U	N N	KURODAIA HALIAETI				SPINY FLORIDA SANDHILL
U	U	N N	NEOPHILOPTERUS HETEROPYGUS	U	U	N N	HYPOTRICHIA SP18SIPES
U	U	N N	PECTINOPYGUS FREGATIPHAGUS	U	U	C2 N	MICRONASPIS FLORIDANA
U	U	N N	PECTINOPYGUS OCCIDENTALIS				FLORIDA INTERTIDAL
U	U	N N	PIAGETIELLA BURSAEPELECANI				FIREFLY
U	U	N N	QUADRACEPS AURATUS	U	U	N N	MYCOTRUPES CARTWRIGHTI
U	U	N N	QUADRACEPS GIEBELI	U	U	N N	MYCOTRUPES CAIGEI
U	U	N N	QUADRACEPS MYCHTHEMERUS	U	U	C2 N	MYCOTRUPES PEDESTER
U	U	N N	SAEMUNDSSONIA HAEMATOPHI				SCARAB BEETLE
U	U	N N	SAEMUNDSSONIA	U	U	C2 N	NICROPHORUS AMERICANUS
U	U	N N	MELANOCEPHALUS	U	U	N N	ONTHOPHAGUS ACICULATULUS
			TRICHODECTES PINGUIS	U	U	C2 N	ONTHOPHAGUS POLYPHEMI
			EUARCTIDOS				POLYPHEMI
				U	U	C2 N	ONTHOPHAGUS POLYPHEMI
							SPARSISETOSUS
				U	U	N N	PELTOTRUPES PROFUNDUS
				U	U	C2 N	PELTOTRUPES YOUNGI
							SCARAB BEETLE
							OCALA BURROWING SCARAB
							BEETLE
				U	U	C2 N	PHOTURIS BRUNNIPENNIS
							FLORIDANA
				U	U	C2 N	PHOTURIS SP 1
				U	U	N N	PHYLLOPHAGA ELIZORIA
				U	U	N N	PHYLLOPHAGA ELONGATA
				U	U	N N	PHYLLOPHAGA OKEECHOBEEA
				U	U	N N	PHYLLOPHAGA OVALIS
				U	U	N N	PHYLLOPHAGA PANORPA
				U	U	N N	PHYLLOPHAGA YOUNGI
				U	U	C2 N	POLYLAMINA PUBESCENS
							WOOLY GULF DUNE SCARAB
							BEETLE
				U	U	N N	PSEUDATAENIUS WALTHERHORNII
				U	U	N N	RUTELA FORMOSA
				U	U	N N	SERICA DELICATA
				U	U	C2 N	SERICA FROSTI
							FROST'S SPRING SERICAN
							SCARAB BEETLE
				U	U	N N	SERICA PUSILLA
				U	U	N N	SERICA RHYPHA
				U	U	C2 N	SERICA TANTULA
							TANTULA SERICAN SCARAB
							BEETLE
				U	U	C2 N	TRIGONOPELTASTES FLORIDANA
							SCRUB PALMETTO FLOWER
				U	U	C2 N	TROX HOWELLI
							SCARAB BEETLE
							CARACARA COMMENSAL SCARAB
							BEETLE

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GLOBAL/STATE RANK	FED/ST STATUS	NAME	COMMON NAME	GLOBAL/STATE RANK	FED/ST STATUS	NAME	COMMON NAME	
INSECTA: TRICHOPTERA				INSECTA: DIPTERA				
U	U	N N	AGARODES LIBALIS	U	U	C2 N	HEMIARGUS THOMASI	MIAMI BLUE BUTTERFLY
U	U	C2 N	AGARODES ZICZAC	G4?T3? SA	N N		BETHUNE-BAKERI	
U	U	C2 N	CERACLEA FLORIDANA	G4?T1 S1	LE LE		HERACLIDES ANDRAEMON	BAHAMAN SWALLOWTAIL
U	U	N N	CERNOTINA TRUNCATA	U	U	3C N	DONHOTEI	
U	U	N N	CHEUMATOPSYCHE PETERSI	U	U	C2 N	HERACLIDES ARISTODEMUS	SCHAUS' SWALLOWTAIL
U	U	N N	CHIMARRA FLORIDA	U	U	C2 N	PONCEANUS	
U	U	N N	HYDROPTILA BERNERI	U	U	N N	MITOURA HESSELI	HESSEL'S HAIRSTREAK
U	U	N N	HYDROPTILA HOLSONAE	U	U	C2 N	PROSERPINUS CAURAL	BUTTERFLY
U	U	N N	NEOTRICHIA ELEROBI	U	U	C2 N	PYREFEKRA CEROMATICA	CAURA SPHINX
U	U	C2 N	OCHROTRICHIA PROVOSTI	U	U	C2 N	STRYMON ACIS BARTRAMI	CEROMATIC NOCTUID MOTH
U	U	N N	OECETIS DAYTONA					BARTRAM'S HAIRSTREAK
U	U	C2 N	OECETIS PARVA					
U	U	N N	OECETIS PRATELIA					
U	U	N N	ORTHOTRICHIA CURTA					
U	U	N N	ORTHOTRICHIA DENTATA					
U	U	N N	ORTHOTRICHIA INSTABILIS					
U	U	C2 N	OXYETHIRA FLORIDA					
U	U	N N	OXYETHIRA NOVASOTA					
U	U	N N	OXYETHIRA JANELLA					
U	U	N N	TRIAENODES FLORIDA					
U	U	N N	TRIAENODES FURCELLA					
U	U	C2 N	TRIAENODES TRIDONTA					
INSECTA: LEPIDOPTERA								
U	U	C2 N	ANAEA FLORIDALIS					
U	U	N N	CHLOROSTRYMON MAESITES					
U	S1	C2 N	EUMAEUS ATALA FLORIDA					
U	U	N N	EUNICA TATILA TATILISTA					

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FLORIDA NATURAL COMMUNITIES

Terrestrial

Lands not regularly inundated or saturated and characterized by upland vegetation.

- Scrub - old dune with deep fine white sand substrate; xeric; subtropical; occasional or rare fire; vegetation characterized by sand pine and/or scrub oaks and/or rosemary and cladonia.
- Sandhill - upland with deep sand substrate; xeric; temperate; annual or frequent fire; vegetation characterized by longleaf pine and/or turkey oak with wiregrass understory.
- Xeric Hammock - upland with deep sand substrate; xeric-mesic; subtropical or temperate; rare or no fire; vegetation characterized by live oak.
- Upland Pine Forest - upland with sand substrate; mesic-xeric; temperate; frequent or occasional fire; vegetation characterized by shortleaf pine and/or loblolly pine and/or longleaf pine and red oak and wiregrass.
- Upland Mixed Forest - upland with sand/clay substrate; mesic; temperate; rare or no fire; vegetation characterized by loblolly pine and/or shortleaf pine and/or laurel oak and/or magnolia and spruce pine and/or mixed hardwoods.
- Upland Hardwood Forest - upland with clay substrate; mesic; temperate; rare or no fire; vegetation characterized by spruce pine, magnolia, beech, pignut hickory, white oak, and mixed hardwoods.
- Slope Forest - steep slope on bluff or in sheltered ravine; sand/clay substrate; mesic-hydric; temperate; rare or no fire; vegetation characterized by magnolia, beech, spruce pine, Shumard oak, Florida maple, pyramid magnolia, and mixed hardwoods.
- Mesic Flatwoods - flatland with sand substrate; mesic; subtropical; frequent fire; vegetation characterized by slash pine or longleaf pine with saw palmetto, gallberry and/or wiregrass understory.
- Scrubby Flatwoods - flatland with sand substrate; xeric-mesic; subtropical; occasional fire; vegetation characterized by longleaf pine or slash pine with scrub oaks and wiregrass understory.
- Pine Rockland - flatland with exposed limestone substrate; mesic-xeric; tropical; frequent fire; vegetation characterized by South Florida slash pine.

- Rockland Hammock - flatland with limestone substrate; mesic; tropical or subtropical; rare or no fire; vegetation characterized by mixed hardwoods.
- Dry Prairie - flatland with sand substrate; mesic-xeric; subtropical; annual or frequent fire; vegetation characterized by wiregrass, saw palmetto, and mixed grasses and herbs.
- Prairie Hammock - flatland with sand/organic soil over marl or limestone substrate; mesic; subtropical; occasional or rare fire; vegetation characterized by live oak and/or cabbage palm.
- Sinkhole - karst feature with steep limestone walls; mesic-hydric; tropical, subtropical, or temperate; no fire; vegetation characterized by ferns, herbs, shrubs, and hardwoods.
- Beach Dune - active coastal dune with sand substrate; xeric; tropical, subtropical or temperate; occasional or rare fire; marine influence; vegetation characterized by sea oats and/or mixed halophytic grasses and herbs.
- Coastal Strand - stabilized coastal dune with sand substrate; xeric; tropical, subtropical, or temperate; occasional or rare fire; marine influence; vegetation characterized by dense saw palmetto and/or seagrape and/or mixed stunted shrubs, yucca, and cacti.
- Maritime Hammock - stabilized coastal dune with sand substrate; xeric-mesic; tropical, subtropical, or temperate; rare or no fire; marine influence; vegetation characterized by mixed hardwoods and/or live oak.
- Overwash Plain - coastal flatland with sand substrate; mesic-hydric; tropical, subtropical, or temperate; frequent or occasional fire; marine influence; vegetation characterized by slash pine and/or cabbage palm or buttonwood and/or mixed halophytic shrubs and herbs.
- Coastal Berm - old bar or storm debris ridge with sand/shell substrate; xeric-mesic; tropical or subtropical; rare or no fire; marine influence; vegetation characterized by buttonwood, and/or mixed halophytic herbs, shrubs, and/or trees.
- Coastal Rock Barren - flatland with exposed limestone substrate; xeric; tropical; no fire; marine influence; vegetation characterized by algae and mixed halophytic herbs, and/or cacti and stunted shrubs.
- Shell Mound - Indian midden with shell substrate; xeric-mesic; tropical or subtropical; rare or no fire; marine influence; vegetation characterized by mixed hardwoods.
- Upland Glade - upland with calcareous rock and/or clay substrate; hydric-xeric; temperate; vegetation characterized by sparse mixed grasses and herbs with occasional stunted trees and shrubs.
- Bluff - steep slope with rock, sand, and/or clay substrate; hydric-xeric; temperate; sparse vegetation characterized by mixed grasses, herbs, and shrubs.

FLORIDA NATURAL COMMUNITIES

Palustrine

Lands regularly inundated or saturated by freshwater and characterized by wetland vegetation.

- Bottomland Forest** - flatland with sand/clay/organic substrate; occasionally inundated; temperate; rare or no fire; vegetation characterized by water oak, red maple, beech, magnolia, tuliptree, sweetgum, bays, cabbage palm, and mixed hardwoods.
- Floodplain Forest** - floodplain with alluvial substrate of sand, silt, clay or organic soil; seasonally inundated; subtropical or temperate; rare or no fire; vegetation characterized by diamondleaf oak, overcup oak, water oak, swamp chestnut oak, blue palmetto, cane, and mixed hardwoods.
- Floodplain Swamp** - floodplain with organic/alluvial substrate; usually inundated; subtropical or temperate; rare or no fire; vegetation characterized by cypress, tupelo, blackgum, and/or pop ash.
- Freshwater Tidal Swamp** - rivermouth wetland; organic soil with extensive root mat; inundated with freshwater in response to tidal cycles; rare or no fire; vegetation characterized by cypress, bays, cabbage palm, gums, and/or cedars.
- Floodplain Marsh** - floodplain with organic/sand/alluvial substrate; seasonally inundated; subtropical; frequent or occasional fire; vegetation characterized by maidencane, pickerel weed, sagittaria, buttonbush, and mixed emergents.
- Strand Swamp** - broad, shallow channel with peat over mineral substrate; seasonally inundated; flowing water; tropical or subtropical; occasional or rare fire; vegetation characterized by cypress and/or willow.
- Slough** - broad, shallow channel with peat over mineral substrate; usually inundated; flowing water; tropical or subtropical; rare or no fire; vegetation characterized by pop ash and/or pond apple or waterlily.
- Swale** - broad, shallow channel with sand/peat substrate; seasonally inundated; flowing water; tropical or subtropical; frequent or occasional fire; vegetation characterized by maidencane, pickerel weed, and/or mixed emergents.
- Dome** - rounded depression in sand/limestone substrate with peat accumulating toward center; seasonally inundated; still water; tropical, subtropical, or temperate; occasional or rare fire; woody vegetation tallest in center, characterized by cypress, blackgum, or bays.

- Depression Marsh** - rounded depression in sand substrate with peat accumulating toward center; seasonally inundated; still water; tropical, subtropical, or temperate; frequent or occasional fire; vegetation in concentric bands, characterized by maidencane, fire flag, pickerel weed, and mixed emergents.
- Basin Swamp** - basin with peat substrate; seasonally inundated; still water; subtropical or temperate; occasional or rare fire; vegetation characterized by cypress, blackgum, bays and/or mixed hardwoods.
- Basin Marsh** - basin with peat substrate; seasonally inundated; temperate or subtropical; frequent fire; vegetation characterized by sawgrass and/or cattail and/or buttonbush and/or mixed emergents.
- Baygall** - wetland at base of slope with peat substrate; maintained by downslope seepage--usually saturated, occasionally inundated; subtropical or temperate; rare or no fire; vegetation characterized by bays and/or dahoon holly and/or red maple and/or mixed hardwoods.
- Bog** - wetland on deep peat substrate; maintained by capillary action--soil usually saturated, occasionally inundated; subtropical or temperate; rare fire; vegetation characterized by sphagnum moss and titi and/or bays and/or dahoon holly, and/or mixed hydrophytic shrubs.
- Seepage Slope** - wetland on or at base of slope with organic/sand substrate; maintained by downslope seepage--usually saturated, but rarely inundated; subtropical or temperate; frequent or occasional fire; vegetation characterized by sphagnum moss with pond pine and/or mixed grasses and herbs or mixed hydrophytic shrubs.
- Wet Prairie** - flatland with sand substrate; seasonally inundated; subtropical or temperate; annual or frequent fire; vegetation characterized by maidencane, beakrush, spikerush, wiregrass, St. John's Wort, mixed herbs.
- Marl Prairie** - flatland with marl over limestone substrate; seasonally inundated; tropical; frequent to no fire; vegetation characterized by sawgrass, spikerush, and/or mixed grasses, sometimes with dwarf cypress.
- Wet Flatwoods** - flatland with sand substrate; seasonally inundated; subtropical or temperate; frequent fire; vegetation characterized by slash pine or pond pine and/or cabbage palm with mixed grasses and herbs.
- Hydric Hammock** - lowland with sand/clay/organic soil, often over limestone; mesic-hydric; subtropical or temperate; rare or no fire; vegetation characterized by water oak, cabbage palm, red cedar, red maple, bays, hackberry, hornbeam, blackgum, needle palm, and mixed hardwoods.

FLORIDA NATURAL COMMUNITIES

Lacustrine

Lentic waters of natural topographic depressions. Emergent vegetation is confined to the perimeter, if present; floating and submersed aquatics may be found throughout.

- Clastic Upland Lake** - generally irregular basin in clay uplands; predominantly with inflows, frequently without surface outflow; clay or organic substrate; characteristically colored, acidic, soft water with low mineral content (sodium, chloride, sulfate); oligo-mesotrophic to eutrophic.
- Sandhill Upland Lake** - generally rounded solution depression in deep sandy uplands or sandy uplands shallowly underlain by limestone; predominantly without surface inflows/outflows; typically sand substrate with organic accumulations toward middle; characteristically clear, acidic, moderately soft water with varying mineral content; ultra-oligotrophic to mesotrophic.
- Flatwood/Prairie Lake** - generally shallow basin in flatlands with high water table; frequently with a broad littoral zone; still water or flow-through; sand or peat substrate; variable water chemistry, but characteristically colored to clear, acidic to slightly alkaline, soft to moderately hard water with moderate mineral content (sodium, chloride, sulfate); oligo-mesotrophic to eutrophic.
- Marsh Lake** - generally shallow, open water area within wide expanses of freshwater marsh; still water or flow-through; peat, sand or clay substrate; occurs in most physiographic regions; variable water chemistry, but characteristically highly colored, acidic, soft water with moderate mineral content (sodium, chloride, sulfate); oligo-mesotrophic to eutrophic.

Swamp Lake

- generally shallow, open water area within basin swamps; still water or flow-through; peat, sand or clay substrate; occurs in most physiographic regions; variable water chemistry, but characteristically highly colored, acidic, soft water with moderate mineral content (sodium, chloride, sulfate); oligo-mesotrophic to eutrophic.

River Floodplain Lake

- meander scar, backwater, or larger flow-through body within major river floodplains; sand, alluvial or organic substrate; characteristically colored, alkaline or slightly acidic, hard or moderately hard water with high mineral content (sulfate, sodium, chloride, calcium, magnesium); mesotrophic to eutrophic.

Coastal Dune Lake

- basin or lagoon influenced by recent coastal processes; predominantly sand substrate with some organic matter; salinity variable among and within lakes, and subject to saltwater intrusion and storm surges; characteristically slightly acidic, hard water with high mineral content (sodium, chloride).

Coastal Rockland Lake

- shallow basin influenced by recent coastal processes; predominantly barren oolitic or Miami limestone substrate; salinity variable among and within lakes, and subject to saltwater intrusion, storm surges and evaporation (because of shallowness); characteristically slightly alkaline, hard water with high mineral content (sodium, chloride).

Sinkhole Lake

- typically deep, funnel-shaped depression in limestone base; occurs in most physiographic regions; predominantly without surface inflows/outflows, but frequently with connection to the aquifer; characteristically clear, alkaline, hard water with high mineral content (calcium, bicarbonate, magnesium).

FLORIDA NATURAL COMMUNITIES

Riverine

Natural lotic waters from the source of origin downstream to the limits of tidal influence and bounded by a channel bank.

- Seepage Stream - upper perennial or intermittent/seasonal watercourse characterized by clear to lightly colored water derived from shallow groundwater seepage
- Alluvial Stream - lower perennial or intermittent/seasonal watercourse characterized by turbid water with suspended silt, clay, sand and small gravel; generally with a distinct, sediment-derived (alluvial) floodplain and a sandy, elevated natural levee just inland from the bank
- Blackwater Stream - perennial or intermittent/seasonal watercourse characterized by tea-colored water with a high content of particulate and dissolved organic matter derived from drainage through swamps and marshes; generally lacking an alluvial floodplain
- Spring-run Stream - perennial watercourse with deep aquifer headwaters and characterized by clear water, circumneutral pH and, frequently, a solid limestone bottom

FLORIDA NATURAL COMMUNITIES

Subterranean

Twilight, middle and deep zones of natural chambers overlain by the earth's crust and characterized by climatic stability and assemblages of trogloneic, troglophilic, and troglotic organisms.

- Aquatic Cave- cavernicolous area permanently or periodically submerged; often characterized by troglotic crustaceans and salamanders; includes high energy systems which receive large quantities of organic detritus and low energy systems
- Terrestrial Cave - cavernicolous area lacking standing water; often characterized by bats, such as *Myotis*, and other terrestrial vertebrates and invertebrates; includes interstitial areas above standing water such as fissures in the ceiling of caves

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FLORIDA NATURAL COMMUNITIES

Marine

Subtidal, intertidal and supratidal zones of the sea, landward to the point at which seawater becomes significantly diluted with freshwater inflow from the land.

Estuarine

Subtidal, intertidal, and supratidal zones of a coastal body of water, usually semi-enclosed by land but with a connection to the open sea, within which seawater is significantly diluted with freshwater inflow from the land.

Consolidated Substrate

- expansive subtidal, intertidal and supratidal area composed primarily of nonliving compacted or coherent and relatively hard, naturally formed mass of mineral matter (e.g., coquina, limerock and relic reefs); octocorals, sponges, stony corals, nondrift macrophytic algae, blue-green mat-forming algae and seagrasses sparse, if present.

Unconsolidated Substrate

- expansive subtidal, intertidal and supratidal area composed primarily of loose mineral matter (e.g., coralgai, gravel, marl, mud, sand and shell); octocorals, sponges, stony corals, nondrift macrophytic algae, blue-green mat-forming algae and seagrasses sparse, if present.

Octocoral Bed

- expansive subtidal area occupied primarily by living sessile organisms of the Class Anthozoa, Subclass Octocorallia (e.g., soft corals, horny corals, sea fans, sea whips, and sea pens); sponges, stony corals, nondrift macrophytic algae and seagrasses sparse, if present.

Sponge Bed

- expansive subtidal area occupied primarily by living sessile organisms of the Phylum Porifera (e.g., sheepswal sponge, Florida loggerhead sponge and branching candle sponge); octocorals, stony corals, nondrift macrophytic algae and seagrasses sparse, if present.

Coral Reef

- expansive subtidal area with elevational gradient or relief and occupied primarily by living sessile organisms of the Class Hydrozoa (e.g., fire corals and hydrocorals) and Class Anthozoa, Subclass Zoantharia (e.g., stony corals and black corals); includes deepwater bank reefs, fringing barrier reefs, outer bank reefs and patch reefs, some of which may contain distinct zones of assorted macrophytes, octocorals, & sponges.

Mollusk Reef

- substantial subtidal or intertidal area with relief from concentrations of sessile organisms of the Phylum Mollusca, Class Bivalvia (e.g., molluscs, oysters, & worm shells); octocorals, sponges, stony corals, macrophytic algae and seagrasses sparse, if present.

Worm Reef

- substantial subtidal or intertidal area with relief from concentrations of sessile, tubicolous organisms of the Phylum Annelida, Class Polychaeta (e.g., chaetopterids and sabellariids); octocorals, sponges, stony corals, macrophytic algae and seagrasses sparse, if present.

Algal Bed

- expansive subtidal, intertidal or supratidal area, occupied primarily by attached thallophytic or mat-forming prokaryotic algae (e.g., halimeda, blue-green algae); octocorals, sponges, stony corals and seagrasses sparse, if present.

Grass Bed

- expansive subtidal or intertidal area, occupied primarily by rooted vascular macrophytes, (e.g., shoal grass, halophila, widgeon grass, manatee grass and turtle grass); may include various epiphytes and epifauna; octocorals, sponges, stony corals, and attached macrophytic algae sparse, if present.

Composite Substrate

- expansive subtidal, intertidal, or supratidal area, occupied primarily by Natural Community elements from more than one Natural Community category (e.g., Grass Bed and Algal Bed species; Octocoral and Algal Bed species); includes both patchy and evenly distributed occurrences.

Tidal Marsh

- expansive intertidal or supratidal area occupied primarily by rooted, emergent vascular macrophytes (e.g., cord grass, needlerush, saw grass, saltwort, saltgrass and glasswort); may include various epiphytes and epifauna.

Tidal Swamp

- expansive intertidal and supratidal area occupied primarily by woody vascular macrophytes (e.g., black mangrove, buttonwood, red mangrove, and white mangrove); may include various epiphytes and epifauna.

DEFINITIONS OF TERMS

Terrestrial and Palustrine Natural Communities

Physiography

- Upland** - high area in region with significant topographic relief; generally undulating
- Lowland** - low area in region with or without significant topographic relief; generally flat to gently sloping
- Flatland** - generally level area in region without significant topographic relief; flat to gently sloping
- Basin** - large, relatively level lowland with slopes confined to the perimeter or isolated interior locations
- Depression** - small depression with sloping sides, deepest in center and progressively shallower towards the perimeter
- Floodplain** - lowland adjacent to a stream; topography influenced by recent fluvial processes
- Bottomland** - lowland not on active floodplain; sand/clay/organic substrate.

Hydrology

- occasionally inundated** - surface water present only after heavy rains and/or during flood stages
- seasonally inundated** - surface water present during wet season and flood periods
- usually inundated** - surface water present except during droughts

Climatic Affinity of the Flora

- tropical** - community generally occurs in practically frost-free areas
- subtropical** - community generally occurs in areas that experience occasional frost, but where freezing temperatures are not frequent enough to cause true winter dormancy
- temperate** - community generally occurs in areas that freeze often enough that vegetation goes into winter dormancy

Fire

- annual fire** - burns about every 1-2 years
- frequent fire** - burns about every 3-7 years
- occasional fire** - burns about every 8-25 years
- rare fire** - burns about every 26-100 years
- no fire** - community develops only when site goes more than 100 years without burning

VEGETATION

- anise** - Illicium floridanum
- bays** - swamp bay - Persea palustris
gordonia - Gordonia lasianthus
sweetbay - Magnolia virginiana
- beakrush** - Rhynchospora spp.
- beech** - Fagus grandifolia
- blackgum** - Nyssa biflora
- blue palmetto** - Sabal minor
- bluestem** - Andropogon spp.
- buttonbush** - Cephalanthus occidentalis
- cabbage palm** - Sabal palmetto
- cacti** - Opuntia and Cereus spp.,
predominantly stricta and
pentagonus
- cane** - Arundinaria gigantea or A. tecta
- cattail** - Typha spp.
- cedars** - red cedar - Juniperus silicicola
white cedar - Chamaecyparis thyoides or
C. henryi
- cladonia** - Cladonia spp.
- cypress** - Taxodium distichum
- dahoon holly** - Ilex cassine
- diamondleaf oak** - Quercus laurifolia
- fire flag** - Thalia geniculata
- Florida maple** - Acer barbatum
- gallberry** - Ilex glabra
- gums** - tupelo - Nyssa aquatica
blackgum - Nyssa biflora
Ogeechee gum - Nyssa ogeche
- hackberry** - Celtis laevigata
- hornbeam** - Carpinus caroliniana
- laurel oak** - Quercus hemisphaerica
- live oak** - Quercus virginiana
- loblolly pine** - Pinus taeda
- longleaf pine** - Pinus palustris
- magnolia** - Magnolia grandiflora
- maidencane** - Panicum hemitomon
- needle palm** - Rapidophyllum hystrix
- overcup oak** - Quercus lyrata
- pickerel weed** - Pontederia cordata or
P. lanceolata
- pignut hickory** - Carya glabra
- pop ash** - Fraxinus caroliniana
- pond apple** - Annona glabra
- pond pine** - Pinus serotina
- pyramid magnolia** - Magnolia pyramidata
- railroad vine** - Ipomoea pes-caprae
- red cedar** - Juniperus silicicola
- red maple** - Acer rubrum
- red oak** - Quercus falcata
- rosemary** - Ceratiola ericoides
- sagittaria** - Sagittaria lancifolia
- sand pine** - Pinus clausa
- saw palmetto** - Serenoa repens
- sawgrass** - Cladium jamaicensis
- scrub oaks** - Quercus geminata, Q. chapmani, Q. myrtifolia,
Q. inopina
- sea oats** - Uniola paniculata
- seagrape** - Coccoloba uvifera
- shortleaf pine** - Pinus echinata
- Shumard oak** - Quercus shumardii
- slash pine** - Pinus elliottii
- sphagnum moss** - Sphagnum spp.
- spikerush** - Eleocharis spp.
- spruce pine** - Pinus glabra
- St. John's wort** - Hypericum spp.
- swamp chestnut oak** - Quercus prinus
- sweetgum** - Liquidambar styraciflua
- titi** - Cyrilla racemiflora
- tuliptree** - Liriodendron tulipifera
- tupelo** - Nyssa aquatica
- turkey oak** - Quercus laevis
- water oak** - Quercus nigra
- waterlily** - Nymphaea odorata
- white cedar** - Chamaecyparis thyoides
- white oak** - Quercus alba
- willow** - Salix caroliniana
- wiregrass** - Aristida stricta
- yucca** - Yucca aloifolia

FLORIDA NATURAL AREAS INVENTORY

MARCH 1986

NATURAL COMMUNITIES LIST

GLOBAL/STATE
RANK

NAME

TERRESTRIAL

G4	83	BEACH DUNE
G3	82	BLUFF
G3	82	COASTAL BERM
G3	81	COASTAL ROCK BARREN
G3	83	COASTAL STRAND
G2	82	DRY PRAIRIE
G4	83	MARITIME HAMMOCK
G5	85	MESIC FLATWOODS
G3	83	OVERWASH PLAIN
G2	81	PINE ROCKLAND
G4	84	PRAIRIE HAMMOCK
G3	82	ROCKLAND HAMMOCK
G4	83	SANDHILL
G3	82	SCRUB
G3	83	SCRUBBY FLATWOODS
G3	83	SHELL MOUND
G3	82	SINKHOLE
G3	82	SLOPE FOREST
G2	81	UPLAND GLADE
G4	83	UPLAND HARDWOOD FOREST
G4	84	UPLAND MIXED FOREST
G5	84	UPLAND PINE FOREST
G3	82	XERIC HAMMOCK

PALUSTRINE

G4	83	BASIN MARSH
G5	84	BASIN SWAMP
G4	84	BAYGALL
G4	83	BOC
G4	83	BOTTOMLAND FOREST
G5	85	DEPRESSION MARSH
G5	85	DOME
G4	84	FLOODPLAIN FOREST
G3	83	FLOODPLAIN MARSH
G4	84	FLOODPLAIN SWAMP
G3	83	FRESHWATER TIDAL SWAMP
G4	83	HYDRIC HAMMOCK
G4	83	MARL PRAIRIE
G4	83	SEEPAGE SLOPE
G5	85	SLOUGH
G4	84	STRAND SWAMP
G4	83	SWALE
G4	84	WET FLATWOODS
G5	84	WET PRAIRIE

GLOBAL/STATE
RANK

NAME

LACUSTRINE

G3	82	CLASTIC UPLAND LAKE
G2	81	COASTAL DUNE LAKE
G2	81	COASTAL ROCKLAND LAKE
G4	83	FLATWOOD/PRAIRIE LAKE
G4	84	MARSH LAKE
G4	82	RIVER FLOODPLAIN LAKE
G3	82	SANDHILL UPLAND LAKE
G3	83	SINKHOLE LAKE
G4	83	SWAMP LAKE

RIVERINE

G4	82	ALLUVIAL STREAM
G4	82	BLACKWATER STREAM
G4	82	SEEPAGE STREAM
G2	82	SPRING-RUN STREAM

ESTUARINE

G3	82	ESTUARINE ALCAL BED
G3	83	ESTUARINE COMPOSITE SUBSTRATE
G3	83	ESTUARINE CONSOLIDATED SUBSTRATE
G2	81	ESTUARINE CORAL REEF
G2	82	ESTUARINE GRASS BED
G3	83	ESTUARINE MOLLUSK REEF
G2	81	ESTUARINE OCTOCORAL BED
G2	82	ESTUARINE SPONGE BED
G4	84	ESTUARINE TIDAL MARSH
G3	83	ESTUARINE TIDAL SWAMP
G5	85	ESTUARINE UNCONSOLIDATED SUBSTRATE
G1	81	ESTUARINE WORM REEF

GLOBAL/STATE
RANK

NAME

MARINE

G3	82	MARINE ALCAL BED
G3	83	MARINE COMPOSITE SUBSTRATE
G3	83	MARINE CONSOLIDATED SUBSTRATE
G2	81	MARINE CORAL REEF
G2	82	MARINE GRASS BED
G3	83	MARINE MOLLUSK REEF
G2	81	MARINE OCTOCORAL BED
G2	82	MARINE SPONGE BED
G4	84	MARINE TIDAL MARSH
G3	83	MARINE TIDAL SWAMP
G5	85	MARINE UNCONSOLIDATED SUBSTRATE
G1	81	MARINE WORM REEF

SUBTERRANEAN

G3	82	AQUATIC CAVE
G3	81	TERRESTRIAL CAVE

BALD EAGLE

Haliaeetus leucocephalus (Linnaeus)Order: FalconiformesFamily: Accipitridae

Status: Endangered throughout the forty-eight conterminous States except for the populations in Washington, Oregon, Minnesota, Wisconsin, and Michigan, which are classified as threatened (Federal Register 3/11/67; 2/14/78).

Range: Found throughout the United States and northward to the Arctic. Nesting in the southeast is limited principally to peninsular Florida, and to a much lesser extent the coastal areas of Louisiana, Mississippi, and South Carolina. The birds occur elsewhere in the southeast as migrants, or rarely as nesting pairs.

Description: A large raptor, wingspread of about 7 feet, plumage mainly dark brown with pure white head and tail when adult. First year juveniles are often chocolate brown to blackish, sometimes with white mottling on the tail, belly, and underwings. The head and tail become increasingly white with age until full adult plumage is reached in the fifth or sixth year.

Reasons for Current Status: In some areas of the country, pesticide residues in eagles have apparently played a significant role in their decline. Studies have shown that high residue levels, particularly of dieldrin, have lowered reproductive success by rendering the egg shells thin and easily broken. In other locations, including large parts of Florida, the most significant factors have probably been loss of feeding and nesting sites, and human disturbance during the nesting period. Additional factors in the decline include illegal shooting, loss of nest trees, and electrocution.

Habitat: The bald eagle is primarily riparian, associated with coasts, rivers, and lakes, usually nesting near bodies of water where they feed. In Florida some interior pairs nest far from expanses of open water on marshes and ponds.

Selection of nesting sites varies tremendously depending on the species of trees growing in a particular area. Although the tops of tall trees, either living or dead, are generally preferred, bald eagles in Florida may even nest in small mangroves less than 20 feet above ground. Regardless of this large variation in sites, there are certain general elements which seem to be consistent. These include (1) the proximity of water (usually within a half mile) and a clear flight path to a close point on the water,

BALD EAGLE - H. leucocephalus

(2) the largest living tree in a span, and (3) an open view of the surrounding area. The proximity of good perching trees may also be a factor in site selection. An otherwise suitable site may not be used if there is excessive human activity in the area.

Bald eagles exhibit territorial behavior during the breeding season by showing aggressiveness toward other large birds, including eagles, which approach the vicinity of their nest. Territorial defense may begin 2 or 3 months before eggs are laid. Studies conducted in Alaska revealed territory sizes ranging from 28 to 112 acres and averaging 57 acres.

When nesting is finished and migration occurs, habitat requirements are somewhat altered. The birds are not as closely limited to shores at this time, with both adults and immatures gathering food where it is most easily available. Often immatures, as in the Everglades National Park, will fly inland at night to roost communally well away from coastal nesting areas.

Critical Habitat: None designated in Region 4.

Feeding Habits: Bald eagles are opportunistic feeders and will take a variety of vertebrate prey, both living and carrion, depending upon locality and food availability. When fish are abundant, they generally comprise the major part of the diet, and they are the item of choice if the birds have an opportunity for selection.

Reproduction and Development: The breeding season of bald eagles varies with latitude. The general tendency is for winter breeding in the South with a progressive shift toward spring breeding in northern locations. In Florida some breeding activity may occur almost year-round, except for perhaps in mid-summer.

The female does most of the nest construction with supplemental help being provided by the male. In some cases, eagles have been observed to take over the nests of other large birds, especially ospreys. Eagles may lay from 1 to 4 eggs, but the usual clutch size is 2 eggs. A second clutch may be laid if the first is lost. The incubation time is about 35 days, another 10 to 12 weeks are needed for fledging, and it requires 4 to 5 years for the birds to reach breeding age. The total life span is apparently quite long, since eagles have been known to live for 50 years in captivity.

Population Level: During 1975 and 1976, the number of breeding pairs in the lower 48 states was variously estimated at 700 to 1000. Eagle populations in Canada and Alaska are much higher and appear to be doing well; populations in the Southeast have been substantially reduced. As an example, one 1976 report indicates that the Florida population has declined by at least 50 percent in the last 30 years.

BALD EAGLE - H. leucocephalus

According to unpublished information, Louisiana had 13 active nests during the 1977-78 breeding season, and South Carolina about fourteen. One nesting pair resides in southern Mississippi near the point where Interstate Highway 10 crosses the Biloxi River, but the pair did not nest during 1977-78 apparently because of human disturbance. Recent estimates by various authorities place the number of active nests in Florida at slightly over 300.

Recovery Team: Mr. Thomas M. Murphy (Team Leader)
Wildlife and Marine Resources Department
Division of Game and Fresh Water Fisheries
Poco Sabo Plantation
Green Pond, South Carolina 29446
Telephone: 803/795-6350, Ext. 282

Recovery Plan: In preparation.

Other Management Activities/Recommendations: Protective measures instituted include legal and regulatory measures, captive rearing, and habitat protection and improvement. Bald eagles are protected by Federal laws which are enforced by both the Fish and Wildlife Service and State Game Departments; and their nest sites are protected under management programs on such Federal lands as national wildlife refuges and national forests.

The Patuxent Wildlife Research Center, Maryland, has on-going studies relating to captive rearing and environmental contaminants. The National Audubon Society is conducting investigations on bald eagle distribution, population status, breeding biology, and limiting factors. The Florida Audubon Society has obtained agreements with private land owners for 2,300,000 acres of land to be treated as sanctuaries.

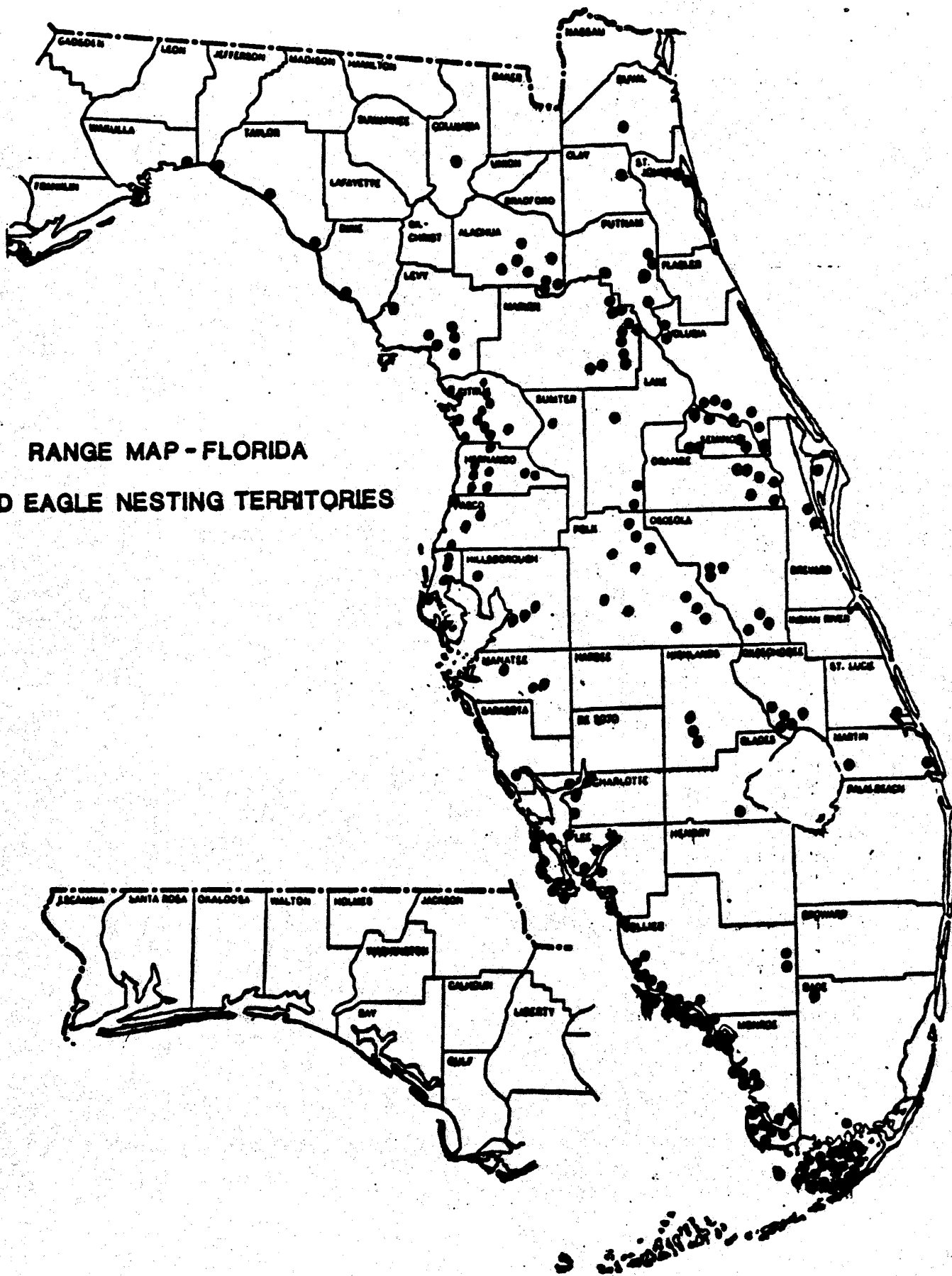
Proposed measures include continued surveys to determine nesting success and population trends; continued research on pesticide effects and other limiting factors; implementation of public information programs, and additional personal contacts with private land owners in bald eagle nesting areas to obtain their cooperation in protecting the eagles and their nests.

The National Wildlife Federation, aided by an Exxon Corporation grant, has set up a Raptor Information Center. An exhaustive, computerized bibliography of bald eagle information will be available early in 1978. Other objectives of the Center include: identify and protect habitat; increase communications and act as a literature clearing-house; and identify and encourage support of research and annual censusing. The Center will eventually be expanded to include all raptors.

References:

U.S. Department of Interior. 1977. Species accounts for Sensitive Wildlife Information System (SWIS). Fish and Wildlife Service, National Wildlife Laboratory, Gainesville, Florida.

RANGE MAP - FLORIDA
BALD EAGLE NESTING TERRITORIES



EASTERN INDIGO SNAKE

Drymarchon corais couperi

Order: Squamata

Family: Colubridae

Status: Threatened throughout its range (Federal Register 1/31/78).

Range: Currently known to occur in southeast Georgia, penninsular Florida into the lower Keys, and disjunctively in the Florida panhandle. Historically, the range also included southern Alabama, southern Mississippi, and the extreme southeastern portion of South Carolina.

Description: A large docile non-poisonous snake growing to a maximum length of about 8 feet. The color in both young and adults is shiny bluish-black, including the belly, with some red or cream coloring about the chin and sides of the head.

Reasons for Current Status: The decline is attributed to a loss of habitat due to such uses as farming, construction, forestry, pasture, etc., and to over-collecting for the pet trade. The snake's large size and docile nature have made it much sought after as a pet.

The effect of Rattlesnake Roundups on the indigo snake are speculative. Both indigos and rattlers utilize the burrows of gopher tortoises at certain times. Rattlesnake hunters often pour gasoline down these burrows to drive out the snakes. While some indigos may be killed by this practice, the actual degree of impact on the population is unknown.

Habitat: The indigo snake seems to be strongly associated with high, dry, well-drained sandy soils, closely paralleling the sandhill habitat preferred by the gopher tortoise; however, especially during the warmer months, indigos also frequent streams and swamps, and individuals are occasionally found in flat woods. Gopher tortoise burrows and other subterranean cavities are commonly used as dens and for egg laying.

Telemetry studies conducted near Tifton, Georgia, between September 1976 and June 1978 showed the home range for indigos to vary considerably according to the season. Averages for different periods were as follows: December-April, 12 acres; May-July, 107 acres; and August-November, 243 acres. The most extensive monthly movements occurred during August. Of a total of 108 den sites which were located, 77 percent were in gopher tortoise burrows, 18 percent were in or under decayed stumps and logs, and 5 percent were under plant debris. The study area included windrows of debris piled up in the 1960's during site preparation for a slash pine plantation. The snakes showed some tendency to prowl and locate their dens near these windrows.

Critical Habitat: None designated.

EASTERN INDIGO SNAKE - *D. c. couperi*

Feeding Habits: The indigo subdues its prey (including venomous snakes) through the use of its powerful jaws, swallowing the prey, usually still alive. Food items include snakes, frogs, salamanders, toads, small mammals, birds, and occasionally young turtles.

Reproduction and Development: Indigo snakes probably reach sexual maturity at three to four years of age. Based on observations of captive indigos at Auburn University, mating begins in November, peaks in December, and continues into March. Clutches averaging eight to nine eggs laid in late spring hatch approximately 16 weeks later. The snakes remain active to some degree throughout the winter, often emerging from their dens whenever air temperatures exceed 50 degrees F.

Recovery Team: None appointed.

Recovery Plan: None prepared.

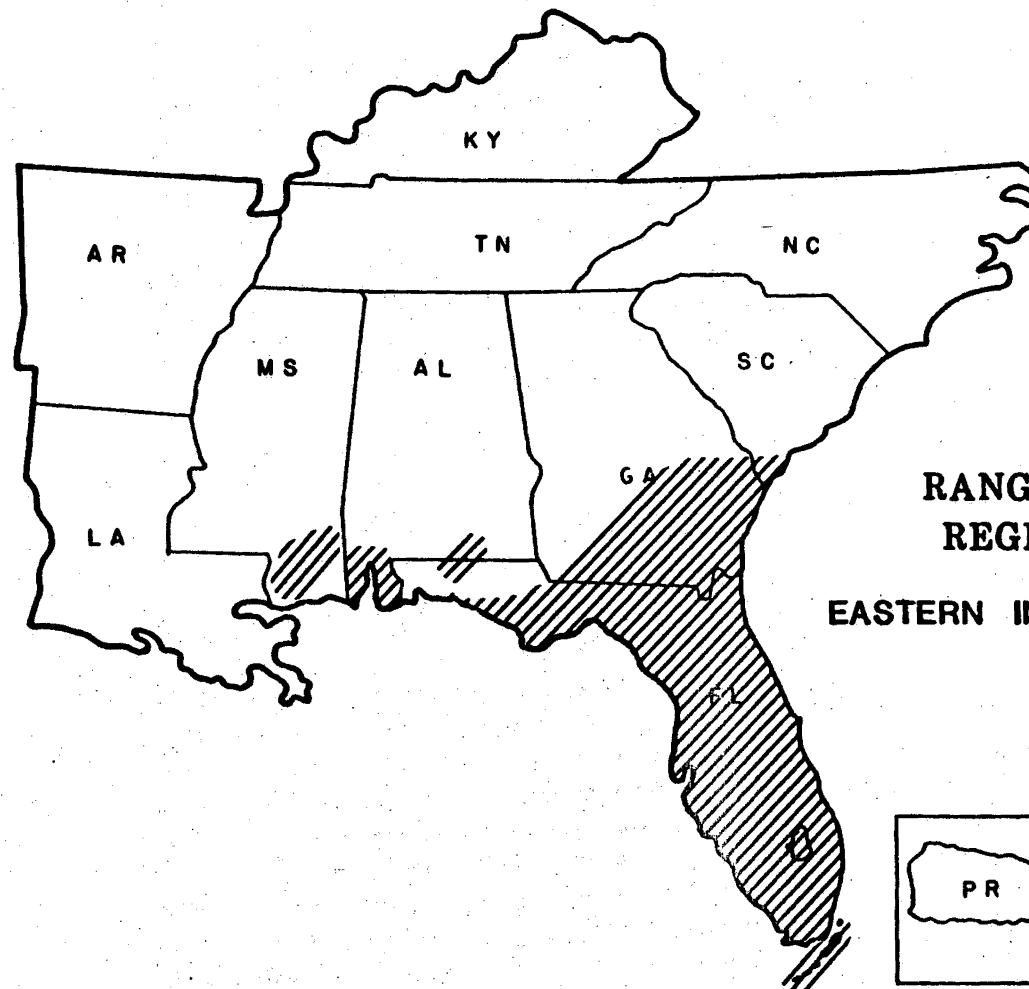
Other Management Activities/Recommendations: Measures suggested to improve the status of this species include: (1) identification and acquisition of prime habitat; (2) implementation of a public education program to encourage conservation of the species; (3) encouragement of beneficial forest management practices, where practical, to provide for what appears to be the most desirable habitat (i.e., fire sub-climax, burned every 15 to 20 years); (4) captive propagation and restocking; and (5) evaluation of other potentially limiting factors such as pesticides and gassing of burrows. Survey information is also needed to better define the indigo's range and true population level.

References:

Federal Register, Vol. 43, No. 21. January 31, 1978.

Odum, R. R., J. R. McCollum, M. A. Neville, and D. R. Ettman. 1977. Georgia's protected wildlife. Georgia Department of Natural Resources, Game and Fish Division. Social Circle, Georgia. 51 pp.

Speake, D. W., J. A. McGlincy, and T. R. Colvin. In press. Ecology and Management of the Eastern Indigo Snake in Georgia: A Progress Report. Presented at the Symposium on Rare and Endangered Vertebrates, Athens, Georgia. August 1978.



**RANGE MAP
REGION 4
EASTERN INDIGO SNAKE**

RED-COCKADED WOODPECKER

Picoides (=Dendrocopos) borealis (Vieillot)

Order: Piciformes

Family: Picidae

Status: Endangered (Federal Register 10/13/70).

Range: Presently found in scattered locations throughout the southeast; previous range slightly larger with more uniform distribution.

Description: Small woodpecker, 18 to 20 cm long, wing span 35 to 38 cm, black and white horizontal stripes on back, white cheeks and under parts, flanks black streaked. The cap and stripe on the side of the neck and the throat are black. The male has a small red spot on each side of the black cap.

Reasons for Current Status: The red-cockaded woodpecker was described by Audubon as being abundant in 1839, but it received little study until around 1970 when investigations began to indicate that the species could be headed for extinction. The decline is attributed primarily to the reduction of pine forest with trees sixty years old and older. Living pines in this age group infected with red-heart disease generally provide the specialized nesting sites which these woodpeckers require.

Habitat: The basic habitat requirement is for open stands of pines with a minimum age of 60 years. Longleaf pine (Pinus palustris) is most commonly used, but other species of southern pine are also acceptable. Dense stands, stands that are primarily hardwoods, or that have a dense understory are avoided.

Cavity excavation for roosting almost always occurs in living pines, and usually in those which are infected with a fungus producing what is known as red-heart disease. The average cavity tree age is nearly 100 years for longleaf and about 80 years for loblolly and other pines (Jackson et al. 1979b). A cavity tree area is referred to as a colony. There may be a number of cavities in the colony and up to seven or eight woodpeckers in the immediate area, but there will be only one breeding pair in the group. Completed cavities in active use usually have numerous small surrounding excavations which exude sap. The birds keep the sap flowing apparently as a cavity defense mechanism against rat snakes and possibly other predators. The home range for a clan (a family unit) averages about 200 acres, but observers have reported home ranges running from a low of around 100 acres in good habitat, to an upper extreme of more than a thousand in very poor habitat.

Critical Habitat: None designated.

RED-COCKADED WOODPECKER - P. borealis

Feeding Habits: The diet consists mainly of insects which include ants, beetles, grasshoppers, wood-boring insects, caterpillars, and corn ear worms if available; and to a lesser extent, seasonal wild fruits (about 16 to 19 percent of the diet).

Reproduction and Development: Egg laying occurs during April, May, and June with the female utilizing her mate's roosting cavity for a nest. Maximum clutch size is seven eggs with the average being three to five eggs. From egg laying to fledging requires about thirty-eight days, and then another several weeks are needed before the young become completely independent. Most often the parent birds and some of their offspring from previous years form a family unit called a clan, and rearing the new birds becomes a shared responsibility of the clan. However, single pairs may also breed successfully without the benefit of these "helpers".

Population Level: Estimated at 3,000 to 10,000.

Recovery Plan: Completed (1979).

Management (Activities, Recommendations, Implications): The recovery plan provides recommendations as very briefly outlined below:

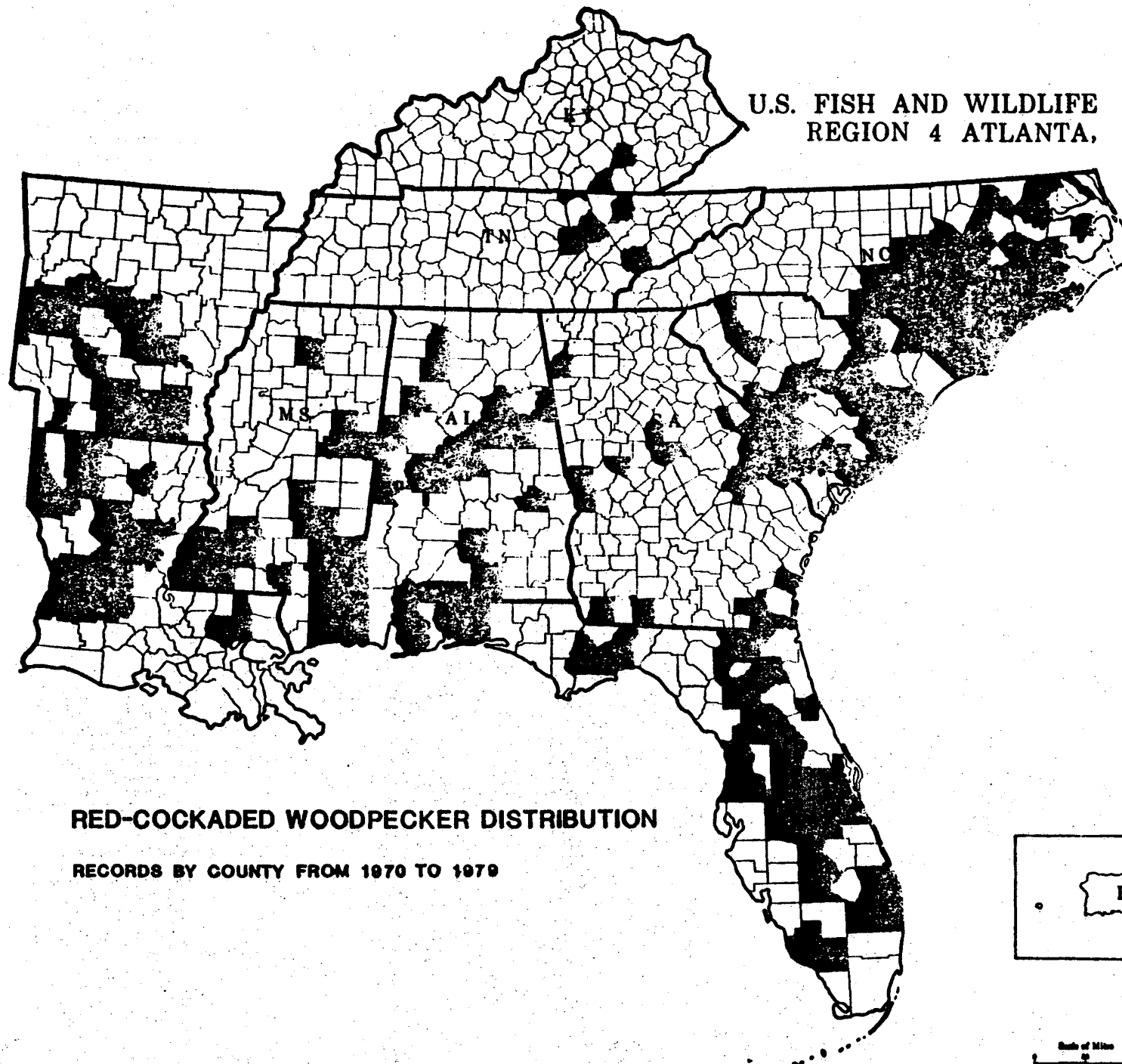
1. Identify extant populations and maintain a file of this information.
2. Protect extant populations when possible and encourage beneficial management on both private and public lands.
3. Attempt reestablishment of populations where the birds have been extirpated, but where suitable habitat still exists.
4. Link existing populations with habitat corridors to allow population expansion and reunion of fragmented segments of the gene pool.

A cooperative range-wide population survey involving both Federal and State agencies is scheduled to begin in the fall of 1980 and be completed by the fall of 1982.

References:

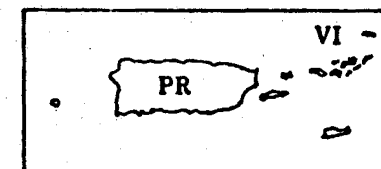
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- Jackson, J.A., M.R. Lennartz, and R.C. Hooper. 1979b. Tree age and cavity initiation by red-cockaded woodpeckers. J. Forestry. 77:102-103.
- U.S. Department of Interior. 1977. Species accounts for Sensitive Wildlife Information System (SWIS). Fish and Wildlife Service, National Wildlife Laboratory, Gainesville, Florida.

U.S. FISH AND WILDLIFE SERVICE
REGION 4 ATLANTA, GA

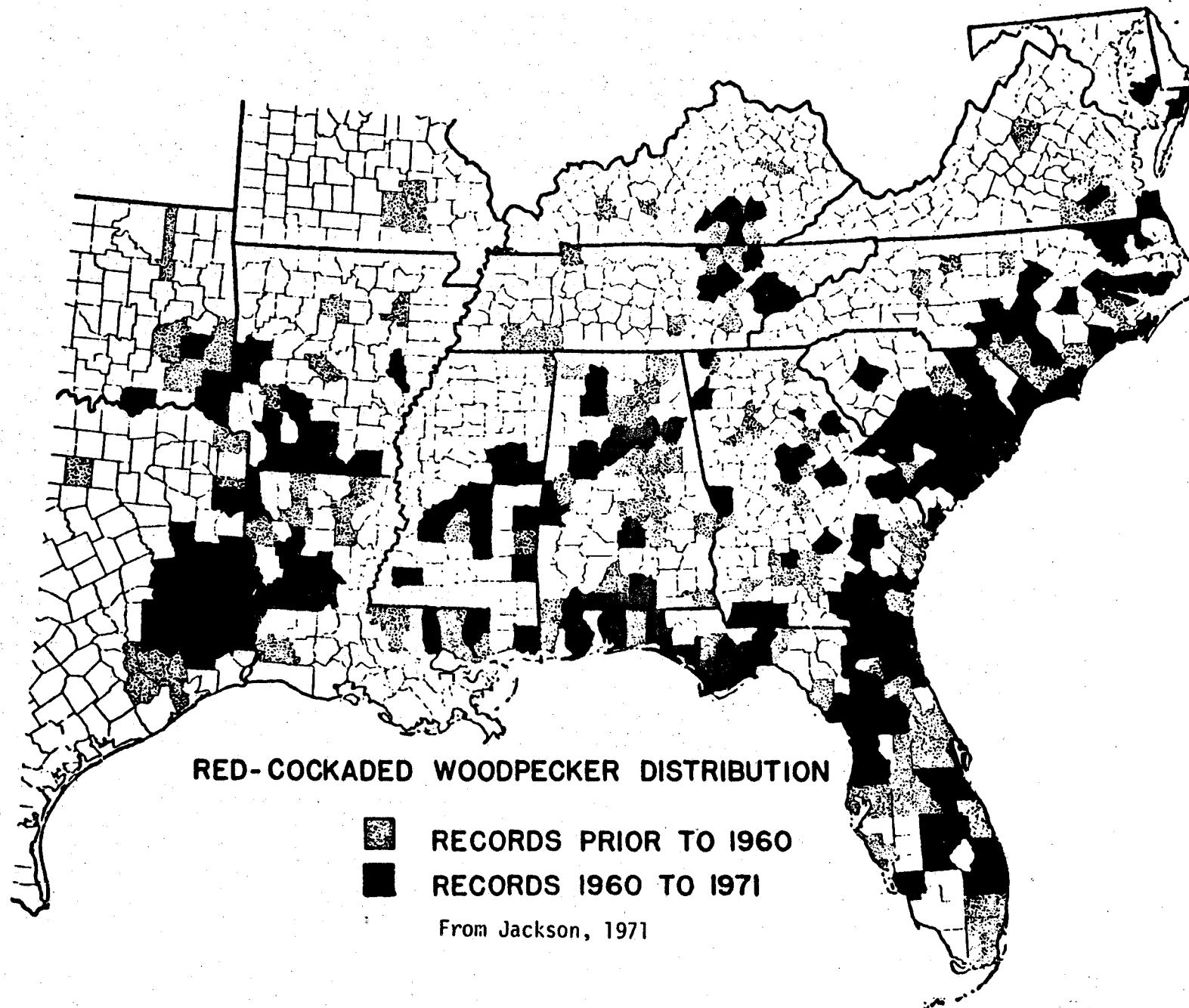


RED-COCKADED WOODPECKER DISTRIBUTION

RECORDS BY COUNTY FROM 1970 TO 1979



Scale of Miles
0 25 50



WOOD STORK

Mycteria americana

Order: Ciconiiformes

Family: Ciconiidae

Status: Endangered - U.S. Breeding Population (Federal Register 2/28/84)

Range: Recent U.S. breeding has been restricted to Florida, Georgia, and marginally to South Carolina. The birds formerly bred in most of the southeastern U.S. and Texas. Another population, believed to be distinct, breeds from Mexico to northern Argentina.

Storks from both populations move northward after breeding, as far as Arkansas and Tennessee in the Mississippi Valley, and North Carolina on the Atlantic coast. There have been occasional sightings in all states east of the Mississippi River, and sporadic sightings in some states west of the Mississippi and in Ontario.

Description: Wood storks are large, long-legged wading birds, about 35-45 inches long (excluding legs), with a wingspan of 60-65 inches. The plumage is white except for black primaries and secondaries and a short black tail. The head and neck are largely unfeathered and dark gray in color. The bill is black, thick at the base, and slightly decurved. Immature birds are dingy gray and have a yellowish bill.

Reasons for Current Status: The U.S. breeding population of the wood stork declined from an estimated 20,000 pairs in the 1930s to about 10,000 pairs by 1960. Since 1978, fewer than 5,000 pairs have bred each year. If this trend were to continue, the U.S. breeding population would be near extinction by the turn of the century (Ogden and Patty 1981). The decline is believed to be due primarily to the loss of suitable feeding habitat (Ogden and Patty 1981). This is especially true of south Florida rookeries, where repeated nesting failures have occurred despite protection afforded the rookeries. Feeding areas in south Florida have decreased by about 35 percent since 1900 due to man's alteration of wetlands. Additionally, manmade levees, canals, and floodgates have greatly changed natural water regimes in south Florida.

Wood storks have a unique feeding technique and require higher prey concentrations than other wading birds. Optimal water regimes for the wood stork involve periods of flooding, during which prey (fish) populations increase, alternating with dryer periods, during which receding water levels concentrate fish at higher densities coinciding with the stork's nesting season. Loss of nesting habitat (primarily cypress swamps) may be affecting wood storks in central Florida, where nesting in non-native trees and in manmade impoundments has been occurring recently. Less significant factors known to affect nesting success include prolonged drought and flooding, raccoon predation on nests, and human disturbance of rookeries.

Wood Stork - M. americana

Habitat: Storks are birds of freshwater and brackish wetlands, primarily nesting in cypress or mangrove swamps, and feeding in freshwater marshes, flooded pastures and flooded ditches. Particularly attractive feeding sites are depressions in marshes or swamps where fish become concentrated during periods of falling water levels.

Critical Habitat: Critical habitat was not designated at the time the wood stork was listed for three reasons: (1) localities of some wood stork rookeries and feeding areas change over time and would make it necessary to continually adjust critical habitat designations; (2) the wood stork is wide-ranging and it would not be feasible to include all areas that are utilized; and (3) publication of the precise location of rookeries, as required for critical habitat designation, would increase the chance that these areas would be subjected to human disturbance or vandalism.

Feeding Habits: The primary food is small fish 1-6 inches long, especially topminnows and sunfish, captured by a specialized technique known as groping or tacto-location. Feeding often occurs in water 6-10 inches deep, where a stork probes with the bill partly open. When a fish touches either mandible, the bill quickly snaps shut on it.

Wood storks use thermals to soar as far as 80 miles from nesting to feeding areas. Since thermals do not form in early morning, wood storks may arrive at feeding areas later than other wading bird species such as herons. Energy requirements for a pair of nesting wood storks and their young have been estimated at about 443 pounds of fish for the breeding season (based on an average production of 2.25 fledglings per nest).

Reproduction and Development: The wood stork is a highly colonial species usually nesting in large rookeries and feeding in flocks. Age at first breeding is 4 years. Successful nesting in south Florida most often occurs in years when rookeries form from November through January and young fledge before summer rains begin in June. The smaller central and north Florida rookeries form during February - April, and fledge young during summer. Nests are frequently located in the upper branches of large cypress trees (Big Cypress region and central Florida), or in mangroves on islands (Everglades region), with several nests usually located in each tree. Recent nesting in central and northern Florida has taken place in numerous other tree species. Storks lay 2-5 eggs, and average about 2 young fledged per successful nest under good conditions.

Population Level: The number of adult birds is difficult to monitor, since not all nest each year. The present population is believed to number about 10,000 adults.

Management (Activities, Recommendations, Implications):

The historically large colonies in south Florida which are fully protected (Everglades National Park; Corkscrew Swamp Sanctuary) have experienced frequent nesting failures in recent years. This is due to adverse water management practices in south Florida. Water management plans must take the needs of the wood stork into account if the species is to survive in these areas.

Wood Stork - M. americana

Water level management may also be crucial at rookeries. Flooding may be necessary to stimulate nesting and to prevent predators from destroying nests. Periodic drying also may be necessary to prevent trees from dying and to allow recruitment of new trees.

Clay settling ponds resulting from phosphate mining in central Florida support nesting wood storks, as well as a variety of other wildlife. Marsh restoration is feasible in these areas and inclusion of the wood stork in management and restoration planning might benefit it and provide additional rookery sites.

References:

- Kahl, M.P. 1964. Food ecology of the wood stork (Mycteria americana) in Florida. Ecol. Monogr. 34:97-117.
- Kale, H.W.II (ed). 1978. Birds. Vol. 2. Rare and endangered biota of Florida. Univ. Florida Press, Gainesville.
- Ogden, J.C. and B.W. Patty. 1981. The recent status of the wood stork in Florida and Georgia. Georgia Dept. Nat. Res. Game and Fish Div. Tech. Bull. WL 5:97-101.

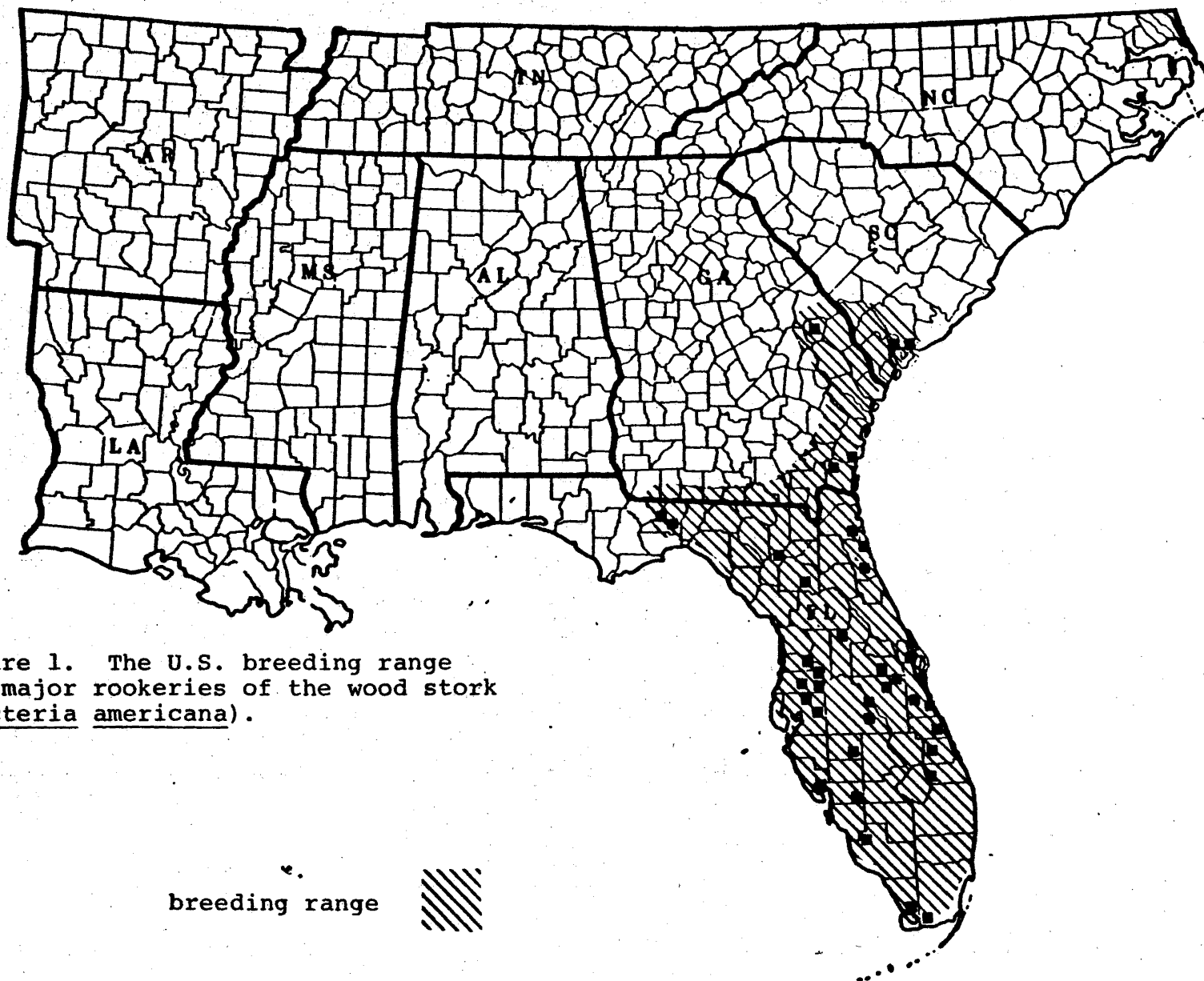


Figure 1. The U.S. breeding range and major rookeries of the wood stork (*Mycteria americana*).

breeding range



major rookeries



DESCRIBE THE LEVEL OF LOCATIONAL ACCURACY NECESSARY FOR YOUR PROJECT.

HOW WILL THE INFORMATION BE USED?

IN WHAT FORM AND DETAIL DO YOU PLAN TO PUBLISH THIS INFORMATION?

The Florida Natural Areas Inventory is an ongoing, continuously updated data base. The Natural Areas Inventory cannot provide a definitive statement on the presence, absence or condition of natural features for any part of the State. Therefore, information provided from the data base should never be considered a complete statement on the elements occurring at a specific location. It is just one part of a complete site evaluation package. We welcome any additional input you could provide us.

Any use of the data must credit the Florida Natural Areas Inventory.

SIGNATURE _____

Return completed form to:

Florida Natural Areas Inventory
254 East Sixth Avenue
Tallahassee, Florida 32303
904/224-8207

APPENDIX 10.11

**HYDROLOGIC CALCULATIONS FOR
STORMWATER MANAGEMENT SYSTEM DESIGN**

APPENDIX 10.11

HYDROLOGIC CALCULATIONS FOR STORMWATER
MANAGEMENT SYSTEM DESIGNINTRODUCTION

The design of the stormwater management system for the Pasco County - Hays Road resource recovery facility and related landfill is based on the Southwest Florida Water Management District (SWFWMD) requirement that the peak discharge rate from the post-development facility be less than or equal to the predevelopment conditions for the 25-year, 24-hour rainfall event. The project site and surrounding area has been determined "volume sensitive" by SWFWMD. Therefore, the volume of water being discharged from the project site may not be increased beyond the volume that occurs naturally from the 25-year, 24-hour design storm. Additionally, as required by Chapter 17-25 FAC, quality treatment must be provided through retention and filtration of the runoff from the first one-inch of rainfall. Compliance with Chapter 40D-4 FAC will require attenuating peak discharge rates to that of the predevelopment condition.

The hydrographs for the various basin and subbasin areas were created by the SCSUNIT computer model (Advanced Engineering Technologies - AET). This model uses the soil conservation service curve number method to compute the runoff hydrographs. As an aid in the design of the conveyance system from the facility site to the respective retention areas, the AET interconnected pond routing model was used.

SITE CONDITIONS

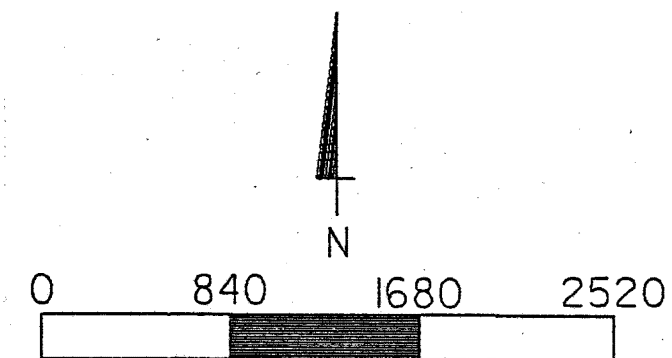
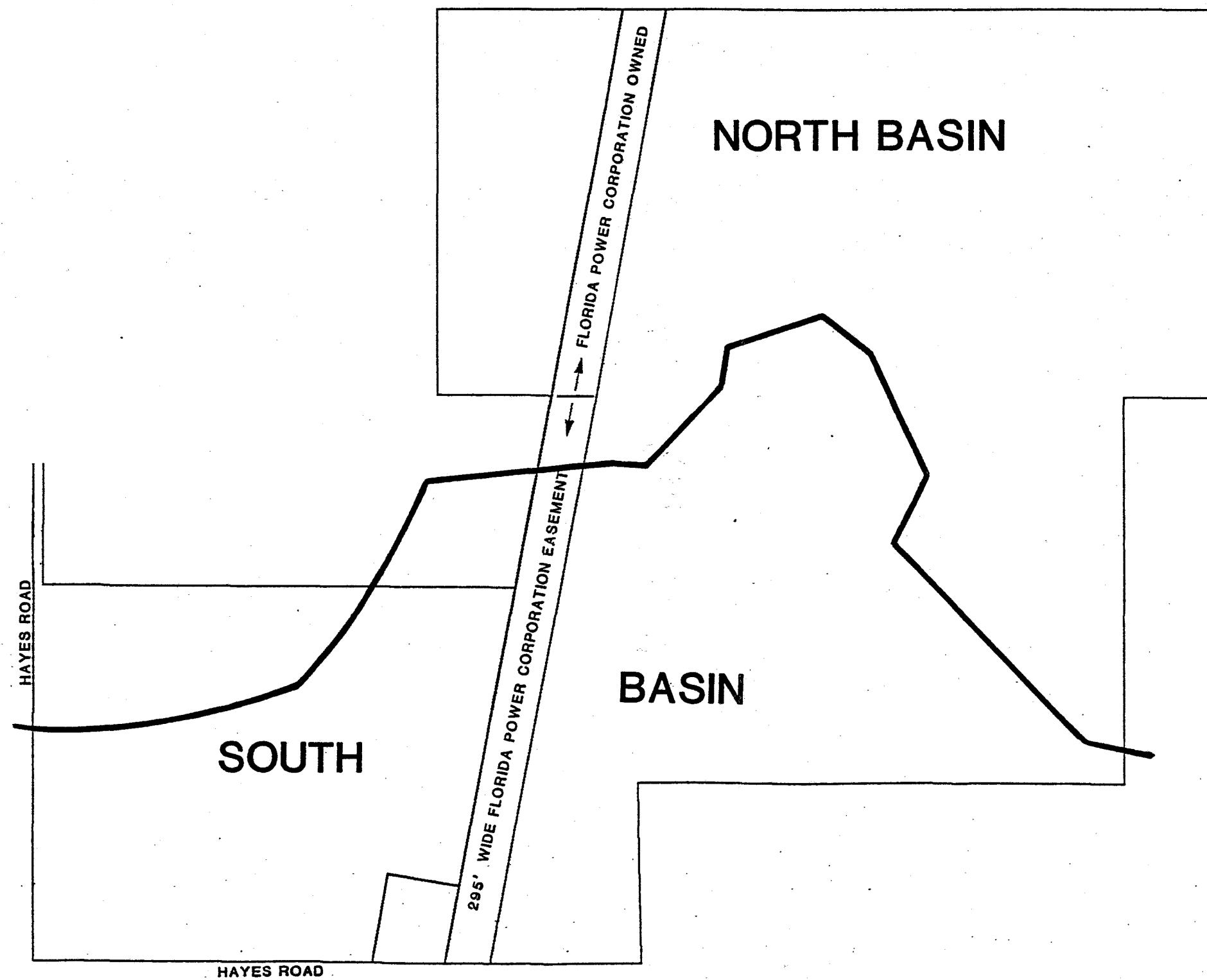
The site currently consists of relatively flat grassland and lightly forested area. The bulk of the site has been recently cleared. The northeastern portion of the site contains the remnants of a pine tree

farming operation. The western portion of the site, the portion unintended for development, has several isolated wetlands, some of which have standing water within them at all times.

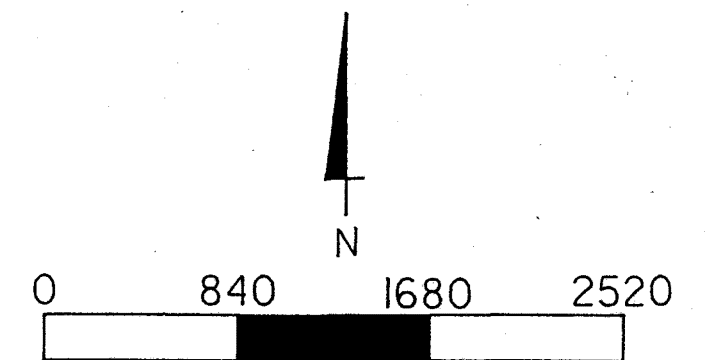
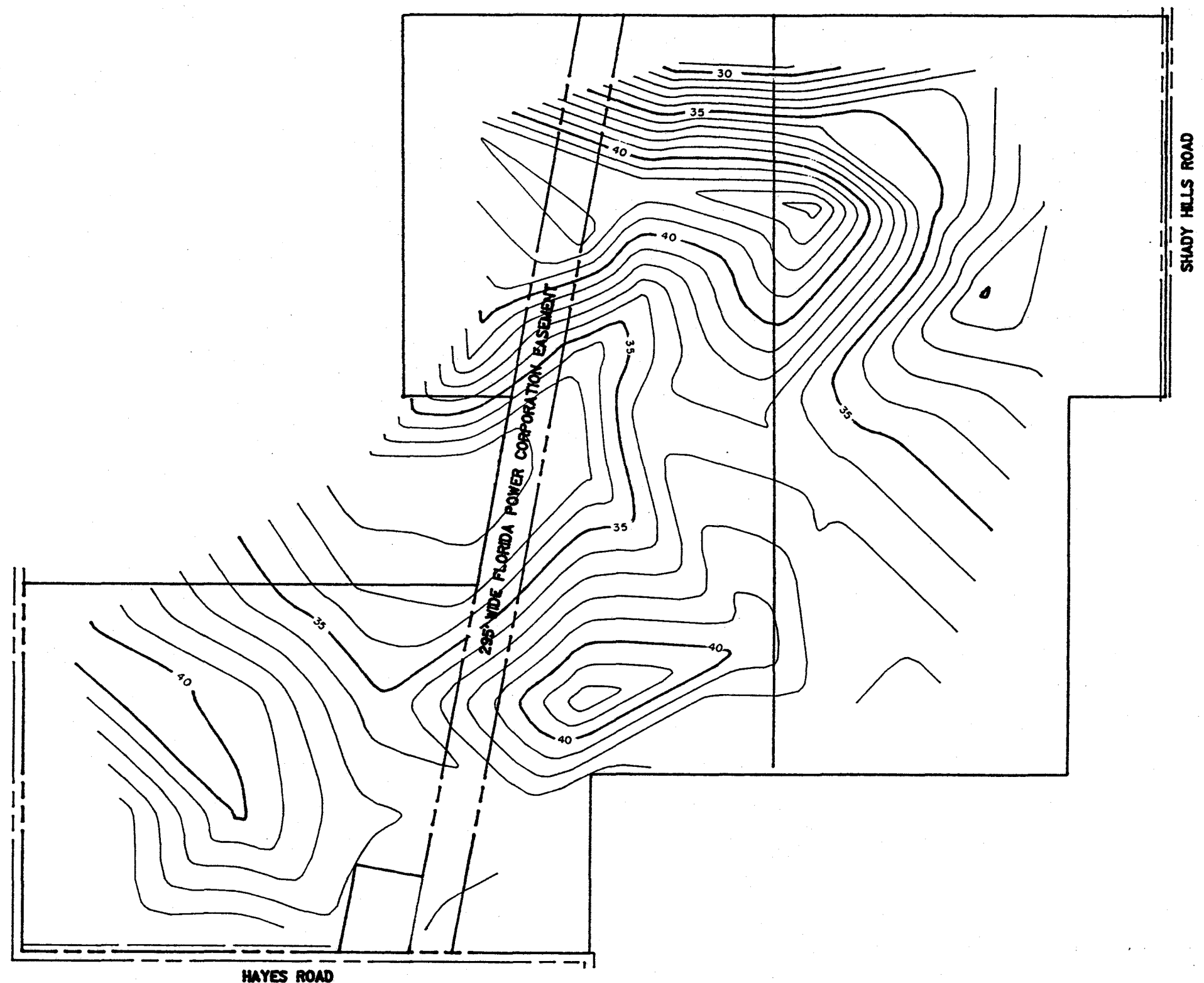
A man-made drainage ditch exists along the north and east boundaries of the proposed landfill area. This drainageway was constructed to alleviate potential flooding from Crews Lake located to the east. Available information reveals that this drainageway has never carried any great volume of water through the site. In fact, a recent site visit has shown various flora and fauna residing within the ditch that are indigenous to dry, semiarid regions.

The existing topography exhibits a drainage basin divide that basically runs east-west through the central portion of the site as shown on Figure 1. The site slopes vary gently from east to west. However, it is believed that very little surface flow occurs and that the primary recharge vehicle for the isolated wetlands is the surficial aquifer flow. This is largely due to the very porous sandy soils as shown in the Preliminary Foundation and Soil Study furnished by Jammal & Associates (contained in Attachment 2 of Volume IV). This report identifies the primary soil group throughout the site as SCS rated "Type A" soil. Type "A" soils are those that provide the greatest amount of infiltration. It has been determined that due to the type soils and location of the depressional areas, no runoff leaves the site during all but the most severe rainfalls.

A series of piezometers and groundwater monitoring wells were installed onsite on an 800-foot square grid system to determine groundwater elevations and subsurface hydrologic conditions. The data obtained were used to generate groundwater contour maps (Figures 2 and 3) to demonstrate groundwater fluctuations during periods of extended rainfall. This information was pertinent in establishing vertical placement of stormwater facilities.

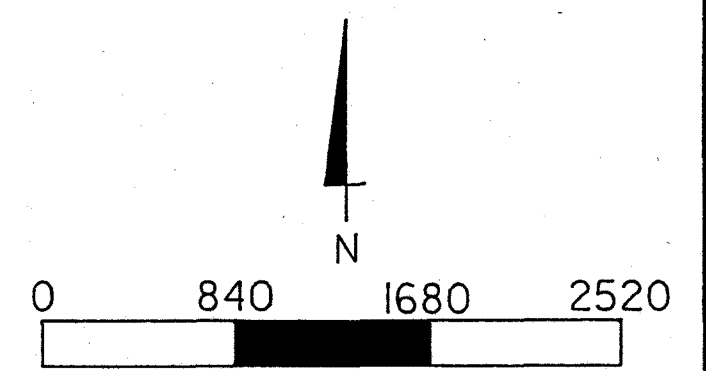
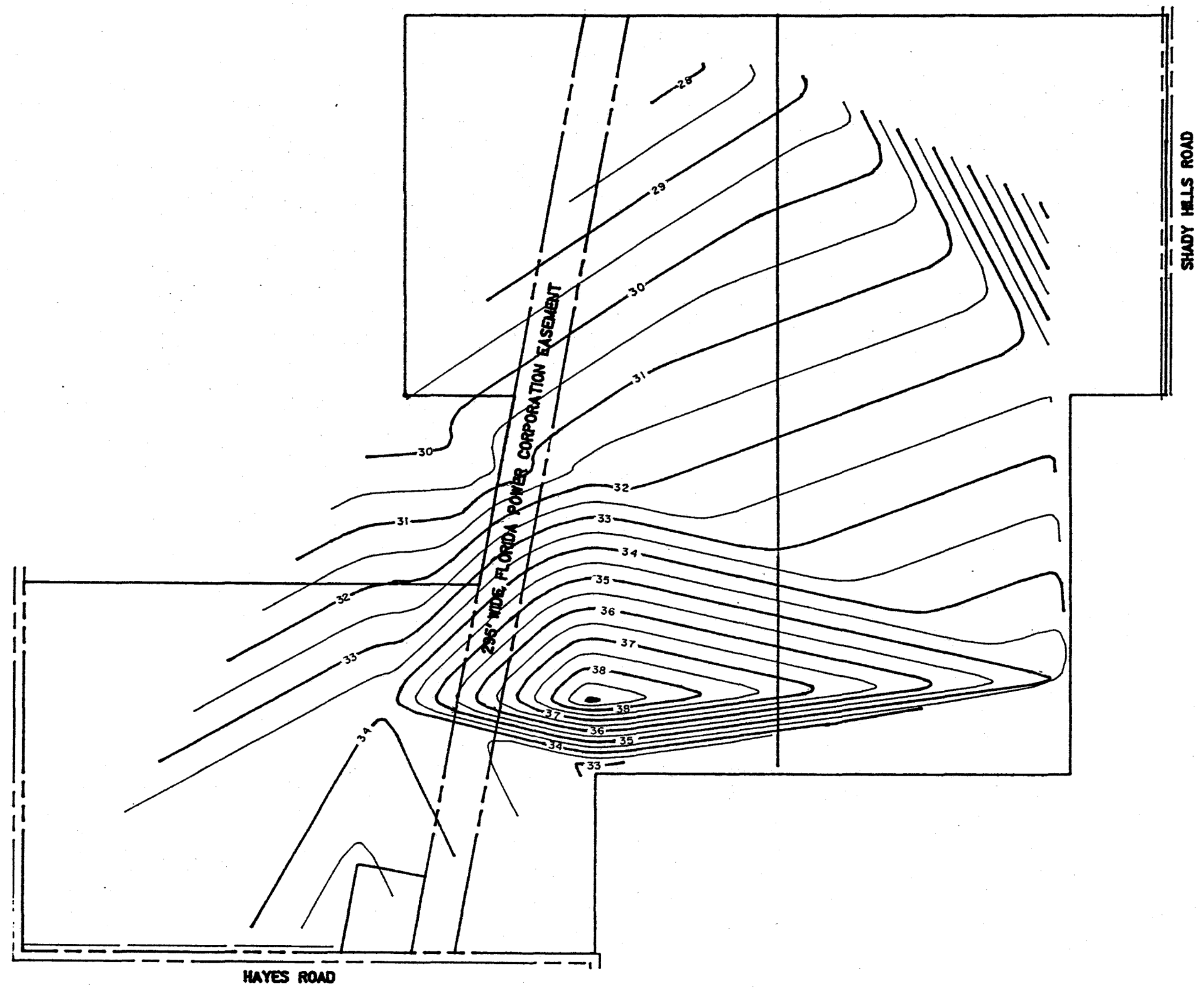


Pasco County Resource Recovery Program
Predevelopment Surface Water Drainage Basins



Pasco County Resource Recovery Program
Site Surficial Water Table-September 6, 1986

FIGURE 2



Pasco County Resource Recovery Program
Site Surficial Water Table- November 1, 1986

FIGURE 3

PREDEVELOPMENT CONDITIONS

To determine the predevelopment hydrologic conditions, the SCSUNIT model was used to compile the individual drainage basin unit hydrographs (Attachment 3). In order to provide a more representative analysis, the predevelopment conditions were analyzed within the confines of the postdevelopment basin boundaries. This provides a more accurate estimation of the SCS curve number (CN) and time of concentration (T_c) as the SCSUNIT model requires. Times of concentration were calculated using velocities of flow determined by the graphical method. Attachment 4, Predevelopment Condition Drainage Calculations, displays the input data required by the SCSUNIT model, calculations and summarized results for the drainage basins as delineated on Figure 4.

POSTDEVELOPMENT CONDITIONS

Postdevelopment conditions differ markedly from existing conditions by the development of a 198-acre ashfill and a 35-acre resource recovery facility. The proposed development will occupy approximately 30 percent of the 750-acre project site. Stormwater runoff from the developed areas as well as offsite flows from the south will be conveyed by swale to one of four major retention areas, as shown on Attachment 1 of Volume IV (Sheets 13 and 14). The remaining onsite and offsite runoff will continue to follow its natural preexisting flow path. A single exception to this will be the relocation of the existing drainageway from Crews Lake to allow for the construction of retention Pond No. 3 in a cost-effective manner.

Once again, the SCSUNIT model was used to generate the outflow hydrographs (Attachment 5) from the four basin areas. The specific hydrologic properties attributed to each basin are given in Attachment 6 (Postdevelopment Condition Drainage Calculations). Generally, the ashfill hydrograph was determined to occur within the outfall swale located at the base of the ashfill slope. This swale is connected to the respective retention pond located adjacent to each basin area. The stage-storage relationship for the swales and the ponds were determined and used as input

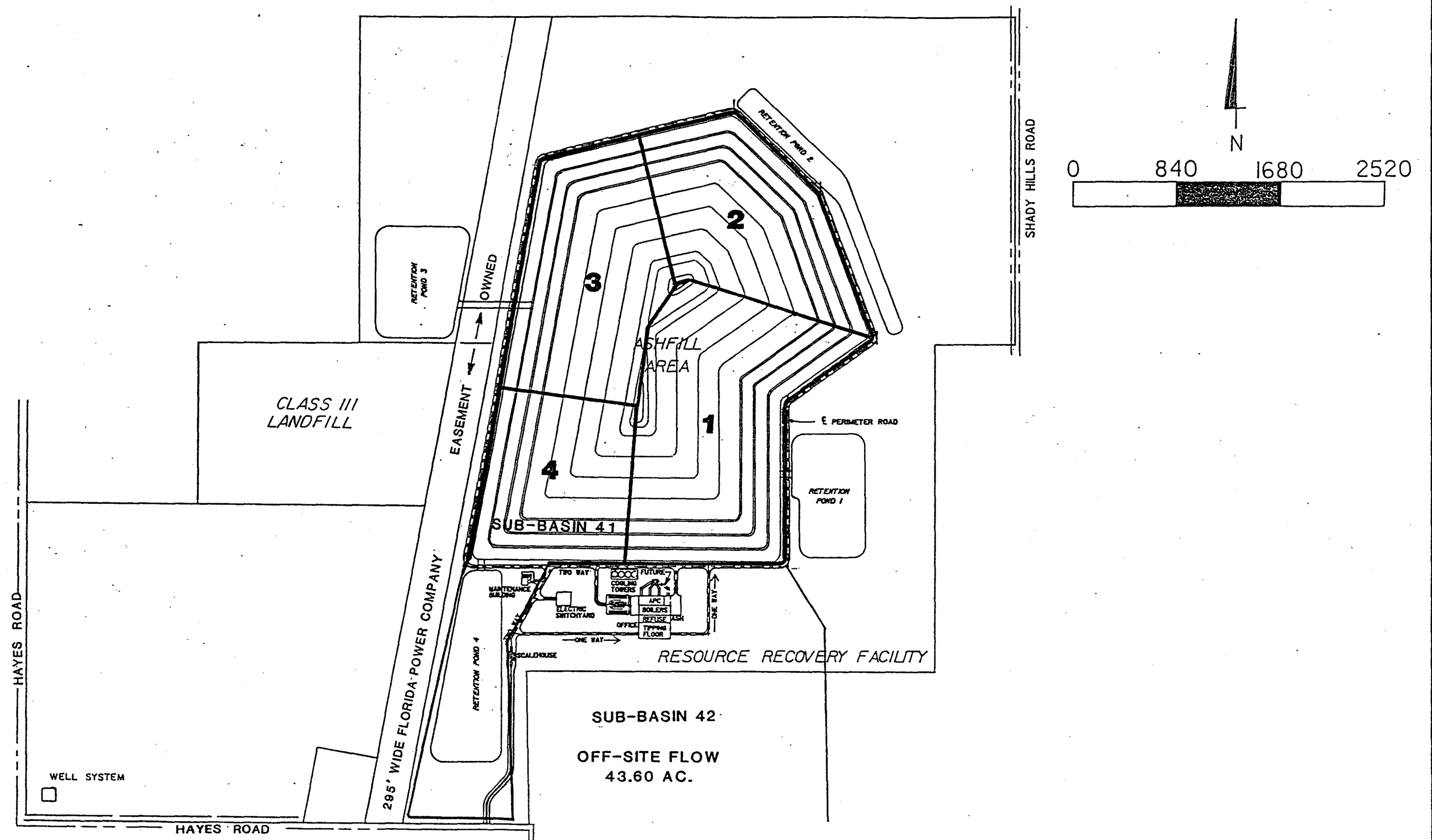
to the ICPR model (Attachment 7). This model allows for the routing of flows from one reservoir to another.

As proposed, the swale system located within each basin along the base of the ashfill will act as a minidetention reservoir. However, no credit has been taken for this and all retention volume will be provided in the proposed ponds. Each pond will have a broad-crested weir-type outfall located to coincide with the natural drainage features.

Retention system recovery shall be achieved by lateral flow and vertical percolation within 72 hours as required by Chapter 17-25 FAC.

The ashfill will be constructed in incremental phases over a 30-year period. The stormwater facilities will be operational prior to the construction of any of the ashfill phases. That is, the stormwater facilities for Basin 1 will be operational prior to construction of any of the phases in the Basin 1 area as with Basin 2, Basin 3, etc. Therefore, as the ashfill progresses, the drainage system for each successive increment will be constructed prior to its need.

The final design of the resource recovery facility will be performed by the selected contractor at a future date. Therefore, the stormwater calculations for this area will be based on predevelopment conditions. When the contractor has completed the final design, he will be responsible for filing the appropriate permit modifications.



Pasco County Resource Recovery Program
Drainage Basin Delineations

FIGURE 4

ATTACHMENT 1

PLAN SHEETS

Plan Sheets are provided in Volume IV of this permit application.

ATTACHMENT 2

GEOTECHNICAL AND SOILS REPORT

The geotechnical and soils report is provided in Volume IV of this permit application.

ATTACHMENT 3
PREDEVELOPMENT HYDROGRAPHS

WEST PASCO LF PRE. BASIN 1

BASIN INPUT DATA

=====

BASIN AREA	65.95	ACRES
SCS CURVE NUMBER	56.00	
INITIAL ABSTRACTION	1.57	INCHES
TIME OF CONCENTRATION	47.62	MINUTES
SCS SHAPE FACTOR	256	

OUTPUT SUMMARY

=====

STORM RAINFALL	9.30	INCHES
STORM DURATION	24.00	HOURS
TOTAL RUNOFF	3.79	INCHES
PEAK RUNOFF RATE	69.79	CFS
TIME OF PEAK	12.50	HOURS
UNIT GRAPH VOLUME	0.99	INCHES

REFERENCE FILES

=====

INPUT DATA	C:LASTFI.DAT
OUTPUT TO DISK	
RAINFALL DISTRIBUTION	RAIN3.RAI
UNIT HYDROGRAPH	UNIT1.UHG

WEST PASCO LF PRE. BASIN 1

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
0.00	0.00	0.00	11.25	3.72	0.04
0.25	0.00	0.00	11.50	5.77	0.06
0.50	0.00	0.00	11.75	12.60	0.10
0.75	0.00	0.00	12.00	31.83	0.22
1.00	0.00	0.00	12.25	57.23	0.44
1.25	0.00	0.00	12.50	69.79	0.70
1.50	0.00	0.00	12.75	67.32	0.95
1.75	0.00	0.00	13.00	60.36	1.18
2.00	0.00	0.00	13.25	53.95	1.38
2.25	0.00	0.00	13.50	48.64	1.57
2.50	0.00	0.00	13.75	43.89	1.73
2.75	0.00	0.00	14.00	39.71	1.88
3.00	0.00	0.00	14.25	36.37	2.02
3.25	0.00	0.00	14.50	33.91	2.15
3.50	0.00	0.00	14.75	31.72	2.26
3.75	0.00	0.00	15.00	29.58	2.38
4.00	0.00	0.00	15.25	27.49	2.48
4.25	0.00	0.00	15.50	25.34	2.57
4.50	0.00	0.00	15.75	23.21	2.66
4.75	0.00	0.00	16.00	21.23	2.74
5.00	0.00	0.00	16.25	19.46	2.81
5.25	0.00	0.00	16.50	17.89	2.88
5.50	0.00	0.00	16.75	16.03	2.94
5.75	0.00	0.00	17.00	14.05	3.00
6.00	0.00	0.00	17.25	12.75	3.04
6.25	0.00	0.00	17.50	11.68	3.09
6.50	0.00	0.00	17.75	10.88	3.13
6.75	0.00	0.00	18.00	10.23	3.17
7.00	0.00	0.00	18.25	9.60	3.20
7.25	0.00	0.00	18.50	8.94	3.24
7.50	0.00	0.00	18.75	8.43	3.27
7.75	0.00	0.00	19.00	8.08	3.30
8.00	0.00	0.00	19.25	7.72	3.33
8.25	0.00	0.00	19.50	7.41	3.35
8.50	0.00	0.00	19.75	7.11	3.38
8.75	0.00	0.00	20.00	6.80	3.41
9.00	0.00	0.00	20.25	6.50	3.43
9.25	0.00	0.00	20.50	6.25	3.46
9.50	0.01	0.00	20.75	6.05	3.48
9.75	0.05	0.00	21.00	5.91	3.50
10.00	0.19	0.00	21.25	5.82	3.52
10.25	0.46	0.00	21.50	5.72	3.54
10.50	0.90	0.01	21.75	5.66	3.56
10.75	1.55	0.01	22.00	5.55	3.59
11.00	2.45	0.02	22.25	5.37	3.61

WEST PASCO LF PRE. BASIN 1

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
22.50	5.19	3.63			
22.75	5.06	3.64			
23.00	4.97	3.66			
23.25	4.90	3.68			
23.50	4.82	3.70			
23.75	4.61	3.72			
24.00	4.03	3.73			
24.25	3.28	3.74			
24.50	2.63	3.75			
24.75	2.13	3.76			
25.00	1.73	3.77			
25.25	1.41	3.77			
25.50	1.15	3.78			
25.75	0.94	3.78			
26.00	0.77	3.78			
26.25	0.62	3.79			
26.50	0.48	3.79			
26.75	0.37	3.79			
27.00	0.28	3.79			
27.25	0.19	3.79			
27.50	0.13	3.79			
27.75	0.08	3.79			
28.00	0.05	3.79			
28.25	0.02	3.79			
28.50	0.00	3.79			
28.75	0.00	3.79			
29.00	0.00	3.79			
29.25	0.00	3.79			

WEST PASCO LF PRE. BASIN 2

BASIN INPUT DATA

=====

BASIN AREA	46.57	ACRES
SCS CURVE NUMBER	56.00	
INITIAL ABSTRACTION	1.57	INCHES
TIME OF CONCENTRATION	29.76	MINUTES
SCS SHAPE FACTOR	256	

OUTPUT SUMMARY

=====

STORM RAINFALL	9.30	INCHES
STORM DURATION	24.00	HOURS
TOTAL RUNOFF	3.75	INCHES
PEAK RUNOFF RATE	59.39	CFS
TIME OF PEAK	12.50	HOURS
UNIT GRAPH VOLUME	0.98	INCHES

REFERENCE FILES

=====

INPUT DATA	C:\LASTFI.DAT
OUTPUT TO DISK	
RAINFALL DISTRIBUTION	RAIN3.RAI
UNIT HYDROGRAPH	UNIT1.UHG

WEST PASCO LF PRE. BASIN 2

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
0.00	0.00	0.00	11.25	3.73	0.05
0.25	0.00	0.00	11.50	5.87	0.08
0.50	0.00	0.00	11.75	15.29	0.16
0.75	0.00	0.00	12.00	38.08	0.37
1.00	0.00	0.00	12.25	58.23	0.68
1.25	0.00	0.00	12.50	59.39	0.99
1.50	0.00	0.00	12.75	50.89	1.26
1.75	0.00	0.00	13.00	43.36	1.50
2.00	0.00	0.00	13.25	37.44	1.69
2.25	0.00	0.00	13.50	32.85	1.87
2.50	0.00	0.00	13.75	29.52	2.03
2.75	0.00	0.00	14.00	26.72	2.17
3.00	0.00	0.00	14.25	24.00	2.30
3.25	0.00	0.00	14.50	21.33	2.41
3.50	0.00	0.00	14.75	18.72	2.51
3.75	0.00	0.00	15.00	16.52	2.60
4.00	0.00	0.00	15.25	14.33	2.67
4.25	0.00	0.00	15.50	12.39	2.74
4.50	0.00	0.00	15.75	11.50	2.80
4.75	0.00	0.00	16.00	10.83	2.86
5.00	0.00	0.00	16.25	10.22	2.91
5.25	0.00	0.00	16.50	9.71	2.96
5.50	0.00	0.00	16.75	9.15	3.01
5.75	0.00	0.00	17.00	8.34	3.06
6.00	0.00	0.00	17.25	7.56	3.10
6.25	0.00	0.00	17.50	7.01	3.14
6.50	0.00	0.00	17.75	6.61	3.17
6.75	0.00	0.00	18.00	6.27	3.20
7.00	0.00	0.00	18.25	5.85	3.24
7.25	0.00	0.00	18.50	5.43	3.26
7.50	0.00	0.00	18.75	5.21	3.29
7.75	0.00	0.00	19.00	5.04	3.32
8.00	0.00	0.00	19.25	4.83	3.34
8.25	0.00	0.00	19.50	4.68	3.37
8.50	0.00	0.00	19.75	4.52	3.39
8.75	0.00	0.00	20.00	4.32	3.42
9.00	0.00	0.00	20.25	4.16	3.44
9.25	0.00	0.00	20.50	4.05	3.46
9.50	0.01	0.00	20.75	3.97	3.48
9.75	0.07	0.00	21.00	3.93	3.50
10.00	0.24	0.00	21.25	3.91	3.52
10.25	0.54	0.00	21.50	3.87	3.54
10.50	0.98	0.01	21.75	3.84	3.56
10.75	1.63	0.02	22.00	3.73	3.58
11.00	2.49	0.03	22.25	3.57	3.60

WEST PASCO LF PRE.

BASIN 2

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
22.50	3.45	3.62			
22.75	3.40	3.64			
23.00	3.36	3.66			
23.25	3.31	3.67			
23.50	3.28	3.69			
23.75	2.97	3.71			
24.00	2.33	3.72			
24.25	1.70	3.73			
24.50	1.26	3.74			
24.75	0.94	3.74			
25.00	0.71	3.75			
25.25	0.53	3.75			
25.50	0.39	3.75			
25.75	0.27	3.75			
26.00	0.18	3.75			
26.25	0.10	3.75			
26.50	0.06	3.75			
26.75	0.02	3.75			
27.00	0.00	3.75			
27.25	0.00	3.75			
27.50	0.00	3.75			
27.75	0.00	3.75			

WEST PASCO LF PRE. BASIN 3

BASIN INPUT DATA

=====

BASIN AREA	53.00	ACRES
SCS CURVE NUMBER	56.00	
INITIAL ABSTRACTION	1.57	INCHES
TIME OF CONCENTRATION	47.62	MINUTES
SCS SHAPE FACTOR	256	

OUTPUT SUMMARY

=====

STORM RAINFALL	9.30	INCHES
STORM DURATION	24.00	HOURS
TOTAL RUNOFF	3.79	INCHES
PEAK RUNOFF RATE	56.08	CFS
TIME OF PEAK	12.50	HOURS
UNIT GRAPH VOLUME	0.99	INCHES

REFERENCE FILES

=====

INPUT DATA	C:\LASTFI.DAT
OUTPUT TO DISK	
RAINFALL DISTRIBUTION	RAIN3.RAI
UNIT HYDROGRAPH	UNIT1.UHG

WEST PASCO LF PRE.

BASIN 3

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
0.00	0.00	0.00	11.25	2.99	0.04
0.25	0.00	0.00	11.50	4.64	0.06
0.50	0.00	0.00	11.75	10.13	0.10
0.75	0.00	0.00	12.00	25.58	0.22
1.00	0.00	0.00	12.25	45.99	0.44
1.25	0.00	0.00	12.50	56.08	0.70
1.50	0.00	0.00	12.75	54.10	0.95
1.75	0.00	0.00	13.00	48.51	1.18
2.00	0.00	0.00	13.25	43.36	1.38
2.25	0.00	0.00	13.50	39.09	1.57
2.50	0.00	0.00	13.75	35.27	1.73
2.75	0.00	0.00	14.00	31.92	1.88
3.00	0.00	0.00	14.25	29.23	2.02
3.25	0.00	0.00	14.50	27.25	2.15
3.50	0.00	0.00	14.75	25.49	2.26
3.75	0.00	0.00	15.00	23.77	2.38
4.00	0.00	0.00	15.25	22.09	2.48
4.25	0.00	0.00	15.50	20.36	2.57
4.50	0.00	0.00	15.75	18.65	2.66
4.75	0.00	0.00	16.00	17.06	2.74
5.00	0.00	0.00	16.25	15.64	2.81
5.25	0.00	0.00	16.50	14.38	2.88
5.50	0.00	0.00	16.75	12.88	2.94
5.75	0.00	0.00	17.00	11.29	3.00
6.00	0.00	0.00	17.25	10.24	3.04
6.25	0.00	0.00	17.50	9.39	3.09
6.50	0.00	0.00	17.75	8.74	3.13
6.75	0.00	0.00	18.00	8.22	3.17
7.00	0.00	0.00	18.25	7.71	3.20
7.25	0.00	0.00	18.50	7.18	3.24
7.50	0.00	0.00	18.75	6.78	3.27
7.75	0.00	0.00	19.00	6.49	3.30
8.00	0.00	0.00	19.25	6.21	3.33
8.25	0.00	0.00	19.50	5.96	3.35
8.50	0.00	0.00	19.75	5.72	3.38
8.75	0.00	0.00	20.00	5.46	3.41
9.00	0.00	0.00	20.25	5.22	3.43
9.25	0.00	0.00	20.50	5.02	3.46
9.50	0.01	0.00	20.75	4.86	3.48
9.75	0.04	0.00	21.00	4.75	3.50
10.00	0.15	0.00	21.25	4.68	3.52
10.25	0.37	0.00	21.50	4.60	3.54
10.50	0.72	0.01	21.75	4.55	3.56
10.75	1.24	0.01	22.00	4.46	3.59
11.00	1.97	0.02	22.25	4.31	3.61

WEST PASCO LF PRE. BASIN 3

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
22.50	4.17	3.63			
22.75	4.06	3.64			
23.00	4.00	3.66			
23.25	3.94	3.68			
23.50	3.88	3.70			
23.75	3.70	3.72			
24.00	3.24	3.73			
24.25	2.64	3.74			
24.50	2.11	3.75			
24.75	1.71	3.76			
25.00	1.39	3.77			
25.25	1.13	3.77			
25.50	0.92	3.78			
25.75	0.75	3.78			
26.00	0.62	3.78			
26.25	0.50	3.79			
26.50	0.39	3.79			
26.75	0.30	3.79			
27.00	0.22	3.79			
27.25	0.16	3.79			
27.50	0.11	3.79			
27.75	0.06	3.79			
28.00	0.04	3.79			
28.25	0.01	3.79			
28.50	0.00	3.79			
28.75	0.00	3.79			
29.00	0.00	3.79			
29.25	0.00	3.79			

WEST PASCO LF PRE. BASIN 41

BASIN INPUT DATA

=====

BASIN AREA	42.31	ACRES
SCS CURVE NUMBER	56.00	
INITIAL ABSTRACTION	1.57	INCHES
TIME OF CONCENTRATION	45.63	MINUTES
SCS SHAPE FACTOR	256	

OUTPUT SUMMARY

=====

STORM RAINFALL	9.30	INCHES
STORM DURATION	24.00	HOURS
TOTAL RUNOFF	3.78	INCHES
PEAK RUNOFF RATE	45.82	CFS
TIME OF PEAK	12.50	HOURS
UNIT GRAPH VOLUME	0.99	INCHES

REFERENCE FILES

=====

INPUT DATA	C:LASTFI.DAT
OUTPUT TO DISK	
RAINFALL DISTRIBUTION	RAIN3.RAI
UNIT HYDROGRAPH	UNIT1.UHG

WEST PASCO LF PRE. BASIN 41

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
0.00	0.00	0.00	11.25	2.47	0.04
0.25	0.00	0.00	11.50	3.84	0.06
0.50	0.00	0.00	11.75	8.51	0.11
0.75	0.00	0.00	12.00	21.51	0.23
1.00	0.00	0.00	12.25	38.17	0.46
1.25	0.00	0.00	12.50	45.82	0.73
1.50	0.00	0.00	12.75	43.64	0.98
1.75	0.00	0.00	13.00	38.84	1.21
2.00	0.00	0.00	13.25	34.57	1.41
2.25	0.00	0.00	13.50	31.08	1.60
2.50	0.00	0.00	13.75	27.97	1.76
2.75	0.00	0.00	14.00	25.29	1.91
3.00	0.00	0.00	14.25	23.23	2.04
3.25	0.00	0.00	14.50	21.68	2.17
3.50	0.00	0.00	14.75	20.21	2.29
3.75	0.00	0.00	15.00	18.76	2.40
4.00	0.00	0.00	15.25	17.34	2.50
4.25	0.00	0.00	15.50	15.88	2.59
4.50	0.00	0.00	15.75	14.46	2.68
4.75	0.00	0.00	16.00	13.19	2.76
5.00	0.00	0.00	16.25	12.07	2.83
5.25	0.00	0.00	16.50	10.78	2.89
5.50	0.00	0.00	16.75	9.53	2.95
5.75	0.00	0.00	17.00	8.74	3.00
6.00	0.00	0.00	17.25	7.95	3.04
6.25	0.00	0.00	17.50	7.31	3.09
6.50	0.00	0.00	17.75	6.82	3.13
6.75	0.00	0.00	18.00	6.43	3.16
7.00	0.00	0.00	18.25	6.02	3.20
7.25	0.00	0.00	18.50	5.61	3.23
7.50	0.00	0.00	18.75	5.30	3.26
7.75	0.00	0.00	19.00	5.09	3.29
8.00	0.00	0.00	19.25	4.87	3.32
8.25	0.00	0.00	19.50	4.67	3.35
8.50	0.00	0.00	19.75	4.48	3.37
8.75	0.00	0.00	20.00	4.29	3.40
9.00	0.00	0.00	20.25	4.10	3.42
9.25	0.00	0.00	20.50	3.95	3.45
9.50	0.00	0.00	20.75	3.83	3.47
9.75	0.03	0.00	21.00	3.75	3.49
10.00	0.13	0.00	21.25	3.69	3.51
10.25	0.31	0.00	21.50	3.64	3.53
10.50	0.60	0.01	21.75	3.60	3.56
10.75	1.03	0.01	22.00	3.53	3.58
11.00	1.63	0.02	22.25	3.41	3.60

WEST PASCO LF PRE.

BASIN 41

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
22.50	3.29	3.62			
22.75	3.21	3.63			
23.00	3.17	3.65			
23.25	3.11	3.67			
23.50	3.07	3.69			
23.75	2.92	3.71			
24.00	2.53	3.72			
24.25	2.04	3.73			
24.50	1.62	3.74			
24.75	1.30	3.75			
25.00	1.05	3.76			
25.25	0.85	3.76			
25.50	0.69	3.77			
25.75	0.56	3.77			
26.00	0.45	3.77			
26.25	0.36	3.77			
26.50	0.27	3.77			
26.75	0.21	3.78			
27.00	0.15	3.78			
27.25	0.10	3.78			
27.50	0.06	3.78			
27.75	0.04	3.78			
28.00	0.01	3.78			
28.25	0.00	3.78			
28.50	0.00	3.78			
28.75	0.00	3.78			
29.00	0.00	3.78			

WEST PASCO LF PRE. BASIN 42

BASIN INPUT DATA

```
=====
BASIN AREA           31.22  ACRES
SCS CURVE NUMBER     56.00
INITIAL ABSTRACTION  1.57  INCHES
TIME OF CONCENTRATION 45.63  MINUTES
SCS SHAPE FACTOR     256
```

OUTPUT SUMMARY

```
=====
STORM RAINFALL       9.30  INCHES
STORM DURATION       24.00  HOURS
TOTAL RUNOFF         3.78  INCHES
PEAK RUNOFF RATE     33.81  CFS
TIME OF PEAK         12.50  HOURS
UNIT GRAPH VOLUME    0.99  INCHES
```

REFERENCE FILES

```
=====
INPUT DATA           C:LASTFI.DAT
OUTPUT TO DISK
RAINFALL DISTRIBUTION RAIN3.RAI
UNIT HYDROGRAPH       UNIT1.UHG
```

WEST PASCO LF PRE.

BASIN 42

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
0.00	0.00	0.00	11.25	1.83	0.04
0.25	0.00	0.00	11.50	2.83	0.06
0.50	0.00	0.00	11.75	6.28	0.11
0.75	0.00	0.00	12.00	15.87	0.23
1.00	0.00	0.00	12.25	28.16	0.46
1.25	0.00	0.00	12.50	33.81	0.73
1.50	0.00	0.00	12.75	32.20	0.98
1.75	0.00	0.00	13.00	28.66	1.21
2.00	0.00	0.00	13.25	25.51	1.41
2.25	0.00	0.00	13.50	22.93	1.60
2.50	0.00	0.00	13.75	20.64	1.76
2.75	0.00	0.00	14.00	18.66	1.91
3.00	0.00	0.00	14.25	17.14	2.04
3.25	0.00	0.00	14.50	16.00	2.17
3.50	0.00	0.00	14.75	14.91	2.29
3.75	0.00	0.00	15.00	13.84	2.40
4.00	0.00	0.00	15.25	12.79	2.50
4.25	0.00	0.00	15.50	11.72	2.59
4.50	0.00	0.00	15.75	10.67	2.68
4.75	0.00	0.00	16.00	9.73	2.76
5.00	0.00	0.00	16.25	8.90	2.83
5.25	0.00	0.00	16.50	7.95	2.89
5.50	0.00	0.00	16.75	7.03	2.95
5.75	0.00	0.00	17.00	6.45	3.00
6.00	0.00	0.00	17.25	5.87	3.04
6.25	0.00	0.00	17.50	5.39	3.09
6.50	0.00	0.00	17.75	5.03	3.13
6.75	0.00	0.00	18.00	4.74	3.16
7.00	0.00	0.00	18.25	4.45	3.20
7.25	0.00	0.00	18.50	4.14	3.23
7.50	0.00	0.00	18.75	3.91	3.26
7.75	0.00	0.00	19.00	3.75	3.29
8.00	0.00	0.00	19.25	3.59	3.32
8.25	0.00	0.00	19.50	3.45	3.35
8.50	0.00	0.00	19.75	3.31	3.37
8.75	0.00	0.00	20.00	3.17	3.40
9.00	0.00	0.00	20.25	3.03	3.42
9.25	0.00	0.00	20.50	2.91	3.45
9.50	0.00	0.00	20.75	2.82	3.47
9.75	0.03	0.00	21.00	2.76	3.49
10.00	0.09	0.00	21.25	2.72	3.51
10.25	0.23	0.00	21.50	2.69	3.53
10.50	0.44	0.01	21.75	2.66	3.56
10.75	0.76	0.01	22.00	2.60	3.58
11.00	1.21	0.02	22.25	2.51	3.60

WEST PASCO LF PRE. BASIN 42

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
22.50	2.43	3.62			
22.75	2.37	3.63			
23.00	2.34	3.65			
23.25	2.30	3.67			
23.50	2.27	3.69			
23.75	2.16	3.71			
24.00	1.87	3.72			
24.25	1.51	3.73			
24.50	1.20	3.74			
24.75	0.96	3.75			
25.00	0.78	3.76			
25.25	0.63	3.76			
25.50	0.51	3.77			
25.75	0.41	3.77			
26.00	0.33	3.77			
26.25	0.26	3.77			
26.50	0.20	3.77			
26.75	0.15	3.78			
27.00	0.11	3.78			
27.25	0.07	3.78			
27.50	0.04	3.78			
27.75	0.03	3.78			
28.00	0.01	3.78			
28.25	0.00	3.78			
28.50	0.00	3.78			
28.75	0.00	3.78			
29.00	0.00	3.78			

WEST PASCO LF PRE. BASIN 43

BASIN INPUT DATA

=====

BASIN AREA	74.49	ACRES
SCS CURVE NUMBER	56.00	
INITIAL ABSTRACTION	1.57	INCHES
TIME OF CONCENTRATION	87.30	MINUTES
SCS SHAPE FACTOR	256	

OUTPUT SUMMARY

=====

STORM RAINFALL	9.30	INCHES
STORM DURATION	24.00	HOURS
TOTAL RUNOFF	3.81	INCHES
PEAK RUNOFF RATE	55.65	CFS
TIME OF PEAK	13.00	HOURS
UNIT GRAPH VOLUME	1.00	INCHES

REFERENCE FILES

=====

INPUT DATA	C:\LASTFI.DAT
OUTPUT TO DISK	
RAINFALL DISTRIBUTION	RAIN3.RAI
UNIT HYDROGRAPH	UNIT1.UHG

WEST PASCO LF PRE. BASIN 43

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
0.00	0.00	0.00	11.25	2.12	0.02
0.25	0.00	0.00	11.50	3.33	0.03
0.50	0.00	0.00	11.75	6.53	0.05
0.75	0.00	0.00	12.00	14.40	0.10
1.00	0.00	0.00	12.25	27.28	0.19
1.25	0.00	0.00	12.50	41.95	0.33
1.50	0.00	0.00	12.75	52.32	0.50
1.75	0.00	0.00	13.00	55.65	0.69
2.00	0.00	0.00	13.25	54.65	0.87
2.25	0.00	0.00	13.50	51.77	1.04
2.50	0.00	0.00	13.75	48.23	1.20
2.75	0.00	0.00	14.00	45.02	1.35
3.00	0.00	0.00	14.25	42.39	1.49
3.25	0.00	0.00	14.50	39.92	1.63
3.50	0.00	0.00	14.75	37.55	1.75
3.75	0.00	0.00	15.00	35.39	1.87
4.00	0.00	0.00	15.25	33.31	1.98
4.25	0.00	0.00	15.50	31.32	2.08
4.50	0.00	0.00	15.75	29.63	2.18
4.75	0.00	0.00	16.00	28.34	2.28
5.00	0.00	0.00	16.25	27.26	2.37
5.25	0.00	0.00	16.50	26.25	2.45
5.50	0.00	0.00	16.75	25.21	2.54
5.75	0.00	0.00	17.00	24.12	2.62
6.00	0.00	0.00	17.25	22.92	2.70
6.25	0.00	0.00	17.50	21.62	2.77
6.50	0.00	0.00	17.75	20.34	2.83
6.75	0.00	0.00	18.00	19.10	2.90
7.00	0.00	0.00	18.25	17.90	2.96
7.25	0.00	0.00	18.50	16.70	3.01
7.50	0.00	0.00	18.75	15.53	3.07
7.75	0.00	0.00	19.00	14.47	3.11
8.00	0.00	0.00	19.25	13.57	3.16
8.25	0.00	0.00	19.50	12.76	3.20
8.50	0.00	0.00	19.75	11.98	3.24
8.75	0.00	0.00	20.00	11.22	3.28
9.00	0.00	0.00	20.25	10.26	3.31
9.25	0.00	0.00	20.50	9.33	3.34
9.50	0.00	0.00	20.75	8.83	3.37
9.75	0.02	0.00	21.00	8.43	3.40
10.00	0.07	0.00	21.25	8.10	3.43
10.25	0.19	0.00	21.50	7.82	3.45
10.50	0.42	0.00	21.75	7.58	3.48
10.75	0.79	0.00	22.00	7.35	3.50
11.00	1.33	0.01	22.25	7.12	3.53

WEST PASCO LF PRE.

BASIN 43

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
22.50	6.87	3.55			
22.75	6.63	3.57			
23.00	6.42	3.59			
23.25	6.25	3.61			
23.50	6.09	3.63			
23.75	5.90	3.65			
24.00	5.60	3.67			
24.25	5.14	3.69			
24.50	4.56	3.71			
24.75	3.99	3.72			
25.00	3.48	3.73			
25.25	3.04	3.74			
25.50	2.67	3.75			
25.75	2.36	3.76			
26.00	2.08	3.76			
26.25	1.84	3.77			
26.50	1.62	3.78			
26.75	1.44	3.78			
27.00	1.27	3.78			
27.25	1.12	3.79			
27.50	0.99	3.79			
27.75	0.88	3.79			
28.00	0.77	3.80			
28.25	0.67	3.80			
28.50	0.58	3.80			
28.75	0.49	3.80			
29.00	0.42	3.80			
29.25	0.35	3.81			
29.50	0.28	3.81			
29.75	0.23	3.81			
30.00	0.18	3.81			
30.25	0.14	3.81			
30.50	0.11	3.81			
30.75	0.08	3.81			
31.00	0.06	3.81			
31.25	0.04	3.81			
31.50	0.02	3.81			
31.75	0.01	3.81			
32.00	0.00	3.81			
32.25	0.00	3.81			
32.50	0.00	3.81			
32.75	0.00	3.81			

ATTACHMENT 4

PREDEVELOPMENT CONDITION DRAINAGE CALCULATIONS

ATTACHMENT 4

PREDEVELOPMENT CONDITION DRAINAGE CALCULATIONS

THE PREDEVELOPMENT CONDITION DRAINAGE CALCULATIONS ARE BASED ON THE FOLLOWING DESIGN PARAMETERS.

1. PREEXISTING CONDITIONS WITHIN THE CONFINES OF THE POSTDEVELOPMENT BASIN BOUNDARIES.
2. 25-YEAR, 24-HOUR RECURRING STORM EVENT.
3. SCS UNIT HYDROGRAPH SHAPE FACTOR 256.
4. RAINFALL INTENSITY OF 9.3 INCHES.
5. SCS TYPE II MODIFIED RAINFALL DISTRIBUTION.
6. SCS CURVE NUMBER 56.
7. INITIAL ABSTRACTION RATIO OF 0.20.

THE FOLLOWING RUNOFF DATA AND UNIT HYDROGRAPHS HAVE BEEN GENERATED BY THE SCS UNIT HYDROGRAPH COMPUTER PROGRAM.

BASIN NO. 1

1. AREA = 65.95 ACRES.
2. PERCENT SLOPE: 5' RELIEF/1000' LENGTH (100) = 0.50%
3. VELOCITY = 21 FT/MIN.
4. $T_c = 1000' / 21 \text{ FT/MIN.} = 47.62 \text{ MIN.}$
5. TOTAL RUNOFF = 3.75 IN.
6. PEAK RUNOFF RATE = 59.39 CFS
7. TOTAL RUNOFF VOLUME = 3.75 IN./12 IN.(65.95 AC.) = 20.82 AC. FT.

BASIN NO. 2

1. AREA = 46.57 ACRES
2. PERCENT SLOPE: 5' RELIEF/500' LENGTH (100) = 1.00%
3. VELOCITY = 16.80 FT./MIN.
4. $T_c = 500' / 16.80 \text{ FT./MIN.} = 29.76 \text{ MIN.}$
5. TOTAL RUNOFF = 3.75 IN.
6. PEAK RUNOFF RATE = 59.39 CFS
7. TOTAL RUNOFF VOLUME = 3.75 IN./12 IN.(46.57 AC.) = 14.5 AC. FT.

BASIN NO. 3

1. AREA = 53.0 ACRES
2. PERCENT SLOPE: $5' \text{ RELIEF} / 1000' \text{ LENGTH} (100) = 0.50\%$
3. VELOCITY = 21 FT./MIN.
4. $T_c = 1000' / 21 \text{ FT./MIN.} = 47.62 \text{ MIN.}$
5. TOTAL RUNOFF = 3.79 IN.
6. PEAK RUNOFF RATE = 56.08 CFS
7. TOTAL RUNOFF VOLUME = $3.79 \text{ IN.} / 12 \text{ IN.} (53.0 \text{ AC.}) = 16.74 \text{ AC. FT.}$

BASIN NO. 4 - SUBBASIN NO. 41 (LANDFILL AREA)

1. AREA = 42.31 ACRES
2. PERCENT SLOPE: $5' \text{ RELIEF} / 1200' \text{ LENGTH} (100) = 0.42\%$
3. VELOCITY = 26.30 FT./MIN.
4. $T_c = 1200' / 26.30 \text{ FT./MIN.} = 45.63 \text{ MIN.}$
5. TOTAL RUNOFF = 3.78 IN.
6. PEAK RUNOFF RATE = 45.82 CFS
7. TOTAL RUNOFF VOLUME = $3.78 \text{ IN.} / 12 \text{ IN.} (42.31 \text{ AC.}) = 13.33 \text{ AC. FT.}$

SUBBASIN NO. 42 (RESOURCE RECOVERY AREA)

1. AREA - 31.22 ACRES
2. PERCENT SLOPE: $5' \text{ RELIEF} / 1200' \text{ LENGTH} (100) = 0.42\%$
3. VELOCITY = 26.30 FT./MIN.
4. $T_c = 1200' / 26.30 \text{ FT./MIN.} = 45.63 \text{ MIN.}$
5. TOTAL RUNOFF = 3.78 IN.
6. PEAK RUNOFF RATE = 33.81 CFS
7. TOTAL RUNOFF VOLUME = $3.78 \text{ IN.} / 12 \text{ IN.} (31.22 \text{ AC.}) = 9.83 \text{ AC. FT.}$

SUBBASIN NO. 43

(ONSITE AREA SOUTH OF THE RESOURCE RECOVERY FACILITY AND CONTRIBUTING OFFSITE AREA)

1. AREA = 74.49 ACRES
2. PERCENT SLOPE: $5' \text{ RELIEF} / 2200' \text{ LENGTH} (100) = 0.23\%$
3. VELOCITY = 25.20 FT./MIN.
4. $T_c = 2200' / 25.20 \text{ FT./MIN.} = 87.30 \text{ MIN.}$
5. TOTAL RUNOFF = 3.81 IN.
6. PEAK RUNOFF RATE = 55.65 CFS
7. TOTAL RUNOFF VOLUME = $3.81 \text{ IN.} / 12 \text{ IN.} (74.49 \text{ AC.}) = 23.65 \text{ AC. FT.}$

ATTACHMENT 5
POSTDEVELOPMENT HYDROGRAPHS

WEST PASCO LF POST. BASIN 1 BASIN 1

BASIN INPUT DATA

```
=====
BASIN AREA           65.95  ACRES
SCS CURVE NUMBER     90.00
INITIAL ABSTRACTION  0.22  INCHES
TIME OF CONCENTRATION 11.58  MINUTES
SCS SHAPE FACTOR     256
```

OUTPUT SUMMARY

```
=====
STORM RAINFALL       9.30  INCHES
STORM DURATION       24.00  HOURS
TOTAL RUNOFF         7.96  INCHES
PEAK RUNOFF RATE     301.79  CFS
TIME OF PEAK        12.25  HOURS
UNIT GRAPH VOLUME    0.98  INCHES
```

REFERENCE FILES

```
=====
INPUT DATA           C:LASTFI.DAT
OUTPUT TO DISK        PASCO1
RAINFALL DISTRIBUTION RAIN3.RAI
UNIT HYDROGRAPH       UNIT1.UHG
```

WEST PASCO LF POST. BASIN 1 BASIN 1

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
0.00	0.00	0.00	3.75	1.31	0.01
0.08	0.00	0.00	3.83	1.39	0.01
0.17	0.00	0.00	3.92	1.46	0.02
0.25	0.00	0.00	4.00	1.57	0.02
0.33	0.00	0.00	4.08	1.77	0.02
0.42	0.00	0.00	4.17	2.01	0.02
0.50	0.00	0.00	4.25	2.18	0.03
0.58	0.00	0.00	4.33	2.22	0.03
0.67	0.00	0.00	4.42	2.20	0.03
0.75	0.00	0.00	4.50	2.21	0.03
0.83	0.00	0.00	4.58	2.27	0.04
0.92	0.00	0.00	4.67	2.34	0.04
1.00	0.00	0.00	4.75	2.47	0.04
1.08	0.00	0.00	4.83	2.70	0.05
1.17	0.00	0.00	4.92	2.95	0.05
1.25	0.00	0.00	5.00	3.09	0.05
1.33	0.00	0.00	5.08	3.07	0.06
1.42	0.00	0.00	5.17	2.99	0.06
1.50	0.00	0.00	5.25	3.01	0.06
1.58	0.00	0.00	5.33	3.20	0.07
1.67	0.00	0.00	5.42	3.46	0.07
1.75	0.00	0.00	5.50	3.67	0.08
1.83	0.00	0.00	5.58	3.80	0.08
1.92	0.00	0.00	5.67	3.89	0.09
2.00	0.00	0.00	5.75	4.00	0.09
2.08	0.00	0.00	5.83	4.14	0.10
2.17	0.00	0.00	5.92	4.31	0.10
2.25	0.00	0.00	6.00	4.46	0.11
2.33	0.00	0.00	6.08	4.60	0.11
2.42	0.02	0.00	6.17	4.72	0.12
2.50	0.06	0.00	6.25	4.80	0.13
2.58	0.09	0.00	6.33	4.83	0.13
2.67	0.12	0.00	6.42	4.84	0.14
2.75	0.17	0.00	6.50	4.96	0.14
2.83	0.24	0.00	6.58	5.29	0.15
2.92	0.34	0.00	6.67	5.68	0.16
3.00	0.44	0.00	6.75	5.90	0.17
3.08	0.54	0.00	6.83	5.85	0.17
3.17	0.65	0.00	6.92	5.71	0.18
3.25	0.74	0.00	7.00	5.71	0.19
3.33	0.83	0.01	7.08	5.96	0.19
3.42	0.91	0.01	7.17	6.33	0.20
3.50	1.00	0.01	7.25	6.68	0.21
3.58	1.10	0.01	7.33	7.05	0.22
3.67	1.22	0.01	7.42	7.40	0.23

WEST PASCO LF POST. BASIN 1 BASIN 1

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
7.50	7.80	0.24	11.25	40.74	1.36
7.58	8.39	0.25	11.33	44.32	1.42
7.67	9.07	0.26	11.42	48.50	1.48
7.75	9.73	0.27	11.50	53.19	1.55
7.83	10.46	0.29	11.58	59.52	1.62
7.92	11.17	0.30	11.67	66.00	1.70
8.00	11.58	0.31	11.75	84.79	1.81
8.08	11.61	0.33	11.83	131.69	1.97
8.17	11.50	0.34	11.92	190.14	2.21
8.25	11.59	0.36	12.00	237.84	2.51
8.33	12.03	0.37	12.08	273.92	2.85
8.42	12.62	0.39	12.17	300.23	3.23
8.50	13.14	0.41	12.25	301.79	3.61
8.58	13.59	0.42	12.33	268.61	3.94
8.67	13.97	0.44	12.42	225.75	4.23
8.75	14.36	0.46	12.50	193.69	4.47
8.83	14.84	0.48	12.58	168.67	4.68
8.92	15.36	0.50	12.67	148.13	4.87
9.00	15.82	0.52	12.75	131.36	5.03
9.08	16.19	0.54	12.83	115.95	5.18
9.17	16.52	0.56	12.92	101.76	5.30
9.25	16.81	0.58	13.00	89.37	5.42
9.33	17.09	0.60	13.08	77.64	5.51
9.42	17.35	0.62	13.17	67.79	5.60
9.50	17.78	0.64	13.25	59.79	5.67
9.58	18.57	0.67	13.33	52.94	5.74
9.67	19.47	0.69	13.42	47.31	5.80
9.75	20.09	0.72	13.50	43.31	5.85
9.83	20.33	0.74	13.58	41.24	5.91
9.92	20.41	0.77	13.67	39.54	5.95
10.00	20.81	0.79	13.75	37.99	6.00
10.08	21.86	0.82	13.83	36.32	6.05
10.17	23.16	0.85	13.92	34.67	6.09
10.25	24.21	0.88	14.00	33.24	6.13
10.33	24.95	0.91	14.08	31.92	6.17
10.42	25.51	0.94	14.17	30.73	6.21
10.50	26.30	0.98	14.25	29.85	6.25
10.58	27.70	1.01	14.33	29.23	6.29
10.67	29.36	1.05	14.42	28.76	6.32
10.75	30.99	1.09	14.50	28.12	6.36
10.83	32.75	1.13	14.58	27.10	6.39
10.92	34.48	1.17	14.67	26.00	6.42
11.00	35.98	1.22	14.75	25.15	6.46
11.08	37.44	1.26	14.83	24.51	6.49
11.17	38.77	1.31	14.92	24.01	6.52

WEST PASCO LF POST.

BASIN 1

BASIN 1

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
15.00	23.63	6.55	18.75	9.18	7.39
15.08	23.36	6.57	18.83	9.20	7.40
15.17	23.11	6.60	18.92	9.16	7.41
15.25	22.65	6.63	19.00	9.04	7.42
15.33	21.81	6.66	19.08	8.77	7.43
15.42	20.90	6.69	19.17	8.46	7.44
15.50	20.32	6.71	19.25	8.32	7.45
15.58	20.10	6.74	19.33	8.42	7.47
15.67	20.06	6.76	19.42	8.60	7.48
15.75	19.94	6.79	19.50	8.66	7.49
15.83	19.63	6.81	19.58	8.53	7.50
15.92	19.27	6.84	19.67	8.31	7.51
16.00	18.96	6.86	19.75	8.11	7.52
16.08	18.64	6.88	19.83	7.96	7.53
16.17	18.35	6.91	19.92	7.84	7.54
16.25	18.04	6.93	20.00	7.72	7.55
16.33	17.64	6.95	20.08	7.56	7.56
16.42	17.22	6.97	20.17	7.39	7.57
16.50	16.98	6.99	20.25	7.29	7.58
16.58	16.98	7.01	20.33	7.29	7.58
16.67	17.10	7.04	20.42	7.34	7.59
16.75	16.81	7.06	20.50	7.34	7.60
16.83	15.69	7.08	20.58	7.25	7.61
16.92	14.33	7.09	20.67	7.14	7.62
17.00	13.36	7.11	20.75	7.09	7.63
17.08	12.83	7.13	20.83	7.13	7.64
17.17	12.50	7.14	20.92	7.22	7.65
17.25	12.19	7.16	21.00	7.29	7.66
17.33	11.80	7.17	21.08	7.34	7.67
17.42	11.38	7.19	21.17	7.38	7.68
17.50	11.10	7.20	21.25	7.36	7.68
17.58	11.05	7.21	21.33	7.27	7.69
17.67	11.09	7.23	21.42	7.17	7.70
17.75	11.06	7.24	21.50	7.12	7.71
17.83	10.89	7.26	21.58	7.17	7.72
17.92	10.65	7.27	21.67	7.26	7.73
18.00	10.47	7.28	21.75	7.28	7.74
18.08	10.36	7.30	21.83	7.22	7.75
18.17	10.26	7.31	21.92	7.13	7.76
18.25	10.00	7.32	22.00	6.97	7.77
18.33	9.43	7.33	22.08	6.64	7.77
18.42	8.81	7.34	22.17	6.26	7.78
18.50	8.50	7.35	22.25	6.07	7.79
18.58	8.65	7.37	22.33	6.15	7.80
18.67	8.98	7.38	22.42	6.32	7.80

WEST PASCO LF POST. BASIN 1 BASIN 1

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
22.50	6.37	7.81			
22.58	6.20	7.82			
22.67	5.92	7.83			
22.75	5.82	7.84			
22.83	6.04	7.84			
22.92	6.37	7.85			
23.00	6.45	7.86			
23.08	6.17	7.87			
23.17	5.78	7.87			
23.25	5.62	7.88			
23.33	5.86	7.89			
23.42	6.25	7.90			
23.50	6.39	7.90			
23.58	6.14	7.91			
23.67	5.76	7.92			
23.75	5.48	7.93			
23.83	5.33	7.93			
23.92	4.99	7.94			
24.00	4.15	7.94			
24.08	3.16	7.95			
24.17	2.42	7.95			
24.25	1.86	7.95			
24.33	1.44	7.96			
24.42	1.11	7.96			
24.50	0.86	7.96			
24.58	0.64	7.96			
24.67	0.46	7.96			
24.75	0.31	7.96			
24.83	0.20	7.96			
24.92	0.12	7.96			
25.00	0.07	7.96			
25.08	0.03	7.96			
25.17	0.00	7.96			
25.25	0.00	7.96			
25.33	0.00	7.96			
25.42	0.00	7.96			

WEST PASCO LF POST. BASIN 1 BASIN 2

BASIN INPUT DATA

=====

BASIN AREA	12.54	ACRES
SCS CURVE NUMBER	100.00	
INITIAL ABSTRACTION	0.00	INCHES
TIME OF CONCENTRATION	10.00	MINUTES
SCS SHAPE FACTOR	256	

OUTPUT SUMMARY

=====

STORM RAINFALL	9.30	INCHES
STORM DURATION	24.00	HOURS
TOTAL RUNOFF	9.13	INCHES
PEAK RUNOFF RATE	62.44	CFS
TIME OF PEAK	12.17	HOURS
UNIT GRAPH VOLUME	0.98	INCHES

REFERENCE FILES

=====

INPUT DATA	C:LASTFI.DAT
OUTPUT TO DISK	PASCO1
RAINFALL DISTRIBUTION	RAIN3.RAI
UNIT HYDROGRAPH	UNIT1.UHG

WEST PASCO LF POST. BASIN 1 BASIN 2

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
0.00	0.07	0.00	3.75	1.40	0.34
0.08	0.24	0.00	3.83	1.38	0.35
0.17	0.44	0.00	3.92	1.36	0.36
0.25	0.60	0.01	4.00	1.39	0.37
0.33	0.77	0.01	4.08	1.48	0.38
0.42	0.91	0.02	4.17	1.60	0.39
0.50	0.98	0.03	4.25	1.64	0.40
0.58	1.00	0.03	4.33	1.59	0.41
0.67	0.99	0.04	4.42	1.51	0.42
0.75	1.02	0.05	4.50	1.46	0.43
0.83	1.09	0.05	4.58	1.45	0.44
0.92	1.16	0.06	4.67	1.45	0.45
1.00	1.19	0.07	4.75	1.49	0.46
1.08	1.16	0.08	4.83	1.58	0.47
1.17	1.11	0.08	4.92	1.67	0.48
1.25	1.10	0.09	5.00	1.68	0.49
1.33	1.13	0.10	5.08	1.61	0.50
1.42	1.18	0.11	5.17	1.53	0.51
1.50	1.20	0.11	5.25	1.51	0.52
1.58	1.16	0.12	5.33	1.57	0.53
1.67	1.11	0.13	5.42	1.67	0.54
1.75	1.10	0.14	5.50	1.73	0.55
1.83	1.16	0.14	5.58	1.75	0.57
1.92	1.24	0.15	5.67	1.75	0.58
2.00	1.28	0.16	5.75	1.75	0.59
2.08	1.30	0.17	5.83	1.78	0.60
2.17	1.30	0.18	5.92	1.82	0.61
2.25	1.31	0.19	6.00	1.85	0.62
2.33	1.33	0.19	6.08	1.87	0.64
2.42	1.36	0.20	6.17	1.89	0.65
2.50	1.34	0.21	6.25	1.88	0.66
2.58	1.25	0.22	6.33	1.86	0.67
2.67	1.15	0.23	6.42	1.83	0.69
2.75	1.12	0.24	6.50	1.85	0.70
2.83	1.17	0.24	6.58	1.96	0.71
2.92	1.24	0.25	6.67	2.07	0.72
3.00	1.29	0.26	6.75	2.11	0.74
3.08	1.33	0.27	6.83	2.05	0.75
3.17	1.36	0.28	6.92	1.97	0.77
3.25	1.36	0.29	7.00	1.95	0.78
3.33	1.35	0.30	7.08	2.02	0.79
3.42	1.34	0.30	7.17	2.13	0.81
3.50	1.34	0.31	7.25	2.22	0.82
3.58	1.36	0.32	7.33	2.32	0.84
3.67	1.39	0.33	7.42	2.40	0.85

WEST PASCO LF POST. BASIN 1 BASIN 2

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
7.50	2.50	0.87	11.25	8.96	2.32
7.58	2.66	0.88	11.33	9.76	2.38
7.67	2.84	0.90	11.42	10.63	2.45
7.75	3.01	0.92	11.50	11.64	2.53
7.83	3.20	0.94	11.58	13.00	2.61
7.92	3.37	0.97	11.67	14.30	2.71
8.00	3.43	0.99	11.75	18.87	2.83
8.08	3.38	1.01	11.83	29.69	3.03
8.17	3.30	1.03	11.92	41.93	3.30
8.25	3.29	1.06	12.00	51.22	3.64
8.33	3.40	1.08	12.08	57.94	4.02
8.42	3.53	1.10	12.17	62.44	4.44
8.50	3.63	1.12	12.25	61.18	4.84
8.58	3.71	1.15	12.33	52.91	5.19
8.67	3.77	1.17	12.42	43.75	5.48
8.75	3.83	1.20	12.50	37.15	5.72
8.83	3.93	1.22	12.58	31.96	5.93
8.92	4.03	1.25	12.67	27.73	6.11
9.00	4.11	1.28	12.75	24.22	6.27
9.08	4.17	1.31	12.83	20.95	6.41
9.17	4.21	1.33	12.92	17.76	6.53
9.25	4.25	1.36	13.00	15.16	6.63
9.33	4.29	1.39	13.08	13.05	6.71
9.42	4.31	1.42	13.17	11.45	6.79
9.50	4.39	1.45	13.25	10.20	6.86
9.58	4.57	1.48	13.33	9.13	6.92
9.67	4.76	1.51	13.42	8.52	6.97
9.75	4.86	1.54	13.50	8.06	7.03
9.83	4.88	1.57	13.58	7.69	7.08
9.92	4.85	1.61	13.67	7.42	7.13
10.00	4.93	1.64	13.75	7.16	7.17
10.08	5.18	1.67	13.83	6.83	7.22
10.17	5.46	1.71	13.92	6.54	7.26
10.25	5.67	1.75	14.00	6.28	7.30
10.33	5.80	1.78	14.08	6.03	7.34
10.42	5.88	1.82	14.17	5.81	7.38
10.50	6.03	1.86	14.25	5.66	7.42
10.58	6.35	1.90	14.33	5.55	7.45
10.67	6.70	1.95	14.42	5.48	7.49
10.75	7.03	1.99	14.50	5.36	7.53
10.83	7.40	2.04	14.58	5.14	7.56
10.92	7.74	2.09	14.67	4.93	7.59
11.00	8.02	2.15	14.75	4.77	7.62
11.08	8.30	2.20	14.83	4.66	7.65
11.17	8.54	2.26	14.92	4.57	7.68

WEST PASCO LF POST. BASIN 1 BASIN 2

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
15.00	4.51	7.71	18.75	1.76	8.56
15.08	4.46	7.74	18.83	1.77	8.57
15.17	4.42	7.77	18.92	1.75	8.58
15.25	4.32	7.80	19.00	1.73	8.59
15.33	4.14	7.83	19.08	1.67	8.60
15.42	3.96	7.85	19.17	1.61	8.61
15.50	3.86	7.88	19.25	1.59	8.62
15.58	3.83	7.91	19.33	1.62	8.64
15.67	3.84	7.93	19.42	1.66	8.65
15.75	3.82	7.96	19.50	1.67	8.66
15.83	3.75	7.98	19.58	1.63	8.67
15.92	3.68	8.00	19.67	1.58	8.68
16.00	3.62	8.03	19.75	1.54	8.69
16.08	3.56	8.05	19.83	1.51	8.70
16.17	3.50	8.08	19.92	1.50	8.71
16.25	3.45	8.10	20.00	1.47	8.72
16.33	3.36	8.12	20.08	1.44	8.73
16.42	3.29	8.14	20.17	1.41	8.74
16.50	3.25	8.16	20.25	1.39	8.75
16.58	3.26	8.18	20.33	1.40	8.76
16.67	3.28	8.21	20.42	1.41	8.76
16.75	3.20	8.23	20.50	1.40	8.77
16.83	2.96	8.25	20.58	1.39	8.78
16.92	2.68	8.26	20.67	1.36	8.79
17.00	2.50	8.28	20.75	1.36	8.80
17.08	2.41	8.30	20.83	1.37	8.81
17.17	2.36	8.31	20.92	1.39	8.82
17.25	2.30	8.33	21.00	1.40	8.83
17.33	2.22	8.34	21.08	1.41	8.84
17.42	2.14	8.36	21.17	1.42	8.85
17.50	2.10	8.37	21.25	1.42	8.86
17.58	2.10	8.38	21.33	1.39	8.87
17.67	2.11	8.40	21.42	1.37	8.87
17.75	2.11	8.41	21.50	1.37	8.88
17.83	2.07	8.43	21.58	1.38	8.89
17.92	2.04	8.44	21.67	1.40	8.90
18.00	2.01	8.45	21.75	1.40	8.91
18.08	1.99	8.47	21.83	1.38	8.92
18.17	1.97	8.48	21.92	1.36	8.93
18.25	1.90	8.49	22.00	1.33	8.94
18.33	1.78	8.50	22.08	1.26	8.95
18.42	1.66	8.51	22.17	1.18	8.95
18.50	1.61	8.52	22.25	1.15	8.96
18.58	1.65	8.54	22.33	1.18	8.97
18.67	1.73	8.55	22.42	1.21	8.98

WEST PASCO LF POST. BASIN 1 BASIN 2

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
22.50	1.22	8.99			
22.58	1.18	8.99			
22.67	1.12	9.00			
22.75	1.11	9.01			
22.83	1.16	9.02			
22.92	1.23	9.02			
23.00	1.24	9.03			
23.08	1.18	9.04			
23.17	1.10	9.05			
23.25	1.07	9.05			
23.33	1.13	9.06			
23.42	1.21	9.07			
23.50	1.23	9.08			
23.58	1.17	9.09			
23.67	1.09	9.09			
23.75	1.04	9.10			
23.83	1.01	9.11			
23.92	0.93	9.11			
24.00	0.75	9.12			
24.08	0.55	9.12			
24.17	0.41	9.12			
24.25	0.31	9.13			
24.33	0.23	9.13			
24.42	0.17	9.13			
24.50	0.12	9.13			
24.58	0.08	9.13			
24.67	0.06	9.13			
24.75	0.03	9.13			
24.83	0.02	9.13			
24.92	0.01	9.13			
25.00	0.00	9.13			
25.08	0.00	9.13			
25.17	0.00	9.13			
25.25	0.00	9.13			

W. PASCO LF BASIN 2 BASIN 1

BASIN INPUT DATA

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=====
BASIN AREA          46.57 ACRES
SCS CURVE NUMBER    90.00
INITIAL ABSTRACTION 0.22 INCHES
TIME OF CONCENTRATION 12.54 MINUTES
SCS SHAPE FACTOR    256
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OUTPUT SUMMARY

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=====
STORM RAINFALL      9.30 INCHES
STORM DURATION      24.00 HOURS
TOTAL RUNOFF        7.99 INCHES
PEAK RUNOFF RATE    210.73 CFS
TIME OF PEAK        12.25 HOURS
UNIT GRAPH VOLUME   0.99 INCHES
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REFERENCE FILES

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INPUT DATA          C:LASTFI.DAT
OUTPUT TO DISK       PASCO2
RAINFALL DISTRIBUTION RAIN3.RAI
UNIT HYDROGRAPH      UNIT1.UHG
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W. PASCO LF BASIN 2 BASIN 1

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
0.00	0.00	0.00	3.75	0.91	0.01
0.08	0.00	0.00	3.83	0.97	0.01
0.17	0.00	0.00	3.92	1.02	0.02
0.25	0.00	0.00	4.00	1.09	0.02
0.33	0.00	0.00	4.08	1.23	0.02
0.42	0.00	0.00	4.17	1.39	0.02
0.50	0.00	0.00	4.25	1.52	0.02
0.58	0.00	0.00	4.33	1.55	0.03
0.67	0.00	0.00	4.42	1.55	0.03
0.75	0.00	0.00	4.50	1.56	0.03
0.83	0.00	0.00	4.58	1.59	0.04
0.92	0.00	0.00	4.67	1.65	0.04
1.00	0.00	0.00	4.75	1.73	0.04
1.08	0.00	0.00	4.83	1.88	0.05
1.17	0.00	0.00	4.92	2.06	0.05
1.25	0.00	0.00	5.00	2.17	0.05
1.33	0.00	0.00	5.08	2.16	0.06
1.42	0.00	0.00	5.17	2.11	0.06
1.50	0.00	0.00	5.25	2.12	0.06
1.58	0.00	0.00	5.33	2.25	0.07
1.67	0.00	0.00	5.42	2.42	0.07
1.75	0.00	0.00	5.50	2.57	0.08
1.83	0.00	0.00	5.58	2.67	0.08
1.92	0.00	0.00	5.67	2.74	0.09
2.00	0.00	0.00	5.75	2.81	0.09
2.08	0.00	0.00	5.83	2.91	0.10
2.17	0.00	0.00	5.92	3.03	0.10
2.25	0.00	0.00	6.00	3.14	0.11
2.33	0.00	0.00	6.08	3.24	0.11
2.42	0.01	0.00	6.17	3.32	0.12
2.50	0.04	0.00	6.25	3.38	0.13
2.58	0.06	0.00	6.33	3.41	0.13
2.67	0.08	0.00	6.42	3.42	0.14
2.75	0.11	0.00	6.50	3.50	0.14
2.83	0.16	0.00	6.58	3.71	0.15
2.92	0.23	0.00	6.67	3.99	0.16
3.00	0.30	0.00	6.75	4.15	0.16
3.08	0.37	0.00	6.83	4.13	0.17
3.17	0.44	0.00	6.92	4.04	0.18
3.25	0.51	0.00	7.00	4.04	0.19
3.33	0.57	0.01	7.08	4.20	0.19
3.42	0.63	0.01	7.17	4.44	0.20
3.50	0.69	0.01	7.25	4.69	0.21
3.58	0.76	0.01	7.33	4.95	0.22
3.67	0.84	0.01	7.42	5.19	0.23

W. PASCO LF BASIN 2 BASIN 1

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
7.50	5.47	0.24	11.25	28.54	1.36
7.58	5.87	0.25	11.33	30.95	1.41
7.67	6.34	0.26	11.42	33.84	1.47
7.75	6.80	0.27	11.50	37.04	1.54
7.83	7.31	0.28	11.58	41.35	1.61
7.92	7.80	0.30	11.67	45.89	1.69
8.00	8.12	0.31	11.75	57.88	1.79
8.08	8.16	0.33	11.83	88.64	1.95
8.17	8.10	0.34	11.92	128.64	2.18
8.25	8.16	0.36	12.00	162.32	2.47
8.33	8.46	0.37	12.08	188.18	2.80
8.42	8.86	0.39	12.17	207.34	3.17
8.50	9.23	0.40	12.25	210.73	3.54
8.58	9.55	0.42	12.33	190.29	3.88
8.67	9.83	0.44	12.42	161.22	4.17
8.75	10.11	0.46	12.50	138.78	4.41
8.83	10.45	0.47	12.58	121.32	4.63
8.92	10.81	0.49	12.67	107.00	4.82
9.00	11.13	0.51	12.75	95.35	4.99
9.08	11.40	0.53	12.83	84.94	5.14
9.17	11.64	0.55	12.92	75.38	5.27
9.25	11.85	0.57	13.00	66.84	5.39
9.33	12.05	0.60	13.08	59.16	5.50
9.42	12.24	0.62	13.17	51.86	5.59
9.50	12.53	0.64	13.25	45.61	5.67
9.58	13.06	0.66	13.33	40.20	5.74
9.67	13.69	0.69	13.42	35.72	5.80
9.75	14.14	0.71	13.50	32.31	5.86
9.83	14.34	0.74	13.58	29.83	5.91
9.92	14.41	0.76	13.67	28.56	5.96
10.00	14.67	0.79	13.75	27.40	6.01
10.08	15.37	0.82	13.83	26.14	6.06
10.17	16.26	0.85	13.92	24.95	6.10
10.25	17.00	0.88	14.00	23.91	6.15
10.33	17.54	0.91	14.08	22.91	6.19
10.42	17.96	0.94	14.17	22.06	6.23
10.50	18.49	0.97	14.25	21.40	6.26
10.58	19.44	1.01	14.33	20.91	6.30
10.67	20.59	1.04	14.42	20.56	6.34
10.75	21.72	1.08	14.50	20.11	6.37
10.83	22.95	1.12	14.58	19.39	6.41
10.92	24.16	1.17	14.67	18.62	6.44
11.00	25.24	1.21	14.75	18.00	6.47
11.08	26.27	1.26	14.83	17.53	6.50
11.17	27.21	1.30	14.92	17.15	6.53

W. PASCO LF BASIN 2 BASIN 1

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
15.00	16.87	6.56	18.75	6.51	7.42
15.08	16.65	6.59	18.83	6.54	7.43
15.17	16.47	6.62	18.92	6.51	7.44
15.25	16.16	6.65	19.00	6.43	7.45
15.33	15.58	6.68	19.08	6.25	7.46
15.42	14.95	6.71	19.17	6.03	7.47
15.50	14.52	6.73	19.25	5.92	7.48
15.58	14.34	6.76	19.33	5.97	7.49
15.67	14.29	6.78	19.42	6.09	7.50
15.75	14.19	6.81	19.50	6.14	7.51
15.83	13.98	6.83	19.58	6.05	7.53
15.92	13.73	6.86	19.67	5.91	7.54
16.00	13.51	6.88	19.75	5.77	7.55
16.08	13.28	6.90	19.83	5.67	7.56
16.17	13.07	6.93	19.92	5.59	7.57
16.25	12.85	6.95	20.00	5.50	7.58
16.33	12.57	6.97	20.08	5.38	7.59
16.42	12.28	6.99	20.17	5.26	7.59
16.50	12.09	7.02	20.25	5.19	7.60
16.58	12.07	7.04	20.33	5.18	7.61
16.67	12.14	7.06	20.42	5.21	7.62
16.75	11.97	7.08	20.50	5.22	7.63
16.83	11.25	7.10	20.58	5.16	7.64
16.92	10.31	7.12	20.67	5.08	7.65
17.00	9.62	7.14	20.75	5.04	7.66
17.08	9.21	7.15	20.83	5.06	7.67
17.17	8.96	7.17	20.92	5.11	7.68
17.25	8.73	7.18	21.00	5.16	7.69
17.33	8.45	7.20	21.08	5.20	7.70
17.42	8.16	7.21	21.17	5.23	7.70
17.50	7.96	7.23	21.25	5.22	7.71
17.58	7.90	7.24	21.33	5.16	7.72
17.67	7.91	7.25	21.42	5.09	7.73
17.75	7.89	7.27	21.50	5.05	7.74
17.83	7.76	7.28	21.58	5.08	7.75
17.92	7.60	7.30	21.67	5.14	7.76
18.00	7.46	7.31	21.75	5.16	7.77
18.08	7.36	7.32	21.83	5.12	7.78
18.17	7.29	7.34	21.92	5.06	7.79
18.25	7.12	7.35	22.00	4.96	7.80
18.33	6.75	7.36	22.08	4.74	7.80
18.42	6.32	7.37	22.17	4.48	7.81
18.50	6.08	7.38	22.25	4.33	7.82
18.58	6.15	7.39	22.33	4.37	7.83
18.67	6.37	7.40	22.42	4.48	7.83

W. PASCO LF BASIN 2 BASIN 1

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
22.50	4.52	7.84			
22.58	4.41	7.85			
22.67	4.23	7.86			
22.75	4.15	7.87			
22.83	4.28	7.87			
22.92	4.50	7.88			
23.00	4.57	7.89			
23.08	4.39	7.90			
23.17	4.13	7.90			
23.25	4.01	7.91			
23.33	4.14	7.92			
23.42	4.40	7.93			
23.50	4.52	7.93			
23.58	4.37	7.94			
23.67	4.11	7.95			
23.75	3.92	7.96			
23.83	3.80	7.96			
23.92	3.58	7.97			
24.00	3.03	7.98			
24.08	2.35	7.98			
24.17	1.82	7.98			
24.25	1.42	7.99			
24.33	1.11	7.99			
24.42	0.87	7.99			
24.50	0.69	7.99			
24.58	0.54	7.99			
24.67	0.40	7.99			
24.75	0.29	7.99			
24.83	0.19	7.99			
24.92	0.13	7.99			
25.00	0.08	7.99			
25.08	0.04	7.99			
25.17	0.02	7.99			
25.25	0.00	7.99			
25.33	0.00	7.99			
25.42	0.00	7.99			
25.50	0.00	7.99			

W. PASCO LF BASIN 2 BASIN 2

BASIN INPUT DATA

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BASIN AREA	9.50	ACRES
SCS CURVE NUMBER	100.00	
INITIAL ABSTRACTION	0.00	INCHES
TIME OF CONCENTRATION	10.00	MINUTES
SCS SHAPE FACTOR	256	

OUTPUT SUMMARY

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STORM RAINFALL	9.30	INCHES
STORM DURATION	24.00	HOURS
TOTAL RUNOFF	9.13	INCHES
PEAK RUNOFF RATE	47.31	CFS
TIME OF PEAK	12.17	HOURS
UNIT GRAPH VOLUME	0.98	INCHES

REFERENCE FILES

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INPUT DATA	C:\LASTFI.DAT
OUTPUT TO DISK	PASCO2
RAINFALL DISTRIBUTION	RAIN3.RAI
UNIT HYDROGRAPH	UNIT1.UHG

W. PASCO LF BASIN 2 BASIN 2

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
0.00	0.05	0.00	3.75	1.06	0.34
0.08	0.18	0.00	3.83	1.05	0.35
0.17	0.33	0.00	3.92	1.03	0.36
0.25	0.46	0.01	4.00	1.05	0.37
0.33	0.58	0.01	4.08	1.12	0.38
0.42	0.69	0.02	4.17	1.21	0.39
0.50	0.75	0.03	4.25	1.24	0.40
0.58	0.76	0.03	4.33	1.20	0.41
0.67	0.75	0.04	4.42	1.14	0.42
0.75	0.77	0.05	4.50	1.11	0.43
0.83	0.82	0.05	4.58	1.10	0.44
0.92	0.88	0.06	4.67	1.10	0.45
1.00	0.90	0.07	4.75	1.13	0.46
1.08	0.88	0.08	4.83	1.19	0.47
1.17	0.84	0.08	4.92	1.26	0.48
1.25	0.83	0.09	5.00	1.27	0.49
1.33	0.86	0.10	5.08	1.22	0.50
1.42	0.89	0.11	5.17	1.16	0.51
1.50	0.91	0.11	5.25	1.14	0.52
1.58	0.88	0.12	5.33	1.19	0.53
1.67	0.84	0.13	5.42	1.27	0.54
1.75	0.84	0.14	5.50	1.31	0.55
1.83	0.88	0.14	5.58	1.32	0.57
1.92	0.94	0.15	5.67	1.32	0.58
2.00	0.97	0.16	5.75	1.33	0.59
2.08	0.98	0.17	5.83	1.35	0.60
2.17	0.98	0.18	5.92	1.38	0.61
2.25	0.99	0.19	6.00	1.40	0.62
2.33	1.01	0.19	6.08	1.42	0.64
2.42	1.03	0.20	6.17	1.43	0.65
2.50	1.02	0.21	6.25	1.43	0.66
2.58	0.95	0.22	6.33	1.41	0.67
2.67	0.87	0.23	6.42	1.39	0.69
2.75	0.85	0.24	6.50	1.40	0.70
2.83	0.88	0.24	6.58	1.48	0.71
2.92	0.94	0.25	6.67	1.57	0.72
3.00	0.98	0.26	6.75	1.60	0.74
3.08	1.01	0.27	6.83	1.55	0.75
3.17	1.03	0.28	6.92	1.49	0.77
3.25	1.03	0.29	7.00	1.48	0.78
3.33	1.02	0.30	7.08	1.53	0.79
3.42	1.01	0.30	7.17	1.61	0.81
3.50	1.02	0.31	7.25	1.68	0.82
3.58	1.03	0.32	7.33	1.75	0.84
3.67	1.05	0.33	7.42	1.82	0.85

W. PASCO LF BASIN 2 BASIN 2

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
7.50	1.89	0.87	11.25	6.79	2.32
7.58	2.02	0.88	11.33	7.39	2.38
7.67	2.15	0.90	11.42	8.05	2.45
7.75	2.28	0.92	11.50	8.81	2.53
7.83	2.42	0.94	11.58	9.85	2.61
7.92	2.55	0.97	11.67	10.83	2.71
8.00	2.60	0.99	11.75	14.30	2.83
8.08	2.56	1.01	11.83	22.49	3.03
8.17	2.50	1.03	11.92	31.76	3.30
8.25	2.49	1.06	12.00	38.80	3.64
8.33	2.57	1.08	12.08	43.89	4.02
8.42	2.67	1.10	12.17	47.31	4.44
8.50	2.75	1.12	12.25	46.35	4.84
8.58	2.81	1.15	12.33	40.08	5.19
8.67	2.85	1.17	12.42	33.15	5.48
8.75	2.90	1.20	12.50	28.14	5.72
8.83	2.97	1.22	12.58	24.21	5.93
8.92	3.05	1.25	12.67	21.01	6.11
9.00	3.11	1.28	12.75	18.35	6.27
9.08	3.16	1.31	12.83	15.87	6.41
9.17	3.19	1.33	12.92	13.46	6.53
9.25	3.22	1.36	13.00	11.48	6.63
9.33	3.25	1.39	13.08	9.89	6.71
9.42	3.27	1.42	13.17	8.67	6.79
9.50	3.33	1.45	13.25	7.72	6.86
9.58	3.46	1.48	13.33	6.92	6.92
9.67	3.61	1.51	13.42	6.46	6.97
9.75	3.69	1.54	13.50	6.11	7.03
9.83	3.69	1.57	13.58	5.83	7.08
9.92	3.68	1.61	13.67	5.62	7.13
10.00	3.74	1.64	13.75	5.42	7.17
10.08	3.92	1.67	13.83	5.18	7.22
10.17	4.14	1.71	13.92	4.95	7.26
10.25	4.29	1.75	14.00	4.76	7.30
10.33	4.39	1.78	14.08	4.56	7.34
10.42	4.45	1.82	14.17	4.40	7.38
10.50	4.57	1.86	14.25	4.29	7.42
10.58	4.81	1.90	14.33	4.21	7.45
10.67	5.07	1.95	14.42	4.15	7.49
10.75	5.33	1.99	14.50	4.06	7.53
10.83	5.61	2.04	14.58	3.89	7.56
10.92	5.86	2.09	14.67	3.73	7.59
11.00	6.08	2.15	14.75	3.62	7.62
11.08	6.29	2.20	14.83	3.53	7.65
11.17	6.47	2.26	14.92	3.46	7.68

W. PASCO LF BASIN 2 BASIN 2

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
15.00	3.42	7.71	18.75	1.34	8.56
15.08	3.38	7.74	18.83	1.34	8.57
15.17	3.35	7.77	18.92	1.33	8.58
15.25	3.27	7.80	19.00	1.31	8.59
15.33	3.14	7.83	19.08	1.27	8.60
15.42	3.00	7.85	19.17	1.22	8.61
15.50	2.93	7.88	19.25	1.21	8.62
15.58	2.91	7.91	19.33	1.23	8.64
15.67	2.91	7.93	19.42	1.26	8.65
15.75	2.89	7.96	19.50	1.26	8.66
15.83	2.84	7.98	19.58	1.24	8.67
15.92	2.79	8.00	19.67	1.20	8.68
16.00	2.74	8.03	19.75	1.17	8.69
16.08	2.69	8.05	19.83	1.15	8.70
16.17	2.66	8.08	19.92	1.13	8.71
16.25	2.61	8.10	20.00	1.12	8.72
16.33	2.55	8.12	20.08	1.09	8.73
16.42	2.49	8.14	20.17	1.07	8.74
16.50	2.46	8.16	20.25	1.05	8.75
16.58	2.47	8.18	20.33	1.06	8.76
16.67	2.49	8.21	20.42	1.07	8.76
16.75	2.43	8.23	20.50	1.06	8.77
16.83	2.24	8.25	20.58	1.05	8.78
16.92	2.03	8.26	20.67	1.03	8.79
17.00	1.90	8.28	20.75	1.03	8.80
17.08	1.83	8.30	20.83	1.04	8.81
17.17	1.79	8.31	20.92	1.05	8.82
17.25	1.74	8.33	21.00	1.06	8.83
17.33	1.68	8.34	21.08	1.07	8.84
17.42	1.62	8.36	21.17	1.08	8.85
17.50	1.59	8.37	21.25	1.07	8.86
17.58	1.59	8.38	21.33	1.06	8.87
17.67	1.60	8.40	21.42	1.04	8.87
17.75	1.60	8.41	21.50	1.03	8.88
17.83	1.57	8.43	21.58	1.04	8.89
17.92	1.54	8.44	21.67	1.06	8.90
18.00	1.52	8.45	21.75	1.06	8.91
18.08	1.50	8.47	21.83	1.05	8.92
18.17	1.49	8.48	21.92	1.03	8.93
18.25	1.44	8.49	22.00	1.01	8.94
18.33	1.35	8.50	22.08	0.95	8.95
18.42	1.26	8.51	22.17	0.90	8.95
18.50	1.22	8.52	22.25	0.87	8.96
18.58	1.25	8.54	22.33	0.89	8.97
18.67	1.31	8.55	22.42	0.92	8.98

W. PASCO LF BASIN 2 BASIN 2

TIME	RUNOFF	CUMUL-	TIME	RUNOFF	CUMUL-
(hrs)	RATE	ATIVE	(hrs)	RATE	ATIVE
(hrs)	(cfs)	(ins)	(hrs)	(cfs)	(ins)
22.50	0.92	8.99			
22.58	0.89	8.99			
22.67	0.85	9.00			
22.75	0.84	9.01			
22.83	0.88	9.02			
22.92	0.93	9.02			
23.00	0.94	9.03			
23.08	0.89	9.04			
23.17	0.83	9.05			
23.25	0.81	9.05			
23.33	0.86	9.06			
23.42	0.92	9.07			
23.50	0.93	9.08			
23.58	0.89	9.09			
23.67	0.83	9.09			
23.75	0.79	9.10			
23.83	0.77	9.11			
23.92	0.71	9.11			
24.00	0.57	9.12			
24.08	0.42	9.12			
24.17	0.31	9.12			
24.25	0.23	9.13			
24.33	0.17	9.13			
24.42	0.13	9.13			
24.50	0.09	9.13			
24.58	0.06	9.13			
24.67	0.04	9.13			
24.75	0.03	9.13			
24.83	0.01	9.13			
24.92	0.01	9.13			
25.00	0.00	9.13			
25.08	0.00	9.13			
25.17	0.00	9.13			
25.25	0.00	9.13			

WEST PASCO LF POST. BASIN 3

BASIN INPUT DATA

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BASIN AREA	53.00	ACRES
SCS CURVE NUMBER	90.00	
INITIAL ABSTRACTION	0.22	INCHES
TIME OF CONCENTRATION	11.64	MINUTES
SCS SHAPE FACTOR	256	

OUTPUT SUMMARY

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STORM RAINFALL	9.30	INCHES
STORM DURATION	24.00	HOURS
TOTAL RUNOFF	7.96	INCHES
PEAK RUNOFF RATE	242.35	CFS
TIME OF PEAK	12.25	HOURS
UNIT GRAPH VOLUME	0.98	INCHES

REFERENCE FILES

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INPUT DATA	C:LASTFI.DAT
OUTPUT TO DISK	
RAINFALL DISTRIBUTION	RAIN3.RAI
UNIT HYDROGRAPH	UNIT1.UHG

WEST PASCO LF POST.

BASIN 3

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
0.00	0.00	0.00	3.75	1.05	0.01
0.08	0.00	0.00	3.83	1.12	0.01
0.17	0.00	0.00	3.92	1.17	0.02
0.25	0.00	0.00	4.00	1.26	0.02
0.33	0.00	0.00	4.08	1.42	0.02
0.42	0.00	0.00	4.17	1.61	0.02
0.50	0.00	0.00	4.25	1.75	0.03
0.58	0.00	0.00	4.33	1.78	0.03
0.67	0.00	0.00	4.42	1.77	0.03
0.75	0.00	0.00	4.50	1.78	0.03
0.83	0.00	0.00	4.58	1.82	0.04
0.92	0.00	0.00	4.67	1.88	0.04
1.00	0.00	0.00	4.75	1.99	0.04
1.08	0.00	0.00	4.83	2.17	0.05
1.17	0.00	0.00	4.92	2.37	0.05
1.25	0.00	0.00	5.00	2.48	0.05
1.33	0.00	0.00	5.08	2.47	0.06
1.42	0.00	0.00	5.17	2.40	0.06
1.50	0.00	0.00	5.25	2.42	0.06
1.58	0.00	0.00	5.33	2.57	0.07
1.67	0.00	0.00	5.42	2.78	0.07
1.75	0.00	0.00	5.50	2.95	0.08
1.83	0.00	0.00	5.58	3.05	0.08
1.92	0.00	0.00	5.67	3.13	0.09
2.00	0.00	0.00	5.75	3.21	0.09
2.08	0.00	0.00	5.83	3.33	0.10
2.17	0.00	0.00	5.92	3.46	0.10
2.25	0.00	0.00	6.00	3.59	0.11
2.33	0.00	0.00	6.08	3.69	0.11
2.42	0.02	0.00	6.17	3.79	0.12
2.50	0.04	0.00	6.25	3.86	0.13
2.58	0.07	0.00	6.33	3.88	0.13
2.67	0.10	0.00	6.42	3.89	0.14
2.75	0.13	0.00	6.50	3.99	0.14
2.83	0.19	0.00	6.58	4.25	0.15
2.92	0.27	0.00	6.67	4.56	0.16
3.00	0.35	0.00	6.75	4.74	0.17
3.08	0.44	0.00	6.83	4.70	0.17
3.17	0.52	0.00	6.92	4.59	0.18
3.25	0.60	0.00	7.00	4.59	0.19
3.33	0.67	0.01	7.08	4.79	0.19
3.42	0.73	0.01	7.17	5.08	0.20
3.50	0.80	0.01	7.25	5.37	0.21
3.58	0.89	0.01	7.33	5.66	0.22
3.67	0.98	0.01	7.42	5.95	0.23

WEST PASCO LF POST.

BASIN 3

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
7.50	6.26	0.24	11.25	32.72	1.36
7.58	6.74	0.25	11.33	35.59	1.42
7.67	7.28	0.26	11.42	38.94	1.48
7.75	7.81	0.27	11.50	42.70	1.54
7.83	8.40	0.29	11.58	47.78	1.62
7.92	8.97	0.30	11.67	52.98	1.70
8.00	9.30	0.31	11.75	67.98	1.81
8.08	9.33	0.33	11.83	105.49	1.97
8.17	9.24	0.34	11.92	152.38	2.21
8.25	9.31	0.36	12.00	190.71	2.51
8.33	9.67	0.37	12.08	219.74	2.85
8.42	10.14	0.39	12.17	240.93	3.23
8.50	10.55	0.41	12.25	242.35	3.60
8.58	10.91	0.42	12.33	215.92	3.94
8.67	11.23	0.44	12.42	181.56	4.22
8.75	11.54	0.46	12.50	155.81	4.47
8.83	11.92	0.48	12.58	135.72	4.68
8.92	12.34	0.50	12.67	119.23	4.86
9.00	12.70	0.52	12.75	105.77	5.03
9.08	13.01	0.54	12.83	93.40	5.17
9.17	13.27	0.56	12.92	82.03	5.30
9.25	13.50	0.58	13.00	72.08	5.41
9.33	13.73	0.60	13.08	62.63	5.51
9.42	13.94	0.62	13.17	54.68	5.60
9.50	14.28	0.64	13.25	48.20	5.67
9.58	14.92	0.67	13.33	42.65	5.74
9.67	15.64	0.69	13.42	38.10	5.80
9.75	16.14	0.72	13.50	34.84	5.85
9.83	16.33	0.74	13.58	33.17	5.90
9.92	16.40	0.77	13.67	31.81	5.95
10.00	16.72	0.79	13.75	30.55	6.00
10.08	17.56	0.82	13.83	29.21	6.05
10.17	18.60	0.85	13.92	27.88	6.09
10.25	19.44	0.88	14.00	26.73	6.13
10.33	20.04	0.91	14.08	25.67	6.17
10.42	20.50	0.94	14.17	24.71	6.21
10.50	21.12	0.98	14.25	24.00	6.25
10.58	22.25	1.01	14.33	23.50	6.29
10.67	23.58	1.05	14.42	23.12	6.32
10.75	24.89	1.09	14.50	22.61	6.36
10.83	26.31	1.13	14.58	21.79	6.39
10.92	27.69	1.17	14.67	20.91	6.42
11.00	28.90	1.22	14.75	20.23	6.45
11.08	30.07	1.26	14.83	19.71	6.49
11.17	31.14	1.31	14.92	19.30	6.52

WEST PASCO LF POST.

BASIN 3

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
15.00	18.99	6.55	18.75	7.38	7.39
15.08	18.78	6.57	18.83	7.40	7.40
15.17	18.58	6.60	18.92	7.36	7.41
15.25	18.21	6.63	19.00	7.26	7.42
15.33	17.53	6.66	19.08	7.05	7.43
15.42	16.81	6.69	19.17	6.80	7.44
15.50	16.34	6.71	19.25	6.69	7.45
15.58	16.16	6.74	19.33	6.76	7.46
15.67	16.13	6.76	19.42	6.91	7.48
15.75	16.02	6.79	19.50	6.96	7.49
15.83	15.78	6.81	19.58	6.86	7.50
15.92	15.49	6.83	19.67	6.68	7.51
16.00	15.24	6.86	19.75	6.52	7.52
16.08	14.98	6.88	19.83	6.40	7.53
16.17	14.75	6.91	19.92	6.30	7.54
16.25	14.50	6.93	20.00	6.20	7.55
16.33	14.18	6.95	20.08	6.07	7.56
16.42	13.84	6.97	20.17	5.94	7.57
16.50	13.65	6.99	20.25	5.86	7.58
16.58	13.65	7.01	20.33	5.86	7.58
16.67	13.74	7.04	20.42	5.90	7.59
16.75	13.51	7.06	20.50	5.90	7.60
16.83	12.62	7.08	20.58	5.83	7.61
16.92	11.52	7.09	20.67	5.74	7.62
17.00	10.75	7.11	20.75	5.70	7.63
17.08	10.32	7.13	20.83	5.73	7.64
17.17	10.05	7.14	20.92	5.80	7.65
17.25	9.80	7.16	21.00	5.86	7.66
17.33	9.48	7.17	21.08	5.90	7.67
17.42	9.15	7.19	21.17	5.93	7.68
17.50	8.93	7.20	21.25	5.92	7.68
17.58	8.88	7.21	21.33	5.85	7.69
17.67	8.92	7.23	21.42	5.76	7.70
17.75	8.89	7.24	21.50	5.73	7.71
17.83	8.75	7.26	21.58	5.76	7.72
17.92	8.56	7.27	21.67	5.83	7.73
18.00	8.41	7.28	21.75	5.85	7.74
18.08	8.33	7.30	21.83	5.80	7.75
18.17	8.25	7.31	21.92	5.73	7.76
18.25	8.04	7.32	22.00	5.60	7.77
18.33	7.59	7.33	22.08	5.34	7.77
18.42	7.09	7.34	22.17	5.04	7.78
18.50	6.84	7.35	22.25	4.88	7.79
18.58	6.95	7.37	22.33	4.94	7.80
18.67	7.22	7.38	22.42	5.08	7.80

WEST PASCO LF POST. BASIN 3

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
22.50	5.12	7.81			
22.58	4.98	7.82			
22.67	4.76	7.83			
22.75	4.68	7.84			
22.83	4.85	7.84			
22.92	5.12	7.85			
23.00	5.18	7.86			
23.08	4.96	7.87			
23.17	4.65	7.87			
23.25	4.52	7.88			
23.33	4.71	7.89			
23.42	5.02	7.90			
23.50	5.14	7.90			
23.58	4.94	7.91			
23.67	4.63	7.92			
23.75	4.40	7.93			
23.83	4.29	7.93			
23.92	4.01	7.94			
24.00	3.34	7.94			
24.08	2.55	7.95			
24.17	1.95	7.95			
24.25	1.50	7.95			
24.33	1.16	7.96			
24.42	0.90	7.96			
24.50	0.70	7.96			
24.58	0.52	7.96			
24.67	0.37	7.96			
24.75	0.25	7.96			
24.83	0.17	7.96			
24.92	0.10	7.96			
25.00	0.06	7.96			
25.08	0.02	7.96			
25.17	0.00	7.96			
25.25	0.00	7.96			
25.33	0.00	7.96			
25.42	0.00	7.96			

WEST PASCO LF POST. BASIN 3 BASIN 2

BASIN INPUT DATA

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BASIN AREA	10.10	ACRES
SCS CURVE NUMBER	100.00	
INITIAL ABSTRACTION	0.00	INCHES
TIME OF CONCENTRATION	10.00	MINUTES
SCS SHAPE FACTOR	256	

OUTPUT SUMMARY

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STORM RAINFALL	9.30	INCHES
STORM DURATION	24.00	HOURS
TOTAL RUNOFF	9.13	INCHES
PEAK RUNOFF RATE	50.29	CFS
TIME OF PEAK	12.17	HOURS
UNIT GRAPH VOLUME	0.98	INCHES

REFERENCE FILES

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INPUT DATA	C:LASTFI.DAT
OUTPUT TO DISK	
RAINFALL DISTRIBUTION	RAIN3.RAI
UNIT HYDROGRAPH	UNIT1.UHG

WEST PASCO LF POST. BASIN 3 BASIN 2

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
0.00	0.05	0.00	3.75	1.12	0.34
0.08	0.20	0.00	3.83	1.11	0.35
0.17	0.35	0.00	3.92	1.10	0.36
0.25	0.49	0.01	4.00	1.12	0.37
0.33	0.62	0.01	4.08	1.20	0.38
0.42	0.73	0.02	4.17	1.29	0.39
0.50	0.79	0.03	4.25	1.32	0.40
0.58	0.80	0.03	4.33	1.28	0.41
0.67	0.80	0.04	4.42	1.22	0.42
0.75	0.82	0.05	4.50	1.18	0.43
0.83	0.88	0.05	4.58	1.17	0.44
0.92	0.93	0.06	4.67	1.17	0.45
1.00	0.96	0.07	4.75	1.20	0.46
1.08	0.93	0.08	4.83	1.27	0.47
1.17	0.89	0.08	4.92	1.34	0.48
1.25	0.88	0.09	5.00	1.35	0.49
1.33	0.91	0.10	5.08	1.30	0.50
1.42	0.95	0.11	5.17	1.23	0.51
1.50	0.96	0.11	5.25	1.21	0.52
1.58	0.94	0.12	5.33	1.27	0.53
1.67	0.90	0.13	5.42	1.35	0.54
1.75	0.89	0.14	5.50	1.39	0.55
1.83	0.94	0.14	5.58	1.41	0.57
1.92	1.00	0.15	5.67	1.41	0.58
2.00	1.03	0.16	5.75	1.41	0.59
2.08	1.04	0.17	5.83	1.44	0.60
2.17	1.05	0.18	5.92	1.46	0.61
2.25	1.05	0.19	6.00	1.49	0.62
2.33	1.08	0.19	6.08	1.51	0.64
2.42	1.10	0.20	6.17	1.52	0.65
2.50	1.08	0.21	6.25	1.52	0.66
2.58	1.01	0.22	6.33	1.50	0.67
2.67	0.93	0.23	6.42	1.47	0.69
2.75	0.90	0.24	6.50	1.49	0.70
2.83	0.94	0.24	6.58	1.58	0.71
2.92	1.00	0.25	6.67	1.67	0.72
3.00	1.04	0.26	6.75	1.70	0.74
3.08	1.07	0.27	6.83	1.65	0.75
3.17	1.09	0.28	6.92	1.58	0.77
3.25	1.10	0.29	7.00	1.57	0.78
3.33	1.09	0.30	7.08	1.63	0.79
3.42	1.08	0.30	7.17	1.71	0.81
3.50	1.08	0.31	7.25	1.79	0.82
3.58	1.10	0.32	7.33	1.86	0.84
3.67	1.12	0.33	7.42	1.93	0.85

WEST PASCO LF POST.

BASIN 3

BASIN 2

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
7.50	2.01	0.87	11.25	7.21	2.32
7.58	2.14	0.88	11.33	7.86	2.38
7.67	2.29	0.90	11.42	8.56	2.45
7.75	2.42	0.92	11.50	9.37	2.53
7.83	2.58	0.94	11.58	10.47	2.61
7.92	2.71	0.97	11.67	11.52	2.71
8.00	2.76	0.99	11.75	15.20	2.83
8.08	2.72	1.01	11.83	23.92	3.03
8.17	2.66	1.03	11.92	33.77	3.30
8.25	2.65	1.06	12.00	41.25	3.64
8.33	2.73	1.08	12.08	46.67	4.02
8.42	2.84	1.10	12.17	50.29	4.44
8.50	2.92	1.12	12.25	49.27	4.84
8.58	2.99	1.15	12.33	42.61	5.19
8.67	3.03	1.17	12.42	35.24	5.48
8.75	3.08	1.20	12.50	29.92	5.72
8.83	3.16	1.22	12.58	25.74	5.93
8.92	3.24	1.25	12.67	22.33	6.11
9.00	3.31	1.28	12.75	19.51	6.27
9.08	3.36	1.31	12.83	16.87	6.41
9.17	3.39	1.33	12.92	14.31	6.53
9.25	3.43	1.36	13.00	12.21	6.63
9.33	3.45	1.39	13.08	10.51	6.71
9.42	3.47	1.42	13.17	9.22	6.79
9.50	3.54	1.45	13.25	8.21	6.86
9.58	3.68	1.48	13.33	7.35	6.92
9.67	3.84	1.51	13.42	6.87	6.97
9.75	3.92	1.54	13.50	6.49	7.03
9.83	3.93	1.57	13.58	6.20	7.08
9.92	3.91	1.61	13.67	5.98	7.13
10.00	3.97	1.64	13.75	5.77	7.17
10.08	4.17	1.67	13.83	5.50	7.22
10.17	4.40	1.71	13.92	5.27	7.26
10.25	4.56	1.75	14.00	5.06	7.30
10.33	4.67	1.78	14.08	4.85	7.34
10.42	4.74	1.82	14.17	4.68	7.38
10.50	4.86	1.86	14.25	4.56	7.42
10.58	5.11	1.90	14.33	4.47	7.45
10.67	5.39	1.95	14.42	4.41	7.49
10.75	5.66	1.99	14.50	4.31	7.53
10.83	5.96	2.04	14.58	4.14	7.56
10.92	6.23	2.09	14.67	3.97	7.59
11.00	6.46	2.15	14.75	3.84	7.62
11.08	6.69	2.20	14.83	3.75	7.65
11.17	6.88	2.26	14.92	3.68	7.68

WEST PASCO LF POST.

BASIN 3

BASIN 2

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
15.00	3.63	7.71	18.75	1.42	8.56
15.08	3.59	7.74	18.83	1.42	8.57
15.17	3.56	7.77	18.92	1.41	8.58
15.25	3.48	7.80	19.00	1.39	8.59
15.33	3.33	7.83	19.08	1.35	8.60
15.42	3.19	7.85	19.17	1.30	8.61
15.50	3.11	7.88	19.25	1.28	8.62
15.58	3.09	7.91	19.33	1.30	8.64
15.67	3.09	7.93	19.42	1.34	8.65
15.75	3.08	7.96	19.50	1.34	8.66
15.83	3.02	7.98	19.58	1.32	8.67
15.92	2.96	8.00	19.67	1.27	8.68
16.00	2.91	8.03	19.75	1.24	8.69
16.08	2.87	8.05	19.83	1.22	8.70
16.17	2.82	8.08	19.92	1.20	8.71
16.25	2.78	8.10	20.00	1.19	8.72
16.33	2.71	8.12	20.08	1.16	8.73
16.42	2.65	8.14	20.17	1.13	8.74
16.50	2.61	8.16	20.25	1.12	8.75
16.58	2.62	8.18	20.33	1.12	8.76
16.67	2.64	8.21	20.42	1.13	8.76
16.75	2.58	8.23	20.50	1.13	8.77
16.83	2.38	8.25	20.58	1.12	8.78
16.92	2.16	8.26	20.67	1.10	8.79
17.00	2.02	8.28	20.75	1.09	8.80
17.08	1.94	8.30	20.83	1.10	8.81
17.17	1.90	8.31	20.92	1.12	8.82
17.25	1.85	8.33	21.00	1.13	8.83
17.33	1.79	8.34	21.08	1.14	8.84
17.42	1.72	8.36	21.17	1.14	8.85
17.50	1.69	8.37	21.25	1.14	8.86
17.58	1.69	8.38	21.33	1.12	8.87
17.67	1.70	8.40	21.42	1.11	8.87
17.75	1.70	8.41	21.50	1.10	8.88
17.83	1.67	8.43	21.58	1.11	8.89
17.92	1.64	8.44	21.67	1.13	8.90
18.00	1.62	8.45	21.75	1.13	8.91
18.08	1.60	8.47	21.83	1.12	8.92
18.17	1.58	8.48	21.92	1.10	8.93
18.25	1.53	8.49	22.00	1.07	8.94
18.33	1.44	8.50	22.08	1.01	8.95
18.42	1.34	8.51	22.17	0.95	8.95
18.50	1.30	8.52	22.25	0.93	8.96
18.58	1.33	8.54	22.33	0.95	8.97
18.67	1.39	8.55	22.42	0.98	8.98

WEST PASCO LF POST.

BASIN 3

BASIN 2

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
22.50	0.98	8.99			
22.58	0.95	8.99			
22.67	0.90	9.00			
22.75	0.89	9.01			
22.83	0.94	9.02			
22.92	0.99	9.02			
23.00	1.00	9.03			
23.08	0.95	9.04			
23.17	0.88	9.05			
23.25	0.86	9.05			
23.33	0.91	9.06			
23.42	0.98	9.07			
23.50	0.99	9.08			
23.58	0.94	9.09			
23.67	0.88	9.09			
23.75	0.84	9.10			
23.83	0.81	9.11			
23.92	0.75	9.11			
24.00	0.60	9.12			
24.08	0.44	9.12			
24.17	0.33	9.12			
24.25	0.25	9.13			
24.33	0.18	9.13			
24.42	0.14	9.13			
24.50	0.10	9.13			
24.58	0.07	9.13			
24.67	0.05	9.13			
24.75	0.03	9.13			
24.83	0.01	9.13			
24.92	0.01	9.13			
25.00	0.00	9.13			
25.08	0.00	9.13			
25.17	0.00	9.13			
25.25	0.00	9.13			

W PASCO LF BASIN 4 BASIN 41

BASIN INPUT DATA

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=====
BASIN AREA           48.31  ACRES
SCS CURVE NUMBER     90.00
INITIAL ABSTRACTION  0.22  INCHES
TIME OF CONCENTRATION 11.64  MINUTES
SCS SHAPE FACTOR     256
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OUTPUT SUMMARY

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=====
STORM RAINFALL       9.30  INCHES
STORM DURATION       24.00  HOURS
TOTAL RUNOFF         7.96  INCHES
PEAK RUNOFF RATE     193.47  CFS
TIME OF PEAK         12.25  HOURS
UNIT GRAPH VOLUME    0.98  INCHES
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REFERENCE FILES

```
=====
INPUT DATA          C:LASTFI.DAT
OUTPUT TO DISK       PASCO4
RAINFALL DISTRIBUTION RAIN3.RAI
UNIT HYDROGRAPH      UNIT1.UHG
```

W PASCO LF BASIN 4

BASIN 41

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
0.00	0.00	0.00	3.75	0.84	0.01
0.08	0.00	0.00	3.83	0.89	0.01
0.17	0.00	0.00	3.92	0.93	0.02
0.25	0.00	0.00	4.00	1.00	0.02
0.33	0.00	0.00	4.08	1.13	0.02
0.42	0.00	0.00	4.17	1.29	0.02
0.50	0.00	0.00	4.25	1.40	0.03
0.58	0.00	0.00	4.33	1.42	0.03
0.67	0.00	0.00	4.42	1.41	0.03
0.75	0.00	0.00	4.50	1.42	0.03
0.83	0.00	0.00	4.58	1.45	0.04
0.92	0.00	0.00	4.67	1.50	0.04
1.00	0.00	0.00	4.75	1.59	0.04
1.08	0.00	0.00	4.83	1.73	0.05
1.17	0.00	0.00	4.92	1.89	0.05
1.25	0.00	0.00	5.00	1.98	0.05
1.33	0.00	0.00	5.08	1.97	0.06
1.42	0.00	0.00	5.17	1.92	0.06
1.50	0.00	0.00	5.25	1.93	0.06
1.58	0.00	0.00	5.33	2.05	0.07
1.67	0.00	0.00	5.42	2.22	0.07
1.75	0.00	0.00	5.50	2.35	0.08
1.83	0.00	0.00	5.58	2.44	0.08
1.92	0.00	0.00	5.67	2.50	0.09
2.00	0.00	0.00	5.75	2.56	0.09
2.08	0.00	0.00	5.83	2.66	0.10
2.17	0.00	0.00	5.92	2.76	0.10
2.25	0.00	0.00	6.00	2.86	0.11
2.33	0.00	0.00	6.08	2.95	0.11
2.42	0.01	0.00	6.17	3.03	0.12
2.50	0.04	0.00	6.25	3.08	0.13
2.58	0.06	0.00	6.33	3.10	0.13
2.67	0.08	0.00	6.42	3.11	0.14
2.75	0.11	0.00	6.50	3.18	0.14
2.83	0.15	0.00	6.58	3.39	0.15
2.92	0.22	0.00	6.67	3.64	0.16
3.00	0.28	0.00	6.75	3.78	0.17
3.08	0.35	0.00	6.83	3.75	0.17
3.17	0.41	0.00	6.92	3.66	0.18
3.25	0.48	0.00	7.00	3.66	0.19
3.33	0.53	0.01	7.08	3.82	0.19
3.42	0.58	0.01	7.17	4.06	0.20
3.50	0.64	0.01	7.25	4.28	0.21
3.58	0.71	0.01	7.33	4.52	0.22
3.67	0.78	0.01	7.42	4.75	0.23

W PASCO LF BASIN 4 BASIN 41

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
7.50	5.00	0.24	11.25	26.12	1.36
7.58	5.38	0.25	11.33	28.41	1.42
7.67	5.81	0.26	11.42	31.09	1.48
7.75	6.24	0.27	11.50	34.09	1.54
7.83	6.71	0.29	11.58	38.14	1.62
7.92	7.16	0.30	11.67	42.30	1.70
8.00	7.42	0.31	11.75	54.27	1.81
8.08	7.45	0.33	11.83	84.22	1.97
8.17	7.37	0.34	11.92	121.64	2.21
8.25	7.43	0.36	12.00	152.25	2.51
8.33	7.72	0.37	12.08	175.42	2.85
8.42	8.09	0.39	12.17	192.33	3.23
8.50	8.42	0.41	12.25	193.47	3.60
8.58	8.71	0.42	12.33	172.37	3.94
8.67	8.96	0.44	12.42	144.94	4.22
8.75	9.21	0.46	12.50	124.38	4.47
8.83	9.52	0.48	12.58	108.34	4.68
8.92	9.85	0.50	12.67	95.18	4.86
9.00	10.14	0.52	12.75	84.43	5.03
9.08	10.38	0.54	12.83	74.57	5.17
9.17	10.59	0.56	12.92	65.48	5.30
9.25	10.78	0.58	13.00	57.54	5.41
9.33	10.96	0.60	13.08	50.00	5.51
9.42	11.13	0.62	13.17	43.65	5.60
9.50	11.40	0.64	13.25	38.48	5.67
9.58	11.91	0.67	13.33	34.05	5.74
9.67	12.49	0.69	13.42	30.41	5.80
9.75	12.88	0.72	13.50	27.82	5.85
9.83	13.04	0.74	13.58	26.48	5.90
9.92	13.09	0.77	13.67	25.39	5.95
10.00	13.35	0.79	13.75	24.39	6.00
10.08	14.01	0.82	13.83	23.32	6.05
10.17	14.85	0.85	13.92	22.26	6.09
10.25	15.52	0.88	14.00	21.34	6.13
10.33	16.00	0.91	14.08	20.49	6.17
10.42	16.36	0.94	14.17	19.73	6.21
10.50	16.86	0.98	14.25	19.16	6.25
10.58	17.76	1.01	14.33	18.76	6.29
10.67	18.83	1.05	14.42	18.46	6.32
10.75	19.87	1.09	14.50	18.05	6.36
10.83	21.00	1.13	14.58	17.39	6.39
10.92	22.10	1.17	14.67	16.69	6.42
11.00	23.07	1.22	14.75	16.15	6.45
11.08	24.01	1.26	14.83	15.73	6.49
11.17	24.86	1.31	14.92	15.41	6.52

W PASCO LF BASIN 4

BASIN 41

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
15.00	15.16	6.55	18.75	5.89	7.39
15.08	14.99	6.57	18.83	5.91	7.40
15.17	14.83	6.60	18.92	5.87	7.41
15.25	14.53	6.63	19.00	5.80	7.42
15.33	14.00	6.66	19.08	5.63	7.43
15.42	13.42	6.69	19.17	5.43	7.44
15.50	13.04	6.71	19.25	5.34	7.45
15.58	12.90	6.74	19.33	5.40	7.46
15.67	12.87	6.76	19.42	5.52	7.48
15.75	12.79	6.79	19.50	5.56	7.49
15.83	12.60	6.81	19.58	5.47	7.50
15.92	12.37	6.83	19.67	5.33	7.51
16.00	12.16	6.86	19.75	5.21	7.52
16.08	11.96	6.88	19.83	5.11	7.53
16.17	11.77	6.91	19.92	5.03	7.54
16.25	11.58	6.93	20.00	4.95	7.55
16.33	11.32	6.95	20.08	4.85	7.56
16.42	11.05	6.97	20.17	4.74	7.57
16.50	10.89	6.99	20.25	4.68	7.58
16.58	10.90	7.01	20.33	4.68	7.58
16.67	10.97	7.04	20.42	4.71	7.59
16.75	10.79	7.06	20.50	4.71	7.60
16.83	10.08	7.08	20.58	4.65	7.61
16.92	9.20	7.09	20.67	4.58	7.62
17.00	8.58	7.11	20.75	4.55	7.63
17.08	8.24	7.13	20.83	4.58	7.64
17.17	8.03	7.14	20.92	4.63	7.65
17.25	7.83	7.16	21.00	4.68	7.66
17.33	7.57	7.17	21.08	4.71	7.67
17.42	7.30	7.19	21.17	4.73	7.68
17.50	7.13	7.20	21.25	4.72	7.68
17.58	7.09	7.21	21.33	4.67	7.69
17.67	7.12	7.23	21.42	4.60	7.70
17.75	7.10	7.24	21.50	4.57	7.71
17.83	6.99	7.26	21.58	4.60	7.72
17.92	6.84	7.27	21.67	4.65	7.73
18.00	6.72	7.28	21.75	4.67	7.74
18.08	6.65	7.30	21.83	4.63	7.75
18.17	6.59	7.31	21.92	4.57	7.76
18.25	6.41	7.32	22.00	4.47	7.77
18.33	6.06	7.33	22.08	4.26	7.77
18.42	5.66	7.34	22.17	4.02	7.78
18.50	5.46	7.35	22.25	3.90	7.79
18.58	5.55	7.37	22.33	3.94	7.80
18.67	5.76	7.38	22.42	4.06	7.80

W PASCO LF BASIN 4 BASIN 41

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
22.50	4.09	7.81			
22.58	3.98	7.82			
22.67	3.80	7.83			
22.75	3.73	7.84			
22.83	3.87	7.84			
22.92	4.08	7.85			
23.00	4.14	7.86			
23.08	3.96	7.87			
23.17	3.71	7.87			
23.25	3.61	7.88			
23.33	3.76	7.89			
23.42	4.01	7.90			
23.50	4.10	7.90			
23.58	3.94	7.91			
23.67	3.69	7.92			
23.75	3.52	7.93			
23.83	3.42	7.93			
23.92	3.20	7.94			
24.00	2.67	7.94			
24.08	2.04	7.95			
24.17	1.56	7.95			
24.25	1.20	7.95			
24.33	0.93	7.96			
24.42	0.72	7.96			
24.50	0.56	7.96			
24.58	0.42	7.96			
24.67	0.30	7.96			
24.75	0.20	7.96			
24.83	0.13	7.96			
24.92	0.08	7.96			
25.00	0.04	7.96			
25.08	0.02	7.96			
25.17	0.00	7.96			
25.25	0.00	7.96			
25.33	0.00	7.96			
25.42	0.00	7.96			

W PASCO LF BASIN 4 BASIN 42

BASIN INPUT DATA

=====

BASIN AREA	95.71	ACRES
SCS CURVE NUMBER	55.00	
INITIAL ABSTRACTION	1.57	INCHES
TIME OF CONCENTRATION	15.00	MINUTES
SCS SHAPE FACTOR	256	

OUTPUT SUMMARY

=====

STORM RAINFALL	9.30	INCHES
STORM DURATION	24.00	HOURS
TOTAL RUNOFF	3.79	INCHES
PEAK RUNOFF RATE	206.38	CFS
TIME OF PEAK	12.25	HOURS
UNIT GRAPH VOLUME	0.99	INCHES

REFERENCE FILES

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INPUT DATA	C:LASTFI.DAT
OUTPUT TO DISK	PASCO4
RAINFALL DISTRIBUTION	RAIN3.RAI
UNIT HYDROGRAPH	UNIT1.UHG

Image Quality

As you review the next group of images, Please note that the original documents were of poor quality.

W PASCO LF BASIN 4

BASIN 42

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
0.00	0.00	0.00	3.75	0.00	0.00
0.08	0.00	0.00	3.83	0.00	0.00
0.17	0.00	0.00	3.92	0.00	0.00
0.25	0.00	0.00	4.00	0.00	0.00
0.33	0.00	0.00	4.08	0.00	0.00
0.42	0.00	0.00	4.17	0.00	0.00
0.50	0.00	0.00	4.25	0.00	0.00
0.58	0.00	0.00	4.33	0.00	0.00
0.67	0.00	0.00	4.42	0.00	0.00
0.75	0.00	0.00	4.50	0.00	0.00
0.83	0.00	0.00	4.58	0.00	0.00
0.92	0.00	0.00	4.67	0.00	0.00
1.00	0.00	0.00	4.75	0.00	0.00
1.08	0.00	0.00	4.83	0.00	0.00
1.17	0.00	0.00	4.92	0.00	0.00
1.25	0.00	0.00	5.00	0.00	0.00
1.33	0.00	0.00	5.08	0.00	0.00
1.42	0.00	0.00	5.17	0.00	0.00
1.50	0.00	0.00	5.25	0.00	0.00
1.58	0.00	0.00	5.33	0.00	0.00
1.67	0.00	0.00	5.42	0.00	0.00
1.75	0.00	0.00	5.50	0.00	0.00
1.83	0.00	0.00	5.58	0.00	0.00
1.92	0.00	0.00	5.67	0.00	0.00
2.00	0.00	0.00	5.75	0.00	0.00
2.08	0.00	0.00	5.83	0.00	0.00
2.17	0.00	0.00	5.92	0.00	0.00
2.25	0.00	0.00	6.00	0.00	0.00
2.33	0.00	0.00	6.08	0.00	0.00
2.42	0.00	0.00	6.17	0.00	0.00
2.50	0.00	0.00	6.25	0.00	0.00
2.58	0.00	0.00	6.33	0.00	0.00
2.67	0.00	0.00	6.42	0.00	0.00
2.75	0.00	0.00	6.50	0.00	0.00
2.83	0.00	0.00	6.58	0.00	0.00
2.92	0.00	0.00	6.67	0.00	0.00
3.00	0.00	0.00	6.75	0.00	0.00
3.08	0.00	0.00	6.83	0.00	0.00
3.17	0.00	0.00	6.92	0.00	0.00
3.25	0.00	0.00	7.00	0.00	0.00
3.33	0.00	0.00	7.08	0.00	0.00
3.42	0.00	0.00	7.17	0.00	0.00
3.50	0.00	0.00	7.25	0.00	0.00
3.58	0.00	0.00	7.33	0.00	0.00
3.67	0.00	0.00	7.42	0.00	0.00

W PASCO LF BASIN 4

BASIN 42

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
7.50	0.00	0.00	11.25	10.28	0.06
7.58	0.00	0.00	11.33	11.89	0.07
7.67	0.00	0.00	11.42	13.89	0.09
7.75	0.00	0.00	11.50	16.25	0.10
7.83	0.00	0.00	11.58	19.34	0.12
7.92	0.00	0.00	11.67	22.92	0.14
8.00	0.00	0.00	11.75	30.89	0.16
8.08	0.00	0.00	11.83	51.95	0.21
8.17	0.00	0.00	11.92	84.98	0.26
8.25	0.00	0.00	12.00	121.12	0.38
8.33	0.00	0.00	12.08	156.00	0.52
8.42	0.00	0.00	12.17	187.70	0.58
8.50	0.00	0.00	12.25	206.38	0.86
8.58	0.00	0.00	12.33	199.45	1.03
8.67	0.00	0.00	12.42	176.88	1.18
8.75	0.00	0.00	12.50	155.69	1.32
8.83	0.00	0.00	12.58	138.88	1.44
8.92	0.00	0.00	12.67	125.35	1.55
9.00	0.00	0.00	12.75	114.10	1.65
9.08	0.00	0.00	12.83	104.14	1.74
9.17	0.00	0.00	12.92	95.50	1.82
9.25	0.00	0.00	13.00	88.08	1.89
9.33	0.00	0.00	13.08	81.02	1.96
9.42	0.00	0.00	13.17	74.37	2.03
9.50	0.00	0.00	13.25	68.11	2.09
9.58	0.02	0.00	13.33	61.44	2.14
9.67	0.07	0.00	13.42	55.17	2.19
9.75	0.17	0.00	13.50	49.95	2.23
9.83	0.32	0.00	13.58	45.72	2.27
9.92	0.49	0.00	13.67	42.28	2.31
10.00	0.69	0.00	13.75	39.50	2.34
10.08	0.97	0.00	13.83	37.81	2.37
10.17	1.32	0.00	13.92	36.10	2.41
10.25	1.69	0.00	14.00	34.58	2.43
10.33	2.07	0.01	14.08	33.23	2.46
10.42	2.46	0.01	14.17	31.99	2.49
10.50	2.89	0.01	14.25	30.98	2.52
10.58	3.44	0.01	14.33	30.28	2.54
10.67	4.08	0.02	14.42	29.74	2.57
10.75	4.79	0.02	14.50	29.15	2.60
10.83	5.58	0.03	14.58	28.27	2.62
10.92	6.44	0.03	14.67	27.23	2.64
11.00	7.32	0.04	14.75	26.34	2.67
11.08	8.23	0.05	14.83	25.67	2.69
11.17	9.17	0.05	14.92	25.13	2.71

W PASCO LF BASIN 4 BASIN 42

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
15.00	24.70	2.73	18.75	9.84	3.35
15.08	24.36	2.75	18.83	9.91	3.36
15.17	24.09	2.77	18.92	9.88	3.37
15.25	23.71	2.79	19.00	9.80	3.38
15.33	23.03	2.81	19.08	9.59	3.39
15.42	22.19	2.83	19.17	9.29	3.39
15.50	21.53	2.85	19.25	9.07	3.40
15.58	21.20	2.87	19.33	9.07	3.41
15.67	21.09	2.89	19.42	9.21	3.42
15.75	20.96	2.91	19.50	9.30	3.43
15.83	20.69	2.92	19.58	9.23	3.43
15.92	20.35	2.94	19.67	9.04	3.44
16.00	20.04	2.96	19.75	8.85	3.45
16.08	19.75	2.98	19.83	8.71	3.46
16.17	19.47	2.99	19.92	8.60	3.46
16.25	19.17	3.01	20.00	8.47	3.47
16.33	18.79	3.02	20.08	8.30	3.48
16.42	18.38	3.04	20.17	8.12	3.49
16.50	18.09	3.06	20.25	8.00	3.49
16.58	18.01	3.07	20.33	7.97	3.50
16.67	18.07	3.09	20.42	7.99	3.51
16.75	17.91	3.10	20.50	8.00	3.51
16.83	17.09	3.12	20.58	7.94	3.52
16.92	15.86	3.13	20.67	7.84	3.53
17.00	14.83	3.14	20.75	7.77	3.53
17.08	14.15	3.16	20.83	7.77	3.54
17.17	13.74	3.17	20.92	7.83	3.55
17.25	13.38	3.18	21.00	7.89	3.55
17.33	12.96	3.19	21.08	7.94	3.56
17.42	12.53	3.20	21.17	7.99	3.57
17.50	12.21	3.21	21.25	7.99	3.57
17.58	12.08	3.22	21.33	7.93	3.58
17.67	12.06	3.23	21.42	7.84	3.59
17.75	12.00	3.24	21.50	7.77	3.60
17.83	11.83	3.25	21.58	7.80	3.60
17.92	11.59	3.26	21.67	7.87	3.61
18.00	11.37	3.27	21.75	7.92	3.62
18.08	11.20	3.28	21.83	7.89	3.62
18.17	11.06	3.29	21.92	7.81	3.63
18.25	10.82	3.30	22.00	7.68	3.64
18.33	10.36	3.31	22.08	7.41	3.64
18.42	9.78	3.32	22.17	7.06	3.65
18.50	9.39	3.33	22.25	6.80	3.65
18.58	9.38	3.34	22.33	6.79	3.66
18.67	9.63	3.34	22.42	6.92	3.67

W PASCO LF BASIN 4

BASIN 42

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
22.50	6.99	3.67			
22.58	6.88	3.68			
22.67	6.64	3.68			
22.75	6.48	3.69			
22.83	6.61	3.69			
22.92	6.89	3.70			
23.00	7.04	3.71			
23.08	6.85	3.71			
23.17	6.49	3.72			
23.25	6.27	3.72			
23.33	6.38	3.73			
23.42	6.72	3.74			
23.50	6.92	3.74			
23.58	6.79	3.75			
23.67	6.46	3.75			
23.75	6.18	3.76			
23.83	6.00	3.76			
23.92	5.71	3.77			
24.00	5.00	3.77			
24.08	4.05	3.78			
24.17	3.22	3.78			
24.25	2.60	3.78			
24.33	2.10	3.78			
24.42	1.69	3.78			
24.50	1.36	3.79			
24.58	1.11	3.79			
24.67	0.89	3.79			
24.75	0.71	3.79			
24.83	0.54	3.79			
24.92	0.39	3.79			
25.00	0.27	3.79			
25.08	0.18	3.79			
25.17	0.11	3.79			
25.25	0.07	3.79			
25.33	0.03	3.79			
25.42	0.00	3.79			
25.50	0.00	3.79			
25.58	0.00	3.79			
25.67	0.00	3.79			

W PASCO LF BASIN 4 BASIN 43

BASIN INPUT DATA

```
=====
BASIN AREA          15.00  ACRES
SCS CURVE NUMBER    100.00
INITIAL ABSTRACTION 0.00  INCHES
TIME OF CONCENTRATION 10.00 MINUTES
SCS SHAPE FACTOR    256
```

OUTPUT SUMMARY

```
=====
STORM RAINFALL      9.30  INCHES
STORM DURATION      24.00  HOURS
TOTAL RUNOFF        9.13  INCHES
PEAK RUNOFF RATE    74.69  CFS
TIME OF PEAK        12.17  HOURS
UNIT GRAPH VOLUME   0.98  INCHES
```

REFERENCE FILES

```
=====
INPUT DATA          C:\LASTFI.DAT
OUTPUT TO DISK       PASC04
RAINFALL DISTRIBUTION RAIN3.RAI
UNIT HYDROGRAPH      UNIT1.UHG
```


W PASCO LF BASIN 4

BASIN 43

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
0.00	0.08	0.00	3.75	1.67	0.34
0.08	0.39	0.00	3.83	1.66	0.35
0.17	0.52	0.00	3.92	1.63	0.36
0.25	0.72	0.01	4.00	1.66	0.37
0.33	0.92	0.01	4.08	1.77	0.38
0.42	1.08	0.02	4.17	1.91	0.39
0.50	1.18	0.03	4.25	1.96	0.40
0.58	1.20	0.03	4.33	1.90	0.41
0.67	1.19	0.04	4.42	1.81	0.42
0.75	1.22	0.05	4.50	1.75	0.43
0.83	1.30	0.05	4.58	1.74	0.44
0.92	1.38	0.06	4.67	1.74	0.45
1.00	1.42	0.07	4.75	1.78	0.46
1.08	1.39	0.08	4.83	1.89	0.47
1.17	1.33	0.08	4.92	1.99	0.48
1.25	1.31	0.09	5.00	2.01	0.49
1.33	1.35	0.10	5.08	1.93	0.50
1.42	1.41	0.11	5.17	1.83	0.51
1.50	1.43	0.11	5.25	1.80	0.52
1.58	1.39	0.12	5.33	1.88	0.53
1.67	1.33	0.13	5.42	2.00	0.54
1.75	1.32	0.14	5.50	2.07	0.55
1.83	1.39	0.14	5.58	2.09	0.57
1.92	1.48	0.15	5.67	2.09	0.58
2.00	1.53	0.16	5.75	2.10	0.59
2.08	1.55	0.17	5.83	2.13	0.60
2.17	1.55	0.18	5.92	2.18	0.61
2.25	1.57	0.19	6.00	2.21	0.62
2.33	1.60	0.19	6.08	2.24	0.64
2.42	1.63	0.20	6.17	2.26	0.65
2.50	1.60	0.21	6.25	2.25	0.66
2.58	1.50	0.22	6.33	2.22	0.67
2.67	1.38	0.23	6.42	2.19	0.69
2.75	1.34	0.24	6.50	2.22	0.70
2.83	1.39	0.24	6.58	2.34	0.71
2.92	1.48	0.25	6.67	2.48	0.72
3.00	1.55	0.26	6.75	2.52	0.74
3.08	1.59	0.27	6.83	2.45	0.75
3.17	1.62	0.28	6.92	2.35	0.77
3.25	1.63	0.29	7.00	2.33	0.78
3.33	1.62	0.30	7.08	2.42	0.79
3.42	1.60	0.30	7.17	2.54	0.81
3.50	1.60	0.31	7.25	2.66	0.82
3.58	1.63	0.32	7.33	2.77	0.84
3.67	1.66	0.33	7.42	2.87	0.85

W PASCO LF BASIN 4 BASIN 43

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
7.50	2.99	0.87	11.25	10.71	2.32
7.58	3.19	0.88	11.33	11.57	2.38
7.67	3.40	0.90	11.42	12.72	2.45
7.75	3.50	0.92	11.50	13.99	2.52
7.83	3.83	0.94	11.58	15.55	2.61
7.92	4.03	0.97	11.67	17.11	2.71
8.00	4.10	0.99	11.75	22.59	2.82
8.08	4.04	1.01	11.83	35.52	3.03
8.17	3.94	1.03	11.92	50.15	3.30
8.25	3.94	1.06	12.00	61.27	3.54
8.33	4.06	1.08	12.08	69.31	4.02
8.42	4.22	1.10	12.17	74.69	4.44
8.50	4.34	1.12	12.25	73.18	4.84
8.58	4.44	1.15	12.33	63.29	5.19
8.67	4.50	1.17	12.42	52.34	5.48
8.75	4.58	1.20	12.50	44.44	5.72
8.83	4.70	1.22	12.58	38.23	5.93
8.92	4.82	1.25	12.67	33.17	6.11
9.00	4.91	1.28	12.75	28.97	6.27
9.08	4.98	1.31	12.83	25.06	6.41
9.17	5.04	1.33	12.92	21.25	6.53
9.25	5.09	1.36	13.00	18.13	6.63
9.33	5.13	1.39	13.08	15.61	6.71
9.42	5.16	1.42	13.17	13.69	6.79
9.50	5.26	1.45	13.25	12.20	6.86
9.58	5.47	1.48	13.33	10.92	6.92
9.67	5.70	1.51	13.42	10.20	6.97
9.75	5.82	1.54	13.50	9.65	7.03
9.83	5.83	1.57	13.58	9.20	7.08
9.92	5.81	1.61	13.67	8.88	7.13
10.00	5.90	1.64	13.75	8.56	7.17
10.08	6.19	1.67	13.83	8.17	7.22
10.17	6.53	1.71	13.92	7.82	7.26
10.25	6.78	1.75	14.00	7.51	7.30
10.33	6.93	1.78	14.08	7.21	7.34
10.42	7.03	1.82	14.17	6.95	7.38
10.50	7.22	1.86	14.25	6.77	7.42
10.58	7.59	1.90	14.33	6.64	7.45
10.67	8.01	1.95	14.42	6.55	7.49
10.75	8.41	1.99	14.50	6.41	7.53
10.83	9.85	2.04	14.58	6.15	7.56
10.92	9.26	2.09	14.67	5.90	7.59
11.00	9.60	2.15	14.75	5.71	7.62
11.08	9.93	2.20	14.83	5.57	7.65
11.17	10.31	2.26	14.92	5.47	7.68

W PASCO LF BASIN 4

BASIN 43

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
15.00	5.39	7.71	18.75	2.11	8.56
15.08	5.34	7.74	18.83	2.11	8.57
15.17	5.28	7.77	18.92	2.10	8.59
15.25	5.17	7.80	19.00	2.07	8.59
15.33	4.95	7.83	19.08	2.00	8.60
15.42	4.74	7.85	19.17	1.93	8.61
15.50	4.62	7.88	19.25	1.90	8.62
15.58	4.59	7.91	19.33	1.94	8.64
15.67	4.59	7.93	19.42	1.99	8.65
15.75	4.57	7.96	19.50	2.00	8.66
15.83	4.49	7.98	19.58	1.96	8.67
15.92	4.40	8.00	19.67	1.89	8.68
16.00	4.33	8.03	19.75	1.85	8.69
16.08	4.26	8.05	19.83	1.81	8.70
16.17	4.19	8.08	19.92	1.79	8.71
16.25	4.12	8.10	20.00	1.76	8.72
16.33	4.02	8.12	20.08	1.72	8.73
16.42	3.93	8.14	20.17	1.68	8.74
16.50	3.88	8.16	20.25	1.66	8.75
16.58	3.89	8.18	20.33	1.67	8.76
16.67	3.93	8.21	20.42	1.68	8.76
16.75	3.83	8.23	20.50	1.68	8.77
16.83	3.54	8.25	20.58	1.66	8.78
16.92	3.21	8.26	20.67	1.63	8.79
17.00	3.00	8.28	20.75	1.62	8.80
17.08	2.88	8.30	20.83	1.64	8.81
17.17	2.82	8.31	20.92	1.66	8.82
17.25	2.75	8.33	21.00	1.68	8.83
17.33	2.66	8.34	21.08	1.69	8.84
17.42	2.56	8.36	21.17	1.70	8.85
17.50	2.51	8.37	21.25	1.69	8.86
17.58	2.51	8.38	21.33	1.67	8.87
17.67	2.53	8.40	21.42	1.64	8.87
17.75	2.52	8.41	21.50	1.63	8.88
17.83	2.48	8.43	21.58	1.65	8.89
17.92	2.44	8.44	21.67	1.67	8.90
18.00	2.40	8.45	21.75	1.67	8.91
18.08	2.37	8.47	21.83	1.66	8.92
18.17	2.35	8.48	21.92	1.63	8.93
18.25	2.28	8.49	22.00	1.59	8.94
18.33	2.13	8.50	22.08	1.50	8.95
18.42	1.98	8.51	22.17	1.41	8.95
18.50	1.93	8.52	22.25	1.38	8.96
18.58	1.98	8.54	22.33	1.41	8.97
18.67	2.06	8.55	22.42	1.45	8.98

W PASCO LF BASIN 4 BASIN 43

TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)	TIME (hrs)	RUNOFF RATE (cfs)	CUMUL- ATIVE (ins)
22.50	1.46	8.99			
22.58	1.41	8.99			
22.67	1.34	9.00			
22.75	1.32	9.01			
22.83	1.32	9.02			
22.92	1.48	9.02			
23.00	1.49	9.03			
23.08	1.41	9.04			
23.17	1.31	9.05			
23.25	1.28	9.05			
23.33	1.35	9.06			
23.42	1.45	9.07			
23.50	1.48	9.08			
23.58	1.40	9.09			
23.67	1.30	9.09			
23.75	1.24	9.10			
23.83	1.21	9.11			
23.92	1.12	9.11			
24.00	0.89	9.12			
24.08	0.66	9.12			
24.17	0.49	9.12			
24.25	0.37	9.13			
24.33	0.27	9.13			
24.42	0.20	9.13			
24.50	0.15	9.13			
24.58	0.10	9.13			
24.67	0.07	9.13			
24.75	0.04	9.13			
24.83	0.02	9.13			
24.92	0.01	9.13			
25.00	0.00	9.13			
25.08	0.00	9.13			
25.17	0.00	9.13			
25.25	0.00	9.13			

ATTACHMENT 6

POSTDEVELOPMENT CONDITION DRAINAGE CALCULATIONS

ATTACHMENT 6

POSTDEVELOPMENT CONDITION DRAINAGE CALCULATIONS

POSTDEVELOPMENT DESIGN CONDITIONS ARE BASED ON THE FOLLOWING PARAMETERS.

1. 25-YEAR, 24-HOUR RECURRING STORM EVENT
2. 9.3 INCHES OF RAINFALL
3. SCS TYPE II MODIFIED RAINFALL DISTRIBUTION
4. SCS UNIT HYDROGRAPH SHAPE FACTOR OF 256
5. SCS CURVE NUMBER OF 90 (UNLESS OTHERWISE NOTED)
6. INITIAL ABSTRACTION RATIO OF 0.20

BASIN NO. 1

1. AREA = 65.95 ACRES
2. PERCENT SLOPE:
 ABOVE ELEV. 125 - 23' RELIEF/765' LENGTH (100) = 3.0%
 BELOW ELEV. 125 - 75' RELIEF/350' LENGTH (100) = 21.4%
3. VELOCITY:
 ABOVE ELEV. 125 = 78 FT./MIN.
 BELOW ELEV. 125 = 198 FT./MIN.
4. T_c :
 ABOVE ELEV. 125 - 765'/78 FT./MIN. = 9.81 MIN.
 BELOW ELEV. 125 - 350'/198 FT./MIN. = 1.77 MIN.
 9.81 MIN. + 1.77 MIN. = 11.58 MIN.
5. TOTAL RUNOFF = 7.96 IN.
6. PEAK RUNOFF RATE = 301.79 CFS
7. TOTAL RUNOFF VOLUME:
 7.96 IN./12 IN. (65.95 AC.) + 9.13 IN./12 IN. (12.54 AC.) = 53.29 AC. FT.

BASIN NO. 2

1. AREA = 46.57 ACRES
2. PERCENT SLOPE:
 ABOVE ELEV. 125 - 25' RELIEF/840' LENGTH (100) = 3.0%
 BELOW ELEV. 125 - 75' RELIEF/350' LENGTH (100) = 21.4%
3. VELOCITY:
 ABOVE ELEV. 125 = 78 FT./MIN.
 BELOW ELEV. 125 = 198 FT./MIN.
4. T_c :
 ABOVE ELEV. 125 - 840'/78 FT./MIN. = 10.77 MIN.
 BELOW ELEV. 125 - 350'/198 FT./MIN. = 1.77 MIN.
 10.77 MIN. + 1.77 MIN. = 12.54 MIN.
5. TOTAL RUNOFF = 7.99 IN.
6. PEAK RUNOFF RATE = 210.73 CFS
7. TOTAL RUNOFF VOLUME:
 7.99 IN./12 IN. (46.57 AC.) + 9.13 IN./12 IN. (9.50 AC.) = 38.24 AC. FT.

BASIN NO. 3

1. AREA = 53.00 ACRES
2. PERCENT SLOPE:
 ABOVE ELEV. 125 - 23' RELIEF/770' LENGTH (100) = 3.0%
 BELOW ELEV. 125 - 75' RELIEF/350' LENGTH (100) = 21.4%
3. VELOCITY:
 ABOVE ELEV. 125 = 78 FT./MIN.
 BELOW ELEV. 125 = 198 FT./MIN.
4. T_c :
 ABOVE ELEV. 125 - 770'/78 FT./MIN. = 9.87 MIN.
 BELOW ELEV. 125 - 350'/198 FT./MIN. = 1.77 MIN.
 9.87 MIN. + 1.77 MIN. = 11.64 MIN.
5. TOTAL RUNOFF = 7.96 IN.
6. PEAK RUNOFF RATE = 242.35 CFS
7. TOTAL RUNOFF VOLUME:
 7.96 IN./12 IN. (53.00 AC.) + 9.13 IN./12 IN. (10.10 AC.) = 42.99 AC. FT.

BASIN NO. 4

SUBBASIN NO. 41 (LANDFILL AREA)

1. AREA = 42.31 ACRES
2. PERCENT SLOPE:
 ABOVE ELEV. 125 - 23' RELIEF/770' LENGTH (100) = 3.0%
 BELOW ELEV. 125 - 75' RELIEF/350' LENGTH (100) = 21.4%
3. VELOCITY:
 ABOVE ELEV. 125 = 78 FT./MIN.
 BELOW ELEV. 125 = 198 FT./MIN.
4. T_c :
 ABOVE ELEV. 125 - 770'/78 FT./MIN. = 9.87 MIN.
 BELOW ELEV. 125 - 350'/198 FT./MIN. = 1.77 MIN.
 9.87 MIN. + 1.77 MIN. = 11.64 MIN.
5. TOTAL RUNOFF = 7.96 IN.
6. PEAK RUNOFF RATE = 193.47 CFS
7. TOTAL RUNOFF VOLUME:
 7.96 IN./12 IN. (42.31 AC.) = 28.07 AC. FT.

SUBBASIN NO. 42 (RESOURCE RECOVERY AREA)

THE DESIGN OF THE RESOURCE RECOVERY FACILITY IS STRICTLY CONCEPTUAL AT THIS TIME AND WILL BE PERFORMED BY THE CONTRACTOR (OR HIS ENGINEER) AT A FUTURE DATE. THEREFORE, THE STORMWATER CALCULATIONS FOR THIS AREA WILL BE BASED ON PREDEVELOPMENT CONDITIONS WITHIN THE CONFINES OF THE POSTDEVELOPMENT BOUNDARIES. THE RETENTION POND RECEIVING RUNOFF FROM THIS SUBBASIN WILL BE ADEQUATELY SIZED TO ACCOMMODATE THE ENTIRE VOLUME OF PREDEVELOPMENT RUNOFF. THIS BEING A GREATER VOLUME THAN THAT OF THE PRE-POST, THE POND WILL NOT REQUIRE ANY FUTURE REDESIGN OR EXPANSION. HOWEVER, UPON COMPLETION OF THE RESOURCE RECOVERY FACILITY DESIGN, IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO FILE ALL APPROPRIATE PERMIT APPLICATION MODIFICATIONS.

1. AREA = 31.22
2. PERCENT SLOPE: 5' RELIEF/1,200' LENGTH (100) = 0.42%
3. VELOCITY = 26.30 FT./MIN.

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4. CN = 56
5. $T_c = 1,200' / 26.30 \text{ FT./MIN.} = 45.63 \text{ MIN.}$
6. TOTAL RUNOFF = 3.78 IN.
7. PEAK RUNOFF RATE = 33.81 CFS
8. TOTAL RUNOFF VOLUME: $3.78 \text{ IN./12 IN. (31.22 AC.)} = 9.83 \text{ AC. FT.}$

SUBBASIN NO. 43

(ON-SITE AREA SOUTH, EAST AND WEST OF THE RESOURCE
RECOVERY FACILITY AND CONTRIBUTING OFFSITE AREA)

1. AREA = 64.49 ACRES
2. CN = 56
3. PERCENT SLOPE: $5' \text{ RELIEF} / 2,200' \text{ LENGTH (100)} = 0.23\%$
2. VELOCITY = 25.2 FT./MIN.
5. $T_c = 2,200' / 25.2 \text{ FT./MIN.} = 87.30 \text{ MIN.}$
6. TOTAL RUNOFF = 3.79 IN.
7. PEAK RUNOFF RATE = 139.06 CFS
8. TOTAL RUNOFF VOLUME: $3.79 \text{ IN./12 IN. (64.49 AC.)} = 20.37 \text{ AC. FT.}$

BASIN NO. 4 RUNOFF VOLUME TOTAL

1. TOTAL RUNOFF VOLUME FROM BASIN NO. 4:
 $28.07 \text{ AC. FT.} + 9.83 \text{ AC. FT.} + 20.37 \text{ AC. FT.} + 9.13 \text{ IN./12 IN. (15 AC.)}$
 $= 69.68 \text{ AC. FT.}$

TABLE 1
REQUIRED STORAGE VOLUMES

BASIN NO.	RUNOFF VOLUME (ACRE-FEET)		REQUIRED STORAGE (ACRE-FEET)
	POSTDEVELOPMENT	PREDEVELOPMENT	
1	53.29	20.82	32.47
2	38.24	14.55	23.69
3	42.99	16.74	26.25
4	69.68	46.81	22.87
TOTAL	204.20	98.92	105.28

SWALE DESIGN

THE SWALES HAVE BEEN DESIGNED TO ACCOMMODATE THE PEAK FLOW FROM THE 25-YEAR, 24-HOUR STORM EVENT. PEAK STAGE ELEVATIONS HAVE BEEN CALCULATED FROM EACH SWALE USING THE INTERCONNECTED POND ROUTING COMPUTER PROGRAM (ICPR). THE COMPUTER PRINTOUTS ARE ATTACHED AS ATTACHMENT 5. THE SWALES IN BASINS 1, 2, AND 3 ARE IDENTIFIED AS NODE 100 ON THE ATTACHED ICPR PRINT-OUTS. THE SWALES IN BASIN NO. 4 ARE IDENTIFIED AS NODE 100 AND NODE 200.

SWALE STAGE-STORAGE

BASIN NO. 1 SWALE

TOP ELEVATION = 52.0
 DESIGN HIGH WATER ELEVATION = 51.0
 BOTTOM ELEVATION = 47.0
 BOTTOM WIDTH = 16 FT.
 LENGTH = 3,325 FT.
 SIDE SLOPES = 4:1

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CROSS-SECTIONAL AREA

<u>ELEVATION</u>	<u>AREA (FT²)</u>
51	128
50	84
49	48
48	20
47	0

STAGE-STORAGE

<u>ELEVATION</u>		<u>STORAGE</u> <u>(AC. FT.)</u>
51	3,325' X 128 FT ² / 43,560 FT ² =	9.77
50	3,325' X 84 FT ² / 43,560 FT ² =	6.41
49	3,325' X 48 FT ² / 43,560 FT ² =	3.66
48	3,325' X 20 FT ² / 43,560 FT ² =	1.45
47		0

PEAK STORAGE VOLUME = 9.44 AC. FT.

PEAK STAGE ELEVATION = 50.31

PEAK FLOW RATE = 191.10 CFS

BASIN NO. 2 SWALE

TOP ELEVATION = 52.0

DESIGN HIGH WATER ELEVATION = 51.0

BOTTOM ELEVATION = 47.0

BOTTOM WIDTH = 16 FT.

LENGTH = 3,100 FT.

SIDE SLOPES = 4:1

CROSS-SECTIONAL AREA IS THE SAME AS BASIN NO. 1 SWALE

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STAGE-STORAGE

<u>ELEVATION</u>		<u>STORAGE</u> <u>(AC. FT.)</u>
51	3,100' X 128 FT ² /43,560 FT ² =	9.11
50	3,100' X 84 FT ² /43,560 FT ² =	5.98
49	3,100' X 48 FT ² /43,560 FT ² =	3.42
48	3,100' X 20 FT ² /43,560 FT ² =	1.42
47		0

PEAK STORAGE VOLUME = 6.36 AC. FT.

PEAK STAGE ELEVATION = 50.09

PEAK FLOW RATE = 141.75 CFS

BASIN NO. 3 SWALE

TOP ELEVATION = 52.0

DESIGN HIGH WATER ELEVATION = 51.0

BOTTOM ELEVATION = 47.0

BOTTOM WIDTH = 16 FT.

LENGTH = 2,680 FT.

SIDE SLOPES = 4:1

CROSS-SECTIONAL AREA IS THE SAME AS BASIN NO. 1 SWALE

STAGE-STORAGE

<u>ELEVATION</u>		<u>STORAGE</u> <u>(AC. FT.)</u>
51	2,680' X 128 FT ² /43,560 FT ² =	7.88
50	2,680' X 84 FT ² /43,560 FT ² =	5.17
49	2,680' X 48 FT ² /43,560 FT ² =	2.95
48	2,680' X 20 FT ² /43,560 FT ² =	1.23
47		0

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PEAK STORAGE VOLUME = 6.37 AC. FT.

PEAK STAGE ELEVATION = 50.35

PEAK FLOW RATE = 173.25 CFS

SUBBASIN NO. 41 SWALE

TOP ELEVATION = 52.0

DESIGN HIGH WATER ELEVATION = 51.0

BOTTOM ELEVATION = 47.0

BOTTOM WIDTH = 16 FT.

LENGTH = 2,900 FT.

SIDE SLOPES = 4:1

CROSS-SECTIONAL AREA IS THE SAME AS BASIN NO. 1 SWALE

STAGE-STORAGE

<u>ELEVATION</u>		<u>STORAGE</u> <u>(AC. FT.)</u>
51	2,900' X 128 FT ² /43,560 FT ² =	8.52
50	2,900' X 84 FT ² /43,560 FT ² =	5.59
49	2,900' X 48 FT ² /43,560 FT ² =	3.20
48	2,900' X 20 FT ² /43,560 FT ² =	1.33
47		0

PEAK STORAGE VOLUME = 5.82 AC. FT.

PEAK STAGE ELEVATION = 50.04

PEAK FLOW RATE = 138.34 CFS

SUBBASIN NO. 42 AND 43 SWALE

TOP ELEVATION = 47.85

DESIGN HIGH WATER ELEVATION = 46.85

BOTTOM ELEVATION = 43.0 (WEST) AND 44.0 (EAST)

BOTTOM WIDTH = 22 FT. (WEST) AND 10 FT. (EAST)

LENGTH = 1,025 FT. (WEST) AND 1,380 FT. (EAST)

SIDE SLOPES = 8:1

CROSS-SECTIONAL AREAS

WEST		EAST	
ELEVATION	AREA (FT ²)	ELEVATION	AREA (FT ²)
47	216	47	102
46	138	46	52
45	76	45	18
44	30	44	0
43	0		

STAGE-STORAGE (WEST):

ELEVATION	LENGTH	X-SECT. AREA		VOLUME
47	891'	X	216 FT ²	192,456 FT ³
46	875'	X	138 FT ²	120,750 FT ³
45	859'	X	76 FT ²	65,284 FT ³
44	843'	X	30 FT ²	25,290 FT ³
43	710'	X	0	0
47	-		192,456 FT ³ / 43,560 FT ²	= 4.42 AC. FT.
46	-		120,750 FT ³ / 43,560 FT ²	= 2.77 AC. FT.
45	-		65,284 FT ³ / 43,560 FT ²	= 1.50 AC. FT.
44	-		25,290 FT ³ / 43,560 FT ²	= 0.58 AC. FT.
43				0

STAGE-STORAGE (EAST):

ELEVATION	LENGTH	X-SECT. AREA		VOLUME
47	1,286'	X	102 FT ²	131,172 FT ³
46	1,278'	X	52 FT ²	66,456 FT ³
45	1,270'	X	18 FT ²	22,860 FT ³
44	1,262'	X	0	0
47	-		131,172 FT ³ / 43,560 FT ²	= 3.01 AC. FT.
46	-		66,456 FT ³ / 43,560 FT ²	= 1.53 AC. FT.
45	-		22,860 FT ³ / 43,560 FT ²	= 0.52 AC. FT.
44				0

THE SWALE LENGTHS AS SHOWN ABOVE ARE SHORTER THAN AS SHOWN IN THE SWALE INFORMATION SECTION. THIS IS BECAUSE THE INTERSECTION AREA WAS CALCULATED BASED ON AREA AS MEASURED BY PLANIMETRY.

STAGE-STORAGE (INTERSECTION AREA)

<u>ELEVATION</u>	<u>AREA</u>	<u>X</u>	<u>DEPTH</u>
47	15,300 FT ²	X	$15,300 \text{ FT}^3 / 43,560 \text{ FT}^2 = 0.35 \text{ AC. FT.}$
46	13,000 FT ²	X	$13,000 \text{ FT}^3 / 43,560 \text{ FT}^2 = 0.30 \text{ AC. FT.}$
45	10,175 FT ²	X	$10,175 \text{ FT}^3 / 43,560 \text{ FT}^2 = 0.23 \text{ AC. FT.}$
44	6,850 FT ²	X	0' = 0

TOTAL STAGE-STORAGE FOR SUBBASIN 42 AND 43 SWALE

ELEVATION

47	4.42 + 3.01 + 0.35 = 7.78 AC. FT.
46	2.77 + 1.53 + 0.30 = 4.60 AC. FT.
45	1.50 + 0.52 + 0.23 = 2.25 AC. FT.
44	0.58 + 0 + 0 = 0.58 AC. FT.
43	0

PEAK STORAGE VOLUME = 7.26 AC. FT.

PEAK STAGE ELEVATION = 46.84

PEAK FLOW RATE = 110.49 CFS

RETENTION POND DESIGN

THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT HAS DETERMINED THIS PROJECT SITE AND SURROUNDING AREA TO BE VOLUME SENSITIVE. THEREFORE, THE RETENTION PONDS HAVE BEEN DESIGNED TO RETAIN BOTH THE DIFFERENCE IN VOLUMES AND PEAK FLOWS FOR THE 25-YEAR, 24-HOUR STORM EVENT.

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RETENTION POND NO. 1

TOP ELEVATION = 51.0

DESIGN HIGH WATER ELEVATION = 50.0

BOTTOM ELEVATION = 43.0

SIDE SLOPES = 4:1

WET SEASON HIGH GROUND WATER ELEVATION = 37.0

POND OUTFALL: BROAD-CRESTED WEIR

STAGE-STORAGE

ELEVATION	AREA (FT ²)	AREA (AC.)	AVG. AREA (AC.)	CUMULATIVE STORAGE (ACRE-FEET)
50	546,492	12.54		81.48
			12.41	
49	534,494	12.27		69.07
			12.14	
48	522,590	12.00		56.93
			11.87	
47	510,797	11.73		44.79
			11.60	
46	499,103	11.46		33.19
			11.33	
45	487,511	11.19		21.86
			11.06	
44	476,013	10.93		10.80
			10.80	
43	464,621	10.67		0

STORAGE VOLUME REQUIRED = 32.47 AC. FT.

(FROM TABLE 1)

STORAGE VOLUME PROVIDED = 81.48 AC. FT.

PASCO6C.4/2

AS ALL RUNOFF FROM BASIN NO. 1 IS RETAINED, THERE IS NO DISCHARGE FROM POND NO. 1 AT ANY TIME DURING THE 24-HOUR EVENT. THIS IS EVIDENT UPON REVIEW OF THE ATTACHED ICPR PRINTOUT FOR BASIN NO. 1 WHERE POND NO. 1 IS REPRESENTED AS NODE 200.

RETENTION RECOVERY

BASED ON INFILTRATION OF ALL STORMWATER WITHIN 72 HOURS

PERMEABILITY RATES: TEST NO. 1 = 28.4 FT./DAY

TEST NO. 2 = 1.4 FT./DAY

$28.4 \text{ FT./DAY} + 1.4 \text{ FT./DAY} = 29.8 \text{ FT./DAY}$

AVERAGE RATE = $29.8 \text{ FT./DAY} / 2 = 14.9 \text{ FT./DAY}$

AVERAGE HOURLY RATE = $14.9 \text{ FT./DAY} / 24 \text{ HOURS} = 0.62 \text{ FT./HR.}$

TIME REQUIRED TO DRAIN POND:

$(4.61' \text{ WATER DEPTH}) / 0.62 \text{ FT./HR.} = 7.44 \text{ HOURS}$

7.44 HOURS IS LESS THAN THE 72-HOUR REQUIREMENT

RETENTION POND NO. 2

TOP ELEVATION = 51.0

DESIGN HIGH WATER ELEVATION = 50.0

BOTTOM ELEVATION = 43.0

SIDE SLOPES = 4:1

WET SEASON HIGH GROUND WATER ELEVATION = 35.0

STAGE-STORAGE

ELEVATION	AREA (FT ²)	AREA (AC.)	AVG. AREA (AC.)	CUMULATIVE STORAGE (ACRE-FEET)
50	413,746	9.50		55.33
			9.27	
49	393,699	9.04		46.06
			8.81	
48	373,757	8.58		37.25
			8.35	
47	353,886	8.12		28.90
			7.90	
46	334,117	7.67		21.00
			7.45	
45	314,458	7.22		13.55
			7.00	
44	294,907	6.77		6.55
			6.55	
43	275,452	6.32		0

STORAGE VOLUME REQUIRED = 23.69 AC. FT.
(FROM TABLE 1)

STORAGE VOLUME PROVIDED = 55.33 AC. FT.

AS WITH POND NO. 1, THERE IS NO DISCHARGE FROM THIS POND DURING THE 24-HOUR EVENT. POND NO. 2 IS REPRESENTED AS NODE 200 ON THE ATTACHED ICPR PRINTOUT FOR BASIN NO. 2.

RETENTION RECOVERY

PERMEABILITY RATES: TEST NO. 1 = 19.6 FT./DAY
TEST NO. 2 = 35.0 FT./DAY
TEST NO. 3 = 19.3 FT./DAY

PASCO6C.4/2

$19.6 \text{ FT./DAY} + 35.0 \text{ FT./DAY} + 19.3 \text{ FT./DAY} = 73.9 \text{ FT./DAY}$
 $\text{AVERAGE RATE} = 73.9 \text{ FT./DAY} / 3 = 24.63 \text{ FT./DAY}$
 $\text{AVERAGE HOURLY RATE} = 24.63 \text{ FT./DAY} / 24 \text{ HOURS} = 1.03 \text{ FT./HR.}$

TIME REQUIRED TO DRAIN POND:

$(4.95' \text{ WATER DEPTH}) / 1.03 \text{ FT./HR.} = 4.81 \text{ HOURS}$

RETENTION POND NO. 3

TOP ELEVATION = 48.0

DESIGN HIGH WATER ELEVATION = 47.0

BOTTOM ELEVATION = 43.0

SIDE SLOPES = 4:1

WET SEASON HIGH GROUND WATER ELEVATION = 35.0 TO 40.0

STAGE-STORAGE

ELEVATION	AREA (FT ²)	AREA (AC.)	AVG. AREA (AC.)	CUMULATIVE STORAGE (ACRE-Feet)
47	439,956	10.10		38.45
			9.98	
46	429,066	9.85		28.47
			9.37	
45	418,612	9.61		18.74
			9.49	
44	408,157	9.37		9.25
			9.25	
43	397,703	9.13		0

STORAGE VOLUME REQUIRED = 26.25 AC. FT.

(FROM TABLE 1)

STORAGE VOLUME PROVIDED = 38.45 AC. FT.

PASCO6C.4/2

PEAK DISCHARGE RATE = 7.13 CFS

POND NO. 3 IS REPRESENTED AS NODE 200 ON THE ATTACHED ICPR PRINTOUT FOR
BASIN NO. 3.

RETENTION RECOVERY

PERMEABILITY RATES: TEST NO. 1 = 1.0 + FT./DAY

TEST NO. 2 = 37.5 FT./DAY

$1.0 \text{ FT./DAY} + 37.5 \text{ FT./DAY} = 38.5 \text{ FT./DAY}$

AVERAGE RATE = $38.5 \text{ FT./DAY} / 2 = 19.25 \text{ FT./DAY}$

AVERAGE HOURLY RATE = $19.25 \text{ FT./DAY} / 24 \text{ HOURS} = 0.80 \text{ FT./HR.}$

TIME REQUIRED TO DRAIN POND:

$(4.0' \text{ WATER DEPTH}) / 0.80 \text{ FT./HR.} = 5.0 \text{ HOURS}$

RETENTION POND NO. 4

TOP ELEVATION = 47.0

DESIGN HIGH WATER ELEVATION = 46.0

BOTTOM ELEVATION = 41.0

SIDE SLOPES = 4:1

WET SEASON HIGH GROUND WATER ELEVATION = 37.0

STAGE-STORAGE

ELEVATION	AREA (FT ²)	AREA (AC.)	AVG. AREA (AC.)	CUMULATIVE STORAGE (ACRE-Feet)
46	655,951	15.06		61.21
			14.89	
45	640,732	14.71		46.32
			14.34	
44	625,592	14.36		31.98
			14.19	
43	610,574	14.02		17.79
			11.37	
42	380,015	8.72		6.42
			6.42	
41	180,205	4.12		0

STORAGE VOLUME REQUIRED = 22.87 AC. FT.
(FROM TABLE 1)

STORAGE VOLUME PROVIDED = 61.21 AC. FT.

PEAK RUNOFF RATE (PREDEVELOPMENT) = 135.28 CFS

PEAK DISCHARGE RATE = 7.50 CFS

(POND NO. 4 IS REPRESENTED AS NODE 300 ON THE ATTACHED ICPR PRINTOUT FOR
BASIN NO. 4.)

RETENTION RECOVERY

PERMEABILITY RATES: TEST NO. 1 = 1.0 ± FT./DAY
TEST NO. 2 = 1.0 ± FT./DAY
TEST NO. 3 = 13.3 ± FT./DAY

PASCO6C.4/2

$1.0 \text{ FT./DAY} + 1.0 \text{ FT./DAY} + 13.3 \text{ FT./DAY} = 15.3 \text{ FT./DAY}$

$\text{AVERAGE RATE} = 15.3 \text{ FT./DAY} / 3 = 5.1 \text{ FT./DAY}$

$\text{AVERAGE HOURLY RATE} = 5.1 \text{ FT./DAY} / 24 \text{ HOURS} = 0.21 \text{ FT./HR.}$

TIME REQUIRED TO DRAIN POND:

$(4.00' \text{ WATER DEPTH}) / 0.21 \text{ FT./HR.} = 19.05 \text{ HOURS}$

ATTACHMENT 7

**INTERCONNECTED POND ROUTING
COMPUTER PROGRAM PRINT-OUTS**

WEST PASCO LF ROUTING BASIN 1
11/4/87

*** CONTROL DATA ***

Simulation time increment (mins)	-->	2.5
Simulation duration (hrs)	-->	24
Starting time (hrs)	-->	0
Print interval	-->	24

*** NODE AND INITIALIZATION DATA ***

NODE #	NODE TYPE	INITIAL STAGE
-----	-----	-----
100	1	47.000
200	1	43.000
300	2	45.000

WEST PASCO LF ROUTING BASIN 1
 11/4/87

 *** STAGE/STORAGE/TIME DATA ***

NODE # 100

STAGE	47.000	48.000	49.000	50.000	51.000
STORAGE	0.000	1.600	3.700	6.400	10.800
STAGE	0.000	0.000	0.000	0.000	0.000
STORAGE	0.000	0.000	0.000	0.000	0.000
STAGE	0.000	0.000	0.000	0.000	0.000
STORAGE	0.000	0.000	0.000	0.000	0.000

NODE # 200

STAGE	43.000	44.000	45.000	46.000	47.000
STORAGE	0.000	10.800	21.560	33.190	44.790
STAGE	48.000	49.000	50.000	51.000	0.000
STORAGE	56.930	69.070	81.480	150.000	0.000
STAGE	0.000	0.000	0.000	0.000	0.000
STORAGE	0.000	0.000	0.000	0.000	0.000

NODE # 300

STAGE	48.000	48.000	0.000	0.000	0.000
TIME	0.000	24.000	0.000	0.000	0.000
STAGE	0.000	0.000	0.000	0.000	0.000
TIME	0.000	0.000	0.000	0.000	0.000
STAGE	0.000	0.000	0.000	0.000	0.000
TIME	0.000	0.000	0.000	0.000	0.000

WEST PASCO LF ROUTING BASIN 1
 11/4/87

 *** REACH DATA ***

NOTE: Type 1 for sharp crested weir/gate and orifice
 Type 2 for broad crested weir/gate and orifice
 * Type 3 for culvert
 * Type 4 for trapezoidal channel
 * Type 5 for parabolic channel
 Type 6 for rating curve

* (Negative type indicates riser)

REACH #	FROM NODE	TO NODE	REACH TYPE
1	100	200	3
2	200	300	2

REACH # 1 from node # 100 -- to node # 200

-> Elliptical Culvert <-

Span (inches)	-->	49
Rise (inches)	-->	32
Length (feet)	-->	100
Manning's n	-->	.012
Headwater invert (feet)	-->	47
Tailwater invert (feet)	-->	46.5
Energy loss coefficient	-->	1
Entrance loss coefficient	-->	.5
# of culverts/channels	-->	3

REACH # 2 from node # 200 -- to node # 300

Broad Crested Weir/Gate and Orifice <-

Crest elevation (feet)	-->	50
Crest length (feet)	-->	100
Weir discharge coefficient	-->	3.2
Weir exponent	-->	1.5
% to effective submergence	-->	67
Gate opening (feet)	-->	999
# of end contractions	-->	0
Discharge coef for gate under ori flw	-->	1
Circular orifice centerline (feet)	-->	999
Orifice diameter (feet)	-->	1
Orifice discharge coefficient	-->	1
# identical orifices	-->	1

*** INTER-CONNECTED PCND ROUTING PROGRAM ***
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IC86141 VER 2.7

WEST PASCO LF ROUTING BASIN 1
11/4/87

*** INFLOW HYDROGRAPHS ***

INFLOW HYDROGRAPHS TO BE READ FROM DISK FILE

WEST PASCO LF ROUTING BASIN 1
 11/4/87

NODE #	TIME (hrs)	STAGE (feet)	STORAGE (acft)	INFLOW (cfs)	OUTFLOW (cfs)	
					# 1	TOTAL
100	0.00	47.00	0.00	0.00	0.00	0.00
200	0.00	43.00	0.00	0.07	0.00	0.00
300	0.00	45.00	0.00	0.00	-----	0.00
100	1.00	47.00	0.00	0.00	0.00	0.00
200	1.00	43.01	0.07	1.19	0.00	0.00
300	1.00	48.00	0.00	0.00	-----	0.00
100	2.00	47.00	0.00	0.00	0.00	0.00
200	2.00	43.02	0.15	1.28	0.00	0.00
300	2.00	48.00	0.00	0.00	-----	0.00
100	3.00	47.00	-0.01	0.44	0.00	0.00
200	3.00	43.03	0.29	1.29	0.00	0.00
300	3.00	48.00	0.00	0.00	-----	0.00
100	4.00	47.00	-0.00	1.57	0.00	0.00
200	4.00	43.04	0.48	1.39	0.00	0.00
300	4.00	48.00	0.00	0.00	-----	0.00
100	5.00	47.00	-0.00	3.09	0.00	0.00
200	5.00	43.07	0.79	1.68	0.00	0.00
300	5.00	48.00	0.00	0.00	-----	0.00
100	6.00	47.13	0.21	4.46	0.65	0.65
200	6.00	43.09	1.02	2.49	0.00	0.00
300	6.00	48.00	0.00	0.00	-----	0.00
100	7.00	47.32	0.52	5.71	2.51	2.51
200	7.00	43.12	1.30	4.46	0.00	0.00
300	7.00	48.00	0.00	0.00	-----	0.00
100	8.00	47.54	0.87	11.58	6.30	6.30
200	8.00	43.17	1.84	9.73	0.00	0.00
300	8.00	48.00	0.00	0.00	-----	0.00
100	9.00	47.75	1.22	15.22	11.98	11.98
200	9.00	43.27	2.89	15.08	0.00	0.00
300	9.00	48.00	0.00	0.00	-----	0.00
100	10.00	47.94	1.51	20.91	17.85	17.85
200	10.00	43.41	4.48	22.73	0.00	0.00
300	10.00	48.00	0.00	0.00	-----	0.00

WEST PASCO LF ROUTING BASIN 1
 11/4/87

NODE #	TIME (hrs)	STAGE (feet)	STORAGE (acft)	INFLOW (cfs)	OUTFLOW (cfs) # 1	TOTAL
100	11.00	48.18	1.98	25.98	27.27	27.27
200	11.00	43.63	6.79	35.30	0.00	0.00
300	11.00	48.00	0.00	0.00	-----	0.00
100	12.00	49.45	4.92	237.84	97.74	97.74
200	12.00	44.08	11.69	148.96	0.00	0.00
300	12.00	48.00	0.00	0.00	-----	0.00
100	13.00	50.31	7.57	86.37	156.89	156.89
200	13.00	45.62	28.76	172.05	0.00	0.00
300	13.00	48.00	0.00	0.00	-----	0.00
100	14.00	48.78	3.24	33.24	56.28	56.28
200	14.00	46.41	37.96	63.16	0.00	0.00
300	14.00	48.00	0.00	0.00	-----	0.00
100	15.00	48.26	2.14	23.63	30.56	30.56
200	15.00	46.74	41.79	35.07	0.00	0.00
300	15.00	48.00	0.00	0.00	-----	0.00
100	16.00	48.06	1.73	18.96	22.32	22.32
200	16.00	46.96	44.28	25.93	0.00	0.00
300	16.00	48.00	0.00	0.00	-----	0.00
100	17.00	47.92	1.48	13.36	17.35	17.35
200	17.00	47.12	46.20	19.95	0.00	0.00
300	17.00	48.00	0.00	0.00	-----	0.00
100	18.00	47.77	1.23	10.47	12.28	12.28
200	18.00	47.23	47.58	14.29	0.00	0.00
300	18.00	48.00	0.00	0.00	-----	0.00
100	19.00	47.69	1.10	9.04	9.86	9.86
200	19.00	47.32	48.63	11.58	0.00	0.00
300	19.00	48.00	0.00	0.00	-----	0.00
100	20.00	47.64	1.03	7.72	8.63	8.63
200	20.00	47.39	49.53	10.10	0.00	0.00
300	20.00	48.00	0.00	0.00	-----	0.00
100	21.00	47.60	0.96	7.29	7.61	7.61
200	21.00	47.45	50.31	9.02	0.00	0.00
300	21.00	48.00	0.00	0.00	-----	0.00

WEST PASCO LF ROUTING BASIN 1
 11/4/87

NODE #	TIME (hrs)	STAGE (feet)	STORAGE (acft)	INFLOW (cfs)	OUTFLOW (cfs) # 1	TOTAL
100	22.00	47.59	0.94	6.97	7.12	7.12
200	22.00	47.52	51.05	8.44	0.00	0.00
300	22.00	48.00	0.00	0.00	-----	0.00
100	23.00	47.60	0.95	6.45	5.53	5.53
200	23.00	47.56	51.65	6.77	0.00	0.00
300	23.00	48.00	0.00	0.00	-----	0.00
100	24.00	47.62	1.00	4.15	4.43	4.43
200	24.00	47.61	52.17	5.18	0.00	0.00
300	24.00	48.00	0.00	0.00	-----	0.00

WEST PASCO LF ROUTING BASIN 1
 11/4/87

*** PEAK CONDITIONS SUMMARY ***

NODE #	PEAK STAGE (feet)	PEAK STORAGE (acft)	TIME TO PEAK (hrs)	PEAK OUTFLOW (cfs)	TIME TO PEAK (hrs)
100	50.80	9.44	12.50	191.10	12.50
200	47.61	52.19	24.04	0.00	0.04
300	48.00	0.00	0.04	0.00	0.04

FROM NODE	TO NODE	PEAK OUTFLOW (cfs)	TIME TO PEAK (hrs)
100	200	191.10	12.50
200	300	0.00	0.04

WEST PASCO LF ROUTING BASIN 2
11/4/87

*** CONTROL DATA ***

Simulation time increment (mins)	-->	2.5
Simulation duration (hrs)	-->	24
Starting time (hrs)	-->	0
Print interval	-->	24

*** NODE AND INITIALIZATION DATA ***

NODE #	NODE TYPE	INITIAL STAGE
----	----	-----
100	1	47.000
200	1	47.000
300	2	48.000

WEST PASCO LF ROUTING BASIN 2
 11/4/87

 *** STAGE/STORAGE/TIME DATA ***

NODE # 100

STAGE	47.000	48.000	49.000	50.000	51.000
STORAGE	0.000	1.400	3.400	6.000	9.800
STAGE	52.000	0.000	0.000	0.000	0.000
STORAGE	20.000	0.000	0.000	0.000	0.000
STAGE	0.000	0.000	0.000	0.000	0.000
STORAGE	0.000	0.000	0.000	0.000	0.000

NODE # 200

STAGE	43.000	44.000	45.000	46.000	47.000
STORAGE	0.000	6.550	13.550	21.000	28.900
STAGE	48.000	49.000	50.000	51.000	0.000
STORAGE	37.250	46.060	55.330	100.000	0.000
STAGE	0.000	0.000	0.000	0.000	0.000
STORAGE	0.000	0.000	0.000	0.000	0.000

NODE # 300

STAGE	48.000	48.000	0.000	0.000	0.000
TIME	0.000	24.000	0.000	0.000	0.000
STAGE	0.000	0.000	0.000	0.000	0.000
TIME	0.000	0.000	0.000	0.000	0.000
STAGE	0.000	0.000	0.000	0.000	0.000
TIME	0.000	0.000	0.000	0.000	0.000

WEST PASCO LF ROUTING BASIN 2
 11/4/87

 *** REACH DATA ***

NOTE: Type 1 for sharp crested weir/gate and orifice
 Type 2 for broad crested weir/gate and orifice
 * Type 3 for culvert
 * Type 4 for trapezoidal channel
 * Type 5 for parabolic channel
 Type 6 for rating curve

* (Negative type indicates riser)

REACH #	FROM NODE	TO NODE	REACH TYPE
1	100	200	3
2	200	300	2

REACH # 1 from node # 100 -- to node # 200

-> Elliptical Culvert <-

Span (inches)	-->	49
Rise (inches)	-->	32
Length (feet)	-->	50
Manning's n	-->	.012
Headwater invert (feet)	-->	47
Tailwater invert (feet)	-->	46
Energy loss coefficient	-->	1
Entrnc loss coefficient	-->	.5
# of culverts/channels	-->	3

REACH # 2 from node # 200 -- to node # 300

Broad Crested Weir/Gate and Orifice <-

Crest elevation (feet)	-->	50
Crest length (feet)	-->	100
Weir discharge coefficient	-->	2.3
Weir exponent	-->	1.5
% to effective submergence	-->	67
Gate opening (feet)	-->	999
# of end contractions	-->	0
Discharge coef for gate under ori flw	-->	1
Circular orifice centerline (feet)	-->	999
Orifice diameter (feet)	-->	1
Orifice discharge coefficient	-->	1
# identical orifices	-->	1

*** INTER-CONNECTED POND ROUTING PROGRAM ***
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IC36141 VER 2.7

WEST PASCO LF ROUTING BASIN 2
11/4/87

*** INFLOW HYDROGRAPHS ***

INFLOW HYDROGRAPHS TO BE READ FROM DISK FILE

WEST PASCO LF ROUTING BASIN 2
 11/4/87

NODE #	TIME (hrs)	STAGE (feet)	STORAGE (acft)	INFLOW (cfs)	OUTFLOW # 1	(cfs) TOTAL
100	0.00	47.00	0.00	0.00	0.00	0.00
200	0.00	43.00	0.00	0.05	0.00	0.00
300	0.00	48.00	0.00	0.00	-----	0.00
100	1.00	47.00	0.00	0.00	0.00	0.00
200	1.00	43.01	0.05	0.50	0.00	0.00
300	1.00	48.00	0.00	0.00	-----	0.00
100	2.00	47.00	0.00	0.00	0.00	0.00
200	2.00	43.02	0.12	0.97	0.00	0.00
300	2.00	48.00	0.00	0.00	-----	0.00
100	3.00	47.00	-0.02	0.30	0.00	0.00
200	3.00	43.04	0.23	0.98	0.00	0.00
300	3.00	48.00	0.00	0.00	-----	0.00
100	4.00	47.00	-0.02	1.03	0.00	0.00
200	4.00	43.05	0.37	1.05	0.00	0.00
300	4.00	48.00	0.00	0.00	-----	0.00
100	5.00	47.00	0.00	2.17	8.09	8.09
200	5.00	43.09	0.58	9.36	0.00	0.00
300	5.00	48.00	0.00	0.00	-----	0.00
100	6.00	47.00	-0.01	3.14	0.00	0.00
200	6.00	43.14	0.91	1.40	0.00	0.00
300	6.00	48.00	0.00	0.00	-----	0.00
100	7.00	47.01	0.01	4.04	8.14	8.14
200	7.00	43.20	1.31	9.62	0.00	0.00
300	7.00	48.00	0.00	0.00	-----	0.00
100	8.00	47.20	0.28	8.12	1.07	1.07
200	8.00	43.25	1.58	3.66	0.00	0.00
300	8.00	48.00	0.00	0.00	-----	0.00
100	9.00	47.55	0.75	11.12	6.38	6.38
200	9.00	43.33	2.15	9.49	0.00	0.00
300	9.00	48.00	0.00	0.00	-----	0.00
100	10.00	47.75	1.07	14.67	12.04	12.04
200	10.00	43.49	3.23	15.73	0.00	0.00
300	10.00	48.00	0.00	0.00	-----	0.00

WEST PASCO LF ROUTING BASIN 2
 11/4/87

NODE #	TIME (hrs)	STAGE (feet)	STORAGE (acft)	INFLOW (cfs)	OUTFLOW (cfs) # 1	TOTAL
100	11.00	48.00	1.40	25.24	19.99	19.99
200	11.00	43.75	4.89	26.07	0.00	0.00
300	11.00	48.00	0.00	0.00	-----	0.00
100	12.00	48.99	3.38	162.32	58.97	58.97
200	12.00	44.35	8.38	107.78	0.00	0.00
300	12.00	48.00	0.00	0.00	-----	0.00
100	13.00	49.62	5.00	86.84	108.74	108.74
200	13.00	45.99	20.90	120.22	0.00	0.00
300	13.00	48.00	0.00	0.00	-----	0.00
100	14.00	48.45	2.29	23.91	39.28	39.28
200	14.00	46.72	27.24	44.04	0.00	0.00
300	14.00	48.00	0.00	0.00	-----	0.00
100	15.00	49.06	1.52	16.87	23.23	23.23
200	15.00	47.13	30.00	25.65	0.00	0.00
300	15.00	48.00	0.00	0.00	-----	0.00
100	16.00	47.87	1.22	13.51	15.42	15.42
200	16.00	47.35	21.78	18.16	0.00	0.00
300	16.00	48.00	0.00	0.00	-----	0.00
100	17.00	47.77	1.08	9.62	12.13	12.13
200	17.00	47.51	23.13	14.03	0.00	0.00
300	17.00	48.00	0.00	0.00	-----	0.00
100	18.00	47.66	0.92	7.46	7.66	7.66
200	18.00	47.62	34.11	9.16	0.00	0.00
300	18.00	48.00	0.00	0.00	-----	0.00
100	19.00	47.71	0.99	6.43	5.47	5.47
200	19.00	47.69	34.70	6.78	0.00	0.00
300	19.00	48.00	0.00	0.00	-----	0.00
100	20.00	47.73	1.07	5.50	4.49	4.49
200	20.00	47.76	35.21	5.61	0.00	0.00
300	20.00	48.00	0.00	0.00	-----	0.00
100	21.00	47.82	1.14	5.15	4.94	4.94
200	21.00	47.81	35.65	5.01	0.00	0.00
300	21.00	48.00	0.00	0.00	-----	0.00

*** INTER-CONNECTED POND ROUTING PROGRAM ***
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IC86141 VER 2.7

WEST PASCO LF ROUTING BASIN 2
 11/4/87

NODE #	TIME (hrs)	STAGE (feet)	STORAGE (acft)	INFLOW (cfs)	OUTFLOW (cfs) # 1	TOTAL
100	22.00	47.87	1.21	4.96	4.34	4.34
200	22.00	47.86	26.09	5.34	0.00	0.00
300	22.00	48.00	0.00	0.00	-----	0.00
100	23.00	47.91	1.28	4.57	5.07	5.07
200	23.00	47.91	36.47	6.01	0.00	0.00
300	23.00	48.00	0.00	0.00	-----	0.00
100	24.00	47.95	1.33	3.02	0.00	0.00
200	24.00	47.95	36.83	0.57	0.00	0.00
300	24.00	48.00	0.00	0.00	-----	0.00

WEST PASCO LF ROUTING BASIN 2
 11/4/87

*** PEAK CONDITIONS SUMMARY ***

NODE #	PEAK STAGE (feet)	PEAK STORAGE (acft)	TIME TO PEAK (hrs)	PEAK OUTFLOW (cfs)	TIME TO PEAK (hrs)
100	50.09	5.36	12.50	141.75	12.50
200	47.95	35.83	24.04	0.00	0.04
300	48.00	0.00	0.04	0.00	0.04

FROM NODE	TO NODE	PEAK OUTFLOW (cfs)	TIME TO PEAK (hrs)
100	200	141.75	12.50
200	300	0.00	0.04

WEST PASCO LF BASIN 3
9/16/87

BASIN 3

*** CONTROL DATA ***

Simulation time increment (mins)	-->	2.5
Simulation duration (hrs)	-->	24
Starting time (hrs)	-->	0
Print interval	-->	24

*** NODE AND INITIALIZATION DATA ***

NODE #	NODE TYPE	INITIAL STAGE
-----	-----	-----
100	1	47.000
200	1	43.000
300	2	45.000

WEST PASCO LF BASIN 3
 9/16/87

 *** STAGE/STORAGE/TIME DATA ***

NODE # 100

STAGE	47.000	48.000	49.000	50.000	51.000
STORAGE	0.000	1.250	3.000	5.200	8.500
STAGE	52.000	53.000	0.000	0.000	0.000
STORAGE	13.000	100.000	0.000	0.000	0.000
STAGE	0.000	0.000	0.000	0.000	0.000
STORAGE	0.000	0.000	0.000	0.000	0.000

NODE # 200

STAGE	43.000	44.000	45.000	46.000	47.000
STORAGE	0.000	9.300	18.800	28.500	38.500
STAGE	48.000	0.000	0.000	0.000	0.000
STORAGE	50.000	0.000	0.000	0.000	0.000
STAGE	0.000	0.000	0.000	0.000	0.000
STORAGE	0.000	0.000	0.000	0.000	0.000

NODE # 300

STAGE	44.000	44.000	0.000	0.000	0.000
TIME	0.000	24.000	0.000	0.000	0.000
STAGE	0.000	0.000	0.000	0.000	0.000
TIME	0.000	0.000	0.000	0.000	0.000
STAGE	0.000	0.000	0.000	0.000	0.000
TIME	0.000	0.000	0.000	0.000	0.000

WEST PASCO LF BASIN 3
9/16/87

*** REACH DATA ***

NOTE: Type 1 for sharp crested weir/gate and orifice
Type 2 for broad crested weir/gate and orifice
* Type 3 for culvert
* Type 4 for trapezoidal channel
* Type 5 for parabolic channel
Type 6 for rating curve

* (Negative type indicates riser)

REACH #	FROM NODE	TO NODE	REACH TYPE
1	100	200	3
2	200	300	2

REACH # 1 from node # 100 -- to node # 200

-> Elliptical Culvert <-

Span (inches)	--> 53
Rise (inches)	--> 34
Length (feet)	--> 500
Manning's n	--> .012
Headwater invert (feet)	--> 47
Tailwater invert (feet)	--> 44
Energy loss coefficient	--> 1
Entrnc loss coefficient	--> .5
# of culverts/channels	--> 3

REACH # 2 from node # 200 -- to node # 300

Broad Crested Weir/Gate and Orifice <-

Crest elevation (feet)	--> 47
Crest length (feet)	--> 100
Weir discharge coefficient	--> 3.2
Weir exponent	--> 1.5
% to effective submergence	--> 67
Gate opening (feet)	--> 999
# of end contractions	--> 0
Discharge coef for gate under ori flw	--> 1
Circular orifice centerline (feet)	--> 999
Orifice diameter (feet)	--> 1
Orifice discharge coefficient	--> 1
# identical orifices	--> 1

*** INTER-CONNECTED POND ROUTING PROGRAM ***
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IC86141 VER 2.7

WEST PASCO LF BASIN 3
9/16/87

*** INFLOW HYDROGRAPHS ***

INFLOW HYDROGRAPHS TO BE READ FROM DISK FILE

WEST PASCO LF BASIN 3
 9/16/87

NODE #	TIME (hrs)	STAGE (feet)	STORAGE (acft)	INFLOW (cfs)	OUTFLOW # 1 (cfs)	TOTAL
100	0.00	47.00	0.00	0.00	0.00	0.00
200	0.00	43.00	0.00	0.05	0.00	0.00
300	0.00	45.00	0.00	0.00	-----	0.00
100	1.00	47.00	0.00	0.00	0.00	0.00
200	1.00	43.01	0.05	0.96	0.00	0.00
300	1.00	44.00	0.00	0.00	-----	0.00
100	2.00	47.00	0.00	0.00	0.00	0.00
200	2.00	43.01	0.13	1.03	0.00	0.00
300	2.00	44.00	0.00	0.00	-----	0.00
100	3.00	47.00	-0.03	0.35	0.00	0.00
200	3.00	43.03	0.26	1.04	0.00	0.00
300	3.00	44.00	0.00	0.00	-----	0.00
100	4.00	47.00	-0.01	1.26	0.00	0.00
200	4.00	43.04	0.39	1.12	0.00	0.00
300	4.00	44.00	0.00	0.00	-----	0.00
100	5.00	47.00	-0.02	2.48	0.00	0.00
200	5.00	43.07	0.65	1.35	0.00	0.00
300	5.00	44.00	0.00	0.00	-----	0.00
100	6.00	47.00	-0.02	3.59	0.00	0.00
200	6.00	43.11	1.01	1.49	0.00	0.00
300	6.00	44.00	0.00	0.00	-----	0.00
100	7.00	47.00	0.00	4.59	11.74	11.74
200	7.00	43.16	1.46	13.31	0.00	0.00
300	7.00	44.00	0.00	0.00	-----	0.00
100	8.00	47.02	0.03	9.30	5.62	5.62
200	8.00	43.23	2.15	8.38	0.00	0.00
300	8.00	44.00	0.00	0.00	-----	0.00
100	9.00	47.50	0.62	12.70	5.70	5.70
200	9.00	43.29	2.68	9.01	0.00	0.00
300	9.00	44.00	0.00	0.00	-----	0.00
100	10.00	47.80	1.01	16.72	14.06	14.06
200	10.00	43.41	3.80	18.04	0.00	0.00
300	10.00	44.00	0.00	0.00	-----	0.00

WEST PASCO LF BASIN 3

9/16/87

NODE #	TIME (hrs)	STAGE (feet)	STORAGE (acft)	INFLOW (cfs)	OUTFLOW (cfs) # 1	TOTAL
----	-----	-----	-----	-----	-----	-----
100	11.00	48.05	1.34	28.90	23.20	23.20
200	11.00	43.61	5.71	29.66	0.00	0.00
300	11.00	44.00	0.00	0.00	-----	0.00
100	12.00	49.23	3.51	190.71	89.33	89.33
200	12.00	44.06	9.83	130.58	0.00	0.00
300	12.00	44.00	0.00	0.00	-----	0.00
100	13.00	49.66	4.46	72.08	120.29	120.29
200	13.00	45.61	24.74	132.50	0.00	0.00
300	13.00	44.00	0.00	0.00	-----	0.00
100	14.00	48.38	1.92	26.73	38.40	38.40
200	14.00	46.27	31.21	43.46	0.00	0.00
300	14.00	44.00	0.00	0.00	-----	0.00
100	15.00	48.05	1.33	18.99	23.05	23.05
200	15.00	46.55	33.99	26.68	0.00	0.00
300	15.00	44.00	0.00	0.00	-----	0.00
100	16.00	47.88	1.10	15.24	16.76	16.76
200	16.00	46.74	35.89	19.67	0.00	0.00
300	16.00	44.00	0.00	0.00	-----	0.00
100	17.00	47.78	0.97	10.75	13.45	13.45
200	17.00	46.89	37.36	15.47	0.00	0.00
300	17.00	44.00	0.00	0.00	-----	0.00
100	18.00	47.65	0.82	8.41	9.49	9.49
200	18.00	46.99	38.43	11.11	0.00	0.00
300	18.00	44.00	0.00	0.00	-----	0.00
100	19.00	47.59	0.73	7.26	7.69	7.69
200	19.00	47.05	39.12	9.08	3.96	3.96
300	19.00	44.00	0.13	3.96	-----	0.00
100	20.00	47.55	0.69	6.20	6.82	6.82
200	20.00	47.08	39.37	8.01	6.65	6.65
300	20.00	44.00	0.59	6.65	-----	0.00
100	21.00	47.52	0.65	5.86	6.02	6.02
200	21.00	47.08	39.41	7.16	7.13	7.13
300	21.00	44.00	1.17	7.13	-----	0.00

WEST PASCO LF BASIN 3
 9/16/87

NODE #	TIME (hrs)	STAGE (feet)	STORAGE (acft)	INFLOW (cfs)	OUTFLOW (cfs) # 1	TOTAL
----	----	-----	-----	-----	-----	-----
100	22.00	47.51	0.64	5.60	5.83	5.83
200	22.00	47.08	39.41	6.90	7.07	7.07
300	22.00	44.00	1.75	7.07	-----	0.00
100	23.00	47.48	0.60	5.18	5.21	5.21
200	23.00	47.08	39.37	6.21	6.65	6.65
300	23.00	44.00	2.32	6.65	-----	0.00
100	24.00	47.45	0.56	3.34	4.72	4.72
200	24.00	47.07	39.33	5.33	6.17	6.17
300	24.00	44.00	2.85	6.17	-----	0.00

WEST PASCO LF BASIN 3
 9/16/87

*** PEAK CONDITIONS SUMMARY ***

NODE #	PEAK STAGE (feet)	PEAK STORAGE (acft)	TIME TO PEAK (hrs)	PEAK OUTFLOW (cfs)	TIME TO PEAK (hrs)
100	50.35	6.37	12.46	173.25	12.46
200	47.08	39.41	21.12	7.13	21.12
300	44.00	0.00	0.04	0.00	0.04

FROM NODE	TO NODE	PEAK OUTFLOW (cfs)	TIME TO PEAK (hrs)
100	200	173.25	12.46
200	300	7.13	21.12

WEST PASCO LF ROUTING BASIN 4
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*** CONTROL DATA ***

Simulation time increment (mins)	-->	1
Simulation duration (hrs)	-->	24
Starting time (hrs)	-->	0
Print interval	-->	30

*** NODE AND INITIALIZATION DATA ***

NODE #	NODE TYPE	INITIAL STAGE
100	1	47.000
200	1	43.000
300	1	41.000
400	2	44.000

WEST PASCO LF ROUTING BASIN 4
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 *** STAGE/STORAGE/TIME DATA ***

NODE # 100

STAGE	47.000	48.000	49.000	50.000	51.000
STORAGE	0.000	1.200	3.200	5.600	10.500
STAGE	52.000	0.000	0.000	0.000	0.000
STORAGE	15.900	0.000	0.000	0.000	0.000
STAGE	0.000	0.000	0.000	0.000	0.000
STORAGE	0.000	0.000	0.000	0.000	0.000

NODE # 200

STAGE	43.000	44.000	45.000	46.000	47.000
STORAGE	0.000	0.740	2.260	4.500	7.730
STAGE	48.000	0.000	0.000	0.000	0.000
STORAGE	100.000	0.000	0.000	0.000	0.000
STAGE	0.000	0.000	0.000	0.000	0.000
STORAGE	0.000	0.000	0.000	0.000	0.000

NODE # 300

STAGE	41.000	42.000	43.000	44.000	45.000
STORAGE	0.000	5.420	17.790	31.980	46.320
STAGE	46.000	47.000	48.000	0.000	0.000
STORAGE	61.310	85.000	150.000	0.000	0.000
STAGE	0.000	0.000	0.000	0.000	0.000
STORAGE	0.000	0.000	0.000	0.000	0.000

NODE # 400

STAGE	44.000	44.000	0.000	0.000	0.000
TIME	0.000	24.000	0.000	0.000	0.000
STAGE	0.000	0.000	0.000	0.000	0.000
TIME	0.000	0.000	0.000	0.000	0.000
STAGE	0.000	0.000	0.000	0.000	0.000
TIME	0.000	0.000	0.000	0.000	0.000

WEST PASCO LF ROUTING BASIN 4
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 *** REACH DATA ***

NOTE: Type 1 for sharp crested weir/gate and orifice
 Type 2 for broad crested weir/gate and orifice
 * Type 3 for culvert
 * Type 4 for trapezoidal channel
 * Type 5 for parabolic channel
 Type 6 for rating curve

* (Negative type indicates riser)

REACH #	FROM NODE	TO NODE	REACH TYPE
1	100	300	3
2	200	300	3
3	300	400	2

REACH # 1 from node # 100 -- to node # 300

-> Elliptical Culvert (-

Span (inches)	-->	49
Rise (inches)	-->	32
Length (feet)	-->	60
Manning's n	-->	.012
Headwater invert (feet)	-->	47
Tailwater invert (feet)	-->	45
Energy loss coefficient	-->	1
Entrnc loss coefficient	-->	.5
# of culverts/channels	-->	3

REACH # 2 from node # 200 -- to node # 300

-> Box Culvert (-

Span (inches)	-->	72
Rise (inches)	-->	36
Length (feet)	-->	100
Manning's n	-->	.012
Headwater invert (feet)	-->	43
Tailwater invert (feet)	-->	42.5
Energy loss coefficient	-->	1
Entrnc loss coefficient	-->	.5
# of culverts/channels	-->	1

REACH # 3 from node # 300 -- to node # 400

Broad Crested Weir/Gate and Orifice (-

Crest elevation (feet)	-->	46
Crest length (feet)	-->	100
Weir discharge coefficient	-->	3.2
Weir exponent	-->	1.5
* Effective submergence	-->	17

Gate opening (feet)	-->	999
# of end contractions	-->	0
Discharge coef for gate under ori flw ->		1
Circular orifice centerline (feet)	-->	999
Orifice diameter (feet)	-->	1
Orifice discharge coefficient	-->	1
# identical orifices	-->	1

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WEST PASCO LF ROUTING BASIN 4
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*** INFLOW HYDROGRAPHS ***

INFLOW HYDROGRAPHS TO BE READ FROM DISK FILE

WEST PASCO LF ROUTING BASIN 4
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NODE #	TIME (hrs)	STAGE (feet)	STORAGE (acft)	INFLOW (cfs)	OUTFLOW # 1	OUTFLOW TOTAL
100	0.00	47.00	0.00	0.00	0.00	0.00
200	0.00	43.00	0.00	0.00	0.00	0.00
300	0.00	41.00	0.00	0.08	0.00	0.00
400	0.00	44.00	0.00	0.00	-----	0.00
100	0.50	47.00	0.00	0.00	0.00	0.00
200	0.50	43.00	0.00	0.00	0.00	0.00
300	0.50	41.00	0.03	1.18	0.00	0.00
400	0.50	44.00	0.00	0.00	-----	0.00
100	1.00	47.00	0.00	0.00	0.00	0.00
200	1.00	43.00	0.00	0.00	0.00	0.00
300	1.00	41.01	0.08	1.42	0.00	0.00
400	1.00	44.00	0.00	0.00	-----	0.00
100	1.50	47.00	0.00	0.00	0.00	0.00
200	1.50	43.00	0.00	0.00	0.00	0.00
300	1.50	41.02	0.14	1.43	0.00	0.00
400	1.50	44.00	0.00	0.00	-----	0.00
100	2.00	47.00	0.00	0.00	0.00	0.00
200	2.00	43.00	0.00	0.00	0.00	0.00
300	2.00	41.03	0.20	1.53	0.00	0.00
400	2.00	44.00	0.00	0.00	-----	0.00
100	2.50	47.00	-0.01	0.04	0.00	0.00
200	2.50	43.00	0.00	0.00	0.00	0.00
300	2.50	41.04	0.27	1.50	0.00	0.00
400	2.50	44.00	0.00	0.00	-----	0.00
100	3.00	47.00	-0.01	0.29	0.00	0.00
200	3.00	43.00	0.00	0.00	0.00	0.00
300	3.00	41.05	0.33	1.55	0.00	0.00
400	3.00	44.00	0.00	0.00	-----	0.00
100	3.50	47.00	-0.00	0.34	0.00	0.00
200	3.50	43.00	0.00	0.00	0.00	0.00
300	3.50	41.06	0.42	1.50	0.00	0.00
400	3.50	44.00	0.00	0.00	-----	0.00
100	4.00	47.00	0.00	1.00	10.50	10.50
200	4.00	43.00	0.00	0.00	0.00	0.00
300	4.00	41.08	0.51	13.19	0.00	0.00
400	4.00	44.00	0.00	0.00	-----	0.00

WEST PASCO LF ROUTING BASIN 4
 11/4/87

NODE #	TIME (hrs)	STAGE (feet)	STORAGE (acft)	INFLOW (cfs)	CUTFLOW # 1	TOTAL (cfs)
100	4.50	47.00	-0.00	1.42	0.00	0.00
200	4.50	43.00	0.00	0.00	0.00	0.00
300	4.50	41.10	0.65	1.75	0.00	0.00
400	4.50	44.00	0.00	0.00	-----	0.00
100	5.00	47.00	-0.01	1.66	0.00	0.00
200	5.00	43.00	0.00	0.00	0.00	0.00
300	5.00	41.12	0.79	2.01	0.00	0.00
400	5.00	44.00	0.00	0.00	-----	0.00
100	5.50	47.00	-0.01	2.35	0.00	0.00
200	5.50	43.00	0.00	0.00	0.00	0.00
300	5.50	41.15	0.95	2.97	0.00	0.00
400	5.50	44.00	0.00	0.00	-----	0.00
100	6.00	47.00	-0.00	2.95	0.00	0.00
200	6.00	43.00	0.00	0.00	0.00	0.00
300	6.00	41.18	1.15	2.21	0.00	0.00
400	6.00	44.00	0.00	0.00	-----	0.00
100	6.50	47.00	-0.01	3.18	0.00	0.00
200	6.50	43.00	0.00	0.00	0.00	0.00
300	6.50	41.21	1.37	2.22	0.00	0.00
400	6.50	44.00	0.00	0.00	-----	0.00
100	7.00	47.00	-0.00	3.66	0.00	0.00
200	7.00	43.00	0.00	0.00	0.00	0.00
300	7.00	41.25	1.62	2.33	0.00	0.00
400	7.00	44.00	0.00	0.00	-----	0.00
100	7.50	47.00	0.00	5.00	10.50	10.50
200	7.50	43.00	0.00	0.00	0.00	0.00
300	7.50	41.30	1.90	13.48	0.00	0.00
400	7.50	44.00	0.00	0.00	-----	0.00
100	8.00	47.07	0.08	7.42	1.02	1.02
200	8.00	43.00	0.00	0.00	0.00	0.00
300	8.00	41.35	2.22	5.03	0.00	0.00
400	8.00	44.00	0.00	0.00	-----	0.00
100	8.50	47.30	0.35	8.42	2.02	2.02
200	8.50	43.00	0.00	0.00	0.00	0.00
300	8.50	41.38	2.44	5.41	0.00	0.00
400	8.50	44.00	0.00	0.00	-----	0.00

WEST PASCO LF ROUTING BASIN 4
 11/4/87

NODE #	TIME (hrs)	STAGE (feet)	STORAGE (acft)	INFLOW (cfs)	OUTFLOW (cfs) # 1	TOTAL
100	9.00	47.49	0.59	10.14	5.18	5.18
200	9.00	43.00	0.00	0.00	0.00	0.00
300	9.00	41.43	2.77	10.07	0.00	0.00
400	9.00	44.00	0.00	0.00	-----	0.00
100	9.50	47.63	0.76	11.40	8.33	8.33
200	9.50	43.00	-0.00	0.00	0.00	0.00
300	9.50	41.51	3.27	13.57	0.00	0.00
400	9.50	44.00	0.00	0.00	-----	0.00
100	10.00	47.73	0.88	13.35	11.06	11.06
200	10.00	43.00	-0.00	0.00	0.00	0.00
300	10.00	41.51	3.91	15.06	0.00	0.00
400	10.00	44.00	0.00	0.00	-----	0.00
100	10.50	47.83	0.99	15.86	14.07	14.07
200	10.50	43.05	0.04	0.00	0.00	0.00
300	10.50	41.74	6.74	21.50	0.00	0.00
400	10.50	44.00	0.00	0.00	-----	0.00
100	11.00	47.96	1.15	23.07	18.61	18.61
200	11.00	43.27	0.20	7.32	2.11	2.11
300	11.00	41.90	5.78	30.32	0.00	0.00
400	11.00	44.00	0.00	0.00	-----	0.00
100	11.50	48.10	1.41	34.09	24.04	24.04
200	11.50	43.54	0.47	15.25	7.53	7.53
300	11.50	42.08	7.29	45.43	0.00	0.00
400	11.50	44.00	0.00	0.00	-----	0.00
100	12.00	48.35	2.98	152.24	62.99	62.99
200	12.00	44.68	1.77	121.12	31.96	31.96
300	12.00	42.36	10.56	156.22	0.00	0.00
400	12.00	44.00	0.00	0.00	-----	0.00
100	12.50	48.67	5.53	124.39	133.24	133.24
200	12.50	45.34	5.32	155.70	97.33	97.33
300	12.50	43.19	20.45	275.55	0.00	0.00
400	12.50	44.00	0.00	0.00	-----	0.00
100	13.00	48.43	4.83	57.34	96.43	96.43
200	13.00	45.70	5.33	80.03	104.55	104.55
300	13.00	43.32	30.97	215.11	0.00	0.00
400	13.00	44.00	0.00	0.00	-----	0.00

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WEST PASCO LF ROUTING BASIN 4

11/4/87

NODE #	TIME (hrs)	STAGE (feet)	STORAGE (acft)	INFLOW (cfs)	OUTFLOW # 1	OUTFLOW (cfs) TOTAL
100	13.50	48.77	2.74	27.82	26.03	55.02
200	13.50	48.21	5.60	49.95	88.56	38.56
300	13.50	44.46	38.55	124.34	0.00	0.00
400	13.50	44.00	0.00	0.00	---	0.00
100	14.00	48.36	1.91	21.74	25.01	35.01
200	14.00	45.75	4.03	34.59	57.46	57.46
300	14.00	44.84	44.01	109.99	0.00	0.00
400	14.00	44.00	0.00	0.00	---	0.00
100	14.50	48.14	1.48	18.05	25.52	25.52
200	14.50	45.32	3.01	39.15	39.72	39.72
300	14.50	45.12	47.94	71.65	0.00	0.00
400	14.50	44.00	0.00	0.00	---	0.00
100	15.00	48.01	1.22	15.16	20.29	20.29
200	15.00	45.30	2.97	34.70	19.52	19.52
300	15.00	45.25	50.16	45.31	0.00	0.00
400	15.00	44.00	0.00	0.00	---	0.00
100	15.50	47.89	1.06	12.04	15.94	15.94
200	15.50	45.40	3.20	21.53	15.36	15.36
300	15.50	45.37	51.85	26.93	0.00	0.00
400	15.50	44.00	0.00	0.00	---	0.00
100	16.00	47.81	0.97	12.16	12.79	12.79
200	16.00	45.49	3.41	20.04	15.24	15.24
300	16.00	45.47	53.30	23.36	0.00	0.00
400	16.00	44.00	0.00	0.00	---	0.00
100	16.50	47.75	0.91	10.93	12.20	12.20
200	16.50	45.53	3.52	18.09	13.95	13.95
300	16.50	45.55	54.59	23.94	0.00	0.00
400	16.50	44.00	0.00	0.00	---	0.00
100	17.00	47.72	0.86	9.59	10.92	10.92
200	17.00	45.55	3.75	14.92	11.97	11.97
300	17.00	45.53	55.75	25.55	0.00	0.00
400	17.00	44.00	0.00	0.00	---	0.00
100	17.50	47.64	0.77	7.12	9.92	9.92
200	17.50	45.71	3.92	12.21	9.43	9.43
300	17.50	45.73	55.71	20.95	0.00	0.00
400	17.50	44.00	0.00	0.00	---	0.00

WEST PASCO LF ROUTING BASIN 4
 11/4/87

NODE #	TIME (hrs)	STAGE (feet)	STORAGE (acft)	INFLOW (cfs)	OUTFLOW # 1	(cfs) TOTAL
100	18.00	47.50	0.72	6.72	7.72	7.72
200	18.00	45.76	4.04	11.37	8.35	8.35
300	18.00	45.75	57.52	18.46	0.00	0.00
400	18.00	44.00	0.00	0.00	-----	0.00
100	18.50	47.56	0.59	5.46	6.86	6.86
200	18.50	45.81	4.18	9.39	6.72	6.72
300	18.50	45.80	58.24	15.51	0.00	0.00
400	18.50	44.00	0.00	0.00	-----	0.00
100	19.00	47.54	0.65	5.80	6.20	6.20
200	19.00	45.85	4.25	9.80	7.55	7.55
300	19.00	45.84	59.89	15.92	0.00	0.00
400	19.00	44.00	0.00	0.00	-----	0.00
100	19.50	47.52	0.62	5.56	5.81	5.81
200	19.50	45.89	4.23	9.30	5.28	5.28
300	19.50	45.89	59.52	14.48	0.00	0.00
400	19.50	44.00	0.00	0.00	-----	0.00
100	20.00	47.51	0.61	4.95	5.50	5.50
200	20.00	45.93	4.43	8.47	6.62	6.62
300	20.00	45.93	60.11	13.88	0.00	0.00
400	20.00	44.00	0.00	0.00	-----	0.00
100	20.50	47.49	0.58	4.71	5.09	5.09
200	20.50	45.97	4.52	8.00	5.44	5.44
300	20.50	45.96	60.64	13.21	0.00	0.00
400	20.50	44.00	0.00	0.00	-----	0.00
100	21.00	47.48	0.57	4.62	4.84	4.84
200	21.00	46.00	4.60	7.89	5.71	5.71
300	21.00	46.00	61.16	12.23	0.00	0.00
400	21.00	44.00	0.00	0.00	-----	0.00
100	21.50	47.47	0.56	4.57	4.76	4.76
200	21.50	46.02	4.67	7.77	5.57	5.57
300	21.50	46.02	61.67	12.66	0.37	0.37
400	21.50	44.00	0.01	0.37	-----	0.00
100	22.00	47.47	0.55	4.47	4.69	4.69
200	22.00	46.04	4.74	7.68	5.69	5.69
300	22.00	46.04	62.12	12.97	2.43	2.43
400	22.00	44.00	0.08	2.43	-----	0.00

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WEST PASCO LF ROUTING BASIN 4
 11/4/87

NODE #	TIME (hrs)	STAGE (feet)	STORAGE (acft)	INFLOW (cfs)	OUTFLOW (cfs) # 1	TOTAL
100	22.50	47.45	0.54	4.09	4.41	4.41
200	22.50	46.06	4.73	6.99	5.16	5.16
300	22.50	46.05	62.46	12.04	4.01	4.01
400	22.50	44.00	0.21	4.01	-----	0.00
100	23.00	47.44	0.53	4.14	4.16	4.16
200	23.00	46.07	4.82	7.04	6.09	6.09
300	23.00	46.07	62.77	11.76	5.40	5.40
400	23.00	44.00	0.40	5.40	-----	0.00
100	23.50	47.43	0.51	4.10	4.03	4.03
200	23.50	46.08	4.85	6.92	6.01	6.01
300	23.50	46.08	63.00	11.51	6.59	6.59
400	23.50	44.00	0.65	6.59	-----	0.00
100	24.00	47.41	0.50	3.67	3.84	3.84
200	24.00	46.08	4.87	5.00	5.23	5.23
300	24.00	46.08	63.15	9.96	7.48	7.48
400	24.00	44.00	0.94	7.48	-----	0.00

SUBJECT: ROBERT L. BOWLING, BORN: 4
*1/16/27

*** TECH CONDITIONS SUMMARY ***

MODE #	PEAK STORE (ft)	PEAK STORES (ft)	TIME TO PEAK (hrs)	PEAK OUTFLOW (cfs)	TIME TO PEAK (hrs)
100	49.58	5.55	18.47	133.50	18.45
200	48.74	5.55	18.88	105.38	18.50
300	45.08	52.16	84.89	117.50	87.00
400	44.33	3.00	3.00	10.00	3.00

[illegible]

APPENDIX 10.12

APPENDIX 10.12

NOISE STUDY

1.0 BACKGROUND AND PURPOSE OF NOISE STUDY

1.1 INTRODUCTION

The purpose of this noise study is to assess the predicted noise impacts from the construction and operation of the Pasco County resource recovery facility. This study provides the background information necessary to evaluate, quantify, and locate any potential increase of noise levels. The noise analysis is divided into five phases:

- Phase I is the development of a noise assessment protocol. The discussion of this phase includes a description of sensitive receptors, noise monitoring stations and instrumentation, and noise impact assessment methodology.
- Phase II is the field monitoring and analysis to measure background noise levels. The background noise level is the sound level prior to facility operation, and is used in conjunction with estimated facility noise levels to determine if facility operations will cause a discernible noise impact.
- Phase III is the determination of facility noise levels. This determination is based on a typical resource recovery facility, because a specific facility description has not yet been formalized. Noise sources include various types of equipment and work activities. Noise from refuse and ash residue trucks traveling to and from the site and from facility construction is also considered.
- Phase IV is the process of calculating overall noise levels (background plus facility) at each sensitive

receptor location identified in Phase I. Included in this section is a discussion of the various attenuation factors which cause sound levels to diminish with distance from the source.

- Phase V is the assessment of noise impacts from the resource recovery facility on the community surrounding each site. The assessment includes a comparison of background noise levels at each site and a discussion of possible mitigation measures.

1.2 DEFINITIONS

Many terms used in this report are fundamental to studying the impact of noise on a community. Therefore, to facilitate a better understanding of the noise analysis, a few key terms are defined below.

Attenuation

- The reduction of sound levels by absorption and reflection over distance. This reduction is measured in decibels.

A-Weighting

- A method which is used to adjust sound level readings to represent the sensitivity of the human ear. A-weighting is accomplished by subtracting, at each octave band level, a specified weighting value from the flat response (dB) to account for the sensitivity of the human ear. A-weighted sound levels are measured in A-weighted decibels (dBA).

Decibels

- A unit used to express relative difference in sound pressure levels. A decibel is 10 times the common logarithm (base 10) of the ratio of sound intensity to a reference intensity. The unit symbol is dB for a flat response reading and dBA for an A-weighted reading.

Flat Response

- Sound level readings which are not weighted and are therefore independent of frequency range. The human ear is not equally sensitive to noise at all frequencies, but a flat response measures sound levels at all frequencies with equal sensitivity.

Frequency

- The number of times in 1 second that a periodic event, such as a sound wave, repeats itself.

Hertz (Hz)

- The unit of frequency that corresponds to 1 cycle per second.

Noise

- Unwanted sound, caused by numerous sources, often with widely varying sound levels at various frequencies.

Noise (Sound) Intensity

- In a specified direction, the average rate of flow of sound energy through a unit area in a sound field. Noise intensities may be added to find the noise intensity of a combination of sources. Units: watt/m^2 .

Noise (Sound) Level

- The quantity in decibels (dB or dBA) of noise or sound as measured by a sound level meter. Levels are ratios and therefore cannot be added directly to find the noise level of a combination of sources. Levels must be converted to intensities to allow for addition. The sound pressure level (SPL) is related to the sound intensity (I) by the following equation:

$$SPL = 10 \log \left(\frac{I}{10^{-12}} \right)$$

Octave Band

- A range of frequencies whose basic ratio is 2. For example, in this noise analysis the first octave band median frequency is 31.5 Hz; the next band frequency is 63 Hz (2 times the first) then 125 Hz, 250, 500, 1000, 2000, 4000, 8000 and 16000 Hz.

2.0 PHASE I - DEVELOPMENT OF A NOISE ASSESSMENT PROTOCOL

2.1 INTRODUCTION

Specification of existing noise levels is essential to the evaluation of impacts caused by new noise sources. The noise monitoring program is intended to determine the existing background noise levels in the community and is used as a baseline for the impact analyses. Once existing conditions are determined, the facility-produced noise levels can be compared to background noise levels and community impacts may be assessed.

The noise monitoring program is divided into three tasks. The first task involves establishing noise monitoring stations which requires an evaluation of zoning, land use and population, existing regulations and potential sensitive receptors to determine the most appropriate location for the stations. The second task includes determining monitoring specifications and obtaining proper equipment. This involves establishing meter calibration and data collection procedures and determining monitoring periods. The third task is the data collection and analysis phase which involves actual noise monitoring and the determination of various parameters. The details of each part of the program are provided below.

2.2 MONITORING STATION EVALUATION

Assessing noise impacts from the facility requires that background noise levels be measured first. To accomplish this, a monitoring program has been developed to provide a network for acquiring sound level data. The selection of monitoring stations is a critical step in the development of a representative baseline monitoring program. Three criteria are of concern in establishing monitoring station locations. They are: (1) land use or zoning—an area with a large residential population would be more heavily monitored than an area which is sparsely populated (2) local noise ordinances—government agencies have established local noise levels which may not be exceeded, and (3) sensitive receptors—concentrations of individuals who may be particularly sensitive to an increase in noise

levels (i.e., hospitals, schools, nursing homes). The most important of these criteria are the sensitive receptors.

2.2.1 LAND USE, POPULATION AND ZONING

Population, in conjunction with zoning and land use, is used in identifying areas which should be monitored. Areas with large populations or those which are mainly zoned for residential uses would be monitored more heavily than an area with limited population and/or industrial zoning.

The site is located on a 750-acre tract owned by Pasco County. The site had been used as a coniferous tree farm. The intensity of tree cover varies throughout the property. The northwest section is clear-cut and the northeast section remains densely planted with slash pine and sand pine. The remaining portion of the property consists of sparsely populated trees planted in well-spaced rows. There are brush piles and tree stumps scattered about. Various native grasses and pine seedlings are taking over the open areas.

Surrounding properties consist of vacant grassland, small cattle farms and low density housing. The Shady Hills Park, which consists of a civic center, three baseball diamonds and a football field is located north of the site. Adjacent to the park is a small restaurant. Most of the surrounding area is zoned A-C (agricultural) and A-R (agricultural-residential). Low density residential areas are established south and northwest of the site. Housing in other areas is sparse.

2.2.2 NOISE REGULATIONS

There are two major types of noise regulations which apply to noise generators. The federal Occupational Safety and Health Act (OSHA) of 1970 is designed to protect workers and is used as a guideline for this ambient analysis but is not discussed in detail. The facility operator must comply with OSHA standards or else operations could be curtailed. The second type of regulation is local noise ordinances which may govern noise levels at the site boundaries or sensitive receptors. Local ordinances are the focus of this regulatory discussion.

Pasco County has established allowable maximum noise levels for daytime (7 am to 6 pm) and nighttime (6 pm to 7 am) operation of an industrial facility. The following regulation is cited from Section 16-3/4-29 SPECIFIC NOISES PROHIBITED in the Pasco County Code.

"No noise shall be created in an industrial zone which exceeds those levels given below, as measured on the adjacent property line.

MAXIMUM NOISE LEVELS PERMITTED IN
INDUSTRIAL ZONES

Adjoining Commercial

District

(No Time Limit)

72 dBA

Adjoining Residential

District

7:00 am-6:00 pm

Monday - Saturday

66 dBA

6:00 pm-7:00 am

Monday - Saturday

and all hours of
Sunday

55 dBA

In cases of impulsive noises, the noise levels mentioned above shall be increased by ten (10) dBA (as measured on a sound level meter) during the hours of 7:00 am to 6:00 pm, Monday through Saturday, but shall not exceed the levels mentioned above during the period from 6:00 pm to 7:00 am, Monday through Saturday and all day Sunday."

2.2.3 SENSITIVE RECEPTORS

A noise sensitive receptor is located in an area where noise sensitive persons (such as children or infants) live, work or play. Schools, day care centers, hospitals and groups of homes are generally identified as sensitive receptors. Businesses and industries are not considered to be sensitive receptors because noise levels at the business may be as high or higher than those expected from the facility. Also, commercial and industrial buildings often keep windows closed to facilitate the heating

and ventilation system. Each monitoring station is located at a sensitive receptor, although some of the monitoring stations are used to define noise levels at more than one sensitive receptor.

Table 2-1 lists the sensitive receptors identified. The area surrounding the site is sparsely populated, therefore sensitive receptors are located in areas where the most homes are located. Figure 2-1 identifies the location of each receptor/monitoring site.

2.2.4 MONITORING STATION LOCATIONS

Based on the criteria detailed above, monitoring stations were located around the site. In some cases, a monitoring station was used to assess background sound levels at more than one sensitive receptor. For example, if two sensitive receptors were located in similar surroundings, only one receptor was used to define existing levels for both. The monitoring station locations selected are discussed below.

Station 1 is located on Hays Road at the nearest residence to the facility entrance. Impacts due to facility operation and truck traffic noise will be greatest at this monitoring station. Station 2 is located 3/4 of a mile west of Station 1 on Hays Road. It was selected to assess background levels and impacts on residents southwest of the site. Station 3 is located on 1st Avenue near the site property line. It was selected to assess impacts on residents northwest of the site. Finally, Station 4 is located in Shady Hills Park which is just north of the site property line. Readings were taken off the road and in the park to better assess noise in the area. All of the stations are located in relatively flat, open land with light to moderate traffic flow nearby.

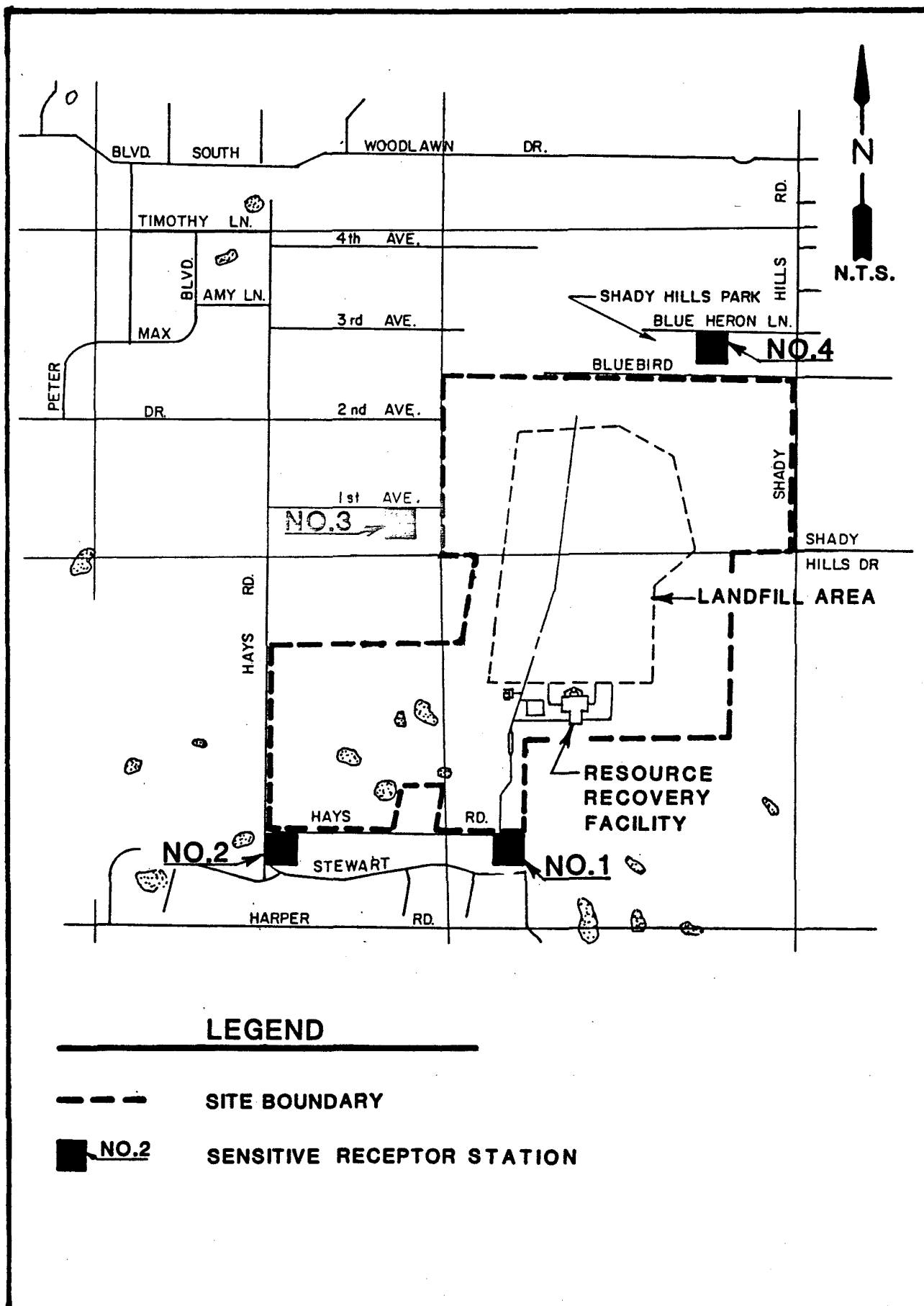
2.3 MONITORING EQUIPMENT AND SPECIFICATIONS

2.3.1 EQUIPMENT

A Quest Model 215 hand-held sound level meter and analyzer was used to measure sound levels at each monitoring station. This meter meets ANSI

TABLE 2-1
SENSITIVE RECEPTORS
NOISE MONITORING PROGRAM

MONITORING STATION NUMBER	SENSITIVE RECEPTOR	COMMENTS
1	Residents	Assess impacts to resident closest to site entrance
2	Residents	Assess impacts to residents southwest of the site
3	Residents	Assess impacts to residents northwest of the site
4	County Park	Assess impacts to participants of park activities



Pasco County Resource Recovery Program
Sensitive Receptors Locations

FIGURE 2-1

standards for Type 2 sound meters. The meter is capable of measuring total noise (overall frequencies) in flat response, A, B, or C weighting. The unit is equipped with a random incidence microphone with an attached windscreen.

The sound meter has an accompanying sound level calibrator. The calibrator is used to check the calibration of the meter by measuring a known sound level. If the meter is out of adjustment it can easily be corrected to the proper level.

2.3.2 SPECIFICATIONS

Calibration

Calibration procedures, repeated at the beginning and at the end of each data collection session, were performed as prescribed by the manufacturer. The meter was determined to be within the frequency-weighting, linearity and tracking, dynamic characteristics, and RMS accuracy prescribed by the GenRad calibration manual. A daily calibration was performed.

Microphone Orientation

Two general types of microphones exist: (1) those which have a frequency response for sound arriving at random incidence to the microphone; and (2) those which have a frequency response for sound arriving at perpendicular incidence. The meter described previously is equipped with a random incidence type microphone which measures the sound response based on the average of sound waves that strike the microphone from all angles of incidence. The recommended orientation for this type of microphone is 70° with respect to the source. Also, according to the procedures manual, the windscreen must be in use and the meter height should be set at approximately five feet.

Measurement Data Set

For all monitoring periods, sound levels were measured 40 times during each data set. A data set consists of forty 10-second readings. The readings were averaged to calculate the equivalent sound level, L_{eq} , for each data set. The equivalent sound level is a single value of sound level for any desired duration which includes all of the time-varying sound energy in the measurement period. Throughout the daytime hours 6:00 am to 6:00 pm, six data sets were taken at each monitoring station. Nighttime measurements were performed at each station from 6:00 pm to 6:00 am. Nighttime equivalent sound level readings L_n were calculated from six data sets.

Recordings were performed using the A-weighting filter which simulates the human hearing frequency. Data is annotated "dBA" to specify the A-weighted filtering.

Monitoring Period

Community noise has several sources. The most significant of these is from transportation vehicles including automobiles, trucks, trains, planes, etc. Other noises are caused by industrial sources such as factories, farm equipment such as tractors, and commercial sources such as air conditioning equipment. Noise levels from these sources vary as a function of the time of day (rush hour vs. nonrush hour) and day of the week (weekday vs. weekend).

Sound variations as a function of time of day are very important to a community noise study. For instance, an increase in facility noise levels which occurs during rush hour traffic will have a much lower impact on the surrounding community than the same noise increase in the early morning hours when background noise levels are low. Increased noise during the weekdays may cause less of an impact than a comparable increase during the typically quiet weekends. Selection of monitoring periods must account for these variations.

3.0 PHASE II - DATA ACQUISITION AND ANALYSIS

3.1 DATA ACQUISITION

As discussed, noise levels were measured over a 24-hour period at each monitoring station. Monitoring was performed by Environmental Engineering Consultants, Inc. and consisted of measurements made for 20 minutes every 2 hours at each site for a single 24-hour period. The ground level monitoring procedure and data are included in Attachment 1.

3.2 ANALYSIS OF EXISTING NOISE LEVELS

The data discussed in Section 3.1 were used to evaluate existing noise levels near each site.

While averages of noise levels over time are helpful in comparing existing noise conditions, statistical formulas yielding single number values are more concise and, thus, more useful for comparison. Therefore, statistical noise parameters were used to evaluate and compare background noise levels. These same noise descriptors are also used in Section 6.0 to evaluate possible facility impacts on the surrounding community. There are five basic descriptors which are of value. They are: (1) $L_{eq,24}$, the 24-hour equivalent continuous sound level, (2) L_n , the nighttime equivalent continuous sound level, (3) L_{10} and L_{90} , the 10th and 90th percentile exceedance levels, respectively, (4) TNI, the traffic noise index, and (5) NPL, the noise pollution level. These descriptors are defined in the subsections that follow. Table 3-1 lists the noise parameters calculated by monitoring station. Overall, the monitoring noise levels were dominated by aircraft and wildlife. Occasional, temporary high-level periods also occurred due to traffic noise, but these periods were rare. The monitoring program substantiated the rural nature of the site, and established aircraft, wildlife and traffic as the major existing noise sources.

TABLE 3-1

NOISE LEVEL PARAMETERS BY MONITORING STATION

PARAMETER	MONITORING STATION			
	1	2	3	4
10 th Percentile Exceedance (L^{10})	52	52	50	56
90 th Percentile Exceedance (L_{90})	31	32	32	32
Daily A-weighted ($L_{eq, 24}$)	51	51	50	52
^a Nighttime A-weighted (L_n)	51	51	51	53
Noise Pollution Level (NPL)	71	70	70	73
Traffic Noise Index (TNI)	85	82	74	98

*Calculated for nighttime hours (6:00 pm to 7:00 am)

3.2.1 DAILY EQUIVALENT CONTINUOUS SOUND LEVEL

$L_{eq,24}$ is the average A-weighted sound level recorded over the 24-hour monitoring period. The $L_{eq,24}$ for each monitoring station is listed in Table 3-1.

For the four monitoring sites, the existing $L_{eq,24}$ ranges from 50 dBA to 52 dBA. Station 3 located northwest of the site has the lowest $L_{eq,24}$. Station 3 is away from main roads and experiences relatively little activity. The other stations have similar levels.

3.2.2 NIGHTTIME EQUIVALENT CONTINUOUS SOUND LEVEL

The nighttime equivalent continuous sound level (L_n) is the average A-weighted sound level of those values recorded from 6:00 pm to 7:00 am. It represents the sound level over all frequencies and quantifies the nighttime noise level. The L_n for each station is listed in Table 3-1.

Nighttime noise is important because this is the period in which most people are sleeping and resting from work activities.

3.2.3 PERCENTILE EXCEEDANCE LEVELS

Percentile exceedance sound levels (L_x) define the sound level that is surpassed x percent of the time. These descriptors are calculated for the A-weighted response only. The L_{10} descriptor is a measure of discrete or variable noise such as passing traffic or machine operations. An elevated L_{10} value generally indicates a high level of traffic noise. The L_{90} descriptor is taken as a measure of the "residual" noise level. The "residual" noise is the steady background noise level upon which single noise events, such as passing traffic, children playing, and machines operating, are superimposed. These parameters are also used to define the traffic noise index, which is discussed in Section 3.2.4.

The L_{10} and L_{90} values are listed by site in Table 3-1. The L_{10} levels vary from 50 to 56 dBA. The consistently low L_{10} levels indicate that none

of the sites experience a high level of traffic noise or other discrete noises. Stations 1 and 2 experience moderate levels of variable noise produced by the fluctuating traffic flows on nearby roads. Stations 3 and 4 have only limited traffic noise since they are located on dead-end roads. Discrete noise levels at these stations are produced by other activities such as lawn mowers, off-road vehicles, sporting events, etc. Similarly, the L_{90} values varied only slightly (31 to 32 dBA). The low-level readings indicate that the background noise level for the area is also low.

3.2.4 TRAFFIC NOISE INDEX

The traffic noise index (TNI) takes into account the amount of variability in observed sound levels to estimate the correlation between traffic/community noise measurements and subjective response to noise. The TNI is defined as:

$$TNI = 4 (L_{10} - L_{90}) + L_{90} - 30 \text{ dBA}$$

The first term ($L_{10} - L_{90}$) represents the range between single event noises and the residual noise level, while the second term (L_{90}) is a measure of the residual noise level. High values of the TNI, 80 or above, indicate a wide variation in noise levels with time. Table 3-1 lists the calculated TNI for each monitoring station.

The TNI varies from 74 to 98 dBA. All of the monitoring sites except Site 3 showed a high variability of noise. This corresponds with the L_{10} and L_{90} values, in which the differences between the residual noise level (L_{90}) and discrete noise level (L_{10}) were greater than 18 dBA in all cases.

3.2.5 NOISE POLLUTION LEVEL

The noise pollution level (NPL) is a measure of the increased annoyance to the community due to fluctuations of noise levels with time. The NPL is defined as:

$$\text{NPL} = L_{eq} 24 + 2.56 \text{ STD}$$

Where STD = standard deviation

$L_{eq} 24$ is the equivalent continuous (A-weighted) sound level in decibels and STD is the standard deviation of the recorded sound levels sampled during the 24-hour analysis. Table 3-1 lists the NPL values for each monitoring station.

The NPLs ranged from a low of 70 dBA to a high of 73 dBA. The NPL, like the TNI, is a quantitative estimate of the variability and fluctuation of noise levels over time.

All stations have similar NPL values. The major fluctuation of noise level for these areas is from day to night. Noise levels at these stations are relatively low in the night and increase during the day as would be expected. Monitor Station 3 has the lowest NPL value since there is only a minor increase in noise level at night.

4.0 PHASE III - DETERMINATION OF FACILITY RELATED NOISE LEVELS

There are many sources of noise at a resource recovery facility, including noise from equipment such as power generators and vent systems, and activities such as loading and unloading solid waste. In addition, refuse trucks traveling to and from the facility will cause increased noise levels during various hours of the day. Noise from construction activities related to building the resource recovery facility will also occur.

4.1 CONSTRUCTION IMPACTS

There are two basic concerns associated with potential noise related impacts. One concern is short-term noise impacts from construction and the other is long-term impacts from facilities operation. While construction noise impacts are important, their short-term nature and the availability of effective mitigative measures minimizes their significance. This analysis is primarily concerned with long-term land use impacts.

Noise at a given construction site will depend on the phase of construction and the type of equipment being used.

The noise produced by construction equipment depends upon the source of power used to run the equipment, and the material properties and operational characteristics of the equipment. Construction noise will also vary with time of day. The most common construction equipment noise sources are:

- Earth moving equipment, including excavating machinery such as bulldozers, shovels, front-end loaders, and trucks.
- Materials handling equipment, such as cranes, concrete mixers, and concrete pumps.
- Stationary equipment, such as pumps and compressors.

Typical construction equipment noise ranges are shown in Table 4-1.

Construction noise impacts, as mentioned, will be of short duration. Because of shielding due to vegetation, coupled with the rural nature of the local area, these temporary noise levels should result in only a slightly adverse impact on the local area.

4.2 FACILITY NOISE

Once background sound levels have been measured, facility noise levels must be quantified. A specific facility design has not been defined; therefore, the equipment and designs discussed here are based on the typical resource recovery facility discussed in Section 3.1.3 in the main text of this document. It is assumed for this analysis that noise sources emanate from one central location. This section of the analysis presents the estimated noise levels at the facility. Table 4-2 lists each noise source and its accompanying noise level.

4.3 TRAFFIC NOISE

The traffic noise analysis was based upon the U.S. Department of Transportation Federal Highway Administration STAMINA 2.0 model, which predicts highway traffic noise. The model uses the following parameters to predict noise levels which can be attributed to traffic alone:

- number of cars and trucks per hour
(differentiated into large and medium trucks)
- speed of vehicles
- length of road

Noise attenuation is calculated using Beranek's (1971) approach as detailed in Section 6.0.

Noise levels were calculated at 50-foot intervals away from each road segment.

TABLE 4-1
CONSTRUCTION EQUIPMENT SOUND LEVELS

Equipment	Sound Level at 50 feet (dBA)
<u>Earth Moving</u>	
Compactors (Rollers)	72 - 75
Front Loaders	72 - 85
Backhoes	72 - 93
Tractors	76 - 93
Scrapers, Grader	80 - 94
Trucks	83 - 95
<u>Material Handling</u>	
Concrete Mixers	75 - 88
Concrete Pumps	82 - 85
Cranes (Movable)	76 - 87
Cranes (Derrick)	86 - 89
<u>Stationary</u>	
Pumps	69 - 71
Generators	71 - 83
Compressors	75 - 87
<u>Impact Equipment</u>	
Pneumatic Wrenches	82 - 89
Jack Hammers & Rock Drills	81 - 98
Impact Pile Drivers (Peaks)	95 - 110
<u>Miscellaneous</u>	
Vibrator	69 - 81
Saws	71 - 82

Source: US EPA (January 1976)

TABLE 4-2
FACILITY NOISE LEVELS (dB) BY SOURCE^a

Source Name	dB
Tipping Floor	111.4
Building Vent System	109.3
Boiler System 1	111.5
F.D. Fan 1	115.1
Boiler System 2	111.5
F.D. Fan 2	115.1
Boiler System 3	111.5
F.D. Fan 3	115.1
ESP 1	96.3
ESP 2	96.3
ESP 3	96.3
Dry Scrubber 1	96.3
Dry Scrubber 2	96.3
Dry Scrubber 3	96.3
I.D. Fan 1	117.3
I.D. Fan 2	117.3
I.D. Fan 3	117.3
Stack Exit (3 Flues)	137.3
Turbine 1	106.8
Generator 1	118.4
Condenser 1	108.0
Condenser 2	108.0
Condenser 3	108.0
Deaerator	109.3
Residual Handling	123.6
Cooling Tower	109.4
Material Handling	121.9
Trucks	112.2

^adB at meter from noise source.

The maximum existing traffic volumes per hour identified in the traffic study were used as a basis for the required existing parameters. Maximum traffic volumes associated with the resource recovery facility are added to the existing traffic volumes to estimate the maximum possible traffic noise that could be generated by the facility. Using maximum levels makes the model highly conservative by considering the worst case scenario.

PRIMARY REFERENCES FOR EQUIPMENT NOISE LEVELS

1. Construction Equipment Cavanaugh Tocci Associates (CTA) Measurements of construction equipment noise.
2. Tipping Floor A-weighted reading obtained at North Andover Resource Recovery Facility. The distribution over frequencies was determined from CTA measurements of unloading activities at RESCO resource recovery facility, Revere, MA.
3. Building Ventilation System Harris, Cyril M. Handbook of Noise Control McGraw-Hill Book Co., NY, NY, 1978
4. Condensers ibid.
5. F.D. Fan ASHRAE Guide Systems Volume, 1973
6. I.D. Fan ibid.
7. Boiler System Power Plant Environmental Noise Guide, Edison Electric Institute, NY, NY, 1978
8. Electrostatic Precipitators ibid.
9. Dry Scrubber ibid.
10. Stacks ibid.
11. Generators ibid.
12. Deaerators ibid.
13. Turbines Power Plant Acoustics, Department of the Army, 1968
14. Residual Handling CTA Noise Measurements at ANSWERS resource recovery facility, Albany, NY
15. Cooling Tower General Electric, Personal Communication, February 3, 1986

5.0 PHASE IV - ATTENUATION OF FACILITY NOISE LEVELS

5.1 INTRODUCTION

Noise levels outside the site boundaries will be attenuated by a variety of influences, such as the atmosphere, natural and man-made barriers (brush, trees, walls) and geometrical divergence. To estimate receptor noise levels, a simplified and conservative equation was used to estimate the sound pressure level at a receptor based on the initial sound power level and various attenuation factors. The equation is:

$$L_A = L_{A \text{ ref}} - (A_{\text{atm}} + A_{\text{div}} + A_{\text{trees}} + A_{\text{barrier}} + A_{\text{wall}})$$

where

L_A = A-weighted sound pressure level at the receptor location (dB)

$L_{A \text{ ref}}$ = Initial A-weighted sound power level at the source (dB)

A_{atm} = Attenuation from the atmosphere (dB)

A_{div} = Attenuation due to the geometrical divergence of sound from the source (dB)

A_{trees} = Attenuation caused by trees or dense vegetation (dB)

A_{barrier} = Attenuation from barriers between the source and receptor (dB)

A_{wall} = Attenuation from walls surrounding the source (dB)

For each sensitive receptor the resultant facility noise level (sound reaching the receptor) was predicted using the above formula. The facility noise levels from the sources discussed in Section 4.0 were added to estimate the total noise level of the facility. Then, based on frequency,

distance, and atmospheric conditions, the attenuation factors were calculated and subtracted from the total facility noise. Section 6.0 details the results of this analysis. The attenuation factors in the above equation are defined in detail below.

5.2 ATMOSPHERIC ATTENUATION

As sound travels through the atmosphere its energy is gradually converted into heat. This process is called atmospheric absorption. The attenuation of sound due to atmospheric absorption A_{atm} , through a distance r meters between the (source and the receptor), is given by

$$A_{atm} = \alpha r/100$$

Where α is the atmospheric attenuation coefficient in decibels per 100m. The attenuation coefficients depend strongly on frequency and relative humidity, and less strongly on temperature. Atmospheric attenuation is generally lower at low temperature and high humidity. For this analysis, a temperature of 20°C (68°F) and a relative humidity of 90 percent were assumed. These conditions result in a very low attenuation and a high estimate of noise.

5.3 DIVERGENT ATTENUATION

Sound in a free field (no obstructions) is radiated in spherical waves. The attenuation of sound due to wave divergence is related to the directivity index, DI , and the distance from source to the receptor by the equation:

$$A_{div} = DI - 10 \log (4\pi r^2)$$

The directivity index is a measure of true shape from which the noise emits. For the facility noise sources, the shape is that of a hemisphere (half sphere, $DI = 3$) due to the earth's flat surface under the sources. For a point source, such as the facility, radiating equally in all directions, the equation indicates that a doubling of distance reduces the

sound level by 6 dB. For a line source, such as traffic, the attenuation is 3 dB per doubling of distance.

5.4 EXCESS ATTENUATION

Several factors are involved in excess attenuation including surface vegetation, wind, temperature, wind turbulence and precipitation.

Forests and dense vegetation reduce noise levels as a function of emission frequency and length of dense forest. The relationship is:

$$A_{\text{trees}} = 0.01 (f)^{1/3} r$$

Where r is the thickness, in meters, of a dense forest separating the source and receptor, and f is frequency in Hz. A 30-meter thick forest reduces sound by 3 dB.

Wind, wind turbulence, temperature, and precipitation tend to reduce or attenuate sound levels. During the day, temperature levels decrease with increasing height while wind velocities increase. A shadow zone develops where sound may be attenuated by up to 20 dB. However, the creation of this shadow zone is a function of wind speed and temperature and only becomes important at long distances which are not characteristic of this study. Therefore the effects of wind and temperature gradients will be considered negligible in this study.

Wind turbulence during unstable atmospheric conditions can cause fluctuations in sound reception. However, this is of minor importance; therefore, it is also considered negligible. Additionally, the effect of precipitation, although slightly more significant, only reduces sound levels by 0.5 dB over 100 m and is also considered negligible.

The assumption that wind, temperature, wind turbulence, and precipitation have negligible effects on sound levels would produce a conservatively high estimate of noise levels offsite. This means that actual sound levels offsite would be less than those predicted.

5.5 BARRIER ATTENUATION

A barrier, man-made or natural, is a solid body which blocks the line of sight between the source and the receiver and causes a reduction in noise levels by absorbing sound waves. Barriers include hills, buildings, cliffs, etc. The Fresnel theory of diffraction is used to evaluate the attenuation of noise caused by barriers. This assumes that only the region of the wavefield close to the top of the barrier contributes appreciably to the wavefield that is diffracted over the barrier. No major natural barriers are present at this site. Therefore, it was conservatively assumed that barrier attenuation is negligible.

5.6 WALL ATTENUATION

Most of the noise sources listed in Table 4-2 are enclosed by at least one wall. Walls will reduce noise levels reaching receptors outside the site area. Two assumptions were made in calculation of transmission loss through walls. First, one aluminum wall is assumed to surround the source; second, sound loss by frequency (Hz) due to the wall is as found by Beranek (1971).

6.0 PHASE V - IMPACT ASSESSMENT

6.1 CONSTRUCTION IMPACTS

There are two basic areas of concern associated with potential noise related impacts. One area is with short-term noise impacts from construction and the other area is with longer-term impacts from facilities operation. While construction noise impacts are important, their short-term nature minimizes their significance in what is essentially a noise analysis for long-term land use impacts.

Noise at a given construction site will depend on the phase of construction and the type of equipment being used. Most of the construction noise impacts will occur in early construction phases. During later construction phases, erected buildings will partially shield residential areas from noise produced by most construction activity. Construction noise will vary with time of day. Additionally, the noise produced by construction equipment depends on the phase of construction and the type of equipment being used.

Construction noise impacts, as mentioned, will be of short duration. Because of the shielding due to vegetation, these temporary noise levels should result in only a minor impact on the local area.

6.2 FACILITY IMPACTS AND MITIGATION

The main purpose of this noise analysis is to define the community noise impacts from operating a resource recovery facility. The estimation of facility noise levels described in Sections 4.0 and 5.0 is conservative because attenuation factors such as barriers, precipitation and winds were assumed to be negligible at each site. This conservative assumption was used to estimate a worst case scenario for each receptor.

Impacts were analyzed in two different ways: (1) combined facility and background noise levels were analyzed to determine if a "discernible" impact would occur at specified receptors; and (2) facility noise levels at the site boundary were estimated and compared with county standards.

6.2.1 DISCERNIBLE IMPACTS

At each sensitive receptor defined in Section 2, ambient levels are combined with predicted facility levels to determine if there is a "discernible" noise increase. A "discernible" impact is defined at each receptor as a greater than 3-dBA increase over existing levels in the overall A-weighted sound level (Beranek, 1971). To simplify, a discernible impact exists when there is a noticeable (to a person) change in the level or character of the existing ambient noise.

Two background noise levels were used for the impact analysis. The 24-hour L_{eq} was used to analyze facility noise impact at its maximum level. The night L_n was used to analyze the facility noise impact at its lowest level. During the night the tipping floor is inactive, therefore the sound level from this source is insignificant. The expected facility levels are calculated by adding the facility noise sources identified in Section 4.0 and then subtracting the attenuation factors as defined in Section 5.0. The results of the analysis are shown in Table 6-1. Table 6-1 shows the background noise levels, expected noise levels produced by the facility, combined (background and facility) levels and change in existing noise levels for each sensitive receptor identified in Section 2.0. None of the sensitive receptors would have a discernible impact.

6.2.2 TRAFFIC NOISE IMPACT

The operation of the proposed facility will increase daytime truck traffic levels along roadways in the vicinity of the site. Truck traffic will be restricted to daytime hours, more specifically 8 am to 5 pm. Other vehicles such as commuting operators and administrators will impact traffic during the day and the night. This study will distinguish between daytime impacts and nighttime impacts.

TABLE 6-1
FACILITY IMPACTS

Station	Background Level (dBA) 24-hour	Level (dBA) Night Only ^a	Expected Facility Level (dBA)	Combined Level (dBA)	County Standard ^b	dBA Change
1	51	—	48	53	55	2
	—	51	48	53	55	2
2	51	—	40	51	55	0
	—	51	40	51	55	0
3	50	—	43	51	55	1
	—	51	43	52	55	1
4	52	—	39	52	55	0
	—	53	39	53	55	0

^a 6 pm - 7 am per Pasco County Code.

^b The most restrictive standard for Sundays and nighttime was used for comparison.

The noise that would be generated by traffic related to the proposed facility was determined by using the FHWA Level 2 Highway Traffic Noise Prediction Model, Stamina 2.0 (1982). The results compared the existing and future modeled sound levels with and without the proposed resource recovery facility. The results of the modeling are the highest expected noise levels. The model was run assuming no sound barriers, trees or hills. These values were calculated at the junction of the three segments, shown in Figure 6-1, so that values are impacted by traffic from all three segments. The results of the model show a cumulative effect of the traffic noise associated with segments 1, 2 and 3.

The noise level at a point away from the roadway is a function of:

- The distance from the roadway.
- Traffic volume on the roadway.
- The percentage of light-duty, medium-duty and heavy-duty vehicles.
- Vehicle speed

Vehicle speeds traveling along SR 52 and Hays Road have been estimated at 45 mph for cars, 40 mph for medium trucks and 35 mph for heavy trucks. At the intersection, the vehicles will need to slow down to about 10 mph or stop. Nevertheless, the model used the higher velocities to maintain the conservatism of the analysis. SR 52 and Hays Road do not have grades that could increase truck generated noise levels.

Table 6-2 presents the average and peak traffic noise with and without the facility at given intervals of distance from the roadway. In both the existing and future cases, the sound level increase due to facility traffic was less than 1 dBA. An increase of 3 dBA is barely perceptible in the natural environment. This study shows no substantial increase of noise levels (between 0-1 dBA) due to facility traffic.

TABLE 6-2

NOISE LEVEL ATTENUATION FROM ROADWAYS

Distance (FT)	Without Facility				With Facility			
	Daytime		Nighttime		Daytime		Nighttime	
	Average	Peak	Average	Peak	Average	Peak	Average	Peak
Existing								
50	68.2	69.6	61.7	65.7	68.9	70.2	61.7	65.8
100	63.7	65.0	57.1	61.2	64.4	65.6	57.2	61.3
150	61.0	62.3	54.5	58.5	61.7	63.0	54.5	58.6
200	59.0	60.4	52.6	56.6	59.8	61.1	52.6	56.7
250	57.6	59.0	51.1	55.1	58.3	59.6	51.1	55.2
300	56.4	57.7	49.9	53.9	57.1	58.4	49.9	54.0
400	54.5	55.5	47.9	52.0	55.1	56.4	48.0	52.0
500	53.0	54.3	46.4	50.5	53.6	54.9	46.5	50.5
750	50.2	51.5	4					
1000	48.1	49.4	41.6	45.6	48.8	50.1	41.6	45.7
50	70.1	71.4	63.3	67.5	70.8	72.1	63.4	67.6
100	65.6	66.8	58.8	63.0	66.3	67.5	58.8	63.0
150	62.9	64.2	56.1	60.3	63.6	64.9	56.2	60.4
200	61.0	62.2	54.2	58.4	61.7	63.0	54.2	58.5
250	59.5	60.8	52.7	56.9	60.2	61.5	52.8	57.0
300	58.3	59.5	51.5	55.7	59.0	60.3	51.5	55.8
400	56.4	57.6	49.6	53.8	57.1	58.3	49.6	53.8
500	54.8	56.1	48.0	52.3	55.6	56.8	48.1	52.3
750	52.0	53.3	45.2	49.5	52.8	54.0	45.3	49.5
1000	50.0	51.3	43.2	47.4	50.7	52.0	43.3	47.5

6.2.3 COMPARISON TO COUNTY STANDARDS

As discussed in Section 2.0, Pasco County has established noise standards relating to industrial facilities. Table 6-1 shows the expected facility noise level at each monitoring station versus the county standard. The combined impact of the facility noise levels and existing background are predicted to be lower than both the daytime standard and the nighttime standard.

6.2.4 MITIGATION

The incremental noise increases at all receptors are predicted to be below discernible levels and well within county standards. Mitigation measures will not be required.

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ATTACHMENT 1
SOUND LEVEL MONITORING

SOUND LEVEL MONITORING
PASCO COUNTY RESOURCE
RECOVERY FACILITY
October 6-7, 1987

Prepared For:

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I. SUMMARY

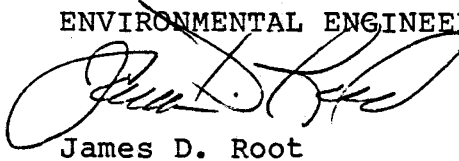
On October 6-7, 1987 Environmental Engineering Consultants, Inc. conducted sound level measurements at the Pasco County Resource Recovery Facility site located north of CR 52. The tests were a series of daytime and nighttime measurements conducted to establish background sound levels.

The tests were performed by James Root, Byron Burrows and Mike Koch of Environmental Engineering Consultants, Inc. with the assistance and cooperation of the employees of Camp, Dresser, and McKee of Tampa, Florida.

I hereby certify that these results are true and correct and were obtained by the procedures and methods described herein.

Respectfully Submitted;

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

A handwritten signature in dark ink, appearing to read "James D. Root", is written over the printed name.

James D. Root

II. SOURCE DESCRIPTION

The Pasco County Resource Recovery Facility site is located off Hays Rd. north of CR 52 in Pasco Co. Site boundaries are formed on the north by Bluebird Lane, on the east by Shady Hills Rd., and on the south and west by Hayes Rd. All land bordering the facility is of residential and agricultural uses.

The measurement site locations are shown in Figure 1. Sites MS-1 and MS-2 were located across Hays Rd. along the southern boundary. Site MS-3 was located at the end of 1st Avenue and site MS-4 was located at the ballpark on Blue Heron Lane.

MONITOR STATION LOCATIONS

- M.S.1 Located directly across the road from the site entrance at the 90^o bend to the west on Hays Rd. (unpaved section).
Owner: Joe Ramsey
House is on a corner lot, fenced and has a satellite dish.
- M.S.2 Traveling west on Hays Rd. from M.S.1, M.S.2 is the last house on the unpaved section of Hays Rd. (1/4 mile from M.S.1)
- M.S.3 From M.S.2, travel north on Hays Rd., turn right on 1st Avenue (unpaved). M.S.3 is the third to the last house on the right. The house has 3 evergreen shrubs out front.
- M.S.4 From SR 52, turn north on Shady Hills Road, travel approximately 3 miles on Shady Hills Road, turn left on Blue Heron Rd. M.S.4 is the Shady Hills Park. Readings were taken behind the maintenance garage next to the 1st ball diamond.

III. METHODS AND PROCEDURES

The general outline of the sound level monitoring procedures were defined by the Sound Level Monitoring Protocol used by Ogden Projects, Inc. as modified by Dan Strobridge of CDM and Donald Elias. A complete sound level monitoring test consisted of measurements at each of the selected sites once every 2 hours over a single twenty four hour period. Each site measurement was conducted for 20 minutes.

The method used to record and determine the sound levels was taken from a United States Department of Transportation Publication: Sound Procedures For Measuring Highway Noise: Final Report, Section 6.0 Non-Traffic Noise Source Measurement Procedure (Appendix C).

For each measurement the Quest Model 215 Type 2 Sound Level Meter was mounted on a tripod at an approximate height of 5 feet and the calibration checked with a one point battery powered calibrator. The meter was adjusted if necessary before starting measurements.

With the meter set on the A-weighted scale and slow response, the readings were observed for 10 seconds at the beginning of each 30 second measurement interval. The maximum sound level value during the 10 seconds was recorded on the field data sheet. An effort was made to distinguish between normal background noise and noise from other sources such as highway traffic, airplanes, etc. Each site measurement consisted of 40 readings.

Sound level limits for the test sites in residential areas adjacent to the Pasco site are as follows:

<u>Category</u>	<u>Time</u>	<u>Sound Level Limit, dBA</u>
Residential, Public	7 AM - 10 PM	60
Space, Agricultural	10 PM - 7 AM	55

APPENDIX A

Non-Traffic Noise Source Measurement Procedure

6.0 NON-TRAFFIC NOISE SOURCE MEASUREMENT PROCEDURE

6.1 PURPOSE

This procedure is used to measure the contribution of noise sources (other than traffic) to ambient sound levels at noise sensitive land use areas. Typical of these noise sources are railroad activity, aircraft overflights, industrial plant operations, construction activity, etc. The A-weighted equivalent sound level (L_{eq}) due to the noise source is measured at the noise sensitive land use area. Two techniques are presented, one for stationary sources of sound and the other for mobile sources.

6.2 INSTRUMENTATION

The following equipment is required:

- Sound Level Meter (Type 2)
- Sound Level Calibrator
- Earphone/Headphone
- Stopwatch
- Wind Speed Indicator
- Psychrometer
- Tripod
- Microphone Cable
- Data Sheets
- Windscreen
- Spare Batteries

6.3 MEASUREMENT LOCATIONS

Measurements are made at noise sensitive land uses in the vicinity of a proposed highway, or at noise sensitive land uses along an existing route. The location should be chosen so that, if possible, noise sources other than the one being measured, have minimum influence on measurements.

6.4 PERSONNEL

The procedure can be accomplished by one person.

6.5 MEASUREMENT PROCEDURE

1. Mount the microphone (or sound level meter/microphone combination if the microphone cannot be remotely mounted on a tripod at a height of 1.5 metres $\pm$ 16cm (5 feet $\pm$ 6 inches) above the ground, and if practical, at least 3 metres (10 feet) from any substantial reflecting surface (e.g., buildings, vehicles, billboards).

2. Sketch the measurement locations, with site features and dimensions, on the back of the data sheet (Figure 18 or 19) to provide a record which can be used if future measurements are required. The sketch should be of sufficient detail to permit future measurements at the same location.

6.5.1 Stationary Sources

For stationary sources of noise (e.g., construction activity, industrial activity), the following procedure is used:

1. Set the sound level meter to the A-weighting network and "slow" response.
2. Observe the sound level meter during a 10 ± 2 second sampling period at the start of each minute and half minute and note maximum value $\bar{L}_A$ in each period on data sheet.

If the source is intermittent (e.g. operates for 15 minutes and then is off for 10 minutes) disregard periods when the source is not operating but continue to sample until 60 samples are acquired.

3. Disregard measurements affected by intrusive noise sources other than the identified noise source. Extend the number of half minute observations for more than 30 minutes until 60 valid measurements are obtained.
4. Determine the arithmetic average sound level $\bar{L}_A$ as:

$$\bar{L}_A = \frac{1}{n} (L_1 + L_2 + L_3 + L_4 + \dots + L_n)$$

where $L_1, L_2, \dots, L_n$ are those sound levels that fall within a range of from 6 decibels less than the maximum level to the maximum level (e.g., if maximum is 70 dB, all levels from 64 dB to and including 70 dB are used).

n is the number of L_A values used for computing the arithmetic average.

5. Apply the corrections shown in Table 5 to obtain the equivalent sound level, L_{eq} .

TABLE 5

Corrections to $\bar{L}_A$ to Obtain L_{eq}

n/60	Correction - dB
.8 to 1	0
.7 to .8	1
.6 to .7	2
.5 to .6	3
.4 to .5	4
.3 to .4	5
.2 to .3	7
<.2	10

where n is the number of samples used
in the calculation of $\bar{L}_A$

$$L_{eq} = \bar{L}_A - \text{correction}$$

APPENDIX B
Field Data Sheets

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 49	truck	31. 43	
2. 42		32. 39	
3. 38		33. 43	
4. 49	truck	34. 42	
5. 50	"	35. 35	
6. 40		36. 35	
7. 45	truck	37. 42	
8. 53	bus	38. 42	
9. 52	"	39. 41	
10. 41		40. 41	
11. 45	truck	41.	
12. 41		42.	
13. 52	air plane	43.	
14. 55	"	44.	
15. 49	truck	45.	
16. 44		46.	
17. 45	truck	47.	
18. 48	"	48.	
19. 43		49.	
20. 40		50.	
21. 55	air plane	51.	
22. 59	"	52.	
23. 53	"	53.	
24. 43		54.	
25. 40		55.	
26. 36		56.	
27. 37		57.	
28. 36		58.	
29. 36		59.	
30. 46	bird	60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location MS-1 Date 10/6/87 Time 0849
 Wind Velocity 0 mph. Temperature 72 °F. Engineer [Signature]
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 43		31. 35	
2. 42		32. 37	
3. 41		33. 40	
4. 41		34. 37	
5. 39		35. 35	
6. 42		36. 39	
7. 49	air plane	37. 41	
8. 62	"	38. 42	
9. 59	"	39. 45	bird
10. 48	"	40. 35	
11. 47	truck	41.	
12. 47	bird	42.	
13. 47	"	43.	
14. 47	"	44.	
15. 46	"	45.	
16. 47	"	46.	
17. 47	"	47.	
18. 48	"	48.	
19. 48	air plane	49.	
20. 56	"	50.	
21. 49	"	51.	
22. 46	bird	52.	
23. 45	"	53.	
24. 48	"	54.	
25. 39		55.	
26. 38		56.	
27. 39		57.	
28. 39		58.	
29. 37		59.	
30. 45	bird	60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location MS-2 Date 10/6/87 Time 0918
 Wind Velocity 0 mph. Temperature 75 °F. Engineer [Signature]
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 32		31. 39	
2. 41		32. 46	airplane
3. 40		33. 60	"
4. 35		34. 55	"
5. 37		35. 42	
6. 37		36. 41	
7. 36		37. 37	
8. 41		38. 35	
9. 34		39. 33	
10. 37		40. 40	
11. 36		41.	
12. 37		42.	
13. 35		43.	
14. 35		44.	
15. 38		45.	
16. 40		46.	
17. 36		47.	
18. 36		48.	
19. 38		49.	
20. 40		50.	
21. 38		51.	
22. 41		52.	
23. 52	airplane	53.	
24. 62	"	54.	
25. 60	"	55.	
26. 43		56.	
27. 48	bird	57.	
28. 43		58.	
29. 41		59.	
30. 36		60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location MS-3 Date 10/6/87 Time 0946
 Wind Velocity 0 mph. Temperature 77 °F. Engineer [Signature]
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 46		31. 39	
2. 54	tractor	32. 35	
3. 46		33. 37	
4. 42		34. 37	
5. 43		35. 37	
6. 41		36. 35	
7. 42		37. 43	
8. 43		38. 35	
9. 40		39. 37	
10. 37		40. 37	
11. 44		41.	
12. 47		42.	
13. 54	airplane	43.	
14. 53	"	44.	
15. 48		45.	
16. 39		46.	
17. 35		47.	
18. 40		48.	
19. 35		49.	
20. 35		50.	
21. 55	sump pump	51.	
22. 37		52.	
23. 45		53.	
24. 39		54.	
25. 40		55.	
26. 41		56.	
27. 50	airplane	57.	
28. 53	"	58.	
29. 46		59.	
30. 40		60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location MS-4 Date 10/6/87 Time 1032
 Wind Velocity 0 mph. Temperature 77 °F. Engineer [Signature]
 Remarks dog barking in bldg.

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 52	road work	31. 40	
2. 43	"	32. 41	
3. 46	"	33. 39	
4. 42		34. 40	
5. 43		35. 39	
6. 40		36. 43	
7. 42		37. 41	
8. 40		38. 44	
9. 44		39. 51	airplane
10. 49	bird	40. 44	
11. 45	airplane	41.	
12. 49	"	42.	
13. 48	Construction	43.	
14. 38		44.	
15. 40		45.	
16. 42		46.	
17. 42		47.	
18. 50	airplane	48.	
19. 41		49.	
20. 42		50.	
21. 46	wind gust	51.	
22. 47	bird	52.	
23. 40		53.	
24. 41		54.	
25. 43		55.	
26. 41		56.	
27. 40		57.	
28. 41		58.	
29. 45	impulse noise	59.	
30. 40		60.	

SUM: * _____

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A$ = Sum/n: _____ n/60 _____ Correction _____ L_{eq} _____

Location MS-2 Date 10/6/87 Time 1517
 Wind Velocity 3 mph. Temperature 85 °F. Engineer [Signature]
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 37		31. 40	
2. 38		32. 48	bird
3. 41		33. 33	
4. 44		34. 33	
5. 44		35. 35	
6. 38		36. 46	bird
7. 40		37. 57	airplane
8. 40		38. 62	"
9. 39		39. 50	"
10. 39		40. 46	"
11. 37		41.	
12. 37		42.	
13. 36		43.	
14. 39		44.	
15. 41		45.	
16. 43		46.	
17. 42		47.	
18. 40		48.	
19. 37		49.	
20. 39		50.	
21. 57	airplane	51.	
22. 60	"	52.	
23. 47	"	53.	
24. 49	"	54.	
25. 38		55.	
26. 34		56.	
27. 34		57.	
28. 35		58.	
29. 37		59.	
30. 36		60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location MS-1 Date 10/6/87 Time 1109
 Wind Velocity 0 mph. Temperature 80 °F. Engineer [Signature]
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 35		31. 38	
2. 38		32. 36	
3. 38		33. 38	
4. 37		34. 36	
5. 40		35. 48	bird
6. 41		36. 45	"
7. 42		37. 38	
8. 42		38. 42	
9. 38		39. 40	
10. 40		40. 36	
11. 59	airplane	41.	
12. 60	"	42.	
13. 50	"	43.	
14. 50	construction	44.	
15. 46	"	45.	
16. 41		46.	
17. 40		47.	
18. 41		48.	
19. 40		49.	
20. 38		50.	
21. 41		51.	
22. 49	airplane	52.	
23. 43		53.	
24. 41		54.	
25. 40		55.	
26. 38		56.	
27. 43		57.	
28. 37		58.	
29. 38		59.	
30. 39		60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location MS-2 Date 10/6/87 Time 1133
 Wind Velocity 0 mph. Temperature 80 °F. Engineer [Signature]
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 32		31. 33	
2. 33		32. 35	
3. 33		33. 33	
4. 32		34. 32	
5. 34		35. 33	
6. 34		36. 40	
7. 49	airplane	37. 56	airplane
8. 56	"	38. 50	"
9. 48	"	39. 39	
10. 50	"	40. 43	
11. 46	"	41.	
12. 38		42.	
13. 33		43.	
14. 35		44.	
15. 38		45.	
16. 38		46.	
17. 37		47.	
18. 38		48.	
19. 56	airplane	49.	
20. 58	"	50.	
21. 55	"	51.	
22. 45	"	52.	
23. 40		53.	
24. 43		54.	
25. 38		55.	
26. 40		56.	
27. 34		57.	
28. 37		58.	
29. 34		59.	
30. 35		60.	

SUM: * _____

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A$ = Sum/n: _____ n/60 _____ Correction _____ L_{eq} _____

Location MS-3 Date 10/6/87 Time 1158
 Wind Velocity 3 mph. Temperature 80 °F. Engineer [Signature]
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 49	bird	31. 46	car
2. 54	"	32. 42	
3. 39		33. 46	airplane
4. 42		34. 50	"
5. 58	bird	35. 45	bird
6. 54	"	36. 40	
7. 57	"	37. 41	
8. 57	"	38. 35	
9. 57	"	39. 40	
10. 42		40. 55	semp pump
11. 41		41.	
12. 40		42.	
13. 58	airplane	43.	
14. 56	"	44.	
15. 41		45.	
16. 40		46.	
17. 36		47.	
18. 41		48.	
19. 43		49.	
20. 41		50.	
21. 42		51.	
22. 56	wind gust	52.	
23. 50	"	53.	
24. 44		54.	
25. 40		55.	
26. 41		56.	
27. 55	airplane	57.	
28. 57	"	58.	
29. 46	bird	59.	
30. 41		60.	

SUM: * _____

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A$ = Sum/n: _____ n/60 _____ Correction _____ L_{eq} _____

Location MS-4 Date 10/6/87 Time 1227
 Wind Velocity 3 mph. Temperature 80 °F. Engineer [Signature]
 Remarks people eating lunch in bldg.

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 51	airplane	31. 42	
2. 46	impulse noise	32. 42	
3. 41		33. 43	
4. 39		34. 38	
5. 50	airplane	35. 38	
6. 55	"	36. 50	truck
7. 48	"	37. 39	
8. 46	"	38. 40	
9. 41		39. 39	
10. 46	bird	40. 46	airplane
11. 55	airplane	41.	
12. 53	"	42.	
13. 46	"	43.	
14. 42		44.	
15. 38		45.	
16. 40		46.	
17. 40		47.	
18. 41		48.	
19. 56	airplane	49.	
20. 56	"	50.	
21. 43		51.	
22. 42		52.	
23. 42		53.	
24. 38		54.	
25. 40		55.	
26. 42		56.	
27. 64	airplane	57.	
28. 67	"	58.	
29. 41		59.	
30. 44		60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location MS-1 Date 10/6/87 Time 1301
 Wind Velocity 3 mph. Temperature 80 °F. Engineer [Signature]
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 48	airplane	31. 46	construction
2. 54	"	32. 60	truck
3. 48	"	33. 61	"
4. 47	"	34. 41	
5. 50	"	35. 38	
6. 47	"	36. 42	
7. 47	"	37. 42	
8. 60	"	38. 42	
9. 60	"	39. 46	construction
10. 56	"	40. 44	
11. 48	"	41.	
12. 48	"	42.	
13. 40		43.	
14. 46	airplane	44.	
15. 60	"	45.	
16. 50	"	46.	
17. 53	"	47.	
18. 57	"	48.	
19. 51	"	49.	
20. 47	"	50.	
21. 49	"	51.	
22. 41		52.	
23. 39		53.	
24. 38		54.	
25. 40		55.	
26. 39		56.	
27. 60	truck	57.	
28. 43		58.	
29. 36		59.	
30. 40		60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location MS-2 Date 10/6/87 Time 1324
 Wind Velocity 0 mph. Temperature 80 °F. Engineer [Signature]
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 35		31. 58	airplane
2. 35		32. 56	"
3. 35		33. 41	
4. 47	airplane	34. 41	
5. 55	"	35. 38	
6. 49	"	36. 41	
7. 37		37. 35	
8. 43		38. 43	
9. 35		39. 48	bird
10. 37		40. 73	
11. 42		41.	
12. 50	airplane	42.	
13. 55	"	43.	
14. 57	"	44.	
15. 38		45.	
16. 45	airplane	46.	
17. 39		47.	
18. 35		48.	
19. 34		49.	
20. 35		50.	
21. 35		51.	
22. 36		52.	
23. 38		53.	
24. 46	airplane	54.	
25. 40		55.	
26. 38		56.	
27. 37		57.	
28. 46	car	58.	
29. 34		59.	
30. 52	airplane	60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location MS-3 Date 10/6/87 Time 1349
 Wind Velocity 3 mph. Temperature 80 °F. Engineer [Signature]
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 48	lawn mower	31. 39	
2. 45	"	32. 40	
3. 43		33. 40	
4. 46	lawn mower	34. 43	
5. 48	"	35. 44	
6. 46	"	36. 47	lawn mower
7. 50	"	37. 48	"
8. 44		38. 48	"
9. 46	lawn mower	39. 46	"
10. 47	"	40. 47	"
11. 50	"	41.	
12. 50	"	42.	
13. 49	"	43.	
14. 46	"	44.	
15. 47	"	45.	
16. 45	"	46.	
17. 44		47.	
18. 53	bird	48.	
19. 47	lawn mower	49.	
20. 46	"	50.	
21. 49	"	51.	
22. 60	airplane	52.	
23. 43		53.	
24. 40		54.	
25. 42		55.	
26. 42		56.	
27. 41		57.	
28. 39		58.	
29. 41		59.	
30. 37		60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location MS-4 Date 10/6/87 Time 1718
 Wind Velocity 3 mph. Temperature 80 °F. Engineer [Signature]
 Remarks mowing in bkgrd.

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 53	road work	31. 54	road work
2. 48	"	32. 50	"
3. 51	"	33. 52	"
4. 49	"	34. 54	truck
5. 46	"	35. 80	road work
6. 42		36. 40	
7. 41		37. 68	road work
8. 53	truck	38. 58	"
9. 40		39. 58	"
10. 39		40. 50	"
11. 37		41.	
12. 38		42.	
13. 39		43.	
14. 42		44.	
15. 40		45.	
16. 38		46.	
17. 39		47.	
18. 44		48.	
19. 46	impulse noise	49.	
20. 58	truck	50.	
21. 77	dog bark	51.	
22. 70	"	52.	
23. 41		53.	
24. 44		54.	
25. 49	air plane	55.	
26. 57	"	56.	
27. 55	road work	57.	
28. 55	"	58.	
29. 70	"	59.	
30. 76	"	60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location MS-1 Date 10/6/57 Time 1454
 Wind Velocity 3 mph. Temperature 85 °F. Engineer [Signature]
 Remarks road work in block (heavy equipment)

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 35		31. 36	
2. 39		32. 37	
3. 36		33. 40	
4. 37		34. 39	
5. 36		35. 39	
6. 42		36. 38	
7. 38		37. 42	
8. 55	airplane	38. 36	
9. 59	"	39. 37	
10. 46	"	40. 36	
11. 41		41.	
12. 39		42.	
13. 41		43.	
14. 38		44.	
15. 37		45.	
16. 46	bird	46.	
17. 64	airplane	47.	
18. 60	"	48.	
19. 42		49.	
20. 40		50.	
21. 36		51.	
22. 38		52.	
23. 37		53.	
24. 36		54.	
25. 36		55.	
26. 37		56.	
27. 39		57.	
28. 38		58.	
29. 38		59.	
30. 37		60.	

SUM: * _____

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A$ = Sum/n: _____ n/60 _____ Correction _____ L_{eq} _____

Location M5-3 Date 10/6/87 Time 1542
 Wind Velocity 5 mph. Temperature 83 °F. Engineer [Signature]
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 62	air plane	31. 44	
2. 54	"	32. 54	air plane
3. 46		33. 55	"
4. 44		34. 44	
5. 46		35. 43	
6. 44		36. 40	
7. 57	air plane	37. 37	
8. 58	"	38. 35	
9. 47		39. 37	
10. 42		40. 42	
11. 45		41.	
12. 47		42.	
13. 43		43.	
14. 44		44.	
15. 50	CAR	45.	
16. 42		46.	
17. 40		47.	
18. 45		48.	
19. 44		49.	
20. 46		50.	
21. 41		51.	
22. 44		52.	
23. 41		53.	
24. 44		54.	
25. 43		55.	
26. 42		56.	
27. 42		57.	
28. 39		58.	
29. 43		59.	
30. 43		60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location MS-4 Date 10/6/87 Time 1610
 Wind Velocity 5 mph. Temperature 80 °F. Engineer [Signature]
 Remarks sump pump and birds in bldg.

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 41		31. 50	airplane
2. 38		32. 45	
3. 46		33. 40	
4. 45		34. 42	
5. 48		35. 42	
6. 46		36. 42	
7. 46		37. 41	
8. 39		38. 42	
9. 42		39. 52	airplane
10. 42		40. 60	"
11. 42		41.	
12. 56	airplane	42.	
13. 57	"	43.	
14. 52	"	44.	
15. 45		45.	
16. 56	truck	46.	
17. 48		47.	
18. 40		48.	
19. 54	airplane	49.	
20. 50	"	50.	
21. 48		51.	
22. 41		52.	
23. 40		53.	
24. 39		54.	
25. 42		55.	
26. 41		56.	
27. 44		57.	
28. 47		58.	
29. 59	airplane	59.	
30. 54	"	60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A$ = Sum/n: _____ n/60 _____ Correction _____ L_{eq} _____

Location MS-1 Date 10/6/87 Time 1652
 Wind Velocity 3 mph. Temperature 80 °F. Engineer [Signature]
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 52	Truck	31. 42	
2. 48	↓	32. 42	
3. 52	Airplane	33. 52	Bird
4. 42		34. 50	Airplane
5. 41		35. 55	↓
6. 44		36. 52	Jayger
7. 41		37. 53	Airplane
8. 39		38. 50	↓
9. 45	Bird	39. 52	↓
10. 42	Dog	40. 44	
11. 45	Highway	41.	
12. 44	↓	42.	
13. 47	Bird	43.	
14. 42		44.	
15. 42		45.	
16. 43	Boxing fan truck	46.	
17. 42		47.	
18. 42		48.	
19. 44	Bird	49.	
20. 40		50.	
21. 48	Airplane	51.	
22. 45		52.	
23. 48	Truck	53.	
24. 47	Bird	54.	
25. 50	Airplane	55.	
26. 61	↓	56.	
27. 54	↓	57.	
28. 44		58.	
29. 43		59.	
30. 41		60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location ms-2 Date 10/16/87 Time 1725
 Wind Velocity 2 mph. Temperature 80 °F. Engineer m. d. k.
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 42		31. 54	Bird
2. 42		32. 67	↓
3. 38		33. 61	↓
4. 40		34. 62	↓
5. 40		35. 58	↓
6. 38		36. 47	↓
7. 40		37. 44	
8. 40		38. 55	Airplane
9. 40		39. 47	
10. 39		40. 45	
11. 40		41.	
12. 44	Bird	42.	
13. 40		43.	
14. 40		44.	
15. 50	Airplane	45.	
16. 67	↓	46.	
17. 69	Car	47.	
18. 47	Airplane	48.	
19. 58	↓	49.	
20. 45		50.	
21. 42		51.	
22. 43		52.	
23. 42		53.	
24. 43		54.	
25. 54	Airplane	55.	
26. 57	↓	56.	
27. 55	↓	57.	
28. 48	↓	58.	
29. 46	Highway Noise	59.	
30. 48	↓	60.	

SUM: * _____

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location MS-3 Date 10/6/77 Time 1800
 Wind Velocity 1 mph. Temperature 75 °F. Engineer NEAL KIL
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 52	*	31. 57	*
2. 45		32. 57	↓
3. 47	Bird	33. 58	↓
4. 55	*	34. 54	↓
5. 50	↓	35. 55	↓
6. 52	↓	36. 56	↓
7. 50	↓	37. 55	↓
8. 54	↓	38. 56	↓
9. 58	↓	39. 62	Car
10. 57	↓	40. 55	*
11. 57	↓	41.	
12. 58	↓	42.	
13. 57	↓	43.	
14. 56	↓	44.	
15. 57	↓	45.	
16. 58	↓	46.	
17. 58	↓	47.	
18. 57	↓	48.	
19. 59	↓	49.	
20. 64	Airplane	50.	
21. 58	↓	51.	
22. 58	*	52.	
23. 57	↓	53.	
24. 57	↓	54.	
25. 62	Airplane	55.	
26. 60	Car	56.	
27. 60	Car	57.	
28. 57	*	58.	
29. 62	person whistling	59.	
30. 57	*	60.	

SUM: * _____

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location ms-4 Date 10/6/87 Time 1840
 Wind Velocity 0 mph. Temperature 75 °F. Engineer mla/OK
 Remarks * Football + cheerleading practice + all running in BKg

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L _A	Remarks	L _A	Remarks
1. 42		31. 44	Highway
2. 42		32. 40	Music from Hoop
3. 45		33. 43	Highway
4. 52	Dog	34. 40	Music
5. 51	↓	35. 36	
6. 65	Car	36. 41	Highway
7. 44		37. 39	↓
8. 42		38. 50	↓
9. 42		39. 45	↓
10. 41		40. 40	
11. 43		41.	
12. 43		42.	
13. 42		43.	
14. 38		44.	
15. 40	Dog	45.	
16. 36		46.	
17. 36		47.	
18. 34		48.	
19. 44	Highway	49.	
20. 64	Car	50.	
21. m 8:48	Highway	51.	
22. 36		52.	
23. 35		53.	
24. 52	Bird	54.	
25. 40	Dog	55.	
26. 36		56.	
27. 44	Highway	57.	
28. 40	↓	58.	
29. 35		59.	
30. m 2:47	Airplane	60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$$\bar{L}_A = \text{Sum}/n: \quad n/60 \quad \text{Correction} \quad L_{eq}$$

Location ms-1 Date 10/6/87 Time 1917
Wind Velocity 0 mph. Temperature 72 °F. Engineer: ma/kl
Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 40		31. 44	
2. 44	Airplane	32. 43	
3. 62		33. 46	Dog
4. 55		34. 48	Dog
5. 54		35. 48	Highway
6. 45		36. 44	
7. 45		37. 48	Dog
8. 44		38. 47	Dog
9. 44		39. 44	
10. 42		40. 52	Highway
11. 45		41.	
12. 44		42.	
13. 44		43.	
14. 46		44.	
15. 46		45.	
16. 62	Airplane	46.	
17. 62		47.	
18. 54		48.	
19. 52		49.	
20. 45		50.	
21. 46		51.	
22. 46		52.	
23. 48	Dog	53.	
24. 52		54.	
25. 46		55.	
26. 45		56.	
27. 45		57.	
28. 48		58.	
29. 48		59.	
30. 44		60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location MS-2 Date 10/6/87 Time 1942
 Wind Velocity 1 mph. Temperature 73 °F. Engineer NEOKO
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 48	Dog	31. 44	
2. 46	↓	32. 47	Dog
3. 48	↓	33. 47	↓
4. 48	↓	34. 48	↓
5. 48	↓	35. 48	↓
6. 48	↓	36. 47	↓
7. 49	↓	37. 48	↓
8. 52	Airplane	38. 53	Airplane
9. 50	↓	39. 62	↓
10. 48	Dog	40. 54	↓
11. 48	↓	41.	
12. 48	↓	42.	
13. 47	↓	43.	
14. 48	↓	44.	
15. 50	Car	45.	
16. 50	Dog	46.	
17. 51	↓	47.	
18. 48	↓	48.	
19. 47	↓	49.	
20. 47	↓	50.	
21. 47	↓	51.	
22. 47	↓	52.	
23. 47	↓	53.	
24. 46	↓	54.	
25. 45	↓	55.	
26. 47	↓	56.	
27. 44		57.	
28. 48	Dog	58.	
29. 47	↓	59.	
30. 47	↓	60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location ms-3 Date 10/6/87 Time 2011
 Wind Velocity 1 mph. Temperature 70 °F. Engineer melville
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks
1. 40	
2. 42	
3. 38	
4. 40	
5. 43	Highway
6. 38	
7. 42	Highway
8. 40	↓
9. 42	↓
10. 37	
11. 40	
12. 46	Highway
13. 40	↓
14. 44	↓
15. 37	
16. 46	Car
17. 38	
18. 55	Airplane
19. 57	↓
20. 48	↓
21. 40	
22. 43	Highway
23. 70	Car
24. 48	Bicycles
25. 40	
26. 43	Highway
27. 50	
28. 44	Car
29. 44	
30. 39	

L_A	Remarks
31. 40	
32. 41	
33. 37	
34. 37	
35. 40	
36. 60	Car
37. 40	
38. 45	Highway
39. 36	
40. 47	Highway
41.	
42.	
43.	
44.	
45.	
46.	
47.	
48.	
49.	
50.	
51.	
52.	
53.	
54.	
55.	
56.	
57.	
58.	
59.	
60.	

SUM: * _____

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location ms-7 Date 10/6/87 Time 2044
 Wind Velocity 1 mph. Temperature 69 °F. Engineer MDK
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 42		31. 71	Truck
2. 38		32. 40	
3. 40		33. 37	
4. 40		34. 32	
5. 41	Day	35. 37	
6. 37		36. 39	
7. 42	Highway	37. 38	
8. 40		38. 40	
9. 50	Highway	39. 39	
10. 37		40. 37	
11. 40		41.	
12. 40		42.	
13. 40		43.	
14. 44	Highway	44.	
15. 38		45.	
16. 38		46.	
17. 40		47.	
18. 38		48.	
19. 38		49.	
20. 44	Day	50.	
21. 40	↓	51.	
22. 40	↓	52.	
23. 44	↓	53.	
24. 44	↓	54.	
25. 46	Highway	55.	
26. 43	Day	56.	
27. 40		57.	
28. 42	Highway	58.	
29. 46	↓	59.	
30. 44	↓	60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location ms-1 Date 10/6/87 Time 8:30 AM
 Wind Velocity 0 mph. Temperature 69 °F. Engineer NO. 04.0
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 49	Day	31. 38	
2. 46	↓	32. 40	Day
3. 37		33. 34	
4. 40		34. 35	
5. 36		35. 44	Highway
6. 40	Day	36. 40	↓
7. 35		37. 43	Day
8. 33		38. 43	
9. 32		39. 62	Day
10. 33		40. 61	Day
11. 33		41.	
12. 35		42.	
13. 40	Day	43.	
14. 36	Highway	44.	
15. 42	↓	45.	
16. 44	↓	46.	
17. 40	Airplane	47.	
18. 36		48.	
19. 38	Airplane	49.	
20. 56	↓	50.	
21. 46	↓	51.	
22. 43		52.	
23. 36		53.	
24. 35		54.	
25. 48	Highway	55.	
26. 46	↓	56.	
27. 41	Airplane	57.	
28. 53	↓	58.	
29. 54	↓	59.	
30. 45	↓	60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location ms-a Date 10/6/57 Time 11:50
 Wind Velocity 0 mph. Temperature 69 °F. Engineer NEA/Ord
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L _A	Remarks	L _A	Remarks
1. 36		31. 32	
2. 36		32. 32	
3. 35		33. 33	
4. 34		34. 33	
5. 35		35. 33	
6. 32		36. 34	
7. 33		37. 48	Bird
8. 32		38. 35	
9. 32		39. 34	
10. 35	Hammer on hole	40. 35	
11. 33		41.	
12. 33		42.	
13. 33		43.	
14. 32		44.	
15. 33		45.	
16. 32		46.	
17. 34		47.	
18. 37		48.	
19. 40	Hammer on hole	49.	
20. 37	↓	50.	
21. 33		51.	
22. 37	Day	52.	
23. 35		53.	
24. 33		54.	
25. 35		55.	
26. 35		56.	
27. 35		57.	
28. 37	Airplane	58.	
29. 33		59.	
30. 34		60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$$\bar{L}_A = \text{Sum}/n: \quad n/60 \quad \text{Correction} \quad L_{eq}$$

Location ms-3 Date 10/6/67 Time 2219
Wind Velocity 0 mph. Temperature 68 °F. Engineer meo
Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 52	Airplane	31. 37	
2. 50	↓	32. 36	
3. 48	↓	33. 37	
4. 40		34. 36	
5. 37		35. 34	
6. 35		36. 35	
7. 35		37. 33	
8. 35		38. 44	Highway Noise
9. 44	Highway Noise	39. 46	
10. 36		40. 37	
11. 42	Highway Noise	41.	
12. 37		42.	
13. 37		43.	
14. 37		44.	
15. 42	Dog	45.	
16. 41	↓	46.	
17. 40	Highway Noise	47.	
18. 42	" "	48.	
19. 55	" "	49.	
20. 43	Dog	50.	
21. 41	↓	51.	
22. 41	↓	52.	
23. 37		53.	
24. 42	Highway Noise	54.	
25. 40	" "	55.	
26. 37		56.	
27. 37		57.	
28. 42	Highway Noise	58.	
29. 37		59.	
30. 42	Highway Noise	60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location MS-4 Date 10/6/87 Time 2251
 Wind Velocity 0 mph. Temperature 69 °F. Engineer maeue
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 42		31. 33	
2. 38		32. 35	
3. 38		33. 32	
4. 35		34. 32	
5. 34		35. 31	
6. 32		36. 31	
7. 32		37. 32	
8. 32		38. 32	
9. 33		39. 31	
10. 32		40. 31	
11. 37		41.	
12. 42	Highway Noise	42.	
13. 33		43.	
14. 32		44.	
15. 38		45.	
16. 37	Highway Noise	46.	
17. 37	↓	47.	
18. 40	↓	48.	
19. 42	↓	49.	
20. 40	↓	50.	
21. 37		51.	
22. 46	Highway Noise	52.	
23. 49	↓	53.	
24. 54	↓	54.	
25. 50	↓	55.	
26. 37		56.	
27. 37		57.	
28. 36		58.	
29. 33		59.	
30. 32		60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A$ = Sum/n: _____ n/60 _____ Correction _____ L_{eq} _____

Location MS-1 Date 10/6/57 Time 2327
 Wind Velocity 2 mph. Temperature 68 °F. Engineer MARKS
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 33		31. 33	
2. 33		32. 33	
3. 33	VEHICLE PASSING	33. 33	
4. 50	" "	34. 33	
5. 70	" "	35. 33	
6. 35		36. 33	
7. 35		37. 50	MOTORCYCLE PASSING
8. 35		38. 50	" "
9. 35		39. 33	
10. 33		40. 33	
11. 33		41.	
12. 35	DOGS BARKING	42.	
13. 35	" "	43.	
14. 35	" "	44.	
15. 33		45.	
16. 33		46.	
17. 34		47.	
18. 34		48.	
19. 33		49.	
20. 33		50.	
21. 33		51.	
22. 33		52.	
23. 33		53.	
24. 33		54.	
25. 33		55.	
26. 33		56.	
27. 41	VEHICLE NOISE	57.	
28. 49	" "	58.	
29. 33		59.	
30. 33		60.	

SUM: * _____

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location M.S. 2 Date 10-7-87 Time 1200 2405 0005
 Wind Velocity 0 mph. Temperature 70 °F. Engineer [Signature]
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 58	DOG BARKING	31. 30	
2. 58	" "	32. 30	
3. 30		33. 30	
4. 35	DOG BARKING	34. 30	
5. 32		35. 30	
6. 32		36. 30	
7. 52	DOG BARKING	37. 30	
8. 42	" "	38. 33	
9. 50	" "	39. 30	
10. 49	" "	40. 30	
11. 45	" "	41.	
12. 41	" "	42.	
13. 42	" "	43.	
14. 42	" "	44.	
15. 40	" "	45.	
16. 35	" "	46.	
17. 36	" "	47.	
18. 40	" "	48.	
19. 42	" "	49.	
20. 44	" "	50.	
21. 35	" "	51.	
22. 43	" "	52.	
23. 35	" "	53.	
24. 30		54.	
25. 35	DOGS BARKING	55.	
26. 35	" "	56.	
27. 35	" "	57.	
28. 33	" "	58.	
29. 33	" "	59.	
30. 33	" "	60.	

SUM: * _____

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location MS3 Date 10-7-87 Time 0045
 Wind Velocity 0 mph. Temperature 68°F °F. Engineer [Signature]
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 30		31. 30	
2. 30		32. 30	
3. 30		33. 30	
4. 30		34. 30	
5. 30		35. 30	
6. 30		36. 30	
7. 30		37. 30	
8. 30		38. 30	
9. 30		39. 30	
10. 30		40. 30	
11. 30		41.	
12. 30		42.	
13. 33	DOG BARKING	43.	
14. 33	DOG BARKING	44.	
15. 30		45.	
16. 30		46.	
17. 30		47.	
18. 30		48.	
19. 30		49.	
20. 30		50.	
21. 30		51.	
22. 30		52.	
23. 30		53.	
24. 30		54.	
25. 30		55.	
26. 30		56.	
27. 30		57.	
28. 30		58.	
29. 30		59.	
30. 30		60.	

SUM: * _____

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A$ = Sum/n: _____ n/60 _____ Correction _____ L_{eq} _____

Location MS 4 Date 10-7-87 Time 0120
 Wind Velocity 0 mph. Temperature 65 °F. Engineer By J. S. Sumner
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 30		31. 30	
2. 30		32. 30	
3. 30		33. 30	
4. 30		34. 30	
5. 30		35. 30	
6. 30		36. 30	
7. 30		37. 30	
8. 30		38. 30	
9. 30		39. 30	
10. 30		40. 30	
11. 30		41.	
12. 30		42.	
13. 30		43.	
14. 30		44.	
15. 30		45.	
16. 30		46.	
17. 30		47.	
18. 30		48.	
19. 30		49.	
20. 35	CAR PASSING	50.	
21. 45	" "	51.	
22. 35	DOG BARKING	52.	
23. 30		53.	
24. 30		54.	
25. 30		55.	
26. 30		56.	
27. 30		57.	
28. 30		58.	
29. 30		59.	
30. 30		60.	

SUM: * _____

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location MS1 Date 10-7-87 Time 0155
 Wind Velocity 0 mph. Temperature 65 °F. Engineer [Signature]
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 32		31. 32	
2. 32		32. 32	
3. 32		33. 32	
4. 32		34. 32	
5. 32		35. 32	
6. 32		36. 44	CAR PASSING
7. 32		37. 32	
8. 32		38. 32	
9. 32		39. 32	
10. 44	CAR PASSING	40. 32	
11. 35	" "	41.	
12. 32		42.	
13. 32		43.	
14. 32		44.	
15. 32		45.	
16. 32		46.	
17. 32		47.	
18. 32		48.	
19. 32		49.	
20. 32		50.	
21. 32		51.	
22. 55	AIRPLANE	52.	
23. 50	"	53.	
24. 30		54.	
25. 32		55.	
26. 32		56.	
27. 32		57.	
28. 42	CAR PASSING	58.	
29. 32		59.	
30. 42	CAR PASSING	60.	

SUM: * _____

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A$ = Sum/n: _____ n/60 _____ Correction _____ L_{eq} _____

Location MSZ Date _____ Time 0230
 Wind Velocity 0 mph. Temperature 65 °F. Engineer [Signature]
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 30		31. 30	
2. 30		32. 30	
3. 30		33. 31	
4. 30		34. 35	RAIN INCREASE
5. 30		35. 34	
6. 30		36. 30	
7. 30		37. 30	
8. 30		38. 30	
9. 30		39. 30	
10. 30		40. 30	
11. 30		41.	
12. 35	CRICKETS	42.	
13. 35	"	43.	
14. 30		44.	
15. 30		45.	
16. 30		46.	
17. 35	DOGS BARKING	47.	
18. 35	"	48.	
19. 35	"	49.	
20. 32	"	50.	
21. 30		51.	
22. 30		52.	
23. 30		53.	
24. 36	CAR PASSING	54.	
25. 32		55.	
26. 32	LIGHT RAIN BEGINS	56.	
27. 32		57.	
28. 32		58.	
29. 30		59.	
30. 30		60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location MS 3 Date 10-7-87 Time 0304
 Wind Velocity 0 mph. Temperature 65 °F. Engineer B. J. B.
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 32		31. 42	CAR PASSING
2. 32		32. 35 35	DOG WHELP
3. 32		33. 35 38	"
4. 32		34. 35 38	"
5. 32		35. 30	
6. 32		36. 30	
7. 32		37. 30	
8. 40	CAR PASSING	38. 30	
9. 44	"	39. 32	CRICKETS
10. 35	DOG BARKING	40. 32	"
11. 55	CAR PASSING	41.	
12. 45	"	42.	
13. 35		43.	
14. 50	CAR PASSING	44.	
15. 45	"	45.	
16. 35		46.	
17. 30		47.	
18. 30		48.	
19. 30		49.	
20. 30		50.	
21. 32		51.	
22. 32		52.	
23. 32		53.	
24. 32		54.	
25. 32		55.	
26. 32		56.	
27. 32		57.	
28. 32		58.	
29. 32		59.	
30. 55	CAR PASSING	60.	

SUM: * _____

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location MS 4 Date 10-7-87 Time 0336
 Wind Velocity 0 mph. Temperature 65 °F. Engineer [Signature]
 Remarks TRANSFORMER STREET LIGHT MAKING NOISE (~2db)

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 33	MISC. W. L. LIFE	31. 42	CAR PASSING
2. 33	"	32. 40	"
3. 33	"	33. 55	"
4. 33	"	34. 35	"
5. 33	"	35. 35	"
6. 33	"	36. 32	
7. 33	"	37. 32	
8. 33	"	38. 32	
9. 33	"	39. 30	
10. 33	"	40. 30	
11. 33	"	41.	
12. 30		42.	
13. 30		43.	
14. 30		44.	
15. 32		45.	
16. 32		46.	
17. 32		47.	
18. 32		48.	
19. 33		49.	
20. 31		50.	
21. 30		51.	
22. 32		52.	
23. 32		53.	
24. 30		54.	
25. 30		55.	
26. 32		56.	
27. 32		57.	
28. 32		58.	
29. 32		59.	
30. 40	CAR PASSING	60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location MS 1 Date 10-7-87 Time 0407
 Wind Velocity 0 mph. Temperature 65 °F. Engineer [Signature]
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 42	WELL PUMP	31. 48	SEMI-TRUCK PASSING
2. 42	"	32. 55	"
3. 42	"	33. 47	"
4. 42	"	34. 40	CAR PASSING
5. 42	"	35. 33	
6. 35		36. 32	
7. 33		37. 30	
8. 33		38. 30	
9. 33		39. 30	
10. 33		40. 30	
11. 33		41.	
12. 35		42.	
13. 33		43.	
14. 33		44.	
15. 33		45.	
16. 33		46.	
17. 33		47.	
18. 43	CAR PASSING	48.	
19. 35		49.	
20. 32		50.	
21. 32		51.	
22. 32		52.	
23. 32		53.	
24. 32		54.	
25. 32		55.	
26. 55	CAR PASSING	56.	
27. 40	"	57.	
28. 42	"	58.	
29. 45	"	59.	
30. 45	"	60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A$ = Sum/n: _____ n/60 _____ Correction _____ L_{eq} _____

Location MS 2 Date 10-7-87 Time 0430
 Wind Velocity 0 mph. Temperature 65 °F. Engineer [Signature]
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 35	DOGS BARKING	31. 35	
2. 38	"	32. 33	
3. 38	"	33. 33	
4. 38	"	34. 33	
5. 38	"	35. 33	
6. 38	"	36. 33	
7. 41	"	37. 33	
8. 38	"	38. 33	
9. 40	"	39. 33	
10. 38	"	40. 33	
11. 38	"	41.	
12. 38	"	42.	
13. 40	"	43.	
14. 36	"	44.	
15. 24		45.	
16. 24		46.	
17. 35		47.	
18. 35		48.	
19. 33		49.	
20. 33		50.	
21. 33		51.	
22. 33		52.	
23. 38	CAR PASSING	53.	
24. 35	"	54.	
25. 33		55.	
26. 33		56.	
27. 33		57.	
28. 33		58.	
29. 33		59.	
30. 33		60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location MS3 Date 10-7-87 Time 0455

Wind Velocity 0 mph. Temperature 65 °F. Engineer [Signature]

Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 46	CARS PASSING (HWY)	31. 43	CAR PASSING
2. 46	"	32. 45	HWY NOISE
3. 46	"	33. 48	"
4. 40	"	34. 50	"
5. 42	"	35. 48	"
6. 40	"	36. 44	"
7. 41	"	37. 44	"
8. 40	"	38. 39	"
9. 42	"	39. 45	"
10. 46	"	40. 52	CAR PASSING
11. 44	"	41.	
12. 45	"	42.	
13. 51	"	43.	
14. 42	"	44.	
15. 40	"	45.	
16. 47	"	46.	
17. 43	"	47.	
18. 42	"	48.	
19. 53	"	49.	
20. 40	"	50.	
21. 37	"	51.	
22. 44	HWY / DOG BARKING	52.	
23. 50	"	53.	
24. 45	HWY NOISE	54.	
25. 48	"	55.	
26. 40	"	56.	
27. 40	"	57.	
28. 37	"	58.	
29. 36	"	59.	
30. 45	"	60.	

SUM: * _____

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location MS 4 Date 10-7-87 Time 0535
 Wind Velocity 0 mph. Temperature 65 °F. Engineer Bryan D. Bunn
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 45	HWY NOISE	31. 49	HWY. NOISE
2. 45	"	32. 44	"
3. 48	"	33. 46	"
4. 52	"	34. 42	"
5. 50	"	35. 48	"
6. 45	"	36. 44	"
7. 50	"	37. 48	"
8. 57	"	38. 44	"
9. 46	"	39. 42	"
10. 48	"	40. 48	"
11. 40	"	41.	
12. 44	"	42.	
13. 40	"	43.	
14. 50	"	44.	
15. 52	"	45.	
16. 36	"	46.	
17. 37	"	47.	
18. 43	"	48.	
19. 43	"	49.	
20. 46	"	50.	
21. 48	"	51.	
22. 45	"	52.	
23. 37	"	53.	
24. 65	MAIL CAR PASSING	54.	
25. 42	HWY NOISE	55.	
26. 42	"	56.	
27. 40	"	57.	
28. 40	"	58.	
29. 45	"	59.	
30. 45	"	60.	

SUM: * _____

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ n/60 _____ Correction _____ L_{eq} _____

Location MSI Date 10-7-87 Time 0608
 Wind Velocity 0 mph. Temperature 65 °F. Engineer By A. R. R.
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 45	HWY NOISE	31. 30	
2. 40	"	32. 57	CAR PASSING/HWY NOISE
3. 44	"	33. 30	
4. 43	"	34. 64	MOTORCYCLE
5. 43	"	35. 30	
6. 46	"	36. 62	MOTORCYCLE
7. 48	"	37. 33	
8. 50	"	38. 82	SCHOOL BUS PASSING
9. 43	"	39. 30	
10. 60	CAR PASSING	40. 30	
11. 40	HWY. NOISE	41.	
12. 40	"	42.	
13. 39	"	43.	
14. 42	"	44.	
15. 46	"	45.	
16. 46	"	46.	
17. 42	"	47.	
18. 42	"	48.	
19. 46	"	49.	
20. 42	"	50.	
21. 44	"	51.	
22. 45	"	52.	
23. 50	"	53.	
24. 44	"	54.	
25. 42	"	55.	
26. 42	"	56.	
27. 42	"	57.	
28. 42	"	58.	
29. 44	"	59.	
30. 47		60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A$ = Sum/n: _____ n/60 _____ Correction _____ L_{eq} _____

Location MS 2 Date 10-7-87 Time 0635
 Wind Velocity 0 mph. Temperature 65 °F. Engineer By B. B. B.
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 40	HWY NOISE	31. 35	
2. 40	"	32. 35	
3. 40	"	33. 33	
4. 35	"	34. 33	
5. 41	"	35. 32	
6. 41	"	36. 33	
7. 44	"	37. 35	
8. 42	"	38. 33	
9. 41	PCG PARKING	39. 35	
10. 41	"	40. 36	
11. 40		41.	
12. 40		42.	
13. 40		43.	
14. 40		44.	
15. 40		45.	
16. 40		46.	
17. 40		47.	
18. 50	ROOSTER	48.	
19. 42		49.	
20. 40		50.	
21. 41		51.	
22. 35		52.	
23. 35		53.	
24. 35		54.	
25. 35		55.	
26. 35		56.	
27. 35	AIRPLANE	57.	
28. 58	"	58.	
29. 56	"	59.	
30. 54		60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$ $n/60$ Correction L_{eq}

Location MS 3 Date 10-7-87 Time 0700
 Wind Velocity 0 mph. Temperature 65 °F. Engineer B. J. B.
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks
1. 45	HWY NOISE
2. 54	"
3. 50	"
4. 51	"
5. 52	"
6. 52	"
7. 45	"
8. 50	"
9. 52	AIRPLANE
10. 54	"
11. 53	"
12. 46	HWY NOISE
13. 54	"
14. 48	BIRD
15. 47	"
16. 48	"
17. 42	HWY NOISE
18. 46	"
19. 42	"
20. 45	"
21. 41	"
22. 52	"
23. 52	"
24. 45	"
25. 47	"
26. 47	"
27. 60	TRACTOR
28. 62	"
29. 55	"
30. 48	HWY NOISE

L_A	Remarks
31. 45	HWY NOISE
32. 46	"
33. 46	"
34. 55	"
35. 45	"
36. 45	"
37. 45	"
38. 45	"
39. 45	"
40. 45	"
41.	
42.	
43.	
44.	
45.	
46.	
47.	
48.	
49.	
50.	
51.	
52.	
53.	
54.	
55.	
56.	
57.	
58.	
59.	
60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location MS-4 Date 10-7-87 Time 0730
 Wind Velocity 0 mph. Temperature 65 °F. Engineer B. J. B.
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks
1. 52	GEN. HWY NOISE
2. 45	"
3. 40	"
4. 40	"
5. 44	"
6. 47	"
7. 42	"
8. 43	"
9. 53	"
10. 45	"
11. 44	"
12. 44	"
13. 44	"
14. 44	"
15. 44	"
16. 49	BIRD
17. 49	"
18. 49	"
19. 44	HWY NOISE
20. 44	"
21. 44	"
22. 44	"
23. 44	"
24. 44	"
25. 44	"
26. 44	"
27. 42	"
28. 42	"
29. 42	"
30. 42	"

L_A	Remarks
31. 41	GEN. HWY. NOISE
32. 40	"
33. 43	"
34. 42	"
35. 40	"
36. 46	"
37. 40	"
38. 42	"
39. 44	"
40. 47	"
41. 44 BB	
42. 52 BB	
43.	
44.	
45.	
46.	
47.	
48.	
49.	
50.	
51.	
52.	
53.	
54.	
55.	
56.	
57.	
58.	
59.	
60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location MS 1 Date 10-7-87 Time 0810
 Wind Velocity 0 mph. Temperature 65 °F. Engineer [Signature]
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks
1. 40	
2. 39	
3. 42	
4. 48	bird
5. 47	"
6. 47	"
7. 41	
8. 37	
9. 38	
10. 38	
11. 41	
12. 40	
13. 40	
14. 46	airplane
15. 58	"
16. 52	"
17. 47	"
18. 39	
19. 39	
20. 40	
21. 41	
22. 46	bird
23. 48	airplane
24. 52	"
25. 47	"
26. 42	
27. 39	
28. 38	
29. 39	
30. 39	

L_A	Remarks
31. 48	truck
32. 39	
33. 37	
34. 37	
35. 41	
36. 42	
37. 42	
38. 39	
39. 35	
40. 38	
41.	
42.	
43.	
44.	
45.	
46.	
47.	
48.	
49.	
50.	
51.	
52.	
53.	
54.	
55.	
56.	
57.	
58.	
59.	
60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A$ = Sum/n: _____ n/60 _____ Correction _____ L_{eq} _____

Location MS-2 Date 10/7/87 Time 0845
 Wind Velocity 0 mph. Temperature 69 °F. Engineer [Signature]
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks	L_A	Remarks
1. 35		31. 38	
2. 37		32. 39	
3. 37		33. 40	
4. 36		34. 40	
5. 40		35. 37	
6. 38		36. 39	
7. 41		37. 43	
8. 39		38. 41	
9. 48	airplane	39. 40	
10. 55	"	40. 40	
11. 56	"	41.	
12. 43		42.	
13. 40		43.	
14. 39		44.	
15. 36		45.	
16. 36		46.	
17. 38		47.	
18. 35		48.	
19. 39		49.	
20. 40		50.	
21. 50	airplane	51.	
22. 62	"	52.	
23. 47	"	53.	
24. 46	bird	54.	
25. 39		55.	
26. 36		56.	
27. 35		57.	
28. 35		58.	
29. 36		59.	
30. 34		60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A = \text{Sum}/n$: _____ $n/60$ _____ Correction _____ L_{eq} _____

Location MS-3 Date 10/7/87 Time 0913
 Wind Velocity 0 mph. Temperature 73 °F. Engineer [Signature]
 Remarks _____

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Instructions:

1. Calibrate sound level meter using acoustic calibrator.
2. Install windscreen, select A-weighting network, select "slow" response.
3. Observe for 10 ± 2 seconds at the start of each minute and 1/2 minute for 30 minutes.
4. Record maximum reading L_A during each 10 ± 2 second period.

Determine Arithmetic Average $\bar{L}_A$

L_A	Remarks
1. 45	
2. 42	
3. 42	
4. 46	
5. 43	
6. 55	Sump pump
7. 47	
8. 46	
9. 46	
10. 43	
11. 40	
12. 44	
13. 45	
14. 47	
15. 46	
16. 47	
17. 43	
18. 58	bird
19. 45	
20. 46	
21. 41	
22. 55	airplane
23. 62	"
24. 58	"
25. 46	
26. 42	
27. 43	
28. 40	
29. 39	
30. 40	

L_A	Remarks
31. 50	airplane
32. 60	"
33. 52	"
34. 43	
35. 41	
36. 46	
37. 45	
38. 40	
39. 39	
40. 42	
41.	
42.	
43.	
44.	
45.	
46.	
47.	
48.	
49.	
50.	
51.	
52.	
53.	
54.	
55.	
56.	
57.	
58.	
59.	
60.	

SUM: *

* Consider for the sum only those values within 6 dB of the maximum value observed.

$\bar{L}_A$ = Sum/n: _____ n/60 _____ Correction _____ L_{eq} _____

Location MS-4 Date 10/7/87 Time 0942

Wind Velocity 0 mph. Temperature 75 °F. Engineer [Signature]

Remarks _____

APPENDIX C

Instrument Calibration Data

Certificate of Calibration



The following equipment was calibrated with instrumentation whose accuracies are traceable to the U.S. National Bureau of Standards:

MODEL: 215, PH-35, CA-12, RA-100

SERIAL NUMBER: M1050028, P2070002, U1040109, 1424

CALIBRATION DATE: 12-17-86

CALIBRATED BY:

William J. Nielsen

WILLIAM J. NIELSEN
STANDARDS ENGINEER

QUEST ELECTRONICS

510 S. WORTHINGTON ST., OCONOMOWOC, WI 53066

414/567-9157

CDM

NOV. 1987

**PASCO COUNTY, FLORIDA
SOLID WASTE RESOURCE RECOVERY FACILITY
APPLICATION FOR POWER PLANT SITE CERTIFICATION**

VOLUME III - AIR QUALITY

ORIGINAL

PASCO COUNTY, FLORIDA
SOLID WASTE RESOURCE RECOVERY FACILITY
APPLICATION FOR
POWER PLANT SITE CERTIFICATION



SUBMITTED BY
THE PASCO COUNTY
BOARD OF COUNTY COMMISSIONERS

NOVEMBER 1987

PREPARED BY
CAMP DRESSER & MCKEE INC.

*environmental engineers, scientists,
planners & management consultants*

CDM

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VOLUME III - AIR QUALITY

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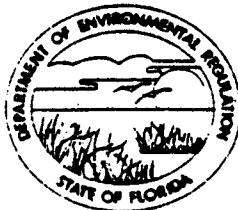
FDER FORM 17-1.202(1)

APPLICATION TO OPERATE/CONSTRUCT

AIR POLLUTION SOURCES

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
300 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301



BOB GRAHAM
GOVERNOR
VICTORIA J. TSCHINKEL
SECRETARY

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Resource Recovery Facility (RRF) ☒ New¹ ☐ Existing¹

APPLICATION TYPE: ☒ Construction ☐ Operation ☐ Modification

COMPANY NAME: Pasco County COUNTY: Pasco

Identify the specific emission point source(s) addressed in this application (i.e. Line
Resource Recovery Facility
Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired) with Dry Scrubber/Baghouse

SOURCE LOCATION: Street Hays Road City

UTM: East 347.12 km North 3139.23 km

Latitude 28 ° 22 ' 19 "N Longitude 82 ° 33 ' 36 "W

APPLICANT NAME AND TITLE: Pasco County

APPLICANT ADDRESS: 7536 State Street New Port Richey, FL 33553

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of Pasco County

I certify that the statements made in this application for a construction and operation permit are true, correct and complete to the best of my knowledge and belief. Further, I agree to maintain and operate the pollution control source and pollution control facilities in such a manner as to comply with the provision of Chapter 403, Florida Statutes, and all the rules and regulations of the department and revisions thereof. I also understand that a permit, if granted by the department, will be non-transferable and I will promptly notify the department upon sale or legal transfer of the permitted establishment.

*Attach letter of authorization

Signed: [Signature]
John J. Gallagher, County Administrator
Name and Title (Please Type)

Date: 10/24/87 Telephone No. (813)-847-8115

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA (where required by Chapter 471, F.S.)

This is to certify that the engineering features of this pollution control project have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgment, that

¹ See Florida Administrative Code Rule 17-2.100(57) and (104)

the pollution control facilities, when properly maintained and operated, will discharge an effluent that complies with all applicable statutes of the State of Florida and the rules and regulations of the department. It is also agreed that the undersigned will furnish, if authorized by the owner, the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.



Signed

Louis R. Tortora, P.E.

Name (Please Type)

Camp Dresser & McKee, Inc.

Company Name (Please Type)

1321 U.S. 19 S., Suite 100 B, Clearwater, FL 34624

Mailing Address (Please Type)

Florida Registration No. 0032073

Date: 11/9/87

Telephone No. 813/530-9984

SECTION II: GENERAL PROJECT INFORMATION

- A. Describe the nature and extent of the project. Refer to pollution control equipment, and expected improvements in source performance as a result of installation. State whether the project will result in full compliance. Attach additional sheet if necessary.

The Pasco County RRF will combust municipal solid waste and generate steam for electrical production. The facility will incorporate a dry scrubber to remove acid gases and a baghouse to remove particulate matter. The proposed emission limits will meet existing state and federal standards and satisfy BACT for all applicable pollutants.

- B. Schedule of project covered in this application (Construction Permit Application Only)

Start of Construction June 1988

Completion of Construction January 1991

- C. Costs of pollution control system(s): (Note: Show breakdown of estimated costs only for individual components/units of the project serving pollution control purposes. Information on actual costs shall be furnished with the application for operation permit.)

Dry scrubbers (4) \$8,468,000 Total *

Baghouses (4) \$8,522,000 Total *

* includes bond burden

- D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.

Not Applicable

I. Requested permitted equipment operating time: hrs/day 24; days/wk 7; wks/yr 52;
if power plant, hrs/yr 8760; if seasonal, describe: _____

F. If this is a new source or major modification, answer the following questions.
(Yes or No)

1. Is this source in a non-attainment area for a particular pollutant? No
 - a. If yes, has "offset" been applied? _____
 - b. If yes, has "Lowest Achievable Emission Rate" been applied? _____
 - c. If yes, list non-attainment pollutants. _____
2. Does best available control technology (BACT) apply to this source?
If yes, see Section VI. Yes
3. Does the State "Prevention of Significant Deterioration" (PSD)
requirement apply to this source? If yes, see Sections VI and VII. Yes
4. Do "Standards of Performance for New Stationary Sources" (NSPS)
apply to this source? Yes
5. Do "National Emission Standards for Hazardous Air Pollutants"
(NESHAP) apply to this source? No
- H. Do "Reasonably Available Control Technology" (RACT) requirements apply
to this source? No
 - a. If yes, for what pollutants? _____
 - b. If yes, in addition to the information required in this form,
any information requested in Rule 17-2.650 must be submitted.

Attach all supportive information related to any answer of "Yes". Attach any justifi-
cation for any answer of "No" that might be considered questionable.

See: Prevention of Significant Deterioration
Permit Application; Appendix 10.1.5
of Power Plant Siting Application

SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES (Other than Incinerators)

A. Raw Materials and Chemicals Used in your Process, if applicable:

Description	Contaminants		Utilization Rate - lbs/hr	Relate to Flow Diagram
	Type	% Wt		
Lime Silo	Pebble Lime		1,060	(See Figure 1-3 in
Ash Handling Bldg	Ash Residue		30,000	Section 1.0 of the
				PSD Permit Application)

B. Process Rate, if applicable: (See Section V, Item 1)

1. Total Process Input Rate (lbs/hr): _____

2. Product Weight (lbs/hr): _____

C. Airborne Contaminants Emitted: (Information in this table must be submitted for each emission point, use additional sheets as necessary)

Name of Contaminant	Emission ¹		Allowed ⁴ Emission Rate per Rule 17-2	Allowable ³ Emission lbs/hr	Potential ⁴ Emission		Relate to Flow Diagram
	Maximum lbs/hr	Actual T/yr			lbs/yr	T/yr	
Pebble Lime	0.086	0.016					(See
Ash Residue	nil *						Figure 1-3
	* ash residue wetted to 20 percent						of PSD
	moisture to suppress dust formation						Permit
							Application)

¹See Section V, Item 2.

²Reference applicable emission standards and units (e.g. Rule 17-2.600(5)(b)2. Table II, E. (1) - 0.1 pounds per million BTU heat input)

³Calculated from operating rate and applicable standard.

⁴Emission, if source operated without control (See Section V, Item 3).

. Control Devices: (See Section V, Item 4)

Name and Type (Model & Serial No.)	Contaminant	Efficiency	Range of Particles Size Collected (in microns) (If applicable)	Basis for Efficiency (Section V Item 5)
To be supplied by	Pebble Lime	0.01 gr/ACF		Manufacture
vendor	Ash Residue	0.01 gr/ACF		Specification

E. Fuels

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	
Natural Gas	0.002 MMcf/hr	0.06 MMcf/hr	60 MMBtu/hr
	(per furnace; 4 furnaces total)		

*Units: Natural Gas--MMCF/hr; Fuel Oils--gallons/hr; Coal, wood, refuse, other--lbs/hr.

Fuel Analysis:

Percent Sulfur: _____ Percent Ash: _____

Density: _____ lbs/gal Typical Percent Nitrogen: _____

Heat Capacity: _____ BTU/lb _____ BTU/gal

Other Fuel Contaminants (which may cause air pollution): _____

F. If applicable, indicate the percent of fuel used for space heating.

Annual Average _____ Maximum _____

G. Indicate liquid or solid wastes generated and method of disposal.

H. Emission Stack Geometry and Flow Characteristics (Provide data for each stack):

Stack Height: _____ ft. Stack Diameter: _____ ft.
 Gas Flow Rate: _____ ACFM _____ DSCFM Gas Exit Temperature: _____ °F.
 Water Vapor Content: _____ % Velocity: _____ FPS

SECTION IV: INCINERATOR INFORMATION

Type of Waste	Type 0 (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Pathological)	Type V (Liq. & Gas By-prod.)	Type VI (Solid By-prod.)
Actual lb/hr Incinerated			100,000				
Uncontrolled (lbs/hr)			100,000				

Description of Waste Municipal Solid Waste

Total Weight Incinerated (lbs/hr) 110,000 (110%) Design Capacity (lbs/hr) 100,000

Approximate Number of Hours of Operation per day 24 day/wk 7 (name plate rating) wks/yr. 52

Manufacturer Vendor not yet selected

Date Constructed _____ Model No. _____

	Volume (ft) ³	Heat Release (BTU/hr)	Fuel		Temperature (°F)
			Type	BTU/hr	
Primary Chamber	Vendor specific information				
Secondary Chamber					

Stack Height: 275 ft. Stack Diamter: 5 ft per flue Stack Temp. 250°F

Gas Flow Rate: 60,628 ACFM (4 flues) DSCFM* Velocity: 51.5 FPS

*If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

Type of pollution control device: ☐ Cyclone ☐ Wet Scrubber ☐ Afterburner

☒ Other (specify) Dry Scrubber/Baghouse

Brief description of operating characteristics of control devices: A dry scrubber removes acid gases from the flue gas stream through the injection of a lime slurry into a reaction vessel where the lime reacts with the acid gases to form salt particles. The baghouse follows the dry scrubber and collects particulate matter through a process of physical filtration by the cake that accumulates on the fabric filter media.

Ultimate disposal of any effluent other than that emitted from the stack (scrubber water, ash, etc.):

Wastewater effluent will go to the Hudson Subregional Wastewater Treatment Plant.

Ash residue will be sent to the colocated Class I Sanitary Ash/Landfill (double lined).

NOTE: Items 2, 3, 4, 6, 7, 8, and 10 in Section V must be included where applicable.

SECTION V: SUPPLEMENTAL REQUIREMENTS

Please provide the following supplements where required for this application.

1. Total process input rate and product weight -- show derivation [Rule 17-2.100(127)]
2. To a construction application, attach basis of emission estimate (e.g., design calculations, design drawings, pertinent manufacturer's test data, etc.) and attach proposed methods (e.g., FR Part 60 Methods 1, 2, 3, 4, 5) to show proof of compliance with applicable standards. To an operation application, attach test results or methods used to show proof of compliance. Information provided when applying for an operation permit from a construction permit shall be indicative of the time at which the test was made.
3. Attach basis of potential discharge (e.g., emission factor, that is, AP42 test).
4. With construction permit application, include design details for all air pollution control systems (e.g., for baghouse include cloth to air ratio; for scrubber include cross-section sketch, design pressure drop, etc.)
5. With construction permit application, attach derivation of control device(s) efficiency. Include test or design data. Items 2, 3 and 5 should be consistent: actual emissions = potential (1-efficiency).
6. An 8 1/2" x 11" flow diagram which will, without revealing trade secrets, identify the individual operations and/or processes. Indicate where raw materials enter, where solid and liquid waste exit, where gaseous emissions and/or airborne particles are evolved and where finished products are obtained.
7. An 8 1/2" x 11" plot plan showing the location of the establishment, and points of airborne emissions, in relation to the surrounding area, residences and other permanent structures and roadways (Example: Copy of relevant portion of USGS topographic map).
8. An 8 1/2" x 11" plot plan of facility showing the location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.

9. The appropriate application fee in accordance with Rule 17-4.05. The check should be made payable to the Department of Environmental Regulation.
10. With an application for operation permit, attach a Certificate of Completion of Construction indicating that the source was constructed as shown in the construction permit.

SECTION VI: BEST AVAILABLE CONTROL TECHNOLOGY

- A. Are standards of performance for new stationary sources pursuant to 40 C.F.R. Part 60 applicable to the source?

☒ Yes ☐ No

Contaminant	Rate or Concentration
Particulate matter	0.08 grains per dry standard cubic foot corrected to 12% CO ₂ (gr/dscf @ 12% CO ₂)

- B. Has EPA declared the best available control technology for this class of sources (If yes, attach copy)

☒ Yes ☐ No See Section 4.0 of PSD Permit Application

Contaminant	Rate or Concentration
Various	See Table 4-2 in PSD Permit Application Appendix 10.1.5 of PPSA

- C. What emission levels do you propose as best available control technology?

Contaminant	Rate or Concentration
Carbon Monoxide, Nitrogen Oxides,	See PSD Permit Application
Sulfur Dioxide, Lead, Beryllium,	Section 4.0
Mercury, Fluorides, and Sulfuric Acid Mist	Appendix 10.1.5 of PPSA

- D. Describe the existing control and treatment technology (if any).

- | | |
|---------------------------|--------------------------|
| 1. Control Device/System: | 2. Operating Principles: |
| 3. Efficiency:* | 4. Capital Costs: |

Explain method of determining

5. Useful Life:

6. Operating Costs:

7. Energy:

8. Maintenance Cost:

9. Emissions:

Contaminant

Rate or Concentration

10. Stack Parameters

a. Height:

ft. b. Diameter:

ft.

c. Flow Rate:

ACFM d. Temperature:

°F.

e. Velocity:

FPS

E. Describe the control and treatment technology available (As many types as applicable, use additional pages if necessary).

1.

PLEASE SEE ATTACHMENT

a. Control Device:

b. Operating Principles:

c. Efficiency:¹

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:²

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

2.

a. Control Device:

b. Operating Principles:

c. Efficiency:¹

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:²

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

¹Explain method of determining efficiency.

²Energy to be reported in units of electrical power - KWH design rate.

ATTACHMENT

E. Describe the control and treatment technology available (As many types as applicable, use additional pages if necessary).

1.

- | | | | |
|--|---|--------------------------|---|
| a. Control Device: | a) dry scrubber
b) baghouse | b. Operating Principles: | a) acid neutralization with lime slurry
b) fabric filtration |
| c. Efficiency: ¹ | a) 90% HCl or 100 ppmdv @ 7% O ₂
70% SO ₂ or 100 ppmdv @ 7% O ₂
b) 0.015 gr/dscf @ 12% CO ₂ | d. Capital Cost: | \$16,990,000
(includes bond burden) |
| e. Useful Life: | 20 years | f. Operating Cost: | \$706,000 |
| g. Energy: ² | 445 KWH | h. Maintenance Cost: | \$152,000 |
| i. Availability of construction materials and process chemicals: | Readily available | | |
| j. Applicability to manufacturing processes: | Not applicable | | |
| k. Ability to construct with control device, install in available space, and operate within proposed levels: | Site and design are adequate | | |

2.

- | | | | |
|--|---|--------------------------|--|
| a. Control Device: | a) dry scrubber
b) electrostatic precipitator | b. Operating Principles: | a) acid neutralization with lime slurry
b) dry collection of charged particles on oppositely charged surfaces |
| c. Efficiency: ¹ | a) 90% HCl or 100 ppmdv @ 7% O ₂
70% SO ₂ or 100 ppmdv @ 7% O ₂
b) 0.015 gr/dscf @ 12% CO ₂ | d. Capital Cost: | \$19,507,000 |
| e. Useful Life: | 20 years | f. Operating Cost: | \$878,000 |
| g. Energy: ² | 500 KWH | h. Maintenance Cost: | \$72,000 |
| i. Availability of construction materials and process chemicals: | Readily available | | |

¹Explain method of determining efficiency.

²Energy to be reported in units of electrical power - KWH design rate

j. Applicability to manufacturing processes: Not Applicable

k. Ability to construct with control device, install in available space, and operate within proposed levels: Site and design are adequate.

3.

a. Control Device:

b. Operating Principles:

c. Efficiency:¹

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:²

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

4.

a. Control Device:

b. Operating Principles:

c. Efficiency:¹

d. Capital Costs:

e. Useful Life:

f. Operating Cost:

g. Energy:²

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

F. Describe the control technology selected:

90% HCl or 100 ppmdv @ 7% O₂

70% SO₂ or 100 ppmdv @ 7% O₂

10.015 gr/dscf @ 12% CO₂

1. Control Device: dry scrubber and baghouse

2. Efficiency:

3. Capital Cost: \$16,990,000

4. Useful Life: 20 years

5. Operating Cost: \$706,000

6. Energy:² 445 KWH

7. Maintenance Cost: \$152,000

8. Manufacturer: Not yet selected

9. Other locations where employed on similar processes:

a. (1) Company: Ogden Martin Systems of Marion, Inc.

(2) Mailing Address: 4850 Brooklake Road, NE

(3) City: Brooks

(4) State: OR 97305

¹Explain method of determining efficiency.

²Energy to be reported in units of electrical power - KWH design rate.

- (5) Environmental Manager: Robert Hansen
 (6) Telephone No.: Marion County, Director of Public Works
 (503) 588-5036
 (7) Emissions:¹

Contaminant	Rate or Concentration
SO ₂	73 lbs/hr
HCl	23 lbs/hr
Particulate Matter	0.030 gr/dscf @ 12 % CO ₂

(8) Process Rate:¹ 550 tpd of MSW

b. (1) Company:

(2) Mailing Address:

(3) City:

(4) State:

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:¹

Contaminant	Rate or Concentration

(8) Process Rate:¹

See Section 4.0 of PSD Permit

10. Reason for selection and description of systems: Application; Appendix 10.1.5 of PPSA

¹Applicant must provide this information when available. Should this information not be available, applicant must state the reason(s) why.

SECTION VII - PREVENTION OF SIGNIFICANT DETERIORATION

A. Company Monitored Data

1. _____ no. sites _____ TSP _____ () SO₂* _____ Wind spd/dir

Period of Monitoring _____ / _____ / _____ to _____ / _____ / _____
 month day year month day year

Other data recorded _____

Attach all data or statistical summaries to this application.

Specify bubbler (B) or continuous (C).

2. Instrumentation, Field and Laboratory

- a. Was instrumentation EPA referenced or its equivalent? ☐ Yes ☐ No
- b. Was instrumentation calibrated in accordance with Department procedures?
☐ Yes ☐ No ☐ Unknown

B. Meteorological Data Used for Air Quality Modeling

1. 5 Year(s) of data from 01 / 01 / 70 to 12 / 30 / 74
month day year month day year
2. Surface data obtained from (location) Tampa International Airport
3. Upper air (mixing height) data obtained from (location) Tampa International Airport
4. Stability wind rose (STAR) data obtained from (location) Not Used

C. Computer Models Used

1. Industrial Source Complex (ISC) Version-6 Modified? If yes, attach description.
2. _____ Modified? If yes, attach description.
3. _____ Modified? If yes, attach description.
4. _____ Modified? If yes, attach description.

Attach copies of all final model runs showing input data, receptor locations, and principle output tables.

D. Applicants Maximum Allowable Emission Data

Pollutant	Emission Rate
TSP	<u>1.95</u> grams/sec
SO ₂	<u>13.5</u> grams/sec

E. Emission Data Used in Modeling

Attach list of emission sources. Emission data required is source name, description of point source (on NEDS point number), UTM coordinates, stack data, allowable emissions, and normal operating time.

F. Attach all other information supportive to the PSD review.

G. Discuss the social and economic impact of the selected technology versus other applicable technologies (i.e., jobs, payroll, production, taxes, energy, etc.). Include assessment of the environmental impact of the sources.

H. Attach scientific, engineering, and technical material, reports, publications, journals, and other competent relevant information describing the theory and application of the requested best available control technology.

APPENDIX 10.1.5

PREVENTION OF SIGNIFICANT DETERIORATION

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LIST OF ACRONYMS

AAL	Ambient Acceptable Level
ACGIH	American Conference of Governmental and Industrial Hygienists
AQCR	Air Quality Control Region
BACT	Best Available Control Technology
BAQM	Bureau of Air Quality Management
BH	Baghouse
Btu	British Thermal Unit
CARB	California Air Resources Board
DER	Department of Environmental Regulation
DS	Dry Scrubber
EPA	U.S. Environmental Protection Agency
ESP	Electrostatic Precipitator
FAAQs	Florida Ambient Air Quality Standards
FAC	Florida Administrative Code
FR	Federal Register
GEP	Good Engineering Practice
GLC	Ground Level Concentrations
HC	Hydrocarbons
HHV	Higher Heating Value
ISCST	Industrial Source Complex - Short Term
LAER	Lowest Achievable Emission Rate

MCU	Modular Combustion Units
MSW	Municipal Solid Waste
MMBtu	Million Btu
MW	Megawatts
NAAQS	National Ambient Air Quality Standards
NAMS	National Air Monitoring Stations
NESHAP	National Emission Standards for Hazardous Air Pollutants
NSPS	New Source Performance Standards
NSR	New Source Review
NWR	National Wildlife Refuge
PM	Particulate Matter
PM ₁₀	Particulate Matter with a Diameter of Less than 10 Microns
ppm	Parts per Million
PPSA	Power Plant Siting Act
PSD	Prevention of Significant Deterioration
RRF	Resource Recovery Facility
SIP	State Implementation Plan
SLAMS	State and Local Air Monitoring Stations
TLV	Threshold Limiting Values
tpy	Tons per Year
TSP	Total Suspended Particles
tpd	Tons per Day
TWA	Time Weighted Averages
ug/m ³	Micrograms per cubic meter
UNAMAP	Users Network for the Applied Modeling of Air Pollution
UTM	Universal Transverse Mercator
VOC	Volatile Organic Compounds

1.0 DESCRIPTION OF THE PROJECT

1.0 DESCRIPTION OF THE PROJECT

1.1 INTRODUCTION

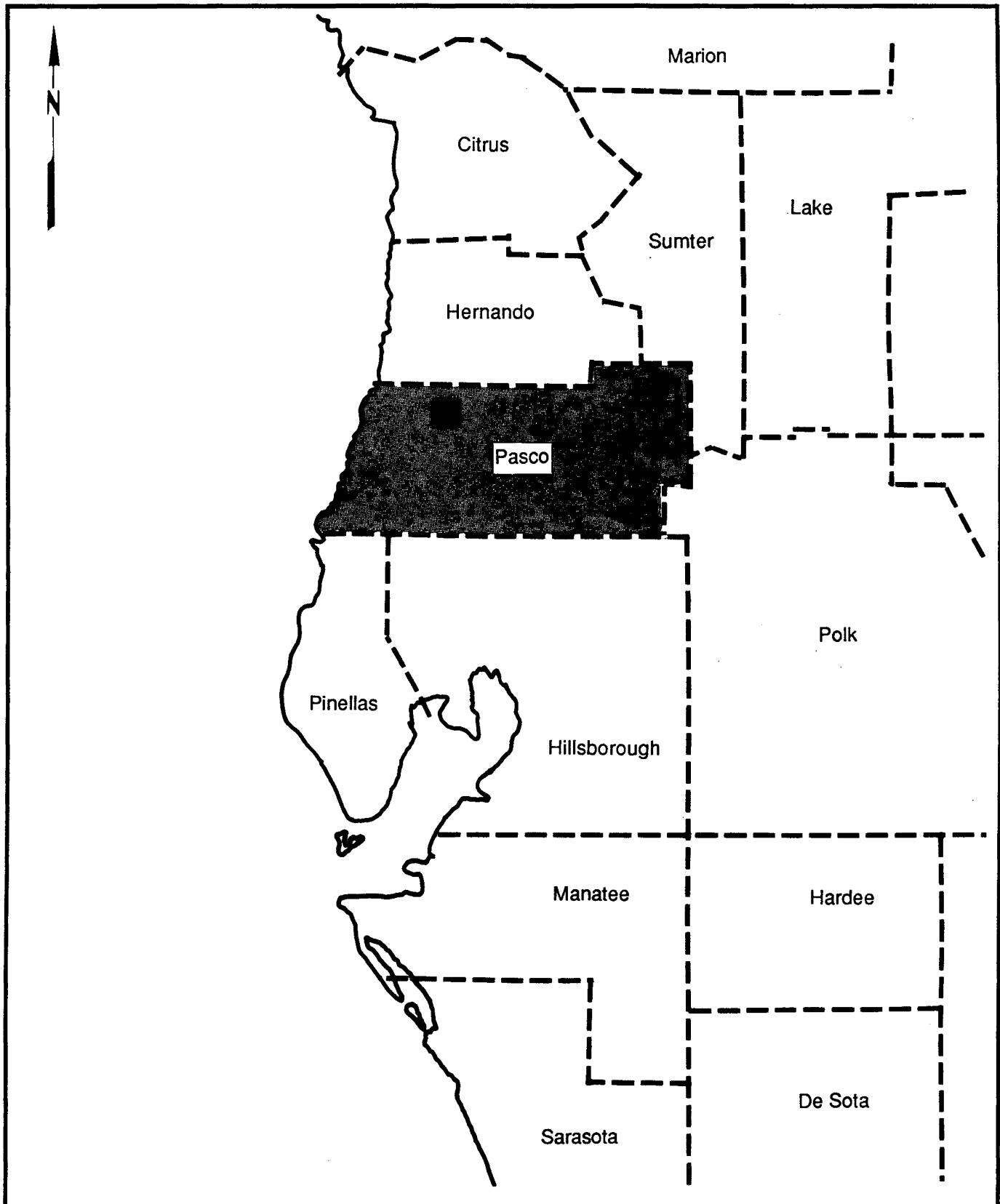
In Pasco County, increased interest in solid waste disposal and in the concept of resource recovery from solid wastes has been stimulated by an awareness of the long-term groundwater contamination problems often associated with traditional, unlined landfill disposal methods and of the value of energy and recyclable materials. On February 12, 1985, the Pasco County Board of County Commissioners approved a contract with Camp Dresser and McKee Inc. for the development of a Resource Recovery Program, the stated objective of which is the:

Development and implementation of a county-wide resource recovery program, ancillary facilities and a landfill/ashfill.

A Sanitary Landfill Site Selection report was completed on August 23, 1986, which identified a 751 acre site on Hays Road as the location site for development of the Pasco County Resource Recovery facility (RRF) and sanitary/ash landfill. The general location of this site is shown in Figure 1-1.

1.2 FACILITY DESCRIPTION

After evaluating several technologies, the County has concluded that a resource recovery facility incorporating a mass-burn technology and operated by a full-service vendor under contract to the County would best fit its present and foreseeable needs. The energy recovery facility is anticipated to have a nameplate generating capacity of approximately 22 megawatts (MW), using 900 tons per day (tpd) of municipal solid waste (MSW) as fuel. However, certification for an ultimate site capacity of about 29 MW, capable of processing 1,200 tpd of MSW, is being sought in anticipation of future solid waste disposal requirements. The energy produced would be used to satisfy internal power demands, with the surplus going to an electric utility.



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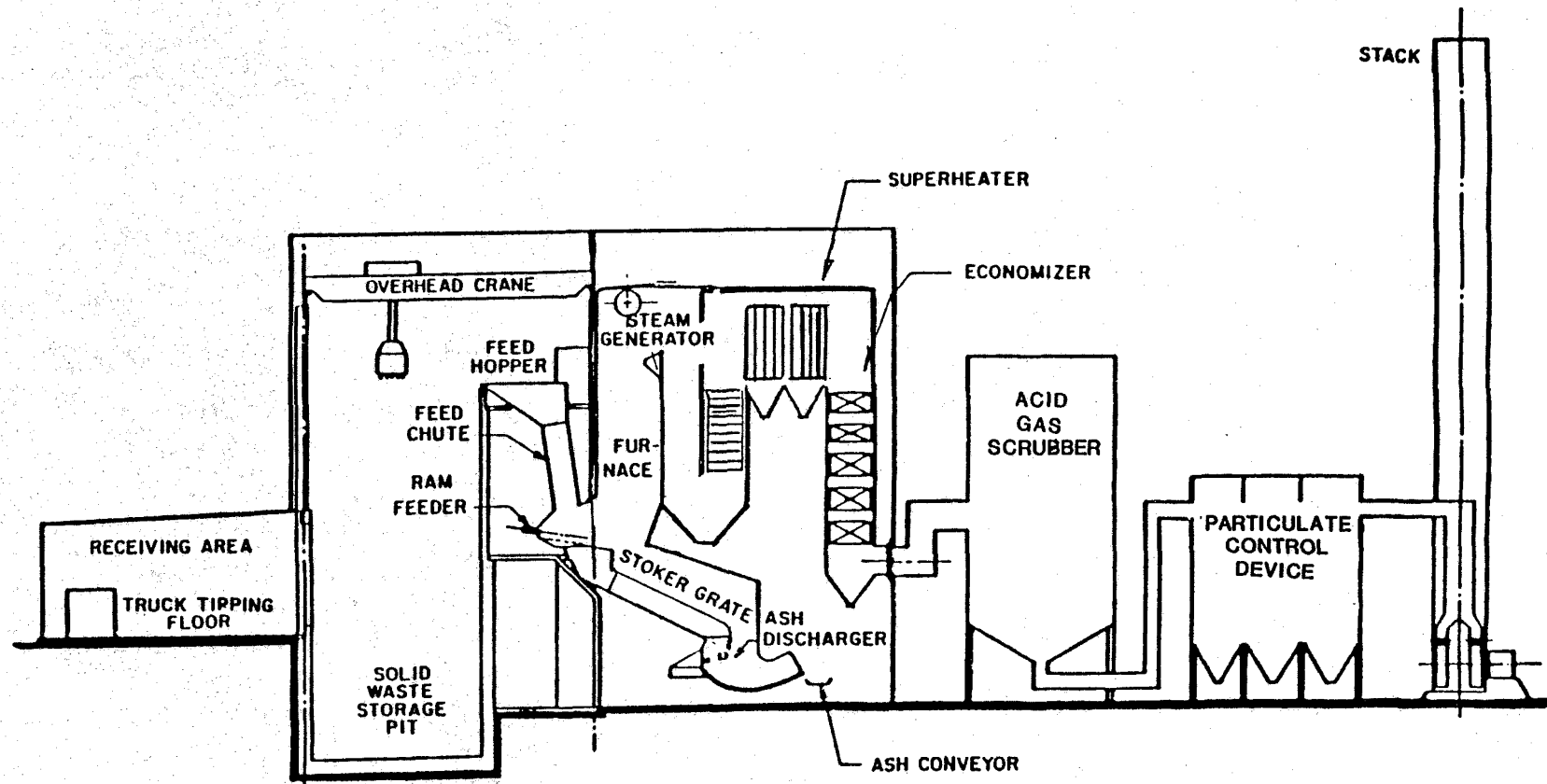
**FIGURE 1-1
GENERAL SITE LOCATION**

Because the proposed facility will utilize mass-burn technology, there will be no complex preprocessing of wastes at the facility prior to combustion. Identifiable quantities of sludge from wastewater treatment plants and any construction waste containing asbestos or other hazardous waste will not be accepted at the facility. Oversized items will be separated from the incoming refuse by an overhead crane, and a roto-shear (shredder) may be utilized to reduce the size of this material. After size reduction, this material will either be landfilled, sold as scrap, or charged into the furnace, as appropriate.

A conceptual schematic diagram of the recovery facility is presented in Figure 1-2. Truck transport will be used to deliver municipal solid waste (MSW) to the facility and to remove ash residue from the facility. Under a 1,200 tpd configuration, four 300-tpd units would be used in the facility. MSW would be dumped into the refuse bunker directly from packer trucks. The tipping floor is entirely inside the building thus providing control over fugitive emissions. All waste will be stored inside the fully enclosed building and kept under negative air pressure. No waste will be visible from the outside, and fugitive dust emission will be contained within the building. The overhead cranes will mix MSW in the bunker and load the four charging hoppers as required. Each boiler will be equipped with a dry scrubber (DS) and baghouse (BH) for acid gas and particulate air emission control, respectively.

A dry scrubber is a vessel into which lime slurry is injected to react with acidic compounds. Pebble lime is mixed with water to form a lime slurry which is injected into the vessel through nozzles or a rotary atomizer. The water in the slurry evaporates, cooling the flue gases. The resulting dry free-flowing powder reacts with SO_2 , HCl and other acidic compounds. The salts formed by this reaction and any residual lime are collected in the particulate control device.

Pebble lime is stored in lime silos where it is kept until it is needed. During deliveries, an enclosed pneumatic self-unloading transfer truck unloads pebble lime into the silo. The displaced air and suspended lime dust is vented from the silo through a particulate control device.



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FIGURE 1-2
TYPICAL FACILITY CROSS-SECTION

Emissions occur only during the unloading operation, and are expected to result in less than 32 pounds of particulate emissions per year.

A baghouse collects particulate matter by filtering flue gases through a tubular fabric filter media (bag). Multiple bags are contained in a series of modular units which comprise the total baghouse system. Initial collection forms a thick porous cake of collected particulate on the bags. This cake then acts as the filter collection medium, with the bag serving to support the particulate cake. As the cake builds, the pressure drop across the baghouse also increases. Periodically, the cake is removed by reversing the air flow of each modular unit, blowing a pulse of compressed air through the bags or shaking the bags depending on the type of baghouse employed. The BH will be designed to ensure an emission limitation for particulate matter of 0.015 grains per dry standard cubic foot (gr/dscf) corrected to 12% CO₂. The flue gas will be drawn through the BHs by an induced draft fan which will be located between the stack and the BHs.

Bottom ash from the furnace and flyash from the fabric filters will be mixed prior to removal from the facility. Ash will comprise approximately 10 percent of the volume and 25 percent of the weight of the MSW processed by the facility. The ash will be quenched with water prior to transport to a landfill. The ash handling area is fully enclosed, and emissions of particulate matter generated during the handling of the ash will be controlled through a particulate control device before being vented to the atmosphere.

The landfill, located on site, will be developed using the "cell-method", a design and operating strategy which reduces the amount of exposed earth and minimizes the potential for fugitive emissions. The ash will be wet when it is placed to prevent the resuspension of particulate matter.

As noted above, while the proposed facility will have a maximum design rated capacity of 1,200 tpd, its initial design throughput will be 900 tpd (comprised of three 300 tpd units). Because each boiler unit operates independently from the others, it will be possible to routinely shut down any one unit for periods of maintenance and inspection.

1.3 GOOD ENGINEERING PRACTICE STACK HEIGHT EVALUATION

The 1977 Clean Air Act Amendments sought to require that pollutant emission limitations were not affected by the stack height which exceeds good engineering practice (GEP), or any other dispersion technique. The GEP stack height was that "height necessary to insure that emissions from the stack do not result in excessive concentrations of any air pollutant in the immediate vicinity of the source as a result of atmospheric downwash, eddies, and wakes which may be created by the source itself, nearby structures, or nearby terrain obstacles." (PL 95-11) The Act does not restrict the actual height of any stack, only to limit the theoretical stack height used in determining a source's allowable emission rate for pollutants regulated under the Act. This section of the Clean Air Act does not apply to stacks in existence before December 31, 1970.

The EPA promulgated regulations to implement Section 123 on July 8, 1985 (50 FR 27892). The GEP stack height is the greater of 65 meters or the height calculated from:

$$H_G = H + 1.5L$$

where:

H_G = the maximum GEP stack height

H = the height of the structure

L = the lesser dimension (height or width) of the structure.

This formula is applicable to any structure located within five times dimension "L", but not exceeding 0.8 km, of the proposed stack. The height and width of a structure is based on the frontal area of the structure projected onto a plane perpendicular to a line originating from the stack and following the direction of the wind. The stack height may be less than the maximum GEP height if excess concentrations do not result due to aerodynamic downwash.

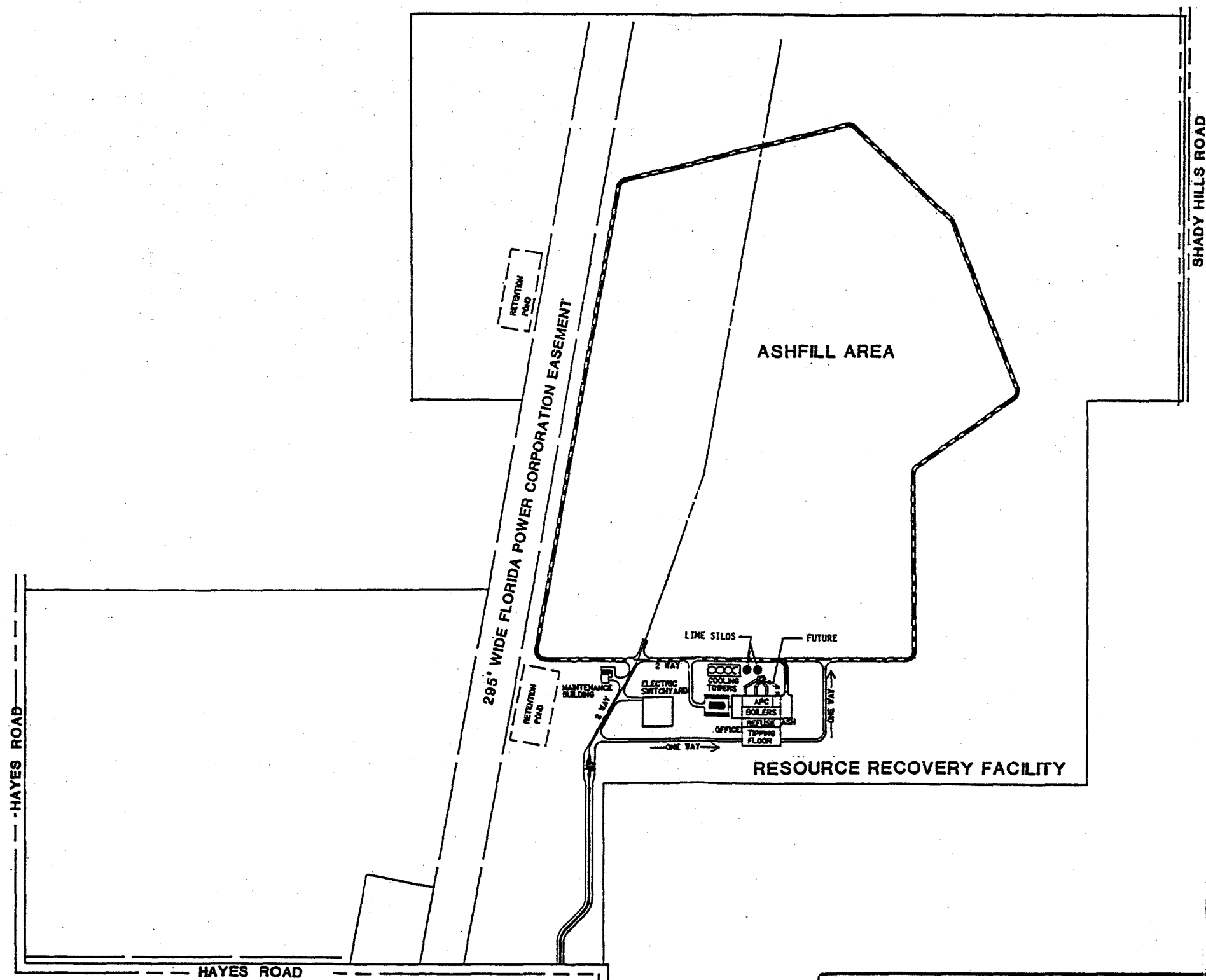
The location of the proposed facility on the site, shown in Figure 1-3, is in a relatively flat rural environment; thus, only the furnace and boiler building is within the area of influence of the plume. This structure is anticipated to be a squat building, where the estimated building height of 110 feet is the lesser dimension in comparison to the building width. The GEP stack height equation, as applied to this facility, is two-and-one-half times the building height. The maximum GEP stack height is calculated to be 275 feet. Because the proposed stack height is equal to the maximum GEP stack height, the effects of downwash do not need to be considered in predicting ground level concentrations. For a further discussion regarding the proposed stack height, see Appendix 10.16 "Stack Height Analysis and Recommendations".

1.4 BOILER OPERATING CONDITIONS

The resource recovery facility will consist of four boilers, each designed to fire 300 tpd of 4,800 Btu/lb reference waste. This firing rate is based on the average higher heating value (HHV) and will be adjusted as the heat content of the waste changes. This variability occurs as the plant maintains the heat load to the boiler by providing a constant heat release on the grate. When the HHV is low (higher moisture and ash fractions, lower combustibles fraction), more waste will be processed (up to 330 tpd per boiler). Likewise, when the HHV is high, less waste will be processed.

The boiler operating conditions selected for modeling were based on identifying minimum, maximum and typical load conditions, as well as identifying high and low values of the HHV. The boiler conditions associated with each case are listed in Table 1-1. The flow rates presented in Table 1-1 were calculated using a CDM proprietary mathematical combustion model called BURN. The model is used to analyze combustion systems by specifying the operational parameters and waste characteristics.

Auxiliary burners will be used primarily during startup and shut-down to assure that furnace temperatures sufficient to achieve good combustion are maintained. The natural gas fired burners will also be used if combustion temperatures fall below a predetermined set point when firing refuse with a



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FIGURE 1-3
GENERAL SITE LAYOUT

TABLE 1-1

BOILER OPERATING CONDITIONS
PER COMBUSTION/BOILER UNIT

Refuse Fired		Boiler Exit		Flue Exit		
Feed Rate (tpd)	Heat Content (Btu/lb)	Flow Rate (acfm)	Temperature (°F)	Flow Rate (acfm)	Temperature (°F)	Velocity (fps)
330	4500	71,419	425	60,926	250	51.7
330	4000	64,652	425	55,160	250	46.8
300	5000	71,078	425	60,628	250	51.5
300	4500	64,926	425	55,387	250	47.0
300	4000	58,775	425	50,145	250	42.6
225	5000	53,308	425	45,741	250	38.6
225	4500	47,675	425	41,540	250	35.3

SOURCE: CDM

low heat content. Because combustion of natural gas results in the release of fewer pollutants on a pound per million Btu basis than the combustion of refuse, the operation of the auxiliary burner during startup, shut-down or operation for temperature maintenance would result in the release of fewer pollutants than firing refuse alone.

1.5 AIR QUALITY IMPACT ASSESSMENT

An air quality impact assessment was conducted on pollutant emissions from the Pasco County RRF. The Industrial Source Complex - Short Term (ISCST) dispersion model was used to predict the potential air quality impacts in accordance with the modeling protocol approved by the Florida Department of Environmental Regulation (DER). The analysis was conducted using meteorological data from Tampa International Airport for the five year period from 1970 to 1974. The worst case boiler operating condition of 1,200 tpd of refuse with a heat content of 5,000 Btu/lb was used to predict air quality impacts for all pollutant averaging times.

A comparison of the maximum predicted ground level concentrations and the background concentrations to the National Ambient Air Quality Standards was conducted. This comparison demonstrated that the Pasco County RRF would not violate ambient air quality standards. A comparison between the maximum air quality impacts to the PSD Class II increments demonstrates that the Pasco County RRF would have an insignificant impact on Class II increment consumption. A more detail discussion of air quality impacts from the facility is provided in Section 6.0.

SECTION 2

2.0 REGULATORY REVIEW

2.0 REGULATORY REVIEW

2.1 APPLICABLE REGULATIONS

Air quality regulations promulgated by the U.S. EPA and the Florida Department of Environmental Regulation (DER) define ambient air quality standards and regulate the sources of air contaminants in order to achieve and maintain these ambient standards. The Pasco County RRF may be subject to the following rules and regulations:

- Prevention of Significant Deterioration (PSD)
- New Source Performance Standards (NSPS)
- National Emission Standards for Hazardous Air Pollutants (NESHAP)
- Florida DER Air Pollution Administrative Code (F.A.C.)

In many cases the Florida DER Air Pollution Administrative Code reflects the standards established by the EPA. For those cases where the Florida code represents a more restrictive ambient impact requirement, the Florida regulation has been applied.

2.2 PREVENTION OF SIGNIFICANT DETERIORATION

In general, a PSD permit application must contain the following basic components:

- A complete description of the nature and operation of the source
- A Best Available Control Technology (BACT) review and application
- An analysis of existing ambient air quality

- An impact assessment demonstrating that emissions from the new source will not cause a violation of ambient air quality standards or PSD increments
- An assessment of the source's impact on air quality-related values including soils, vegetation, and visibility

2.2.1 SOURCE APPLICABILITY

As described in Section 1.0, the Pasco County RRF will ultimately include four mass-burn furnaces equipped with steam generating boilers, each capable of charging 300 tpd of refuse. The combustion gases will be exhausted through individual flues contained in a single 275-foot stack. Minor point source emissions from the lime silo and ash handling building will be controlled by a particulate filter. The tipping area and refuse storage bunker will be totally enclosed and kept under negative pressure. The air exhausted from this area will be drawn into the furnaces as combustion air supply. As a result, no significant quantifiable fugitive emissions will be generated from the proposed facility.

The Pasco County RRF is considered a "major stationary source", and is subject to PSD review, because it will burn over 250 tpd of refuse and has the potential to emit greater than 100 tons per year of certain PSD regulated pollutants.

2.2.2 POLLUTANT APPLICABILITY

The PSD regulations state that if the proposed source emits criteria pollutants for which the site area is designated as attainment or unclassifiable or any other PSD regulated pollutants a rate greater than the significant emission rate, then the source is subject to PSD review for those pollutants. A source is exempt from PSD review and subject to New Source Review for Nonattainment Areas for those pollutants designated as nonattainment in the siting area. Table 2-1 compares the PSD significant emission rates with the potential source emissions.

TABLE 2-1
COMPARISON OF SIGNIFICANT EMISSION RATES
AND FACILITY POTENTIAL EMISSIONS

Pollutants	Significant ^a Emission Rates (tons/year)	Potential ^b to Emit (tons/year)
Particulate matter		
(Total suspended particulate)	25	68
(Inhalable particulate, PM ₁₀)	15	68
Carbon monoxide (Annual)	100	103
Nitrogen oxides	40	1,351
Sulfur dioxide	40	471
Ozone (VOCs)	40	44
Lead	0.6	3.4
Beryllium	0.0004	0.000285
Mercury	0.1	3.07
Inorganic Arsenic	—	1.91 x 10 ⁻²
Fluorides	3	17
Sulfuric acid mist	7	75
Vinyl chloride	1	— ^c
Asbestos	0.007	— ^c
Total reduced sulfur (including H ₂ S)	10	— ^c
Reduced sulfur (including H ₂ S)	10	— ^c
Hydrogen sulfide	10	— ^c
Hydrogen chloride ^d	—	267
Dioxin (as 2,3,7,8 TCDD toxic equiv.) ^d	—	7.45 x 10 ⁻⁶

^a F.A.C. 17.2 Part V Table 500.2 or 40 CFR 52.21 (b)(23)(i).

^b Emission estimates at 100 percent system capacity and availability.

^c Emissions of these pollutant is negligible.

^d Not a PSD regulated pollutant.

The Hays Road site is located in the federally and state-designated West Central Florida Intrastate Air Quality Control Region (AQCR). The proposed site and impact areas located in Pasco County are designated as attainment with respect to the NAAQS for sulfur dioxide, particulate matter and lead; and as unclassifiable for nitrogen dioxide, carbon monoxide and ozone. Areas designated as unclassifiable are those where insufficient or unrepresentative monitoring data exist to support an attainment designation, although these areas are assumed to be in attainment and are treated as such until proven otherwise. Based on the pollutant emission rates and the attainment status of the area, the Pasco County RRF is subject to PSD review for the pollutants listed on Table 2-1 with the exception of beryllium, asbestos, vinyl chloride, hydrogen sulfide, total reduced sulfur and reduced sulfur compounds.

Additionally, hydrogen chloride and dioxin (as expressed as 2,3,7,8 TCDD toxic equivalents) are not PSD regulated pollutants. They were added to this list at the request of the Florida DER and were considered in setting emission limitations for the PSD regulated pollutants. See Attachment C for a discussion of the 2,3,7,8 toxic equivalency.

2.2.3 BEST AVAILABLE CONTROL TECHNOLOGY

The control technology review required for new sources to evaluate and apply BACT is defined as follows:

An emission limitation, including a visible emission 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, environment, and economic impacts, and other costs, determines is achievable through application of production processes and available methods, systems, and techniques for control of each pollutant.
(F.A.C. 17-2.100(22)).

According to the DER, BACT should be applied for each pollutant subject to PSD review requirements. Pollutants subject to PSD are those designated

attainment or unclassified for the area for which construction of the new facility is proposed, and those which would have potential emissions equal to or greater than those defined by the de minimis emission rates listed in Table 2-1.

The application of BACT may result in emission rates equal to or less than the New Source Performance Standards (NSPS). In establishing BACT, the emission limiting standards proposed by other states shall be considered. All scientific, engineering and technical material as well as the social and economic impact of the application of such technology, must be included in a BACT evaluation.

2.2.4 EXISTING AIR QUALITY ANALYSIS

An analysis of ambient air quality in the vicinity of the proposed facility must be provided for sources subject to PSD review requirements.

Pollutants that do not have established ambient air quality standards shall include such monitoring data as the DER determines are necessary to assess air quality. Pollutants with established Florida or National Ambient Air Quality Standards (FAAQS or NAAQS) are subject to monitoring to determine whether emissions would violate those standards or any PSD increment. The monitoring data usually are gathered over a 12-month period, although shorter periods of no less than four months may be allowed. Sources may be exempt from the monitoring requirements if representative data exist or ambient impacts are below the de minimis monitoring concentrations listed in Table 2-2. Typically, existing air quality monitoring data may be used instead of preconstruction monitoring if the following apply:

- The data are representative of the impact of the proposed facility;
- The data would meet PSD quality assurance requirements; and
- The data are current.

TABLE 2-2

SIGNIFICANT (De Minimis) MONITORING CONCENTRATIONS

Pollutant	Air Quality Concentrations ($\mu\text{g}/\text{m}^3$) and Averaging Time
Carbon Monoxide	575 (eight-hour)
Nitrogen dioxide	14 (annual)
Sulfur dioxide	13 (24-hour)
Particulate Matter (TSP)	10 (24-hour)
(PM_{10})	10 (24-hour)
Ozone	**
Lead	0.1 (3 month)
Beryllium	0.001 (24-hour)
Mercury	0.25 (24-hour)
Fluorides	0.25 (24-hour)
Vinyl Chloride	15 (24-hour)
Total Reduced Sulfur	10 (1-hour)
Reduced Sulfur Compounds	10 (1-hour)
Hydrogen Sulfide	0.2 (1-hour)

** No specific air quality concentration for ozone is prescribed. Exemptions are granted when a source's VOC emissions are <100 tons/year.

SOURCE: 52 FR 24714; July 1987

A demonstration of de minimis air quality impact was conducted using air quality screening modeling methodologies. Based on that demonstration, a waiver from preconstruction monitoring requirements was granted (see Attachment A).

2.2.5 AIR QUALITY IMPACT ANALYSIS

The source must demonstrate that the proposed emissions will not violate FAAQS or NAAQS or PSD maximum allowable increases (increments). The estimates of ambient air quality impact from the proposed source must be based on the models and meteorological data acceptable to the DER and EPA.

The FAAQS and NAAQS are ambient concentrations which must not be violated. To demonstrate compliance with these standards, an impact analysis of the proposed source is done by dispersion modeling. Resulting air quality levels are then determined by adding the facility's impacts to background pollutant levels. Background pollutant levels are established by monitoring data, modeling existing sources, or a combination of both.

The PSD regulations set maximum allowable increases above ambient concentrations for SO_2 and TSP (Table 2-3). These incremental concentrations are categorized depending on the degree of industrial development desired. Class I areas allow only minimal industrial development and include areas such as international parks, national wilderness areas and national parks; Class II areas allow moderate industrial development; and Class III areas allow for substantial industrial development. The increments associated with each class are listed in Table 2-3.

EPA intends to establish PM_{10} increments over the next several years. Until that time, the TSP increments will continue to apply in mandatory Class I areas and Class II areas designated as attainment or unclassifiable for TSP. When EPA approves the State's control strategy as sufficient to attain and maintain the PM_{10} NAAQS, it will also approve redesignation of area from TSP to PM_{10} .

TABLE 2-3
PSD AIR QUALITY INCREMENTS

<u>Class I*</u>	
<u>Pollutant</u>	<u>Maximum Allowable Increase (micrograms per cubic meter)</u>
Total Suspended Particulate Matter:	
Annual Geometric mean	5
24-hour maximum	10
Sulfur Dioxide:	
Annual arithmetic mean	2
24-hour maximum	5
Three-hour maximum	25
<u>Class II**</u>	
<u>Pollutant</u>	<u>Maximum Allowable Increase (micrograms per cubic meter)</u>
Total Suspended Particulate Matter:	
Annual Geometric mean	19
24-hour maximum	37
Sulfur Dioxide:	
Annual arithmetic mean	20
24-hour maximum	91
Three-hour maximum	512
<u>Class III***</u>	
<u>Pollutant</u>	<u>Maximum Allowable Increase (micrograms per cubic meter)</u>
Total Suspended Particulate Matter:	
Annual Geometric mean	37
24-hour maximum	75
Sulfur Dioxide:	
Annual arithmetic mean	40
24-hour maximum	182
Three-hour maximum	700

* Nearest Class I area is the Chassahowitzka National Wilderness Area located approximately 16 miles NNW of the facility.

** Pasco County is designated as Class II.

*** No Class III areas currently exist in Florida.

To determine the amount of increment consumed, the potential emissions from the proposed facility are modeled along with the actual emissions from those sources which have:

- Emission increases and decreases at major stationary sources resulting from construction that began after January 6, 1975; and
- Emission increases and decreases at all stationary sources occurring after the baseline date (F.A.C. 17-500 (4)(b)2.C).

The baseline date of December 27, 1977 has been set for TSP and SO₂ for the entire state of Florida.

The DER requested additional impact estimates be made on Class I areas and neighboring non-attainment areas. Special receptor locations were specified and an impact analysis was conducted, even though predicted concentrations fell below the significant impact levels listed in Table 2-4.

2.3 NEW SOURCE PERFORMANCE STANDARDS

The EPA and DER under the New Source Performance Standards (NSPS) listed in Section 40 CFR Part 60 and F.A.C. 17-2 Part VI, respectively, have promulgated source specific and general emissions limitations applicable to new and modified sources. These NSPS, represent the maximum degree of emission control using available technology.

For incinerators with a charging rate of greater than 50 tons per day of refuse, a limit is established for particulate matter of 0.08 gr/dscf corrected to 12% CO₂. This is almost identical to the Florida particulate matter limit of 0.08 gr/dscf corrected to 50% excess air. The proposed particulate emission rate of 0.015 gr/dscf @ 12% CO₂ is less than one fifth of the federal and state NSPS.

TABLE 2-4
SIGNIFICANT IMPACT LEVELS

Pollutant	Averaging Time				
	Annual	24-Hour	8-Hour	3-Hour	1-Hour
SO ₂	1.0 ug/m ³	5.0 ug/m ³ 1.0 ug/m ³ *		25.0 ug/m ³	
TSP**	1.0 ug/m ³	5.0 ug/m ³ 1.0 ug/m ³ *			
NO ₂	1.0 ug/m ³				
CO			0.5 mg/m ³		2.0 mg/m ³

[F.A.C. 17-2.100(147)]

* Significance level for Class I areas (F.A.C. 17-2.100(170)).

** Significance levels for PM₁₀ are defined by federal regulations (52 FR 24672) and are equal to TSP levels for areas other than the Class I areas.

2.4 NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS

The EPA has promulgated standards for certain hazardous air pollutants in 40 CFR Part 61. The pollutants currently listed are asbestos, beryllium, mercury, vinyl chloride and inorganic arsenic. Currently the National Emission Standards for Hazardous Air Pollutants (NESHAP) do not effect the design or operation of a resource recovery facility which utilizes municipal solid waste.

2.5 DER AIR POLLUTION CONTROL REGULATIONS

The Florida Administrative Code, Chapter 17-2, for the most part has incorporated Federal regulations for each of the air programs previously discussed. Some slight differences which are important to this study do exist, however.

Emission Limitations

The DER emission limitations that apply to this mass burn facility are contained in FAC 17.2.600(1)(c) for sources with a charging rate equal to or greater than 50 tons per day. This regulation restricts particulate matter emissions to 0.08 gr/dscf of exhaust gas corrected to 50 percent of excess air. This is very nearly identical to the NSPS found in the federal code. In developing BACT, however, emission limitations more restrictive than this may be required. Florida further sets a specific limitation that incinerators emit no objectionable odor. The general opacity rule found in Florida Administrative Code (FAC) rule 17-2.610 does not apply to a source for which either a specific particulate standard or a specific opacity standard is provided elsewhere in the rules. Because the resource recovery facility is subject to the specific particulate standard in F.A.C. 17-2.600(1)(c), the general opacity standard does not apply. Although it is anticipated that a specific opacity limit will be a condition of the permit.

Permit Requirements

An Application to Operate/Construct Air Pollution Sources shall be obtained by the owner or operator of a new source prior to construction, in accordance with F.A.C. 17-2 Part V. On October 27, 1986, EPA published a notice allowing the DER to review applications and issue PSD construction permits to sources subject to the Power Plant Siting Act (PPSA) (51 FR 37972). This notice was effective as of July 1, 1986, when the FLORIDA Legislature amended the PPSA to free the State PSD regulations and allow the issuance of PSD construction permits.

SECTION 3

3.0 AIR POLLUTANT EMISSIONS

3.0 AIR POLLUTANT EMISSIONS

3.1 INTRODUCTION

The combustion of refuse to produce energy in the boilers of resource recovery facilities results in the emission of various air pollutants as a consequence of several mechanisms and processes. Pollutants generated in the system either depend upon the composition of the waste stream or reflect the character of the combustion process. The quantity ultimately released may also depend on whether they are controlled through the use of air pollution control technology.

The discussion of emission factors and rates presented in this chapter focuses primarily on those pollutants of most obvious public health and regulatory concern. The review compares the emission rates estimated by CDM with recently permitted resource recovery facilities in Florida. The emission estimates for the Pasco County RRF are based on stack testing data from existing facilities and discussed in greater detail in Attachment C.

Emission of pollutants such as fluorides, hydrogen chloride, sulfur dioxide, lead, mercury, and beryllium and arsenic, are primarily influenced by the composition of the as-received waste stream, but operating conditions (especially temperature) affect these emissions to a significant degree. Emission of acid gases are minimized through the use of a dry scrubber. Some control of those waste composition-dependent pollutants such as lead, beryllium, arsenic and other trace metals that partially adhere to particles or are inherently found as particles is provided by the particulate control device which traps and removes much of these pollutants. Other composition dependent pollutants are minimized by controlling the composition of the waste stream. Identifiable contaminants, such as those found in asbestos-containing construction material and other hazardous waste, will not be accepted at the facility.

Emissions of pollutants such as carbon monoxide, oxides of nitrogen, hydrocarbons, and trace organic compounds are principally influenced by the

combustion process. Combustion controls are employed to optimize the combustion efficiency and minimize these emissions.

3.2 COMBUSTION OF MUNICIPAL SOLID WASTE

Waste composition is an important consideration in developing emission estimates, especially any unique or unusual aspects that would prohibit the use of emissions data obtained from similar operating facilities. The understanding of combustion chemistry is not sufficient to allow the calculation of emission rates based on waste composition alone. Reference waste composition is used in combustion calculations to predict flue gas flow rates, which are used to calculate pollutant emission rates from empirical flue gas concentrations. Tables 3-1 and 3-2 show waste composition and ultimate analysis of refuse expected to be processed at the Pasco County RRF.

MSW is a heterogeneous mixture of materials, and the physics and chemistry of its combustion is very complex. Empirical relationships describing matters involving chemical reaction kinetics and equilibrium, furnace fluid mechanics, and heat transfer rates are sufficient to broadly describe the combustion process. During ignition of the organic fraction, elementary degradation and oxidation reactions occur, followed by intermediate reactions (oxidation, re-arrangement, addition and others) during propagation, ultimately leading to extinction reactions which produce the byproducts of combustion. Some of these byproducts are emitted to the atmosphere through the facility's stack.

If an ideal analysis could be performed on the reactions of the MSW fuel with the atmosphere and various elementary and intermediate products of combustion, it would require an in-depth understanding and analytical simulation of such factors as:

- Temperature profiles throughout the facility (time-variant)
- Turbulence within the combustion chamber and boiler

TABLE 3-1
REFERENCE WASTE COMPOSITION
(as received)

Waste Category	Nominal Percent by Weight
Moisture	20.7
Combustible Matter	60.1
Paper	
Cardboard	
Plastic	
Yard Waste	
Misc. Combustible	
Noncombustible	19.2
Ferrous	
Aluminum	
Glass	
Misc. Noncombustible	
TOTAL	100.0

SOURCE: CDM, 1987

TABLE 3-2
REFERENCE WASTE ULTIMATE ANALYSIS
(as received)

Waste Category	Nominal Percent by Weight
Moisture	20.7
Total Inerts	19.22
Carbon	27.4
Hydrogen	3.88
Nitrogen	0.70
Sulfur	0.13
Chlorine	0.46
Oxygen	27.5
TOTAL	100.0
Higher Heating Value (HHV)	4800 Btu/lb

SOURCE: CDM, 1987

- Fate of elementary and intermediate combustion products within the combustion zone
- Flame profiles for various molecular components
- Reaction rate coefficients

Although much has been learned about these physical processes from experience with other combustion facilities, it is still impossible to follow elements or compounds in the refuse through the combustion process and know exactly the portion emitted at the stack. As a result, reasonable upper limit emission factors must be predicted on a pollutant specific basis from empirical data obtained from other similar sources.

3.3 COMPARISON TO OTHER PERMITTED FACILITIES

In order to determine the air quality impacts of the Pasco County RRF, estimates of pollutant emissions must be established. The emission factors (in terms of mass of pollutant per mass of refuse burned) contained in this section are based on numerous literature sources which were reviewed to obtain current emission data from existing facilities that incorporate similar mass burn technology. "Criteria" pollutants are those for which National Ambient Air Quality Standards (NAAQS) have been established. "Non-criteria" pollutants do not have ambient air quality standards. Both "criteria" and "non-criteria" pollutants known to be emitted from municipal incinerators and/or recovery facilities burning refuse are quantified in this section.

Data have been compiled on emissions from several existing mass burning MSW resource recovery facilities and through research activities conducted by such agencies as the EPA. These were reviewed to determine applicability for use in predicting emission factors for various pollutants.

To compare the data presented in these studies and reports, it was necessary to convert all emission rates to uniform units of measure. Usually, data from stack testing activities appear as pollutant concentra-

tions in the stack gas (e.g., parts per million (ppm)). From the relationship of the flue gas flow rate to the waste burning rate, pounds of pollutant emitted per ton of refuse fired (lb/ton) can be calculated. If the Btu value of the refuse is known, it is also possible to obtain pollutant emission rates as pounds of pollutant emitted per million Btu of heat input (lb/MMBtu).

The estimated emission factors (expressed as lb/ton of refuse and lb/MMBtu of heat input) for the Pasco County RRF are shown in Table 3-3. The numbers presented in Table 3-3 are based on the available stack testing data from existing facilities. When data were sufficient, the emission factor presented was greater than the average value. The emission factors were selected to conservatively overestimate actual emissions from the Pasco County RRF. A more detailed description of the basis for the emission factors shown in Table 3-3 is presented in Attachment C.

The emission factors for the Pasco County RRF are compared to other resource recovery facilities recently permitted in Florida in Table 3-4. Because the Pasco County RRF will incorporate acid gas scrubbers and high efficiency fabric filters, the emission factors for sulfur dioxide, sulfuric acid mist, hydrogen chloride, and particulate matter are much lower than the Hillsborough County RRF which uses an ESP alone. Other pollutants are either consistent with or lower than permitted emission factors at the other Florida facilities. The emission limits for sulfuric acid mist from the Broward County and Hillsborough County RRF were deleted from the final permit because EPA Region VI determined there was no reliable testing method for this pollutant. Because the Pasco County RRF will be employing a dry scrubber which will effectively minimize sulfuric acid emissions, an exemption from establishing an emission limitation for sulfuric acid mist is requested.

Minor short-term variations in emissions can be expected due to the heterogeneous nature of MSW. Therefore, the short term emission rates presented in Table 3-5 and expressed in pounds per hour are based on the worst case operating condition of 1,200 tpd at 5,000 Btu per pound waste.

TABLE 3-3

CONTROLLED EMISSION FACTORS FOR THE PASCO COUNTY RRF

Pollutant	Emission Factor	
	lb/ton Refuse	lb/MMBtu*
Particulate Matter (TSP or PM ₁₀)	0.309	0.0322
Sulfur Dioxide	2.15	0.224
Nitrogen Oxides (as NO ₂)	6.17	0.643
Carbon Monoxide (annual)	0.470	0.0490
(8-hour)	0.940	0.0979
(1-hour)	3.75	0.391
Non-Methane Hydrocarbons	0.200	0.0208
Lead	0.0155	0.00161
Sulfuric Acid Mist	0.344	0.0358
Hydrogen Chloride	1.22	0.127
Fluoride (as HF)	0.0770	0.00802
Beryllium	1.30x10 ⁻⁶	1.35x10 ⁻⁷
Mercury	0.0140	0.00146
Asbestos	**	**
Vinyl Chloride	**	**
Total Reduced Sulfur	**	**
Reduced Sulfur Compounds	**	**
Inorganic Arsenic	8.71x10 ⁻⁵	9.07x10 ⁻⁶
Dioxin (as 2,3,7,8 TCDD equiv.)	3.4x10 ⁻⁸	3.54x10 ⁻⁹

*Based on a high heating value of 4,800 Btu/lb.

**Very low emission rate, the numerical value of which is strongly dependent on composition of the refuse incinerated.

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TABLE 3-4

COMPARISON OF ESTIMATED EMISSION FACTORS TO
PERMITTED VALUES AT OTHER REGIONAL MASS BURN FACILITIES
(lb/ton of refuse)

Pollutants	Pasco	Hillsborough ^a	North Broward ^c	Pinellas 3 ^b	Palm Beach ^d	Bay County ^c	South Broward ^e
Particulate matter	0.309	0.42	0.42	0.5	0.33	0.56	--
Sulfur dioxide	2.15	8.5	2.79*	4.08	7.7	2.8	2.79
Nitrogen oxides	6.17	6.4	5.04	6.1	4.0	2.2	5.0
Carbon monoxide	0.470	1.8	0.81	1.58	12.0	11.4	0.8
Hydrocarbons	0.200	0.2	0.12	0.3	0.20	0.232	--
Lead	0.0155	0.02	0.018	0.067	0.005	0.0036	0.018
Mercury	0.0140	0.004	0.0083	0.01	0.003	0.00171	--
Beryllium	1.30×10^{-6}	1.31×10^{-5}	8.4×10^{-6}	1.3×10^{-6}	9.0×10^{-6}	48×10^{-6}	--
Fluorides	0.0770	0.06	0.16	0.1	0.04	--	--
Sulfuric acid mist	0.344	1.38	0.42	--	0.0004	--	--
Hydrogen chloride	1.22	4.0	--	4.0	3.5	--	--

SOURCE:

^aHillsborough Co., Power Plant Site Certification, PA 83-19 - Requested Modification May 1, 1987

^bPinellas Co. Unit 3, Power Plant Site Certification, PA 83-18 and an August 87, telephone conversation with the DER

^cNorth Broward, Power Plant Site Certification, February 1, 1986

^dPalm Beach, Power Plant Site Certification, February 11, 1986, per telephone conversation with Barry Andrews DER, October 8, 1987

^eSouth Broward, August 87 telephone conversation with the Florida DER

*Based on a SO₂ upper limit of 0.31 lb/MMBtu and a refuse heat content of 4,500 Btu/lb, telephone conversation with Barry Andrews of DER, August 26, 1987

TABLE 3-5

ESTIMATED EMISSION RATES FOR THE PASCO COUNTY RRF

Pollutant	Controlled Emission Rate	
	Tons/year ^a	Pounds/hour ^b
Particulate Matter (TSP or PM ₁₀)	68	16.1
Sulfur Dioxide (SO ₂)	471	113
Nitrogen Dioxide (NO ₂)	1,351	322
Carbon Monoxide (CO) ^c	103	196
Hydrocarbons (VOC)	44	10.4
Lead (Pb)	3.4	0.805
Arsenic (As)	0.0191	0.00454
Mercury (Hg)	3.07	0.729
Beryllium (Be)	0.000285	0.0000677
Fluoride (as HF)	17	4.01
Sulfuric Acid (H ₂ SO ₄)	75	17.9
Hydrogen Chloride (HCl)	267	63.5
Dioxin (as 2,3,7,8 TCDD toxic equiv.)	7.45x10 ⁻⁶	1.77x10 ⁻⁶

^a Annual Emission rates are based on 100% of the nominal capacity.

^b Short-term emission rates based on a 300 tpd throughput of 5000 Btu/lb waste.

^c Annual emission rate based on the annual emission factor, short term emission rate based on the 1-hour emission factor.

The annual emission rates presented in Table 3-5 are higher than the expected annual averages because the facility would be operating at less than 100 percent of its availability in order to perform routine maintenance.

4.0 EMISSION CONTROL TECHNOLOGY EVALUATION

4.0 EMISSION CONTROL TECHNOLOGY EVALUATION

4.1 DESCRIPTION OF BACT REVIEW

A Best Available Control Technology (BACT) analysis involves the determination of pollutant applicability and the evaluation of control strategy alternatives. The emission control strategy which provides the maximum degree of emission reduction is then identified for each pollutant, on a case-by-case basis, taking into account energy, economic and environmental impacts.

4.1.1 ENERGY

Where additional control equipment is required (such as scrubbers for SO₂ and HCl control), the cost of the energy consumed by the equipment was determined. If the best method to control a pollutant is good operation or the actual design of the facility (such as controlling CO by properly distributing the over and under-fire combustion air, and temperature maintenance) then no additional costs for energy would be incurred to control the pollutant.

4.1.2 ECONOMIC

Where additional control equipment is required, the capital and operating costs were determined for the equipment. If the best method to control a pollutant is good operation or the design of the facility, then no additional capital or operating costs would be incurred to control the pollutant.

4.1.3 ENVIRONMENTAL

EPA-approved dispersion modeling is performed for each control strategy and corresponding stack parameters. The dispersion modeling results, ground-level concentrations (GLC), are compared with Prevention of Significant Deterioration (PSD) allowable increments, National Ambient Air

Quality Standards (NAAQS) and Florida Ambient Air Quality Standards (FAAQS) where possible. A refined dispersion modeling analysis was performed for the proposed air pollution control system and is included in Section 6.0.

4.1.4 POLLUTANT APPLICABILITY

The PSD regulations state that any major source must apply a BACT strategy to each PSD pollutant emitted in quantities greater than the PSD significant emission rates. The PSD significant emission rates and the projected emissions from the Pasco County RRF are shown in Table 4-1. BACT requirements apply only to pollutants emitted in areas designated as in attainment or unclassified with respect to the NAAQS. The Pasco County RRF site is designated as being in attainment of or unclassified for nitrogen dioxide (NO_2), total suspended particulate (TSP), lead (Pb), carbon monoxide (CO), sulfur dioxide (SO_2), ozone (O_3) and volatile organic compounds (VOC's).

BACT also applies to PSD-regulated pollutants without established NAAQS if emissions exceed certain thresholds. From Table 4-1, the following PSD-regulated pollutants are projected to be emitted in quantities greater than the PSD significant emission rates: carbon monoxide (CO), nitrogen oxides (NO_x), sulfur dioxide (SO_2), lead (Pb), mercury (Hg) and sulfuric acid mist (H_2SO_4), particulate matter (TSP or PM_{10}), Hydrocarbons (VOC), and fluorides (as HF). A control technology review based on BACT methodology was also performed for the unregulated pollutants; hydrogen chloride (HCl), arsenic (As) and dioxins (PCDD) and furans (PCDF). Table 4-1 also contains the proposed control technology for these pollutants.

4.1.5 SELECTION AND EVALUATION OF ALTERNATIVE CONTROL STRATEGIES

The alternative control strategy analysis for economic impact is based on the following factors: capital cost (debt service), operating and maintenance costs (including water, waste disposal). Capital and operating costs for the various external air pollution control equipment (such as baghouses and ESP's) have been supplied by reputable manufacturers. Those facility design features that affect air pollutant emissions but are primarily related to the furnace design and operational parameters (e.g.,

TABLE 4-1

COMPARISON OF THE PROJECTED EMISSION RATES
TO PSD SIGNIFICANCE VALUES
AND PROPOSED CONTROL TECHNOLOGY

	PSD Significant Emission Rate (tpy)	Potential Controlled Emission Rate (lbs/ton)	(tpy) ^a	Proposed Control Technology
Carbon Monoxide (CO)	100	0.47	103	Furnace Design & Proper Operation
Nitrogen Oxides (NO _x)	40	6.17	1,351	Furnace Design & Proper Operation
Sulfur Dioxide (SO ₂)	40	2.15	471	Dry Scrubber @ 70% Removal or 100 ppmdv @ 7% O ₂
Particulate Matter	25 (TSP) 15 (PM ₁₀)	0.309	68	Baghouse - 0.015 gr/dscf @ 12% CO ₂
Hydrocarbons (VOC)	40	0.2	44	Furnace Design & Proper Operation
Lead (Pb)	0.6	0.0155	3.4	Baghouse - 0.015 gr/dscf @ 12% CO ₂
Beryllium (Be)	0.0004	1.3 x 10 ⁻⁶	2.85 x 10 ⁻⁴	Baghouse - 0.015 gr/dscf @ 12% CO ₂
Mercury (Hg)	0.1	0.014	3.07	Baghouse - 0.015 gr/dscf @ 12% CO ₂

TABLE 4-1 (Continued)

COMPARISON OF THE PROJECTED EMISSION RATES
TO PSD SIGNIFICANCE VALUES
AND PROPOSED CONTROL TECHNOLOGY

	PSD Significant Emission Rate (tpy)	Potential Controlled Emission Rate (lbs/ton)	(tpy) ^a	Proposed Control Technology
Fluorides (as HF)	3	0.077	17	Dry Scrubber @ 50% Removal
Sulfuric Acid Mist (H ₂ SO ₄)	7	0.344	75	Dry Scrubber @ 60% Removal
Hydrogen Chloride (HCl)	NA ^c	1.22	267	Dry Scrubber @ 90% Removal or 100 ppm _{dv} @ 7% O ₂
Inorganic Arsenic (As)	NA	8.71 x 10 ⁻⁵	1.91 x 10 ⁻²	Baghouse - 0.015 gr/dscf @ 12% CO ₂
Dioxins (as 2,3,7,8 TCDD Toxic Equivalents)	NA ^c	3.4 x 10 ⁻⁸	7.45 x 10 ⁻⁶	Furnace Design, proper Operation, Dry Scrubber and Baghouse

^a Assuming 100 percent annual facility availability at design capacity. The accepted industry standard for on-line availability of a resource recovery facility is 85 percent. The Emission Control Technology Evaluation accounts for the effect on economics attributed to 85 percent availability.

^b BACT not required, emissions less than PSD Significant Emission Rate.

^c Not applicable, not EPA PSD affected, but requested for review by DER.

grate design, excess air level) are not included in the economic analysis. With these data, the total annual cost (economic impact) of each control strategy for each pollutant can be assessed and comparisons made.

Relative to energy, the Pasco County RRF would have a positive effect since it would produce steam for electrical generation. Because energy recovery from refuse represents a resource that would be wasted if not used, other sources of energy (e.g., coal, oil or natural gas) may be conserved as a result of generating electricity from refuse. Based on the same electrical generation rate, the facility would produce less SO₂ emissions than a coal fired facility.

Environmentally, the evaluation and ultimate selection of air pollution control equipment is based on how effectively it controls certain regulated (criteria and non-criteria) pollutants and non-regulated pollutants. The non-regulated pollutants of concern include dioxins and furans, heavy metals and acid gases. Environmental benefits of the proposed facility include the reduction of traditional, unlined landfilling practices that result in fugitive dust emissions, odor problems, and potential groundwater pollution. The Pasco County RRF will also reduce the need for acquiring additional landfill space.

4.2 DEVELOPMENT OF THE PROPOSED EMISSION CONTROL STRATEGIES

Pasco County is proposing to equip the facility with dry scrubbers and baghouses to be designed as follows:

<u>Pollutant</u>	<u>Level of Control</u>
Sulfur Dioxide	100 ppmdv at 7% O ₂ or 70% weight reduction (whichever is less stringent)
Hydrogen Chloride	100 ppmdv at 7% O ₂ or 90% weight reduction (whichever is less stringent)
Particulate Matter	0.015 gr/dscf at 12% CO ₂

This control strategy was selected because of the reduction in emissions of SO₂ and particulate matter and the potential reduction in emissions of unregulated trace metal and organic compounds. Development of the proposed control strategy is based on previously selected BACT for other permitted facilities and also proven capabilities of various control technologies. The EPA's BACT/LAER Clearinghouse contains a partial list of permitted resource recovery facilities. These facilities and their permitted emission rates are shown in Table 4-2.

Although the Clearinghouse is a principal source of information, it is not complete. The submittal of information from the permitting agencies to the Clearinghouse is voluntary. Recently permitted facilities may have not yet been added. Older facilities permitted before the Clearinghouse was established may also be missing. Not all the facilities listed as resource recovery facilities by the Clearinghouse are applicable to the Pasco County facility. A listed facility may use another fuel, employ a different technology, or operate at much lower firing rates.

Of the 13 facilities in Table 4-2, 8 have been permitted with ESPs, 4 have been permitted with fabric filters and one can have either. In the past, ESP's have been installed in many municipal incinerators and resource recovery facilities for particulate control, due primarily to their ability to operate at high temperature. Table 4-3 shows prior to 1980 ESPs alone were the primary means of controlling pollutant emissions. In recent years, however, the development of higher temperature fabrics and the requirements of regulatory agencies for greater particulate emission controls have resulted in a trend toward fabric filters (baghouses).

All the facilities in Table 4-2, except for the Commerce Refuse to Energy Facility in California have listed combustion control and facility design as BACT for control of NO_x. The Commerce Facility is the first U.S. facility to incorporate thermal deNO_x (ammonia injection into the boiler) to reduce NO_x emissions. The BACT/LAER Clearinghouse compilation is normally updated either annually or biannually and thus, does not include some recently permitted facilities. Some permitted facilities which are not included in Table 4-2, and their BACT determinations are shown below for the detail available.

TABLE 4-2

RECENT BACT DETERMINATIONS FOR FACILITIES BURNING REFUSE

Source Type/Company Name Location/Permit Number Date of Issue	Source Size Process Description	Proposed Control Technology	BACT Emission Limitation Determination	
Refuse Incineration/Energy Answers Corp. SEMASS Project Rochester, MA/025-120MA14 3/15/82	3 new waterwall boilers rated at 600 tpd each firing refuse derived fuel	3 stage ESP with overall PM collection efficiency of 96% - dry scrubbers - boiler design for NO_x	PM:	0.05 gr/dscf @ 12% CO ₂
			SO ₂ :	0.34 lb/MMBTU
			NO _x :	0.5 lb/MMBTU
Refuse Incineration/Municipal Incinerator Pulaski Hwy. Baltimore, MD/78MD-09 1/25/80	600 tpd municipal incinerator	- ESP with an overall PM collection efficiency of 98% - proper combustion techniques for SO₂, CO, VOC, NO_x	PM:	per SIP (0.03 gr/dscf @ 12% CO ₂)
			SO ₂ :	35.1 lb/hr
			CO:	30 lb/hr
			VOC:	1.3 lb/hr
			NO _x :	2.6 lb/hr
Refuse Incineration/Refuse Fuels Inc. Lawrence, MA/023-121MA12 3/23/81	New RDF waterwall furnace for 960 tpd of RDF	5 field ESP with an overall PM collection efficiency of 98%	PM:	Subject to LAER 0.025 gr/dscf @ 12% CO ₂
			SO ₂ :	1.2 lb/MMBTU
			NO _x :	0.7 lb/MMBTU
Refuse Incinerator/Resource Authority Gallatin, TN 8/1/80	2 new refuse mass burning waterwall boilers at 75 tpd each	Scrubber and fabric filters with overall PM collection	PM:	0.04 gr/dscf (NSPS)
NOTE: Due to problems encountered with the existing scrubber/fabric filter system, they have been replaced with ESPs.				

TABLE 4-2 (Continued)

RECENT BACT DETERMINATIONS FOR FACILITIES BURNING REFUSE

Source Type/Company Name Location/Permit Number Date of Issue	Source Size Process Description	Proposed Control Technology	BACT Emission Limitation Determination	
Refuse Incineration/NESWC North Andover, MA/029-121-MA16 5/27/82	2 new mass burn water- wall refuse fired boilers with a total capacity of 1500 tpd	• ESP designed to meet approved BACT determination capacity of 1500 tpd • Incineration design	PM:	0.05 gr/dscf @ 12% CO ₂
			NO _x :	0.32 lb/MMBTU
			CO:	0.07 lb/MMBTU
			SO _x :	0.02 lb/MMBTU
Refuse Incineration/McKay Bay Tampa, FL PSD-FL-086 7/2/82	New refuse fired mass burn furnaces with a total capacity of 1000 tpd	• ESP designed to comply with LAER • low S fuel • boiler design and operating procedures for NO_x control	PM:	Subject to LAER not BACT
			Be:	5.0 gr/day
			Hg:	0.6 lb/hr
			Pb:	3.1 lb/hr
			SO ₂ :	170 lb/hr
			NO _x :	300 lb/hr
			VOC:	9 lb/hr
			F:	6.0 lb/hr
Refuse Incinerator/Westchester County, NY 2/22/82	New Mass burn waterwall refuse fired boilers with a total capacity of 2250 tpd	• ESP designed to comply with approved BACT determination ESP constitutes BACT • Design, high excess air, good combustion • Design, proper operation	PM:	0.03 gr/dscf @ 12% CO ₂
			CO:	0.62 lb/ton
			NO _x :	3 lb/ton

TABLE 4-2 (Continued)

RECENT BACT DETERMINATIONS FOR FACILITIES BURNING REFUSE

Source Type/Company Name Location/Permit Number Date of Issue	Source Size Process Description	Proposed Control Technology	BACT Emission Limitation Determination
Refuse Incineration/Katy Seghers Clearfield, UT 2/24/84	500 tpd Incinerator & Waste Heat Boiler	• ESP • Lime Scrubber/ Injection • Combustion Control	PM: 0.025 gr/dscf @ 12% CO ₂ VE: 20% Opacity F: 1.1 lb/hr Hg: 0.12 lb/hr PB: 0.22 lb/hr SO ₂ : 22.4 lb/hr (50% Rem) HCl: 31.8 lb/hr (50% Rem) NO _x : 29.9 lb/hr CO _x : 35.5 lb/hr
Refuse Incineration/N.E. Maryland Waste isposal Authority Baltimore, MD/81MD01 9/01/81	3 Waterwall Incinerators 2010 tpd total	• ESP	PM: 0.019 gr/dscf @ 12% CO Being considered as LAER ² SO ₂ : 335 lb/hr CO: 109 lb/hr NO _x : 227 lb/hr F: 4.2 lb/hr Pb: 0.22 lb/hr
Refuse Incineration/Trans Energy Brooks, OR 24-5398 12/19/83	2 Incinerators, 312 tpd total	• Baghouse or ESP • Scrubber • Equipment Design & Operation	PM: 0.03 gr/dscf @ VE: 10% Opacity HCl: 23 lb/hr 80% removal NO _x : 94 lb/hr SO ₂ : 73 lb/hr CO: 55 lb/hr Hg: 0.17 lb/hr VOC: 3.1 lb/hr Pb: 0.52 lb/hr FLU: 1.6 lb/hr

TABLE 4-2 (Continued)

RECENT BACT DETERMINATIONS FOR FACILITIES BURNING REFUSE

Source Type/Company Name Location/Permit Number Date of Issue	Source Size Process Description	Proposed Control Technology	BACT Emission Limitation Determination	
Refuse Incineration/Dutchess Resource Recovery Poughkeepsie, NY 134601-0024 10/14/83	Waterwall combustion 200 tpd total	• Baghouse • Low S Fuel • Lime Coating for Baghouse • Proper Boiler Design • Good Combustion Control	PM:	0.015 gr/dscf
			SO ₂ :	25 lb/hr
			HCl:	33 lb/hr, 80% removal
			NO _x :	25 lb/hr
			CO:	13 lb/hr
Commerce Refuse to Energy, CA 5/8/84	Waterwall Mass Burn Incinerator 380 tpd	• Baghouse • Spray Dryer (80% efficiency) • Exxon Thermal DeNO_x • Good Combustion Control	PM:	6 lb/hr 0.015 gr/dscf
			SO _x :	11 lb/hr
			NO _x :	41 lb/hr
			CO:	NA
Norfolk Naval Shipyard Norfolk, VA 3/26/84	Boilers (4) 18,000 lb/day	• Baghouse & Cyclone (99.0% efficiency) • Low Sulfur Fuel	PM:	0.07 lb/MMBTU 0.015 gr/dscf
			SO ₂ :	1.2 lb/MMBTU
			HF:	1.1 lb/MMBTU
			HCl:	3.3 lb/MMBTU

SOURCE: EPA BACT/LAER cleaninghouse

PM - Particulate Matter
 ESP - Electrostatic Precipitator
 VOC - Volatile Organic Compounds

BACT - Best Available Control Technology
 MMBTU - Million BTU
 LAER - Lowest Achievable Emission Rate

TABLE 4-3

PARTIAL LISTING OF ADVANCED PARTICULATE CONTROL EQUIPMENT APPLICATIONS
TO MSW INCINERATORS - 1970 TO 1986

Facility	Date	Air Pollution Control Equipment	Particulate Test Data gr/dscf
S.W. Brooklyn	1970/71	ESP	.114/.146
South Shore, Brooklyn	1970	ESP	.056
Dade, FL	1970	ESP	.027
Braintree, MA	1970/78	ESP	.108/.083
Montreal, Canada	1970/71	ESP	.013/.08
Chicago, NW	1971/75	ESP	.025/.03
Washington, DC	1972	ESP	.0548
Harrisburg, PA	1974	ESP	.06
Quebec City	1974	ESP	.095
E. Bridgewater, MA	1975	FF	.02
Pasadena, CA	1975	FF	.008
Nashville, TN	1978	ESP	.018
Nashville, TN	1980	FF	.008
Framingham, MA	1980	Dry Scr/FF	.02
Isogo, Japan	1980	Dry Scr/FF	.026
Malmo, Sweden	1982	Dry Scr/FF	.02
Saugus, MA	1983	ESP	.025
Saugus, MA	1983	FF	.01
Gallatin, TN	1983	FF	.029
Susanville, CA	1983	FF	.01
Tsushima, Japan	1983	Dry Scr/FF	.01
Bamberg, Germany	1983	Wet Scr/FF	.009
Munich North, Germany	1984	Dry Scr/FF	.0104
Lausanne, Switzerland	1984	Elec/Scr/ESP	.014
Baltimore, MD	1984	4 FIELD ESP	.01
Westchester, NY	1985	3 FIELD ESP	.016
Avesta, Sweden	1985	Cond. Scr/FF	.0115
Quebec City	1985	Dry Scr/FF	.001
Wurzburg, Germany	1985	Dry Scr/FF	.0012
Copenhagen, Denmark	1985	Dry Scr/FF	.0044
Malmo, Sweden	1985	Dry Inj. Scr/FF	.004
Kempten, Germany	1985	Dry Inj. Scr/FF	.0016
Hogdalen, Sweden	1985	Dry Scr/FF	.006
Linkoping, Sweden	1985	Dry Scr/FF	.006
Tulsa, OK — Boiler 1	1986	ESP	.024
— Boiler 2	1986	ESP	.020
Marion, OR — Boiler 1	1986	Dry Scr/FF	.016
— Boiler 2	1986	Dry Scr/FF	.004
Montauban, France	1986	Scr/FF	.002
Baltimore, MD	1986	4-field ESP	.003

TABLE 4-3 (Continued)

PARTIAL LISTING OF ADVANCED PARTICULATE CONTROL EQUIPMENT APPLICATIONS
TO MSW INCINERATORS - 1970 TO 1986

Facility	Date	Air Pollution Control Equipment	Particulate Test Data gr/dscf
Cattaraugus, NY	1986	none	.317
Oneida County, NY	1986	ESP	.0263
Zurich, Germany	1986	SDA/Lg. SCA ESP	.002
Hogdalen, Sweden	1986	Dry Inj.Scr/FF	.0006
Rosenheim, Germany	1986	SDA/FF	.004
Iserlohn, Germany	1986	Wet Scr/Cycl/ESP	.006
Frankfurt, NW	1986	SDA/ESP	.02
Frankfurt, NW	1986	SDA/ESP/FF	.004
Frankfurt, Osthafen	1986	Wet Scr/Cycl	.012
Schwandorf, Germany	1986	Dry Inj.Scr/ESP	.015

SOURCE: Clarke, Marjorie J., March 27, 1987, 2nd Edition.

FF - Fabric Filter (Baghouse)
Dry Scr - Dry Scrubber
Dry Inj - Dry Lime Injection
ESP - Electrostatic Precipitator
Wet Scr - Wet Scrubber
Cycl - Cyclone

- Bay County, FL - This 500 tpd facility is permitted with an ESP at 0.03 gr/dscf at 12 percent CO₂ for particulate control. Other permitted emission in lb/ton of MSW are 2.8 for SO₂, 2.2 for NO_x, 11.4 for CO and 0.0036 for Pb. Furnace design, good operation, and proper excess air allow for control of CO, NO_x and VOC emissions.
- Broward County, FL - There are two facilities proposed for Broward County. The North facility will have a 2200 tpd capacity with four furnaces and dry scrubbers for SO₂ and HCl control, and an ESP for particulate control at 0.015 gr/dscf at 12 percent CO₂. Some of the other proposed emissions in lb/ton of MSW include SO₂ at 4.95, NO_x at 5.0, CO at 0.8 and Pb at 0.018. Furnace design and good operation control the level of CO, NO_x and HC emitted. The South facility will have a 2250 tpd capacity with three furnaces and is permitted with a dry scrubber for SO₂ and HCl control, and an ESP for particulate control at 0.015 gr/dscf at 12 percent CO₂. Other projected emissions in lb/ton of MSW are 2.79 for SO₂, 5.04 for NO_x, 0.81 for CO, and 0.018 for Pb. Furnace design and good operation control the level of CO, NO_x and VOC emitted.
- Palm Beach County, FL - This 2,000 tpd facility is proposed with a scrubber and ESP for acid gas and particulate control at 0.015 gr/dscf corrected to 12 percent CO₂, respectively. Other proposed emissions in lb/ton of MSW are 7.7 for SO₂, 4.0 for NO_x, 12.0 for CO and 0.005 for Pb. Furnace design, good operation and proper excess air will allow for the control of CO, NO_x and VOC emissions.
- Pinellas County, FL - This 3,000 TPD facility is permitted with an ESP for particulate control at 0.03 gr/dscf corrected to 12 percent CO₂. The facility consists of three 1,000 tpd mass burn units with the third unit's emissions permitted in lb/ton of MSW at 4.08 for SO₂, 6.1 for NO_x, 1.6 for CO and

0.067 for Pb. Furnace design, good operation and proper excess air allow for control of CO, NO_x and VOC emissions.

- Hillsborough County, FL - This 1,200 tpd facility is permitted with an ESP for particulate control at 0.021 gr/dscf corrected to 12 percent CO₂. The permitted emissions in lb/ton of MSW are 8.5 for SO₂, 6.4 for NO_x, 1.8 for CO and 0.02 for Pb. Furnace design and combustion control are listed as BACT for the control of CO, VOC, and NO_x.
- Bristol, CT - This 650 tpd facility is permitted with a dry scrubber for acid gas control and baghouse for particulate control at 0.015 gr/dscf corrected to 12 percent CO₂. Other projected emissions in lb/ton of MSW are 2.881 for SO₂, 5.4 for NO_x, 1.34 for CO and 0.006 for Pb. Furnace design and combustion control are listed as BACT for CO, VOC and NO_x.
- Alexandria, VA - This 975 tpd facility is permitted with an ESP at 0.03 gr/dscf corrected to 12 percent CO₂ for particulates control. The projected emissions in lb/ton of MSW are 2.5 for SO₂, 3.0 for NO_x, 7.3 for CO, and 0.015 for Pb. Furnace design and combustion control are listed as LAER for CO and VOC, and as BACT for NO_x.
- Indianapolis, Indiana - This 2,178 tpd facility is permitted with dry scrubbers for acid gas control and baghouses for particulate control. The baghouse is permitted at 0.01 gr/dscf corrected to 12 percent CO₂ and constitutes LAER. Other permitted emissions in lb/ton of MSW are 1.1 for SO₂, 5.0 for NO_x, 1.5 for CO and 0.022 for Pb. Furnace design and combustion controls are listed as BACT for CO, NO_x and VOC.
- Fairfax County, VA - This 3,000 tpd facility is permitted with a dry scrubber for acid gases and an baghouse for particulate control. The baghouse is permitted to 0.01 gr/dscf corrected to 12 percent CO₂. Other projected emissions in lb/ton of MSW are 1.42 for SO₂, 4.84 for NO_x, 5.06 for CO, and 0.054 for Pb.

- Marion County, OR - This 550 tpd facility is permitted with a dry scrubber for acid gas control and a baghouse for particulate control. The baghouse is permitted to 0.03 gr/dscf at 12 percent CO₂. Other permitted emissions in lb/ton of MSW are 3.19 for SO₂, 4.1 for NO_x, 2.4 for CO and 0.023 for Pb. Furnace design and combustion controls are considered BACT for CO, NO_x and VOC emissions.
- Tulsa, OK - This 750 ton per day facility is permitted with an ESP to 0.06 gr/dscf at 12 percent CO₂. Other permitted emissions in lb/ton of MSW are 3.23 for SO₂, 6.4 for NO_x, 1.33 for CO and 0.0064 for Pb. Furnace design and combustion controls are considered BACT for CO, NO_x and VOC emissions.
- Stanislaus County, CA - This 800 tpd facility is permitted with a baghouse for particulate control at 0.0275 gr/dscf corrected at 12 percent CO₂, a dry scrubber for acid gases and ammonia injection for NO_x control. Other permitted emissions in lb/ton of MSW are 1.0 for SO₂, 2.83 for NO_x, 1.0 for CO and 0.12 for VOC. Furnace design and combustion controls provide for CO and VOC control.

4.3 BACT REVIEW FOR SO₂ AND ACID GAS COMPOUNDS

Like all municipal incinerators, the Pasco County RRF will discharge acid gases including hydrogen chloride (HCl), hydrogen fluoride (HF) and sulfuric acid (H₂SO₄) from refuse combustion. The amount of these gases emitted is primarily dependent on the halogen and sulfur content and chemical form of these elements in the refuse. Sulfide and organic sulfur in the refuse will to a large extent, during combustion, oxidize to sulfur dioxide (SO₂) which may further oxidize to sulfur trioxide (SO₃) in the incinerator. Ultimately, the sulfur trioxide will combine with water droplets in the air to form sulfuric acid (H₂SO₄). The presence of sulfuric acid in the atmosphere may result in reduced visibility, corroded metals, and acid rain or fog. Hydrogen chloride (HCl) and hydrogen fluoride (HF) are formed during combustion from organic chlorine and

fluorine containing compounds in the refuse. Several plastics, such as polyvinyl chloride, and many bleached paper products are major sources of organic chlorine in refuse. Fluoride emissions from municipal incinerators result primarily from the combustion of fluorinated plastics and other fluorocarbon products. These acid gases in the air can cause corrosion and irritate the eyes, nose and throat.

4.3.1 FORMATION OF SO_2 AND ACID GASES

The sulfur, chlorine and fluorine found in refuse is comprised of organic and inorganic forms. During combustion, a portion of these elements escape from the furnace as various chemical compounds. The type of sulfur, chlorine and fluorine compounds released from the furnace will be strongly dependent on the presence of other gaseous compounds, combustion temperatures, and environmental (oxidizing or reducing) conditions in the furnace. Similarly, emission rates of these compounds will be related to the refuse concentration of sulfur, chlorine and fluorine, and the combustion techniques. Normally the organic sulfur, chlorine and fluorine will oxidize and form acid gases, such as SO_2 , SO_3 , HCl and HF . The inorganic constituent normally is found in the bottom or flyash as inerts.

Various sulfur compounds are produced from direct combustion processes. Excess oxygen conditions generally result in formation of sulfur dioxide (SO_2) and sulfur trioxide (SO_3). Reducing (oxygen lean) conditions result in hydrogen sulfide (H_2S), carbonyl sulfide (COS) and elemental sulfur. However, in an excess air combustion environment, reduced forms of sulfur are not likely to be emitted. Sulfur dioxide (SO_2) is the predominant form of sulfur compound emitted from refuse-burning processes with its rate being dependent on the quantity and type of sulfur found in the refuse. The net conversion of organic refuse sulfur to gaseous SO_2 appears to be between 35 to 50 percent and dependent on refuse compositions.

Hydrogen chloride is the predominant equilibrium chlorine product from the combustion of refuse. Plastic and paper products are major contributors of chlorine in the refuse stream and therefore have been considered as the primary sources of HCl emissions at refuse-burning facilities. The percent net yield of refuse (organic and inorganic) chlorine to HCl , as determined

in a 1972 study by Kaiser and Carotti and in similar Swedish findings, is approximately between 60 and 65 percent with the remainder bound in the bottom ash. Both studies indicate that the net yield of HCl tends to decrease as the chlorine content of the solid waste increases.

Fluoride emissions from refuse combustion are primarily from fluorinated plastics and other fluorocarbon products such as teflons, polyvinyl fluoride films, and aerosols. The mechanisms which govern fluorine release and hydrogen fluoride formation from MSW combustion are considered much the same as hydrogen chloride due to the chemical similarities between them. Little information, however, is available on the concentration of fluorine in today's refuse.

4.3.2 DESCRIPTION OF SO₂ AND ACID GAS CONTROL ALTERNATIVES

Emissions of sulfur dioxide, sulfuric acid, hydrochloric acid, and hydrofluoric acid can be reduced at refuse-burning plants by utilizing flue gas control systems (scrubbers). Three alternative control strategies were evaluated for controlling acid gases: no control, wet scrubbers, and dry scrubbers. The "no control" alternative represents the combustion of low sulfur content fuel (refuse) when compared to fossil fuels while the latter two control alternatives are conventional scrubbing techniques which use alkaline reagents.

Pasco County is proposing dry scrubbers as the control equipment for acid gases. The alternative control strategies were selected based on proven equipment capabilities, other PSD permit applications and the data contained in the BACT/LAER Clearinghouse. Table 4-4 contains the projected and controlled emissions of the "no control" and dry scrubber alternatives.

No Control

This term is used to indicate a control strategy for SO₂ reflecting the fact that MSW is considered a low sulfur fuel when compared to fossil fuels. The "no control" alternative represents a legitimate SO₂ control strategy if an analysis is made on the quantity of SO₂ produced as a result

TABLE 4-4

ALTERNATIVE CONTROL STRATEGIES FOR SO₂ AND HCl

Control Strategy	SO ₂			HCl		
	Controlled Exit Concentration	Uncontrolled Emissions	Controlled Exit Emissions	Controlled Exit Concentration	Uncontrolled Emissions	Controlled Exit Emissions
	ppmdv at 7% O ₂	TPY	TPY	ppmdv at 7% O ₂	TPY	TPY
No Control	246	1161	1161	804	2146	2146
Dry Scrubber	100	1161	471	100	2146	267

of generating electrical energy from the combustion of either coal or refuse. The heat input of fuel required to generate and deliver a KWhr of electrical energy from a coal fired power generating station is the net-plant-heat rate and is estimated at 9,000 Btu/KWhr. A typical net electrical generation rate from RRFs (520 KWhr/ton of MSW) can be used with an average heat input for coal (12,000 Btu/lb) to determine the quantity of coal (375 lbs) as opposed to refuse (2,000 lbs) required to produce the electrical output. The uncontrolled SO₂ emission factor for the Pasco County RRF is 5.3 lb/ton of MSW. Using these values, the amount of SO₂ generated from coal combustion (assuming a 2% sulfur content) would be about three times (283 percent) of the uncontrolled emission from refuse combustion at Pasco County to produce the same amount of electricity.

Wet Scrubbers

Wet scrubbers can remove particulates and acid gases simultaneously but, are not normally installed at resource recovery facilities (RRFs) because of numerous disadvantages including: 1) a liquid waste discharge which may require further treatment; 2) high water usage; 3) aesthetic problems associated with a steam plume discharge at the stack; and 4) an inability to comply with the stringent particulate emission standards applicable to new facilities. A discussion, however, on wet scrubbers has been provided.

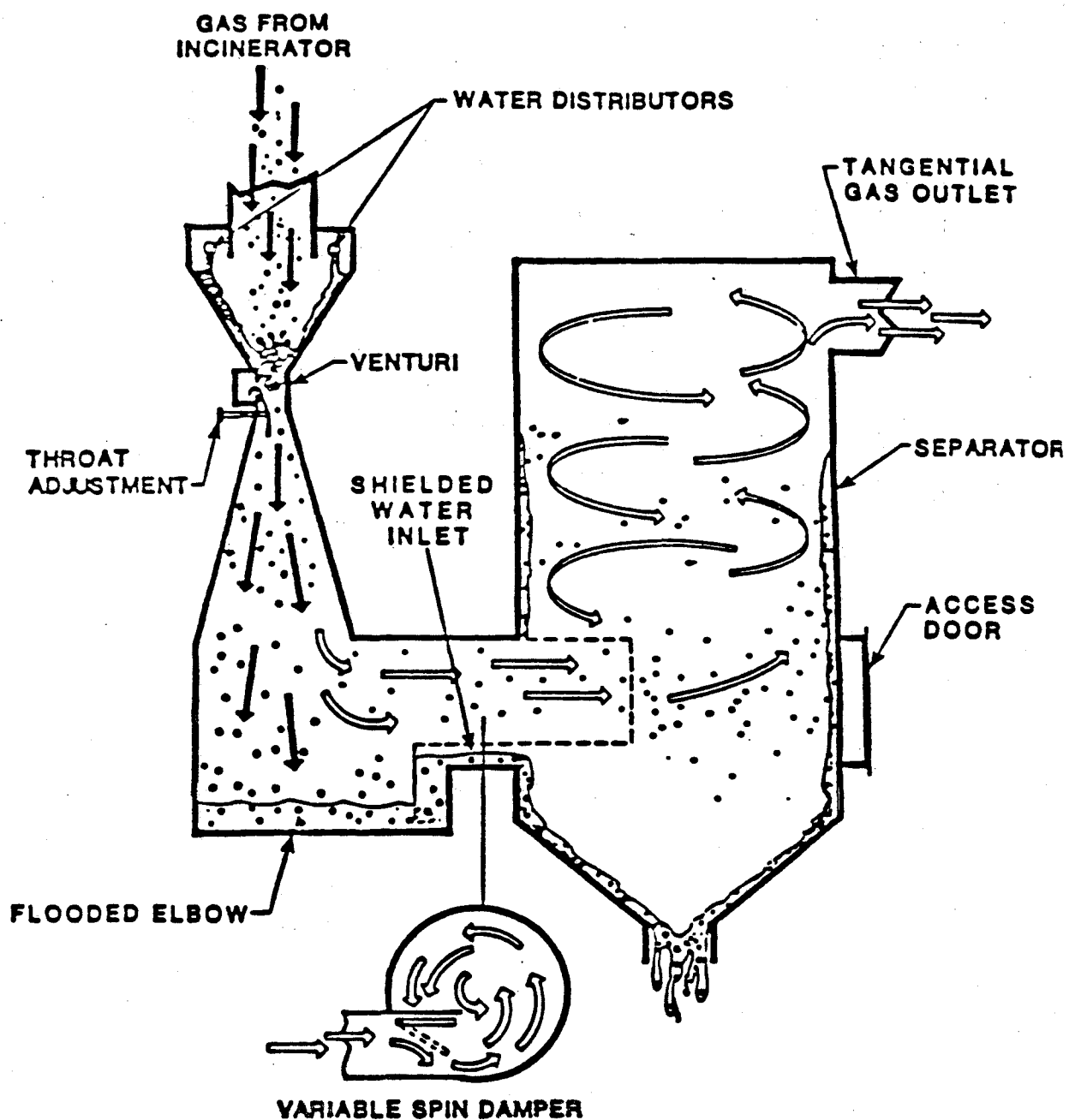
Wet scrubbers for RRFs would use an alkaline water solution to wash the exhaust combustion gases of acid gas pollutants and to a lesser extent particulates. The low operating temperatures of scrubbers are useful in condensing some gaseous pollutants which escape capture in high temperature, dry collection devices. Wet scrubbers can be either a spray-type, using droplets as the collecting medium, or a type which uses a wetted surface to collect pollutants by impaction. Spray-type scrubbers emit a series of droplets (spray) usually in the range of 100 to 1000 microns in diameter. These droplets become attached to collecting surfaces, removing the pollutants from the gas stream by the mechanism of aerodynamic capture.

Figure 4-1 shows a high pressure drop wet Venturi scrubber which uses Brownian motion, chemical reaction, and inertial impaction for removal of both gaseous and particulate pollutants. Wet scrubbers were used primarily as the final particulate collection device on many volume reduction incinerators in the 1960s and 1970s. Most of these installations, however, are incapable of complying with the stringent emission standards of today's RRFs. Examples of these types of incinerators are located in Pawtucket, RI; Framingham, MA; Fall River, MA; and Louisville, KY, to name only a few. Of those mentioned, only the Louisville, KY incinerator operated into the 1980's with the original wet scrubbers. Wet scrubbers are now considered an obsolete technology for the removal of both particulates and acid gases on RRFs. If wet scrubbers are applied, a high efficiency particulate control device would need to precede the scrubber.

Presently, there are no resource recovery facilities planned to be equipped with a wet scrubber. The major reasons cited for the lack of use of wet scrubbers on resource recovery plants are:

- High operating costs for electrical consumption of a high energy wet Venturi scrubber.
- Liquid effluent from the wet scrubber which requires pretreatment to meet regulatory requirements before discharge to a municipal sewer.
- Visible plume under most meteorological conditions; during periods of high relative humidity a dilute but mildly corrosive cloud would form.
- A lower plume buoyancy compared to dry systems which exit at higher temperatures. This reduced buoyancy results in lower plume rise and hence, higher ground-level concentrations.

Because of these significant disadvantages, the wet scrubber alternative is not considered a viable means of acid gas control and no further analysis of this option was performed. The more detailed analysis of various



Source: Sly Manufacturing Company

Pasco County Resource Recovery Project

Pasco County, Florida

PSD Permit Application

Camp Dresser & McKee

FIGURE 4-1
HIGH PRESSURE WET
VENTURI SCRUBBER

control options focuses on those technologies with fewer restricting features.

Dry Scrubbers

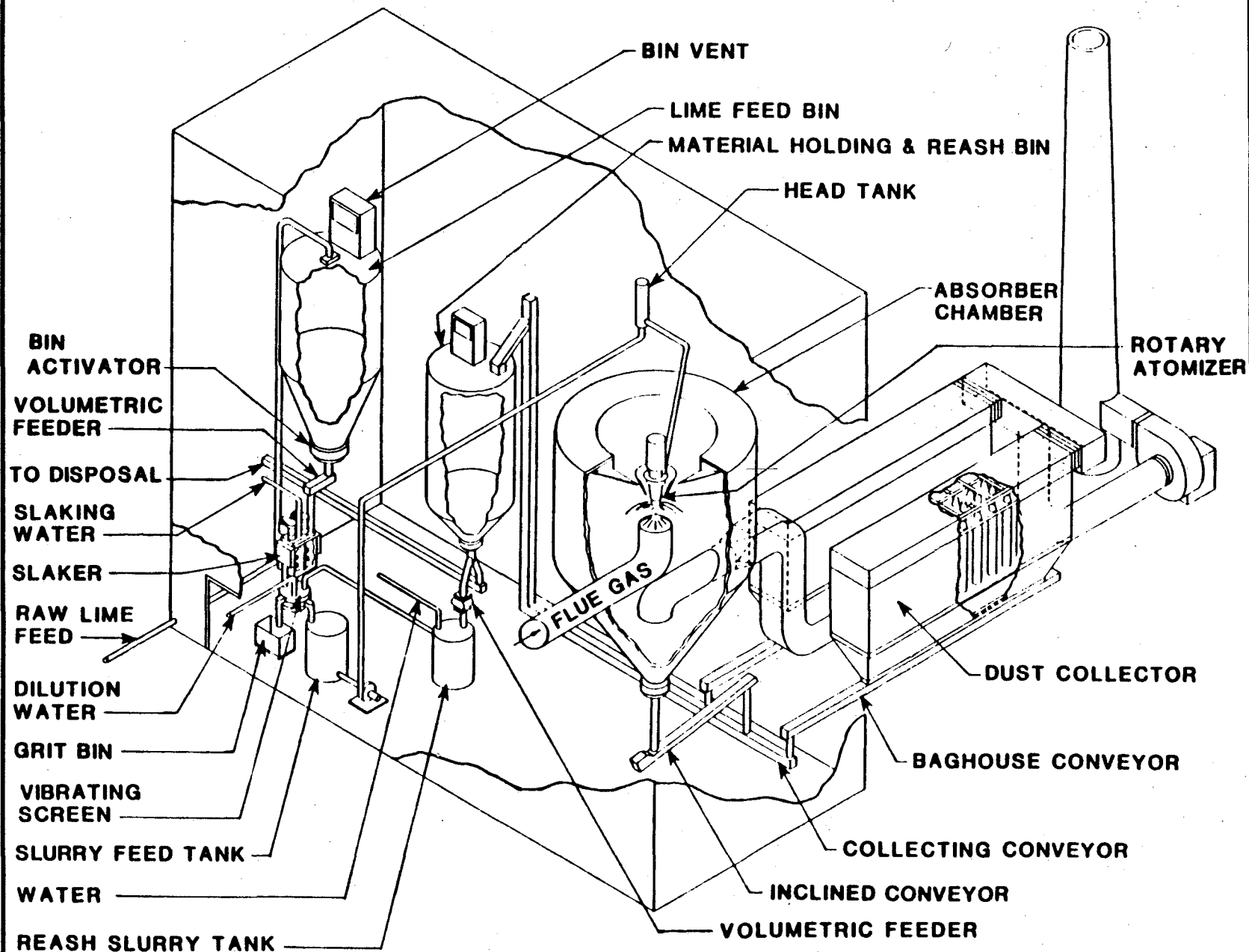
Dry scrubbers offer an innovative means of controlling acid-gas emissions from resource recovery facilities. Although the use of acid-gas controls for resource recovery facilities in the U.S. is just beginning, European and Japanese regulatory agencies have required acid-gas controls for several years. Many of the newer acid gas controls in Europe and Japan have been dry scrubbers using lime as the neutralizing reagent.

With the dry scrubber system, the flue gases from the boiler are introduced into an absorbing chamber where the gases are contacted by an alkaline water slurry (lime). Acid gases are adsorbed by the slurry mixture and through evaporation dried to a powder, thereby reducing flue gas temperatures. A portion of the powder drops to the bottom of the chamber while the flue gases, containing the remaining powder with reacted acid gas salts and the particulates generated during refuse incineration, are delivered to the particulate collector (baghouse or ESP) for removal. The particulate collector is a necessary part of the control system when dry scrubbers are involved since it provides a means of removing particles generated from refuse incineration and the lime from the dry scrubber flue gas. A typical dry scrubbing system is shown on Figure 4-2.

The dry scrubbing process operates as follows:

- Pebble lime (CaO) is hydrated by slaking and mixed with water to form a lime slurry.
- The slurry is pumped to the nozzles or rotary atomizer, which are located inside the dry scrubber vessel. Additional cooling water, as required, is also pumped to the nozzles or rotary atomizer. The slurry contains approximately 1 to 3 times the amount of lime required to neutralize the SO_2 and HCl .

FIGURE 4-2
DRY SO₂ SCRUBBER



Source: Niro Atomizer, Inc.

- The atomized slurry and water are contacted by the SO_2 and HCl in the flue gas and are condensed or absorbed. A dry, free-flowing powder is formed as the water is evaporated by the heat of the furnace gases. The HCl and SO_2 react with the water and lime to form salts. The most prevalent salts formed are CaCl_2 , CaSO_3 and CaSO_4 .
- The larger dry particles are separated from the gas in the dry scrubber vessel by gravity and fall to the cone bottom of the vessel.
- The smaller dry particles are carried to the ESP or baghouse for separation from the gas.
- The collected flyash from the dry scrubber and ESP or baghouse are combined with the bottom ash or residue from the facility.

As shown in Table 4-5, in a 1982 report by Craig and O'Connell, 19 dry scrubbers were identified with start-up dates from 1973 to 1981. Of the units sited, 8 reported HCl and SO_2 emission and control efficiency data (see Table 4-6) ranging from 75 to 99 percent and 48 to 88 percent, respectively.

Of the 19 systems shown in Table 4-5, only one is a US installation: the Teller system in Framingham, MA, installed in 1979. The Framingham incinerator is for the volume reduction of waste and incorporates a wet scrubbing system which was retrofitted into a dry scrubber. Presently, the Marion County, OR, RRF is the only dry scrubbing system which has been tested in the US. The Marion system is a Teller system which began operations in 1986. The City of Commerce, CA RRF also has a dry scrubber in operation, but no known test data exists. Other RRF's which will employ dry scrubbers include: Bristol, CT; Kent County, MI; Stanislaus County, CA; Indianapolis, IN; Babylon, NY and; SEMASS, Rochester, MA.

TABLE 4-5
 DRY SCRUBBERS ON MUNICIPAL INCINERATORS

	Mfgr	Inst. Date	Particulate Control	Size tpd
Dusseldorf, FRG	D.B.	1980	ESP	1-330
Hamburg, Stelling Moor, FRG	D.B.	1979	ESP	2-386
Hamburg, FRG	D.B.	1973	ESP	2-516
Hamburg, FRG	Steinmuller	1978	BH	NA
Oberhausen, FRG	D.B.	1981	BH	600
Munich, FRG	D.B.	1980	NA	NA
Pinneberg, FRG	D.B.	1974	ESP	130
Isogo in Yokohama, J.	T	1980	ESP	NA
Isogo in Yokohama, J.	T	1980 demo	BH	150
Hokubu in Yokohama, J.	T	1981	ESP	NA
Sakai, J.	T	1980	ESP	NA
Kohnan in Yokohama, J.	T	1980	ESP	NA
Kumamoto, J.	T	1981	BH	NA
Asahi in Yokohama, J.	T	1979	ESP	NA
Ohojo in Yokohama, J.	T	1980	ESP	NA
Minamintosuka in Yokohama, J.	T	1981	ESP	NA
Sendai, J.	T	1980	ESP	NA
Framingham, MA	T	1979	BH	250
Momloe, Sweden	F	1981	BH	300

DB = D B Gas Cleaning
 T = Teller Environmental Systems
 F = Flakt
 ESP = Electrostatic Precipitator

FRG = "West" Germany
 J = Japan
 NA = not available
 BH = Baghouse

(Craig & O'Connell, 1982)

TABLE 4-6

PERFORMANCE OF DRY ACID GAS SCRUBBERS ON MUNICIPAL INCINERATORS

Location	Mfgr.	Scrubber Type & TSP Collection Device	HCl			SO ₂			Size, Ton per Day
			ppm in	ppm out	Control Efficiency %	ppm in	ppm out	Control Efficiency %	
Isogo, Japan	T	dry BH	650	4.5	99	150	17.5	88	150
Sakai, Japan	T	dry ESP	280	NA	88	38	NA	71	NA
Kumamoto, Japan	T	dry BH	700	NA	93	200	NA	88	NA
Ohnojo, Japan	T	dry ESP	725	NA	75	115	NA	48	NA
Sendai, Japan	T	dry ESP	700	NA	79	NA	NA	NA	NA
Framingham, MA	T	dry BH	400	NA	97	NA	NA	NA	250
Framingham, MA	T	dry BH	NA	29.4	NA	NA	NA	NA	250
Hamburg Stellingner, Moor, DFG	DB	dry ESP	860	74	91	210	80	62	2 @ 386
Oberhausen, DFG	DB	dry BH	850	65	92	260	33	87	600

T = Teller

DB = DB Gas Cleaning

NA = not available

(From Craig & O'Connell, 1982)

The addition of lime changes the characteristics of the bottom ash and flyash, which can be combined. The alkaline nature of lime will increase the pH of the combined ash residue. Physical/chemical testing of the ash is necessary to ensure compatibility with planned disposal or reuse/recycling of the ash. The combined bottom ash and flyash of other facilities have been tested and determined as not exhibiting hazardous waste qualities, thus, the same is likely to be true for the Pasco County RRF.

The disadvantages of a dry scrubber are as follows:

- Susceptibility to clogging of spray nozzles and/or accumulation of lime and particulates on the walls of the dry scrubber vessel
- Greater particulate loading on the gases leaving the system, thus demanding more efficient, but costly, air pollution control for particulates.
- Additional solids disposal (containing soluble salts)
- Frequent maintenance of lime and residue handling systems
- Decrease in plume temperatures, reducing plume rise and thereby reducing plume dispersion (versus no control).

The dry scrubber has the proven ability of effectively removing acidic gases such as H_2SO_4 , HF and HCl and SO_2 . Recently, however, some data has been generated addressing a secondary benefit through the reduction of some organic emissions such as dioxins and furans beyond that achieved by good combustion design and operation using a properly operated scrubber and particulate control device (EPA, 1987). Toxic organic compounds are removed by passing flue gas first through a dry scrubber which provides the cooling necessary for the adsorption and/or condensation of organic pollutants onto particulates in the flue gas. This stream would then pass through a particulate control device such as a baghouse or an ESP which

would remove the particulates from the flue gas. The more efficient the particulate collection device and the lower the dry scrubber operating temperature, the more efficiently condensable products of incomplete combustion will be removed.

As is the case of organics, it has been demonstrated that RRFs equipped with a dry scrubber and an efficient particulate control device can reduce heavy metal emissions, except for mercury, by as much 99%. This removal can be achieved by a particulate control device since the condensation temperature of metal compounds emitted by RRFs are above 300°C. The Quebec City scrubber/baghouse tests concur with reports of over 99% of the heavy metals (except mercury) contained in the inlet gas flow being removed at 110°C and over 90% at temperatures below 140°C (Environment Canada, 1986). The removal of either organic or metal emissions to this degree can't be achieved with the use of "no control". Clearly, however, a conventional, high-efficiency particulate control device does remove a large fraction of the metal inlet loading.

4.3.3 COMPARISON OF SO₂ AND ACID GAS ALTERNATIVE CONTROL STRATEGIES

The comparison was performed based on energy, economic and environmental criteria, which were determined as follows.

Energy

The amount of energy consumed (kWh) was calculated for the dry scrubber. Included was the power required by the I.D. fan for the pressure drop (3.5 inches, water column) across the dry scrubber, compressed air for atomizing nozzles or power required for rotary atomizer, and motors required for the lime handling and injection system. The power consumption of the dry scrubber is shown on Table 4-7. The "no control" alternative does not require any additional energy.

TABLE 4-7

CAPITAL AND OPERATIONS/MAINTENANCE COSTS FOR SO₂ & HCl ALTERNATIVE CONTROL STRATEGIES

CAPITAL COSTS, ANNUALIZED COASTAL COSTS, POWER REQUIREMENTS AND ANNUAL O&M COSTS (in 1000's \$)									
System and HCl & SO ₂ Control Efficiency	Capital Cost	Annualized ^a Capital Cost	Power (KW)	Power ^b Cost	Labor ^c Cost	Materials & Supplies	Chemical Cost	Special Costs	Total Annual Cost
No Control	0	0	0	0	0	0	0	0	0
Dry Scrubber	8,468 ^g	863	205	61	60	30 ^d	316 ^e	168 ^f	1,498

^a Annualized capital costs assume 20 year plant life and interest rate equals 8% (capital recovery factor = 0.1019).

^b Power costs assume plant operation 24 hr/day, 365 days/year and 85% availability. Power cost = \$0.04/kWh.

^c Labor costs assume two man-years at \$30,000 /yr.

^d Maintenance cost equals 0.5 percent of capital cost.

^e Chemical costs assume lime @ \$68/ton.

^f Includes water costs and landfill disposal costs for reacted reagent.

^g Includes Bond Burden at 40 percent.

Economic

For the dry scrubber alternative, the annual capital and operating costs were calculated. These costs include: 1) the amortization (20 years at 8 percent) of the installed capital equipment and bond burden; 2) cost relating to the consumption of power, water and lime; 3) preventive maintenance and; 4) disposal costs of reacted reagent. The "no control" alternative does not have any additional costs associated with it. From the economic data shown in Table 4-7, it can be seen that the annual costs for the "no control" and the dry scrubber strategies are \$0/yr and \$1.5 million/yr, respectively.

Environmental

Ground-level concentrations were predicted by EPA-approved dispersion modeling with one year of meteorological data and a radial receptor grid. For the dry scrubber alternative, the stack gas conditions reflected the lower gas temperature (250°F), volume, and density of the quenched gas from the dry scrubber. The "no control" alternative modeling was performed for the furnace gases at a temperature of 425°F, which assumes the dry scrubber is not installed. Both alternatives were modeled using the same design exit gas velocity. For both cases a 100% load was assumed. As stated above, this modeling was done to show relative impacts between the control and no control options. It does not represent overall maximum impacts.

The SO₂ GLCs were compared to the NAAQS/FAAQs, the PSD Class II allowable increment and the PSD significant levels for air quality impact as shown in Table 4-8. From Table 4-8 it can be seen that both the "no control" and dry scrubber alternatives have low annual GLCs compared to the NAAQS and FAAQS for SO₂. If either alternative were selected, a portion of the annual, 24-hour, and 3-hour PSD increment would be consumed. HCl is not a regulated pollutant under the PSD guidelines. Based on the dry scrubber comparison modeling the projected annual GLC for HCl is 1.02 ug/m³ (no scrubber) and 0.2 ug/m³ (with dry scrubber).

TABLE 4-8

COMPARATIVE ANALYSIS OF SO₂ ALTERNATIVE CONTROL TECHNOLOGIES
TO NAAQS AND PSD INCREMENTS^a

Control Alternative	Annual Concentrations of SO ₂ *			24-Hour Concentrations of SO ₂ **		
	Estimated Maximum Impact (ug/m3)	Percent of FAAQs (%)	Percent of PSD Increment (%)	Estimated Maximum Impact (ug/m3)	Percent of FAAQs (%)	Percent of PSD Increment (%)
No Control	0.55	0.9	2.8	4.64	1.8	5.1
Dry Scrubber	0.36	0.6	1.8	2.85	1.1	3.1
3-Hour Concentrations of SO ₂ ***						
	Estimated Maximum Impact (ug/m ³)	Percent of FAAQs (%)	Percent of PSD Increment*** (%)			
No Control	18.3	1.4	3.6			
Dry Scrubber	11.4	0.9	2.2			
<u>Regulated Concentrations</u>						
<u>*Annual SO₂</u>		<u>**24-Hour SO₂</u>		<u>***3-Hour SO₂</u>		
FAAQs = 60 ug/m ³		FAAQs = 260 ug/m ³		FAAQs = 1300 ug/m ³		
PSD Increment = 20 ug/m ³		PSD Increment = 91 ug/m ³		PSD Increment = 512 ug/m ³		
PSD Significance level = 1 ug/m ³		PSD Significance level = 5 ug/m ³		PSD Significance level = 25 ug/m ³		

^a Predicted concentrations are based on the facility operating at 100 percent load for an entire year (8760 hours) and 1977 meteorological data.

As mentioned, a dry scrubber system operates with a lower stack gas exit temperature (250°F) than that of no control case (425°F). The lower gas exit temperature reduces plume buoyancy resulting in a lower plume rise and hence, higher ground-level concentrations of pollutants. The no control alternative, although its exit gas has a greater buoyancy than a dry scrubbers, would have a greater GLC for SO₂ (approximately 45 percent) than a dry scrubber on an annual basis.

4.3.4 BACT DETERMINATION FOR SO₂ AND ACID GASES

The BACT determination for SO₂ and HCl was based on a comparison of economic and environmental criteria, as shown in Table 4-9. The criteria included the following:

- Control efficiency of the strategy (percent)
- Tons of pollutant emissions controlled (tpy)
- Incremental controlled emissions (tpy)
- Annual control costs
- Pollutant control costs (\$/ton of pollutant controlled)
- Tipping fee associated with the control alternative (\$/ton of waste combusted).

The dry scrubber would control 690 tpy of SO₂ and 1,879 tpy of HCl vs. zero for the "no control" alternative. The annual GLCs shown in Table 4-8 for the two alternatives show that there is not a large environmental benefit of one alternative over another because both alternatives will result in a minimal impact of HCl or SO₂ in the ambient air. The no control alternative has a "zero" cost while the dry scrubber will have an annual capital and operating fee of \$1,498,000 per year, which will increase the overall plant's waste disposal fee by \$4.02/ton. Although the environmental benefit associated with SO₂ and HCl is not large, the use of acid gas

TABLE 4-9

COST COMPARISON OF SO₂ AND HCl ALTERNATIVE CONTROL STRATEGIES

Alternative Control Strategy	Controlled Exit Concentration ppmdv @ 7% O ₂		Controlled ^b (Removed) Pollutant Emissions TPY		Incremental Controlled Emissions TPY		Annual ^a Control Costs 1000's \$/yr	Control Costs \$/ton HCl & SO ₂ Controlled	Tipping Fee Increase \$/ton
No Control	SO ₂	231	SO ₂	0	SO ₂	-	0	0	0
	HCl	962	HCl	0	HCl	-			
			Total	0					
Dry Scrubber	SO ₂	100	SO ₂	690	SO ₂	+690	1,498	583 ^c	4.02 ^d
	HCl	100	HCl	1,879	HCl	+1,879			
			Total	2,569	Total	+2,569			

^aFrom Table 4-7.^bFrom Table 4-4.^cControl Costs (SO₂ & HCl controlled) equals the Annual Control Costs (\$/yr) divided by the Controlled Pollutant Emissions (TPY), i.e. $1,498 \times 10^3 / (690 + 1,879)$ equals \$583/ton of pollutant controlled.^dTipping Fee (\$/ton) equals the Annual Control Costs (\$/yr) divided by the Tons of Waste Processed with 85 percent availability ($1200 \text{ tpd} \times 365 \text{ days/yr} \times 0.85 = 372,300 \text{ tpy}$), i.e. $1,498 \times 10^3 / 372,300 = \$4.02/\text{ton}$.

scrubbers in conjunction with high efficiency particulate control devices may be used to control trace organic and metal compounds. Thus, dry scrubbers are proposed for the Pasco County RRF to control acid gases.

4.3.5 BACT DETERMINATION FOR HF AND H₂SO₄

HF and H₂SO₄ will be controlled by the BACT alternative for the control of SO₂ and HCl. Dry scrubbers and no control were evaluated for SO₂ and HCl removal with the former alternative being selected for the Pasco County RRF. For this analysis, an environmental evaluation was performed for the dry scrubber and no control alternative for the control of HF and H₂SO₄. The no control alternative represents the use of low fluorine and sulfur content fuel (MSW) which when compared to fossil fuels limits the formation of HF and H₂SO₄. The HF and H₂SO₄ which are generated are highly reactive and it would be expected that removal efficiencies of 50 percent for HF and 60 percent for H₂SO₄ would be attained by the dry scrubber alternative. The no control alternative would have no effect on HF and H₂SO₄ removal. Table 4-10 contains the removal efficiencies, annual emissions, controlled annual emissions, and projected 24-hour GLCs for the two alternatives.

Modeling for the two control alternatives was done using the same protocol used for SO₂ and HCl. PSD regulations do not include PSD increments for HF or H₂SO₄. Also, there are no NAAQS or FAAQS for HF and H₂SO₄.

From Table 4-10, the GLCs for HF are 0.102 ug/m³ and 0.135 ug/m³ for the dry scrubber and no control alternatives, respectively. In either case, the proposed facility is expected to have a minimal impact on ambient air quality for HF. Thus, the no control alternative is proposed as BACT for HF but, as noted, Pasco County will use the more efficient dry scrubber for the proposed facility.

The GLCs for H₂SO₄ are 0.457 ug/m³ and 0.742 ug/m³ for the dry scrubber and no control alternatives, respectively. In either case, it is expected that the proposed facility will have a minimal impact on ambient air quality for H₂SO₄. The more efficient dry scrubber is proposed for the Pasco County RRF.

TABLE 4-10

COMPARISON OF ALTERNATIVE CONTROL STRATEGIES FOR HF AND H₂SO₄

HF					H ₂ SO ₄			
Control Strategy	Control Efficiency, %	Annual ^a Emissions, tpy	Annual Controlled (Removed) Emissions tpy	24-Hour GLC ₃ ug/m ³	Control Efficiency, %	Annual ^a Emissions, tpy	Annual Controlled (Removed) tpy	24-Hour GLC ₃ ug/m ³
No Control	0	34	0	0.135	0	186	0	0.742
Dry Scrubber	50	17 ⁽²⁾	17	0.102	60	75 ⁽²⁾	111 ^b	0.457

^aWith 100% Availability^bFrom Table 2-1

4.4 BACT REVIEW FOR PARTICULATE MATTER

The combustion of waste in any commercially available combustion system will result in inert particulate matter being carried out of the furnace in the combustion gases. Particulate matter can be removed from the gases by various types of control equipment. The initial particulate collection device used in the U.S. on MSW incinerators (no heat recovery) was the wet venturi scrubber or impingement-type scrubber. During the 1960s, 1970s and early 1980s when heat recovery was employed on waste combustion sources, ESPs were mainly used as the particulate control device. Recently, however, both baghouses and ESPs have been selected for resource recovery facilities for TSP control. This BACT review was performed for the following alternative particulate control strategies: ESP, wet venturi scrubber, and a baghouse. These strategies and their outlet emission rate, control efficiency, annual controlled and uncontrolled emissions are shown in Table 4-11.

4.4.1 DESCRIPTION OF PARTICULATE CONTROL ALTERNATIVES

Electrostatic Precipitators (ESP's)

An ESP uses an electrostatic field for precipitating or removing solid or liquid particles from the gas in which they are entrained. It consists of an alternating array of negatively-charged wires or grids and positively-charged collection plates. Particulate collection is accomplished by applying a high voltage across the negative electrodes and collection plates, establishing a corona around the negative electrode. The corona ionizes electronegative gases (e.g., O_2 , CO_2 , and SO_2), which in turn charge particulate matter in the gas stream. The charged particles migrate to the positively-charged collection plates where they are deposited. The particulates are dislodged by rappers and fall by gravity into hoppers. Periodically, the collecting electrode plates are "rapped" and the cake of dust slides down the plate into hoppers. A typical ESP is shown in Figure 4-3.

TABLE 4-11

ALTERNATIVE PARTICULATE CONTROL STRATEGIES

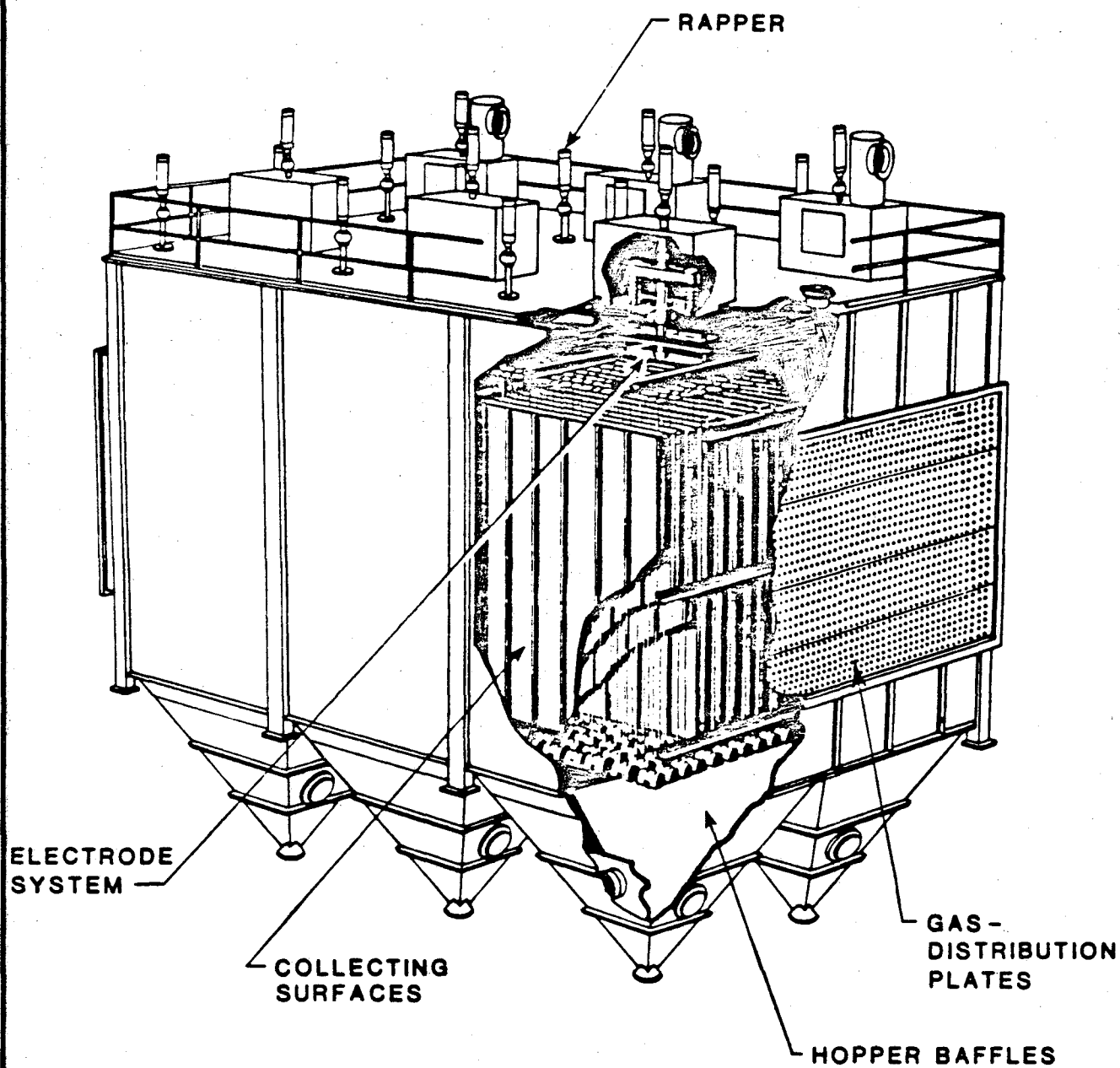
Particulate Control Strategy	Particulate Emission rate, gr/dscf @ 12% CO ₂	Control Efficiency % by weight	Annual Emissions TPY	Annual Controlled (Removed) Emissions TPY ^a
Wet Venturi	0.04 ^a	98.6	159	11,175
ESP	0.015 ^b	99.4	68	11,265
Baghouse	0.015 ^b	99.4	68	11,265

^a Proven capability.

^b Based on BACT/LAER clearinghouse and equipment capability. See Table 4-3.

^c Based on inlet TSP loading to TSP collection device of 2.5 grains/dscf which equates to 11,333 tpy uncontrolled TSP emissions.

^d Based on facility with 100% availability with no downtime. Normal guaranteed availability is 85%.



Source: Joy Manufacturing Co.

Pasco County Resource Recovery Project

Pasco County, Florida

PSD Permit Application

Camp Dresser & McKee

FIGURE 4-3
ELECTROSTATIC PRECIPITATOR

The collection efficiency of precipitators is very high, normally designed to exceed 99 percent, and is primarily a function of the strength of the electrostatic field, the residence time in the electrostatic field, and the resistivity of the particulates being removed. Overall efficiency may be enhanced by installation of additional stages of precipitation in series, commonly referred to as fields. The critical property affecting the performance of ESPs is the resistivity (the reciprocal of conductivity) of the particulate cake collected on the plates. If the resistivity is too high, the cake acts to reduce the effective field strength within the ESP, and collection efficiency declines. If the resistivity is too low, the charge on the cake drains off quickly and, without the cake attraction forces to hold them, the surface particles are re-entrained by the gas, increasing the outlet loading. Experience has shown the optimum resistivity to range between 10^8 and 10^{12} ohm-centimeters. Resistivity varies with moisture and ash composition, which vary with temperature.

Advantages of ESPs are:

1. Demonstrated high collection efficiency.
2. Ability to operate over a wide range of gas temperatures (approximately between 250 and 500°F).
3. Minimal gas pressure drop across the ESP results in lower power consumption by the flue gas mover (such as an induced draft fan).
4. Particulate matter is collected dry; therefore, no liquid sidestreams requiring treatment are generated.
5. Longest operating record.
6. High reliability with low maintenance.
7. Capability to operate in a humidified gas stream.

Some of the disadvantages are:

1. Precipitators are not adapted easily to variable conditions; they are most efficient when operating conditions are constant and at design parameters.
2. Some particles are not amenable to removal in a precipitator because of extremely high or low resistivity.
3. Electrical precipitation does not effectively remove contaminants in the gaseous phase (unless they condense on particulate matter prior to the ESP).
4. Special precautions are required to safeguard personnel from the high voltage present in the ESP units. High voltage sparks could cause fires if the collected particulate is a combustible.
5. Potential for corrosion if the flue gas temperature falls below the dewpoint of the acid gases.
6. Increases in the volumetric gas flow will tend to decrease efficiency.

The principal components of an electrostatic precipitator include the discharge electrodes or corona wires, the collecting electrodes, rappers, shell, gas inlet distribution, and ash hoppers. A transformer and DC rectifier power pack are used to power the system. Construction materials are mainly carbon steel. Precipitated particulate matter is removed from the collecting electrode plate with a sharp, hammer-like blow or vibration to cause the collected dust to dislodge and fall into the ash hoppers below. To prevent re-entrainment of precipitated particulate matter, proper design of rapping mechanisms and collecting plates, and the maintenance of uniform and sufficiently low gas velocities are required. The ESP shell must be insulated to prevent condensation, which could create problems with corrosion and electrode fouling. A general rule is to

maintain temperatures at least 40°F above the dew point of the gas being treated. Corrosion problems can be alleviated, first through proper construction to avoid ambient air leakage into the ESP and, secondly, by insulation and external heating of the unit to avoid cold spots where condensation can occur. As previously mentioned, dry scrubbers shall be followed by a particulate collection device. The dry scrubber will lower the temperature of the furnace exit gases by evaporative cooling to 250°F to 280°F which is 70°F to 100°F above the acid gas dew point.

ESPs have been used in the United States for more than 50 years on a wide variety of applications. Most of the new municipal refuse incinerators use ESPs for particulate emission control. Some major MSW incineration plants equipped with ESPs are located in Harrisburg, Pennsylvania; Chicago, Illinois; Nashville, Tennessee; Norfolk, Virginia; Westchester, New York; Hillsborough County, FL; Saugus, Massachusetts; Baltimore, Maryland; Tampa, Florida; Dade County, Florida; Bay County, Florida; Tulsa, Oklahoma; and Pinellas County, Florida. Throughout the U.S. and the world, MSW combustion facilities are successfully utilizing ESPs for the efficient control of particulate matter. This is further demonstrated by the fact that almost all the facilities listed in Table 4-2 are equipped with ESPs.

Wet Scrubbers

Wet scrubbers were discussed with the control technologies for SO₂ and HCl because they can simultaneously remove acid gases and particulates. That discussion concluded that wet scrubbers are considered an obsolete technology for particulate control on resource recovery facilities because of the following disadvantages:

- High operating costs for electrical consumption of a high energy wet Venturi scrubber versus the operating costs associated with an ESP or baghouse.
- Liquid effluent from the wet scrubber which requires pretreatment to meet regulatory requirements before discharge to a municipal sewer.

- A saturated plume visible under most meteorological conditions and during periods of high relative humidity acid gases could condense out.
- High maintenance expense.

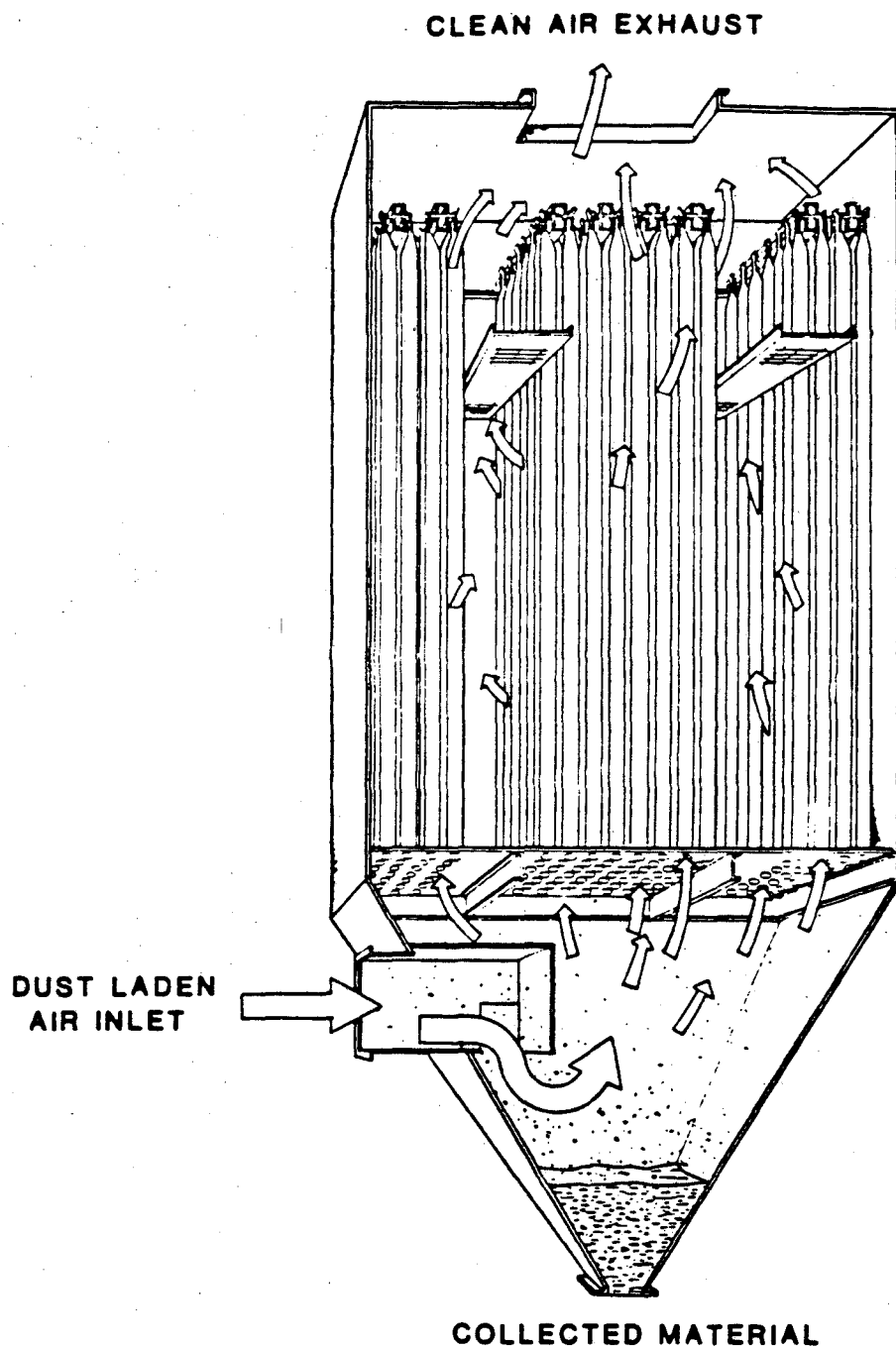
Because of these significant disadvantages, the venturi alternative is not considered a viable means of particulate control and no further analysis of this option was performed.

Fabric Filters (Baghouses)

Fabric filtration takes place in a baghouse, where exhaust gases are channelled through filter bags. The bags can be made of various materials, such as cloth fabric, teflon coated fiberglass fabric, or stainless steel. Although the clean filter material is woven with a pore size of about 1 micron and the fly ash is expected to include smaller particles, after a short seasoning period the collected dust will further limit passage, and the filter will be very effective as long as it does not experience condensation. If condensation occurs, particles stick to the bag and eventually work their way into the fabric blinding the bag. This may happen during transients, startup, or shutdown. Cleaning the filter bags usually incorporates gravity and one of three mechanical processes: traveling rings, vibration of bags, or use of air jets. Figure 4-4 illustrates a typical baghouse. Particulate matter removed from the bags falls into a dust hopper for their removal and ultimate disposal.

Advantages of baghouses are:

1. The dry collection of particle matter by physical filtration.
2. The ability to attain high collection efficiencies.
3. With sorbent chemical precoat, the ability to collect gaseous pollutants as they travel through the collected cake present on the bags.



Source: Micropul Corporation

Pasco County Resource Recovery Project

Pasco County, Florida

PSD Permit Application

Camp Dresser & McKee

FIGURE 4-4
BAGHOUSE FILTER OPERATION

4. Less sensitive to process variations (inlet particulate loading, particle size distribution, variability in waste composition, variability in flue gas flow rates, and particulate resistivity) because it is a physical filtration device.
5. The ability to perform unit maintenance such as bag replacement without having to shutdown the resource recovery system.

Disadvantages are:

1. High sensitivity to relative humidity (condensation). "Cementation" of the bags, the formation of a hard crust on the filter fabric, can occur in a highly humid gas stream. High humidity in the exit gas is not normally associated with dry scrubbers.
2. Inability to accept high-temperature gases. Loss of structural integrity of the bags at high temperature surges above 500-550°F.
3. Susceptibility of the filters and metal surfaces to chemical attack and corrosion by acid gases.
4. High gas pressure drop across the baghouse results in higher energy consumption by the gas mover (induced draft fan).
5. Long-term reliability of bags not demonstrated.
6. Very limited previous application to resource recovery facilities.
7. Susceptibility to fires caused by incandescent or burning particles reaching the bags and causing burn holes through the bag.

Fabric designs are currently available that reduce the effects of temperature, corrosivity, abrasion and the potential for burning or singeing the bag. Individual bag failures can be limited when the fabric and cleaning methods are properly selected. Gas velocity, pressure drop and the air-to-cloth ratio are important operating parameters that must be considered in designing a system. As discussed previously, the dry scrubber will cool the furnace gases by evaporative cooling which should extinguish or quench any burning embers and thus maintain the gas temperature below the cloth material's maximum allowable temperature.

Although fabric filters are used extensively in the coal-fired utility sector and the aluminum industry, their history of application to municipal refuse incineration is extremely limited. In general, fabric filters have not been proven on refuse incineration plants from a longevity standpoint, as compared with ESPs. To date, there have been only three operating full-scale mass burn resource recovery facilities utilizing filters as the sole control device, two in Switzerland and the other in East Bridgewater, Massachusetts.

The East Bridgewater facility is composed of two units at 150 tpd each. The chief problem at the East Bridgewater plant was corrosion of metal and fabric surfaces due to acid condensation occurring at cold spots during system shutdowns. The plant has been shut down for several years. Both of the Swiss facilities are small facilities in the 150 to 200 tpd range. The particulate emission rate from one of the Switzerland installations was reported at 0.05 gr/dscf @ 12% CO₂. Operating experience at the Neuchatal, Switzerland plant is reported to be satisfactory following considerable system modifications. No data is available on the other Swiss facility.

Recently, special metal fabric baghouses have been used on several small municipal plants' modular combustion units (MCU). These plants include:

- Windham, Connecticut
- Portsmouth, New Hampshire
- Auburn, Maine

These facilities use stainless steel bags to eliminate the possibility of bag damage caused by fires. However, blinding of the bags has been a recurring problem at the plants due to variation in the moisture content of the flue gas. At the Windham plant, blinding of the bags was so severe that the suction from the fan collapsed the bags.

A 200 tpd facility in Gallatin, Tennessee was originally equipped with baghouses which incorporated fabric bags coated with teflon and a particle ionization system for enhanced submicron particulate removal. The ionization system consisted of an ion-emitting wire within the bag. The bags at this facility suffered burn spots and fires and ultimately the baghouse was abandoned and replaced with an ESP.

The best operating record is that of the Framingham unit, which has been in operation since 1979. It should be noted that the Framingham unit is not equipped for energy recovery. This system, incorporating acid gas neutralization, is applied to the 500 tpd municipal incinerator (volume reduction only) and differs from conventional fabric filter applications. The Framingham, Massachusetts unit (500 tpd) reported an average particulate emission rate from three compliance tests of 0.0266 gr/dscf @ 12% CO₂. The Framingham facility utilizes the Teller dry scrubber that involves acid gas neutralization and particle pretreatment prior to collection in a baghouse. The pretreatment consists of dry injection of a crystalline material for the protection of the bags against blinding, cementation and burning embers. Bag life was 2.5 years, even with weekly shutdowns on weekends.

Dry scrubber and baghouse systems have also been installed and tested at the Marion County, Oregon 550 tpd resource recovery facility. The facility consists of two-275 tpd mass burn units, each with a dedicated air pollution control system, which include dry crystalline material injection for bag pretreatment identical to that provided at the Framingham, MA incinerator. The results obtained during the facility acceptance test showed high removal efficiencies of particulate:

Marion County, OR ^a Resource Recovery Facility Particulate Emissions				
	Unit #1		Unit #2	
	Avg.	Max.	Avg.	Max.
Emissions, gr/dscf @ 12% CO ₂	0.016	0.021 ^b	0.004	0.006
Opacity	Visible Emissions 0%			

^a Reprinted from Ogden Martin Systems, Inc. stack test report dated November 7, 1986 to the Oregon Department of Environmental Quality.

^b Baghouse was bypassed for five minutes during the test run.

Because the filter bags are directly in contact with the combustion gases, the filter bag material is an important consideration in baghouse design. It is critical to use filter bags that can withstand a range of gas temperatures, corrosive and abrasive constituents in the gas stream.

Based on very limited operating data, bag life projections are difficult to estimate. The Framingham facility which uses the reverse-air bag cleaning technique (gentler than other methods) required total bag replacement after 2.5 years, but had some bag failures after 2 years. It is estimated that complete bag replacement would be required every 2.5 years on a RRF.

Thus, the major uncertainty of fabric filtration systems when used as the sole device, as compared to ESPs, is their reliability, which is dependent on bag life and other variables, and can result in both increased emissions and increased O&M costs. When the baghouse follows a dry scrubber, the scrubber should protect the fabric bags from high-temperature surges. The data on operating baghouse applications on resource recovery facilities reveals that the baghouse installations included a dry scrubber upstream (or in front) of the baghouse, which protects the fabric bags from any burning embers which could reach the baghouse.

Connecticut and California are requiring baghouses because metals and toxic organic compounds are believed to attach preferentially to submicron

particles. A baghouse may remove a higher percentage of the respirable particles than an ESP. The phenomenon in which submicron particles contain a higher percentage by weight of heavy metals than the total particulate matter is known as an enrichment factor.

4.4.2 COMPARISON OF PARTICULATE ALTERNATIVE CONTROL STRATEGIES

The comparison of the alternatives was performed based on energy, economic and environmental criteria. These criteria were determined as follows:

Energy

The amount of energy consumed (kWh) was calculated for each alternative as shown below.

ESP. Power required of an electrode charging transformer, the induced draft (I.D.) fan for the pressure drop across the ESP (1.0 inch water column), and fly ash collecting system (screw conveyors).

Baghouse. Power required for compressed air by compressors for pulse cleaning of bags, the I.D. fan for the pressure drop across the baghouse (6.0 inches water column), and fly ash collecting system (screw conveyors).

The power required for of the I.D. fan is related to the gas volume handled. For this BACT review, the gas exiting the dry scrubbers was used in calculating the power consumption of the I.D. fan. This gas analysis is shown below.

<u>Item</u>	<u>Quantity</u>
Flow	60,000 acfm per furnace (1 out of 4)
Temperature	250°F
Density	0.0518 pounds/cubic foot

The power requirements for the ESP and baghouse were based on equipment vendor supplied information. The economic effect of the energy consumption is presented in the economic section. The power required by the alternatives is shown in Table 4-12.

Economic

The annual capital and operating costs for each alternative were calculated. They included the amortization (20 years at 8 percent) of the capital cost of the equipment, cost of consumed energy, preventive maintenance and labor. All operating costs are based on operating the facility at nameplate capacity (1200 tpd of waste) for 365 days per year with 85 percent availability. The baghouse also included the cost of replacing the bags every 2.5 years. The cost of bag replacement is \$80,000 per year and was derived using the vendor supplied information. The economic data are shown in Table 4-12.

Another difference in the operating costs of an ESP and a baghouse relates to the different amount of lime consumed in the dry scrubber. Unreacted lime and remaining acid gases from the dry scrubber are allowed to react further on the fabric filter bag surfaces. A ESP does not offer the advantage of allowing the acid gases to further react. Thus, to compensate for this, the Dry Scrubber/Electrostatic Precipitator (DS/ESP) system will utilize a higher lime consumption rate. The cost associated with this addition of lime is included in Table 4-12. Firm vendor bids show an increase of 10 pounds of lime per ton of waste combusted for an ESP versus a baghouse for the same level of acid gas control.

Environmental

The environmental impacts for particulate matter were determined using the ISCST air quality dispersion model with one year of meteorological data and a radial receptor grid. The modeling protocol used was the same as that specified in Section 6.3. The GLC were compared to the PSD Class II allowable increments, PSD significant levels for air quality impacts, and FAAQS as shown in Table 4-13. The particulate emission rate using the ESP

TABLE 4-12

CAPITAL AND OPERATIONS/MAINTENANCE COSTS FOR PARTICULATE ALTERNATIVE CONTROL STRATEGIES

System and Outlet Grain Loading ^a	CAPITAL COSTS (IN 1000's \$)		POWER REQUIREMENTS AND ANNUAL O&M COSTS (IN 1000's \$)					Total Annual Cost
	Capital ^f Cost	Annualized ^b Capital Cost	Power (KW)	Power ^c Cost	Labor ^d Cost	Maintenance Materials & Supplies ^g	Special Costs	
ESP @ 0.015 gr/dscf	11,039	1,125	295	88	30	42	155 ^h	1,440
Baghouse 0.015 gr/dscf	8,522	868	240	71	30	42	80 ^e	1,091

^aCorrected to 12 percent CO₂.

^bAnnualized capital costs assume 20 year plant life and interest rate equals 8% (capital recovery factor = 0.1019).

^cPower costs assume plant operation for an entire year with 85% Availability. Power cost = \$0.04/kWh.

^dLabor costs assume base 1 man-year required at \$30,000/yr.

^eBag replacement every 2.5 years.

^fIncludes Bond Burden.

^gMaintenance assumed to be 0.5 percent of capital cost of baghouse.

^hLime and disposal costs due to extra consumption in ESP compared to baghouse.

TABLE 4-13

COMPARISON OF TSP CONCENTRATIONS FOR ALTERNATIVE PARTICULATE
CONTROL TECHNOLOGIES TO NAAQS AND PSD INCREMENTS

Control Alternative ^a	Annual Concentrations of TSP			24-Hour Concentrations of TSP		
	Estimated Maximum Impact (ug/m ³)	Percent of FAAQS (%)	Percent of PSD Increment (%)	Estimated Maximum Impact (ug/m ³)	Percent of FAAQS (%)	Percent of PSD Increment (%)
ESP @ 0.015 gr/dscf	0.05	0.08	0.26	0.41	0.27	1.1
Baghouse @ 0.015 gr/dscf	0.05	0.08	0.26	0.41	0.27	1.1

Regulated Concentrations

<u>Annual</u>	<u>24-Hour</u>
FAAQS = 60 ug/m ³	FAAQS = 150 ug/m ³
PSD Increment = 19 ug/m ³	PSD Increment = 37 ug/m ³
PSD Significance level = 1 ug/m ³	PSD Significance level = 5 ug/m ³

^aIncludes the operation of a dry scrubber.

or the baghouse is 1.95 gram per second. The ESP and baghouse result in a predicted GLC which consumes 0.26 percent of the annual PSD allowable increment. The ESP and baghouse result in a predicted GLC which consumes 1.1 percent of the 24-hour allowable PSD increment.

4.4.3 BACT DETERMINATION FOR TSP AND PM_{10}

A comparison of economic and environmental factors shown in Table 4-14 includes the following:

- Control efficiency of the strategy (percent)
- Tons of pollutant emissions controlled (tpy)
- Incremental controlled emissions (tpy)
- Annual control costs (\$/yr)
- Pollutant control costs (\$/ton of pollutant controlled)
- Tipping fee (\$/ton of waste combusted)

Either the baghouse or the ESP would control 11,265 tpy of particulate matter with a facility availability of 100 percent. The annual GLCs of both alternatives are equal which shows that there is not a significant environmental benefit of one alternative over another. Both alternatives would result in a less than significant impact on TSP and PM_{10} in the ambient air. Emissions of PM_{10} would also be minimized by either control alternative. The baghouse will result in an annual savings of \$349,000. Seventy-five percent of the cost difference is associated to capital cost, which will not escalate with time due to fixed interest rate financing. The remaining twenty-five percent will increase with inflation.

Tables 4-12 and 4-14 show that the baghouse is more cost effective than the ESP. There is not an environmental benefit of one alternative over another. An advantage of the ESP is that it has shown long-term

TABLE 4-14

COST COMPARISON OF PARTICULATE ALTERNATIVE CONTROL STRATEGIES

Particulate Alternative Control Strategy	Particulate Emission Rate, gr/dscf @ 12% CO ₂	Particulate Removal Efficiency, %	Controlled Particulate Emissions, TPY ^a	Incremental Controlled Particulate Emissions, TPY	Annual Control Costs 1000's \$/yr ^a	Control Costs \$/ton PM Controlled ^b	Tipping Fee Increase \$/ton ^{ac}
ESP	0.015	99.4	11,265	--	1,440	128	3.87
Baghouse	0.015	99.4	11,265	0	1,091	97	2.93

^aBased on operations for an entire year with 100% availability.

^bControl Costs (\$/ton of PM Controlled) equals the Annual Control Costs (1000's \$/yr) divided by the Controlled PM Emissions (TPY), i.e. $1,440 \times 10^3 / 11,265 = \$128/\text{ton}$.

^cTipping Fee Increase (\$/ton) equals the Annual Control Costs (1000's \$/yr) divided by the Tons of Waste Processed per year with 85% availability ($1200 \text{ TPD} \times 365 \text{ days/yr} \times 0.85 = 372,300 \text{ TPY}$).

reliability on waste fired applications. Baghouses are operating at Marion County, OR and Framingham, MA and as discussed previously the Framingham bags lasted 2.5 years. After a complete bag change is performed the baghouse could be considered to be in an almost-new condition (the filtering media is new). Thus, the baghouse is "renewed" every 2.5 years and they have been shown to be effective particulate collection devices for that period.

4.5 BACT REVIEW FOR TRACE METAL EMISSIONS

The combustion of MSW at RRFs, including the Pasco County RRF, will result in the emission of numerous trace metals. The quantity and characteristics of these pollutants depends on the composition of the waste, the chemical and physical properties of the trace metals, operational features of the combustion process, and performance of the particulate control device. Trace metals found in the combustible and inert fractions of the waste may be liberated in their elemental forms, as a salt or an oxide in the combustion process.

Among the trace metals, four PSD regulated pollutants, lead (Pb), mercury (Hg), beryllium (Be) and arsenic (As) will be liberated in trace quantities during combustion in the furnace. The EPA criteria pollutant, Pb, is regulated by the National Ambient Air Quality Standard (NAAQS) while the non-criteria pollutants, Hg, Be and As, are regulated for facilities other than RRFs under the National Emission Standards for Hazardous Air Pollutants (NESHAP). These regulated pollutants are, however, subject to the BACT requirements of the PSD regulations. Generally, As and Hg are two of the more volatile trace metals liberated (volatilized) from MSW combustion due to the low boiling point temperatures of many of their compounds. Portions of these as well as other trace metals are expected to condense/adsorb onto particulate matter as the flue gas temperature decreases. The dry scrubber will aid in their removal by cooling the gas stream, thus allowing for condensation/adsorption to occur. An efficient particulate control device (baghouse) would then be able to remove a significant portion of these metals.

The proposed BACT for TSP and PM_{10} is a baghouse with an emission outlet rate of 0.015 gr/dscf at 12 percent CO_2 , and thus is proposed as BACT for the trace metals. The quantity of the trace metals in the MSW is small and regardless of which particulate control device (ESP or baghouse) is employed, the overall impact of these pollutants would be small when compared to standards and guideline levels. Ground-level concentrations were predicted using air quality dispersion modeling as described previously.

The Pb emission rate from the baghouse is 0.015 pounds per ton of MSW which equates to 3.4 tpy with 100 percent availability. This results in an incremental ground-level concentration of 0.02 ug/m^3 for a 24-hour average. This is approximately 1.3 percent of the NAAQS for Pb (1.5 ug/m^3 for a 3-month period) even without an adjustment for the difference in averaging times. Therefore, the Pasco County RRF is expected to have a minimal impact on ambient air quality with respect to Pb.

The Be emission rate from the baghouse is 1.3×10^{-6} pounds per ton of MSW which equates to 2.85×10^{-4} tpy with 100 percent availability. The resulting incremental ground-level concentration of Be from the baghouse is $1.73 \times 10^{-6} \text{ ug/m}^3$ for a 24-hour averaging time. Although no NAAQS/FAAQS exists for Be, NESHAP is based on an acceptable concentration of 0.01 ug/m^3 for a 30-day averaging period (40 CFR 61.32). The projected Be concentration for a 24-hour period is approximately 0.02 percent of the guideline defined for the longer 30-day average. Therefore, the Pasco County RRF is expected to have a minimal impact on ambient air quality with respect to Be.

The Hg emissions are typically unaffected by particulate control devices and are expected to be 1.4×10^{-2} pounds per ton of MSW which equates to 3.07 tpy of Hg with 100 percent availability. This results in an incremental ground-level concentration increase of 0.0186 ug/m^3 for a 24-hour averaging time. NESHAP for mercury is based on an acceptable concentration of 1.0 ug/m^3 for a 30-day averaging period (40 FR 48297). The projected Hg emission rate is 1.86 percent of the guideline.

Therefore, the Pasco County RRF is expected to have a minimal impact on ambient air quality for Hg.

The As emissions from the baghouse are expected to be 8.65×10^{-5} tpy and are expected to have a minimal impact on ambient air quality. There is no NAAQS for As, but inorganic arsenic emissions from primary copper smelters is regulated under NESHAPS. However, an acceptable ambient concentration was not used as the basis for setting the emission limitations.

Some data from Niro Atomizer shows reduced Hg emissions when a Niro dry scrubber is employed. However, for this analysis the degree of reduction achieved by the dry scrubber was not quantified and no reduction in Hg emissions was assumed. Therefore, BACT for Hg, Pb, Be and As is a baghouse with an outlet of 0.015 gr/dscf @ 12% CO₂.

4.6 BACT REVIEW FOR BY-PRODUCTS OF COMBUSTION

As a part of EPA's Report to Congress on the Municipal Waste Combustion Study (EPA, 1987), a set of combustion strategy elements termed "good combustion practices" were developed. These practices along with their preliminary specifications for each of the elements provides general guidance against which the goal of complete combustion sought. The following practices have been reviewed by trade and professional organizations such as the American Society of Mechanical Engineers and the American Boiler Manufacturers Association.

<u>Practice</u>	<u>Mass Burn Preliminary Target</u>
Design temperature at fully mixed height	1,800°F at fully mixed height
Underfire air control	At least four separately adjustable plenums. One each under the drying and burnout zones and at least two separately adjustable plenums under the burning zone.

Overfire air capacity (not an operating requirement)	40% of total air
Overfire air injector design	That required for penetration and coverage of furnace cross section
Auxiliary fuel capacity	That required to meet start-up temperature and 1800°F criteria under part-load operations
Excess Air	6-12% excess oxygen (dry basis)
Turndown restrictions	80-110% of design - lower limit may be extended with verification tests
Start-up procedures	On auxiliary fuel to design temperature
Use of auxiliary fuel	On prolonged high CO or low furnace temperature
Oxygen in flue gas (continuous monitor)	6-12% dry
CO in flue gas (continuous monitor)	50 ppm on 4 hour average - corrected to 12% CO ₂
Furnace temperature (continuous monitor)	Minimum of 1800°F (mean) at fully mixed highest across furnace
Adequate air distribution	Verification test

The combustion optimization strategy may do little for the control of other than carbon monoxide and volatile organic compounds, however. Combustion optimization is expected to have little impact on acid gases and particulate matter and may increase emissions of NO_x and metals.

The above combustion practices are operational guidelines not proposed permit condition for the Pasco County RRF. The combustion control measures proposed as BACT for emissions of NO_x , CO and VOC are described below.

4.6.1 BACT DETERMINATION FOR OXIDES OF NITROGEN (NO_x)

Oxides of nitrogen (NO_x) are products of combustion processes, including refuse combustion, with nitric oxide (NO) being the predominant form produced. A small amount of NO is further oxidized to form nitrogen dioxide (NO_2), a brown-red gas, which in the presence of sunlight and hydrocarbons can react to form ozone (O_3) and other secondary pollutants.

NO_x emissions are generated in fuel combustion by two separate sources. NO_x is formed by the reduction and subsequent oxidation of the available organically bound nitrogen in the fuel (fuel NO_x). NO_x formation also results from high temperature oxidation of atmospheric nitrogen which enters into the combustion process as part of the combustion air (thermal NO_x).

Though the precise mechanism by which fuel and combustion air nitrogen are converted to NO_x is not completely understood, the relative quantities of fuel NO_x and thermal NO_x are known to be a function of furnace design factors, refuse composition and plant operating parameters. Reports generally support the theory that most NO_x emissions resulting from refuse firing are fuel nitrogen oxidation.

The prime factors affecting the formation of thermal NO_x are the quantity of oxygen present in the combustion zone and the flame temperature. The rate of nitrogen oxide formation tends to increase significantly with temperatures above 2,100°F, particularly if the oxygen concentration in the combustion zone is greater than approximately 2 percent by volume. The formation of fuel NO_x is strongly affected by the mixing rate of the fuel and combustion air (flame intensity), the quantity of oxygen present in the primary combustion zone, and the nitrogen content of the fuel. The proportion of fuel nitrogen that may be oxidized in the primary combustion

zone tends to diminish as the nitrogen content increases. This is due to the limitation of free oxygen in that zone and is a function of the excess air, manner of fuel burning, and combustion air distribution.

The control of NO_x emissions from the proposed facility are inherent in the design and operation of the furnaces. Thermal NO_x formation will be inhibited by controlling flame temperatures. Currently, NO_x control techniques other than standard refuse combustion control techniques (i.e. the proper distribution of combustion over and underfire air supply and temperature maintenance) are not normally applied to mass-burning systems. Besides reducing NO_x emissions through the design and operation of the furnace, NO_x emissions may potentially be reduced at refuse-burning facilities by other methods: minimizing the quantity of NO_x generated during combustion (combustion modification), and by reducing the quantity of NO_x in the flue gas stream (flue gas controls).

Combustion modification techniques such as flue gas recirculation (FGR) and staged combustion can potentially be used to reduce NO_x emissions from refuse-fired incinerators. FGR, however, has been employed more than staged combustion on MSW facilities with applications in Japan, West Germany, and Denmark. Combustion modifications have not been employed on U.S. MSW facilities. In staged combustion, fuel is burned under starved air conditions such that the combustion gas temperatures are significantly below the adiabatic flame temperature and until there is no available oxygen. Following some heat removal in the boiler, additional air is added downstream to allow complete combustion of the cooler flue gases. The initial step drives the fuel nitrogen into the gas-phase with the net-effect of lowering the amount oxidized during combustion to thermal NO_x levels at the reduced temperature. FGR operates by lowering peak flame temperatures by dilution thus, decreasing thermal NO_x formation.

Staged combustion has been applied successfully to fossil fuel fired boilers. Tests of its effects on a tangentially-fired pulverized coal boiler operating at 16 percent excess air indicated that a NO_x emission reduction of 33 percent was achievable. The direct application of these results to MSW combustion are not possible. The tangential burning of

pulverized coal at 16 percent excess air is a completely different mechanism than the moving grate or travelling grate spreader stoker operating at much higher excess air levels in MSW combustion.

To some extent, a form of staged combustion can be attempted in today's MSW furnaces through the strategic use of under and over-fire air injection. Informal testing at a North Andover, MA RRF on the effects of controlled and reduced combustion air levels on NO_x emissions showed approximately a 20% reduction. The test conditions, however, resulted in immediate boiler instability and slagging with the expectation of future boiler corrosion. It was concluded that this approach to staged combustion as a NO_x control method for MSW incinerators is not feasible due to boiler problems and associated reduction in availability. Thus, the possible operational problems associated with staged combustion and its lack of application on U.S. resource recovery facilities does not warrant its implementation at the Pasco County RRF.

Flue gas recirculation (FGR) is a combustion modification which reduces NO_x emissions by extracting a portion of the flue gas and returning it to the furnace through the burner windbox. The system consists of an FGR fan assembly, air apportioning and mixing system, and ductwork necessary to connect the stack to the windbox. Because the recirculated flue gas is relatively cool, the bulk furnace temperature decreases, resulting in a reduction of thermal NO_x formation. FGR is commercially available and applicable to all gas and distillate oil-fired industrial boilers, since NO_x emissions due to firing of these low-nitrogen fuels are contributed mostly by thermal NO_x . FGR is not, however, as effective for residual oil- and coal-fired boilers, since much of the total NO_x emissions may be attributed to fuel- NO_x , the type of NO_x minimally controlled by FGR.

FGR has been applied at MSW facilities in Japan and Europe by ducting cool flue gas from a point after the air pollution control device back to the underfire air fan. Since MSW contains relatively high amounts of nitrogen, as with coal and residual oil, and since it is generally accepted that NO_x generated from refuse is primarily due to fuel nitrogen conversion and not oxidation of atmospheric nitrogen, flue gas recirculation is expected to

achieve only limited NO_x reduction on refuse-fired facilities. Results from experimentation at a 660 TPD refractory wall furnace at the Kita refuse burning facility in Japan indicated that only a 25 percent NO_x emission reduction was achievable.

Little data is available to support that FGR will improve NO_x control at the Pasco County RRF when used in conjunction with the proposed combustion controls. Thus, FGR would be expected to be only of limited effectiveness in controlling NO_x and therefore, does not warrant the installation expense and lower fuel efficiency caused by a decrease in optimum flame temperature.

Flue gas controls appear to offer the greatest potential for NO_x reductions though their application on full-scale RRFs has been limited. The controls which have been applied to combustion processes are selective catalytic reduction (SCR) and selective non-catalytic reduction (SNCR). The SNCR system involves the intimate contact of ammonia and flue gas NO_x in the boiler through the use of injectors located in the boiler's wall. Like SNCR, the SCR technology also injects ammonia into the flue gas, however, its reaction with NO_x is at a lower temperature and enhanced by using a catalyst bed.

Critical to the success of the SNCR process is the prevailing flue gas temperature (1,600–1,800°F) which can be difficult to control due to variations in refuse composition. If the flue gas in the boiler rises to above 1,800°F and ammonia is allowed to come in contact, than a counter productive situation (reaction) occurs with more NO_x being produced. Below 1,600°F, ammonia will not react and thus, can freely pass through the system (ammonia slippage) and into the ambient atmosphere.

Several technical difficulties have been reported with the SNCR technology. Maintaining furnace gas temperatures in the optimal temperature range poses problems. Hence, a major concern over use of ammonia injection is the effect of the NH_3 breakthrough in the flue gas. Residual NH_3 may react with sulfuric acid (H_2SO_4) and hydrochloric acid (HCl) to form ammonium sulfate $[(\text{NH}_4)_2\text{SO}_4]$, ammonium bisulfate (NH_4HSO_4), and ammonium chloride

(NH_4Cl). NH_4Cl is a dry, neutral pH, white salt which forms as a finely divided fume at low temperatures (250°F or less) which can contribute to a visible plume when present in sufficient concentrations. The acidic hygroscopic compound, NH_4HSO_4 , has a relatively low melting point (as low as 266°F) and therefore can contribute to significant fouling and corrosion in low temperature heat recovery equipment. The potential for cyanide formation from chemical reactions between ammonia and hydrocarbons poses potentially worse environmental trade-offs (CARB 1984).

The SNCR system has been applied primarily in Japan at several installations on small-to medium sized incinerators. U.S. installations appear only in California with one unit operating (Commerce RRF) and another planned (Stanislaus RRF). It should be noted that both of the California RRFs are in non-attainment areas for NO_x thus, the SNCR systems represent LAER and not BACT. The largest of the Japanese units features three Mitsubishi-Martin furnaces rated at 300 tpd of refuse. Tests on these units from 1976 to 1978 indicated that denitrification efficiencies of approximately 60 percent were possible with ammonia breakthroughs of 30 ppmv. These efficiencies were accomplished by controlling furnace temperature and the molar injection ratio. California's 300 tpd Commerce RRF has been operating since February of 1987 with a SNCR system that achieves an average NO_x reduction of 40 percent. The system, permitted as "Innovative Technology," has had minimal operating problems with no ammonium chloride visible in the plume although some ammonia breakthrough does occur. The Stanislaus facility, in its 12th month of construction, has been permitted with a SNCR system as being able to achieve NO_x reductions of 43.5 percent.

In the SCR process, after the anhydrous ammonia is injected into the flue gas stream, the mixture passes through a catalyst bed, located between the boiler and the economizer, where NO is converted to N_2 . The function of the catalyst is to effectively lower the activation energy of the NO decomposition reaction. The reaction is allowed to proceed in a cooler part of the flue gas stream, rather than in the furnace at high temperatures (1,600-1,800°F) as required with the SNCR. Optimum temperature for reduction using SCR is between 530 and 800°F. Lower

temperatures yield slow reaction rates; higher temperatures result in a shortened catalyst life.

SCR systems have been experimented at facilities firing coal or oil; NO_x removal efficiencies in excess of 90% have been reported. In addition, high reductions have been achieved on full-scale operations with the catalyst located both upstream and downstream of the particulate control device. In contrast, refuse-fired boilers have encountered difficulties with the use of SCR for NO_x control, particularly because of catalyst fouling due to difficulties with particulate and/or condensable removal. In applications where the catalyst is upstream of the particulate removal device, the relatively high particulate grain loading of the flue gas fouls the catalyst, rendering the bed ineffective for NO_x removal. The particulate may erode the catalyst and substrate material, or may poison or blind the catalyst.

SCR has been applied extensively on a development basis to oil, gas and coal fired boilers in Japan; has been tested on oil and gas fired boilers in the U.S.; and has been applied to coal-fired boilers in the U.S. on a limited basis. No refuse incinerator, however, in the United States has been equipped with SCR. In addition, no firm vendor guarantees have been offered. As a result, SCR cannot be considered as a control alternative under the guidelines established for determining BACT.

Summarizing, beyond the standard combustion controls used at RRF (i.e. furnace temperature maintenance and combustion air distribution), only the SNCR system has been applied at RRFs with one operating and another unit planned in the U.S., and several others in Japan. The operating U.S. installation has been able to achieve limited NO_x control (average 40% reduction) with minimal operational problems. Implementation in the U.S., however, has occurred in non-attainment areas for NO_x (California) and thus represent LAER and not BACT. Consequently, since the SNCR has limited operating and reliability data on U.S. resource recovery facilities and the projected NO_2 impacts from a Pasco County RRF will be well within compliance of the NAAQS/FAAQS, additional NO_x control are not warranted.

The proposed system for controlling NO_x emissions is standard combustion controls. The temperature within the furnace chamber will be below 2100°F , thus inhibiting the formation of thermal NO_x . Also, O_2 analyzers will be installed on each combustion train to ensure that the proper quantity of excess air is added to the furnace.

The emissions of NO_x from the proposed facility are projected to be 6.17 pounds per ton of MSW and equates to be 1,351 tpy based on 100 percent availability. At this rate the maximum annual predicted NO_2 impact concentration is 1.03 ug/m^3 , well below the annual NO_2 NAAQS/FAAQS of 100 ug/m^3 . Therefore, the proposed BACT for nitrogen oxides is combustion controls inherent in the system design, as mentioned above.

4.6.2 BACT DETERMINATION FOR CARBON MONOXIDE (CO)

Since carbon monoxide is a product of incomplete combustion, its formation in an incinerator is largely dependent on the underfire air dispersion to the grates, the underfire-overfire air ratio, the design of the overfire air jets, and the combustion temperature. Specific add-on technologies for control of CO have not been incorporated into present-day municipal incinerator designs. CO emissions are controlled in modern incinerators using commonly employed combustion control measures, i.e., control of the combustion air to achieve a furnace temperature high enough to achieve a good burnout of volatilized hydrocarbons, optimal placement of the overfire air jets, and the use of high-pressure air to promote good mixing and turbulence of unburned furnace gases with overfire air. Using these control measures along with continuously monitoring CO and O_2 to ensure good combustion provides adequate control of CO. No additional controls are required. The oxidation of CO to CO_2 will also increase the heat released by combustion. Allowing CO to exit the combustion system would be a loss of valuable energy.

Based on modern incinerator design the annual emission rate for CO is estimated to be 0.47 pounds per ton of MSW which equates to 103 tpy with 100 percent availability. The maximum hourly CO concentration is projected to be 56 ug/m^3 with a PSD hourly significance level of $2,000 \text{ ug/m}^3$. The

resulting maximum 8-hour CO concentration is projected to be 3.6 ug/m^3 , which is well below the 8-hour NAAQS/FAAQS of $10,000 \text{ ug/m}^3$. Therefore, the Pasco County RRF will not have a significant impact on ambient air quality with respect to CO. Therefore, BACT for CO is the proposed furnace design and combustion control system.

4.6.3 BACT DETERMINATION FOR VOLATILE ORGANIC COMPOUNDS (VOCs)

Like carbon monoxide, VOCs are the products of incomplete combustion. The modern grates and rotary kilns and combustion air control systems are designed to maintain elevated oxygen levels, and therefore provide for a near complete burnout of combustible organic compounds, thus limiting the formation of VOCs. As mentioned in the BACT for CO, VOCs will be controlled by ensuring that adequate excess air and furnace temperature is maintained, overfire air jets are located to produce adequate mixing of overfire air (O_2) with VOCs to achieve volatilization of the VOCs before leaving the furnace and CO and O_2 are continuously monitored for good combustion. The Pasco County RRF is projected to emit 0.20 lb/ton of waste, which equates to 44 tpy of VOCs at 100 percent availability. Modern resource recovery facilities have not incorporated any type of add-on control system to reduce HC emissions. Therefore, the combustion control system inherent in the furnace design is proposed as BACT for VOC.

4.6.4 BACT DETERMINATION FOR DIOXINS AND FURANS

Dioxin is a generic term for two groups of closely related chemical compounds called polychlorinated dibenzo-p-dioxins (PCDD or dioxin) and polychlorinated dibenzofurans (PCDF or furan). Structurally, they are similar with each composed of two benzene rings joined by either two oxygen atoms (PCDD) or one oxygen atom (PCDF). Their release into the environment is of particular concern because of the high toxicity of certain isomers. Tests disclose that out of the 75 PCDD and 135 PCDF isomers, 45 and 71 have occurred from MSW incinerator emissions, respectively. The chemical, physical and toxicological properties of each isomer vary according to their chemical structure. In general, the most toxic isomers are those having four chlorine atoms located at the molecules' lateral positions.

Consequently, attention and research have focused towards 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD).

Numerous quantitative emission tests have been conducted for PCDD and PCDF from MSW combustion since 1977 when Olie reported their occurrence in the flyash of three MSW incinerators in the Netherlands. Tests on MSW facilities mainly have been done in the United States, Canada, Italy, France, West Germany, Sweden and Japan with results showing considerable emission variations. These variations result from a variety of factors, including sampling protocol, analytical techniques, furnace design and operation, control technology design and performance and waste characteristics.

Many studies have been performed trying to explain what mechanisms are involved in the formation of PCDDs and PCDFs from all sources including MSW combustion. The literature indicates that PCDD and PCDF emissions from MSW incinerators may be formed by a number of mechanisms, however, three principle theories exist. The first suggests that PCDD and PCDF emitted during combustion, actually enter the process as trace components of the waste stream. The remaining theories are based on the conclusion that they are formed during the combustion process. One hypothesizes that they are produced from precursors such as PCBs and chlorophenols which undergo a chemical change during combustion. Although this theory is supported by laboratory studies, no evidence exists to support this for full-scale incinerators (Daly 1985). The other theory proposes that they are formed via "de novo" synthesis from unrelated materials becoming chlorinated during the combustion process.

Beyond the theories already mentioned, a more recent one explaining the formation of PCDDs and PCDFs was first suggested by Eiceman in 1982. The theory presumes that reactions occur between precursors and chlorine donors after being adsorbed from the gas phase onto the flyash surface rather than reacting principally in the gaseous phase. These reactions are expected to occur in the cooler downstream temperatures of the furnace. The underlying concept is that the flyash surface is very porous material with an extremely large surface area that allows for reacting molecules to be

adsorbed. After adsorption, the flyash acts as a catalyst due to previously adsorbed metals and thus, promotes the reactions necessary to form PCDDs and PCDFs.

The levels of PCDDs appear to be affected by combustion conditions which can be controlled and monitored in modern incinerators. Based on performance data at the Hamilton, Ontario, and Issy, France, incinerators, there is an apparent correlation between combustion conditions and trace organic emissions (Hasselriis 1984). The primary factors affecting PCDD and PCDF formation are combustion air distribution, excess air, combustion temperatures, and residence time at temperatures over 1,400°F. As evidenced in this study, PCDD and PCDF emissions were virtually extinguished at operating temperatures above 1400°F.

The furnaces for the Pasco County RRF will be designed with enhanced flue gas mixing and well operated at temperatures at or above 1,800°F with flue gas residence times exceeding one second. Auxiliary burners will automatically ignite if temperatures in the furnace falls below a predetermined set point. Therefore, emissions of PCDD and PCDF, as well as any possible precursor, should be minimized through the design of the furnace and combustion control system. Flue gas constituents, such as CO, O₂ and CO₂ and combustion temperatures will be continuously monitored to control combustion efficiency in the furnaces. Those which are formed may be controlled by the dry scrubber and the highly efficient particulate control device by removing particulates which have PCDDs and PCDFs adsorbed or condensed on them.

Consequently, BACT for PCDD and PCDF is proper combustion operation and design of the furnace as well as the operation of a highly efficient particulate control device. The particulate control device (baghouse) will be designed to achieve an outlet grain loading of 0.015 gr/dscf corrected to 12 percent CO₂. It is estimated that 7.45×10^{-6} tons/yr of PCDD/PCDF will be emitted from the facility (expressed as 2,3,7,8-TCDD toxic equivalence).

5.0 EXISTING AMBIENT AIR QUALITY

5.0 EXISTING AMBIENT AIR QUALITY

5.1 NATIONAL AND FLORIDA AMBIENT AIR QUALITY STANDARDS

The EPA has established ambient standards for certain criteria pollutants as mandated by the Clean Air Amendments of 1970 (P.L. 91-604). These standards, known as the National Ambient Air Quality Standards (NAAQS), are set at two levels. Primary standards define levels which are necessary to protect the public health. Secondary standards define levels which protect the public welfare. The pollutants regulated under NAAQS are sulfur dioxide (SO_2), particulate matter (as particles with an equivalent aerodynamic diameter of less than 10 microns, PM_{10}), carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2) and lead (Pb). Recently the NAAQS for total suspended particulate matter (TSP) was rescinded, but the PSD increments for TSP remain. (A more detailed discussion of PSD increments for particulate matter is presented in Section 2.0).

On July 1, 1987, EPA promulgated final rules that replaced the TSP ambient air quality standards with standards for PM_{10} as an indicator of potential impacts to the public health and welfare from particulate matter (52 FR 24634). The PM_{10} ambient air quality standards were promulgated because they represent a direct measure of inhalable particulate matter and relate more closely than TSP to potential impacts on human health. A new reference method for sampling ambient concentrations of PM_{10} was established and included in the regulations as Appendix J. EPA also promulgated Appendix K which describes the rule for applying the new statistically based PM_{10} standard. The new particulate standard became effective on July 31, 1987.

The Florida Ambient Air Quality Standards (FAAQS) are a single set of standards which incorporates both the federal primary and secondary standards. The FAAQS for SO_2 annual and 24-hour averaging periods are more stringent than the national standards. The Florida standards for particulate matter are expressed as TSP. The demonstration of compliance with ambient air quality standards were based on the more stringent of the

NAAQS or FAAQS for each pollutant. The NAAQS and the corresponding FAAQS, as defined in the Florida Administrative Code (F.A.C.) 17-2.300, are presented in Table 5-1.

Each state has been given the primary responsibility for maintaining air quality by submitting a State Implementation Plan (SIP) to EPA. The state has defined geographic areas as attainment or non-attainment for the NAAQS based on ambient monitoring data in those areas. Areas that cannot be defined due to the lack of ambient air data are designated as unclassifiable. Areas designated unclassifiable may be treated as attainment until further information becomes available.

To implement the new PM_{10} standard, EPA has promulgated a transition policy. To avoid disruption of the existing particulate control program, a state's existing State Implementation Plan (SIP) for TSP will remain in effect until a PM_{10} SIP is approved by EPA. The existing regulations will continue to be enforced during the transition period. The area designations of attainment or non-attainment for TSP will also remain. When EPA approves the state's control strategy as sufficient to attain or maintain the PM_{10} NAAQS, it will also approve area redesignations for PM_{10} . An area designation for particulate matter must be retained until EPA promulgates PM_{10} increments because the PSD increments depend on the existence of attainment area designations.

In accordance with F.A.C. 17-2.410, 17-2.420 and 17-2.430, Pasco County, adjacent counties and subsections of these counties have been designated as nonattainment, attainment or unclassifiable with respect to each air pollutant which has a FAAQS. Pasco County is wholly designated attainment for TSP, NO_2 , CO, O_3 and Pb. The southwest corner of the county is designated unclassifiable for SO_2 , whereas the remainder of the county is designated attainment for SO_2 .

The EPA document "Procedures for Estimating Probability of Nonattainment of a PM_{10} NAAQS Using Total Suspended Particulate or PM_{10} Data" (EPA-450/4-86-017) and the "Interpretation of the National Ambient Air Quality Standards for Particulate Matter" (40 CFR 50, Appendix K) were used

TABLE 5-1

SUMMARY OF AMBIENT AIR QUALITY STANDARDS NATIONAL (40 CFR 50) AND FLORIDA (F.A.C. 17-2.300) (a)

Contaminant (b)	Averaging Period	FAAQS			NAAQS					
		Conc.	Units	Stat. (c)	Primary			Secondary		
					Conc.	Units	Stat. (c)	Conc.	Units	Stat. (c)
	Annual (0.02)	60 (PPM)	ug/m ³	A.M. (0.03)	80 (PPM)	ug/m ³	A.M.			
SULFUR DIOXIDE (SO ₂)	24-hour	260 (0.1)	ug/m ³ (PPM)	MAX.	365 (0.14)	ug/m ³ (PPM)	MAX.			
	3-hour	1300 (0.5)	ug/m ³ (PPM)	MAX.				1300 (0.5)	ug/m ³ (PPM)	MAX.
CARBON MONOXIDE (CO)	8-hour	10 (9)	mg/m ³ (PPM)	MAX.	10 (9)	mg/m ³ (PPM)	MAX.			
	1-hour	40 (35)	mg/m ³ (PPM)	MAX.	40 (35)	mg/m ³ (PPM)	MAX.			
OZONE (O ₃)	1-hour	235 (0.12)	mg/m ³ (PPM)	MAX.	235 (0.12)	mg/m ³ (PPM)	MAX.	235	ug/m ³	MAX.
NITROGEN DIOXIDE (NO ₂)	Annual	100 (0.05)	ug/m ³ (PPM)	A.M.	100 (0.05)	ug/m ³ (PPM)	A.M.	100	ug/m ³	A.M.
PARTICULATE MATTER	Annual	60 (as TSP)	ug/m ³	G.M.	50 (as PM ₁₀)	ug/m ³	A.M.	50 (as PM ₁₀)	ug/m ³	A.M.
	24-hour	150 (as TSP)	ug/m ³	MAX.	150 (as PM ₁₀)	ug/m ³	MAX.	150 (as PM ₁₀)	ug/m ³	MAX.
LEAD (Pb)	3-month	1.5	ug/m ³	A.M.	1.5	ug/m ³	MAX.			

(a) As last officially amended on October 20, 1986.

(b) Gaseous concentrations are corrected to a reference temperature of 25°C and to a reference pressure of 760 millimeters of mercury.

(c) All MAX. values are not to be exceeded more than once per year. The O₃ Std. may not to be exceeded more than one day per year.

A.M. = Arithmetic Mean of 24-hour average concentrations

G.M. = Geometric Mean of 24-hour average concentrations

to assess the status of ambient air quality for PM_{10} at the proposed site. Based on the studies that attempted to correlate TSP hi-vol sampling data to the fraction of a sample that was PM_{10} , no statistically significant correlation between PM_{10} fraction and site descriptors (e.g., urban, rural, or industrial) or geographic location was found. Thus, a probabilistic approach was adopted to assess the likelihood of PM_{10} attainment. The procedure for determining the probability of PM_{10} attainment from TSP data only are described below.

- Annual Averaging Period—Calculate the average arithmetic mean TSP level using the most recent 3 years of data; then estimate the probability of nonattainment using the observed annual arithmetic mean TSP concentration and the national distribution of annual arithmetic mean PM_{10} /TSP ratios.
- 24-Hour Averaging Periods—Estimate the probability of individually observed 24-hour TSP concentrations exceeding the 24-hour PM_{10} standard using observed 24-hour TSP data, the relationship between the probability of exceeding the 24-hour PM_{10} concentration and the equations which account for completeness of the data collection.

There are no TSP monitors within Pasco County. But based on a review of Florida ambient monitoring data from, the surrounding counties for the most recent three years, 1984 to 1986, the estimated background concentrations for TSP are 86.8 ug/m^3 for a 24-hour average and 45.2 ug/m^3 for an annual arithmetic mean. Thus, even if the TSP data are assumed to be entirely PM_{10} , the probability of exceeding the PM_{10} 24-hour and annual ambient air quality standards is zero.

The ambient air quality for the seven counties (Table 5-2) abutting Pasco County is in attainment for all FAAQS except for portions of Hillsborough and Pinellas counties. A 452 square-kilometer section of Hillsborough County centered about the intersection of U.S. 41 South and State Road 60 is designated nonattainment for TSP; the northernmost boundary of this area is more than 20 km from the Pasco County RRF site. Northernmost Pinellas

TABLE 5-2

NAAQS ATTAINMENT STATUS FOR SELECT COUNTIES WITHIN
THE WEST CENTRAL FLORIDA INTRASTATE AQCR

Location	SO ₂	TSP	NO ₂	CO	O ₃
Citrus Co.	A	A	A	A	A
Hernando Co.	A	A	A	A	A
Hillsborough Co.	U	NA ^a /A	A	A	NA
Lake Co.	A	A	A	A	A
Pasco Co.	U ^c /A	A	A	A	A
Pinellas Co.	NA ^b /A	A	A	A	NA
Polk Co.	A	U	A	A	A
Sumter Co.	A	A	A	A	A

REFERENCE: 40 CFR 81.310 (Revised 7/1/86)

Abbreviations: A = in attainment or unclassifiable for the specific pollutant

NA = nonattainment status for the specific pollutant

U = not classifiable for the specific pollutant

NA/A = portion of county is not in attainment for the specific pollutant whereas the remainder of the county is in attainment for that pollutant

^aNA status applies for that area in Hillsborough Co. circumscribed by a circle of 12 km radius with a focus at the intersection of U.S. 41 South and State Road 60. This area does not meet the TSP secondary standard.

^bNA status applies for the section of Pinellas Co. bounded on the south by 3112.00 UTM-North and on the east by 329.00 UTM-East, and on the north by the Pasco Co. line. The Gulf of Mexico forms a natural western boundary.

^cThe southwest section of Pasco County is unclassifiable for SO₂.

County, 20-25 km south-southwest from the proposed site, is designated nonattainment for SO₂ due to emissions from the currently nonoperational Stouffer Chemical Co. (The SO₂ nonattainment designation is expected to be rescinded in the near future¹. However, no formal notice of redesignation has been published in the Federal Register as of this document release date.) Polk and Hillsborough counties are unclassifiable for SO₂ and TSP, respectively.

5.2 AVAILABLE AMBIENT MONITORING DATA

There are numerous State and Local Air Monitoring Stations (SLAMS) and National Air Monitoring Stations (NAMS) operating in counties abutting Pasco County as shown in Table 5-3. A majority of the monitors used to develop criteria pollutant background concentrations for the Pasco County RRF site are located in Hillsborough and Pinellas counties toward the south and southeast. Background concentrations measured at these sites display an inherent conservatism from urban emissions influencing these monitor sites, but not the proposed site.

The proposed site is in a rural setting. An inventory of existing major SO₂ and TSP sources in the region indicates that there are few, if any, emitters located within 10 km of the Pasco County RRF site that could substantially degrade the local ambient air quality. Most major emitters, defined here as emission sources exceeding 1000 lb/hr of SO₂ or PM, are situated more than 40 km from the site. Included in this group are the Tampa Electric Company and Florida Power generating stations including Gannon, Anclote, Higgins, Bartow and Big Bend. The only exception is Anclote (Unit 1) which is 31 km southwest of the site.

There are no ambient air monitoring stations within 10 km of the Pasco County RRF site. The proposed site is in an area generally free from impacts of other major point and area sources. The low density of industry within 25 km of the proposed site suggests that there is an associated low probability of a significant impact on air quality by such sources near the

¹Information from a conversation with Mr. Tom Rogers, Meteorologist, DER, Tallahassee on September 3, 1987.

TABLE 5-3

NUMBER OF AMBIENT AIR MONITORS SPECIFIED BY COUNTY
AND CRITERIA POLLUTANT FOR 1986

County	Pollutant					
	SO ₂	PM	NO ₂	CO	O ₃	Pb
Citrus	2	3	0	0	0	0
Hillsborough	9	24	1	4	3	10
Pinellas	4	10	0	4	3	3
Polk	2	7	0	0	0	0

SOURCE: Florida DER Air Quality Statistical Report for 1986 (4/16/87)

Pasco County RRF site. Regional background concentrations for several pollutants were developed from available monitoring data from the surrounding counties. Most of the monitors for TSP and SO₂ are sited near major electric utilities. The nearest monitors for NO₂, Pb, and CO are located in congested urban areas. Therefore, the estimates of background concentrations derived from these monitors for the proposed site are conservative, because they are based on monitors that are influenced by major point and area pollution sources.

5.3 DEVELOPMENT OF BACKGROUND POLLUTANT CONCENTRATIONS

The criteria pollutant background concentrations proposed for use in the Pasco County RRF modeling study are presented in Table 5-4. Descriptions of the methodologies employed to calculate representative pollutant backgrounds are described in subsequent paragraphs. Each analysis used the most recent three years (i.e., 1984 to 1986) of Florida ambient monitoring data.

The sulfur dioxide background concentrations were developed based on the following criteria, as requested by DER:

- Use of only the continuous SO₂ monitor data for which the Pulsed Fluorescence Technique was employed.
- Consideration of only those monitors operating for at least the most recent three consecutive years or for 1986 alone.
- Consideration of only those monitors for which the 3-hour and 24-hour maximum concentrations did not include substantial influence from nearby SO₂ sources.

Monitors within the three abutting counties meeting at least the first two of these criteria are listed in Table 5-5. Four of the SO₂ monitors (marked with asterisks) were subsequently disqualified because they are located near the Big Bend and Gannon power plants. However, annual average concentrations from these monitors were retained for consideration in the

TABLE 5-4

PROPOSED BACKGROUND CONCENTRATIONS OF CRITERIA POLLUTANTS
FOR THE PASCO COUNTY RRF SITE*
($\mu\text{g}/\text{m}^3$)

Pollutant	Averaging Periods					
	1-hr	3-hr	8-hr	24-hr	Quarterly	Annual
SO ₂	-	456 ^a (35%)	-	103 ^a (28%)	-	26 ^b (43%)
TSP	-	-	-	87 ^c (58%)	-	43 ^c (73%)
PM ₁₀	-	-	-	87 ^g (58%)	-	45 ^g (90%)
NO ₂	-	-	-	-	-	39 ^h (39%)
Pb	-	-	-	-	0.4 ^e (27%)	-
CO	5,153 ^f (13%)	-	1,145 ^f (11%)	-	-	-
O ₃	222 ^h (94%)	-	-	-	-	-

Symbols:

H = Highest concentration

HSH = Highest, second-highest concentration

() = Number between parentheses denotes percentage of FAAQS consumed. PM₁₀ is compared to the NAAQS.Superscripts:

* = Selection based on 1984-1986 ambient monitoring data

^a HSH, SAROAD No. 1800-095-G02, 1984; 5012 Causeway, Tampa, Hillsborough County^b Highest Arithmetic Mean, SAROAD No. 4360-052-G01, 1986; HCEPC. OFC, Ybor City, Hillsborough Co.^c Refer to Table 5-6.^d SAROAD No. 4360-052-G01 1986; HCEPC OFC, Ybor City, Hillsborough County; Highest annual arithmetic mean for a continuous monitor with >75% data capture for 1986.^e SAROAD No. 1800-082-G02, 1986; County Maintenance Barn #82, Orient Road, Hillsborough County; Highest 3-month average concentration for 1986.^f Assumed 4.5 ppm (1-hour) and 1 ppm (8-hour) backgrounds based on data from the Florida Indirect Source Modeling Interim Guideline.^g Assumed that the TSP background concentrations are entirely PM₁₀.^h SAROAD No. 4360-035-G02, 1986; Coast Guard Station, Davis Island, Tampa, Hillsborough County.

TABLE 5-5

AMBIENT SO₂ MONITOR DATA USED TO DERIVE BACKGROUND CONCENTRATIONS FOR
THE PROPOSED PASCO COUNTY RRF DISPERSION MODELING STUDY

1984, 1985, 1986 Monitored Concentrations (ug/m ³)								
County	Address	SAROAD No.	Monitor	3-Hour Avg. HSH	24-Hour Avg. HSH	Annual+ H	Monitoring Location Relative to Pasco RRF Site++	
			Reference Letter				Distance (km)	Azimuth (degrees)
Hillsborough	Apollo Beach/Apollo Beach	1800084G02*	A	548,521,397	97,85,91	13,13,13	69.3	167.7
	5012 Causeway, Tampa	1800095G02	B	(456),376,360	(103),83,84	15,21,22	52.2	163.3
	Coast Grd. Sta., Davis Is.	4360035G02	C	393,287,350	82,67,77	19,14,20	50.3	168.8
	Ballast. Pt. Prk, Interbay Blvd.	4360053G02	D	383,265,340	69,69,84	16,15,20	54.3	172.5
	HCEPC OFC., Ybor City	4360052G01*	E	474,303,467	127,82,133	16,14,(26)	47.1	166.0
	Big Bend Road, Hillsb.	1800021G02*	F	437,637,475	82,134,99	13,15,16	67.2	163.5
Citrus	Crystal Rvr./Curtis Tool Co.	0580002F02	G	261,212,x	59,48,x	12,x,x	64.2	355.2
	Crystal Rvr./Twin Rvr. Marina	0580003J02	H	114,144,104	23,36,17	5,4,3	58.2	357.9
	East of FPC Plt./Crystal River	0580005J02	I	310,323,176	59,77,36	7,6,6	73.7	354.4
Pinellas	Pinellas Prk./11500 43rd Av.	3620002G05	J	266,258,202	71,61,75	10,10,11	57.5	193.7
	Derby Lane 10100 San Mar., St. Petersburg	3980023G02*	K	406,362,497	95,85,121	16,16,19	56.7	187.0
	303A Anclotte Rd., Tarpon Springs	4380001G02	L	96,92,122	28,30,28	5,6,6	31.2	223.6
	Brooker Creek Prk., Tarpon Springs	4380002G03	M	196,135,211	44,29,50	8,7,8	34.2	204.6

Data Source: Florida air quality statistical reports for 1984, 1985, and 1986 (Florida BAQM, Air Monitoring and Analysis Section)

Abbreviations: H = Highest
HSH = Highest, Second-Highest

Symbols: + = Arithmetic mean
* = Monitor impacted by local industry/utilities; not representative of general air quality
x = Less than 75% annual data collection efficiency
() = Selected ambient background SO₂ concentration (for given averaging period) proposed for Pasco Site
++ = Pasco Site stack coordinates are approximately 347.12 UTM-East, 3139.23 UTM-NORTH

selection of a conservative background concentration for the Pasco County RRF site.

The proposed background SO₂ concentrations are identified in Table 5-4. (Monitor references are hereafter made with the Table 5-5 letter designations).

The highest, second-highest 3-hour average SO₂ concentration of 456 ug/m³ is very conservative for the Pasco County RRF site. It was sampled at an urban monitor (B). The 3-hour average concentrations for monitors are lower than 456 ug/m³. The 103 ug/m³ 24-hour average concentration and 26 ug/m³ annual average concentration are the highest values for all non-influenced monitors for short-term averages and among all monitors for the long-term average, respectively. The distances between SO₂ monitors and the proposed site are listed in the second-to-last column of Table 5-5. The fact that the closest monitor (L) to the Pasco County RRF site has the lowest monitored SO₂ concentrations suggests that SO₂ background concentrations near the proposed site are probably lower than those listed in Table 5-4.

A background concentration for TSP was derived for the Pasco County RRF site from all three years of monitoring data for Hillsborough, Citrus, Pinellas and Polk counties. Because the proposed site is designated attainment for TSP, only monitors located in attainment areas of the surrounding counties were used to define the TSP background concentration. The proposed site is more than 20 km from the Hillsborough County TSP non-attainment area. The high, second-highest 24-hour average and highest annual geometric mean concentrations in Table 5-6 were computed by (1) adding the concentrations from all monitors within the four counties for individual years and eliminating any monitored concentrations within the TSP nonattainment area, and (2) dividing the composite concentration for each averaging period by the applicable number of contributing monitors. The computation results are presented in Table 5-6, and the 87 ug/m³ 24-hour average and 43 ug/m³ annual geometric mean concentrations are listed in the Table 5-4 background summary. These concentrations are conservative for use as Pasco County RRF site background concentrations for the following reasons:

TABLE 5-6

AMBIENT TSP CONCENTRATIONS AVERAGED FOR ALL MONITORS^a
($\mu\text{g}/\text{m}^3$)

Year	24-Hour Avg. HSH	Number of Monitors	Annual Average GM	Annual Average AM	Number of Monitors
1984	83.5	42	39.2	44.6	34
1985	(86.8)	39	41.1	44.0	34
1986	84.8	43	(42.9)	(45.2)	38

^a TSP data for Citrus, Hillsborough, Pinellas and Polk Counties from the Florida DER BAQM Air Quality Statistical Reports for 1984, 1985 and 1986.

Monitored concentrations $\geq 150 \mu\text{g}/\text{m}^3$ (24-hour avg.) and $\geq 60 \mu\text{g}/\text{m}^3$ (annual geometric mean) are not included in the calculations

() = Concentration within parentheses chosen as a TSP background concentration for the Pasco County RRF Site

AM = Arithmetic Mean

GM = Geometric Mean

- Urban monitors exposed to continuous resuspension of PM by vehicles, and the localized impact of small PM emitters and regional utilities were included in the calculations even though the Pasco County RRF site is rural.
- The highest computed concentration for the three year period (1984-1986) was used.

Total suspended particulate monitors from Citrus, Hillsborough, Pinellas, and Polk counties were included in the TSP analysis. As previously stated, a vast majority of these monitors were sited in areas containing urban sources. The highest percentage of the total monitors and the highest percentage clustered about urban sources were in Tampa. Thus, the background concentration is skewed in favor of an urban TSP background concentration.

The same monitors that were used to calculate the background TSP concentrations were used to estimate PM_{10} values. Assuming that the 24-hour average TSP concentration is entirely composed of particles with an aerodynamic diameter of less than 10 microns, the 24-hour PM_{10} concentration is 87 ug/m^3 . The average of the annual arithmetic means for the samplers defined above is 45 ug/m^3 in 1986. Assuming that all the TSP data are entirely PM_{10} , the annual PM_{10} concentration is 45 ug/m^3 .

A nitrogen dioxide (NO_2) background concentration was chosen from available 1986 monitoring data in Hillsborough County. The 39 ug/m^3 annual arithmetic mean concentration (Table 5-4) is the only 1986 monitored value available from a monitor site with greater than 75% data capture. It is consistent with 1985 reported NO_2 concentrations in urbanized Hillsborough and Pinellas Counties.

The Table 5-4 quarterly lead (Pb) background of 0.4 ug/m^3 is the highest value recorded in 1986. Since the recent trend for lead concentrations is distinctly downward due to the phase-out of lead additives in gasoline, 1986 concentration data should conservatively represent current conditions. The Pb background level at the rural Pasco County RRF site should be even

lower than the monitored value of 0.4 ug/m^3 due to less vehicle emissions in the vicinity.

The background CO concentrations are based on the values of 4.5 ppm ($5,153 \text{ ug/m}^3$) for a 1-hour average and 1 ppm ($1,145 \text{ ug/m}^3$) for an 8-hour average presented in the Florida Indirect Source Modeling Interim Guideline. These values are representative of rural CO concentrations and recommended by DER for use as the background CO concentrations at the Pasco County RRF site.

Ozone is not directly emitted from resource recovery facilities but is the result of complex atmospheric reactions. Of the six ozone monitors located in Hillsborough and Pinellas Counties only two have not reported violations of the ozone standard. Because Pasco County is designated as in attainment for O_3 , the highest hourly value from the second highest day of 0.113 ppm (222 ug/m^3) reported at these two monitors is used to represent background ozone concentrations at the Pasco County RRF site.

In summary, a set of conservative estimates of background concentrations has been developed for each criteria pollutant in the preceding paragraphs. Use of these conservative approximations, in conjunction with impacts predicted near the Pasco County RRF site, will ensure that compliance with the FAAQS will be maintained with a significant allowance for uncertainty in ambient air quality.

SECTION 6

6.0 AIR QUALITY ANALYSIS

6.0 AIR QUALITY ANALYSIS

6.1 OVERVIEW

The purpose of this section is to present the predicted Pasco County RRF air quality impacts. These concentrations were estimated using EPA guideline pollutant dispersion models and techniques discussed with and approved by Florida DER prior to starting the analyses. A detailed modeling protocol was approved by DER in a letter dated March 23, 1987 which is included as Attachment A. The results of the detailed modeling analysis demonstrate that the Pasco County RRF:

- will not violate any FAAQS or NAAQS
- will not be a significant consumer of TSP and SO₂ PSD Class II increments
- will not be a significant consumer of TSP and SO₂ PSD Class I increments at the Chassahowitzka National Wildlife Refuge (NWR)
- will not contribute to an exceedence of any PSD Class I increments at the Chassahowitzka NWR as a result of simultaneous combined impacts with post-baseline background emissions sources
- will not significantly impact or prevent reasonable further progress toward attainment of NAAQS and FAAQS in surrounding SO₂ and TSP nonattainment areas.

Therefore, the proposed facility will be in compliance with all applicable Florida and Federal guidelines and standards regulating air quality impacts from resource recovery facilities.

Section 6 is organized to provide a logical progression from the development of emissions source characteristics to the presentation of modeled pollutant impacts associated with the project.

A summary of source parameters for potential operating conditions, including stack parameters, exhaust gas conditions and pollutant emission rates is presented in Section 6.2. The selection of a dispersion model and presentation of the modeling protocol used to evaluate impacts from potential operating conditions are included in Section 6.3.

Two levels of air quality impact assessment were conducted: a screening modeling analysis and a detailed modeling analysis. Section 6.4 presents the results of the screening analysis and identifies the operating condition (i.e., 1,200 tpd refuse at 5,000 Btu/lb) that results in the highest ground level impacts. Air quality impacts from this worst case operating condition are then evaluated using more detailed modeling techniques that require five years of hourly meteorological data and an extensive receptor grid. The results of the detailed analysis are presented in Section 6.5 along with a discussion of the exemption from preconstruction monitoring requirements and the impact of pollutants not regulated under FAAQS and NAAQS. A demonstration of compliance with the FAAQS and NAAQS, based on the results for the detailed modeling analysis, is presented in Section 6.6. Section 6.7 assesses the potential impacts from noncriteria pollutants. Section 6.8 provides a demonstration of facility compliance with PSD Class I and Class II increments. At the request of DER, the Class I increment consumption demonstration included a source interaction analysis at the Chassahowitzka NWR PSD Class I Area.

6.2 SOURCE CHARACTERISTICS

The Pasco County RRF will have an initial design capacity of 900 tons per day (tpd) of reference waste with a higher heating value (HHV) of 4,800 Btu per pound of waste. The facility will have an ultimate capacity of 1,200 tpd of reference waste. The primary source of pollutant emissions is the facility stack from which combustion process gases are emitted to the atmosphere. Potential secondary sources of pollutant emissions include the

ash residue handling building and lime silos servicing the acid-gas scrubbers. These minor secondary sources will be enclosed and controlled through the use of a particulate control device and filters. (Secondary source emissions and impacts are discussed in Section 7.6). No significant quantifiable fugitive emissions will be generated from the proposed resource recovery facility.

The Pasco County RRF will receive municipal solid waste with an average heat content of 4,800 Btu/lb. At the design charging rate of 300 tpd per unit, the heat release in the furnace will be 120 million Btu/hr (MMBtu/hr) per unit. The refuse will be burned in four mass burning furnace/boiler units with combustion temperatures in excess of 1,800°F. The exhaust gases from the boiler of each unit will pass through a dry scrubber and baghouse with a particulate control efficiency of greater than 99 percent.

Each furnace/boiler will be equipped with a separate acid-gas scrubber followed by a baghouse (BH) to collect particulate matter. The dry scrubber will remove sulfur dioxide (SO_2) at an efficiency of 70 percent or 100 ppmdv corrected to 7 percent O_2 , whichever is less stringent. Hydrogen chloride (HCl) will likewise be removed at an efficiency of 90 percent or 100 ppmdv corrected to 7 percent O_2 , whichever is less stringent. The baghouse particulate emission limitation is assumed to be 0.015 grains-per-dry-standard-cubic-foot corrected to 12 percent CO , (gr/dscf @ 12% CO_2).

The flues from each of the four units will be enclosed in a single stack. The stack will attain a height of 275 feet above the stack base elevation. This stack height is equal to the good engineering practice (GEP) stack height defined for a squat building with a building height of 110 feet. Thus, the proposed stack is sufficiently high to avoid building aerodynamic wake and cavity effects. The method for determining the GEP stack height is outlined in Appendix 10.16 of the Power Plant Siting Application.

Each flue will have an inside diameter of 5 feet. An effective flue diameter of 10 feet was calculated from the total volumetric flow rate for four flues that maintains an exit velocity in the effective flue equal to

that of a single 5 foot diameter flue; this is in adherence to stack regulation revisions promulgated on July 8, 1985 in 50 FR 27892. The combining of flue gas streams from a stack with multiple flues to form a single larger plume is a real and observable phenomenon. The calculation of an effective diameter is allowable and correct because it accounts for this phenomenon without artificially increasing flue gas velocities and plume height.

While each furnace/boiler unit will have a design capacity of 300 tpd, the actual throughput will vary depending upon the season and the influence of programmed maintenance activities. Each unit at the facility will process waste at a rate between 75 and 110 percent of the nominal 300 tpd charging rate. The refuse heat content will also vary to some degree throughout the year. Seven operating conditions representing a broad range of possible refuse throughput and heat content combinations are presented in Table 6-1 and were modeled (Section 6.4) for their potential air quality impacts. Although the actual design case of 1,200 tpd throughput with 4,800 Btu/lb reference waste was not specifically included in the seven cases analyzed, it was used to calculate pollutant emissions presented in Table 6-2. The seven operating conditions in Table 6-1 bound the actual design case.

The emission rates presented in Table 6-2 are based on the design capacity of the Pasco County RRF. The emission rates used in the detailed air quality modeling analyses are normalized and adjusted relative to the design heat release. Thus, the ground level concentration for any pollutant can be obtained by multiplying the emission rate (in grams-per-second) from Table 6-2 by the normalized ground level concentrations (i.e., the X/Q values) predicted by the air quality dispersion model and presented in later sections.

6.3 MODELING METHODOLOGY

Computer-based mathematical dispersion models approved by DER and the EPA were used to evaluate air quality impacts due to emissions from the Pasco County RRF. Input data to these dispersion models were conservatively specified in order to prevent an underestimation of impacts. A screening

TABLE 6-1

SOURCE PARAMETERS OF SEVEN POTENTIAL
OPERATING CONDITIONS FOR THE PASCO COUNTY RRF

Facility Throughput (tpd)	Heat Content (Btu/lb)	Heat Release (MMBtu/hr)	Normalized Emission Rate ^a (g/s)	Stack Height (m)	Exit Temp. (K)	Exit Velocity (m/s)	Effective Stack Diameter ^b (m)
1320	4500	495	1.0313	83.8	394.3	15.77	3.05
1320	4000	440	0.9167	83.8	394.3	14.27	3.05
1200	5000	500	1.042	83.8	394.3	15.69	3.05
1200	4500	450	0.9375	83.8	394.3	14.33	3.05
1200	4000	400	0.8333	83.8	394.3	12.98	3.05
900	5000	375	0.7813	83.8	394.3	11.77	3.05
900	4500	338	0.7042	83.8	394.3	10.75	3.05

^aNormalized with respect to the nominal operating case, i.e., 1,200 tpd at 4,800 Btu/lb.

^bCalculation of effective diameter for four flues of equal diameter: Define the effective stack diameter for four flues as $D = (4A/\pi)^{0.5}$, where A is the combined area for four 5 ft. diameter flues (e.g., $D = 3.05$ m for $A = 78.54$ ft²). The gas exit velocity for the effective diameter stack is equal to that for each individual flue.

SOURCE: CDM, 1987

TABLE 6-2

ANNUAL AVERAGE EMISSION RATES OF POLLUTANTS FOR THE
PASCO COUNTY RESOURCE RECOVERY FACILITY

Pollutant ^c	Controlled Emission Rate ^a	
	(lb/hr)	(g/s)
Particulate Matter (as TSP or PM ₁₀)	15.5	1.95
Sulfur Dioxide (SO ₂)	108	13.5
Nitrogen Dioxide ^b (NO ₂)	309	38.9
Carbon Monoxide (CO)		
(Annual)	23.5	2.96
(8-Hour)	47.0	5.92
(1-Hour)	188	23.6
Hydrocarbons (HC)	10	1.26
Lead (Pb)	0.773	0.0974
Fluoride (as HF)	3.85	0.485
Sulfuric Acid (H ₂ SO ₄)	17.2	2.17
Hydrogen Chloride (HCl)	61.0	7.69
Mercury (Hg)	0.700	0.0882
Beryllium (Be)	6.50x10 ⁻⁵	8.19x10 ⁻⁶
Arsenic (As)	4.36x10 ⁻³	5.49x10 ⁻⁴
Dioxins (as 2,3,7,8-TCDD toxic equiv.)	1.70x10 ⁻⁶	2.14x10 ⁻⁷

^a Emission rates are based on 100% of the nominal capacity (i.e., 1,200 tpd at 4,800 Btu/lb) and continuous operation of the air pollution control system during reference waste firing. System availability is rated 100% for the modeling exercise.

^b Assumes total NO_x emissions are emitted as NO₂.

^c Dioxins, hydrogen chloride and arsenic are not PSD regulated pollutants (40 CFR 52.21).

SOURCE: CDM, 1987

modeling analysis was used to simulate plume dispersion under a variety of possible meteorological conditions, thereby identifying maximum pollutant ground level concentrations. A detailed modeling analysis was performed to determine the maximum pollutant concentrations for the worst-case operating condition using recorded meteorological data and site terrain data.

6.3.1 INDUSTRIAL SOURCE COMPLEX MODEL

The UNAMAP Version 6 of EPA's Industrial Source Complex Short-Term Model (ISCST) was the sole model used in the air quality impact analysis. It was developed for the EPA for the purpose of estimating impacts from industrial sources with complex geometries and multiple emission sources. It is the EPA-recommended impact assessment technique most appropriate for the characteristics of the proposed source and surrounding site dispersion environment. Recent revisions to ISCST have made it virtually identical to other EPA-approved models such as MPSTER and CRSTER for the treatment of sources not subject to aerodynamic wake effects.

The ISCST model is a steady-state Gaussian plume dispersion model which can be used to assess pollutant concentrations from a wide variety of sources associated with an industrial complex. For this study, the ISCST model was used to calculate ground level concentrations for all regulated pollutant concentration averaging periods. ISCST uses sequential hourly meteorological data to compute 1-hour average concentrations. Average concentrations (for 3-hour, 8-hour, 24-hour, and annual periods) are computed as arithmetic averages of blocks of successive hourly concentrations.

6.3.2 ISC MODEL OPTIONS

An ISCST simulation of the Pasco County RRF air quality impacts required an input of source parameters, receptor coordinates with terrain heights, and representative meteorological data. The input data were reviewed to ensure that they were likely to produce overestimates of ground level concentrations; conservative momentum and buoyancy fluxes were modeled to minimize plume rise and maximum downwind concentrations. The ISCST model

includes numerous options or switches which may be selected to simulate the impact from the Pasco County RRF. The modeling options used in the dispersion analysis conformed to DER procedures and EPA modeling guidance as presented in the "Guideline on Air Quality Models — Revised" (EPA, 1986) and included:

- Final plume rise. The ISC program is capable of evaluating the dispersion of a plume based on either final plume rise or transitional plume rise with distance. Final plume rise is the preferred option unless building wake effects are a possibility (i.e., if the stack height is not equal to a good engineering practice (GEP) stack height) or terrain above stack-tip occurs closer to the stack than the distance at which final plume height is realized.

The stack elevation included in the present Pasco County RRF design is a GEP stack height, and the terrain elevation does not exceed stack-top within the study area. Therefore, plume dispersion was evaluated based on final plume rise.

- Stack-tip downwash. The ISC model was programmed to allow modification of the stack height to account for downwash effects induced by the stack tip (Briggs, 1974) when the ratio of gas exit velocity to stack-tip wind speed is less than 1.5.
- Buoyancy-induced dispersion. The ISC model was programmed to increase the dispersion coefficients at the point of plume release to account for buoyancy enhancement of the plume from turbulent mixing and air entrainment and hence greater initial dispersion volume than without buoyancy.
- Calm Processing. The model employed an EPA calm-processing routine (CALMPRO) to calculate blocked concentrations when there are "calm" hours of preprocessed data with wind speeds of 1 meter per second occurring with directional persistence.

Calm hours are assigned a 1 m/s wind speed by the CRSTER preprocessor when the observed wind speed is less than 2 knots and the wind direction persists from the previous hour. Calm hours are treated as missing hours by CALMPRO. Short-term concentrations are estimated in an EPA prescribed manner to account for calms (EPA, 1986: Section 9.3.4).

- Pollutant Half-Life. Recent EPA guidance suggests including a half-life of 4 hours for modeling of SO₂ dispersion in urban areas. This half-life was not included in the present analysis because the study area is categorized as rural. Conservative estimates of SO₂ impacts will result.

These assumptions and conditions established the basis for evaluating air quality impacts from the Pasco County RRF.

Land Use Classification

The dispersion environment was classified as rural based on a qualitative review of land use within a 3 km (1.9 miles) radius of the site and a comparison of the observed land use with Auer (1978) land use criteria. A significant fraction of the area consisted of open land or low density housing that could be readily classified as rural. The ISCST model was executed in the rural mode incorporating dispersion coefficients developed by Turner (1970) and as recommended by the EPA for regulatory applications in rural areas (EPA, 1986). (No terrain elevations exceed stack top elevation within a 15 km radius of the Pasco County RRF).

Dispersion Meteorology

The rate of plume dispersion as defined with the ISCST model is determined by a set of atmospheric variables including wind speed, wind direction, ambient temperature, depth of the mixing layer, and the ambient turbulence level (i.e., atmospheric stability). These variables vary as functions of space and time. The selection of acceptable meteorological data

representative of the site dispersion environment is necessary to correctly characterize downwind concentrations from the proposed source.

The refined modeling analysis utilized the most recent five years of meteorological data available. Digitized meteorological data are available from the National Climatic Data Center (NCDC) which archives regular observations made at National Weather Service (NWS) stations. Surface and upper air data from Tampa International Airport were obtained for the years 1970 to 1974, the most recent data available at the time of the analysis.

Surface data consist of hourly observations of wind speed, wind direction, temperature, cloud cover, and several other parameters. Mixing height is calculated from twice daily upper air soundings which measure atmospheric temperature profiles. The surface and upper air data were treated with the CRSTER pre-processor to create five years of hourly meteorological data sets to be used in the detailed, sequential-hour modeling analysis. These data were approved by DER as spatially and temporally representative of the Pasco County RRF site.

6.4 SCREENING ANALYSIS

An air quality screening analysis was conducted to identify the operating condition from Table 6-1 that produced the worst-case ground level pollutant concentrations in the vicinity of the proposed facility. A meeting was held on December 18, 1986 with DER to discuss the screening modeling methodology prior to conducting the analysis. The approved dispersion modeling options and inputs are presented in Table 6-3. The modeling procedures were consistent with the "Guideline on Air Quality Models — Revised" (EPA, 1986) and "Guideline for Air Quality Maintenance Planning and Analysis, Volume 10R: Procedures for Evaluating Air Quality Impacts of New Stationary Sources" (EPA, 1977).

Seven operating conditions were identified from a review of the waste characteristics and throughputs for the combustion unit. Two of the operating conditions were found to have flue gas and emissions parameters similar to other operating conditions in the set and were excluded from

TABLE 6-3

PASCO COUNTY RRF SCREENING MODELING PROTOCOL

I. MODEL SELECTION AND OPTIONS

- A. The EPA Industrial Source Complex - Short Term model, version 6 (ISCST) was used.
- B. The regulatory options identified in EPA's "Guideline on Air Quality Models" (July, 1986) were employed. These options included:
 - o Buoyancy induced dispersion
 - o Final plume rise
 - o Stack tip downwash
- C. Pasquill-Gifford rural dispersion coefficients.

II. WORST CASE METEOROLOGICAL DATA

- A. The Pasquill-Gifford stability class and wind speed combinations in PTPLU were used.

Note: Forty-eight rather than 49 conditions were used in order to make an even two days as suggested by DER. The 0.5 m/s wind speed for stability class D was dropped and the 0.8 m/s wind speed for stability D was changed to a 1.0 m/s wind speed for stability class C. Persistent wind speeds less than 1.0 m/s are associated with calm conditions and would not be used in the sequential meteorological data for the computation of average concentrations.

<u>Stability Class</u>	<u>Wind Speed (m/s)</u>
A	0.5, 0.8, 1.0, 1.5, 2.0, 2.5, 3.0
B	0.5, 0.8, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0, 5.0
C	1.0, 2.0, 2.5, 3.0, 4.0, 5.0, 7.0, 10.0, 12.0, 15.0
D	1.0, 1.5, 2.0, 2.5, 3.0, 4.0, 5.0, 7.0, 10.0, 12.0, 15.0, 20.0
E	2.0, 2.5, 3.0, 4.0, 5.0
F	2.0, 2.5, 3.0, 4.0, 5.0

- B. An ambient temperature of 293K was assumed.
- C. The ISC rural default wind speed profile exponents and potential temperature gradients were used.
- D. A mixing height of 2000 m was assumed.

TABLE 6-3 (Continued)

PASCO COUNTY RRF SCREENING MODELING PROTOCOL

III. RECEPTOR GRID

- A. A polar coordinate grid was used with receptors placed along a single radial. The downwind distances used in this analysis are as follows:
- o every 100m from 0.1 to 2km
 - o every 200m from 2.2 to 3km
 - o every 500m from 3.5 to 5km
 - o every 1000m from 6 to 10km
 - o every 2000m from 12 to 16km
- B. The highest receptor elevation within each ring was chosen based on recommendations in the "Regional Workshop on Air Quality Modeling" (April, 1981).

IV. POLLUTANT CONCENTRATION AVERAGING TIMES

- A. To estimate pollutant concentrations for periods greater than one hour, the scaling factors identified in "Guideline for Air Quality Maintenance Planning and Analysis Volume 10R" were used to obtain 3-hour, 8-hour, and 24-hour averages. The scaling factors are as follows:

<u>Averaging Period</u>	<u>Scaling Factor</u>
1-hour to 3-hour	0.9
1-hour to 8-hour	0.7
1-hour to 24-hour	0.4

- B. There are no generally accepted scaling factors that allow 3-month and annual concentrations to be estimated from hourly concentrations. For the purposes of this screening analysis, a scaling factor of 0.1 was used to conservatively estimate both the 3-month and annual averaging periods. The actual pollutant concentrations for these averaging periods will be predicted by the ISC model for the refined modeling analysis.

The predicted maximum concentration for the 24-hour averaging period will be substituted for the quarterly averaging period as a conservative upper-limit prediction of the quarterly impact.

NOTE: Based on the modeling analyses for the Hillsborough Co. RRF PSD Permit (August 1984), the 1970 to 1974 Tampa meteorological data resulted in a ratio of the highest, second-highest hourly concentrations to highest annual and 3-month concentrations of 0.02 and 0.04, respectively. This suggests that the choice of a 0.1 scale factor is conservative.

further consideration to avoid redundant analyses. The five non-redundant operating conditions were included in an air quality screening analysis using the modeling methodologies described above.

The Table 6-4 screening modeling results demonstrate that the 1,200 tpd at 5,000 Btu/lb of refuse operating condition caused the highest ground level concentrations. The location of maximum impacts for the Pasquill-Gifford stability classes are provided in the table.

6.5 DETAILED MODELING ANALYSIS

A detailed dispersion modeling analysis was conducted for the Pasco County RRF worst-case operating condition (with emission rate normalized with respect to the nominal operating condition) to resolve the maximum impacts over a 360-receptor polar grid for each year of the 1970-74 hour-by-hour meteorological data set. (ISCST detailed modeling options are listed in Table 6-5) The points of maximum impact were included in a "refined analysis" in which they were overlain with fine resolution grids to further resolve the absolute highest annual and highest, second-highest short-term pollutant concentrations for the five year period. These concentrations were compared to the NAAQS and FAAQS. The modeling results demonstrate that the Pasco County RRF has a less than significant impact for all criteria pollutants except nitrogen dioxide (NO_2). The NO_2 highest annual impact of 1.03 ug/m^3 only exceeds the 1 ug/m^3 significant impact level by about 3 percent, and constitutes only 1 percent of the NAAQS/FAAQS. An additional analysis may be required to establish compliance of the proposed source and background sources to the annual 100 ug/m^3 nitrogen dioxide NAAQS/FAAQS.

6.5.1 ISCST MODEL APPLICATION

A detailed dispersion modeling analysis was conducted with ISCST using the facility operating condition from Table 6-4 that produced the highest ground-level concentration in the screening modeling exercise. The "worst-case" short-term operating condition was 1,200 tpd of refuse with a heat content of 5,000 Btu/lb. The increased volumetric flow and subsequent enhanced plume height only partially offset the higher pollutant emission

TABLE 6-4

PASCO COUNTY RRF SCREENING ANALYSIS RESULTS
FOR VARIOUS OPERATING LOADS(Concentrations in s-ug/g-m³)

THROUGHPUT (tpd)	1,320	1,200	1,200	1,200	900
HEAT CONTENT (Btu/lb)	4,000	5,000	4,500	4,000	4,500
RELATIVE EMISSION RATE (g/s)	0.9167	1.042	0.9375	0.8333	0.7031
<u>STABILITY CLASS</u>	<u>Maximum Normalized 1-Hour Average Concentrations^a</u>				
A	1.316	1.423	1.273	1.343	1.198
B	0.876	0.944	0.844	0.893	0.799
C	0.727	0.777	0.700	0.741	0.660
D	0.396	0.422	0.383	0.405	0.361
E	0.401	0.436	0.383	0.410	0.355
F	0.181	0.181	0.174	0.185	0.164
	<u>Downwind Distance (km) of Maximum Concentration</u>				
A	0.7	0.7	0.7	0.7	0.7
B	1.1	1.2	1.1	1.1	1.2
C	2.0	2.0	2.0	2.0	1.9
D	6.0	6.0	6.0	6.0	6.0
E	10.0	12.0	10.0	10.0	10.0
F	16.0	14.0	16.0	16.0	16.0

^aNormalized to 1,200 tpd at 4,800 Btu/lb. Assumes a dry scrubber and baghouse.

SOURCE: CDM, 1987.

TABLE 6-5

PASCO COUNTY RRF DETAILED ANALYSIS
ISCST MODEL INPUTS AND OPTIONS

Calculate (Concentration = 1, Deposition = 2)	ISW(1) = 1
Receptor Grid System (Rectangular = 1 or 3, Polar = 2 or 4)	ISW(2) = 4
Discrete Receptor System (Rectangular = 1, Polar = 2)	ISW(3) = 1

Terrain Elevations are Read (Yes = 1, No = 0)	ISW(4) = 1
Calculations Are Written to Tape (Yes = 1, No = 0)	ISW(5) = 0
List All Input Data (No = 0, Yes = 1, Met Data Also = 2)	ISW(6) = 1

Compute average concentrations (or total deposition)
with the following time periods:

Hourly (Yes = 1, No = 0)	ISW(7) = 1
2-Hour (Yes = 1, No = 0)	ISW(8) = 0
3-Hour (Yes = 1, No = 0)	ISW(9) = 1
4-Hour (Yes = 1, No = 0)	ISW(10) = 0
6-Hour (Yes = 1, No = 0)	ISW(11) = 0
8-Hour (Yes = 1, No = 0)	ISW(12) = 1
12-Hour (Yes = 1, No = 0)	ISW(13) = 0
24-Hour (Yes = 1, No = 0)	ISW(14) = 1
Print "N"-Day Table(s) (Yes = 1, No = 0)	ISW(15) = 1

Print the following types of tables whose time periods are
specified by ISW(7) through ISW(14):

Daily Tables (Yes = 1, No = 0)	ISW(16) = 0
Highest And Second Highest Tables (Yes = 1, No = 0)	ISW(17) = 1
Maximum 50 Tables (Yes = 1, No = 0)	ISW(18) = 1

Meteorological Data Input Method (Pre-processed = 1, Card = 2)	ISW(19) = 1
Rural-Urban Option (Rural = 0, Urban Mode 1=1, Urban Mode 2=2)	ISW(20) = 0
Wind Profile Exponent Values (Defaults = 1, User Enters = 2,3)	ISW(21) = 1

Vertical Pot. Temp. Gradient Values (Defaults = 1, User Enters = 2, 3)	ISW(22) = 1
Scale Emission Rates for All Sources (No = 0, Yes > 0)	ISW(23) = 0
Program Calculates Final Plume Rise Only (Yes = 1, No = 2)	ISW(24) = 1

Program Adjusts all Stack Heights for Downwash (Yes = 2, No = 1)	ISW(25) = 2
Program Uses Buoyancy Induced Dispersion (Yes = 1, No = 2)	ISW(26) = 1
Concentrations During Calm Periods Set = 0 (Yes = 1, No = 2)	ISW(27) = 1
Reg. Default Option Chosen (Yes = 1, No = 2)	ISW(28) = 1
Type of Pollutant to be Modelled (1 = SO ₂ , 2 = Other)	ISW(29) = 2
Debug Option Chosen (1 = Yes, 2 = No)	ISW(30) = 1

rate for this operating condition relative to other operating conditions. This operating condition was modeled for annual, 24-hour, 8-hour, 3-hour, and 1-hour block-averaged periods. As shown in Table 6-4, this condition produced the maximum impacts for all P-G stability classes.

Actual plant availability will be approximately 85 percent because furnaces and boilers will be periodically taken off-line for scheduled maintenance. Long-term ambient impacts are likely to be less than those presented in Tables 6-6 and 6-7 because of scheduled maintenance and periods of operation at less than maximum load at times during the year.

A "normalized" and unitized emission rate of 1.042 grams per second (g/s) was used as the ISCST input emission rate for the 1,200 tpd at 5,000 Btu/lb operating condition. This emission rate is the quotient of refuse higher heating values of 5,000 Btu/lb and 4,800 Btu/lb, or equivalently 1.25×10^8 Btu/hr divided by 1.20×10^8 Btu/hr, for each of the four boiler/furnace units.

Ground level impacts for the 1,200 tpd at 5,000 Btu/lb operating condition were predicted with five years of meteorological data (1970-1974) using a 360-receptor (dense) polar grid. The locations of relative maxima were identified for each year and each regulated pollutant averaging period. The following relative maxima were identified:

- (1) The highest concentration
- (2) The highest, second-highest concentration
- (3) The second-highest concentration at the location of the highest concentration
- (4) The highest concentration at the location of the highest, second-highest concentration

These relative maxima were further resolved using a 1 km square cartesian grid with a 100 meter refined grid spacing. The absolute highest and

TABLE 6-6

MAXIMUM NORMALIZED AND UNITIZED GROUND LEVEL CONCENTRATIONS PREDICTED
BY ISCST FOR 1970-74 DUE TO PASCO COUNTY RRF STACK EMISSIONS

Averaging Period	Rank ^a	Meteorological Period			Receptor Location ^b		
		Year	Day	Hour Ending	Distance (km)	Direction (degrees)	X/Q ^c (s-ug/g-m ³)
1-hour	H	1971	237	11	0.7	70	2.440
	HSB	1972	222	11	0.7	90	1.492
3-hour	H	1970	119	12	1.2	70	0.981
	HSB	1970	99	15	1.17	75	0.851
8-hour	H	1971	129	16	1.6	90	0.637
	HSB	1971	220	16	1.4	90	0.577
24-hour	H	1972	242	24	1.7	90	0.255
	HSB	1972	180	24	2.0	90	0.221
Annual	H	1971	NA	NA	2.0	90	0.0264

^aAbbreviations: H = Highest
HSB = Highest, Second-Highest
NA = Not applicable

^bReceptor location relative to Pasco County RRF stack.

^cNormalized, unitized ground level concentration based on an input unit emission rate for the nominal (5,000 Btu/lb) operating condition corrected by the quotient of the refuse higher heating values of 5,000 Btu/lb and 4,800 Btu/lb (the refuse design heat content), or 1.042.

Multiply X/Q by the appropriate Table 6-2 controlled emission rate to get the ground level concentration for each pollutant.

TABLE 6-7

COMPARISON OF MAXIMUM PREDICTED CONCENTRATIONS OF
REGULATED POLLUTANTS TO SIGNIFICANT IMPACT AND
DE MINIMIS MONITORING LEVELS

(concentrations in $\mu\text{g}/\text{m}^3$)

Pollutant	Averaging Period	Rank ^c	Maximum Predicted Concentration ^b	PSD Class II ^a Significant Impact Level	Impact as Percent of SIL	PSD De Minimis Monitoring Level
Sulfur Dioxide (SO_2)	Annual	H	0.36	1	36	NA
	24-hour	HSH	2.98	5	60	13
	3-hour	HSH	11.49	25	46	NA
Particulate Matter (as TSP or PM_{10})	Annual	H	0.05	1	5	NA
	24-hour	HSH	0.43	5	9	10
Nitrogen Dioxide (NO_2)	Annual	H	1.03	1	103	14
Carbon Monoxide (CO)	8-hour	HSH	3.42	500	1	575
	1-hour	HSH	35.2	2,000	2	NA
Lead ^a (Pb)	24-hour	HSH	0.02	NA	NA	0.1
Mercury (Hg)	24-hour	H	2.25×10^{-2}	NA	NA	2.5×10^{-1}
Beryllium (Be)	24-hour	H	2.09×10^{-6}	NA	NA	5.0×10^{-4}
Fluorides (as HF)	24-hour	H	1.24×10^{-2}	NA	NA	2.5×10^{-1}

^aThe de minimis monitoring level for lead is a quarterly-averaged value. The 24-hour average concentration was substituted as a conservative estimate of the quarterly value.

^bLocation and time-of-occurrence for maximum impacts (by rank) are provided in Table 6-6.

^cAbbreviations: H = Highest concentration
HSH = Highest, second-highest concentration
NA = Not Applicable

highest, second-highest predicted concentrations and their respective locations were identified and tabulated for each of the five years.

6.5.2 MODEL RECEPTORS

Receptor grid points, i.e., locations where facility ground level concentrations are estimated, were selected based on the results of the screening modeling exercise summarized in Table 6-4. The detailed modeling receptor grid was developed as a polar grid with focus coincident with the Pasco County RRF stack and radials extending outward to 15 kilometers. A receptor radial was placed at each 10 degree azimuth increment about the 360 degree compass (e.g., 10 degrees, 20 degrees,...360 degrees). Each radial is intersected by ten ring distances where receptors are positioned: 0.3, 0.7, 1.2, 2.0, 2.7, 3.6, 4.8, 6.3, 10.0, and 15 km. Ring distances were clustered about distances at which maximum facility impacts were identified in the Table 6-4 dispersion screening modeling results. Additional discrete receptors were located at the Chassahowitzka NWR Class I area, Cedar Keys NWR and along the border of the Pinellas County SO, non-attainment area. Receptor elevations for the dense radial grid were set equal to the highest elevation in a 10 degree wide sector centered about the receptor radial (e.g., the intersection of the 10 degree radial and ring at a given radial distance) and extending one-half of the receptor-to-receptor radial distance in each direction. Thus, for a receptor located at 10 degrees relative to the facility and at a distance of 3.0 km (with adjacent rings at 2.5 km and 3.5 km), the assigned terrain elevation would be the maximum elevation in an area within the 5-to-15 degree sector at a radial distance of between 2.75 and 3.25 km.

The last step of the detailed analysis consisted of a fine grid ISCST modeling analysis in the vicinity of maximum facility impacts originally predicted by ISCST on the dense radial grid. Fine resolution receptor grids were placed at the locations of modeled relative maximum impacts to resolve the absolute maximum facility impacts. These grids consisted of one-kilometer cartesian squares centered on the point of relative maximum concentration with receptors placed at 100 meter increments. They were positioned at the locations of (1) the estimated highest annual average

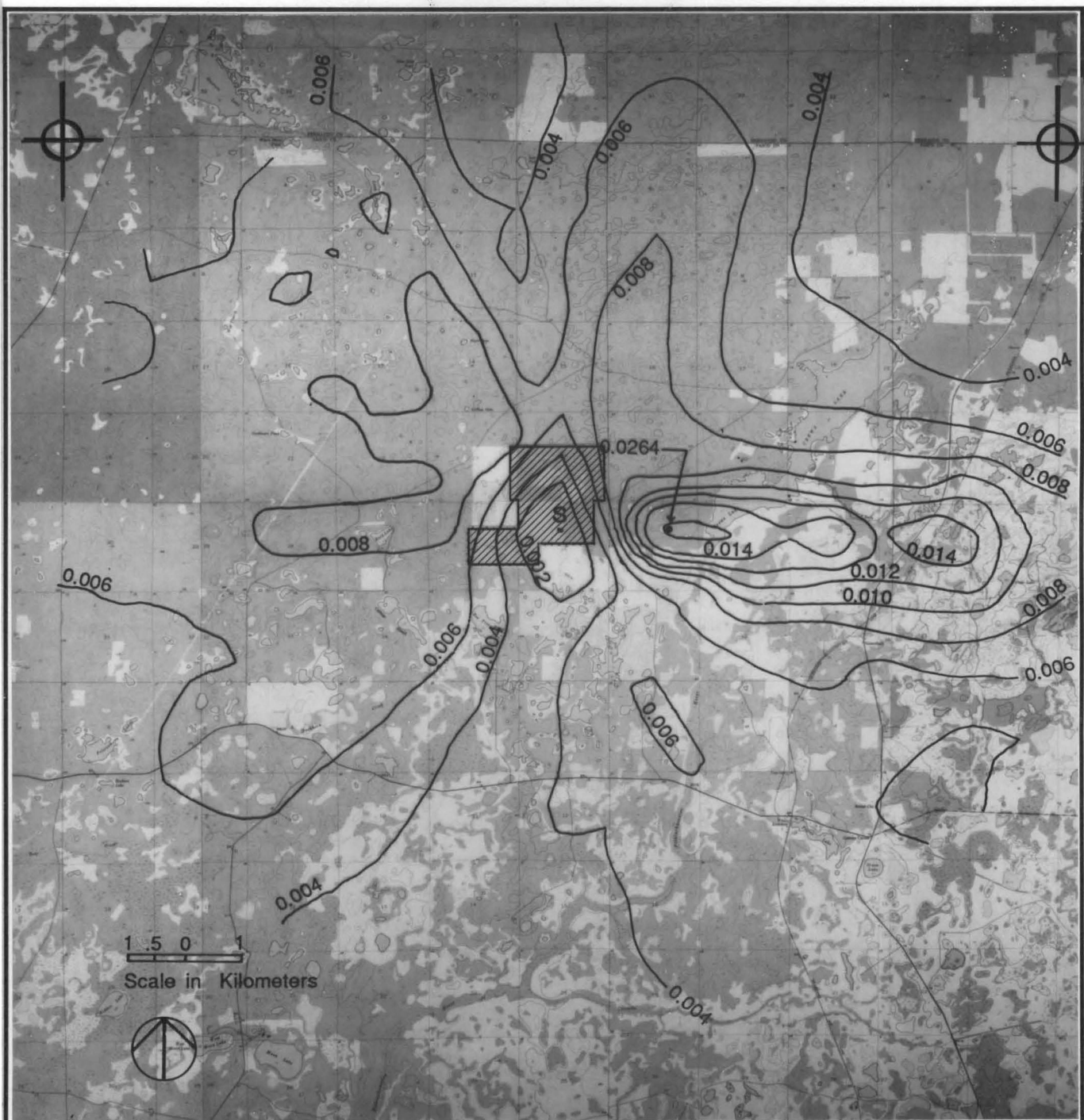
concentration, and (2) the locations for both the highest and second-highest estimated concentrations for the 1-hour, 3-hour, 8-hour and 24-hour averaging periods. In all, 121 fine resolution receptors per grid were modeled.

Discrete receptors were positioned at the boundaries of two national wildlife refuges: the Chassahowitzka Class I area and the Cedar Keys National Wildlife Refuge located a minimum of 27 km and 100 km from the Pasco County RRF, respectively. A receptor spacing of 1 km was adopted along each wildlife area border closest to the Pasco County RRF. Additional discrete receptors were placed along the northern boundary of the Pinellas County SO₂ non-attainment area at 1 km intervals. All three areas are more than 20 km from the Pasco County RRF. A 1 km receptor spacing is approximately equal to a two-degrees of azimuth resolution at the Chassahowitzka NWR border relative to the stack coordinates. A more detailed discussion of Class I area and non-attainment area impacts are presented in Section 6.7 and Section 7.7, respectively.

6.5.3 DETAILED MODELING RESULTS

Results of the ISCST detailed modeling analysis are tabulated in Table 6-6. These are the highest and highest, second-highest predicted concentrations for the worst-case operating condition (1,200 tpd at 5,000 Btu/lb refuse) normalized with respect to the 4,800 Btu/lb design heat content of the refuse. The limiting short-term (ie., 1-hour, 3-hour, 8-hour, and 24-hour) impacts for comparison with NAAQS and FAAQS are based on the highest, second-highest concentrations predicted for each averaging period over the five years of meteorological data. Limiting annual average impacts are based on the highest concentration predicted for the same data. The highest 24-hour concentration was used as a conservative estimate of the lead quarterly impact.

The predicted normalized and unitized impacts for the Pasco County RRF stack emissions have been plotted to illustrate their distribution in the vicinity of the proposed site. Figures 6-1, 6-2 and 6-3 show the normalized unitized impacts predicted for the limiting plant operating



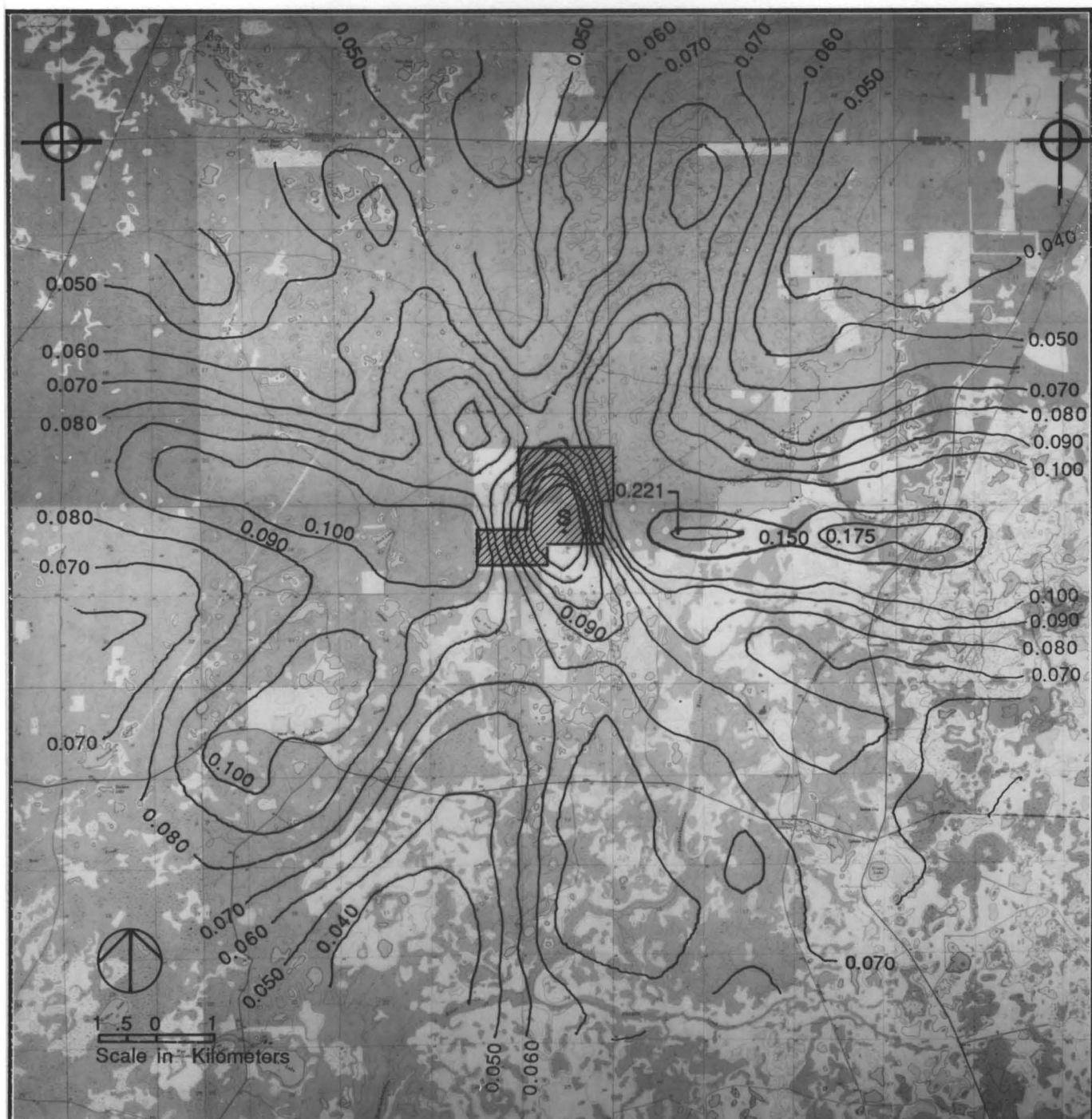
Pasco County Resource Recovery Project

Pasco County, Florida

PSD Permit Application

Camp Dresser & McKee

FIGURE 6-1
Predicted Annual Average
Unitized Concentrations for the Year of
Maximum Annual Average Impact (1971)



Pasco County Resource Recovery Project

Pasco County, Florida

PSD Permit Application

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FIGURE 6-2
Predicted Highest, Second- Highest
24-Hour Unitized Concentrations for the
Year of Maximum 24-Hour Impact (1972)



Pasco County Resource Recovery Project

Pasco County, Florida

PSD Permit Application

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FIGURE 6-3
Predicted Highest, Second -Highest
3-Hour Unitized Concentrations for the
Year of Maximum 3-Hour Impact (1970)

conditions (i.e., 100 percent of all hours during each year) for annual, 24-hour, and 3-hour block-averaged periods, respectively. In each case, the distribution of impacts is presented for the year in which the limiting impact (highest annual average concentration or highest, second-highest short-term concentration) was predicted. The concentration scale used in these figures is seconds-micrograms per gram-meter-cubed based on the normalized unitized emission rate 1.042 grams per second that was input to ISCST. The ground level concentrations for a specific pollutant can be calculated at a point on the figure by multiplying the normalized and unitized concentration by the appropriate emission rate listed in Table 6-2.

In Figure 6-1 the highest annual average facility X/Q of 0.0264 s-ug/g-m³ occurs for 1971 at 2 km toward 90 degrees. The highest annual X/Q values exceeding 0.010 s-ug/g-m³ are concentrated east of the site, and minimum X/Q values of less than 0.004 s-ug/g-m³ are centered along a line passing through the site toward the north and south. A weak maximum of 0.008 s-ug/g-m³ is located 2 km west and northwest of the site.

Figure 6-2 depicts the highest, second-highest 24-hour average facility X/Q isopleths for 1972 with a maximum of 0.221 s-ug/g-m³ at 2 km toward 90 degrees. Lobes of relative maximum X/Q exceeding 0.100 s-ug/g-m³ extend toward the east, west and southwest. Lobes of relative minimum X/Q less than 0.040 s-ug/g-m³ extend toward the northeast and south-southwest relative to the facility stack.

The predicted highest, second-highest 3-hour average X/Q values maximized in 1970 and the isopleths are depicted in Figure 6-3. The maximum modeled X/Q value is 0.851 s-ug/g-m³ at 1.17 km toward 75 degrees. Lobes of relative maximum X/Q extend east and west from the facility stack. A broad area of X/Q exceeding 0.500 s-ug/g-m³ occurred in a hemisphere shaped area north of the facility stack.

As shown in the X/Q isopleth maps for the Pasco County RRF impacts and summarized in Table 6-6, the modeling results indicate that predicted maximum impacts tend to occur east to east-northeast of the site within 2

km of the stack. Modeled Pasco County RRF ground level concentrations presented in Table 6-7 were calculated from the product of the 100%-of-nominal-capacity controlled emission rates (Table 6-2) and the ISCST predicted normalized and unitized ground level concentrations (produced with the 1.042 g/s input emission factor).

Maximum predicted impacts with the shortest averaging periods occur closest to the stack, whereas maximum impacts for the longest averaging periods occur farthest from the stack. These results are consistent with the range of meteorological conditions that caused the maximum impacts for the different averaging periods. The meteorological conditions on each day of a maximum impact listed in Table 6-6 are presented in Attachment B. For example, the 1-hour and 3-hour maximum impacts were associated with the unstable Pasquill-Gifford A and B stability conditions that enhanced the plume vertical dispersion and caused the plume to impact closer to the stack than for other meteorological conditions. Maximum 8-hour and 24-hour impacts were associated with persistent wind direction conditions, moderate wind speeds and unstable to neutral atmospheric stability conditions. These atmospheric conditions are slightly more stable than those for the 1-hour and 3-hour maximum impacts. Plume vertical dispersion increases as atmospheric stability decreases. Thus, the impact zone for longer averaging periods with greater atmospheric stability is usually farther from the stack. Lastly, the highest annual average concentration occurs in the direction of the most frequent wind flow for the year.

6.5.4 MODELED IMPACTS FOR REGULATED AND NONREGULATED POLLUTANTS

Ground level concentrations were modeled for all pollutants emitted by the Pasco County RRF as listed in Table 6-2. Maximum predicted ground level concentrations are compared to PSD de minimis monitoring levels and PSD significant impact levels in Table 6-7. Criteria pollutant impacts are compared to the NAAQS/FAAQs in Table 6-8. Table 6-9 presents the highest modeled concentrations for PSD regulated noncriteria pollutants and PSD nonregulated pollutants emitted by the Pasco County RRF.

TABLE 6-8

SUMMARY OF THE ISCST PREDICTED CRITERIA POLLUTANT CONCENTRATIONS RESULTING FROM
PASCO COUNTY RRF EMISSIONS FOR THE MODELING PERIOD 1970-74

Pollutant	Averaging Period	Rank	Period	Location		Facility Impact	Ambient Background	Total Impact	FAAQS/NAAQS	Total as Percent
			(Year/Date/End Hour)	Dist (km)	Dir (deg)	(ug/m ³)	(ug/m ³)	(ug/m ³)	(ug/m ³)	of FAAQS/NAAQS
Sulfur Dioxide	3-hour	H	1970/119/12	1.2	70	13.2	456	469.2	1300	36.1
		HSH	1970/99/15	1.17	75	11.5	456	467.5	1300	36.0
	24-hour	H	1972/242/24	1.7	90	3.44	103	106.4	260	40.9
		HSH	1972/180/24	2.0	90	2.98	103	106.0	260	40.8
	Annual	H	1971/NA/NA	2.0	90	0.356	26	25.4	60	44.0
Particulate Matter ^c	24-hour	H	1972/242/24	1.7	90	0.497	87 (87)	87.5 (87.5)	150 ^a (150 ^b)	58.3 (58.3)
		HSH	1972/180/24	2.0	90	0.431	87 (87)	87.4 (87.4)	150 (150)	58.3 (58.3)
	Annual	H	1971/NA/NA	2.0	90	0.0515	43 (45)	43.1 (45.1)	60 ^a (50 ^b)	71.8 (90.8)
Nitrogen Dioxide	Annual	H	1971/NA/NA	2.0	90	1.03	39	40.0	100	40.0
Carbon Monoxide	1-hour	H	171/237/11	0.7	70	57.6	5153	5210.6	40,000	13.0
		HSH	172/222/11	0.7	90	35.2	5153	5188.2	40,000	13.0
	8-hour	H	141/129/16	1.6	90	3.77	1145	1148.8	10,000	11.5
		HSH	171/220/16	1.4	90	3.42	1145	1148.4	10,000	11.5
Lead ^d	3-month	H	1972/242/24	1.7	90	0.0244	0.4	0.42	1.5	28.0

^a FAAQS for particulate matter expressed as total suspended particulate (TSP).

^b NAAQS primary and secondary standard for particulate expressed as PM₁₀.

^c Facility impact for particulate matter equals impact for PM₁₀. Numbers in parentheses denote PM₁₀ concentrations. Numbers without parentheses denote total particulate concentrations.

^d The 24-hour average concentration was substituted for the quarterly average concentration.

TABLE 6-9

MAXIMUM PREDICTED CONCENTRATIONS OF NONCRITERIA POLLUTANTS
RESULTING FROM PASCO COUNTY RRF EMISSIONS

Pollutant ^a	Averaging Period	Highest Concentration	ACGIH TLV ^e (ug/m ³)	Massachusetts AAL ^c (ug/m ³)	New York AAL ^d (ug/m ³)
Mercury (Hg)	8-hour	5.62×10^{-2}	50	—	—
	24-hour	2.25×10^{-2}	—	—	—
	Annual	2.33×10^{-3}	—	—	3.3×10^{-1}
Beryllium (Be)	8-hour	5.22×10^{-6}	2.0	—	—
	24-hour	2.09×10^{-6}	—	4.2×10^{-3}	$1.0 \times 10^{-2 f}$
	Annual	2.16×10^{-7}	—	—	—
Fluorides (as HF)	8-hour	0.309	2,000	—	—
	24-hour	0.124	—	3.4	—
	Annual	0.0128	—	—	8.3
Sulfuric Acid Mist (H ₂ SO ₄ aqueous)	8-hour	1.38	1,000	—	—
	24-hour	0.553	—	14	—
	Annual	0.0573	—	—	—
Arsenic (As)	8-hour	3.50×10^{-4}	200	—	—
	24-hour	1.40×10^{-4}	—	—	—
	Annual	1.45×10^{-5}	—	—	0.67
Hydrogen Chloride ^b	8-hour	4.90	7,000	—	—
	24-hour	1.96	—	10	—
	Annual	0.203	—	—	140
Dioxins ^b (as 2,3, 7,8-TCDD toxic equiv.)	Annual	5.65×10^{-9}	—	—	—

^aAsbestos, vinyl chloride and hydrogen sulfide are regulated (40 CFR 52.21) pollutants with NIL emission rates from the proposed Pasco County RRF. Therefore, the resulting ambient impacts are NIL and are not listed.

^bHydrogen chloride and dioxins are not regulated under the Clean Air Act or NESHAPS and thereby are not PSD regulated pollutants.

^cDEQE June, 1987 Draft AALs.

^d1985-86 Edition of the New York Air Guide-1 AALs.

^eNIOSH, (September, 1985)

^fOne-month average value from NESHAP.

Comparison to De Minimis Monitoring Levels

One of the requirements for a PSD permit is an analysis of existing ambient air quality in the vicinity of the proposed source for each pollutant that has the potential to emit in greater than de minimis amounts. The de minimis levels established by EPA for PSD regulated pollutants are listed in Table 6-7. Monitoring data in the form of existing representative air quality data or a site-specific monitoring program are used to establish existing air quality for purposes of satisfying this requirement. Preconstruction monitoring by an applicant may be waived on a pollutant-by-pollutant basis by the reviewing authority (here the Florida DER), if the emissions of pollutants subject to PSD review would cause minimal ambient impacts as defined by the de minimis monitoring concentrations.

The ISCST predicted maximum concentrations of PSD regulated criteria and noncriteria pollutants are compared with PSD de minimis monitoring levels in Table 6-7. The maximum ISCST predicted ground level concentrations (in $\mu\text{g}/\text{m}^3$) presented in the table were obtained by multiplying the normalized unitized modeled concentration (in $\text{s-}\mu\text{g}/\text{g-}\text{m}^3$) from Table 6-6 for the appropriate pollutant averaging period by the 100-percent-load emission rate (in g/s) from Table 6-2. For example, the highest annual sulfur dioxide concentration of $0.36 \mu\text{g}/\text{m}^3$ in Table 6-7 was calculated as the product of the Table 6-6 annual X/Q equal to $0.0264 \text{ s-}\mu\text{g}/\text{g-}\text{m}^3$ and the $13.5 \text{ g}/\text{s}$ facility emission rate listed in Table 6-2. The receptor locations and dates on which each averaging period concentration occurred are documented in Table 6-6.

The Table 6-7 concentrations demonstrate that preconstruction ambient air quality monitoring for PSD criteria and noncriteria pollutants will not be required for the Pasco County RRF project because source impacts during the modeled 1970-74 period were less than EPA de minimis monitoring levels. The letters from Florida DER and EPA Region IV granting the preconstruction monitoring waiver are included in Attachment A.

Significant Impact Levels (SILs)

The EPA has defined a set of impact levels to determine whether a major new source will "significantly" affect the air quality of an area. These concentration values, or SILs, are based on the PSD Class I increments and are interpreted by EPA and DER as representing the minimum amount of ambient impact that is significant. In general, regulatory agencies limit the impact analysis of a major new source to areas where impacts are above the SILs indicated in Table 6-7 for PSD criteria and noncriteria pollutants. This area, defined as a circle with a radius equal to the maximum downwind distance where concentrations exceed the significant impact level is referred to as the significant impact area (SIA). Sources with no significant impact area for a particular pollutant and averaging period for which a SIL is defined are not required to perform a full ambient air quality impact analysis for that pollutant/averaging period. The demonstration of no significant impact exempts a source from the need to model the impact of major background sources and PSD increment consuming sources within the proposed facility's SIA in order to show compliance with ambient air quality standards and PSD increments.

Predicted Pasco County RRF impacts in Table 6-7 are below PSD significant impact levels for SO_2 , particulate matter (including PM_{10}) and CO. No further analysis will be necessary to document NAAQS/FAAQs maintenance or PSD Class II increment consumption for these pollutants. Nitrogen oxides emitted as NO_2 are predicted to have an area of significant impact.

The NO_2 significant annual-average impact of 1.03 ug/m^3 is 3-percent above the 1.0 ug/m^3 significant impact level listed in Table 6-7. The maximum radius of this NO_2 significant impact area is 2.0 kilometers. It includes only areas designated as Class II with respect to PSD increment consumption. The nearest Class I area is 27 km north-northwest, well beyond the NO_2 SIA. A discussion of FAAQS and NAAQS compliance within the Pasco County RRF SIA for nitrogen dioxide is deferred to Section 6.6.

6.6 COMPARISON WITH AMBIENT AIR QUALITY STANDARDS

A comparison of the ISCST estimated criteria pollutant impacts from the Pasco County RRF to the NAAQS/FAAQs is presented in Table 6-8. The facility impacts alone are very small in comparison to the ambient air quality standards. All facility impacts (excluding lead) consume less than 1.1 percent of the FAAQS. The highest 24-hour average lead impact is 0.025 ug/m³, or 1.7 percent of the Florida quarterly standard. This percentage is inherently conservative because the highest 24-hour average concentration was used to estimate the quarterly impact. The highest, second-highest 3-hour and 24-hour SO₂ concentrations represent only 0.9 percent and 1.1 percent of the respective FAAQS. The highest annual SO₂ impact is only 0.6 percent of the FAAQS. The highest, second-highest total suspended particulate (TSP) and PM₁₀ 24-hour concentrations are 0.3 percent of the ambient standards, whereas the highest annual TSP and PM₁₀ concentrations are 0.08 percent and 0.10 percent of the respective ambient standards. The modeled highest annual NO₂ concentration is 1.0 percent of the FAAQS. Predicted highest, second-highest carbon monoxide concentrations for 1 hour and 8-hour averaging periods consume only 0.09- and 0.03-percent of their respective FAAQS.

The projected ambient air quality levels in Table 6-8 are presented as the sum of modeled Pasco County RRF impacts and the DER approved Table 5-4 ambient background concentrations for each criteria pollutant. The tabulated total impacts suggest that the FAAQS/NAAQS will be maintained by substantial margins. The largest estimated total concentration as a percent of its NAAQS/FAAQs is obtained by adding the estimated PM₁₀ annual impact and the monitored background concentration. The highest annual average PM₁₀ concentration consumes 90.8 percent of its 50 ug/m³ NAAQS. This impact is conservative because 100 percent of the TSP background concentration was assumed to be PM₁₀. Studies conducted by EPA (1987b) show that the upper limit (97.1 percentile) of the PM₁₀-to-TSP concentration ratios is 0.66. The Pasco County RRF PM₁₀ emissions alone are predicted to contribute a de minimis impact comprising only 0.1 percent of the combined background-plus-facility concentration. With the

¹ Personal communication with Mr. Tom Rogers of Florida DER-Tallahassee on July 16, 1987.

exception of particulate matter impacts, each of the remaining criteria pollutant impacts added to its respective ambient background concentration consumes less than 45 percent of its FAAQS/NAAQS. This total impact as a percent of FAAQS is presented in the last column of Table 6-8.

The 1.03 ug/m^3 highest predicted annual NO_2 impact for the Pasco County RRF exceeds the 1.0 ug/m^3 SIL by 3 percent, but consumes only one-percent of the FAAQS/NAAQS. The DER has suggested that the highest 1986 ambient background NO_2 concentration when added to the proposed source impact is an adequate demonstration of source compliance with the FAAQS/NAAQS for NO_2 within the modeled 2 km radius SIA, because the 39 ug/m^3 ambient background is a conservative estimate of site conditions and includes contributions from local NO_2 sources. Table 6-8 shows that the sum of highest ambient background concentration and proposed source impact consumes only 40 percent of the 100 ug/m^3 NO_2 FAAQS/NAAQS.

6.7 ASSESSMENT OF NONCRITERIA POLLUTANT IMPACTS

In the context of this discussion the term "noncriteria pollutant" is used as a general term for all pollutants listed in Table 6-9. These pollutants do not have FAAQS or NAAQS, and the Florida DER has not established a set of Acceptable Ambient Levels (AALs) for the assessment of acceptable ground level concentrations resulting from facility operation.

6.7.1 ASSESSMENT METHODS

Guideline concentrations for short-term and long-term periods including industrial toxicological limits (8-hour time-weighted-averages, TWA) and AALs (24-hour and annual averages) from two states with active air toxics management programs are listed for the purpose of comparison to modeled ground level concentrations of mercury, beryllium, hydrogen fluoride, sulfuric acid mist, arsenic and hydrogen chloride.

Threshold limit values (TLVs) adopted by the American Conference of Governmental Industrial Hygienists (ACGIH) are presented for comparison with

8-hour average concentrations from the facility. These limits are normally intended for use in the practice of industrial hygiene for 8-hour workday and 40-hour workweek exposures and not for estimating the toxic potential of continuous, uninterrupted exposures. It is believed that nearly all workers may be repeatedly exposed day after day to a TLV without adverse effects (Plunkett, 1976). The ACGIH TLVs are the most complete listing of quantified acceptable exposure levels available.

New York AALs were determined by New York State Department of Environmental Conservation and Department of Health toxicologists as guideline values — not standards — after analysis of all available data, using risk assessment technology suitable for each contaminant. The selection criteria are described at length in the New York State Air Guide-1 (NYSDEC, 1985). New York AALs are presented in Table 6-9 as annual average exposure guidelines.

Massachusetts AALs are 24-hour-average guideline concentrations based on health effects only. The levels were set by the Department of Environmental Quality Engineering's Division of Air Quality Control and the Office of Research and Standards. A 24 member Advisory Committee on Air Toxics composed of scientists, environmentalists, public health professionals, industry representatives and academicians developed the Chemical Health Effects Assessment Methodology (CHEM) from which it derived AALs (DEQE, 1985). The AALs presented in Table 6-9 are the most recent draft values proposed by DEQE in June, 1987.

6.7.2 COMPARISON WITH ACGIH TLVs AND AALs

Highest impacts of noncriteria pollutants listed in Table 6-9 are substantially less than the ACGIH TLVs and the two sets of AALs. It is suggested that the Pasco County RRF emissions will not pose a health risk to the surrounding population because the ground level concentrations do not exceed acceptable levels for short-term or long-term periods as established by agencies with well-established air toxics research and management programs.

The emission rate and highest annual ground level concentration of dioxins (expressed as 2,3,7,8-TCDD equivalents) for the Pasco County RRF are low compared to other permitted facilities. For example, two California facilities (i.e., the Irwindale and Stanislaus County RRFs), located in heavily populated areas near Los Angeles and Sacramento, were permitted after comprehensive health risk assessments and agency review with ambient dioxin impacts up to one order of magnitude higher than those predicted for the Pasco County RRF. These and other data from permits for other resource recovery facilities located nationwide suggest that chronic health risk due to dioxin emissions from the Pasco County RRF will be negligible.

6.8 COMPARISON WITH PSD INCREMENTS

The Pasco County RRF is a significant SO_x and TSP emissions source as defined in the F.A.C. 17-2 (Table 500-2), and as presented in this application in Table 2-1. As such, it is subject to a PSD increment consumption analysis to ensure compliance with all PSD increments. For a compliance analysis, Pasco County and all abutting counties are designated as PSD Class II areas in F.A.C. 17-2.440. The Chassahowitzka National Wildlife Refuge (NWR), located 16 miles (or about 27 km) north-northwest from the proposed site, is the only PSD Class I area within 100 km of the Pasco County RRF.

A dispersion modeling analysis was performed with ISCST in order to assess the potential for significant impacts and PSD increment consumption by the Pasco County RRF and background sources within these Class I and Class II areas. The Chassahowitzka NWR is well within the 50 km distance from the Pasco County RRF to which Gaussian models are considered accurate for estimating emission limits (EPA, 1986).

The following sections discuss impacts on those areas classified as in attainment for FAAQS and NAAQS. A discussion of Pasco County RRF impacts on nonattainment areas is presented in Section 7.7.

All dispersion modeling for the PSD Class II area increment analysis was based on the worst-case operating conditions of 5,000 Btu/lb of refuse at

design throughput for five years (1970-1974) of hourly meteorological data and the 360 receptor polar grid discussed in Section 6.5.

6.8.1 PSD Class II Areas

The baseline date for all PSD Class II areas in Florida is December 27, 1977 as specified in FAC 17-2.450. In the present case, all new sources and modifications subject to PSD review after this date were assumed to be PSD increment consuming sources (hereafter referred to as PSD background sources). The ground level SO₂ and TSP impacts predicted for the Pasco County RRF were discussed in Section 6.5.4, and are shown in Table 6-10 to cause less than significant ground level concentrations at all modeled receptors within PSD Class II areas for the 1970-1974 period. As a major post-baseline source of SO₂ and TSP, the facility is considered to consume PSD increment for the pollutant-specific averaging periods listed in Table 6-10.

Total SO₂ concentrations are conservatively estimated to be 46 percent, 60 percent, and 36 percent of the 3-hour, 24-hour, and annual average Significant Impact Level (SIL), respectively. Annual average TSP concentrations are 5 percent of the appropriate SIL, and the 24-hr average TSP concentration is 9 percent of its SIL. A modeling exercise to determine the effect of other PSD sources on the available Class II increment was not required because the predicted TSP and SO₂ impacts in Table 6-10 for the Pasco County RRF were below all SILs.

6.8.2 PSD Class I Increments

Section 17-2.440 of the FAC, the Federal PSD regulations, and Section 165(e) of the Clean Air Act require that a proposed source subject to PSD review conduct a dispersion modeling analysis of its impacts on any PSD Class I areas located within a 100 km radius. In the present application there is one applicable Class I area, the Chassahowitzka National Wildlife Refuge (NWR), which is located 27 km north-northwest from the Pasco County RRF site. An analysis of the air quality impacts on the Chassahowitzka NWR was conducted with ISCST to demonstrate that the Pasco County RRF alone

TABLE 6-10

COMPARISON OF PREDICTED PASCO COUNTY RRF IMPACTS
TO PSD CLASS II INCREMENTS AND SIGNIFICANT IMPACT LEVELS
FOR THE PERIOD 1970 - 1974

Pollutant	Averaging Period	Rank	Ground-Level Concentration (ug/m ³)	Significant Impact Level (ug/m ³)	Impacts as % of Significant Impact Level
SO ₂	Annual	H	0.36	1	36
	24-Hour	HSH	2.99	5	60
	3-Hour	HSH	11.43	25	46
TSP	Annual	H	0.05	1	5
	24-Hour	HSH	0.43	5	9

Abbreviations:

H = highest concentration
HSH = highest, second-highest concentration

would not have a significant impact or contribute with other PSD sources to an exceedance of an allowable PSD increment. The term "significant impact" is defined in F.A.C. 17-2.100(168) as a highest 24-hour average SO₂ or TSP impact exceeding 1 ug/m³. An initial ISCST modeling analysis was performed to assess the Pasco County RRF impacts. A set of discrete receptors was located along the southernmost NWR boundary. The impacts relative to significance levels are listed in Table 6-11. The proposed source consumed less than one-half of the allowed significant impact level for all short-term periods.

Further modeling was performed to quantify the Class I PSD increment consumed by all increment consuming sources (including the proposed source and the PSD background sources) relative to available increments established in F.A.C. 17-2.100 (168) and listed in Table 6-11. The modeling results demonstrate that the Pasco County RRF together with PSD background sources will not contribute to concentrations in excess of PSD Class I increments.

PSD Background Sources

An assessment of total PSD increment consumption at Chassahowitzka NWR by the Pasco County RRF and background sources was performed using DER supplied background sources listed in Table 6-12. This list represents a subset of the known local sources. Selection of background sources was performed as follows:

1. Fourteen SO₂ sources and 66 TSP sources (Table 6-12) were chosen from the DER approved 1982 Florida Crushed Stone Corporation PSD application as post-baseline PSD background sources.
2. Major SO₂ and TSP background sources, including power generation units operated by the Tampa Electric Company (TECO) and Florida Power Company (FPC), were identified as pre-baseline sources by DER and not modeled. These included:

TABLE 6-11

MAXIMUM MODELED IMPACTS AT THE CHASSAHOWITZKA NWR CLASS I AREA
FROM PASCO COUNTY RRF EMISSIONS FOR THE PERIOD 1970-1974

Pollutant	Averaging Period	Rank ^a	Maximum Concentration (ug/m ³)	Class I Significant Impact Level (ug/m ³)	Impact as % of Significant Impact Level	Class I PSD Increment (ug/m ³)	Impact as % of PSD Increment
TSP	24-Hour	H	0.061	1	6	10	0.6
	Annual	H	0.0039	—	—	5	<0.1
SO ₂	3-Hour	H	1.98	—	—	25	7.9
	24-Hour	H	0.42	1	42	5	8.4
	Annual	H	0.027	—	—	2	1.4

Abbreviations:

H = highest concentration
HSH = highest, second-highest concentration

Service: CDM

^aNo exceedences of the Class I Significant Impact Level are allowed.

TABLE 6-12

LOCAL TSP AND SO₂ SOURCES INCLUDED IN THE PSD CLASS I INCREMENT CONSUMPTION ANALYSIS

No.	SOURCE NAME	SO2 EMISSION (g/s)	PM EMISSION (g/s)	X COORD. (km)	Y COORD. (km)	STACK HEIGHT (m)	GAS TEMP (DEG K)	STACK VELOCITY (m/s)	STACK DIAM. (m)
1	PASCO CO. RRF	14.1	2.03	347.100	3139.200	83.82	394.3	15.7	3.05
3	DLS 6 KILN 2	1.3	1	397.200	3182.600	21.4	391.2	12.7	1.41
4	DLS 6 LIME DRY	7.5	1	397.200	3182.600	9.3	329.2	13	1.21
5	DLS 6 LIME COOL	0	0.6	397.200	3182.600	29.2	389.2	10	1.41
6	DLS 6 CaCO ₃	0	0.2	397.200	3182.600	16.8	314.2	14.5	0.5
7	DLS 6 MISC.	0	0.7	397.200	3182.600	6.4	314.2	23.3	0.5
8	DLS 6 COAL HANDLING	0	0.1	397.200	3182.600	7	314.2	3.9	0.3
9	DLS 6 KILN 1	1.3	0.8	397.200	3182.600	21.1	391.2	13.7	1.21
10	DLS 6 KILN 1 DUST	0	0.1	397.200	3182.600	7	314.2	11.4	0.4
25	TEC 15 BIG BEND 4	655	16.4	361.500	3075.000	150.3	342.2	20.1	7.36
26	FMM 8 RAW MATERIAL STRGE/GRDNG	0	9.4	356.200	3169.900	24.5	314.2	10.9	0.91
27	FMM 8 KILN 1	0.7	4.7	356.200	3169.900	23	400.2	10.9	3.02
28	FMM 8 COOLER 1	0	4.3	356.200	3169.900	24.5	376.2	9.7	2.31
29	FMM 8 CLINKER GRINDING	0	4.5	356.200	3169.900	24.5	314.2	15.9	0.91
30	FMM 8 CLINKER SILO 1	0	4.3	356.200	3169.900	44.5	314.2	4.9	0.6
31	FMM 8 CLAY CRUSH 1	2.1	3.3	356.200	3169.900	7.3	405.2	13.9	0.6
32	FMM 8 BTM BLEND	0	4.7	356.200	3169.900	62.9	366.2	18.8	0.8
33	FMM 8 PRODUCT STORAGE	0	4.3	356.200	3169.900	41.4	314.2	10.6	0.91
34	FMM 8 MASONRY SILO (3)	0	0.3	356.200	3169.900	64.4	336.1	15.3	0.7
35	FMM 8 KILN 2	2.52	2.7	356.200	3169.900	27.4	470.2	7.48	4.88
36	FMM COOLER 2	0	2.9	356.200	3169.900	15.3	477.9	22	2.31
37	FMM 8 CLINKER SILO (L07)	0	0.2	356.200	3169.900	46	358.2	16.3	0.91
38	FMM 8 FINISH MILL 1 & 2	0	0.6	356.200	3169.900	23	366.2	15.3	1.41
39	FMM 8 CLAY CRUSH 2	0	1	356.200	3169.900	6.1	405.2	15.3	1.51
40	FMM 8 KILN FEED	0	0.1	356.200	3169.900	27.6	327.2	13.6	0.5
41	FCS 1 CLAY CRUSH 1	0	0.1	360.044	3162.648	7.6	314.2	12.3	0.7
42	FCS 1 LIMESTONE CONV	0	0.1	360.123	3162.379	16.9	314.2	14.5	0.5
43	FCS 1 LIMESTONE TRANSFER	0	0.1	359.950	3162.477	4.6	314.2	13	0.6
44	FCS 1 PREMIX/FLY ASH BIN	0	0.16	360.005	3162.337	38.1	314.2	9.7	0.61
45	FCS 1 KILN	121.6	10.9	360.008	3162.392	97.6	381.2	13.71	4.88
46	FCS 1 RAW MAT'LS TRANSFER	0	0.04	360.030	3162.335	21.3	355.2	12.9	0.3
47	FCS 1 BLEND SILO	0	0.42	360.037	3162.312	73.2	355.2	13.72	1.1
48	FCS 1 KILN FEED	0	0.1	360.044	3162.306	15.2	366.2	9.7	0.61
49	FCS 1 COOLER DISCHARGE	0	0.1	360.086	3162.200	8.8	366	9.7	0.61
50	FCS 1 CLINKER SILO L12 & L13	0	0.16	360.114	3162.137	41.2	366	14.39	0.46
51	FCS 1 CLINKER SILO DISCHARGE	0	0.23	360.105	3162.125	15.2	314	14.5	0.76
52	FCS 1 LIMESTONE SILO	0	0.1	360.105	3162.143	7.6	314.2	12.5	0.4
53	FCS 1 CEMENT SILO	0	0.1	360.123	3162.133	7.6	339.2	13	0.6

TABLE 6-12 (cont.)

LOCAL TSP AND SO₂ SOURCES INCLUDED IN THE PSD CLASS I INCREMENT CONSUMPTION ANALYSIS

No.	SOURCE NAME	SO2 EMISSION (g/s)	PM EMISSION (g/s)	X COORD. (km)	Y COORD. (km)	STACK HEIGHT (m)	GAS TEMP (DEG K)	STACK VELOCITY (m/s)	STACK DIAM. (m)
54	FCS 1 FINISH MILL	0	0.81	360.111	3162.157	21.3	372.2	12.93	1.5
55	FSC 1 CEMENT SILO DISCHARGE(4)	0	0.08	360.125	3162.100	15.2	344.2	14.39	0.46
56	FCS 1 CEMENT SILOS (5)	0	0.3	360.125	3162.110	61	355.2	14.39	0.46
57	FCS 1 PACKING PLANT	0	0.1	360.155	3162.032	16.9	314.2	10.5	0.8
58	FCS 1 MASONRY SILOS (3)	0	0.1	360.147	3162.047	30.5	314.2	12.9	0.61
59	FCS 1 RAW/POWER COAL BINS	0	0.2	360.102	3162.210	30.7	314.2	12.5	0.4
60	FCS 1 GYPSUM 5.10	0	0.5	360.080	3162.010	7.6	314.2	12.5	0.4
61	EVN 7 20493	0.2	0.1	383.300	3135.800	12.3	466.2	9.2	0.4
74	FPC 11 FLY 1,2,5	0	11.1	334.400	3204.510	2.4	366.3	7.4	0.3
75	FPC 11 FLY ASH 3	0	4.6	334.400	3204.510	28.6	339.2	46.7	0.5
76	FPC 11 FLY ASH 4	0	4.5	334.400	3204.510	10.8	339.2	0.5	0.6
78	FPC 11 #4	0	0.3	356.200	3169.900	67.5	366.2	18.8	0.8
79	FMM 8 RAW MATERIALS FEED	0	0.1	356.200	3169.900	3.1	314.2	15.3	1
80	2 ADAMS CONSTRUCTION	7.4	1.2	361.400	3168.400	8.5	366.2	17.1	1.21
81	4 DAIRY SERVICE BOILER	4.7	0.3	364.200	3158.300	9.3	477.2	10.6	0.6
82	4 DAIRY SERVICE DRYER	4.7	1.3	364.200	3158.300	18.4	336.2	12.5	0.8
83	5 DELTONA	1.4	4.7	359.800	3164.000	7.6	347.2	5	1.81
84	13 HERNANDO CONC.	0	1.6	365.300	3158.300	15.3	314.2	4.9	0.6
85	18 WEST COAST CONC.	0	0.4	352.000	3157.000	16.8	314.2	4.9	0.6
86	3 CHEM LIME CCALC.	0	2.7	359.400	3162.300	27.6	319.2	4.7	1.21
87	3 CHEM LIME HYD.	0	1.8	359.400	3162.300	6.1	314.2	4.4	1.21
88	3 CHEM LIME DRYER	0	4.2	359.400	3162.300	9.3	394.2	18.6	1.11
89	3 CHEM LIME BOILER 1 & 2	0.2	0.0	359.400	3162.300	10.8	422.2	14.7	0.20
90	3 CHEM LIME BAGGING	0	1.5	359.400	3162.300	19	314.2	11.3	0.5

No.	AREA SOURCE NAME	PM EMISSION (g/s/m2)	X COORD. (km)	Y COORD. (km)	RELEASE HEIGHT (m)	LENGTH OF SIDE (m)
91	DEEP BUKT CNVYR	0 0.00021	360.130	3162.100	15	45
92	IRON ORE STORAGE	0 0.00029	360.130	3162.100	15	90
93	CEMENT DIST. SYS	0 0.00013	360.130	3162.100	10	20
94	COAL LDNG/PSHNG	0 0.00008	360.130	3162.100	10	80
95	VEH. TRAFFIC	0 0.000028	360.130	3162.100	10	80
96	WIND EROSION	0 0.000002	360.130	3016.200	10	80

- Gannon Generating Station Units 1 through 6,
 - Hookers Point Generating Station Units 1 through 3,
 - Bartow Generating Station Units 1 through 3,
 - Anclote Generating Station Units 1 and 2,
 - Big Bend Generating Station Units 1 through 3,
 - Evans Packing Company, and
 - Lykes-Pasco Company.
3. The TECO Big Bend Unit 4 was identified as a post-baseline source by DER, and its emissions were modeled.¹

The Table 6-12 emissions data base has been approved by DER and reflects recent updates of source characteristics.² Source number 35 recently submitted a PSD permit application to DER. Its proposed higher SO₂ emission rate was modeled.

The receptor grid oriented east-west along the southernmost boundary of the Chassahowitzka NWR included receptors spaced one-kilometer apart which is the equivalent of about a two-degree azimuthal resolution. All receptors were assigned a conservative ground level elevation of 50 ft. msl which equals the Pasco County RRF stack base elevation.

¹Based on personal communications with Mr. Tom Rogers and Mr. Bill Thomas of Florida DER-Tallahassee during the week of August 17-21, 1987.

²Summarized in an October 12, 1987 personal correspondence from Mr. Tom Rogers, FDER.

A total of 67 days were identified (Table 6-13) from the ISCST detailed modeling for which 3-hour and/or 24-hour average SO₂ concentrations caused by the Pasco County RRF at Chassahowitzka receptors were equal to or greater than five-percent of the 3-hour or 24-hour Class I PSD increments.

This five percent cut-off is equivalent to SO₂ impacts at least equal to 1.25 ug/m³ and 0.25 ug/m³ for the 3-hour and 24-hour averaging periods, respectively.

Model Inputs

The modeling analysis was set up with the following elements:

1. Ten receptors listed in Table 6-14 were positioned along the southernmost boundary of the Chassahowitzka NWR at 1 km intervals.
2. All background source emissions were modeled using the maximum allowable rates as recommended in Table 9-1 of Section 9.2.3 in the Guideline on Air Quality Models -- Revised (EPA-450/2-78-027R, July 1986).
3. ISCST was employed for the dispersion modeling.
4. Modeling was performed for five years (1970-74) of hourly meteorological data.
5. Short-term PSD increment consumption at Chassahowitzka NWR by background sources and the Pasco County RRF was modeled for all days of the five-year period (Table 6-13) on which the Pasco County RRF consumed at least five percent of the 3-hour and/or 24-hour SO₂ Class I increments.

The last element states that the short-term increment consumption analysis was limited to days that the proposed source emissions consumed at least five percent of any Class I PSD increment for SO₂. Big Bend Unit 4, which

TABLE 6-13

1970-1974 JULIAN DAYS USED IN THE
SHORT-TERM AVERAGING CLASS I PSD
INCREMENT CONSUMPTION MODELING ANALYSIS
FOR CHASSAHOWITZKA NWR^a

Year	Julian Date	Year	Julian Date	Year	Julian Date
1970	33	1972	2	1974	38
	85		4		92
	89		14		95
	221		162		143
	236		212		162
	298		236		175
			237		182
1971	5		274		187
	26		308		189
	37		315		206
	58		316		208
	73		335		213
	78				218
	85	1973	39		289
	120		40		324
	179		79		341
	216		93		349
	224		146		
	227		148		
	228		183		
	229		193		
	252		208		
	324		304		
	355		331		
			332		
			339		
			349		
			364		

^aDates represent those on which the proposed Pasco County RRF emissions resulted in a five-percent or greater consumption of the PSD SO₂ Class I increments or equivalently 1.25 ug/m³ (3-hour average) and 0.25 ug/m³ (24-hour average).

SOURCE: CDM, 1987.

TABLE 6-14

DISCRETE RECEPTORS AT THE CHASSAHOWITZKA NWR CLASS I
AREA AND USED IN THE PSD INCREMENT CONSUMPTION ANALYSIS

Distance (km)	Direction (km)	Receptor Coordinates		Assigned Elevation (ft, msl)	Reference Letter
		UTM-East (km)	UTM-North (km)		
26.0	359.1	346.7	3165.26	50	A
26.1	356.9	345.7	3165.26	50	B
26.2	354.7	344.7	3165.26	50	C
26.3	352.5	343.7	3165.26	50	D
26.4	350.4	342.7	3165.26	50	E
26.6	348.2	341.7	3165.26	50	F
26.8	346.1	340.7	3165.26	50	G
27.1	344.1	339.7	3165.26	50	H
27.4	342.1	338.7	3165.26	50	I
27.7	340.1	337.7	3165.26	50	J

SOURCE: CDM, 1987

accounts for 79 percent of the SO₂ emissions from all modeled sources in Table 6-12, is nearly in direct alignment with the Pasco County RRF and the Chassahowitzka NWR. Days of maximum impacts for the Pasco County RRF should correspond to the days of maximum combined impacts for the other increment consuming sources because Big Bend Unit 4 dominates the mass emissions and aligns with the Pasco County RRF and Chassahowitzka NWR. There are no other major sources in the vicinity of the NWR.

Modeling Results

Modeled Pasco County RRF impacts and total impacts (i.e., proposed source plus background sources) for all discrete receptors are listed in Table 6-15 for TSP and Table 6-16 for SO₂.

In Table 6-15 the paired maximum TSP PSD increment consumption for all sources of 2.79 ug/m³ (annual average) and 7.56 ug/m³ (24-hour average) represent 56 percent and 76 percent of the respective allowable PSD increments. Similarly in Table 6-16, the maximum SO₂ PSD increment consumption for Pasco County RRF and the background sources is 1.43 ug/m³ (annual average), 4.91 ug/m³ (24-hour average) and about 21.12 ug/m³ (3-hour average). These represent 72 percent, 98 percent and 84 percent of the respective allowable PSD Class I increments.

It can be concluded, based on the five-year PSD Class I increment consumption analysis that:

- The Pasco County RRF emissions of SO₂ and TSP cause a less than significant impact at the Chassahowitzka NWR.
- The composite SO₂ and TSP PSD increment consumption by the Pasco County RRF and PSD background sources is less than the allowable increment for all regulated averaging periods.

Therefore, the Pasco County RRF will not cause, or contribute to, a significant impact or exceedence of PSD increment at the Chassahowitzka Class I area.

TABLE 6-15

MODELED TSP IMPACTS AT THE CHASSAHOWITZKA NWR CLASS I AREA
DUE TO PASCO COUNTY RRF AND BACKGROUND SOURCES

Year	Averaging Period	Paired Maximum Impacts ^b					Total as Percent of PSD Increment
		Julian Date	Receptor Reference Letter	Pasco Co. Impact (ug/m ³)	Background Sources Impact ^a (ug/m ³)	Total Impact (ug/m ³)	
1970	annual ^c	NA	A	0.003	2.63	2.63	53
	24-hour	33	A	0.00	3.50	3.50	35
1971	annual	NA	A	0.004	2.42	2.42	48
	24-hour	224	A	0.02	3.63	3.65	37
1972	annual	NA	B	0.002	2.79	2.79	56
	24-hour	315	D	0.01	7.55	7.56	76
1973	annual	NA	A	0.003	2.44	2.44	49
	24-hour	183	I	0.03	5.97	6.00	60
1974	annual	NA	A	0.003	2.63	2.63	53
	24-hour	182	A	0.02	6.54	6.56	66

^aSixty-six TSP background sources were modeled.

^bMaximum paired-in-space-and-time impacts.

^cAnnual average concentrations were computed for the full 365- or 366-day duration.

NA = Not Applicable.

SOURCE: CDM, 1987

TABLE 6-16

MODELED SO₂ IMPACTS AT THE CHASSAHOWITZKA PSD CLASS I AREA
DUE TO PASCO COUNTY RRF AND BACKGROUND SOURCES

Year	Averaging Period	Paired Maximum Impacts ^b					
		Julian Date/ End Hour	Receptor Reference Letter	Pasco Co. RRF Impact (ug/m ³)	Background Sources Impact ^a (ug/m ³)	Total Impact (ug/m ³)	Total as Percent of PSD Increment
1970	annual ^c	NA	A	0.021	1.390	1.41	71
	24-hour	85	D	0.08	2.69	2.77	55
	3-hour	85/6	A	0.38	15.05	15.43	62
1971	annual	NA	A	0.026	1.201	1.23	61
	24-hour	252	F	0.28	2.79	3.07	61
	3-hour	252/3	F	1.60	16.50	18.10	72
1972	annual	NA	F	0.018	1.408	1.43	72
	24-hour	237	H	0.34	4.41	4.75	95
	3-hour	237/15	D	0.65	12.77	13.12	52
1973	annual	NA	A	0.022	1.316	1.34	67
	24-hour	39	A	0.30	4.61	4.91	98
	3-hour	39/3	A	0.85	20.27	21.12	84
1974	annual	NA	A	0.021	1.326	1.34	67
	24-hour	187	A	0.15	3.72	3.87	77
	3-hour	324/3	A	0.73	12.18	12.91	52

^a Fourteen SO₂ background sources were modeled.

^b Maximum paired-in-space-and-time impacts.

^c Annual average concentrations were computed for the full 365- or 366-day duration.

NA = Not Applicable.

SOURCE: CDM, 1987

SECTION 7

7.0 ADDITIONAL IMPACT ANALYSES

7.0 ADDITIONAL IMPACT ANALYSES

7.1 INTRODUCTION

This section describes the analysis performed to assess the impact of the Pasco County RRF on Air Quality Related Values (AQRVs) as required under the PSD regulations. The AQRVs assessed are:

- Visibility in Class I Areas within 100 km of the Pasco County RRF
- Impacts from growth indirectly related to the facility
- Potential for impacts to soil and vegetation

Air quality impacts from criteria pollutants in the Chassahowitzka Class I area, and Cedar Keys National Wildlife Refuge (NWR) are also presented. Other issues addressed in this section include an assessment of secondary sources from the Pasco County RRF and an analysis of predicted impacts within pollutant non-attainment areas.

7.2 VISIBILITY IMPACTS

Visibility impairment can be quantified by determining the spectral light intensity at a given location in the atmosphere with known aerosol and pollutant concentrations. Visibility impairment includes such things as the reduction of visual range, the perceptibility of plume shapes and haze layers, atmospheric discoloration, and plume-modified visual contrast of distant objects. These effects are caused by changes in light intensity as a result of the scattering and absorption of light (radiation) by particles and/or atmospheric aerosols. When the physical and chemical properties of the plume are known, the impact on visibility can be estimated (Latimer and Ireson, 1980).

Pollutants from combustion sources have specific effects upon visibility within the atmosphere. First, the presence of particulate matter will result in scattering and reflection of light by the plume. Secondly, emitted primary precursors/pollutants such as nitrogen oxides and sulfur dioxide react with elements in the ambient atmosphere (O_2 , ozone, etc.) to form secondary pollutants that impact visibility. These secondary pollutants cause diffraction and/or absorption of light waves and changes in the ambient atmospheric color.

The EPA-approved Level 1 Visibility Analysis outlined in the "Workbook for Estimating Visibility Impairment" (Latimer and Ireson, 1980), was used to estimate the impact of the stack emissions from the Pasco County RRF upon visibility. It is designed to identify emission sources that have the potential of adversely affecting visibility. This analysis is based on conservative assumptions of pollutant emissions, atmospheric pollutant photochemistry, and worst-case meteorological conditions that would produce maximum in-plume pollutant concentrations. If a Level I analysis shows that a source would not cause adverse visibility impairment, then a more rigorous Level II analysis would not be required. Visibility indices C1, C2, and C3 defined below are calculated in Attachment D for the Chassahowitzka Class I area, several nearby national wildlife refuges and the Whitlacoochie State forest. If the visibility indices predicted for the Pasco County RRF are below the threshold value of 0.1, then the source is presumed to have a negligible impact on visibility at those locations.

The Level I analysis prepared for the Pasco County RRF assesses the in-plume concentrations of nitrogen dioxide, sulfur dioxide and particulate matter to determine indices of plume contrast against the sky (C1), the plume contrast against terrain (C2) and changes in sky/terrain contrast caused by primary and secondary precursor pollutants (C3). Included as input to the analysis is the minimum distance of the source from a potentially affected Class I area, the vertical dispersion coefficient corresponding to the Pasquill-Gifford F stability category (Turner, 1970) for that distance, and Pasco County RRF emission rates for NO_2 , SO_2 and TSP. An example of the hand calculation, as presented in the "Workbook for

Estimating Visibility Impairment" (Latimer and Ireson, 1980), is presented in Attachment D.

A Level I visibility screening analysis was performed for Pasco County RRF impacts on PSD Class I areas within 100 km of the proposed site in accordance with FAC 17-2,500 (5)(e) 1. The Chassahowitzka National Wildlife Refuge (NWR) is located approximately 27 km north-northwest of the site. In addition, the potential for adverse visibility impacts was examined for the Cedar Key NWR, and the Withacoochie State Forest and Anclote NWR, located 35 km northeast and southwest from the site, respectively. An analysis of potential visibility impairment was expanded to include these additional recreational areas. Computations of the three contrast parameters C1, C2, and C3 for all four areas are presented in Attachment D and the results are listed in Table 7-1. Results of the Level I visibility impairment analysis for each area demonstrates that all contrast parameters have values much less than the 0.1 threshold value. Thus, emissions from the Pasco County RRF will not have a significant impact on visibility at the four Class I and recreation areas.

7.3 GROWTH ANALYSIS

The Pasco County RRF will employ approximately 50 persons. It is anticipated that the majority of these personnel requirements will be filled from within the local labor force. Significant in-migration to the area is therefore not anticipated. As a result, no increase in population attributable to the facility in the area is expected to occur.

The project does not require the destruction, relocation, or alteration of any residential property in the area. In addition, since no net migration to the area is anticipated, there will be no change in demand for housing units in the area.

The construction and operation of the Pasco County RRF will have a minor positive net effect on industrial and commercial development. The facility will promote development by providing for solid waste disposal, and thereby be an integral part of the plans for development within Pasco County. It

TABLE 7-1

LEVEL I VISIBILITY PARAMETERS FOR PSD CLASS I AREAS
AND MAJOR RECREATIONAL LANDS WITHIN 100 KM OF THE PASCO COUNTY RRF

Impact Area	Distance to Source ^a (km)	Absolute Value of Visibility Contrast Parameters ^b			Threshold Value	C1/C2/C3 as Percent of Threshold ^c
		C1	C2	C3		
Chassahowitzka Natl. Wildlife Refuge (PSD Class I Area)	27	2.60×10^{-2}	9.9×10^{-3}	1.7×10^{-4}	0.1	26%/10%/0.2%
Cedar Keys N.W.R.	100	5.38×10^{-4}	2.98×10^{-5}	1.67×10^{-4}	0.1	0.5%/0.02%/0.2%
Anclote N.W.R.	35	2.02×10^{-2}	7.93×10^{-3}	1.67×10^{-4}	0.1	20%/8%/0.2%
Whitlacoochie State Forest	35	2.02×10^{-2}	7.93×10^{-3}	1.67×10^{-4}	0.1	20%/8%/0.2%

^a Approximate minimum distance between source and receptor

^b C1 = a measure of plume contrast against sky

C2 = a measure of plume contrast against terrain

C3 = a measure of change in sky/terrain contrast caused by primary or secondary aerosol

^c A Value of C1, C2, or C3 less than 0.1 implies that the emissions source is unlikely to cause an adverse visibility impairment within the Class I area. A more refined analysis than Level I (Latimer and Ireson, 1980) is unnecessary.

is not anticipated that this effect will be significant when considered on a regional basis.

The growth analysis indicates that no net significant change in employment, population, housing, or commercial/industrial development will be associated with the project. As a result, there will not be any significant increases in pollutant emissions indirectly associated with the Pasco County RRF.

7.4 CLASS I AIR QUALITY ANALYSIS

The Class I area nearest to the facility is the Chassahowitzka National Wildlife Refuge (NWR) located about 27 km to the north-northwest. Although the Cedar Key NWR is not a Class I area, it was also included in this assessment. An analysis of potential impacts of these areas was performed using the ISCST dispersion model and the same five-year meteorological data set and source input values employed for the FAAQS and PSD increment compliance demonstration in Section 6.0. The pollutants analyzed are those with specified significance levels, namely SO_2 , TSP, NO_2 , and CO.

Table 7-2 presents the results of this analysis for the averaging periods of interest. Normalized and adjusted concentrations, otherwise referred to as X/Q (concentration/emission rate) values, are presented in this table for a 1.042 g/s emission rate. The emission rate reflects the increased emissions from the worst case operating condition of 1,200 tpd of 5,000 Btu/lb refuse over the design operating condition. The Julian day and year of the predicted maximum are also listed. Table 7-3 details the maximum concentration and the appropriate significance level for the four pollutants at the proposed emission rates modeled for 1970-74 meteorology. As can be noted from Table 7-3, all predicted impacts are approximately 10 percent or less of their respective significance levels. Therefore, no significant impact due to Pasco County RRF emissions is predicted at the Chassahowitzka Class I area or the Cedar Keys NWR. A more detailed assessment of PSD Class I increment consumption at the Chassahowitzka NWR is presented in Section 6.0.

TABLE 7-2
SPECIAL RECEPTOR MODELING RESULTS

Averaging Period	Receptor	Maximum X/Q	Day	Year
Annual	Chassahowitzka ^a	0.00187	—	1971
	Cedar Key ^b	0.00082	—	1971
24-hour	Chassahowitzka	0.03233	40	1973
	Cedar Key	0.01050	51	1971
8-hour	Chassahowitzka	0.07436	341	1974
	Cedar Key	0.02809	37	1971
3-hour	Chassahowitzka	0.13997	120	1971
	Cedar Key	0.05012	46	1970
1-hour	Chassahowitzka	0.33866	179	1971
	Cedar Key	0.13394	251	1971

^a Chassahowitzka National Wildlife Area, modeled at 27 km north-northwest of the Pasco County RRF.

^b Cedar Keys National Wildlife Refuge, modeled at approximately 97 km north of the Pasco County RRF.

TABLE 7-3
MAXIMUM CONCENTRATIONS AT SPECIAL RECEPTOR LOCATIONS

Pollutant	Averaging Time	Chassahowitzka Class I Area ($\mu\text{g}/\text{m}^3$)	Cedar Keys NWR ($\mu\text{g}/\text{m}^3$)	PSD Class II Significant Impact Level ^a
SO ₂	Annual	0.025	0.011	1
	24-hour	0.436	0.142	5(1 ^b)
	3-hour	1.89	0.677	25
TSP	Annual	0.0036	0.0016	1
	24-hour	0.063	0.0205	5(1 ^b)
NO ₂	Annual	0.073	0.0032	1
CO	8-hour	0.440	0.166	500
	1-hour	7.99	3.16	2000

^a F.A.C. 71-2.100 (170)

^b Significant Impact Level for Class I Areas

7.5 SOILS AND VEGETATION IMPACT ANALYSIS

DER requires that an assessment be undertaken of the potential impacts of emissions from a proposed facility on soils and vegetation of commercial or recreational value (F.A.C. 17-2.500(5)(e)). Pollutant emissions from the Pasco County RRF were used to compute potential impacts on soils and vegetation.

Vegetative impacts from airborne pollutants may result from deposition on leaf surfaces as particulate matter (dry deposition), as solutions in rainfall (wet deposition), or by gaseous exchange. Airborne components may also enter vegetation through roots following deposition to soils. Accumulation of airborne pollutants in soil can also lead to changes in soil characteristics.

The majority of land area within the proposed project area consists of planted slash pine (Pinus elliotti) and sand pine (P. clausa) coniferous forest and clear cut areas. These forests are found on the excessively drained Candler fine sands and the moderately well drained Tavares sand. Limited acreage of hardwood forest comprised predominantly of Live Oak (Quercus virginiana) are found in the southwest portion of the study area. Freshwater marshes found on the somewhat poorly drained Adamsville fine sand are also present in the southwest portion of the study area. Impacts associated with the airborne pollutants are therefore evaluated with respect to forest ecosystem effects.

7.5.1 PREDICTED AIR QUALITY IMPACTS

The ground level concentrations used in this section are the maximum annual concentrations predicted in Section 6.0. Although the maximum concentration was predicted at only a single downwind location, it will be used to conservatively demonstrate that impacts to soils and vegetation surrounding the facility should not be adversely affected by pollutant emissions from the facility.

To evaluate the potential impacts of air pollutants on the soils and vegetation, a Level-1 screening analysis, as recommended by the California Air Resources Board (CARB) for conservatively estimating pollutant deposition rates, was performed. For particulate matter and pollutants that are emitted primarily as particles, a deposition velocity of 2 cm/s was assumed. Because mercury is emitted primarily as a vapor, a deposition velocity of 1 cm/s was assumed. The deposition rates were calculated by multiplying the deposition velocities by the annual ground level concentrations at the point of maximum impact and used to assess pollutant impacts throughout the study area.

Incremental soil concentrations were predicted by assuming that accumulation of pollutants within the first centimeter of soil would occur over the 30-year life span of the facility and an average soil density of 1,500 kg/m³. These deposition velocities are greater than those determined in the field for SO₂ deposition on grass (0.8 cm/sec) and therefore provide a conservative amount of potential impacts.

7.5.2 ACID PRECIPITATION

The pH of precipitation recorded from approximately 100 National Atmospheric Data Program sites in the U.S. and southern Canada indicates that the pH of the rainfall in Pasco County is approximately 5.0 (CAST, 1985). The pH of "pure" rainfall is approximately 5.2 due to the presence of carbon dioxide in the atmosphere. This report indicates that the research performed to date which has shown injury to crop foliage, has been performed utilizing simulated acid rain with a pH of 3.5 to 3.0 or lower. The report concludes that there is no evidence that acid precipitation as it occurs in the field has detrimental effects on crops or a direct damaging impact on forest vegetation.

The instances where local damage to trees and other vegetation has been observed are correlated to the presence of point sources emitting large quantities of sulfur dioxide such as ore smelters (CAST, 1985). This type of damage may be more likely attributed to "acid deposition" rather than acid precipitation. In acid deposition the sulfur dioxide emitted as a gas

reacts with moisture to form sulfurous acid either in atmospheric moisture, condensation or as it is absorbed by plants.

The emissions from the proposed resource recovery facility would not be expected to significantly alter the nature or extent of acid precipitation in the region. The predicted annual SO_2 concentration of 0.36 ug/m^3 is only 1.4 percent of the existing background levels.

7.5.3 SPECIFIC POLLUTANTS

Pollutants may be deposited on soils and vegetation in dry or wet phases or in a combination. Much of the SO_2 present in the atmosphere will be deposited as SO_2 but some may also be oxidized and deposited as H_2SO_4 . The H_2SO_4 may also be subject to neutralization in air in the presence of ammonia (Pierson and Husar, 1986). NO , NO_2 and hydrocarbons emitted to the atmosphere interact in the photochemical system to produce O_3 , nitrous acid, nitric acid and peroxyacetyl nitrate (PAN) as well as partially reacted hydrocarbons (HC). Of these chemical species O_3 , SO_2 and NO_2 in relation to O_3 and SO_2 appear to be the species of greatest concern with respect to vegetative impacts.

Sulfur Dioxide

SO_2 has been observed to effect photosynthesis and plant respiration at concentrations as low as 52 to 92 ug/m^3 for periods as short as 1 hour, far below the U.S. secondary 3-hour standard of $1,300 \text{ ug/m}^3$ (Pierson and Husar, 1986). However, the maximum hourly SO_2 concentration from the Pasco County RRF of 20 ug/m^3 is well below even these levels. Thus, no adverse impact is expected.

Total Suspended Particulates

The Pasco County RRF is expected to emit 68 tons/year of particulate matter. This equates to a maximum deposition over a 30-year period of 0.975 g/m^2 and contributes less than 65 mg/kg to the top centimeter of

soil. This is a small fraction of the settleable particulate matter that naturally occurs.

Fluoride

Airborne fluoride has been identified as being capable of causing phytotoxic symptoms at levels a thousandfold less than that of sulfur compounds (Brandt and Heck, 1978). The fluoride emitted from a point source may occur as either gaseous HF, which is phytotoxic, or as particulate F which may represent a substantial portion of the total fluorine deposition (Polomski, et al. 1982). Accumulation of atmospheric fluoride in soils occurs at a slow rate even in severely fluorine polluted areas, however, atmospheric fluorine pollution over several decades may result in elevating the level of water extractable fluorine in soils (Polomski et al. 1982). The deposition of fluorides from the Pasco County RRF would result in a soil concentration of about 16.2 mg/kg over the 30-year lifespan of the facility. This is only 5 percent of the fluoride found in typical humid temperate region soils. Once incorporated into the soil, fluoride is less hazardous to vegetation as it is retained on iron and aluminum oxides. Thus, no adverse impact from fluoride emissions is expected.

Trace Metals

The Pasco County RRF estimated total metal deposition values are 0.05 g/m² for Pb, 0.02 g/m² for Hg and 4.10×10^{-6} g/m² for Be over the 30-year life span of the facility.

Although there appears to be little to no effect of atmospheric lead deposition on vegetation (NAS, 1972), the potential for accumulation in soils to phytotoxic levels or to levels which could lead to elevated rates of uptake is of concern. Uncontaminated soils typically contain 2 to 200 mg/kg of lead (Allaway, 1968). The maximum addition of lead to the top centimeter of soil over 30 years would be 3.23 mg/kg. As a comparison the addition of up to 500 kg/ha of lead (250 mg/kg) can be added to cropland

via municipal sludge application on soils with low cation exchange capacity. Thus, no adverse impact from Pb emissions is expected.

Mercury emitted from point sources may affect plants due to further adsorption or uptake from soils and translocation in vegetation (CAST, 1976). Soils typically contain 0.05 mg/kg of mercury (Bohn et al., 1977). The typical range of mercury in humid temperate soils is 0.02 to 0.2 mg/kg. At a mercury mine and refining facility in Almaden Spain no vegetative damage was observed in soils with 10 to 20 times average soil mercury levels (Lundberg et al. 1979). In this case, over the life of the Pasco County RRF, the maximum addition within the top centimeter of soil is 1.5 mg/kg. Because of the conservativeness of the analysis (30-year accumulation in one centimeter of soil without depletion), mercury impacts are not expected to result in adverse impacts to vegetation.

Beryllium is highly toxic to plants and visual toxicity symptoms and decreases in growth rates have been observed in bean plants grown in nutrient solutions of 3-5 ppm (Romney et al. 1962). After 30 years of deposition, soil concentrations increases from beryllium emissions of less than 0.0003 mg/kg (ppm) would result. These additions are negligible compared to concentrations in typical humid temperate soils and well below levels toxic to vegetation.

7.6 ASSESSMENT OF SECONDARY SOURCES

There are two secondary sources of particulate emissions associated with the Pasco County RRF. The vent on the top of the lime storage silo is a potential source of lime dust. The ash handling building vent is a potential source of ash residue emissions. These vents are minor point sources whose emissions are small compared to the particulate emissions from the stack and whose ambient impacts are expected to be insignificant. The nature of these sources and the manner in which they will be controlled is described below.

7.6.1 LIME SILO ROOF VENT

The lime silo is a storage vessel for pebble lime used by the dry scrubber to control acid gas emissions. The silos are sized to store four to seven days of pebble lime. Pebble lime is delivered in enclosed tractor-trailer trucks equipped with a dense phase pneumatic unloading system. Ambient air is used to fluidize and convey pebble lime through pneumatic piping into the lime silo. The displaced air in the silo and air flow associated with the unloading operation released through a roof vent into a fabric filter which reduces entrained pebble lime emissions to less than 0.02 grains per actual cubic foot (ACF).

The deliveries of pebble lime are made every three to five days. In normal practice, the truck operator will require about an hour to unload the pebble lime and about five minutes to clear the trailer hoppers and piping of any residual lime. The air flow rates during the transfer process range from 750 to 1,000 ACF per minute. Assuming that the pebble lime will be unloaded at the higher air flow rate, the maximum hourly emission is estimated at 0.086 pounds of particulate matter per hour. If three deliveries of two hours in duration are made per week, the annual emission rate would be 32 pounds of particulate matter per year.

7.6.2 ASH HANDLING BUILDING VENT

Particulate emissions from the ash handling building are expected to be negligible. The ash handling practices at modern massburn resource recovery facilities are such that resuspension of ash residue is greatly reduced.

Ash that from the end of the furnace grate or air pollution control equipment is quenched in a water tank and wetted to 15 to 25 percent moisture by weight. From the quench tank the ash is conveyed to an ash handling building where the ash may enter a magnetic separator to remove ferrous material. If the conveyor must exit the main building to reach the ash handling building, the conveyor is fully enclosed. Within the ash handling building, the ash is kept in bins until it can be taken to the

ash/landfill. The moisture content of the residue is maintained throughout the ash handling process to reduce resuspension of residue material. Any material that may become suspended is controlled through the use of particulate control devices on the ash handling building vents.

7.7 IMPACT WITHIN POLLUTANT NON-ATTAINMENT AREAS

In order to demonstrate that a new source will not prevent reasonable further progress toward attainment of the NAAQS, a source located outside a pollutant non-attainment area must show that it will have a less than significant impact within the non-attainment area. The Pasco County RRF is not located within an area designated as non-attainment for any of the criteria pollutants. The nearest pollutant non-attainment areas are located in Hillsborough and Pinellas Counties. A 452 km² section of Hillsborough County centered about the intersection of U.S. 41 South and State Road 60 is designated non-attainment for TSP; the northernmost boundary of this area is more than 20 km from the Pasco County RRF site. Northernmost Pinellas County, 250-25 km south-southwest from the proposed site, is designated non-attainment for SO₂ due to emissions from the currently nonoperational Stouffer Chemical Co. (The SO₂ non-attainment designation is expected to be rescinded in the near future. However no formal notice of redesignation has been published in the Federal Register as of this document release date).

The ground level concentration of SO₂ and TSP at the point of maximum impact, 1.2 to 2.0 km from the Pasco County RRF, are well below their respective significant impact levels. Pollutant impacts at locations 20 to 25 km from the proposed facility would be considerably less. However, an impact assessment of SO₂ concentration along the northern border of the Pinellas County SO₂ non-attainment area was conducted. This analysis demonstrated that predicted SO₂ impacts would be about one tenth of the maximum ground level concentrations presented in Section 6.5. Thus, the pollutant emissions from the Pasco County RRF will not adversely impact air quality within the Hillsborough and Pinellas County non-attainment areas.

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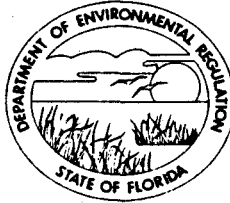
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ATTACHMENT A

AMBIENT AIR QUALITY
MONITORING WAIVER

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32399-2400



BOB MARTINEZ
GOVERNOR
DALE TWACHTMANN
SECRETARY

March 23, 1987

Mr. Raymond C. Porter
Camp, Dresser & McKee, Inc.
One Center Plaza
Boston, Massachusetts 02108

Dear Mr. Porter:

Re: Pasco County Resource Recovery Project
Response to CDM Letter of March 11, 1987

The department has reviewed the results of your screening modeling and your subsequent request for exemption from the preconstruction monitoring requirements. Based on these modeling results, as presented in your March 11, 1987 letter, the department concurs with your request, and thus, will not require preconstruction ambient monitoring for any pollutant.

The conservative technique used to establish the background concentrations at the rural Pasco County project site is acceptable. Although these values do not reflect the actual background in the immediate vicinity of the proposed site, they are acceptable for the purpose of establishing reasonable assurance that ambient air quality standards will not be exceeded.

The department has also reviewed your proposed refined modeling protocol. We concur with that protocol with the following exceptions:

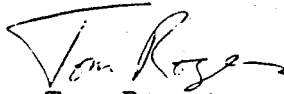
1. The points of maximum concentration for the 100 meter resolution refined modeling should include the days and receptors having (a) the highest concentration, (b) the high, second-highest concentration, (c) the second-highest concentration at the location of the highest concentration, and (d) the highest concentration at the location of the high, second-highest concentration. The purpose of this exercise is to account for the possibility that the highest and second-highest days may flip-flop.
2. If applicable, building wake downwash should be included in the modeling.

Mr. Raymond C. Porter
Page Two
March 23, 1987

3. Your use of the term "PSD significant level" is assumed to be referring to the definition of "significant impact" as written in Rule 17-2.100(170) of the Florida Administrative Code.

If you have any questions on the above comments please call me at (904)488-1344.

Sincerely,



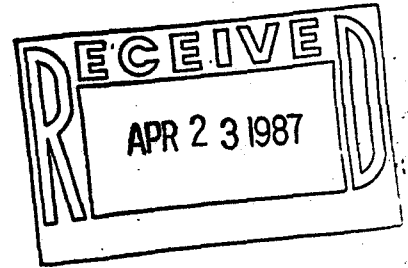
Tom Rogers
Meteorologist
Bureau of Air Quality
Management

TR/ks

cc: Buck Oven
Don Elias
David Dee
Lew Nagler

APR 17 1987

4APT-AP/ljf



Mr. Larry George, Chief
Air Modeling Section
State of Florida
Department of Environmental Regulation
Bureau of Air Quality Management
2600 Blair Stone Rd.
Twin Towers Office Building
Tallahassee, Florida 32301

Re: Pasco County Resource Recovery Project

Dear Mr. George:

The Region IV staff have reviewed the Camp Dresser and McKee proposed protocol for the air quality analysis portion of the Pasco County Resource Recovery Project. We concur with the proposed screening analysis and refined modeling procedure.

Camp Dresser and McKee also has asked that an exemption from preconstruction monitoring be granted for each air pollution control alternative. We agree that for the dry scrubber/electrostatic precipitator (ESP) alternative there are no requirements for preconstruction monitoring based on the predicted maximum impacts. We also agree that for the ESP alternative no preconstruction monitoring is necessary even though for fluorides and for SO₂ (1200 tpd only) the screening analysis indicates that these pollutants exceed the de minimus monitoring guideline values.

Please provide our comments on the Pasco Resource Recovery Facility to Camp Dresser and McKee. If you have any questions, please contact me or Lewis Nagler of my staff at 404-347-2864.

Sincerely yours,

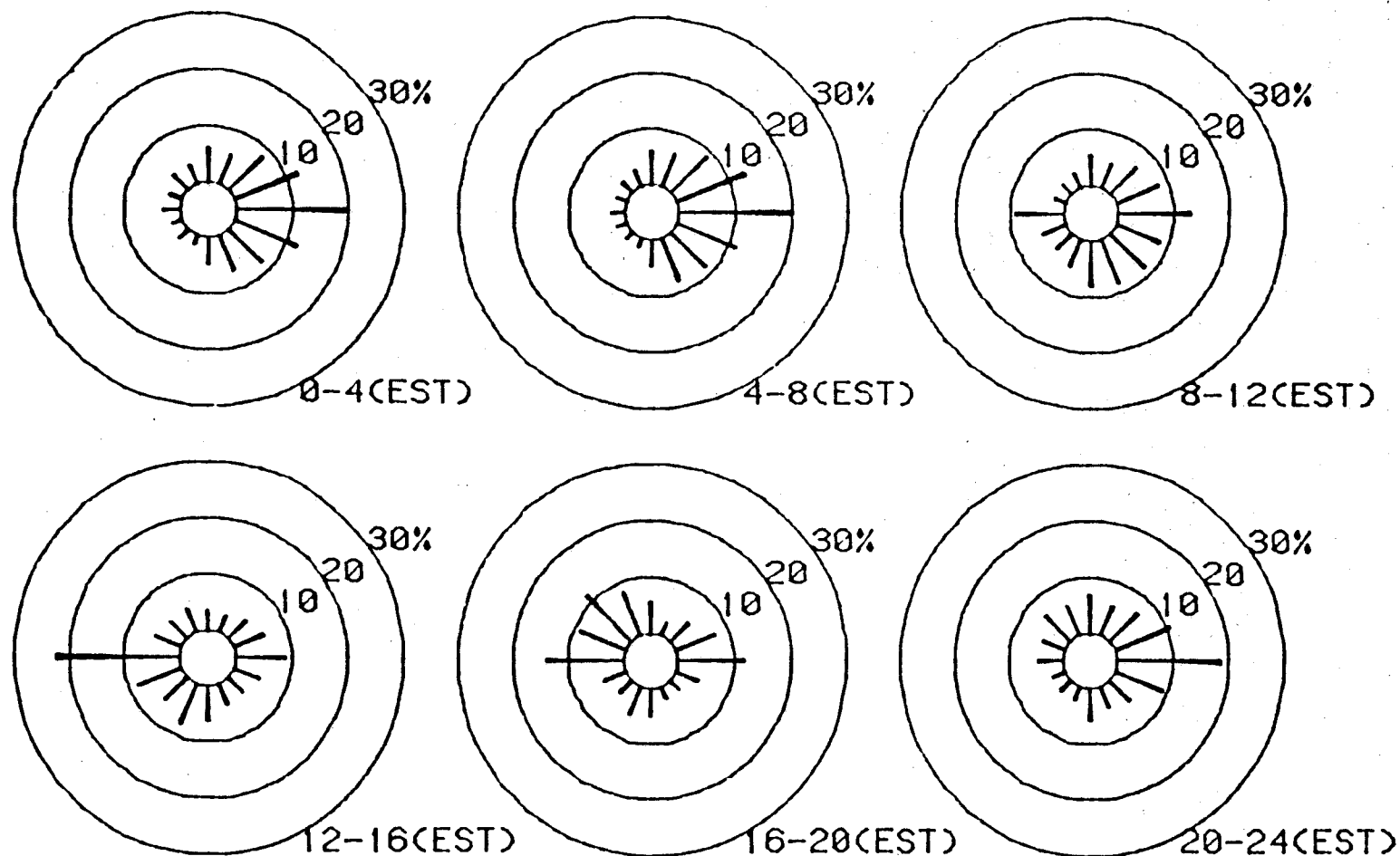
Bruce P. Miller, Chief
Air Programs Branch
Air, Pesticides, and Toxics
Management Division

ATTACHMENT B

METEOROLOGICAL DATA
FOR TAMPA INTERNATIONAL AIRPORT

SEASONAL/DIURNAL WIND ROSES

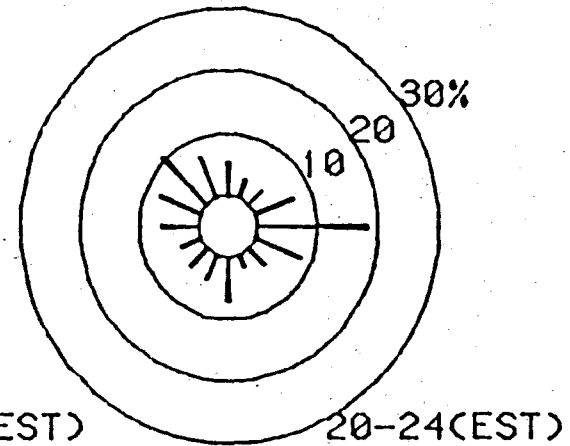
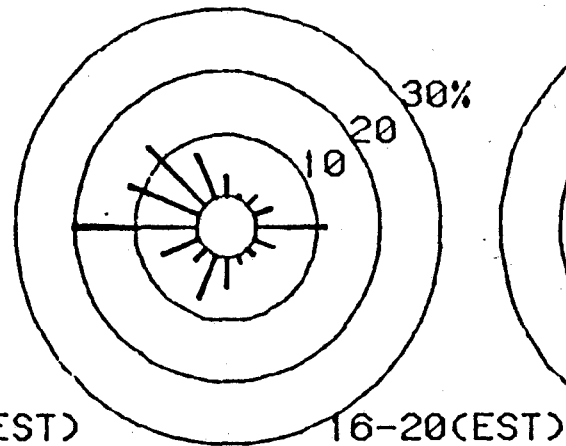
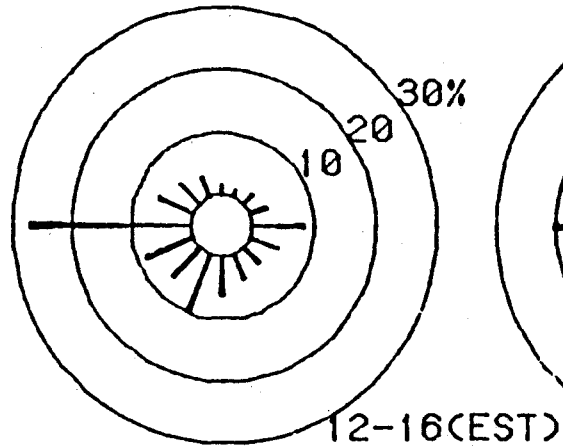
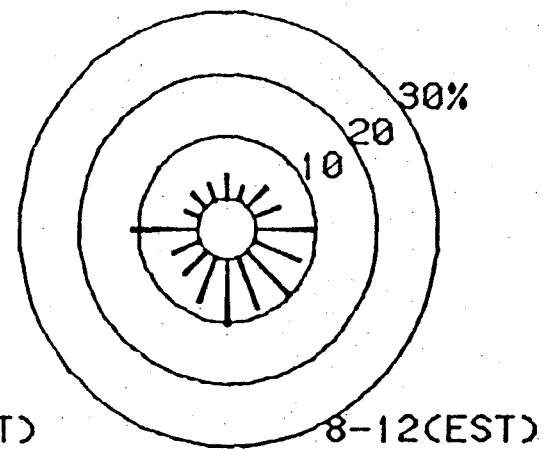
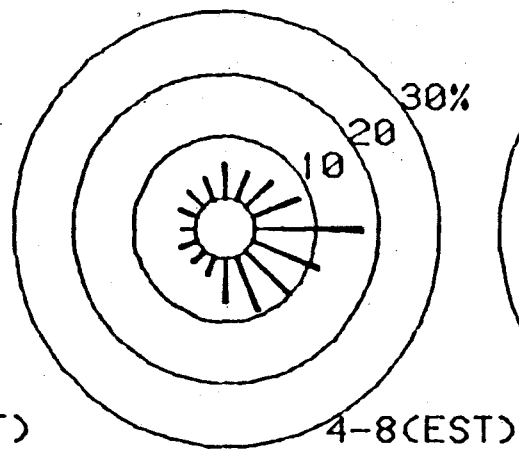
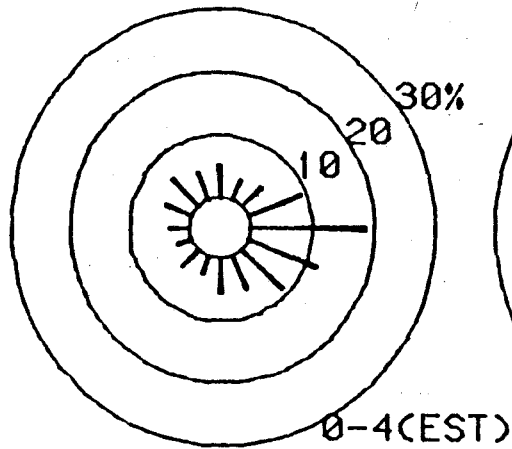
DIURNAL WIND DIRECTION ROSES



ALL SEASONS (1970 through 1974)

FIGURE B-1
DIURNAL WIND DIRECTION ROSES

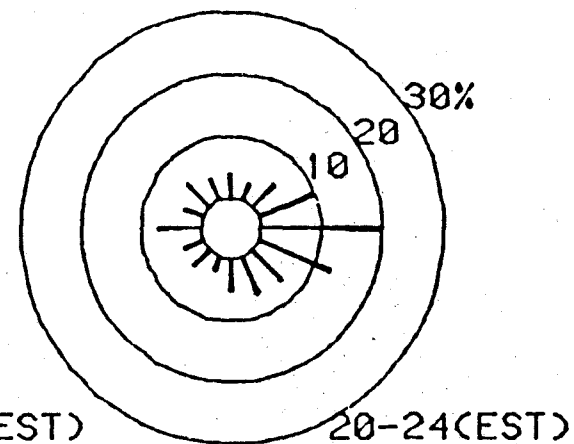
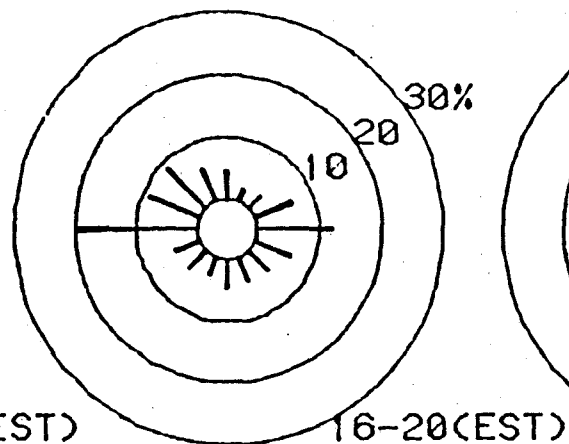
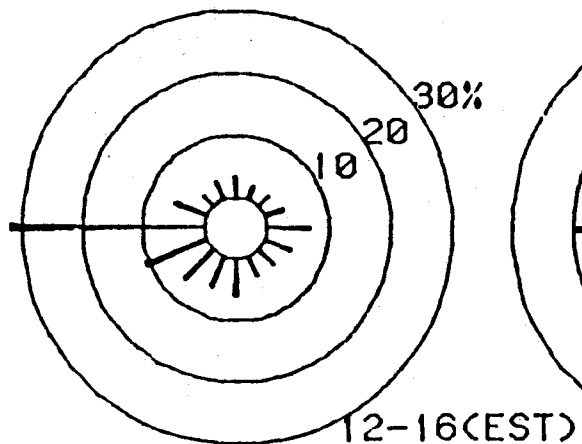
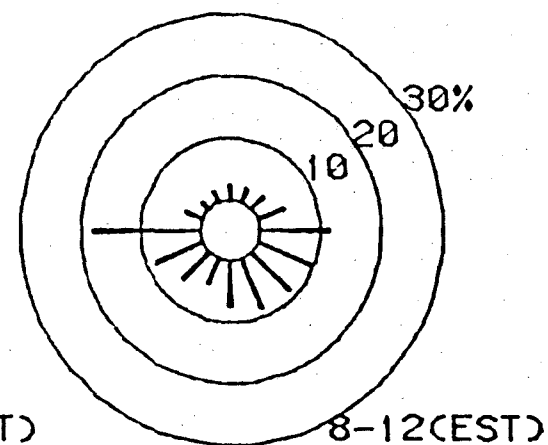
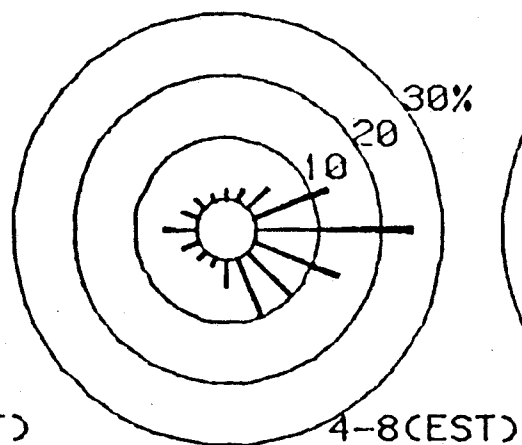
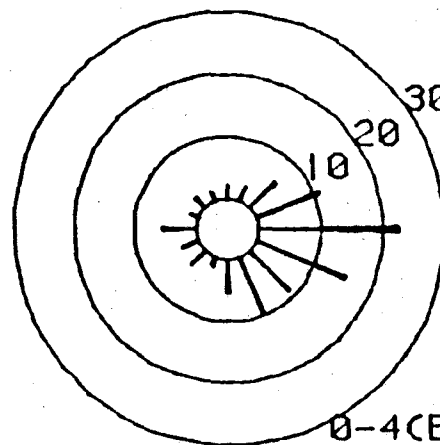
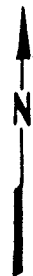
DIURNAL WIND DIRECTION ROSES



SPRING SEASONS (1970 through 1974)

FIGURE B-2
DIURNAL WIND ROSES FOR SPRING

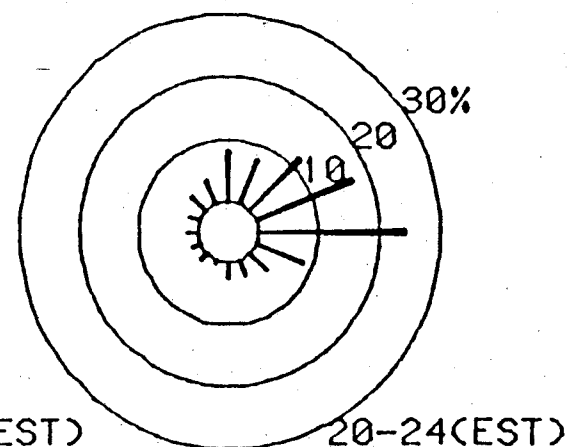
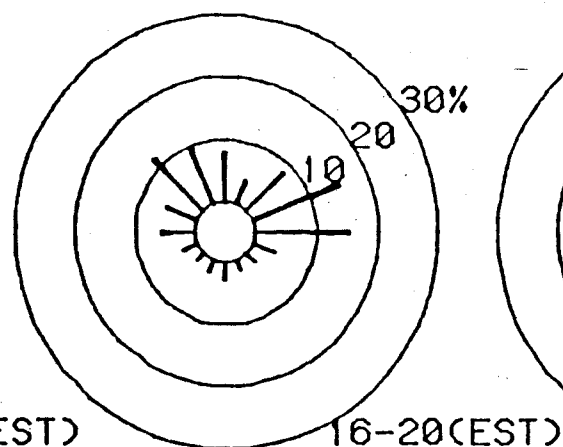
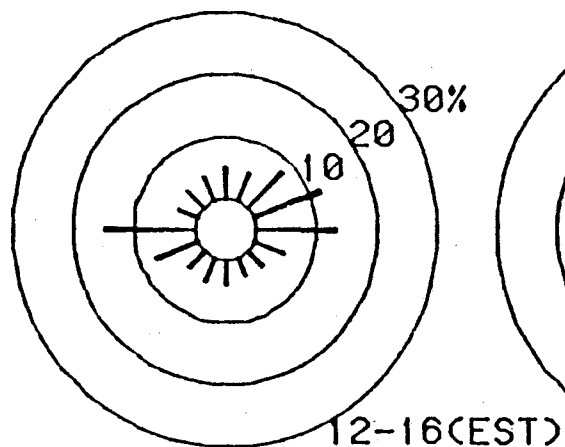
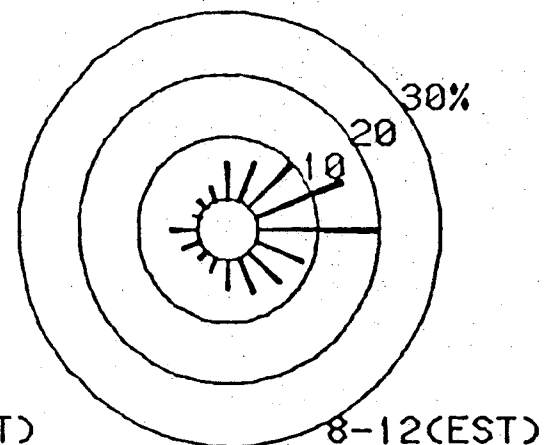
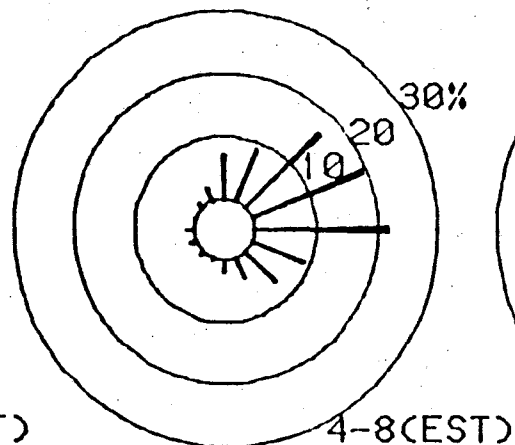
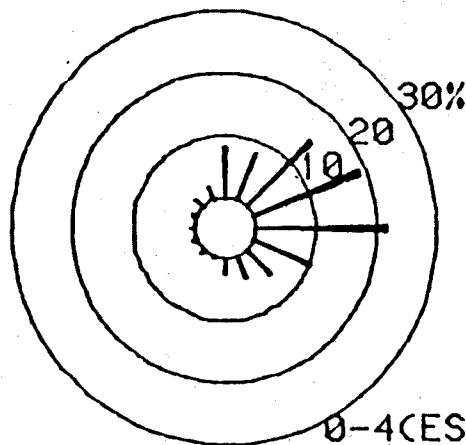
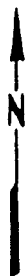
DIURNAL WIND DIRECTION ROSES



SUMMER SEASONS (1970 through 1974)

FIGURE B-3
DIURNAL WIND ROSES FOR SUMMER

DIURNAL WIND DIRECTION ROSES

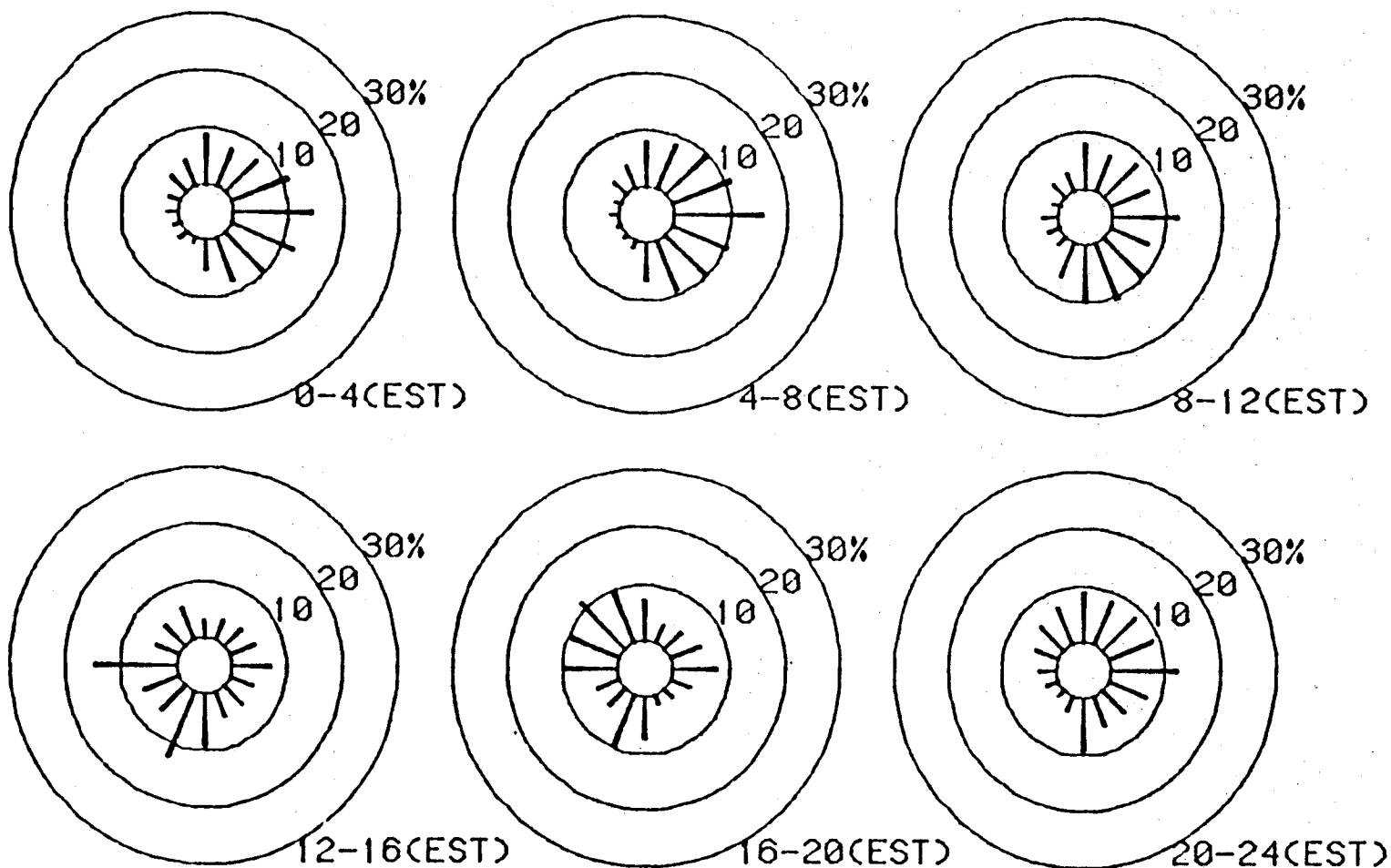


FALL SEASONS (1970 through 1974)

FIGURE B-4
DIURNAL WIND ROSES FOR FALL



DIURNAL WIND DIRECTION ROSES



WINTER SEASONS (1970 through 1974)

FIGURE B-5
DIURNAL WIND ROSES FOR WINTER

STABILITY/WIND
FREQUENCY DISTRIBUTIONS

TABLE B-1

METEOROLOGY FOR TAMPA INTERNATIONAL AIRPORT

STABILITY WIND ROSE

STABILITY CLASS A

FROM JAN. 1 1970 THROUGH DEC. 31 1974

DIRECTION	+-----WIND SPEED CLASSES (MPH)-----+						TOTAL	AVERAGE WIND SPEED
	0-2	2-3	3-5	5-8	8-11	≥11		
N	0.00	0.08	0.00	0.00	0.00	0.00	0.08	0.00
NNE	0.00	0.29	0.00	0.00	0.00	0.00	0.29	0.45
NE	0.00	0.42	0.00	0.00	0.00	0.00	0.42	0.75
ENE	0.00	0.61	0.00	0.00	0.00	0.00	0.61	0.91
E	0.00	0.84	0.00	0.00	0.00	0.00	0.85	1.00
ESE	0.01	0.67	0.00	0.00	0.00	0.00	0.67	1.68
SE	0.00	0.40	0.00	0.00	0.00	0.00	0.41	2.19
SSE	0.00	0.19	0.00	0.00	0.00	0.00	0.19	2.98
S	0.00	0.23	0.00	0.00	0.00	0.00	0.24	1.17
SSW	0.00	0.05	0.00	0.00	0.00	0.00	0.05	6.31
SW	0.00	0.12	0.00	0.00	0.00	0.00	0.13	0.80
WSW	0.00	0.11	0.00	0.00	0.00	0.00	0.11	1.57
W	0.01	0.23	0.00	0.00	0.00	0.00	0.24	0.77
WNW	0.00	0.19	0.00	0.00	0.00	0.00	0.20	1.32
NW	0.00	0.47	0.00	0.00	0.00	0.00	0.47	0.50
NNW	0.00	0.49	0.00	0.00	0.00	0.00	0.49	1.12
TOTAL	0.05	5.40	0.00	0.00	0.00	0.00	5.45	1.21
AVG SPD	1.40	1.39	0.00	0.00	0.00	0.00	1.21	1.21

TABLE B-2

METEOROLOGY FOR TAMPA INTERNATIONAL AIRPORT

STABILITY WIND ROSE

STABILITY CLASS 3

FROM JAN. 1 1970 THROUGH DEC. 31 1974

DIRECTION	+-----WIND SPEED CLASSES (MPH)-----+						TOTAL	AVERAGE WIND SPEED
	0-2	2-3	3-5	5-8	8-11	>11		
N	0.01	0.01	0.03	0.00	0.00	0.00	0.06	2.84
NNE	0.01	0.05	0.12	0.00	0.00	0.00	0.18	3.12
NE	0.01	0.05	0.13	0.00	0.00	0.00	0.19	3.20
ENE	0.01	0.04	0.19	0.00	0.00	0.00	0.24	3.27
E	0.02	0.08	0.33	0.00	0.00	0.00	0.42	3.32
ESE	0.03	0.06	0.18	0.00	0.00	0.00	0.27	3.07
SE	0.02	0.06	0.24	0.00	0.00	0.00	0.32	3.30
SSE	0.01	0.05	0.24	0.00	0.00	0.00	0.30	3.23
S	0.01	0.04	0.28	0.00	0.00	0.00	0.33	3.44
SSW	0.01	0.04	0.28	0.00	0.00	0.00	0.33	3.56
SW	0.01	0.04	0.39	0.01	0.00	0.00	0.44	3.63
WSW	0.00	0.05	0.53	0.00	0.00	0.00	0.59	3.63
W	0.02	0.09	0.81	0.01	0.00	0.00	0.94	3.66
WNW	0.01	0.02	0.12	0.01	0.00	0.00	0.15	3.48
NW	0.01	0.02	0.04	0.00	0.00	0.00	0.06	2.99
NNW	0.01	0.03	0.07	0.00	0.00	0.00	0.11	3.02
TOTAL	0.20	0.70	3.99	0.04	0.00	0.00	4.93	3.43
AVG SPD	1.60	2.56	3.77	5.62	0.00	0.00	3.43	3.43

TABLE B-3

METEOROLOGY FOR TAMPA INTERNATIONAL AIRPORT

STABILITY WIND ROSE

STABILITY CLASS C

FROM JAN. 1 1970 THROUGH DEC. 31 1974

DIRECTION	+-----WIND SPEED CLASSES (MPS)-----+						TOTAL	AVERAGE WIND SPEED
	0-2	2-3	3-5	5-8	8-11	>11		
N	0.01	0.02	0.08	0.03	0.00	0.00	0.14	3.98
NNE	0.01	0.06	0.33	0.15	0.00	0.00	0.56	4.23
NE	0.02	0.06	0.42	0.18	0.00	0.00	0.67	4.24
ENE	0.03	0.10	0.63	0.32	0.00	0.00	1.08	4.24
E	0.02	0.16	1.02	0.47	0.01	0.00	1.68	4.27
ESE	0.02	0.12	0.63	0.30	0.00	0.00	1.07	4.25
SE	0.02	0.09	0.59	0.29	0.00	0.00	0.99	4.30
SSE	0.02	0.08	0.60	0.32	0.00	0.00	1.03	4.34
S	0.06	0.08	0.48	0.33	0.01	0.00	0.96	4.34
SSW	0.04	0.05	0.52	0.37	0.01	0.00	0.99	4.52
SW	0.01	0.05	0.48	0.22	0.00	0.00	0.77	4.28
WSW	0.01	0.09	0.69	0.36	0.00	0.00	1.16	4.36
W	0.03	0.09	1.44	1.36	0.05	0.00	2.97	4.85
WNW	0.04	0.04	0.27	0.22	0.02	0.00	0.59	4.55
NW	0.02	0.04	0.20	0.14	0.01	0.00	0.41	4.40
NNW	0.01	0.03	0.19	0.15	0.01	0.00	0.39	4.73
TOTAL	0.39	1.17	8.56	5.21	0.14	0.01	15.48	4.43
AVG SPD	1.45	2.49	4.17	5.71	8.72	13.17	4.43	4.43

TABLE B-4

METEOROLOGY FOR TAMPA INTERNATIONAL AIRPORT

STABILITY WIND ROSE

STABILITY CLASS D

FROM JAN. 1 1970 THROUGH DEC. 31 1974

DIRECTION	+-----WIND SPEED CLASSES (MPH)-----+						TOTAL	AVERAGE WIND SPEED
	0-2	2-3	3-5	5-8	8-11	>11		
N	0.01	0.05	0.20	0.33	0.03	0.00	0.63	5.12
NNE	0.05	0.17	0.68	1.00	0.04	0.00	1.94	4.89
NE	0.04	0.22	0.87	1.58	0.08	0.00	2.79	5.10
ENE	0.05	0.34	1.28	1.43	0.07	0.00	3.18	4.75
E	0.10	0.61	2.12	2.53	0.10	0.00	5.46	4.77
ESE	0.09	0.32	1.12	1.18	0.04	0.00	2.75	4.60
SE	0.05	0.21	0.90	1.13	0.02	0.00	2.32	4.76
SSE	0.06	0.22	0.92	1.05	0.04	0.00	2.30	4.74
S	0.07	0.24	0.96	1.28	0.12	0.01	2.67	5.01
SSW	0.04	0.14	0.61	1.03	0.10	0.00	1.92	5.24
SW	0.02	0.14	0.42	0.44	0.02	0.00	1.04	4.63
WSW	0.03	0.11	0.54	0.62	0.04	0.00	1.33	4.88
W	0.03	0.22	1.11	2.71	0.12	0.01	4.20	5.38
WNW	0.05	0.11	0.55	1.12	0.22	0.04	2.08	5.73
NW	0.04	0.12	0.64	1.22	0.24	0.03	2.30	5.68
NNW	0.03	0.10	0.58	1.13	0.22	0.01	2.07	5.67
TOTAL	0.76	3.32	13.51	19.79	1.50	0.12	39.00	5.05
AVG SPD	1.43	2.46	4.05	6.33	9.32	12.58	5.05	5.05

TABLE B-5

METEOROLOGY FOR TAMPA INTERNATIONAL AIRPORT

STABILITY WIND ROSE

STABILITY CLASS E

FROM JAN. 1 1970 THROUGH DEC. 31 1974

DIRECTION	+-----WIND SPEED CLASSES (MPH)-----+						TOTAL	AVERAGE WIND SPEED
	0-2	2-3	3-5	5-8	8-11	>11		
N	0.01	0.06	0.18	0.04	0.00	0.00	0.29	3.61
NNE	0.04	0.24	0.50	0.12	0.00	0.00	0.90	3.52
NE	0.06	0.32	0.83	0.14	0.00	0.00	1.36	3.48
ENE	0.07	0.72	1.24	0.17	0.00	0.00	2.21	3.32
E	0.16	1.07	2.07	0.28	0.00	0.00	3.58	3.33
ESE	0.10	0.58	1.02	0.20	0.00	0.00	1.90	3.36
SE	0.06	0.33	0.74	0.10	0.00	0.00	1.23	3.38
SSE	0.04	0.32	0.59	0.06	0.00	0.00	1.00	3.23
S	0.04	0.32	0.49	0.06	0.00	0.00	0.90	3.20
SSW	0.03	0.13	0.28	0.02	0.00	0.00	0.46	3.28
SW	0.02	0.18	0.25	0.00	0.00	0.00	0.45	3.03
WSW	0.04	0.11	0.25	0.04	0.00	0.00	0.44	3.33
W	0.07	0.17	0.49	0.08	0.00	0.00	0.82	3.38
WNW	0.06	0.18	0.38	0.05	0.00	0.00	0.66	3.15
NW	0.07	0.28	0.62	0.04	0.00	0.00	1.01	3.18
NNW	0.03	0.20	0.48	0.06	0.00	0.00	0.77	3.37
TOTAL	0.89	5.20	10.41	1.46	0.00	0.00	17.96	3.33
AVG SPD	1.41	2.44	3.94	5.43	8.75	0.00	3.33	3.33

TABLE B-6

METEOROLOGY FOR TAMPA INTERNATIONAL AIRPORT

STABILITY WIND ROSE

STABILITY CLASS F

FROM JAN. 1 1970 THROUGH DEC. 31 1974

DIRECTION	+-----WIND SPEED CLASSES (MPH)-----+						TOTAL	AVERAGE WIND SPEED
	0-2	2-3	3-5	5-8	8-11	>11		
N	0.02	0.17	0.08	0.00	0.00	0.00	0.28	2.49
NNE	0.12	0.60	0.20	0.00	0.00	0.00	0.92	2.36
NE	0.14	0.93	0.34	0.00	0.00	0.00	1.40	2.39
ENE	0.26	1.72	0.58	0.00	0.00	0.00	2.56	2.40
E	0.39	2.50	0.96	0.00	0.00	0.00	3.85	2.42
ESE	0.21	1.15	0.48	0.00	0.00	0.00	1.84	2.40
SE	0.15	0.57	0.24	0.00	0.00	0.00	0.95	2.34
SSE	0.12	0.47	0.28	0.00	0.00	0.00	0.87	2.45
S	0.12	0.45	0.19	0.00	0.00	0.00	0.75	2.38
SSW	0.03	0.14	0.06	0.00	0.00	0.00	0.23	2.45
SW	0.07	0.20	0.10	0.00	0.00	0.00	0.37	2.36
WSW	0.10	0.20	0.09	0.00	0.00	0.00	0.38	2.24
W	0.10	0.18	0.14	0.00	0.00	0.00	0.42	2.31
WNW	0.11	0.28	0.12	0.00	0.00	0.00	0.52	2.32
NW	0.16	0.57	0.25	0.00	0.00	0.00	0.98	2.34
NNW	0.12	0.56	0.19	0.00	0.00	0.00	0.87	2.33
TOTAL	2.22	10.68	4.28	0.01	0.00	0.00	17.19	2.39
AVG SPD	1.38	2.43	3.27	5.65	0.00	0.00	2.39	2.39

TABLE B-7

MET. DATA
DAY 242

*** PASCO:1200 TPD/5000 BTU/ISC6/DS/BIN MET/FG/1Hr-H1H/1972

* METEOROLOGICAL DATA FOR DAY 242 *

HOUR	FLOW VECTOR (DEGREES)	RANDOM FLOW VECTOR (DEGREES)	WIND SPEED (MPS)	MIXING HEIGHT (METERS)	TEMP. (DEG. K)	INPUT STABILITY CATEGORY	ADJUSTED STABILITY CATEGORY
1	250.0	253.0	2.06	1770.8	297.6	6	6
2	250.0	252.0	1.00	1780.3	297.0	6	6
3	250.0	249.0	1.00	1789.9	297.0	6	6
4	250.0	247.0	1.00	1799.5	296.5	6	6
5	250.0	249.0	1.00	1809.0	296.5	6	6
6	280.0	281.0	1.54	1818.6	296.5	6	6
7	280.0	283.0	1.00	199.4	297.6	6	6
8	280.0	285.0	1.00	441.6	300.9	5	5
9	90.0	86.0	3.09	683.8	302.0	4	4
10	100.0	97.0	3.60	926.1	303.1	3	3
11	90.0	94.0	3.60	1168.3	303.7	2	2
12	90.0	90.0	3.60	1410.5	304.3	2	2
13	90.0	88.0	5.14	1652.8	304.8	3	3
14	100.0	102.0	4.12	1895.0	305.4	2	2
15	90.0	86.0	5.66	1895.0	304.8	3	3
16	90.0	88.0	5.14	1895.0	304.8	3	3
17	90.0	89.0	5.14	1895.0	304.3	4	4
18	100.0	98.0	4.12	1895.0	303.1	4	4
19	100.0	103.0	4.12	1880.5	301.5	5	5
20	110.0	111.0	3.60	1786.4	300.9	5	5
21	90.0	94.0	2.06	1692.3	299.8	6	6
22	100.0	105.0	2.57	1598.1	299.8	6	6
23	180.0	177.0	1.54	1504.0	298.7	6	6
24	180.0	178.0	1.00	1409.8	298.7	6	6

* CALM HOURS (=1) FOR DAY 242 * 0 1 1 1 1 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1

TABLE B-8

MET. DATA
DAY 222

*** PASCO:1200 TPD/5000 BTU/ISC6/DS/BIN MET/FG/1Hr-H1H/1972

* METEOROLOGICAL DATA FOR DAY 222 *

HOUR	FLOW VECTOR (DEGREES)	RANDOM FLOW VECTOR (DEGREES)	WIND SPEED (MPS)	MIXING HEIGHT (METERS)	TEMP. (DEG. K)	INPUT STABILITY CATEGORY	ADJUSTED STABILITY CATEGORY
1	320.0	316.0	4.12	1695.6	298.7	5	5
2	270.0	272.0	2.57	1690.5	298.7	6	6
3	240.0	241.0	1.54	1685.5	297.6	6	6
4	300.0	304.0	2.06	1680.4	297.6	6	6
5	320.0	322.0	2.06	1675.4	297.6	6	6
6	280.0	282.0	2.57	1670.4	298.1	6	6
7	280.0	281.0	2.06	201.4	298.1	5	5
8	310.0	313.0	2.57	405.5	301.5	4	4
9	340.0	339.0	2.57	609.6	303.1	3	3
10	20.0	23.0	2.57	813.7	303.7	2	2
11	90.0	87.0	2.57	1017.8	304.8	1	1
12	110.0	112.0	6.17	1221.8	304.8	2	2
13	100.0	102.0	5.14	1425.9	305.9	3	3
14	110.0	108.0	5.66	1630.0	306.5	3	3
15	80.0	82.0	5.14	1630.0	303.7	4	4
16	100.0	104.0	4.12	1630.0	302.6	3	3
17	170.0	175.0	2.57	1630.0	302.6	3	3
18	280.0	279.0	5.66	1630.0	300.9	4	4
19	280.0	284.0	1.00	1630.0	299.8	3	3
20	360.0	4.0	3.09	1644.8	298.7	4	4
21	240.0	245.0	2.57	1662.8	299.3	5	5
22	270.0	274.0	4.63	1680.6	298.1	5	5
23	290.0	290.0	3.09	1698.5	297.6	6	6
24	290.0	294.0	3.09	1716.4	298.1	6	6
222 *	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	1 0 0 0 0	0 0 0 0 0

TABLE B-9

MET. DATA
DAY 180

*** PASCO:1200 TPD/5000 BTU/ISC6/DS/BIN MET/FG/1Hr-H1H/1972

* METEOROLOGICAL DATA FOR DAY 180 *

HOUR	FLOW VECTOR (DEGREES)	RANDOM FLOW VECTOR (DEGREES)	WIND SPEED (MPS)	MIXING HEIGHT (METERS)	TEMP. (DEG. K)	INPUT STABILITY CATEGORY	ADJUSTED STABILITY CATEGORY
1	80.0	83.0	3.09	1148.9	299.8	6	6
2	70.0	70.0	2.57	1135.2	299.8	6	6
3	70.0	74.0	2.57	1121.5	299.3	6	6
4	80.0	76.0	3.09	1107.8	299.3	5	5
5	80.0	80.0	3.60	1094.1	299.8	4	4
6	70.0	75.0	3.60	1080.4	299.8	4	4
7	80.0	84.0	3.60	1066.8	300.4	3	3
8	90.0	87.0	2.57	1053.1	300.9	4	4
9	80.0	79.0	4.12	1039.4	302.0	3	3
10	90.0	89.0	4.12	1025.7	302.6	3	3
11	90.0	94.0	4.12	1012.0	303.1	2	2
12	100.0	103.0	5.14	998.4	304.3	3	3
13	110.0	111.0	5.14	984.7	304.8	3	3
14	90.0	91.0	5.14	971.0	304.8	3	3
15	90.0	90.0	5.14	971.0	304.8	3	3
16	90.0	93.0	6.17	971.0	304.3	4	4
17	90.0	92.0	4.63	971.0	303.7	3	3
18	90.0	87.0	4.12	971.0	303.1	3	3
19	80.0	79.0	2.57	971.0	302.0	4	4
20	50.0	53.0	2.06	974.1	299.8	5	5
21	80.0	76.0	3.09	979.6	299.8	6	6
22	70.0	72.0	2.57	985.1	299.8	6	6
23	70.0	73.0	2.57	990.6	299.8	6	6
24	70.0	73.0	4.12	996.1	299.8	5	5

TABLE B-10

MET. DATA
DAY 237

*** PASCO:1200 TPD/5000 BTU/ISC6/DS/BIN MET/FG/1Hr-H1H/1971 ***

* METEOROLOGICAL DATA FOR DAY 237 *

HOUR	FLOW VECTOR (DEGREES)	RANDOM FLOW VECTOR (DEGREES)	WIND SPEED (MPS)	MIXING HEIGHT (METERS)	TEMP. (DEG. K)	INPUT STABILITY CATEGORY	ADJUSTED STABILITY CATEGORY
1	360.0	357.0	1.00	1168.4	297.0	6	6
2	300.0	305.0	1.54	1116.4	297.0	6	6
3	300.0	303.0	1.00	1064.4	297.0	6	6
4	300.0	301.0	1.00	1012.3	297.0	6	6
5	290.0	294.0	1.54	960.3	297.0	6	6
6	290.0	294.0	1.00	908.3	296.5	6	6
7	270.0	266.0	2.06	53.9	296.5	5	5
8	300.0	301.0	3.60	116.5	298.7	4	4
9	330.0	334.0	2.57	179.1	300.9	3	3
10	300.0	298.0	2.06	241.7	303.1	2	2
11	70.0	72.0	2.57	304.3	303.1	1	1
12	70.0	74.0	1.00	366.8	302.6	1	1
13	100.0	100.0	6.17	429.4	301.5	2	2
14	160.0	163.0	2.57	492.0	299.3	2	2
15	230.0	231.0	2.57	492.0	299.3	3	3
16	220.0	217.0	3.09	492.0	299.8	3	3
17	180.0	181.0	2.57	492.0	301.5	4	4
18	220.0	217.0	2.57	492.0	300.4	4	4
19	270.0	273.0	3.60	495.0	299.8	4	4
20	320.0	325.0	3.60	541.5	298.7	4	4
21	290.0	293.0	3.09	587.9	298.1	5	5
22	270.0	267.0	1.54	634.4	298.1	6	6
23	280.0	285.0	1.54	680.9	297.6	6	6
24	280.0	281.0	2.06	727.4	297.0	6	6

* CALM HOURS (=1) FOR DAY 237 * 0 0 1 1 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0

TABLE B-11

*** PASCO:1200 TPD/5000 BTU/ISC6/DS/BIN MET/FG/3Hr-H1H/1970

MET. DATA
DAY 119

* METEOROLOGICAL DATA FOR DAY 119 *

HOUR	FLOW VECTOR (DEGREES)	RANDOM FLOW VECTOR (DEGREES)	WIND SPEED (MPS)	MIXING HEIGHT (METERS)	TEMP. (DEG. K)	INPUT STABILITY CATEGORY	ADJUSTED STABILITY CATEGORY
1	30.0	27.0	2.06	1458.2	295.9	5	5
2	30.0	32.0	1.00	1450.1	295.9	6	6
3	250.0	246.0	2.57	1442.0	294.8	5	5
4	250.0	251.0	1.00	1433.9	293.7	6	6
5	250.0	247.0	1.00	1425.8	293.7	6	6
6	230.0	229.0	2.57	10.2	293.1	5	5
7	270.0	270.0	1.54	178.1	294.8	4	4
8	240.0	237.0	1.54	345.9	298.1	3	3
9	30.0	34.0	3.09	513.8	300.4	2	2
10	70.0	72.0	3.60	681.6	300.9	2	2
11	70.0	75.0	3.60	849.5	302.0	2	2
12	70.0	73.0	3.60	1017.3	303.1	2	2
13	70.0	74.0	4.12	1185.2	303.7	2	2
14	70.0	71.0	4.63	1353.0	303.1	2	2
15	90.0	89.0	4.63	1353.0	303.1	3	3
16	110.0	109.0	5.66	1353.0	302.6	3	3
17	140.0	136.0	5.14	1353.0	301.5	4	4
18	110.0	109.0	4.63	1353.0	300.4	4	4
19	120.0	122.0	4.63	1354.3	299.3	5	5
20	140.0	137.0	2.57	1396.6	297.0	6	6
21	140.0	144.0	3.09	1438.8	295.9	6	6
22	120.0	124.0	2.06	1481.1	294.8	6	6
23	120.0	122.0	1.00	1523.3	294.8	6	6
24	180.0	183.0	2.06	1565.6	293.7	6	6

* CALM HOURS (=1) FOR DAY 119 * 0 1 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0

TABLE B-12

MET. DATA
DAY 99

*** PASCO:1200 TPD/5000 BTU/ISC6/DS/BIN MET/FG/3Hr-H1H/1970

* METEOROLOGICAL DATA FOR DAY 99 *

HOUR	FLOW VECTOR (DEGREES)	RANDOM FLOW VECTOR (DEGREES)	WIND SPEED (MPS)	MIXING HEIGHT (METERS)	TEMP. (DEG. K)	INPUT STABILITY CATEGORY	ADJUSTED STABILITY CATEGORY
1	320.0	321.0	4.12	1442.0	290.4	5	5
2	320.0	316.0	3.60	1443.6	289.8	5	5
3	300.0	300.0	3.09	1445.3	289.3	6	6
4	300.0	297.0	2.57	1446.9	288.7	6	6
5	290.0	289.0	2.57	1448.5	287.6	6	6
6	270.0	267.0	2.06	1450.1	287.0	6	6
7	280.0	281.0	2.06	138.0	287.0	5	5
8	280.0	276.0	2.57	327.3	290.9	4	4
9	290.0	289.0	4.12	516.5	294.3	3	3
10	340.0	342.0	3.60	705.8	295.9	2	2
11	40.0	43.0	3.09	895.1	297.0	2	2
12	70.0	74.0	4.12	1084.4	297.6	2	2
13	80.0	81.0	4.12	1273.7	298.7	2	2
14	80.0	76.0	3.60	1463.0	298.7	2	2
15	70.0	71.0	3.60	1463.0	298.7	2	2
16	90.0	87.0	3.09	1463.0	298.7	2	2
17	90.0	87.0	4.63	1463.0	298.7	3	3
18	100.0	103.0	4.63	1463.0	296.5	4	4
19	120.0	119.0	3.09	1462.2	293.7	5	5
20	120.0	120.0	2.57	1458.6	290.9	6	6
21	110.0	110.0	2.57	1454.9	290.4	6	6
22	130.0	128.0	2.06	1451.3	289.8	6	6
23	150.0	152.0	1.54	1447.7	289.3	6	6
24	150.0	149.0	1.00	1444.0	288.7	6	6
* CALM HOURS (=1) FOR DAY 99 *	0	0	0	0	0	0	0
	0	0	0	0	0	0	1

TABLE B-13

MET. DATA
DAY 129

*** PASCO:1200 TPD/5000 BTU/ISC6/DS/BIN MET/FG/1HR-H1H/1971

* METEOROLOGICAL DATA FOR DAY 129 *

HOUR	FLOW VECTOR (DEGREES)	RANDOM FLOW VECTOR (DEGREES)	WIND SPEED (MPS)	MIXING HEIGHT (METERS)	TEMP. (DEG. K)	INPUT STABILITY CATEGORY	ADJUSTED STABILITY CATEGORY
1	280.0	280.0	1.00	1827.3	292.6	6	6
2	330.0	329.0	3.09	1825.7	293.1	6	6
3	360.0	356.0	1.54	1824.0	293.1	6	6
4	180.0	182.0	3.09	1822.4	291.5	6	6
5	180.0	182.0	3.09	1820.7	291.5	6	6
6	360.0	4.0	1.54	42.0	290.9	5	5
7	330.0	332.0	2.06	262.5	292.6	4	4
8	170.0	168.0	2.06	483.0	294.3	4	4
9	130.0	134.0	2.57	703.5	299.3	3	3
10	90.0	90.0	4.12	924.0	300.9	3	3
11	60.0	64.0	4.63	1144.5	302.0	2	2
12	100.0	103.0	4.63	1365.0	303.1	2	2
13	100.0	100.0	6.17	1585.5	304.3	3	3
14	110.0	114.0	6.69	1806.0	304.3	3	3
15	110.0	109.0	7.20	1806.0	304.3	4	4
16	100.0	96.0	5.66	1806.0	303.7	3	3
17	100.0	102.0	6.17	1806.0	303.1	4	4
18	100.0	96.0	5.14	1806.0	302.0	4	4
19	170.0	173.0	5.14	1806.0	300.4	4	4
20	180.0	176.0	3.09	1799.6	297.6	5	5
21	180.0	183.0	2.57	1792.7	296.5	6	6
22	180.0	180.0	1.00	1785.8	294.3	6	6
23	180.0	185.0	3.09	1779.0	294.3	6	6
24	180.0	185.0	2.57	1772.1	294.3	6	6

[illegible]

TABLE B-14

MET. DATA
DAY 220

*** PASCO:1200 TPD/5000 BTU/ISC6/DS/BIN MET/FG/1Hr-H1H/1971

* METEOROLOGICAL DATA FOR DAY 220 *

HOURL	FLOW VECTOR (DEGREES)	RANDOM FLOW VECTOR (DEGREES)	WIND SPEED (MPS)	MIXING HEIGHT (METERS)	TEMP. (DEG. K)	INPUT STABILITY CATEGORY	ADJUSTED STABILITY CATEGORY
1	280.0	276.0	1.00	1572.8	297.0	6	6
2	280.0	280.0	1.00	1582.6	296.5	6	6
3	260.0	262.0	1.54	1592.4	295.9	6	6
4	250.0	252.0	1.54	1602.1	295.9	6	6
5	280.0	278.0	1.54	1611.9	295.9	6	6
6	270.0	268.0	1.54	0.9	295.4	6	6
7	280.0	276.0	1.54	213.3	296.5	5	5
8	270.0	267.0	1.54	425.7	300.9	4	4
9	120.0	125.0	2.06	638.1	302.6	3	3
10	150.0	152.0	3.09	850.5	303.7	2	2
11	90.0	90.0	3.09	1062.8	304.8	2	2
12	90.0	89.0	3.09	1275.2	304.8	2	2
13	90.0	88.0	3.60	1487.6	305.4	2	2
14	90.0	92.0	4.12	1700.0	307.0	2	2
15	90.0	88.0	5.66	1700.0	307.0	3	3
16	110.0	111.0	4.12	1700.0	306.5	3	3
17	100.0	97.0	4.63	1700.0	305.4	3	3
18	110.0	115.0	4.63	1700.0	304.3	3	3
19	150.0	152.0	3.60	1700.0	302.0	4	4
20	130.0	127.0	2.57	1698.3	300.4	5	5
21	150.0	149.0	2.57	1696.1	299.8	6	6
22	130.0	135.0	2.06	1693.9	298.7	6	6
23	150.0	151.0	2.06	1691.7	298.1	6	6
24	140.0	141.0	2.06	1689.5	298.1	6	6

* CALM HOURS (=1) FOR DAY 220 * 0 1 0

ATTACHMENT C
EMISSION FACTOR SUPPORT DOCUMENT

ATTACHMENT C
EMISSION FACTOR SUPPORT DOCUMENT

In this attachment, the emission factors for the Pasco County RRF are derived based on stack testing data from existing facilities. Although several resource recovery facilities have recently received site certification, only three, Hillsborough County, Bay County and the third unit in Pinellas County, have begun operation. The emission factors selected represent a reasonable upper limit of emissions based on the data available.

The flue gas flow rates and composition used to calculate the following pollutant emission factors are based on the output of the BURN combustion model. BURN is a CDM proprietary mathematical model used to analyze combustion systems by specifying the operational parameters and waste characteristics. The output for analysis based on the combustion of 300 tpd per unit of reference waste with a heat content of 4800 Btu/lb is presented in Attachment C-1.

C.1 PARTICULATE MATTER

The design particulate emission rate is 0.015 grains per dry standard cubic foot (dscf) at 12% CO₂. The particulate emission rate is related to the volumetric flow rate of exhaust gases generated by the combustion of refuse and the design particulate loading from the boiler, which is 2.5 grains per dry standard cubic foot (gr/dscf) adjusted to 12% CO₂. Peak loads are expected to be about twice this value, or 5 to 6 grains per dry standard cubic foot. The baseline (average) particulate emission rate (and annual particulate emissions) are based on the design particulate emission rate. The particulate emission factor is calculated as shown below:

Basis: 0.015 grains per dry standard cubic foot corrected to 12
percent carbon dioxide (gr/dscf @ 12% CO₂)

1. Adjust to actual CO₂ calculated by BURN

$$\begin{array}{lcl} 0.015 \text{ gr/dscf} & \left(\frac{10.04\% \text{ CO}_2}{12.00\% \text{ CO}_2} \right) & = 0.0126 \text{ gr/dscf} \\ @ 12\% \text{ CO}_2 & & @ \text{ actual CO}_2 \end{array}$$

2. Calculate the dry volumetric flow rate per unit

$$93.33 \frac{\text{moles of dry flue gas}}{\text{min}} \left(\frac{385.3 \text{ cubic feet}}{\text{mole}} \right) = 35,960 \frac{\text{dscf}}{\text{min}}$$

3. Calculate particulate emission rate per unit

$$0.0126 \frac{\text{gr}}{\text{dscf}} \left(\frac{35,960 \text{ dscf}}{\text{min}} \right) \left(\frac{\text{lb}}{7000 \text{ gr}} \right) \left(\frac{60 \text{ min}}{\text{hr}} \right) =$$

$$3.87 \frac{\text{lb PM}}{\text{hr}} \text{ per unit}$$

4. Calculate particulate emission factor

$$3.87 \frac{\text{lb PM}}{\text{hr}} \left(\frac{\text{day}}{300 \text{ tons}} \right) \left(\frac{24 \text{ hr}}{\text{day}} \right) = 0.309 \frac{\text{lb PM}}{\text{ton refuse}}$$

C.2 SULFUR DIOXIDE

The sulfur dioxide emission data collected at the Westchester RESCO facility (Von Roll grate system) are presented in Table A-1 in Attachment C-2. Fifty one-hour runs are listed. The arithmetic mean of these concentrations is 154 ppm at 12% CO₂. Stack testing data from the Baltimore RESCO facility was conducted by Entropy Environmentalists, Inc. on January 23 and 24, 1985. Three sampling runs were made on each of three 750 tpd units. The arithmetic mean of the nine SO₂ concentrations is 113 ppm @ 12% CO₂. This is less than the concentration from the Westchester facility, making the use of the Westchester data a more conservative estimate of pollutant emissions.

The SO₂ emission data from the Westchester facility is expressed in a variety of units. To extrapolate from this data to an emission estimate for the Pasco County RRF, an SO₂ emission factor expressed in pounds of pollutant per million Btu (lb/MMBtu) is used. This emission factor will more accurately account for the differences in the heating value of the wastes. To account for the differences between short-term sampling and operational variations and long-term averaging times, the upper limit (99th percentile) based on an assumed normal distribution (i.e., the arithmetic upper limit) will be used to estimate uncontrolled emissions.

The arithmetic upper limit for SO₂ emissions is 0.55 lb/MMBtu. With a reference waste heat content of 4800 Btu/lb, the uncontrolled SO₂ emission factor is 5.3 lb/ton of refuse. The controlled emission factor is based on the use of a dry scrubber designed to achieve 70 percent removal or 100 ppm_{dv} corrected to 7% O₂ for SO₂, and is calculated as follows:

Basis: 100 parts per million on a dry volume basis corrected to 7 percent oxygen (ppm_{dv} @ 7% O₂)

1. Adjust to actual O₂ calculated by BURN

$$\frac{100 \text{ ppm}_{dv}}{\text{@ } 7\% \text{ O}_2} \frac{(21\% - 10.53\% \text{ O}_2)}{(21\% - 7.00\% \text{ O}_2)} = 74.8 \text{ ppm}_{dv} \text{ @ actual O}_2$$

2. Calculate sulfur dioxide emission rate per unit

$$\frac{74.8 \text{ moles SO}_2}{1,000,000 \text{ moles}} \left(\frac{93.33 \text{ moles dry flue gas}}{\text{min}} \right) \left(\frac{64.07 \text{ lb SO}_2}{\text{mole SO}_2} \right) \left(\frac{60 \text{ min}}{\text{hr}} \right) = 26.8 \frac{\text{lb SO}_2}{\text{hr}} \text{ per unit}$$

3. Calculate sulfur dioxide emission factor

$$26.8 \frac{\text{lb SO}_2}{\text{hr}} \left(\frac{\text{day}}{300 \text{ tons}} \right) \left(\frac{24 \text{ hr}}{\text{day}} \right) = 2.15 \frac{\text{lb SO}_2}{\text{ton refuse}}$$

Basis: 5.3 $\frac{\text{lb SO}_2}{\text{ton refuse}}$ uncontrolled

1. Apply 70 percent control efficiency

$$5.3 \frac{\text{lb SO}_2}{\text{ton}} (1 - 70\%) = 1.59 \frac{\text{lb SO}_2}{\text{ton refuse}}$$

Because the emission factor based on the allowable SO₂ flue gas concentration results in the greater emission factor, 2.15 lb SO₂ per ton of refuse will be used as the basis for calculating the controlled emission rate.

C.3 PRODUCTS OF COMBUSTION

Emissions of carbon monoxide (CO), nitrogen oxides (NO_x) and volatile organic compounds (VOC) are primarily a function of combustion conditions. The quantity of pollutant produced is dependent upon the design and operation of the furnace. Modern furnaces are designed to maximize air and fuel mixing effectiveness and combustion completion through proper grate design and the ability to control refuse feed. Proper design of the overfire air jets, combustion temperature, and overfire air ratio promotes oxidation of the products of incomplete combustion.

CARBON MONOXIDE

Formation of CO in the furnace results from failure of the combustion system to complete the burnout of the combustible gases rising from the burning refuse bed. The injection of sufficient air and its proper mixing with the combustible gases are critical factors in reducing CO emissions. Even when operated at high excess air levels, unbound CO can be generated from local areas of the burning refuse bed due to solid waste heterogeneity or grate overloading, which creates deficiencies in available oxygen necessary for proper combustion.

O'Connell et.al., (1982) reports that a modern mass burn waterwall incinerator incorporating overfire air and temperature monitoring can achieve an emission rate of 1.9 pounds of CO per ton of refuse. A four-day testing program conducted by Cooper Engineers (Sept., 1983) at the older Chicago NW (Martin grate system) plant indicated an average emission factor from all the tests of 0.67 lb CO per ton.

Due to the existence of short-term ambient CO standards (1-hour and 8-hour), peak emission estimates were also quantified to be used in the determination of source compliance with ambient air quality. A maximum 1-hour emission factor of 4.6 lb CO/ton was established as well as a maximum 8-hour CO emission factor of 1.2 lb/ton.

Because of the variability of CO emissions as demonstrated by the different emission factors determined by Cooper Engineering, several emission factors for CO are proposed; an annual rate of 50 ppm_{dv} at 7% O₂, an 8-hour average rate of 100 ppm_{dv} at 7% O₂ and a 1-hour average rate of 400 ppm_{dv} at 7% O₂. The annual rate reflects the need to achieve good combustion and the short-term rates reflect the likelihood of higher CO emission when the quality of the refuse is more variable. Emission factors are calculated as follows:

Basis: 50 ppm_{dv} @ 7% O₂ - annual average
 100 ppm_{dv} @ 7% O₂ - 8-hour average
 400 ppm_{dv} @ 7% O₂ - hourly average

1. Adjust to actual O₂ calculated by BURN

$$\begin{array}{lcl} 50 \text{ ppm}_{dv} & \left(\frac{21\% - 10.53\% \text{ O}_2}{21\% - 7.00\% \text{ O}_2} \right) & = 37.4 \text{ ppm}_{dv} \\ @ 7\% \text{ O}_2 & & @ \text{ actual O}_2 \end{array}$$

2. Calculate carbon monoxide emission rate per unit

$$\frac{37.4 \text{ moles CO}}{1,000,000 \text{ moles}} \left(\frac{93.33 \text{ moles flue gas}}{\text{min}} \right) \left(\frac{28.01 \text{ lb CO}}{\text{mole CO}} \right)$$

$$\frac{(60 \text{ min})}{\text{hr}} = 5.9 \frac{\text{lb CO}}{\text{hr}} \text{ per unit}$$

3. Calculate carbon monoxide emission factor

$$5.9 \frac{\text{lb CO}}{\text{hr}} \left(\frac{\text{day}}{300 \text{ tons}} \right) \left(\frac{24 \text{ hr}}{\text{day}} \right) = 0.47 \frac{\text{lb CO}}{\text{ton refuse}}$$

$$\text{Annual Average} = 0.47 \text{ lb CO/ton refuse}$$

$$\text{8-Hour Average} = 0.94 \text{ lb CO/ton refuse}$$

$$\text{1-Hour Average} = 3.75 \text{ lb CO/ton refuse}$$

These emission factors are within the range of observed at Chicago NW and the annual emission factor is typical of that observed at other modern mass burn facilities.

NITROGEN OXIDES

Formation of nitrogen oxides (NO_x) arises via two major mechanisms: thermal NO_x formation and fuel NO_x formation. The NO_x produced by exposing the nitrogen and oxygen contained in the ambient air to the high temperatures of combustion is referred to as thermal NO_x . This is an inevitable result of oxidation at high temperatures, as ambient air contains approximately 78 percent nitrogen (by volume). Fuel NO_x is formed when the nitrogen contained in the fuel is oxidized. According to a review of NO_x formation (Russell et al., 1984), fuel NO_x appears most likely to be the dominant source of NO_x found in the stack. The level of NO_x produced, therefore, is a function of the chemical composition of the refuse, as well as temperature and excess air (oxygen availability). While thermal NO_x formation does occur in modern mass-burn facilities, it is generated in significant quantities only at temperatures in excess of 2,000°F.

High-temperature, well-mixed, excess air conditions favor the formation of NO_x from both thermal fixation of molecular nitrogen and conversion of fuel nitrogen. NO_x formation exhibits relatively slow reaction kinetics, so that once formed, significant disassociation of NO_x does not occur rapidly

as the flue gas temperature falls in the boiler. The NO_x produced in the furnace is, therefore, essentially "frozen".

Older, less thermally-efficient furnaces have demonstrated relatively low NO_x emissions, indicative of poor (low-temperature) combustion rather than efficient emission control. New facilities have incorporated high temperature combustion (temperature greater than $1,800^\circ\text{F}$ for at least 1 second) to achieve greater hydrocarbon and trace organic destruction efficiencies. This has lead to higher NO_x formation and emissions.

<u>Facility</u>	<u>NO_x (ppmdv @ 12% CO_2)</u>
Westchester	304 (95th percentile of 9 hourly samples)
Tulsa	385 (3-hour average)
Marion	357 (3-hour average)

Based on the higher NO_x emissions observed at recently tested facilities, an NO_x flue gas concentration of 400 ppm dv at 7% O_2 is proposed. The emission factor calculation is as follows:

Basis: 400 ppm dv @ 7% O_2 - hourly average

1. Adjust to actual O_2 calculated by BURN

$$\begin{array}{lcl} 400 \text{ ppm dv} & \left(\frac{21\% - 10.53\% \text{ O}_2}{21\% - 7.00\% \text{ O}_2} \right) & = 299.1 \text{ ppm dv} \\ @ 7\% \text{ O}_2 & & @ \text{ actual O}_2 \end{array}$$

2. Calculate nitrogen oxides emission rate per unit

$$\begin{array}{lcl} \frac{299.1 \text{ moles NO}_x}{1,000,000 \text{ moles}} & \left(\frac{93.33 \text{ moles flue gas}}{\text{min}} \right) & \left(\frac{46.01 \text{ lb NO}_x}{\text{mole NO}_x} \right) \\ & & \\ \frac{(60 \text{ min})}{\text{hr}} & = & 77.1 \frac{\text{lb NO}_x}{\text{hr}} \text{ per unit} \end{array}$$

3. Calculate nitrogen oxides emission factor

$$77.1 \frac{\text{lb NO}_x}{\text{hr}} \left(\frac{\text{day}}{300 \text{ tons}} \right) \left(\frac{24 \text{ hr}}{\text{day}} \right) = 6.17 \frac{\text{lb NO}_x}{\text{ton refuse}}$$

VOLATILE ORGANIC COMPOUNDS

Like CO, gaseous hydrocarbon (HC) emissions (also referred to as volatile organic compounds or VOCs) are also a reflection of a failure in the maintenance of superior combustion conditions rather than the composition of the solid waste. High levels of HC result from poor combustion at low temperatures and/or with insufficient oxygen. A well designed furnace with adequate turbulence and operated at temperatures in excess of 1400°F will provide effective control of hydrocarbon emissions.

Hydrocarbons are initially released by pyrolysis (thermal cracking) of the burning refuse and are subsequently oxidized to H₂O and CO₂. Achievement of complete hydrocarbon combustion within the furnace chamber requires proper mixing of the excess air and retention of resulting gases at elevated temperatures (>1,400°F) for an adequate time (typically >0.5 sec). Once oxidized, hydrocarbons initially released by pyrolysis do not re-form upon cooling to the lower exit temperatures found in the air pollution control equipment.

Based upon values used in recent Florida PSD permit applications, an expected emission rate of 0.2 lb HC/ton of refuse was selected for this analysis and appears reasonable for a modern mass-burn facility.

C.4 ACID GASES

The presence of acid gases in the combustion process is primarily a function of the composition of the refuse. Chlorides, fluorides and sulfates in the flue gas stream are assumed to be emitted entirely as acidic compounds (i.e., hydrogen chloride, hydrogen fluoride and sulfuric acid). Emissions of acidic compounds will be controlled through the use of a dry scrubber.

HYDROGEN CHLORIDE

Hydrogen chloride (HCl) emission is primarily a function of the organically bound chlorine content of the fuel. The emission of HCl depends both on the quantity of chlorine in the solid waste and on the species of chlorine present because not all of the chlorine content of the combusted solids waste exits the stack as gaseous HCl. Chlorine occurs in the waste stream as organic chlorine (chlorinated organic combustibles) and as inorganic chlorine; e.g., NaCl. Organic chlorine has generally been held to be the main source of stack HCl emissions (Hollander et al. 1980), but in the last decade, inorganic chlorine volatilization and/or conversion to HCl has been suggested (Altar 1979; Krause et al. 1974; Robertson 1974). Chlorine that is not volatilized or converted to HCl remains in the grate residue; some stack HCl may precipitate out in the flyash also.

Total chloride (as HCl) emission data collected at the Westchester Facility are presented in Table A-5 in Attachment C-2. Eighteen runs are listed. The arithmetic mean of these concentrations is 546 ppm @ 12% CO₂. Stack testing at the Baltimore facility was conducted for HCl. The arithmetic mean of the nine sampling runs is 316 ppm @ 12% CO₂. Using the higher Westchester data, the arithmetic upper limit for HCl is 1.02 lb/MMBtu. Based on a reference waste heat content of 4800 Btu/lb, the uncontrolled HCl emission limit is 9.8 lb/ton.

The Pasco County RRF will incorporate a dry scrubber designed to achieve 90% removal efficiency or 100 ppm_{dv} at 7% O₂ for HCl. The emission factor calculations are as follows:

Basis: 100 parts per million on a dry volume basis corrected to 7 percent oxygen (ppm_{dv} @ 7% O₂)

1. Adjust to actual O₂ calculated by BURN

$$\begin{array}{rcl} 100 \text{ ppm}_{dv} & \frac{(21\% - 10.53\% \text{ O}_2)}{(21\% - 7.00\% \text{ O}_2)} & = 74.8 \text{ ppm}_{dv} \\ @ 7\% \text{ O}_2 & & @ \text{ actual O}_2 \end{array}$$

2. Calculate hydrogen chloride emission rate per unit

$$\frac{74.8 \text{ moles HCl}}{1,000,000 \text{ moles}} \left(\frac{93.33 \text{ moles flue gas}}{\text{min}} \right) \left(\frac{36.47 \text{ lb HCl}}{\text{mole HCl}} \right)$$

$$\left(\frac{60 \text{ min}}{\text{hr}} \right) = 15.3 \frac{\text{lb HCl}}{\text{hr}} \text{ per unit}$$

3. Calculate hydrogen chloride emission factor

$$15.3 \frac{\text{lb HCl}}{\text{hr}} \left(\frac{\text{day}}{300 \text{ tons}} \right) \left(\frac{24 \text{ hr}}{\text{day}} \right) = 1.22 \frac{\text{lb HCl}}{\text{ton refuse}}$$

$$\text{Basis: } 9.8 \frac{\text{lb HCl}}{\text{ton refuse}} \text{ uncontrolled}$$

1. Apply 90 percent control efficiency

$$9.8 \frac{\text{lb HCl}}{\text{ton}} (1 - 90\%) = 0.98 \frac{\text{lb HCl}}{\text{ton refuse}}$$

Because the emission factor based on the allowable HCl flue gas concentration results in the greater emission factor, 1.22 lb HCl per ton of refuse will be used as the basis for calculating the controlled emission rate.

SULFURIC ACID MIST

Small quantities of gaseous SO_3 emissions are associated with emissions of SO_2 . In the flue gas stream and in the emitted vapor plume, the dry gaseous SO_3 reacts with the water droplets to produce sulfuric acid mist, H_2SO_4 . The H_2SO_4 emission is a function of the quantity of SO_2 generation and degree of the successive oxidation of SO_2 to SO_3 to H_2SO_4 .

The stack test data from the Tulsa, OK facility shows the ratio of the H_2SO_4 to SO_2 emission rates for a 3-hour average were 16.8 and 16.5 for

units 1 and 2, respectively. Assuming that H_2SO_4 will react with lime in the dry scrubber in the same rate as SO_2 , a 16% conversion factor of H_2SO_4 from SO_2 will be applied to the controlled emission factor for SO_2 . Thus, the controlled H_2SO_4 emission factor is 0.344 lb H_2SO_4 /ton refuse.

FLUORIDE

Fluoride (as HF) emissions are primarily a function of the organically based fluorine content of the solid waste combusted. The fluorine content of refuse in the U.S. has been subject to recent change due to restrictions upon the production of certain fluorine-containing products (aerosol propellants formerly used in spray containers). Emissions of fluorides result primarily from the combustion of fluorinated plastics and other fluorocarbon products.

The fluorides emissions data collected during nine tests at the Westchester Facility are presented in the Table A-6 in Attachment C-2. The arithmetic mean of these concentrations is 15.8 ppm @ 12% CO_2 . The arithmetic upper limit at the 99 percent probability gives 22.3 ppm @ 12% CO_2 . This corresponds to an uncontrolled emission factor of 0.016 lb HF/MMBtu. Based on the reference waste heat content of 4800 Btu/lb, the uncontrolled emission factor is 0.154 lb/ton. Assuming that fluoride emissions are only partially controlled, a conservative control efficiency of 50 percent is proposed. The controlled HF emission factor is 0.077 lb/ton.

C.5 TRACE METALS

Metal emissions from resource recovery facilities are a function of waste composition, combustion conditions and particulate control equipment. The emission factors for metal emissions from the Pasco County RRF are based on recent stack testing data from facilities of similar design. Because of the combustion conditions (high temperatures and long retention times) and air pollution control equipment (dry scrubbers and baghouse) employed at the facility, the mechanisms of volatilization, condensation, and agglomeration will differ from those of older facilities. Trace metal

emissions from six modern mass burn resource recovery facilities are presented in Table C-1.

Because of the high condensation temperatures, the volatilization and condensation of elemental metals and their compounds are expected to occur primarily in the furnace. Except for metals with low boiling points, such as mercury and arsenic, any further movement of metals from the gas phase to the particulate phase is expected to be negligible. Thus, it is expected that most trace metals will be present in the solid phase and subject to capture by the fabric filter. Although the dry scrubbers are not particulate control devices, their use appears to enhance the collection efficiency of certain metals either through the condensation of inorganic metallic compounds or agglomeration of fine metal-bearing particles.

LEAD

Lead is widespread as a trace metal in most components of the combustible fraction of solid waste, and also appears in more concentrated metallic forms in the metals fraction, particularly in ferrous cans and general solderings. The Pb associates with particles upon volatilization, which allows for its control by fabric filters.

A few years ago, lead was assumed to make up 9 to 11 percent of the particulate emissions. Recent stack tests of facilities with high efficiency particulate control devices and stringent permit limitations have shown lead making up a much smaller fraction of the total particulate emission. The highest proportion of lead found in the Westchester sampling runs was 3.66 percent. Thus, a conservative estimate for lead of 5 percent of particulate matter is assumed.

The lead emission factor, based on a particulate emission factor of 0.309 lb/ton, is 0.015 lb Pb per ton of refuse. This emission factor is conservative when compared to emission factors for lead presented in Table C-1 and consistent with emission limits set for lead at other Florida facilities.

TABLE C-1

METAL EMISSIONS FROM MODERN MASS BURN
RESOURCE RECOVERY FACILITIES

Pollutant	Hillsborough ESP lb/ton	Tulsa ESP lb/ton	Westchester ESP lb/ton	Baltimore ESP lb/ton	Marion DS/FF lb/ton	Wurzburg DS/FF lb/ton	Munich DS/ESP lb/ton
Lead	2.6×10^{-3}	3.5 E-3	1.1 E-3	6.8 E-4	2.6 E-4	7.4 E-5	6.85×10^{-4}
Mercury	2.18×10^{-3}	3.5 E-3	1.4 E-2	—	2.6 E-3	—	—
Beryllium	—	2.5 E-8	9.9 E-8	6.7 E-7	1.9 E-8	—	3.86×10^{-9}
Arsenic	—	—	1.8 E-5	6.7 E-5	—	3.8 E-8	3.56×10^{-6}

BERYLLIUM

Municipal solid waste is not a "beryllium containing waste" as described by the federal regulations for hazardous air pollutants. Beryllium is present only in trace quantities in soils and in refuse. Therefore, beryllium emissions are expected to be minimal. Beryllium emissions from existing facilities, as shown in Table C-1, are highly variable, with emission factors extending over three orders of magnitude. The variation in emissions is directly related to the amount of beryllium in the waste at the time testing was conducted.

Beryllium emissions from resource recovery facilities are associated with particulate emissions and will be efficiently controlled through the use of a fabric filter. Beryllium emissions from existing facilities, if detected at all, are present in only small quantities. The highest emission factor from the facilities listed in Table C-1 is 6.7×10^{-7} lb/ton. Emission limits for Be from resource recovery facilities in Florida range from 13.1 to 1.3×10^{-6} lb per ton of refuse. Based on the stack test data from other mass burn facilities, an emission factor of 1.3×10^{-6} lb Be per ton of refuse is a conservative estimate of emissions from the Pasco County RRF.

MERCURY

Only trace quantities of mercury and its compounds are evident in municipal solid waste. Usually, only a small portion of Hg is retained in the grate residue as Hg is volatilized into the flue gas. As vaporized Hg passes through the boiler and air pollution control system, some Hg vapor condenses onto suspended particulates in the flue gas stream. Because fine particulates have a high surface area to volume ratio, the fraction of Hg vapor that does condense would be preferentially associated with fine particulate emissions.

The stack testing data available for mercury emission is limited. Because of the lower outlet temperatures and the additional retention times between boiler outlet and fabric filter inlet, facilities incorporating a dry

scrubber are assumed to have lower Hg emissions. However, there is insufficient data to verify or quantify the degree of reduction that may be achieved. Therefore, the highest emission factor of 1.4×10^{-2} lb per ton of refuse for mercury observed at facilities (Table C-1) without acid gas control is proposed for the Pasco County RRF.

ARSENIC

As with mercury emissions, arsenic is expected to be emitted both as a vapor and particulate. The St. Louis Demonstration (Gorman, 1977) calculated vapor metal emissions of arsenic. The study indicated that the ratio of metal in the vapor phase to metal in the particulate phase is 0.30. Because dry scrubbers are assumed to promote additional condensation and agglomeration, the vapor to particulate ratio is expected to be lower and the fraction of arsenic controlled is expected to be greater.

The emission factors for arsenic in Table C-1 show a three to four order of magnitude variation in stack sampling results. Most of the stack test methodologies do not include the sampling for arsenic in the vapor phase. Therefore, the highest sampled emission factor of 6.7×10^{-5} lb/ton for facilities with ESP alone and the Gorman vapor to metal ratio of 0.3 will be used to calculate arsenic emissions. The computation, presented below, results in an emission factor of 8.71×10^{-5} lb As per ton of refuse for the Pasco County RRF.

$$6.7 \times 10^{-5} + (0.3) 6.7 \times 10^{-5} = 8.71 \times 10^{-5} \text{ lb As/ton refuse}$$

C.6 DIOXINS AND FURANS

The combustion conditions and air pollution control equipment employed at the Pasco County RRF will affect the formation, destruction, and removal of polychlorinated dibenzo-p-dioxins/dibenzofurans (PCDD/PCDF). Recent stack test data from six similar mass burn waterwall facilities was used to estimate emissions from the Pasco County RRF. Although simple comparisons between facilities with and without dry scrubbers suggests that PCDD/PCDF emissions can be reduced by 50 to 90 percent with the use of a dry

scrubber, such comparisons neglect factors other than the type of air pollution control device which may also account for differences between facilities. Facilities incorporating dry scrubbers were used to develop an emission factor for PCDD/PCDF emission from the proposed facility, but no additional collection efficiency was applied for the use of dry scrubbers. Many investigators report and correlate PCDD/PCDF emissions as total PCDD or PCDF expressed in units of ng/Nm^3 . This reporting strategy has two principle deficiencies: (1) the primary concern, human health risk, does not correlate with total PCDD/PCDF but with the toxicity-weighted sum of the actual isomer/congener mix; and (2) the emission rate in ng/Nm^3 introduces excess air levels as a (usually unspecified) variable in estimation. To eliminate these problems, a standard approach used is to equate the total PCDD/PCDF value with its toxicity in terms of the most toxic isomer, 2,3,7,8-TCDD, in units of pounds per ton of refuse.

Because of its high toxicity, more research has been done on health effects of 2,3,7,8-TCDD than on any other PCDD/PCDF isomer, and it is used as a basis for comparing the relative toxicity of the other PCDDs and PCDFs. EPA has developed 2,3,7,8-TCDD toxic equivalency factors (TEFs) based on the different homologues' similarity in mode of action, but differing degree of result in laboratory tests (U.S. EPA, 1987). TEFs have been developed by other groups, such as the Swiss Federal Office of Environmental Protection (1982). Total toxicity of all isomers compared to 2,3,7,8-TCDD has been calculated to range from 8 to 80 times the toxicity of 2,3,7,8-TCDD concentrations alone (Barnes, 1983). The use of TEFs permits an estimation of the total toxicity of a mixture of PCDDs and PCDFs relative to the known toxicity of 2,3,7,8-TCDD. Table C-2 presents a list of TEFs used. The TEF approach assumes that all isomers having chlorine atoms in the 2,3,7,8 positions are more toxic than non-2,3,7,8 homologues. It assigns them relative weighting factors based on the ratio of estimated toxicity of the isomer to the 2,3,7,8-TCDD isomer. The PCDD/PCDF emission rates, expressed as equivalent 2,3,7,8-TCDD, for several modern mass burn resource recovery facilities are presented in Table C-3.

Because short term stack tests will be used to verify emissions which are variable in nature, the upper limit 99th percentile flue gas concentration

TABLE C-2
TOXIC EQUIVALENCY FACTORS

HOMOLOGUE/CONGENER	TEF
2,3,7,8-TCDD	1.0
OTHER TCDDs	0.01
2,3,7,8-PeCDDs	0.5
OTHER PeCDDs	0.005
2,3,7,8-HxCDDs	0.04
OTHER HxCDDs	0.0004
2,3,7,8-HpCDDs	0.001
OTHER HpCDDs	0.00001
OCDDs	0.0000
2,3,7,8-TCDF	0.1
OTHER TCDFs	0.001
2,3,7,8-PeCDF	0.1
OTHER PeCDFs	0.001
2,3,7,8-HxCDFs	0.01
OTHER HxCDFs	0.0001
2,3,7,8-HpCDF	0.001
OTHER HpCDFs	0.00001
OCDFs	0.0000

SOURCE: U.S. EPA, 1987

TABLE C-3

DIOXIN EMISSIONS FROM
MODERN MASS BURN FACILITIES

Facility	Size TPD	APC	Total TEF ng/Nm ³
Westchester	2250	ESP	1.229
North Andover	1500	ESP	4.890
Tulsa	750	ESP	0.708
Marion	550	DS/BH	0.108
Wurzburg	660	DS/BH	0.378
Hogdalen	438	DS/BH	0.233
Combined Average			1.258
Standard Deviation			1.826
Upper Limit for the mean at 99% Probability (One Tailed Test Criterion)			3.766

of 3.766 ng/Nm³ expressed in 2,3,7,8-TCDD toxic equivalents (TEF) will be used for the Pasco County RRF. The conversion to an emission factor is as follows:

Basis: 3.766 nanograms per normal cubic meter (ng/Nm³) corrected to 12 percent CO₂

1. Adjust to actual CO₂ calculated by BURN

$$\frac{3.766 \text{ ng/Nm}^3}{@ 12\% \text{ CO}_2} \left(\frac{10.04\% \text{ CO}_2}{12.00\% \text{ CO}_2} \right) = 3.15 \text{ ng/Nm}^3 @ \text{ actual CO}_2$$

2. Calculate the dry volumetric flow rate per unit

$$93.33 \frac{\text{moles of dry flue gas}}{\text{min}} \left(\frac{385.3 \text{ cubic feet}}{\text{mole}} \right) = 35,960 \frac{\text{dscf}}{\text{min}}$$

$$\frac{35,960}{\text{min}} \frac{\text{dscf}}{\text{dscf}} \left(\frac{0.0283 \text{ Nm}^3}{\text{dscf}} \right) = \frac{1,018 \text{ Nm}^3}{\text{min}}$$

3. Calculate dioxin/furan emission rate per unit

$$\begin{aligned} & \frac{3.15 \text{ ng/Nm}^3}{\text{actual}} \left(\frac{1,018 \text{ Nm}^3}{\text{min}} \right) \left(\frac{1 \times 10^{-9} \text{ gm}}{\text{ng}} \right) \left(\frac{60 \text{ min}}{\text{hr}} \right) \\ & \left(\frac{0.0022 \text{ lb}}{\text{gm}} \right) = 4.25 \times 10^{-7} \frac{\text{lb}}{\text{hr}} \text{ per unit} \end{aligned}$$

- #### 4. Calculate dioxin/furan emission factor

$$4.25 \times 10^{-7} \frac{\text{lb dioxin}}{\text{HR}} \left(\frac{\text{day}}{300 \text{ TONS}} \right) \left(\frac{24 \text{ HR}}{\text{DAY}} \right) = 3.40 \times 10^{-8} \frac{\text{lb dioxin}}{\text{TON REFUSE}}$$

ATTACHMENT C-1

OUTPUT FROM BURN

COMBUSTION CALCULATIONS - RUN PA120598 FOR Pasco County, FL. RRF. 2/5/82

WASTE FEED STREAMS

WEIGHT FIRED		PERCENT (DRY BASIS)					
NAME	in Wet LB/Hr	Carbon	Hydrogen	Sulfur	Fe(OH)3	Al(OH)3	Oxygen
PASCO4800DS100	25000.	34.560	4.890	.150	.000	.000	34.700
COMPOSITE IN LB	25000.	6851.52	969.44	29.74	.00	.00	6879.27
COMPOSITE MOLES	0.	570.96	484.72	.93	.00	.00	214.98

PERCENT (DRY BASIS)

NAME	Nitrogen	Chlorine	CaCO3	Inert	Iron	Aluminum	Pct.H2O	BTU /LB
PASCO4800DS100	.880	.580	.000	24.240	.000	.000	20.700	8053.8
COMPOSITE IN LB	174.46	114.99	.00	4805.58	.00	.00	5175.0	4800.5
COMPOSITE MOLES	6.23	3.24	.00	4805.58	.00	.00	287.5	

THE MODIFIED DULONG DRY BASIS HEATING VALUE IS: 5985.3 BTU/LB
 THE MODIFIED DULONG WET BASIS HEATING VALUE IS: 4746.4 BTU/LB

THE BOIE DRY BASIS HEATING VALUE IS: 6107.3 BTU/LB
 THE BOIE WET BASIS HEATING VALUE IS: 4843.1 BTU/LB

DAILY CHARGE RATE EQUALS: 300.0 TONS PER DAY.

RUN CONDITIONS AS INPUT

AMBIENT AIR 60.0 DEG. F PRESSURE 1.0 ATM ABSOLUTE HUMIDITY .007500
 PREHEATED AIR .0 CFM AT .0 DEG. F
 OPERATING TEMPERATURES IN DEG. F MINIMUM 1800.0, MAXIMUM 2200.0
 FURNACE WATER COOLED, 100.00 PERCENT OF AREA
 BOILER WATER COOLED, 100.00 PERCENT OF AREA
 TEMPERATURES MODERATED WITH AIR AND ELEVATED WITH GAS
 STEAM CONDITIONS: 865. PSIA PRESSURE 830. DEG. F DELTA H=1196. BTU/LB
 PROCESS WATER IS AT 60. DEG. F, EXCESS AIR LEVEL IS AT 100.00 PCT
 FLUE GASES LEAVE BOILER AT 425.0 DEG. F, QUENCHER AT 250.0 DEG. F.
 THE FLUE GASES LEAVE THE SUBCOOLER AT: 0 DEG. F
 STACK DIAMETER IS 5.0 FT, HEIGHT 275.0 FT, WIND AT .0 FT/SEC
 RESIDUE IS WATER QUENCHED AND LEAVES SYSTEM AT 425.0 DEG. F
 UNBURNED PERCENTAGES OF FEED ARE - CARBON 1.5, IRON .0, ALUMINUM .0
 OPERATING FACTOR 100.00 % OF DESIGN CAPACITY; ATMOS. STABILITY CLASS = 0

POLYNOMIAL SOLUTION FOR GAS TEMPERATURE

$$0 = D - \text{SENH} + \text{AGAS} * (T) + \text{BGAS} * (T**2) + \text{CGAS} * (T**3)$$

WHERE D-SENH= -.1055031E+09 D= -.2745554E+07 SENH= .1027576E+09
 AGAS= .4550398E+05
 BGAS= .4276764E+01
 CGAS= -.3771564E-03

ROOTR ROOTI
 .2006977E+04 .0000000E+00
 -.8028396E+04 .0000000E+00
 .1736092E+05 .0000000E+00

SENH = SENSIBLE HEAT OF FURNACE GAS IN BTU/HR AT 2006.98 DEG. F

SUMMARY OF FURNACE OPERATIONS

GAS ANALYSIS AFTER FURNACE

COMPONENT	PERCENT DRY BASIS	PERCENT WET BASIS	MOLES PER MINUTE
CO2	10.04	8.734	9.373
SO2	.1659E-01	.1443E-01	.1549E-01
N2	79.35	69.02	74.08
O2	10.53	9.161	9.832
HCL	.5783E-01	.5030E-01	.5398E-01
H2O		13.02	13.97
	-----	-----	-----
TOTAL	100.0	100.0	107.3

FOR 5 % CONVERSION OF SO2 TO SO3 THE SULPHURIC ACID DEW POINT IS: 278.3 DEG. F

PREHEATED AIR	.00	ACFM		
	.00	SCFM		
COMBUSTION AIR	35954.04	ACFM		
	35954.04	SCFM		
BURNER AIR	.00	ACFM		
	.00	SCFM		
COOLING AIR	.00	ACFM		
	.00	SCFM		
AFTERBURNER AIR	.00	ACFM		
	.00	SCFM		
COOLING WATER	.00	GAL/MIN		
WITHOUT COOLING OR FUEL USE AND USING	.00	ACFM		OF PREHEATED AIR
FURNACE TEMPERATURE IS	2007.	DEG. F		
1901. DEG. F	IS THE CORRESPONDING APPROXIMATE FURNACE TEMPERATURE			
FLUE GAS	193181.70	ACFM	2006.98	DEG. F
	40719.67	SCFM		
FUEL USE	.00	CFM	GAS	
AFTERBURNER FUEL USE	.00	CFM	GAS	
QUENCH TANK MAKEUP	3.27	GAL/MIN		
RESIDUE ASSUMED TO LEAVE HOT ZONE AT	425.0	DEG. F		
RESIDUE WEIGHT (75 PCT. SOLIDS)	6542.83	LB/HR		
(DRY)	4308.35	LB/HR		
RADIATION LOSS	748455.	BTU/HR		
MOISTURE LOSS	15985970.	BTU/HR		
DRY GAS LOSS	102757600.	BTU/HR		
RESIDUE LOSS	358310.	BTU/HR		
DESIGN EXCESS AIR (ON FEED) IS	100.00			
ACTUAL EXCESS AIR (ON FEED) IS	100.01			
ACTUAL EXCESS AIR (ON TOTAL COMBUSTIBLE) IS	100.01			
EQUILIBRIUM THERMAL NOX CONCENTRATION IS	405.9	PARTS PER MILLION (VOLUME)		
PERCENT FUEL NITROGEN CONVERTED TO NOx=	61.698			
FUEL NITROGEN NOx (Estimated by Soete) in PPM=	1194.007			
SO2 EMISSION RATE (UNCONTROLLED) IS	7.50	GM/SEC		
HCL EMISSION RATE (UNCONTROLLED) IS	14.91	GM/SEC		
WITH ACID GAS CONTROL AT 90.0 PERCENT,				
SO2 EMISSION RATE (CONTROLLED) IS	.75	GM/SEC		
HCL EMISSION RATE (CONTROLLED) IS	1.49	GM/SEC		
CaCO3, IF PRESENT, WILL BE DECOMPOSED TO CaO (	.00	LB/HR	PRODUCED)	
FeOH3, IF PRESENT, WILL BE DECOMPOSED TO Fe2O3 (	.00	LB/HR	PRODUCED)	
AlOH3, IF PRESENT, WILL BE DECOMPOSED TO Al2O3 (	.00	LB/HR	PRODUCED)	

SUMMARY OF BOILER OPERATION CALCULATIONS

 BOILER STEAM PRODUCTION .7080E+05 LB/HR
 PRESSURE 865. PSIA
 TEMPERATURE 830.00 DEG. F

FLUE GAS TEMPERATURE AT BOILER EXIT 425. DEG. F

RADIATION LOSS 7.4846E+05 BTU/HR

MEAN MOLECULAR WEIGHT OF GASES

(DRY BASIS) 30.04

(WET BASIS) 28.47

TOTAL GAS EMISSION LB/MIN

(DRY BASIS) 2804.16

(WET BASIS) 3055.59

EFFLUENT GAS HUMIDITY .08966404

GAS DEW POINT IS 121.9 DEG. F

SUMMARY OF QUENCHER OPERATIONS

 GAS EXIT TEMPERATURE 250.0 DEG. F

WATER USE 14.77 GAL/MIN

GAS ANALYSIS AFTER QUENCHER

COMPONENT	PERCENT DRY BASIS	PERCENT WET BASIS	MOLES PER MINUTE
CO2	10.04	8.211	9.373
SO2	.1659E-01	.1357E-01	.1549E-01
N2	79.35	64.89	74.08
O2	10.53	8.612	9.832
HCL	.5783E-01	.4729E-01	.5398E-01
H2O	-----	18.23	20.81
TOTAL	100.0	100.0	114.2

FOR 5 % CONVERSION OF SO2 TO SO3 THE SULPHURIC ACID DEW POINT IS: 283.6 DEG. F

SUMMARY OF STACK CALCULATIONS AFTER SYSTEM

NATURAL DRAFT 1.077E+00 IN H2O
FRICTION LOSS 1.560E+00 IN H2O
VELOCITY HEAD 4.256E-02 IN H2O
MINIMUM FAN PRESSURE 5.262E-01 IN H2O
EXIT VELOCITY 50.085 FT/SEC
TOTAL FLOW 59004.770 CFM
AT TEMPERATURE 248.376 DEG. F
MEAN MOLECULAR WEIGHT OF GASES
(DRY BASIS) 30.04
(WET BASIS) 27.84
TOTAL GAS EMISSION LB/MIN
(DRY BASIS) 2804.16
(WET BASIS) 3178.66
EFFLUENT GAS HUMIDITY .13355130
GAS DEW POINT IS 134.7 DEG. F

FOR 5 % CONVERSION OF SO2 TO SO3 THE SULPHURIC ACID DEW POINT IS: 283.6 DEG. F

END OF JOB

Enter END to Stop

ATTACHMENT C-2

WESTCHESTER STACK TEST DATA

TABLE A-1
SUMMARY OF EMISSION TESTS
WESTCHESTER PESCO
SULFUR DIOXIDE
MODIFIED EPA METHOD 60R 8

SAMPLE RUN	DATE	BOILER NUMBER	TEST RUN	SO2 PPM DRY (12% O2) IMPROPER BOILER OPERATION	SO2 PPM DRY (7% O2) IMPROPER BOILER OPERATION	LBS OF SO2 PER HOUR IMPROPER BOILER OPERATION	LBS OF SO2/ TON OF REFUSE* IMPROPER BOILER OPERATION	LBS OF SO2/ MM BTU IMPROPER BOILER OPERATION
1	03/03/84	1	1-1					
2	03/03/84	1	1-2					
3	03/03/84	1	1-3					
4	04/24/84	2	2-1	163.3	168.2	134.3	3.59	0.41
5	04/24/84	2	2-2	215.5	224.4	150.2	4.86	0.54
6	04/25/84	2	2-3	167.9	173.3	103.9	3.78	0.42
7	04/26/84	3	3-7	221.5	219.5	152.5	4.77	0.53
8	04/26/84	3	3-8	186.4	195.9	132.9	4.32	0.48
9	05/06/84	1	1-1	167.1	171.2	129	3.78	0.42
10	06/06/84	1	1-2	163.5	168.9	131	3.69	0.41
11	06/06/84	1	1-3	146.2	150.7	116	3.33	0.37
12	06/06/84	1	1-4	136.1	140.1	111	3.06	0.34
13	05/06/84	1	1-5	179.3	184.9	154	4.05	0.45
14	05/06/84	1	1-6	145.5	148.1	116	3.24	0.36
15	06/06/84	1	1-7	162.6	165.2	122	3.6	0.4
16	06/06/84	1	1-8	108.9	112.8	80.9	2.43	0.27
17	06/12/84	3	3-1	136.8	141.7	97.1	3.06	0.34
18	06/12/84	3	3-2	142	147.2	92.1	3.24	0.36
19	06/12/84	3	3-3	115	119.6	65.5	2.61	0.29
20	06/12/84	3	3-4	119.5	126.1	77.7	2.79	0.31
21	06/13/84	2	2-1	125.8	131	70.8	2.99	0.32
22	06/13/84	2	2-2	189.4	199.4	91.1	4.32	0.48
23	06/13/84	2	2-3	135.6	143.9	78.2	3.15	0.35
24	05/13/84	1	1-1	147.7	155.9	73	3.42	0.39
25	05/13/84	1	1-2	176.5	187.2	119.1	4.05	0.45
26	06/13/84	1	1-3	160.3	167.8	100.5	3.69	0.41
27	06/19/84	1	1-1	152.2	166	114	3.5	0.4
28	06/19/84	1	1-2	114.4	119.4	60.4	2.61	0.29
29	06/19/84	1	1-3	174.9	181	123	3.96	0.44
30	06/20/84	2	2-7	112.5	125.1	65	2.7	0.3
31	06/20/84	2	2-8	179.2	193.5	122	4.05	0.45
32	06/20/84	2	2-9	156.5	166.1	137	3.6	0.4
33	06/20/84	3	3-4	149.6	153.6	107	3.33	0.37
34	06/20/84	3	3-5	146.2	151.4	113	3.33	0.37
35	06/20/84	3	3-6	176.4	181.1	133	3.96	0.44
36	06/26/84	1	1-1	129.5	142.9	74	3.15	0.35
37	05/25/84	3	3-2	153.2	165.1	111	3.5	0.4
38	06/26/84	3	3-3	215	224.3	151	4.95	0.55
39	06/27/84	2	2-4	167.4	172.4	117	3.79	0.42
40	05/27/84	2	2-5	169.4	179.5	119	3.96	0.44
41	06/27/84	2	2-6	187.4	199.1	127	4.32	0.48
42	06/24/84	1	1-7	155.2	169.2	137	4.32	0.49
43	05/25/84	1	1-8	143.9	152.6	106	3.33	0.37
44	06/28/84	1	1-9	130.3	133.1	95	2.83	0.32
45	07/09/84	1	1-1	129.3	131.1	98.5	2.98	0.32
46	07/09/84	1	1-2	144.3	147.3	108	3.24	0.36
47	07/09/84	1	1-3	140.2	147.5	106	3.24	0.36
48	07/09/84	2	2-1	135.5	135.2	100	3.06	0.34
49	07/10/84	2	2-4	137.9	143.3	104	3.15	0.35
50	07/10/84	2	2-5	137.5	145.6	101	3.15	0.35
51	07/10/84	3	3-1	149.6	157.1	104	3.42	0.38
52	07/10/84	3	3-2	143.7	150.7	111	3.33	0.37

53	07/10/84	3	3-3	121.4	127.6	15.7	2.79	0.31
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AVG(GEOMETRIC)				151.9	152.4	126.4	3.45	0.38
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UPPER LIMIT AT 99% PROBABILITY (STUDENT'S "T" STATISTICS) "ONE TAILED" TEST (CRITERION)				227.2	236	174.3	5.16	0.57
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AVG(ARITHMETIC)				154	160.5	102.5	3.51	0.39
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UPPER LIMIT AT 99% PROBABILITY (STUDENT'S "T" STATISTICS) "ONE TAILED" TEST (CRITERION)				217.5	225.7	160.3	4.93	0.55
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* AT 4500 BTU PER POUND
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TABLE A-2
SUMMARY OF EMISSION TESTS
WESTCHESTER RESCO
NITROGEN OXIDES
EPA METHOD 7

SAMPLE RUN	DATE	BOILER NUMBER	TEST RUN	NOX PPM DRY (12% O ₂)	NOX PPM DRY (7% O ₂)	LBS OF NOX PER HOUR	LBS OF NOX/TON OF REFUSE	LBS OF NOX/MM BTU
1	03/03/84	1	1-1	IMPROPER BOILER OPERATION	IMPROPER BOILER OPERATION	IMPROPER BOILER OPERATION	IMPROPER BOILER OPERATION	IMPROPER BOILER OPERATION
2	03/03/84	1	1-2	119.3	193.5	95.7	3.06	0.34
3	03/03/84	1	1-1	246.7	251.9	112	3.76	0.44
4	07/07/84	1	1-2	271.7	297.9	149	4.5	0.5
5	07/07/84	1	1-1	255	259.9	116	4.05	0.45
6	07/07/84	2	2-1	253.8	263.7	140	4.14	0.46
7	07/07/84	2	2-4	220.2	233.2	117	3.69	0.41
8	07/10/84	2	2-5	224.5	237.5	113	3.69	0.41
9	07/10/84	3	3-1	228	237.1	127	3.75	0.42
10	07/10/84	3	3-2	213.4	227.3	125	3.5	0.4
11	07/10/84	3	3-3					
12	07/10/84	3	3-3					

AT 4500 BTU PER POUND

AVE(ARITHMETIC)	234.5	244	125.9	3.83	0.43
UPPER LIMIT AT 99% PROBABILITY (STUDENT'S "T" STATISTICS; "ONE TAILED" TEST CRITERION)	303.5	316.1	170.5	4.94	0.55
AVG(GEOMETRIC)	233.2	242.7	124.8	3.47	0.42
UPPER LIMIT AT 99% PROBABILITY (STUDENT'S "T" STATISTICS; "ONE TAILED" TEST CRITERION)	314.4	329	181.5	5.22	0.57

TABLE A-3
SUMMARY OF EMISSION TESTS
WESTCHESTER RESCO
CARBON MONOXIDE
EPA METHOD 10

SAMPLE RUN	DATE	BOILER NUMBER	TEST RUN	CO PPM DRY (12% CO ₂)	CO PPM DRY (7% O ₂)	LB'S OF CO PER HOUR	LB'S OF CO/TON OF REFUSE	LB'S OF CO/ MM BTU
1	03/03/84	1	1-1	IMPROPER	IMPROPER	IMPROPER	IMPROPER	IMPROPER
2	03/03/84	1	1-2	BOILER	BOILER	BOILER	BOILER	BOILER
3	03/03/84	1	1-3	OPERATION	OPERATION	OPERATION	OPERATION	OPERATION
4	04/24/84	2	2-1	25.4	26.5	7.2	0.25	0.029
5	04/25/84	2	2-2	22.0	23.0	5.4	0.22	0.025
6	04/25/84	2	2-3	35.6	37.4	13.4	0.36	0.04
7	04/26/84	3	3-7	49.2	43.7	14.1	0.47	0.052
8	04/26/84	3	3-8	34.1	35.2	10.6	0.34	0.038
9	07/09/84	1	1-1	12.7	11.3	2.3	0.3	0.033
10	07/09/84	1	1-2	17.4	15.2	5.4	0.17	0.019
11	07/09/84	1	1-3	41.5	43.7	13.7	0.41	0.046
12	07/09/84	2	2-1	11	13.3	5.4	0.17	0.019
13	07/10/84	2	2-4	27.1	29.4	9.1	0.27	0.03
14	07/10/84	2	2-5	15.7	16.6	5.1	0.16	0.018
15	07/10/84	3	3-1	49.7	51.5	14.9	0.49	0.055
16	07/10/84	3	3-2	41.4	43.5	14	0.41	0.046
17	07/10/84	3	3-3	20.4	21.8	7.2	0.21	0.023

* AT 4500 BTU PER POUND

AVG(ARITHMETIC)	30.7	31.9	7.5	0.3	0.034
UPPER LIMIT AT 99% PROBABILITY (STUDENT'S "T" STATISTICS; "ONE TAILED" TEST CRITERION)	59.4	62	13.5	0.52	0.066
AVG(GEOMETRIC)	24.3	29.8	7	0.2	0.032
UPPER LIMIT AT 99% PROBABILITY (STUDENT'S "T" STATISTICS; "ONE TAILED" TEST CRITERION)	76.0	79.3	23.4	0.76	0.045

TABLE 4-4
SUMMARY OF EMISSION TESTS
WESTCHESTER RESCO
LEAD
MODIFIED EPA METHOD 12

SAMPLE RUN	DATE	BOILER NUMBER	TEST RUN	PERCENT Pb IN PAET	Pb ppm dry (72.02)	LBS OF Pb PER HOUR	LBS OF Pb/TON OF REFUSE*	LBS OF Pb/MY BTU
1	03/03/84	1	1-1	IMPROPER	IMPROPER	IMPROPER	IMPROPER	IMPROPER
2	03/03/84	1	1-2	BOILER	BOILER	BOILER	BOILER	BOILER
3	03/03/84	1	1-3	OPERATION	OPERATION	OPERATION	OPERATION	OPERATION
4	04/24/84	2	2-1	1.6	0.0259	0.058	0.00477	0.00023
5	04/25/84	2	2-2	2.7	0.0171	0.0262	0.0039	0.0011
6	04/25/84	2	2-3	3.66	0.0151	0.0714	0.00252	0.00029
7	04/26/84	3	3-7	1.55	0.0164	0.002	0.00201	0.00029
8	04/26/84	3	3-8	1.21	0.0153	0.002	0.00125	0.00014
9	07/03/84	1	1-1	0.35	0.0136	0.03	0.00099	0.00011
10	07/03/84	1	1-2	0.42	0.0234	0.056	0.00162	0.00018
11	07/03/84	1	1-3	1.09	0.0227	0.054	0.00152	0.00019
12	07/03/84	2	2-1	1.34	0.0159	0.092	0.00279	0.00031
13	07/10/84	2	2-4	3.9	0.0676	0.159	0.00477	0.00055
14	07/10/84	2	2-5	1.3	0.0712	0.159	0.00495	0.00055
15	07/10/84	3	3-1	0.73	0.0508	0.13	0.00432	0.00048
16	07/10/84	3	3-2	1.75	0.1159	0.23	0.00819	0.00091
17	07/10/84	3	3-3	1.59	0.0134	0.12	0.0016	0.0004

* AT 4500 BTU PER POUND

AVG(ARITHMETIC)	1.4586	0.0424	0.097	0.0032	0.00033
UPPER LIMIT AT 99% PROBABILITY (STUDENT'S "T" STATISTICS; "ONE TAILED" TEST CRITERION)	3.6454	0.1153	0.2727	0.0095	0.00096
AVG(GEOMETRIC)	1.2502	0.0149	0.0734	0.0027	0.0003
UPPER LIMIT AT 99% PROBABILITY (STUDENT'S "T" STATISTICS; "ONE TAILED" TEST CRITERION)	5.6314	0.1967	0.4446	0.015	0.0015

N. 1

TABLE A-5
SUMMARY OF EMISSION TESTS
WESTCHESTER RESCO
CHLORIDES
SUM OF MODIFIED EPA METHOD 5 AND 3

SAMPLE RUN	DATE	BOILER NUMBER	TEST RUN	CL PPM DRY (1% O2)	CL PPM DRY (7% O2)	LBS OF CL PER HOUR	LBS OF CL/ TON OF REFUSE	LBS OF CL/ 4% BTU
1	03/03/84	1	1-1	IMPROPER	IMPROPER	IMPROPER	IMPROPER	IMPROPER
2	03/03/84	1	1-2	BOILER	BOILER	BOILER	BOILER	BOILER
3	03/03/84	1	1-3	OPERATION	OPERATION	OPERATION	OPERATION	OPERATION
4	04/24/84	2	2-1	SAMPLING	SAMPLING	SAMPLING	SAMPLING	SAMPLING
5	04/25/84	2	2-2	PROBLEMS	PROBLEMS	PROBLEMS	PROBLEMS	PROBLEMS
6	04/25/84	2	2-3	.	.	.	.	.
7	04/25/84	3	3-7	.	.	.	.	.
8	04/25/84	3	3-8	.	.	.	.	.
9	05/17/84	1	1-1	520.5	507.4	215	7.02	0.78
10	05/17/84	1	1-2	535.3	552.1	210	7.02	0.78
11	06/17/84	1	1-3	501.4	612.2	231	7.65	0.85
12	06/27/84	2	2-7	474.5	531	194	6.21	0.69
13	06/27/84	2	2-8	517.5	532.3	197	6.66	0.74
14	06/27/84	2	2-9	557.9	592.4	211	7.33	0.82
15	06/27/84	3	3-4	597.2	613.3	237	7.65	0.85
16	06/27/84	3	3-5	539.4	558.7	232	6.73	0.77
17	06/27/84	3	3-6	605.5	621.0	252	7.74	0.86
18	06/27/84	3	3-1	597.5	597.7	212	7.47	0.83
19	06/26/84	3	3-2	675.7	753	279	7.56	1.04
20	06/26/84	3	3-3	551.3	587	219	7.29	0.81
21	06/27/84	2	2-4	475.5	450.6	184	6.12	0.68
22	06/27/84	2	2-5	569.6	633.3	222	7.47	0.83
23	06/27/84	2	2-6	503.1	623.3	221	7.74	0.86
24	06/27/84	1	1-7	412.5	434.4	150	5.4	0.6
25	06/27/84	1	1-2	521.4	533.1	217	6.94	0.76
26	06/27/84	1	1-9	529.5	541	216	6.75	0.75
27	07/09/84	1	1-1	SAMPLING	SAMPLING	SAMPLING	SAMPLING	SAMPLING
28	07/09/84	1	1-2	PROBLEMS	PROBLEMS	PROBLEMS	PROBLEMS	PROBLEMS
29	07/10/84	1	1-3	.	.	.	.	.
30	07/10/84	2	2-1	.	.	.	.	.
31	07/10/84	2	2-4	.	.	.	.	.
32	07/10/84	2	2-5	.	.	.	.	.
33	07/10/84	3	3-1	.	.	.	.	.
34	07/10/84	3	3-2	.	.	.	.	.
35	07/10/84	3	3-3	.	.	.	.	.

* AT 4500 BTU PER POUND

AVG(ARITHMETIC)

546.4 576.5 217.7 7.15 0.79

UPPER LIMIT AT 99% PROBABILITY
(STUDENT'S "T" STATISTICS;
"ONE TAILED" TEST CRITERION)

592.3 741.6 250.2 9.24 1.02

AVG(GEOMETRIC)

542.4 573.6 216.4 7.11 0.79

UPPER LIMIT AT 99% PROBABILITY
(STUDENT'S "T" STATISTICS;
"ONE TAILED" TEST CRITERION)

720.5 763.6 255.5 9.52 1.06

C-30

TABLE A-6
SUMMARY OF EMISSION TESTS
WESTCHESTER RESCO
FLUORIDES (HF)
MODIFIED EPA METHOD 6

SAMPLE RUN	DATE	BOILER NUMBER	TEST RUN	F PPM DRY (12% O ₂)	F PPM DRY (7% O ₂)	LB5 OF F PER HOUR	LB5 OF F / 1% OF REFUSE	LB5 OF F / 4% STU
1	03/33/34	1	1-1	IMPROPER	IMPROPER	IMPROPER	IMPROPER	IMPROPER
2	03/33/34	1	1-2	BOILER	BOILER	BOILER	BOILER	BOILER
3	03/33/34	1	1-3	OPERATION	OPERATION	OPERATION	OPERATION	OPERATION
4	04/24/34	2	2-1	(unusually low results deleted due to probable sampling problems)				
5	04/25/34	2	2-2					
6	04/26/34	2	2-3					
7	04/26/34	3	3-7					
8	04/26/34	3	3-9					
9	07/09/34	1	1-1	15.3	15.7	3.14	0.107	0.0119
10	07/09/34	1	1-2	17.9	15.3	3.75	0.125	0.0139
11	07/09/34	1	1-3	13.1	13.3	2.56	0.096	0.0105
12	07/09/34	2	2-1	15.2	15.5	3.57	0.112	0.0125
13	07/10/34	2	2-4	17.4	20.2	4.37	0.133	0.0153
14	07/10/34	2	2-5	15.7	17.6	3.65	0.12	0.0133
15	07/10/34	3	3-1	15.9	16.5	3.23	0.114	0.0127
16	07/10/34	3	3-2	14.1	14.3	3.22	0.101	0.0112
17	07/17/34	3	3-3	15.5	14.3	3.2	0.107	0.0123

• AT 4500 BTU PER POUND

AVG(ARITHMETIC)	15.8	15.4	3.5	0.11	0.012
UPPER LIMIT AT 99% PROBABILITY (STUDENT'S "T" STATISTICS; "ONE TAILED" TEST CRITERION)	21.4	22	4.7	0.15	0.016
AVG(GEOMETRIC)	15.7	16.3	3.5	0.11	0.012
UPPER LIMIT AT 99% PROBABILITY (STUDENT'S "T" STATISTICS; "ONE TAILED" TEST CRITERION)	22.3	22.9	4.6	0.15	0.02

ATTACHMENT D

LEVEL I VISIBILITY SCREENING ANALYSIS COMPUTATIONS

COMPUTATIONAL METHOD FOR LEVEL I
VISIBILITY SCREENING ANALYSIS

Reference: Latimer, D.A., and R.G. Ireson, November 1980,
Workbook for Estimating Visibility Impairment,
(EPA-450/4-80-031)

Chassahowitzka National Wildlife Refuge Class I Area

I. Determine plume dispersion parameter p:

$$p = \frac{2.0 \times 10^8}{S_z X}$$

where:

p = plume dispersion parameter

X = straight line distance, in kilometers, between the emission source and the closest boundary of a Class I area.

S_z = the vertical dispersion coefficient (in meters corresponding to x based on the Pasquill-Gifford F stability curve (from Turner, 1969)).

For the Pasco County RRF impacts on the Chassahowitzka National Wildlife Refuge Class I area:

$$x_{min} = 27 \text{ km}$$

$$S_z = 66.5 \text{ m}$$

Therefore:

$$p = \frac{2.0 \times 10^8}{63 \times 27}$$

$$p = 1.1 \times 10^5$$

II. Determine the total mass emission rates (in metric tons per day) of:

- a) particulates (Q_{part})
- b) Nitrogen oxides as NO_2 (Q_{NO_x})
- c) Sulfur dioxide (Q_{SO_2})

Therefore:

$$Q_{\text{part}} \text{ (from Table 7-6)} = 1.96 \text{ g/sec (100\% operation)}$$

$$Q_{\text{part}} \frac{\text{metric tons}}{\text{day}} = \frac{15.5 \text{ lb}}{\text{hr}} \cdot \frac{24 \text{ hr}}{\text{dy}} \cdot \frac{\text{met-ton}}{2205 \text{ lb}}$$

$$Q_{\text{part}} = 0.169 \text{ metric tons per day}$$

Similarly:

$$Q_{\text{NO}_x} = 3.37 \text{ metric tons per day}$$

$$Q_{\text{SO}_2} = 1.18 \text{ metric tons per day}$$

III. Calculate the optical thickness (T)

Therefore:

$$T_{\text{part}} = (10 \times 10^{-7}) (p) (Q_{\text{part}})$$

$$T_{\text{part}} = (10 \times 10^{-7}) (1.1 \times 10^5) (0.169)$$

$$T_{\text{part}} = 0.0186$$

Similarly:

$$T_{\text{NO}_x} = (1.7 \times 10^{-7}) (p) (Q_{\text{NO}_x})$$

$$T_{\text{NO}_x} = 0.0629$$

IV. Determine background visual range (r_{v_0}) of emission source location and Class I area location.

From Figure 13 of Latimer and Ireson (1980)

$$a) \quad r_{v_0} \text{ (Emission source)} = 25 \text{ km}$$

$$b) \quad r_{vo} \text{ (Class I area)} = 25 \text{ km}$$

For computational purposes, r_{vo} will equal 25 km.

- V. Calculate the optical thickness parameter for primary and secondary aerosols.

$$\begin{aligned} \text{Taerosol} &= (1.06 \times 10^{-5}) (r_{vo}) (Q_{\text{part}} + 1.31 Q_{\text{SO}_2}) \\ &= (1.06 \times 10^{-5}) (25 \text{ km}) (0.169 + 1.31 [1.18]) \end{aligned}$$

$$\text{Taerosol} = 4.54 \times 10^{-4}$$

- VI. Calculate contrast parameters:

$$a) \quad C_1 = \text{plume contrast against sky}$$

$$b) \quad C_2 = \text{plume contrast against terrain}$$

$$c) \quad C_3 = \text{change in sky/terrain contrast caused by primary or secondary aerosol}$$

$$\begin{aligned} a) \quad C_1 &= - \frac{\text{TNO}_2}{\text{Tpart} + \text{TNO}_2} [1 - \exp(-\text{Tpart} - \text{TNO}_x)] [\exp(-0.78 \text{ x}/r_{vo})] \\ &= - \frac{0.0629}{0.0186 + 0.0629} [1 - \exp(-0.0186 - 0.0629)] [\exp(-0.78(27)/25)] \\ &= - 0.772 (0.0782) (0.431) \\ C_1 &= - 0.0260 \end{aligned}$$

$$\begin{aligned} b) \quad C_2 &= [1 - \frac{1}{C_1 + 1} \exp(-\text{Tpart} - \text{TNO}_x)] [\exp(-1.56 \text{ x}/r_{vo})] \\ &= [1 - \frac{0.1973}{0.974} \exp(-0.0814)] [\exp(-1.69)] \\ &= [1 - (0.946)] [0.186] \\ C_2 &= 0.0099 \end{aligned}$$

$$\begin{aligned} c) \quad C_3 &= 0.368 [1 - \exp(-\text{Taerosol})] \\ &= 0.368 [1 - \exp(-0.000454)] \\ &= 0.368 [0.000454] \\ &= 0.000167 \end{aligned}$$

VII. Test contrast parameters:

$$C_1 = -0.0260$$

$$C_2 = 0.0099$$

$$C_3 = 0.00017$$

If the absolute values of C_1 , C_2 , and C_3 are all less than 0.10, the emissions source is unlikely to cause adverse visibility impairment in the Class I areas. The C_1 , C_2 and C_3 parameters for the Chassahowitzka N.W.R. periphery are only 26%, 10%, and 0.2% respectively.

Therefore, C_1 , C_2 and C_3 are all much lower than 0.10 and a more refined analysis of potential visibility impacts is unnecessary.

Cedar Key National Wildlife Refuge

The impact of the Pasco County RRF on visibility parameters at the Cedar Key NWR Class I Area (100 km toward the north-northwest from the Pasco County RRF) are as follows:

$$\begin{aligned}x &= 100 \text{ km} \\S_z &= 93.0 \text{ m} \\p &= 2.15 \times 10^4 \\T_{\text{part}} &= 0.000363 \\TNO_x &= 0.0123 \\r_{v_o} \text{ (emission source)} &= 25 \text{ km} \\r_{v_o} \text{ (Cedar Key NWR)} &= 25 \text{ km} \\T_{\text{aerosol}} &= 4.53 \times 10^{-4} \\C_1 &= -0.000538 \\C_2 &= 0.0000298 \\C_3 &= 0.000167\end{aligned}$$

The values of C_1 , C_2 and C_3 are all less than 0.1 and represent only 0.5%, 0.02% and 0.2% of the threshold value, respectively. Therefore, the Pasco County RRF should not adversely affect visibility at the Cedar Key NWR.

Anclote National Wildlife Refuge and Withlacoochee State Forest

Although the Anclote NWR and Withlacoochee State Forest are not Class I PSD Areas, the aesthetic beauty of both of concern to the citizens of the area. Both areas are located about 35 km from the Pasco County RRF site. The impact of the proposed source on visibility for both areas are as follows:

$$\begin{aligned}
 x &= 35 \text{ km} \\
 S_z &= 71.8 \text{ m} \\
 p &= 7.96 \times 10^{-4} \\
 T_{\text{part}} &= 0.0135 \\
 r_{v_0} \text{ (emissions source)} &= 25 \text{ km} \\
 r_{v_0} \text{ (Anclote NWR, Withlacoochee SF)} &= 25 \text{ km} \\
 T_{\text{aerosol}} &= 4.53 \times 10^{-4} \\
 C_1 &= -0.0202 \\
 C_2 &= 0.00793 \\
 C_3 &= 0.000167
 \end{aligned}$$

The three plume contrast parameters are respectively 20%, 8%, and 0.2% of the 0.1 threshold value. There should not be an adverse effect on visibility due to Pasco County RRF emissions.

APPENDIX 10.16
STACK HEIGHT ANALYSIS AND RECOMMENDATIONS

TABLE OF CONTENTS

- 1.0 Summary
- 2.0 Overview
- 3.0 Technical basis for GEP Stack Height
- 4.0 Determination of GEP Stack Height
- 5.0 Conclusion

1.0 Summary

The development of a Resource Recovery Facility in Pasco County, Florida, includes the design of a stack for discharging exhaust to the atmosphere. The stack is designed to be of sufficient height to comply with EPA criteria for good engineering practice (GEP) Stack height as stated in 40 CFR 51 and F.A.C. 17-2.70 (3). The calculated GEP stack height for the proposed facility is 275 feet.

2.0 Overview

As a result of the Clean Air Act, EPA has promulgated regulations to assure that the degree of emission limitation required for the control of any air pollutant is not affected by (1) that portion of any stack height which exceeds good engineering practice (GEP) or by (2) any other dispersion technique.

A GEP stack height, as defined in the Clean Air Act and 40 CFR 51 is "the height necessary to insure that emissions from the stack do not result in excessive concentrations of any air pollutant in the immediate vicinity of the source as a result of atmospheric downwash, eddies or wakes which may be created by the source itself, nearby structures or nearby terrain obstacles." In addition, a GEP stack can not exceed two and one-half times the height of the source unless a physical demonstration is performed justifying a higher stack.

According to 40 CFR 51.1(ii), "Good Engineering Practice (GEP) Stack Height" means greater of :

1. 65 meters, measured from the ground-level elevation at the base of the stack;
2. (a) for stacks in existence on January 12, 1979, and for which the owner or operator had obtained all applicable permits or approvals required under 40 CFR Parts 51 and 52,

$$H_g = 2.5H \quad (\text{Equation 1})$$

provided the owner or operator produces evidence that this equation was actually relied on in designing the stack or establishing an emission limitation to ensure protection against downwash;

(b) for all other stacks,

$$H_g = H + 1.5L \quad (\text{Equation 2})$$

where: H_g = good engineering practice stack height, measured from the ground-level elevation at the base of the stack,

H = height of nearby structure(s) measured from the ground-level elevation at the base of the stack,

L = lesser dimension, height or projected width, of nearby structure(s),

Provided that the EPA, State or local control agency may require the use of a field study or fluid model to verify GEP stack height for the source.

In equation 2, both the height and width of the structure are determined from the frontal area of the structure, projected onto a plane perpendicular to the wind direction. A plane projection may have a multitude of heights or widths, particularly for a multilayered structure. In general, the GEP stack height should be based on the plane projection lying upwind from the source (stack) which results in the greatest justifiable height.

Equation 2 is used to calculate the GEP stack height for squat building such as the furnace/boiler building designed for the Pasco County Resource Recovery Facility (RRF). More complex structures such as hyperbolic cooling towers or open sided structures, require a much more in-depth analysis.

The GEP stack height should also minimize the adverse effects of elevated terrain in the vicinity of the stack. The terrain around the site for the Pasco County RRF is relatively flat and well below stack top. The nearest area of relatively elevated terrain is well over 25 kilometers away.

3.0 Technical Basis for GEP Stack Height

Atmospheric flow is disrupted by aerodynamic forces in the immediate vicinity of structures or terrain obstacles. The aerodynamic forces evolve from interacting frictional forces and pressure gradients induced by the local obstruction. The surface friction and pressure gradients combine to retard the atmospheric surface layer flow enough to produce regions where the flow is locally distorted, causing an area of stagnation (cavity) to develop. The flow within the stagnant region is highly turbulent and conceptually perceived as circulating eddies. The outer boundary of the eddy or cavity region extends from the point of separation to reattachment downwind, as shown in Figure 1. The wake is defined as the entire region of the flow field that is disturbed by the obstacle. The upper boundary of the wake is called the "envelope", as shown in Figure 1. The reattachment point is taken as the ground-level position where the flow is no longer drawn back towards the backside of the building. Downwind, beyond the reattachment, the flow readjusts itself to a boundary layer appropriate to local surface roughness. For sharp-edged obstacles the flow distinctly separates at the leading edges. For rounded obstacles the point of separation can vary greatly. The disrupted flow near either building structures or terrain obstacles can both enhance the vertical dispersion of emissions from the source and reduce the effective height of emissions from the source. For elevated sources, these aerodynamic effects tend to cause an increase in the maximum ground-level concentrations.

The complex pattern of flow around a rectangular block is depicted by Figure 2. A review of the literature clearly indicates that the aerodynamic influences and the extent of the wake are highly dependent on the particular shape and design of the obstruction. The extent of the wake also depends on the characteristics of the approaching atmospheric flow. Presently, theoretical and quantitative understanding of the extent of

obstacle influences are limited. Further examinations of the extend of influence for a wide range of structures and terrain obstacles are needed.

A review and evaluation of current literature reveals a consensus that the height of the cavity downwind of structures extends to the height of the structure plus 0.5 times the height or width, whichever dimension is less. However, significant influences on plume behavior are found to extend further. The established 2.5 times rule (which specifies that stacks designed to discharge at least 2.5 times the height of the highest nearby structures would escape building influences) is found to be the consensus opinion as the stack height necessary to avoid significant effects for buildings whose projected width is greater than its height, although individual studies show some deviation. For tall buildings, where the width is less than the height, the stack height need only be equal to the height of the building plus 1.5 times its width. Thus, the good engineering practice stack height has been determined to be equal to the height of the structure plus 1.5 times the height or width, whichever is less. This determination is most applicable to sharp-edged structures. The extent of significant effects for rounded structures are likely not as great as those for sharp-edged structures.

Additional discussions of the aerodynamically induced disruption around obstacles can be found, for example, in Hunt, et al (1978); Cermak (1976); Halitsky (1963); Batchelor (1967).

4.0 Determination of GEP Stack Height

GEP stack height is designed to ensure that emissions from a stack do not result in excessive concentrations as a result of aerodynamic effects from nearby structures or terrain features. Lower ground-level concentrations will result when: (1) the emission point is well above the disturbed flow, (2) the effluent rise is sufficiently great to keep a significant part of the effluent plume above the disturbed flow or (3) the wind direction places the stack outside the area of disturbed flow.

GEP stack height has been defined in equation 2 to be equal to the height of adjacent or nearby structures plus 1.5 times the structure height or width, whichever is less. Both the height and width of the structure are determined from the frontal area of the structure, projected on a plane perpendicular to the direction of the wind. The GEP stack height used for the air quality analysis (275 feet) is determined from the dimensions of a squat building with a controlling tier height of 110 feet. A squat building is defined as one with a height-to-width ratio less than unity in accordance with guidance provided by Mr. Steven Perkins of EPA-Region I (Perkins, 1981).

The Pasco County RRF is designed to have a building that fits the criteria of a squat building, therefore, the building height of 110 feet is the controlling dimension in the GEP height equation (equation 2). Completing the calculation:

$$(a) \quad H_g = H + 1.5L \quad (\text{Equation 2})$$

$$(b) \quad H_g = 110 + 1.5 (110)$$

$$(c) \quad H_g = 275 \text{ feet}$$

The proposed stack is sufficiently high to avoid aerodynamic downwash.

GEP stack height as determined by Equation 2 does not consider plume rise. However, plume rise should not be significant in the determination of GEP stack height because under high wind speeds, plume rise near the source is negligible. For most sources, even those with a relatively high exit velocity, a wind speed of 15-20 m/s will result in significantly reduced plume rise.

Therefore, to attain a conservative estimate for the GEP stack height, plume rise is not considered in determining GEP stack height.

5.0 Conclusions

Using EPA-recommended techniques for determining GEP Stack Height, a GEP stack height of 275 feet was calculated for a stack in the vicinity of a squat building having a height of 110 feet. This stack height is necessary to prevent building induced downwash effects that may cause excessive ground-level concentrations.

The ISC short-term model was used to simulate pollutant emission and dispersion from a GEP stack. Dispersion modeling results presented in Section 6.0 of the PSD permit application show that estimated concentrations of pollutants are well below all applicable FAAQS, NAAQS, and PSD increments. As presented in the PSD permit, the highest single source pollutant impact is for lead at 1.4 percent of the standard. All other pollutant impacts are lower. Hence, the GEP stack proposed for the Pasco County RRF will be sufficient to avoid building aerodynamic wake and cavity effects.

REFERENCES

- Batchelor, G. K., 1967: An Introduction to Fluid Dynamics. Cambridge University Press, Cambridge, (Greater Britain), 325-331.
- Cermak, J. E., 1976: Aerodynamics of Buildings. In Annual Review of Fluid Mechanics, Vol. 8, Van Dyke, M. and W.G. Vincenti (Co. Ed.), Annual Reviews, Inc., Palo Alto, CA, pp. 75-106.
- Halitsky, J., 1963: Gas Diffusion Near Buildings. ASHRAE (Trans.), 69, pp. 464-484.
- Halitsky, J., 1963: Gas Diffusion Near Building. In Meteorology and Atomic Energy - 1968, D.H. Slade (Ed.), Chapter 5-5.
- Hunt, J. C., C. J. Abell, J. A. Peterka, and H. Woo, 1978: Kinematical Studies of the Flows Around FREE OR Surface Mounted Obstacles; Applying Topology to Flow Visualization. J. Fluid Mech., 3, Part 1, 179-200.
- USEPA, 1985, Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations), EPA-450/4-80-023R, June, 1985.

CDM

NOV. 1987

**PASCO COUNTY, FLORIDA
SOLID WASTE RESOURCE RECOVERY FACILITY
APPLICATION FOR POWER PLANT SITE CERTIFICATION**

VOLUME IV - LANDFILL/ASHFILL

ORIGINAL

PASCO COUNTY, FLORIDA
SOLID WASTE RESOURCE RECOVERY FACILITY
APPLICATION FOR
POWER PLANT SITE CERTIFICATION



SUBMITTED BY
THE PASCO COUNTY
BOARD OF COUNTY COMMISSIONERS

NOVEMBER 1987

PREPARED BY
CAMP DRESSER & MCKEE INC.

*environmental engineers, scientists,
planners & management consultants*

CDM

PASCO COUNTY, FLORIDA
SOLID WASTE RESOURCE RECOVERY FACILITY
APPLICATION FOR
POWER PLANT SITE CERTIFICATION



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PASCO COUNTY, FLORIDA

SOLID WASTE RESOURCE RECOVERY FACILITY
APPLICATION FOR POWER PLANT SITE CERTIFICATION

VOLUME IV - LANDFILL/ASHFILL

PERMIT APPLICATION FORM

GENERAL

1. LETTER OF TRANSMITTAL
2. TABLE OF CONTENTS
3. PERMIT FEE
4. COPIES
5. ENGINEER SEAL
6. ENGINEER'S LETTER OF APPOINTMENT
7. OPERATOR/OWNER AGREEMENT
8. PROOF OF PUBLICATION OF NOTICE

SPECIFICATION ATTACHMENT ITEMS

1. FOUNDATION ANALYSIS
2. ZONING CONFORMANCE
3. FACILITY DESIGN
4. LANDFILL PERFORMANCE AND DESIGN STANDARDS
5. OPERATIONS PLAN
6. WATER QUALITY STANDARDS
7. CLOSURE
8. SOLID WASTE DISPOSAL FACILITY DATA FORM
9. SOLID WASTE VOLUME REDUCTION AND RESOURCE RECOVERY
FACILITY DATA FORM (not applicable)
10. CERTIFICATION OF COMPLETION FORM (submitted following
preparation of landfill to accept solid waste/ash)
11. PROHIBITIONS

TECHNICAL APPENDICES

Technical Appendix A	Engineer's Letter of Appointment
Technical Appendix B	Warranty Deed and Order of Taking
Technical Appendix C	Evidence of Local Zoning Conformance
Technical Appendix D	Pasco County Solid Waste Quantity Projections and Anticipated Landfill Volume
Technical Appendix E	Groundwater Monitoring Plan Supplement
Technical Appendix F	Liner Specifications
Technical Appendix G	Leachate Depth Calculations

ATTACHMENTS

Attachment 1	Permit Drawings
Attachment 2	Soils and Geotechnical Report

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
CONSTRUCTION/OPERATIONS PERMIT APPLICATION
FOR THE PASCO COUNTY
HAYS ROAD SANITARY LANDFILL/ASHFILL

Prepared for:

PASCO COUNTY BOARD OF COUNTY COMMISSIONERS
7530 Little Road
New Port Richey, Florida 33553

Prepared by:

CAMP DRESSER & McKEE INC.
One Tampa City Center, Suite 1750
Tampa, Florida 33602

SEPTEMBER 1987

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241



BOB GRAHAM
GOVERNOR
VICTORIA J. TSCHINKEL
SECRETARY

APPLICATION FOR PERMIT TO
CONSTRUCT ☒
OPERATE ☒

A SOLID WASTE RESOURCE RECOVERY AND MANAGEMENT FACILITY
GENERAL REQUIREMENTS

Solid Waste Resource Recovery and Management Facilities shall be permitted pursuant to Section 403.707, Florida Statutes, and in accordance with Florida Administrative Code Rule 17-7. A minimum of six copies of the application shall be submitted to the Department District Office having jurisdiction over the facility. Complete appropriate sections for the type of facility for which application is made. Entries should be typed or printed in ink. All blanks should be filled in or marked not applicable. The application shall include all information, drawings, and reports necessary to evaluate the facility. Information required to support the application is listed on the attached pages of this form.

Facility Type: Existing _____ Proposed X
Sanitary Landfill: X Class I,
Class II,
Class III: Trash/yard Trash
Class III: Yard Trash Composting
Volume Reduction: _____
Composting
Shredder
Incinerator/Trench Burner
Resource Recovery:
Energy _____ Materials
Sludge Landspreading: _____
Grade I
Grade II
Grade III
Septage/Food Service

FACILITY NAME: Hays Road Sanitary Landfill/Ashfill / DER ID Number

FACILITY LOCATION (main entrance): Hays Road
S 24, 25, 26 T 24S, R 17E / Latitude 28 ° 22 ' 30 " Longitude 82 ° 34 ' 00 "
section township range

Applicant Name (operating authority): Pasco County
Street Address & P. O. Box: 7536 State St., New Port Richey, Florida 33553
City County Zip

Contact Person: George Ellsworth (813) 847-8145
Name Phone Number

Authorized Agent/Consultant: Camp Dresser & McKee Inc. (813) 221-2833
Name Phone Number

Contact Person: Robert Hauser, One Tampa City Center, Suite 1750 (813) 221-2833
Name Street P. O. Box Phone Number
Tampa Hillsborough Florida 33602
City County State Zip

Landowner (if different than applicant): Pasco County Board of County Commissioners

Address of Landowner: 7530 Little Road, New Port Richey, FL 33553
Street, P. O. Box City State Zip

Cities, Towns and Areas to be Served: Entire Pasco County (unincorporated areas and six municipalities)

Current and Projected Population to Served: 290,000 (1991) 425,000 (2010)

Acres within Waste Site Boundary: 195 Acres within Property Boundary: 751

Protecting Florida and Your Quality of Life

Refuse - 120
Volume of Solid Waste to be received: Ash - 180 cu. yds/day (tons/day) gallons/day
Date Site Ready to Receive Solid Waste: Jan. 1991 Estimated Life of Facility 35 years
Estimated Cost of Construction, Total: \$12,300,000 Estimated cost of Closing: \$11,700,000
Anticipated Construction Starting and Completion Dates
From: Jan. 1990 To: Jan. 1991

**REQUIRED ATTACHEMENTS FOR CONSTRUCTION/OPERATION PERMIT
FOR A RESOURCE RECOVERY AND MANAGEMENT FACILITY**

GENERAL

Permit application and supporting information shall include the following (17-7.030(2), F.A.C.):

- | | <u>Completeness Check</u> |
|--|---------------------------|
| 1. A letter of transmittal to the Department; (17-7.030(3)(a) F.A.C.) | — |
| 2. A table of contents listing the main sections of the application: (17-7.030(3)(b), F.A.C.) | — |
| 3. The permit fee specified in Florida Administrative Code Rule 17-4.05 in check or money order payable to the Department; (17-7.030(3)(c), F.A.C.) | — |
| 4. Six copies, at minimum, of the completed application form, all supporting data, and reports; (17-7.030(2), F.A.C.) | — |
| 5. Engineer seal; (17-7.030(2)(d), F.A.C.) | — |
| 6. Engineer's letter of appointment if applicable; (17-7.030(3)(e), F.A.C.) | — |
| 7. Copy of any lease agreement, transfer of property agreement with right of entry for long-term care, or any other agreement between operator and property owner by which the closing and long-term care of the facility may be affected; (17-7.030(3)(h) | — |
| 8. Proof of publication of notice of application for the proposed activity in a newspaper of general circulation; (17-7.03(4), F.A.C) | — |

SPECIFICATION ATTACHMENT ITEMS

The following information items must be included in the application or an explanation given if they are not applicable.

Construction Permits:

- A. Landfills - Submit items 1, 2, 3, 4, 5, 6, 7, 8, 10.
- B. Volume Reduction - Submit items 1, 2, 3, 4, 5, 6, 7, 9, 10.
- C. Sludge Landspreading - Submit items 2, 3, 4, 5, 6, 8, 10.

Operation Permits:

- A. Landfills - All the items above.
- B. Volume Reduction - All the items above.
- C. Sludge Landspreading - All the items above.

NOTE: For facilities that have been satisfactorily constructed in accordance with their construction permit the information required for A, B, and C type facilities does not have to be resubmitted for an operation permit if the information has not changed during the construction period.

- 1. A foundation analysis (17-7.050(2)(b), F.A.C.)
- 2. Evidence that the facility is in conformance with local zoning (17-7.050(2)(c)4, F.A.C)
- 3. **Facility Design** (17-7.050(3), F.A.C.):

NOTE: All maps, plan sheets, drawings, isometrics, cross-sections, or aerial photographs shall be legible; be signed and sealed by the registered professional engineer responsible for their preparation; be of appropriate scale to show clearly all required details; be numbered, referenced to narrative, titled, have a legend of symbols used, contain horizontal and vertical scales (where applicable), and specify drafting or origination dates; and use uniform scales as much as possible, contain a north arrow, and use NGVD for all elevations.

Completeness Check

a. A map or aerial photograph of the area, no more than 1 year old, showing land use and zoning within 1 mile of the facility. (17-7.050(3)(a), F.A.C.)

b. Plot Plan (17-7.050(3)(b), F.A.C.)

NOTE: The plot plan on a scale not greater than 200 feet to the inch showing the following:

- (1) Dimensions and Legal Description of the site
- (2) Location and depth (NGVD) of soil borings
- (3) Plan for trenching or disposal areas
- (4) Fencing or other measures to restrict access
- (5) Cross sections showing both original and proposed fill elevations
- (6) Location, depth, and construction details of monitoring wells

c. Topographic Maps (17-7.050(3)(c), F.A.C.)

NOTE: The topographic maps, which may be combined with the plot plan (item 4b), on a scale not greater than 200 feet to the inch showing the following:

- (1) Five foot contour intervals
- (2) Proposed fill areas
- (3) Borrow areas
- (4) Access roads
- (5) Grades required for proper drainage
- (6) Typical cross sections of disposal site including lifts, borrow areas and drainage controls
- (7) Special drainage devices
- (8) Fencing
- (9) Equipment facilities
- (10) Other pertinent information based on intended use of facility

d. Report (17-7.050(3)(d), F.A.C.)

- (1) Estimated population and area served by the proposed site with basis for the estimate
- (2) Anticipated type, annual quantity, and source of solid waste
- (3) Anticipated life of site
- (4) Source and characteristics of cover material

e. Ground Water Monitoring Plan (17-7.050(3)(e), F.A.C.)

- (1) Plan and hydrogeological survey, including foundation analysis, in accordance with 17-4.245(6), 17-7.030, and 17-7.050 F.A.C.; or
- (2) A copy of a Department letter of approval of a previously submitted plan, if applicable.

Completeness Check

4. Landfill Performance and Design Standards (17-7.050(4), F.A.C.)

- a. Liner performance (17-7.050(4)(a)(b), F.A.C.)
 - (1) Material type (soil, synthetic, other)
 - (2) Adequate base support
 - (3) Planned installation adequate to cover all surrounding earth
 - (4) Equivalency to design standards
- b. Liner quality control plan (17-7.050(4)(c), F.A.C.)
 - (1) Specifications
 - (2) Construction/installation methods
 - (3) Sampling and testing
 - (4) Manufacturer's specifications and recommendations
- c. Leachate control and removal system performance (17-7.050(4)(e), F.A.C.)
 - (1) Construction materials
 - (2) Strength and thickness
 - (3) Measures to prevent clogging
 - (4) Central collection point for treatment and disposal
 - (5) Leachate depth not to exceed one foot
 - (6) Equivalency to design standards
- d. Surface water management system performance (17-7.050(4)(g), F.A.C.)
 - (1) Prevention of surface water flow onto waste-filled areas
 - (2) Stormwater run-off controls; retention, detention ponds
 - (3) Equivalency to design standards
 - (4) Water management district approval
- e. Gas control system performance (17-7.050(4)(i), F.A.C.)
 - (1) Prevention of methane migration
 - (2) Prevention of damage to vegetation
 - (3) Prevention of objectionable odors off site
 - (4) Equivalency to design standards

5. Operations Plan (17-7.050(5)(b),(c)(d) & (e), F.A.C.)

- a. Designation of responsible person(s)
- b. Contingency operations
- c. Controlling the type of waste received at the site:

	<u>Completeness Check</u>
d. Weighing or measuring incoming waste	—
e. Vehicle traffic control and unloading	—
f. Method and sequence of filling waste	—
g. Waste compaction and application of cover	—
h. Operations of gas, leachate, and storm water controls	—
i. Ground water monitoring	—
j. All weather access roads	—
k. Effective barrier	—
l. Signs indicating name of operating authority, traffic flow, hours of operation, and charges for disposal (if any)	—
m. Dust control methods	—
n. Litter control devices	—
o. Fire protection and fire fighting facilities	—
p. Attendant	—
q. Communication facilities	—
r. Adequate in-service and reserve equipment	—
s. Safety devices on equipment to shield and protect operators	—
6. <u>Water Quality Standards (17-7.050(5)(g) & (h), F.A.C.)</u>	—
Describe how surface runoff and leachate will be handled to meet water quality standards of Florida Administrative Code Rules 17-3 and 17-4.	
7. <u>Closure (17-7.070(2), F.A.C.)</u>	—
a. <u>Closure plan (17-7.073, F.A.C.)</u>	—
(1) Design	—
(2) Final use	—
(3) Closure operations	—
(4) Post-closure (17-7.075, F.A.C.)	—
(5) Financial responsibility(17-7.071, F.A.C.)	—
b. <u>Closure plan schedule (17-7.071, F.A.C.)</u>	—
8. <u>Solid Waste Disposal Facility Data Form</u>	—
9. <u>Solid Waste-Volume Reduction and Resource Recovery Facility Data Form</u>	—
10. <u>Certification by Applicant and Engineer or Public Officer</u>	—

SOLID WASTE DISPOSAL FACILITY DATA FORM

Date Form Completed: _____

Permit No.: _____ Issue Date: _____ Expires: _____

DER ACTION:	☐ Add	☐ Delete	☐ Change	☐ Deactivate Site
-------------	------------------------------	---------------------------------	---------------------------------	--

1. DER IDENTIFICATION NUMBER		2. SITE NAME Pasco County Hays Road Landfill	
3. COUNTY Pasco		4. FACILITY ADDRESS (Road, cross road, street) Hays Road	
4a. Facility Phone Number:		4b. Facility Site Supervisor To be appointed	
5a. <u>28° 22' 30"</u> Latitude	<u>82° 34' 00"</u> Longitude	5b. <u>24S</u> Township	<u>17E</u> Range
		<u>24, 25, 26</u> Section	
6. Operating Authority Name Pasco County		8. Operating Authority Address 7536 State Street New Port Richey, FL 33553	
7. Phone Number (813) 847-8145			
9. Owner of Site Property (if different from operator) Same as above		11. Address of Owner Same as above	
10. Phone Number of Owner Same as above			
12. Facility Type ☒ Class I, Sanitary Landfill ☐ Class II, Sanitary Landfill ☐ Class III, Trash/Yard Trash ☐ Class III Yard trash comp.		Sludge Landspreading: ☐ Grade I ☐ Grade II ☐ Grade III ☐ Septage	
		Type ☐ Other Facility	
13. Month Year Begun Jan. 1991	14. Disposal Area 195 Acres	15. Population Served 290,000 (1991)	
16. Expected Useful Lifetime 20 Years	17. Weighing Scales ☒ Yes ☐ No	18. Security to Prevent Unauthorized Used ☒ Yes ☐ No	
19. Depth of Water Table See Sec. 4.2 Ft. (NGVD)	20. Quantity of Waste/Day 790 tons or Yd ³	21. Charge \$unknown/ton	
22. Surrounding Land Use Zoning ☒ Residential ☐ None ☒ Agricultural ☐ Commercial ☐ Industrial ☐ Other			
23. Types of Waste Received ☒ Residential ☒ Agricultural ☒ Yard Trash/Trash ☐ Other: ☒ Commercial ☐ Septic Tank ☐ Sewage Sludge ☒ Incinerator Residue ☒ Industrial ☐ Industrial Sludge ☐ Pathological/Infectious ☐ Water/Air Treat Sludge ☐ Hospital			
24. Number of Monitoring Wells 8 (to be added in 1991)		25. Number of Surface Monitoring Points 0	
26. Gas Control / Recovery ☒ Yes ☐ No / ☐ Yes ☒ No		28. Attendant ☒ Yes ☐ No	
27. Salvaging Permitted ☐ Yes ☒ No			

29. Leachate Control Method - Liner Type: ☐ Natural ☐ Emplaced Clay ☒ Synthetic ☐ None ☐ Other		
Collection Method: ☐ Well Point ☐ Perimeter Ditch ☐ None ☒ Under Site Drains ☐ Other		
Treatment Method: ☐ Oxidation ☐ Recirculated ☐ Chemical ☐ Advanced ☒ None ☐ Other See Attached		
30. Leachate Discharge ☐ Yes ☒ No	Class of Receiving Water	
31. Site Located in ☐ Floodplain ☐ Wetlands ☒ Other: Uplands > 85%		
32. Surface Runoff Collected ☒ Yes ☐ No	Type of Runoff Treatment Retention/Detention Pond	Class of Receiving Waters Isolated Wetlands
33. Property Recorded as a Solid waste Disposal Site in County Land Records ☐ Yes ☒ No		
34. Days of Operation 7	Days of Cover as required	Hours of Operation 7 a.m. - 5 p.m.
35. Name, Title and Phone Number of Person Completing Form Louis R. Tortora, Jr., P.E. (813) 530-9984		

NOTE: All blanks must be filled or marked as not applicable.

SOLID WASTE VOLUME REDUCTION AND RESOURCE RECOVERY FACILITY DATA FORM

Permit No.: _____ Issue Date: _____ Expires: _____

Facility No. (DER Identification): _____

DER ACTION: ☐ Add ☐ Delete ☐ Change ☐ Deactivate Site ☐ Other

1. County <u>Pasco</u>		2. Site Name <u>Hays Road Resource Recovery Facility</u>	
3. Date Form Completed <u>10/15/87</u>		4. Facility Address <u>Hays Road</u>	
4a. Facility Phone No. <u>N/A</u>		4b. Facility Site Supervisor <u>N/A</u>	
5a. <u>28° 22' 30"</u> Latitude	<u>82° 34' 00"</u> Longitude	5b. <u>24S</u> Township	<u>17E</u> Range
		<u>24, 25, 26</u> Section	
6. Operating Authority Name <u>Vendor to be selected</u>		8. Operating Authority Address <u>N/A</u>	
7. Phone Number _____			
9. Owner of Site Property (if different from Operator) <u>Pasco County</u>		11. Address of Owner <u>7536 State Street</u> <u>New Port Richey, FL 33553</u>	
10. Phone Number of Owner <u>(813) 847-8145</u>			
12. Facility Type (check one or more)			
☒ Incinerator Only ☐ Biomass Gas Production ☐ Pyrolysis ☐ Other: ☐ Sludge Concentration ☐ Baler (compactor) ☐ Composting Plant ☐ Transfer Station ☒ Waterwall Incinerator ☐ Shredder (pulverizer)			
13. Month/Year Begun <u>1/1991</u>		14. Disposal Area <u>195</u> Acres	
15. Population Served <u>290,000</u>			
16. Expected Useful Lifetime <u>35</u> Years		17. Weighing Scales ☒ Yes ☐ No	
18. Waste Processed Per Operational Day <u>900</u> (tons/gal/yd)			
19. Charge/ <u>unknown</u>		20. Days Operated <u>S M T W T F S</u>	
21. Hours/Day Operated <u>24</u>			
22. Maximum Processing Rate <u>1,200 tons/day</u>			
23. Material Recovered, Tons/Week			
<u>200</u> Paper <u> </u> Glass Other: <u> </u> Ferrous Metals <u> </u> Non-Ferrous Metals <u> </u> Aluminum <u> </u> Plastics			
24. Energy Recovery, in units shown			
<u>22,000</u> High Pressure Steam-lb/hr <u> </u> Chilled Water-gal/hr <u> </u> Gas-ft ³ /hr Low Pressure Steam-lb/hr Oil-gal/hr Gas-BTU/hr Electricity-kw/hr Oil-BTU/hr Other:			
25. Process Water Recycled ☒ Yes ☐ No		Treatment Method Used <u>transmitted to WWTP</u>	
Discharged to: <u>None</u> ☐ Surface Waters ☐ Underground		Class Receiving Water _____	
26. Final Residue is <u><30 %</u> of waste intake		Residue is disposed of at (Site Name) <u>Hays Rd Ashfill (colocated)</u>	
27. Supplementary Fuel Used			
Type <u>gas</u>		Quantity Used/Hour <u>startup only</u>	
28. Estimated Operating Costs Material - Energy Revenue <u>Sunknow</u>		Total Cost/Ton <u>Sunknow</u> Net Cost/Ton \$ <u>68.00</u> (estimate)	
29. Number of Staff <u>50</u> (estimate)		30. State Pollution Control Bond Financing Amount \$ <u>none</u>	
31. Estimated Amount of Tax Exemptions that will be Requested <u>\$89 Million</u>			
32. Name and Title of Person Completing Form _____			

Note: All blanks must be filled or marked as not applicable.

CERTIFICATION BY APPLICANT AND ENGINEER OR PUBLIC OFFICER

A. Applicant

The undersigned applicant or authorized representative of _____
is aware that statements made in this form and attached information are an application for a

Permit from the Florida Department of Environmental Regulation and certifies that the information in this application is true, correct and complete to the best of his knowledge and belief. Further, the undersigned agrees to comply with the provisions of Chapter 403, Florida Statutes, and all rules and regulations of the Department. It is understood that the Permit is not transferable, and, the Department will be notified prior to the sale or legal transfer of the permitted facility.

Signature of Applicant or Agent

Name and Title

Date:

Attach letter of authorization if agent is not a
governmental official, owner, or corporate officer.

B. Professional Engineer Registered in Florida or Public Officer as Required in Section 403.707 and 403.7075, Florida Statutes

This is to certify that the engineering features of this resource recovery and management facility have been designed/examined by me and found to conform to engineering principals applicable to such facilities. In my professional judgement, this facility, when properly maintained and operated, will comply with all applicable statutes of the State of Florida and rules of the Department. It is agreed that the undersigned will provide the applicant with a set of instructions of proper maintenance and operation of the facility.

Signature

Name and title (please type)

Florida Registration Number
(please affix seal)

Mailing Address

City, State, Zip Code

Telephone Number

Date:

Construction Cost Estimate: _____

Permit Number: _____

Issue Date: _____

Review Date: _____

Expiration Date: _____

CERTIFICATION BY APPLICANT AND ENGINEER OR PUBLIC OFFICER

A. Applicant

The undersigned applicant or authorized representative of Pasco County is aware that statements made in this form and attached information are an application for a Construction and operation of a Class I sanitary landfill Permit from the Florida Department of Environmental Regulation and certifies that the information in this application is true, correct and complete to the best of his knowledge and belief. Further, the undersigned agrees to comply with the provisions of Chapter 403, Florida Statutes, and all rules and regulations of the Department. It is understood that the Permit is not transferable, and, the Department will be notified prior to the sale or legal transfer of the permitted facility.

George Ellsworth

Signature of Applicant or Agent

George Ellsworth, Resource Rec. Manager,

Name and Title

Date: 10/20/87

Pasco Co. Utilities
Dept.

Attach letter of authorization if agent is not a governmental official, owner, or corporate officer.

B. Professional Engineer Registered in Florida or Public Officer as Required in Section 403.707 and 403.7075, Florida Statutes

This is to certify that the engineering features of this resource recovery and management facility have been designed/examined by me and found to conform to engineering principals applicable to such facilities. In my professional judgement, this facility, when properly maintained and operated, will comply with all applicable statutes of the State of Florida and rules of the Department. It is agreed that the undersigned will provide the applicant with a set of instructions of proper maintenance and operation of the facility.

Louis R. Tortora

Name and title (please type)

0032073

Florida Registration Number

(please affix seal)

Camp Dresser & McKee Inc.

1321 U.S. 19 South, Suite 100B

Clearwater, FL 34624

(813) 530-9984

Telephone Number

Date: _____

Construction Cost Estimate: _____

Permit Number: _____

Issue Date: _____

Review Date: _____

Expiration Date: _____

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
PERMIT APPLICATION TO CONSTRUCT AND OPERATE
THE WEST PASCO COUNTY HAYS ROAD CLASS I LANDFILL/ASHFILL

I. INTRODUCTION

The following checklist of information has been prepared to specifically follow the solid waste Construction and Operations Permit Application checklist as it appears in FDER form 17-7.130(1) effective December 10, 1985. It is intended that this format will assist the FDER staff in reviewing the county's construction and operations permit application. The attachments listed in the Table of Contents are a part of this permit application.

This report presents Pasco County's intended plan for construction and operation of the proposed Class I Landfill which will provide the county with a disposal site for ash from their proposed resource recovery facility, as well as unprocessed Class I waste. The goal is to build landfill cell systems which effectively contain, collect, and convey leachate to centralized collection facilities, while minimizing the generation of future leachate quantities. The treatment of raw leachate will consist of evaporation on the working face and/or transport to a wastewater treatment facility.

This submittal refers to elevations in terms of mean sea level (msl) which is considered identical to the National Geodetic Vertical Datum (NGVD).

II. GENERAL INFORMATION

1. Letter of transmittal to the Department.

Response:

A letter of transmittal is not necessary. This application is being submitted as Volume IV of the Application for Power Plant Site Certification.

2. Table of Contents.

Response:

A table of contents listing the general information and requested submittal items is included starting on page i.

3. Permit fee specified in Florida Administrative Code Rule 17-7.030 in check or money order, payable to the FDER.

Response:

This permit application is part of the application for Power Plant Site Certification. Payment for the PPSA includes this permit application.

4. Copies of Permit.

Response:

Ten copies of this permit application and accompanying attachments are hereby provided.

5. Engineer's Seal.

Response:

The permit application is sealed by Louis R. Tortora, Jr., P.E., Vice President, Camp Dresser & McKee Inc., the designated engineer-of-record (see Letter of Appointment).

6. Engineer's Letter of Appointment.

Response:

A letter of appointment for Louis R. Tortora, Jr., P.E., is provided in Technical Appendix A.

7. Copy of any lease agreement, transfer of property agreement, with right of entity for long-term care, or any other agreement

between operator and property owner by which the closing and long-term care of the facility may be affected.

Response:

Long-term maintenance and closure will be performed by the current owner (Pasco County, Florida). No agreement for lease or transfer of property is necessary since the county intends to retain possession beyond the closure period. Proof of county ownership is evidenced by the Warranty Deed and Order of Taking found in Technical Appendix B.

8. Proof of publication of notice of application for the proposed activity in a newspaper of general circulation.

Response:

This permit will be included in the publication of Notice of Application for the Power Plant Site Certification Application.

III. SPECIFICATION ATTACHMENT ITEMS

Items will be presented as they appear in FDER Form 17-7.130(1).

SECTION 1 - FOUNDATION ANALYSIS

Response:

An analysis of the geological stratification of the Pasco County Hays Road Landfill/Ashfill was performed by Jammal & Associates. This foundation analysis can be found in Attachment 2, Section 5.4, page 38. As part of the hydrogeological investigation, 92 SPT borings, 4 deep and 4 shallow groundwater monitoring wells, and 57 piezometers were installed. Over 7.5 miles of ground surface was investigated using ground penetrating radar (GPR) and was also evaluated in the grid pattern indicated on sheet numbers 2 and 3 of the boring location plan in Attachment 2.

SECTION 2 - EVIDENCE THAT THE FACILITY IS IN CONFORMANCE WITH LOCAL ZONING

Response:

Technical Appendix C contains a letter from the Pasco County Zoning Director indicating that the proposed facility is exempt from local zoning.

SECTION 3 - FACILITY DESIGN

3A. Map or aerial photograph of the area not more than one year old showing land use and zoning within one mile of the facility.

Response:

Aerials of the site are provided on Sheets, 2, 3, 4, and 5 in Attachment 1, including topographic contours for the site and the area within one mile of the Hays Road Landfill site boundary. The aerial on Sheet 2 was flown in November 1986 and has a 1-inch equals 1,000-foot scale. The aerial on Sheets 3, 4, and 5 was flown in September 1986 and has a 1-inch equals 200-foot scale. Land use and zoning designations within one mile of the Hays Road Landfill are delineated on Sheet 2.

3B. Plot Plan.

3B(1) Dimensions and Legal Description of the Site.

Response:

The dimensions and legal description of the site are shown on Sheet 6 in Attachment 1. The legal description indicates the entire site acreage to be 810.26 acres, more or less.

Approximately 59.23 acres have been designated for a Class III landfill. Approximately 751.03 acres are included in the power plant siting act submittal for the Class I landfill/ashfill and the resource recovery facility. The Class III landfill will be permitted separately at a later date.

3B(2) Location and Depth of Soil Borings.

Response:

The location and depth of the soil borings are presented on Sheet 7 of Attachment 1.

3B(3) Plan for Disposal Areas.

Response:

Sheet 9 of Attachment 1 shows the plan for disposal areas. The minimum elevation of the secondary liner is 48 feet msl. As can be seen on Sheet 7, the existing ground surface is located near 48 feet msl over most of the area to be landfilled.

3B(4) Fencing or Other Measures to Restrict Access.

Response:

Access will be controlled at all times. Vehicles entering the landfill will be required to stop at the scale house for weighing or approval before proceeding. Access or containment barriers will include a locking access gate at the Hays Road entrance to the landfill, and an eight-foot high chain link fence with two strands of barbed wire along the top completely enclosing the Class I landfill area as shown on Sheet 8 of Attachment 1.

3B(5) Cross Sections Showing Original and Proposed Fill Elevations.

Response:

Original and proposed final fill elevations are identified on the landfill cross sections shown on Sheet 15 of Attachment 1.

3B(6) Location, Depth, and Construction Details of Monitoring Wells

Response:

The location and depth of the four existing and three proposed monitoring wells are shown on Sheet 7 of Attachment 1. The four existing wells were installed in November 1986. Typical construction details are shown on Plates 1 through 5 of Attachment 2.

3C Topographical Maps.

3C(1) Five-Foot Contour Intervals.

Response:

One-foot contour intervals are shown at a scale of 1-inch equals 200 feet on Sheets 3, 4, and 5 in Attachment 1 on the aerial topographical map flown in September 1986.

3C(2) Proposed Fill Areas.

Response:

Sheet 7 of Attachment 1 is a topographic map with one-foot contour intervals showing the proposed location of fill areas.

3C(3) Borrow Areas.

Response:

Borrow will be provided from excavation of the four stormwater management ponds. Existing elevations are shown on Sheet 7 of Attachment 1 and proposed final elevations are shown on Sheets 13 and 14 of Attachment 1.

3C(4) Access Roads.

Response:

The main access road and the ingress and egress roads for the refuse-to-energy facility will account for approximately 0.8 mile of asphaltic concrete surface. The permanent landfill/ashfill perimeter road design consists of about 2.3 miles of stabilized base with limestone surface which will be constructed in phases as the landfill cells are filled. The main access road and the perimeter road will be 24 feet wide and provide two-way traffic flow. The ingress and egress roads will be 18 feet wide, one way roads. The access road plan is shown on Sheet 11 of Attachment 1.

3C(5) Grades Required for Proper Drainage.

Response:

The efficiency of surface drainage will directly affect the amount of leachate production. Drainage grades from future cells will be developed to divert surface runoff away from active cell areas to reduce the amount of potential leachate. A cell interior drainage plan is shown on Sheet 10 of Attachment 1. The closeout surface water drainage plan is illustrated on Sheets 13 and 14 of Attachment 1. The surface water management ponds shown on Sheets 13 and 14 of Attachment 1 will be constructed to adequately handle surface water drainage in accordance with Chapters 17-3 and 17-4 FAC. Appendix 10.11 of Volume II provides the hydrologic calculations for the stormwater basin design.

3C(6) Typical Cross Sections of Disposal Site, including Lifts, Borrow Areas and Drainage Controls.

Response:

Sheet 15 of Attachment 1 shows cross sections through the proposed landfill. The bench terraces located along the 4:1 side slopes reduce the velocity of surface water drainage to minimize erosion. The perimeter swale between the landfill toe of slope and the

perimeter road directs the surface water to the surface water management ponds. Sheet 10 shows a typical cross section of a cell including interior drainage, swales, berms, and lifts.

3C(7) Special Drainage Devices.

Response:

No special drainage devices will be necessary for stormwater management. The drainage operation for leachate and stormwater runoff is shown on Sheet 10 of Attachment 1.

3C(8) Fencing.

Response:

See response 3B(4) and Sheet 8 of Attachment 1.

3C(9) Equipment Facilities.

Response:

The approximately 3,000 square-foot maintenance building shown on Sheet 8 of Attachment 1 will be available for servicing and storing equipment as well as providing office and locker areas. Facility layout will be a part of final design.

3C(10) Other Pertinent Information Based on Intended Use of Facility.

Response:

A resource recovery facility initially capable of processing all of Pasco County's processible waste is expected to be operational on the site just south of the landfill by 1991 (see Sheet 8 of Attachment 1). Therefore, the landfill will be accepting only ash residue and bypass (nonprocessable) waste when the resource recovery facility is operational until the quantity of refuse generated by Pasco County exceeds the capacity of the resource recovery facility.

3D Report.**3D(1) Estimated Population and Area Served by the Proposed Site
with Basis for the Estimate.****Response:**

The projected population for Pasco County, Florida is presented below:

<u>Year</u>	<u>Population</u>
1990	279,100
2000	356,400

These population figures are based on projections of Florida population by county, as reported by the University of Florida, College of Business Administration, Bureau of Economic and Business Research, April 1986.

The area to be served by the Pasco County Hays Road Landfill facility includes the incorporated and unincorporated areas of Pasco County, Florida.

3D(2) Anticipated Type, Annual Quantity, and Source of Solid Waste.**Response:**

The Pasco County Hays Road Landfill will accept only solid waste which may be disposed at a Class I sanitary landfill as defined in Chapter 17-7, FAC (12-10-85). Hazardous or infectious waste as defined by U.S. EPA and FDER will not be accepted. The landfill will accept ash residue, non-processible waste and raw solid waste which exceeds the resource recovery facility capacity. The projected annual quantities of solid waste are presented in Technical Appendix D. Solid waste is primarily from domestic and commercial sources. See Section 3.3, Fuel, of Volume I for further details.

3D(3) Anticipated Life of Site.

Response:

The life of the landfill is estimated to be over 30 years, with a resource recovery facility operational by 1991. See Technical Appendix D.

3D(4) Source and Characterization of Cover Materials.

Response:

The nature and source of temporary and intermediate cover material is native sandy type soil excavated from surface water management ponds. Sections 5.6 and 5.7 of Attachment 2 discuss the cover soils. Sheets 13 and 14 of Attachment 1 show the pond locations.

3E Groundwater Monitoring Plan.

**3E(1) Plan and Hydrogeological Survey Including Foundation
Analysis in Accordance with 17-4.245(6) and 17-7.050 FAC**

Response:

Section 5.4 of Attachment 2 evaluates the soils that will form the base of the proposed landfill in terms of structural compressibility, consolidation, and differential settlement. This report contains information about soil borings, monitoring well installations, aquifer property testing, groundwater and surface water measurements, analysis of surface water and groundwater quality, and background soil chemistry. Slug test data was analyzed to compute hydraulic conductivities of the aquifer under the Hays Road Landfill.

See Section 6.2 of Attachment 2 and Technical Appendix E of this permit application for a groundwater monitoring plan.

SECTION 4 - LANDFILL PERFORMANCE AND DESIGN STANDARDS

4A Liner Performance.

4A(1) Material Type (soil synthetic, other).

Response:

The design concept proposed employs a double liner/leachate collection system. The secondary liner/leachate collection system acts as a backup to the primary liner as well as providing a means of leak detection of the primary liner.

A geotechnical/hydrogeologic study over the site was performed relating to implementation of a Class I sanitary landfill/ashfill. Because of the site's topographic, geologic, and hydrogeologic conditions, the study addressed in detail the potential for sinkhole activity over the project sites.

Both the primary and the secondary liner will be a 60 mil thick high density polyethylene material or equivalent that meets the minimum requirements of the National Sanitation Foundation Standard Number 54, Flexible Membrane Liners (November 1983). High density polyethylene (HDPE) was selected as the liner material for several reasons. HDPE contains no additives or fillers which can leach out and cause deterioration over time. Most importantly, HDPE is resistant to a wide range of chemicals including acids, bases, salts, alcohols, amines, oils, heavy metals and hydrocarbons.

4A(2) Adequate Base Support.

Response:

A clay layer 5 to 10 feet below the ground surface and 5 to 15 feet thick was identified by Jammal & Associates over about 250 acres of the 810-acre site (See Sheets 2 and 3 in Attachment 2). The proposed landfill was configured to stay

within this area of a subsurface clay layer. The clay layer adds support and mitigates the degree of differential settlement. Section 5.4 of Attachment 2 discusses this and other advantages to limiting the landfill to the area found to contain this subsurface clay layer.

Landfill settlement considerations are discussed in Section 5.4 of the Jammal & Associates report (1987, Attachment 2). Consolidation test results are recorded on Plates 9-16 and settlement estimates are shown on Sheet 1 in Appendix B of the report. Total settlement of the landfill under the maximum landfill height of 100 feet is anticipated to be 13 to 15 inches. Under the height of 75 feet, distortion plus consolidation is estimated to be 11 to 13 inches. Total settlement at the toe of the slope is estimated at 2 to 3 inches. The critical area for differential settlement is between the toe and the high point of the 1V:4H slope (330 feet). The maximum differential settlements over this distance should be 10 to 12 inches. Given a tolerance of 10 percent material elongation, the liner can withstand a 12-inch deflection if the radius is equal to or greater than 2.2 feet. The 330-foot radius between the toe and the high point of the slope is much greater than 2.2 feet, thus the liner settlement design is very conservative.

As part of the Jammal & Associates report (Attachment 2), the future sinkhole potential over the landfill/ashfill area was investigated. Study of the existing site conditions and the various factors associated with sinkhole formation showed the potential for sinkhole formation over the landfill area to be slight. See Section 5.9 of Attachment 2 for further details.

4A(3) Planned Installation Adequate to Cover All Surrounding Earth.

Response:

Sheet 8 of Attachment 1 illustrates the extent of the synthetic liner placement. As shown on Sheet 9, the installation of this

liner will be in phases. All seams will be hot welded with parent materials to prevent the introduction of foreign adhesives. Corners will be constructed with separate side pieces, rather than wrapped around. Disposal waste will be contained in each cell by surrounding berms. The liner in each cell will completely cover the base of the cell and the inside slope of the berm. The liner will be anchored at the top of the berms. See Sheet 16 of Attachment 1 for a liner anchor detail. Any penetration of the liner by the leachate collection system will be wrapped, with protective liner boots constructed of the liner material. Boots will be seamed to the liner to assure a contiguous surface.

4A(4) Equivalency to Design Standards.

Response:

The synthetic liner material will meet the specifications for permability and strength as required in FDER 17-7.050(4)(a). The proposed liner material (HDPE) is highly chemically resistant to leachate degradation. Performance in a leachate environment will be tested using the EPA 9090 materials test for chemical degradation. Additional materials test data will be provided by the manufacturer including tensile strength, burst strength, impact puncture strength, friction pullout and permeability.

4B Liner Quality Control Plan.

4B(1) Specifications.

Response:

Liner specifications are provided in Technical Appendix F including a Liner Quality Control Plan.

4B(2) Construction/Installation Methods.

Response:

Synthetic liner failure primarily results from seaming and subgrade failures. Additional causes of failure include machine damage (puncture) during construction and excessive stress imposed during cell filling. Therefore, the method of installation of the liner is as important as the materials from which it is made. Recommended construction practices are included within the Liner Quality Control Plan in Technical Appendix F.

Liner installation will occur by phased construction (see Sheet 9 of Attachment 1). Additional liner will be fused to the in-place liner as more cell areas are developed for landfilling.

Joining of field seams will be by heat fusion using extrudate of the same type as the liner material. Corners will be fused to fit cell grading contours.

The liner will be protected by a minimum 24-inch layer of sand placed above the liner. This layer will attenuate the tractive and compressive forces of construction and operations equipment. Construction methods and techniques will be in accordance with EPA publication SW-870, March 1983, "Lining of Waste Impoundment and Disposal Facilities."

4B(3) Sampling and Testing.

Response:

As part of the Liner Quality Control Plan in Technical Appendix F, field samples of completed seams, as well as material samples from the liner sections, will be subjected to non-destructive vacuum testing. Fatigue strength, impact puncture, friction pullout, as well as tensile strength and compressibility, will also be tested.

4B(4) Manufacturers Specifications and Recommendations.

Response:

Manufacturer specifications and recommendations over and above those in Technical Appendix F will be used. Manufacturer recommendations will be followed, upon FDER concurrence, if improved methods of installation/construction for specific materials have been developed since EPA publication SW-870 was issued.

4C Leachate Control and Removal System Performance.

4C(1) Construction Materials.

Response:

The leachate collection system will be constructed of perforated collection pipe and closed conduit header pipe of a strength sufficient to support the static and live loads which will be imposed upon it. A material such as polyethylene or PVC pipe which can withstand the anticipated compressive loads will be utilized. The materials used in the leachate collection/conveyance system will be resistant to leachate degradation.

Leachate collection systems will be supported by a liner subbase. Leachate collection pipes will be surrounded by stone or gravel of a diameter between 1 and 2 inches to allow increased leachate migration to the drainage pipe. Stone will be wrapped with filter fabric to prevent clogging. A sand bedding layer at least three feet thick will be placed over the leachate collection system for structural protection and to act as a drainage media to increase leachate migration to the collection pipes. Refer to Sheet 12 of Attachment 1 for a plan view of the proposed leachate collection and transmission system. A detail of the collection system is shown on Sheet 16 of Attachment 1.

4C(2) Strength and Thickness.

Response:

The pipe wall thickness will be greater than or equal to SDR 17 for polyethylene and schedule 80 for PVC. The synthetic liner thickness will be 60 mil HDPE. The geotextile material will be 6 ounces or greater and be as manufactured by Celonese Fibres Manufacturing Company, Mirafi Incorporated, or approved equal.

4C(3) Measure to Prevent Clogging.

Response:

The leachate collection system pipes will be surrounded by stone for improved leachate migration. Geotextile filter fabric will be wrapped around the stone to prevent the protective sand layer from clogging the stones.

4C(4) Central Collection Point for Treatment and Disposal.

Response:

The leachate collection system will be sloped to carry leachate to holding facilities. Collection pipes will be sloped toward common header pipes. The header pipe will drain toward the leachate holding tanks to allow collection by gravity flow. See Sheet 12, Attachment 1.

4C(5) Leachate Depth not to Exceed One Foot.

Response:

Leachate depth over the primary liner was computed for permitting purposes using the U.S. EPA Formula SW-869, Landfill and Surface Impoundment Performance Evaluation, April 1983. Leachate depth was estimated based on system design, precipitation, and soil data. Results were used for hydraulic design of the leachate removal system. Using the assumptions stated below, a maximum pipe spacing of 110 feet was calculated. (Calculations provided in Technical Appendix G.)

EPA Formula SW-869 was calculated using the following assumptions.

- Porosity = 0.34
- Permeability = 22 ft./day
- Average Annual Rainfall = 53.95 in./yr. (1950-80)
- Rate of Impingement = $1/2 \times 53.95$ in/yr. = 26.98 in./yr.
- Maximum Head = 12 in.

Drainage slopes between perforated pipes were assumed to be 2 percent. Soil data were based on soil tests of onsite material.

4C(6) Equivalency to Design Standards.

Response:

The leachate collection and transmission system is designed to collect and convey leachate so that leachate depth will not exceed one foot under average case conditions.

4D Surface Water Management System Performance.

4D(1) Prevention of Surface Water Flow into Waste Filled Cells

Response:

Prevention of surface water flow into waste filled areas will be accomplished by the design and implementation of several different common engineering practices. Initially, the proposed access road encompassing the landfill area will be elevated above existing ground elevations preventing any surface water from entering the waste filled area.

Secondly, a large swale will be located at the base of the landfill slope on the interior side of the access road. The swale has been designed to receive runoff from the predeveloped and closed-out portions of the landfill area and transport it to one of the four major retention basins. Additionally, the proposed berm to be constructed interior to the swale will be lined with a high-density polyethylene liner to an elevation well above the design high-water elevation of the swale. In the unlikely event of any standing water within the swale, the liner will prevent any lateral flow to the landfill area. Finally, an 18-inch thick clay cap will be installed over top of the waste area to inhibit vertical infiltration/percolation of rainfall.

4D(2) Stormwater Runoff Controls, Retention/Detention Ponds.

Response:

The stormwater management system for this project will consist of a series of swales, pipes, and four retention ponds. The system has been designed to comply with all of the requirements of both Chapters 17-25 FAC. and 40 D-4 FAC. Additionally, as the project site has been determined "volume sensitive" by the Southwest Florida Water Management District (SWFWMD), the system has been designed to allow no greater volume of discharge under postdevelopment conditions than currently exists naturally under predevelopment conditions.

4D(3) Equivalency to Design Standards.

Response:

The surface water collection system for the new cells will be designed to route surface water away from solid waste fill areas. The drainage ditches/swales and surface water management ponds are designed to satisfy both the Chapter 17-25, FAC criteria, and those of (SWFWMD). See Appendix 10.11 of Volume II of this application.

4D(4) Water Management District Approval.

Response:

All pertinent information will be forwarded to SWFWMD for approval by FDER officials.

4E Gas Control System Performance.

4E(1) Prevention of Methane Migration.

Response:

The municipal solid waste area of the landfill will require a means of releasing trapped gases that migrate to the top of the landfill after the low permeability top cap material is in place. Therefore, a gas venting system will be installed in conjunction with installation of the top cap material. See methane gas vent detail on Sheet 16 of Attachment 1. The impermeable bottom liner will limit downward and sideward migration of methane.

The portion of the landfill containing ash will not produce methane gas since the contents are inorganic. For this reason, gas vents will not be installed in this area.

4E(2) Prevention of Damage to Vegetation.

Response:

The landfill is primarily designed as a disposal area for ash and nonprocessible waste. Methane gas formation from the ash material will be low and damage to local vegetation is not anticipated. Vegetation will be visually monitored for adverse effects due to methane gas.

4E(3) Prevention of Objectionable Odors Offsite.

Response:

The closest distance from the proposed waste limits to the site boundary is approximately 600 feet at the east property line (see Sheet 8 of Attachment 1). Prevailing winds are from the east. The closest residence is approximately 2,600 feet south of the proposed waste limits. The dispersion of any odors generated from the landfill is expected to be adequate to prevent complaints from offsite sources. If odor complaints do become a concern, they will be investigated and appropriate action will be taken.

4E(4) Equivalency to Design Standards.

Response:

The gas control vents will be designed to adequately reduce gas pressure to prevent explosion or fires. A gas vent detail is shown on Sheet 16 of Attachment 1.

SECTION 5 - OPERATIONS PLAN

5A Designation of Responsible Persons.

Response:

The Pasco County Board of County Commissioners sets policy for the administration and management of the disposal of solid waste in the county. William Munz, Pasco County Utilities Director, coordinates solid waste management in the county. He is assisted by George Ellsworth, Resource Recovery Manager.

5B Contingency Operations.

Response:

Solid waste due to a natural disaster may be stockpiled for later removal, or debris may be isolated and burned in an area adjacent to the operational phase in a virgin area. Cooled ash would then

be landfilled. Special access roads can be built at the landfill to allow normal operations under adverse conditions. Cooperative lending agreements with other Pasco County departments will be pursued for backup equipment.

5C Controlling the Type of Waste Received at the Site.

Response:

The Hays Road Landfill will only accept wastes which are permitted for Class I sanitary landfills as defined in Chapter 17-7, FAC. Hazardous waste as defined by the U.S. EPA and FDER will not be accepted at the site for disposal.

Special industrial wastes will be accepted only with prior approval and inspection by the resource recovery manager or his designate. Weigh masters, spotters, and equipment operators will be trained to identify unacceptable wastes, and spotters will be instructed to remove certain types of waste when found in the active cell areas. Wastes to be removed for alternate disposal include automotive batteries, liquid paints, pesticide formulations, and solvents.

All Hays Road Landfill personnel will be trained and instructed to watch for barrels and other suspicious containers to control materials that may be classified as hazardous, to halt their unloading, and to report the incident to the foreman.

5D Weighing or Measuring Incoming Wastes.

Response:

All waste or ash residue entering the landfill site will be weighed, except for certain small loads delivered by private vehicles. Vehicles with a franchise or commercial license will be weighed and issued a ticket indicating the weight.

5E Vehicle Traffic Control and Unloading.

Response:

Directional signs will be placed to safely direct vehicles to the current waste unloading area. These signs will have large legible letters and will be cleaned when necessary. Signs will be placed at points so that the route is clear to the drivers. Speed limit, safety, and prohibitive practice signs will be placed as necessary to encourage a safe, clean operating area.

Unloading will be permitted only at designated working faces of currently operating cells. Haulers will be responsible for unloading their own vehicles. Wastes requiring special handling will be coordinated with and unloaded under the direct supervision of Hays Road Landfill personnel.

5F Method and Sequence of Filling Waste.

Response:

The landfill will be developed using 16 cells as shown on Sheet 9 of Attachment 1. Each cell is approximately 10 acres. Sheet 10 of Attachment 1 depicts the sequencing progression of lifts within a typical cell. As this sheet indicates, the liner and leachate collection system will be constructed one cell at a time with temporary roads and swales for access and surface water management.

Cell SW-1 through SW-8 will be designated for disposal of solid waste. Cells A-1 through A-6 will be designed for ash disposal. Depending on future volumes, Cell I-1 and I-2 may be used for either ash or solid waste. The ash and solid waste will be disposed of separately. No mixing of the two materials will be allowed. A synthetic or clay liner will be used to separate the materials at the interface. The operational method of filling will be similar for both materials.

The method of filling wastes in an individual cell is described below:

All incoming ash/solid waste will be directed to the working face. Ash/solid waste will be placed against the side slope of the previous day's refuse. The first row will act as a berm to provide a guide for the placement of refuse for the remaining rows. In each row, cells will be constructed having a minimum length of working face to control the operation and leachate quantities, yet of sufficient length to provide adequate dumping areas and room for the landfill equipment to operate (see Sheet 10, Attachment 1). A slope of 3 to 1 on a 135-foot wide working face will provide for centralization of operations, while providing maneuvering area for large private and commercial vehicles unloaded each day.

The sequence of filling future lined cell areas with installed leachate collection systems is developed to meet the following objectives.

- Complete subsequent lifts over lower lifts frequent enough to minimize infiltration and conserve the field capacity of the lower lift cell.
- Direct the surface runoff from unused portions of cells away from ash/solid waste using control valves and berms.
- Design landfill slopes during operation to maximize surface runoff away from the working face and minimize leachate generation.
- Provide bench terraces along side slopes to minimize erosion.

Efficient use of these techniques will reduce the need for intermediate cover, and decrease leachate volumes.

Final cover will be applied over cell lifts within 180 days after the final lift over an area is completed. Final cover will consist of a 18 inches of clayey material covered with 6 inches of native soils. The top six inches will be uncompacted and vegetated with native grasses or other vegetation to promote evapotranspiration. See Sheet 15 of Attachment 1.

5G Waste Compaction and Application of Cover.

Response

Sufficient cover material will be stockpiled near the working face to provide an adequate supply for at least one week of operation. In areas near a borrow area, stockpiling may not be necessary.

The ash/solid waste is to be placed at the bottom of the working face, spread up toward the top in 2-foot layers. The solid waste will be compacted with a minimum of three to five passes of a compactor. The ash will be compacted as necessary by a front end loader or bulldozer. The spreading of refuse is a continuous operation.

Application of initial, intermediate, and final cover is to be performed as required per Chapter 17-7, FAC. Six inches of initial cover will be applied to the working face when solid waste is not placed on it within 18 hours. Intermediate cover consisting of 1 foot of compacted native sandy soil from an onsite borrow pit will be applied within 7 days of cell completion if final cover or an additional lift is not to be applied within 180 days of cell completion. Any intermediate areas that will not be landfilled or covered with final cover within 6 months will be seeded or covered with wood chips, straw or other appropriate cover material to avoid slope erosion.

Final cover will be applied to the landfill once the final grades are reached. The initial final slope on top of landfill areas will be a minimum of 2 percent and will not exceed 4 percent. The

perimeter sides of all completed cells will have a slope of 4:1 to minimize erosion. Areas with final cover will be seeded or planted with grass or suitable cover vegetation.

5H Operations of Gas, Leachate, and Stormwater Controls.

Response:

Since the site closure plan includes a low permeability top cap, the gas venting system in the solid waste cells will be installed as the cells are constructed. The detail of this gas vent is shown on Sheet 16 of Attachment 1. The vents will provide an escape route for gases that are lighter than air, such as methane, to prevent lateral migration of these potentially explosive gases.

The leachate collection and transmission system will consist of gravity drains, sumps (manholes), and isolation valves. The normal operation is by gravity drain to the leachate collection tank. See Sheet 12 of Attachment 1.

When the leachate reaches a predetermined level in the storage tank(s), leachate will be withdrawn and delivered to the proposed Pasco County Hudson Subregional Wastewater Treatment Plant. If testing of the leachate indicates the need for pretreatment prior to processing at the wastewater treatment plant, the necessary pretreatment will be performed.

An alternative under consideration is the removal of leachate from the storage tank into a tank truck that would distribute it on top of the working face. This would help control dust and assist in compaction. The quantity of leachate distributed on the working face will be dependent upon the field capacity of refuse at the working face and the weather conditions. Sufficient leachate will be used to prevent surface runoff. When the working face is saturated due to heavy rains, no leachate will be distributed. During periods of low precipitation this method will be used to take advantage of evaporation.

The stormwater controls shown on Sheets 13 and 14 of Attachment 1 will be operated to collect and convey runoff to surface water management areas for sedimentation control in accordance with Chapters 17-3 and 17-4 FAC. Surface water management areas will be maintained by periodic removal of sediments. Surface water control devices such as weirs and culverts will be routinely checked, and cleaned to assure proper performance.

All water coming into contact with solid waste will be handled as leachate.

5I Groundwater Monitoring Plan.

Response:

The groundwater monitoring plan is presented in Technical Appendix E and Section 6.2 of Attachment 2. This plan complies with Chapter 2.424(b) FAC.

5J All Weather Access Roads.

Response:

This subject is addressed in Response 3C(4).

5K Effective Barrier.

Response:

Access controls or other barriers will include a locking access gate at the Hays Road entrance to the landfill, and an eight-foot high chain link fence with two strands of barbed wire along the top. This will completely enclose the Class I landfill area, as shown on Sheet 8 of Attachment 1.

5L Signs Indicating Name of Operating Authority, Traffic Flow, Hours of Operation, and Charges for Disposal.

Response:

There will be a permanent sign identifying the Pasco County Landfill and the resource recovery facility and indicating hours of operation and charges for different types of loads. A sign near the scale house will also indicate materials that are not accepted for disposal in the landfill.

Signs indicating approach and exit routes and one-way roads will be strategically placed so traffic at the landfill will move smoothly and efficiently to and from the working face area. A roll-off container will be located near the scale area to provide small vehicles with a disposal location in lieu of the landfill working face.

5M Dust Control Methods.

Response:

Dust control will be performed using a spray truck which will wet down unpaved access roads and areas immediately adjacent to the working face. Dust masks will also be available to personnel working in excessively dusty areas.

5N Litter Control Devices.

Response:

Litter will be controlled by requiring covered loads, efficient unloading and cover operations, and by routine clean-up.

5O Fire Protection and Fire Fighting Facilities.

Response:

In the event that an uncontrollable fire does occur at the landfill site, the Fire Department will be contacted immediately.

Small fires on the working face will be snuffed by a bulldozer. Onsite stockpiles of soil will be available for suppressing fires.

A hot load area will be provided by the spotter in a location away from the working face to allow any vehicles arriving at the landfill with a fire in their load to dump quickly in an area where the "hot load" can be controlled and quickly covered with soil. The location of the hot load area will change from time to time with changing working face locations. Hot loads will not be dumped on the working face until sufficiently cool to avoid combustion. A 1-mgd onsite well will provide a source of water for fire extinguishing.

5P Attendant.

Response:

There will be an attendant at the scale house and a landfill spotter responsible for guiding vehicles and promoting an efficient operation during normal operating hours. The resource recovery facility will operate 24 hours per day, thus providing continuous attendance.

5Q Communication Facilities.

Response:

A telephone will be installed at the scale house and the maintenance building.

5R Adequate In-Service and Reserve Equipment.

Response:

Table 1 lists equipment proposed for the Pasco County Hays Road Landfill. Cooperative lending agreements can also be used as a means of procuring additional back-up equipment.

TABLE 1

PROPOSED EQUIPMENT AT THE PASCO COUNTY HAYS ROAD CLASS I LANDFILL

Number	Equipment
1	Compactor
2	Bulldozers
1	Pan-Scraper
2	Roll-off Containers
1	Water Truck w/Spray Boom
1	Leachate Transport Vehicle
*	Leachate Pumps
1	Front-end Loader
2	Dump Trucks

*Will be added as landfill expands.

5S Safety Devices on Equipment to Shield and Protect Operators.

Response:

All safety devices will be maintained in accordance with recommended safe operating procedures.

SECTION 6 - WATER QUALITY STANDARDS

Describe how surface runoff and leachate will be handled to meet water quality standards of the Florida Administrative Code Rules 17-3 and 17-4.

Surface Water and Leachate Management

Surface water from new cell areas will be segregated from waste cell areas using berms, valves and piping, temporary and permanent swales, and ditches. Leachate from active cell areas will be routed to leachate storage tanks for sedimentation of suspended solids before transport to the proposed Pasco County Hudson Sub-regional Wastewater Treatment Plant or distribution onto the working face. The surface water collection system is sized to collect the runoff estimated for the 25-year, 24-hour design storm event.

SECTION 7 - CLOSURE

7A Closure Plan.

7A(1) Design.

Response:

A vegetated, graded cover will be used to minimize infiltration and future leachate quantities. The design for a cover includes 6 inches of native topsoil over 18 inches of clayey material. A schematic of the proposed cover design is presented on Sheet 15 of Attachment 1. Grading will be provided to assure proper drainage,

with routine maintenance performed to maintain the final slopes. Top slopes and side slopes will not exceed 4 percent and 25 percent, respectively. A closure design plan will be prepared and submitted to FDER at least 90 days prior to the date when wastes will no longer be accepted, per 17-7.072, FAC.

7A(2) Final Use.

Response:

The final use of the landfill is expected to be for recreational purposes. Post development land use would commence after all onsite landfilling activities are completed, and sufficient time for stabilization has passed (5 to 7 years).

7A(3) Closure Operations.

Response:

A closure design plan and permit application will be prepared and submitted to FDER at least 90 days prior to the date when wastes will no longer be accepted in the future refuse cell areas, per 17-7.072, FAC. The closure report will include the items specified in FDER 17-7.073. At least one year prior to final closure, written notice of closure will be given to the appropriate agencies, and notice to users at least 120 days prior, per 17-7.071, FAC.

7A(4) Post Closure.

Response:

Pasco County, as the owner/operator of the Hays Road Landfill, will provide for long-term care of the facility in accordance with Sections 17-7.075 and 17-7.076, FAC.

7A(5) Financial Responsibility.

Response:

Pasco County will be financially responsible for the project.

7B. Closure Plan Schedule.

Response:

See Response 7A3.

SECTION 8 - SOLID WASTE DISPOSAL FACILITY DATA FORM

Response:

A Solid Waste Disposal Facility Data Form is provided as pages 7 of 10, and 8 of 10 in FDER Form 17-7.130(1), located at the beginning of Volume IV of this permit application.

**SECTION 9 - SOLID WASTE DISPOSAL VOLUME REDUCTION AND RESOURCE RECOVERY
DATA FORM**

Response:

This form is provided as page 9 of 10 in FDER Form 17-7.130(1), located at the beginning of Volume IV of this permit application.

SECTION 10 - CERTIFICATION BY APPLICANT AND ENGINEER OR PUBLIC OFFICER

Response:

The required certification form is included on page 10 of 10 of the FDER Form 17-7.130(1), provided at the beginning of Volume IV of this permit application.

SECTION 11 - PROHIBITIONS

1. No Solid Waste shall be disposed of except by sanitary landfill, incineration, recycling process or other approved method.

Response:

Solid waste disposed at the Pasco County Hays Road Landfill/Ashfill will consist of incinerator ash residue and sanitary landfilling of bypass and nonprocessable solid waste.

2. No solid waste shall be disposed of by being placed:

- (a) in an open sinkhole or in an area where geological formations or subterranean features would not provide support for a landfill/ashfill;

Response:

An extensive geotechnical/hydrogeologic study of the area was performed showing the geologic structure of the subsurface materials will provide support for the landfill/ashfill as designed (see Attachment 2 of Volume IV). The landfill/ashfill will be equipped with a double synthetic liner and leachate collection system.

- (b) in a limestone, or gravel pit

Response:

The Pasco County Hays Road Landfill/Ashfill will not use a limestone or gravel pit. No mining pits are located on the facility site.

- (c) in an area immediately adjacent to or within 500 feet of an existing or approved shallow water supply well;

Response:

There are no water supply wells within 500 feet of landfill/ashfill boundaries. See Section 2.3.3 of Volume I for further information. There are no known shallow aquifer wells within 500 feet of the proposed facility.

(d) in a dewatered pit;

Response:

The landfill/ashfill will be constructed above the seasonal high groundwater level. Dewatering will not be required.

(e) in an area subject to frequent and periodic flooding;

Response:

The landfill/ashfill location is located outside the 100 Year Flood Prone Areas (see Figure 2-7 of Volume I).

(f) in any natural or artificial body of water including groundwater;

Response:

The landfill/ashfill is not located in a body of water. There are no water bodies within the proposed limits of the landfill/ashfill.

(g) within 200 feet of any natural or artificial body of water;

Response:

The landfill/ashfill is located more than 200 feet from all isolated ponds onsite (see Sheet 2, Attachment 1).

- (h) in any area open to public view from any major thoroughfare;

Response:

Existing onsite vegetation will be used as a buffer zone to obstruct view of the facility from adjacent roads and park. (See Section 3.2.2 of Volume I for a detailed visual impact assessment.)

- (i) on the right-of-way of any public highway, road, or alley.

Response:

The landfill/ashfill is not located in any public right-of-way.

- (j) within the boundaries of any airport property;

Response:

The landfill/ashfill is not located within any airport property. The nearest airport is located approximately 4.5 miles southeast.

- (k) within ten thousand feet of the closest point of any runway at any airport...

Response:

The landfill/ashfill is located more than ten thousand feet from any airport [see (j) above].

- 3. Burning of solid waste shall not be permitted at any landfill...

Response:

Burning of solid waste in the landfill/ashfill area will not be allowed. The facility will receive primarily ash residue and noncombustible (nonprocessable) solid waste.

4. Hazardous Waste...

Response:

Hazardous waste will not be accepted at the Pasco County Hays Road Landfill/Ashfill.

5. Infectious Waste...

Response:

Infectious waste will not be accepted at the Pasco County Hays Road Landfill/Ashfill.

6. Transportation and disposal of solid wastes...

Response:

Special Act HB1182, codified 87-441 was passed by the Florida Legislature on May 29, 1987. The act authorizes Pasco County to exercise control over solid waste hauling and disposal for the county. Any cross-county transfer of solid waste must be first approved by the Pasco County Board of County Commissioners. Proper hauling practices will be enforced by the county.

7. The Department shall not issue a construction permit for a new sanitary landfill within 3,000 feet of Class I surface waters.

Response:

There are no Class I surface waters within 3,000 feet of the proposed landfill/ashfill. The nearest Class I surface water is Tampa Bay which is located 25 miles from the landfill/ashfill.

TECHNICAL APPENDIX A

TECHNICAL APPENDIX A
ENGINEER'S LETTER OF APPOINTMENT



Pasco County Utilities Division
7536 State Street
New Port Richey, Florida 33553
(813) 847-8145

October 20, 1987

Dr. Richard D. Garrity, Manager
Florida Department of Environmental Regulation
450 Oak Fair Boulevard
Tampa, Florida 33610

RE: Pasco County Hays Road Sanitary Landfill/
Ashfill - Engineer of Record

Dear Dr. Garrity:

The authorized Engineer of Record for the Pasco County Hays Road Sanitary Landfill/Ashfill is Louis R. Tortora, Jr., P.E. of Camp Dresser & McKee Inc.

If you have any questions regarding this letter of appointment, please contact me at your convenience.

Very truly yours,

A handwritten signature in cursive script that reads 'George Ellsworth'.

George Ellsworth, Resource Recovery Manager
Pasco County Utilities Division

dmc
LOT7C.4/8



BINDER & COVER
Vincent, Al 35178
Dallas, Tx 75207

TECHNICAL APPENDIX B

TECHNICAL APPENDIX B
WARRANTY DEED AND ORDER OF TAKING

14.50
250 Chas. County Attorney - 115-002
1,871,685.47
(6)

REC	17.00
ST	2358.50
RUE	
LT	
TOT	2375.50

WARRANTY DEED

THIS WARRANTY DEED made this 17th day of December, 1985, by RICHU GROVES PARTNERSHIP, a Florida general partnership and RICHARD M. CLEWIS, III, hereinafter collectively called the Grantor, to PASCO COUNTY, a political subdivision, of the State of Florida, whose post office address is Pasco County Courthouse, Dade City, Florida, hereinafter called the Grantee:

WITNESSETH: That the Grantor for and in consideration of the sum of \$10.00 and other valuable considerations, receipt whereof is hereby acknowledged, hereby grants, bargains, sells, aliens, remises, releases, conveys and confirms unto the Grantee all that certain land situate in Pasco County, Florida, more particularly described in Exhibit A attached hereto and incorporated herein by reference.

TOGETHER with all the tenements, hereditaments and appurtenances thereto belonging or in anywise appertaining.

TO HAVE AND TO HOLD, the same in fee simple forever.

AND the Grantor hereby covenants with said Grantee that the Grantor is lawfully seized of said land in fee simple; that the Grantor has good right and lawful authority to sell and convey said land; that the Grantor hereby fully warrants the title to said land and will defend the same against the lawful claims of all persons whomsoever; and that said land is free of all encumbrances, except taxes accruing subsequent to December 31, 1985 and subsequent years, zoning, restrictions, prohibitions and other requirements imposed by governmental authority and those matters set forth in Exhibit B attached hereto and incorporated herein by reference.

IN WITNESS WHEREOF, the said Grantor has signed and sealed these presents the day and year first above written.

Witnesses:

[Signature]
[Signature]
As to Richard M. Clewis,
III

[Signature]
RICHARD M. CLEWIS, III

[Signature]
[Signature]
As to Carlisle K. Clewis,
General Partner of Richu
Groves Partnership

RICHU GROVES PARTNERSHIP

By: [Signature]
CARLISLE K. CLEWIS, General
Partner of Richu Groves
Partnership

This Instrument prepared by:

Stephen L. Kussner, Esquire
Shackleford, Farrior, Stallings &
Evans, Professional Association
Post Office Box 3324
Tampa, Florida 33601

R

RECORD VERIFIED
JED BY
CLERK OF PASCO COUNTY
[Signature]

O.R. 1470 PG 0012

207347
FILED FOR RECORD
DEC 30 6 41 PM '85
CLERK OF PASCO COUNTY

STATE OF FLORIDA

COUNTY OF Hillsborough

The foregoing instrument was acknowledged before me this 17th day of December, 1985, by CARLISLE K. CLEWIS, general partner on behalf of RICHU GROVES PARTNERSHIP, a Florida partnership.

Shirley A. Pugh
Notary Public, State of
Florida at Large

Notary Public, State of Florida
My Commission Expires Oct. 6, 1989
Bonded thru TROY FARM - Insurance Inc.

My Commission Expires:

10-6-89

STATE OF FLORIDA

COUNTY OF Hillsborough

The foregoing instrument was acknowledged before me this 17th day of December, 1985 by RICHARD M. CLEWIS, III.

Shirley A. Pugh
Notary Public, State of
Florida at Large

Notary Public, State of Florida
My Commission Expires Oct. 6, 1989
Bonded thru TROY FARM - Insurance Inc.

My Commission Expires:

10-6-89

0680K

EXHIBIT A

PARCEL ONE

A portion of the Northeast $\frac{1}{4}$ of the Northeast $\frac{1}{4}$ of Section 26 and a portion of the Northwest $\frac{1}{4}$ of the Northwest $\frac{1}{4}$ of Section 25, Township 24, Range 17 East, Pasco County, Florida. Beginning at the Northwest corner of Section 25 and running thence; North $89^{\circ}52'05''$ East along the North line of Section 25, 906.48 feet to the center line of a Florida Power Corporation right-of-way; thence South $10^{\circ}10'31''$ West along the center line of said Florida Power Corporation right-of-way, 1338.58 feet; thence South $89^{\circ}56'36''$ West, 665.99 feet to the West line of Section 25 and the East line of Section 26; thence South $00^{\circ}10'29''$ East along the West line of Section 25 and the East line of Section 26, 658.05 feet; thence North $89^{\circ}51'58''$ West, 2647.92 feet to the East right-of-way line of Hayes Road; thence North $00^{\circ}07'03''$ West along the East right-of-way line of Hayes Road, 657.81 feet; thence South $89^{\circ}52'17''$ East, 1323.63 feet; thence North $00^{\circ}08'46''$ West, 1315.86 feet to the North line of Section 26; thence South $89^{\circ}52'53''$ East along the North line of Section 26, 1322.98 feet to the Northwest corner of Section 25 and the point of beginning. Containing 103.73 acres, more or less and subject to a Florida Power Corporation right-of-way along the most easterly line.

PARCEL TWO

A portion of Sections 25 and 26, Township 24 South, Range 17 East, Pasco County, Florida. Beginning at a point on the North line of Section 25, said point being South $89^{\circ}52'05''$ West along the North line of Section 25, 661.37 feet from the Northeast corner of said Section 25. Running thence; South $00^{\circ}04'08''$ East, 2644.31 feet to the South line of the North $\frac{1}{4}$ of Section 25; thence North $89^{\circ}58'53''$ West along the South line of the North $\frac{1}{4}$ of Section 25, 3296.71 feet; thence South $00^{\circ}05'03''$ East, 1254.08 feet to the North right-of-way line of Hayes Road; thence North $89^{\circ}58'20''$ West along the North right-of-way line of Hayes Road, 1265.79 feet to the Easterly line of lands of Florida Power Corporation; thence North $10^{\circ}10'31''$ East along the Easterly line of lands of Florida Power Corporation, 540.00 feet; thence North $79^{\circ}49'29''$ West along the Northerly line of lands of Florida Power Corporation, 480.00 feet; thence South $10^{\circ}10'31''$ West along the Westerly line of lands of Florida Power Corporation, 625.07 feet to the North right-of-way line of Hayes Road; thence North $89^{\circ}51'51''$ West along the North right-of-way line of Hayes Road, 2209.35 feet to the West line of the East $\frac{1}{4}$ of Section 26; thence North $00^{\circ}07'03''$ West along the West line of the East $\frac{1}{4}$ of Section 26 and the East right-of-way line of Hayes Road, 1911.82 feet; thence South $89^{\circ}51'58''$ East, 2647.92 feet to the East line of Section 26 and the West line of Section 25; thence North $00^{\circ}10'29''$ West along the East line of Section 26 and the West line of Section 25, 658.05 feet; thence North $89^{\circ}56'36''$ East, 665.99 feet to the center line of the Florida Power Corporation right-of-way; thence North $10^{\circ}10'31''$ East along the center line of the Florida Power Corporation right-of-way, 1338.58 feet to the North line of Section 25; thence North $89^{\circ}52'05''$ East along the North line of Section 25, 3709.87 feet to the point of beginning. Containing 403.34 acres more or less and subject to a 295 foot wide Florida Power Corporation right-of-way and a Florida Power Corporation easement along the North right-of-way line of Hayes Road as described in O.R. Book 1067, Page 1379 of the Public Records of Pasco County, Florida.

EXHIBIT B

1. Oil, gas, mineral oil and coal reservation conditions and requirements as set forth in Deed Book 156, Page 461; waiver of surface rights recorded in Official Records Book 779, Page 1431, and instruments of conveyance, assignment and transfer recorded in Official Records Book 1266, Page 1258, all of the Public Records of Pasco County, Florida.
2. Easement granted to Florida Power Corporation recorded in Official Records Book 281, Page 111, of the Public Records of Pasco County, Florida.
3. Supplemental easement granted to Florida Power Corporation recorded in Official Records Book 1067, Page 1373, of the Public Records of Pasco County, Florida.
4. Guying easement granted to Florida Power Corporation by instrument recorded in Official Records Book 1067, Page 1380, of the Public Records of Pasco County, Florida.
5. Easement granted to Florida Power Corporation recorded in Official Records Book 1067, Page 1376, of the Public Records of Pasco County, Florida.

200006 10 2443 12-30-85 2105
14:00
RECORDING 1 14.50
DOC STAMPS 1 9358.50
10 CASH TOTAL 1 9373.00

200006 30 2444 12-30-85 2105
14:01
9 AUTH
GOV CHG RECORD 1 2.50
21 10 40 115002 ACCT
30 CHARGES TOTAL 1 2.50

O.R. 1470 PG 0015

N/C

IN THE CIRCUIT COURT OF THE SIXTH JUDICIAL CIRCUIT
OF THE STATE OF FLORIDA, IN AND FOR PASCO COUNTY

FILED FOR RECORD
PASCO COUNTY, Florida
SEP 3 2 14 PM '86
JED BROWN, CLERK OF COURT
ANALYST

PASCO COUNTY, a political
subdivision of the State
of Florida,

Petitioner,

vs.

Case No. 86-2053CA
Division "H"

SUMNER A. WILLIAMS, as Sole
remaining Trustee under the
Adelaide S. Bolling Revocable
Trust; S. A. WILLIAMS CORPORA-
TION, a Florida corporation;
and MIKE OLSON, as Tax Collector
for Pasco County, Florida,

EMINENT DOMAIN

FILED FOR RECORD
PASCO COUNTY, FL
SEP 8 4 23 PM '86
275648

Defendants.

ORDER OF TAKING

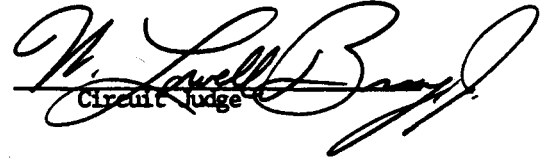
THIS CAUSE coming on to be heard by the Court, it appearing that proper notice was first given to all the defendants, and to all persons having or claiming any equity, lien, title, or other interest in or to the real property described in the Petition, that the Petitioner would apply to this Court on the 25th day of August, 1986, for an Order of Taking, and the Court being fully advised in the premises, upon consideration, it is therefore,

ADJUDGED:

1. That the Court has jurisdiction of the subject matter of and the parties to this cause.
2. That the pleadings in this cause are sufficient, and the Petitioner is properly exercising its delegated authority.
3. That fee simple title to the property specified in Exhibit A, attached hereto and incorporated herein by reference, shall vest in the Petitioner upon payment of the deposit hereinafter specified into the Registry of the Court.
4. That the deposit of money will secure the persons lawfully entitled to the compensation which will be ultimately determined by final judgment of this Court.
5. That the deposit does not reflect the fair market value, if any, of timber and mineral deposits on the property, which will be ultimately determined by final judgment of this Court.

6. That the sum of money to be deposited in the Registry of the Court within twenty (20) days of the entry of this Order shall be in the amount of One Million One Hundred Fifty-Two Thousand Three Hundred (\$1,152,300.00) Dollars.
7. That on deposit as set forth above and without further notice or Order of this Court the Petitioner shall be entitled to possession of the property described in the Petition.

DONE AND ORDERED this 21st day of August, 1986, in Chambers, New Port Richey, Pasco County, Florida.


Circuit Judge

Copies to:

Mark P. Buell, Esq.
Edward B. Helvenston, Esq.
H. Clyde Hobby, Esq.
James G. Murphy, Jr., Esq.

RECORD VERIFIED
JED PITTMAN
Clerk Circuit Court, Pasco County
By CEFLAX

EXHIBIT "A"

The southeast 1/4 of Section 24, Township 24 South, Range 17 East subject to an easement over and across the east 33 feet of said property as heretofore conveyed to the County of Pasco, Florida for road right-of-way purposes.

A N D

The southwest 1/4 of Section 24, Township 24 South, Range 17 East, less a 295' foot wide strip of land extending through the SW 1/4 of said Section, being more particularly described as follows:

From a concrete monument marking the southwest corner of Section 24, Township 24 South, Range 17 East, run N. 89° 52' 06" E along the south boundary of said Section 24, 756.69 feet to the point of beginning; thence N 10° 10' 31" E., 2693.54 feet to a point on the north boundary of the SW 1/4 of Section 24, Township 24 South, Range 17 East that is N. 89° 56' 24" E., 1242.84 feet from the northwest corner of said SW 1/4, thence N. 89° 56' 24" E. along said north boundary, 299.75 feet to a point that is S. 89° 56' 24" W., 1097.79 feet from the northeast corner of said SW 1/4; thence S. 10° 10' 31" W., 2693.16 to a point on the south boundary of the SW 1/4 of Section 24, Township 24 South, Range 17 East that is S. 89° 52' 06" W., 1575.26 feet from the southeast corner of said SW 1/4; thence S. 89° 52' 06" W., 299.83 feet to the point of beginning.

EXHIBIT "A"

EXHIBIT "A"

The southeast 1/4 of Section 24, Township 24 South, Range 17 East subject to an easement over and across the east 33 feet of said property as heretofore conveyed to the County of Pasco, Florida for road right-of-way purposes.

AND

The southwest 1/4 of Section 24, Township 24 South, Range 17 East, less a 295' foot wide strip of land extending through the SW 1/4 of said Section, being more particularly described as follows:

From a concrete monument marking the southwest corner of Section 24, Township 24 South, Range 17 East, run N. 89° 52' 06" E along the south boundary of said Section 24, 756.69 feet to the point of beginning; thence N. 10° 10' 31" E., 2693.54 feet to a point on the north boundary of the SW 1/4 of Section 24, Township 24 South, Range 17 East that is N. 89° 56' 24" E., 1242.84 feet from the northwest corner of said SW 1/4, thence N. 89° 56' 24" E. along said north boundary, 299.75 feet to a point that is S. 89° 56' 24" W., 1097.79 feet from the northeast corner of said SW 1/4; thence S. 10° 10' 31" W., 2693.16 to a point on the south boundary of the SW 1/4 of Section 24, Township 24 South, Range 17 East that is S. 89° 52' 06" W., 1575.26 feet from the southeast corner of said SW 1/4; thence S. 89° 52' 06" W., 299.83 feet to the point of beginning.

STATE OF FLORIDA
COUNTY OF PASCO

THIS IS TO CERTIFY THAT THE FOREGOING IS A
TRUE AND CORRECT COPY OF THE DOCUMENT ON FILE
OF PUBLIC RECORD IN THIS OFFICE. WITNESS MY
HAND AND OFFICIAL SEAL THIS 15th DAY OF

September 1986

D. Pittman, CLERK OF CIRCUIT COURT
Maurice K. Peppers D.C.

EXHIBIT "A"

FILED FOR RECORD
Pasco County, Florida
SEP 3 2 14 PM '86
JED PITTMAN, CLERK OF CIRCUIT COURT
AND COUNTY CLERK

O.R. 1535 PG 0428

10.00
Charge to
County Attorney
115-002

IN THE CIRCUIT COURT OF THE SIXTH JUDICIAL CIRCUIT
IN AND FOR PASCO COUNTY, FLORIDA

PASCO COUNTY, a political
subdivision of the State
of Florida,

Petitioner,

vs.

Case No. 86-2053 CA
Division "H"

SUMNER A. WILLIAMS, as sole
remaining Trustee under the
ADELAIDE S. BOLLING Revocable
Trust; S. A. WILLIAMS CORPORA-
TION, a Florida corporation,
and MIKE OLSON, as Tax Collector
for Pasco County, Florida,

Defendants.

278153
FILED FOR
CLERK OF THE CIRCUIT COURT
SEP 16 6 23 PM '86

CERTIFICATE OF CLERK

The undersigned Clerk of the above-entitled Court hereby certifies that the sum of One Million One Hundred Fifty-Two Thousand Three Hundred Dollars (\$1,152,300.00) as specified in the Order of Taking of August 29, 1986 relating to the property described in Exhibit "A" attached hereto and incorporated herein by reference, was paid into the Registry of this Court by Pasco County on September 10, 1986.

WITNESS MY HAND AND OFFICIAL SEAL on this 11th day of September, A.D., 1986.

RECORD VERIFIED

JED PITTMAN
Clerk Circuit Court of Pasco County

JED PITTMAN,

CLERK OF THE CIRCUIT COURT OF FLORIDA
IN AND FOR THE COUNTY OF PASCO

R County ATTORNEY
N.P.R.

By James P. Pacing
Deputy Clerk

[S E A L]

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that a copy of the above Certificate of Deposit has been furnished by regular U. S. Mail to JAMES G. MURPHY, JR., ESQ., P. O. Box 3324, Tampa, FL 33601, EDWARD B. HELVENSTON, ESQ., Assistant County Attorney, Pasco County Government Center, 7530 Little Road, New Port Richey, FL 33553 and H. CLYDE HOBBY, ESQ., 6917 County Road 54, New Port Richey, FL 33552, this 11th day of September, 1986.

STATE OF FLORIDA
COUNTY OF PASCO
THIS IS TO CERTIFY THAT THE FOREGOING IS A
TRUE AND CORRECT COPY OF THE DOCUMENT ON FILE
OR OF RECORD IN THIS OFFICE. WITNESS MY
HAND AND SEAL OF OFFICE THIS 11th DAY OF
SEPTEMBER 1986
JED PITTMAN
CLERK OF THE CIRCUIT COURT

By James P. Pacing
Deputy Clerk

O.R. 1537 PG 1596

A BOUNDARY SURVEY
OF LAND
ENCOMPASSING THE PROPOSED

PASCO COUNTY LANDFILL AREA (WEST)

LYING AND BEING IN TOWNSHIP 24 SOUTH, RANGE 17 EAST,
PASCO COUNTY, FLORIDA.

BEING THE SOUTH ONE-HALF OF SECTION 24,
THE NORTH ONE-HALF OF SECTION 25, LESS THE EAST
ONE-EIGHTH, MORE OR LESS; THE NORTHWEST
ONE-QUARTER OF THE SOUTHWEST ONE-QUARTER OF
SECTION 25, LYING NORTH OF HAYES ROAD,
MORE OR LESS.

THE NORTH THREE-QUARTERS OF THE EAST ONE-HALF
OF SECTION 26, LYING NORTH AND EAST OF
HAYES ROAD, MORE OR LESS; LESS THE
NORTHWEST ONE-QUARTER OF THE NORTHEAST
QUARTER OF SAID SECTION 26 AND SUBJECT
TO RIGHTS-OF-WAY AND EASEMENTS OF RECORD,
BEING MORE PARTICULARLY DESCRIBED AS:

BEGINNING AT THE SOUTHWEST CORNER OF SECTION 24, TOWNSHIP 24 SOUTH, RANGE 17 EAST, PASCO COUNTY, FLORIDA, RUN N 00°02'29" W ALONG THE WEST BOUNDARY OF SAID SECTION 24 FOR 2,652.47 FEET TO THE WEST QUARTER CORNER SAID SECTION; THENCE S 89°52'32" E ALONG THE EAST-WEST CENTER LINE OF SAID SECTION 24 FOR 5,295.53 FEET TO THE EAST QUARTER CORNER OF SAID SECTION; THENCE S 00°20'48" W ALONG THE EAST BOUNDARY OF SAID SECTION 24 FOR 2,645.44 FEET TO THE SOUTHEAST CORNER OF SAID SECTION 24; THENCE N 89°57'07" W ALONG THE SOUTH BOUNDARY OF SAID SECTION 24 FOR 661.63 FEET; THENCE S 00°06'14" W FOR 2,643.74 FEET; THENCE N 89°48'39" W ALONG THE EAST-WEST CENTER LINE OF SECTION 25 FOR 3,296.94 FEET; THENCE S 00°05'25" W FOR 1,254.12 FEET TO THE NORTH RIGHT-OF-WAY OF HAYES ROAD; THENCE N 89°48'11" W FOR 1,315.46' ALONG SAID NORTH RIGHT-OF-WAY TO THE INTERSECTION WITH THE WEST BOUNDARY OF SECTION 25; CONTINUE THENCE ALONG SAID NORTH RIGHT-OF-WAY OF HAYES ROAD N 89°41'16" W FOR 2,647.38 FEET TO THE POINT OF INTERSECTION WITH THE EASTERLY RIGHT-OF-WAY OF SAID HAYES ROAD AT ROAD TURN TO THE NORTH, BOTH RIGHTS-OF-WAYS BEING 66 FEET WIDE. RUN THENCE N 00°03'45" E ALONG AFORESAID EASTERLY RIGHT-OF-WAY FOR 2,570.05 FEET TO THE INTERSECTION, MORE OR LESS, WITH THE SOUTH BOUNDARY OF THE NORTHWEST ONE-QUARTER OF THE NORTHEAST ONE-QUARTER OF SAID SECTION 25; THENCE S 89°41'29" E FOR 1,323.59 FEET; THENCE N 00°01'28" E FOR 1,315.54' TO THE NORTH BOUNDARY OF SAID SECTION 25; THENCE N 89°42'39" E FOR 1,323.33 FEET TO THE POINT OF BEGINNING.

LESS, THAT CERTAIN PARCEL CONTAINING 18.24 ACRES, MORE OR LESS, FOR A 295 FOOT WIDE RIGHT-OF-WAY FOR FLORIDA POWER CORPORATION LYING IN THE SOUTH ONE-HALF OF SAID SECTION 24 DESCRIBED IN O.R. BOOK 284, PAGE 705, PUBLIC RECORDS OF PASCO COUNTY, FLORIDA, AND

LESS, THAT CERTAIN PARCEL CONTAINING 6.42 ACRES, MORE OR LESS, FOR FLORIDA POWER CORPORATION SUBSTATION LYING IN SAID SECTIONS 25 AND 26 ADJOINING HAYES ROAD AS DESCRIBED IN O.R. BOOK 1068, PAGE 1339, PUBLIC RECORDS OF PASCO COUNTY, FLORIDA, AND

SUBJECT TO A RIGHT-OF-WAY FOR SHADY HILLS ROAD BEING THE EAST 33 FEET OF SAID SECTION 24 ACCORDING TO O.R. BOOK 51, PAGE 450, PUBLIC RECORDS OF PASCO COUNTY, FLORIDA, AND

SUBJECT TO AN EASEMENT FOR A 295 FOOT WIDE RIGHT-OF-WAY FOR FLORIDA POWER CORPORATION ACROSS THE NORTH THREE-QUARTERS OF THE WEST ONE-HALF OF SAID SECTION 25 AS DESCRIBED IN O.R. BOOK 281, PAGES 111-115, PUBLIC RECORDS OF PASCO COUNTY, FLORIDA, AND

SUBJECT TO AN EASEMENT 43 FEET WIDE ALONG THE NORTH RIGHT-OF-WAY OF HAYES IN SAID SECTION 26 AS DESCRIBED IN O.R. BOOK 1067, PAGES 1373-1381, PUBLIC RECORDS OF PASCO COUNTY, FLORIDA, AND

OTHER EASEMENTS, RESTRICTIONS OR RIGHTS-OF-WAY OF RECORD.

CONTAINING 810.26 ACRES, MORE OR LESS.

THE ABOVE DESCRIPTION ENCOMPASSES ALL OF THE LANDS DESCRIBED IN DEEDS OF RECORD FROM THIS COMPOSITE PARCEL IS SURVEYED AND ABOVE REDESCRIBED VIZ:

O.R. BOOK 1470, PAGES 0012-0015; O.R. BOOK 284, PAGE 705; O.R. BOOK 81, PAGES 383 & 385; O.R. BOOK 1068, PAGE 1339, ALL RECORDED IN THE PUBLIC RECORDS OF PASCO COUNTY, FLORIDA.

TECHNICAL
APPENDIX

C

TECHNICAL APPENDIX C

TECHNICAL APPENDIX C
EVIDENCE OF LOCAL ZONING CONFORMANCE

PASCO COUNTY, FLORIDA
INTER-OFFICE MEMORANDUM

TO: Robert J. Tietz
Environmental Manager

DATE: 12/19/86

FILE: PL87-241

Kenneth W. Bagynski
FROM: Kenneth W. Bagynski
Zoning Administrator

SUBJECT: Article XXVIII - Proposed Resource
Recovery and Ashfill Facilities

REFERENCES: UT87-71

Per your request, I have reviewed the applicable sections of the Zoning Ordinance, specifically Article XXVIII. It is my determination that if the appropriate agencies of the County have determined that a development or an activity, to be conducted by Pasco County, is undertaken for the promotion of the public health, safety, morals or general welfare, that development or activity is exempt from the provisions of Ordinance No. 75-21 as amended.

KWB/pm

cc: Dan Strobbridge, CDM, Tampa
David Dee, P.A.
John J. Gallagher, County Administrator
J. Benjamin Harrill, County Attorney
William G. Munz, Public Works & Utilities Director

TECHNICAL
APPENDIX



TECHNICAL APPENDIX D

TECHNICAL APPENDIX D
PASCO COUNTY SOLID WASTE QUANTITY PROJECTIONS
AND
ANTICIPATED LANDFILL VOLUME

APPENDIX D

PROJECTED ESTIMATED ANNUAL QUANTITIES OF PROCESSIBLE WASTE
FOR THE INCORPORATED AND UNINCORPORATED AREA OF PASCO COUNTY
(THOUSANDS OF TONS PER YEAR)

Year	Tons x 1000
1987	240
1988	248
1989	256
1990	264
1991	272
1992	279
1993	287
1994	295
1995	303
1996	311
1997	319
1998	327
1999	335
2000	343
2001	351
2002	359
2003	367
2004	375
2005	383
2006	391
2007	399
2008	407
2009	415
2010	425
TOTAL	7,951

APPENDIX D

PASCO COUNTY REQUIRED LANDFILL VOLUME (1985 TO 2009)

YEAR	WASTE STREAM		LIME ASH		ASH		NON-PROCESSABLES		WASTE VOLUME		LANDFILL VOLUME	
	TONS	IN-PLACE CY	TONS	IN-PLACE CY	TONS	IN-PLACE CY	TONS	IN-PLACE CY	PER YEAR	CUMULATIVE	PER YEAR	CUMULATIVE
	(a)	(b)			(c)	(d)	(e)	(f)		CY		CY (g)
1985	237,100	474,200							474,200	474,200	569,040	569,040
1986	246,820	493,640							493,640	967,840	592,368	1,161,408
1987	256,540	513,080							513,080	1,480,920	615,696	1,777,104
1988	262,260	524,520							524,520	2,005,440	629,424	2,406,528
1989	275,980	551,960							551,960	2,557,400	662,352	3,068,880
1990	280,186	560,372							560,372	3,117,772	672,446	3,741,326
1991	288,075	0	5762	6402	61,216	68,018	43,211	138,328	182,448	3,300,220	218,937	3,960,263
1992	295,964	0	5920	6577	62,892	69,880	44,395	110,957	187,444	3,487,664	224,933	4,185,196
1993	303,853	0	6078	6753	64,569	71,743	45,578	113,945	192,441	3,680,104	230,929	4,416,125
1994	311,742	0	6236	6928	66,245	73,606	46,761	116,903	197,437	3,877,542	236,925	4,653,050
1995	319,631	0	6394	7104	67,922	75,468	47,945	119,862	202,434	4,079,976	242,921	4,895,971
1996	327,520	0	6552	7279	69,542	77,269	49,088	122,721	207,269	4,287,245	248,723	5,144,694
1997	334,881	12,762	6570	7300	69,306	77,562	49,275	123,188	220,812	4,508,057	264,974	5,409,668
1998	342,505	28,010	6570	7300	69,306	77,562	49,275	123,188	236,060	4,744,116	283,272	5,692,940
1999	350,130	43,260	6570	7300	69,806	77,562	49,275	123,188	251,310	4,995,426	301,272	5,994,211
2000	357,755	58,450	6570	7300	69,806	77,562	49,275	123,188	266,500	5,261,926	319,800	6,314,011
2001	364,236	71,472	6570	7300	69,806	77,562	49,275	123,188	279,522	5,541,447	335,426	6,649,437
2002	370,716	84,432	6570	7300	69,806	77,562	49,275	123,188	292,482	5,833,929	350,978	7,000,415
2003	377,197	97,393	6570	7300	69,806	77,562	49,275	123,188	305,443	6,139,372	365,531	7,367,246
2004	383,677	0	7673	8526	81,531	90,590	57,552	143,879	242,995	6,382,367	291,594	7,658,840
2005	390,158	0	7803	8670	82,909	92,121	58,524	146,339	247,100	6,629,467	296,520	7,955,360
2006	393,932	0	7879	8754	83,711	93,012	59,090	147,725	249,491	6,878,957	299,389	8,254,749
2007	397,706	0	7954	8838	84,513	93,903	59,656	149,140	251,880	7,130,838	302,256	8,557,005
2008	401,480	0	8030	8922	85,315	94,794	60,222	150,555	254,271	7,385,109	305,125	8,862,130
2009	405,254	0	8105	9006	86,116	95,685	60,789	151,970	256,661	7,641,769	307,993	9,170,123
2010	409,000	0	8180	9089	86,913	96,569	61,350	153,375	259,033	7,900,803	310,840	9,480,963
2011	415,175	0	8303	9226	88,225	98,027	62,276	155,691	262,944	8,163,746	315,532	9,796,496
2012	421,350	0	8427	9363	89,537	99,485	63,203	158,006	266,855	8,430,601	320,226	10,116,722
2013	427,525	0	8550	9500	90,849	100,943	64,129	160,322	270,765	8,701,367	324,918	10,441,640
2014	433,700	0	8674	9638	92,161	102,401	65,055	162,638	274,677	8,976,043	329,612	10,771,252
2015	439,875	3,750	8760	9733	93,075	103,417	65,700	164,250	281,150	9,257,193	337,380	11,108,632
2016	446,050	16,100	8760	9733	93,075	103,417	65,700	164,250	293,500	9,550,693	352,200	11,460,832
2017	452,225	28,450	8760	9733	93,075	103,417	65,700	164,250	305,850	9,856,543	367,020	11,827,852
2018	458,400	40,800	8760	9733	93,075	103,417	65,700	164,250	318,200	10,174,743	381,840	12,209,692
2019	464,575	53,150	8760	9733	93,075	103,417	65,700	164,250	330,550	10,505,293	396,660	12,606,352
2020	470,750	65,500	8760	9733	93,075	103,417	65,700	164,250	342,900	10,848,193	411,480	13,017,832
2021	476,925	77,850	8760	9733	93,075	103,417	65,700	164,250	355,250	11,203,443	426,300	13,444,132
2022	483,100	90,200	8760	9733	93,075	103,417	65,700	164,250	367,600	11,571,043	441,120	13,885,252
2023	489,275	102,550	8760	9733	93,075	103,417	65,700	164,250	379,950	11,950,993	455,940	14,341,192
2024	495,450	114,900	8760	9733	93,075	103,417	65,700	164,250	392,300	12,343,293	470,760	14,811,952
2025	501,625	127,250	8760	9733	93,075	103,417	65,700	164,250	404,650	12,747,943	485,580	15,297,532
2026	507,800	139,600	8760	9733	93,075	103,417	65,700	164,250	417,000	13,164,943	500,400	15,797,932
2027	513,975	151,950	8760	9733	93,075	103,417	65,700	164,250	429,350	13,594,293	515,220	16,313,152
2028	520,150	164,300	8760	9733	93,075	103,417	65,700	164,250	441,700	14,035,993	530,040	16,843,192
2029	526,325	176,650	8760	9733	93,075	103,417	65,700	164,250	454,050	14,490,043	544,860	17,388,052
2030	532,500	189,000	8760	9733	93,075	103,417	65,700	164,250	466,400	14,956,443	559,680	17,947,732
2031	538,675	201,350	8760	9733	93,075	103,417	65,700	164,250	478,750	15,435,193	574,500	18,522,232
2032	544,850	213,700	8760	9733	93,075	103,417	65,700	164,250	491,100	15,926,293	589,320	19,111,552
2033	551,025	226,050	8760	9733	93,075	103,417	65,700	164,250	503,450	16,429,743	604,140	19,715,692
2034	557,200	238,400	8760	9733	93,075	103,417	65,700	164,250	515,800	16,945,543	618,960	20,334,652
2035	563,375	250,750	8760	9733	93,075	103,417	65,700	164,250	528,150	17,473,693	633,780	20,968,432

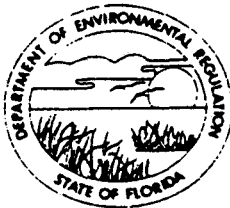
ASSUMPTIONS: (a) Pasco Resource Recovery Study, Nov. 1985, CDN, pg. 3-12.
 (b) Before Resource Recovery, 100% of Waste Stream to Landfill
 In-Place Density = 1000 lb/cy
 After Resource Recovery, Waste Stream Exceeding Plant Capacity
 to Landfill
 (c) 25% of Waste Stream
 (d) Ash In-Place Density = 1800 lb/cy
 (e) 15% of Waste Stream
 (f) Non-Processables In-Place Density = 800 lb/cy
 (g) Includes 20% Landfill Volume for Daily and Intermediate Cover

TECHNICAL
APPENDIX



TECHNICAL APPENDIX E
GROUNDWATER MONITORING PLAN SUPPLEMENT

DEPARTMENT OF ENVIRONMENTAL REGULATION

NORTHWEST DISTRICT
BRANCH OFFICEWIN TOWERS OFFICE BUILDING
300 BLAIR STONE ROAD
ALLAHASSEE, FLORIDA 32301BOB GRAHAM
GOVERNORVICTORIA J. TSCHINKEL
SECRETARYAPPLICATION FOR MONITORING PLAN APPROVAL
(Existing Sources)

INSTRUCTIONS: Submit four copies of this application and four copies of supporting information such as laboratory reports, maps and other documents to the appropriate District Office.

PART I - General Information

In compliance with Florida Administrative Code Rule 17-4.245(6)(c)2., the undersigned installation owner applies for approval from the Department for the monitoring criteria on the following property owned by:

Pasco County

Corporation or Owner's Name

Permit No.

Hays Road Landfill Monitoring Wells

Installation Name

SIC Code

Nearest City: Port Richey

Street Address

City

Zip County

82°33'30"N 28°22'05"W
Latitude Longitude1/4 1/4 1/4 of 24,25,26 T24S R17E
Section, Township, Range

OWNER OR AUTHORIZED REPRESENTATIVE (If representative, attach letter of authorization.)

Pasco County

Name and Official Title (Print or Type)

7530 Little Road, New Port Richey, Florida 33553(813) 847-6132

Street

City

State Zip

Telephone Number

Signature: George W. Ellsworth

Date: _____

PART II - Content of Monitoring Plan

Pursuant to Rule 17-4.245(6)(d), the plan shall contain findings, recommendations and plans for ground water monitoring derived from site specific information. For the type of information to be considered in the development and assessment of the plan, see page two of this form. In any case, the following items must be included:

1. Location(s) of proposed well(s) to sample natural unaffected background water quality and the intermediate and compliance well(s) in the down gradient direction.
2. Construction details of the monitor well(s), including type of casing material, diameter of casing, depth of casing and location of screens.
3. A water sampling and chemical analysis procedure which can determine the natural unaffected background quality of the ground water, and the quality of the receiving ground water in the downgradient intermediate and compliance wells.

The following information is the type generally required for detailed assessment of the most complex plans, with less complex cases not needing this degree of evaluation:

1. Hydrogeological, physical and chemical data for the site, including:
 - a. Direction and rate of ground water flow, and background ground water quality;
 - b. Porosity, horizontal and vertical permeability for the aquifer(s) and the depth to, and lithology of, the first confining bed(s);
 - c. Vertical permeability, thickness, and extent of any confining beds;
 - d. Topography, soil information and surface water drainage systems surrounding the site;
2. Waste disposal rate and frequency, chemical composition, method of discharge, pond volume, spray-field dimension, or other applicable site specific information;
3. Toxicity of waste;
4. Present and anticipated wastewater volume, seepage rate to the receiving ground water, physical, chemical, microbiological (whichever is applicable) characteristics of the leachate;
5. Disposal system water balance;
6. Present and reasonably expected future pollution sources located within one mile radius of the site;
7. Inventory depth, construction details, and cones of depression of water supply wells and monitor wells located within one mile radius of the site or potentially affected by the discharge;
8. Site specific economic and feasibility considerations;
9. Chronological information on water levels in the monitor wells and water quality data on water supplies collected from the water supply and monitor wells;
10. Type and number of waste disposal facilities within the installation;
11. Chronological information on surface water flows and water quality upstream and downstream from the site;
12. Construction and operation details of disposal facilities;
13. History of construction and land development in the vicinity of the site.

A monitoring program instituted under some other state, federal, or local government regulation or permit may be substituted (or referenced if contained in an existing department permit) if such program is in substantial compliance with Part II.

APPLICATION FOR MONITORING
PLAN APPROVAL
(SUPPLEMENT)

FOR THE

HAYS ROAD LANDFILL
PASCO COUNTY, FLORIDA

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2.2 Aquifer Systems	2-1
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1.0 INTRODUCTION

1.1 BACKGROUND

The existing landfill serving the western part of Pasco County is near capacity. Favorable portions of the Hays Road Site are being developed into a Class I sanitary/ash landfill to serve the future needs of Western Pasco County. A resource recovery plant is being constructed in the southern portion of the site. It is anticipated that both raw refuse and ash from the resource recovery plant will be disposed at the lined landfill. The landfill height is anticipated to be about 75 feet.

1.2 PURPOSE AND SCOPE

This report is in support of an Application for Monitoring Plan Approval [DER Form 17-1.216(1)] for the Hays Road Class I Landfill site. Chapter 2.424(b), Florida Administrative Code (FAC), requires groundwater monitoring for facilities which discharge to the groundwater. The information requested is presented in a configuration and numbering system similar to page 2 of the form. The majority of information is contained in Attachment 2, Geotechnical and Hydrogeologic Investigation Proposed Landfill Site - Hays Road, Pasco County, Florida (Jammal & Associates, April 1987) and the answers are referenced therein.

2.0 HYDROGEOLOGY

2.1 HYDROGEOLOGIC FRAMEWORK

The principal formations in Pasco County are a series of limestones and dolostones mantled by relatively thin sand and clay deposits. The surficial sands and clays are undifferentiated with the lower portion of the deposits generally assigned to the Hawthorn Formation. The Hawthorn Formation, which is generally composed of clays, sand and dolosilt, is relatively thin in the eastern part of the county and may be absent in some areas, particularly in the northern part of Pasco County.

The uppermost limestone in northwest Pasco County is the Tampa Limestone, or in areas where not present, the Suwannee Limestone. Most domestic and many irrigation wells produce from the lower Suwannee Limestone. The Ocala Group and the Avon Park Formation are composed of limestone and dolostone with dolostone becoming more prevailing with depth. Most large production wells produce from the lower Ocala Group and/or the dolostone of the Avon Park Formation.

In general, the soil materials at the Hays Road site consist of a varying thickness of sand (less than 10% fines) overlying clayey materials also of varying thickness and consistency, which in turn overlie either significantly weathered limestone with clay or more intact weathered limestone. The preferred area for the landfill shows at least 5 feet of intact and nearly continuous clayey semi-confining unit material separating the surficial aquifer from the limestone of the Floridan aquifer. Detailed site specific information is contained in Chapters 4 and 5 of the Jammal report (April, 1987), Attachment 2.

2.2 AQUIFER SYSTEMS

Two distinct water-bearing geologic units, or aquifer systems, capable of supplying economical quantities of water to wells, occur in the western portion of Pasco County. The uppermost of the two is the surficial aquifer

system, comprised of the permeable portions of the unconsolidated deposits overlying the limestones. The limestone formations form the deeper Floridan aquifer, an artesian and sometimes unconfined aquifer system which underlies most of central Florida.

The surficial aquifer system is apparently relatively thin in western Pasco County and may be absent or discontinuous in some areas. The transmissivity, or ability to transmit water, of the water table aquifer is dependent upon the permeability of the aquifer deposits and the saturated thickness. In areas where the surficial sand deposits are thin, the transmissivity of the unit typically is comparatively less than in areas where the deposits are thicker. The surficial aquifer system in western Pasco County is seldom used for a water supply source primarily because the deeper Floridan aquifer supplies greater quantities of higher quality water to wells.

The surficial or water table aquifer system is recharged primarily by precipitation and subsequent infiltration to the saturated zone. Water is discharged from the aquifer by evapotranspiration, seepage to lakes and streams and by vertical leakage to underlying aquifers.

The top of the Floridan aquifer system in Pasco County is represented by either the Miocene Tampa Limestone or where absent, the Oligocene Suwannee Limestone. The top of the Floridan aquifer occurs at an altitude of near mean sea level (msl) in northwest Pasco County. The aquifer becomes progressively more deeply buried beneath the surficial clastic deposits southward.

The Suwannee Limestone is a very permeable, productive zone of the Floridan aquifer. Most domestic and many irrigation wells produce from the lower part of the Suwannee Limestone. The Ocala Group is highly permeable over much of the area and yields large quantities of water to wells. The underlying Avon Park Formation contains a fractured, cavernous zone near the top which yields large quantities of water to wells.

Groundwater flow in the Floridan aquifer system in Pasco County moves generally westward toward the Gulf of Mexico from the "Pasco High" centered in the eastern part of the county. The "Pasco High" represents an area of highest altitude in the vicinity of the potentiometric surface of the Floridan aquifer.

Based on available publications, the transmissivity of the Floridan aquifer in this area of Pasco County is highly variable; varying from about 40,000 to 130,000 ft.²/day. The natural leakance rate through the semi-confining clayey unit in this area of Pasco County varies from about 5×10^{-3} to 5×10^{-4} /day⁻¹.

3.0 DISPOSAL SYSTEM ASSESSMENT

The following information is presented in the same numerical order as the items contained on page 2 of the Application for Monitoring Plan Approval.

1. Hydrogeological, physical and chemical data for the site.
 - a. The altitude of the surficial aquifer is shown at the end of the wet season for September 6, 1986, and for the dryer period of November 13, 1986 in Figures 2-20 and 2-21, respectively (Volume I). The direction of groundwater flow is from the higher water table elevations toward lower water table elevations. Groundwater conditions in the surficial aquifer are discussed in Section 4.2 of the Jammal & Associates report (April, 1987), Attachment 2. It appears that the water table is from 5 to 18 feet below land surface in the favorable landfill area with the water table being 10 to 12 feet below present surface over the majority of the above area.

The lowest measured points on the water table surface occurred along the north and northeast margin of the site. Water table elevations of less than +30 feet above msl were measured in wells in these areas. Geologic data, discussed above, suggests that the clay deposits covering the limestone may be missing in areas along the northern site boundary.

Water levels in wells at the site indicate that the water table surface above the Hawthorn clay deposits ranged in altitude from about +30 to +40 feet above msl. Based on the potentiometric surface maps of the underlying Floridan aquifer prepared by SWFWMD (Plate 2, Appendix A, Jammal & Associates, April 1987, Attachment 2), the difference in head between the Floridan and overlying water table aquifer is relatively small, approximately 5 feet on an average.

No tests of the surficial aquifer at the site were performed. The upper fine sands are expected to have a permeability of about 10 to 20 feet/day.

The average linear velocity (seepage velocity) for the Floridan aquifer was calculated using the following formula (Freeze and Cherry, 1979; Fetter, 1980).

$$v = \frac{-Kdh}{ndl} \quad K = \frac{T}{b}$$

where:

v = average linear velocity (ft/day)

K = hydraulic conductivity (ft/day)

$\frac{dh}{dl}$

dl = hydraulic gradient (ft/day)

n = effective porosity

T = transmissivity (ft²/day)

b = thickness of aquifer (ft)

The steepest hydraulic gradient perpendicular to the September 6, 1986 groundwater contours was about 1 foot decline in 50 feet. Assuming an effective porosity of $N = 0.20$, the average linear velocity is:

$$v = \frac{20}{0.20} \frac{1}{50} = 2 \text{ feet/day}$$

The hydraulic gradient of the Floridan aquifer determined from the potentiometric surface (water level) in the monitor wells at the site was 1 foot in 826 feet from readings taken on November 13, 1986 (Jammal & Associates, April 1987, Table 4, Attachment 2). This compares favorably with the gradient interpreted from USGS potentiometric surface maps for the area. The direction of groundwater flow in the upper Floridan aquifer at the site is to the northwest.

The nearest pump test sites were 5 miles to the east at the Cross Bar Ranch Well Field where transmissivity values ranged from 50,000 to 115,000 ft²/day (Hutchinson, 1985, Figure 5). Jammal & Associates (April 1987, Attachment 2) state that the transmissivity in this area is highly variable, varying from about 40,000 to 130,000 ft²/day. A transmissivity of 150,000 ft²/day is used in calculations for the Hays Road site for a worst case velocity determination.

No values for the effective porosity of the upper Floridan aquifer in the vicinity of the site could be found. An effective porosity of 0.05 for the Floridan aquifer is used in the G-1 Rule as adopted by the Florida Department of Environmental Regulation. The thickness of the upper Floridan aquifer in the vicinity of the site is estimated to be about 800 feet (Ryder, 1985, Figure 10). Therefore:

$$K = \frac{T}{b} = \frac{150,000}{800} = 187.5 \text{ ft/day}$$

and:

$$v = \frac{-Kdh}{ndl} = \frac{187.5}{.05} \times \frac{1}{826} = 4.54 \text{ ft/day}$$

Water quality analyses have been performed for the onsite monitor wells. The results of the analyses (Appendix A) show no violation of primary and secondary drinking water standards (Chapter 17-22.104, FAC). The surficial aquifer water may be slightly acidic, high in dissolved iron, and have a high color.

- b. See Item 1.a. above for available information on aquifer porosity and permeability.

The top of the first semi-confining unit is very irregular. The clay to sandy clay of strata 8 and 9, and the more clayey portions of the clayey sand of strata 7 make up the semi-confining unit (Sections 5.2 and 5.7, Jammal & Associates, April 1987, Attachment 2).

- c. The clayey semi-confining unit was present and fairly consistent in physical properties in the area classified as favorable (proposed area to be landfilled). The highly plastic clays of strata 8 and 9 are considered essentially impermeable to vertical movement of water. However, there appear to be minor inconsistencies and seams of secondary seepage that allow some vertical movement of groundwater.

The thickness in the favorable area varies from 5 to 15 feet with a thickness of 6 to 8 feet in most cases. The average vertical permeability is approximately 7.2×10^{-5} cm/sec.

- d. The project site is situated in a relatively flat section of the Pamlico Terrace of the Gulf Coastal Lowlands physiographic province with greater relief to the east and northeast. Numerous lakes and ponds are found south of the site and the relatively large/linear Crews Lake is located about 1.5 miles to the east of the site. The topography and physiographic settings are further discussed in Sections 1.3 and 2.1, respectively, of the Jammal & Associates report (April 1987, Attachment 2).

Section 3.1 of the Jammal & Associates report (April 1987, Attachment 2) discusses the test drilling program during evaluation of the Hays Road site. The results of the soil borings are presented as soil profiles on Sheets 5 through 11 and discussed in Section 4.1.

In the northern portion of the project site, a relict drainage ditch 5 to 8 feet deep is present. It appears to have been dry for a considerable length of time.

The Hays Road site has no surface water bodies within the landfill construction area. Several small limestone-solution, sinkhole related depression areas are located west of the power line easement that bisects the property and do not lie within an area where construction is planned.

There is no distinct drainage pattern, since the surface material is generally very permeable and most rainfall infiltrates directly into the sandy soil. The existing surface water runoff flows toward closed shallow depressions. The overland flow occurs downgradient, generally via sheet flow. It is envisioned that the stormwater management system will, to the greatest extent possible, retain this general flow regime. This will permit the development of the project with a minimal amount of disruption to the existing environment.

2. Pasco County currently generates an estimated 660 tons per day of solid waste, or approximately 240,000 tons per year. This is expected to increase to approximately 1,160 tons per day or 425,000 tons per year in the year 2010. The East Pasco Sanitary Landfill, east of Dade City, is the only active sanitary landfill site presently serving Pasco County. The Hays Road Landfill will serve the 70% of the population that lives in western Pasco County. See Section 3.7.1 of Volume I for further information on the types and quantities of solid waste.
3. Hazardous wastes, as defined by the U.S. Environmental Protection Agency (EPA) and identified by FDER in Chapter 17-30, FAC, may not be disposed of at the landfill. The small amounts of solvents and household chemicals contained in typical community solid wastes are

not hazardous because they form such a tiny fraction of the total mass of wastes. The overall toxicity of the solid waste should be low.

4. The characteristics of the leachate generated are not known. The indicator parameters selected for the groundwater quality analyses should detect any leachate reaching the groundwater by water quality changes.

The volume of water infiltrating the landfilled solid waste area is discussed in the following paragraph (Item 5).

5. Disposal System Water Balance. Site Water Budget and Area Uses are discussed in Section 2.3.3 of Volume I. Water infiltrating the solid waste/ash landfilled area will be intercepted by the leachate collection system for treatment and disposal.
6. There are no known existing or expected future pollution sources located within one mile of the site.
7. Information on wells located within one mile of the site is located in Section 2.3.3 of Volume I and Appendix 10.8 of this volume.
8. The Hays Road site was recommended for the construction of a new sanitary landfill for the following reasons:
 - A sanitary landfill at this location should not have any adverse environmental impacts and can be constructed and operated to minimize any impacts upon adjacent land use.
 - A sanitary landfill can be constructed at this site with very minimal potential impacts to groundwater quality.
 - The Hays Road site has a lower annual disposal cost (between \$3.00 to \$6.00 per ton) than the East Pasco landfill site, primarily because of the higher transportation cost associated with the East Pasco site.

9. Groundwater conditions are described in Section 4.2 of the Jammal & Associates summary report (April 1987, Attachment 2). Measurements are given on Table 3, and groundwater elevation contour maps are included on Sheets 12 and 13. All of the monitor wells can be used to obtain background water quality, as the landfill facility is not in operation. See Item 1.a. above for background water quality data.
10. The waste disposal facilities will consist of an electrical power generating plant which will burn solid waste as fuel and a sanitary landfill co-located at the site. The lined landfill will be utilized for disposal of incinerator residue and bypass solid waste.
11. There are no streams or other surface water flows present at the site.
12. The design, construction and operation plans of the solid waste resource recovery facility, and the sanitary landfill are contained in Appendix 10.6 of this volume.
13. The immediate surrounding land use at the Hays Road site is primarily non-residential, with chicken and tree farms and undeveloped lands on the southern and eastern site boundaries. There is sparse mobile home development on the western and northern boundaries along First Avenue and Bluebird Lane, respectively. The Shady Hills Civic Association recreational complex is located north of the site. A Florida Power Corporation 230 KV transmission line passes through and a substation is located in a residential development north of the site. The natural barriers present on the site, and the access to the site by Hays Road will minimize contact with nearby residents.

4.0 MONITOR WELL SYSTEM

4.1 LOCATION OF MONITOR WELLS

A series of four monitor well clusters have been installed at selected locations around the perimeter of the site as illustrated in Figure 4-1. Each monitor well cluster consists of a surficial aquifer well and a Floridan aquifer well. The surficial monitor wells are designated 2MW1 to 2MW4 while the Floridan monitor wells are designated 4MW1 to 4MW4.

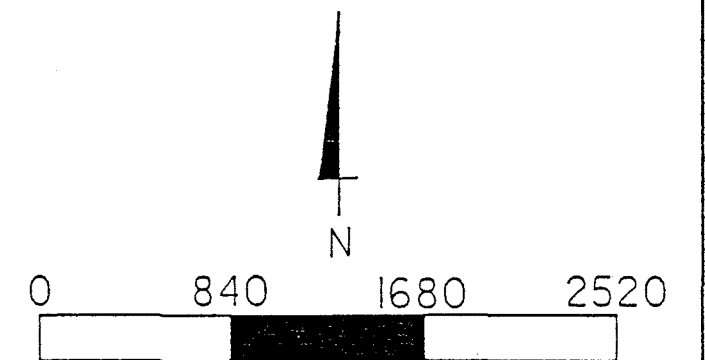
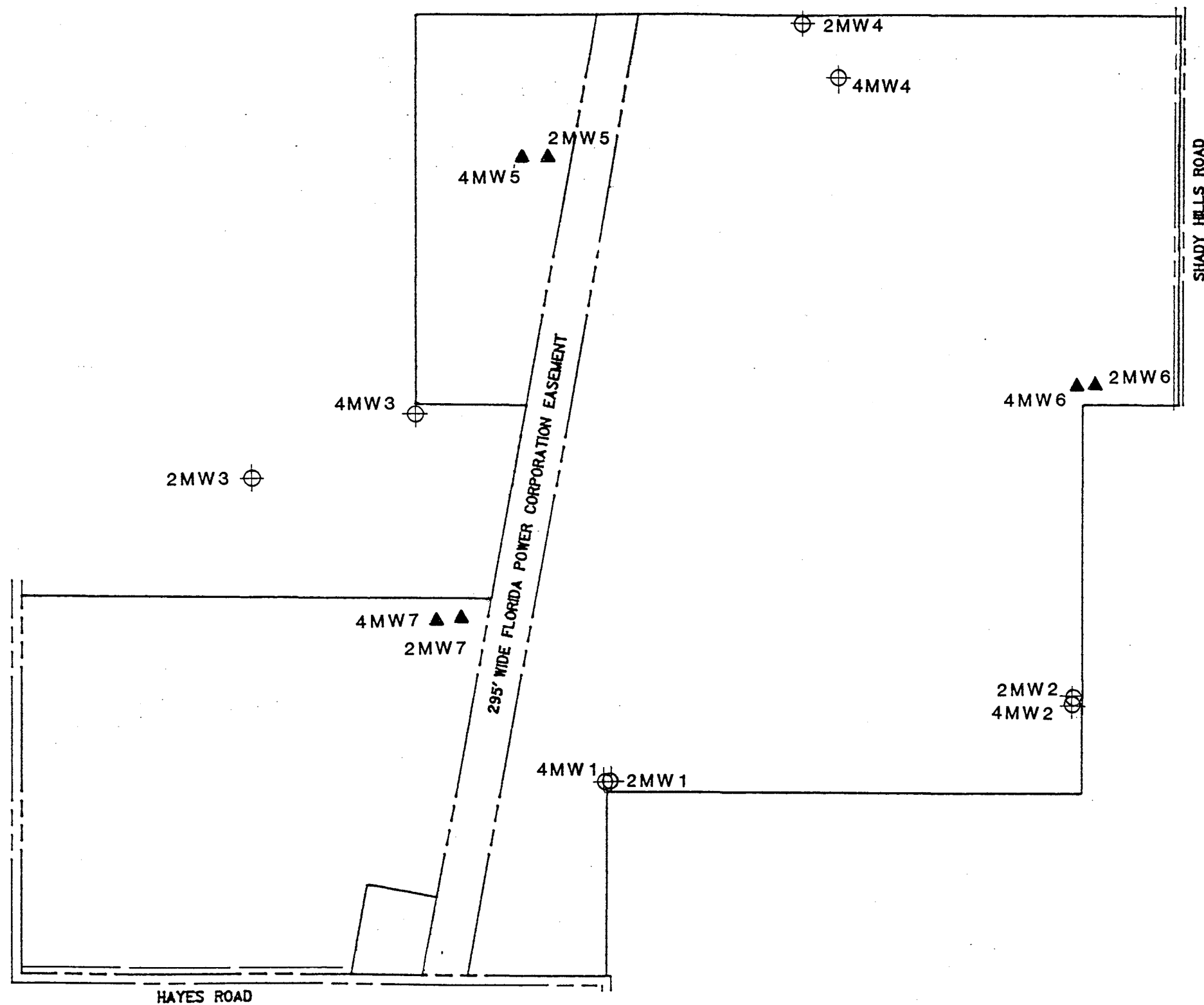
It is recommended that three additional monitor well clusters be constructed in locations which are shown as monitor well clusters 5, 6 and 7 as shown in Figure 4-1. These monitor wells would be used as compliance wells. The background water quality monitor wells would be monitor well 2MW1 for the surficial aquifer and 4MW1 for the Floridan aquifer. The remaining surficial aquifer monitor wells 2MW2 to 2MW4 and Floridan aquifer monitor wells 4MW2 to 4MW4 will be used as compliance wells.

4.2 MONITOR WELL CONSTRUCTION

The surficial aquifer monitor wells are installed generally just above the semi-confining clayey materials. In general, the casings of the deep monitor wells were set and grouted several feet into competent limestone and then an open hole for monitoring the Floridan aquifer was drilled into the limestone.

The well construction details for each of the shallow and deep monitor wells are included in Appendix E, on Plates 1 through 5 of the Jammal & Associates report (April 1987, Attachment 2). Sections 3.3 and 6.2 of the Jammal & Associates report (April 1987) contain further information on monitor well construction.

When construction of the groundwater monitoring system is complete, the following information will be submitted to the Florida Department of Environmental Regulation for all groundwater monitoring wells:



LEGEND

- ⊕ EXISTING MONITOR WELL
- ▲ PROPOSED MONITOR WELL

Well identification

Latitude/longitude

Aquifer monitored

Screen type and slot size

Screen length

Elevation at top of pipe

Elevation at land surface

Elevation at top and bottom
of construction zone (screen)

Driller's log

Total depth of well

Casing diameter

Casing type and length

Direction of groundwater flow
in screened zone

Well construction

permit numbers

Site map showing well location

5.0 GROUNDWATER MONITORING

5.1 SAMPLING PROCEDURES

Upon completion of construction, all new monitor wells will be sampled for the Primary and Secondary Drinking Water parameters included in Chapter 17-22, Florida Administrative Code, Public Drinking Water Systems. The specific parameters to be considered are the Primary [17-22.104(1)] and Secondary [17-22.104(2)] Drinking Water Standards listed in Part II, Quality Standards, Analytical Methods, Sampling.

All groundwater monitor wells will be sampled quarterly at a minimum for the indicator parameters determined from initial water quality analyses. However, additional sample(s) and parameter(s) may be required during the permit period based upon the results or trends of the indicator parameter analyses. Also water levels (ft. msl) will be reported.

Samples from the monitor wells will be taken after a minimum of 3 to 5 well volumes of water have been removed and temperature and conductivity have stabilized. Water samples must be drawn from the aquifer since water which has been stationary and exposed to the atmosphere within the casing will not have the same chemistry as that in the aquifer. The field testing, sample collection and preservation and laboratory testing, including quality control procedures, will comply with Chapter 17-4.246 and 17-3.401, FAC.

Approved methods as published by FDER or as published in Standard Methods, ASTM or EPA methods shall be used. Approved methods for chemical analyses are summarized in the Federal Register, December 1, 1976 (41FR52780), except that turbidity will be measured by the Nephelometric Method.

The groundwater monitoring analyses will be reported on FDER form 17-1.215(2), Quarterly Report on Ground Water Monitoring. The results will be submitted to FDER no later than the fifteenth (15th) day of the month immediately following the end of the sampling period.

If a monitor well becomes damaged or inoperable, FDER will be notified immediately and a detailed written report will follow within fourteen (14) days indicating the problem that has occurred and remedial measures that have been taken to prevent recurrence. All monitoring well design and replacement will be approved by FDER before installation.

6.0 BIBLIOGRAPHY

Fetter, C.W., Jr., 1980. Applied Hydrogeology. Charles E. Merrill Publishing Co. Columbus, Ohio.

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Hutchinson, C.B. 1985. Hydrogeology of the Cross Bar Ranch Well-Field Area and Projected Impact of Pumping, Pasco County, Florida. U.S. Geological Survey Water Resources Investigations Report 85-4001.

Jammal & Associates, Inc. April 17, 1987. Summary Report, Geotechnical/Hydrogeologic Study, Proposed Class I Sanitary/Ash Landfill Site--Hays Road, Pasco County, Florida.

Ryder, P.D. 1985. Hydrology of the Floridan Aquifer System in West-Central Florida. U.S. Geological Survey Open File Report 84-611.

APPENDIX A
WATER QUALITY DATA

FIRST SAMPLING

Image Quality

As you review the next group of images, Please note that the original documents were of poor quality.

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MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICES

TELEPHONE (813) 223-9702
P.O. BOX 2880

June 5, 1987

Laboratory Number 560052

For Jammal & Assoc. Inc.
6313 Benjamin Rd. Suite 101
Tampa, FL 33614

Attention R. Mortensen

Project Pasco County Landfill
Sample Site 4MWS
Date & Time Collected 5/7/87, 11:50 am
Date & Time Received 5/7/87
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.38
Conductivity (umhos/cm) 270
Temperature, °C 22

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #84147

SECONDARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
Calcium (Ca)	--	58	CORROSIVITY		
Chloride (Cl)	250	8.3	Total Hardness (c)	--	150
Color (Pt-Co Units)	15	2	Total Alkalinity (c)	--	134
Copper (Cu)	1	<0.005	N.C.H. (c)	--	16
Foaming Agents	0.5	<0.02	Bicarbonate (HCO ₃)	--	163
Hydrogen Sulfide	--	0.82	Carbon Dioxide (CO ₂)	--	2.6
Iron (Fe)	0.3	0.095	Bicarbonate (c)	--	134
Magnesium (Mg)	--	1.4	Carbonate (c)	--	-0-
Manganese (Mn)	0.05	0.013	Hydroxide (c)	--	-0-
Odor (Threshold Units)	3	-0-	pH Value	--	7.6
pH Value	6.5 Min.	8.0	Saturation Index	<-0.2	
Sulfate (SO ₄)	250	2.6		>+0.2	0.4
Total Dissolved Solids	500	176	Stability Index		7.2
Zinc (Zn)		<0.005	Interpretation		Scale Forming

Analysis according to approved methods listed in Chapter 17-22.

a. Quality Standards, Chapter 17-22.104 F.A.C.

b. All results are expressed as mg/L except as noted.

c. Results expressed as mg/L CaCO₃.

THORNTON LABORATORIES, INC.

Paul R. Hartley

THORNTON LABORATORIES, INC.

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TELEPHONE (813) 223-97
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June 5, 1987

Laboratory Number 660052

For Jammal & Assoc. Inc.
6313 Benjamin Rd. Suite 101
Tampa, FL 33614

Attention R. Mortensen

Project Pasco County Landfill
Sample Site 4MW3
Date & Time Collected 5/7/87, 11:50 am
Date & Time Received 5/7/87
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.38
Conductivity (umhos/cm) 270
Temperature, °C 22

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #84147

PRIMARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
INORGANICS			ORGANICS		
Arsenic (As)	0.05	<0.005	Endrin	0.0002	<0.0001
Barium (Ba)	1.0	<0.03	Lindane	0.004	<0.0002
Cadmium (Cd)	0.01	<0.002	Methoxychlor	0.1	<0.005
Chromium (Cr)	0.05	<0.005	Toxaphene	0.005	<0.001
Lead (Pb)	0.05	<0.01	2,4-D	0.1	<0.02
Mercury (Hg)	0.002	0.0016	2,4,5-TP	0.01	<0.002
Nitrate (N)	10	0.05	TRIHALOMETHANES		
Selenium (Se)	0.01	<0.005	Chloroform	--	<0.001
Silver (Ag)	0.05	0.007	Bromodichloromethane	--	<0.001
Sodium (Na)	160	2.9	Dibromochloromethane	--	<0.001
Fluoride (F)	--	<0.1	Bromoform	--	<0.001
Turbidity	--	1.2	Total THM	0.10	<0.001
RADIONUCLIDES			MICROBIOLOGICAL		
Gross Alpha	--	1.2+/-0.7	Total Coliform MPN/100cc	1	<3

Analysis performed by approved methods listed in Chapter 17-22.

- Quality Standards, Chapter 17-22.104 F.A.C.
- All results are expressed as mg/L except as noted.
- At 95% Confidence Limits.

THORNTON LABORATORIES, INC.

Paul R. Haultz

THORNTON LABORATORIES, INC.

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June 5, 1987

Laboratory Number 560052

For Jammal & Assoc. Inc.
6313 Benjamin Rd. Suite 101
Tampa, FL 33614

Attention R. Mortensen

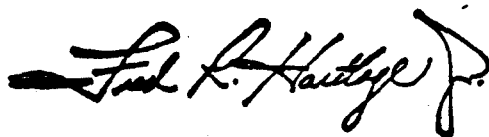
Project Pasco County Landfill
Sample Site 4MW3
Date & Time Collected 5/7/87, 11:50 am
Date & Time Received 5/7/87
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.38
Conductivity (umhos/cm) 270
Temperature, °C 22

DRINKING WATER CHEMICAL ANALYSIS
LABORATORY ID#84147

ANALYSIS	RESULT, ug/L	DETECTION LIMIT, ug/L
TRICHLOROETHYLENE	BDL*	1
TETRACHLOROETHYLENE	BDL	1
CARBON TETRACHLORIDE	BDL	1
VINYL CHLORIDE	BDL	1
1,1,1-TRICHLOROETHANE	BDL	1
1,2-DICHLOROETHANE	BDL	1
BENZENE	BDL	1
ETHYLENE DIBROMIDE	BDL	0.02

*Below Detection Limit

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SECOND SAMPLING

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MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICES

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P.O. BOX 2880

October 7, 1987

Laboratory Number 667568

For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Site Pasco County Resource Recovery Site
Location Pasco County
Sample Site 4 MW-3
Date & Time Collected 9/9/87, 8:50 am
Date & Time Received 9/9/87, 5:30 pm
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.3
Temperature °C 22
Conductivity (umhos/cm) 260

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #84147

PRIMARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
INORGANICS			ORGANICS		
Arsenic (As)	0.05	<0.005	Endrin	0.0002	<0.0001
Barium (Ba)	1.0	0.11	Lindane	0.004	<0.0002
Cadmium (Cd)	0.01	<0.002	Methoxychlor	0.1	<0.005
Chromium (Cr)	0.05	<0.005	Toxaphene	0.005	<0.001
Lead (Pb)	0.05	<0.01	2,4-D	0.1	<0.02
Mercury (Hg)	0.002	<0.0002	2,4,5-TF	0.01	<0.002
Nitrate (N)	10	3.8	TRIHALOMETHANES		
Selenium (Se)	0.01	<0.005	Chloroform	--	<0.001
Silver (Ag)	0.05	<0.005	Bromodichloromethane	--	<0.001
Sodium (Na)	160	3.0	Dibromochloromethane	--	<0.001
Fluoride (F)	1.6	<0.1	Bromoform	--	<0.001
Turbidity (NTU)	1	3.0	Total THM	0.10	<0.001
RADIONUCLIDES(c)			MICROBIOLOGICAL		
Gross Alpha, pCi/L		1.8±1.4	Total Coliform/100cc 1		<3

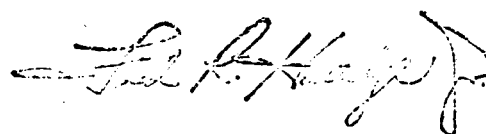
Analysis according to approved methods listed in Chapter 17-22.

a. Quality Standards, Chapter 17-22.104 F.A.C.

b. All results are expressed as mg/L except as noted.

c. At 95% Confidence Limits.

THORNTON LABORATORIES, INC.



THORNTON LABORATORIES, INC.

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P.O. BOX 2880

October 7, 1987

Laboratory Number 667568

For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Site Pasco County Resource Recovery Site
Location Pasco County
Sample Site 4 MW-3
Date & Time Collected 9/9/87, 8:50 am
Date & Time Received 9/9/87, 5:30 pm
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.3
Temperature °C 22
Conductivity (umhos/cm) 260

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #84147

SECONDARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
Calcium (Ca)	--	52	CORROSIVITY		
Chloride (Cl)	250	5.6	Total Hardness(c)	--	132
Color(Pt-Co Units)	15	2	Total Alkalinity(c)	--	145
Copper (Cu)	1	<0.005	N.C.H. (c)	--	-0-
Foaming Agents	0.5	<0.02	Bicarbonate (HCO ₃)	--	177
Hydrogen Sulfide	--	0.12	Carbon Dioxide (CO ₂)	--	17
Iron (Fe)	0.3	0.27	Bicarbonate (c)	--	145
Magnesium (Mg)	--	0.24	Carbonate (c)	--	-0-
Manganese (Mn)	0.05	0.006	Hydroxide (c)	--	-0-
Odor(Threshold Units)	3	-0-	pHs Value	--	7.5
pH Value	6.5 Min.	7.5	Saturation Index	<-0.2	
Sulfate (SO ₄)	250	5.9		>+0.2	-0.2
Total Dissolved Solids	500	142	Stability Index		7.7
Zinc (Zn)	5	0.009	Interpretation		Stable

Analysis according to approved methods listed in Chapter 17-22.

a. Quality Standards, Chapter 17-22.104 F.A.C.

b. All results are expressed as mg/L except as noted.

c. Results expressed as mg/L CaCO₃.

THORNTON LABORATORIES, INC.

THORNTON LABORATORIES, INC.TWX 810 878-9134
THORNT LAB TPA1145 EAST CASS STREET
TAMPA, FLORIDA 33601 - 2880
MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICESTELEPHONE (813) 223-9702
P.O. BOX 2880

October 7, 1987

Laboratory Number 667568
For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624
Attention C. Gable
Marks 4 MW-3

DRINKING WATER CHEMICAL ANALYSIS
LABORATORY ID#B4147

ANALYSIS	RESULT, ug/L	DETECTION LIMIT, ug/L	MCL (a)
TRICHLOROETHYLENE	BDL*	1	3
TETRACHLOROETHYLENE	BDL	1	3
CARBON TETRACHLORIDE	BDL	1	3
VINYL CHLORIDE	BDL	1	1
1,1,1-TRICHLOROETHANE	BDL	1	200
1,2-DICHLOROETHANE	BDL	1	3
BENZENE	BDL	1	1
ETHYLENE DIBROMIDE	BDL	0.02	0.02

Analysis according to approved methods listed in Chapter 17-22.
(a) Maximum Contaminant Levels, Chapter 17-22.104 (1) (g).

*Below Detection Limit

THORNTON LABORATORIES, INC.

THORNTON LABORATORIES, INC.TWX 810 876-9134
THORNTON LAB TPA1145 EAST CASS STREET
TAMPA, FLORIDA 33601 - 2880
MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICESTELEPHONE (813) 223-9702
P.O. BOX 2880

October 7, 1987

Laboratory Number 667476

For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Site Pasco County Resource Recovery Site
Location Pasco County
Sample Site 4 MW-1
Date & Time Collected 9/8/87, 6:20 pm
Date & Time Received 9/9/87, 07:00
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.4
Temperature °C 24
Conductivity (umhos/cm) 200

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #84147

PRIMARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
INORGANICS			ORGANICS		
Arsenic (As)	0.05	<0.005	Endrin	0.0002	<0.0001
Barium (Ba)	1.0	<0.03	Lindane	0.004	<0.0002
Cadmium (Cd)	0.01	<0.002	Methoxychlor	0.1	<0.005
Chromium (Cr)	0.05	<0.005	Toxaphene	0.005	<0.001
Lead (Pb)	0.05	<0.01	2,4-D	0.1	<0.02
Mercury (Hg)	0.002	<0.0002	2,4,5-TP	0.01	<0.002
Nitrate (N)	10	0.10	TRIHALOMETHANES		
Selenium (Se)	0.01	<0.005	Chloroform	--	<0.001
Silver (Ag)	0.05	<0.005	Bromodichloromethane	--	<0.001
Sodium (Na)	160	2.6	Dibromochloromethane	--	<0.001
Fluoride (F)	1.6	<0.1	Bromoform	--	<0.001
Turbidity (NTU)	1	1.4	Total THM	0.10	<0.001
RADIONUCLIDES(c)			MICROBIOLOGICAL		
Gross Alpha, pCi/L		2.2±1.0	Total Coliform/100cc 1		<3

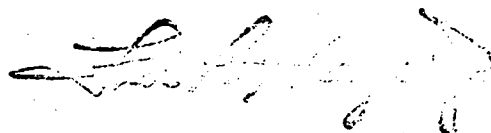
Analysis according to approved methods listed in Chapter 17-22.

a. Quality Standards, Chapter 17-22.104 F.A.C.

b. All results are expressed as mg/L except as noted.

c. At 95% Confidence Limits.

THORNTON LABORATORIES, INC.



THORNTON LABORATORIES, INC.TWX 810 876-9134
THORNT LAB TPA1145 EAST CASS STREET
TAMPA, FLORIDA 33601 - 2880
MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICESTELEPHONE (813) 223-9702
P.O. BOX 2880

October 7, 1987

Laboratory Number 667476

For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Site Pasco County Resource Recovery Site
Location Pasco County
Sample Site 4 MW-1
Date & Time Collected 9/8/87, 6:20 pm
Date & Time Received 9/9/87, 07:00
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.4
Temperature °C 24
Conductivity (umhos/cm) 200

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #84147

SECONDARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
Calcium (Ca)	--	36	CORROSIVITY		
Chloride (Cl)	250	3.8	Total Hardness (c)	--	93
Color (Pt-Co Units)	15	5	Total Alkalinity (c)	--	100
Copper (Cu)	1	<0.005	N.C.H. (c)	--	-0-
Foaming Agents	0.5	<0.02	Bicarbonate (HCO ₃)	--	122
Hydrogen Sulfide	--	0.24	Carbon Dioxide (CO ₂)	--	5.5
Iron (Fe)	0.3	0.13	Bicarbonate (c)	--	100
Magnesium (Mg)	--	0.88	Carbonate (c)	--	-0-
Manganese (Mn)	0.05	<0.005	Hydroxide (c)	--	-0-
Odor (Threshold Units)	3	-0-	pHs Value	--	7.8
pH Value	6.5 Min.	7.7	Saturation Index	<-0.2	
Sulfate (SO ₄)	250	6.1		>+0.2	-0.4
Total Dissolved Solids	500	136	Stability Index		8.2
Zinc (Zn)	5	<0.005	Interpretation		Corrosive

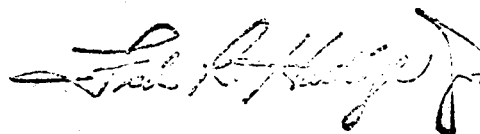
Analysis according to approved methods listed in Chapter 17-22.

a. Quality Standards, Chapter 17-22.104 F.A.C.

b. All results are expressed as mg/L except as noted.

c. Results expressed as mg/L CaCO₃.

THORNTON LABORATORIES, INC.



THORNTON LABORATORIES, INC.TWX 810 876-9134
THORNT LAB TPA1145 EAST CASS STREET
TAMPA, FLORIDA 33601 - 2880
MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICESTELEPHONE (813) 223-9702
P.O. BOX 2880

October 7, 1987

Laboratory Number 667476
For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624
Attention C. Gable
Marks 4 MW-1

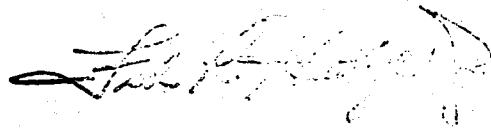
DRINKING WATER CHEMICAL ANALYSIS
LABORATORY ID#84147

ANALYSIS	RESULT, ug/L	DETECTION LIMIT, ug/L	MCL (a)
TRICHLOROETHYLENE	BDL*	1	3
TETRACHLOROETHYLENE	BDL	1	3
CARBON TETRACHLORIDE	BDL	1	3
VINYL CHLORIDE	BDL	1	1
1,1,1-TRICHLOROETHANE	BDL	1	200
1,2-DICHLOROETHANE	BDL	1	3
BENZENE	BDL	1	1
ETHYLENE DIBROMIDE	BDL	0.02	0.02

Analysis according to approved methods listed in Chapter 17-22.
(a) Maximum Contaminant Levels, Chapter 17-22.104 (1) (g).

*Below Detection Limit

THORNTON LABORATORIES, INC.



THORNTON LABORATORIES, INC.

1145 EAST CASS STREET

TAMPA, FLORIDA 33601 - 2880

MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICES

TELEPHONE (813) 223-9702

P.O. BOX 2880

TWX 810 876-9134

THORNT LAB TPA

October 7, 1987

Laboratory Number 667477

For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Site Pasco County Resource Recovery Site
Location Pasco County
Sample Site 4 MW-2
Date & Time Collected 9/8/87, 2:30 pm
Date & Time Received 9/9/87, 07:00
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.7
Temperature °C 24
Conductivity (umhos/cm) 170

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #84147

PRIMARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
INORGANICS			ORGANICS		
Arsenic (As)	0.05	<0.005	Endrin	0.0002	<0.0001
Barium (Ba)	1.0	<0.03	Lindane	0.004	<0.0002
Cadmium (Cd)	0.01	<0.002	Methoxychlor	0.1	<0.005
Chromium (Cr)	0.05	<0.005	Toxaphene	0.005	<0.001
Lead (Pb)	0.05	<0.01	2,4-D	0.1	<0.02
Mercury (Hg)	0.002	<0.0002	2,4,5-TP	0.01	<0.002
Nitrate (N)	10	0.19	TRIHALOMETHANES		
Selenium (Se)	0.01	<0.005	Chloroform	--	<0.001
Silver (Ag)	0.05	<0.005	Bromodichloromethane	--	<0.001
Sodium (Na)	160	2.2	Dibromochloromethane	--	<0.001
Fluoride (F)	1.6	<0.1	Bromoform	--	<0.001
Turbidity (NTU)	1	0.91	Total THM	0.10	<0.001
RADIONUCLIDES (c)			MICROBIOLOGICAL		
Gross Alpha, pCi/L		1.6±0.9	Total Coliform/100cc	1	<3

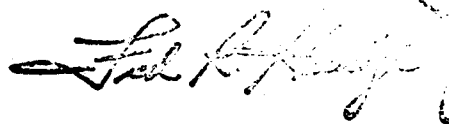
Analysis according to approved methods listed in Chapter 17-22.

a. Quality Standards, Chapter 17-22.104 F.A.C.

b. All results are expressed as mg/L except as noted.

c. At 95% Confidence Limits.

THORNTON LABORATORIES, INC.



THORNTON LABORATORIES, INC.TWX 810 876-9134
THORNT LAB TPA1145 EAST CASS STREET
TAMPA, FLORIDA 33601 - 2880
MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICESTELEPHONE (813) 223-9702
P.O. BOX 2880

October 7, 1987

Laboratory Number 667477

For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Site Pasco County Resource Recovery Site
Location Pasco County
Sample Site 4 MW-2
Date & Time Collected 9/8/87, 2:30 pm
Date & Time Received 9/9/87, 07:00
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.7
Temperature °C 24
Conductivity (umhos/cm) 170

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #84147

SECONDARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
Calcium (Ca)	--	31	CORROSIVITY		
Chloride (Cl)	250	4.8	Total Hardness (c)	--	80
Color (Pt-Co Units)	15	-0-	Total Alkalinity (c)	--	86
Copper (Cu)	1	<0.005	N.C.H. (c)	--	-0-
Foaming Agents	0.5	<0.02	Bicarbonate (HCO ₃)	--	105
Hydrogen Sulfide	--	0.24	Carbon Dioxide (CO ₂)	--	3.0
Iron (Fe)	0.3	0.046	Bicarbonate (c)	--	86
Magnesium (Mg)	--	0.72	Carbonate (c)	--	-0-
Manganese (Mn)	0.05	<0.005	Hydroxide (c)	--	-0-
Odor (Threshold Units)	3	-0-	pHs Value	--	7.9
pH Value	6.5 Min.	7.8	Saturation Index	<-0.2	
Sulfate (SO ₄)	250	7.1		>+0.2	-0.2
Total Dissolved Solids	500	88	Stability Index		8.1
Zinc (Zn)	5	<0.005	Interpretation		Stable

Analysis according to approved methods listed in Chapter 17-22.

a. Quality Standards, Chapter 17-22.104 F.A.C.

b. All results are expressed as mg/L except as noted.

c. Results expressed as mg/L CaCO₃.

THORNTON LABORATORIES, INC.

THORNTON LABORATORIES, INC.TWX 810 876-9134
THORNT LAB TPA1145 EAST CASS STREET
TAMPA, FLORIDA 33601 - 2880
MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICESTELEPHONE (813) 223-9702
P.O. BOX 2880

October 7, 1987

Laboratory Number 667477
For Camp. Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624
Attention C. Gable
Marks 4 MW-2

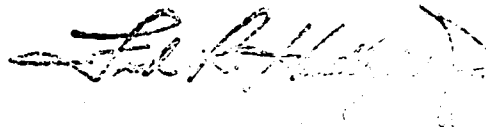
DRINKING WATER CHEMICAL ANALYSIS
LABORATORY ID#84147

ANALYSIS	RESULT, ug/L	DETECTION LIMIT, ug/L	MCL (a)
TRICHLOROETHYLENE	BDL*	1	3
TETRACHLOROETHYLENE	BDL	1	3
CARBON TETRACHLORIDE	BDL	1	3
VINYL CHLORIDE	BDL	1	1
1,1,1-TRICHLOROETHANE	BDL	1	200
1,2-DICHLOROETHANE	BDL	1	3
BENZENE	BDL	1	1
ETHYLENE DIBROMIDE	BDL	0.02	0.02

Analysis according to approved methods listed in Chapter 17-22.
(a) Maximum Contaminant Levels, Chapter 17-22.104 (i) (g).

*Below Detection Limit

THORNTON LABORATORIES, INC.



THORNTON LABORATORIES, INC.TWX 810 876-9134
THORNT LAB TPA1145 EAST CASS STREET
TAMPA, FLORIDA 33601 - 2880
MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICESTELEPHONE (813) 223-9702
P.O. BOX 2880

October 7, 1987

Laboratory Number 667629

For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Site Pasco County Resource Recovery Site
Location Pasco County
Sample Site 4 MW-4
Date & Time Collected 9/10/87, 12:45 pm
Date & Time Received 9/10/87, 15:45
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.5
Temperature °C 22
Conductivity (umhos/cm) 260

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #84147

PRIMARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
INORGANICS			ORGANICS		
Arsenic (As)	0.05	<0.005	Endrin	0.0002	<0.0001
Barium (Ba)	1.0	0.09	Lindane	0.004	<0.0002
Cadmium (Cd)	0.01	<0.002	Methoxychlor	0.1	<0.005
Chromium (Cr)	0.05	<0.005	Toxaphene	0.005	<0.001
Lead (Pb)	0.05	<0.01	2,4-D	0.1	<0.02
Mercury (Hg)	0.002	0.0003	2,4,5-TP	0.01	<0.002
Nitrate (N)	10	0.17	TRIHALOMETHANES		
Selenium (Se)	0.01	<0.005	Chloroform	--	<0.001
Silver (Ag)	0.05	<0.005	Bromodichloromethane	--	<0.001
Sodium (Na)	160	2.8	Dibromochloromethane	--	<0.001
Fluoride (F)	1.6	<0.1	Bromoform	--	<0.001
Turbidity (NTU)	1	12	Total THM	0.10	<0.001
RADIONUCLIDES(c)			MICROBIOLOGICAL		
Gross Alpha, pCi/L		6.6±2.3	Total Coliform/100cc 1		<3

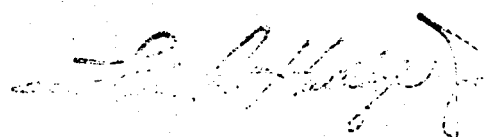
Analysis according to approved methods listed in Chapter 17-22.

a. Quality Standards, Chapter 17-22.104 F.A.C.

b. All results are expressed as mg/L except as noted.

c. At 95% Confidence Limits.

THORNTON LABORATORIES, INC.



THORNTON LABORATORIES, INC.

1146 EAST CASS STREET

TAMPA, FLORIDA 33601 - 2880

MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICES

TWX 810 876-9134

THORNT LAB TPA

TELEPHONE (813) 223-9702

P.O. BOX 2880

October 7, 1987

Laboratory Number 667629

For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Site Pasco County Resource Recovery Site
Location Pasco County
Sample Site 4 MW-4
Date & Time Collected 9/10/87, 12:45 pm
Date & Time Received 9/9/87, 15:45
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.5
Temperature °C 22
Conductivity (umhos/cm) 260

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #84147

SECONDARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
Calcium (Ca)	--	52	CORROSIVITY		
Chloride (Cl)	250	6.0	Total Hardness(c)	--	130
Color(Pt-Co Units)	15	-0-	Total Alkalinity(c)	--	123
Copper (Cu)	1	<0.005	N.C.H. (c)	--	7
Foaming Agents	0.5	<0.02	Bicarbonate (HCO ₃)	--	150
Hydrogen Sulfide	--	0.16	Carbon Dioxide (CO ₂)	--	5.5
Iron (Fe)	0.3	0.19	Bicarbonate (c)	--	123
Magnesium (Mg)	--	<0.2	Carbonate (c)	--	-0-
Manganese (Mn)	0.05	<0.005	Hydroxide (c)	--	-0-
Odor(Threshold Units)	3	-0-	pHs Value	--	7.6
pH Value	6.5 Min.	7.8	Saturation Index	<-0.2	
Sulfate (SO ₄)	250	6.8		>+0.2	-0.1
Total Dissolved Solids	500	134	Stability Index		7.7
Zinc (Zn)	5	<0.005	Interpretation		Stable

Analysis according to approved methods listed in Chapter 17-22.

a. Quality Standards, Chapter 17-22.104 F.A.C.

b. All results are expressed as mg/L except as noted.

c. Results expressed as mg/L CaCO₃.

THORNTON LABORATORIES, INC.

THORNTON LABORATORIES, INC.

1145 EAST CASS STREET

TAMPA, FLORIDA 33601 - 2880

MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICES

TELEPHONE (813) 223-9702

P.O. BOX 2880

TWX 810 876-8134

THORNT LAB TPA

October 7, 1987

Laboratory Number 667629

For
Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Marks 4 MW-4

DRINKING WATER CHEMICAL ANALYSIS
LABORATORY ID#84147

ANALYSIS	RESULT, ug/L	DETECTION LIMIT, ug/L	MCL (a)
TRICHLOROETHYLENE	BDL*	1	3
TETRACHLOROETHYLENE	BDL	1	3
CARBON TETRACHLORIDE	BDL	1	3
VINYL CHLORIDE	BDL	1	1
1,1,1-TRICHLOROETHANE	BDL	1	200
1,2-DICHLOROETHANE	BDL	1	3
BENZENE	BDL	1	1
ETHYLENE DIBROMIDE	BDL	0.02	0.02

Analysis according to approved methods listed in Chapter 17-22.

(a) Maximum Contaminant Levels, Chapter 17-22.104 (1) (g).

*Below Detection Limit

THORNTON LABORATORIES, INC.

THORNTON LABORATORIES, INC.

1145 EAST CASS STREET

TAMPA, FLORIDA 33601 - 2880

MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICES

TWX 810 876-9134

THORNT LAB TPA

TELEPHONE (813) 223-9702

P.O. BOX 2880

October 7, 1987

Laboratory Number 667475

For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Site Pasco County Resource Recovery Site
Location Pasco County
Sample Site 2 MW-2
Date & Time Collected 9/8/87, 4:10 pm
Date & Time Received 9/9/87, 07:00
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 6.5
Temperature °C 25
Conductivity (umhos/cm) 54

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #84147

PRIMARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
INORGANICS			ORGANICS		
Arsenic (As)	0.05	<0.005	Endrin	0.0002	<0.0001
Barium (Ba)	1.0	<0.03	Lindane	0.004	<0.0002
Cadmium (Cd)	0.01	<0.002	Methoxychlor	0.1	<0.005
Chromium (Cr)	0.05	0.006	Toxaphene	0.005	<0.001
Lead (Pb)	0.05	<0.01	2,4-D	0.1	<0.02
Mercury (Hg)	0.002	<0.0002	2,4,5-TP	0.01	<0.002
Nitrate (N)	10	0.12	TRIHALOMETHANES		
Selenium (Se)	0.01	<0.005	Chloroform	--	<0.001
Silver (Ag)	0.05	<0.005	Bromodichloromethane	--	<0.001
Sodium (Na)	160	9.0	Dibromochloromethane	--	<0.001
Fluoride (F)	1.6	<0.1	Bromoform	--	<0.001
Turbidity (NTU)	1	165	Total THM	0.10	<0.001
RADIONUCLIDES(c)			MICROBIOLOGICAL		
Gross Alpha, pCi/L		12.7±4.1	Total Coliform/100cc 1		<3

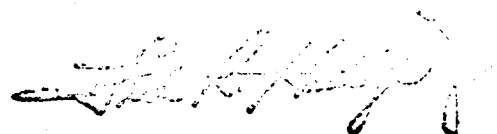
Analysis according to approved methods listed in Chapter 17-22.

a. Quality Standards, Chapter 17-22.104 F.A.C.

b. All results are expressed as mg/L except as noted.

c. At 95% Confidence Limits.

THORNTON LABORATORIES, INC.



THORNTON LABORATORIES, INC.

1145 EAST CASS STREET

TAMPA, FLORIDA 33601 - 2880

MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICES

TWX 810 876-9134
THORNT LAB TPATELEPHONE (813) 223-9702
P.O. BOX 2880

October 7, 1987

Laboratory Number 667475

For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Site Pasco County Resource Recovery Site
Location Pasco County
Sample Site 2 MW-2
Date & Time Collected 9/8/87, 4:10 pm
Date & Time Received 9/9/87, 07:00
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 6.5
Temperature °C 25
Conductivity (umhos/cm) 54

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #84147

SECONDARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
Calcium (Ca)	--	4.9	CORROSIVITY		
Chloride (Cl)	250	5.0	Total Hardness (c)	--	16
Color (Pt-Co Units)	15	3	Total Alkalinity (c)	--	37
Copper (Cu)	1	0.012	N.C.H. (c)	--	-0-
Foaming Agents	0.5	<0.02	Bicarbonate (HCO ₃)	--	45
Hydrogen Sulfide	--	0.28	Carbon Dioxide (CO ₂)	--	21
Iron (Fe)	0.3	5.2	Bicarbonate (c)	--	37
Magnesium (Mg)	--	0.91	Carbonate (c)	--	-0-
Manganese (Mn)	0.05	0.14	Hydroxide (c)	--	-0-
Odor (Threshold Units)	3	-0-	pHs Value	--	9.1
pH Value	6.5 Min.	6.9	Saturation Index	<-0.2	
Sulfate (SO ₄)	250	9.2		>+0.2	-2.6
Total Dissolved Solids	500	142	Stability Index		11.7
Zinc (Zn)	5	0.024	Interpretation		Corrosive

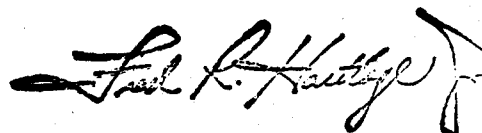
Analysis according to approved methods listed in Chapter 17-22.

a. Quality Standards, Chapter 17-22.104 F.A.C.

b. All results are expressed as mg/L except as noted.

c. Results expressed as mg/L CaCO₃.

THORNTON LABORATORIES, INC.



THORNTON LABORATORIES, INC.

1145 EAST CASS STREET

TAMPA, FLORIDA 33601 - 2880

MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICES

TWX 810 876-9134

THORNT LAB TPA

TELEPHONE (813) 223-9702

P.O. BOX 2880

October 7, 1987

Laboratory Number 667475
For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624
Attention C. Gable
Marks 2 MW-2

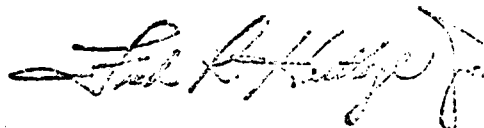
DRINKING WATER CHEMICAL ANALYSIS
LABORATORY ID#84147

ANALYSIS	RESULT, ug/L	DETECTION LIMIT, ug/L	MCL (a)
TRICHLOROETHYLENE	BDL*	1	3
TETRACHLOROETHYLENE	BDL	1	3
CARBON TETRACHLORIDE	BDL	1	3
VINYL CHLORIDE	BDL	1	1
1,1,1-TRICHLOROETHANE	BDL	1	200
1,2-DICHLOROETHANE	BDL	1	3
BENZENE	BDL	1	1
ETHYLENE DIBROMIDE	BDL	0.02	0.02

Analysis according to approved methods listed in Chapter 17-22.
(a) Maximum Contaminant Levels, Chapter 17-22.104 (1) (g).

*Below Detection Limit

THORNTON LABORATORIES, INC.



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THORNT LAB TPA1145 EAST CASS STREET
TAMPA, FLORIDA 33601 - 2880
MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICESTELEPHONE (813) 223-9702
P.O. BOX 2880

October 7, 1987

Laboratory Number 667474

For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Site Pasco County Resource Recovery Site
Location Pasco County
Sample Site B&B Ranch, Robert Whitley Well
Date & Time Collected 9/8/87, 10:20 am
Date & Time Received 9/9/87, 07:00
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.3
Temperature °C 23
Conductivity (umhos/cm) 350

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #84147

PRIMARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
INORGANICS			ORGANICS		
Arsenic (As)	0.05	<0.005	Endrin	0.0002	<0.0001
Barium (Ba)	1.0	<0.03	Lindane	0.004	<0.0002
Cadmium (Cd)	0.01	<0.002	Methoxychlor	0.1	<0.005
Chromium (Cr)	0.05	<0.005	Toxaphene	0.005	<0.001
Lead (Pb)	0.05	<0.01	2,4-D	0.1	<0.02
Mercury (Hg)	0.002	<0.0002	2,4,5-TP	0.01	<0.002
Nitrate (N)	10	0.37	TRIHALOMETHANES		
Selenium (Se)	0.01	<0.005	Chloroform	--	<0.001
Silver (Ag)	0.05	<0.005	Bromodichloromethane	--	<0.001
Sodium (Na)	160	4.0	Dibromochloromethane	--	<0.001
Fluoride (F)	1.6	<0.1	Bromoform	--	<0.001
Turbidity (NTU)	1	0.72	Total THM	0.10	<0.001
RADIONUCLIDES(c)			MICROBIOLOGICAL		
Gross Alpha, pCi/L		1.3±0.9	Total Coliform/100cc	1	<3

Analysis according to approved methods listed in Chapter 17-22.

a. Quality Standards, Chapter 17-22.104 F.A.C.

b. All results are expressed as mg/L except as noted.

c. At 95% Confidence Limits.

THORNTON LABORATORIES, INC.

THORNTON LABORATORIES, INC.

1145 EAST CASS STREET

TAMPA, FLORIDA 33601 - 2880

MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICES

TELEPHONE (813) 223-9702

P.O. BOX 2880

TWX 810 876-9134

THORNT LAB TPA

October 7, 1987

Laboratory Number 667474

For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624

Attention C. Gable

Site Pasco County Resource Recovery Site
Location Pasco County
Sample Site B&B Ranch, Robert Whitley Well
Date & Time Collected 9/8/87, 10:20 am
Date & Time Received 9/9/87, 07:00
Collector Joan Hallgren of Thornton Laboratories, Inc.
pH 7.3
Temperature °C 23
Conductivity (umhos/cm) 350

DRINKING WATER CHEMICAL ANALYSIS

Laboratory ID #B4147

SECONDARY STANDARDS

PARAMETER	MCL (a)	RESULT (b)	PARAMETER	MCL (a)	RESULT (b)
Calcium (Ca)	--	57	CORROSIVITY		
Chloride (Cl)	250	6.7	Total Hardness (c)	--	147
Color (Pt-Co Units)	15	3	Total Alkalinity (c)	--	157
Copper (Cu)	1	0.011	N.C.H. (c)	--	-0-
Foaming Agents	0.5	<0.02	Bicarbonate (HCO ₃)	--	191
Hydrogen Sulfide	--	0.20	Carbon Dioxide (CO ₂)	--	14
Iron (Fe)	0.3	0.049	Bicarbonate (c)	--	157
Magnesium (Mg)	--	1.3	Carbonate (c)	--	-0-
Manganese (Mn)	0.05	0.005	Hydroxide (c)	--	-0-
Odor (Threshold Units)	3	-0-	pHs Value	--	7.4
pH Value	6.5 Min.	7.6	Saturation Index	<-0.2	
Sulfate (SO ₄)	250	8.1		>+0.2	-0.1
Total Dissolved Solids	500	210	Stability Index		7.5
Zinc (Zn)	5	0.042	Interpretation		Stable

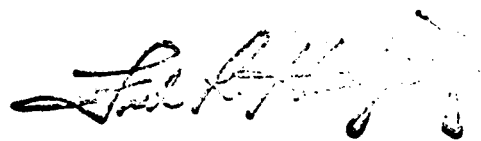
Analysis according to approved methods listed in Chapter 17-22.

a. Quality Standards, Chapter 17-22.104 F.A.C.

b. All results are expressed as mg/L except as noted.

c. Results expressed as mg/L CaCO₃.

THORNTON LABORATORIES, INC.



THORNTON LABORATORIES, INC.TWX 810 876-9134
THORNT LAB TPA1145 EAST CASS STREET
TAMPA, FLORIDA 33601 - 2880
MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICESTELEPHONE (813) 223-9702
P.O. BOX 2880

October 7, 1987

Laboratory Number 667474
For Camp, Dresser & McKee
1321 US 19 S. Suite 100B
Clearwater, FL 34624
Attention C. Gable
Marks B&B Ranch. Robert Whitley Well

DRINKING WATER CHEMICAL ANALYSIS
LABORATORY ID#84147

ANALYSIS	RESULT, ug/L	DETECTION LIMIT, ug/L	MCL(a)
TRICHLOROETHYLENE	BDL*	1	3
TETRACHLOROETHYLENE	BDL	1	3
CARBON TETRACHLORIDE	BDL	1	3
VINYL CHLORIDE	BDL	1	1
1,1,1-TRICHLOROETHANE	BDL	1	200
1,2-DICHLOROETHANE	BDL	1	3
BENZENE	BDL	1	1
ETHYLENE DIBROMIDE	BDL	0.02	0.02

Analysis according to approved methods listed in Chapter 17-22.

(a) Maximum Contaminant Levels, Chapter 17-22.104 (1) (g).

*Below Detection Limit

THORNTON LABORATORIES, INC.

TECHNICAL APPENDIX F

TECHNICAL APPENDIX F
LINER SPECIFICATIONS

TECHNICAL SPECIFICATIONS

HIGH DENSITY POLYETHYLENE MEMBRANE

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals required and install the High Density Polyethylene (HDPE) membrane as shown on the Drawings and as specified herein. The work shall include placement and seaming of the liner and all other work as shown on the Drawings and as specified herein.

1.02 RELATED WORK NOT INCLUDED

- A. Earthwork and fill materials are to be provided by Owner.
- B. Geotextile fabrics (woven and/or nonwoven) are to be provided by Owner.

1.03 CONTRACTOR'S EXPERIENCE

- A. The manufacturer and installer of the HDPE membrane shall have demonstrated by previous experience their ability to do the work. The manufacturer of the lining material described hereunder shall have previously demonstrated his ability to produce this membrane by having successfully manufactured a minimum of ten million square feet of similar liner material for hydraulic lining installations. The manufacturer must be listed by NSF (National Sanitation Foundation) Standard 54 as meeting all the requirements for manufacturing HDPE. The installer shall have installed not less than five comparable installations now giving satisfactory service in the United States. The installer shall submit a work plan to Pasco County.

1.04 SUBMITTALS

- A. Prior to furnishing and installation of the HDPE membrane, the Contractor shall submit to Pasco County, for approval, the following:
 - 1. Samples of HDPE membrane material and field seams for visual inspection and testing.
 - 2. Shop drawings showing the following:
 - a. Proposed layout of the HDPE membrane system.
 - b. Details of seaming the HDPE membrane, anchoring, connections, penetrations, boots and other construction details.
 - 3. Certificates of compliance with the requirements of standards specified herein for the HDPE membrane and its installation.
 - 4. Installation and erection data and schedule.
 - 5. Maintenance and repair requirements.
 - 6. Manufacturer's standard guarantee.
 - 7. A quality control manual that specifically defines the quality assurance program. Included in the manual shall be daily procedure, welding technique, field testing procedure, lab testing procedure, specific steps that are to be taken in the event of a failure or defect, personnel requirements, levels of authority, and

all other information necessary to ensure a high quality liner installation. The liner quality control documentation included at the end of this section shall be used unless alternative documentation is approved by the Engineer.

- B. The resin manufacturer must submit sampling procedures, sampling frequency, testing methods and test results. Any materials not conforming to the specifications will be rejected. All acceptable results will be forwarded to the County and a copy held on file until the completion of the project. Upon completion of the project, the file will be stored in the County's archives for the duration of the warranty.

1.05 JOB CONDITIONS

- A. Site Preparation
 - 1. The HDPE membrane will be placed over prepared surfaces as constructed by the County.
- B. HDPE Membrane Protection
 - 1. The surface of the subgrade shall be smooth, uniform, free from sudden changes in grade, rocks, stones, debris, and deleterious materials.
 - 2. The earth subgrade shall be prepared prior to installation of the HDPE membrane. The subgrade will be maintained in a smooth, uniform and compacted condition during installation of the HDPE membrane.
 - 3. No liner material shall be installed when the temperature is lower than 40°F or greater than 100°F.
 - 4. All areas of the membrane damaged during installation as determined by the County or their representative shall be repaired by the Contractor as specified herein and at no additional expense.

1.06 MATERIAL WARRANTY

- A. The HDPE membrane manufacturer shall warrant the membrane against manufacturing defects and material degradation under outdoor exposure for a period of two years from the date of installation. The manufacturer shall replace at no expense any material which fails from the above causes within the warranty period. The manufacturer shall furnish a written warranty covering the requirements of this paragraph.

1.07 GUARANTEE

- A. The Contractor shall guarantee the HDPE membrane against defects in installation and workmanship for the period of two years commencing with the date of final acceptance. The guarantee shall include the services of qualified service technicians and all materials required for the repairs at no expense to the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General

1. The membrane liner shall be manufactured of new, first-quality products designed and manufactured specifically for the purpose of liquid containment in hydraulic structures, and chemically resistant to leachate.
2. The liner material shall be so produced as to be free of holes, blisters, undispersed raw materials, or any sign of contamination by foreign matter.
3. The lining materials shall be manufactured a minimum 22.0 ft seamless width. Labels on the roll shall identify the thickness, length, width, and manufacturer's mark number.

B. Properties:

1. Material properties shall comply with NSF Standard Number 54, Table 5, Material Properties for High Density Polyethylene (HDPE).

C. Other Materials

1. All welding material shall be of a type recommended and supplied by the manufacturer and shall be delivered in the original sealed containers - each with an indelible label bearing the brand name, manufacturer's mark number, and complete directions as to proper storage and shelf life.

PART 3 - EXECUTION

3.01 SUBBASE PREPARATION

A. General

1. Preparation of the subbase is to be provided by the County.
2. Anchoring of membrane shall be as shown on an approved shop drawing.
3. The earth subgrade will be maintained in a smooth, uniform, and compacted condition during installation of the HDPE membrane.

3.02 PREPARATION AND INSTALLATION OF HDPE MEMBRANE

A. Preparation

1. The HDPE membrane material shall be cleaned of all debris and materials which may negatively affect the performance of the system.

B. Installation

1. Each panel of the HDPE membrane shall be laid out and installed in accordance with the approved shop drawings prepared by the Contractor. The layout shall be designed to keep field joining of the HDPE membrane to a minimum and consistent with proper methods of HDPE membrane installation.
2. The HDPE membrane shall be installed by crews experienced in making lining installation.
3. All membrane shall be anchored as shown on the Drawings and consistent with manufacturer's recommendations.

4. Persons working on the HDPE membrane shall not smoke, wear damaging shoes or involve themselves in any activity that may damage the membrane.
5. All edges of the HDPE membrane shall be properly weighted to avoid uplift due to wind.
6. Traffic across the HDPE membrane shall be minimized, all areas exposed to traffic shall be protected by a minimum of one (1) foot of soil cover.
7. All damage shall be recorded and located in the as-built drawings.
8. The HDPE membrane shall not be placed in excessive winds.

C. HDPE Boots

1. HDPE boots or shrouds shall be furnished and installed where indicated on the Drawings. The boots shall be of the same material as the liner.
2. The liner end of the boots shall terminate in a flare section suitable for welding to the liner. The overlap between the boot and the liner shall be approximately 18 inches. The boot shall be welded to the liner as previously specified herein.

D. Field Seams

1. Individual panels of liner material shall be laid out and overlapped by a minimum of 4-inches prior to welding. Extreme care shall be taken in the preparation of the areas to be welded. The area to be welded shall be cleaned and prepared according to the procedures laid down by the material manufacturer. All sheeting shall be welded together by either of the two processes:
 - a. A homogeneous overlap extrusion process.
 - b. Double track hot wedge process.The composition of any extrudate shall be identical to the lining material.
2. The welding equipment used shall be capable of continuously monitoring and controlling the temperatures and pressures in the zone of contact where the machine is actually fusing the lining material so as to ensure that changes in environmental conditions will not affect the integrity of the weld.
3. No "fish mouths" will be allowed within the seam area. Where "fish mouths" occur, the material shall be cut, overlapped, and a patch fusion weld shall be applied. All welds on completion of the work shall be tightly bonded. Any membrane area showing injury due to excessive scruffing, puncture, or distress from any cause shall be replaced or repaired with an additional piece of HDPE membrane.
4. All seams shall have a seam number that corresponds with the panel numbers. The numbering system shall be used in the development of the as-built drawings. Seam numbers shall be derived from the combination of the two panel numbers that are to be welded together.
5. All fusion welded "T" seams (i.e. the result of geomembrane panels placed perpendicular to each other) shall be double welded. The extrusion process shall be used for the second weld.
6. All extrudate shall be free of dirt, dry and protected from damage.
7. If an extrusion welder is stopped for longer than one minute, it shall be purged to remove heat-degraded extrudate.

8. All fusion welded seams shall extend to the outside edge of panels.
9. All seams that are to be extrusion-welded shall be cleaned of oxidation. This shall be done by using a hand grinder with 80-grit sanding discs. Care will be taken as not to damage the geomembrane.

3.03 FIELD QUALITY CONTROL

- A. A test weld three feet long from each welding machine shall be run twice during each shift and under the same conditions as exist for the liner welding. The test weld shall be marked with date, ambient temperature, and welding machine number. Samples of weld 1/4-inch to 1/2-inch wide shall be cut from the test weld and tested on site in shear and peel in accordance with ASTM D638 Test Methods. Seams shall be stronger than the material. No welder may start work until the sample weld has been approved.
- B. The weld samples shall be submitted to an independent testing laboratory (approved by the Engineer) each day for subsequent testing on laboratory tensometer equipment in accordance with the applicable ASTM Standards. Test results for each days testing shall be verbally submitted to the Engineer by the end of the next working day. Certified test results shall be submitted to the Engineer by noontime of the second working day.
- C. A quality-control technician provided by the membrane manufacturer shall inspect each foot of seam. Any area showing defect shall be marked and repaired in accordance with the manufacturer's repair procedures.
- D. The Contractor shall employ on site non-destructive testing on all welds to ensure watertight homogeneous seams.
 1. Non-destructive testing for the hot wedge weld shall consist of the air pressure test as per manufacturer's recommendations.
 - a. For the air pressure test the maximum allowable leak down air pressure shall not exceed thirteen (13%) percent after fifteen (15) minutes of applied recommended pressure.
 - b. Should failure occur through excessive leak down over the scheduled time period of the air pressure test, check end seals and retest. Should failure reoccur, trim excess overlap from seam and visually inspect fusion area. If rupture is located, patch and test each side of patch. If rupture is not located, then peel tests shall be performed at the beginning and end of the seam to qualify seam strength. If both samples pass, apply vacuum test procedures. If both samples fail, remove seam and replace. Should one sample pass and the other fail, additional samples shall be taken randomly from the seam and peel tested. If either of these fail, remove and replace seam. If both pass, apply vacuum procedures.
 2. Non-destructive testing for all extrusion welds shall be performed by means of a vacuum box test. Vacuum testing shall follow the following procedure:
 - a. A leak indicator spray shall be applied to the section of seam to be tested.

- b. The vacuum box shall be placed over the seam section and a vacuum of at least 8 psi produced within the bell for at least one minute.
 - c. Bubbling of the leak indicator spray indicates a leak that must be repaired and retested.
 - d. The seam shall be approved only after the area tests clear of any leaks.
 - e. Before performing the tests, a detailed vacuum test procedure for welded seams shall be submitted by the Contractor for approval by the County.
3. Vacuum testing will be required in the event of the pressure test failure and on patches, extrusions, penetration joints, and on other areas requiring tests that are not practical to pressure test.

3.04 DISPOSAL OF WASTE MATERIAL

- A. On completion of installation, the Contractor shall dispose of all trash, waste material and equipment used in connection with the work hereunder and shall leave the premises in a neat and acceptable condition.

PART 4 - QUALITY ASSURANCE

4.01 MATERIAL GUARANTEE

- A. The materials supplied under these specifications shall be first quality products designed and manufactured specifically for the purposes of this work as specified herein and which have been satisfactorily demonstrated by prior use to be suitable and durable for such purposes. At the time of bidding prior to furnishing and installing the HDPE membrane, the Contractor shall supply the County with the name of the lining fabricator and shall submit to the County an affidavit from the manufacturer that guarantees that the HDPE membrane material meets the performance requirements specified herein.

4.02 TECHNICAL ASSISTANCE

- A. A representative of the manufacturer shall be present during the entire installation procedure and shall provide technical assistance for the installation and anchoring of the HDPE membrane.

4.03 QUALITY CONTROL PLAN

- A. The Contractor shall prepare a quality control manual as previously outlined in 1.04A7 and complete the documentation included at the end of this section. A copy of each document will be made and kept on file until the project is complete. Upon completion, all copies will be stored in the County's archives for the duration of the warranty.

END OF SECTION

LINER QUALITY CONTROL DOCUMENTATION

Prior to commencing work, the following project personnel shall be identified by name and recorded in the project files:

- Client's Representative (CR)
- Liner Supplier's Site Manager (LSSM)
- Engineer's Field Representative (EFR)
- Engineer's Office Representative (EOR)
- Seaming Machine Technician (SMT)
- Earthwork Contractor's Representative (ECR)
- Laboratory Technician (LT)

Two duplicate project files shall be maintained. One shall be maintained by the EFR and the other shall be maintained by the LSSM. At the end of each work week the files shall be updated and checked to assure that copies of all pertinent project information is included in each file.

Blank copies of the following nine project forms shall be available onsite throughout the duration of the project:

<u>Form No.</u>	<u>Title</u>
1	Startup
2	Liner Pre-Delivery
3	Liner Delivery
4	Daily Checklist
5	Geomembrane Pond Placement
6	Onsite Geomembrane Welding Report
7	Damage and Failure Rempport
8	In-Situ Weld Testing Report
9	Post Installation Checklist

Project Name _____

Project No. _____

FORM NO. 1

START-UP

Date

1. Project start-up meeting held with selected manufacturer/installer.
2. Duplicate project files established.
3. Project personnel recorded.
4. Liner construction drawings accepted.
5. One complete drawing set received onsite.
6. Drawings and specifications log begun by LSSM.
7. Verification that all equipment to be used is operating properly to be signed and placed in file by LSSM.
8. Liner warranty reviewed and accepted by CR.

Project Name _____

Project No. _____

FORM NO. 2

LINER PRE-DELIVERY

Date

1. Certificates of compliance with specifications received by EOR (including resin and factory seams). _____
2. Certificates meet specifications.
- EOR Signature _____
3. - LSSM Signature _____
4. Liner fabrication and installation schedule received by EOR. _____
5. Schedule is accepted as submitted _____
as revised _____
- EOR Signature _____
- ECR Signature _____
6. Liner shop and installation drawings received by EOR. _____
7. Copy of installer's affidavit given him by the manufacturer or supplier received by EOR. _____

Project Name _____

Project No. _____

FORM NO. 3

LINER DELIVERY

ROLL # _____

Date/Time

1. Roll number has been assigned. _____
2. Copy of test results confirming compliance with all applicable specifications delivered with roll. _____
3. Roll visually inspected by EFR and LSSM. _____
4. Checked for agreement with Bill of Lading. _____
5. Bill of Lading signed by LSSM. _____
6. Non-conforming material segregated and tagged "Do Not Use" with explanation for non-compliance, dated and signed by LSSM. _____
7. EFR aware of non-conforming material. _____
8. Roll Accepted _____
Rejected _____
- LSSM Signature _____
- EFR Signature _____

Project Name _____

Project No. _____
Date _____FORM NO. 4DAILY CHECKLIST

	<u>Time</u>
1. Surfaces for liner placement meet specifications:	
- LSSM Signature _____	_____
- EFR Signature _____	_____
2. Optimum seaming process parameters determined based on the following ambient conditions:	
- Temperature _____ °F	_____
- Barometric Atmospheric Pressure _____ in-Hg	_____
- Humidity _____ %	_____
4. Test seams inspected:	
- LSSM Signature _____	_____
- EFR Signature _____	_____
5. All equipment settings and changes recorded by operator and placed in file.	_____
6. Non-destructive tests conducted on all seams.	
- No. of failures: _____	_____
- No. of repairs: _____	_____
- Failure locations marked on liner. _____	_____
- Failure locations recorded in file. _____	_____
- LSSM Signature _____	_____
- EFR Signature _____	_____

Date _____

FORM NO. 4
(Continued)

DAILY CHECKLIST

	<u>Time</u>
7. Destructive testing completed according to specifications.	_____
- No. of failures. _____	_____
- No. of repairs. _____	_____
- Peel and shear test results recorded. _____	_____
- LSSM Signature _____	_____
- EFR Signature _____	_____
8. All SMTs have been thoroughly trained in the use, limitations, adjustment, and repair of each seaming machine.	
- LSSM Signature _____	_____
- Seaming Machine Operator Names:	
_____	_____ to _____
_____	_____ to _____
_____	_____ to _____
_____	_____ to _____
_____	_____ to _____
9. Number of rolls installed. _____	
10. Roll Nos. installed. _____	
11. LSSM Comments: _____	

LSSM Signature _____	

Date _____

FORM NO. 4
(Continued)

DAILY CHECKLIST

Time

12. EFR Comments: _____

- Signature _____

13. No. of additional comment pages attached.

Project Name _____
Project No. _____
Date _____

FORM NO. 5GEOMEMBRANE PANEL PLACEMENT

Panel No.	Roll No.	Subgrade Condition	Length	Width	Visual Inspection Pass/Fail	LSSM Initials	EFR Initials
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
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Comments: _____

ON-SITE GEOMEMBRANE WELDING REPORT

Welding Machine No.: _____ Liner Thickness: _____

[illegible]

Comments: _____

Project Name _____
Project No. _____
Date/Page _____

FORM NO. 7DAMAGE AND FAILURE REPORT

Panel No.	Seam No.	Location of Repair or Damage	Type of Damage	Inspec. Date	LSSM Initials	EFR Initials
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Comments: _____

Project Name _____
Project No. _____

FORM NO. 9

POST-INSTALLATION CHECKLIST

PRIMARY _____ SECONDARY _____

_____ Date _____

1. Measurements of installed liner conducted by LSSM and EFR. _____
 2. No. of deviations from design drawings:
No. _____
 3. Deviations acceptable and as-built drawings modified accordingly (No. ____).
 4. Deviations unacceptable and liner installation corrected (No. ____).
- ESSM Signature _____
- EFR Signature _____

TECHNICAL APPENDIX G

TECHNICAL APPENDIX G
LEACHATE DEPTH CALCULATIONS

REFERENCE: EPA SW-869 APRIL 1983, LANDFILL AND SURFACE IMPOUNDMENT
PERFORMANCE EVALUATION

For a liner system designed w/a slope α ;

$$h_{\max} = \frac{L}{2N} \left[\sqrt{\frac{e}{K_s} + \tan^2 \alpha} - \tan \alpha \right]$$

where: L = Length of spacing between drainlines

N = Porosity

Ks = Permeability

e = Rate of Impingement
(use 1/2 x average annual rainfall)

α = Slope

$h_{\max}$ = Maximum head

Assume:

Porosity = N = 0.34

Permeability = $K_{s1} = 7.76 \times 10^{-3}$ cm/s, 22 ft./day

Rate of Impingement = e = 1/2 of 53.95 in/yr

= 2.20×10^{-6} cm/sec

Slope = $\alpha = 2\% = 1.146^\circ$

$h_{\max} = 12" = 30.48$ cm

Calculation:

$$30.48 = \frac{L}{2(0.34)} \left[\sqrt{\frac{2.20 \times 10^{-6}}{7.76 \times 10^{-3}} + \tan^2(1.146)} - \tan(1.146) \right]$$

$$30.48 = \frac{L}{2(0.34)} [0.00614]$$

$3371_{cm} = L = 110'$ maximum spacing between drainlines

USE 2% SLOPE W/100' PIPE SPACING

NOTE: 53.95" Avg. Annual Rainfall for Brooksville, 1950-80

ATTACHMENT 1

PLANS

ATTACHMENT 2

SOILS AND GEOTECHNICAL REPORT

SUMMARY REPORT
GEOTECHNICAL/HYDROGEOLOGIC STUDY
PROPOSED CLASS I SANITARY/ASH
LANDFILL SITE - HAYS ROAD
PASCO COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

MEMBER

Associated Soil and Foundation Engineers, Inc.
American Consulting Engineers Council
National Society of Professional Engineers
Florida Institute of Consulting Engineers
American Society for Testing and Materials
American Concrete Institute

6313 Benjamin Road, Suite 101, Tampa, Florida 33614 ■ Telephone (813) 886-1075

JAMMAL & ASSOCIATES, INC. Consulting Engineers

April 17, 1987
Project No. 85-30267

TO: Camp, Dresser, & McKee, Inc.
1321 U.S. 19 South, Suite 601
Clearwater, Florida 33546

Attention: Mr. Lou Tortora, P.E.

SUBJECT: SUMMARY REPORT
Geotechnical/Hydrogeologic Study
Proposed Class I Sanitary/Ash
Landfill Site - Hays Road
Pasco County, Florida

Dear Mr. Tortora:

Please find enclosed herein our summary report which includes the results of our geotechnical/hydrogeologic study of the proposed Class I sanitary/ash landfill site off of Hays Road in northwest Pasco County.

Thank you for this opportunity to be of service to you and Pasco County on this significant and challenging project. If you have any questions during your review of the report, please do not hesitate to give either Mr. S.E. Jammal or myself a call.

Sincerely,

JAMMAL & ASSOCIATES, INC.

Richard A. Mortensen
Richard A. Mortensen, P.E. *gm*
Vice President

S.E. Jammal
S. E. Jammal, P.E. *gm*
President

RAM/bp:1498M

Attachment: Summary Report

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 - Dated: 9-6-86 (Sheet 12)
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 - Dated: 11-13-86 (Sheet 13)

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Appendix F

- USDA GPR Letters and Our Response Letter



1.0 INTRODUCTION

1.1 Purpose and Scope of Geotechnical and Hydrogeologic Study

The primary purpose of our geotechnical/hydrogeologic study over the selected or proposed landfill site (Hays Road Site) was to address some of the permitting requirements set forth in Chapters 17-4 and 17-7 of the Florida Administrative Code (F.A.C.) relating to the geotechnical and hydrogeological aspects of implementation of a Class I sanitary/ash landfill. In addition, because of the site's topographic, geologic and hydrogeologic conditions, it was our intention to address in detail the future potential for sinkhole activity over the project site and to discuss soils and groundwater data relevant to this phenomenon.

Our initial study or evaluation of the Hays Road site was submitted to Camp, Dresser & McKee, Inc. in our report dated August 17, 1985 (Project No. 86-30225). In that report four (4) potential landfill sites were investigated, three in northwest Pasco County and one in eastern Pasco County. The results suggested that the Hays Road site was the most favorable of the three sites in northwest Pasco County for implementation of a sanitary/ash landfill, in terms of the geologic and hydrogeologic conditions and implications. The results of our preliminary study were based on our review of available literature, topographic, geologic and hydrogeologic maps of the site, and a very limited test boring program.

The primary objectives of our final level evaluation of the Hays Road site, as presented herein, was to collect adequate subsurface soil and groundwater information over the project site in order to provide geotechnical and hydrogeologic input and recommendations in each of the following areas:

1. Identify favorable areas over the project site for implementation of a sanitary/ash landfill.
2. Identify favorable areas on-site for acquisition of daily sand cover material.



3. Identify favorable areas on-site for implementation of the stormwater management disposal system.
4. Identify and evaluate the soil stratigraphy and upper limestone conditions over the project site. Determine and evaluate the thickness, integrity and permeability of the semi-confining clayey unit separating the shallow watertable aquifer from the deeper Floridan Aquifer. Identify areas of favorable and unfavorable semi-confining unit conditions.
5. Identify and evaluate the groundwater conditions, flow directions and gradients over the project site. Identify and evaluate the potentiometric levels of the Floridan Aquifer. Discuss Floridan Aquifer recharge potential over the project site. Discuss groundwater considerations relating to the design and construction of the landfill.
6. Determine and evaluate the compressibility characteristics of the subsurface materials in order to address the settlement potential and magnitudes of the landfill mass under the anticipated landfill heights.
7. Discuss and evaluate the ground penetrating radar (GPR) data collected over the project site by the United States Department of Agriculture (USDA). Discuss the impacts of this data on the project and the corresponding ground truth test boring results, specifically drilled in GPR concern areas identified by USDA.
8. Discuss final clayey cover material considerations, on-site sources and implications, and potential off-site needs.
9. Evaluate and discuss the potential for future sinkhole activity over the proposed landfill site. Discuss the potential risks of future sinkhole activity. Discuss potential sinkhole sizes and depths. Discuss, in general, sinkhole related processes and mechanisms.



10. Perform a literature well inventory within a 2 mile radius of the project site, considering data collected from the Southwest Florida Water Management District (SWFWMD) and the United States Geological Survey (USGS).
11. Generate and design the necessary groundwater quality monitoring well network for the proposed landfill facility in general accordance with Chapter 17-4. Provide proposed groundwater monitoring well construction details.

1.2 Project Description and Location

The proposed sanitary/ash landfill site studied herein is shown located on the Pasco County Site Location Map included on Sheet 1. On Sheet 1 the proposed landfill site is shown with respect to local county roads, existing wellfields in Pasco County, and location with respect to township, section and range. The area studied herein encompasses approximately 810 acres and has been termed the Hays Road Site.

We understand that it is proposed to develop the favorable portions of the site studied herein into a Class I sanitary/ash landfill. It is anticipated that, adjacent to or just south of the landfill, a resource recovery plant will be constructed. It is anticipated that both raw refuse and ash generated from the resource recovery plant will be disposed of at the proposed landfill site. Because of the physiographic setting of the site a lined landfill is anticipated. The landfill height is anticipated on the order of 75 to 100 feet.

1.3 Topography and Site Description

The project site is shown located on recent aerial topographic maps prepared for our use by Camp, Dresser & McKee, Inc. The scale of these aerial topographic maps is 1"=200'. The aerial topographic maps are included as Sheets 2, 3 and 4. The topographic maps present approximately one foot ground elevation contour intervals over the entire project site. The site boundaries are also shown located on the maps.



In general, the ground surface over the project site varies from low elevations in the vicinity of +35 feet MSL to higher elevations on the order of +55 feet MSL. Over the southwestern and western portions of the site, and also in the northeastern portions of the site, several closed circular depressional areas are present and evident on the site aerial topographic map. Over the southeastern and central portions of the project site, the ground elevations are, in general, fairly consistent, varying from +45 to +52 feet MSL. In general, over the southeastern and central portions of the site, no significant depressional areas are evident.

In the northern portion of the project site, a relict drainage ditch is present, as evident on the aerials. This ditch varies from approximately 5 to 8 feet lower than the surrounding grade on either side of the ditch. It appears, based on visual observations of the ditch, that it has been dry for a considerable length of time. During our study of the project site, no water was observed in this ditch. In any event, this feature is very distinct and is evident on nearly all maps of the site.

A Florida Power Corporation easement, approximately 295 feet wide, runs generally north-south through the entire project site. The easement is identifiable on the aerial topographic maps (Sheets 2-4). A small outparcel that includes the Florida Power Substation is located on the south end of the site, just off Hays Road.

At the time of our field investigation, the majority of the project site, which was formerly a pine tree farm, was cleared by the previous landowner of nearly all the pine trees. Some pine trees remain in the northeastern portion of the site, as evident on the aerials. Over the majority of the site east of the power easement, generally underbrush, weed growth, and tree trunks are present. West of the Florida Power easement, in general, the site is near its natural state, which primarily consists of sparse to moderate tree growth and underbrush.

In the southwestern portion of the project site, west of the Florida Power easement, several of the closed circular depressional areas contain standing water. These depressional areas and water elevations are identifiable on the topographic maps provided on Sheets 2-4.



In the northern portion of the site, a concrete block house-like structure is present and is somewhat visible on the aerial topographic map. Near this structure an old deep water well is present. No information was available about this well. Aside from this abandoned structure, it does not appear that the site was developed for other purposes, other than tree farming or pastureland.

2.0 REGIONAL GEOLOGY AND HYDROGEOLOGY

2.1 Physiographic Setting

The proposed Pasco County landfill site is located within the Gulf Coastal Lowlands physiographic province along the west coast of Florida. In this portion of Pasco County, the Gulf Coastal Lowlands province is bounded on the east by the Brooksville Ridge, a distinct north-south trending sand ridge reaching altitudes of about 300 feet above mean sea level (MSL). To the west of the ridge, land surface elevations decline to MSL along the gulf coast. Two major erosional terraces, the Pamlico Terrace and the Wicomico Terrace, occur between the Brooksville Ridge and the coast. The Wicomico Terrace is marked on its seaward face by a break in land surface slope at an altitude of around +100 feet MSL. Farther west, a distinct break in slope again occurs, at an altitude of +25 feet MSL, delineating the seaward scarp of the Pamlico Terrace. The proposed Pasco County landfill site is situated within the Pamlico Terrace, westward from the Wicomico scarp.

The project site is situated in a relatively flat section of the Pamlico Terrace. More rugged topography with greater local relief occurs to the east and northeast. Relief within the project site ranges from about 20 to 30 feet in the southwestern portion and about 10 feet throughout the remainder of the project area.

Numerous lakes and ponds exist to the south of the proposed landfill site. This area is drained primarily by Buckhorn Creek and the Pithlachascotee River. The major surface water feature in the vicinity of the project site is Crews Lake, a linear, northeast-trending lake located about 1.5 miles to the east.



2.2 Regional Geology

The principal geologic formations in Pasco County are comprised primarily of a thick sequence of limestones and dolostones. The uppermost limestone formation identified in northwest Pasco County is the Tampa Limestone, or in areas where the Tampa is not present, the Suwannee Limestone.

The surface of the limestones is mantled throughout the county by interbedded deposits of sand and clay which may range in thickness up to as much as 250 feet within Pasco County. The lower portion of the sand and clay deposits in Pasco County are generally assigned to the Hawthorn Formation, a deposit comprised primarily of clays. According to available data, the Hawthorn Formation is absent in areas north of Pasco County, is relatively thin in the eastern portion of the county, and thickens appreciably to the south towards Tampa Bay. The Hawthorn Formation is overlain by deposits of quartz sand which form the present land surface.

A brief description of the various geologic and hydrogeologic units and their stratigraphic position within Pasco County is presented on Tables 1 and 2. The table does not differentiate the Hawthorn Formation from the contemporaneous deposits of the Tampa Limestone, owing to the similar lithology of each unit. That differentiation is made, as shown on the geologic cross section presented on Figures 1 and 2. An interpretation of geologic formations serving as the basis for the cross-section is presented on Tables 1 and 2.

2.3 Groundwater Systems

Two distinct water-bearing geologic units, or aquifers, able to supply economical quantities of water to wells occur within the western portion of Pasco County. The uppermost of the two is the water table aquifer, comprised of the permeable portions of the unconsolidated deposits overlying the limestones. The limestone formations are generally considered to form the skeleton of the deeper Floridan Aquifer, an artesian and sometimes unconfined aquifer system which underlies most of central Florida.



The water table aquifer is recharged primarily by precipitation and subsequent infiltration to the saturated zone. Water is discharged from the aquifer by evapotranspiration, seepage to lakes and streams and by vertical leakance to underlying aquifers.

The water table aquifer is apparently relatively thin in western Pasco County and according to some studies may be absent or discontinuous in some areas. The transmissivity, or ability to transmit water, of the water table aquifer is dependent upon the permeability of the aquifer deposits and the saturated thickness. In areas where the surficial sand deposits are thin, the transmissivity of the unit typically is comparatively less than in areas where the deposits are thicker.

The upper water table aquifer in western Pasco County is seldom used for a water supply source primarily because deeper aquifers supply greater quantities of better quality water to wells. Consequently, hydraulic characteristics of the water table aquifer are not well documented in Pasco County.

The regionally extensive Floridan Aquifer is the main water supply source throughout most of Florida. In Pasco County, the Floridan Aquifer is considered to consist of the Miocene, Oligocene and Eocene age rocks, primarily limestones and dolostones. As shown on the geologic cross-section (Figure 2), the top of the Floridan Aquifer in Pasco County is represented by either the Miocene Tampa Limestone or the Oligocene Suwannee Limestone. According to some studies, the top of the Floridan Aquifer occurs at an altitude of near mean sea level in northwest Pasco County. The aquifer becomes progressively more deeply buried beneath the surficial clastic deposits with distance southward. The increasing depth to the top of the Floridan Aquifer in the southerly direction reflects the regional dip of the upper Eocene and younger beds from the axis of the Ocala Uplift farther to the north.

Groundwater flow in the Floridan Aquifer in Pasco County moves generally westward towards the Gulf of Mexico from the well known "Pasco High" centered in the eastern part of the county. The "Pasco High" represents an area of highest altitude of the potentiometric surface of the Floridan Aquifer. The elevation of the potentiometric surface in this area is generally about



+80 to +90 feet MSL. Groundwater moves from the "Pasco High" downgradient to discharge areas along the gulf coast. The elevation of the potentiometric surface is generally less than +10 feet MSL along the coast. The general westward flow is locally perturbed by discharge from numerous springs situated near the coast. Larger springs, such as Weeki Wachee, discharge copious quantities of groundwater from the Floridan Aquifer. Smaller springs and local seepage areas discharge water from the aquifer as base flow to the river drainage systems in southern Pasco County. A recent potentiometric surface of the upper Floridan Aquifer map, showing the site location, levels and regional flow directions, is included on Plate 2 in Appendix A.

Based on available publications, the transmissivity of the Floridan Aquifer in this area of Pasco County is highly variable; varying from about 40,000 to 130,000 ft.²/day. The natural leakance rate through the semi-confining clayey unit in this area of Pasco County, in general, varies from about 5×10^{-3} to 5×10^{-4} /day⁻¹. Based on the map on Plate 2 in Appendix A, the potentiometric surface of the Floridan Aquifer in September 1986 in the general site vicinity of the proposed landfill was on the order of about +35 to +37 feet MSL.

2.4 General Sinkhole Related Processes and Mechanisms

Sinkholes in Florida are the result of the geologic and hydrologic setting of the Florida Peninsula. The entire state is underlain to various depths with limestones and dolostones which are susceptible to dissolution from groundwater. Depending on factors such as the extent of dissolution, depth from land surface to the top of limestone, the hydrogeology of the area, the extent of recharge to the limestone from unconsolidated sediments that overlie the limestone, and the amount of circulation within the limestone, sinkholes may be experienced to varying degrees of frequency and severity. The extent of the sinkhole occurrence, then, depends on the particular geologic and hydrogeologic conditions of the area in question.

Where extensive subsurface chemical weathering and dissolution of limestone has taken place during geologic times, a reduction of subsurface limestones has slowly occurred, resulting in



downward movement or deformation of the surface of the ground. Where such solution becomes a dominant process in land development it results in the production of a unique type of topography that is commonly referred to or described as Karst topography. Karst is a comprehensive term applied to areas underlain by water soluble rocks such as dolostones. These areas possess a topography particular to and dependent upon underground solution activity and the diversion of surface waters to the underground. Karst topography is abundant within the central portion of the State of Florida and is particularly evident within the western-central Gulf Coast counties.

The geologic and hydrogeologic conditions that are a prerequisite for the optimum development of Karst may be summarized as follows:

- 1) Soluble limestone at or near ground surface,
- 2) The limestone should be dense, highly jointed, and thin bedded,
- 3) Major entrenched valleys exist in a position such that groundwater can emerge into surface streams,
- 4) The region should have a moderate to abundant rainfall.

Subsidence (including sinkholes) in faulted recharge areas is common where the features listed below are prevalent. No one feature is mandatory, but the greater number present, the greater the subsidence susceptibility.

- 1) shallow, flat-lying aquifers encompassing large areas,
- 2) seasonal fluid level fluctuations (e.g. piezometric levels),
- 3) Pliocene or younger bedding,
- 4) clay interbeds,
- 5) fine grained aquifers,



- 6) groundwaters contain low chloride and carbonate levels, and/or are acidic,
- 7) near surface solution and erosion of underlying limestone,
- 8) little dolomitization of the limestones, and
- 9) topography diverts infiltration towards the faults.

By comparison, faulted areas with poor subsidence susceptibility,

- 1) contain significant cementation of the intergranular structure and/or a high degree of sand packing, hence low porosity and permeability.
- 2) may have experienced preconsolidation from a previous period of deep burial, or
- 3) experience little solution activity.

In northern and central Florida sinkholes have resulted from numerous breaches in the confining beds overlying the artesian aquifers. Thus, water is free to move downward to these aquifers through fractures and the permeable sand bottoms of sinkholes (if the watertable is higher than the potentiometric surface). This is the primary method of recharge. Where the water table is considerably higher than the potentiometric surface, recharge may also be accomplished by slow percolation through low permeability beds. The infiltrating recharge waters are especially active in areas where clastics typically overlying the Tertiary limestones were never deposited, have been stripped away, or are relatively thin. Researchers indicate that initial flow causes pronounced solution particularly in the upper zones, because of the shorter flow lines involved, greater circulation, and higher reactive ion concentrations.

Potentiometric surface maps have been prepared by the Florida Department of Natural Resources (and local SWFWMD) to determine areas of recharge, discharge, and direction and rate of groundwater movement. Groundwater moves from high pressure to



low pressure zones in a direction perpendicular to the pressure contour lines. Potentiometric mounds, (referred to as "highs"), usually indicate areas of recharge to the aquifer. Potentiometric depressions or troughs, (referred to as "lows"), usually indicate areas of discharge from the aquifer. Recharge and discharge thus may take place anywhere from the high to the low where hydrogeologic conditions are favorable. Thus, there is no single point of recharge or discharge.

Groundwater in the central part of Florida moves outward in all directions under the influence of an elongated potentiometric high which extends approximately from central Lake County to southern Highlands County. This is generally referred to as the "Polk high". A smaller potentiometric high in Pasco County, commonly referred to as the "Pasco high", is also recognized. Water entering the aquifer in central Florida in general, is less mineralized than water already in the aquifer. Water entering is low in mineral content because the overlying sands and clays generally are less soluble than the limestones of the Floridan Aquifer. Therefore, in recharge areas the mineral content of the water should increase as the water moves through the aquifer until it becomes saturated with calcium and bicarbonate. Using only the mineral content to indicate areas of recharge could be misleading because water entering the aquifer in some areas could be more highly charged with carbon dioxide than in other areas.

A review of the literature indicates lack of consensus or uniformity in classifying sinkholes. Basically, however, there are two major types or classes of sinkholes, namely; a collapse sinkhole and a ravelled sinkhole. Sinkholes in Florida fall in both of the above classes, however, ravelled sinkholes are the most common, and typical in Pasco County as well as surrounding areas.

A collapse sinkhole is the result of collapse of the roof of a cavity within the limestone. This collapse is followed by a drop down of the overlying unconsolidated sediments which were supported by the limestone roof. Collapse sinkholes are normally steep sided, rocky and abruptly descending forms. This implies a structural break or collapse of the limestone and, hence, is referred to as a "collapse sinkhole". There is wide acceptance of the usage of collapse sinkhole to suggest this type of sinkhole and mechanism. Figure 3 is an illustration of the collapse sinkhole type and mechanism.



A raveling sinkhole is often referred to as a solution sink, erosion sink, soil condition sink and less frequently, doline sink. This type of sinkhole originates within limestones containing openings or cavities at the interface of the limestone and the overlying unconsolidated sediments. This type of sinkhole initially develops slowly where soil from the overburden materials gradually erode into openings present within the limestone. Slow, long-term, continual erosion and raveling of soil materials into the limestone, develop a cavity or a dome within the overburden, which, under favorable hydrogeologic conditions, can continue to enlarge and work upward towards land surface. The action of water percolating downward to the limestone enhances the development of such a dome within the unconsolidated sediments. As the dome or cavity within the unconsolidated material enlarges, a point is reached where the soil which overlies the dome can no longer bridge the opening, and, under favorable conditions, the material above begins to collapse and fall into the underlying opening. Figure 4 is an illustration of the mechanism of a ravelled sinkhole. Ravelled sinkholes range from funnel shaped depressions that open upward to pan or bowl shaped.

Ravelled sinkholes are formed in environments with some or all of the following physical characteristics:

- o Limestones which contain openings and are overlain by unconsolidated sediments. Overburden sediments may range from a few feet to 150 feet in thickness.
- o Cavity systems must be present in the limestone and must extend upward to be in contact with overlying sediments.
- o The elevation of the water table must be higher than the potentiometric surface elevation of the Floridan Aquifer.
- o There must be breaching of the limestone into the cavernous zone creating a point of high recharge to the artesian aquifer.
- o There must be a sufficiently large cavity or opening within the limestone capable of receiving the eroded unconsolidated materials from above.



It has been established that sinkholes, as experienced in Florida, are the result of geologic and hydrogeologic processes. The relationship of these processes to the formation of sinkholes has received some appreciable attention in the past recent years and the State of Florida has been mapped for areas with varying degrees of sinkhole potential. Four zones varying from very little to no risk in terms of sinkhole potential to high risk areas of sinkhole potential have been delineated, as illustrated on Figure 5. This figure was adapted from information published by the Florida Bureau of Geology. It can provide a qualitative and meaningful early comparative indication of the potential for sinkhole development for various geographic regions of the State and can be used as an early guide in the formulation of a sinkhole potential opinion. An assessment of the site specific sinkhole potential is provided later in the report.

3.0 FIELD AND LABORATORY INVESTIGATION

3.1 Test Drilling Program

As previously mentioned, during the preliminary evaluation of the Hays Road site, thirteen (13) Standard Penetration Test (SPT) borings were advanced to the limestone level over the project site in order to obtain, in general, adequate site coverage. These test borings are designated "B". The approximate locations of these thirteen (13) test borings are included on the boring location plan presented on Sheets 2-4. These thirteen (13) borings are the only test borings that were not surveyed-in, in terms of location and ground elevation. These boring locations are shown approximately on the boring location plans.

For our final level study of the Hays Road site, the test drilling program basically was broken down into two phases. Phase I consisted of drilling SPT borings down to the limestone level on a grid system. In general, the Phase I borings were spaced approximately 800 feet apart over the site, and as close as 400 feet apart in the area that was anticipated to be the primary location of the landfill.



For the Phase I drilling program, fifty-seven (57) SPT test borings were drilled to the limestone level. The approximate locations of these borings as surveyed-in by the project surveyor, Atwood and Associates, Inc., are shown on Sheets 2-4. At each of the the fifty-seven (57) Phase I test boring locations, a shallow 2-inch diameter PVC pipe, hacksaw cut screen, piezometer was installed in a auger borehole that was advanced adjacent to the SPT boring location. This temporary piezometer was installed to measure shallow groundwater levels during our study. These shallow piezometers were, in nearly all instances, installed to a depth just above the first clayey material layer.

During the Phase II test boring program, an additional eighteen (18) SPT borings were drilled at selected and surveyed-in locations indicated on Sheets 2-4. These eighteen (18) test borings, as will be discussed later, were drilled in areas identified as suspect anomaly locations by USDA considering their interpretation of the ground penetrating radar (GPR) survey. In addition, during the Phase II drilling program, four (4) SPT borings were drilled to the limestone level at the four (4) deep groundwater monitoring well locations selected during our study.

In general, the designation of the borings drilled during the Phase I and II test boring programs correspond to the coordinate of the grid system that we established over the project site. Upon completion of all the SPT borings that encountered clayey material and/or the limestone bedrock surface, the borehole was grouted up to the ground surface upon completion, in accordance with SWFWMD requirements. In general, all the SPT borings were performed in general accordance with ASTM D-1586. All the test borings performed on this project were performed using men and drill rigs from the Tampa Regional Office of Jammal & Associates, Inc. A degreed geologist was utilized in the field with the drill crews to coordinate field operations and to log the test borings.

At selected locations in several of the test borings, relatively undisturbed Shelby tube samples were collected of the semi-confining clayey unit material. Approximately 3-inch diameter Shelby tube samples were collected, at the approximate locations indicated on the soil profiles.



The results of all the test borings performed during the preliminary study and Phase I and II program are shown illustrated as soil profiles on Sheets 5-11. All the test borings are plotted according to ground elevation as determined by the project surveyor, with the exception of the thirteen (13) preliminary study test borings, which were estimated. Pertinent drilling notes are also included along the soil boring profiles.

3.2 Ground Penetrating Radar (GPR) Survey

At the request of Pasco County and Camp, Dresser & McKee, Inc., the United States Department of Agriculture (USDA) was retained to perform a ground penetrating radar (GPR) survey over the proposed Hays Road landfill site. The initial GPR survey was conducted by USDA at the project site on May 29, 1986, with observation from Jammal & Associates, Inc. The GPR survey grid lines are shown on the boring location plans and aerial topographic maps included on Sheets 2-4. Heavy dashed lines indicate the path of the GPR survey. The GPR survey lines were established by Jammal & Associates, Inc. Approximately 39,800 lineal feet of GPR survey testing was performed over the project site, (approximately 7.5 miles).

After the initial GPR testing results were reviewed and discussed, it was decided by all parties concerned to utilize the GPR equipment in locating selected and specific potential anomaly or concern locations in the field to be test drilled during the Phase II field program. Therefore, on October 3, 1986, the GPR equipment was brought back to the site to locate approximately eighteen (18) potential anomaly locations, for ground truth testing purposes. All eighteen (18) of the potential anomaly locations were test drilled during the Phase II drilling program. The potential anomaly drilling locations were selected by the soil scientist, Mr. Gregg Schellentrager, interpreting the GPR data for USDA. The term "anomaly" as discussed herein and defined by Webster's Dictionary refers to something that is different, abnormal or peculiar. An "anomaly" does not necessarily have an adverse impact on the proposed landfill.



Tape results of the initial GPR testing performed along the grid lines illustrated on Sheets 2-4, are available for review upon request from the USDA/SCS office in Gainesville, Florida. The specific results at the eighteen (18) suspect anomaly locations selected by USDA, are included in Appendix C. On each of the eighteen (18) plates included in Appendix C is a copy of the initial GPR survey result that was collected on May 29, 1986, at a fast speed, and also the GPR result from the October 3, 1986 survey that was conducted at a somewhat slower speed to more accurately locate and define the suspect anomaly. Also on each plate is the resulting Phase II ground truth test boring. The test results included in Appendix C are discussed later in this report.

3.3 Installation of Groundwater Monitoring Wells

To assist in evaluating the groundwater levels over the project site, four (4) deep groundwater monitoring wells and four (4) shallow groundwater monitoring wells were installed at the approximate locations indicated on Sheets 2-4. In general, the four (4) deep groundwater monitoring wells were sealed several feet within the limestone surface and were open-hole drilled into the limestone. In general, the shallow groundwater monitoring wells were installed just above the semi-confining clayey materials at each of the shallow well locations. In general, the groundwater monitoring well locations, which basically consist of four (4) well pairs, each with a shallow and a deep groundwater monitoring well, were selected to obtain adequate site coverage and are located, in general, near the perimeter of the project site.

The monitoring wells that were installed for our study were positioned in the field at the approximate locations approved by Camp, Dresser & McKee, Inc. and The Department of Environmental Regulation (DER), specifically, Mr. Gardner Strasser. The intent of these well locations was to utilize them as part of the permanent groundwater monitoring plan for the landfill. The well construction details for each of the shallow and deep monitoring wells installed for this study are included in Appendix E, on Plates 2-5. In addition, on each of these plates the corresponding soil boring profile from the test boring performed at the deep well location is also illustrated. The well construction details were approved by DER prior to well installation. Upon completion of each well,



it was developed by pumping and/or air surging until the water produced was reasonably clear and clean. Ground elevations were determined at each well location by the project surveyor, Atwood and Associates, Inc.

3.4 Soil Physical Property Testing and Classification

To assist in visual classification of the soil samples and evaluating soil engineering properties relevant to our study, a series of full grain size analyses, minus No. 200 sieve washes, and liquid and plastic limit tests were conducted. The results of all these tests are included on the soil profiles on Sheets 5-11. The grain size distribution curves are included in Appendix B. The soil samples were classified utilizing procedures in general accordance with the Unified Soil Classification System. The soils were grouped into different strata according to the soil legend included on the soil profile sheets.

The strata break lines included on the soil profiles represent approximate boundaries between different soil or rock material types. The actual transition between soil or rock conditions not considered important to our evaluations were abbreviated or omitted for clarity.

3.5 Consolidation and Permeability Testing

In order to evaluate the consolidation potential of the subsurface clayey deposits under the anticipated landfill heights and loadings, it was necessary to perform a limited amount of consolidation tests. Selected 3-inch diameter Shelby tube samples of the clayey confining unit materials were utilized for consolidation testing. The approximate location of each of the eight (8) consolidation tests that were performed are shown at the appropriate sample depth on the soil profiles. In general, we believe that the consolidation tests are spread adequately over the proposed landfill area and represent the more plastic clayey materials that could exhibit significant consolidation settlement. The consolidation test curves are included in Appendix B. The physical soil properties of each consolidation sample are also included on



the consolidation test curve result in Appendix B. The consolidation test results were utilized in our settlement evaluation discussed later.

In order to evaluate the permeability of the semi-confining clayey unit material over the proposed landfill site, some of the Shelby tube samples of the clayey material were selected for permeability testing. The permeability testing was conducted utilizing falling head testing techniques on a sample cut into a consolidometer. The sample was loaded to the approximate insitu effective overburden pressure. The results of the permeability tests are included at the appropriate depth on the soil profiles. Because the permeability tests were conducted on the clayey sample that was utilized for consolidation testing, the permeability test result is also included on the consolidation test curve result included in Appendix B. The results of the permeability testing of the semi-confining clayey unit materials will be discussed later in this report.

4.0 SITE SPECIFIC SUBSURFACE CONDITIONS

4.1 Soil Stratigraphy

As previously mentioned, the results of the soil borings are presented as soil profiles on Sheets 5-11. Also included on the soil profile sheets are the results of the laboratory testing of selected physical properties of selected soil types. In addition, pertinent drilling notes relevant to our study and evaluation are also included on the soil profiles. Standard Penetration Test "N" values and a legend which describes the soils encountered and the Unified Soil Classification designation are included on the soil profile sheets.

In general, the soil materials over the project site consist of a varying thickness of sandy material (Strata 3, 4, 5 and 6) overlying clayey materials of varying thickness and consistency (Strata 2, 7, 8 and 9), which in turn overlie either significantly weathered upper limestone material with clay (Stratum 10) or the more intact weathered limestone materials (Stratum 11).



The upper sandy materials of Strata 3, 4, and 5 generally contain less than 10% fines passing the No. 200 sieve. Strata 3 and 4 materials are the lighter colored sands at the project site and vary from fine sand to slightly silty fine sand. Strata 5 is comprised of the dark brown slightly silty fine sands to silty fine sands. Stratum 5 has the appearance of some organic staining. In general, the upper fine sands (Strata 3, 4, and 5) vary in thickness and in depth considerably depending on the location on-site. The thickness of the upper sands varies from as little as 1 to 2 feet to as deep as 70 to 90 feet. The grainsize analysis results indicate that the upper fine sands are poorly graded with low fines content (clay and silt fraction). In general, over the project site, the topsoil materials are on the order of 1 foot thick and are basically either Stratum 1, which is black organic debris, or Stratum 3, which is gray slightly silty fine sand with traces of roots.

In general, the upper fine sands (Strata 3, 4, and 5) vary in relative density from loose to medium dense. Some very loose zones (SPT "N" values of less than 4) were indicated in a few borings. Some drilling fluid circulation was lost in a few of the test borings within the upper sand strata, indicating zones of secondary permeability. The locations of the drilling fluid circulation losses are indicated at the appropriate depth on the soil profiles. The significance of the drilling fluid circulation losses is discussed later.

Beneath the fine sands of Strata 3, 4, and 5, slightly clayey sands to clayey sand materials of Strata 6 and 7 were generally encountered. These materials are generally the transition materials from the upper sands to the lower more plastic clayey materials. The thickness and presence of the Strata 6 and 7 materials varies considerably over the project site. In most borings, these materials are absent. The results of laboratory tests on selected Strata 6 and 7 soil samples are included on the soil profiles or in Appendix B. In general, the materials of Strata 6 have generally between 10% and 20% fines, and the materials of Strata 7 have generally less than 35% fines, passing the No. 200 sieve. The results of liquid and plastic limit tests performed on the more clayey materials of Stratum 7 indicate that the clayey sands are of low plasticity.



Either beneath the sandy materials of Strata 3, 4, and 5 or beneath the slightly clayey sand materials of Strata 6 and 7, the more plastic clayey materials of Strata 8 and 9 are present. Both of these materials are classified as sandy clay to clay and exhibit, in general, moderate to high plasticity. The difference between Strata 8 and 9 materials is essentially coloring, with Stratum 8 being more of a mottled colored material and Stratum 9 being more of a pure greenish-gray to green clayey material. The depth, thickness and presence of the clayey materials of Strata 8 and 9 are highlighted on the soil profiles on Sheets 5-11. These materials are shaded in for easy identification purposes. At several of the boring locations, a dark gray to black silty to sandy clay (Stratum 2) material was encountered. This material is also a moderately to highly plastic clay; however, it was noticeably black and organic-stained. The clayey materials of Strata 8 and 9 and the darker colored clays of Stratum 2 are, in our opinion, the major components of the semi-confining unit clayey material which underlies the project site. In all but a few of the test borings, the clayey materials of Strata 8 and 9 were discovered.

Based on the results of liquid and plastic limit tests performed on selected Strata 8 and 9 materials, the plasticity of these materials varies significantly from moderately to extremely plastic. In general, liquid limit values of the Strata 8 and 9 materials varied from 50% to 150%; in general, the liquid limit was in the vicinity of 80% to 120%. Minus No. 200 sieve washes indicate that the fines content of the Strata 8 and 9 material was generally in excess of 50%. In general, the natural moisture content of the Strata 8 and 9 materials is in excess of the plastic limit.

Based on SPT "N" values, in general, the consistency of the cohesive materials of Strata 8 and 9 varies from stiff to very stiff. Several very loose and soft zones were identified and are indicated on the soil profiles. In general, these locations correspond to zones that displayed either "WH", "WR" or "WK" drilling notations. In these zones, either the weight of the drill rod (WR), weight of the rod plus the hammer (WH) or the weight of the rod plus kelly (WK) fell under its own weight because of the extremely soft or loose clayey conditions. At some locations identified on the soil profiles, drilling fluid circulation losses were experienced while drilling through these soft clayey materials.



Observing some of the clayey samples taken from the soil borings classified as Strata 8 or 9, it was evident that seams of sand and zones of secondary seepage were present. Thin hairline seams and lines of iron or rust color were evident in most of the clayey samples observed from Strata 8 and 9. These zones indicate that water is probably very slowly moving down through some discontinuities in the clayey materials.

As previously mentioned, significant consolidation testing and vertical permeability testing was performed on selected clayey samples from Strata 8 and 9. The results of these tests are included in Appendix B.

Beneath the clayey materials of Strata 8 and 9, in general, highly weathered limestone with traces of clay (Stratum 10) or more competent weathered limestone (Stratum 11) was encountered. The presence and consistency of the extremely weathered portions of the limestone (Stratum 10) are indicated on the soil profiles. In general, Stratum 10 was classified as white to light brown calcareous silty clay with varying amounts of limestone fragments and traces of the green clay of Stratum 9. Stratum 10 was not encountered at all the borings locations. Stratum 11 was considered the upper unit of the Floridan Aquifer. This stratum was generally comprised of white to light gray weathered limestone and was found in nearly all the boring locations. In general, Stratum 10 materials overlaid more competent weathered limestone (Stratum 11). As noted on the soil profiles, significant drilling fluid circulation losses were reported when encountering Stratum 10 or 11 materials. At several boring locations, evidence of very loose or solutioning conditions was discovered with the indication of "WK", "WH" or "WR" adjacent to the soil profile. Based on SPT "N" values, the consistency and integrity of the extremely weathered limestone material (Stratum 10) and the more competent weathered limestone of Stratum 11, varied considerably throughout the depth of rock penetrated at each boring location.



It is important to note the following items with regard to the site specific soil conditions discovered over the project site during this study:

1. As expected, the soil and rock conditions over the project site are extremely variable in thickness, material type, elevation of occurrence, and consistency or relative density; for example, boring D+100-8 and boring D-8, performed along the northern portion of the project site about 100 feet apart. The boring results for these two borings are presented on Sheet 5; these results illustrate the potential variability of soil conditions within a short distance.
2. It is important to note the thickness and occurrence of the semi-confining unit clayey materials of Strata 8 and 9 at individual boring locations; especially within the favorable area proposed for the landfill discussed later.
3. It is important to note the presence of weight of hammer (WH), weight of rod (WR), and weight of kelly (WK), that occurred at several of the boring locations throughout the project site. The depth and thickness of these extremely loose zones that were discovered during drilling operations is indicated on the soil profiles. These areas are indicative of solutioning or ravelling activity.
4. It is important to note the depths and locations of minor and major losses of drilling fluid circulation. At nearly all the boring locations, there were some drilling fluid circulation losses reported. The approximate depth and degree of circulation loss is indicated on the soil profiles at the corresponding depth. Drilling fluid circulation losses noted above the limestone materials of Strata 10 and 11, indicate zones of secondary permeability within the upper unconsolidated deposits. The significance of these losses is discussed later in Section 5.9.



5. It is important to note that the consistency and physical properties of the clayey materials of Strata 8 and 9 within the landfill area are fairly consistent and uniform, based on the liquid and plastic limit tests, SPT "N" values and other laboratory data.

4.2 Groundwater Conditions

As previously mentioned, a series of shallow temporary piezometers were installed at the Phase I boring locations throughout the site. Land surface elevations were determined at each piezometer location by the project surveyor. The depth to groundwater was measured in each piezometer and the resulting depth measurements were transposed to elevations, referenced to mean sea level (MSL).

Groundwater measurements were taken in each piezometer on September 6, 1986 and again on November 13, 1986. The results of these measurements are presented on Table 3. Groundwater elevation contour maps for each date are included on Sheets 12 and 13.

On September 6, 1986, measured depths to the groundwater surface ranged from less than one-half foot in a low-lying portion of the site to over 20 feet in one of the higher areas. The average depth to the groundwater surface was about 11 feet. Of the 57 installed piezometers, 13 were dry at the time of measurement on September 6th. The average depth to water and the range of depths reflect measurements taken in 44 of the piezometers. The average elevation of the groundwater surface was about +36.5 feet MSL on September 6, 1986; and ranged, from a low of about +28.8 feet MSL in C+300-4, located in the extreme northern portion of the project site, to a high of +44.4 feet MSL in C-13+35, located in the north-central area.

The groundwater contour maps over the project site for each date were generated by Camp, Dresser & McKee, Inc. from our September 6th and November 13th measurements. The contour maps were drawn using a one-foot contour interval by interpolation



It is important to note the following items with regard to the site specific soil conditions discovered over the project site during this study:

1. As expected, the soil and rock conditions over the project site are extremely variable in thickness, material type, elevation of occurrence, and consistency or relative density; for example, boring D+100-8 and boring D-8, performed along the northern portion of the project site about 100 feet apart. The boring results for these two borings are presented on Sheet 5; these results illustrate the potential variability of soil conditions within a short distance.
2. It is important to note the thickness and occurrence of the semi-confining unit clayey materials of Strata 8 and 9 at individual boring locations; especially within the favorable area proposed for the landfill discussed later.
3. It is important to note the presence of weight of hammer (WH), weight of rod (WR), and weight of kelly (WK), that occurred at several of the boring locations throughout the project site. The depth and thickness of these extremely loose zones that were discovered during drilling operations is indicated on the soil profiles. These areas are indicative of solutioning or ravelling activity.
4. It is important to note the depths and locations of minor and major losses of drilling fluid circulation. At nearly all the boring locations, there were some drilling fluid circulation losses reported. The approximate depth and degree of circulation loss is indicated on the soil profiles at the corresponding depth. Drilling fluid circulation losses noted above the limestone materials of Strata 10 and 11, indicate zones of secondary permeability within the upper unconsolidated deposits. The significance of these losses is discussed later in Section 5.9.



between data points representing the locations of the measured piezometers. Distinct local highs in the groundwater surface are apparent on the contour maps. The highs are marked by elevations of the water surface greater than +40 feet MSL. Two saddle configurations of the groundwater surface separate the localized highs as well as areas of lower elevations in the west-central and northeast portions of the site.

Given the groundwater surface configuration as mapped from the September 6th measurements, groundwater movement within the site is essentially radial from the three local highs to adjacent areas of lower water surface elevations. Superposition of groundwater drainage divides on the high indicates that the largest portion of the site drains groundwater towards the area of low groundwater elevations in the central portion of the area and to the west of the Florida Power easement. In the eastern portion of the site groundwater apparently moves from the two major highs in the northern and southern areas toward a depression in the groundwater surface in the northeast part of the site. The extreme northern and southern portions of the site appear to drain off-site.

Depth to groundwater surface measurements recorded in the on-site piezometers on November 13, 1986 are indicated on Table 3. At some piezometers, the groundwater surface had receded below the depth of the pipe and, thus, no water level measurements were recorded. In other cases, the piezometers were found to have been physically destroyed or were not able to be located in the field and no measurements were possible. Sheet 13 is less detailed than Sheet 12 and is provided for information purposes only. Of the piezometers located along the groundwater highs on-site, only one, piezometer E-48, was deep enough to intercept the groundwater surface on this date of measurement. The remaining 11 piezometers suitable for measurement were located off the groundwater highs in areas where water elevations were recorded at +37 feet MSL and lower in September.

A general trend of declining water levels is apparent at the 12 piezometers measured in November. Three piezometers indicated a rise in water levels, especially piezometer A-13+35 which showed an increase of 4.3 feet from the September measurement. A small increase in water level was noted at piezometers C+300-4 and A-24 of 0.1 and 0.5 feet, respectively. The



remaining nine piezometers recorded recessions of the groundwater surface of between 0.8 and 3.6 feet. The average measured decline was about 1.6 feet.

4.3 Groundwater Recharge Potential

Most of Pasco County provides some recharge to the regional groundwater system. The exceptions are areas along the coast and along the western margin of the Green Swamp area in the eastern part of the County. These areas are discharge areas for the Floridan Aquifer. According to researchers, the most effective recharge area for the Floridan Aquifer is the northwest portion of Pasco County where annual recharge is estimated at greater than 15 inches per year. Groundwater recharge rates throughout the central portion of the County are estimated to range between 5 and 15 inches per year on average. The lack of a well-defined surface drainage network in an area of abundant rainfall is evidence of groundwater recharge potential. Apparently, the primary surface drainage mechanism is internal to the groundwater system which serves to convey water to discharge areas along the gulf coast.

The majority of the test borings drilled within the boundaries of the project site penetrated several feet of high plasticity clays overlying the limestone surface. In an idealized hydrogeologic model, the clay bed acts to retard the vertical interchange of water from the surficial sand deposits to the underlying limestones. Groundwater elevation data collected from on-site observation wells suggest that the clay beds are either discontinuous within the site, locally breached, or contain seams or zones of secondary seepage.

The surficial sand aquifer, which intercepts and stores excess precipitation, is relatively thin or non-existent in portions of the project site. With the top of the clay representing the base of the watertable aquifer, measurements at the observation wells indicate that the watertable aquifer is generally on the order of 5 feet thick or less when the measurements were taken in September. As September typically represents the end of the rainy season when groundwater elevations are highest, the surficial aquifer in this portion of Pasco County may not be perennial.



Four deep monitoring wells were installed into the upper portion of the Floridan Aquifer within the project site. Water level measurements taken in November of 1986 (Table 4) indicate elevations of the potentiometric surface ranged from +29.2 to +34.5 feet MSL, and averaged about +31.5 feet MSL. These measured values are in good agreement with recent potentiometric surface maps for the area published by the U.S. Geological Survey and SWFWMD (Plate 2, Appendix B). These maps suggest a typical end-of-wet-season elevation of about +30 to +35 feet MSL for the site and near vicinity. The available aquifer maps indicate higher potentiometric surface elevations in the southeastern part of the site. The hydraulic gradient is toward lower elevations to the northwest and west.

The three major local highs identified during this study on the groundwater surface may be indicative of areas where the clay beds at the base of the water table aquifer are most effective in inhibiting recharge to the underlying limestones. The groundwater highs do not necessarily correlate with topographic highs on the land surface where thicker sand deposits would normally be anticipated. The area of low groundwater elevations in the west-central portion of the site correlates with a topographic high on the land surface. Consequently, the watertable is deeper in this area, tending to approach the elevation of the potentiometric surface of the Floridan Aquifer. The north and northeast portions of the site exhibit similar characteristics. Assuming uniform distribution of rainfall across the project site immediately preceding the measurements taken in September, the most effective recharge areas to the Floridan Aquifer within the project site are identified by the depressions in the watertable surface as shown on Sheets 12 and 13.



5.0 EVALUATIONS AND CONCLUSIONS

5.1 Subsurface Conditions and Basis for Landfill Area Site Selection

The area within the shaded-in limits on Sheets 2 and 3 on the aerial topographic maps (approximately 267 acres), we have identified as being favorable or suitable for location of a lined sanitary or ash landfill. The limits of the favorable area for implementation of the landfill were based on our interpretation and evaluation of all the test boring data available from Phases I and II and also on the GPR data collected by USDA. We understand that a synthetic liner system will be constructed under all areas to be land filled. We agree that the landfill should be lined with a leachate collection system.

Generally speaking, favorable areas outlined include areas where test borings:

- a. showed at least five (5) feet or more of intact and nearly continuous clayey semi-confining unit material (Strata 8 or 9 as described on the soils legend);
- b. were in general conformance with the trend of the neighboring soil stratigraphy;
- c. lacked significant evidence or indicators of internal soil erosion in the overburden soils, and/or the propagation of this feature upward;
- d. in general, showed the typical results, that is, sand over clay over limestone; or with some acceptable deviation from this soil profile.

It is important to note that favorable areas were also selected considering the site topography. Consistency in topography and the lack or avoidance of depressional areas characterize the favorable areas. Of the 267 acres, approximately 200 of the



acres showed more consistency in several of the qualifications mentioned above. In other words, the clayey semi-confining unit over the 200 acres is generally greater than five (5) feet in thickness and less subsurface anomalies are present in the soil profiles.

The USDA's interpretation of the GPR data includes the identification of some potential subsurface anomalies within the favorable areas we have identified. The results of the majority of our Phase II test borings suggest that the feature shown on the GPR tapes included in Appendix C is not an anomaly of major consequence or not an anomaly at all in our opinion. Based on the Phase II boring results performed at the selected potential subsurface anomalies identified with GPR by USDA, we are of the opinion that the minor anomalies, which were interpreted within the favorable landfill area, should not adversely impact the landfill with the design concept as planned. The GPR data and the ground truth test borings are discussed in a later section.

5.2 Semi-Confining Unit Presence and Permeability

The clayey semi-confining unit separating the upper shallow aquifer system from the deeper Floridan Aquifer was present and fairly consistent in physical properties in nearly all the test borings performed within the favorable area outlined on Sheets 2 and 3. The clayey semi-confining unit is primarily comprised of the highly plastic clays of Strata 8 and 9, and the more clayey portions of Stratum 7. The highly plastic and intact portions of Strata 8 and 9 are considered essentially impermeable to vertical groundwater movement. However, through minor inconsistencies and seams of secondary seepage within the semi-confining unit, some vertical movement of groundwater is occurring. As previously mentioned, the thickness of the semi-confining unit varies over the favorable area from approximately 5 to 15 feet in thickness. In most instances, the thickness of the semi-confining unit is in the range of 6 to 8 feet. The semi-confining unit discovered over the favorable area of the landfill should significantly inhibit direct vertical groundwater movement from the upper sand aquifer to the deeper Floridan Aquifer.



From our observation of the clayey samples and some evidence of vertical seepage down through clayey portions, we are of the opinion that the semi-confining unit over the favorable area of the landfill site, although apparently consistently present, is somewhat leaky. Essentially, we believe that this is the case based on the shallow groundwater conditions discovered over the project site and based on the significant iron staining and small zones of secondary permeability discovered within intact highly plastic, clayey samples. We believe that over the majority of the favorable landfill area that some slow vertical movement down through the semi-confining unit is taking place through the small inconsistencies and vertical and somewhat circuitous paths made over the years through the clay layers. It is important to note that our test borings did not show significant signs of weathering or upward ravelling of the semi-confining unit, nor direct areas of recharge through breaches in the semi-confining unit over the favorable landfill area. Therefore, over the favorable landfill area vertical recharge should be lower than the surrounding areas.

As previously mentioned, the results of the vertical permeability tests performed over the landfill area on selected Shelby tube samples of the semi-confining unit clayey materials are presented on the consolidation test result curves in Appendix B and also are shown on the soil profiles on Sheets 5-11. The vertical permeability of the semi-confining unit clayey materials varies from a high of approximately 2.3×10^{-4} centimeters per second to a low of 1.2×10^{-8} centimeters per second. The variability is attributable to the fine secondary seams of seepage. Based on the data collected, the average vertical permeability of the semi-confining unit clayey materials is on the order of 7.2×10^{-5} centimeters per second. Essentially, these values show that the semi-confining unit clayey materials are nearly impermeable to vertical groundwater movement. The very low to low vertical permeability test results on the clayey materials suggests favorable conditions regarding implementation of a lined landfill.

5.3 Groundwater Design Considerations

Based on the results of groundwater level measurements included on Table 3 and Sheets 12 and 13, it appears that the groundwater table depth over the favorable landfill area varies from approximately five (5) feet to as much as eighteen (18) feet



deep. In general, over the majority of the central portion of the favorable landfill area, the groundwater depth is indicated on the order of 10 to 12 feet below present grades. We anticipate that the groundwater levels measured herein could be as much as 3 to 5 feet higher at certain locations under natural conditions on an interim basis (short-term during wet seasons). Considering the groundwater table depth information collected and the depth of clayey materials, it is possible that some areas of the favorable area could be cut to accommodate landfilling. Also, after liner installation and some landfill construction, the post-development groundwater levels beneath the landfill area should be more favorable for cutting because less recharge will be occurring. We recommend that no areas be considered for major cutting (in excess of 2 feet) that show clayey materials, Strata 7, 8, or 9, within 10 feet of present grades. This is recommended primarily because of the potential for temporary perched groundwater during sustained wet periods. Although some cutting is possible, it is our opinion that only minimal cutting should be considered primarily because of the variability in the elevation of the top of the clay. We recommend that the proposed landfill primarily achieve capacity by being filled above present grades.

5.4 Landfill Settlement Considerations

We have had the opportunity to review the preliminary landfill plan layout, proposed height data and the proposed typical north-south and east-west cross-sections through the landfill. The proposed landfill site plan is shown on Sheet 1 in Appendix B. Based on the plans provided, the landfill height is anticipated on the order of 75 to 100 feet above general present grades. Little cutting is anticipated. From general present grade to about a height of 75 feet, the net slope of the sides of the landfill is planned on the order of 1V:4H. From a height of 75 feet to a height of 100 feet, the net slope of the landfill sides is considerably flatter at about 1V:35H. Based on the preliminary plans, the landfill is planned primarily just above, at, or just below, general site grades over the favorable area selected. The base elevation of the landfill, in general, is compatible with our recommendations.



Based on the consolidation test data available, in general, distortion (sand) plus consolidation (clay) total settlements of the landfill under the maximum landfill height of 100 feet are anticipated to be on the order of 13 to 15 inches. Under the landfill height of about 75 feet at the top of the 1V:4H slope (elevation +125 ft. MSL), total settlements, distortion plus consolidation are anticipated to be on the order of 8 to 13 inches. Total settlements at the toe of 1V:4H slope are estimated on the order of 2 to 3 inches. Settlement estimates are shown on Sheet 1 in Appendix B.

Differential settlements will be primarily dependent on the uniformity of the clayey semi-confining unit, the differences in landfill heights across a typical cross-section through the landfill and construction sequencing. Based on the proposed landfill cross-sections, it appears that the most critical area for differential settlement is between the toe (elevation +50 feet MSL) and the high point (elevation +125 feet MSL) of the 1V:4H slope over an average distance of about 330 feet. Considering the total settlements above, the maximum differential settlements over the 1V:4H slope (a distance of about 330 feet with a landfill height difference of 75 feet) should be on the order of 10 to 12 inches.

We are assuming that the anticipated liner materials and leachate collection systems will be able to take the gradual differential settlements over the sections mentioned above. We understand that Camp, Dresser & McKee, Inc. will forward the settlement results to the liner manufacturer for their review. If this is not the case, we should be contacted for additional evaluation.

5.5 GPR Data and Ground Truth Test Borings

As discussed in Section 3.2, we have included in Appendix F the original letter from USDA to Pasco County discussing the Ground Penetrating Radar (GPR) test results performed over the Hays Road site; this letter is dated July 24, 1986. Because this letter and attachments contained several inaccuracies including scaling mistakes, stationing and plotting errors, and other discrepancies, we met with USDA at our office on September 15, 1986 to discuss these concerns. As a result of our meeting of September 15, 1986, USDA reinterpreted then resubmitted their



evaluation of the initial GPR test results over the Hays Road site in a letter to the County dated September 16, 1986. This letter is also included in Appendix F. Also included in Appendix F is our letter to Camp, Dresser & McKee discussing our September 15th meeting with Mr. Gregg Schellentrager of USDA, as well as other concerns relating to the USDA interpretation of the GPR data.

We have included in Appendix C the results of the Ground Penetrating Radar (GPR) testing and ground truth test borings performed at the eighteen (18) potential subsurface anomaly locations identified by USDA in their letter of September 16, 1986. The ground truth testing of these potential anomaly locations was performed during our Phase II drilling program. The definition of an "anomaly" was presented in Section 3.2. The results of the ground truth test borings are shown adjacent to the GPR results on the Plates included in Appendix C. Each plate is discussed below.

Plate 1: Some minor anomaly was indicated in the test boring at location B+150-13+35, primarily a total loss of drilling fluid circulation at a depth of about 30 feet and a soft zone at a depth of approximately 35 feet. Significant intact clay (Stratum 9) was discovered over the weathered limestone and above these features. These features are considered below the effective depth of GPR equipment and below clays that would somewhat impair the GPR signal. Because of the favorable relative density and consistence of the overburden soils above a depth of 30 feet, this is not considered a significant subsurface anomaly or an area of concern for the anticipated landfill.

Plate 2: At location C-15+45, some minor anomaly was noted at a depth of 25 feet in a total loss of drilling fluid circulation at the top of the clay. However, at least 5 feet of intact clay was found over the limestone. Because of the favorable relative density and consistency of the overburden soils above this minor feature, this does not represent a significant subsurface anomaly, nor should this adversely impact the proposed landfill.



Plate 3: At location C-19+35, some anomaly was noted at a depth of approximately 30 to 34 feet in total loss of drilling fluid circulation and extremely loose clayey materials of Stratum 2. This condition is considered somewhat of a small anomaly; however, considering the thickness of the clayey materials of Strata 2 and 9 and the thickness and relative density of the overburden sands, this should not adversely impact the landfill.

Plate 4: At location C-35+58, some anomaly was discovered in the form of a drilling fluid circulation loss at a depth of approximately 43 feet and some loose conditions were discovered between the depth of 50 to 55 feet within the clayey materials of Stratum 8. Also, a seam of highly weathered limestone (Stratum 10) was discovered at a depth of 33 to 38 feet. These conditions are not considered significant anomalies and should not adversely impact the proposed landfill because of the favorable relative density, consistency and depth of the overburden soils.

Plate 5: Essentially, the soil conditions discovered at this potential anomaly location C-38+05, do not represent an anomaly. The discovered conditions are typical of the soil stratigraphy anticipated over the favorable area.

Plate 6: At location C+105-24, the boring results do not represent an anomaly. The discovered conditions are typical of what is anticipated over the favorable area of the landfill.

Plate 7: At location C+210-40 a small anomaly was noted in the presence of Stratum 11 limestone at a depth of 24 to 28 feet between layers of Stratum 9. In addition, some very loose zones were discovered over deeper Stratum 11 between the depths of 37 to 42 feet. This is considered a minor anomaly, however, should not adversely impact the proposed landfill, because of the favorable relative density, consistency and depth of the overburden soils.



Plate 8: At location C+750-8, we do not believe that the test boring shows an anomaly at this location. The stratigraphy is typical of the favorable area.

Plate 9: At location D-13+90, a significant zone of soft material was discovered between the depths of approximately 35 to 60 feet below ground. The material was primarily soft clays of Stratum 8. We do consider this an anomaly; however, we believe that this condition is isolated (based on the other site boring data) and should not adversely impact the proposed landfill, because of the favorable relative density and thickness of the upper sands.

Plate 10: At location D-19+40, some anomaly was noted at a depth of approximately 30 to 40 feet deep, in the presence of extremely soft clayey materials of Stratum 9 and drilling fluid circulation losses. This represents a minor anomaly, however, should not adversely impact the proposed landfill considering the favorable presence of approximately 10 feet of intact clay above the soft conditions, and the relative density and thickness of the upper sands.

Plate 11: At location D+100-8, this was somewhat of an anomaly as the boring was advanced to a depth of approximately 100 feet and no clayey material of Strata 8 or 9 was discovered. However, the sands to a depth of 100 feet are medium-dense to dense, and no drilling circulation losses were reported. As evident on Sheet 2, this location is outside the favorable area for the landfill, primarily because of the borings in the vicinity of this boring which do show some other subsurface variabilities.

Plate 12: At location D+295-24, we do not think that the conditions at this boring location show an anomaly, as the conditions are typical of what is anticipated over the favorable area.



Plate 13: At location E-11+90, some minor anomaly was discovered at depths of approximately 30 and 35 feet in the form of drilling fluid circulation losses and soft clays of Stratum 9. In addition, some additional soft clay was discovered over the weathered limestone of Stratum 11. Considering the depth to limestone, thickness and general consistency of the clays and the favorable relative density and thickness of the overburden sands, these conditions should not adversely impact the proposed landfill.

Plate 14: At location E-14+40, although the presence of the clayey materials and weathered limestone appeared at a relatively shallow depth, this is not considered an anomaly. This condition should not adversely impact the proposed landfill because of the favorable relative density and consistency of the overburden soils.

Plate 15: At location E-15+30, some anomaly was discovered at a depth of approximately 50 to 59 feet (below the range of the GPR equipment) in the form of very weathered limestone of Stratum 10. However, approximately 10 feet of intact Stratum 9 was discovered above it, underlying dense to very dense overburden sands. This condition does represent a minor anomaly; however, should not adversely impact the proposed landfill because of the above items relative to the depth and condition of the overburden soils.

Plate 16: At location E-16+20, some small anomaly was noted at a depth of approximately 25 feet in the form of minor circulation losses and soft clayey conditions, and an additional soft zone was discovered over the weathered limestone of Stratum 11. This represents a minor anomaly, however, considering the thickness of the clay and relative density of the overburden sands, this should not adversely impact the proposed landfill.



Plate 17: At location E-20+80, some minor soft conditions were discovered at the bottom of Stratum 9 overlying the weathered limestone of Stratum 10; however, this is somewhat typical. This represents a very minor anomaly and should not adversely impact the proposed landfill because of the favorable depth, relative density and consistency of the overburden soils.

Plate 18: At location E-45+60, this boring does not represent an anomaly. This soil stratigraphy is typical of what is anticipated under the favorable area of the landfill.

Considering all of the Phase I and Phase II test boring data and the GPR tests results discussed and provided herein, we believe that the presence of anomalies under the landfill is a possibility. Major anomalies under the favorable landfill area that could adversely impact the landfill are unlikely, considering the extensive GPR testing and test drilling performed over the favorable area. We are of the opinion that the favorable area for the landfill outlined on Sheets 2 and 3 is appropriate.

5.6 Favorable Areas of Site for Daily Sand Cover

The following areas on-site (outside the limits of the "favorable" landfill area) should be considered the better areas on-site to acquire and access daily sand cover material. In general, the fine sands to slightly fine sands of Strata 3, 4, 5 and 6 are suitable as daily cover material.

- The area north and northeast of the dry drainage ditch and east of the powerline easement, in the vicinity of borings D+400-4, C+300-4, B-3, B-4, A+400-4, B-2, A-13+35, and B-1. In this area, in general, based on the boring results, at least 20 feet of fine sand to slightly silty fine sand (less than 15 percent fines passing the No. 200 sieve) is present. Significantly deeper deposits of fine sand are present in the area of borings



D+400-4 and C+300-4; as much as 50 to 60 feet of fine sand to slightly silty fine sand. The shallow groundwater level is in the vicinity of +30 to +35 feet MSL, or about 10 to 25 feet below the ground surface depending upon the ground elevation.

- ° In the southwestern portion of the site, in the vicinity of borings I+400-44 and I-48. In this area a topographic high sandy knoll is present. Based on the boring results in this area (approximately 15 acres) as much as 13 to 18 feet of fine sand to slightly silty fine sand is present. Based on the shallow groundwater data collected from the two piezometers in this area, the groundwater level is in the vicinity of elevation +40 to +45 feet MSL or approximately 10 to 15 feet below the ground surface depending on the general elevation.
- ° In the western central portion of the site, west of the power line right-of-way, in the vicinity of borings G-32, B-8, F-32, F-40, and G-40. In this area a topographic high sandy knoll is present. Based on the boring results in this area (approximately 15 acres) as much as 15 to 20 feet of fine sand to slightly silty fine sand is present. Based on the shallow groundwater data recently collected from the piezometers in the area, the groundwater level is in the vicinity of elevation +30 to +35 feet MSL or approximately 10 to 20 feet below the ground surface depending on the ground elevation.

It is important to note that the upper sandy materials of Strata 3, 4, 5 and 6 within the favorable area for the landfill are also suitable for daily sand cover. However, care should be exercised in accessing the sand materials in the landfill area to maintain the necessary cover and clearance over the natural clayey materials. After areas have been selected to acquire sand cover, additional test borings, prior to excavation, are warranted at closer spacings to confirm the availability of sandy materials.



5.7 Final Cover Material Considerations

Regarding final cover clayey material, because of the following items below, we are of the opinion that the acquisition of offsite clayey material will be necessary for construction of the final clay cover (cap) over completed portions of the landfill. We do not recommend excavating clayey semi-confining unit materials from areas around landfill.

- a. The predominant clay materials of Strata 8 and 9 are, in general, highly plastic and upon excavation, drying, and compaction may crack or fissure due to dessication. This could cause a "leaky" final cover.
- b. Stratum 7, clayey sand (which would be suitable final cover material) is not an abundant material type over the non-landfill areas of the site.
- c. In general, the clayey material excavated would be below shallow perched groundwater levels; thus, some difficulty in excavation would be associated with dewatering and the drying of near-saturated clayey material.
- d. In general, over the non-landfill areas of the site, when the clayey material is closer to the surface (easy access), in turn the top of the limestone is shallower.
- e. On-site clayey materials, Strata 8 and 9, and the more clayey portions of Stratum 7 make up the semi-confining unit separating the two aquifer systems. In general, the semi-confining unit is on the order of 5 to 10 feet over the site; with the thicker and more consistent confining unit being under areas identified as "favorable" for siting the landfill. Thus, the remaining areas have generally a lesser quality semi-confining unit.



5.8 Favorable Areas of Site For Stormwater Disposal

At this time, no preliminary stormwater management plans are available; however, we are providing our general thoughts relative to this matter. Considering the natural low depressional areas located, in general, in the northeast and southwest portions of the site, it is reasonable to ultimately direct treated stormwater towards these lower areas. Detention/retention facilities could be constructed adjacent to selected depressional areas that could provide ultimate discharge after some pretreatment. In the northeast and southwest areas of the site, a significant thickness of upper sand aquifer (Strata 3, 4, 5 and 6) is present to promote positive horizontal exfiltration from new stormwater detention/retention basins. If possible, the primary stormwater management features should be planned in these areas.

The groundwater data provided herein should be utilized in the design and selection of control levels in the retention/detention ponds. Although no permeability testing was performed on the sand strata, we anticipate that permeability values on the order of 10 to 20 feet/day would be appropriate for the materials of Strata 3 and 4, and 1 to 7 feet/day for Strata 5 and 6 materials. After preliminary stormwater plans are available, some permeability testing of the sands and additional test borings should be performed.

5.9 Future Sinkhole Potential Over Landfill Area

The proposed Pasco County landfill site and adjacent areas exhibit Karst features typical of west central Florida. The land surface is a gently rolling terrain dotted by numerous topographically-closed depressions. Within the boundaries of the project site, land surface depressions are more common in the western portion and especially in the southwest corner where apparently perennial ponds occur.



Although numerous sinkholes and other Karst-related features exist within the project site and near vicinity, the standard penetration test borings drilled for this investigation did not encounter significant voids in the underlying limestones. This fact, and the general configuration of most of the on-site land surface depressions suggest that sinkholes in the area are primarily caused by areal solution of the limestone surface and subsequent progressive subsidence of the land surface over a relatively long period of time.

Researchers described this type of Karst process forming specific types of features known as limestone-solution sinkholes. Researchers attribute this process to areas where a relatively thin cover of overburden is overlying a limestone surface that is jointed and fractured. Researchers report that in general, the northern portion of west central Florida, including northwest Pasco County, is characterized by the occurrence of shallow, broad sinkholes that develop progressively over fairly long periods of time. The subsidence rate observable at the land surface occurs roughly at the same rate as the dissolving of the limestone by aggressive recharge waters.

Sinkholes and resultant Karst topographic features of the land surface have been intermittently active during the various geologic periods subsequent to deposition of the carbonate bedrocks. During the Pleistocene Age, the sea level has risen and fallen relative to current datum as water was stored and released in glacial and interglacial periods. It is commonly believed that the most recent maximum sea level regression occurred about 18,000 years ago when sea level was approximately 300 feet or more below today's level.

The Karst processes operating in west central Florida must have been more active in the past during low sea level stands. The drowned Karst features along the present coast line and offshore are solid evidence of past intense solution erosion of the region's limestone foundation. It is very likely that most of the sinkholes in the region were formed in the past and that these processes have slowed considerably with the onset of a transgressive, or rising sea which is continuing today.



An assessment of the potential for formation of new sinkholes within the proposed favorable landfill area is presented in this report, based on the geomorphologic history of the region, together with evaluations of site-specific geologic and hydrogeologic data collected during the project investigation. Data collected and utilized in our assessment consisted of:

1. Geologic logs prepared from test borings drilled throughout the project site.
2. Groundwater elevations measured in installed observation wells.
3. Ground penetrating radar (GPR) surveys.
4. Review of type, occurrence and distribution of existing sinkholes and related features within the project site boundaries.
5. Land surface fracture trace/lineament map of the area and vicinity that was developed for the Pasco County Public Works Department by FDOT, a portion of which was traced over the USGS map illustrated on Sheet 3 in Appendix D.

Geologic logs of the numerous test borings drilled within the project site indicate that:

1. The surface of the limestone bedrock, likely the Tampa Limestone, is fairly rugged in relief. This surface marks a lithologic change between the Miocene carbonates of the Tampa or Suwannee Limestone and the predominant clay lithology of the overlying Miocene Hawthorn Formation.
2. The Hawthorn Formation is apparently present throughout most of the site overlying the limestone surface. The Hawthorn here is comprised of deposits of very plastic clays.
3. The Pleistocene to Recent Age quartz sand deposits are relatively thin and generally medium-dense throughout the site.
4. The Hawthorn clay deposits, while apparently continuous throughout most of the site, may be missing in the extreme northern portion along the north property boundary.



Measured water levels in wells installed throughout the site, indicate that the water table surface above the Hawthorn clay deposits ranged in altitude from about +30 to +40 feet above MSL. Based on the potentiometric surface maps of the underlying Floridan Aquifer prepared by SWFWMD (Plate 2, Appendix A), the difference in head between the Floridan and overlying water table aquifer is relatively small, on the order of 5 feet as an average.

The lowest measured points on the water table surface occurred along the north and northeast margin of the site. Water table elevations of less than +30 feet above MSL were measured in wells in these areas. Geologic data, discussed above, suggests that the clay deposits covering the limestone may be missing in areas along the northern site boundary. A very similar hydrogeologic feature was noted at the Cross Bar Ranch well field, located about three to four miles due east. Researchers attributed the feature to a pinching-out of the primary confining bed over the Floridan Aquifer in a south-to-north direction through the well field.

The September 6, 1986 water level measurements also indicate that excess precipitation recharging the upper sand watertable aquifer within the project area builds groundwater mounds in the central part of the site, as indicated on the watertable contour maps, Sheets 12 and 13. The map data and groundwater contours suggest that groundwater throughout most of the site moves east and west towards areas of lower water table elevation.

Goelectric signatures generated from the GPR surveys identified interpreted potential geologic anomalies at certain locations along the survey lines. Some locations were drilled by Standard Penetration Test (SPT) methods to correlate the GPR signatures with actual geologic logs and samples. The SPT data indicate that the GPR responses may reflect density differences in the sedimentary beds overlying the limestone surface. The SPT data did not indicate noticable voids and cavities, either in the sand and clay deposits or in the underlying limestones.

The topographic map of the project site indicates numerous, small surface depressions within the project site. Two distinct types, or forms, of depressions are noted: small,



rounded depressions with relatively steep slopes, mainly in the southwest corner of the site, and; very shallow, gently-sloping depressions occurring primarily in the interior portion of the site. Most of the land surface depressions within the site are of the latter category. These depressions are generally very shallow, perhaps two to three feet deep on average and relatively broad, ranging up to several acres in area.

Within the proposed landfill area, a linear relationship between land surface depressions and other geomorphic features was not particularly noted during review of aerial photographs and U.S. Geological Survey 7-1/2 minute quadrangle maps. Other major lineament features were not observed in the immediate vicinity of the proposed landfill, as evident on Sheet 3 in Appendix D.

Given the above considerations, the predominant sinkhole-forming process operating at the proposed project site appears to be very slow dissolution of calcium carbonate at the surface of the limestone bedrock. The result is the occurrence of very shallow depressions forming over very long periods of time. The primary hydrogeologic factors controlling the process are: 1.) the existence of a nearly continuous clay layer covering the limestone surface throughout the interior or favorable portion of the site, and 2.) the small head difference between the water table and Floridan Aquifer. Collected data suggests that active recharge to the Floridan Aquifer limestones, a prerequisite for formation of new sinkholes, occurs away from the project favorable boundaries. The clay deposits of the Hawthorn Formation apparently form an effective aquatard, or semi-confining bed, throughout nearly all of the favorable area.

In view of the apparent site conditions and the various factors associated with sinkhole formation, we consider the potential sinkhole related risks to the integrity of the proposed landfill to be slight over the favorable area identified on Sheets 2 and 3. The apparent hydraulic gradient driving water to the Floridan Aquifer limestones is relatively small throughout the site and the potential for erosion or ravelling of the unconsolidated deposits into limestone voids is low. The noticable lack of significant cavities in the limestones



penetrated at test boring locations further reduces the potential for significant sinkhole risk to the landfill. In addition, with construction of the liner and landfill, Floridan Aquifer natural recharge will be significantly reduced in the landfill area, reducing the natural potential for sinkhole activity in the landfill area, and slowing solutioning processes identified at the greater depths in some of the deep SPT borings in the favorable area.

Sinkholes formed by catastrophic collapse of caverns in the limestone are considered to be uncommon in the project area. The relatively thin overburden covering the limestone formations, together with the apparent small head difference between the water table and potentiometric surface are two factors supporting the formation of surface depressions as a slow on-going process directly related to solution activity at the limestone surface. Sinkholes of this type tend to develop slowly, over long periods of time and may be typically on the order of 1 to 3 feet deep near the center and 10 to 20 feet in diameter. The potential to generate catastrophic, short-period failure sinkholes is considered to be very low.

6.0 GROUNDWATER QUALITY MONITORING PROGRAM

6.1 Well Inventory

To satisfy DER requirements discussed at one of our earlier meetings with them, a water supply well inventory was conducted within a one mile radius of the proposed Hays Road site boundaries. In addition, wells located within a two mile radius of the site were also located. Computer printouts of consumptive use permits (CUPS) and well construction lists for the area were obtained from the Southwest Florida Water Management District (SWFWMD). Also, a list of monitoring wells within the two mile radius that are still used by the United States Geological Survey (USGS) was also obtained. The USGS well locations, as well as the SWFWMD CUPS well locations, are shown approximately located on the USGS map (Sheet 1) and on a



recent 1" = 1,000' aerial of the area (Sheet 2) included in Appendix D. The pertinent well inventory data collected from USGS and SWFWMD, as well as the well construction listing of wells within the one mile radius which could not be plotted because no locations are provided, are also included within the well inventory data section in Appendix D.

It is important to note that near the existing concrete structure in the northern portion of the site, a deep abandoned well casing is present. It is imperative that this well be abandoned properly and grouted to the ground surface in accordance with SWFWMD requirements before the landfill is put into operations. Other than this old abandoned well, no other wells were found on the project site, based on available data and our reconnaissance of the site.

Based on the CUPS data collected from SWFWMD, it appears that only one major water supply well is located with the one mile radius of the project site. This well is labelled Number 5 and is shown located on Sheet 1 and Sheet 2 in Appendix D. This well is located approximately one mile from the northern border of the site and is significantly upgradient (Floridan Aquifer) of the landfill. Pertinent data relative to this well is provided in Appendix D. Based on data collected from SWFWMD and USGS, it does not appear that there are any other major permitted water supply wells within a one mile radius of the project site.

Based on the data collected on the SWFWMD well construction list, there appears to be a significant number of smaller water supply wells located within a one mile radius of the project site. In addition, it appears that there are significant small water wells located west and south of the site, or in other words, downgradient of the landfill area. It is important to note, that there is no County water available within 1 mile around the site. Therefore, it should be assumed that all residences, businesses, etc. within a 1-mile radius of the landfill site (and more) have a small potable water supply well, based on the extensive well construction list.



6.2 Groundwater Monitoring Plan

To assess the shallow and deep aquifer background water quality at the proposed Hays Road landfill site, a series of four well pairs, as previously discussed, were installed at selected locations around the perimeter of the site. In particular, these well pairs consisted of a shallow and a deep well installed in accordance with DER regulations. The four well pair locations are shown illustrated on Sheet 1 and Sheet 2 in Appendix D and also on the aerial topographic maps provided on Sheets 2, 3, and 4. Basically, the shallow groundwater monitoring wells are designated 2MW1 to 2MW4. The 2 as the prefix in the well designation corresponds to the diameter in inches of the well. The number following the lettering MW is the well number designation. Likewise, for the four deep groundwater monitoring wells, the 4 prefix represents a 4-inch diameter well and the number after the MW designation corresponds to the well number. For purposes of assessing the background water quality at the project site, four shallow and four deep groundwater monitoring wells were installed. We understand that water quality sampling from these wells to establish background parameters will be conducted by Camp, Dresser & McKee, Inc.

The construction details for the four shallow and four deep groundwater monitoring wells that were installed to assess background water quality at the project site are included on Plates 2-5 in Appendix E. As previously discussed, the well details were approved by DER prior to installation.

It is recommended that for the long-term monitoring program, for the proposed landfill, and assuming that the landfill is sited within the favorable area outlined on Sheets 2 and 3, that three (3) additional well pairs be installed for groundwater quality monitoring purposes. The three additional well pair locations designated 5, 6 and 7 are shown approximately located on Sheets 1 and 2 in Appendix D and also on the aerial topographic maps provided on Sheets 2, 3, and 4. Essentially, these additional groundwater monitoring wells are located approximately 100 feet away from the edge of the proposed landfill area. The proposed well construction details for the shallow and deep groundwater monitoring wells, which are similar to the existing wells previously installed, are included on Plate 1 in Appendix E.



We understand, based on conversations with Camp, Dresser & McKee, Inc., that CDM will be providing the recommended well sampling frequency that will be necessary during operation of the landfill. In addition, CDM will also be recommending the parameters that will be required during the testing process. As a minimum, we recommend that initially all the wells be sampled and analyzed for the State primary organic and inorganic drinking water parameters, as well as the State secondary drinking water standards. We anticipate that some additional parameters will be required by DER and Pasco County. Also, as a minimum, we recommend that quarterly sampling be performed at each of the well locations during the initial five years of the landfill operation. If tested parameters show concerns, then the testing frequency will need to be adjusted.

6.3 Other Well Considerations

We understand that a water supply well (about 1.0 mgd) will be necessary as a back-up (emergency situations) to accommodate water demands at the adjacent resource recovery plant. It is anticipated that the primary water source will be piped in reclaimed treated domestic wastewater. We strongly recommend that this well be located at the southwestern-most point of the project site to minimize the impact on future site sinkhole potential. In addition, the well should be designed with our input after more details become available, and the well should be constructed under close inspection.



7.0 TABLE AND FIGURES

Table 1 Geologic Formations

Table 2 Hydrogeologic Framework

Table 3 Groundwater Measurements

Table 4 Soil Boring and Groundwater Data

Figure 1 Location of Geologic Sections

Figure 2 North-South Geologic Cross-Section

Figure 3 Illustration of Limestone Cavity Collapse

Figure 4 Illustration of Ravelling Collapse

Figure 5 Sinkhole Prone Areas in Florida

Image Quality

As you review the next group of images, Please note that the original documents were of poor quality.

TABLE 1 1/
GEOLOGIC FORMATIONS

Age		Formation	Lithology	Quality of water	Use
Recent and Pleistocene		Undifferentiated sand and clay	Interbedded sand and clay up to 250 feet thick.	Objectionable concentration of iron and high organic color are common.	Only a few small domestic wells.
Miocene		Tampa Limestone	White to gray, sandy, fossiliferous limestone.	Generally satisfactory for domestic supplies without treatment.	Most domestic and many irrigations wells produce water from the basal Suwannee Limestone. Some wells in southwestern Pasco County produce water from the Tampa Limestone if the Suwannee Limestone contains salty water.
Oligocene		Suwannee Limestone	Fossiliferous, yellow to white, fine-grained limestone. Hard at bottom.		
Eocene	Ocala Group	Crystal River Formation	Soft, chalky, white to tan co-quinoid limestone.	Not well known but probably similar to water from Suwannee Limestone in most of area.	Only a few wells produce water from local cavities.
		Williston Formation			
		Inglis Formation	Hard, fossiliferous, brown to gray dolomitic limestone.	Contains more sulfate than water from overlying formations but probably does not exceed public health limits in most of area.	Most wells that produce more than 1,000 gpm penetrate the Inglis Formation and/or part of the hard brown dolomitic section of the Avon Park and Lake City Limestones.
		Avon Park Limestone	Soft to hard, fossiliferous, brown limestone with dark brown beds of dolomitic limestone. Some sapropel.		
		Lake City Limestone			

¹The classification and nomenclature of rock units in this report conform to the usage of the Florida Geological Survey and also, except for the Ocala Group and its subdivisions, with those of the U. S. Geological Survey.

1/Taken from Wetterhall (1964) -

TABLE 2

3/

HYDROGEOLOGIC FRAMEWORK

System	Series	Stratigraphic unit	General lithology	Major lithologic unit	Hydrogeologic unit	Geologic process	Age estimates of boundaries, in million years—
Quaternary	Holocene Pleistocene	Surficial sand, terrace sand, phosphorite	Predominantly fine sand; interbedded clay, marl, shell, limestone, phosphorite.	Sand	Surficial aquifer		
Tertiary	Pliocene	Undifferentiated deposits	Clayey and pebbly sand; clay, marl, shell, phosphatic.	Clastic deposits	Confining bed	INTERMEDIATE AQUIFER AND CONFINING UNITS	Fluctuations of sea level with consequent high water tables and deposition in low-lying areas alternating with low water tables and accelerated weathering of soluble rocks.
		Miocene	Hawthorn Formation	Dolomite, sand, clay, and limestone; silty, phosphatic.	Carbonate and clastic deposits		Aquifer
	Tampa Limestone		Limestone, sandy, phosphatic, fossiliferous; sand and clay in lower part in some areas.	5			
	Oligocene	Suwannee Limestone	Limestone, sandy limestone, fossiliferous.	Carbonate deposits	Confining bed	Exposure and weathering	24
	Eocene	Ocala Limestone	Limestone, chalky, foraminiferal, dolomitic near bottom.			Carbonate deposition	38
		Avon Park Formation	Limestone and hard brown dolomite; intergranular evaporite in lower part in some areas.			Carbonate and evaporite deposits	FLORIDAN AQUIFER SYSTEM
		Oldsmar Formation	Dolomite and limestone, containing intergranular gypsum in most areas.	Middle confining unit			
	Paleocene	Cedar Keys Formation	Dolomite and limestone with beds of anhydrite.		Lower Floridan aquifer	Exposure and weathering	55
					Sub-Floridan confining unit	Carbonate deposition	63

^{1/} Geologic Times Chart, 1984.^{2/} Includes all or parts of Caloosahatchee Marl, Bone Valley Formation, Alachua Formation, and Tamiami Formation.^{3/} Taken from Sinclair, et al (1985)

TABLE 3

GROUNDWATER MEASUREMENTS
(September 6, 1986/November 13, 1986)

Observation Well No.	Land Surface Elevation (ft above msl)	Depth to <u>1</u> /. Water (ft)	Groundwater Elevation (ft above msl)	Water Level <u>2</u> /. Change (ft)
D+400-4	45.6	16.6/17.8	29.0/27.8	- 1.2
C+300-4	46.4	17.6/17.5	28.8/28.9	+ 0.1
A+400-4	49.7	16.7/33.0	33.0/ --3/.	--
F-8	50.2	7.2/ --	43.0/ --	--
D-8	50.2	13.0/ --	37.2/ --	--
C-8	48.7	12.6/ --	36.1/ --	--
E-16	47.6	4.4/ --	43.2/ --	--
D+400-12	48.2	5.6/ --	42.6/ --	--
C-13+35	49.6	5.2/ --	44.4/ --	--
B-13+35	43.0	7.5/ --	35.5/ --	--
A-13+35	49.0	18.1/13.8	30.9/35.2	+ 4.3
F-20	44.8	4.1/ --	40.7/ --	--
A+400-20	43.1	13.2/ --	29.9/ --	--
E-24	46.9	13.7/ --	33.2/ --	--
D-24	49.4	11.8/ --	37.6/ --	--
D-16	45.6	-- / --	-- / --	--
C+400-12	48.5	-- / --	-- / --	--
D+400-20	46.9	11.2/ --	35.7/ --	--
C+400-20	50.4	-- / --	-- / --	--
B+400-20	48.8	-- / --	-- / --	--
B-24	49.8	-- / --	-- / --	--
F-24	45.6	6.5/ --	39.1/ --	--
A-24	52.0	20.3/19.8	31.7/32.2	+ 0.5
H-32	45.0	-- / --	-- / --	--
G-32	48.9	17.9/18.8	31.0/30.1	- 0.9
E-32	50.8	18.1/19.1	32.7/31.7	- 1.0
F-32	47.8	16.8/17.6	31.0/30.2	- 0.8
D+400-28	48.6	12.0/ --	36.6/ --	--
C+400-28	50.2	13.1/ --	37.1/ --	--
C-32	50.6	13.9/ --	36.7/ --	--
H-40	46.0	-- / --	-- / --	--
G-40	47.4	14.5/ --	32.9/ --	--
F-40	45.5	13.1/ --	32.4/ --	--
E-40	44.2	-- / --	-- / --	--

Table 3 (Cont'd)

D+400-36	46.5	-- / --	-- / --	--
D-40	49.7	-- / --	-- / --	--
C+400-36	50.6	-- / --	-- / --	--
C-40	51.8	-- / --	-- / --	--
B-40	52.1	-- / --	-- / --	--
I+400-44	60.0	19.2/ --	40.8/ --	--
I-48	54.9	14.5/ --	40.4/ --	--
H-48	46.7	7.0/ --	39.7/ --	--
G-48	35.7	0.4/ 1.7	35.3/34.0	- 1.3
E-48	47.1	4.4/ 8.0	42.7/39.1	- 3.6
D+400-44	48.0	11.5/ --	36.5/ --	--
D-48	48.8	11.1/ --	37.7/ --	--
C+400-44	50.9	11.1/ --	39.8/ --	--
C-48	49.2	11.4/ --	37.8/ --	--
B-48	50.2	11.8/ --	38.4/ --	--
I-56	40.5	4.9/ 7.0	35.6/33.5	- 2.1
H-56	45.2	5.0/ --	40.2/ --	--
G-56	44.2	6.9/ --	37.3/ --	--
E+400-56	43.4	7.0/ --	36.4/ --	--
I-64	41.3	5.8/ --	35.5/ --	--
H-64	45.2	9.8/11.3	35.4/33.9	- 1.5
G+100-64	42.4	5.6/ 7.5	36.8/34.9	- 1.9
F-64	43.7	8.1/ --	35.6/ --	--

1/. First value is 9/6/86 measurement, second value is 11/13/86.

2/. Measured change from 9/6/86 to 11/13/86.

3/. -- indicates no water level measurement, piezometer dry.

TABLE 4

PHASE 1
PASCO COUNTY LANDFILL
BORING LOGS

Boring Number	Ground Elev. +Ft. MSL	GWT Elev. +Ft./MSL	Top of Clay +Ft. MSL	Top of Limestone +Ft. MSL
D+400-4	45.6	29.0/27.8	-24.5	-32.5
C+300-4	46.4	28.8/28.9	-12.5	-21.5
B-4	43.5	---	20.5	6.5
A+400-4	49.7	33./-	27.0	18.0
F-8	50.2	43.0/dry-7'	43.0	33.0
B-5	47.2	---	34.0	29.0
D-8	50.2	37.2/dry-12'	38.0	34.0
C-8	48.7	36.1/dry-13'	35.0	17.5
B-3	41.5	---	- 7.0	-15.0
B-2	44.3	---	16.0	-11.0
B-7	32.5	---	29.5	21.5
E-16	47.6	43.2/dry-5'	45.5	35.5
D+400-12	48.2	42.6/dry-5'	44.5	27.5
D-16	45.6	dry-10'/dry-8.5'	37.5	28.5
C+400-12	48.5	dry-10'/dry-9'	36.0	31.0
C-13+35	49.6	44.4/dry-5'	48.0	22.5
B-13+35	43.0	35.5/dry-7'	37.5	4.0
A-13+35	49.0	30.9/35.2	25.0	2.0 (est.)
F-20	44.8	40.7/dry-5'	38.5	30.0
*D+400-20	46.9	35.7/dry-13'	34.0	25.0
C+400-20	50.4	dry-15'/dry-14'	35.0	11.0
B+400-20	48.8	dry-6'/dry-6'	41.0	37.0
A+400-20	43.1	29.9/dry-17'	22.5	6.0
*F-24	45.6	39.1/damaged	41.5	17.0
E-24	46.9	33.2/dry-14'	28.0	- 5.0 (est.)
D-24	49.4	37.6/dry-13'	36.5	26.5
B-6	46.5	---	42.0	34.0
B-24	49.8	dry-18'/dry-17'	31.0	17.0
*A-24	52.0	31.7/32.2	28.5	17.0
B-1	44.2	---	-19.0	-35.0 (est.)
*H-32	45.0	dry-13'	32.0	22.0
G-32	48.9	31.0/30.1	27.5	20.5
B-8	48.0	---	30.0	18.0
F-32	47.8	31.0/30.2 damaged	25.5	19.5
E-32	50.8	32.7/31.7	16.0	-45.0 (est.)

TABLE 4 (cont'd)

PHASE 1
PASCO COUNTY LANDFILL
BORING LOGS

Boring Number	Ground Elev. +Ft. MSL	GWT Elev. +Ft./MSL	Top of Clay +Ft. MSL	Top of Limestone +Ft. MSL
D+400-28	48.6	36.6/dry-15'	31.0	26.5
B-9	46.3	---	38.0	22.0
C+400-28	50.2	37.1/dry-13'	32.0	18.0
C-32	50.6	36.7/dry-14'	36.0	23.0
B-10	51.7	---	33.5	28.5
H-40	46.0	dry-15'/damaged	40.0	19.0
G-40	47.4	32.9/damaged	33.5	17.5
*F-40	45.5	32.4/damaged	16.5	-20.0 (est.)
E-40	44.2	dry-10'/dry-9'	32.0	12.0
D+400-36	46.5	dry-8'/dry-8'	28.0	12.0 (est.)
D-40	49.7	dry-10'/dry-10'	38.0	19.0
C+400-36	50.6	dry-18'/dry-16'	28.0	8.0 (est.)
C-40	51.8	dry-5'/dry-5'	49.5	40.0
B-40	52.1	dry-10'/dry-8'	42.0	40.0
I+400-44	60.0	40.8/dry-19'	35.0	26.0 (est.)
I-48	54.9	40.4/dry-14'	41.5	3.0 (est.)
H-48	46.7	39.7/damaged	38.5	22.5
G-48	35.7	35.3/34.0 damaged	26.0	17.0
B-13	48.0	---	39.5	31.0
*E-48	47.1	42.7/39.1	20.5	- 5.0 (est.)
D+400-44	48.0	36.5/dry-13'	40.5	15.0 (est.)
D-48	48.8	37.7/dry-11'	36.5	23.5
C+400-44	50.9	39.8/dry-11'	37.0	32.0
B-12	49.0	---	39.5	32.5
C-48	49.2	37.8/dry-13'	36.0	17.0
*B-48	50.2	38.4/dry-12'	35.5	20.0
B-11	52.3	---	34.0	28.0
I-56	40.5	35.6/33.5	33.0	25.0
H-56	45.2	40.2/damaged	41.5	31.0
G-56	44.2	37.3/dry-7'	40.5	32.0
E+400-56	43.4	36.4/couldn't find	15.0	7.5
I-64	41.3	35.5/dry-11'	36.5	25.0
H-64	45.2	35.4/33.9	31.5	17.0
G+100-64	42.4	36.8/34.9	34.5	24.5
F-64	43.7	35.6/couldn't find	30.0	15.0

NOTES: * anomaly or judgement applied

- no piezometer installed

dry - 10' no groundwater level to 10 feet deep

groundwater elevations 9-6-86/11-13-86

PHASE 2
PASCO COUNTY LANDFILL
BORING LOGS*

<u>Boring Number</u>	<u>Ground Elev. +Ft. MSL</u>	<u>GWT Elev. +Ft./MSL</u>	<u>Top of Clay +Ft. MSL</u>	<u>Top of Limestone +Ft. MSL</u>
B+150-13+35	47.8	-	26.0	5.0
C-15+45	49.7	-	26.0	19.0
C-19+35	48.8	-	25.5	5.0
C-35+58	52.6	-	26.5	-13.5
C-38+05	51.7	-	29.5	8.0
C+105-24	48.1	-	35.0	26.0
*C+210-40	50.2	-	32.0	27.0
C+750-8	49.4	-	39.5	35.5
C-13+90	45.6	-	10.5	-14.5
D-19+40	46.5	-	30.0	- 1.5
*D+100-8	49.9	-	-50.0 (est.)	-60.0 (est.)
D+295-24	48.5	-	34.0	26.0
E-11+90	47.0	-	17.0	-21.0
E-14+40	45.8	-	40.0	22.0
E-15+30	45.9	-	5.0	-13.0
E-16+20	45.5	-	27.5	5.5
E-20+80	44.4	-	32.0	21.5
E-45+60	46.0	-	36.5	30.0
E-52	45.5	-	31.5 (est.)	31.0
A-44	53.0	-	19.0	17.0
F+600-26	48.9	-	43.5	32.0
C-8N	48.1	-	40.5	29.0

*No shallow piezometers were installed in these borings, all borings were grouted upon completion.

TABLE 4 (cont'd)

GROUNDWATER LEVELS IN MONITORING WELLS*

Elevations (+ Ft. MSL)

2MW1	dry-10' (below +36.2)
4MW1	32.9
2MW2	35.0
4MW2	34.5
2MW3	dry-10' (below +36.7)
4MW3	29.5
2MW4	dry-19' (below +32.3)
4MW4	29.2

*Readings taken 11-13-86

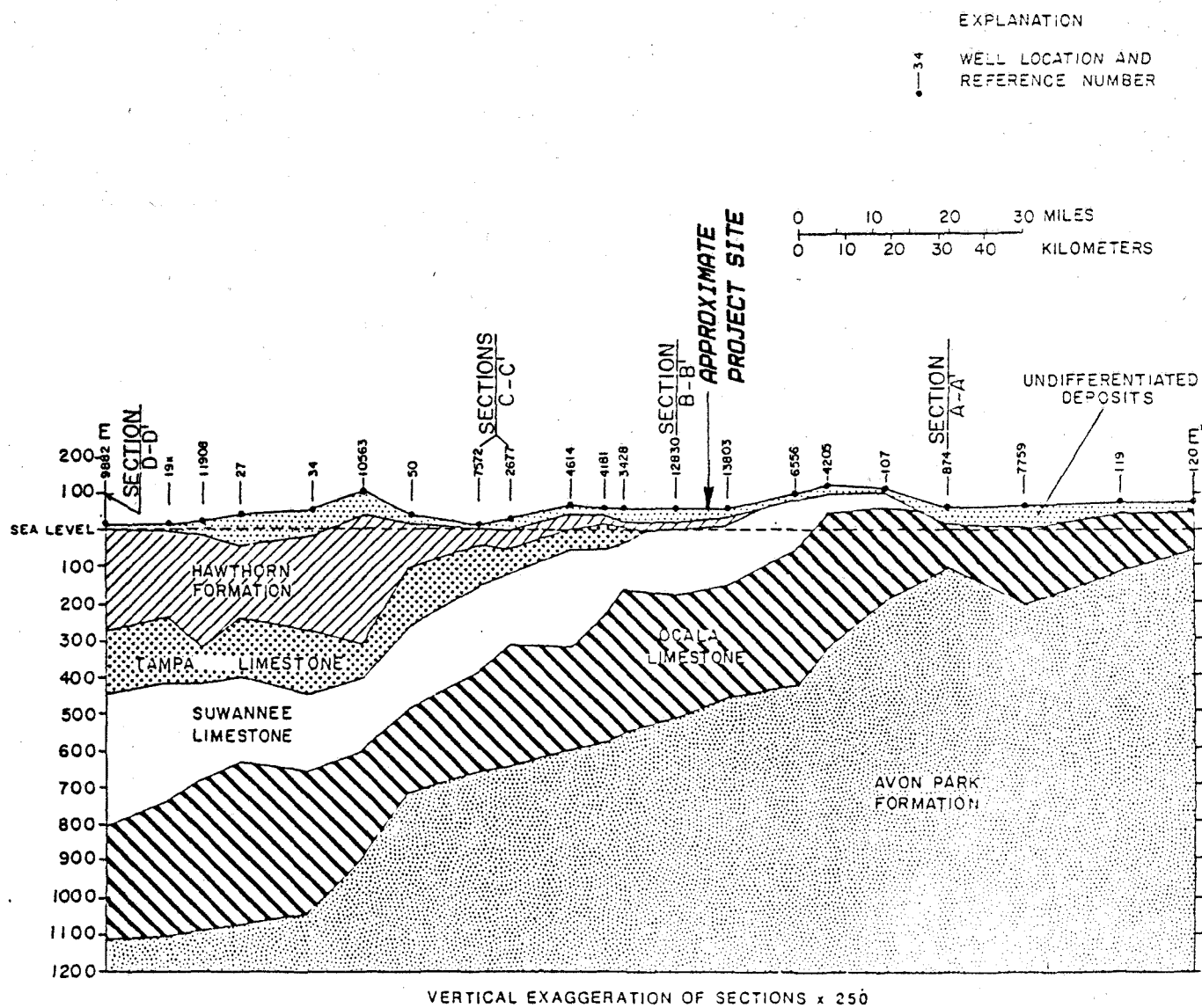
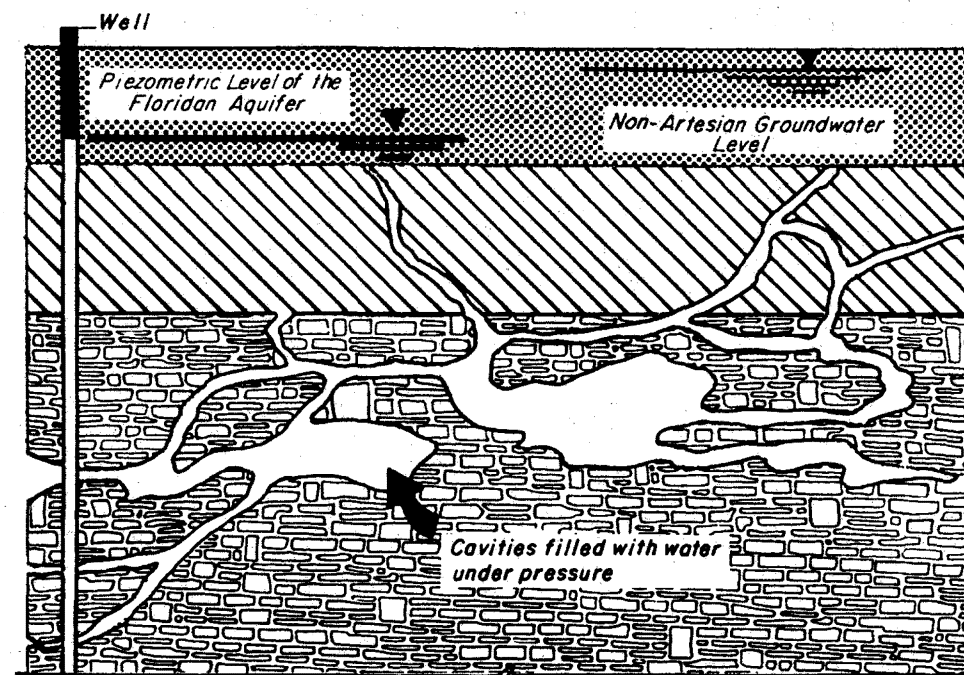
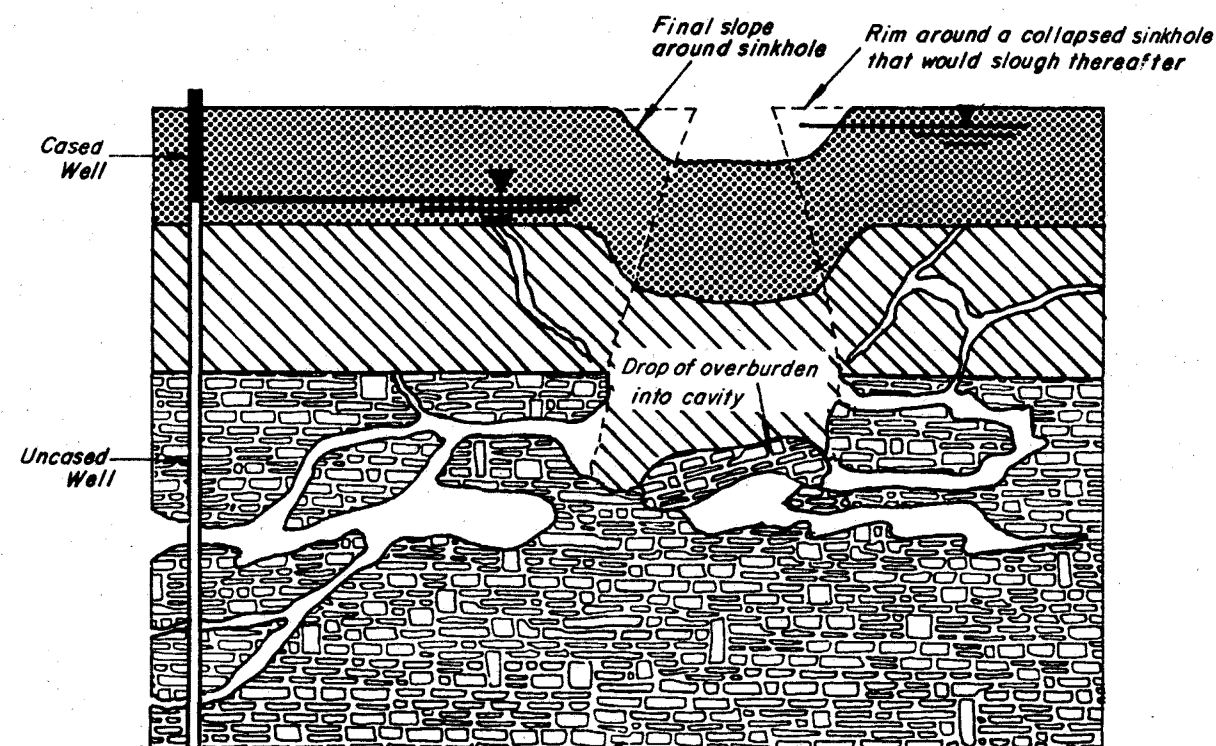


FIGURE 2 NORTH-SOUTH GEOLOGIC CROSS-SECTION



Condition Before Collapse



Condition After Collapse

Sands, Silty Sands and
Clayey Sands

HAWTHORN FORMATION
Clays, Shell, Sand,
Phosphate and Silt

OCALA LIMESTONE
above
AVON PARK LIMESTONE

Cavities filled with water
under pressure

Final slope
around sinkhole
Rim around a collapsed sinkhole
that would slough thereafter

Drop of overburden
into cavity

Cased
Well

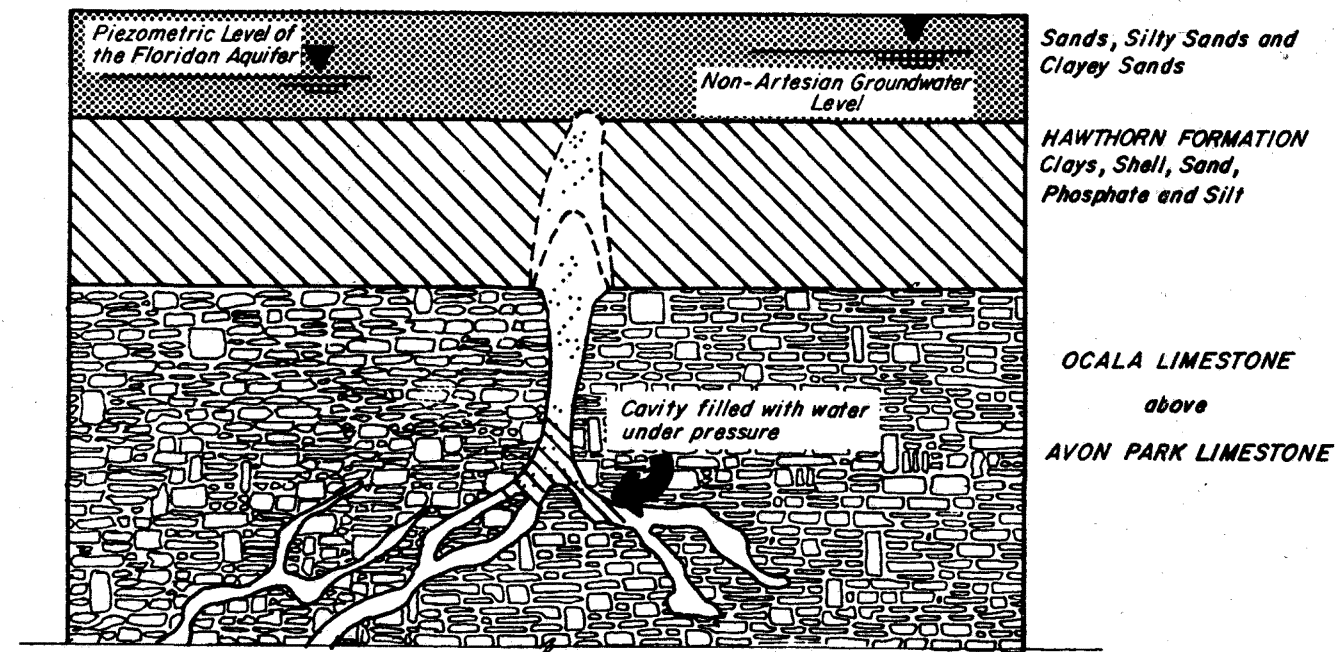
Uncased
Well

Collapse Sinkhole: Collapse sinkholes are the result of the collapse of roofs of cavities within the limestone that underlies the surface followed by a drop-down of the overlying unconsolidated sediment that was supported by the limestone roof. This implies a structural break or collapse of the limestone and hence is referred to as a "Collapse Sinkhole". There is a wide spread acceptance of the usage of Collapse Sinkhole to suggest this type of mechanism.

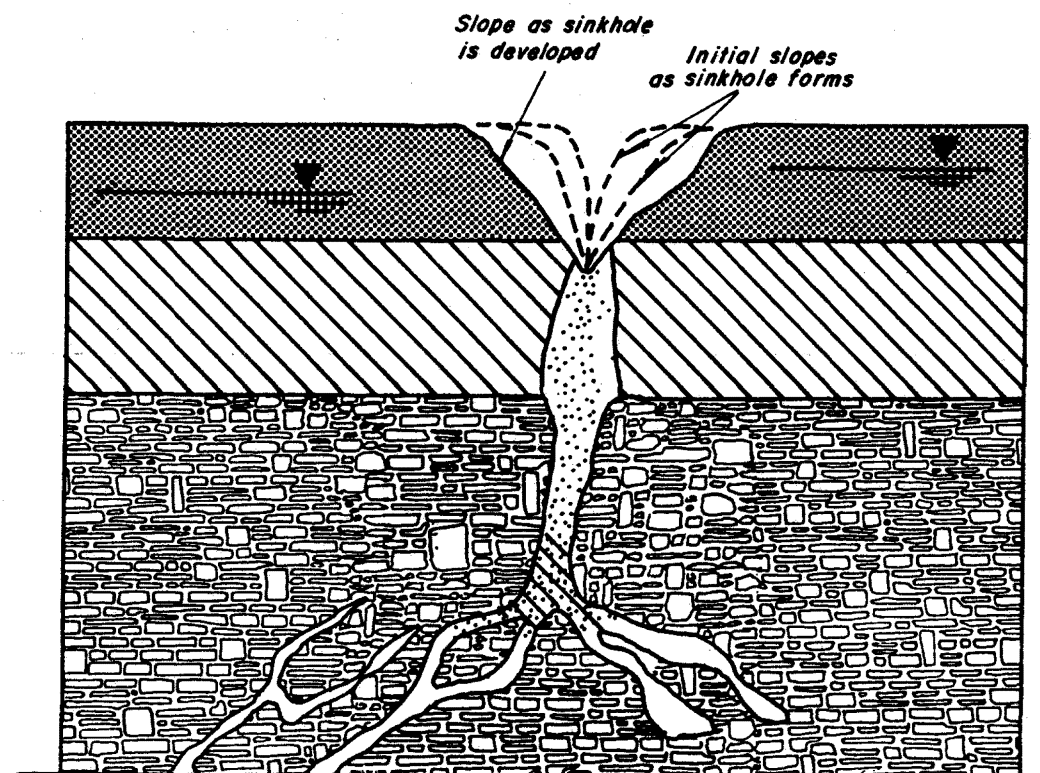


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FIGURE: 3
Illustration of Limestone
Cavity Collapse



Condition Before Sinkhole



Condition After Sinkhole

Ravelled Sinkholes: This type of sinkhole is often referred to as "Solution Sink", "Erosion Sink", "Soil Condition Sink", and less frequently "Doline Sink". This type of sinkhole originates within the unconsolidated sediment that overlies limestones containing openings or cavities near the interface of the limestone and the overlying unconsolidated sediment. This type of sinkhole develops as soil from the overburden material erodes into openings present within the limestone beneath. Such continual erosion of soil material into the limestone develop raveling or a cavity or a dome within the overburden which under favorable hydrogeologic conditions can continue to enlarge and work itself upward towards the surface of the ground. The presence of water circulating from near the surface of the ground to the limestone enhances the development of such a dome within the unconsolidated sediment and it is almost a pre-requisite for the development of such a sinkhole. As the dome or cavity within the unconsolidated material enlarges, the soil that overlies the dome can no longer bridge the opening and under favorable conditions the material above begins to collapse and fall into the underlying opening. In the Geotechnical Engineering Profession and Practice, "Ravelled Sinkhole", to describe this type of mechanism has become popular within the past few years and will be used herein as opposed to "Solution Sink", "Erosion Sink", "Soil Condition Sink" or a "Doline Sink".

FIGURE: 4
Illustration of Ravelling
Collapse

In certain regions, solution becomes a dominant process in landform development resulting in a unique type of topography to which the name Karst has been applied. Most of the notable Karst areas are in regions where limestones underlie the surface although in some localities the rocks are dolomitic limestones or dolomites. Limestones are abundant in their distribution; hence it might be expected that Karst topography would also be widespread. In actuality, significant development of Karst features is restricted to a relatively small number of localities. Some of the important areas are in western Yugoslavia, southern France, southern Spain, Greece, northern Yucatan, Jamaica, northern Puerto Rico, western Cuba, southern Indiana, parts of Tennessee, Virginia, Kentucky and central Florida. In any of the above areas, numerous Karst features are found, but in none are all the possible individual forms to be seen, as they exhibit varying stages of Karst development and different types of geologic structures.

The geologic and hydrologic conditions necessary for the optimum development of Karst can be summarized as follows:

- 1) Soluble rock (limestone) at or near the surface.
- 2) The limestone should be dense; highly jointed, and thin bedded.
- 3) Major entrenched valleys exist in a position such that ground water can emerge into surface streams.
- 4) The region should have moderate to abundant rainfall.

Florida possesses the above-mentioned conditions only in part and consequently has only moderately well-developed Karst. Limestones are not highly indurated or dense and therefore possess some degree of mass permeability, however, Florida limestones are highly fractured and do possess moderate vertical differential permeability to concentrate water movement. If a rock is highly porous and permeable throughout, rainfall will be absorbed en masse and move through the whole of the rock resulting in no differential solution.

Florida also does not have major entrenched valleys into which ground water can emerge and

drain off; however, the artesian aquifer accomplishes a similar result. In this case water entering the system moves down gradient discharging through springs or eventually into the Atlantic Ocean or Gulf of Mexico. The rate of movement in this system is very slow and this decreases the amount of solution taking place.

Thus Florida is an area that fulfills in part the conditions for optimum Karst development and reflects this in having a moderately developed Karst topography characterized by one Karst feature, sinkholes. The sinkhole is the most common and widespread topographic form in a Karst terrain.

It is most difficult to classify sinkholes because of the many variations that they exhibit and the varying local usage of terms applied to them. Fundamentally, however, they are of two major types, those that are produced by collapse of the limestone roof above an underground void and those that are developed slowly downward by solution beneath a soil mantle without physical disturbance of the rock in which they are developing. These two types have been referred to as collapse sinks and solution sinks or dolines. Collapse sinks are normally steep-sided, rocky and abruptly descending forms while dolines range from funnel-shaped depressions broadly open upward to pan or bowl-shaped. Sinkholes of Florida fall in both of the above categories, however, more commonly they constitute a third type.

Florida sinkholes are most commonly formed in an environment with the following physical characteristics:

1. Limestones overlain by unconsolidated sediments less than 100 feet thick.
2. Cavity systems present in the Limestone.
3. Water table higher than the potentiometric surface.
4. Breaching of the Limestone into the cavernous zone creating a point of high recharge of the artesian aquifer.

Under these circumstances water moving down into the Limestone may take large amounts of sediments into the cavernous system creating a void in the overlying sediments. These sediments are generally incompetent and will reflect at the surface as either a structural sag or as catastrophic collapse.

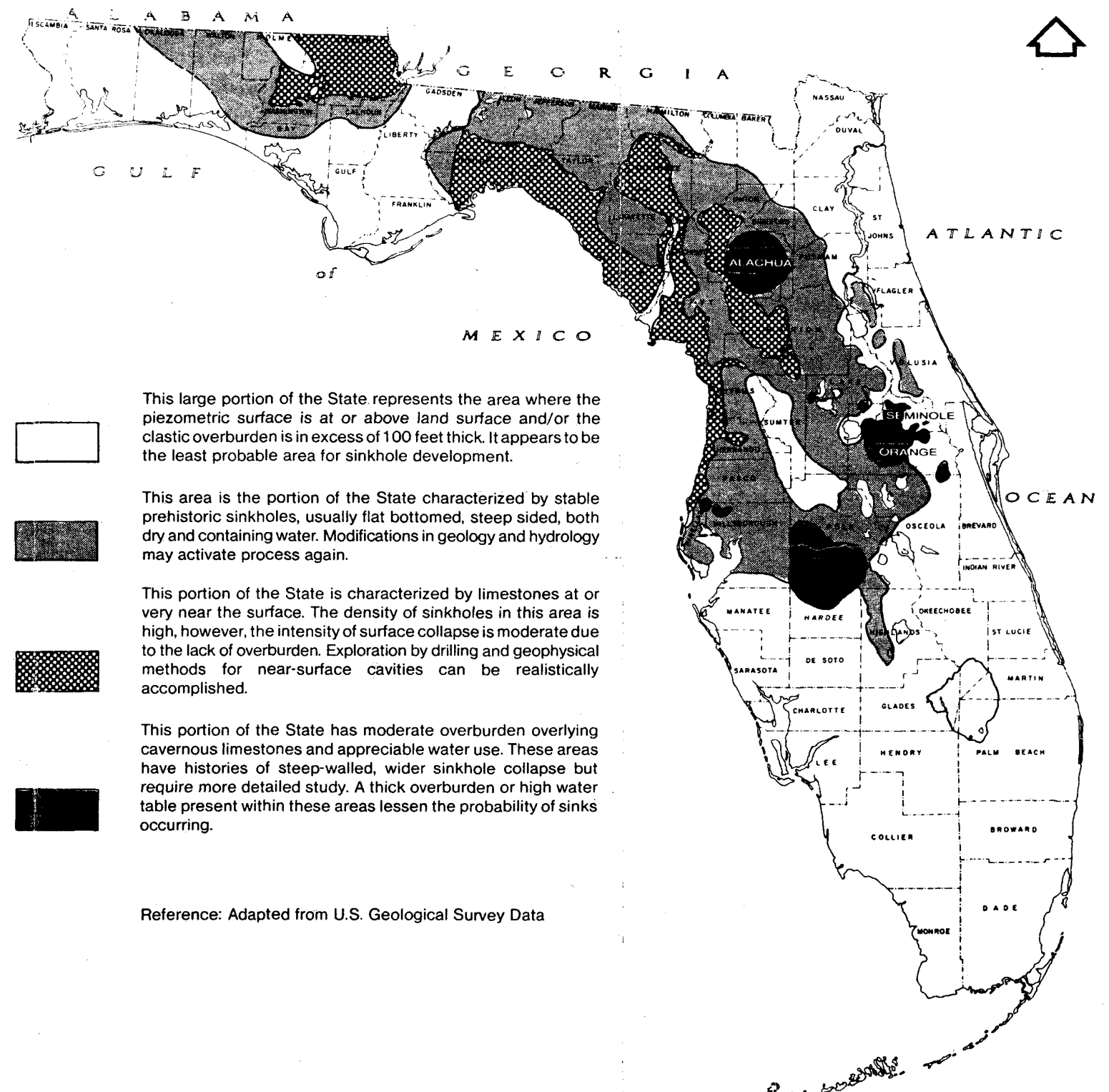


FIGURE 5
Sinkhole Prone
Areas in Florida

8.0 SHEETS

1. Pasco County Site Location Map
2. Aerial Topographic Map/Boring location Plan (1"=200')
3. Aerial Topographic Map/Boring Location Plan (1"=200')
4. Aerial Topographic Map/Boring Location Plan (1"=200')
5. Soil Profiles
6. Soil Profiles
7. Soil Profiles
8. Soil Profiles
9. Soil Profiles
10. Soil Profiles
11. Soil Profiles

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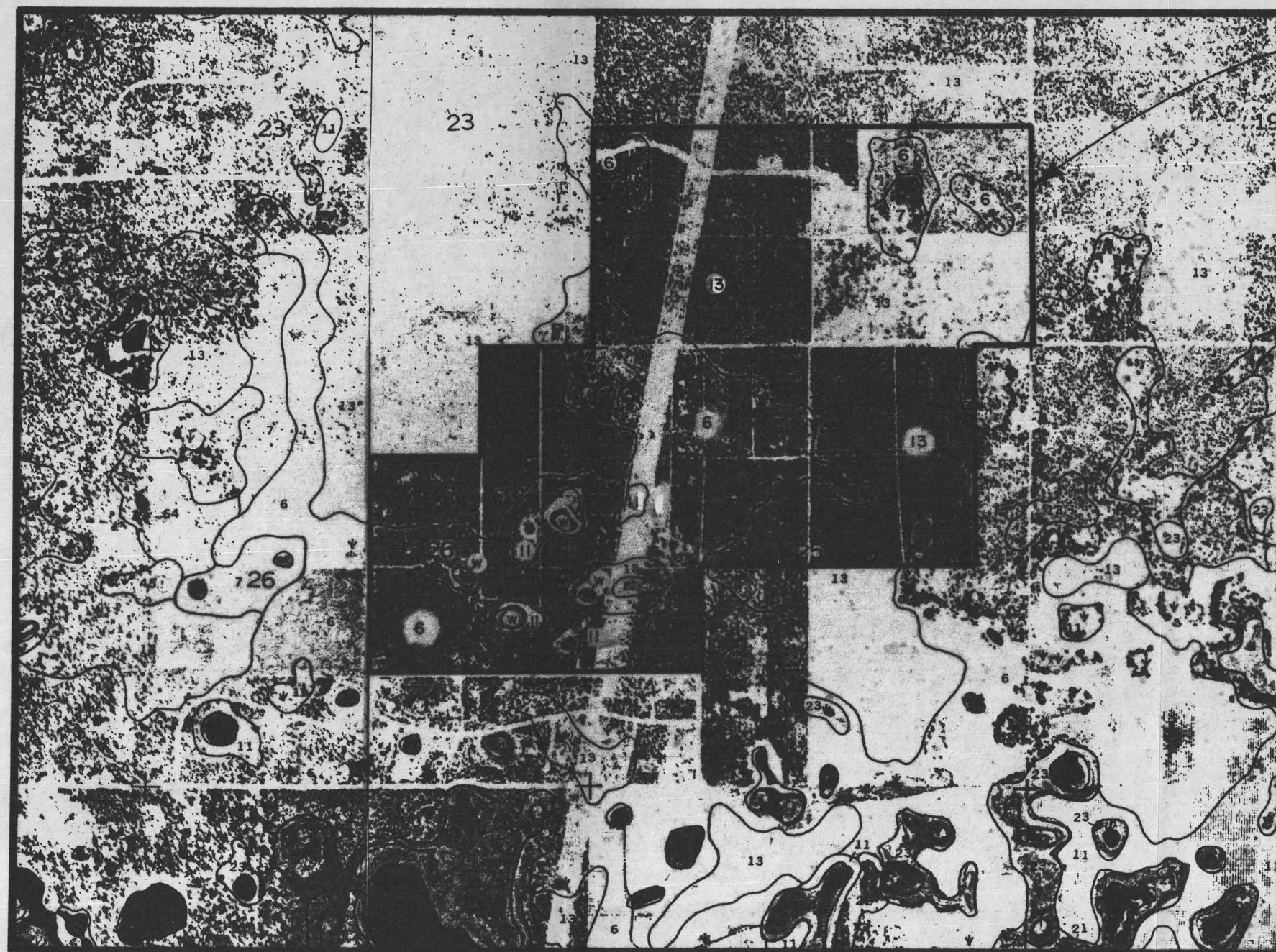
9.0 APPENDICES

APPENDIX A

USDA VICINITY MAP (PLATE 1)
USDA/SCS SOIL DESCRIPTIONS

Image Quality

As you review the next group of images, Please note that the original documents were of poor quality.



APPROXIMATE SITE
LIMITS

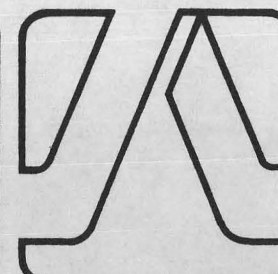
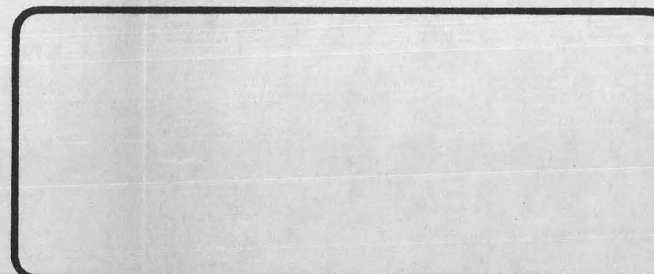
NOTE : For Soil Description
see Appendix A.

USDA VICINTY MAP

SCALE: 1" = 1667'

REFERENCE : USDA Soil Survey
Pasco County, Florida
Aerial 1975
Issued 1982

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APPVD:	RAM
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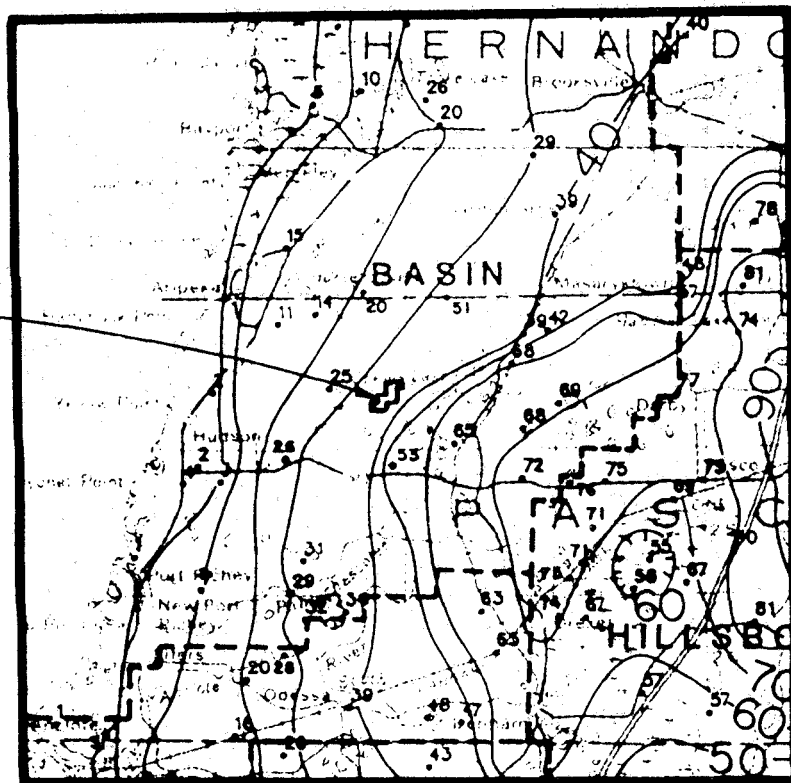


GEOTECHNICAL / HYDROGEOLOGIC STUDY
PROPOSED PASCO COUNTY LANDFILL -
HAYS ROAD SITE
PASCO COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

DATE: DEC. 86 PROJ. NO: 85-30267 PLATE 1

APPROXIMATE PROJECT
LOCATION



POTENTIOMETRIC SURFACE OF THE UPPER FLORIDAN AQUIFER

NTS



Reference: Potentiometric Surface of the Upper Floridan
Aquifer, Southwest Florida Water Management
District, September 1986. U.S. Geological Survey
Open-File Report 86-603

GEOTECHNICAL / HYDROGEOLOGIC STUDY
PROPOSED PASCO COUNTY LANDFILL -
HAYS ROAD SITE
PASCO COUNTY, FLORIDA



JAMMAL & ASSOCIATES, INC. Consulting Engineers

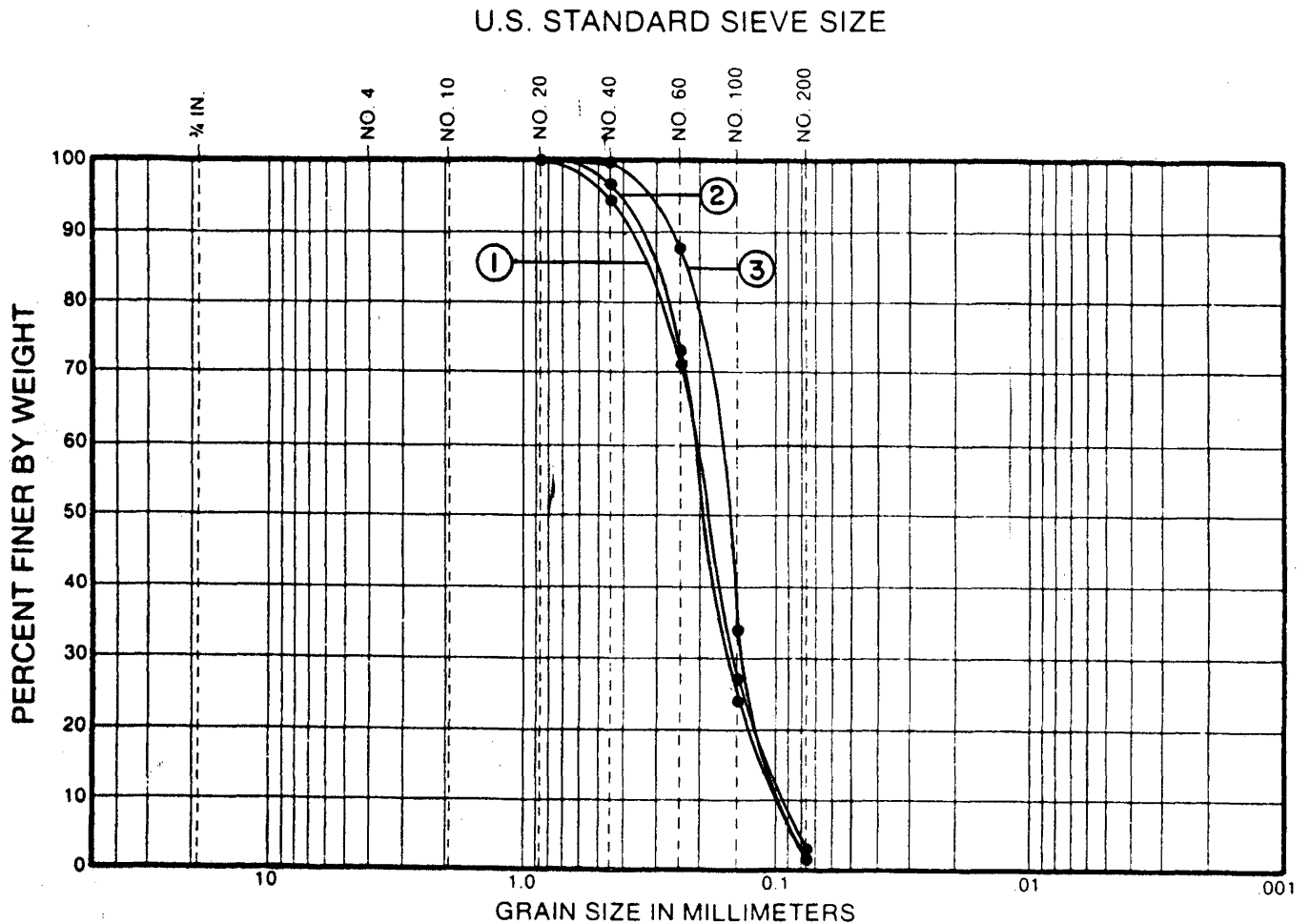
DRAWN	STB	SCALE	PROJ NO
CHKD	RAM	DATE	85-30267
		DEC. 86	PLATE 2

USDA/SCS SOIL DESCRIPTIONS

<u>Mapping Unit</u>	<u>Depth (Ft.)</u>	<u>Soil Description</u>	<u>Drainage</u>	<u>Water Table (Ft.)</u>
Tavares SAND (6)	0 to 1/4 1/4 to 1 1 to 3 3 to 4-1/2 4-1/2 to 6 6 to 7-1/2	Very dark gray SAND Yellowish-brown SAND Light yellowish-brown SAND Yellowish-brown SAND Very pale brown SAND White SAND	Moderately well drained	3-1/2 to 5 feet most of the year, more than 5 feet during dry season
Sparr fine SAND (7)	0 to 1/2 1/2 to 1 1 to 1-1/2 1-1/2 to 3 3 to 3-1/2 3-1/2 - 6-1/2	Dark gray fine SAND Grayish brown fine SAND Pale brown fine SAND Very pale brown fine SAND Light yellowish- brown fine SAND Light yellowish-brown sandy CLAY loam	Somewhat poorly drained, moderately permeable	2 to 3-1/2 feet for 1 to 4 months per year
Adamsville fine SAND (11)	0 to 1/2 1/2 to 1 1 to 2 2 to 4 4 to 6-1/2	Dark gray to gray fine SAND Light gray loose fine SAND Light yellowish- brown fine SAND Yellowish-brown fine SAND White fine SAND	Somewhat poor; surface runoff; rapid internal drainage when not retarded by the high water table	1-1/2 to 2-1/2 feet for 1 to 2 months per year; floods over in 5-20 years for 1-4 weeks
Candler fine Sand, 0 - 5 Percent slopes (13)	0 to 1/4 1/4 to 3/4 3/4 to 2-1/2 2-1/2 to 4 4 to 7	Grayish brown fine SAND Brown fine SAND Brownish yellow fine SAND Yellow fine SAND Mixed brownish-yellow and yellow fine SAND	Excessively drained rapidly permeable	2 to 3-1/2 feet for 2 to 6 months per year, more than 3-1/2 during dry season
Electra Variant (18)	0 to 1/2 1/2 to 3-1/4 3-1/4 to 3-1/2 3-1/2 to 5-1/4 5-1/4 to 6 6 to 6-1/4 6-1/4 to 6-1/2 6-1/2 to 7	Dark gray to gray fine SAND White fine SAND Dark brown fine SAND Dark yellowish-brown fine SAND Brown fine SAND Grayish brown fine sandy loam Grayish brown sandy CLAY loam White soft LIMESTONE	Somewhat poorly drained, slowly permeable	2 to 3-1/2 feet for 4 months per year, more than 3-1/2 during dry season

APPENDIX B

GRAIN SIZE ANALYSIS RESULTS (PLATES 1-8)
CONSOLIDATION TEST RESULTS (PLATES 9-16)



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION SYSTEM

	1	2	3
LIQUID LIMIT :	---	---	---
PLASTIC LIMIT :	---	---	---
FINE THAN # 200:	2%	1%	1%
CLASSIFICATION:	SP	SP	SP

Sample Location: 1) D+400-44 4.5 Ft.
 2) C+400-36 9.0 Ft.
 3) E-32 30.5 Ft.

Sample Description: 1) Light brown fine SAND
 2) Light brown to brown fine SAND
 3) Brown to dark brown fine SAND

GRAIN SIZE ANALYSIS

PROPOSED PASCO COUNTY LANDFILL
 HAYS ROAD SITE



JAMMAL & ASSOCIATES, INC. Consulting Engineers

Drawn by: KFB

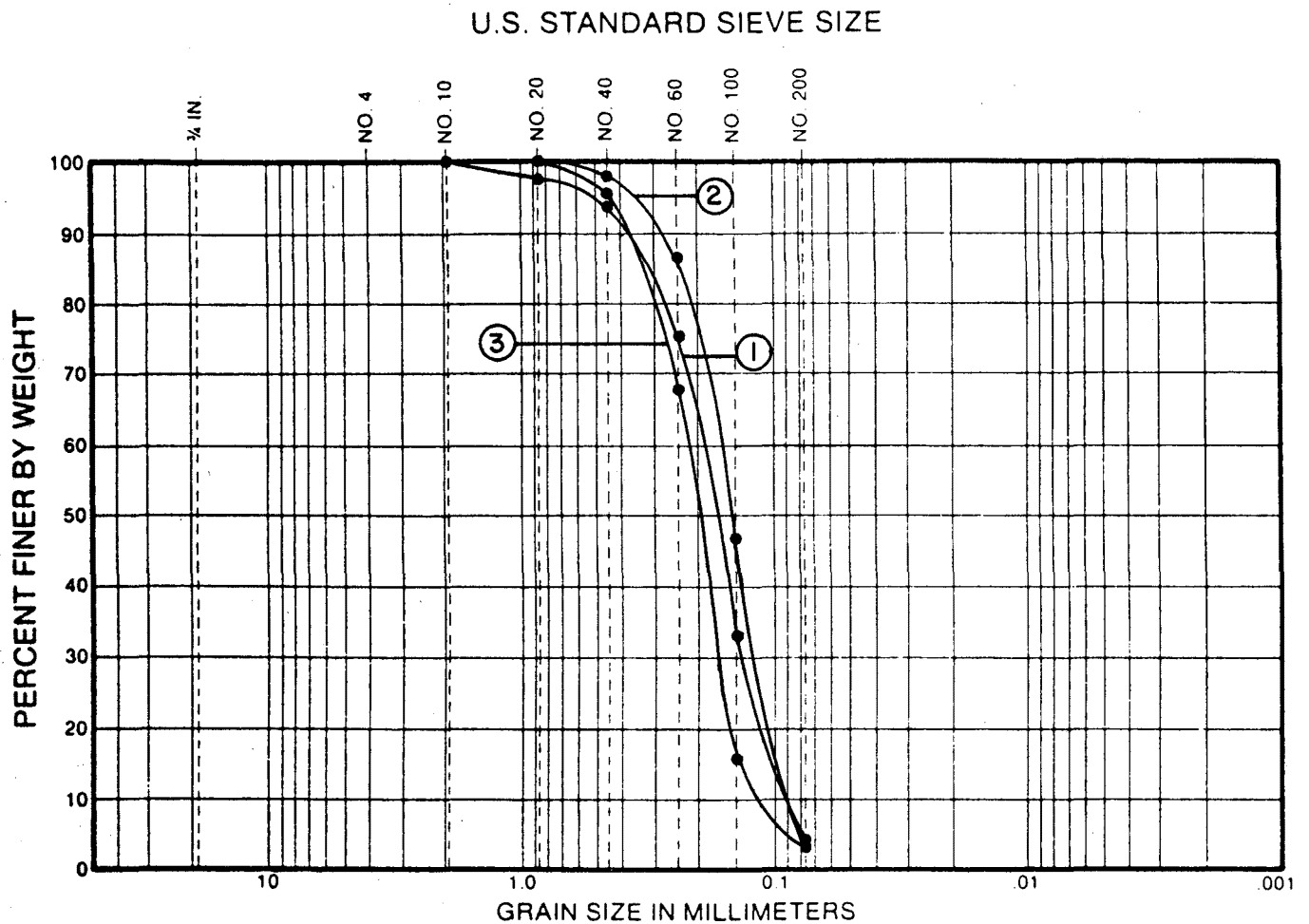
Tested by:

Project No.: 85-30267

Checked by: RAM

Date: AUG, '86

PLATE I



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION SYSTEM

	1	2	3
LIQUID LIMIT : ---	---	---	---
PLASTIC LIMIT : ---	---	---	---
FINE THAN # 200: 3%	2%	2%	
CLASSIFICATION: SP	SP	SP	

Sample Location: 1) G-32 5.0 Ft.
 2) F-40 25.0 Ft.
 3) H-32 10.5 Ft.

Sample Description: 1) Light brown fine SAND
 2) Dark brown fine SAND
 3) Dark brown fine SAND

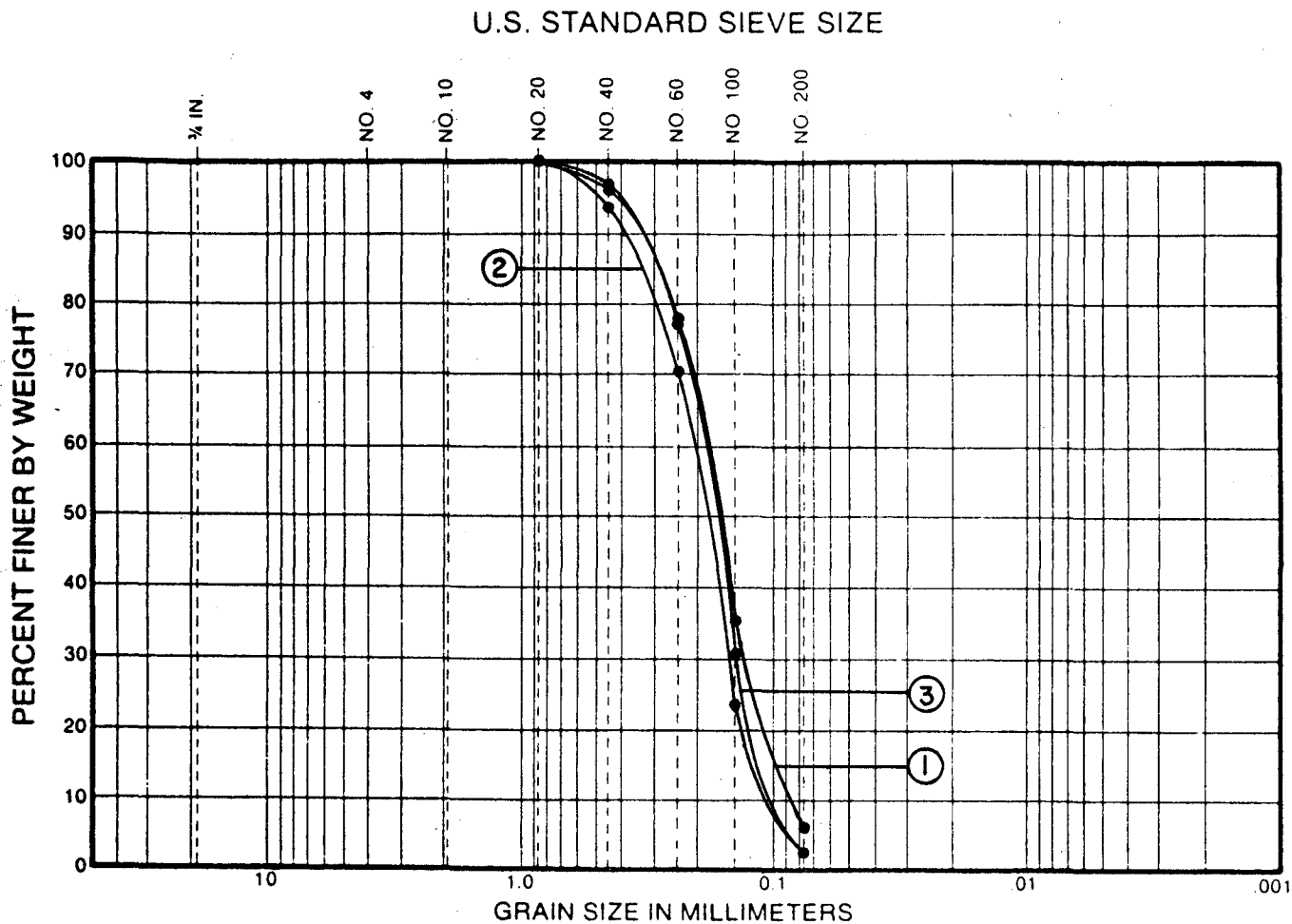
GRAIN SIZE ANALYSIS

PROPOSED PASCO COUNTY LANDFILL
 HAYS ROAD SITE



JAMMAL & ASSOCIATES, INC. Consulting Engineers

Drawn by: KFB	Tested by:	Project No.: 85-30267
Checked by: RAM	Date: AUG. '86	PLATE 2



Sample Location: 1) H-64 5.0 Ft.
 2) I-48 7.0 Ft.
 3) I+400-44 7.0 Ft.

Sample Description: 1) Light brown fine SAND
 to slightly silty fine SAND

2) Light brown fine SAND

3) Light brown fine SAND

GRAIN SIZE ANALYSIS

PROPOSED PASCO COUNTY LANDFILL
 HAYS ROAD SITE



JAMMAL & ASSOCIATES, INC. Consulting Engineers

Drawn by: KFB

Tested by:

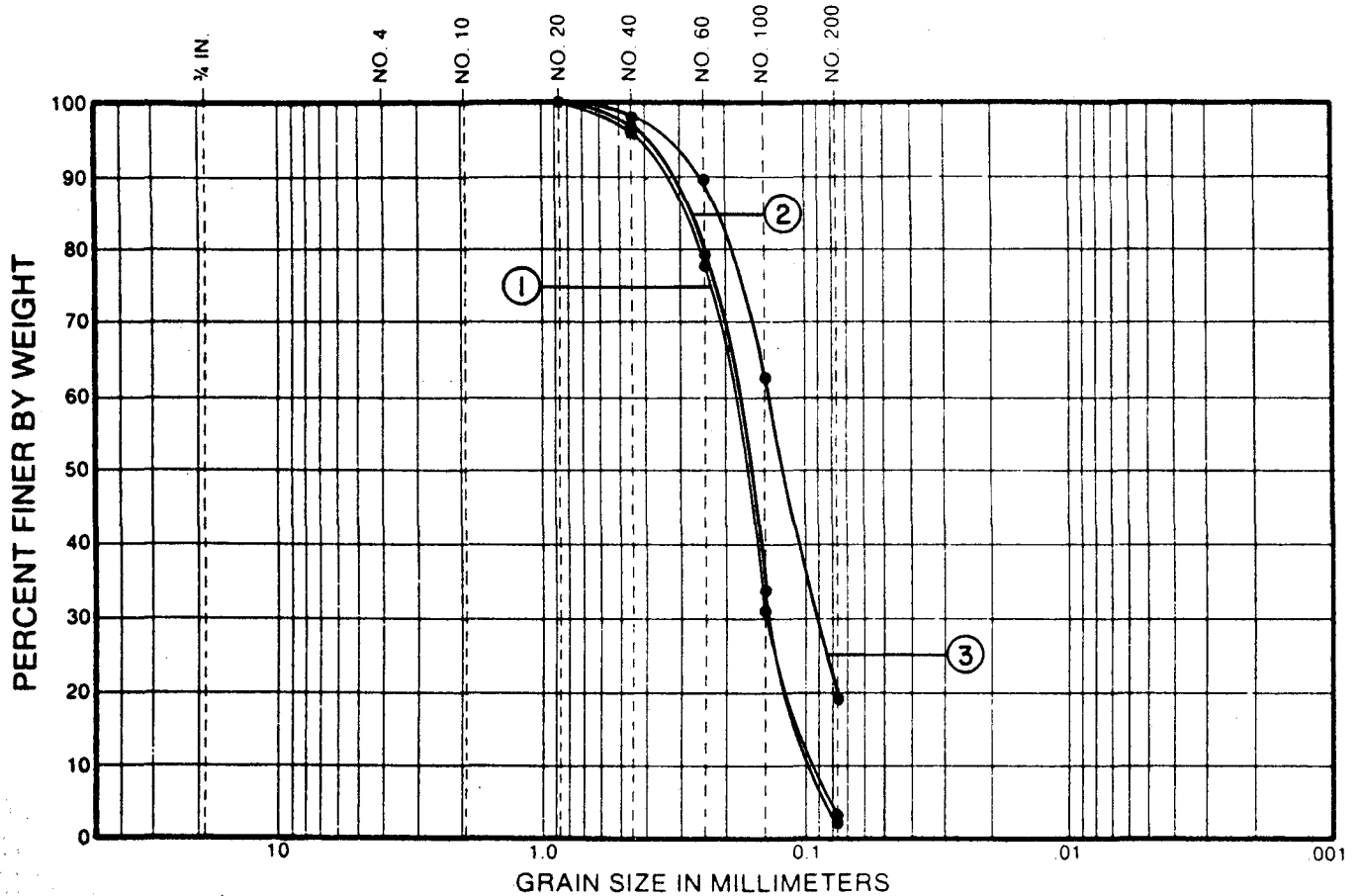
Project No. 85-30267

Checked by: RAM

Date: AUG. '86

PLATE 3

U.S. STANDARD SIEVE SIZE



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION SYSTEM

	1	2	3
LIQUID LIMIT :	---	---	---
PLASTIC LIMIT :	---	---	---
FINE THAN # 200:	2%	2%	20%
CLASSIFICATION:	SP	SP	SC

Sample Location: 1) C+400-12 5.0 Ft.
 2) C-8 5.0 Ft.
 3) D-24 7.0 Ft.

Sample Description: 1) Light brown fine SAND
 2) Light brown fine SAND, trace roots
 3) Light brown slightly clayey fine SAND

GRAIN SIZE ANALYSIS

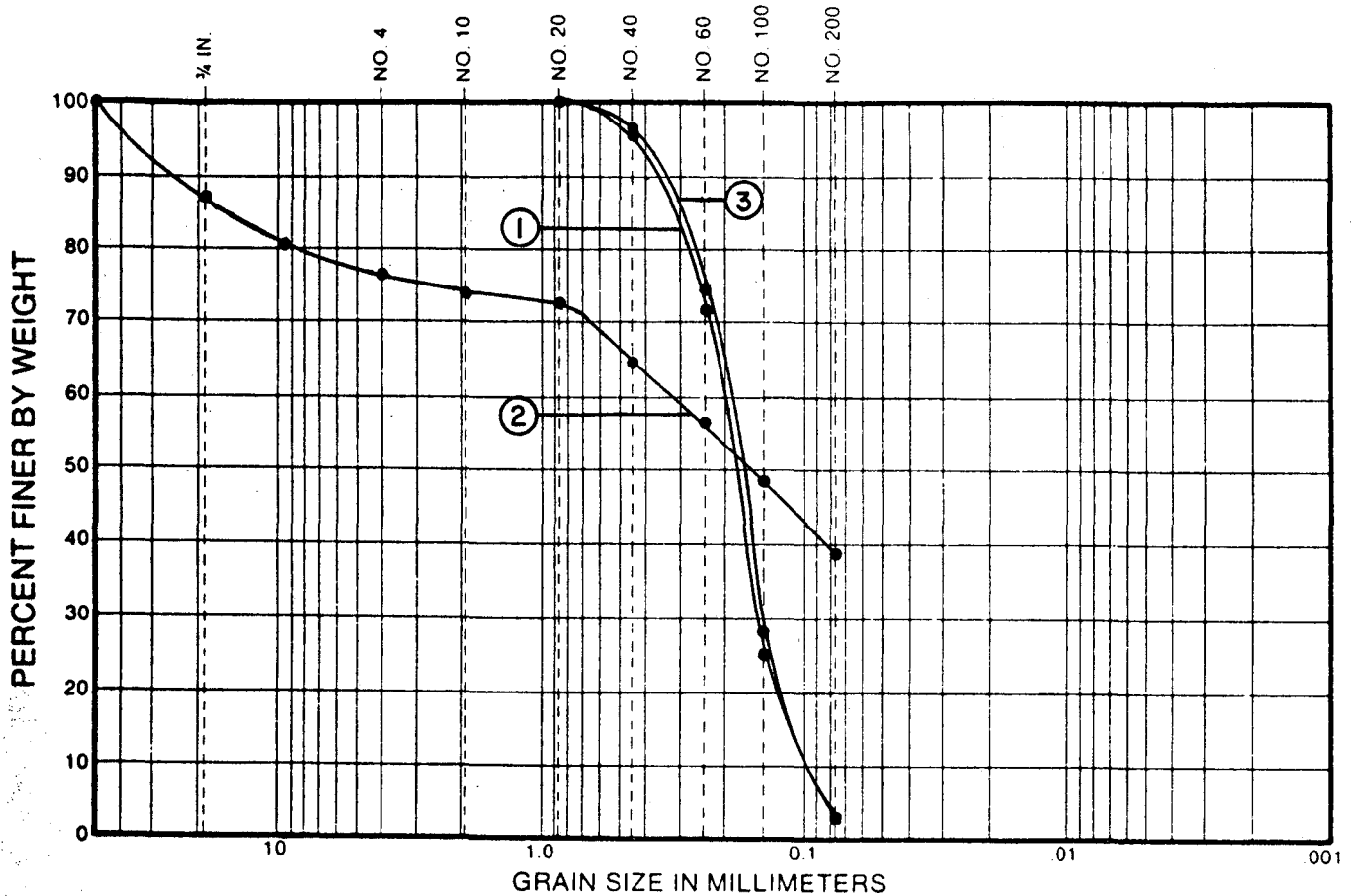
PROPOSED PASCO COUNTY LANDFILL
 HAYS ROAD SITE



JAMMAL & ASSOCIATES, INC. Consulting Engineers

Drawn by: KFB	Tested by:	Project No. 85-30267
Checked by: RAM	Date: AUG. '86	PLATE 4

U.S. STANDARD SIEVE SIZE



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION SYSTEM

	1	2	3
LIQUID LIMIT :	---	---	---
PLASTIC LIMIT :	---	---	---
FINE THAN # 200:	2%	39%	2%
CLASSIFICATION:	SP	SC-CH	SP

Sample Location: 1) E-24 9.5 Ft.
 2) E-24 45.0 Ft.
 3) F-32 15.0 Ft.

Sample Description: 1) Brown fine SAND
 2) Cream colored weathered limestone and silty sandy CLAY
 3) Dark brown fine SAND

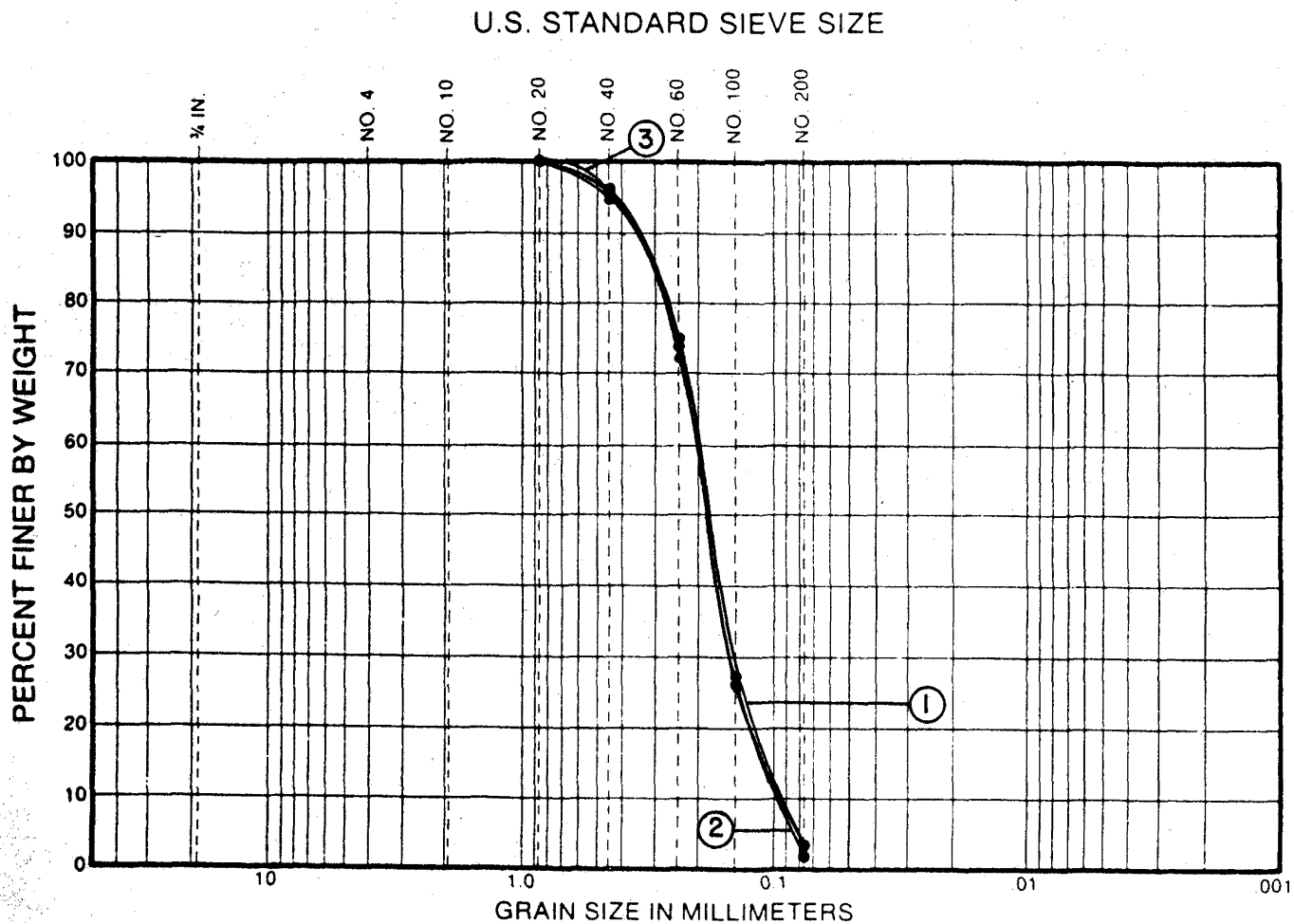
GRAIN SIZE ANALYSIS

PROPOSED PASCO COUNTY LANDFILL
 HAYS ROAD SITE



JAMMAL & ASSOCIATES, INC. Consulting Engineers

Drawn by: KFB	Tested by:	Project No: 85-30267
Checked by: DJD	Date: AUG. '86	PLATE 5



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION SYSTEM

	1	2	3
LIQUID LIMIT	---	---	---
PLASTIC LIMIT	---	---	---
FINE THAN # 200:	2%	1%	2%
CLASSIFICATION:	SP	SP	SP

Sample Location: 1) D+400-20 10.0 Ft.
 2) C+400-28 10.0 Ft.
 3) E-32 9.0 Ft.

Sample Description: 1) Light brown to brown fine SAND

2) Dark brown fine SAND
 3) Brown fine SAND

GRAIN SIZE ANALYSIS

PROPOSED PASCO COUNTY LANDFILL
 HAYS ROAD SITE



JAMMAL & ASSOCIATES, INC. Consulting Engineers

Drawn by: KFB

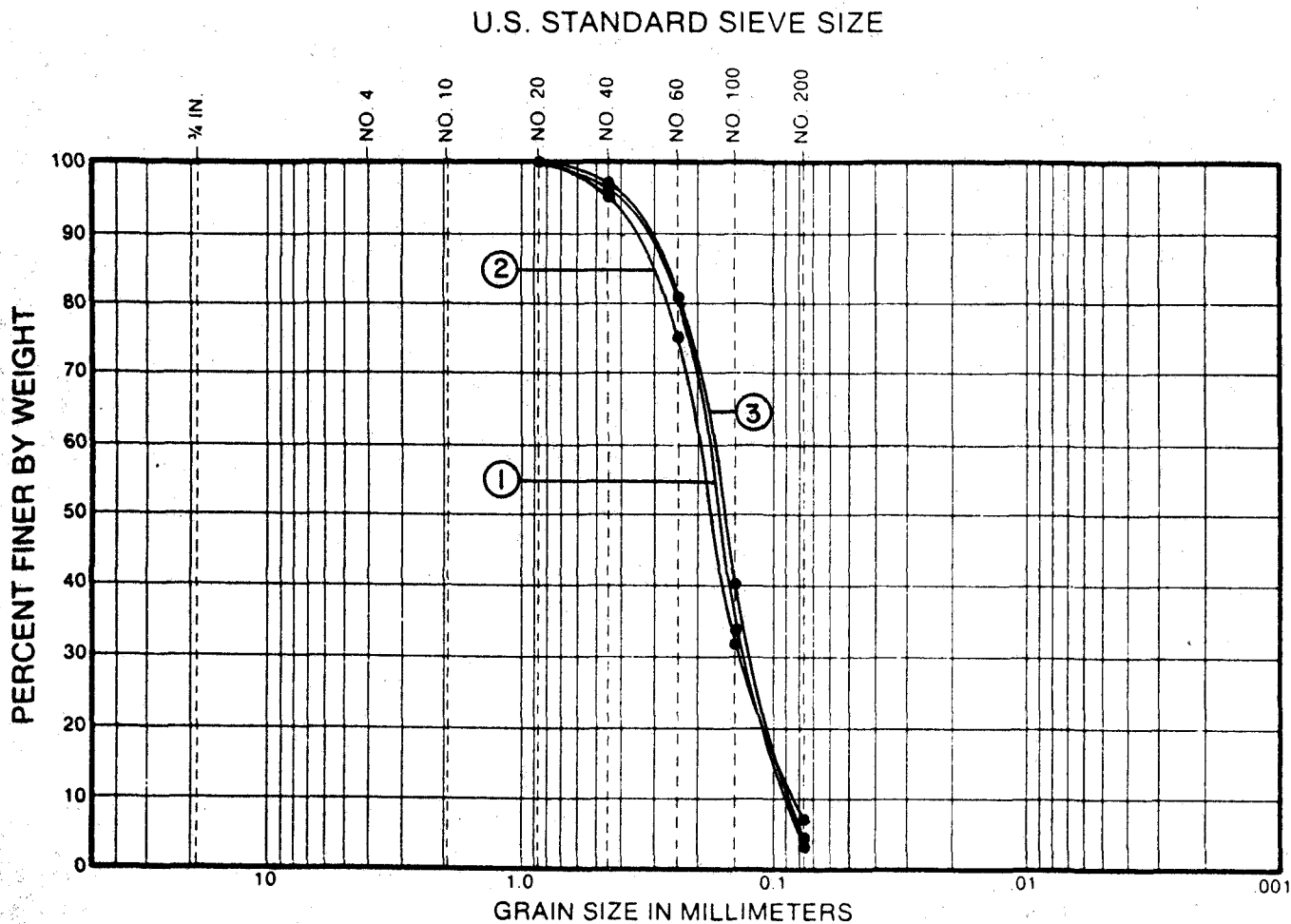
Tested by:

Project No: 85-30267

Checked by: DJD

Date: AUG '86

PLATE 6



Sample Location: 1) F-8 3.0 Ft.
 2) B-13+35 4.0 Ft.
 3) A-24 5.0 Ft.

Sample Description: 1) Light brown to white
 fine SAND
 2) Light gray-brown fine SAND to slightly
 silty fine SAND
 3) Light brown fine SAND

GRAIN SIZE ANALYSIS

PROPOSED PASCO COUNTY LANDFIL
 HAYS ROAD SITE



JAMMAL & ASSOCIATES, INC. Consulting Engineers

Drawn by: KFB

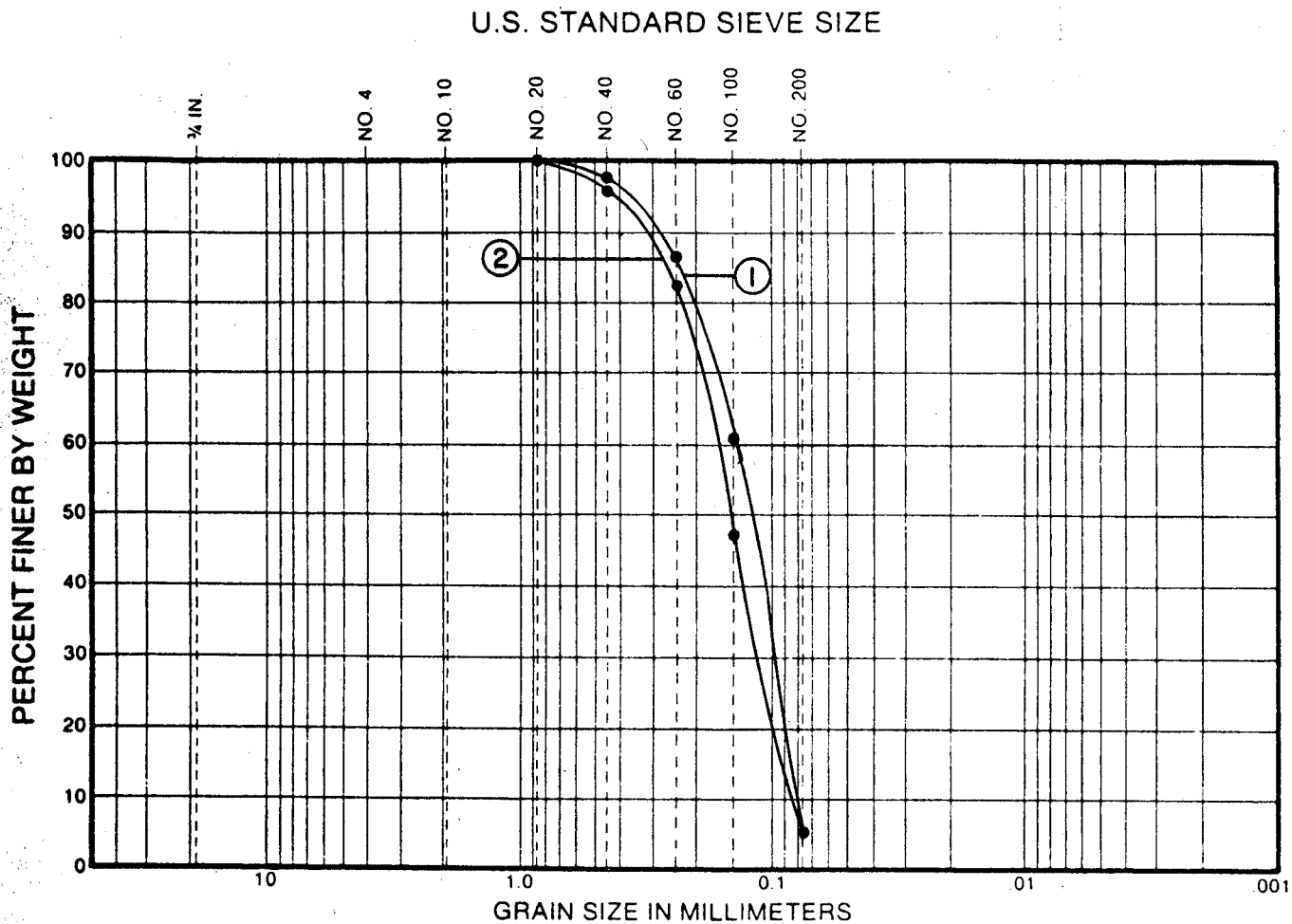
Tested by:

Project No 85-30267

Checked by: RAM

Date: AUG. '86

PLATE 7



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION SYSTEM

	1	2
LIQUID LIMIT :	---	---
PLASTIC LIMIT :	---	---
FINE THAN # 200:	5%	5%
CLASSIFICATION:	SP	SP

Sample Location: 1) A-24 16.0 Ft.
2) A-13+35 15.0 Ft.

Sample Description: 1) Brown to dark brown fine SAND
2) Dark gray fine SAND

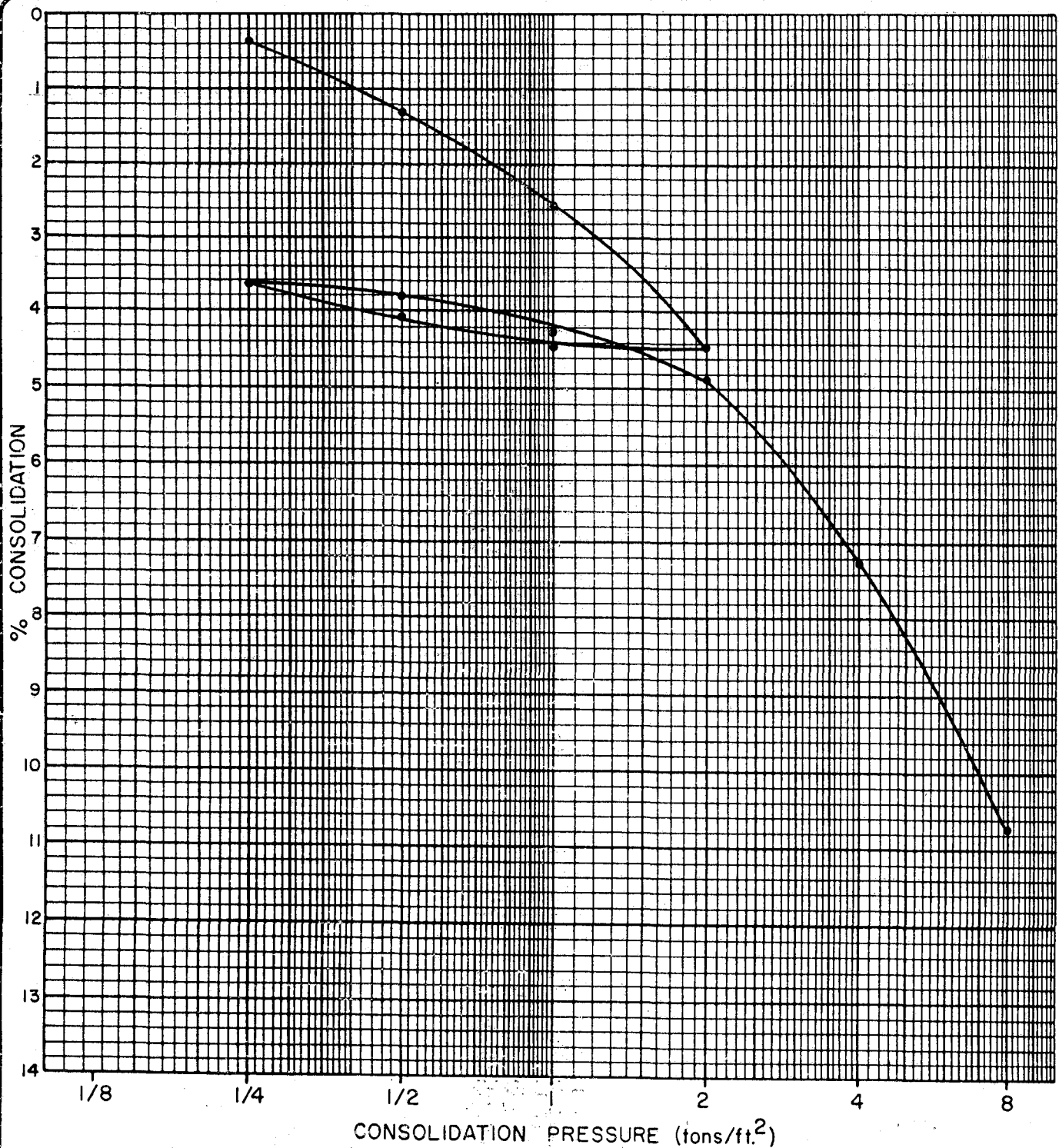
GRAIN SIZE ANALYSIS

PROPOSED PASCO COUNTY LANDFILL
HAYS ROAD SITE



JAMMAL & ASSOCIATES, INC. Consulting Engineers

Drawn by: KFB	Tested by:	Project No. 85-30267
Checked by: RAM	Date: AUG. '86	PLATE 8



SAMPLE LOCATION: D+400-12 DEPTH: 8.0 Ft.

SOIL DESCRIPTION: Greenish-gray CLAY (CH)

Stratum 9

($k_v = 3.4 \times 10^{-4}$ cm/sec)

DRY UNIT WEIGHT: 62 pcf

NATURAL MOISTURE CONTENT: 63%

LIQUID LIMIT: 109%

PLASTIC LIMIT: 56%

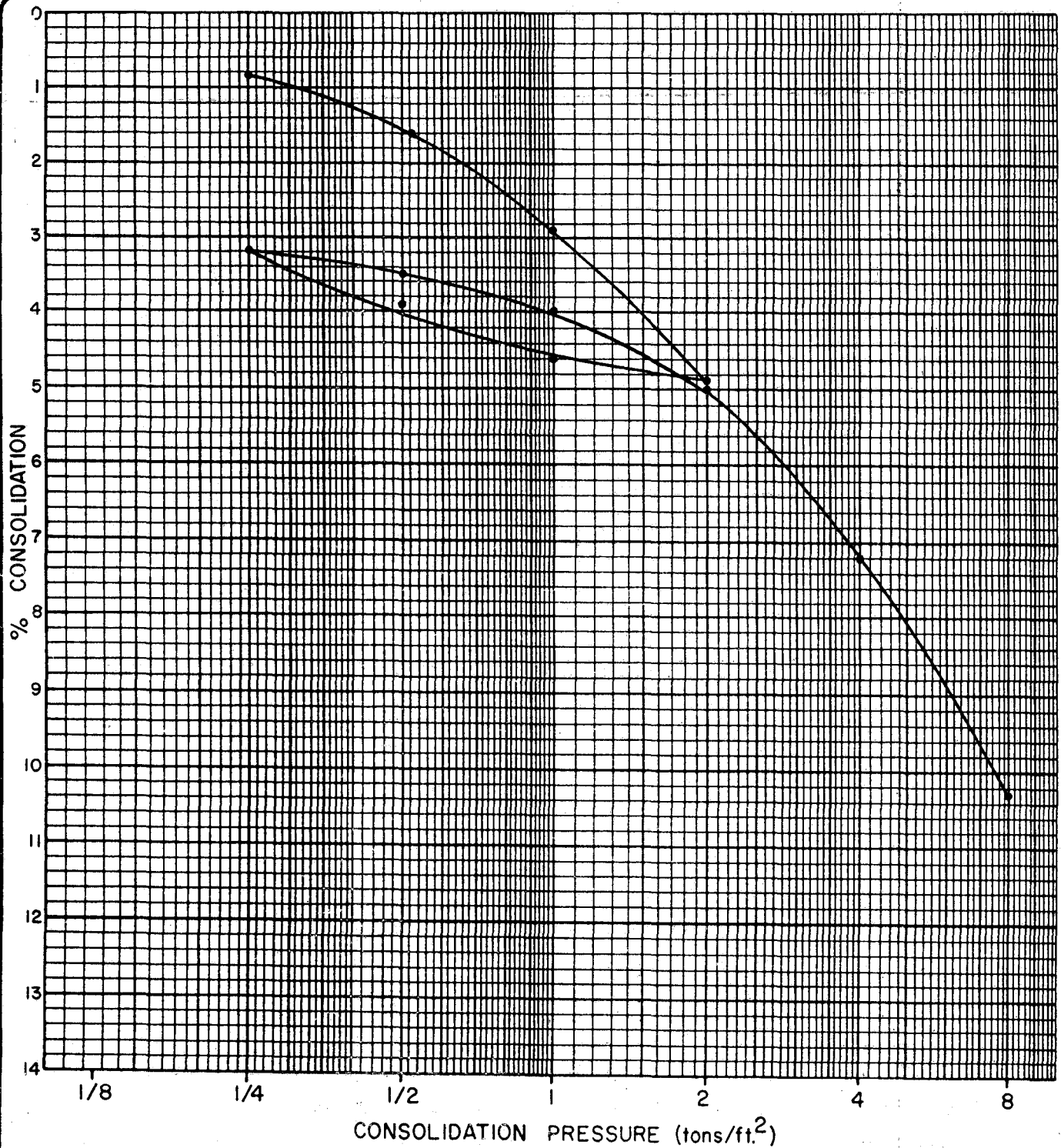
MINUS 200: 93%

CONSOLIDATION TEST RESULTS
PROPOSED PASCO COUNTY LANDFILL -
HAYS ROAD SITE
PASCO COUNTY, FLORIDA



JAMMAL & ASSOCIATES, INC. Consulting Engineers

DRAWN	KFB	SCALE	—	PROJ NO	85-30267
CHKD	DAM	DATE	NOV. 86	PLATE	9



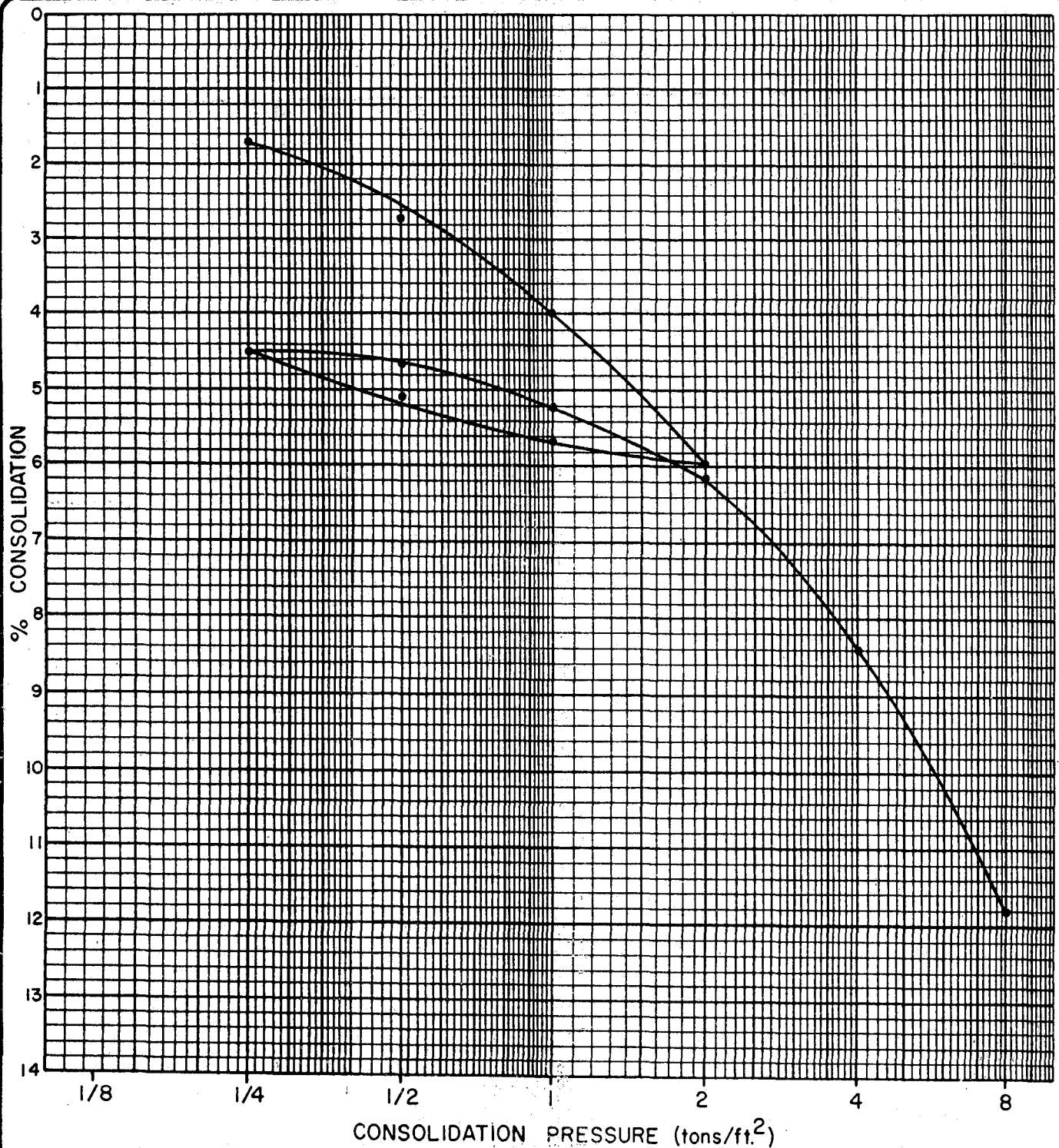
SAMPLE LOCATION: D-16 DEPTH: 9.5 Ft.
 SOIL DESCRIPTION: Greenish-gray CLAY (CH)
Stratum 9
($k_v = 4.0 \times 10^{-7}$ cm/sec)
 DRY UNIT WEIGHT: 73 pcf
 NATURAL MOISTURE CONTENT: 54%
 LIQUID LIMIT: 95%
 PLASTIC LIMIT: 41%
 MINUS 200: 94%

CONSOLIDATION TEST RESULTS
 PROPOSED PASCO COUNTY LANDFILL -
 HAYS ROAD SITE
 PASCO COUNTY, FLORIDA



JAMMAL & ASSOCIATES, INC. Consulting Engineers

DRAWN	KFB	SCALE	—	PROJ. NO	85-30267
CHKD	DAM	DATE	NOV. 86	PLATE	10



SAMPLE LOCATION: C+400-20 DEPTH: 15.5 Ft.
 SOIL DESCRIPTION: Greenish-gray CLAY (CH)
 Stratum 9

($k_v = 4.8 \times 10^{-8}$ cm/sec)

DRY UNIT WEIGHT: _____

NATURAL MOISTURE CONTENT: 52%

LIQUID LIMIT: 102%

PLASTIC LIMIT: 39%

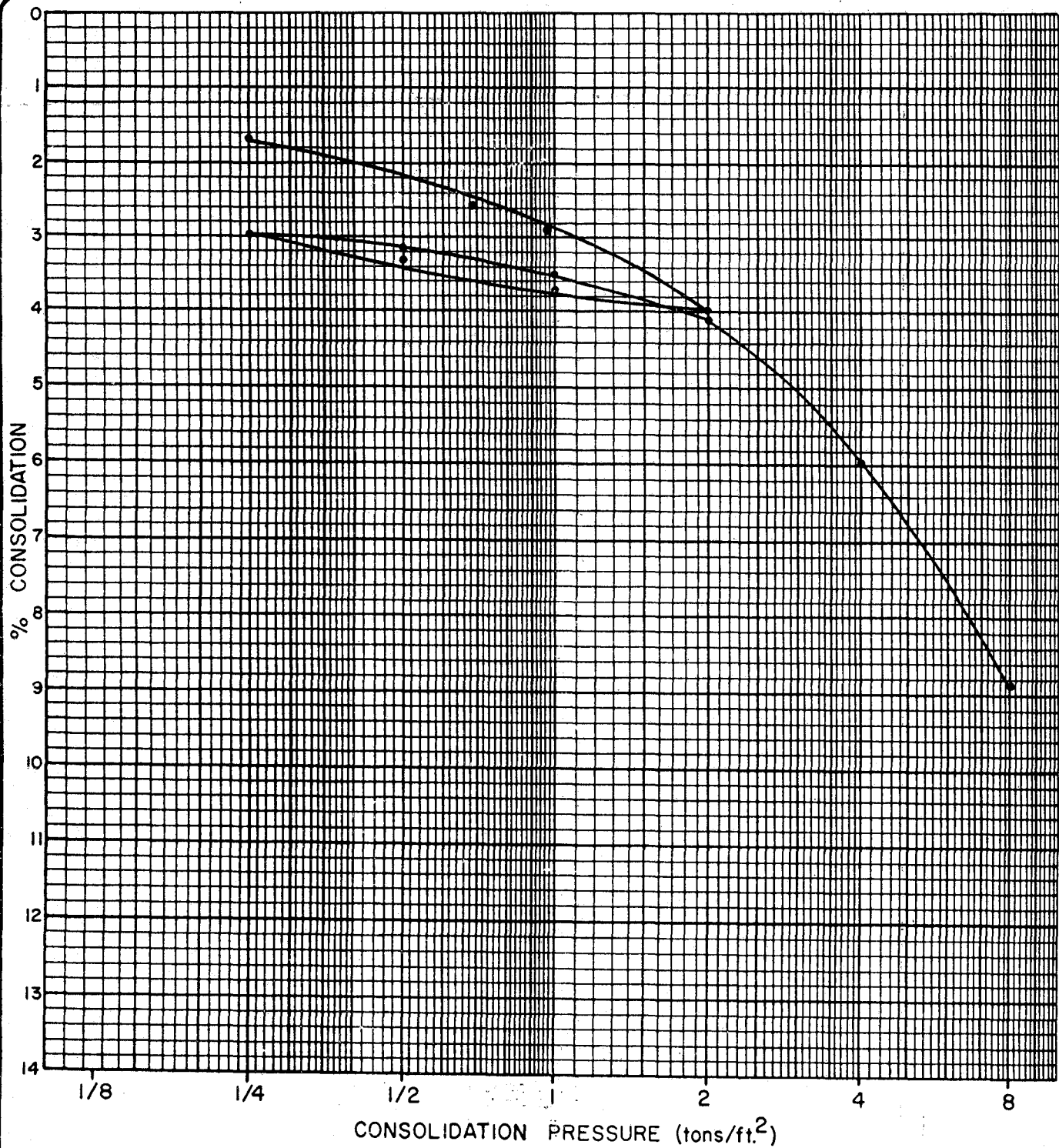
MINUS 200: 98%

CONSOLIDATION TEST RESULTS
 PROPOSED PASCO COUNTY LANDFILL -
 HAYS ROAD SITE
 PASCO COUNTY, FLORIDA



JAMMAL & ASSOCIATES, INC. Consulting Engineers

DRAWN	KFB	SCALE	—	PROJ. NO.	85-30267
CHKD	DAM	DATE	NOV. 86	PLATE	II

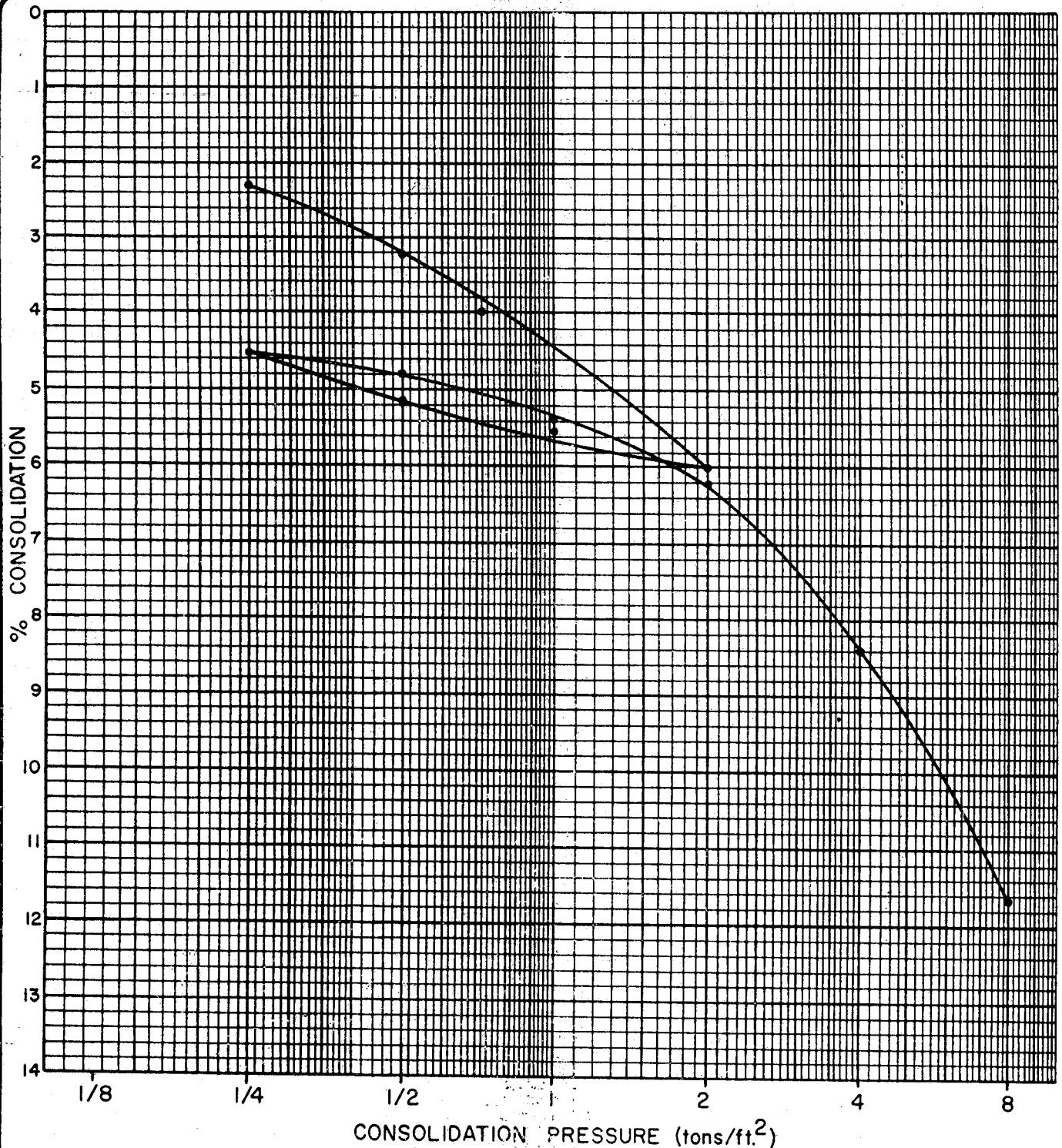
SAMPLE LOCATION: B-24 DEPTH: 21.0 Ft.SOIL DESCRIPTION: Greenish-gray CLAY (CH)
Stratum 9 $(k_v = 2.5 \times 10^{-6} \text{ cm/sec})$ DRY UNIT WEIGHT: 73 pcfNATURAL MOISTURE CONTENT: 44%LIQUID LIMIT: 72%PLASTIC LIMIT: 44%MINUS 200: 88%

CONSOLIDATION TEST RESULTS
 PROPOSED PASCO COUNTY LANDFILL -
 HAYS ROAD SITE
 PASCO COUNTY, FLORIDA



JAMMAL & ASSOCIATES, INC. Consulting Engineers

DRAWN: KFB	SCALE: —	PROJ. NO. 85-30267
CHKD: DAM	DATE: NOV. 86	PLATE 12



SAMPLE LOCATION: D-24 DEPTH: 14.5 Ft.

SOIL DESCRIPTION: Greenish-gray CLAY (CH)

Stratum 9

($k_v = 1.0 \times 10^{-6}$ cm/sec)

DRY UNIT WEIGHT: 68 pcf

NATURAL MOISTURE CONTENT: 56%

LIQUID LIMIT: 100%

PLASTIC LIMIT: 47%

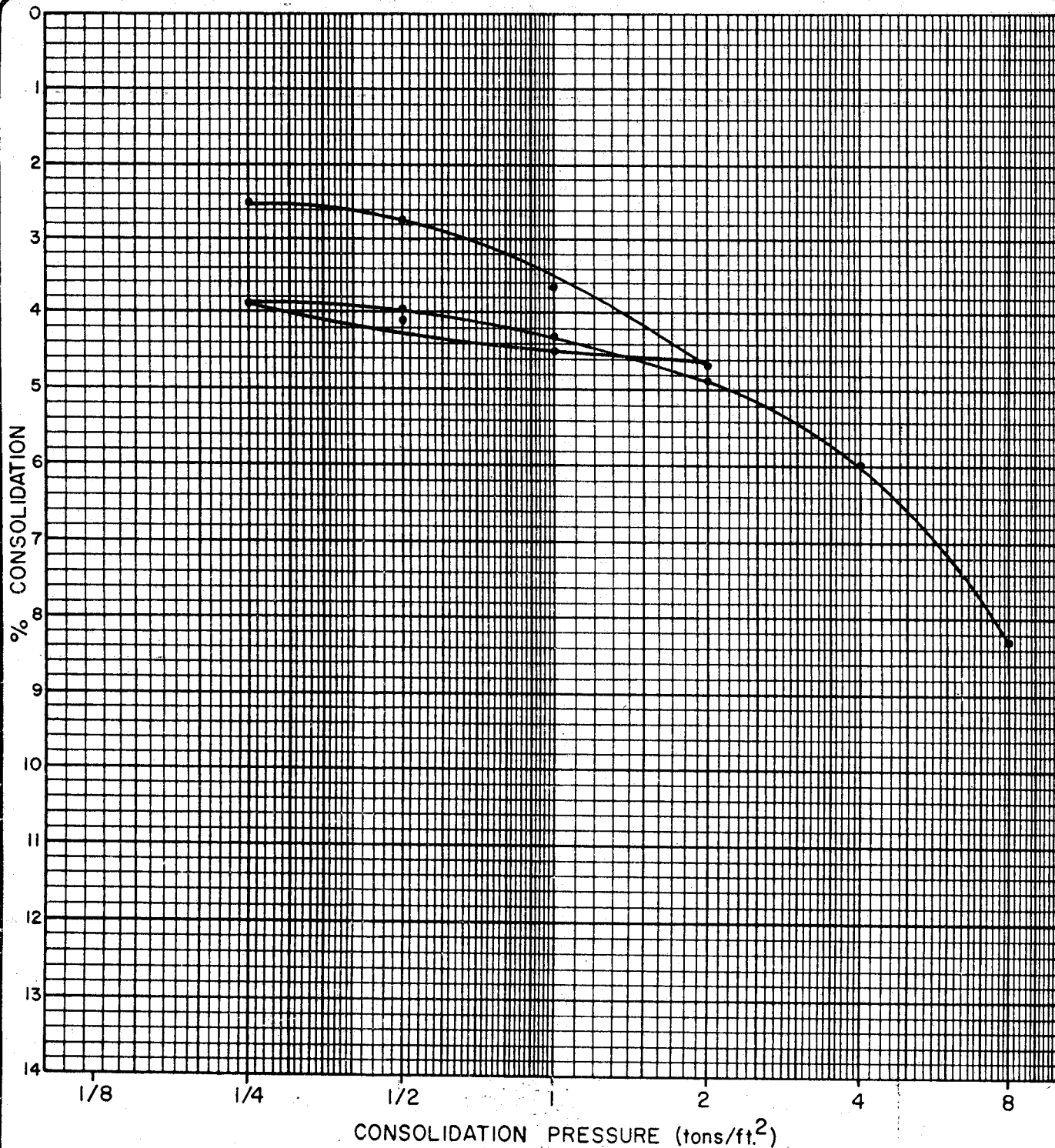
MINUS 200: 96%

CONSOLIDATION TEST RESULTS
PROPOSED PASCO COUNTY LANDFILL -
HAYS ROAD SITE
PASCO COUNTY, FLORIDA



JAMMAL & ASSOCIATES, INC. Consulting Engineers

DRAWN	KFB	SCALE	—	PROJ. NO	85-30267
CHKD	DAM	DATE	NOV. 86	PLATE	13



SAMPLE LOCATION: E-24 DEPTH: 21.0 Ft.

SOIL DESCRIPTION: Greenish-gray CLAY (CH)

Stratum 9

$(k_v = 2.9 \times 10^{-8} \text{ cm/sec})$

DRY UNIT WEIGHT: 60 pcf

NATURAL MOISTURE CONTENT: 68%

LIQUID LIMIT: 104%

PLASTIC LIMIT: 54%

MINUS 200: 99%

CONSOLIDATION TEST RESULTS
PROPOSED PASCO COUNTY LANDFILL -
HAYS ROAD SITE
PASCO COUNTY, FLORIDA



JAMMAL & ASSOCIATES, INC. Consulting Engineers

DRAWN

KFB

SCALE

PROJ NO

85-30267

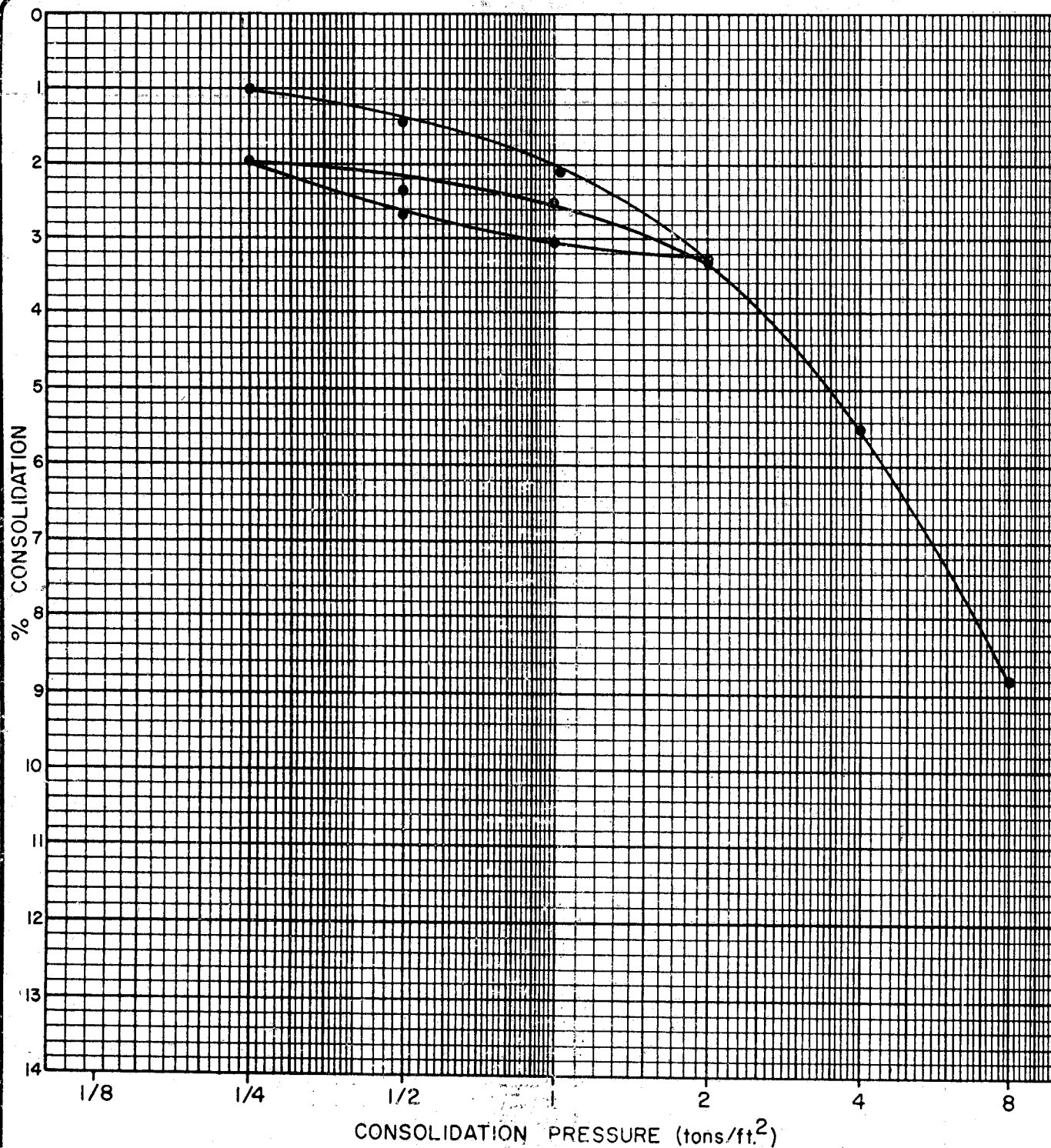
CHKD

DAM

DATE

NOV. 86

PLATE 14

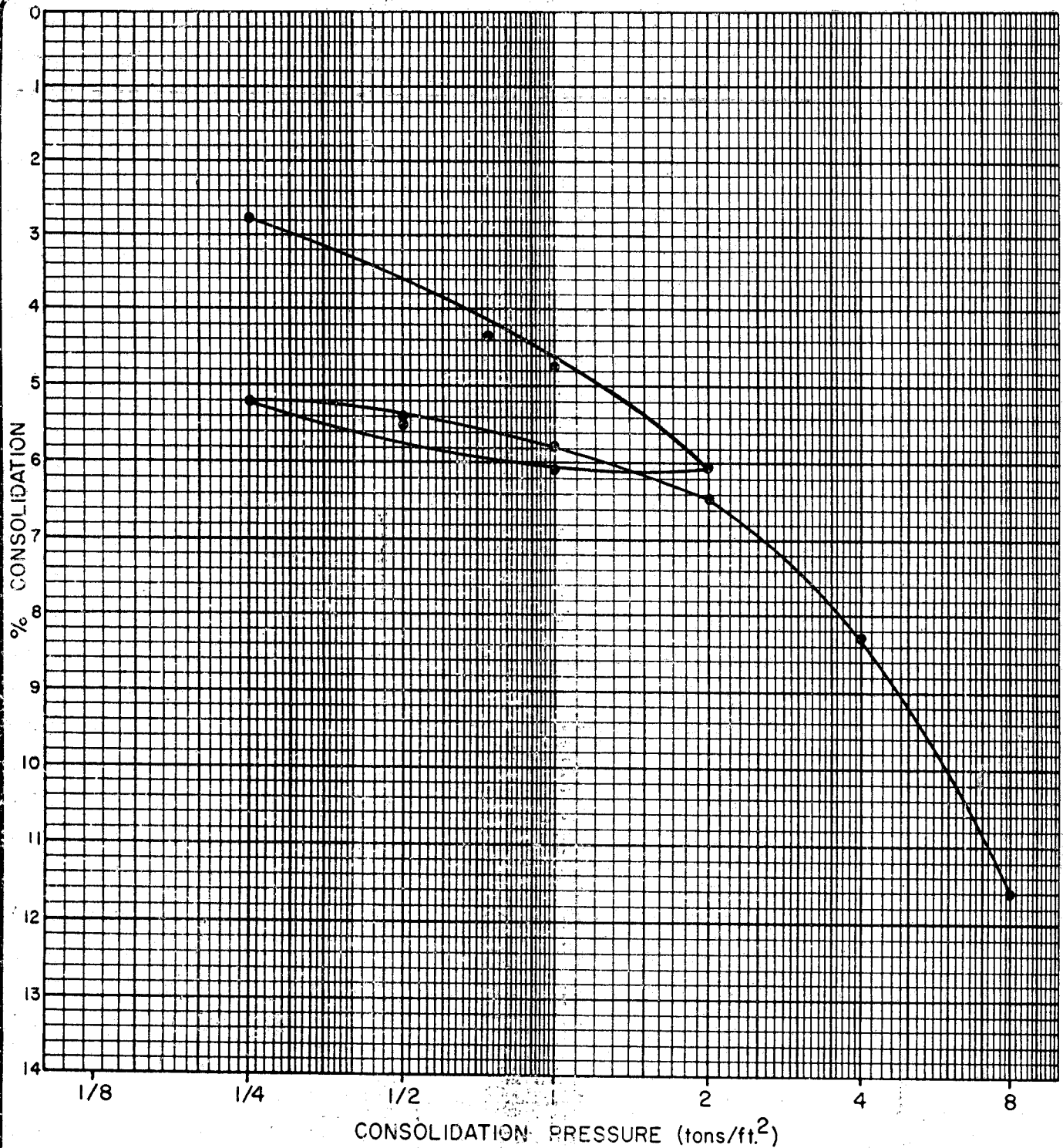
SAMPLE LOCATION: C+400-36 DEPTH: 26.0 Ft.SOIL DESCRIPTION: Greenish-gray CLAY (CH)
Stratum 9. $(k_v = 1.2 \times 10^{-8} \text{ cm/sec})$ DRY UNIT WEIGHT: 78 pcfNATURAL MOISTURE CONTENT: 43%LIQUID LIMIT: 81%PLASTIC LIMIT: 23%MINUS 200: 69%

CONSOLIDATION TEST RESULTS
 PROPOSED PASCO COUNTY LANDFILL -
 HAYS ROAD SITE
 PASCO COUNTY, FLORIDA



JAMMAL & ASSOCIATES, INC. Consulting Engineers

DRAWN	KFB	SCALE	—	PROJ. NO	85-30267
CHKD	DAM	DATE	NOV. 86	PLATE	15

SAMPLE LOCATION: D-48 DEPTH: 13.5 Ft.SOIL DESCRIPTION: Greenish-mottled CLAY
(CH) Stratum 8 $(k_v = 2.3 \times 10^{-4} \text{ cm/sec})$ DRY UNIT WEIGHT: 62 pcfNATURAL MOISTURE CONTENT: 61%LIQUID LIMIT: 105%PLASTIC LIMIT: 47%MINUS 200: 98%

CONSOLIDATION TEST RESULTS
 PROPOSED PASCO COUNTY LANDFILL -
 HAYS ROAD SITE
 PASCO COUNTY, FLORIDA



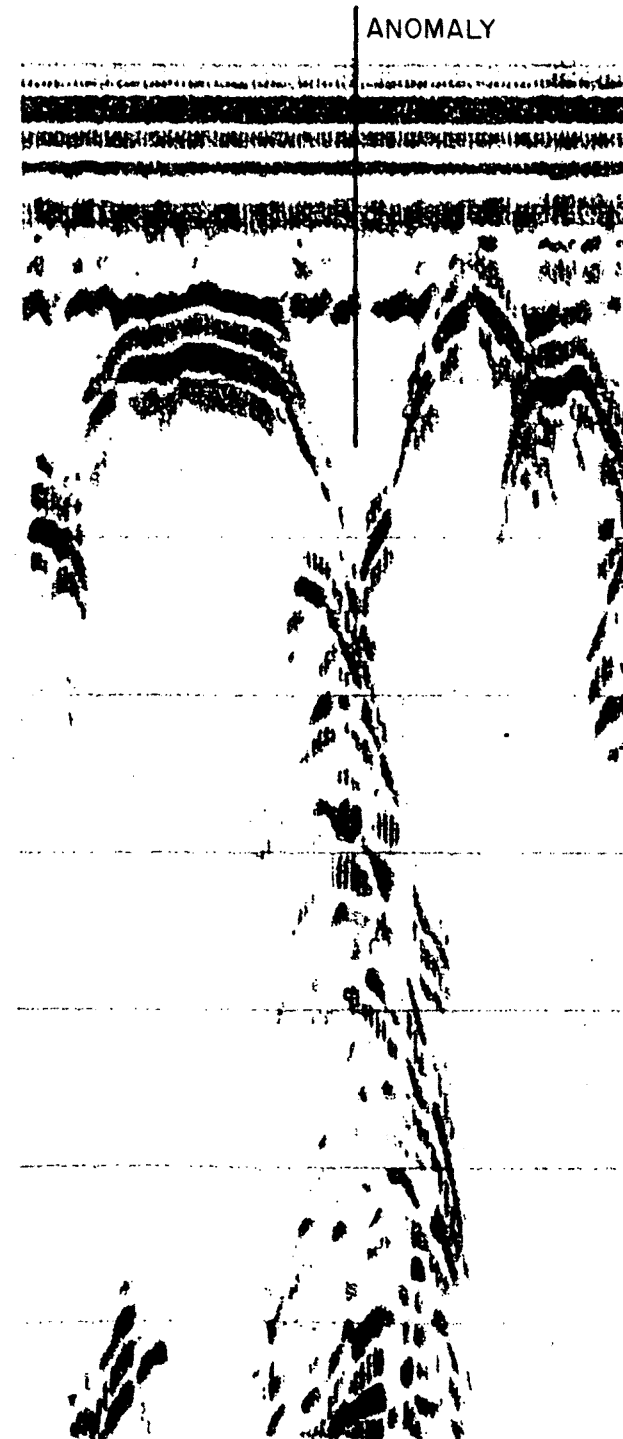
JAMMAL & ASSOCIATES, INC. Consulting Engineers

DRAWN	KFB	SCALE	PROJ NO
CHKD	DAM	DATE	85-30267
		NOV. 86	PLATE 16

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DOCUMENT WAS
REMOVED AND
INSERTED INTO
OCULUS
SEPARATELY.
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APPENDIX C

GROUND PENETRATING RADAR (GPR) AND GROUND
TRUTH TEST BORING RESULTS (PLATES 1-18)

**GPR RESULT**

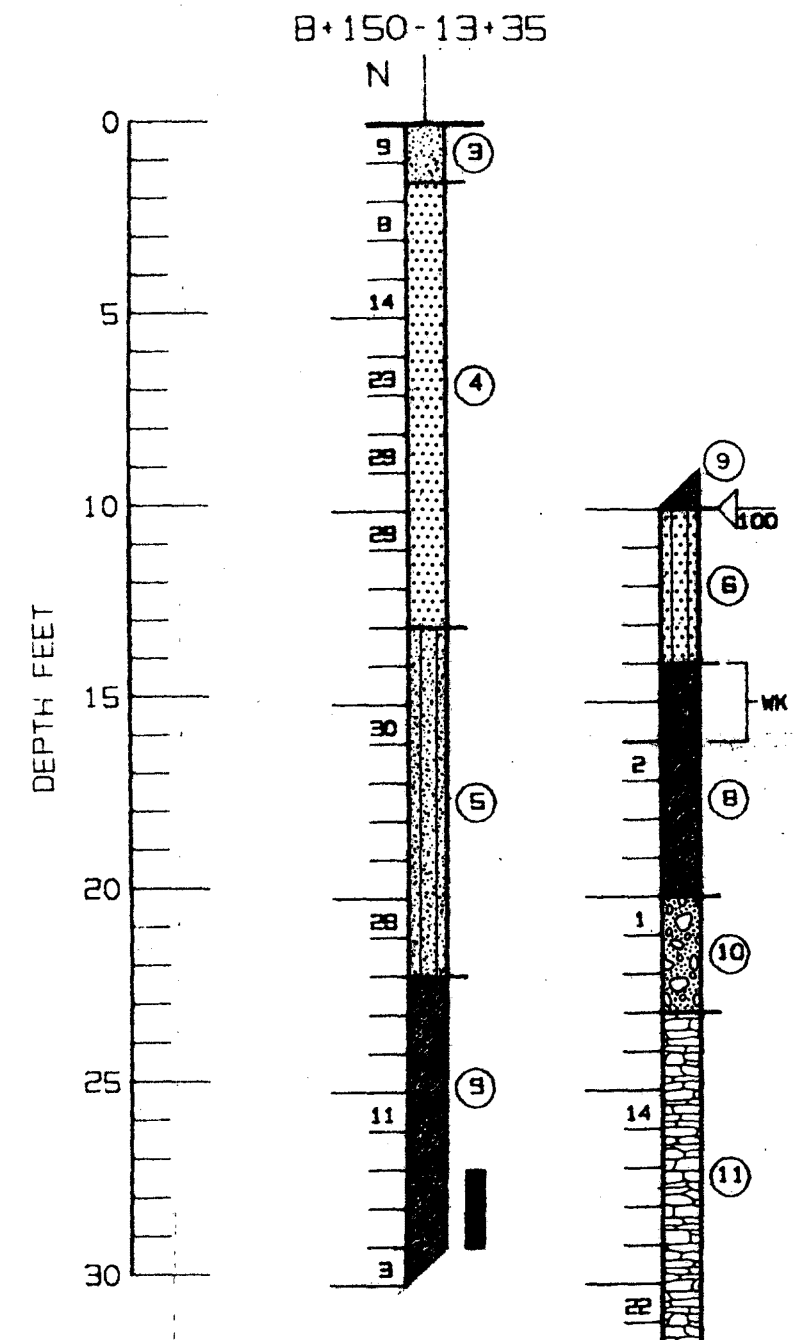
(Fast Speed, May 29, 1986)

DRAWN: KFB
 CHKD: KFB
 APPVD: RAM
 SCALE: —

**GPR RESULT**

(Slow Speed, Oct. 3, 1986)

LOCATION:
 B+150-13+35

**GROUND TRUTH SPT BORING**

(Date: Oct. 14, 1986)

GEOTECHNICAL / HYDROGEOLOGIC STUDY
 PROPOSED PASCO COUNTY LANDFILL -
 HAYS ROAD SITE
 PASCO COUNTY, FLORIDA

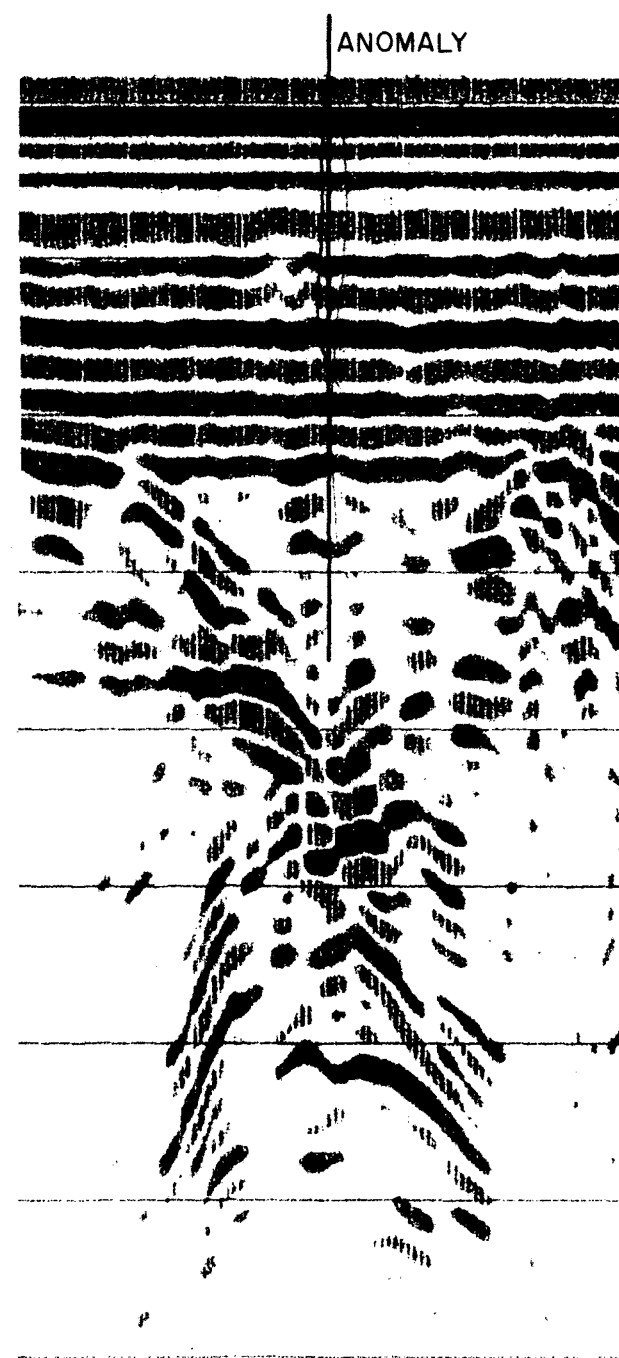
JAMMAL & ASSOCIATES, INC. Consulting Engineers

DATE: DEC. 86 PROJ. NO.: 85-30267 PLATE 1

**GPR RESULT**

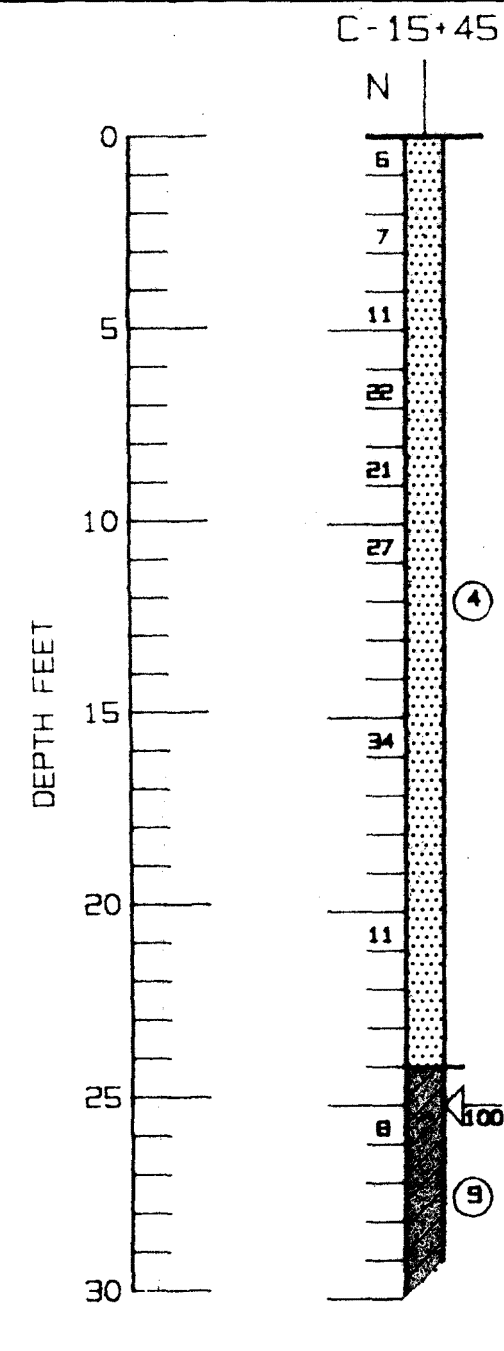
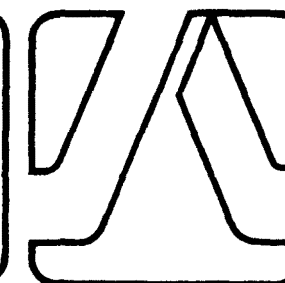
(Fast Speed, May 29, 1986)

DRAWN:	KFB
CHKD:	KFB
APPVD:	RAM
SCALE:	—

**GPR RESULT**

(Slow Speed, Oct. 3, 1986)

LOCATION:
C-15+45

**GROUND TRUTH SPT BORING**

(Date: Oct. 3, 1986)

GEOTECHNICAL / HYDROGEOLOGIC STUDY
PROPOSED PASCO COUNTY LANDFILL -
HAYS ROAD SITE
PASCO COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

DATE DEC. 86 PROJ. NO. 85-30267 PLATE 2



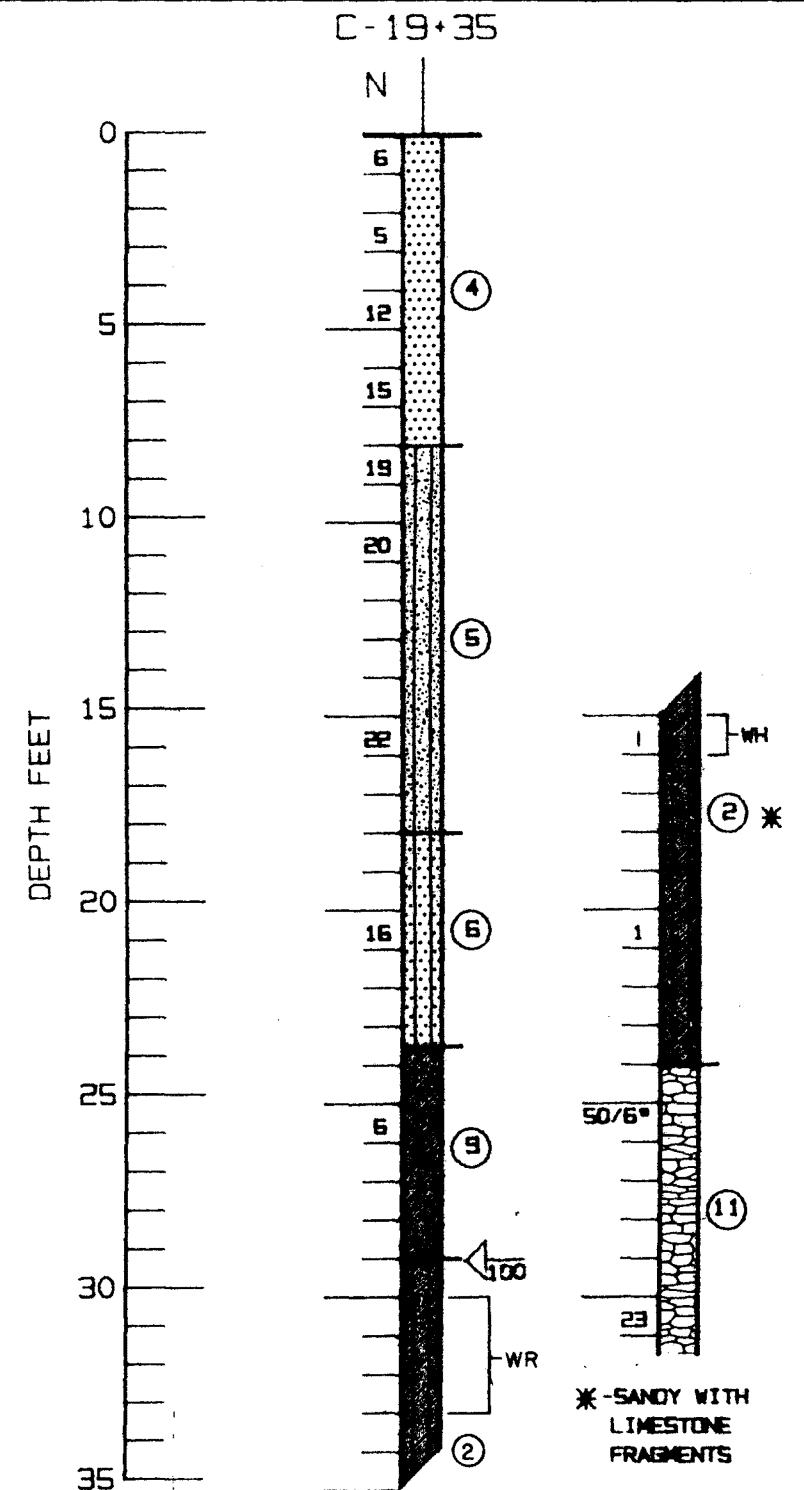
GPR RESULT
(Fast Speed, May 29, 1986)



GPR RESULT
(Slow Speed, Oct. 3, 1986)

DRAWN:	KFB
CHKD:	KFB
APPVD:	RAM
SCALE:	—

LOCATION:
C-19-35

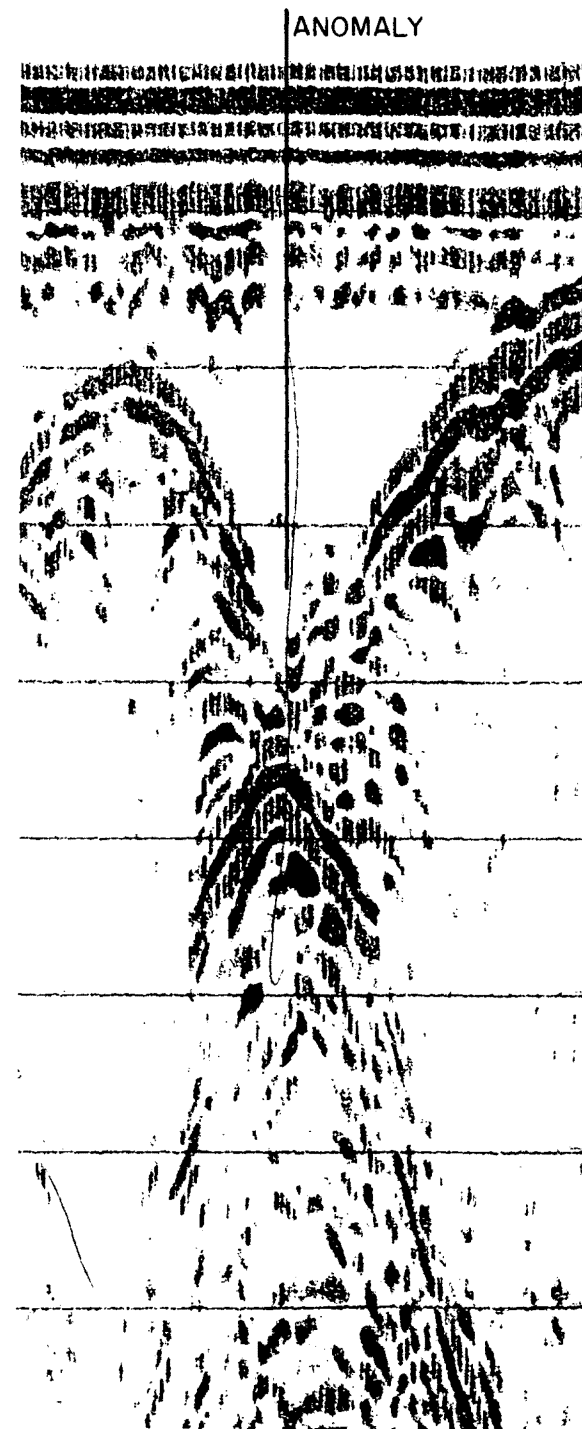


GROUND TRUTH SPT BORING
(Date: Oct. 14, 1986)

GEOTECHNICAL / HYDROGEOLOGIC STUDY
PROPOSED PASCO COUNTY LANDFILL -
HAYS ROAD SITE
PASCO COUNTY, FLORIDA

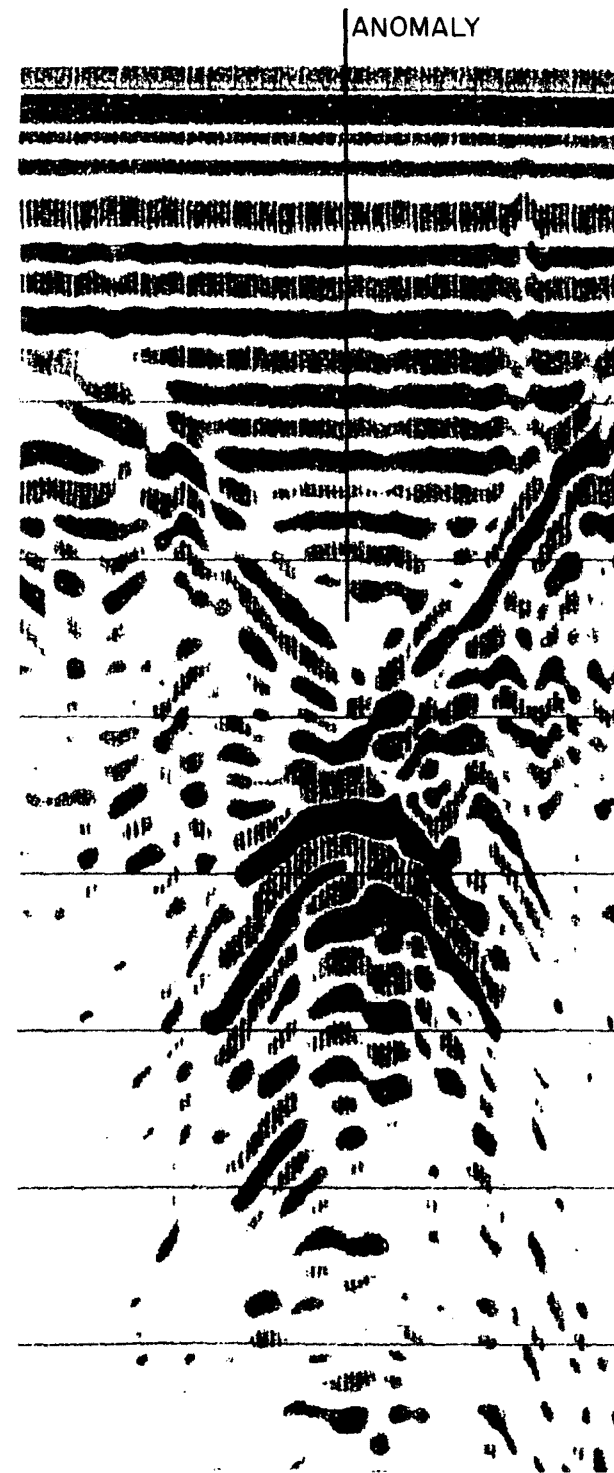
JAMMAL & ASSOCIATES, INC. Consulting Engineers

DATE DEC. 86 PROJ NO. 85-30267 PLATE 3



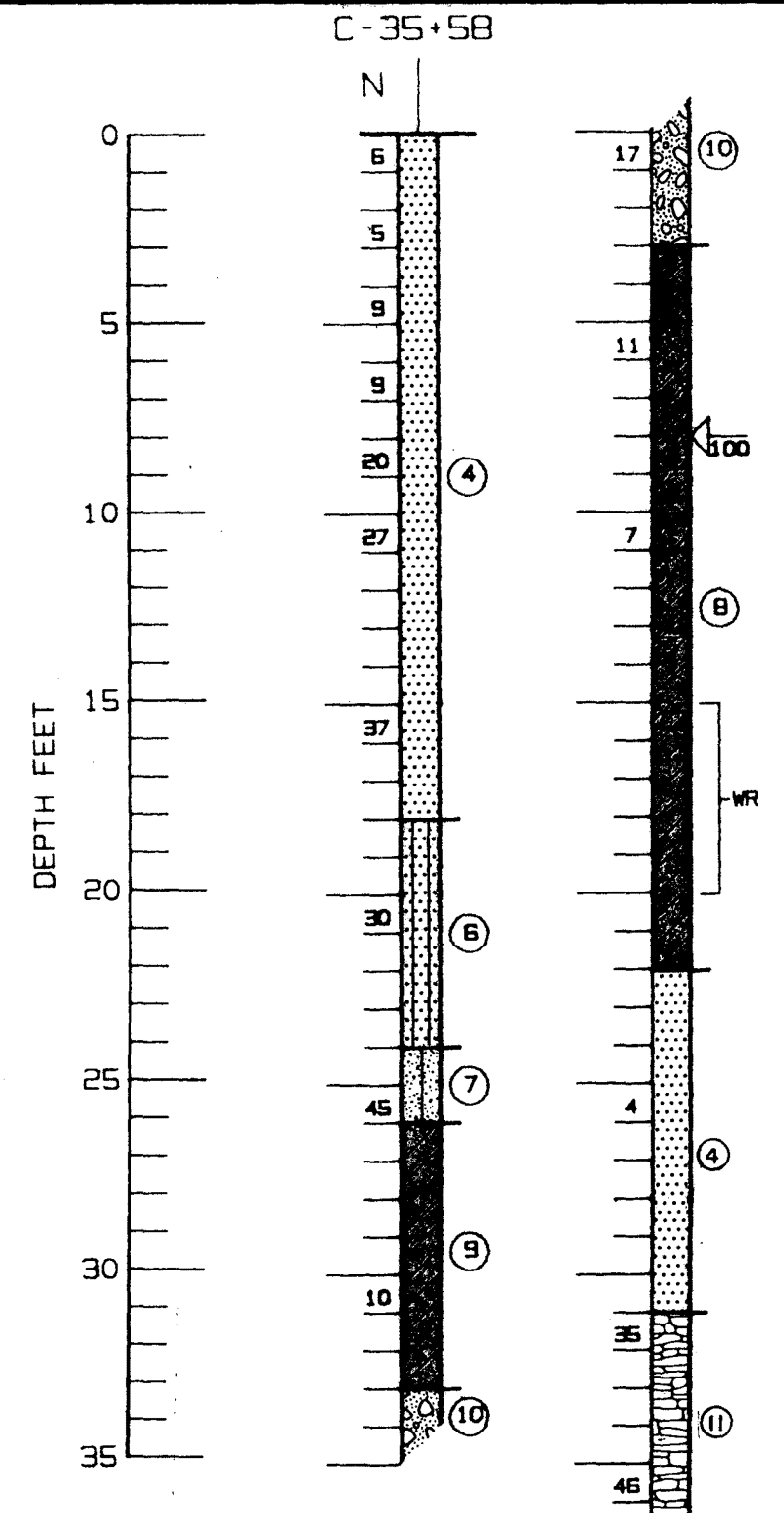
GPR RESULT

(Fast Speed, May 29, 1986)



GPR RESULT

(Slow Speed, Oct. 3, 1986)



GROUND TRUTH SPT BORING

(Date Oct. 15, 1986)

GEOTECHNICAL / HYDROGEOLOGIC STUDY
PROPOSED PASCO COUNTY LANDFILL -
HAYS ROAD SITE
PASCO COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

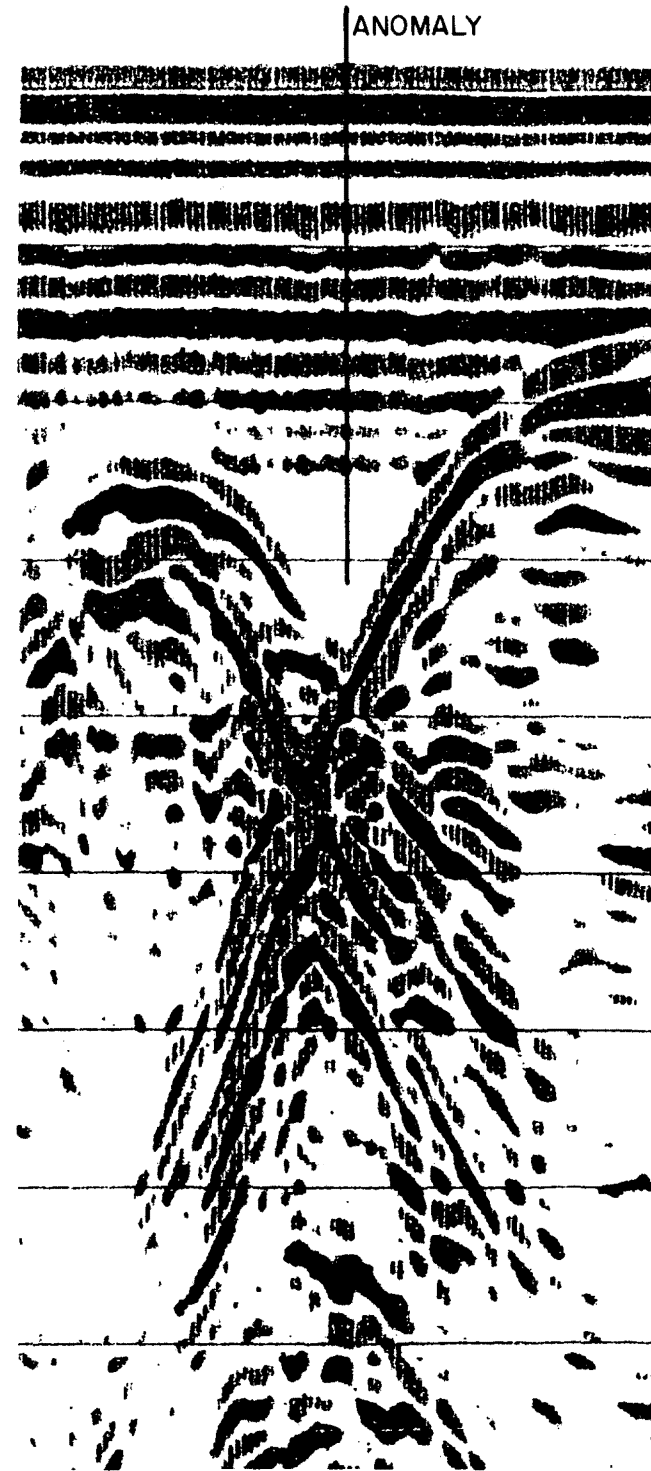
DATE	DEC. 86	PROJ. NO.	85-30267	PLATE	4
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DRAWN:	KFB
CHKD:	KFB
APPVD:	RAM
SCALE:	

LOCATION:
C-35+58



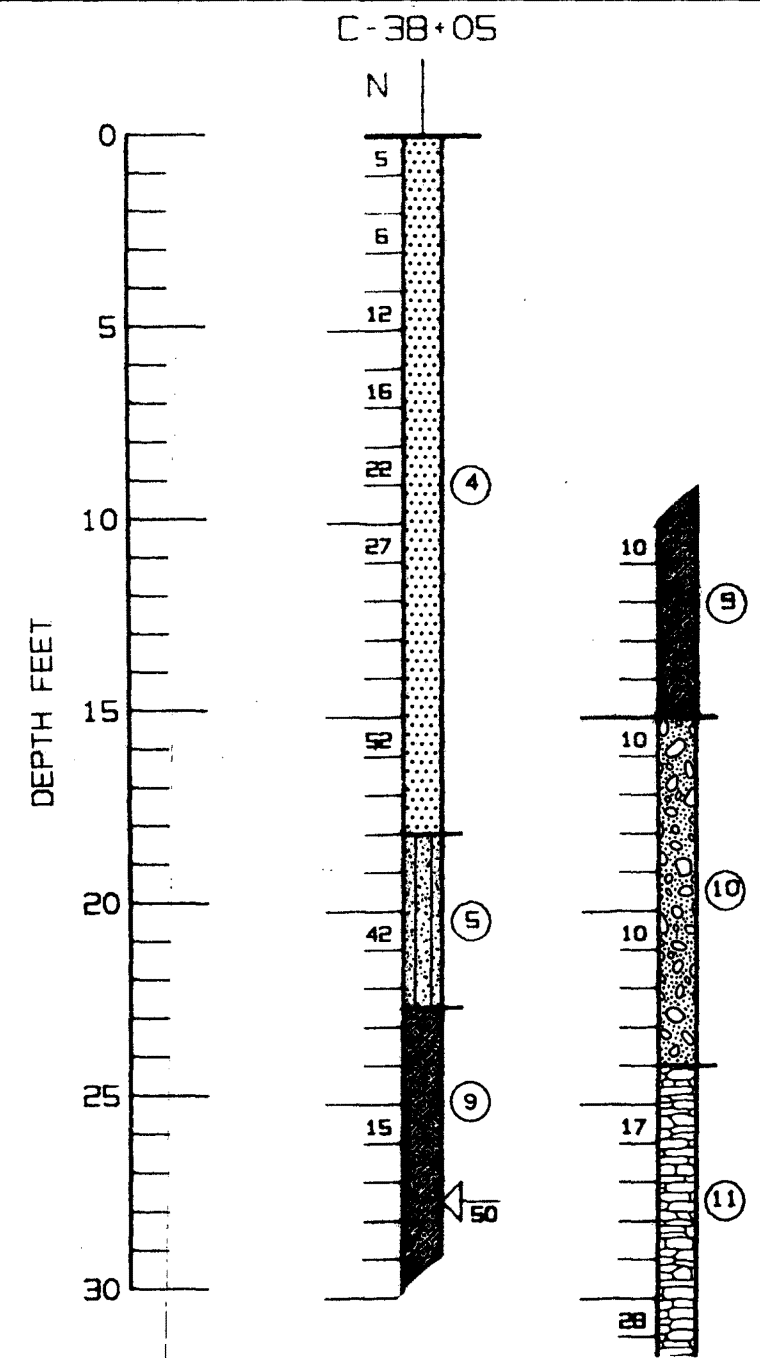
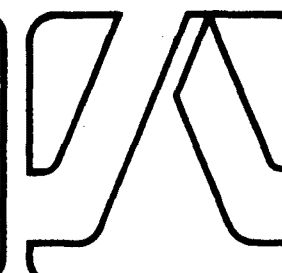
GPR RESULT
(Fast Speed, May 29, 1986)



GPR RESULT
(Slow Speed, Oct. 3, 1986)

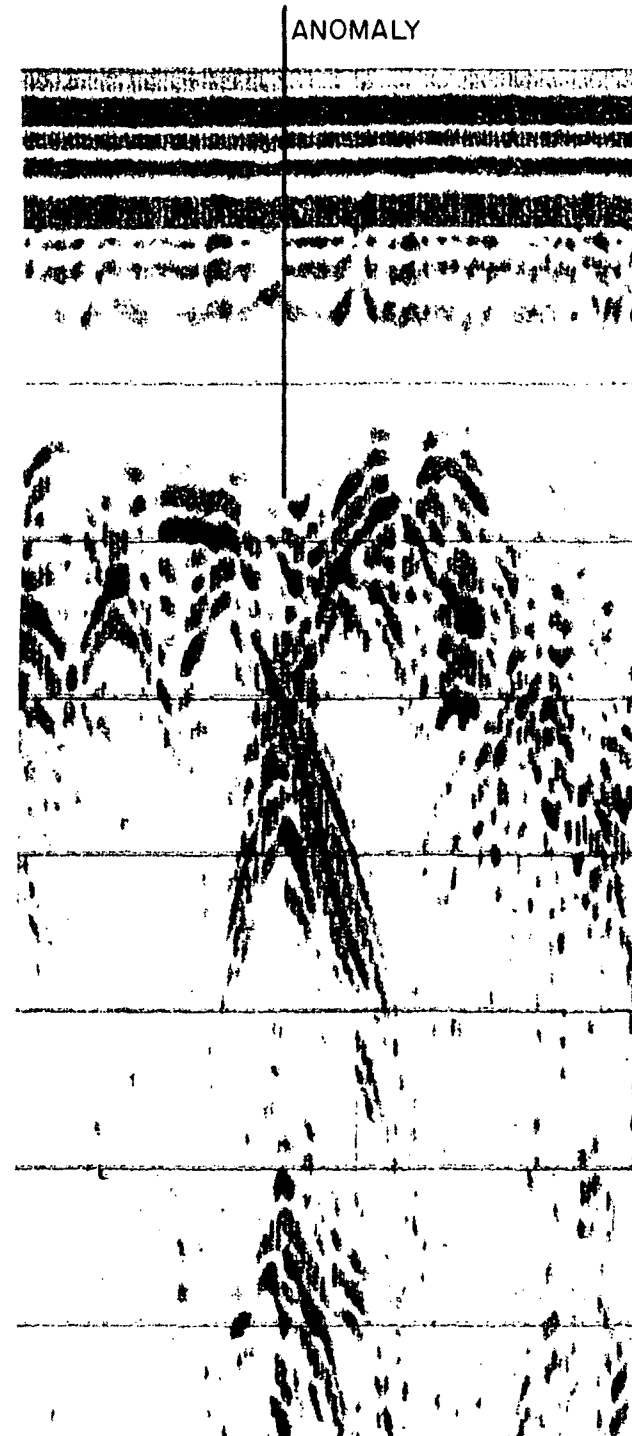
DRAWN:	KFB
CHKD:	KFB
APPVD:	RAM
SCALE:	—

LOCATION:
C-38+05



GROUND TRUTH SPT BORING
(Date: Oct. 15, 1986)

GEOTECHNICAL / HYDROGEOLOGIC STUDY PROPOSED PASCO COUNTY LANDFILL - HAYS ROAD SITE PASCO COUNTY, FLORIDA		
JAMMAL & ASSOCIATES, INC. Consulting Engineers		
DATE DEC. 86	PROJ. NO. 85-30267	PLATE 5

**GPR RESULT**

(Fast Speed, May 29, 1986)

DRAWN: KFB

CHKD: KFB

APPVD: RAM

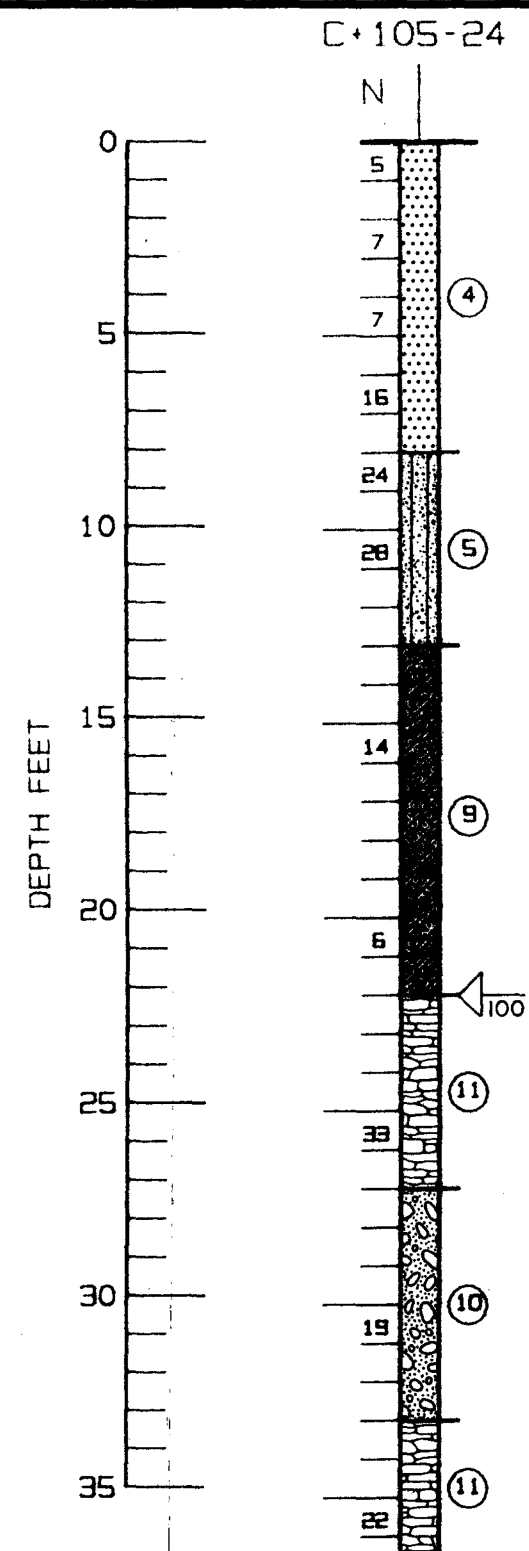
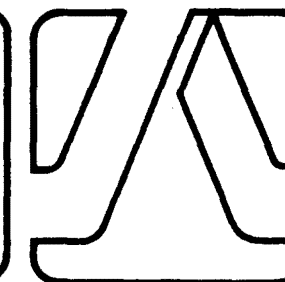
SCALE: —

**GPR RESULT**

(Slow Speed, Oct. 3, 1986)

LOCATION:

C+105-24

**GROUND TRUTH SPT BORING**

(Date: Oct. 13, 1986)

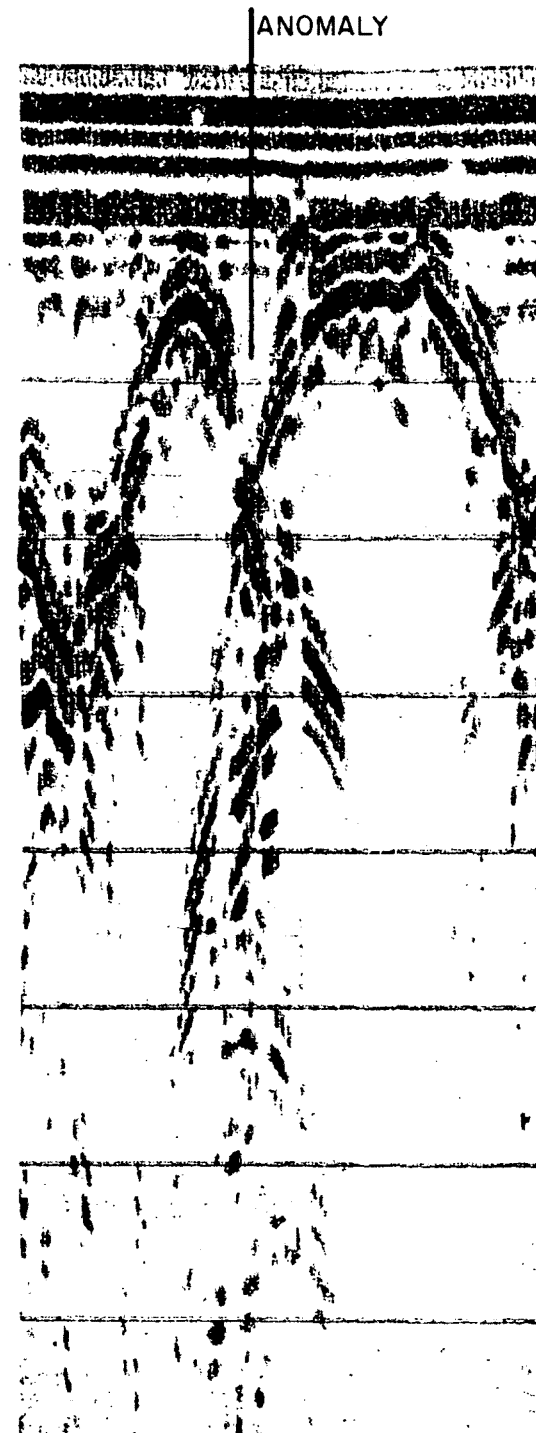
GEOTECHNICAL / HYDROGEOLOGIC STUDY
 PROPOSED PASCO COUNTY LANDFILL -
 HAYS ROAD SITE
 PASCO COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

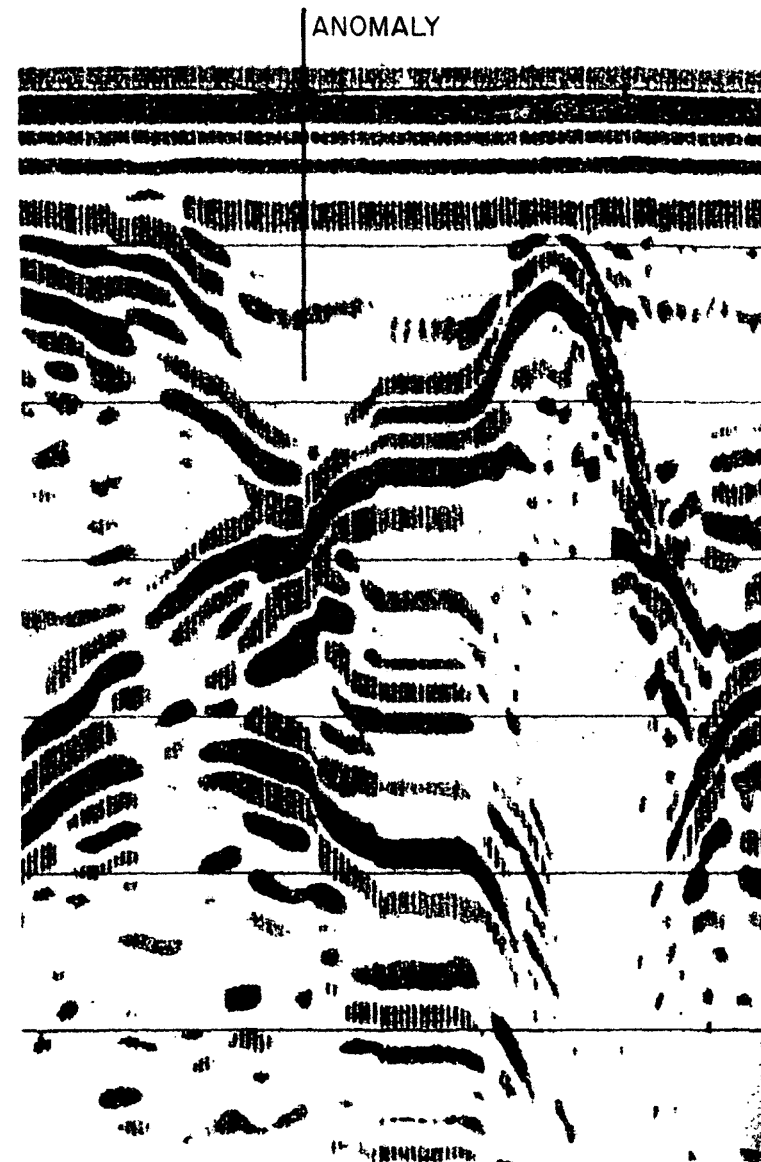
DATE: DEC. 86

PROJ. NO. 85-30267

PLATE 6



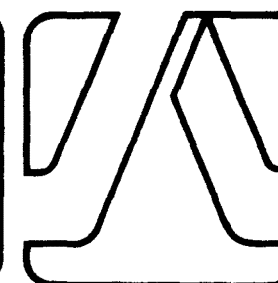
GPR RESULT
(Fast Speed, May 29, 1986)



GPR RESULT
(Slow Speed, Oct. 3, 1986)

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CHKD:	KFB
APPVD:	RAM
SCALE:	—

LOCATION:
C+210-40



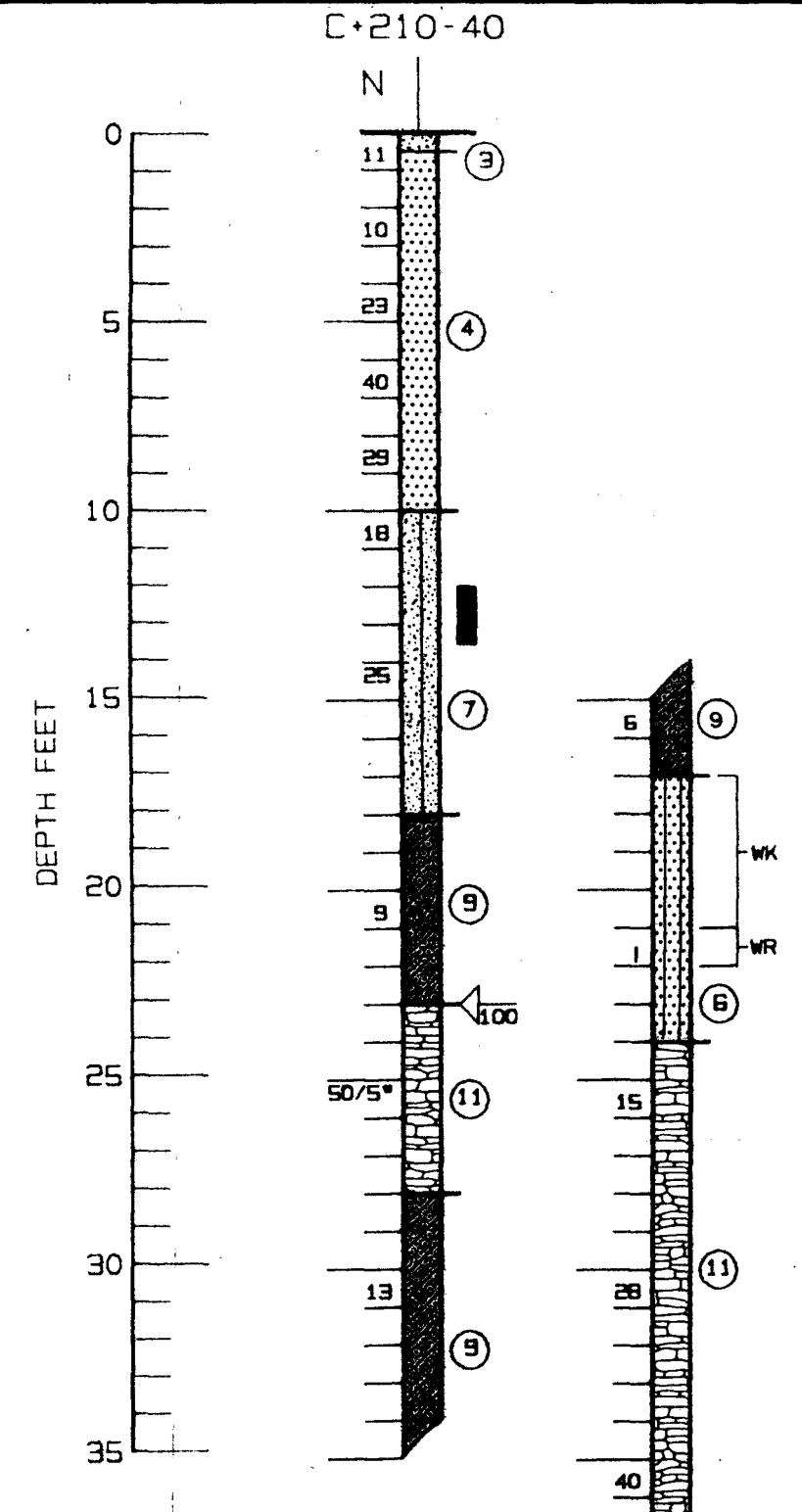
GROUND TRUTH SPT BORING

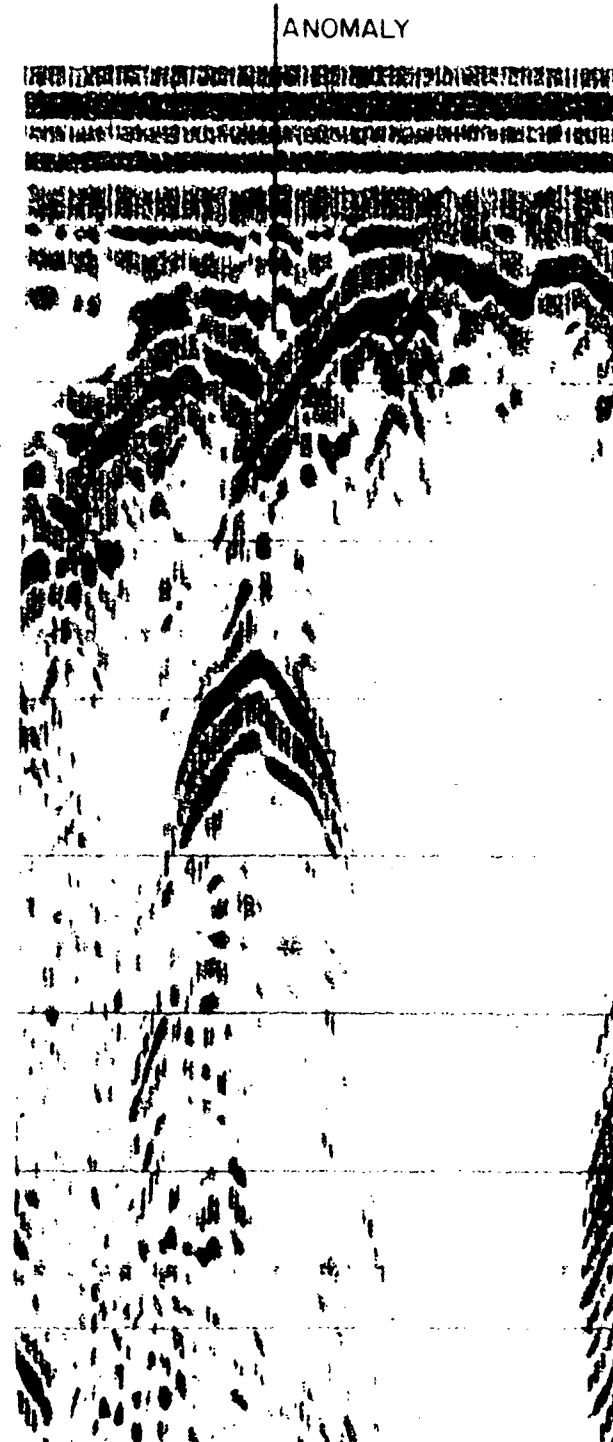
(Date: Oct. 15, 1986)

GEOTECHNICAL / HYDROGEOLOGIC STUDY
PROPOSED PASCO COUNTY LANDFILL -
HAYS ROAD SITE
PASCO COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

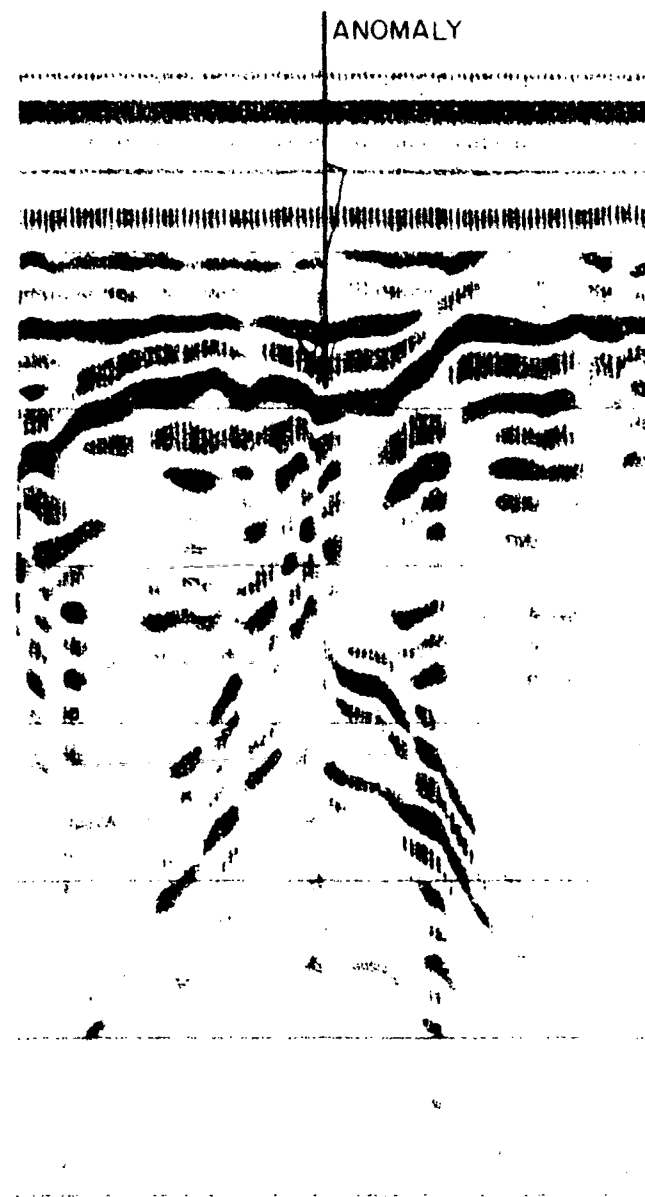
DATE DEC. 86 PROJ. NO. 85-30267 PLATE 7



GPR RESULT

(Fast Speed, May 29, 1986)

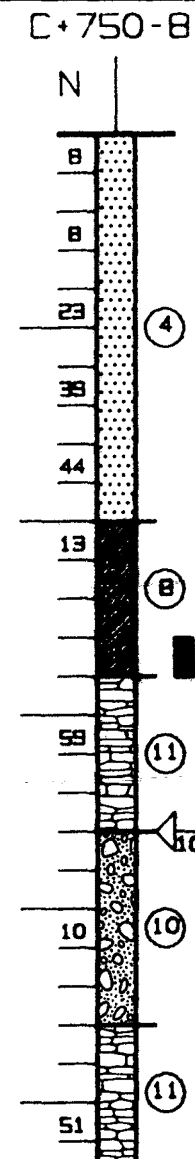
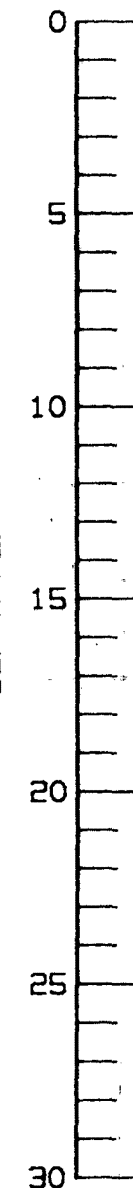
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CHKD:	KFB
APPVD:	RAM
SCALE:	—

GPR RESULT

(Slow Speed, Oct. 3, 1986)

LOCATION:
C+750-8

DEPTH FEET

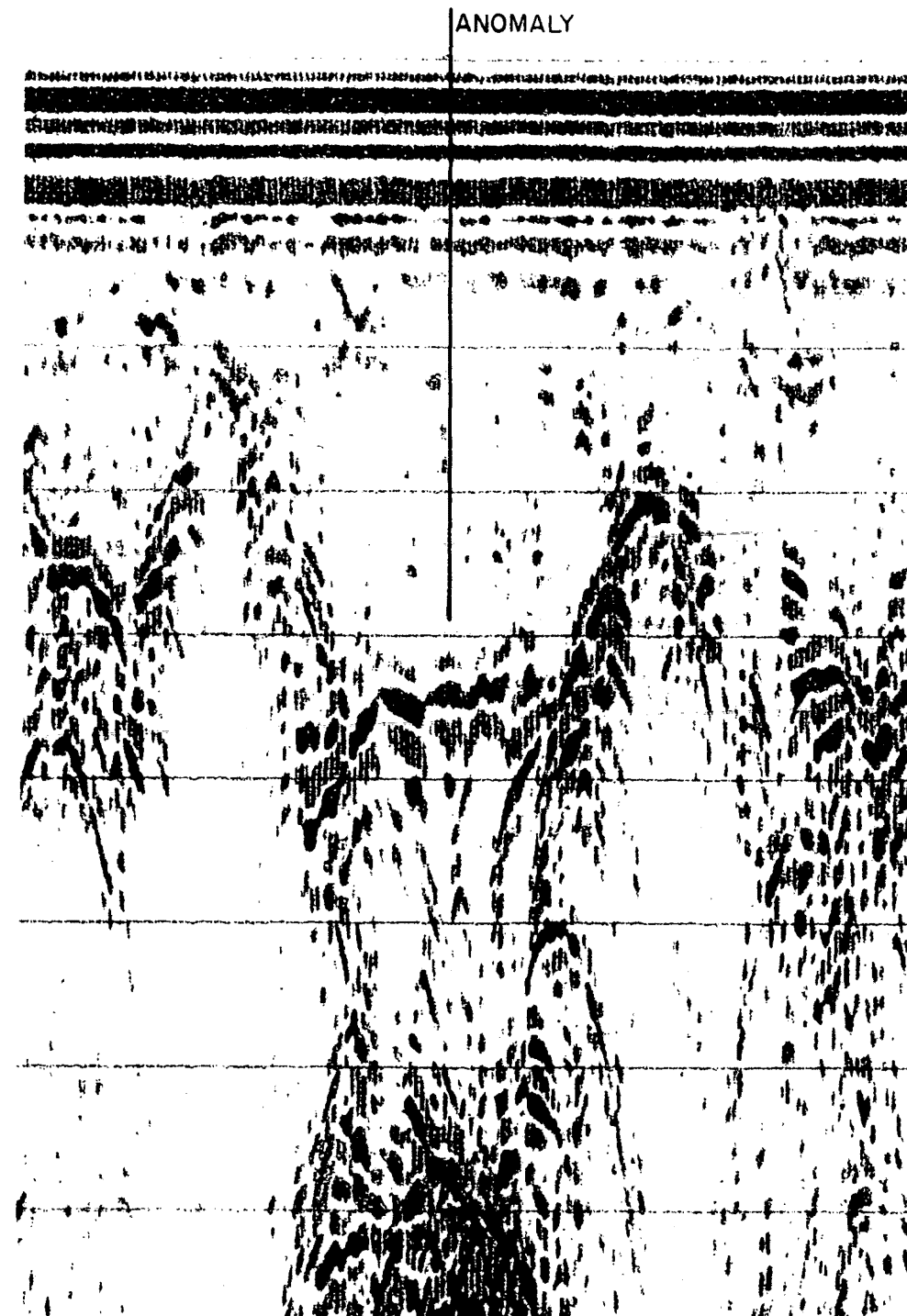
GROUND TRUTH SPT BORING

(Date: Oct. 9, 1986)

GEOTECHNICAL / HYDROGEOLOGIC STUDY
PROPOSED PASCO COUNTY LANDFILL -
HAYS ROAD SITE
PASCO COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

DATE DEC. 86 PROJ. NO. 85-30267 PLATE 8



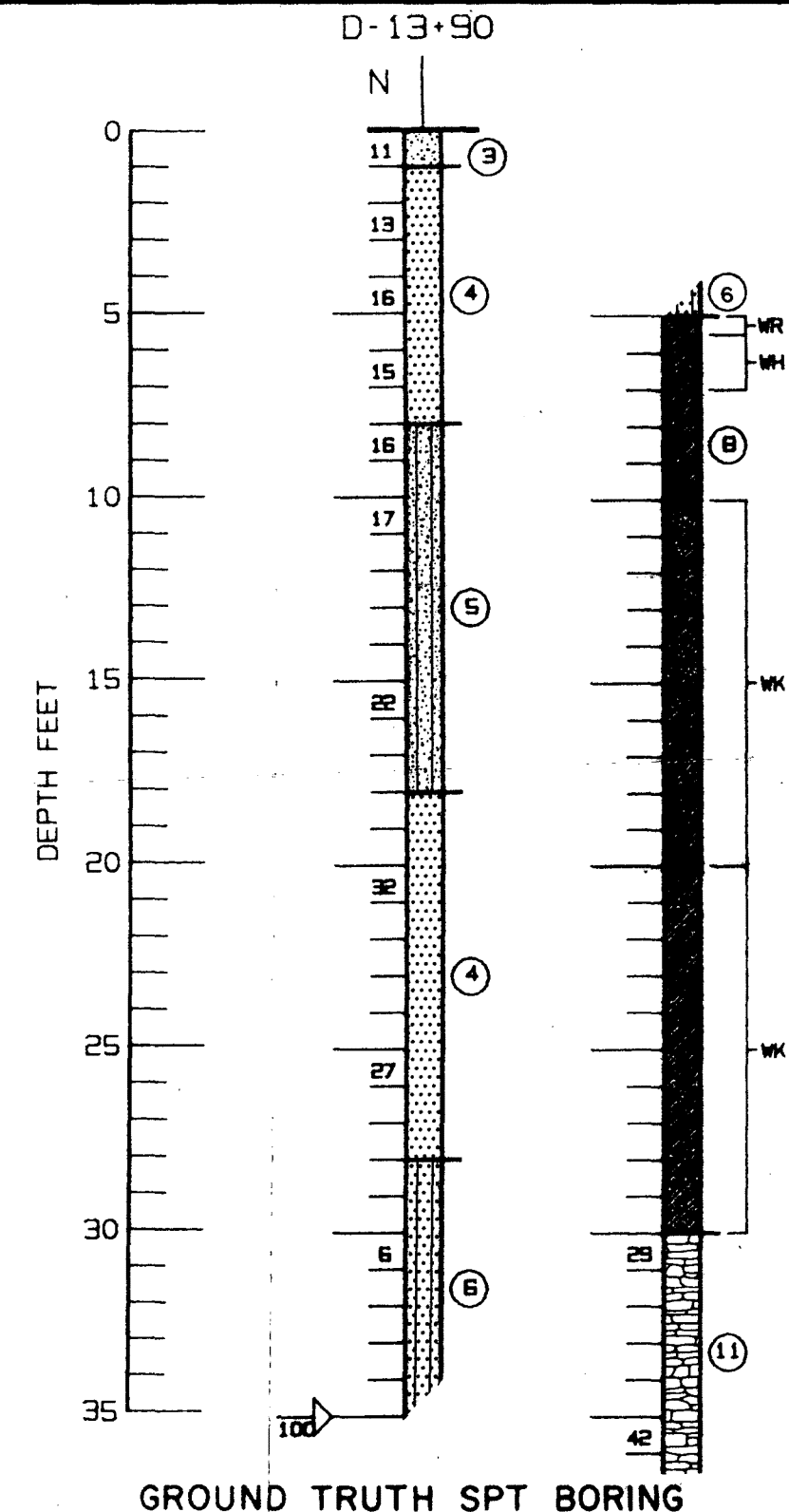
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(Fast Speed, May 29, 1986)

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APPVD:	RAM
SCALE:	—

LOCATION:

D-13+90



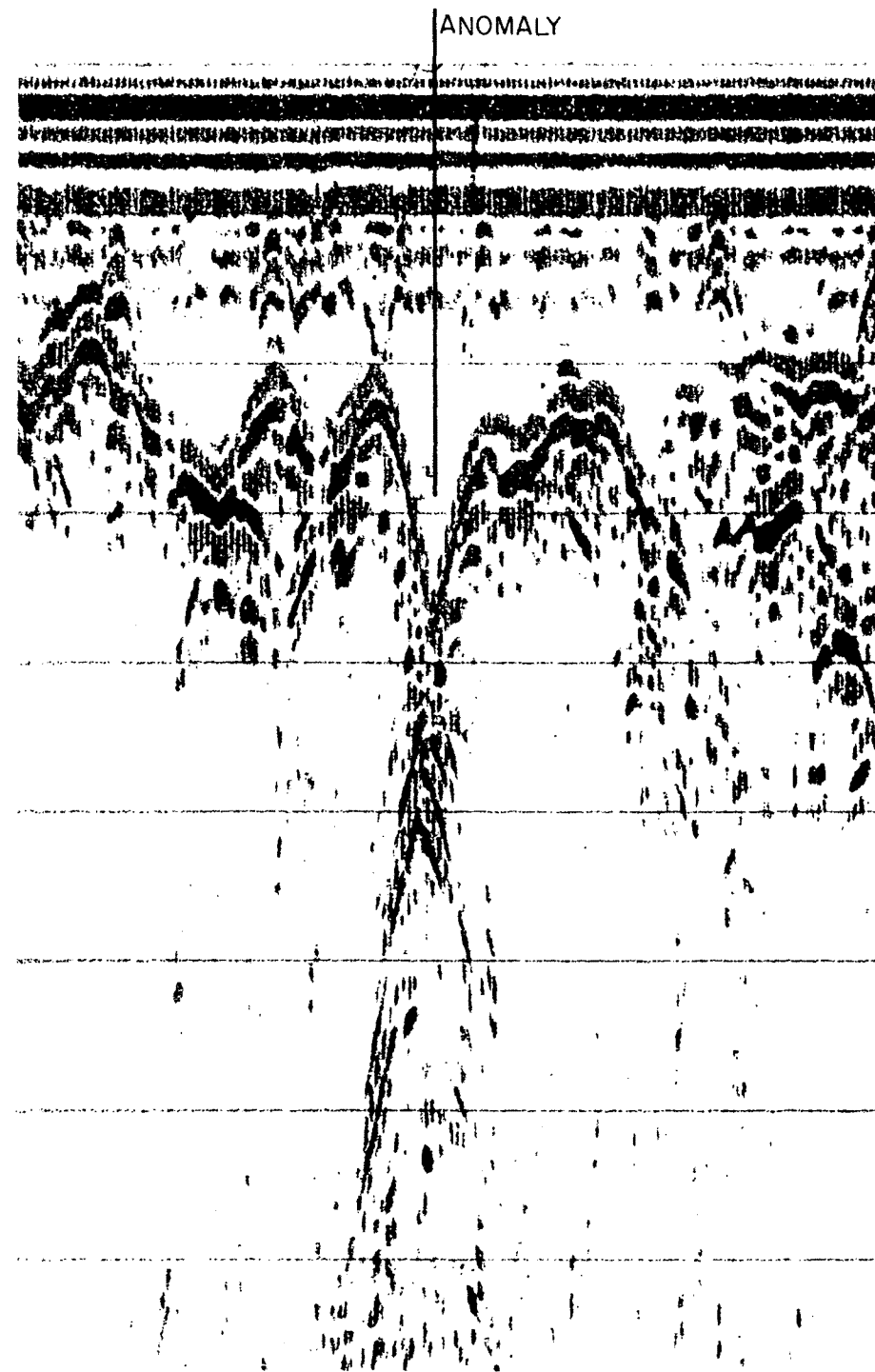
GROUND TRUTH SPT BORING

(Date: Oct. 9, 1986)

GEOTECHNICAL / HYDROGEOLOGIC STUDY
PROPOSED PASCO COUNTY LANDFILL -
HAYS ROAD SITE
PASCO COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

DATE: DEC. 86 PROJ NO: 85-30267 PLATE 9

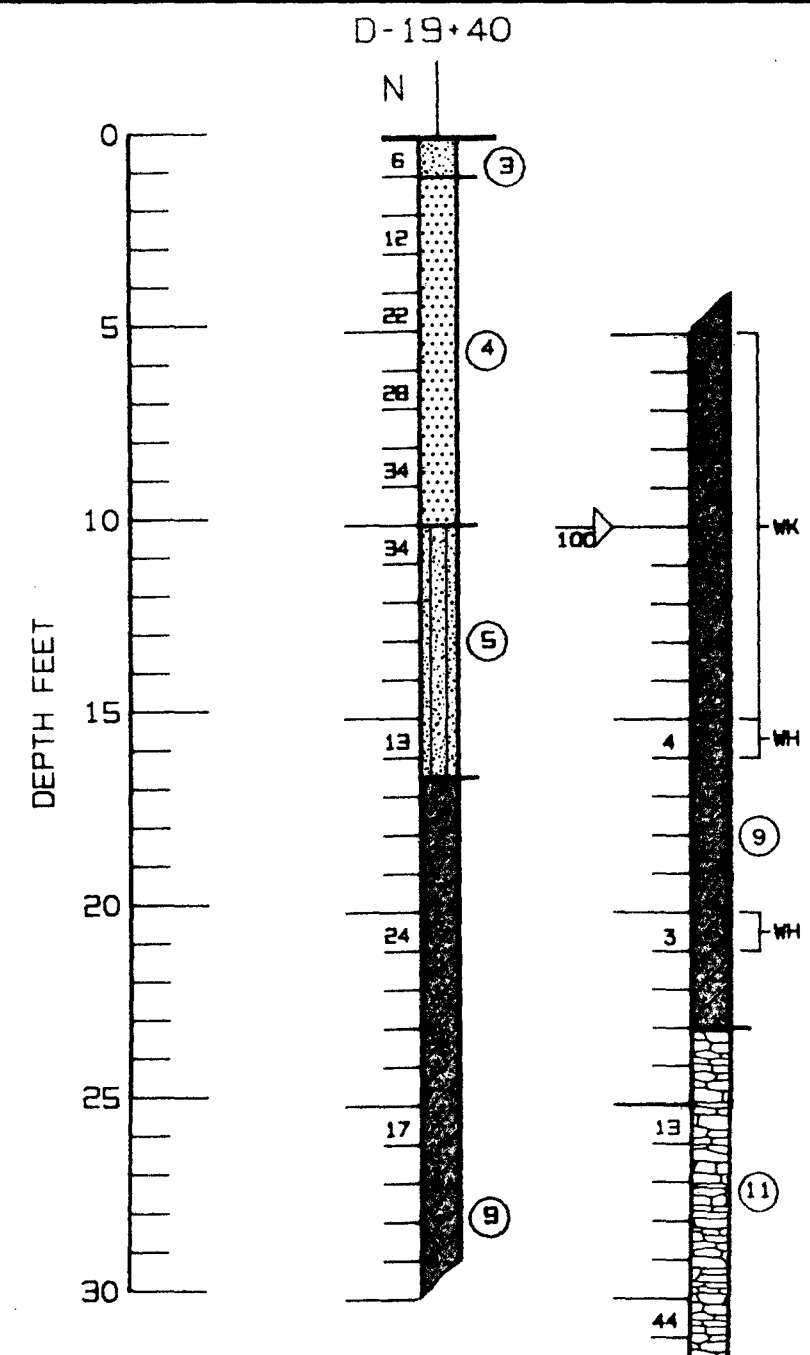
**GPR RESULT**

(Fast Speed, May 29, 1986)

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CHKD:	KFB
APPVD:	RAM
SCALE:	—

LOCATION:

D-19-40

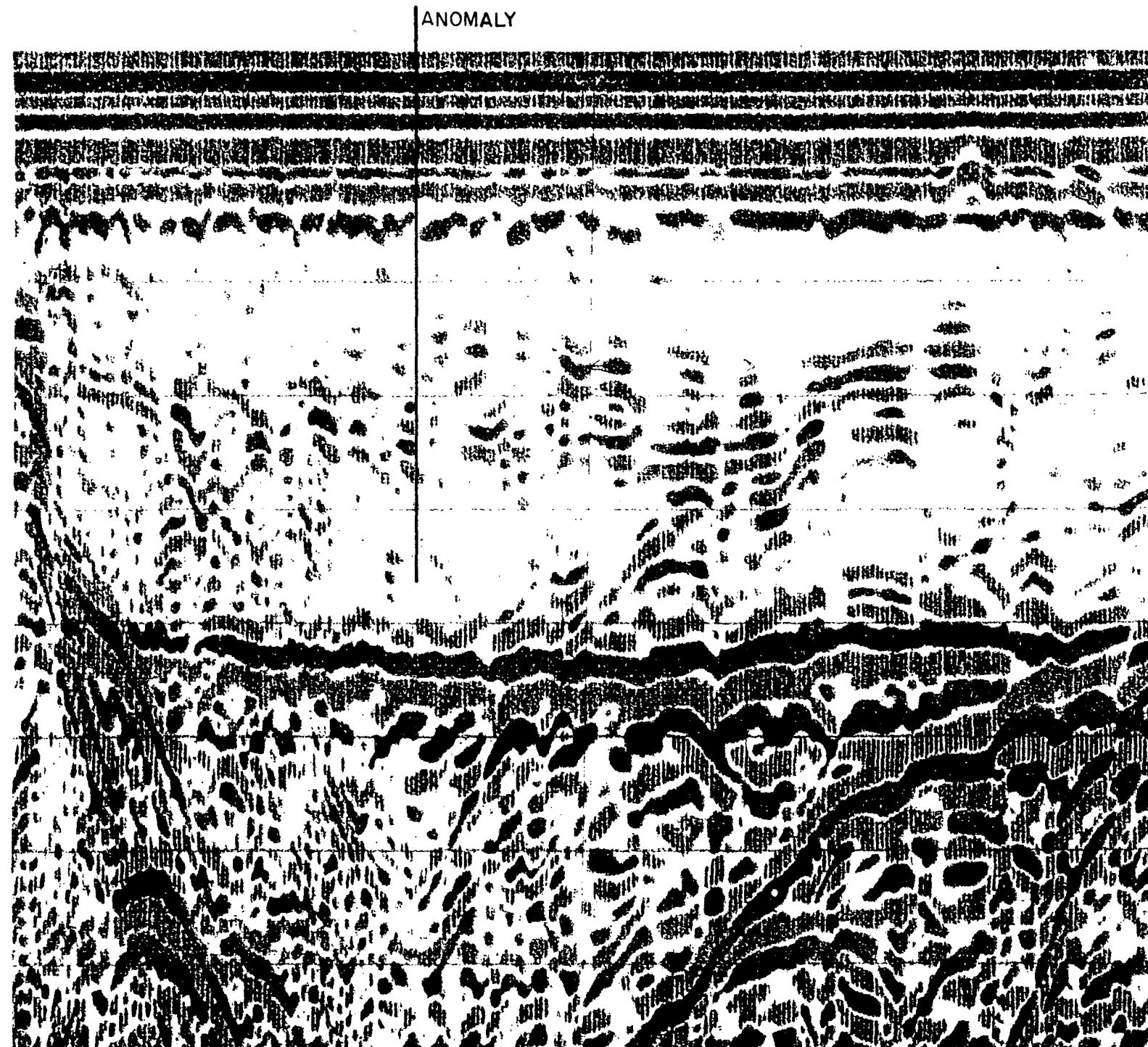
**GROUND TRUTH SPT BORING**

(Date: Oct. 9, 1986)

GEOTECHNICAL / HYDROGEOLOGIC STUDY
 PROPOSED PASCO COUNTY LANDFILL -
 HAYS ROAD SITE
 PASCO COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

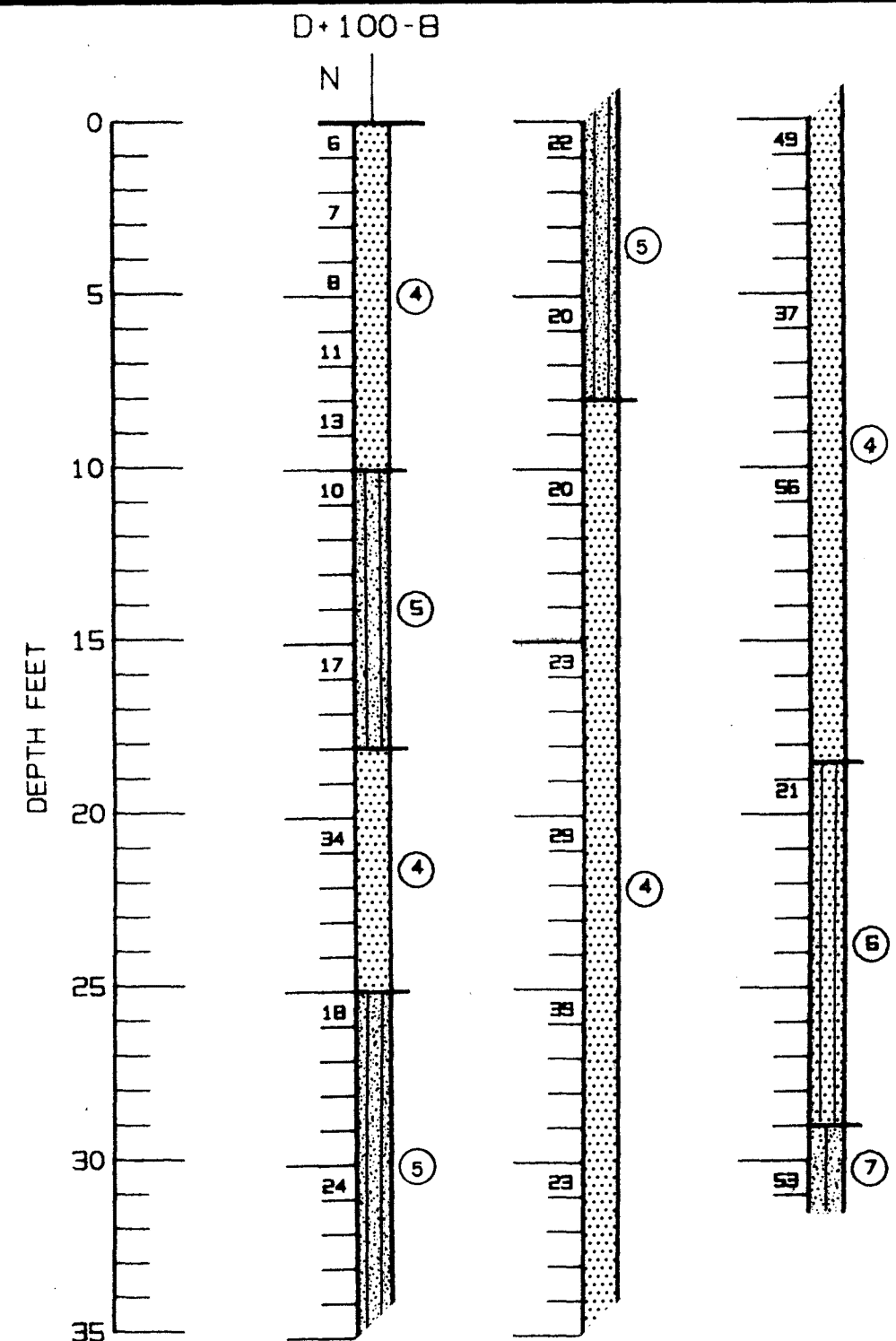
DATE DEC. 86	PROJ. NO. 85-30267	PLATE 10
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**GPR RESULT**

(Fast Speed, May 29, 1986)

DRAWN:	KFB
CHKD:	KFB
APPVD:	RAM
SCALE:	—

LOCATION:
D+100-8

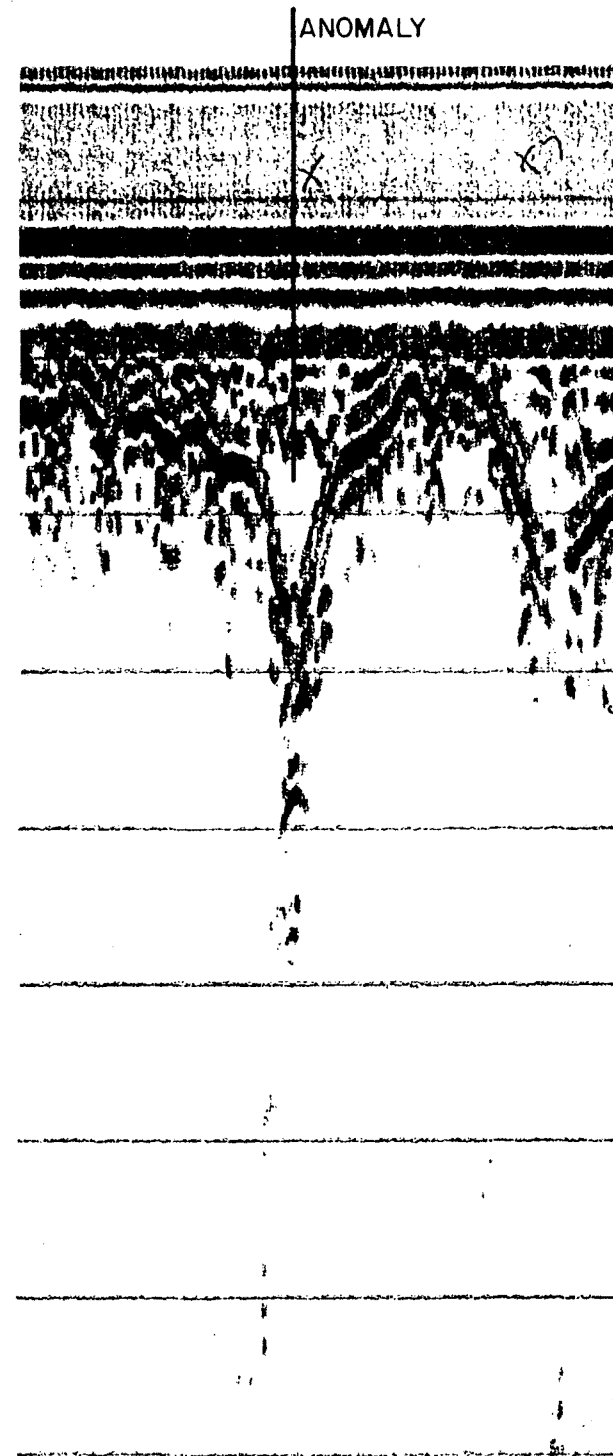
**GROUND TRUTH SPT BORING**

(Date: Oct. 8, 1986)

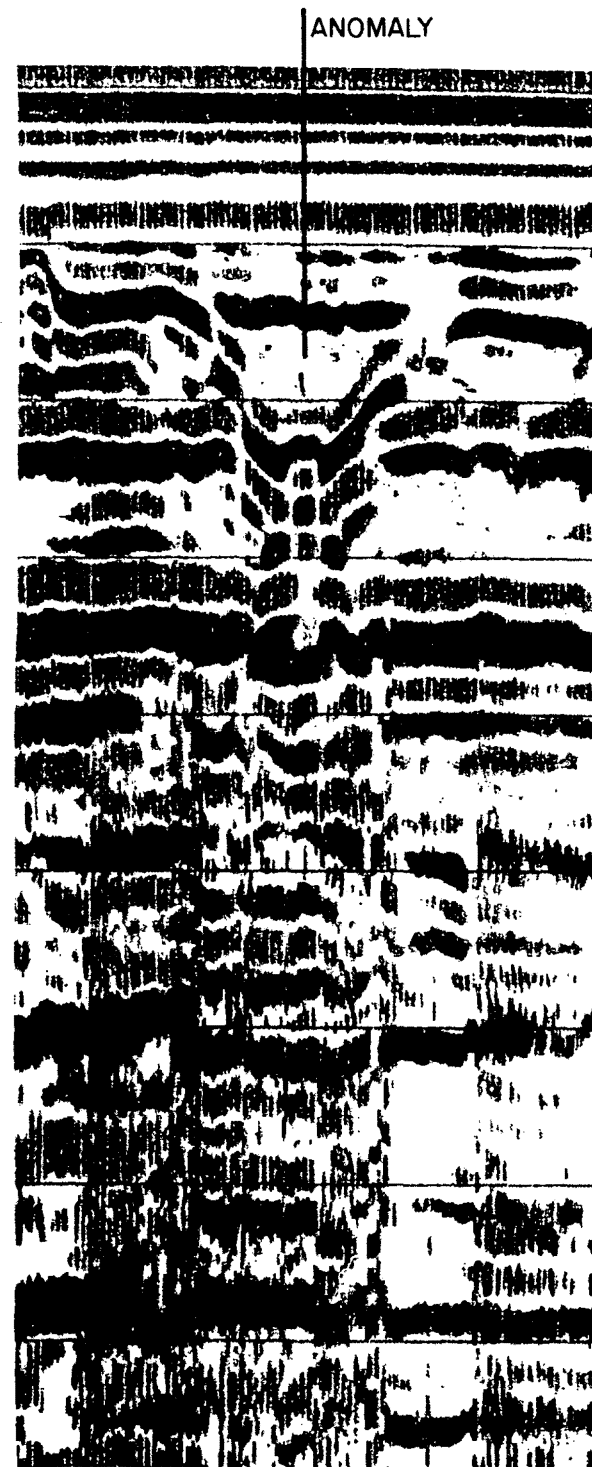
GEOTECHNICAL / HYDROGEOLOGIC STUDY
PROPOSED PASCO COUNTY LANDFILL -
HAYS ROAD SITE
PASCO COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

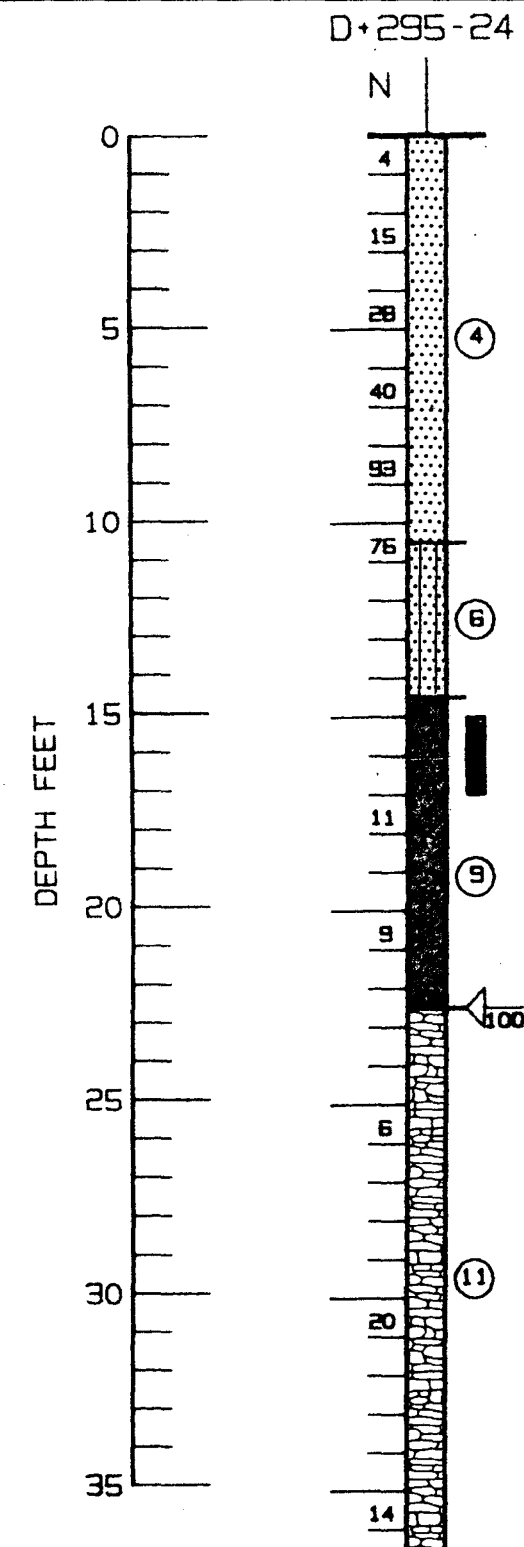
DATE DEC. 86 PROJ. NO 85-30267 PLATE 11



GPR RESULT
(Fast Speed, May 29, 1986)



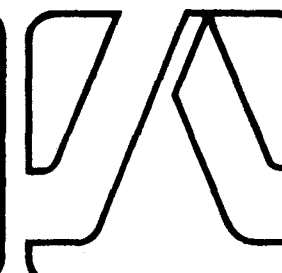
GPR RESULT
(Slow Speed, Oct. 3, 1986)



GROUND TRUTH SPT BORING
(Date Oct. 13, 1986)

DRAWN:	KFB
CHKD:	KFB
APPVD:	RAM
SCALE:	—

LOCATION:
D+295-24



GEOTECHNICAL / HYDROGEOLOGIC STUDY PROPOSED PASCO COUNTY LANDFILL - HAYS ROAD SITE PASCO COUNTY, FLORIDA		
JAMMAL & ASSOCIATES, INC. Consulting Engineers		
DATE DEC. 86	PROJ NO 85-30267	PLATE 12

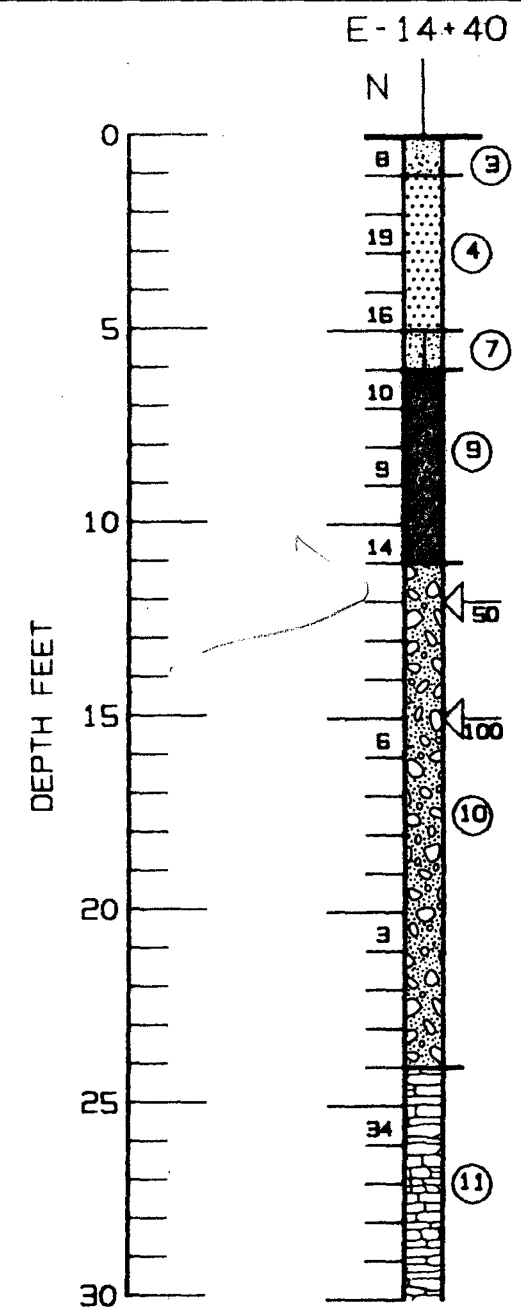


GPR RESULT

(Fast Speed, May 29, 1986)

DRAWN:	KFB
CHKD:	KFB
APPVD:	RAM
SCALE:	—

LOCATION:
E-14+40



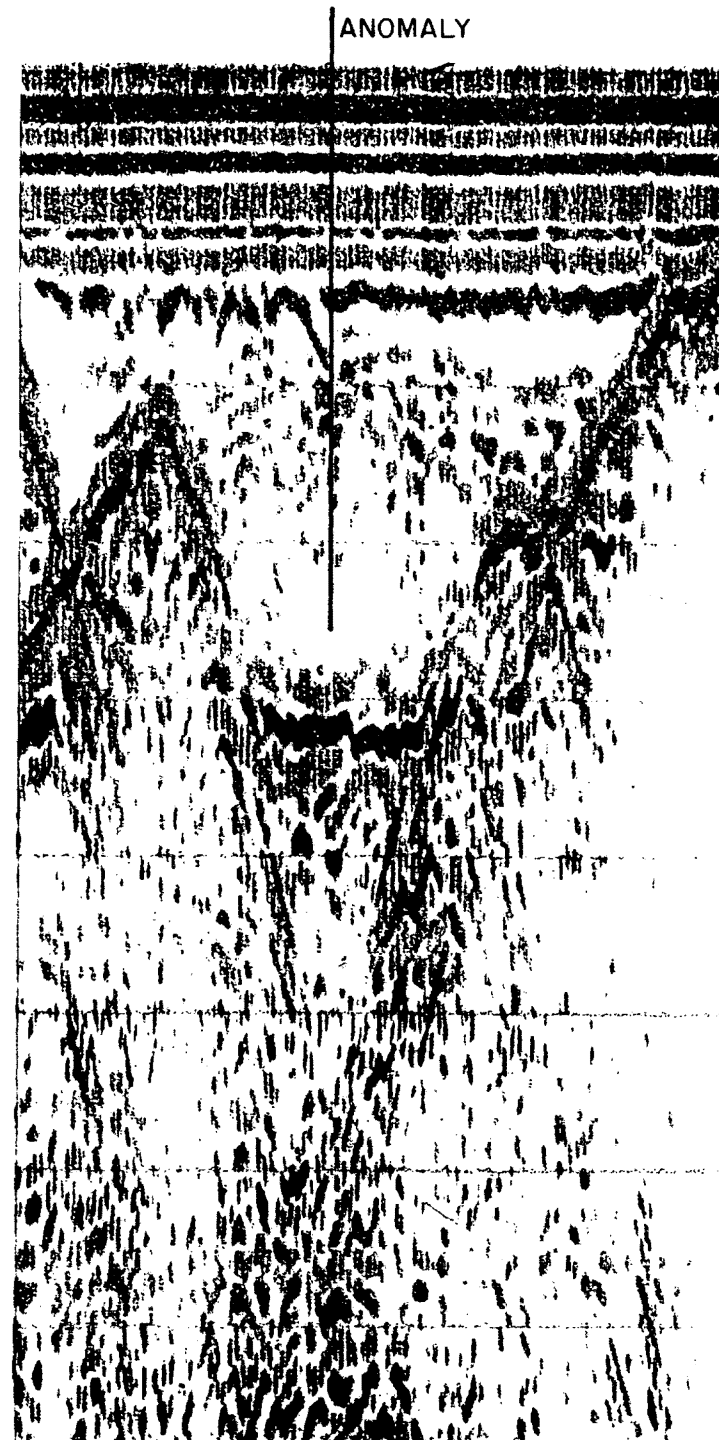
GROUND TRUTH SPT BORING

(Date Oct. 7, 1986)

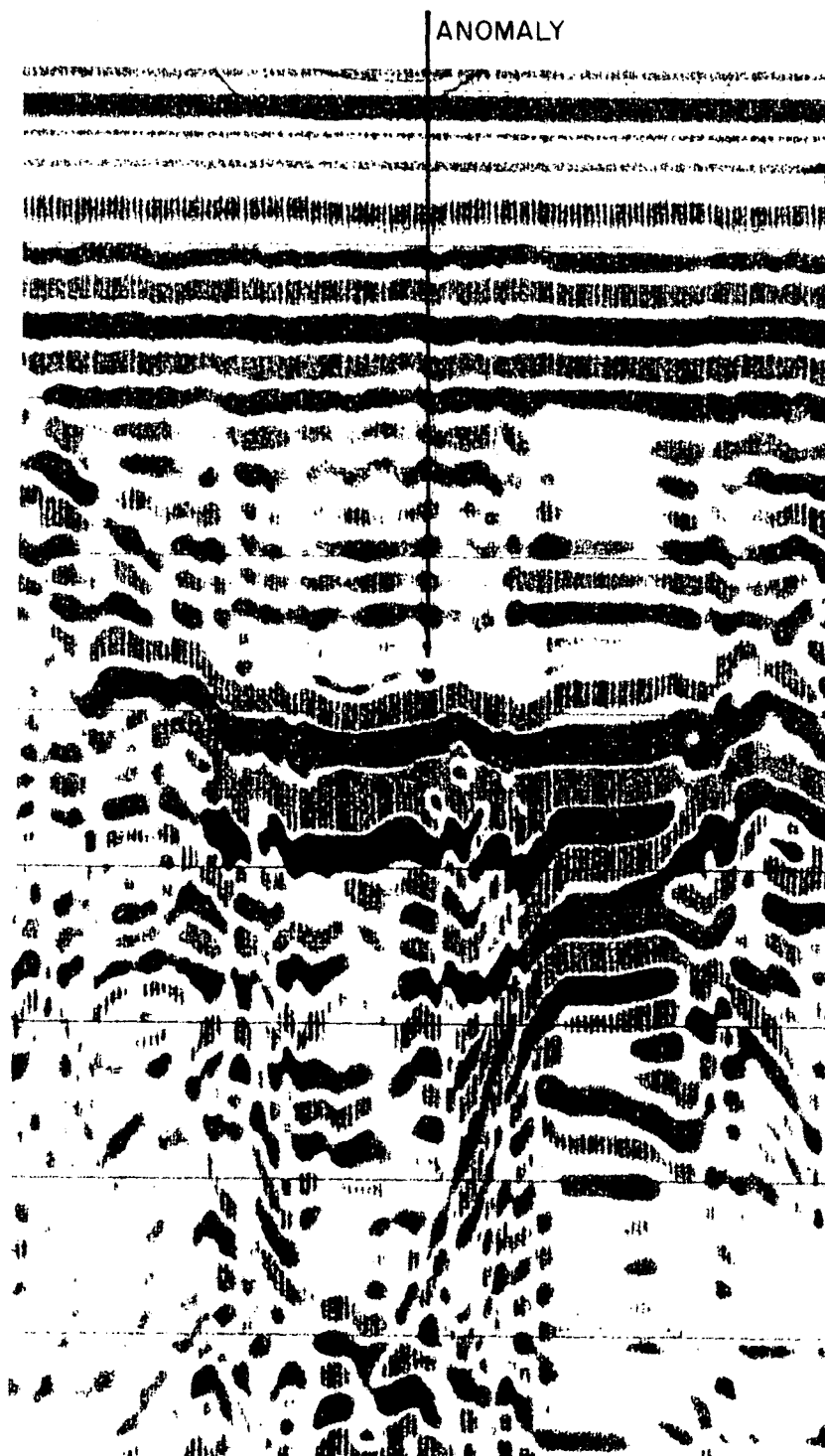
GEOTECHNICAL / HYDROGEOLOGIC STUDY
PROPOSED PASCO COUNTY LANDFILL -
HAYS ROAD SITE
PASCO COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

DATE DEC. 86 PROJ NO. 85-30267 PLATE 14



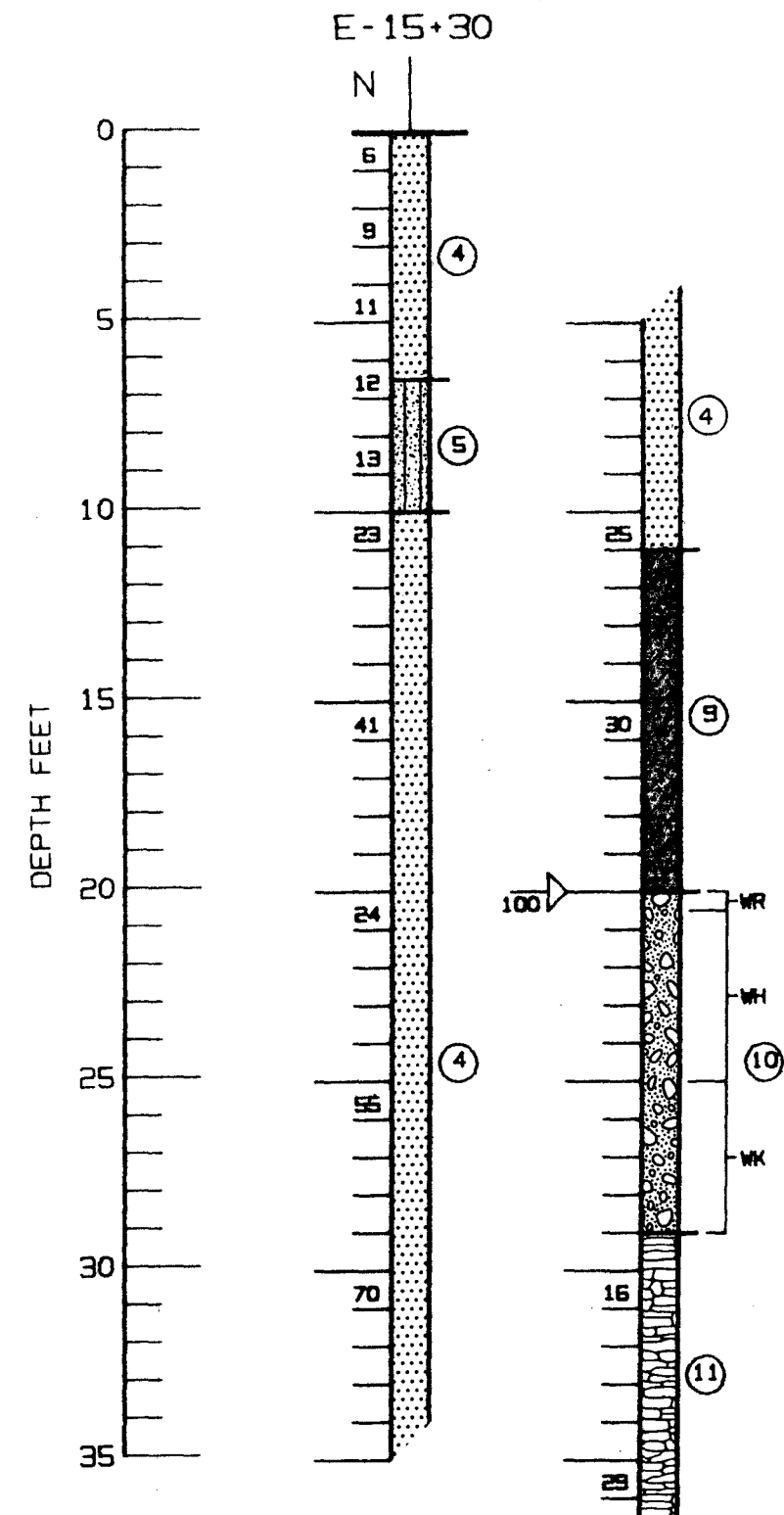
GPR RESULT
(Fast Speed, May 29, 1986)



GPR RESULT
(Slow Speed, Oct. 3, 1986)

DRAWN	KFB
CHKD	KFB
APPVD	RAM
SCALE	—

LOCATION:
E-15+30



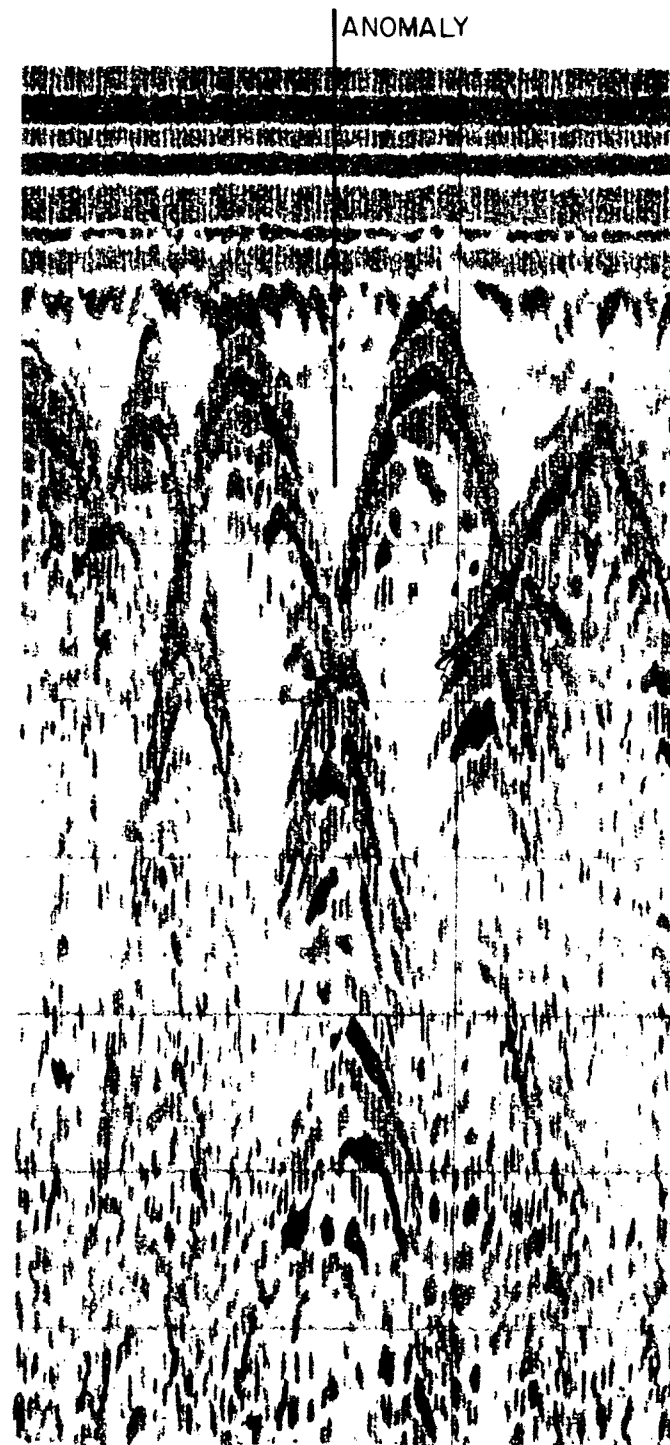
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(Date: Oct. 7, 1986)

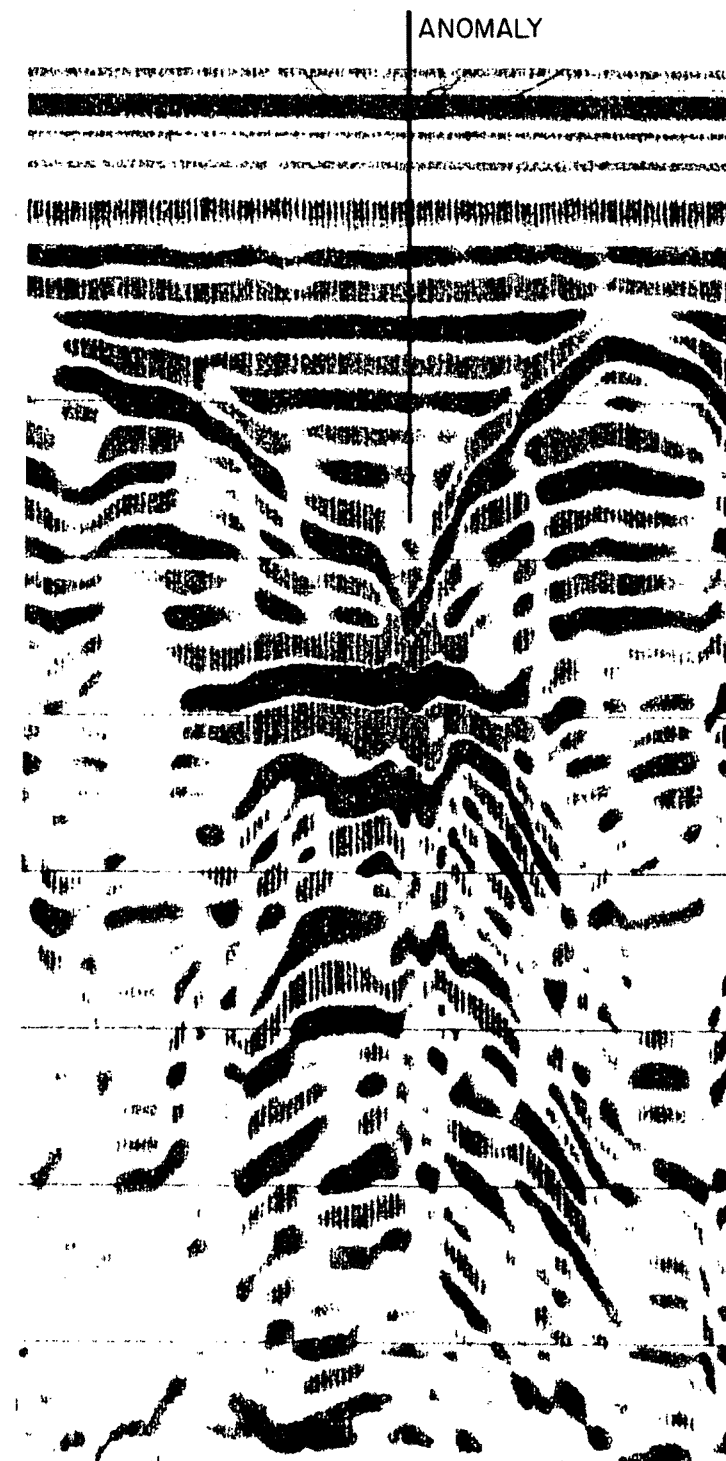
GEOTECHNICAL / HYDROGEOLOGIC STUDY
PROPOSED PASCO COUNTY LANDFILL -
HAYS ROAD SITE
PASCO COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

DATE DEC. 86 PROJ. NO. 85-30267 PLATE 15

**GPR RESULT**

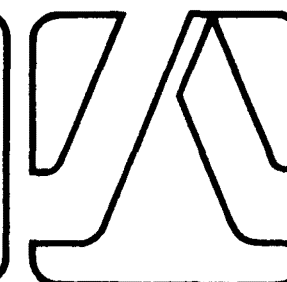
(Fast Speed, May 29, 1986)

**GPR RESULT**

(Slow Speed, Oct. 3, 1986)

DRAWN:	KFB
CHKD:	KFB
APPVD:	RAM
SCALE:	—

LOCATION:
E-16+20

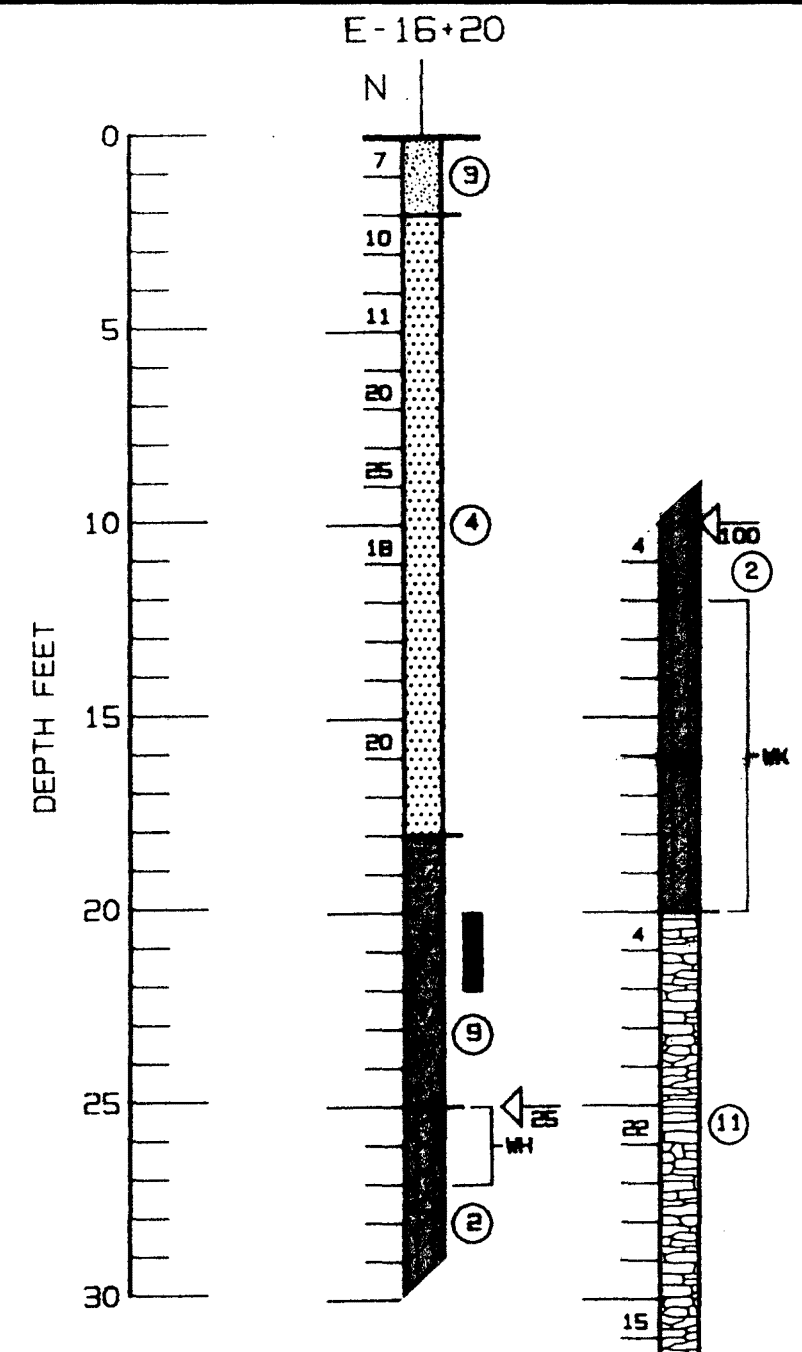
**GROUND TRUTH SPT BORING**

(Date Oct. 6, 1986)

GEOTECHNICAL / HYDROGEOLOGIC STUDY
PROPOSED PASCO COUNTY LANDFILL -
HAYS ROAD SITE
PASCO COUNTY, FLORIDA

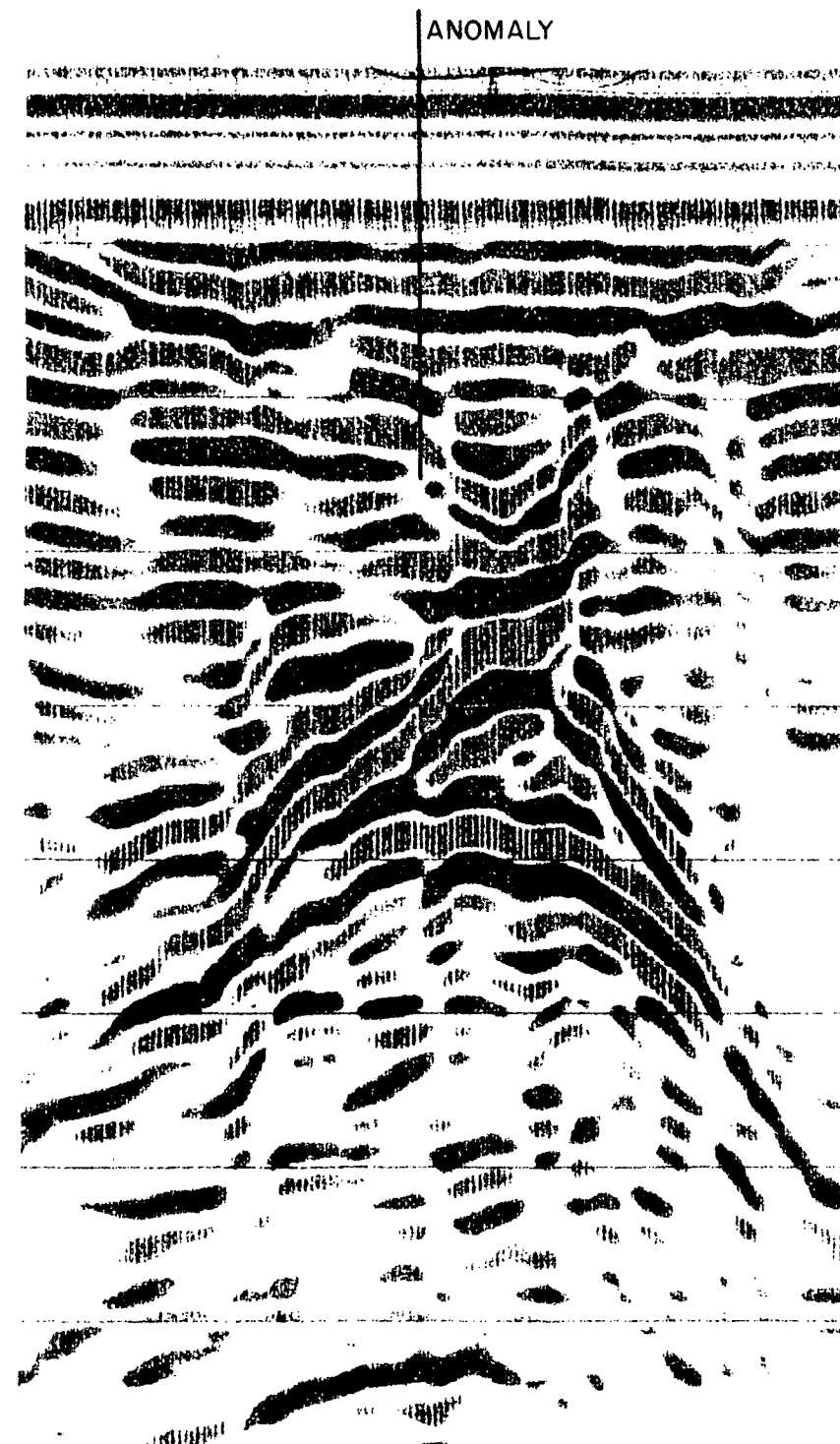
JAMMAL & ASSOCIATES, INC. Consulting Engineers

DATE DEC. 86 PROJ NO 85-30267 PLATE 16



**GPR RESULT**

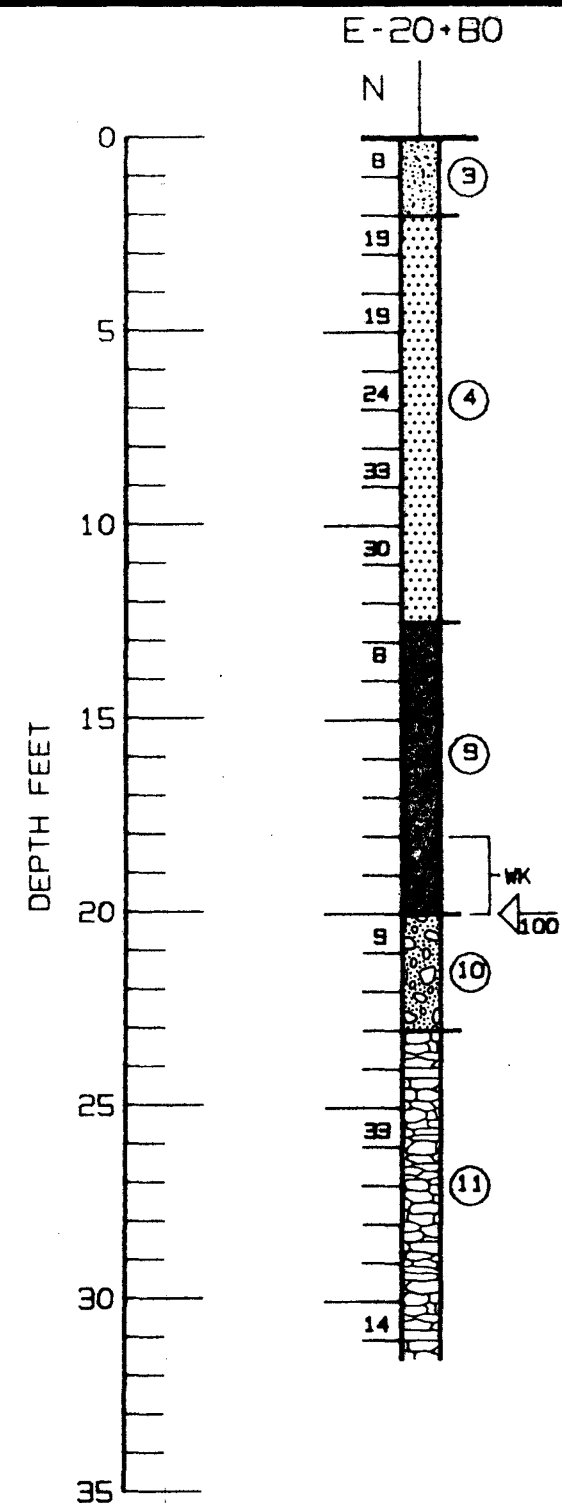
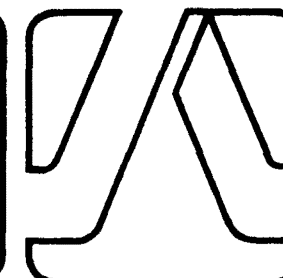
(Fast Speed, May 29, 1986)

**GPR RESULT**

(Slow Speed, Oct. 3, 1986)

DRAWN:	KFB
CHKD:	KFB
APPVD:	RAM
SCALE:	—

LOCATION:
E-20+80

**GROUND TRUTH SPT BORING**

(Date Oct. 6, 1986)

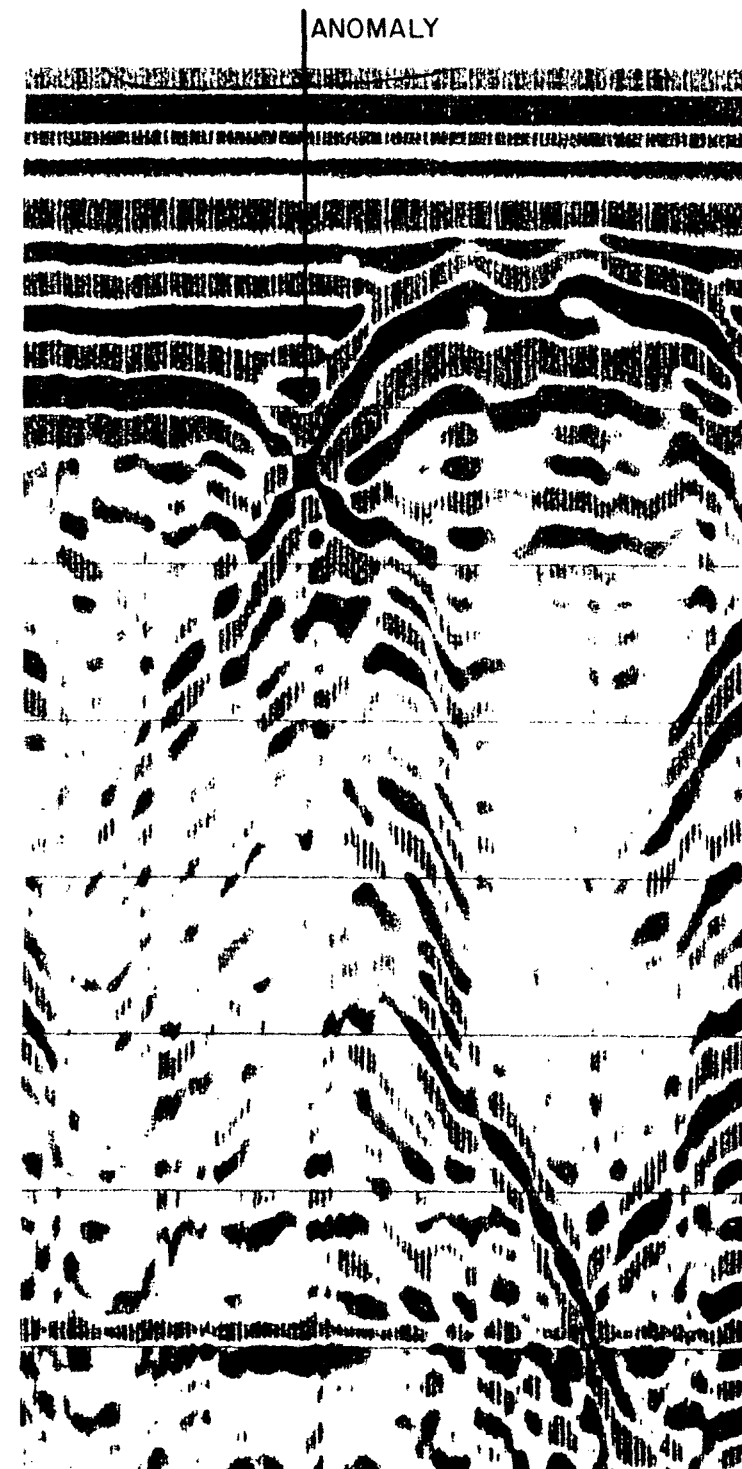
GEOTECHNICAL / HYDROGEOLOGIC STUDY
PROPOSED PASCO COUNTY LANDFILL -
HAYS ROAD SITE
PASCO COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

DATE DEC. 86	PROJ NO 85-30267	PLATE 17
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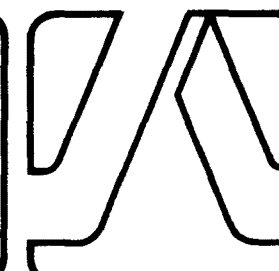
GPR RESULT
(Fast Speed, May 29, 1986)



GPR RESULT
(Slow Speed, Oct. 3, 1986)

DRAWN:	KFB
CHKD:	KFB
APPVD:	RAM
SCALE:	—

LOCATION:
E-45+60



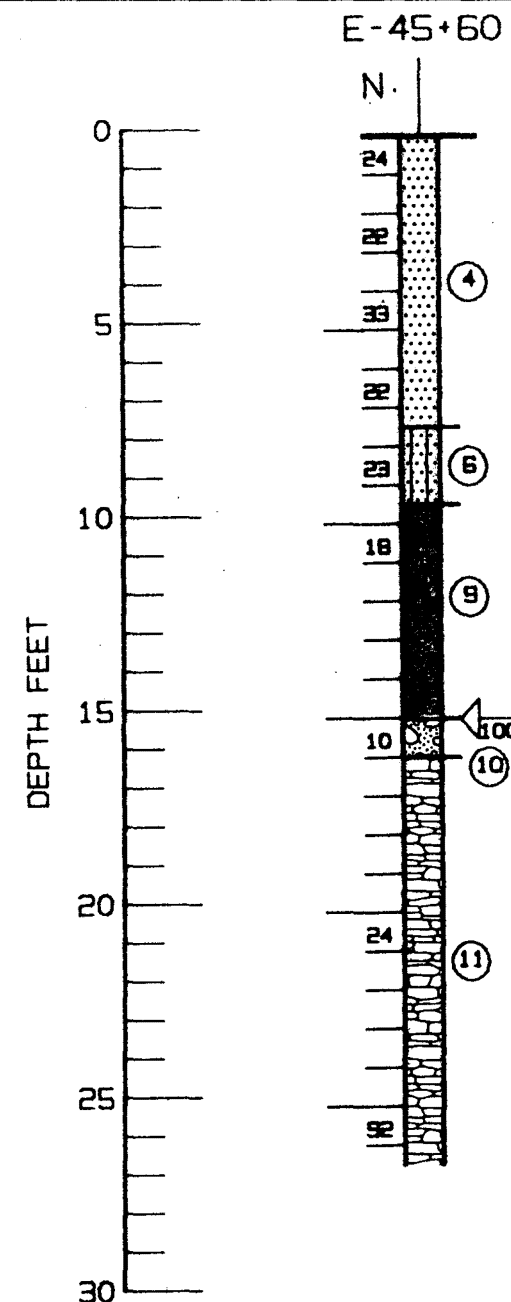
GROUND TRUTH SPT BORING

(Date: Oct. 6, 1986)

GEOTECHNICAL / HYDROGEOLOGIC STUDY
PROPOSED PASCO COUNTY LANDFILL -
HAYS ROAD SITE
PASCO COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

DATE: DEC. 86 PROJ NO 85-30267 PLATE 18



APPENDIX D

USGS WELL INVENTORY MAP (SHEET 1)
AERIAL VICINITY MAP/WELL INVENTORY MAP (SHEET 2)
WELL INVENTORY DATA

WELL INVENTORY DATA

Image Quality

As you review the next group of images, Please note that the original documents were of poor quality.

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY
MULTIPLE STATION LISTING - STATION LOCATION

PROCESS DATE: MAY 1985

STATION NUMBER	STATION NAME	LAT	LONG	ST	OS	CTY	LAST UPDATED
282053082234400	OAKES POND	282053	0822344	12	12	101	23-FEB-84
282108082290401	NORRIS CATTLE CO. S. WELL 840 NR GOWERS CORNER	282108	0822904	12	12	101	23-FEB-84
282108082290501	CROSSBAR WF N433 DEEP	282108	0822905	12	12	101	23-FEB-84
282109082073301	82120703 24S22E12 PS7406 CORE HOLE	282109	0820733	12	12	101	23-FEB-84
282110082290700	RAINFALL AT CROSS BAR SOUTH NR LOYCE	282110	0822907	12	12	101	23-FEB-84
282111082073101	82120704 24S22E32 CUMMER TRAILER WELL	282111	0820731	12	12	101	23-FEB-84
282113082241401	FT. KING RANCH GROVE WELL	282113	0822414	12	12	101	23-FEB-84
282114082103101	82121001 24S21E35 QUARTERS WELL	282114	0821031	12	12	101	23-FEB-84
282115082283701	CROSSBAR WF N-16 DEEP	282115	0822837	12	12	101	23-FEB-84
282117082062001	82120601 24S22E32 CUMMER CYPRESS	282117	0820620	12	12	101	23-FEB-84
282120082391109	DELMAR CORP WATER SUPPLY TREATED	282120	0823911	12	12	101	23-FEB-84
282121082071101	82120702 24S22E32 CUMMER OFFICE WELL	282121	0820711	12	12	101	23-FEB-84
282123082274401	CB-1 NR MASARYKTOWN	282123	0822744	12	12	101	23-FEB-84
282130082082401	82120802 24S22E31 AUTON WELL	282130	0820824	12	12	101	23-FEB-84
282130082082901	82120801 24S22E31 MAC BRIAN	282130	0820829	12	12	101	23-FEB-84
282132082115901	82121106 24S21E34 BOLTIN RESIDENCE	282132	0821159	12	12	101	23-FEB-84
282133082275301	CB-2 NR MASARYKTOWN	282133	0822753	12	12	101	23-FEB-84
282138082115201	82121107 24S21E34 DADE CITY SUPPLY WELL	282138	0821152	12	12	101	23-FEB-84
282139082414801	PASCO	282139	0824148	12	12	101	23-FEB-84
282141082101901	82121002 24S21E26 COLLURA WELL NO.2 W/LOG	282141	0821019	12	12	101	23-FEB-84
282141082334901	HAYS RD S. WELL 751 NR GOWERS CORNER	#1 282141	0823349	12	12	101	23-FEB-84
282141082335201	HAYS RD S. WELL 750 NR GOWERS CORNER	#2 282141	0823352	12	12	101	23-FEB-84
282142082253701	CROSSBAR WF A DEEP	282142	0822537	12	12	101	23-FEB-84
282142082283702	CROSSBAR WF A SHALLOW	282142	0822837	12	12	101	23-FEB-84
282143082093201	82120902 24S21E25 THOMAS WELL 6-IN.	282143	0820932	12	12	101	23-FEB-84
282143082093301	82120903 24S21E25 THOMAS WELL 3-IN	282143	0820933	12	12	101	23-FEB-84
282144082414709	HUDSON COMMUNITY WATER WORKS TREATED	282144	0824147	12	12	101	23-FEB-84
282147082113001	82121101 24S21E27 DADE CITY NO 1	282147	0821130	12	12	101	23-FEB-84
282147082113002	82121102 24S21E27 DADE CITY NO 2	282147	0821130	12	12	101	23-FEB-84
282147082113003	82121103 24S21E27 DADE CITY NO. 3	282147	0821130	12	12	101	23-FEB-84
282147082113004	821211213WATER PLANT WELL 4 AT DADE CITY, FL.	282147	0821130	12	12	101	23-FEB-84
282148082122400	DADE CITY PUBLIC SUPPLY COMPOSITE 2 WELLS	282148	0821229	12	12	101	23-FEB-84
282148082122401	DADE CITY PUBLIC SUPPLY UNTREATED COMP. 2 WELLS	282148	0821229	12	12	101	23-FEB-84
282148082122402	DADE CITY PUBLIC SUPPLY TREATED COMP. 2 WELLS	282148	0821229	12	12	101	23-FEB-84
282148082281801	CROSSBAR WF A-1 DEEP	282148	0822818	12	12	101	23-FEB-84
282148082281802	CROSSBAR WF A-1 SHALLOW	282148	0822818	12	12	101	23-FEB-84
282148082300701	FIVAY # 752 SHALLOW	282148	0823007	12	12	101	23-FEB-84
282152082114101	82121105 24S21E27 JOHN B. BURKS	282152	0821141	12	12	101	23-FEB-84
282152082411201	24S16E27 821241124	282152	0824137	12	12	101	23-FEB-84
282152082411201	24S16E27 821241123	282152	0824138	12	12	101	23-FEB-84
282153082085601	82120803 24S22E30 PARKER WELL	282153	0820856	12	12	101	23-FEB-84
282153082085602	82120804 24S22E30 PARKER WELL W/LOG	282153	0820856	12	12	101	23-FEB-84
282153082092601	82120901 24S21E25 GRIFFIN WELL	282153	0820926	12	12	101	23-FEB-84
282154082142401	82121401 24S21E30 HAYCRAFT WELL	282154	0821424	12	12	101	23-FEB-84
282154082142401	CB-4 NR MASARYKTOWN	282154	0821424	12	12	101	23-FEB-84

MULTIPLE STATION LISTING - STATION LOCATION

STATION NUMBER	STATION NAME	LAT	LONG	ST	DS	CTY	LAST UPDATED
232154062280401	CROSSBAR WF A-2 DEEP	232154	0822804	12	12	101	23-FEB-84
282154082280402	CROSSBAR WF A-2 SHALLOW	232154	0822804	12	12	101	23-FEB-84
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232158082170801	82121701 25S20E26 821217221	232158	0821708	12	12	101	23-FEB-84
232201082324301	SULTENFUSS NR FIVAY	232201	0823243	12	12	101	23-FEB-84
282202082414901	H E MOUNTAIN WATER CO 822 241 324	232202	0824149	12	12	101	23-FEB-84
232207082271101	CROSSBAR WF A-3 DEEP	232207	0822711	12	12	101	23-FEB-84
232207082271102	CROSSBAR WF A-3 SHALLOW	232207	0822711	12	12	101	23-FEB-84
282207082402401	HUDSON WELL 14 NEAR HUDSON, FL.	232207	0824024	12	12	101	13-SEP-84
282212082094501	82220901 24S21E25 LUNCEFORD WELL	232212	0820948	12	12	101	23-FEB-84
232212082121801	82221201 24S21E28 WITHLA ELECT CORP	232212	0821218	12	12	101	23-FEB-84
282212082121802	82221202 24S21E28 WITHLAA ELECT COOP.	232212	0821218	12	12	101	23-FEB-84
232220082093301	82220902 24S21E25 PS7404 CORE HOLE	232220	0820933	12	12	101	23-FEB-84
232221082103001	82221001 24S21E26 COLLURA WELL NO. 1	232221	0821030	12	12	101	23-FEB-84
282222082230701	CB-5 NR MASARYKTOWN	232222	0822807	12	12	101	23-FEB-84
282225082293501	DETROIT RESORT MOTEL	232225	0822935	12	12	101	23-FEB-84
232228082222701	JOE GILMORE	232228	0822227	12	12	101	23-FEB-84
232228082402001	CITY OF HUDSON D. WELL AT HUDSON, FL	232228	0824020	12	12	101	23-FEB-84
282229082410301	822 241 422	232228	0824103	12	12	101	23-FEB-84
282229082405801	COASTAL PASCO D. WELL 02 AT HUDSON, FL	232229	0824058	12	12	101	23-FEB-84
282229082415701	USGS WELL PASCO 1 NR HUDSON	232229	0824157	12	12	101	23-FEB-84
232230082112301	82221102 24S21E27 LYKES-PASCO NO. 14	232230	0821122	12	12	101	23-FEB-84
232230082112202	82221112 24S21E27 LYKES-PASCO 4-IN OBS	232230	0821122	12	12	101	23-FEB-84
232230082223000	EHREN TEST QUAD NE CORNER NOT DATA SITE	232230	0822230	12	12	101	23-FEB-84
232230082230000	MASARYKTOWN TEST QUAD SE CORNER NOT DATA SITE	232230	0822300	12	12	101	23-FEB-84
232230082300000	FIVAY TEST QUAD NE CORNER NOT DATA SITE	232230	0823000	12	12	101	23-FEB-84
232230082373000	PORT RICHEY TEST QUAD NE CORNER NOT DATA SITE	#9 232230	0823730	12	12	101	23-FEB-84
232230082450000	PORT RICHEY TEST QUAD NW CORNER NOT DATA SITE	232230	0824500	12	12	101	23-FEB-84
232231082231700	POND NEAR BIG FISH LAKE	232231	0822317	12	12	101	23-FEB-84
282233082102401	82221102 24S21E22 PASCO PACKING #12	232233	0821024	12	12	101	23-FEB-84
282233082112201	82221104 24S21E22 LYKES-PASCO NO. 8	232233	0821122	12	12	101	23-FEB-84
232233082112202	82221112 24S21E22 LYKES-PASCO NO. 9	232233	0821122	12	12	101	23-FEB-84
232233082112203	82221101 24S21E22 LYKES-PASCO NO. 12 PTBL	232233	0821122	12	12	101	23-FEB-84
232233082112204	82221103 24S21E22 LYKES-PASCO NO. 15	232233	0821122	12	12	101	23-FEB-84
232233082112205	82221114 24S21E22 LYKES-PASCO NO. 11	232233	0821122	12	12	101	23-FEB-84
232233082112206	82221113 24S21E22 LYKES-PASCO NO. 10	232233	0821122	12	12	101	23-FEB-84
232233082233501	CR-6 NR MASARYKTOWN	232233	0822838	12	12	101	23-FEB-84
232234082164401	82221601 24S20E23 DONALD MATHE WELL W/LOG	232234	0821644	12	12	101	23-FEB-84
232234082405801	BUTTERWORTH 822 240 133	232234	0824058	12	12	101	23-FEB-84
232235082111101	82221115 24S21E22 LYKES-PASCO NO. 13	232235	0821119	12	12	101	23-FEB-84
232235082112301	82221105 24S21E22 LYKES-PASCO NO. 1	232235	0821123	12	12	101	23-FEB-84
232235082112302	82221106 24S21E22 LYKES-PASCO NO. 2	232235	0821123	12	12	101	23-FEB-84
232236082362101	JUSTICE DP NR HUDSON	#10 232236	0823621	12	12	101	23-FEB-84
232239082112401	82221107 24S21E22 LYKES-PASCO NO. 3	232239	0821124	12	12	101	23-FEB-84
232240082112501	82221108 24S21E22 LYKES-PASCO NO. 4	232240	0821120	12	12	101	23-FEB-84

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY
MULTIPLE STATION LIST - STATION LOCATION

PROCESS DATE: MAY 1986

STATION NUMBER	STATION NAME	LAT	LONG	ST	DS	CTY	LAST UPDATED
282240082112002	82221109 24S21E22 LYKES-PASCO NO. 5	282240	0821120	12	12	101	23-FEB-84
282240082112003	82221110 24S21E22 LYKES-PASCO NO. 6	282240	0821120	12	12	101	23-FEB-84
282240082112004	82221111 24S21E22 LYKES-PASCO NO. 7	282240	0821120	12	12	101	23-FEB-84
282240082310300	JUMPING GULLY AT MOUTH NR GREENFIELD, FLA.	#11 282240	0823103	12	12	101	23-FEB-84
282240082281601	CROSSBAR WF B DEEP	282240	0822816	12	12	101	23-FEB-84
282240082281602	CROSSBAR WF B SHALLOW	282240	0822816	12	12	101	23-FEB-84
282250082283101	CROSSBAR WF N4S4 DEEP	282250	0822831	12	12	101	23-FEB-84
282253082404001	RED BARN BAR D. WELL NR HUDSON, FL	282253	0824040	12	12	101	23-FEB-84
282256082394101	W F SAYLOR 823 239 121	282256	0823941	12	12	101	23-FEB-84
282258082113101	82221116 24S21E16 L-P NO. 16 FIRE WELL	282258	0821131	12	12	101	23-FEB-84
282258082113102	82221117 24S21E22 L-P 4-IN FIRE TEST WELL	282258	0821131	12	12	101	23-FEB-84
282258082193601	822 219 5836	282258	0821936	12	12	101	23-FEB-84
282259082104101	82221001 LYKES PASCO W. NR. DADE CITY, FL.	282259	0821041	12	12	101	23-FEB-84
282259082110901	82221119 24S21E23 WINDMILL WELL NO. 1	282259	0821109	12	12	101	23-FEB-84
282259082282801	CROSSBAR WF B-1 DEEP	282259	0822828	12	12	101	23-FEB-84
282259082282802	CROSSBAR WF B-1 SHALLOW	282259	0822828	12	12	101	23-FEB-84
282302082113401	82321101 24S21E22 RUG OUTLET WELL	282302	0821134	12	12	101	23-FEB-84
282302082290301	CROSSBAR WF S-1 SHALLOW	282302	0822903	12	12	101	23-FEB-84
282303082094901	82320901 24S21E24 CALVERT WELL	282303	0820949	12	12	101	23-FEB-84
282303082113401	82321102 24S21E22 BOLTIN WELL W/LOG	282303	0821134	12	12	101	23-FEB-84
282304082164401	82321601 24S20E23 C J PETTERS AND SONS	282304	0821644	12	12	101	23-FEB-84
282305082292101	RAINFALL AT JUMPING GULLY NR LOYCE, FLA	282305	0822921	12	12	101	23-FEB-84
282306082112601	82321107 24S21E22 MUSEUM WELL W/LOG	282306	0821126	12	12	101	23-FEB-84
282307082111101	82321108 24S21E23 LARKIN RES WELL	282307	0821111	12	12	101	23-FEB-84
282310082281901	CB-8 NR MASARYKTOWN	282310	0822819	12	12	101	23-FEB-84
282313082284301	CROSSBAR WF B-2 DEEP	282313	0822843	12	12	101	23-FEB-84
282313082284302	CROSSBAR WF B-2 SHALLOW	282313	0822843	12	12	101	23-FEB-84
282315082113601	82321103 24S21E22 NURSERY WELL	282315	0821136	12	12	101	23-FEB-84
282319082105201	82321002 24S21E23 LOVETT WELL	282319	0821052	12	12	101	23-FEB-84
282319082115001	82321104 24S21E22 STANBERRY WELL	282319	0821150	12	12	101	23-FEB-84
282324082181901	CB-9 NR DARBY	282324	0821819	12	12	101	23-FEB-84
282325082400601	BEAUDEAUX 823 240 422	282325	0824006	12	12	101	23-FEB-84
282326082112001	82321109 24S21E15 W. TERRIE WELL W/LOG	282326	0821120	12	12	101	23-FEB-84
282326082280901	CROSSBAR WF N4S2 DEEP	282326	0822809	12	12	101	23-FEB-84
282326082285201	CROSSBAR WF B-3 DEEP	282326	0822852	12	12	101	23-FEB-84
282326082285202	CROSSBAR WF B-3 SHALLOW	282326	0822852	12	12	101	23-FEB-84
282328082341601	WOODLAWN DP NR HUDSON	#4 282328	0823416	12	12	101	23-FEB-84
282330082290501	ROUAN FARMS 4 INCH BARN WELL	282330	0822905	12	12	101	23-FEB-84
282332082110101	82321106 24S21E14 BOLTIN IRRIGATION WELL	282332	0821101	12	12	101	23-FEB-84
282336082091001	82320902 24S22E18 RANCH HOUSE WELL	282336	0820910	12	12	101	23-FEB-84
282339082395801	ZAZZY'S D. WELL NR HUDSON, FL	282339	0823958	12	12	101	23-FEB-84
282342082042101	82320401 24S22E14 CUMPRESCO RANCH AT STURKEY	282342	0820421	12	12	101	23-FEB-84
282342082274501	CB-10 NR MASARYKTOWN	282342	0822745	12	12	101	23-FEB-84
282343082114901	82321105 24S21E15 SAPP WELL W/LOG	282343	0821149	12	12	101	23-FEB-84
282346082271201	CB-11 NR DARBY	282346	0822712	12	12	101	23-FEB-84

UNITED STATES DEPARTMENT OF THE INTERIOR GEOLOGICAL SURVEY
MULTIPLE STATION LIST - STATION LOCATION

PROCESS DATE: MAY 1980

STATION NUMBER	STATION NAME	LAT	LONG	ST	DS	CTY	LAST UPDATED
281923082252201	PUMP 93 DEEP WELL NEAR GOWERS CORNER, FL	281923	0822522	12	12	101	23-FEB-84
281923082252202	PUMP 93 SHALLOW WELL NEAR GOWERS CORNER, FL	281923	0822522	12	12	101	23-FEB-84
281926082212901	JCT OF SR 52 & 581 S. WELL NR DABBY, FLA	281926	0822129	12	12	101	23-FEB-84
281926082212902	SR 52 & 581 S. WELL NR DABBY, FLA	281926	0822129	12	12	101	23-FEB-84
281926082212903	SR 52 & 581 S. WELL NR DABBY, FLA	281926	0822129	12	12	101	23-FEB-84
281927082111201	51921101 25S21E11 C W HALL	281927	0821112	12	12	101	23-FEB-84
281929082131301	51921301 25S21E09 LAKE PASADENA WELL	281929	0821313	12	12	101	23-FEB-84
281930082093701	51920901 25S21E12 LYKES-PASCO FERTILIZER	281930	0820937	12	12	101	23-FEB-84
281930082093702	51920902 25S21E12 LYKES PASCO FERT 4-INCH	281930	0820937	12	12	101	23-FEB-84
281930082113101	51921102 25S21E10 MINUTE MAID CORP	281930	0821131	12	12	101	23-FEB-84
281931082284101	SRW-DEEP NR DABBY	281931	0822841	12	12	101	23-FEB-84
281931082284102	SRW-SH NR DABBY	281931	0822841	12	12	101	23-FEB-84
281934082401900	BEAR SINK HI NR BAYONET POINT, FL.	281934	0824019	12	12	101	07-JAN-85
281936082112201	51921106 TOM OAKLEY RESIDENCE US 301	281936	0821122	12	12	101	23-FEB-84
281938082402100	BEAR SINK #2 NR BAYONET POINT, FL.	281938	0824021	12	12	101	07-JAN-85
281938082402101	BALICKI DP WELL NR BAYONET POINT, FL.	281938	0824021	12	12	101	07-JAN-85
281942082113101	51921103 25S21E10 FLORAL MEMORY GARDENS	281942	0821131	12	12	101	23-FEB-84
281943082241501	FT. KING RANCH 10 INCH WELL	281943	0822418	12	12	101	23-FEB-84
281946082415301	WILHACOOCHEE ELEC U1 AT BAYONET POINT, FL	281946	0824153	12	12	101	23-FEB-84
281949082332001	SR52 DP WELL WEST OF GOWERS CORNER, NR LOYCE, FL	281949	0823320	12	12	101	23-FEB-84
281949082332002	SR52 SH WELL WEST OF GOWERS CORNER, NR LOYCE, FL	281949	0823320	12	12	101	23-FEB-84
281950082415700	10J RAINFALL AT BAYONET POINT, FLA	281950	0824157	12	12	101	23-FEB-84
281954082413401	PONDEROSA DEV O. WELL AT BAYONET POINT, FL	281954	0824134	12	12	101	23-FEB-84
281955082111701	51921104 25S21E03 JOHNSON WELL	281955	0821117	12	12	101	23-FEB-84
281958082110201	51921105 25S21E02 COUNTRY AIRE ESTS WELL	281958	0821102	12	12	101	23-FEB-84
282000082160001	SAINT LEO NOAA STATION 7851	282000	0821600	12	12	101	23-FEB-84
282005082112301	82021104 25S21E03 STEARNS WELL	282005	0821128	12	12	101	23-FEB-84
282005082153501	82021501 25S20E01 GOLF COURSE WELL	282005	0821535	12	12	101	23-FEB-84
282006082234000	MARSH NEAR CYPRESS CREEK AND SR 52	282006	0822340	12	12	101	23-FEB-84
282007082142901	82021401 25S21E06 ST HWY 52 NR RAY POND	282007	0821429	12	12	101	23-FEB-84
282009082373801	SR 52 O. WELL NR HUDSON, FLA	282009	0823738	12	12	101	23-FEB-84
282009082373802	SR 52 S. WELL NR HUDSON, FLA	282009	0823738	12	12	101	23-FEB-84
282010082035801	82020301 25S22E01 CUMPRESCO RANCH	282010	0820358	12	12	101	23-FEB-84
282011082162301	SAN ANTONIO WTR SUPPLY TREATED	282011	0821623	12	12	101	23-FEB-84
282011082162701	82021601 25S20E02 SAN ANTONIO PROD WELL	282011	0821627	12	12	101	23-FEB-84
282036082112101	82021102 25S21E03 EVANS PROP	282036	0821121	12	12	101	23-FEB-84
282036082300801	H. L. AND H. NURSERY	282036	0823008	12	12	101	23-FEB-84
282037082111601	82021103 25S21E03 EVANS WELL	282037	0821116	12	12	101	23-FEB-84
282037082370301	SHADOW RIDGE WELL NO. 1 NEAR HUDSON, FL.	282037	0823703	12	12	101	04-SEP-84
282038082112001	82021101 25S21E03 EVANS MAIN PLANT WELL	282038	0821120	12	12	101	23-FEB-84
282040082335000	CYPRESS CREEK DRAINAGE CANAL	282040	0823350	12	12	101	23-FEB-84
282044082311201	JOHN WOTTON	282044	0823112	12	12	101	23-FEB-84
282044082312401	H. KENT GROVE WELL	282044	0823124	12	12	101	23-FEB-84
282048082120301	82021201 24S21E37 KRISSMAN WELL	282048	0821203	12	12	101	23-FEB-84
282052082404301	WATSON WOODS WELL 7 AT NEW PORT RICHEY, FL.	282052	0824043	12	12	101	14-SEP-84

REPORT NUMBER 41-099

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

PAGE 4
DATE 86/12/22

PERMIT NUM STAT NAME

ADDRESS

CITY

ST ZIP

04038 01 P PASCO CO MUNI FIRE SERVICE UNIT 530 SUNSET RD

NEW PORT RICHEY

FL 33552

BASIN

COUNTY

COASTAL RIVERS

PASCO

PERMITTED AVG	PERMITTED MAX	NUM USES	NUM GWD PTS	NUM SWD PTS	TOT-ACRES	SEC/TWNSHP/PGE	EXPIRE DATE
5,000	15,000	1	1	0	5.0	13 24 17	94/04/04

WD TYPE W/LAT W/LONG SOURCE NAME

DIAMETER WD PER AVG WD PER MAX W/D DESCRIPTION

WD#001	G	282347	823310	#5	6	5,000	15,000	ESSENTIAL SERVICES
	USE CODE	USE DESCRIPTION			USE PUMPAGE	USE ACRES		

USE#01 001 ESSENTIAL SERVICES

5,000 0.0

WELL NUM	STIP CODE	FREQ CODE	DUE DATE	NEXT DUE	DESCRIPTION
----------	-----------	-----------	----------	----------	-------------

000	073	06	84/05	00/00	DISTRICT RESERVES RIGHT TO COLLECT SAMPLES
000	082	72	94/05	00/00	MINIMUM AQUIFER LEVEL MAY BE SET
000	095	06	84/05	00/00	DISTRICT RESERVES RIGHT TO REQUIRE PUMPAGE RECORDS
000	097	06	84/05	00/00	WATER CONSERVATION METHODS

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

PAGE 5
DATE 86/12/22

REPORT NUMBER 41-099

PERMIT NUM STAT NAME

ADDRESS

CITY

ST ZIP

06821 01 P QUAIL RIDGE GOLF & COUNTRY CLUB

1600 SHADY HILLS RD

SPRING HILL

FL 33526

BASIN

COUNTY

COASTAL RIVERS

PASCO

PERMITTED AVG	PERMITTED MAX	NUM USES	NUM GWD PTS	NUM SWD PTS	TOT-ACRES	SEC/TWNSHP/RGE	EXPIRE DATE
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167,000	252,000	1	2	0	181.0	06 25 18	88/08/04
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WD TYPE	W/LAT	W/LONG	SOURCE NAME	DIAMETER	WD PER AVG	WD PER MAX	W/D DESCRIPTION
WD#001	G	282040	823233 #12	4	24,000	36,000	IRRIGATION
WD#002	G	282039	823233 #13	8	143,000	216,000	IRRIGATION
USE CODE	USE DESCRIPTION	USE PUMPAGE	USE ACRES				

USE#01	105	GOLF COURSE	167,000	50.0			
WELL NUM	STIP CODE	FREQ CODE	DUE DATE	NEXT DUE	DESCRIPTION		

000	073	06	85/11	00/00	DISTRICT RESERVES RIGHT TO COLLECT SAMPLES		
000	082	72	88/11	00/00	MINIMUM AQUIFER LEVEL MAY BE SET		
000	097	06	85/11	00/00	WATER CONSERVATION METHODS		
001	005	01	85/09	87/01	METER PUMPAGE-READ AND SUBMIT MONTHLY		
002	005	01	85/09	87/01	METER PUMPAGE-READ AND SUBMIT MONTHLY		

REPORT NUMBER 41-099

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

PAGE 6
DATE 86/12/22

PERMIT NUM STAT NAME

ADDRESS

CITY

ST ZIP

07672 00 P MEADOW OAKS GOLF-COUNTRY CLUB TR 13314 WYNN RANCH RD

HUDSON

FL 33562

PASIN

COUNTY

COASTAL RIVERS

PASCO

PERMITTED AVG	PERMITTED MAX	NUM USES	NUM GWD PTS	NUM SWD PTS	TOT-ACRES	SEC/TWNSHP/RGE	EXPIRE DATE
217,000	413,000	1	1	1	403.0	33 24 17	90/08/01

WD TYPE	W/LAT	W/LONG	SOURCE NAME	DIAMETER	WD PER AVG	WD PER MAX	W/D DESCRIPTION
WD#001	G	282103	823607 #14	6	90,000	324,000	RECREATION
WD#002	S	282104	823602 PRETTY NORTH, LAKE #15	8	217,000	413,000	IRRIGATION

USE CODE USE DESCRIPTION

USE PUMPAGE USE ACRES

USE#01	105	GOLF COUPSE	217,000	60.0	
WELL NUM	STIP CODE	FREQ CODE	DUE DATE	NEXT DUE	DESCRIPTION

000	073	06	84/11	00/00	DISTRICT RESERVES RIGHT TO COLLECT SAMPLES
000	082	72	90/11	00/00	MINIMUM AQUIFER LEVEL MAY BE SET
000	097	06	84/11	00/00	WATER CONSERVATION METHODS
000	423	06	84/11	87/05	WATER QUALITY ANALYSES PERFORMED BY DISTRICT SPECS
001	005	01	84/12	87/01	METER PUMPAGE-READ AND SUBMIT MONTHLY
001	038	01	84/12	87/01	CHLORIDE ANALYSIS MONTHLY, SUBMIT MONTHLY

REPORT NUMBER 41-099

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

PAGE 3
DATE 86/12/22

PERMIT NUM STAT NAME

ADDRESS

CITY

ST ZIP

03761 01 P PASCO COUNTY UTILITIES DEPT

7536 STATE ST

NEW PORT RICHEY

FL 33553

RASIN

COUNTY

COASTAL RIVERS

PASCO

PERMITTED AVG	PERMITTED MAX	NUM USES	NUM GWD PTS	NUM SWD PTS	TOT-ACRES	SEC/TWNSHP/RGE	EXPIRE DATE
550,000	1,100,000	1	2	0	2,560.0	04 25 17	92/05/02

WD TYPE	W/LAT	W/LONG	SOURCE NAME	DIAMETER	WD PER AVG	WD PER MAX	W/D DESCRIPTION
WD#001	G	282042	823657 #16	8	435,000	870,000	PUBLIC SUPPLY
WD#002	G	282032	823656 #17	6	115,000	230,000	PUBLIC SUPPLY

USE CODE USE DESCRIPTION

USE PUMPAGE USE ACRES

USE#01 026 ON-SITE PERCOLATION & PONDING

550,000

0.0

WELL NUM	STIP CODE	FREQ CODE	DUE DATE	NEXT DUE	DESCRIPTION
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000	073	06	84/11	00/00	DISTRICT RESERVES RIGHT TO COLLECT SAMPLES
000	082	72	92/11	00/00	MINIMUM AQUIFER LEVEL MAY BE SET
000	097	06	84/11	00/00	WATER CONSERVATION METHODS
000	115	72	92/11	00/00	REPORT ALTERNATIVE SOURCE OF SUPPLY & DEVELOPMENT
000	175	03	84/11	87/02	REVIEW PERMIT STIPULATIONS AND PROJECTED SCHEDULE
000	423	06	84/11	87/05	WATER QUALITY ANALYSES PERFORMED BY DISTRICT SPECS
001	005	01	84/07	87/01	METER PUMPAGE-READ AND SUBMIT MONTHLY
001	038	01	84/07	87/01	CHLORIDE ANALYSIS MONTHLY, SUBMIT MONTHLY
002	005	01	84/07	87/01	METER PUMPAGE-READ AND SUBMIT MONTHLY

WELL CONSTRUCTION LIST

DATE 1/31/86

D	P	D	E	L	O	D	D	D	S	S	S	S	D	C	T	D	C	T	I	C	D	C	U
P	E	R	R	A	C	C	O	C	M	R	B	I	E	L	C	D	O	I	I	1	2	2	2
U	M	I	U	S	N	T	I	A	E	O	A	L	L	L	C	S	C	C	C	C	C	C	F
S	I	L	S	I	T	N	A	S	L	U	G	L	E	S	A	C	F	I	L	L	L	L	E
E	T	L	L	N	Y	SLTNRG	M	E	L	T	S	M	V	D	P	L	E	C	E	R	A	A	A

WPE336474	1696	D	15	51	132417	4	63	100	C	MS	30	10				40	63					SNOWDEN L
WPE336473	1696	D	15	51	132417	4	70	100	C	MS	25	20	45		5	45	70					HUGHES
WPE339355	1696	D	15	51	132417	4	52	95	C	MS	10	11	21		21	21	42					HUTCHINSON
WPE340205	1056	D	15	51	132417	4	41	112	C	MS	5	15				40	WH	40	WH			GAPAREK, N
WPH344283	1696	D	15	51	132417	4	63	100	C													GRABIL, J
WPH345002	1696	D	15	51	132417	4	63	99	C	MS	31	11				42	52					DELHOFF, W A
WPN345008	1696	D	15	51	132417	4	*** CANCELLED ***															
WPC384539	1841	D	15	51	5932132417	4	115	145	C													HOOBLE, PA
WPC390501	2364	D	15	51	132417	4	63	85	C													KEPPEL, L E
WPC392084	1533	D	15	51	132417	4	33	36	C													KERR, KENNE
WPC410944	2364	D	15	51	132417	4	84	110	C													BARADLAY, T
WPE308413	0012	D	15	51	142417	3	84	120	C							60	60					M BAULERSON
WPE311289	0196	D	15	51	142417	3	94	108	C							95	95					A STAILER
WPE312239	0086	D	15	51	142417	3	50	95	C							23	23					A FABRIZI
WPC347171	1817	D	15	51	142417	4	40	130	C													ALLEY, CLIF
WPC350046	1904	A	15	51	142417	2		65	C													STOKES, LAR
WPC348688	1696	D	15	51	142417	4	50	73	C													TOOHEY, MIC
WPC350314	1696	D	15	51	142417	4	63	105	C													MICKLE
WPC357440	1533	D	15	51	1483142417	2	53	68	C													JORDAN, ROB
WPN363007	2159	D	15	51	142417	4	*** CANCELLED ***															
WPC368577	2159	D	15	51	142417	4	52	115	C													HANSON, MRS
WPN368018	2177	D	15	51	1103142417	2	*** CANCELLED ***															
WPC370019	1533	D	15	51	1465142417	4	64	71	C				1	20								PONCZKIEWI2
WPC375414	1056	D	15	51	142417	4	76	140	C					25								GELICH, KEN
WPC377470	1056	D	15	51	142417	4	52	140	R					16								TOOLE, DAYL
WPC377364	2177	D	15	51	1518142417	4	100	110	C													HENLEY, EDM
WPC377365	2177	D	15	51	11281142417	4	55	65	C													REDDING, HE
WPC379685	2075	D	15	51	142417	4	45	100	R					10								MCCOY, EDNA
WPC379684	2075	D	15	51	142417	4	84	115	C					18								KRAUS, NORM
WPH309300	0123	D	15	51	142417	4	60	108	C				25	22								
WPE313696	0196	D	15	51	142417	3	70	105	C					18								D E ESTOCAD
WPE314687	0086	D	15	51	142417	2	30	103	C					17								R JANDZINIS
WPE317355	0228	D	15	51	142417	3	62	90	C					18								H HUTCHINSD
WPE316169	0086	D	15	51	142417	4	40	100						20								R MOORE
WPC320513	0086	D	15	51	142417	3	51	120	C	MS	26	23				49	WH	49	WH			R WILLIAMS

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6	P	C	D	B	L	O	D	D	G	R	W	P	S	E	P	L	H	P	L	H	L	P	L	N	O
7	R	R	A	C	C	D	C	M	R	B	I	E	L	C	C	C	C	C	C	C	A	C	R	R	F
8	U	M	I	U	S	N	T	I	A	E	O	A	L	L	C	S	L	L	L	L	R	R	C	C	E
9	S	I	L	S	I	T	N	A	S	L	U	G	L	E	S	A	C	F	S	E	R	A	A	A	R
10	E	T	L	E	N	Y	S	E	T	N	R	G	H	E	L	T	S	H	V	D	P	L	L	O	R
11																									
12																									
13	WPE321387	1037	D	15	51	SESE1424	17	3	40	65		C	15							18	18			J WATTS	
14	WPE322285	1436	D	15	51	1424	17	4	56	56		C	12							42	42	CE		J GANT	
15	WPE321532	1037	D	15	51	NWSW1424	17	3	44	80		C	24							21	21			W M TRACER	
16	WPE324070	1037	D	15	51	1424	17	3	42	97		C	31							22	WH	22	WH	JAMES JONES	
17	WPE324174	1232	A	15	51	1424	17	4	37	75		C	31							36	WH	45		BIBLE BAPT	
18	WPE325469	1037	D	15	51	1424	17	3	45	50		C										43		C NIX	
19	WPE325144	1056	D	15	51	1424	17	4	61	170		C	25							6		15	44	O BURROUGH	
20	WPE326933	1271	D	15	51	1424	17	3	76	115		C	32							10	MR	40	50	C SIKES	
21	WPE328938	1056	D	15	51	1424	17	4	46	120		C	46							20		30		J S RUSSELL	
22	WPE337946	1696	D	15	51	1424	17	4	84	90		C	8							42		33		AYLOR, O	
23	WPE341890	1696	D	15	51	1424	17	4	66	105		C	15							42		21		RILEY, O	
24	WPE343113	1986	D	15	51	NESW1424	17	2																BRIITS, L	
25	WPC381396	1525	D	15	51	1424	17	4	46	60		C	16											DEVINCENT,	
26	WPC381696	2075	D	15	51	1424	17	4	45	140	36	R	16											HICKLE, JAM	
27	WPC381395	1525	D	15	51	1424	17	4	46	55		C	16											DEVINCENT,	
28	WPC388208	2075	D	15	51	1424	17	4	45	100		C	11											TIBERII, JO	
29	WPC400227	1841	D	15	51	1424	17	4	122	195		C	18											KYTE, RUTH	
30	WPC406248	2092	D	15	51	1424	17	2	37	44		C	20											ANGELSON, J	
31	WPC405421	1040	D	15	51	1424	17	4	98	135		C	21											TAYLOR, BET	
32	WPC407275	1056	D	15	51	SWNE1424	17	4	63	138		C	20											ALLSTATE HO	
33	WPE409345	2801	D	15	51	1424	17	4																VIRGILIO, V	
34	WPE311591	0244	M	15	51	1524	17	3	74	80		C								55	55			W DCES	
35	WPE312150	0106	D	15	51	1524	17	3	41	98		C	22							24				D L RENAND	
36	WPE312152	0106	L	15	51	SWNW1524	17	4	160	180		C	22							135				J W JOHNSON	
37	WPC353335	1151	D	15	51	1524	17	2	46	56		C												DIEHL, CLAR	
38	WPC352029	1151	D	15	51	1524	17	2	46	57		C	26											WELLS, GENE	
39	WPC352030	1151	D	15	51	1524	17	2	63	80		C	27											BARGH, BEN	
40	WPC355327	1841	D	15	51	1524	17	3	84	105		C	20											VAN NESS, L	
41	WPC357302	1525	D	15	51	1524	17	2	68	74		C	30											ROSS, THOM	
42	WPC360956	1525	A	15	51	1524	17	2	17	22		C	11											GILBERT, F	
43	WPE313716	0106	D	15	51	1524	17	3	40	50		C	8											J C BEAVU J	
44	WPE312931	0106	D	15	51	NWSW1524	17	3	61	95		C	20							39	40			D J EXUM	
45	WPE313343	0106	D	15	51	SWNW1524	17	4	61	110		C	50							58	58			J E SNYDER	
46	WPE312932	0106	D	15	51	SESE1524	17	3	81	115		C	22							36	36			C F EXUM	
47	WPE315556	0077	D	15	51	1524	17	4	59	110		C	16							76	76			K F FRANK	
																				54	54				

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D	P	D	B	L	D	D	D	S	S	S	S	D	C	T	D	C	T	1	C	D	C	U	O	
P	E	D	B	O	G	R	W	P	F	F	P	L	H	P	L	H	L	P	L	N				
U	R	I	U	S	N	T	I	A	E	O	A	L	L	L	C								M	
S	I	L	S	I	T	N	A	S	L	U	G	L	E	S	A	C	F	S					N	
E	T	L	E	N	Y	S	E	T	N	R	G	H	E	L	T	S	H	V	D	P	L	E	O	R
MPE335768	1841	D	15	51	212417	4	69	80	C	29			35	DB	5	40	DA	8	68	WH	69	WH	CHC	MYCKOFF, J
MPE336747	1841	D	15	51	212417	4	31	95	C	22			22	WH	6				28	WH	31	WH		FOLEY, F
MPE337621	1696	D	15	51	SVNM212417	4	63	95	C	25			35		16				85		51			MAHONEY, J
MPE337482	1696	D	15	51	SWSW212417	4	130	155	C	12									120		120			HANSON, J
MPE340074	1696	D	15	51	212417	4	42	110	C	25			21		10				31		42			JUSTICE, G
MPE341174	1036	D	15	51	212417	2																		DATRSFELD, B
MPE345001	1696	D	15	51	212417	4	60	100	C	21									51		60			HUPP, R
MPE345433	1040	D	15	51	212417	2	42	77	C															ABRAMS, A
MPE345591	1826	D	15	51	212417	2	***	CANCELLED	***															
MPE345484	1826	D	15	51	212417	2	42	50	C															SCALES, L
MPC381142	1841	B	15	51	212417	4	83	120	18	R	18													FOLEY, FRED
MPE381239	1841	V	15	51	L800212417	4	***	CANCELLED	***															
MPC399299	2800	D	15	51	212417	2	84	105	C															DOLCE, ANTO
MPC348451	1841	D	15	51	222417	4	104	125	C															LEWIS, BARB
MPC354734	1040	D	15	51	222417	2	42	73	C															PETERSON, J
MPC356273	1841	D	15	51	222417	4	146	190	C	28														HAYES, ELME
MPC355235	1533	D	15	51	222417	2	47	53	C	15														VUONO, JOHN
MPC362978	1525	A	15	51	222417	2	21	26	C	10														PEACOCK, JO
MPE310649	0232	D	15	51	222417	3	70	90	C															R FAST
MPE312976	0232	D	15	51	222417	3	31	85	C									999		999				R B KNAPP
MPE313726	0281	D	15	51	222417	3	81	92	C															WH SEGER
MPE313282	0214	D	15	51	222417	4	40	80	C	18								30		40				G P NOLEN
MPE315057	0254	D	15	51	222417	4	66	68	C	21								60		60				DONALD DEAN
MPE317392	0344	D	15	51	NESW222417	3	42	87	C									29		35				J P DESLIN
MPE317393	0344	D	15	51	NWSW222417	3	81	100	C									999		999				R PATTEESON
MPE317486	0344	D	15	51	NWSW222417	3	81	84	C									81		81				J BONNER
MPE317120	0214	D	15	51	NWSW222417	3	81	57	C									35		35				B MOLAN
MPE319044	0344	D	15	51	222417	3	52	74	C	23								27		27				C LITTLE
MPE318330	0334	D	15	51	222417	3	51	82	C	30								32		32				A MULLINS
MPE317921	0344	D	15	51	222417	3	51	87	C									32		32				R P COFFIN
MPE318331	0344	D	15	51	222417	3	81	78	C									34		34				M LEDUC
MPE318267	0344	D	15	51	222417	3	81	79	C									31		31				R M CONKERY
MPE318552	0344	D	15	51	222417	3	81	100	C									31		31				M MILLER
MPE318049	0344	D	15	51	222417	3	51	87	C	22								32		32				L L SIZEMOR
MPE319321	0344	D	15	51	222417	4	52	52	C	24								31		31				J FISH

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5	D	P			L	D	D		S	S	S	S	D	C	I	D	C	T	I	C	D	C	U	
6	P	E	D	B	O		G	R	W	P		E	E	P	L	H	P	L	H	L	P	L	N	
7		R	R	A	C	C	O	C	W	R	B	I	E	L	L	C				C	I			
8	W	M	I	U	S	N	T	I	A	E	O	A	L	L	L	C	S	C	C	C	C	C		
9	S	I	L	S	I	T	N	A	S	L	U	G	L	E	S	A	C	Z	L	L	L	L		
10	E	T	L	E	N	Y	S	E	T	N	R	G	H	E	L	T	S	H	V	D	P	L	E	
11																								
12																								
13	WPE328570	1050	D	15	51	222417	3	52	70	C	20	MS	MA	30	22				40	WH	52	WH	D H SMITH	
14	WPE328406	1050	D	15	51	222417	3	50	61	C	15	MS	MA	20	WH	20	40	ME	10	50	WH	52	WH	J COOMBES
15	WPE329852	1050	D	15	51	222417	3	41	60	C	20	MS	MA	20	WH	5				25	WH	25	WH	J LUMPKIN
16	WPE331811	1533	D	15	51	222417	4	21	40	C	12	MS		18	2				20		20			GIANAKAS
17	WPE334138	1040	D	15	51	222417	4	100	155	C	18	MS		21	WH	29	50	MR	24	100		100		RICHARDSON
18	WPC344395	1533	D	15	51	222417	4	71	84	C	16													GIDCOHB, D.
19	WPC345196	1533	D	15	51	222417	4	21	31	C	15													SANDERSON,
20	WPC381365	1533	D	15	51	222417	4	68	86	C	11													GORDEN, RUS
21	WPC388552	2207	D	15	51	222417	2	42	65	C	20													BETTY, TERR
22	WPC408221	1036	D	15	51	222417	2	57	66	C	11													MITCHELL, B
23	WPE308989	0072	D	15	51	232417	4	61	112	C	12								61		85			
24	WPE312338	0086	D	15	51	232417	3	40	98	C									36					J C FARMER
25	WPE312468	0006	D	15	51	232417	4	60	113	R	18								24					R A LONG
26	WPC349301	1904	D	15	51	232417	2		75	C	31													HOUSE, HARR
27	WPC351067	1094	D	15	51	232417	2	139	302	R	16													STANLEY, BI
28	WPC351371	1904	D	15	51	232417	2		110	C	28													WRIGHT, WAY
29	WPC355099	1533	D	15	51	232417	2	46	49	C	23													CASSER, KEN
30	WPC361535	1904	D	15	51	232417	2	50	55	C	25													HENDERSON,
31	WPN361571	1587	D	15	51	232417	2	***	CANCELLED	***														
32	WPC362645	2100	D	15	51	232417	4	40	50	C	29													WOOLINES, T
33	WPN363463	1587	D	15	51	232417	4	***	CANCELLED	***														
34	WPC368152	1841	D	15	51	232417	4	44	102	C	29													DRANKWALTER
35	WPC369677	2100	D	15	51	232417	2	40	45	C	22													KEMMIS, TIM
36	WPC369678	2100	D	15	51	232417	2		80	C	25													BAUER, GENE
37	WPC372217	2092	D	15	51	232417	4		114	C	30													ACHTERFOF,
38	WPC378212	1056	D	16	51	232417	4	70	130	C	15													SPARKS, DAV
39	WPC380674	2035	D	15	51	232417	4	94	145	C	12													WOODS, BILL
40	WPE310354	0072	D	15	51	232417	4	31	51	C									31					E POTTER
41	WPE312598	0006	D	15	51	232417	4	94	133	R	26								56		56			R HARRIS
42	WPE313579	0254	D	15	51	232417	3	61	97	J	18								58					M J EDWARDS
43	WPE315245	0435	D	15	51	232417	4	205	210	C	22								999		999			WILEY KING
44	WPE315290	0086	D	15	51	232417	3	40	74	C	20								32		32			OHELAHI
45	WPE315971	0043	D	15	51	232417	4	90	90	C	25								35		35			W HOPPER
46	WPE314619	0086	D	15	51	232417	3	60	112	C	46								57		57			D D CANALE
47	WPE317431	0002	D	15	51	232417	4	31	85	C	16								30		30			C FREEMAN

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[illegible]

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D	P			L		D	D	D	S	S	S	D	C	T	D	C	T	I	C	D	C	U
P	F			O		G	R	W	P		L	E	P	L	H	P	L	H	L	P	L	N
	R	R	A	C		C	D	C	W	R	B	I	E	L		D	D	1	1	1	2	2
U	M	I	U	S	N	T	I	A	E	O	A	L	L	L	C	S	C	C	C	C	C	C
S	I	L	S	I	T	N	A	S	L	U	G	L	E	S	A	C	F	S	Z	L	L	L
E	T	L	E	N	Y	S	E	T	N	R	G	M	E	L	T	S	M	V	D	P	L	E

WPC356241	2100	A	15	51	342417	2		26		C	12	
WPC360442	1525	A	15	51	342417	2	12	19		C	12	
WPC362168	1040	A	15	27	LT09342417	3	63	85		C	30	
WPC372554	1525	A	15	51	342417	2	32	33		C	15	
WPE317073	0190	D	15	51	342417	3	34	50		C	6	
WPE327970	1533	D	15	51	342417	4	40	60		C	12	
WPE335087	1121	D	15	51	342417	3	29	45		C	18	
WPC394570	1040	D	15	51	342417	4	98	98		C		
WPE394715	1040	D	15	51	342417	2						
WPC407407	2837	A	15	51	342417	2	22	30		C	21	G
WPE409435	1040	D	15	51	342417	4						
WPH314129	0086	D	15	51	352417	3	30	91		C	17	
WPE304355	0000	L	15	51	NE362417	4						
WPE304352	0000	L	15	51	NE362417	4						
WPE304351	0000	L	15	51	362417	4						
WPE304353	0000	L	15	51	NE362417	4						
WPE304358	0000	A	15	51	NE362417	6						
WPE304357	0000	L	15	51	NE362417	4						
WPE304356	0000	L	15	51	NE362417	4						
WPE304354	0000	L	15	51	NE362417	4						
WPE304359	0000	L	15	51	NE362417	6						
WPC349017	1696	A	15	51	362417	4	73	100		C	6	
WPC354758	1436	D	15	27	362417	4	53	125		C		
WPC358678	2071	D	15	51	362417	4	105	130		C	31	
WPC360518	1841	D	15	51	LT18362417	4	52	90		C	16	
WPC366128	1056	D	15	51	SWNW362417	4	60	130		C	22	
WPE303219	0000	L	15	51	NE362417	4						
WPE303211	0000	L	15	51	NE362417	6						
WPE303218	0000	L	15	51	NE362417	4						
WPE303214	0000	L	15	51	NE362417	4						
WPE303215	0000	L	15	51	NE362417	4						
WPE303217	0000	L	15	51	NE362417	4						
WPE303216	0000	L	15	51	NE362417	4						
WPH303212	0000	V	15	51	NE362417	6						
WPE303213	0000	L	15	51	362417	4						

MS	MY	31	MA	7		34						
MS		16		4	20	5	20	29	38	WH	38	WH

CARINI, ALB
ALFIERI, TH
COOPER, ROY
SWANSON
G CONSTANTI
B ARTER
FINIANI D
THOMAS DONA
MOBLEY, HUG
LARELL, LEO
THOMAS, DON
F SCARBOROUGH

NEWBORN GRO
SPANGLER, P
ZINK, JIM
CAVONIS, D.
SINGLETON,

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D	P	D	B	L	D	D	G	D	S	S	S	S	D	C	T	D	C	T	I	C	D	C	U
P	R	R	A	C	O	C	W	R	B	I	E	L	P	L	H	P	L	H	L	L	P	L	N
U	M	I	U	S	T	I	A	E	O	A	L	L	C	C	C	C	C	C	A	C	R	R	F
S	I	L	S	I	N	A	S	L	U	G	L	E	S	A	C	F	S	Z	L	L	L	L	L
E	T	L	E	N	Y	SETNRG	M	L	L	T	S	M	V	D	P	L	E	G	E	R	A	A	A
MPE324842	1346	D	15	51	172418	3	63	90		C	34		MC LB	40 LB	20			60		60			L W PETERS
MPE338684	1696	D	15	51	172418	4	50	90		C	25		MS	21	21			42		42			BROOKS, P
MPC381361	2092	D	15	51	172418	4	63	81		C	32												THOMAS, ART
MPC384458	1525	A	15	51	105172418	4	84	86		C	43												DETERLINE,
MPC386494	1056	D	15	51	172418	4	51	100		C	22												TALONE, GEN
MPC389141	1841	D	15	51	172418	4	63	130		C	45												HOCH, ALFRE
MPC391859	2092	D	15	51	172418	4	42	60		C	26												JOLLY, WILL
MPE392086	1533	D	15	51	172418	2																	BARNETT, EV
MPE403473	1533	D	15	51	172418	4																	CLARK, K
MPC405094	2451	A	15	51	172418	4	63	93		C	35												PRONTO, BIL
MPC407078	2364	D	15	51	172418	4	84	110		C	37												WILLIAMS, D
MPC305295	1056	D	15	51	182418	3	52	95		C	35							45		45			NOFTHEN, RO
MPE308635	0483	D	15	51	182418	3	42	62		C	33							42		42			P JEFFERSON
MPE309081	0086	D	15	51	182418	3	50	111		C								46		46			C GILLEY
MPE311757	0086	D	15	51	182418	3	42	80		C	19							38		38			A J LAMPEL
MPE311305	0086	D	15	51	182418	3	40	80		C								35		35			M LINDSAY
MPE311128	0086	D	15	51	182418	3	125	130		C	18							125		125			C W GARTON
MPE312186	0086	D	15	51	182418	3	40	92		C								38					RAMSEY
MPE312237	0086	D	15	51	182418	3	50	98										47		47			B ONEAL
MPE311100	0086	D	15	51	182418	3	125	145		C	33							125		125			T CANNELLA
MPE311734	0086	D	15	51	182418	3	68	100		C								60		60			DAVID SAYLO
WPN348262	1056	D	15	51	182418	4	***	CANCELLED	***														
WPN349580	1040	D	15	51	182418	4	***	CANCELLED	***														
WPN353529	1696	D	15	51	182418	4	***	CANCELLED	***														
MPC369866	2160	D	15	51	182418	4	110	130		C	42												ROYCE, KEVI
MPC372311	2132	D	15	51	182418	4	63	110		C	38												AIRAL
MPC375524	1056	D	15	51	182418	4	55	120		C													PETTY, PAUL
MPE306547	0119	D	15	27	182418	3	100	145		C	27							100		115			R L AYRES
MPE306634	0072	D	15	51	182418	3	81	97		C	28							61		61			D RANKS
MPE306927	0072	D	15	51	182418	3	41	88		C	27							41		41			R BRADY
MPE306549	0072	D	15	51	182418	3	91	110		C	25							51		51			D W STEINRU
MPE307157	0072	D	15	51	182418	3	61	110		C	32							61		61			D CARTER
MPE306844	0086	D	15	51	182418	3	50	102		C	30							48		48			J P HILLIER
MPC305656	1436	D	15	51	182418	3	53	83		C	25							42		52			WHITE, EARL
MPE310913	0086	D	15	51	182418	4	52	140		C	24							40					R WADDELL

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D	P	R	D	B	A	C	L	O	D	D	G	H	S	S	S	S	D	C	T	D	C	T	I	C	D	C	U			
P	R	R	A	C	C	D	C	W	R	B	I	E	L	V	P	L	E	F	L	H	P	L	H	C	L	P	L	N		
U	M	I	U	S	N	T	I	A	E	O	A	L	L	C	S	C	C	C	C	C	C	C	A	C	R	R	F			
S	I	L	S	I	T	M	A	S	L	U	G	L	E	S	A	C	F	S	L	L	L	L	L	R	R	C	C	E		
E	T	L	E	N	Y	SETNRG	M	E	L	T	S	M	V	D	P	L	E	O	E	R	A	A	A	A	A	B	B	K	K	A
MPE310967	0086	D	15	51	182418	3	70	103	C	21														50	60		J DONOVON			
MPE310808	0373	D	15	51	182418	3	60	90		15														40	60		R HALL			
MPE314511	0086	D	15	51	182418	3	40	105	C	20														36	36		R CASTLEBER			
MPE317315	0086	D	15	51	182418	3	110	164	C	24														101	101		T THOMAS			
MPE317265	0086	D	15	51	182418	3	90	142	C	20														87	87		A BRANNEN			
MPE319349	0305	D	15	51	182418	3	84	105	J	32														84	84		E KRAFT			
MPE318460	0086	D	15	51	182418	3	60	128	C	30														58	58		J RAINES			
MPE319936	0072	D	15	51	182418	3	71	125	C	32														71	81		R STRINRICK			
MPE320837	1037	D	15	51	182418	3	40	65	C	31														33	33		SHADY H B C			
MPE324570	1050	D	15	51	182418	3	42	55	C	35				MS	MA	17	MY	18						35	WH	35	WH	G LEATHERS		
MPE324398	1436	D	15	51	182418	3	42	90	C	21				MS		28	WH	4						32	WH	32	WH	T MCDANIELS		
MPE324313	1050	D	15	51	182418	3	73	86	C					MS	MA	42	MY	21						63	CR	63	CR	T THOMPSON		
MPE323971	1121	D	15	51	182418	3	74	95	C	28														32	74		S F KENNEDY			
MPE326072	1050	D	15	51	182418	3	63	82	C	38				MS	MA	21	MY	27						48	WH	48	WH	A N WELLS		
MPE324972	1121	D	15	51	182418	3	47	65	C	14														40	47		HARRY RIEGE			
MPE326213	1121	D	15	51	182418	3	87	87	C																82			M HOWARD		
MPE326071	1050	D	15	51	182418	3	41	60	C	25				MS	MA	32	CR	10						42	42		S SORIA			
MPE327113	1050	D	15	51	182418	3	63	80	C	43				MS	MB	18	MY	18	36	WH	18			36	WH	54	WH	VASILOWSKI		
MPE329132	1050	D	15	51	182418	3	42	66	C	31				MS	MY	20	ME	10						30	WH	30	WH	L E AASENG		
MPE342700	1699	D	15	51	182418	4																						GILLETTE, B		
MPE343137	1841	D	15	51	182418	4	41	85	C	39				MS		27	MA	10						41	41		TRUNDLE, F			
MPE390858	2074	D	15	51	182418	4																						BLAZEVIE, A		
MPC390660	2169	D	15	51	182418	4	122	122	C	37																		FERANDES, M		
MPC390451	1056	D	15	51	182418	4		130	C	31																		HRUSKA, MAR		
MPC392973	1056	D	15	51	182418	4	63	140	C	36																		JOHNSON, RI		
MPC391718	2263	D	15	51	182418	4	84	115	C																			CHANDLER, D		
MPC391717	2263	D	15	51	182418	4	84	120	C																			CHANDLER, D		
MPC396807	1841	D	15	51	182418	4	95	140	C	27																		LAPSEN, RON		
MPC397353	2092	D	15	51	182418	4	58	70	C	28																		NEASE, MARY		
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MPC407082	2501	D	15	51	182418	2	104	120	C	37																		HOUSE, DUAN		
MPE405619	1533	D	15	51	182418	4																						HELTON, MAD		
MPE411678	1056	D	15	51	182418	4																						GREER, JOSE		
MPC411779	1533	D	15	51	182418	4	105	125	C	39																		KLINE, D		
MPC305611	1232	D	15	51	182418	3	40	86	C	33														31	31			CARTER, ROY		

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6	P	E	O	B	L	D	D	R	S	S	D	C	T	D	C	T	I	C	D	C	U		
7	R	R	A	C	C	D	C	W	R	B	I	E	L	D	D	I	I	1	2	2	2		
8	U	M	I	U	S	N	T	I	A	E	O	A	L	L	C	S	C	C	C	C	C		
9	S	I	L	S	I	T	N	A	S	E	U	G	L	E	S	A	C	F	S	Z	L		
10	E	T	L	E	N	Y	SETNR6	M	E	L	T	S	M	V	D	P	L	E	O	A	R		
11																							
12																							
13	WPE308439	0086	D	15	51	192418	3	60	111			C								58	58	HELEN MADDO	
14	WPE307971	0086	D	15	51	NWSW192418	3	43	102			C	44							32	32	E W PAYCER	
15	WPE308550	0086	D	15	51	192418	3	50	110			C	18							46	46	L C HOUSELL	
16	WPE308008	0119	D	15	51	192418	3	60	85			C	33							38	38	L E RYALS	
17	WPE307902	0086	D	15	51	SESW192418	3	100	147			C	30							43	43	A L STEWART	
18	WPE308438	0086	D	15	51	192418	4	64	121			C								42			
19	WPE309080	0086	D	15	51	192418	3	50	100			C								47	47	P C WITT	
20	WPE311606	0119	D	15	51	192418	3	72	90			C	25							45	68	W CHILES	
21	WPE311605	0119	D	15	51	192418	3	61	80			C	18							38	38	C SIBICKLAN	
22	WPE311607	0119	D	15	51	192418	3	24	65			C	18							15	15	H L VANCE	
23	WPC350731	1696	D	15	51	192418	4	105	150			C	45									HAYES, WILL	
24	WPC353630	1696	D	15	51	192418	4	71	110			C	40									ROACH, TIM	
25	WPC354835	1533	D	15	51	192418	4	63	90			C	45									SPAULDING,	
26	WPN355305	1587	A	15	51	192418	4	***	CANCELLED	***													
27	WPC359063	1699	D	15	51	192418	4	79	110			C	46									DRAIN, JOHN	
28	WPC362955	1056	D	15	51	SWNW192418	4	50	125			C	55									HINKLE, CHA	
29	WPC365840	2177	D	15	51	L611192418	2	88	91			C										ALLEN, ROBE	
30	WPC367750	2159	D	15	51	192418	4	67	100			C	51									WAHLE, WARR	
31	WPC369860	1817	D	15	51	SESW192418	4	80	126			C										COLSTON, BR	
32	WPC376431	1525	A	15	51	192418	4	139	450			C	30									TESTA, ANTH	
33	WPE379193	2177	D	15	51	LT-A192418	2															KELLEHAN, S	
34	WPE307440	0106	D	15	51	192418	3	71	96			C								55	71	E K CHANDE	
35	WPC305845	1436	D	15	51	NWSW192418	3	51	88			C	40							40	40	GIVEN, RUTH	
36	WPE307439	0106	D	15	51	192418	3	48	86			C								28	41	W G CHANDE	
37	WPE310342	0119	D	15	51	192418	4	49	96			C	17							35		D WOODRUFF	
38	WPH313262	0106	D	15	51	192418	3	60	85			C	10							58	58	J C BEAVER	
39	WPE313580	0254	D	15	51	NWNE192418	4	51	72			J	39								39		L DAVIS
40	WPE312729	0106	D	15	51	192418	3	81	105			C	25							39	73	J D ALDERMA	
41	WPE314786	0605	D	15	51	192418	3	53	87			C	31							50	50	E REMON	
42	WPE314688	0086	D	15	51	192418	4	120	167			C	39							114	114	J POST	
43	WPE314920	0086	D	15	51	192418	6	40	91			C	16							33	33	T HENDERSON	
44	WPE316685	0305	D	15	51	192418	3	42	85			J	33							42	42	W HOSEY	
45	WPE316530	0086	D	15	51	192418	4	50	102			C	34							44	44	E USHERWOOD	
46	WPE318117	0305	D	15	51	192418	3	60	90			J	39							60	60	D LONES	
47	WPE318118	0305	D	15	51	192418	3	49	90			J	39							49	49	W DESNINO	

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D	P	D	U	L	D	D	D	S	S	S	S	D	C	T	D	C	T	I	C	U	C	U
P	E	R	R	A	C	C	D	C	W	R	B	I	E	L	C	D	1	1	1	2	2	2
U	M	I	U	S	N	T	I	A	E	O	A	L	L	L	C	S	C	C	C	C	A	C
S	I	L	S	I	T	N	A	S	L	U	G	L	E	S	A	C	F	S	Z	L	L	L
E	T	L	E	N	Y	SETNRG	H	E	L	T	S	M	V	D	P	L	L	O	E	R	A	A
WPE318435	0228	D	15	51	192418	4	100	120												100	100	P E WHISLER
WPE320321	0086	D	15	51	192418	3	41	110												40	40	J L HUGHES
WPE322693	1050	D	15	51	NESE	192418	4	72	72											61	61	E MYERS
WPE326963	1050	D	15	9	192418	3	42	50												18	18	M HOULE
WPE328555	1050	D	15	51	192418	3	60	80												20	60	WH 60 WH
WPE330661	1388	D	15	51	192418	4	133	200												90	MY 11 114	MY 6 101
WPE334240	1696	D	15	51	192418	4	49	105												49	49	VERLIN E
WPE334283	1056	D	15	51	192418	4	61	115												5	NR 18 45	NR 10 23
WPE336498	1016	A	15	51	192418	4	100	180												40	MA 80	120 150
WPE337484	1696	D	19	51	SENE	192418	4	63	105											35	28	55 63
WPE338354	1498	D	15	51	192418	4	66	95												35	MA 31	56 56
WPE340346	1056	D	15	51	192418	4	107	170												35	20 70	30 100
WPC384752	1056	D	15	51	SWNE	192418	4	102	145													107 WH
WPC387451	1056	D	15	51	SENE	192418	4	44	115													
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WPN395652	0012	D	15	9	192418	3	***	CANCELLED	***													
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WPE304344	0000	I	15	51	202418	4																
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WPE311069	0086	D	15	51	202418	3	40	107												32	40	F R FXURN
WPE346756	1699	D	15	29	202418	4	2222	2222												222	222 222	222 222
WPC358702	2103	D	15	51	ILTA	202418	4	42	130													
WPC364911	2177	D	15	51	LT-A20	202418	2	53	58													
WPC366961	2177	D	15	51	SWNW	202418	2	50	62													
WPC365446	2177	D	15	51	202418	2	66	74														
WPC365447	2177	D	15	51	202418	2	45	45														
WPC368715	1151	D	15	51	202418	2	58	86														
WPC368362	2071	D	15	51	202418	4	84	171														
WPE370216	2177	D	15	51	202418	2																
WPC370031	2177	D	15	51	202418	4	52	61														
WPC369550	2177	D	15	51	202418	2	52	65														

ROACH, DORO

COUGH, GEO

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D	P		L	D	D	G	R	S	S	S	D	C	T	D	C	T	C	D	C	U						
P	E	D	B	O	D			W	P	E	E	P	L	H	P	L	H	I	L	P	L	N	O			
R	R	A	C	C	D	C	W	B	I	E	L	L	C	D	D	I	I	1	2	2	C	1	W			
U	M	I	U	S	N	T	A	E	O	A	L	L	C	S	C	C	C	C	C	A	C	R	R	F	N	
S	I	L	S	I	T	M	A	S	L	U	G	L	E	S	A	C	F	S	L	L	L	L	L	L	E	E
E	T	L	E	N	Y	SETNR6	M	E	L	T	S	H	V	D	P	L	E	O	R	A	A	A	A	A	A	R

13	MP	348628	1841 D 15 27	272418 4		120		C																		CARVEL HOME
14	MP	352436	1696 A 15 51	272418 4	70	100		C	15																	BLACK, G.
15	MP	360727	1056 D 13 29	WENE272418 4	147	170		C	15																	ALLSTATE HO
16	MP	373110	1056 D 13 51	WENE272418 4	50	115		C	13																	PHODES, ALB
17	MP	374295	1436 D 15 51	272418 2	73	88		C	5																	BEN MERCHER
18	MP	374296	1436 D 15 51	272418 4	82	115		C	5																	MERCHER, BE
19	MP	376802	1974 D 15 51	272418 4	60	120		R	6																	HUNTER, WYN
20	MPH	303230	0000 V 15 51	272418 4																						
21	MPE	313333	0276 D 13 51	SEMW272418 3	79	104		C	9								74	74								R H STEWART
22	MPE	312731	0106 D 15 51	WENE272418 3	101	125		C	15								30	101								WM L WAGNER
23	MPE	320949	0086 D 15 51	272418 3	50	100		C									46	46								O ROESBERRY
24	MPE	325536	1587 D 15 51	272418 4	84	142		C										50								J MONROE
25	MPH	343511	1094 D 15 51	272418 2	131	182		R	2																	HINOTE, J L
26	MP	385170	1056 D 15 51	WNE272418 4	62	135		C	9																	REEDY, BARB
27	MPE	384355	1436 D 15 51	272418 3																						WILLIAMS, G
28	MP	385609	1056 D 15 51	SWNE272418 4	52	140		C	5																	QUALITY CON
29	MP	392743	1905 D 15 51	272418 4	84	130		C	20																	CADRECHA, B
30	MP	397512	2074 D 15 51	272418 4																						HOPPER, RAY
31	MP	336570	1056 D 15 51	282418 4	70	128		C	36	MS	27 MR	40					67 WH	67 WH								ALLSTATE HM
32	MP	383307	1436 D 15 51	282418 3																						MERCER, BEN
33	MP	404647	1024 D 15 51	282418 4	115	203		C	10																	THOMAS, MIL
34	MP	409098	1024 D 15 51	282418 4																						THOMAS, MIL
35	MP	313031	0192 D 15 51	292418 3	91	115		C	28								70									BEN LEON
36	MP	335735	1056 D 15 51	292418 3	42	90		C	37	MS	12 MR	13					25	25								P KIDWELL
37	MP	308067	0065 D 15 51	302418 3	40	137		C	36								37	37								D E LAHOTTE
38	MP	308154	0065 D 15 51	SWNW302418 3	90	95		C	30								80	80								C A HINES
39	MP	308094	0065 D 15 51	302418 3	40	113		C	34								37	52								C B CRONAN
40	MP	359346	0000 D 15 51	302418 2																						HEAVILIAN,
41	MP	358711	0000 D 15 51	302418 2																						FELICIANO,
42	MP	377911	1525 D 15 51	302418 2	140	143		C	35																	FIRST WESLE
43	MP	307105	0065 D 15 51	SWSW302418 4	102	160		C	52								91									
44	MP	307106	0065 D 15 51	SWNE302418 4	63	160		C	22								49									
45	MP	314989	0086 D 15 51	302418 4	50	136		C	26								41	41								R L VELEZ
46	MP	331262	1328 D 15 51	302418 3	63	85		D	18	MS	MY	14 MY	22				27	36 WH								S STOKES
47	MP	310911	0065 D 15 51	NESE312418 4	50	147		C	12								45	60								FUGAP COLLI

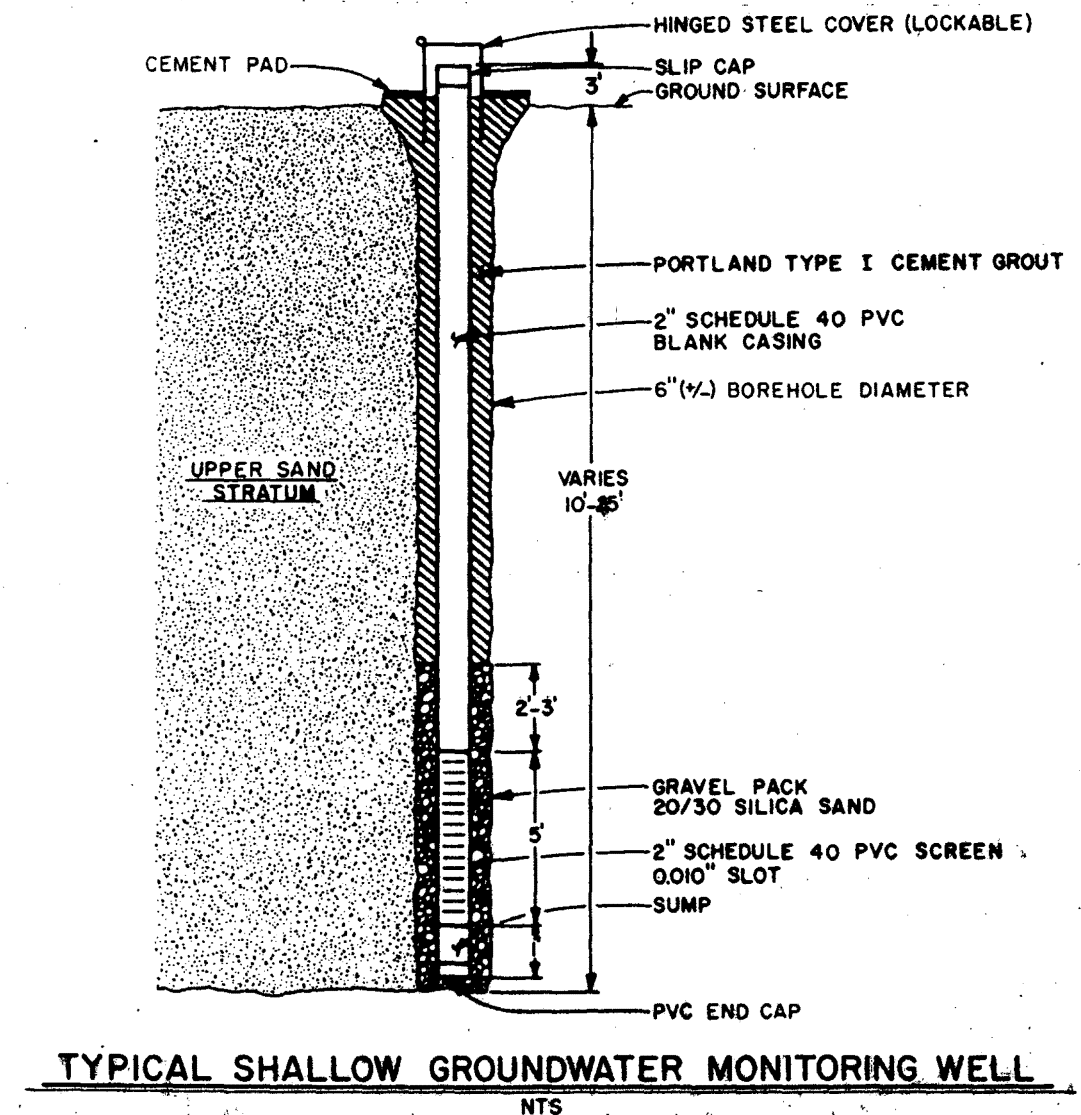
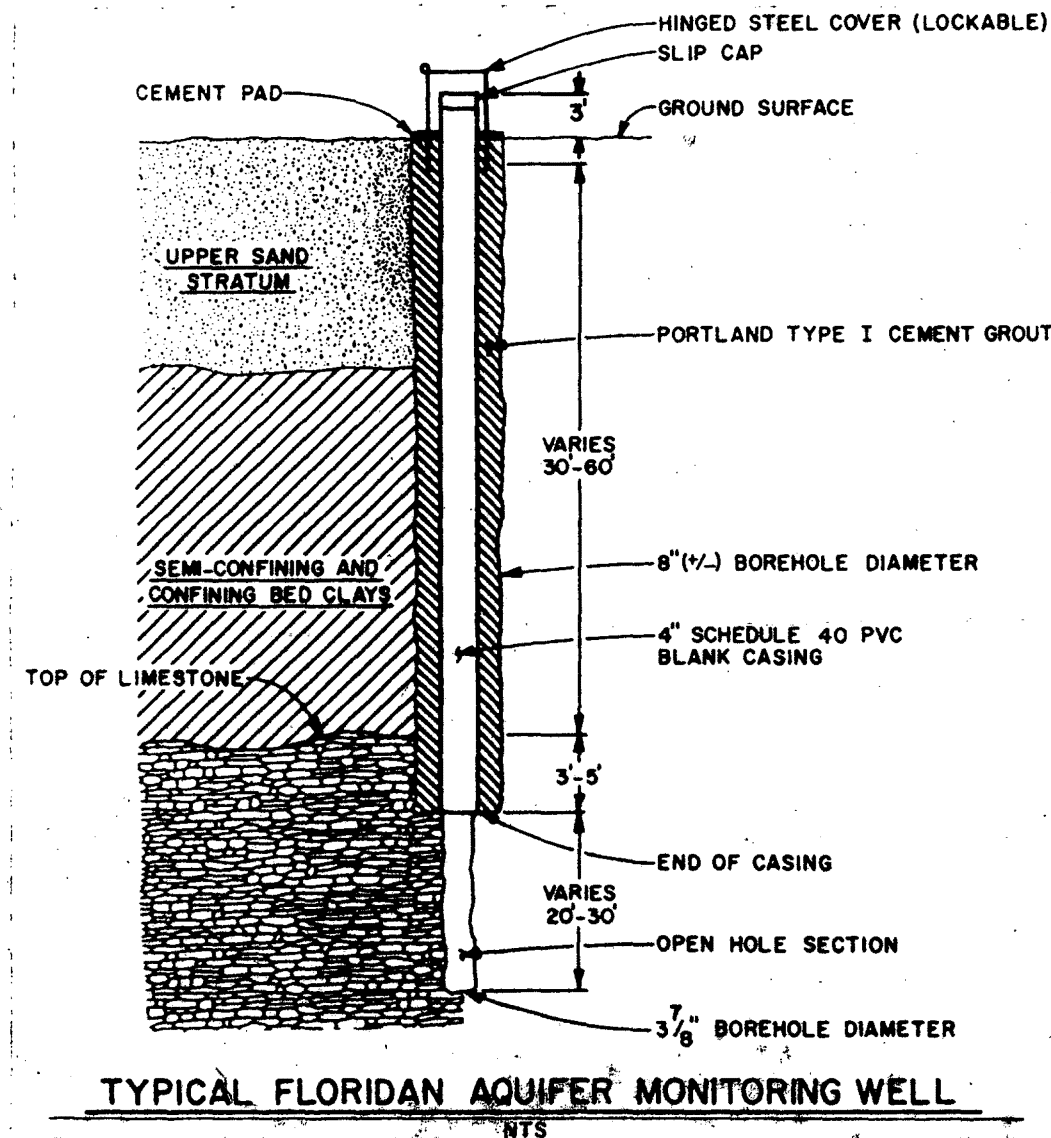
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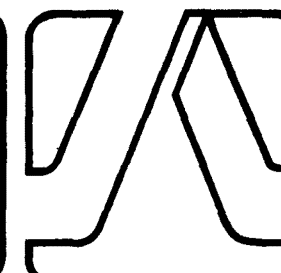
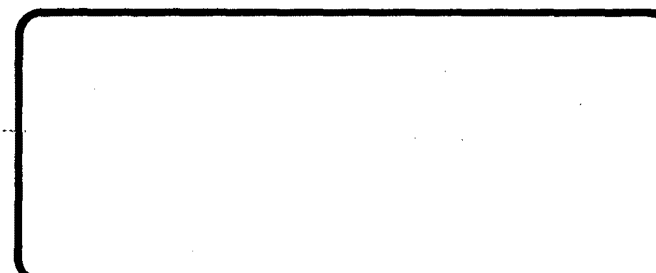
APPENDIX E

PROPOSED GROUNDWATER MONITORING WELL DETAILS (PLATE 1)
EXISTING GROUNDWATER MONITORING WELL DETAILS (PLATE 2-5)



PROPOSED GROUNDWATER WELL DETAILS

DRAWN:	KFB
CHKD:	KFB
APPVD:	RAM
SCALE:	



GEOTECHNICAL / HYDROGEOLOGIC STUDY		
PROPOSED PASCO COUNTY LANDFILL -		
HAYS ROAD SITE		
PASCO COUNTY, FLORIDA		
JAMMAL & ASSOCIATES, INC. Consulting Engineers		
DATE: DEC. 86	PROJ. NO. 85-30267	PLATE 1

4MWI

Diagram illustrating the wellbore construction and geological profile:

- HINGED STEEL COVER (LOCKABLE)
- SLIP CAP
- CEMENT PAD
- GROUND SURFACE
- 3'
- UPPER SAND STRATUM
- PORTLAND TYPE I CEMENT GROUT
- 25'
- 8" (+/-) BOREHOLE DIAMETER
- 4" SCHEDULE 40 PVC BLANK CASING
- END OF CASING
- 25'
- OPEN HOLE SECTION
- 3 7/8" BOREHOLE DIAMETER
- SEMI-CONFINING AND CONFINING BED CLAYS
- TOP OF LIMESTONE DEPTH 14.5'
- LIMESTONE

A detailed cross-sectional diagram of a well casing and screen assembly, labeled '2MW1' at the top. The diagram shows a vertical assembly within a borehole. At the top, a 'HINGED STEEL COVER (LOCKABLE)' is shown with a 'SLIP CAP' below it. The 'GROUND SURFACE' is indicated by a horizontal line. A 'CEMENT PAD' is shown at the top of the casing. The casing is labeled '2" SCHEDULE 40 PVC BLANK CASING' and has a '6" (1/2") BOREHOLE DIAMETER'. The casing is surrounded by 'PORTLAND TYPE I CEMENT GROUT'. A dimension of '3'' is shown for the distance from the ground surface to the top of the casing. The casing extends down to a 'PVC END CAP' at the bottom. A '0.5' BENTONITE PELLETS' section is shown above a 'GRAVEL PACK 20/30 SILICA SAND' section. The gravel pack is surrounded by a '2" SCHEDULE 40 PVC SCREEN 0.010" SLOT'. A dimension of '5'' is shown for the height of the gravel pack. Below the gravel pack is a '0.5' SUMP'. The entire assembly is located within an 'UPPER SAND STRATUM'. A dimension of '10'' is shown for the total depth of the casing from the ground surface to the bottom of the sump.

2MW1

HINGED STEEL COVER (LOCKABLE)

SLIP CAP

GROUND SURFACE

CEMENT PAD

3'

PORTLAND TYPE I CEMENT GROUT

2" SCHEDULE 40 PVC BLANK CASING

6" (1/2") BOREHOLE DIAMETER

UPPER SAND STRATUM

10'

0.5' BENTONITE PELLETS

GRAVEL PACK 20/30 SILICA SAND

5'

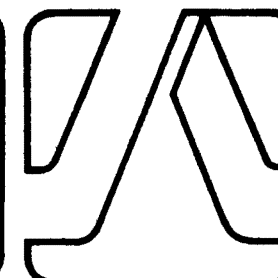
2" SCHEDULE 40 PVC SCREEN 0.010" SLOT

0.5' SUMP

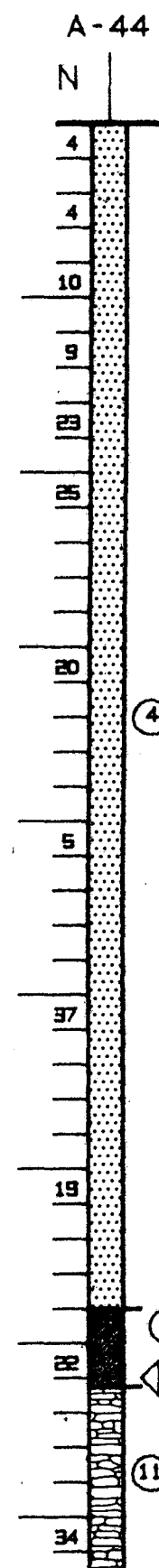
PVC END CAP

SHALLOW GROUNDWATER MONITORING WELL

DRAWN:	KFB
CHKD:	KFB
APPVD:	RAM
SCALE:	
NOTED	



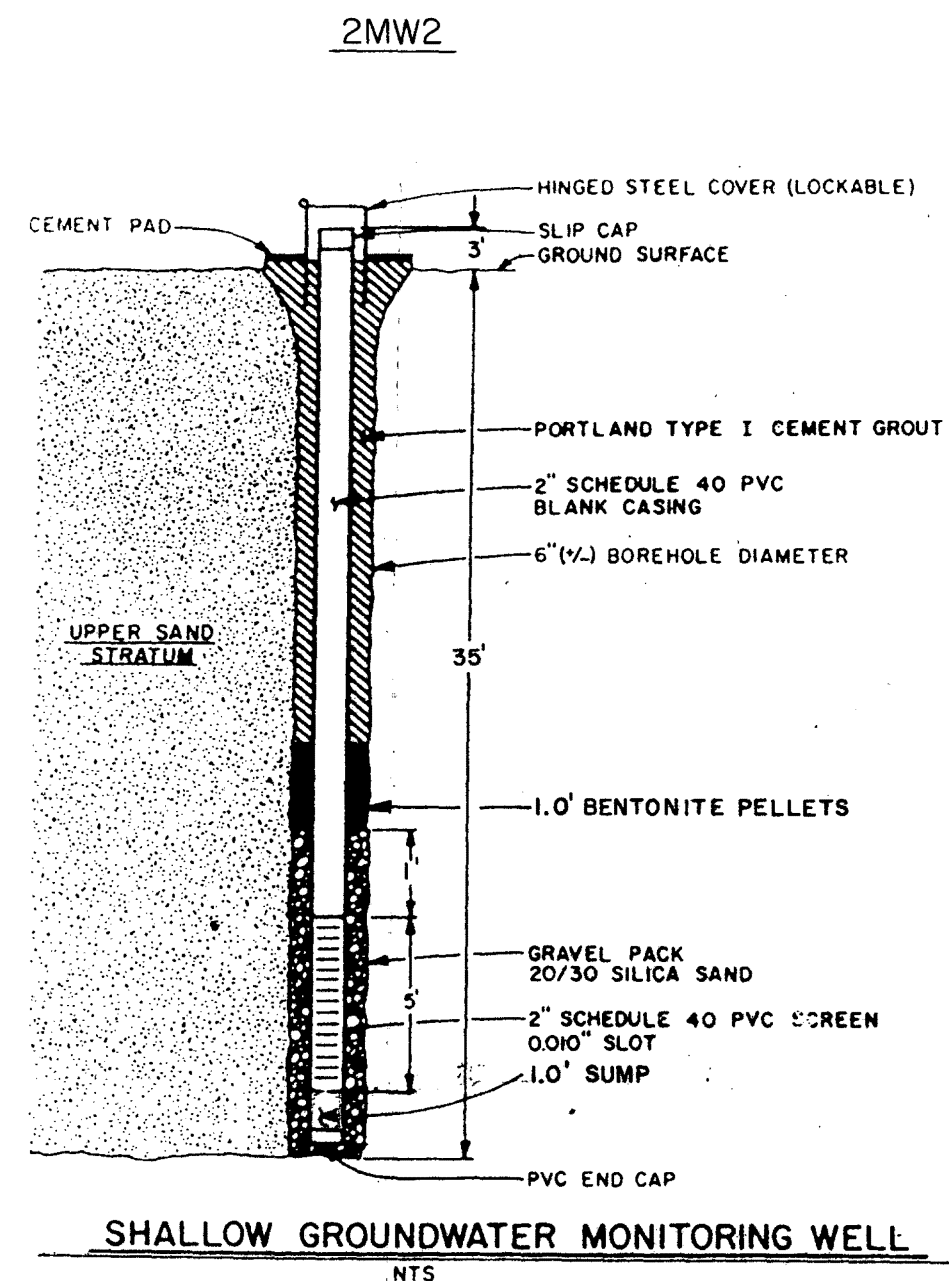
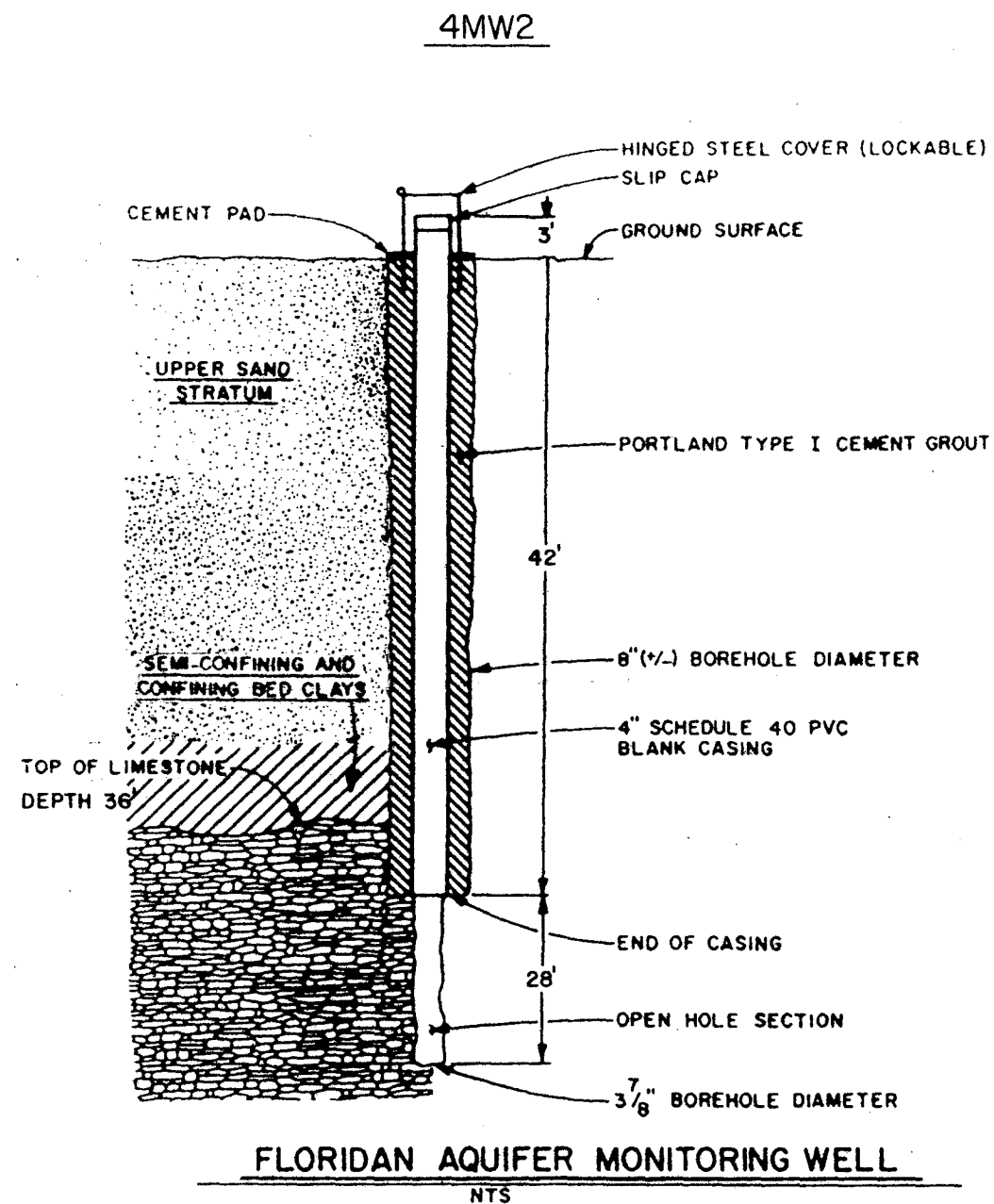
DATE DEC. 86	PROJ NO. 85-30267	PLATE 2
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VERTICAL SCALE: 1"=5'

NOTE: For Soil Legend See Report

DRAWN:	KFB
CHKD:	KFB
APPVD:	RAM
SCALE:	NOTED



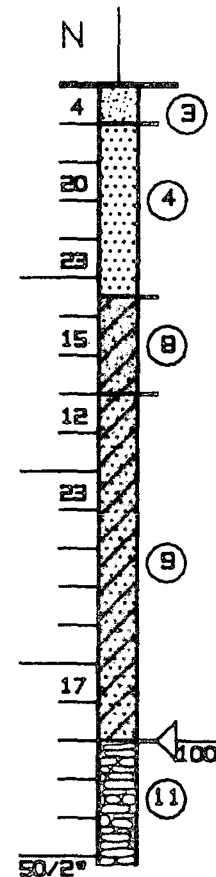
EXISTING GROUNDWATER WELL DETAILS

GEOTECHNICAL / HYDROGEOLOGIC STUDY
PROPOSED PASCO COUNTY LANDFILL -
HAYS ROAD SITE
PASCO COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

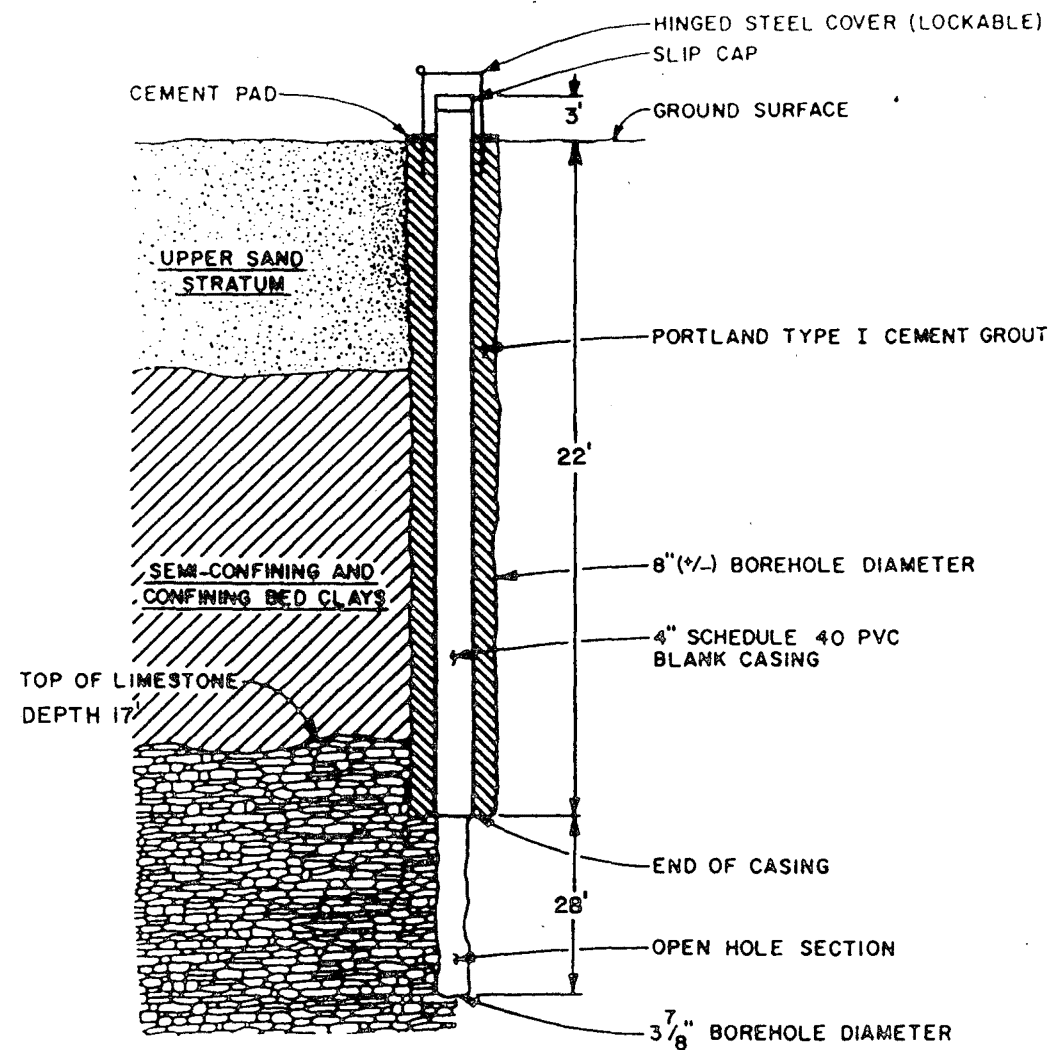
DATE DEC. 86 PROJ. NO. 85-30267 PLATE 3

F+500-25



VERTICAL SCALE: 1"=5'

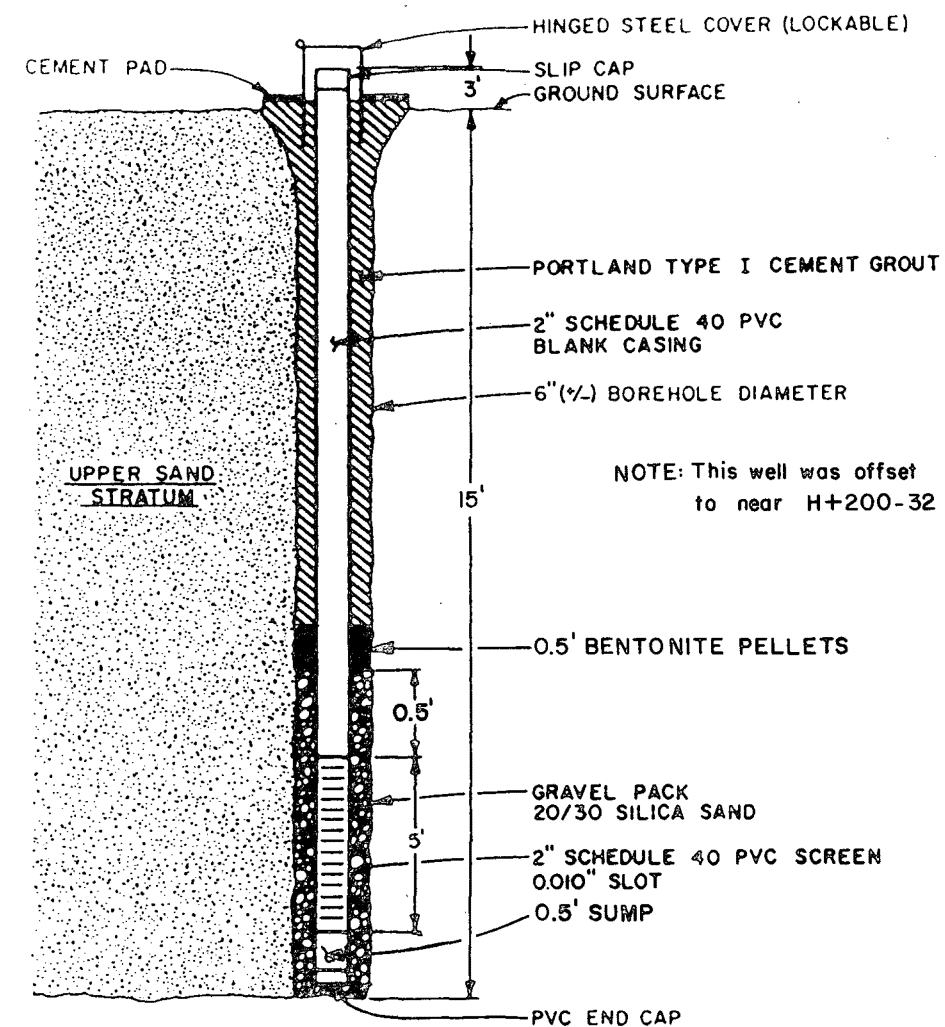
4MW3



FLORIDAN AQUIFER MONITORING WELL

NTS

2MW3



SHALLOW GROUNDWATER MONITORING WELL

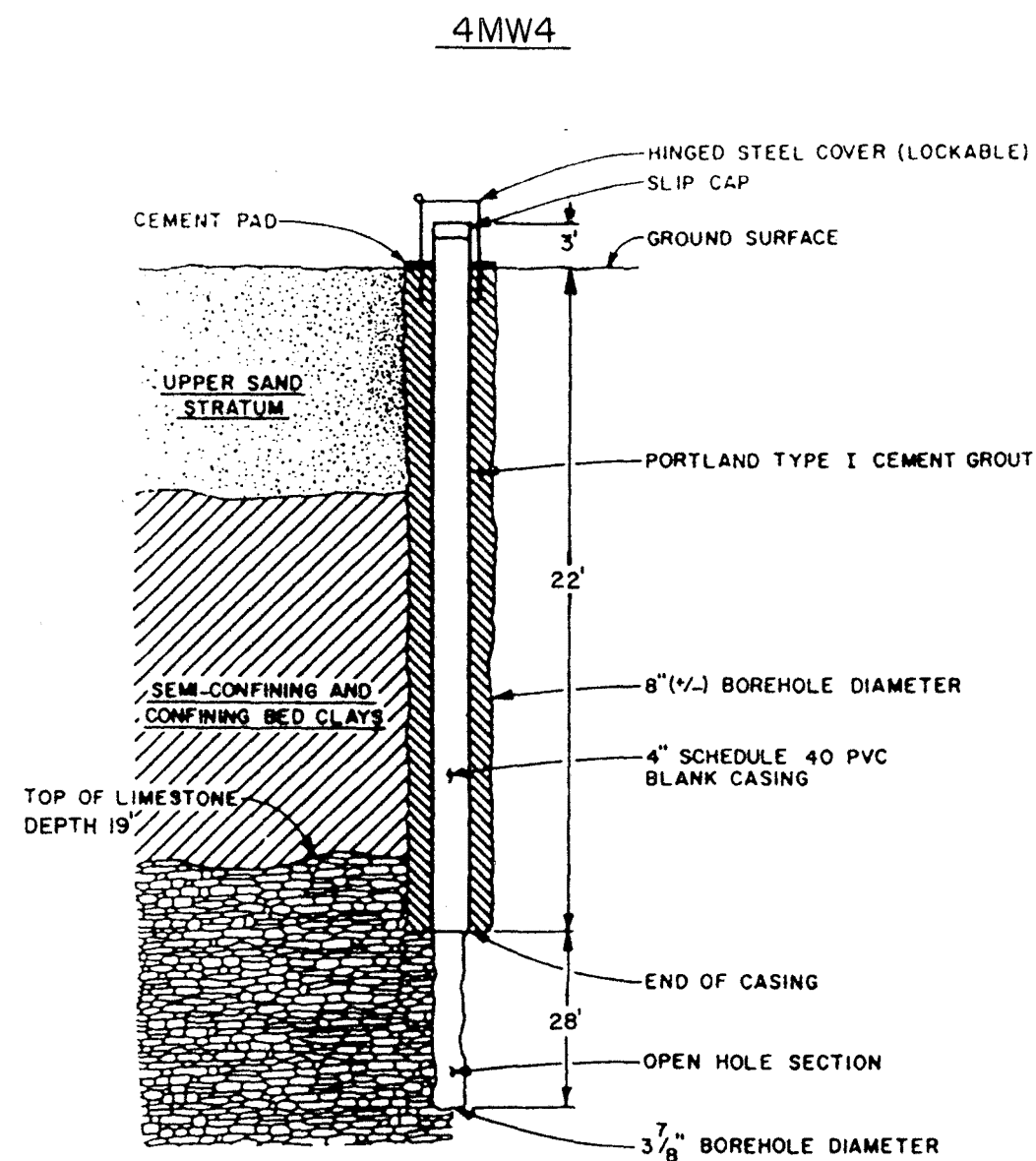
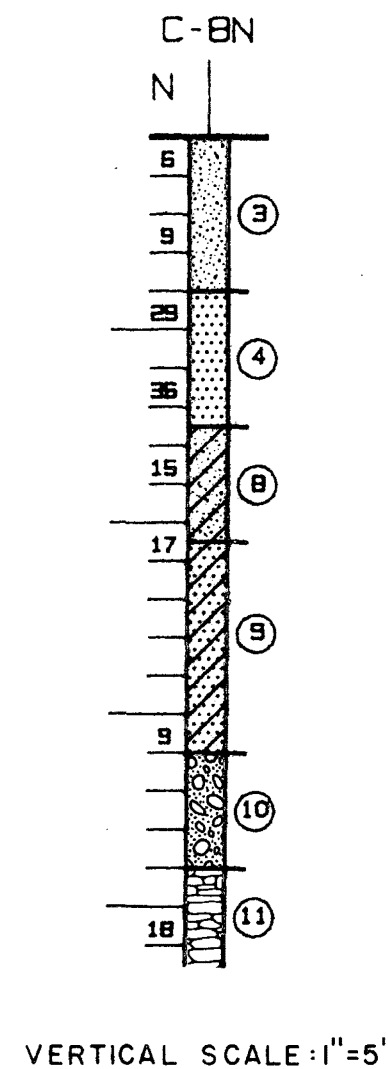
NTS

EXISTING GROUNDWATER WELL DETAILS

NOTE: For Soil Legend See Report

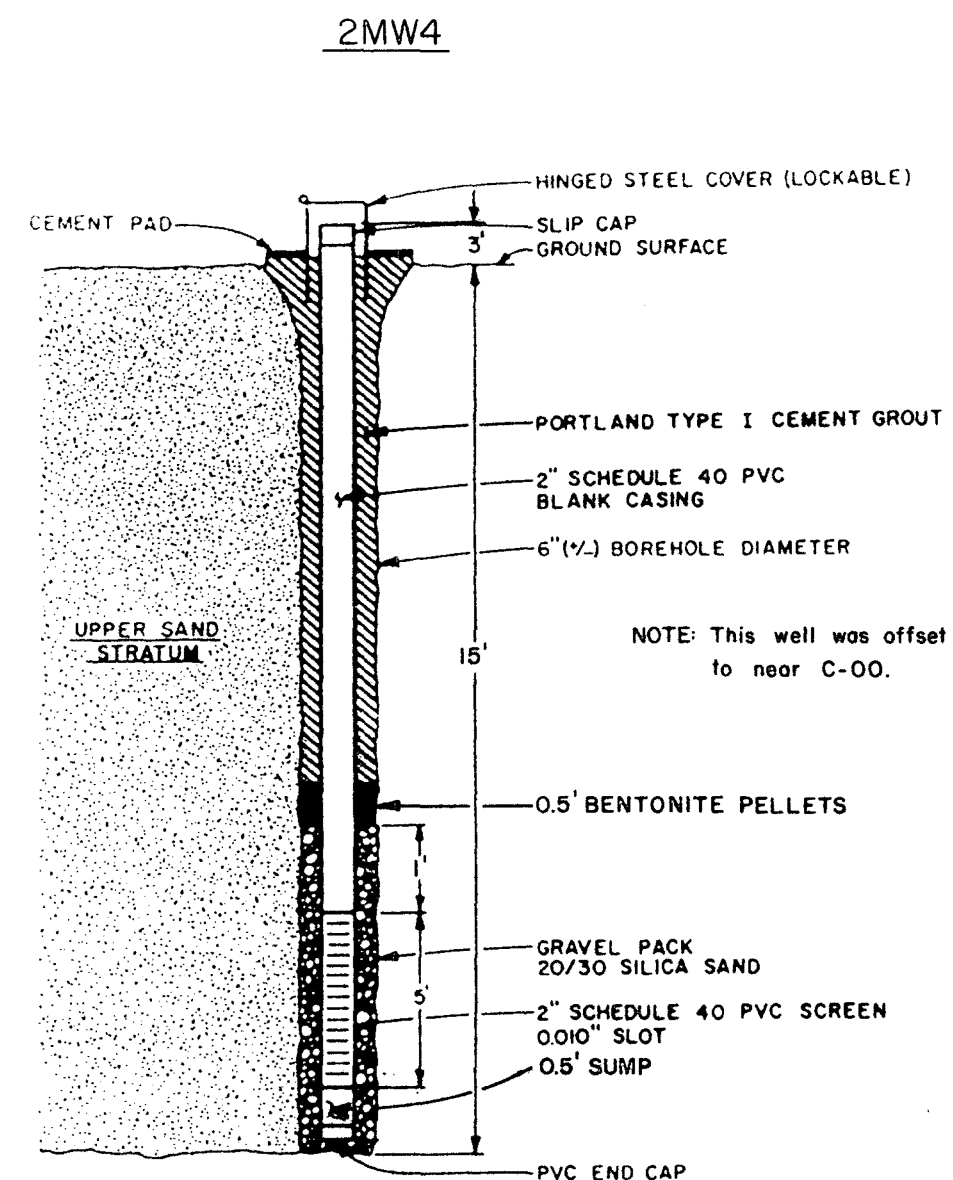
DRAWN:	KFB
CHKD:	KFB
APPVD:	RAM
SCALE:	NOTED

GEOTECHNICAL / HYDROGEOLOGIC STUDY PROPOSED PASCO COUNTY LANDFILL - HAYS ROAD SITE PASCO COUNTY, FLORIDA		
JAMMAL & ASSOCIATES, INC. Consulting Engineers		
DATE: DEC. 86	PROJ. NO: 85-30267	PLATE 4



FLORIDAN AQUIFER MONITORING WELL

NTS



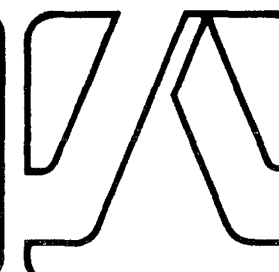
SHALLOW GROUNDWATER MONITORING WELL

NTS

EXISTING GROUNDWATER WELL DETAILS

NOTE: For Soil Legend See Report

DRAWN:	KFB
CHKD:	KFB
APPVD:	RAM
SCALE:	NOTED



GEOTECHNICAL / HYDROGEOLOGIC STUDY
PROPOSED PASCO COUNTY LANDFILL -
HAYS ROAD SITE
PASCO COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

DATE DEC. 86 PROJ NO 85-30267 PLATE 5

APPENDIX F

USDA GPR LETTERS AND OUR RESPONSE LETTER



United States
Department of
Agriculture

Soil
Conservation
Service

401 S.E. 1st Ave. Rm. 248
Gainesville, FL 32601

Subject: SOI-GPR-Hays Road Site

Date: September 16, 1986

RECEIVED
SEP 18 1986

To: Paul Pilney
Resource Soil Scientist
SCS, Bushnell, FL

File code:

Ans'd.....

It has come to my attention that there has been some misunderstanding of the results contained in my letter dated July 24, 1986, pertaining to the GPR investigation of the Hays Road site. This letter supersedes the letter dated July 24, 1986, and provides clarification of critical points.

Due to scale limitations, the computer plotted location map contained in the previous letter was not intended to be accurate. The purpose of placing subsurface features on this map was to identify possible lineament features at the site. More detailed locations of subsurface features should be accessed from the radar tapes. To avoid any further confusion, the exact locations of subsurface anomalies due to karstic process which have been identified on the radar tapes are included in tabular form in this report. Error is ± 10 feet.

Another copy of the radar tape is enclosed. Along the top margin are the location markers. In addition, I have identified subsurface anomalies with an "A". Those anomalies which I believe would yield interesting data if drilled are marked with a "***". The horizontal scale of the radar tape is variable, depending on the horizontal speed of the antenna. I, therefore, strongly suggest that GPR be used to exactly locate any subsurface anomalies prior to further investigatory drilling.

On the enclosed tapes, I have highlighted in red the interface between sand and clayey stratum as best I can. The graphic recorder used in this investigation prints radar signals in 16 shades of gray. The darker the signal the more contrasting the interface being measured. The apparent density of this signal on the tape varies. This is a result of one or more of the following conditions:

1. Change in soil moisture content of the overlying sand.
2. Change in amount (%) of clay in the fine earth fraction of the confining layer.
3. Change in minerology of the confining layer.

In general, darker signals will be apparent at the interface of dry sand and material with a high proportion of montmorillonite clays. Where the signal is weak or obscured, I have dashed the line.



The Soil Conservation Service
is an agency of the
United States Department of Agriculture



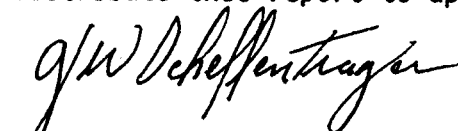
The subsurface anomalies identified on the radar tape are a result of karstal processes. Paleo-sinkholes are one feature of a karst topography. These subsurface anomalies have occurred in recent (approx. 15,000 b.p.) geologic history. Not all paleo-sinkholes can be classified as having been catastrophic collapses, such as the one experienced in 1982 in Winter Park. The anomalies identified on the radar tapes are most likely a result of one of the following sequences:

1. The gradual subsidence or sudden collapse of the ground surface into an underground cavity, and subsequent inundation by Holocene sands.
2. The gradual contortion of overlying clayey strata as a result of solution of underlying limestone.

It is my belief that most of the anomalies apparent on the GPR tape can be attributed to the second hypothesis. At the Hays Road site, the karstified limestone is mantled by variable thicknesses of sand and clay. Radar penetration is limited due to the high electrical conductivity of the clay which dissipates the radar signal. However, ongoing karst processes have deformed the overburdened strata by gradual subsidence. Consequently, the radar profile of the clay layer reveals karstic features associated with the underlying limestone. In addition, I believe the hyperbolic features outlined in dashed red lines represent domed intrusions of strata 10 into the upper 10 meters of soil. Further investigation will either prove or disprove this hypothesis.

I hope this has helped in clarifying some of the points presented in the previous letter.

If I can be of further assistance, no not hesitate to call. Please distribute this report to appropriate parties.



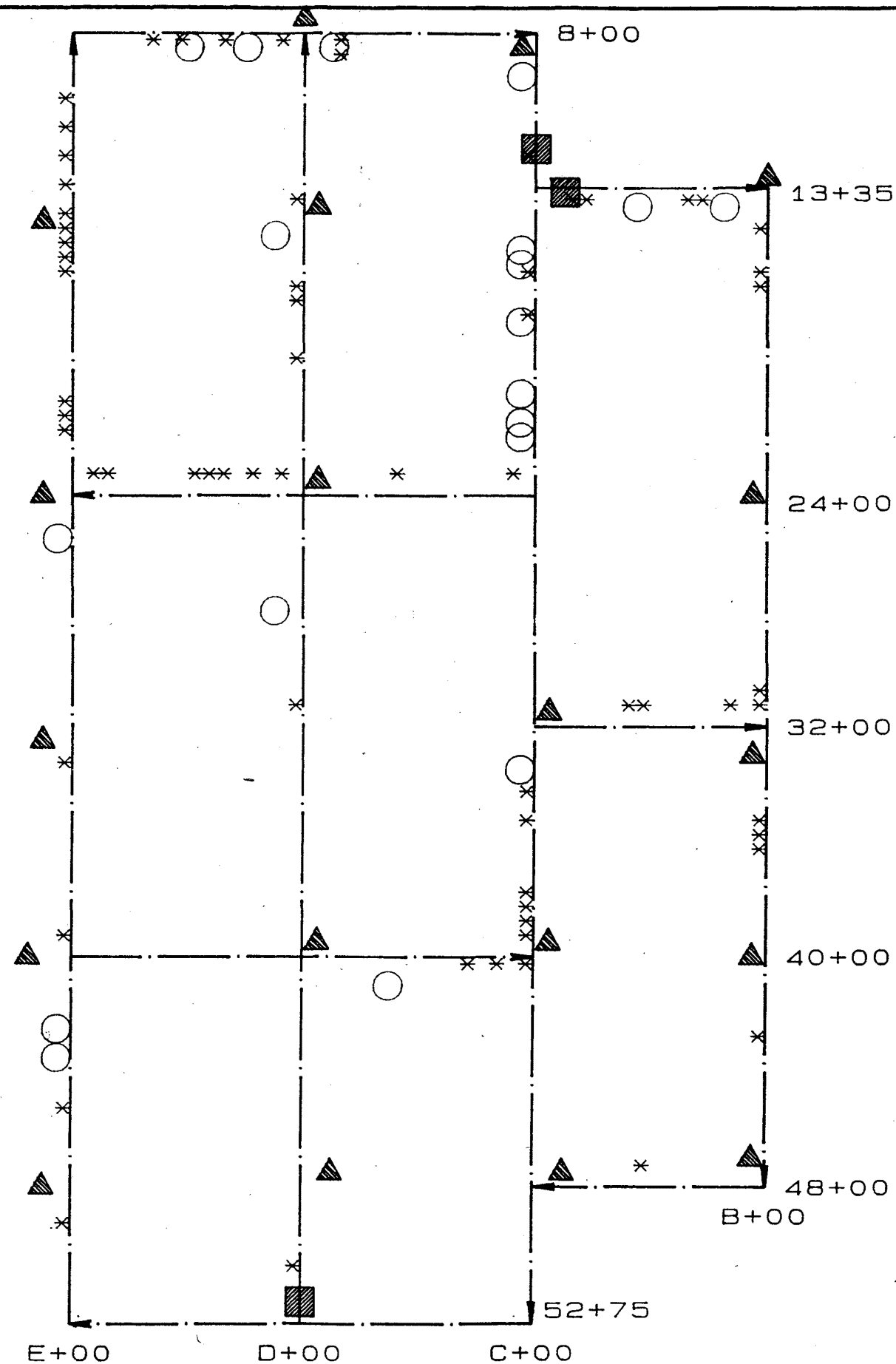
Gregg W. Schellentrager
Soil Specialist (GPR)

Enclosure

cc: Elmer Sauer w/o encl
Mortensen, Jammal & Assoc. ✓

USDA SOIL CONSERVATION
SERVICE

PROPOSED PASCO COUNTY
RESOURCE RECOVERY PLANT
EAST PHASE



* paleo-sink

O potential cavity

■ manual boring

▲ deep borings along
GPR transects

→ transect direction

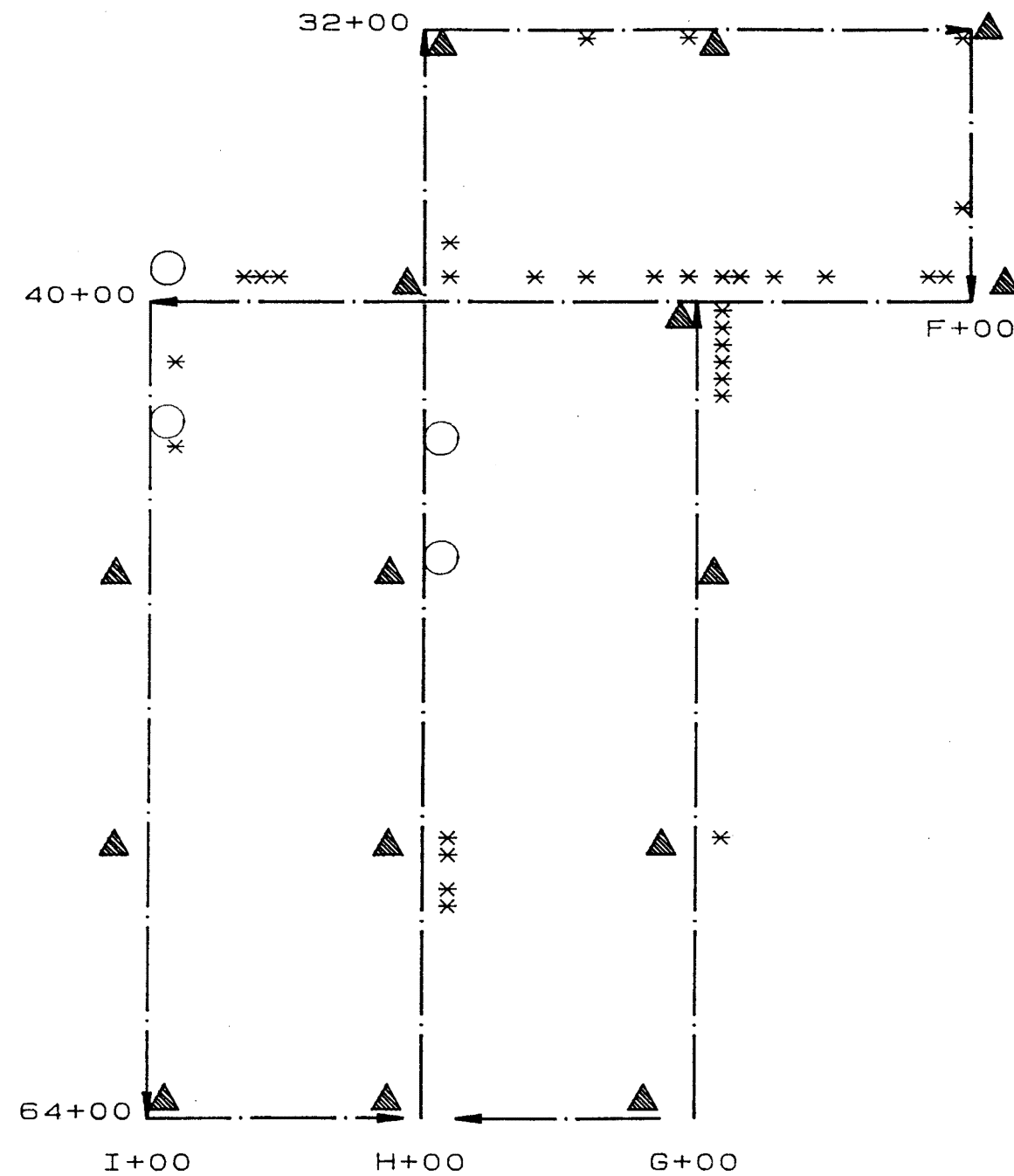
SCALE:

1000' - 0"

N

USDA SOIL CONSERVATION
SERVICE

PROPOSED PASCO COUNTY
RESOURCE RECOVERY PLANT
WEST PHASE



▲ deep borings along
GPR transects

○ potential
cavity

* paleo-sink

—→ transect direction

SCALE:

1000' - 0"

HAYS RD. SITE: SUBSURFACE ANOMALIES ¹

<u>transect E:</u> 49+10 42+80 43+40 44+50** 44+90 46+50 39+50 33+80 24+80 21+00 20+50 19+90** 10+90* 11+90 12+70 13+50 14+20** 14+90 15+30** 15+60 15+80	<u>transect 8+00:</u> D+100** D+210 D+310 D+420 D+440 D+550 C+640 C+720** <u>transect C:</u> 15+50** 15+90 12+40 9+30 17+10 18+10 19+30** 20+00 20+40 21+50 21+90 23+20 34+70 35+50** 38+00* 38+50 39+40 39+60 39+90	<u>transect D:</u> 13+90** 19+70** 17+30 17+10 31+20 28+10 51+80 <u>transect 13+35:</u> B+140** B+220 B+240 B+460 B+510 B+590 <u>transect B:</u> 14+40 15+90 16+20 30+80 31+50 35+30 35+60 36+10 43+10 <u>transect 48+00:</u> B+440	<u>transect 40+00:</u> C+110 C+210** C+480 C+10** <u>transect 32+00:</u> B+80 B+140 B+440 B+500 <u>transect 24+00:</u> C+80** C+510 D+100 D+200 D+300** D+350 D+380 D+650 D+750 <u>potential lack of dense clay:</u> C 46+10 to 47+10 C 50+00 to 49+50 52+75 C+100 to C+300
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*: secondary drilling site

** : primary drilling site

1: expected error is (+) or (-) 10 feet

September 30, 1986
Project No. 85-30267

TO: Camp Dresser & McKee, Inc.
555 Winderley Place
Maitland, Florida 32751

Attention: Mr. Dan Morrical, P.E.

SUBJECT: GPR Testing and Discussion with USDA
Proposed Pasco County Landfill-Hays Road Site
Pasco County, Florida

Dear Mr. Morrical:

As you know, I met with Mr. Greg Schellentrager with the USDA on September 15, 1986, at my office here in Tampa. Briefly, at the meeting we discussed some of our comments and concerns regarding the initial letter that he forwarded to all parties concerned on July 24, 1986, pertaining to the GPR investigation at the Hays Road landfill site. I discussed with Mr. Schellentrager several of my concerns which primarily included some scaling mistakes, stationing errors that we had discovered and some other discrepancies that we noted in our review of the actual GPR tapes and comparing them to his letter and computer plot which summarized the results of his initial evaluation. At the outcome of our meeting, Mr. Schellentrager agreed to resubmit a letter to all parties concerned clarifying the discrepancies.

Also, at our meeting, I discussed our concern relative to some verbage he utilized in his July 24th letter; specifically where he talked about "paleo-sinks" and "potential cavities". I mentioned to him that these were strong or extreme terms, when considering the very generalized nature of the results associated with GPR investigations. I felt it was not

appropriate at this time, to utilize these terms unless actual ground truth test borings were performed to justify those descriptions. Instead, I suggested that features which he felt were potential concern areas be termed "subsurface anomalies"; he agreed. Afterwards, I asked him if he could identify, on another set of tapes, those "subsurface anomalies" that he would like to see drilled during our Phase II borings; in other words, identify those features on the tape which he feels would probably produce some discontinuity during the drilling process.

Last week, I received the revised letter from Mr. Schellentrager. A copy of this letter is attached. He has included a table of "subsurface anomalies", where on that table, he has identified primary drilling sites and secondary drilling sites. In order to accurately locate these "subsurface anomalies" in the field, it was decided to utilize the GPR machine out in the field to relocate these positions for purposes of ground truth test borings.

As recently discussed with Mr. Dick Schlemmer in your Clearwater office, the GPR locating of these Phase II test boring areas will be conducted on Friday, October 3, 1986, at the site. Talking with Mr. Tietz yesterday, he will be at the site also at 8:00 to 8:30 in the morning. The Phase II boring locations will be staked on Friday. We recommend that the locations that he has selected as being primary and secondary drilling sites, be ground truth tested during our Phase II boring program, to properly address the issue and effectively utilize the GPR data. Approximately twenty (20) test boring locations are planned in our Phase II investigation.

Along with the letter from Mr. Schellentrager, I was suppose to receive the new radar tapes from the initial GPR investigation at the site. On these tapes Mr. Schellentrager was going to locate areas of inconsistent clay confining unit and areas of continuous clay confining unit. Inadvertently, these tapes were sent to Mr. Tietz instead. I am in the process right now of obtaining them from Mr. Tietz.

We plan to proceed with our Phase II drilling program on Monday, October 6th. On Friday, I plan to attend the meeting at the site with Mr. Schellentrager and Mr. Tietz to locate the

Camp, Dresser, & McKee, Inc.
Project No. 85-30267
Page 3

Phase II test borings. Surveyors can tie down these new locations as well as the monitoring well locations later next week.

As a separate note, one of the deep wells that we had installed at the Pasco County landfill site was vandalized and filled with sand. The 4-inch PVC pipe was damaged and broken. This necessitated drilling a new deep well adjacent to the previous one that we just installed. Also, regarding the wells, they should all be developed this week; therefore, next week sometime they would be available for water quality sampling.

If you have any questions about this letter, please give me a call. If not, we will probably see you on Friday, October 3rd at the site.

Sincerely,

JAMMAL & ASSOCIATES, INC.

Richard A. Mortensen, P.E.
Tampa Regional Manager

RAM/bp
1191M

Attachment: Letter from USDA dated September 16, 1986

cc: Mr. Bob Hauser
Mr. Dick Schlemmer



United States
Department of
Agriculture

Soil
Conservation
Service 401 S.E. First Ave. Rm. 248
Gainesville, FL 32601

Subject: SOI-GPR Investigation of Proposed Pasco County
Landfill - Hays Road Site

Date: July 24, 1986

To: Paul Pilney
Resource Soil Scientist
SCS, Bushnell, FL

File Code: 430-13

Enclosed are the tapes of GPR investigation conducted on 29 May '86 at the proposed Pasco County Landfill Site. The tape has been depth scaled at the beginning of the first transect and all transects have been identified. Depth scale error should be expected to be ± 5 inches.

Due to the massive amount of data collected, I have not traced the confining clay layer throughout the entire tape. However, you will find that I have identified the clay signal at the beginning of transect E 52+75. Additionally, I have highlighted an observed paleo-sink feature for reference at E 44+50 and a potential cavity/limestone layer at E 43+50 and E 42+50. If there are any questions concerning specific portions of the tape, I will be glad to discuss them with interested parties.

Along the top margin of the tape you will find symbols which I have used to identify subsurface features consistent with a karst landscape. A "x" is used to identify a paleo-sink, a "o" is used to identify a potential cavity/limestone surface and a "0" is used to identify a paleo-sink of major contrasting features. A "V" has been used to identify locations of borings conducted by Jammal & Associates, Inc.

The radar results correspond remarkably well to the boring data generated by Jammal & Associates, Inc. Some variations may be expected. These may be grouped in two categories: (i) sampling errors, and (ii) in-site soil conditions.

- (i) Sampling errors most often may be attributed to depth-scaling radar imagery from borings not taken directly beneath the radar antenna path. The GPR images only those subsurface features which pass beneath it. In a karst area such as the Hays Rd. site, soil and geologic structures change rapidly over a horizontal distance. Consequently, boring conducted 50 to 100 feet away from the radar's path (such as transect E 52+75 to E 8+00) may exhibit some deviation from the radar record.
- (ii) Ground-Penetrating Radar actually detects and records changes in soils electromagnetic properties. The rate and subsequently depth of penetration of a radar signal is governed by an electromagnetic property called the dielectric constant by the following equation:

$$d(m) = tp(ns) \left(\frac{0.15}{\sqrt{\epsilon_R}} \right)$$

where: d(m) is distance to interface in meters

t(ns) is the two-way travel time to the interface in nanoseconds (ns)

ϵ_R is the relative dielectric constant of the medium.

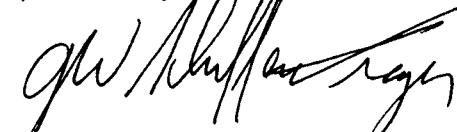
From this equation you can see that any increase in relative dielectric constant will decrease the depth of penetration at a set travel time. Soils do not have homogenous dielectric properties. The conductivity and subsequent dielectric constant of earthen materials increases with moisture content, the concentrations of salts in solution, and the amount and type of clay in the matrix. Consequently, a uniform depth scale applied to a non-uniform soil medium may be misleading. However, with our current state of knowledge of electromagnetic wave propagation in earthen materials, we must accept this error.

Sinkhole prediction, as is earthquake prediction, is a risky business. Only minimal degrees of accuracy have yet to be attained. However, by studying the underlying formations of rock and clay, we may observe the recent history of sinkhole occurrence in an area.

Over time, in a humid climate such as Florida, underlying highly soluble limestone is dissolved. Gradually, caverns form and fractures widen. The overlying sand and clay materials begin to contort and conform with the underlying limestone surface. It is these type of features which we attempted to observe with GPR in order to ascertain the degree of Karstal processes of an area.

On the enclosed site maps you will see areas which I have observed to indicate paleo (or ancient) sinks and potential cavity/limestone surface areas. While the radar signals representing paleo-sinks are obvious, those representing cavities/limestone surface would require further ground truth observations in order to confirm their presence.

I hope this information has been of some use to you. If you have any further questions, do not hesitate to call.



Gregg W. Schellentrager
Soil Specialist (GPR)

cc: w/o encl: Elmer Sauer
w/encl: D. Morrical, C.D.M.



Approximate Boring Coordinates

Boring	Northing	Easting
RR-1	1,467,560	319,800
RR-2	1,467,345	319,657
RR-3	1,467,345	319,934
RR-4	1,467,115	319,675
RR-5	1,467,130	319,955

DESIGNED BY
DRAWN BY
CHECKED BY
APPROVED BY

DATE
DATE
DATE
DATE

REMARKS

PROJECT NO.
86-30743

SHEET NO.
SHEET 1 OF 2

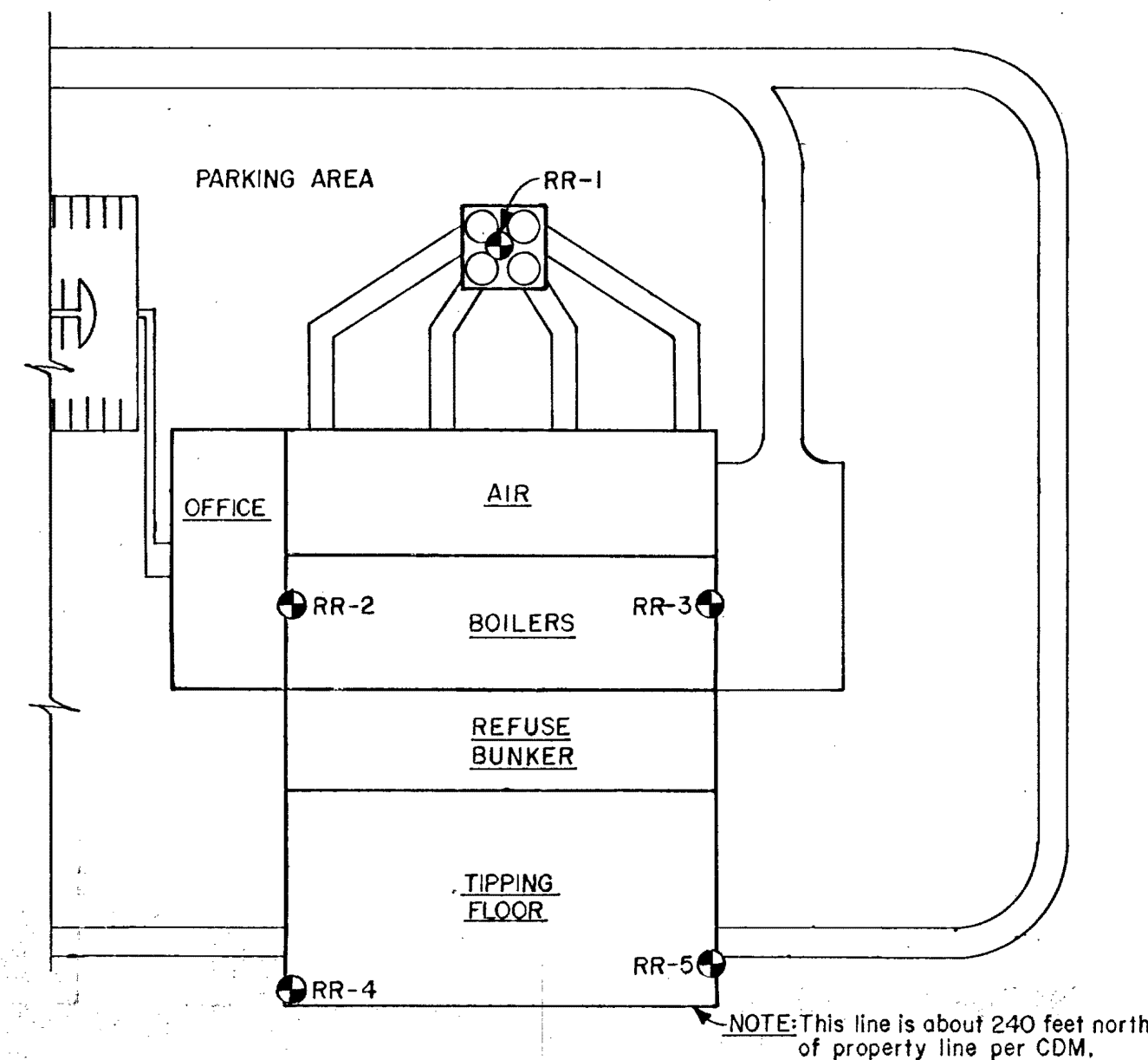
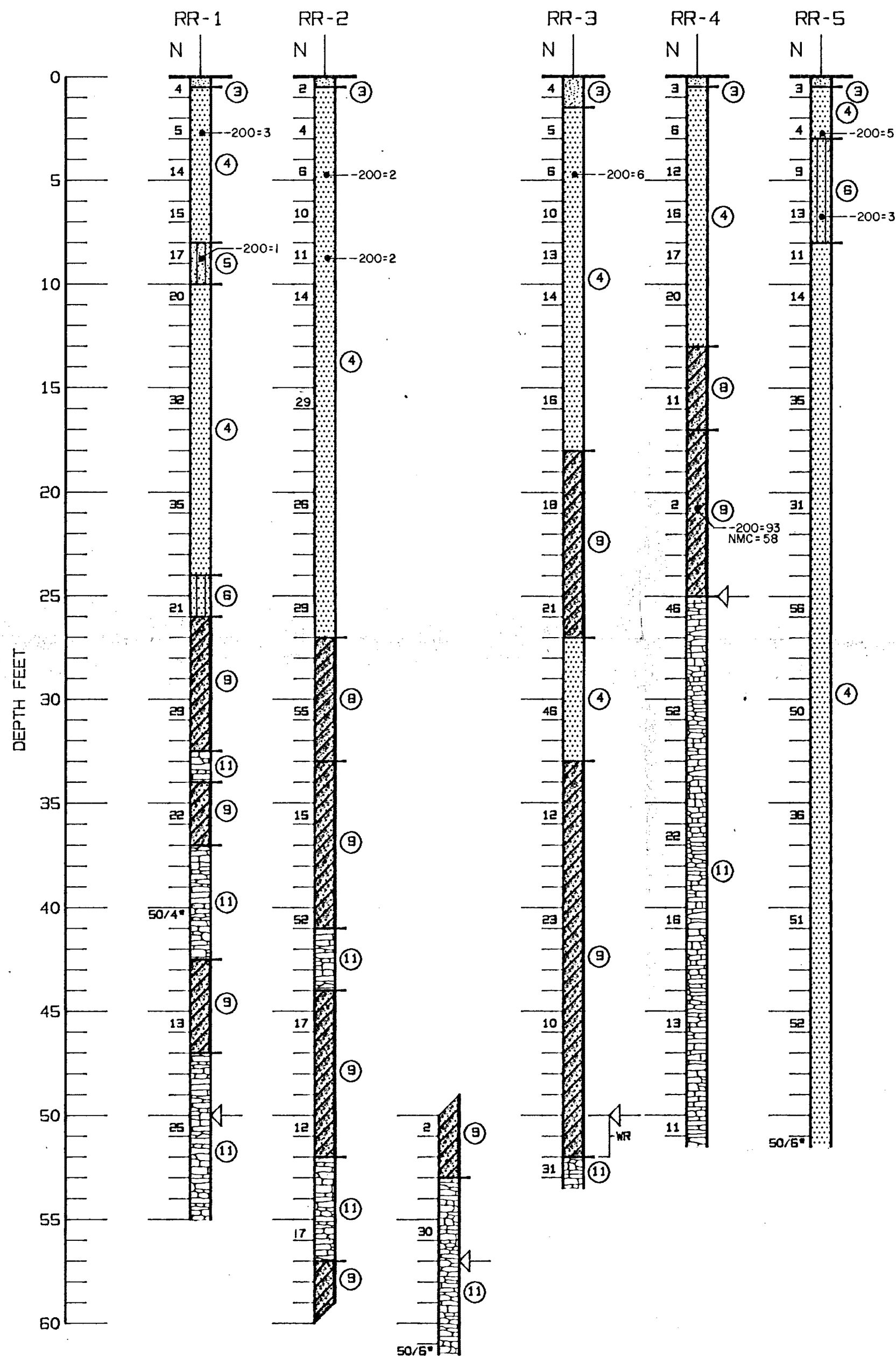
SHEET 1 OF 2

PRELIMINARY FOUNDATION AND SOILS STUDY
PROPOSED RESOURCE RECOVERY PLANT
PASCO COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC.
Consulting Engineers
DATE: MAY 87
PROJECT NO.: 86-30743
SHEET 1 OF 2

CAMP DRESSER & MCKEE INC.

CDM

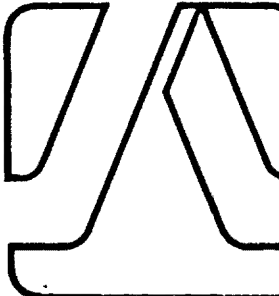


LEGEND

- ① Black organic debris - MUCK (PT)
- ② Dark gray to black silty to sandy CLAY (CL/CH)
- ③ Gray slightly silty fine SAND, trace roots (SP-SM)
- ④ Light brown to brown fine SAND to slightly silty fine SAND (SP/SP-SM)
- ⑤ Dark brown slightly silty fine SAND to silty fine SAND (SP-SM/SM)
- ⑥ Brown to orange-brown silty fine SAND to slightly clayey fine SAND (SM/SP-SC)
- ⑦ Gray clayey SAND (SC)
- ⑧ Light gray and reddish-brown mottled sandy CLAY to CLAY (CL/CH)
- ⑨ Light brown or greenish-gray to green sandy CLAY to CLAY (CL/CH)
- ⑩ White to light brown calcareous silty CLAY, with limestone fragments and traces of green clay
- ⑪ White to light gray weathered LIMESTONE
- SC Unified Soil Classification group symbol as determined by visual examination
- N SPT "N" value in blows/foot
- 50/4" Fifty blows for four inches
- ← Loss of total circulation
- WR Fell under weight of rod
- 200 Fines passing No. 200 sieve (%)
- NMC Natural Moisture Content (%)
- ⊕ Approximate SPT boring location

FIELD: MDZ
DRAWN: KFB/OS
CHKD: KFB
APPVD: JRM
HORIZ. SCALE: NOTED
VERT. SCALE: NOTED

DATE	BY	REVISION



PRELIMINARY FOUNDATION AND SOILS STUDY		
PROPOSED RESOURCE RECOVERY PLANT		
PASCO COUNTY, FLORIDA		
JAMMAL & ASSOCIATES, INC. Consulting Engineers		
DATE: MAY 87	PROJ. NO: 86-30743	SHEET 2 OF 2

R15E

R16E

R17E

R18E

R19E

R20E

R21E

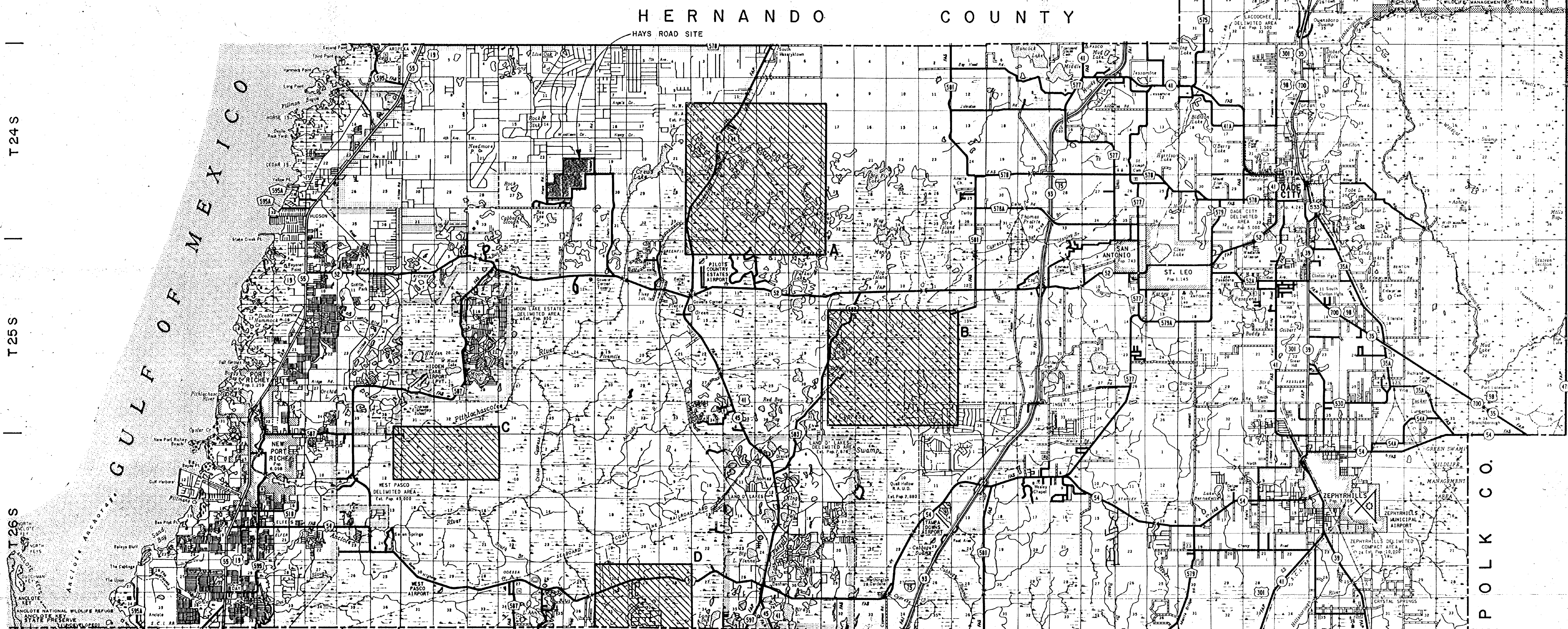
R22E

T23S

T24S

T25S

T26S



PINELLAS
CO.

HILLSBOROUGH COUNTY

LEGEND

- = Well Field Area (Based on SWFWMD data)
- A** = Cross Bar Ranch Well Field
- B** = Cypress Creek Well Field
- C** = Starkey Well Field
- D** = Pasco County Well Field
- = Proposed Landfill Site

PASCO COUNTY SITE LOCATION MAP

SCALE: 1" = 8000'



SUMTER CO.

POLK CO.

REMARKS	DESIGNED BY	DATE	DRWN	CHKD
	DRAWN BY	CHECKED BY	APPROVED BY	DATE
CAMP DRESSER & MCKEE INC. CDM environmental engineers, scientists, planners, & management consultants				
PROJECT NO. 85-30267 SHEET NO. 1 OF 13				

GEOTECHNICAL/HYDROLOGIC STUDY
PROPOSED PASCO COUNTY LANDFILL - HAYS ROAD SITE
PASCO COUNTY, FLORIDA
JAMMAL & ASSOCIATES, INC. Consulting Engineers
DATE: DEC. 86. PROJ. NO. 85-30267 SHEET 1 OF 13

LEGEND

- Approximate SPT boring location (Preliminary Study August 1985)
- SPT boring location - Phase 1
- SPT boring location - Phase 2
- Existing Deep Groundwater Monitoring Well Location (4)
- Existing Shallow Groundwater Monitoring Well Location (4)
- Ground Penetrating Rader (GPR) grid line
- Area on-site Most Suitable for Landfill
- Proposed Deep Groundwater Monitoring Well Location (3)
- Proposed Shallow Groundwater Monitoring Well Location (3)



CAMP DRESSER & MCKEE INC.

GEOTECHNICAL/HYDROGEOLOGIC STUDY
PROPOSED PASCO COUNTY LANDFILL - HAYS ROAD SITE
PASCO COUNTY, FLORIDA
JAMMAL & ASSOCIATES, INC. Consulting Engineers
DATE: DEC. 86 PROJ. NO. 85-30267 SHEET 2 OF 13

PROJECT NO.
85-30267
SHEET NO.
SHEET 2 OF 13

REMARKS

CHKD

DATE

DESIGNED BY

DRAWN BY

CHECKED BY

APPROVED BY

DATE

CDM

CDM

CDM

CDM

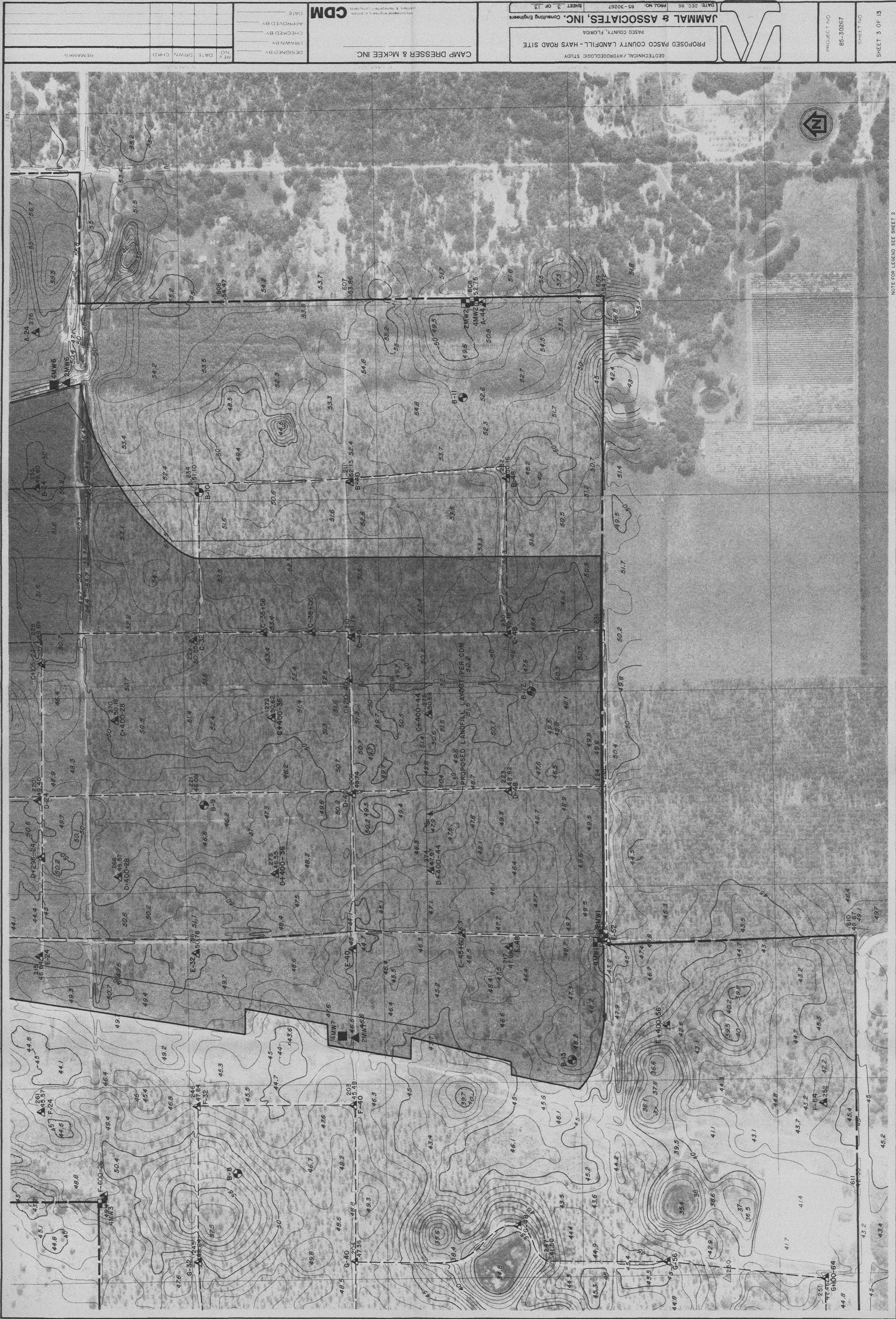
CDM

CDM

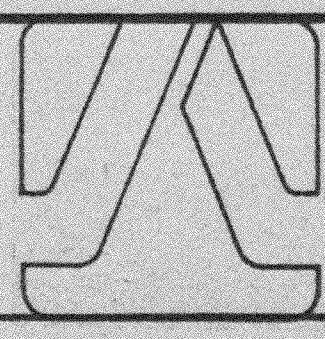
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CDM

CDM

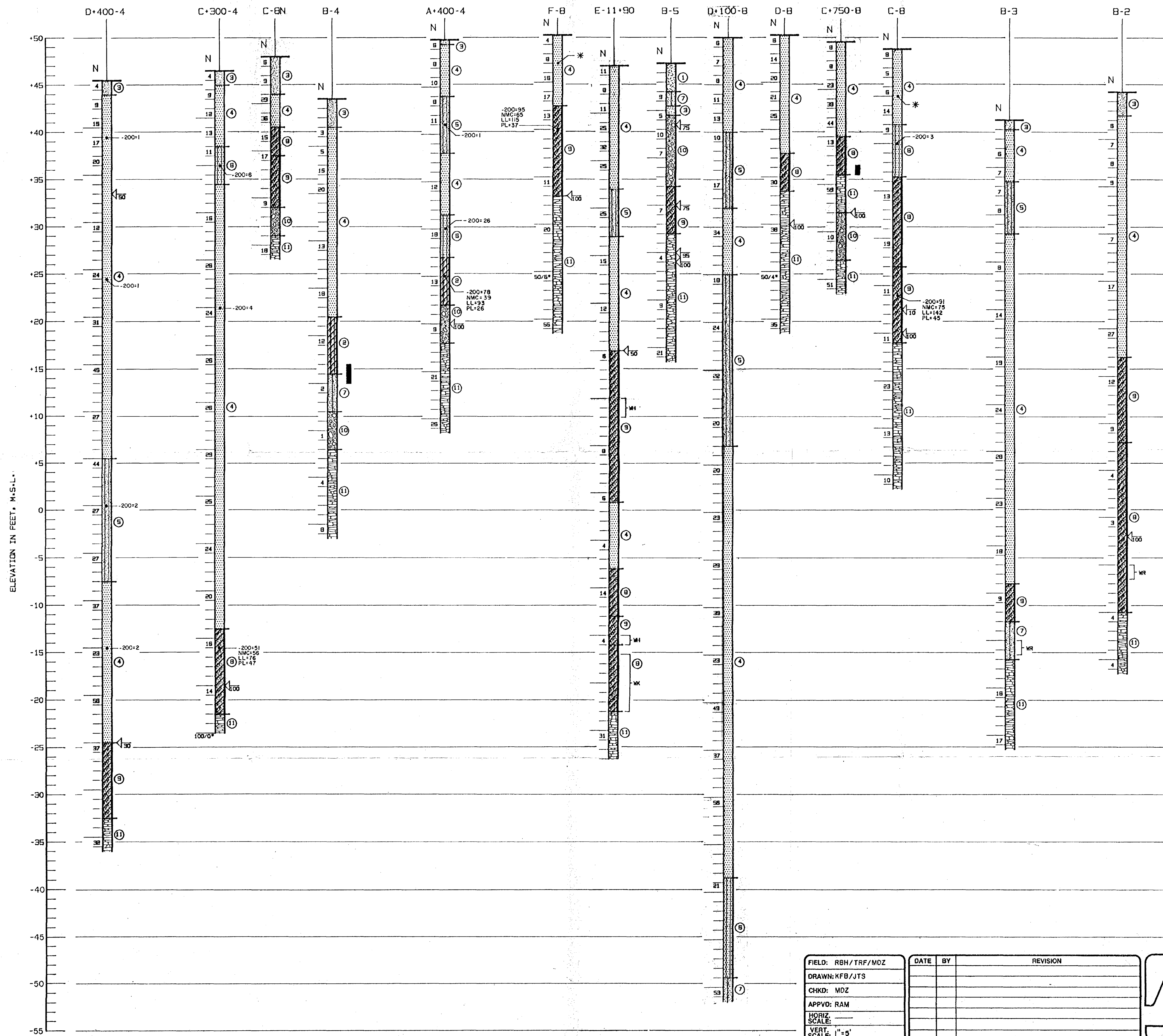




	GEOTECHNICAL / HYDROGEOLOGIC STUDY		CAMP DRESSER & MCKEE INC.		DESIGNED BY _____ DRAWN BY _____ CHECKED BY _____ APPROVED BY _____ DATE _____	REV NO DATE DRWN CHKD	REMARKS
	PROPOSED PASCO COUNTY LANDFILL - HAYS ROAD SITE PASCO COUNTY, FLORIDA		JAMMAL & ASSOCIATES, INC. Consulting Engineers DATE: DEC. 86 PROJ. NO: 85-30267 SHEET 4 OF 13				

LEGEND

- ① Black organic debris - MUCK (PT)
- ② Dark gray to black silty to sandy CLAY (CL/CH)
- ③ Gray slightly silty fine SAND, trace roots (SP-SM)
- ④ Light brown to brown fine SAND to slightly silty fine SAND (SP/SP-SM)
- ⑤ Dark brown slightly silty fine SAND to silty fine SAND (SP-SM/SM)
- ⑥ Brown to orange-brown silty fine SAND to slightly clayey fine SAND (SM/SP-SC)
- ⑦ Gray clayey SAND (SC)
- ⑧ Light gray and reddish-brown mottled sandy CLAY to CLAY (CL/CH)
- ⑨ Light brown or greenish-gray to green sandy CLAY to CLAY (CL/CH)
- ⑩ White to light brown calcareous silty CLAY, with limestone fragments and traces of green clay
- ⑪ White to light gray weathered LIMESTONE
- SP Unified Soil Classification group symbol as determined by visual examination
- N "N" value in blows/foot
- 50/4" Fifty blows for four inches
- ← Loss of circulation (LC)
- WK Fell under weight of rod & kelly
- WH Fell under weight of rod & hammer
- WR Fell under weight of rod
- 200 Fines passing No. 200 sieve (%)
- NMC Natural Moisture Content (%)
- LL Liquid Limit (%)
- PL Plastic Limit (%)
- ⊙ Consolidation test performed
- k_v Coefficient of Vertical Permeability (cm/sec)
- ▬ Shelby tube sample location
- * Grain Size Analysis performed, see appendices
- RW Rotary Wash



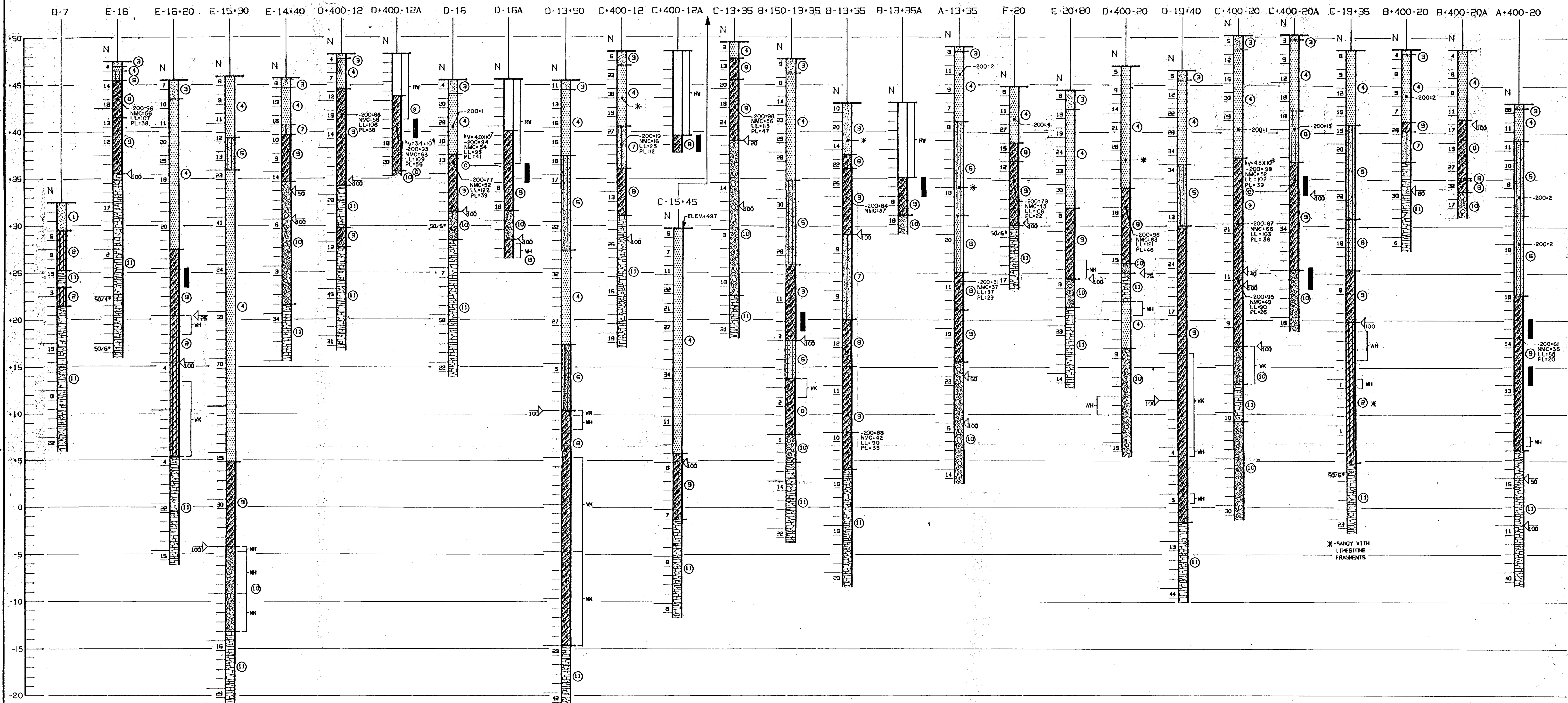
FIELD: RBH/TRF/MDZ
 DRAWN: KFB/JTS
 CHKD: MDZ
 APPVD: RAM
 HORIZ. SCALE:
 VERT. SCALE: 1"=5'

DATE	BY	REVISION

GEOTECHNICAL / HYDROGEOLOGIC STUDY
 PROPOSED PASCO COUNTY LANDFILL - HAYS ROAD SITE
 PASCO COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

DATE: DEC. 86 PROJ. NO: 85-30267 SHEET 5 OF 13



LEGEND

- ① Black organic debris - MUCK (PT)
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- WR Fell under weight of rod
- 200 Fines passing No. 200 sieve (%)
- NMC Natural Moisture Content (%)
- LL Liquid Limit (%)
- PL Plastic Limit (%)
- ⊙ Consolidation test performed
- k_v Coefficient of Vertical Permeability (cm/sec)
- Shelby tube sample location
- * Grain Size Analysis performed, see appendices
- RW Rotary Wash

FIELD: RBH/TRF/MOZ
 DRAWN: KFB/JTS
 CHKD: MOZ
 APPVD: RAM
 HORIZ. SCALE:
 VERT. SCALE: 1"=5'

DATE	BY	REVISION

GEOTECHNICAL / HYDROGEOLOGIC STUDY

PROPOSED PASCO COUNTY LANDFILL - HAYS ROAD SITE

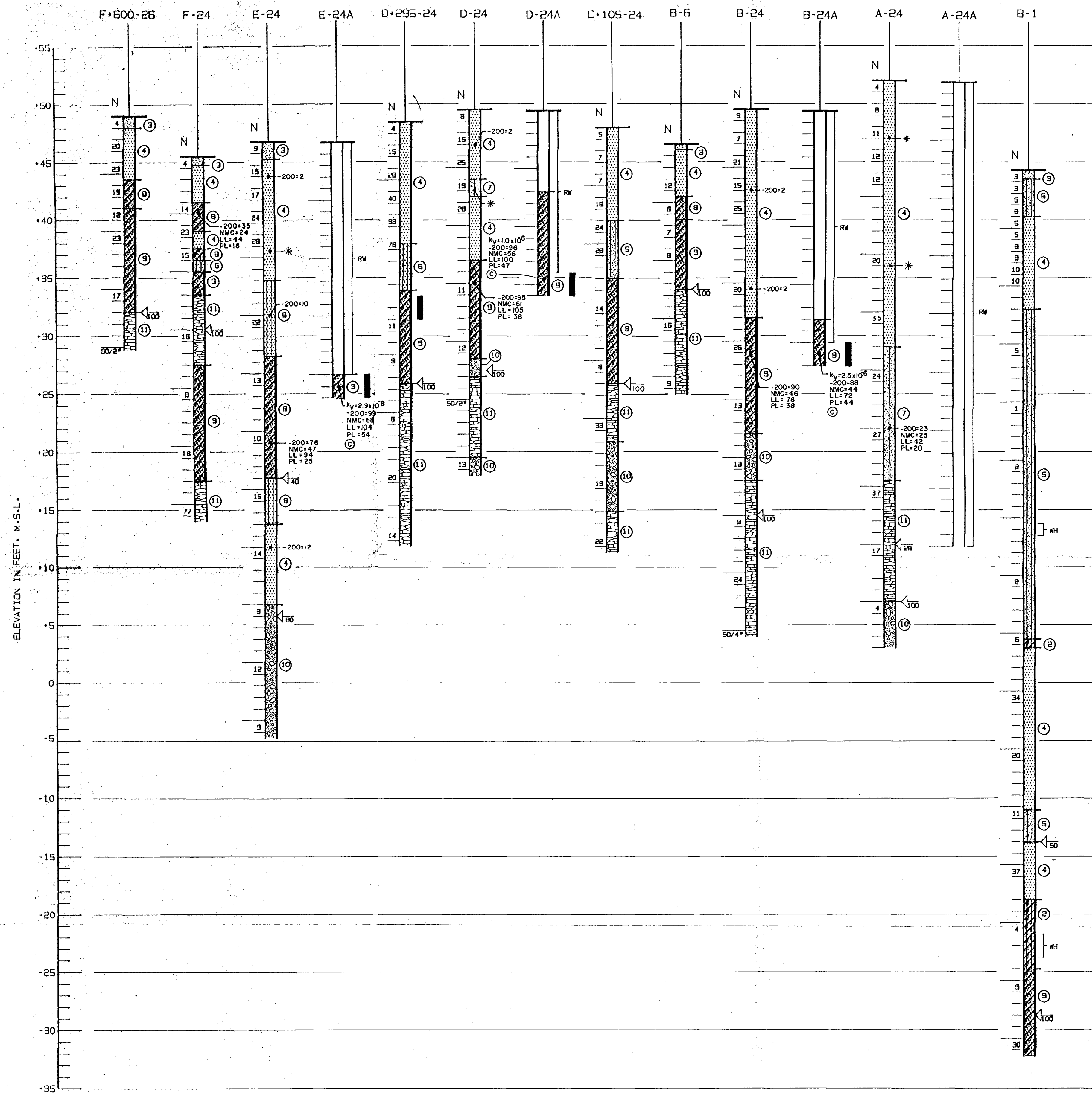
PASCO COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

DATE: AUG. 86 PROJ. NO: 85-30267 SHEET 6 OF 13

LEGEND

- ① Black organic debris - MUCK (PT)
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- WR Fell under weight of rod
- 200 Fines passing No. 200 sieve (%)
- NMC Natural Moisture Content (%)
- LL Liquid Limit (%)
- PL Plastic Limit (%)
- ⊙ Consolidation test performed
- k_v Coefficient of Vertical Permeability (cm/sec)
- ▬ Shelby tube sample location
- * Grain Size Analysis performed, see appendices
- RW Rotary Wash



FIELD: RBH/TRF/MDZ
 DRAWN: KFB/JTS
 CHKD: MDZ
 APPVD: RAM
 HORIZ. SCALE:
 VERT. SCALE: 1" = 5'

DATE	BY	REVISION

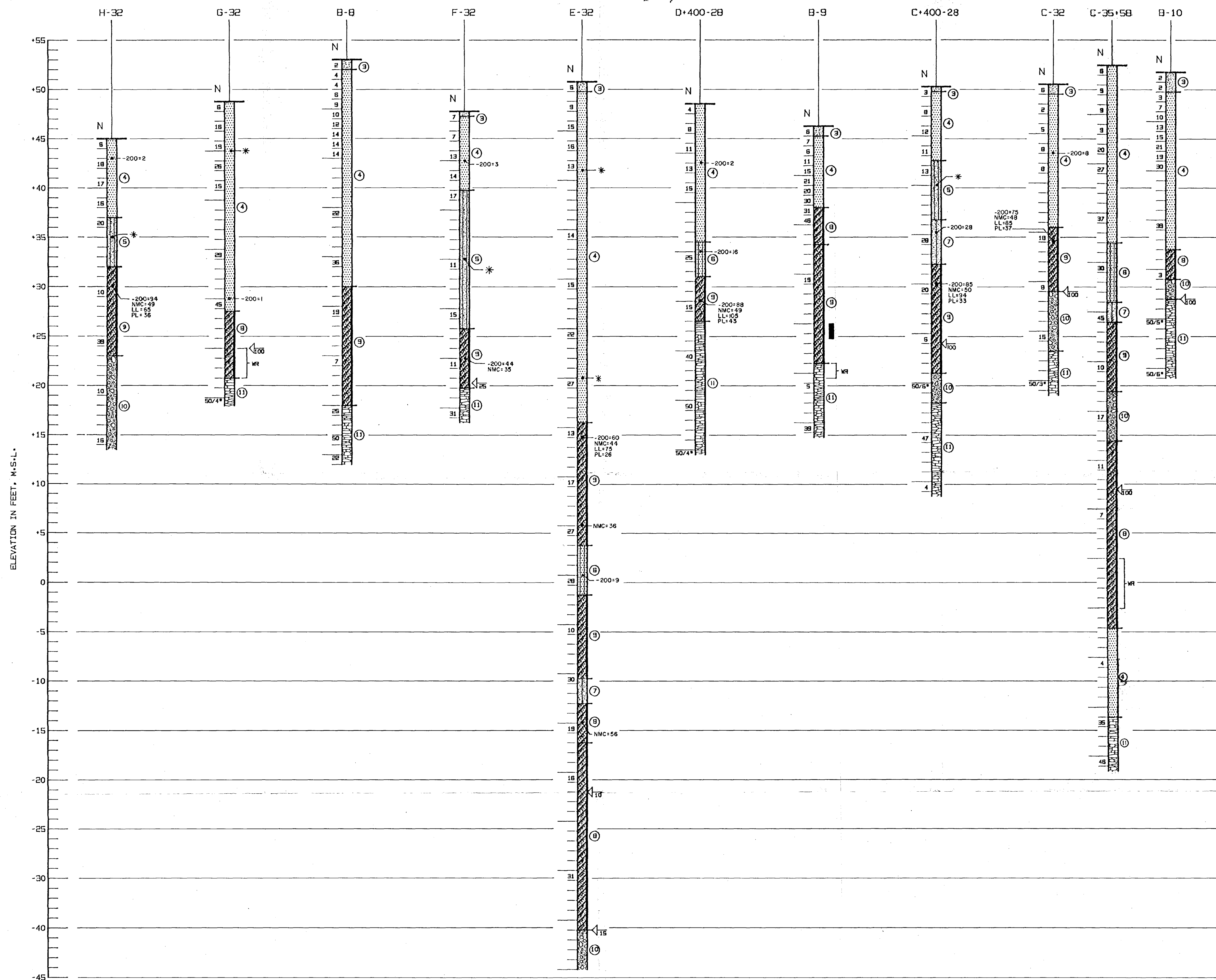
GEOTECHNICAL / HYDROGEOLOGIC STUDY
 PROPOSED PASCO COUNTY LANDFILL - HAYS ROAD SITE
 PASCO COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

DATE: AUG. 86 PROJ. NO: 85-30267 SHEET 7 OF 13

LEGEND

- ① Black organic debris - MUCK (PT)
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- WH Fell under weight of rod & hammer
- WR Fell under weight of rod
- 200 Fines passing No. 200 sieve (%)
- NMC Natural Moisture Content (%)
- LL Liquid Limit (%)
- PL Plastic Limit (%)
- ⊙ Consolidation test performed
- k_v Coefficient of Vertical Permeability (cm/sec)
- ▬ Shelby tube sample location
- * Grain Size Analysis performed, see appendices
- RW Rotary Wash



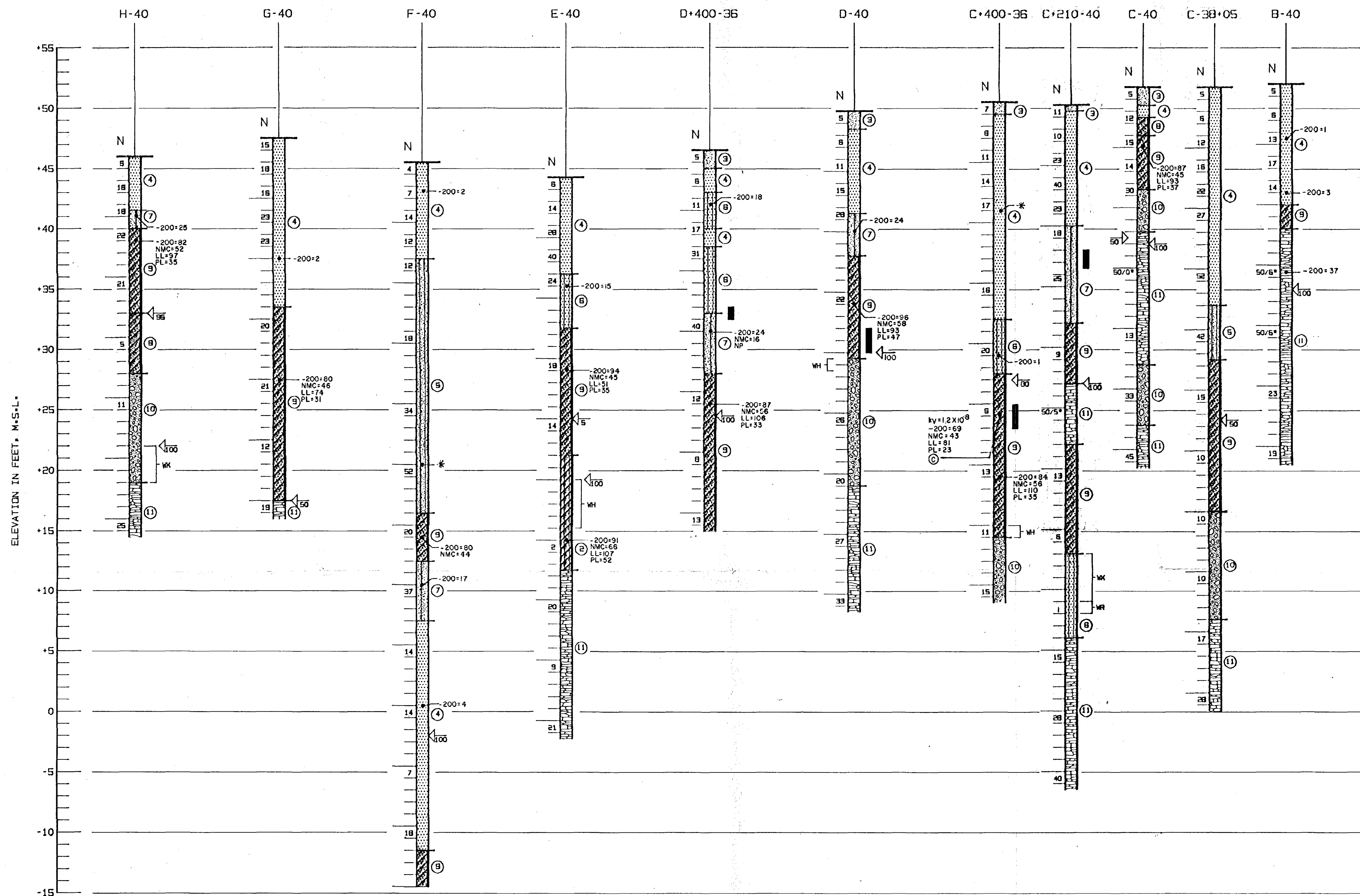
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 DRAWN: KFB/JTS
 CHKD: MDZ
 APPVD: RAM
 HORIZ SCALE:
 VERT SCALE: 1"=5'

DATE	BY	REVISION

GEOTECHNICAL / HYDROGEOLOGIC STUDY
 PROPOSED PASCO COUNTY LANDFILL - HAYS ROAD SITE
 PASCO COUNTY, FLORIDA
JAMMAL & ASSOCIATES, INC. Consulting Engineers
 DATE: AUG. 86 PROJ. NO: 85-30267 SHEET 9 OF 13

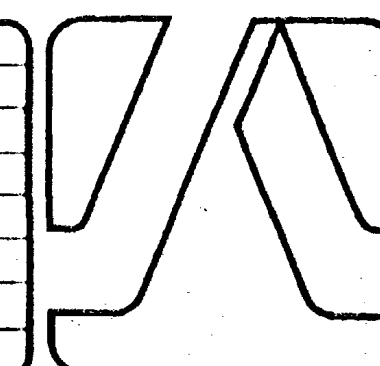
LEGEND

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- NMC Natural Moisture Content (%)
- LL Liquid Limit (%)
- PL Plastic Limit (%)
- ⊙ Consolidation test performed
- k_v Coefficient of Vertical Permeability (cm/sec)
- ▬ Shelby tube sample location
- * Grain Size Analysis performed, see appendices
- RW Rotary Wash



FIELD: RSH/TRF/MDZ
 DRAWN: KFB/JTS
 CHKD: MDZ
 APPVD: RAM
 HORIZ. SCALE: —
 VERT. SCALE: 1" = 5'

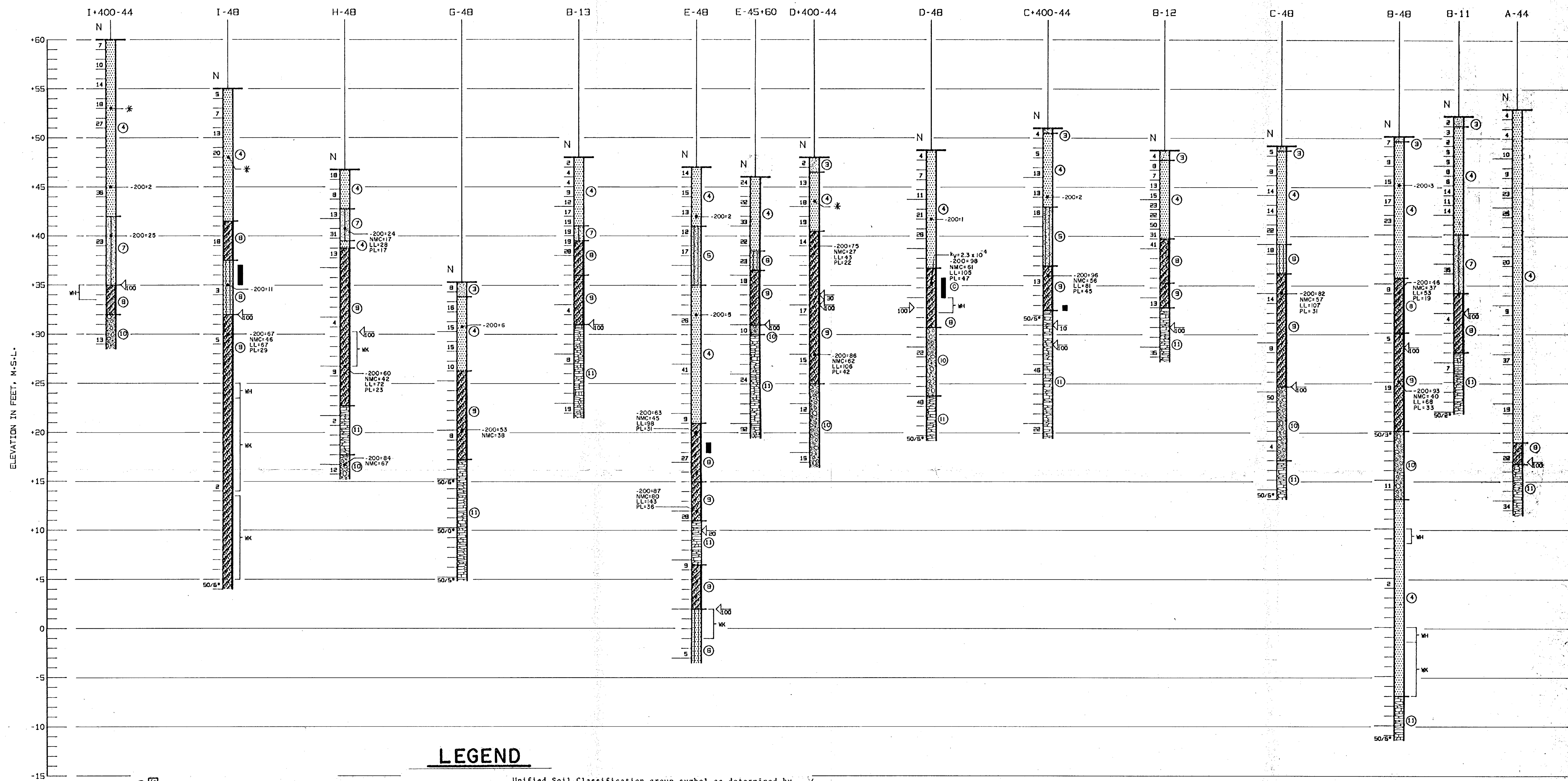
DATE	BY	REVISION



GEOTECHNICAL / HYDROGEOLOGIC STUDY
 PROPOSED PASCO COUNTY LANDFILL - HAYS ROAD SITE
 PASCO COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

DATE: AUG. 86 PROJ. NO: 85-30267 SHEET 9 OF 13

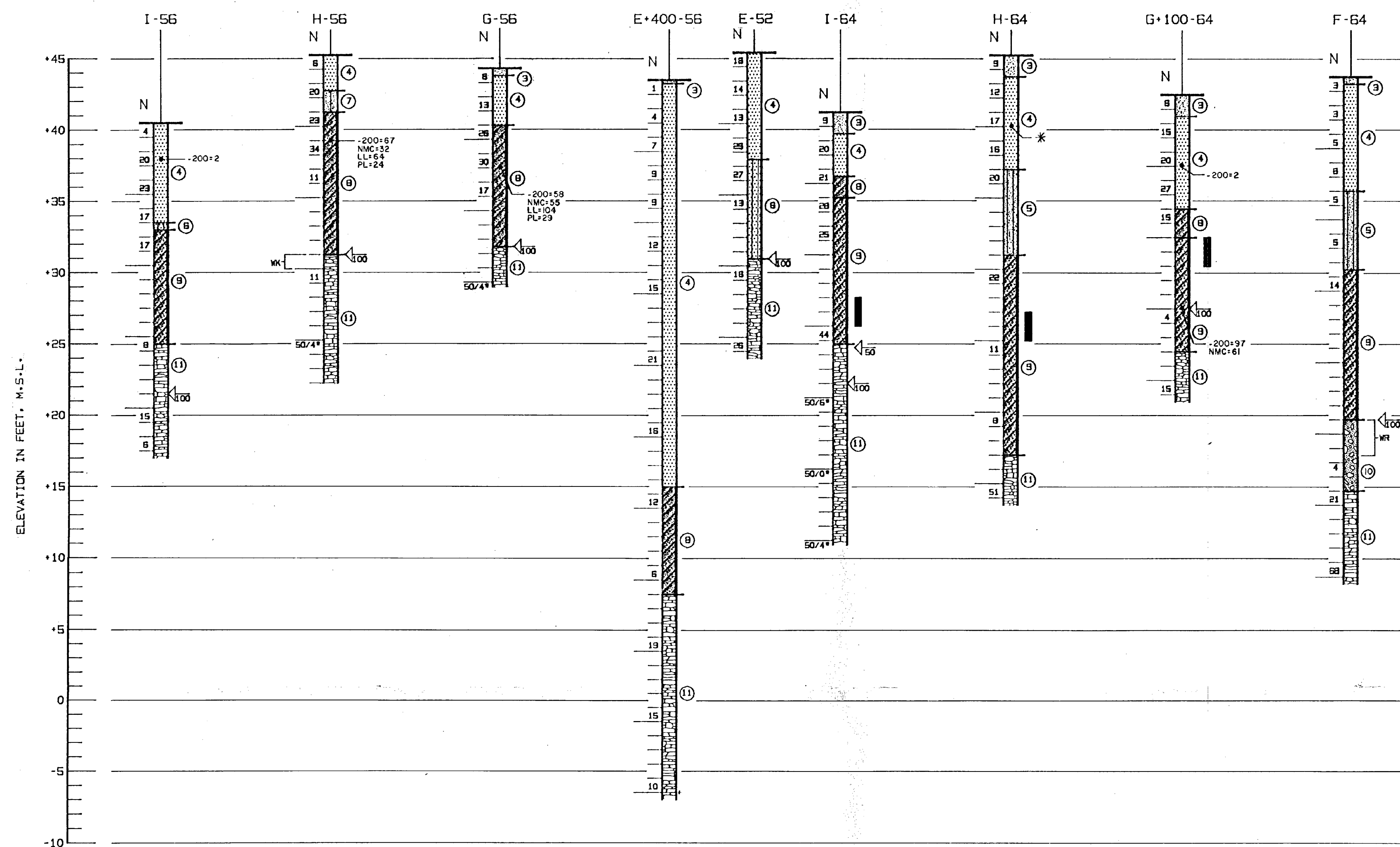


LEGEND

- | | |
|---|---|
| ① Black organic debris - MUCK (PT) | SP Unified Soil Classification group symbol as determined by visual examination |
| ② Dark gray to black silty to sandy CLAY (CL/CH) | N "N" value in blows/foot |
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| ⑤ Dark brown slightly silty fine SAND to silty fine SAND (SP-SM/SM) | WK Fell under weight of rod & kelly |
| ⑥ Brown to orange-brown silty fine SAND to slightly clayey fine SAND (SM/SP-SC) | WH Fell under weight of rod & hammer |
| ⑦ Gray clayey SAND (SC) | WR Fell under weight of rod |
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| ⑪ White to light gray weathered LIMESTONE | PL Plastic Limit (%) |
| | © Consolidation test performed |
| | Kv Coefficient of Vertical Permeability (cm/sec) |
| | Shelby tube sample location |
| | * Grain Size Analysis performed, see appendices |
| | RW Rotary Wash |

FIELD: RBH/TRF/MDZ	DATE	BY	REVISION
DRAWN: KFB/JTS			
CHKD: MDZ			
APPVD: RAM			
HORIZ. SCALE: 1"=5'			
VERT. SCALE: 1"=5'			

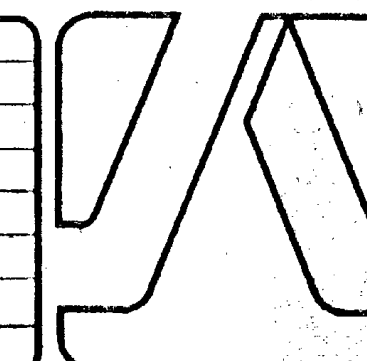
GEOTECHNICAL / HYDROGEOLOGIC STUDY		
PROPOSED PASCO COUNTY LANDFILL - HAYS ROAD SITE		
PASCO COUNTY, FLORIDA		
JAMMAL & ASSOCIATES, INC. Consulting Engineers		
DATE: AUG. 86	PROJ. NO: 85-30267	SHEET 10 OF 13

LEGEND

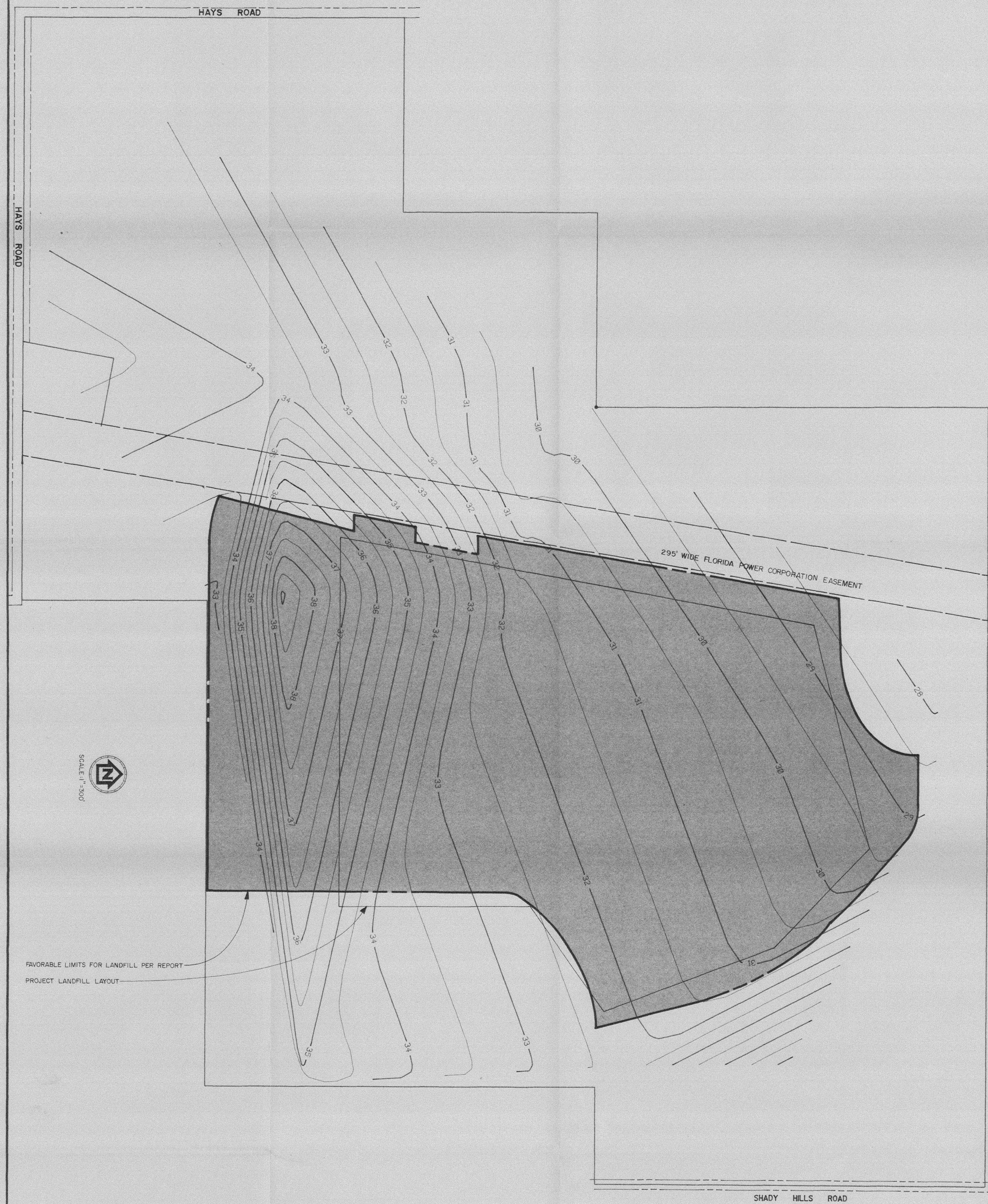
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 WR Fell under weight of rod
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 NMC Natural Moisture Content (%)
 LL Liquid Limit (%)
 PL Plastic Limit (%)
 ⊙ Consolidation test performed
 k_v Coefficient of Vertical Permeability (cm/sec)
 ■ Shelby tube sample location
 * Grain Size Analysis performed, see appendices
 RW Rotary Wash

FIELD: RBH/TRF/MDZ
 DRAWN: KFB/JTS
 CHKD: MDZ
 APPVD: RAM
 HORIZ. SCALE: —
 VERT. SCALE: 1" = 5'

DATE	BY	REVISION



GEOTECHNICAL / HYDROGEOLOGIC STUDY
 PROPOSED PASCO COUNTY LANDFILL - HAYS ROAD SITE
 PASCO COUNTY, FLORIDA
JAMMAL & ASSOCIATES, INC. Consulting Engineers
 DATE: AUG. 86 PROJ. NO: 85-30267 SHEET 11 OF 13



GROUNDWATER CONTOURS - DATE: 11/13/86

NOTE: This contour map was prepared by CDM using our data.

PROJECT NO. 65-30267	SHEET NO. SHEET 13 OF 13		GEO TECHNICAL / HYDROGEOLOGIC STUDY		CAMP DRESSER & MCKEE INC.		DESIGNED BY _____		REV NO	DATE	DRWN	CHKD	REMARKS
			PROPOSED PASCO COUNTY LANDFILL - HAYS ROAD SITE		PASCO COUNTY, FLORIDA		CHECKED BY _____						
JAMMAL & ASSOCIATES, INC. Consulting Engineers			DATE: DEC. 86		PROJ. NO.: 85-30267		APPROVED BY _____						
			SHEET 13 OF 13		environmental engineers, scientists, planners & management consultants		CDM						

LEGEND

5-7" ▲ Approximate total settlement estimate range (inches) under proposed landfill heights

— 130 — Proposed landfill contour (+ FT. M.S.L.)

— — — Limits of favorable area for landfill

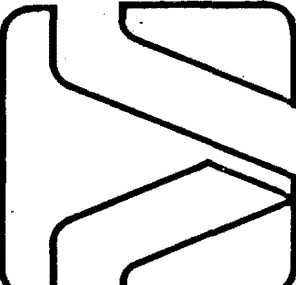
— — — Property border

NOTE: Plan layout prepared by CDM.

295' WIDE FLORIDA POWER CORPORATION EASEMENT

FIELD:	—
DRAWN:	STB
CHECKED:	KFB
APPROVED:	RAM
HORIZ. SCALE:	1" = 300'
VERT. SCALE:	—

DATE	BY	REVISION

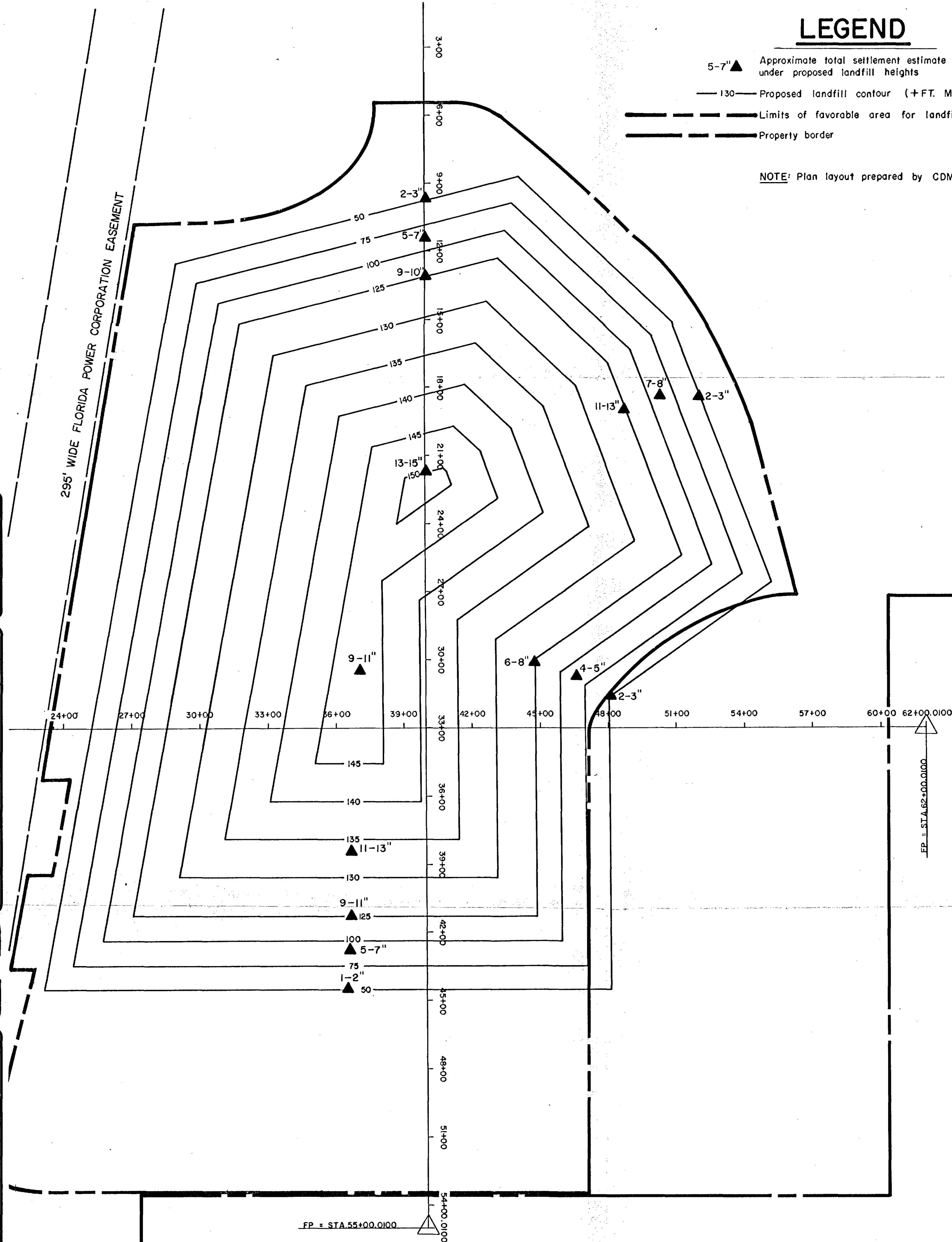


DATE: DEC. 86
 PROJ. NO.: 85-30267
 SHEET 1 OF 1

JAMMAL & ASSOCIATES, INC.
 Consulting Engineers

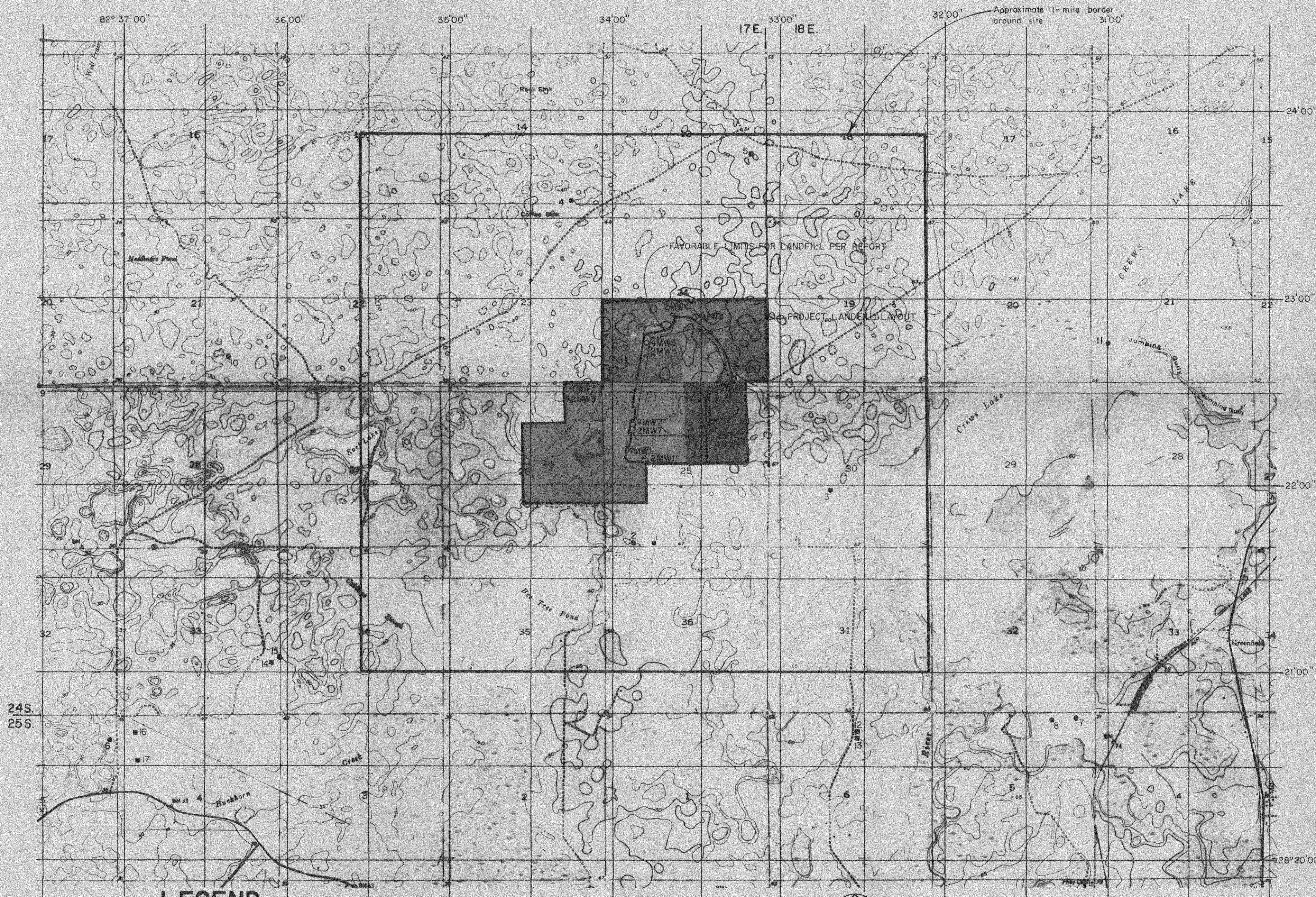
PROPOSED PASCO COUNTY LANDFILL - HAYS ROAD SITE
 PASCO COUNTY, FLORIDA

GEOTECHNICAL / HYDROGEOLOGIC STUDY



PROPOSED LANDFILL SITE PLAN/ SETTLEMENT ANALYSIS RESULTS





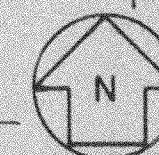
LEGEND

- USGS Well
- SWFWMD CUPS Well
- △ Existing Deep Groundwater Monitoring Well
- ▲ Existing Shallow Groundwater Monitoring Well
- Proposed Deep Groundwater Monitoring Well (100ft. from Landfill Toe)
- Proposed Shallow Groundwater Monitoring Well (100ft. from Landfill Toe)

WELL INVENTORY MAP

FIELD:	—
DRAWN:	STB
CHKD:	KFB
APPVD:	RAM
HORIZ. SCALE:	1" = 2000'
VERT. SCALE:	—

DATE	BY	REVISION



REFERENCE: USGS Quadrangle Map
 "Fivay Junction" 1954
 "Port Richey NE" 1954
 T.24S. R.17E Sections 24, 25 and 26

GEOTECHNICAL / HYDROGEOLOGIC STUDY

PROPOSED PASCO COUNTY LANDFILL - HAYS ROAD SITE

PASCO COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

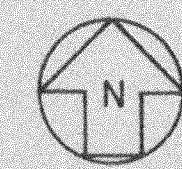
DATE: DEC. 86 PROJ. NO. 86-30267

SHEET 1 OF 3



LEGEND

- USGS Well
- SWFWMD CUPS Well
- △ Existing Deep Groundwater Monitoring Well
- ▲ Existing Shallow Groundwater Monitoring Well
- Proposed Deep Groundwater Monitoring Well
- Proposed Shallow Groundwater Monitoring Well



SCALE: 1"=1000'

PROJECT NO.
85-30267

SHEET NO.
SHEET 2 OF 3

PROPOSED PASCO COUNTY LANDFILL - HAYS ROAD SITE
PASCO COUNTY, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers
DATE: DEC. 86

PROJ. NO.: 85-30267

SHEET 2 OF 3

CAMP DRESSER & MCKEE INC.

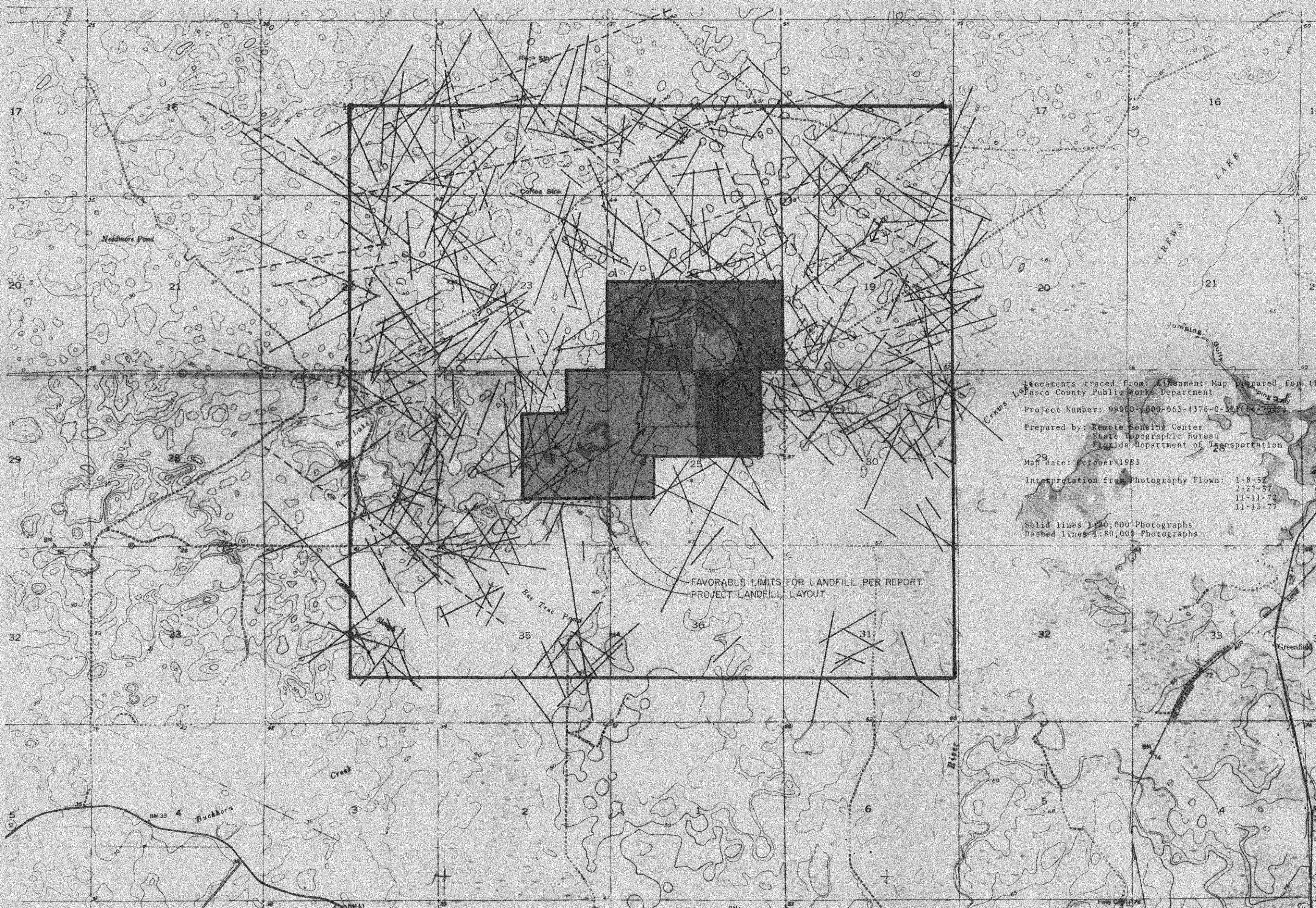
DESIGNED BY
DRAWN BY
CHECKED BY
APPROVED BY

DATE

CDM

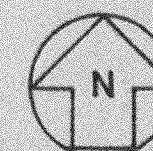
AMERICAN OVERSEAS CONSTRUCTION CORPORATION
A Division of CDM Limited

DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY	DATE
NEW	DATE	DEAN	CARD	REVISION



Lineaments traced from: Lineament Map prepared for the
Pasco County Public Works Department
Project Number: 99900-1000-063-4376-0-311(84-7873)
Prepared by: Remote Sensing Center
State Topographic Bureau
Florida Department of Transportation
Map date: October 1983
Interpretation from Photography Flown: 1-8-57
2-27-57
11-11-72
11-13-77
Solid lines 1:40,000 Photographs
Dashed lines 1:80,000 Photographs

FRACTURE TRACE/LINEAMENT MAP



REFERENCE: USGS Quadrangle Map
"Fivay Junction" 1954
"Port Richey NE" 1954
T.24S. R.17E Sections 24, 25 and 26

FIELD: —
DRAWN: KFB
CHKD: KFB
APPVD: RAM
HORIZ. SCALE 1"=2000'
VERT. SCALE —

DATE	BY	REVISION



GEOTECHNICAL / HYDROGEOLOGIC STUDY		
PROPOSED PASCO COUNTY LANDFILL - HAYS ROAD SITE		
PASCO COUNTY, FLORIDA		
JAMMAL & ASSOCIATES, INC. Consulting Engineers		
DATE: DEC. 86	PROJ. NO: 85-30267	SHEET 3 OF 3