HARDEE POWER STATION

SITE CERTIFICATION APPLICATION/ ENVIRONMENTAL ASSESSMENT

VOLUME 2

APPENDICES

SUBMITTED BY:

TECO POWER SERVICES

TAMPA ELECTRIC COMPANY

SEMINOLE ELECTRIC COOPERATIVE, INC.

HARDEE POWER STATION

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11.1 STATE AND FEDERAL PERMIT APPLICATIONS

11.1.1 NPDES APPLICATION/PERMIT

Please print or type in the unshaded areas only
(fill—in areas are spaced for elite type, i.e., 12 characters/inch).

Form Approved. OMB No. 2040-0086 Approval expires 7-31-88

FORM 1 GENERAL

U.S. ENVIRONMENTAL PROTECTION AGENCY

GENERAL INFORMATION

Consolidated Permits Program

(Read the "General Instructions" before starting.)

I. EPA I.D. NUMBER

S F | T/A | C D

LABEL ITEMS

I. EPA I.D. NUMBER

II. FACILITY NAME

III. FACILITY MAILING ADDRESS

IV. FACILITY LOCATION

PLEASE PLACE LABEL IN THIS SPACE

GENERAL INSTRUCTIONS

If a preprinted label has been provided, affix it in the designated space. Review the information carefully; if any of it is incorrect, cross through it and enter the correct data in the appropriate fill—in area below. Also, if any of the preprinted data is absent *(the area to the left of the label space lists the information that should appear)*, please provide it in the proper fill—in area*(s)* below. If the label is complete and correct, you need not complete Items I, III, V, and VI *(except VI-B which must be completed regardless)*. Complete all items if no label has been provided. Refer to the instructions for detailed item descriptions and for the legal authorizations under which this data is collected.

II. POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of bold—faced terms.

SPECIFIC QUESTIONS	MARK 'X' YES	NO	FORM ATTACHED
A. Is this facility a **publicly owned treatment works** which results in a **discharge** to **waters of the U.S.**? (FORM 2A)		X	
B. Does or will this facility *(either existing or proposed)* include a **concentrated animal feeding operation** or **aquatic animal production facility** which results in a **discharge** to **waters of the U.S.**? (FORM 2B)		X	
C. Is this a facility which currently results in **discharges** to **waters of the U.S.** other than those described in A or B above? (FORM 2C)		X	
D. Is this a proposed facility *(other than those described in A or B above)* which will result in a **discharge** to **waters of the U.S.**? (FORM 2D)	X		X
E. Does or will this facility treat, store, or dispose of **hazardous wastes**? (FORM 3)		X	
F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4)		X	
G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4)		X	
H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4)		X	
I. Is this facility a proposed **stationary source** which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an **attainment area**? (FORM 5)		X	
J. Is this facility a proposed **stationary source** which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an **attainment area**? (FORM 5)	X		X+

III. NAME OF FACILITY

1 SKIP: HARDEE POWER STATION-TECO POWER SERVICES

IV. FACILITY CONTACT

A. NAME & TITLE *(last, first, & title)*	B. PHONE *(area code & no.)*
2 JERRY L WILLIAMS, DIRECTOR ENV*	813 228 4111

V. FACILITY MAILING ADDRESS

A. STREET OR P.O. BOX

3 702 N FRANKLIN STREET

B. CITY OR TOWN	C. STATE	D. ZIP CODE
4 TAMPA	FL	33602

VI. FACILITY LOCATION

A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER

5 COUNTY ROAD 663

B. COUNTY NAME

RDEE

C. CITY OR TOWN	D. STATE	E. ZIP CODE	F. COUNTY CODE *(if known)*
6 FORT GREEN	FL	33834	

EPA Form 3510-1 (Rev. 10-80)

+ See Section 11.1.4 of SCA/EA for PSD application.

* See attached authorization form.

CONTINUE ON REVERSE

CONTINUED FROM THE FRONT

VII. SIC CODES (4-digit, in order of priority)

A. FIRST	B. SECOND
7 4911 (specify) Electric Generation	7 (specify)
C. THIRD	**D. FOURTH**
(specify)	7 (specify)

VIII. OPERATOR INFORMATION

A. NAME

8 TECO POWER SERVICES CORP

B. Is the name listed in Item VIII-A also the owner? ☐ YES ☐ NO (66) *

C. STATUS OF OPERATOR (Enter the appropriate letter into the answer box; if "Other", specify.)

F = FEDERAL; S = STATE; P = PRIVATE; M = PUBLIC (other than federal or state); O = OTHER (specify)

P (56) (specify)

D. PHONE (area code & no.)

A 813 228 4111

E. STREET OR P.O. BOX

702 N FRANKLIN STREET

F. CITY OR TOWN

B TAMPA

G. STATE FL

H. ZIP CODE 33602

IX. INDIAN LAND

Is the facility located on Indian lands? ☐ YES ☒ NO (52)

X. EXISTING ENVIRONMENTAL PERMITS

A. NPDES (Discharges to Surface Water)	D. PSD (Air Emissions from Proposed Sources)	
9 N NONE	9 P NONE	
B. UIC (Underground Injection of Fluids)	**E. OTHER** (specify)	(specify)
9 U NONE	9 NONE	
C. RCRA (Hazardous Wastes)	**E. OTHER** (specify)	(specify)
9 R NONE	9 NONE	

XI. MAP

Attach to this application a topographic map of the area extending to at least one mile beyond property bounderies. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface water bodies in the map area. See instructions for precise requirements.

XII. NATURE OF BUSINESS (provide a brief description)

Proposed 660 MW Combined Cycle Electric Generating Facility.
See Section 3.0 of the SCA/EA for project description, including information regarding the cooling reservoir construction and operation.

XIII. CERTIFICATION (see instructions)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME & OFFICIAL TITLE (type or print)	B. SIGNATURE	C. DATE SIGNED
Richard E. Ludwig President, TECO Power Services Corp.		7/26/89

COMMENTS FOR OFFICIAL USE ONLY

C

* See Section 1.0 of SCA/EA for project ownership description.

☆ U.S. Government Printing Office : 1985 - 486-785/32991

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EPA ID Number *(copy from Item 1 of Form 1)*

Form Approved
OMB No. 2040-0086
Approval expires 7-31-88

Form 2D NPDES

EPA New Sources and New Dischargers Application for Permit to Discharge Process Wastewater

I. Outfall Location

For each outfall, list the latitude and longitude, and the name of the receiving water.

Outfall Number *(list)*	Latitude			Longitude			Receiving Water *(name)*
	Deg	Min	Sec	Deg	Min	Sec	
001	27	39	00	81	58	45	Payne Creek
002	27	38	00	81	58	15	Payne Creek

II. Discharge Date *(When do you expect to begin discharging?)*

III. Flows, Sources of Pollution, and Treatment Technologies

A. For each outfall, provide a description of (1) All operations contributing wastewater to the effluent, including process wastewater, sanitary wastewater, cooling water, and stormwater runoff; (2) The average flow contributed by each operation; and (3) The treatment received by the wastewater. Continue on additional sheets if necessary. (See attached outfall descriptions)

Outfall Number	1. Operations Contributing Flow *(list)*	2. Average Flow *(include units)*	3. Treatment *(Description or List Codes from Table 2D-1)*
001	Recirculation Cooling		
	Reservoir with makeup from		
	the following sources:		
	• Rainfall	2,267,000 gpd	---
	• Well water	2,372,000 gpd	---
	• Surface runoff	187,000 gpd	---
	• Seepage	375,000 gpd	---
	• Demineralization		
	Regeneration		
	Basin Effluent	57,000 gpd	Neutralization & Sedmentation
			(2-K & 1-U)
	• Oil Separator Effluent	35,000 gpd	Oil Flotation (1-H)
	• Sanitary Effluent	6,000 gpd	Biological Treatment (3-A)
			Sedimentation (1-U)
			Chlorine Disinfection (2-F)
	Continued on next page.		

Please type or print in the unshaded areas only

EPA ID Number *(copy from Item 1 of Form 1)*

Form Approved
OMB No 2040-0086
Approval expires 7-31-88

Form 2D NPDES

New Sources and New Dischargers
Application for Permit to Discharge Process Wastewater

I. Outfall Location

For each outfall, list the latitude and longitude, and the name of the receiving water.

Outfall Number *(list)*	Latitude			Longitude			Receiving Water *(name)*
	Deg	Min	Sec	Deg	Min	Sec	

II. Discharge Date *(When do you expect to begin discharging?)*

III. Flows, Sources of Pollution, and Treatment Technologies

A. For each outfall, provide a description of (1) All operations contributing wastewater to the effluent, including process wastewater, sanitary wastewater, cooling water, and stormwater runoff; (2) The average flow contributed by each operation; and (3) The treatment received by the wastewater. Continue on additional sheets if necessary. (See attached outfall descriptions)

Outfall Number	1. Operations Contributing Flow *(list)*	2. Average Flow *(include units)*	3. Treatment *(Description or List Codes from Table 2D-1)*
	• Plant Service Water		
	Pretreatment System		
	Backwash	31,000 gpd	---
	• Temporary Construction Dewatering	1,102,000 gpd	Sedimentation (1-U)
002	Plant Site Stormwater		
	Retention Pond Discharge	36,000 gpd	Sedimentation (1-U)
	Including Temporary		
	Construction Dewatering	526,000 gpd	Sedimentation (1-U)

Please type or print in the unshaded areas only

EPA ID Number *(copy from Item 1 of Form 1)*

Form Approved
OMB No. 2040-0086
Approval expires 7-31-88

Form 2D NPDES

EPA New Sources and New Dischargers Application for Permit to Discharge Process Wastewater

I. Outfall Location

For each outfall, list the latitude and longitude, and the name of the receiving water.

Outfall Number *(list)*	Latitude			Longitude			Receiving Water *(name)*
	Deg	Min	Sec	Deg	Min	Sec	

II. Discharge Date *(When do you expect to begin discharging?)*

III. Flows, Sources of Pollution, and Treatment Technologies

A. For each outfall, provide a description of (1) All operations contributing wastewater to the effluent, including process wastewater, sanitary wastewater, cooling water, and stormwater runoff; (2) The average flow contributed by each operation; and (3) The treatment received by the wastewater. Continue on additional sheets if necessary. (See attached outfall descriptions)

Outfall Number	1. Operations Contributing Flow *(list)*	2. Average Flow *(include units)*	3. Treatment *(Description or List Codes from Table 2D-1)*
	• Plant Service Water		
	Pretreatment System		
	Backwash	31,000 gpd	---
002	Plant Site Stormwater		
	Retention Pond Discharge	36,000 gpd	Sedimentation (1-U)

Outfall Descriptions

Outfall #001

Outfall #001 is an emergency overflow from the 570 acre recirculating cooling reservoir to be constructed as part of the 660 MW combined cycle power plant. This recirculating cooling reservoir will function as water supply for use in condenser cooling and heating dissipation system for the Heat Recovery Steam Generator portion of the combined cycle plant.

Water makeup to the reservoir includes: rainfall onto the reservoir; surface runoff and surficial aquifer seepage from the upland basin; treated sanitary and plant wastewaters discharged to the reservoir; and makeup water pumped from the lower Floridan Aquifer wells. The reservoir will also receive discharge from temporary construction dewatering activities during plant construction. This water will be similar in quality to surficial aquifer quality. Water flows out of the reservoir include: evaporation; lateral seepage through the confining berm into the surficial aquifer; leekance down through the confining layers into deeper confined aquifers; and discharges to Payne Creek.

Based on long term water balance modeling (51 years of data analysis) and HEC-1 hydraulic modeling, the proposed cooling reservoir will only discharge in cases caused by extreme or cumulative rainfall in excess of the 10- year 24-hour hydrologic event, where unavoidable to prevent loss of life, severe property damage, or damage to the physical integrity of the cooling reservoir or its structures.

Outfall #002

Outfall #002 is the overflow discharge from the plant site stormwater retention pond. This stormwater pond has been designed to meet all applicable Southwest Florida Water Management District and Florida Department of Environmental Regulation stormwater quantity and quality control requirements. Specifically, the pond will provide retention with filtration for runoff from the first 1 inch of rainfall, and post development peak flows will not exceed pre-development peak flows for the 25 year - 24 hour rainfall storm.

The pond will also receive discharge from temporary construction dewatering activities during construction. After removal of suspended materials through sedimentation, this water will be similar in quality to surficial aquifer water quality.

Given the proposed fuels for the proposed combined cycle plant (i.e., gas or oil), no fuel related stormwaters (e.g., coal pile runoff) will be directed to this pond. Influent plant site stormwater is expected to be similar to stormwater from other light industrial sites.

B. Attach a line drawing showing the water flow through the facility. Indicate sources of intake water, operations contributing wastewater to the effluent, and treatment units labeled to correspond to the more detailed descriptions in Item III-A. Construct a water balance on the line drawing by showing average flows between intakes, operations, treatment units, and outfalls. If a water balance cannot be determined (e.g., for certain mining activities), provide a pictorial description of the nature and amount of any sources of water and any collection or treatment measures. Water Balance attached.

C. Except for storm runoff, leaks, or spills, will any of the discharges described in item III-A be intermittent or seasonal?

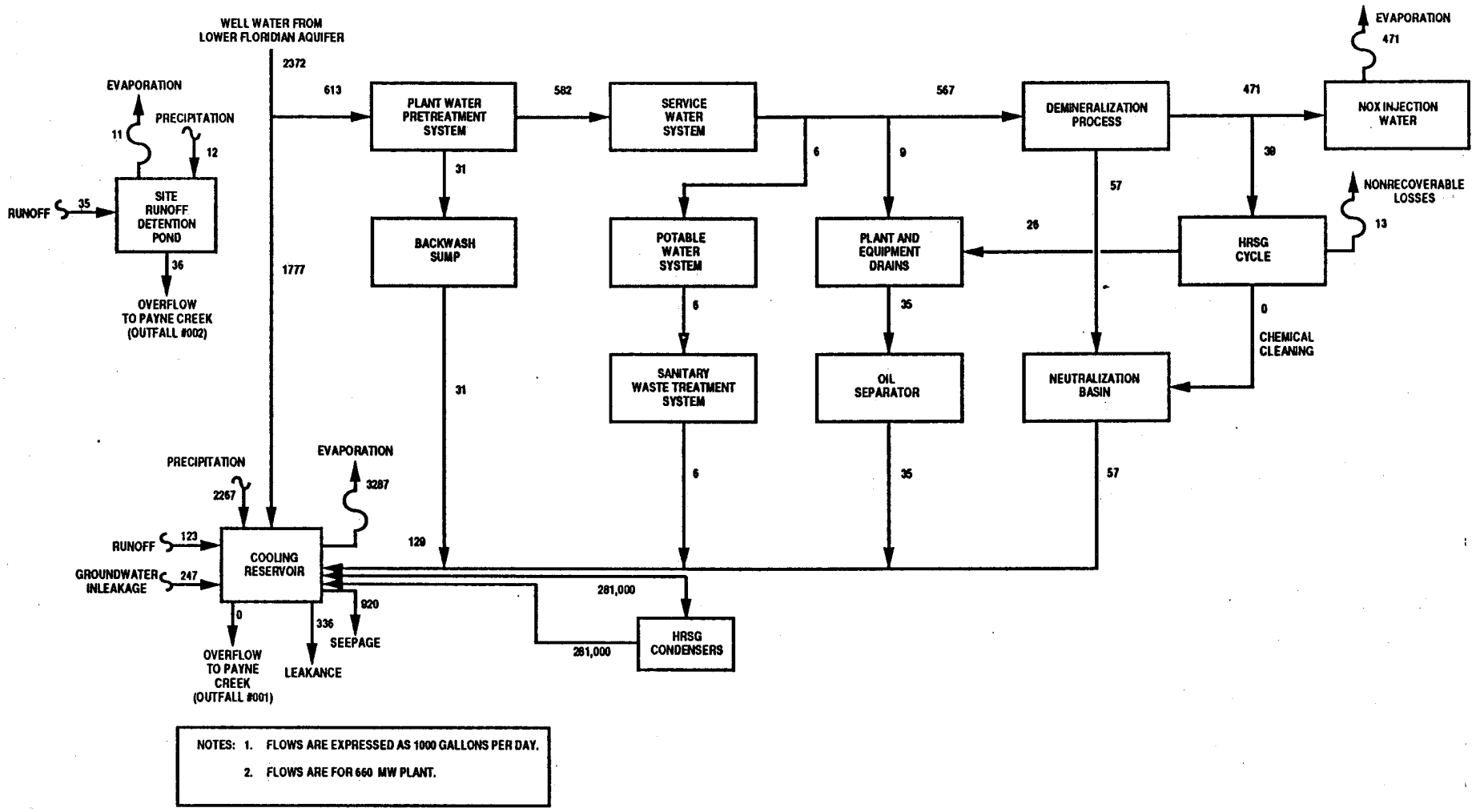
☒ Yes *(complete the following table)* ☐ No *(go to item IV)*

Outfall Number	1. Frequency		2. Flow		
	a. Days Per Week *(specify average)*	b. Months Per Year *(specify average)*	a. Maximum Daily Flow Rate *(in mgd)*	b. Maximum Total Volume *(specify with units)*	c. Duration *(in days)*
001 - Cooling reservoir	Cooling reservoir will will only discharge due to extreme or cummulative rainfall in excess of the 10-year 24-hour storm, where unavoidable to prevent loss of life, severe property damage, or damage to the physical integnity of the cooling reservoir or its structures.		0.213 MGD (see note 1)	2.3 acre-feet	7 days (see note 1)
			Note 1: Flow estimates are based on the 25-year 24-hour rainfall.		
002 - Stormwater Retention Pond Including Temporary Construction Dewatering	Temporary Activity During Construction; 7 Days per Week for 6 Months during Construction		0.526 MGD	291 acre-ft	180 days during construction

IV. Production

If there is an applicable production-based effluent guideline or NSPS, for each outfall list the estimated level of production (projection of actual production level, not design), expressed in the terms and units used in the applicable effluent guideline or NSPS, for each of the first 3 years of operation. If production is likely to vary, you may also submit alternative estimates (attach a separate sheet).

Year	a. Quantity Per Day	b. Units of Measure	c. Operation, Product, Material, etc *(specify)*



NOTES: 1. FLOWS ARE EXPRESSED AS 1000 GALLONS PER DAY.

2. FLOWS ARE FOR 660 MW PLANT.

WATER MASS BALANCE:
ANNUAL AVERAGE MAKEUP

Hardee Power Station

Rev. 2 10/30/89

CONTINUED FROM THE FRONT	EPA ID Number *(copy from Item 1 of Form 1)*	Outfall Number 001 & 002

V. Effluent Characteristics

A, and B: These items require you to report estimated amounts *(both concentration and mass)* of the pollutants to be discharged from each of your outfalls. Each part of this item addresses a different set of pollutants and should be completed in accordance with the specific instructions for that part. Data for each outfall should be on a separate page. Attach additional sheets of paper if necessary.

General Instructions *(See table 2D-2 for Pollutants)*

Each part of this item requests you to provide an estimated daily maximum and average for certain pollutants and the source of information. Data for all pollutants in Group A, for all outfalls, must be submitted unless waived by the permitting authority. For all outfalls, data for pollutants in Group B should be reported only for pollutants which you believe will be present or are limited directly by an effluent limitations guideline or NSPS or indirectly through limitations on an indicator pollutant.

1. Pollutant	2. Maximum Daily Value *(include units)*	3. Average Daily Value *(include units)*	4. Source *(see instructions)*
See Table V-1 for Outfall	#001		
See Table V-2 for Outfall	#002		

Table V-1. Estimated Cooling Reservoir Discharge (Outfall #001) Effluent Water Quality (Page 1 of 2)

Parameter	Cooling Reservoir Discharge (Outfall #001) Quality[1]	Source
Biochemical Oxygen Demand (5-day), mg/L	<5	See note 2
Chemical Oxygen Demand, mg/L	<40	
Total Organic Carbon, mg/L	NA	
Total Suspended Solids, mg/L	<25	
Flow, cfs see note	3	
Ammonia Nitrogen, mg/L	0.4	
Temperature, maximum summer, °C	35	
Temperature, average summer, °C	32	
Temperature, maximum winter, °C	23	
Temperature, average winter, °C	18	
pH, units	6-9	
Calcium, mg/L as CaCO3	240	
Magnesium, mg/L as CaCO3	100	
Sodium, mg/L as CaCO3	200	
Potassium, mg/L as CaCO3	16	
Total Hardness, mg/L as CaCO3	340	
Alkalinity, mg/L as CaCO3	260	
Sulfate, mg/L as CaCO3	250	
Chloride, mg/L as CaCO3	50	
Silca, mg/L	60	
Fluoride, mg/L	4.1	
Cyanide, mg/L	0.01	
MBAS, mg/L	0.36	
Oil and Grease, mg/L	<5	
Turbidity, NTU	31	
Total Dissolved Solids, mg/L	860	
Specific Conductivity, umhos/cm	1080	
Total Kjeldahl Nitrogen, mg/L	0.9	
Unionized Ammonia, mg/L (4)	0.014	
Organic Nitrogen, mg/L	0.4	
Nitrate+Nitrite-Nitrogen, mg/L	0.1	
Total Nitrogen, mg/L	1.0	
Orthophosphorus, mg/L	0.5	
Total Phosphorus, mg/L	0.8	

Table V-1. Estimated Cooling Reservoir Discharge (Outfall #001) Effluent Water Quality (Page 2 of 2)

Parameter	Cooling Reservoir Discharge (Outfall #001) Quality[1]	Source
Arsenic, ug/L	20	See note 2
Barium, ug/L	150	
Beryllium, ug/L	4.0	
Cadmium, ug/L	2.6	
Chromium, ug/L	28	
Copper, ug/L	27	
Iron, ug/L	980	
Lead, ug/L	29	
Manganese, ug/L	47	
Mercury, ug/L	0.5	
Nickel, ug/L	49	
Selenium, ug/L	32	
Silver, ug/L	0.8	
Strontium, ug/L	610	
Zinc, ug/L	280	
Alpha, Gross (pC/L)	22.2	
Radium 226 (pC/L)	6.2	

Note:
1. Reservoir effluent estimates are based on mass balances and do not take into account any chemical reaction, precipitation, sedimentation, deposition or biological activity which may occur in the reservoir and act to remove material from the water column and thus reduce reservoir concentrations. Estimated values are average values unless otherwise noted.

2. All parameter concentrations were estimated based on engineering studies (Source Code 1) and Best Professional Estimates (Source Code 4).

3. Discharge will only occur in cases caused by extreme or cumulative rainfall in excess of the 10-year 24-hour hydrologic event, where unavoidable to prevent loss of life, severe property damage, or damage to the physical integrity of the cooling reservoir or its structures.

4. Unionized ammonia concentrations are based on a worst case reservoir water temperature of 95°F (35°C).

Table V-2. Estimated Stormwater Detention Pond Discharge (Outfall #002) Water Quality
(Page 1 of 2)

Parameter	Stormwater Detention Pond Discharge (Outfall #002) Quality	Source
Biochemical Oxygen Demand (5-day), mg/L	<5	
Chemical Oxygen Demand, mg/L	<50	
Total Organic Carbon, mg/L	NA	
Total Suspended Solids, mg/L	<25	
Ammonia N, mg/L	0.5	
Flow, gallons/day	36,000	
Temperature, Average Winter, °C	18	
Temperature, Average Summer, °C	32	
pH	6-9	
Calcium, mg/L as CaCO3	63	See note 1
Magnesium, mg/L as CaCO3	39	
Sodium, mg/L as CaCO3	17	
Potassium, mg/L as CaCO3	0	
Alkalinity, mg/L as CaCO3	61	
Sulfate, mg/L as CaCO3	37	
Chloride, mg/L as CaCO3	21	
Silca, mg/L	5.4	
Fluoride, mg/L	1.0	
Cyanide, mg/L	<0.004	
Methylene Blue Active Substances, mg/L	0.040	
Oil and Grease, mg/L	<5	

Table V-2. Estimated Stormwater Detention Pond Discharge (Outfall #002) Water Quality
(Page 2 of 2)

Parameter	Stormwater Detention Pond Discharge (Outfall #002) Quality	Source
pH, units	7	See note 1
Total Dissolved Solids, mg/L	190	
Specific Conductivity, umhos/cm	173	
Total Kjeldahl Nitrogen, mg/L	0.74	
Ammonia Nitrogen, mg/L	0.11	
Orgainic Nitrogen, mg/L	0.65	
Nitrate+Nitrite-Nitrogen, mg/L	0.50	
Total Nitrogen, mg/L	1.24	
Orthophosphorus, mg/L	0.41	
Total Phosphorus, mg/L	0.44	
Arsenic, ug/L	<5	
Barium, ug/L	<10	
Beryllium, ug/L	<3	
Cadmium, ug/L	<0.4	
Chromium, ug/L	<10	
Copper, ug/L	7	
Iron, ug/L	293	
Lead, ug/L	6.1	
Manganese, mg/L	7.9	
Mercury, ug/L	0.24	
Nickel, ug/L	16	
Selenium, ug/L	<5	
Silver, ug/L	<0.08	
Strontium, ug/L	100	
Zinc, ug/L	7.4	
Alpha, Gross (pC/L)	1.7	
Radium 226 (pC/L)	0.7	

Note: 1. All parameter concentrations were estimated based on engineering studies of Payne Creek water quality (Source Code 1) and Best Professional Estimates (Source Code 4).

CONTINUED FROM THE FRONT	EPA ID Number *(copy from Item 1 of Form 1)*	

C. Use the space below to list any of the pollutants listed in Table 2D-3 of the instructions which you know or have reason to believe will be discharged from any outfall. For every pollutant you list, briefly describe the reasons you believe it will be present.

1. Pollutant	2. Reason for Discharge
Outfall #001 Strontium	Trace amounts of naturally occuring strontium have been detected in upland surface runoff (100/ug/L) and Lower Floridan aquifer well makeup water (300 ug/L). Therefore, similar trace levels can be expected in the recirculation cooling reservoir. No strontium will be used in the operation of the proposed combined cycle power plant.

VI. Engineering Report on Wastewater Treatment

A. If there is any technical evaluation concerning your wastewater treatment, including engineering reports or pilot plant studies, check the appropriate box below.

☒ Report Available ☐ No Report

Engineering studies and evaluations are included as part of the Site Certification Application to the State of Florida.

B. Provide the name and location of any existing plant(s) which, to the best of your knowledge, resembles this production facility with respect to production processes, wastewater constituents, or wastewater treatments.

Name	Location
No power plant cooling reservoirs have been built on reclaimed phoshate mines.	

EPA ID Number *(copy from item one of Form 1)*

VII. Other Information *(Optional)*

Use the space below to expand upon any of the above questions or to bring to the attention of the reviewer any other information you feel should be considered in establishing permit limitations for the proposed facility. Attach additional sheets if necessary.

VIII. Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

A. Name and Official Title *(type or print)*	B. Phone No.
Richard E. Ludwig President, TECO Power Services Corp.	(813) 228-4111
C. Signature	D. Date Signed
R E Ludwig	7/26/89

TECO
POWER SERVICES
A TECO ENERGY COMPANY

TO WHOM IT MAY CONCERN:

Please be advised that Jerry L. Williams, Director of Environmental for Tampa Electric Company, is the authorized representative of TECO Power Services Corporation concerning matters with which this permit application deals.

Sincerely,

Richard E. Ludwig
President

REL:ams

11.1.2 CONSUMPTIVE USE PERMIT APPLICATION

This application has been prepared for information purposes only as required by FDER Form 17-1.211(1). Refer to Applicant Information in the SCA.

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
CONSUMPTIVE USE PERMIT APPLICATION
2379 Broad Street
Brooksville, Florida 34609-6899

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. Assistance with this application can be obtained by calling (904) 796-7211, Brooksville, Florida; (813) 985-7481, Tampa, Florida; (813) 533-6972, Bartow, Florida or (813) 488-4666, Venice, Florida. There is no permit fee.

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 and address 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 the 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 Refer to Applicant Information in SCA

Address, City, State, Zip Code Telephone w/area code

2. LOCAL CONTACT Refer to Applicant Information in SCA

Address, City, State, Zip Code Telephone w/area code

3. OWNER Refer to Applicant Information in SCA

Address, City, State, Zip Code Telephone w/area code

4. PROPERTY 35 and 36 32S 23E Polk & Hardee
Section(s), Township(s), Range(s) County

Acres: owned _____ leased _____ serviced* _____ total _____

* 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. COMPLETE SUPPLEMENTAL INFORMATION FORM(S): Complete the enclosed form(s) applicable to your water use category: Public Supply, Industrial, Agricultural. Attach as part of this application.

7. CLASSIFICATION OF USE: (Estimate percentages of total supply).

Attractions (public parks, etc.)	____ %
Public Supply	____ %
Essential services (fires, hospitals, etc.)	____ %
Industrial	____ %
Irrigation	____ %
Lawns	____ %
Livestock	____ %
Mining	____ %
Perishable food processing	____ %
Power	100 %
Recreational	____ %
Total	100 %

8. LIST OF ADJACENT PROPERTY OWNERS FOR GROUND WATER WITHDRAWALS:

a. If the total average daily withdrawal (pumpage) for all wells on the property will not exceed 100,000 gallons per day (gpd) and if the withdrawal during any single day for all wells on the property will not exceed 1,000,000 gallons it is not necessary to list adjacent property owners.

b. Complete part c. below if your average daily withdrawal is to exceed 100,000 gpd or if the withdrawal during any single day is to exceed 1,000,000 gallons, and this application is for a (1) new use, (2) modification or renewal of a permit which requests an increase of water withdrawals from what is currently permitted.

c. 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:

Average GPD on an Annual Basis	OR	Maximum GPD During Any Single Day	
More than 100,000 but not more than 500,000		More than 1,000,000 but not more than 5,000,000	All property owners within 660' of the well, or within 100' of your property boundary.
More than 500,000 but not more than 1,000,000		More than 5,000,000 but not more than 10,000,000	All property owners within 1,320' of the well, or within 200' of your property boundary.
More than 1,000,000		More than 10,000,000	All property owners within 2,640' of the well, or within 400' of your property boundary.

Name	Address
CF Industries	P.O. Box 1549, Wauchula, FL 33873
Agrico Chemical Co.,	P.O. Box 110, Mulberry, FL 33860

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 or renewal of a permit which requests an increase of water withdrawals from what is currently permitted.

b. If your withdrawal is from a lake or other impoundment with a surface area of:

80 acres or less	List below all riparian owners on the lake or impoundment.
Over 80 acres	List below all riparian 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:

Not more than 5,000,000 gallons during a single day	List below all riparian owners 660' upstream and 1,320' downstream from your property boundaries at the shoreline.
More than 5,000,000 gallons during a single day	List below all riparian owners 1,320' upstream and 2,640' downstream from your property boundaries at the shoreline.

Name Address

N/A

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 _____

THANK YOU

CONSERVE WATER TODAY FOR TOMORROW

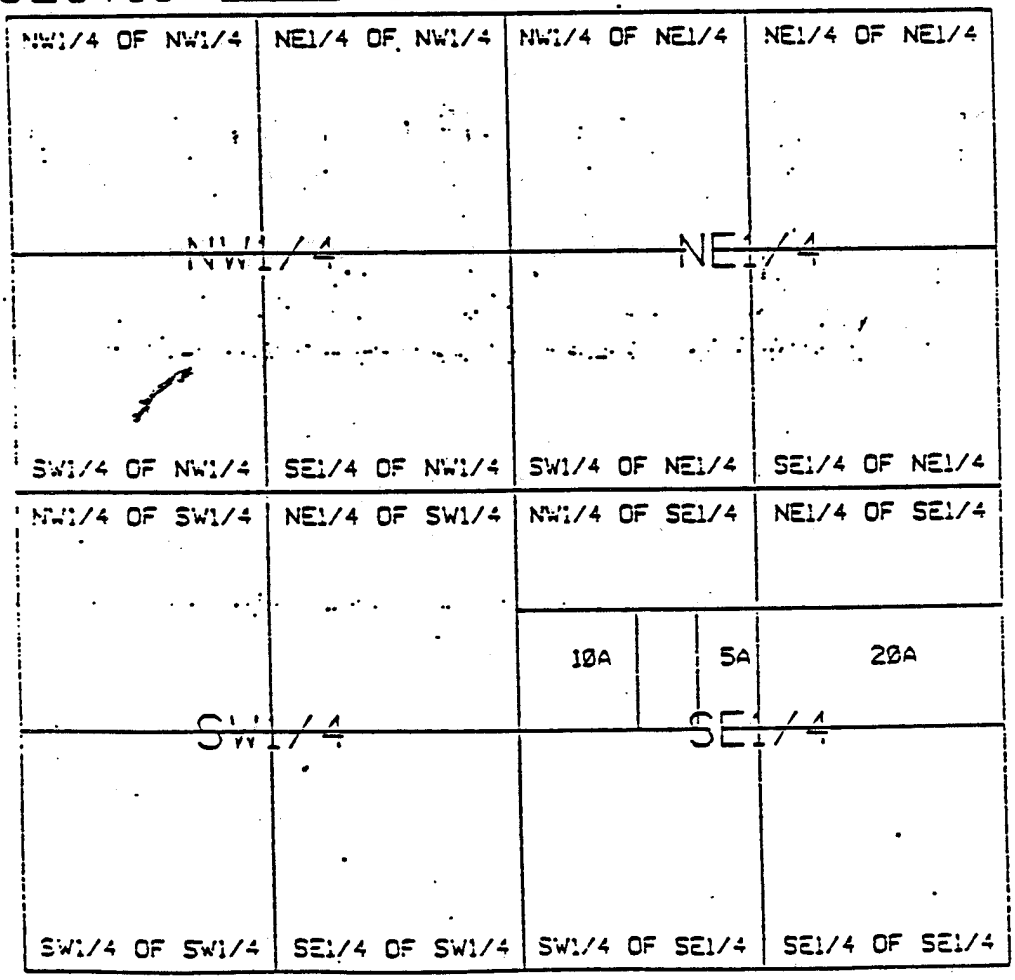
R-10/1/88

PROPERTY LOCATION MAP
ONE SECTION

*See SCA/EA Sections 2.1 for property boundaries and Section 2.3.3 for description of active and inactive wells.

INSTRUCTIONS: THE MAP BELOW REPRESENTS ONE SECTION OF LAND. IF YOUR PROPERTY IS LOCATED ENTIRELY WITHIN ONE SECTION, DRAW THE PROPERTY BOUNDARIES ON THIS MAP. LOCATE ALL WELLS (ACTIVE AND INACTIVE), SURFACE WITHDRAWALS, AND DISCHARGE POINTS, IF APPLICABLE, ON YOUR PROPERTY.

SECTION ____ TOWNSHIP ____ RANGE ____



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 _____
(same as shown on CUP application form)

2. OPERATION The well field will make up water for the cooling water reservoir which
(brief description of operation and product produced)
in turn is used as a heat rejection system for combined cycle electric generating facilities.

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.** See SCA/EA Chapter 3.0 for project description and water balance.

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.** See SCA/EA Section 2.1 for property map and Section 2.3.3-1 for well locations.

5. TOTAL REQUESTED WITHDRAWAL:
average daily (gpd) 3,800,000 maximum daily (gpd) 8,640,000 .

6. WATER SUPPLY: Withdrawal points must agree with those shown on property location map. See Figure 3.2-1 in the SCA

a. GROUND WATER WITHDRAWALS: Include all wells both active and inactive (existing and proposed, standby, capped, etc.). 3 wells proposed - See SCA/EA Section 5.3.2 for impact discussion

Well ID number	Well Dia. size	Well depth casing/total	Beg. W/D Date	Withdrawal (gpd) x 1,000 Pump Cap. (gpm)	average	maximum	Metered Yes/No	Use if more than one, list percent each
	22"	surface to 160'		2,000	3,800	8,640	No	50%
each	18"	160' to 480'		Proposed for full 660 MW				
well	16"	480' to 1300'		build out; 1500 gpm pump capacity				
				will be required for Phase 1-A, the				
				295 MW capacity facility (see SCA/EA				
				Section 3.1 for project description)				

b. SURFACE WITHDRAWALS:

Source Name and Intake Diameter	Beg. W/D Date	Pump Cap. (gpm)	Withdrawal Information average	Withdrawal Information maximum	Metered Yes/No	Use if more than one, list percent each
N/A						

7. WITHDRAWAL DATE: (to be) initiated N/A most recent date of use N/A.

8. PRODUCTION RATE: Presently N/A Projected 3,800,000 gpm as of 1991.
(average daily)

9. SOURCE OF POTABLE WATER SUPPLY well water Daily Work Population: *
* 225 workers for 26-month construction period and approximately 80 workers for operation of 295MW facility.

10. METHOD OF DISPOSAL:

Individual septic tank		%	
Spray irrigation		%	
Percolation and ponding	100	%	Pond acreage: 570 acres
Off-site discharge		%	discharges to: Payne Creek
Total	100	%	

Are there any DER/NPDES discharge permits? yes
Number and type of Permit. one
NPDES/DER permits applied for as part of the SCA/EA Application.

11. LIST OF ADJACENT PROPERTY OWNERS: If applicable, complete Items 8 and/or 9, Pages 2 and 3 of the CUP application form.

Agrico Chemical Co., P. O. Box 110, Mulberry, FL 33860

CF Industries, P.O. Box 1549, Wauchula, FL 33873

11.1.3 JOINT APPLICATION - DEPARTMENT OF THE ARMY/ FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION

JOINT APPLICATION
DEPARTMENT OF THE ARMY/FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
For Activities in the Waters of the State of Florida

CORPS APPLICATION NUMBER (official use only)	DER APPLICATION NUMBER (official use only)

1. APPLICANT'S NAME AND ADDRESS

SEMINOLE ELECTRIC COOPERATIVE
NAME

16313 N. DALE MABRY HIGHWAY
STREET

TAMPA FL 33688-2000
CITY STATE ZIP

TELEPHONE NUMBER (Day) (813) 963-0994 (Night) ( ) Same

2. Name, address, zip code and title of applicant's authorized agent for permit application coordination

W. Micheal Roddy
Seminole Electric Company
16313 N. Dale Mabry Highway
Tampa, FL 33688-2000

Telephone Number 813 / 963-0994

3. NAME OF WATERWAY AT LOCATION OF THE ACTIVITY.

Wetlands with intermittent drainage to Payne Creek

DER Code _____
W/W Code _____

4. LOCATION WHERE PROPOSED ACTIVITY EXISTS OR WILL OCCUR.

Hardee Power Station Site
Street, road or other descriptive location

35 & 36 Section | 32S Township | 23E Range

N/A
Incorporated city or town

Latitude _____ Longitude _____

Polk
County

Tax Assessors Description: (if known)

Map No. _____ Subdiv. No. _____ Lot No. _____

5. NAME AND ADDRESS INCLUDING ZIP CODE OF ADJOINING PROPERTY OWNERS WHOSE PROPERTY ALSO ADJOINS THE WATERWAY.

CF Industries, P.O. Box 1549, Wauchula, FL 33873
Agrico Chemical Co., P.O. Box 1110, Mulberry, FL 33860

6. PROPOSED USE
Private Single Dwelling [ ] Private Multi-dwelling [ ] Public [ ]
Commercial [ ] Other [X] (Explain in remarks) energy facility

7. DESCRIPTION OF PROJECT (Use additional sheets, if necessary)

A. Structures: 1. New work [X] Maintenance of existing structure [ ]

COE Work Code

2. Piers, docks and use: Commercial [ ] Private [ ] Public [ ]

a. Single pier [ ] length _____ width _____

b. Number of piers [ ] length _____ width _____

c. Number of boat slips [ ] length _____ width _____

d. Number of finger piers [ ] length _____ width _____

e. Other (please describe) _____

3. Seawalls, revetments, bulkheads: length _____

a. Type: Vertical [ ] Riprap [ ] Slope: _____Horizontal:_____Vertical

b. Material to be used _____

4. Other type of structure Cooling water reservoir, See SCA/EA Section 3.5.1

B. Excavation or Dredging: New Work [X] Maintenance work [ ] Total acreage involved 570 (12.3 acres below O.H.W.)

1. Access Channel [ ] or Canal [ ] Length _____ft. Width _____ft. Depth _____ft.

2. Boat Basin [ ] or Boat Slip [ ] Length _____ft. Width _____ft. Depth _____ft.

3. Other Cooling water reservoir Length 730 ft. Width 4500 (max) ft. Depth >10 ft.

4. Cubic yards: Total for project 24,830,000 cyd

a. 536,000 cyd. waterward/ 24,294,000 cyd. landward of ordinary/mean high water

b. Type of material to be excavated/dredged overburden, see SCA/EA Section 2.3.6.1, and 4.2.1.2

C. Fill:

1. Amount of material

DER Code 253 403

a. Cubic yards placed waterward of ordinary/mean high water 0

b. Cubic yards placed landward of ordinary/mean high water 0

c. Total acreage to be filled 10 Total acreage of wetlands involved 0

2. Containment for fill

a. Dikes [ ] b. Seawall, etc. [ ] c. Other (please explain) berms

See SCA/EA Section 3.5.1, 4.1

3. Type of fill material to be used none

4. Source of fill material to be used _____

8. Date activity is proposed to commence October 1990 ; to be completed February 1991 .

9. Previous permits for this project have been DER #53112 0329 Polk County Corps #

A. Denied (date) _____

B. Issued (date) _____

C. Other (please explain) Agrico has applied for a permit under permit Application No. 531120329

Differentiate between existing work and proposed work on the drawings.

10. Remarks (See Instruction Pamphlet for additional information required for all applications and certain activities. Use additional sheets if necessary.)

See SCA/EA 1.0 and 3.0 for descriptions and need of the projections, Section 8.2 for alternatives and Sections 4.1, 4.2, 4.4, 5.1 and 5.8 for impacts.

11. AFFIDAVIT OF OWNERSHIP OR CONTROL of the property on which the proposed project is to be undertaken

I CERTIFY THAT: (please check appropriate space)

[ ] I am the record owner, lessee, or record easement holder of the property described below.

[X] I am not the record owner, lessee, or record easement holder of the property described below, but I will have before undertaking the proposed work the requisite property interest. (Please explain what the interest will be and how it will be acquired.)

LEGAL DESCRIPTION OF PROPERTY SITUATED IN Polk COUNTY, FLORIDA
(Use additional sheets if necessary)

The west 1400.00 feet of east 2700.00 feet of the south 3300.00 feet of Section 36, Township 32 south, Range 23 east, Polk County, Florida.

Michael P. Olinski
Signature

Sworn and subscribed before me at HILLSBOROUGH County, FLORIDA, this 27TH day of JUNE, 1989.

Kenneth L. Burton
NOTARY PUBLIC

My commission expires: Notary Public, State of Florida My Commission Expires Dec. 3, 1989 Bonded Thru Troy Fain - Insurance, Inc.

12. Application is made for a permit(s) to authorize the activities described herein.

A. I authorize the agent listed in Item #2 to negotiate modifications or revisions, when necessary, and accept or assent to any stipulations on my behalf.

B. I understand I may have to provide any additional information/data that may be necessary to provide reasonable assurance or evidence to show that the proposed project will comply with the applicable State Water Quality Standards or other environmental standards both before construction and after the project is completed.

C. In addition, I agree to provide entry to the project site for inspectors with proper identification or documents as required by law from the environmental agencies for the purpose of making preliminary analyses of the site. Further, I agree to provide entry to the project site for such inspectors to monitor permitted work if a permit is granted.

D. Further, I hereby acknowledge the obligation and responsibility for obtaining all of the required state, federal or local permits before commencement of construction activities I also understand that before commencement of this proposed project I must be granted separate permits or authorizations from the U.S. Corps of Engineers, the U.S. Coast Guard, the Department of Environmental Regulation, and the Department of Natural Resources, as necessary.

I CERTIFY that I am familiar with the information contained in this application, and that to the best of my knowledge and belief such information is true, complete and accurate. I further certify that I possess the authority to undertake the proposed activities.

Signature of Applicant

6-25-89
Date

NOTE: THIS APPLICATION MUST BE SIGNED by the person who desires to undertake the proposed activity or by an authorized agent. If an agent is applying on behalf of the applicant, attach proof of authority for the agent to sign and bind the applicant.

18 U.S.C. Section 1001 provides that: Whoever in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up by any trick, scheme, or device a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statement or entry, shall be fined not more than $10,000 or imprisoned not more than five years, or both.

NOTICE TO PERMIT APPLICANTS

This is a Joint Application; it is NOT a Joint Permit!

You Must Obtain All Required Local, State, and Federal

Authorizations or Permits Before Commencing Work!!

For your information: Section 370.034, Florida Statutes, requires that all dredge and fill equipment owned, used, leased, rented or operated in the state shall be registered with the Department of Natural Resources. Before selecting your contractor or equipment you may wish to determine if this requirement has been met. For further information, contact the Chief of the Bureau of Licenses and Motorboat Registration, Department of Natural Resources, 3900 Commonwealth Boulevard, Tallahassee, Florida 32303. Telephone Number 904/488-1195. THIS IS NOT A REQUIREMENT FOR A PERMIT FROM THE DEPARTMENT OF ENVIRONMENTAL REGULATION.

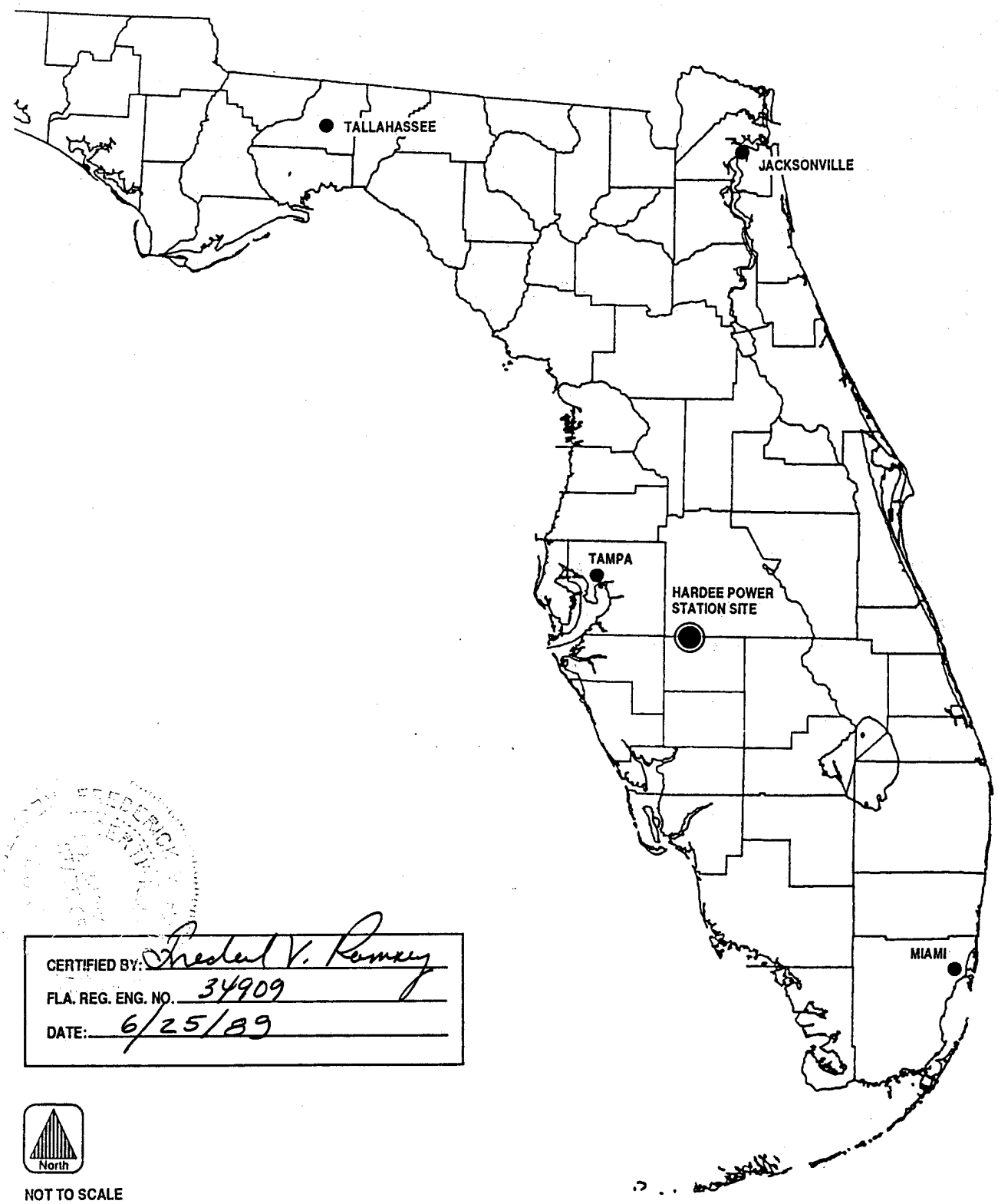


Figure 1 GENERAL LOCATION OF HARDEE POWER STATION

Hardee Power Station

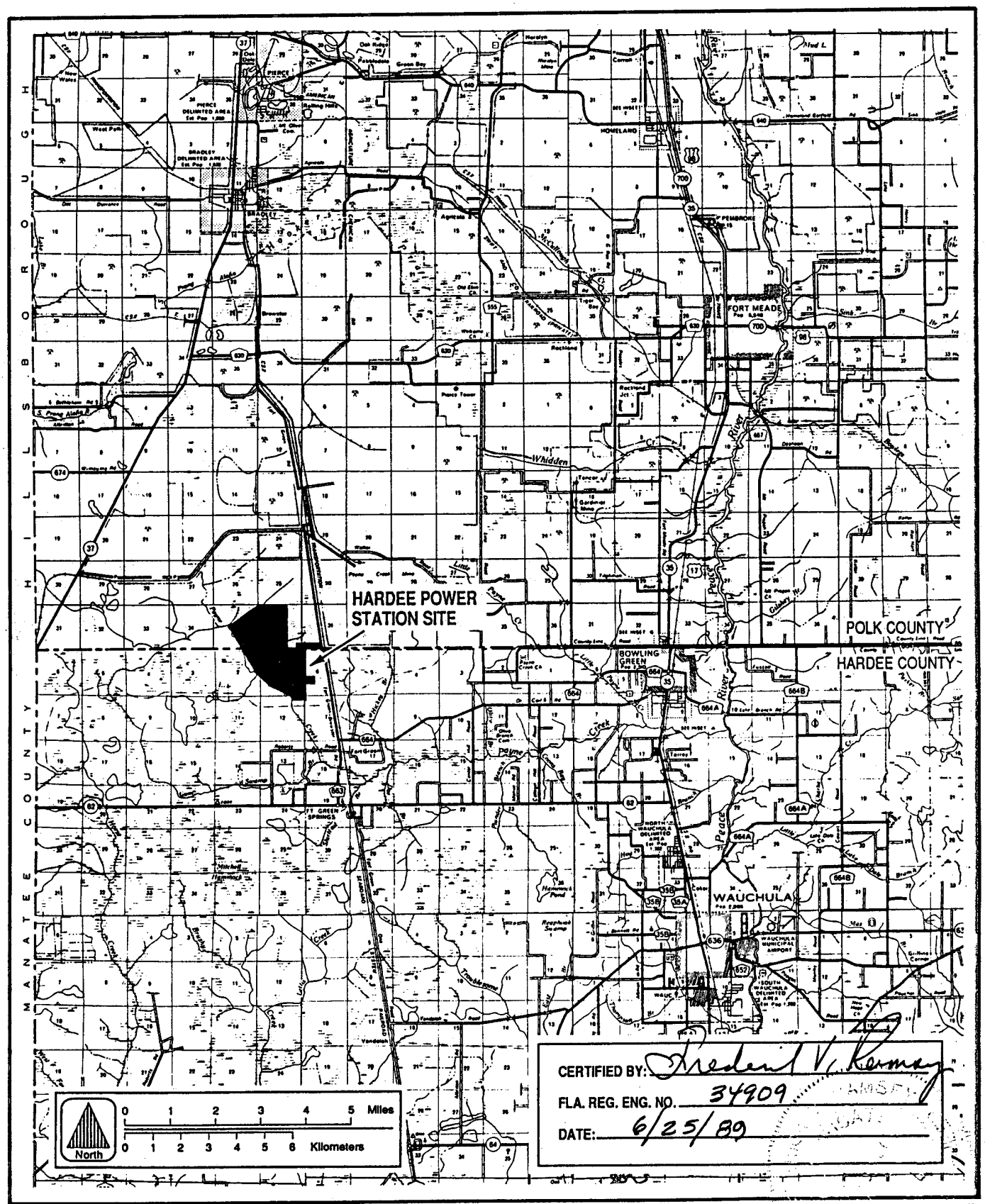


Figure 2 HARDEE POWER STATION SITE LOCATION

Hardee Power Station

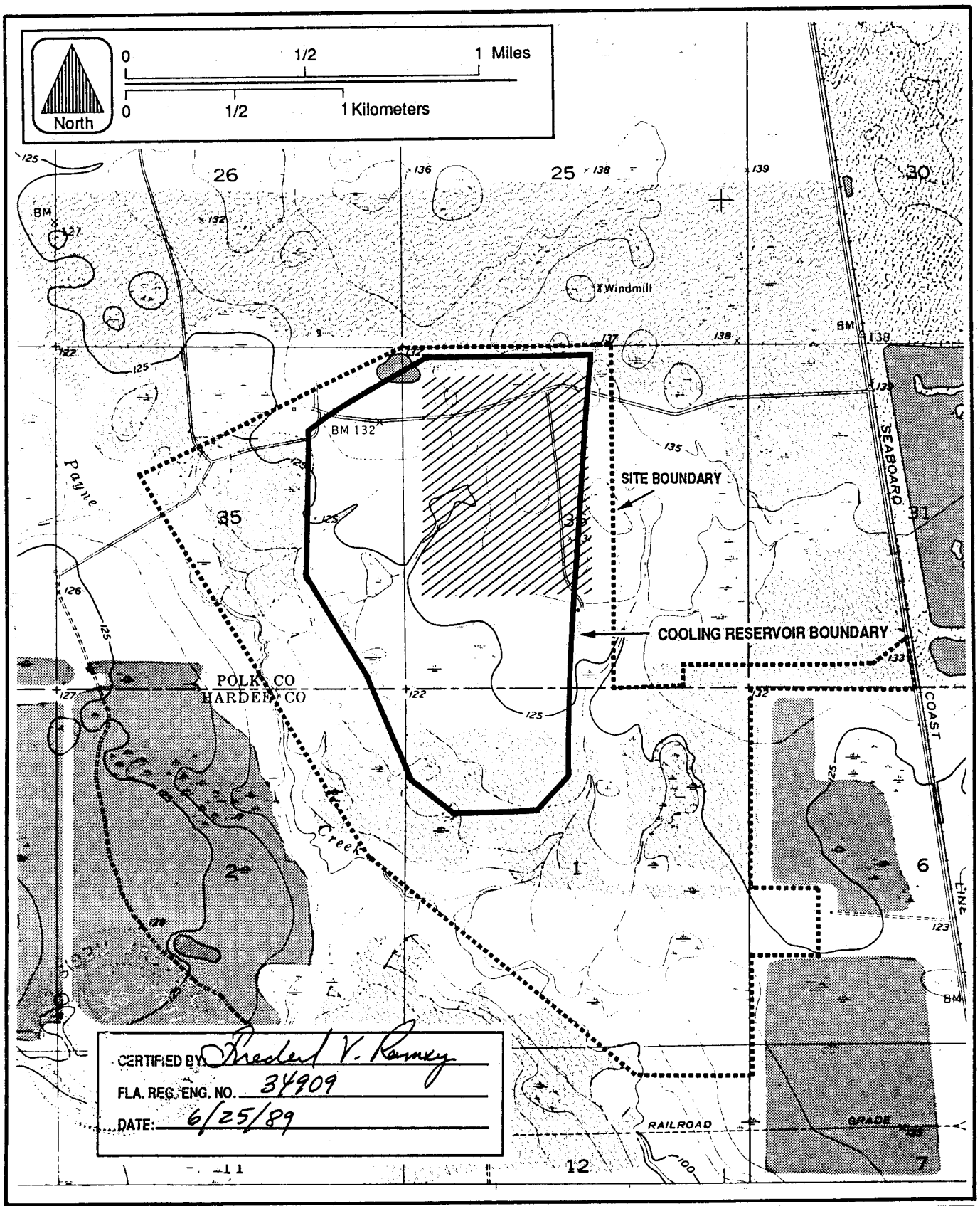
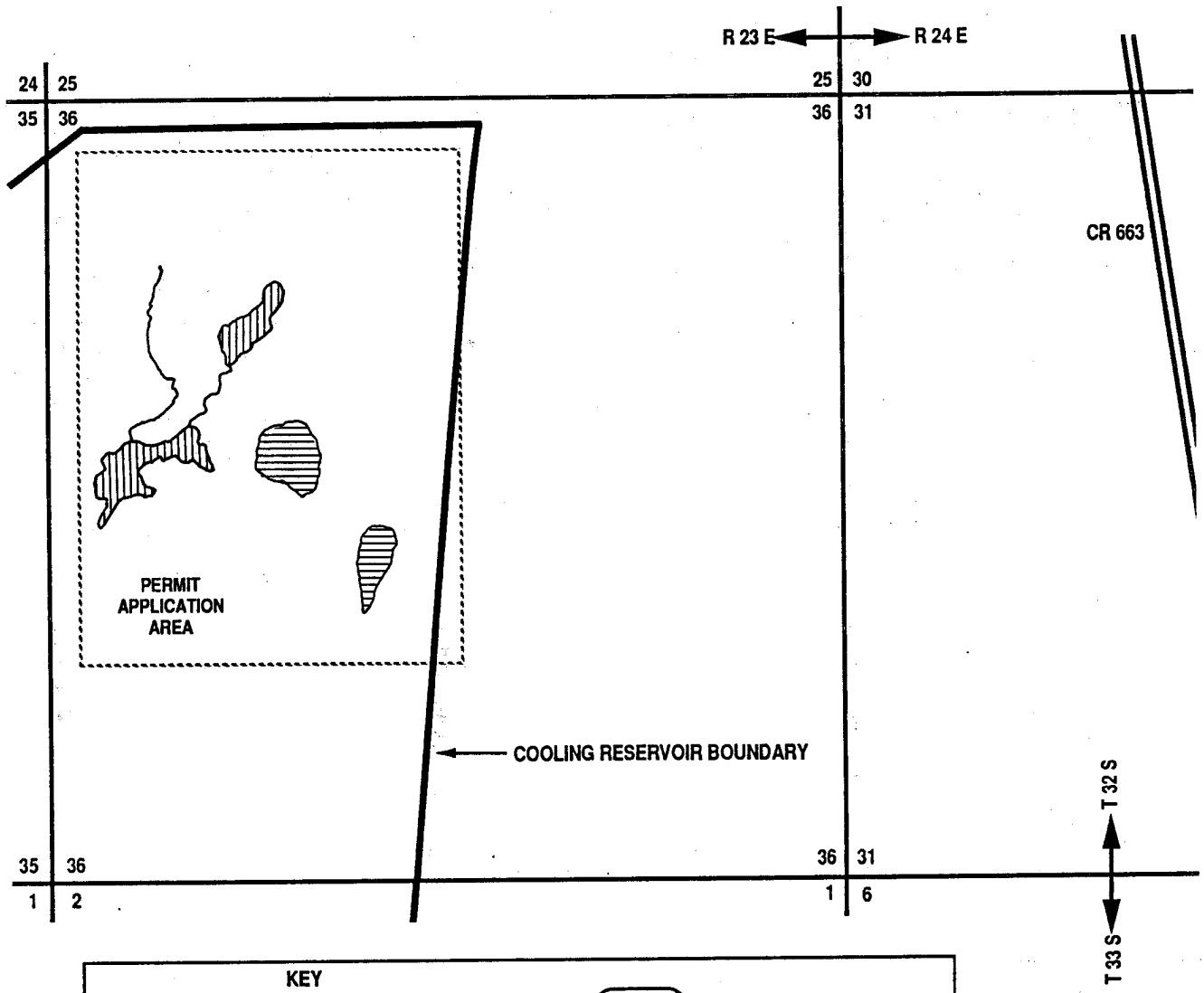


Figure 3 LOCATIONS OF SITE BOUNDARY (PERIMETERS) AND PERMIT APPLICATION AREA

Hardee Power Station



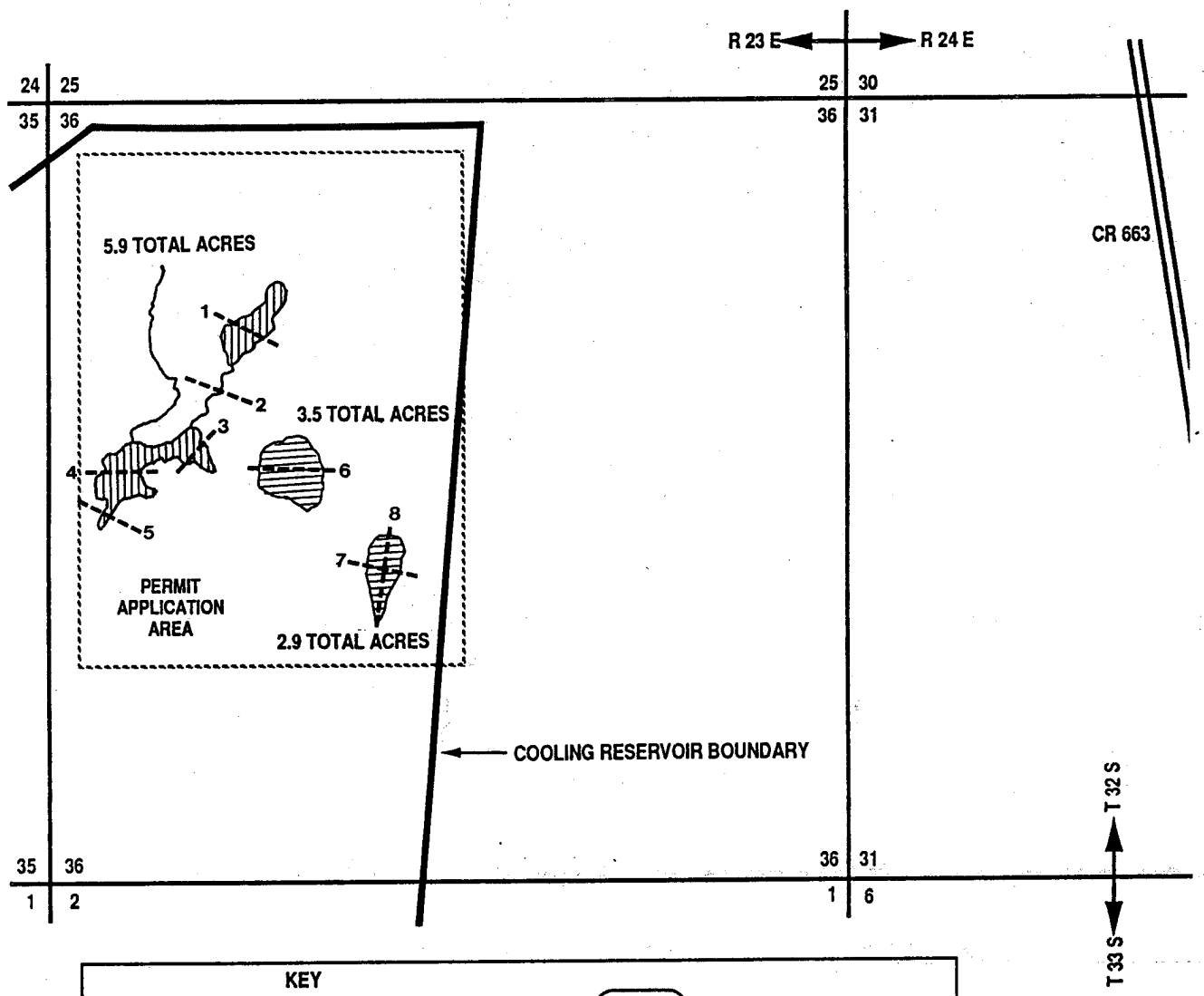
CERTIFIED BY: Fred V. Ramsey

FLA. REG. ENG. NO. 34909

DATE: 6/25/89

Figure 4 PLAN VIEW

Hardee Power Station



KEY

CONTIGUOUS WETLANDS

ISOLATED WETLANDS

North

0 1000 Feet

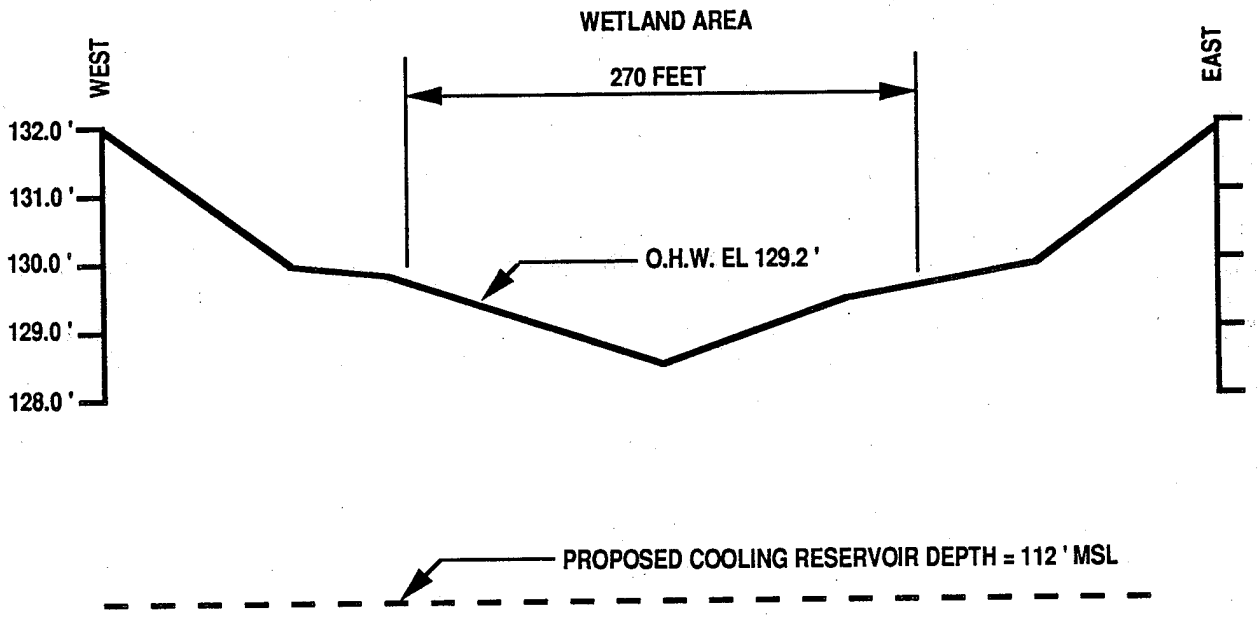
CERTIFIED BY: Fredel V. Ramsey

FLA. REG. ENG. NO. 34909

DATE: 6/25/89

Figure 5 PLAN VIEW - LOCATION OF CROSS SECTIONS

Hardee Power Station



0 100 Feet
HORIZONTAL SCALE

0 3 Feet
VERTICAL SCALE

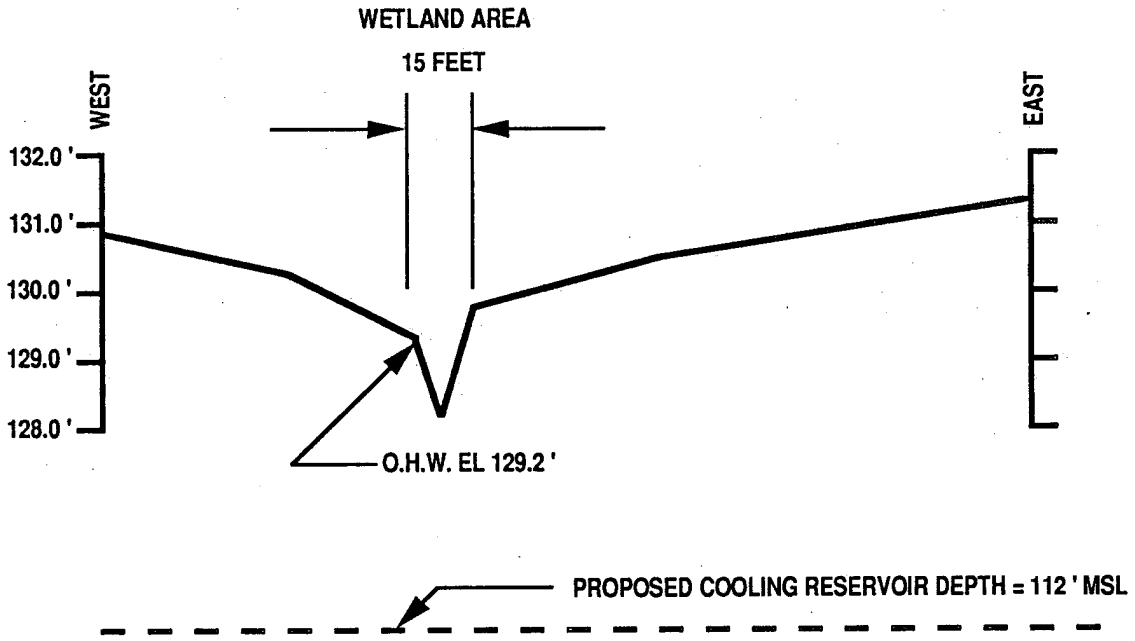
CERTIFIED BY: Fred V. Ramsey

FLA. REG. ENG. NO. 34909

DATE: 6/25/89

Figure 6 CROSS SECTION NO. 1 - LOOKING NORTH
(SEC. 36, T. 32S, R. 23E)

Hardee Power Station



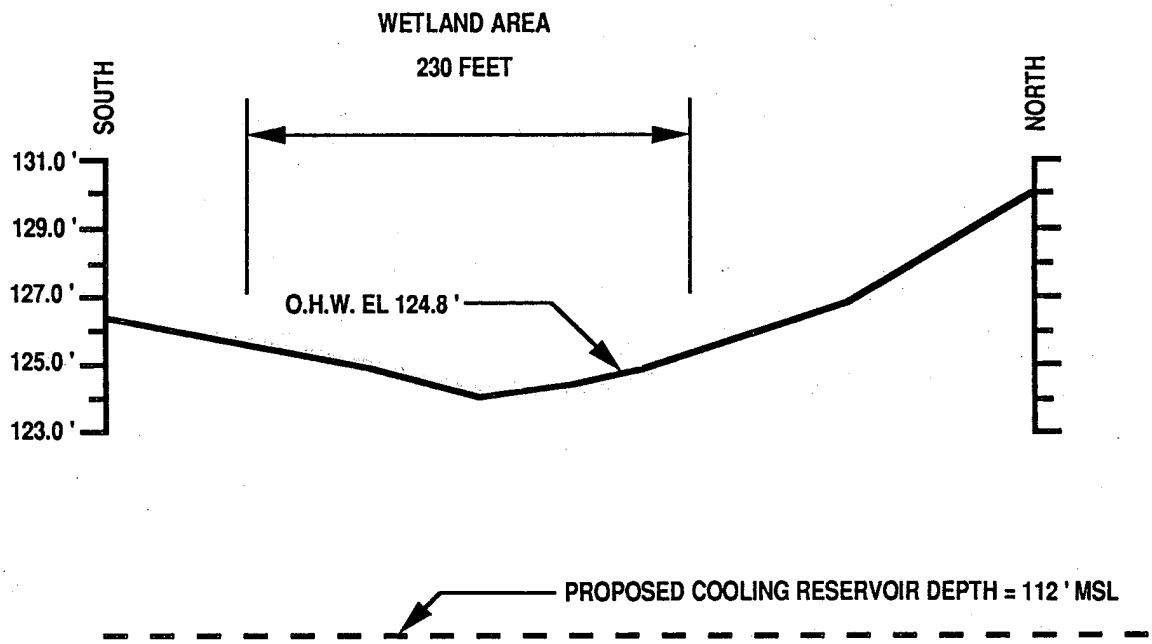
CERTIFIED BY: Frederick V. Ramsey

FLA. REG. ENG. NO. 34909

DATE: 6/25/89

Figure 7 CROSS SECTION NO. 2 - LOOKING NORTH
(SEC. 36, T. 32S, R. 23E)

Hardee Power Station



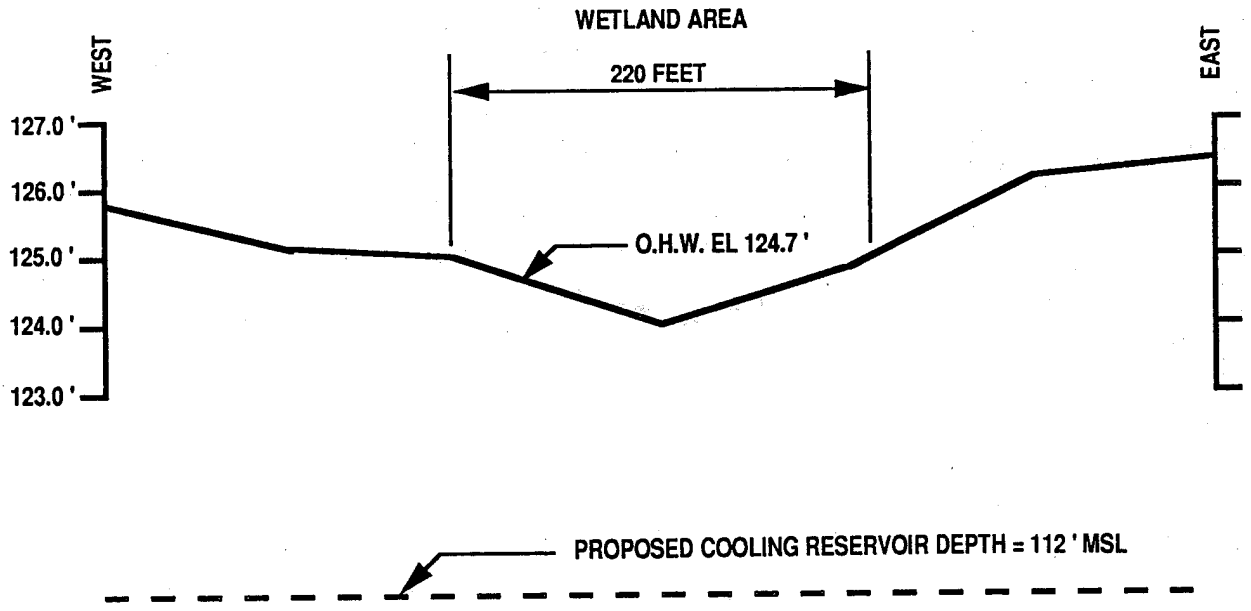
CERTIFIED BY: Frederick V. Ramsey

FLA. REG. ENG. NO. 34909

DATE: 6/25/89

Figure 8 CROSS SECTION NO. 3 - LOOKING WEST
(SEC. 36, T. 32S, R. 23E)

Hardee Power Station



0 100 Feet
HORIZONTAL SCALE

0 3 Feet
VERTICAL SCALE

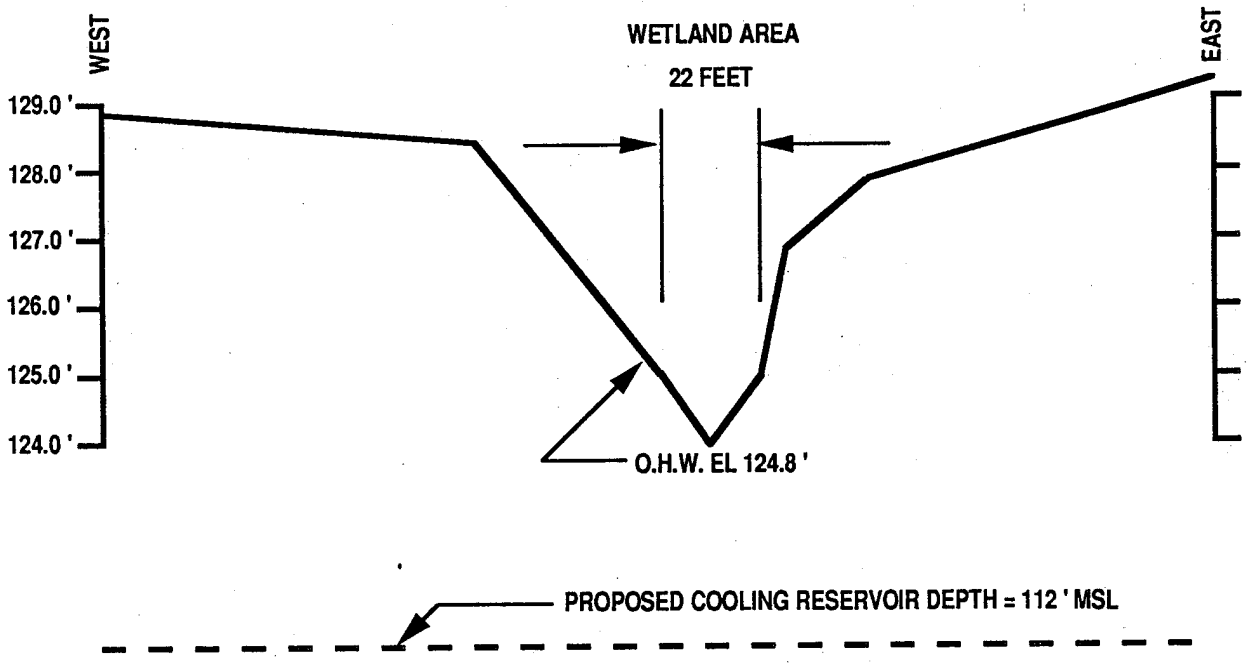
CERTIFIED BY: Fredal V. Ramsey

FLA. REG. ENG. NO. 34909

DATE: 6/25/89

Figure 9 CROSS SECTION NO. 4 - LOOKING NORTH
(SEC. 36, T. 32S, R. 23E)

Hardee Power Station



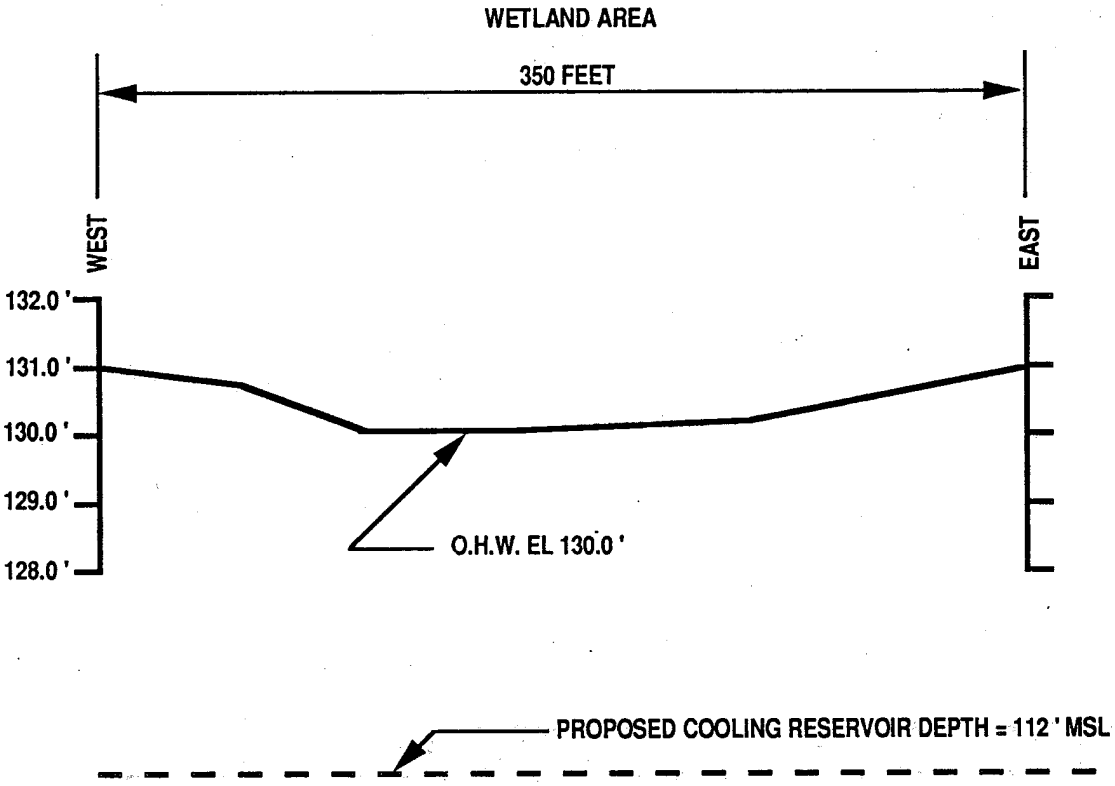
CERTIFIED BY: Fred V. Ramsey

FLA. REG. ENG. NO. 34909

DATE: 6/25/89

Figure 10 CROSS SECTION NO. 5 - LOOKING NORTH
(SEC. 36, T. 32S, R. 23E)

Hardee Power Station



0 70 Feet
HORIZONTAL SCALE

0 4 Feet
VERTICAL SCALE

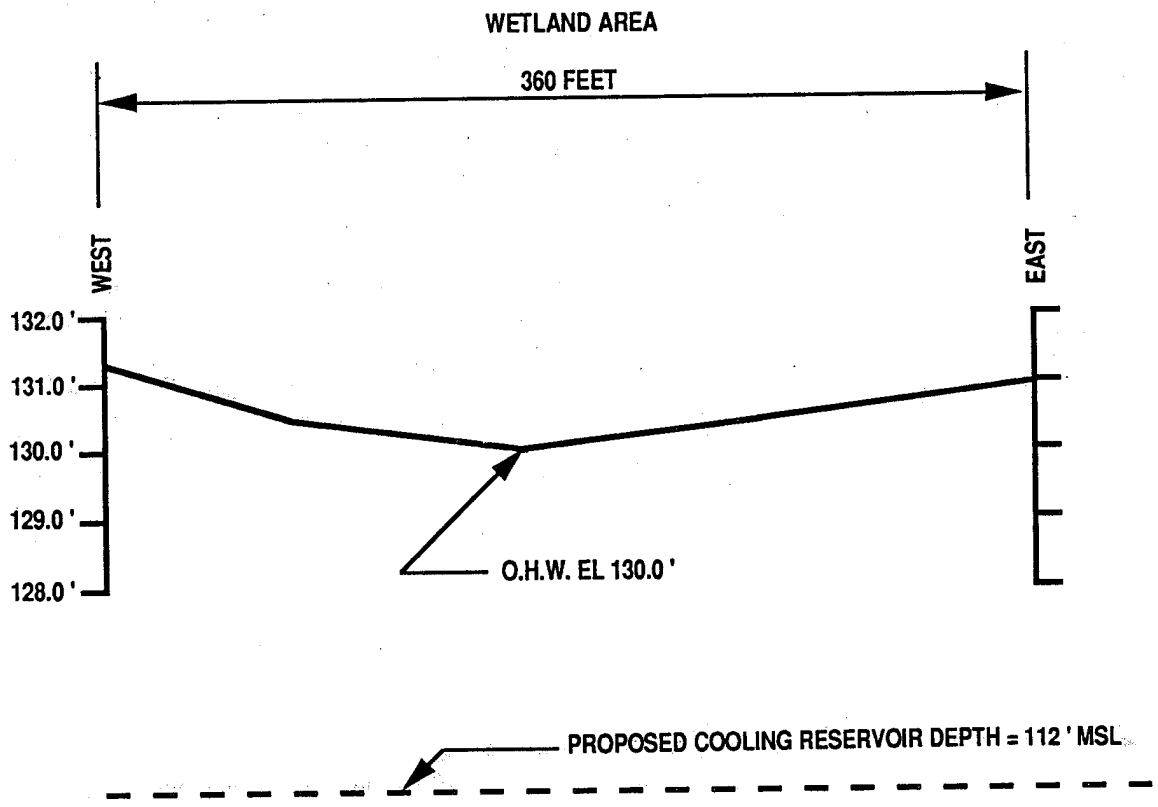
CERTIFIED BY: Fred V. Rumsey

FLA. REG. ENG. NO. 34909

DATE: 6/25/89

Figure 11 CROSS SECTION NO. 6 - LOOKING NORTH (SEC. 36, T. 32S, R. 23E)

Hardee Power Station



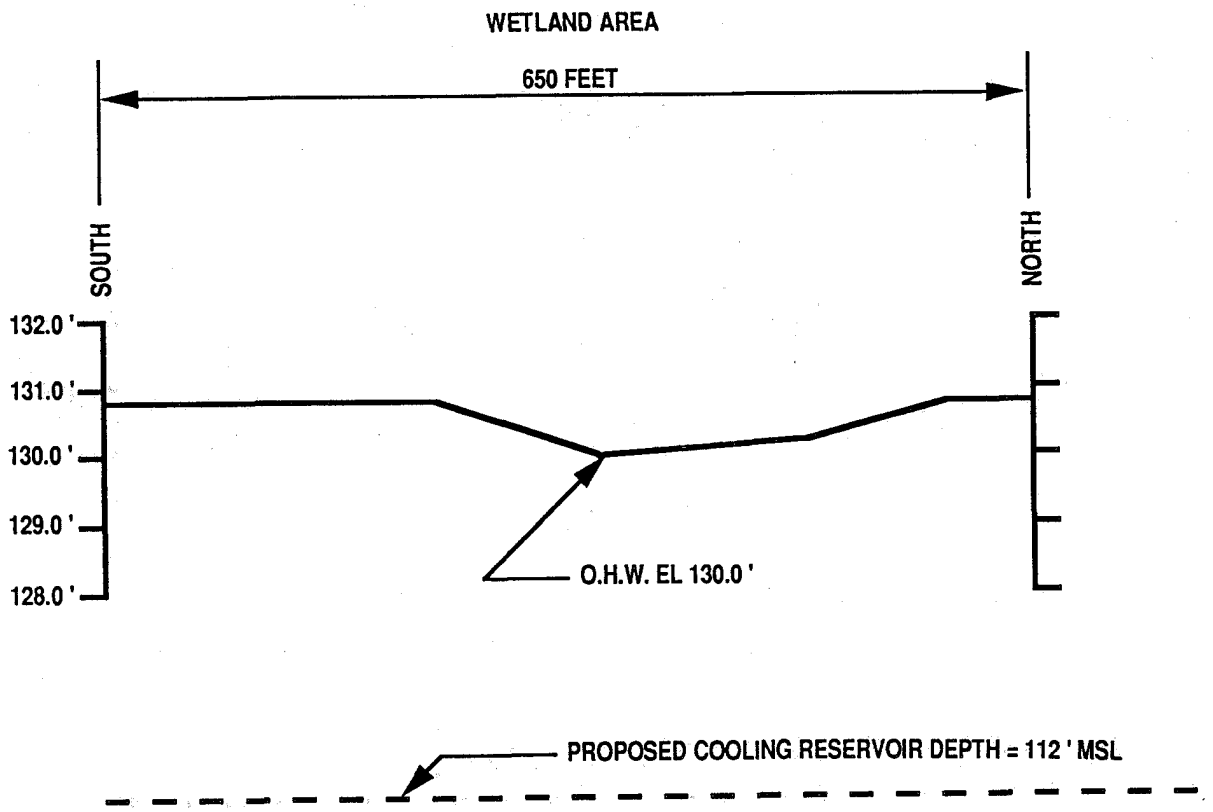
CERTIFIED BY: Frederick V. Ramsey

FLA. REG. ENG. NO. 34909

DATE: 6/25/89

Figure 12 CROSS SECTION NO. 7 - LOOKING NORTH
(SEC. 36, T. 32S, R. 23E)

Hardee Power Station



0 130 Feet
HORIZONTAL SCALE

0 4 Feet
VERTICAL SCALE

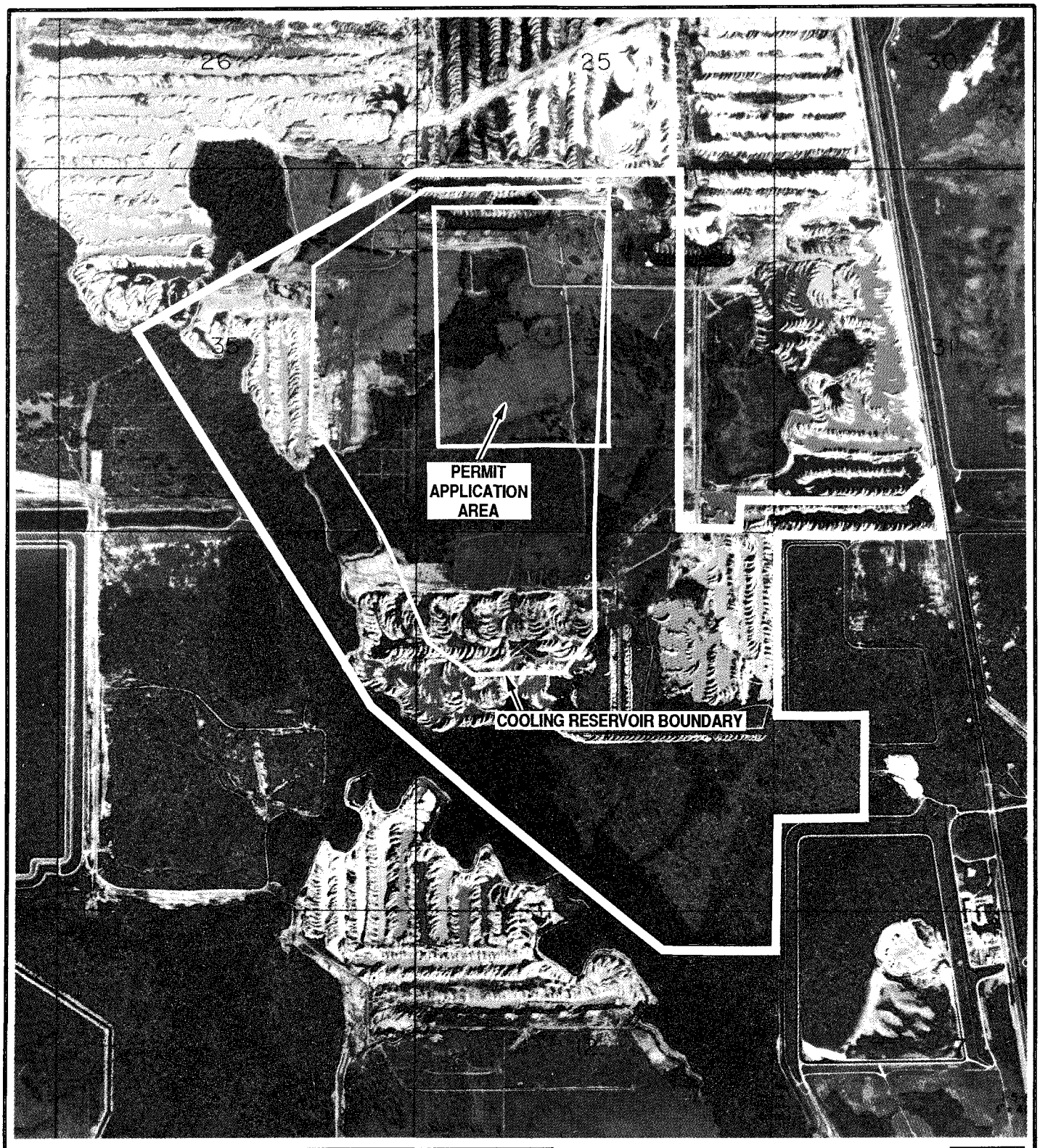
CERTIFIED BY: Frederick V. Ramsey

FLA. REG. ENG. NO. 34909

DATE: 6/25/89

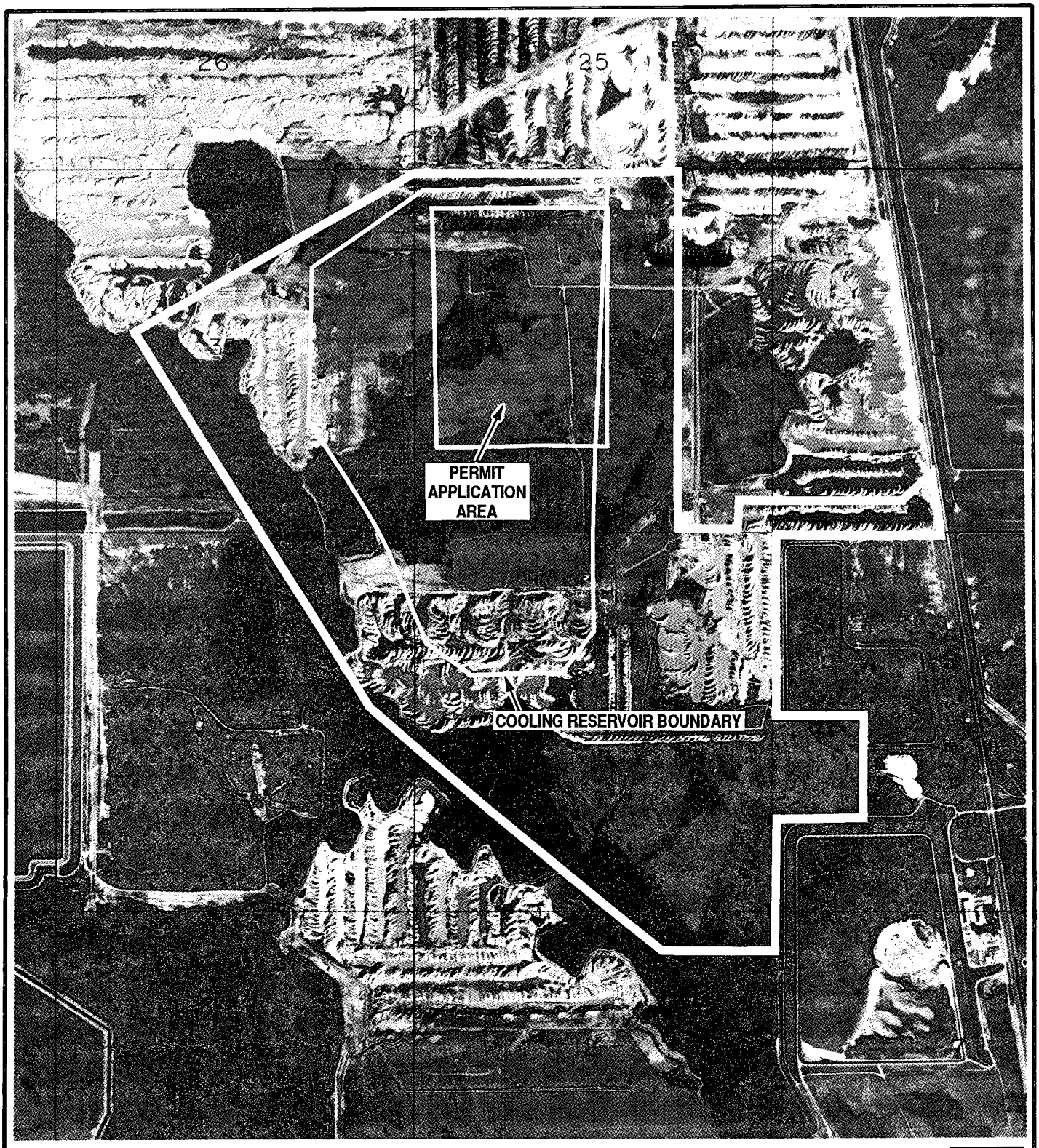
Figure 13 CROSS SECTION NO. 8 - LOOKING WEST
(SEC. 36, T. 32S, R. 23E)

Hardee Power Station



AERIAL PHOTO OF PERMIT APPLICATION AREA

Hardee Power Station



AERIAL PHOTO OF PERMIT APPLICATION AREA

Hardee Power Station

11.1.4 PREVENTION OF SIGNIFICANT DETERIORATION

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1.0 INTRODUCTION

The Hardee Power Station, will consist of a combined cycle power plant that will burn natural gas and distillate fuel oil. The facility will be constructed in modules that will consist of combustion turbines and associated electric generator, and heat recovery steam generators (HRSG); the HRSG will utilize the waste heat from the combustion turbines to generate steam for producing additional electricity in a steam turbine. Each module will have a nominal generating capacity of 220 MW (net) and would likely consist of two combustion turbines and associated electric generators, and two HRSGs and one steam electric generator. The ultimate capacity of the facility is being planned for 660 MW; however, but only 295 MW will be initially constructed.

The Hardee Power Station will emit air pollutants above regulatory threshold amounts which will require a Prevention of Significant Deterioration (PSD) review promulgated under 40 Code of Federal Regulations (CFR) Part 52.21 and implemented through delegation by the Florida Department of Environmental Regulation (FDER) and its regulations codified in Chapter 17-2.510 Florida Administrative Code (F.A.C.). This document provides the technical information and analyses required by these regulations. The information and analyses provided herein are based on a nominal 660 MW plant configuration; however they are transferable for smaller configurations since conservative emissions and impact analyses were assumed.

While this document is an appendix to the Site Certification Application (SCA), it has been prepared as a stand alone PSD application. The application is divided into seven major sections. Section 2.0 presents a description of the facility, and emissions and stack parameters. PSD review requirements and applicability are presented in Section 3.0. The control technology review, including the Best Available Control Technology (BACT) evaluation is presented in Section 4.0. Sections 5.0, 6.0, 7.0 and 8.0 present the air quality monitoring information and the methodology and results of the impact analyses performed for the project.

2.0 PROJECT DESCRIPTION

2.1 GENERAL DESCRIPTION

The combined cycle facility will be constructed in modules to achieve the desired capacity additions. The final design will depend on the selected combustion turbine with either five or six combustion turbines required to achieve theultimate capacity of 660 MW. Both simple cycle and combined cycle operation are planned; the latter would use by-pass stacks when only combustion turbine operation is needed, or the steam cycle is inoperable. The HRSG would not be supplementally fired.

2.2 FACILITY EMISSIONS AND STACK OPERATING PARAMETERS

The performance information and stack parameters that envelope the combustion turbine manufacturer's designs currently being considered for the project are presented in Table 2-1. This information provides conservative emission estimates of criteria pollutants (Table 2-2), other regulated pollutants (Table 2-3), and non-regulated pollutants (Table 2-4). Specific manufacturer designs would provide emissions no greater than those shown in these tables. The fuel specifications for natural gas and distillate oil are presented in Tables 2-5 and 2-6, respectively.

For a 660-MW (nominal) facility, the maximum emissions are produced with five combustion turbines; the design, stack, and emission characteristics are presented in Tables 2-1 through 2-4. This configuration will also have the highest exhaust flow. Lower exhaust flow rates and emissions will occur for a 660-MW (nominal) facility using six of the smaller combustion turbines. The exhaust flow and corresponding emissions are important in establishing air quality impacts and must be determined separately for each configuration. As a result, the range in stack parameters used in modeling, as well as corresponding sulfur dioxides (SO_2) emissions, are presented in Table 2-7. In either configuration the maximum potential air quality impacts will occur during combined cycle operation when the exhaust temperature is 240°F.

Table 2-1. Maximum Design and Stack Parameters for Each Combustion Turbine Associated with the Hardee Power Station Combined Cycle Plant

Data	Gas Turbine Natural Gas @ 32°F	Gas Turbine No.2 Oil @ 32°F	Gas Turbine Natural Gas @ 95°F	Gas Turbine No.2 Oil @ 95°F
General:				
Heat Input (mmBtu/hr)	1,268.4	1,312.3	1,074.1	1,107.2
Natural Gas (mcf/hr)	1,251.4	NA	1,059.8	NA
Fuel Oil (lb/hr)	NA	73,437.1	NA	61,956.3
Fuel:				
Heat Content - Gas (LHV)	1014 Btu/cf	NA	1014 Btu/cf	NA
Heat Content - Oil (LHV)	NA	17,870 Btu/lb	NA	17,870 Btu/lb
% Sulfur	NA	0.5	NA	0.5
Stack:				
Volume Flow (acfm)	1,924,021	1,929,288	1,707,645	1,782,889
Volume Flow (scfm)	713,401	714,351	615,452	628,415
Mass Flow (lb/hr)	3,110,000	3,114,140	2,683,000	2,739,512
Temperature (°F)*	964	966	1,005	1,038
Diameter (ft)	16.0	16.0	16.0	16.0
Velocity (ft/sec)	159.5	159.9	141.6	147.8
Height (ft)	75.0	75.0	75.0	75.0
Moisture (%)	10.3	9.3	13.5	12.4
Oxygen (%)	12.8	12.1	12.5	12.0
Water Injected (lb/hr)	76,010	96,698	63,350	82,047

* Exhaust from HRSG Stack will be 240°F.
NA = Not Applicable
Note: Data Presented in this table represent the design information used to produce maximum emissions from a single combustion turbine. Tables 2-2 through 2-3 present the maximum estimated emissions.

Table 2-2. Maximum Estimated Emissions for Each Combustion Turbine Associated with the Hardee Power Station Combined Cycle Plant Criteria Pollutants

Pollutant	Gas Turbine Natural Gas @ 32°F	Gas Turbine No. 2 Oil @ 32°F	Gas Turbine Natural Gas @ 95°F	Gas Turbine No. 2 Oil @ 95°F
Particulate:				
Basis*	0.8 g/s	7.2 g/s	0.63 g/s	6 g/s
lb/hr	6.3	57.1	5.6	55.5
TPY	27.8	250.1	24.3	243.1
Sulfur Dioxide:				
Basis*	20 gr/100 scf	0.5 % Sulfur	20 gr/100 scf	0.5 % Sulfur
lb/hr	35.75	734.37	30.28	619.56
TPY	156.6	3,216.5	132.6	2,713.7
Nitrogen Oxides:				
Basis*	42 ppm**	65 ppm**	42 ppm**	65 ppm**
lb/hr	215.9	383.8	174.9	311.5
TPY	945.7	1,680.9	766.0	1,364.3
ppm	42.0	65.0	42.0	65.0
Carbon Monoxide:				
Basis*	41 ppm**	13 ppm**	41 ppm**	13 ppm**
lb/hr	128.3	46.7	103.9	37.9
TPY	562.0	204.6	455.2	166.1
ppm	41.0	13.0	41.0	13.0
VOC's:				
Basis*	10 ppm**	10 ppm**	10 ppm**	10 ppm**
lb/hr	17.9	20.5	14.5	16.7
TPY	78.2	89.9	63.4	73.0
ppm	10.0	10.0	10.0	10.0
Lead:				
Basis		USEPA(1988)		USEPA(1988)
lb/hr	neg.	0.01	neg.	0.01
TPY	neg.	0.05	neg.	0.04

* From manufacturers estimates.
** Corrected to 15% O2 dry conditions.
Neg. = negligible

Emission factors used: No. 2 Fuel Oil; Lead - 8.9 lb/10^{12} Btu from USEPA (1988).

Table 2-3. Maximum Estimated Emissions for Each Combustion Turbine Associated with the Hardee Power Station Combined Cycle Plant Other Regulated Pollutants

Pollutant	Gas Turbine Natural Gas @ 32°F	Gas Turbine No. 2 Oil @ 32°F	Gas Turbine Natural Gas @ 95°F	Gas Turbine No. 2 Oil @ 95°F
Arsenic (As) (lb/hr)	neg.	0.0055	neg.	0.0047
(TPY)	neg.	0.0241	neg.	0.0204
Beryllium (Be) (lb/hr)	neg.	0.0033	neg.	0.0028
(TPY)	neg.	0.0144	neg.	0.0121
Mercury (Hg) (lb/hr)	0.0144	0.0039	0.0122	0.0033
(TPY)	0.0633	0.0172	0.0536	0.0145
Fluorides (F) (lb/hr)	neg.	0.0427	neg.	0.0360
(TPY)	neg.	0.1868	neg.	0.1576
H2SO4 Mist (lb/hr)	1.6	33.7	1.4	28.4
(TPY)	7.2	147.6	6.1	124.6

Neg. = Negligible
Emission factors used:
Natural gas:
Hg - 11.34 lb/10^{12} Btu,
H_2SO_4 mist - 3% of Sulfur Emissions;

No. 2 Fuel Oil:
As - 4.2 lb/10^{12} Btu, Be - 2.5 lb/10^{12} Btu,
Hg - 3.0 lb/10^{12} Btu, F^- - 32.5 lb/10^{12} Btu,
H_2SO_4 mist - 3% of Sulfur Emissions.

Sources: USEPA, 1980 for Hg from natural gas firing; USEPA 1981 for F^- from oil
USEPA, 1988 for all others.

Table 2-4. Maximum Estimated Emissions for Each Combustion Turbine Associated with the Hardee Power Station Combined Cycle Plant Non-Regulated Pollutants

Pollutant	Gas Turbine Natural Gas @ 32°F	Gas Turbine No. 2 Oil @ 32°F	Gas Turbine Natural Gas @ 95°F	Gas Turbine No. 2 Oil @ 95°F
Manganese (lb/hr)	neg.	0.0085	neg.	0.0071
(TPY)	neg.	0.0370	neg.	0.0312
Nickel (lb/hr)	neg.	0.2231	neg.	0.1882
(TPY)	neg.	0.9772	neg.	0.8244
Cadmium (lb/hr)	neg.	0.0138	neg.	0.0116
(TPY)	neg.	0.0604	neg.	0.0509
Chromium (lb/hr)	neg.	0.0623	neg.	0.0526
(TPY)	neg.	0.2730	neg.	0.2303
Copper (lb/hr)	neg.	0.3674	neg.	0.3100
(TPY)	neg.	1.6094	neg.	1.3578
Vanadium (lb/hr)	neg.	0.0915	neg.	0.0772
(TPY)	neg.	0.4007	neg.	0.3381
Selenium (lb/hr)	neg.	0.0308	neg.	0.0260
(TPY)	neg.	0.1349	neg.	0.1138
POM (lb/hr)	0.0008	0.0004	0.0007	0.0003
(TPY)	0.0036	0.0016	0.0031	0.0014
Formaldehyde (lb/hr)	0.1120	0.5315	0.0949	0.4484
(TPY)	0.4906	2.3279	0.4155	1.9640

Neg. = Negligible

Emission Factors Used:

Natural Gas: Polycyclic Organic Matter (POM) - 0.65 lb/10^{12} Btu, Formaldehyde - 0.088 lb/10^{9} Btu;

No. 2 Fuel Oil: Manganese - 6.44 lb/10^{12} Btu, Nickel - 170 lb/10^{12} Btu, Cadmium - 10.5 lb/10^{12} Btu, Chromium - 47.5 lb/10^{12} Btu, Copper - 280 lb/10^{12} Btu, Vanadium - 69.7 lb/10^{12} Btu, Selenium - 23.5 lb/10^{12} Btu, POM - 0.279 lb/10^{12} Btu (emission factor indicated as a less than in reference), Formaldehyde - 405 lb/10^{12} Btu.

Source: USEPA, 1988.

Table 2-5. Typical Natural Gas Specification*

Constituents, Percent by Volume	
Hydrogen (H_2)	--
Methane (CH_4)	83.40
Ethylene (C_2H_4)	--
Ethane (C_2H_6)	15.80
Carbon Monoxide (CO)	--
Carbon Dioxide (CO_2), max.	2.0
Nitrogen (N_2)	0.80
Oxygen (O_2), max.	0.40
Hydrogen Sulfide (H_2S), max.	1 grain/100 SCF
Water (H_2O) Vapor, max.	4 lb/10^6 SCF
Synthetic Lubricants (Phosphate-Ester Based)	Trace
Specific Gravity (relative to air)	0.636
Ultimate, Percent by Weight	
Sulfur (S), max.	20 grains/100 SCF
Hydrogen (H_2)	23.53
Carbon (C)	75.25
Nitrogen (N_2)	1.22
Oxygen (O_2)	--
Btu/ft^3 @ 60 F and 30 inches HgA (HHV)	950 (min) - 1129
Btu/lb of Fuel (HHV)	23,170
(LHV)	20,870

* Pipeline Grade.

Table 2-6. Typical Fuel Oil Specification*

Specific gravity, 60°F	0.82 - 0.86
Viscosity, cSt, 100°F, min.	0.5
Pour point, max, °F	0
Gross heating value, kcal/kg	10,500 - 10,950
Gross heating value, Btu/lb	19,000 - 19,600
Filterable dirt, mg/100 ml	4
Carbon residue (10% Bottoms), %, max.	0.25
Carbon residue (100% Sample), %, max.	1.0
Sulfur, %, maximum	0.5
Nitrogen, %	0.005 - 0.015
Hydrogen, %	12.2 - 13.2
Ash (fuel as delivered), ppm, max.	50
Trace metal contaminants (untreated)	
Sodium plus potassium, ppm, max.	1
Vanadium, ppm, max.	0.5
Lead, ppm, max.	1
Calcium, ppm, max.	2

* Specification is typical of American Society of Testing and Materials (ASTM) Grade of No. 2 (ASTM D-398).

Table 2-7. Stack Parameters and SO_2 Emissions Used in Modeling for the Hardee Power Station

	Highest Emission		Lowest Flow Rate	
	32°F CASE 1	95°F CASE 2	32°F CASE 3	95°F CASE 4
Stack Gas Flow (ACFM)	947,056	833,126	770,627	654,455
Stack Gas Temperature (°F)	240	240	240	240
Stack Velocity (ft/sec)	78.5	69.1	63.9	54.2
Stack Diameter (ft)	16	16	16	16
Stack Height (ft)*	75	75	75	75
SO_2 Emissions (lb/hr)	734.37	619.56	558.04	456.34

* This stack height was used for the HRSG exhaust along with worst case structure dimensions (see Table 6-13) to conservatively estimate air quality impacts.

Note: Cases 1 and 2 are for five combustion turbines.
Cases 3 and 4 are for six combustion turbines.
Stack parameters and emissions are shown on a per-unit basis.

3.0 AIR QUALITY REVIEW REQUIREMENTS AND APPLICABILITY

The following discussion pertains to the federal and state air regulatory requirements and their applicability to the project. These regulations must be satisfied before the proposed facility can operate.

3.1 NATIONAL AND STATE AAQS

The existing applicable National and Florida ambient air quality standards (AAQS) are presented in Table 3-1. Primary National AAQS were promulgated to protect the public health, and secondary National AAQS were promulgated to protect the public welfare from any known or anticipated adverse affects associated with the presence of pollutants in the ambient air. Areas of the country in violation of AAQS are designated as nonattainment areas, and new sources to be located in or near these areas may be subject to more stringent air permitting requirements.

3.2 PSD REQUIREMENTS

3.2.1 General Requirements

Under federal PSD review requirements, all major new or modified sources of air pollutants regulated under the Clean Air Act (CAA) must be reviewed and approved by the U.S. Environmental Protection Agency (USEPA). (For sources in Florida, PSD review and approval has been delegated to FDER.) A "major stationary source" is defined as any one of 28 named source categories which has the potential to emit 100 tons per year (TPY) or more, or any other stationary source which has the potential to emit 250 TPY or more, of any pollutant regulated under CAA. "Potential to emit" means the capability, at maximum design capacity, to emit a pollutant after the application of control equipment.

A "major modification" is defined under PSD regulations as a change at an existing major stationary source which increases emissions by greater than "significant amounts." PSD significant emission rates are shown in Table 3-2.

Table 3-1. National and State AAQS, Allowable PSD Increments, and Significance Levels (ug/m^3)

Pollutant	Averaging Time	AAQS National Primary Standard	AAQS National Secondary Standard	AAQS State of Florida	PSD Increments Class I	PSD Increments Class II	Significant Impact Levels
Particulate Matter (TSP)	Annual Geometric Mean	NA	NA	NA	5	19	1
	24-Hour Maximum+	NA	NA	NA	10	37	5
Particulate Matter (PM10)	Annual Arithmetic Mean	50	50	50	NA	NA	1
	24-Hour Maximum*	150	150	150	NA	NA	5
Sulfur Dioxide	Annual Arithmetic Mean	80	NA	60	2	20	1
	24-Hour Maximum+	365	NA	260	5	91	5
	3-Hour Maximum+	NA	1,300	1300	25	512	25
Carbon Monoxide	8-Hour Maximum+	10,000	10,000	10,000	NA	NA	500
	1-Hour Maximum+	40,000	40,000	40,000	NA	NA	2000
Nitrogen Dioxide	Annual Arithmetic Mean	100	100	100	2.5**	25**	1
Ozone	1-Hour Maximum++	235	235	235	NA	NA	NA
Lead	Calendar Quarter Arithmetic Mean	1.5	1.5	1.5	NA	NA	NA

+ Maximum concentration not to be exceeded more than once per year.

* Achieved when the expected number of exceedances per year is less than 1.0.

** The State of Florida has not yet adopted the PSD Increments for NO_2 concentrations.

++ Achieved when the expected number of days per year with concentrations above the standard is less than 1.0.

NA = Not applicable, i.e., no standard exists.

Sources: Federal Register, Vol. 43, No. 118, June 19, 1978.
40 CFR 50
40 CFR 52.21

Table 3-2. PSD Significant Emission Rates and De Minimis Air Quality Impact Concentrations

Pollutant	Regulated Under	Significant Emission Rate (TPY)	De Minimis Air Quality Impact (ug/m^3)
Sulfur Dioxide	NAAQS, NSPS	40	13, 24-hour
Particulate Matter (TSP)	NAAQS, NSPS	25	10, 24-hour
Particulate Matter (PM10)	NAAQS	15	10, 24-hour
Nitrogen Oxides	NAAQS, NSPS	40	14, Annual
Carbon Monoxide	NAAQS, NSPS	100	575, 8-hour
Volatile Organic Compounds (Ozone)	NAAQS, NSPS	40	100 TPY+
Lead	NAAQS	0.6	0.1, 3-month
Sulfuric Acid Mist	NSPS	7	*
Total Fluorides	NSPS	3	0.25, 24-hour
Total Reduced Sulfur	NSPS	10	10, 1-hour
Reduced Sulfur Compounds	NSPS	10	10, 1-hour
Hydrogen Sulfide	NSPS	10	0.2, 1-hour
Asbestos	NESHAP	0.007	*
Beryllium	NESHAP	0.0004	0.001, 24-hour
Mercury	NESHAP	0.1	0.25, 24-hour
Vinyl Chloride	NESHAP	1	15, 24-hour
Benzene	NESHAP	0	*
Radionuclides	NESHAP	0	*
Inorganic Arsenic	NESHAP	0	*

*No ambient measurement method.
+Increases in VOC emissions.

Notes: Ambient monitoring requirements for subject pollutants may be exempted if the impact of the increase in emissions is below air quality impact de minimis levels.
NAAQS = National Ambient Air Quality Standards.
NSPS = New Source Performance Standards.
NESHAP = National Emission Standards for Hazardous Air Pollutants.

Sources: 40 CFR 52.21.
Chapter 17-2, Florida Administrative Code

PSD review is used to determine whether significant air quality deterioration will result from the new or modified source. PSD requirements are contained in 40 CFR 52.21, Prevention of Significant Deterioration of Air Quality. Major sources and modifications are required to undergo the following analysis related to PSD for each pollutant emitted in "significant" amounts:

1. Control technology review,
2. Source impact analysis,
3. Air quality analysis (monitoring),
4. Source information, and
5. Additional impact analyses.

In addition to these analyses, a new source must also be reviewed with respect to Good Engineering Practice (GEP) stack height regulations. Discussions concerning each of these requirements are presented in the following sections.

3.2.2 Increments/Classifications

In promulgating the 1977 CAA Amendments, Congress specified that certain increases above an air quality "baseline concentration" level of SO_2 and PM concentrations would constitute "significant deterioration." The magnitude of the allowable increment depends on the classification of the area in which a new source (or modification) will be located or have an impact. Three classifications were designated based on criteria established in the CAA Amendments. Initially, Congress promulgated areas as Class I (international parks, national wilderness areas, and memorial parks larger than 5,000 acres, and national parks larger than 6,000 acres) or as Class II (all areas not designated as Class I). Class III areas, which would be allowed greater deterioration than Class II areas, have not been designated. USEPA then promulgated as regulations the requirements for classifications and area designations.

On October 17, 1988, the USEPA promulgated regulations to prevent significant deterioration due to NO_x emissions and established PSD increments for NO_2 concentrations. The USEPA class designations and

allowable PSD increments are presented in Table 3-1. The Florida DER has adopted the USEPA class designations and allowable PSD increments for SO_2 and PM but has not yet adopted the NO_2 increments.

The term "baseline concentration" evolves from federal and state PSD regulations and denotes a fictitious concentration level corresponding to a specified baseline date and certain additional baseline sources. By definition in the PSD regulations, as amended August 7, 1980, baseline concentration means the ambient concentration level which exists in the baseline area at the time of the applicable baseline date. A baseline concentration is determined for each pollutant for which a baseline date is established and includes:

1. The actual emissions representative of sources in existence on the applicable baseline date; and
2. The allowable emissions of major stationary sources which commenced construction before January 6, 1975, but were not in operation by the applicable baseline date.

The following emissions are not included in the baseline concentration and therefore affect PSD increment consumption:

1. Actual emissions from any major stationary source on which construction commenced after January 6, 1975 for SO_2 and TSP concentrations and February 8, 1988, for NO_2 concentrations; and
2. Actual emission increases and decreases at any stationary source occurring after the baseline date.

"Baseline date" means the earliest date after August 7, 1977 for SO_2 and TSP concentrations and February 8, 1988, for NO_2 concentrations, on which the first complete application under 40 CFR 52.21 is submitted by a major stationary source or major modification subject to the requirements of 40 CFR 52.21.

3.2.3 Control Technology Review

The control technology review requirements of the federal PSD regulations require that all applicable federal and state emission limiting standards be met and that Best Available Control Technology (BACT) be applied to control emissions from the source (40 CFR 52.21). The BACT requirements are applicable to all regulated pollutants for which the increase in emissions from the source or modification exceeds the significant emission rate (see Table 3-2).

BACT is defined in 40 CFR 52.21 as:

> An emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under the Act...which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable...through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant.... If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology.

The requirements for BACT were promulgated within the framework of PSD in the 1977 amendments of the CAA [Public Law 95-95; Part C, Section 165(a)(4)]. The primary purpose of BACT is to optimize consumption of PSD air quality increments and thereby enlarge the potential for future economic growth without significantly degrading air quality (USEPA, 1978; 1980). Guidelines for the evaluation of BACT can be found in USEPA's "Guidelines for Determining Best Available Control Technology (BACT)," (USEPA, 1978) and in the "PSD Workshop Manual" (USEPA, 1980). These guidelines were promulgated by USEPA to provide a consistent approach to BACT and to ensure that the impacts of alternative emission control systems are measured by the same set of parameters. In addition, through implementation of these guidelines, BACT in one area may not be identical to BACT in another area.

According to USEPA (1980), "BACT analyses for the same types of emissions unit and the same pollutants in different locations or situations may determine that different control strategies should be applied to the different sites, depending on site-specific factors. Therefore, BACT analyses must be conducted on a case-by-case basis."

The BACT requirements are intended to ensure that the control systems incorporated in the design of a proposed facility reflect the latest in control technologies used in a particular industry and take into consideration existing and future air quality in the vicinity of the proposed facility. BACT must, as a minimum, demonstrate compliance with NSPS for a source (if applicable). An evaluation of the air pollution control techniques and systems, including a cost-benefit analysis of alternative control technologies capable of achieving a higher degree of emission reduction than the proposed control technology, is required. The cost-benefit analysis requires the documentation of the materials, energy, and economic penalties associated with the proposed and alternative control systems, as well as the environmental benefits derived from these systems. A decision on BACT is to be based on sound judgement, balancing environmental benefits with energy, economic, and other impacts (USEPA, 1978).

3.2.4 Air Quality Analysis

In accordance with requirements of 40 CFR 52.21(m), any application for a PSD permit must contain an analysis of continuous ambient air quality data in the area affected by the proposed major stationary source or major modification. For a new major source, the affected pollutants are those that the source would potentially emit in significant amounts. For a major modification, the pollutants are those for which the net emissions increase exceeds the significant emission rate (see Table 3-2).

According to CAA, ambient air monitoring for a period of up to 1 year is generally appropriate to satisfy the PSD monitoring requirements. A minimum of four (4) months of data is required. Existing data from the vicinity of

the proposed source may be utilized if the data meet certain quality assurance requirements; otherwise, additional data may need to be gathered. Guidance in designing a PSD monitoring network is provided in USEPA's "Ambient Monitoring Guidelines for Prevention of Significant Deterioration" (USEPA, 1987a).

The regulations include an exemption which excludes or limits the pollutants for which an air quality analysis must be conducted. This exemption states that the Administrator may exempt a proposed major stationary source or major modification from the monitoring requirements of 40 CFR 52.21(m) with respect to a particular pollutant if the emissions increase of the pollutant from the source or modification would cause, in any area, air quality impacts less than the de minimis levels presented in Table 3-2.

3.2.5 Source Impact Analysis

A source impact analysis must be performed by a proposed major source subject to PSD for each pollutant for which the increase in emissions exceeds the significant emission rate (Table 3-2). The PSD regulations specifically require the use of atmospheric dispersion models in performing impact analysis, estimating baseline and future air quality levels, and determining compliance with AAQS and allowable PSD increments. Designated USEPA models must normally be used in performing the impact analysis. Specific applications for other than USEPA-approved models require USEPA's consultation and prior approval. Guidance for the use and application of dispersion models is presented in the USEPA publication, "Guideline on Air Quality Models (Revised)" (USEPA, 1987b). The source impact analysis for criteria pollutants may be limited to only the new or modified source if the net increase in impacts due to the new or modified source is below significance levels, as presented in Table 3-1.

Various lengths of record for meteorological data can be utilized for impact analysis. A 5-year period can be used with corresponding evaluation of highest, second-highest short-term concentrations for comparison to AAQS or PSD increments. The term "highest, second-highest" refers to the highest of

the second-highest concentrations at all receptors (i.e., the highest concentration at each receptor is discarded). The second-highest concentration is significant because short-term AAQS specify that the standard should not be exceeded at any location more than once a year. If less than 5 years of meteorological data are used in the modeling analysis, the highest concentration at each receptor must normally be used for comparison to air quality standards.

3.2.6 Additional Impact Analysis

In addition to air quality impact analyses, federal PSD regulations require analyses of the impairment to visibility and the impacts on soils and vegetation that would occur as a result of the proposed source. These analyses are to be conducted primarily for PSD Class I areas. Impacts due to general commercial, residential, industrial, and other growth associated with the source must also be addressed. These analyses are required for each pollutant emitted in significant amounts (Table 3-2).

3.2.7 Good Engineering Practice Stack Height

The 1977 CAA Amendments require that the degree of emission limitation required for control of any pollutant not be affected by a stack height that exceeds GEP, or any other dispersion technique. On July 8, 1985, USEPA promulgated final stack height regulations (USEPA, 1985). GEP stack height is defined as the highest of:

1. 65 meters (m), or
2. A height established by applying the formula:

   $Hg = H + 1.5L$

   where: H_g = GEP stack height,

   H = Height of the structure or nearby structure, and

   L = Lesser dimension (height or projected width) of nearby structure(s).
3. A height demonstrated by a fluid model or field study.

"Nearby" is defined as a distance up to five times the lesser of the height or width dimensions of a structure or terrain feature, but not greater than

0.8 km. Although GEP stack height regulations require that the stack height used in modeling for determining compliance with AAQS and PSD increments not exceed the GEP stack height, the actual stack height may be greater.

The stack height regulations also allow increased GEP stack height beyond that resulting from the above formula in cases where "plume impaction" occurs. Plume impaction is defined as concentrations measured or predicted to occur when the plume interacts with "elevated terrain." "Elevated terrain" is defined as terrain which exceeds the height calculated by the GEP stack height formula. Because the terrain in the vicinity of the proposed facility is flat, plume impaction was not considered in determining the GEP stack height.

3.3 NONATTAINMENT RULES

On August 7, 1980, USEPA promulgated rules for review of major new sources and major modifications in areas where air quality does not meet federal standards [Emission Offset Interpretative Ruling (40 CFR 51, Appendix S), which applies to new and modified major sources affecting nonattainment areas.] Under Section IV.A of the Ruling, such sources are required to: (1) meet an emission limitation which specifies the lowest achievable emission rate for such sources, (2) certify that all existing major sources owned or operated by the applicant in the same state are in compliance with all applicable emission limitations and standards under the Act, (3) obtain emission offsets such that there will be reasonable progress toward attainment of the applicable national AAQS, and (4) demonstrate that the emission offsets would provide a positive net air quality benefit in the affected area [not applicable for volatile organic compounds (VOC) or NO_x]. FDER has promulgated rules that are consistent with the USEPA requirements [17-2.510 Florida Administrative Code]. Based on these current nonattainment provisions, all major new sources and modifications to existing major sources located in the nonattainment area must undergo the nonattainment review procedures if the proposed facility or source has the potential to emit 100 TPY or more of the nonattainment pollutant, or the

major modification results in a significant net emission increase at the facility of the nonattainment pollutant.

For major sources or major modifications which locate in an attainment or unclassifiable area, the nonattainment review procedures apply if the source or modification is located within the area of influence of a nonattainment area (F.A.C, Section 17-2.510). The area of influence is defined as an area which is outside the boundary of a nonattainment area but within the locus of all points that are 50 km outside the boundary of the nonattainment area. Based on F.A.C, Section 17-2.510(2)(a) 2.a, all VOC sources which are located within an area of influence are exempt from the provisions of new source review for nonattainment areas. Sources which emit other pollutants and are located within the area of influence are subject to nonattainment review unless the maximum allowable emissions from the proposed source do not have a significant impact within the nonattainment area.

3.4 SOURCE APPLICABILITY

3.4.1 PSD Review

3.4.1.1 Potential Emissions

The proposed facility would be considered a "major source" if the emission rate for one of the regulated pollutants exceeds 100 TPY. Once the source is considered to be a major source, PSD review is required for any pollutant that exceeds the PSD significant emission rates presented in Table 3-2. As presented in Table 3-3, the proposed source will have potential emissions of SO_2, NO_2, PM, CO, VOC, and sulfuric acid mist that are major and will exceed the PSD significant emission rates for Be, Hg and As. Therefore, the proposed facility is a major source and is subject to PSD review for those pollutants.

3.4.1.2 Area Classification

The proposed facility unit will be located in Hardee County which is designated by FDER as an attainment area for all criteria pollutants, and a PSD Class II area for SO_2, TSP and NO_2. The nearest nonattainment area is Hillsborough County which is nonattainment for ozone. Also, portion

Table 3-3. Potential Emissions and Predicted Impacts of the Project Compared to PSD Significant Emission Rates and De Minimis Air Quality Impacts Levels (Page 1 of 2)

Pollutant	Emissions (TPY) Potential From Proposed Source++	Signif-icant Emission Rate	Impacts (ug/m^3) Predicted Impacts	Impacts (ug/m^3) De Minimus Air Quality Impact Level
Sulfur Dioxide	16,083	40	62.5	13, 24-hour
Particulate Matter (TSP)	1,250	25	7.5	10, 24-hour
Particulate Matter (PM10)	1,250	15	7.5	10, 24-hour
Nitrogen Dioxide	8,405	40	4.6	14, Annual
Carbon Monoxide	2,810	100	38.0	575, 8-hour
Votatile Organic Compounds	450	40	--	Emissions Increase of 100 TPY
Lead	0.25	0.6	**	0.1, Calendar quarter
Sulfuric Acid Mist	738	7	*	*
Total Fluorides	0.93	3	**	0.25, 24-hour
Total Reduced Sulfur	NEG	10	**	10, 1-hour
Reduced Sulfur Compounds	NEG	10	**	10, 1-hour
Hydrogen Sulfide	NEG	10	**	0.2, 1-hour
Asbestos	NEG	0.007	*	*
Beryllium	0.072	0.0004	0.0004	0.001, 24-hour
Mercury	0.32	0.1	0.0016	0.25, 24-hour
Vinyl Chloride	NEG	1	**	15, 24-hour
Benzene	NEG	0	*	*
Radionuclides	NEG	0	*	*
Inorganic Arsenic	0.12	0	+	*

Table 3-3. Potential Emissions and Predicted Impacts of the Project Compared to PSD Significant Emission Rates and De Minimis Air Quality Impacts Levels (Page 2 of 2)

Note : NA = Not applicable.
NEG = Negligible.

* No acceptable ambient measurement method has been developed and, therefore, de minimis levels have not been established by USEPA.
\+ Predicted impacts are presented in Section 8 to assess effects on soils and vegetation.
** Predicted impacts are not required because emissions are less than significant emission rates.
++ Based on 100 percent capacity factor at 100 percent load when firing oil at 32°F conditions; all pollutant emissions based on 5 combustion turbines which produce the maximum emisssions for an ultimate capacity of 660 MW.

of Hillsborough County has been reclassified by FDER from a TSP nonattainment area to unclassifiable for PM10. This change will go into effect upon USEPA approval. The proposed facility will also be located more than 100 km from the PSD Class I areas of the Chassahowitzka National Wilderness Area and the Everglades National Park. Because impacts from the proposed source's emissions are not expected to be significant at such distances, potential impacts on the Class I area were not addressed in the analysis.

3.4.1.3 Ambient Monitoring

Based upon the pollutant impacts presented in Table 3-3, a PSD preconstruction ambient monitoring analysis is required for SO_2, NO_2, PM, CO, VOC, sulfuric acid mist, Be, Hg and As. However, if the impact of these pollutant emissions is less than the de minimis levels, then an exemption from the preconstruction ambient monitoring requirement may be granted. Predicted impacts are less than de minimis levels for all pollutants, except SO_2 (refer to Table 3-3). For SO_2 concentrations, the Applicant has requested and received from the Florida DER an exemption from PSD preconstruction monitoring. For ozone concentrations, the de minimis air quality impact level is specified as an increase of 100 TPY or more of VOC emissions. Because the maximum potential VOC emissions from the proposed plant are greater than 100 TPY, preconstruction monitoring review is required for O_3 concentrations. However, because of the rural nature of the proposed site and locations of existing monitoring stations, data from existing monitoring stations will be used to fulfill the ambient monitoring requirements for this application. A more detailed discussion about the preconstruction monitoring exemption and use of existing ambient data is presented in Section 5.0.

3.4.1.4 GEP Stack Height Impact Analysis

The GEP stack height regulations allow any stack to be at least 65 meters high. The proposed stack heights are 75 and 90 ft (23 and 27 meters), respectively, for the by-pass and HRSG stacks; therefore, they do not exceed the GEP stack height. Impact analyses were performed with both stacks at

75 ft (23 m) to produce worst case ambient impacts. The potential for downwash of the units' emissions due to nearby structures is discussed in Section 6.0, Air Quality Modeling Approach.

3.4.2 Nonattainment Review

Although the proposed facility is located in an attainment area for all regulated pollutants, it may be subject to nonattainment review if it is located within the area of influence of a nonattainment area (F.A.C., Section 17-2.510).

The proposed facility is located approximately 9 km from Hillsborough County, which is designated as nonattainment for O_3 concentrations, and 40 km from that portion of Hillsborough County designated as nonattainment for TSP concentrations. Therefore, the proposed facility is located within the area of influence of both nonattainment areas. However, based on FDER regulations, the proposed facility is exempt from nonattainment review for VOC emissions but must comply with PSD review requirements. Based on the maximum concentrations predicted for the proposed facility presented in Section 7.0, the maximum allowable TSP emissions will produce impacts that are not significant within the reclassified nonattainment area. In fact, the proposed facility has a significant TSP impact that extends out to only about 10 km from the project site. Based on these results, the proposed facility is not subject to nonattainment review for either VOC or PM emissions.

4.0 CONTROL TECHNOLOGY REVIEW

4.1 APPLICABILITY

The Control Technology review requirements of the PSD regulations are applicable to emissions of NO_x, CO, SO_2, TSP/PM10, VOC, mercury, inorganic arsenic and sulfuric acid mist and beryllium (see Section 3.0). This section presents the applicable New Source Performance Standards (NSPS) and the proposed BACT for these pollutants. The approach to BACT analyses are based on the regulatory definitions of BACT.

4.2 NEW SOURCE PERFORMANCE STANDARDS

The applicable NSPS for gas turbines are codified in 40 CFR part GG. These regulations apply to:

1. "Electric utility stationary gas turbine" with a heat input at peak load of greater than 100 million Btu/hr [40 CFR 60.332 (b)];
2. "Stationary gas turbines" with a heat input at peak load between 10 and 100 million Btu/hr [40 CFR 60.332 (c)]; or
3. "Stationary gas turbines" with a manufacture's rate based load at ISO conditions of 30 MW or less [40 CFR 60.332 (d)].

The "electric utility stationary gas turbine" provisions apply to stationary gas turbines constructed for the purpose of supplying more than one-third of its potential electric output capacity to any utility power distribution system for sale [40 CFR 60.331 (q)]. The requirements for "electric utility stationary gas turbines" are applicable to the project and are the most stringent provision of the NSPS and are a technically feasible control alternative for the project. These requirements are summarized in Table 4-1 and were considered in the BACT analysis.

As noted from Table 4-1, the NSPS can be adjusted upward to allow for fuel bound nitrogen. For a fuel bound nitrogen concentration of 0.015% or less no increase in the NSPS is provided; for a fuel bound nitrogen concentration of 0.06% the NSPS is increased by 0.0024% or 24 ppm.

Table 4-1. Federal NSPS for Stationary Gas Turbines

Pollutant	Emission Limitation*
Sulfur Dioxide	Maximum of 0.015 percent by volume at 15 percent oxygen on a dry basis or sulfur in fuel no greater than 0.8 percent by weight
Nitrogen Oxides+	0.0075 percent by volume (75 ppm) at 15 percent O_2 on a dry basis adjusted for heat rate and fuel nitrogen

* Applicable to electric utility gas turbines with a heat input at peak load of greater than 100 x 10^6 Btu/hr.

\+ Standard is multiplied by 14.4/Y; where Y is the manufacturer's rated heat rate in kilojoules per watt at rated load or actual measured heat rate based on the lower heating value of fuel measured at actual peak load Y cannot be greater than 14.4.

** Standard is adjusted upward (additive) by the percent of nitrogen in the fuel:

Fuel-bound nitrogen (percent by weight)	Allowed Increase NO_x percent by volume
N<0.015	0
0.015<N<0.1	0.04(N)
0.1<N<0.25	0.004+0.0067(N-0.1)
N>0.25	0.005

where:
N = the nitrogen content of the fuel (percent by weight).

Source: 40 CFR 60 Subpart GG.

4.3 BEST AVAILABLE CONTROL TECHNOLOGY

4.3.1 Nitrogen Oxides

4.3.1.1 Emission Control Hierarchy

NO_x emissions from combustion of fossil fuels consist of thermal NO_x and fuel bound NO_x. Thermal NO_x is formed from the reaction of oxygen and nitrogen in the combustion air at combustion temperatures. Formation of thermal NO_x depends on the flame temperature, residence time, combustion pressure, and air to fuel ratios in the primary combustion zone. The design and operation of the combustion chamber dictates these conditions. Fuel bound NO_x is created by the oxidation of volatilized nitrogen in the fuel. Nitrogen content in the fuel is the primary factor in its formation.

Table 4-2 presents a listing of the LAER/BACT decisions for gas turbines made by state environmental agencies and EPA regional offices. This table was developed from the information contained in the LAER/BACT clearinghouse documents (USEPA, 1985, 1986b, 1987c 1988c) and by contacting state agencies such as the California Air Control Board and the South Coast Air Quality Management District.

Presently, there are about 35 operating and permitted facilities with Selective Catalytic (SCR) in the United States. Almost all of these facilities were required to have SCR due to nonattainment status of the area where the facility was located. The requirement for SCR in these cases was to meet the Lowest Achievable Emission Rate (LAER). LAER is defined as follows:

> Lowest achievable emission rate means, for any source, the more stringent rate of emissions based on the following: (i) The most stringent emissions limitation which is contained in the implementation of any State of such class or category of stationary source, unless the owner or operator of the proposed stationary source demonstrates that such limitations are not achievable; or (ii) The most stringent emissions limitation which is achieved in practice by such class or

Table 4-2. LAER/BACT Decisions

Company Name	State	Unit Description	Capacity (Size)	Date of Permit	Emission Limit	Emission Control
Virginia Power	VA	GE Turbine	1,875 MMBTU/hr	Apr-88	NOx 42ppm 490 lb/hr	Steam Injection W/Maximazation NSPS subpart GG
Trunkline LNG	LA	Gas Turbine	147,102 SCF/hr	May-87	NOx 59 lb/hr	
Wichita Falls E. I., I.	TX	Gas Turbine	20 MW	Jun-86	NOx 684 TPY CO 420 TPY	Steam Injection
Merck Sharp & Pohme	PA	Turbine	310 MMBTU/hr	May-88	NOx 42 ppm @ 15% O2	Steam Injection
California Dept. of Corr.	CA	Gas Turbine	5.1 MW	Dec-86	NOx 38 ppmv @ 15% O2	1 to 1 H2O injection
City of Santa Clara	CA	Gas Turbine		Jan-87	NOx 42 ppmvd @ 15% O2	Water Injection
Combined Energy Resources	CA	Cogeneration Fac.	27 MW	Mar-87	NOx 199 lb/D	SCR Unit, Duct Burner H2O Injection, Low NOx Design
Double 'C' Limited	CA	Gas Turbine	25 MW	Nov-86	NOx 194 lb/D	H2O Inj. & Selected Catalytic Red. 95.80 Efficiency
Kern Front Limited	CA	Gas Turbine	25 MW	Nov-86	NOx 194 lb/D 4.5 ppmvd @ 15% O2	H2O Inj. & Selected Catalytic Red. 95.80 Efficiency
Midway - Sunset Project	CA	Gas Turbine	973 MMBTU/hr	Jan-87	NOx 113.4 lb/hr 16.31 ppmv	H2O Injection, 73% Efficiency
O'Brien Energy Systems	CA	Gas Turbine	359.5 MMBTU/hr	Dec-86	NOx 30.3 lb/hr 15 ppmvd @ 15% O2	Duct Burner, H2O Injection and Scrubber
PG & E, Station T	CA	GE Gas Turbine	396 MMBTU/hr	Aug-86	NOx 25 ppm @ 15% O2 63 lb/hr	Steam Injection @ Steam/Fuel Ratio of 1.7/1, 75% Efficiency
Sierra LTD.	CA	GE Gas Turbine	11.34 MMCF/D		NOx 4.04 lb/hr 0.016 lb/MMBTU	Scrubber & CO Catalytic Converter Steam Injection 95.86 Efficiency

Table 4-2. LAER/BACT Decisions (Page 2 of 5)

Company Name	State	Unit Description	Capacity (Size)	Date of Permit	Emission Limit	Emission Control
Sycamore Cogeneration Co.	CA	Gas Turbine	75 MW	Mar-87	CO 10 ppmv @ 15% O2 3 hr Avg	CO Oxidizing Catalyst Combustion Control
U.S. Borax & Chemical Corp.	CA	Gas Turbine	45 MW	Feb-87	NOx 40 lb/hr 25 ppm @ 15% O2 Dry CO 23 lb/hr	Scrubber Proper Combust. Techniques
Western Power System, Inc	CA	GE Gas Turbine	26.5 MW	Mar-86	NOx 9 ppmvd @ 15% O2	H2O Injection, Selective Cat. Red. 80% Efficiency
Calcogen, Cal Polytechic	CA	Gas Turbine	21.4 MW	Apr-84	NOx 42 ppm @ 15% O2	H2O Injection, 70% Efficiency
Greenleaf Power Co.	CA	GE Gas Turbine	35.62 MW	Apr-85	NOx 42 ppm @ 15% O2 91 lb/hr CO 20.4 lb/hr	H2O Injection Good Eng. Practices
		Duct Burner	63.7 MMBTU/hr	Apr-85	NOx 0.1 lb/MMBTU 6.4 lb/hr CO 0.12 lb/MMBTU 7.6 lb/hr	Low NOx Design
OLS Energy	CA	GE Gas Turbine	256 MMBTU/hr	Jan-86	NOX 9 PPMVD @ 15% O2	H2O Injection & Scrubber 80% Eff. for Scrubber
Ciba Giegy Corp.	NJ	Gas Turbine	3 MW	Jan-85	NOx 11.06 lb/hr CO 9.4 lb/hr	SIP, H2O Injection, 55% Eff.
Energy Reserve, Inc.	CA	Gas Turbine	322.5 MMBTU/hr	Oct-85	NOx 185.4 lb/D	H2O Injection, Select. Cat. Red. 92.5% Efficiency
Gilroy Energy Co.	CA	Gas Turbine	60 MW	Aug-85	NOx 25 PPMDV @ 15% O2	Steam Inj., Quiet Combustor
		Auxiliary Boiler	90 MMBTU/hr		NOx 40 PPMDV @ 3% O2	Low NOx Burners

Table 4-2. LAER/BACT Decisions (Page 3 of 5)

Company Name	State	Unit Description	Capacity (Size)	Date of Permit	Emission Limit	Emission Control
Kern Energy Corp.	CA	Gas Turbine	8.8 MMCF/D	Apr-86	NOx 8.29 lb/hr 0.023 lb/MMBTU	Scrubber w/ NH3 Red. Agent Steam Inj. & Low NOx Config. Exh. Duct Burner 87% Efficiency
Moran Power, Inc.	CA	Gas Turbine	8.0 MMCF/D	Apr-86	NOx 8.29 lb/hr 0.023 lb/MMBTU	Scrubber w/ NH3 Red. Agent Steam Inj. & Low NOx Config. Exh. Duct Burner 87% Efficiency
Northern California Power	CA	GE Gas Turbine	25.8 MW	Apr-85	NOx 75 ppm	H2O Injection
Shell California Production	CA	Gas Turbine	22 MW	Apr-85	NOx 42 ppm @ 15% O2 35 lb/hr CO 10 PPMV @ 15% O2 22 lb/hr	H2O Inj. Proper Combustion
Southeast Energy, Inc.	CA	Gas Turbine	8.0 MMCF/D	Apr-86	NOx 8.29 lb/hr 0.023 lb/MMBTU	Scrubber w/ NH3 Red. Agent Steam Inj. & Low NOx Config. Exh. Duct Burner 87% Efficiency
Sunlaw/Industrial Park	CA	Gas Turbine	412.3 MMBTU/hr	Jun-85	NOx 9 PPMVD @ 15% O2 CO 10 PPMVD @ 15% O2	Scr. & Steam Inj., 80% Eff. Mfg Guarantee on CO Emissions
Union Cogeneration	CA	Gas Turbine w/ Duct Burner	16 MW	Jan-86	NOx 25 PPMV @ 15% O2 CO 8 lb/hr 29.2 TPY	H2O Injection & Scrubber Oxidizing Catalyst, 80% Efficiency
Willamette Industries	CA	GE Gas Turbine	230 MMBTU/hr	Apr-85	NOx 15 PPMVD @ 15% O2	H2O Inj. w/ Selective Cat. Red. 92% Efficiency

Table 4-2. LAER/BACT Decisions (Page 4 of 5)

Company Name	State	Unit Description	Capacity (Size)	Date of Permit	Emission Limit	Emission Control
Witco Chemical Corp.	CA	Gas Turbine	350 MMBTU/hr	Dec-84	NOx 0.18 lb/MMBTU Oil 0.20 lb/MMBTU Gas	
		Duct Burner	111.6 MMBTU/hr		NOx 0.12 lb/MMBTU	Gas Firing Only
AES Placerita, Inc.	CA	Turbine & Recovery Boiler	519 MMBTU/hr	Mar-86	NOx 629 lb/d 7 PPMVD @ 15% O2 CO 103 lb/d 2 PPMVD @ 15% O2	H2O Inj, Select. Cat. Red. 80% Efficiency
AES Placerita, Inc.	CA	Turbine & Recovery Boiler	530 MMBTU/hr	Jul-87	NOx 340 lb/D 9 PPMVD @ 15% O2	Steam Inj, Select. Cat. Red.
AES Placerita, Inc.	CA	Gas Turbine	530 MMBTU/hr	Jul-87	NOx 289 lb/D 9 PPMVD @ 15% O2	Steam Inj, Select. Cat. Red.
Alaska Electrical Generation	AK	Gas Turbine	80 MW	Mar-87	NOx 75 PPMVD @ 15% O2 CO 109 lb/SCF Fuel	H2O Injection
Alaska Electrical Generation	AK	Gas Turbine	38 MW	Mar-85	NOx 75 PPM @ 15% O2	H2O Injection
BAF Energy	CA	Turbine, Generator	887.2 MMBTU/hr	Jul-87	NOx 9 PPM @ 15% O2 30.1 lb/hr	Steam Injection, Scrubber 80% Efficiency
BAF Energy	CA	Auxiliary Boiler	150 MMBTU/hr	Oct-87	NOx 17.4 lb/D 40 PPMVD @ 3% O2 CO 63.6 lb/D 0.018 lb/MMBTU	Flue Gas Recirculation Low NOx Burners Oxidation Catalyst
Champion International Corp.	TX	Gas Turbine	30.6 MW (1342 MMBTU/hr)	Mar-85	NOx 720.34 TPY CO 70.08 TPY	Low NOx Burners
Cogen Technologies	NJ	GE Gas Turbines	40 MW	Jun-87	NOx 9.6 PPMVD @ 15% O2 CO 50 PPMVD @ 15% O2	H2O Inject. & SCR, 95% Efficiency

Table 4-2. LAER/BACT Decisions (Page 5 of 5)

Company Name	State	Unit Description	Capacity (Size)	Date of Permit	Emission Limit	Emission Control
Combined Energy Resources	CA	Gas Turbine	2 MW	Feb-88	NOx 199 lb/hr	H2O Inj. & Scrubber, 81% Efficiency
Formosa Plastic Corp.	TX	GE Gas Turbine	38.4 MW	May-86	NOx 640 TPY CO 32.4 TPY	Steam Injection
Midland Cogeneration Venture	MI	Turbine	984.2 MMBTU/hr	Feb-88	NOx 42 PPMV @ 15% O2 CO 26 lb/hr	Steam Injection Turbine Design
		Duct Burner	249 MMBTU/hr		NOx 0.1 lb/MMBTU	Burner Design
Pacific Gas Transmission	OR	Gas Turbine	14000 HP	May-87	NOx 154 PPM 50 lb/hr CO 6 lb/hr 25 TPY	Combustion Control
Power Development Co.	CA	Gas Turbine	49 MMBTU/H	Jun-87	NOX 36 lb/D 9 PPMVD @ 15% O2	Scrubber & H2O Injection
San Joaquin Cogen Limited	CA	Gas Turbine	48.6 MW	Jun-87	NOx 250 lb/D 6 PPMVD @ 15% O2 CO 1326 lb/d 55 PPMVD @ 15% O2	Scrubber & H2O Injection 76% Efficiency Combustion Controls
TBG/Grumman	NY	Gas Turbine	16 MW	Mar-88	NOx 75 PPM + NSPS Corr. 0.2 lb/MMBTU CO 0.181 lb/MMBTU	H2O Inj. & Combustion Controls CO Catalyst
Texas Gas Transmission Corp.	KY	Gas Turbine	14300 HP	Feb-88	NOx 0.015 % by Volume	
Orlando Utilities Commission	FL	Gas Turbine	4 x 445 MMBTU/H	Sept-88	NOx 42 PPMDV Gas 65 PPMDV Oil CO 10 PPMMDV	Steam Injection Good Combustion
Anheuser-Busch	FL	Gas Turbine	95.7 MMBTU/hr	Apr-87	NOx 0.1 lb/MMBTU	

category of stationary source. This limitation, when applied to a modification, means the lowest achievable emissions rate for the new or modified emissions units within the stationary source. In no event shall the application of this term permit a proposed new modified stationary source to emit any pollutant in excess of the amount allowable under applicable new source standards of performance (40 CFR 51 Appendix S. II, A.18).

As noted from the discussion contained in Subsection 3.2.3, there is a regulatory distinction between LAER and BACT.

In Florida, the most recent permits have required wet injection for NO_x control. The emission limits were 42 ppm and 65 ppm (corrected to 15% O_2, dry conditions) respectively, for natural gas and fuel oil firing.

The hierarchy for NO_x control suggested by the existing and permitted facilities is as follows:

1. Selective Catalytic Reduction (SCR).
2. Wet Injection using standard or advanced combustor design.

The selected control level of SCR used for the BACT analysis was 9 ppm NO_x corrected to 15% dry conditions using natural gas. This level of control assumes 80% removal of NO_x by the SCR equipment with an input concentration of 42 ppm. For fuel oil firing, a control level of 14 ppm was used to account for fuel bound nitrogen. These levels of control are the most stringent being established as BACT. For wet injection, the advanced combustor design can limit NO_x to 25 ppm when firing natural gas and 42 ppm when firing fuel oil while the standard combustor design can limit No_x to 42 ppm when firing natural gas and 65 ppm when firing fuel oil.

4.3.1.2 Technology Description and Feasibility

SELECTIVE CATALYTIC REDUCTION (SCR)

SCR uses ammonia (NH_3) to react with NO_x in the gas stream under the presence of a catalyst. NH_3, which is diluted with air to about 5% by

volume, is introduced into the gas stream at reaction temperatures between 600°F and 700°F. The reactions are as follows:

$$4NH_3 + 4NO = 4N_2 + 6H_2O$$
$$4NH_3 + 2NO_2 = 3N_2 + 6H_2O$$

SCR has mainly been installed at facilities located in nonattainment areas for NO_2 and mainly in California. While the operating experience has not been extensive, certain cost, technical and environmental considerations have surfaced. These considerations are summarized in Table 4-3.

The operating experience consists primarily of baseload natural gas fired installations either of cogeneration or combined cycle configuration; no simple cycle facilities have SCR. Exhaust gas temperatures of simple cycle combustion turbines are generally in the range of 1000°F, which exceeds the optimum range for SCR. While cooling could be accomplished through the introduction of ambient air, the increased volume of air would increase the catalyst size, and thus the cost, considerably. Water quenching is not feasible since the catalyst can be damaged and ammonium hydroxide, a corrosive, would be formed.

The use of fuel oil in SCR facilities has been limited since SCR catalysts are contaminated by sulfur containing fuels. For most fuel oil burning facilities, catalyst operation is discontinued, or the exhaust bypasses the SCR system. As presented in Table 4-3, ammonium bisulfate is formed by the reaction of NH_3 and SO_3. Experience at the United Airlines cogeneration facility using 0.05% fuel oil found catalyst contamination after 2,500 hours of operation. For this facility, the catalyst has been replaced three times and the recommended hours of operation by the manufacturer is now 500 hours.

Reported and permitted NO_x removal efficiencies of SCR range from 40 to 80%. Emission limiting standards with SCR are in the 9 ppm range for natural gas firing. However, two facilities have reported emission limits

Table 4-3. SCR Cost, Technical and Environmental Considerations for Combustion Turbines (Page 1 of 2)

Consideration	Description
COST:	
Catalyst Replacement	Catalyst life varies depending on the application. Cost ranges from 20 to 40% of total capital cost and is the dominate annual cost factor.
Ammonia	Ratio of at least 1:1 NO_x to NH_3 generally needed to obtain high removal efficiencies. Special storage and handling equipment required.
Space Requirements	For new installations, space in the catalyst is needed for replacement layers. Additional space is also required for catalyst maintenance and replacement.
Backup Equipment	Reliability requirements necessitate redundant systems such as ammonia control and vaporization equipment.
Catalyst Back Pressure Heat Rate Pressure	Addition of catalyst creates back pressure on the turbine which reduces overall heat rate.
TECHNICAL:	
Ammonia Flow Distribution	NH_3 must be uniformly distributed in the exhaust steam to assure optimum mixing with NO_x prior to reaching the catalyst.
Temperature	The narrow temperature range that SCR systems operate, i.e., about 100°F, must be maintained even during load changes. Operational problems could occur if this range is not maintained. HRSG duct firing requires careful monitoring.
Ammonia Control System	Quantity of NH_3 introduced must be carefully controlled. With too little NH3, the desired control efficiency is not reached; with too much NH_3, NH_3 emissions occur.

Table 4-3. SCR Cost, Technical and Environmental Considerations for Combustion Turbines (Page 2 of 2)

Consideration	Description
Flow Control	The velocity through the catalyst must be within a range to assure satisfactory residence time.
ENVIRONMENTAL:	
Ammonia Slip	NH_3 slip, or NH_3 that passes unreacted through the catalyst and into the atmosphere can occur if: 1) too much ammonia is added, 2) the flow distribution is not uniform, 3) the velocity is not within the optimum range, or the proper temperature is not maintained.
Ammonia Bisulfate and Chloride Salts	Ammonium bisulfate and chloride salts can lead to increased corrosion. These usually occur when firing fuel oil. These compounds are emitted as particulates.
N_2O and Nitrosoamines formation	The mechanism under which these compounds form is not totally understood. Secondary impacts can occur.

of about 4.5 ppm. These emission limits were clearly determined to be LAER on machines using water injection below 42 ppm. For fuel oil firing, permitted NO_x emissions with SCR has ranged from 14 ppm to 42 ppm.

The available information suggests that SCR is a technically feasible alternative for the project. However, the following technical limitations exist:

1. SCR is not technically applicable to the simple cycle portion of the combined cycle configuration, i.e., the combustion turbine by-pass stack exhaust, and
2. Continuous operation of SCR using distillate oil has not demonstrated; technical, economic and environmental uncertainties would result.

WET INJECTION

The injection of water or steam in the combustion zone of turbines reduces the flame temperature with a decrease of NO_x emissions. The amount of NO_x reduction possible depends on the combustor design and the water to fuel ratio used. An increase in the water to fuel ratio will cause a concomitant decrease in NO_x emissions until flame instability occurs. At this point, operation of the turbine becomes inefficient and unreliable, and significant increases in products of incomplete combustion will be emitted, i.e., CO and VOC.

With standard combustion chamber design, there is a point where the amount of water or steam injected into the turbine seriously degrades its reliability and operational life. This generally occurs at NO_x emissions levels of about 65 ppmvd (with no heat rate adjustment) on oil and 42 ppmvd on natural gas. These NO_x emission levels can be achieved with little additional cost and with limited impact on reliability or power output over those costs required to comply with the NSPS.

Since the combustion turbine NSPS was last revised in 1982, combustion turbines have improved their tolerance to the water or steam necessary to

control NO_x emissions below the NSPS requirement. Some manufactures have begun to market an improved low NO_x burner design. [These burners provide improved air/fuel mixing with water or steam injection result in reduced flame temperatures and concomitantly lower concentrations of NO_x as compared to a standard combustion chamber design (with water or steam injection).] These design improvements result in a NO_x emission rate of 25 ppmvd compared to 42 ppmvd with a standard combustor design. However there is the lack of operating experience with such designs and there is a significant increase in capital cost of the turbines. Also, approximately 25 gpm of additional demineralized water per turbine would be required for injection into the combustion chamber. The improved combustors would, however, increase CO concentrations relative to the standard combustor. Low NO_x burner designs are however, not available for several of the manufacturers being considered. Because of this and the lack of operating experience of those manufacturers with burners, low NO_x burner design are considered marginally feasible for the project.

Wet injection is a technically feasible alternative for the project. The application of this technology has the following limitations:

1. Wet injection can be accomplished until a condition of maximum moisturization occurs; this design condition depends on the combustor design but usually occurs at 42 ppm on natural gas and 65 ppm on fuel oil,

2. Wet injection will not substantially reduce NO_x formation due to fuel bound nitrogen, any emission limiting requirements must account for this effect, and

3. Wet injection will increase the emissions of CO and VOC depending on the water to fuel ratio.

For the BACT analysis, emissions with wet injection were considered to be 25 ppm and 42 ppm when firing natural gas and 42 ppm and 65 ppm when firing

fuel oil (both corrected to 15% O_2 dry conditions). These emission levels are the most stringent being established as BACT.

4.3.1.3 Impact Analysis

A BACT determination requires an analysis of the economic, environmental, and energy impacts of the proposed and alternative control technologies (see 40 CFR 52.21(b)(12) and 17-2.100(25) and 17-2.500(5)(c) FAC). The analysis must be specific to the project, i.e., case-by-case. The economic and environmental impacts of the control technologies evaluated for NO_x are summarized in Table 4-4. The specific analyses are discussed below.

ECONOMIC

The total annualized cost for alternative NO_x control technologies range from $22,014,000 for SCR to $2,490,000 for wet injection to meet NSPS (Table 4-5). Incremental cost effectiveness for SCR was estimated to range from $8,250/ton NO_x removed for natural gas firing to $4,641/ton NO_x removed for fuel oil firing. This incremental cost is about a factor of four higher than the improved combustor design. Indeed, the incremental cost effectiveness was estimated to be over 25 times that of the standard combustor. For the improved combustor design the incremental cost effectiveness ranged from $1,626 to $915/ton of NO_x removed, which was about seven times or more higher than the standard combustor design. These costs reflect increased CO emissions. Assuming CO controls the incremental cost effectiveness would be $5,007/ton of NO_x removed when firing natural gas and $2,817/ton of NO_x removed when firing fuel oil. The incremental cost effectiveness for the standard combustor ranged from $176 to $504/ton of NO_x removed.

ENVIRONMENTAL

The maximum predicted impacts of the alternative technologies are all considerably below the PSD increment (i.e., 25 ug/m^3) and AAQS (i.e., 100 ug/m^3). Additional controls beyond NSPS improve air quality to less than about 20% of the PSD increment and about 5% of the AAQS.

Table 4-4. Summary of BACT Analysis

Pollutant	Control Option			Economic Impact		Environmental Impacts	
	Description	Fuel	Emissions (TPY)	Annualized Cost ($)	Incremental Cost Effectiveness ($/ton)	Impacts for Controlled Pollutant	Other Impacts
NOx	Water Injection with SCR to 9 ppm	Natural Gas	1,018	22,014,000	8,250	0.6 (Max. Annual)	Ammonia @ 10ppm
	Water Injection with SCR to 14 ppm	Fuel Oil	1,810	22,014,000	4,641	1.0 (Max. Annual)	Ammonia @ 10ppm Ammonium Bisulfate
	Improved Combustor Design to 25 ppm	Natural Gas	3,058	5,210,000 (10,868,000)	1,626 (5,007)	1.7 (Max. Annual)	Increase in CO & VOC; water use
	Improved Combustor Design to 42 ppm	Fuel Oil	5,431	5,210,000 (10,868,000)	915 (2,817)	3.0 (Max. Annual)	Increase in CO & VOC; water use
	Standard Combustor Design to 42 ppm	Natural Gas	4,729	2,490,000	176*	2.6 (Max. Annual)	Water use
	Standard Combustor Design to 65 ppm	Fuel Oil	8,405	2,490,000	504*	4.6 (Max. Annual)	Water use
CO	Catalytic Oxidation to 10 ppm	Natural Gas	685	5,658,000	2,663	10 (Max. 8 hr)	
	Combustion Techniques to 41 ppm	Natural Gas	2,810	--	--	39 (Max. 8 hr)	
SO2	0.20 % Sulfur Fuel	Fuel Oil	6,433	21,009,000	NA	25 (Max. 24 hr)	
	0.50 % Sulfur Fuel	Fuel Oil	16,083	--	--	63 (Max. 24 hr)	

* Based on an NSPS Emission Level of 98 ppm and an estimated annualized cost of $1,813,000.

Table 4-5. Annualized Cost Estimate for Alternative NOx Control Technology

Item	Basis	Standard Combustor & SCR	Improved Combustor	Standard Combustor
DIRECT COSTS (DC):				
Differential Turbine Costs		$ 1,800,000	$8,750,000	$1,800,000
SCR Reactor		$22,140,000	$0	$0
Ammonia Storage & Injection Equipment		$5,530,000	$0	$0
Water Treatment, Storage & Injection		$2,810,000	$4,240,000	$2,810,000
Balance of Plant		$1,160,000	$1,380,000	$1,060,000
Subtotal:		$33,440,000	$14,370,000	$5,670,000
CONTINGENCY:	10% of DC	$3,344,000	$1,437,000	$567,000
TOTAL CAPITAL COSTS (TCC):		$36,784,000	$15,807,000	$6,237,000
ESCALATION:		$5,429,318	$2,333,113	$920,581
TOTAL ESCALATED COST (TEC):		$42,213,318	$18,140,113	$7,157,581
SALES AND USE TAX:	6% of TEC	$2,532,799	$1,088,407	$429,455
SUBTOTAL:		$44,746,118	$19,228,520	$7,587,036
INDIRECT COSTS:	14.5% of Subtotal	$6,488,187	$2,788,135	$1,100,120
INTEREST DURING CONSTRUCTION:	10.45%	$5,353,985	$2,300,740	$907,808
INSTALLED COST:		$56,588,289	$24,317,396	$9,594,964
OPERATING COSTS:				
Operating & Maintenance*		$10,208,333	$986,111	$652,778
Ammonia		$ 1,305,556	$0	$0
Energy		$ 2,125,000	$625,000	$416,667
ANNUAL OPERATING COST:		$13,638,889	$1,611,111	$1,069,444
FIXED CHARGES ON CAPITAL:	14.8% of Installed Cost	$ 8,375,067	$3,598,975	$1,420,055
TOTAL LEVELIZED ANNUAL COST:		$22,013,956	$5,210,086	$2,489,499

* Includes Catalyst Replacement

Additional air quality impacts would occur with the installation of SCR. Emissions of ammonia, ammonium sulfates, such as ammonium bisulfate, and chloride salts would occur. Ammonia would be emitted at a concentration of at least about 10 ppm based on previous experience; previous permit conditions have selected this level. For a 660 MW plant, ammonia emissions would be about 400 ton/year. However, ammonia emissions could be five times this level since actual operating experience has found ammonia slippage rates as high as 50 ppm.

The replacement of SCR catalyst will create additional economic and environmental impacts since such catalyst, e.g. vanadium pentoxide, are listed as hazardous chemical wastes under RCRA regulations (40 CFR 261).

ENERGY

Energy penalties will occur with all control alternatives evaluated. The most significant is with SCR would reduce the output of the combustion turbine by about 0.1% over wet injection. This would amount to about a 5,800,000 kw/hr loss in potential generation/year.

4.3.1.4 Proposed BACT and Rationale

The proposed BACT for the Hardee Power Station is wet injection using standard combustor design. The NO_x emissions levels using standard combustor with wet injection would be 42 ppm when firing natural gas and 65 ppm when firing fuel oil. This alternative control is proposed for the following reasons:

1. SCR was rejected based on technical economic and environmental grounds. Operation of SCR during simple cycle CT operation has not been demonstrated since the temperature range of the exhaust exceeds operational requirements for optimum catalytic reaction. Fuel oil firing when operating SCR would cause operating problems and result in catalyst poisoning. The estimated total and incremental costs exceed $2,000 and $5,000/tons of NO_x removed, respectively. These costs are over an order of magnitude more costly than the proposed BACT levels. Additional environmental

impacts would result from SCR operation including emissions of ammonia and ammonium bisulfates, and the generation of hazardous waste, i.e., spent catalyst replacement.

2. The improved combustor design is rejected based on technical economic and environmental reasons. Not all manufacturers offer improved combustor designs. For those who do, an economic penalty would result: the annualized cost of such systems is over twice that of the standard combustor design. In addition, these improved combustor designs have not been demonstrated to achieve the reliability and maintenance requirements as standard designs. Environmental impacts would also result including increases in CO and VOC emissions and water consumption. Control of CO and VOC emissions greatly increase the cost of the advanced combustor. The cost effectiveness would exceed $2,500/ton of NO_x removed. Water use has been estimated to increase 25 gpm per turbine or about 130,000 gpd more than a standard combustor design.

3. The proposed BACT provides the least costly alternative and results in the maximum environmental impacts of less than 20% of the PSD increments and 5% of the AAQS. Wet injection at the proposed emissions levels has been adopted as BACT previously and manufacturers have guaranteed this level.

4.3.2 Carbon Monoxide (CO)

4.3.2.1 Emission Control Hierarchy

CO emissions are a result of incomplete or partial combustion of fossil fuel. Combustion design and catalytic oxidation are the control alternatives that are viable for the project.

Combustion design is the more prevalent control technique used in combustion turbines. Sufficient time, temperature and turbulence is required within the combustion zone to minimize the emissions of CO. As such, combustion

efficiency is dependent upon combustor design and, in NO_x control systems, the amount of water or steam injected in the combustion zone. For the combustion turbines being evaluated, CO emissions range from 10 ppm to 41 ppm, corrected to 15% O_2 dry conditions.

Catalytic oxidation is a post combustion control that has been installed where CO nonattainment regulations have required CO reduction due to increases caused by wet injection. These LAER installations typically have CO limits in the 10 ppm range (corrected to 15% O_2 and dry conditions).

4.3.2.2 Technology Description

Oxidation catalyst control CO emissions by allowing unburned CO to react with oxygen at the surface of a precious metal catalyst such as a platinum coated surface. Combustion of CO starts at about 300°F with efficiencies above 90% occurring at temperatures above 600°F. Catalytic oxidation occurs at temperatures 50% lower than that of thermal oxidation which reduces the amount of thermal energy required. For combustion turbine and HRSG combinations, the oxidation catalyst can be located directly after the turbine or in the HRSG. Catalyst size depends upon the exhaust flow, temperature and desired efficiency. The existing gas turbine applications have been limited to smaller cogeneration facilities burning natural gas. Controlled CO levels of 10 ppm have generally been established as BACT.

Oxidation catalysts have not been used on fuel oil fired combustion turbines or combined cycle facilities. The use of sulfur containing fuels in a system with oxidation catalyst would result in an increase of SO_3 emissions and concomitant corrosive effects to the back end of the HRSG and stack. In addition, trace metals in the fuel would result in catalyst poisoning during prolonged periods of operation.

Since the facility would likely require numerous start-ups, variations in exhaust conditions would influence catalyst life and performance. Very little technical data exist to demonstrate the effect of such cycling. The size and fuel requirements for the project would suggest rejection of

catalytic oxidation as a technically feasible alternative. However, continuous operation using natural gas is technically feasible and therefore evaluated or an alternative BACT technology.

Combustion design is dependent upon the manufacturer's operating specifications which include air to fuel ratio and the amount of water injected. All combustion turbines presently being considered have designs to optimize combustion efficiency and minimize CO emissions.

4.3.2.3 Impact Analysis

ECONOMIC

The estimated annualized cost of a CO oxidation catalyst is $5,658,000 (Table 4-6) with a total cost effectiveness of $2,663/ton of CO removed. The latter assumes that the "worst-case" emissions will be in the range of 41 ppm corrected to 15% O_2 dry conditions. At a CO emission of 25 ppm, the cost effectiveness would exceed $5,000/ton of pollutant removed. No costs are associated with combustion techniques since they are inherent to the process.

ENVIRONMENTAL

The air quality impacts of both techniques are below the significant impact levels for CO. Therefore, no environmental benefit would be realized by the installation of a CO catalyst.

ENERGY

An energy penalty would result from the pressure drop across the catalyst bed. A pressure drop of about 1 1/2 to 2 1/2 water gauge would be expected. At a catalyst back pressure of about 2 in, an energy penalty of about 4,000,000 kw-hr/year would result.

4.3.2.4 Proposed BACT and Rationale

Combustion design is proposed as BACT due to the technical and economic consequences of installing catalytic oxidation. Catalytic oxidation is not

Table 4-6. Annualized Cost Estimate for CO Catalyst

Item	Basis	Cost
DIRECT COSTS (DC):		
Catalyst	Manufacturer	$7,644,000
Installation	45% of Catalyst	$3,439,800
Subtotal:		$11,083,800
CONTINGENCY:	10% of DC	$1,108,380
TOTAL CAPITAL COSTS (TCC):		$2,032,030
ESCALATION:		$1,799,568
TOTAL ESCALATED COST (TEC):		$13,831,651
SALES AND USE TAX:	6% of TEC	$839,504
SUBTOTAL:		$14,831,253
INDIRECT COSTS:	14.5% of Subtotal	$2,150,532
INTEREST DURING CONSTRUCTION:	10.45% of Subtotal	$1,549,866
INSTALLED COST:		$18,531,651
OPERATING COSTS:		
Labor	1 man-year	$270,000
Catalyst Replacement*	Manufacturer	$2,400,000
Miscellaneous Parts	1% of Installed Cost	$185,316
Energy Penalty	Estimated	$60,000
ANNUAL OPERATING COST:		$2,915,316
FIXED CHARGES ON CAPITAL:	14.8% of Installed Cost	$2,742,684
TOTAL LEVELIZED ANNUAL COST:		$5,658,000

* 2-year replacement interval on fuel oil

considered feasible, not withstanding the lack of environmental benefit, for the following reasons:

1. Catalytic oxidation has not been demonstrated on cycling combustion turbines or those using fuel oil; and
2. The economic impacts are significant, i.e. annualized cost of $5,658,000 with a likely cost effectiveness of over $5,000/tons of pollutant removed.

4.3.3 Sulfur Dioxide (SO_2)

4.3.2.1 Emission control Hierarchy

Sulfur dioxide (SO_2) emissions are a result of the oxidation of sulfur in fossil fuel and can be minimized by reducing the sulfur content in fuel or through applying post combustion removed techniques. For combustion turbines, the use of low sulfur fuels is the only demonstrated control technology determined to be technically feasible. Post combustion techniques, such as flue gas desulfurization (FGD) have not been applied to combustion turbines.

FGD systems have been applied to oil and coal-fired steam electric power plants. However, the relative gas volume for such facilities is significantly less than that for combustion turbines (i.e., about 2 to 3 times) and the resultant SO_2 concentration is considerably more. While the former factor will influence the cost of FGD, the later poses significant technological constraints to removing SO_2.

The BACT/LAER clearinghouse documents (1985, 1986b, 1987c, 1988c) show fuel sulfur contents from 0.8% to less than 0.2%. The lowest sulfur containing fuels were required in California where LAER decisions dictate more stringent standards. Furthermore, such requirements generally limited fuel oil use for backup or emergency purposes only. For the Hardee Power Station the only technically feasible control technology for SO_2 is therefore low sulfur fuel use. The use of natural gas will clearly minimize SO_2 emission. SO_2 emissions from distillate fuel can be minimized by specification of a lower sulfur content fuel, or blending of a lower sulfur

content fuel, such as No. 1 fuel oil or kerosene, with No. 2 fuel oil. To reduce the uncertainties of supplier reliability, the blending of kerosene was selected as an alternative control technology of the project. A sulfur content of 0.2% was selected as the BACT level since it is near the lowest of sulfur contents contained in the BACT clearinghouse documents.

4.3.3.2 Technology Description

The sulfur content of No. 2 fuel oil will have a maximum sulfur content of 0.5% with a nominal average of 0.3%. For the purposes of the analysis the maximum sulfur content was assumed. Kerosene has a sulfur content of 0.05%.

To obtain an average sulfur content of 0.2%, No. 2 fuel oil and Kerosene would have to be blended in a ration of about 1 to 2. Blending would require a separate storage tank, transfer pumps, mixing tank and mixing equipment.

4.3.3.3 Impact Analysis

ECONOMIC

The total annualized cost for achieving a maximum 0.2% sulfur fuel was estimated at $21,009,000 (Table 4-7). The incremental cost of $2,177/ton of pollutant removed reflects the assumption that the No.2 fuel oil received would be 0.5%. At the more nominal sulfur content of 0.3% for No. 2 fuel oil the cost effectiveness would be $6,531/ton of pollutant removed. In addition, the cost effectiveness would substantially increase as the percentage of fuel oil decreases. As discussed previously primary fuel for the project is natural gas.

ENVIRONMENTAL

Both alternatives are less than the PSD increment and AAQS. Substantial air quality benefits are not expected given the primary use of natural gas and the fact that the maximum SO_2 concentrations were predicted to occur at the property boundary.

Table 4-7. Annualized Cost Estimate for SO_2 Control

Item	Basis	Cost
DIRECT COSTS (DC):		
Oil Tank & Mixers	Estimate	$5,000,000
Installation	45% of Equipment	$2,250,000
Subtotal:		$7,250,000
CONTINGENCY:	10% of DC	$725,000
TOTAL CAPITAL COSTS (TCC):		$7,975,000
ESCALATION:		$1,177,110
TOTAL ESCALATED COST (TEC):		$9,152,110
SALES AND USE TAX:	6% of TEC	$549,127
SUBTOTAL:		$9,701,237
INDIRECT COSTS:	14.5% of Subtotal	$1,406,679
INTEREST DURING CONSTRUCTION:	10.45% of Subtotal	$1,013,779
INSTALLED COST:		$12,121,695
OPERATING COSTS:		
Labor	1 man-year	$45,000
Fuel Cost	$0.07/gallon differential	$19,049,008
Miscellaneous Parts	1% of Installed Cost	$121,217
ANNUAL OPERATING COST:		$19,215,225
FIXED CHARGES ON CAPITAL:	14.8% of Installed Cost	$1,794,011
TOTAL LEVELIZED ANNUAL COST:		$21,009,236

* 2-year replacement interval on fuel oil

ENERGY

No substantial energy penalties were assumed to occur with the blending of kerosene with No. 2 fuel oil.

4.3.3.4 Proposed BACT and Rationale

The proposed BACT for the Hardee Power Station is the use of natural gas and No. 2 fuel oil with a maximum sulfur content 0.5%. The basis for this control alternative are:

1. The blending of Kerosene is not economically feasible. Indeed, it is uncertain if the quantities of kerosene required to be blended with No. 2 fuel oil could be obtained.
2. The primary fuel for the project is natural gas which would increase the relative cost effectiveness of blending kerosene with No. 2 fuel oil.

4.3.4 Particulate Emissions

The emission of particulates from the combustion turbine facility are a result of some incomplete combustion that may occur and of having some trace solids in the fuel, especially fuel oil. The design of the combustion turbines will insure that particulate emissions will be minimized by combustion controls and the use of clean fuels. A review of the USEPA's BACT/LAER Clearinghouse documents did not reveal any post combustion particulate control technologies being used on gas/oil fueled combustion turbines. The natural gas and distillate fuel oil to be used in the proposed combustion turbines will only contain trace quantities of particulate. Therefore, the fuel and combustion design will ensure maximum possible fuel combustion and are the proposed BACT for total suspended particulate, and particulate matter smaller than 10 microns (PM10). Indeed, the maximum particulate emissions will be of less concentration than that normally specified for fabric filter designs; i.e., the grain loading of the maximum particulate emissions (57 lbs/yr) is less than 0.01 grains/SCF which a typical design specification for a baghouse.

4.3.5 Other Criteria and Non-Regulated Pollutants Emissions

Emission estimates indicate that significance levels are exceeded for VOC, sulfuric acid mist, mercury beryllium and arsenic, requiring PSD review (including BACT) for these pollutants.

There are no technically feasible methods for controlling the emission of these pollutants from combustion turbines, other than complete combustion of the fuel, and the inherent quality of the fuel (see Section 4.3.3 and 4.3.4). Sulfuric acid mist emissions are a direct function of the sulfur content of the fuel. BACT regarding mercury beryllium, and arsenic is the inherent quality of the fuel.

For the non-regulated pollutants, none of the control technologies evaluated would reduce these concentrations. The air quality impacts of the pollutants are expected to be significantly below any levels that would cause health effects.

5.0 AIR QUALITY ANALYSIS

5.1 GENERAL MONITORING REQUIREMENTS

The CAA requires that an air quality analysis be conducted for each pollutant subject to regulation under the act before a major stationary source or major modification is constructed. This analysis may be performed through the use of modeling and/or monitoring the air quality. The use of monitoring data refers to either the use of representative air quality data from existing monitoring stations or establishing a monitoring network to monitor existing air quality. Monitoring must be conducted for a period up to 1 year prior to submission of a construction permit application. In addition to establishing existing air quality, the air quality data are useful for determining background concentrations (i.e., concentrations from sources not considered in the modeling). The background concentrations can be added to the concentrations predicted for the sources considered in the modeling to estimate total air quality impacts. These total concentrations are then evaluated to determine compliance with the AAQS.

For the criteria pollutants, continuous air quality monitoring data must be used to establish existing air quality concentrations in the vicinity of the proposed source or modification. However, preconstruction monitoring data will generally not be required if the ambient air quality concentration before construction is less than the de minimis impact monitoring concentrations, (refer to Table 3-3 for de minimis impact levels). Also, if the maximum predicted impact of the source or modification is less than the de minimis impact monitoring concentrations, the source generally would be exempt from preconstruction monitoring.

For noncriteria pollutants, USEPA recommends that an analysis based on the air quality modeling should generally be used instead of monitoring data. The permit-granting authority has discretion in requiring preconstruction monitoring data when:

1. The state has an air quality standard for the noncriteria pollutant and emissions from the source or modification pose a threat to the standard;

2. The reliability of emission data used as input to modeling existing sources is highly questionable; or
3. Air quality models have not been validated or may be suspect for certain situations, such as complex terrain or building downwash conditions.

However, before a permit granting authority requires preconstruction monitoring, USEPA recommends that an acceptable measurement method approved by USEPA should be available and the maximum concentrations due to the major source or major modification are predicted to be above the significant monitoring concentrations.

The USEPA "Ambient Monitoring Guidelines for Prevention of Significant Deterioration" (PSD) (USEPA, 1987a) sets forth guidelines for preconstruction monitoring. The guidelines allow the use of existing air quality data in lieu of additional air monitoring, if the existing data are "representative." The criteria used in determining the representativeness of data are: 1) monitor location, 2) quality of data, and 3) currentness of data.

For the first criteria, monitor location, the existing monitoring data should be representative of three types of areas: (1) the location(s) of maximum concentration increase from the proposed source or modification, (2) the location(s) of the maximum air pollutant concentration from existing sources, and (3) the location(s) of the maximum impact area, i.e., where the maximum pollutant concentration hypothetically would occur based on the combined effect of existing sources and the proposed new source or modification. The locations and size of the three types of areas are determined through the application of air quality models. The areas of maximum concentration or maximum combined impact vary in size and are influenced by factors such as the size and relative distribution of ground level and elevated sources, the averaging times of concern, and the distances between impact areas and contributing sources.

5.2 PROJECT MONITORING APPLICABILITY

As determined by the source applicability analysis described in Section 3.4, an ambient monitoring analysis is required by PSD regulations for SO_2, NO_2, PM, CO, VOC, sulfuric acid mist, Hg, Be and As. However, dispersion modeling analysis demonstrates that impacts due to the emissions from the proposed facility are less than the de minimis impact levels established for NO_2, PM, CO, Hg, and Be, but above the de minimis level for SO_2. The proposed emissions of VOC, sulfuric acid mist and arsenic are above the significant emission rates. However, for sulfuric acid mist and arsenic, no de minimis levels have been established for these pollutants because acceptable monitoring methods have not been developed. Therefore, monitoring is not required for sulfuric acid mist or arsenic.

For SO_2, the Florida DER has approved an exemption from PSD ambient air quality monitoring for this project. The request was made in the Environmental Licensing Plan of Study (KBN, 1988) with FDER's recommendation for monitoring exemption in September 1988 (FDER, 1988). The exemption is appropriate because:

1. The site is not located near (i.e., within 10 km) any major sources of pollutant emissions;
2. Background concentrations are expected to be low and near the PSD monitoring de minimis impact levels; and
3. Data from existing monitors will provide conservative background concentrations because these sites are located in more industrial areas than the project site.

Because of the rural area and minimal amount of air pollution sources in Hardee County, the Florida DER does not operate any monitoring stations in the county. Existing air quality data were obtained from monitoring stations operated by the Florida DER in Polk County, which has monitoring stations closest to the proposed project site. The closest ambient air monitoring stations to the proposed project site that measure SO_2 concentrations are located in Nichols, about 25 km north-northwest of the site, and in Lakeland, about 50 km north of the site. Because these

monitors are located in urban areas, and/or in proximity (i.e., within 10 km) of major sources, the observed concentrations are considered to be higher than those expected to occur at the proposed facility. A more detailed discussion about the monitoring data collected at these stations is presented in Section 6.6 on background concentrations.

Preconstruction monitoring review is required for O_3 concentrations because the maximum potential VOC emissions from the proposed plant are greater than 100 TPY. The proposed facility is located in Hardee County which is an attainment area for O_3 concentrations. As discussed earlier, the proposed facility is located in a rural area with minimal industrial development (i.e., lack of major VOC emission sources) within 15 km of the site.

A summary of the nearest monitoring stations to the proposed facility that measure O_3 concentrations is presented in Table 5-1. These stations are operated by the FDER or are part of the Florida Acid Deposition Monitoring Program (FADMP) (ESE, 1988). These sites are located between 50 and 79 km in directions from the east clockwise through west from the site. Except for the FDER station in Hillsborough County, all stations have measured maximum 1-hour average O_3 concentrations that are less than 1-hour AAQS of 0.12 ppm. The Hillsborough County monitoring station has measured 1-hour concentration greater than the AAQS but this station is located in an urban area near and within the vicinity of major VOC emission sources. Data measured at this station are not considered representative of the proposed facility's site.

Therefore, based on the modeling results and the use of existing monitoring data, an exemption from preconstruction monitoring for all pollutants is appropriate.

Table 5-1. Ozone Concentration Measured in 1987 at FDER and FADMP Monitoring Sites Near the Proposed Hardee Power Station

County/Location	Identification Number	UTM Coordinate (km)* East	UTM Coordinate (km)* North	Number of Observations	1-Hour Concentration (ppm) First	1-Hour Concentration (ppm) Second
FDER Sites						
Manatee/Brandenton	0320-002-G002	340.0	3041.9 (257°, 66.6 km)	7839	0.115	0.105
Sarasota/Sarasota	4080-002-G01	350.0	3019.8 (236°, 66.5 km)	4907	0.094	0.090
Sarasota/Sarasota	4100-012-G01	371.7	3028.9 (229°, 43.7 km)	8054	0.093	0.092
Hillsborough/ Hillsborough Bay	1800-081-G03	355.2	3068.8 (283°, 50.8 km)	8593	0.171	0.151
FADMP Site						
Highlands/Archbold	1780-013-9A	465.2	3006.5 (130°, 79.0 km)	7773	0.110	0.091

* Relative location from the proposed plant given in parentheses.

Source: FDER, 1988.
ESE, 1988.

6.0 AIR QUALITY MODELING APPROACH

6.1 GENERAL MODELING APPROACH

The general modeling approach followed USEPA and FDER modeling guidelines for determining compliance with AAQS and PSD increments. In general, when model predictions are used to determine compliance with AAQS and PSD increments, current policies stipulate that the highest annual average and highest, second-highest short-term (i.e., 24 hours or less) concentrations can be compared to the applicable standard when 5 years of meteorological data are used. The highest, second-highest concentration is calculated for a receptor field by:

1. Eliminating the highest concentration predicted at each receptor,
2. Identifying the second-highest concentration at each receptor, and
3. Selecting the highest concentration among these second-highest concentrations.

This approach is consistent with the air quality standards, which permit a short-term average concentration to be exceeded once per year at each receptor.

To develop the maximum short-term concentrations for the proposed facility, the general modeling approach was divided into screening and refined phases to reduce the computation time required to perform the modeling analysis. The basic difference between the two phases is the receptor grid used when predicting concentrations, the number of emission points, and the number of meteorological periods evaluated. In general, concentrations for the screening phase were predicted using a coarse receptor grid, limited number of major sources, and a 5-year meteorological record.

After a final list of highest, second-highest short-term concentrations was developed, the refined phase of the analysis was conducted by predicting concentrations for a refined receptor grid centered on the receptor at which the highest, second-highest concentration from the screening phase was produced. The air dispersion model was executed for the meteorological periods during which both the highest and second-highest concentrations were

predicted to occur at that receptor, based on the screening phase results. This approach was used to ensure that valid highest, second-highest concentrations were obtained. More detailed descriptions of the emission inventory and receptor grids used in the screening and refined phases of the analysis are presented in the following sections.

6.2 MODEL SELECTION

The selection of a model was based on its applicability to simulate impacts in areas surrounding the proposed facility. Within 3.0 km of the proposed facility, the terrain can be described as simple, i.e., flat to gently rolling. As defined in the USEPA modeling guidelines, simple terrain is considered to be an area where the terrain features are all lower in elevation than the top of the stack(s) under evaluation. Beyond 3.0 km and within 50 km of the proposed facility's site, the terrain has maximum elevations of 50 ft above ground elevation at the facility. These areas are also considered to be simple since the stacks being modeled are greater than the terrain elevation. Therefore, a simple terrain model was used to predict maximum ground-level concentrations.

The ISC dispersion model (USEPA, 1988a) was used to evaluate the pollutant emissions from proposed facility and existing major facilities. This model is contained in USEPA's User's Network for Applied Modeling of Air Pollution (UNAMAP), Version 6 (USEPA, 1988b). The ISC model is applicable to sources located in either flat or rolling terrain where terrain heights do not exceed stack heights.

The ISC model consists of two sets of computer codes which are used to calculate short- and long-term ground level concentrations. The main differences between the two codes are the input format of the meteorological data and the method of estimating the plume's horizontal dispersion.

The first model code, the ISCST model, is an extended version of the single-source (CRSTER) model (USEPA, 1977). The ISCST model is designed to

calculate hourly concentrations based on hourly meteorological parameters (i.e., wind direction, wind speed, atmospheric stability, ambient temperature, and mixing heights). The hourly concentrations are processed into non-overlapping, short-term and annual averaging periods. For example, a 24-hour average concentration is based on twenty-four 1-hour averages calculated from midnight to midnight of each day. For each short-term averaging period selected, the highest and second-highest average concentrations are calculated for each receptor. As an option, a table of the 50 highest concentrations over the entire field of receptors can be produced.

The second model code of the ISC model is the ISC long-term (ISCLT) model, which is an extension of the Air Quality Display Model (AQDM) and the Climatological Dispersion Model (CDM). The ISCLT model uses joint frequencies of wind direction, wind speed, and atmospheric stability to calculate seasonal and/or annual average ground-level concentrations. Because the input wind directions are for 16 sectors, with each sector defined as 22.5 degrees, the model calculates concentrations by assuming that the pollutant is uniformly distributed in the horizontal plane within a 22.5-degree sector.

In this analysis, the ISCST model was used to calculate both short-term and annual average concentrations because these concentrations are readily obtainable from the model output.

Major features of the ISCST model are presented in Table 6-1. Concentrations due to stack and volume sources are calculated by the ISCST model using the steady-state Gaussian plume equation for a continuous source. The area source equation in the ISCST model is based on the equation for a continuous and finite crosswind line source. The ISC model has rural and urban options which affect the wind speed profile exponent law, dispersion rates, and mixing-height formulations used in calculating ground level concentrations. The criteria used to determine when the rural or urban mode is appropriate are based on land use near the proposed plant's

Table 6-1. Major Features of the ISCST Model

ISCST Model Features
o Polar or Cartesian coordinate systems for receptor locations
o Rural or one of three urban options which affect wind speed profile exponent, dispersion rates, and mixing height calculations
o Plume rise due to momentum and buoyancy as a function of downwind distance for stack emissions (Briggs, 1969, 1971, 1972, and 1975)
o Procedures suggested by Huber and Snyder (1976); Huber (1977); and Schulmann and Hanna (1986) and Schulmann and Scire (1980) for evaluating building wake effects
o Procedures suggested by Briggs (1974) for evaluating stack-tip downwash
o Separation of multiple point sources
o Consideration of the effects of gravitational settling and dry deposition on ambient particulate concentrations
o Capability of simulating point, line, volume and area sources
o Capability to calculate dry deposition
o Variation with height of wind speed (wind speed-profile exponent law)
o Concentration estimates for 1-hour to annual average
o Terrain-adjustment procedures for elevated terrain including a terrain truncation algorithm
o Receptors located above local terrain, i.e., "flagpole" receptors
o Consideration of time-dependent exponential decay of pollutants
o The method of Pasquill (1976) to account for buoyancy-induced dispersion
o A regulatory default option to set various model options and parameters to EPA recommended values (see text for regulatory options used)
o Procedure for calm-wind processing

Source: USEPA, 1988a

surroundings (Auer, 1978). If the land use is classified as heavy industrial, light-moderate industrial, commercial, or compact residential for more than 50% of the area within a 3 km radius circle centered on the proposed source, the urban option should be selected. Otherwise, the rural option is more appropriate.

For modeling analyses that will undergo regulatory review, such as PSD permit applications, the following model features are recommended by USEPA (1987a) and are referred to as the regulatory options in the ISCST model:

1. Final plume rise at all receptor locations,
2. Stack-tip downwash,
3. Buoyancy-induced dispersion,
4. Default wind speed profile coefficients for rural or urban option,
5. Default vertical potential temperature gradients,
6. Calm wind processing, and
7. Reducing calculated SO_2 concentrations in urban areas by using a decay half-life of 4 hours (i.e., reduce the SO_2 concentration emitted by 50% for every 4 hours of plume travel time).

In this analysis, the USEPA regulatory options were used to address maximum impacts. Based on a review of the land use around the facility and discussions with the FDER, the rural mode was selected because of the lack of residential, industrial and commercial development within 3 km the proposed facility site.

6.3 METEOROLOGICAL DATA

Meteorological data used in the ISCST model to determine air quality impacts consisted of a concurrent 5-year period of hourly surface weather observations and twice-daily upper air soundings from the National Weather Service (NWS) stations at Tampa International Airport and Ruskin, respectively. The 5-year period of meteorological data was from 1982 through 1986. The NWS station in Tampa, located approximately 67 km to the west-northwest of the proposed site, was selected for use in the study because it is the closest primary weather station to the study area with

similar surrounding topographical feature. This station also has the most readily available and complete database which is representative of the plant site. In addition, FDER has requested the use of this meteorological data. The surface observations included wind direction, wind speed, temperature, cloud cover, and cloud ceiling. The wind speed, cloud cover, and cloud ceiling values were used in the ISCST meteorological preprocessor program to determine atmospheric stability using the Turner stability scheme. Based on the temperature measurements at morning and afternoon, mixing heights were calculated with the radiosonde data at Ruskin using the Holzworth approach (1972). Hourly mixing heights were derived from the morning and afternoon mixing heights using the interpolation method developed by USEPA (Holzworth, 1972). The hourly surface data and mixing heights were used to develop a sequential series of hourly meteorological data (i.e., wind direction, wind speed, temperature, stability, and mixing heights). Because the observed hourly wind directions were classified into one of thirty-six 10-degree sectors, the wind directions were randomized within each sector using a USEPA preprocessing program to account for the expected variability in air flow.

6.4 EMISSION INVENTORY

Preliminary modeling indicated that the proposed facility's impacts could be above the significant impact levels for SO_2, NO_2 and PM at distances of approximately 50, 50, and 10 km, respectively, from the facility. Therefore, the emission inventories for those pollutants were developed from available databases, such as FDER's Air Pollution Inventory System (APIS) and previous studies performed by KBN. The initial step involved requesting and receiving from FDER the listing of all facilities within 100 km square centered on the proposed site. From this listing, a total of 305 facilities were identified. Using current data from APIS for each facility within the 100 km square, there were 32 facilities that had maximum allowable SO_2 emissions greater than 100 TPY and were within 50 km of the proposed facility; 19 facilities that had maximum allowable NO_2 emissions greater than 100 TPY and were within 50 km of the proposed facility; there were no facilities that had maximum allowable PM emissions greater than 100 TPY

within 10 km of the proposed facility. However, within 50 km of the proposed facility, there were 42 facilities that had maximum allowable PM emissions greater than 100 TPY. Listings of the sources in the inventory with maximum allowable SO_2, NO_2, and PM emissions greater than 100 TPY and within 50 km of the proposed facility are presented in Tables 6-2 through 6-4, respectively.

Each facility was screened to determine the probability of interaction with the proposed facility. The screening technique is the "Screening Threshold" method, developed by the North Carolina Department of Natural Resources and Community Development, and approved for use by the USEPA and FDER. The method is designed to objectively eliminate from the emission inventory those sources which are not likely to have a significant interaction with the source undergoing evaluation. In general, sources that should be considered in the modeling analyses are those with emissions greater than Q (in TPY) which is calculated by the following criteria:

$$Q = 20 \times D$$

where D is the distance (km) from the source to the source undergoing review.

A listing of the emission sources and associated Q are presented in Tables 6-5 through 6-7. The sources with maximum allowable emissions which are below the calculated "screening threshold" emissions were eliminated from further consideration in the modeling analysis. A total of 22, 19, and 42 facilities (excluding the proposed facility) were included in the modeling analysis for SO_2, NO_2, and PM emissions.

In order to reduce the model computation time but effectively model sources that are most likely to interact with the proposed facility, modeling was performed in screening and refined phases. In the screening phase, only those sources with emissions above a certain threshold, based on the source's distance from the proposed facility, were modeled. The following

Table 6-2. SO2 Sources (>100 TPY) Within 50 km of Proposed Hardee Power Station

Facility	UTM Coordinates (km) East	UTM Coordinates (km) North	Relative Location (km) To Proposed Site X	Relative Location (km) To Proposed Site Y	Distance From Proposed Site (km)	Direction From Proposed Site (degree)	Maximum SO2 * Emissions (TPY)
Gardinier	415.3	3063.3	10.5	5.9	12.0	61	1,173
Imperial Phosphate	404.8	3069.5	0.0	12.1	12.1	0	275
Agrico Chemical Co. (S. Pierce)	407.5	3071.5	2.7	14.1	14.4	11	4,557
Mobil Oil Big Four Mine	394.7	3069.6	-10.1	12.2	15.8	320	569
U.S. Agri-Chemicals	416.0	3069.0	11.2	11.6	16.1	44	2,933
Wachula City Power Plant	418.4	3047.0	13.6	-10.4	17.1	127	180
IMC Fort Lonesome	389.5	3067.9	-15.3	10.5	18.6	304	1,714
Agrico Chemical Co. (Pierce)	403.7	3079.0	-1.1	21.6	21.6	357	417
Mobil-Electrophosphate Division+	405.6	3080.0	0.8	22.6	22.6	2	1,428
Farmland Industries	409.5	3080.1	4.7	22.7	23.2	12	3,692
IMC	396.7	3079.4	-8.1	22.0	23.4	340	10,251
IMC/Noralyn Mine Road	414.7	3080.3	9.9	22.9	24.9	23	505
C.F. Industries	408.4	3082.4	3.6	25.0	25.3	8	8,443
Kaplan Industries	418.3	3079.3	13.5	21.9	25.7	32	385
American Orange Corp.	429.8	3047.3	25.0	-10.1	27.0	112	198
Conserv. Chemicals	398.7	3084.2	-6.1	26.8	27.5	347	1,597
Royster Co.	406.8	3085.1	2.0	27.7	27.8	4	1,283
Mobil Chemical Co./Nichols	398.4	3085.3	-6.4	27.9	28.6	347	1,516
IMC/Praire	402.9	3087.0	-1.9	29.6	29.7	356	137
W.R. Grace & Co.	409.8	3086.7	5.0	29.3	29.7	10	8,186
U.S. Agri-Chemicals	413.2	3086.3	8.4	28.9	30.1	16	1,575
FPL Manatee	367.2	3054.1	-37.6	-3.3	37.7	265	85,305
Tricil Recovery Services	422.7	3091.9	17.9	34.5	38.9	27	240
Consolidated Minerals	393.8	3096.3	-11.0	38.9	40.4	344	3,302
Teco Big Bend	361.9	3075.0	-42.9	17.6	46.4	292	371,733
Citrus World	441.0	3087.3	36.2	29.9	47.0	50	597
Columbus Company	361.9	3077.8	-42.9	20.4	47.5	295	167
Gardinier	362.9	3082.2	-41.9	24.8	48.7	301	5,181
Lakeland City Power	409.0	3106.2	4.2	48.8	49.0	5	4,014
Lakeland City Power	409.2	3106.2	4.4	48.8	49.0	5	30,176
Adams Packing	421.7	3104.2	16.9	46.8	49.8	20	172

						Total	551,901

* Maximum facility emissions from APIS, or other available information on facility.

Table 6-3. NO2 Sources (>100 TPY) Within 50 km of Proposed Hardee Power Station

Facility	UTM Coordinates (km) East	UTM Coordinates (km) North	Relative Location (km) To Proposed Site X	Relative Location (km) To Proposed Site Y	Distance From Proposed Site (km)	Direction From Proposed Site (degree)	Maximum NO2 * Emissions (TPY)
Gardinier	415.3	3063.3	10.5	5.9	12.0	61	176
Agrico Chemical	407.5	3071.5	2.7	14.1	14.4	11	139
Mobil Oil Big Four Mine	394.7	3069.6	-10.1	12.2	15.8	320	156
U.S. Agri-Chemicals	416.0	3069.0	11.2	11.6	16.1	316	131
IMC Fort Lonesome	389.5	3067.9	-15.3	10.5	18.6	304	610
Farmland Industries	409.5	3080.1	4.7	22.7	23.2	12	226
IMC	396.7	3079.4	-8.1	22.0	23.4	340	322
Kaplan Industries	418.3	3079.3	13.5	21.9	25.7	32	100
Mobil Chemical Co./Nichols	398.4	3085.3	-6.4	27.9	28.6	347	134
W.R. Grace & Co.	409.8	3086.7	5.0	29.3	29.7	10	528
FPL Manatee	367.2	3054.1	-37.6	-3.3	37.7	265	22,734
Consolidated Minerals	393.8	3096.3	-11.0	38.9	40.4	344	534
Sherex Polymers	410.7	3098.9	5.9	41.5	41.9	352	617
Juice Bowl Products	409.4	3099.9	4.6	42.5	42.7	354	109
Owens-Illinois	406.0	3102.3	1.2	44.9	44.9	358	391
Teco Big Bend	361.9	3075.0	-42.9	17.6	46.4	292	82,624
Citrus World	441.0	3087.3	36.2	29.9	47.0	50	1,382
Gardinier	362.9	3082.2	-41.9	24.8	48.7	301	466
Lakeland City Power	409.2	3106.2	4.4	48.8	49.0	5	5,028
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* Maximum facility emissions from APIS, or other available information on facility.

Table 6-4. PM Sources (>100 TPY) Within 50 km of Proposed Hardee Power Station

Facility	UTM Coordinates (km) East	UTM Coordinates (km) North	Relative Location (km) To Proposed Site X	Relative Location (km) To Proposed Site Y	Distance From Proposed Site (km)	Direction From Proposed Site (degree)	Maximum PM * Emissions (TPY)
Gardinier	415.3	3063.3	10.5	5.9	12.0	61	132
Imperial Phosphates	404.8	3069.5	0.0	12.1	12.1	0	162
Agrico Chemical	407.5	3071.5	2.7	14.1	14.4	11	1,705
Mobil Oil Big Four Mine	394.7	3069.6	-10.1	12.2	15.8	320	263
U.S. Agri-Chemicals	416.0	3069.0	11.2	11.6	16.1	316	871
Biochemical Energy, LTD	418.3	3048.0	13.5	-9.4	16.5	125	281
IMC Fort Lonesome	389.5	3067.9	-15.3	10.5	18.6	304	679
IMC	398.2	3075.7	-6.6	18.3	19.5	340	168
Agrico Chemical	403.7	3079.0	-1.1	21.6	21.6	357	631
C&M Products	405.5	3079.1	0.7	21.7	21.7	358	162
Mobil-Electrophos Division	405.6	3080.0	0.8	22.6	22.6	358	555
Farmland Industries	409.5	3080.1	4.7	22.7	23.2	12	977
IMC	396.7	3079.4	-8.1	22.0	23.4	340	162
IMC	414.7	3080.3	9.9	22.9	24.9	337	973
C.F. Industries	408.4	3082.4	3.6	25.0	25.3	352	788
IMC/ Uranium Recovery	408.4	3082.8	3.6	25.4	25.7	8	831
American Orange Corp.	429.8	3047.3	25.0	-10.1	27.0	112	180
Conserv Chemical	398.7	3084.2	-6.1	26.8	27.5	13	1,620
Royster	406.8	3085.1	2.0	27.7	27.8	4	210
Mobil Chemical Co./Nichols	398.4	3085.3	-6.4	27.9	28.6	347	433
W.R. Grace & Co.	409.8	3086.7	5.0	29.3	29.7	10	636
Ridge Pallets	418.6	3084.1	13.8	26.7	30.1	27	180
U.S. Agri-Chemicals	413.2	3086.3	8.4	28.9	30.1	16	182
Allsun Products	413.5	3093.8	8.7	36.4	37.4	13	317
FPL Manatee	367.2	3054.1	-37.6	-3.3	37.7	265	7,578
Consolidated Minerals	393.8	3096.3	-11.0	38.9	40.4	344	740
Pavers, Inc.	414.0	3098.2	9.2	40.8	41.8	347	114
Rinker Cencon Corp.	412.4	3099.0	7.6	41.6	42.3	350	159
Quikrete	412.8	3099.0	8.0	41.6	42.4	349	253
Landia Chemical	403.7	3101.8	-1.1	44.4	44.4	1	2,313
Kraft Citrus	399.0	3101.8	-5.8	44.4	44.8	353	108
Owens-Illinois	406.0	3102.3	1.2	44.9	44.9	358	102
Jahna Concrete, Inc.	450.0	3052.2	45.2	-5.2	45.5	97	139
Teco Big Bend	361.9	3075.0	-42.9	17.6	46.4	292	7,699
Agrico Chemical Co.	362.1	3076.1	-42.7	18.7	46.6	66	184
Macasphalt	451.1	3050.0	46.3	-7.4	46.9	99	165
Citrus World	441.0	3087.3	36.2	29.9	47.0	50	166
FPL Avon Park	451.4	3050.5	46.6	-6.9	47.1	98	212
Gardinier	362.9	3082.2	-41.9	24.8	48.7	301	863
Lakeland City Power	409.2	3106.2	4.4	48.8	49.0	5	14,705
Coca Cola Citrus	421.6	3103.7	16.8	46.3	49.3	20	334
Adams Packing Association	421.7	3104.2	16.9	46.8	49.8	20	129
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* Maximum facility emissions from APIS, or other available information on facility.

Table 6-2. SO2 Sources (>100 TPY) Within 50 km of Proposed Hardee Power Station

Facility	UTM Coordinates (km) East	UTM Coordinates (km) North	Relative Location (km) To Proposed Site X	Relative Location (km) To Proposed Site Y	Distance From Proposed Site (km)	Direction From Proposed Site (degree)	Maximum SO2 Emissions (TPY)
Gardinier	415.3	3063.3	10.5	5.9	12.0	61	1,173
Imperial Phosphate	404.8	3069.5	0.0	12.1	12.1	0	275
Agrico Chemical Co. (S. Pierce)	407.5	3071.5	2.7	14.1	14.4	11	4,557
Mobil Oil Big Four Mine	394.7	3069.6	-10.1	12.2	15.8	320	569
U.S. Agri-Chemicals	416.0	3069.0	11.2	11.6	16.1	44	2,933
Wachula City Power Plant	418.4	3047.0	13.6	-10.4	17.1	127	180
IMC Fort Lonesome	389.5	3067.9	-15.3	10.5	18.6	304	1,714
Agrico Chemical Co. (Pierce)	403.7	3079.0	-1.1	21.6	21.6	357	417
Mobil-Electrophosphate Division+	405.6	3079.4	0.8	22.0	22.0	2	1,428
Farmland Industries	409.5	3080.1	4.7	22.7	23.2	12	3,692
IMC	396.7	3079.4	-8.1	22.0	23.4	340	10,251
IMC/Noralyn Mine Road	414.7	3080.3	9.9	22.9	24.9	23	505
C.F. Industries	408.4	3082.4	3.6	25.0	25.3	8	8,443
Kaplan Industries	418.3	3079.3	13.5	21.9	25.7	32	385
American Orange Corp.	429.8	3047.3	25.0	-10.1	27.0	112	198
Conserv. Chemicals	398.7	3084.2	-6.1	26.8	27.5	347	1,597
Royster Co.	406.8	3085.1	2.0	27.7	27.8	4	1,283
Mobil Chemical Co./Nichols	398.4	3085.3	-6.4	27.9	28.6	347	1,516
IMC/Praire	402.9	3087.0	-1.9	29.6	29.7	356	137
W.R. Grace & Co.	409.8	3086.7	5.0	29.3	29.7	10	8,186
U.S. Agri-Chemicals	413.2	3086.3	8.4	28.9	30.1	16	1,575
FPL Manatee	367.3	3054.2	-37.5	-3.2	37.6	265	85,305
Tricil Recovery Services	422.7	3091.9	17.9	34.5	38.9	27	240
Consolidated Minerals	393.8	3096.3	-11.0	38.9	40.4	344	3,302
Teco Big Bend	361.9	3075.0	-42.9	17.6	46.4	292	371,733
Citrus World	441.0	3087.3	36.2	29.9	47.0	50	597
Columbus Company	361.9	3077.8	-42.9	20.4	47.5	295	167
Gardinier	363.4	3082.4	-41.4	25.0	48.4	301	5,181
Lakeland City Power	409.0	3106.2	4.2	48.8	49.0	5	4,014
Lakeland City Power	409.2	3106.2	4.4	48.8	49.0	5	30,176
Adams Packing	421.7	3104.2	16.9	46.8	49.8	20	172
						Total	551,901

* Maximum facility emissions from APIS, or other available information on facility.

Table 6-3. NO2 Sources (>100 TPY) Within 50 km of Proposed Hardee Power Station

Facility	UTM Coordinates (km) East	UTM Coordinates (km) North	Relative Location (km) To Proposed Site X	Relative Location (km) To Proposed Site Y	Distance From Proposed Site (km)	Direction From Proposed Site (degree)	Maximum NO2 Emissions (TPY)
Gardinier	415.3	3063.3	10.5	5.9	12.0	61	176
Agrico Chemical	407.5	3071.5	2.7	14.1	14.4	11	139
Mobil Oil Big Four Mine	394.7	3069.6	-10.1	12.2	15.8	320	156
U.S. Agri-Chemicals	416.0	3069.0	11.2	11.6	16.1	316	131
IMC Fort Lonesome	389.5	3067.9	-15.3	10.5	18.6	304	610
Farmland Industries	409.5	3080.1	4.7	22.7	23.2	12	226
IMC	396.7	3079.4	-8.1	22.0	23.4	340	322
Kaplan Industries	418.3	3079.3	13.5	21.9	25.7	32	100
Mobil Chemical Co./Nichols	398.4	3085.3	-6.4	27.9	28.6	347	134
W.R. Grace & Co.	409.8	3086.7	5.0	29.3	29.7	10	528
FPL Manatee	367.3	3054.2	-37.5	-3.2	37.6	265	22,734
Consolidated Minerals	393.8	3096.3	-11.0	38.9	40.4	344	534
Sherex Polymers	410.7	3098.9	5.9	41.5	41.9	352	617
Juice Bowl Products	409.4	3099.9	4.6	42.5	42.7	354	109
Owens-Illinois	406.0	3102.3	1.2	44.9	44.9	358	391
Teco Big Bend	361.9	3075.0	-42.9	17.6	46.4	292	82,624
Citrus World	441.0	3087.3	36.2	29.9	47.0	50	1,382
Gardinier	363.4	3082.4	-41.4	25.0	48.4	301	466
Lakeland City Power	409.0	3106.2	4.2	48.8	49.0	5	5,028
						Total	116,407

* Maximum facility emissions from APIS, or other available information on facility.

Table 6-4. PM Sources (>100 TPY) Within 50 km of Proposed Hardee Power Station

Facility	UTM Coordinates (km) East	UTM Coordinates (km) North	Relative Location (km) To Proposed Site X	Relative Location (km) To Proposed Site Y	Distance From Proposed Site (km)	Direction From Proposed Site (degree)	Maximum PM * Emissions (TPY)
Gardinier	415.3	3063.3	10.5	5.9	12.0	61	132
Imperial Phosphates	404.8	3069.5	0.0	12.1	12.1	0	162
Agrico Chemical	407.5	3071.5	2.7	14.1	14.4	11	1,705
Mobil Oil Big Four Mine	394.7	3069.6	-10.1	12.2	15.8	320	263
U.S. Agri-Chemicals	416.0	3069.0	11.2	11.6	16.1	316	871
Biochemical Energy, LTD	418.3	3048.0	13.5	-9.4	16.5	125	281
IMC Fort Lonesome	389.5	3067.9	-15.3	10.5	18.6	304	679
IMC	398.2	3075.7	-6.6	18.3	19.5	340	168
Agrico Chemical	403.7	3079.0	-1.1	21.6	21.6	357	631
C&M Products	405.5	3079.1	0.7	21.7	21.7	358	162
Mobil-Electrophos Division	405.6	3079.4	0.8	22.0	22.0	358	555
Farmland Industries	409.5	3080.1	4.7	22.7	23.2	12	977
IMC	396.7	3079.4	-8.1	22.0	23.4	340	162
IMC	414.7	3080.3	9.9	22.9	24.9	337	973
C.F. Industries	408.4	3082.4	3.6	25.0	25.3	352	788
IMC/ Uranium Recovery	408.4	3082.8	3.6	25.4	25.7	8	831
American Orange Corp.	429.8	3047.3	25.0	-10.1	27.0	112	180
Conserv Chemical	398.7	3084.2	-6.1	26.8	27.5	13	1,620
Royster	406.8	3085.1	2.0	27.7	27.8	4	210
Mobil Chemical Co./Nichols	398.4	3085.3	-6.4	27.9	28.6	347	433
W.R. Grace & Co.	409.8	3086.7	5.0	29.3	29.7	10	636
Ridge Pallets	418.6	3084.1	13.8	26.7	30.1	27	180
U.S. Agri-Chemicals	413.2	3086.3	8.4	28.9	30.1	16	182
Allsun Products	413.5	3093.8	8.7	36.4	37.4	13	317
FPL Manatee	367.3	3054.2	-37.5	-3.2	37.6	265	7,578
Consolidated Minerals	393.8	3096.3	-11.0	38.9	40.4	344	740
Pavers, Inc.	414.0	3098.2	9.2	40.8	41.8	347	114
Rinker Cencon Corp.	412.4	3099.0	7.6	41.6	42.3	350	159
Quikrete	412.8	3099.0	8.0	41.6	42.4	349	253
Landia Chemical	403.7	3101.8	-1.1	44.4	44.4	1	2,313
Kraft Citrus	399.0	3101.8	-5.8	44.4	44.8	353	108
Owens-Illinois	406.0	3102.3	1.2	44.9	44.9	358	102
Jahna Concrete, Inc.	450.0	3052.2	45.2	-5.2	45.5	97	139
Teco Big Bend	361.9	3075.0	-42.9	17.6	46.4	292	7,699
Agrico Chemical Co.	362.1	3076.1	-42.7	18.7	46.6	66	184
Macasphalt	451.1	3050.0	46.3	-7.4	46.9	99	165
Citrus World	441.0	3087.3	36.2	29.9	47.0	50	166
FPL Avon Park	451.4	3050.5	46.6	-6.9	47.1	98	212
Gardinier	363.4	3082.4	-41.4	25.0	48.4	301	863
Lakeland City Power	409.0	3106.2	4.2	48.8	49.0	5	14,705
Coca Cola Citrus	421.6	3103.7	16.8	46.3	49.3	20	334
Adams Packing Association	421.7	3104.2	16.9	46.8	49.8	20	129
						Total	49,061

Table 6-5. Summary of SO2 Emission Sources Considered in the Modeling Analysis for the Hardee Power Station

Facility*	Location from Proposed Facility Distance (km)	Direction (degrees)	Maximum SO2 Emissions (TPY)	Emission Threshold, Q (TPY)	Included in Modeling	Modeled Sources in Analyses: Screen.	Refined
Gardinier	12.0	61	1,173	241	YES	YES	YES
Imperial Phosphate	12.1	0	275	242	YES	NO	YES
Agrico Chemical Co. (S. Pierce)	14.4	11	4,557	287	YES	YES	YES
Mobil Oil Big Four Mine	15.8	320	569	317	YES	NO	YES
U.S. Agri-Chemicals	16.1	44	2,933	322	YES	YES	YES
Wachula City Power Plant	17.1	127	180	342	NO	--	--
IMC Fort Lonesome	18.6	304	1,714	371	YES	YES	YES
Agrico Chemical Co. (Pierce)	21.6	357	417	433	NO	--	--
Mobil-Electrophosphate Division	22.0	2	1,428	440	YES	NO	YES
Farmland Industries	23.2	12	3,692	464	YES	YES	YES
IMC	23.4	340	10,251	469	YES	YES	YES
IMC/Noralyn Mine Road	24.9	23	505	499	YES	NO	YES
C.F. Industries	25.3	8	8,443	505	YES	YES	YES
Kaplan Industries	25.7	32	385	515	NO	--	--
American Orangr Corp.	27.0	112	198	539	NO	--	--
Conserv. Chemicals	27.5	347	1,597	550	YES	NO	YES
Royster Co.	27.8	4	1,283	555	YES	NO	YES
Mobil Chemical Co./Nichols	28.6	347	1,516	572	YES	NO	YES
IMC/Prairie	29.7	356	137	593	NO	--	--
W.R. Grace & Co.	29.7	10	8,186	594	YES	YES	YES
U.S. Agri-Chemicals	30.1	16	1,575	602	YES	NO	YES
FPL Manatee	37.6	265	85,305	753	YES	YES	YES
Tricil Recovery Services	38.9	27	240	777	NO	--	--
Consolidated Minerals	40.4	344	3,302	809	YES	YES	YES
Teco Big Bend	46.4	292	371,733	927	YES	YES	YES
Citrus World	47.0	50	597	939	NO	--	--
Columbus Company	47.5	295	167	950	NO	--	--
Gardinier	48.4	301	5,181	967	YES	YES	YES
Lakeland City Power	49.0	5	4,014	980	YES	YES	YES
Lakeland City Power	49.0	5	30,176	980	YES	YES	YES
Adams Packing	49.8	20	172	995	NO	--	--
			551,901				

* Refer to Table 6-2 for facility UTM coordinates (East, North) and relative locations (x, y) to proposed site.

Table 6-6. Summary of NO2 Emission Sources Considered in the Modeling Analysis for the Hardee Power Station

Facility*	Location From Proposed Facility: Distance (km)	Direction (degrees)	Maximum NO2 Emissions (TPY)	Emission Threshold, Q (TPY)	Included in Modeling	Modeled Sources in Analyses: Screen.	Refined
Gardinier	12.0	61	176	241	NO	--	--
Agrico Chemical	14.4	11	139	287	NO	--	--
Mobil Oil Big Four Mine	15.8	320	156	317	NO	--	--
U.S. Agri-Chemicals	16.1	316	131	322	NO	--	--
IMC Fort Lonesome	18.6	304	610	371	YES	NO	YES
Farmland Industries	23.2	12	226	464	NO	--	--
IMC	23.4	340	322	469	NO	--	--
Kaplan Industries	25.7	32	100	515	NO	--	--
Mobil Chemical Co./Nichols	28.6	347	134	572	NO	--	--
W.R. Grace & Co.	29.7	10	528	594	NO	--	--
FPL Manatee	37.6	265	22,734	753	YES	YES	YES
Consolidated Minerals	40.4	344	534	809	NO	--	--
Sherex Polymers	41.9	352	617	838	NO	--	--
Juice Bowl Products	42.7	354	109	855	NO	--	--
Owens-Illinois	44.9	358	391	898	NO	--	--
Teco Big Bend	46.4	292	82,624	927	YES	YES	YES
Citrus World	47.0	50	1,382	939	YES	NO	YES
Gardinier	48.4	301	466	967	NO	--	--
Lakeland City Power	49.0	5	5,028	980	YES	YES	YES
		Total	116,407				

* Refer to Table 6-3 for facility UTM coordinates (East, North) and relative locations (x, y) to proposed site.

Table 6-7. Summary of PM Emission Sources Considered in the Modeling Analysis for the Hardee Power Station

Facility*	Location from Proposed Facility		Maximum PM Emissions (TPY)	Emission Threshold, Q (TPY)	Included in Modeling	Modeled Sources in Analyses:	
	Distance (km)	Direction (degrees)				Screen.	Refined
Gardinier	12.0	61	132	241	NO	--	--
Imperial Phosphates	12.1	0	162	242	NO	--	--
Agrico Chemical	14.4	11	1,705	287	YES	YES	YES
Mobil Oil Big Four Mine	15.8	320	263	317	NO	--	--
U.S. Agri-Chemicals	16.1	316	871	322	YES	NO	YES
Biochemical Energy, LTD	16.5	125	281	329	NO	--	--
IMC Fort Lonesome	18.6	304	679	371	YES	NO	YES
IMC	19.5	340	168	389	NO	--	--
Agrico Chemical	21.6	357	631	433	YES	NO	YES
C&M Products	21.7	358	162	434	NO	--	--
Mobil-Electrophos Division	22.0	358	555	440	YES	NO	YES
Farmland Industries	23.2	12	977	464	YES	NO	YES
IMC	23.4	340	162	469	NO	--	--
IMC	24.9	337	973	499	YES	NO	YES
C.F. Industries	25.3	352	788	505	YES	NO	YES
IMC/ Uranium Recovery	25.7	8	831	513	YES	NO	YES
American Orange Corp.	27.0	112	180	539	NO	--	--
Conserv Chemical	27.5	13	1,620	550	YES	NO	YES
Royster	27.8	4	210	555	NO	--	--
Mobil Chemical Co./Nichols	28.6	347	433	572	NO	--	--
W.R. Grace & Co.	29.7	10	636	594	YES	NO	YES
Ridge Pallets	30.1	27	180	601	NO	--	--
U.S. Agri-Chemicals	30.1	16	182	602	NO	--	--
Allsun Products	37.4	13	317	749	NO	--	--
FPL Manatee	37.6	265	7,578	753	YES	YES	YES
Consolidated Minerals	40.4	344	740	809	NO	--	--
Pavers, Inc.	41.8	347	114	836	NO	--	--
Rinker Cencon Corp.	42.3	350	159	846	NO	--	--
Quikrete	42.4	349	253	847	NO	--	--
Landia Chemical	44.4	1	2,313	888	YES	NO	YES
Kraft Citrus	44.8	353	108	896	NO	--	--
Owens-Illinois	44.9	358	102	898	NO	--	--
Jahna Concrete, Inc.	45.5	97	139	910	NO	--	--
Teco Big Bend	46.4	292	7,699	927	YES	YES	YES
Agrico Chemical Co.	46.6	66	184	932	NO	--	--
Macasphalt	46.9	99	165	938	NO	--	--
Citrus World	47.0	50	166	939	NO	--	--
FPL Avon Park	47.1	98	212	942	NO	--	--
Gardinier	48.4	301	863	967	NO	--	--
Lakeland City Power	49.0	5	14,705	980	YES	YES	YES
Coca Cola Citrus	49.3	20	334	985	NO	--	--
Adams Packing Association	49.8	20	129	995	NO	--	--
		Total	49,061				

* Refer to Table 6-4 for facility UTM coordinates (East, North) and relative location (x, y) to proposed site.

criteria was used to determine the sources to be modeled in the screening analysis:

Distance (km)	Emission Threshold (TPY)
0 - 15	500
15 - 20	1000
20 - 25	1500
25 - 30	2000
30 - 50	3000

Facilities considered in the screening and refined analyses are presented in Tables 6-5 through 6-7. Summaries of the amount of modeled emissions in the screening phase compared to the refined phase by distance categories from the proposed facility are given in Tables 6-8 through 6-10. For the SO_2 modeling analysis, approximately 98% of the SO_2 emissions in the refined phase were modeled in the screening phase. As indicated, most of the emissions occur beyond 30 km from the proposed facility.

For the NO_2 modeling analysis, approximately 98% of the NO_2 emissions in the refined analysis were modeled in the screening phase. Similar to the SO_2 emission sources, most of the NO_2 emissions occur beyond 30 km from the proposed facility.

For the PM modeling analysis, approximately 75% of the PM emissions were modeled in the screening phase. As indicated in Tables 6-7 and 6-10, there were no emission sources within 10 km of the proposed facility (the significant impact distance) with most emissions occurring beyond 30 km from the proposed facility.

6.5 RECEPTOR LOCATIONS

As discussed in Section 6.1, the general modeling approach considered screening and refined phases to address compliance with maximum allowable PSD Class II increments and AAQS. In the ISCST modeling, concentrations were predicted for the screening phase using several receptor grids. The

Table 6-8. Summary of Modeled SO2 Emissions Used for Screening and Refined Analyses for the Hardee Power Station

Distance From Proposed Site (km)	Threshold Emissions (TPY)	Refined Analysis	Screening Analysis	
		Emissions (TPY)	Emissions (TPY)	Percent Modeled of Refined Analysis
0 - 15	> 500	6,005	5,730	95.4
15 - 20	> 1000	5,216	4,647	89.1
20 - 25	> 1500	15,876	13,943	87.8
25 - 30	> 2000	21,025	16,629	79.1
30 - 50	> 3000	501,286	499,711	99.7
0 - 50		549,408	540,660	98.4

Table 6-9. Summary of Modeled NO2 Emissions Used for Screening and and Refined Analyses for the Hardee Power Station

Distance From Proposed Site (km)	Threshold Emissions (TPY)	Refined Analysis	Screening Analysis	
		Emissions (TPY)	Emissions (TPY)	Percent Modeled of Refined Analysis
0 - 15	> 500	0	0	--
15 - 20	> 1000	610	0	0.0
20 - 25	> 1500	0	0	--
25 - 30	> 2000	0	0	--
30 - 50	> 3000	111,768	110,386	98.8
0 - 50		112,378	110,386	98.2

Table 6-10. Summary of Modeled PM Emissions Used for Screening and Refined Analyses for the Hardee Power Station

Distance From Proposed Site (km)	Threshold Emissions (TPY)	Refined Analysis	Screening Analysis	
		Emissions (TPY)	Emissions (TPY)	Percent Modeled of Refined Analysis
0 - 15	> 500	1,705	1,705	100.0
15 - 20	> 1000	1,550	0	0.0
20 - 25	> 1500	3,136	0	0.0
25 - 30	> 2000	3,875	0	0.0
30 - 50	> 3000	32,295	29,982	92.8
0 - 50		42,561	31,687	74.5

locations of the receptors were based on identifying the areas in which maximum concentrations would be expected due to the proposed unit.

A description of the receptor locations for determining compliance with PSD Class II increments and AAQS is as follows:

1. 344 receptors located in a radial grid centered on the proposed facility. These receptors were classified into two main groups: (1) plant property receptors and (2) near-field receptors.

2. The grid for the plant property receptors consisted of 36 receptors, presented in Table 6-11.

3. The grid for the near-field receptors consisted of 308 receptors located at distances of 600, 900, 1,250, 1,750, 2,250, 2,750, 3,500, 4,500, and 6,000 m along 36 radials with each radial spaced at 10 degree increments. For directions of 10 through 160 degrees, receptors at a downwind distance of 600 m from the proposed facility were not included in the analysis because these receptors are on plant property.

After the screening modeling was completed, refined short-term modeling was conducted using a receptor grid centered on the receptor which had the highest, second-highest short-term concentrations. The receptors were located at intervals of 100 m between the distances considered in the screening phase along 9 radials, at 2 degree increments, centered on the radial which the maximum concentration was produced. For example, if the maximum concentration was produced along the 90 degree radial at a distance of 1.75 km, the refined receptor grid would consist of receptors at the following locations:

Table 6-11. Plant Property Receptors Used in the Screening Analysis for the Hardee Power Station

Direction (degrees)	Distance (km)	Direction (degrees)	Distance (km)
10	1.050	190	0.450
20	1.100	200	0.420
30	1.160	210	0.390
40	0.960	220	0.380
50	0.820	230	0.360
60	0.760	240	0.420
70	0.710	250	0.490
80	0.830	260	0.410
90	1.060	270	0.360
100	0.700	280	0.330
110	0.700	290	0.320
120	0.740	300	0.300
130	0.820	310	0.300
140	0.890	320	0.300
150	0.790	330	0.320
160	0.760	340	0.350
170	0.540	350	0.400
180	0.500	360	0.450

Directions (degrees)	Distance (km)
82, 84, 86, 88, 90, 92, 94, 96, 98	1.35, 1.45, 1.55, 1.65, 1.75, 1.85, 1.95, 2.05, and 2.15 per direction

To ensure that a valid highest, second-highest concentration was calculated, concentrations were predicted for the refined grid for the periods that produced both the highest and second-highest concentration from the screening receptor grid.

Refined modeling analysis was performed for the annual average period but used a different approach than that used for short-term average periods. Because the spatial distributions of annual average concentrations are not expected to vary significantly from those produced from the screening analysis, concentrations were calculated at the receptor which produced the highest annual concentration in the screening analysis. For this analysis, concentrations were calculated for the entire year using the refined emission inventory.

6.6 BACKGROUND CONCENTRATIONS

Background concentrations are air quality concentrations due to air pollutant sources not explicitly accounted for in the air modeling analysis. Because the site is not located near any major sources of SO_2, PM, and NO_x emissions, background concentrations are expected to be low. As a result, existing monitoring data were used to estimate background concentrations. A summary of the maximum concentrations measured at the closest monitors to the proposed facility is presented in Table 6-12. The ambient data are collected in areas that are more industrialized and have higher emission densities than the proposed site. Therefore the estimated background concentrations are considered to be conservative (i.e., higher concentrations than actually exist at the proposed plant site).

For SO_2 concentrations, data collected at the monitoring stations in Nichols and Lakeland were reviewed and used in estimating background concentrations. The nearest station to the proposed site is located in Nichols,

Table 6-12. Summary of maximum SO_2, TSP, and NO_2 Concentrations Measured at the Closest Monitoring State on to the Proposed Hardee Power Station

Pollutant	Location	Site Number	UTM Coordinates (km)* East	UTM Coordinates (km)* North	Year	Observations+ Number	Observations+ %	Concentration (ug/m^3) 3-Hour 1st	3-Hour 2nd	24-Hour 1st	24-Hour 2nd	Annual
SO_2	Lakeland	2160-001-F01	407.5	3107.5	1987	8444	96.4	200	162	86	55	10
			(3°, 50 km)		1986	6520	74.4	267	178	81	71	13
	Nichols	3680-010-F02	399.5	3081.3	1987	8571	97.8	697	267	115	51	11
			(348°, 24.5 km)		1986	4994	57.0	203	162	38	35	7
TSP	Lakeland	2160-001-F01	407.5	3107.5	1987	58	95.1	-	-	87	86	50
			(3°, 50 km)		1986	58	95.1	-	-	109	87	47
	Nichols	3680-010-F02	399.5	3081.3	1987	58	95.1	-	-	73	73	38
			(348°, 24.5 km)		1986	58	95.1	-	-	119	81	38
	Bartow	0180-010-F01	418.4	3084.15	1987	42	68.9	-	-	74	71	40
			(27°, 29.9 km)		1986	57	93.4	-	-	70	70	37
	Mulberry	2860-003-F02	405.0	3085.5	1987	42	68.9	-	-	75	75	43
			(360°, 28 km)		1986	54	88.5	-	-	74	74	38
	Bradley	3680-011-F02	403.1	3074.8	1987	61	100.0	-	-	110	91	45
			(354°, 17.5 km)		1986	60	98.4	-	-	94	80	41
NO_2	Ybor City	4360-052-601	358.4	3093.5	1987	6005	68.6	-	-	-	-	45
			(308°, 59.8 km)		1986	7808	89.1	-	-	-	-	39

* Direction and distance from the site listed in parentheses.

\+ For TSP, based on observations every 6 days (61 per year).

Source: FDER, 1987/88

approximately 24.5 km to the north-northwest. During 1987, the second highest 3- and 24-hour and annual average concentrations were 267, 51, and 11 ug/m^3, respectively. These concentrations were assumed to represent background concentrations.

TSP concentration data collected at the monitoring station in Bradley were used in estimating background PM_{10} concentrations. These values were the second highest 24-hour and annual average concentrations of 91 and 45 ug/m^3, respectively. The data from this station were selected because this is the closest station to the project site with TSP concentrations. It should be noted that the AAQS for particulate matter is based on PM with a nominal diameter of 10 u or less. TSP concentrations include particles with diameters up to approximately (PM10) 30 u. Therefore, the use of TSP concentrations to estimate PM10 background concentrations will provide an additional conservative factor in determining compliance with AAQS.

There are no stations within 50 km of the proposed site location that measure NO_2 concentrations. The nearest station to the proposed site is located in Ybor City, Hillsborough County, approximately 60 km to the west-northwest. This station is in a highly urbanized area and has a significant impact from vehicular traffic. During 1987, this station measured an annual average concentration of 45 ug/m^3, based on 69% data capture. This concentration was used to represent a conservative estimate of the background concentration.

6.7 BUILDING DOWNWASH EFFECTS

Based on the building dimensions associated with buildings or structures at the proposed facility, the stack for the proposed unit will be less than GEP. Therefore, the potential for building downwash to occur must be considered in the modeling analysis.

The procedures used for addressing the effects of building downwash are those recommended in the ISC Dispersion Model User's Guide. The building height, length, and width are input to the model which are used to modify

the dispersion parameters. For short stacks (i.e., physical stack height is less than $h_b + 0.5\ L_B$, where h_b is the building height and L_b is the lessor of the building height or projected width), the Schulman and Scire method is used. If this method is used, then direction-specific building dimensions are input for h_b and L_B for the 36 directions, with each direction representing a 10 degree sector. The features of the Schulman and Scire method are: 1) reduced plume rise due to initial plume dilution, 2) enhanced plume spread as a linear function of the effective plume height, and 3) specification of building dimensions as a function of wind direction.

For cases where the physical stack is greater than $h_b + 0.5\ L_B$ but less than GEP, the Huber-Snyder method is used. For this method, the ISCST model calculates the area of the building using the length and width, assumes the area is representative of a circle, and then calculates a building width by determining the diameter of the circle. If a specific width is to be modeled, then the value input to the model must be adjusted according to the following formula:

$$M_w = \sqrt{\left(\frac{H_w}{2}\right)^2}$$

$$M_w = 0.8886\ H_w$$

where M_w is input to the model to produce a building width of H_w used in the dispersion calculation.
H_w is the actual building width for which dispersion calculations are performed.

The building dimensions considered for the proposed facility are presented in Table 6-13. In these analyses, building downwash conditions were assumed to occur for all directions around each stack although these conditions may not occur for certain directions. Based on sensitivity analyses performed for the proposed facility, higher concentrations were produced with the

Table 6-13. Structure Dimensions and GEP Stack Height Calculations for the Hardee Power Station

Structure	Building Dimensions (ft)				
	Height	Length	Width	Maximum Projected Width	GEP Stack Height
HRSG*	45	50	25	56	113
Combustion Turbine Enclosure**	40	1175	75	1178	100

Note: These structure dimensions produced the worst case impacts for a HRSG stack height of 75 feet.

* Used in modeling analyses.

** Based on a single structure that encloses all the combustion turbines associated with a 660 MW plant.

building dimension using a height of 45 ft which also produced the highest GEP height. Therefore, the building dimensions associated with this height were used in performing subsequent model calculations.

7.0 AIR QUALITY MODELING RESULTS

7.1 PROPOSED FACILITY ONLY

For the screening analysis, a summary of the maximum SO_2, NO_2, PM, CO, and Be concentrations due to the proposed facility is presented in Table 7-1. Model results were calculated for a range of operating conditions for which maximum impacts could occur (see Section 2.0 for the operating data and rational for modeling these conditions). These operating conditions, which were based on either maximum emissions or minimum flow rate for the units, were as follows (Refer to Table 2-7 for Stack parameters and SO_2 emission):

1. Case 1: Maximum emissions at 32°F;
2. Case 2: Maximum emissions at 95°F;
3. Case 3: Minimum flow rate at 32°F; and
4. Case 4: Minimum flow rate at 95°F.

As indicated in Table 7-1, the maximum concentrations are predicted for the operating conditions with minimum flow rates (Cases 3 and 4). It should be noted that the modeled SO_2 emissions were specific for each case because the maximum predicted SO_2 concentrations were relatively high when compared to PSD Class II increments. For the other pollutants, the emissions from Case 1, which had the highest emissions among the cases, were modeled using the stack parameters for Cases 2,3, and 4; therefore, the maximum impacts predicted for cases 2 through 4 are conservative (lower impacts would be predicted if the emissions associated with each case were modeled). See Section 2.0 for a more detailed discussion about the emission data and associated operating parameters used in the modeling.

The maximum predicted 3-, 24-hour and annual SO_2 concentrations are 424, 62.5 and 6.7 ug/m^3, respectively. The maximum 24-hour concentration is above the de minimis monitoring level and, therefore, preconstruction monitoring data are required to be submitted by the Applicant as part of the permit application. As indicated in Section 5.0, existing monitoring data collected by the FDER are being used in this application to satisfy preconstruction monitoring requirements and to establish background concentrations.

Table 7-1. Maximum Concentrations Predicted for the Combined Cycle Plant (660 MW) for 4 Operating Designs

Pollutant	Averaging Period	Maximum Concentrations (ug/m3)				Air Quality Requirements (ug/m3)	
		Maximum Emissions		Minimum Flow Rate		Deminimis Levels	PSD Class II Increment
		32 oF	95 oF	32 oF	95 oF		
		Case 1	Case 2	Case 3	Case 4		
SO2	3-hour	196	281	359	424	NA	512
	24-hour	54.7	53.8	62.5	60.0	13	91
	Annual	5.8	5.7	6.7	6.5	NA	20
PM(TSP)	24-hour	5.1	5.9	6.4	7.5	10	37
	Annual	0.54	0.63	0.68	0.82	NA	19
PM(PM10)	24-hour	5.1	5.9	6.4	7.5	10	NA
	Annual	0.54	0.63	0.68	0.82	NA	NA
NO2	Annual	3.0	3.5	3.8	4.6	14	25
CO	1-hour	99.0	112.0	130.3	178.5	NA	NA
	8-hour	21.4	24.2	26.1	38.0	575	NA
Be	24-hour	0.0002	0.0003	0.0003	0.0004	0.001	NA
Hg	24-hour	0.0011	0.0012	0.0013	0.0016	0.25	NA

NA = Not applicable

* Modeled as 3 stacks, each separated by 100 m.

Hardee Power Station
Site Certification Application and Environmental Assessment

Clarification No. 2

Date: August 7, 1989

Affected Sections: 11.1.4 Prevention of Significant Deterioration (Section 7.1)

Question: The PSD analyses in Appendix 11.1.4 provides insufficient detail in analyses ... on visibility impacts (re: FDER letter: Oven to Conn, July 17, 1989, Item No. 7).

Response: The Clean Air Act Amendments provide for implementation of guidelines to prevent visibility impairment in mandatory PSD Class I areas. For sources undergoing PSD review, a visibility impairment analysis must be performed for any source locating within 100 km of a Class I area. The nearest Class I area to the proposed facility is the Chassahowitzka National Wilderness Area located about 125 km to the northwest of the proposed facility. Although the proposed facility is more than 100 km from the Class I area, a visibility analysis was performed to determine if any impairment would occur as a result of the proposed facility's emissions.

The procedures used to quantify potential visibility impairment are based on USEPA recommendations presented in Workbook for Plume Visual Impact Screening and Analysis, EPA-450/4-88-05, September, 1988. A Level-1 screening analysis was performed using the USEPA program, VISCREEN, which is designed to provide a conservative estimate of plume visual impacts (i.e., impacts that would be larger than those calculated with more realistic input and modeling assumptions). The VISCREEN model assumes worst-case meteorological conditions of extremely stable atmospheric conditions and wind speed of 1 m/s persisting for 12 hours toward the Class I area.

The model inputs and results of the modeling for the proposed facility are presented in the following table. As shown in the results section of the table, the proposed facility's visual impacts do not exceed the USEPA screening criteria either inside or outside the Class I area. Based on these results, the proposed facility's emissions are highly unlikely to cause visibility impairment in the Class I area.

Visual Effects Screening Analysis for
Source: HARDEE POWER STATION
Class I Area: CHAS. NWR

*** Level-1 Screening ***

Input Emissions for

Particulates	1500.00	TON/YR
NOx (as NO2)	8405.00	TON/YR
Primary NO2	.00	TON/YR
Soot	.00	TON/YR
Primary SO4	.00	TON/YR

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	25.00 km
Source-Observer Distance:	125.00 km
Min. Source-Class I Distance:	125.00 km
Max. Source-Class I Distance:	140.00 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	6
Wind Speed:	1.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	84.	125.0	84.	2.00	.118	.05	.000
SKY	140.	84.	125.0	84.	2.00	.028	.05	-.001
TERRAIN	10.	84.	125.0	84.	2.00	.005	.05	.000
TERRAIN	140.	84.	125.0	84.	2.00	.001	.05	.000

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	75.	121.0	94.	2.00	.123	.05	.000
SKY	140.	75.	121.0	94.	2.00	.029	.05	-.002
TERRAIN	10.	65.	116.6	104.	2.00	.008	.05	.000
TERRAIN	140.	65.	116.6	104.	2.00	.002	.05	.000

Hardee Power Station
Site Certification Application and Environmental Assessment

Clarification No. 3

Date: August 7, 1989

Affected Sections: 11.1.4 Prevention of Significant Deterioration (Section 7.1)

Question: Please clarify the description of modeling outputs that deal with Part II or provide the computer printouts (re: Conversation with Max Lin, FDER 8/2/89).

Response: Air dispersion modeling was performed for SO_2, NO_2, and PM concentrations as part of the screening analysis to address compliance with PSD increments and AAQS (see Part II of the Index to Computer Printouts). The initial analyses were performed for Cases 1 and 4 in the same run to demonstrate the range of impacts associated with the operating and emission data used for these cases. (Cases refer to various combinations of emissions and flow rates for combustion turbines.) The results from these cases should produce the highest and lowest impacts expected from the range of flow rates and emissions from the four configurations considered because Case 1 and Case 4 represent the maximum emissions and the lowest flow rate, respectively. As discussed in Section 7.0 of the PSD Application, the maximum impacts for the proposed facility were predicted for either Case 3 or Case 4. Because the results were already calculated for Case 4, additional modeling was performed for Case 3 to determine compliance with PSD increments and AAQS. The configuration of operating and emission data for Case 2 is expected to produce lower impacts than the results for Cases 3 and 4 and, therefore, was not explicitly modeled in the analysis.

The maximum predicted 24-hour and annual average PM concentrations are 7.5 and 0.82 ug/m^3, respectively. Because the maximum 24-hour concentration is below the de minimis monitoring level, preconstruction is not required for the permit application.

The maximum predicted annual NO_2 concentration is 4.6 ug/m^3, which is below the de minimis monitoring level. Similar to the PM concentrations, preconstruction monitoring requirements is not required for the permit application.

The maximum predicted 1- and 8-hour average CO concentrations are 17.9 and 38.0 ug/^{3}, respectively, which are less than the significance levels. The maximum 8-hour concentration is also less than the de minimis monitoring levels and, therefore, preconstruction monitoring is not required. Because the maximum predicted impacts due to the proposed facility are less than the CO significance levels, additional modeling is not required for this pollutant.

The maximum predicted 24-hour average Be and Hg concentrations are 0.0004 and 0.0016 ug/m^3, respectively, which are less than the de minimis monitoring levels. Therefore, preconstruction monitoring is not required for these pollutants.

7.2 PSD CLASS II INCREMENT ANALYSIS

Summaries of the maximum SO_2, PM, and NO_2 concentrations predicted in the screening analysis for comparison to the PSD Class II increments are presented in Tables 7-2 through 7-4, respectively. These results show that maximum concentrations due to all PSD sources are less than the maximum allowable PSD Class II increments for all averaging periods and pollutants.

The refined analysis was based on modeling the meteorological periods during which the overall highest, second-highest and associated highest 3- and 24-hour SO_2 and 24-hour PM concentrations were predicted in the screening analysis. The refined analysis for the annual average concentrations was based on modeling the receptor and year which produced

Table 7-2. Maximum Predicted SO_2 Concentrations in the Screening Analysis for Comparison to PSD Class II Increments

Averaging Period	Maximum Concentration (ug/m^3)	Receptor Location Direction (°)	Receptor Location Distance (km)	Period Julian Day	Period Hour Ending	Period Year
3-Hour*	194+	110	2.25	214	12	1982
	195+	310	1.75	211	12	1983
	198+	130	2.75	59	6	1984
	424**	360	0.45	243	12	1985
	203+	90	0.90	194	15	1986
24-Hour*	62.6+	240	2.25	241	24	1982
	58.2+	240	3.50	289	24	1883
	58.5**	120	0.74	59	24	1984
	61.4+	90	2.75	118	24	1985
	60.5+	90	2.25	201	24	1986
Annual	8.0++	240	3.50	-	-	1982
	6.5**	240	3.50	-	-	1983
	8.1**	240	3.50	-	-	1984
	7.4++	250	3.50	-	-	1985
	8.0**	90	1.75	-	-	1986

* Highest, second-highest concentrations predicted for this averaging period.
\+ Based on Operating Case 3.
** Based on Operating Case 4.
++ Based on Operating Cases 3 and 4.

Table 7-3. Maximum Predicted PM Concentrations in the Screening Analysis for Comparison to PSD Class II Increments

Averaging Period	Maximum Concentration (ug/m^3)	Receptor Location		Period		
		Direction (°)	Distance (km)	Julian Day	Hour Ending	Year
24-Hour*	7.5	240	1.75	123	24	1982
	6.9	240	3.50	289	24	1883
	6.0	240	4.50	313	24	1984
	7.2	90	2.25	118	24	1985
	6.5	90	1.75	201	24	1986
Annual	0.8	240	3.50	-	-	1982
	0.6	240	3.50	-	-	1983
	0.8	240	3.50	-	-	1984
	0.7	250	3.50, 4.50	-	-	1985
	0.8	90	1.75	-	-	1986

* Highest, second-highest concentrations predicted for this averaging period.

Table 7-4. Maximum Predicted NO_2 Concentrations in the Screening Analysis for Comparison to PSD Class II Increments

Averaging Period	Maximum Concentration (ug/m^3)	Receptor Location		Period		
		Direction (°)	Distance (km)	Julian Day	Hour Ending	Year
Annual	4.6	240	3.50	-	-	1982
	3.3	240	3.50	-	-	1983
	4.4	240	3.50	-	-	1984
	4.0	240	4.50	-	-	1985
	4.5	90	1.75	-	-	1986

the highest annual concentration using the refined emission inventory. A summary of the maximum SO_2, PM, and NO_2 concentrations predicted in the refined analysis is presented in Table 7-5.

The maximum 3-hour average SO_2 PSD increment consumption from the refined analysis is predicted to be 424 ug/m^3, which is 83% of the maximum allowable PSD Class II increment of 512 ug/m^3, not to be exceeded more than once per year. The proposed facility contributed 100% to this maximum 3-hour average concentration.

The maximum 24-hour average SO_2 PSD increment consumption is predicted to be 66.0 ug/m^3, which is 73% of the maximum allowable PSD Class II increment of 91 ug/m^3, not to be exceeded more than once per year. Approximately 99% of this concentration is due to the proposed facility.

The maximum annual average SO_2 PSD increment consumption is predicted to be 8.1 ug/m^3, which is 41% of the maximum allowable PSD Class II increment of 20 ug/m^3. Approximately 77% of this concentration is due to the proposed facility.

The maximum 24-hour average TSP PSD increment consumption is predicted to be 8.0 ug/m^3, which is 22% of the maximum allowable PSD Class II increment of 37 ug/m^3, not to be exceeded more than once per year. Approximately 99% of this concentration is due to the proposed source.

The maximum annual average TSP PSD increment consumption from the refined analysis is predicted to be 0.9 ug/m^3, which is 6% of the maximum allowable PSD Class II increment of 19 ug/m^3. Approximately 89% of this concentration is due to the proposed facility.

The maximum annual average NO_2 PSD increment consumption from the refined analysis is predicted to be 4.6 ug/m^3, which is 17% of the maximum allowable PSD Class II increment of 25 ug/m^3. This concentration is entirely due to the proposed facility.

Table 7-5. Maximum Predicted SO_2, PM, and NO_2 Concentrations in the Refined Analysis for Comparison to PSD Class II Increments

Averaging Period	Maximum Concentration (ug/m^3)	Receptor Location Direction (°)	Receptor Location Distance (km)	Period Julian Day	Period Hour Ending	Period Year
SO_2 Concentrations						
3-Hour*	424	360	0.45	243	12	1985
24-Hour*	66.0	242	2.05	241	24	1982
Annual	8.1	240	3.5	--	--	1984
PM (TSP) Concentrations						
24-Hour*	8.0	242	1.95	123	24	1982
Annual	0.9	240	3.5	--	--	1982
NO_2 Concentrations						
Annual	4.6	240	3.5	--	--	1982

* Highest, second-highest concentrations predicted for this averaging period.

7.3 AAQS ANALYSIS

A summary of the maximum 3-hour, 24-hour, and annual average total SO_2 concentrations predicted in the screening analysis is presented in Table 7-6. Summaries of the maximum 24-hour and annual total PM and annual NO_2 concentrations are given in Tables 7-7 and 7-8, respectively. The total concentrations are determined from the impacts of the modeled sources added to the background concentration determined from monitoring data. These results show that the maximum SO_2, PM, and NO_2 concentrations due to all sources are below the AAQS for all averaging periods.

Similar to the PSD Class II increment analysis, the refined analysis was based on modeling the meteorological periods during which the overall highest, second-highest and associated highest 3- and 24-hour concentrations were predicted in the screening analysis. A summary of the maximum SO_2 and PM concentrations predicted in the refined analysis is presented in Table 7-9.

The maximum 3-hour average SO_2 concentration due to all sources from the refined analysis is predicted to be 691 ug/m^3, which is 53% of the AAQS of 1300 ug/m^3, not to be exceeded more than once per year. The proposed facility contributed 61% to this maximum 3-hour average concentration.

The maximum 24-hour average SO2 concentration due to all sources is predicted to be 169 ug/m^3, which is 65% of the AAQS of 260 ug/m^3, not to be exceeded more than once per year. The proposed facility contributed 29% to this maximum 24-hour average concentration.

The maximum annual average SO_2 concentration due to all sources is predicted to be 30.3 ug/m^3, which is 51% of the AAQS of 60 ug/m^3. The proposed facility contributed 20% to the maximum concentration.

The maximum 24-hour PM concentration due to all sources is predicted to be 112 ug/m^3, which is 75% of the AAQS of 150 ug/m^3. The proposed facility did not contribute to this maximum concentration.

Table 7-6. Maximum Predicted Total SO_2 Concentrations in the Screening Analysis for Comparison to AAQS

Averaging Period	Concentration (ug/m^3) Total	Total Due To: Modeled Sources	Total Due To: Background	Receptor Location: Direction (^{o})	Receptor Location: Distance (km)	Period: Julian Day	Period: Hour Ending	Period: Year
3-hour*	607	340+	267	110	1.75	214	12	1982
	634	367++	267	30	2.75	151	9	1983
	589	322+	267	110	1.25	226	12	1984
	691	424**	267	360	0.45	243	12	1985
	579	312**	267	10	6.00	230	9	1986
24-hour*	163	112**	51	120	1.75	234	24	1982
	152	101**	51	190	2.75	299	24	1983
	149	97.9**	51	120	2.75	96	24	1984
	152	101**	51	90	2.25	153	24	1985
	146	94.9**	51	110	2.25	106	24	1986
Annual	27.4	16.4**	11	240	3.50	-	-	1982
	28.5	17.5**	11	270	4.50	-	-	1983
	29.4	18.4**	11	50	6.00	-	-	1984
	29.2	18.2**	11	70	2.75	-	-	1985
	29.5	18.5**	11	80	1.75	-	-	1986

* Highest, second-highest concentrations predicted for this averaging period.

\+ Based on Operating Case 3.

** Based on Operating Case 4.

\++ Based on Operating Cases 3 and 4.

Table 7-7. Maximum Predicted Total PM Concentrations in the Screening Analysis for Comparison to AAQS

Averaging Period	Concentration (ug/m^3) Total	Total Due To: Modeled Sources	Total Due To: Background	Receptor Location: Direction (°)	Receptor Location: Distance (km)	Period: Julian Day	Period: Hour Ending	Period: Year
24-hour*	101	9.7	91	20	6.00	38	24	1982
	104	12.5	91	20	6.00	297	24	1983
	100	10.3	91	30	6.00	317	24	1984
	104	12.9	91	30	6.00	350	24	1985
	101	9.8	91	360	6.00	303	24	1986
Annual	46.4	1.4	45	240	2.75	-	-	1982
	46.3	1.3	45	300	6.00	-	-	1983
	46.4	1.4	45	240	3.50	-	-	1984
	46.4	1.4	45	80	2.25	-	-	1985
	46.4	1.4	45	90	1.75	-	-	1986

* Highest, second-highest concentrations predicted for this averaging period.

Table 7-8. Maximum Predicted Total NO_2 Concentrations in the Screening Analysis for Comparison to AAQS

Averaging Period	Concentration (ug/m^3)			Receptor Location		Period		
		Total Due To						
	Total	Modeled Sources	Background	Direction (°)	Distance (km)	Julian Day	Hour Ending	Year
Annual	50.7	5.7	45	240	3.50	-	-	1982
	49.7	4.7	45	240	3.50	-	-	1983
	50.8	5.8	45	240	4.50	-	-	1984
	50.5	5.5	45	240	4.50	-	-	1985
	50.8	5.8	45	90	1.75	-	-	1986

Table 7-9. Maximum Predicted SO_2, PM and NO_2 Concentrations in the Refined Analysis for Comparison to AAQS.

Average Period	Concentration (ug/m^3)			Receptor Location		Period		
	Total	Total due to Modeled Sources	Total due to Background	Direction (o)	Distance (km)	Julian Day	Hour Ending	Year
SO_2 Concentrations								
3-Hour*	691	424	267	360	0.45	243	12	1985
24-Hour*	169	118	51	116	2.15	234	24	1982
Annual	30.3	19.3	11	80	1.75	---	---	1986
PM (TSP) Concentrations								
24-Hour*	112	21.2	91	28	6.2	13	24	1985
Annual	48.6	3.6	45	240	3.5	---	---	1984
NO_2 Concentration								
Annual	50.9	5.9	45	90	1.75	---	---	1986

* Highest, second-highest concentrations predicted for this averaging period.

The maximum annual average concentration due to all sources is predicted to be 48.6 ug/m^3, which is 97% of the AAQS of 50 ug/m^3. The proposed facility contributed less than 2% to the maximum concentration.

The maximum annual average NO_2 concentrations of 50.9 ug/m^3 due to all sources is below the AAQS of 100 ug/m^3. The proposed facility contributed approximately 8% to the maximum concentration.

7.4 NONATTAINMENT ANALYSIS

As discussed in Section 3.4.2, the proposed facility is located approximately 40 km from that portion of Hillsborough County designated as nonattainment for TSP concentrations. Because the proposed facility is located within the area of influence of a nonattainment area (i.e., 50 km), nonattainment review requirements may apply to the facility except if the proposed facility's impacts are less than the significant impact levels. As presented in Table 3-1, the 24-hour and annual average significant impact levels for TSP concentrations are 5 and 1 ug/m^3, respectively. Based on the modeling performed for the proposed facility, the furthest distances from the site at which the proposed facility's impacts are less than the significant impact levels for any direction are as follows:

Year	Distance (km) of Significant Impact	
	24-hour	Annual
1982	7.5-10	Not significant
1983	7.5-10	Not significant
1984	7.5-10	Not significant
1985	7.5-10	Not significant
1986	7.5-10	Not significant

From this analysis, the proposed plant's impact is significant out to approximately 10 km from the site, based on the 24-hour average concentration. The proposed plant's impacts are not significant on an annual average basis. Because the proposed plant's predicted impacts are

not significant at the TSP nonattainment area (i.e., 40 km), nonattainment review for TSP emissions is not required for this project.

8.0 IMPACTS ON AIR QUALITY RELATED VALUES, VEGETATION, AND SOILS

8.1 IMPACTS ON VEGETATION

The response of vegetation to atmospheric pollutants is influenced by the concentration of the pollutant, duration of the exposure and the frequency of exposures. The pattern of pollutant exposure expected from the facility is that of a few episodes of relatively high ground-level concentration which occur during certain meteorological conditions interspersed with long periods of extremely low ground-level concentrations. If there are any effects of stack emissions on plants they will be from the short-term higher doses. A dose is the product of the concentration of the pollutant and the duration of the exposure. The impact of the Hardee Power Station on regional vegetation was assessed by comparing pollutant doses that are predicted from modeling with threshold doses reported from the scientific literature which could adversely affect plant species typical of those present in the region.

SULFUR DIOXIDE

The maximum total 3-hour average SO_2 concentration predicted in the Hardee Power Station region is 691 ug/m^3. This concentration is predicted to occur about 0.5 km (0.24 mile) north of the stacks and represents the concentration that would occur during the worst-case meteorological conditions of the past five years (see Section 7.0). The maximum 3-hour average ground-level concentration predicted for the other four years ranged from 579 to 634 ug/m^3. These concentrations would occur between 1 (0.6 mile) and 6 km (3.7 miles) from the stacks with directions ranging from north to east-southeast. Concentrations decrease with distance beyond the location of the maximum concentration.

The maximum total predicted 24-hour average SO_2 concentration is 169 ug/m^3 and is located approximately 2 km (1.24 miles) east-southeast of the stacks. The maximum total predicated annual SO_2 concentration is 30.3 ug/m^3. This

concentration is predicted to occur 1.75 km (1.1 miles) to the east of the stacks.

These concentrations and averaging times can be compared with SO_2 doses known to adversely affect plant species that are presented in Table 8-1. The expected doses from operation of the Hardee Power Station combined with background sources are much lower than doses known to cause a detrimental effect on vegetation.

NITROGEN OXIDES

The maximum predicted 3-hour, 24-hour and annual average NO_2 concentrations due to the Hardee Power Station are predicted to be 297, 42 and 4.6 ug/m^3, respectively. The maximum total predicted annual average concentrations due to all sources is 50.9 ug/m^3 which includes a background concentration of 45 ug/m^3 derived from monitoring data in Bartow. The NO_2 doses known to adversely affect some plant species that have been tested are shown in Table 8-1. The predicted doses of NO_2 due to the proposed facility are far lower than the doses reported to injure vegetation; therefore, the proposed facility's NO_2 emissions are not expected to have an adverse affect on vegetation.

TOTAL SUSPENDED PARTICULATES

The maximum total 24-hour and annual average concentrations are predicted to be 112 and 48.6 ug/m^3, respectively. These concentrations are predicted to occur between 1.75 to 6 km from the stacks. High deposition of particulates on plant leaves can reduce photosynthesis through shading and impede diffusion of gases. However, at least 5 g/m^2 leaf surface of particulates are required to cause these impacts (Thompson, et al., 1984). This concentration is not expected due to the maximum predicted impacts from the Hardee Power Station.

Table 8-1. SO_2 and NO_2 Doses Reported to Affect Plant Species Similar to Vegetation in the Region of the Hardee Power Plant

Pollutant	Species	Dose and Effect	Reference
SO_2	Strawberry	1,040 ug/m^3 for 6 hours per day for 3 days had no affect on growth	Rajput, et al.,1977
SO_2	Citrus	2,080 ug/m^3 for 23 days with 10 day interruption reduced leaf area	Matsushima and Brewer 1972
SO_2	Ryegrass	42 ug/m^3 for 26 weeks or 367 ug/m^3 for 131 days reduced dry weight	Bell, et al., 1979 Ayazaloo and Bell, 1981
SO_2	Tomato	1,258 ug/m^3 for 5 hours per day, for 57 days, reduced growth	Kohut, et al., 1983
SO_2	Duckweed	390 ug/m^3 for 6 weeks reduced growth	Fankhauser, et al., 1976
SO_2	Lichens (Parmotrema and Ramalina spp.)	400 ug/m^3 6 hours per week for 10 weeks reduced CO_2 uptake and biomass gain of Ramalina, not Parmotrema	Hart, et al., 1988
SO_2	Bald Cypress	1,300 and 2,600 ug/m^3 for 48 hours. Only 2600 ug/m^3 reduced leaf area.	Shanklin and Kozlowski, 1985
SO_2	Green Ash	210 ug/m^3 for 4 hours per day, 5 days per week for 6 weeks reduced growth	Chappelka, et al., 1988
NO_2	Ryegrass	39.5 ug/m^3 for 6 minutes had no affect on shoot weight	Lane and Bell, 1984
NO_2	Citrus	470 ug/m^3 for 290 days injured trees	Thompson, et al., 1970
NO_2	Sphagnum	11.7 ug/m^3 averaged over 18 months compared with control of 4.8 ug/m^3 (exceeded 15 ug/m^3 4 times) reduced growth	Press, et al., 1986

CARBON MONOXIDE

The maximum predicted 1-hour and 8-hour average CO concentrations due to the facility are 179 and 38.0 ug/m^3, respectively. Soil microorganisms can use carbon monoxide as a carbon source and are a major sink for this pollutant (Bennett and Hill, 1975). Plants are not known to be injured by CO. No adverse impacts to vegetation are expected from CO emissions from the Hardee Power Station.

BERYLLIUM

The maximum 24-hour average Be concentration due to the proposed facility is predicted to be 0.0004 ug/m^3. Levels of Be greater than 2 ug/g in nutrient solution have been found to reduce growth of experimental plants (Gough, et al., 1979). Therefore, the low levels of Be predicted from plant operation are not expected to adversely affect vegetation.

MERCURY

The maximum 24-hour average Hg concentration due to the proposed facility is predicted to be 0.0016 ug/m^3. Siegel, et al., (1984) reported that 7 days of exposure to 50 ug/m^3 Hg vapor resulted in massive leaf abscission in 15 plant species and cultivars. This dose is orders of magnitude higher than the dose expected from operation of the Hardee Power Plant. Therefore, the predicted Hg concentrations due to the proposed facility are not expected to adversely affect vegetation.

8.2 IMPACTS TO SOILS

Soils in the site region have been disrupted and altered by phosphate mining. They were originally sandy, siliceous hyperthermic Haploquods with very strongly acid subsoils. The undisturbed soils of the Payne Creek floodplain formed in unconsolidated loamy textured sediment influenced by calcareous material (Robbins, et al., 1984). They are coarse-loamy siliceous, hyperthermic Typic Ochraqualfs.

SO_2 and NO_2 that reach the soil by deposition from the air are converted by physical and biotic processes to sulfates and nitrates. (CO, particulates, and metals have no affect on soils at the levels predicted.) The effects can be beneficial to plants if either sulfates or nitrates in native soils are less than plant requirements for optimum growth. However, sulfates and nitrates can also increase acidity of unbuffered soils, causing adverse effects due to changes in nutrient availability and cycling. The predicted concentrations of SO_2 and NO_2 from stack emissions are not expected to have a significant adverse affect on soils in the vicinity because (1) the predicted concentrations of both gases are low, (2) Payne Creek floodplain and other wetland soils contain organic matter and/or calcium carbonate nodules that buffer changes in acidity, and (3) ground limestone will be applied to lands being reclaimed for pasture and citrus. Therefore, the facility is not expected to have a significant adverse impact on regional vegetation or soils.

8.3 IMPACTS DUE TO ADDITIONAL GROWTH

A limited number of additional personnel will be added to the work force due to the proposed facility. These additional personnel are expected to have an insignificant effect on the residential, commercial, and industrial growth of Hardee and Polk counties.

Fuel oil will be delivered by truck every week to the facility. Based on a truck capacity of 9,200 gallons, approximately 129 trucks per week trucks or 18 trucks per day will deliver oil to the site. These additional trucks are not expected to adversely affect existing traffic patterns or air quality in the vicinity of the plant.

Therefore, no air quality related impacts associated with residential, commercial and industrial growth are anticipated.

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11.1.5 APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

This application has been prepared for information purposes only as required by FDER Form 17-1.211(1). Refer to Applicant Information in the SCA.

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

This application is being completed for information purposes as required by Section 3.4.1 of DERFORM 17-1.211 (1); Power Plant Site Certification Application (SCA).

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Combustion Turbine [X] New[1] [ ] Existing[1]

APPLICATION TYPE: [ ] Construction [ ] Operation [ ] Modification

COMPANY NAME: Refer to Applicant Information in the SCA COUNTY: Hardee

Identify the specific emission point source(s) addressed in this application (i.e. Lime Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired) By-Pass and HRSG Stack

SOURCE LOCATION: Street _____ City _____

UTM: East 404.8 km North 3057.4 km

Latitude ____° ____' ____"N Longitude ____° ____' ____"W

APPLICANT NAME AND TITLE: Refer to Applicant Information in the SCA

APPLICANT ADDRESS: Refer to Applicant Information in the SCA

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT N/A

I am the undersigned owner or authorized representative* of _____

I certify that the statements made in this application for a _____ 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: _____

Name and Title (Please Type)

Date: _____ Telephone No. _____

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA (where required by Chapter 471, F.S.)

N/A

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_____

Name (Please Type)

Company Name (Please Type)

Mailing Address (Please Type)

Florida Registration No._____ Date:_____ Telephone No._____

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.

Refer to Section 2.0 of the PSD Application

B. Schedule of project covered in this application (Construction Permit Application Only)

Refer to Chapter 1 of the SCA.
Start of Construction _____ Completion of Construction _____

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.)

Refer to Section 4.0 of the PSD Application: Table 4-4

D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.

No previous permits have been issued.

E. 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? N/A

   b. If yes, has "Lowest Achievable Emission Rate" been applied? N/A

   c. If yes, list non-attainment pollutants. N/A

2. Does best available control technology (BACT) apply to this source? If yes, see Section VI. Yes

3. Does the State "Prevention of Significant Deterioriation" (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? N/A

   b. If yes, in addition to the information required in this form, any information requested in Rule 17-2.650 must be submitted. N/A

Attach all supportive information related to any answer of "Yes". Attach any justification for any answer of "No" that might be considered questionable.

Refer to the following sections in the PSD Application:

PSD Applicability - Subsection 3.4.1
Non-Attainment Applicability - Subsection 3.4.2
BACT Applicability - Section 4.1
NSPS Applicability - Section 4.2

SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES (Other than Incinerators)

A. Raw Materials and Chemicals Used in your Process, if applicable:

Not Applicable

Description	Contaminants		Utilization Rate - lbs/hr	Relate to Flow Diagram
	Type	% Wt		

B. Process Rate, if applicable: (See Section V, Item 1) Not Applicable

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)

Refer to Tables 2-2 through 2-4 of the PSD Application

Name of Contaminant	Emission[1]		Allowed 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/hr	T/yr	
TSP/PM10	57	250	--	--	57	250	Refer To
SO_2	734	3,217	0.5% sulfur fuel	1174	734	3,217	Figure 2-1 in PSD
NO_x	384	1,681	65 ppm corrected	> 440	384	1,681	Applica-tion
CO	128	562	--		128	562	
VOC	21	90	--		21	90	

Above information is maximum emissions for each CT.

[1]See Section V, Item 2.

[2]Reference 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)

[3]Calculated from operating rate and applicable standard.

[4]Emission, if source operated without control (See Section V, Item 3).

D. 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)
Refer to Section 4.0 in the PSD Application				

E. Fuels Refer to Table 3-3 in SCA and Table 2-1 in PSD Application

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	
Natural Gas	--	1251.4 MCF/hr	
No. 2 Fuel Oil	--	73,437 lb/hr	1312.3

*Units: Natural Gas--MMCF/hr; Fuel Oils--gallons/hr; Coal, wood, refuse, other--lbs/hr.

Fuel Analysis: Refer to Tables 2-5 and 2-6 in the PSD Application

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.

Refer to Section 3.6 in the SCA

Refer to Table 2-7 in the PSD Application

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

Not Applicable

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							
Uncontrolled (lbs/hr)							

Description of Waste _____

Total Weight Incinerated (lbs/hr) _____ Design Capacity (lbs/hr) _____

Approximate Number of Hours of Operation per day _____ day/wk _____ wks/yr. _____

Manufacturer _____

Date Constructed _____ Model No. _____

	Volume $(ft)^3$	Heat Release (BTU/hr)	Fuel		Temperature (°F)
			Type	BTU/hr	
Primary Chamber					
Secondary Chamber					

Stack Height: _____ ft. Stack Diamter: _____ Stack Temp. _____

Gas Flow Rate: _____ ACFM _____ DSCFM* Velocity: _____ 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) _____

Brief description of operating characteristics of control devices: _____

_____

_____

_____

_____

Ultimate disposal of any effluent other than that emitted from the stack (scrubber water, ash, etc.):

_____

_____

_____

_____

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)]
   See Table 2-1 in the PSD Application
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. Refer to Tables 2-2 through 2-4 in the PSD Application
3. Attach basis of potential discharge (e.g., emission factor, that is, AP42 test).
   Refer to Tables 2-2 through 2-4 in the PSD Application
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.)
   Refer to Section 4.0 in the PSD Application
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). Refer to Section 4.0 in the PSD Application
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. See Figure 2-1 in the PSD Application
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).
   See Figures 3.2-1 and 3.2-2 in the SCA
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.
   See Figures 3.2-1 and 3.2-2 in the SCA

9. The appropriate application fee in accordance with Rule 17-4.05. The check should be made payable to the Department of Environmental Regulation.
Not Applicable

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?

[X] Yes [ ] No 40 CFR Part 60 Subpart GG

Contaminant	Rate or Concentration
See Table 4-1 in PSD Application	

B. Has EPA declared the best available control technology for this class of sources (If yes, attach copy)

[X] Yes [ ] No

Contaminant	Rate or Concentration
Refer to Section 4.3 in the PSD Application	

C. What emission levels do you propose as best available control technology?

Contaminant	Rate or Concentration
Refer to Tables 2-2 and 2-5 in the PSD Application	

D. Describe the existing control and treatment technology (if any). Not Applicable

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). Refer to Section 4.3 in the PSD Application

1.

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:

[1]Explain method of determining efficiency.
[2]Energy to be reported in units of electrical power - KWH design rate.

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

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 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:

F. Describe the control technology selected: Refer to Section 4.3 in the PSD Application

1. Control Device:

2. Efficiency:[1]

3. Capital Cost:

4. Useful Life:

5. Operating Cost:

6. Energy:[2]

7. Maintenance Cost:

8. Manufacturer:

9. Other locations where employed on similar processes:

a. (1) Company:

(2) Mailing Address:

(3) City:

(4) State:

[1]Explain method of determining efficiency.
[2]Energy to be reported in units of electrical power - KWH design rate.

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

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]

10. Reason for selection and description of systems:

[1]Applicant 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 Refer to Section 5.0 in the PSD Application

1. _____no. sites _____ TSP _____( ) SO^2* _____ 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 Refer to Section 6.3 in the PSD Application

1. _____ Year(s) of data from ____/____/____ to ____/____/____
month day year month day year

2. Surface data obtained from (location)_____

3. Upper air (mixing height) data obtained from (location)_____

4. Stability wind rose (STAR) data obtained from (location)_____

C. Computer Models Used

1. _____ 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 Refer to Table 2-1 in PSD Application

Pollutant	Emission Rate	
TSP	_____	grams/sec
SO^2	_____	grams/sec

E. Emission Data Used in Modeling Refer to Table 2-7 in the PSD Application

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. Refer to PSD Application

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. Refer to Section 4.0 of the PSD Application

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. Refer to Section 4.0 of the PSD Application

11.2 ZONING CONSISTENCY

JAN 31 1989
FILE COPY

IMPERIAL

POLK COUNTY

DEPARTMENT OF DEVELOPMENT COORDINATION

ZONING DIVISION

GERALD C. MARTIN
Zoning Administrator

January 24, 1989

MERLE H. BISHOP
Director

Mr. Mike Opalinski
Environmental Affairs
Seminole Electric Cooperative, Incorporated
P. O. Box 272000
Tampa, Florida 33688-2000

RE: Combined Cycle Power Plant - Consistency and Compliance with applicable Comprehensive Plan and Zoning Ordinance

Dear Mr. Opalinski:

As per your request, the Planning Division and I have reviewed the proposal of Seminole Electric Cooperative, Inc. to construct a combined cycle power plant on a site located in Hardee County. It is our understanding that some directly associated plant facilities will be located in Polk County. These directly associated facilities include: (1) a portion of a 570 acre cooling reservoir (2) a 230 KV transmission line to the Pebbledale Substation located 4 miles southwest of Mulberry and (3) a natural gas pipeline connecting the plant to Florida Gas Transmission's main gas line northeast of Lake Hancock.

These facilities are defined in the Polk County Zoning Ordinance (Ord. No. 83-2, as amended) as essential services. Specifically, transmission lines and gas pipelines are Class I essential services; and the power plant's cooling reservoir is a Class II essential service. Class I essential services are permitted in all zoning districts. The site of the proposed cooling reservoir in Polk County is zoned Rural Conservation (RC) which permits Class II essential services. Therefore, these proposed facilities are in compliance with the Polk County Zoning Ordinance. Also, attached is a memorandum from the Planning Division of Polk County which indicates consistency with the current Comprehensive Plan.

I trust this information will assist you.

Sincerely,

Gerald C. Martin

Gerald C. Martin
Zoning Administrator

POST OFFICE BOX 550 • BARTOW, FLORIDA 33830 • PHONE (813) 534-6000

GCM/mlh

cc: Robert D. Anders, Planning Director
Ron Borchers, Chief of Current Planning

enc.

RECEIVED
JAN 20 1989
POLK COUNTY
ZONING DEPARTMENT

BOARD OF COUNTY COMMISSIONERS

IMPERIAL

POLK COUNTY

DEPARTMENT OF DEVELOPMENT COORDINATION

PLANNING DIVISION
Robert D. Anders, AICP
Planning Director

MERLE H. BISHOP
Director

January 20, 1989

MEMORANDUM

TO: Gerald Martin, Zoning Administrator

VIA: Robert D. Anders, Planning Director

FROM: Ron Borchers, Chief of Current Planning

SUBJECT: Seminole Electric Cooperative, Inc. Proposed Power Plant and Associated Facilities

Seminole Electric Cooperative, Inc. is proposing a power plant location in Hardee County. The following associated facilities will be located in Polk County: a portion of a 570 acre cooling reservoir, a 230 KV transmission line to the Pebbledale Substation located four (4) miles southwest of Mulberry and a natural gas pipeline connecting the plant to Florida Gas Transmission's main gas line northeast of Lake Hancock. These facilities, considered as essential services, would be in compliance with the Polk County Comprehensive Plan as adopted by the Board of County Commissioners on June 26, 1979.

RB:el

11.3 FLORIDA DIVISION OF HISTORIC RESOURCES OPINION

FLORIDA DEPARTMENT OF STATE
Jim Smith
Secretary of State
DIVISION OF HISTORICAL RESOURCES
R.A. Gray Building
Tallahassee, Florida 32399-0250
(904) 488-1480

April 4, 1989

In Reply Refer To:
Laura A. Kammerer
Historic Sites Specialist
(904) 487-2333
Project File No. 890750

Dr. J. Raymond Williams
Department of Anthropology
University of South Florida
Tampa, Florida 33620-8177

RE: Cultural Resource Assessment Request
Seminole Electric Cooperative, Inc.
Preliminary Transmission Line Corridors
Polk, Hardee, DeSoto, Charlotte and Lee Counties, Florida

Dear Dr. Williams:

We have compared the plotting of the proposed transmission line corridors provided by Seminole Electric with Mark Hurd aerial photographs in the Florida Master Site File. It is the opinion of this agency that the majority of the proposed corridor siting study areas have a low likelihood to contain significant archaeological or historical sites. We have plotted in red hatching on the USGS quadrangle maps, those portions of the study corridors that appear to be archaeologically sensitive. However, we cannot identify all potential locations using this method because some potential site locales are simply not visible on the USGS quadrangle maps or the Mark Hurd aerials.

Since potentially significant archaeological and historic sites may be present, it is our recommendation that, once the final corridor selection has been made, those areas of the corridor hatched in red on the maps be subjected to a professional archaeological and historical survey prior to any project related land clearing or ground disturbing activities within the project area. The purpose of this survey will be to locate and assess the significance of cultural resources present. The resultant survey report must be forwarded to this agency in order to complete the process of reviewing the impact of this project on archaeological and historic resources.

Please note that it is ultimately the survey archaeologist who is responsible for locating and assessing the cultural resources within these areas, regardless of this agency's recommendations. However, this agency is willing to work with the survey archaeologist in determining appropriate field methodology.

Finally, if sites determined to be potentially eligible for listing in the National Register of Historic Places are encountered within the corridor siting by the archaeologist, it will be the recommendation of this office that those sites be avoided during the construction of the transmission line, and subsequently during all line maintenance activities to insure preservation. If avoidance is not feasible, it will be our recommendation that project impacts be mitigated through archaeological salvage excavation, conducted by a professional archaeologist. The resulting mitigative salvage excavation report should be submitted to this agency in order to complete the process of reviewing the impact of this of this project on archaeological and historical resources.

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 historical resources are appreciated.

Sincerely,

George W. Percy, Director
Division of Historical Resources
and
State Historic Preservation Officer

GWP/lak
xc: Joseph M. Norton

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

FLORIDA DEPARTMENT OF STATE

Jim Smith
Secretary of State

DIVISION OF HISTORICAL RESOURCES
R.A. Gray Building
500 South Bronough
Tallahassee, Florida 32399-0250
Director's Office (904) 488-1480
Telecopier Number (FAX) (904) 488-3353

April 14, 1989

Dr. J. Raymond Williams
Department of Anthropology
University of South Florida
Tampa, Florida 33620-8177

In Reply Refer To:
Laura A. Kammerer
Historic Sites Specialist
(904) 487-2333
Project File No. 890751

RE: Cultural Resource Assessment Request:
Seminole Electric Cooperative, Inc.
Gas Pipeline Corridor
Polk County, Florida

Dear Dr. Williams:

We have compared the plotting of the proposed gasline corridor provided by Seminole Electric, with USGS quadrangle maps in the Florida Master Site File. It is the opinion of this agency that the majority of the proposed corridor siting study areas have a low likelihood to contain significant archaeological or historical sites. We have plotted in red hatching on USGS quadrangle maps, those portions of the study corridor that appear to be archaeologically sensitive. However, we cannot identify all potential locations using this method because some potential site locales are simply not visible on the USGS quadrangle maps.

Since potentially significant archaeological and historic sites may be present, it is our recommendation that those areas of the corridor hatched in red on the maps be subjected to a professional archaeological and historical survey prior to any project related land clearing or ground disturbing activities within the project area. The purpose of this survey will be to locate and assess the significance of cultural resources present. The resultant survey report must be forwarded to this agency in order to complete the process of reviewing the impact of this project on archaeological and historic resources.

Please note that it is ultimately the survey archaeologist who is responsible for locating and assessing the cultural resources within these areas, regardless of this agency's recommendations. However, this agency is willing to work with the survey archaeologist in determining appropriate field methodology.

Finally, if sites determined to be potentially eligible for listing in the National Register of Historic Places are encountered within the corridor siting by the archaeologist, it will be the recommendation of this office that those sites be avoided during the construction of the transmission line, and subsequently during all line maintenance activities to insure preservation. If avoidance is not feasible, it will be our recommendation that project impacts be

mitigated through archaeological salvage excavation, conducted by a professional archaeologist. The resulting mitigative salvage excavation report should be submitted to this agency in order to complete the process of reviewing the impact of this of this project on archaeological and historical resources.

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 historical resources are appreciated.

Sincerely,

for George W. Percy, Director
Division of Historical Resources
and
State Historic Preservation Officer

GWP/lak
xc: Joseph M. Norton

FLORIDA DEPARTMENT OF STATE

Jim Smith
Secretary of State

DIVISION OF HISTORICAL RESOURCES
R.A. Gray Building
500 South Bronough
Tallahassee, Florida 32399-0250
Director's Office (904) 488-1480
Telecopier Number (FAX) (904) 488-3353

June 22, 1989

Mr. Roy Zwolak
Hunter Services, Inc.
1715 N. Westshore Blvd., Suite 500
Tampa, Florida 33607-3999

In Reply Refer To:
Laura A. Kammerer
Historic Sites Specialist
(904) 487-2333
Project File No. 891460

RE: Cultural Resource Assessment Request
Liquid Fuel Pipeline Corridor
Hardee, Hillsbourgh, Manatee and Polk Counties

Dear Roy Zwolak:

We have compared the plotting of the proposed liquid fuel line corridor provided by Hunter Services, Inc. with USGS quadrangle maps in the Florida Master Site File. It is the opinion of this agency that the majority of the proposed corridor siting study areas have a low likelihood to contain significant archaeological or historical sites. We have plotted in black hatching on your aerial maps, those portions of the study corridor that appear to be archaeologically sensitive. However, we cannot identify all potential locations using this method because some potential site locales are simply not visible on the aerials or the USGS quadrangle maps. However, because of environmental change, the unpredictability of special use sites such as burial mounds, cemeteries, quarries and other site types, it is possible that sites may be found in unidentified locales which are not indicated in the black hatched areas, but which the survey archaeologist may investigate at his or her own discretion. This agency is willing to work with the survey archaeologist in determining appropriate field methodology.

Since potentially significant archaeological and historic sites may be present, it is our recommendation that those areas of the corridor hatched in black on the maps be subjected to a professional archaeological and historical survey prior to any project related land clearing or ground disturbing activities within the project area. The purpose of this survey will be to locate and assess the significance of cultural resources present. The resultant survey report must be forwarded to this agency in order to complete the process of reviewing the impact of this project on archaeological and historic resources.

Finally, if sites determined to be potentially eligible for listing in the National Register of Historic Places are encountered within the corridor siting by the archaeologist, it will be the recommendation of this office that those sites be avoided during the construction of the liquid fuel line, and subsequently during all line maintenance activities to insure preservation. If avoidance is not feasible, it will be our recommendation that project impacts be

mitigated through archaeological salvage excavation, conducted by a professional archaeologist. The resulting mitigative salvage excavation report should be submitted to this agency in order to complete the process of reviewing the impact of this of this project on archaeological and historical resources.

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 historical resources are appreciated.

Sincerely,

GWP/lak

George W. Percy, Director
Division of Historical Resources
and
State Historic Preservation Officer

11.4 SUPPORTING GEOHYDROLOGICAL INFORMATION

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-1
SHEET 1 of 4

CLIENT	PROJECT	PROJECT NO.
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	N 1200 E 750	122.3	100.3	11/4/88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Level, grass	P. L. Nelson	11/7/88

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh

SAMPLING SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORING CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
SPT	1	1	1	2	3	1.3								1		SAND; dark grey grading to light grey; loose; poorly graded; fine grained; rounded; moist; trace of silt	Boring advanced by continuous driving of SPT to 6.5'.
SPT	2	3	4	9	13	1.5								3		Grading to brown	
SPT	3	8	10	10	20	1.5								5		Clayey SAND; greenish-white; medium dense; well graded; fine grained; rounded; moist	At 6.5' boring advanced by rotary wash w/3 7/8" wing bit and bentonite as drilling fluid. Water encountered at 7.5'.
TW	4					2.0								7			
SPT	5	8	10	12	22	1.5								10		Grading coarser sand	Pushed w/750 psi.
TW	6					2.0								15		SAND; white; medium dense; poorly graded; fine grained; rounded; moist; trace of clay	Pushed w/400 psi
SPT	7	1	1	2	3	1.1								20		SAND; brown; loose; well graded; fine to coarse grained; angular; wet; trace of silt	Lost circulation at 21'-25'
TW	8					1.7								25		6" cemented zone (bent tube at 27')	Switched to 2 7/8" roller bit at 25'. Tube sunk first foot by rod weight. Harder at 26.5'. Pushed 4" casing to 29'.

P-ST-0036D

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-1
SHEET 2 of 4

CLIENT		PROJECT		PROJECT NO.
Seminole Electric Cooperative, Inc.		Combined Cycle		14845
PROJECT LOCATION	**COORDINATES**	**ELEVATION (DATUM)**	**TOTAL DEPTH**	**DATE START**
Agrico South	N 1200 E 750	122.3	100.3	11/4/88
SURFACE CONDITIONS		**INSPECTOR**		**DATE FINISH**
Level, grass		P. L. Nelson		11/7/88
CHECKED BY		**APPROVED BY**		
M. R. Osbourn		L. J. Almaleh		

SAMPLING							CORING								
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	CLASSIFICATION OF MATERIAL	REMARKS
SPT	9	6	7	50 / 5.5"		57+	1.4							1	Clayey SAND; light grey w/mottled tan; medium dense; poorly graded; fine grained; rounded; wet	Chattering 31'-32.5'
														2		
														3		
														4		
SPT	10	6	11	13	24	1.5								35	Grading finer sand	
														6		
														7		
														8		
														9		
SPT	11	8	11	16	27	1.5								40		Stopped at 40' on 11/4/88
														1		Water observed at 2.3' on 11/7/88 a.m.
														2		
														3		
														4		
SPT	12	10	50 / 4"		50+	0.8								45	Silty SAND; light grey w/black specs; medium dense; poorly graded; fine grained; rounded; moderate cementation; wet	Hard drilling 45.5'-47.5'
														6		
														7		
														8		
														9		
SPT	13	14	13	12	25	1.5								50	Grading no cementation	
														1		
														2		
														3		
														4		
SPT	14	11	10	10	20	1.5								55		
														6		
														7		
														8		
														9		
														60		

P-ST-0360

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-1
SHEET 3 of 4

CLIENT				PROJECT		PROJECT NO.
Seminole Electric Cooperative, Inc.				Combined Cycle		14845
PROJECT LOCATION	COORDINATES			ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	N 1200 E 750			122.3	100.3	11/4/88
SURFACE CONDITIONS				INSPECTOR		DATE FINISH
Level, grass				P. L. Nelson		11/7/88
CHECKED BY				APPROVED BY		
M. R. Osbourn				L. J. Almaleh		

SAMPLING							CORING								
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	CLASSIFICATION OF MATERIAL	REMARKS
SPT	15	4	5	10	15	1.5								1		
														2		
														3		
														4		Hard drilling 63.5'-67.5'
SPT	16	50/5"			50+	0.2								65		
														6	Grading moderate cementation	
														7		
														8		
														9		
SPT	17	4	5	48	53	1.5								70		
														1	SAND; black w/mottled light grey; very dense; poorly graded; fine grained; rounded; moist; some clay	Hard drilling 71'-71.5'
														2		
														3		
														4		
SPT	18	15	15	37	52	0.8								75		
														6	Thin cemented layers	
														7		
														8		Chattering 78'-79'
														9		
SPT	19	9	11	32	43	1.5								80		
														1	Sandy SILT; light grey; hard; plastic; moist; trace clay	
														2		
														3		Chattering 82.5'-84'
														4		
SPT	20	35	50/4.5"		50+	0.3								85		
														6		Chattering between 86'-96'.
														7		
														8		
														9		
														90		

P-ST-0360

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-1
SHEET 4 of 4

CLIENT		PROJECT		PROJECT NO.
Seminole Electric Cooperative, Inc.		Combined Cycle		14845
PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	N 1200 E 750	122.3	100.3	11/4/88
SURFACE CONDITIONS		INSPECTOR		DATE FINISH
Level, grass		P. L. Nelson		11/7/88
		CHECKED BY	APPROVED BY	
		M. R. Osbourn	L. J. Almaleh	

SAMPLING							CORING								
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	CLASSIFICATION OF MATERIAL	REMARKS
SPT	21	50/4"			50+	0.3								0	Chert nodule in sample	
SPT	22	19	50/3"		50+	0.7								95		Drilling easier 96-97.5'.
SPT	23	50/4"			50+	0								100		Bottom of boring at 100.3'. Backfilled w/cement grout. Water level not recorded.

P-ST-0366

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-2
SHEET 1 of 4

CLIENT		PROJECT		PROJECT NO.
Seminole Electric Cooperative, Inc.		Combined Cycle		14845
PROJECT LOCATION	**COORDINATES**	**ELEVATION (DATUM)**	**TOTAL DEPTH**	**DATE START**
Agrico South	S 535 W 185	114.2	101.5	11/2/88
SURFACE CONDITIONS		**INSPECTOR**		**DATE FINISH**
8" long grass, level		P. L. Nelson		11/2/88
CHECKED BY		**APPROVED BY**		
M. R. Osbourn		L. J. Almaleh		

SAMPLING							CORING								
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	GRAPHICS LOG
SPT	1	1	0	2	3	1.4								1	
SPT	2	4	6	4	10	1.5								2	
														3	
														4	
SPT	3	2	2	4	6	1.5								5	
SPT	4	3	3	6	9	1.0								6	
														7	
														8	
														9	
TW	5					1.25								10	
														1	
														2	
														3	
														4	
TW	6					2.0								15	
														6	
														7	
														8	
														9	
SPT	7	20	50/3"		50+	0.7								20	
														1	
														2	
														3	
														4	
SPT	8	16	8	9	17	0.7								25	
														6	
														7	
														8	
														9	
														30	

CLASSIFICATION OF MATERIAL

Silty SAND; dark grey grading light grey; very loose; poorly graded; fine grained; rounded; dry; trace of organics

Grading brown, no organics

Clayey SAND; tan; loose; poorly graded; fine grained; rounded; moist

Grading finer

Clayey SAND; tan; dense; poorly graded; fine grained; rounded; moist

Sandy CLAY; light brown; hard; plastic; moist; moderate cementation; trace of coarse sand and gravel

Clayey SAND; light brown; dense; well graded; medium to coarse grained; angular; moist; weak cementation; some gravel

REMARKS

Boring advanced to 6.5' by continuous driving and cleaning out of split spoon.

At 6.5' switched to rotary wash w/3 7/8" roller bit, using bentonite as drilling fluid.

Water encountered at 5'.

Chattering 20.5'-24' in 3"-6" increments.

Drilling easier.

P-ST-0360

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-2
SHEET 2 of 4

CLIENT	PROJECT	PROJECT NO.
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	S 535 W 185	114.2	101.5	11/2/88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
8" long grass, level	P. L. Nelson	11/2/88

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh

SAMPLING							CORING						
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD
SPT	9	9	17	23	40	1.5							
TW	10					0.75							
SPT	11	28	12	8	20	1.5							
SPT	12	3	6	50	56	1.5							
SPT	13	50/2.5"			50+	0							
SPT	14	37	18	21	39	1.5							

DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
1–3		Silty SAND; brown mottled tan; dense; poorly graded; fine grained; moist; trace clay	
3			Drilling easier at 33'.
35–9		Sandy CLAY; grey mottled brown; high plasticity; moist; trace silt	
40			Chattering, 39'-40'
40–4		Clayey SAND; grey mottled brown; medium dense; poorly graded; fine grained; moist; trace silt	
45			Switched to 2 7/8" roller bit at 45'
45–2		Clayey SAND; dark grey; very dense; poorly graded; fine grained; moist; trace of silt	
50			Chattering 50'-52.5'
55–9		Sandy CLAY; light grey w/black specs; high plasticity; wet; trace of silt	
60			Drilling easier 58.5'-59.7'.

P-ST-0360

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-2
SHEET 3 of 4

CLIENT	PROJECT	PROJECT NO.
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	S 535 W 185	114.2	101.5	11/2/88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
8" long grass, level	P. L. Nelson	11/2/88

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh

SAMPLING							CORING							DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD				
SPT	15	50/1"			50+	0								1			Chattering 59.7'-62.0'
														2			
														3			
														4			
SPT	16	7	8	16	24	1.5								65		SAND; black; medium dense; poorly graded; rounded; fine grained; moist; trace of silt	
														6			
														7			
														8			
														9			
SPT	17	14	8	19	27	1.5								70			
														1			
														2			Chattering 72'-72.5'
														3			
														4			
SPT	18	12	6	5	11	1.5								75		Intermittent 2"-4" sandy clay layers	
														6			
														7			
														8			Drilling hard 77.5'-83'
														9			
SPT	19	10	18	16	34	1.5								80		Sandy CLAY; tan w/black specs; hard; high plasticity; wet; weak cementation; trace of silt	
														1			
														2			
														3			Drilling hard w/chattering 83'-93'
														4			
SPT	20	50/1"			50+	0								85			
														6			
														7			
														8			
														9			
														90			

P-ST-0360

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-2
SHEET 4 of 4

CLIENT	PROJECT	PROJECT NO.
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	S 535 W 185	114.2	101.5	11/2/88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
8" long grass, level	P. L. Nelson	11/2/88

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh

SAMPLING							CORING								
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	CLASSIFICATION OF MATERIAL	REMARKS
SPT	21	50/2"			50+	0								1 2 3 4		Intermittent hard drilling 93'-95'.
SPT	22	50/0.2'			50+	0.2								95 6 7 8 9	Clayey SAND; light grey w/black specs; very dense; well graded; fine grained; round; moist; weak cementation	Drilling easier 95.5'-100'.
SPT	23	14	18	37	55	1.5								100 1 2 3 4 105 6 7 8 9 110 1 2 3 4 115 6 7 8 9 120	Sandy SILT; light grey w/black specs; hard; plastic; moist; trace clay	Bottom of boring at 101.5'. Water level not recorded. Backfilled hole to surface with cement grout.

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BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-3
SHEET 1 of 4

CLIENT	PROJECT	PROJECT NO.
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	S 900 E 1800	121.7	100.7	10/31/88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Flat, heavy surface vegetation	M. R. Osbourn	11/1/88

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh

SAMPLING							CORING						
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD
SPT	1	1	1	2	3	1.0							
SPT	2	3	4	4	8	1.5							
SPT	3	17	21	31	52	1.5							
SPT	4	7	10	15	25	1.4							
SPT	5	20	18	16	34	1.2							
TW	6					2.0							
TW	7					2.0							
SPT	8	3	4	5	9	1.5							

DEPTH IN FEET	CLASSIFICATION OF MATERIAL	REMARKS
1	Silty SAND; grey; very loose; poorly graded; fine grained; dry; trace of topsoil; w/organics	Boring advanced to 5' by continuous driving and cleaning out of split spoon. Boring then advanced with 3 7/8" wing bit, using bentonite as drilling fluid.
5	SAND; light grey; very loose; poorly graded; fine grained; dry	
6	Silty SAND; dark brown; loose to very dense; poorly graded; fine grained; dry; w/iron nodules	
8	SAND; light tan; very dense; poorly graded; very fine grained; dry; trace silt	
10	Clayey SAND; light grey; medium dense; poorly graded; fine grained; slight cementation; moist; w/iron staining	At 10' attempted TW
	Grading coarser	
15	Sandy CLAY; light gray; very stiff; high plasticity; moist	
20	CLAY; light gray; stiff; plastic; moist; trace sand	At 20' 600 psi down pressure required to push TW
25	Becoming varved w/sand stringers	
30		

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BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-3
SHEET 2 of 4

CLIENT	PROJECT	PROJECT NO.
Seminole Electric Cooperative Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	S 900 E 1800	121.7	100.7	10/31/88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Flat, heavy surface vegetation	M. R. Osbourn	11/1/88

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh

SAMPLING							CORING							DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD				
TW	9					1.7								1		Encountered fragments of cemented material	Too stiff to push below 31.8'. Cemented layer determined from hard drilling. At 33' began drilling with a 2 7/8" tricone roller bit.
														2			
														3			
														4		Cemented stringer	
SPT	10	21	9	11	20	1.0								35		SAND; light brown; dense; well graded; medium-fine grained; wet; w/phosphate nodules and some silt	Terminated drill on 10/31/88 at 36.5'
														6			
														7			
														8			Resumed drilling on 11/01/88.
														9			
														40			
SPT	11	10	41	50/3"	+91	1.3								1		Sandy CLAY; light grey mottled brown; hard; plastic; weak cementation; moist; w/phosphate nodules and trace of silt	
														2			
														3			
														4		At 44'-45.5' signs of cementation	
SPT	12	16	9	10	19	1.2								45		Clayey SAND; grey; medium dense; poorly graded; fine grained; rounded; moist	
														6			
														7			
														8			
														9			At 49.0' to 51.5' drill became very difficult (signs of cementation)
SPT	13	50/0			+50	0								50			
														1			
														2			
														3			
														4			
SPT	14	5	4	6	10	1.5								55		Clayey SAND; grey to light grey; medium dense; poorly graded; fine grained; moist; w/clayey silt seams	
														6			
														7			
														8			
														9			
														60			

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ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-3
SHEET 3 of 4

CLIENT		PROJECT		PROJECT NO.
Seminole Electric Cooperative, Inc.		Combined Cycle		14845
PROJECT LOCATION	**COORDINATES**	**ELEVATION (DATUM)**	**TOTAL DEPTH**	**DATE START**
Agrico South	S 900 E 1800	121.7	100.7	10/31/88
SURFACE CONDITIONS		**INSPECTOR**		**DATE FINISH**
Flat, heavy surface vegetation		M. R. Osbourn		11/1/88
CHECKED BY		**APPROVED BY**		
M. R. Osbourn		L. J. Almaleh		

SAMPLING							CORING							DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD				
SPT	15	5	6	6	12	1.0								65		Silty SAND; grey to dark grey; medium dense; poorly graded; fine grained; wet	
TW	16					1.3								70		Sandy CLAY; dark brown; stiff; high plasticity; moist; w/trace peat at 67'	
SPT	17	10	7	7	14	1.5								75		SAND; light grey; medium dense; poorly graded; fine grained; wet; w/some clay Grading grey at 70.5'	Drilling became harder from 73'-75'
SPT	18	10	32	15	47	1.4								80		Grading coarser Cemented seam at 75.9'	
SPT	19	8	8	28	36	1.5								85		Sandy SILT; light grey; stiff; high plasticity; moist; w/cemented pieces	Drilling became hard at 81.5' to 84.0'
SPT	20	50/1"	-	-	+50	0.1								90			

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BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-3
SHEET 4 of 4

CLIENT	PROJECT	PROJECT NO.
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	S 900 E 1800	121.7	100.7	10/31/88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Flat, heavy surface vegetation	M. R. Osbourn	11/1/88

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh

SAMPLING							CORING								
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	CLASSIFICATION OF MATERIAL	REMARKS
SPT	21	50/3"	-	-	+50	0.3								1	Clayey SAND; grey to light grey; very dense; poorly graded; fine grained; rounded; moist	Drilling showed interbedding layers of hard and soft material
														2		
														3		
														4		
SPT	22	50/4"	-	-	+50	0								95		
														6	Sandy SILT; light grey; hard; plastic; moist; moderate cementation	
														7		
														8		
														9		
SPT	23	22	50/4"	-	+50	0.7								100		
														1		Bottom of boring at 100.7 Water level not recorded Boring backfilled to surface with cement grout
														2		
														3		
														4		
														105		
														6		
														7		
														8		
														9		
														110		
														1		
														2		
														3		
														4		
														115		
														6		
														7		
														8		
														9		
														120		

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LOG OF BORING

BORING NO. B-4
SHEET 1 of 4

CLIENT	PROJECT	PROJECT NO.
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	S 80 E 570	120.5	101.5	11/3/88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
8" long grass, level	P. L. Nelson	11/4/88

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh

SAMPLING							CORING								
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	CLASSIFICATION OF MATERIAL	REMARKS
SPT	1	2	1	2	3	1.5								1	SAND; dark grey grading to light grey; very loose; uniform; fine grained; rounded; dry; trace silt; little organics	Boring advanced to 6.5' by continuous driving and cleaning out of split spoon. Boring then advanced with 4" wing bit using bentonite as drilling fluid.
SPT	2	3	4	3	7	0.8								2		
														3		
														4	Grading to dark brown	
SPT	3	6	7	8	15	1.5								5		
														6	Grading to light grey	
SPT	4	3	3	4	7	1.1								7		Water encountered at 5'
														8	Grading finer	
														9		
TW	5					2.0								10	Clayey SAND; light tan; medium dense; well graded; fine grained; rounded; moist	Pushed TW w/500 psi.
														1		
														2		
														3		
														4		
TW	6					2.0								15	Sandy CLAY; greenish-tan; stiff; high plasticity; moist	Pushed w/400 psi.
														6		
														7		
														8		
														9		
SPT	7	1	0	1	1	0								20		First blow 1', next blow 1.7'. Lost mud after driving spoon. Spoon showed traces of coarse sand at 21'.
														1		
														2	SAND; greenish-white; very loose; poorly graded; medium grained; rounded; wet	
SPT	8	1	2	8	10	1.5								3		
														4	Sandy CLAY; tan; stiff; plastic; moist; weakly cemented; trace gravel and coarse sand	
														25		Set 4" casing to 24.5'.
														6		
														7		
														8		Harder at 27.5'.
															Cemented stringer	
														9	Gravelly SAND; tan; medium dense; poorly graded; angular; wet; trace of clay	Lost mud at 29'.
														30		

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ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-4
SHEET 2 of 4

CLIENT	PROJECT	PROJECT NO.
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	S 80 E 570	120.5	101.5	11/3/88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
8" long grass, level	P. L. Nelson	11/4/88

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh

SAMPLING							CORING							DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD				
SPT	9	26	6	9	15	1.5								1 2 3 4		Clayey SAND; grey mottled tan; medium dense; poorly graded; medium-fine grained; rounded; moist; trace gravel	Installed 5' more casing to 29.5'. Drilling easier 30'-35'.
SPT	10	6	32	25	57	1.5								35 6 7 8 9		Silty CLAY; dark grey; hard; dry; low plastic; trace fine sand	
SPT	11	50/3"			50+	0.25								40 1 2 3 4		Sandy SILT; light grey w/black specs; hard; plasticity; moist; trace clay	Drilling harder 40'-41'.
SPT	12	10	31	15	46	1.5								45 6 7 8 9			
SPT	13	38	9	13	22	1.5								50 1 2 3 4		Weakly cemented	
SPT	14	36	9	16	25	1.5								55 6 7 8 9 60		Clayey SAND; black; medium dense; poorly graded; rounded; fine grained; moist	

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ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-4
SHEET 3 of 4

CLIENT	PROJECT	PROJECT NO.
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	S 80 E 570	120.5	101.5	11/3/88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
8" long grass, level	P. L. Nelson	11/4/88

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh

SAMPLING							CORING								
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	CLASSIFICATION OF MATERIAL	REMARKS
SPT	15	4	4	5	9	1.5								1	Sandy CLAY; black grey mottled; stiff; plastic; moist	
														2		
														3		
														4		Chattering 64'-64.5'.
SPT	16	21	19	21	40	1.5								65	SAND; black; medium dense; poorly graded; fine grained; rounded; moist; trace clay	
														6		
														7		
														8		
														9		
SPT	17	7	7	21	28	1.5								70		
														1		
														2		
														3		
														4		
SPT	18	8	9	10	19	1.5								75	Grading clayier	Chattering 76.5'-79'.
														6		
														7		
														8		
														9		Drilling easier 79'-82'.
SPT	19	5	7	22	29	1.5								80	Silty SAND; light grey w/dark grey marl; medium dense; well graded; coarse to fine grained; rounded; moist; trace gravel	
														1		
														2		Drilling harder 82'-86'.
														3		
														4		
SPT	20	22	50/5.5"		50+	0.9								85	Grading coarser, weakly cemented	
														6		
														7		
														8		
														9		
														90		

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BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-4
SHEET 4 of 4

CLIENT	PROJECT	PROJECT NO.
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	S 80 E 570	120.5	101.5	11/3/88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
8" long grass, level	P. L. Nelson	11/4/88

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh

SAMPLING							CORING								
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	CLASSIFICATION OF MATERIAL	REMARKS
SPT	21	26	50		50+	0.6								1		Firm drilling 86'-100'.
														2		
														3		
														4		
SPT	22	16	50/3"		50+	0.7								95	Grading clayier	
														6		
														7		
														8		
														9		
SPT	23	14	14	29	43	1.0								100		
														1		
														2		Bottom of boring at 101.5'. Water level not recorded.
														3		
														4		Boring backfilled to surface with cement grout.
														105		
														6		
														7		
														8		
														9		
														110		
														1		
														2		
														3		
														4		
														115		
														6		
														7		
														8		
														9		
														120		

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ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-5
SHEET 1 of 4

CLIENT	PROJECT	PROJECT NO.
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	S 530 E 385	119.1'	101.5'	11/02/88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Flat (next to spoil pile) grass vegetation	M. R. Osbourn	11/02/88

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh

SAMPLING							CORING							DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD				
SPT	1	1	1	3	4	1.2								1		TOPSOIL; black; w/organics SAND; grey; very loose; poorly graded; fine grained; moist	Boring advanced w/3 7/8" diameter wing bit; using bentonite as drilling fluid.
SPT	2	4	4	4	8	1.0								3		Silty SAND; greyish-brown; loose; poorly graded; fine grained; moist	
SPT	3	4	4	7	11	1.4								6		Clayey SAND; light grey; medium dense; poorly graded; fine grained; rounded; moist	
TW	4					2.0								9			
SPT	5	5	5	7	12	1.3								10		Lens w/increasing sand content	
TW	6					2.0								15		Sandy CLAY; light grey; stiff; high plasticity; moist	
SPT	7	3	5	12	17	1.5								20		Clayey SAND; light grey mottled tan; medium dense; poorly graded; fine grained; rounded; moist Light grey sand lense; 0.5' thick	
SPT	8	50/4"	-	-	50+	0.3								25		Trace of gravel	Attempted to push shelby tube. Hard drilling at 27.5'.
														30			

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ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-5
SHEET 2 of 4

CLIENT		PROJECT		PROJECT NO.
Seminole Electric Cooperative, Inc.		Combined Cycle		14845
PROJECT LOCATION	**COORDINATES**	**ELEVATION (DATUM)**	**TOTAL DEPTH**	**DATE START**
Agrico South	S 530 E 385	119.1'	101.5'	11/02/88
SURFACE CONDITIONS		**INSPECTOR**		**DATE FINISH**
Flat (next to spoil pile) grass vegetation		M. R. Osbourn		11/02/88
CHECKED BY		**APPROVED BY**		
M. R. Osbourn		L. J. Almaleh		

SAMPLING							CORING						DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD				
SPT	9	50/6"	-	-	50+	0.0							1			
													2			
													3			
													4			
SPT	10	50/5"	-	-	50+	0.4							35		SAND; grey w/traces of brown; very dense; well graded; medium to fine grained; occasional strong cementation; moist; w/phosphate nodules and traces of clay	At 35' switched to 2 7/8" tricone roller bit. Hard drilling to 37', then becomes softer.
													6			
													7			
													8			
													9			
SPT	11	5	6	30	36	1.5							40		SAND; dark grey; dense; poorly graded; fine grained; moist; marled w/light grey clayey silt	
													1			
													2			
													3			
													4			
SPT	12	8	14	50	64	1.4							45		Minor cementation	
													6			
													7			
													8			
													9			
SPT	13	6	7	11	18	1.5							50		Increasing silt content	
													1		Silty SAND; light grey; medium dense; well graded; coarse to fine grained; rounded, weak cementation; moist; occasionally strongly cemented; nodules; trace clay	
													2			
													3			
													4			
SPT	14	50/5"	-	-	50+	0.4							55		Fragments of strongly cemented material	
													6			
													7			
													8			
													9			
													60			

P-STD-036D

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-5
SHEET 3 of 4

CLIENT		PROJECT		PROJECT NO.
Seminole Electric Cooperative, Inc.		Combined Cycle		14845
PROJECT LOCATION	**COORDINATES**	**ELEVATION (DATUM)**	**TOTAL DEPTH**	**DATE START**
Agrico South	S 530 E 385	119.1'	101.5'	11/02/88
SURFACE CONDITIONS		**INSPECTOR**		**DATE FINISH**
Flat (next to spoil pile) grass vegetation		M. R. Osbourn		11/02/88
CHECKED BY		**APPROVED BY**		
M. R. Osbourn		L. J. Almaleh		

SAMPLING							CORING							DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD				
SPT	15	50	-	-	50+	0.5								1 2 3 4		Increasing sand content	
SPT	16	21	11	50/4"	50+	1.4								65 6 7 8 9			
SPT	17	5	50/2"	-	50+	0.0								70 1 2 3 4			
SPT	18	50/5"	-	-	50+	0.4								75 6 7 8 9		Silty SAND; grey; very dense; poorly graded; fine grained; moist; w/seams of strong cementation; trace clay	
SPT	19	50/1"	-	-	50+	0.0								80 1 2 3 4			
SPT	20	38	17	12	29	1.5								85 6 7 8 9 90		Silty SAND; light grey; medium dense; poorly graded; fine grained; rounded; moist; trace clay	

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-5
SHEET 4 of 4

CLIENT	PROJECT		PROJECT NO.
Seminole Electric Cooperative	Combined Cycle		14845
PROJECT LOCATION / **COORDINATES**	**ELEVATION (DATUM)**	**TOTAL DEPTH**	**DATE START**
Agrico South — S 530 E 385	119.1'	101.5'	11/02/88
SURFACE CONDITIONS	**INSPECTOR**		**DATE FINISH**
Flat (next to spoil pile) grass vegetation	M. R. Osbourn		11/02/88
CHECKED BY	**APPROVED BY**		
M. R. Osbourn	L. J. Almaleh		

SAMPLING							CORING								
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	CLASSIFICATION OF MATERIAL	REMARKS
SPT	21	50/3"			50+	0.3								1	Fragments of strongly cemented material	91' to 92' strongly cemented layer.
														2		
														3		
														4		
SPT	22	50/2"			50+	0.2								95	Minor cementation	
														6		
														7		
														8		
														9		
SPT	23	6	10	12	22	0.4								100	Sandy SILT; light grey; very stiff; plastic; moist	
														1		
														2		Bottom of boring at 101.5'.
														3		Water level not recorded.
														4		Boring backfilled w/cement grout to surface.
														105		
														6		
														7		
														8		
														9		
														110		
														1		
														2		
														3		
														4		
														115		
														6		
														7		
														8		
														9		
														120		

P-ST-0360

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-6
SHEET 1 of 2

CLIENT	PROJECT	PROJECT NO.
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	S 1100 E 350	115.05	41.0'	10/31/88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Level w/8" grass and 5' woody bushes	P. L. Nelson	11/1/88

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh

SAMPLING							CORING						
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD
SPT	1	2	3	5	8	1.2							
SPT	2	8	9	8	17	1.0							
SPT	3	2	1	4	5	1.5							
SPT	4	6	8	9	17	1.4							
SPT	5	7	6	5	11	1.5							
SPT	6	1	1	2	3	1.5							
SPT	7	8	5	5	10	1.5							
SPT	8	4	5	8	13	1.5							

DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
1–3		SAND; dark grey grading to light grey; loose; well graded; fine grained; rounded; dry; trace silt	Boring advanced with 3 7/8" wing bit, using bentonite as drilling fluid.
4–7		Silty SAND; brown; loose; well graded; fine grained; rounded; wet	Water encountered at 5'.
8–4		Clayey SAND; grey; medium dense; poorly graded; fine grained; rounded; moist	
15–9		Silty SAND; grey; very loose; well graded; fine grained; angular; wet; trace clay	
20–4		Gravel seam SAND; grey w/black specs; medium dense; well graded; medium to fine grained; angular; wet; trace silt	
25–9		Sandy CLAY; tan mottled grey; stiff; plastic; moist; trace silt	Set 4" casing to 27.5'
30			

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ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-6
SHEET 2 of 2

CLIENT	PROJECT	PROJECT NO.
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	S 1100 E 350	115.05	41.0'	10/31/88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Level w/8" grass and 5' woody bushes	P. L. Nelson	11/1/88

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh

SAMPLING							CORING							DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD				
1 5/8"	1							1	2.5	1.4 32.5	0.5	56	20	1 2 3 4		LIMESTONE; argillaceous; tannish-white; medium bedded; fine grained; partially consolidated (limerock)	Stopped at 32.5' on 10/31. Resumed drilling on 11/1/88.
SPT	9	8	12	15	27	1.5								35 6 7 8 9		Clayey SAND; light grey mottled brown; medium dense; well graded; fine grained; rounded; wet	Pulled casing and finished boring w/2 7/8" roller bit.
TW	10					1.0								40 1 2 3 4			Bottom of boring at 41.0'. Water level not recorded at conclusion of boring. Backfilled boring to surface with cement grout.
														45 6 7 8 9			
														50 1 2 3 4			
														55 6 7 8 9			
														60			

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BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-7
SHEET 1 of 2

CLIENT	PROJECT	PROJECT NO.
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	S 150 E 850	118.5	51.5'	11/7/88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Grass, small bushes	P. L. Nelson	11/8/88

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh

SAMPLING							CORING								
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	CLASSIFICATION OF MATERIAL	REMARKS
SPT	1	1	2	3	5	1.5								1	SAND; dark grey grading to light brown; loose; poorly graded; fine; rounded; moist; trace silt; little organics	Boring advanced to 6.5' by continuous driving and cleaning out of split spoon.
SPT	2	4	4	3	7	1.5								2		
														3		
														4	Grading to dark brown	
SPT	3	8	9	10	19	1.5								5	Clayey SAND; grey; medium dense; well graded; fine; rounded; moist; trace of silt	Boring advanced with 3 7/8" wing bit using bentonite as drilling fluid.
														6		
TW	4					2.0								7		
														8		Pushed w/500 psi.
														9	Sandy CLAY; greenish-white; high plasticity; moist; trace of silt	
SPT	5	2	2	2	4	1.5								10		
														1		
														2		
														3		
														4		
TW	6					2.0								15		Pushed w/500 psi.
														6		
														7		
														8		
														9		
SPT	7	3	4	5	9	1.5								20		
														1	Grading tan	
														2		Stiff drilling at 21.5'.
														3		
														4		
														25		Switched to 2 7/8" roller bit at 25'. TW bent at 25', no recovery.
SPT	8	25	22	16	38	1.1								6	Sandy CLAY; tan mottled light grey; hard; high plasticity; moist; trace silt	
														7		
														8		Chattering 28'-31'.
														9		
														30		

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BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-7
SHEET 2 of 2

CLIENT	PROJECT	PROJECT NO.
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	S 150 E 850	118.5	51.5'	11/7/88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Grass, small bushes	P. L. Nelson	11/8/88

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh

SAMPLING SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORING CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
SPT	9	50/2"			50+	0								1			Drilling easier 31'-32.5'.
														2			
														3			
														4			
SPT	10	50/5"			50+	0.4								35		Silty SAND; tan mottled grey; very dense; well graded; coarse to fine grained; rounded; moderate cementation; moist	
														6			
														7			
														8			
														9			
SPT	11	50/5"			50+	0.4								40			Chattering 40.5'-41.5'.
														1			Drilling easier 41.5'-42.5'.
														2			
														3			Drilling harder 42.5'-46'.
														4			
SPT	12	23	50/4"		50+	0.7								45		Increasing plasticity	
														6			Drilling easier 46'-47'.
														7			Drilling harder 47'-47.5'.
														8			
														9		Sandy CLAY; light grey mottled brown; stiff; plastic; moist	
SPT	13	2	5	13	18	1.5								50			
														1			Bottom of boring at 51.5'.
														2			
														3			Water level not recorded at conclusion of boring.
														4			
														55			Backfilled boring to surface with cement grout.
														6			
														7			
														8			
														9			
														60			

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ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-8
SHEET 1 of 4

CLIENT	PROJECT	PROJECT NO.
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	S 525 E 1420	121.4	100.0	11/2/88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Flat (next to spoil pile) heavy vegetation	M. R. Osbourn	11/7/88

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh

SAMPLING SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORING CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
SPT	1	1	3	4	7	1.5								1		Silty SAND; light grey; loose; well graded; fine grained; dry; w/organics	Boring advanced by continuous driving of SPT to 11.5'.
SPT	2	10	8	10	18	1.2								2			
														3		Silty SAND; dark brown; medium dense; poorly graded; fine grained; weakly cemented; dry	
SPT	3	6	6	6	12	1.4								4			
														5		SAND; light brown; medium dense; poorly graded; fine grained; dry; trace of silt	
SPT	4	5	3	6	9	1.5								6			
														7		Grading lighter brown	
														8			
														9			
SPT	5	25	13	10	23	1.5								10		Clayey SAND; light tan; medium dense; poorly graded; fine grained; occasional cementation; moist; at 11' very cemented lens ~.2' thick.	N value at 10' may not be exactly accurate. On 11/4/88 boring advanced to 15' w/3 /8" wing bit and water as drilling fluid. On 11/7/88 water level reported at 10'. Boring advanced from 15' w/3 7/8" wing bit and bentonite as drilling fluid.
														1			
														2			
														3			
														4			
														15		Clayey SAND; light grey; medium dense; poorly graded; fine grained; occasional cementation; moist	
SPT	6	5	9	9	18	1.5								6			
														7			
														8			
														9			
TW	7					0.3								20		Sandy CLAY; light grey; stiff; high plasticity; moist; at 20.5' sand lens	
														1			
														2			
														3			
														4			
														25			
TW	8					2.0								6		With cemented light grey clayey silt; and phosphate nodules	
														7			
														8			
														9			
														30			

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ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-8
SHEET 2 of 4

CLIENT		PROJECT		PROJECT NO.
Seminole Electric Cooperative, Inc.		Combined Cycle		14845
PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	S 525 E 1420	121.4	100.0	11/2/88
SURFACE CONDITIONS		INSPECTOR		DATE FINISH
Flat (next to spoil pile) heavy vegetation		M. R. Osbourn		11/7/88
CHECKED BY		APPROVED BY		
M. R. Osbourn		L. J. Almaleh		

SAMPLING							CORING						
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD
SPT	9	22	28	21	49	1.5							
TW	10					1.7							
SPT	11	22	11	8	19	0.0							
SPT	12	50/1"	-	-	50+	0.1							
SPT	13	50	18	14	32	0.5							
SPT	14	7	50/2"	-	50+	0.7							

DEPTH IN FEET	CLASSIFICATION OF MATERIAL	REMARKS
1	SAND; greyish-brown mottled tan; dense; poorly graded; fine grained; weak cementation; moist; w/some silt	
35	Increasing grey clayey silt, w/high plasticity	Hard drilling between 37' to 38.5' (cemented layer)
40		Hard drilling at 42'.
45	Strongly cemented, greyish tan	Switched to 2 7/8" tricone roller bit at 45'.
50	Silty SAND; grey w/brown sand; dense; well graded; coarse to fine grained; round; moist; cemented nodules	
55	Weak cementation, grading finer sand	Hard drilling at 56'.
60		

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ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-8
SHEET 3 of 4

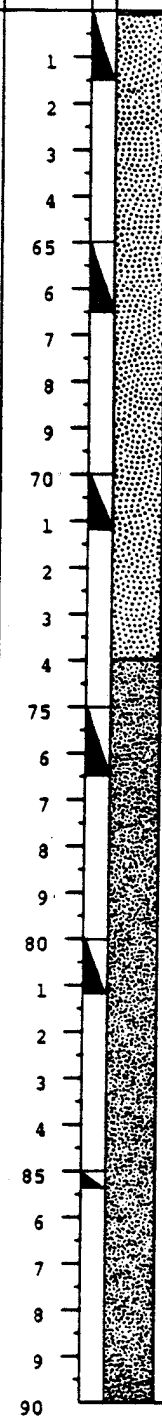
CLIENT	PROJECT	PROJECT NO.
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	S 525 E 1420	121.4	100.0	11/2/88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Flat (next to spoil pile) heavy vegetation	M. R. Osbourn	11/7/88

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh

SAMPLING							CORING						
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD
SPT	15	17	32	20	52	1.4							
SPT	16	22	42	43	85	1.2							
SPT	17	10	13	50/2"	50+	1.1							
SPT	18	22	32	50/4"	50+	0.0							
SPT	19	13	30	50/3"	50+	1.2							
SPT	20	50/1"	-	-	50+	0.1							



CLASSIFICATION OF MATERIAL	REMARKS
SAND; dark grey; very dense; poorly graded; fine grained; moist; w/cemented clayey silt layers (strongly cemented at 61')	
Strongly cemented clayey silt lens (~0.1' thick)	
Increasing moisture Strongly cemented clayey silt lens	
Sandy SILT; light grey; very dense; weak cementation; plastic; moist; trace of clay	Circulation lost at 80'. Intermittent hard drilling from 80' to 90'.
Very cemented w/chert	

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ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. ~~B-3~~
SHEET 4 of 4

CLIENT: Seminole Electric Cooperative, Inc.		PROJECT: Combined Cycle	PROJECT NO.: 14845
PROJECT LOCATION: Agrico South	COORDINATES: S 525 E 1420	ELEVATION (DATUM): 121.4 / TOTAL DEPTH: 100.0	DATE START: 11/2/88
SURFACE CONDITIONS: Flat (next to spoil pile) heavy vegetation		INSPECTOR: M. R. Osbourn	DATE FINISH: 11/7/88
	CHECKED BY: M. R. Osbourn	APPROVED BY: L. J. Almaleh	

SAMPLING SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORING CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
SPT	21	50/2"	-	-	50+	0.1								0		Strongly cemented	Drilling easier at 90'. Drilled to 100' boring collapsed at 70' unable to obtain a sample at 100'.
SPT	22	50/2"	-	-	50	0.1								95			
														100			Bottom of boring at 100'. Water level not recorded at conclusion of boring. Grout induced at 45' depth and boring grouted to surface.

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ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-9
SHEET 1 of 4

CLIENT	PROJECT	PROJECT NO.
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	S 550 E 2050	123.4	100.2	11/3/88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Flat (~40' south of spoil pile) grass vegetation	M. R. Osbourn	11/4/88

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh

SAMPLING							CORING								
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	CLASSIFICATION OF MATERIAL	REMARKS
SPT	1	1	0	1	1	0.4								1	Silty SAND; grey; loose; fine grained; dry; w/organics	Boring advanced w/3 7/8" wing bit using bentonite as drilling fluid.
SPT	2	1	4	8	12	1.2								3	Silty SAND; brown to dark brown; medium dense; poorly graded; fine grained; weakly cemented; moist	
SPT	3	25	35	50/4"	50+	1.1								5	At 5' grading to dark brown; very dense	
SPT	4	50/5"	-	-	50+	0.5								8	At 7.5' grading brown; slightly coarser	
SPT	5	21	32	33	65	1.2								10	Clayey SAND; light tan; very dense; fine grained; occasional cementation; moist	Easier drilling at ~12.5'.
TW	6					2.0								15	Sandy CLAY; light grey; stiff; high plasticity; moist; trace of silt	
SPT	7	3	2	3	5	1.5								20		
TW	8					2.0								25	Reduction in sand content	
														30		

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BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-9
SHEET 2 of 4

CLIENT: Seminole Electric Cooperative, Inc.			PROJECT: Combined Cycle	PROJECT NO.: 14845
PROJECT LOCATION: Agrico South	COORDINATES: S 550 E 2050		ELEVATION (DATUM): 123.4	TOTAL DEPTH: 100.2	DATE START: 11/3/88
SURFACE CONDITIONS: Flat (~40' south of spoil pile) grass vegetation			INSPECTOR: M. R. Osbourn	DATE FINISH: 11/4/88
	CHECKED BY: M. R. Osbourn		APPROVED BY: L. J. Almaleh	

SAMPLING: SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORING: CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
														0			
SPT	9	4	5	6	11	1.5	SPT	9	4	5	6	11	1.5	1		Becoming mottled w/tan clay	
														2			
														3			
														4			
														35			Switched to 2 7/8" tricone roller bit at 35'.
TW	10					2.0	TW	10					2.0	6			
														7		Grading grey	
														8			
														9			
SPT	11	12	12	10	22	1.0	SPT	11	12	12	10	22	1.0	40			
														1			
														2			
														3			
														4			
SPT	12	7	7	10	17	0.8	SPT	12	7	7	10	17	0.8	45		Becoming mottled w/tan clay; increasing plasticity	
														6			
														7			Hard drilling at 47' (cemented layer).
														8			Lost circulation at 48.5'.
														9			
SPT	13	50/0"			+50	0.1	SPT	13	50/0"			+50	0.1	50		Limestone fragments	
														1			
														2			Drilling easier at 52' reamed boring with 3 7/8" tricone roller bit.
														3			
														4			
SPT	14	8	9	11	20	1.5	SPT	14	8	9	11	20	1.5	55		Sandy CLAY; light grey mottled brown (sand); stiff; plastic; moist; trace of silt	At 55' discontinued drill on 11/3/88. Resumed drilling on 11/4/88. Set casing to 57'.
														6			
														7			
														8			
														9			
														60			

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ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-9
SHEET 3 of 4

CLIENT		PROJECT		PROJECT NO.
Seminole Electric Cooperative, Inc.		Combined Cycle		14845
PROJECT LOCATION	**COORDINATES**	**ELEVATION (DATUM)**	**TOTAL DEPTH**	**DATE START**
Agrico South	S 550 E 2050	123.4	100.2	11/3/88
SURFACE CONDITIONS		**INSPECTOR**		**DATE FINISH**
Flat (~40' south of spoil pile) grass vegetation		M. R. Osbourn		11/4/88
CHECKED BY		**APPROVED BY**		
M. R. Osbourn		L. J. Almaleh		

SAMPLING							CORING						
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD
SPT	15	5	6	50/5"	50+	1.5							
SPT	16	50/3"	-	-	50+	0.3							
SPT	17	50	50/4"	-	50+	0.8							
SPT	18	50/0"	-	-	50+	0.2							
SPT	19	50/1"	-	-	50+	0.1							
SPT	20	34	17	16	33	1.5							

DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
1		SAND; brownish-grey; very dense; well graded; medium to fine grained; wet; w/cementation at 61.4'	
65		Increasing cemented fragments	
70		Sandy SILT; light grey w/black specs; hard; low plasticity; strong cementation; moist; marled w/light grey clayey silt	
75		At 75' strongly cemented	
80			Hard drilling ~80.5'- ~82.0'
85		SAND; dark grey; medium dense; poorly graded; medium to fine grained; moist; some silt; w/cemented clayey silt seam at 86' ~0.2' thick	Hard drilling 87'-88'.
90			

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LOG OF BORING

BORING NO. B-9
SHEET 4 of 4

CLIENT: Seminole Electric Cooperative, Inc.		PROJECT: Combined Cycle		PROJECT NO.: 14845
PROJECT LOCATION: Agrico South	COORDINATES: S 550 E 2050	ELEVATION (DATUM): 123.4	TOTAL DEPTH: 100.2	DATE START: 11/3/88
SURFACE CONDITIONS: Flat (~40' south of spoil pile) grass vegetation		INSPECTOR: M. R. Osbourn		DATE FINISH: 11/4/88
		CHECKED BY: M. R. Osbourn		APPROVED BY: L. J. Almaleh

SAMPLING							CORING								
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	CLASSIFICATION OF MATERIAL	REMARKS
SPT	21	50	-	-	50+	0.0								1		Hard drilling ~92.0' - ~93.0'
														2		
														3		
														4		Hard drilling at 94'.
SPT	22	26	42	35	77	1.5								95	Marled w/cemented clayey silt	
														6		
														7		
														8		
														9		
SPT	23	50/0"	-	-	50+	0.2								100		Bottom of boring at 100.2'.
														1		Water level not recorded at conclusion of boring.
														2		
														3		Boring backfilled to surface w/cement grout.
														4		
														105		
														6		
														7		
														8		
														9		
														110		
														1		
														2		
														3		
														4		
														115		
														6		
														7		
														8		
														9		
														120		

P-ST-0360

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-10
SHEET 1 of 4

CLIENT	PROJECT	PROJECT NO.
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	N 2110 E 4575	127.4	100.1	11/8/88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Flat minor vegetation (reclaimed area)	M. R. Osbourn	11/8/88

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh

SAMPLING							CORING						
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD
SPT	1	2	3	3	6	1.5							
SPT	2	4	3	5	8	0.5							
SPT	3	7	8	8	16	1.5							
SPT	4	6	5	6	11	1.5							
SPT	5	8	9	11	20	1.5							
SPT	6	8	3	4	7	0.5							
SPT	7	2	3	5	8	1.5							
SPT	8	5	3	5	8	1.5							

DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
1–30		SAND; light grey; loose; poorly graded; fine grained; moist; some silt, w/topsoil and organics (fill) TAILINGS; composed of sand; light grey; loose; poorly graded; fine grained; wet (reclaimed fill) Grading medium dense Grading loose Sandy CLAY; greyish-tan to mottled tan; firm; high plastic; moist; w/some silt	Boring advanced w/3 7/8" wing bit using bentonite as drilling fluid.

P-ST-0360D

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-10
SHEET 2 of 4

CLIENT	PROJECT	PROJECT NO.
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	N 2110 E 4575	127.4	100.1	11/8/88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Flat minor vegetation (reclaimed area)	M. R. Osbourn	11/8/88

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh

SAMPLING							CORING						
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD
SPT	9	19	13	46	59	1.1							
SPT	10	3	6	9	15	0.5							
SPT	11	9	12	31	43	1.3							
SPT	12	50/5"	-	-	50+	0.5							
SPT	13	14	50/2"	-	50+	0.6							
SPT	14	25	50/5"	-	50+	0.0							

DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
1		Grading light tan w/occasional cementation	At 30' switched to 2 7/8" tricone roller bit. At 32' drilling became harder.
35		Clayey SAND; tannish-grey; medium dense; well graded; medium to fine grained; weak cementation; moist; mottled w/brown sand; w/phosphate nodules	
40		SAND; greyish-brown; dense; poorly graded; fine grained; moist; marled w/some grey silty clay	
45		Sandy SILT; tannish-grey; very dense; weak cementation; w/occasional strongly cemented lens; moist	
50			
55			Drilling easier at 59'.
60			

P-ST-0360

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-1
SHEET 3 of 4

CLIENT		PROJECT		PROJECT NO.
Seminole Electric Cooperative, Inc.		Combined Cycle		14845
PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	N 2110 E 4575	127.4	100.1	11/8/88
SURFACE CONDITIONS		INSPECTOR		DATE FINISH
Flat minor vegetation (reclaimed area)		M. R. Osbourn		11/8/88
	CHECKED BY	APPROVED BY		
	M. R. Osbourn	L. J. Almaleh		

SAMPLING							CORING						
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD
SPT	15	9	8	11	19	0.6							
SPT	16	50/5"	-	-	50+	0.5							
SPT	17	7	6	5	11	0.0							
SPT	18	50/5"	-	-	50+	0.5							
SPT	19	26	17	22	39	1.5							
SPT	20	50/0"	-	-	50+	0.1							

DEPTH IN FEET | SAMPLE TYPE / GRAPHICS LOG

CLASSIFICATION OF MATERIAL

Sandy SILT; grey; very stiff; high plasticity; moist; w/traces of light grey clay

Becoming cemented; no plasticity; w/increasing sand content; and traces of peat

Silty SAND; dark grey; very dense; poorly graded; fine grained; moist; mottled w/light grey cemented clayey silt

Sandy CLAY; light grey; very dense; strongly cemented; moist; trace of silt

REMARKS

Hard drilling at 71.5'.

Hard drilling at 73.5'.

Hard drilling at 76'.

Hard drilling at 78'.

Hard drilling at 79.5'.

P-ST-0360

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-10
SHEET 4 of 4

CLIENT	PROJECT	PROJECT NO.
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Agrico South	N 2110 E 4575	127.4	100.1	11/8/88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Flat minor vegetation (reclaimed area)	M. R. Osbourn	11/8/88

CHECKED BY M. R. Osbourn

APPROVED BY L. J. Almaleh

SAMPLING							CORING								
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	CLASSIFICATION OF MATERIAL	REMARKS
SPT	21	50/4"	-	-	50+	0.3								1		
														2		
														3		
														4		
SPT	22	6	12	50/3"	50+	1.3								95	Lens w/greater sand content Strongly cemented lens	
														6		
														7		
														8		
														9		
SPT	23	50/1"	-	-	50+	0.1								100		Bottom of boring at 100.1'. Water level not recorded at conclusion of boring. Boring backfilled to surface w/cement grout.
														1		
														2		
														3		
														4		
														105		
														6		
														7		
														8		
														9		
														110		
														1		
														2		
														3		
														4		
														115		
														6		
														7		
														8		
														9		
														120		

P-ST-0366D

BLACK & VEATCH
CONSULTING ENGINEERS

PIEZOMETER INSTALLATION LOG

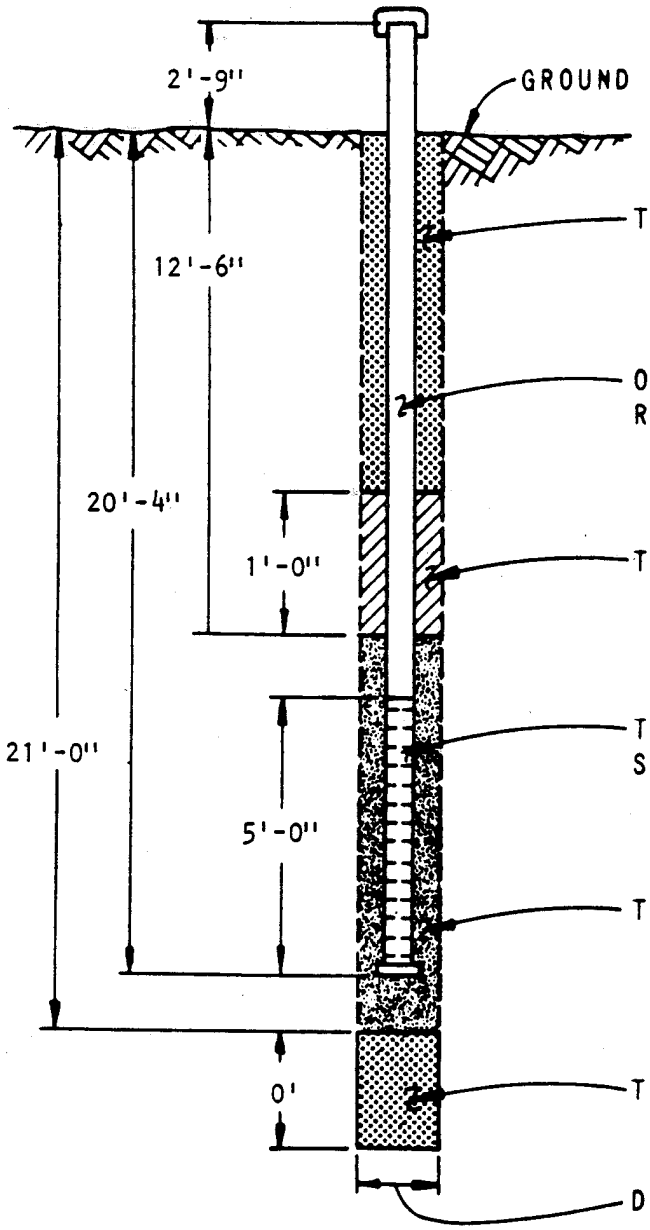
PIEZOMETER NO. P-1

CLIENT	PROJECT	PROJECT NO
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	GROUND ELEVATION	DATE
Agrico South	N 1200 E 750	122.3	11/8/88

STRATUM MONITORED	INSPECTOR
Upper Sands	P. L. Nelson

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh



TYPE OF SEAL	Water-Cement Grout
O.D. & TYPE OF RISER PIPE	2 3/8" Sch. 40 PVC
TYPE OF SEAL	Bentonite Pellets
TYPE AND SIZE OF SCREEN OR OPENINGS	.01" Sch. 40 PVC
TYPE OF FILTER	20/30 Sand
TYPE OF SEAL	N/A
DIAMETER OF BOREHOLE	9"

METHOD OF INSTALLATION
Bored to 21' w/6" ID HSA, cleaned bottom 3' w/4 3/4" roller bit, placed 8" sand, installed piezometer, alternated placing sand and pulling augers, placed pellets, waited 15 minutes and installed grout.

REMARKS
Grouted to 4.5' below ground surface, as protective casing not on job site. Water level at 6'-11" below ground surface after installation.

P-ST-021B

BLACK & VEATCH
CONSULTING ENGINEERS

PIEZOMETER INSTALLATION LOG

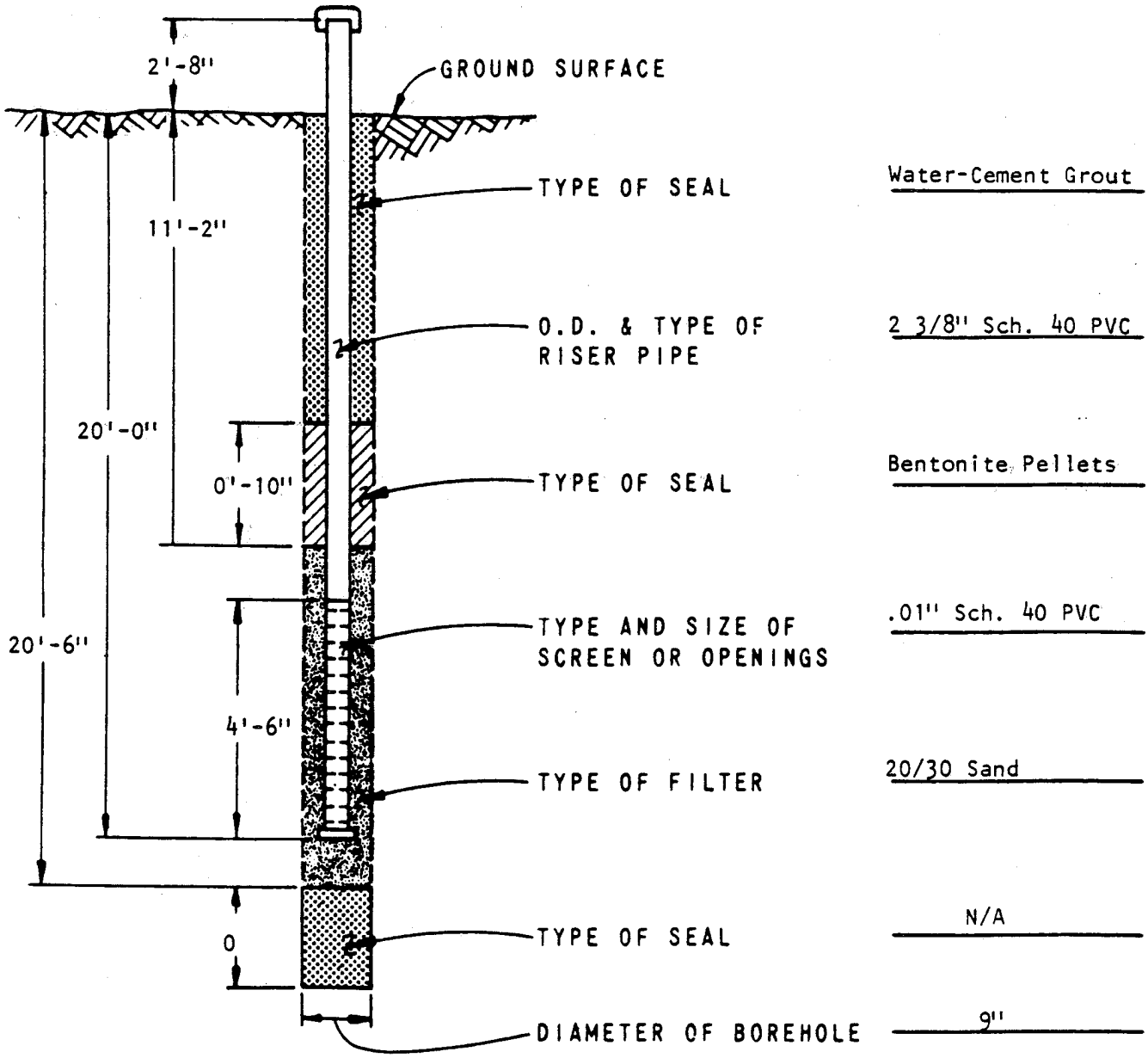
PIEZOMETER NO. P-2

CLIENT	PROJECT	PROJECT NO
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	GROUND ELEVATION	DATE
Agrico South	S 535 W 185	114.2	11/9/88

STRATUM MONITORED	INSPECTOR
Upper Sands	P. L. Nelson

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh



METHOD OF INSTALLATION
Augered to 21' w/6" ID HSA, cleaned hole to 20'-6" w/4 3/4" roller bit, placed 6" of sand, installed piezometer, alternated sand and pulling augers, placed pellets, waited 10 minutes, placed grout and pulled augers completely.

REMARKS
Grouted to 2'-0" below ground surface. Protective casing to be installed at a later date.
Water level at 3'-10" below ground surface after completing installation.

P-ST-021B

BLACK & VEATCH
CONSULTING ENGINEERS

PIEZOMETER INSTALLATION LOG

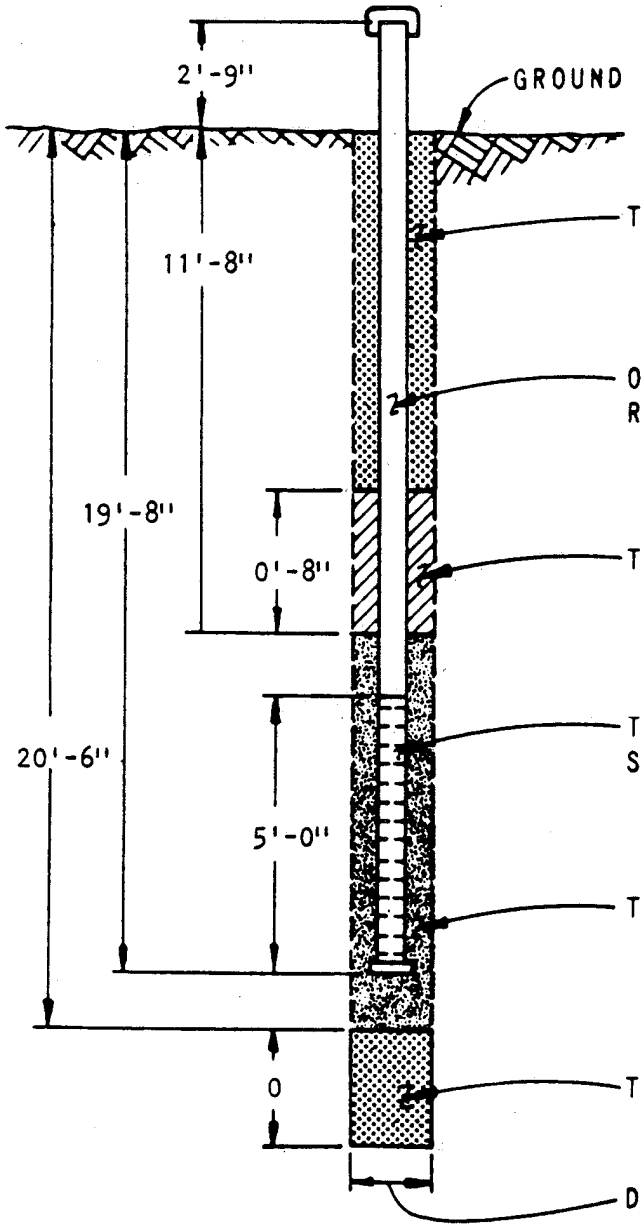
PIEZOMETER NO. P-3

CLIENT	PROJECT	PROJECT NO
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	GROUND ELEVATION	DATE
Agrico South	S 900 E 1800	121.7	11/10/88

STRATUM MONITORED	INSPECTOR
Upper Sands	P. L. Nelson

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh



TYPE OF SEAL	Water-Cement Grout
O.D. & TYPE OF RISER PIPE	2 3/8" Sch. 40 PVC
TYPE OF SEAL	Bentonite Pellets
TYPE AND SIZE OF SCREEN OR OPENINGS	.01" Sch. 40 PVC
TYPE OF FILTER	20/30 Sand
TYPE OF SEAL	N/A
DIAMETER OF BOREHOLE	9"

METHOD OF INSTALLATION:
Augered to 20' w/6" ID HSA, cleaned hole w/4 3/4" roller bit to 20.5', installed 10" of sand, placed piezometer, alternated sand and pulling augers, placed bentonite, placed grout.

REMARKS
Grouted to 1'-1" from ground surface. Protective casing to be installed at a later date.
Water level at 7'-11" below ground surface after piezometer installation.

P-ST-021B

BLACK & VEATCH
CONSULTING ENGINEERS

PIEZOMETER INSTALLATION LOG

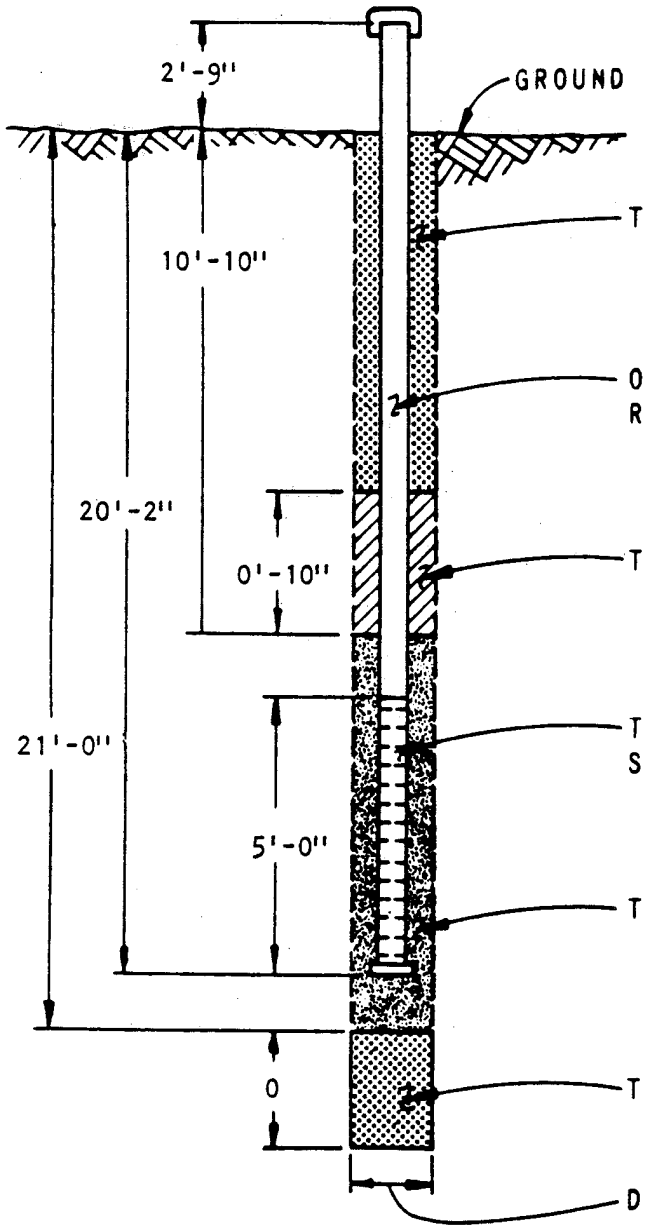
PIEZOMETER NO. P-10

CLIENT	PROJECT	PROJECT NO
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	GROUND ELEVATION	DATE
Agrico South	N 2110 E 4575	127.36	11/10/88

STRATUM MONITORED	INSPECTOR
Upper Sands	P. L. Nelson

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh



TYPE OF SEAL	Water-Cement Grout
O.D. & TYPE OF RISER PIPE	2 3/8" Sch. 40 PVC
TYPE OF SEAL	Bentonite Pellets
TYPE AND SIZE OF SCREEN OR OPENINGS	.01" Sch. 40 PVC
TYPE OF FILTER	20/30 Sand
TYPE OF SEAL	N/A
DIAMETER OF BOREHOLE	9"

METHOD OF INSTALLATION
Augered 21' w/6" ID HSA, cleaned out w/4 3/4" roller bit to 21', install 10" of sand, alternate sand and pulling auger, place pellets, install cement grout and pull remaining augers.

REMARKS
Placed grout to 2'-8" below ground surface. Protective casing to be added later. Water level 3'-3" below ground surface after installing piezometer.

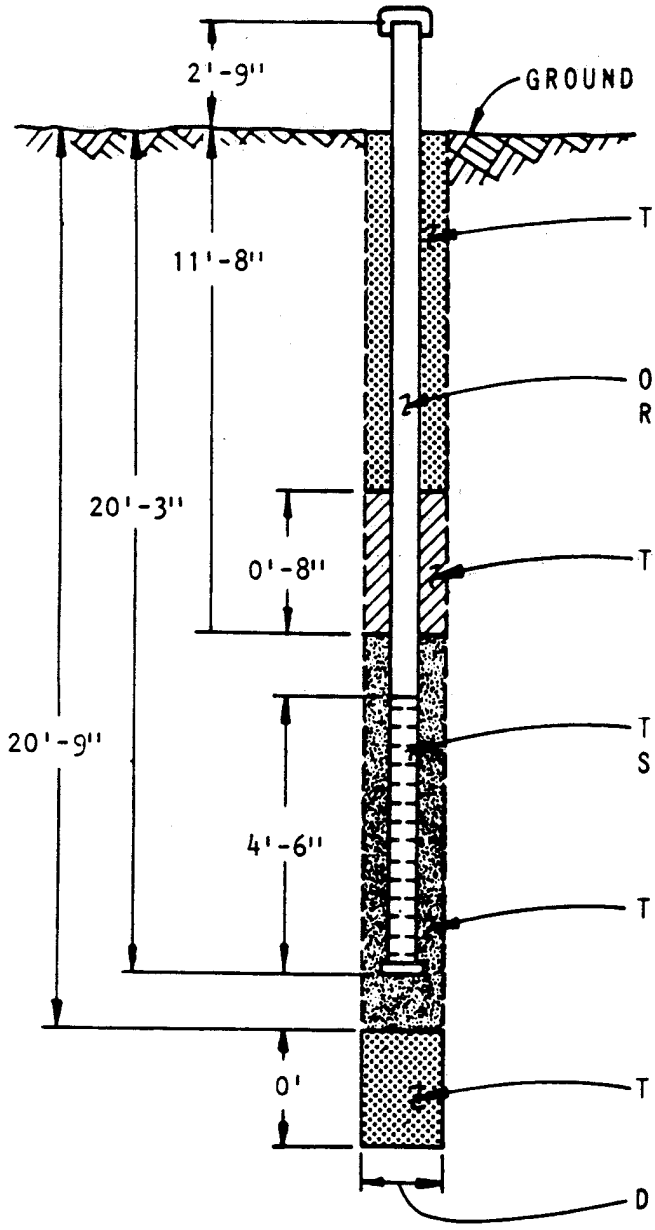
P-ST-0218

BLACK & VEATCH
CONSULTING ENGINEERS

PIEZOMETER INSTALLATION LOG

PIEZOMETER NO. P-11

CLIENT: Seminole Electric Cooperative, Inc.	PROJECT: Combined Cycle		PROJECT NO: 14845
PROJECT LOCATION: Agrico South	COORDINATES: S 1215 W 200	GROUND ELEVATION: 113.1	DATE: 11/9/88
STRATUM MONITORED: Upper Sands		INSPECTOR: P. L. Nelson	
CHECKED BY: M. R. Osbourn	APPROVED BY: L. J. Almaleh		



TYPE OF SEAL	Water-Cement Grout
O.D. & TYPE OF RISER PIPE	2 3/8" Sch. 40 PVC
TYPE OF SEAL	Bentonite Pellets
TYPE AND SIZE OF SCREEN OR OPENINGS	.01" Sch. 40 PVC
TYPE OF FILTER	20/30 Sand
TYPE OF SEAL	N/A
DIAMETER OF BOREHOLE	9"

METHOD OF INSTALLATION:
Augered to 20' w/6" ID HSA, washed boring out to 20'-9" w/4 3/4" roller bit, placed 6" sand, installed piezometer, alternated sand and pulling augers, installed pellets, placed grout.

REMARKS:
Grouted to 1'-8" below ground surface. Protection pipe to be installed later. Ground water table was 3'-3" below ground surface after installation of piezometer.

P-ST-021B

BLACK & VEATCH
CONSULTING ENGINEERS

PIEZOMETER INSTALLATION LOG

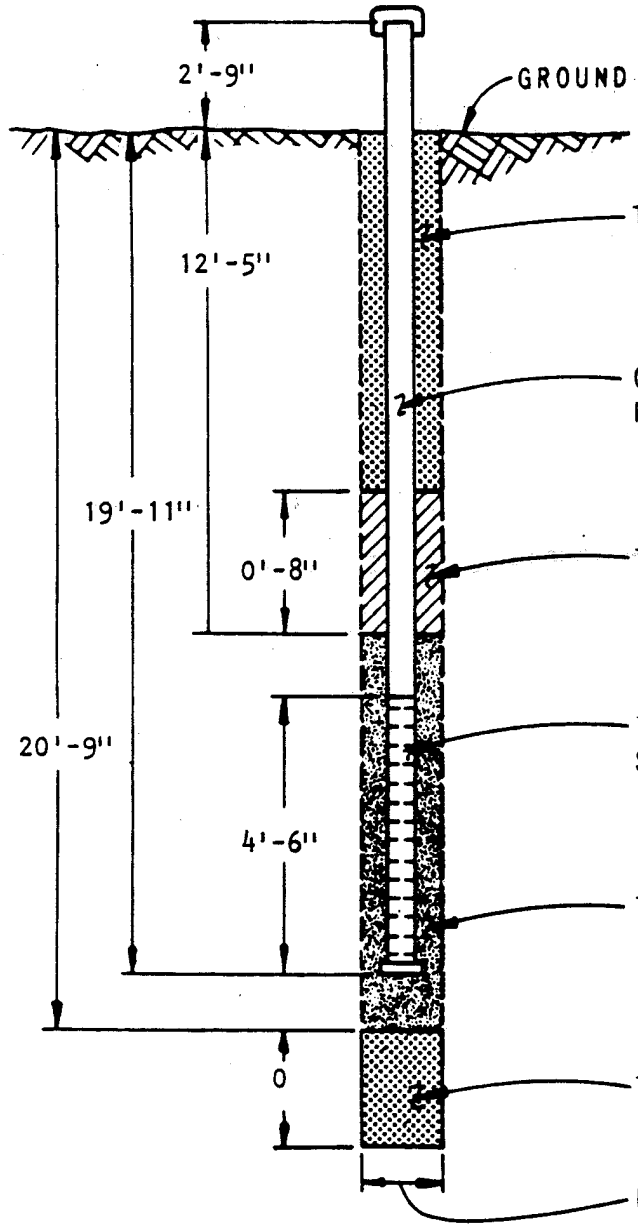
PIEZOMETER NO. P-12

CLIENT	PROJECT	PROJECT NO
Seminole Electric Cooperative, Inc.	Combined Cycle	14845

PROJECT LOCATION	COORDINATES	GROUND ELEVATION	DATE
Agrico South	N 2600 E 755	126.30	11/10/88

STRATUM MONITORED	INSPECTOR
Upper Sands	P. L. Nelson

CHECKED BY	APPROVED BY
M. R. Osbourn	L. J. Almaleh



TYPE OF SEAL	Water-Cement Grout
O.D. & TYPE OF RISER PIPE	2 3/8" Sch. 40 PVC
TYPE OF SEAL	Bentonite Pellets
TYPE AND SIZE OF SCREEN OR OPENINGS	.01" Sch. 40 PVC
TYPE OF FILTER	20/30 Sand
TYPE OF SEAL	N/A
DIAMETER OF BOREHOLE	9"

METHOD OF INSTALLATION
Augered to 20'w/6" ID HSA, cleaned out hole w/4 3/4" roller bit to 20'-9", installed sand, put in piezometer, alternated sand and pulling augers, placed bentonite, installed grout and pulled remaining augers.

REMARKS
Grout was 2'-2" below ground surface. Protective casing to be added later. Water level was 4'-4" below ground surface after installing piezometer.

P-ST-0218

FORM 6-6-0

PIEZOMETER INSTALLATION REPORT
STONE & WEBSTER ENGINEERING CORP.

PIEZOMETER NO. P-3A

SITE: Seminole Electric Cooperative

J.O. NO. 18191.04

DATE 11/17/88 DRILLER Ardaman/R.P. INSPECTOR D. Cregger

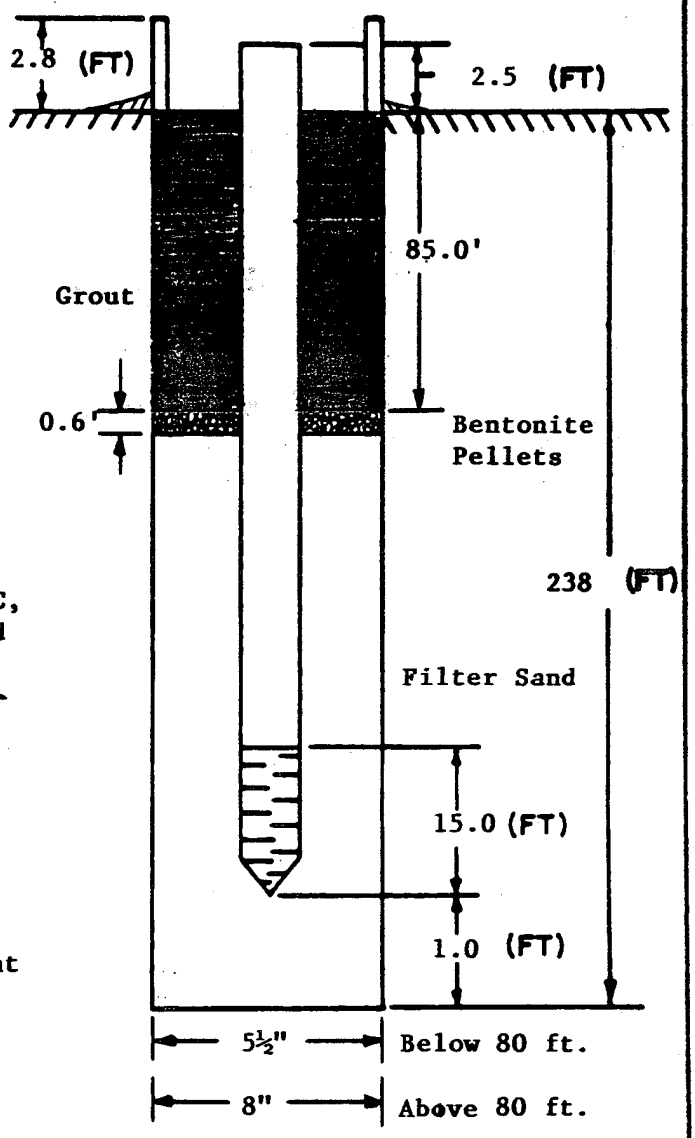
COORDINATES 900 South 1800 East GROUND ELEV. 121.7

INSTALLED IN BORING adjacent to B-3 ELEV. TOP OF LEADS. _____

RIG & CREW TIME 11/17/88 to _____

DETAILED INSTALLATION DESCRIPTION :

Hole washed with 2 tanks potable water until clear return. PVC placed in bottom of hole and back-filled with sandblast sand (20-30 size). Bentonite pellets dropped for seal, then bentonite grout to surface and concrete in steel guard pipe.



DESCRIPTION OF PIEZOMETER TIP AND STAND PIPE ASSEMBLY

Nominal 2-inch diameter schedule 40 PVC, threaded flush joint couplings, threaded end cap at base. Length = 239 ft. Screen slot size = 0.001.

DESCRIPTION OF SOIL AT TIP ELEVATION :

White limestone w/some amber coloered flakes; fairly hard rock w/o significant water loss.

NOTE : SKETCH IN ALL COMPONENTS PERTINENT TO THE INSTALLATION WITH APPLICABLE DIMENSIONS EG : FILTER SAND, SEALS, GROUT, CASING, ETC.

FORM G-1-1

FIELD TEST BORING RECORD COVER SHEET
STONE & WEBSTER ENGINEERING CORP.

BORING NO. P-3A

SITE	J.O. NO.	SHEET
Seminole Electric Coop/Hardee County	18191.04	1 OF 3

COORDINATES 900 South 1800 East GROUND ELEV. 121.7

INCLINATION Vert. BEARING N/A INSPECTOR D.M. Cregger

DATE START/FINISH 11/17/88 CONTRACTOR/DRILLER Ardaman & Associates Roger Parker

STATIC G.W. DEPTH/DATE _____ (FT) / _____ DRILL RIG TYPE Failing 1500

DEPTH TO BEDROCK 32 (FT) TOTAL DEPTH DRILLED 238.0 (FT)

METHODS:

DRILLING SOIL 8 inch roller bit & 6 inch casing to 80 ft.

SAMPLING SOIL 1½" I.D. Standard Split Spoon, wash samples below 160 ft.

DRILLING ROCK 5 7/8" Tricone roller bit (worn to 5½" Ø)

SPECIAL TESTING OR INSTRUMENTATION Installed piezometer in lower carbonate rock section, screen depth 222-237 ft.

COMMENTS Hawthorn formation monitoring and groundwater sampling well adjacent to test broing B-3.

SUMMARY

SOIL DRILLED 238 (FT) ROCK CORED 0 (FT)

NUMBER SPLIT BARREL SAMPLES 3

NO. & TYPE UNDISTURBED SAMPLES None

DRILL RIG & CREW TIME _____ (HRS.)

LIST ALL TEST, INSPECTION, & CALIBRATION RECORDS ATTACHED:

Piezometer Installation Report.

GROUNDWATER (DEPTH BELOW GROUND SURFACE)

DEPTH	DATE	DEPTH	DATE
33.5	11/17/88		
36.0	11/18/88		

NOTES

1. DATUM IS M.S.L. UNLESS OTHERWISE INDICATED

LEGEND FOR FIELD BORING LOGS

DISTURBED SAMPLES
- W - WASH
- S - SPLIT BARREL (ASTM - D1586 UNLESS OTHERWISE NOTED)
- E - ENVIRONMENTAL
- Z - OTHER, DESCRIBE:

UNDISTURBED SAMPLES
- US - SHELBY TUBE
- UF - STATIONARY (FIXED PISTON)
- UO - OSTERBERG
- UP - PITCHER
- UD - DENISON
- X - OTHER, DESCRIBE:

N - STD PENETRATION RESISTANCE BLOWS/FT (140 LB. HAMMER, UNLESS OTHERWISE NOTED)
REC - RECOVERY
RQD - ROCK QUALITY DESIGNATION
( ) - INCHES OF SAMPLE RECOVERY
NQ - WIRELINE ROCK CORE SAMPLES

APPROVED	DATE

FORM G-2-1

FIELD BORING LOG
STONE & WEBSTER ENGINEERING CORP.

SITE	J.O. NO.	BORING NO.	SHEET
Seminole Electric/Pok-Hardee Site	18191.04	P-3A	2 OF 3

DRILLER	INSPECTOR
Ardaman/R.P.	D. Cregger

ELEV.	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS/OR REC/RQD	SPT N VALUE	GROUP SYMBOL	SAMPLE DESCRIPTION
121.7	0						**Silty Sand:** overburden (See log of test boring B-3) Top of rock at 32.0 ft.
	20						
	40						**Clayey Sand and Silty Sand:** phosphatic sand of upper Hawthorn formation. (see log of test boring B-3)
	60						
	80						Split Spoon Refusal at 85 ft.
	100						**Silty Clay and Clayey Silt:** phosphatic sand of upper Hawthorn formation. (see log of test boring B-3)
	120	S	24			ML	**Gravelly Phosphatic Silt:** nonplastic, widely graded, 10-30% limestone gravel, 10-20% mostly fine black phosphate sand; buff to light gray occrust w/black speckling; firm; (Hawthorn Formation).
	140	S	25	50/2"	50+	ML	**Sandy Phosphatic Silt:** nonplastic, poorly graded, 2-5% phosphate nodule gravel to ½" max; 15-25% coarse to fine, mostly coarse phosphatic sand; buff to light gray; indurafed (very stiff), chaotic internal structure (Hawthorn Formation).
	160						

FORM G-2-1

FIELD BORING LOG

STONE & WEBSTER ENGINEERING CORP.

BORING NO.	
P-3A	

SITE	J.O. NO.	SHEET
Seminole Electric/AGRICO	18191.04	3 OF 3

DRILLER	INSPECTOR
Ardaman/E.	D. Cregger

ELEV.	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS/OR REC / ROD	SPT N VALUE	GROUP SYMBOL	SAMPLE DESCRIPTION
	160	S	26			CL	Silty Clay: slightly to moderately plastic; 5-10% gravel (limestone) to 3/4" max; 5-10% coarse to fine sand; light gray w/greenish gray inclusions (Lower Hawthorn). Clay disturbed, can't determine consistency.
	180						Hard layer 188-189 ft.
20/ft E.O.D 11/15/88	200	W	27				Phosphatic sand in wash cuttings, w/few greenish clay balls, also greenish porcellanite chips
	220						Hard layer 210-211 ft.
		W	28				Hard layer 220-238 ft. Limestone - white cuttings & also clearish brown (aragonite) cuttings. Mud scraped from bit & placed injar.
238ft E.O.D 11/16/88	240						Bottom of hole at 238.0 ft.
	260						
	280						
	300						

FORM 6-6-0

PIEZOMETER INSTALLATION REPORT
STONE & WEBSTER ENGINEERING CORP.

PIEZOMETER NO.
P-10A

SITE	J.O. NO.
Seminole Electric Coop/Polk-Hardee Site	18191.04

DATE 11/28/88 DRILLER R. Parker INSPECTOR D. Cregger

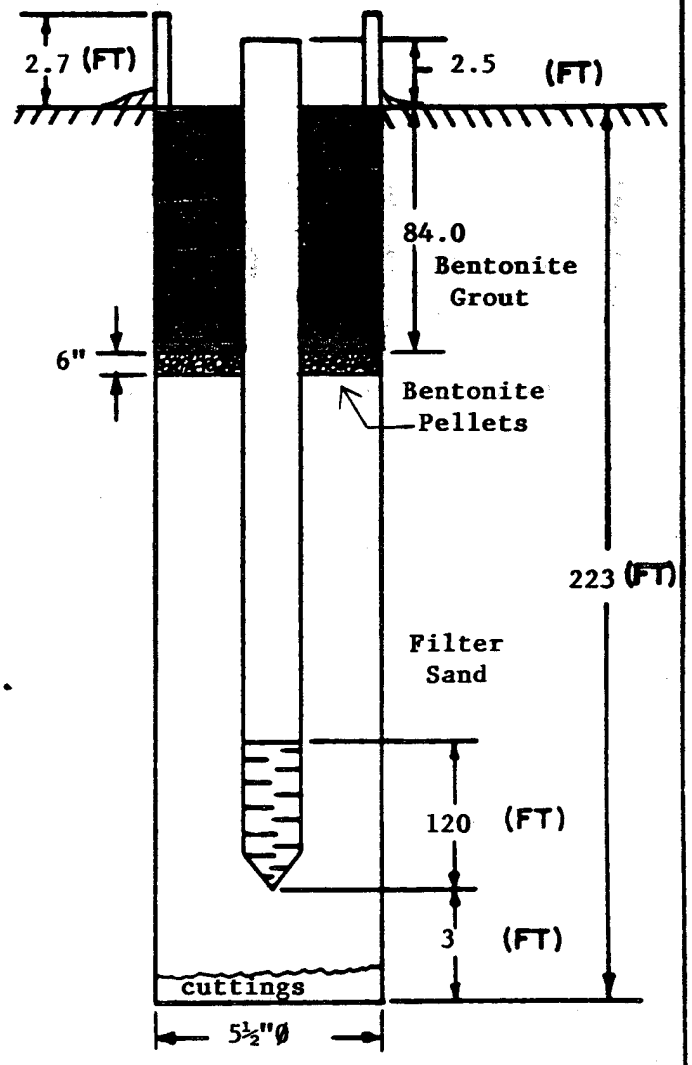
COORDINATES E 4500 N 2190 GROUND ELEV. 127.4

INSTALLED IN BORING P-10A ELEV. TOP OF LEADS.

RIG & CREW TIME full day to install

DETAILED INSTALLATION DESCRIPTION:

Drill out w/5½"Ø bit and flush hole, silt coming off wall at 100-ft depth. Set screw joint screen & riser then backfill w/uniform fine sand (20-30 size sandblast sand) - used 2400 lb. Place bentonite pellets one-at-a-time and tamp w/weighted tape - used 12 lb tremie grout with 4 bags & 3 lb super gelx per 55 gallon drum - used 13 bags total. Concrete in steel guard pipe later.



DESCRIPTION OF PIEZOMETER TIP AND STAND PIPE ASSEMBLY

Nominal 2"Ø schedule 40 PVC with threaded-flush joint couplers, in 10-ft sections, conical screw-in tip, slot size = 0.010", by Monoflex, Inc.

DESCRIPTION OF SOIL AT TIP ELEVATION:

Phosphatic sand and clay with cemented zones - Hawthorne formation (lower).

NOTE: SKETCH IN ALL COMPONENTS PERTINENT TO THE INSTALLATION WITH APPLICABLE DIMENSIONS EG: FILTER SAND, SEALS, GROUT, CASING, ETC.

FORM G-1-1

FIELD TEST BORING RECORD COVER SHEET
STONE & WEBSTER ENGINEERING CORP.

BORING NO. P-10A

SITE	J.O. NO.	SHEET
Seminole Electric Coop/Polk-Hardee Site	18191.04	1 OF 3

COORDINATES E4500 N2190 GROUND ELEV. 127.4

INCLINATION VERT BEARING N/A INSPECTOR D. Cregger

DATE: START/FINISH 11/21/88 CONTRACTOR/DRILLER Ardaman/R. Parker

STATIC G.W. DEPTH/DATE _____ (FT) / _____ DRILL RIG TYPE Failing 1500

DEPTH TO BEDROCK 31.0 (FT) TOTAL DEPTH DRILLED 223 (FT)

METHODS:

DRILLING SOIL 8-inch roller bit and 6-inch casing to 80 ft.

SAMPLING SOIL Wash samples.

DRILLING ROCK 5 7/8-inch hard rock roller bit to bottom of hole.

SPECIAL TESTING OR INSTRUMENTATION Installed Piezometer

COMMENTS Hawthorne formation water quality well.

SUMMARY

8" cased SOIL DRILLED 80 (FT) 5½" uncased ROCK CORED 143 (FT)

NUMBER SPLIT BARREL SAMPLES 0

NO. & TYPE UNDISTURBED SAMPLES 0

DRILL RIG & CREW TIME _____ (HRS.)

LIST ALL TEST, INSPECTION, & CALIBRATION RECORDS ATTACHED:

GROUNDWATER (DEPTH BELOW GROUND SURFACE)

DEPTH	DATE	DEPTH	DATE
8.3	11/28/88		
9.9	11/29/88		

NOTES

1. DATUM IS M.S.L. UNLESS OTHERWISE INDICATED

LEGEND FOR FIELD BORING LOGS

DISTURBED SAMPLES
- W - WASH
- S - SPLIT BARREL (ASTM-D1586 UNLESS OTHERWISE NOTED)
- E - ENVIRONMENTAL
- Z - OTHER, DESCRIBE:

UNDISTURBED SAMPLES
- US - SHELBY TUBE
- UF - STATIONARY (FIXED PISTON)
- UO - OSTERBERG
- UP - PITCHER
- UD - DENISON
- X - OTHER, DESCRIBE:

N - STD PENETRATION RESISTANCE BLOWS/FT (140 LB. HAMMER, UNLESS OTHERWISE NOTED)
REC - RECOVERY
RQD - ROCK QUALITY DESIGNATION
( ) - INCHES OF SAMPLE RECOVERY
NQ - WIRELINE ROCK CORE SAMPLES

APPROVED	DATE

FORM G-2-1

FIELD BORING LOG

STONE & WEBSTER ENGINEERING CORP.

SITE	J.O. NO.	BORING NO.	SHEET
Seminole Electric Coop/Polk- Hardee Site	18191.04	P-10A	2 OF 3

DRILLER	INSPECTOR
Ardaman & Assoc/R.P.	D. Cregger

ELEV.	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	GROUP SYMBOL	SAMPLE DESCRIPTION
127.4	0				Sand: poorly graded, mostly fine grained; white. Reclaimed mine land.
	20				
					Top of "rock" (mine pit bottom) @ 31 ft.
		W	1	31'	Cemented Yellow Brown Sandy Clay: Some chips of bone flake. Yellow Brown and Gray to White Lime Rock Frags: Some pebbles.
	40	W	2	42'	
		W	3	53'	Calcareous Clay: Mostly white lime rock fragments w/clay balls. Salt & pepper sand.
57.0	60	W	4	67'	Dark Gray Clay: dark gray clay w/black sand. Hawthorn Formation.
				68.5	Cemented clayey sand at 67-68.5 & 78-81 ft.
		W	5	78'	
81.0	80			81'	Phosphatic Sandy Clay: dark gray clay in bit for casing seat; cuttings mostly light gray "salt & pepper" limestone & some buff limestone, only occ yellow brown limestone.
	85	W	6	89'	Phosphatic Sand: light gray to buff (no clay balls) limestone fragments as above; w/rope-like organics.
	90				
	100				
	105	W	7		Phosphatic Sand: light gray to buff w/black specks; fast drilling
	110				
	120				
	125	W	8		Dark Gray Clay: greenish gray soft sticky clay w/phosphate sand.
	130				
	140				
	145	W	9	147	Phosphatic Sand: light gray to buff w/black phosphate fragments; cemented at 151-157 ft.
	150			148	
				151	
	160			157'	

FORM G-2-1

FIELD BORING LOG
STONE & WEBSTER ENGINEERING CORP.

SITE	J.O. NO.	BORING NO.
Seminole Electric Coop/Polk-Hardee Site	18191.04	P-10A
DRILLER	INSPECTOR	SHEET 3 OF 3

ELEV.	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER			GROUP SYMBOL	SAMPLE DESCRIPTION
	160	W	10	160			
				165			Clay: mixed buff-gray and dark greenish gray moderately plastic clay with phophatic sand and limestone fragments.
					175		
	180			180	180		Porcellanite marker bed at 180ft (very hard)
		W	11	185			Clay: gray moderately plastic, with phosphate sand. Trace of clearish green porcellanite chips in wash.
					187		
					193		
	200			200	199		
		W	12		201		Clay: light gray w/phosphate. Extremely hard,
				205	204		amber colored chert at 204 underlain by brown clay.
				215			
	220			220	219.5		Cemented Clay: light gray clay and phosphate sand.
					221		Hard layer 1½ ft thick.
							Total Depth: 223.0 ft.
							-127.4
							95.6 = -95.6 MSL
	240						
	260						

FORM 6-6-0

PIEZOMETER INSTALLATION REPORT
STONE & WEBSTER ENGINEERING CORP.

PIEZOMETER NO.
P-12A

SITE	J.O. NO.
Seminole Electric Coop/Polk-Hardee Site	18191.04

DATE 12/2/88 DRILLER R. Parker INSPECTOR D. Cregger

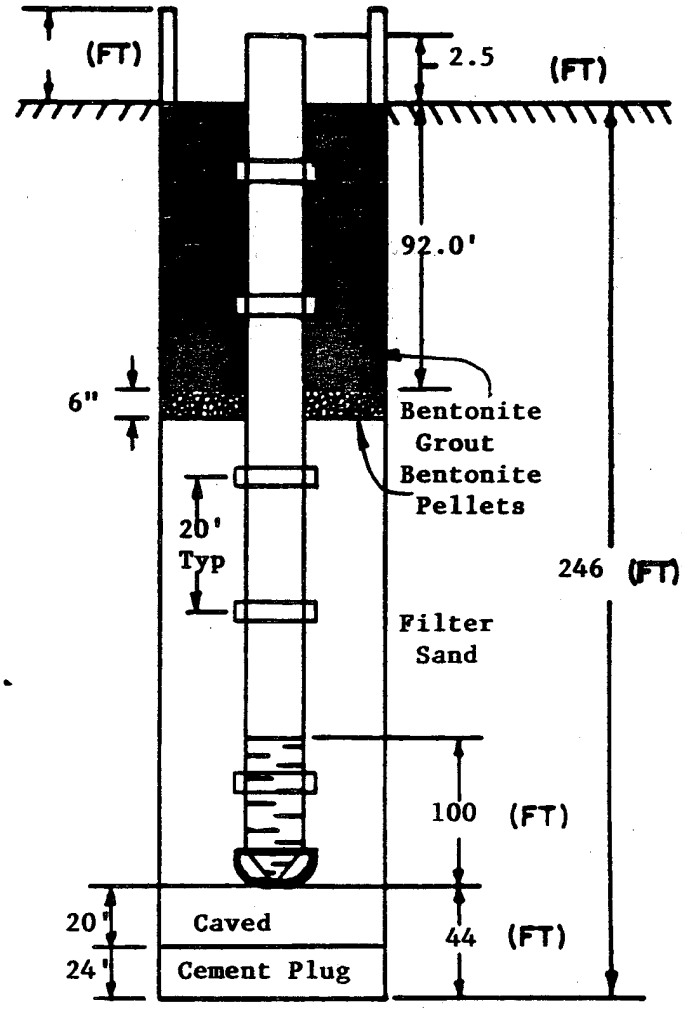
COORDINATES from map E 1070 N2620 GROUND ELEV. 126.3

INSTALLED IN BORING P-12A ELEV. TOP OF LEADS. _____

RIG & CREW TIME 7:30 a.m. - 2:00 p.m.

DETAILED INSTALLATION DESCRIPTION :

Tremie grouted cement plug into water loss zone at 241ft and set overnight. Place 1½ bag sand in a.m. and it bridged on laitance layer. Glued couplers on way down and place sand (20-30 size) to 9.5ft above screen - total 2500 lb. Place bentonite and tamped to 6" thick - 12lb. Pulled casing and tremie grout to surface.



DESCRIPTION OF PIEZOMETER TIP AND STAND PIPE ASSEMBLY

Nominal 2"Ø schedule 40 PVC with glued couplers, in 20ft sections. PVC end cap for 0.010-inch slot size PVC screen.

DESCRIPTION OF SOIL AT TIP ELEVATION :

Phosphatic Sand:
fine grained gray w/black speckles; w/occ sandy clay interbeds.

NOTE : SKETCH IN ALL COMPONENTS PERTINENT TO THE INSTALLATION WITH APPLICABLE DIMENSIONS EG : FILTER SAND, SEALS, GROUT, CASING, ETC.

FORM G-4-1

BOREHOLE BACKFILL INSPECTION REPORT
STONE & WEBSTER ENGINEERING CORP.

BORING NO. P-12A

SITE Seminole Electric Coop/Polk-Hardee Site

J.O. NO. 18191.04

DATE 12/1/88 DRILLER R. Parker INSPECTOR D. Cregger

METHOD(S): ☐ SOIL BACKFILL ☒ TREMIE GROUT

HOLE DEPTH 246 (FT) HOLE DIAMETER 6" = 0.5 (FT) = 0.196 ft^3/ft

CASING LEFT IN PLACE (DIA/LENGTH) none (IN./FT)

RIG & CREW TIME 10:30 a.m.-12:30 p.m. ☒ CLEANUP SATISFACTORY

☐ LOCATION MARKED WITH STAKE

GROUT RECORD

20 gallons in pump

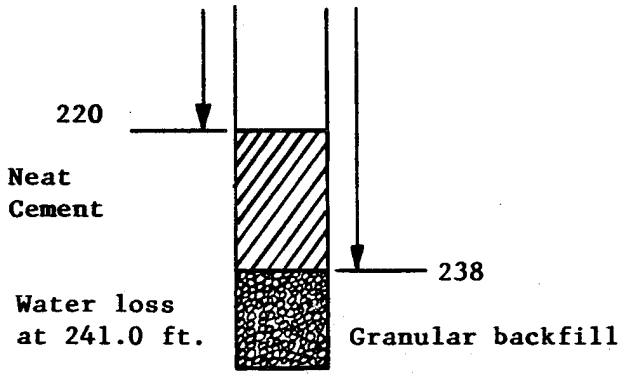
CEMENT TYPE Florida Lafarge BAG WEIGHT 94lb NO. BAGS USED 5

DETAILS OF MIX: WATER 6 gallons CEMENT 1 bag BENTONITE 0 %

1.7' in the barrel x 1.9'ø -> 2.8ft^3/ft -> 4.8 ft^3 = 36 gallons

STAGE NO.	DEPTH (FT.)	GROUT TAKE SACKS
1	239 - ?	0.3' x 2.8 = 0.8 ft^3 = 6 gallons
2	? - 220 ft	1.2' x 2.8 = 3.3ft^3 = 25 gallons

COMMENTS: (IF BACKFILL IS BY COMBINATION OF METHODS, SKETCH AND SHOW DEPTHS)



FORM G-1-1

FIELD TEST BORING RECORD COVER SHEET
STONE & WEBSTER ENGINEERING CORP.

BORING NO. P-12A

SITE	J.O. NO.	SHEET
Seminole Electric Coop/Polk-Hardee	18191.04	1 OF 3

COORDINATES from map E1070 ± N2620 ± GROUND ELEV. 126.3

INCLINATION VERT BEARING N/A INSPECTOR D. Cregger

DATE: START/FINISH 11/29 / 88 CONTRACTOR/DRILLER Ardaman/R. Parker

STATIC G.W. DEPTH/DATE _____ (FT) / _____ DRILL RIG TYPE Failing 1500

DEPTH TO BEDROCK 29.5 (FT) TOTAL DEPTH DRILLED _____ (FT)

METHODS:

DRILLING SOIL 4½" pilot hole to 80', then 8"Ø + casing to seat at 74'

SAMPLING SOIL wash samples in screen

DRILLING ROCK 5½"Ø hard rock bit to bottom of hole

SPECIAL TESTING OR INSTRUMENTATION Installed piezometer

COMMENTS

SUMMARY

Cased SOIL DRILLED 74 (FT) ROCK CORED _____ (FT)

NUMBER SPLIT BARREL SAMPLES 0

NO. & TYPE UNDISTURBED SAMPLES 0

DRILL RIG & CREW TIME None (HRS.)

LIST ALL TEST, INSPECTION, & CALIBRATION RECORDS ATTACHED:

Piezometer installation report

GROUNDWATER (DEPTH BELOW GROUND SURFACE)

DEPTH	DATE	DEPTH	DATE
71 ft	12/1/88		

NOTES

1. DATUM IS M.S.L. UNLESS OTHERWISE INDICATED

LEGEND FOR FIELD BORING LOGS

DISTURBED SAMPLES
- W - WASH
- S - SPLIT BARREL (ASTM - D1586 UNLESS OTHERWISE NOTED)
- E - ENVIRONMENTAL
- Z - OTHER, DESCRIBE:

UNDISTURBED SAMPLES
- US - SHELBY TUBE
- UF - STATIONARY (FIXED PISTON)
- UO - OSTERBERG
- UP - PITCHER
- UD - DENISON
- X - OTHER, DESCRIBE:

N - STD PENETRATION RESISTANCE BLOWS/FT (140 LB. HAMMER, UNLESS OTHERWISE NOTED)
REC - RECOVERY
RQD - ROCK QUALITY DESIGNATION
( ) - INCHES OF SAMPLE RECOVERY
NQ - WIRELINE ROCK CORE SAMPLES

APPROVED	DATE

FORM G-2-1

FIELD BORING LOG
STONE & WEBSTER ENGINEERING CORP.

BORING NO.	
P-12A	

SITE	J.O. NO.	SHEET
Seminole Electric Coop/Polk-Hardee Site	18191.04	2 OF 3

DRILLER	INSPECTOR
R. Parker	D. Cregger

ELEV.	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	GROUP SYMBOL	SAMPLE DESCRIPTION
126.3	0				Top Soil to 3.0 ft then brown subsoil to 6.0 ft Unmined land (pasture).
		W	1	SC	Clayey Sand: fine grained w/mod. plastic fines (from bit smaple), white w/occ black coarse sand inclusions.
	20	W	2	SP	Phosphatic Sand: coarse to fine sand w/trace of silt and clay; light gray w/balck coarse phosphate.
		W	3	SC	Phosphatic Clayey Sand: coarse to fine sand, gray to yellow-brown w/chips of yellow-brown limestone (pit bottom)
	40	W	4	SC	Phosphatic Clayey Sand: similar to above except w/occ phosphate gravel to 3/8" max, all tan.
		W	5	SM	Phosphatic Silty Sand: coarse to fine sand, tan w/ phosphate gravel to 3/8" max.
	60	W	6	ML	Phosphatic Silt: fine sand in dark gray slightly plastic silt.
		W	7	ML-	Phosphatic Organic Silt: mostly fine sand in dark gray to dark brownish gray slightly plastic silt. Peat (decomposed) at 68-71 ft.
	80	W	8	ML	Phosphatic Silt: coarse to fine sand and light gray silt, some limestone chips in wash.
		W	9	ML	Phosphatic Silt: same as above except whiter and trace cohesive clay.
	100	W	10	ML	Phosphatic Silt: mostly fine sand and silt with dark gray cohesive clay on top of hard layer at 105.5'. Slightly cemented clay zone (typ)
	120			SP	Phosphatic Sand: fine grained sand w/some silt and occ hard cemented layers, light to medium gray. Fast drilling between hard layers.
	140			SC	Phosphatic Clayey Sand: medium to fine grained sand in clayey matrix, light gray.
		W	12	SC	Phosphatic Clayey Sand: same as above, atlernately white clay and medium gray clay in washed cuttings.
		W	13		

FORM G-2-1

FIELD BORING LOG
STONE & WEBSTER ENGINEERING CORP.

SITE	J.O. NO.	BORING NO.	SHEET
Seminole Electric Coop/Polk-Hardee Site	18191.04	P-12A	3 OF 3

DRILLER	INSPECTOR
R. Parker	D. Cregger

ELEV.	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	GROUP SYMBOL	SAMPLE DESCRIPTION
	160	W	14	CL	Sandy Clay: coarse to fine sand in a greenish-clay; slow drilling.
	180	W	15	SP	Phosphatic Sand: mostly fine sand, gray w/ black speckles; fast drilling
	200	W	16	SP	Phosphatic Sand: mostly fine grained, gray w/ black speckles; fast drilling.
	220	W	17	CL-LS	Phosphatic Sandy Clay: brown and gray clay lumps and chips of buff to white limerock.
		W	18	LS	Limestone: buff limerock chips w/some med. brown clay lumps and the amber chert marker bed.
	240				Lost circulation at 241'; very soft drilling to 246' total depth.

File No. 88-51-9155A

LABORATORY TEST RESULTS
Agrico - South Site
Seminole Electric Cooperative, Inc.

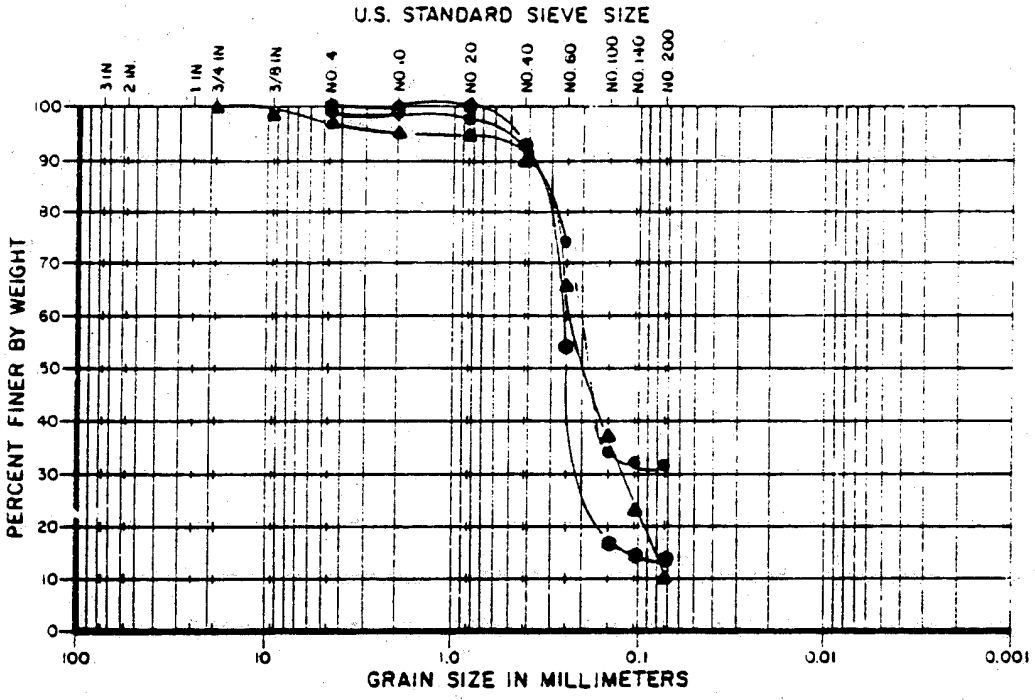
Sample Number	Depth Ft.	Water Content Percent	Dry Density P.C.F.	Liquid Limit Percent	Plastic Limit Percent	Permeability Coefficient cm/sec	Organic Content Percent	Minus 200 Percent
B-1								
2	2.5 - 4.0	15.6	---	---	---	---	2.32	10.5
TW-4	7.5 - 9.5	18.4	113.3	32.4	13.9	---	---	30.0
TW-6	15.0 - 17.0	25.8	98.4	29.4	15.2	---	---	
TW-8	25.0 - 27.0	34.4	86.5	---	---	---	---	3.0
10	35.0 - 36.5	38.3	---	53.3	29.4	---	---	24.0
14	65.0 - 66.5	65.8	---	107.1	41.9	---	---	32.4
17	70.0 - 71.5	39.4	---	---	---	---	---	15.2
22	95.0 - 96.5	27.6	---	32.1	26.6	---	---	50.8
B-2								
2	2.5 - 4.0	15.9	---	---	---	---	1.0	26.7
4	7.5 - 9.0	16.8	---	28.0	11.1	---	---	20.4
TW-5	10.0 - 12.0	24.8	104.0	115.1	21.9	---	---	31.0
TW-6	15.0 - 17.0	46.8	74.5	88.0	16.0	---	---	
8	25.0 - 26.5	29.6	---	---	---	---	---	36.1
TW-10	35.0 - 36.0	44.2	81.4	95.7	41.2	---	---	56.0
12	45.0 - 46.5	63.1	---	71.3	30.5	---	---	34.5
14	55.0 - 56.5	38.5	---	54.0	32.9	---	---	53.7
17	70.0 - 71.5	33.8	---	---	---	---	---	6.1
19	80.0 - 81.5	77.4	---	65.6	40.9	---	---	50.0
23	100.0 - 101.5	37.6	---	53.7	35.8	---	---	63.0
B-3								
2	2.5 - 4.0	7.9	---	---	---	---	0.93	36.0
5	10.0 - 11.5	16.4	---	---	---	---	---	24.3
TW-6	15.0 - 17.0	36.0	86.9	114.0	20.0	---	---	
TW-7	20.0 - 22.0	70.4	59.0	109.7	26.1	---	---	94.0
TW-9	30.0 - 31.5	56.3	69.7	185.2	57.3	---	---	
10	35.5 - 36.5	43.2	---	---	---	---	---	16.6
	40.0 - 41.5	30.4	---	---	---	---	---	64.5
	55.0 - 56.5	67.7	---	---	---	---	---	38.7
	60.0 - 61.5	53.2	---	---	---	---	---	29.8
	65.0 - 67.0	72.9	59.5	179.0	61.0	---	---	73.0

LABORATORY TEST RESULTS
Agrico - South Site
Seminole Electric Cooperative, Inc.

Sample Number	Depth Ft.	Water Content Percent	Dry Density P.C.F.	Liquid Limit Percent	Plastic Limit Percent	Permeability Coefficient cm/sec	Organic Content Percent	Minus 200 Percent
B-3								
17	70.0 - 71.5	44.7	---	---	---	---	---	13.8
19	80.0 - 81.5	40.7	---	46.0	27.8	---	---	52.9
21	90.0 - 91.5	35.9	---	---	---	---	---	33.8
23	100.0 - 101.5	35.8	---	---	---	---	---	60.5
B-4								
TW-5	10.0 - 12.0	19.0	112.3	78.0	16.1	---	---	27.0
TW-6	15.0 - 17.0	---	---	---	---	---	---	
9	30.0 - 31.5	42.2	---	63.3	28.7	---	---	25.3
12	45.0 - 46.5	58.7	---	97.7	43.8	---	---	48.1
16	65.0 - 66.5	35.3	---	---	---	---	---	8.0
21	90.0 - 91.5	30.3	---	34.6	30.5	---	---	28.9
B-5								
2	2.5 - 4.0	20.2	---	---	---	---	1.22	39.4
TW-4	7.5 - 9.5	18.0	110.6	28.0	12.1	6.7×10^{-6}	---	33.0
TW-6	15.0 - 17.0	51.0	71.4	123.2	25.7	1.2×10^{-7}	---	48.0
10	35.0 - 36.5	19.4	---	---	---	---	---	9.7
12	45.0 - 46.5	25.3	---	---	---	---	---	14.9
16	65.0 - 66.5	29.1	---	---	---	---	---	36.9
18	75.0 - 76.5	28.7	---	---	---	---	---	36.9
20	85.0 - 86.5	53.5	---	64.2	28.3	---	---	31.5
23	100.0 - 101.5	37.0	---	---	---	---	---	60.5
B-6								
1	0.0 - 1.5	5.4	---	---	---	---	---	7.2
5	10.0 - 11.5	19.5	---	22.4	10.4	---	---	19.4
7	20.0 - 21.5	24.7	---	---	---	---	---	14.8
9	35.0 - 36.5	41.1	---	---	---	---	---	32.6
B-7								
TW-6	15.0 - 17.0	64.7	60.2	176.5	50.4	---	---	46.0
8	25.0 - 26.5	29.1	---	62.8	24.3	---	---	64.5
12	45.0 - 45.7	34.2	---	55.9	35.0	---	---	33.4

LABORATORY TEST RESULTS
Agrico - South Site
Seminole Electric Cooperative, Inc.

Sample Number	Depth Ft.	Water Content Percent	Dry Density P.C.F.	Liquid Limit Percent	Plastic Limit Percent	Permeability Coefficient cm/sec	Organic Content Percent	Minus 200 Percent
B-8								
2	1.5 - 3.0	5.9	---	---	---	---	2.3	32.3
3	5.0 - 6.5	5.7	---	---	---	---	---	10.0
5	10.0 - 11.5	15.6	---	---	---	---	---	21.6
TW-7	20.0 - 22.0	41.8	77.0	86.4	18.6	---	---	
TW-8	25.0 - 27.0	47.5	74.4	152.9	28.0	---	---	
TW-10	35.0 - 37.0	39.9	80.2	92.7	46.6	---	---	18.0
13	50.0 - 51.5	26.2	---	---	---	---	---	44.3
14	55.0 - 56.5	40.4	---	---	---	---	---	30.9
15	60.0 - 66.5	26.7	---	---	---	---	---	14.3
17	70.0 - 71.5	46.8	---	---	---	---	---	13.6
19	80.0 - 81.5	54.9	---	---	---	---	---	46.8
B-9								
4	7.5 - 7.9	19.4	---	---	---	---	8.2	46.4
TW-6	15.0 - 17.0	35.4	89.2	111.0	24.1	7.4×10^{-9}	---	51.0
TW-8	25.0 - 27.0	72.7	57.4	105.2	43.8	---	---	54.0
TW-10	35.0 - 37.0	85.7	50.3	197.8	80.9	---	---	
11	40.0 - 41.5	72.2	---	124.4	40.5	---	---	71.0
15	60.0 - 61.5	39.1	---	---	---	---	---	13.0
18	75.0 - 75.1	47.8	---	---	---	---	---	54.9
22	95.0 - 96.5	25.2	---	non-plastic		---	---	13.2
B-10								
1	0.0 - 1.5	12.4	---	---	---	---	---	14.3
2	2.5 - 3.0	24.4	---	---	---	---	---	3.8
5	10.0 - 11.5	28.5	---	---	---	---	---	2.1
7	20.0 - 21.5	25.9	---	---	---	---	---	2.2
8	25.0 - 26.5	56.8	---	83.1	26.9	---	---	79.6
10	35.0 - 36.5	39.6	---	---	---	---	---	40.1
11	40.0 - 41.5	37.6	---	---	---	---	---	14.3
13	50.0 - 51.5	53.4	---	---	---	---	---	55.9
15	60.0 - 61.5	44.8	---	55.5	34.3	---	---	48.6
18	75.0 - 76.5	13.1	---	---	---	---	---	33.3
19	80.0 - 81.5	42.0	---	---	---	---	---	52.4
22	95.5 - 96.5	53.1	---	---	---	---	---	55.6



TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
1	2	2.5-4'	▲		
1	17	70-71.5'	●		
1	14	65-66.5'	●		

GRAIN SIZE DISTRIBUTION

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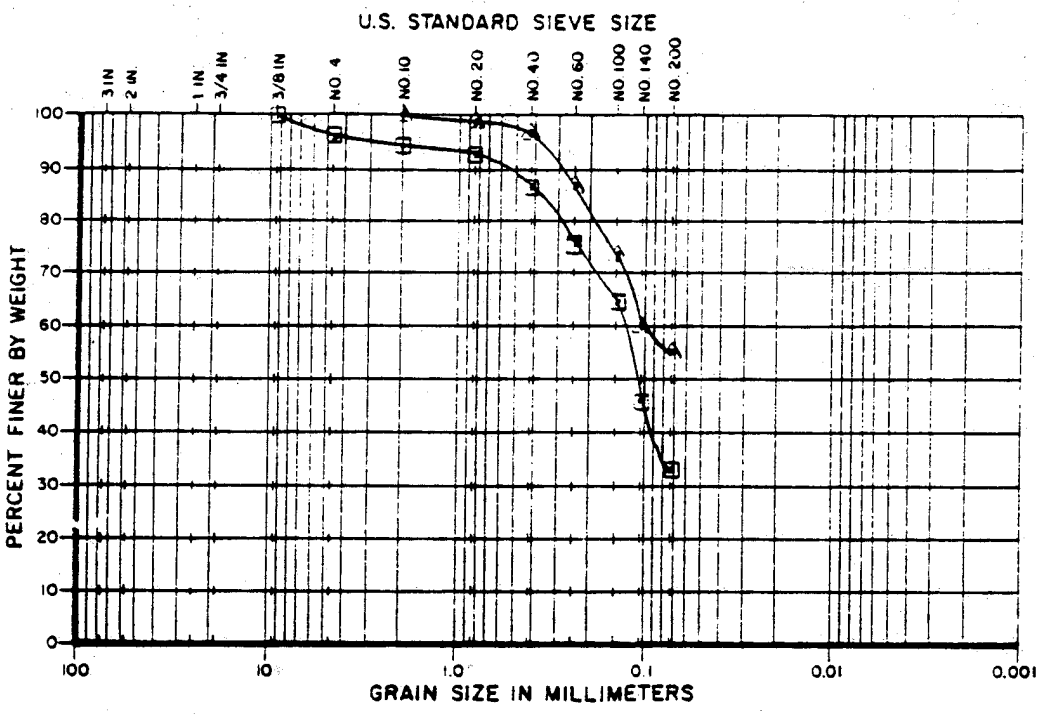

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
2	TW-10	35-36'	△		
2	TW-5	10-12'	□		

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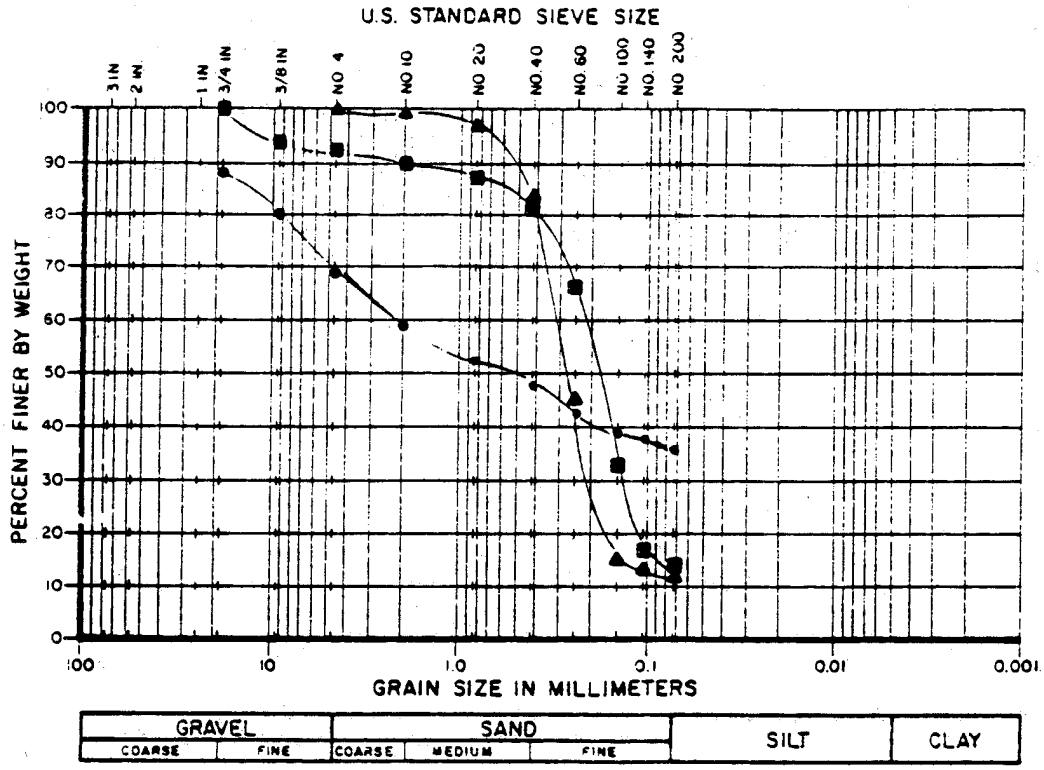

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
2	8	25-26.5'	●		
3	17	70-71.5'	▲		
10	11	40-41.5'	■		

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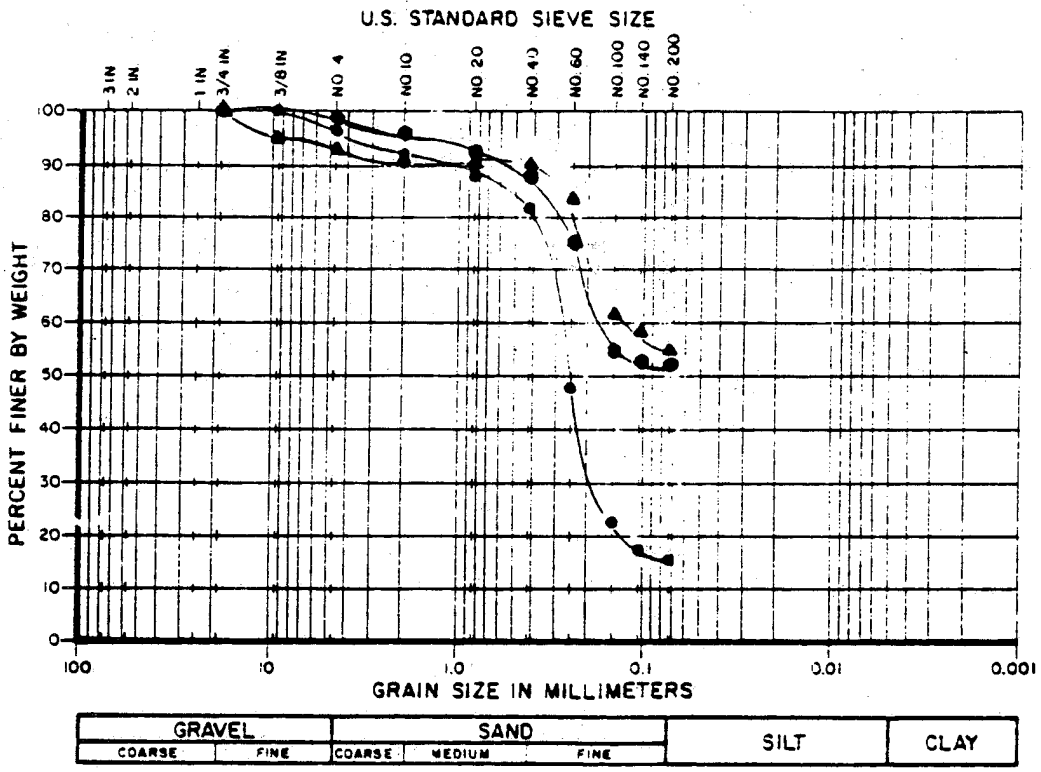

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
3	10	35-36.5 '	●		
2	14	55-56.5'	●		
9	18	75-76.5'	▲		

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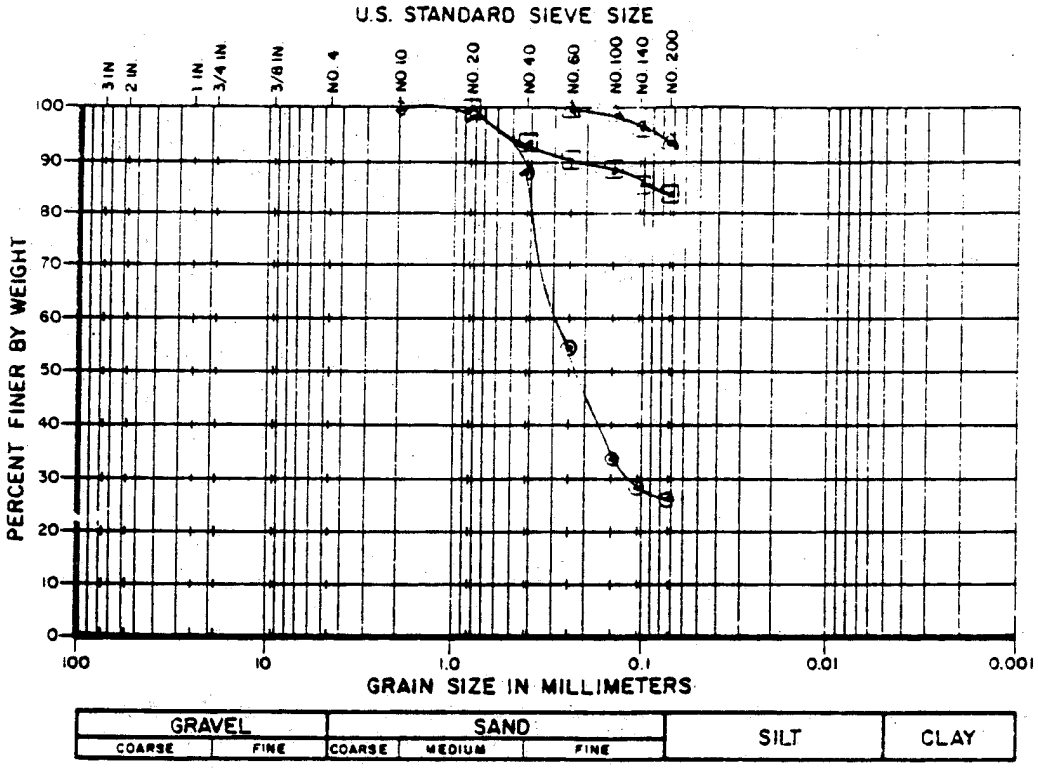

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
3	TW-6	20-22'	△		
3	TW-16	65-67'	□		
4	TW-5	10-12'	○		

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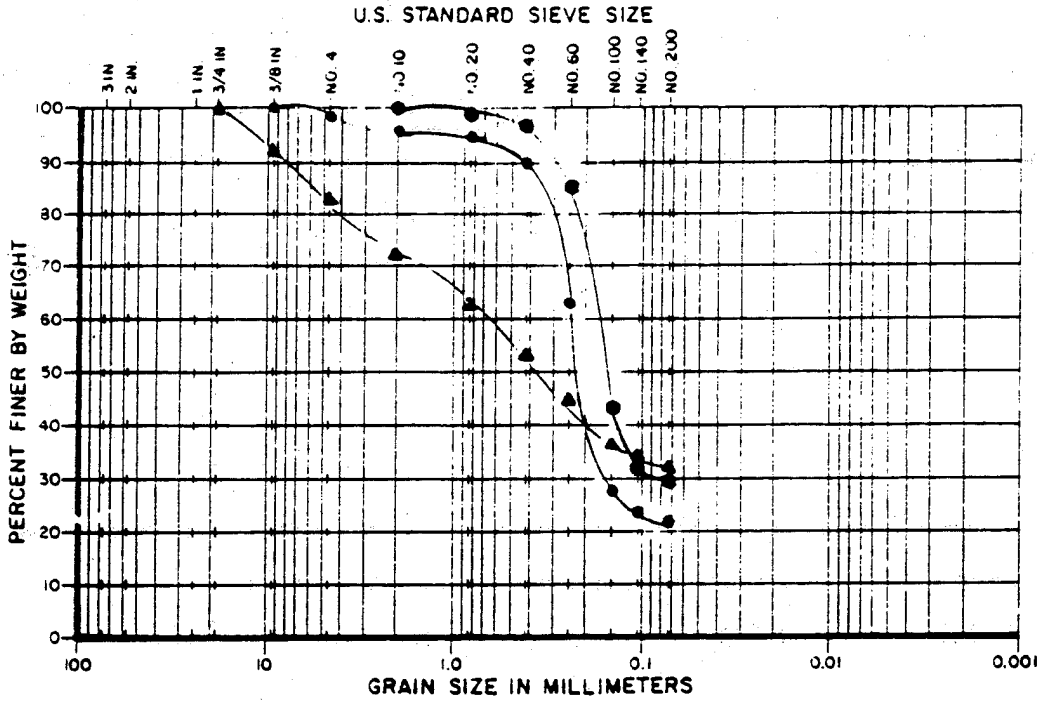

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
8	5	10-11.5'	●		
3	21	90-91.5'	▲		
3	15	60-61.5'	■		

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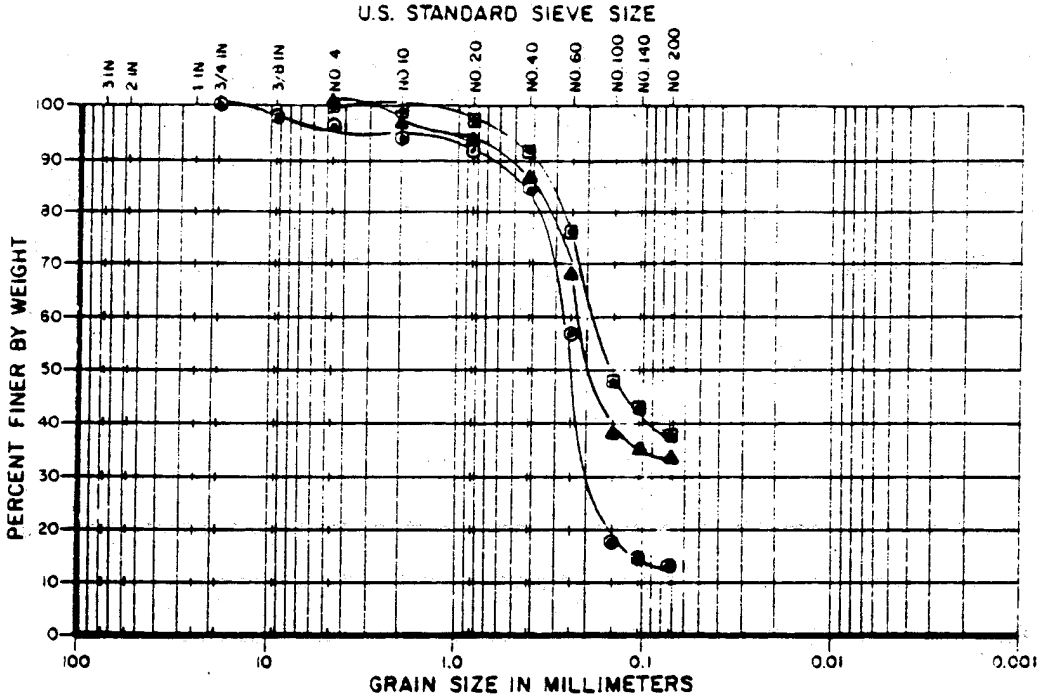

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
3	14	55-56.5'	⊡		
2	12	45-46.5'	▲		
8	15	60-61.5'	◉		

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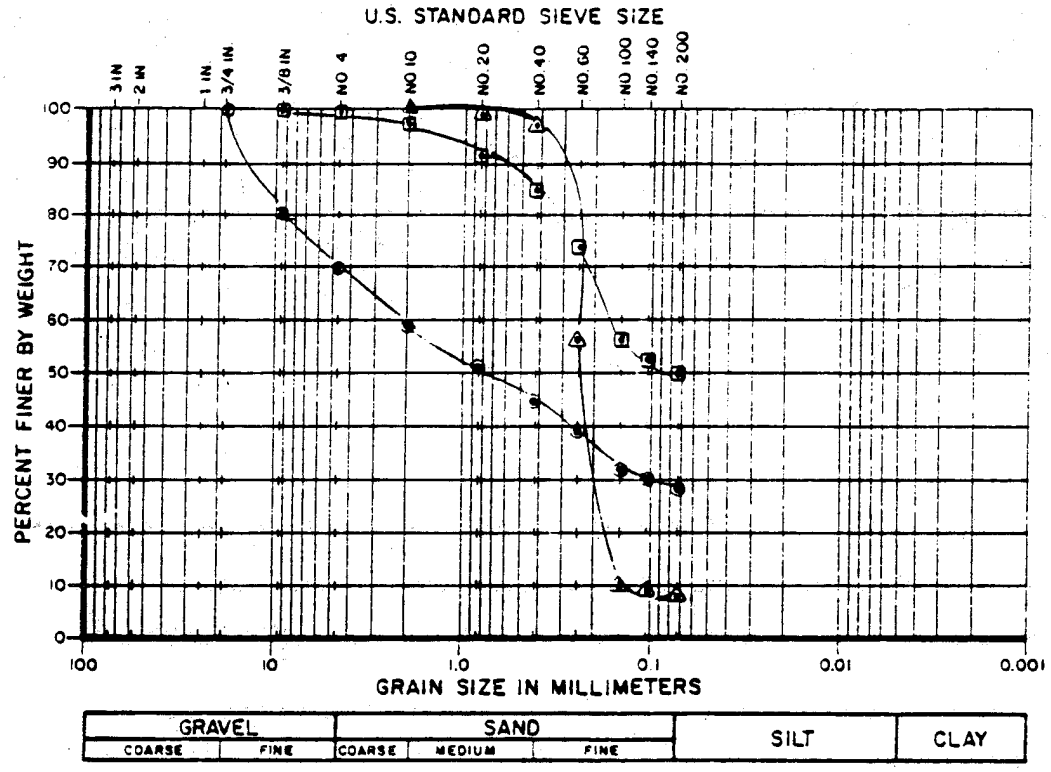

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
4	21	45-46.5'	⊙		
4	16	65-66.5'	△		
1	22	95-96.5'	⊡		

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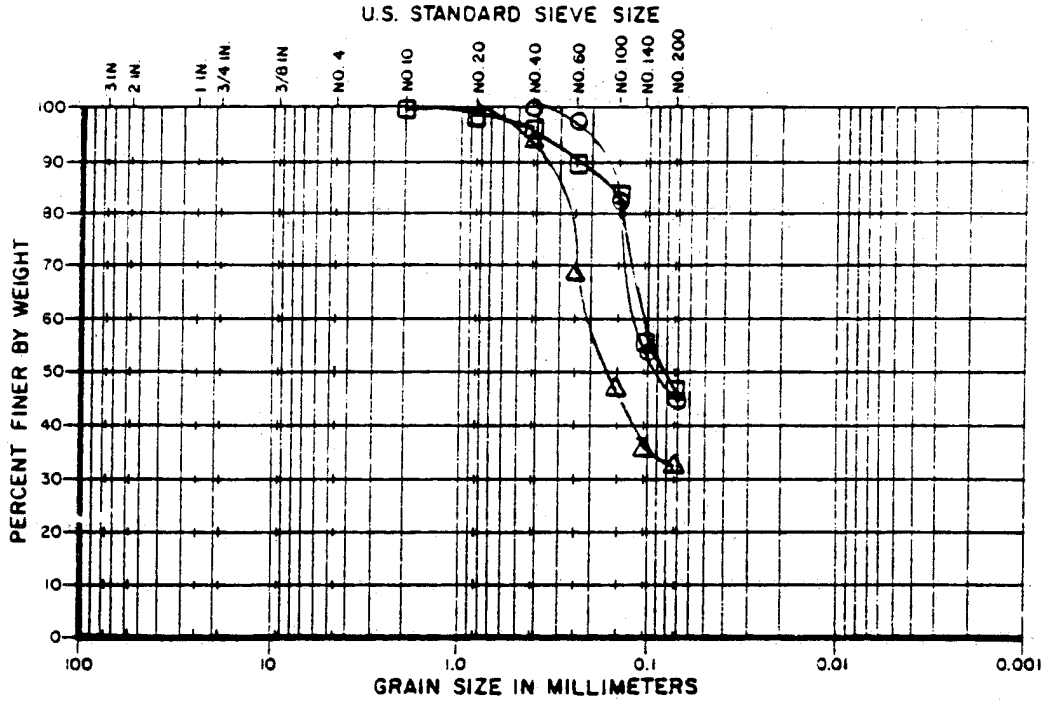

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
5	TW-4	7.5-9.5'	△		
5	TW-6	15-17'	□		
7	TW-6	15-17'	○		

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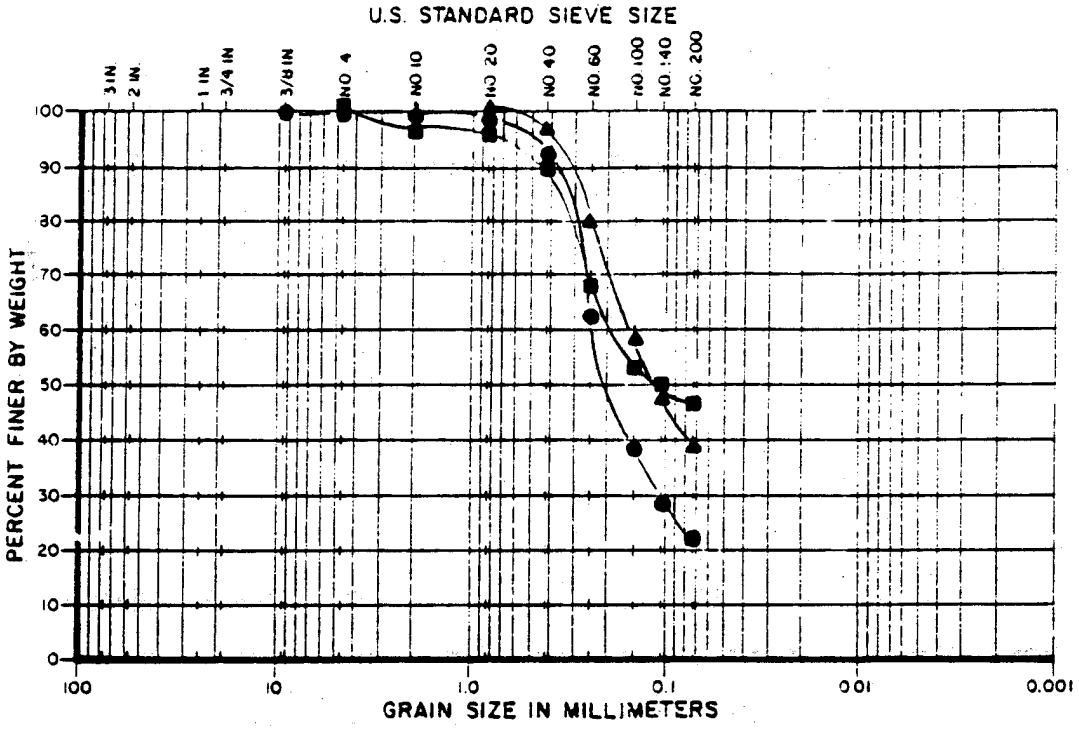

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
2	4	7.5-9.0'	●		
9	4	7.5-9.0'	■		
5	2	2.5-4.0'	▲		

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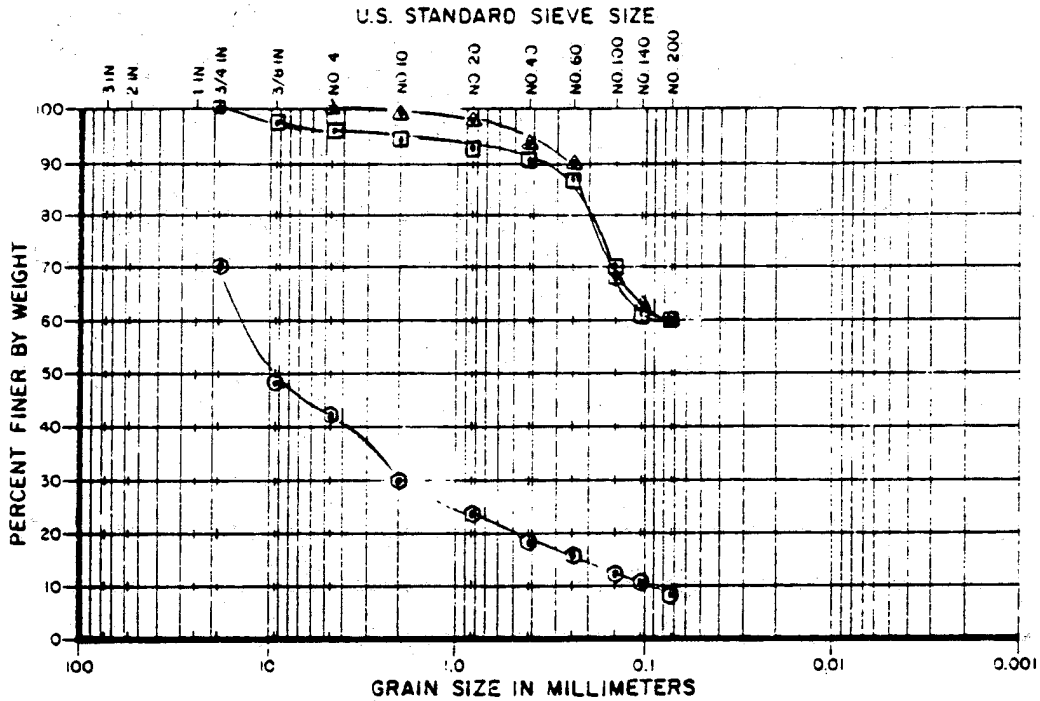

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
5	10	35-36.5'	⊙		
5	23	100-101.5'	△		
3	23	100-101.7'	⊡		

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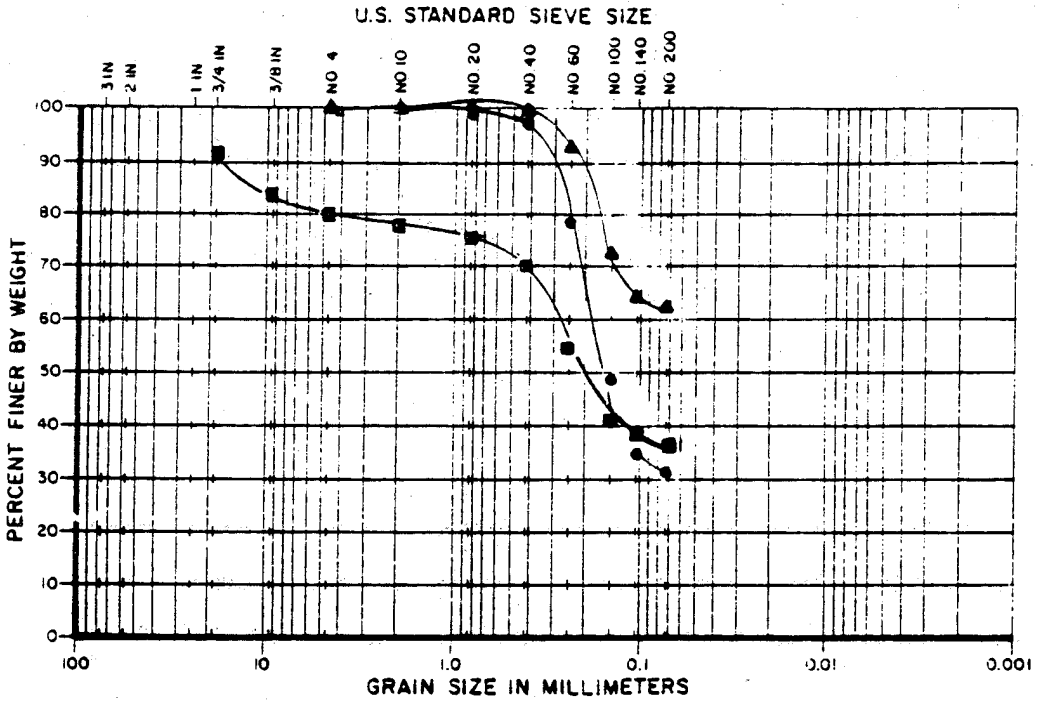

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
5	20	85-86.5'	●		
5	16	65-66.5'	■		
2	23	100-101.5'	▲		

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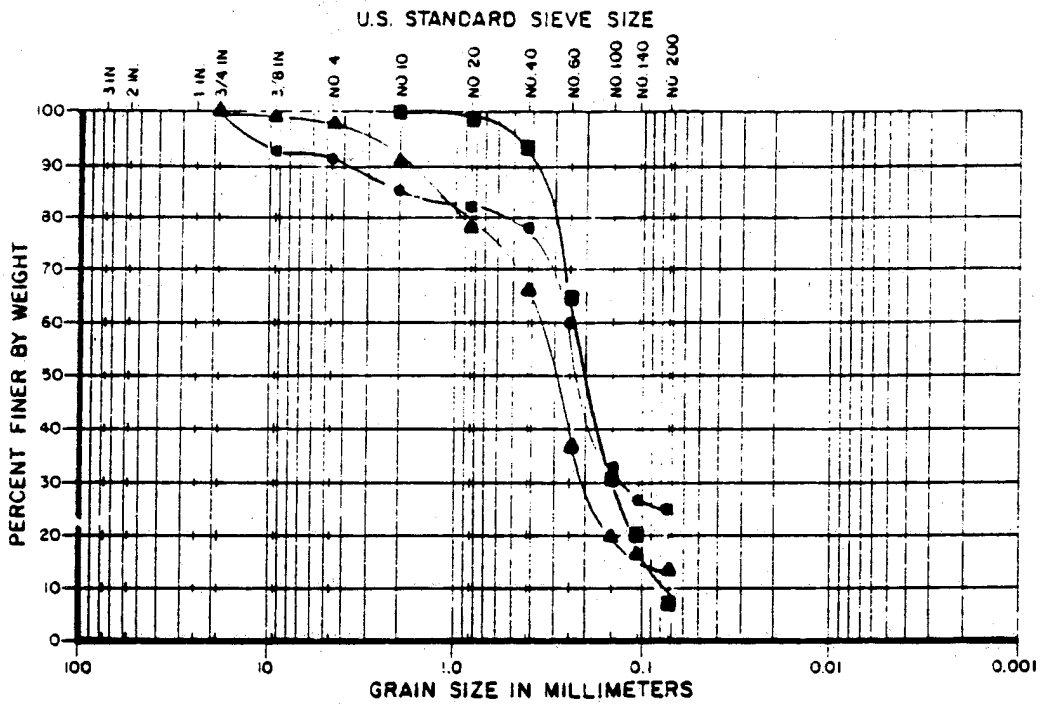

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
4	9	30-31.5'	●		
6	7	20-21.5'	▲		
6	1	0-1.5'	■		

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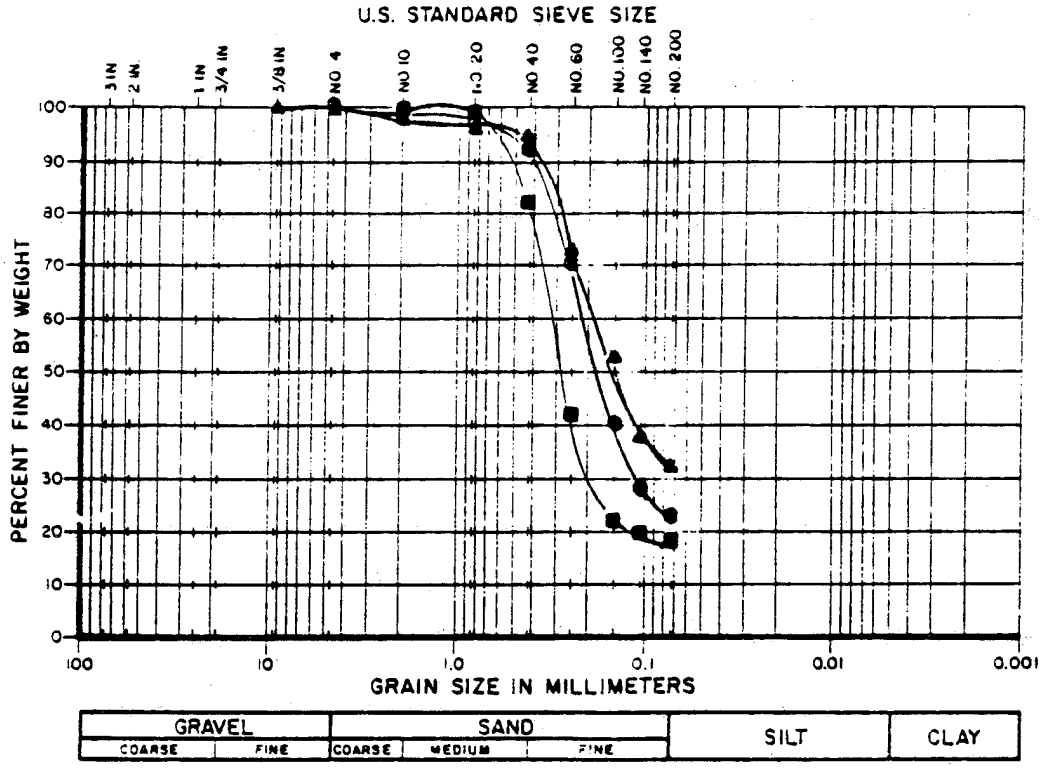

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
6	5	10-11.5'	■		
6	9	35-36.5'	▲		
1	10	35-36.5'	●		

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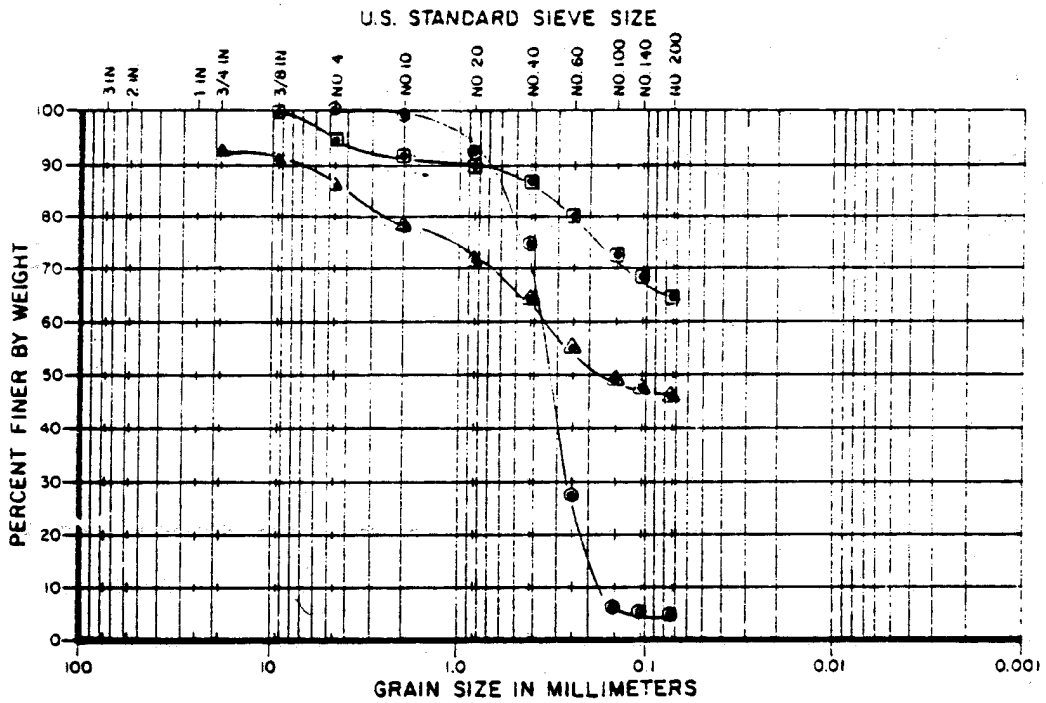

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
2	17	70-71.5'	⬡		
8	19	80-81.5'	▲		
7	8	25-26.5'	◪		

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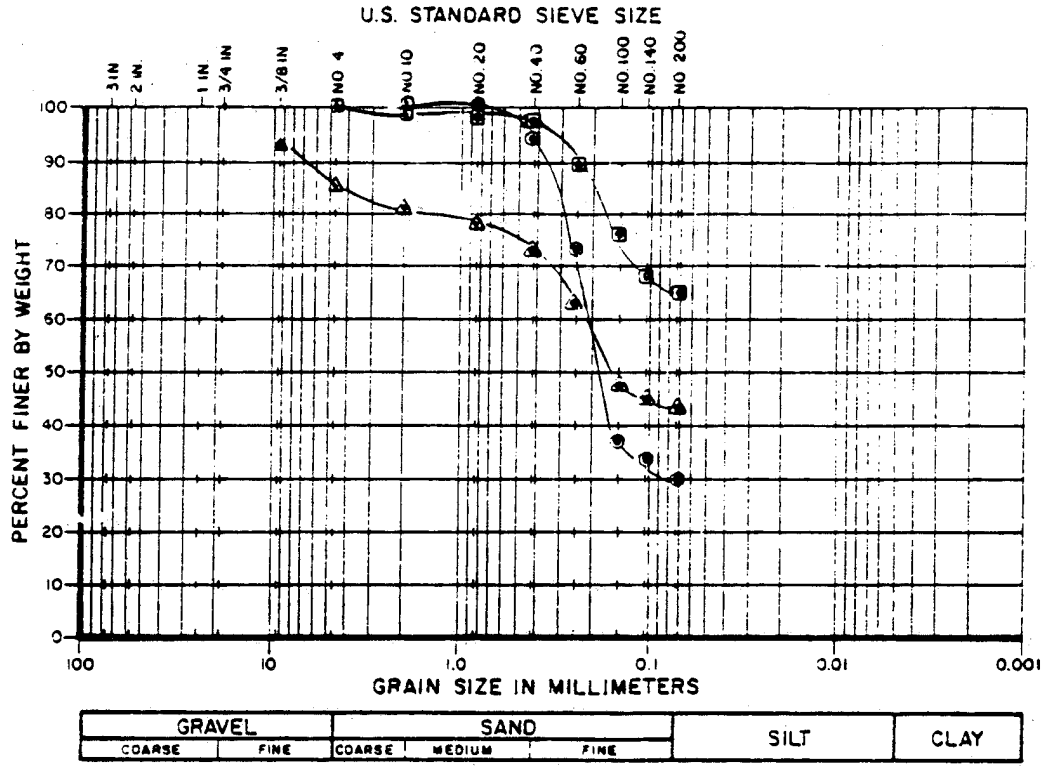

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
3	11	10-11.5'	⊡		
8	13	50-51.5'	△		
8	14	55-56.5'	⊙		

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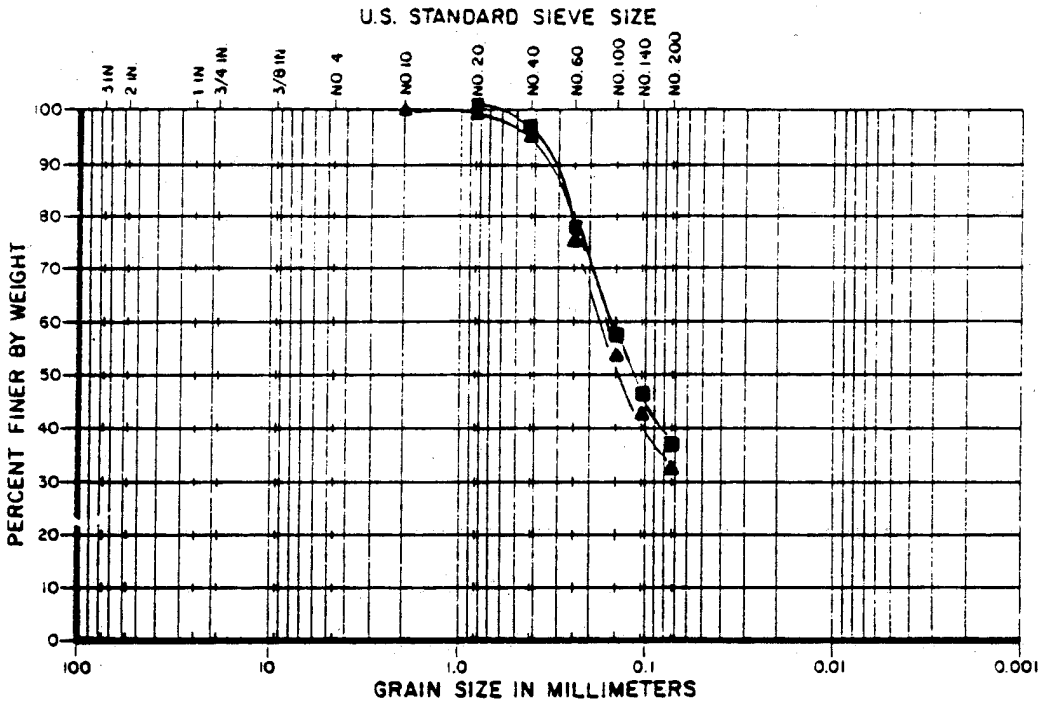

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
8	2	1.5-3'	▲		
3	2	2.5-4'	■		

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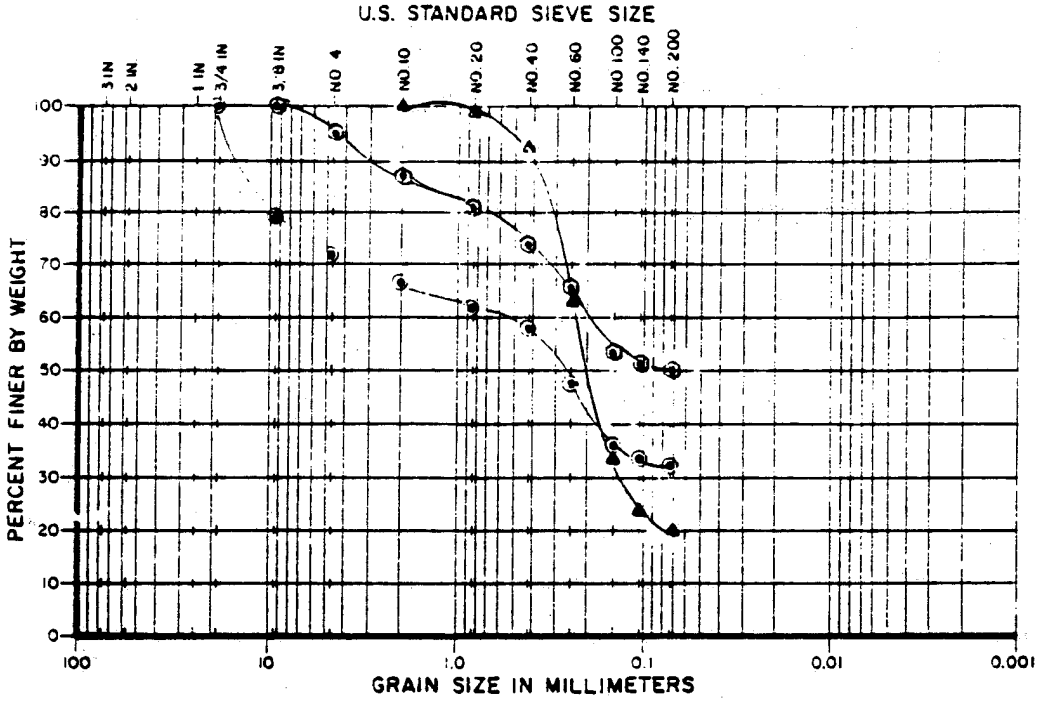

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
7	12	45-45.8'	●		
8	3	5-6.5'	▲		
2	19	80-81.5	●		

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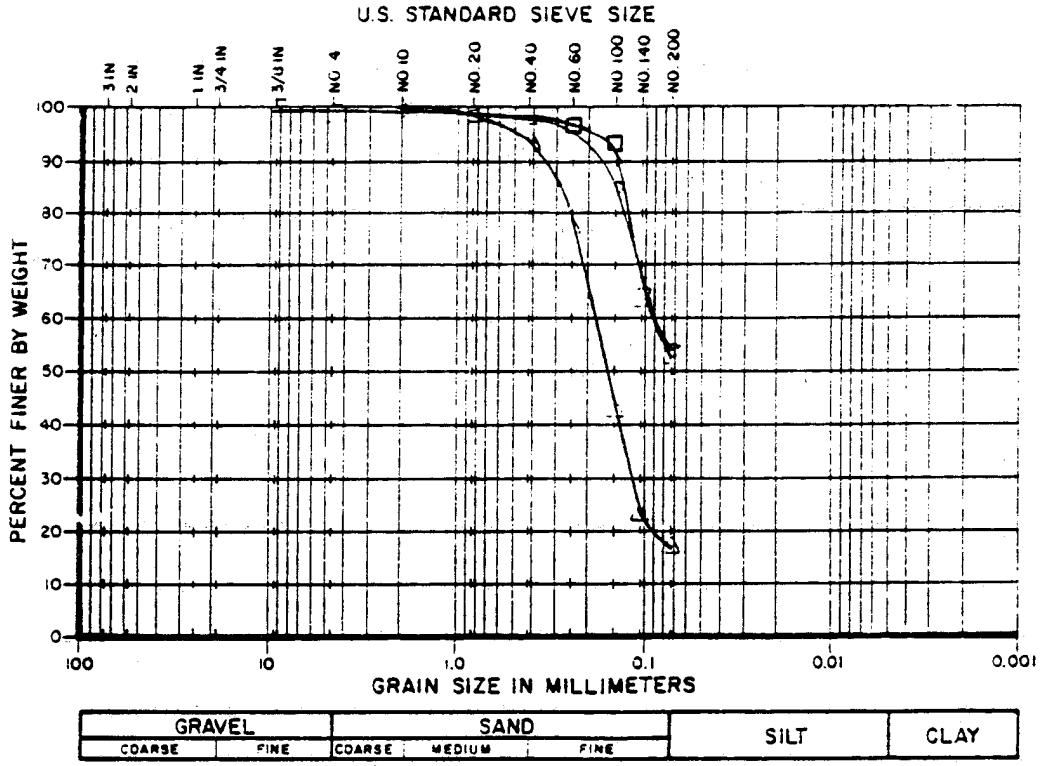

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
8	TW-10	35-37'	△		
9	TW-6	15-17'	☐		
9	TW-8	25-27'	○		

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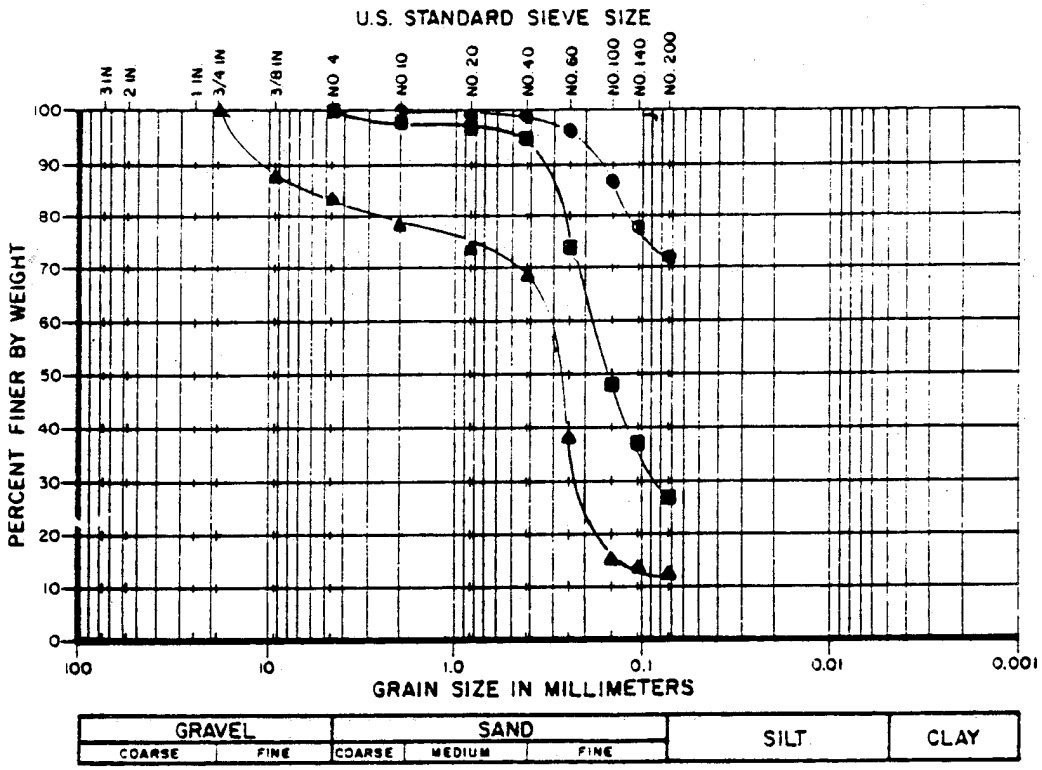

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
9	22	90'	▲		
9	11	40-41.5'	●		
2	2	2.5-4'	■		

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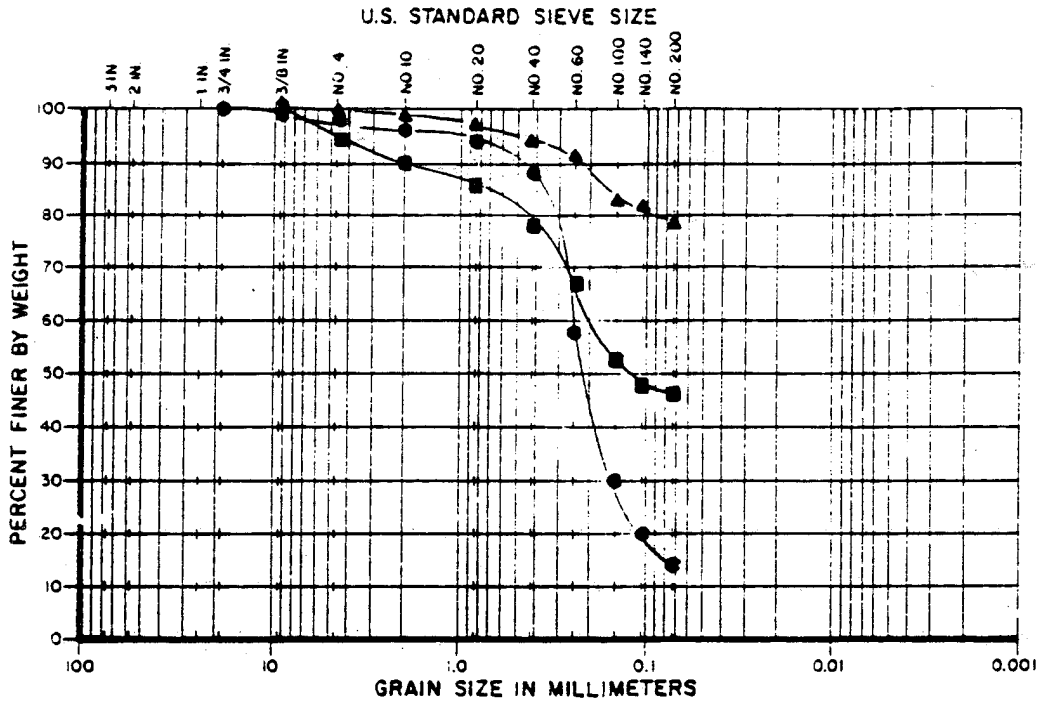

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
10	1	0-1.5'	●		
10	8	25-26.5'	▲		
4	12	45-46.5'	■		

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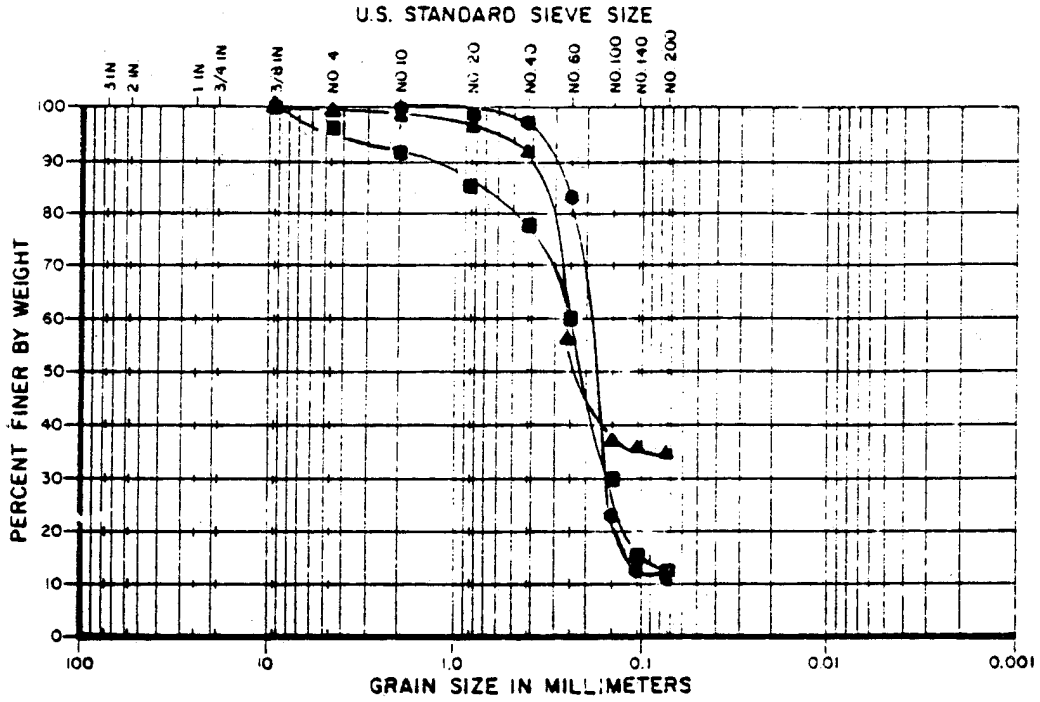

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
9	15	60-61.5'	■		
8	17	70-71.5'	●		
5	18	75-76.5'	▲		

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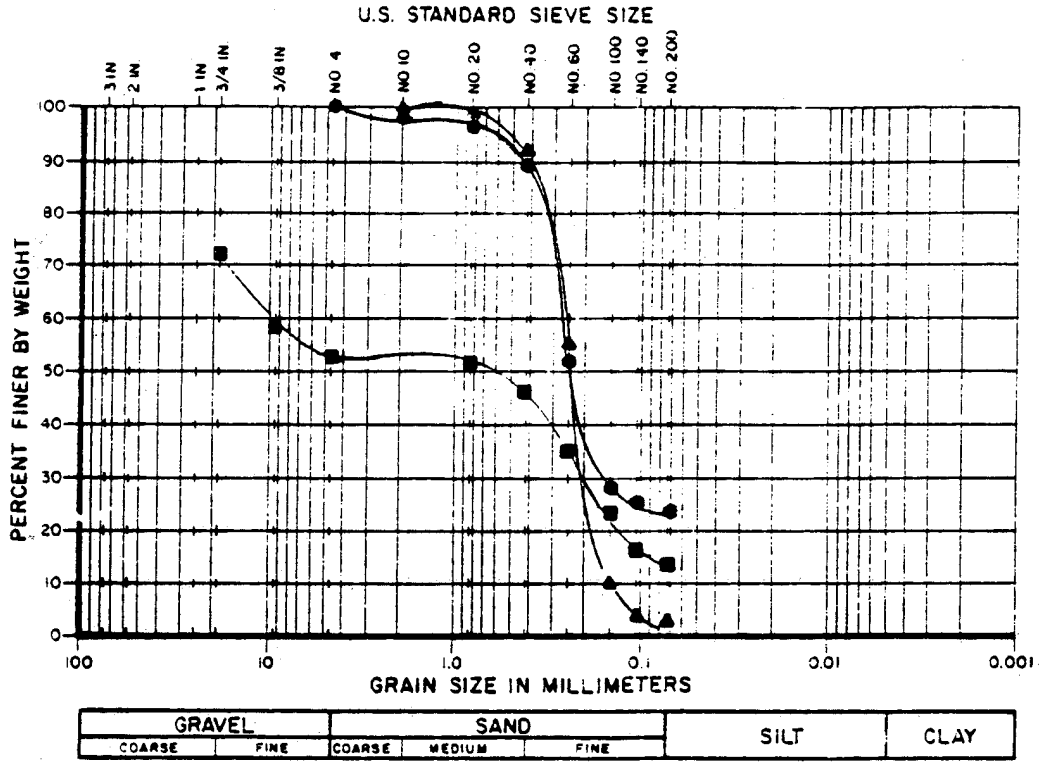

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
10	5	10-11.5'	▲		
3	5	10-11.5'	●		
5	12	45-46.5'	■		

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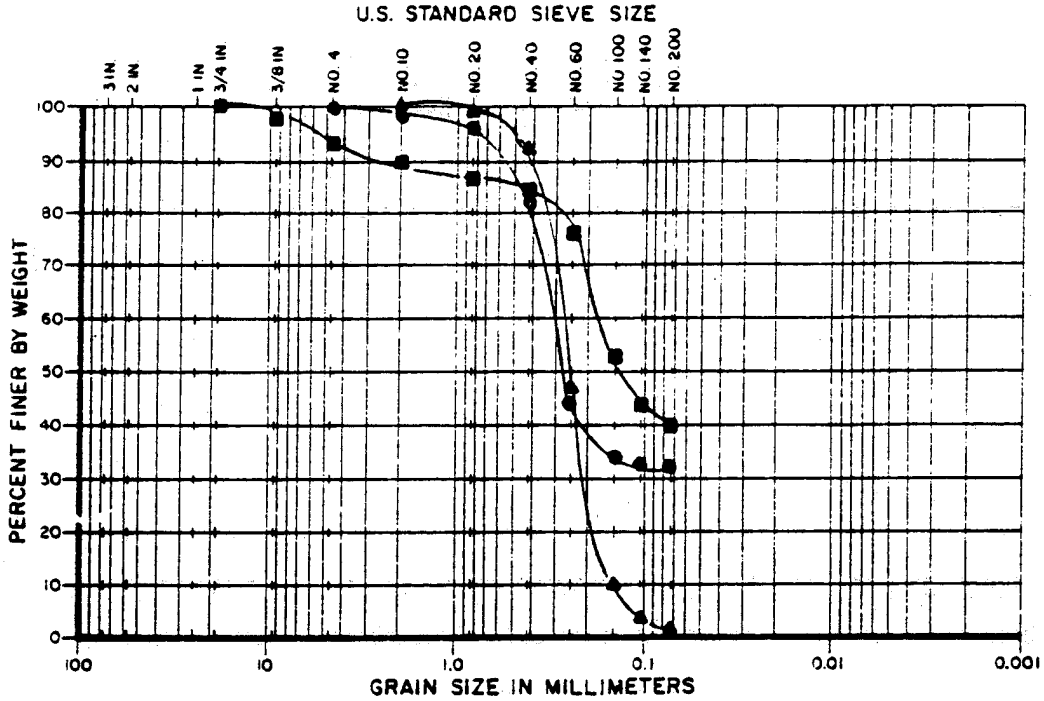

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
10	7	20-21.5'	▲		
10	10	35-36.5'	■		
10	18	75-76.5'	●		

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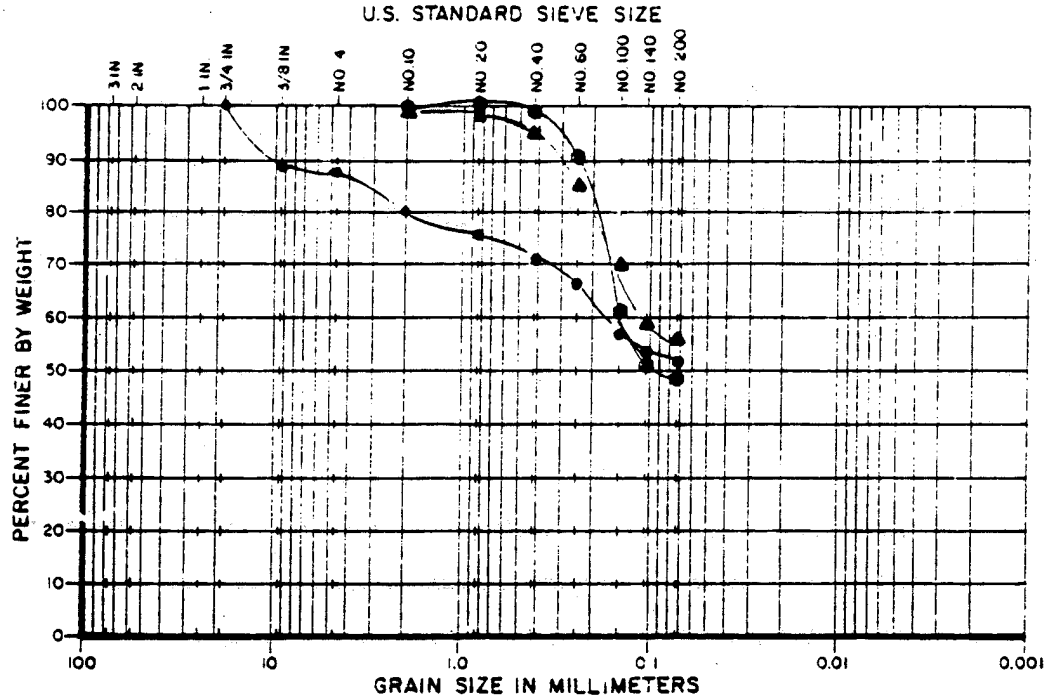

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
3	19	80'	●		
10	22	95-96.5'	▲		
10	15	60-61.5'	●		

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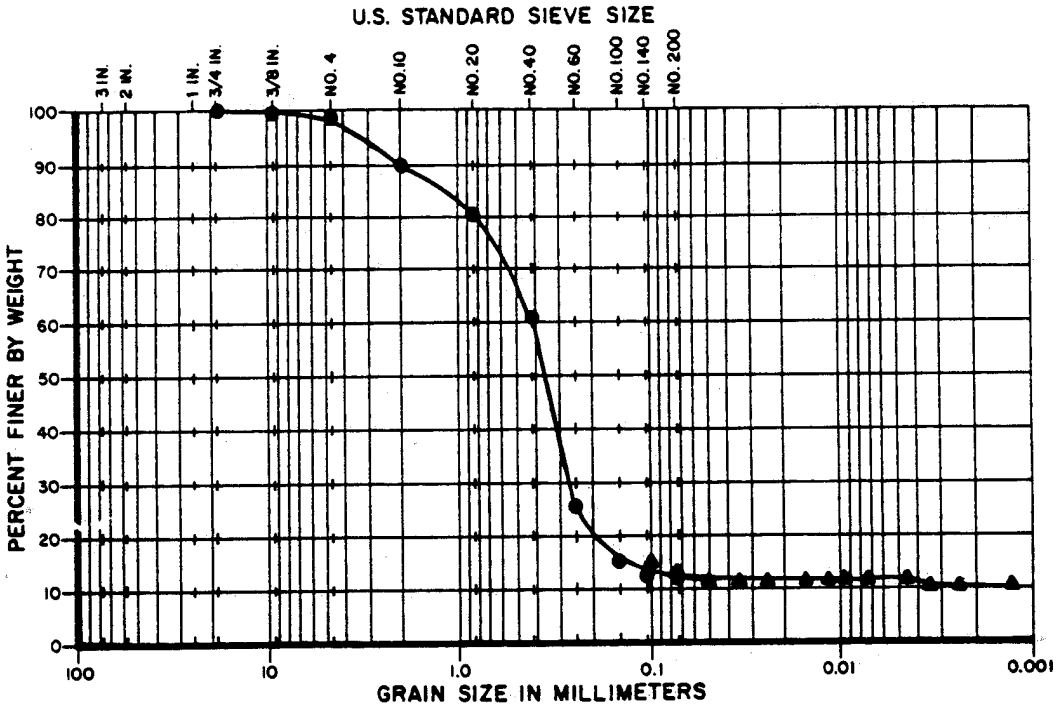

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
B-1	US-6	15.0'-17.0'		GRAYISH BROWN SLIGHTLY CLAYEY FINE SAND	SC
			●	SIEVE ANALYSIS	
			▲	HYDROMETER	

GRAIN SIZE DISTRIBUTION

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SEMINOLE ELECTRIC COOPERATIVE INC.
4040 MEGAWATT COMBUSTION GENERATOR
AGRICO-SOUTH SITE

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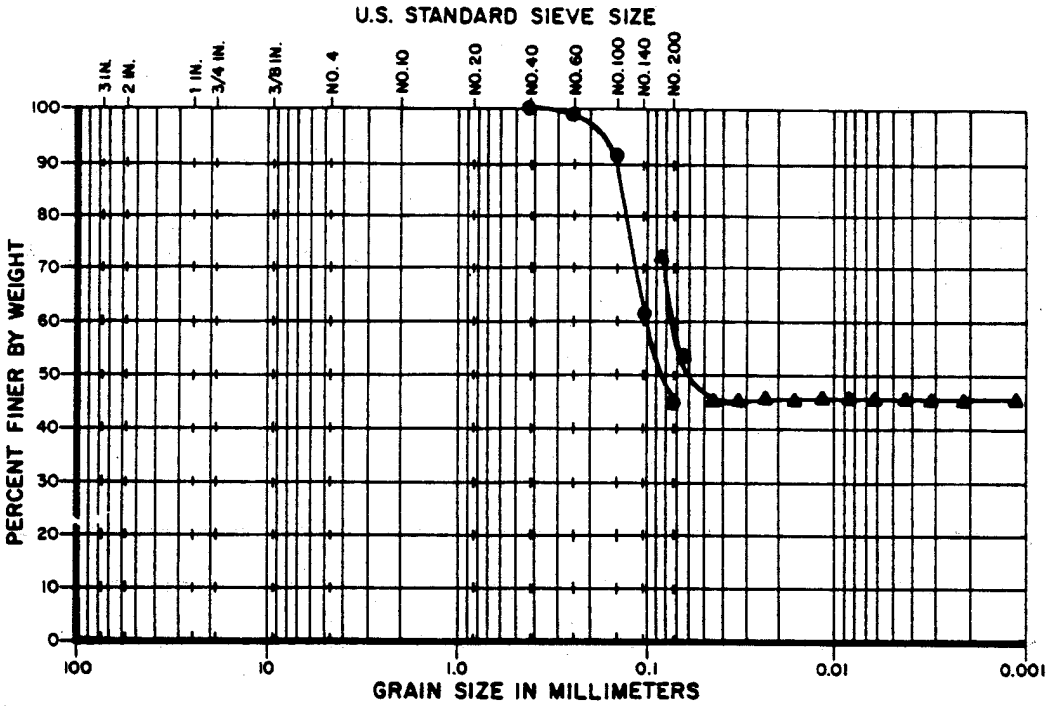

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
B-2	US-6'	15.0'-17.0'		BROWNISH GRAY CLAYEY FINE SAND	SC
			●	SIEVE ANALYSIS	
			▲	HYDROMETER	

GRAIN SIZE DISTRIBUTION

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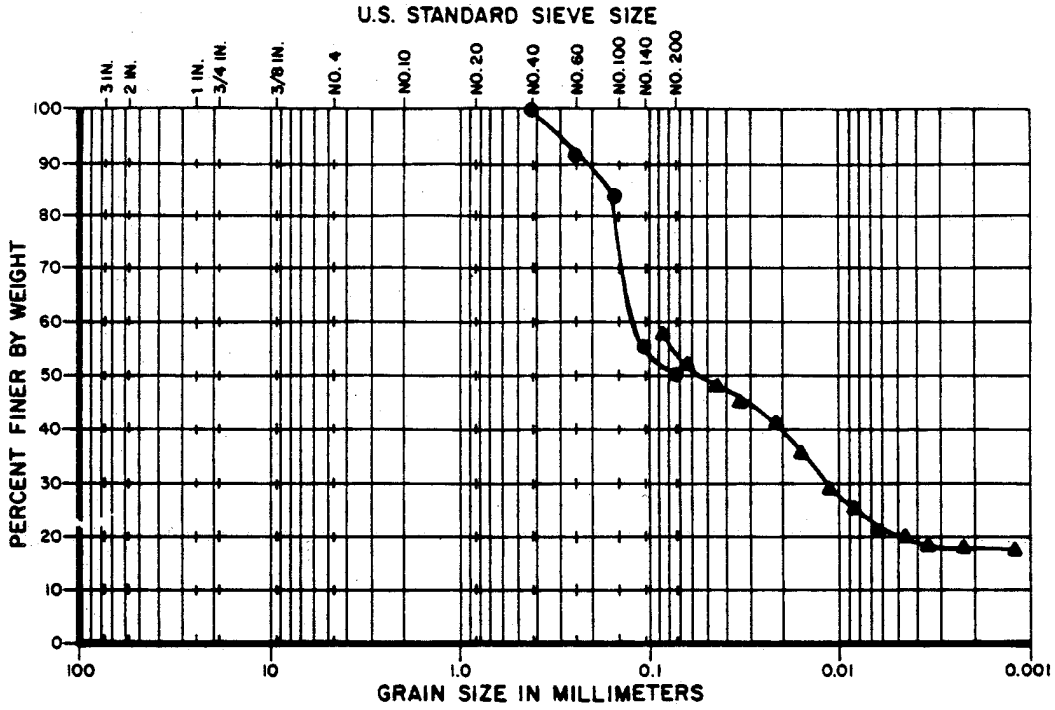

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
B-2	US-10'	35.0'-36.0'		BROWNISH YELLOW SANDY CLAY	CH
			●	SIEVE ANALYSIS	
			▲	HYDROMETER	

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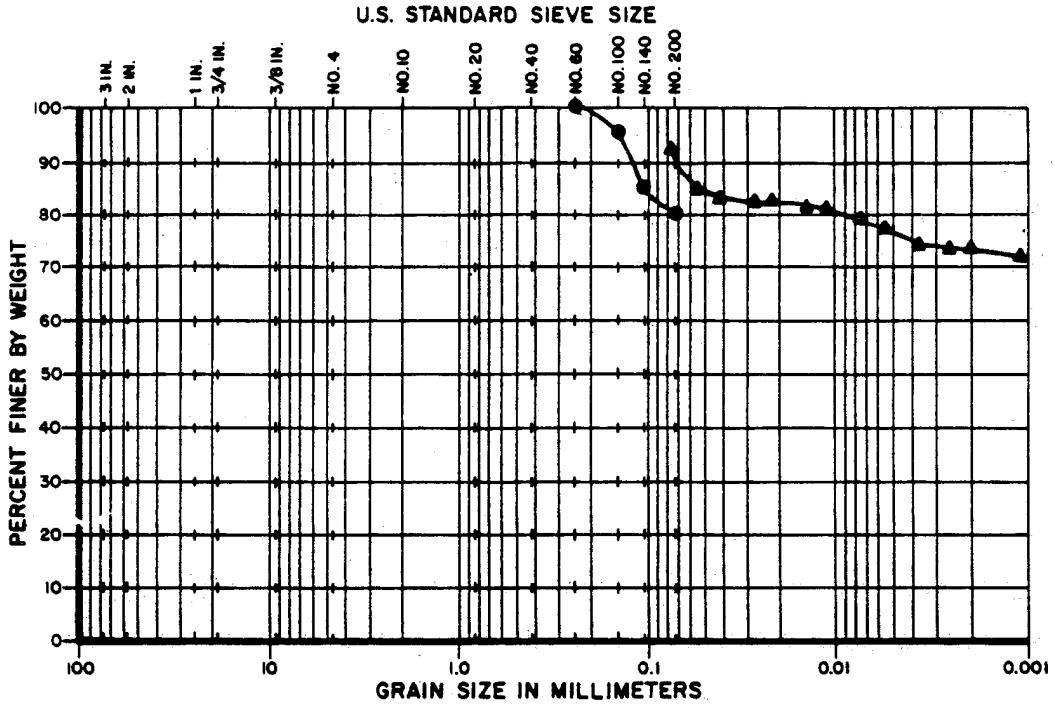

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
B-3	US-6	15.0'-17.0'		GRAY CLAY WITH SEAMS OF GRAY FINE SAND	CH
			●	SIEVE ANALYSIS	
			▲	HYDROMETER	

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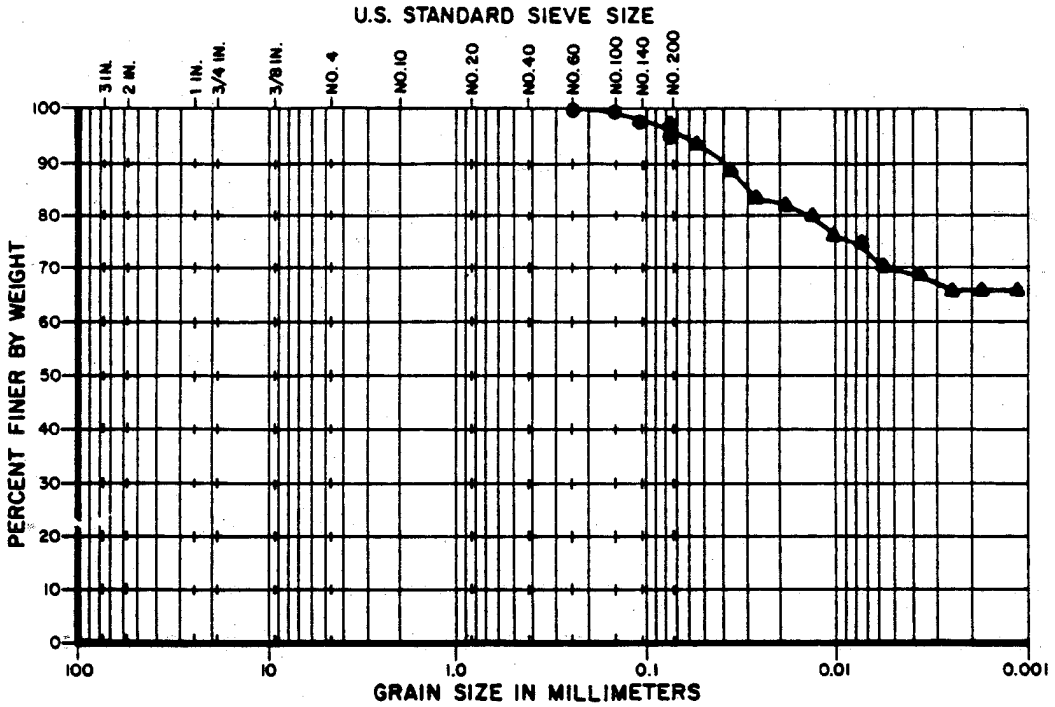

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
B-3	US-9	30.0'-31.5'		BROWN CLAY	CH
			●	SIEVE ANALYSIS	
			▲	HYDROMETER	

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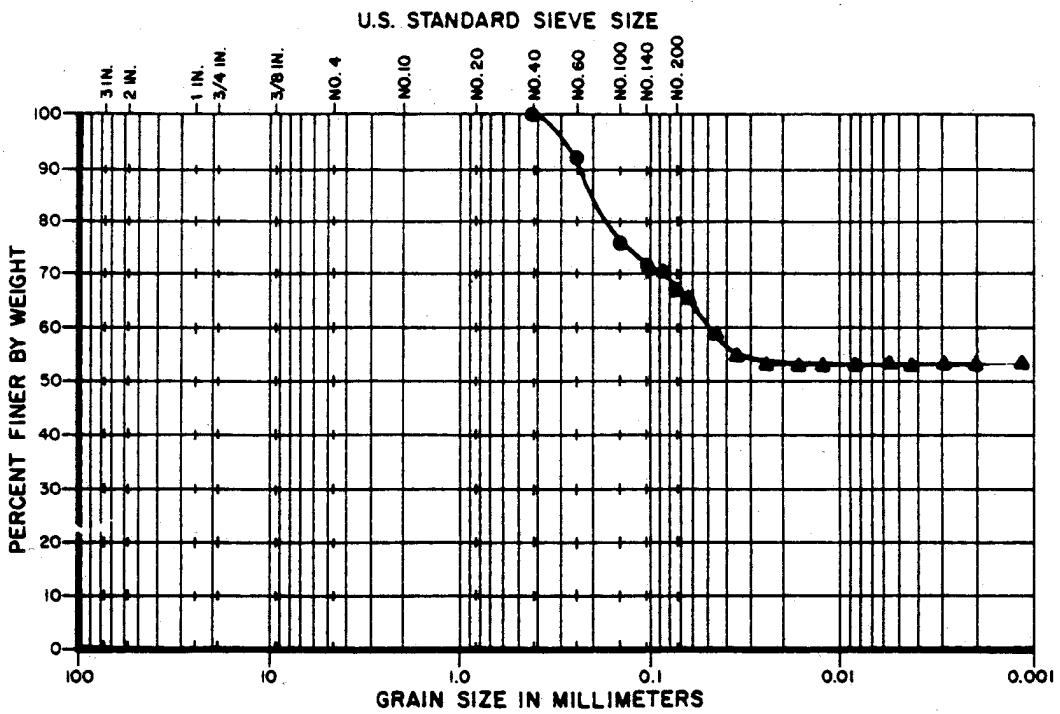

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
B-3	US-16	65.0'-66.3'		DARK GRAY SANDY CLAY	CH
			●	SIEVE ANALYSIS	
			▲	HYDROMETER	

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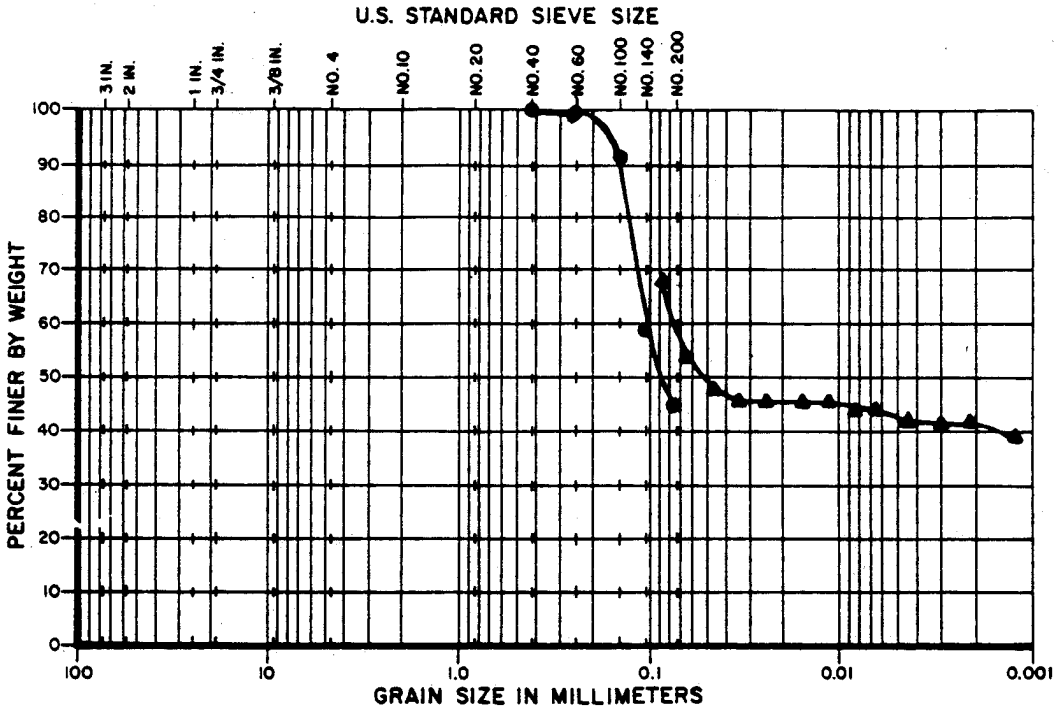

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
B-4	US-6	15.0'-17.0'		GRAY CLAY WITH SEAMS OF GRAY FINE SAND	CH
			●	SIEVE ANALYSIS	
			▲	HYDROMETER	

GRAIN SIZE DISTRIBUTION

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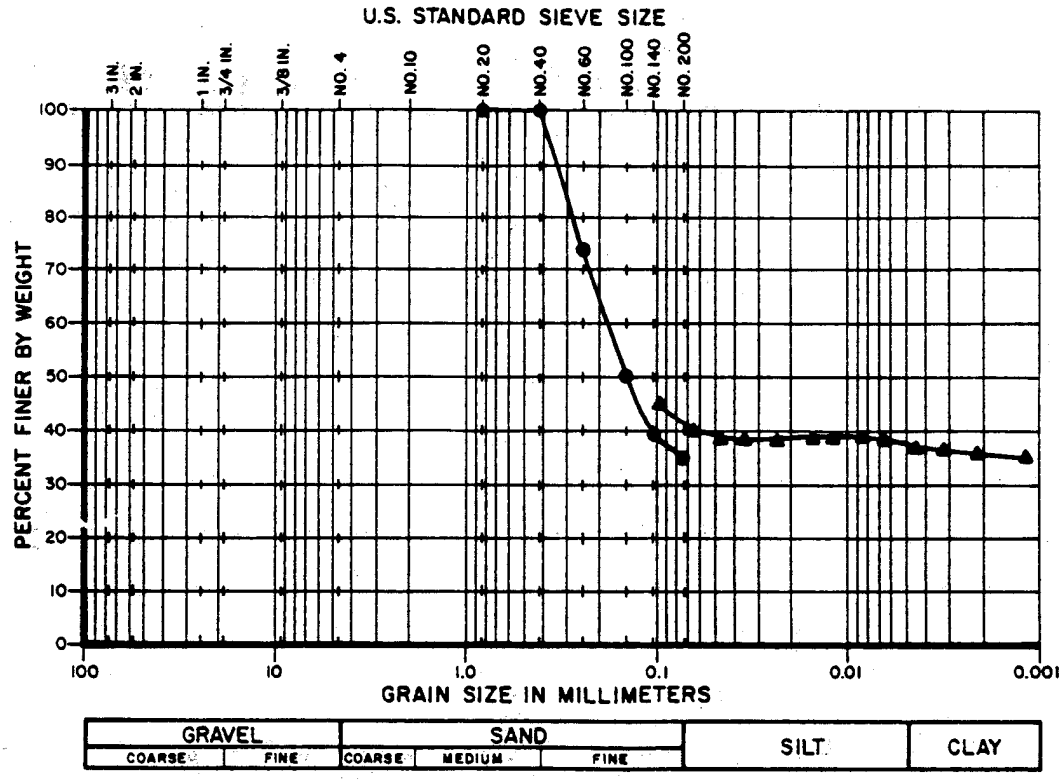

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
B-5	US-4	7.5'-9.5'		GRAY CLAYEY FINE SAND	SC
			●	SIEVE ANALYSIS	
			▲	HYDROMETER	

GRAIN SIZE DISTRIBUTION

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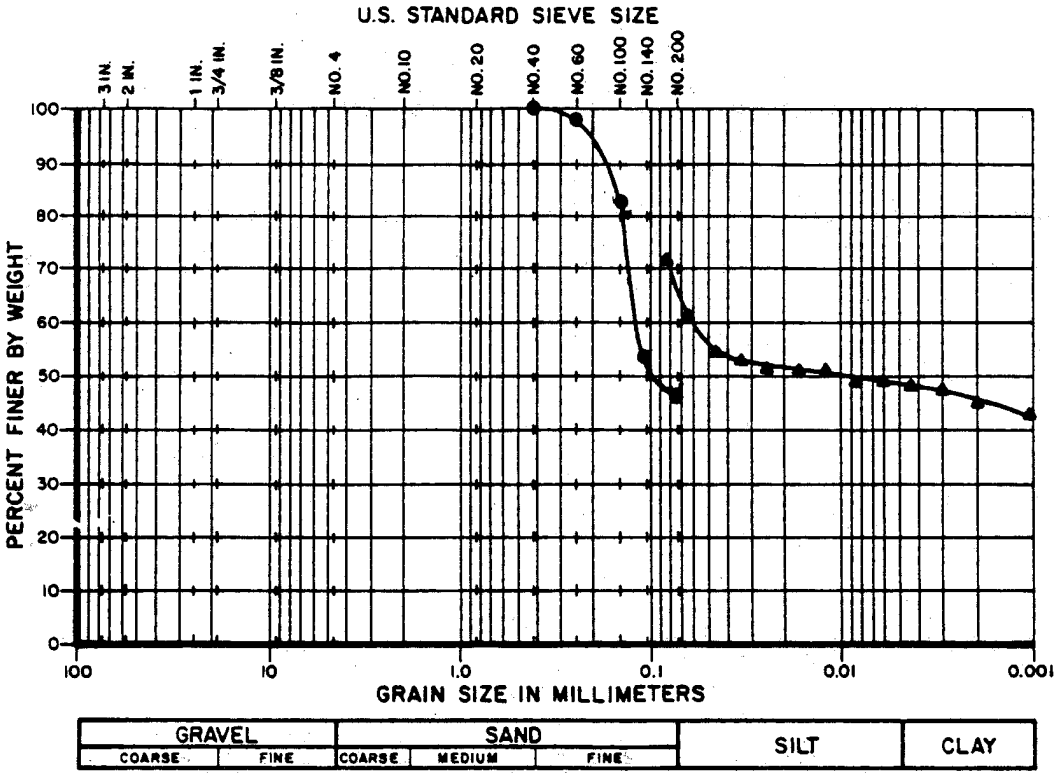

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
B-7	US-6	15.0'-17.0'		GREENISH GRAY SANDY CLAY	CH
			●	SIEVE ANALYSIS	
			▲	HYDROMETER	

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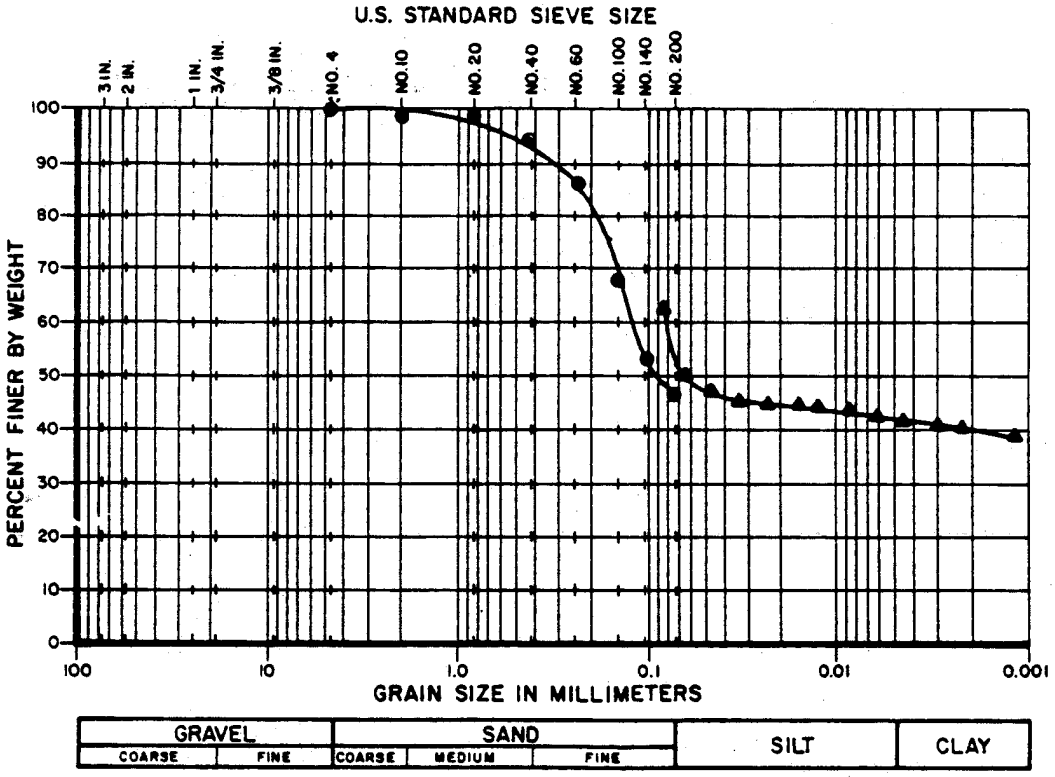

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
B-8	US-7	20.0'-22.0'		BROWNISH GRAY SANDY CLAY	CH
			●	SIEVE ANALYSIS	
			▲	HYDROMETER	

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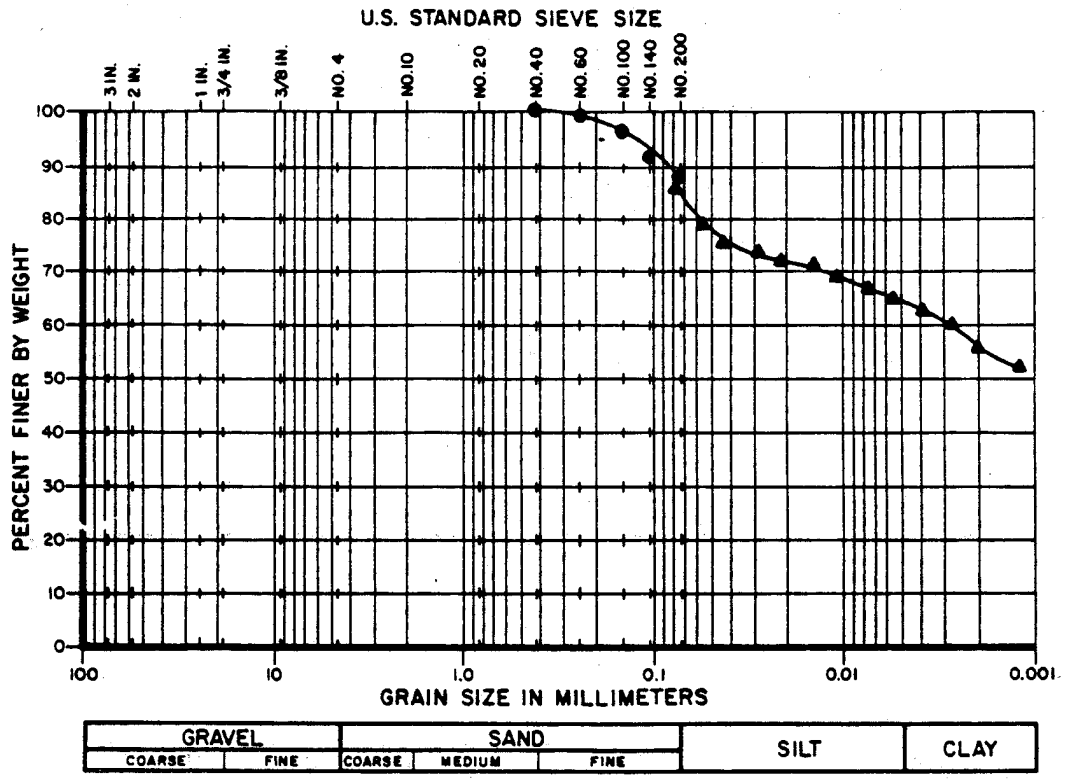

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
B-8	US-8	25.0'-27.0'		BROWNISH GRAY SILTY CLAY	CH
			●	SIEVE ANALYSIS	
			▲	HYDROMETER	

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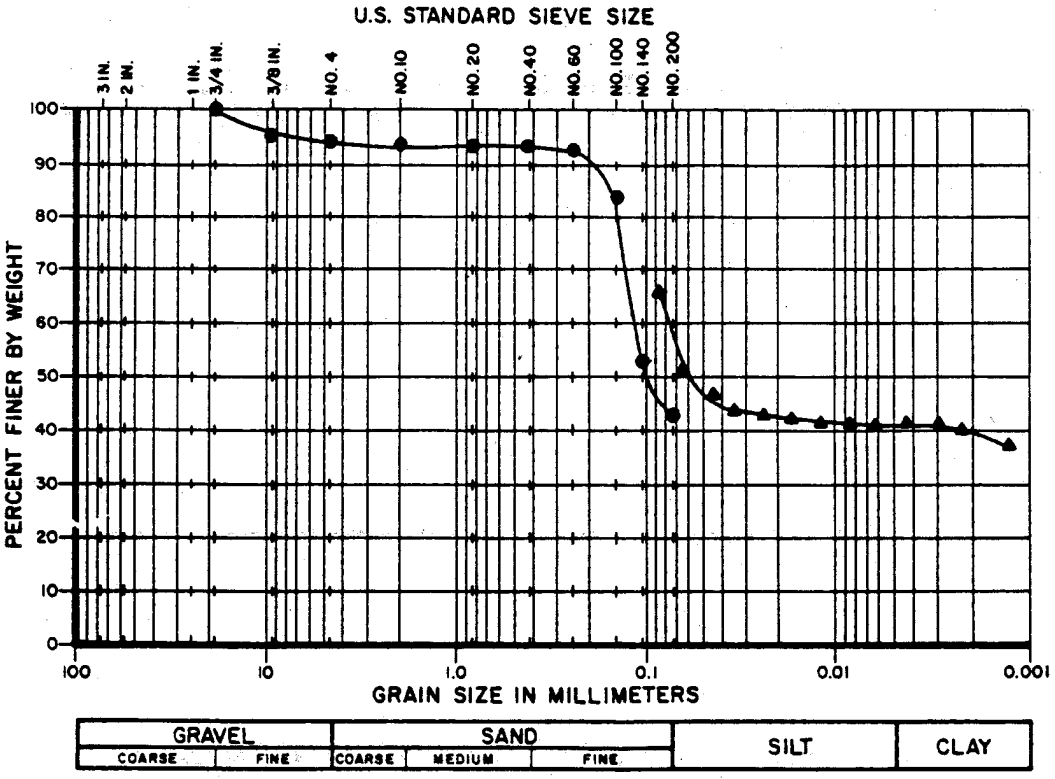

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
B-9	US-6	15.0'-17.0'		GREENISH BROWN SANDY CLAY	CH
			●	SLEVE ANALYSIS	
			▲	HYDROMETER	

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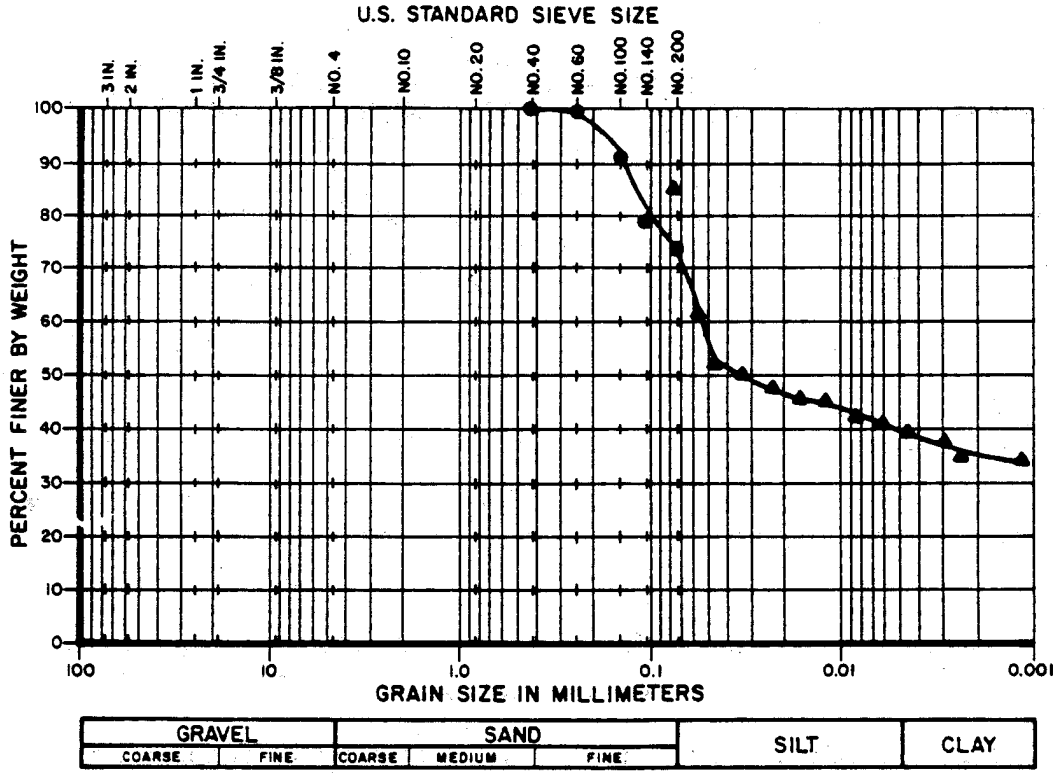

TEST HOLE NO.	SAMPLE NO.	DEPTH	SYMBOL	SAMPLE DESCRIPTION	UNIFIED CLASS.
B-9	US-10	35.0'-37.0'		GRAY SANDY CLAY	CH
			●	SIEVE ANALYSIS	
			▲	HYDROMETER	

GRAIN SIZE DISTRIBUTION

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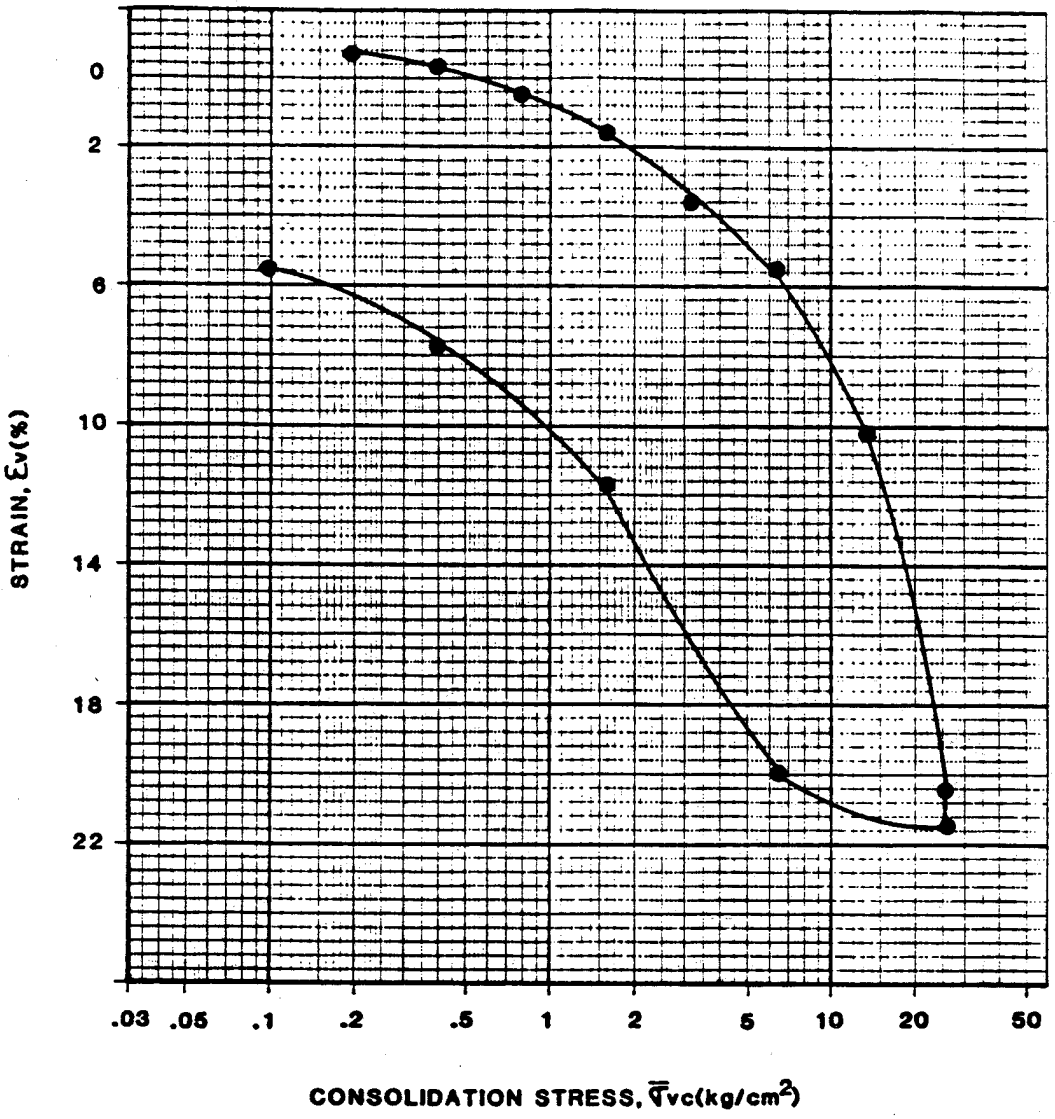

TEST DATA

BORING NUMBER B-2
SAMPLE NUMBER US-5
DEPTH (FEET) 10.0'-12.0', BLOCK #2
CLASSIFICATION
HEIGHT (INCHES) .74625
DIAMETER (INCHES) 1.9685
INITIAL MOISTURE CONTENT(%) 39.9
INITIAL DRY DENSITY(LB/FT^3) 81.2
SPECIFIC GRAVITY 2.72
FINAL MOISTURE CONTENT(%) 40.0
LIQUID LIMIT(%)
PLASTIC LIMIT(%)

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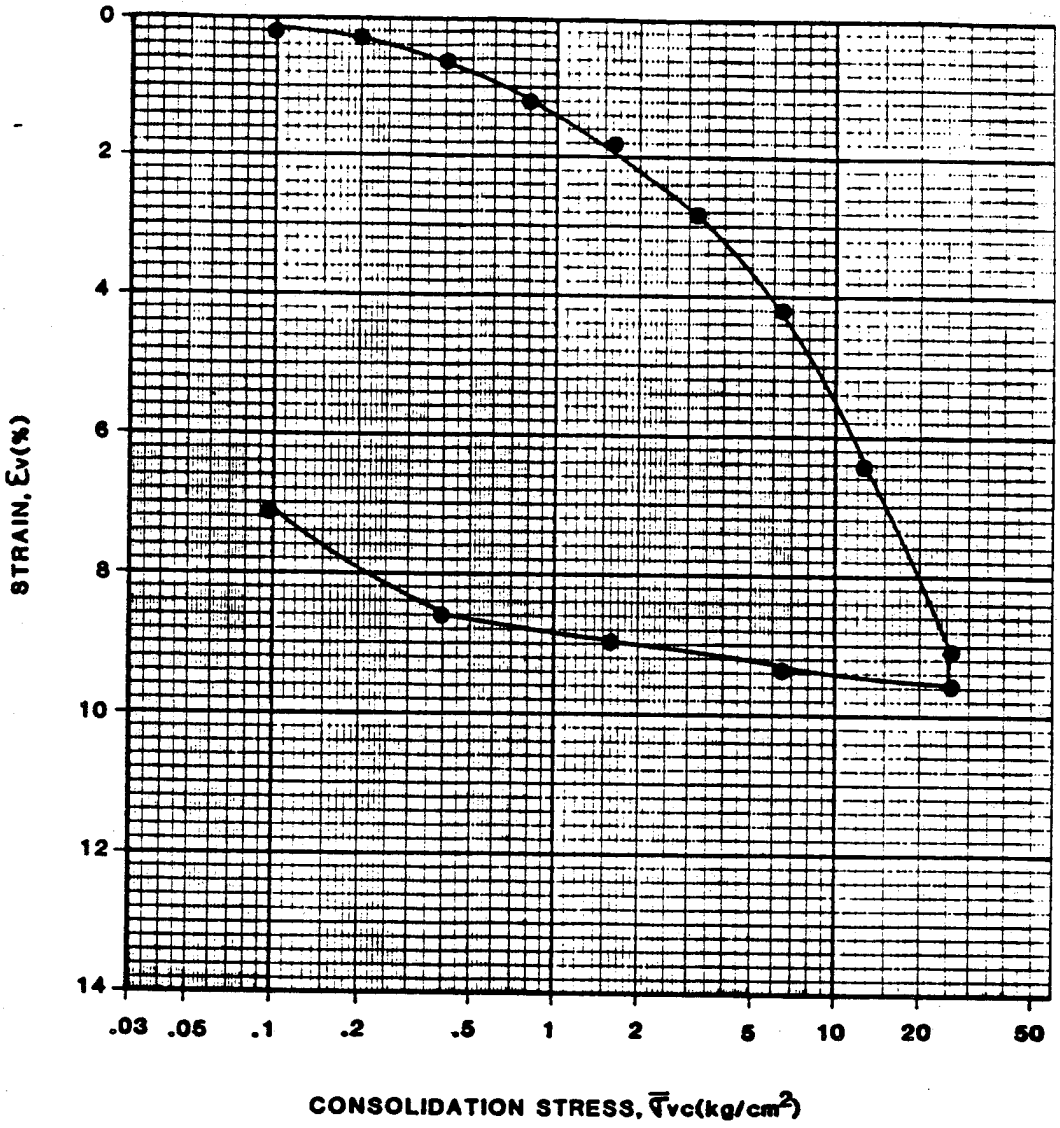
88-9155A		

N82070



TEST DATA

BORING NUMBER B-1
SAMPLE NUMBER US-4
DEPTH (FEET) 7.5'-9.5' CON #1
CLASSIFICATION
HEIGHT (INCHES) .74550
DIAMETER (INCHES) 1.9685
INITIAL MOISTURE CONTENT(%) 16.9
INITIAL DRY DENSITY(LB/FT^3) 108.9
SPECIFIC GRAVITY 2.68
FINAL MOISTURE CONTENT(%) 15.5
LIQUID LIMIT (%)
PLASTIC LIMIT (%)

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FILE NO	APPROVED BY	
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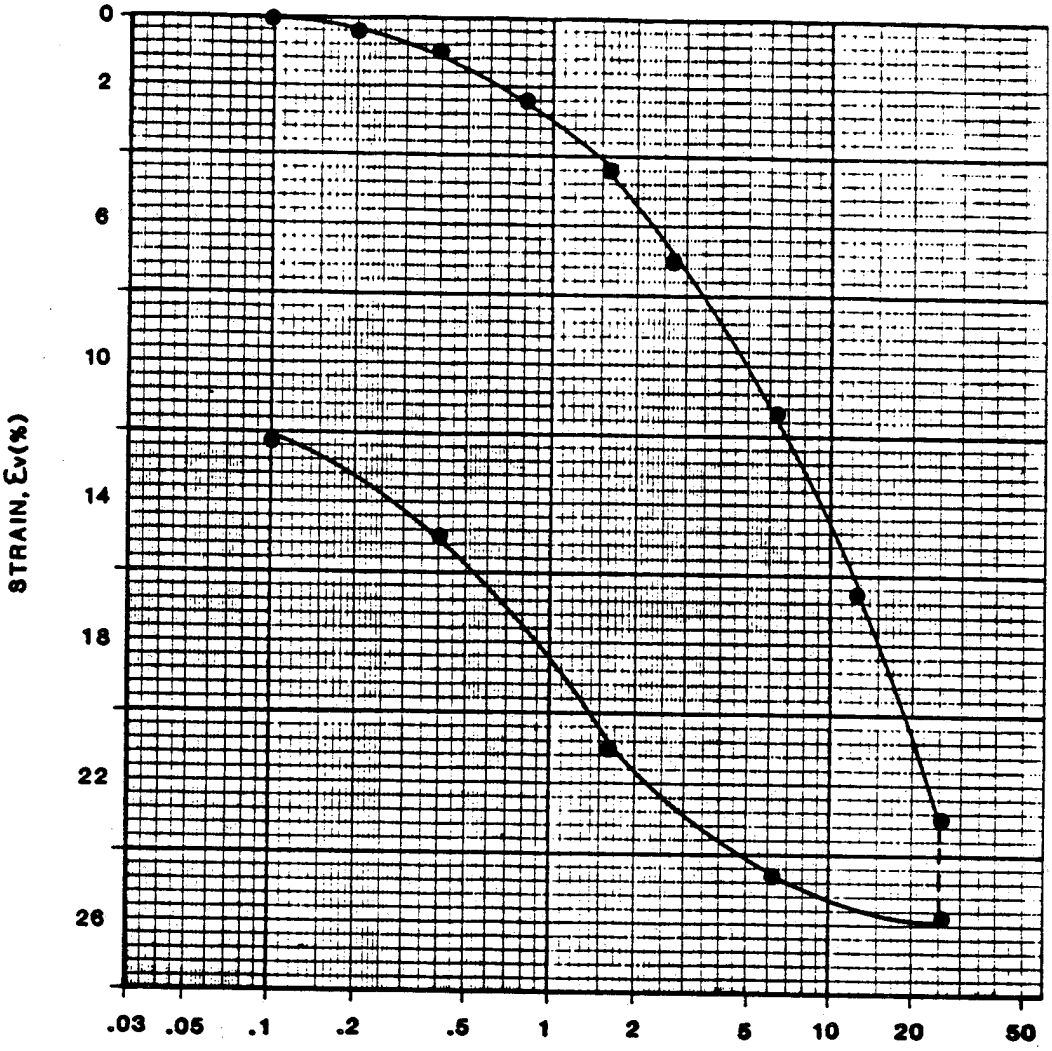
N82070



TEST DATA

BORING NUMBER B-5
SAMPLE NUMBER US-6
DEPTH (FEET) 15.0'-17.0', CON #1
CLASSIFICATION
HEIGHT (INCHES) .75025
DIAMETER (INCHES) 1.9685
INITIAL MOISTURE CONTENT(%) 44.8
INITIAL DRY DENSITY(LB/FT^3) 72.4
SPECIFIC GRAVITY 2.70
FINAL MOISTURE CONTENT(%) 42.3
LIQUID LIMIT(%)
PLASTIC LIMIT(%)

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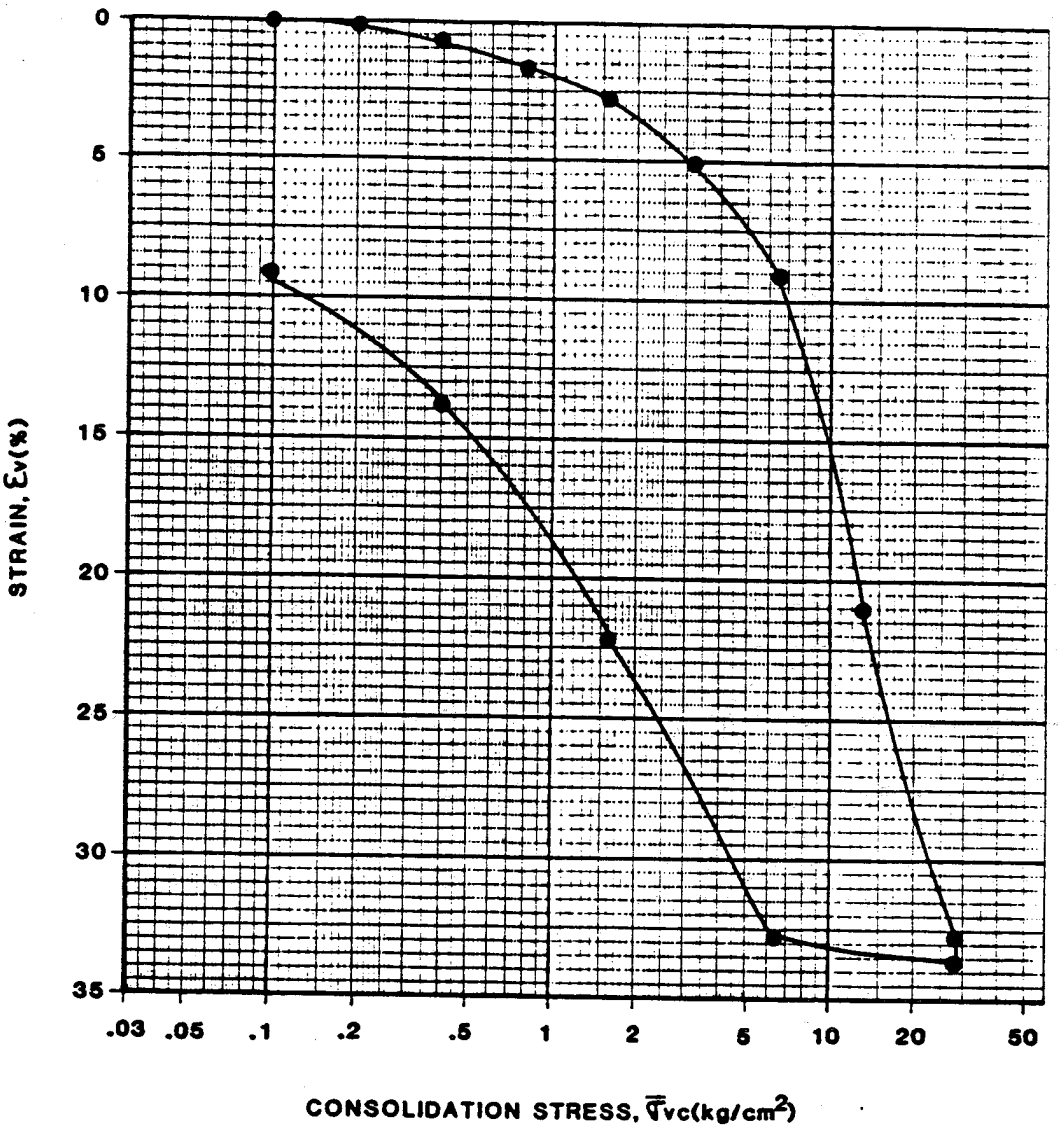

TEST DATA

BORING NUMBER B-9
SAMPLE NUMBER US-8
DEPTH (FEET) 25.0'-27.0', CON #2
CLASSIFICATION
HEIGHT (INCHES) .77550
DIAMETER (INCHES) 1.9865
INITIAL MOISTURE CONTENT(%) 80.5
INITIAL DRY DENSITY(LB/FT^3) 51.6
SPECIFIC GRAVITY 2.73
FINAL MOISTURE CONTENT(%) 52.9
LIQUID LIMIT(%)
PLASTIC LIMIT(%)

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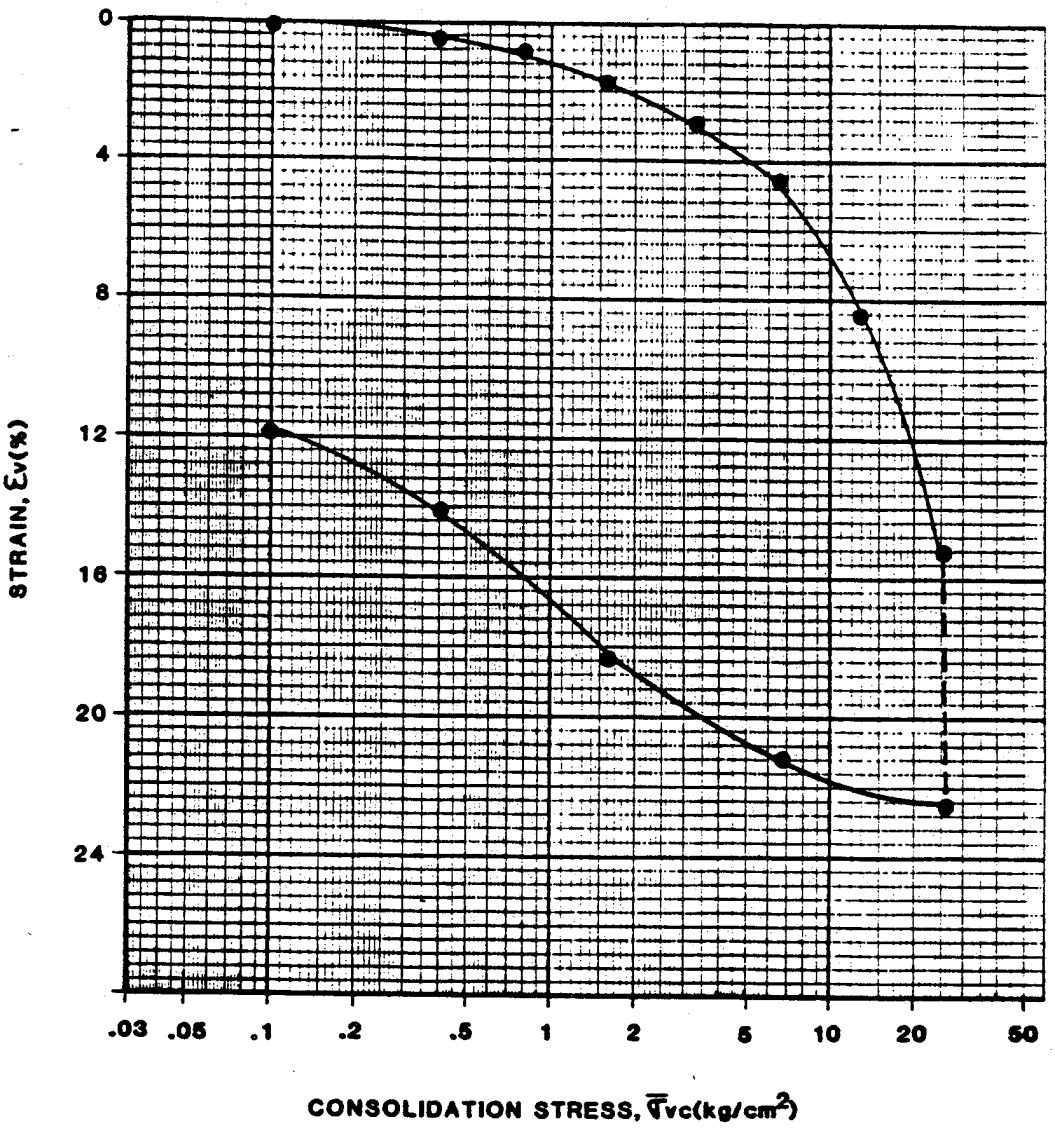

TEST DATA

BORING NUMBER B-3
SAMPLE NUMBER US-16
DEPTH (FEET) 66.0'-67.0', CON #1
CLASSIFICATION
HEIGHT (INCHES) .74800
DIAMETER (INCHES) 1.9685
INITIAL MOISTURE CONTENT(%) 63.2
INITIAL DRY DENSITY(LB/FT^3) 59.9
SPECIFIC GRAVITY 2.69
FINAL MOISTURE CONTENT(%) 56.5
LIQUID LIMIT(%)
PLASTIC LIMIT(%)

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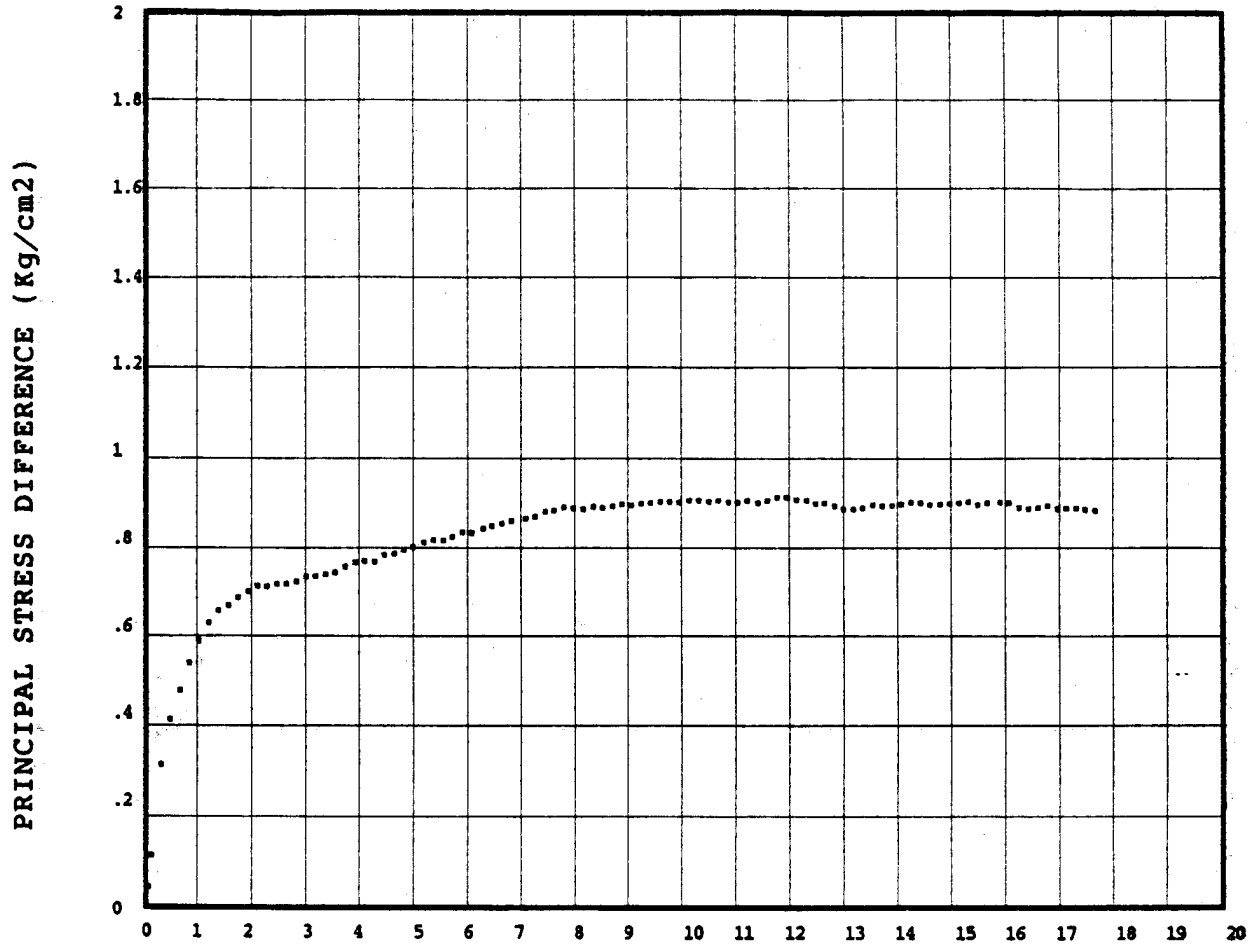
N82070

Sample Name : B-1, US-4, 7.5'-9.5', BLOCK #2



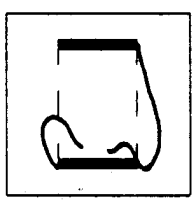
Dry density :108.40 pcf

Water content : 15.80 %

Saturation : 78.04 %

Cell pressure : 0.30 kg/cm2

Strain rate : 1.00%/min



TYPE OF FAILURE

UNCONSOLIDATED - UNDRAINED TRIAXIAL COMPRESSION TEST

Ardaman & Associates Inc.

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4040 MEGAWATT COMBUSTION GENERATOR
AGRICO-SOUTH SITE

DRAWN BY:HAD	CHECKED BY:	DATE:12/16/88
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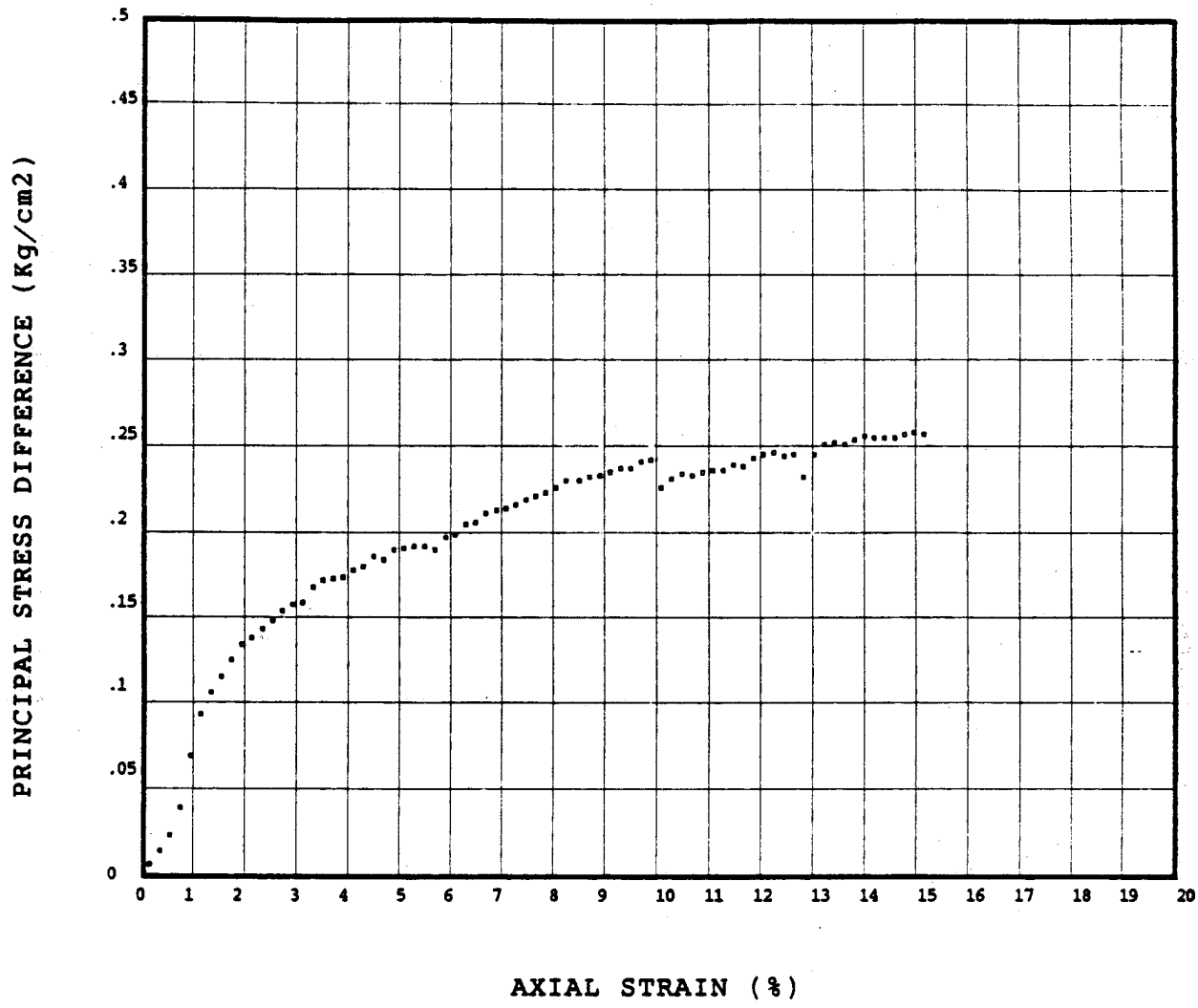
Sample Name : B-1, US-8, 25.0'-27.0', SS#1



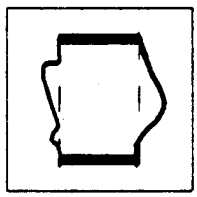
Dry density : 90.03 pcf

Water content : 29.71 %

Saturation : 94.07 %

Cell pressure : 0.73 kg/cm2

Strain rate : 1.00%/min



TYPE OF FAILURE

UNCONSOLIDATED - UNDRAINED TRIAXIAL COMPRESSION TEST

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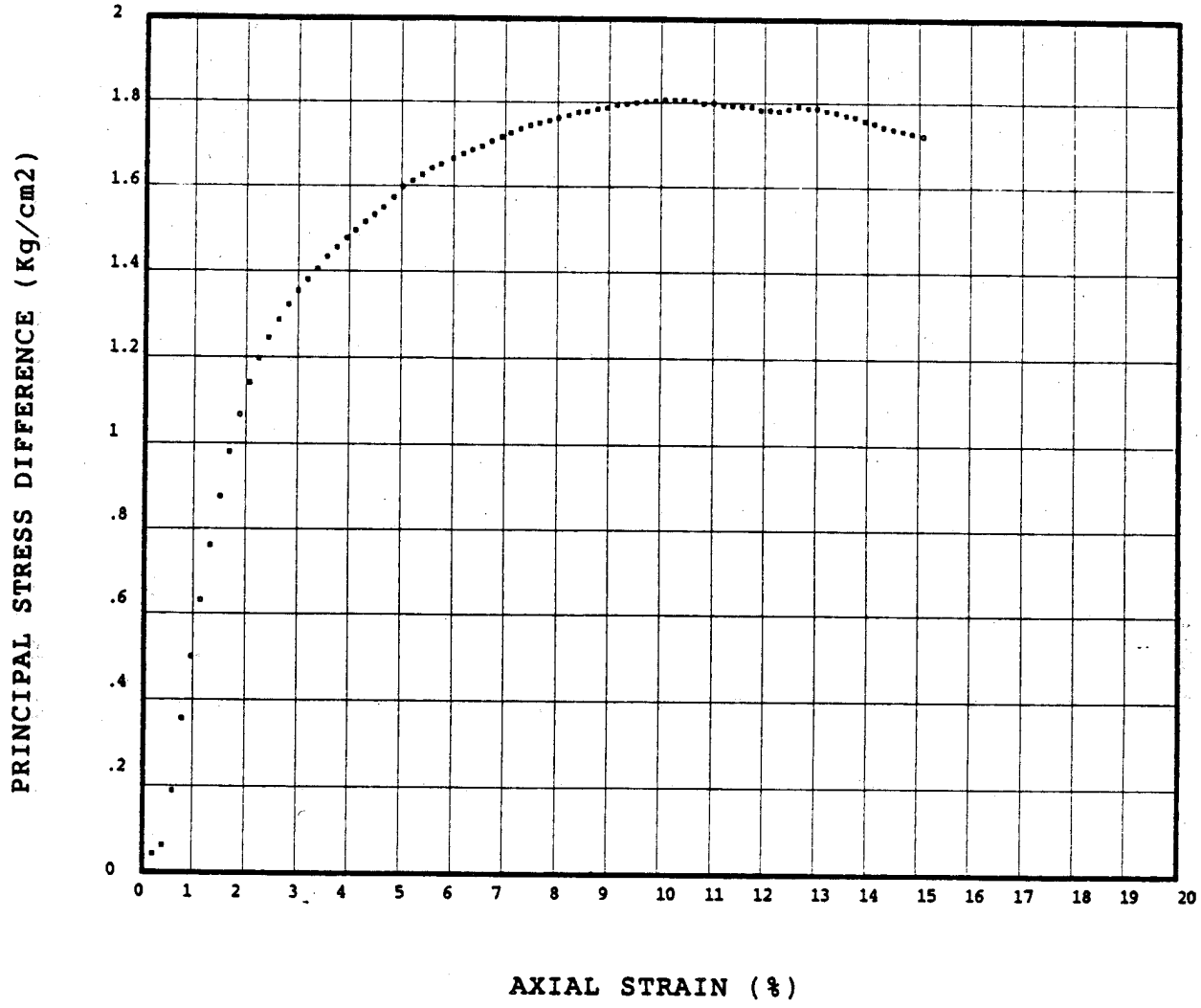
FILE NO. 88-9155A	APPROVED BY:	

Sample Name : B-2, US-5, 10.0'-12.0', SS#2



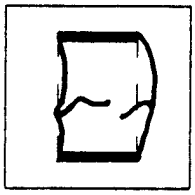
Dry density :101.49 pcf

Water content : 21.96 %

Saturation : 90.85 %

Cell pressure : 0.37 kg/cm2

Strain rate : 1.00%/min



TYPE OF FAILURE

UNCONSOLIDATED - UNDRAINED TRIAXIAL COMPRESSION TEST

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4040 MEGAWATT COMBUSTION GENERATOR
AGRICO-SOUTH SITE

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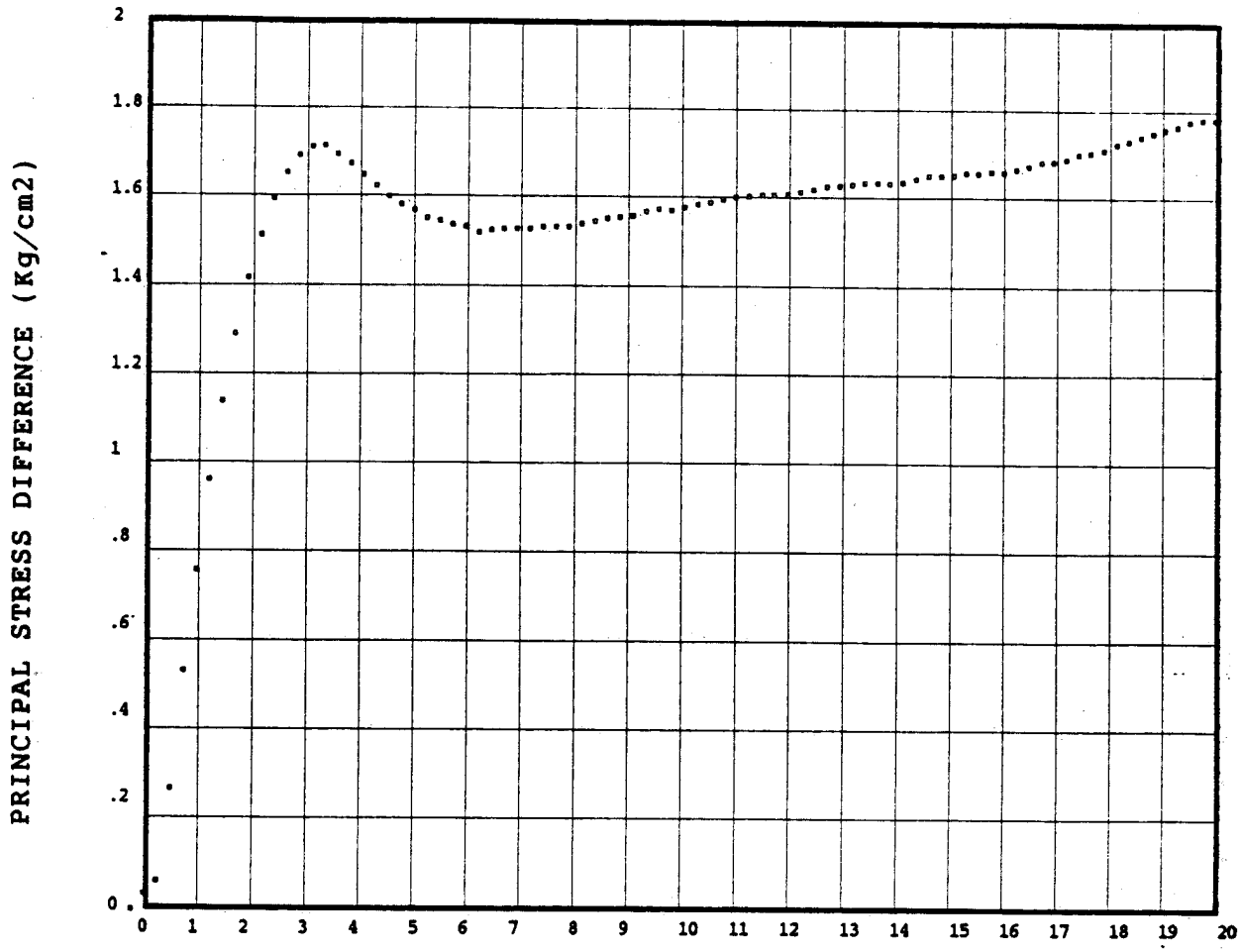
Sample Name : B-2, US-10, 35.0'-36.0', SS#1



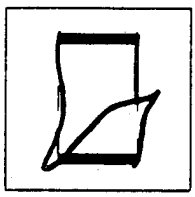
Dry density : 80.86 pcf

Water content : 39.77 %

Saturation : 98.77 %

Cell pressure : 0.90 kg/cm2

Strain rate : 1.00%/min



TYPE OF FAILURE

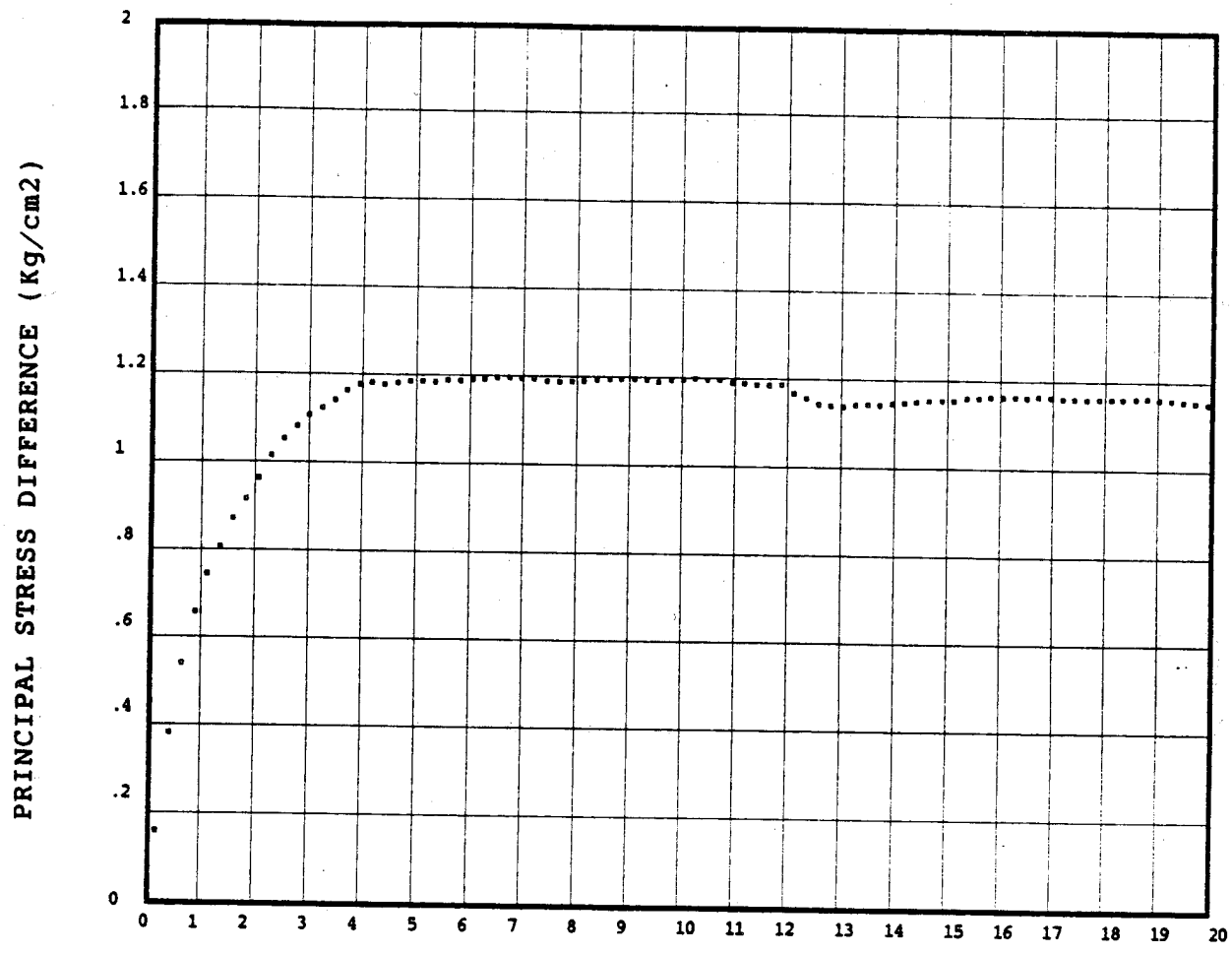
UNCONSOLIDATED - UNDRAINED TRIAXIAL COMPRESSION TEST

Ardaman & Associates Inc.

SEMINOLE ELECTRIC COOPERATIVE INC.
4040 MEGAWATT COMBUSTION GENERATOR
AGRICO-SOUTH SITE

DRAWN BY: HAD	CHECKED BY:	DATE: 12/16/88
FILE NO. 88-9155A	APPROVED BY:	

Sample Name : B-3, US-7, 20.0'-21.5', SS#1



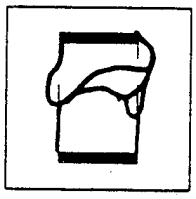
Dry density : 54.40 pcf

Water content : 75.55 %

Saturation : 96.60 %

Cell pressure : 0.58 kg/cm2

Strain rate : 1.00%/min



TYPE OF FAILURE

UNCONSOLIDATED - UNDRAINED TRIAXIAL COMPRESSION TEST

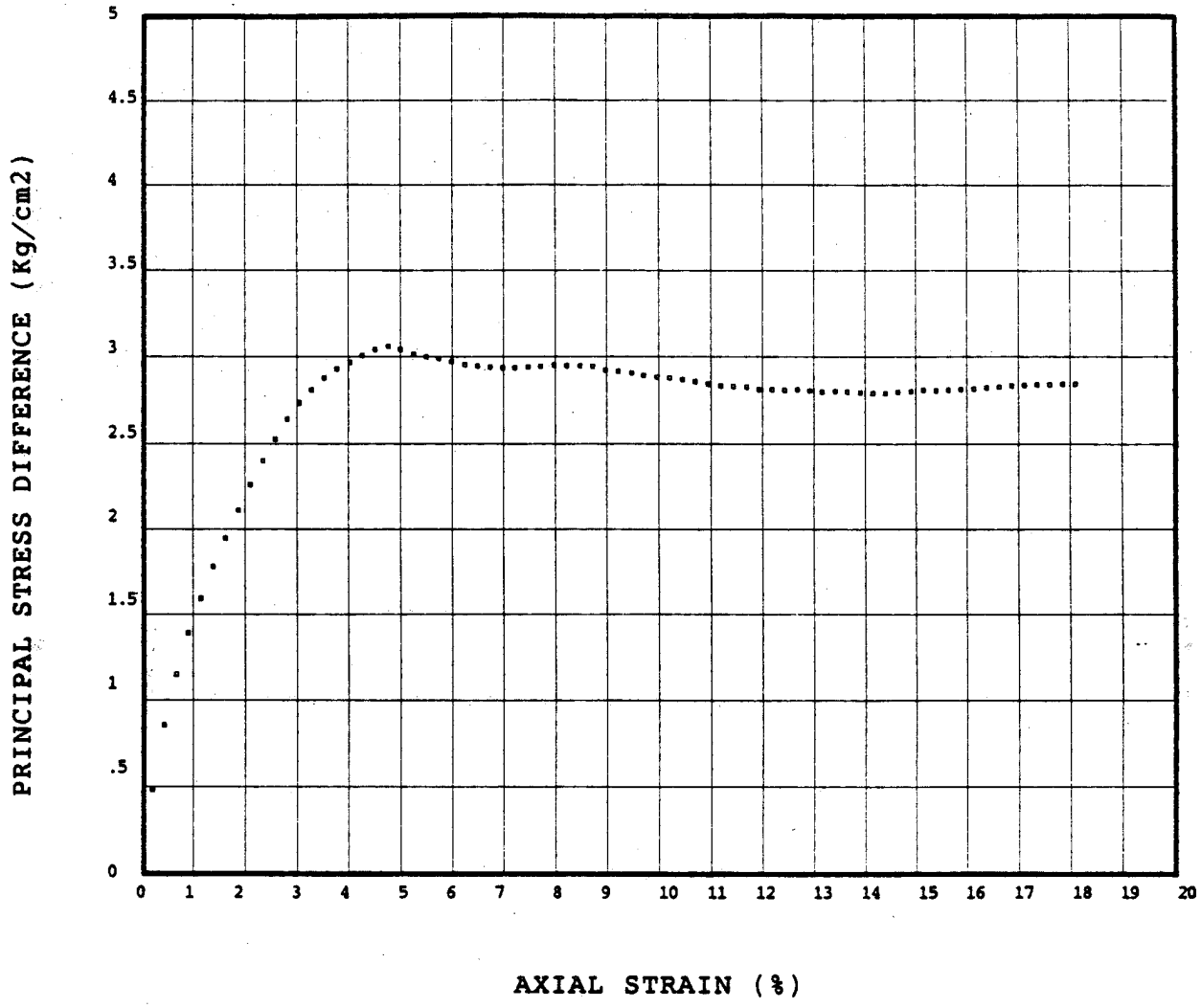
Ardaman & Associates Inc.

SEMINOLE ELECTRIC COOPERATIVE INC.
4040 MEGAWATT COMBUSTION GENERATOR
AGRICO-SOUTH SITE

DRAWN BY: HAD | CHECKED BY: | DATE: 12/16/88

FILE NO. 88-9155A | APPROVED BY:

Sample Name : B-3, US-16, 65.0'-67.0', SS#1



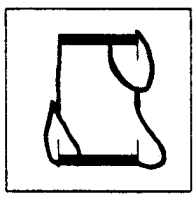
Dry density : 38.50 pcf

Water content :119.91 %

Saturation : 95.70 %

Cell pressure : 1.61 kg/cm2

Strain rate : 1.00%/min



TYPE OF FAILURE

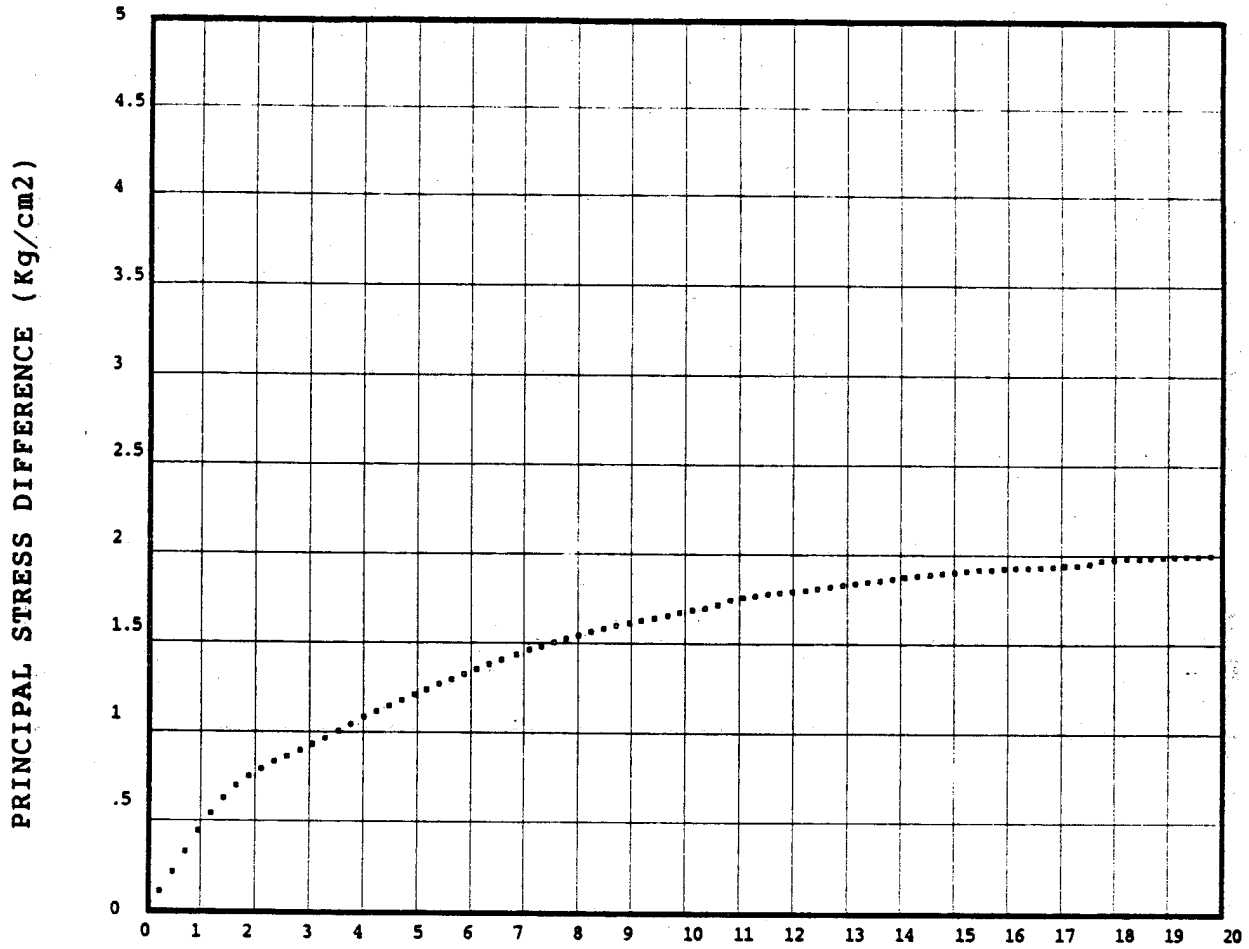
UNCONSOLIDATED - UNDRAINED TRIAXIAL COMPRESSION TEST

Ardaman & Associates Inc.

SEMINOLE ELECTRIC COOPERATIVE INC.
4040 MEGAWATT COMBUSTION GENERATOR
AGRICO-SOUTH SITE

DRAWN BY:HAD	CHECKED BY:	DATE:12/16/88
FILE NO. 88-9155A	APPROVED BY:	

Sample Name : B-4, US-5, 10.0'-12.0', SS#1



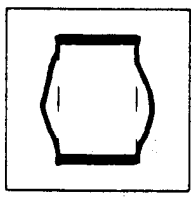
Dry density :116.46 pcf

Water content : 15.25 %

Saturation : 93.76 %

Cell pressure : 0.39 kg/cm2

Strain rate : 1.00%/min



TYPE OF FAILURE

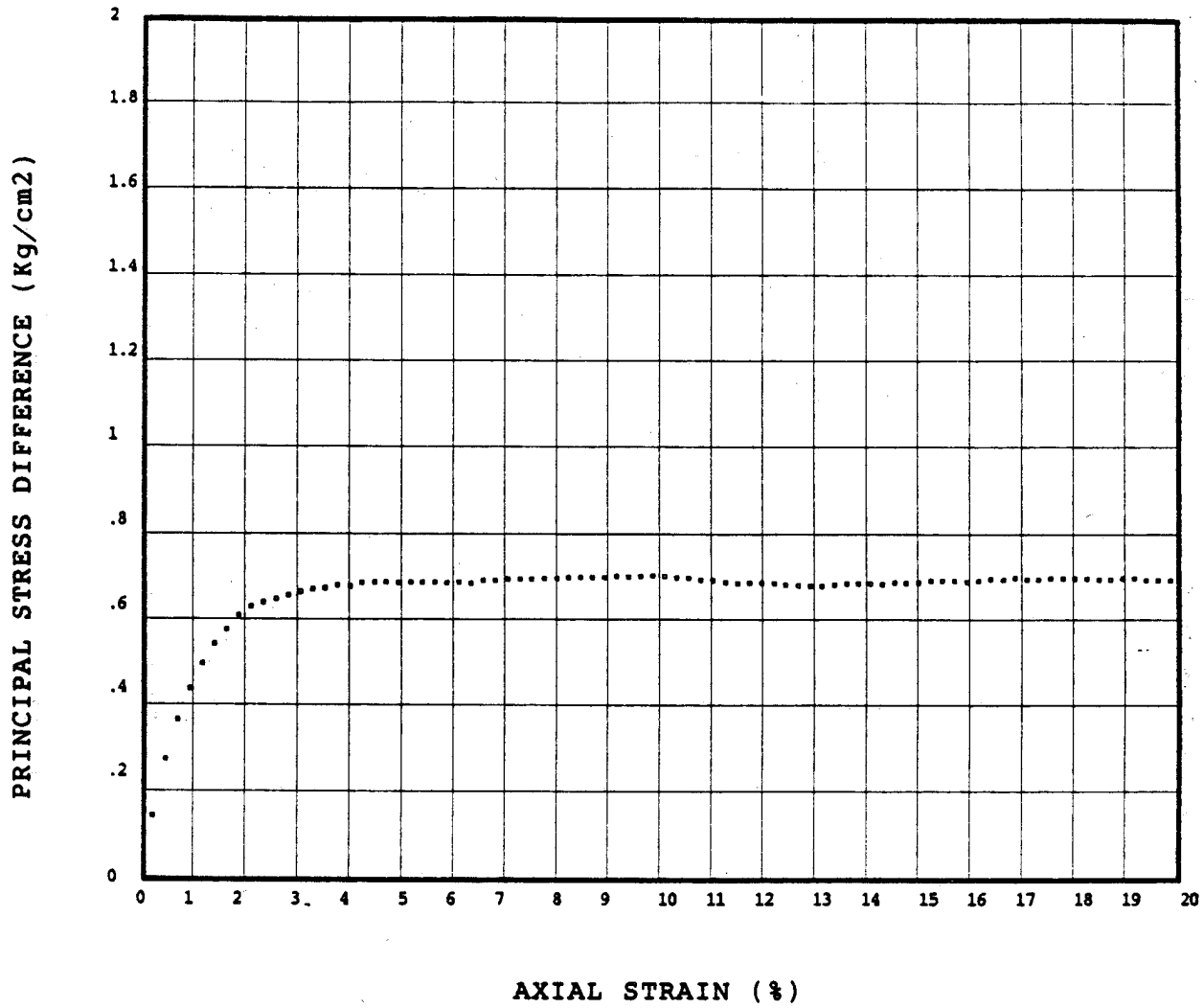
UNCONSOLIDATED - UNDRAINED TRIAXIAL COMPRESSION TEST

Ardaman & Associates Inc.

SEMINOLE ELECTRIC COOPERATIVE INC.
4040 MEGAWATT COMBUSTION GENERATOR
AGRICO-SOUTH SITE

DRAWN BY:HAD	CHECKED BY:GJ	DATE:12/16/88
FILE NO. 88-9155A	APPROVED BY:	

Sample Name : B-4, US-6, 15.0'-17.0', SS#1



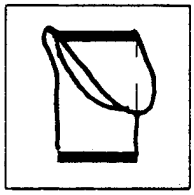
Dry density : 78.66 pcf

Water content : 38.86 %

Saturation : 91.58 %

Cell pressure : 0.63 kg/cm2

Strain rate : 1.00%/min



TYPE OF FAILURE

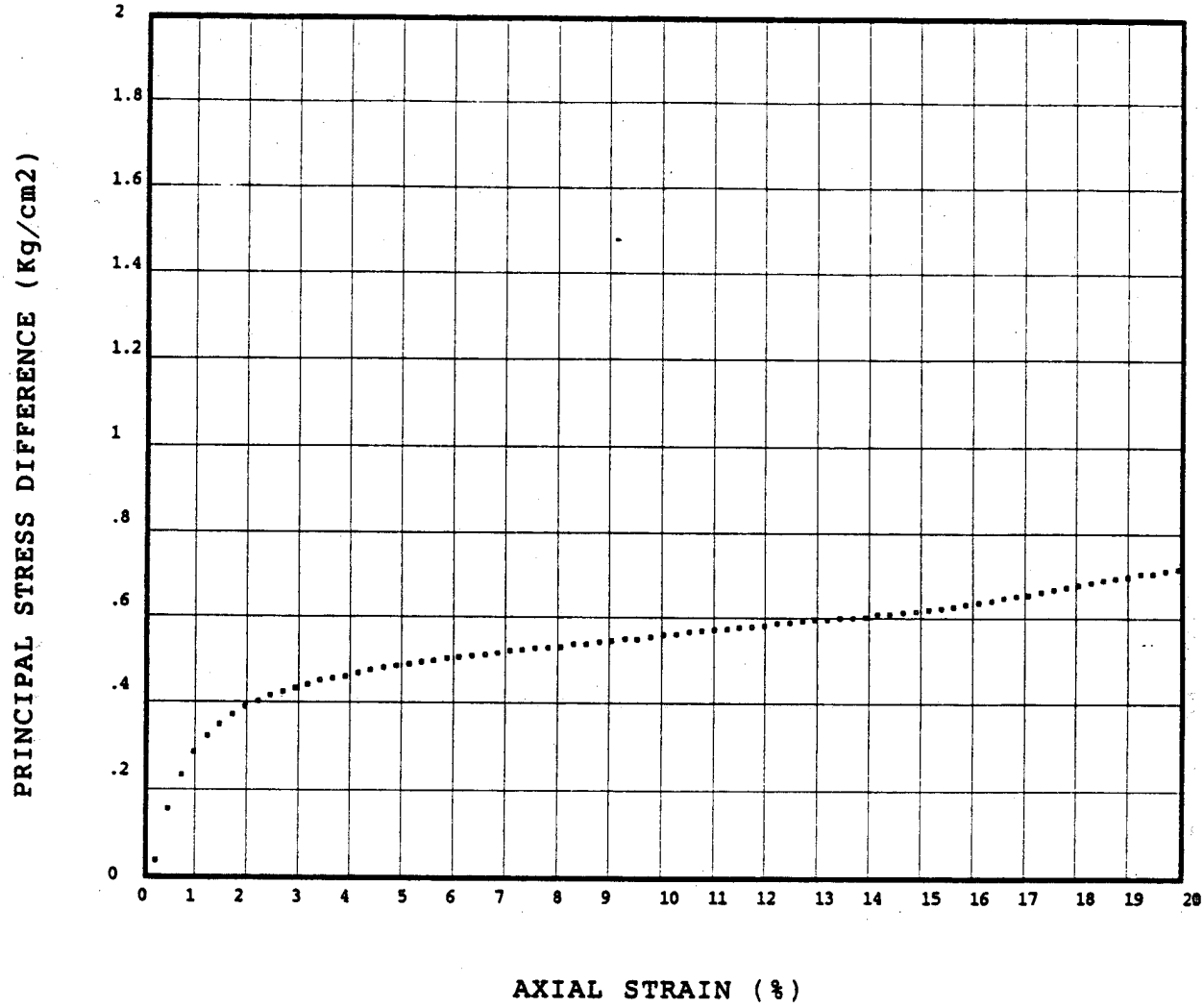
UNCONSOLIDATED - UNDRAINED TRIAXIAL COMPRESSION TEST

Ardaman & Associates Inc.

SEMINOLE ELECTRIC COOPERATIVE INC.
4040 MEGAWATT COMBUSTION GENERATOR
AGRICO-SOUTH SITE

DRAWN BY: HAD	CHECKED BY:	DATE: 12/16/88
FILE NO. 88-9155A	APPROVED BY:	

Sample Name : B-5, US-6, 15.0'-17.0', SS#1



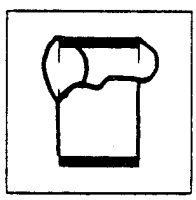
Dry density : 71.49 pcf

Water content : 49.34 %

Saturation : 98.19 %

Cell pressure : 0.49 kg/cm2

Strain rate : 1.00%/min



TYPE OF FAILURE

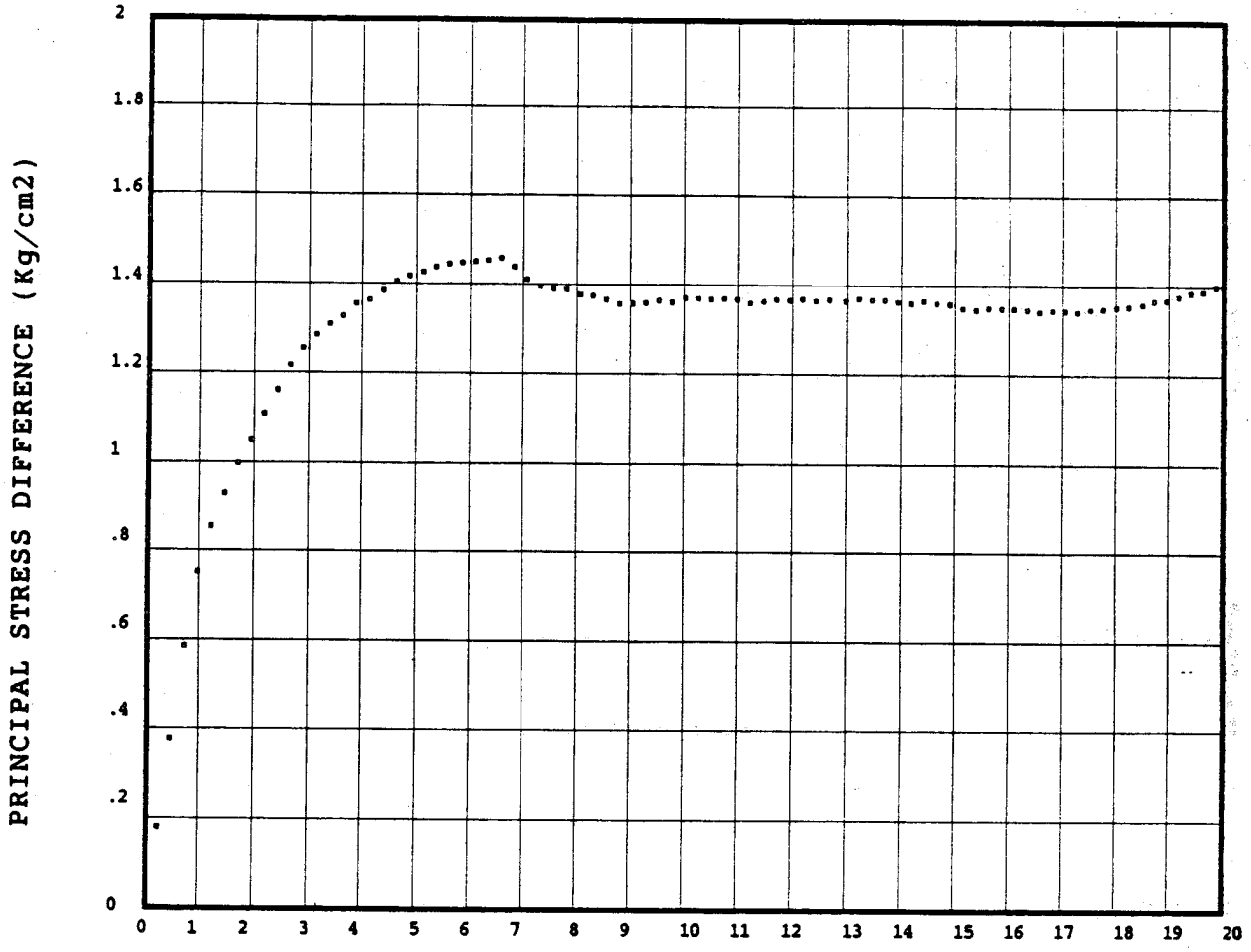
UNCONSOLIDATED - UNDRAINED TRIAXIAL COMPRESSION TEST

Ardaman & Associates Inc.

SEMINOLE ELECTRIC COOPERATIVE INC.
4040 MEGAWATT COMBUSTION GENERATOR
AGRICO-SOUTH SITE

DRAWN BY: HAD	CHECKED BY:	DATE: 12/16/88
FILE NO. 88-9155A	APPROVED BY:	

Sample Name : B-7, US-6, 15.0'-17.0', SS#1



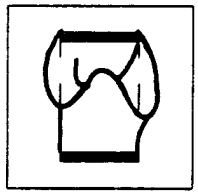
Dry density : 60.44 pcf

Water content : 62.53 %

Saturation : 94.44 %

Cell pressure : 0.49 kg/cm2

Strain rate : 1.00%/min



TYPE OF FAILURE

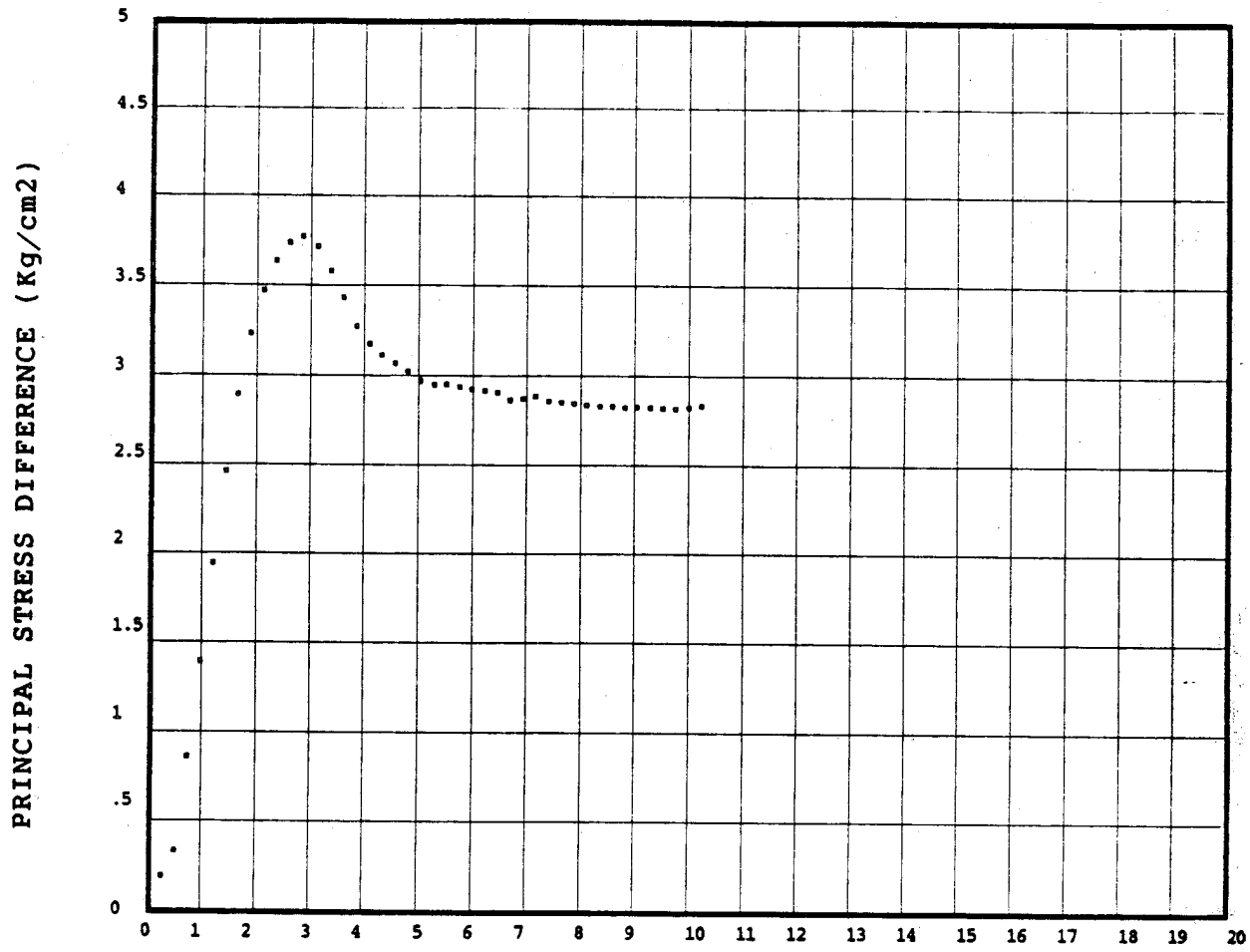
UNCONSOLIDATED - UNDRAINED TRIAXIAL COMPRESSION TEST

Ardaman & Associates Inc.

SEMINOLE ELECTRIC COOPERATIVE INC.
4040 MEGAWATT COMBUSTION GENERATOR
AGRICO-SOUTH SITE

DRAWN BY: HAD	CHECKED BY: JW	DATE: 12/16/8
FILE NO. 88-9155A	APPROVED BY:	

Sample Name : B-8, US-10, 35.0'-37.0', SS#1



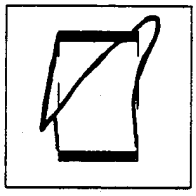
Dry density : 81.63 pcf

Water content : 35.30 %

Saturation : 90.55 %

Cell pressure : 0.93 kg/cm2

Strain rate : 1.00%/min



TYPE OF FAILURE

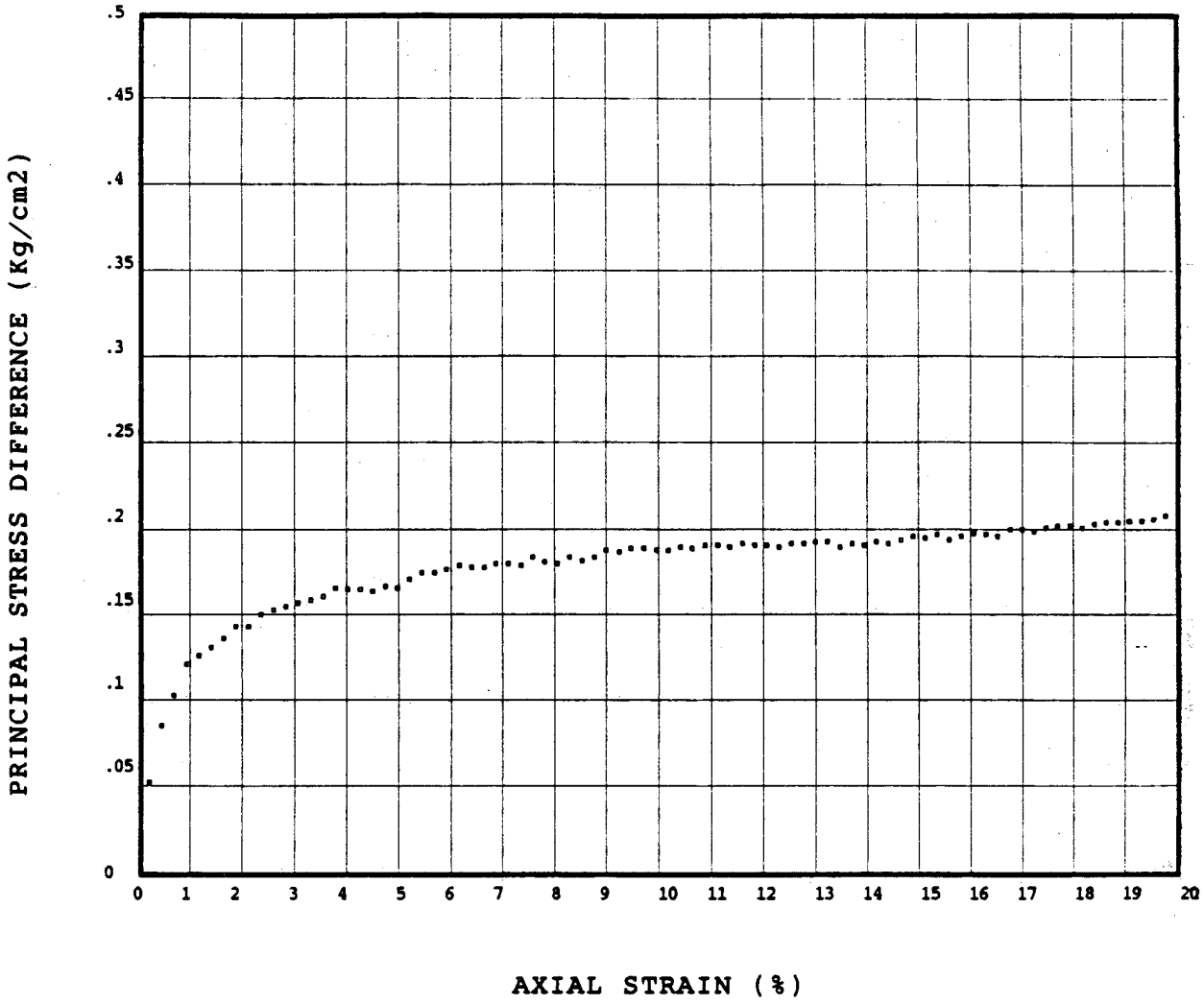
UNCONSOLIDATED - UNDRAINED TRIAXIAL COMPRESSION TEST

Ardaman & Associates Inc.

SEMINOLE ELECTRIC COOPERATIVE INC.
4040 MEGAWATT COMBUSTION GENERATOR
AGRICO-SOUTH SITE

DRAWN BY: HAD	CHECKED BY: JAJ	DATE: 12/16/88
FILE NO. 88-9155A	APPROVED BY:	

Sample Name : B-9, US-8, 25.0'-27.0', SS#1



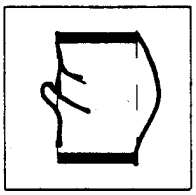
Dry density : 60.61 pcf

Water content : 69.90 %

Saturation :106.05 %

Cell pressure : 0.73 kg/cm2

Strain rate : 1.00%/min



TYPE OF FAILURE

UNCONSOLIDATED - UNDRAINED TRIAXIAL COMPRESSION TEST

Ardaman & Associates Inc.

SEMINOLE ELECTRIC COOPERATIVE INC.
4040 MEGAWATT COMBUSTION GENERATOR
AGRICO-SOUTH SITE

DRAWN BY: HAD	CHECKED BY: JW	DATE: 12/16/88
FILE NO. 88-9155A	APPROVED BY:	

Response to KBN/SECI-88-052 per B&V-SECI-89-145

Item: Section 2.3.1.4

(The following text can be used as an introduction to the SCA appendix that will contain the boring logs--logs previously transmitted direct to KBN by B&V).

The field investigation and laboratory test program were performed in accordance with the following ASTM standards unless otherwise noted.

Field Testing

1.	Split Barrel Sampling	D1586
2.	Tin Walled Tube Sampling	D1587
3.	Dilatometer Tests	ASTM Subcommittee D18.02.10, June 1986

Laboratory Testing

1.	Moisture Content	D2216
2.	Density	D653
3.	Atterbery Limits	D4318
4.	Sieve Analysis	D2217
5.	Hydrometer	D422
6.	Permeability	US Department of the Army EM 1110-2-1906
7.	Organic Content	D2974
8.	Triaxial Compression	D2850
9.	Consolidation	D2435

DESCRIPTION OF GROUND-TRUTHING FEATURES

1. Depression, 2-3 feet deep. Vegetation: dead water hyacinths; and grasses; very soggy center.

2. Depression, 1 foot deep. Vegetation: dead water hyacinths; dry; hog wallows nearby.

3. Depression, 1-2 feet deep. Vegetation: water hyacinth with a reed like grass in the center. I was expecting this depression to have standing water in the center but is it located close to the mining operations and may have been dewatered. Power lines to the east and pipe on ground near east edge of sink. Very small area which looks like a possible sink near the east edge of orange grove an west of this depression.

4. Depression, 3-4 feet deep. Vegetation: water hyacinth with cattails in center. Standing water in center.

5. Depression, 4 feet deep. Vegetation: mature water oaks and other lowland vegetation, marijuana.

6. Could not verify due to mining operations.

7. Depression, 10-12 feet deep. Vegetation: water lillies and other water vegetation. Standing water in bottom.

8. Depression, 4 feet deep. Vegetation: dead water hyacinth, standing water in center.

9. Depression, 6+ feet deep. Vegetation: unidentified reeds and water grasses. Standing water. Wetland.

10. Depression, 4+ feet deep. Vegetation: unidentified; some water lillies; standing water, wetland. Alligator droppings.

11. Depression, continuation of 10, not as deep.

12. Depression, 1-2 feet deep. Vegetation: dead water hyacinths.

13. Depression, 4 feet deep.

14. Depression, 2+ feet deep.

15. Depression, unknown depth, northwest side has scarp could not tell if this was depression rim or just drainage. Drainage developed within trees to a marsh area in center. Center very wet. Vegetation: mature trees, with some wetland vegetation in center. Hard to tell extent of marshy area due to thick vegetation.

16. Depression, 1/2-1 foot in drainage area. Dry possibly due to mine dewatering. Hog wallows nearby.

17. Could not verify due to mining operations.

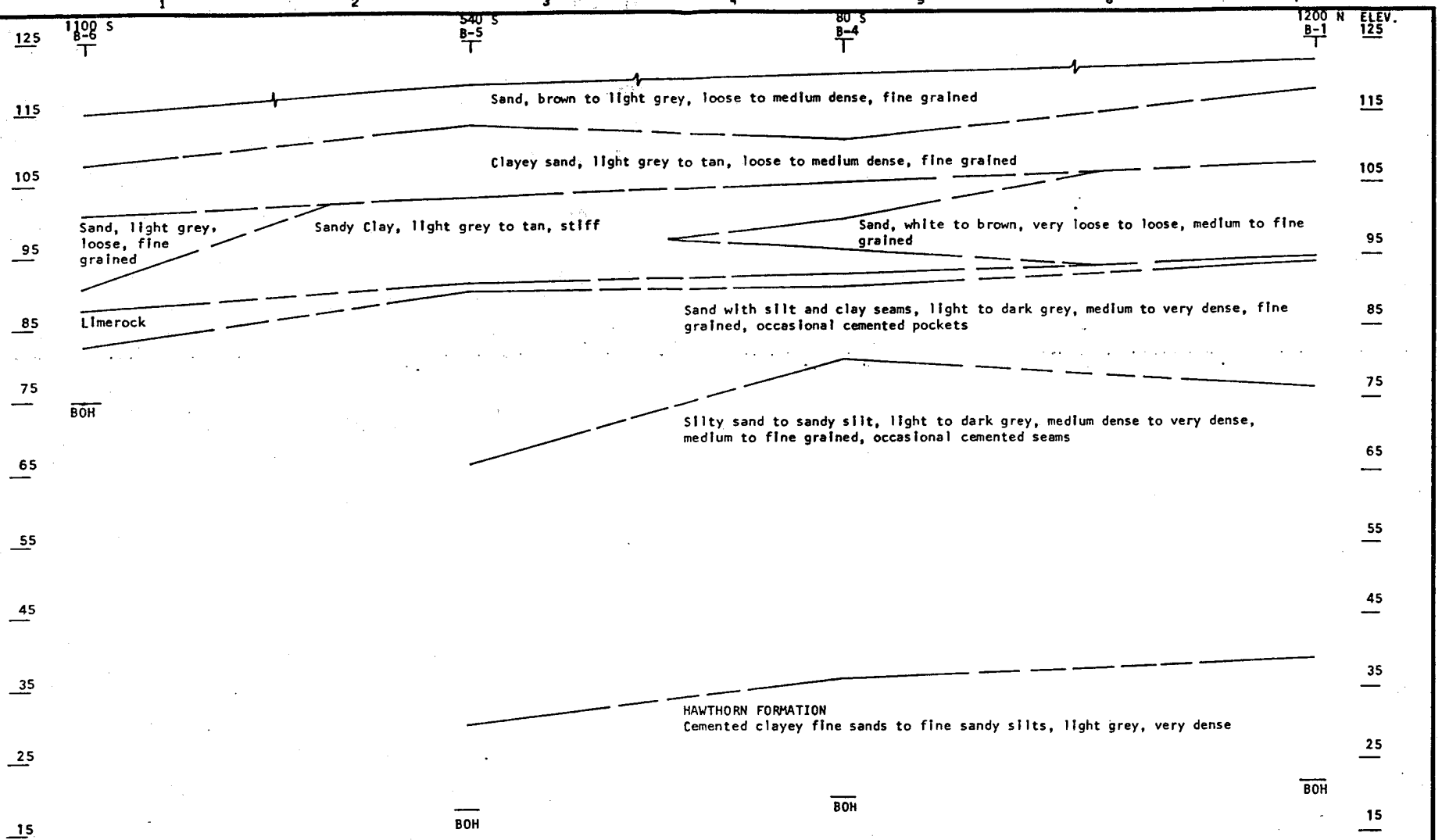
18. Could not verify because inaccessible.

19. Depression, 1-2 feet deep. Vegetation: mature trees and underbrush, dry.

20. Depression, 2-3 feet deep. Vegetation: mature trees and underbrush, dry.

21. Dragline Pit - man made.

22. Depression, part of it is very disturbed and there is evidence that this was used as a dragline pit. Other parts look like a natural depression. The only way to tell is to obtain old photography (pre-mining) and see if a depression was there originally.



NO	DATE	REVISIONS AND RECORD OF ISSUE	BY	CHK	APP	FLM

BLACK & VEATCH
ENGINEERS-ARCHITECTS

ENGINEER PLN | DRAWN MRJ
CHECKED | DATE

SEMINOLE ELECTRIC COOPERATIVE INC.
COMBUSTION TURBINE PROJECT

SOIL STATIGRAPHY
FIGURE

PROJECT 14845-SK-122088-01 | DRAWING NUMBER | REV

CODE
AREA

FIGURE 3-1

P-GN-2628

11.5 SUPPORTING HYDROLOGICAL INFORMATION

11.5.1 PRECIPITATION DATA

Table A-1. Monthly and Annual Precipitation at Wauchula, Florida (Page 1 of 2)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1933	0.85	2.23	1.95	5.44	2.54	7.64	11.60	4.52	12.19	1.08	1.74	0.14	51.92
1934	1.09	2.23	1.71	6.36	7.53	12.98	4.00	5.52	7.28	0.77	1.07	0.21	50.75
1935	0.27	1.65	0.20	2.79	4.71	8.11	7.66	7.92	6.83	2.93	0.79	3.16	47.02
1936	4.53	8.92	3.17	1.21	2.09	9.23	5.77	8.46	8.31	4.02	2.76	1.89	60.36
1937	1.99	5.26	4.20	3.77	4.38	12.22	8.02	6.34	6.40	3.03	3.91	0.63	60.15
1938	1.02	1.11	1.17	0.55	3.99	10.82	11.32	2.97	5.73	9.38	1.79	0.11	49.96
1939	0.96	1.04	0.57	4.21	7.17	18.42	10.78	13.99	7.18	2.13	0.61	1.17	68.23
1940	3.61	4.46	3.43	1.53	2.41	8.17	7.84	7.25	8.54	0.00	0.02	4.20	51.46
1941	3.44	2.55	2.45	4.19	0.55	10.78	7.82	4.59	4.24	2.50	3.13	2.21	48.45
1942	3.46	5.34	4.50	3.29	2.34	8.98	6.19	6.77	7.04	0.62	0.25	2.04	50.82
1943	1.27	0.63	4.52	1.48	6.08	15.11	11.74	12.54	4.72	3.36	0.66	0.87	62.98
1944	0.92	0.63	4.30	1.79	2.23	9.29	7.91	6.16	4.35	1.52	0.23	0.39	39.72
1945	2.85	0.19	0.18	0.22	0.29	15.24	13.62	5.58	7.99	5.55	0.42	1.77	53.90
1946	1.08	3.03	0.60	0.68	3.54	7.22	15.54	4.95	6.90	1.74	0.43	0.33	46.04
1947	1.75	3.64	6.76	7.75	6.86	10.63	9.86	9.52	18.06	2.64	2.78	1.85	82.10
1948	4.19	0.80	2.26	2.38	1.65	3.02	13.29	10.02	13.91	0.82	0.38	1.29	54.01
1949	0.26	0.45	0.75	3.41	0.56	10.40	12.29	15.53	7.88	2.69	3.29	0.00	57.51
1950	0.08	0.33	3.43	1.09	3.01	4.97	4.06	9.89	5.22	6.85	0.52	4.13	43.58
1951	0.45	1.90	1.10	8.26	2.28	5.04	8.84	4.21	8.37	4.10	2.48	0.96	47.99
1952	1.29	5.24	4.16	1.16	6.72	2.40	6.44	6.29	7.43	9.67	3.02	1.54	55.36
1953	2.98	2.46	3.30	6.55	0.43	16.03	8.89	12.46	14.38	6.21	6.43	3.36	83.48
1954	1.62	2.77	1.19	4.14	11.32	11.87	6.61	8.08	6.00	2.87	2.23	2.10	60.80
1955	2.57	1.32	2.10	2.14	1.49	10.62	7.35	8.64	6.87	1.39	0.83	1.11	46.43
1956	0.54	1.25	0.94	4.25	5.65	3.69	5.63	12.11	6.99	2.79	0.24	0.12	44.20
1957	3.42	4.47	5.28	4.14	11.31	5.39	7.83	3.75	9.41	2.96	1.71	2.70	62.37
1958	7.20	4.26	7.72	2.95	5.11	3.48	7.87	3.30	7.09	2.82	2.99	4.77	59.56
1959	2.33	2.54	9.22	2.49	3.43	13.97	12.12	8.08	8.97	3.86	0.80	1.32	69.13
1960	0.62	5.46	4.47	3.39	2.86	3.72	14.60	8.40	13.83	5.11	0.08	1.37	63.91
1961	2.19	3.35	2.21	1.96	5.30	4.27	5.57	8.20	1.19	0.57	0.36	1.76	36.93
1962	1.07	0.58	3.77	6.94	6.27	14.77	2.80	7.93	11.41	0.96	2.30	0.43	59.23
1963	2.24	7.37	0.90	0.03	10.61	9.91	7.29	5.86	8.62	0.27	5.89	2.58	61.57
1964	3.13	5.04	4.34	3.39	2.68	3.26	6.20	4.84	8.17	2.78	0.86	1.16	45.85
1965	1.51	3.86	6.85	0.96	0.01	8.92	13.76	4.17	6.03	3.96	1.20	2.77	54.00
1966	6.49	4.95	0.84	2.52	1.82	5.37	7.16	5.48	6.70	1.33	0.24	0.76	43.66
1967	0.52	2.98	0.08	0.00	0.77	11.87	10.91	7.51	3.79	0.93	0.03	2.67	42.06
1968	0.73	1.79	1.16	0.65	7.82	15.85	10.18	6.50	5.01	3.43	2.32	0.37	55.81
1969	2.91	2.05	6.53	2.05	1.65	7.88	6.40	8.67	9.77	5.14	1.97	2.70	57.72
1970	2.89	2.60	5.80	0.13	5.01	5.91	12.31	4.24	5.96	2.16	0.84	0.89	48.74
1971	0.35	4.01	1.46	0.05	5.80	5.65	8.24	7.86	7.09	4.08	1.23	0.94	46.76
1972	0.67	4.70	4.41	2.11	7.42	9.05	5.40	8.83	1.44	1.65	4.75	2.68	53.11
1973	7.26	2.64	5.09	3.49	1.27	4.81	10.91	4.76	8.44	0.59	0.76	1.78	51.80

Table A-1. Monthly and Annual Precipitation at Wauchula, Florida (Page 2 of 2)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1974	0.03	1.12	0.30	1.56	2.74	14.97	10.05	7.92	3.58	0.10	0.16	2.32	44.85
1975	0.50	1.62	0.88	0.23	6.87	7.02	8.45	5.41	9.41	10.36	0.36	0.60	51.71
1976	1.04	0.69	0.35	1.60	8.39	10.74	9.09	6.33	3.26	1.57	1.26	2.56	46.88
1977	2.41	1.77	0.84	0.28	4.05	8.06	12.46	5.34	5.38	1.55	2.66	4.83	49.63
1978	2.93	3.59	2.09	0.00	5.68	7.25	10.40	6.41	2.70	1.43	0.97	2.90	46.35
1979	7.84	1.41	1.52	1.72	7.08	8.00	7.16	8.62	11.56	0.45	0.72	1.91	57.99
1980	2.25	2.37	1.70	4.66	6.39	10.05	4.17	6.02	2.00	1.24	3.08	0.78	44.71
1981	0.58	4.37	1.35	0.08	2.91	8.09	2.21	6.91	8.12	0.22	0.44	1.38	36.66
1982	1.13	3.08	5.35	4.32	6.50	15.96	9.08	2.66	10.95	1.73	0.82	0.98	62.56
1983	4.29	7.99	7.45	2.75	1.79	8.25	9.66	9.49	7.42	3.14	2.22	3.79	68.24
1984	0.72	2.44	3.45	1.73	6.13	3.82	7.70	6.85	5.10	0.36	1.30	0.47	40.07
1985	0.96	0.84	2.08	2.63	4.95	7.33	3.63	10.27	7.51	2.81	1.25	0.75	45.01
1986	2.66	1.88	5.78	0.73	2.22	11.65	9.08	7.06	4.79	3.84	0.82	5.51	56.02
1987	2.96	1.99	7.03	0.16	3.02	4.47	8.56	5.16	3.35	4.51	11.18	0.74	53.13
1988	1.77	2.56	5.55	0.70	3.24	4.48	12.45	8.06	7.16				45.97
AVG	2.15	2.85	3.12	2.48	4.30	8.88	8.69	7.24	7.29	2.81	1.74	1.76	53.33
MAX	7.84	8.92	9.22	8.26	11.32	18.42	15.54	15.53	18.06	10.36	11.18	5.51	83.48
MIN	0.03	0.19	0.08	0.00	0.01	2.40	2.21	2.66	1.19	0.00	0.02	0.00	36.66

Sources: Southwest Florida Water Management District, 1988
NOAA, 1988

11.5.2 STREAMFLOW DATA

Table B. Water Level on Payne Creek (Station PC-2): Daily Averages

Date	Level (ft)	Discharge (cfs)	Date	Level (ft)	Discharge (cfs)
11-Oct-88	2.55	11.35	24-Nov-88	2.52	10.85
12-Oct-88	2.45	9.76	25-Nov-88	2.54	11.18
13-Oct-88	2.31	7.81	26-Nov-88	2.47	10.06
14-Oct-88	2.21	6.61	27-Nov-88	2.37	8.61
15-Oct-88	2.15	5.95	28-Nov-88	2.31	7.81
16-Oct-88	2.19	6.38	29-Nov-88	2.25	7.07
17-Oct-88	2.39	8.88	30-Nov-88	2.15	5.95
18-Oct-88	2.25	7.07	01-Dec-88	2.08	5.25
19-Oct-88	2.06	5.06	02-Dec-88	2.02	4.70
20-Oct-88	1.99	4.44	03-Dec-88	1.98	4.36
21-Oct-88	1.96	4.20	04-Dec-88	1.95	4.11
22-Oct-88	1.94	4.04	05-Dec-88	1.94	4.04
23-Oct-88	1.93	3.96	06-Dec-88	2.04	4.88
24-Oct-88	1.93	3.96	08-Dec-88	1.99	4.44
25-Oct-88	1.92	3.88	09-Dec-88	1.96	4.20
26-Oct-88	1.91	3.80	10-Dec-88	1.94	4.04
27-Oct-88	1.88	3.58	11-Dec-88	1.92	3.88
28-Oct-88	1.86	3.44	12-Dec-88	2.04	4.88
29-Oct-88	1.84	3.30	13-Dec-88	2.04	4.88
31-Oct-88	1.83	3.24	14-Dec-88	2.00	4.53
01-Nov-88	1.83	3.24	15-Dec-88	1.97	4.28
02-Nov-88	1.84	3.30	16-Dec-88	1.96	4.20
03-Nov-88	1.82	3.17	17-Dec-88	1.94	4.04
04-Nov-88	2.19	6.38	18-Dec-88	1.92	3.88
05-Nov-88	2.49	10.37	19-Dec-88	1.91	3.80
06-Nov-88	2.52	10.85	20-Dec-88	1.91	3.80
07-Nov-88	2.56	11.52	21-Dec-88	1.91	3.80
08-Nov-88	2.45	9.76	22-Dec-88	1.90	3.73
08-Nov-88	2.35	8.33	23-Dec-88	1.90	3.73
09-Nov-88	2.27	7.31	24-Dec-88	1.90	3.73
10-Nov-88	2.21	6.61	25-Dec-88	1.90	3.73
11-Nov-88	2.14	5.85	26-Dec-88	1.90	3.73
12-Nov-88	2.08	5.25	27-Dec-88	1.89	3.66
13-Nov-88	2.06	5.06	28-Dec-88	1.89	3.66
14-Nov-88	2.03	4.79	29-Dec-88	1.90	3.73
15-Nov-88	2.01	4.61	30-Dec-88	1.91	3.80
16-Nov-88	1.98	4.36	31-Dec-88	1.90	3.73
17-Nov-88	1.96	4.20	01-Jan-89	1.89	3.66
18-Nov-88	1.95	4.11	02-Jan-89	1.88	3.58
19-Nov-88	1.94	4.04	03-Jan-89	1.87	3.51
20-Nov-88	1.93	3.96	04-Jan-89	1.76	2.79
21-Nov-88	1.92	3.88	05-Jan-89	1.74	2.67
22-Nov-88	2.18	6.27	06-Jan-89	1.77	2.85

Table B. Water Level on Payne Creek (Station PC-2): Daily Averages

Date	Level (ft)	Discharge (cfs)	Date	Level (ft)	Discharge (cfs)
07-Jan-89	1.79	2.98	19-Feb-89	1.78	2.91
08-Jan-89	1.79	2.98	20-Feb-89	1.76	2.79
09-Jan-89	1.79	2.98	21-Feb-89	1.74	2.67
10-Jan-89	1.79	2.98	22-Feb-89	1.72	2.56
11-Jan-89	1.79	2.98	23-Feb-89	1.70	2.45
12-Jan-89	1.78	2.91	24-Feb-89	1.69	2.39
13-Jan-89	1.74	2.67	25-Feb-89	1.68	2.34
14-Jan-89	1.69	2.39	26-Feb-89	1.67	2.29
15-Jan-89	2.03	4.79	27-Feb-89	1.67	2.29
16-Jan-89	2.37	8.61	28-Feb-89	1.66	2.24
17-Jan-89	2.35	8.33	01-Mar-89	1.66	2.24
18-Jan-89	2.21	6.61	02-Mar-89	1.73	2.62
19-Jan-89	2.15	5.95	03-Mar-89	2.11	5.54
20-Jan-89	2.17	6.17	04-Mar-89	2.36	8.47
21-Jan-89	2.28	7.43	05-Mar-89	2.26	7.19
22-Jan-89	2.76	15.31	06-Mar-89	2.16	6.06
23-Jan-89	3.18	26.16	07-Mar-89	2.09	5.35
24-Jan-89	3.49	37.19	08-Mar-89	2.13	5.75
25-Jan-89	3.50	37.60	09-Mar-89	2.05	4.97
26-Jan-89	3.25	28.41	10-Mar-89	1.96	4.20
27-Jan-89	3.06	22.62	11-Mar-89	1.88	3.58
28-Jan-89	2.88	17.98	12-Mar-89	1.82	3.17
29-Jan-89	2.97	20.20	13-Mar-89	1.77	2.85
30-Jan-89	2.92	18.95	14-Mar-89	1.74	2.67
31-Jan-89	2.72	14.49	15-Mar-89	1.80	3.04
01-Feb-89	2.67	13.51	16-Mar-89	1.80	3.04
02-Feb-89	2.61	12.39	17-Mar-89	1.91	3.80
03-Feb-89	2.55	11.35	18-Mar-89	1.74	2.67
04-Feb-89	2.49	10.37	19-Mar-89	1.69	2.39
05-Feb-89	2.43	9.46	20-Mar-89	1.72	2.56
06-Feb-89	2.37	8.61	21-Mar-89	1.69	2.39
07-Feb-89	2.31	7.81	22-Mar-89	1.68	2.34
08-Feb-89	2.26	7.19	23-Mar-89	1.67	2.29
09-Feb-89	2.20	6.49	24-Mar-89	1.66	2.24
10-Feb-89	2.14	5.85	25-Mar-89	1.64	2.14
11-Feb-89	2.08	5.25	26-Mar-89	1.61	1.99
12-Feb-89	2.02	4.70	27-Mar-89	1.69	2.39
13-Feb-89	1.96	4.20	28-Mar-89	1.85	3.37
14-Feb-89	1.90	3.73	29-Mar-89	1.80	3.04
15-Feb-89	1.83	3.24	30-Mar-89	1.70	2.45
16-Feb-89	1.80	3.04	31-Mar-89	1.66	2.24
17-Feb-89	1.79	2.98	01-Apr-89	1.63	2.09
18-Feb-89	1.79	2.98	02-Apr-89	1.64	2.14

Table B. Water Level on Payne Creek (Station PC-2): Daily Averages

Date	Level (ft)	Discharge (cfs)
03-Apr-89	1.98	4.36
04-Apr-89	1.85	3.37
05-Apr-89	1.72	2.56
06-Apr-89	1.65	2.19
07-Apr-89	1.61	1.99
08-Apr-89	1.57	1.81
09-Apr-89	1.55	1.73
10-Apr-89	1.53	1.64
11-Apr-89	1.52	1.60
12-Apr-89	1.52	1.60
13-Apr-89	1.52	1.60

Table C-1. Discharge of Payne Creek (station 2): 11-October-1988 @ 17:30

Distance from Initial Point (ft)	Total Depth (ft)	Observation Depth (ft)	Velocity (fps) Point	Vert.	Mean	Area (ft^2)	Discharge (cfs)
1	0.9	0.54	0.00		0.00	1.8	0.00
			0.00				
3	1.5	0.9	0.00		0.00	3	0.00
			0.00				
5	2.4	1.44	0.07		0.07	4.8	0.32
			0.07				
7	2.5	1.5	0.50		0.50	5	2.50
			0.50				
9	2	1.2	0.87		0.87	4	3.47
			0.87				
11	1.65	0.99	0.90		0.90	3.3	2.97
			0.90				
13	1.5	0.9	0.83		0.83	3	2.50
			0.83				
15	0.9	0.54	0.27		0.27	1.8	0.48
			0.27				
16	0	0	0.00		0.00	0	0.00
			0.00				
						---	---
				Total		26.7	12.2

Source: Applied Technology and Management, Inc., 1989

Table C-2. Discharge of Payne Creek (station 2): 8-November-1988 @ 15:21

Distance from Initial Point (ft)	Total Depth (ft)	Observation Depth (ft)	Velocity (fps) Point	Vert. Mean	Area (ft^2)	Discharge (cfs)
1	0	0	0.03	0.03	0	0.00
			0.03			
3	1	0.6	0.40	0.40	2	0.79
		0	0.40			
5	2	1.2	0.62	0.62	4	2.47
		0	0.62			
7	2.25	1.35	0.91	0.91	4.5	4.10
		0	0.91			
9	2.25	1.35	0.54	0.54	4.5	2.45
		0	0.54			
1	2	1.2	0.25	0.25	4	0.99
		0	0.25			
13	1.5	0.9	0.17	0.17	3	0.52
		0	0.17			
15	1.25	0.75	0.10	0.10	2.5	0.25
		0	0.10			
17	0	0	0.03	0.03	0	0.00
		0	0.03			
19	0	0	0.03	0.03	0	0.00
		0	0.03			
20.5	0	0	0.03	0.03	0	0.00
		0	0.03			
				Total	24.5	11.6

Source: Applied Technology and Management, Inc., 1989

Table C-3. Discharge of Payne Creek (station 2): 12-December-1988 @ 8:40

Distance from Initial Point (ft)	Total Depth (ft)	Observation Depth (ft)	Velocity (fps) Point	Vert. Mean	Area (ft^2)	Discharge (cfs)
1	0	0	0.03	0.03	0	0.00
			0.03			
3	1	0.6	0.32	0.32	2	0.64
		0	0.32			
5	1.7	1.02	0.47	0.47	3.4	1.60
		0	0.47			
7	1.9	1.14	0.47	0.47	3.8	1.78
		0	0.47			
9	1.5	0.9	0.14	0.14	3	0.41
		0	0.14			
11	1	0.6	0.10	0.10	2	0.20
		0	0.10			
13	0.5	0.3	0.10	0.10	1	0.10
		0	0.10			
15	0	0	0.03	0.03	0	0.00
		0	0.03			
17	0	0	0.03	0.03	0	0.00
		0	0.03			
19	0	0	0.03	0.03	0	0.00
		0	0.03			
20.5	0	0	0.03	0.03	0	0.00
		0	0.03			
				Total	15.2	4.7

Source: Applied Technology and Management, Inc., 1989

Table C-4. Discharge of Payne Creek (station 2): 11-January-1989 @ 17:05

Distance from Initial Point (ft)	Total Depth (ft)	Observation Depth (ft)	Velocity (fps) Point	Vert. Mean	Area (ft^2)	Discharge (cfs)
2	0.5	0.3	0.00	0.00	1.25	0.00
			0.00			
3	0.7	0.42	0.07	0.07	0.7	0.05
		0	0.07			
4	0.9	0.54	0.03	0.03	0.9	0.03
		0	0.03			
5	1.1	0.66	0.20	0.20	1.1	0.22
		0	0.20			
6	1.2	0.72	0.32	0.32	1.2	0.38
		0	0.32			
7	1	0.6	0.33	0.33	1	0.33
		0	0.33			
8	0.8	0.48	0.45	0.45	0.8	0.36
		0	0.45			
9	0.8	0.48	0.45	0.45	0.8	0.36
		0	0.45			
10	0.5	0.3	0.48	0.48	0.5	0.24
		0	0.48			
11	0.25	0.15	0.50	0.50	0.25	0.13
		0	0.50			
12	0.15	0.09	0.50	0.50	0.375	0.19
		0	0.50			
14	0	0	0.00	0.00	0	0.00
		0	0.00			
				Total	8.9	2.3

Source: Applied Technology and Management, Inc., 1989

Table C-5. Discharge of Payne Creek (station 4): 8-December-1988 @ 12:20

Distance from Initial Point (ft)	Total Depth (ft)	Observation Depth (ft)	Velocity (fps) Point	Vert. Mean	Area (ft^2)	Discharge (cfs)
6.5	0.75	0.45	0.99	0.99	1.125	1.11
			0.99			
9.5	1.5	0.9	1.21	1.21	2.25	2.72
		0	1.21			
12.5	1.8	1.08	1.50	1.50	2.7	4.06
		0	1.50			
15.5	2	1.2	1.43	1.43	3	4.28
		0	1.43			
18.5	2	1.2	1.43	1.43	3	4.28
		0	1.43			
21.5	2	1.2	1.32	1.32	3	3.95
		0	1.32			
24.5	2.2	1.32	1.32	1.32	3.3	4.35
		0	1.32			
27.5	2.2	1.32	1.21	1.21	3.3	3.98
		0	1.21			
30.5	1	0.6	1.21	1.21	1.5	1.81
		0	1.21			
32	0	0	0.03	0.03	0	0.00
		0	0.03			
				Total	23.2	30.5

Source: Applied Technology and Management, Inc., 1989

Table C-6. Discharge of Payne Creek (station 4): 11-January-1988 @ 10:25

Distance from Initial Point (ft)	Total Depth (ft)	Observation Depth (ft)	Velocity (fps) Point	Vert. Mean	Area (ft^2)	Discharge (cfs)
1	0.45	0.27	0.63	0.63	0.9	0.57
			0.63			
3	0.8	0.48	0.63	0.63	1.6	1.01
		0	0.63			
5	1.47	0.88	0.77	0.77	2.94	2.25
		0	0.77			
7	1.8	1.08	0.80	0.80	3.6	2.88
		0	0.80			
9	1.92	1.15	0.90	0.90	3.84	3.46
		0	0.90			
11	2.1	1.26	0.87	0.87	4.2	3.64
		0	0.87			
13	2.1	1.26	0.83	0.83	4.2	3.50
		0	0.83			
15	2.2	1.32	0.77	0.77	4.4	3.37
		0	0.77			
17	2.2	1.32	0.70	0.70	4.4	3.08
		0	0.70			
19	2.35	1.41	0.60	0.60	4.7	2.82
		0	0.60			
21	2.25	1.35	0.63	0.63	4.5	2.85
		0	0.63			
23	2.3	1.38	0.57	0.57	4.6	2.61
		0	0.57			
25	1.1	0.66	0.63	0.63	2.2	1.39
		0	0.63			
26	0	0	0.00	0.00	0	0.0
				Total	46.1	33.4

Source: Applied Technology and Management, Inc., 1989

Table C-7. Discharge of Peace River (station 1): 13-October-1988 @ 11:00

Distance from Initial Point (ft)	Total Depth (ft)	Observation Depth (ft)	Velocity (fps) Point	Vert.	Mean	Area (ft^2)	Discharge (cfs)
2	1	0.6	0.17		0.17	4	0.70
			0.17				
6	2	1.2	0.32		0.32	8	2.58
		0	0.32				
10	2.75	1.65	0.62		0.62	11	6.79
		0	0.62				
14	4	0.8	0.47		0.54	16	8.69
		3.2	0.62				
18	5	1	0.62		0.64	20	12.71
		4	0.65				
22	5.5	1.1	0.99		0.95	22	20.88
		4.4	0.91				
26	5.5	1.1	1.21		1.21	22	26.55
		4.4	1.21				
30	3.5	2.1	1.21		1.21	14	16.90
		0	1.21				
34	3.5	2.1	1.43		1.43	14	20.00
		0	1.43				
38	3.5	2.1	1.35		1.35	14	18.96
		0	1.35				
42	3	1.8	1.21		1.21	12	14.48
			1.21				
46	2.5	1.5	1.28		1.28	10	12.81
			1.28				
50	2	1.2	1.06		1.06	8	8.48
			1.06				
54	1	0.6	0.84		0.84	4	3.35
			0.84				
56	0	0	0.00		0.00	0	0.00
				Total		179.0	173.9

Source: Applied Technology and Management, Inc., 1989

Table C-8. Discharge of Peace River (station 1): 8-November-1988 @ 17:25

Distance from Initial Point (ft)	Total Depth (ft)	Observation Depth (ft)	Velocity (fps) Point	Vert. Mean	Area (ft^2)	Discharge (cfs)
2.5	1.25	0.75	0.25	0.25	6.25	1.55
			0.25			
7.5	2	1.2	0.25	0.25	10	2.48
		0	0.25			
12.5	4	0.8	0.69	0.69	20	13.82
		3.2	0.69			
17.5	5	1	0.84	0.76	25	19.11
		4	0.69			
22.5	5.1	1	1.06	1.17	25.5	29.84
		4	1.28			
27.5	5.1	1	1.43	1.50	25.5	38.30
		4	1.58			
32.5	3.8	0.76	1.72	1.61	19	30.64
		3	1.50			
37.5	3.2	0.6	1.87	1.83	16	29.34
		2.6	1.80			
42.5	3	1.8	1.80	1.80	15	26.95
		0	1.80			
47.5	1.9	1.15	1.43	1.43	9.5	13.57
		0	1.43			
52.5	1.2	0.7	0.91	0.91	3	2.74
			0.91			
54.5	0.75	0.45	0.76	0.76	1.875	1.43
			0.76			
57	0	0	0.00	0.00	0	0.00
				Total	176.6	209.8

Source: Applied Technology and Management, Inc., 1989

Table C-9. Discharge of Peace River (station 1): 7-December-1988 @ 17:59

Distance from Initial Point (ft)	Total Depth (ft)	Observation Depth (ft)	Velocity (fps) Point	Vert. Mean	Area (ft^2)	Discharge (cfs)
3	1	0.6	0.84	0.84	6	5.03
			0.84			
9	1.9	1.14	1.43	1.43	11.4	16.28
		0	1.43			
15	3	1.8	1.87	1.87	18	33.67
		0	1.87			
21	3.2	1.9	2.09	2.09	19.2	40.17
		0	2.09			
27	3.5	2.1	1.94	1.94	21	40.83
		0	1.94			
33	4	2.4	1.65	1.65	24	39.59
		0	1.65			
39	5	3	0.91	0.91	30	27.36
		0	0.91			
45	4.2	2.5	0.58	0.58	25.2	14.62
		0	0.58			
51	2	1.2	0.65	0.65	12	7.85
		0	0.65			
57	1.2	0.9	0.40	0.40	7.2	2.85
		0	0.40			
				Total	174.0	228.3

Source: Applied Technology and Management, Inc., 1989

Table C-10. Discharge of Peace River (station 1): 11-January-1989 @ 13:00

Distance from Initial Point (ft)	Total Depth (ft)	Observation Depth (ft)	Velocity (fps) Point	Vert.	Mean	Area (ft^2)	Discharge (cfs)
2.5	0.5	0	0.03		0.03	2.5	0.00
			0.03				
7.5	1.5	0.9	0.76		0.76	7.5	5.73
		0	0.76				
12.5	2.5	1.5	0.99		0.99	12.5	12.32
		0	0.99				
17.5	2.6	1.5	1.13		1.13	13	14.73
		0	1.13				
22.5	3.1	1.9	1.13		1.13	15.5	17.57
		0	1.13				
27.5	3.5	2.1	1.06		1.06	17.5	18.54
		0	1.06				
32.5	3.7	2.96	0.80		0.86	18.5	15.85
		0.74	0.91				
37.5	4.4	3.52	0.51		0.62	22	13.58
		0.88	0.73				
42.5	3.5	2.1	0.43		0.43	17.5	7.57
		1.2	0.43				
47.5	2	0.9	0.40		0.40	10	3.96
		0	0.40				
52.5	1.5	0	0.21		0.21	7.5	1.59
		0	0.21				
55	0	0	0.00		0	0	0.00
				Total		144.0	111.4

Source: Applied Technology and Management, Inc., 1989

Table C-11. Discharge of Peace River (station 4): 7-December-1988 @ 15:40

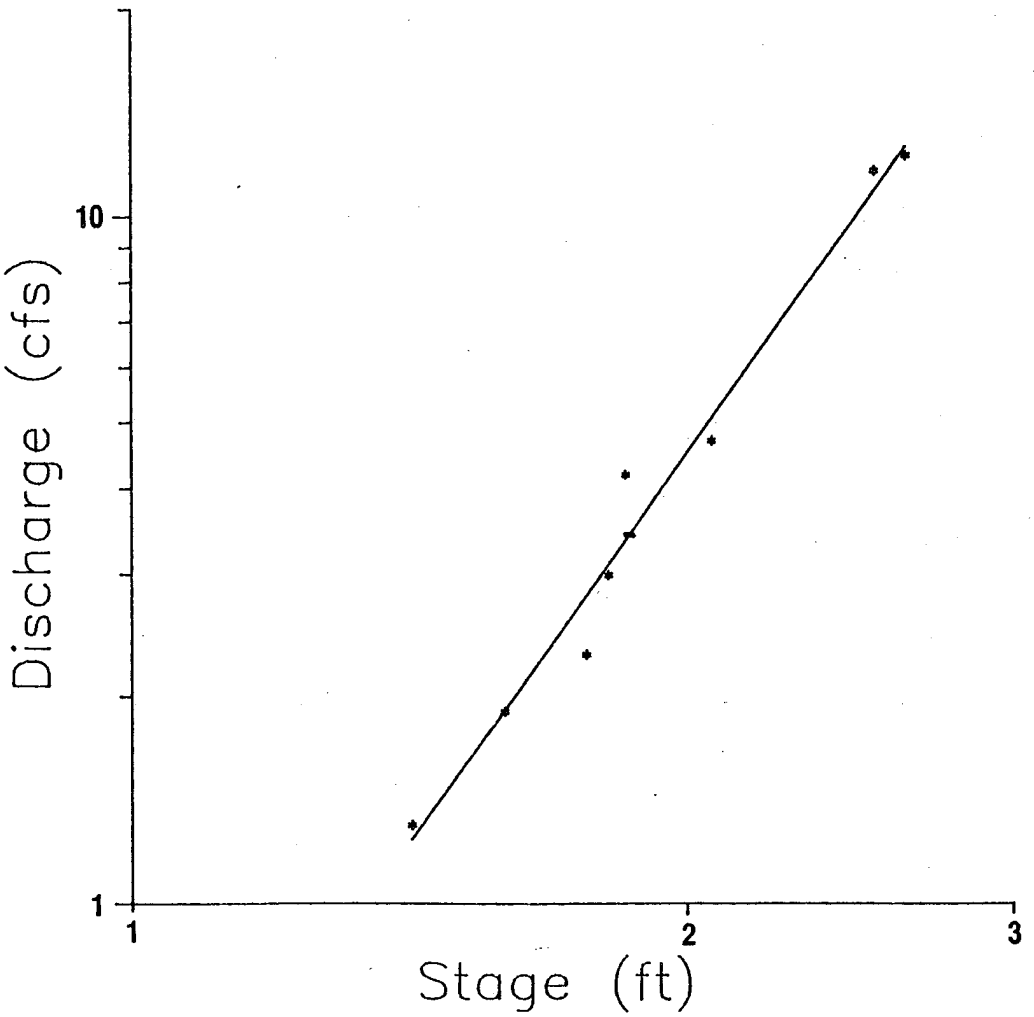
Distance from Initial Point (ft)	Total Depth (ft)	Observation Depth (ft)	Velocity (fps) Point	Vert.	Mean	Area (ft^2)	Discharge (cfs)
3	1.5	0.9	0.21		0.21	9	1.90
			0.21				
9	3	1.8	0.25		0.25	18	4.47
		0	0.25				
15	4	2.4	0.69		0.69	24	16.58
		0	0.69				
21	5	3	0.99		0.99	30	29.57
		0	0.99				
27	5.8	3.5	1.28		1.28	34.8	44.57
		0	1.28				
33	6.3	3.8	1.28		1.28	37.8	48.41
		0	1.28				
39	7	4.2	1.17		1.17	42	49.15
		0	1.17				
45	7	4.2	1.06		1.06	42	44.50
		0	1.06				
51	7	4.2	1.32		1.32	42	55.34
		0	1.32				
57	6.2	3.7	1.21		1.21	37.2	44.90
		0	1.21				
62.5	5.4	3.2	0.91		0.91	27	24.63
		0	0.91				
65	0	0	0.00		0	0	0
				Total		343.8	364.0

Source: Applied Technology and Management, Inc., 1989

Table C-12. Discharge of Peace River (station 4): 11-January-1989 @ 08:16

Distance from Initial Point (ft)	Total Depth (ft)	Observation Depth (ft)	Velocity (fps) Point	Vert. Mean	Area (ft^2)	Discharge (cfs)
3	4	3.2	0.32	0.29	24	6.85
		0.8	0.25			
9	5.5	4.4	0.65	0.52	33	17.32
		1.1	0.40			
15	6	4.8	0.54	0.47	36	16.91
		1.2	0.40			
21	6	4.8	0.76	0.58	36	20.89
		1.2	0.40			
27	5.6	4.5	0.69	0.73	33.6	24.45
		1.1	0.76			
33	5.1	4.1	0.69	0.76	30.6	23.40
		1	0.84			
39	4.5	3.6	0.54	0.64	27	17.16
		0.9	0.73			
45	3.6	2.9	0.40	0.51	21.6	10.94
		0.7	0.62			
51	3.1	1.9	0.40	0.40	18.6	7.36
		0	0.40			
57	2.4	1.4	0.40	0.40	19.2	7.60
		0	0.40			
				Total	279.6	152.9

Source: Applied Technology and Management, Inc., 1989



STAGE DISCHARGE CURVE FOR PAYNE CREEK NEAR THE HARDEE POWER STATION

SOURCE: APPLIED TECHNOLOGY AND MANAGEMENT, 1989.

Hardee Power Station

11.5.3 HISTORICAL WATER QUALITY DATA

Table D-1. Payne Creek - Agrico Ft. Green Reclamation Report - 1975 through 1982

Parameter/Location	9/75	1/76	7/82	8/82	9/82	10/82	11/82	12/82
Silicon								
AG-1	- -	- -	- -	- -	2.36	- -	- -	1.20
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	3.84	- -	- -	2.60
Total Suspended Solids								
AG-1	- -	- -	- -	- -	4.34	- -	- -	4.12
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	2.54	- -	- -	3.22
Flouride (Mg/L)								
AG-1	- -	- -	- -	- -	1.18	- -	- -	1.79
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	1.03	- -	- -	1.45
Turbidity (NTU)								
AG-1	- -	- -	- -	- -	2.12	- -	- -	2.32
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	10	9	- -	- -	1.84	- -	- -	1.72
pH								
AG-1	- -	- -	- -	- -	7.10	- -	- -	7.41
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	7.38	- -	- -	7.68
Flow (cfs)								
AG-1	- -	- -	- -	- -	7.27	- -	- -	2.01
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	73.68	- -	- -	10.58
Dissolved Oxygen								
AG-1	- -	- -	0.68	0.56	1.16	0.63	1.07	1.08
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	5.20	6.23	7.01	7.70	7.92	7.92
Temperature (F)								
AG-1	- -	- -	83.0	81.1	78.4	75.2	74.3	72.6
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	78.8	76.6	75.0	73.4	72.8	70.0

Table D-1. Payne Creek - Agrico Ft. Green Reclamation Report - 1975 through 1982

Parameter/Location	9/75	1/76	7/82	8/82	9/82	10/82	11/82	12/82
Alkalinity								
AG-1	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -
Ammonia (NH3)								
AG-1	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -
Arsenic								
AG-1	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	0.002	<0.001	- -	- -	- -	- -	- -	- -
Barium								
AG-1	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -
Berylium								
AG-1	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -
Bicarbonate (HCO3)								
AG-1	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -
Biological Oxygen Demand								
AG-1	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	1.4	7.1	- -	- -	- -	- -	- -	- -

Table D-1. Payne Creek - Agrico Ft. Green Reclamation Report - 1975 through 1982

Parameter/Location	9/75	1/76	7/82	8/82	9/82	10/82	11/82	12/82
Cadmium								
AG-1	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	0.003	<0.002	- -	- -	- -	- -	- -	- -
Carbonate (CO3)								
AG-1	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -
Chromium								
AG-1	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	0.03	<0.02	- -	- -	- -	- -	- -	- -
Copper								
AG-1	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	0.01	0.03	- -	- -	- -	- -	- -	- -
Total Dissolved Solids								
AG-1	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	170	190	- -	- -	- -	- -	- -	- -
Gross Alpha (AGi/l)								
AG-1	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -
Iron								
AG-1	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	0.32	0.26	- -	- -	- -	- -	- -	- -

Table D-1. Payne Creek - Agrico Ft. Green Reclamation Report - 1975 through 1982

Parameter/Location	9/75	1/76	7/82	8/82	9/82	10/82	11/82	12/82
Kjeidahl Nitrogen								
AG-1	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	2.7	0.28	- -	- -	- -	- -	- -	- -
Lead								
AG-1	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	0.008	0.01	- -	- -	- -	- -	- -	- -
Manganese								
AG-1	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -
Nitrate (NO3)								
AG-1	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -
Nitrite (NO2)								
AG-1	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -
Specific Conductivity (UMHOS)								
AG-1	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -
Sulfate								
AG-1	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -

Table D-1. Payne Creek - Agrico Ft. Green Reclamation Report - 1975 through 1982

Parameter/Location	9/75	1/76	7/82	8/82	9/82	10/82	11/82	12/82
Total Nitrogen								
AG-1	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -
Total Phosphate								
AG-1	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -
Total Phosphorus								
AG-1	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -
Zinc								
AG-1	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	0.1	0.04	- -	- -	- -	- -	- -	- -
Total Hardness								
AG-4	65	134	- -	- -	- -	- -	- -	- -
Sulfide								
AG-4	0.04	0	- -	- -	- -	- -	- -	- -
Chloride								
AG-4	13	17	- -	- -	- -	- -	- -	- -
Chemical Oxygen Demand								
AG-4	47	12	- -	- -	- -	- -	- -	- -
Calcium								
AG-4	15	34	- -	- -	- -	- -	- -	- -
Magnesium								
AG-4	6.9	12	- -	- -	- -	- -	- -	- -
Nickel								
AG-4	0.01	<0.002	- -	- -	- -	- -	- -	- -

Table D-1. Payne Creek - Agrico Ft. Green Reclamation Report - 1975 through 1982

Parameter/Location	9/75	1/76	7/82	8/82	9/82	10/82	11/82	12/82
Sodium								
AG-4	7.1	<9	- -	- -	- -	- -	- -	- -
Selenium								
AG-4	0.014	5	- -	- -	- -	- -	- -	- -
Phenols								
AG-4	0.03	0	- -	- -	- -	- -	- -	- -
MBAS								
AG-4	<0.25	0.01	- -	- -	- -	- -	- -	- -
Fecal Strep (per 100 ml)								
AG-4	360	5	- -	- -	- -	- -	- -	- -
Hexane Solubles								
AG-4	20	24	- -	- -	- -	- -	- -	-

Table D-2. Payne Creek - Agrico Ft. Green Reclamation Report - January 1983 through November 1983

Parameter/Location	1/83	2/83	3/83	4/83	5/83	6/83	7/83	8/83	11/83
Silicon									
AG-1	- -	- -	2.02	- -	- -	3.30	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	2.72	- -	- -	2.92	- -	- -	- -
Total Suspended Solids									
AG-1	- -	- -	5.26	- -	- -	5.36	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -		- -	- -	- -	- -	- -	- -
AG-4	- -	- -	3.56	- -	- -	2.86	- -	- -	- -
Flouride (Mg/L)									
AG-1	- -	- -	0.85	- -	- -	1.74	- -	1.76	1.78
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -		- -	- -	- -	- -	- -	0.59
AG-4	- -	- -	0.80	- -	- -	1.50	- -	1.75	1.52
Turbidity (NTU)									
AG-1	- -	- -	4.04	- -	- -	3.04	- -	3.5	0.5
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -		- -	- -	- -	- -	- -	0.8
AG-4	- -	- -	2.40	- -	- -	0.80	- -	1.5	0.5
pH									
AG-1	- -	- -	6.76	- -	- -	7.00	- -	7.2	7.4
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	7.2
AG-4	- -	- -	6.90	- -	- -	7.38	- -	7.5	7.5
Flow (cfs)									
AG-1	- -	- -	12.47	- -	- -	6.22	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	105.21	- -	- -	33.67	- -	- -	- -
Dissolved Oxygen									
AG-1	2.18	3.33	3.49	2.60	1.95	1.22	1.00	1.80	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	5.5
AG-4	8.26	8.66	8.39	7.53	7.40	6.55	6.60	7.20	- -
Temperature (F)									
AG-1	66.6	64.4	65.2	71.3	76.1	81.8	84.2	82.4	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	58
AG-4	64.4	61.6	63.0	69.8	74.6	80.0	80.6	78.8	

Table D-2. Payne Creek - Agrico Ft. Green Reclamation Report -
January 1983 through November 1983

Parameter/Location	1/83	2/83	3/83	4/83	5/83	6/83	7/83	8/83	11/83
Alkalinity									
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	57
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Ammonia (NH3)									
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Arsenic									
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Barium									
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	<0.01
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Berylium									
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	0.69
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Bicarbonate (HCO3)									
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Biological Oxygen Demand									
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	0.4
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -

Table D-2. Payne Creek - Agrico Ft. Green Reclamation Report - January 1983 through November 1983

Parameter/Location	1/83	2/83	3/83	4/83	5/83	6/83	7/83	8/83	11/83
Cadmium									
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Carbonate (CO3)									
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Chromium									
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	<0.10
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Copper									
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	<0.01
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Total Dissolved Solids									
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	252
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Gross Alpha (AGi/l)									
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	4.4
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Iron									
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	0.05
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -

Table D-2. Payne Creek - Agrico Ft. Green Reclamation Report - January 1983 through November 1983

Parameter/Location	1/83	2/83	3/83	4/83	5/83	6/83	7/83	8/83	11/83
Kjeidahl Nitrogen									
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Lead									
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	<0.20
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Manganese									
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Nitrate (NO3)									
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	0.43
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	0.9
AG-4	- -	- -	- -	- -	- -	- -	- -	0.05	0.23
Nitrite (NO2)									
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Specific Conductivity (UMHOS)									
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	860
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Sulfate									
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -

Table D-2. Payne Creek - Agrico Ft. Green Reclamation Report - January 1983 through November 1983

Parameter/Location	1/83	2/83	3/83	4/83	5/83	6/83	7/83	8/83	11/83
Total Nitrogen									
AG-1	- -	- -	- -	- -	- -	- -	- -	3.5	2.12
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	0.69
AG-4	- -	- -	- -	- -	- -	- -	- -	0.7	0.11
Total Phosphate									
AG-1	- -	- -	- -	- -	- -	- -	- -	0.52	0.6
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	0.18
AG-4	- -	- -	- -	- -	- -	- -	- -	0.45	0.28
Total Phosphorus									
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Zinc									
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	<0.05
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Total Hardness									
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Sulfide									
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Chloride									
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Chemical Oxygen Demand									
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Calcium									
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Magnesium									
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Nickel									
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -

Table D-2. Payne Creek - Agrico Ft. Green Reclamation Report - January 1983 through November 1983

Parameter/Location	1/83	2/83	3/83	4/83	5/83	6/83	7/83	8/83	11/83
Sodium									
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Selenium									
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Phenols									
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
MBAS									
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Fecal Strep (per 100 ml)									
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -
Hexane Solubles									
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -

Table D-3. Payne Creek - Agrico Ft. Green Reclamation Report - 1984 through 1986

Parameter/Location	2/84	6/84	8/84	10/84	2/85	5/85	8/85	11/85	2/86	5/86
Silicon										
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Total Suspended Solids										
AG-1	- -	- -	8	3.4	3.7	4.6	4.9	3.6	10.4	9.8
AG-2	- -	- -	5.1	2.6	4.9	26.3	3.2	1.2	4.3	3.6
AG-3	- -	- -	1.8	1.3	2	28.3	2.2	1	2.6	1.5
AG-4	- -	- -	4.2	3.3	1	1	2.2	1	2.6	1.5
Flouride (Mg/L)										
AG-1	1.69	1.88	0.74	1.17	1.31	1.21	1.01	1.01	0.93	1.07
AG-2	- -	- -	0.53	0.61	0.58	0.76	1.88	1.2	0.5	0.46
AG-3	1.67	1.18	0.58	0.62	0.64	0.76	1.91	1.21	0.64	0.56
AG-4	1.78	0.37	0.65	1.16	0.93	1.11	1.64	1.33	0.95	0.6
Turbidity (NTU)										
AG-1	1.1	4	2.5	2.2	1.5	3	2.4	4.4	4	6.2
AG-2	- -	- -	2.5	1.2	1	15	1.3	1.3	2	4.5
AG-3	1.1	2.8	1	1	1	18	0.9	2.5	0.8	2.5
AG-4	1.2	1.8	1.8	1.5	0.8	0.5	1.6	1	1.2	1.5
pH										
AG-1	6.8	6.9	6.8	7.8	7.2	7.1	6.6	7.2	7.1	7.1
AG-2	- -	- -	6.8	6.8	6.7	6.3	7.1	6.9	6.6	7.1
AG-3	7.2	7.1	7	6.9	7.2	7	7.1	6.9	6.9	6.5
AG-4	7.6	7.8	6.9	7.7	7.7	7.4	7.2	7.6	7.3	7.6
Flow (cfs)										
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Dissolved Oxygen										
AG-1	- -	- -	0.1	2	2.2	4.2	0.1	1.5	3	0.5
AG-2	- -	- -	1	4.2	5	0.4	1.8	2	1.5	1.1
AG-3	9.5	1.7	1	4	5.7	0.1	1.8	2.2	2.6	1
AG-4	- -	- -	4.5	9	8.8	6.2	4.4	5.6	7.2	7.4
Temperature (F)										
AG-1	- -	- -	78	60	68	78	80	72	66	70
AG-2	- -	- -	82	63	59	80	85	75	66	73
AG-3	65	80	81	63	59	80	85	76	66	72
AG-4	- -	- -	77	63	58	80	82	73	64	70

Table D-3. Payne Creek - Agrico Ft. Green Reclamation Report - 1984 through 1986

Parameter/Location	2/84	6/84	8/84	10/84	2/85	5/85	8/85	11/85	2/86	5/86
Alkalinity										
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	46	50	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Ammonia (NH3)										
AG-1	- -	- -	0.07	0.16	0.51	0.17	0.1	0.11	<0.02	0.17
AG-2	- -	- -	0.51	0.34	0.03	0.28	0.2	0.03	0.03	0.9
AG-3	- -	- -	0.36	0.24	0.23	0.12	0.18	0.04	0.02	0.03
AG-4	- -	- -	0.09	0.02	0.03	0.04	0.02	0.04	0.02	0.05
Arsenic										
AG-1	- -	- -	<0.002	<0.001	<0.001	<0.03	- -	- -	- -	- -
AG-2	- -	- -	<0.002	<0.001	<0.001	<0.03	- -	- -	- -	- -
AG-3	- -	- -	<0.002	<0.001	<0.001	<0.03	- -	- -	- -	- -
AG-4	- -	- -	<0.002	<0.001	<0.001	<0.03	- -	- -	- -	- -
Barium										
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	<0.01	<0.01	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Berylium										
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	<0.01	<0.01	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Bicarbonate (HCO3)										
AG-1	- -	- -	71	283	81	160	56	191	191	203
AG-2	- -	- -	52	62	70	72	60	63	57	50
AG-3	- -	- -	56	65	72	90	52	64	64	62
AG-4	- -	- -	29	75	69	98	52	69	50	61
Biological Oxygen Demand										
AG-1	- -	- -	6.7	3.9	2.8	5.0	4.9	3.6	6.7	5.4
AG-2	- -	- -	1.5	1.1	1.1	4.0	1.1	1.7	0.9	1.5
AG-3	1.2	3	0.5	0.6	0.8	2.0	1.5	1.6	0.6	1.3
AG-4	- -	- -	1.6	1.8	1.1	2.0	0.8	5.8	1.5	1.5

Table D-3. Payne Creek - Agrico Ft. Green Reclamation Report - 1984 through 1986

Parameter/Location	2/84	6/84	8/84	10/84	2/85	5/85	8/85	11/85	2/86	5/86
Cadmium										
AG-1	- -	- -	0.02	<0.005	<0.01	<0.005	- -	- -	- -	- -
AG-2	- -	- -	0.02	<0.005	<0.01	<0.005	- -	- -	- -	- -
AG-3	- -	- -	0.01	<0.005	<0.01	<0.005	- -	- -	- -	- -
AG-4	- -	- -	0.01	<0.005	<0.01	<0.005	- -	- -	- -	- -
Carbonate (CO3)										
AG-1	- -	- -	0.0	0.0	0.0	0.0	- -	- -	- -	- -
AG-2	- -	- -	0.0	0.0	0.0	0.0	- -	- -	- -	- -
AG-3	- -	- -	0.0	0.0	0.0	0.0	- -	- -	- -	- -
AG-4	- -	- -	0.0	0.0	0.0	0.0	- -	- -	- -	- -
Chromium										
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	<0.10	<0.01	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Copper										
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	<0.01	<0.01	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Total Dissolved Solids										
AG-1	- -	- -	188.0	374.0	278.6	248.3	201.0	273.0	291.8	331.4
AG-2	- -	- -	141.0	164.0	148.5	205.0	248.0	179.0	252.0	191.0
AG-3	284	202	154.0	176.0	182.0	185.0	214.0	170.0	120.0	192.9
AG-4	- -	- -	177.0	181.0	171.4	186.3	244.0	190.0	125.7	221.4
Gross Alpha (AGi/l)										
AG-1	- -	- -	0.30	14.00	0.50	<0.10	8.20	2.60	<0.10	11.60
AG-2	- -	- -	0.10	<0.10	<0.10	1.20	1.00	1.50	0.70	7.50
AG-3	0.7	1.3	0.60	0.40	0.10	0.10	0.80	3.40	2.90	8.40
AG-4	- -	- -	1.10	2.40	0.70	0.10	8.20	2.60	0.10	10.20
Iron										
AG-1	- -	- -	1.51	0.22	0.67	0.94	2.94	0.92	1.02	1.48
AG-2	- -	- -	1.63	0.40	0.73	5.60	0.32	0.38	0.48	0.85
AG-3	0.19	1.56	0.50	0.32	0.20	4.77	0.16	0.36	0.18	0.65
AG-4	- -	- -	1.01	0.10	0.20	0.20	0.48	0.14	0.28	0.26

Table D-3. Payne Creek - Agrico Ft. Green Reclamation Report - 1984 through 1986

Parameter/Location	2/84	6/84	8/84	10/84	2/85	5/85	8/85	11/85	2/86	5/86
Kjeidahl Nitrogen										
AG-1	- -	- -	0.37	0.81	1.06	0.37	1.14	0.76	0.73	1.06
AG-2	- -	- -	0.69	0.56	1.44	0.53	0.31	0.29	0.17	0.95
AG-3	- -	- -	0.38	0.63	0.42	0.2	0.22	0.28	0.16	0.42
AG-4	- -	- -	0.5	0.29	0.59	0.22	0.41	0.28	0.31	0.31
Lead										
AG-1	- -	- -	<0.01	<0.03	<0.05	0.01	- -	- -	- -	- -
AG-2	- -	- -	<0.01	<0.03	<0.05	<0.01	- -	- -	- -	- -
AG-3	<0.20	<0.01	<0.01	<0.03	<0.05	<0.01	- -	- -	- -	- -
AG-4	- -	- -	<0.01	<0.03	<0.05	0.01	- -	- -	- -	- -
Manganese										
AG-1	- -	- -	0.05	0.02	0.02	<0.05	0.02	0.03	0.03	0.05
AG-2	- -	- -	0.06	0.01	0.02	<0.05	<0.02	0.01	0.02	0.02
AG-3	- -	- -	0.03	0.01	0.01	0.05	0.02	0.02	0.02	0.02
AG-4	- -	- -	0.02	0.01	0.01	0.05	0.02	0.01	0.02	0.01
Nitrate (NO3)										
AG-1	1.61	5.9	1.1	<0.01	0.75	<0.02	<0.02	<0.02	<0.02	<0.02
AG-2	- -	- -	0.36	<0.01	0.31	<0.02	0.15	0.15	0.19	<0.02
AG-3	0.39	1.25	0.65	<0.01	0.22	<0.02	0.05	0.05	0.12	0.02
AG-4	0.03	0.5	<0.02	<0.01	0.08	<0.02	1	0.02	0.13	0.02
Nitrite (NO2)										
AG-1	- -	- -	<0.01	0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01
AG-2	- -	- -	0.39	0.02	<0.01	0.05	<0.01	<0.01	<0.01	<0.01
AG-3	- -	- -	0.05	0.03	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
AG-4	- -	- -	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	0.02	<0.01
Specific Conductivity (UMHOS)										
AG-1	- -	- -	206	577	343	318	191	398	431	314
AG-2	- -	- -	177	219	217	232	256	258	216	142
AG-3	302	244	180	218	225	232	262	259	228	156
AG-4	- -	- -	135	255	243	247	246	271	264	162
Sulfate										
AG-1	- -	- -	12	5	68	<1	- -	- -	- -	- -
AG-2	- -	- -	18	30	32	59	- -	- -	- -	- -
AG-3	- -	- -	17	28	33	50	- -	- -	- -	- -
AG-4	- -	- -	15	38	35	61	- -	- -	- -	- -

Table D-3. Payne Creek - Agrico Ft. Green Reclamation Report - 1984 through 1986

Parameter/Location	2/84	6/84	8/84	10/84	2/85	5/85	8/85	11/85	2/86	5/86
Total Nitrogen										
AG-1	0.48	12.7	1.47	0.83	1.82	0.41	1.77	0.79	0.76	1.09
AG-2	- -	- -	1.44	0.59	1.76	0.6	0.47	0.45	0.37	0.98
AG-3	0.45	2.65	1.08	0.67	0.65	0.23	0.28	0.34	0.29	0.45
AG-4	0.02	0.92	0.53	0.32	0.68	0.25	1.42	0.31	0.46	0.34
Total Phosphate										
AG-1	0.42	0.5	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	0.41	0.5	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	0.5	0.58	- -	- -	- -	- -	- -	- -	- -	- -
Total Phosphorus										
AG-1	- -	- -	0.92	0.42	1.11	1.12	1	0.35	0.6	0.43
AG-2	- -	- -	0.77	0.34	0.29	1.8	0.59	0.45	0.35	0.35
AG-3	- -	- -	0.62	0.25	0.36	0.72	0.57	0.58	0.35	0.15
AG-4	- -	- -	0.79	0.29	0.35	0.25	0.69	0.49	0.51	0.35
Zinc										
AG-1	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-2	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AG-3	<0.05	<0.01	- -	- -	- -	- -	- -	- -	- -	- -
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Total Hardness										
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Sulfide										
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Chloride										
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Chemical Oxygen Demand										
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Calcium										
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Magnesium										
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Nickel										
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

Table D-3. Payne Creek - Agrico Ft. Green Reclamation Report - 1984 through 1986

Parameter/Location	2/84	6/84	8/84	10/84	2/85	5/85	8/85	11/85	2/86	5/86
Sodium										
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Selenium										
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Phenols										
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
MBAS										
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Fecal Strep (per 100 ml)										
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Hexane Solubles										
AG-4	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

11.5.4 PAYNE CREEK WATER QUALITY DATA OCTOBER 1988 - MARCH 1989

OCTOBER 1988

ENVIRONMENTAL LABORATORIES, INC.

November 11, 1988

Mr. John Good
Applied Technology and Management, Inc.
502 N.W. 75th Street
Suite 95
Gainesville, Florida 32607

Dear John:

Enclosed are the results of our analyses of your samples which we received on October 7, 1988.

All data were determined in accordance with published procedures (EPA-600/14-79-020, Methods for Chemical Analysis of Water and Wastes, Revised March 1983). Our laboratory is certified by the Florida DHRS (Lab Nos. 82282 and E82001). Please note the coliform analyses were performed by P.E. LaMoreaux and Associates, Inc., of Lakeland, Florida (Lab Nos. 84183 and E84098). The chlorophyll analyses were performed by CH2M Hill of Gainesville, Florida (Lab Nos. 82112 and E82124). The gross alpha, gross beta, radium 228, and radium 226 analyses were performed by ESE, Inc. of Gainesville, Florida (Lab Nos. 82138 and E82067). The strontium 90 analyses were performed by CEP, Inc. of Santa Fe, New Mexico (Lab No. 87239).

If you have any questions concerning this report, please do not hesitate to give me a call.

Sincerely,

Tom Park

Tom Park
Project Manager

TP:jlm

Enclosure

cc: Dr. Jim Newman
KBN Engineering & Applied Sciences
P.O. Box 14288
Gainesville, FL 32604

6821 SW ARCHER ROAD, GAINESVILLE, FLORIDA 32608 Tel. (904) 377-2349

ENVIRONMENTAL LABORATORIES, INC.

REPORT OF ANALYSES

Applied Technology and Management, Inc.
502 N.W. 75th Street
Suite 95
Gainesville, Florida 32607
Attn: John Good

PROJECT NO.: 87-008 ATM
DATE: 11/11/88
YOUR REF/PO#: Verbal

Table 1. (Page 1 of 2)

Station ID:	PC-1	PC-2	PC-3
PPB #:	30013	30014	30015
Alkalinity, mg/L as $CaCO_3$	48	44	44
Cyanide, mg/L	<0.004	<0.004	<0.004
Fluoride, mg/L	0.6	0.9	1.2
Methylene Blue Active Substances, mg/L	<0.025	<0.025	<0.025
Total Kjeldahl Nitrogen, mg/L	0.864	0.737	1.53
Ammonia Nitrogen, mg/L	0.121	0.030	<0.005
Organic Nitrogen, mg/L	0.743	0.707	1.53
Nitrate+Nitrite-Nitrogen, mg/L	0.190	0.617	0.625
Total Nitrogen, mg/L	1.05	1.35	2.16
Oil and Grease, mg/L	<5	<5	<5
Carbonaceous Biochemical Oxygen Demand, mg/L	<1	1.0	1.2
Chemical Oxygen Demand, mg/L	31	47	70
Orthophosphorus, mg/L	0.500	0.509	0.572
Total Phosphorus, mg/L	0.573	0.624	0.703
Sulfate, mg/L	9.2	17.4	16.9
Turbidity, NTU	1.5	2.0	6.1
Aluminum, ug/L	137	220	169
Antimony, ug/L	<10	<10	<10
Arsenic, ug/L	<5	<5	<5
Beryllium, ug/L	<3	<3	<3
Cadmium, ug/L	<0.4	<0.4	<0.4
Chromium, ug/L	<10	<10	<10
Copper, ug/L	<6	<6	<6
Iron, ug/L	648	542	440
Lead, ug/L	<5	<5	<5
Mercury, ug/L	<0.2	<0.2	<0.2
Nickel, ug/L	<15	<15	<15
Selenium, ug/L	<5	<5	<5
Silver, ug/L	<0.08	<0.08	<0.08
Sodium, mg/L	6.3	6.8	7.5
Zinc, ug/L	<5	10	<5
Total Coliforms, colonies/100 ml	209	600	2,000
Fecal Coliforms, colonies/100 ml	18	36	118

6821 SW ARCHER ROAD, GAINESVILLE, FLORIDA 32608, Tel. (904) 377-2349

PROJECT MANAGER

ENVIRONMENTAL LABORATORIES, INC.

REPORT OF ANALYSES

Applied Technology and Management, Inc.
502 N.W. 75th Street
Suite 95
Gainesville, Florida 32607
Attn: John Good

PROJECT NO.: 87-008 ATM
DATE: 11/11/88
YOUR REF/PO#: Verbal

Table 1. (Page 2 of 2)

	Station ID: PC-4 PPB #: 30016
Alkalinity, mg/L as $CaCO_3$	56
Cyanide, mg/L	<0.004
Fluoride, mg/L	1.4
Methylene Blue Active Substances, mg/L	<0.025
Total Kjeldahl Nitrogen, mg/L	0.896
Ammonia Nitrogen, mg/L	<0.005
Organic Nitrogen, mg/L	0.896
Nitrate+Nitrite-Nitrogen, mg/L	0.994
Total Nitrogen, mg/L	1.89
Oil and Grease, mg/L	<5
Carbonaceous Biochemical Oxygen Demand, mg/L	<1
Chemical Oxygen Demand, mg/L	69
Orthophosphorus, mg/L	0.478
Total Phosphorus, mg/L	0.578
Sulfate, mg/L	30.2
Turbidity, NTU	2.9
Aluminum, ug/L	365
Antimony, ug/L	<10
Arsenic, ug/L	<5
Beryllium, ug/L	<3
Cadmium, ug/L	<0.4
Chromium, ug/L	<10
Copper, ug/L	<6
Iron, ug/L	332
Lead, ug/L	<5
Mercury, ug/L	<0.2
Nickel, ug/L	<15
Selenium, ug/L	<5
Silver, ug/L	<0.08
Sodium, mg/L	8.6
Zinc, ug/L	<5
Total Coliforms, colonies/100 ml	400
Fecal Coliforms, colonies/100 ml	146

PROJECT MANAGER

6821 SW ARCHER ROAD, GAINESVILLE, FLORIDA 32608 Tel. (904) 377-2349

ENVIRONMENTAL LABORATORIES, INC.

REPORT OF ANALYSES

Mr. John Good
Applied Technology and Management, Inc.
502 N.W. 75th Street, Suite 95
Gainesville, Florida 32607

PROJECT NO.: 87-008 ATM

DATE: 11/11/88

YOUR REF/PO#: Verbal

Table 2.

ID No.: / PPB #:	PC-1 30013	PC-2 30014	PC-3 30015	PC-4 30016
Alpha, Gross (pC/L)	0.9	2.5	2.2	0.5
Alpha, Gross, Ct. Error +/- (pC/L)	1.2	1.2	1.6	2.2
Beta, Gross (pC/L)	2.3	5.5	6.1	5.1
Beta, Gross, Ct. Error +/- (pC/L)	1.4	1.5	1.6	1.9
Radium 226 (pC/L)	0.7	0.5	1.1	1.0
Radium 226 Ct. Error +/- (pC/L)	0.1	0.1	0.1	0.1
Radium 228 (pC/L)	0.0	0.0	0.2	0.0
Radium 228, Ct. Error (pC/L)	0.5	0.5	0.4	0.5
Strontium-90 (pC/L)	<0.5	<0.5	<0.5	<0.5
Chlorophyll-a, mg/m^3	ND*	ND	29.9	1.28

*ND=None detected.

Tom Park
Project Manager

6821 SW ARCHER ROAD, GAINESVILLE, FLORIDA 32608 Tel. (904) 377-2349

DECEMBER 1988

ENVIRONMENTAL LABORATORIES, INC.

January 19, 1989

Mr. John Good
Applied Technology and Management, Inc.
502 N.W. 75th Street
Suite 95
Gainesville, Florida 32607

Dear John:

Enclosed are the results of our analyses of your samples which we received on December 9, 1988.

All data were determined in accordance with published procedures (EPA-600/4-79-020, Methods for Chemical Analysis of Water and Wastes, Revised March 1983). Our laboratory is certified by the Florida DHRS (Lab Nos. 82282 and E82001). Please note the coliform analyses were performed by P.E. LaMoreaux and Associates, Inc., of Lakeland, Florida (Lab Nos. 84183 and E84098). The chlorophyll analyses were performed by CH2M Hill of Gainesville, Florida (Lab Nos. 82112 and E82124). The gross alpha, gross beta, radium 228, and radium 226 analyses were performed by ESE, Inc. of Gainesville, Florida (Lab Nos. 82138 and E82067). The strontium 90 analyses were performed by CEP, Inc. of Santa Fe, New Mexico (Lab No. 87239).

If you have any questions concerning this report, please do not hesitate to give me a call.

Sincerely,

Tom Park

Tom Park
Project Manager

TP:jlm

Enclosure

cc: Dr. Jim Newman
KBN Engineering & Applied Sciences
P.O. Box 14288
Gainesville, FL 32604

6821 SW ARCHER ROAD, GAINESVILLE, FLORIDA 32608 Tel. (904) 377-2349

ENVIRONMENTAL LABORATORIES, INC.

REPORT OF ANALYSES

Applied Technology and Management, Inc.
502 N.W. 75th Street
Suite 95
Gainesville, Florida 32607
Attn: John Good

PROJECT NO.: 87-008 ATM

DATE: 1/19/89

YOUR REF/PO#: Verbal

Table 1. Water Quality Data (Page 1 of 2)

Station ID:	PC-1	PC-2	PC-3
PPB #:	31083	31084	31085
Alkalinity, mg/L as $CaCO_3$	50	60	58
Cyanide, mg/L	<0.004	<0.004	<0.004
Fluoride, mg/L	0.8	0.8	0.8
Methylene Blue Active Substances, mg/L	<0.025	<0.025	<0.025
Total Kjeldahl Nitrogen, mg/L	0.809	0.883	1.22
Ammonia Nitrogen, mg/L	0.345	0.325	0.486
Organic Nitrogen, mg/L	0.464	0.558	0.734
Nitrate+Nitrite-Nitrogen, mg/L	0.608	0.845	0.951
Total Nitrogen, mg/L	1.42	1.73	2.17
Oil and Grease, mg/L	<5	<5	<5
Carbonaceous Biochemical Oxygen Demand, mg/L	<1	<1	<1
Chemical Oxygen Demand, mg/L	66	75	78
Orthophosphorus, mg/L	0.308	0.307	0.392
Total Phosphorus, mg/L	0.318	0.311	0.430
Sulfate, mg/L	21.5	22.3	23.2
Turbidity, NTU	1.6	1.6	2.3
Aluminum, ug/L	70	81	96
Antimony, ug/L	<10	<10	<10
Arsenic, ug/L	<5	<5	<5
Beryllium, ug/L	<3	<3	<3
Cadmium, ug/L	<0.4	<0.4	<0.4
Chromium, ug/L	<10	<10	<10
Copper, ug/L	<6	<6	<6
Iron, ug/L	181	164	192
Lead, ug/L	<5	<5	<5
Mercury, ug/L	0.5	0.5	0.4
Nickel, ug/L	<15	<15	<15
Selenium, ug/L	<5	<5	<5
Silver, ug/L	<0.08	<0.08	<0.08
Sodium, mg/L	7.9	7.9	8.5
Zinc, ug/L	<5	<5	<5
Total Coliforms, colonies/100 ml	109	164	291
Fecal Coliforms, colonies/100 ml	36	164	182

6821 SW ARCHER ROAD, GAINESVILLE, FLORIDA 32609 TEL. (904) 377-2349

PROJECT MANAGER

ENVIRONMENTAL LABORATORIES, INC.

REPORT OF ANALYSES

Applied Technology and Management, Inc.
502 N.W. 75th Street
Suite 95
Gainesville, Florida 32607
Attn: John Good

PROJECT NO.: 87-008 ATM
DATE: 1/19/89
YOUR REF/PO#: Verbal

Table 1. Water Quality Data (Page 2 of 2)

	Station ID: PC-4 PPB #: 31086
Alkalinity, mg/L as $CaCO_3$	65
Cyanide, mg/L	<0.004
Fluoride, mg/L	1.7
Methylene Blue Active Substances, mg/L	<0.025
Total Kjeldahl Nitrogen, mg/L	0.698
Ammonia Nitrogen, mg/L	0.034
Organic Nitrogen, mg/L	0.664
Nitrate+Nitrite-Nitrogen, mg/L	2.77
Total Nitrogen, mg/L	3.47
Oil and Grease, mg/L	<5
Carbonaceous Biochemical Oxygen Demand, mg/L	<1
Chemical Oxygen Demand, mg/L	171
Orthophosphorus, mg/L	0.364
Total Phosphorus, mg/L	0.378
Sulfate, mg/L	43.9
Turbidity, NTU	1.6
Aluminum, ug/L	111
Antimony, ug/L	<10
Arsenic, ug/L	<5
Beryllium, ug/L	<3
Cadmium, ug/L	<0.4
Chromium, ug/L	<10
Copper, ug/L	<6
Iron, ug/L	118
Lead, ug/L	<5
Mercury, ug/L	0.3
Nickel, ug/L	<15
Selenium, ug/L	<5
Silver, ug/L	<0.08
Sodium, mg/L	9.1
Zinc, ug/L	<5
Total Coliforms, colonies/100 ml	709
Fecal Coliforms, colonies/100 ml	346

6821 SW ARCHER ROAD, GAINESVILLE, FLORIDA 32605 / Tel. (904) 377-2349

PROJECT MANAGER

E N V I R O N M E N T A L L A B O R A T O R I E S, I N C.

REPORT OF ANALYSES

Mr. John Good
Applied Technology and Management, Inc.
502 N.W. 75th Street, Suite 95
Gainesville, Florida 32607

PROJECT NO.: 87-008 ATM

DATE: 1/19/89

YOUR REF/PO#: Verbal

Table 2. Radiation and Chlorophyll-a Data

ID No.:	PC-1	PC-2	PC-3	PC-4
PPB #:	31083	31084	31085	31086
Alpha, Gross (pC/L)	3.8	0.4	2.0	4.6
Alpha, Gross, Ct. Error +/- (pC/L)	2.1	1.5	1.9	3.0
Beta, Gross (pC/L)	0.2	1.7	4.1	2.8
Beta, Gross, Ct. Error +/- (pC/L)	1.6	1.7	2.6	3.6
Radium 226 (pC/L)	0.6	0.1	0.9	0.6
Radium 226 Ct. Error +/- (pC/L)	0.0	0.0	0.0	0.0
Radium 228 (pC/L)	0.5	0.1	1.1	1.2
Radium 228, Ct. Error (pC/L)	0.9	0.7	0.7	0.7
Strontium-90 (pC/L)	<0.5	<0.5	<0.5	<0.5
Chlorophyll-a, mg/m^3	<1	<1	<1	<1

*ND=None detected.

Tim Poole
Project Manager

6821 SW ARCHER ROAD, GAINESVILLE, FLORIDA 32608 Tel. (904) 377-2349

NOVEMBER 1988

ENVIRONMENTAL LABORATORIES, INC.

January 31, 1989

Mr. John Good
Applied Technology and Management, Inc.
502 N.W. 75th Street
Suite 95
Gainesville, Florida 32607

Dear John:

Enclosed are the results of our analyses of your samples which we received on November 10, 1988.

All data were determined in accordance with published procedures (EPA-600/4-79-020, Methods for Chemical Analysis of Water and Wastes, Revised March 1983). Our laboratory is certified by the Florida DHRS (Lab Nos. 82282 and E82001). Please note the coliform analyses were performed by P.E. LaMoreaux and Associates, Inc., of Lakeland, Florida (Lab Nos. 84183 and E84098). The chlorophyll analyses were performed by CH2M Hill of Gainesville, Florida (Lab Nos. 82112 and E82124). The gross alpha, gross beta, radium 228, and radium 226 analyses were performed by ESE, Inc. of Gainesville, Florida (Lab Nos. 82138 and E82067). The strontium 90 analyses were performed by CEP, Inc. of Santa Fe, New Mexico (Lab No. 87239). The organics analyses were performed by Southeastern Environmental Laboratories, Inc. of Orange Park, Florida (Lab Nos. 82315 and E82179).

If you have any questions concerning this report, please do not hesitate to give me a call.

Sincerely,

Tom Park

Tom Park
Project Manager

TP:jlm

Enclosure

cc: Dr. Jim Newman
KBN Engineering & Applied Sciences
P.O. Box 14288
Gainesville, FL 32604

6821 SW ARCHER ROAD, GAINESVILLE, FLORIDA 32608 Tel. (904) 377-2349

ENVIRONMENTAL LABORATORIES, INC.

REPORT OF ANALYSES

Applied Technology and Management, Inc.
502 N.W. 75th Street
Suite 95
Gainesville, Florida 32607
Attn: John Good

PROJECT NO.: 87-008 ATM
DATE: 1/31/89
YOUR REF/PO#: Verbal

Table 1. Water Quality Data (Page 1 of 2)

Station ID:	PC-1	PC-2	PC-3
PPB #:	30732	30733	30734
Alkalinity, mg/L as $CaCO_3$	42	44	36
Cyanide, mg/L	<0.004	<0.004	<0.004
Fluoride, mg/L	0.6	0.6	0.5
Methylene Blue Active Substances, mg/L	<0.025	<0.025	<0.025
Total Kjeldahl Nitrogen, mg/L	0.770	0.747	0.566
Ammonia Nitrogen, mg/L	<0.005	<0.005	0.019
Organic Nitrogen, mg/L	0.770	0.747	0.547
Nitrate+Nitrite-Nitrogen, mg/L	0.218	0.258	0.516
Total Nitrogen, mg/L	0.988	1.00	1.08
Oil and Grease, mg/L	<5	<5	<5
Carbonaceous Biochemical Oxygen Demand, mg/L	<1	1.7	<1
Chemical Oxygen Demand, mg/L	<10	<10	<10
Orthophosphorus, mg/L	0.404	0.416	0.510
Total Phosphorus, mg/L	0.318	0.332	0.444
Sulfate, mg/L	25.0	25.3	34.4
Turbidity, NTU	1.1	0.8	1.9
Aluminum, ug/L	67	116	157
Antimony, ug/L	<10	<10	<10
Arsenic, ug/L	<5	<5	<5
Beryllium, ug/L	<3	<3	<3
Cadmium, ug/L	<0.4	<0.4	<0.4
Chromium, ug/L	<10	<10	<10
Copper, ug/L	<6	<6	<6
Iron, ug/L	224	210	229
Lead, ug/L	6.7	<5	<5
Mercury, ug/L	<0.2	<0.2	<0.2
Nickel, ug/L	<15	<15	<15
Selenium, ug/L	<5	<5	<5
Silver, ug/L	<0.08	<0.08	<0.08
Sodium, mg/L	7.6	7.8	8.6
Zinc, ug/L	<5	<5	<5
Total Coliforms, colonies/100 ml	364	418	809
Fecal Coliforms, colonies/100 ml	73	64	291

6821 SW ARCHER ROAD, GAINESVILLE, FLORIDA 32608 Tel. (904) 377-2349

Tom Park
PROJECT MANAGER

ENVIRONMENTAL LABORATORIES, INC.

REPORT OF ANALYSES

Applied Technology and Management, Inc.
502 N.W. 75th Street
Suite 95
Gainesville, Florida 32607
Attn: John Good

PROJECT NO.: 87-008 ATM

DATE: 1/31/89

YOUR REF/PO#: Verbal

Table 1. Water Quality Data (Page 2 of 2)

	Station ID: PC-4 PPB #: 30735
Alkalinity, mg/L as $CaCO_3$	66
Cyanide, mg/L	<0.004
Fluoride, mg/L	1.3
Methylene Blue Active Substances, mg/L	<0.025
Total Kjeldahl Nitrogen, mg/L	0.702
Ammonia Nitrogen, mg/L	0.006
Organic Nitrogen, mg/L	0.696
Nitrate+Nitrite-Nitrogen, mg/L	1.03
Total Nitrogen, mg/L	1.73
Oil and Grease, mg/L	<5
Carbonaceous Biochemical Oxygen Demand, mg/L	<1
Chemical Oxygen Demand, mg/L	<10
Orthophosphorus, mg/L	0.510
Total Phosphorus, mg/L	0.465
Sulfate, mg/L	50.1
Turbidity, NTU	1.9
Aluminum, ug/L	214
Antimony, ug/L	<10
Arsenic, ug/L	<5
Beryllium, ug/L	<3
Cadmium, ug/L	<0.4
Chromium, ug/L	<10
Copper, ug/L	<6
Iron, ug/L	133
Lead, ug/L	5.9
Mercury, ug/L	<0.2
Nickel, ug/L	<15
Selenium, ug/L	<5
Silver, ug/L	<0.08
Sodium, mg/L	9.4
Zinc, ug/L	<5
Total Coliforms, colonies/100 ml	700
Fecal Coliforms, colonies/100 ml	73

PROJECT MANAGER

6821 SW ARCHER ROAD, GAINESVILLE, FLORIDA 32608, Tel. (904) 377-2349

ENVIRONMENTAL LABORATORIES, INC.

REPORT OF ANALYSES

Mr. John Good
Applied Technology and Management, Inc.
502 N.W. 75th Street, Suite 95
Gainesville, Florida 32607

PROJECT NO.: 87-008 ATM

DATE: 1/31/89

YOUR REF/PO#: Verbal

Table 2. Radiation and Chlorophyll Data

ID No.: / PPB #:	PC-1 30732	PC-2 30733	PC-3 30734	PC-4 30735
Alpha, Gross (pC/L)	0.5	3.0	1.2	3.9
Alpha, Gross, Ct. Error +/- (pC/L)	1.2	1.7	1.5	2.3
Beta, Gross (pC/L)	0.8	3.2	2.3	1.2
Beta, Gross, Ct. Error +/- (pC/L)	1.7	2.0	1.8	1.8
Radium 226 (pC/L)	1.0	1.2	0.9	0.7
Radium 226 Ct. Error +/- (pC/L)	0.1	0.1	0.1	0.1
Radium 228 (pC/L)	0.8	0.0	0.8	1.0
Radium 228, Ct. Error (pC/L)	0.7	0.7	0.7	0.6
Strontium-90 (pC/L)	<0.5	<0.5	<0.5	<0.5
Chlorophyll-a, mg/m^3	ND*	ND	ND	ND

*ND=None detected.

Tom Park
Project Manager

6821 SW ARCHER ROAD, GAINESVILLE, FLORIDA 32608 Tel. (904) 377-2349

ENVIRONMENTAL LABORATORIES, INC.

REPORT OF ANALYSES

Mr. John Good
Applied Technology and Management, Inc.
502 N.W. 75th Street, Suite 95
Gainesville, Florida 32607

PROJECT NO.: 87-008 ATM

DATE: 1/31/89

YOUR REF/PO#: Verbal

Table 3. Organics Data (all results as ug/L, micrograms per liter) (Page 1 of 2)

ID No.: / PPB #:	PC-1 30732	PC-2 30733	PC-3 30734	PC-4 30735
Phenols	<5	<5	<5	<5
Aldrin	<0.003	<0.003	<0.003	<0.003
Dieldrin	<0.003	<0.003	<0.003	<0.003
Chlordane	<0.01	<0.01	<0.01	<0.01
4,4'DDT	<0.001	<0.001	<0.001	<0.001
Demeton	<0.1	<0.1	<0.1	<0.1
Endrin	<0.004	<0.004	<0.004	<0.004
Endosulfan	<0.003	<0.003	<0.003	<0.003
Guthion	<0.01	<0.01	<0.01	<0.01
Heptachlor	<0.001	<0.001	<0.001	<0.001
Lindane	<0.01	<0.01	<0.01	<0.01
Malathion	<0.1	<0.1	<0.1	<0.1
Methoxychlor	<0.03	<0.03	<0.03	<0.03
Myrex	<0.001	<0.001	<0.001	<0.001
Parathion	<0.04	<0.04	<0.04	<0.04
2,4-D	<10	<10	<10	<10
Silvex	<20	<20	<20	<20
Toxaphene	<0.005	<0.005	<0.005	<0.005
PCB-1016	<0.001	<0.001	<0.001	<0.001
PCB-12217	<0.001	<0.001	<0.001	<0.001
PCB-1232	<0.001	<0.001	<0.001	<0.001
PCB-1242	<0.001	<0.001	<0.001	<0.001
PCB-1248	<0.001	<0.001	<0.001	<0.001
PCB-1254	<0.001	<0.001	<0.001	<0.001
PCB-1260	<0.001	<0.001	<0.001	<0.001

*ND=None detected.

Tom Pauk
Project Manager

6821 SW ARCHER ROAD, GAINESVILLE, FLORIDA 32608 Tel. (904) 377-2349

ENVIRONMENTAL LABORATORIES, INC.

REPORT OF ANALYSES

Mr. John Good
Applied Technology and Management, Inc.
502 N.W. 75th Street, Suite 95
Gainesville, Florida 32607

PROJECT NO.: 87-008 ATM

DATE: 1/31/89

YOUR REF/PO#: Verbal

Table 3. Organics Data (all results as ug/L, micrograms per liter) (Page 2 of 2)

ID No.:	PC-1	PC-2	PC-3	PC-4
PPB #:	30732	30733	30734	30735
Chlorinated Hydrocarbons				
2-Chloronapthalene	<10	<10	<10	<10
1,2-Dichlorobenzene	<10	<10	<10	<10
1,3-Dichlorobenzene	<10	<10	<10	<10
1,4-Dichlorobenzene	<10	<10	<10	<10
Hexachlorobenzene	<10	<10	<10	<10
Hexachlorobutadiene	<10	<10	<10	<10
Hexachlorocyclopentadiene	<10	<10	<10	<10
Hexachloroethane	<10	<10	<10	<10
1,2,4-Trichlorobenzene	<10	<10	<10	<10

*ND=None detected.

Tom Park
Project Manager

JANUARY 1989

ENVIRONMENTAL LABORATORIES, INC.

February 24, 1989

Mr. John Good
Applied Technology and Management, Inc.
502 N.W. 75th Street
Suite 95
Gainesville, Florida 32607

Dear John:

Enclosed are the results of our analyses of your samples which we received on January 13, 1989.

All data were determined in accordance with published procedures (EPA-600/4-79-020, Methods for Chemical Analysis of Water and Wastes, Revised March 1983). Our laboratory is certified by the Florida DHRS (Lab Nos. 82282 and E82001). Please note the coliform analyses were performed by P.E. LaMoreaux and Associates, Inc., of Lakeland, Florida (Lab Nos. 84183 and E84098). The chlorophyll analyses were performed by CH2M Hill of Gainesville, Florida (Lab Nos. 82112 and E82124). The gross alpha, gross beta, radium 228, and radium 226 analyses were performed by ESE, Inc. of Gainesville, Florida (Lab Nos. 82138 and E82067). The strontium 90 analyses were performed by CEP, Inc. of Santa Fe, New Mexico (Lab No. 87239).

If you have any questions concerning this report, please do not hesitate to give me a call.

Sincerely,

Kelley Bugdoll for Tom Park

Tom Park
Project Manager

TP:jlm

Enclosure

cc: Dr. Jim Newman
KBN Engineering & Applied Sciences
P.O. Box 14288
Gainesville, FL 32604

6821 SW ARCHER ROAD, GAINESVILLE, FLORIDA 32608 Tel. (904) 377-2349

ENVIRONMENTAL LABORATORIES, INC.

REPORT OF ANALYSES

Applied Technology and Management, Inc.
502 N.W. 75th Street
Suite 95
Gainesville, Florida 32607
Attn: John Good

PROJECT NO.: 87-008 ATM

DATE: 2/24/89

YOUR REF/PO#: Verbal

Table 1. Water Quality Data (Page 1 of 2)

Station ID:	PC-1	PC-2	PC-3
PPB #:	31649	31650	31651
Alkalinity, mg/L as $CaCO_3$	56	52	60
Cyanide, mg/L	<0.004	<0.004	<0.004
Fluoride, mg/L	0.6	0.6	1.3
Methylene Blue Active Substances, mg/L	<0.025	<0.025	<0.025
Total Kjeldahl Nitrogen, mg/L	0.519	0.579	0.647
Ammonia Nitrogen, mg/L	0.013	0.014	0.061
Organic Nitrogen, mg/L	0.506	0.565	0.586
Nitrate+Nitrite-Nitrogen, mg/L	0.441	0.420	0.591
Total Nitrogen, mg/L	0.960	0.999	1.24
Oil and Grease, mg/L	<5	<5	<5
Carbonaceous Biochemical Oxygen Demand, mg/L	<1	<1	<1
Chemical Oxygen Demand, mg/L	36	38	55
Orthophosphorus, mg/L	0.288	0.243	0.378
Total Phosphorus, mg/L	0.352	0.353	0.483
Sulfate, mg/L	22.4	23.3	49.7
Turbidity, NTU	0.95	0.90	1.0
Aluminum, ug/L	78	140	94
Antimony, ug/L	<10	<10	<10
Arsenic, ug/L	<5	<5	<5
Beryllium, ug/L	<3	<3	<3
Cadmium, ug/L	<0.4	<0.4	<0.4
Chromium, ug/L	<10	<10	<10
Copper, ug/L	<6	<6	<6
Iron, ug/L	259	246	240
Lead, ug/L	<5	8.9	9.6
Mercury, ug/L	<0.2	<0.2	<0.2
Nickel, ug/L	<15	<15	<15
Selenium, ug/L	<5	<5	<5
Silver, ug/L	<0.08	<0.08	<0.08
Sodium, mg/L	8.7	8.8	11
Zinc, ug/L	<5	<5	7.1
Total Coliforms, colonies/100 ml	27	55	45
Fecal Coliforms, colonies/100 ml	<1	9	36

6821 SW ARCHER ROAD, GAINESVILLE, FLORIDA 32608 Tel. (904) 377-2349

Kelly Berdoll for Tom Park
PROJECT MANAGER

ENVIRONMENTAL LABORATORIES, INC.

REPORT OF ANALYSES

Applied Technology and Management, Inc.
502 N.W. 75th Street
Suite 95
Gainesville, Florida 32607
Attn: John Good

PROJECT NO.: 87-008 ATM
DATE: 2/24/89
YOUR REF/PO#: Verbal

Table 1. Water Quality Data (Page 2 of 2)

	Station ID: PC-4 PPB #: 31652
Alkalinity, mg/L as $CaCO_3$	72
Cyanide, mg/L	<0.004
Fluoride, mg/L	1.6
Methylene Blue Active Substances, mg/L	<0.025
Total Kjeldahl Nitrogen, mg/L	0.664
Ammonia Nitrogen, mg/L	0.019
Organic Nitrogen, mg/L	0.645
Nitrate+Nitrite-Nitrogen, mg/L	3.02
Total Nitrogen, mg/L	3.68
Oil and Grease, mg/L	<5
Carbonaceous Biochemical Oxygen Demand, mg/L	<1
Chemical Oxygen Demand, mg/L	55
Orthophosphorus, mg/L	0.378
Total Phosphorus, mg/L	0.469
Sulfate, mg/L	62.6
Turbidity, NTU	0.50
Aluminum, ug/L	63.0
Antimony, ug/L	<10
Arsenic, ug/L	<5
Beryllium, ug/L	<3
Cadmium, ug/L	<0.4
Chromium, ug/L	<10
Copper, ug/L	<6
Iron, ug/L	49.3
Lead, ug/L	<5
Mercury, ug/L	<0.2
Nickel, ug/L	<15
Selenium, ug/L	<5
Silver, ug/L	<0.08
Sodium, mg/L	10.2
Zinc, ug/L	<5
Total Coliforms, colonies/100 ml	55
Fecal Coliforms, colonies/100 ml	18

6821 SW ARCHER ROAD, GAINESVILLE, FLORIDA 32608 Tel. (904) 377-2349

Kelly Birdsall for Tom Pank
PROJECT MANAGER

ENVIRONMENTAL LABORATORIES, INC.

REPORT OF ANALYSES

Mr. John Good
Applied Technology and Management, Inc.
502 N.W. 75th Street, Suite 95
Gainesville, Florida 32607

PROJECT NO.: 87-008 ATM

DATE: 2/24/89

YOUR REF/PO#: Verbal

Table 2. Radiation and Chlorophyll-a Data

ID No.: / PPB #:	PC-1 31649	PC-2 31650	PC-3 31651	PC-4 31652
Alpha, Gross (pC/L)	0.8	0.2	0.0	3.9
Alpha, Gross, Ct. Error +/- (pC/L)	1.1	1.3	1.4	2.3
Beta, Gross (pC/L)	2.2	1.0	2.9	3.9
Beta, Gross, Ct. Error +/- (pC/L)	1.6	1.4	1.5	2.9
Radium 226 (pC/L)	0.6	0.4	0.7	1.4
Radium 226 Ct. Error +/- (pC/L)	0.0	0.0	0.0	0.1
Radium 228 (pC/L)	0.0	0.0	0.0	0.0
Radium 228, Ct. Error (pC/L)	1.9	1.6	1.6	1.6
Strontium-90 (pC/L)	<0.5	<0.5	<0.5	1.5 ±1.3
Chlorophyll-a, mg/m^3	<1	<1	<1	<1

*ND=None detected.

Kelly Beardall for
Project Manager Tom Burke

6821 SW ARCHER ROAD, GAINESVILLE, FLORIDA 32608 Tel. (904) 377-2349

FEBRUARY 1989

ENVIRONMENTAL LABORATORIES, INC.

March 27, 1989

Mr. John Good
Applied Technology and Management, Inc.
502 N.W. 75th Street
Suite 95
Gainesville, Florida 32607

Dear John:

Enclosed are the results of our analyses of your samples which we received on February 17, 1989.

All data were determined in accordance with published procedures (EPA-600/4-79-020, Methods for Chemical Analysis of Water and Wastes, Revised March 1983). Our laboratory is certified by the Florida DHRS (Lab Nos. 82282 and E82001). Please note the coliform analyses were performed by P.E. LaMoreaux and Associates, Inc., of Lakeland, Florida (Lab Nos. 84183 and E84098). The chlorophyll analyses were performed by CH2M Hill of Gainesville, Florida (Lab Nos. 82112 and E82124). The gross alpha, gross beta, radium 228, and radium 226 analyses were performed by ESE, Inc. of Gainesville, Florida (Lab Nos. 82138 and E82067). The strontium 90 analyses were performed by CEP, Inc. of Santa Fe, New Mexico (Lab No. 87239). The organics analyses were performed by Southeastern Environmental Laboratories, Inc. of Orange Park, Florida (Lab Nos. 82315 and E82179).

If you have any questions concerning this report, please do not hesitate to give me a call.

Sincerely,

Tom Park

Tom Park
Project Manager

TP:jlm

Enclosure

cc: Dr. Jim Newman
KBN Engineering & Applied Sciences
P.O. Box 14288
Gainesville, FL 32604

6821 SW ARCHER ROAD, GAINESVILLE, FLORIDA 32608 Tel. (904) 377-2349

ENVIRONMENTAL LABORATORIES, INC.

REPORT OF ANALYSES

Applied Technology and Management, Inc.
502 N.W. 75th Street
Suite 95
Gainesville, Florida 32607
Attn: John Good

PROJECT NO.: 87-008 ATM
DATE: 3/27/89
YOUR REF/PO#: Verbal
DHRS#: 82282, E82001

Table 1. Water Quality Data (Page 1 of 2)

Station ID:	PC-1	PC-2	PC-3
PPB #:	32096	32097	32098
Alkalinity, mg/L as $CaCO_3$	48	68	60
Cyanide, mg/L	<0.004	<0.004	<0.004
Fluoride, mg/L	0.8	0.8	0.7
Methylene Blue Active Substances, mg/L	0.050	0.054	0.033
Total Kjeldahl Nitrogen, mg/L	0.338	0.245	0.657
Ammonia Nitrogen, mg/L	0.015	0.006	<0.005
Organic Nitrogen, mg/L	0.323	0.239	0.657
Nitrate+Nitrite-Nitrogen, mg/L	0.434	0.386	0.400
Total Nitrogen, mg/L	0.772	0.631	1.06
Oil and Grease, mg/L	<5	<5	<5
Carbonaceous Biochemical Oxygen Demand, mg/L	<1	<1	2.4
Chemical Oxygen Demand, mg/L	<10	<10	<10
Orthophosphorus, mg/L	0.326	0.309	0.558
Total Phosphorus, mg/L	0.327	0.342	0.578
Sulfate, mg/L	23.0	23.1	28.2
Turbidity, NTU	0.8	2.3	2.8
Aluminum, ug/L	45	32	74
Antimony, ug/L	<10	<10	<10
Arsenic, ug/L	<5	<5	<5
Beryllium, ug/L	<3	<3	<3
Cadmium, ug/L	<0.4	0.5	<0.4
Chromium, ug/L	<10	<10	<10
Copper, ug/L	<7	12	<7
Iron, ug/L	310	260	215
Lead, ug/L	<5	9.8	<5
Mercury, ug/L	<0.2	<0.2	<0.2
Nickel, ug/L	<17	35	<17
Selenium, ug/L	<5	<5	<5
Silver, ug/L	<0.08	<0.08	<0.08
Sodium, mg/L	7.9	7.9	9.7
Zinc, ug/L	7.0	36	8.8
Total Coliforms, colonies/100 ml	164	182	691
Fecal Coliforms, colonies/100 ml	9	36	327

6821 SW ARCHER ROAD, GAINESVILLE, FLORIDA 32608 Tel. (904) 377-2349

Tom Park

ENVIRONMENTAL LABORATORIES, INC.

REPORT OF ANALYSES

Applied Technology and Management, Inc.
502 N.W. 75th Street
Suite 95
Gainesville, Florida 32607
Attn: John Good

PROJECT NO.: 87-008 ATM
DATE: 3/27/89
YOUR REF/PO#: Verbal
DHRS#: 82282, E82001

Table 1. Water Quality Data (Page 2 of 2)

	Station ID: PC-4 PPB #: 32099
Alkalinity, mg/L as $CaCO_3$	76
Cyanide, mg/L	<0.004
Fluoride, mg/L	1.8
Methylene Blue Active Substances, mg/L	0.026
Total Kjeldahl Nitrogen, mg/L	0.615
Ammonia Nitrogen, mg/L	<0.005
Organic Nitrogen, mg/L	0.615
Nitrate+Nitrite-Nitrogen, mg/L	1.54
Total Nitrogen, mg/L	2.16
Oil and Grease, mg/L	<5
Carbonaceous Biochemical Oxygen Demand, mg/L	1.4
Chemical Oxygen Demand, mg/L	<10
Orthophosphorus, mg/L	0.629
Total Phosphorus, mg/L	0.670
Sulfate, mg/L	55
Turbidity, NTU	1.9
Aluminum, ug/L	49
Antimony, ug/L	<10
Arsenic, ug/L	<5
Beryllium, ug/L	<3
Cadmium, ug/L	<0.4
Chromium, ug/L	<10
Copper, ug/L	11
Iron, ug/L	157
Lead, ug/L	<5
Mercury, ug/L	<0.2
Nickel, ug/L	<17
Selenium, ug/L	<5
Silver, ug/L	<0.08
Sodium, mg/L	10.3
Zinc, ug/L	<5
Total Coliforms, colonies/100 ml	500
Fecal Coliforms, colonies/100 ml	118

6821 SW ARCHER ROAD, GAINESVILLE, FLORIDA 32608, Tel. (904) 377-2349

Tom Park
PROJECT MANAGER

ENVIRONMENTAL LABORATORIES, INC.

REPORT OF ANALYSES

Mr. John Good
Applied Technology and Management, Inc.
502 N.W. 75th Street, Suite 95
Gainesville, Florida 32607

PROJECT NO.: 87-008 ATM

DATE: 3/27/89

YOUR REF/PO#: Verbal

DHRS#: 82282, E82001

Table 2. Radiation, Chlorophyll, and Additional Water Quality Data

ID No.:	PC-1	PC-2	PC-3	PC-4
PPB #:	32458	32459	32460	32461
Alpha, Gross (pC/L)				
Alpha, Gross, Ct. Error +/- (pC/L)				
Beta, Gross (pC/L)				
Beta, Gross, Ct. Error +/- (pC/L)				
Radium 226 (pC/L)				
Radium 226 Ct. Error +/- (pC/L)				
Radium 228 (pC/L)				
Radium 228, Ct. Error (pC/L)				
Strontium-90 (pC/L)				
Chlorophyll-a, mg/m^3	<1	<1	<1	<1
Chloride, mg/L				
Total Dissolved Solids, mg/L	126	125	149	199
Silica, dissolved reactive, mg/L	3.1	2.8	4.8	2.3

*ND=None detected.

Tony Park
Project Manager

6821 SW ARCHER ROAD, GAINESVILLE, FLORIDA 32608 Tel. (904) 377-2349

ENVIRONMENTAL LABORATORIES, INC.

REPORT OF ANALYSES

Mr. John Good
Applied Technology and Management, Inc.
502 N.W. 75th Street, Suite 95
Gainesville, Florida 32607

PROJECT NO.: 87-008 ATM

DATE: 3/27/89

YOUR REF/PO#: Verbal

DHRS#: 82282, E82001

Table 2. Radiation and Chlorophyll Data

ID No.: / PPB #:	PC-1 32096	PC-2 32097	PC-3 32098	PC-4 32099
Alpha, Gross (pC/L)	3.6	2.4	2.5	0.8
Alpha, Gross, Ct. Error +/- (pC/L)	2.1	1.6	2.4	1.7
Beta, Gross (pC/L)	0.0	1.1	3.9	0.1
Beta, Gross, Ct. Error +/- (pC/L)	1.7	1.5	1.8	1.8
Radium 226 (pC/L)	0.3	0.6	0.6	0.5
Radium 226 Ct. Error +/- (pC/L)	0.0	0.0	0.0	0.0
Radium 228 (pC/L)	0.0	0.0	0.0	1.1
Radium 228, Ct. Error (pC/L)	0.8	0.7	0.7	0.9
Strontium-90 (pC/L)	<0.5	<0.5	<0.5	<0.5
Chlorophyll-a, mg/m^3	<1	<1	<1	<1

*ND=None detected.

Tom Park
Project Manager

6821 SW ARCHER ROAD, GAINESVILLE, FLORIDA 32608 Tel. (904) 377-2349

ENVIRONMENTAL LABORATORIES, INC.

REPORT OF ANALYSES

Mr. John Good
Applied Technology and Management, Inc.
502 N.W. 75th Street, Suite 95
Gainesville, Florida 32607

PROJECT NO.: 87-008 ATM

DATE: 3/27/89

YOUR REF/PO#: Verbal

DHRS#: 82282, E82001

Table 3. Organics Data (all results as ug/L, micrograms per liter) (Page 1 of 2)

ID No.:	PC-1	PC-2	PC-3	PC-4
PPB #:	32096	32097	32098	32099
Phenols	<5	<5	<5	<5
Aldrin	<0.003	<0.003	<0.003	<0.003
Dieldrin	<0.003	<0.003	<0.003	<0.003
Chlordane	<0.01	<0.01	<0.01	<0.01
4,4'DDT	<0.001	<0.001	<0.001	<0.001
Demeton	<0.1	<0.1	<0.1	<0.1
Endrin	<0.004	<0.004	<0.004	<0.004
Endosulfan	<0.003	<0.003	<0.003	<0.003
Guthion	<0.01	<0.01	<0.01	<0.01
Heptachlor	<0.001	<0.001	<0.001	<0.001
Lindane	<0.01	<0.01	<0.01	<0.01
Malathion	<0.1	<0.1	<0.1	<0.1
Methoxychlor	<0.03	<0.03	<0.03	<0.03
Myrex	<0.001	<0.001	<0.001	<0.001
Parathion	<0.04	<0.04	<0.04	<0.04
2,4-D	<10	<10	<10	<10
Silvex	<20	<20	<20	<20
Toxaphene	<0.005	<0.005	<0.005	<0.005
PCB-1016	<0.001	<0.001	<0.001	<0.001
PCB-12217	<0.001	<0.001	<0.001	<0.001
PCB-1232	<0.001	<0.001	<0.001	<0.001
PCB-1242	<0.001	<0.001	<0.001	<0.001
PCB-1248	<0.001	<0.001	<0.001	<0.001
PCB-1254	<0.001	<0.001	<0.001	<0.001
PCB-1260	<0.001	<0.001	<0.001	<0.001

*ND=None detected.

Tom Park
Project Manager

6821 SW ARCHER ROAD, GAINESVILLE, FLORIDA Tel. (904) 377-2349

ENVIRONMENTAL LABORATORIES, INC.

REPORT OF ANALYSES

Mr. John Good
Applied Technology and Management, Inc.
502 N.W. 75th Street, Suite 95
Gainesville, Florida 32607

PROJECT NO.: 87-008 ATM

DATE: 3/27/89

YOUR REF/PO#: Verbal

DHRS#: 82282, E82001

Table 3. Organics Data (all results as ug/L, micrograms per liter) (Page 2 of 2)

ID No.:	PC-1	PC-2	PC-3	PC-4
PPB #:	32096	32097	32098	32099
Chlorinated Hydrocarbons				
2-Chloronapthalene	<10	<10	<10	<10
1,2-Dichlorobenzene	<10	<10	<10	<10
1,3-Dichlorobenzene	<10	<10	<10	<10
1,4-Dichlorobenzene	<10	<10	<10	<10
Hexachlorobenzene	<10	<10	<10	<10
Hexachlorobutadiene	<10	<10	<10	<10
Hexachlorocyclopentadiene	<10	<10	<10	<10
Hexachloroethane	<10	<10	<10	<10
1,2,4-Trichlorobenzene	<10	<10	<10	<10

*ND=None detected.

Tom Park
Project Manager

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ENVIRONMENTAL LABORATORIES, INC.

REPORT OF ANALYSES

Applied Technology and Management, Inc.
502 N.W. 75th Street
Suite 95
Gainesville, Florida 32607
Attn: Fred Ramsey

PROJECT NO.: 87-008 ATM
DATE: 4/19/89
YOUR REF/PO#: Verbal
DHRS#: 82282, E82001

Table 1. Water Quality Data (Page 1 of 2)

Station ID:	PC-1	PC-2	PC-3
PPB #:	32458	32459	32460
Alkalinity, mg/L as $CaCO_3$	60	60	60
Cyanide, mg/L	<0.004	<0.004	<0.004
Fluoride, mg/L	0.8	0.8	0.7
Methylene Blue Active Substances, mg/L	0.116	0.084	0.090
Total Kjeldahl Nitrogen, mg/L	0.638	0.676	0.599
Ammonia Nitrogen, mg/L	<0.005	0.017	0.057
Organic Nitrogen, mg/L	0.638	0.659	0.542
Nitrate+Nitrite-Nitrogen, mg/L	0.254	0.209	0.628
Total Nitrogen, mg/L	0.892	0.885	1.23
Oil and Grease, mg/L	<5	<5	<5
Carbonaceous Biochemical Oxygen Demand, mg/L	<1	<1	1.2
Chemical Oxygen Demand, mg/L	24	<10	19
Orthophosphorus, mg/L	0.452	0.424	0.480
Total Phosphorus, mg/L	0.464	0.429	0.537
Sulfate, mg/L	18.8	22.1	28.1
Turbidity, NTU	0.9	1.6	1.3
Aluminum, ug/L	102	81	116
Antimony, ug/L	<10	<10	<10
Arsenic, ug/L	<5	<5	<5
Beryllium, ug/L	<3	<3	<3
Cadmium, ug/L	<0.4	<0.4	<0.4
Chromium, ug/L	<10	<10	<10
Copper, ug/L	<7	10	<7
Iron, ug/L	409	254	253
Lead, ug/L	<5	8.9	6.2
Mercury, ug/L	<0.2	<0.2	<0.2
Nickel, ug/L	<12	<12	<12
Selenium, ug/L	<5	<5	<5
Silver, ug/L	<0.08	<0.08	<0.08
Sodium, mg/L	8.3	8.4	9.6
Zinc, ug/L	<5	<5	<5
Total Coliforms, colonies/100 ml	46	<1	355
Fecal Coliforms, colonies/100 ml	36	9	63

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Tom Park

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PROJECT NO.: 87-008 ATM
DATE: 4/19/89
YOUR REF/PO#: Verbal
DHRS#: 82282, E82001

Table 1. Water Quality Data (Page 2 of 2)

	Station ID: PC-4 PPB #: 32461
Alkalinity, mg/L as $CaCO_3$	66
Cyanide, mg/L	<0.004
Fluoride, mg/L	1.6
Methylene Blue Active Substances, mg/L	0.088
Total Kjeldahl Nitrogen, mg/L	0.676
Ammonia Nitrogen, mg/L	0.013
Organic Nitrogen, mg/L	0.663
Nitrate+Nitrite-Nitrogen, mg/L	1.52
Total Nitrogen, mg/L	2.20
Oil and Grease, mg/L	<5
Carbonaceous Biochemical Oxygen Demand, mg/L	<1
Chemical Oxygen Demand, mg/L	<10
Orthophosphorus, mg/L	0.596
Total Phosphorus, mg/L	0.632
Sulfate, mg/L	58
Turbidity, NTU	0.8
Aluminum, ug/L	132
Antimony, ug/L	<10
Arsenic, ug/L	<5
Beryllium, ug/L	<3
Cadmium, ug/L	<0.4
Chromium, ug/L	<10
Copper, ug/L	<7
Iron, ug/L	85
Lead, ug/L	6.4
Mercury, ug/L	<0.2
Nickel, ug/L	<12
Selenium, ug/L	<5
Silver, ug/L	<0.08
Sodium, mg/L	10.3
Zinc, ug/L	<5
Total Coliforms, colonies/100 ml	282
Fecal Coliforms, colonies/100 ml	36

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ENVIRONMENTAL LABORATORIES, INC.

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Mr. Fred Ramsey
Applied Technology and Management, Inc.
502 N.W. 75th Street, Suite 95
Gainesville, Florida 32607

PROJECT NO.: 87-008 ATM
DATE: 4/19/89
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DHRS#: 82282, E82001

Table 2. Radiation, Chlorophyll, and Additional Water Quality Data

ID No.:	PC-1	PC-2	PC-3	PC-4
PPB #:	32458	32459	32460	32461
Alpha, Gross (pC/L)	2.2	1.6	1.6	0.0
Alpha, Gross, Ct. Error +/- (pC/L)	1.4	1.6	1.1	1.4
Beta, Gross (pC/L)	0.0	1.9	1.8	2.9
Beta, Gross, Ct. Error +/- (pC/L)	2.1	1.4	1.7	1.8
Radium 226 (pC/L)	0.8	0.3	0.0	0.9
Radium 226 Ct. Error +/- (pC/L)	0.1	0.0	0.0	0.0
Radium 228 (pC/L)	1.3	0.0	1.7	1.4
Radium 228, Ct. Error (pC/L)	1.1	0.9	1.0	1.0
Strontium-90 (pC/L)	NA**	NA	NA	NA
Chlorophyll-a, mg/m^3	<1	<1	<1	<1
Chloride, mg/L	12.6	11.6	15.2	16.1
Total Dissolved Solids, mg/L	126	125	149	199
Silica, dissolved reactive, mg/L	3.1	2.8	4.8	2.3

*ND=None detected.
**NA=Not Available.

Tony Park
Project Manager

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Table 1. October 1988 Sampling Trip

Station ID:	PC-1	PC-2	PC-3	PC-4
PPB #:	30013	30014	30015	30016
Calcium, mg/L	12.3	14.9	16.1	22.1
Magnesium, mg/L	7.0	7.6	7.7	10.9
Manganese, ug/L	16	16	15	18
Potassium, mg/L	NA*	NA	NA	NA
Hardness, mg equiv. CaCO3/L	59.5	68.5	71.9	100
Bicarbonate alkalinity, as mg CaCO3/L	48	44	44	56
Carbonate alkalinity, as mg CaCO3/L	<0.5	<0.5	<0.5	<0.5

*NA=Not available.

Tom Park
PROJECT MANAGER

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Table 2. November 1988 Sampling Trip

Station ID:	PC-1	PC-2	PC-3	PC-4
PPB #:	30732	30733	30734	30735
Calcium, mg/L	14.6	15.3	16.0	25.8
Magnesium, mg/L	8.3	8.5	8.8	13.2
Manganese, ug/L	5.0	5.6	7.9	8.5
Potassium, mg/L	0.9	0.9	2.3	2.1
Hardness, mg equiv. CaCO3/L	70.6	73.2	76.2	119
Bicarbonate alkalinity, as mg CaCO3/L	42	44	36	66
Carbonate alkalinity, as mg CaCO3/L	<0.5	<0.5	<0.5	<0.5

Tom Pohl
PROJECT MANAGER

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Table 3. December 1988 Sampling Trip

Station ID:	PC-1	PC-2	PC-3	PC-4
PPB #:	31083	31084	31085	31086
Calcium, mg/L	15.4	15.6	15.7	26.3
Magnesium, mg/L	9.1	9.1	8.8	12.8
Manganese, ug/L	4.1	3.2	7.0	6.7
Potassium, mg/L	0.7	0.9	1.7	1.8
Hardness, mg equiv. CaCO3/L	75.9	77.5	75.4	118
Bicarbonate alkalinity, as mg CaCO3/L	50	60	58	65
Carbonate alkalinity, as mg CaCO3/L	<0.5	<0.5	<0.5	<0.5

Tom Park
PROJECT MANAGER

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DHRS#: 82282, E82001

Table 4. January 1989 Sampling Trip

Station ID:	PC-1	PC-2	PC-3	PC-4
PPB #:	31649	31650	31651	31652
Calcium, mg/L	16.3	16.2	24.9	28.6
Magnesium, mg/L	9.0	9.0	12.0	13.9
Manganese, ug/L	4.4	6.8	9.9	4.7
Potassium, mg/L	0.7	0.7	2.0	0.1
Hardness, mg equiv. CaCO3/L	77.8	77.5	112	129
Bicarbonate alkalinity, as mg CaCO3/L	56	52	60	72
Carbonate alkalinity, as mg CaCO3/L	<0.5	<0.5	<0.5	<0.5

Tom Park
PROJECT MANAGER

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Table 5. February 1989 Sampling Trip

Station ID:	PC-1	PC-2	PC-3	PC-4
PPB #:	32096	32097	32098	32099
Calcium, mg/L	16.2	16.7	19.2	28.1
Magnesium, mg/L	9.8	9.9	10.2	14.3
Manganese, ug/L	3.0	5.5	8.9	5.7
Potassium, mg/L	0.5	0.6	2.6	1.5
Hardness, mg equiv. CaCO3/L	80.8	82.5	89.9	129
Bicarbonate alkalinity, as mg CaCO3/L	48	68	60	76
Carbonate alkalinity, as mg CaCO3/L	<0.5	<0.5	<0.5	<0.5

Tom Park
PROJECT MANAGER

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Table 6. March 1989 Sampling Trip

Station ID:	PC-1	PC-2	PC-3	PC-4
PPB #:	32458	32459	32460	32461
Calcium, mg/L	17.4	17.1	20.0	29.7
Magnesium, mg/L	10.2	10.2	10.8	14.2
Manganese, ug/L	6.7	5.7	11	7.1
Potassium, mg/L	0.7	0.8	2.4	1.5
Hardness, mg equiv. CaCO3/L	85.4	84.7	94.4	133
Bicarbonate alkalinity, as mg CaCO3/L	60	60	60	66
Carbonate alkalinity, as mg CaCO3/L	<0.5	<0.5	<0.5	<0.5

Tom Parks
PROJECT MANAGER

6821 SW ARCHER ROAD, GAINESVILLE, FLORIDA 32608 Tel. (904) 377-2349

11.5.5 CHEMICAL MIXING ZONE ANALYSES

Table 1. Hardee Power Station Cooling Reservoir Water Discharge and Payne Creek Dispersion Modeling - Cadmium

Payne Creek Conditions	
River Channel Width	20 feet
Average River Depth	2.5 feet
River Discharge	22 feet3/second
Average Flow Velocity	0.500 feet/second
Flow Shear Velocity	0.259 feet/second
Transverse Mixing Coeff.	0.389 feet2/second
Background Water Quality	<0.4 ug/L
Reservoir Water Discharge Conditions	
Discharge Flow Rate	0.33 feet3/second
Discharge Water Quality	2.6 ug/L

Distance Downstream (feet)	Mixed Concentration (ug/L) at Various Distances (feet) Across Payne Creek										
	0	0.5	1	1.5	2	2.5	3	4	5	10	20
0	2.6	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
50	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
100	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
150	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
200	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
250	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
300	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
350	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
400	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
450	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
500	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
550	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
600	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
650	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
700	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
750	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
800	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
850	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
900	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
950	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
1,000	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
1,050	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
1,100	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
1,150	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
1,200	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
1,250	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4

Table 2. Hardee Power Station Cooling Reservoir Water Discharge and Payne Creek Dispersion Modeling - Cyanide

Payne Creek Conditions		
River Channel Width	20	feet
Average River Depth	2.5	feet
River Discharge	22	feet3/second
Average Flow Velocity	0.500	feet/second
Flow Shear Velocity	0.259	feet/second
Transverse Mixing Coeff.	0.389	feet2/second
Background Water Quality	<4	ug/L
Reservoir Water Discharge Conditions		
Discharge Flow Rate	0.33	feet3/second
Discharge Water Quality	10	ug/L

Distance Downstream (feet)	Mixed Concentration (ug/L) at Various Distances (feet) Across Payne Creek										
	0	0.5	1	1.5	2	2.5	3	4	5	10	20
0	10.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
50	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	<4.0
100	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
150	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
200	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
250	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
300	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
350	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
400	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
450	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
500	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
550	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
600	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
650	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
700	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
750	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
800	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
850	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
900	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
950	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
1,000	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
1,050	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
1,100	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
1,150	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
1,200	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
1,250	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1

Table 3. Hardee Power Station Cooling Reservoir Water Discharge and Payne Creek Dispersion Modeling - Mercury

Payne Creek Conditions	
River Channel Width	20 feet
Average River Depth	2.5 feet
River Discharge	22 feet3/second
Average Flow Velocity	0.500 feet/second
Flow Shear Velocity	0.259 feet/second
Transverse Mixing Coeff.	0.389 feet2/second
Background Water Quality	<0.1 ug/L
Reservoir Water Discharge Conditions	
Discharge Flow Rate	0.33 feet3/second
Discharge Water Quality	0.5 ug/L

Distance Downstream (feet)	Mixed Concentration (ug/L) at Various Distances (feet) Across Payne Creek										
	0	0.5	1	1.5	2	2.5	3	4	5	10	20
0	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
50	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1
100	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1
150	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1
200	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1
250	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1
300	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1
350	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1
400	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1
450	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1
500	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1
550	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1
600	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1
650	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1
700	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1
750	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1
800	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1
850	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1
900	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1
950	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1
1,000	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1
1,050	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1
1,100	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1
1,150	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1
1,200	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1
1,250	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1

Table 4. Hardee Power Station Cooling Reservoir Water Discharge and Payne Creek Dispersion Modeling - Selenium

Payne Creek Conditions	
River Channel Width	20 feet
Average River Depth	2.5 feet
River Discharge	22 feet3/second
Average Flow Velocity	0.500 feet/second
Flow Shear Velocity	0.259 feet/second
Transverse Mixing Coeff.	0.389 feet2/second
Background Water Quality	<5.0 ug/L
Reservoir Water Discharge Conditions	
Discharge Flow Rate	0.33 feet3/second
Discharge Water Quality	32.0 ug/L

Distance Downstream (feet)	Mixed Concentration (ug/L) at Various Distances (feet) Across Payne Creek										
	0	0.5	1	1.5	2	2.5	3	4	5	10	20
0	32	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
50	6	6	6	6	6	6	6	5	5	5	5
100	5	5	5	5	5	5	5	5	5	5	5
150	5	5	5	5	5	5	5	5	5	5	5
200	5	5	5	5	5	5	5	5	5	5	5
250	5	5	5	5	5	5	5	5	5	5	5
300	5	5	5	5	5	5	5	5	5	5	5
350	5	5	5	5	5	5	5	5	5	5	5
400	5	5	5	5	5	5	5	5	5	5	5
450	5	5	5	5	5	5	5	5	5	5	5
500	5	5	5	5	5	5	5	5	5	5	5
550	5	5	5	5	5	5	5	5	5	5	5
600	5	5	5	5	5	5	5	5	5	5	5
650	5	5	5	5	5	5	5	5	5	5	5
700	5	5	5	5	5	5	5	5	5	5	5
750	5	5	5	5	5	5	5	5	5	5	5
800	5	5	5	5	5	5	5	5	5	5	5
850	5	5	5	5	5	5	5	5	5	5	5
900	5	5	5	5	5	5	5	5	5	5	5
950	5	5	5	5	5	5	5	5	5	5	5
1,000	5	5	5	5	5	5	5	5	5	5	5
1,050	5	5	5	5	5	5	5	5	5	5	5
1,100	5	5	5	5	5	5	5	5	5	5	5
1,150	5	5	5	5	5	5	5	5	5	5	5
1,200	5	5	5	5	5	5	5	5	5	5	5
1,250	5	5	5	5	5	5	5	5	5	5	5

Table 5. Hardee Power Station Cooling Reservoir Water Discharge and Payne Creek Dispersion Modeling - Silver

Payne Creek Conditions	
River Channel Width	20 feet
Average River Depth	2.5 feet
River Discharge	22 feet3/second
Average Flow Velocity	0.500 feet/second
Flow Shear Velocity	0.259 feet/second
Transverse Mixing Coeff.	0.389 feet2/second
Background Water Quality	<0.04 ug/L
Reservoir Water Discharge Conditions	
Discharge Flow Rate	0.33 feet3/second
Discharge Water Quality	<0.80 ug/L

Distance Downstream (feet)	Mixed Concentration (ug/L) at Various Distances (feet) Across Payne Creek										
	0	0.5	1	1.5	2	2.5	3	4	5	10	20
0	0.80	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
50	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	<0.04
100	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
150	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
200	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
250	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
300	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
350	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
400	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
450	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
500	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
550	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
600	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
650	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
700	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
750	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
800	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
850	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
900	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
950	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
1,000	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
1,050	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
1,100	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
1,150	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
1,200	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
1,250	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05

Table 6. Hardee Power Station Cooling Reservoir Water Discharge and Payne Creek Dispersion Modeling - Turbidity

Payne Creek Conditions	
River Channel Width	20 feet
Average River Depth	2.5 feet
River Discharge	22 feet3/second
Average Flow Velocity	0.500 feet/second
Flow Shear Velocity	0.259 feet/second
Transverse Mixing Coeff.	0.389 feet2/second
Background Water Quality	1.5 NTU
Reservoir Water Discharge Conditions	
Discharge Flow Rate	0.33 feet3/second
Discharge Water Quality	31 NTU

Distance Downstream (feet)	Mixed Concentration (ug/L) at Various Distances (feet) Across Payne Creek										
	0	0.5	1	1.5	2	2.5	3	4	5	10	20
0	31.0	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
50	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	1.8	1.6
100	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.7
150	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.8
200	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
250	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
300	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
350	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
400	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
450	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
500	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
550	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
600	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
650	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
700	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
750	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
800	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
850	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
900	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
950	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
1,000	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
1,050	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
1,100	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
1,150	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
1,200	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
1,250	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8

Table 7. Hardee Power Station Cooling Reservoir Water Discharge and Payne Creek Dispersion Modeling - Gross Alpha

Payne Creek Conditions	
River Channel Width	20 feet
Average River Depth	2.5 feet
River Discharge	22 feet3/second
Average Flow Velocity	0.500 feet/second
Flow Shear Velocity	0.259 feet/second
Transverse Mixing Coeff.	0.389 feet2/second
Background Water Quality	1.7 ug/L
Reservoir Water Discharge Conditions	
Discharge Flow Rate	0.33 feet3/second
Discharge Water Quality	22.2 ug/L

Distance Downstream (feet)	Mixed Concentration (pC/L) at Various Distances (feet) Across Payne Creek										
	0	0.5	1	1.5	2	2.5	3	4	5	10	20
0	22.2	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
50	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	1.9	1.8
100	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9
150	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9
200	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
250	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
300	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
350	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
400	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
450	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
500	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
550	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
600	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
650	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
700	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
750	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
800	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
850	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
900	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
950	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
1,000	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
1,050	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
1,100	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
1,150	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
1,200	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
1,250	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9

Table 8. Hardee Power Station Cooling Reservoir Water Discharge and Payne Creek Dispersion Modeling - Radium 226

Payne Creek Conditions	
River Channel Width	20 feet
Average River Depth	2.5 feet
River Discharge	22 feet3/second
Average Flow Velocity	0.500 feet/second
Flow Shear Velocity	0.259 feet/second
Transverse Mixing Coeff.	0.389 feet2/second
Background Water Quality	0.5 ug/L
Reservoir Water Discharge Conditions	
Discharge Flow Rate	0.33 feet3/second
Discharge Water Quality	6.2 ug/L

Distance Downstream (feet)	Mixed Concentration (pC/L) at Various Distances (feet) Across Payne Creek										
	0	0.5	1	1.5	2	2.5	3	4	5	10	20
0	6.2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
50	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5
100	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5
150	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
200	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
250	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
300	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
350	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
400	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
450	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
500	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
550	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
600	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
650	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
700	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
750	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
800	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
850	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
900	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
950	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
1,000	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
1,050	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
1,100	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
1,150	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
1,200	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
1,250	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6

11.5.6 SWFWMD PERMIT INFORMATION

This application has been prepared for information purposes only as required by FDER Form 17-1.211(1). Refer to Applicant Information in the SCA.

APPLICATION TO THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
SURFACE WATER MANAGEMENT PERMIT

TO: SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
2379 Broad Street
Brooksville, Florida 34609-6899
Telephone: (904) 796-7211

(For Use By SWFWMD Only)
Date Rec'd:_____
App. No.:_____

GENERAL INSTRUCTIONS: Please provide complete information below. Attach additional information if necessary. A processing fee of $10.00 is required with this application. Please submit four (4) copies of application, drawings, calculations, etc. Note: Project may also require State or Federal permits.

Please check appropriate box.

APPLICATION FOR: (X) CONCEPTUAL APPROVAL PERMIT
( ) CONSTRUCTION/OPERATION PERMIT
( ) MODIFICATION OF EXISTING PERMIT, NO.:_____

Owner(s) of land upon which surface water management system will be constructed/operated:

NAME: Refer to Applicant Information in SCA/EA Chapter 1

ADDRESS:_____

_____

TELEPHONE:( )_____

_____
Signature of owner or authorized agent

Description of Land: Total Land Area (acres): 1300 Acres

County: Polk & Hardee

Section: see SCA/EA Chapter 1 Township:_____ Range:_____

Person who prepared the plans and specifications of construction:
Conceptual hydrologic/hydraulic analyses only:
Name: Frederick V. Ramsey, P.E. Vice President

Address: Applied Technology & Management, Inc., 502 N.W. 75th St., Suite 95
Gainesville, Florida 32607

Telephone: (904) 375-8700

Construction Plans and Specifications: Submit drawings, calculations and engineering details sufficient to define the nature, scope, intent and functioning of work proposed. Reference Rule 40D-4/40D-40.

Person who will construct the proposed work:

Name: Refer to Applicant Information in SCA/EA Chapter 1

Address:_____

_____

Telephone:( )_____

General purpose of proposed work:

Project Name: Hardee Power Station

Project Size (acres): 1300 Acres Zoning: see SCA/EA Chapter 2
(if different from total land area)

EXHIBIT A

The following information may be required in support of the application. The applicant should submit as much of the information listed as the complexity of the project and the sensitivity of the area necessitates.

If there are any questions or further assistance is required, please contact the Surface Water Permitting Division in vicinity of the project.

Note: The application must be signed by the owner or his authorized agent, and submitted to the District with FOUR (4) copies of all information required. However, for conceptual approval, Items A.8., A.10., B.5. and B.6. will not be necessary.

A. **SITE INFORMATION:**

1.___ Detailed location sketch.
2.___ Topographic map of the site and adjacent hydrologically related areas, which shall include location and description of bench marks (minimum of one per major water control structure).
3.___ Overall map of the area showing existing runoff patterns and size, location, topography, and land use of off-site areas which drain through, onto, and from the project.
4.___ Identification of wet season high water table elevations.
5.___ If the project is in the known floodway of a stream, or other watercourse, the floodway should be identified and approximate flooding elevations determined. The 100 year flood plain elevations and limits should be identified, if applicable.
6.___ Description of vegetative cover, wetland areas in and adjacent to the project area and limits of waters of the state if activities are proposed for these areas.
7.___ Recent areal photography of a scale no smaller than 1" equals 800', encompassing the project area with project boundaries delineated.
8.___ The construction drawings for the paving, grading and drainage plans, with special attention to perimeter site grading.
9.___ Percolation tests, if percolation or exfiltration systems are proposed. Percolation tests shall be representative of design conditions.
10.___ Complete description of measures to be implemented during the construction period to mitigate adverse quantity and quality impacts off-site.

B. **MASTER DRAINAGE PLAN:**

1.___ Location of all water bodies with details of size, side slopes, elevations and depths.
2.___ Location and details of all major water control structures. Control elevations of the control structures must be included along with any seasonal water level regulation schedules.
3.___ Drainage basin boundaries showing direction of flow, taking into account off-site runoff being routed through or around the project.
4.___ Locations of roads and buildings along with their proposed elevations.
5.___ Right-of-way and easement locations for the drainage system including all areas to be reserved for water management purposes.
6.___ Location and size of internal minor water management facilities.
7.___ Nearby existing off-site water resource facilities which might be affected by the proposed construction or development. The names and addresses of the owners of such facilities should also be submitted.

C. **DRAINAGE CALCULATIONS:**

1.___ Design storms used including depth, duration and distribution.
2.___ Off-site inflow.
3.___ Stage-storage computations for the project and stage-discharge computations for the outfall structure(s).
4.___ Acreages and percentage of property proposed as:
___ Impervious surfaces (excluding water bodies)
___ Pervious surfaces (green areas)
___ Lakes, canals, retention areas, etc.
___ Total acreage of project
5.___ Runoff calculations showing discharges, elevations, and volumes retained and/or detained during applicable storm events. Mathematical computations may be required to demonstrate that the proposed development will not significantly alter net storage from the project area for events up to the 100 year frequency.
6.___ Calculations required for determination of minimum building flood and road elevations.

D. **LEGAL/INSTITUTIONAL INFORMATION:**

1.___ Identification of the entity responsible for operation and maintenance of the surface water management system.
2.___ A letter of other evidence of potential, acceptance from the public body, if the operation and maintance entity is to be a public body such as a city drainage district. Documents verifying the existence of such an organization and its ability to accept operation and maintenance responsibility, if the entity is a homeowners association.
3.___ Indication of how water and wastewater service will be supplied. Letters of commitment from off-site suppliers must be included.
4.___ Identification of agencies and organization contacted in connection with the project. Include meeting summaries and/or responses. Give status of local approvals indicating if site plan and/or subdivisions approval has been granted, final plats recorded and building or construction permits issued.
5.___ Present and proposed zoning: Evidence of current density and classification under local government zoning or comprehensive plan must be submitted; include the status under the DRI process, if applicable. The number of proposed dwelling units and/or square feet of commercial area must be supplied. If the project is an approved DRI then a copy of the final approved development order must be supplied.
6.___ A copy of a boundary survey and evidence of ownership or control; if the Applicant is a contractual buyer then a copy of the executed contract must be provided.
7.___ Documentation of legal and physical availability of receiving water system to receive project discharge if such is not evident.

EXHIBIT A CONTINUED ON FOLLOWING PAGE

EXHIBIT A (CONTINUED)

A. SITE INFORMATION

A.1. Information regarding the site location is presented in Section 1.2.2 of the SCA.

A.2. A topographic map of the site and related topographic information is presented in Section 2.3.4.1 of the SCA.

A.3. Information regarding the site runoff patterns is presented in Section 2.3.4.1 of the SCA. Information regarding the vegetation and land use of adjacent lands is presented in Section 2.3.5 of the SCA.

A.4. A description of the water table (shallow) aquifer system and elevations is presented in Section 2.3.2.1 of the SCA.

A.5. Information regarding the flood plain elevations is presented in Section 2.3.4.1 of the SCA.

A.6. A description of the vegetative cover and wetlands on and near the site is presented in Section 2.3.6 of the SCA.

A.7. Recent aerial photography is provided as part of the SCA.

A.8. This application is for conceptual approval of the proposed surface water management plans; therefore, no construction drawings are provided or required.

A.9. Information on the water table (shallow) aquifer soils and hydraulic properties is presented in Section 2.3.2. of the SCA.

A.10. Information on the measures to be implemented during construction to mitigated or avoid adverse water quality and quality impacts is presented in Section 4.2 of the SCA.

B. MASTER DRAINAGE PLAN

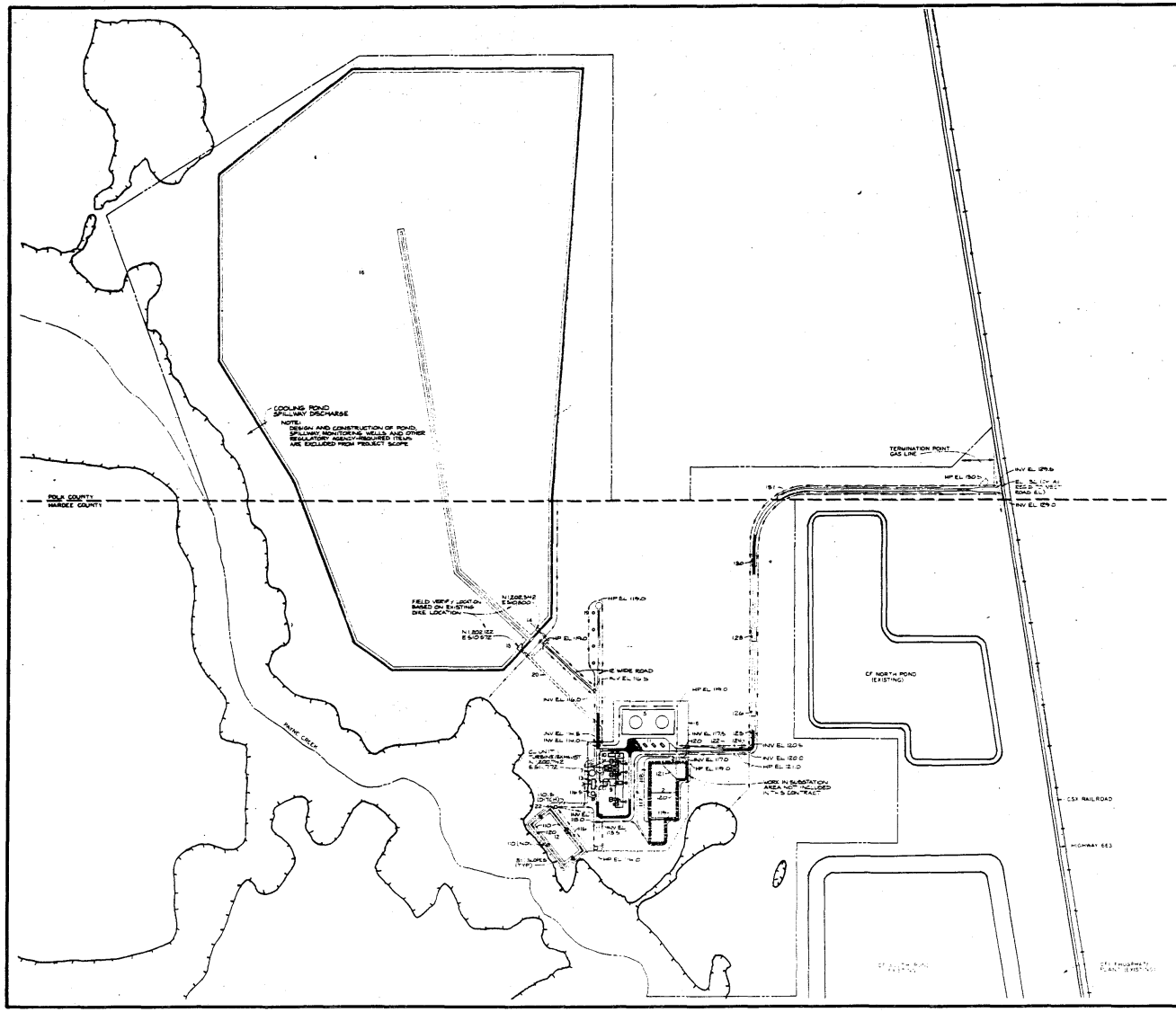
B.1. Relevant details regarding all major water bodies are presented in the Site Drainage Plan, attached as Exhibit B-1.

B.2. Relevant details regarding all major water control structures are presented in the Site Drainage Plan, attached as Exhibit B-1.

B.3. Site drainage basin boundaries and directions of flow are presented in Site Drainage Basin Map, attached as Exhibit B-3.

B.4. Available information regarding road and building locations are presented in Section 3.0 of the SCA and the Site Drainage Plan, attached as Exhibit B-1.

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



BUILDING AND FACILITIES LEGEND	
NO.	NOMENCLATURE
1	POWER BLOCK
2	SWITCHYARD
3	WATER TREATMENT BUILDING
4	SERVICE BUILDING
5	FUEL OIL STORAGE TANK W/CONTAINMENT WALL
6	SECURITY FENCE
7	DEMINERALIZED WATER STORAGE TANK
8	RAW WATER STORAGE TANK
9	CONTROL BUILDING
10	WAREHOUSE
11	FUEL OIL UNLOADING STATION
12	SITE RUNOFF DETENTION POND
13	NEUTRALIZATION BASIN
14	DISCHARGE STRUCTURE
15	INTAKE STRUCTURE
16	COOLING RESERVOIR
17	PLANT WASTEWATER SUMP/OIL SEPARATOR
18	SEWAGE TREATMENT PLANT
19	WATER SUPPLY WELL
20	PIPING CORRIDOR
21	MOTORIZED GATE
22	STORMWATER PUMP PIT

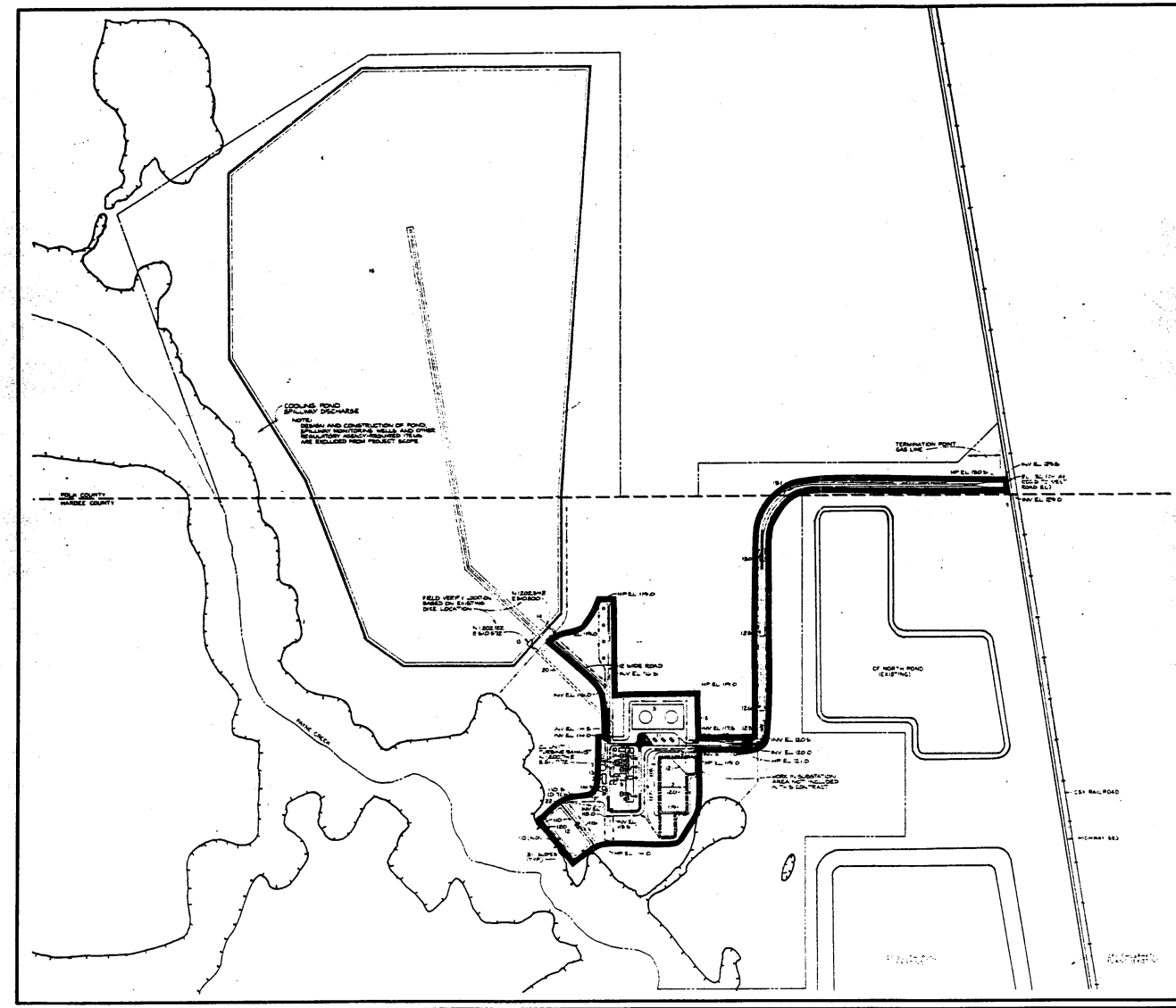
PROPERTY LINE
FUTURE
WETLANDS
ASPHALT PAVING (ROADS 20' WIDE)
GRAVEL SURFACING

North

0 400 800 1200 Feet

Exhibit B-1

Hardee Power Station



BUILDING AND FACILITIES LEGEND	
NO.	NOMENCLATURE
1	POWER BLOCK
2	SWITCHYARD
3	WATER TREATMENT BUILDING
4	SERVICE BUILDING
5	FUEL OIL STORAGE TANK W/CONTAINMENT WALL
6	SECURITY FENCE
7	DEMINERALIZED WATER STORAGE TANK
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21	MOTORIZED GATE
22	STORMWATER PUMP PIT

PROPERTY LINE

FUTURE

WETLANDS

ASPHALT PAVING (ROADS 20' WIDE)

GRAVEL SURFACING

North

0 400 800 1200 Feet

Exhibit B-3

Hardee Power Station

B.5. Not required for conceptual approval.

B.6. Not required for conceptual approval.

B.7. A detailed evaluation of off site water resources impacts is presented in Section 5.1 of the SCA.

C. DRAINAGE CALCULATIONS

C.1. Water quantity and discharge evaluations were conducted using a 25-year 24-hour rainfall of 9.0 inches, distributed based on the SCS Type IIa rainfall distribution. Water quality control volumes were calculated based on a 1 inch rainfall.

C.2. As shown in the Site Drainage Basin Map (attached as Exhibit B-2), drainage from areas adjacent to the plant site will be routed around the plant site. Off site areas upstream of the cooling reservoir (i.e. part of the 470 acre watershed to the cooling reservoir) will be routed to the cooling reservoir and have been considered in the analysis.

C.3. Stage storage computations for the site stormwater detention pond and the cooling reservoir are presented in Exhibit C-3. Discharges from the plant site stormwater detention pond and the cooling reservoir were calculated based on the standard rectangular weir formula.

C.4. Post development subbasin #1 is the plant sited and is approximately 72.9 acres. Approximately 75 % of the total plant site area will be paved or otherwise developed. It is estimated that this plant site area will have a SCS runoff curve number of 93. The site stormwater detention pond serving this site will be approximately 3.1 acres.

Post development subbasin #2 is the entrance road and is approximately 14.1 acres. Of this total area of 14.1 acres, 24% or 3.4 acres will be paved road surface and the SCS runoff curve number is estimated to be 98. The remaining 76% of the basin or 10.7 acres will be grassed and will have a SCS runoff curve number of 80.

The cooling reservoir watershed is approximately 470 acres and, after restoration, will be grassed pasture or replanted forested uplands with a curve number of 80. This watershed will contribute to the 570 acre cooling reservoir.

C.5 Runoff calculations for the pre- and post development plant site and entrance road subbasins for the 25-year 24-hour rainfall are summarized in attached Exhibit C-5. Evaluation of detention volumes and side drain filtration calculations for the water quality control for the plant site for the 1 inch rainfall are summarized in attached Exhibit C-5. An evaluation of discharge from the cooling reservoir for the 25-year 24-hour rainfall is presented in Section 5.1 of the SCA.

D. LEGAL/INSTITUTIONAL INFORMATION

D.1. The entity responsible for the operation and maintenance of these surface water management systems is described in Section 1.0 of the SCA.

D.2. Not Applicable.

D.3. Water and wastewater service to the plant site is summarized in Section 3.5 and 3.6 of the SCA

D.4. Coordination with federal, state, regional and local agencies is summarized in detail in Section 9.0 of the SCA.

D.5. Current and future zone of the project site are discussed in Section 2.2.2 of the SCA.

D.6. Information regarding site ownership and control is presented in Section 1.0 of the SCA.

D.7. A detailed evaluation of potential receiving water system impacts is presented in Section 5.1 of the SCA.

Exhibit C-3

Table 1. Stage-Storage and Discharge Information for the Plant Site Detention Pond

Weir Length	2.5 feet
Weir Elevation	113 feet MSL

Elevation (feet MSL)	Total Storage (acre-ft)	Weir Discharge (cfs)
110	0	0
111	3.1	0
112	6.2	0
113	9.3	0
114	12.4	8.3
115	15.5	23.5
116	18.6	43.3
117	21.7	66.6
118	24.8	93.1
119	27.9	122.4

Exhibit C-3

Table 2. Stage-Storage and Discharge Information for the Cooling Reservoir

Reservoir Area	570 acres
Weir Length	10 feet
Weir Elevation	124 feet MSL

Elevation (feet MSL)	Total Storage (acre-ft)	Weir Discharge (cfs)
124.0	0	0
124.1	57	1.1
124.2	114	3.0
124.3	171	5.5
124.4	228	8.4
124.5	285	11.8
124.6	342	15.5
124.7	399	19.5
124.8	456	23.8
124.9	513	28.4
125.0	570	33.3

Exhibit C-5

Table 1. Summary of Runoff Analysis for the 25-Year, 24-Hour Rainfall (9.0 inches) for the Reservoir and Plant Site/Entrance Road

Basin	Total Area (acres)	Total Retention Area (acres)	Peak Discharge (cfs)
PLANT SITE AND ENTRANCE ROAD[1]			
Pre-Development	1040	-	374
Plant Site	72.9	-	79.3
Entrance Road	14.1	-	8.6
Total	87.0	-	87.9
Post Development			
Plant Site	72.9	3.1	68.1
Entrance Road	14.1	-	10.5
Total	87.0	3.1	78.6
COOLING RESERVOIR[2]			
Pre-Development	880	-	317
Post Development	880	570	0.33

Note: 1. Plant site and entrance road runoff analyses were performed using SCS runoff techniques and are attached.

2. Cooling reservoir runoff analyses were conducted using the HEC-1 model, as described in Section 5.1.1 of the SCA. Pre-development basin peak runoff was estimated based on the unit peak runoff (cfs/square mile) for Payne Creek as determined by the HEC-1 modeling analysis.

EXHIBIT C-5 Table 2

HARDEE POWER STATION

SUBWATERSHED NAME	=	PLANT SITE - PRE-DEVELOPMENT
TOTAL AREA	=	72.9 ACRES
HYDRAULIC LENGTH	=	3312 FEEET
WATERSHED SLOPE	=	0.26 %
SOIL STORAGE CAPACITY	=	2.50 INCHES
CURVE NUMBER	=	80.0
TIME OF CONCENTRATION	=	2.71 HOURS
RETURN FREQUENCY	=	25 YEARS
RAINFALL DURATION	=	24 HOURS
TOTAL RAINFALL DEPTH	=	9.00 INCHES

TIME (HR)	RAINFALL (IN)	RUNOFF (CFS)	INFLOW (CFS)	PUMP-OUT (CFS)	DISCHARGE (CFS)	STAGE (FT)
0.00	0.00	0.0	0.0	0.0	0.0	0.00
4.00	0.49	0.0	0.0	0.0	0.0	0.00
6.00	0.80	0.6	0.0	0.0	0.6	0.00
7.00	0.99	1.5	0.0	0.0	1.5	0.00
8.00	1.21	2.7	0.0	0.0	2.7	0.00
9.00	1.48	4.4	0.0	0.0	4.4	0.00
10.00	1.81	6.9	0.0	0.0	6.9	0.00
10.50	2.03	8.8	0.0	0.0	8.8	0.00
11.00	2.32	11.6	0.0	0.0	11.6	0.00
11.50	2.77	16.6	0.0	0.0	16.6	0.00
12.00	5.46	57.0	0.0	0.0	57.0	0.00
12.50	6.47	78.2	0.0	0.0	78.2	0.00
13.00	6.81	76.3	0.0	0.0	76.3	0.00
14.00	7.26	62.8	0.0	0.0	62.8	0.00
15.00	7.58	50.3	0.0	0.0	50.3	0.00
16.00	7.83	40.2	0.0	0.0	40.2	0.00
17.00	8.04	32.3	0.0	0.0	32.3	0.00
18.00	8.22	26.2	0.0	0.0	26.2	0.00
20.00	8.53	18.2	0.0	0.0	18.2	0.00
22.00	8.78	13.3	0.0	0.0	13.3	0.00
24.00	9.00	10.3	0.0	0.0	10.3	0.00
30.00	9.00	1.2	0.0	0.0	1.2	0.00
36.00	9.00	0.1	0.0	0.0	0.1	0.00
40.00	9.00	0.0	0.0	0.0	0.0	0.00
44.00	9.00	0.0	0.0	0.0	0.0	0.00
48.00	9.00	0.0	0.0	0.0	0.0	0.00

FLOW ROUTING SUMMARY

MAXIMUM DISCHARGE WAS 79.3 CFS AT 12.75 HOURS
TOTAL DISCHARGE VOLUME WAS 0.0 ACRE-FEET

EXHIBIT C-5 TABLE 3

HARDEE POWER STATION

SUBWATERSHED NAME	=	PLANT SITE - POST DEVELOPMENT
TOTAL AREA	=	72.9 ACRES
HYDRAULIC LENGTH	=	3312 FEEET
WATERSHED SLOPE	=	0.27 %
SOIL STORAGE CAPACITY	=	0.75 INCHES
CURVE NUMBER	=	93.0
TIME OF CONCENTRATION	=	1.64 HOURS
RETURN FREQUENCY	=	25 YEARS
RAINFALL DURATION	=	24 HOURS
TOTAL RAINFALL DEPTH	=	9.00 INCHES

TIME (HR)	RAINFALL (IN)	RUNOFF (CFS)	INFLOW (CFS)	PUMP-OUT (CFS)	DISCHARGE (CFS)	STAGE (FT)
0.00	0.00	0.0	0.0	0.0	0.0	110.00
4.00	0.49	2.7	0.0	0.0	0.0	110.07
6.00	0.80	6.0	0.0	0.0	0.0	110.30
7.00	0.99	7.9	0.0	0.0	0.0	110.49
8.00	1.21	10.0	0.0	0.0	0.0	110.73
9.00	1.48	13.0	0.0	0.0	0.0	111.03
10.00	1.81	16.8	0.0	0.0	0.0	111.42
10.50	2.03	19.9	0.0	0.0	0.0	111.67
11.00	2.32	24.4	0.0	0.0	0.0	111.96
11.50	2.77	33.0	0.0	0.0	0.0	112.34
12.00	5.46	105.8	0.0	0.0	0.7	113.20
12.50	6.47	181.1	0.0	0.0	18.9	114.73
13.00	6.81	115.6	0.0	0.0	42.8	115.98
14.00	7.26	78.5	0.0	0.0	66.8	117.01
15.00	7.58	53.4	0.0	0.0	65.4	116.95
16.00	7.83	37.5	0.0	0.0	55.3	116.53
17.00	8.04	27.4	0.0	0.0	44.6	116.06
18.00	8.22	20.9	0.0	0.0	35.6	115.64
20.00	8.53	14.2	0.0	0.0	23.6	115.00
22.00	8.78	10.7	0.0	0.0	16.7	114.59
24.00	9.00	8.6	0.0	0.0	12.8	114.33
30.00	9.00	0.2	0.0	0.0	3.3	113.55
36.00	9.00	0.0	0.0	0.0	1.0	113.25
40.00	9.00	0.0	0.0	0.0	0.6	113.17
44.00	9.00	0.0	0.0	0.0	0.3	113.12
48.00	9.00	0.0	0.0	0.0	0.2	113.09

FLOW ROUTING SUMMARY

MAXIMUM STAGE WAS 117.06 FEET AT 14.25 HOURS
MAXIMUM DISCHARGE WAS 68.1 CFS AT 14.25 HOURS
TOTAL DISCHARGE VOLUME WAS 49.6 ACRE-FEET

EXHIBIT C-5 TABLE 4

HARDEE POWER STATION

SUBWATERSHED NAME	=	ENTRANCE ROAD - PRE-DEVELOPMENT
TOTAL AREA	=	14.1 ACRES
HYDRAULIC LENGTH	=	6144 FEEET
WATERSHED SLOPE	=	0.15 %
SOIL STORAGE CAPACITY	=	2.50 INCHES
CURVE NUMBER	=	80.0
TIME OF CONCENTRATION	=	5.85 HOURS
RETURN FREQUENCY	=	25 YEARS
RAINFALL DURATION	=	24 HOURS
TOTAL RAINFALL DEPTH	=	9.00 INCHES

TIME (HR)	RAINFALL (IN)	RUNOFF (CFS)	INFLOW (CFS)	PUMP-OUT (CFS)	DISCHARGE (CFS)	STAGE (FT)
0.00	0.00	0.0	0.0	0.0	0.0	0.00
4.00	0.49	0.0	0.0	0.0	0.0	0.00
6.00	0.80	0.1	0.0	0.0	0.1	0.00
7.00	0.99	0.2	0.0	0.0	0.2	0.00
8.00	1.21	0.3	0.0	0.0	0.3	0.00
9.00	1.48	0.5	0.0	0.0	0.5	0.00
10.00	1.81	0.8	0.0	0.0	0.8	0.00
10.50	2.03	1.0	0.0	0.0	1.0	0.00
11.00	2.32	1.3	0.0	0.0	1.3	0.00
11.50	2.77	1.9	0.0	0.0	1.9	0.00
12.00	5.46	5.8	0.0	0.0	5.8	0.00
12.50	6.47	8.2	0.0	0.0	8.2	0.00
13.00	6.81	8.6	0.0	0.0	8.6	0.00
14.00	7.26	8.2	0.0	0.0	8.2	0.00
15.00	7.58	7.6	0.0	0.0	7.6	0.00
16.00	7.83	7.0	0.0	0.0	7.0	0.00
17.00	8.04	6.3	0.0	0.0	6.3	0.00
18.00	8.22	5.7	0.0	0.0	5.7	0.00
20.00	8.53	4.7	0.0	0.0	4.7	0.00
22.00	8.78	3.8	0.0	0.0	3.8	0.00
24.00	9.00	3.1	0.0	0.0	3.1	0.00
30.00	9.00	1.1	0.0	0.0	1.1	0.00
36.00	9.00	0.4	0.0	0.0	0.4	0.00
40.00	9.00	0.2	0.0	0.0	0.2	0.00
44.00	9.00	0.1	0.0	0.0	0.1	0.00
48.00	9.00	0.1	0.0	0.0	0.1	0.00

FLOW ROUTING SUMMARY

MAXIMUM DISCHARGE WAS 8.6 CFS AT 13.00 HOURS
TOTAL DISCHARGE VOLUME WAS 0.0 ACRE-FEET

EXHIBIT C-5 TABLE 5

HARDEE POWER STATION

SUBWATERSHED NAME	=	ENTRANCE ROAD - POST DEVELOPMENT
TOTAL AREA	=	14.1 ACRES
HYDRAULIC LENGTH	=	6144 FEEET
WATERSHED SLOPE	=	0.15 %
SOIL STORAGE CAPACITY	=	1.86 INCHES
CURVE NUMBER	=	84.3
TIME OF CONCENTRATION	=	5.08 HOURS
RETURN FREQUENCY	=	25 YEARS
RAINFALL DURATION	=	24 HOURS
TOTAL RAINFALL DEPTH	=	9.00 INCHES

TIME (HR)	RAINFALL (IN)	RUNOFF (CFS)	INFLOW (CFS)	PUMP-OUT (CFS)	DISCHARGE (CFS)	STAGE (FT)
0.00	0.00	0.0	0.0	0.0	0.0	0.00
4.00	0.49	0.0	0.0	0.0	0.0	0.00
6.00	0.80	0.2	0.0	0.0	0.2	0.00
7.00	0.99	0.3	0.0	0.0	0.3	0.00
8.00	1.21	0.5	0.0	0.0	0.5	0.00
9.00	1.48	0.8	0.0	0.0	0.8	0.00
10.00	1.81	1.2	0.0	0.0	1.2	0.00
10.50	2.03	1.5	0.0	0.0	1.5	0.00
11.00	2.32	1.9	0.0	0.0	1.9	0.00
11.50	2.77	2.5	0.0	0.0	2.5	0.00
12.00	5.46	7.3	0.0	0.0	7.3	0.00
12.50	6.47	10.1	0.0	0.0	10.1	0.00
13.00	6.81	10.4	0.0	0.0	10.4	0.00
14.00	7.26	9.7	0.0	0.0	9.7	0.00
15.00	7.58	8.8	0.0	0.0	8.8	0.00
16.00	7.83	7.8	0.0	0.0	7.8	0.00
17.00	8.04	7.0	0.0	0.0	7.0	0.00
18.00	8.22	6.2	0.0	0.0	6.2	0.00
20.00	8.53	4.9	0.0	0.0	4.9	0.00
22.00	8.78	3.8	0.0	0.0	3.8	0.00
24.00	9.00	3.1	0.0	0.0	3.1	0.00
30.00	9.00	1.0	0.0	0.0	1.0	0.00
36.00	9.00	0.3	0.0	0.0	0.3	0.00
40.00	9.00	0.1	0.0	0.0	0.1	0.00
44.00	9.00	0.1	0.0	0.0	0.1	0.00
48.00	9.00	0.0	0.0	0.0	0.0	0.00

FLOW ROUTING SUMMARY

MAXIMUM DISCHARGE WAS 10.5 CFS AT 12.75 HOURS
TOTAL DISCHARGE VOLUME WAS 0.0 ACRE-FEET

EXHIBIT C-5 TABLE 6

STORMWATER DETENTION WITH FILTRATION (FDER CHAPTER 17-25)

SIDE DRAIN FILTER DRAWDOWN ANALYSIS (USING DARCY'S LAW)

BASIN NAME = HARDEE POWER STATION - PLANT SITE
AVERAGE POND AREA = 135000 square feet
CONTROL STRUCTURE CREST ELEVATION = 113 feet MSL
POND BOTTOM OR FILTER DRAIN ELEVATION = 110 feet MSL
TOTAL RETENTION DEPTH = 3 feet
FILTER MEDIA HYDRAULIC CONDUCTIVITY, K = 164 feet/day
REQUIRED DETENTION (WITH FILTRATION) VOLUME = 132300 cubic feet
MAXIMUM ALLOWABLE FILTRATION TIME (TO SATISFY FDER 17-25) = 36 hours
LENGHT OF SIDE DRAIN = 400 feet

WATER LEVEL (MSL)	TOTAL HEAD (ft)	DELTA HEAD (ft)	TOTAL VOLUME (ft^3)	DELTA VOLUME (ft^3)	FLOW LENGHT THRU FILTER (ft) MAX	MIN	AVE	HYDRAULIC GRADIENT (ft/ft)	FILTER AREA (ft^2)	FLOW (cfh)	AVE FLOW (cfh)	DELTA TIME (hrs)	TOTAL TIME (hrs)	FILTERED VOLUME (ft^3)
113.00	3.00		405000		8.2	2.0	4.3	0.693	1200.0	5684.4			0.0	0
		0.38		50625							5018.3	10.1		
112.63	2.63		354375		8.2	2.0	4.3	0.607	1050.0	4352.1			10.1	50625
		0.38		50625							3774.8	13.4		
112.25	2.25		303750		8.2	2.0	4.3	0.520	900.0	3197.5			23.5	101250
		0.38		50625							2644.8	19.1		
111.88	1.88		253125		8.2	2.0	4.6	0.408	750.0	2092.2			42.6	151875
		0.38		50625							1626.3	31.1		
111.50	1.50		202500		8.2	2.7	5.3	0.283	600.0	1160.5			73.8	202500
		0.38		50625							867.4	58.4		
111.13	1.13		151875		8.2	3.9	6.0	0.187	450.0	574.4			132.1	253125
		0.38		50625							401.0	126.3		
110.75	0.75		101250		8.2	5.3	6.8	0.111	300.0	227.6			258.4	303750
		0.38		50625							139.4	363.1		
110.38	0.38		50625		8.2	6.8	7.5	0.050	150.0	51.3			621.5	354375
		0.38		50625							25.6	1975.2		
110.00	0.00		0		8.2	8.2	8.2	0.000	0.0	0.0			2596.8	405000

BASED ON THE ABOVE STORMWATER SYSTEM PARAMETERS, THE REQUIRED DETENTION OF %132300 CUBIC FEET WILL BE RESTORED, BY FILTRATION THROUGH A 400 FOOT SIDE DRAIN, IN APPROXIMATELY 35.2 HOURS

11.6 SUPPORTING AQUATIC ECOLOGY INFORMATION

Table 1. Phylogenetic listing of all Taxa Identified from Payne Creek, October/November 1988 and February/March, 1989.

Phylum Class Order Family Genus species	SAMPLE TYPE Ponar	Hester Dendy	DipNet
Coelenterata			
Hydrozoa			
Hydrida			
Hydridae			
Hydra sp.		X	
Turbellaria	X	X	X
Nemertea			
Prostoma rubrum	X		X
Nematoda	X		
Annelida			
Oligochaeta			
Haplotaxida			
Naididae			
Dero flabelliger	X		
D. furcata	X		
D. nivea		X	
Nais communis	X	X	
N. pardalis	X		
N. variabilis	X		
Pristina leidyi	X	X	
P. synclites	X	X	
Slavena appendiculata	X	X	
Opistocystidae			
Trieminentia corderoi			X
Tubificidae			
Aulodrilus pigueti	X		
Limnodrilus hoffmeisteri	X		
Psammoryctides convolutus	X		
Immature with Capil.Setae	X		
Immature w/o Capil. Setae	X		
Lumbriculida			
Lumbriculidae	X		X

Table 2. Macroinvertebrates Collected Using Artificial Substrates from Payne Creek Station PC-1, October-November, 1988

Taxa	Replicates 1	2	3	Total
Turbellaria	92	31	23	146
Pristina leidyi		62		62
P. synclites			8	8
Slavena appendiculata	123			123
Hyalella azteca	92			92
Baetis propinquus	62		31	92
Caenis diminuta	92	154	185	431
Stenacron interpunctatum			31	31
Stenonema exiguum	31	62	62	154
Tricorythodes albilineatus	31			31
Nehallenia sp.	31			31
Cheumatopsyche sp.	1600	923	984	3507
Polycentropus sp.		31		31
Lepidoptera	31		8	38
Heterelmis vulnerata	8			8
Stenelmis fuscata		62		62
Corydalus corneutus			8	8
Ablabesmyia mallochi	62		92	154
Corynoneura taris group	31	62	123	215
Endochironomus group	308	185	1415	1907
Pentaneura inconspicua	554	431	215	1200
Polypedilum convictum	123	646	246	1015
P. fallax		31		31
P. illinoense	62		31	92
P. scalaenum	154	1015	185	1353
Rheocricotopus robacki	31		31	62
Rheotanytarsus exiguus group	185	1169	154	1507
Tanytarsus guerlus group	215		461	677
T. sp. XI Rutter		277		277
Thienemanniella fusca group	31	800	31	861
Simulium sp.		31		31
Hebetancylus excentricus	62			62
TOTAL NUMBER OF SPECIES	23	17	20	32
TOTAL NUMBER OF INDIVIDUALS	4,006	5,967	4,322	14,296
DIVERSITY ($\bar{d}$)	3.27	3.25	3.07	3.62

Table 3. Macroinvertebrates Collected Using Artificial Substrates from Payne Creek Station PC-2, October-November, 1988

Taxa	Replicates 1	2	3	Total
Hydra sp.	31			31
Nais communis		62		62
Pristina leidyi			277	277
Slavena appendiculata	308	31	123	461
Hyalella azteca	31	15		46
Neoperla carlsoni	31	8	23	62
Baetis propinquus		23	15	38
Caenis diminuta	62		38	100
Stenacron interpunctatum	92	15	31	138
Stenonema exiguum	92	8	23	123
S. smithae			15	15
Cheumatopsyche sp.	15	177	15	208
Neotrichia sp.	62		8	69
Polycentropus sp.	62		8	69
Neureclipsis sp.		15		15
Nyctiophylax sp.	185	46	38	269
Hydroptilidae	8			8
Drypos sp.		8		8
Stenelmis fuscata	62	62	15	138
Heterelmis vulnerata	92			92
Corydalus cornutus		8		8
Ceratopogonidae			31	31
Ablabesmyia mallochi	215		31	246
Corynoneura celeripes	62	62	31	154
Endochironomus group	1507		1107	2615
Nanocladius minimus?	31			31
Nilotanypus sp.	31		123	154
Pentaneura inconspicua		123	123	246
Polypedilum convictum	4460	3999	1784	10243
P. fallax	277		154	431
P. illinoense		1230		1230
P. scalaenum	646	277	1077	1999
P. simulans	123			123
Rheocricotopus robacki	92	92	123	308
Rheotanytarsus exiguus group	62	92	123	277
Tanytarsus glabrescens group	400	15	246	661
Thienemanniella fusca group	1015	646	554	2215
Hebetancylus excentricus	31	8		38
Physella cubensis		8		8
TOTAL NUMBER OF SPECIES	28	24	26	39
TOTAL NUMBER OF INDIVIDUALS	10,082	7,029	6,137	23,247
DIVERSITY ($\bar{d}$)	2.99	2.23	3.22	3.14

Table 4. Macroinvertebrates Collected Using Artificial Substrates from Payne Creek Station PC-1, February-March, 1989

Taxa	Replicates 1	3	4	Total
Batracobdella phalera	8	31		38
Hydracarina			54	54
Hyalella azteca			31	31
Caenis diminuta	54	31	123	208
Stenacron interpunctatum	8			8
Argia sedula	46	123	185	354
Corydalus cornutus	8	8	8	23
Homoptera		8		8
Cheumatopsyche sp.	1038	1753	2384	5175
Nectopsyche sp.			31	31
Dubiraphia sp.			31	31
Stenelmis fuscata	15		54	69
Heterelmis vulnerata		31		31
Dineutus sp. (larvae)		62		62
Ceratopogonidae	62			62
Ablabesmyia mallochi		31		31
Cladotanytarsus vanderwulpi gr.		62		62
Corynoneura taris group	492	523	800	1815
Cricotopus bicinctus group	123			123
Demicryptochironomus sp.		54		54
Pentaneura inconspicua	62	492	484	1038
Polypedilum convictum	3753	6783	4122	14657
P. fallax		123		123
P. illinoense		69		69
P. scalaenum		815	246	1061
P. simulans		62		62
Rheocricotopus robacki		1107		1107
Rheosmittia sp.		54		54
Rheotanytarsus exiguus group	492	615	431	1538
Tanytarsus glabrescens group		92		92
T. guerlus group		77	123	200
Thienemanniella fusca group	677	2030	738	3445
Simulium sp.	31	62		92
Planorbella scalaris			15	15
TOTAL NUMBER OF SPECIES	15	25	17	34
TOTAL NUMBER OF INDIVIDUALS	6,867	15,095	9,859	31,821
DIVERSITY ($\bar{d}$)	2.18	2.79	2.59	2.74

Table 5. Macroinvertebrates Collected Using Artificial Substrates from Payne Creek Station PC-2, February-March, 1989

Taxa	Replicates 1	2	3	Total
Dero nivea			31	31
Slavena appendiculata		31		31
Collembola			31	31
Baetis pygmaeus		62	77	138
Caenis diminuta	123		31	154
Stenacron interpunctatum	277	38	77	392
Stenonema exiguum	92	46	8	146
Argia sedula	15			15
Cheumatopsyche sp.			31	31
Cyrnellus sp.			38	38
Nyctiophylax sp.		31		31
Polycentropus sp.	31	23	8	62
Dubiraphia sp. (larva)	92		8	100
Stenelmis fuscata group	38	23	92	154
Dineutus sp. (larva)	31	23	15	69
Gyrinus sp. (larva)			15	15
Ceratopogonidae	31			31
Ablabesmyia mallochi	123	123	31	277
A. monilis			185	185
Corynoneura taris group	369	1415	1846	3630
Cricotopus bicinctus group	62	123		185
Endochironomus sp.	123			123
Labrundinea virescens	31	62	277	369
Nanocladius minimus?	185		308	492
Nilothauma babiyi	62			62
Orthocladius sp.	62			62
Parakiefferiella sp.	92			92
Pentaneura inconspicua	169	185	92	446
Polypedilum convictum	185	1384	1246	2815
P. fallax	615	92	200	907
P. scalaenum	400	123	338	861
Rheocricotopus robacki		92		92
Rheotanytarsus exiguus group	62	554	354	969
Tanytarsus glabrescens group			185	185
T. guerlus group	1600	892	1561	4053
Thienemanniella fusca group	62	4060	1476	5598
Hebetancylus excentricus	415	15		431
Micromenetus dilatatus avus	54			54
Physella cubensis	31			31
TOTAL NUMBER OF SPECIES	28	21	26	39
TOTAL NUMBER OF INDIVIDUALS	5,429	9,397	8,559	23,385
DIVERSITY ($\bar{d}$)	3.80	2.69	3.34	3.58

Table 6. Macroinvertebrates Collected Using Artificial Substrates from Payne Creek Station PC-3, February- March, 1989

Taxa	Replicates 1	2	3	Total
Helobdella fusca			8	8
Hyalella azteca		8	300	308
Callibaetis floridanus	8		8	15
Caenis diminuta	269	62	177	508
Stenacron interpunctatum	38	8		46
Argia sedula	8			8
Corydalus cornutus		8		8
Cheumatopsyche sp.	23			23
Cyrnellus sp.		8		8
Dubiraphia sp.			85	85
Stenelmis fuscata	31		31	62
Dineutus sp. (larvae)	8			8
Ceratopogonidae			8	8
Ablabesmyia mallochi		131	92	223
Corynoneura taris group	38	23		62
Cryptotendipes nr. pseudotener			154	154
Dicrotendipes sp.			308	308
D. simpsoni			738	738
Endochironomus group	400	315	408	1123
Glyptotendipes lobiferous			85	85
Kiefferulus dux			38	38
Nilothauma babiyi	8	31		38
Nanocladius minimus?	31	100		131
Paralauterborniella nigrohalteralis			100	100
Pentaneura inconspicua	54			54
Polypedilum fallax	115	469	215	800
P. illinoense		154		154
P. scalaenum group	215		31	246
Rheotanytarsus exiguus group		31		31
Tanytarsus glabrescens group	523			523
T. guerlus group		308	461	769
T. sp.XI Rutter		31		31
Hebetancylus excentricus		15	38	54
Laevipex floridana			8	8
Amnicola dalli johnsoni	8		15	23
Micromenetus dilatatus avus	123	38	8	169
Physella cubensis	46			46
Byssanodonta cubensis			8	8
TOTAL NUMBER OF SPECIES	18	17	23	38
TOTAL NUMBER OF INDIVIDUALS	1,946	1,738	3,322	7,006
DIVERSITY ($\bar{d}$)	3.14	3.11	3.56	4.11

Table 7. Macroinvertebrates Collected Using Ponar Grab Samples from Payne Creek Station PC-1, October, 1988

Taxa	Replicates 2	3	4	5	Total
Turbellaria			91		91
Prostoma rubrum			91		91
Dero furcata			45		45
Nais communis			45		45
N. variabilis				45	45
Pristina synclites			136		136
Limnodrilus hoffmeisteri	227		136	682	1045
Psammoryctides convolutus		591	45		636
Immature Tubific. w/o Capil. Setae	364	182	136	818	1500
Immature Tubific. w/ Capil. Setae		136	91		227
Helobdella triseralis			91	45	136
Myzobdella lugubris			273		273
Batracobdella phalera				91	91
Palaemonetes paludosus			45		45
Baetis fondalis			45		45
Caenis diminuta			1045		1045
Gomphus minutus			45	45	91
Cheumatopsyche sp.		45	45	45	136
Nectopsyche sp.			45		45
Dubiraphia sp.			318		318
Ablabesmyia monilis			45	45	91
A. mallochi			182	45	227
Chironomus sp.			45		45
Clinotanypus pinguis			45	91	136
Cryptochironomus blarina group			45		45
C. fulvus group		45			45
Endochironomus group			91		91
Polypedilum scalaenum		45	91		136
P. simulans		45	45		91
Hebetancylus exentricus			227		227
Micromenetus d. avus			91		91
Planorbella duryi			45	45	91
Corbicula fluminea	818	364	1182	3136	5499
Sphaerium sp.	45		45		91
Elliptio buckleyi	45			45	91
TOTAL NUMBER OF SPECIES	5	8	31	13	35
TOTAL NUMBER OF INDIVIDUALS	1,500	1,454	4,954	5,181	13,090
DIVERSITY ($\bar{d}$)	1.69	2.35	3.93	1.93	3.38

Table 8. Macroinvertebrates Collected Using Ponar Grab Samples from Payne Creek Station PC-2, October, 1988 (Page 1 of 2)

Taxa	Replicates 1	3	4	6	Total
Turbellaria	136	500			636
Dero flabelliger		45			45
D. furcata		136			136
Pristina synclites		91	91	45	227
P. leidyi			91		91
Slavena appendiculata	91				91
Limnodrilus hoffmeisteri	45	136			182
Psammoryctides convolutus	182		91	45	318
Immature Tubific. w/o Capil. S	45	136	136	91	409
Batracobdella phalera	91	45			136
Hellobdella fusca	136				136
H. triseralis	136	91			227
Collembola				91	91
Baetis sp.				45	45
Caenis diminuta	1000	591	45	45	1682
Stenacron interpunctatum		45			45
Stenonema smithae			45		45
Chloroterpes hubbelli	364	182			545
Gomphus minutus		45			45
Stylarus plagiatus		45			45
Macromia taeniolata	45	91			136
Oecetis sp.		45			45
Polycentropus sp.		45			45
Dubiraphia sp.	45	136			182
Dineutus sp. (larvae)	91				91
Ceratopogonidae		91		91	182
Ablabesmyia monilis	182	45		45	273
A. mallochi	182	45		45	273
Clinotanypus pinguis		45			45
Cryptochironomus fulvus group	91		45		136
Labrundinea sp. 4 Roback	45				45
Larsia lurida	45				45
Phaenopsectra sp.	91		45		136
Polypedilum convictum			45		45
P. scalaenum	545	273			818
P. simulans	45	227		136	409
Rheosmittia sp.				45	45
Rheotanytarsus exiguus group		45			45
Tanytarsus glabrescens group	45	45	45		136
T. guerlus group			45		45
Hebetancylus exentricus			91		91
Laevipex peninsulae	636	954	136		1727
Micromenetus d. avus			45		45

Table 8. Macroinvertebrates Collected Using Ponar Grab Samples from Payne Creek Station PC-2, October, 1988 (Page 2 of 2)

Taxa	Replicates 1	3	4	6	Total
Corbicula fluminea	136	1182	91	136	1545
Sphaerium sp.		136	45	0	182
Elliptio buckleyi	45			45	91
Physella cubensis		45			45
TOTAL NUMBER OF SPECIES	25	29	16	14	47
TOTAL NUMBER OF INDIVIDUALS	4,500	5,545	1,136	909	12,090
DIVERSITY ($\bar{d}$)	3.89	3.92	3.86	3.55	4.50

Table 9. Macroinvertebrates Collected Using Ponar Grab Samples from Payne Creek Station PC-3, October 1988

Taxa	Replicates 2	3	4	5	Total
Slavena appendiculata				45	45
Aulodrilus pigueti	727	227	954		1909
Limnodrilus hoffmeisteri				45	45
Immature Tubific.w/o capil. setae	136	45	45		227
Macromia taeniolata				45	45
Clinotanypus pinguis			91		91
Cryptotendipes nr. pseudotener			45		45
Paratendipes sp.			45		45
Polypedilum simulans			45		45
Tanytarsus sp. 1 Cantrell	45	45	91		182
Corbicula fluminea		909		45	954
TOTAL NUMBER OF SPECIES	3	4	7	4	11
TOTAL NUMBER OF INDIVIDUALS	909	1,227	1,318	182	3,636
DIVERSITY ($\bar{d}$)	0.88	1.12	1.54	2.00	2.07

Table 10. Macroinvertebrates Collected Using Ponar Grab Samples from Payne Creek Station PC-1, February 1989

Taxa	Replicates 1	3	5	6	Total
Nais pardalis	45				45
Pristina synclites		91			91
Limnodrilus hoffmeisteri	91		136	727	954
Psammoryctides convolutus		273	91	182	545
Immature Tubific. w/o Capil. Setae	227	545	273	1273	2318
Hyalella azteca	136	273			409
Caenis diminuta	45	273			318
Stenonema exiguum				364	364
Tricorythodes albilineatus				182	182
Gomphus minutus	45	45		182	273
Stylarus plagiatus				91	91
Cheumatopsyche sp.	227	545			773
Dubiraphia sp.	136	182	45	1273	1636
Stenelmis fuscata group				182	182
Ceratopogonidae	91	455	136	727	1409
Cladotanytarsus vanderwulpi group	318	455	773	1454	3000
Cryptochironomus fulvus group		636	91		727
Nanocladius minimus?	182	364		182	727
Orthocladius sp.	545	91	91		727
Pentaneura inconspicua	91				91
Polypedilum convictum	91			182	273
P. illinoense	455		727	545	1727
P. scalaenum	1364	1454	364	2182	5363
Rheocricotopus nr. effusus	45				45
Rheotanytarsus exiguus group		91			91
Stenochironomus sp.	45				45
Tanytarsus glabrescens group	45				45
T. guerlus group	45	182	227	364	818
Simulium sp.				545	545
Sphaerium sp.			136		136
Corbicula fluminea	1227	864		1136	3227
Elliptio buckleyi	91				91
TOTAL NUMBER OF SPECIES	22	17	12	18	32
TOTAL NUMBER OF INDIVIDUALS	5,590	6,818	3,091	11,772	27,270
DIVERSITY ($\bar{d}$)	3.51	3.64	3.07	3.67	4.02

Table 11. Macroinvertebrates Collected Using Ponar Grab Samples from Payne Creek Station PC-2, February 1989

Taxa	Replicates 1	2	3	4	Total
Lumbriculidae		273			273
Limnodrilus hoffmeisteri	182	91	136	364	773
Immature Tubific.w/o capil. setae		91	136	364	591
Acroneura sp.			91		91
Baetis sp.			136	182	318
Caenis diminuta	182				182
Choroterpes hubbelli	182				182
Stenacron interpunctatum			364		364
Stenonema exiguum			91		91
Argia moesta	45				45
A. sedula			91		91
Hetaerina sp.	45				45
Gomphus minutus	45				45
Cyrnellus sp.			136		136
Polycentropus sp.	545		182		727
Dubiraphia sp.	1636		227		1863
Stenelmis fuscata group	182		136	364	682
Ceratoppogonidae		45	409	2182	2636
Ablabesmyia mallochi			954		954
A. monilis	1454		682		2136
Cladotanytarsus vanderwulpi group				4590	4590
Cryptochironomus fulvus group		91	136	545	773
Polypedilum convictum				182	182
P. fallax			136		136
P. illinoense				364	364
P. scalaenum			273	3818	4091
P. simulans		182		909	1091
Procladius sp.		91			91
Stenochironomus sp.			409		409
Tanytarsus guerlus group	364	273	409	182	1227
Laevipex floridana	182		136		318
Micromenetus d. avus			136		136
Corbicula fluminea		45	227	682	954
Elliptio buckleyi			45		45
Sphaerium sp.			273		273
TOTAL NUMBER OF SPECIES	12	9	24	13	35
TOTAL NUMBER OF INDIVIDUALS	5,045	1,182	5,954	14,726	26,906
DIVERSITY ($\bar{d}$)	2.71	2.89	4.20	2.83	4.14

Table 12. Macroinvertebrates Collected Using Ponar Grab Samples from Payne Creek Station PC-3, February, 1989.

Taxa	Replicates 3	4	5	6	Total
Nematoda			45		45
Dero furcata			45		45
Pristina synclites		45			45
Limnodrilus hoffmeisteri		182	45	45	273
Immature Tub. w/o Capil. Setae	136	136	45	45	364
Baetis sp.			45		45
Ceratopogonidae	45		91		136
Ablabesmyia mallochi			91		91
A. monilis				91	91
Chironomus sp.	227	91		45	364
Clinotanypus pinguis			45		45
Cryptochironomus fulvus group	182	45	182		409
Cryptotendipes nr. pseudotener	45	45	136		227
Polypedilum scalaenum			182		182
Procladius sp.		45			45
Tanytarsus guerlus gr.			182		182
T. sp. XI Rutter		45	136		182
Elliptio buckleyi			45		45
TOTAL NUMBER OF SPECIES	5	8	14	4	18
TOTAL NUMBER OF INDIVIDUALS	636	636	1,318	227	2,818
DIVERSITY ($\bar{d}$)	2.07	2.75	3.56	1.92	3.75

11.7 SUPPORTING NOISE INFORMATION

NOISECALC MODEL DESCRIPTION AND PROGRAM OUTPUTS

The computer program, NOISECALC, was developed by the New York Department of Public Service (NYPDS, 1986) to aid in calculating sound propagation from major noise sources. Source data is input as octave band sound pressure levels. All noise sources are assumed to be point sources; line sources may be simulated by several point sources. Ambient or background noise levels at user-defined receptors (sites) are optional inputs to the model. Both sources and receptors can be input as either polar or rectangular coordinates. Sound propagation is calculated by hemispherical spreading and three user selected attenuation options: Atmospheric attenuation, path specific attenuation and barrier attenuation. Atmospheric attenuation is calculated using the data specified by the American National Standards Institute method for the Calculation of the Absorption of Sound by the Atmosphere (ANSI, 1978). Path specific attenuation can be requested to take into account the attenuating effects of ground cover, foliage and wind shadow. Sound attenuation due to barriers can be specified by providing the barrier's coordinates. Each barriers attenuation contribution is calculated by assuming an indefinitely long barrier perpendicular to the source-receptor path. Both total and A-weighted SPLs are calculated for each receptor.

* RESULTS *

SEMINOLE NOISE STUDY
PROPOSED FACILITY & BACKGROUND MINIMUMS

AT RECEIVER # 1 SITE #1

WITH THE BACKGROUND NOISE (IF ANY)
SOUND PRESSURE LEVEL = +71.0 DB SOUND LEVEL = +49.5 DBA

WITHOUT THE BACKGROUND NOISE
SOUND PRESSURE LEVEL = +71.0 DB SOUND LEVEL = +49.4 DBA

THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+70.1	+63.1	+55.1	+49.1	+45.1	+42.1	+42.1	+38.1	+31.1	+0.0

THE SOURCES WHOSE A-WT CONTRIBUTIONS ARE WITHIN 10 DB
OF THE TOTAL SOURCE SOUND LEVEL AT THE RECEIVER LOCATION, ARE:

SOURCE # 3 , CT #3, CONTRIBUTES:
SOUND PRESSURE LEVEL = +66.3 DB SOUND LEVEL = +44.7 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+65.3	+58.3	+50.3	+44.3	+40.3	+37.3	+37.3	+33.3	+26.3	+0.0

SOURCE # 2 , CT #2, CONTRIBUTES:
SOUND PRESSURE LEVEL = +66.3 DB SOUND LEVEL = +44.6 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+65.3	+58.3	+50.3	+44.3	+40.3	+37.3	+37.3	+33.3	+26.3	+0.0

SOURCE # 1 , CT #1, CONTRIBUTES:
SOUND PRESSURE LEVEL = +66.2 DB SOUND LEVEL = +44.6 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+65.2	+58.2	+50.2	+44.2	+40.2	+37.2	+37.2	+33.2	+26.2	+0.0

AT RECEIVER # 2 SITE #2

WITH THE BACKGROUND NOISE (IF ANY)
SOUND PRESSURE LEVEL = +75.1 DB SOUND LEVEL = +53.5 DBA

WITHOUT THE BACKGROUND NOISE
SOUND PRESSURE LEVEL = +75.1 DB SOUND LEVEL = +53.5 DBA

THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+74.1	+67.1	+59.1	+53.1	+49.1	+46.1	+46.1	+42.1	+35.1	+0.0

THE SOURCES WHOSE A-WT CONTRIBUTIONS ARE WITHIN 10 DB
OF THE TOTAL SOURCE SOUND LEVEL AT THE RECEIVER LOCATION, ARE:

SOURCE # 1 , CT #1, CONTRIBUTES:
SOUND PRESSURE LEVEL = +70.4 DB SOUND LEVEL = +48.7 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+69.4	+62.4	+54.4	+48.4	+44.4	+41.4	+41.4	+37.4	+30.4	+0.0

SOURCE # 2 , CT #2, CONTRIBUTES:
SOUND PRESSURE LEVEL = +70.3 DB SOUND LEVEL = +48.7 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+69.4	+62.4	+54.4	+48.4	+44.4	+41.4	+41.4	+37.4	+30.4	+0.0

SOURCE # 3 , CT #3, CONTRIBUTES:
SOUND PRESSURE LEVEL = +70.3 DB SOUND LEVEL = +48.7 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+69.4	+62.4	+54.4	+48.4	+44.4	+41.4	+41.4	+37.4	+30.4	+0.0

AT RECEIVER # 3 SITE #3

WITH THE BACKGROUND NOISE (IF ANY)
SOUND PRESSURE LEVEL = +70.0 DB SOUND LEVEL = +48.5 DBA

WITHOUT THE BACKGROUND NOISE
SOUND PRESSURE LEVEL = +70.0 DB SOUND LEVEL = +48.4 DBA

THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+69.0	+62.0	+54.0	+48.0	+44.0	+41.0	+41.0	+37.0	+30.0	+0.0

THE SOURCES WHOSE A-WT CONTRIBUTIONS ARE WITHIN 10 DB
OF THE TOTAL SOURCE SOUND LEVEL AT THE RECEIVER LOCATION, ARE:

SOURCE # 1 , CT #1, CONTRIBUTES:
SOUND PRESSURE LEVEL = +65.3 DB SOUND LEVEL = +43.6 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+64.3	+57.3	+49.3	+43.3	+39.3	+36.3	+36.3	+32.3	+25.3	+0.0

SOURCE # 2 , CT #2, CONTRIBUTES:
SOUND PRESSURE LEVEL = +65.2 DB SOUND LEVEL = +43.6 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+64.3	+57.3	+49.3	+43.3	+39.3	+36.3	+36.3	+32.3	+25.3	+0.0

SOURCE # 3 , CT #3, CONTRIBUTES:
SOUND PRESSURE LEVEL = +65.2 DB SOUND LEVEL = +43.5 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+64.2	+57.2	+49.2	+43.2	+39.2	+36.2	+36.2	+32.2	+25.2	+0.0

AT RECEIVER # 4 SITE #4

WITH THE BACKGROUND NOISE (IF ANY)
SOUND PRESSURE LEVEL = +89.1 DB SOUND LEVEL = +67.5 DBA

WITHOUT THE BACKGROUND NOISE
SOUND PRESSURE LEVEL = +89.1 DB SOUND LEVEL = +67.4 DBA

THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+88.1	+81.1	+73.1	+67.1	+63.1	+60.1	+60.1	+56.1	+49.1	+0.0

THE SOURCES WHOSE A-WT CONTRIBUTIONS ARE WITHIN 10 DB
OF THE TOTAL SOURCE SOUND LEVEL AT THE RECEIVER LOCATION, ARE:

SOURCE # 1 , CT #1, CONTRIBUTES:
SOUND PRESSURE LEVEL = +84.7 DB SOUND LEVEL = +63.1 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+83.8	+76.8	+68.8	+62.8	+58.8	+55.8	+55.8	+51.8	+44.8	+0.0

SOURCE # 2 , CT #2, CONTRIBUTES:
SOUND PRESSURE LEVEL = +84.3 DB SOUND LEVEL = +62.7 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+83.3	+76.3	+68.3	+62.3	+58.3	+55.3	+55.3	+51.3	+44.3	+0.0

SOURCE # 3 , CT #3, CONTRIBUTES:
SOUND PRESSURE LEVEL = +83.9 DB SOUND LEVEL = +62.2 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+82.9	+75.9	+67.9	+61.9	+57.9	+54.9	+54.9	+50.9	+43.9	+0.0

AT RECEIVER # 5 SITE #5

WITH THE BACKGROUND NOISE (IF ANY)
SOUND PRESSURE LEVEL = +89.1 DB SOUND LEVEL = +67.4 DBA

WITHOUT THE BACKGROUND NOISE
SOUND PRESSURE LEVEL = +89.1 DB SOUND LEVEL = +67.4 DBA

THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+88.1	+81.1	+73.1	+67.1	+63.1	+60.1	+60.1	+56.1	+49.1	+0.0

THE SOURCES WHOSE A-WT CONTRIBUTIONS ARE WITHIN 10 DB
OF THE TOTAL SOURCE SOUND LEVEL AT THE RECEIVER LOCATION, ARE:

SOURCE # 1 , CT #1, CONTRIBUTES:
SOUND PRESSURE LEVEL = +84.4 DB SOUND LEVEL = +62.8 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+83.4	+76.4	+68.4	+62.4	+58.4	+55.4	+55.4	+51.4	+44.4	+0.0

SOURCE # 2 , CT #2, CONTRIBUTES:
SOUND PRESSURE LEVEL = +84.3 DB SOUND LEVEL = +62.7 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+83.3	+76.3	+68.3	+62.3	+58.3	+55.3	+55.3	+51.3	+44.3	+0.0

SOURCE # 3 , CT #3, CONTRIBUTES:
SOUND PRESSURE LEVEL = +84.2 DB SOUND LEVEL = +62.5 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+83.2	+76.2	+68.2	+62.2	+58.2	+55.2	+55.2	+51.2	+44.2	+0.0

AT RECEIVER # 6 SITE #6

WITH THE BACKGROUND NOISE (IF ANY)
SOUND PRESSURE LEVEL = +64.5 DB SOUND LEVEL = +43.9 DBA

WITHOUT THE BACKGROUND NOISE
SOUND PRESSURE LEVEL = +64.5 DB SOUND LEVEL = +42.8 DBA

THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+63.5	+56.5	+48.5	+42.5	+38.5	+35.5	+35.5	+31.5	+24.5	+0.0

THE SOURCES WHOSE A-WT CONTRIBUTIONS ARE WITHIN 10 DB
OF THE TOTAL SOURCE SOUND LEVEL AT THE RECEIVER LOCATION, ARE:

SOURCE # 1 , CT #1, CONTRIBUTES:
SOUND PRESSURE LEVEL = +59.7 DB SOUND LEVEL = +38.1 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+58.8	+51.8	+43.8	+37.8	+33.8	+30.8	+30.8	+26.8	+19.8	+0.0

SOURCE # 2 , CT #2, CONTRIBUTES:
SOUND PRESSURE LEVEL = +59.7 DB SOUND LEVEL = +38.1 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+58.7	+51.7	+43.7	+37.7	+33.7	+30.7	+30.7	+26.7	+19.7	+0.0

SOURCE # 3 , CT #3, CONTRIBUTES:
SOUND PRESSURE LEVEL = +59.7 DB SOUND LEVEL = +38.0 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+58.7	+51.7	+43.7	+37.7	+33.7	+30.7	+30.7	+26.7	+19.7	+0.0

RESULTS SUMMARY

RECEIVER	WITH BACKGROUND NOISE (IF ANY) S.PRESSURE LEV.(DB)	SOUND LEVEL (DBA)
# 1 SITE #1	+71.0	+49.5
# 2 SITE #2	+75.1	+53.5
# 3 SITE #3	+70.0	+48.5
# 4 SITE #4	+89.1	+67.5
# 5 SITE #5	+89.1	+67.4
# 6 SITE #6	+64.5	+43.9

* RESULTS *

SEMINOLE NOISE STUDY
PROPOSED FACILITY & BACKGROUND Leq

AT RECEIVER # 1 SITE #1

WITH THE BACKGROUND NOISE (IF ANY)
SOUND PRESSURE LEVEL = +71.0 DB SOUND LEVEL = +52.4 DBA

WITHOUT THE BACKGROUND NOISE
SOUND PRESSURE LEVEL = +71.0 DB SOUND LEVEL = +49.4 DBA

THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+70.1	+63.1	+55.1	+49.1	+45.1	+42.1	+42.1	+38.1	+31.1	+0.0

THE SOURCES WHOSE A-WT CONTRIBUTIONS ARE WITHIN 10 DB
OF THE TOTAL SOURCE SOUND LEVEL AT THE RECEIVER LOCATION, ARE:

SOURCE # 3 , CT #3, CONTRIBUTES:
SOUND PRESSURE LEVEL = +66.3 DB SOUND LEVEL = +44.7 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+65.3	+58.3	+50.3	+44.3	+40.3	+37.3	+37.3	+33.3	+26.3	+0.0

SOURCE # 2 , CT #2, CONTRIBUTES:
SOUND PRESSURE LEVEL = +66.3 DB SOUND LEVEL = +44.6 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+65.3	+58.3	+50.3	+44.3	+40.3	+37.3	+37.3	+33.3	+26.3	+0.0

SOURCE # 1 , CT #1, CONTRIBUTES:
SOUND PRESSURE LEVEL = +66.2 DB SOUND LEVEL = +44.6 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+65.2	+58.2	+50.2	+44.2	+40.2	+37.2	+37.2	+33.2	+26.2	+0.0

AT RECEIVER # 2 SITE #2

WITH THE BACKGROUND NOISE (IF ANY)
SOUND PRESSURE LEVEL = +75.1 DB SOUND LEVEL = +53.9 DBA

WITHOUT THE BACKGROUND NOISE
SOUND PRESSURE LEVEL = +75.1 DB SOUND LEVEL = +53.5 DBA

THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+74.1	+67.1	+59.1	+53.1	+49.1	+46.1	+46.1	+42.1	+35.1	+0.0

THE SOURCES WHOSE A-WT CONTRIBUTIONS ARE WITHIN 10 DB
OF THE TOTAL SOURCE SOUND LEVEL AT THE RECEIVER LOCATION, ARE:

SOURCE # 1 , CT #1, CONTRIBUTES:
SOUND PRESSURE LEVEL = +70.4 DB SOUND LEVEL = +48.7 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+69.4	+62.4	+54.4	+48.4	+44.4	+41.4	+41.4	+37.4	+30.4	+0.0

SOURCE # 2 , CT #2, CONTRIBUTES:
SOUND PRESSURE LEVEL = +70.3 DB SOUND LEVEL = +48.7 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+69.4	+62.4	+54.4	+48.4	+44.4	+41.4	+41.4	+37.4	+30.4	+0.0

SOURCE # 3 , CT #3, CONTRIBUTES:
SOUND PRESSURE LEVEL = +70.3 DB SOUND LEVEL = +48.7 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+69.4	+62.4	+54.4	+48.4	+44.4	+41.4	+41.4	+37.4	+30.4	+0.0

AT RECEIVER # 3 SITE #3

WITH THE BACKGROUND NOISE (IF ANY).
SOUND PRESSURE LEVEL = +70.0 DB SOUND LEVEL = +49.2 DBA

WITHOUT THE BACKGROUND NOISE
SOUND PRESSURE LEVEL = +70.0 DB SOUND LEVEL = +48.4 DBA

THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+69.0	+62.0	+54.0	+48.0	+44.0	+41.0	+41.0	+37.0	+30.0	+0.0

THE SOURCES WHOSE A-WT CONTRIBUTIONS ARE WITHIN 10 DB
OF THE TOTAL SOURCE SOUND LEVEL AT THE RECEIVER LOCATION, ARE:

SOURCE # 1 , CT #1, CONTRIBUTES:
SOUND PRESSURE LEVEL = +65.3 DB SOUND LEVEL = +43.6 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+64.3	+57.3	+49.3	+43.3	+39.3	+36.3	+36.3	+32.3	+25.3	+0.0

SOURCE # 2 , CT #2, CONTRIBUTES:
SOUND PRESSURE LEVEL = +65.2 DB SOUND LEVEL = +43.6 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+64.3	+57.3	+49.3	+43.3	+39.3	+36.3	+36.3	+32.3	+25.3	+0.0

SOURCE # 3 , CT #3, CONTRIBUTES:
SOUND PRESSURE LEVEL = +65.2 DB SOUND LEVEL = +43.5 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+64.2	+57.2	+49.2	+43.2	+39.2	+36.2	+36.2	+32.2	+25.2	+0.0

AT RECEIVER # 4 SITE #4

WITH THE BACKGROUND NOISE (IF ANY)
SOUND PRESSURE LEVEL = +89.1 DB SOUND LEVEL = +67.9 DBA

WITHOUT THE BACKGROUND NOISE
SOUND PRESSURE LEVEL = +89.1 DB SOUND LEVEL = +67.4 DBA

THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+88.1	+81.1	+73.1	+67.1	+63.1	+60.1	+60.1	+56.1	+49.1	+0.0

THE SOURCES WHOSE A-WT CONTRIBUTIONS ARE WITHIN 10 DB
OF THE TOTAL SOURCE SOUND LEVEL AT THE RECEIVER LOCATION, ARE:

SOURCE # 1 , CT #1, CONTRIBUTES:
SOUND PRESSURE LEVEL = +84.7 DB SOUND LEVEL = +63.1 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+83.8	+76.8	+68.8	+62.8	+58.8	+55.8	+55.8	+51.8	+44.8	+0.0

SOURCE # 2 , CT #2, CONTRIBUTES:
SOUND PRESSURE LEVEL = +84.3 DB SOUND LEVEL = +62.7 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+83.3	+76.3	+68.3	+62.3	+58.3	+55.3	+55.3	+51.3	+44.3	+0.0

SOURCE # 3 , CT #3, CONTRIBUTES:
SOUND PRESSURE LEVEL = +83.9 DB SOUND LEVEL = +62.2 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+82.9	+75.9	+67.9	+61.9	+57.9	+54.9	+54.9	+50.9	+43.9	+0.0

AT RECEIVER # 5 SITE #5

WITH THE BACKGROUND NOISE (IF ANY)
SOUND PRESSURE LEVEL = +89.1 DB SOUND LEVEL = +67.4 DBA

WITHOUT THE BACKGROUND NOISE
SOUND PRESSURE LEVEL = +89.1 DB SOUND LEVEL = +67.4 DBA

THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+88.1	+81.1	+73.1	+67.1	+63.1	+60.1	+60.1	+56.1	+49.1	+0.0

THE SOURCES WHOSE A-WT CONTRIBUTIONS ARE WITHIN 10 DB
OF THE TOTAL SOURCE SOUND LEVEL AT THE RECEIVER LOCATION, ARE:

SOURCE # 1 , CT #1, CONTRIBUTES:
SOUND PRESSURE LEVEL = +84.4 DB SOUND LEVEL = +62.8 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+83.4	+76.4	+68.4	+62.4	+58.4	+55.4	+55.4	+51.4	+44.4	+0.0

SOURCE # 2 , CT #2, CONTRIBUTES:
SOUND PRESSURE LEVEL = +84.3 DB SOUND LEVEL = +62.7 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+83.3	+76.3	+68.3	+62.3	+58.3	+55.3	+55.3	+51.3	+44.3	+0.0

SOURCE # 3 , CT #3, CONTRIBUTES:
SOUND PRESSURE LEVEL = +84.2 DB SOUND LEVEL = +62.5 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+83.2	+76.2	+68.2	+62.2	+58.2	+55.2	+55.2	+51.2	+44.2	+0.0

AT RECEIVER # 6 SITE #6

WITH THE BACKGROUND NOISE (IF ANY)
SOUND PRESSURE LEVEL = +64.5 DB SOUND LEVEL = +49.9 DBA

WITHOUT THE BACKGROUND NOISE
SOUND PRESSURE LEVEL = +64.5 DB SOUND LEVEL = +42.8 DBA

THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+63.5	+56.5	+48.5	+42.5	+38.5	+35.5	+35.5	+31.5	+24.5	+0.0

THE SOURCES WHOSE A-WT CONTRIBUTIONS ARE WITHIN 10 DB
OF THE TOTAL SOURCE SOUND LEVEL AT THE RECEIVER LOCATION, ARE:

SOURCE # 1 , CT #1, CONTRIBUTES:
SOUND PRESSURE LEVEL = +59.7 DB SOUND LEVEL = +38.1 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+58.8	+51.8	+43.8	+37.8	+33.8	+30.8	+30.8	+26.8	+19.8	+0.0

SOURCE # 2 , CT #2, CONTRIBUTES:
SOUND PRESSURE LEVEL = +59.7 DB SOUND LEVEL = +38.1 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+58.7	+51.7	+43.7	+37.7	+33.7	+30.7	+30.7	+26.7	+19.7	+0.0

SOURCE # 3 , CT #3, CONTRIBUTES:
SOUND PRESSURE LEVEL = +59.7 DB SOUND LEVEL = +38.0 DBA
THE OCTAVE BAND SOUND PRESSURE LEVELS ARE:

31.5	63	125	250	500	1K	2K	4K	8K	16K HERTZ
+58.7	+51.7	+43.7	+37.7	+33.7	+30.7	+30.7	+26.7	+19.7	+0.0

RESULTS SUMMARY

	WITH BACKGROUND NOISE (IF ANY)	
RECEIVER	S.PRESSURE LEV.(DB)	SOUND LEVEL (DBA)
# 1 SITE #1	+71.0	+52.4
# 2 SITE #2	+75.1	+53.9
# 3 SITE #3	+70.0	+49.2
# 4 SITE #4	+89.1	+67.9
# 5 SITE #5	+89.1	+67.4
# 6 SITE #6	+64.5	+49.9

11.8 LIST OF PREPARERS

11.8 LIST OF PREPARERS

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11.9 INITIAL ORDER ON NEED DETERMINATION

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Petition of Seminole Electric Cooperative, Inc. to determine need for electrical power plant.	)	DOCKET NO. 880309-EC ORDER NO. 20930 ISSUED: 3-23-89

The following Commissioners participated in the disposition of this matter:

MICHAEL McK. WILSON, Chairman
THOMAS M. BEARD
GERALD L. GUNTER
JOHN T. HERNDON

INITIAL ORDER ON NEED DETERMINATION

BY THE COMMISSION:

On February 23, 1988, Seminole Electric Cooperative, Inc. (SEC) filed a petition to determine its need for two 220 MW class combined cycle generating units with an in-service date of January 1, 1993. Along with its petition, SEC submitted a Need Determination Study and Need Determination Study Appendices (Exhibits 1 and 2, respectively). These studies were intended to meet the requirements of Rule 25-22.081, Florida Administrative Code, our rule outlining the information required for this Commission to make a determination of need pursuant to the Florida Electrical Power Plant Siting Act (Siting Act), Sections 403.501-.517, Florida Statutes.

After reviewing these documents, Staff concluded that the petition filed by SEC did not meet the requirements of Rules 25-22.081(2), (4), and (6). SEC was given an opportunity to respond to Staff's written objections to its need determination petition. Based on a review of these documents, we found that SEC's petition did not comply with those sections of the rule and that it was unable to meet the statutory requirements of Sections 403.519 and 366.80-.85, Florida Statutes, until several events occurred. Using the earliest date on which all of these events could be completed and evaluated, we set a hearing date of December 7-9, 1988. Order No. 19468, issued on June 8, 1988, at 7-9.

SEC originally filed direct testimony in support of its petition on April 6, 1988 and rebuttal testimony on May 11, 1988. This was replaced by revised direct testimony filed on October 26, 1988. This October testimony completely superseded SEC's earlier testimony and formed the basis of SEC's testimony at trial. Staff filed the direct testimony of Wayne Makin and Theresa Walsh on April 6 as well. This testimony was no longer relevant after our ruling in June and was withdrawn. SEC filed its post-hearing brief on January 10, 1989, addressing all issues raised in the Prehearing Order in this docket, Order No. 20305, issued on November 15, 1988.

As part of its evaluation of the most cost-effective means of supplying its capacity needs in 1993, SEC issued a request for proposals (RFP) for capacity from qualifying facilities and independent power producers. At the December hearing, SEC indicated that it had compiled a "short list" of three bidders,

DOCUMENT NUMBER-DATE
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two of whom, with further negotiation of terms, might provide a more economical means of supplying SEC with its needed capacity than construction of its proposed units. Based on that representation, we requested that our Staff develop a procedure for resolution of this docket which would allow SEC to go forward with the certification of its proposed plants while not impeding SEC's negotiations with the short list of bidders.

The record before us today is fully developed on both SEC's need for 450 MW of capacity in 1993 and the parameters which are attached to its own construction of two 220 MW class combined cycle generating units at its Polk/Hardee county location. That being the case, our Staff has suggested that this docket be bifurcated and two sets of findings made: an initial order which deals with the need of SEC for 450 MW of capacity in 1993 and a second order, the final order in the docket, which deals with the most economical means of satisfying that need if one exists. These two orders taken together would satisfy the reporting requirements of Section 403.507(b), Florida Statutes. We adopt our Staff's approach with the following modification: because we will hear no additional testimony on SEC's own construction alternative, we can find that certain requirements of the Siting Act have been met, absent the RFP process.

SEC is a generation and transmission cooperative serving its member systems from 1214 MW of its own capacity: two 600 MW coal units and a 14 MW share of Florida Power Corporation's (FPC) Crystal River 3. All load above that level is served by partial requirements purchases from Florida Power and Light Company (FPL) and FPC. With the exception of a 50 MW purchase from the City of Gainesville, SEC has been unable to secure reserve capacity contracts for its 1214 MW from other generating utilities beyond 1992.

Thus, unlike other need determination cases which have come before this Commission, SEC is not proposing to build capacity to serve its anticipated load growth. SEC's projected load growth can, for at least the next seven years, continue to be satisfactorily served by FPL and FPC through partial requirements contracts. SEC is instead seeking to build capacity which will provide the necessary reserve margins on its system to "back up" its own generation. For that reason, although we find that SEC's load forecasts are adequate for planning purposes, they do not support the need for the capacity addition requested in this docket.

In order to identify the type and amount of capacity which will allow it to maintain its own system reliability and integrity, SEC has used an Expected Unserved Energy (EUE) standard of 1%. EUE is particularly appropriate in this application because it provides a direct expression of the amount of member load which will not be served by SEC's own generation as a result of capacity shortfalls. Without the addition of 450 MW of capacity in 1993, SEC will fall below the 1% EUE target. At a level below 1% EUE SEC would be unable to meet its own system requirements should one or both of its coal units fail. Maintenance of this amount of capacity is also necessary for SEC to meet the level of reserves required by the terms of its emergency interchange agreements with the other

Florida utilities with whom it is interconnected. Based on this testimony, we find that SEC has proven a need for 450 MW of reserve capacity in 1993.

Having determined that it needed 450 MW of reserve capacity in 1993, SEC then used the PROMOD and PROSCREEN models to evaluate the least-cost construction alternative to satisfy that need. The SEC screened 75 technologies and performed detailed cost analyses over a 30-year period on combinations of three generating technologies: combustion turbine, combined cycle and pulverized coal units. Essentially, the PROMOD and PROSCREEN models compare the present worth of revenue requirements (PWRR) of different options which meet the 1% EUE reliability standard. PWRR measures the capital costs, carrying costs, operation and maintenance costs and fuel costs associated with each unit or combination of units over the study period

SEC developed its own fuel forecasts and capital carrying costs for input into the PROSCREEN and PROMOD models. The capital costs used as inputs into the models were either taken directly from the Electric Power Research Institute's (EPRI) Technical Assessment Guide (TAG) or were based on SEC's own historical experience or the cost projections of its consulting engineers. Operation characteristics of the various units were taken from the EPRI TAG document for all units.

Based on the PROMOD and PROSCREEN models using the above data, two 220 MW class combined cycle units fueled with natural gas and distillate oil on a 80%/20% basis were found to have the lowest PWRR over the 20 year study horizon as well as the 30-year life cycle of the plant. The total PWRR over the study horizon associated with each of the generating alternatives which meet the 1% EUE reliability criterium is as follows:

Two combined cycle 220 MW units*	$ 3300 million
Three 75 MW combustion turbines, one combined cycle 220 MW unit	$ 3326 million
Six 75 MW combustion turbines	$ 3388 million
Southern Company UPS 450 MW	$ 3363 million
500 MW steam coal	$ 3542 million
Two 220 MW combined cycle with coal gasifier	$ 3613 million

*These figures are based on the use of an 80/20% split of natural gas and distillate fuel for all combined cycle and combustion turbine unit combinations.

The figures developed above are the result from SEC's "base case" assumptions. The base case data is data which SEC considers to be the most likely scenario. SEC also did sensitivity studies which used high and low forecasts for fuel prices, the effect of broker sales, high and low load forecasts, high and low capital costs, and high and low interest rates in the computer models. In each instance, the proposed combined cycle units were found to be the most cost-effective on a PWRR basis. Additionally, SEC considered "strategic" factors: operating considerations (SEC's need for capacity which could be brought on line quickly), construction flexibility (combined cycle units are modular, can be constructed within a two-year period, and can be converted

via the addition of a gasifier to burn coal as well as oil and gas) and impact on SEC's ratepayers (addition of a coal unit would initially have a rate impact of 1.0 cents/KWH more than SEC's proposed units; initially adding coal gasification capability to the combined cycle units would have a rate impact of 1.3 cents/KWH more than SEC's proposed units). These strategic factors also support the selection of two 220 MW class combined cycle units as SEC's construction option.

The proposed combined cycle units will be fueled by both natural gas and distillate oil. SEC testified that natural gas would be available on an interruptible basis from the Phase II expansion of the Florida Gas Transmission Company (FGT) pipeline throughout the proposed plant's expected life at least 80 percent of the time. This gas would be transported to the Polk/Hardee site by a service lateral from the FGT pipeline of approximately 34 miles. The site is also capable of handling coal should the addition of a coal gasifier to the site become economically feasible in the future.

In addition to the supply side options discussed above, SEC has also evaluated the ability of conservation or other nongenerating alternatives to mitigate the need for its proposed plant. The forecasts used in the computer model which identified a need for 450 MW of capacity in 1993 included the expected affects of SEC's conservation and load management programs. Conservation decreases primarily weather-sensitive peak period loads. In SEC's case, peak loads are served by its partial requirements contracts. Because the proposed 450 MW is not needed to serve peak period load, but rather to provide reserve capacity should one or all of SEC's own units fail, one would expect that increases in conservation would not affect the need for the capacity. This assumption is borne out by the sensitivity studies conducted by SEC. These studies showed that even when conservation and load management affects were projected at roughly double that projected for Peninsular Florida in the 1986 Planning Hearing, 450 MW of capacity would still be needed in 1993 to maintain a 1% EUE.

Based on the above, we find that SEC has proven that of all of the supply side and demand side options considered, 440 MW of combined cycle capacity constructed at its proposed Polk/Hardee county site would provide SEC with adequate electricity at at reasonable cost. We also find that of the alternatives fully developed in this proceeding, SEC has proven that this option is the most cost-effective. We note again, however, that the final resolution of these issues cannot be made until the record is developed on the alternative or alternatives which are the result of SEC's negotiations with its RFP bidders. We expect that a detailed analysis of these RFP alternatives will be presented at the continuation of this hearing which is currently scheduled for June 14, 1989. Our intention is that this order will establish SEC's construction of two 220 MW combined cycle units as the benchmark against which all RFP bids are measured.

Therefore, it is

ORDERED By the Florida Public Service Commission that Seminole Electric Cooperative, Inc. has proven a need for 450 MW of capacity in 1993. It is further

ORDERED that SEC has proven that of the demand side and supply side options fully developed in the record before us, this need is best and most economically provided by SEC's construction of two 220 MW combined cycle units located at its Polk/Hardee County site. It is further

ORDERED that the final resolution of the alternative which is most cost-effective is deferred until the alternative/s which are the result of negotiations with SEC's RFP bidders are known and presented to this Commission during a subsequent noticed public hearing.

BY ORDER of the Florida Public Service Commission, this 23rd. day of MARCH, 1989.

STEVE TRIBBLE, Director
Division of Records and Reporting

(S E A L)

SBr

11.10 REQUEST FOR VARIANCE FROM CHAPTER 16C-16 AND SUPPORTING INFORMATION

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LIST OF ACRONYMS

Agrico	Agrico Chemical Company
Btu/hr	British thermal units per hour
°C	degrees Celsius
$CaCO_3$	calcium carbonate
cfs	cubic feet per second
cm	centimeters
°F	degrees Fahrenheit
F.A.C.	Florida Administrative Code
FDER	Florida Department of Environmental Regulation
FDNR	Florida Department of Natural Resources
FEPPSA	Florida Electric Power Plant Siting Act
FS	Florida Statutes
ft	feet
gpm	gallons per minute
ha	hectare
in Hg	inches of mercury
km	kilometers
m	meters
m^3/day	cubic meters per day
m^3/sec	cubic meters per second
mgd	million gallons per day
mg/L	milligrams per liter
mm Hg	millimeters of mercury
MSL	mean sea level
MW	megawatts
NTU	nephelometric turbidity unit
pCi/L	picocuries per liter
SCA	Site Certification Application
SCA/EA	Site Certification Application/Environmental Assessment
µg/L	micrograms per liter
umho/cm	micromhos per centimeter

1.0 INTRODUCTION

TECO Power Services, Tampa Electric Company, and Seminole Electric Cooperative Incorporated (the Applicants) filed a site certification application/environmental assessment (SCA/EA) for the Hardee Power Station project under Chapter 17-17, Florida Administrative Code (F.A.C.), Electrical Power Plant Siting. The proposed project is a 660-megawatt (MW) combined cycle power plant that will utilize a cooling reservoir constructed as part of an overall reclamation project by Agrico Chemical Company (AGRICO). The project will require revisions to a reclamation plan filed by Agrico with the Florida Department of Natural Resources (FDNR) for the area being mined. To meet the design requirements of the cooling system, a variance from three of the reclamation criteria of Section 16C-16.0051, F.A.C., will be required. The ultimate decision for project approval and the variance request lies with the Governor and Cabinet under the Florida Electrical Power Plant Siting Act (FEPPSA). This document, as a supplement to the SCA/EA, addresses the variance request and provides additional information to FDNR for its review and decision making. It has been developed with the collaboration and input of Agrico.

Appendix A of this document provides information requested in Parts I and II of the FDNR variance application form, DNR 53-024(16), Draft Revised 9-14-87, Page 2 of 3. The following sections address the supporting information requested in Part III of the variance application, Page 3 of 3.

2.0 PROVIDE THE LANGUAGE OF THE STATUTE OR RULE FROM WHICH A VARIANCE IS SOUGHT

A variance is sought from the underlined provisions of Section 16C-16.0051(1):

1. Safety

(b) Structures. All temporary buildings, pipelines, and other man-made structures shall be removed with the exception of those that are of sound construction with potential use compatible with the reclamation goals.

A variance is sought from the underlined provisions of Section 16C-16.0051(5):

Wetlands and Water Bodies: The design of artificially created wetlands and water bodies shall be consistent with health and safety practices, maximize beneficial contributions within local drainage patterns, provide aquatic and wetland wildlife habitat values, and maintain downstream water quality by preventing erosion and providing nutrient uptake. Water bodies should incorporate a variety of emergent habitats, a balance of deep and shallow water, fluctuating water levels, high ratios of shoreline length to surface area and a variety of shoreline slopes.

(a) At least 25% of the highwater surface area of each water body shall consist of an annual zone of water fluctuation to encourage emergent and transition zone vegetation. This area will also qualify as wetlands under the requirements of subsection (4) above if requirements in paragraph 16C-16.0051(9)(d) are met. In the event that sufficient shoreline configurations, slopes, or water level fluctuations cannot be designed to accommodate this requirement, this deficiency shall be met by constructing additional wetlands adjacent to and hydrologically connected to the water body.

(b) At least 20% of the low water surface shall consist of a zone between the annual low water line and six feet below the annual low water line to provide fish bedding areas and submerged vegetation zones.

3.0 PROVIDE THE FACTS THAT WOULD SHOW THAT A VARIANCE SHOULD BE GRANTED FOR THE REASON(S) CHECKED IN PART II, ITEM 2

3.1 BACKGROUND

3.1.1 INTRODUCTION

As will be discussed in the following sections, none of the alternatives to the proposed cooling system is practicable because of associated increased costs, land availability constraints, increased environmental impacts, and limited environmental benefits. See Section 378.212(1)(a) and (c) Florida Statutes (FS). The cooling reservoir will be required by state and federal discharge requirements to be equipped with a concrete swale and a fixed weir discharge, therefore, a variance from Section 16C-16.005.0051(1)(b), F.A.C. is also requested. The cooling reservoir will be connected to the power plant located to the southeast of the reservoir by buried intake and discharge condenser cooling water pipelines.

3.1.2 HEAT DISSIPATION REQUIREMENTS

One of the more significant design alternative decisions relating to the Hardee Power Station or any other power-generation facility is the selection of the preferred heat rejection or cooling system. This system serves to transfer and/or reject waste heat to the atmosphere from turbine exhaust steam condensate and directly affects the efficiency of the unit. The following is an economic and environmental evaluation of the alternative cooling systems considered for the Hardee Power Station project.

The cooling system must meet the following engineering, design, and operation criteria.

1. It shall have a continuous heat rejection capability of 1.95×10^9 British thermal units per hour (Btu/hr).
2. It shall be capable of supplying to the condenser, at all times, 281,000 gallons per minute (gpm) of water with a maximum temperature of 35 degrees Celsius (°C) [95 degrees Fahrenheit (°F)] or less under all meteorological conditions and at

100 percent load. Additionally, the condenser back pressure shall not exceed 730 millimeters of mercury (mm Hg) [4.5 inches of mercury (in Hg)].

3. It shall physically fit within the total available land at the Hardee Power Station site.
4. It shall be able to maintain satisfactory quality and quantity of cooling water to allow continuous, uninterrupted condenser cooling operation.
5. The cooling system must be able to be constructed and operated without unacceptable adverse environmental impacts.
6. The preferred cooling system shall be the most economical system to construct and operate that satisfies the preceding criteria.

3.1.3 ALTERNATIVE HEAT REJECTION SYSTEMS

The proposed project site is an inland location. A once-through, non-reuse cooling system was not considered to be a feasible alternative because it would require 281,000 gpm [404 million gallons per day (mgd)] of water flow to the condenser from an existing river, lake, stream, or aquifer which would then be discharged. There are no existing water bodies in the area capable of continuously supplying or receiving this amount of water. Therefore, a non-reuse cooling system was eliminated from further consideration.

Two conceptual cooling water heat rejection systems involving reuse were evaluated: a cooling reservoir and mechanical draft cooling tower. The following site-specific alternative designs were identified and evaluated for the Hardee Power Station:

1. A recirculating cooling water reservoir that receives makeup water from Lower Floridan aquifer wells, natural runoff, and the reuse of plant process water;
2. Mechanical draft cooling towers that receive makeup from Lower Floridan aquifer and discharge blowdown to either:
   a. The Peace River,
   b. A percolation pond,

c. A deep injection well, or

d. Payne Creek.

Cooling Water Reservoir

In a recirculating cooling water reservoir system, water from the reservoir is continuously pumped through the condenser, where it is heated 11°C (20°F) and then is returned to the reservoir. The reservoir dissipates this waste heat primarily through evaporative and radiant cooling, and returns water for reuse at a maximum temperature of 35°C (95°F). The cooling reservoir must provide two primary functions:

1. It must collect, store, and supply water for use in condenser cooling; and
2. It must have sufficient surface and depth to dissipate the waste heat generated by the Hardee Power Station through evaporative, radiant, and other cooling processes.

Such a cooling reservoir must be sized to optimize evaporative and radiant cooling--controlled by unimpeded surface area--and minimize solar heating--controlled by water depth. Computer modeling using the Shallow Cooling Pond Performance Code developed by the Department of Civil Engineering, Massachusetts Institute of Technology has shown if the reservoir water depth is 3.1 meters (m) [10 feet (ft)] deep or deeper, the heat load of the Hardee Power Station requires a surface area of 231 hectares (ha) (570 acres); this depth/area combination defines the effective cooling area of this reservoir. To the extent the reservoir is made shallower, the aerial dimensions of the reservoir need to be increased. This surface area of the reservoir is necessary to evaporate and radiate all waste heat generated by the plant. This depth is necessary to avoid excessive solar heating that occurs with shallower systems.

In Florida, the threat of infestation with aquatic macrophytes in ponds, lakes, and reservoirs is a serious problem. In reservoirs, the growth of plants can limit the hydraulic effectiveness by significantly reducing flow and water exchange. If such growth occurred, the overall thermal

effectiveness of a reservoir would be reduced. The major aquatic weed problems in Florida are caused by exotic plants that grow uncontrolled and rapidly invade new areas. The effect of this vegetative growth on the thermal and hydraulic performance of the reservoir is directly dependent on the area involved.

As shown in Figure 3-1, the projected average requirement for annual cooling water reservoir makeup is estimated to be approximately 6,740 cubic meters per day (m^3/day) (1.78 mgd). Water makeup of the reservoir will include direct rainfall, runoff, seepage from the upland watershed, and treated plant wastewater and, as necessary, pumped Lower Floridan aquifer well water. To facilitate the infrequent discharges which may be necessitated by extreme (wet) meteorological conditions, a concrete structure will be provided to allow overflow to Payne Creek. The storage capacity of the cooling reservoir alternative promotes maximum water reuse and minimum Lower Floridan aquifer water withdrawals.

Cooling Tower

This alternative would use a counterflow, wood frame, rectangular mechanical draft cooling tower for waste heat rejection. In this mechanical draft cooling tower system, cooling water is pumped from the cooling tower basin through the condenser where it is heated 11°C (20°F). This heated water is returned to the cooling tower where it is pumped to the top of the tower and allowed to cascade down through the tower. Large electrical fans pull air through the tower, and heat exchange occurs by evaporation and convection.

As water is evaporated in the tower, the dissolved chemical materials contained in the natural makeup water are concentrated in the remaining tower waters. To prevent facility and equipment damage, a significant portion of this highly mineralized water, called blowdown, is withdrawn from the system and discharged. This blowdown is replaced with fresh makeup water. Such cooling tower water losses to evaporation and blowdown

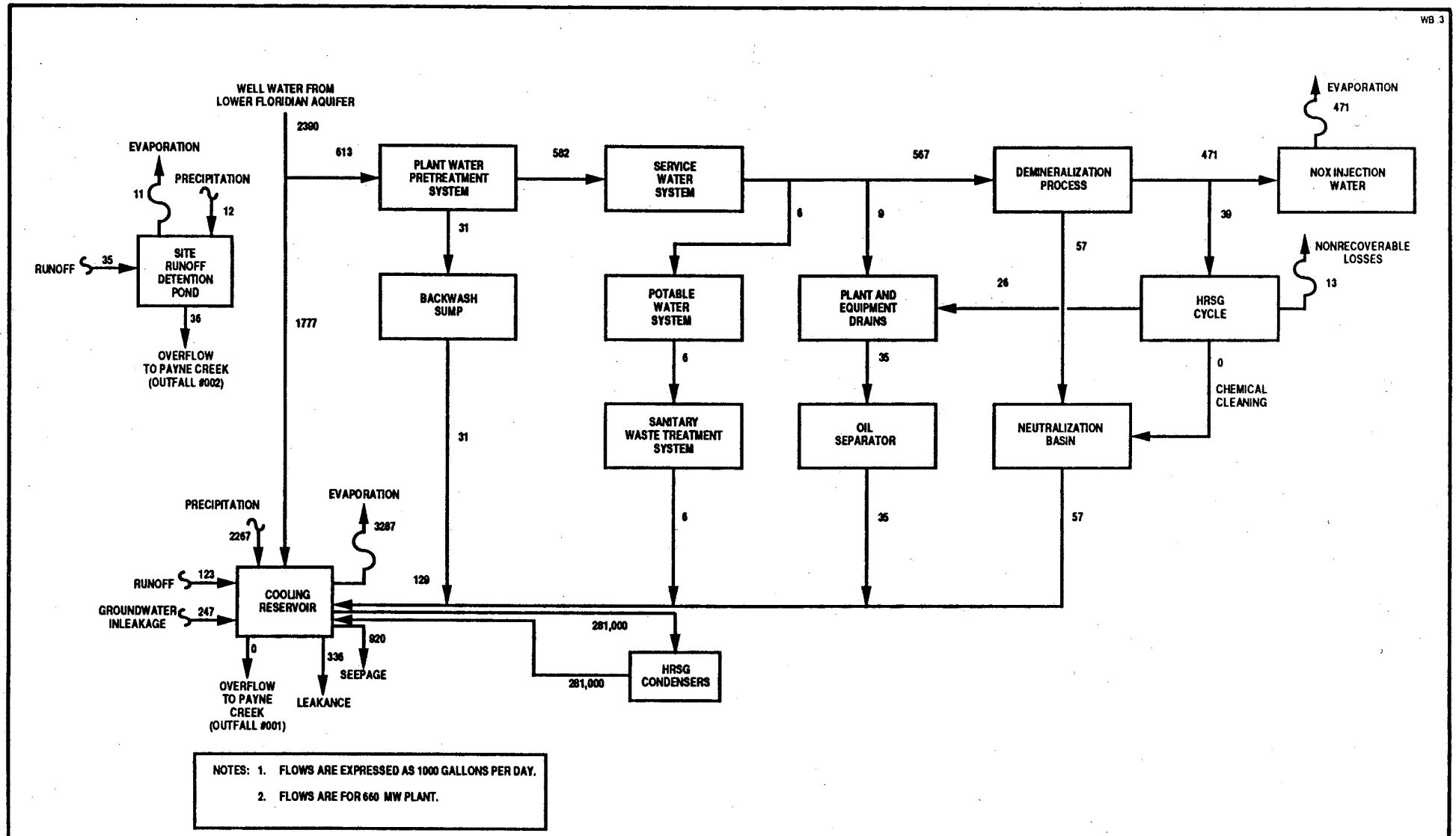


Figure 3-1 WATER MASS BALANCE: ANNUAL AVERAGE MAKEUP

Hardee Power Station

are estimated to be 9,085 m^3/day (2.4 mgd); these losses would be replaced by softened Lower Floridan aquifer water.

Under projected average annual load conditions, cooling tower blowdown discharge is estimated to be 1,514 m^3/day (0.4 mgd) or 0.02 cubic meters per second (m^3/sec) [0.6 cubic feet per second (cfs)]; under maximum annual load conditions, cooling tower blowdown discharge is estimated to be 5,110 m^3/day (1.35 mgd) or 0.059 m^3/sec (2.09 cfs).

Four blowdown discharge options are available at the Hardee Power Station. These options are:

1. Blowdown Discharge to the Peace River--Blowdown from the towers (necessary to maintain operational water quality within the tower) would be routed to the Peace River. The site location would require construction of a pipe 30 centimeters (cm) (12 inches) in diameter approximately 16 kilometers (km) (10 miles) to the Peace River.
2. Blowdown Discharge to the Percolation Pond--This cooling tower alternative would route tower blowdown to a percolation pond located on-site but not on mined lands. To accommodate the anticipated maximum tower blowdown, plant discharge rate, and site-specific surficial aquifer conditions, a preliminary, conceptual design evaluation of the percolation pond indicates a 53-ha (131-acre) pond would be necessary to percolate the required volume of tower blowdown. This percolation pond would discharge tower blowdown through seepage to the surficial aquifer. During extremely wet periods, a surface discharge from the pond to Payne Creek would be necessary.
3. Blowdown Discharge to a Deep Injection Well--This cooling tower alternative would route tower blowdown to a deep injection well. This well would be at least 61 cm (24 inches) in diameter and at least 914 to 1,230 m (3,000 to 4,000 ft) deep.
4. Blowdown Discharge to Payne Creek--The cooling tower alternative would route tower blowdown continuously to Payne Creek.

3.1.4 ECONOMIC EVALUATION OF ALTERNATIVE SYSTEMS

An estimate of capital and operational costs was prepared for four alternative heat rejection systems. No cost analysis was prepared for discharge of tower blowdown to Payne Creek because of failure of this alternative to meet environmental criteria (see Section 3.1.5). The results of the economic evaluation are presented in Table 3-1.

The capital cost analysis shows that, from an economic perspective, the cooling water reservoir is more cost effective than any of the three cooling tower alternatives. This is due in part to the increased capital costs for the additional process water treatment and wastewater disposal system required for the cooling tower alternatives.

The analysis shows that the cooling water reservoir alternative has a lower operational cost compared to any of the cooling tower alternatives. This is a direct function of the increased cooling tower operational energy, water treatment, and maintenance requirements.

Considering both capital and operational costs, the cooling water reservoir alternative is less costly by more than a factor of 2 than any of the cooling tower alternatives. The total present worth of capital and operating costs for the cooling reservoir alternative is approximately $20 million as compared to the approximately $41 million for any of the tower alternatives.

3.1.5 ENVIRONMENTAL EVALUATION OF ALTERNATIVE SYSTEMS

The two major environmental differences between the cooling reservoir alternative and the cooling tower alternative are makeup water requirements and the water discharge requirements. The cooling reservoir will obtain makeup water from natural runoff, reuse of plant process water, and groundwater withdrawal from the Lower Floridan aquifer. The cooling tower can only obtain water from the Lower Floridan aquifer. The cooling reservoir will discharged infrequently, in contrast to the cooling tower alternative, which will discharge blowdown continuously.

Table 3-1. Summary of Total Present Worth Analysis for Capital and Operating Costs for Alternative Heat Rejection Systems Initially Evaluated for the Hardee Power Station

Cost Category	Heat Rejection System Alternatives Total Present Worth			
	Cooling Reservoir	Cooling Towers with Percolation Pond	Cooling Towers with Injection Wells	Cooling Towers with Peace River Discharge
Capital Costs	$13,599,000	$18,870,000	$18,398,000	$19,245,000
Operating Costs	$6,577,000	$22,327,000	$23,512,000	$22,527,000
TOTAL	$20,176,000	$41,197,000	$41,910,000	$41,772,000

Source: Black and Veatch, 1989.

As shown in Figure 3-1, the projected average requirement for annual cooling water reservoir makeup is estimated to be approximately 6,740 m^3/day (1.78 mgd). The reservoir serves as an effective water management facility to minimize the total withdrawal demand placed on the Lower Floridan aquifer groundwater system when compared to the other alternatives. The cooling reservoir alternative will have off-site surface discharges only during extreme meteorological conditions such as those associated with major frontal systems and hurricanes. The cooling water reservoir can be constructed and operated with minimum adverse environmental impacts.

In contrast, the required cooling tower makeup is estimated to be 9,085 m^3/day (2.40 mgd). This is 35 percent more groundwater compared with the reservoir alternative. The cooling tower alternative conserves less water than the reservoir alternative.

Unlike the infrequent discharges from the cooling reservoir, daily cooling tower blowdown discharge will be required. Under projected average annual load conditions, cooling tower blowdown discharge is estimated to be 1,514 m^3/day (0.4 mgd) or 0.02 m^3/sec (0.6 cfs); under maximum annual load conditions, cooling tower blowdown discharge is estimated to be 5,110 m^3/day (1.35 mgd) or 0.059 m^3/sec (2.09 cfs).

The direct discharge of the cooling tower blowdown to the Peace River would require construction of a 16-km (10-mile) pipeline from the plant site to the Peace River. It would also necessitate a mixing zone in order to comply with state water quality standards. The Peace River will be subject to periodic low flow conditions; for example, the 7-day, 10-year low flow for the Peace River near Zolfo Springs is estimated to be 1.53 m^3/sec (54 cfs). Given a maximum cooling tower blowdown discharge rate of 0.059 m^3/sec (2.09 cfs), tower blowdown discharge would be approximately 3.9 percent of the 7-day, 10-year low flow. Therefore, the Peace River should have sufficient flow to allow adequate mixing and dilution of the

tower blowdown discharge to meet Class III water quality criteria at the edge of a mixing zone.

Discharge of the blowdown to a percolation pond would be expected to have greater impacts on surficial aquifer water quality as compared with the cooling reservoir due to differences in dilution volumes. Discharge of the blowdown to deep injection well may be very difficult or infeasible at the project site due to low transmissivity rock formations at depths greater than 914 m (3,000 ft).

3.1.6 PREFERRED HEAT REJECTION SYSTEM ALTERNATIVE

Based on both environmental and economic considerations described previously, the preferred heat rejection alternative is a closed cycle cooling system that utilizes a cooling water reservoir of 231 ha (570 acres) at 3-m (10-ft) depth. This is the preferred alternative because of the following reasons:

1. Meets all engineering criteria,
2. The cooling reservoir is more than a factor of 2 less costly than any other cooling tower alternative,
3. The cooling reservoir uses 35 percent less water as compared to the cooling tower alternatives, and
4. The cooling reservoir has the lowest potential for adverse water quality and quantity impacts.

3.2 ALTERNATIVE COOLING RESERVOIR DESIGNS

Based on the determination that the preferred heat rejection system alternative is a cooling reservoir (see Section 3.1.6), the Applicants designed a cooling reservoir to meet all engineering criteria described in Section 3.1.2. This design is presented in Section 6.0 and is described in the SCA/EA.

A major constraint in the preparation of this design was the availability and location of mined lands for reservoir construction. The area depicted in Figure 3-2 is the maximum amount of land available for reservoir

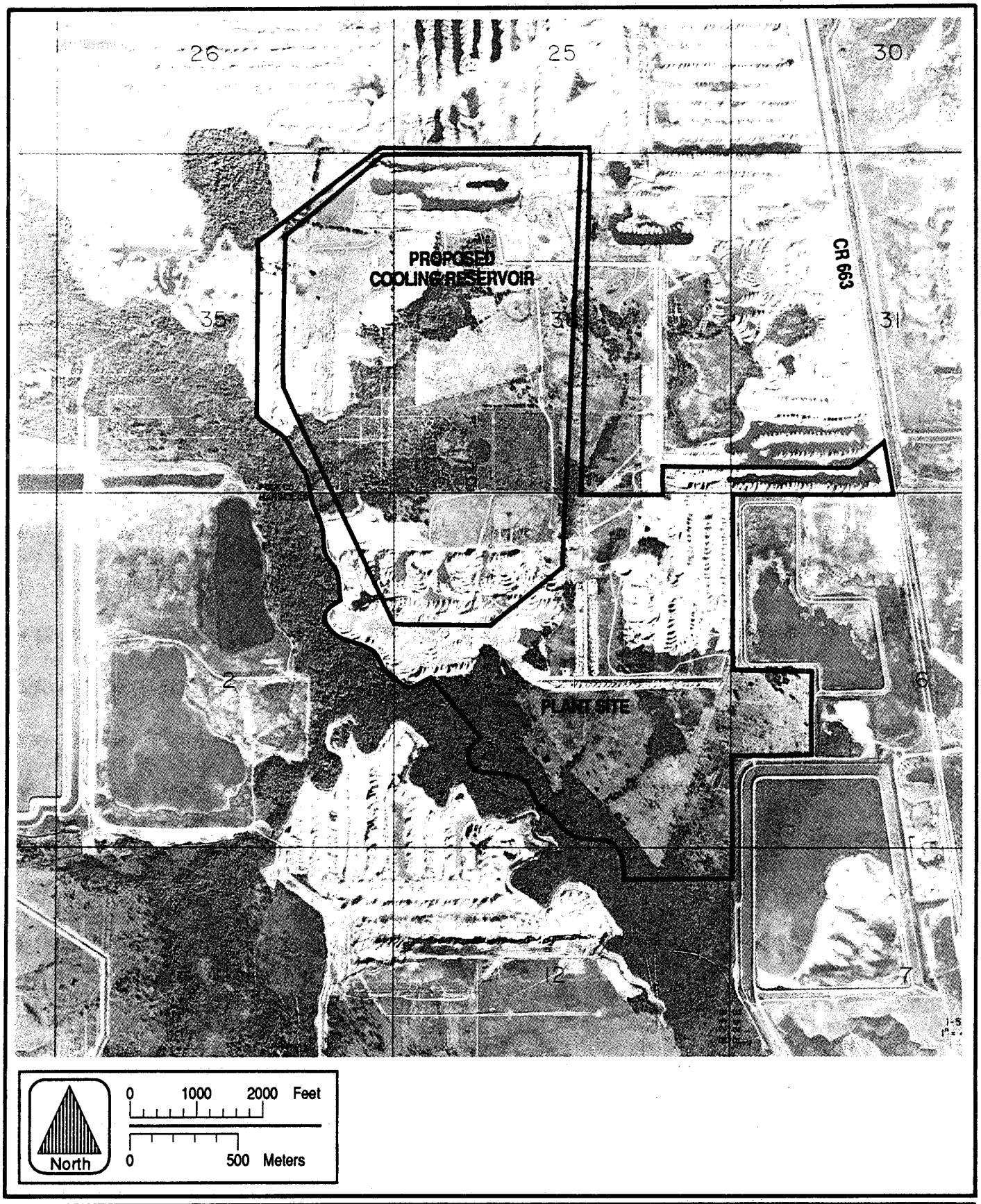


Figure 3-2 HARDEE POWER STATION SITE BOUNDARY AND PROPOSED COOLING RESERVOIR

Hardee Power Station

construction. Lands outside the property boundary depicted in Figure 3-2 could not practicably be obtained due to the following factors:

1. Sand tailing disposal and topographic requirements which must be met by Agrico to the north,
2. Other wetland mitigation areas to be created or preserved by Agrico to the east,
3. The Payne Creek floodplain to the west and southwest, and
4. The plant site location to the southeast.

Within the property boundary depicted in Figure 3-2, 325 ha (803 acres) is the maximum available area for reservoir construction, including open water, buffers, berms and access. The 325 ha (803-acre) area consists of the following:

1. 6.5 ha (16 acres) of divider dike,
2. 4.9 ha (12 acres) of perimeter access roads,
3. 83 ha (205 acres) of sloped upland and wetland buffers, and
4. 231 ha (570 acres) of cooling reservoir underlain by water 3-m (10-ft) deep.

To meet the FDNR 25 and 20 percent criteria, an additional 92.3 ha (228 acres) [i.e., 57.7 ha (142.5 acres) and 34.6 ha (85.5 acres)] would have to be provided between mean high water and 1.8 m (6 ft) below mean low water. A detailed discussion of these area requirements is provided in subsequent sections. No additional land area is available to satisfy these requirements. Therefore, these requirements could only be met by allocating land within the available 325 ha (803 acres). Such an allocation would reduce the total land available for the cooling reservoir, result in a reduced-capacity cooling reservoir, and would create a substantial cost penalty.

The steam turbine exhausts to a condenser cooled by the water from the reservoir. The present design is based on a maximum inlet temperature of 35°C (95°F). If the effective surface area of the pond is reduced from 231 ha (570 acres) to 138 ha (340 acres) to provide the additional area to meet

the 25 percent and 20 percent criteria, the maximum inlet water temperature could rise to 38°C (101°F). This rise in temperature will result in a reduction in plant output by about 1,500 kW, which would have to be made up by purchasing more expensive power. It would also decrease the efficiency of the plant by about 180 Btu/kWh. The replacement power, plus the decreased plant efficiency, would result in a total present worth cost of approximately $31 million (1993 dollars).

The plant also uses the reservoir water to cool plant equipment. The current design uses coolers that require water at 35°C (95°F) or cooler. The effect of a higher water temperature on equipment cooling has not been evaluated, due to its complex effect on plant design.

Such a reduced-capacity cooling reservoir would not meet the engineering criteria described in Section 3.1.2. Therefore, supplemental cooling would be required to assure that all engineering criteria are met.

Two additional cooling reservoir designs were evaluated. These alternatives involved designing a shallower, reduced-capacity cooling reservoir on the available 231 ha (570 acres) of land to meet FDNR reclamation standards. This would require supplemental cooling to meet the required thermal capacity of the reservoir for the proposed 660 MW. These alternatives include a smaller, reduced-capacity cooling reservoir with a helper tower and a serpentine reservoir (of reduced capacity) with a helper tower. The helper tower is a small mechanical draft cooling tower that precools heated condenser cooling water before discharge into the cooling reservoir. The heated condenser cooling water is pumped to the top of the tower, where it is allowed to cascade down through the tower. Large electrical fans pull air through the tower and heat exchange occurs. This water is discharged to the cooling reservoir, where the water is cooled further. The helper tower would be needed to augment the insufficient cooling reservoir capacity of these two alternatives.

3.2.1 COOLING RESERVOIR WITH A HELPER COOLING TOWER

This reduced capacity water cooling reservoir with a helper cooling tower alternative is presented in Appendix C and could be used to meet the applicable FDNR reclamation standards, including the 25 percent and 20 percent standards. Since the available land area is limited, meeting the 25 percent and 20 percent criteria would substantially decrease the effective thermal area of the reservoir and reduce the heat dissipation capacity. Therefore, a helper cooling tower would have to be added to meet the engineering requirements outlined in Section 3.1.2.

This reduced capacity cooling reservoir alternative would be constructed in the same plan area available for the proposed 231-ha (570-acre) reservoir. Under this alternative, the 25 percent and 20 percent standards would be met by the construction of shallow transition zones around the entire perimeter of the reservoir and along the center divider dike, as shown in Appendix B.

To meet the 25 percent standard, a sloped and transition zone approximately 64 m (210 ft) in width would be constructed between the mean high water and mean low water elevations. With a reservoir perimeter of 8,992 m (29,500 ft), this transition zone provides approximately 57.7 ha (142.5 acres), or 25 percent of the total mean high water reservoir area.

To meet the 20 percent standard, a sloped and transition zone approximately 39.6 m (130 ft) in width would be constructed between the mean low water elevation and 1.8 m (6 ft) below the mean low water elevation. With the reservoir perimeter, this transition zone provides approximately 34.6 ha (85.5 acres), or 20 percent of the total mean low water reservoir area.

By meeting the 25 percent and 20 percent standards, at least 92.3 ha (228 acres) of the total reservoir area will be less than 1.8 m (6 ft) in depth at mean low water. The increased influence of solar insolation in these shallow areas and the reduced flow and water exchange due to

significant vegetation growth will cause the overall thermal effectiveness to be significantly reduced to approximately 137.6 ha (340 acres).

To meet the engineering requirements outlined in Section 3.1.2, only 390 MW of the plant capacity could be cooled using this reduced capacity reservoir without helper towers. Therefore, helper towers would have to be provided for 270 MW or 41 percent of the total site capacity of 660 MW. It should be noted that without helper towers, this reduced capacity reservoir does not meet the first phase of anticipated plant construction (440 MW) and requiring the tower to be constructed by 1993.

Construction and operation of these helper cooling towers are estimated to cost approximately $9.4 million.

Use of a shallower reservoir with the helper cooling towers would result in increased water quantity and water quality impacts. Implementation of this alternative would require the increased use of approximately 1,438 m^3/day (380,000 gpd) of groundwater under average annual plant operation conditions due to the increased evaporative losses associated the helper towers. This additional demand would have to be satisfied by a 16 percent increase in total groundwater withdrawal from the Floridan aquifer wells.

Discharge of the helper tower blowdown into the shallower, lower volume reservoir would result in the increased mineralization of the reservoir water. Using the analysis methodology presented in the SCA/EA, anticipated water quality was estimated within this reservoir alternative (including the helper towers) and is summarized in Table 3-2.

Depending on the parameter, the water quality concentrations within this alternative reservoir are as much as 15 percent higher than the larger open reservoir proposed in the SCA (Table 3-2). Two additional water quality parameters, iron and lead, are predicted to exceed applicable Florida Department of Environmental Regulation (FDER) water quality criteria. Mixing zones will be required for these additional parameters. Given the

Table 3-2. Summary of Estimated Cooling Reservoir Quality for the Proposed Open Reservoir, a Smaller Reservoir With Helper Towers, and a Serpentine Reservoir With Helper Towers for the Hardee Power Station

Parameter	Concentration			FDER Class III Water Quality Criteria
	SCA/EA Cooling Reservoir	Smaller Cooling Reservoir with Helper Tower	Serpentine Cooling Reservoir with Helper Tower	
Calcium, mg/L as $CaCO_3$	240	270	280	
Magnesium, mg/L as $CaCO_3$	100	120	120	
Sodium, mg/L as $CaCO_3$	200	210	210	
Potassium, mg/L as $CaCO_3$	16	18	18	
Total Hardness, mg/L as $CaCO_3$	340	390	400	
Alkalinity, mg/L as $CaCO_3$	260	310	310	20
Sulfate, mg/L as $CaCO_3$	250	260	260	
Chloride, mg/L as $CaCO_3$	50	60	60	
Silica, mg/L	60	60	60	
Fluoride, mg/L	4.1	4.7	4.7	10
Cyanide, mg/L	0.01	0.01	0.01	0.005
MBAS, mg/L	0.358	0.413	0.419	0.5
Oil and Grease, mg/L	<5	<5	<5	5
Turbidity, NTU	31	35	36	29 above background
pH, units	7.5	7.5	7.5	6.0-8.5
Total Dissolved Solids, mg/L	860	970	980	
Specific Conductivity, umho/cm	1,080	1,180	1,190	1,275
Total Kjeldahl Nitrogen, mg/L	0.9	1.0	1.0	
Ammonia Nitrogen, mg/L	0.4	0.5	0.5	
Un-ionized Ammonia, mg/L	0.014	0.017	0.017	0.02
Organic Nitrogen, mg/L	0.4	0.5	0.5	
Nitrate+Nitrite-Nitrogen, mg/L	0.1	0.1	0.1	
Total Nitrogen, mg/L	1.0	1.1	1.1	
Orthophosphorus, mg/L	0.5	0.6	0.6	
Total Phosphorus, mg/L	0.8	0.9	0.9	
Arsenic, µg/L	20	20	20	50
Barium, µg/L	150	170	170	
Beryllium, µg/L	4.0	4.3	4.3	1,100
Cadmium, µg/L	2.6	2.8	2.8	1.2
Chromium, µg/L	28	32	32	50
Copper, µg/L	27	29	29	30
Iron, µg/L	980	1,110	1,120	1,000
Lead, µg/L	29	33	34	30
Manganese, µg/L	47	56	57	
Mercury, µg/L	0.5	0.5	0.5	0.2
Nickel, µg/L	49	56	57	100
Selenium, µg/L	32	37	38	25
Silver, µg/L	0.8	0.9	0.9	0.07
Strontium, µg/L	610	700	710	
Zinc, µg/L	280	330	330	1,000
Alpha, Gross (pCi/L)	22.2	24.8	25.1	15
Radium 226 (pCi/L)	6.2	7.1	7.2	5

Note: Reservoir quality estimates are based on mass balances and do not take into account any chemical reaction, precipitation, sedimentation, deposition or biological activity which may occur in the reservoir and act to remove material from the water column and thus reduce reservoir concentrations.

Un-ionized ammonia concentrations are based on a worst case reservoir water temperature of 35°C (95°F).

higher concentrations for the other parameters, slightly longer mixing zones will be required to meet applicable FDER water quality criteria downstream from the point of discharge.

The environmental benefit associated with this alternative is the creation on-site of additional artificial wetlands to meet the 25 percent and 20 percent criteria. However, this alternative will result in additional off-site environmental impacts including increased groundwater withdrawal and additional water quality impacts to Payne Creek. Because of the economic considerations associated with the helper cooling tower, the potential water quantity and quality impacts associated with tower operation, and the lack of commensurate environmental benefit, construction and operation of a reduced capacity cooling reservoir with a helper cooling tower is not a practicable alternative.

3.2.2 SERPENTINE WATER COOLING RESERVOIR WITH A HELPER COOLING TOWER

This reduced-capacity serpentine cooling reservoir with a helper tower alternative is presented in Appendix D and is a second alternative that could be used to meet the applicable FDNR reclamation standards, including the 25 percent and 20 percent standards. This alternative attempts to make use of the mine rows (to the extent possible) as internal baffles to potentially minimize the total earthwork that would have to be done during construction. Since much of this area has been mined and may not be compatible with the required design, substantial recontouring will be required at an additional cost. Since the available land area is limited, including the additional area needed for baffle dikes, meeting the 25 percent and 20 percent criteria would substantially decrease the effective thermal area of the reservoir. A helper cooling tower would have to be added to meet the engineering requirements outlined in Section 3.1.2. This reduced-capacity serpentine cooling reservoir would be constructed in the same plan area available for the proposed 231-ha (570-acre) reservoir. Under this alternative, the 25 percent and 20 percent standards would be met by the construction of transition zones around the entire perimeter of the reservoir and along the internal baffle dikes.

To meet the 25 percent standard, a sloped and transition zone approximately 25 m (82 ft) in width would be constructed between the mean high water and mean low water elevations. With a reservoir perimeter of 21,640 m (71,000 ft), this transition zone provides approximately 53.8 ha (133 acres), or 25 percent of the total mean high water reservoir area.

To meet the 20 percent standard, a sloped and transition zone approximately 15.2 m (50 ft) in width would be constructed between the mean low water elevation and 1.8 m (6 ft) below the mean low water elevation. Given an effective reservoir edge of 21,640 m (71,000 ft), this transition zone provides approximately 33.2 ha (82 acres) or 20 percent of the total mean low water reservoir area.

By meeting the 25 percent and 20 percent standards, at least 87 ha (215 acres) of the total reservoir area will be less than 1.8 m (6 ft) in depth at mean low water. The increased influence of solar insolation in these shallow areas and the reduced flow and water exchange in these areas due to significant vegetation growth will cause the overall thermal effectiveness to be reduced to approximately 127.5 ha (315 acres).

To meet the engineering requirements outlined in Section 3.1.2, only 360 MW of plant capacity could be cooled using this reduced capacity serpentine reservoir without helper towers. Therefore, helper towers would have to be provided for 300 MW or 45 percent of the total site capacity of 660 MW. It should be noted that without helper towers, this reduced capacity, serpentine reservoir does not meet the first phase of the anticipated plant construction (440 MW).

Construction and operation of these helper cooling towers are estimated to cost approximately $9.4 million.

Use of a smaller, serpentine reservoir with the helper cooling towers would result in increased water quantity and water quality impacts. Implementation of this alternative would require the increased use of

groundwater to approximately 1,594 m^3/day (421,000 gpd) under average annual plant operation conditions due to the increased evaporative losses associated with the helper towers. This additional demand would have to be satisfied by an 18 percent increase in total groundwater withdrawal from the Floridan aquifer wells.

Discharge of the helper tower blowdown into the smaller, lower volume reservoir would result in the increased mineralization of the reservoir water. Using the analysis methodology presented in the SCA/EA, anticipated water quality within this reservoir alternative (including the helper towers) was estimated and is summarized in Table 3-2. Depending on the parameter, water quality concentrations within this alternative reservoir are as much as 18 percent higher than the larger reservoir proposed in the SCA. As a result, the two additional water quality parameters, iron and lead, are predicted to exceed applicable FDER water quality criteria. Mixing zones will be required for these additional parameters. Given the higher concentrations for the other parameters, slightly longer mixing zones will be required to meet applicable FDER water quality criteria downstream from the point of discharge.

The environmental benefit associated with this alternative is the creation on-site of additional artificial wetlands to meet the 25 percent and 20 percent criteria. However, this alternative will result in additional off-site environmental impacts including increased groundwater withdrawal and additional water quality impacts to Payne Creek. Because of the economic considerations associated with the helper cooling tower, the potential water quantity and quality impacts associated with tower operation, and the lack of commensurate environmental benefit, construction and operation of a reduced-capacity, serpentine water cooling reservoir with a helper cooling tower is not a practicable alternative.

3.2.3 ECONOMIC EVALUATION OF ALTERNATIVE COOLING RESERVOIR DESIGNS

An estimate was prepared of the capital and operational costs for the alternative cooling reservoir designs. The results of the economic evaluation are presented in Table 3-3.

The capital cost analysis shows that, from an economic perspective, the proposed cooling water reservoir is more cost effective than the smaller cooling reservoir with a helper tower or the serpentine reservoir with a helper tower. The proposed cooling water reservoir has both a lower capital and operational cost compared to the other cooling reservoir alternatives. The proposed cooling water reservoir is less costly by more than a factor of 1.5 than the other cooling reservoir alternatives. The total present worth of capital and operating costs for the proposed cooling reservoir alternative is approximately $20 million as compared to the approximately $30 million for the other reservoir alternatives.

3.2.4 PHASED COOLING RESERVOIR CONSTRUCTION

This construction alternative would be based on the construction of that portion of the reservoir which would be necessary for the early phases of plant construction (e.g., 380 acres for the initial 440 MW) and leave the remaining area (e.g., 190 acres) in an essentially unreclaimed form, allowing for the formation of transition areas along the unreclaimed mine rows.

The major engineering consideration related to this phased alternative is the increased construction cost compared to completing reservoir construction at one time. These additional considerations include costs for additional remobilization, additional dewatering requirements for this area to effectively reclaim these areas, and re-reclamation to an open water body to meet the ultimate capacity of the reservoir.

Any potential environmental benefits (i.e., wetland creation and wildlife usage) associated with this alternative are short term (5 years) and must be balanced against any risk of future impacts (i.e., loss of wetlands and

Table 3-3. Summary of Total Present Worth Analysis for Capital and Operating Costs for Alternative Cooling Reservoir Designs Evaluated for the Hardee Power Station

Cost Category	Alternative Cooling Reservoir Design Total Present Worth: Cooling Reservoir (Proposed)	Cooling Reservoir with Helper Tower	Serpentine Reservoir with Helper Tower[a]
Capital Costs	$13,599,000	$19,076,000	$20,254,000
Operating Costs	$6,577,000	$11,743,000	$12,468,000
TOTAL	$20,176,000	$30,819,000	$32,722,000

[a] The capital costs and operating costs of the serpentine reservoir are assumed to be similar to the cooling reservoir with the helper tower. The costs associated with the helper tower for this case are taken from the cooling reservoir with helper tower case, adjusted slightly to reflect the larger tower required for the serpentine reservoir.

Source: Black & Veatch, 1990.

wildlife usage at the time when the reservoir is expanded to full capacity). For example, if a rookery were to develop in these temporary wetlands during this interim period, this rookery would be destroyed during full capacity expansion construction. Given the realistic potential for this or a similar scenario, the wetland area would have to be managed (e.g., maintenance of herbaceous versus shrub or woody vegetation) to maintain lower wildlife usage to avoid major future environmental impacts as a consequence. Full wetland values would never be realized.

This alternative would only meet or approach the applicable criteria (e.g., 25 percent of high water area and 20 percent of low water area) for the short-term period prior to expansion to full capacity; after expansion, the reservoir would be identical to the proposed alternative with respect to the applicable criteria.

In conclusion, the only benefit of this alternative would be that it meets or approaches the applicable FDNR reclamation criteria in the short term. Given the relatively low and short-term environmental benefits, the potential for significant future impact when the reservoir is expanded to full capacity, and the significant additional construction costs, phased cooling reservoir construction is not a practicable or realistic alternative.

3.3 REQUESTED VARIANCE

3.3.1 SECTION 16C-16.0051(1)(b)

A variance is requested from Section 16C-16.0051(1)(b) because there is no practicable alternative. Water balance and hydrologic modeling have demonstrated that a discharge will be required for rainfall events greater than the 10-year, 24-hour storm. For the operation of the cooling reservoir and associated facilities, this discharge must be released through a properly designed discharge structure to allow accurate measurement of discharge quantities. The proposed fixed weir and swale is the only practicable discharge structure.

3.3.2 SECTION 16C-16.0051(5)(a) and (b)

There is no practicable means known or available to comply with Section 16C-16.0005(5)(a) and (b), F.A.C. in designing the cooling reservoir. The cooling reservoir location is dictated by the power plant location, the Payne Creek floodplain boundaries, the location of preserved wetlands, and the sand tailing disposal area requirements. The size of the cooling reservoir is dictated by the thermal efficiency requirements for the 660-MW power plant. If the 25/20 percent criteria were met, only 137.6 ha (340 acres) of effective cooling area would be available, compared to the 231 ha (570 acres) of effective thermal cooling area required for the 660-MW plant.

4.0 PROVIDE THE FACTS IN SUPPORT OF THE PERIOD OF TIME FOR WHICH THE VARIANCE IS SOUGHT

A perpetual variance from Section 16C-16.0051(1)(b) and Section 16C-16.0051(5)(a) and (b) is sought.

5.0 PROVIDE THE REQUIREMENTS WHICH CAN BE MET BY THE OPERATOR, INCLUDING THE DATE OR TIME WHEN THE REQUIREMENTS CAN BE MET

The following reclamation and restoration standards can be met on the operational date of the Hardee Power Station (1993).

Section 16C-16.0051--Reclamation and Restoration Standards

- Section 16C-16.0051(2) Backfilling and containing
- Section 16C-16.0051(3) Soil zone
- Section 16C-16.0051(4) Wetland restoration
- Section 16C-16.0051(5) Water quality
- Section 16C-16.0051(6) Flooding and drainage
- Section 16C-16.0051(7) Waste disposal
- Section 16C-16.0051(8) Revegetation
- Section 16C-16.0051(9) Wildlife
- Section 16C-16.0051(10) Time schedule

Section 16C-16.0051(5)(a) and (b) can be partially met. Section 16C-16.0051(5)(a), F.A.C. requires that at least 25 percent of the high water surface area of each water body consists of an annual zone of water fluctuation to encourage emergent and transition zone vegetation. The proposed cooling reservoir design will have an annual zone of water fluctuation of 12 ha (29.7 acres); this is 5.2 percent of the total area.

Section 16C-16.0051(5)(b), F.A.C. requires that at least 20 percent of the low surface water shall consist of a zone between the annual low water line and 1.8 m (6 ft) below the annual low water line to provide fish bedding areas and submerged vegetation zones. The proposed cooling reservoir design will consist of 6.9 ha (17.1 acres) of low surface water area which can be used for fish bedding areas and submerged vegetation zones. This is 3.2 percent of the total low surface water area.

These percentages will be met on completion of the reservoir and are described in detail in Section 6.0.

6.0 PROVIDE THE MEASURES OR STEPS THE OPERATOR IS TAKING OR HAS TAKEN TO MEET THE REQUIREMENTS OF THE STATUTE OR RULE FROM WHICH THE VARIANCE IS SOUGHT

The design of the proposed cooling reservoir alternative is presented and evaluated in the SCA/EA. The location and design of the proposed cooling reservoir is also depicted in Figure 3-2 and Appendix B The proposed reservoir will be constructed on land that has been mined for phosphate by Agrico and is a part of their reclamation program.

The cooling reservoir design will meet all the FDNR reclamation requirements with the exception of three requirements. Two of these reclamation requirements will be partially met by changes in the cooling reservoir design. As discussed in the following paragraphs the proposed open-water cooling reservoir design takes into account the intent of the FDNR phosphate mine reclamation requirement (Section 16C-16, F.A.C.) especially Section 16C-16.0051, F.A.C., and will generally meet the engineering requirements in the following manner:

1. The size and shape of the reservoir was arranged to utilize the entire mined land area available to the applicant and still maintain the surface area necessary for heat dissipation. This modification allowed for:
   a. Minimum interior slopes of at least 4:1, thereby creating zones for vegetation growth,
   b. A reservoir perimeter of more than 9,445 m (31,000 ft) versus 6,065 m (19,900 ft) from an ideal rectangular configuration thereby creating 18.9 ha (46.8 acres) of additional littoral zone, and
   c. Creating an additional transitional shelf 31 m (100 ft) wide transitional shelves along 33 percent of the reservoir perimeter.
2. The exterior slopes are either at grade or have a minimum slope of 20:1 to avoid the construction of discernable dams or berms.

3. A minimum access center divider dike with a 38.4 m (126 ft) width was designed to create a shoreline of approximately 3,337 m (11,000 ft), upland habitat acres, littoral zones, and additional transition shelves.

The area and shape of the reservoir were arranged to utilize the maximum amount of mined land area available to the applicant, to meet engineering requirements outlined in Section 3.1.2, and to comply to the maximum extent practicable with the FDNR reclamation requirements. The reservoir will be approximately 231 ha (570 acres) in area and it will be located north and adjacent to the power plant and out of the Payne Creek floodplain. The average cooling reservoir water depth will be greater than 3.1 m (10 ft).

A transitional vegetation zone shelf, varying in width from 31 to 40 m (100 to 130 ft), was added to provide additional littoral zone areas along the northern and eastern portions of the reservoir. This shelf will be constructed at the reservoir mean low water elevation of 37.2 m (122 ft) above mean sea level (MSL) and will provide 8.6 ha (21.1 acres) of transition zone.

The width of the center divider dike was expanded to a total of 38.4 m (126 ft) to create additional shoreline of approximately 3,337 m (11,000 ft). The dike will provide slopes of at least 4:1, thereby creating additional zones for vegetation growth. In addition, a transitional zone shelf 3.1 m (10 ft) wide will facilitate additional littoral zone growth on both sides of the divider dikes. The shelf will be constructed at the reservoir mean low water elevation of 37.2 m (122 ft) MSL and will provide 1.8 ha (4.4 acres) of transitional zone. Therefore, this center divider dike system will support upland habitat acreage, littoral zones, and additional transitional shelves.

Vegetation zones will consist of uplands, a littoral zone, and a submerged zone. The uplands along the divider dike and around the perimeter of the cooling reservoir will be reclaimed to grasslands, with an emphasis placed

on those species which are important for wildlife food and cover. Two wetland zones will be created. The littoral zone, which encompasses the annual zone of water fluctuation, will provide a variety of habitat types by including both transitional and emergent plant species. The second wetland zone will consist of the submerged vegetation zone and encompasses a region between the annual low water line and 1.8 m (6 ft) below the annual low water line. The 4:1 slope along both the reservoir perimeter and center dike will allow the establishment of littoral and submerged vegetation zones along both sections of the cooling reservoir. The uplands vegetation zone, consisting of mixed native grasses, will be established along the upper perimeter of the reservoir and along the top of the center dike.

Given these design features, the proposed open water cooling reservoir design provides an area of approximately 12 ha (29.7 acres) between the mean high water and mean low water elevations. This is 5.2 percent of the total mean high water area. These areas will provide for emergent/wetlands vegetation, habitat areas, and wetlands related water quality functions.

Establishing emergent and transitional vegetation along the edge of the water cooling reservoir between the mean high water and mean low water elevations accomplishes several beneficial goals. First, the wetland and upland vegetation provides habitat for various birds, fish, reptiles, mammals, and amphibians; plants such as salt-bush and woolgrass (Scirpus cyperinus) provide protective cover, whereas plants such as sedges, pennywort, and rushes produce seeds which are an important animal food source. Second, vegetation establishment along the shoreline binds and stabilizes substrates and thus minimizes erosion potential. Third, shoreline vegetation can improve the water quality by removing nutrients, sediments, etc. from the water.

The proposed open water cooling reservoir design provides an area of approximately 6.9 ha (17.1 acres) between the mean low water elevation and 1.8 m (6 ft) below the mean low water elevation. This represents

3.2 percent of the total mean low water surface area. These areas will provide fish bedding areas and submerged vegetation zones.

7.0 DISCUSS THE SOCIAL, ECONOMIC, AND ENVIRONMENTAL IMPACTS ON THE OPERATOR AND RESIDENTS OF THE AREA AND THE STATE, IF THE VARIANCE IS GRANTED AND IF THE VARIANCE IS DENIED

7.1 IMPACTS IF VARIANCE GRANTED

Granting the variances will allow for the construction of a cooling system that is the most economical and efficient and causes the least amount of environmental impact to the area and the state. No negative social, economic, or environmental impacts to the residents of the area and state will occur if the variance is granted; in fact, granting the variance will benefit the residents of the area and state.

Overall, the primary benefit to be derived from the Hardee Power Station project is the provision of a new, clean, reliable source of low-cost energy to the public served by the Applicants. In addition to the provision of energy, the proposed project will provide jobs, tax revenues, and a productive use for the site after mining. As discussed in Section 3.2.3, granting the variance could save the public more than $10 million.

The environmental consequences of not completely meeting Section 16C-16.0051(5), F.A.C. are minimal. There will be no significant adverse environmental effects associated with the proposed cooling reservoir (see SCA/EA, Sections 5.1 and 5.8) and there will be no net loss to the environmental resources of the area (Section 16C-16.0053, F.A.C.), including endangered and threatened species and their habitats, surface water drainage patterns and water quality, and uplands. In fact, in addition to the 83 ha (206 acres) of wetland restored by Agrico in its reclamation plan, an additional 19 ha (47 acres) of wetlands will be created as part of the cooling reservoir design.

The volume of water that enters Payne Creek by subsurface seepage from the cooling reservoir will be equivalent to the volume of water that the creek received from tributaries and stormwater runoff before the site was mined.

However, instead of receiving water in pulses during rainfall events, there will be a steady stabilized flow to the floodplain.

Currently, the flatwoods vegetation of the floodplain is being overgrown by a maturing hardwood canopy due to lack of fire. Steady seepage with no long intervening drought periods will enhance the invasion of hardwood wetland forest into what is now a flatwoods community.

A large off-site wetland adjacent to the northwest corner of the site will be slightly wetter than it is currently due to seepage from the cooling reservoir. Historically, this wetland probably received more water before the surrounding uplands were mined than it does now. The seepage from the cooling reservoir is seen as a positive benefit to this wetland.

The currently proposed reclamation plan for the site without the cooling reservoir shows the proposed reclaimed land uses to be lake, grassland and pastureland, coniferous and upland mixed forest, wetland forested mixed, and vegetated nonforested wetland. The cooling reservoir will result in the replacement of cropland and pastureland, upland coniferous forest, and upland mixed forest with open water. Table 7-1 compares the different existing approved reclamation plan land uses with the proposed revised reclamation plan land uses. If granted, the proposed cooling reservoir with the revised reclamation plan will result in a 180-ha (445-acre) increase in open water, 22-ha (55-acre) increase in wetlands, 168-ha (415-acre) decrease in pasture, and 30-ha (73-acre) decrease in upland forest.

7.2 IMPACTS IF VARIANCE DENIED

If the variance is denied, the Applicants would be forced to use one of the cooling tower alternatives (described in this report) at a significantly higher construction and operational cost penalty, as compared with the proposed cooling reservoir. This significantly higher cost penalty would be reflected in the cost of the electricity generated by this facility.

Table 7-1. Area Differences in Land Use Classification Between the Proposed Revised Reclamation Plan With Cooling Reservoir and the Existing Approved Reclamation Plan Without the Cooling Reservoir

Land Use and Cover	Reclamation Plan Area [ha (acre)] Proposed Revised[a]	Existing Approved[b]	Change in Area
210 - Cropland/pastureland	190 (470)	358 (885)	-168 (-415)
310 - Grassland	42 (104)	24 (60)	+18 (+44)
320 - Shrubs/brushland	3.6 (9)	3.6 (9)	0 (0)
410 - Upland coniferous forest	58 (143)	42 (104)	+16 (+39)
430 - Upland mixed forest	28 (68)	73 (180)	-45 (-112)
520 - Lakes	231 (570)	51 (125)	+180 (+445)
630 - Wetland forested mixed	30 (73)	24 (60)	+6 (+13)
640 - Vegetated nonforested wetlands	19 (47)	2 (5)	+17 (+42)

[a]With the approximately 231-ha (570-acre) cooling reservoir.
[b]Without a cooling reservoir.

Compared to the proposed cooling reservoir, the smaller reservoir with helper towers would have the following social, economic, and environmental impacts:

1. Increase the cost of the cooling system more than 50 percent ($10 million to 12 million).
2. Require a 16-percent increase in total groundwater withdrawal, for additional cooling system makeup,
3. May require more frequent discharge to Payne Creek and greater water quality impacts, and
4. Require additional mixing zones for iron and lead and up to 20 percent longer mixing zones for other parameters.

7.3 CONCLUSION

Section 378.212(2), FS, provides that variances to FDNR reclamation rules shall be considered based on the particular facts and circumstances surrounding each individual request. In this case, the variance would be issued by the Governor and Cabinet either sitting as the head of FDNR, or sitting as the Siting Board. The fundamental legislative criteria for siting decisions are that there be a reasonable balance between the need for the facility and the environmental impact of the facility on resources of the state, and that abundant, low-cost electrical energy be provided. In addition, Section 378.212(1)(c), FS, envisions that a variance in FDNR reclamation rules may be granted, in appropriate cases, in order to avoid economic penalties.

One of the primary advantages of the Hardee Power Station is its beneficial reuse of mined lands for a cooling reservoir that will minimize water consumption demands and avoid the major expense associated with a mechanical cooling tower. Although site constraints, engineering needs, and costs preclude the construction of a cooling system that will comply with all of the normal FDNR reclamation criteria, the cooling reservoir proposed will provide a net increase in lake and wetlands areas over current reclamation plans of Agrico. It is the best and only practicable

cooling alternative that reasonably balances the need for power with the broad interests of the public.

APPENDIX A

FLORIDA DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RESOURCE MANAGEMENT
BUREAU OF MINE RECLAMATION
VARIANCE APPLICATION

Form No. 7

FLORIDA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RESOURCE MANAGEMENT
BUREAU OF MINE RECLAMATION
2051 EAST DIRAC DRIVE
TALLAHASSEE, FLORIDA 32304-7795

DNR Use Only
File No.
Approved
BMR Code

VARIANCE APPLICATION

PART I. GENERAL INFORMATION

1. Operator
   a. Name: Agrico Chemical Company
   b. Mine: Payne Creek Mine

2. Applicant (Authorized Agent)
   a. Name: Mike Opalinski
   b. Title/Position: Manager of Environmental Affairs
   c. Business Address: 16313 N. Dale Mabry Highway
   d. Mailing Address: P.O. Box 27200
   e. City, State & Zip: Tampa, FL 33688-2000
   f. Telephone Number: 813/963-0994

3. Person to Contact Regarding Contents of Application
   a. Name: Mike Opalinski
   b. Title/Position: Manager of Environmental Affairs
   c. Telephone Number: 813/963-0994

PART II. DESCRIPTION OF VARIANCE

1. Statute or Rule from Which a Variance is Requested
   Section 16C-16.0051(1)(b) and (5)(a) and (b) (chapter, section, etc.)

2. Reason(s) for Variance (check one or more)
   X There is no practicable means known or available to comply.
   ___ Compliance will necessitate the taking of measures which must be spread over a considerable period of time.
   X It will relieve or prevent hardship, including economic hardship, of a kind other than the two reasons above.
   ___ It will accommodate specific phosphate mining, processing, or chemical plant uses that otherwise would be inconsistent with the requirements of Chapter 378, Part III, F.S.
   ___ A variance will provide for an experimental technique that would advance the knowledge of reclamation and restoration methods.

3. Duration of Variance: From Date of certification to Life of the site

PART III. See additional attached pages.

Date Submitted

Signature of Applicant

Signature of Coapplicant*

*This application is filed in connection with the Site Certification Application PA 89-25 by TECO Power Services, Tampa Electric Company and Seminole Electric Cooperative Incorporated. Agrico Chemical Company concurs that the variance should be granted.

APPENDIX B

COOLING RESERVOIR (PROPOSED)

OVERSIZE DOCUMENT WAS REMOVED AND INSERTED INTO OCULUS SEPARATELY.

APPENDIX C

COOLING RESERVOIR (REDUCED)

OVERSIZE DOCUMENT WAS REMOVED AND INSERTED INTO OCULUS SEPARATELY.

APPENDIX D

COOLING RESERVOIR (SERPENTINE)

OVERSIZE DOCUMENT WAS REMOVED AND INSERTED INTO OCULUS SEPARATELY.

11.11 AGRICO CHEMICAL COMPANY RECLAMATION PROGRAM APPLICATION

FLORIDA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RESOURCE MANAGEMENT
BUREAU OF MINE RECLAMATION
2051 EAST DIRAC DRIVE
TALLAHASSEE, FLORIDA 32304-7795

RECLAMATION PROGRAM APPLICATION

DNR Use Only
File No. _____
Approved _____
BMR Code _____

PART I. GENERAL INFORMATION

1. Operator
   a. Name: Agrico Chemical Company
   b. Mine: Payne Creek
   c. Business Address: P. O. Box 1110
   d. Mailing Address: Same
   e. City, State & ZIP: Mulberry, FL 33860
   f. Telephone Number: 813 / 428 - 1431

2. Applicant (Authorized Agent)
   a. Name: Mr. Selwyn L. Presnell S L Presnell
   b. Title/Position: Environmental Manager
   c. Business Address: P. O. Box 1110
   d. Mailing Address: Same
   e. City, State & ZIP: Mulberry, FL 33860
   f. Telephone Number: 813 / 428 - 1431

3. Person to Contact Regarding Contents of Application
   a. Name: Mr. George A. Weinman
   b. Title/Position: Superintendent of Reclamation
   c. Business Address: P. O. Box 1110
   d. Mailing Address: Same
   e. City, State & ZIP: Mulberry, FL 33860
   f. Telephone Number: 813 / 428 - 1431

PART II. APPLICATION SUMMARY
(Provide the following information for the program application area.)

1. Location:

	County	Township		Range		Sections
a.	Polk	32	N S	23	E W	25, 26, 35 & 36
b.			N S	24	E W	30 & 31
c.	Hardee	33	N S	23	E W	1 & 2
d.			N S		E W	

2. Mining Operations Acreages:

a.	Mined before 7/1/75	---
b.	Mined from 6/30/75 to present	820
c.	To be mined	149
d.	Disturbed before 7/1/75	---
e.	Disturbed from 6/30/75 to present	40
f.	To be disturbed	20
g.	To remain undisturbed	157

3. Estimated Quantities Considered in Planning Program Reclamation:
   a. Dry tons of clay to dispose of _____
   b. Dry tons of sand tailings to dispose of _____
   c. Dry tons of other waste to dispose of _____

4. If the program application contains a waste disposal site, provide the following:

   Waste Disposal Designation (site code)_____

Disposal area acres	Dam Height Above Grade: Minimum	Maximum	Cap type	Cap thickness

Infill rate	% Solids infill	Immediate % solids	Average Storage Depth	Storage Acre-feet

5. Postreclamation Program Acreage:

a. Uplands	547		
b. Nonforested		508	
c. Forested		39	
d. Coniferous			
e. Hardwood			
f. Mixed			39
g. Water bodies	613		
h. Fluctuating zone		26	
i. Forested			
j. Herbaceous			26
k. Low water area		587	
l. Shallow zone			
m. Deep zone			
n. Streams			
o. Wetlands	26		
p. Forested		23	
q. Herbaceous		3	
k. Total	1,186		

QUESTION:

PART III. OWNERSHIP, LEASES, AND PERMITS.

1. List the names and addresses of all persons having fee simple or lessee estate in the application area.

RESPONSE:

Agrico Chemical Company
P. O. Box 1110
Mulberry, FL 33860

QUESTION:

2. Has the State of Florida, if not included in item 1 above, claimed ownership of any area within the application area? If yes, discuss.

RESPONSE:

No.

QUESTION:

3. If any part of the application area is subject to DRI-ADA approval under section 380.06, Florida Statutes, provide the status of the approval process, including approval dates and the approving agencies when known.

RESPONSE:

This application area is not subject to DRI-ADA approval relative to mining. A power plant siting certification application has been submitted to the Florida Department of Environmental Regulation, Power Plant Siting Department, for Seminole Electric Cooperative/TECO Power Services, Hardee Power Project.

QUESTION:

4. Identify those areas where a jurisdictional determination has been completed and is subject to Department of Environmental Regulation jurisdiction. Provide a copy of each permit obtained.

RESPONSE:

An application to mine 34.6 acres of wetlands over which DER claims jurisdiction (file No. 251224079) was approved June 27, 1986, application file No. 531120329 to mine 63.1 additional acres of wetlands over which DER also claims jurisdiction is pending.

QUESTION:

5. List all other permits related to reclamation activities that have been obtained or are known to be needed for the application area. Provide the identification number (if applicable), type, agency filed with or to be filed with, and status of each permit.

RESPONSE:

Permit	Agency	Status
Polk County Operating Permit	Polk County	Issued.
Dredge and Fill Permit	U.S. Army C.O.E.	Issued Permit No. 87IPB-20211

QUESTION:

PART IV. DESCRIPTION OF APPLICATION AREA.

Describe the application area in a list format. Headings for the list shall be township, range, section, quarter section, and quarter-quarter section. Include the acreage for each partial quarter-quarter section.

RESPONSE:

Township	Range	Section	Quarter Section	Quarter-Quarter Section	Acres
32S	23E	25	SW	SW-1/4	2
32S	23E	25	SW	SE-1/4	2
32S	23E	35	NE	NW-1/4	4
32S	23E	35	NE	NE-1/4	30
32S	23E	35	NE	SW-1/4	23
32S	23E	35	NE	SE-1/4	40
32S	23E	35	SE	NW-1/4	24
32S	23E	35	SE	NE-1/4	40
32S	23E	35	SE	SW-1/4	11
32S	23E	35	SE	SE-1/4	40
32S	23E	36	NE	NW-1/4	7
32S	23E	36	NE	SW-1/4	6
32S	23E	36	NW	NW-1/4	40
32S	23E	36	NW	NE-1/4	40
32S	23E	36	NW	SW-1/4	40
32S	23E	36	NW	SE-1/4	40

Township	Range	Section	Quarter Section	Quarter-Quarter Section	Acres
32S	23E	36	SW	NW-1/4	40
32S	23E	36	SW	SW-1/4	40
32S	23E	36	SW	SE-1/4	40
32S	23E	36	SW	NE-1/4	40
32S	23E	36	SE	NW-1/4	6
32S	23E	36	SE	SW-1/4	5
32S	23E	36	SE	SE-1/4	11
32S	24E	31	SW	SW-1/4	12
32S	24E	31	SW	SE-1/4	15
33S	23E	1	NW	NW-1/4	42
33S	23E	1	NW	SW-1/4	42
33S	23E	1	NW	NE-1/4	40
33S	23E	1	NW	SE-1/4	42
33S	23E	1	NE	NW-1/4	42
33S	23E	1	NE	SW-1/4	42
33S	23E	1	NE	SE-1/4	42
33S	23E	1	NE	NE-1/4	42
33S	23E	1	SE	NW-1/4	42
33S	23E	1	SE	SW-1/4	29
33S	23E	1	SE	SE-1/4	42
33S	23E	1	SE	NE-1/4	42
33S	23E	1	SW	NE-1/4	25
33S	23E	1	SW	SE-1/4	6
33S	23E	1	SW	NW-1/4	7
33S	23E	2	NE	NE-1/4	36
33S	23E	2	NE	SE-1/4	25

QUESTION:

PART V. RECLAMATION PROGRAM

Respond to the items below by providing enough detailed information to evaluate compliance with the standards in section 16C-16.0051 and 16C-16.0053, F.A.C., and the approved conceptual plan.

1. Discuss site cleanup and remaining structure.

RESPONSE:

All items associated with the mining operation will be removed. No structures will be constructed under this program application. A NPDES permitted discharge point will be constructed by the future property owner under separate permit.

QUESTION:

2. Discuss the nature of all backfill material, the proposed landforms, and the proposed land uses.

RESPONSE:

All backfill material will consist of on-site overburden. One lake will be constructed as indicated on the attached pages and drawings. The lake will overflow through a grassland area to the floodplain of the Alafia River. The land-use proportions in the program area compared to pre-mining conditions and approved conceptual plan are listed below.

FLUCCS dated 4/76	Pre-Mining Land Use Acres	Post-Reclamation Land Use Acres
210	644	333
230	41	
310	3	112
320	37	
340	50	
410	89	
430	226	39
520		587
620		
630	44	23
640	45	29
	1,179	1,186

QUESTION:

3. Discuss the topsoils existing prior to mining and the topsoils that will exist after reclamation.

RESPONSE:

Myakka - Pomello - Basinger Soil Association

Nearly level to gently sloping, poorly and moderately well-drained sandy soils with weakly cemented sandy subsoil and poorly drained soils sandy throughout, not subject to flooding.

Myakka fine sand - Poorly drained sandy soils on coastal flatwoods. Surface layer of black sand about six inches thick, subsurface layer of white sand about 14 inches thick. Subsoil reddish brown and dark brown to dark grayish brown sand, 56 to 80 or more inches thick. Slopes range from 0 to 2 percent.

Pomello - Moderately well drained sandy soils occurring in low ridges. Surface layer of gray fine sand about four inches thick with a white subsurface layer about 38 inches thick. Subsoils of dark reddish brown nearly cemented fine sand approximately 12 inches thick. Below a 54-inch depth is a brown to light gray fine sand. Slopes are 0 to 5 percent.

Basinger - A series of poorly drained deep sandy soils that occur in brown sloughs, poorly defined drainage ways and depressions. Surface layer thin and very dark gray with a light gray fine sand subsurface layer. Brown and light brownish gray subsoil between 18 and 36 inches with a light colored fine sand extending to a depth of 60 inches. Slopes are less than 2 percent.

Also present is the Basinger - Pompano - Swamp Association. Nearly level poorly drained soils sandy throughout and very poorly drained soils subject to prolonged flooding.

Pompano - Poorly drained nearly level soils in south and central Florida. In a representative profile, the surface layer is dark gray fine sand in the upper five inches and grayish brown fine sand in the next nine inches. Between depths of 16 to 30 inches is very pale brown fine sand. Below this to depths of 75 inches or more is fine sand. Slopes range from 0 to 2 percent.

The source of soils information for the area to be mined during the application period was the General Soil Map for Polk County, Florida published by the U.S.D.A. Soil Conservation Service. Detailed soils mapping within the application areas is not available at this time. Soil types were not field checked.

QUESTION:

4. Discuss the acreage and type of each wetland to be established and how this information compares with the approved conceptual plan.

RESPONSE:

Reclamation plans for this program provide for 26 acres of herbaceous wetlands in the lake fluctuation zone and 19 acres of forested wetlands near the southeasterly portion of the lake. Total wetland acreage after reclamation will be 52 acres. This will include 23 forested acres (of which four existing acres will remain unmined), and 29 acres of herbaceous wetlands (of which three existing acres will remain unmined). This varies from the Payne Creek conceptual plan for which a modification application is being submitted in conjunction with this program application.

QUESTION:

5. Discuss the design and location of all proposed wetlands and water bodies.

RESPONSE:

The pre-mining drainage in the program area is from north to south. The reclamation plan for the area will maintain the direction of drainage. The proposed lake and wetlands will be constructed by redistributing overburden to achieve design elevations as shown on attached drawings. Marsh soil from other locations on Agrico's property will be utilized to inoculate the wetland sites with seeds and roots of wetland plants.

The forested wetlands will be planted with at least three indigenous species after the site is inoculated with marsh soil. Tree planting will be spaced approximately 10'x10'. At the end of one growing season, at least 200 trees per acre will be established on all areas planted with wetland trees.

The herbaceous wetland area will be inoculated with marsh soil from various locations on Agrico's property. Also, wetland plants common to the area will be planted to augment the natural seeding which will occur on the site.

QUESTION:

6. Discuss what methods will be used to determine that all applicable water quality standards will be met.

RESPONSE:

All process water (water utilized in the processing of the phosphate resource) must pass through a permitted discharge point before leaving Agrico's property. Non-process water (area runoff) is not regulated by Chapter 17-3, F.A.C. The permitted discharge point for this mine is located in SE-1/4, Section 27, Township 32 South, Range 24 East. The NPDES permit number is FL0000353.

All water monitoring data from this discharge point is provided to DER and EPA (Region IV) and must meet permit requirements.

QUESTION:

7. Discuss how the original drainage patterns will be restored and what reasonable steps will be taken to eliminate the risk of flooding on lands not controlled by the operator when reclamation activities are complete.

RESPONSE:

Ditches around the perimeter of the operations intercept runoff which might cause siltation on lands not controlled by Agrico. The ditches are connected to the water recirculation system. Proper spoiling procedures and observing proper setback from property lines when mining also help eliminate the risk of offsite flooding.

Original drainage patterns from north to south will slightly differ from post-reclamation north to south drainage due to DER jurisdictional wetland mitigation and proposed lake construction.

Agrico submitted a surface water model to SWFWMD for the entire Payne Creek Mine site. This model is being reviewed in compliance with Chapter 40D-4. The model will be updated as appropriate.

QUESTION:

8. Discuss the disposal of waste clays, sand tailings, and other material within the application area.

RESPONSE:

Waste clay disposal is not planned within the program area. Sand tailings however will be pumped to backfill part of the area with sufficient material to provide post-reclamation elevations. All sand tailings will be capped with at least 12 inches of overburden and revegetation. Please see attached drawings.

QUESTION:

9. Discuss the plan for revegetating the application area.

RESPONSE:

A probable seed mixture for the upland areas to be grassed is as follows:

Bahia Grass	20 lbs./acre
Bermuda Grass	8 lbs./acre
Millet (if seeded in warm season)	20 lbs./acre
Rye (if seeded in cool season)	60 lbs./acre

The species have proven effective in controlling erosion and offering multiple land use possibilities. The seeding procedures will be as follows:

1. Apply fertilizer to the site.
2. Disc heavily.
3. Apply seed.
4. Disc light or harrow.

Sixty three (63) acres around the lake perimeter will be planted with vegetation consisting of tree and shrub species indigenous to the area in addition to ground cover. This will be a greenbelt area.

Thirty-nine (39) acres will be planted as mixed upland forest. At least three indigenous species will be used. Nineteen (19) acres will be planted with wetland tree species. All tree plantings will be spaced no closer than 10'x10'. At the end of one growing season, at least 200 trees per acre will be established on all areas where trees are planted.

Marsh soil from various locations on Agrico's property will be utilized to inoculate wetland sites discussed in Part V-4 with seeds and plant parts of wetland plants. Marsh soil will not be applied as a layer but scattered lightly as inoculum.

Maintenance of vegetation will include fire protection for trees. The upland areas will be fertilized as necessary. Vegetation maintenance will be carried out as warranted by Agrico's land-use objectives, but will definitely continue until vegetation is well established.

Erosion control measures which may become necessary in the application area include earth structures and grass waterways.

QUESTION:

10. Discuss pre-mining wildlife values and what wildlife considerations have been included in the reclamation program.

RESPONSE:

The capacity for fish and wildlife values is expected to be improved after reclamation due to a diversified habitat. Habitat diversity will be enhanced by utilizing a variety of tree species on area to be reforested. Prompt revegetation of the land area after earth-moving operations will hasten wildlife utilization of the area. Special programs of reclamation for wildlife will not be necessary to provide excellent wildlife values after mining.

Wildlife Habitats (Acres)

	Pre-Mining	Post-Reclamation
Cropland and Pastureland	644	333
Citrus Grove	41	
Grassland	3	112
Shrubland and Brushland	37	
Mixed Rangeland	50	
Greenbelt		63
Coniferous Forest	89	
Mixed Forest	226	39
Lake		587
Wetland-Mixed Forest	44	23
Wetland-Vegetated Non-Forested	45	29

Endangered species of wildlife known or suspected to occur on Agrico property are: Red-cockaded woodpecker and wood stork.

Threatened species which are known or possible inhabitants of property belonging to Agrico are: Sherman's fox squirrel, Audubon's caracara, southeastern kestrel, Florida sandhill crane, southern bald eagle, osprey, American alligator, eastern indigo snake, gopher tortoise, and Florida gopher frog.

Suspected habitation of the area covered by this application by endangered or threatened species is based on the existence of suitable habitat within the application area.

The wood stork is the only endangered species known to be present in the area. Past experience has indicated that the population of this species greatly increase after mining due to the increase of suitable habitat.

Threatened species known to be present within the area are the Florida sandhill crane and the gopher tortoise.

Suitable habitat for the Florida sandhill crane will be increased after reclamation due to the proposed increase of shallow wetland habitat within the application area.

Revegetated, reclaimed lands with sandy soils should provide suitable habitat for the gopher tortoise.

QUESTION:

11. Discuss how the natural resources that will not be disturbed by mining operations will be protected.

RESPONSE:

Ditches around the perimeter of the operations intercept runoff which might cause siltation on lands not controlled by Agrico. The ditches are connected to the water recirculation system. Proper spoiling procedures and observing proper setback from property lines when mining also help eliminate the risk of offsite effects.

VI. VARIANCES

For each variance requested provide a completed variance application, Reclamation Form No. 7. If no variance is requested, state: No Variance Requested.

A completed variance application, Reclamation Form No. 7, is attached requesting a variance to 16C-16.0051(5)(a) and 16C-16.0051(5)(b).

VII. MAPS

Provide the following maps. Do not combine maps. Identify each map by number, title, operator's name, and mine name.

1. Location
2. Mined, Disturbed and Permit Areas
3. Post-Reclamation Topography and Drainage
4. Post-Reclamation Vegetation and Postreclamation Land Use
5. Waste Disposal
6. Cross Section Locations and Temporary Land Use Areas
7. Aerial Photograph

Please see attached drawings.

VIII. CROSS SECTIONS

Provide the following cross sections. Identify each cross section by number, title, operator's name, and mine name.

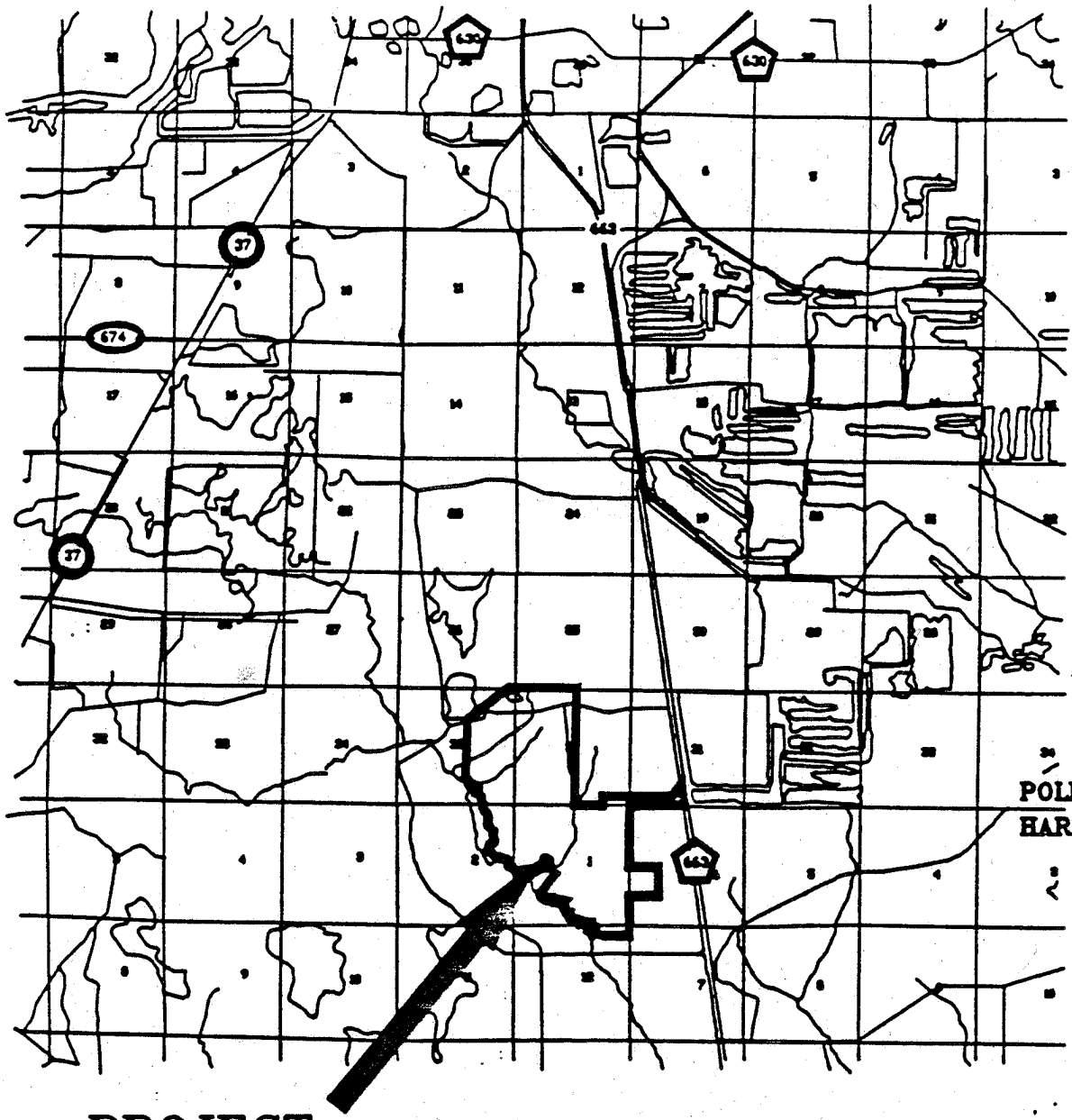
All cross sections shall be identified as A-A', B-B', C-C', etc., and shall be based on actual data or design.

Use the cross section endpoints in the title of each cross section, e.g., GEOLOGIC CROSS SECTIONS A-A', B-B', and C-C'.

1. GEOLOGIC CROSS SECTIONS
2. POSTRECLAMATION CROSS SECTIONS

   A. Upland
   B. Water Body
   C. Wetland

3. DRAINAGE CROSS SECTIONS



PROJECT LOCATION

- STATE PRIMARY HIGHWAY
- STATE SECONDARY HIGHWAY
- COUNTY HIGHWAY

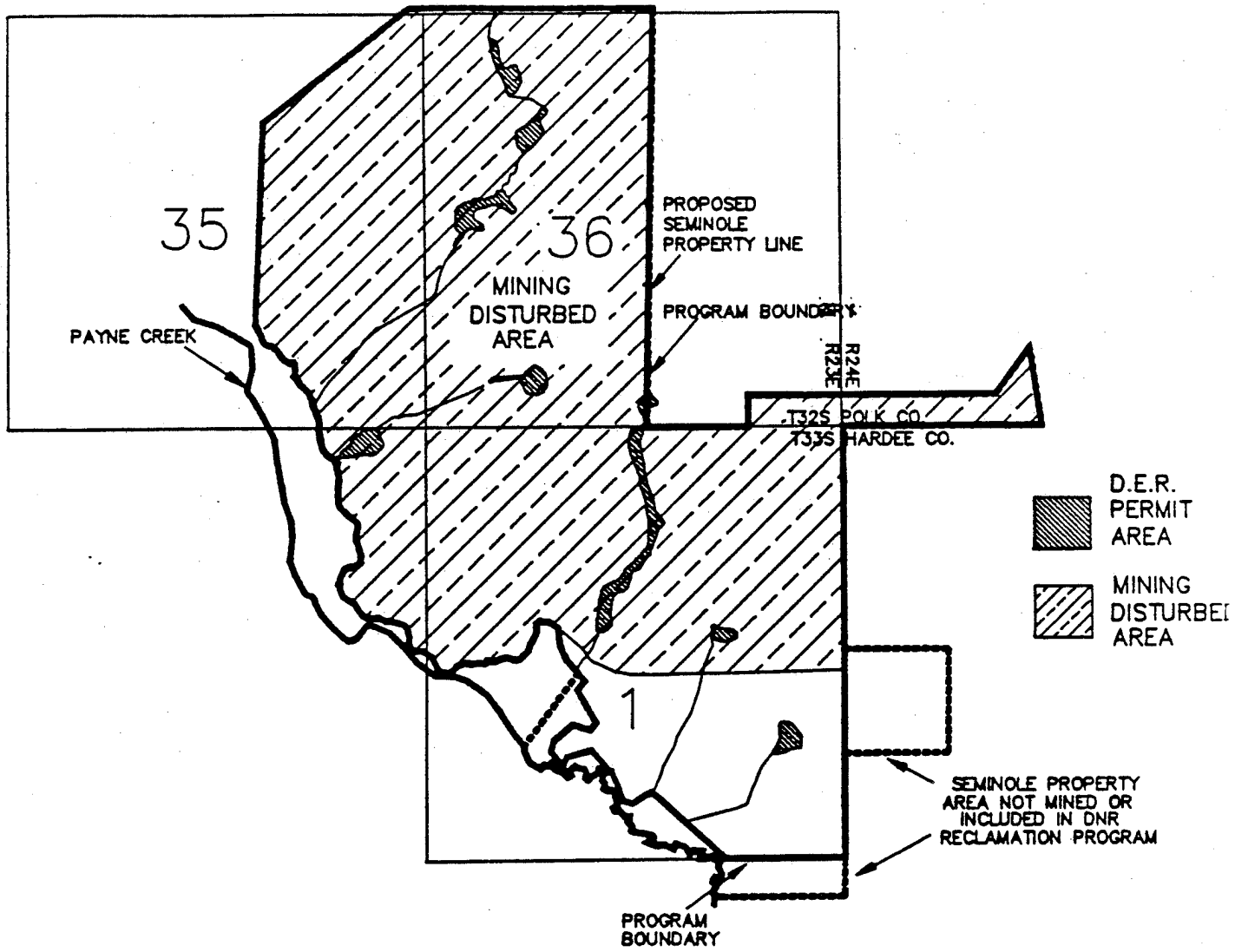
7500' 0' 7500'

AGRICO
Division of Freeport-McMoRan Resource Partners

PROPOSED AGR PC-PC-1
GENERAL LOCATION MAP
SEC.36 T32S,R23E
SEC.1 T33S,R23E

DATE 1/4/90
REV.

Rev. 3 03/30/90



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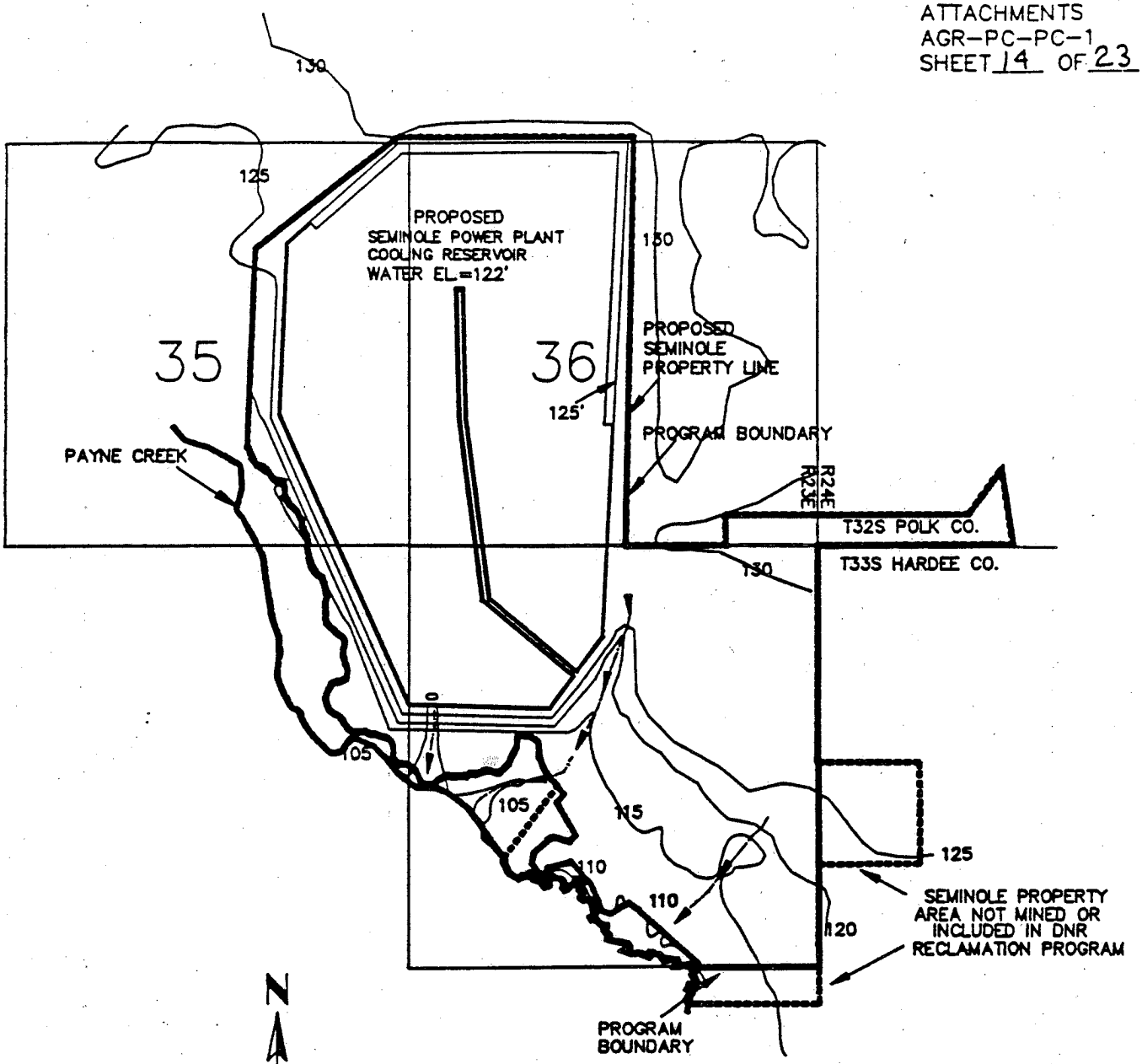
PROPOSED AGR PC-PC-1
MINED, DISTURBED AND PERMIT AREA
SEC.36 T32S,R23E
SEC.1 T33S,R23E

DATE 12/4/89
REV.

Rev. 3 03/30/90

ATTACHMENTS
AGR-PC-PC-1
SHEET 14 OF 23



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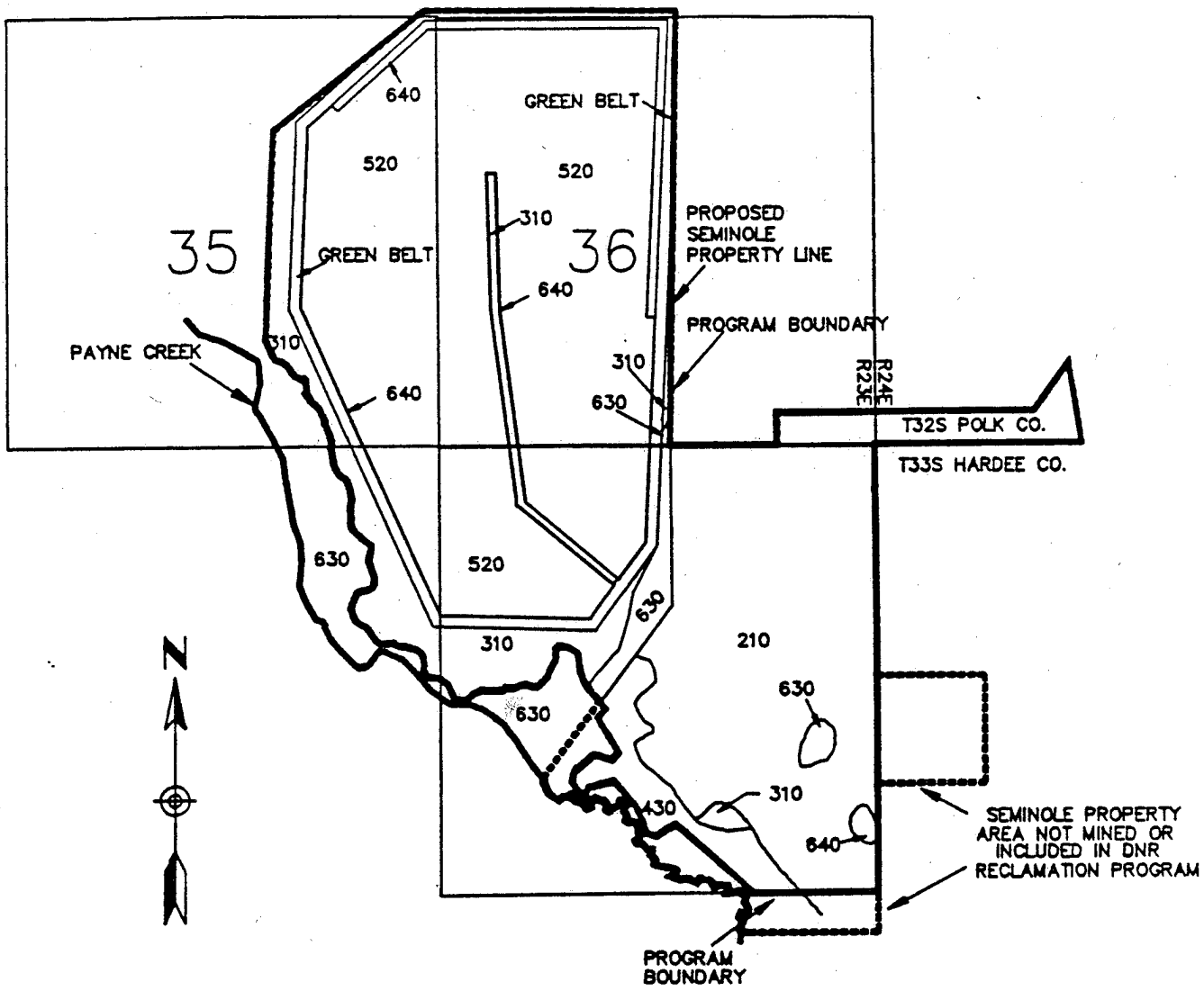
AGRICO
Division of Freeport-McMoRan Resource Partners

PROPOSED AGR PC-PC-1
POST RECLAMATION
TOPOGRAPHY & DRAINAGE
SEC.36 T32S,R23E
SEC.1 T33S,R23E

DATE 12/4/89
REV.

Rev. 3 03/30/90



LEGEND	
LAND USE & COVER TYPE	
210	CROP & PASTURE
310	GRASS
320	SHRUB & BRUSH
330	MIXED RANGE
410	CONIFEROUS FOREST
430	MIXED FOREST
520	LAKES
620	HARDWD FOREST WETLAND
630	MIXED FOREST WETLAND
640	NONFORESTED WETLAND

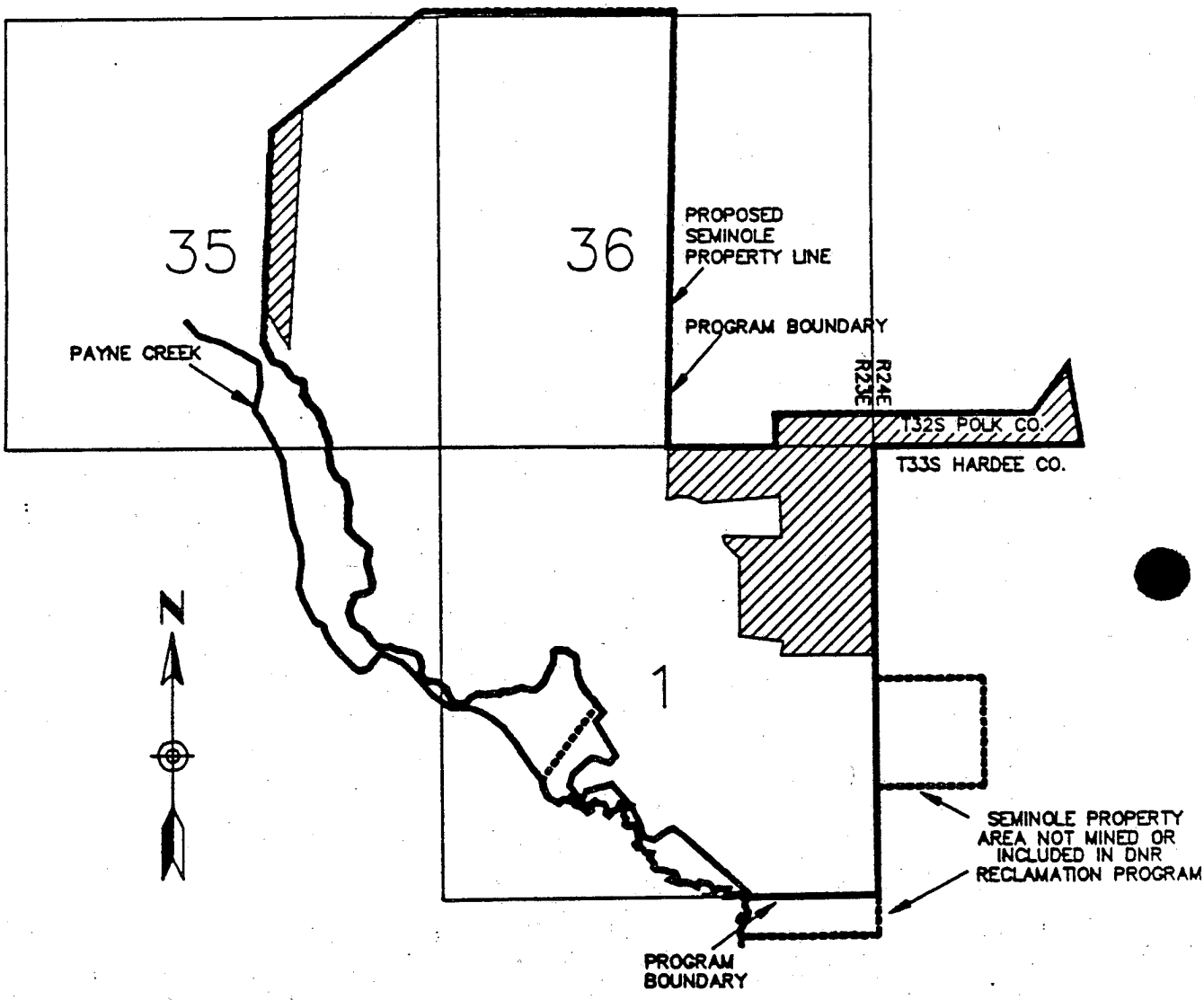
2000 0 2000

AGRICO
Division of Freeport-McMoRan Resource Partners

PROPOSED AGR PC-PC-1
POST RECLAMATION
VEGETATION & LAND USE
SEC.36 T32S,R23E
SEC.1 T33S,R23E

DATE 12/5/89
REV.
DWG.NO

Rev. 3 03/30/90



SAND TAILING AREAS

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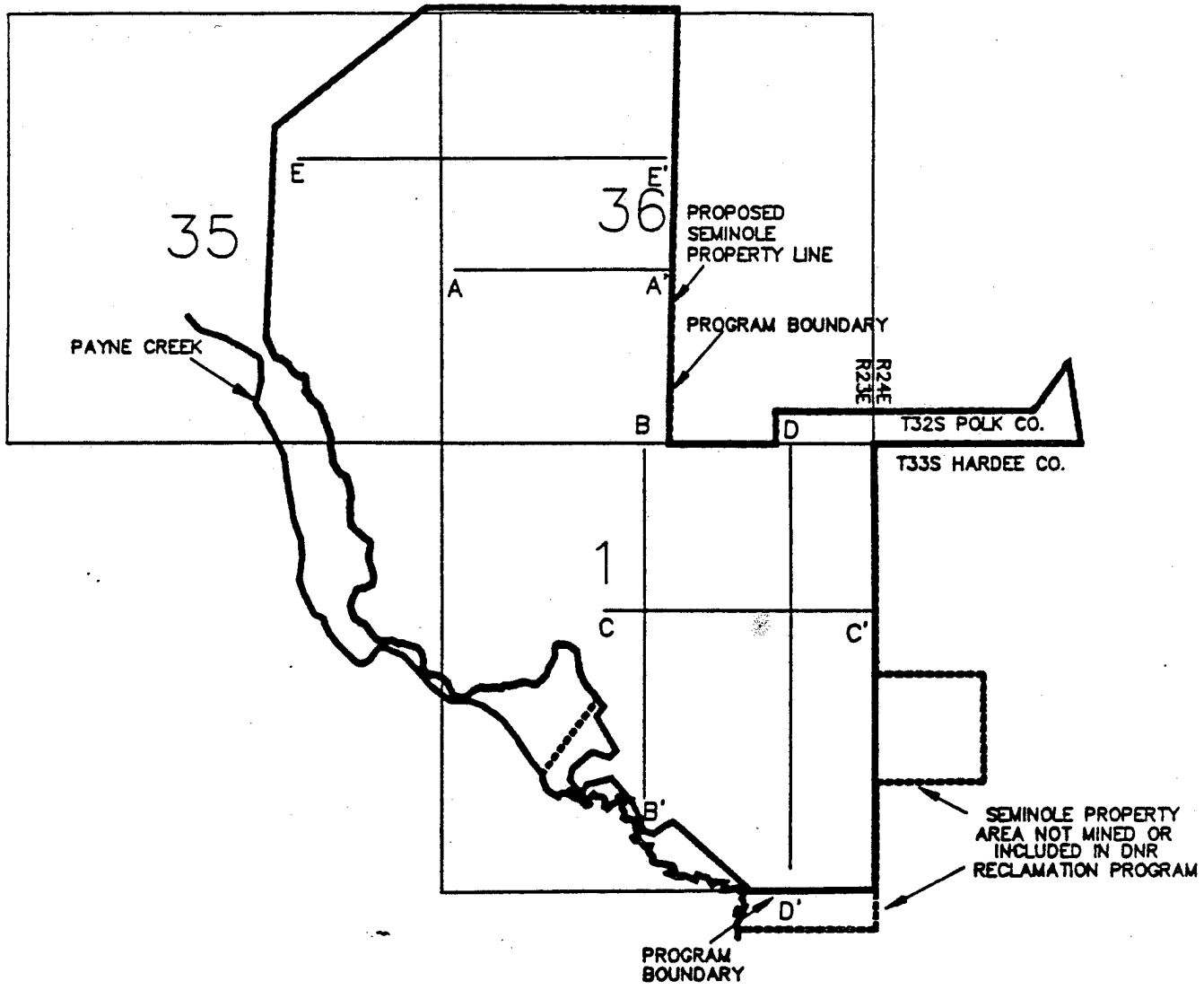
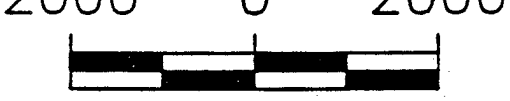
AGRICO
Division of Freeport-McMoRan Resource Partners

PROPOSED PC-PC-1
SAND TAILING
PLACEMENT SITES
SEC.36 T32S,R23E
SEC.1 T33S,R23E

DATE 12/7/89
REV.
DWG.NO

Rev. 3 03/30/90



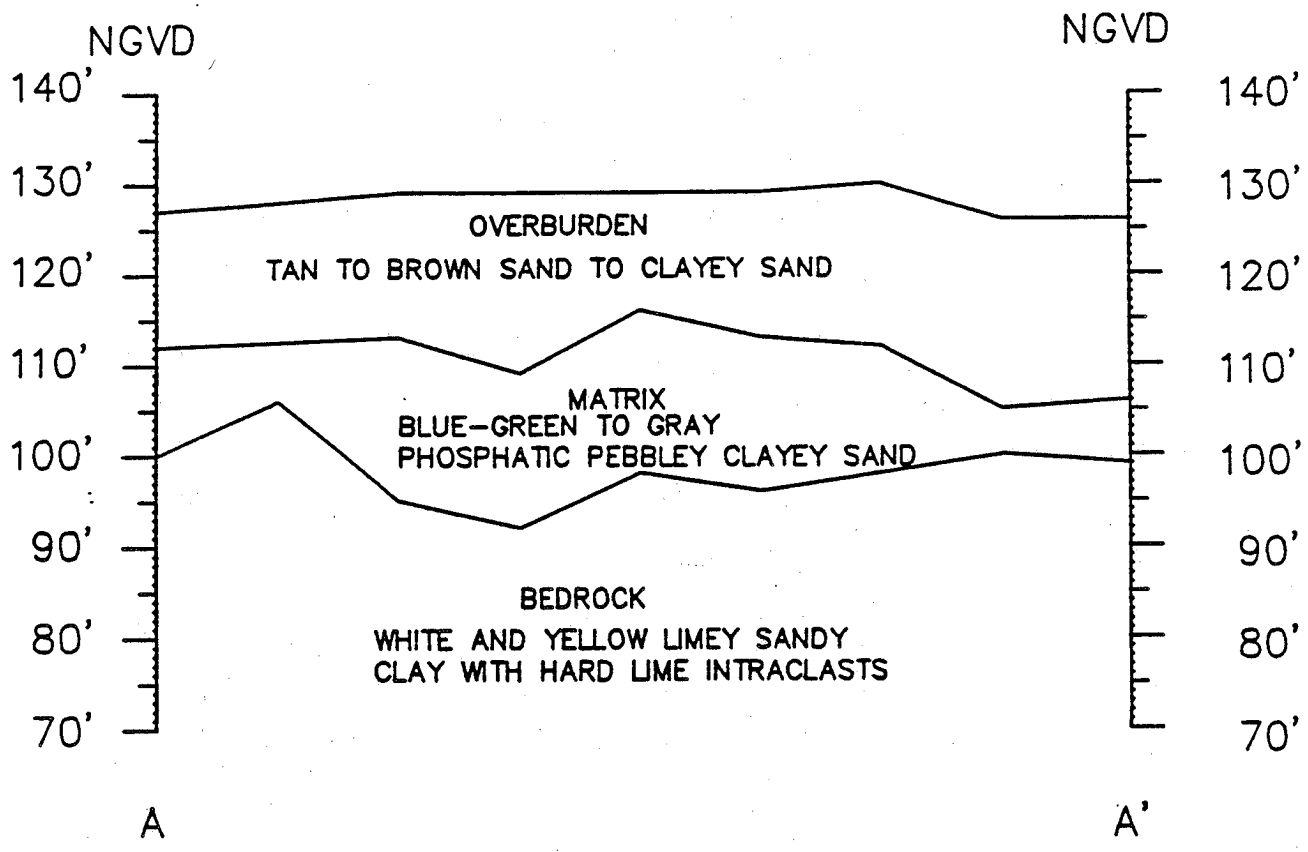


AGRICO
Division of Freeport-McMoRan Resource Partners

AGR PC-PC-1
CROSS SECTIONS LOCATIONS
SEC.36 T32S,R23E
SEC.1 T33S,R23E

DATE 12/4/89
REV.

Rev. 3 03/30/90



HORIZ. SCALE

500' 250' 0 250' 500'

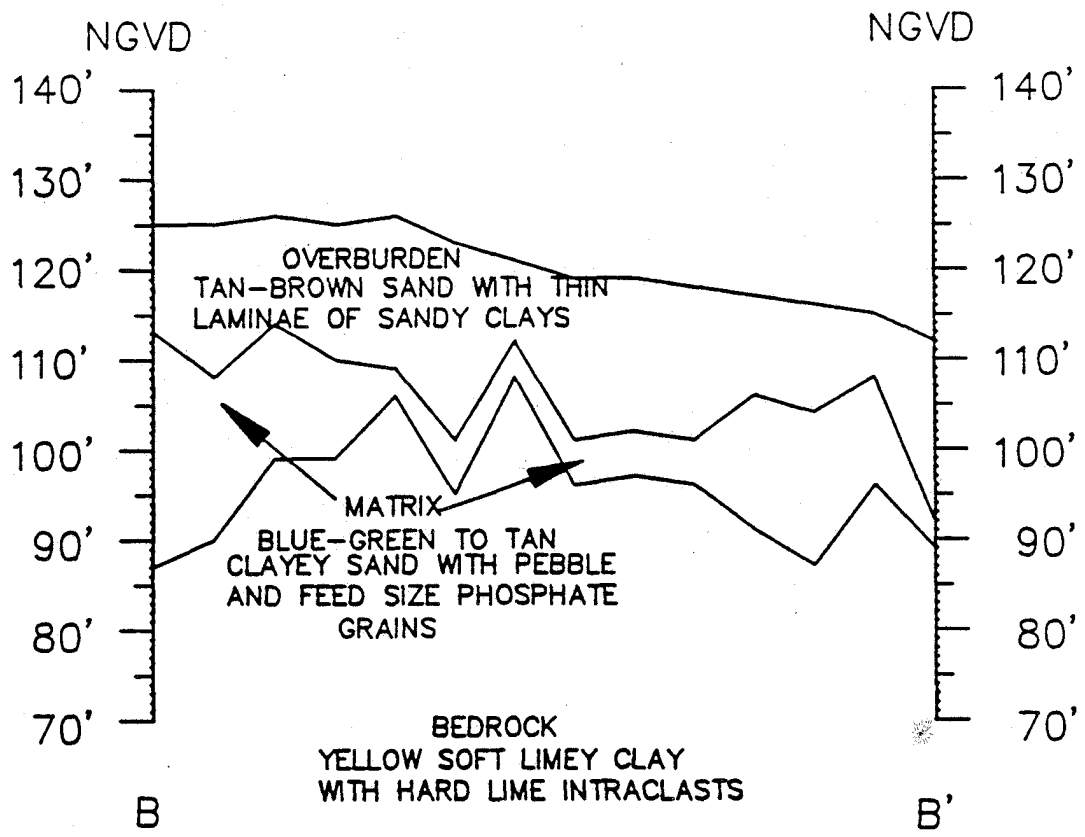
AGRICO
Division of Freeport-McMoRan Resource Partners

AGR PC-PC-1
GEOLOGICAL CROSS SECTION (A-A')
LOOKING NORTH
SEC.36 T32S,R23E
SEC.1 T33S,R23E

DATE 12/4/89
REV.

Rev. 3 03/30/90

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



HORIZ. SCALE

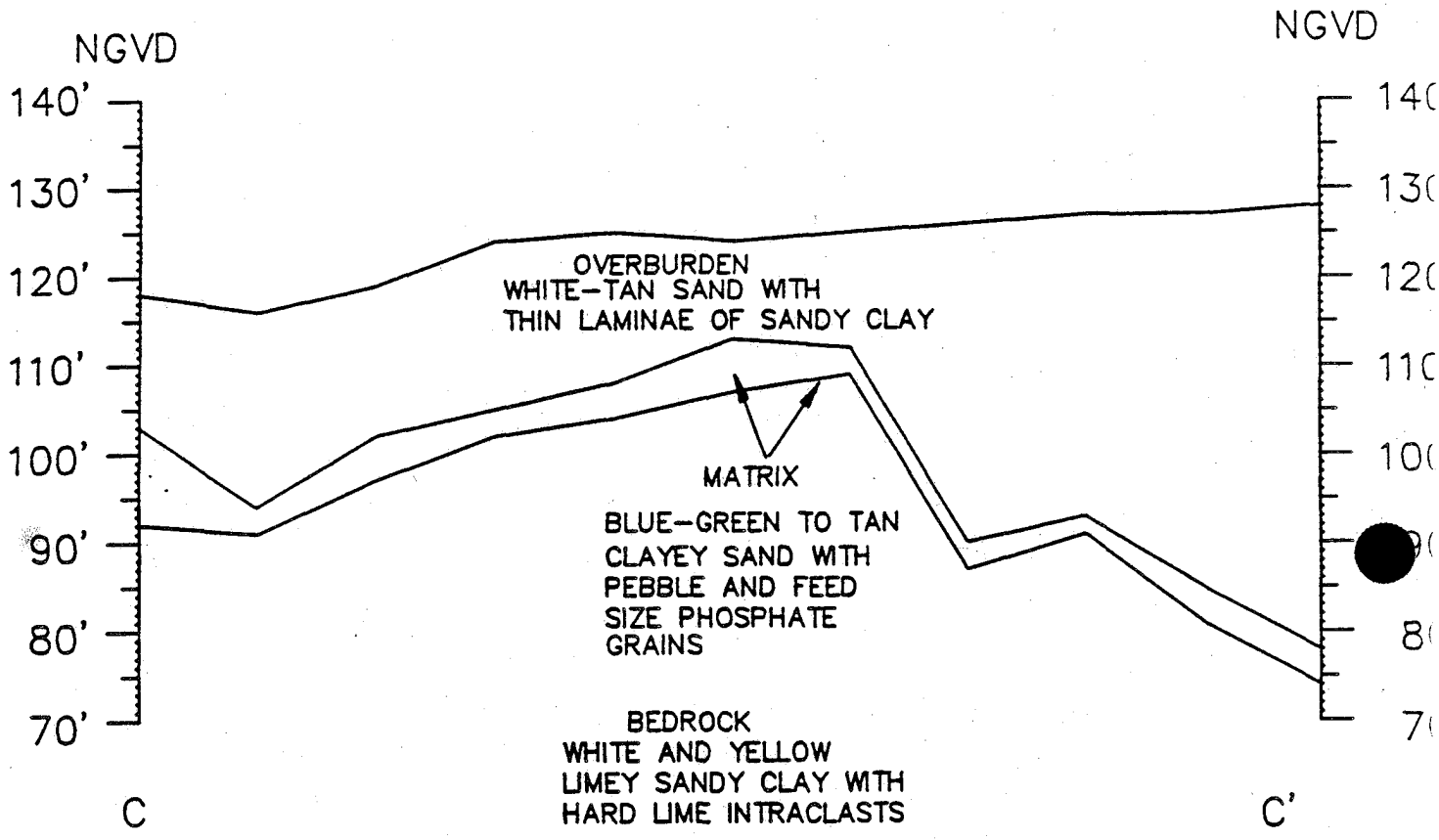
1000' 500' 0 500' 1000'

AGRICO
Division of Freeport-McMoRan Resource Partners

AGR PC-PC-1
GEOLOGICAL CROSS SECTION (B-B')
LOOKING EAST
SEC.36 T32S,R23E
SEC.1 T33S,R23E

DATE 12/4/89
REV.

Rev. 3 03/30/90



HORIZ. SCALE

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AGRICO
Division of Freeport-McMoRan Resource Partners

AGR PC-PC-1
GEOLOGICAL CROSS SECTION (C-C')
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SEC.36 T32S,R23E
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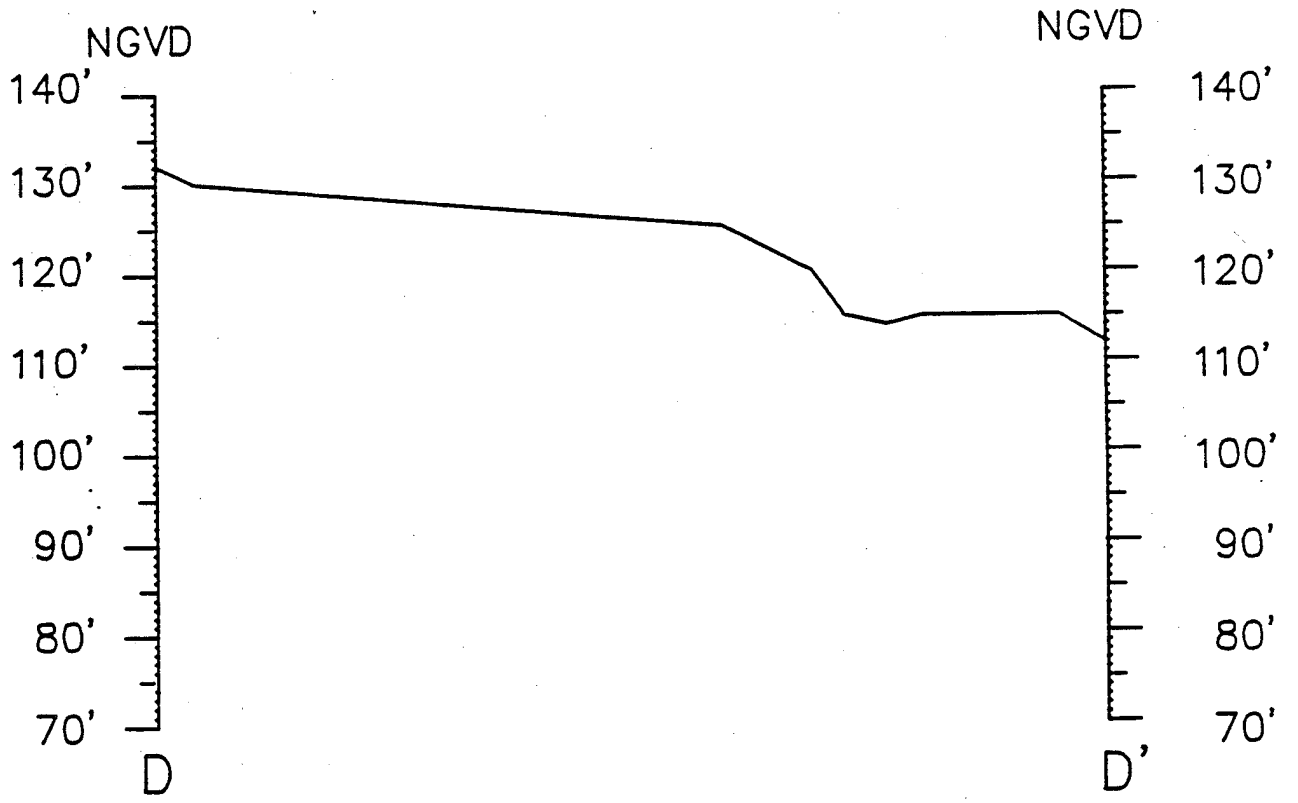
DATE 12/4/89
REV.

Rev. 3 03/30/90



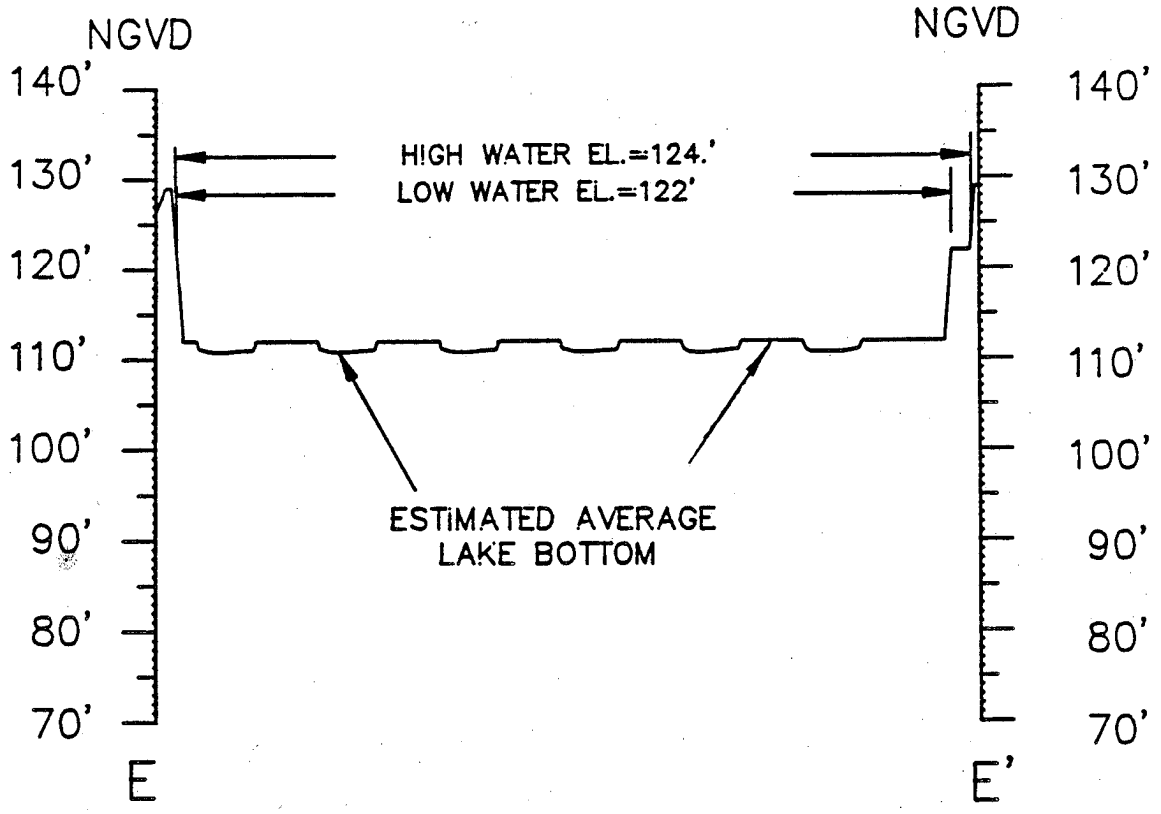
HORIZ. SCALE

AGRICO
Division of Freeport-McMoRan Resource Partners

AGR PC-PC-1
POST RECLAMATION CROSS SECTION (D-D')
LOOKING EAST
SEC.36 T32S,R23E
SEC.1 T33S,R23E

DATE 12/4/89
REV.

Rev. 3 03/30/90



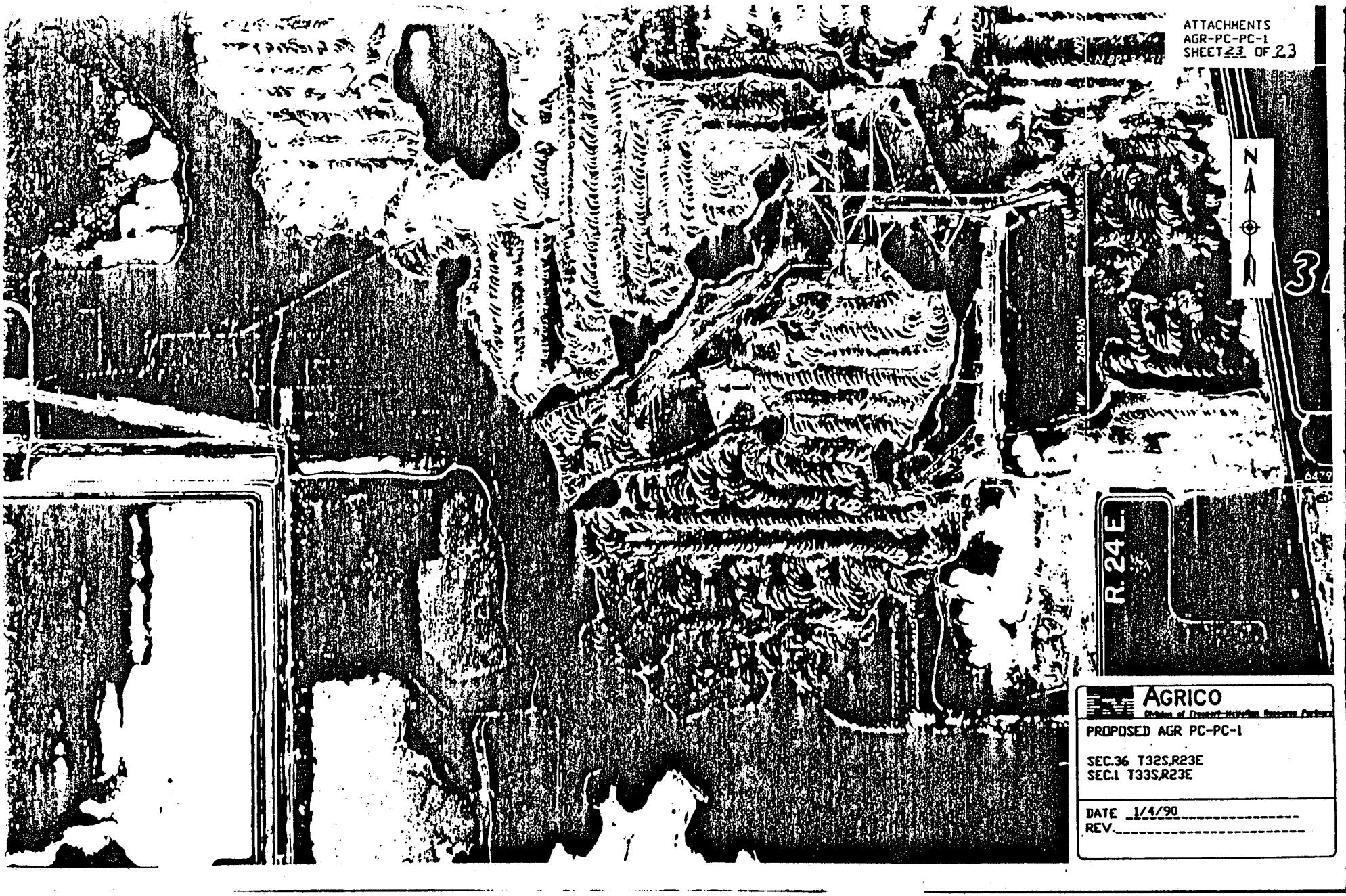
HORIZ. SCALE

AGRICO
Division of Freeport-McMoRan Resource Partners

AGR PC-PC-1
POST RECLAMATION CROSS SECTION (E-E')
LOOKING NORTH
SEC.36 T32S,R23E
SEC.1 T33S,R23E

DATE 12/4/89
REV.

Rev. 3 03/30/90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SEC.36 T32S,R23E
SEC.1 T33S,R23E
DATE 1/4/90
REV:

Rev. 3 03/30/90

11.12 CHARACTERIZATION OF HABITAT WITHIN THE TRANSMISSION LINE CORRIDOR THROUGH CECIL M. WEBB WILDLIFE MANAGEMENT AREA SOUTH TO THE LEE SUBSTATION.

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APPENDIX A -- TRANSMISSION LINE CORRIDOR LOCATIONS

1.0 INTRODUCTION

In support of licensing efforts for the 230-kilovolt (kV) transmission line from the Hardee Power Station in Hardee County south to the Lee substation in Lee County, KBN Engineering and Applied Sciences, Inc. (KBN) conducted a field survey of a proposed 100-foot (ft) right-of-way through the Cecil M. Webb Wildlife Management Area (WMA) (see Figure 1-1 in Appendix A). In addition, a detailed habitat survey of the proposed half-mile corridor running south of Webb WMA to the Lee Substation was completed (see Figure 1-2 in Appendix A). The surveys were conducted between January 15 and 22, 1990. Major habitats were described and the presence of any threatened or endangered species were noted. Species given special attention were the sandhill crane, the gopher tortoise, the Big Cypress fox squirrel, and the red-cockaded woodpecker.

The results of the surveys are presented in the following sections in the form of a narrative, starting at the entrance of the proposed right-of-way (ROW) onto the Webb WMA and continuing to the Lee substation.

2.0 RESULTS OF SURVEY

2.1 CECIL M. WEBB WMA RIGHT-OF-WAY

2.1.1 OVERVIEW OF HABITATS

A proposed ROW has been sited primarily along the boundary of Webb WMA and takes advantage of existing access roads and firebreaks (see Figure 1-1 in Appendix A). The ROW crosses a variety of pine flatwoods habitat and pasture. The location of the ROW has been chosen so that no cavity trees (active, inactive, or abandoned) of the red-cockaded woodpecker occur in the ROW. Additionally, the ROW will be constructed outside the known foraging areas of current red-cockaded woodpecker clans. Locations of abandoned and active cavity trees have been identified through field surveys and communications with Webb WMA personnel. The 30-meter (m) (100-ft) ROW will result in the loss of some pine flatwoods habitat outside the currently known red-cockaded woodpecker foraging areas. The ROW has been chosen so that contiguous areas of mature pines which could serve as habitat for the red-cockaded woodpecker and the Big Cypress fox squirrel are avoided. No gopher tortoise burrows were observed within the ROW. The ROW has been selected to avoid crossing any wetlands larger than 0.4 kilometer (km) (0.25 mile) in length. The ROW does pass next to several smaller wet prairies, which can be spanned by the transmission line. Sandhill cranes and various wading birds forage in low-lying open pastures and wet prairies on Webb WMA. The ROW has been selected to minimize the risk of bird collisions by avoiding major wetlands in Webb WMA, by not directly crossing isolated wetlands, and, where possible, by crossing at the narrowest sections of other surface water drainages. In other wetland areas, the ROW has been sited away from these wetlands to take advantage of pineland buffers. The ROW crosses approximately 42 ha (103 acres) of pine flatwoods, 18 ha (44 acres) of pasture/palmetto, and 4 ha (11 acres) of wetlands. The following is a narrative description of the habitats observed within the 30 m (100 ft) ROW starting from where the transmission line corridor enters the northern part of Webb WMA.

2.1.2 RIGHT-OF-WAY NARRATIVE

Section 1--Beginning at the junction of Section 35, 36, 2, and 1 and proceeding due west adjacent to the highway through Section 2 (see Appendix A, Figure 1-1, Page 1 of 4).

0 to 0.4 mile	Scattered young south Florida slash pine (Pinus elliotti var. densa) with a few older trees up to approximately 10 inches diameter at breast height (dbh). Very few older trees. Heavy, vigorous (evidence of flowering) wiregrass (Aristida stricta) groundcover. Patches of palmetto (Serenoa repens). Some wax myrtle (Myrica cerifera). Some chalky bluestem (Andropogon capillipes) mixed with wiregrass. Some runner oak (Quercus spp.).
0.6 to 0.7 mile	Wiregrass and other grasses with few trees (see Appendix A, Figure 1-1, Page 2 of 4).
0.7 to 1.0 mile	Mostly young pines, but with about 25 percent older trees. Some trees up to 10- to 12-inch dbh with flat tops indicating old age. Palmetto-wiregrass understory.
1.0 to 1.3 mile	Young, relatively dense pines. Generally 3- to 8-inch dbh. A few older trees. Heavy palmetto understory.
1.3 to 1.6 mile	Scattered young pines. A few older trees, but most less than about 8-inch dbh. Mixed grasses with some wiregrass in understory.
1.6 to 1.9 mile	Same as above, but with more vigorous wiregrass.
1.9 to 2.0 miles	Low area. Grassy with more wax myrtle.
2.0 miles	Raised road leading to field trial area. Australian pines (Casuarina equisetifolia) planted on berm are spreading into young pine/palmetto/wiregrass to west.
2.0 to 2.1 miles	Young pines with heavy saw palmetto/wax myrtle understory. Occasional melaleuca (Melalueca quinquenervia).
2.1 to 2.2 miles	Dense, young pines with a few old ones (not very large). Palmetto/wiregrass.

2.2 to 2.4 miles	Scattered, somewhat stressed pines. Trees have sparse needles which often indicates a wet site and marginal pine habitat. Some older trees. Mostly grassy understory with much wiregrass.
2.4 to 3.4 miles	Many older pines, some 10- to 12-inch dbh, but most smaller. Extensive wax myrtle in understory. Needs burning to maintain habitat. Two pine plantations to the south.
3.4 to 4.6 miles	Pasture. Scattered pine, beginning where ROW angles southwest from northern boundary around experimental eucalyptus (Eucalyptus spp.) grove to western boundaries.

Section 2--Beginning where ROW turns toward the south along western boundary of Webb WMA (see Appendix A, Figure 1-1, Page 3 of 4).

0.0 to 0.5 mile	Pasture.
0.0 to 0.4 mile	Pasture.

Section 3--Beginning on western boundary of Webb going due south where FPL line turns to the north (SW quadrant of Section 6) (see Appendix A, Figure 1-1, Page 3 of 4).

0 to 0.1 mile	Wetland. Depression with maidencane (Panicum hemitomon) and pickerel weed (Pontederia cordota). Grasses, including hairgrass (Muhlenbergia capillaris) around edges.
0.1 to 0.7 mile	Grasses, with low, sparse palmettos. Grassy understory is variable. Difficult to ascertain extent of wiregrass, since hairgrass and other similar-looking species are abundant.
0.7 to 0.9 mile	Patchy young pines and palmettos. A few older pines. There are young pines (1- to 6-inch dbh) along fenceline to the west, bordering Charlotte Ranchettes. Some of these are longleaf pine (Pinus palustris).
0.9 to 1.4 mile	Grasses with low, sparse palmettos.
1.4 to 1.5 miles	Patchy young pines and palmettos.
1.5 to 1.6 miles	Wetland surrounded by palmetto rim.

	Maidencane and pickerel weed with spatterdock (Nuphar lutea) in deepest part along the west edge. Grass and sedge band just inside palmettos includes hairgrass, sand cordgrass (Spartina bakeri), and sawgrass (Cladium jamaicense).
1.6 to 2.3 miles	Patchy young pines and palmettos. Mixed grasses, including much wiregrass.

Section 4--Beginning at the Alligator Slough water control structure heading south (see Appendix A, Figure 1-1, Page 3 of 4).

0	Area highly disturbed by construction of weir. Many pines killed to the east by flooding and fire. Banks stabilized with bahiagrass (Paspalum notatum).
0 to 0.1 mile	Some dead pines. Many old (both dead and alive), but few over 8-inch dbh. Disturbed wiregrass understory.
0.1 to 0.2 mile	Few trees. Wiregrass understory, but not especially vigorous. May be relatively heavily grazed. Patchier, shorter, more variable grass. A few melaleuca.
0.2 to 0.3 mile	Wetland. Wet prairie grasses and sedges.
0.3 to 0.5 mile	Scattered young pines. Palmetto/wiregrass understory.

Corridor turns to the southwest:

0.6 to 0.9 mile	Prairie. Wiregrass and other grasses. Palmetto patches. Variable seasonal flooding.
0.9 to 1.0 mile	Scattered pines.
1.0 to 1.2 miles	Prairie. Wiregrass and other grasses. Palmetto patches. Variable seasonal flooding.

This point is at jeep road that goes southeast from Jones Loop into Webb.

1.2 to 1.3 miles	Mostly young pines. Palmetto understory. Patchy recent burn.

1.3 to 1.8 miles	Wet prairie. Mixed grasses and sedges with much maidencane. Distinct border of low palmettos.
1.8 to 1.9 miles	Young pines. Recently burned. No wiregrass.
1.9 to 2.2 miles	Wiregrass. Recently burned.
2.2 to 2.3 miles	Old pasture. Bahia. Recently burned with patchy fire.
2.3 to 2.9 miles	Wiregrass, low palmettos, and wax myrtles. Eastern half recently burned.

This point is at the east end of rock pit.

2.9 to 3.2 miles	Mostly bare ground with some bahiagrass and weeds. Sod has been removed.
3.2 to 3.4 miles	Bahia pasture with a few scattered young pines.
3.4 to 3.6 miles	Dense stand of more mature pines. Palmetto and wiregrass.
3.6 to 3.9 miles	Old bahia pasture heavily invaded by Brazilian pepper (Schinus terebinthifolius) and wax myrtle. Some young pines and palms.

Corridor turns due south (see Appendix A, Figure 1-1, Page 4 of 4).

3.9 to 4.1 miles	Habitat same as previous.
4.1 to 4.3 miles	Dense stand of relatively large pines, but few look old. Some cabbage palms (Sabal palmetto). A few live oaks.
4.3 to 4.9 miles	Scattered large pines, some old. Heavy palmetto understory.
4.9 to 5.0 miles	Floodplain palm/oak hammock. Some bromeliads, serpent fern (Polypodium aureum). Royal fern (Osmunda regalis var. spectabilis) and palmetto along creek.
5.0 to 6.3 miles	Mostly young pines 6- to 8-inch dbh, but some old ones. Heavy palmetto understory. Occasional live oaks (Quercus virginiana). Some eucalyptus, especially to the south. Some wiregrass and wax myrtle.

Section 5--Beginning at Interstate, heading due south (see Appendix A, Figure 1-1, Page 4 of 4).

0 to 1.5 mile	Canal berm dropping off into overgrown pineland to the east. Pines are almost all young. 6- to 8-inch dbh. Melaleuca is abundant. Mostly small, but some 20 ft tall. Palmettos, mixed grasses. A little downy myrtle (Rhodomyrtus tomentosus), laurelleaf greanbrier (Smilax laurifolia), wax myrtle, Brazilian pepper. Weeds on berm. Occasional cattails (Typha spp.) and white waterlilies (Nymphea odoratus) in ditch, torpedograss (Panicum repens) along edges.
1.5 to 1.7 miles	Tuckers Grade.

Grassy, weedy berm continues along the west edge of:

1.7 to 2.0 miles	Cleared field. Mostly bare. Some weedy grasses and forbs. A few melaleuca.
2.0 to 2.4 miles	Young pines. Palmetto understory. Some Brazilian pepper.
2.4 to 2.8 miles	Wet prairie. Deer hider (Stillingia aquatica) and St. Johns wort (Hypericum spp.) around edge. Large patches of maidencane. Hairgrass around edges. Center looks like rush (Juncus spp.).
2.8 to 3.1 miles	Pines. Some moderately old, most young. Palmetto.
3.1 to 3.5 miles	Wet prairie (same as previous). Some older pines around edges.
3.5 to 3.6 miles	Tiny hammock remnant with palms, dahoon (Ilex cassine), wax myrtle, swamp fern (Blechnum serrulatum), palmetto.
3.6 to 3.7 miles	Wet prairie (same as previous).
3.7 to 4.0 miles	Pineland with trees of mixed ages, most young. Wax myrtle/palmetto understory. Hairgrass.

Corridor crosses railroad at Marker 945.

4.0 to 4.7 miles	Young pines with dense understory of saw palmetto and wax myrtle. Some eucalyptus and melaleuca, dense in places.
4.7 to 4.8 miles	Medium-size (6- to 8-inch dbh) pines over better palmetto, myrtle, and wiregrass understory.
4.8 to 5.2 miles	Pines up to 6- to 10-inch dbh, but not very old looking. Also, numerous young trees. Dense palmetto, some gallberry (Ilex glabra).
5.2 to 5.5 miles	Wet prairie with deer hider and St. Johns wort around edges. Hairgrass. Some melaleuca. Bog buttons (Lachnacaulon spp.). Yellow-eyed grass (Xyris spp.). Maidencane in center.
5.5 to 5.7 miles	Weedy thicket with Brazilian pepper, dog fennel (Eupatorium spp.), melaleuca, saltbush (Baccharis spp.), some young pines.

Fire tower at end of Webb corridor.

0.4 to 0.6 mile	Same as above, but with numerous cabbage palms, somewhat more wax myrtle, and some gallberry.

2.2 CORRIDOR SOUTH OF WEBB WMA TO LEE SUBSTATION

2.2.1 OVERVIEW OF HABITATS

Habitats in this section of the corridor are dominated by pine flatwoods interspersed with wet and dry prairies. There are a few cypress domes/strands, one small scrub, and some scattered residential development. The section of corridor from the Webb WMA south to the Lee substation was selected to minimize impacts to the heavily developed areas to the east along Highway 41. Based on the survey, the corridor was adjusted to avoid red-cockaded woodpecker nesting sites.

2.2.2 CORRIDOR NARRATIVE

The following narrative describes the habitats and wildlife observed within the corridor south of the Webb WMA. This survey covered a corridor a

quarter-mile to a half-mile wide. Most of the habitat changes occurred as gradual transitions. Therefore, it was not practical to convey this information in the same segment-by-segment style used for the 100-ft ROW through Webb WMA. The following narrative describes the habitats observed. The survey results are described in a north-to-south direction from Webb WMA. The following references locate the areas surveyed in relation to the point where the corridor enters relatively natural habitats south of the U-pick farm located on the west side of U.S. Highway 41 (see Appendix A, Figure 1-2).

Mile 0--Intersections of Sections 11/12 and Sections 14/13
Mile 1--Sections 14/13
Mile 2--Sections 23/24
Mile 3--Sections 26/25
Mile 4--Sections 35/36
Mile 5--Sections 2/1
Mile 6--Sections 11/12
~Mile 7--Sections 14/13
~Mile 8--Section 24
~Mile 9--Section 30
~Mile 10--Section 29
~Mile 11--Section 28

The corridor leaves Webb along the boundary between Sections 11 and 12 (see Appendix A, Figure 1-2, Page 1 of 4). It crosses the Florida Division of Forestry fire tower property where continuation of the ROW would run the transmission lines across an open field between the buildings and U.S. Highway (U.S.) 41. The corridor continues south across the highway and a large produce farm with a U-pick operation and, to the north, a retail sales stand.

The northern two-thirds of the stretch through Sections 13 and 14 is generally young pine flatwoods interspersed with small patches of wet to dry prairie. From this area south through Section 23, active use and management of the land as rangeland is evident. At the extreme northern

end of this segment, the flatwoods are mesic and somewhat disturbed with bahiagrass between the palmetto clumps in the groundcover. There are some melaleuca stands. The pinelands grade southward into more xeric open flatwoods with saw palmetto, wiregrass, fetterbush (Lyonia ferruginea), shiny blueberry (Vaccinium myrsinites), gopher apple (Licania michauxii), chalky bluestem, liatris (Liatris spp.), and runner oak (Quercus spp.). Entering the southern third of this segment, a large ditch crosses the pineland diagonally. South of the ditch, the western part of the corridor is a treeless dry prairie dominated by dense saw palmettos about 3 feet tall. A grassy wet prairie is to the east.

From this area south through Section 23, the corridor is pine flatwoods with patches of wet prairie. Except for small stands north of Section 23, the pines are virtually all young. In most areas, there is an open understory of frequently burned wiregrass thickly scattered with palmetto clumps. Wax myrtle is abundant in lower spots and there are a few areas of melaleuca invasion.

The habitat is very similar south of the boundary between Sections 23 and 26, but it has not been as actively managed for grazing. There are fewer signs of cattle activity and a heavier understory that has not been burned so frequently. Going south through Sections 26, 35/36, 2/1, and 11/12, the same type of generally young pinelands continue to dominate the landscape, but melaleuca (and, to a lesser extent, Brazilian pepper) invasion and evidence of off-road vehicle (ORV) activity increase and evidence of cattle use decreases (see Appendix A, Figure 1-2, Page 2 of 4). There are a few small clumps of cypress trees in the wettest places.

From Sections 35/36 southward, there are occasional tiny hammocks in the wet prairies. Heavy ORV traffic is clearly playing a role in changing these areas from small patches of pines and palms into more genuinely hammock vegetation. Intense ORV activity has left bare swaths of unvegetated ground around these islands of vegetation. These swaths function as firebreaks and allowing the survival of fire-sensitive plants,

such as cabbage palm, slash pine, dahoon holly, swamp bay (Persea palustris), myrsine (Myrsine guianensis), live oak, wax myrtle, saw palmetto, and swamp fern.

There are areas of deeper wetlands in Sections 2/1. The central parts of many of the wet prairies are fire flag (Thalia geniculata) marshes that hold water most of the year. A Y-shaped slough crosses the corridor in the north part of this segment. The western trunk of this Y is a cypress strand with maidencane and fire flag in the center. The northeastern fork is an extremely wet flatwoods with small slash pines apparently stressed by the long hydroperiod and an understory of grasses and wax myrtle. The southeastern fork is wet prairie with fire flag in the deepest part. Heavy ORV traffic has eliminated almost all of the wet prairie vegetation.

A few older trees begin to appear in Sections 2/1, but no stands of significant extent were noted north of the southern part of Section 11. From the boundary of Sections 11/12 and 14/13 southward through Section 23, there are patches of generally very small and contorted old pines, many of which are so stressed and dwarfed that they are reminiscent of the dwarf cypress (Taxodium distichum) in the Big Cypress Swamp. In most places, these pines are mixed with younger trees and melaleuca to the extent that the habitat must be considered only marginal for red-cockaded woodpeckers.

No signs of red-cockaded woodpeckers were observed in the corridor, although evidence of a clan was noted in the southwest corner of Section 13, where more extensive stands of older trees extend to the west. One active cavity, one active start hole, and three abandoned cavities were observed in this area. Without active melaleuca control, this habitat cannot be expected to sustain red-cockaded woodpeckers for more than a few years. The corridor location has been revised to avoid this area.

North of the Gator Slough Canal in Section 24, melaleuca and Brazilian pepper invasion, heavy ORV traffic, dumping, fire suppression, and other human disturbances have dramatically altered the character of the

flatwoods. The wetland pockets are essentially highly disturbed mud holes with patches of fire flag and/or willow (Salix caroliniana) near the center.

South of the canal, homes are being constructed on large ranchette-type lots. Vegetation includes both improved and well-grazed unimproved pasture and overgrown pine flatwoods (see Appendix A, Figure 1-2, Page 3 of 4). The flatwoods have trees of various ages and a generally tall, dense understory of saw palmetto, Brazilian pepper, wax myrtle, and melaleuca. There is considerable live oak and myrtle oak (Quencus myrtifolia) in places, but no real scrub. These areas might be considered marginal scrub jay habitat, but no scrub jays were observed. In some places, the heavy understory fuel accumulation has burned and the heat of the fire has killed the pines and left a dense thicket of saw palmetto with some fetterbush. There are a few small ponds with willow, fire flag, and maidencane. Two-thirds of the way down this segment, a wet prairie occupies the western portion of the corridor. There is a fire flag pond in the center. Hairgrass, maidencane, deer hider, wax myrtle, and sawgrass grow around the pond and pines, whereas melaleuca, dog fennel, and broomsedge are invading the prairie edges. South of the prairie is a tiny hammock with cabbage palm, slash pine, live oak, redbay (Persea borbonia), myrsine, palmetto, and swamp fern.

The narrow north-south segment through Section 30 is mostly a mixture of young pines and melaleuca with patches of large saw palmettos, wax myrtle, and Brazilian pepper, but there is a small willow marsh in the northern end. This marsh has a tiny patch of fire flag in the center.

The western end of the east-west segment of the corridor across Section 30 is young pine flatwoods with a degraded understory of soft rush (Juncus effusus) and maidencane heavily invaded with melaleuca grading eastward into wiregrass/palmetto beneath middle-aged pines. The central portion is palmetto thicket. The eastern half is burned-out pineland with much palmetto and many snags. The grassy understory includes sawgrass and sand

cordgrass. Where pines survive, they are generally large, relatively young trees. The understory is wiregrass/palmetto heavily invaded by melaleuca, wax myrtle, Brazilian pepper. A pileated woodpecker was observed foraging here.

The edge of a wet prairie extends into the northern border of this segment in the east-central part of Section 30. This prairie, which is dominated by soft rush and has patches of sawgrass, cattail, and open water in deeper portions, appears to be well utilized as a wading bird feeding and roosting area. The survey team observed one wood stork, two immature white ibis, one kildeer, one little blue heron, one great egret, and about 12 common gallinules feeding in this pond. A great blue heron and six snowy egrets were resting in the cattails.

The trail from this prairie eastward to the pond on the boundary between Section 30 and Section 29 appears to be a heavily utilized wildlife corridor. Tracks of foxes, bobcats, armadillos, raccoons, and other animals were abundant along this route.

Pond is bordered by cattails, wax myrtle, and Brazilian pepper. There is bahiagrass on higher ground to the east.

The east-west segment from the pond on the boundary between Sections 30 and 29 eastward has a slash pine plantation at its western end. The trees are young, but large enough to harvest for pulpwood. There is a heavy carpet of pine needles covering the ground. Many palmettos have been left in the understory. The rest of this segment is young pine flatwoods with occasional cabbage palms, oaks, and hog plum (Ximenia americana) and extensive clumps of big saw palmettos. Old logging slash is still evident. A patchy wiregrass understory persists. There is some melaleuca invasion and a few Brazilian peppers and badly freeze-damaged Java plums (Syzygium cumini). The remains of several reptilian eggs presumably preyed upon by raccoons were observed midway through this segment. The species could not be determined.

The narrow north-south segment through Section 29 has a thicket of tall saw palmettos in its southern portion. There are some scrub species here, including shiny blueberry, pennyroyal (Pilobiephis rigida) fetterbush, and a few myrtle oaks and sand live oaks (Quercus geminata). One gopher tortoise burrow was observed in this habitat. The northern end is young pineland with a good wiregrass understory in some places and disturbed ground with bahiagrass and broomsedge in others.

The short, narrow, east-west segment on the eastern side of Section 29 is patchy young pine forest with a degraded wiregrass/palmetto understory heavily invaded by melaleuca.

The edge of a cypress dome protrudes into the northern half of the east end of this segment. The dome has a sawgrass understory and live oaks and wax myrtle around the edge. There are some cabbage palms with serpent fern. A ditch and berm separates the wetland from the pineland.

The northwest quadrant of Section 28 is mesic flatwoods with areas of wet to dry prairie (see Appendix A, Figure 1-2, Page 4 of 4). The overgrown understory of large saw palmetto, wax myrtle, Brazilian pepper, gallberry, and live oak indicates fire has been infrequent in recent years. Melaleuca invasion is extensive. There are scattered cabbage palms, some of which support serpent ferns. Sawgrass is notable in a few low grassy areas. In the eastern part of the corridor, the pines are generally large, but young. In the western part just east of the point where the narrow corridor coming from the west broadens eastward, is a stand of relatively large old trees. The wiregrass/palmetto understory has been so heavily invaded by melaleuca that it no longer has the open character of red-cockaded woodpecker habitat. Trails throughout this segment of the corridor indicate regular horseback riding use.

Along the north-central border of this segment is a large wet prairie dominated by soft rush. Musk-grass (Chara spp.) is the dominant submerged species in two ponds in the deepest part. These areas have patches of fire

flag, cattail, and giant reed (Phragmites australis) around the edges. There are several tiny hammocks of cabbage palm and wax myrtle scattered around the prairie.

The northeastern corner of this segment of the corridor is an expansive thicket of palmetto with small patches of wiregrass groundcover and a few other shrubs, such as fetterbush. There is a little runner oak and chalky bluestem.

An area of scrub on white sand is in the southwestern quadrant of Section 28. This area is dominated by dense saw palmetto with many large scrub oaks up to 15 to 20 ft. Myrtle oak is particularly prominent. Other species include fetterbush, shiny blueberry, goldenrod (Solidago spp.), greenbriar (Smilax spp.), and dwarf wax myrtle. There is very little reindeer moss (Cladonia spp.). The area is not very diverse, but shows little sign of exotic invasion or other disturbance other than light use for horseback riding. Many animal tracks cross the area. No evidence of fire for many decades is indicated. There has been extensive slash pine and cabbage palm invasion around the edges. There is only about an acre with no trees other than oaks. Serpent fern grows on many of the palms, but shows much freeze damage. The area still appears to provide scrub jay habitat, but no jays were observed. The proposed corridor avoids this area.

To the west and north of the Lee Substation is bahiagrass pasture with scattered cabbage palms.

APPENDIX A

TRANSMISSION LINE CORRIDOR LOCATIONS

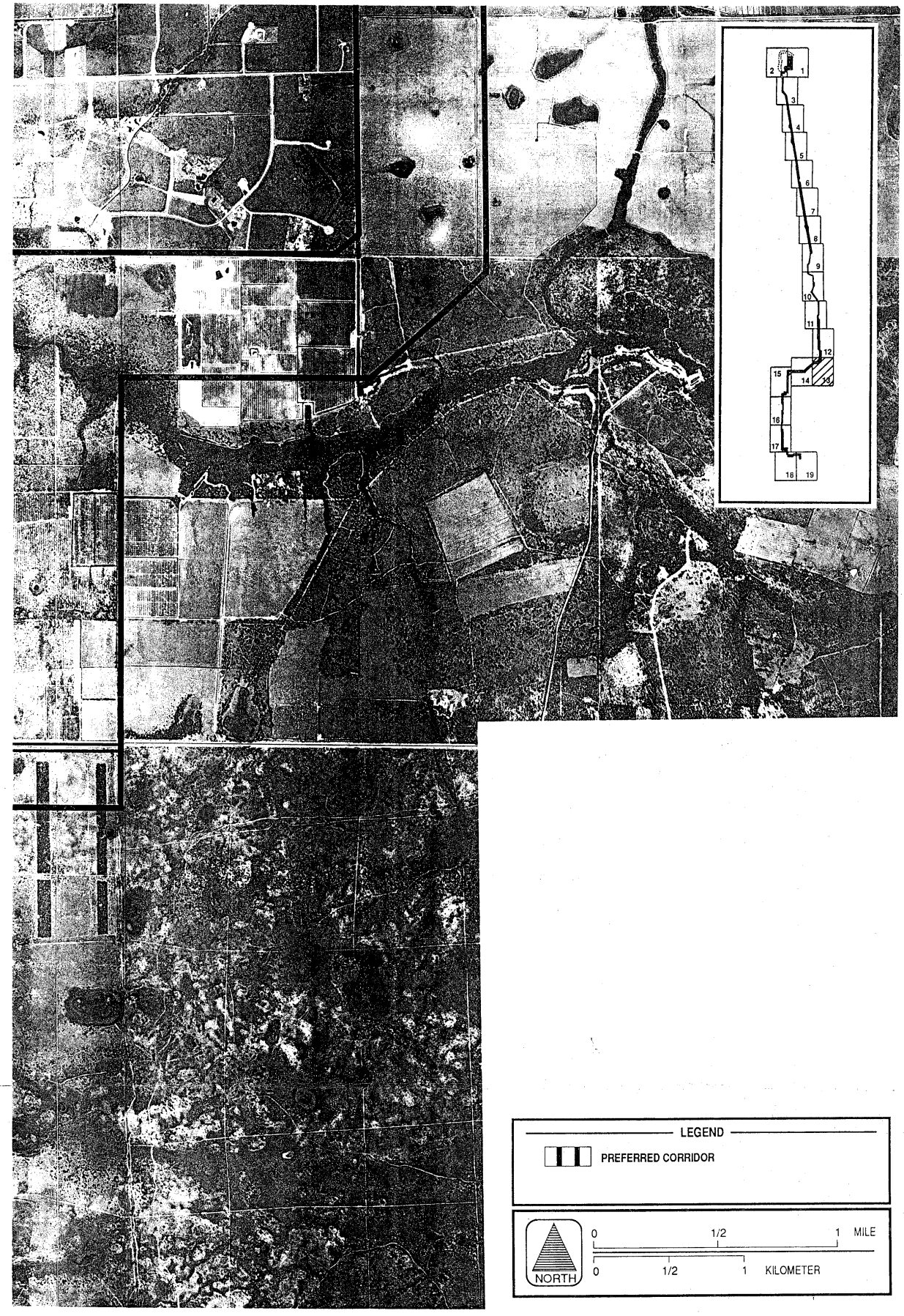


Figure 1-1 TRANSMISSION LINE CORRIDOR AND RIGHT-OF-WAY WITHIN CECIL M. WEBB WILDLIFE MANAGEMENT AREA (PAGE 1 OF 4)

Hardee Power Station

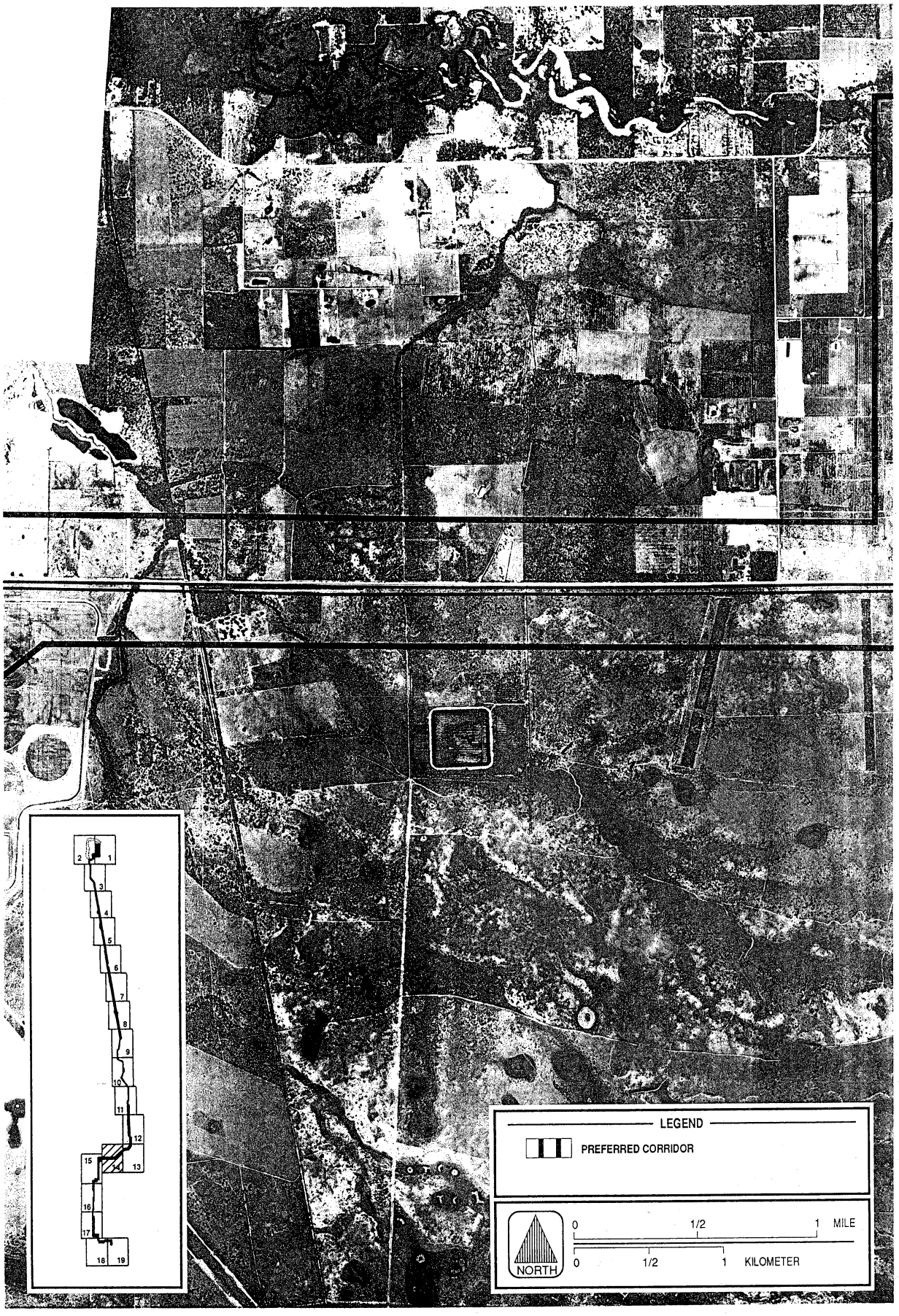


Figure 1-1 TRANSMISSION LINE CORRIDOR AND RIGHT-OF-WAY WITHIN CECIL M. WEBB WILDLIFE MANAGEMENT AREA (PAGE 2 OF 4)

Hardee Power Station

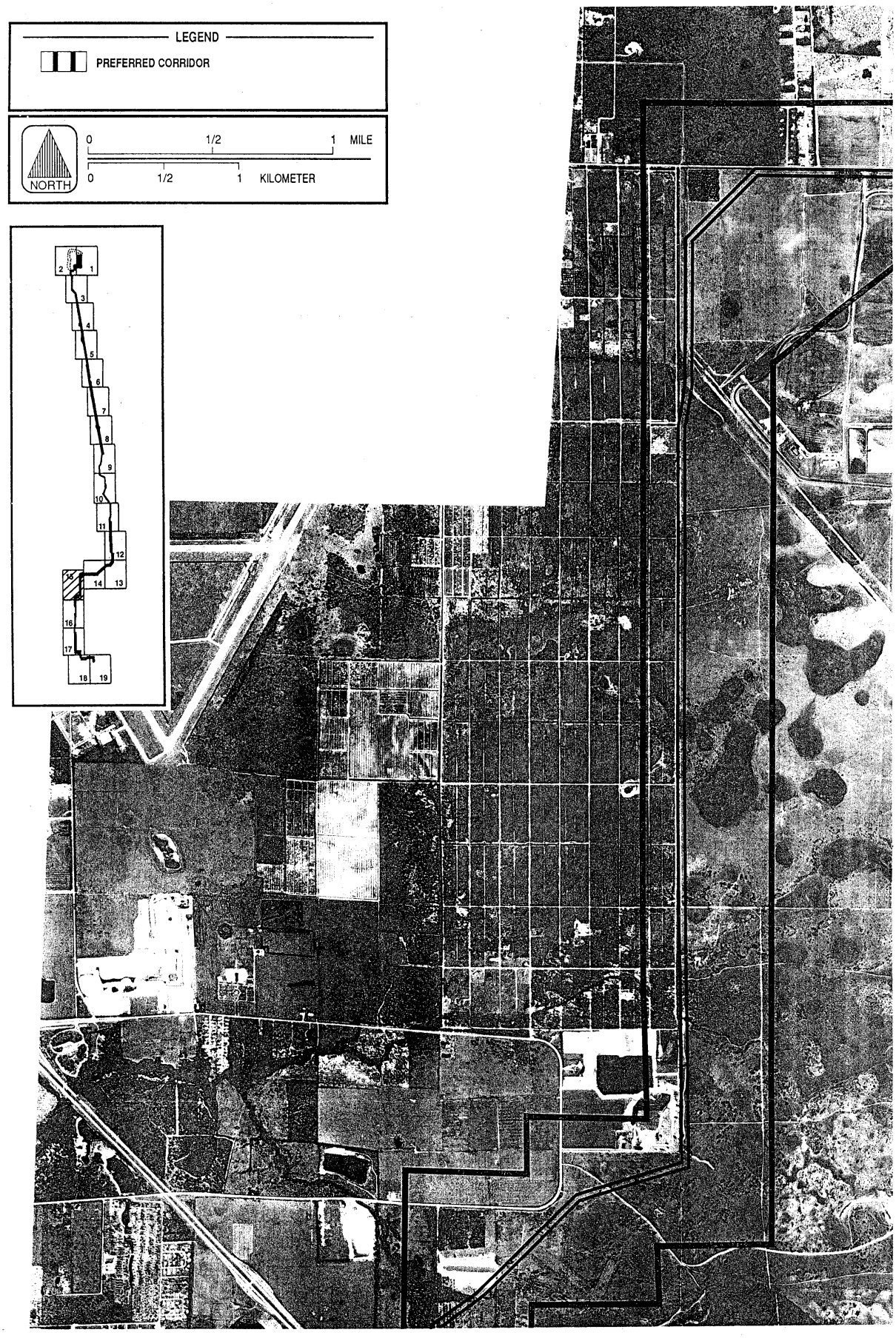


Figure 1-1 TRANSMISSION LINE CORRIDOR AND RIGHT-OF-WAY WITHIN CECIL M. WEBB WILDLIFE MANAGEMENT AREA (PAGE 3 OF 4)

Hardee Power Station

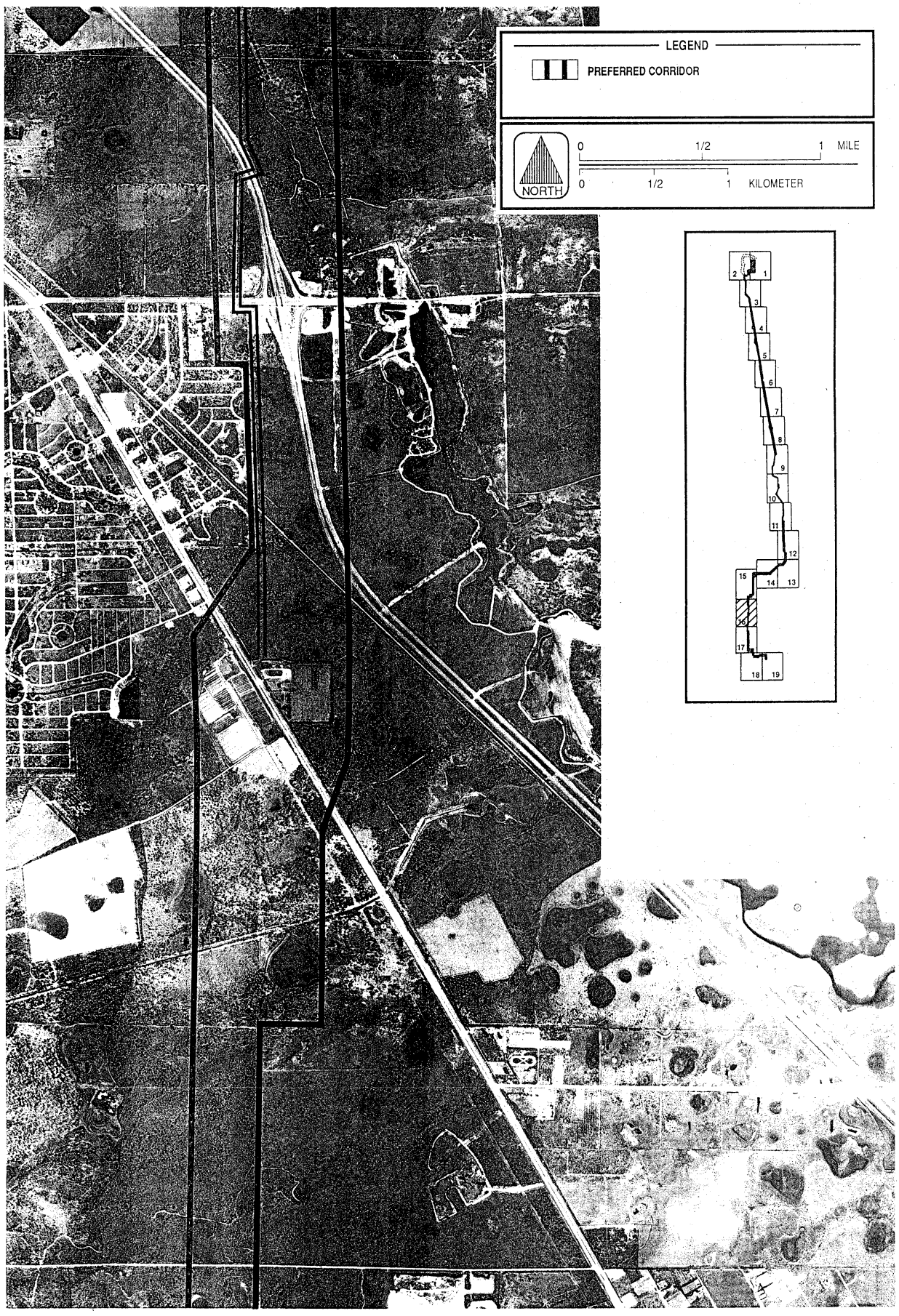


Figure 1-1 TRANSMISSION LINE CORRIDOR AND RIGHT-OF-WAY WITHIN CECIL M. WEBB WILDLIFE MANAGEMENT AREA (PAGE 4 OF 4)

Hardee Power Station

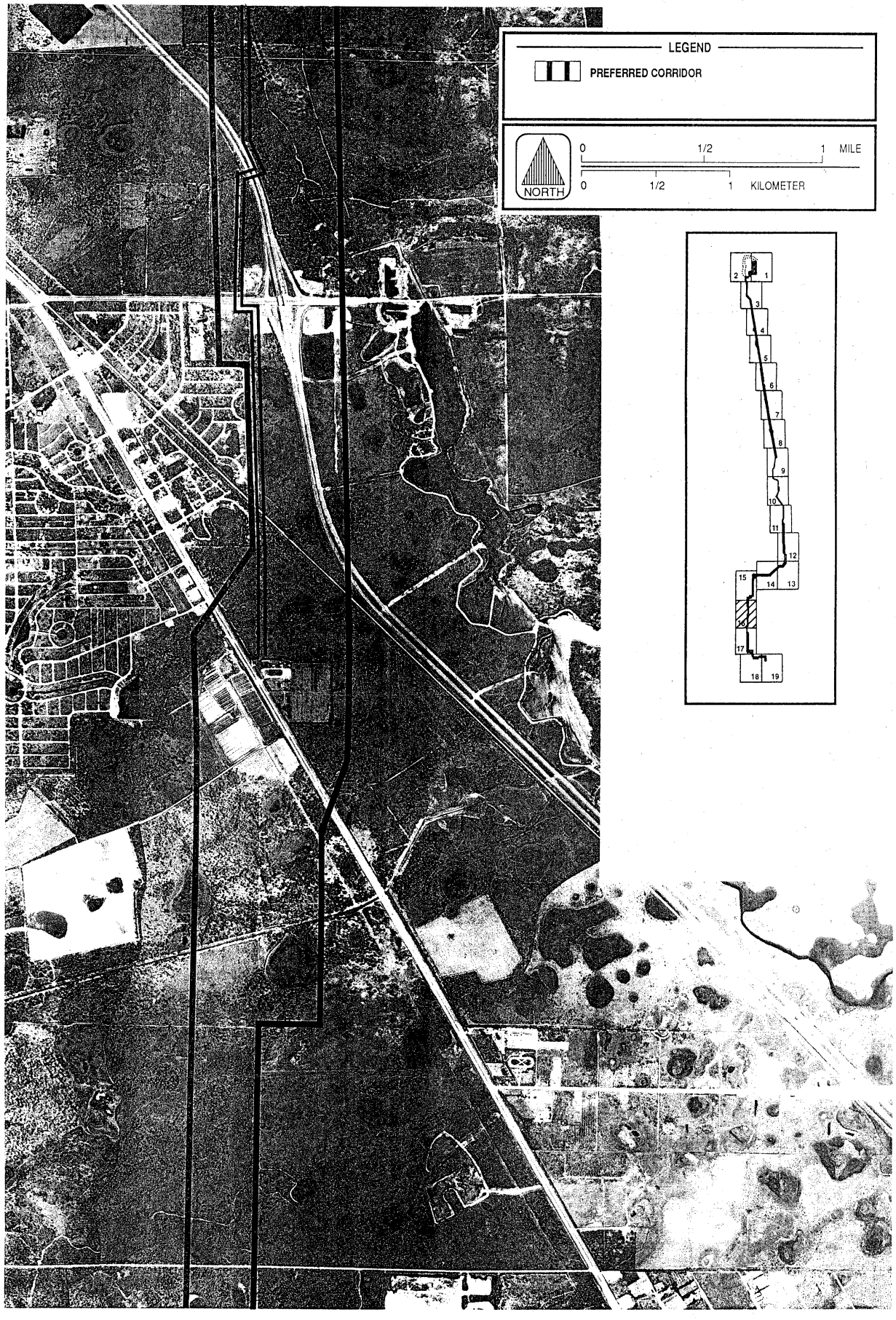


Figure 1-2 TRANSMISSION LINE CORRIDOR SOUTH OF CECIL M. WEBB WILDLIFE MANAGEMENT AREA TO LEE SUBSTATION (PAGE 1 OF 4)

Hardee Power Station

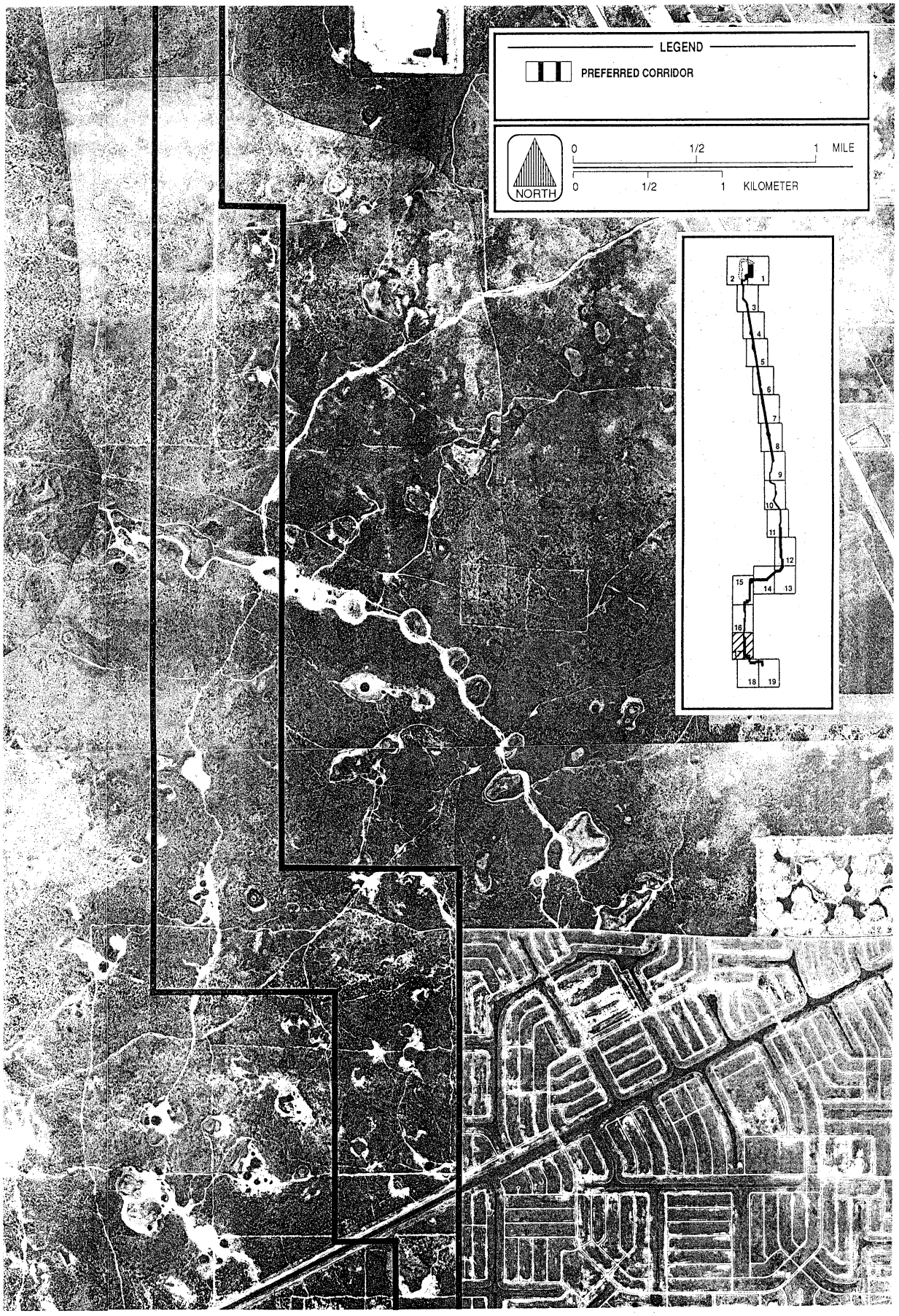
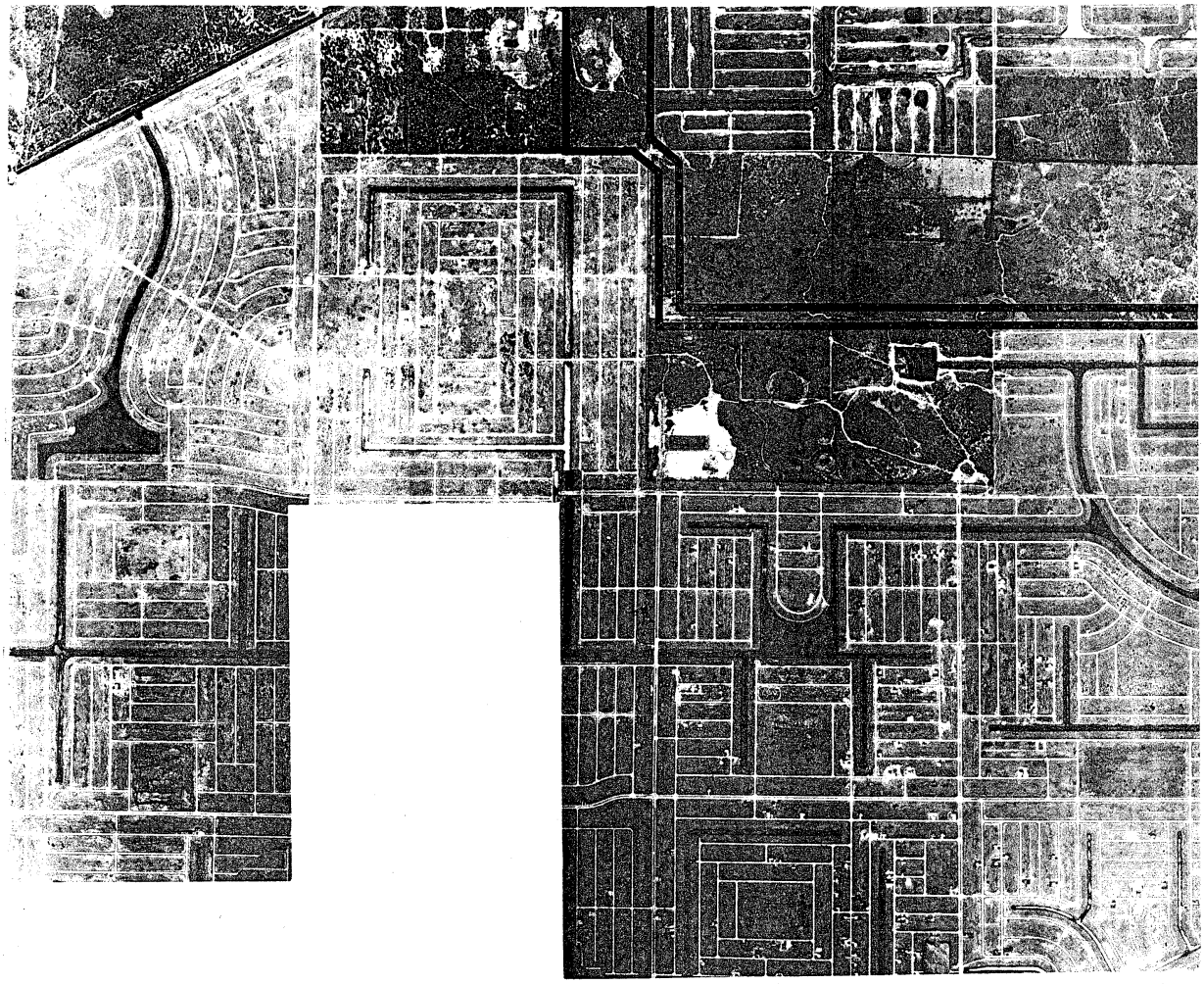
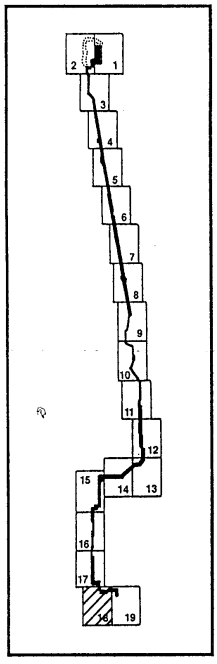


Figure 1-2 TRANSMISSION LINE CORRIDOR SOUTH OF CECIL M. WEBB WILDLIFE MANAGEMENT AREA TO LEE SUBSTATION (PAGE 2 OF 4)

Hardee Power Station





LEGEND

PREFERRED CORRIDOR

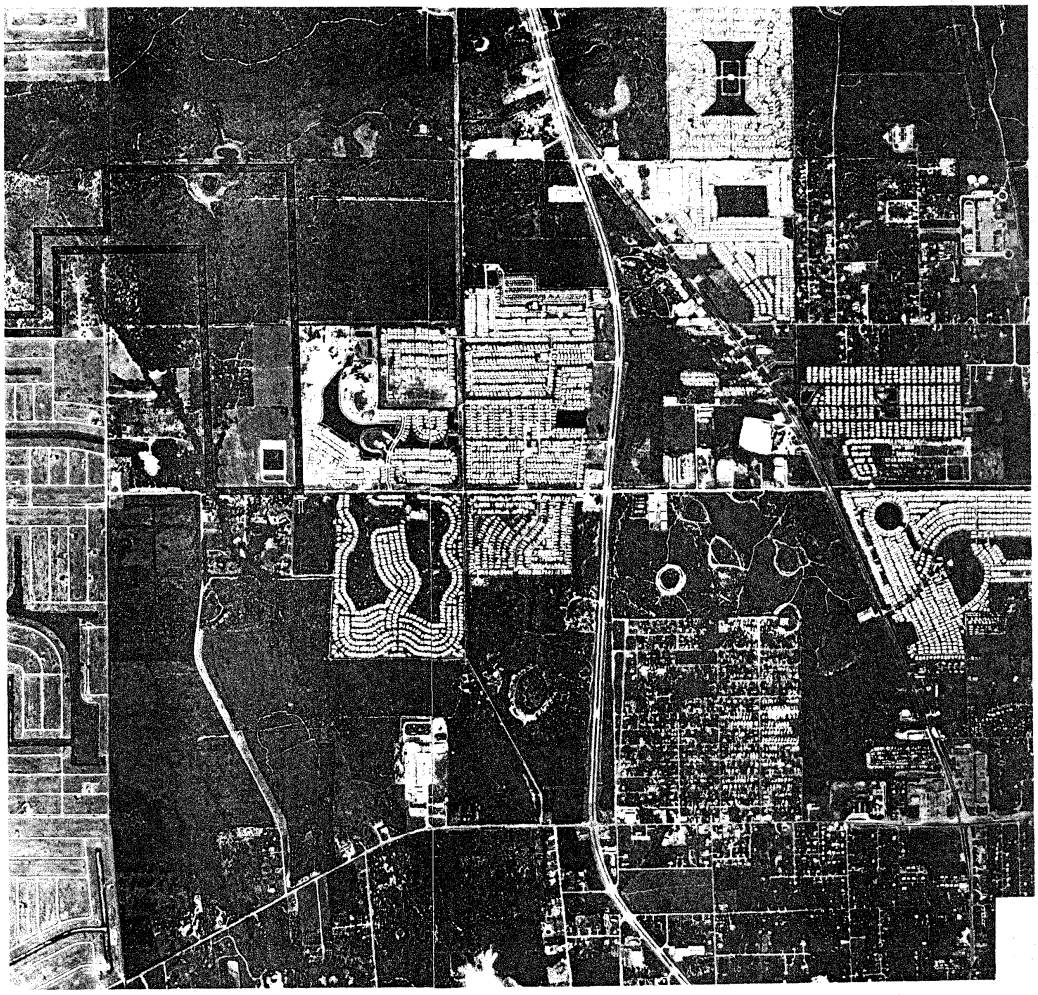
NORTH

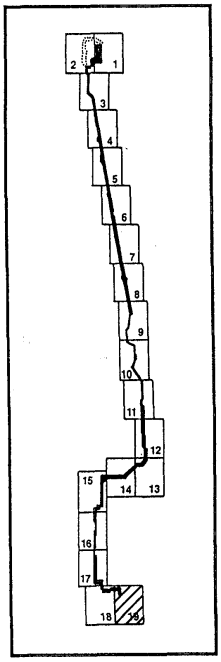
0 1/2 1 MILE

0 1/2 1 KILOMETER

Figure 1-2 TRANSMISSION LINE CORRIDOR SOUTH OF CECIL M. WEBB WILDLIFE MANAGEMENT AREA TO LEE SUBSTATION (PAGE 3 OF 4)

Hardee Power Station





LEGEND

PREFERRED CORRIDOR

NORTH

0 1/2 1 MILE

0 1/2 1 KILOMETER

Figure 1-2 TRANSMISSION LINE CORRIDOR SOUTH OF CECIL M. WEBB WILDLIFE MANAGEMENT AREA TO LEE SUBSTATION (PAGE 4 OF 4)

Hardee Power Station

11.13 JOINT APPLICATION - DEPARTMENT OF THE ARMY/FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION FOR PIPING AND ACCESS ROAD CORRIDOR

JOINT APPLICATION
DEPARTMENT OF THE ARMY/FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
For Activities in the Waters of the State of Florida

CORPS APPLICATION NUMBER (official use only)

DER APPLICATION NUMBER (official use only)

1. APPLICANT'S NAME AND ADDRESS

Seminole Electric Cooperative
NAME

16313 N. Dale Mabry Highway
STREET

Tampa FL 33688-2000
CITY STATE ZIP

TELEPHONE NUMBER (Day) (813) 963-0994 (Night) ( ) Same

2. Name, address, zip code and title of applicant's authorized agent for permit application coordination

Michael Opalinski
Seminole Electric Cooperative Incorporated
16313 N. Dale Mabry Highway
Tampa, FL 33688-2000

Telephone Number (813) 963-0994

3. NAME OF WATERWAY AT LOCATION OF THE ACTIVITY.
Wetlands with intermittent drainage to Payne Creek.

DER Code
W/W Code

4. LOCATION WHERE PROPOSED ACTIVITY EXISTS OR WILL OCCUR.

Hardee Power Station Site
Street, road or other descriptive location

1 Section | 33S Township | 23E Range

N/A
Incorporated city or town

Latitude | Longitude

Hardee
County

Tax Assessors Description: (if known)

Map No. | Subdiv. No. | Lot No.

5. NAME AND ADDRESS INCLUDING ZIP CODE OF ADJOINING PROPERTY OWNERS WHOSE PROPERTY ALSO ADJOINS THE WATERWAY.
CF Industries, P.O. Box 1549, Wauchula, FL 33873
Agrico Chemical Co., P.O. Box 1110, Mulberry, FL 33860

6. PROPOSED USE
Private Single Dwelling [ ] Private Multi-dwelling [ ] Public [ ]
Commercial [ ] Other [X] (Explain in remarks) energy facility

7. DESCRIPTION OF PROJECT (Use additional sheets, if necessary)

A. Structures: 1. New work [X] Maintenance of existing structure [ ]

COE Work Code

2. Piers, docks and use: Commercial [ ] Private [ ] Public [ ]

a. Single pier [ ] length _____ width _____

b. Number of piers [ ] length _____ width _____

c. Number of boat slips [ ] length _____ width _____

d. Number of finger piers [ ] length _____ width _____

e. Other (please describe) _____

3. Seawalls, revetments, bulkheads: length _____

a. Type: Vertical [ ] Riprap [ ] Slope: _____Horizontal:_____Vertical

b. Material to be used _____

4. Other type of structure Cooling water reservoir piping and access road culvert, see Attachment A.

B. Excavation or Dredging: New Work [X] Maintenance work [ ] Total acreage involved 0.033

1. Access Channel [ ] or Canal [ ] Length _____ft. Width _____ft. Depth _____ft.

2. Boat Basin [ ] or Boat Slip [ ] Length _____ft. Width _____ft. Depth _____ft.

3. Other Cooling water reservoir piping and access road culvert Length 20 ft. Width 71 ft. Depth 2.0 ft.

4. Cubic yards: Total for project 105

a. 0 cyd. waterward/ 105 cyd. landward of ordinary/mean high water

b. Type of material to be excavated/dredged Overburden

C. Fill:

1. Amount of material

DER Code 253 403

a. Cubic yards placed waterward of ordinary/mean high water 0.0

b. Cubic yards placed landward of ordinary/mean high water 2294

c. Total acreage to be filled 0.45 Total acreage of wetlands involved 0.45

2. Containment for fill

a. Dikes [ ] b. Seawall, etc. [ ] c. Other (please explain) _____

Turbidity control screens and mulching/seeding

3. Type of fill material to be used Overburden

4. Source of fill material to be used Previous mining operation

8. Date activity is proposed to commence October 1990 ; to be completed October 1995.

9. Previous permits for this project have been DER #531224079 Corps # Hardee County

A. Denied (date) _____

B. Issued (date) _____

C. Other (please explain) Agrico has received a permit under permit Application No. 531224079 for removal and reclamation of these wetlands as part of phosphate mining activities.
Differentiate between existing work and proposed work on the drawings.

10. Remarks (See Instruction Pamphlet for additional information required for all applications and certain activities. Use additional sheets if necessary.)
See SCA/EA 1.0, 3.0 and 8.0 for description of Hardee Power Station Project, need of the project, and overall project alternatives. See Attachment A for detailed description of discussion of alternatives and impacts.

11. AFFIDAVIT OF OWNERSHIP OR CONTROL of the property on which the proposed project is to be undertaken

I CERTIFY THAT: (please check appropriate space)

[ ] I am the record owner, lessee, or record easement holder of the property described below.

[X] I am not the record owner, lessee, or record easement holder of the property described below, but I will have before undertaking the proposed work the requisite property interest. (Please explain what the interest will be and how it will be acquired.)

LEGAL DESCRIPTION OF PROPERTY SITUATED IN Hardee COUNTY, FLORIDA
(Use additional sheets if necessary)

Section 1, Township 33 south, Range 23 east, Hardee County, Florida.

Michael P. Polinski
Signature

Sworn and subscribed before me at Alachua County, Florida, this 30th day of March, 1990

Mary Lewis Adams
NOTARY PUBLIC

My commission expires: NOTARY PUBLIC, STATE OF FLORIDA. MY COMMISSION EXPIRES: NOV. 20, 1992. BONDED THRU NOTARY PUBLIC UNDERWRITERS.

NOTARY PUBLIC STATE OF FLORIDA

12. Application is made for a permit(s) to authorize the activities described herein.

A. I authorize the agent listed in Item #2 to negotiate modifications or revisions, when necessary, and accept or assent to any stipulations on my behalf.

B. I understand I may have to provide any additional information/data that may be necessary to provide reasonable assurance or evidence to show that the proposed project will comply with the applicable State Water Quality Standards or other environmental standards both before construction and after the project is completed.

C. In addition, I agree to provide entry to the project site for inspectors with proper identification or documents as required by law from the environmental agencies for the purpose of making preliminary analyses of the site. Further, I agree to provide entry to the project site for such inspectors to monitor permitted work if a permit is granted.

D. Further, I hereby acknowledge the obligation and responsibility for obtaining all of the required state, federal or local permits before commencement of construction activities I also understand that before commencement of this proposed project I must be granted separate permits or authorizations from the U.S. Corps of Engineers, the U.S. Coast Guard, the Department of Environmental Regulation, and the Department of Natural Resources, as necessary.

I CERTIFY that I am familiar with the information contained in this application, and that to the best of my knowledge and belief such information is true, complete and accurate. I further certify that I possess the authority to undertake the proposed activities.

Michael P. Palmer — Signature of Applicant

3/30/90 — Date

NOTE: THIS APPLICATION MUST BE SIGNED by the person who desires to undertake the proposed activity or by an authorized agent. If an agent is applying on behalf of the applicant, attach proof of authority for the agent to sign and bind the applicant.

18 U.S.C. Section 1001 provides that: Whoever in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up by any trick, scheme, or device a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statement or entry, shall be fined not more than $10,000 or imprisoned not more than five years, or both.

NOTICE TO PERMIT APPLICANTS

This is a Joint Application; it is NOT a Joint Permit!

You Must Obtain All Required Local, State, and Federal

Authorizations or Permits Before Commencing Work!!

For your information: Section 370.034, Florida Statutes, requires that all dredge and fill equipment owned, used, leased, rented or operated in the state shall be registered with the Department of Natural Resources. Before selecting your contractor or equipment you may wish to determine if this requirement has been met. For further information, contact the Chief of the Bureau of Licenses and Motorboat Registration, Department of Natural Resources, 3900 Commonwealth Boulevard, Tallahassee, Florida 32303. Telephone Number 904/488-1195. THIS IS NOT A REQUIREMENT FOR A PERMIT FROM THE DEPARTMENT OF ENVIRONMENTAL REGULATION.

ATTACHMENT A

1.0 DESCRIPTION OF THE PROJECT

The proposed project is located in Hardee County on currently mined lands (see Figures 1 through 4 and aerial photographs) and is part of the Hardee Power Station. Intake and discharge piping are required for the circulation of cooling water between the cooling reservoir and the Hardee Power Station (see SCA/EA, Sections 3.2 and 3.5.1 and Figure 3.2-1). An access road to the cooling reservoir will be colocated with the piping. A reclamation plan for the project area and adjacent mined lands has been submitted to Florida Department of Natural Resources (see Appendix 11.11 of the SCA/EA). The piping and access road will cross a small section [0.18 ha (0.45 acres)] of currently mined and to be reclaimed vegetated forested wetland (Figures 5, 6, and 7). This reclaimed wetland will act as a drainage to Payne Creek for a undisturbed wetland located east of the cooling reservoir.

The road will be located to the south of the circulating water pipe (and miscellaneous pipe) corridor (Figures 7 and 8). The colocation of the road will function to support the piping on the extended road embankment. Two reinforced concrete box culverts, each 10 feet (ft) wide and 5 ft tall, will be installed so that the reclaimed drainage channel along the east and west sides of the mined area will function as a permanent channel. The culvert will be sufficient to carry the peak discharge without overtopping the embankment. Riprap will be placed at the culvert outlet to minimize erosion. Fill will be provided as required to build the embankment and install culverts. Estimates of fill and excavation volumes are provided in Tables A-1 and A-2.

The drainage area for the channel will include the watershed for the preserved wetland area east of the reservoir. Watersheds and wetlands north of the reservoir will drain into the reservoir. The resulting drainage area for the reclaimed drainage channel is approximately 202 hectares (ha) (500 acres). Drainage calculations (based on the

conceptual design) included a design storm of the 100-year event yields a peak flow of 750 cubic feet per second (cfs). The 100-year storm was chosen to minimize the risk of damage to the embankments and piping systems from stormwater runoff overtopping the embankment. The culvert will be designed to minimize the height of the embankment and the quantity of fill needed.

2.0 DESCRIPTION OF IMPACTS

Currently, the permit area is disturbed by mining (Figure 3). As a part of the reclamation plan (Figure 6), the post-reclamation vegetation in the mined-out permit application area is proposed to be grass, crop, and pasture and a mixed forested wetland. The proposed piping corridor and access road project will result in the loss of 0.18 ha (0.45 acres) of reclaimed forested wetlands. This represents 2.0 percent of the total reclaimed forested wetlands [9.3 ha (23 acres)] on the plant size.

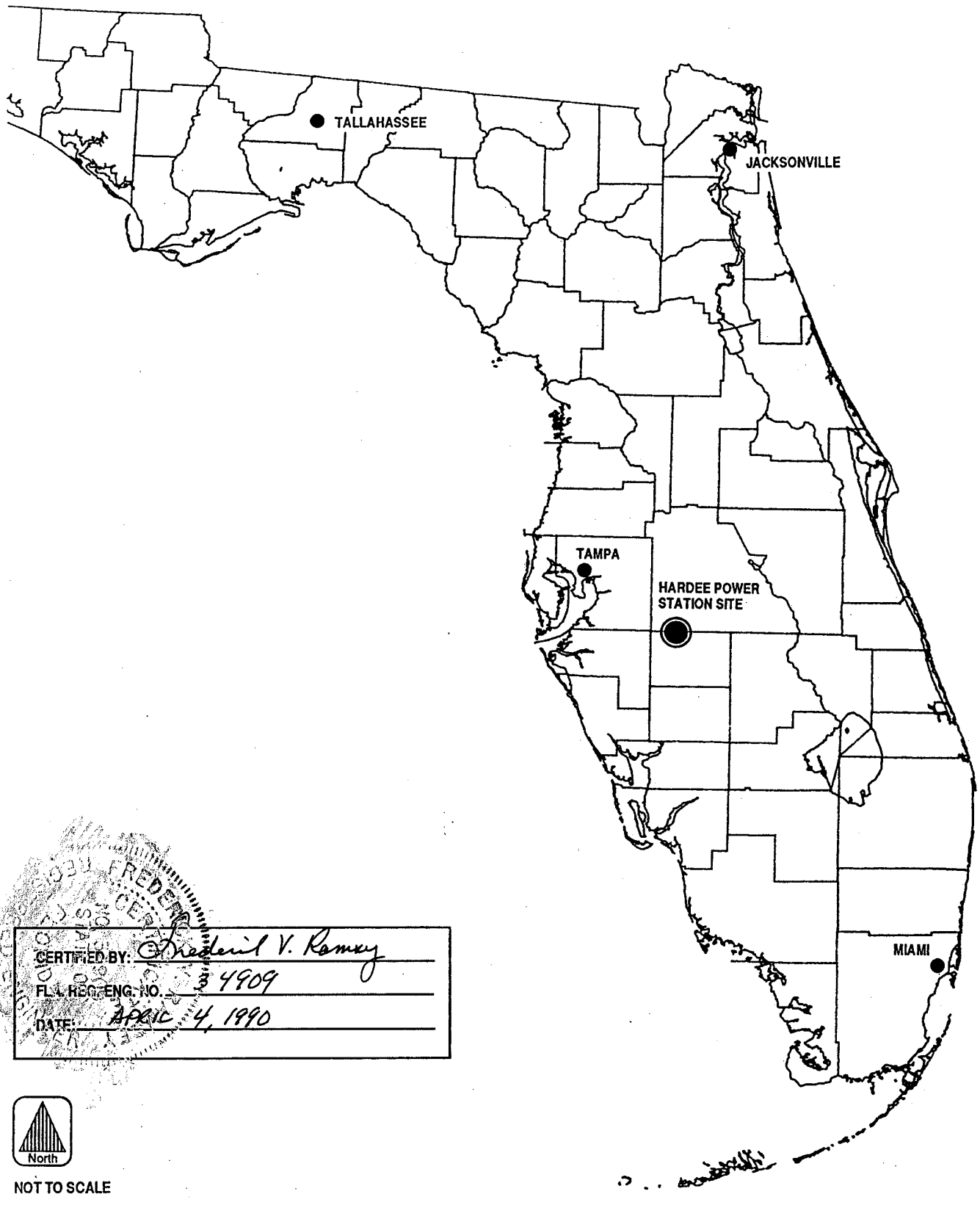
The environmental impacts of the proposed project are not considered adverse or significant. The wetland loss is a very small percentage (2.0 percent) of the total forested wetlands reclaimed on the site. No effects will occur to the connection of the upstream wetlands connected to Payne Creek. The drainage function of the reclaimed wetlands passing next to the cooling reservoir will be maintained during construction by the use of temporary culverting. Potential downstream sedimentation impacts during construction will be minimized by proper sediment control techniques. No impacts to Payne Creek are anticipated.

Table A-1. Determination of Fill Volume and Fill Area

Approximate Road Elevation	36.1 m (118.5 ft) MSL
Reclaimed Elevation at Approximate Limits of Wetlands	35.1 m (115 ft) MSL
Reclaimed Elevation at Centerline of Proposed Culvert	34.7 m (114 ft) MSL
Length of Fill Between the Approximate Limits of Wetlands	106.7 m (350 ft)
Top Width of Fill Section	9.8 m (32 ft)
Side Slopes of Fill Section	3:1
Bottom Width of Fill Section at the Approximate Limits of Wetlands	16.2 m (53 ft)
Bottom Width of Fill Section at the Centerline of Proposed Culvert	18.0 m (59 ft)
Cross-Sectional Area of Fill Section at the Approximate Limits of Wetlands	13.8 m^2 (149 ft^2)
Cross-Sectional Area of Fill Section at the Centerline of Proposed Culvert	19.0 m^2 (205 ft^2)
Average Fill Cross-Sectional Area	16.4 m^2 (177 ft^2)
Total Length of Fill	106.7 m (350 ft)
Total Fill Volume	1,754 m^3 (61,950 ft; 2,294 yd^3)
Bottom Width of Fill Section at the Approximate Limits of Wetlands	16.2 m (53 ft)
Bottom Width of Fill Section at the Centerline of Proposed Culvert	18.0 m (59 ft)
Average Width of Fill	17.1 m (56 ft)
Total Length of Fill	106.7 m (350 ft)
Total Area of Fill	1,821 m^2 (19,600 ft^2)
Total Area of Fill	0.18 ha (0.45 acres)

Table A-2. Determination of Excavation Volume and Area

Design Culvert Invert Elevation	34.1 m (112 ft)
Approximate Road Elevation	36.1 m (118.5 ft) MSL
Top Width of Fill Section	9.8 m (32 ft)
Side Slopes of Fill Section	3:1
Total Length of Culvert	21.6 m (71 ft)
Total Width of Culvert	6.1 m (20 ft)
Total Width of Excavation	6.1 m (20 ft)
Total Area of Culvert Excavation	131.9 m^2 (1,420 ft^2)
Total Area of Culvert Excavation	0.013 ha (0.033 acres)
Reclaimed Elevation at Centerline of Proposed Culvert	34.7 m (114 ft) MSL
Design Culvert Invert Elevation	34.1 m (112 ft)
Depth of Excavation	0.6 m (2 ft)
Total Excavation Volume	80.4 m^3 (2840 ft^3; 105 yd^3)



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FL. REG. ENG. NO. 34909
DATE: APRIL 4, 1990

Figure 1 GENERAL LOCATION OF HARDEE POWER STATION PROJECT

Hardee Power Station

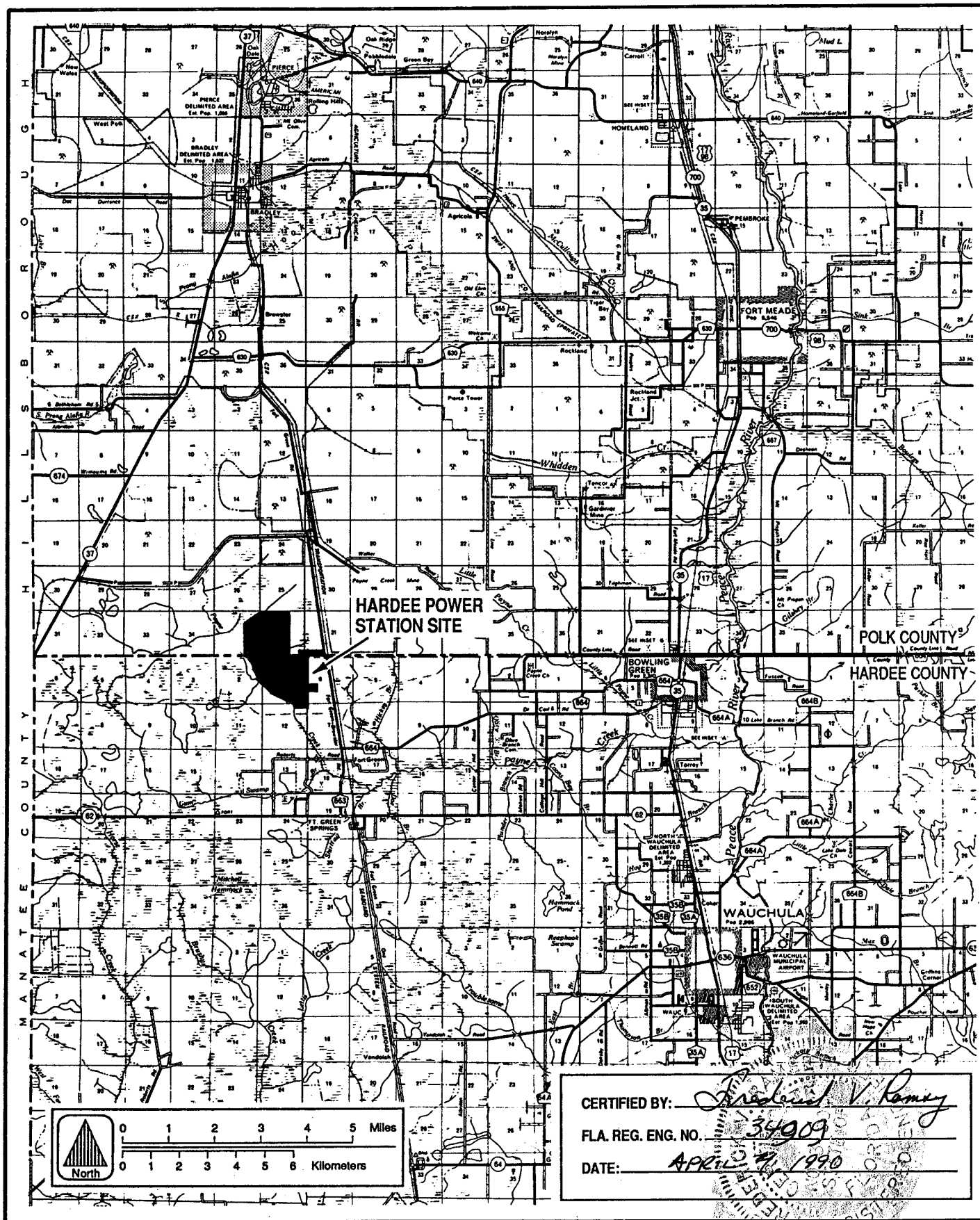


Figure 2 HARDEE POWER STATION SITE LOCATION

Hardee Power Station

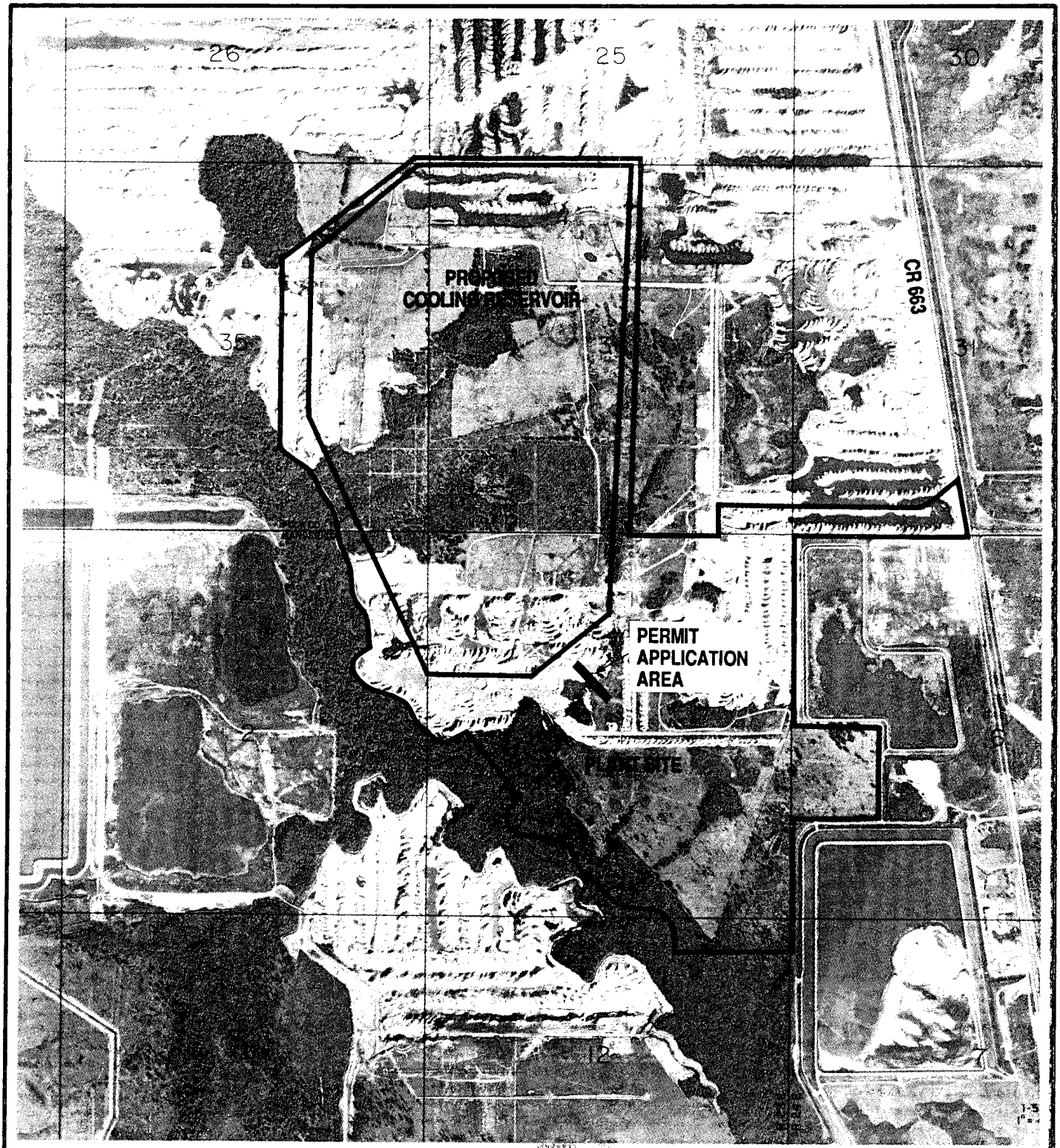
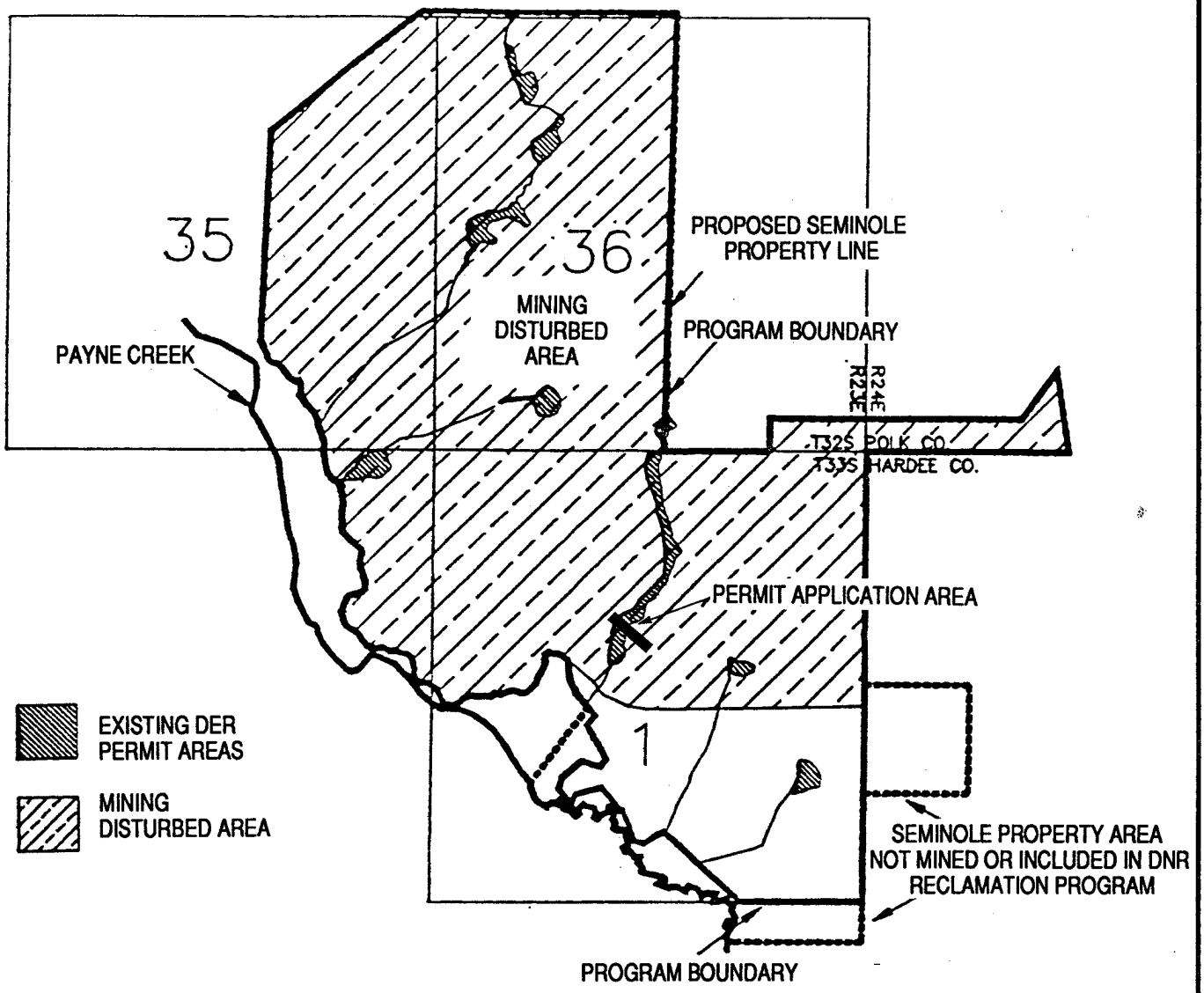


Figure 3 HARDEE POWER STATION SITE BOUNDARY AND PERMIT APPLICATION AREA

Hardee Power Station



North

0 1000 2000 Feet

0 500 Meters

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Fla. Reg. Eng. No.: 34809

Date: April 4 1990

Figure 4 **EXISTING MINED AND PERMITTED AREAS AT HARDEE POWER STATION SITE**

SOURCE: AGRICO RECLAMATION PLAN: AGR-PC-1, 1990.

Hardee Power Station

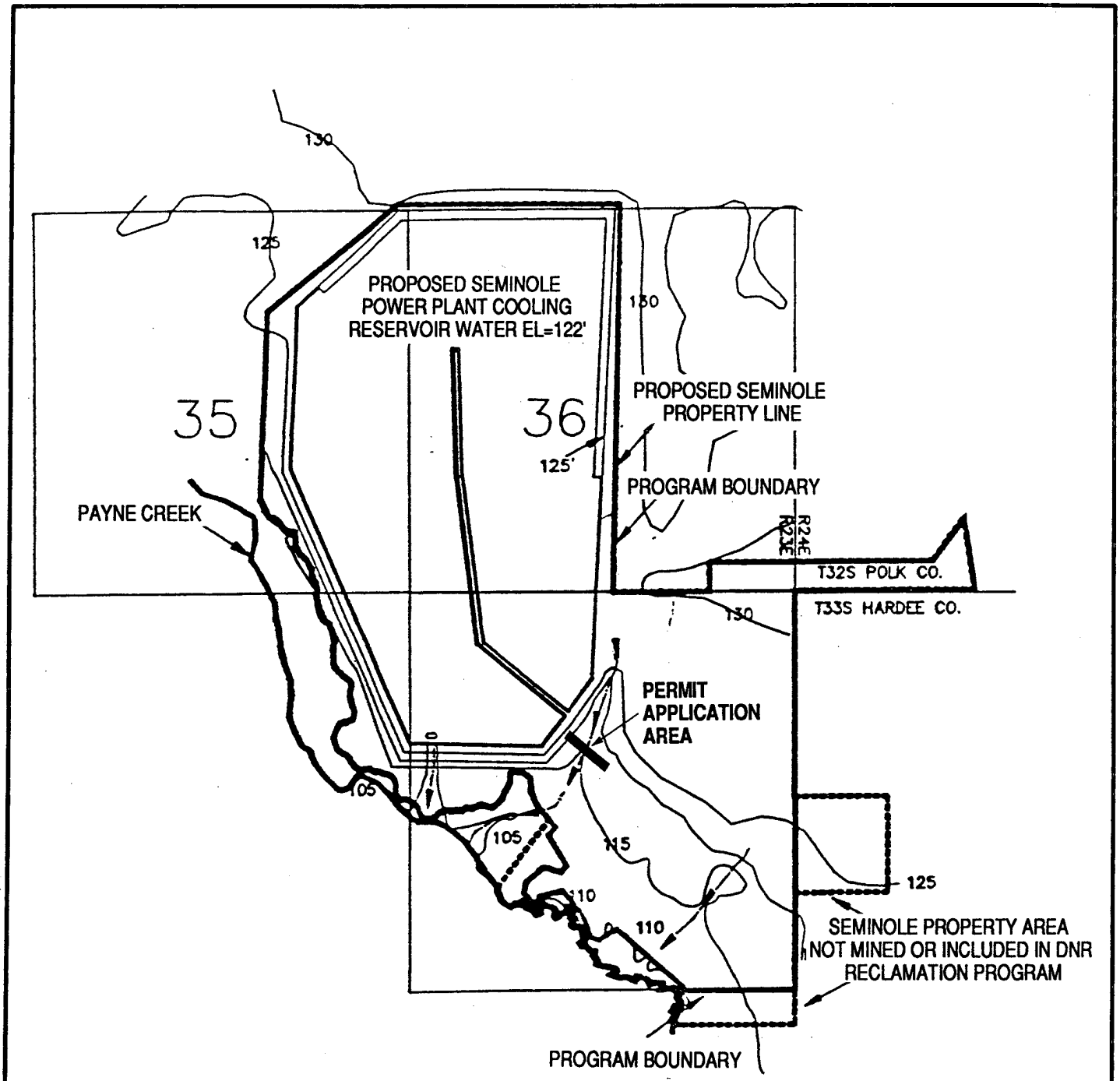
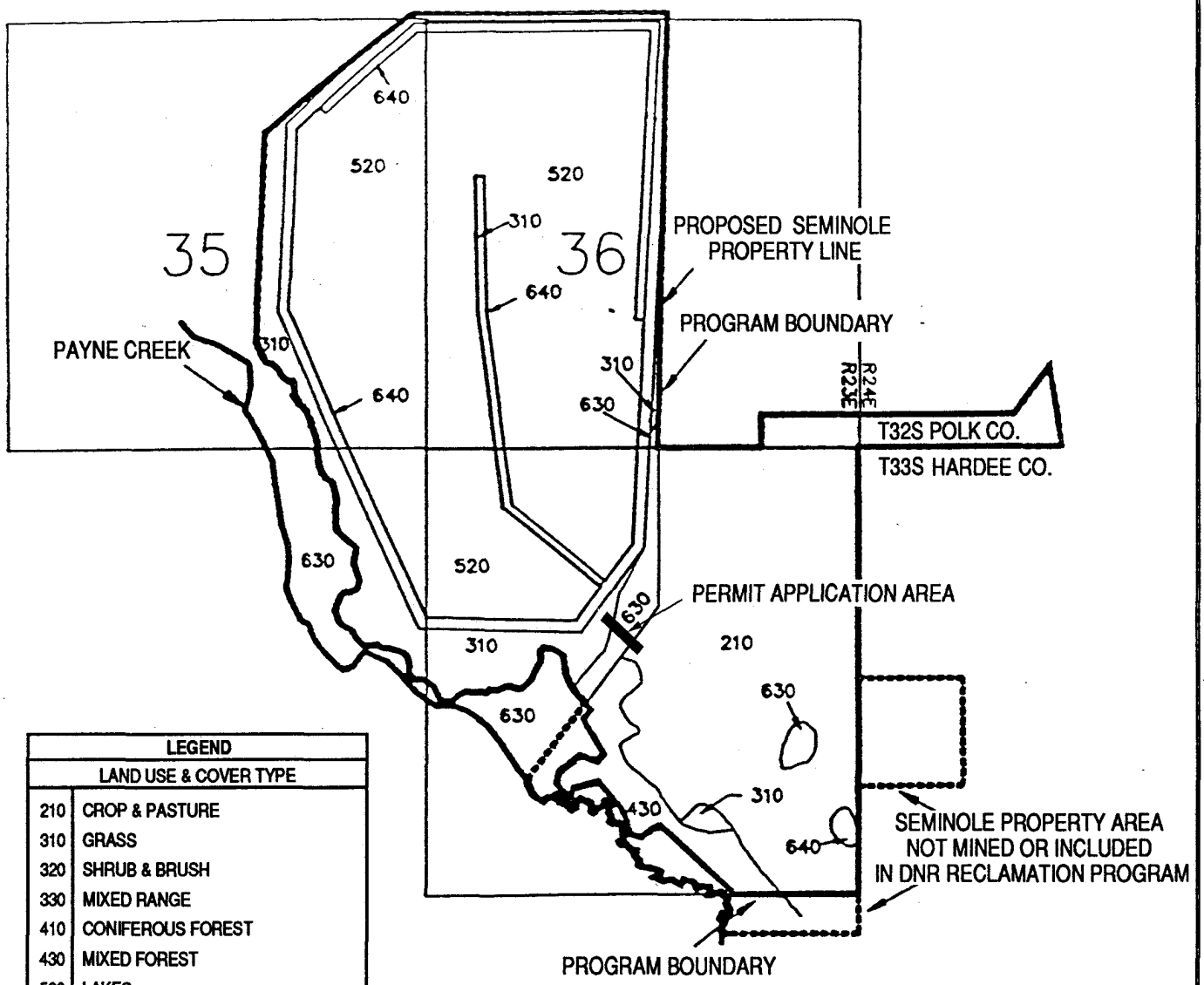


Figure 5 POST-RECLAMATION TOPOGRAPHY AND DRAINAGE AND PERMIT APPLICATION AREA (SECTION 1, T33S, R23E)

SOURCE: AGRICO RECLAMATION PLAN: AGR-PC-1, 1990.

Hardee Power Station



LEGEND	
LAND USE & COVER TYPE	
210	CROP & PASTURE
310	GRASS
320	SHRUB & BRUSH
330	MIXED RANGE
410	CONIFEROUS FOREST
430	MIXED FOREST
520	LAKES
620	HARDWOOD FOREST WETLAND
630	MIXED FOREST WETLAND
640	NONFORESTED WETLAND

North

0 1000 2000 Feet

0 500 Meters

Certified By: Frederick V. Roney

Fla. Reg. Eng. No. 34909

Date: April 4, 1990

NO. 34909
STATE OF
FLORIDA
REGISTERED ENGINEER

Figure 6 **POST-RECLAMATION VEGETATION AND PERMIT APPLICATION AREA (SECTION 1, T33S, R23E)**

SOURCE: AGRICO RECLAMATION PLAN: AGR-PC-1, 1990.

Hardee Power Station

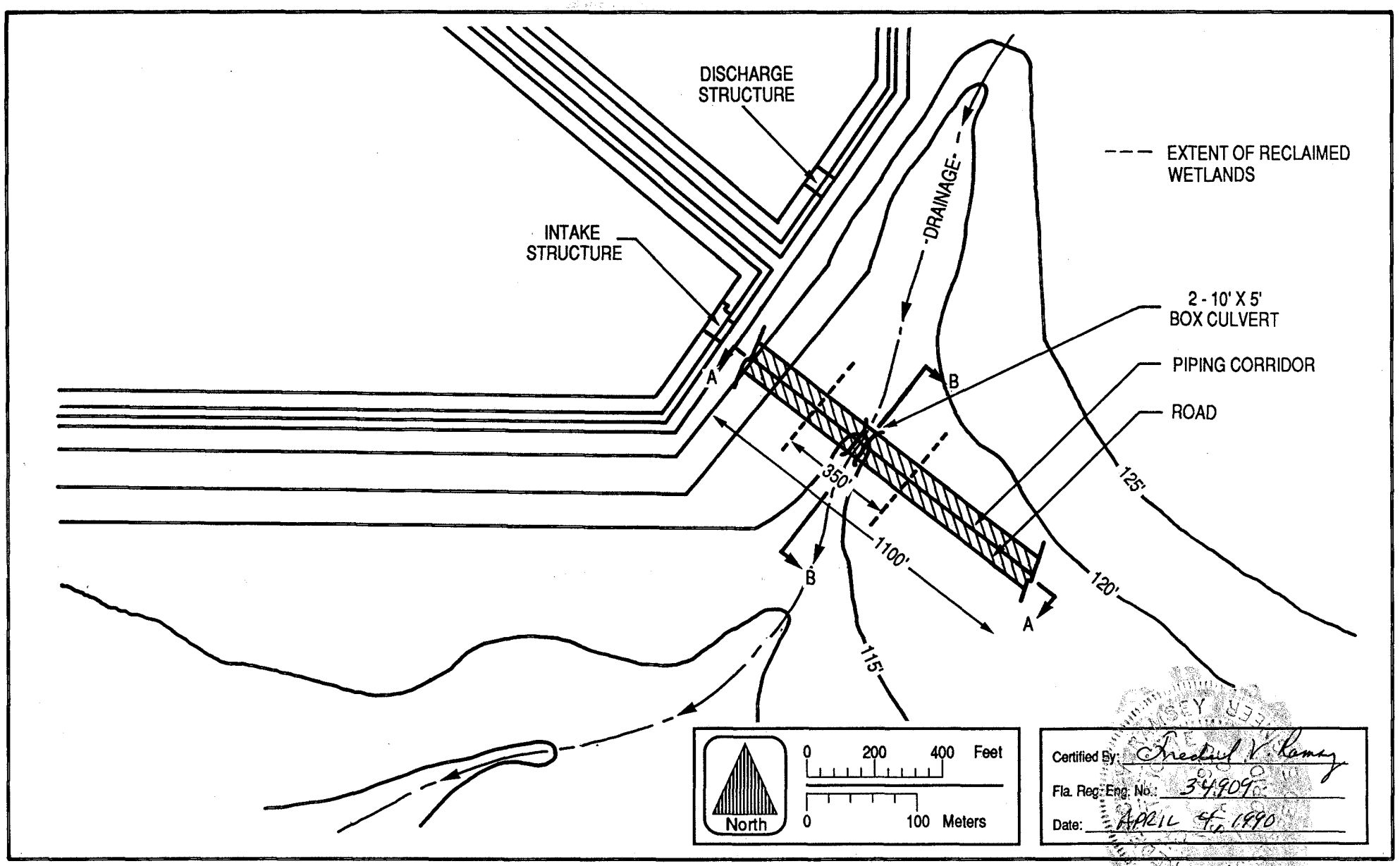
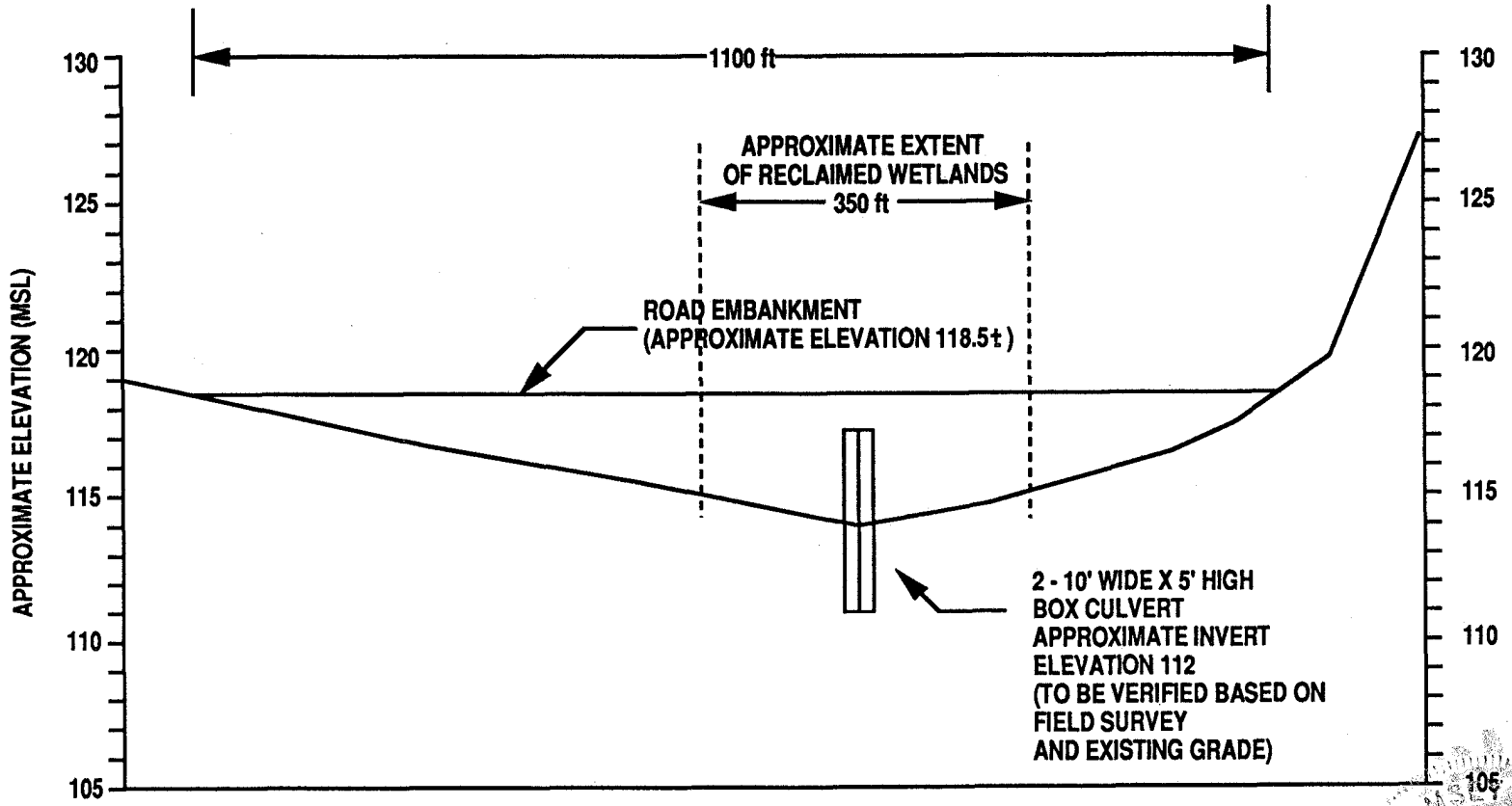


Figure 7 PLAN VIEW — LOCATION OF CROSS SECTIONS A–A AND B–B

Hardee Power Station

KBN10/SECI DF.1



APPROXIMATE SCALE: 1" = 200'

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Figure 8 CROSS-SECTION A–A: LOOKING SOUTHWEST (SECTION 1, T33S, R23E)

Hardee Power Station

KBN10/SECI DF.2

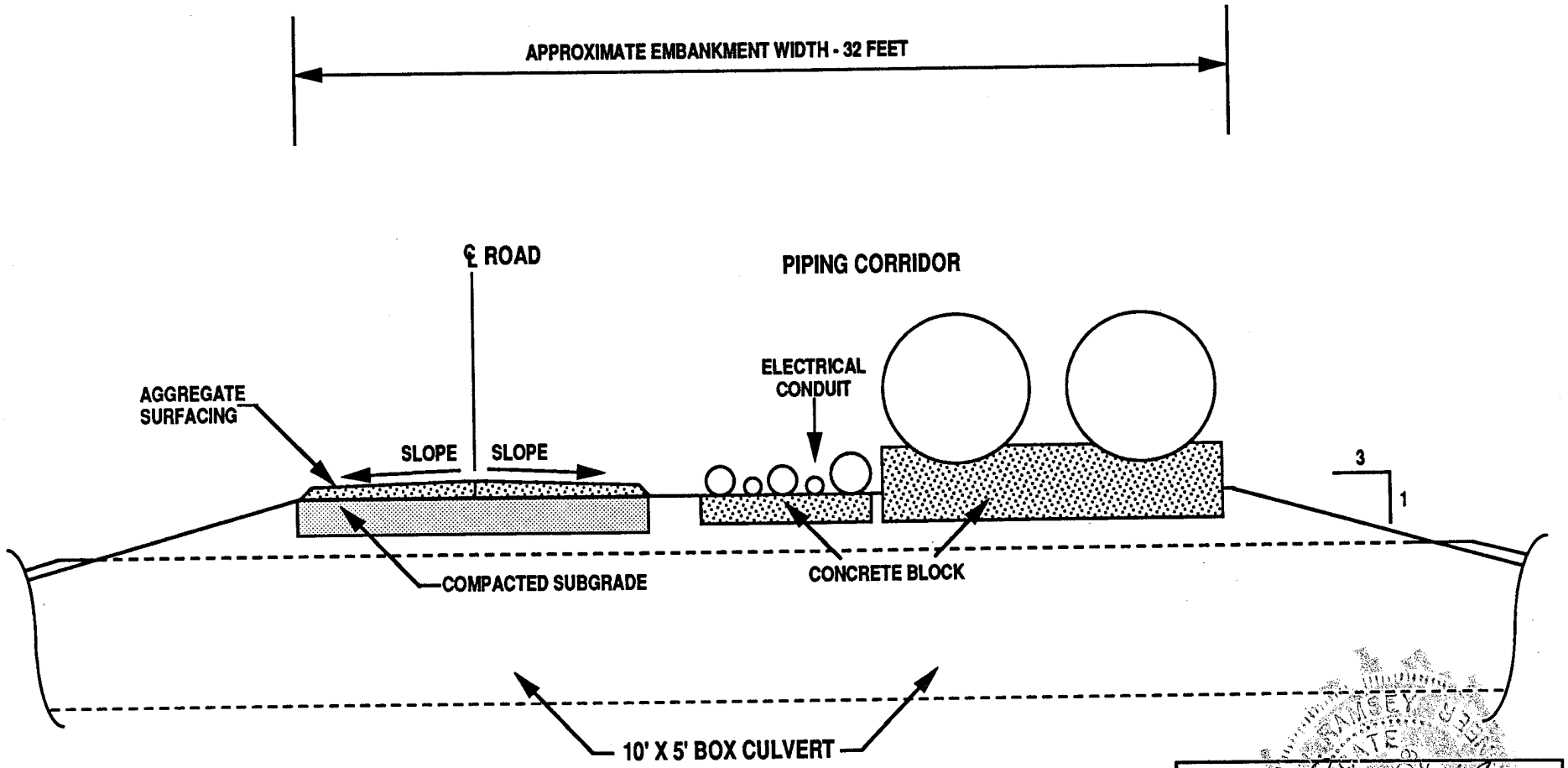

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Figure 9 CROSS-SECTION B–B: LOOKING SOUTHEAST (SECTION 1, T33S, R23E)

Hardee Power Station

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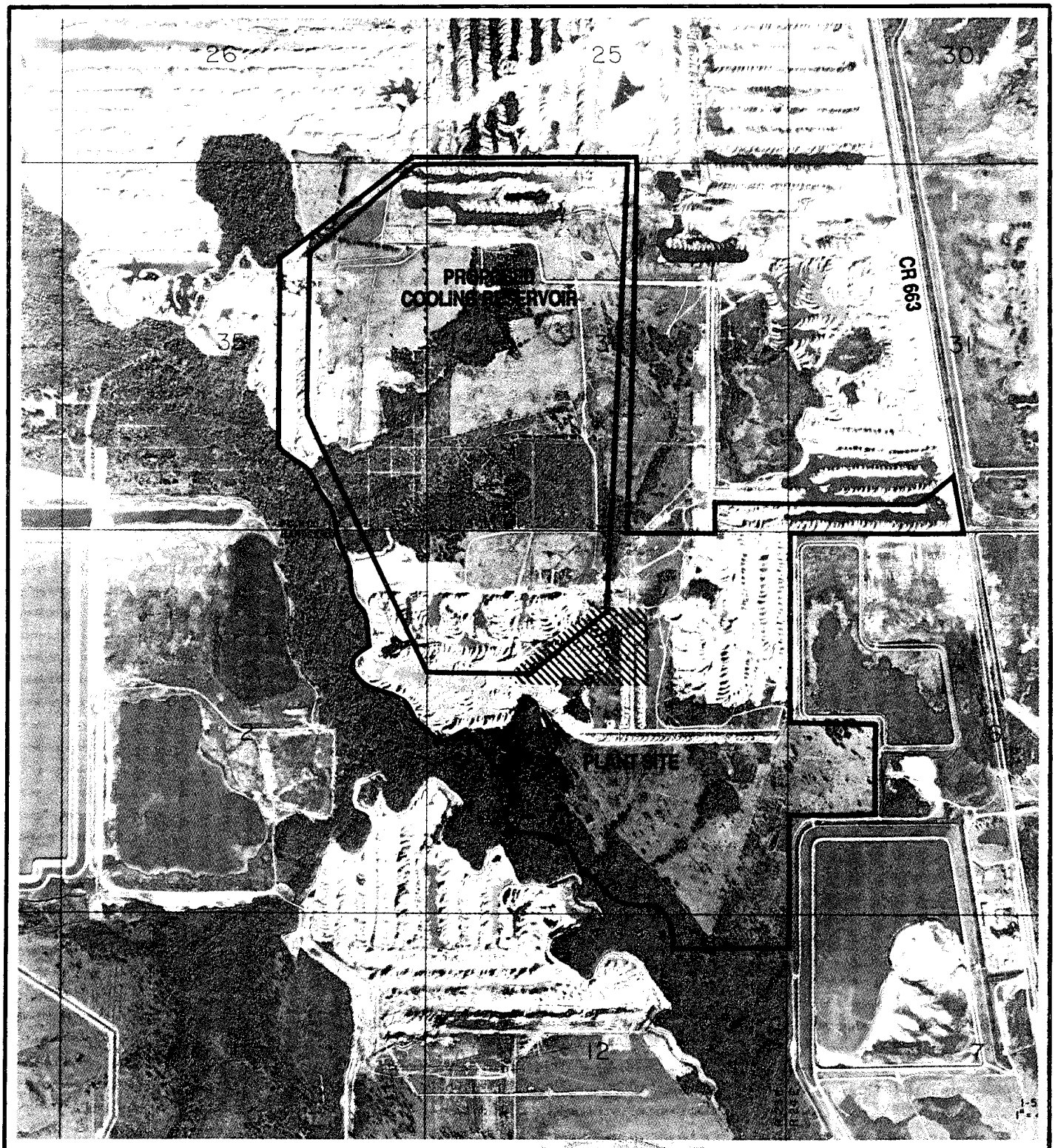

AERIAL PHOTO (AS OF 1/5/89) OF PERMIT APPLICATION AREA

Hardee Power Station

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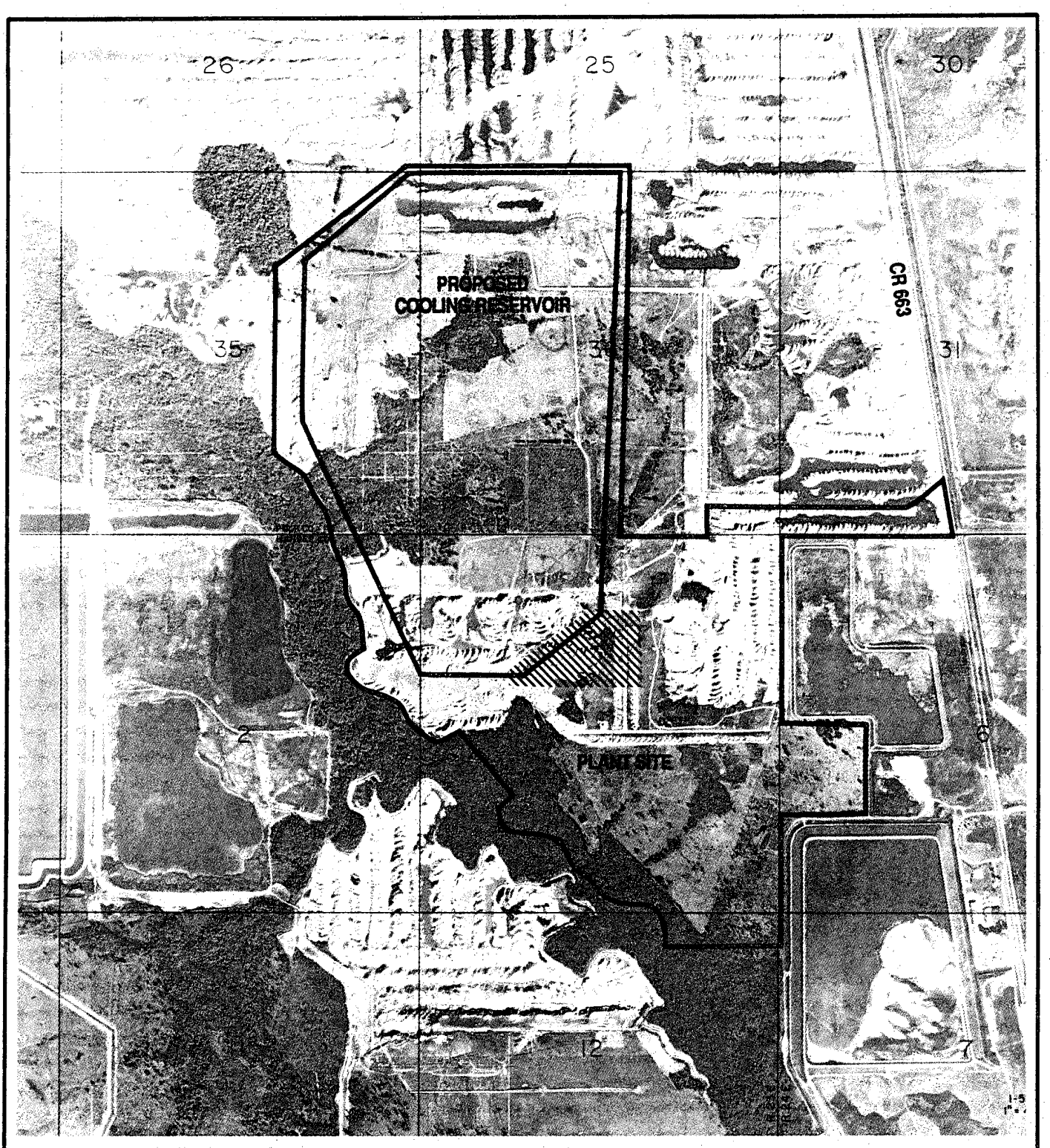

AERIAL PHOTO (AS OF 1/5/89) OF PERMIT APPLICATION AREA

Hardee Power Station

Rev. 3 03/30/90