CITY OF TALLAHASSEE

SITE CERTIFICATION APPLICATION

PURDOM UNIT 8

MARCH 1997

VOLUME 1

Cover Art by Ouida Vick

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March 7, 1997

Mr. Hamilton S. Oven, Jr.
Siting Coordination Office
Department of Environmental Protection
2600 Blair Stone Road MS480
Tallahassee, FL 32399

Dear Mr. Oven:

Subject: Purdom Unit 8 Project
Site Certification Application

Enclosed are five copies of the City of Tallahassee's Site Certification Application for a new unit (Unit 8) at the Sam O. Purdom Generating Station in the City of St. Marks, Wakulla County, Florida. The application requests certification of the existing site simultaneously with the new unit. As you know, the Florida Public Service Commission is considering the need application for this project, which was filed on December 20, 1996.

Also enclosed is a check for $75,000 to cover the application processing fee. Upon your determination of "completeness," the additional copies of the application required by the Department will be provided.

As always, the City of Tallahassee is available to discuss any aspect of this application and looks forward to a close working relationship with you during the certification process. Should you have any questions, please feel free to call me at (904) 891-8850.

Sincerely,

Jennette Curtis

Jennette Curtis
Environmental Administrator

Enclosures

SITE CERTIFICATION APPLICATION

FOR

CITY OF TALLAHASSEE

PURDOM UNIT 8

3/4/97
Harold A. Frediani, Jr., P.E. Date
Florida No. 36394
Raytheon Engineers & Constructors
145 Technology Park
Norcross, Georgia 30092

3/4/97
Darrel J. Graziani, P.E. Date
Florida No. 44685
Foster Wheeler Environmental
Corporation
759 South Federal Highway
Stuart, Florida 34994

APPLICANT INFORMATION

Applicant Official Name: City of Tallahassee

Address: City Hall, 300 South Adams Street, Tallahassee, FL 32301

Address of Official Headquarters: Same

Business Entity (corporation, partnership, co-operative): City

Names, Owners, etc.: N/A

Name and Title of Chief Executive Officer: Anita R. Favors, Interim City Manager

Name, Address, and Phone Number of official Representative responsible for obtaining certification: Jennette Curtis, Environmental Administrator
City of Tallahassee, Utility Services/Third Floor
300 South Adams Street, Tallahassee, FL 32301
(904) 891-8850

Site Location (county): Wakulla

Nearest Incorporated City: St. Marks

Latitude and Longitude: Latitude 30° 9′ 40″; Longitude 84° 12′ 01″

UTM's Northerly: 3,339.767 km
Easterly: 769.611 km

Section, Township, Range: S2, T4S, R1E

Location of any directly associated transmission facilities (counties): Wakulla and Leon (certification is sought for reconductoring as a direct project impact, not as an associated facility. See Section 6.2.)

Name Plate Generating Capacity: 250 MW (nominal)

Capacity of Proposed Additions and Ultimate Site Capacity (where applicable): N/A

Remarks: (Additional information that will help identify the applicant): Applicant is represented by: Mr. Gary Sams
Hopping Green Sams & Smith
P.O. Box 6526, Tallahassee, FL 32314
(904) 222-7500

LIST OF ORGANIZATIONS THAT PARTICIPATED IN THE PREPARATION OF THE SCA

City of Tallahassee
Tallahassee, Florida
- Overall Management and Direction

Raytheon Engineers & Constructors
Norcross, Georgia
- Engineering Contractor

Foster Wheeler Environmental Corporation
Norcross, Georgia; Stuart, Florida
- Overall Environmental Contractor

Hopping Green Sams & Smith
Tallahassee, Florida
- Environmental Attorneys for City of Tallahassee

Moore/Bowers
Tampa, Florida
- Consultant for Land Use, Planning, Zoning, Human Resources, Public Information, and Socioeconomics

Hall Planning & Engineering, Inc.
Tallahassee, Florida
- Subconsultant for Traffic Analyses

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LIST OF ACRONYMS AND ABBREVIATIONS

#/100 ml	Number per 100 Mililiters
° C	Degrees Celsius
μg/l	Micrograms per Liter
μmhos	Micromhos
μmhos/cm	Micromhos per Centimeter
μS	Microsiemens
μS/cm	Microsiemens per Centimeter
° F	Degrees Fahrenheit
$\mu g/m^3$	Micrograms per Cubic Meter
0.05% S	0.05 Percent Sulfur by Weight
2378 TCDD	Dioxin
7Q10	Seven Consecutive Day Low Flow with a Ten Year Recurrence
AADT	Average Annual Daily Traffic
AAQS	Ambient Air Quality Standards
Acfm	Actual Cubic Feet per Minute
ACSR	Aluminum Conductor, Steel Reinforced
AET	Actual evapotranspiration
agl	Above Ground Level
ANSI	American National Standard Institute
AP-42	Compilation of Air Pollutant Emission Factors
AQRV	Air Quality Related Values
ARPC	Apalachee Regional Planning Council
As	Arsenic
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
Aux	Auxiliary
AWG	American Wire Gage
BACT	Best Available Control Technology
BaP	Benzo(a)pyrene
BDL	Below Detection Level
Be	Beryllium
BEBR	Bureau of Economic and Business Research
BMPS	Best Management Practices
BOCC	Board of County Commissioners
BOD-5	5 Day Biological Oxygen Demand
BPIP	Building Profile Input Program
Btu	British Thermal Unit
Btu/ft^3	British Thermal Units per Cubic Foot
Btu/kWh	British Thermal Units per Kilowatt Hour
Btu/lb	British Thermal Units per Pound
Btu/MW-hour	British Thermal Units per Megawatt Hour
Ca	Calcium

LIST OF ACRONYMS AND ABBREVIATIONS (Cont'd)

CAA	Clean Air Act
$CaCO_3$	Calcium Carbonate
CARL	Conservation and Recreation Land
CBOD	Carbonaceous Biological Oxygen Demand
Cd	Cadmium
CEMS	Continuous Emissions Monitoring System
CFR	Code of Federal Regulations
cfs	Cubic Feet per Second
CH	Sandy Clay
CN	Cyanide
CO	Carbon Monoxide
Co	Cobalt
CO_2	Carbon Dioxide
COD	Chemical Oxygen Demand
COE	U.S. Army Corps of Engineers
CompQAP	Comprehensive Quality Assurance Plan
COT	City of Tallahassee
Cr	Chromium
CSM	City of St. Marks
CT	Combustion Turbine
CWA	Clean Water Act
DACS	Department of Agriculture and Consumer Services
dB	Decibel
dBA	Decibel (A level)
DCA	Department of Community Affairs
DEP	Department of Environmental Protection
DHR	Florida Department of State, Division of Historical Resources
DMR	Discharge Monitoring Report
DO	Dissolved Oxygen
DOT	U.S. Department of Transportation
Ds	Stack Diameter
DSM	Demand Side Management
EB	Eastbound
EEI	Edison Electric Institute
EMA	Ecosystem Management Area
EMF	Electric and Magnetic Fields
EMS	Emergency Medical Services
EPA	U. S. Environmental Protection Agency
EPRI	Electric Power Research Institute
EPT	Etheroptera/Pleucoptera/Trichoptera
ESP	Electrostatic Precipitators
F.A.C.	Florida Administrative Code
F.S.	Florida Statutes

LIST OF ACRONYMS AND ABBREVIATIONS (Cont'd)

FAA	Federal Aviation Administration
FAAQS	Florida Ambient Air Quality Standards
FARCs	Florida Ambient Reference Concentrations
FBN	Fuel Bound Nitrogen
FCMP	Florida Coastal Management Program
FDACS	Florida Department of Agriculture and Consumer Services
FDBF	Florida Department of Banking and Finance
FDE	Florida Department of Education
FDEP	Florida Department of Environmental Protection
FDEP-MRD	Florida Department of Environmental Protection, Marine Resources Division
FDLES	Florida Department of Labor and Employment Security
FDNR	Florida Department of Natural Resources
FDOT	Florida Department of Transportation
FEMA	Federal Emergency Management Agency
FGFWFC	Florida Game and Fresh Water Fish Commission
FGS	Florida Geological Survey
FGT	Florida Gas Transmission
Fl	Fluoride
FLMs	Federal Land Managers
FLUCCS	Florida Land Use and Cover Classification System
FNAI	Florida Natural Areas Inventory
FPC	Florida Power Corporation
FR	Federal Register
ft	Foot
ft/day	Feet per Day
ft/sec	Feet per Second
ft^2/day	Square Feet per Day
FWENC	Foster Wheeler Environmental Corporation
FWS	U.S. Fish and Wildlife Service
GE	General Electric
GEP	Good Engineering Practice
Gpd	Gallons per day
Gpm	Gallons per minute
GT	Gas Turbine
GT/STG	Gas Turbine/Steam Turbine Generator
H_2SO_4	Sulfuric Acid Mist
HAP	Hazardous Air Pollutant
HC	Hydrocarbon
HCl	Hydrochloric Acid
HCO_3	Bicarbonate
HCOH	Formaldehyde
HF	Hydrogen Fluoride

LIST OF ACRONYMS AND ABBREVIATIONS (Cont'd)

Hg	Mercury
HGSS	Hopping Green Sams & Smith
HHV	Higher Heating Value
hp	Horse Power
HPE	Hall Planning and Engineering
Hr	Hour
HRSG	Heat Recovery Steam Generator
Hs	Stack Height
IRP	Integrated Resource Planning
ISC3	Industrial Source Complex
ISCST3	Industrial Source Complex, Short-Term
ISO	International Standards Organization
IWW	Industrial Wastewater
km	Kilometers
kV	Kilovolts
kV/m	Kilovolts per Meter
kW	Kilowatt
kWh	Kilowatt hour
L_{10}	Noise Level Exceeded 10 Percent of Each Hour
L_{90}	Noise Level Exceeded 90 Percent of Each Hour
LAER	Lowest Achievable Emission Rate
lb/hr	Pounds per Hour
lb/in^2	Pounds per Square Inch
lb/mmBtu	Pounds per Million British Thermal Units
LDL	Larson-Davis Laboratories
L_{dn}	Day/night noise level
L_{eq}	Equivalent Noise Level
LHV	Lower Heating Value
ln H	Natural Log Hardness
LOS	Level of service
m/s	Meters per Second
MBAS	Methylene Blue Active Substance
MCR	Maximum Current Rating
MF/100ML	Membrane filtration/number per 100 milliliters
MFCP	Main Fire Control Panel
Mg	Magnesium
mG	MilliGauss
mg/l	Milligrams per Liter
MGD	Million Gallons Per Day
mmBtu/hr	Million British Thermal Units per Hour
Mn	Manganese
MODFLOW	Modular Three-Dimensional Finite-Difference Ground Water Flow Model

LIST OF ACRONYMS AND ABBREVIATIONS (Cont'd)

mph	Miles per Hour
msl	Mean Sea Level
MW	Megawatt
MW-hour/year	Megawatt Hour per Year
N/A	Not available
N_2	Nitrogen
NAAQS	National Ambient Air Quality Standards
NB	Northbound
NFPA	National Fire Protection Association
Ni	Nickel
$NiCl_2$	Nickel Chloride
NO_2	Nitrogen Dioxide
NOAA	National Oceanic and Atmospheric Administration
NO_x	Oxides of Nitrogen
NPDES	National Pollutant Discharge Elimination System
NR	No Restrictions
NRCS	Natural Resources Conservation Service
NSPS	New Source Performance Standards
NST	National Standard Thread
NT	Not Tested
NWFWMD	Northwest Florida Water Management District
NWS	National Weather Service
O_2	Oxygen
O_3	Ozone
OFW	Outstanding Florida Waters
OSN	Outfall Serial Number
P	Phosphorus
PAH	Polycyclic aromatic hydrocarbon
Pb	Lead
PbO_3	Lead Oxide
pci/l	Picocuries per Liter
PD	Peak Direction
pH	Negative logarithm of the concentration of hydrogen ions
PK	Peak
PM	Particulate Matter
PM (TSP)	Total Suspended Particulate Matter
PM_{10}	Particulate Matter less than 10 Microns in Diameter
POM	Polycyclic Organic Material
POR	Period of Record
POS	Plan of Study
POTW	Publicly Owned Treatment Works
ppm	Part per Million
ppmvd	Parts per Million by Volume on a dry basis

LIST OF ACRONYMS AND ABBREVIATIONS (Cont'd)

ppmvw	Parts per Million by Volume on a wet basis
PPSA	Florida Electrical Power Plant Siting Act
PSC	Public Service Commission
PSD	Prevention of Significant Deterioration
psig	Pounds per Square Inch Gauge
PVC	Polyvinyl Chloride
PWRR	Present Worth of Revenue Requirements
QA	Quality Assurance
QAPP	QA Project Plan
RARE	Roadless Area Review and Evaluation Area
RE&C	Raytheon Engineers and Constructors
RFP	Request for Proposal
RIMS	Regional Input-Output Modeling System
S-C-T	Salinity-Conductivity-Temperature
Sb	Antimony
SB	Southbound
SC	Clayey Sand
SCA	Site Certification Application
SCDHEC	South Carolina Department of Health and Environmental Control
SCE	Southern California Edison
SCF	Standard Cubic Feet
SCR	Selective Catalytic Reduction
SCRAM	Support Center for Regulatory Air Models
Se	Selenium
SiO_2	Silica, as silicon dioxide
SMCC	St. Marks City Commission
SMNWR	St. Marks National Wildlife Refuge
SNCR	Selective Noncatalytic Reduction
SO_2	Sulfur Dioxide
SO_3	Sulfur Trioxide
SPT	Standard Penetration Test
SR	State Road
STAR	Stability Array
Std.	Standard
SWPPP	Stormwater Pollution Prevention Plan
TDG	Total Dissolved Gases
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TPY	Tons per Year
TRB	Transportation Research Board
Ts	Stack Exit Temperature
TSP	Total Suspended Particulates
TSS	Total Suspended Solids

LIST OF ACRONYMS AND ABBREVIATIONS (Cont'd)

TTN	Technology Transfer Network
USCS	Unified Soil Classification System
USDA	United States Department of Agriculture
USDC	United States Department of Commerce
USDI	United States Department of Interior
USFS	U.S. Forest Service
USFWS	U.S. Fish & Wildlife Service
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
V	Vanadium
VOC	Volatile Organic Compound
Vs	Stack Exit Velocity
WB	Westbound
WMA	Wildlife Management Area
WWTF	Wastewater Treatment Facility
YSI	Yellow Springs Instruments

LIST OF FREQUENTLY USED TERMS

"City of Tallahassee" or "City"	Utilized to refer to the City and the Electric Utility.
"commercial operation"	The date on which the first electricity is generated for sale. This is expected to be in May 2000.
"facility-wide caps"	The federally enforceable permit conditions which would require annual emissions of SO_2 and NO_x to remain at or below recent levels of those pollutants from Units 5, 6, and 7 and from the combustion turbines (GT1 and 2).
"guarantee point"	95°F, 50% relative humidity, firing natural gas.
"guaranteed net heat rate"	7,040 Btu/kWh (HHV) on a 95°F, 50% relative humidity while firing natural gas.
"guaranteed net power output"	232,900 kW on a 95°F, 50% relative humidity while firing natural gas.
"power output"	A nominal 250 MW.
"Project" or "Purdom Unit 8 Project"	Describes the addition of "Unit 8" and the associated modifications to the "Purdom Station," which include but are not limited to the retirement of Units 5 and 6 and future operational limits for Unit 7, Gas Turbine 1, Gas Turbine 2, and auxiliary boiler under facility-wide cap.
"Sam O. Purdom Generating Station" or "Purdom Station" or "Plant" or "Purdom Plant" or "Power Plant" or "the Facility"	Describes the equipment owned or operated by the City on the site. "Purdom Station" is used after the first usage of "Sam O. Purdom Generating Station."
"Purdom Unit 8" or "Unit 8"	Utilized to describe the new combined cycle facility, the zero discharge facility, the cooling tower, and ancillary equipment which is installed as part of the "Project."
"site"	The entire property owned by the City which is being "certified" under the PPSA.
"Unit 8 Location"	The portion of the "site" which is being developed for "Unit 8."
"zero discharge facility"	Utilized to describe the wastewater treatment facility being installed with Unit 8.

PREFACE

The City of Tallahassee (City) is a municipally owned corporation under the laws of the State of Florida. Under the City's charter, the City owns and operates the fourth largest municipal electric utility in Florida and serves approximately 88,000 customers in a service territory of 221 square miles. The City's electric utility continues to enjoy growth in the demand for electricity. The City's current and projected growth rate is approximately 2 percent per year.

The City currently contracts for a 100 MW portion of its supply side resources, 75 MW from the Southern Company and 25 MW from Entergy. In May of 2000, the 75 MW contract will expire and the City has a need to replace this resource as well as meet the increasing customer load. To meet this need, the City proposes to expand its generating capacity at its existing Purdom Generating Station located in the City of St. Marks, Florida. The existing Purdom Station has a nominal generating capacity of 112 MW (Steam Units 5 and 6 - 22 MW each; Steam Unit 7 - 44 MW, Gas Turbines 1 & 2 - 12.5 MW each) This expansion will include the addition of a nominal 250 MW combined cycle generating facility (known as Unit 8) coupled with the early permanent retirement of the existing Purdom Units 5 and 6. This will result in a net addition of over 200 MW to the City's electric system. Unit 8 will primarily burn clean natural gas and utilize Number 2 (0.05% S) diesel fuel oil as a secondary fuel. The design of Unit 8 includes many environmentally beneficial design features that result in a reduced environmental impact from the Purdom Station while the generating capacity is doubled.

The City is seeking approval for the Purdom Unit 8 Project under the Florida Electrical Power Plant Siting Act, Chapter 403, Part II, Florida Statutes (PPSA). The PPSA provides for a centralized review process for new electrical generating facilities in Florida, involving a balancing of "the increasing demand for electrical power plants with the broad interests of the public," including human health, the environment, state waters and wildlife. Under the PPSA, the Florida Public Service Commission (PSC) is the sole forum for the determination of need for a proposed facility. The Florida Department of Environmental Protection (FDEP) acts as the coordinator for the remainder of the certification process, with input from various State, regional and local agencies and ultimate disposition by the Governor and Cabinet sitting as the Siting Board. The City is concurrently seeking certification under the PPSA of its entire Purdom site.

The City submitted a "Petition to Determine Need for Electrical Power Plant - Purdom Unit 8" to the PSC on December 21, 1996. The Petition, along with supporting documentation, addresses the manner in which the Purdom Unit 8 Project will: (i) meet the need for electric system reliability and integrity; (ii) meet the need for adequate electricity at reasonable cost; and (iii) be the most cost-effective alternative available. Salient points of the Need Petition are summarized in Chapter 1 of this Site Certification Application (SCA).

This SCA is being filed with FDEP pursuant to Chapter 62-17, F.A.C. It addresses the environmental and socioeconomic aspects of the Purdom Unit 8 Project by presenting information on the existing natural and human environments, on the generating and associated facilities proposed to be constructed and operated, and on the impacts of those facilities on those environments. In general, the Purdom Unit 8 Project represents a major addition to the City's total generating capacity. Use of an existing site minimizes environmental impacts.

The City provided opportunities for the public to comment on the project during a number of public meetings in Tallahassee and St. Marks in the fall of 1996. Special briefings and meetings were also held with environmental groups, officials of the City of St. Marks and Wakulla County, and regulatory agencies. These comments were considered and addressed, as appropriate, in the SCA and/or separate correspondence with the individual commentors. Appendix 10.7 includes a record of the public comments obtained on the project during preparation of this SCA.

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CHAPTER 1

SUMMARY OF NEED APPLICATION

1.1 INTRODUCTION

The City of Tallahassee (City) has determined that in order to continue to provide reliable, cost-effective service to its customers, as well as to meet future load growth, it must add generating resources to replace an expiring 75 megawatts (MW) purchased power contract which terminates in the year 2000. The most cost-effective way for the City to meet this need is to construct a new 250 MW primarily natural gas fired combined cycle unit to be placed into service by May 2000. This unit will be constructed at the City's existing Sam O. Purdom Generating Station (Purdom Station) located in the City of St. Marks, Florida, and will be designated as Purdom Unit 8. The unit consists of a new combustion turbine/generator, heat recovery steam generator, steam turbine/generator and the associated auxiliary facilities.

The Purdom Unit 8 Project will have an immediate and positive impact on the City's ability to provide cost-effective utility service. Based on an evaluation conducted during the City's Integrated Resource Planning (IRP) process, the addition of Purdom Unit 8 will reduce the electric system average energy cost by approximately 11 percent in the first full year of commercial operation. This savings comes from replacing relatively high-cost purchased power and existing generation from older, less efficient units on the City's system (Purdom Units 5 and 6 will be retired once Purdom Unit 8 goes into service) with generation from a highly efficient new unit. Additionally, Purdom Unit 8 will enhance the reliability of the City's system by enabling the City to meet its reliability criteria in the year 2000 as well as providing the required reactive capability for voltage support to the southeast portion of the City's electric system.

Purdom Unit 8 is being licensed under the Florida Electrical Power Plant Siting Act (PPSA), Chapter 403, Part II, Florida Statutes and the Site Certification Application (SCA) is being filed with the Florida Department of Environmental Protection (FDEP). The City filed its Need for Power Application with the Florida Public Service Commission (PSC) on December 20, 1996. This Chapter 1 of the Site Certification Application is comprised mainly of the Executive Summary of the Need for Power Application. The full Need for Power Application, as filed with the PSC (Docket No. 961512-EM), should be consulted for details.

1.2 BACKGROUND

The City of Tallahassee is a municipal corporation which owns, operates, and maintains an electric generation, transmission, and distribution system to supply electric power in and around the City. One of the City's primary goals in the operation of its utility is to provide an adequate and reliable power supply to its customers.

1.3 THE CITY'S CURRENT POWER SYSTEM

The City currently serves approximately 88,000 customers located within a 221-square mile service territory. The City has two fossil fuel generating stations, each of which contains both steam and gas turbine electric generating facilities, a hydroelectric generating station, and a 1.33 percent undivided ownership interest in Crystal River Unit #3. Together, these generating resources provide 490 MW (net) of summer capacity. The City currently purchases power under a 75 MW contract with the Southern Company which expires on May 31, 2000, and a 25 MW contract with Entergy Power, Inc. which will terminate on March 31, 2002.

1.4 THE CITY'S PLANNING PROCESS

In late 1993, the City recognized that an opportunity would exist at the termination of the Southern Company contract to reduce the cost of supplying power to its customers. Improvements in generating technology made it clear that a new gas fired generator could be installed and operated for significantly less than the price being paid for purchased power. The City began the process of screening various generating technologies and other resources for evaluation in an Integrated Resource Planning (IRP) study.

The City's Initial IRP Study, completed in May 1995, showed that the optimal resource type for meeting the year 2000 need would be a combination of demand side management programs and a long-term base-load-type supply resource, most likely using a gas fired combined cycle technology. In order to determine the most cost-effective alternative for meeting the year 2000 need, the City conducted a competitive Request for Proposal (RFP) process in parallel with the development and evaluation of self-build options.

On August 31, 1995, the City released an RFP for the supply of electric capacity and energy. This RFP solicited proposals for purchased power and/or generating Projects in amounts from 10 MW to 250 MW. A total of 1,410 MW was submitted in response to the request for up to 250 MW of supply-side resources, including five external proposals and two alternatives proposed by the City. All of these proposals included gas fired capacity, and some also included options for additional purchased power.

After an extensive evaluation process, the City selected the Purdom Unit 8 alternative as the best economic choice for meeting the year 2000 need for power. This unit has a guaranteed heat rate of 7,040 Btu/kWh at an ambient temperature of 95°F while firing natural gas. The total construction cost of Purdom Unit 8 is approximately $434/kW exclusive of contingency, capitalized interest, and transmission upgrades and based on a rating of 251,054 kW at ISO conditions). Under base case planning assumptions, the resource plan including Purdom Unit 8 produces savings of approximately $91 million in Present Worth of Revenue Requirements (PWRR) over a 20-year period compared to the next best alternative identified through the RFP process. The Purdom Unit 8 Project also performs best under a wide range of alternative future scenarios identified during the evaluation process.

1.5 OTHER CONSIDERATIONS

1.5.1 Load Forecast

The City's load forecast shows that summer peak demand is projected to grow at a rate of approximately 1.8 percent over a 20-year planning horizon. Although load growth is not the primary driver in the need for additional generating resources in 2000, load growth before and after that date has an impact on the selection of the most cost-effective power supply alternative.

1.5.2 Demand Side Management

The City has implemented demand side management (DSM) programs, which make a significant contribution in reducing demand and energy requirements. While DSM programs can frequently be effective in reducing or delaying utilities' requirements for future capacity additions, there is insufficient DSM potential to avoid the addition of Purdom Unit 8, or to delay its in-service date beyond 2000. The City has a sudden need for additional power supply or sources in the year 2000 as a result of the termination of the purchased power contract for 75 MW from the Southern Company.

DSM nevertheless remains an important part of the City's resource mix. Without existing and proposed DSM, the City would have had to add generating capacity one to two years earlier than currently scheduled in order to continue to meet its 17 percent reserve margin reliability criterion. In addition, DSM defers future combustion turbine unit additions in the later years of the City's planning horizon, thereby producing approximately $16 million PWRR in savings to the City's electric customers.

1.5.3 Reliability Considerations

Purdom Unit 8 enhances the reliability of the City's electric system in a number of ways. It enables the City to continue to meet its reliability criteria when the purchased power contract with the Southern Company expires in May 2000. In addition, the City has determined that the most effective system reactive supply strategy requires at least one unit on line at the Purdom Station in order to provide adequate voltage support to the southeast portion of the City's system. Otherwise, low voltage can become a problem during periods of high load. Purdom Unit 8 will enable the City to supply the needed reactive power by a unit that is expected to be dispatched full time and at a much lower cost than any of the other existing units currently located at the Purdom site.

1.5.4 Consequences Of Delay

A delay in the in-service date for Purdom Unit 8 would have a substantial impact on the cost of power to the City's retail customers. Such a delay could cost customers approximately $947,000 per month. This increased cost would result from the need to replace the Southern Company power purchase with another short-term purchase at a relatively high cost, and from the loss of an efficient new generating resource to displace higher cost generation from existing units on the City's system.

A delay of Purdom Unit 8 would also have negative environmental and system operations impacts. Such a delay would require the City to consume more fuel to serve the same amount of load, thereby increasing the air emissions slightly in the area around Tallahassee. It is also possible that more fuel oil might be consumed in the case where this new unit is delayed and the existing system were called upon to continue to serve the City's load after the expiration of the purchased power contract.

Additionally, a delay could cause an immediate shortfall of adequate capacity and require reliance on transmission tie lines to provide adequate emergency power when the City experiences a forced outage. If Purdom Unit 8 is not on line by May 2000, the City's resource portfolio will be 88 MW below the amount needed to maintain an appropriate reserve margin. This shortfall could be covered by short-term purchases, but such purchases would be made at substantially higher costs than those associated with the Purdom Unit 8 Project.

1.5.5 Consistency With Statewide Need

The construction of Purdom Unit 8 will not result in excess generating capacity on a statewide basis. Purdom Unit 8 has been included in the most recent Ten Year Site Plan for peninsular Florida. Even with the addition of Purdom Unit 8 and the other new generating units shown in that plan, peninsular Florida reserve margins, which are not at excessive levels today, continue to decline over the period 2000 to 2005.

1.5.6 Environmental Features of Purdom Unit 8

The Purdom Unit 8 Project has been designed to comply with all applicable environmental requirements and to minimize the impact or enhance the environmental characteristics of the Purdom Station. Environmental highlights include utilization of clean burning natural gas as the primary fuel, utilization of low sulfur diesel oil as the secondary fuel, utilization of the latest dry low-NO_x combustor technology to achieve a NO_x emission rate lower than that of other recently licensed projects, the use of a zero water discharge design which also eliminates groundwater withdrawals for the entire Purdom Station and reuse of the treated sewage effluent (which is currently discharged to the St. Marks River) from the City of St. Marks Wastewater Treatment Facility.

1.6 CONCLUSION

The construction of Purdom Unit 8 is the most cost-effective alternative, with minimal environmental impacts, available to the City to meet its customers' power supply needs. This Project will enhance the reliability of the City's system and will ensure that its customers have access to an adequate supply of electricity at a reasonable cost while ensuring compliance with all related environmental regulations.

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SITE AND VICINITY CHARACTERIZATION

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2.1 SITE AND ASSOCIATED FACILITIES DELINEATION

2.1.1 Site Location

The site for the Purdom Unit 8 Project is the existing Sam O. Purdom Generating Station, located on 63 acres within the City of St. Marks in Wakulla County, Florida (see Figures 2.1.1-1 and 2.1.1-2). The plant site is located in Section 2 of Township 4S, Range 1E; more specifically, east of State Road (SR) 363 approximately two miles south of US Highway 98. The St. Marks River is the eastern boundary of the Project site.

In addition to Unit 8, the City seeks certification, pursuant to Section 403.5175, Florida Statutes (F.S.), of the existing Purdom Station and its site (see Figure 2.1.1-3). The Project area includes the existing power plant and other existing facilities such as the fuel storage tanks, wastewater treatment facility, switchyard, parking lots, and various buildings.

There are no associated facilities proposed other than those facilities which are addressed in Chapter 6.0.

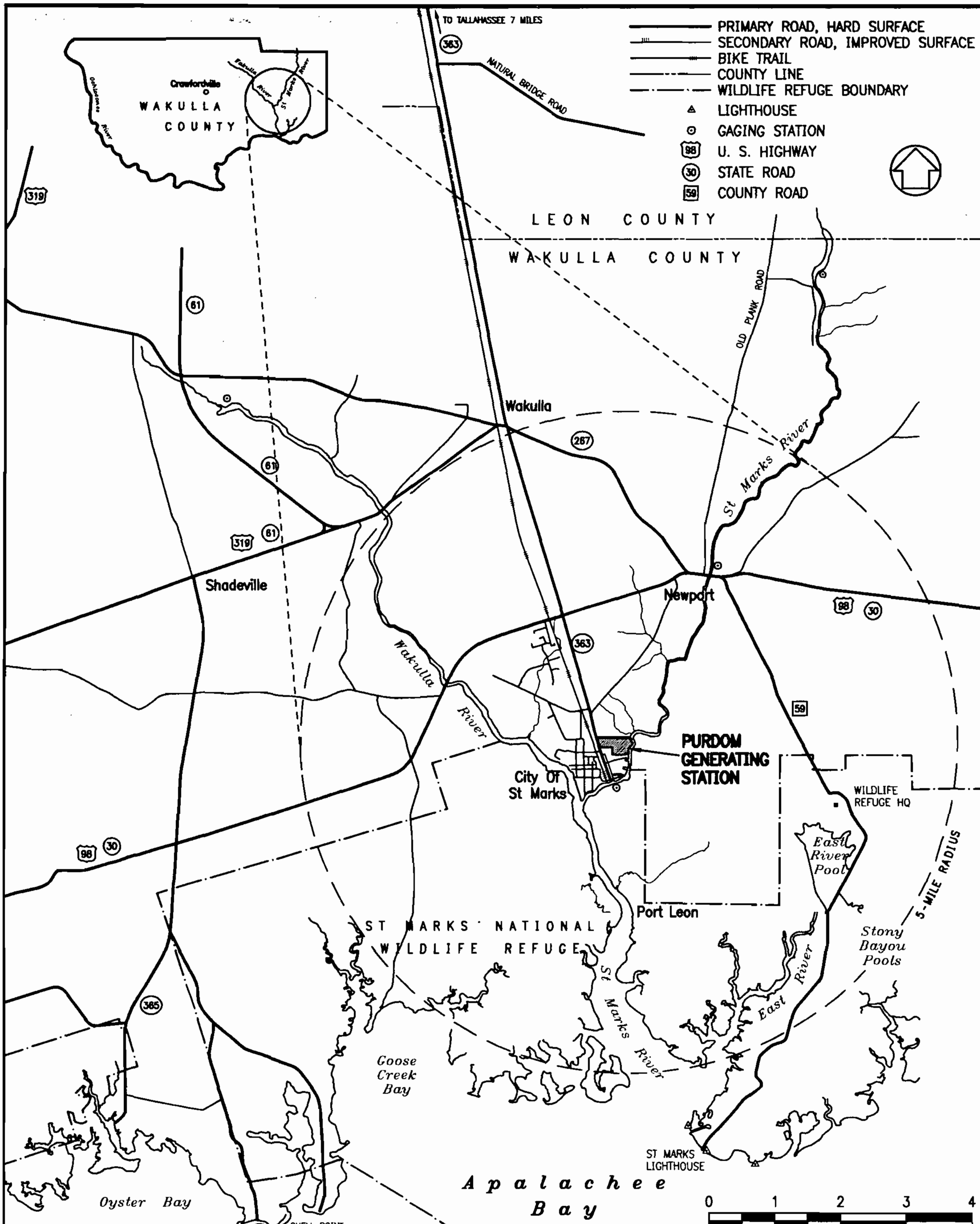
2.1.2 Existing Site Uses

An aerial photograph of the site and surrounding land uses is provided on Figure 2.1.2-1. As shown on this figure, approximately 50 percent of the site is in woodland and open space. The remaining half of the site is occupied by the existing power generation and fuel handling facilities. Those facilities include nine generating units, the retired steam electric Units 1 through 4, the active steam electric Units 5 through 7 and their associated facilities, and the combustion gas turbine (GT) Units 1 and 2. The locations of the existing units are depicted on Figure 2.1.2-2. The two discharge canals are located south of these units with the main oil storage area between them. The natural gas pipeline that provides the primary fuel for the facility enters the plant site at the intersection of SR 363 and the Purdom Station driveway and runs along the south side of the access road. The oil barge unloading facility is located on the east side of the Number 6 fuel oil storage area. The plant access road runs east-west and separates the steam generating units from the Number 6 fuel oil storage area, Number 2 fuel oil storage area, maintenance shops and warehouse, and existing combustion turbines. Number 6 fuel oil is the alternative fuel source for the existing steam units, and Number 2 fuel oil is the alternative fuel for the combustion turbines.

The Purdom Station switchyard is scheduled to be refurbished in the next several years. Construction on the refurbishment is scheduled to be completed no later than the summer of 1999. This work was planned independently of the Unit 8 installation and is intended to replace obsolete equipment and upgrade the switchyard design and functionality.

2.1.3 Adjacent Properties

Surrounding land uses include industrial uses to the north and south, the privately owned and publicly managed Aucilla Wildlife Management Area (WMA) to the east across the St. Marks



SOURCE: FOSTER WHEELER ENVIRONMENTAL CORP, 1997; MOORE/BOWERS, 1997

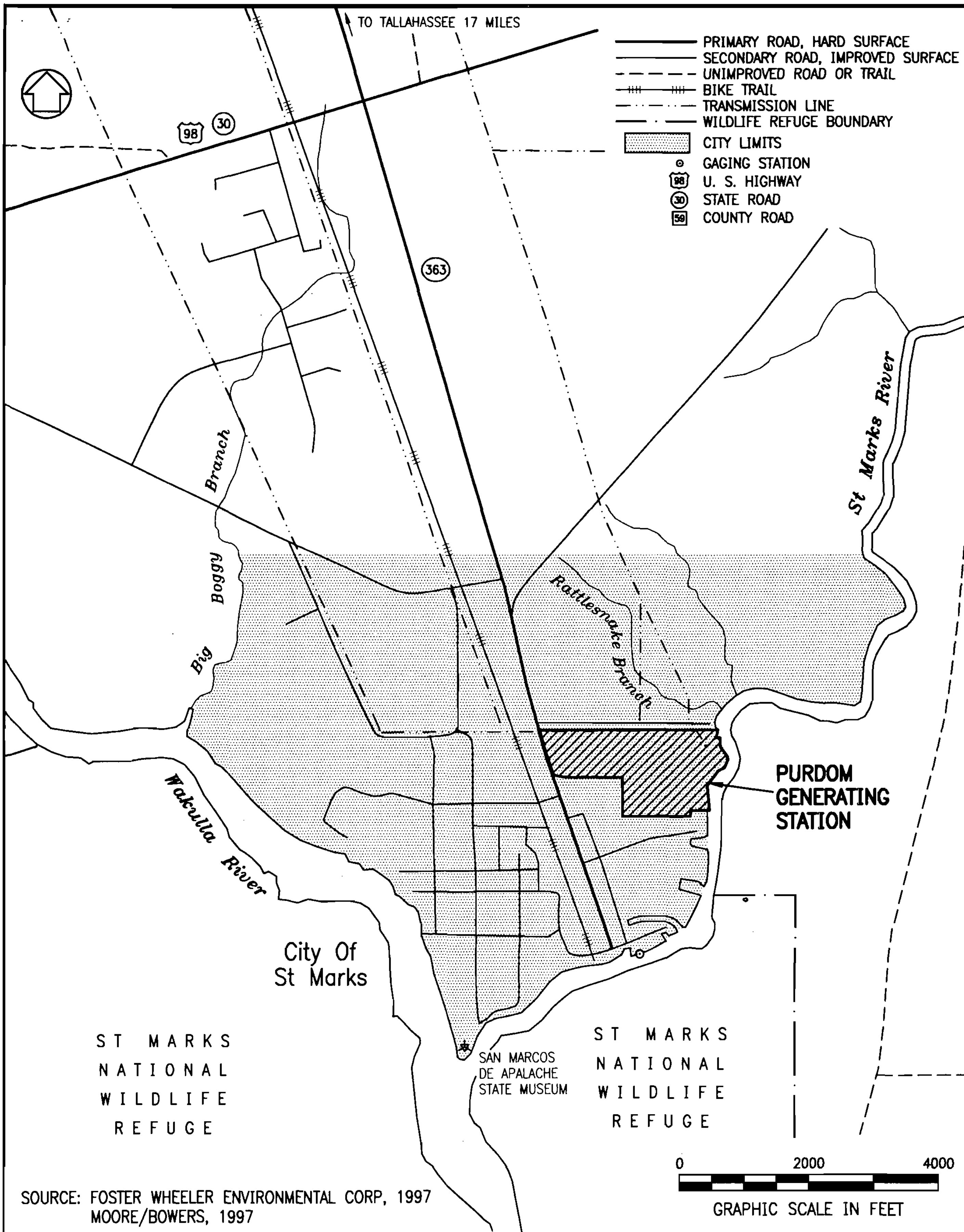
CITY OF TALLAHASSEE

SITE LOCATION MAP

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.1.1-1

PLOT DATE MAR 1, 1997, 1996 C:\15840002\----\00000-35.DWG



SOURCE: FOSTER WHEELER ENVIRONMENTAL CORP, 1997
MOORE/BOWERS, 1997

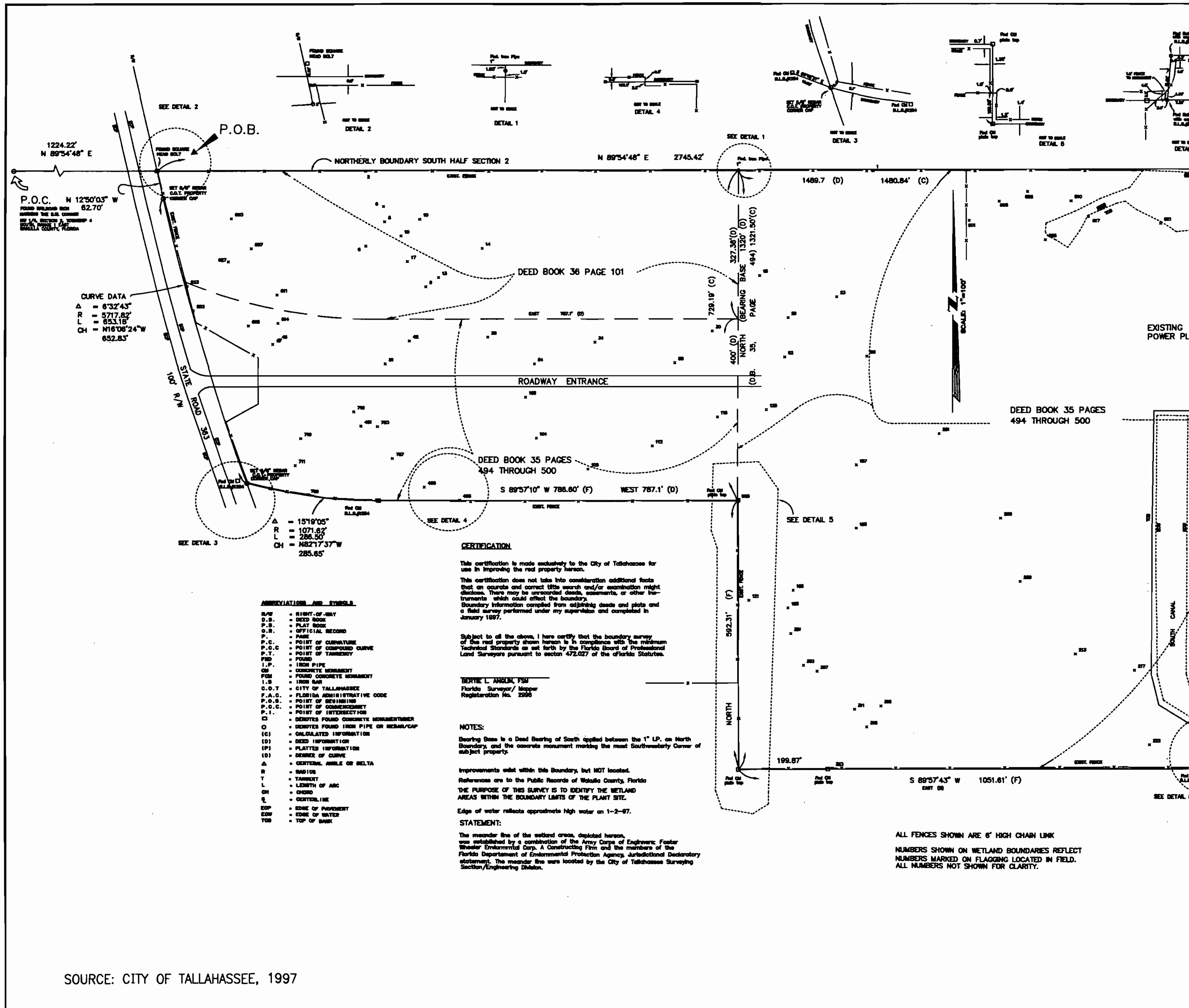
PLOT DATE MAR 1, 19976 C:\15840007\---\00000-33.DWG

CITY OF TALLAHASSEE

SITE LOCATION

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.1.1-2



EXISTING PURDOM STATION AND ITS SITE

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.1.1-3

PLOT DATE FEB 27, 1997 C:\1584000\---\00000-38.DWG

SOURCE: FDOT, 1994; MOORE/BOWERS, 1997
CITY OF TALLAHASSEE, 1997

SAM O. PURDOM GENERATING STATION SITE

1" = 200'

0 200 400

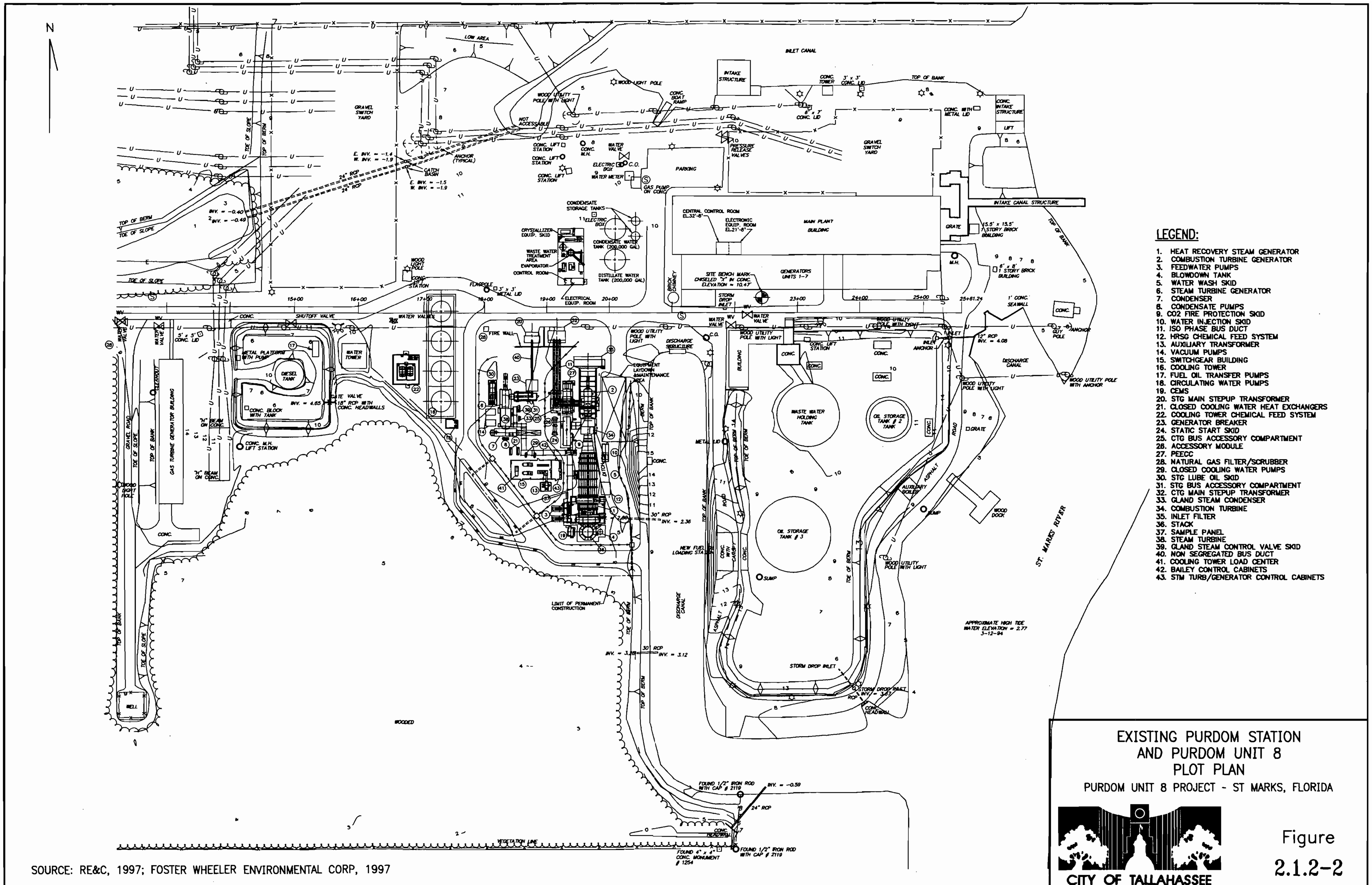
GRAPHIC SCALE IN FEET

AERIAL PHOTOGRAPH OF THE PURDOM GENERATING STATION AND SURROUNDING AREAS

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

CITY OF TALLAHASSEE

Figure 2.1.2-1



EXISTING PURDOM STATION AND PURDOM UNIT 8 PLOT PLAN

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

CITY OF TALLAHASSEE

Figure 2.1.2-2

PLOT DATE FEB 27, 1997 C:\15840002\----\00000-38.DWG

River, and a mix of low density residential uses and scattered commercial uses to the west along SR 363.

2.1.4 Proposed Site Uses

The proposed Unit 8, the location of which is also depicted on Figure 2.1.1-3 consists of a combined cycle unit rated at a nominal 250 MW. Unit 8 is proposed to be installed on the west side of the westernmost discharge canal, south of the plant access road.

The natural gas metering and regulation station located on the plant site will be upgraded and relocated to the west on the site and there is a potential that Florida Gas Transmission will upgrade certain portions of the existing pipeline to accommodate the fuel delivery requirements. The cooling tower will be west of the steam turbine-generator. The zero discharge wastewater treatment system will be just north of the access road. A detailed description of the new unit is provided in Chapter 3.

The proposed unit will utilize the existing natural gas pipeline (after it is upgraded) for fuel delivery, and will similarly transmit the new power over the existing transmission lines (after they are reconductored). The existing Number 2 (0.4% S) diesel oil storage tank near the combustion turbines will be used for the storage of secondary fuel. Oil storage at Purdom Station will be reduced due to the retirement of Units 5 and 6. One of the large Number 6 fuel oil storage tanks will be converted to a wastewater storage tank to facilitate recycling of all plant (and the City of St. Marks) wastewaters. This oil storage tank will be closed in accordance with the procedures of Rule 62-762, Florida Administrative Code (F.A.C.) prior to conversion.

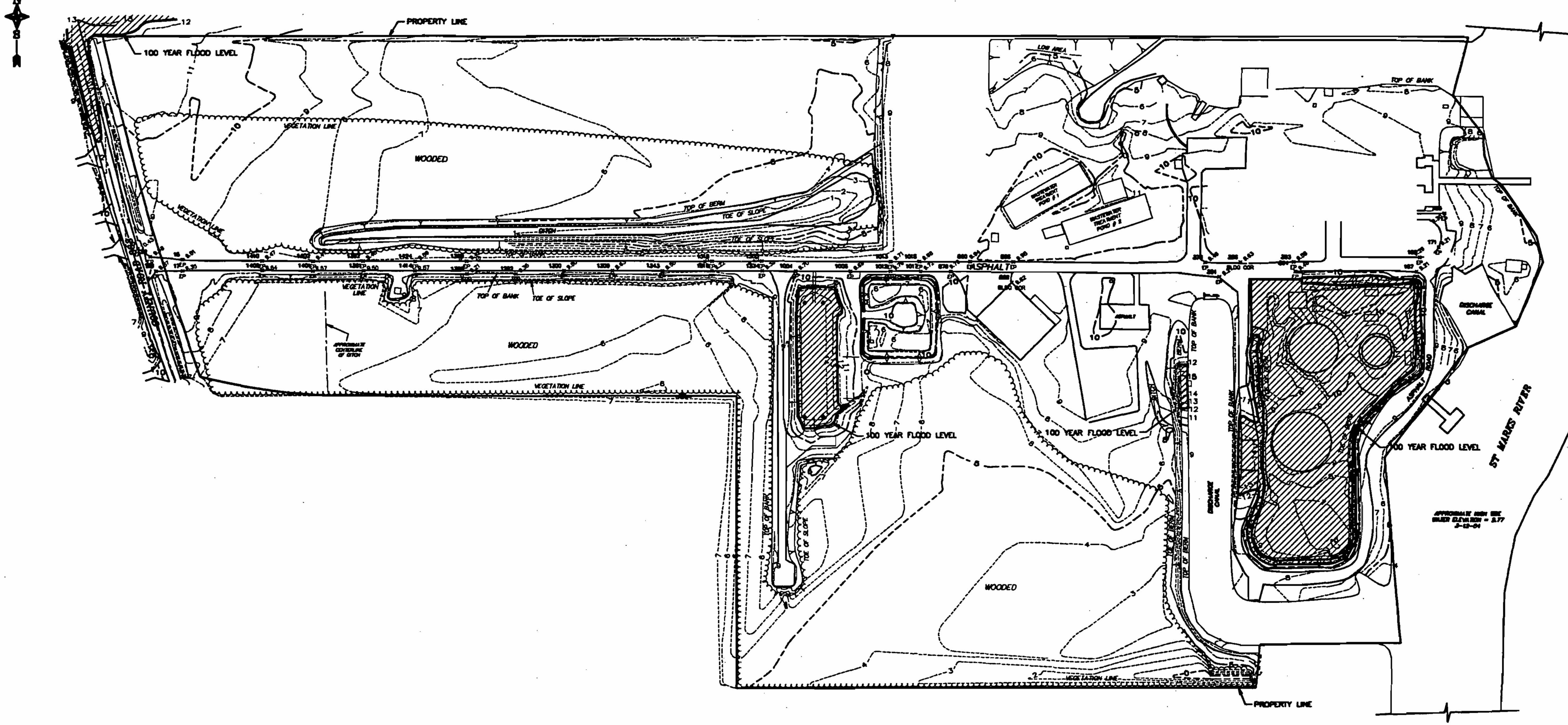
The existing Station is connected to the City of St. Marks' potable water system and sewage collection and treatment system. These connections will be kept with the addition of Unit 8. Because of the retirement of Units 5 and 6, fewer personnel will be required to operate the station; therefore, the existing water and sewer service will be adequate. Similarly, the existing plant access road and access to Port Leon Drive (SR 363) are expected to be adequate.

A new pumping station and pipeline, less than one mile in length, will be installed to deliver the effluent from the City of St. Marks Wastewater Treatment Facility to the Purdom Station for reuse. The pipeline will follow City of St. Marks rights-of-way, and will be located to avoid wetlands.

2.1.5 100-Year Flood Zone

The 100-year flood elevation in the City of St. Marks has been established (FEMA, 1979), pursuant to the requirements of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973, as 12.4 feet above mean sea level (msl). The portions of the site which are at or above that level are shown on Figure 2.1.5-1. As most of the Project is proposed for construction at locations where the existing grade is below the 100-year flood level, structures will be raised or floodproofed to that level, to provide flood protection as required by the National Flood Insurance Program (Pilkey, et al., 1983).

FEMA states that the main cause of flooding in St. Marks is from tidal surge associated with hurricanes. Although the site is mainly within the 100-year flood area, it is within an "A" zone



AREAS ABOVE THE 100 YEAR FLOOD

200 0 200 400
SCALE IN FEET

SOURCE: RE&C, 1997

100 YEAR FLOOD ELEVATION

PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

CITY OF TALLAHASSEE

Figure 2.1.5-1

(in which velocity of water or wave action is not a concern) and not within a "V" zone (in which the velocity of water and battering action of debris are concerns). Thus, flooding in St. Marks is due to gradual rise in water levels caused by hurricanes in the Gulf of Mexico. At this distance inland, violent wave action is not expected.

FEMA made a literature search of historical records of flood elevations in St. Marks and concluded that over the 136 years from 1843 to 1979, the highest flood elevation was 11.3 feet msl. In the 17 years since the study was published, that flood level has not been reached. Therefore, the 100-year flood level established by FEMA is 1.1 feet higher than the highest flood over the 153 year period of record.

2.1.5.1 References

Federal Emergency Management Agency, Federal Insurance Administration. 1979. Flood Insurance Study, Town of St. Marks, Florida, Wakulla County. September, 1979.

Pilkey, O.H. Sr., Pilkey, W.D., Pilkey, O.H. Jr., and Neal, W.J. 1983. Coastal Design. Van Nostrand Reinhold Company, New York, New York.

2.2 SOCIOPOLITICAL ENVIRONMENT

This section contains subsections on the following issues, in accordance with the SCA Guidelines:

- Governmental Jurisdictions
- Zoning and Land Use Plans
- Demography and Ongoing Land Use
- Easements, Title, Agency Works
- Regional Scenic, Cultural and Natural Landmarks
- Archeological and Historic Sites
- Socioeconomics and Public Services

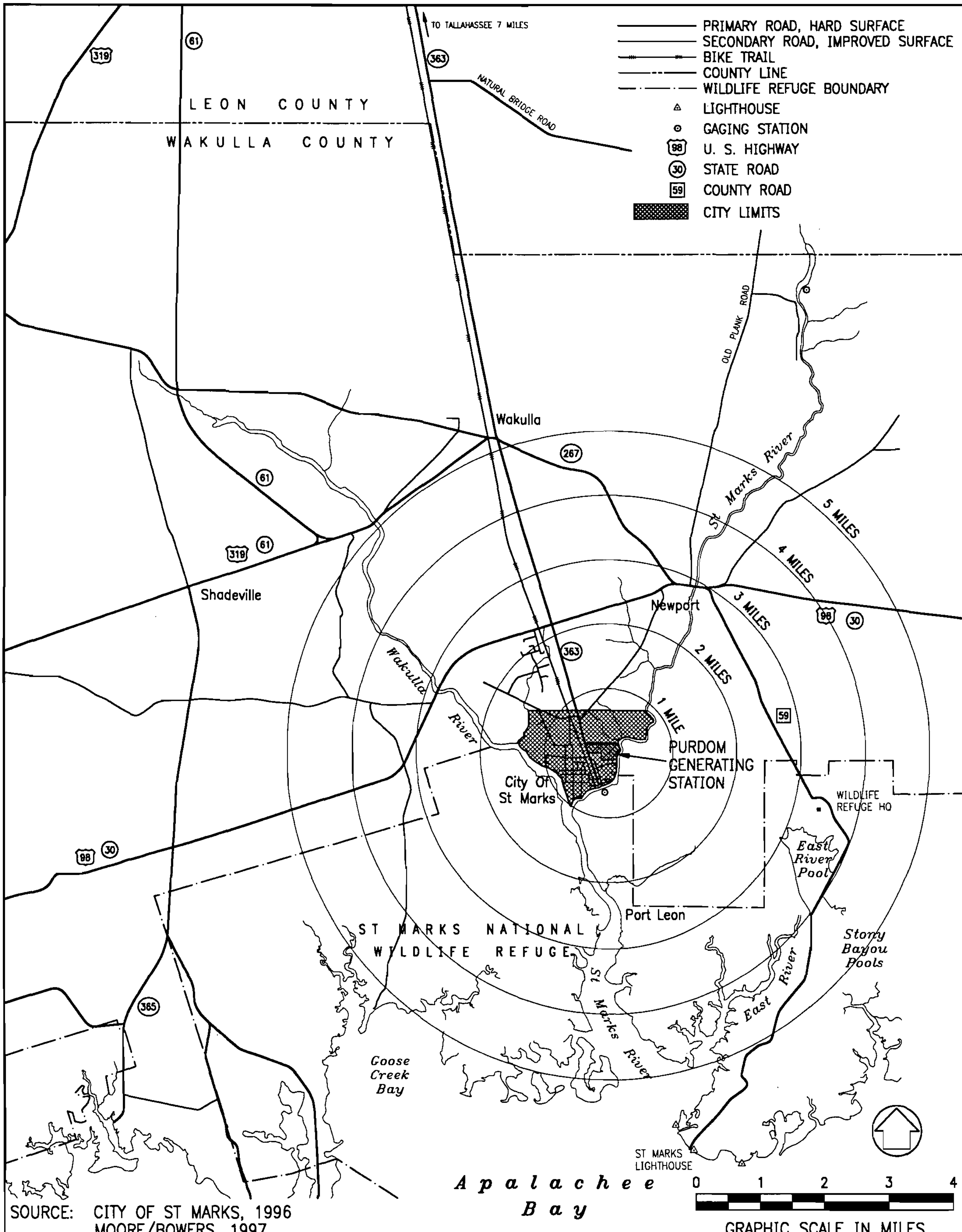
2.2.1 Governmental Jurisdictions

The Purdom Station is located in the City of St. Marks in southeast Wakulla County approximately 20 miles southeast of Tallahassee. As shown on Figure 2.2.1-1, there are no incorporated municipalities other than the City of St. Marks within a 5-mile radius of the Purdom Station.

Parks, recreation areas, and environmentally sensitive lands within 5 miles of the Purdom Station are shown on Figure 2.2.1-2. Several areas are associated with the St. Marks River and the St. Marks National Wildlife Refuge (Refuge) and Wilderness Area. The St. Marks River except that part between Rattlesnake Branch and the confluence of the St. Marks and Wakulla Rivers (near the Purdom Station), the Wakulla River, waters within the St. Marks National Wildlife Refuge, and the Big Bend Aquatic Preserve have been designated Outstanding Florida Waters (OFW). The Refuge boundaries parallel Apalachee Bay from Sopchoppy on the west to the Aucilla River on the east. Refuge headquarters are located east of the St. Marks River on Lighthouse Road. The Wilderness Area, within the Refuge, lies primarily between the St. Marks River and the Aucilla River along the coast of Apalachee Bay. The Aucilla Wildlife Management Area (WMA) is located in the eastern portion of the Refuge. The Big Bend Aquatic Preserve, designated by the Florida Department of Environmental Protection (FDEP), is located in the Apalachee Bay and includes the southern portion of the St. Marks River and East River.

Designated recreational trails in the vicinity of the Purdom Station include the Tallahassee-St. Marks Historic Railroad State Trail, the Florida National Scenic Trail, the Wakulla River Canoe Trail, and the Big Bend Historic Saltwater Paddling Trail. In 1984, the Florida Department of Transportation (FDOT) purchased 16 miles of the Tallahassee-St. Marks Railroad which had been in service for 147 years. The Tallahassee-St. Marks Historic Railroad State Trail, which was constructed and is maintained by the FDEP Division of Recreation and Parks, runs parallel to SR 363 from just south of Capital Circle in Tallahassee south to the St. Marks River. The southern two miles of the trail have been designated a segment of the Florida National Scenic Trail. The Florida National Scenic Trail was established March 28, 1983, and runs 1,300 miles north from Big Cypress National Preserve to the gulf islands. The Florida National Scenic Trail continues across the St. Marks River to historic Port Leon and continues east through the St. Marks National Wildlife Refuge. The Wakulla River Canoe Trail, approximately four miles in length, begins at SR 365 and ends at US 98. The Big Bend Historic Saltwater Paddling Trail, Florida's first legislatively designated water trail, runs from the confluence of the St. Marks and Wakulla Rivers southeasterly along the coast to the Suwannee River, a length of approximately 92 miles.

San Marcos de Apalache State Historic Site (registered as a national historic landmark November 13, 1966) is located at the confluence of the Wakulla and St. Marks Rivers. The site is managed and maintained by the FDEP Division of Recreation and Parks. Registered national historic places include Bird Hammock Indian Mounds, located west of Purdom Station on the south side of US 98.

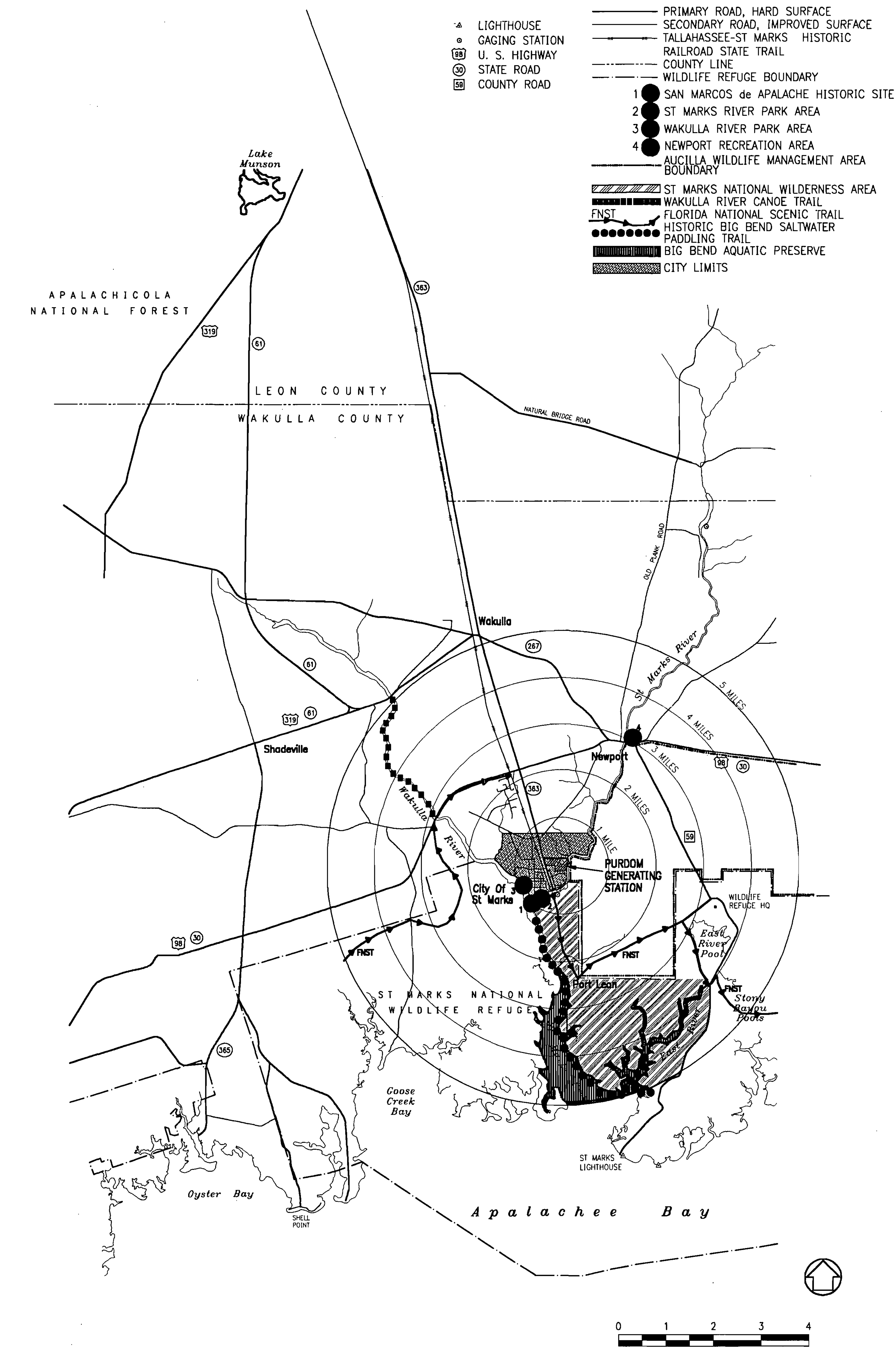


CITY OF TALLAHASSEE

GOVERNMENTAL JURISDICTIONS WITHIN FIVE MILES
1" = 2 MILES

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.2.1-1



SOURCE: MOORE/BOWERS, 1997

CITY OF TALLAHASSEE

PARKS, RECREATION AREAS AND CONSERVATION LANDS WITHIN FIVE MILES

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

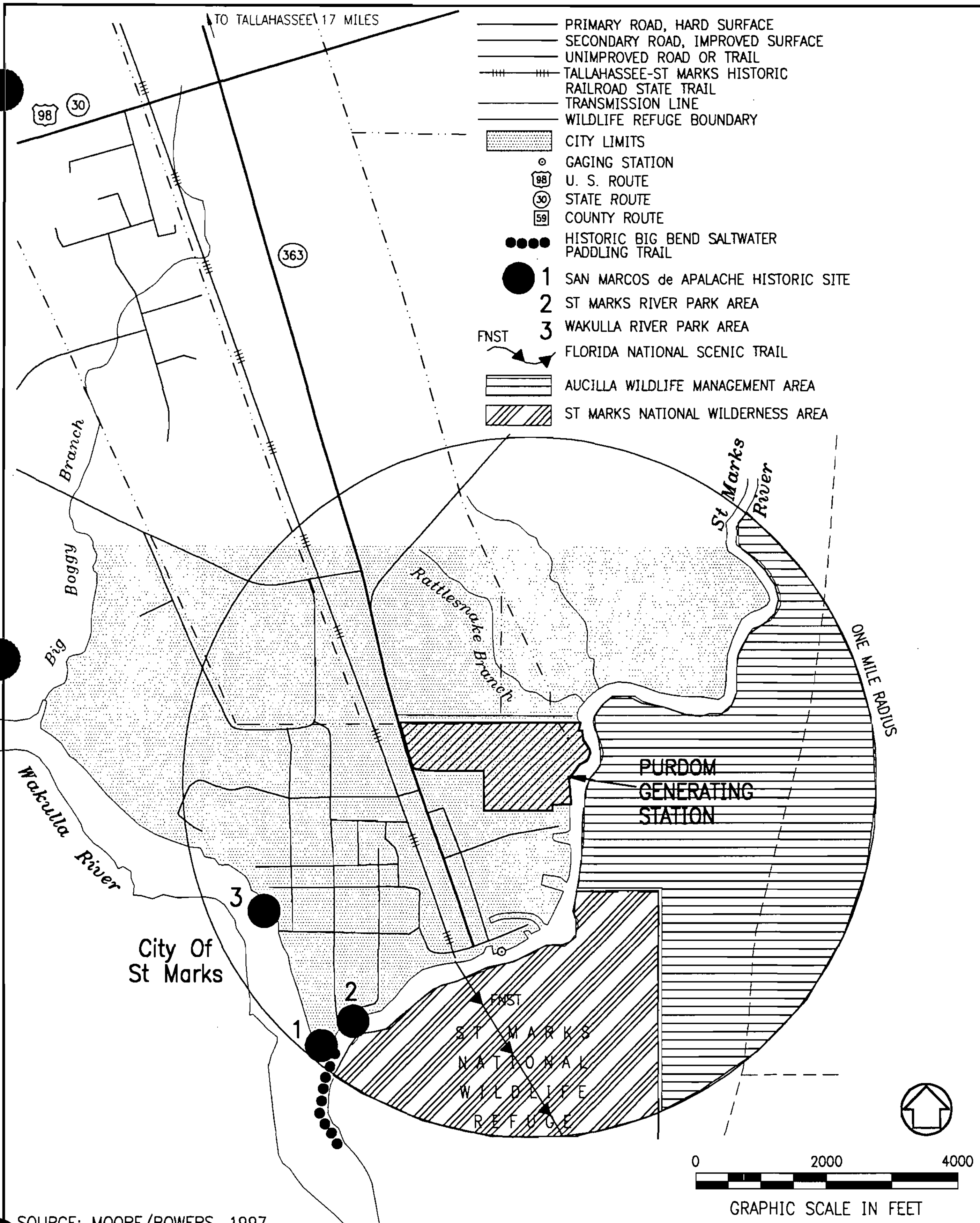
Figure 2.2.1-2

Parks within a 5-mile radius of the proposed new unit include the Wakulla River Boat Ramp (US 98), Wakulla Park Area, Newport Recreation Area, City Park (St. Marks), St. Marks Ballfield, and St. Marks Park Area.

The parks, recreation areas, and environmentally sensitive lands within a 1-mile radius of the Purdom Station are shown on Figure 2.2.1-3. The City of St. Marks owns two parks within the one-mile radius: the Wakulla River park area and the St. Marks River park area. The Wakulla River park area consists of a 2.7 acre site located 0.4 mile north of Fort San Marcos de Apalache. The land was given to the City of St. Marks as part of a land grant in 1928 and is designated for public park purposes. Park facilities include picnic tables, swings, and restroom facilities. The St. Marks River park area is 1.76 acres and is owned and maintained by the City of St. Marks. The park is located adjacent to Fort San Marcos de Apalache on the St. Marks River. Improvements include picnic tables and grills. Wakulla County owns and maintains a boat ramp adjacent to Fort San Marcos de Apalache.

The following areas are not found within a 5-mile radius of the proposed stack location of the new unit:

- National Parks
- National Forests
- National Seashores
- National Memorials or Monuments
- National Marine and Estuarine Sanctuaries
- RARE (Roadless Area Review and Evaluation) Areas
- National Wild and Scenic Rivers
- Critical Habitats of endangered species
- State Parks
- State Forests
- Areas of Critical State Concern
- Conservation and Recreation Lands (CARL)
- Save Our Rivers Lands
- Scenic and Wild Rivers
- Indian Reservations
- Military Lands
- Major private land-holdings for environmental protection



CITY OF TALLAHASSEE

PARKS, RECREATION AREAS AND CONSERVATION LANDS WITHIN ONE MILE

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.2.1-3

2.2.2 Zoning and Land Use Plans

The Purdom Station site is currently in use for power generation. The status of the site with respect to future land use and zoning is outlined in the following paragraphs.

2.2.2.1 Comprehensive Plan Future Land Use Map

As shown in Figure 2.2.2-1, the Purdom Station site is designated Industrial on the Future Land Use Map of the St. Marks Comprehensive Plan. The Industrial future land use category is described as follows in the Comprehensive Plan: "Industrial land use includes land area used for manufacturing, assembly, processing, or storage of products" (Future Land Use Element, p. 2).

Although the Plan does not specifically mention power plants as an allowed use within the Industrial future land use category, the site was in use for electricity generation at the time the Future Land Use Map was prepared. Therefore, it may be assumed that the Industrial future land use category was intended to encompass power plants. The Purdom Station site in relation to the City of St. Marks' Future Land Use Map is shown on Figure 2.2.2-1.

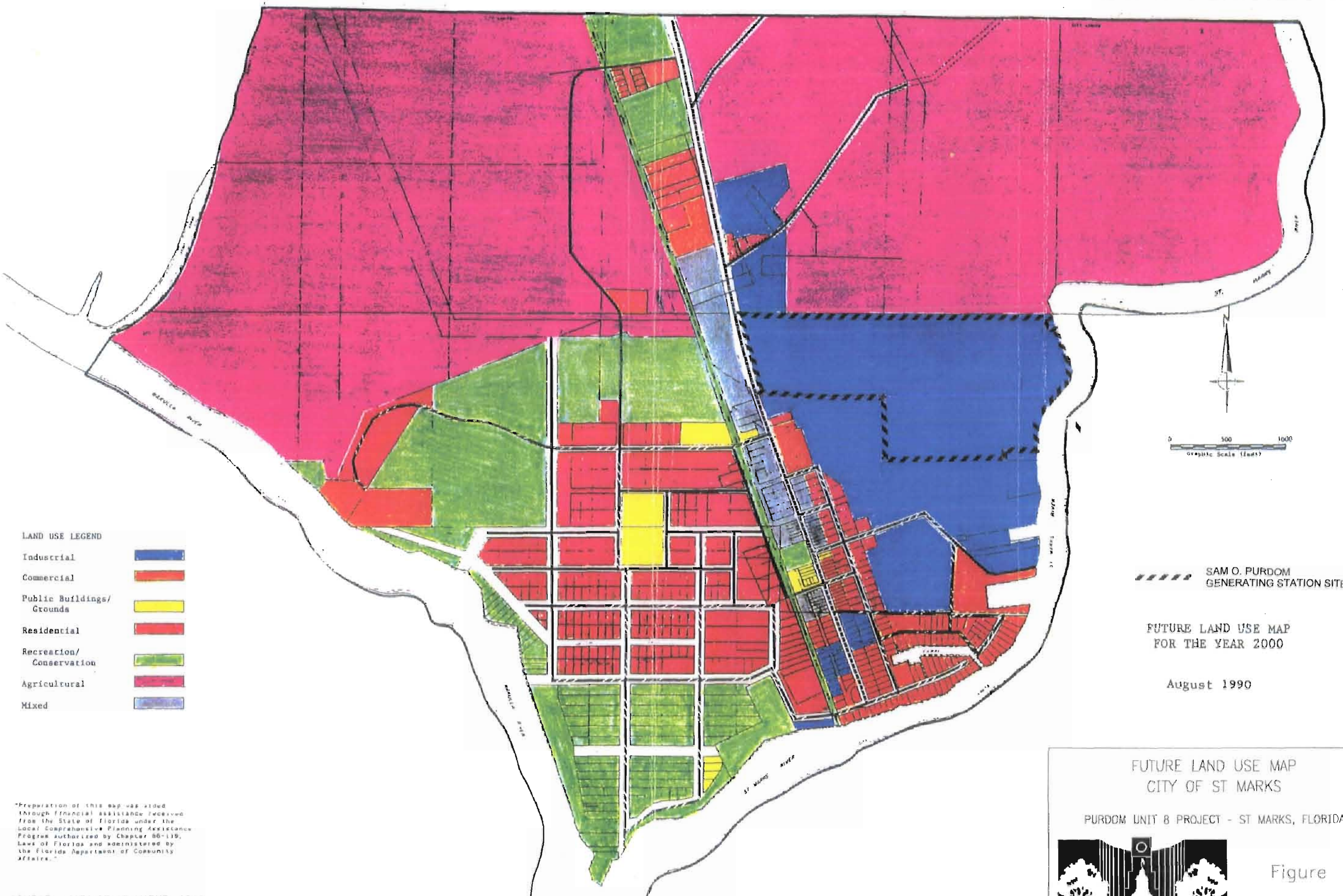
2.2.2.2 Zoning

The City of St. Marks has a draft Land Development Code which has not been adopted. Since the City of St. Marks informally refers to the Code during development reviews, the following sections discuss project zoning in terms of the draft Land Development Code. Zoning districts within the City of St. Marks correspond to the Future Land Use Map and are depicted in Figure 2.2.2-1. Section 2.01.01, p. II-6 of the Land Development Code (draft), entitled Land Use Districts, indicates:

> "Land use districts for the City/County are established in the Comprehensive Plan, Future Land Use Element, including a map. The land use districts and classifications defined in the Future Land Use Element of the City Comprehensive Plan and delineated on the Future Land Use Map shall be the determinants of permissible activities on any parcel in the jurisdiction. Refer to the Future Land Use Element of the Comprehensive Plan for the definitions of each use category."

Thus, the site is zoned Industrial. Since the Land Development Code (draft) implements the Comprehensive Plan, it provides further clarification as to the intent of the Comprehensive Plan in terms of the uses allowed in the Industrial future land use category. Section 2.02.02(I), p. II-15 of the Land Development Code (draft) describes the Industrial land use district as follows:

> "This type of use includes those wholesale and retail businesses for manufacturing, processing, storing, or distributing goods. Included in this category are uses which require primarily outdoor storage or the industrial activity itself is conducted outdoors. Such uses include, for example, LP gas storage and/or distribution exceeding 1,000 gallons, junkyards or salvage yards, recycling centers, and borrow pits (but not excavation which requires blasting)."



"Preparation of this map was aided through financial assistance received from the State of Florida under the Local Comprehensive Planning Assistance Program authorized by Chapter 86-119, Laws of Florida and administered by the Florida Department of Community Affairs."

SOURCE: CITY OF ST MARKS, 1990
MOORE/BOWERS, 1996

FUTURE LAND USE MAP
CITY OF ST MARKS

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

CITY OF TALLAHASSEE

Figure
2.2.2-1

Further, Section 2.02.03, entitled Allowable Uses within Each Land Use District, lists Industrial and Public Service/Utility uses as allowed in the Industrial land use district. Public Service/Utility uses are described in the Land Development Code (draft) as follows:

> "This group of activities includes those uses which provide essential or important public services, and which may have characteristics of outdoor storage, or potential nuisance to adjacent properties due to noise, light and glare, or appearance. Government offices or governmental agency offices specifically are not included in this group of uses. Uses include the following, and substantially similar activities, based upon similarity of characteristics:
>
> 1. Emergency service activities such as buildings, garages, parking, and/or dispatch centers for ambulances, fire, police and rescue.
> 2. Broadcasting stations, transmission towers.
> 3. Utility facilities, such as water plants, wastewater treatment plants, electricity substations serving 230 KV or greater.
> 4. Maintenance facilities and storage yards for schools, government agencies, and telephone and cable companies.
> 5. LP gas storage and/or distribution facility for up to one thousand (1,000) gallons. This shall not be construed to prevent retail sales of LP gas in canisters or similar pre-filled containers.
> 6. Airports, airfields, and truck or bus terminals." (Section 2.02.02(G), p. II-14, emphasis added)

Although generating plants are not specifically mentioned, they clearly provide essential public services and have "substantially similar activities." Indeed, some of the uses mentioned under the Public Service/Utility use, such as high voltage electricity substations, maintenance/storage yards, and large volume fuel storage facilities, are part of any power plant and specifically are part of the Purdom Station. Thus, whether the Purdom Station is considered a place for manufacturing or processing goods (i.e., generating electricity), or a use which provides essential public services and has characteristics of outdoor storage or potential nuisance to adjacent properties, it is clearly allowed within the Industrial land use district. In the first instance, it would be considered an Industrial use; in the second, a Public Service/Utility use. Both are allowed in the Industrial land use district, according to the City of St. Marks Land Development Code (draft).

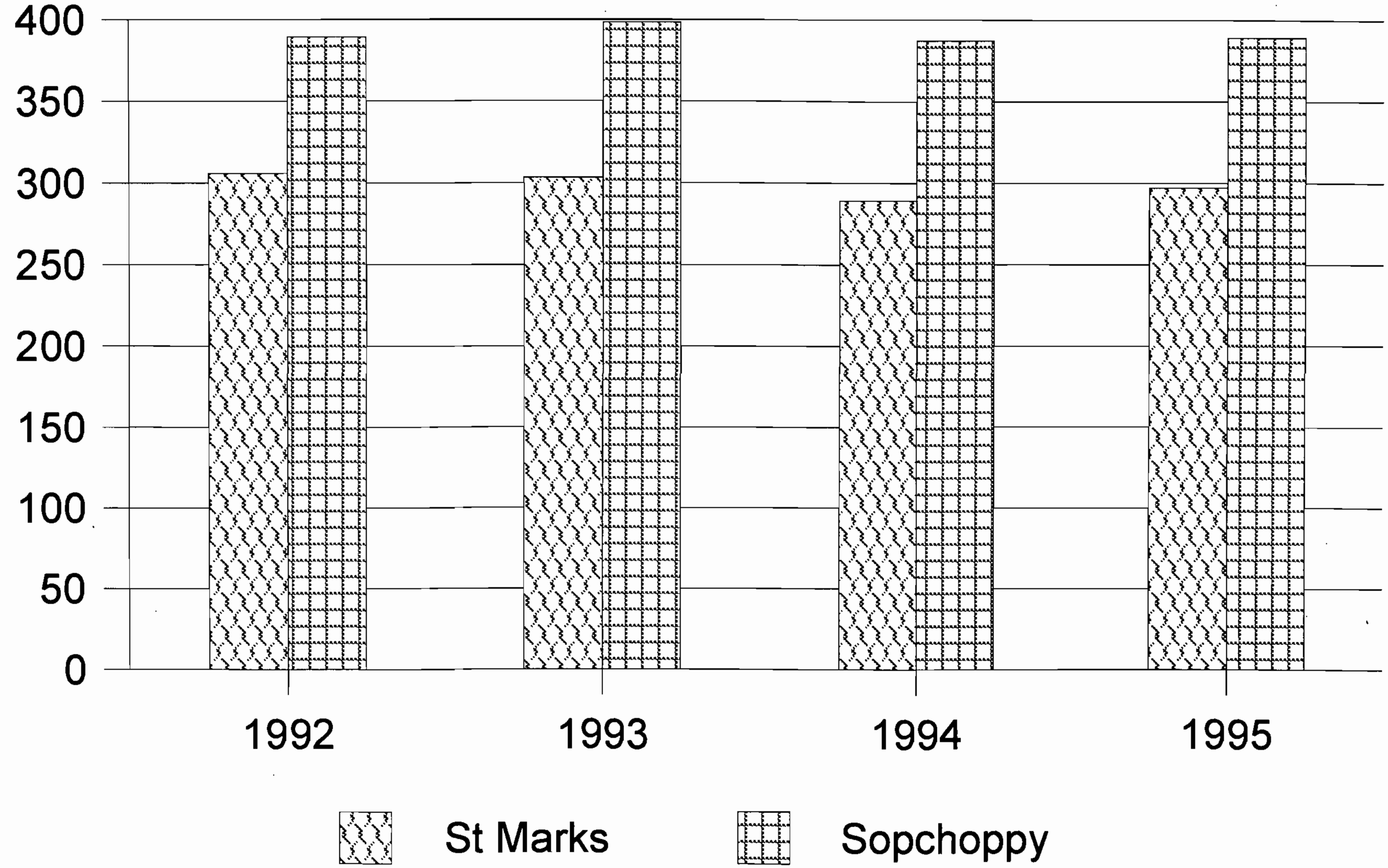
In conclusion, the Purdom Station site is consistent with the City of St. Marks' Future Land Use Map and zoning.

2.2.3 Demography and Ongoing Land Use

The Project is located within the incorporated boundaries of the City of St. Marks. Recent population trends for Wakulla County and the Cities of St. Marks and Sopchoppy are shown on Figures 2.2.3-1 and 2.2.3-2.

The rate of population growth in Florida and Wakulla County is illustrated on Figure 2.2.3-3. Florida's population increased 37.2 percent between 1960 and 1970, 43.5 percent between 1970 and 1980, and 32.7 percent between 1980 and 1990. Wakulla County's population increased 19.8 percent in the 1960s, 73 percent in the 1970s, and 30.3 percent in the 1980s. The unincorporated areas of Wakulla County saw a significant increase in population in the 1970s of 85.3 percent; while the City of St. Marks' population dropped by 21.9 percent between 1970 and 1980. During the 1980s, the growth in the unincorporated areas slowed to a 33.2 percent increase while the City of St. Marks realized an increase of 7.3 percent. According to the University of Florida's Bureau of Economic and Business Research, the population of Wakulla County is projected to increase 10 percent between 2000 and 2005 and 9 percent between 2005 and 2010 (see Figure 2.2.3-4).

Existing land uses within a 5-mile radius of the Purdom Station consist mainly of industrial uses to the north and south, conservation and forest lands to the east across the St. Marks River, and low-density residential areas to the west. The existing land uses within 5 miles of the Purdom Station using the City of St. Marks and Wakulla County existing land use maps are shown on Figure 2.2.3-5. Validity of the land use data was field verified in December 1996. Lands adjacent to the Purdom Station include the Aucilla Wildlife Management Area across the St. Marks River to the east, low density residential uses to the west, and the St. Marks Refinery property and McKenzie Tank Lines to the north and south, respectively.

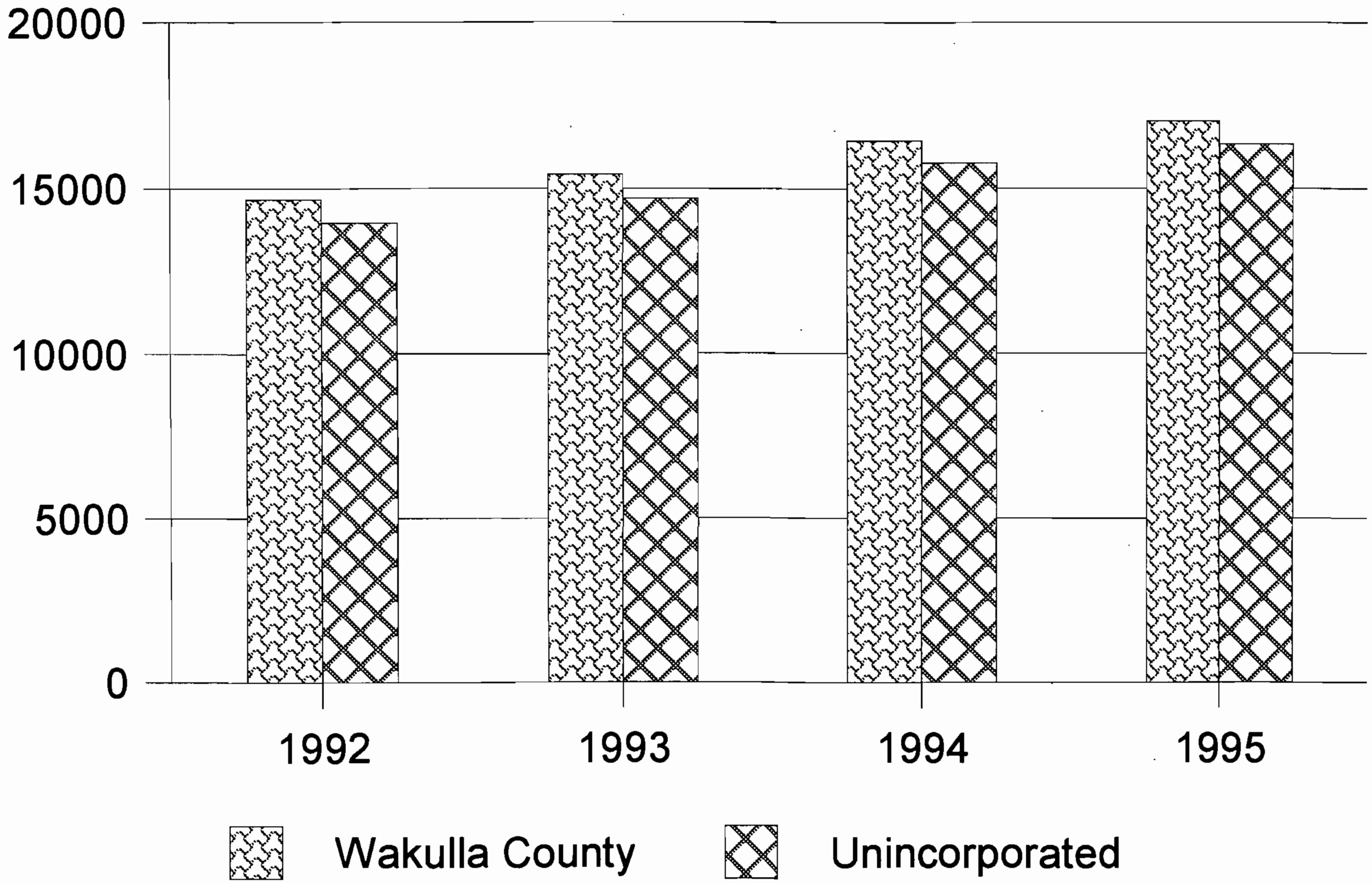


Source: Florida Statistical Abstract, 1996. Moore/Bowers, 1997.

CITY OF TALLAHASSEE

MUNICIPALITIES
POPULATION
1992 - 1995
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure
2.2.3-1



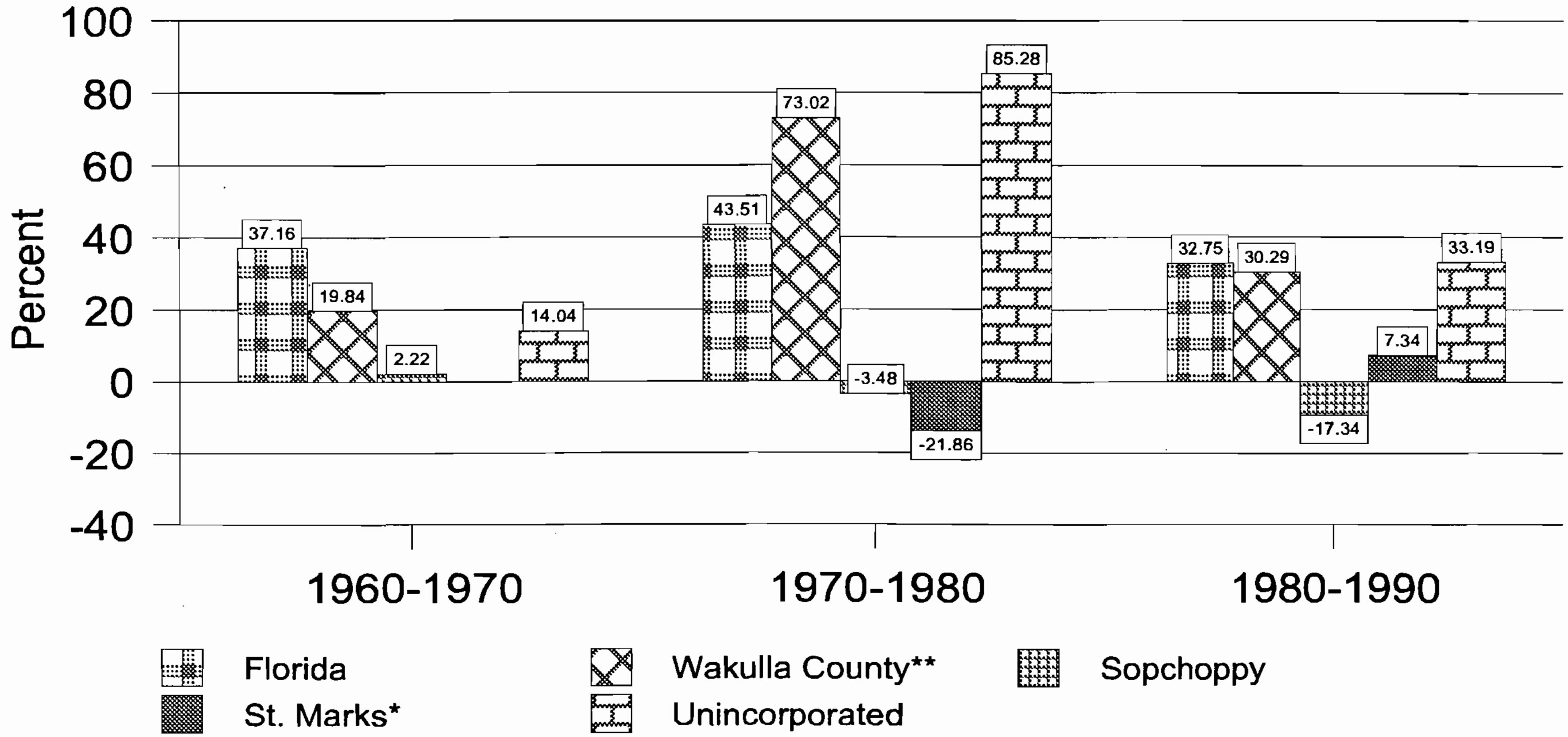
Source: Florida Statistical Abstract, 1996. Moore/Bowers, 1997.

CITY OF TALLAHASSEE

WAKULLA COUNTY AND UNINCORPORATED AREAS
POPULATION
1992 - 1995
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure
2.2.3-2

Population Growth



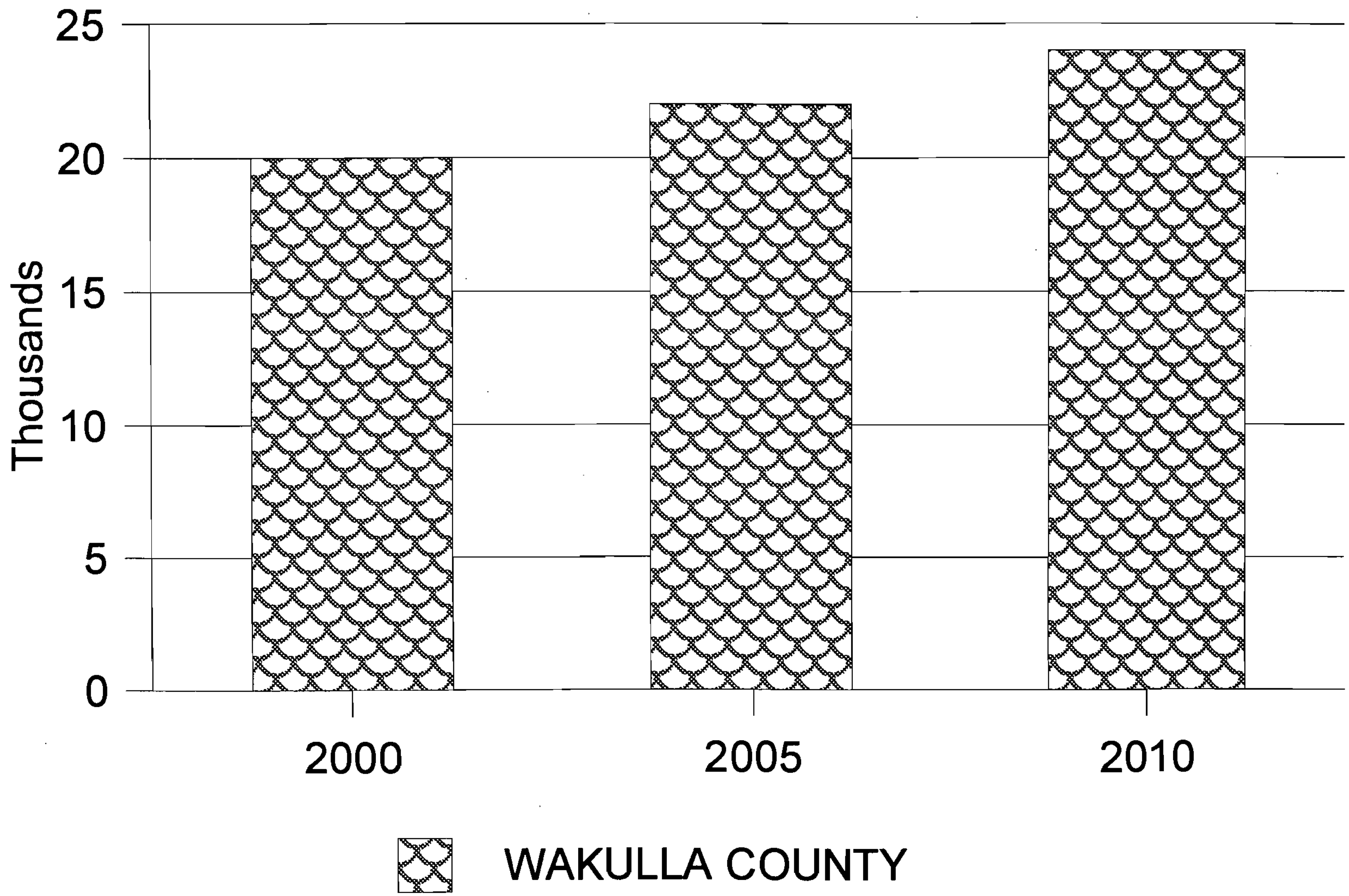
Sources: Florida Statistical Abstract, 1967, 1975, 1985.
U.S. Bureau of the Census, 1990. Moore/Bowers, 1997.

*1960 data unavailable
**Including St. Marks and Sopchoppy

CITY OF TALLAHASSEE

FLORIDA, WAKULLA COUNTY, UNINCORPORATED, ST MARKS AND SOPCHOPPY
POPULATION GROWTH
1960 TO 1990
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure
2.2.3-3



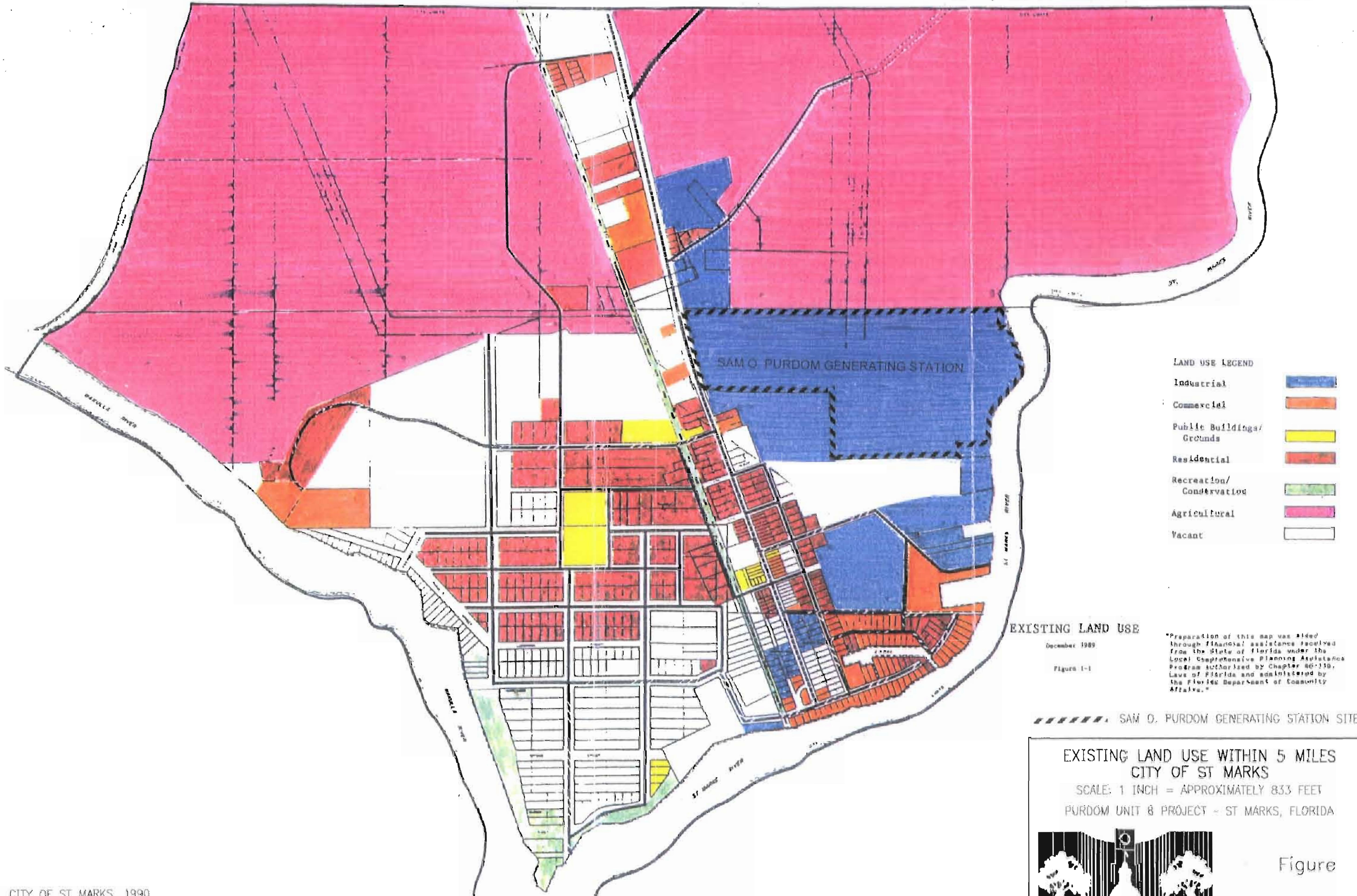
Source: Florida Statistical Abstract, 1996. Moore/Bowers, 1997.

CITY OF TALLAHASSEE

WAKULLA COUNTY
POPULATION PROJECTIONS

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure
2.2.3-4



SOURCE: CITY OF ST MARKS, 1990
MOORE/BOWERS, 1996

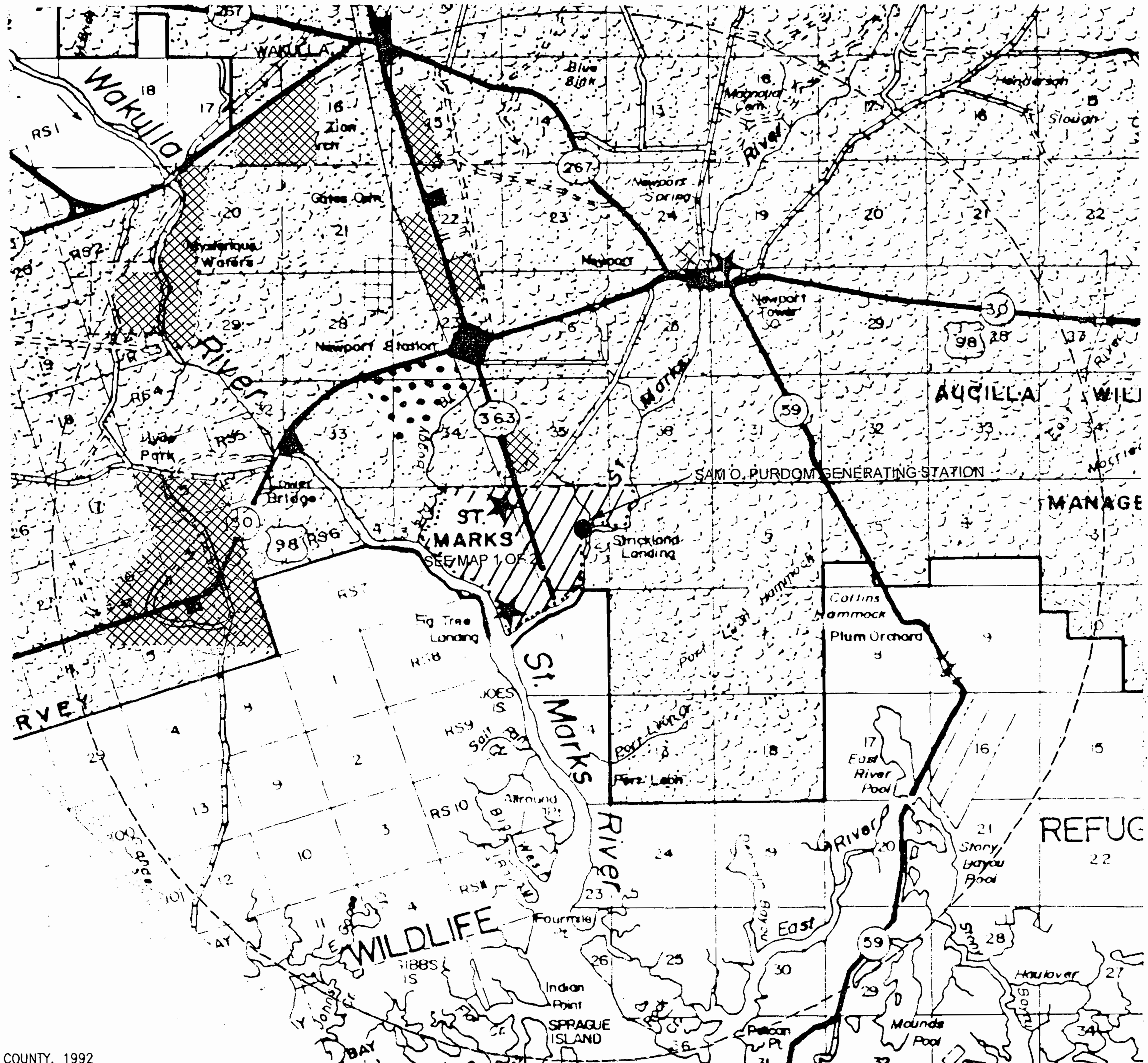
EXISTING LAND USE WITHIN 5 MILES
CITY OF ST MARKS

SCALE: 1 INCH = APPROXIMATELY 833 FEET

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

CITY OF TALLAHASSEE

Figure 2.2.3-5 (1 of 2)



LEGEND

- CONSERVATION
- AGRICULTURE
- RURAL
- RESIDENTIAL
- COMMERCIAL
- INDUSTRIAL
- INCORPORATED CITY
- ★ PUBLIC RECREATION FACILITY

0 1 2
GRAPHIC SCALE IN MILES

SOURCE: WAKULLA COUNTY, 1992
MOORE/BOWERS, 1996

EXISTING LAND USE WITHIN 5 MILES
WAKULLA COUNTY
1" = 1 MILE
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

CITY OF TALLAHASSEE

Figure
2.2.3-5 (2 of 2)

2.2.4 Easements, Title, Agency Works

There are no easements, title, or agency works crossing approvals known to be required for Unit 8. Easements and crossing approvals necessary for the proposed reclaimed water pipeline located off site are discussed in Chapter 6.

2.2.5 Regional Scenic, Cultural and Natural Landmarks

Areas identified in Section 2.2.1 located within 5 miles of the proposed new unit at the Purdom Station include one aquatic preserve, one state wildlife management area, one national wildlife refuge, one national wilderness area, one national historic landmark and state special feature site, one state museum, three parks, two state canoe trails, one state trail, and one national trail. The trails are part of a state and national network of recreational, scenic and historic trails, and by definition would contain areas of scenic value. The trails run through two wilderness areas and the Refuge area which provide access to fishing, hunting, boating, picnicking, wildlife observation, and other intensive recreational uses considered to have scenic value. The state museum and the national historic landmark/state special feature site have cultural significance because they preserve the history of the area and provide educational and recreational opportunities for the visitors. The aquatic preserve is associated with Apalachicola Bay and contains significant scenic and/or natural values. Those areas considered to contain scenic, cultural, and natural landmarks are described briefly below.

1. Big Bend Aquatic Preserve (designated in 1985): Encompassing 450,000 acres, the Big Bend Aquatic Preserve includes saltmarshes and tidal creeks which are dominated by sea grasses. Water depths vary considerably. Florida's Historic Big Bend Paddling Trail runs along the coast and through the preserve.

2. Aucilla Wildlife Management Area: The portion of the WMA that is located in Wakulla County is bounded by the St. Marks River on the west, US 98 to the north, Wakulla/Jefferson County line to the east and the St. Marks National Wildlife Refuge to the south. One of the designated entrances is located where US 98 crosses the St. Marks River. Hunting is permitted. This area is privately owned (St. Joe Paper Company) and "free-leased" to the state and managed by Florida Game and Fresh Water Fish Commission. Hunting is the primary use offered to the public in this area. The area is also actively managed for timber production.

3. St. Marks National Wildlife Refuge: The St. Marks National Wildlife Refuge offers a variety of outdoor recreation activities including hunting, picnicking, fishing, boating, hiking, and wildlife observation. The visitor center is located off SR 59 (Lighthouse Road).

4. St. Marks National Wilderness Area (established 1975): This area received the federal designation as a wilderness area after completion of a Roadless Area Review and Evaluation (RARE) in the 1970s. Much of the wilderness area, located within the National Wildlife Refuge, consists of salt marsh. Motorized vehicles are not permitted except for land management purposes.

5. San Marcos de Apalache State Historic Site and State Museum (registered as a national historic landmark November 13, 1966): This site is located at the confluence of the Wakulla and St. Marks Rivers and is managed and maintained by the FDEP Division of Recreation and Parks. The area has a rich history beginning in 1528 with the arrival of Navarez and 1539 with Hernando de Soto. The first fort was built in 1679 but was burned by pirates several years later. Today, a museum containing

exhibits and artifacts is located on the foundation of an old marine hospital. There is a trail through the fortification ruins.

6. Wakulla River Canoe Trail: The Wakulla River Canoe Trail runs between SR 365 and US 98 for a distance of approximately four miles.
7. Big Bend Historic Saltwater Paddling Trail: Florida's first legislatively designated water trail provides opportunities for paddlers to experience "outside" paddling. The trail is located between the St. Marks River lighthouse and the Suwannee River encompassing the Big Bend Aquatic Preserve. It provides access to hiking, camping and several other parks, preserves, and refuges along the Big Bend coast.
8. Tallahassee-St. Marks Historic Railroad State Trail (established 1984): In 1984, the Florida Department of Transportation (FDOT) purchased 16 miles of the corridor to preserve the right-of-way. The recreational trail was constructed and is maintained by the FDEP Division of Recreation and Parks. Activities permitted on the trail include bicycling, walking, jogging, skating, and horseback riding. The southern two miles of the trail have been designated as a segment of the Florida National Scenic Trail.
9. The Florida National Scenic Trail (established 1983): The portion of the Florida Trail within the five-mile radius of the Purdom Station is certified by the United States Forest Service (USFS) which provides varying degrees of protection. The trail runs through the St. Marks National Wildlife Refuge traversing a variety of forest types and wildlife zones. The segment through the refuge was among the first sections designated in 1981 as part of the Florida National Scenic Trail.
10. Outstanding Florida Waters: Waters within National Wildlife Refuges - St. Marks National Wildlife Refuge (designated by FDEP in 1979 and as modified 10/4/90, 8/8/94); Waters within State Ornamental Gardens, State Botanical Sites, State Historic Sites and State Geological Sites - San Marcos de Apalache State Historic Site (designated 10/4/90); Waters within State Aquatic Preserves - Big Bend Seagrasses (designated 10/29/86) with the exception of several areas in Levy and Taylor Counties; and Special Waters - St. Marks River except that part of the river between Rattlesnake Branch and the confluence of the St. Marks and Wakulla Rivers and the Wakulla River (designated 1979).
11. St. Marks River Park Area: The park site contains 1.76 acres adjacent to the Fort San Marcos de Apalache and provides opportunities for picnicking for local residents and museum visitors. The park is owned and maintained by the City of St. Marks.
12. Wakulla River Park Area: This park is a 2.7-acre parcel with river frontage located approximately 0.4 mile north of the Fort San Marcos de Apalache museum. The park improvements include picnic facilities and restrooms. The park is owned and maintained by the City of St. Marks.
13. Wakulla River Boat Ramp: Owned and maintained by Wakulla County, the ramp is located adjacent to the Fort San Marcos de Apalache.

14. Newport Recreation Area: Located on the St. Marks River, the Newport Recreation Area includes facilities for picnicking. The park is owned and maintained by Wakulla County.

2.2.6 Archeological and Historic Sites

A review of the Florida Site File by the Florida Department of State, Division of Historical Resources (DHR) identified three archeological sites in the Project vicinity, but outside the Project site (DHR, 1992a, 1992b). Based on a review of the Florida Site File, DHR advised the City of Tallahassee that "no significant archeological or historic sites are recorded for or likely to be present within the area of the proposed Purdom Unit 8" (DHR, 1996).

See Section 6.1 of the SCA for discussion of archeological and historic sites as they relate to the off-site reclaimed water pipeline.

2.2.7 Socioeconomics and Public Services

2.2.7.1 Socioeconomics

Employment and Income

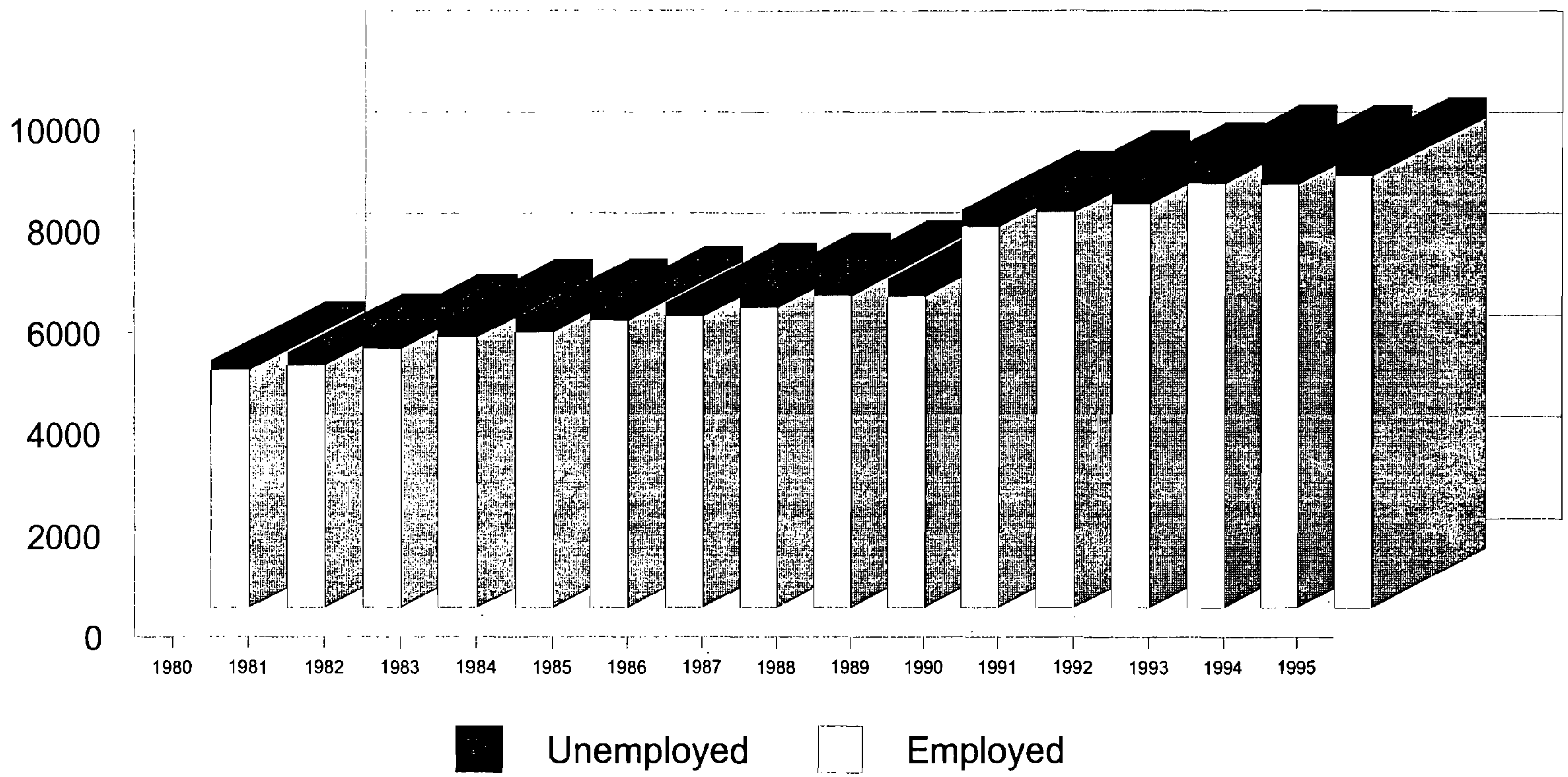
Wakulla County's labor force included 8,877 persons in 1995 (Figure 2.2.7-1). Out of this total, 8,497 were employed, resulting in an unemployment rate of 4.3 percent. This compares to a statewide unemployment rate of 5.5 percent for the same time period. Wakulla County's unemployment rate has consistently been lower than the state average in the last 15 years (Figure 2.2.7-2).

Annual average employment (jobs) for Wakulla County was 3,102 for 1995, according to the Florida Department of Labor and Employment Security (FDLES). The difference between the number of Wakulla County jobs and the size of the work force in Wakulla County reflects the large number of Wakulla County residents who work outside the county. The Wakulla County Comprehensive Plan Future Land Use Element notes that in 1989 only 38 percent of Wakulla County's workforce worked within the county; over 60 percent commuted to Tallahassee to work.

Historically, the City of St. Marks was a port town with a railroad connection to Tallahassee. Also, the railroad, which is now a recreational trail, brought visitors to the City of St. Marks who came for the hunting and fishing. The City of St. Marks still serves those same functions (transportation and recreation), as evidenced by the tank farms and transportation facilities in the community as well as the many recreational opportunities in St. Marks and the surrounding area.

Major industries, in terms of employment, in Wakulla County in 1995 were retail trade (20.2 percent), manufacturing (19.9 percent), services (13.6 percent) and government employment (30.7 percent). See Figure 2.2.7-3. The average annual wages for these industries in 1995 were $9,067 for retail trade, $27,218 for manufacturing, and $17,157 for services (Figure 2.2.7-4). The average annual wage for all government employees was $21,489. Average annual wages for all non-government employees in Wakulla County in 1995 were $18,501. The highest average annual wages were in transportation, communications, and public utilities ($27,460), while the lowest were in retail trade.

Employment in Jobs and Education Partnership Area 5 (Gadsden, Leon, and Wakulla Counties) is projected to increase to 204,023 by the year 2005, according to FDLES's publication on Industry and Occupational Employment Projections (Figure 2.2.7-5). According to these projections, 23.6 percent of the employment will be in services and 19 percent will be in wholesale and retail trade (Figure 2.2.7-6). Government jobs are expected to account for 35.3 percent of the total employment. The FDLES's employment projections show increasing employment in all industries, except for mining. The greatest growth in projected employment is in services, which is projected to increase by 42.75 percent between 1994 and 2005. The least growth will occur in the transportation and public utilities sector, and mining employment in the area is projected to decline.

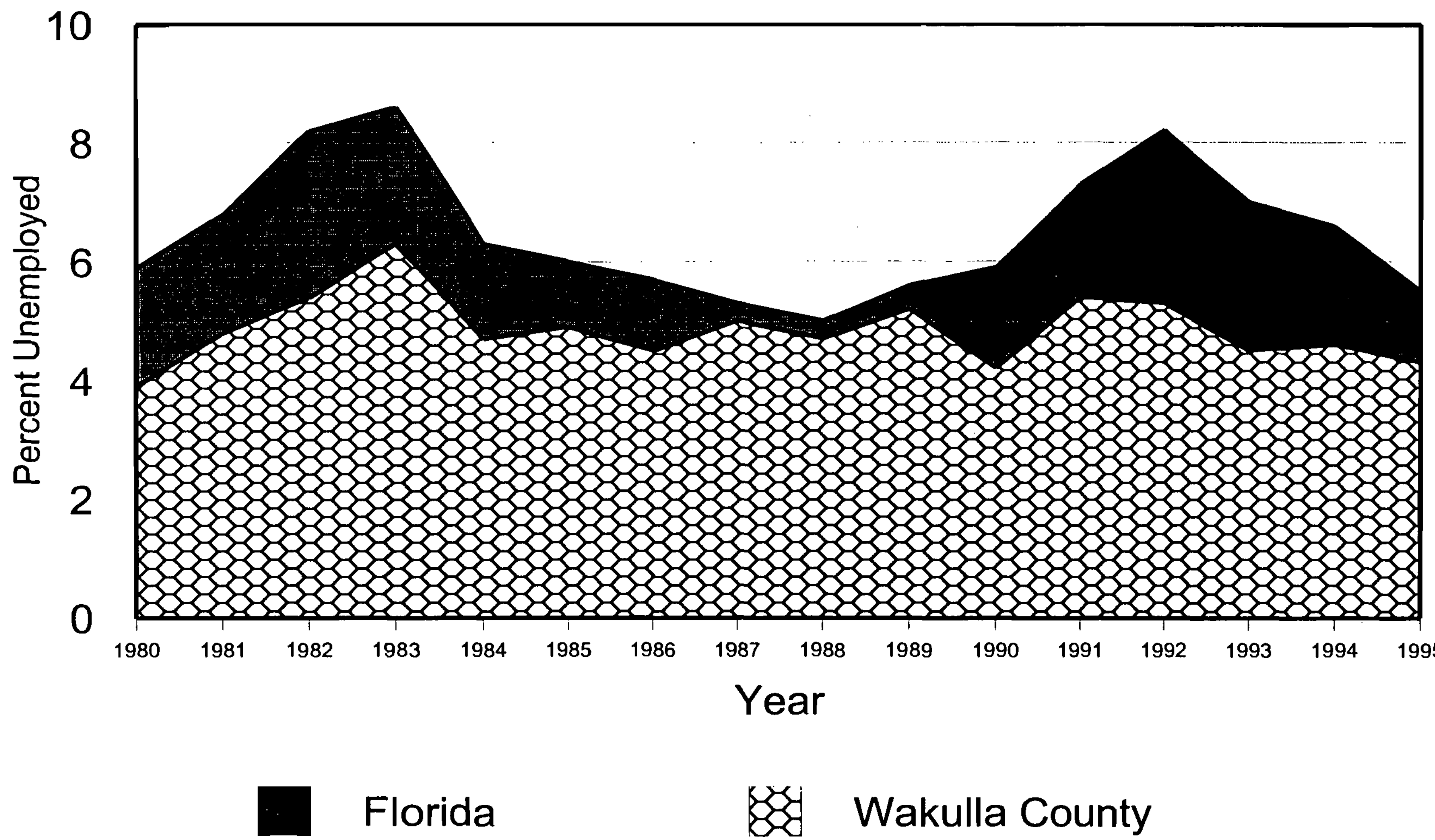


Source: Florida Department of Labor & Employment Security, 1996. Moore/Bowers, 1997.

CITY OF TALLAHASSEE

WAKULLA COUNTY LABOR FORCE
EMPLOYMENT AND UNEMPLOYMENT
1980 THROUGH 1995
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.2.7-1

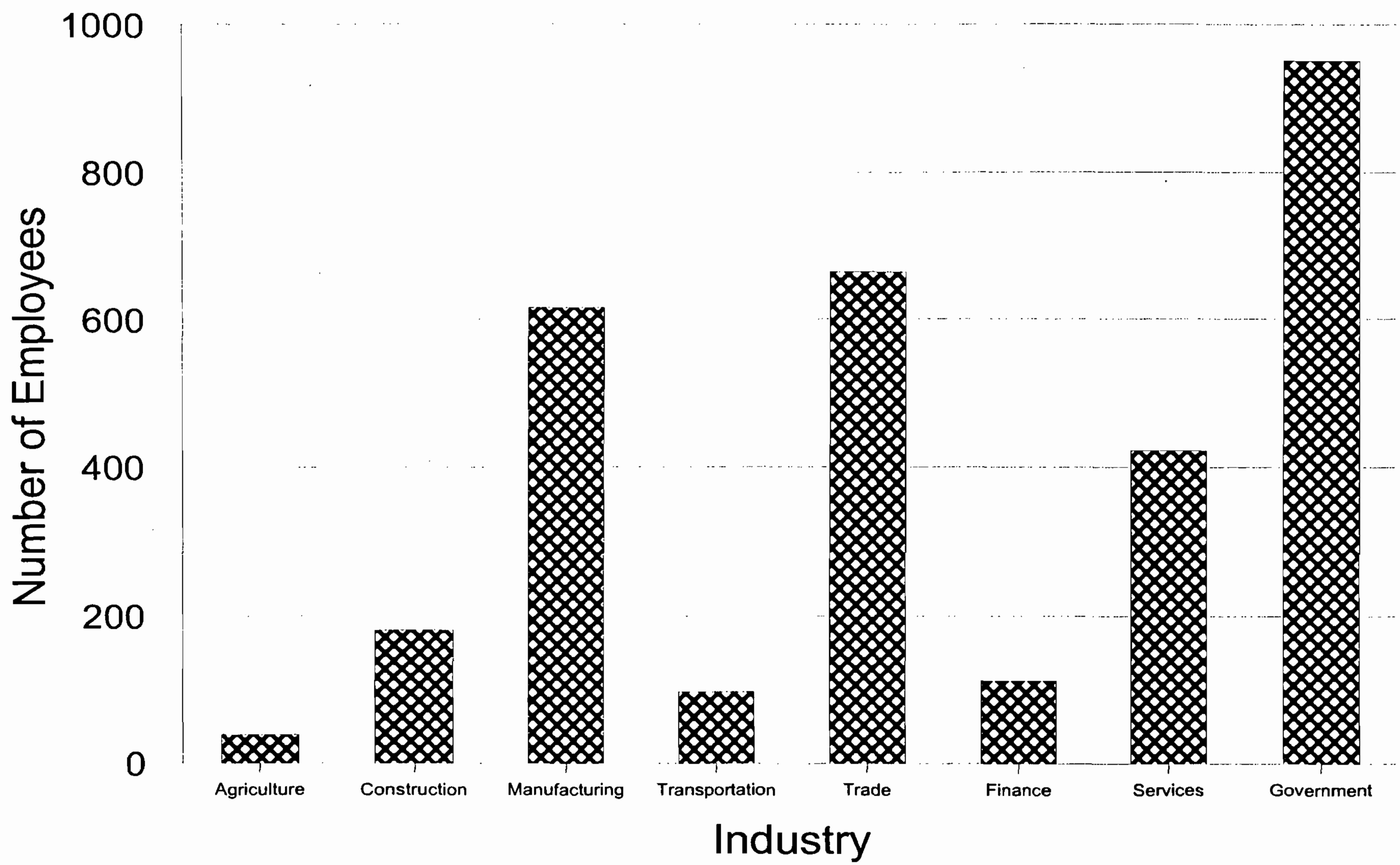


Source: Florida Department of Labor & Employment Security, 1996. Moore/Bowers, 1997.

CITY OF TALLAHASSEE

WAKULLA COUNTY AND FLORIDA
UNEMPLOYMENT RATES
1980 THROUGH 1995
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure
2.2.7-2

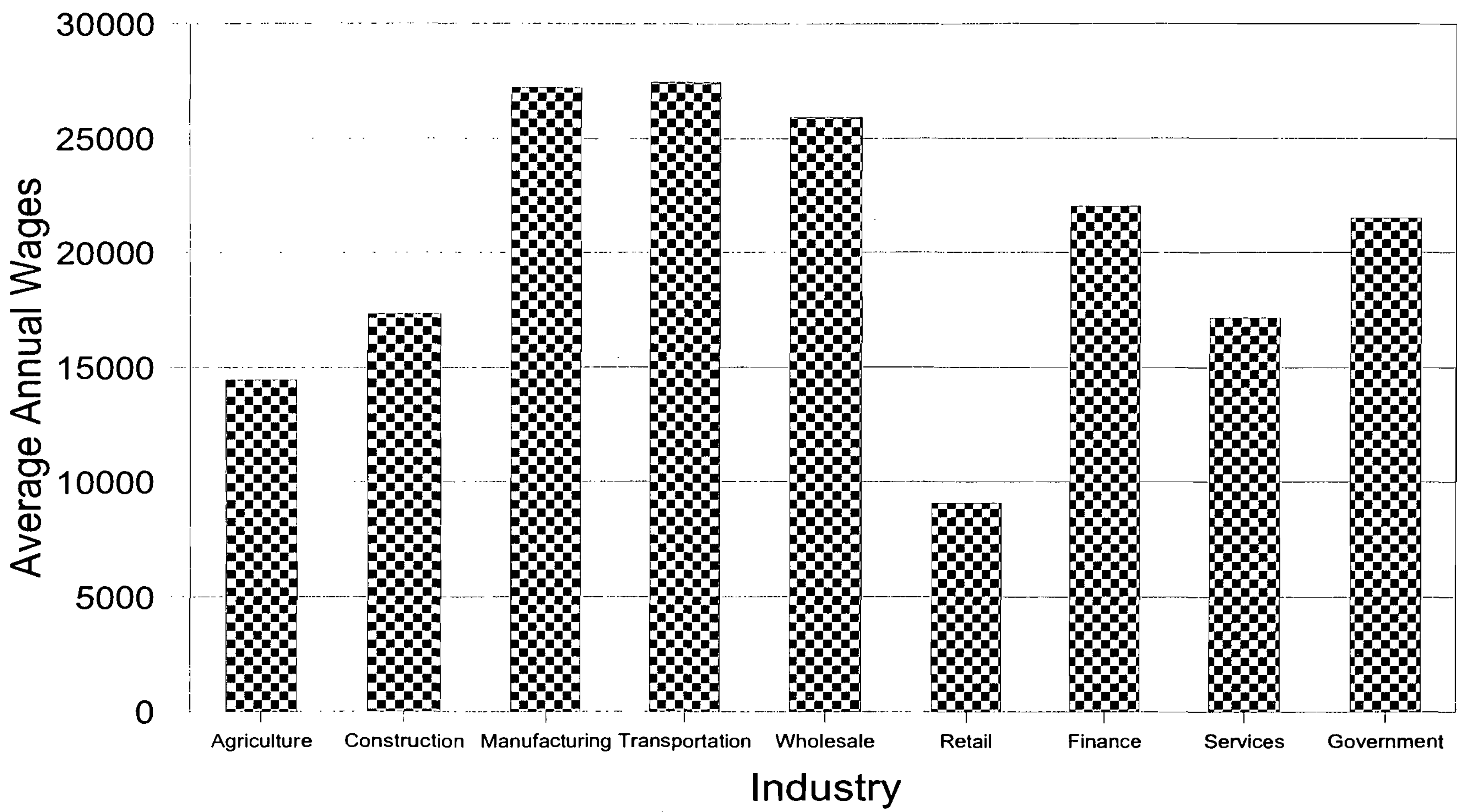


Source: Florida Department of Labor & Employment Security, 1996. Moore/Bowers, 1997.

CITY OF TALLAHASSEE

WAKULLA COUNTY EMPLOYMENT
BY INDUSTRY
1995
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure
2.2.7-3

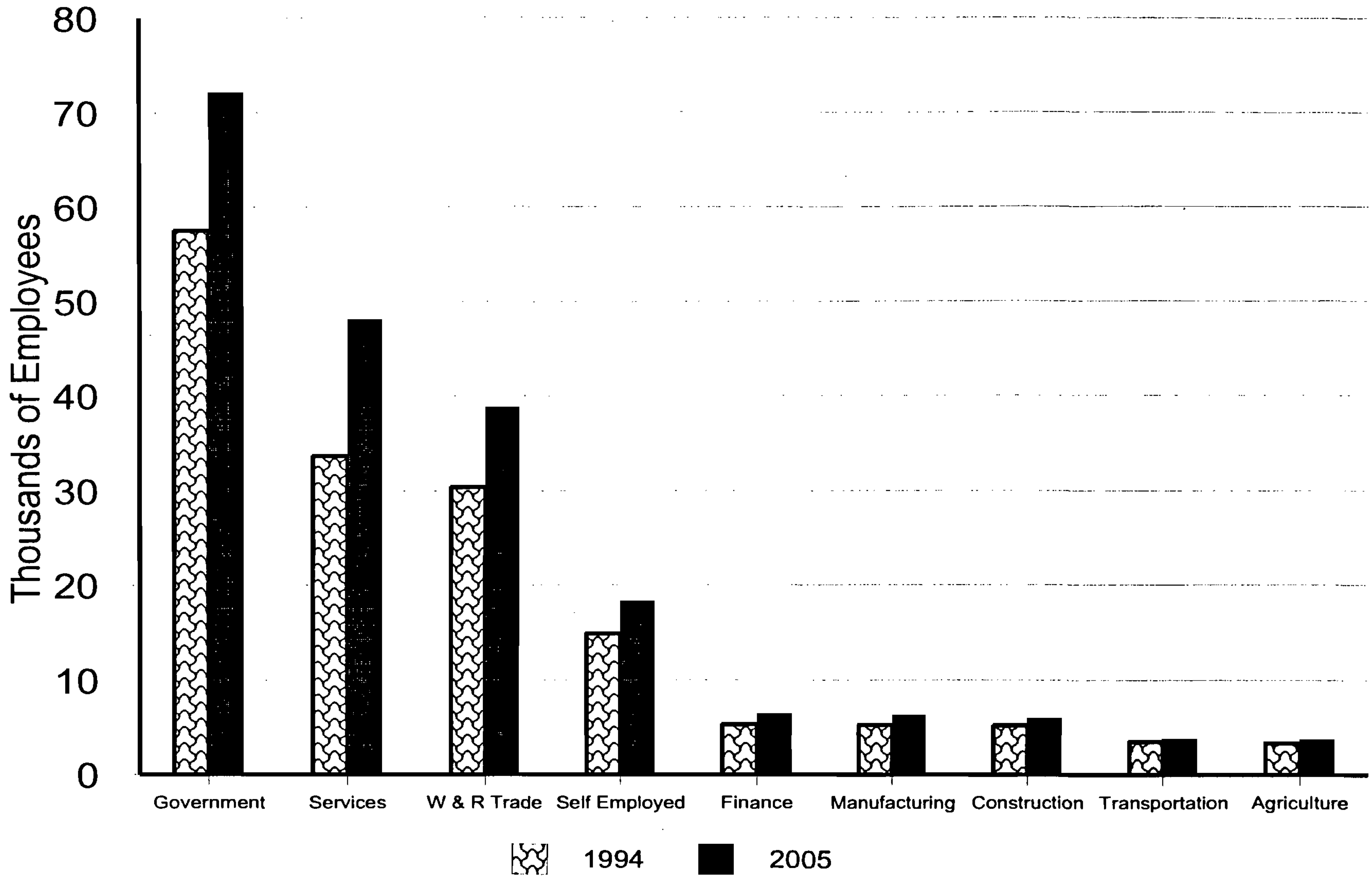


Source: Florida Department of Labor & Employment Security, 1996. Moore/Bowers, 1997.

CITY OF TALLAHASSEE

WAKULLA COUNTY
AVERAGE WAGE BY INDUSTRY
1995
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.2.7-4

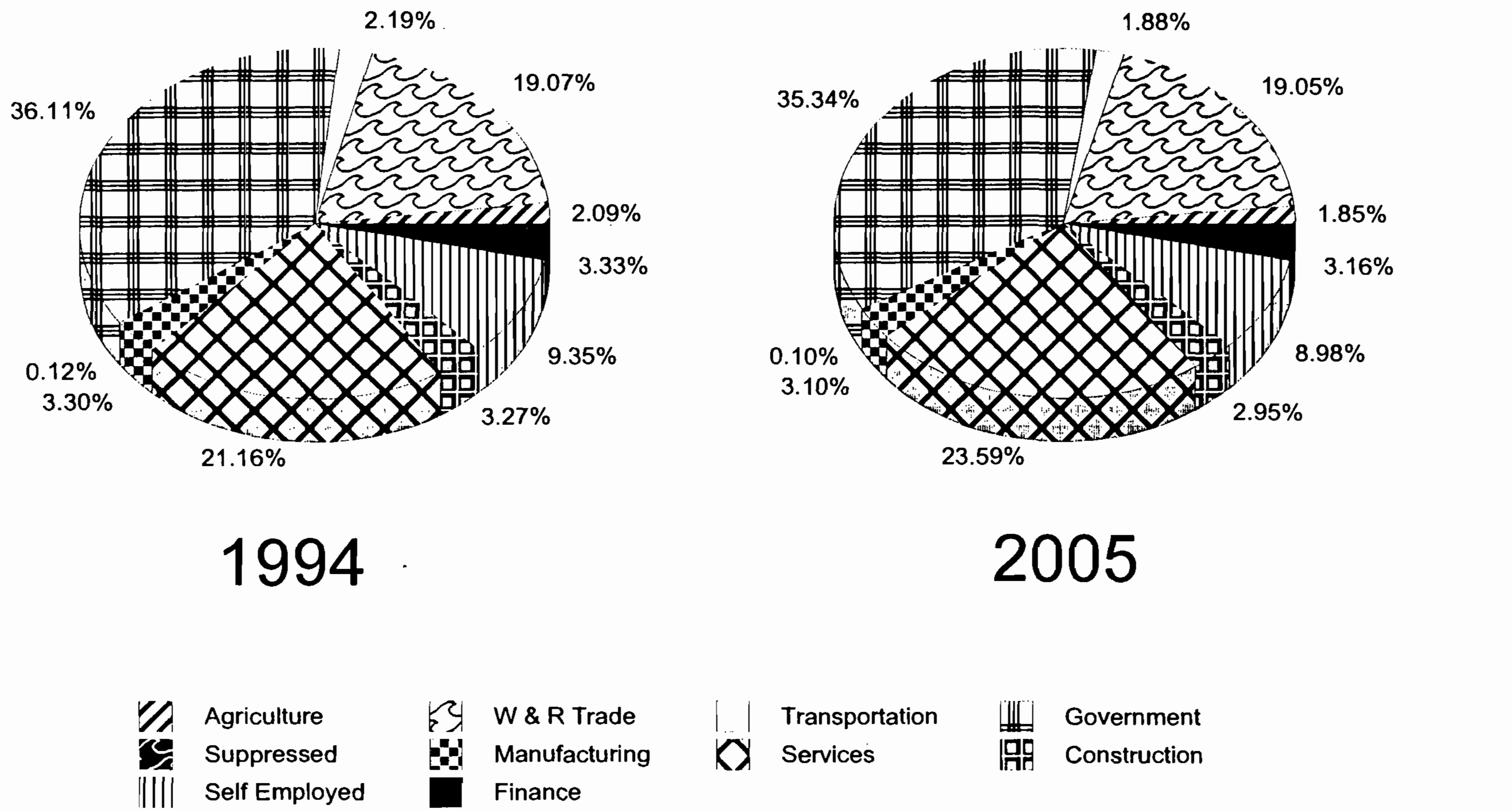


Source: Florida Department of Labor & Employment Security, 1996. Moore/Bowers, 1997.

CITY OF TALLAHASSEE

GADSDEN, LEON AND WAKULLA COUNTIES
1994 EMPLOYMENT AND
2005 PROJECTIONS
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure
2.2.7-5



Source: Florida Department of Labor & Employment Security, 1996. Moore/Bowers, 1997.

CITY OF TALLAHASSEE

GADSDEN, LEON AND WAKULLA COUNTIES
1994 EMPLOYMENT AND
2005 PROJECTIONS
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.2.7-6

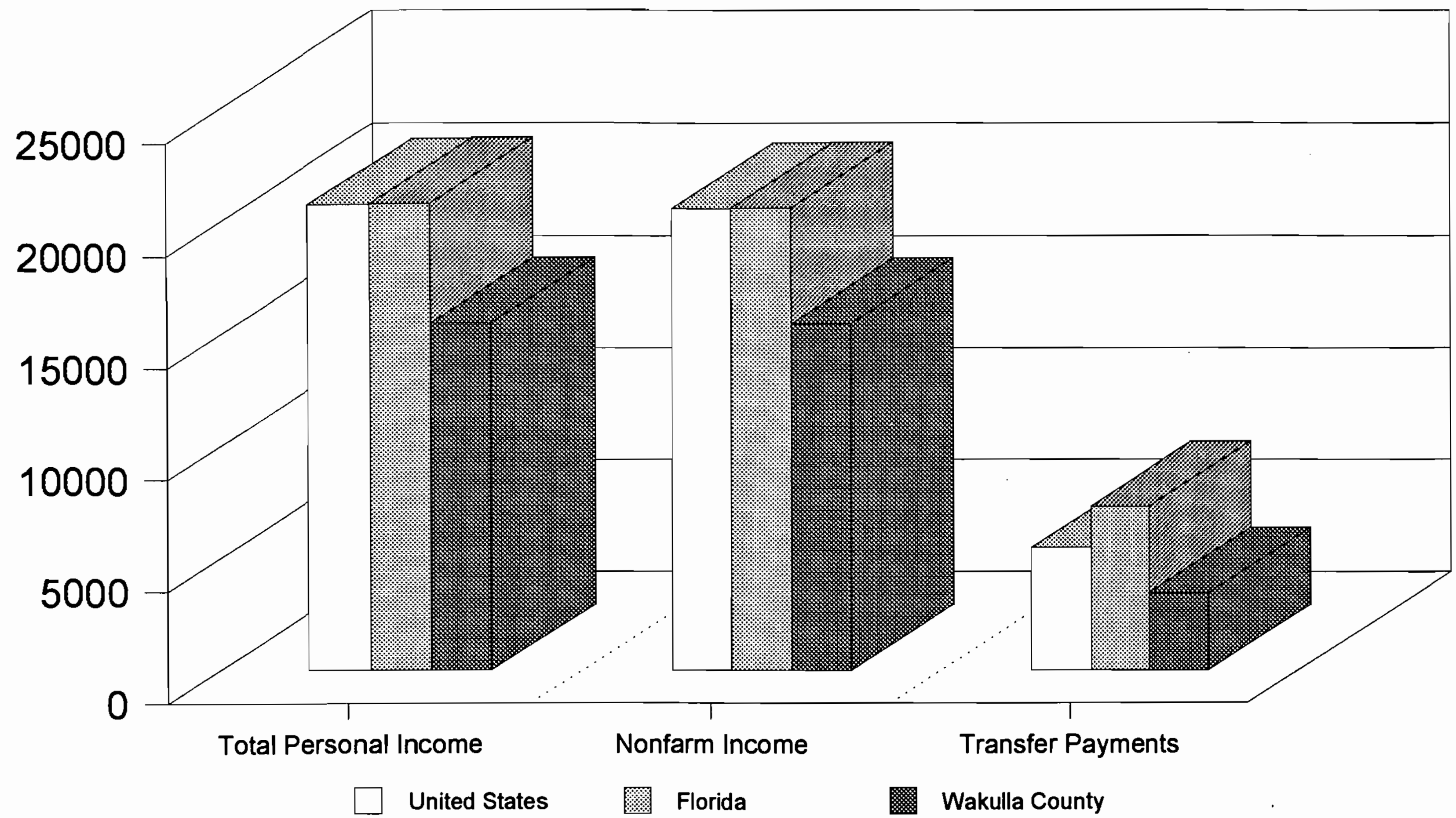
Per capita personal income for Wakulla County was $15,506 in 1993, or approximately 74.5 percent of the Florida average and the national average (Figure 2.2.7-7). Wakulla County's nonfarm per capita income was $15,481 compared to the Florida average of $20,631 and the national average of $20,605. Per capita transfer payments (including unemployment, retirement, and other payments) were $3,427 for Wakulla County compared to $7,294 for Florida and $5,446 nationally. The 1993 per capita income for Wakulla County represented less than a one percent increase over the 1992 per capita income of $15,003.

According to the 1980 Census, households in the lowest income range, less than $15,000 per year, made up 59.1 percent of total households (Figure 2.2.7-8). Middle income households of $15,000 to $24,999 per year made up 25.1 percent of the total, while the moderate income level, $25,000 to $49,999 per year, made up 14.4 percent of total households. Incomes of $50,000 or more per year only made up 1.4 percent of total households. As expected, the 1990 Census data show a shift in the distribution of households among these same income categories. In 1990 households in the lowest income range, less than $15,000 per year, made up 28.7 percent of total households. Middle income households of $15,000 to $24,999 per year made up 21.3 percent of the total, while the moderate income level, $25,000 to $49,999 per year, made up 35.9 percent of total households. Incomes of $50,000 or more per year remained the same at 1.4 percent of total households.

Housing

A breakdown of housing units, by type, shows an increasing trend toward mobile homes. According to the 1970 Census data, conventional single family units in Wakulla County made up 85 percent of all year-round housing units, mobile homes made up 10 percent, and multi-family units made up 5 percent. According to the 1980 census, conventional single family units had declined to 65 percent of all year-round housing units, mobile homes had increased to 32 percent of the total, and multi-family made up 3 percent. By 1990, conventional single family units had decreased to 51 percent, mobile homes had increased to 47 percent, and multi-family had fallen to 2 percent of the total. The Housing Element of the Wakulla County Comprehensive Plan also indicates an increasing trend toward more mobile homes. The trend of increasing reliance on mobile homes for housing in Wakulla County is illustrated on Figure 2.2.7-9.

Housing cost information was obtained from census data. In 1980, 13 percent of the county's housing stock was occupied by renters, 61 percent was occupied by owners, and the remaining 26 percent was vacant. Detailed housing characteristics from the 1980 Census indicates that 97 percent of the rental units rent for less than $400. The median monthly rent in Wakulla County, according to the 1980 Census, was $190. The median cost of owner-occupied units was $284 if the home was mortgaged and $102 if the home was not mortgaged (Figure 2.2.7-10). The 1990 Census reported that the percentage of units occupied by renters was the same as 1980, while units occupied by owners increased to 66 percent. Vacant units accounted for 21 percent of all units in the county. Housing cost data from the 1990 Census indicate that 69 percent of the rental units in the county rented for less than $400 per month. The median monthly rent in Wakulla



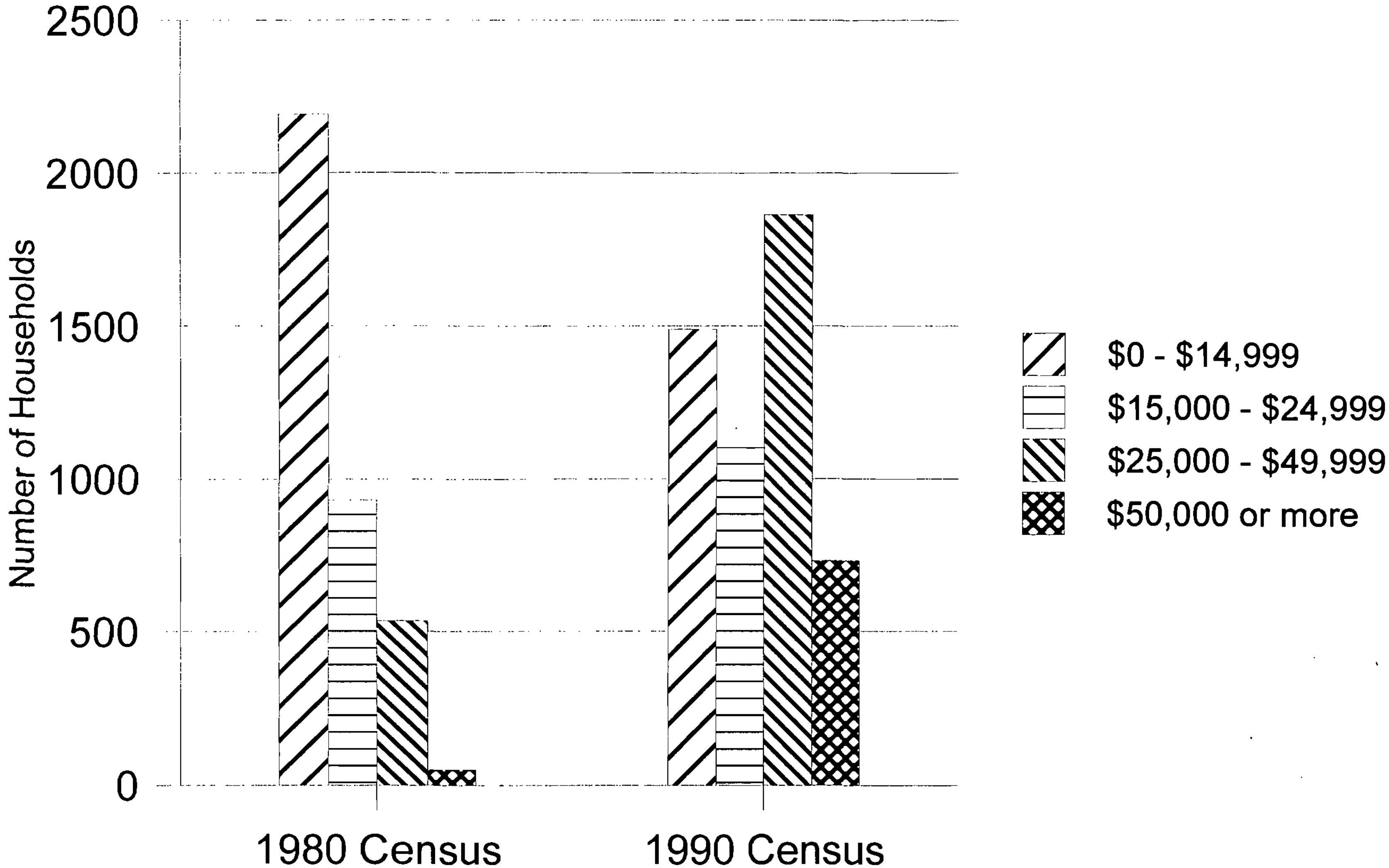
Source: Florida Statistical Abstract, 1996. Moore/Bowers, 1997.

CITY OF TALLAHASSEE

UNITED STATES, FLORIDA AND WAKULLA COUNTY
1993 PER CAPITA INCOME

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.2.7-7

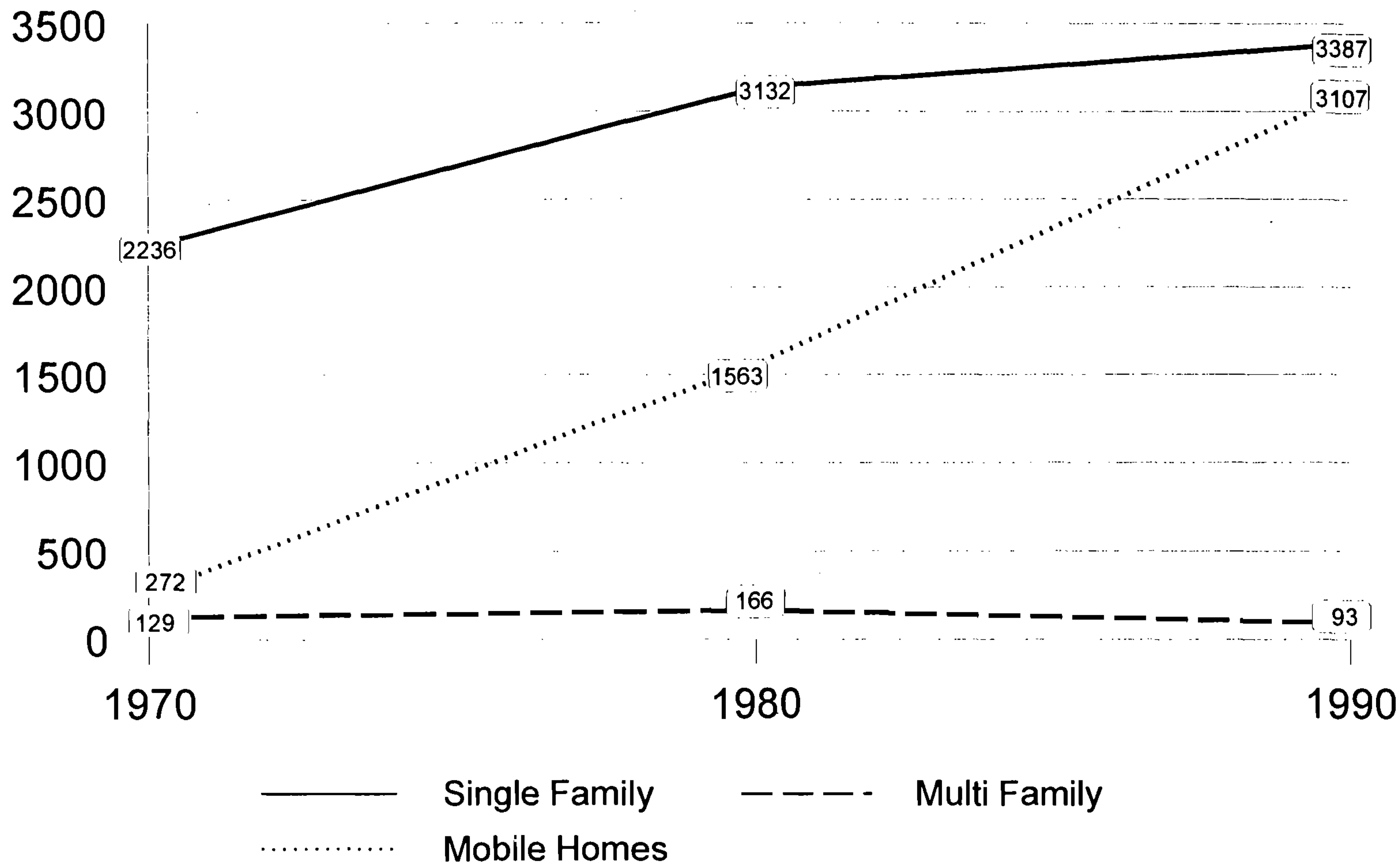


Sources: U.S. Bureau of the Census, 1980. U.S. Bureau of the Census, 1990. Moore/Bowers, 1997.

CITY OF TALLAHASSEE

WAKULLA COUNTY
DISTRIBUTION OF HOUSEHOLD INCOMES
1980 AND 1990
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure
2.2.7-8



Source: U.S. Bureau of the Census, 1970. U.S. Bureau of the Census,1980.
U.S. Bureau of the Census, 1990. Moore/Bowers, 1997.

CITY OF TALLAHASSEE

WAKULLA COUNTY
TREND IN HOUSING UNITS
1970, 1980 AND 1990
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.2.7-9

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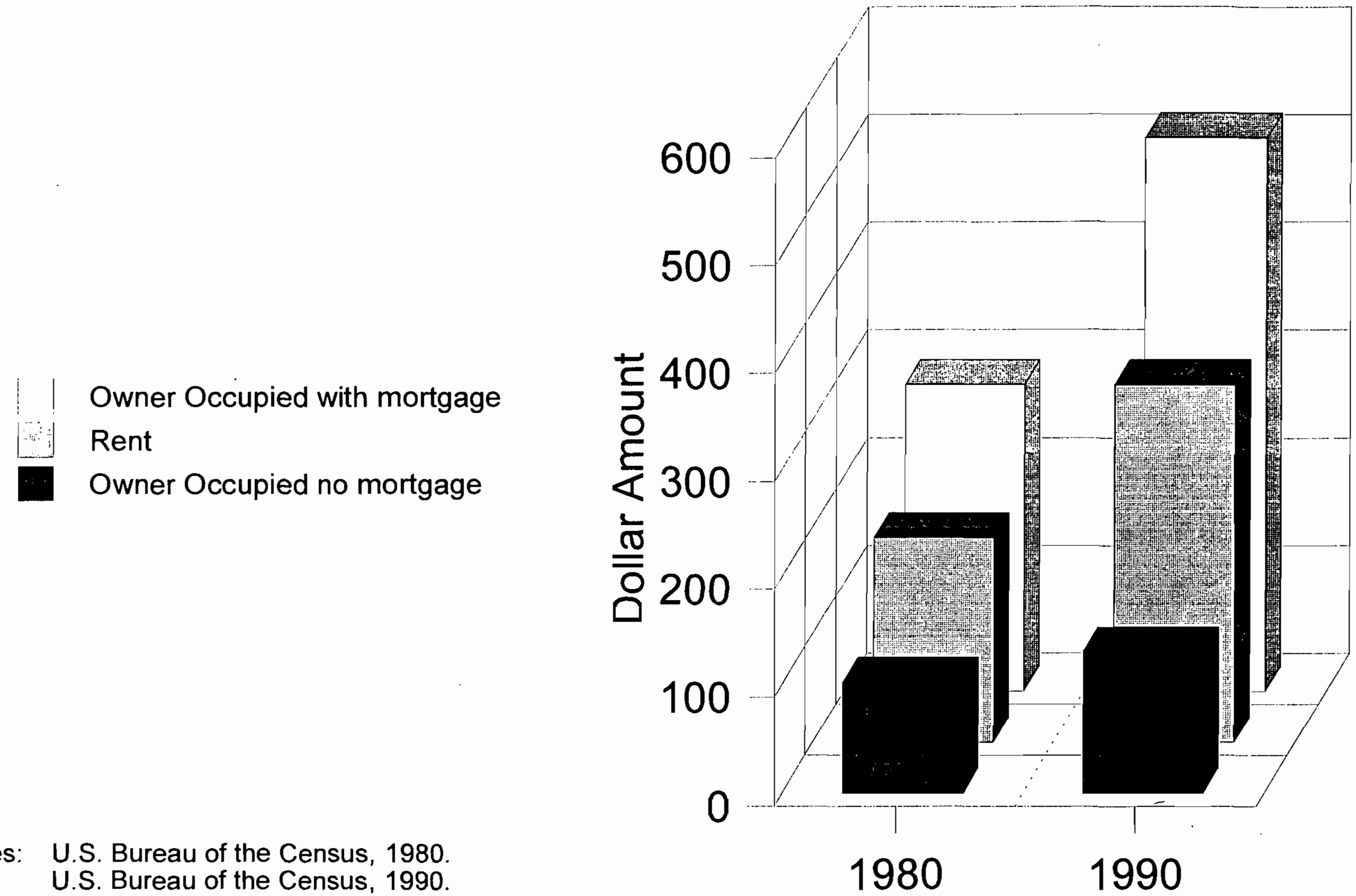


Sources: U.S. Bureau of the Census, 1980.
U.S. Bureau of the Census, 1990.
Moore/Bowers, 1997.

CITY OF TALLAHASSEE

MEDIAN MONTHLY HOUSING COSTS
WAKULLA COUNTY
1980 AND 1990
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.2.7-10

County in 1990 was $331. The median monthly cost of owner-occupied units was $513 for homes with a mortgage and $130 if the home was not mortgaged.

The trend in residential building permits issued in Wakulla County between 1985 and 1994 for the total county according to the Florida Statistical Abstract is illustrated by Figure 2.2.7-11. The County reached a peak of 155 residential permits in 1993. Generally, residential permits have increased every year. In the past 10 years, only 1989 and 1994 showed a decline in the number of permits issued. The number of building permits issued by type for the past three years according to the Wakulla Building Department is shown on Figure 2.2.7-12.

Local Government Revenues and Expenditures

Wakulla County's revenue sources include taxes, licenses and permits, federal grants, state and other governmental sources, charges for services, fines and forfeitures, special assessments and impact fees, other sources/interfund transfers, and other miscellaneous revenues. Total revenues for the county for the fiscal year ending September 30, 1995 were $17,033,075. Other sources/interfund transfers made up 25.5 percent of the county's total revenue (Figure 2.2.7-13). State and other government sources accounted for 16 percent and ad valorem taxes accounted for 14.9 percent of the total.

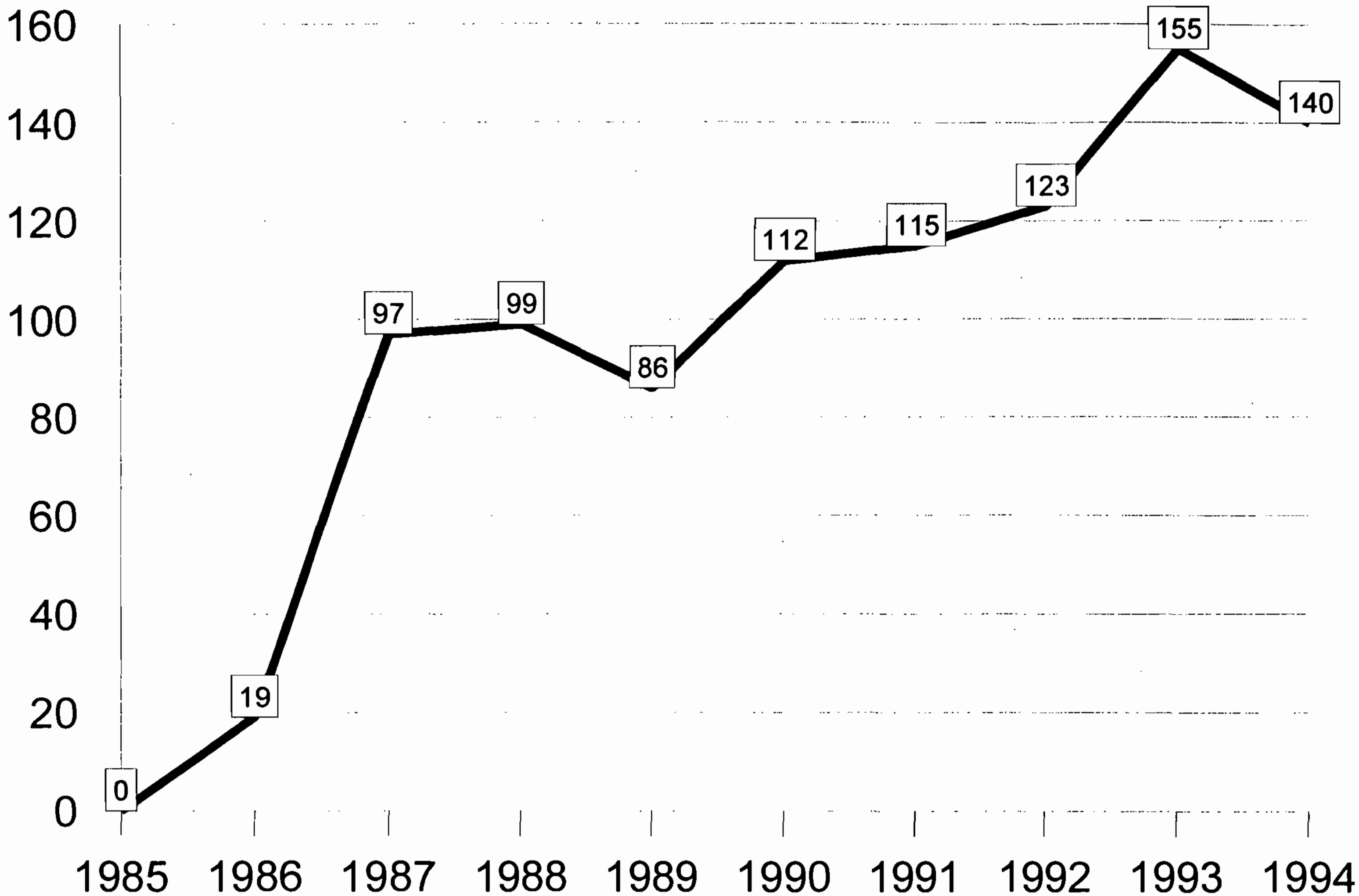
Wakulla County expenditures consisted of general government, public safety, physical environment, transportation, economic environment, human services, cultural/recreation, debt service and other uses/interfund transfers. The total expenditures for the fiscal year ending September 30, 1995, were $16,547,064. Both public safety and other uses/interfund transfers made up 24.3 percent (Figure 2.2.7-14) of the county's expenditures. General government made up 13.6 percent.

Per capita revenues and per capita expenditures for the county are shown on Figure 2.2.7-15 and Figure 2.2.7-16, respectively.

The City of St. Marks' revenue sources include taxes, licenses and permits, state and other governmental sources, charges for services, fines and forfeitures, and other miscellaneous revenues. The City of St. Marks' total revenues for the fiscal year ending September 30, 1995, were $256,566. Charges for services made up 40.8 percent of the City of St. Marks' total revenue (Figure 2.2.7-17). State and other government sources accounted for 29.8 percent and other taxes, fees and licenses accounted for 14.8 percent of the total.

The City of St. Marks' expenditures consisted of general government, physical environment, transportation, cultural/recreation, and debt service. The total expenditures for the fiscal year ending September 30, 1995, were $273,423. Physical environment made up 43.9 percent (Figure 2.2.7-18) of the City of St. Marks' expenditures, while general government made up 19.9 percent.

Per capita revenues and per capita expenditures for the City of St. Marks are shown on Figure 2.2.7-19 and Figure 2.2.7-20 respectively.



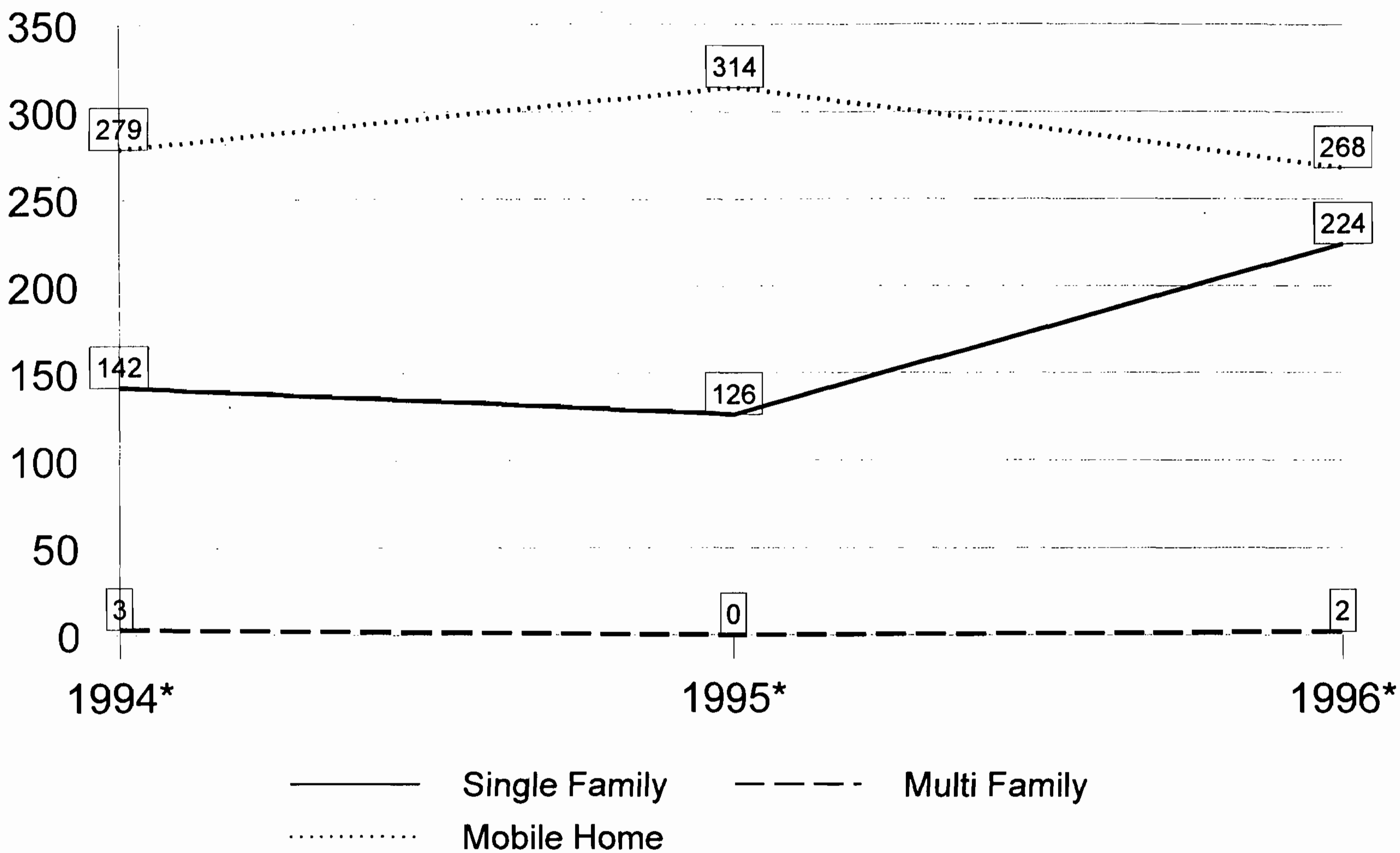
***Note: These numbers do not include mobile home permits.**

Source: Florida Statistical Abstract, 1988, 1990, 1992, 1993, 1994, 1995 and 1996. Moore/Bowers, 1997.

CITY OF TALLAHASSEE

WAKULLA COUNTY
RESIDENTIAL BUILDING PERMITS
1985 THROUGH 1994
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure
2.2.7-11



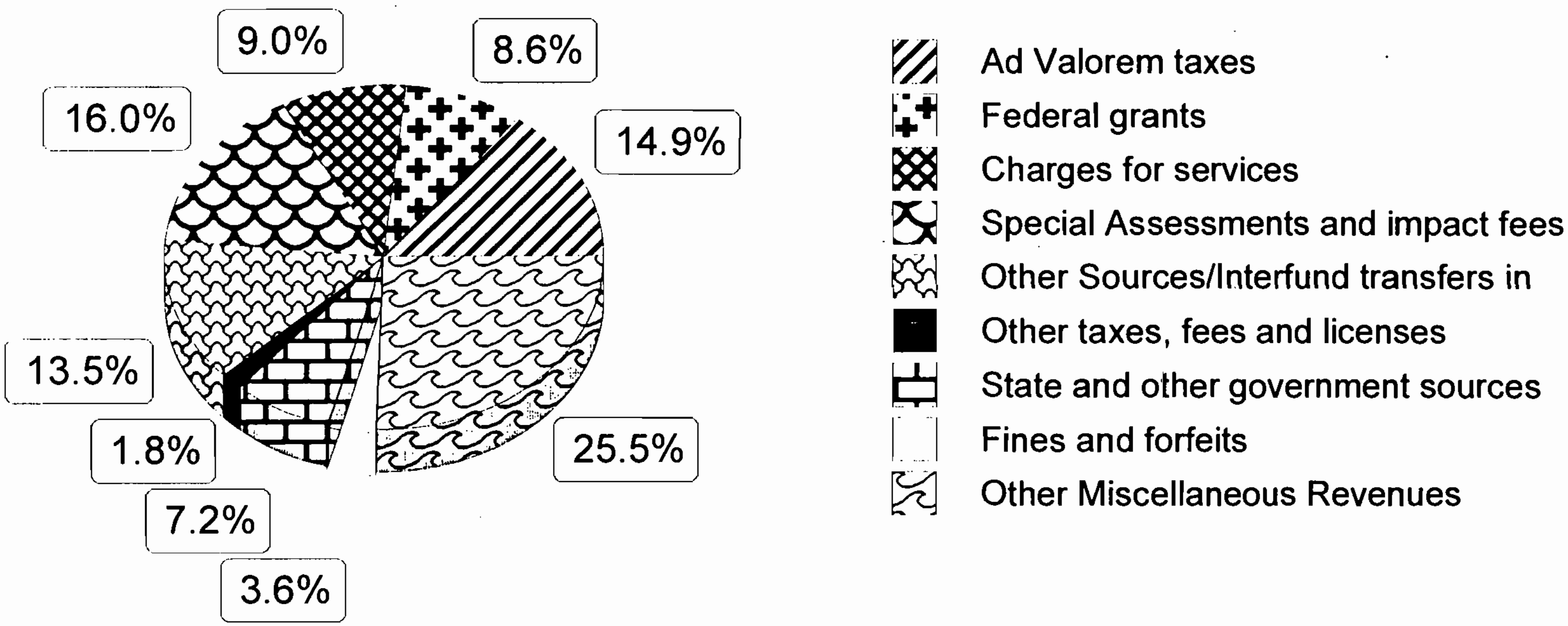
*Figures are based on Wakulla County's fiscal year ending September 30th.

Source: Wakulla County Building Department, 1996. Moore/Bowers, 1997.

CITY OF TALLAHASSEE

WAKULLA COUNTY
RESIDENTIAL BUILDING PERMITS
1994 THROUGH 1996
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure
2.2.7-12



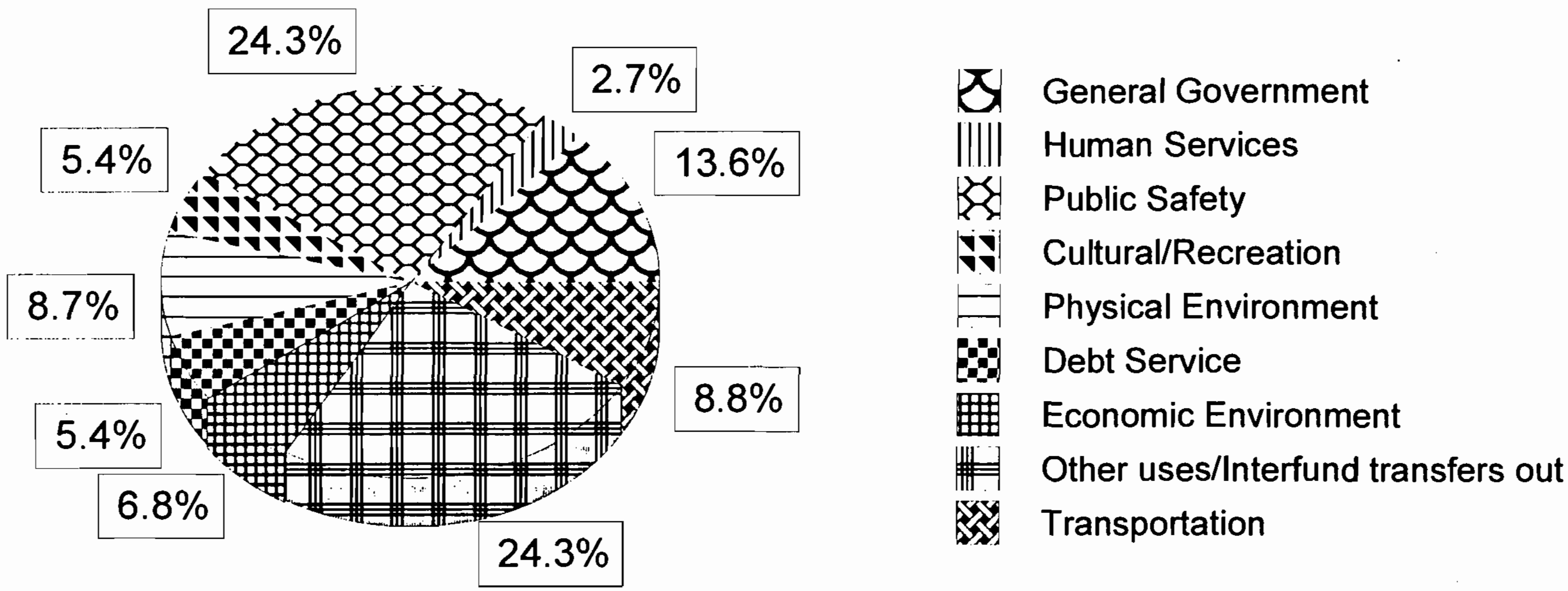
Source: Florida Department of Banking and Finance, 1996. Moore/Bowers, 1997.

CITY OF TALLAHASSEE

WAKULLA COUNTY
1995 REVENUES

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.2.7-13



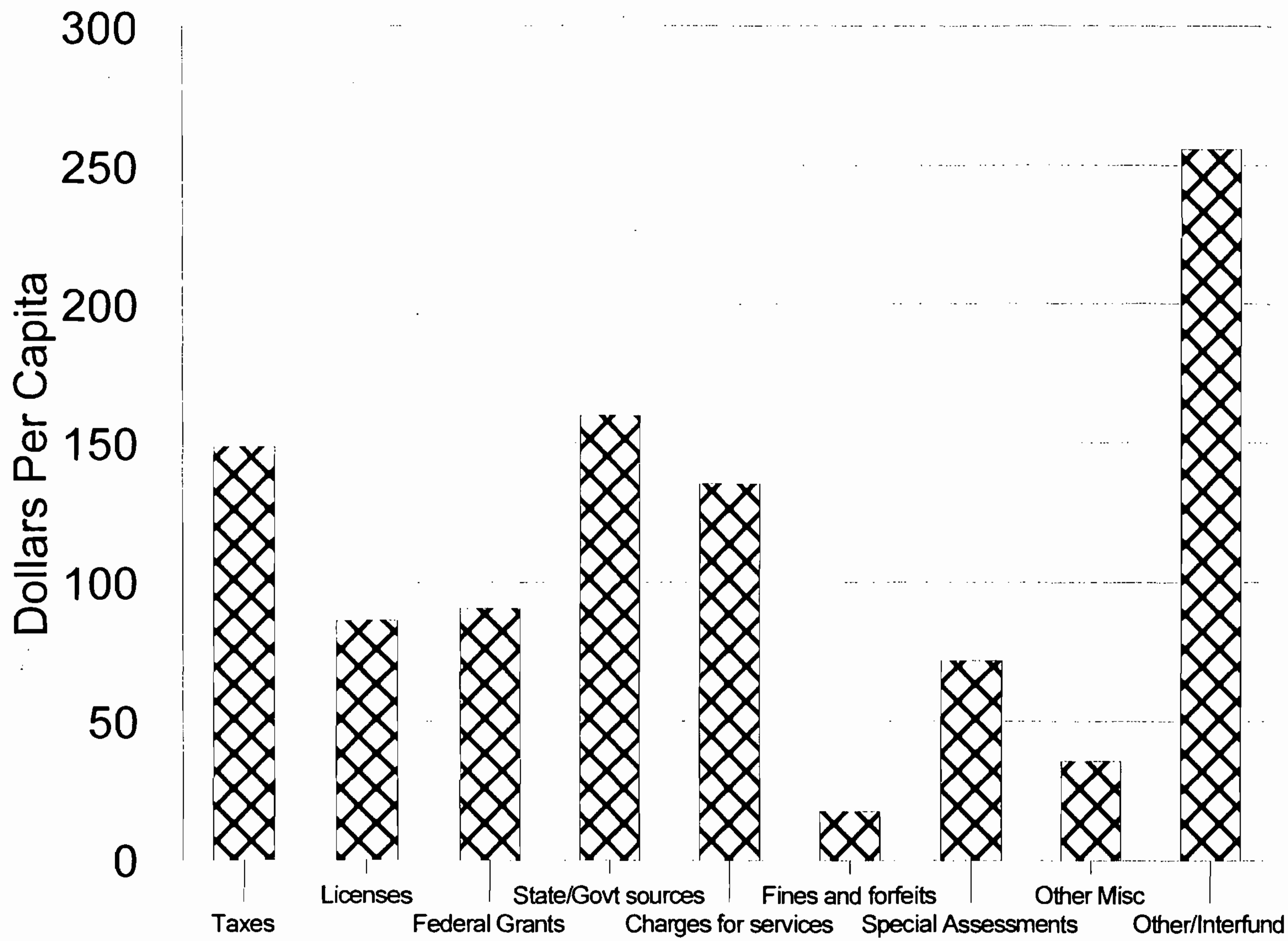
Source: Florida Department of Banking and Finance, 1996. Moore/Bowers, 1997.

CITY OF TALLAHASSEE

WAKULLA COUNTY
1995 EXPENDITURES

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.2.7-14



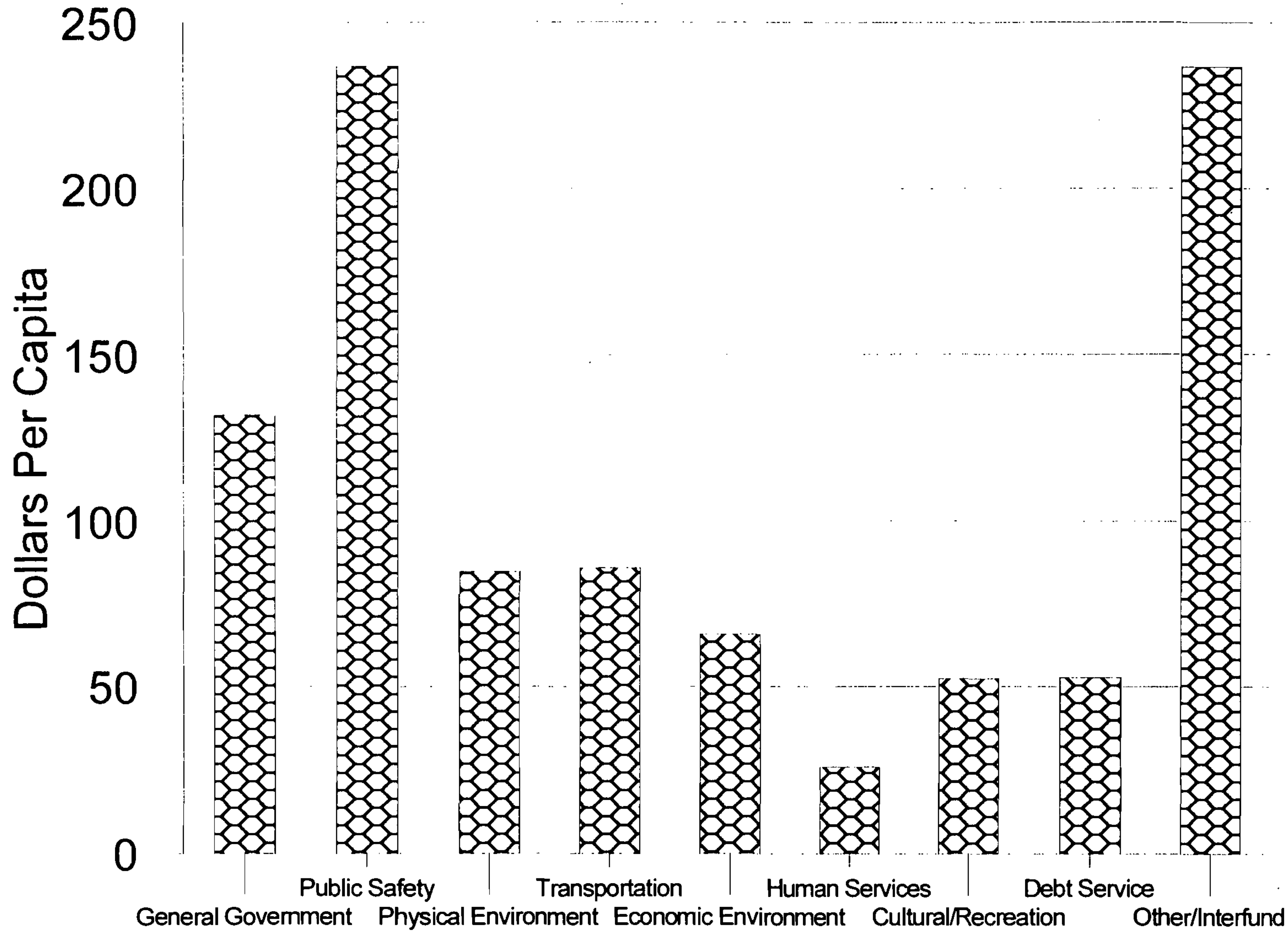
Source: Florida Department of Banking and Finance, 1996. Moore/Bowers, 1997.

CITY OF TALLAHASSEE

WAKULLA COUNTY
1995 REVENUES

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure
2.2.7-15



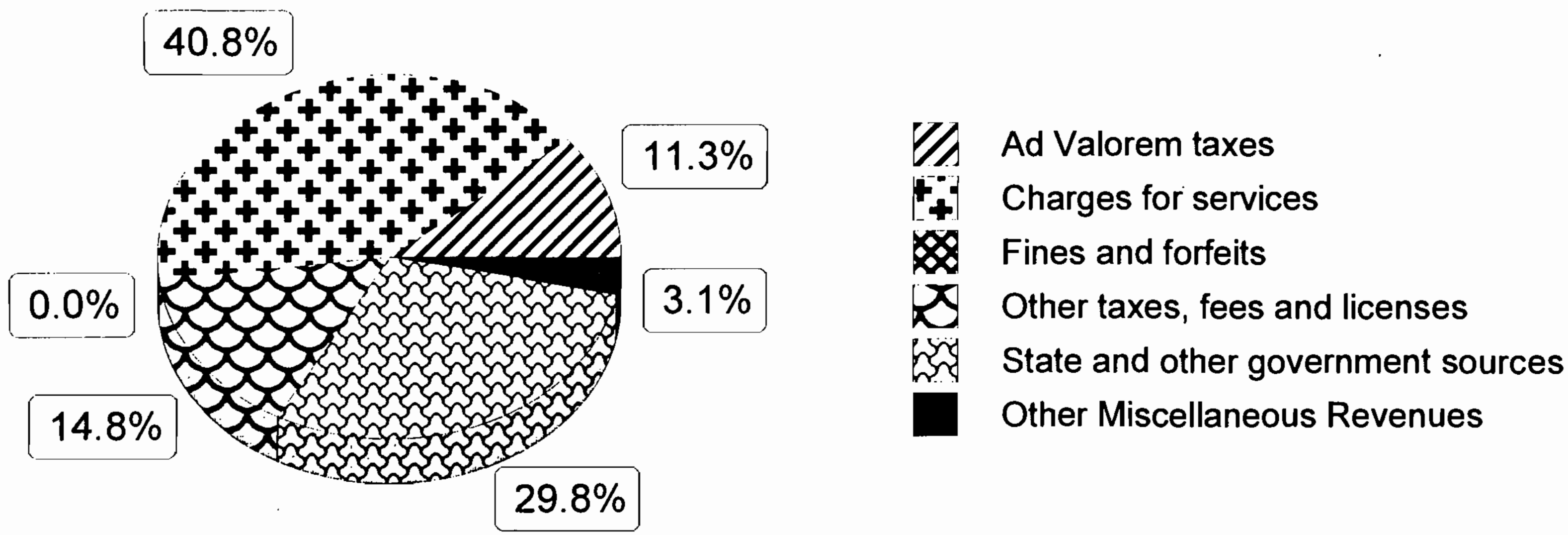
Source: Florida Department of Banking and Finance, 1996. Moore/Bowers, 1997.

CITY OF TALLAHASSEE

WAKULLA COUNTY
1995 EXPENDITURES

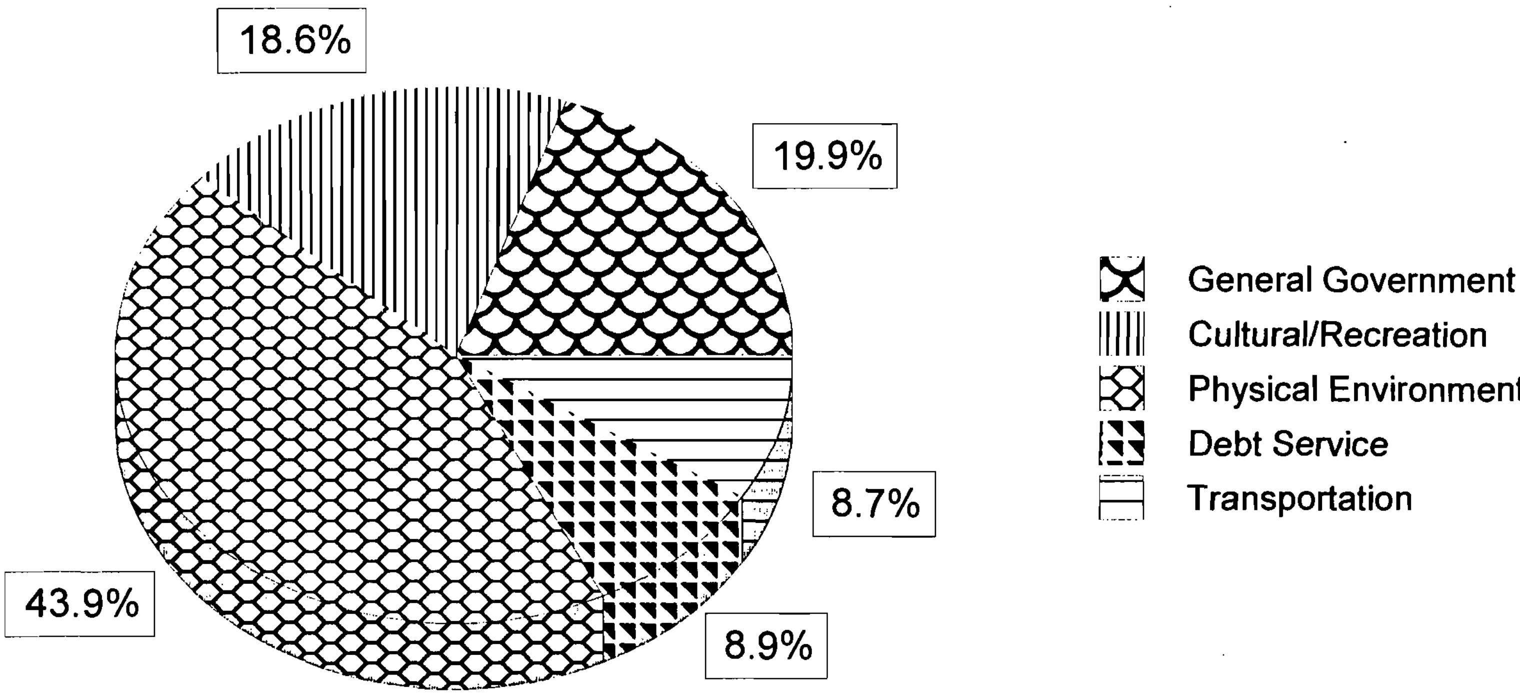
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.2.7-16



Source: Florida Department of Banking and Finance, 1996. Moore/Bowers, 1997.

CITY OF TALLAHASSEE	CITY OF ST MARKS 1995 REVENUES PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA	Figure 2.2.7-17



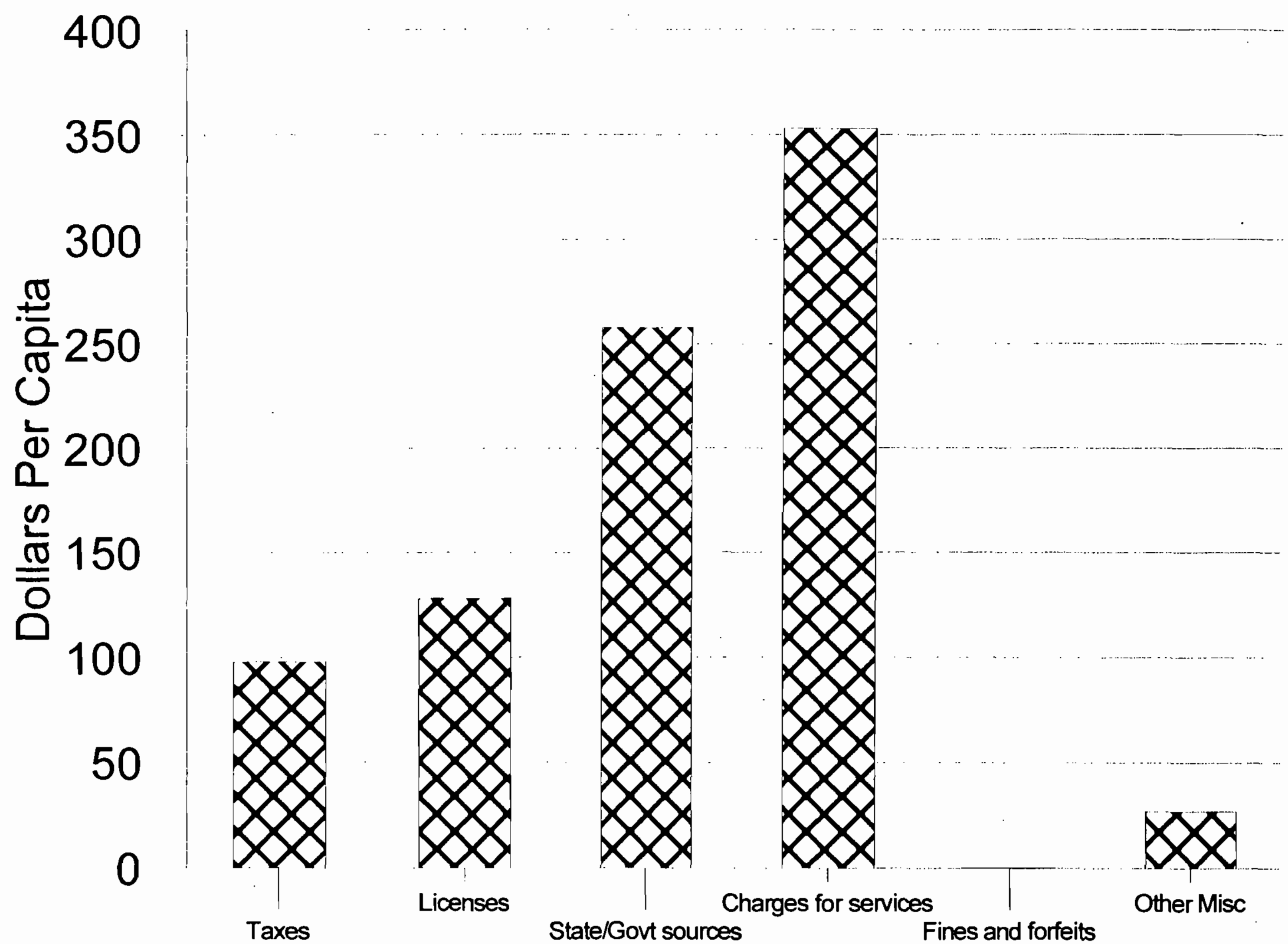
Source: Florida Department of Banking and Finance, 1996. Moore/Bowers, 1997.

CITY OF TALLAHASSEE

CITY OF ST MARKS
1995 EXPENDITURES

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure
2.2.7-18



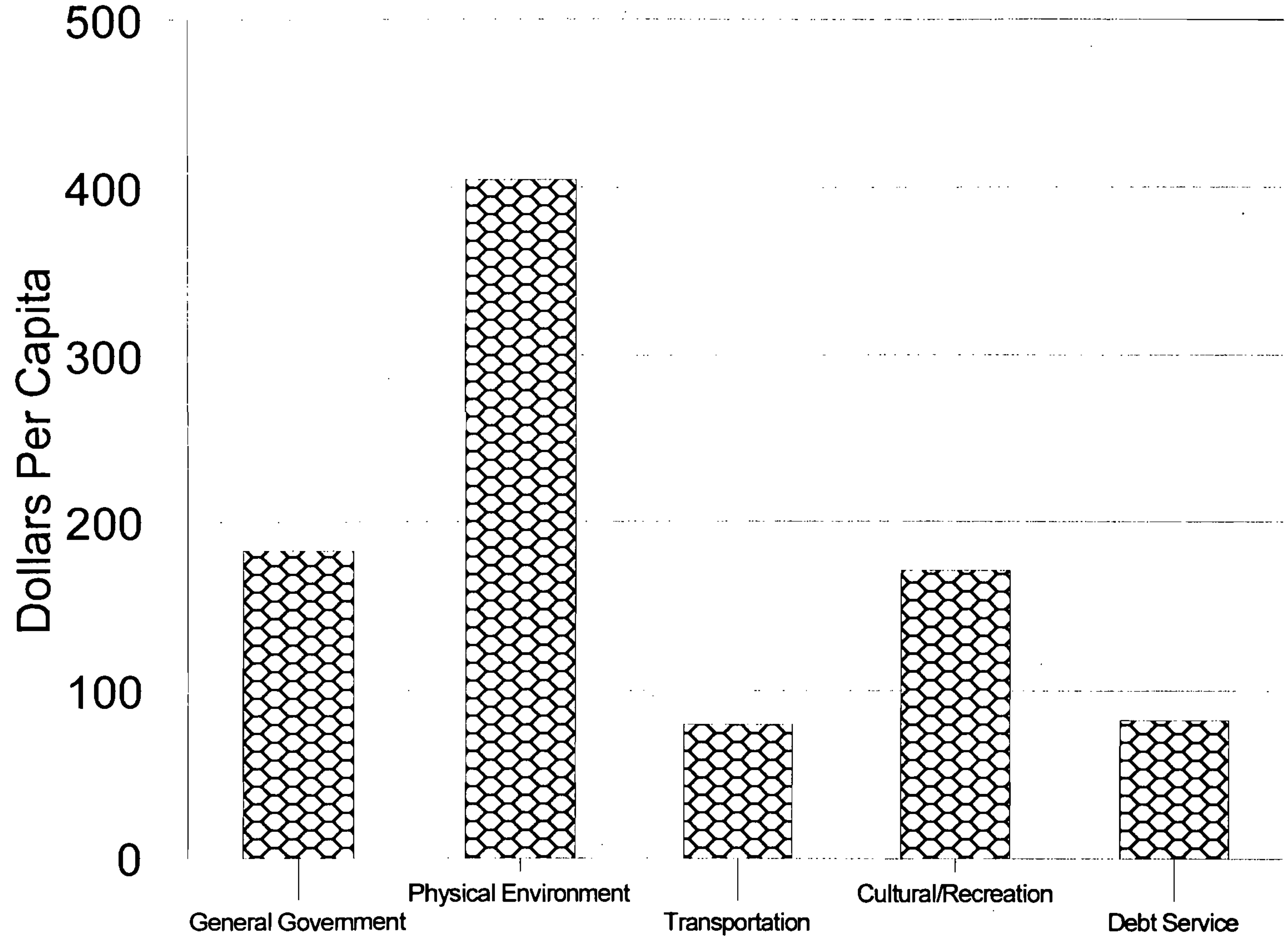
Source: Florida Department of Banking and Finance, 1996. Moore/Bowers, 1997.

CITY OF TALLAHASSEE

CITY OF ST MARKS
1995 REVENUES

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure
2.2.7-19



Source: Florida Department of Banking and Finance, 1996. Moore/Bowers, 1997.

CITY OF TALLAHASSEE

CITY OF ST MARKS
1995 EXPENDITURES

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.2.7-20

2.2.7.2 Public Services

Parks and Recreation

Wakulla County's parks and recreation inventory includes 39 public and private recreational facilities, five designated pastoral open space areas, and five designated corridor open space locations throughout the county. Pastoral open space areas correspond to the boundaries of the Apalachicola National Forest, the St. Marks National Wildlife Refuge, the Aucilla Wildlife Management Area, the Ochlockonee River State Park and the Wakulla Springs State Park. The corridor open space designation includes the St. Marks Rail to Trail (Tallahassee-St. Marks Historic Railroad State Trail), the Wakulla River, Florida National Scenic Trail, Sopchoppy River Canoe Trail, Ochlockonee River Canoe Trail and the St. Marks River.

The City of St. Marks owns and operates two parks. There are three parks located within a five-mile radius of the Purdom Station, including the Wakulla River Park Area, the St. Marks River Park Area and the Newport Recreation Area. Wakulla County owns and maintains the Newport Recreation Area.

Educational Services

Locations of educational facilities in Wakulla County are shown on Figure 2.2.7-21.

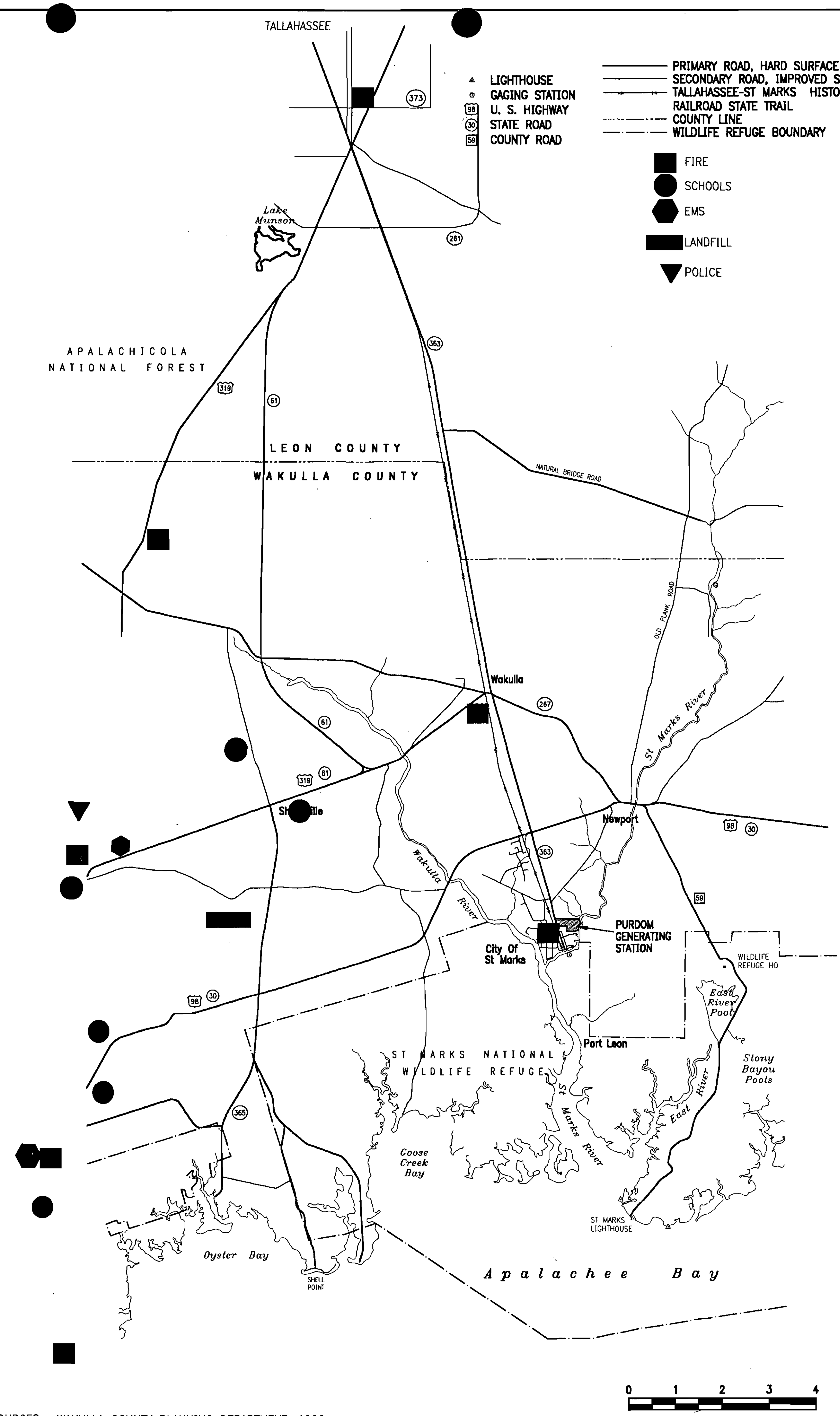
There are five primary and secondary schools in the county, including three elementary schools, one middle/junior high school, one high school, and one other type of school. Tallahassee Community College, Florida State University, and Florida A&M University are located in Tallahassee, approximately 20 miles north of the Purdom Station. Adult and community education is provided at the Wakulla Education Center. The Purdom Station lies within the Shadeville Elementary School District (SR 365), the Wakulla Middle School District, and the Wakulla High School District. The Florida Department of Education calculated a teacher-to-student ratio of 1:18.61 for Wakulla County during the 1994-95 school year. The Wakulla County School District's 1994-95 total budget was $43,185,089 including general revenue, debt service, capital projects, and special revenues. Wakulla County's expenditure per student was $4,494 per full-time equivalent; 92 percent of the statewide average expenditure. Local revenue makes up 12 percent of the school district's revenue, with federal funds contributing 5 percent and state funds contributing the remaining 83 percent.

Wakulla County operates one library which is located at 4330 Crawfordville Highway in Medart.

Public Safety

Locations of public safety facilities in Wakulla County are shown on Figure 2.2.7-21.

Law enforcement is provided by the Wakulla County Sheriff's Office, headquartered at 15 Oak Street, Crawfordville, approximately 15 miles from the Purdom Station. The Sheriff's Office headquarters is also the location of the Wakulla County jail facility and dispatch. The county is



SOURCES: WAKULLA COUNTY PLANNING DEPARTMENT, 1996
MOORE/BOWERS, 1996

CITY OF TALLAHASSEE

LOCATIONS OF PUBLIC SERVICES IN WAKULLA COUNTY

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.2.7-21

divided into three districts: north, central, and east. Coverage is provided by 3 to 4 shifts of 12 hours each.

Fire protection in Wakulla County is provided by 10 volunteer fire departments located throughout the county. The nearest fire stations to the Purdom Station are the St. Marks Volunteer Fire Department and the Wakulla Station Volunteer Fire Department.

The City of Tallahassee, the City of St. Marks, and the St. Marks Volunteer Fire Department have executed a mutual assistance agreement for fire protection and rescue service. That agreement provides for mutual assistance among the parties "in the event of a fire or other emergency which is, or is likely to be, beyond the control of the services, personnel, equipment, and facilities of the agency or fire department having jurisdiction. . . ." (Wakulla County Fire/EMS, 1996). The closest City of Tallahassee fire station likely to respond under the terms of the agreement is at the corner of Monroe Street and Magnolia Avenue on the south side of Tallahassee.

There are two 24-hour Emergency Medical Services (EMS) stations in Wakulla County that provide ambulance and rescue services. Station 2 in Medart is the nearest EMS station, located approximately eight miles from the Purdom Station. The fire departments also act as first responders in medical emergencies and are dispatched through the 911 system. The St. Marks Volunteer Fire Department is approximately one-half mile from the Purdom Station. There are no hospitals in Wakulla County, but two hospitals, Tallahassee Memorial Hospital and Tallahassee Community Hospital, are located approximately 25 miles from the Purdom Station. The Apalachee Health Center, located in Crawfordville, provides primary care health services to a limited number of patients, including, typically, lower income residents without health insurance.

Utility Services

Wastewater

Wakulla County has two wastewater treatment plants: Otter Creek Wastewater Treatment Plant and one at the county jail. The City of St. Marks Wastewater Treatment Facility is a city-wide system that is operated for the collection, treatment and disposal of non-industrial wastewater. The City of St. Marks Wastewater Treatment Facility is the nearest wastewater treatment facility to the Purdom Station. The maximum capacity is 50,000 gallons per day (gpd); current loads average 21,000 gpd.

Other nondomestic wastewater treatment facilities include two industrial wastewater treatment facilities serving the Purdom Station discharging to the St. Marks River and Primex Technologies (formerly Olin Corporation) discharging to the Wakulla River.

Water

The potable water system for the City of St. Marks is municipally owned and operated. The water system also serves the outlying unincorporated areas of the county along SR 30 and SR 363. The facilities comprising the water system include two wells: one supply well and one stand-by well. The water treatment plant has a 10,000 gallon holding tank and a 100,000 gallon elevated storage tank. The facility has the capacity to provide 144,000 gallons per day.

Currently, Wakulla County does not operate any water systems. Other water systems in the county providing services include the City of Tallahassee, Talquin, Sopchoppy Water, and Winco Utilities, which serves the Wakulla County Correctional Facility.

Solid Waste Services

The solid waste system in the City of St. Marks includes collection and disposal services as a municipal service. Residential garbage is collected twice weekly. The county-owned Lower Bridge Landfill is used only for construction debris and is used primarily as a transfer station for garbage before being hauled to the incinerator in Panama City. All other garbage is transferred to the Panama City incinerator in Bay County. Private contractors carry the garbage from the transfer station to Panama City. There are three solid waste drop sites to serve Wakulla County residents. The landfill and drop sites are maintained by the county. The solid waste disposal service is provided by the county for the county and the cities of St. Marks and Sopchoppy. Collection services in the county are currently unregulated. In addition to the City of St. Marks' service, three private contractors, Waste Management, Argus Services, and Quantum Services, provide collection services to county residents at the resident's request.

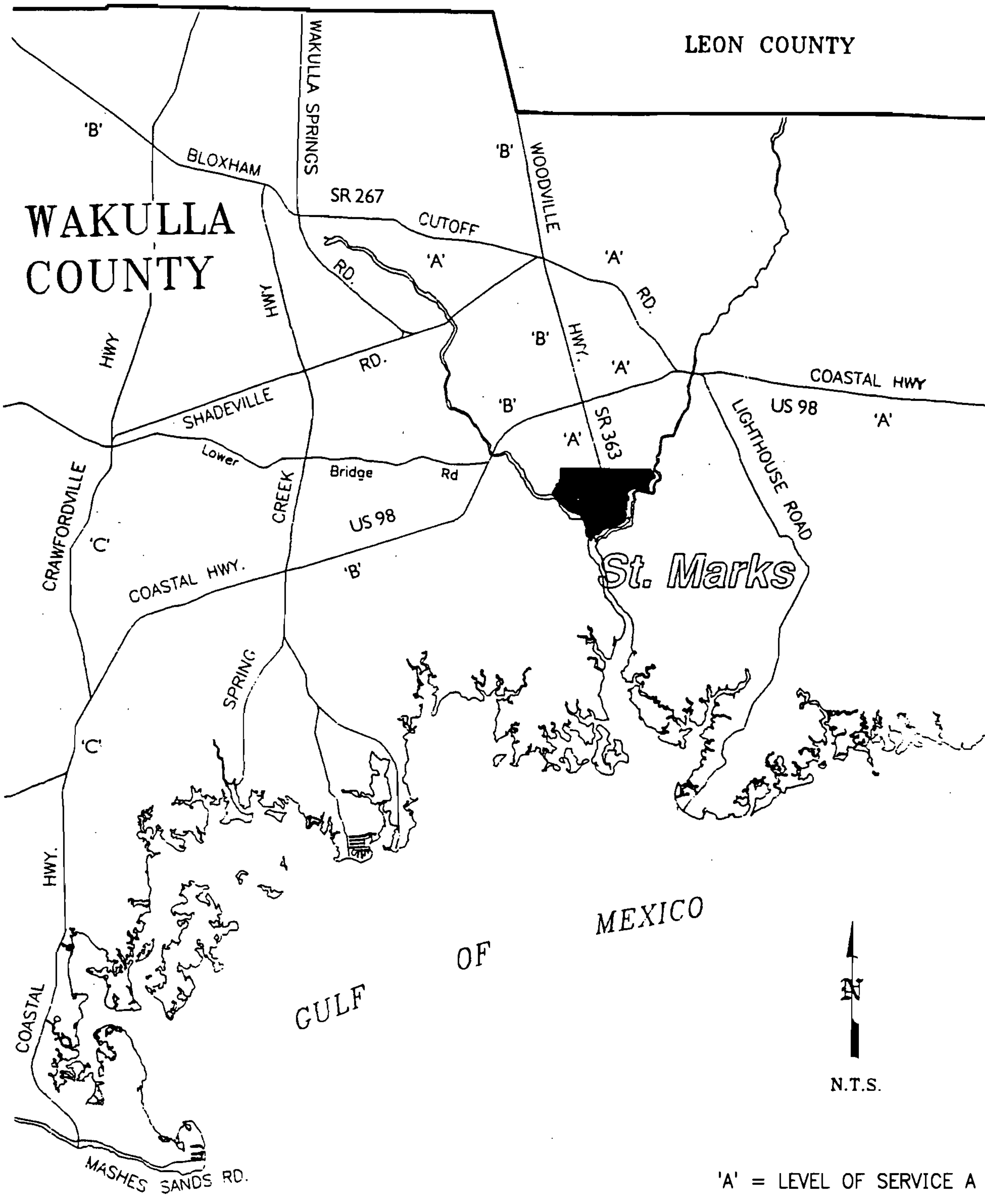
Transportation

Existing Traffic Conditions

To determine the existing levels of service (LOS) in the study area, new traffic volume data were collected in the immediate vicinity of the Purdom Station and county-wide data were obtained from the Apalachee Regional Planning Council (ARPC). In general, the roadways in the vicinity of the plant are lightly traveled.

Study Area

Initial study area limits for the Purdom Station were established based on traffic volumes expected to be generated by the Project. The main travel component consists of project construction traffic. If any impacts occur, traffic generated by the construction workers is expected to have the most impact on the roadways in Wakulla County and parts of Leon County. Since there is limited lodging available in close proximity to the site, the Project study area encompasses the central and eastern part of Wakulla County (Figure 2.2.7-22), and the southeastern part of Leon County (Figure 2.2.7-23).



'A' = LEVEL OF SERVICE A
'B' = LEVEL OF SERVICE B
'C' = LEVEL OF SERVICE C

SOURCE: HALL PLANNING & ENGINEERING, 1997

CITY OF TALLAHASSEE

WAKULLA COUNTY
TRANSPORTATION ROUTES

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.2.7-22

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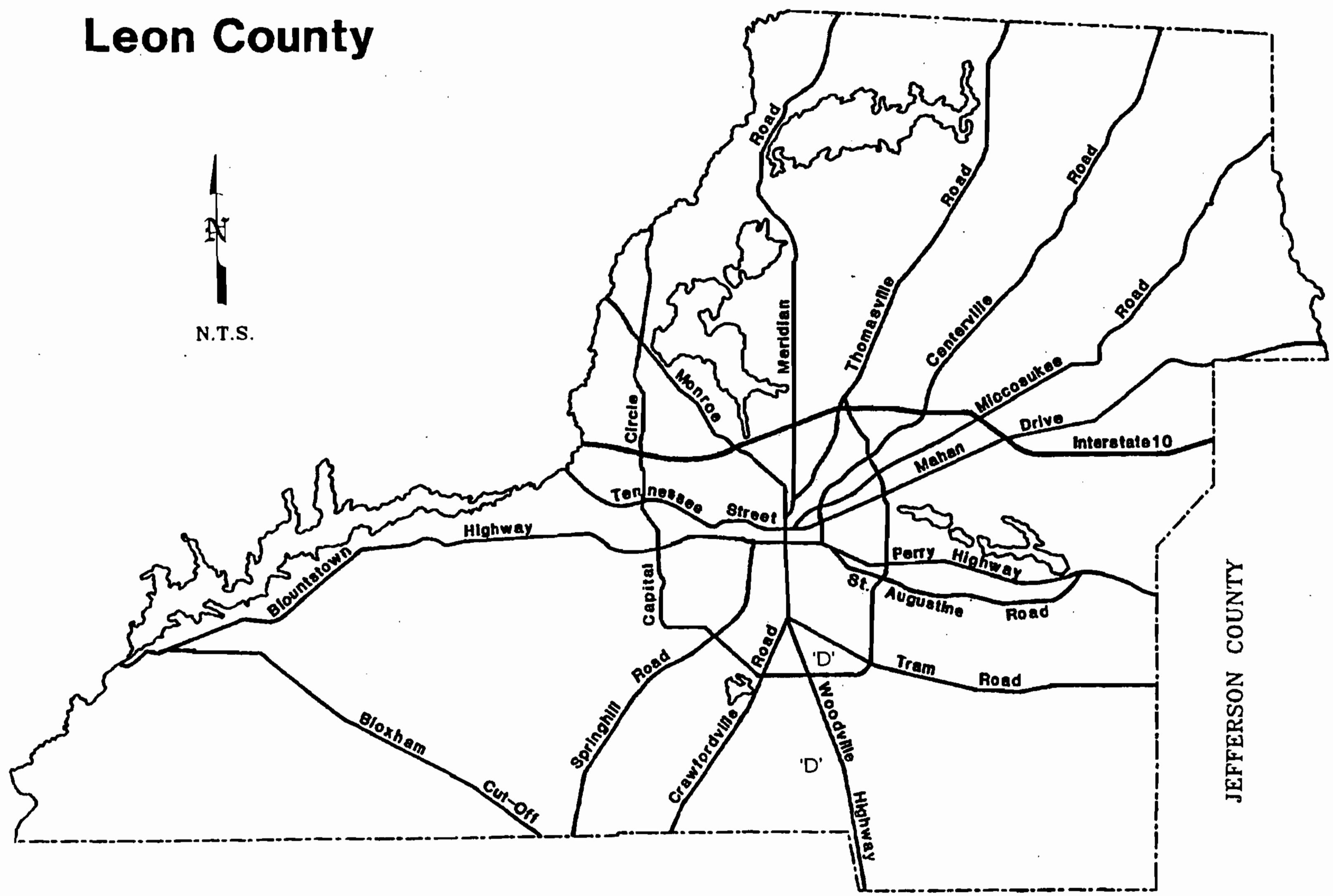

SOURCE: HALL PLANNING & ENGINEERING, 1997

CITY OF TALLAHASSEE

LEON COUNTY
TRANSPORTATION ROUTES

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure
2.2.7-23

The determination of significant traffic impact is different in Wakulla County and Leon County. Wakulla County bases its determination on any traffic impact to a county road in excess of 5 percent of the peak hour directional Maximum Service Flow at LOS D. Leon County considers their rural roads significantly affected by the Project, if:

1. Any roadway segment is operating at or above the adopted LOS, based on the most recent annual traffic count and the Project traffic is expected to contribute vehicle trips equal to 5 percent or more of the service volume at LOS C in the peak hour, and in the peak direction; or,
2. Any roadway segment is operating below the adopted LOS, based on the most recent annual traffic count and the Project traffic is expected to contribute vehicle trips equal to one percent or more of the service volume at LOS C in the peak hour, and in the peak direction.

Level of Service (LOS)

The concept of LOS uses quantitative measures that characterize operational conditions within a traffic stream and their perception by motorists and passengers (TRB, Highway Capacity Manual, Special Report 209). The descriptions for each individual LOS incorporate these conditions via such factors as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience.

Six levels of service are defined for each type of arterial. They are given letter designations, from A to F, with LOS A representing the best operating conditions and LOS F the worst. Each LOS represents a range of operating conditions.

The traffic volume that can be served under the stop-and-go conditions of LOS F is generally lower than the LOS E volume; consequently, service flow rate E defines the maximum flow rate, or capacity, of the facility. For most planning and design purposes; however, service flow rates C or D are usually used because they ensure an acceptable quality of service.

The following general statements describe arterial LOS:

1. *LOS A* consists of primarily free-flow operations at average travel speeds, usually about 90 percent of the free-flow speed for the arterial classification. Vehicles are completely unimpeded in their ability to maneuver within the traffic stream. Stopped delay at signalized intersections is minimal.
2. *LOS B* represents reasonably unimpeded operations at average travel speeds, usually about 70 percent of the free-flow speed for the arterial classification. The ability to maneuver within the traffic stream is only slightly restricted and stopped delays are not bothersome. Drivers are not generally subjected to appreciable tension.
3. *LOS C* represents stable operations; however, ability to maneuver and change lanes in midblock locations may be more restricted than at LOS B, and longer queues, adverse signal coordination, or both may contribute to lower average travel speeds of about 50 percent of the average free-flow speed for the arterial classification. Motorists will experience appreciable tension while driving.

4. *LOS D* borders on a range in which small increases in flow may cause substantial increases in delay and hence decreases in arterial speed. LOS D may be due to adverse signal progression, inappropriate signal timing, high volumes, or some combination of these factors. Average travel speeds are about 40 percent of free-flow speed.
5. *LOS E* is characterized by significant delays and average travel speeds of one-third the free-flow speed or less. Such operations are caused by some combination of adverse progression, high signal density, high volumes, extensive delays at critical intersections, and inappropriate signal timing.
6. *LOS F* characterizes arterial flow at extremely low speeds below one-third to one-fourth of the free-flow speed. Intersection congestion is likely at critical signalized locations, with high delays and extensive queuing. Adverse progress is frequently a contributor to this condition.

Project traffic impacts are defined based on a peak hour directional LOS D standard in Wakulla County. Since these hourly volumes are not generally available, a daily LOS analysis is used and yields an adequate approximation. The existing, relatively low traffic volumes in the area are the main reason the daily analysis is sufficient. Policy 1.1 of the Traffic Element of the Wakulla County Comprehensive Plan states that the County has adopted the LOS standards as defined by the Florida Department of Transportation "Level of Service Standards and Guidelines Manual for Planning."

This report incorporated all adopted LOS standards by state or local governments to remain consistent with their plans. Data collected by the ARPC and the Leon County Growth Management Department are used to supplement the traffic data, as necessary.

The ARPC determined the existing levels of service on all state roads within Wakulla County, based on average annual daily traffic. The Leon County Growth Management Department determined existing levels of service within their jurisdiction for peak hour, peak directional traffic flows (Leon County does not consider the peak hour, non-peak directional flow). These data, together with the roadway geometrics, adopted LOS standards, existing traffic volumes and corresponding LOS are shown in Table 2.2.7-1.

Table 2.2.7-1 shows that all roads in the study area, except two segments of Woodville Highway in Leon County, operate at or above LOS C. Although two segments in the study area operate below LOS C, Project traffic on these segments will not be traveling in the peak direction and, therefore, will not adversely affect the LOS.

Programmed Improvements

Presently, the FDOT is performing a Project Development and Environmental study to four-lane US 319 from US 98 into Leon County. However, the construction phase for this Project has not been scheduled as of this date. In addition, the FDOT has not scheduled any other capacity improvements within the area which would effect the existing LOS.

TABLE 2.2.7-1
EXISTING TRAFFIC CONDITIONS

Roadway	Section	State Road	No. of Lanes	Type	Agency	LOS Standard	Max. Service Flow at Adopted LOS	1996 AADT * = estimated	Existing LOS
Woodville Hwy.	St. Marks to US 98	SR 363	2	Rural Und.	FDOT	C	8200	2040	A
	US 98 to Leon Co. line	SR 363	2	Rural Und.	FDOT	C	8200	3890*	B
US 98	SR 375 to US 319	SR 30/61	2	Rural Dev.	FDOT	C	9200	7530*	C
	US 319 to SR 363	SR 30	2	Rural Und.	FDOT	C	8200	4600	B
	SR 363 to Jefferson Co. line	SR 30	2	Rural Und.	FDOT	C	8200	2400	A
SR 267	US 98 to US 319	SR 267	2	Rural Und.	FDOT	C	8200	2470*	A
	US 319 to CR 373	SR 267	2	Rural Und.	FDOT	C	8200	3390*	B
	CR 373 to Leon Co. line	SR 267	2	Rural Und.	FDOT	C	8200	1160*	C
US 319	SR 30 to Forest Tower	SR 61	2	Rural Und.	FDOT	C	8200	7530*	C
	Crawfordville area	SR 61	2	Rural Dev.	FDOT	C	11000	8030*	C
Leon County (peak hour, peak directional volumes)									
Woodville Hwy.	Wakulla Co. line to Natural Bridge Rd. southbound: peak direction	SR 363	2	Rural Dev.	FDOT	C	650	450	C
	Natural Bridge Rd. to Oak Ridge Rd. southbound: peak direction	SR 363	2	Rural Dev.	FDOT	C	650	900	D
	Oak Ridge Rd. to Capital Circle southbound: peak direction	SR 363	2	Rural Dev.	FDOT	C	810	1060	D

* Volumes were determined by applying an average annual growth factor to the 1995 AADT of the roadway section.

** The peak directional volumes were determined with the Art_Tab program. The non peak directional volumes were determined based on the 1995 FDOT Level of Service tables.

AADT - Average Annual Daily Traffic

Source: Hall Planning and Engineering, 1997

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2.3 BIOPHYSICAL ENVIRONMENT

This section contains subsections on the following issues, in accordance with the SCA Guidelines:

- Geohydrology
- Subsurface Hydrology
- Site Water Budget and Area Uses
- Surficial Hydrology
- Vegetation/Land Use
- Ecology
- Meteorology and Ambient Air Quality
- Noise
- Other Environmental Features

2.3.1 Geohydrology

2.3.1.1 Geologic Description of the Site-Area

This section describes the major geologic features of the eastern panhandle region of Florida, including the area of the Purdom Station, and discusses these geologic features on a regional scale.

Geographic Setting

Wakulla County lies entirely within the Gulf Coastal Lowlands physiographic province. This province is characterized by generally flat, sandy terrain which extends from the Gulf Coast inland to approximately the 100-foot elevation contour. The Gulf Coastal Lowlands province includes the poorly drained pine flatwoods, swamps, and river basins that extend from the Gulf north into Leon County. Surface slope averages about four feet per mile and dips downward toward the coast. A series of Pleistocene marine terraces, defined based on their relative elevations, punctuates the surface of the Gulf Coastal Lowlands (see Figure 2.3.1-1). The Gulf Coastal Lowlands are locally divided into a series of two major and six minor geomorphic subzones (see Figure 2.3.1-1). The major geomorphic zones within this province are the Apalachicola Coastal Lowlands and the Woodville Karst Plain (Rupert and Spencer, 1988).

The Purdom Station is located between and just north of the confluence of the St. Marks and the Wakulla Rivers in St. Marks, Wakulla County, Florida at a site grade elevation of approximately 10 feet above mean sea level. This area is part of the Woodville Karst Plain, one of the two major geomorphic zones within the Gulf Coastal Lowlands. The Woodville Karst Plain comprises the entire eastern portion of Wakulla County. The St. Marks and Wakulla Rivers are the major streams flowing in the Woodville Karst Plain. Both rivers have swampy floodplains averaging less than 10 feet in elevation (Rupert and Spencer, 1988).

Geologic Structure

The subsurface geologic structure of Wakulla County has been influenced by several regional structural features including the Peninsular Arch, the Apalachicola Embayment, the Chattahoochee Anticline, the Gulf Trough, and the Ocala Platform. The location and orientation of these features is illustrated on Figure 2.3.1-2, prepared by the Florida Geological Survey (Florida Geological Survey, 1991).

- *Peninsular Arch* - The Peninsular Arch forms the axis of peninsular Florida. It is a southeast trending structural high in pre-Mesozoic sediments. No direct structural relationships are known to exist between this arch and the Tertiary sediments of Wakulla County. The downwarped western flank of the Peninsular Arch extends beneath the eastern portion of the area (Rupert and Spencer, 1988).

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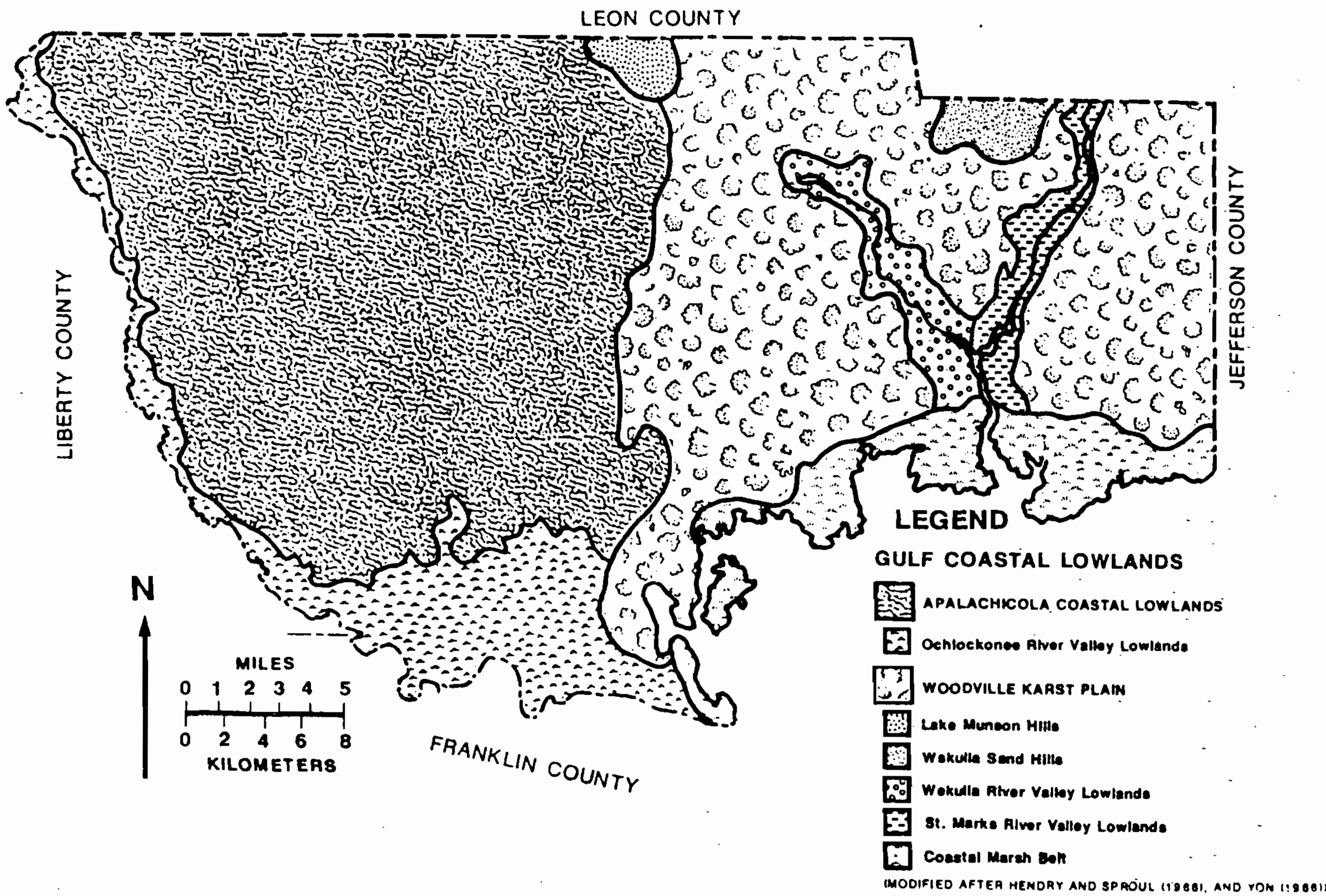


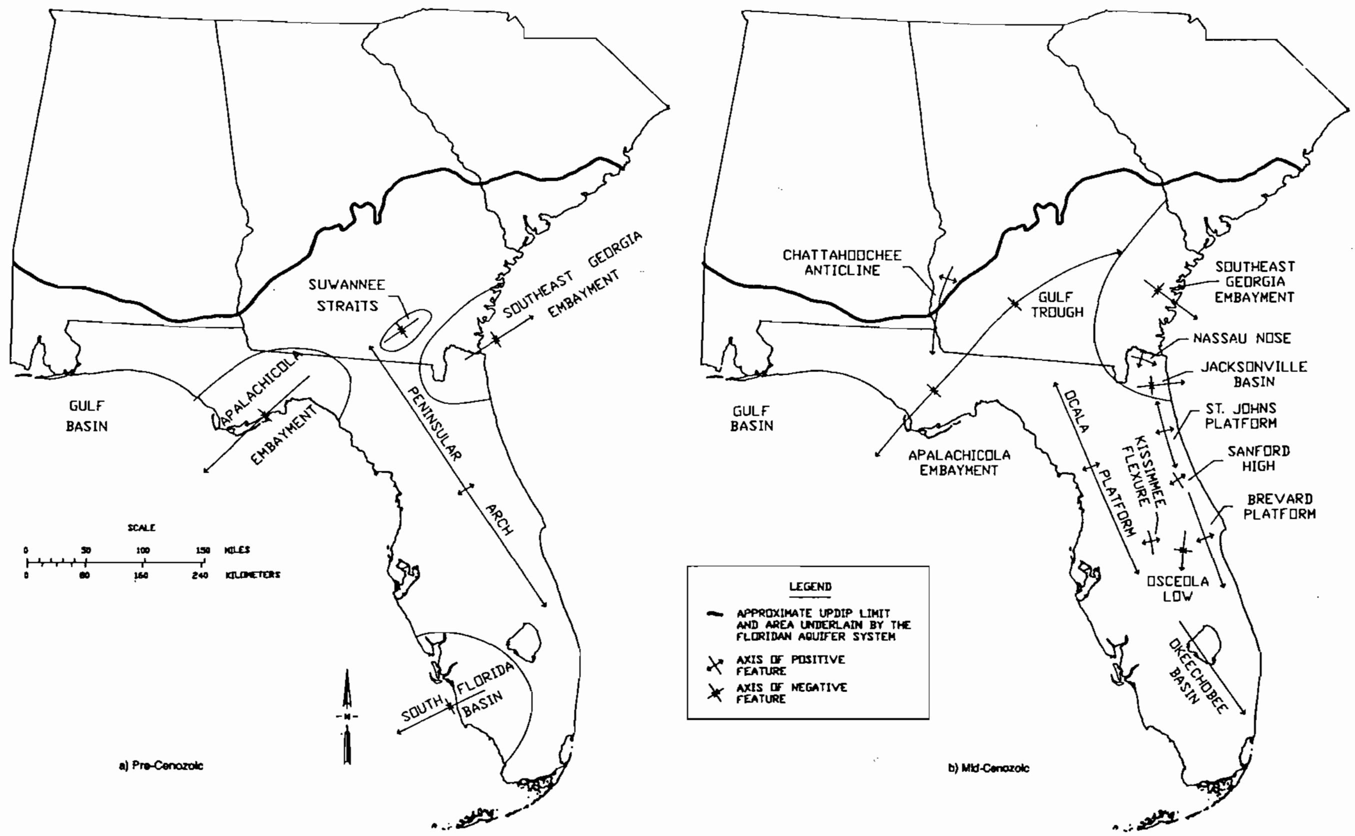
SOURCE: RUPERT AND SPENCER, 1988

CITY OF TALLAHASSEE

GEOMORPHIC PROVINCES OF WAKULLA COUNTY

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.1-1



SOURCE: FLORIDA GEOLOGICAL SURVEY, 1991

CITY OF TALLAHASSEE

STRUCTURAL GEOLOGIC FEATURES OF FLORIDA

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure

2.3.1-2

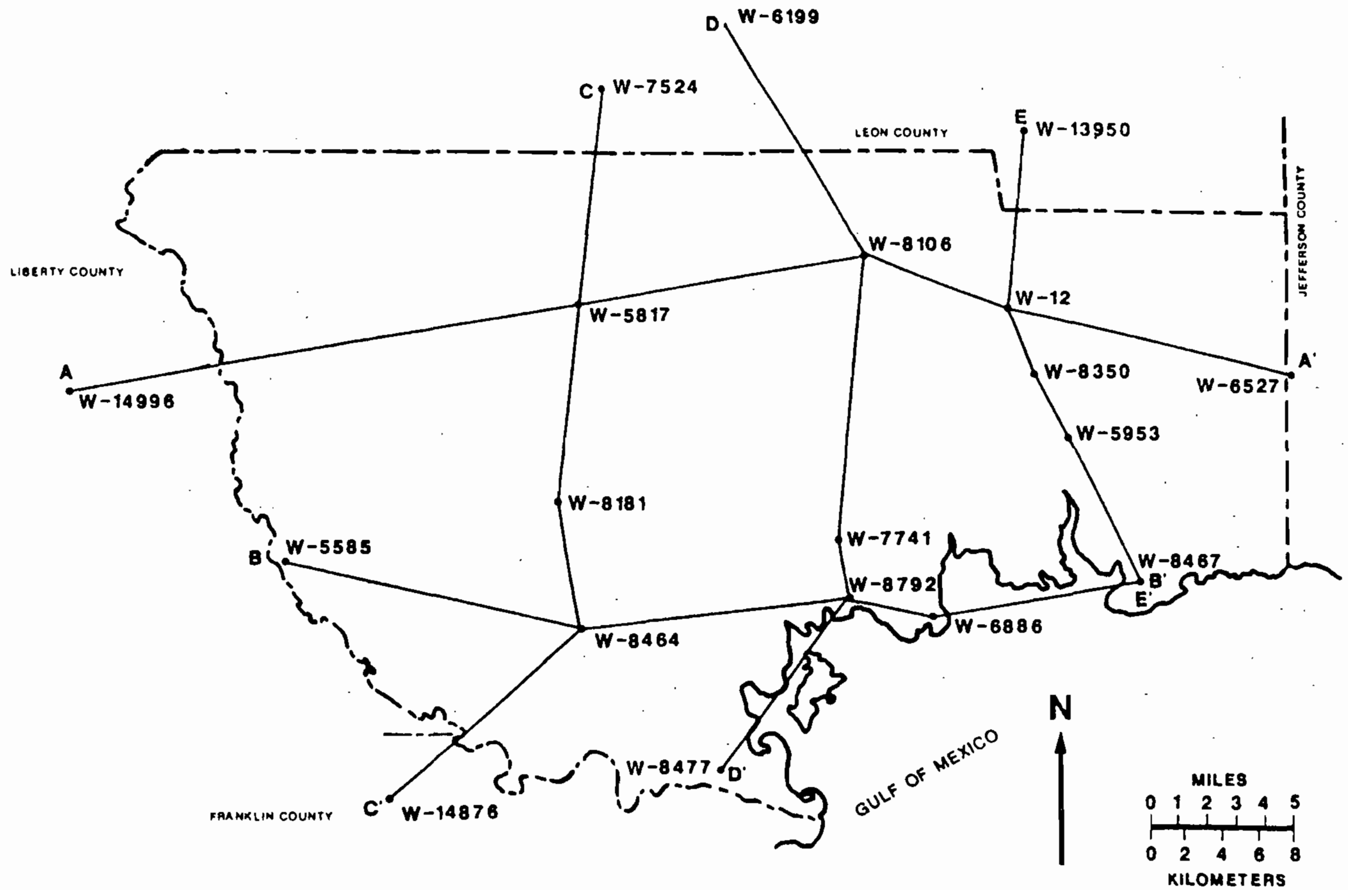
- *Apalachicola Embayment* - Wakulla County is situated along the eastern edge of a broad sedimentary basin known as the Apalachicola Embayment. This basin covers approximately 30,000 square miles. Geologic logs from oil test wells have shown that the sediments in this basin are approximately 13,000 feet thick. These sediments overlie Paleozoic-age metamorphic rocks (Rupert and Spencer, 1988)
- *Chattahoochee Anticline* - North and northwest of the Apalachicola Embayment is a minor structural high named the Chattahoochee Anticline (Rupert and Spencer, 1988). This structure is an elongate anticline trending northeast-southwest. Oligocene and Eocene rocks are exposed at the surface in the vicinity of the crest. Younger sediments pinch out or are truncated against it (Schmidt, 1984).
- *Gulf Trough* - Wakulla County lies in a transitional area between the carbonate-evaporite facies to the southeast and the terrigenous clastic facies to the north and west within a broad basin known as the Gulf Trough. Early researchers proposed the existence of a channel-like area of erosion separating the continental border from the Eocene and Miocene islands of the Florida peninsula. Recent researchers have suggested that strong, scouring water currents in the trough formed both a lithologic and biologic facies barrier during almost the entire Paleocene through Eocene. Wells drilled in Oligocene and younger sediments over the trough show a sediment thickening which may be related to post-Eocene downwarping in the trough or infilling of this topographically low feature (Rupert and Spencer, 1988).
- *Ocala Platform* - The Ocala Platform is a gentle, post-Oligocene flexure in west-central peninsular Florida (Scott, 1988). The platform exposes the Ocala Group and Avon Park Formation near its crest in central Florida. East and west of the crest, younger sediments truncate against the flanks of this structure (Rupert and Spencer, 1988).

Regional Geologic Setting

In eastern Wakulla County, the subsurface geology, in descending order, consists of a thin veneer, usually less than 20 feet thick, of quartz sand and calcareous, clayey, sand deposits of recent alluvium. These sediments were deposited after the Miocene in the Pleistocene through the Holocene. This thin veneer of recent alluvium lies unconformably over weathered limestone of the St. Marks Formation, portions of the Hawthorn Group, and other Miocene age deposits. West of Crawfordville, these recent clastic sedimentary deposits thicken to as much as 100 feet and may lie directly on the Jackson Bluff Formation of the Hawthorn Group, or the St. Marks Formation. The Hawthorn Group consist of several early to mid-Miocene age formations (Rupert and Spencer, 1988).

A location map for two regional geologic cross-sections is provided on Figure 2.3.1-3: A-A' (Figure 2.3.1-4) and E-E' (Figure 2.3.1-5).

The lower Miocene includes two formations, the St. Marks and the Chattahoochee. The Chattahoochee Formation includes the updip, generally silty and clayey facies occurring to the west of Wakulla County. The St. Marks Formation refers to the calcareous downdip facies of this lower Miocene (Rupert and Spencer, 1988). This formation underlies nearly all of Wakulla County, and interfingers with the Chattahoochee Formation to the west and northwest. The St.



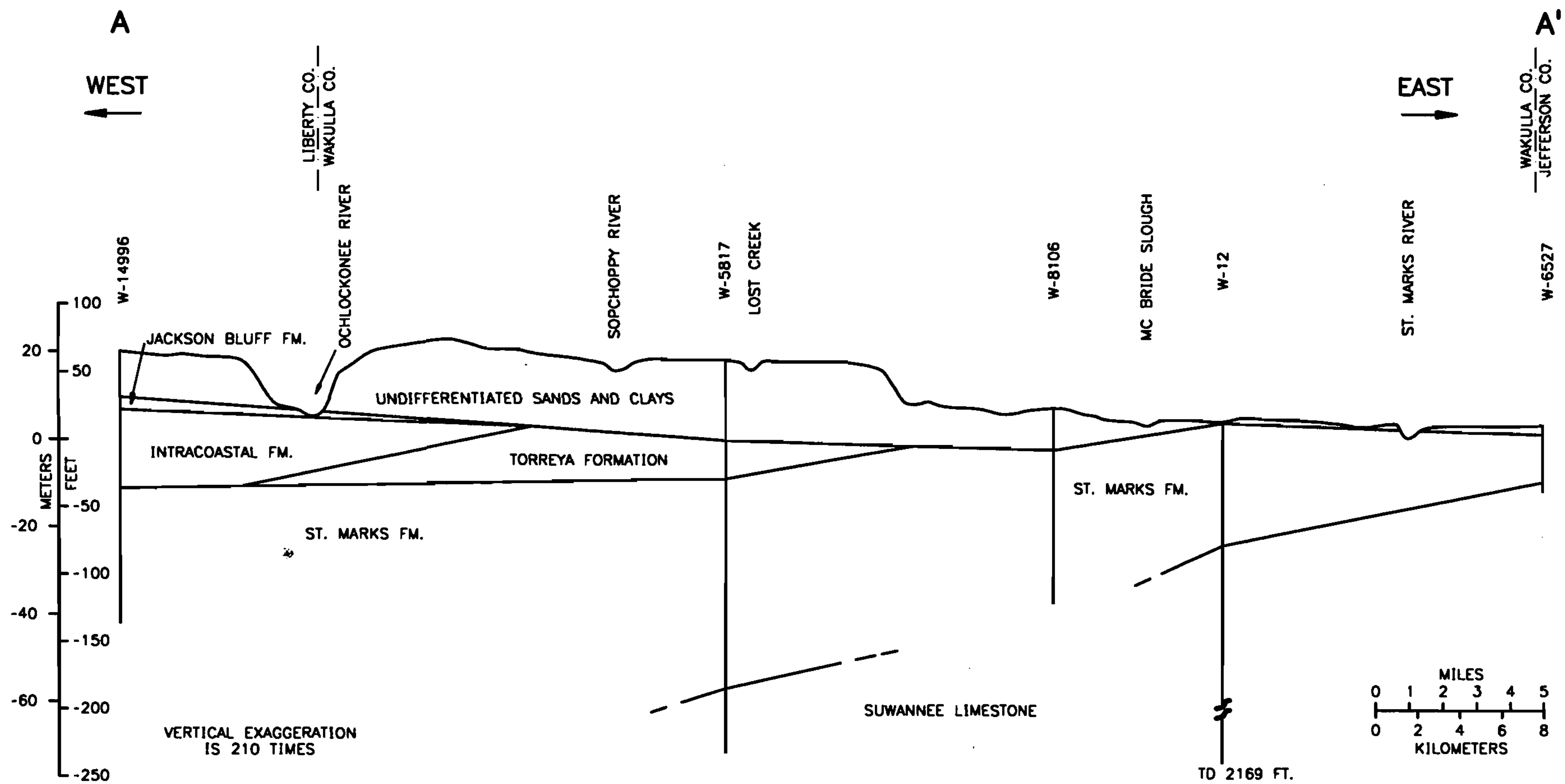
SOURCE: RUPERT AND SPENCER, 1988

CITY OF TALLAHASSEE

GEOLOGIC CROSS SECTION LOCATION MAP

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.1-3



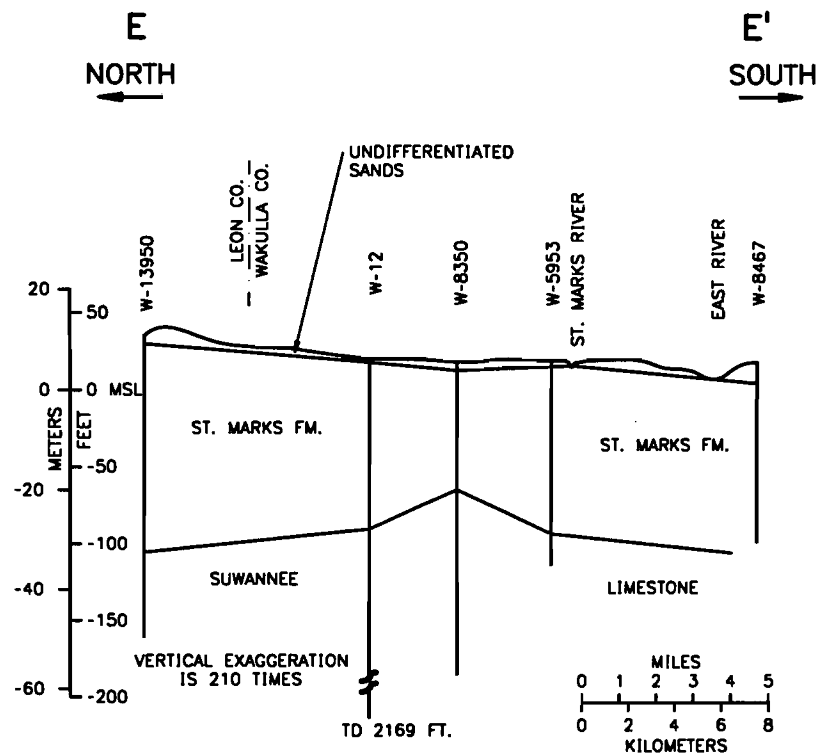
SOURCE: RUPERT AND SPENCER, 1988

CITY OF TALLAHASSEE

GEOLOGIC CROSS SECTION A-A' (EAST-WEST)

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.1-4



SOURCE: RUPERT AND SPENCER, 1988

CITY OF TALLAHASSEE

GEOLOGIC CROSS SECTION E-E' (NORTH-SOUTH)

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.1-5

Marks outcrops throughout much of eastern Wakulla County, particularly along the southeast coast. Many of the springs and sinks present in Wakulla County are associated with the St. Marks River. The St. Marks Formation is typically described as a pale orange, or light gray to white, calcarenitic limestone, generally fossiliferous, well indurated, and frequently dolomitic. Often, the St. Marks consists of several weathered limestone and marl or clay layers which are complexly interfingered. Several common foraminifera and mollusk species are found throughout the St. Marks Formation (Rupert and Spencer, 1988). The United State Geological Survey (USGS) provided the following description for the St. Marks Formation: "a predominately fine- to medium-grained, partially recrystallized, silty to sandy limestone that has undergone degrees of secondary dolomitization" (Davis, 1996).

The thickness of the St. Marks Formation varies from less than 1 foot in southwestern Jefferson County, where it pinches out against the Suwannee Limestone, to over 200 feet in Gulf County to the west of Wakulla County. The lithology of the St. Marks Formation becomes indistinguishable from that of the younger Bruce Creek Limestone west of Wakulla County (Schmidt, 1984).

The Bruce Creek limestone is a younger, Middle Miocene-age limestone, typically white to light yellow-gray, moderately indurated, calcarenitic and quartz sandy, highly fossiliferous limestone. Schmidt places the easternmost limit of this formation's occurrence at the eastern edge of the Apalachicola Embayment, but the extent to which it underlies Wakulla County is yet to be determined (Schmidt, 1984).

The St. Marks Formation lies unconformably over the Suwannee Limestone. All of Wakulla County is underlain by the Suwannee Limestone of the Oligocene which outcrops sporadically in southeast Wakulla County. Some researchers have indicated that the Suwannee Limestone borders the Gulf Coast along a portion of the Wakulla-Jefferson County line (Rupert and Spencer, 1988). Outcrops are in the form of dolostone and silicified limestone boulders. In well cuttings and cores, the Suwannee Limestone is generally described as a white to light-tan, cream, or brown recrystallized calcarenitic limestone, frequently dolomitic, and usually fossiliferous. The USGS described the Suwannee Limestone as "usually consisting of two permeable rock types: 1) cream to tan, crystalline, highly vuggy limestone containing prominent gastropod and pelecypod casts and molds and 2) white to cream, finely pelletal limestone containing small foraminifers and pellets of micrite bound to a finely crystalline limestone matrix" (Davis, 1996). The conduits of the Wakulla Spring cave system are developed in Suwannee Limestone (Rupert and Spencer, 1988). The Suwannee Limestone is the uppermost formation of a group of limestone and dolomite formations which form a blanket several thousand feet thick beneath all of Wakulla County.

Below the Suwannee Limestone lies the Eocene series of the Ocala Group, the Avon Park Formation and the Wilcox Group. Essentially all of Wakulla County is underlain by the Ocala Group. In Wakulla county, the Ocala Group consists in descending order of the Inglis, Williston, and Crystal River Formations. The contact between the Suwannee Limestone Formation and the Ocala Group is an unconformable erosional surface. Lithologic descriptions from several oil test wells reported penetrating a light-tan limestone and brown dolomitic or chalky limestone at depth intervals from 400 to 917 feet below land surface which were described as Eocene deposits (Rupert and Spencer, 1988). The USGS provides the following description of the Ocala Group:

"The Ocala Limestone consists of two different rock types. The upper portion is a white, generally soft and friable, porous coquina consisting of foraminifera, bryzoa fragments, and whole to broken echnoid remains. The lower part of the Ocala Limestone is composed of cream to white, generally fine-grained, soft to semi-indurated, micritic limestone containing abundant miliolid remains and large foraminifers" (Davis, 1996). Eocene Series deposits are underlain by the Paleocene Cedar Keys Formation or Clayton Formations and several other older sedimentary and metamorphic deposits which form the basement of the Eastern Florida Panhandle region.

2.3.1.2 Detailed Site Lithologic Description

The regional geology of the area near the Purdom Station is described in Section 2.3.1.1, based upon available publications. This section presents site-specific data obtained from subsurface geotechnical explorations performed by independent consultants in 1956, 1976, 1994, and 1995 at the Purdom Station. This section describes and correlates site-specific geology to previously described geologic units. The geologic framework is limited to the spatial distribution and depth of the borings conducted.

Seven test soil borings were conducted by Reynolds, Smith & Hills in January 1956 using a split spoon sampler and rotary drill. These borings were completed in an area northeast of the Purdom Unit 8 site to provide geotechnical and foundation data as part of the construction for Unit 5 of the Purdom Station. The borings ranged in depth from approximately 10 to 50 feet below land surface. Samples were collected using a split spoon sampler until refusal. Sediment samples were then collected from cuttings using a rotary drill. The corresponding soil boring logs indicated unconsolidated silty sands, clayey sands, sandy clays, and clays with broken limestone fragments to a depth of approximately 15 to 18 feet below land surface.

Six test borings were completed by Ardaman and Associates in 1976 along the west side of the containment dike around the bulk oil storage tanks. This area is on the east side of the discharge canal which borders the east side of the Purdom Unit 8 site. Four of these borings were hand augered to a depth of 10 feet, and two were completed as split spoon borings using a drilling rig to a depth of 22 feet. Limestone stringers were encountered in all of these borings at depths ranging from 7.5 feet to 14 feet. The two drilled borings found continuous limestone from a depth of 14 feet to the terminal depth of each boring. All four borings encountered mixed lithologies at shallow depths including dark gray sand and clay, limerock rubble, dark brown sandy silt, and gray to green sandy clay.

In August 1994, Ardaman & Associates completed three test borings while conducting a Geotechnical Exploration for a Neutralization Tank near the northwest corner of the bulk oil storage area (east of the Purdom Unit 8 site). Two of these borings were hand augered to depths of 4.5 and 5 feet. The third boring was performed in accordance with ASTM D-1586 using a drilling rig to a terminal depth of 25 feet. Limestone stringers were encountered in all three of these borings at depths between 4.5 and 6 feet. Continuous limestone was not encountered in the deep boring until a depth of 18 feet. All three borings encountered silty sand, fine sand, and clayey sands at shallow depths. The deeper boring encountered several lenses of gray, fat clay with pockets of tan, silty, fine sand.

Four test soil borings were conducted by Ardaman & Associates in November 1995, to provide preliminary geotechnical information to aid in the design and construction of Purdom Unit 8. These borings were completed using the Standard Penetration Test (SPT) in accordance with ASTM D-1586, to depths of 25 feet below the existing ground surface in three borings: TH-2, TH-3, and TH-4. A fourth test boring TH-1 was conducted to a depth of 70 feet below ground surface. The corresponding soil boring logs indicated unconsolidated silty, clayey sands; clayey sands; and sandy clays with seams of weathered limestone to a depth of approximately 20 feet. The log for borings TH-3 and TH-4 noted that some organic matter was encountered at depths of 13 to 18 feet with staining, small roots, and some trace amounts of compressible peat-like material present. At depths greater than 20 feet, a tan to white limestone, with seams of green and gray silty clay containing limestone fragments was encountered. This unit most likely represents the upper surface of the St. Marks Formation.

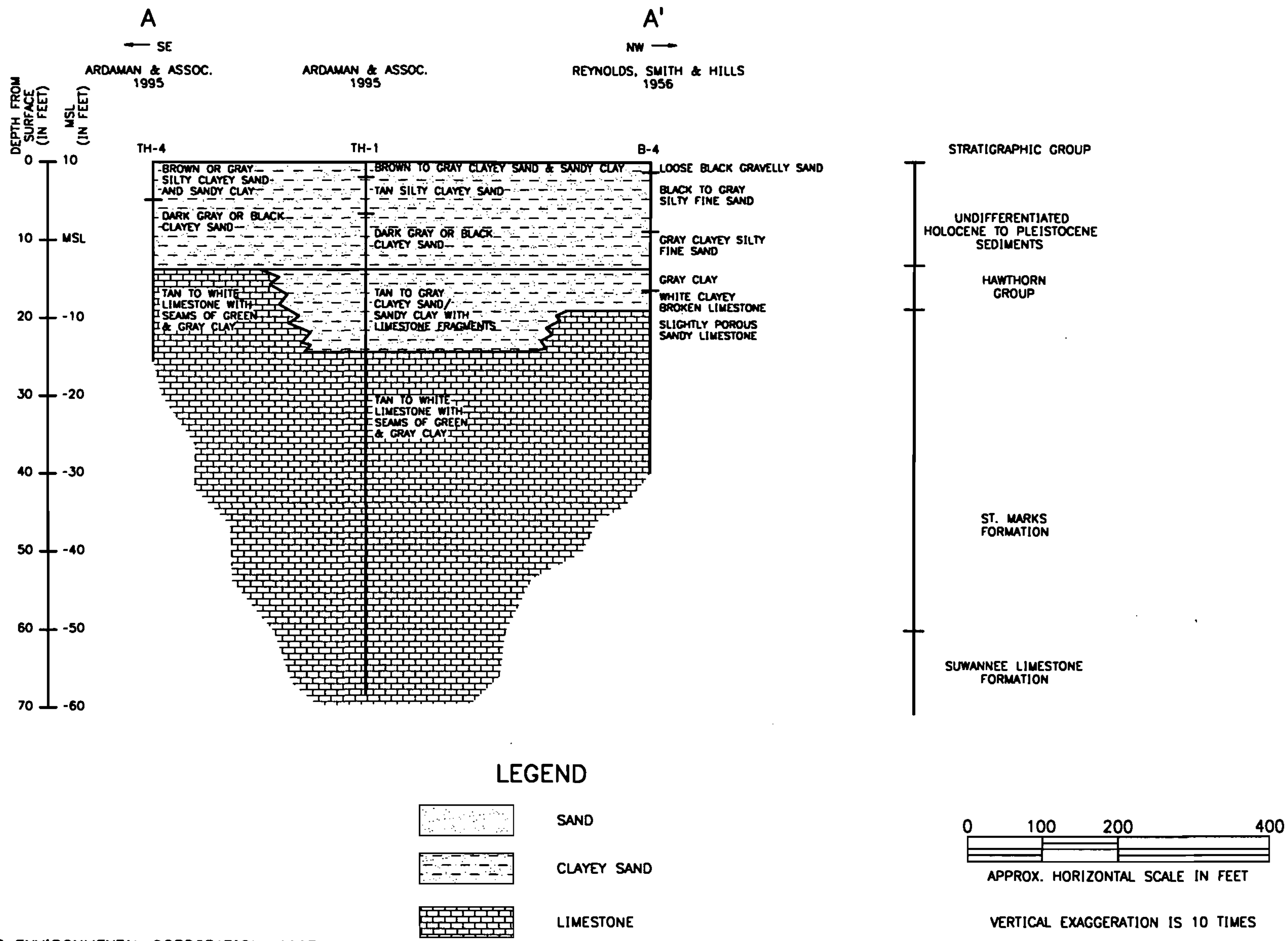
Two geologic cross sections based on interpretation of the geotechnical borings completed between 1956 and 1996 are presented on Figures 2.3.1-6 and 2.3.1-7. These boring investigations indicate that recent (Holocene) to Pleistocene deposits of unconsolidated or poorly consolidated silts, clayey sand, and sandy clay blanket the site from land surface to a depth of 10 to 14 feet. These sand and clay sediments are underlain by mixed clay, marl, and limestone deposits of the Hawthorn or St. Marks Formations to a depth of 18 to 25 feet. Below a depth of 18 to 25 feet limestone deposits of the St. Marks Formation were consistently encountered in all of the borings to their terminal depths. Based on published, geologic maps, the St. Marks Formation lies unconformably over the Suwannee Limestone to a depth of between 75 and 100 feet below land surface at the Purdom Station.

Additional foundation design borings will be performed prior to completion of the final plant design. These additional borings will provide more site-specific data on the lithologic units and their depths.

Soils

Soils from the Tooles-Nutall-Chaires group blanket the entire region of Wakulla County around St. Marks. Tooles-Nutall-Chaires soils cover only about 4.5% of the total land area in Wakulla County. These soils are described as "nearly level, poorly drained, sandy soils; some have a loamy subsoil underlain by limestone, and some have a sandy and loamy subsoil" (USCS, 1991). The Natural Resources Conservation Service (NRCS) specifically classifies the site soils as dredged Quartzipsamments.

The following description of Quartzipsamments was taken entirely from the NRCS publication (USCS, 1991). "These soils are nearly level and are somewhat poorly drained. They formed in fill material that has been reworked and shaped by earthmoving equipment. Slopes are 0 to 1 percent. In a representative area, the surface layer is light brownish gray sand about 7 inches thick. The underlying material extends to a depth of about 80 inches. In sequence downward, it is dark grayish brown sand, light gray sand, dark grayish brown mucky sand, and grayish brown sand. The depth to the high water table in the Quartzipsamments varies with the amount of fill material and the extent of artificial drainage, however, the seasonal high water table is commonly at a depth of 24 to 42 inches. The available water capacity is low. Permeability is rapid. Natural fertility is low."



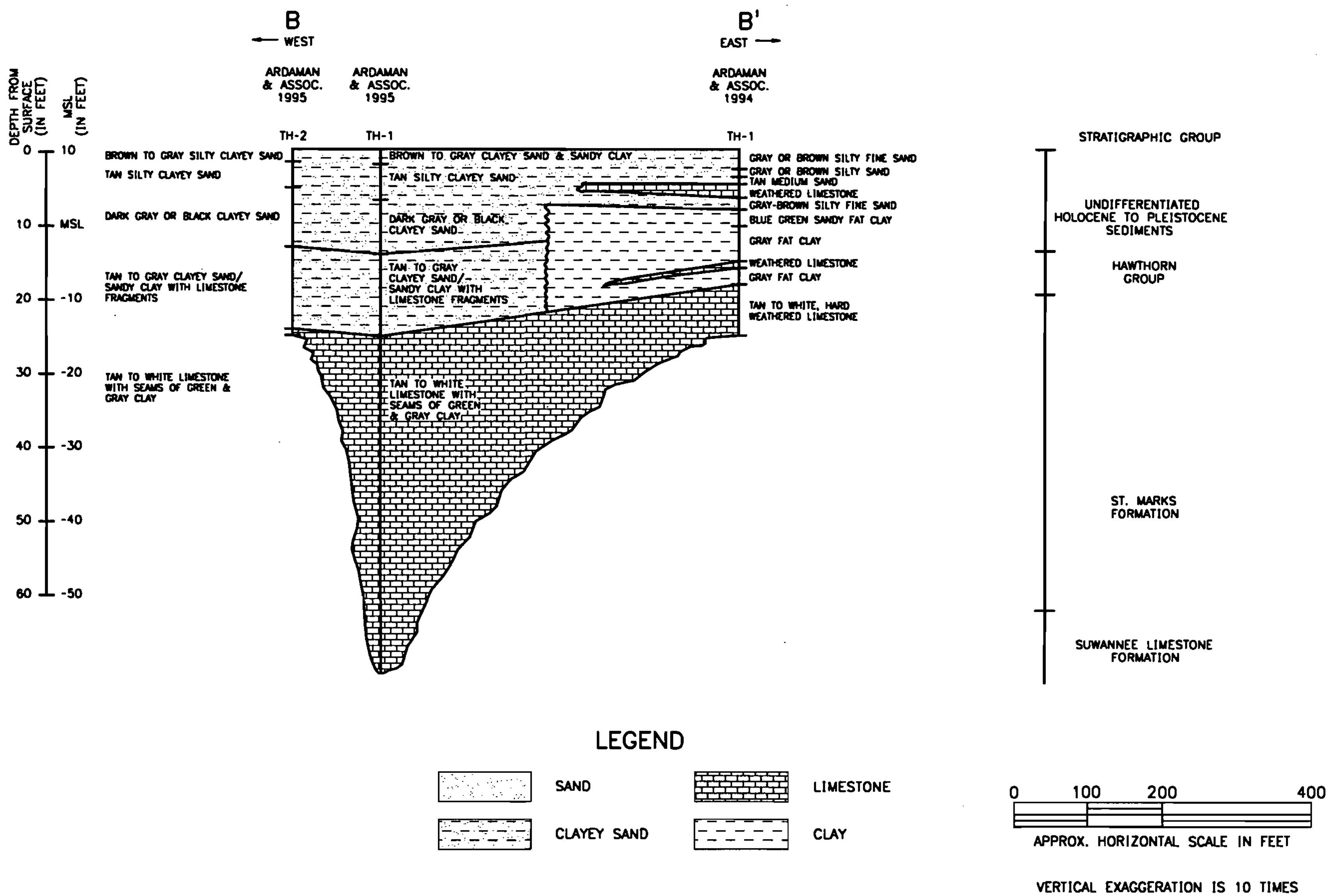
SOURCE: FOSTER WHEELER ENVIRONMENTAL CORPORATION, 1997

CITY OF TALLAHASSEE

SITE-SPECIFIC GEOLOGIC CROSS SECTION A-A'

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.1-6



SOURCE: FOSTER WHEELER ENVIRONMENTAL CORPORATION, 1997

CITY OF TALLAHASSEE

SITE-SPECIFIC GEOLOGIC CROSS SECTION B-B'

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.1-7

2.3.1.3 Geologic Maps

Geologic cross-sections are presented in Sections 2.3.1.1 and 2.3.1.2 which depict the regional and local geologic relationships. Table 2.3.1-1 is adapted from Rupert and Spencer (1988), the Florida Geological Survey (1991), and the USGS (1996). This table presents the stratigraphic and hydrogeologic relationships of the formations present beneath the Purdom Station and their approximate depths and thicknesses based on existing literature. Maps depicting the thickness, potentiometric surface, and confinement of the Floridan aquifer are presented in Section 2.3.2.

2.3.1.4 Bearing Strength

A Preliminary Geotechnical Exploration Program was conducted at the proposed site in October 1995. The exploration was performed by the Tallahassee, Florida office of Ardaman & Associates, Inc. Field exploration consisted of performing four Standard Penetration Test (SPT) soil borings in accordance with ASTM D-1586, to depths of 25 feet below the existing ground surface in test borings TH-2, 3 and 4 and to a depth of 70 feet below the existing ground surface in TH-1.

Although some variability in the subsurface conditions exist from one boring to another, the following is a generalization of the overall conditions encountered (Ardaman, 1995).

Depth From (ft)	Depth To (ft)	
0	1.5 - 5	Stratum 1, a dark brown or gray to light gray silty clayey sand to sandy clay (SC to CH) with roots and limestone fragments in a loose to medium dense condition (possible "fill").
1.5 - 3.5	3 - 6.5	Stratum 2, tan to light tan silty to clayey sand (SC) with limestone fragments in a medium dense condition.
4.5 - 6.5	13 - 18	Stratum 3, dark gray or black clayey sand (SC) in a loose to medium dense condition.
13 - 18 sand	16.5 - 25	Stratum 4, a tan to light gray to white calcareous clayey to sandy clay (SC to CH) with seams of hard limestone (weathered limestone).
16.5 - 25	Termination	Stratum 5, tan to white hard limestone with seams of green or gray calcareous silty sandy clay (CH) and clayey sand (SC) with limestone fragments.

At the time of the test borings (early October 1995), groundwater was encountered at depths ranging from approximately 4 to 7 feet below existing land surface. The groundwater levels in the borings were estimated by the drillers, in the field, and verified by visual examination of soil samples returned to the laboratory. Fluctuations in groundwater levels should be anticipated through the year due to seasonal variations in rainfall, tides, and other factors.

Laboratory testing was performed on selected samples to aid in soil classification and to further define the engineering properties of the soils. The laboratory tests included Natural Moisture Content (ASTM D-2216), Percent Finer than the U.S. No. 200 Sieve and Sieve Analyses (ASTM D-1140 and D-422 to determine percent silt and clay), Atterberg Limits (ASTM D-4318 to evaluate plasticity characteristics), and Unconfined Compression Tests (ASTM D-2166) on cored specimens suitable for such testing.

TABLE 2.3.1-1
GENERALIZED GEOLOGIC AND HYDROGEOLOGIC UNITS IN WAKULLA COUNTY AND AT THE PURDOM STATION

Era	System	Series	Wakulla County: West	Wakulla County: East	Purdom Station: Stratigraphy	Purdom Station: Approx. Depth[(1)]	Purdom Station: Aquifer Units
Cenozoic	Tertiary	Holocene	Undifferentiated Sand and Clay			+10 to -10	
		Pleistocene	Undifferentiated Sand and Clay			+10 to -10	Upper Floridan Aquifer
		Pliocene	Jackson Bluff Fm	Absent	Possible-Gray Marly Clay	0 to -10	
		Miocene	Intracoastal Fm	Absent	Absent	N/A	
			Bruce Creek Limestone Fm	Absent	Absent	N/A	
			Hawthorn Group	Absent	Possible-Gray Marly Clay	0 to -10	
			St. Marks Fm		Clay, Marl, & Calcarenite	-10 to -50	
		Oligocene	Suwannee Limestone Fm		Limestone	-50 to >-400	
		Eocene	Ocala Group		Limestone	>-400 to Unk	
			Avon Park Fm		Limestone & Dolomite	Unk	
			Oldsmar Fm		Dolomitic Limestone	Unk	
		Paleocene	Cedar Keys or Clayton Fm		Dolomitic Limestone	Unk	Sub-Floridan Confining Unit
Mesozoic	Cretaceous and Older		Undifferentiated		Unk	Unk	

[(1)] Note: Approximate depths given are based on mean sea level.
ft - feet
Fm - formation
Unk - unknown

Source: Adapted from Rupert and Spencer, 1988; Florida Geological Survey, 1991; and USGS, 1996.

Based upon the subsurface soil conditions, the foundation support systems will consist of either auger-cast in place concrete piles, concrete caissons (drilled shafts), shallow spread footings, or a continuous structural mat foundation. The equipment size, weight, and foundation economics will dictate which foundation system will be used.

For the heavy pieces of equipment (i.e., combustion turbine, steam turbine, etc.), a pile foundation system will be used. The piles will be founded at a depth of approximately 25 feet below existing ground level and will have a 60-ton vertical capacity, 5-ton lateral capacity, and 25-ton uplift capacity. Lighter equipment (i.e., small tanks, compressors, small pipe supports, slabs on grade, etc.) will be placed on spread footings or mat type foundations. The allowable soil bearing strength to be used for design will be 1,500 pounds per square foot.

By using the shallow foundation system of spread footings or a structural mat, some significant settlements may occur given the relatively loose soils encountered in the depth range from about 8 to 18 feet below land surface. However, using the allowable bearing strength of no more than 1,500 pounds per square foot, these settlements should not exceed about 2 inches total. However, of special concern may be possible differential settlements due to the presence of slightly more compressible Stratum 3 soils at TH-3 and TH-4. Differential settlements will be evaluated and kept to within the industry standard of less than 1 inch.

2.3.1.5 References

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2.3.2 Subsurface Hydrology

2.3.2.1 Subsurface Hydrologic Data for the Site

Southern Wakulla County is underlain entirely by sedimentary formations which form the Floridan aquifer system. This aquifer system extends from Georgia throughout Florida. In the study area, it is divided into two units, the Upper Floridan aquifer and the Lower Floridan aquifer. The Upper Floridan aquifer extends from southwestern Georgia to the Gulf of Mexico in the eastern panhandle region of Florida (Davis, 1996). The total thickness of the Upper Floridan aquifer in this region exceeds 2,200 feet and includes all of the permeable units in the St. Marks Formation, the Suwannee Limestone, the Ocala Group, and the Avon Park and Oldsmar Formations. This unit is separated from the Lower Floridan aquifer by low permeability sediments of the Paleocene Cedar Keys or Clayton Formation. In the City of St. Marks, the top of the Floridan aquifer occurs at a depth of about 10 to 20 feet below land surface. The thickness of the Floridan aquifer throughout this region is depicted on Figure 2.3.2-1 from the Florida Geological Survey.

The Floridan aquifer is not confined at the surface in this region and a separate water table aquifer is not present above this aquifer. The confined and unconfined areas of the Floridan aquifer on a regional scale are mapped on Figure 2.3.2-2, from the Northwest Florida Water Management District (NWFWMD). The potentiometric surface of the Floridan at the site is normally at an elevation between 1 and 3 feet above mean sea level (msl) and is commonly found in the clayey sand and marl units which coincide with and overlie the top of the St. Marks Formation. A potentiometric surface map of the Floridan aquifer is provided on Figure 2.3.2-3.

The NWFWMD and the USGS both classify the area in and around St. Marks as a recharge zone for the Floridan aquifer system (Davis, 1996; Florida Geological Survey, 1991). The USGS estimates of recharge for the area vary from less than 1 to 18 inches per year and average near 7 inches in the St. Marks area. Groundwater discharges from the aquifer via numerous springs and rivers, including the Wakulla and St. Marks Rivers, and the Gulf of Mexico. Some of the most prolific springs in Florida are located within a few miles of the Purdom Station. Wakulla Springs to the west has recorded flows which vary between 25 and 1,910 cubic feet per second (cfs). The USGS conducted extensive numerical groundwater flow modeling of the Upper Floridan aquifer, in the eastern panhandle of Florida, from 1990 to 1994 and derived a transmissivity of 10,000 ft^2 per day along with a porosity of 25 percent for the Upper Floridan aquifer in this area (Davis, 1996). Based on the USGS groundwater modeling results, groundwater normally flows through this area from the north near Tallahassee and elsewhere in Leon County, southward to its discharge points at a rate of nearly 1 foot per day.

Both domestic and public supply wells throughout the area rely on water from the Upper Floridan aquifer for their production. Due to the abundant supplies of water produced by the Floridan aquifer these wells are seldom drilled more than 200 feet deep. Recent pumping of this aquifer has caused a steady increase in total dissolved solids, chlorides, and conductivity values in the region around the City of St. Marks. These increases resulted both from upward migration (upconing) of saltwater in the lower portions of the aquifer and from lateral infiltration of saltwater in the Gulf and near the mouths of local rivers. This influx of saline waters to the

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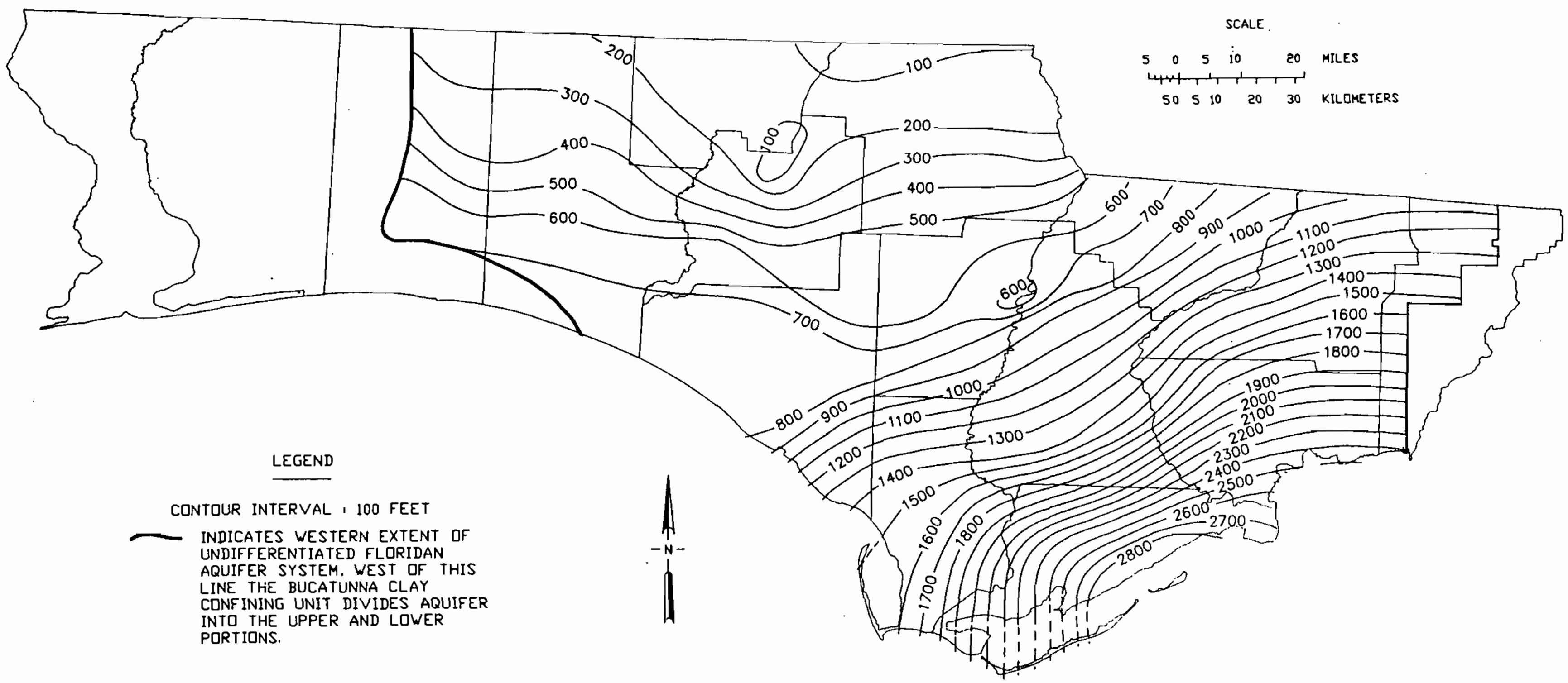


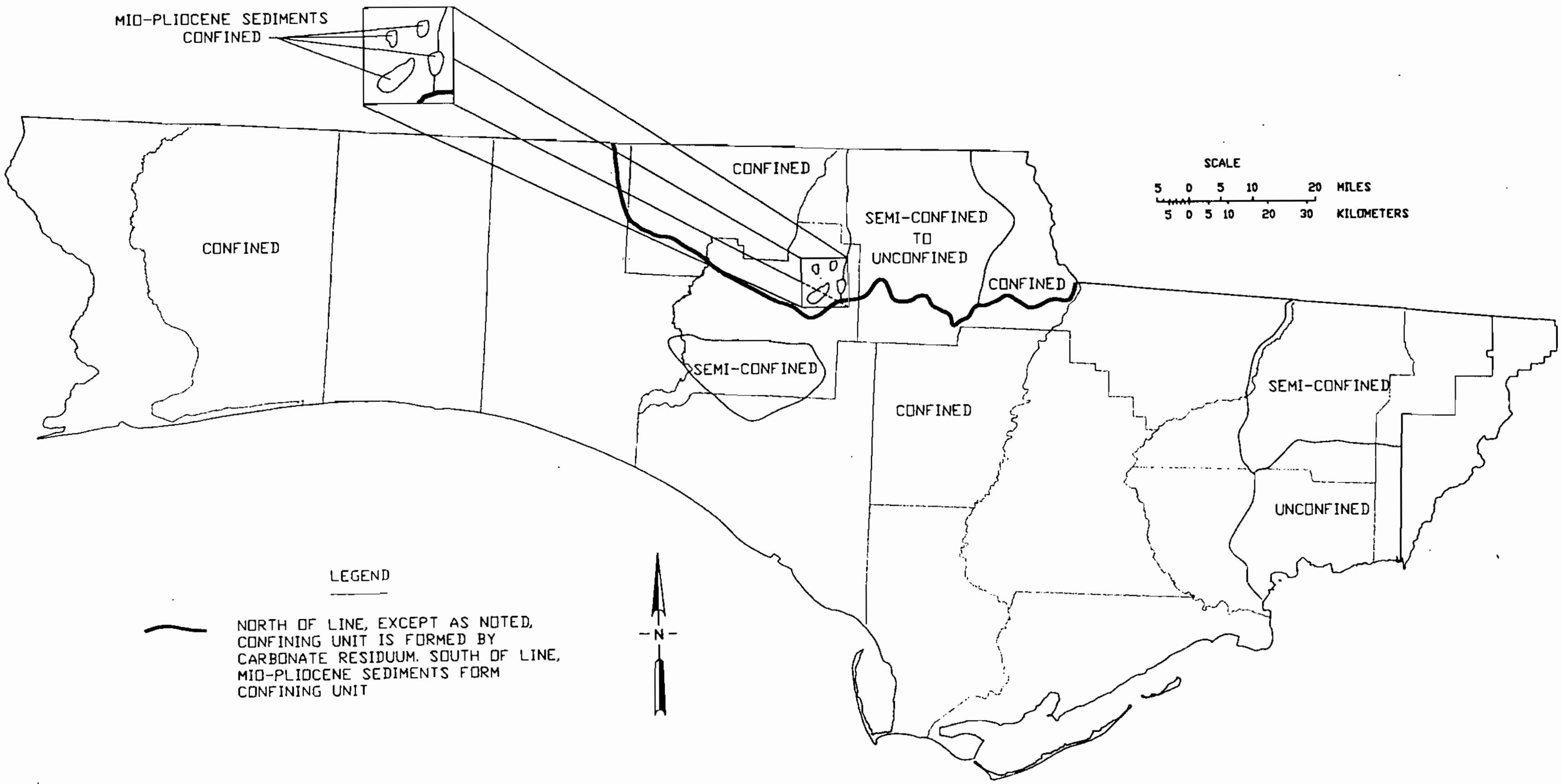
SOURCE: FLORIDA GEOLOGICAL SURVEY, 1991

CITY OF TALLAHASSEE

THICKNESS OF THE FLORIDAN AQUIFER SYSTEM
IN THE NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.2-1



SOURCE: FLORIDA GEOLOGICAL SURVEY, 1991

CITY OF TALLAHASSEE

CONFINEMENT OF THE FLORIDAN AQUIFER SYSTEM IN THE NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.2-2

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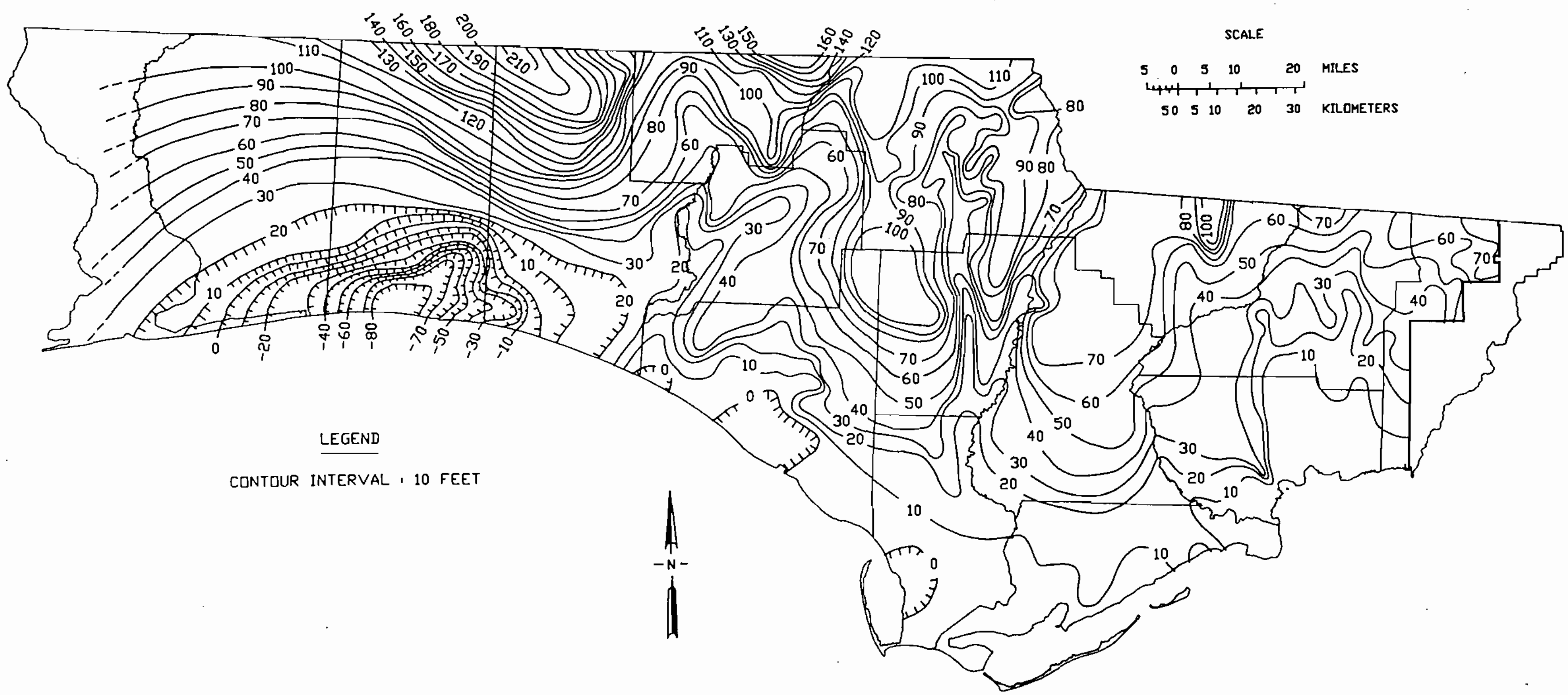

SOURCE: FLORIDA GEOLOGICAL SURVEY, 1991

CITY OF TALLAHASSEE

FLORIDAN AQUIFER SYSTEM POTENTIOMETRIC SURFACE
IN THE NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure

2.3.2-3

formerly freshwater portion of the Floridan aquifer is caused by well withdrawals which have reduced potentiometric heads in the immediate area. The reduction in water quality has prompted the City of St. Marks and the Purdom Station to move most of their water supply wells farther inland from coastal areas to areas where the water quality is better. A list with the locations of existing and former water supply wells used by the Purdom Station is provided on Table 2.3.2-1. All of the former water supply wells were either plugged or removed from service due to poor water quality caused by saltwater intrusion in the area.

TABLE 2.3.2-1
EXISTING AND FORMER WATER SUPPLY WELLS AT THE PURDOM STATION

Well No.	Location	Year Drilled	Casing Depth	Total Depth	Usage
1	Sec 2, T4S, R1E	1949	88	165	Properly Abandoned
2	Sec 2, T4S, R1E	1953	Unk	140	Properly Abandoned
3	Sec 2, T4S, R1E	1959	112	185	Properly Abandoned
4	Sec 34, T3S, R1E	1959	71	106	NWFWMD Observation
5	Sec 34, T3S, R1E	1960	44.5	136	Properly Abandoned
6	Sec 34, T3S, R1E	1962	95	152	Permitted Public Supply
7	Sec 34, T3S, R1E	1962	90	215	Permitted Public Supply
8	Sec 34, T3S, R1E	1965	84	210	Permitted Public Supply
9	Sec 34, T3S, R1E	1972	125	205	Permitted Public Supply

Source: NWFWMD Consumptive Use Permit Files; City of Tallahassee; S. O. Purdom Generation Station, facility records

Specific data on the availability of water in the Lower Floridan aquifer is not available for this area.

Groundwater Quality

The FDEP classifies the waters of the Floridan aquifer in Wakulla County as G-II. (All groundwater aquifers which have a total dissolved solids content of less than 10,000 mg/l are classified as G-II.)

The NWFWMD collected and compiled data on the ambient groundwater quality throughout the District, including Wakulla County in 1986 (Clemons, 1989). Samples were obtained and the results were reported for 12 wells throughout Wakulla County. A reprint of the results from three of these wells closest to the Purdom Station, including one of the former City of Tallahassee Purdom Station wells (Number 4) in their wellfield is provided in Table 2.3.2-2.

City of Tallahassee Well Number 4 had the highest chloride, specific conductance, total dissolved solids, and bicarbonate (HCO_3) of the 12 Wakulla County wells in the NWFWMD report. Well Number 4 was removed from service by the City of Tallahassee because its water quality no longer met plant requirements.

Historically, the City of Tallahassee has had nine wells in the Purdom Station wellfield. Well Numbers 1 through 3 and 5 were properly abandoned, Well Number 4 is used by the NWFWMD for monitoring, and Well Numbers 6 through 9 are currently used to provide water for the Purdom Station. Well Numbers 1, 2, and 3 were located close to the Purdom Station and nearer to the Gulf Coast, and Well Nos. 4 through 9 have each been located successively further north

TABLE 2.3.2-2
RESULTS OF SELECTED GROUNDWATER QUALITY ANALYSES

Physical Properties	Well No.			
	Purdom Station No. 4(1) (1989)	Purdom Station No. 4(1) (1994)	St. Marks National Wildlife Refuge(2)	Wakulla County Park Rec. Center(3)
Well Depth (ft)	106	106	65	120
Casing Depth (ft)	71	71	45	35
Aquifer	Floridan	Floridan	Floridan	Floridan
Date Sampled	7/31/86	2/16/94	7/29/86	2/24/86
Analytical Measurements				
Temperature (°C)	22.2	20.6	22.9	21.5
Specific Conductance (μmhos)	950	990	531	150
pH (Std. units)	6.9	6.9	6.8	8.1
Total Dissolved Solids (mg/l)	640	540	350	120
Total Organic Carbon (mg/l)	5.4	N/A	10.2	0.4
Chloride (mg/l)	130	110	88	4
HCO_3 (mg/l)	451	456	183	59
Nitrate (mg/l)	1.6	N/A	1.4	11.0
Sulfate (mg/l)	3.2	1.4	9.2	1.5
Arsenic (μg/l)	<2	<1.0	14	<1
Barium (μg/l)	250	120	50	<5
Cadmium (μg/l)	3.0	<1.0	5.0	<0.5
Calcium (mg/l)	110	100	58	21
Chromium (μg/l)	<10	<5	<10	<13
Copper (μg/l)	<10	<10	50	<10
Cyanide (mg/l)	<0.01	N/A	<10.00	<0.01
Fluoride (mg/l)	0.3	0.3	0.1	0.1
Iron (mg/l)	1.5	2.2	0.8	0.2
Lead (μg/l)	<10.0	<1	10.0	1.6
Magnesium (mg/l)	48.0	50	6.2	1.8
Manganese (μg/l)	20	13	25	<10
Mercury (μg/l)	<0.5	0.1	<0.5	0.5
Nickel (μg/l)	<10	<10	<10	<13
Orthophosphate (mg/l)	0.04	0.03	1.20	0.09
Potassium (mg/l)	2.4	3.3	3.4	0.3
Selenium (μg/l)	<2	N/A	<2	<1
Silver (μg/l)	<10	<1	<10	<10
Sodium (mg/l)	33.0	26	66.0	0.8
Zinc (μg/l)	30	58	60	180
Gross Alpha (pci/l)	5.3	N/A	<2.1	<1.9
Gross Beta (pci/l)	<4.4	N/A	<3.1	<2.6
Total Coliform (MF/100ML)(4)	50	N/A	0	0
Fecal Coliform (MF/100ML)(4)	50	N/A	<2	<2

(1) Purdom Well No. 4 located approximately 1 mile north of the Purdom Station, east of SR 363.
(2) St. Marks National Wildlife Headquarters potable well located approximately 3.5 miles east of the Purdom Station.
(3) Wakulla County Parks and Recreation Center potable well located approximately 10 miles west of the Purdom Station.
(4) Membrane filtration/number per 100 ml.

Source: NWFWMD, 1989; and USGS STORET Database, 1994 of the Purdom Station in an effort to improve their water quality. Well Number 9 is located approximately 2.5 miles north of the Purdom Station along the railroad easement which parallels the west side of SR 363.

The results of several recent water quality analyses from the City of Tallahassee's Well Number 9 are presented in Table 2.3.2-3. Figure 2.3.2-4 is a graphical representation of the results for chloride analysis from this well over time. The results shown in Table 2.3.2-3 and on Figure 2.3.2-4 indicate that the chloride levels for Well Number 9 have been slowly increasing over time and that the most dramatic increases occurred between 1986 and 1993. The exact cause for this rapid deterioration in water quality is not known, but it is probably related to saltwater intrusion caused by local pumping of groundwater resources. There are several other groundwater users in the area (see Groundwater Modeling in this Section).

Groundwater discharges via several springs to the St. Marks River which flows along the east side of Purdom Station. The water quality of the St. Marks River can be compared to groundwater quality for the Upper Floridan aquifer. Tables in Section 2.3.4 Surficial Hydrology present the results of recent water quality analyses from the St. Marks River at the Purdom Station. These results indicate that water samples collected from the river have lower specific conductance, chlorides, sulfates, and hardness than recent groundwater samples collected from the City of Tallahassee Well Number 9 (Table 2.3.2-3). For example, specific conductance in the St. Marks River ranged from 183 to 583 µmhos/cm in two 1996 samples; whereas, specific conductance in Well Number 9 ranged from 683 to 782 in three samples collected between 1991 and 1994. Furthermore, there is a trend in groundwater samples collected from Well Number 9 of higher conductivity values over time which can be interpreted as decreasing water quality. This decrease in water quality may be due to the upconing of lower quality water from lower portions of the aquifer which may have been caused by local groundwater pumping.

TABLE 2.3.2-3
RESULTS OF SELECTED ADDITIONAL GROUNDWATER QUALITY ANALYSES

Physical Properties	**City of Tallahassee Well Number 9**			
Date Sampled	**3/6/87**	**1/2/91**	**10/1/93**	**5/4/94**
Analytical Measurements				
Specific Conductance (µmhos)	N/A	683	766	782
pH (Std. units)	4.8	7.8	7.7	7.8
Total Dissolved Solids (mg/l)	N/A	452	478	440
Chloride (mg/l)	21.6	64	101	84
Sulfate (mg/l)	10.2	31	36	41
Hardness as $CaCO_3$ (mg/l)	N/A	291	296	258
Ca Hardness as $CaCO_3$ (mg/l)	N/A	246	250	<5
Mg Hardness as $CaCO_3$ (mg/l)	N/A	44	46	49
Sodium (mg/l)	N/A	36	66.0	50

N/A - Not Reported

Source: City of Tallahassee S. O. Purdom Generating Station, facility records

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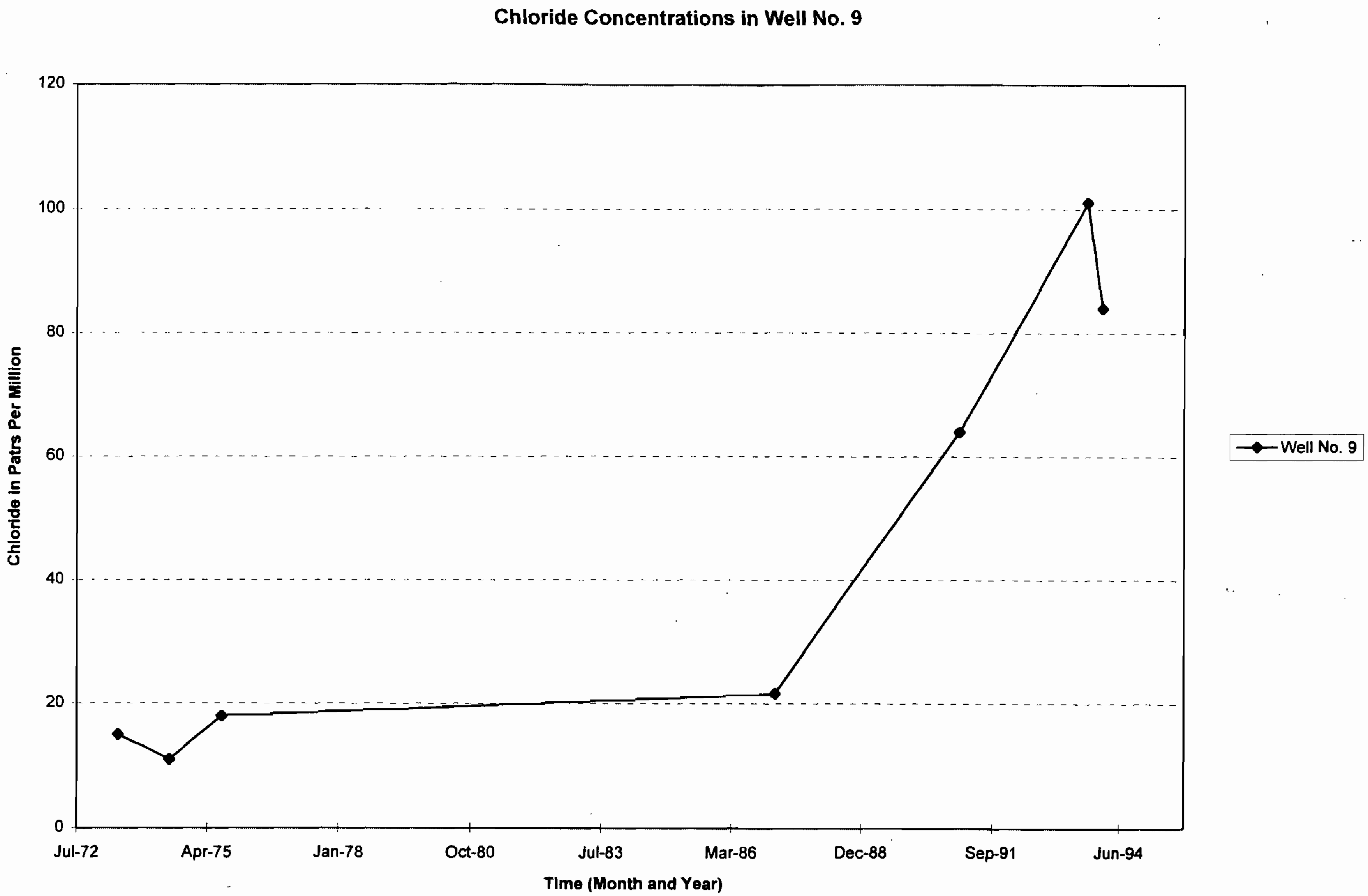

SOURCE: CITY OF TALLAHASSEE

CITY OF TALLAHASSEE

CHLORIDE CONCENTRATIONS
IN CITY OF TALLAHASSEE PURDOM WELL NO. 9

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure
2.3.2-4

Site Screening Assessment

Because of its prior industrial usage and as part of the SCA studies, the City conducted a Site Screening Assessment of the area where Purdom Unit 8 will be constructed. Field activities were conducted by Foster Wheeler Environmental in November 1996, and by Woodward-Clyde Consultants in February 1997. The Site Screening Assessment included screening of shallow soil samples from borings in the field with an organic vapor analyzer (OVA), and laboratory analyses of surface soil and groundwater samples for volatile and semivolatile organic compounds, metals, and asbestos (soil only). A copy of the Site Screening Assessment Report is included as Appendix 10.5.8 of the SCA; only a brief summary of the results is provided here.

While the soil assessment did detect some positive results, none of the results from the OVA headspace screening or laboratory analyses of soil samples from the site indicate exceedances of any applicable standards.

The initial results for laboratory analyses of groundwater samples collected from one temporary monitoring well found questionable elevated results for toluene and cadmium. This sample also had undesirably high turbidity which could have affected the results. Based on these questionable results, additional assessment of shallow groundwater in this vicinity was initiated as a supplemental activity. The results of a supplemental groundwater sample collected from a properly developed permanent monitoring well at this location did not duplicate the initial suspect toluene or cadmium results found in the earlier sample, which indicates the previous results were incorrect. Low levels of organic constituents were detected in some of the groundwater samples during the assessment; however, none of the results for groundwater were above DEP regulatory or guidance concentrations.

The City has undertaken to remove soil in several small areas of the site: one with low level petroleum constituents based on soil OVA headspace screening data and in two other areas where asbestos was found in surface soil samples. This material will be managed and disposed of in accordance with applicable requirements.

Groundwater Modeling

A simple groundwater flow model was constructed to model the existing conditions and impacts resulting from the use of the City of Tallahassee's Purdom Station wellfield and other nearby groundwater users. The model was constructed using the USGS's Modular Three-Dimensional Finite-Difference Ground Water Flow Model (MODFLOW) to simulate the Upper Floridan aquifer system (McDonald and Harbaugh, 1988). The model simulates the current effects of groundwater withdrawals by the City of Tallahassee and other nearby users from the Upper Floridan aquifer system in the vicinity of the Purdom Station. The construction of the model and its inputs for aquifer parameters were based on a recent USGS publication, "Hydrogeologic Investigation and Simulation of Ground-Water Flow in the Upper Floridan Aquifer of North-Central Florida and Southwestern Georgia and Delineation of Contributing Areas for selected City of Tallahassee, Florida Water Supply Wells," which provides details on a similar MODFLOW model (Davis, 1996). This recently published USGS model covers a much broader geographic range (including the area near Purdom Station) than the model used for this study. However, because of the broad, regional perspective of the published USGS model it is difficult to discern the details of localized pumping withdrawals near the Purdom Station. Appendix 10.5.3 provides a complete discussion of the construction of the model and the results of model simulations.

A list of groundwater users in the vicinity of the Purdom Station whose withdrawals were included in the groundwater model is provided in Table 2.3.2-4, "Groundwater Modeling Data." A model layout along with the location of each well in Table 2.3.2-3 is provided on Figure 2.3.2-5. The rate of average daily withdrawals from each permitted groundwater user was provided from the NWFWMD permit files.

TABLE 2.3.2-4
GROUNDWATER MODEL DATA

Owner	Number of Wells	Average Pumping Rate/Well (Gpm)[1]
City of Tallahassee	2[2]	100
Olin Corporation	4	158
City of St. Marks	2	29
Wakulla County	1	1.3

(1) Permitted Average Daily Pumping Rates (Source: NWFWMD)
(2) The City of Tallahassee Purdom Station wellfield has four wells, but only two are operated at a time:
Primex Technologies (formerly Olin Corporation) = 910,000 gpd
City of Tallahassee, Purdom Station = 288,000 gpd
City of St. Marks = 84,000 gpd
Wakulla County = 1,900 gpd.

A potentiometric surface map of the Upper Floridan aquifer system, in the vicinity of the Purdom Station was created from the results of the groundwater model (Figure 2.3.2-6). This map represents an estimate of the localized potentiometric surface of the Floridan aquifer based on the effects of groundwater withdrawals. The potentiometric surface map indicates that an elliptical-shaped localized depression in the potentiometric surface exists which is caused by the combined effects of groundwater withdrawals by the City of Tallahassee, Primex Technologies (formerly Olin Corporation), and the City of St. Marks water supply wells. The model simulation estimated that the area of this elliptical-shaped cone of depression is approximately 4,000 feet wide by 5,800 feet long and encompasses approximately 360 acres. The maximum potentiometric drawdowns within this area were estimated to be 2 to 3 feet below the potentiometric surface of the surrounding area. These estimates were calculated by measuring all of the area within a closed region having 1 foot or more of potentiometric drawdown (see Figure 2.3.2-6).

2.3.2.2 Karst Hydrogeology

Throughout Florida where limestone is exposed near the surface, karst terrain is common. Karst terrain consists of an undulating natural surface punctuated by sinkholes, natural bridges, caverns, springs, and disappearing streams. These karst features result from the dissolution of the limestone by naturally occurring chemical and physical processes. More often, the primary contributor to dissolution of the limestone is fluctuating water tables. Rainfall infiltrating through near surface deposits as recharge to the water table normally has a slightly acidic pH and is low

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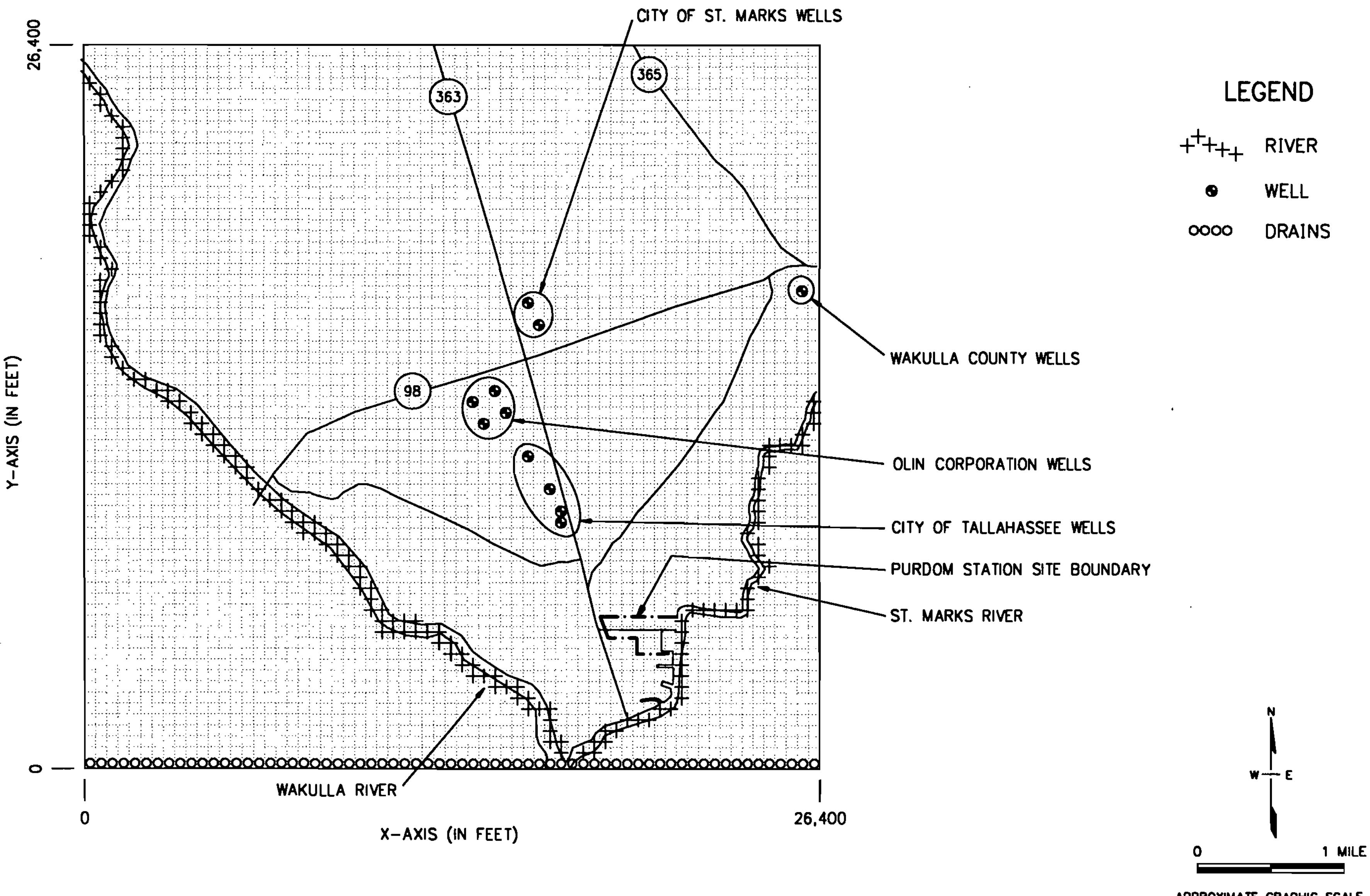

SOURCE: FOSTER WHEELER ENVIRONMENTAL, 1997

CITY OF TALLAHASSEE

GROUNDWATER MODEL
GRID LAYOUT

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.2-5

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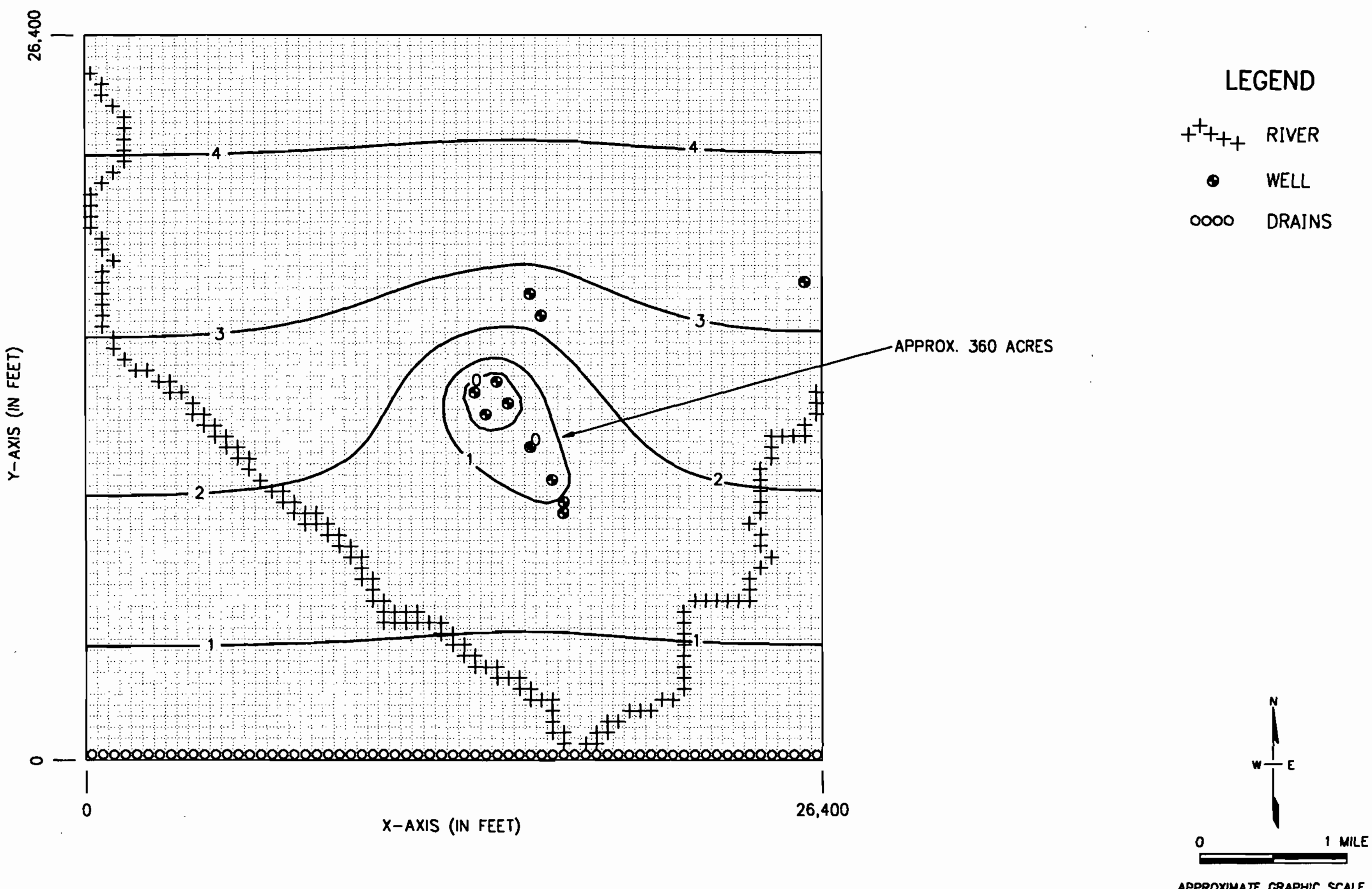


SOURCE: FOSTER WHEELER ENVIRONMENTAL, 1997

CITY OF TALLAHASSEE

GROUNDWATER MODEL
EXISTING CONDITIONS - BASELINE SIMULATION

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.2-6

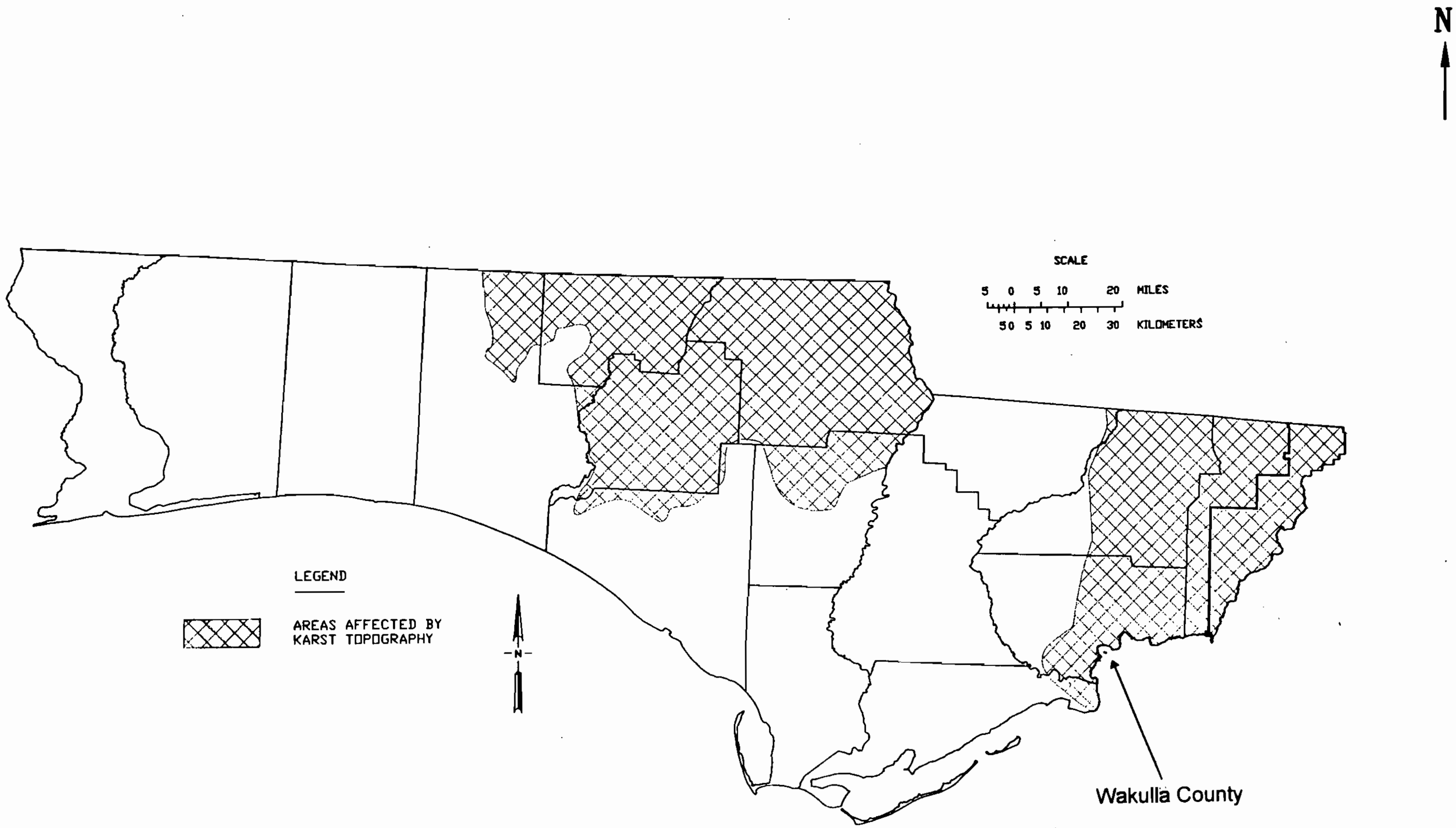
in dissolved solids. When rainwater comes into direct contact with limestone (calcium carbonate [$CaCO_3$]) in the subsurface groundwater aquifer, it causes dissolution of the limestone as part of the natural chemical stabilization of fluids in the aquifer. "Man's activities also impose stresses on the environment, which, in a karst terrain, pose special concerns. In Florida, two categories account for most of the man-induced sinkhole formation: pumpage from wells and construction activities. Well pumpage can cause rapid fluctuation in the water table and construction activities often involve dewatering for foundations, blasting to remove unwanted materials, and heavy equipment traffic all of which can result in the collapse of previously weakened limestone structures" (Lane, 1986). The areas which are most affected by karst development are depicted on Figure 2.3.2-7, from the NWFWMD.

The Purdom Station lies in the River Valley Lowlands geomorphic subdivision of the Woodville Karst Plain geomorphic province (Rupert and Spencer, 1988). This geomorphic subdivision was named for the many shallow dunes and sinkholes that dot the relatively flat countryside of this coastal plain. According to the Florida Geological Survey, "This plain (Woodville Karst Plain) exhibits karst features that are still evolving, for example: many old well developed sinkholes that are either permanently or intermittently flooded (Big Dismal Sink), disappearing streams and natural bridges (Natural Bridge), Wakulla Springs, and new sinkholes reported periodically" (Lane, 1986). Geologically, the area consists of a thin "surface veneer of generally less than 20 feet of quartz sand which overlies the undulating karst surface of the St. Marks and Suwannee Limestone Formations" (Lane, 1986).

There are 18 reported sinkholes in the Florida Sinkhole Research Institute's database for all of Wakulla County as shown in Table 2.3.2-5 (Schmidt, 1995). The closest sinkholes in the database to the Purdom facility are over 2 miles from the plant location (Nos. 59-002 and 59-505). Both of these sinkholes occurred near Newport, approximately two miles northeast of the site. These sinkholes were reported in 1975 and 1976, respectively. Sinkhole No. 59-505 is also the largest reported sinkhole in Wakulla County. This sinkhole reportedly was discovered in 1975 and when reported was approximately 75 feet in diameter and 15 feet deep.

Using statistical calculations and the Florida Sinkhole Research Institute's Sinkhole database, Wilson reports that the rate of new sinkhole formation in Florida falls between 0.001 and 0.05 new sinkholes per square mile per year (Wilson, 1997). Wilson also calculated that the probability of sinkhole development for a large site ranges from 6.5×10^{-5} to 0.28 per year. Based on an analysis of the sinkholes in the Sinkhole Research Institute's database, Wilson found that 50 percent of all new sinkholes are less than 8 feet in diameter and 6 feet deep. "Only 16 percent of all new sinkholes are more than 30 feet wide and only 3.6 percent are more than 100 feet wide" (Wilson, 1997).

A review of aerial black and white and infrared spectrum photographs of the area, within approximately two miles of the Purdom Station, indicates a number of small circular depressions probably of sinkhole origin. None are apparent on the facility property and none are reported in the Florida Sinkhole Research Institute's database. However, two occur west-southwest of the site within the City of St. Marks and several are apparent east of the facility across the St. Marks River. The exact size, depth, and origin of these particular features is unknown. However, some



SOURCE: FLORIDA GEOLOGICAL SURVEY, 1991

CITY OF TALLAHASSEE

AREAS OF KARST DEVELOPMENT
IN THE NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.2-7

TABLE 2.3.2-5
FLORIDA SINKHOLE RESEARCH INSTITUTE DATABASE OF REPORTED SINKHOLES IN THE AREA NEAR THE PURDOM STATION

	Location					
Fgs No.	Latitude	Longitude	Length (ft)	Width (ft)	Depth (ft)	Year Reported
59-001	30°14'15"	84°21'40"	2	2	3	1970
59-002	30°11'50"	84°10'55"	3	3	5	1975
59-003	30°13'50"	84°13'55"	3	3	9	1979
59-004	30°13'50"	84°13'55"	2	2	6	1979
59-501	30°17'43"	84°23'03"	16	10	0	1977
59-502	30°16'37"	84°21'00"	1	1	2	1980
59-503	30°10'47"	84°18'54"	2.5	2.5	2	1978
59-504	30°01'55"	84°23'40"	10	0	1	1980
59-505	30°12'40"	84°11'00"	75	75	15	1976
59-506	30°10'55"	84°19'35"	5	3	4	1973
59-507	30°10'25"	84°21'15"	Unk.	Unk.	Unk.	Unk.
59-508	30°13'02"	84°20'37"	8	8	8	1985
59-509	30°17'36"	84°15'43"	25	15	15	1984
59-510	30°13'34"	84°20'26"	15	15	8	1985
59-511	30°13'02"	84°20'37"	9	9	8	1985
59-512	30°12'19"	84°20'20"	25	25	15	1986
59-513	30°15'10"	84°21'17"	2	2	12	1990
59-514	30°16'30"	84°10'00"	4	4	6	1990

Source: Schmidt, 1995
Unk. - Unknown, not reported.

may have resulted from old karst activities which predate the Sinkhole Research Institute's database.

The Purdom Station has been in operation since the 1950s and there have been no reported occurrences of sinkholes, subsidence, or collapse on the property throughout the history of plant operations. Nineteen geotechnical borings have been completed on the site for foundation design purposes, seven in 1956 (Reynolds, et al., 1956), six in 1976 (Ardaman & Associates, 1976), three in 1994 (Ardaman & Associates, 1994), and four in 1995 (Ardaman & Associates, 1995). The deepest of these borings were drilled to a depth of 75 feet below land surface. None of these borings reported any voids or significant losses of circulation (drilling fluids) during drilling. The reported lithologies from the 11 borings are fairly consistent and without any gross discontinuities which would be expected if an old or infilled sinkhole was encountered. However, the top of the limestone surface does exhibit some variability within the area of the borings, based on the depth at which limestone was encountered in each boring. This variability in the limestone surface (St. Marks Formation) likely resulted from erosion to the limestone surface which occurred after its initial deposition and prior to the deposition of the overlying layers of clastic (sand, clay, and silty) materials. It is important to note that the water table at the plant normally occurs at a depth of approximately 7 feet below land surface (about 2 feet above msl). This depth places the normal water table approximately 5 to 10 feet above the top of the limestone surface. In the absence of large local withdrawals for construction dewatering, it is unlikely that the water table would ever drop below the top of the limestone surface at the site, due to the fact the limestone surface occurs approximately 5 to 10 feet below sea level (below the normal level of water in the St. Marks River adjacent to the site).

No significant construction dewatering activities are planned during construction of Purdom Unit 8. The foundation of this facility has been designed to be supported by piers on drilled caissons which will be cast in-place and filled with cement and reinforcing steel. Additional foundation design borings will be performed prior to completion of the final plant design. These will include borings drilled at each caisson location. If any voids are encountered, they will be filled with concrete or the final foundation design may be revised.

Based on the available information, the likelihood of occurrence of a sinkhole at the Purdom Station appears low but it is a possibility which cannot be entirely ruled out. It is even possible that voids (pre-cursors to the formation of future sinkholes) exist in the limestone beneath the facility at depths greater than the depth of the deepest geotechnical borings (75 feet). However, any voids at this depth will remain well below the water table and the water filled pores of the limestone rock units beneath the site are under hydrostatic pressure which helps to support the matrix of overlying rock units.

2.3.2.3 References

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2.3.3 Site Water Budget and Area Users

2.3.3.1 Discussion

The site area is in northwest Florida where the climate is humid subtropical with relatively high rainfall (Davis, 1995). Based on data from Tallahassee for the period 1961-1990, Davis reports that the average annual temperature was 67° F and the average precipitation was 66 inches per year (Davis, 1995). Average monthly temperatures and rainfall amounts shown in Table 2.3.3-1 below were developed for the Purdom Unit 8 Project and are in substantial agreement with Davis. Please note that different 30-year periods result in somewhat different averages. For example, for the 1931-1960 period, rainfall averaged 56.86 inches/year (Water Information Center, 1994), whereas it averaged 64.59 inches/year for the period 1951-1980 (USDC, 1989).

TABLE 2.3.3-1
AVERAGE MONTHLY TEMPERATURES (1961-1990) AND RAINFALL (1959-1988) AT TALLAHASSEE

Month	Temperature (°F)	Temperature (°C)	Rainfall (inches)
January	50.2	10.1	4.09
February	52.9	11.6	4.75
March	60.1	15.6	5.23
April	66.6	19.2	3.89
May	73.4	23.0	4.12
June	78.4	25.8	6.56
July	79.7	26.5	8.05
August	79.5	26.4	7.00
September	76.8	24.9	5.42
October	67.6	19.8	2.78
November	59.0	15.0	2.95
December	52.5	11.4	4.31
Annual Average	66.4	19.1	4.93
Annual Total			59.15

Source: Foster Wheeler Environmental, 1996

During the summer months, thunderstorms occur on an average of once every other day, making July and August the wettest months. The driest months are October and November. Snowfall is rare and inconsequential to the water budget.

Actual evapotranspiration (AET) is defined as the combined loss of water from soils by evaporation and plant transpiration. Estimated AET near the site area is about 64 percent of annual precipitation, or about 42 inches per year (NWFWMD, 1985). Davis (USGS, 1995) reports recharge rates up to 18 inches per year. Estimated yearly runoff is about 30 percent of precipitation, or about 20 inches per year (NWFWMD, 1985; USGS, 1966) although in this region of Wakulla County, where karstic limestone is bare or thinly covered by surface soil, runoff can be expected to be closer to about 6 inches per year.

The area within a 5-mile radius of the Purdom site lies solely within Wakulla County. Groundwater consumptive use permit holders within or near this radius are shown in Table 2.3.3-2.

TABLE 2.3.3-2
PERMITTED GROUNDWATER CONSUMPTIVE USERS

Owner	Permitted Pumping Rate [(1)]	Average Pumping Rate [(1)]	Site Number [(2)]	Permit Number
Talquin Electric Cooperative	320 gpm	229 gpm	37	840060
Primex Technologies (formerly Olin Corporation)	903 gpm	632 gpm	38	950038
City of Tallahassee - Purdom Station	300 gpm	229 gpm	39	960104
City of St. Marks	100 gpm	58 gpm	47	842449

[(1)] Northwest Florida Water Management District permit listing.
[(2)] Site numbers as shown on Figure 2.3.3-1.
Source: Northwest Florida Water Management District

Primex Technologies (formerly Olin Corporation) and the City of Tallahassee's Purdom Station use their groundwater for industrial purposes, while Talquin Electric Cooperative and the City of St. Marks use it for public supply. Primex Technologies uses a small portion of their groundwater for public supply.

The only consumptive use permit for surface water withdrawal in the county is held by the Purdom Station. This permit (Number 960104) allows the withdrawal of an average of 74,781 gpm and a maximum of 100,000 gpm. This water is withdrawn from the St. Marks River for condenser cooling and is then returned back to the river. There are no other known permitted consumptive uses of surface water in Wakulla County. The other main uses of the St. Marks River are for navigation (the barging of fuels to the various storage and distribution facilities in the town) and for recreation (boating and fishing).

The City of St. Marks permitted its municipal well in 1984 and provides potable water to most of its residents. A review of the Northwest Florida Water Management District list of Well Construction Permits reveals only two domestic wells within 1 mile of the site constructed since 1982. A 4-inch diameter, 98-foot deep well, with 19 feet of casing, was permitted in the name of Maurice Howland on Savannah Road, St. Marks. Another 4-inch diameter, 176-foot deep well, with 13 feet of casing, was permitted under the name George Tillman on 5th Avenue (Tallahassee Avenue), St. Marks. The approximate estimated locations of these two wells are shown on Figure 2.3.3-2.

2.3.3.2 References

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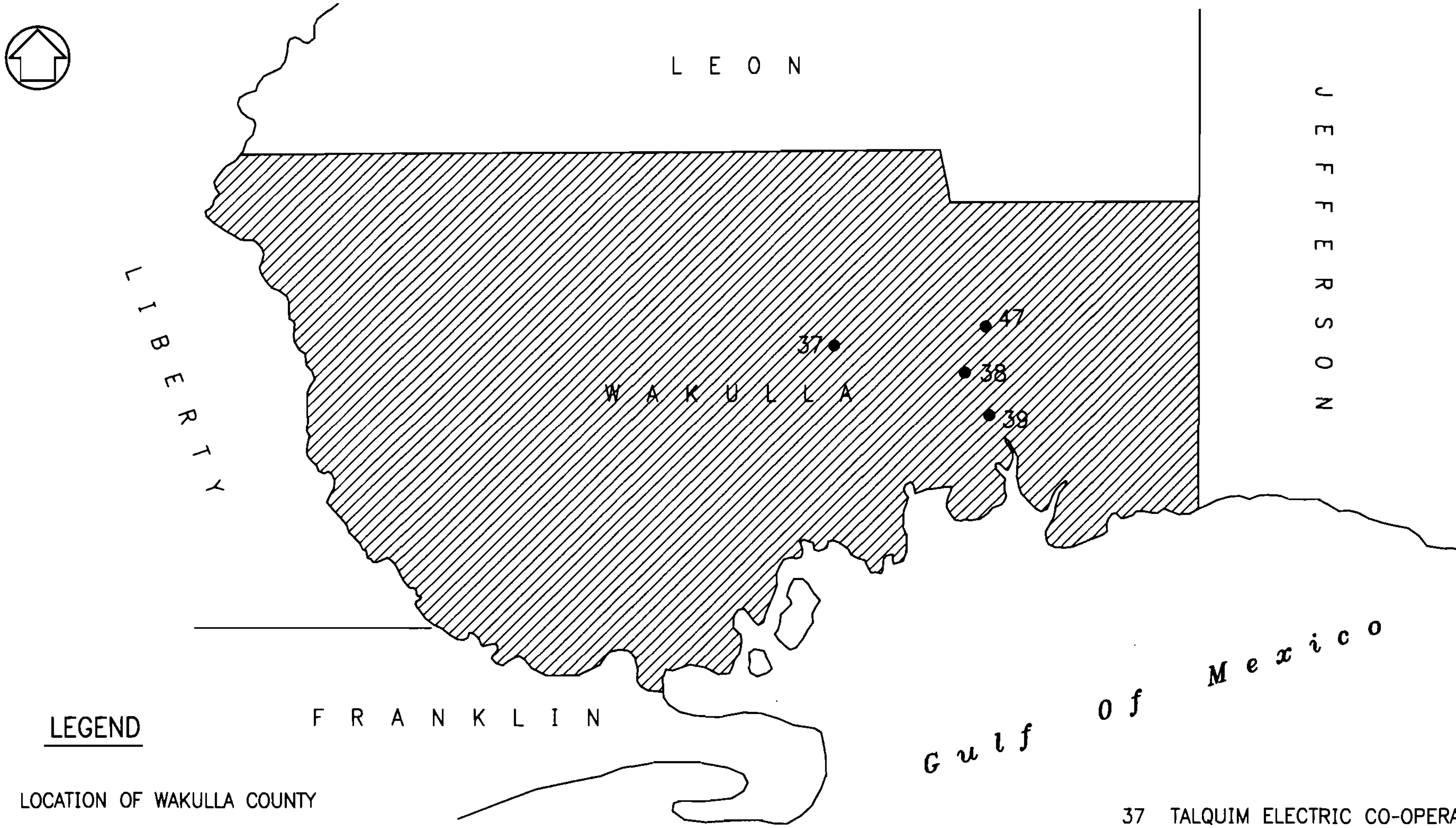


LEGEND

LOCATION OF WAKULLA COUNTY

37 ● PUMPING WELL OR SYSTEM (NUMBER REFERS TO TABLE AT RIGHT)

SOURCE: NWFWMD, 1996

37 TALQUIM ELECTRIC CO-OPERATIVE

38 PRIMEX TECHNOLOGIES (FORMERLY OLIN CORPORATION)

39 PURDOM GENERATING STATION

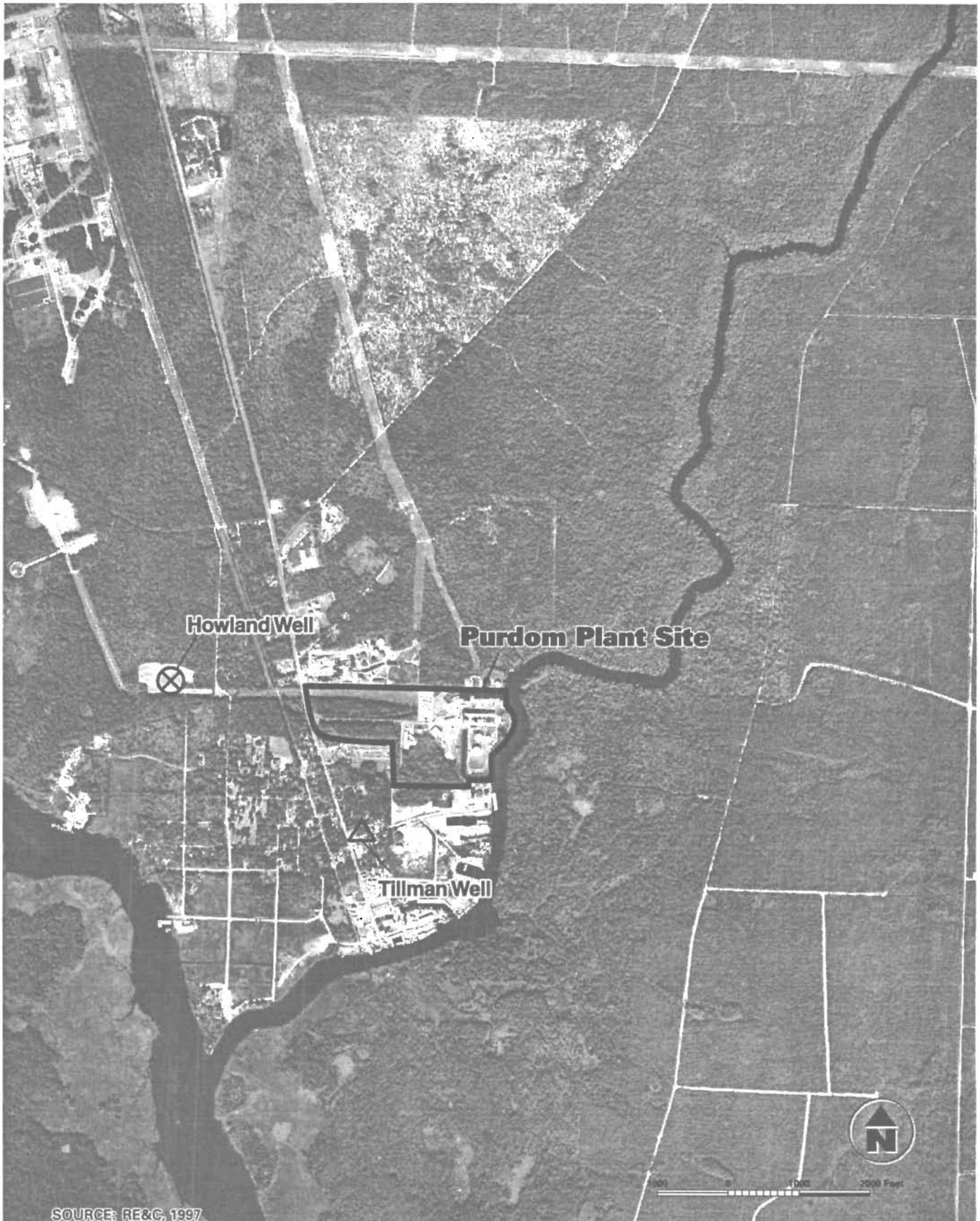
47 CITY OF ST MARKS

CITY OF TALLAHASSEE

PERMITTED GROUNDWATER CONSUMPTIVE USERS

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.3-1



CITY OF TALLAHASSEE

DOMESTIC WELLS
WITHIN ONE(1) MILE OF THE SITE

PURDOM UNIT 8 PROJECT – ST MARKS FLORIDA

Figure
2.3.3-2

USDC (U.S. Department of Commerce). 1989. Local Climatological Data Annual Summaries for 1988. Part II Southern Region. National Climatic Data Center. Asheville, North Carolina.

USGS. 1966. Map Series No. 22.

Water Information Center. 1994. Climates of the States. Volume 2. Port Washington, New York.

2.3.4 Surficial Hydrology

2.3.4.1 Hydrological Characterization

General Description

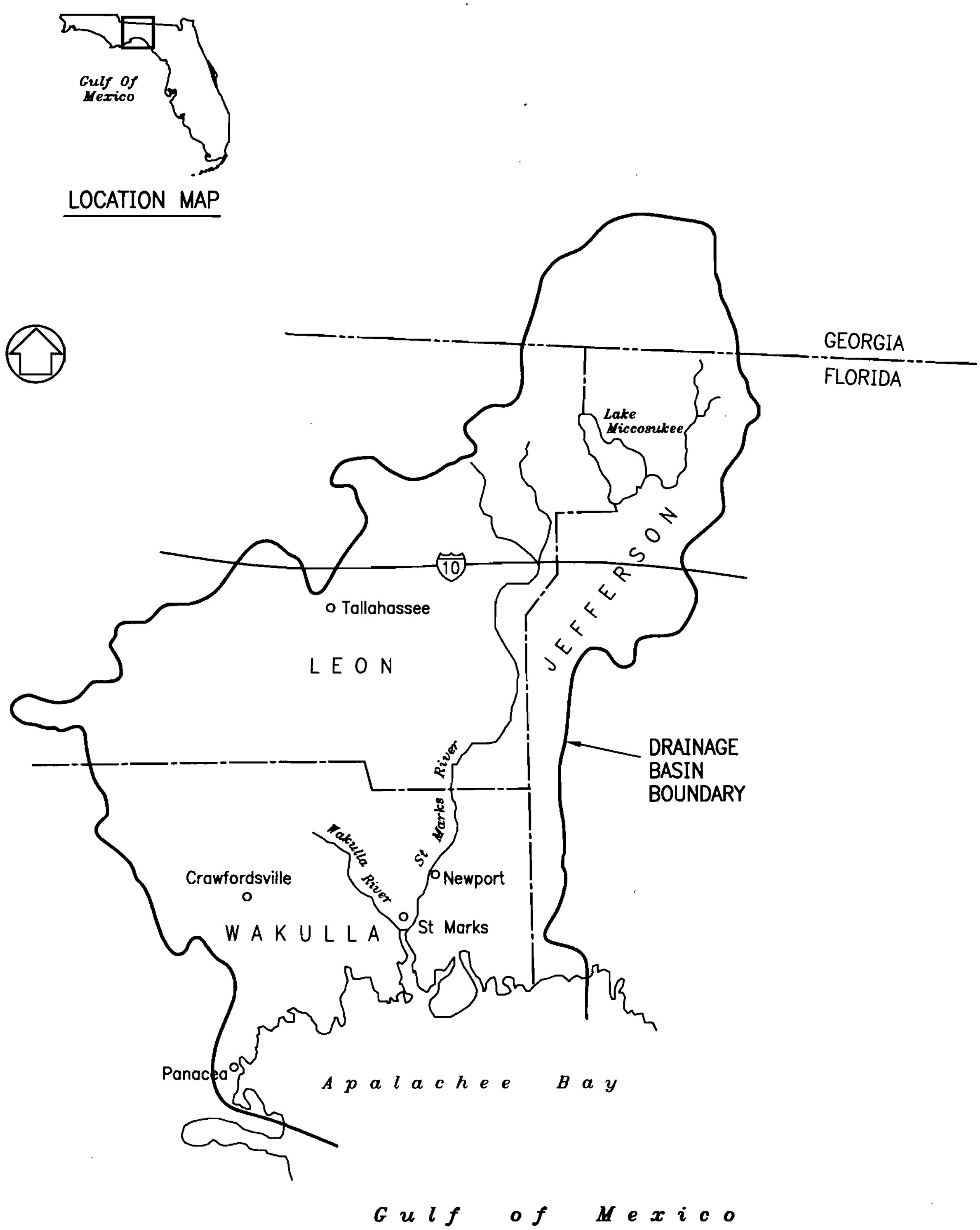
The Purdom site is within the St. Marks River basin (see Figure 2.3.4-1), approximately 7 miles upstream of the mouth of the St. Marks River, and about 1.5 miles upstream of the confluence of the St. Marks and Wakulla Rivers. The following general description of the St. Marks River drainage basin is based upon information provided in NWFWMD (1980), Hand et al. (1994), and Williams et al. (1994). The St. Marks River basin drains approximately 1,180 square miles including parts of Wakulla, Jefferson, and Leon Counties in Florida, and Thomas County in Georgia. It includes approximately one half of the drainage of the metropolitan area of Tallahassee. The river originates in the Red Hills Region of north Florida/south Georgia as a blackwater river. From its headwaters in Georgia to the town of Newport (about 10.2 miles upstream of the mouth) in Wakulla County, approximately half of the drainage basin is non-contributory except during extended periods of rainfall (Franklin and Meadows, 1994). Near the Leon-Wakulla County line (about 12.8 miles upstream of the mouth), the river widens and clarity improves with water input from several springs.

Horn Spring and Rhodes Spring are the first major springs along the St. Marks River, and are in Leon County, north of Natural Bridge. The St. Marks River exhibits a strong interconnection with the groundwater system of the area, and in some locations flows underground. For example, at Natural Bridge during normal flow, the river plunges underground and resurfaces at St. Marks Spring about 1 mile south. The segment from Natural Bridge to the Gulf of Mexico is the only portion of the river that has a well-defined channel all year round. This segment exhibits the characteristics of a spring-fed stream.

The Wakulla River confluences with the St. Marks River in the City of St. Marks, about 5.5 miles upstream of the river mouth. The Wakulla River arises from Wakulla Springs, in the south-central part of the St. Marks basin which is in a highly karstic area (see Section 2.3.2.2). It is widely speculated that there is a strong relationship between the surface waters entering the sinks to the north and west, and the outflow of Wakulla Springs. Wakulla Springs is one of Florida's highest volume springs with an average flow of about 400 cubic feet per second (cfs).

The lower St. Marks and Wakulla Rivers are estuarine in nature, with a strong salt wedge. The salt wedge in the St. Marks River has been detected as far as 9.5 miles upstream of the river mouth or 2.5 miles upstream of the Purdom Station intake area (Ebasco Services Incorporated, 1992), and has been reported (Hand et al., 1994) to extend up the Wakulla River at least 3 miles upstream of its confluence with the St. Marks River.

The St. Marks River is classified by the FDEP as Class III waters from Rattlesnake Branch (about 375 feet upstream of the Purdom intake area, or 7.07 miles upstream of the river mouth) to its confluence with the Wakulla River (about 1.5 miles downstream of the Purdom intake area). The rest of both rivers is classified as Outstanding Florida Waters (OFW).



SOURCE: RE&C, 1997

CITY OF TALLAHASSEE

ST MARKS RIVER DRAINAGE BASIN

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.4-1

PLOT DATE FEB 27, 1997 C:\15840002\----\00000-39.DWG

Hand et al. (1994) indicates that there are only two portions of the St. Marks River Basin which have water quality problems. They are the Lake Munson/Munson Slough area, which has historically been impacted by sewage effluent, and the portion of the river within the City of St. Marks which has been affected by discharges from the Purdom Station, the refinery to the north, tugboats and oil barges, and the City of St. Marks Wastewater Treatment Facility. Hand et al. (1994) also indicates there is only one water quality problem area in the Wakulla River, that being the discharge of nutrients via Boggy Branch by Primex Technologies (formerly Olin Corporation).

Morphometry, Bathymetry, and Stages

The St. Marks River has been used for navigational purposes since colonial times. Prior to the Civil War, it was used to send agricultural products (such as cotton) to market and to receive other goods. This traffic declined after the Civil War, and was finally replaced by traffic in volatile fuels, beginning in the 1930s. The U.S. Army Corps of Engineers (COE) investigated improving the river because of a formation known as the Devil's Rocks which lay between the City of St. Marks and the mouth of the river. Reports for and against improving the channel were made to the Chief of Engineers between 1845 and 1936.

The Project to improve the channel by dredging a channel to the City of St. Marks was completed in 1964. The channel was dredged to be at least 12 feet deep and 125 feet wide from a point about 4 miles offshore in Apalachee Bay to the Turning Basin (see Figure 2.3.4-2). The channel width is reduced to 100 feet from the turning basin to Newport. Dredging was not required between St. Marks and Newport, only "clearing and snagging" (COE, 1996).

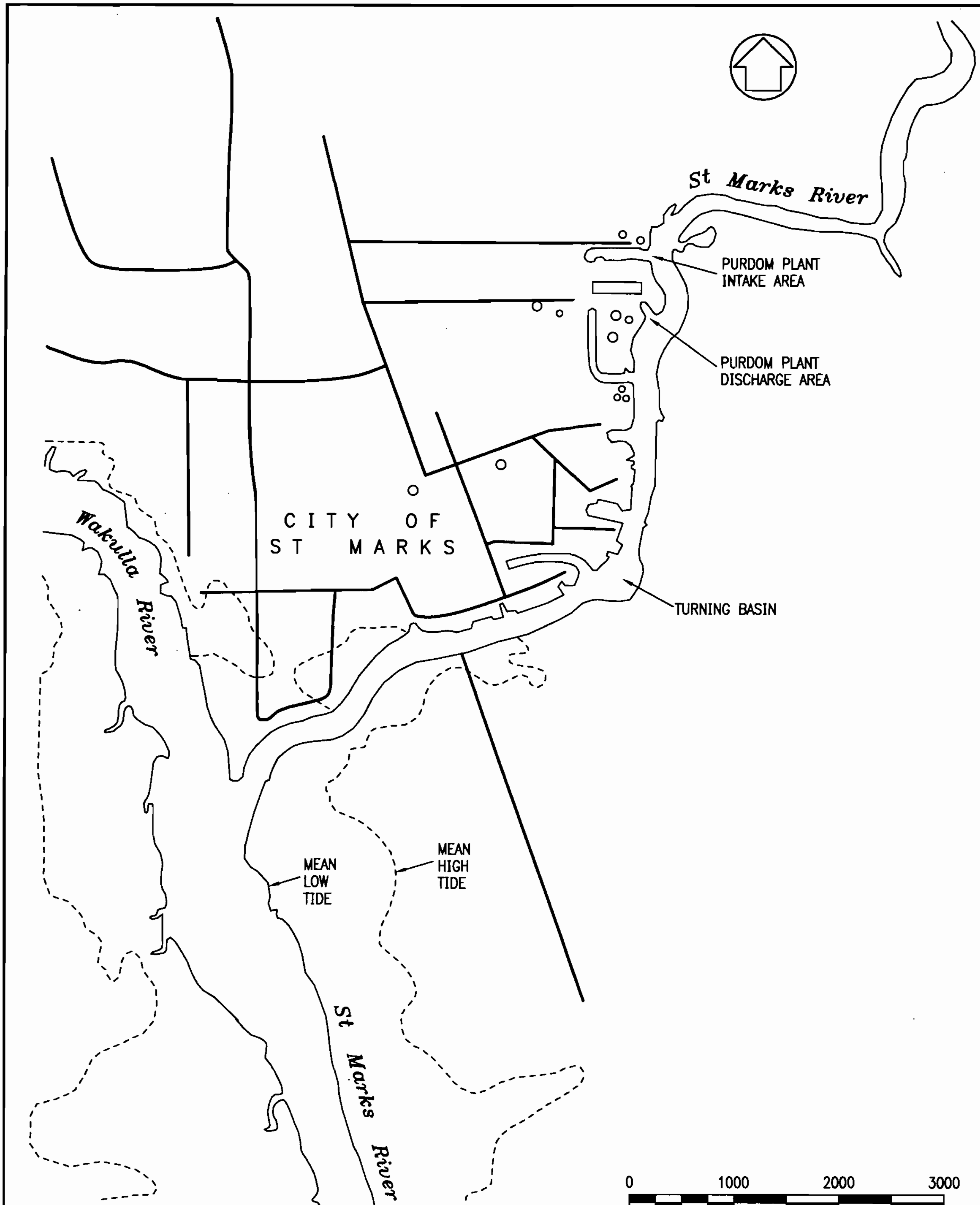
Morphometry and bathymetry of the St. Marks and Wakulla Rivers in the site vicinity are shown on Figures 2.3.4-2 and 2.3.4-3. The tidal range on the St. Marks River varies from 2.58 feet (mean) and 3.49 feet (diurnal) at the mouth, to 2.4 feet (mean) and 3.3 feet (diurnal) in the City of St. Marks. The mean tide level varies from 0.04 feet mean sea level (msl) at the mouth to -0.1 feet msl in St. Marks.

Bathymetry (Ebasco Services, 1992) at the Purdom Station is shown for the Intake Area on Figure 2.3.4-4 and for the Discharge Area on Figure 2.3.4-5.

Measured water levels in the St. Marks River at the Purdom Station are shown on Figure 2.3.4-6. The water level range shown is about 7 feet, indicating the effects of freshwater inflow superimposed upon the tidal levels. Figure 2.3.4-7 shows the water levels for varying freshwater inflows at Newport.

Currents

The National Oceanic and Atmospheric Administration (NOAA) indicates that tidal currents range up to 0.5 ft/sec on flood tides and 0.67 ft/sec on ebb tides, in the St. Marks River within the City of St. Marks (International Marine, 1995b). Actual measurements were performed in 1992 in the vicinity of the Purdom Station, when no generating units were operating, on the ebb tide. Actual measured currents were larger than predicted for two reasons. The first reason is because they were influenced by freshwater inflows. The second reason is that the river is



SOURCE: NOAA NAUTICAL CHART 11406 - MAY, 1991
RE&C, 1997

CITY OF TALLAHASSEE

FEATURES OF THE
ST MARKS RIVER
IN THE SITE VICINITY
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.4-2

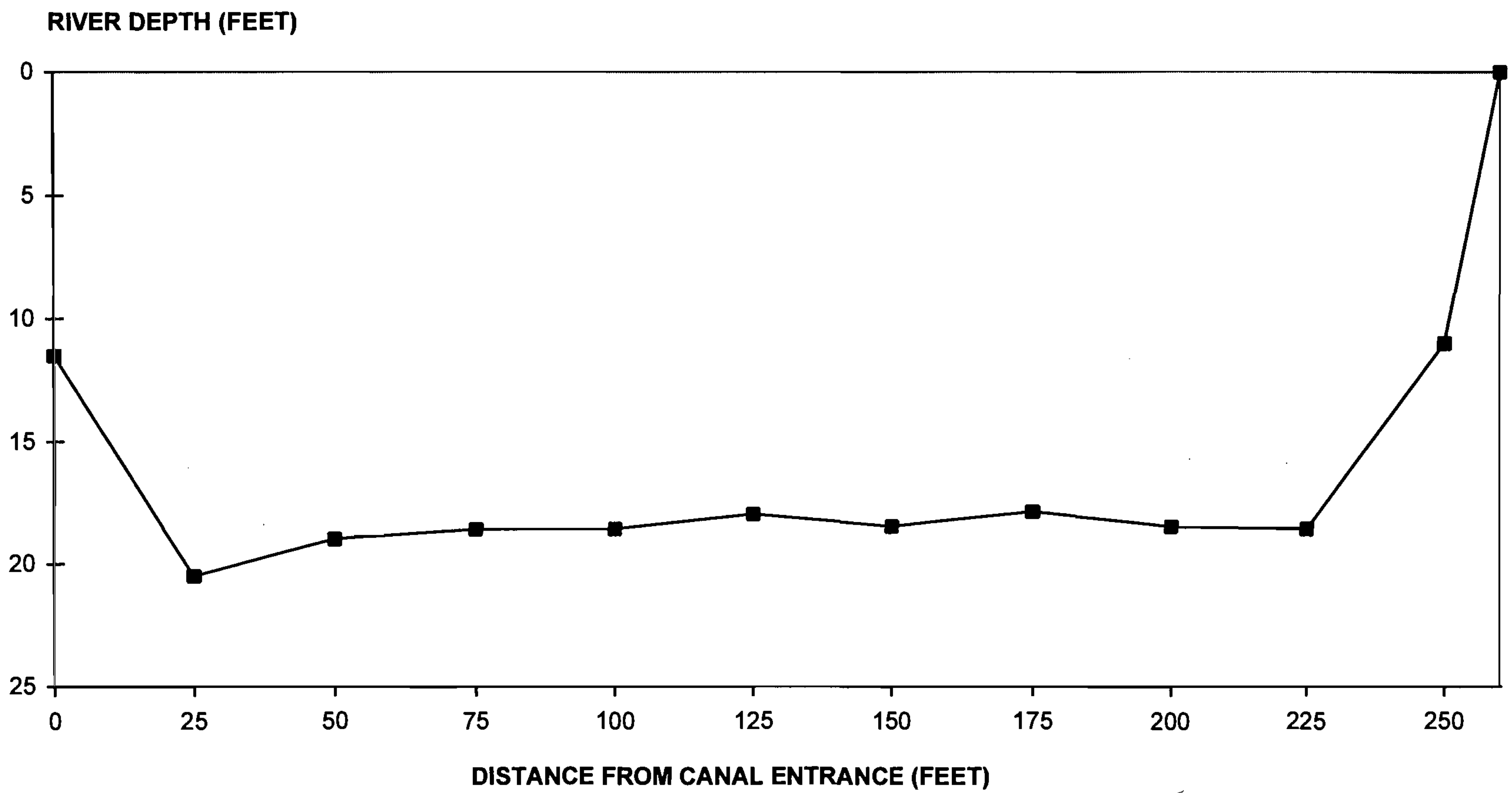
PLOT DATE FEB 28, 1997 C:\15840002\----\00000-21.DWG

CITY OF TALLAHASSEE

RIVERS IN THE SITE VICINITY

PURDOM UNIT 8 PROJECT - ST MARKS FLORIDA

Figure 2.3.4-3



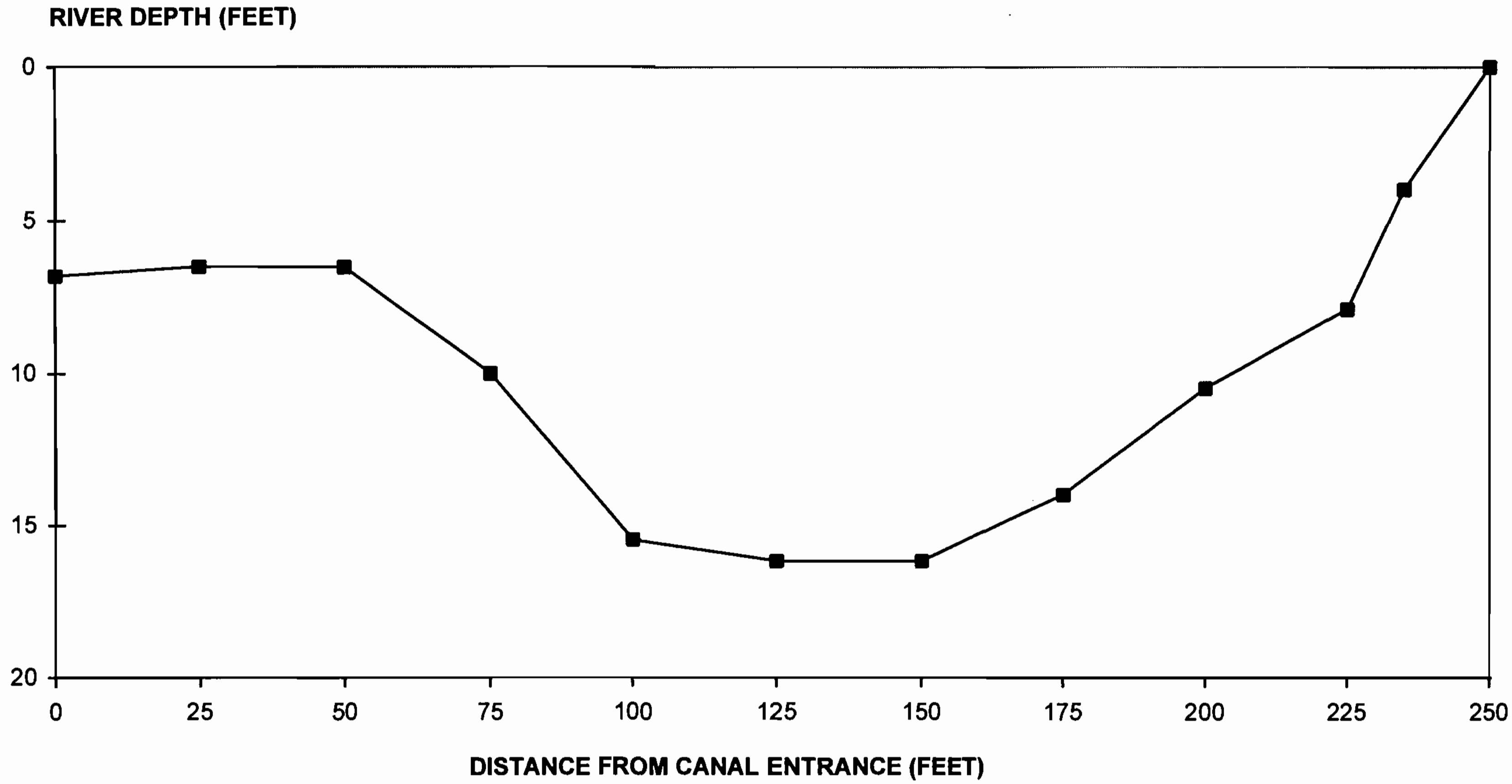
DATA COLLECTED 2/11/92 09:10

SOURCE: EBASCO ENVIRONMENTAL, 1992

CITY OF TALLAHASSEE

BATHYMETRY IN THE INTAKE AREA
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.4-4



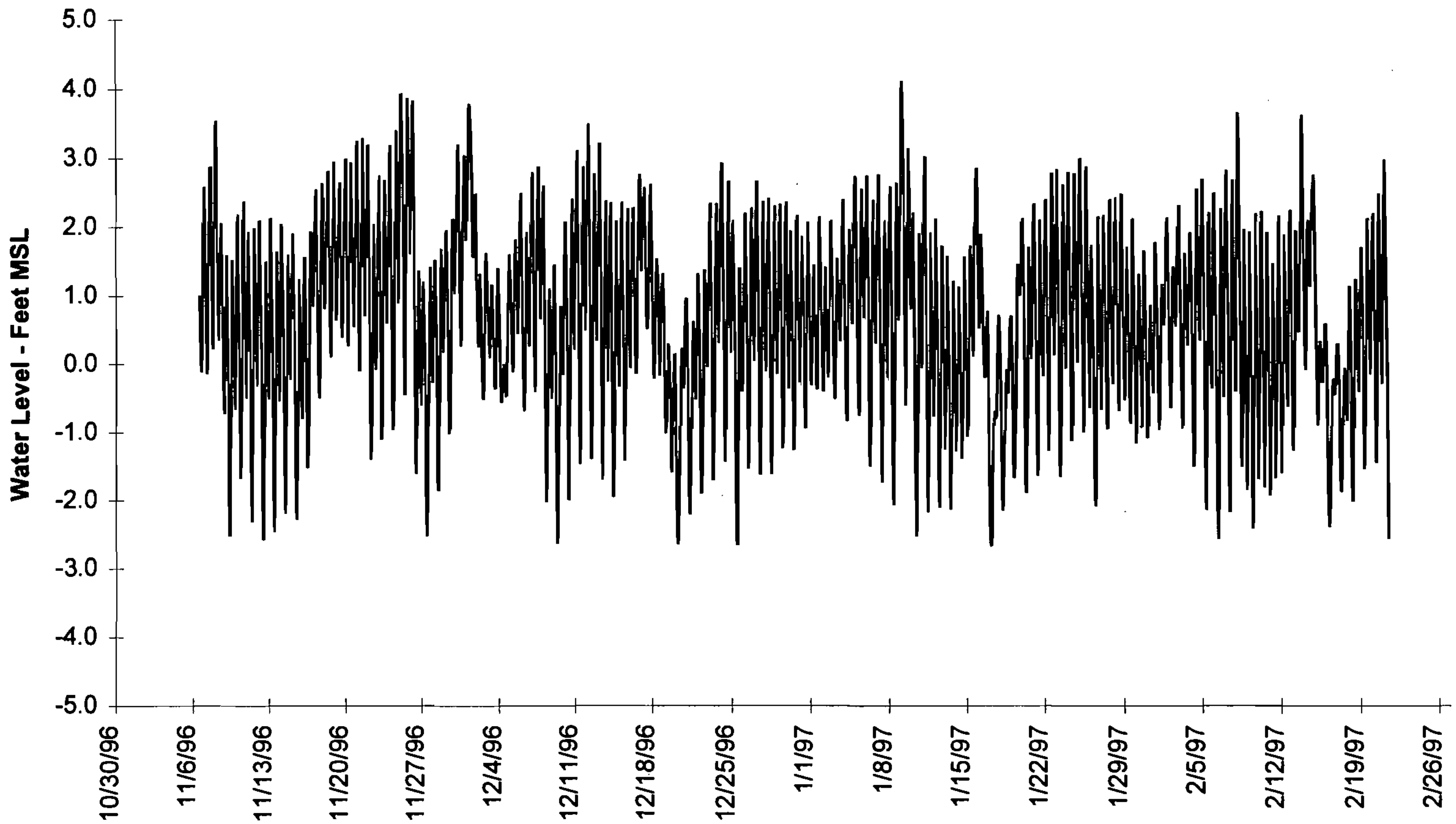
DATA COLLECTED 02/11/92 10:10

SOURCE: EBASCO ENVIRONMENTAL, 1992

CITY OF TALLAHASSEE

BATHYMETRY IN THE DISCHARGE AREA
PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

Figure 2.3.4–5



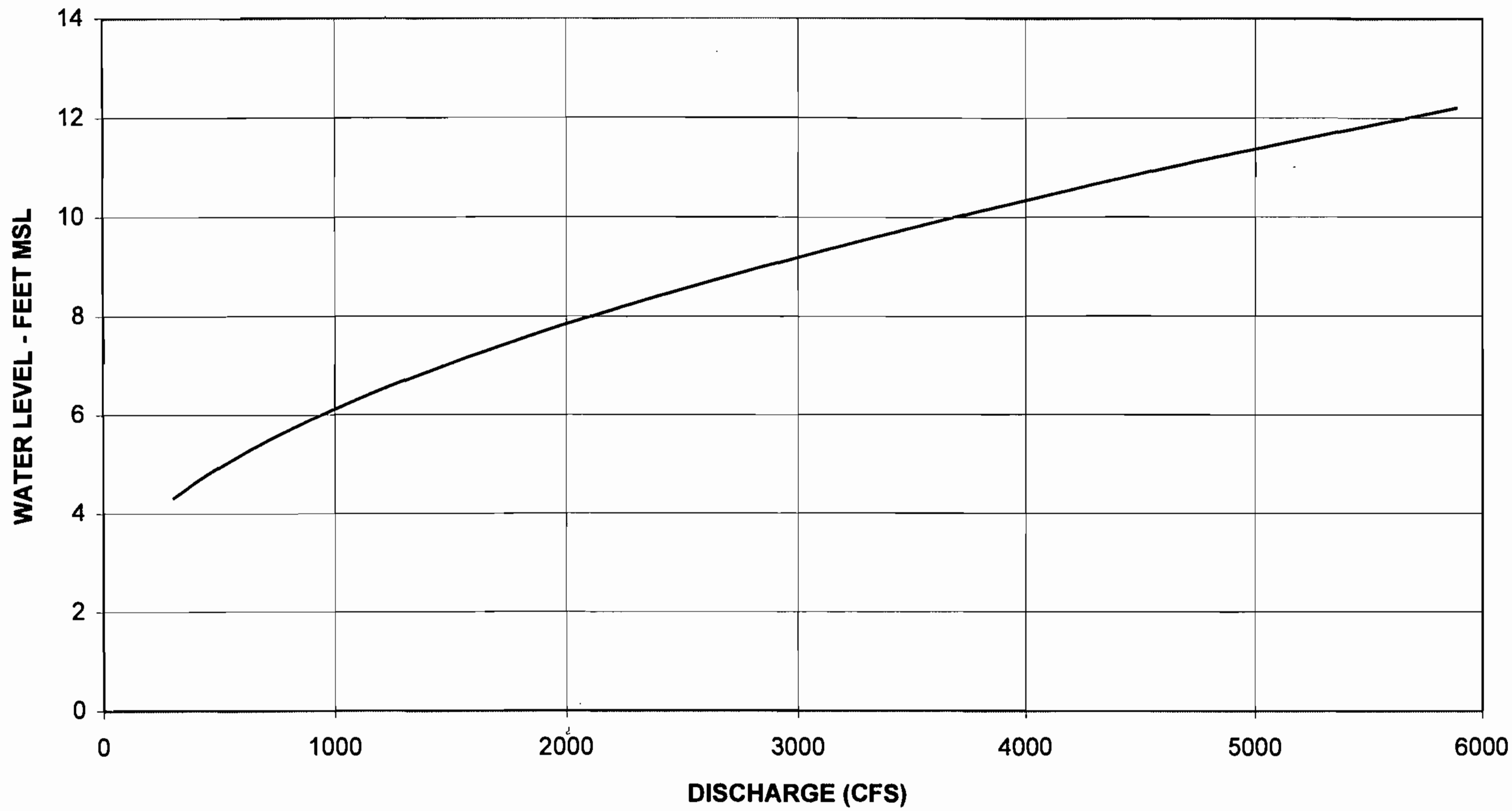
SOURCE:RE&C,1997

CITY OF TALLAHASSEE

WATER LEVELS AT THE PURDOM STATION INTAKE AREA

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.4-6



SOURCE: USGS, 1996

CITY OF TALLAHASSEE

RATING CURVE ST. MARKS RIVER NEAR NEWPORT, FLORIDA
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.4-7

stratified and the freshwater flow is predominantly in the upper layer, and the tidal flow is predominantly in the lower layer.

In July of 1996, baseline monitoring field studies were conducted in the St. Marks River to support this certification application. Complete details of this effort are presented in Appendix 10.5.4. The associated profiling locations are shown on Figure 2.3.4-8 and, in more detail near the plant, Figure 2.3.4-9. A typical current velocity profile on an outgoing tide is illustrated in Figure 2.3.4-10, on which positive current is in the downstream direction.

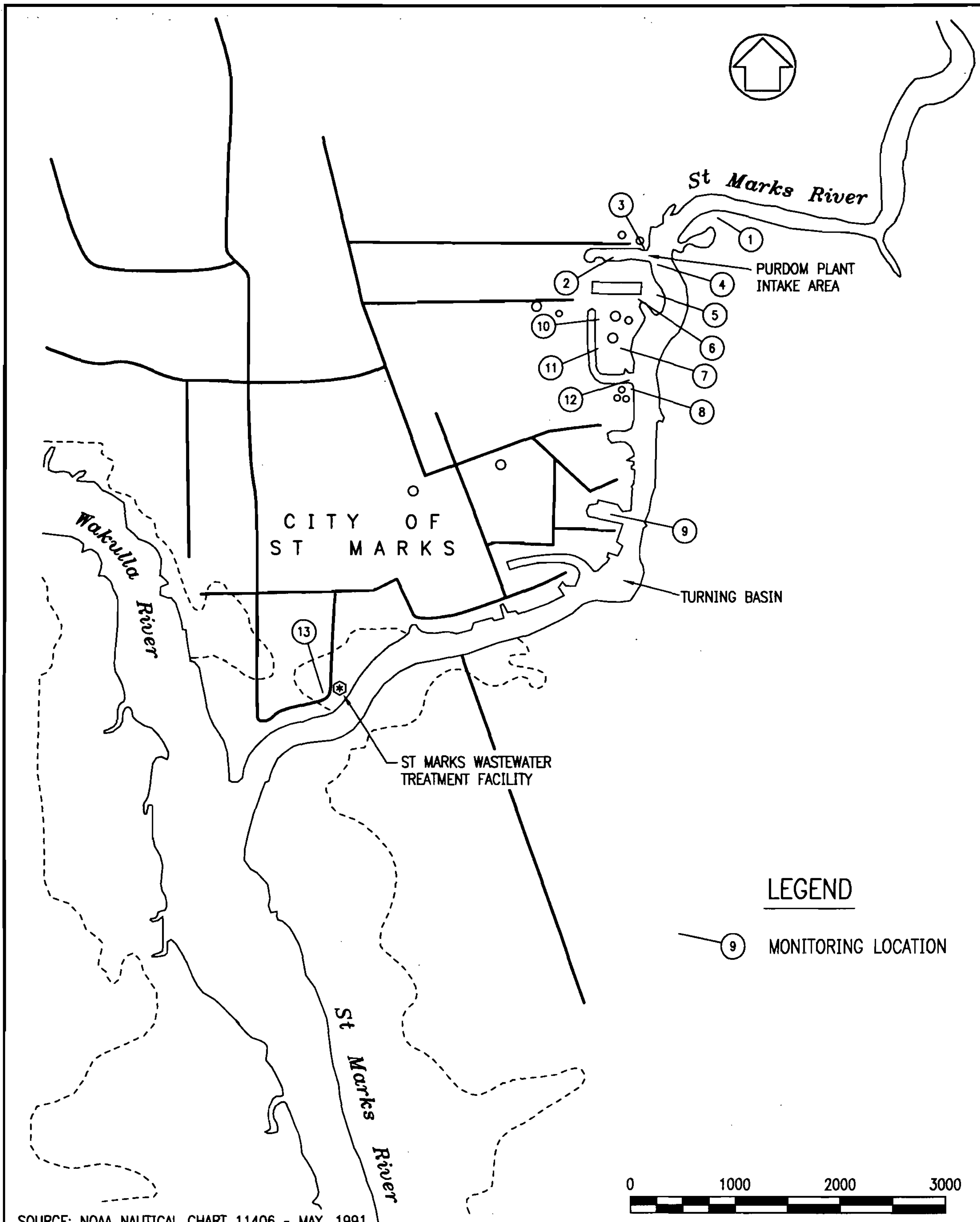
The Purdom Station has five operational generating units, three steam electric units (numbered 5 through 7) and two gas turbine units (numbered GT1 and GT2.) Units 5 and 6 are rated at 22 MW (nominal) and were placed in operation in 1958 and 1961 respectively. The gas turbines are each rated at 12.5 MW (nominal) and were installed in 1961 (GT1) and 1966 (GT2). Unit 7, rated at 44 MW (nominal), became operational in June of 1966.

The units were all installed with once-through cooling systems and have operated under an NPDES permit since the inception of the NPDES permitting program, and a state-issued Industrial Wastewater (IWW) permit. A discharge canal originally constructed along with Units 1 through 4 presently serves Unit 5. The St. Marks River was dredged and a fuel oil barge unloading terminal was installed at the same time. An intake structure was installed on the west bank of the St. Marks River along with Unit 5. A second discharge canal was installed with Unit 6, and another intake structure was installed adjacent to that of Unit 5 for Unit 6. An intake canal and another intake structure were installed with Unit 7, which shares a common discharge canal with Unit 6. Units GT1 and GT2 have an intake structure in, and discharge via a culvert to, the discharge canal serving Units 6 and 7. The locations of these facilities are shown on Figure 2.3.4-11. Units 5 through 7, GT1, and GT2 are presently used for peaking.

When Units 5 and 6 are operating, they superimpose new currents in the vicinity of their intake structures (Location 4 on Figure 2.3.4-8). Westward (into the intake structures) velocities in that area range from 0.12 to 0.43 ft/sec (see Figure 2.3.4-12) with all three steam units running. Similarly, velocities entering the Unit 7 intake canal range from 0.2 ft/sec at the bottom to about 0.004 ft/sec near the surface (see Figure 2.3.4-13). Velocities into the river from the Unit 5 discharge canal range from 0.73 ft/sec at 3.5 feet depth, to 0.05 ft/sec at the surface and at 6.5 feet of depth (see Figure 2.3.4-14) with Unit 5 operating. Velocities into the river from the Units 6 and 7 discharge canal range from 1.083 ft/sec at about 5 feet of depth, to about 0.5 ft/sec near the surface with Units 6 and 7 both running (see Figure 2.3.4-15). If only Unit 7 is running, these velocities drop to a maximum of about 0.67 ft/sec at a depth of 4 feet and a minimum of about 0.067 ft/sec near the water surface (see Figure 2.3.4-16). All of these velocities are of the same order of magnitude as the natural ambient velocities in the river (see Figure 2.3.4-10).

Flows

The only long-term flow gauging station on the St. Marks River was the USGS Station Number 02326900, near Newport. Data were recorded once a day at this station from October 1956 through October 1994, a period of record (POR) of 38 years. The drainage basin upstream of this station encompasses 535 square miles, of which some 240 square miles are noncontributory during periods of low flow. The single maximum daily flow over the POR for each month, the average of the maximum daily flows for each month, the average daily flows for each month, the



SOURCE: NOAA NAUTICAL CHART 11406 - MAY, 1991
RE&C, 1997

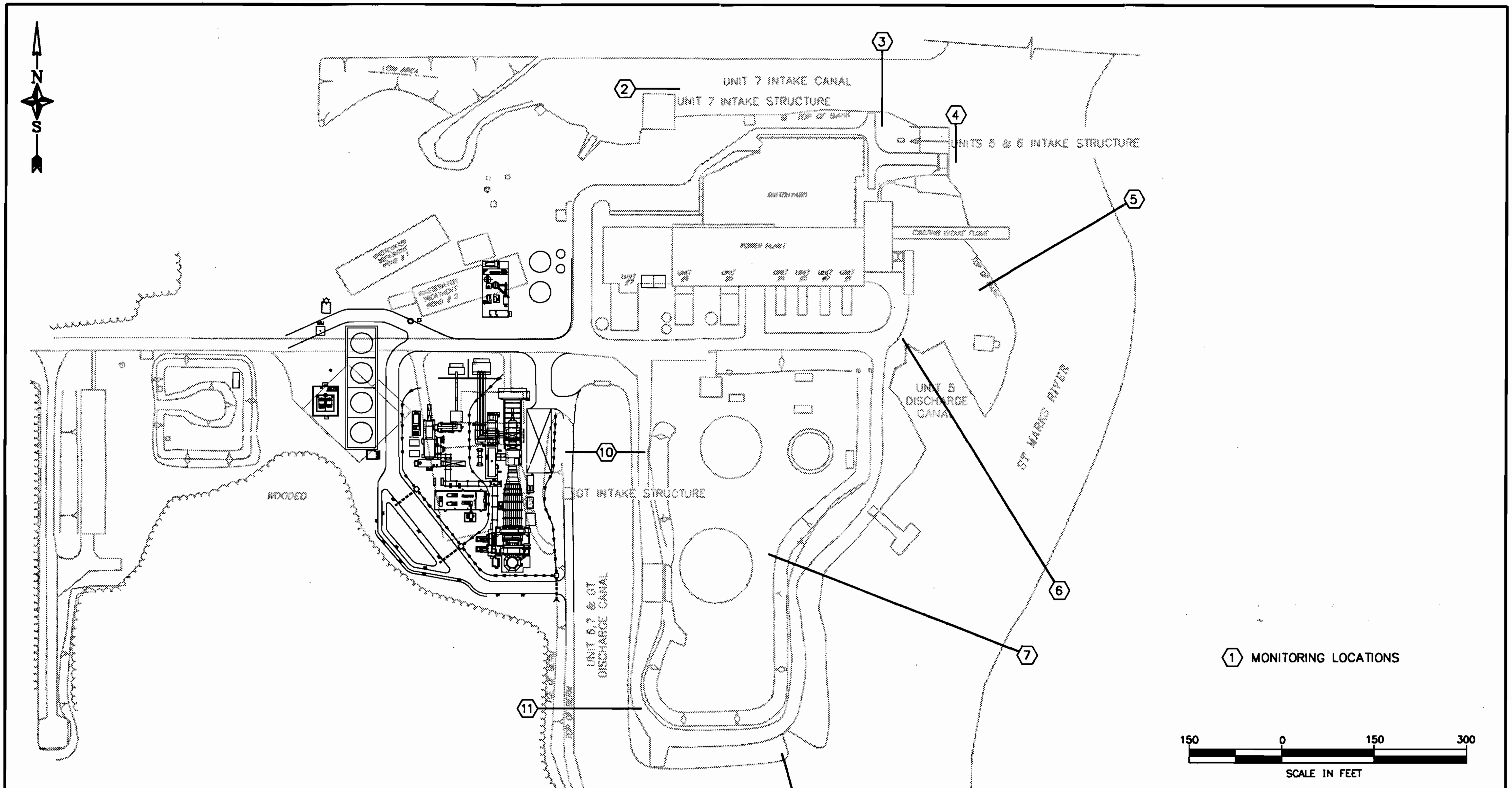
PLOT DATE FEB 28, 1997 C:\15840002\----\00000-29.DWG

CITY OF TALLAHASSEE

SURFICIAL HYDROLOGY
BASELINE MONITORING PROFILING LOCATIONS

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure
2.3.4-8



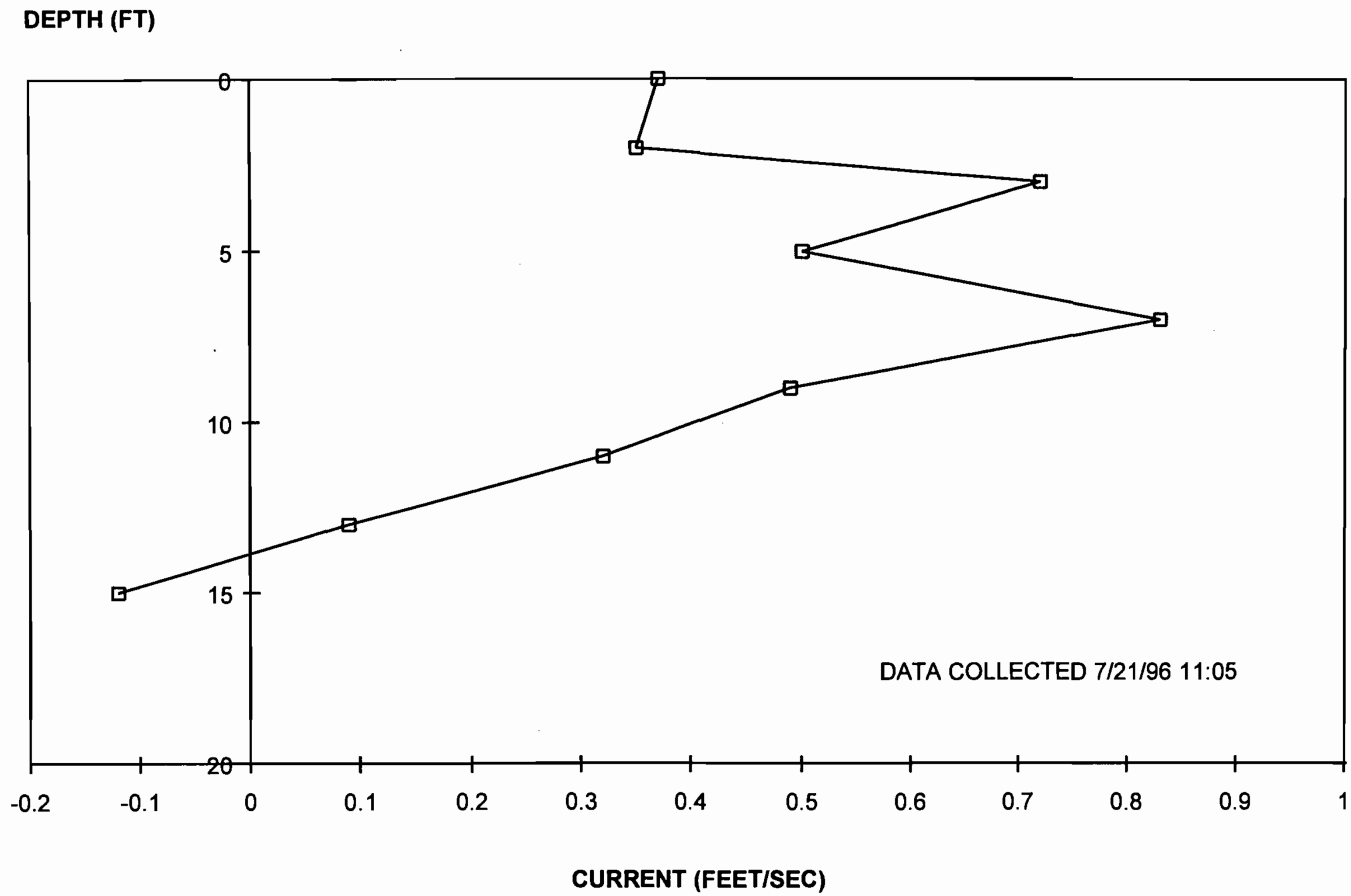
SURFICIAL HYDROLOGY BASELINE MONITORING PROFILING LOCATIONS

PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

CITY OF TALLAHASSEE

Figure 2.3.4-9

SOURCE: RE&C, 1997

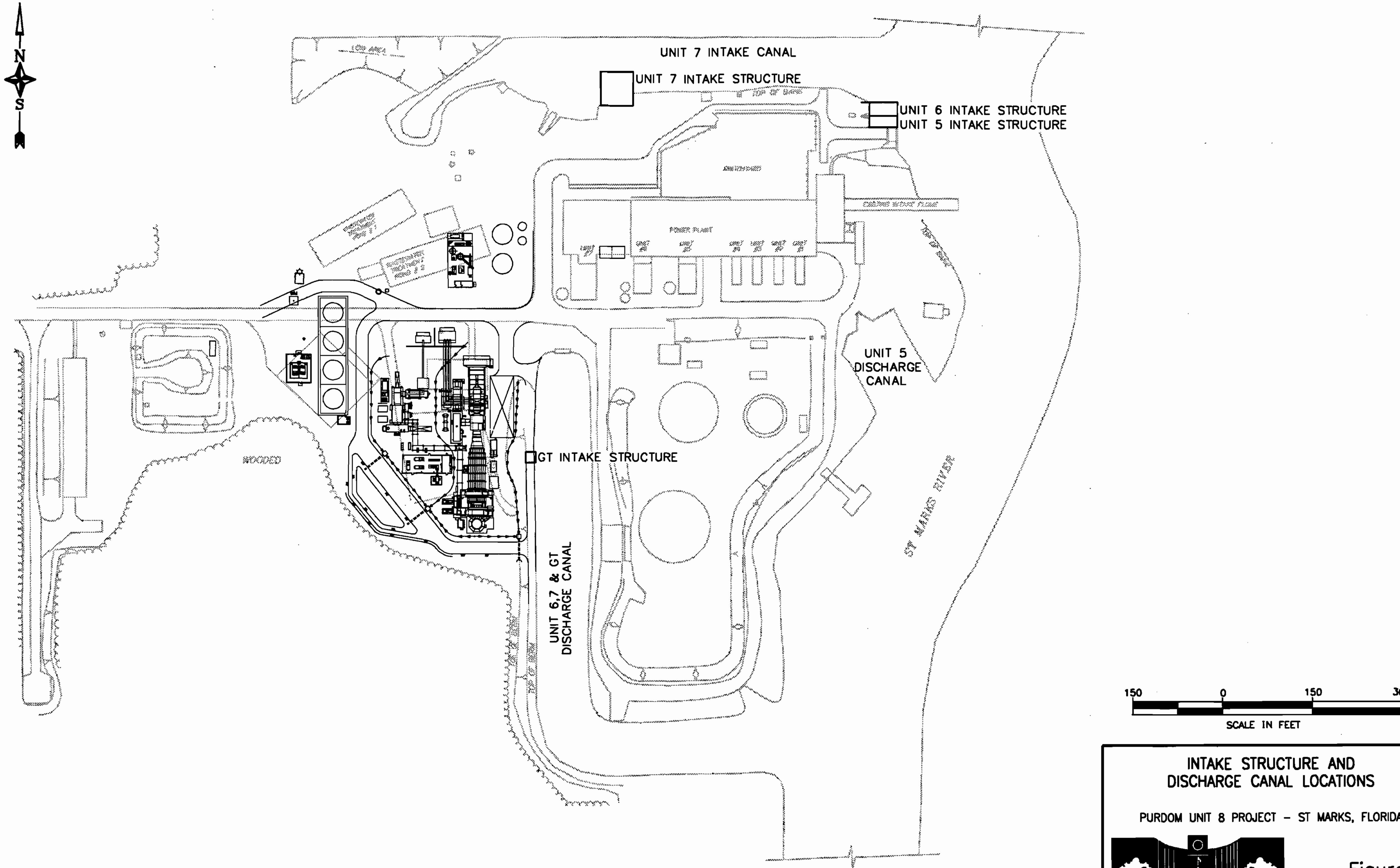


SOURCE:RE&C,1996

CITY OF TALLAHASSEE

LOCATION 8
WATER COLUMN CURRENT PROFILE
AT ST. MARKS RIVER DOWNSTREAM OF UNIT 6/7 DISCHARGE, MID-RIVER
PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

Figure 2.3.4–10



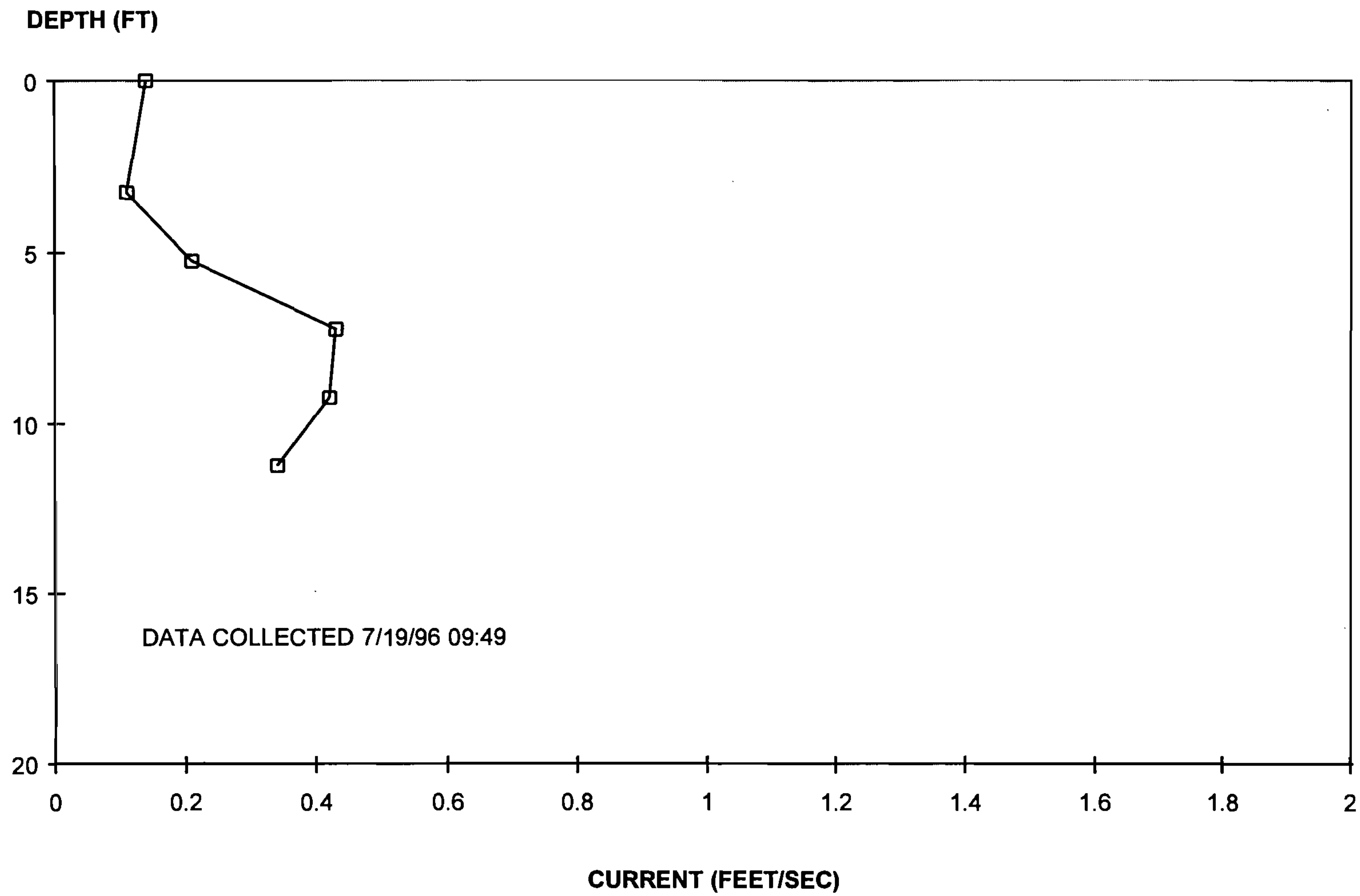
SOURCE: RE&C, 1997

INTAKE STRUCTURE AND DISCHARGE CANAL LOCATIONS

PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

CITY OF TALLAHASSEE

Figure 2.3.4-11

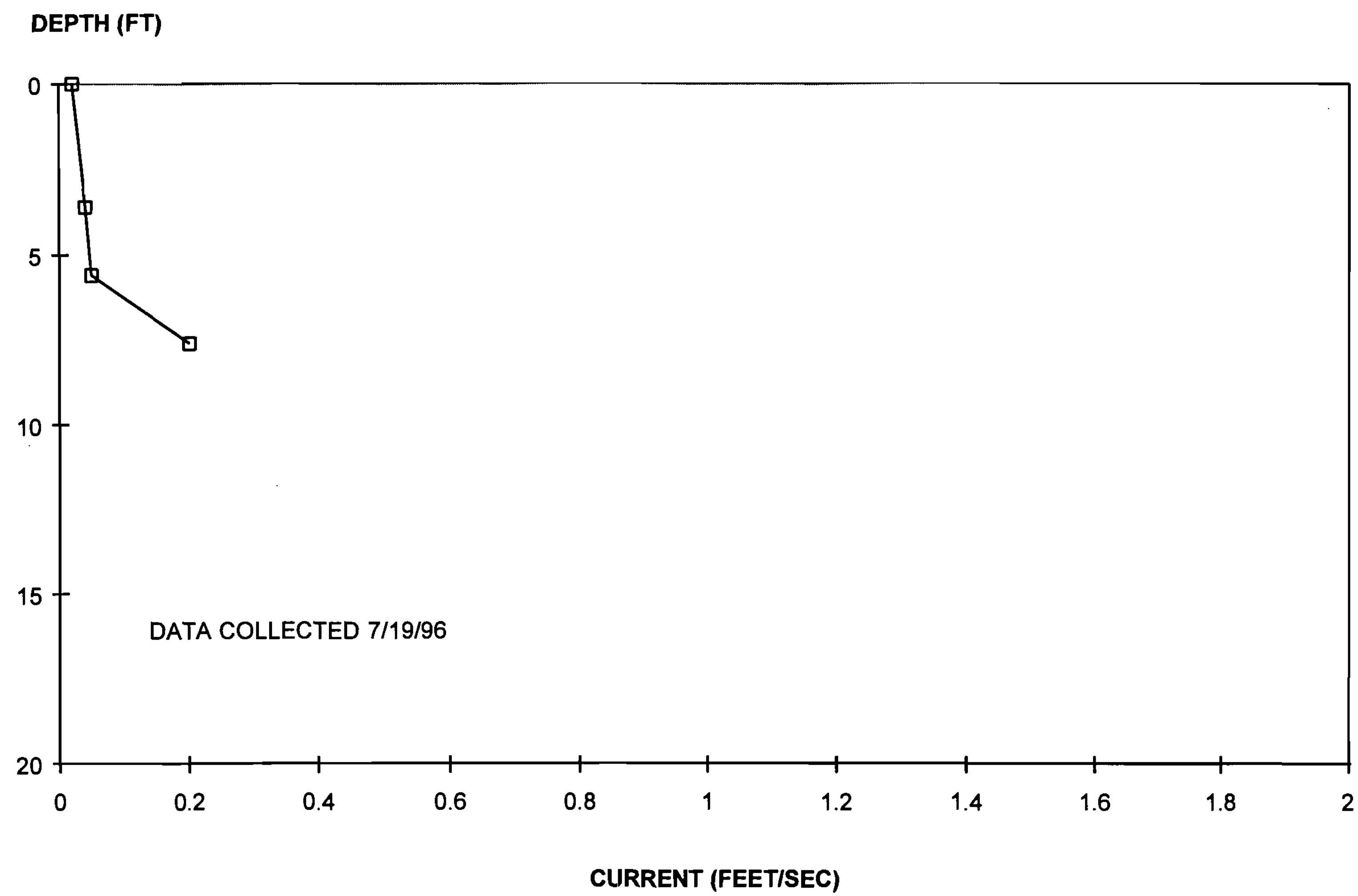


SOURCE:RE&C,1996

CITY OF TALLAHASSEE

LOCATION 4
WATER COLUMN CURRENT PROFILE
AT ST. MARKS RIVER, AT UNIT 5 INTAKE STRUCTURE
PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

Figure 2.3.4–12

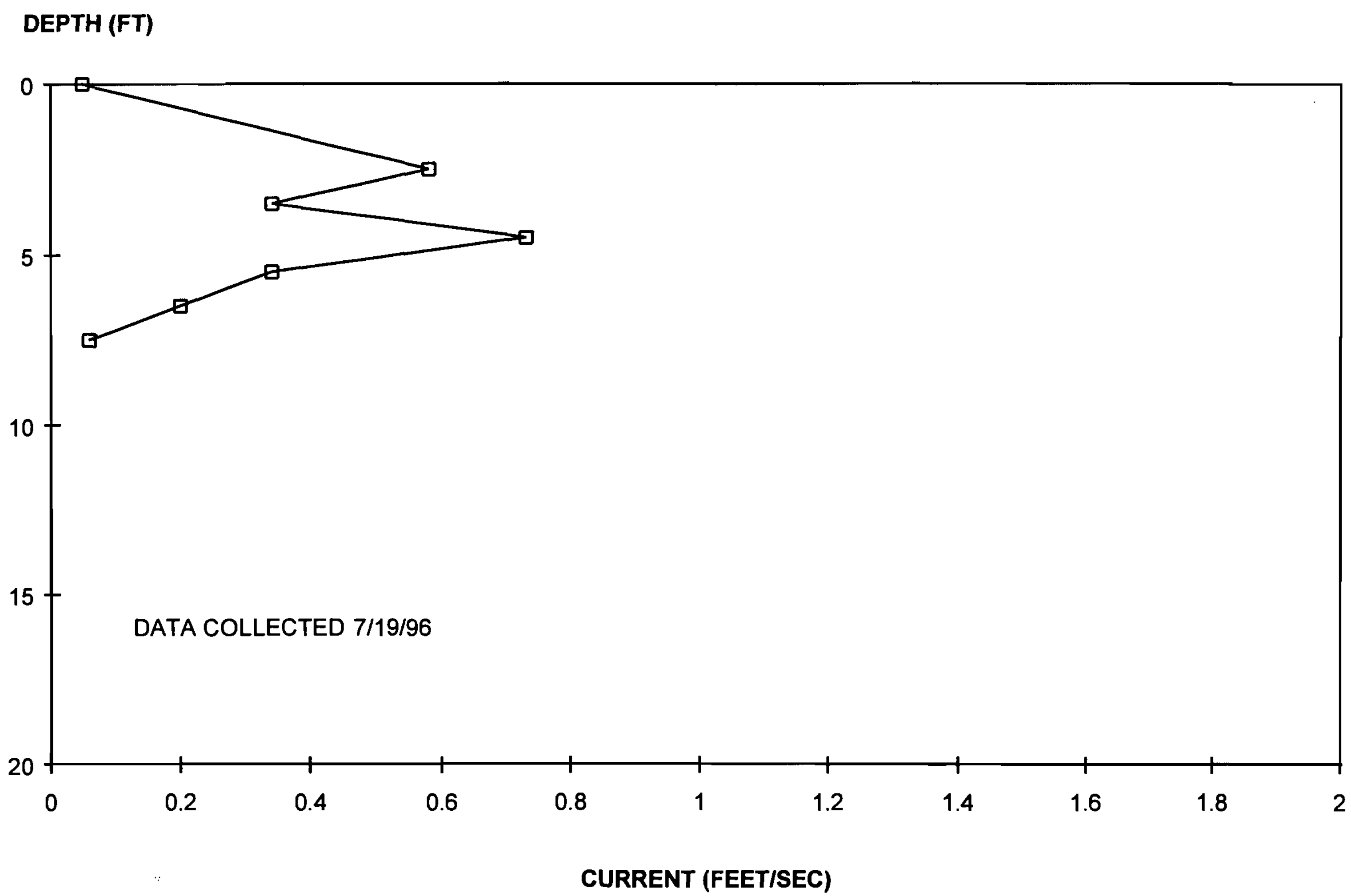


SOURCE:RE&C,1996

CITY OF TALLAHASSEE

LOCATION 3
WATER COLUMN CURRENT PROFILE
AT OPENING OF INTAKE CANAL
PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

Figure
2.3.4–13

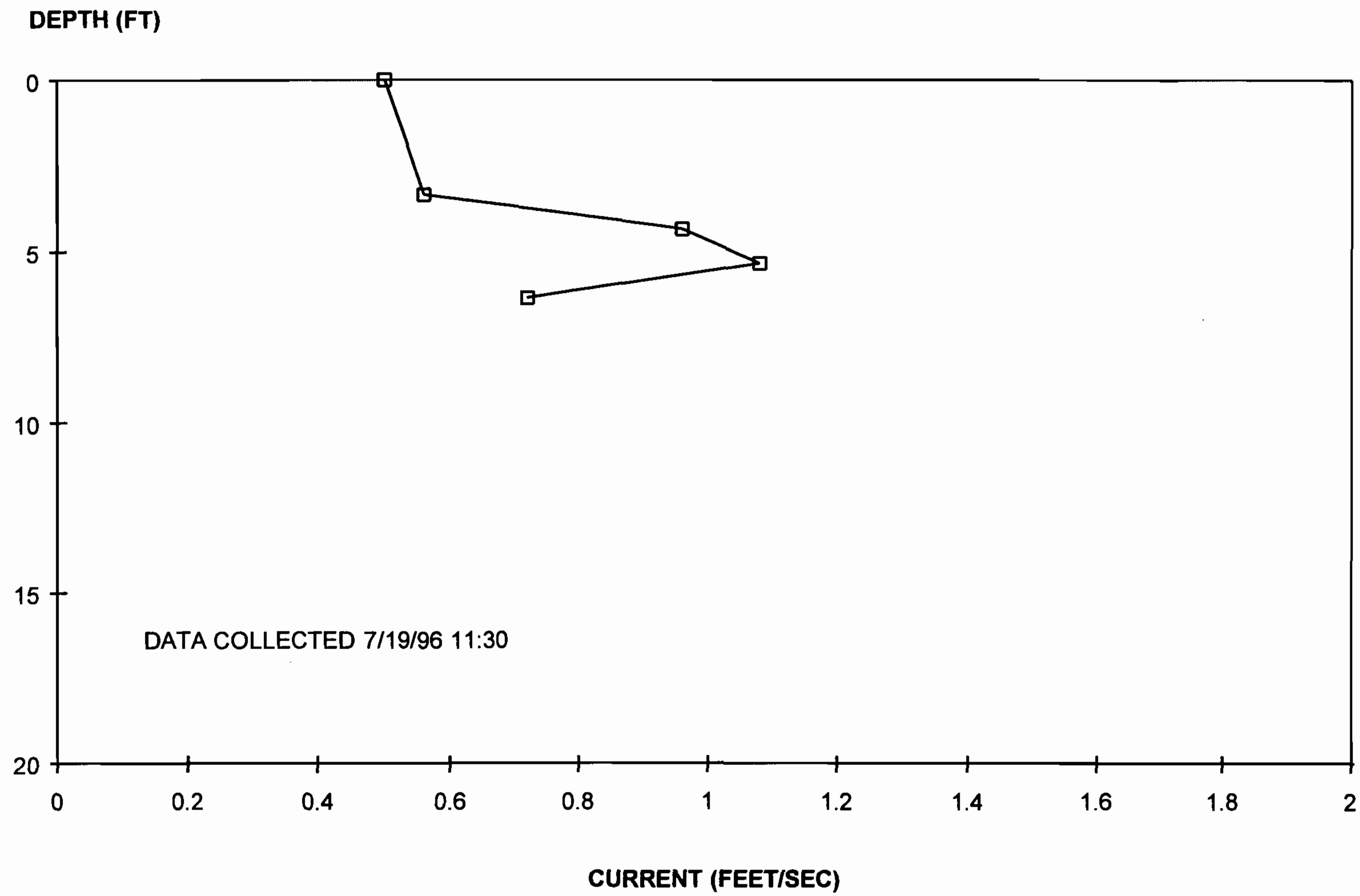


SOURCE:RE&C,1996

CITY OF TALLAHASSEE

LOCATION 6
WATER COLUMN CURRENT PROFILE
AT UNIT 5 DISCHARGE
PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

Figure
2.3.4–14

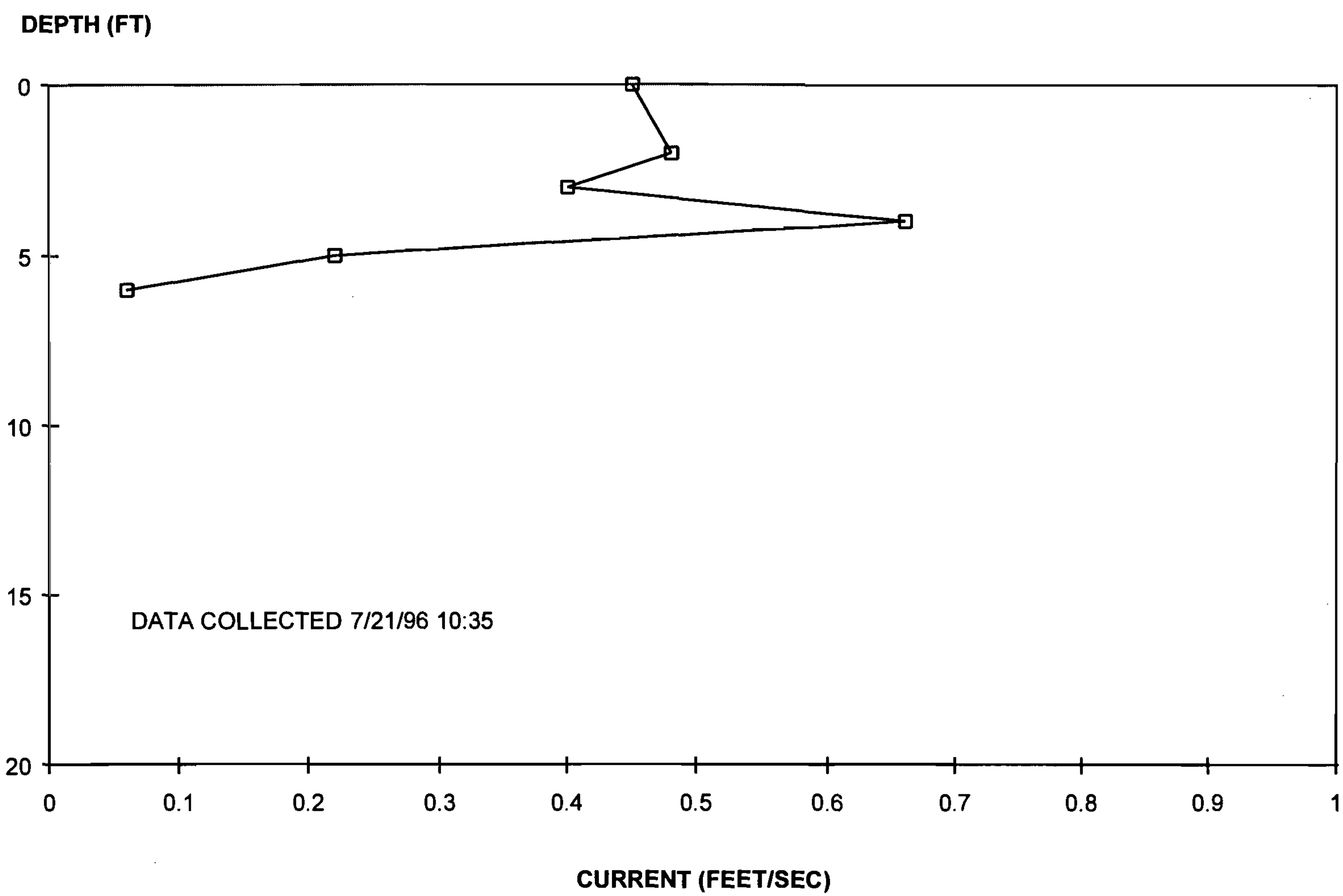


SOURCE:RE&C,1996

CITY OF TALLAHASSEE

LOCATION 12
WATER COLUMN CURRENT PROFILE
AT UNITS 6/7 DISCHARGE, AFTER BEND IN DISCHARGE CANAL
PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

Figure 2.3.4–15



SOURCE:RE&C,1996

CITY OF TALLAHASSEE

LOCATION 12
WATER COLUMN CURRENT PROFILE
AT UNITS 6/7 DISCHARGE, AFTER BEND IN DISCHARGE CANAL
PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

Figure
2.3.4–16

single minimum daily flow for each month over the POR, and the average of the minimum daily flows for each month are shown on Figure 2.3.4-17. The overall average flow over the POR is 720 cfs. Flow at Newport represents freshwater flow of the St. Marks River.

The data were also analyzed to determine the seven consecutive day low flow with a ten year recurrence (7Q10) for the station at Newport. This 7Q10 was determined to be 333 cfs. The 7Q10 at the Purdom Station was estimated, based on the ratio of drainage areas, to be about 347 cfs.

Similarly, the average freshwater flow and 7Q10 of the St. Marks River at the mouth were estimated based on the ratios of drainage areas. The average was determined to be about 1,588 cfs (representing the average freshwater inflow to Apalachee Bay from the St. Marks River) and the 7Q10 was determined to be about 734 cfs.

The average tidal flow at the Purdom Station has been estimated, based on mean tidal ranges, to be about 360 cfs (Envirosphere Company, 1985)

The design flow rates of the five operational units at the Purdom Station are as follows:

Unit	Flow Rate-cfs
5	54
6	54
7	94
GT1	2.3
GT2	2.3
Total	206.6

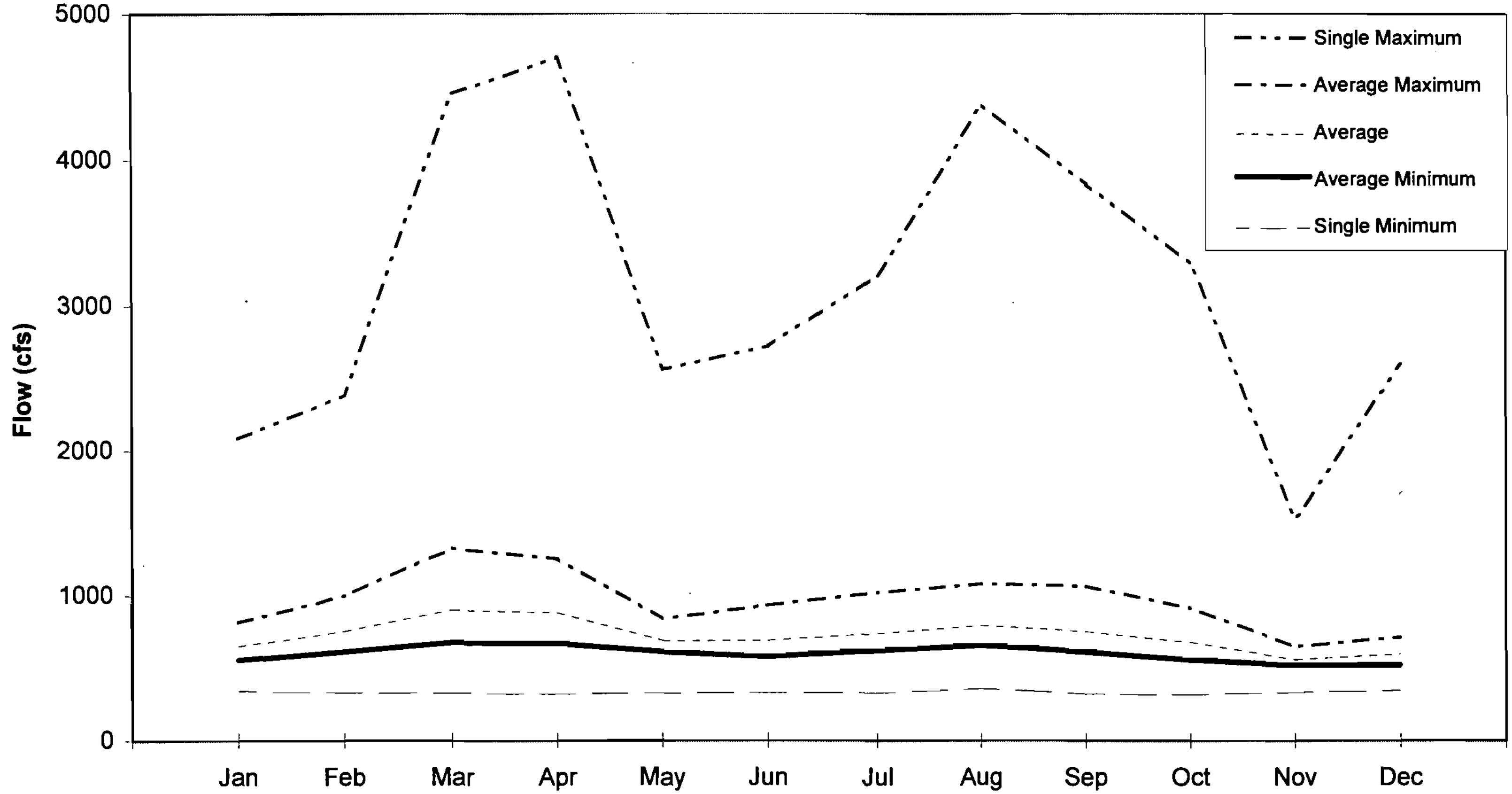
The total of 206.6 cfs represents about 60 percent of the 7Q10 of the St. Marks River. Actual operating data for Units 5, 6, and 7, for Water Year 1996 (October 1, 1995 through September 30, 1996) indicate that the actual flow rates (excluding the GTs) were:

Unit	Gallons Pumped Per Year	% of Design Flow
5	7,255,950,000	57.6
6	6,287,100,000	49.8
7	21,325,764,000	96.4
Total	34,868,814,000	73.6

The City of St. Marks operates a wastewater treatment facility at the location shown on Figure 2.3.4-8. This facility discharges secondary effluent into the St. Marks River at a location about 200 yards upstream of its confluence with the Wakulla River. The discharge flow rate of this facility for the period February 1993 through August 1996 averaged about 21,000 gallons per day (about 0.03 cfs or 15 gpm).

Temperature

The U.S. Geological Survey recorded non-continuous temperature data within the St. Marks River (see Figure 2.3.4-27), near Newport, between June of 1967 and June of 1994, and at Wakulla Springs (the headwaters of the Wakulla River) between May of 1954 and February of 1985. The data are presented in Section 10.5.4, and are plotted in Figures 2.3.4-28 (St. Marks River) and 2.3.4-29 (Wakulla Springs). Temperatures in the St. Marks River near Newport



SOURCE:RE&C,1996; USGS, 1992

CITY OF TALLAHASSEE

ST. MARKS RIVER FLOWS AT NEWPORT
PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

Figure 2.3.4–17

ranged from a low of 12° C (53.6° F) in January of 1979 to a high of 27° C (80.6° F) in May of 1970. Temperatures at Wakulla Springs stayed in a narrower range between a low of 18.5° C (65.3° F) and a high of 24.0° C (75.2° F) in May of 1968. Temperatures at Wakulla Springs are more representative of groundwater temperatures than of surface water temperatures.

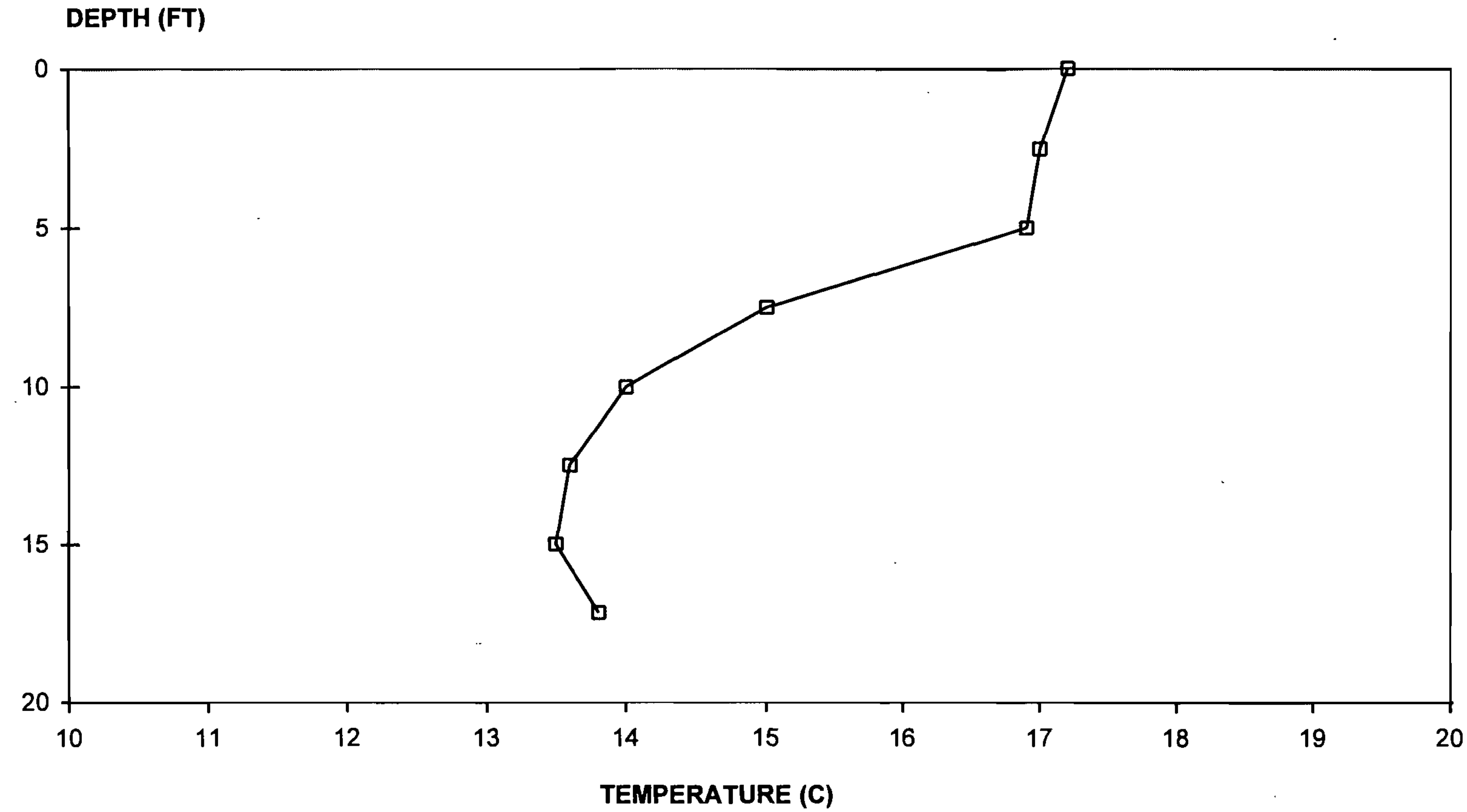
The St. Marks River exhibits strong natural thermal stratification in the vicinity of the Purdom Station, when the generating units are not running, as illustrated for the Intake Area on Figure 2.3.4-18, and for the Unit 6/7 Discharge Area on Figure 2.3.4-19. The difference between top and bottom shown on these figures is about 4° C. (7.2° F). Further north at Newport, there is no thermal stratification in the river (see Figure 2.3.4-20). These data were all taken during the winter, when the salt wedge temperature at the bottom was lower than the freshwater temperature at the top.

When Unit 7 is operating, water from the top 10 feet of the river is drawn into the intake canal, and the temperature therein is an average of the temperatures across that depth (see Figure 2.3.4-21). The resultant temperature shown on that figure was about 1.5° C (3° F) higher than the surface temperature in the river upstream of the plant (see Figure 2.3.4-22). That is because these data were measured during the summer, when the salt wedge at the bottom of the river was at a higher temperature than the freshwater above. The freshwater is influenced by the groundwater temperature, while the salt wedge is influenced by the Apalachee Bay water temperature.

Unit 7 condenser inlet water temperatures were analyzed for the water year 1996 (October 1, 1995 through September 30, 1996). The results, in ° F, are presented on Figure 2.3.4-23. The temperatures range from a minimum of 56° F in February to a maximum of 84.4° F in July. The average difference between the maximum and minimum in any given month averages 13.1° F.

The steam generating units (5, 6, and 7) add heat to the water they circulate from the river. The temperatures resulting from this addition were measured in July 1996. The results are shown for the surface on Figures 2.3.4-24 for all three units operating, and on Figure 2.3.4-25 for Unit 7 only. With three units operating, the thermal plume crossed the river and extended downstream several hundred feet. When only Unit 7 operated, the plume extended about half way across the river, and occupied less than 1 acre. These interpretations of plume size consider that the ambient background temperature increases in the downstream direction, and that the salt wedge impact on temperatures was of the same order of magnitude as that of the plant. This is illustrated by the vertical temperature profile shown on Figure 2.3.4-26, in which the thermal plume from the plant is at the surface, the ambient freshwater temperature is indicated at a depth of 2 to 9 feet, and the salt wedge temperature is at a depth of about 15 feet.

The design temperature rise of the three steam units is estimated to be 13.7° F at 22 megawatts (MW) each for Units 5 and 6, and 14.9° F at 44 MW for Unit 7. This means that when the three units are all running at full load, the cooling water is raised above the intake temperature by the design temperature rise. At part loads, the temperature rises are proportionally less. During Water Year 1996, actual monthly MW-hours were recorded and average heat rejected to the river, condenser rise, and MW were estimated. The design and actual quantities are as follows:



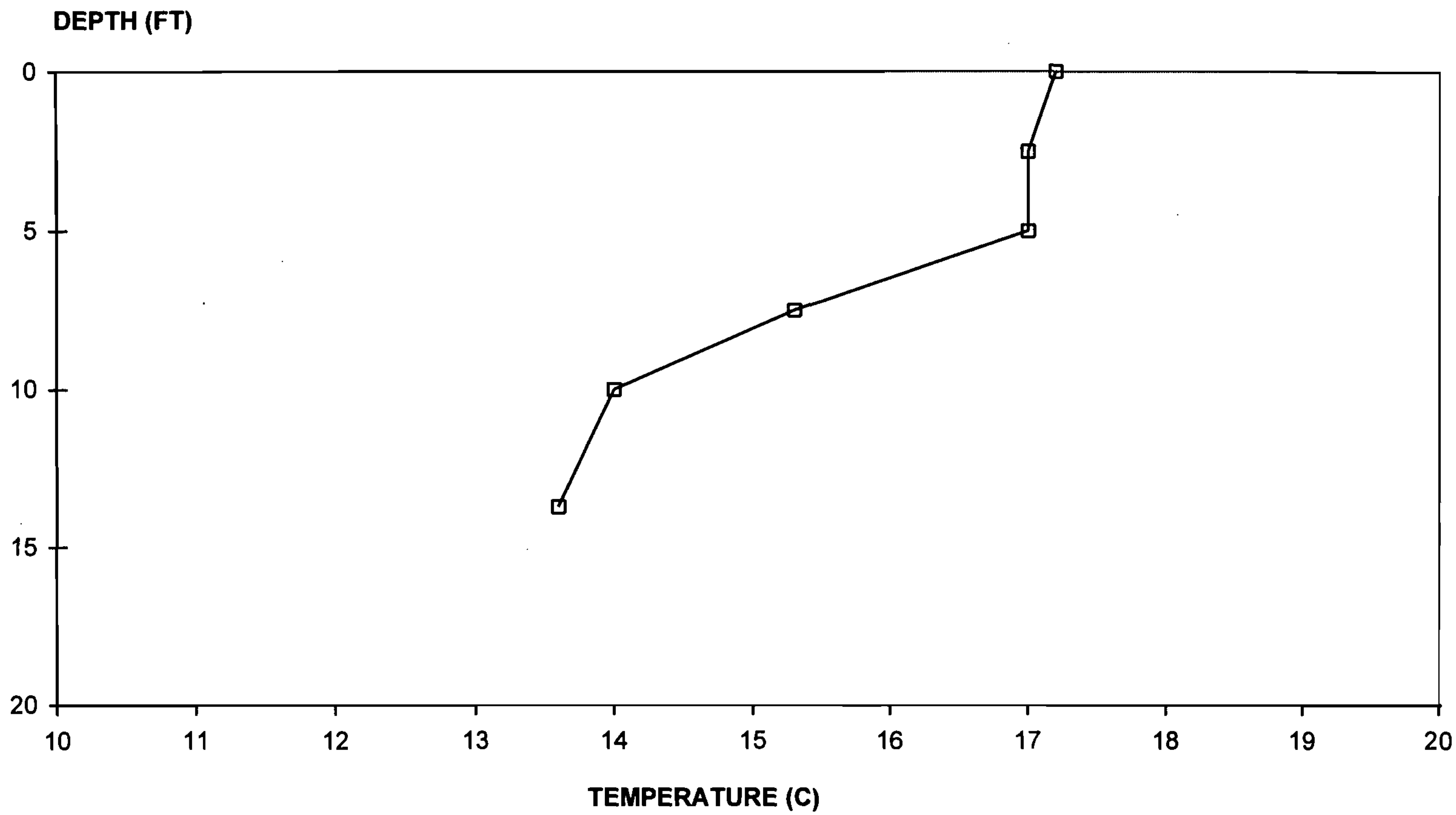
DATA COLLECTED 2/11/92 09:10

SOURCE: EBASCO ENVIRONMENTAL, 1992

CITY OF TALLAHASSEE

WATER COLUMN TEMPERATURE PROFILE
AT UNIT 7 INLET CANAL
PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

Figure
2.3.4–18



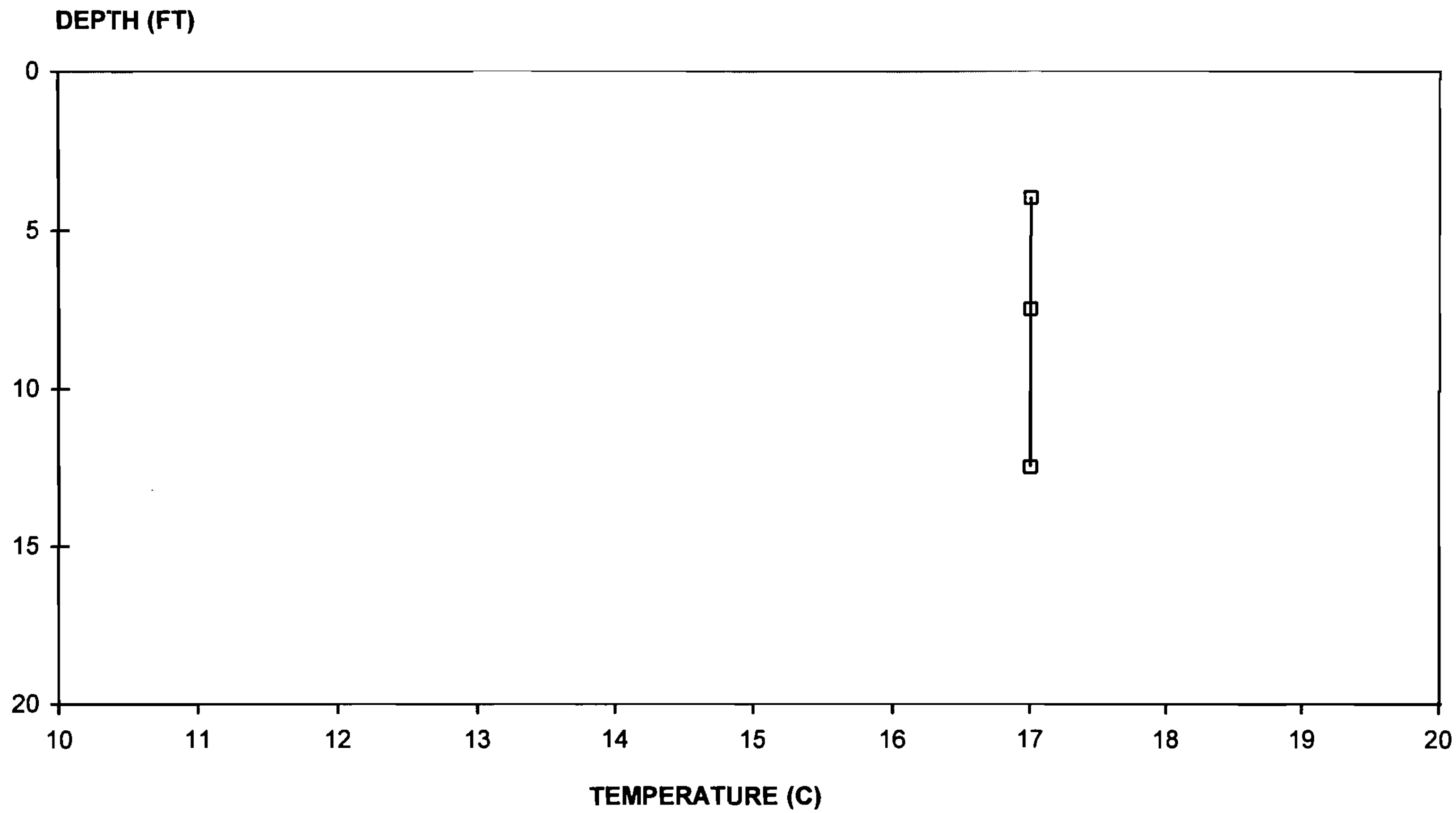
DATA COLLECTED 2/11/92 10:00

SOURCE: EBASCO ENVIRONMENTAL, 1992

CITY OF TALLAHASSEE

WATER COLUMN TEMPERATURE PROFILE
AT UNIT 6 & 7 DISCHARGE CANAL
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure
2.3.4-19



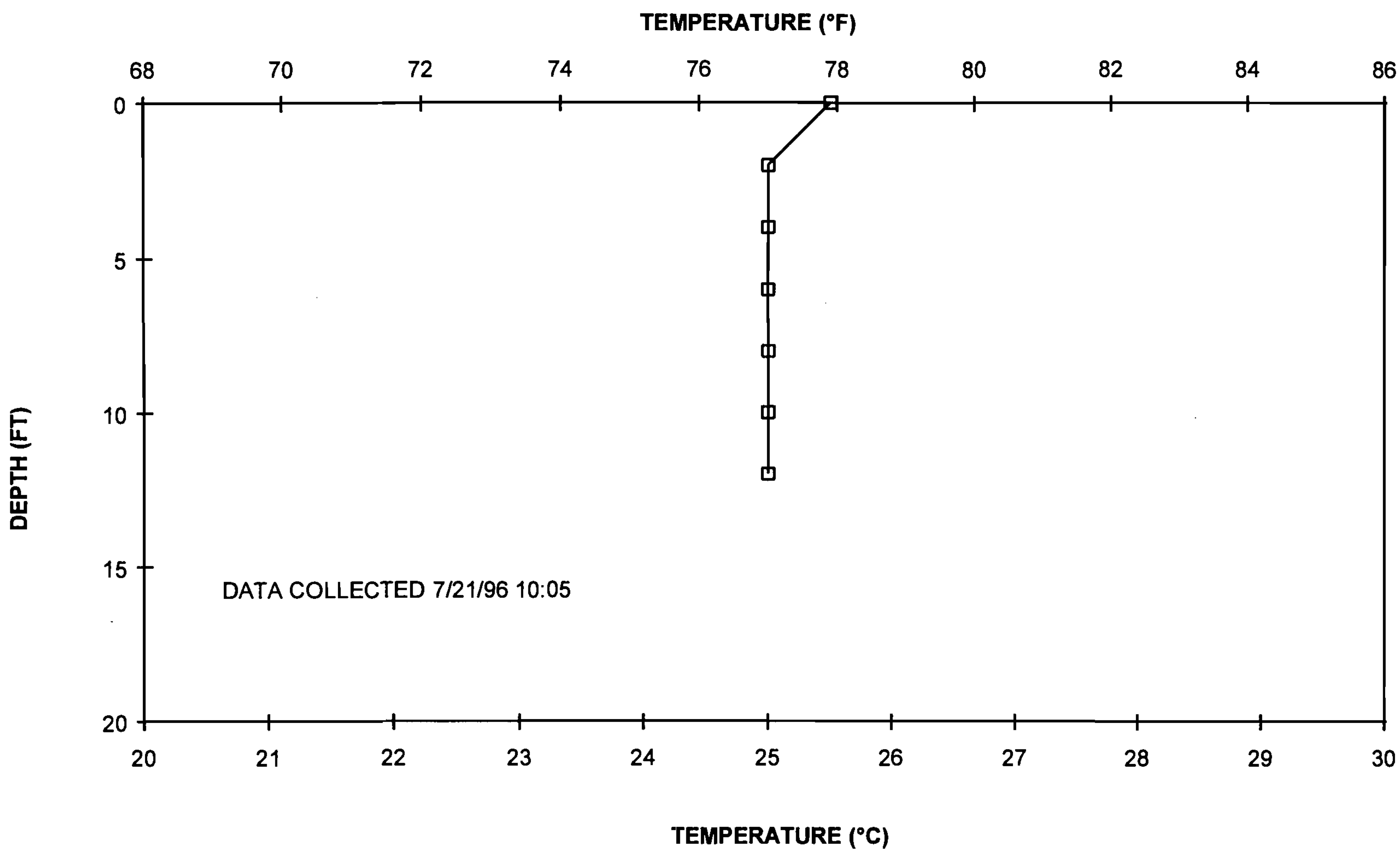
DATA COLLECTED 2/11/92 11:10

SOURCE: EBASCO ENVIRONMENTAL, 1992

CITY OF TALLAHASSEE

WATER COLUMN TEMPERATURE PROFILE
AT NEWPORT BRIDGE
PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

Figure
2.3.4–20

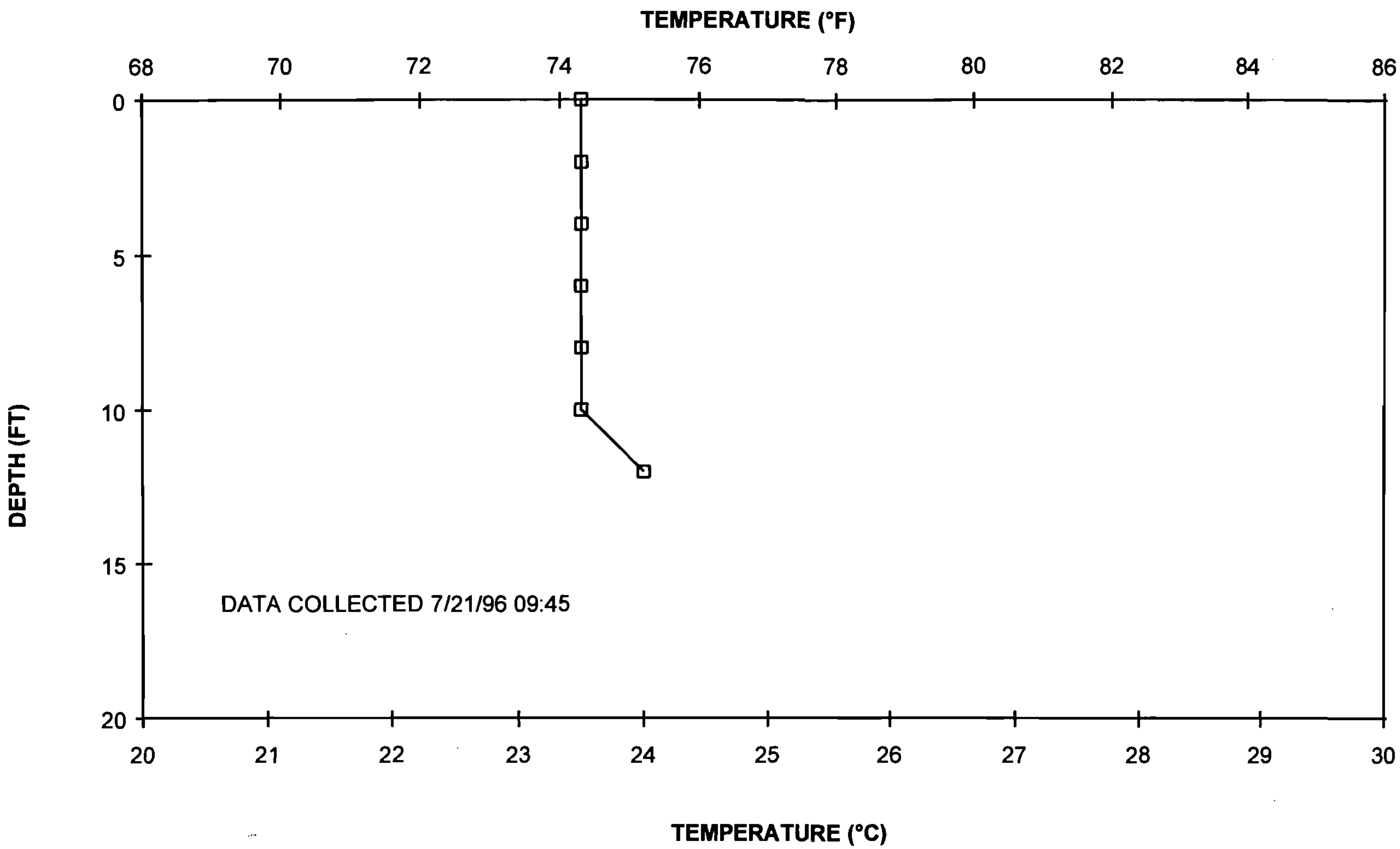


SOURCE:RE&C,1996

CITY OF TALLAHASSEE

LOCATION 2
WATER COLUMN TEMPERATURE PROFILE
AT UNIT 7 INTAKE
PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

Figure 2.3.4–21

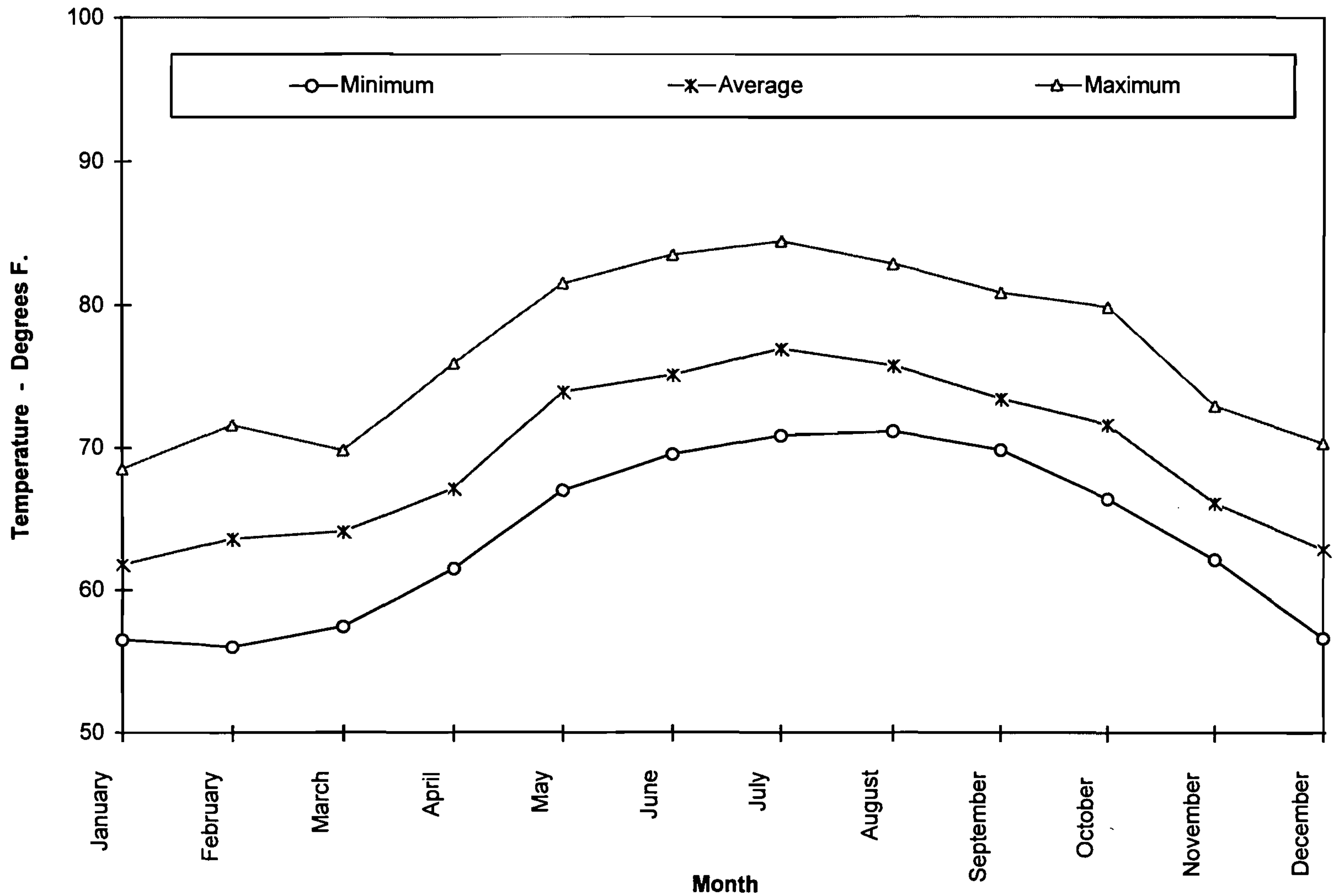


SOURCE:RE&C,1996

CITY OF TALLAHASSEE

LOCATION 1
WATER COLUMN TEMPERATURE PROFILE
AT ST. MARKS RIVER, UPSTREAM OF PLANT INFLUENCES
PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

Figure
2.3.4–22



SOURCE:RE&C,1997

CITY OF TALLAHASSEE

UNIT 7 INTAKE TEMPERATURE ANALYSIS
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.4-23

CITY OF TALLAHASSEE

THERMAL PLUME FOR UNITS 5, 6, AND 7 OPERATIVE

PURDOM UNIT 8 PROJECT – ST MARKS FLORIDA

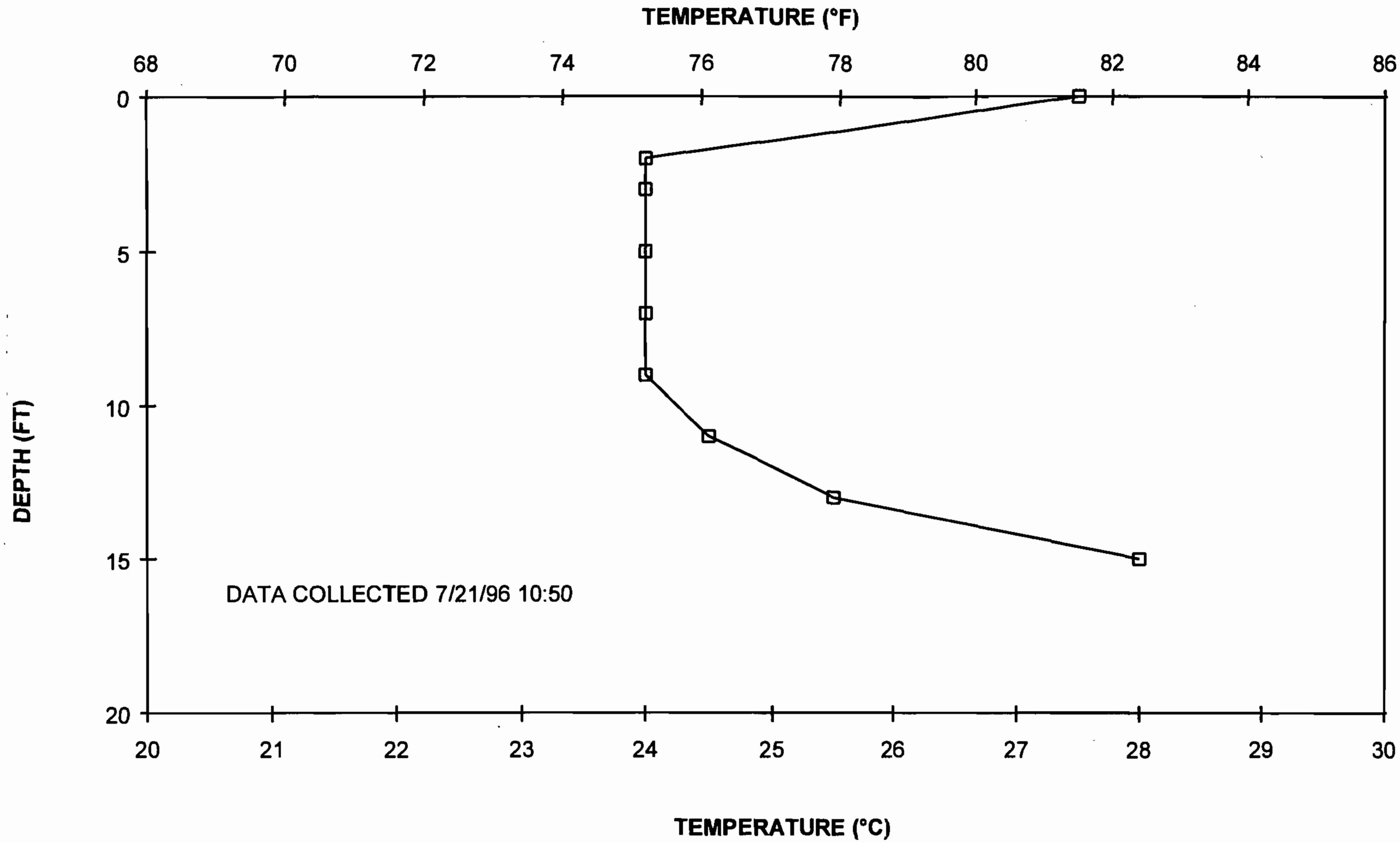
Figure 2.3.4-24

CITY OF TALLAHASSEE

THERMAL PLUME FOR UNIT 7
ONLY OPERATIVE

PURDOM UNIT 8 PROJECT – ST MARKS FLORIDA

Figure
2.3.4-25

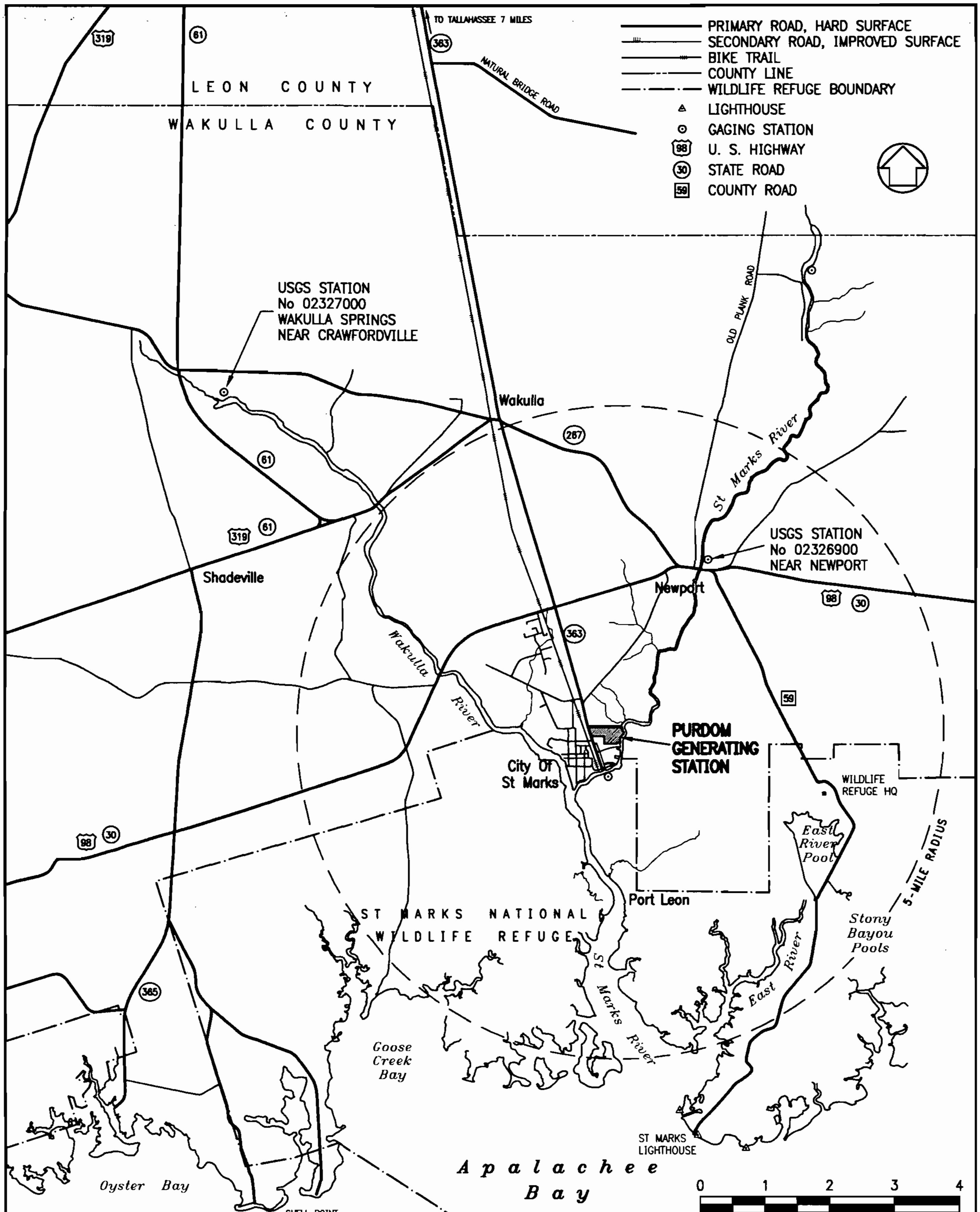


SOURCE:RE&C,1996

CITY OF TALLAHASSEE

LOCATION 12
WATER COLUMN TEMPERATURE PROFILE
AT UNITS 6/7 DISCHARGE, AFTER BEND IN DISCHARGE CANAL, MID-RIVER
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.4-26



SOURCE: RE&C, 1997; USGS, 1996

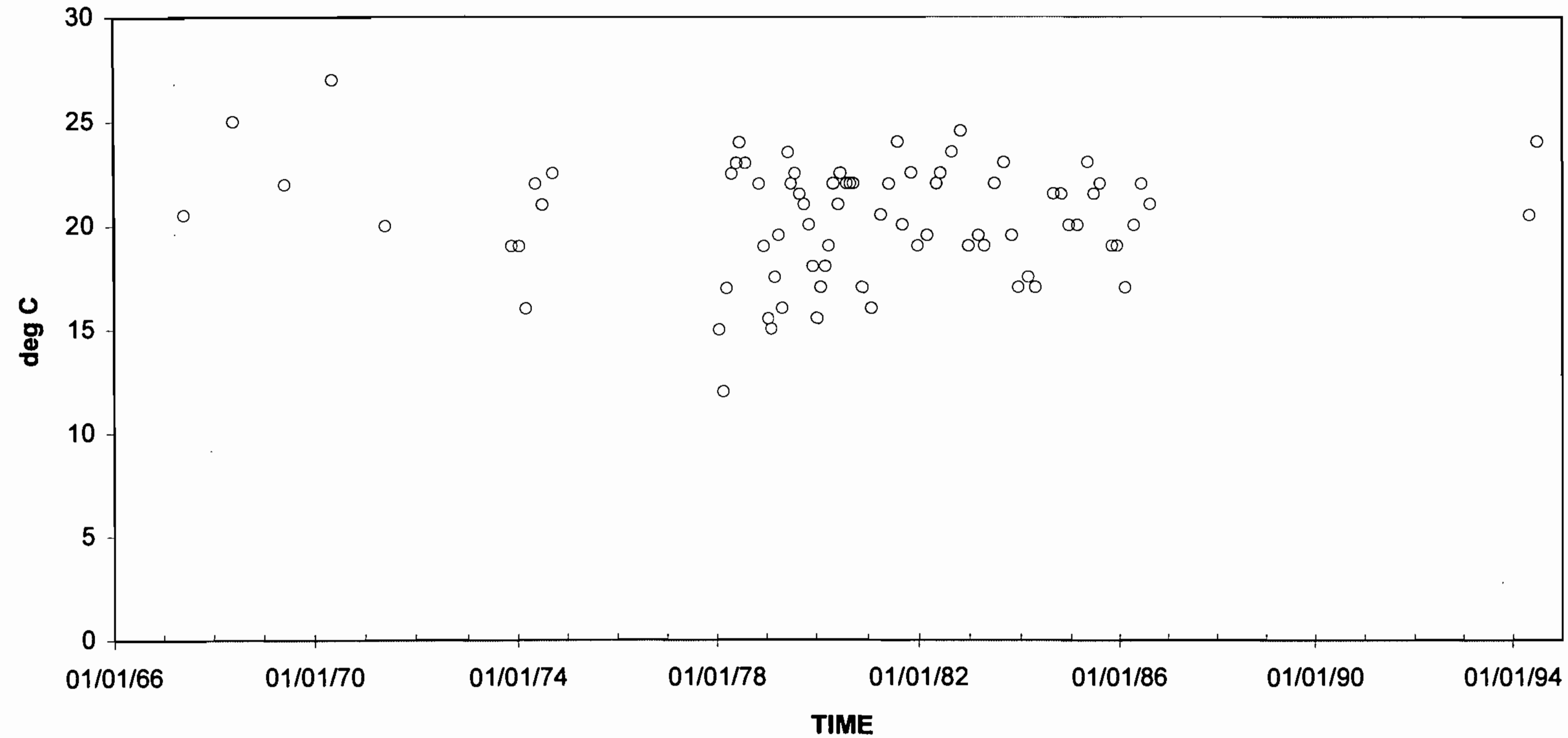
CITY OF TALLAHASSEE

USGS WATER QUALITY
MONITORING STATIONS

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure
2.3.4-27

PLOT DATE FEB 27, 1997, 1996 C:\15840002\----\00000-28.DWG

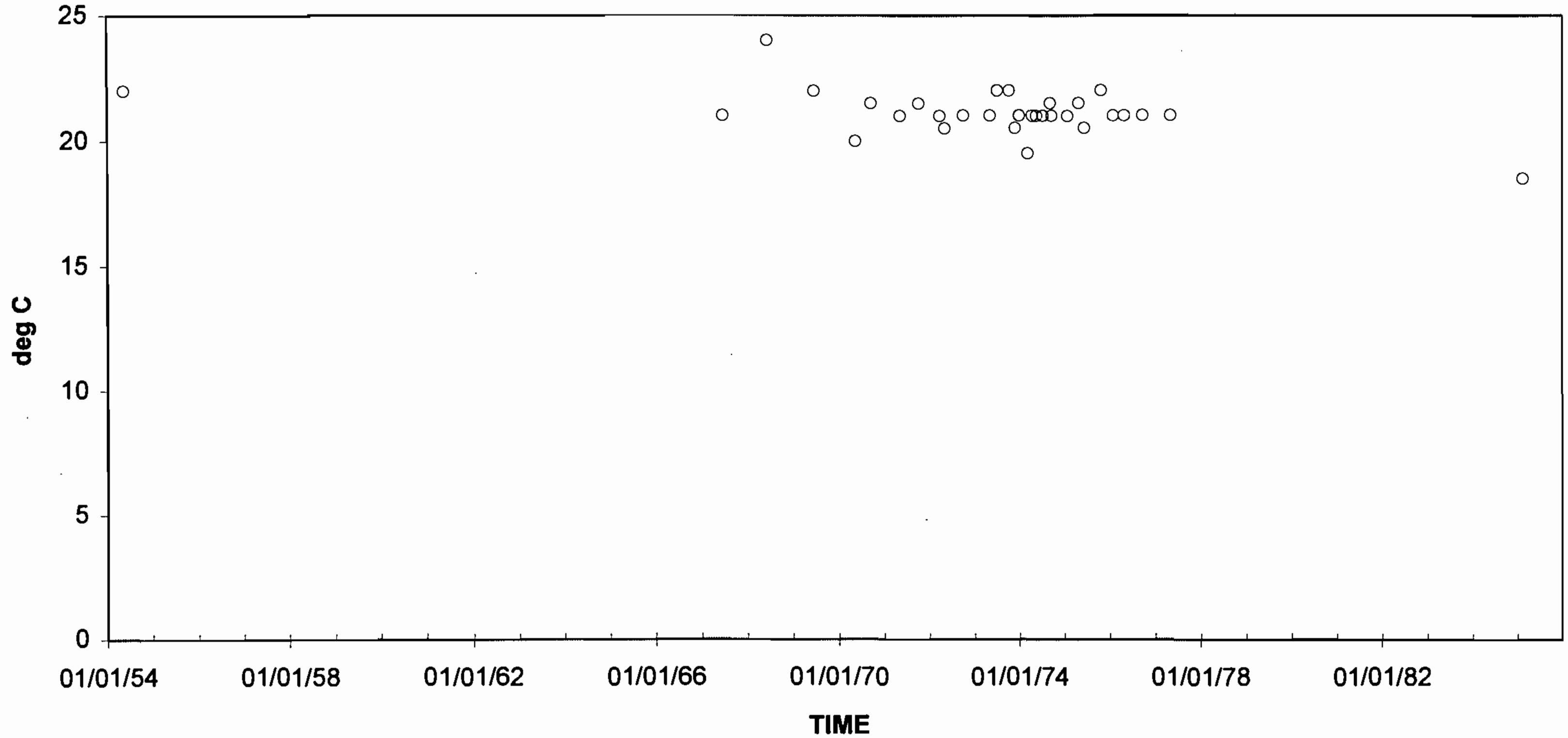


SOURCE:RE&C,1996

CITY OF TALLAHASSEE

USGS STATION NUMBER 02326900
TEMPERATURE, WATER
ST. MARKS RIVER NEAR NEWPORT, FLORIDA
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.4-28



SOURCE:RE&C,1996

CITY OF TALLAHASSEE

USGS STATION NUMBER 02327000
TEMPERATURE, WATER
WAKULLA SPRINGS NEAR CRAWFORDVILLE, FLORIDA
PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

Figure 2.3.4–29

DESIGN CONDITIONS						
Unit	MW	Condenser Rise (°F)	Million Btu/MW-hour	MW-hours/year	% of Design	% of Total
5	22	13.7	164	192,852	100.0%	25.0%
6	22	13.7	164	192,852	100.0%	25.0%
7	44	14.9	179	385,704	100.0%	50.0%
Total	88	NA	507	771,408		100.0%

ACTUALS FROM WATER YEAR 1996						
Unit	MW	Condenser Rise (°F)	Million Btu/MW-hour	MW-hours/year	% of Design	% of Total
5	6.6	4.1	49	57,513	29.8%	18.2%
6	5.8	3.6	43	50,852	26.4%	16.1%
7	23.7	8.0	96	207,691	53.8%	65.7%
Total	36.1	NA	188	316,056	41.0%	100.0%

The existing combustion turbines (GT1 and GT2) have an estimated temperature rise for their cooling water of about 5° F. Because their cooling water flow rate is so low (about 2 percent of the Purdom Station total cooling water flow rate), the temperature effects of these units are negligible.

Water Quality

U.S. Geological Survey Historical Data

As described in the ***Temperature*** sub-section above, the USGS has maintained water quality monitoring stations in the St. Marks River near Newport, and at Wakulla Springs near Crawfordville (see Figure 2.3.4-27). The data from these stations are presented in tabular and graphic form in Section 10.5.4. The data have been segregated into nine distinct groups as follows:

1. Physical: Chemical Oxygen Demand (COD), Color, Dissolved Carbon Dioxide (CO_2), Dissolved Oxygen (DO), pH, Temperature, Total Dissolved Gases (TDG), Turbidity. The data indicate that dissolved CO_2 levels are often high at both locations (1 to 15 mg/l). DO was only measured at Wakulla Springs, and ranged from 20 percent to 80 percent of saturation, and generally less than 4 mg/l. pH at both locations ranged between 6 and 8.5. Turbidity at both locations was generally low, less than 5 units most of the time.

2. General Inorganics: Alkalinity, Aluminum, Fluoride, Cyanide, Hardness, Silica, Specific Conductance, Total Suspended Solids (TSS), Total Dissolved Solids (TDS). Alkalinity is relatively high at both locations. It ranged from 30 to 130 mg/l as calcium carbonate in the St. Marks River, and between 110 and 130 mg/l in Wakulla Springs. Aluminum was detected at both locations. Fluoride was found at low levels (0.1 to 0.7 mg/l) in Wakulla Springs. Water at both locations is moderately hard (up to 150 mg/l as calcium carbonate), with non-carbonate hardness ranging from 10 percent to 20 percent of total hardness. Silica was found in Wakulla Springs at significant levels (8 to 13 mg/l).

Suspended solids were very low in the St. Marks River (generally less than 10 mg/l). Dissolved solids were relatively high at 120 to 140 mg/l for Wakulla Springs, and generally from 50 to 150 mg/l in the St. Marks River. Specific conductance stayed within a narrow band (240 to 300 microsiemens [μS] per centimeter) at Wakulla Springs, but ranged from near 0 to almost 300 μS/cm (μS/cm are the same as μmhos/cm) in the St. Marks River.

3. Major Cations: Calcium, Magnesium, Sodium, and Potassium. Calcium presence was significant, at 15 to 45 mg/l in the St. Marks River, and 30 to 45 mg/l at Wakulla Springs. Magnesium ranged from 2 to 14 mg/l in the St. Marks River, and from 8 to 12 mg/l at Wakulla Springs. Potassium levels were insignificant at both locations, being less than 1 mg/l. Sodium levels were also small, less than 5 mg/l.

4. Major Anions: Bicarbonate, Carbonate, Chloride, and Sulfate. Bicarbonate levels were relatively high at both locations; from 40 to 140 mg/l as calcium carbonate in the St. Marks River, and from 140 to 160 mg/l at Wakulla Springs. As would be expected for the pH ranges presented above, no carbonate was found at either location. Chloride levels at both locations were low, between 2 and 8 mg/l. Sulfate levels were also low, ranging from 2 to 16 mg/l in the St. Marks River, and from 5 to 22 mg/l at Wakulla Springs.

5. Minor/Trace Elements: Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Lithium, Manganese, Mercury, Molybdenum, Nickel, Radium 226, Selenium, Silver, Strontium, Uranium, Vanadium, and Zinc. Ranges of these trace elements, and the associated Class III freshwater standard if applicable, are shown in Table 2.3.4-1 .

6. Nutrients: Carbon, Nitrogen (Ammonia, Nitrate, Nitrite, Organic), Phosphorus (Organic, Orthophosphate, Phosphate). Carbon was present in Wakulla Springs from 15 to 35 mg/l as inorganic, and from 20 to 37 mg/l as total. Nitrogen and phosphorus were present at both locations in all their forms, as summarized in Table 2.3.4-2.

7. Microbiological: 5 Day Biological Oxygen Demand (BOD-5). BOD-5 levels were measured only at Wakulla Springs, and were very low (less than 1.2 mg/l).

8. Organics: Pesticides, Polychlorinated Biphenyls, General Organics. Organics data are very limited. Total Organic Carbon (TOC) ranged from 0 to 23 mg/l in the St. Marks River, of which less than 0.4 mg/l was suspended and the rest was dissolved.

   TOC at Wakulla springs ranged from 0 to 33 mg/l. Some pesticides were found at trace levels in the St. Marks River, and one positive test was recorded for Methylene Blue Active Substance (MBAS, detergent) in Wakulla Springs.

9. Biological. These data are addressed in Section 2.3.6.

TABLE 2.3.4-1 MINOR/TRACE ELEMENTS			
Parameter	St. Marks River	Wakulla Springs	Class III Freshwater Standard
Arsenic (μg/l)	0-3	0-10	50
Barium (μg/l)	0-100	0	NA
Boron (μg/l)	NA	0-50	NA
Beryllium (μg/l)	0-0.9	NA	0.13[a]
Cadmium (μg/l)	0-1	0-2	1.13[b]
Chromium (μg/l)	0-20	0-10	NA
Cobalt (μg/l)	0	0-1	NA
Copper (μg/l)	NA	0-20	11.82[b]
Iron (μg/l)	0-350	0-220	1000
Lead (μg/l)	0-14	0-14	3.18[b]
Lithium (μg/l)	0-14	0	NA
Manganese (μg/l)	0-30	0-40	NA
Mercury (μg/l)	0-0.5	0-0.2	0.012
Molybdenum (μg/l)	0	0-1	NA
Nickel (μg/l)	0-7	0-5	157.7[b]
Radium 226	NA	0.2	NA
Selenium	0	0	5
Silver (μg/l)	0-1	0	0.07
Strontium (μg/l)	25-90	60-160	NA
Uranium (μg/l)	NA	0.5	NA
Vanadium (μg/l)	0	3	NA
Zinc (μg/l)	0-150	0-230	1.54[b]

(a) For flows exceeding the average annual value.
(b) Assuming hardness of 100 mg/l as calcium carbonate.

TABLE 2.3.4-2 NUTRIENTS (in mg/l)		
Parameter	St. Marks River	Wakulla Springs
Ammonia as N	0-0.14	.02-0.2
Dissolved Nitrogen	0.05-0.45	0.35
Nitrate as N	0.0-0.23	0.1-0.55
Nitrite as N	0-0.12	0-0.02
Total Organic Nitrogen	0-0.95	0-0.55
Orthophosphate as P	0-0.38	0.03-0.065
Organic Phosphorus as P	0	0.0-0.05

Other Historical Data

Several single purpose studies have been performed on the St. Marks River. These purposes include documentation and cleanup measures for spilled oil (Olsen et al., 1981; C.K. Associates, 1984), and documentation of the effects of the release of untreated sewage from Newport and the City of St. Marks (Haney et al., 1964). The data from these surveys are not considered representative of present conditions. They do indicate that the St. Marks River has a history of minor oil spills and one major spill (10,000 gallons on July 12, 1978, near the turning basin, about 0.6 mile downstream of the Purdom Station Intake Area), as well as a history of pollution from sanitary sewage.

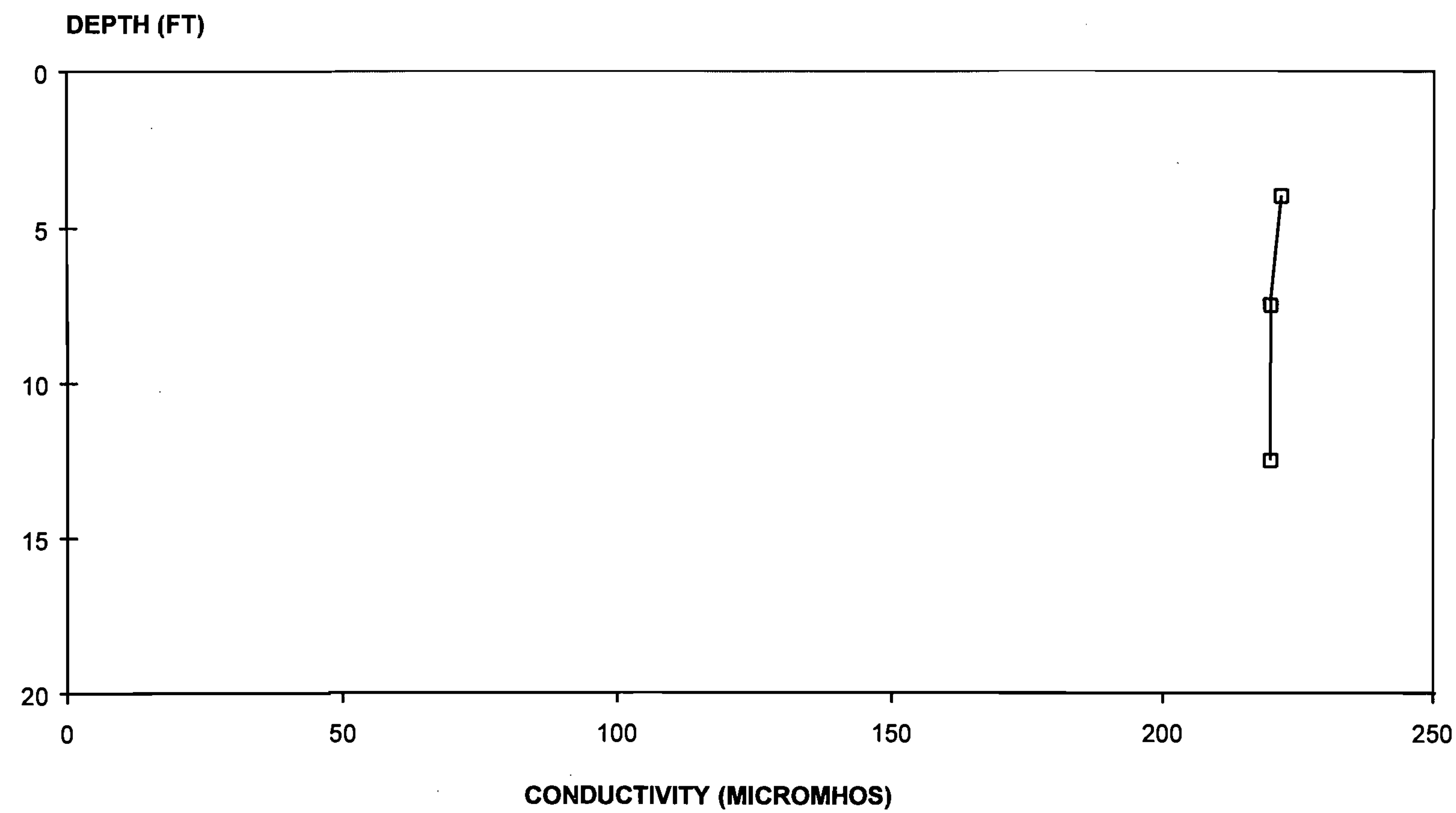
City of Tallahassee Data

The City of Tallahassee has performed sampling surveys in the past (Ebasco, 1992) and as part of the pre-application studies for this SCA. These studies have had two water quality components: conductivity/salinity profiling to identify the salt wedge, and analytical analysis of samples to determine the detailed chemistry of the upper part of the river which would be affected by the Project.

Salinity and conductivity profiles were measured during winter conditions, when no generating units were operating. The results indicate that there was no salt wedge in the St. Marks River at Newport (see Figures 2.3.4-30 and 2.3.4-31), but that there was a well-defined salt wedge in the Station vicinity (see Figures 2.3.4-32 through 2.3.4-35). Similar profiling was performed during summer conditions while either Units 5, 6, and 7 were operating (7/19/96) or when just Unit 7 was operating (7/21/96). The summer results indicated that there was a definite salt wedge in the plant vicinity (see Figures 2.3.4-36 and 2.3.4-37) . As described in ***Temperature*** above, the salt wedge during summer conditions was at a higher temperature than the freshwater above it. Further downstream near the City of St. Marks Wastewater Treatment Facility (see Figure 2.3.4-8) the salt wedge was more pronounced, as shown on Figures 2.3.4-38 and 2.3.4-39. Conductivity (and water level in the river) were measured on a continuous basis (hourly measurements) at the existing Unit 5 Intake Structure (see Figure 2.3.4-11). These conductivity measurements were taken at two depths, one at 1.5 feet below the water level, and the other at a fixed elevation of -3.35 feet msl. These data were taken from November 7, 1996, through February 21, 1997. The data are presented on Figure 2.3.4-40. They indicate that the top 1.5 feet of the river remain relatively fresh most of the time, with peak conductivities seldom exceeding about 7,500 μmhos/cm (same as μS/cm), while the river at elevation -3.35 msl shows more frequent high excursions up to about 22,000 μmhos/cm.

Profiles of DO and pH were taken at selected locations concurrent with the conductivity/salinity profiles. DO values ranged from a maximum of 6.80 mg/l to a minimum of 4.06 mg/l. All values less than 5.9 mg/l were measured in the salt wedge. Similarly, pH ranged from 5.78 to 8.09, with all values less than 7.57 being measured in the salt wedge. Both pH and DO decreased with increasing depth.

The St. Marks River in the vicinity of the Purdom Station is designated as Class III fresh waters. The City of Tallahassee has performed a detailed analysis for all Class III standards (except for Total Dissolved Gases) on two samples that were withdrawn from the river near the Unit 5



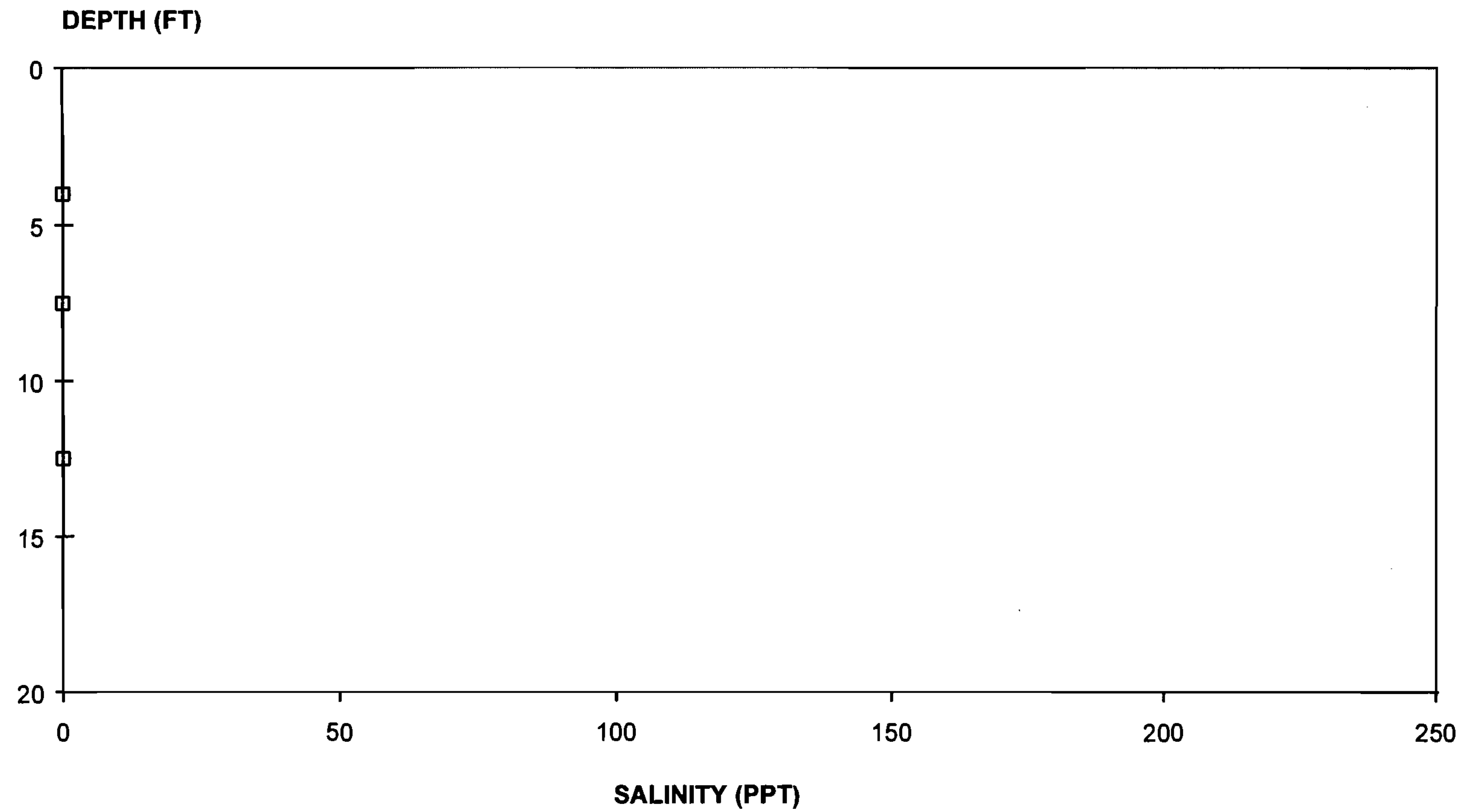
DATA COLLECTED 02/11/92 11:10

SOURCE: EBASCO ENVIRONMENTAL, 1992

CITY OF TALLAHASSEE

WATER COLUMN CONDUCTIVITY PROFILE
AT NEWPORT BRIDGE
PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

Figure
2.3.4-30



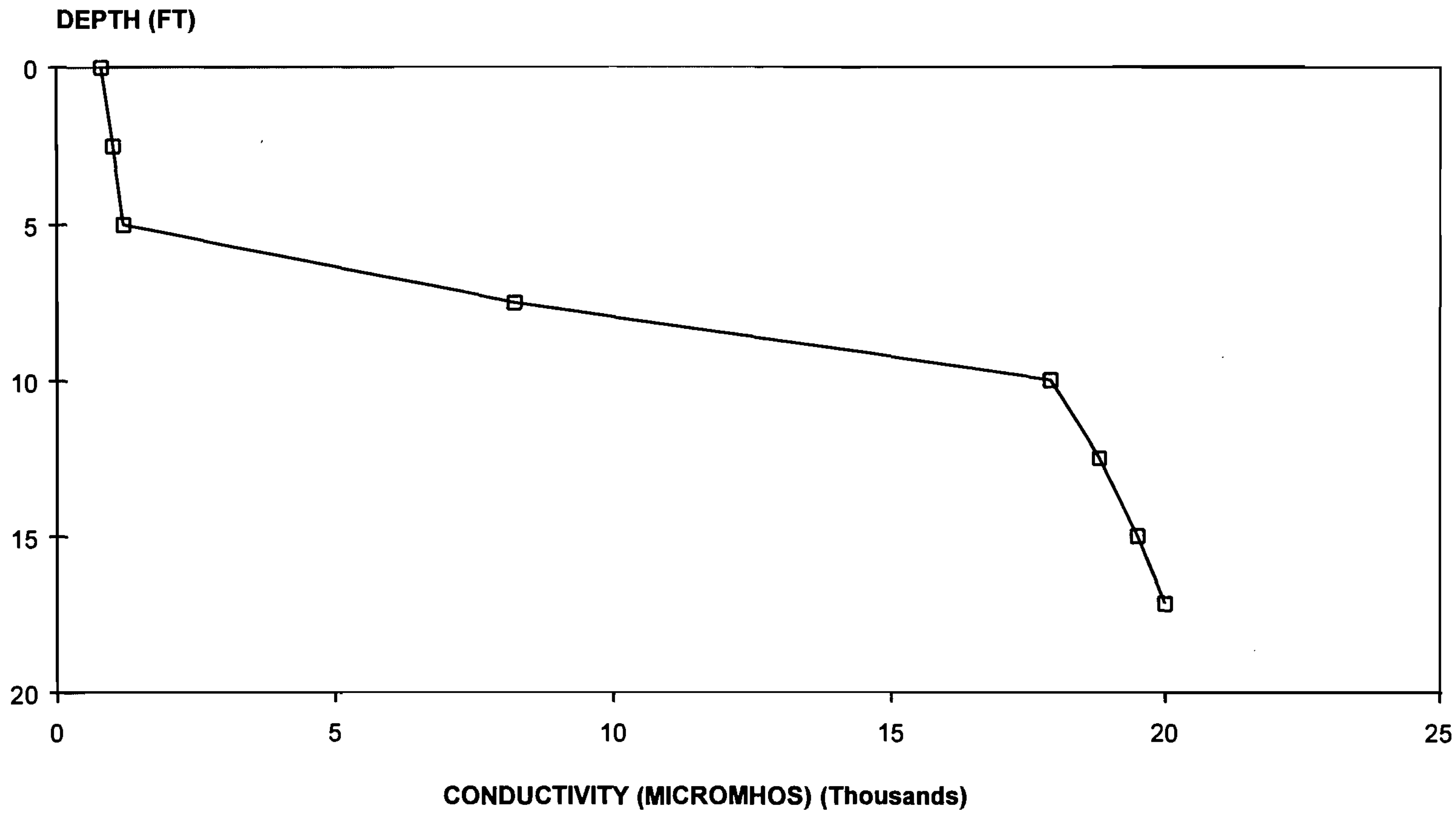
DATA COLLECTED 02/11/92 11:10

SOURCE: EBASCO ENVIRONMENTAL, 1992

CITY OF TALLAHASSEE

WATER COLUMN SALINITY PROFILE
AT NEWPORT BRIDGE
PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

Figure
2.3.4–31



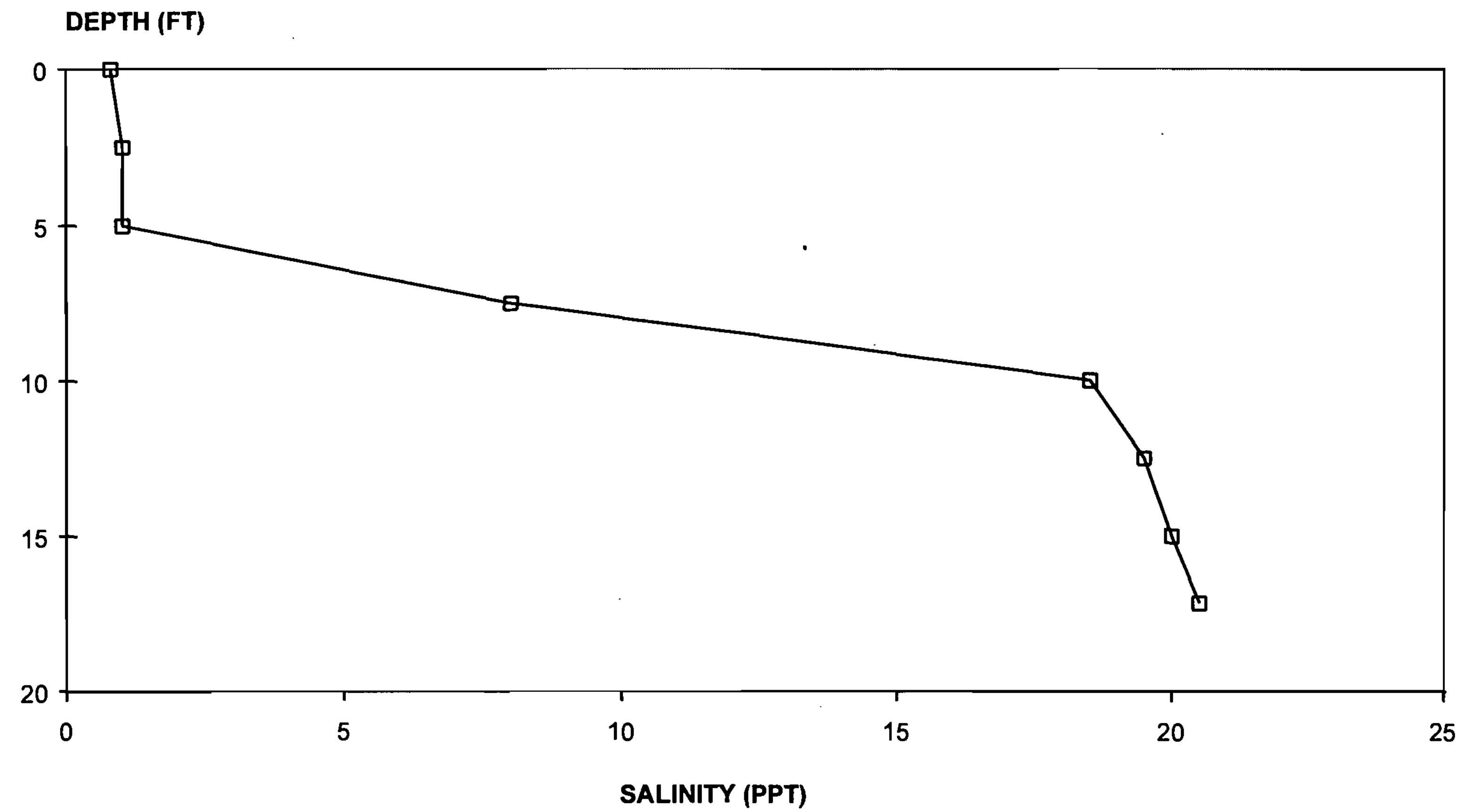
DATA COLLECTED 02/11/92 09:10

SOURCE: EBASCO ENVIRONMENTAL, 1992

CITY OF TALLAHASSEE

WATER COLUMN CONDUCTIVITY PROFILE
AT UNIT 7 INLET CANAL
PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

Figure 2.3.4–32



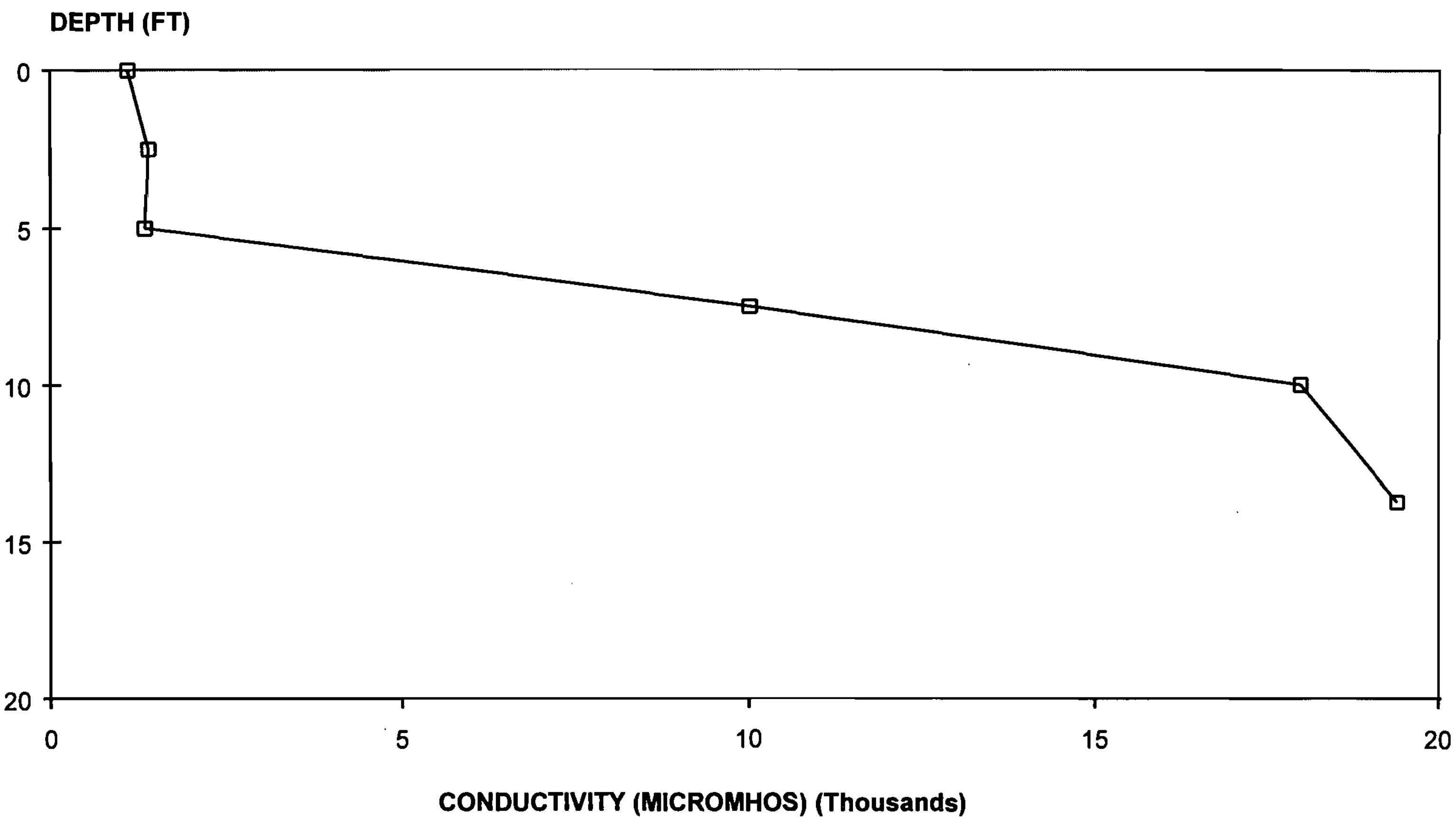
DATA COLLECTED 02/11/92 09:10

SOURCE: EBASCO ENVIRONMENTAL, 1992

CITY OF TALLAHASSEE

WATER COLUMN SALINITY PROFILE
AT UNIT 7 INLET CANAL
PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

Figure
2.3.4–33



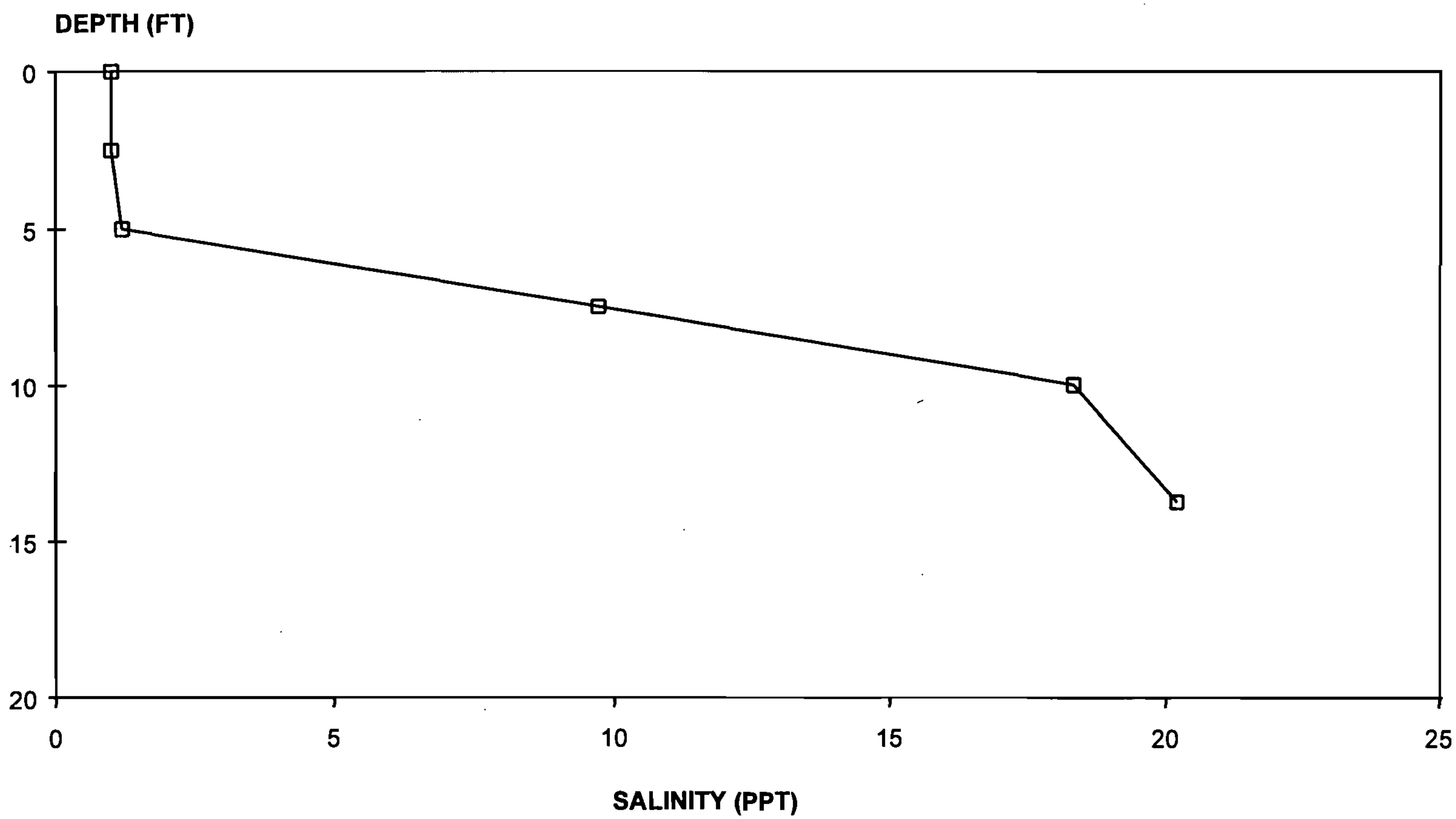
DATA COLLECTED 02/11/92 10:00

SOURCE: EBASCO ENVIRONMENTAL, 1992

CITY OF TALLAHASSEE

WATER COLUMN CONDUCTIVITY PROFILE
AT UNIT 6 & 7 DISCHARGE CANAL
PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

Figure
2.3.4–34



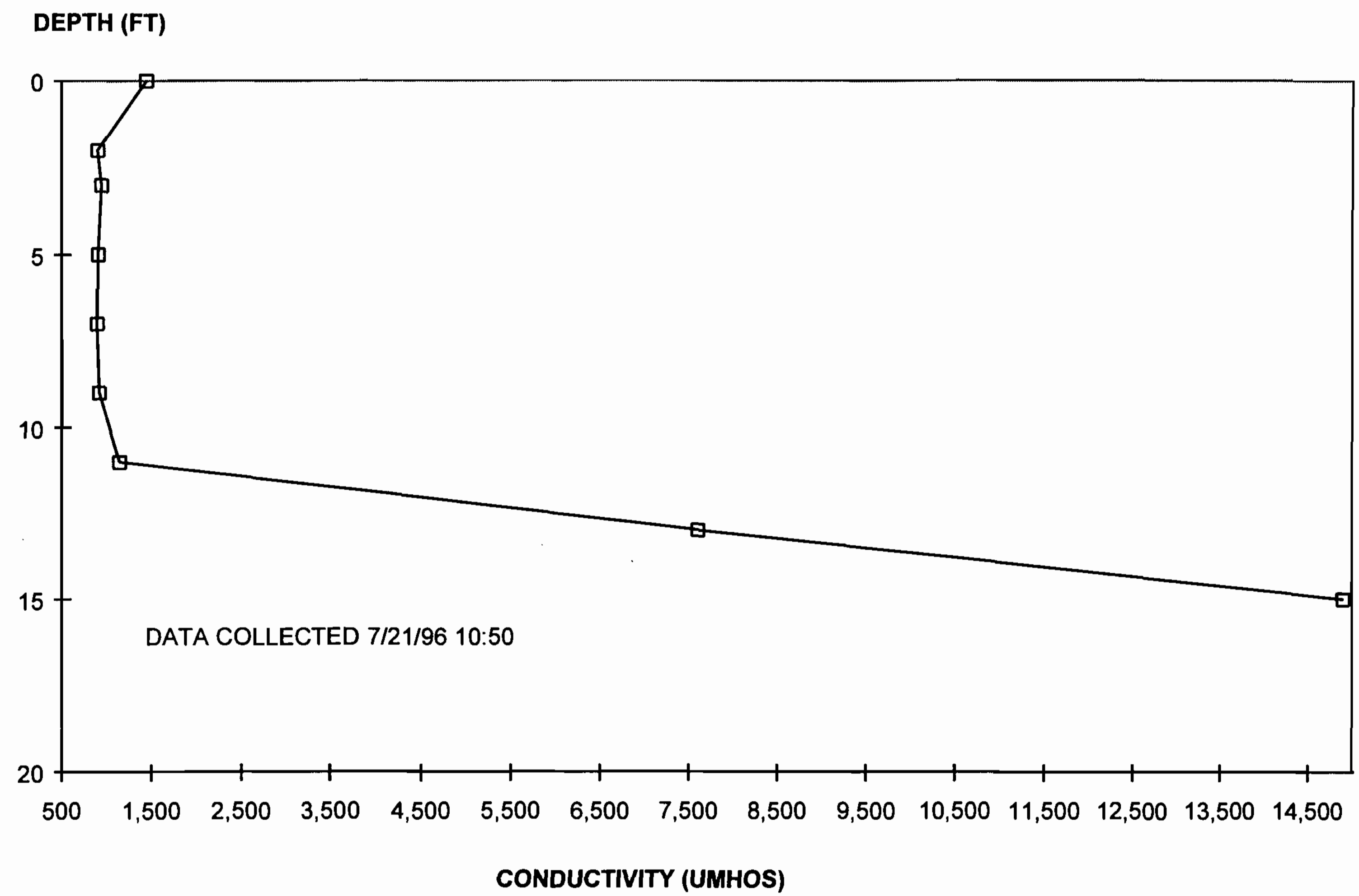
DATA COLLECTED 02/11/92 10:00

SOURCE: EBASCO ENVIRONMENTAL, 1992

CITY OF TALLAHASSEE

WATER COLUMN SALINITY PROFILE
AT UNIT 6 & 7 DISCHARGE CANAL
PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

Figure
2.3.4–35

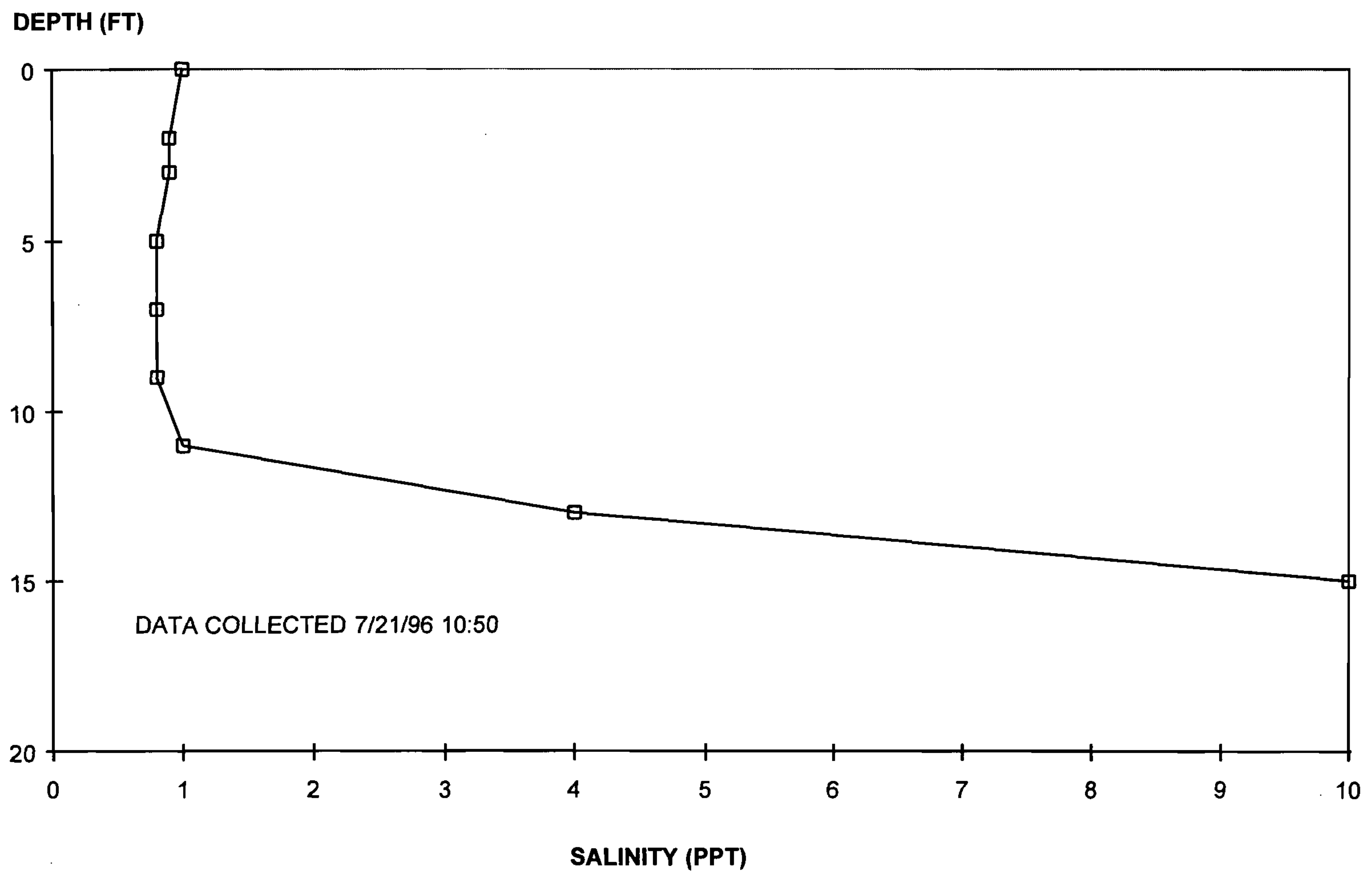


SOURCE:RE&C,1996

CITY OF TALLAHASSEE

LOCATION 12
WATER COLUMN CONDUCTIVITY PROFILE
AT UNITS 6/7 DISCHARGE, EAST OF DISCHARGE CANAL, MID-RIVER
PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

Figure 2.3.4–36

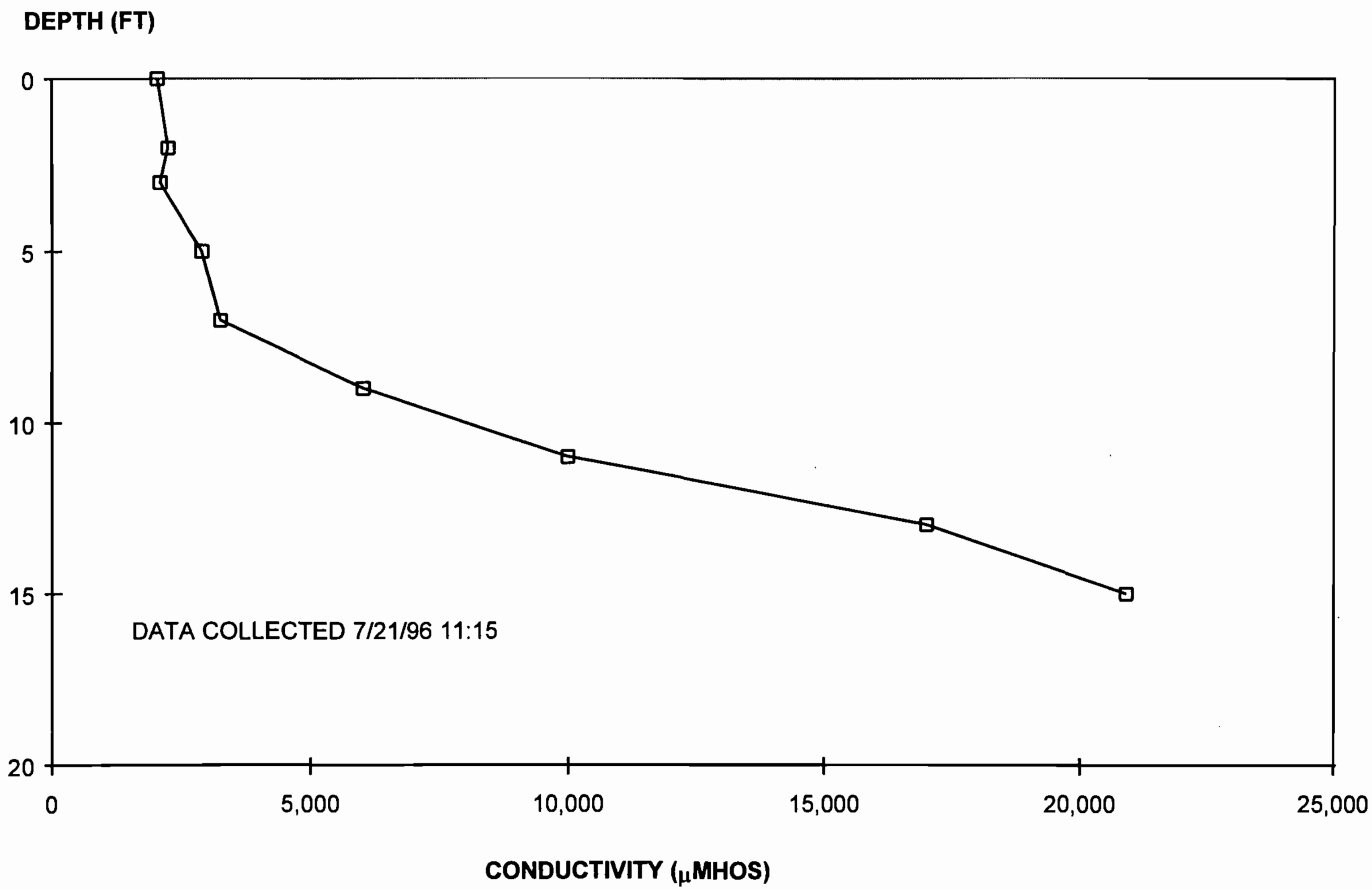


SOURCE:RE&C,1996

CITY OF TALLAHASSEE

LOCATION 12
WATER COLUMN SALINITY PROFILE
AT UNITS 6/7 DISCHARGE, EAST OF DISCHARGE CANAL, MID-RIVER
PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

Figure 2.3.4–37

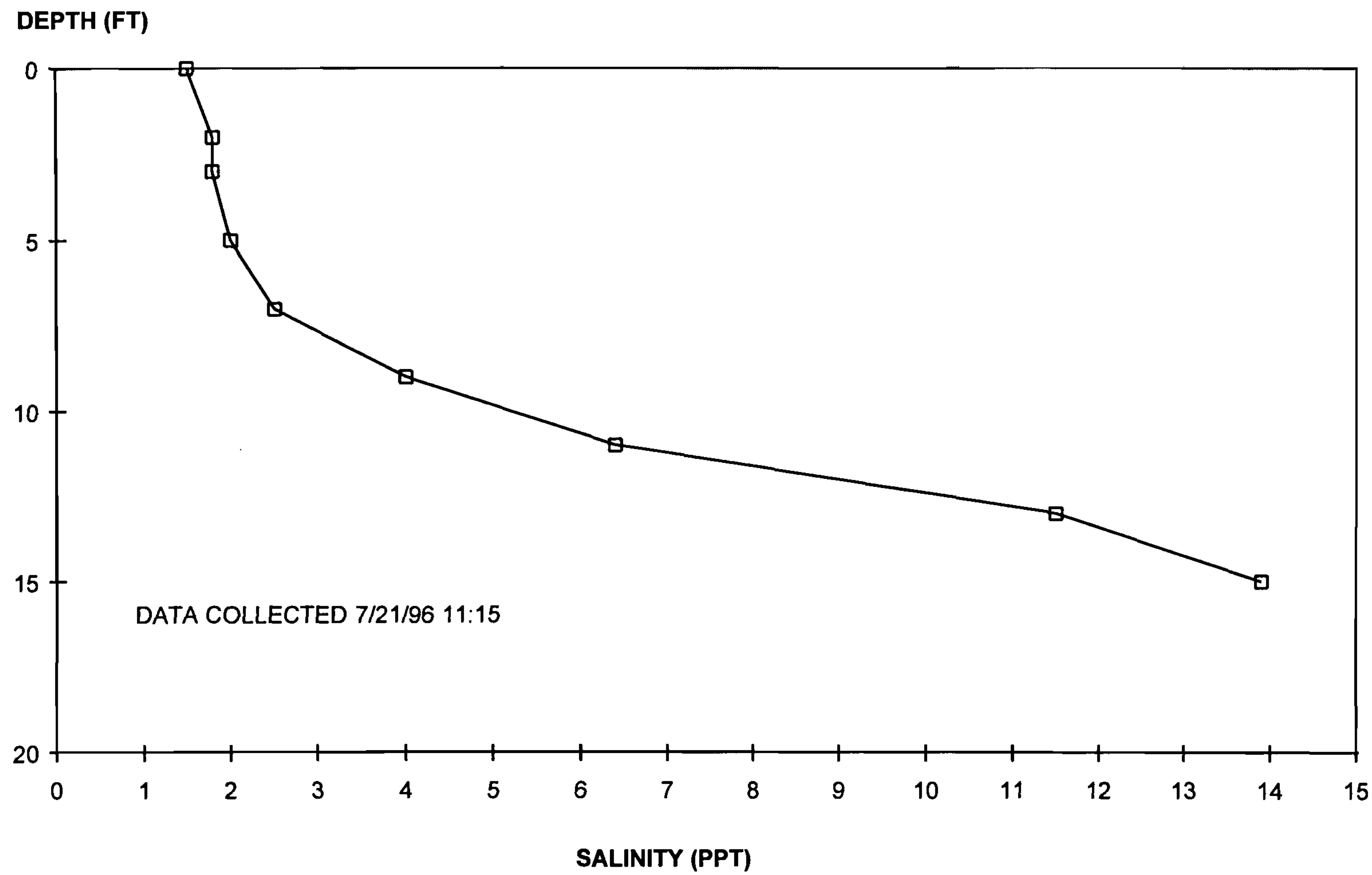


SOURCE:RE&C,1996

CITY OF TALLAHASSEE

LOCATION 13
WATER COLUMN CONDUCTIVITY PROFILE
AT ST. MARKS RIVER, DOWNSTREAM OF ST. MARKS SEWAGE DISCHARGE, MID-RIVER
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.4-38

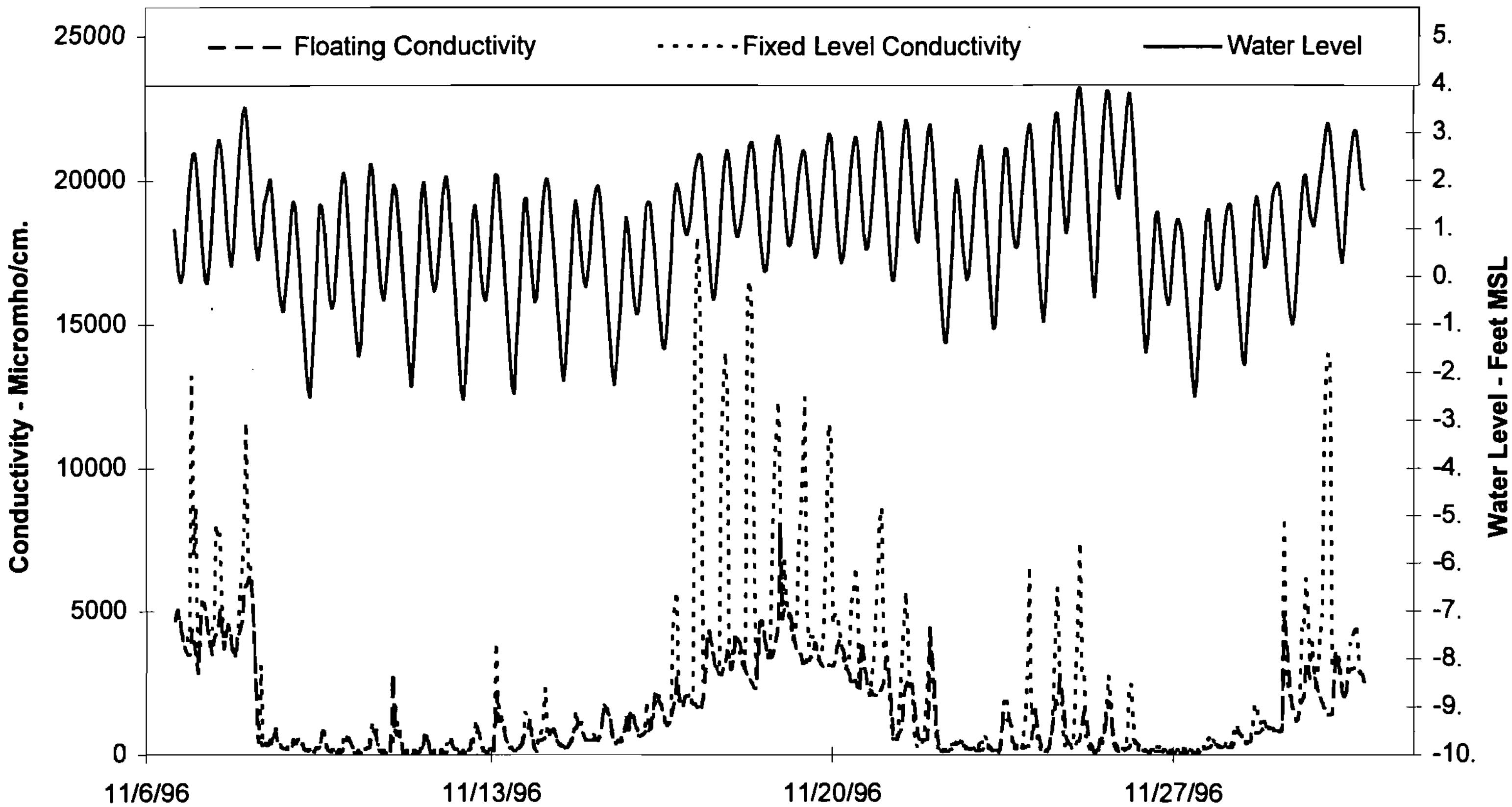


SOURCE:RE&C,1996

CITY OF TALLAHASSEE

LOCATION 13
WATER COLUMN SALINITY PROFILE
AT ST. MARKS RIVER, DOWNSTREAM OF ST. MARKS SEWAGE DISCHARGE, MID-RIVER
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.4-39

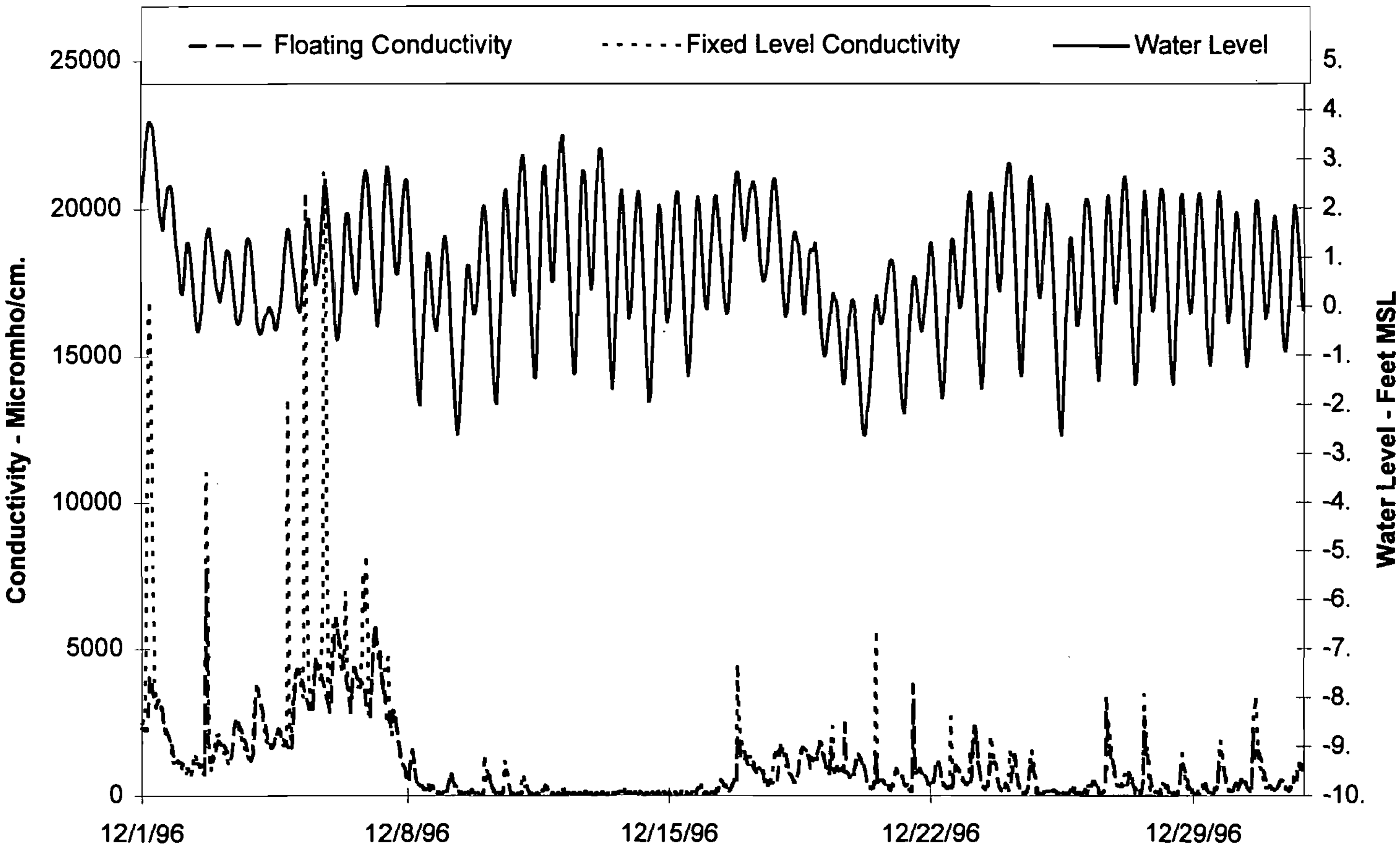


SOURCE:RE&C,1997

CITY OF TALLAHASSEE

CONDUCTIVITY MEASUREMENTS
SHEET 1
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure
2.3.4-40

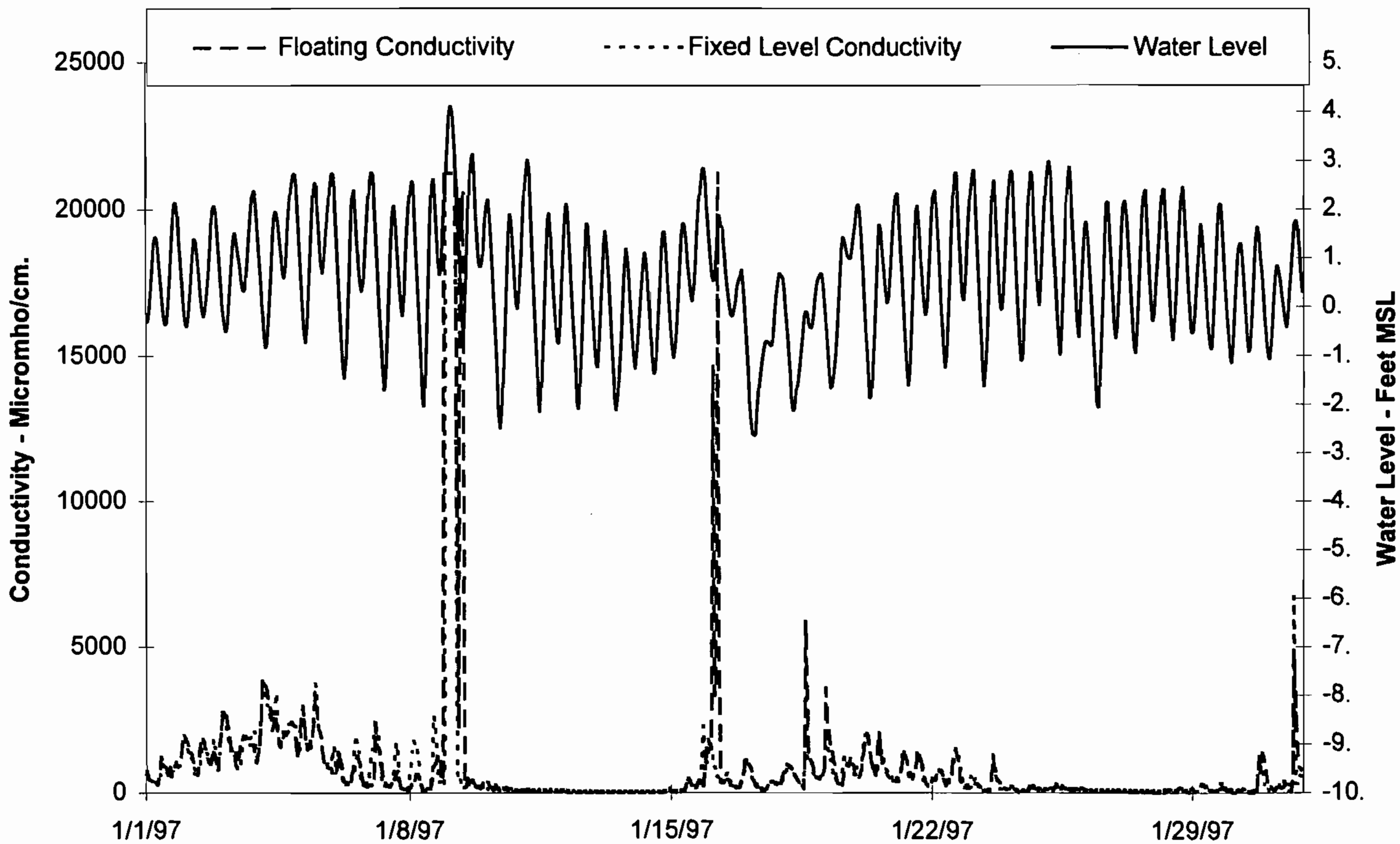


SOURCE:RE&C,1997

CITY OF TALLAHASSEE

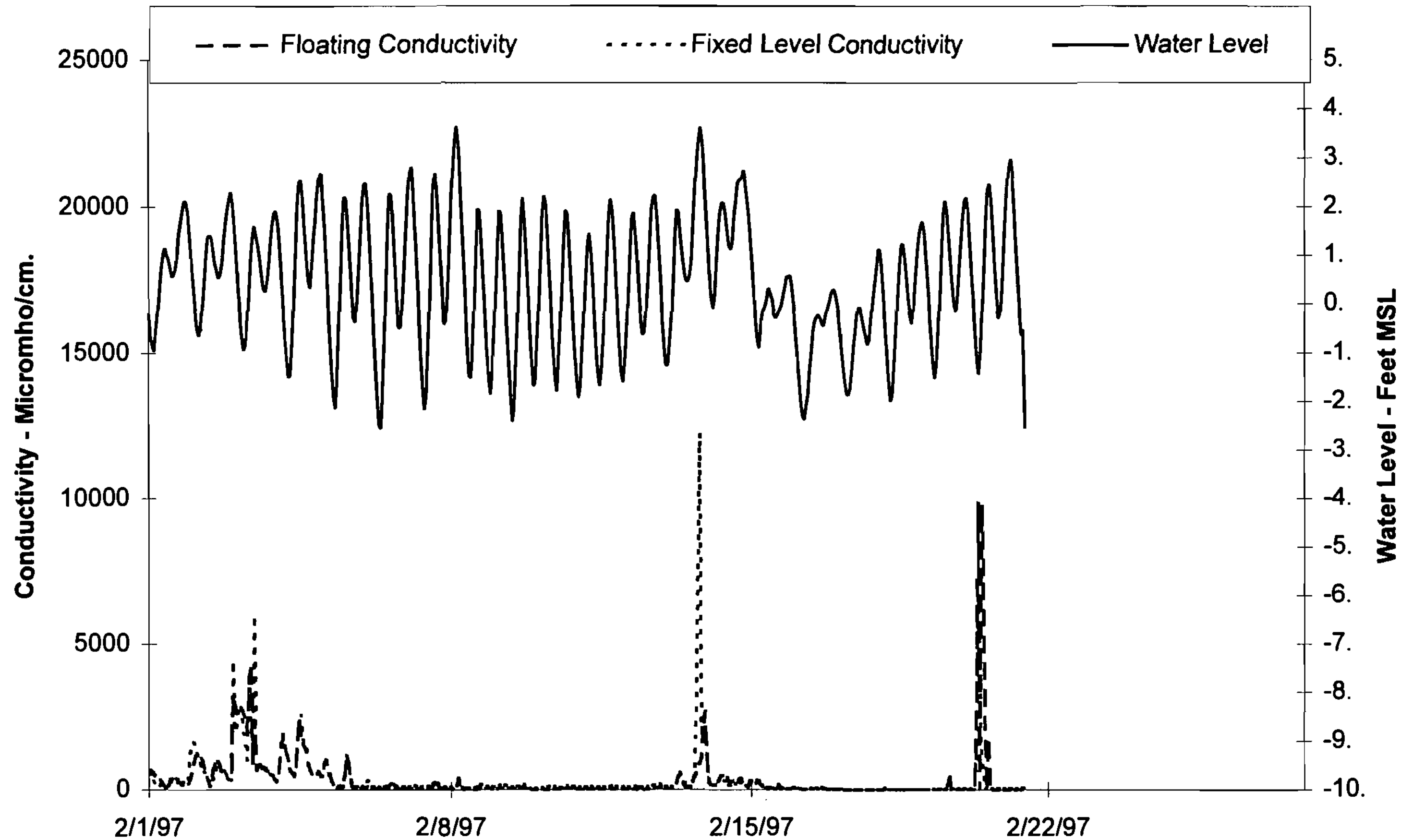
CONDUCTIVITY MEASUREMENTS
SHEET 2
PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

Figure
2.3.4–40



SOURCE:RE&C,1997

CITY OF TALLAHASSEE	CONDUCTIVITY MEASUREMENTS SHEET 3 PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA	Figure 2.3.4–40



SOURCE:RE&C,1997

CITY OF TALLAHASSEE

CONDUCTIVITY MEASUREMENTS
SHEET 4
PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

Figure
2.3.4–40

intake, which is the location from which cooling tower makeup is proposed to be withdrawn for Purdom Unit 8. Analyses were also performed for several other constituents which were needed either to calculate Class III standards (such as hardness), or to predict operation of the proposed Project's heat dissipation system. The full list of constituents, the associated Class III standards where applicable, the test methods used, and the results for the two sampling episodes that were performed are all presented in Table 2.3.4-3. For convenience, only those constituents that were actually detected are reproduced in Table 2.3.4-4.

There are two industrial NPDES-permitted discharges to the St. Marks River in the vicinity of the Purdom Station that will be affected by the proposed Project. The Purdom Station itself discharges, in addition to the cooling water discharges described in ***Temperature*** above, chemical and non-chemical metal cleaning wastes through Outfall Serial Number (OSN) 005, and low volume wastes including boiler blowdown, demineralizer regeneration wastewater, and laboratory sampling wastewater through OSN 006, to the St. Marks River. The permit limits are as follows:

	OSN 005 Average/Maximum	OSN 006 Average/Maximum
TSS	30/100 mg/l	30/100 mg/l
Oil & Grease	NA/5 mg/l	NA/5 mg/l
pH (range)	6.0 to 8.5	6.0 to 8.5
Total Copper	NA/.03 mg/l	NA/NA
Total Iron	1.0/1.0 mg/l	NA/NA
N/A = Not applicable Source: NPDES Permit		

The Discharge Monitoring Reports (DMRs) for the Purdom Station for the periods April through December 1994, and February 1995 through May 1996, have been analyzed with respect to compliance at OSNs 005 and 006. The results are that, with the exception of one reading of 1.8 mg/l for iron at OSN 005 during July 1994, all of the data in the DMRs were in compliance with the permit limits.

The City of St. Marks Wastewater Treatment Facility DMRs for the period from February 1993 through August 1996, were also analyzed. A summary of the data is presented in Table 2.3.4-5. These data indicate that the discharge from the City of St. Marks Wastewater Treatment Facility was in compliance with their NPDES permit.

On-Site Water Bodies

The City of Tallahassee has identified ten on-site water bodies, seven of which are wetlands and three of which are artificial canals serving the power generating units. For convenience, the

TABLE 2.3.4-3
WATER QUALITY SAMPLING ANALYSIS

Parameters to be Sampled For	Constituent	Class III Limit in St. Marks River at Purdom Station (if applicable)	Lab Analytical Method (if applicable)	Results from 10/17/96 Sampling Episode	Results from 11/21/96 Sampling Episode
Physical	pH	Within 1 unit of natural background & between 6 and 8.5, or not less than natural nor more than 1 unit above natural if natural <6, and not more than natural nor less than 1 unit below natural if natural > 8.5	EPA 150.1	7.25	7.18
	Dissolved Oxygen	5 mg/l (minimum)	EPA 360.1	3.67	3.88
	Temperature (° C)	see 62-302.520	EPA 170.1	21.2	20.3
	Total Dissolved Gases	110% of saturation value	field measurement	NT	NT
General Inorganics	Total Suspended Solids	Tested for operational reasons	EPA 160.2	3	2
	Total Dissolved Solids	Tested for operational reasons	EPA 160.1	124	346
	Hardness (as $CaCO_3$)	Required for calculating trace metal limits, abbreviated as H	EPA 130.2	93.0	162
	Alkalinity (as $CaCO_3$)	20 mg/l as $CaCO_3$(minimum)	EPA 310.1	77.1	119
	Specific Conductance (μmhos/cm)	Tested for operational reasons	EPA 120.1	163	583
	Nitrate (as N)	Not to imbalance natural populations	EPA 353.2	BDL	0.124
	Nitrite (as N)	Not to imbalance natural populations	EPA 353.2	BDL	BDL
	Ammonia (as N)	.02 mg/l (un-ionized) and not to imbalance natural populations	EPA 350.1	0.014	0.016
	Total Phosphorus (as P)	Not to imbalance natural populations	EPA 365.4	0.049	BDL
	Silica (as SiO_2)	Tested for operational reasons	SM-4500SiD	8.58	11.6
	Cyanide (as CN)	.0052 mg/l	EPA 335.4	0.017	BDL
	Aluminum	Tested for operational reasons	EPA 202.2	0.218	0.0291
	Sulfides	Tested for operational reasons	EPA 376.1	BDL	BDL
	Total Residual Chlorine	.01 mg/l	EPA 330.1	BDL	0.0
Major Cations	Calcium	Tested for operational reasons	EPA 215.1	25.8	40.4
	Magnesium	Tested for operational reasons	EPA 242.1	4.42	13.4
	Sodium	Tested for operational reasons	EPA 273.1	3.19	53.8
	Potassium	Tested for operational reasons	EPA 258.1	0.51	2.32
Minor/Trace Elements	Antimony	4.3 mg/l	EPA 204.2	BDL	BDL
	Arsenic	.050 mg/l	EPA 206.2	BDL	BDL

TABLE 2.3.4-3
WATER QUALITY SAMPLING ANALYSIS

Parameters to be Sampled For	Constituent	Class III Limit in St. Marks River at Purdom Station (if applicable)	Lab Analytical Method (if applicable)	Results from 10/17/96 Sampling Episode	Results from 11/21/96 Sampling Episode
	Beryllium	.00013 mg/l (at ann avg flow)	EPA 210.2	BDL	BDL
	Cadmium	e^(.7852[ln H]-3.49) µg/l	EPA 213.2	BDL	BDL
	Copper	e^(.8545[ln H]-1.465) µg/l	EPA 220.2	BDL	BDL
	Iron	1.0 mg/l	EPA 236.2	0.314	0.0656
	Lead	e^(1.273[ln H]-4.705) µg/l	EPA 239.2	BDL	BDL
	Mercury	.000012mg/l	EPA 245.1	BDL	BDL
	Nickel	e^(0.846[ln H]+1.1645) µg/l	EPA 249.2	BDL	0.0017
	Selenium	0.005 mg/l	EPA 270.2	BDL	BDL
	Silver	0.00007 mg/l	EPA 272.2	BDL	BDL
	Thallium	0.048 mg/l	EPA 279.2	BDL	BDL
	Zinc	e^(0.8473[ln H]+0.7614) µg/l	EPA 289.1	BDL	BDL
Major Anions	Chloride	Tested for operational reasons	EPA 325.2	5.58	93
	Bicarbonate	Tested for operational reasons	SM500-CO2D	76.96	118.8
	Carbonate	Tested for operational reasons	SM500-CO2D	BDL	BDL
	Sulfate	Tested for operational reasons	EPA 375.2	7.15	21.7
Microbiologicals	Fecal Coliform	Multiple requirements	EPA 600/8/78-017 Section III C, pg 124	154 /100 ml	170 /100 ml
	Total Coliform	Multiple requirements	EPA 600/8/78-017 Section III B, pg 108	533 /100 ml	324 /100 ml
Organics	Benzene	.07128 mg/l (at ann avg flow)	EPA 502.2	BDL	BDL
	Phthalate Esters	0.003 mg/l	EPA 505	ND	BDL
	PCBs	0.000000045 mg/l (ann avg flow) & 0.000014 mg/l	EPA 505	ND	BDL
	Tetrachloroethylene	0.00885 mg/l (ann avg flow)	EPA 502.2	BDL	BDL
	1, 1, 1-Trichloroethane	173 mg/l	EPA 502.2	BDL	BDL
	Trichloroethene	0.0807 mg/l (ann avg flow)	EPA 502.2	BDL	BDL
	Carbon Tetrachloride	.00442 mg/l (ann avg flow)	EPA 502.2	BDL	BDL
	1,1-Dichloroethylene (1,1-Dichloroethene)	.0032 mg/l (ann avg flow)	EPA 502.2	BDL	BDL
	Dichloromethane (methylene chloride)	1.58 mg/l (ann avg flow)	EPA 502.2	BDL	BDL
	2,4-Dinitrotoluene	.0091 mg/l (ann avg flow)	EPA 8270/625	BDL	BDL
	Bromoform	0.360 mg/l (ann avg flow)	EPA 502.2	BDL	BDL

TABLE 2.3.4-3
WATER QUALITY SAMPLING ANALYSIS

Parameters to be Sampled For	Constituent	Class III Limit in St. Marks River at Purdom Station (if applicable)	Lab Analytical Method (if applicable)	Results from 10/17/96 Sampling Episode	Results from 11/21/96 Sampling Episode
	Chlorodibromomethane	0.034 mg/l (ann avg flow)	EPA 502.2	BDL	BDL
	Chloroform	0.4708 mg/l (ann avg flow)	EPA 502.2	BDL	BDL
	Chloromethane (methyl chloride)	0.4708 mg/l (ann avg flow)	EPA 502.2	BDL	BDL
	Dichlorobromomethane	0.022 mg/l (ann avg flow)	EPA 502.2	BDL	BDL
	Hexachlorobutadiene	0.0497 mg/l (ann avg flow)	EPA 502.2	BDL	BDL
	Pentachlorophenol	0.0082 mg/l (ann avg flow) & e^(1.005[pH]-5.29) µg/l & 0.030 mg/l	EPA 525.1		
	Polycyclic aromatic hydrocarbons (PAHs, see Note 1)	0.000031 mg/l (ann avg flow)	EPA 8270/625	BDL	BDL
	Anthracene	110 mg/l	EPA 8270/625	BDL	BDL
	Fluorene	14 mg/l	EPA 8270/625	BDL	BDL
	Pyrene	11 mg/l	EPA 8270/625	BDL	BDL
	Fluoranthene	0.370 mg/l	EPA 8270/625	BDL	BDL
	Acenaphthene	2.7 mg/l	EPA 8270/625	BDL	BDL
	1,1,2,2-Tetrachloroethane	0.0108 mg/l (avg ann flow)	EPA 502.2	BDL	BDL
Pesticides & Herbicides	Aldrin	0.003 mg/l & 0.00000014 mg/l (ann avg flow)	EPA 508	BDL	BDL
	Dieldrin	0.00000014 mg/l (ann avg flow) & 0.0000019 mg/l	EPA 508	BDL	BDL
	Chlordane	0.00000059 mg/l (ann avg flow) & 0.0000043 mg/l	EPA 508	BDL	BDL
	Demeton	0.0001 mg/l	EPA 505	BDL	BDL
	Endosulfan	0.000056 mg/l	EPA 508	BDL	BDL
	Endrin	0.0000023 mg/l	EPA 508	BDL	BDL
	Guthion	.00001 mg/l	EPA 505	BDL	BDL
	Heptachlor	.00000021 mg/l (ann avg flow) & 0.0000038 mg/l	EPA 508	BDL	BDL
	Lindane (g-benzene hexachloride)	0.000063 mg/l (ann avg flow) & 0.00008 mg/l	EPA 508	BDL	BDL
	Malathion	0.0001 mg/l	EPA 505	BDL	BDL
	Methoxychlor	0.00003 mg/l	EPA 508	BDL	BDL
	Mirex	0.000001 mg/l	EPA 617		
	Parathion	0.00004 mg/l	EPA 505	BDL	BDL
	Toxaphene	0.0000002 mg/l	EPA 508	BDL	BDL

TABLE 2.3.4-3
WATER QUALITY SAMPLING ANALYSIS

Parameters to be Sampled For	Constituent	Class III Limit in St. Marks River at Purdom Station (if applicable)	Lab Analytical Method (if applicable)	Results from 10/17/96 Sampling Episode	Results from 11/21/96 Sampling Episode
	beta-hexachlorocyclohexane (b-BHC)	0.000046 mg/l (ann avg flow)	EPA 508	BDL	BDL
	DDT	0.00000059 mg/l (ann avg flow) & 0.000001 mg/l	EPA 508	BDL	BDL
Biological Integrity	Shannon-Weaver diversity index	75% of background levels	field measurement	ND	ND
	Transparency	Not to be reduced more than 10% of natural	field measurement	ND	ND

Note (1) PAH includes the following:
Acenaphthylene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(g,h,i)perylene
Benzo(k)fluoranthene
Chrysene
Dibenzo(a,h)anthracene
Indeno(1,2,3-cd)pyrene
Phenanthrene

Note: NT = not tested as part of these sampling episodes
BDL = below detection level
ND = not done as part of these sampling episodes

Source: City of Tallahassee Water Quality Laboratory, 1996

2.3.4-57

TABLE 2.3.4-4 DETECTED WATER QUALITY CONSTITUENTS					
Parameters to be Sampled For	**Constituent (units are mg/L unless otherwise stated)**	**Class III Limit in St. Marks River at Purdom Station (if applicable)**	**Lab Analytical Method (if applicable)**	**Results from 10/17/96 Sampling Episode**	**Results from 11/21/96 Sampling Episode**
Physical	pH(standard units)	Within 1 unit of natural background & between 6 and 8.5, or not less than natural nor more than 1 unit above natural if natural <6, and not more than natural nor less than 1 unit below natural if natural > 8.5	EPA 150.1	7.25	7.18
	Dissolved Oxygen	5 mg/l (minimum)	EPA 360.1	3.67	3.88
	Temperature (° C)	See 62-302.520	EPA 170.1	21.2	20.3
	Total Dissolved Gases	110% of saturation value	Field measurement	NT	NT
General Inorganics	Total Suspended Solids	Tested for operational reasons	EPA 160.2	3	2
	Total Dissolved Solids	Tested for operational reasons	EPA 160.1	124	346
	Hardness (as $CaCO_3$)	Required for calculating trace metal limits, abbreviated as H	EPA 130.2	93.0	162
	Alkalinity (as $CaCO_3$)	20 mg/l as $CaCO_3$(minimum)	EPA 310.1	77.1	119
	Specific Conductance (μmhos/cm)	Tested for operational reasons	EPA 120.1	163	583
	Nitrate (as N)	Not to imbalance natural populations	EPA 353.2	BDL	0.124
	Ammonia (as N)	.02 mg/l (un-ionized) and not to imbalance natural populations	EPA 350.1	0.014	0.016
	Total Phosphorus (as P)	Not to imbalance natural populations	EPA 365.4	0.049	BDL
	Silica (as SiO_2)	Tested for operational reasons	SM-4500SiD	8.58	11.6
	Cyanide (as CN)	.0052 mg/l	EPA 335.4	0.017	BDL
	Aluminum	Tested for operational reasons	EPA 202.2	0.218	0.0291
Major Cations	Calcium	Tested for operational reasons	EPA 215.1	25.8	40.4
	Magnesium	Tested for operational reasons	EPA 242.1	4.42	13.4
	Sodium	Tested for operational reasons	EPA 273.1	3.19	53.8
	Potassium	Tested for operational reasons	EPA 258.1	0.51	2.32

TABLE 2.3.4-5
CITY OF ST. MARKS WASTEWATER
TREATMENT FACILITY EFFLUENT DATA

Date	Monthly avg daily flow (mgd)	CBOD Effluent (mg/l)	TSS Effluent (mg/l)	pH min	pH max	Ammonia (mg/l)	Nitrate (mg/l)	Total Phosphorus (mg/l)	Nitrite, Effluent (mg/l)	Cadmium (mg/l)	Calcium (mg/l)	Magnesium (mg/l)	Hardness (mg/l)
Feb-93	0.002	5.8	9	7.2	7.2	0.2		3.2					
Mar-93	0.016	7.2	5.5	7.2	7.2	0.1		0.1					
Apr-93	0.023	12.9	12	7.2	7.2	2.4		5					
May-93	0.012	7.9	6.5	7.1	7.2	2.8		6					
Jun-93	0.024	4	2	7.2	7.2	0.3	7	1.5					
Jul-93	0.009	2	2.5	7.2	7.2	0.2	15.8	3.6					
Aug-93	0.013	2	2	7.2	7.2	0.3	4.7	1.6					
Sep-93	0.021	5.5	3.5	7.2	7.2	0.6	0.7	3.6					
Oct-93	0.017	1.8	6.5	7.1	7.4	1.3		21.7					
Nov-93	0.017	2	4	7.4	7.2	0.5	< .1	< .1					
Dec-93	0.015	9	14	7.1	7.4	0.3		1.2					
Jan-94	0.016	9.5	27	7.2	7.3	0.5		9					
Feb-94	0.015	6.5	15.5	7	7.2	0.4		3.3					
Mar-94	0.013	2.5	7.5	7.1	7.2	0.3		3.4					
Apr-94		3.5	13	7	7.1	0.4		4.7					
May-94		4.5	11	7.2	7.3	0.3		3					
Jun-94		2	6	7.3	7.4	0.4		2.9					
Jul-94		21	15	7	7.8	0.4		2.2					
Aug-94		5	9	6.3	7.7	0.2	9.9	3.6					
Sep-94		4.5	6	7	7.9	1	8.3	2.5					
Oct-94	0.029	2	4.5	7	8.1	0.8	2.8	2					
Nov-94	0.035	3.3	4.3	6.9	7.8	0.2	18.4	1.5					
Dec-94	0.031	1	6	6.9	7.6	0.4	12.5	3.9					
Jan-95	0.029	3.5	6	6.9	7.4	5.2	0.21	1.9	0.02				
Feb-95	0.028	2.5	4	6.9	7.4	1.4	< .1	1.2	< .1				
Mar-95	0.029	4.5	10	6.9	7.5	8	0.2	1.6	0.1				
Apr-95	0.024	5	6	7	7.4	12.2	0.2	2.3	0.1				
May-95	0.028	6.1	9	6.9	7.2	0.8	18.8	5.7	< .1				
Jun-95	0.023	2.2	7	6.8	7.2	0.4	6	2.5	< .1				
Jul-95	0.024	3.5	4	6.9	7.2	3.5	0.3	1.6	0.05				

TABLE 2.3.4-5
CITY OF ST. MARKS WASTEWATER TREATMENT FACILITY EFFLUENT DATA

Date	Monthly avg daily flow (mgd)	CBOD Effluent (mg/l)	TSS Effluent (mg/l)	pH min	pH max	Ammonia (mg/l)	Nitrate (mg/l)	Total Phosphorus (mg/l)	Nitrite, Effluent (mg/l)	Cadmium (mg/l)	Calcium (mg/l)	Magnesium (mg/l)	Hardness (mg/l)
Aug-95	0.025	4.5	7	7	7.4	0.2	15.6	3.9	0.1	0.007	77.9	6.1	219.6
Sep-95	0.024	3	5.5	7.3	7.4	0.3	22.8	3.5	< .1	0.003	101.2	6.9	218.2
Oct-95	0.019	3.3	7.3	7.3	7.4	0.16	10.3	3.4	< .1	< .002	114.5	6.1	310.8
Nov-95	0.023	4	5.5	7.3	7.5	0.1	14.7	2.4	< .1	0.003	90.3	10.3	247.1
Dec-95		5.5	11	7.3	7.5	0.01	20.5	3.2	< .01	< .002	103	11.1	302.9
Jan-96		4	13.5	7	7.5	0.17	10.7	3.2	0.04	0.003	33.8	10.9	129.4
Feb-96		5	13.5	7	7.4	0.17	7.9	1.9	< 0.01	< 0.002	94.2	6.3	261.1
Mar-96	0.021	6.5	10	7.1	7.4	1.7	1.1	2.8	0.1	0.002	93.4	9.7	273.2
Apr-96	0.023	4.3	6.7	6.9	7.4	6.1	0.14	2.9	0.2	< 0.002	84.4	8.7	246.4
May-96	0.017	4.5	4.5	7	7.3	1	14.7	5.3	0.04	< .002	94	9.2	272.2
Jun-96	0.018	4	5.5	6.2	6.8	< .1	29.4	4	0.1				
Jul-96	0.024	3	7	7	7.4	0.2	23.9	3.6	< .1	< .002	85.8	6.9	242.4
Aug-96	0.024	4.5	5.5	7	7.3	0.2	25.2	3.2	< .1	< .002	83.6	6.5	235.6
Average	0.0209	4.86	7.93	7.04	7.37	1.34	10.81	3.56	0.09	0.00	88.01	8.23	246.6

Source: Raytheon Engineers & Constructors, 1996.

wetlands have been labeled, and are shown on Figure 2.3.4-41. The size of the wetlands are as follows:

Wetland	Acres
A	0.40
B	0.24
C	6.98
D	0.57
F	0.95
G	1.56
H	8.30
Total	19.00

The wetlands encompass about 30 percent of the total site acreage. The artificial canals have been identified on Figure 2.3.4-11. They include the Unit 7 Intake Canal, the Unit 5 Discharge Canal, and the Units 6/7 Discharge Canal. The artificial canals aggregate about 2.44 acres.

Site Drainage

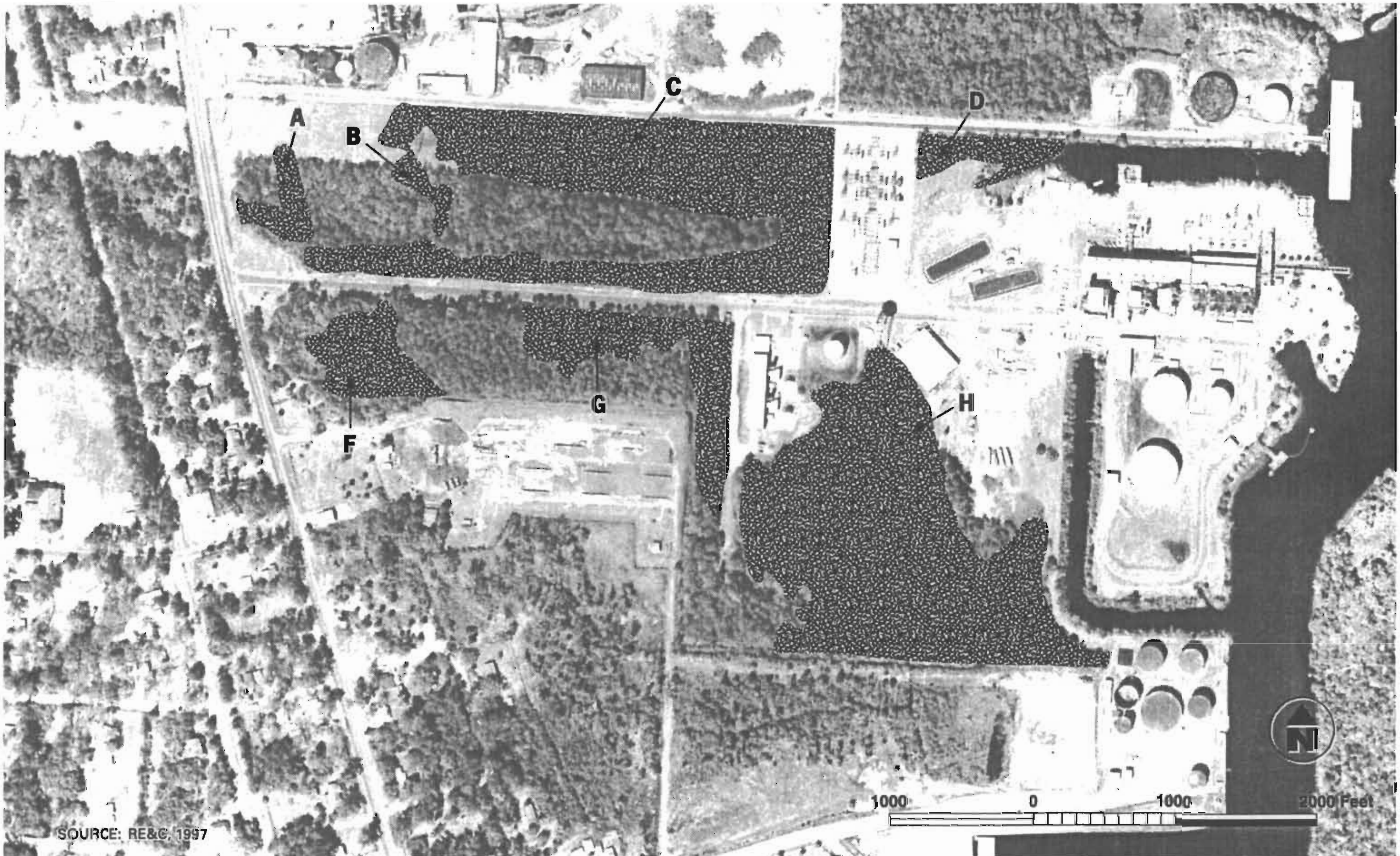
The Purdom site is part of a communal drainage system that drains runoff from the City of St. Marks. This system ties most of the City of St. Marks together through the use of ditches along all of the roads, and culverts under the roadways cross-connecting the ditches. The portion of the City of St. Marks that drains through the Purdom site is estimated to include approximately 139.5 acres (see Figure 2.3.4-42), of which about 62.7 acres are the site itself. On-site drainage is depicted on Figure 2.3.4-43, sheets 1 through 4. Stormwater from the site, unaffected by industrial activity, is permitted under EPA's General Permit. This stormwater is discharged via OSN 007, 008, 009, and 010. The on-site acreage and total acreage draining through each outfall are:

OSN	On-Site Acres	Total Acres
007	18.2	57.1
008	1.7	1.7
009	0*	0*
010	19.3	57.2
Total	39.2	116.0
* OSN 009 is an overflow for OSN 010		

The remaining 23.5 on-site acres include roof drains and grassed areas that sheet flow to the intake and/or discharge canals, the intake and/or discharge canals themselves, and the oil storage tanks containment areas, which are permitted under the plant industrial NPDES permit.

2.3.4.2 Measurement Programs

The surficial hydrology measurement program included hydrographic and hydrothermal monitoring and chemical water quality monitoring. The former included measurements of bathymetry, currents, water levels, and water temperatures at selected locations in the St. Marks River, and the plant intake and discharge canals. The chemical water quality monitoring included in-situ continuous monitoring of water level and conductivity at the proposed location of the

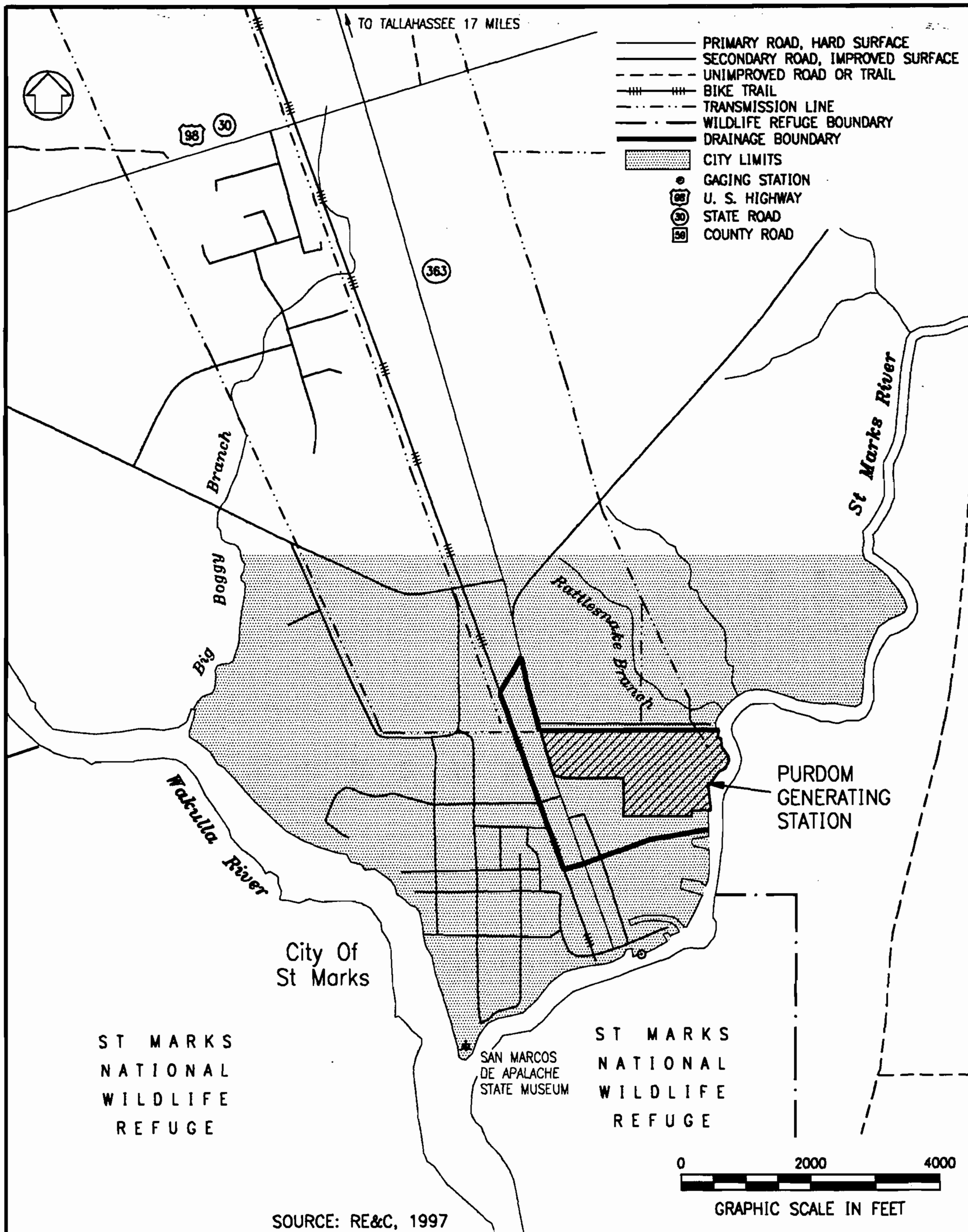


CITY OF TALLAHASSEE

ON-SITE WETLAND WATER BODIES

PURDOM UNIT 8 PROJECT - ST MARKS FLORIDA

Figure 2.3.4-41



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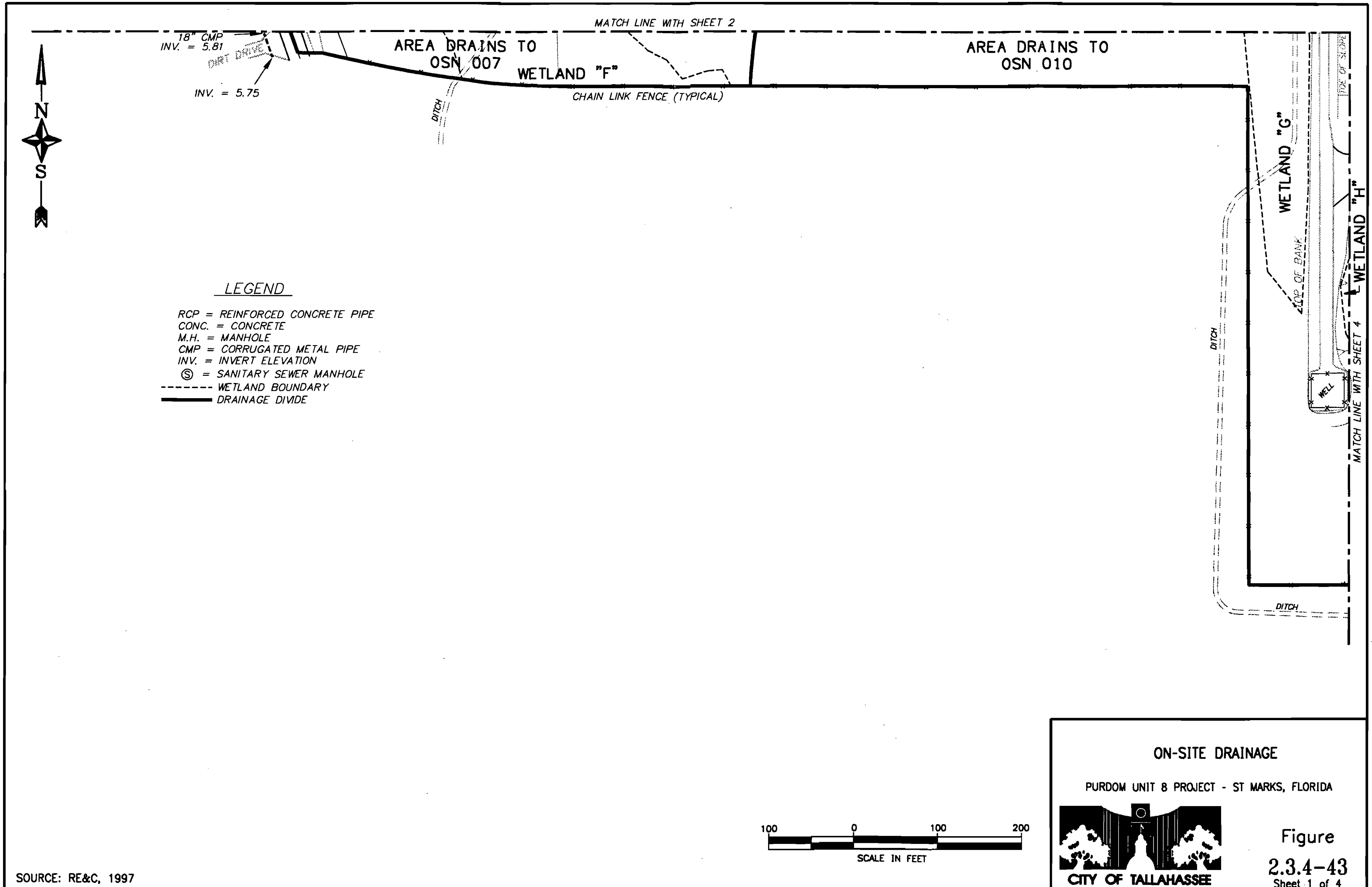
CITY OF TALLAHASSEE

DRAINAGE THROUGH THE PURDOM SITE
1" = 2000'

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.4-42



SOURCE: RE&C, 1997

ON-SITE DRAINAGE

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

CITY OF TALLAHASSEE

Figure 2.3.4-43
Sheet 1 of 4

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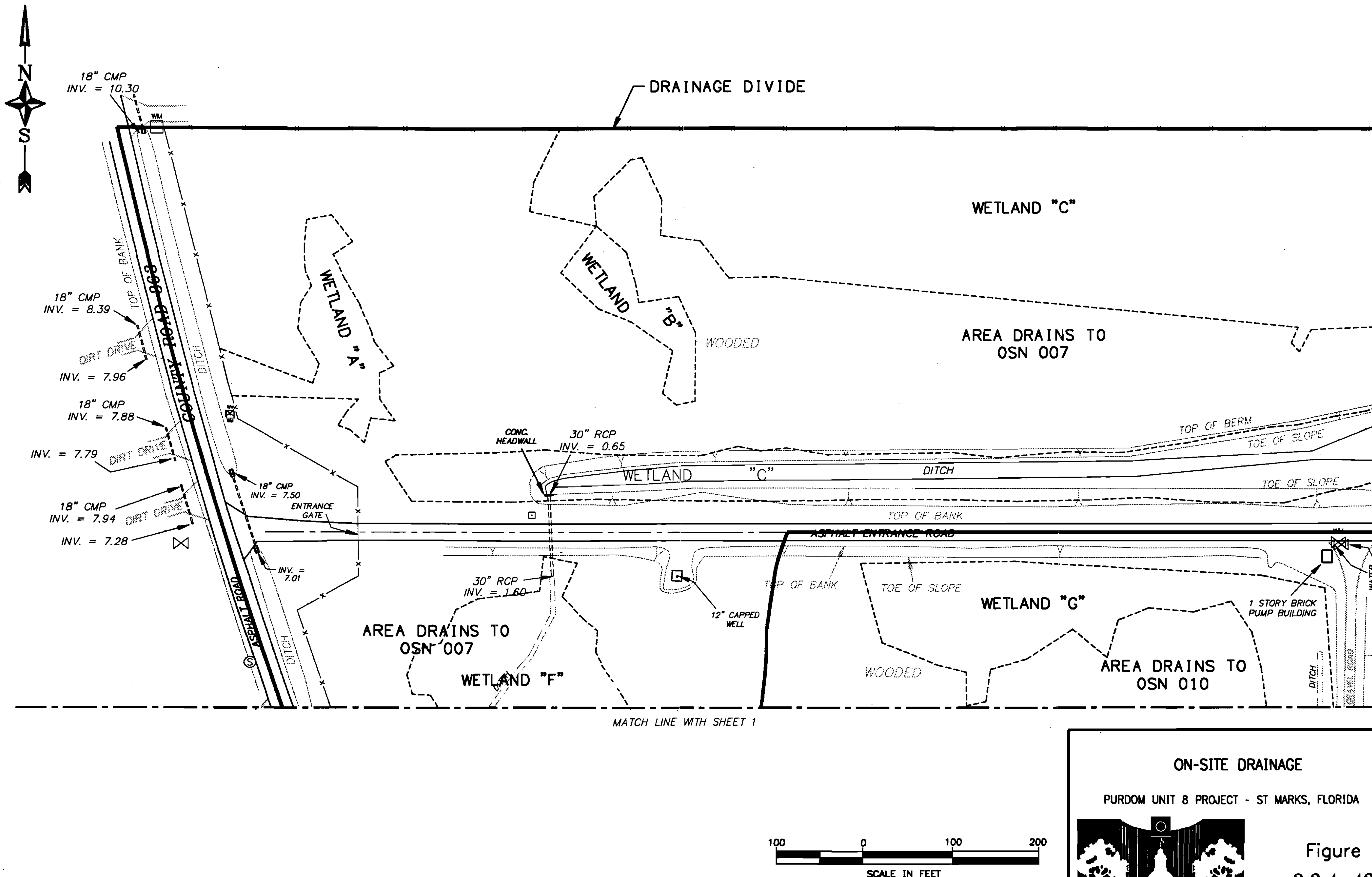


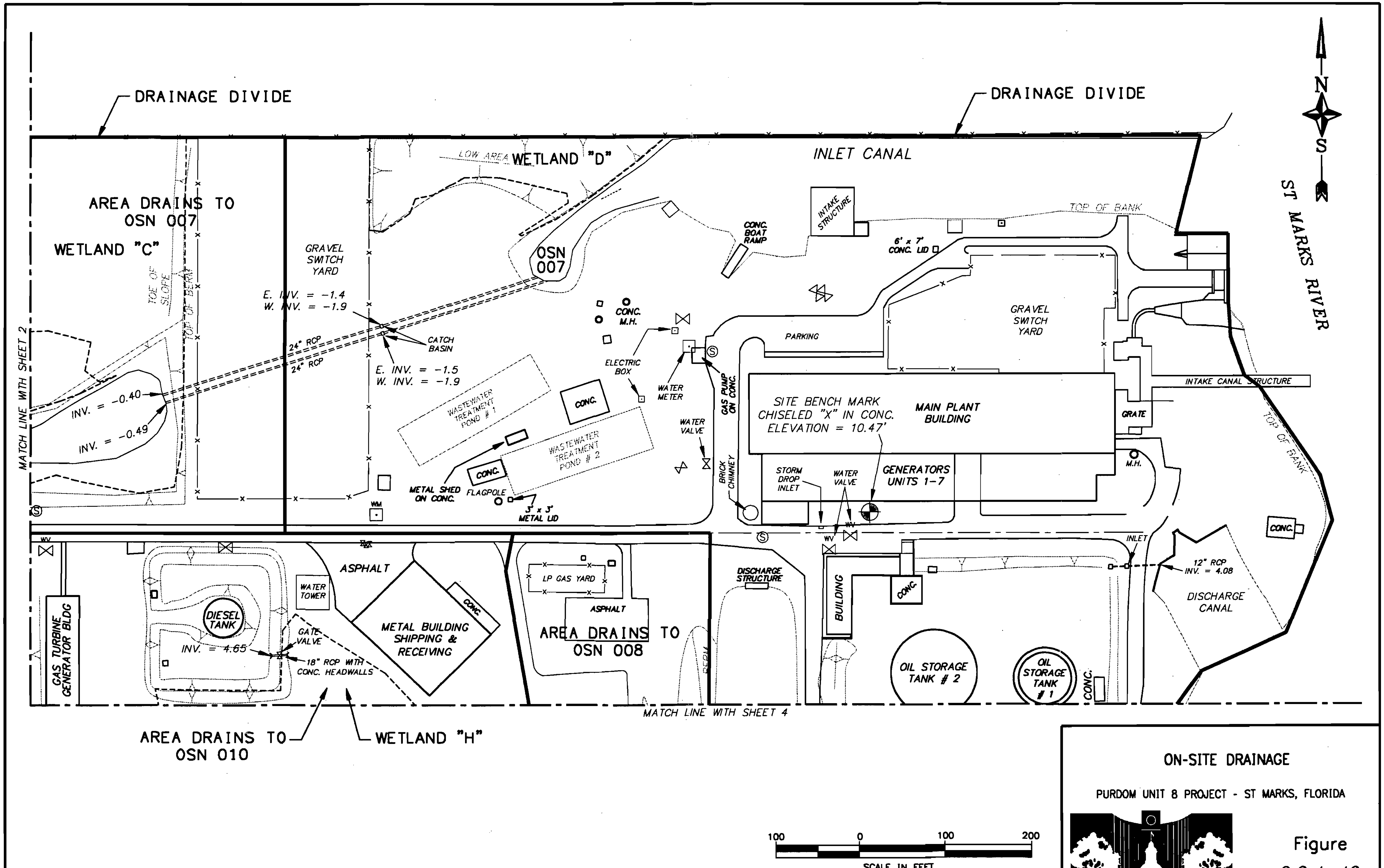
ON-SITE DRAINAGE

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

CITY OF TALLAHASSEE

Figure 2.3.4-43

SOURCE: RE&C, 1997



SOURCE: RE&C, 1997

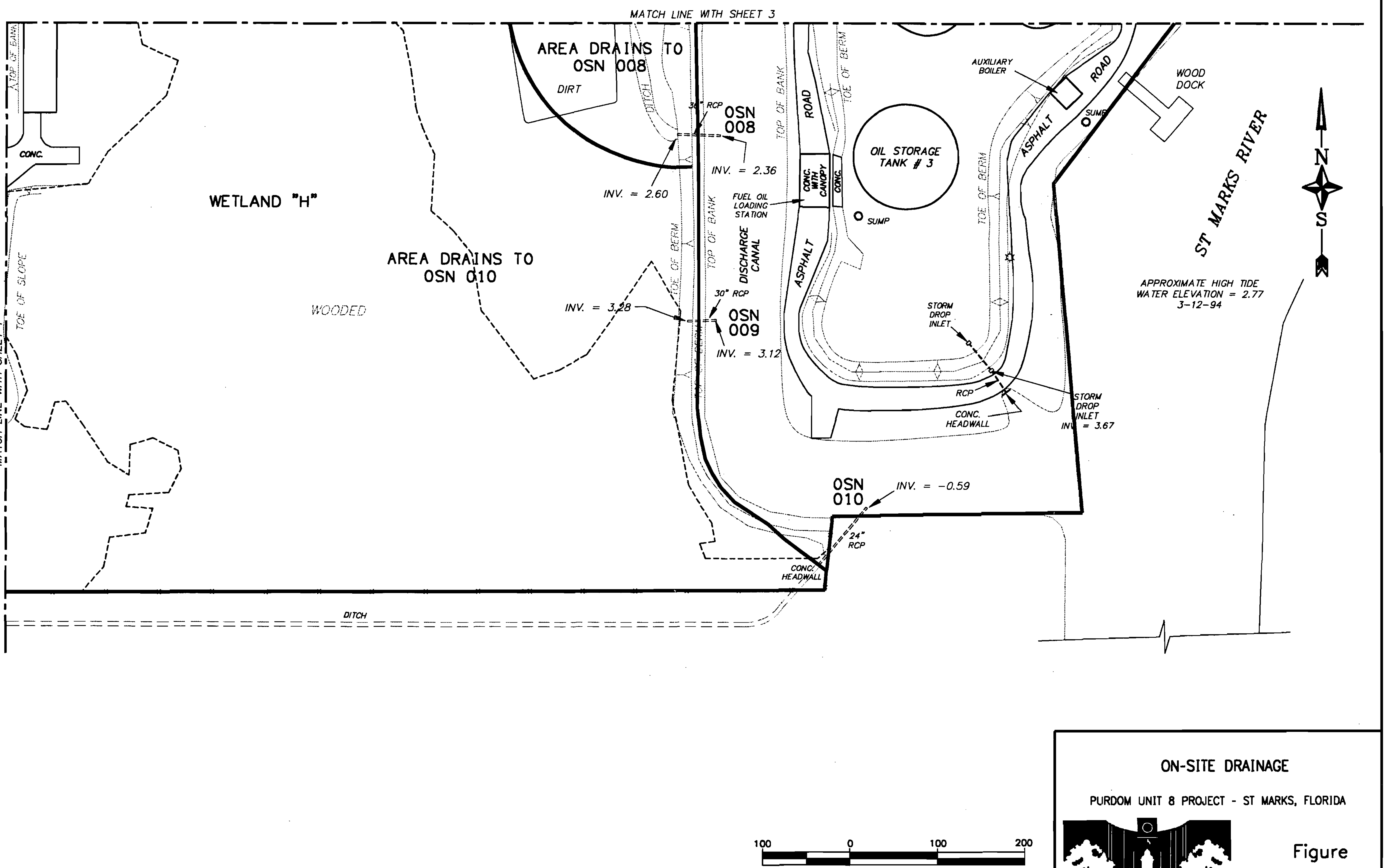
ON-SITE DRAINAGE

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

CITY OF TALLAHASSEE

Figure 2.3.4-43

Sheet 3 of 4



SOURCE: RE&C, 1997

ON-SITE DRAINAGE

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

CITY OF TALLAHASSEE

Figure 2.3.4-43
Sheet 4 of 4

Project surface water withdrawal location, and the taking and detailed laboratory analysis of river water samples at the same location. The City of Tallahassee submitted a Quality Assurance Project Plan in accordance with F.A.C. 62-160; however, the FDEP QA Section stated that a plan was not required. Copies of all the recorded data are presented in Section 10.5.4.

Bathymetry

River bathymetry was measured from a boat using a depth finder. The depth finder operates by measuring the echo delay from a periodic signal aimed toward the river bottom. Water depth is recorded continuously on a strip chart. The signal transmitter/receiver was suspended from the front of the boat and was held in place while the boat was in motion to ensure proper downward orientation of the device. For each bathymetry measurement pass, the recorded depth was verified by taking a duplicate measurement from the front of the boat in the same location as the depth finder signal transmitter/receiver with a calibrated weighted sounding tape. The strip chart recording was marked to identify the beginning and end of each pass.

Salinity, Conductivity, Temperature, Dissolved Oxygen, and pH Profiles

Salinity, conductivity, and temperature measurements were made from a moored boat using a Yellow Springs Instruments (YSI) Model 33 salinity-conductivity-temperature (S-C-T) meter. DO was measured using a YSI Model 50B DO meter. The S-C-T and DO meters were calibrated every four hours, according to the manufacturer's instructions. pH was measured using an Orion Model 230A pH meter, which was also calibrated every four hours, according to the manufacturer's instructions. Calibration data and field measurements were recorded on preprinted forms.

Long-Term Measurements

Long-term conductivity measurements were made using two In-Situ Inc. Model CTS-200 conductivity probes, one floating at a fixed depth and the other at a fixed depth. Long-term water level measurements were made using an In-Situ Inc. Model PTX-161D Pressure Transducer. Data from all three probes were recorded using In-Situ Inc. Hermit Model SE1000C Environmental Data Loggers.

River Current and Stage

River currents were measured using a Marsh-McBirney Flo-Mate™ Model 2000 Flowmeter. Measurements were made from a moored boat as described above under profiles. Stage, or water level, was measured during short term profiling surveys, using a Leupold & Stevens Type F water level recorder. The recorder operates by recording the rotation of a cylinder attached to a float which rises and falls with stage height over time. The recorder was placed on a platform whose elevation was known from a plant drawing, and was calibrated by measuring from the platform to the water surface with a calibrated tape measure.

2.3.4.3 References

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2.3.5 Vegetation/Land Use

The Purdom Station site consists primarily of developed lands associated with the generation of electrical power. The site also includes upland nonforested, disturbed lands; forested uplands and wetlands; nonforested wetlands; and open water areas. The location of the proposed Unit 8 has minimal vegetation cover within upland disturbed land.

2.3.5.1 Baseline Site Conditions

Figure 2.3.5-1 is a vegetation/land cover map of the site. The site includes about 34 acres of developed lands (including areas mowed) and about 29 acres of land with a natural vegetation cover. The new development will occur on the already developed portion of the site.

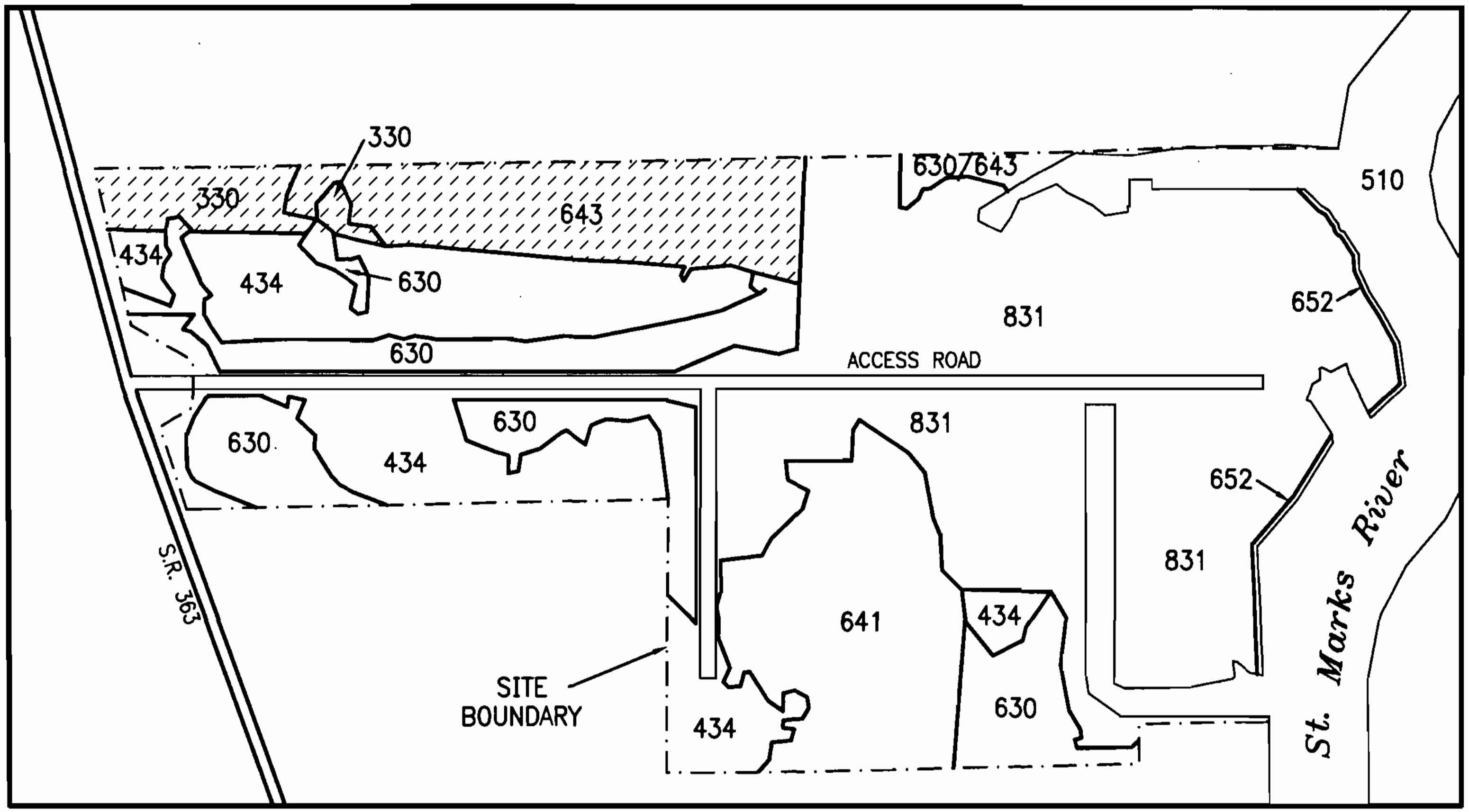
The following vegetation/land use types are present on the site. Classification is based primarily on Levels II and III Florida Land Use, Cover and Forms Classification System (numbers in parenthesis).

- Hardwood-conifer mixed (434)
- Streams and waterways (510)
- Wetland forested mixed (630)
- Freshwater marshes (641)
- Wet prairies (643)
- Shorelines (652)
- Electric power facilities including upland nonforested disturbed land (831)
- Electric power transmission lines (832)

Dominant Indicator Vegetation

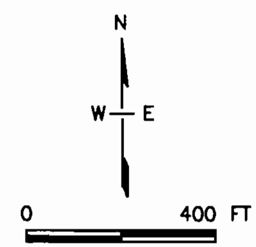
In order to characterize the vegetation/land use types identified above, vegetative cover was inspected and described qualitatively. Site ecological inspections have been carried out at the site periodically since 1992.

Upland nonforested disturbed land is now composed dominantly of grassy vegetation. These areas have a lawn like appearance due to maintenance by mowing. Other uplands on the site (hardwood-conifer mixed - 434), which are relatively undisturbed, are forested with a mix of hardwoods, conifers, and cabbage palm (*Sabal palmetto*). Dominant forest species include live and laurel oaks (*Quercus virginiana* and *Q. laurifolia*), loblolly pine (*Pinus taeda*) and cabbage palm. A relatively well developed middlestory or shrub layer dominated by wax myrtle (*Myrica cerifera*) and saw palmetto (*Serenoa repens*) exists. Generally, minimal ground cover vegetation is present within this forest community.



LEGEND

(hatched)	TRANSMISSION LINE RIGHT OF WAY	641	FRESHWATER MARSHES
330	MIXED RANGELAND	643	WET PRAIRIES
434	HARDWOOD-CONIFER MIXED	652	SHORELINES
510	STREAMS AND WATERWAYS	831	ELECTRICAL POWER FACILITIES
630	WETLAND FORESTED MIXED		



SOURCES: FLORIDA D.O.T. AERIAL PHOTOGRAPHY PD4258-17-9, MARCH 17, 1994
FOSTER WHEELER ENVIRONMENTAL, 1996-1997 SITE INSPECTIONS

CITY OF TALLAHASSEE

PURDOM SITE
LAND COVER AND VEGETATION MAP

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.5-1

Wetlands occurring on the site are generally of three types: forested wetland mixed (630), vegetated nonforested wetland (641, 643 including freshwater marshes and wet prairies), and nonvegetated wetlands along the shoreline (652).

Forested wetlands included species such as sweet bay (*Magnolia virginiana*), red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), blackgum (*Nyssa sylvatica* var *biflora*), and bald cypress (*Taxodium distichum*). Forested wetland areas are noted on Figure 2.3.5-2. Minimal ground cover is present in the forested wetland areas.

Herbaceous nonforested wetlands (the second type of wetlands) are also noted on Figure 2.3.5-2. These areas are dominated by sawgrass (*Cladium jamaciensis*) where water has been present most of the year. Other areas, such as wetlands along the on-site transmission line right-of-way, have no clear dominant species over the entire area. Depending on the local topography, concentrations of individuals of the following species were present: broomsedge (*Andropogon virginicus*), purple lovegrass (*Eragrastis spectabilis*), plumegrass (*Erianthus giganteus*), corn snakeroot (*Eryngium aquaticum*), beakrush (*Rhynchospora* sp.), and red-top panic grass (*Panicum rigidulum*).

The shorelines (the third type of wetlands) are defined by the Florida Land Use, Cover and Forms Classification System as nonvegetated wetlands. The shore is defined as the zone extending from the low tide mark to the farthest point inland to which wave action transports materials.

The principal open water habitat is the St. Marks River, which forms the eastern boundary of the site.

Vegetation Community Quality and Condition

Upland vegetation communities are maintained as oldfield or grasslands or as existing forest land cover. Though there is evidence of earth moving activity in forested areas dating back well over a decade, the existing condition of these stands is relatively good as is the potential for wildlife usage. Several large hardwood trees are present in portions of the forested land.

Herbaceous nonforested wetlands along the transmission line right-of-way are periodically mowed as part of routine maintenance procedures. Since this protective vegetative cover is removed, these areas are not allowed to successionally mature and provide a stable habitat for ground dwelling animal species.

Most other site wetlands are not maintained at a given stage of successional maturity. These areas are less disturbed and provide potential habitat for larger numbers of animal species.

2.3.5.2 Aucilla Wildlife Management Area/St. Marks National Wildlife Refuge

Vegetation communities in the Aucilla Wildlife Management Area and in the nearby St. Marks National Wildlife Refuge are generally similar to the relatively undisturbed site vegetation communities. Much of the Aucilla Wildlife Management Area is in forestry management including pine plantation.

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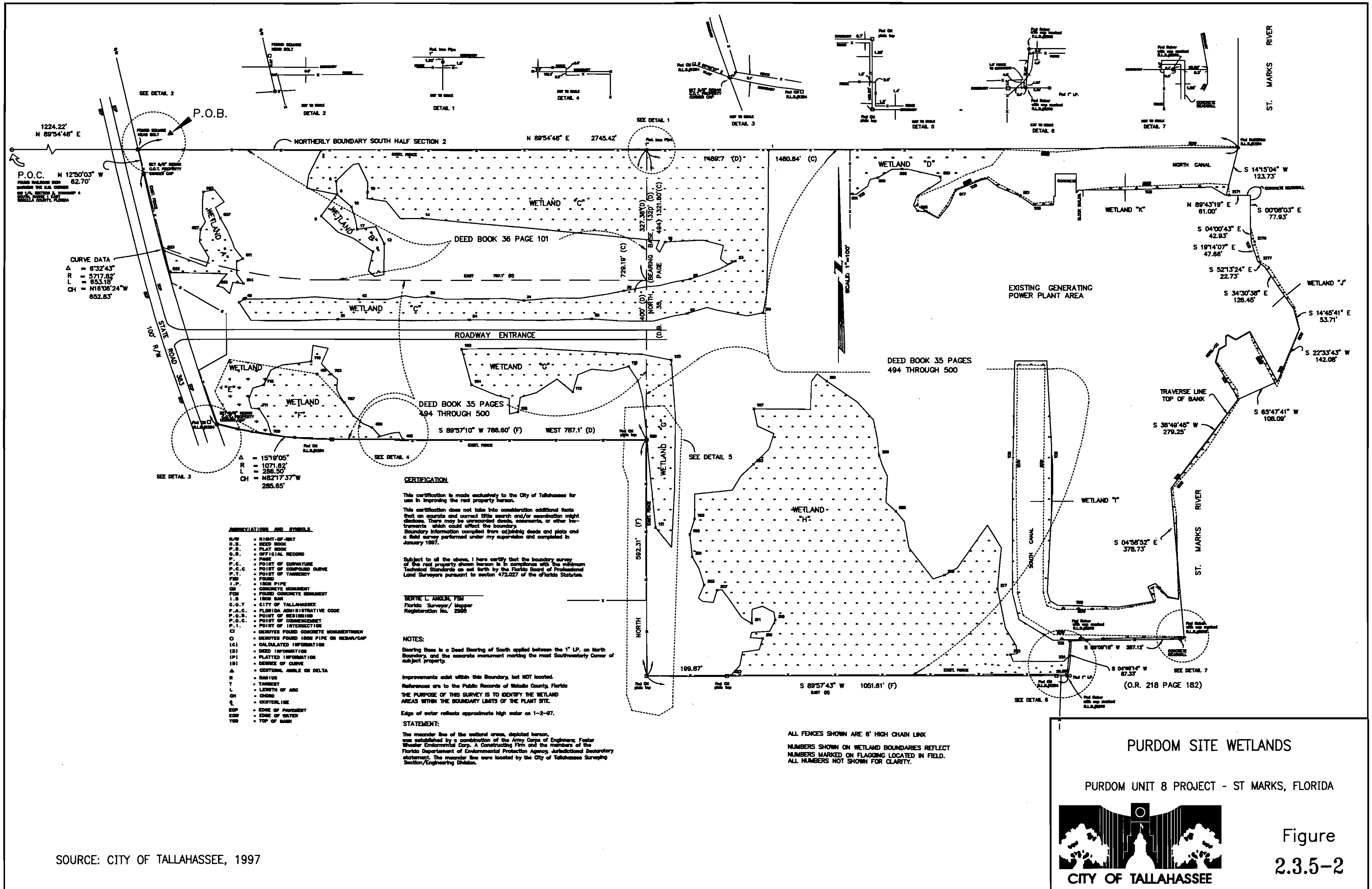

PURDOM SITE WETLANDS

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.5-2

PLOT DATE FEB 27, 1997 C:\15840007\---\00000-41.DWG

Populations of red maple (*Acer rubrum*), swamp tupelo (*Nyssa sylvatica* var *biflora*), slash pine (*Pinus elliottis*), sweetbay magnolia (*Magnolia virginiana* var *australis*), and pond cypress (*Taxodium ascendens*) dominate wetlands in both the Aucilla Wildlife Management Area and the Refuge. Vegetation in wetland transition areas and uplands on the refuge include slash pine, red maple, several species of St. John's wort (*Hypericum* ssp.) and holly (*Ilex* ssp.), winged sumac (*Rhus copallina*), blackberries (*Rubus* spp.), and saw palmetto (*Serenoa repens*) (Gilbert et al., 1995)

Soils over most of the refuge area are hydric or at least hydric components such as Tooles-Nutall-Chaires fine sand and Chaires fine sand. Soils and vegetation near the Gulf Coast in the Refuge reflect those typical of tidal marshes. Extensive areas of black rush (*Juncus roemerianus*) exist in this environment with smooth cordgrass (*Spartina alterniflora*) and other typical salt marsh species occurring in lesser acreage.

2.3.5.3 References

Enserch Environmental Corp. 1995. Existing Conditions Assessment Report. Sam O. Purdom Generating Station Arvah B. Hopkins, Generating Station. Prepared for the City of Tallahassee Electric Department.

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Gilbert, K.M, D. Tobe, R.W. Cantrell, M.E. Sweeley, and J.R. Cooper. 1995. The Florida Wetland Delineation Manual. Florida Department of Environmental Protection and the South Florida, Southwest Florida, St. Johns River, Suwannee River, and Northwest Florida Water Management Districts.

Odum, E. P. 1971. Fundamentals of Ecology. 3rd edition. Saunders Co., Philadelphia, Pennsylvania.

Wood, D.A. 1996. Official Lists of Endangered and Potentially Endangered Fauna and Flora in Florida. Florida Game and Fresh Water Fish Commission. Tallahassee, Florida.

2.3.6 Ecology

The status of important flora and fauna is highlighted in this section. Importance status is based upon species or assemblages of species which are:

- Designated as threatened or endangered by the U.S. Fish and Wildlife Service (USFWS);
- Designated as threatened or endangered or species of special concern by the Florida Game and Fresh Water Fish Commission (FGFWFC) and Department of Agriculture and Consumer Services (DACS);
- Game, furbearers, or fishery resources by the FGFWFC;
- Indicators that are endemic or unique to specific plant communities or habitat types; or
- Species functionally dominant in their vegetation communities or habitat types.

The St. Marks National Wildlife Refuge boundary is southeast of the site on the east side of the St. Marks River. The Aucilla Wildlife Management Area is directly across the river from the site. During periods of time between November and April, hunting by archery and gun is allowed in both the refuge and management area. Additionally, portions of the management area are managed for timber production.

Deer, feral hogs, and turkey are hunted in both areas as are small game (i.e., gray squirrels and raccoons). Additional species are hunted in the management area. These animals include bobwhite, rabbits, beaver, opossum, coyote, armadillo, nutria, and migratory game birds (Urban, 1997).

This section is presented in three parts, beginning first with species-environmental relationships. Secondly, the presence of environmental stress and its effect on area biota is discussed. Finally, the methodologies used to obtain the baseline site characterization data are described.

2.3.6.1 Species - Environmental Relationships

Aquatic Systems

<u>Site Description</u>

The headwaters of the St. Marks River consist of several lakes located within the Tallahassee Hills of Florida. The largest of these lakes is Lake Miccosukee which covers approximately 810 hectares. These headwater lakes typically discharge to sinkholes. Additional sinkholes collect rainwater resulting in very little surface runoff within this area. Lake Miccosukee and the other lakes discharge directly to the St. Marks River during high flow periods through poorly defined channels in swampy terrain. The St. Marks River in its upper reaches flows over shallow bedrock and is a highly stained and sluggish stream. Approximately 0.6 mile north of the Leon-Wakulla county line, the river disappears underground through a number of sinkholes and then emerges as several springs at Natural Bridge approximately 6 miles east of Woodville. From Natural Bridge to Newport, the St. Marks is a typical cool clear spring-fed river flowing through a well-defined channel in fluvial swamps and slash pine-palmetto scrub habitats. Near Newport, the St. Marks becomes tidally influenced with a salt wedge often existing several miles upstream of the site.

The St. Marks is joined by the Wakulla River approximately 0.6 mile south of the City of St. Marks and approximately 1.5 river miles south of the Purdom Station. The St. Marks flows approximately 5.5 miles from the confluence of the Wakulla River to the Gulf of Mexico.

Sampling Station Location and Description

Thirteen water sampling locations were established along the St. Marks River from a point immediately above all influences of the Purdom Station to a point immediately downstream of the discharge of the City of St. Marks Wastewater Treatment Facility (Figures 2.3.4-8 and 2.3.4-9). These sampling locations were utilized to establish water quality characteristics (Section 2.3.4).

Four of these water quality sampling locations were also utilized as collection points for benthic macroinvertebrates. Sampling location PD-01 was located immediately upstream of all Purdom Station influences, upstream of the intake canal for Units 5, 6, and 7. Sampling Location PD-07 was located immediately downstream of the Unit 5 discharge canal. Sampling Location PD-08 was located immediately downstream of the Unit 6/7 discharge canal, and downstream of all Purdom Station influences. Sampling Location 13 was located approximately 0.5 mile downstream of the Purdom Station, immediately downstream of the discharge for the City of St. Marks Wastewater Treatment Facility and just upstream of the confluence of the St. Marks and the Wakulla Rivers.

Water Chemistry

The physical and chemical characteristics of the stations for the date that the Hester-Dendy samplers were deployed, and water chemistry and physical data for each of the stations utilized during the water quality and thermal plume study, are presented in Appendix 10.5.4.

Fisheries

No commercial fishing is allowed above the saltwater line, located approximately at the confluence of the St. Marks and Wakulla Rivers (Shields, 1997). According to local fishermen (Shields, 1997; Hobbs, 1997), typical freshwater sport fish residing in the area of the Purdom Station include: largemouth bass, bluegill, redbreast sunfish, sunfish (shellcrackers), spotted sunfish (stumpnockers), brown catfish, yellow catfish, and channel catfish. These species reside in the St. Marks River year-round. During the winter months, marine fish species typically enter freshwater in search of warm water. Typical marine sport fish species which may move into the Purdom Station area during the winter months include: weakfish (spotted trout), red drum (redfish), gray snapper (mangrove snapper), sheepshead, crevalle jack, and flounder. Forage fish typical of the area include mullet, pinfish, sand seatrout, and shad (*Alosa* sp. and *Dorosoma* sp.), as well as various small and immature freshwater species. Striped bass have historically been stocked within the St. Marks River and striped bass are caught in the St. Marks River in the area of the Purdom Station annually, but there are no reports of striped bass spawning in the St. Marks River. A literature survey was conducted to supplement this listing and to prepare a fish species table. The fish species table is provided to indicate the fish species which are likely to inhabit freshwater, brackish, and marine habitats typical of the St. Marks River near the site and are potentially occurring in the site area. They are presented in Appendix 10.5.5.

Benthic Macroinvertebrates

Benthic macroinvertebrates are benthic or substrate dwelling organisms visible to the unaided eye and are retained on a U.S. Standard No. 30 sieve. They represent an important link in the food chain of many fish species. The majority of these organisms are juvenile or mature life stages of five classes or subclasses: Oligochaeta, Crustacea, Insecta, Gastropoda, and Pelecypoda. Larger individuals or species of several other classes may also be considered macroinvertebrates.

Benthic macroinvertebrates collected from Hester-Dendy sample collections in the St. Marks River near the Purdom Station are presented in Table 2.3.6-1. Based on these data, the benthic macroinvertebrate community appears to be healthy. Total numbers of individuals collected ranged from 221 at the station above all plant influences to 547 below the St. Marks POTW discharge. Total number of taxa collected ranged from 9 above all plant influences to 15 immediately below the Unit 6/7 discharge. The percentage of dominant taxa ranged from 63.0% immediately downstream of the Unit 6/7 discharge, to 21.4% below the St. Marks POTW discharge. Species diversity ranged from 1.29 immediately downstream of the Unit 6/7 discharge to 2.08 below the City of St. Marks Wastewater Treatment Facility discharge.

Site Habitat Value

The St. Marks River in the area of the Purdom Station is tidally influenced and is subject to fluctuations in salinity. Water quality data presented in Appendix 10.5.4 indicate the presence of a salt wedge upstream of the City of St. Marks. These fluctuations in salinity influence the biological community of the river, which exhibits freshwater and marine species. Increased salinities produce conditions which are inhospitable to freshwater species.

Florida Department of Environmental Protection conducted a biological assessment of the Purdom Station's discharges on the St. Marks River (FDEP, 1995). FDEP indicated that reduced Florida Index and Ephemoroptera, Pleucodptera, Trichoptera scores at the reference and test stations may be attributed to the estuarine conditions of the St. Marks River. FDEP also indicated that the water chemistry and physical parameters of the river were within the Class III Water Quality Standards. Biotic indices, using macroinvertebrates, suggested no adverse effects caused by the existing Purdom Station effluent. Toxicity tests using water flea *(Ceriodaphnia dubia)* and bannerfin shiner (*Cyprinella leedsi*) indicated that the effluent was not acutely toxic.

Food Chain Relationships

The waters of the St. Marks River appear to be highly productive. Organic materials are broken down slowly by chemical and biological decomposition in the sediments and their nutrients released. These nutrients are utilized by plankton and aquatic vegetation to produce new organic growth. The plankton and detritivores (worms and certain aquatic insects which feed on decomposing organic materials) form the basis of the food chain for the primary consumers of the ecosystem. Primary consumers (aquatic insects, crustaceans, and small fish) provide food to the secondary consumer (predators). Gizzard and threadfin shad are examples of primary consumers that feed exclusively on plankton. The killifish, cyprinids, and poecillids are primary consumers, as well as predators, in that they feed on aquatic insects, small crustaceans, and

TABLE 2.3.6-1
BENTHIC MACROINVERTEBRATES COLLECTED ON HESTER-DENDY SAMPLES NEAR PURDOM STATION ST. MARKS RIVER

Taxonomy	Station				Total Individuals
	CTAL-PD01 (2)	CTAL-PD07 (3)	CTAL-PD08 (4)	CTAL-PD13 (5)	
Annelida					
Polychaeta					
Serpulidae					
Hydroides sp.	-	-	-	12	12
Molluska					
Gastropoda					
Hydrobiidae					
Littoridinops sp.	28	20	65	76	189
Neritinidae					
Neritina reclivata	38	8	18	11	75
Pelecypoda					
Dreisseniidae					
Mytilopsis leucopheata	2	1	1	-	4
Crustacea					
Thoracica					
Balanidae					
Balanus sp.	2	-	-	98	100
Decapoda					
Pilumnidae					
Rhithropanopeus harrissi	-	7	16	15	38
Amphipoda					
Crangonyctidae					
Crangonyx sp.	-	-	10	110	120
Grammaridae					
Grammarus sp.	3	10	8	33	54
Talitridae					
Hyalella azecta	-	32	1	-	33
Isopoda					
Munna reyondsi	112	156	313	117	698
Asellidae					
Caecidontea sp.	2	23	1	38	64
Ostracoda	-	74	1	-	75
Insecta					
Ephemeroptera					
Baetidae					
Baetis sp.	-	-	1	-	1
Odonata					
Coenagrionidae					
Enallagma sp.	-	-	1	2	3
Trichoptera					
Hydroptilidae					
Oxyethira sp.	-	1	1	-	2
Diptera					
Chironomidae	33	43	59	28	163
Tipulidae					
Liogma sp.	-	-	-	7	7
Arachnida					
Hydroacarina	1	-	-	-	1
Hydroachnidae					
Hydrachna sp.	-	-	1	-	1
Total Individuals	221	375	497	547	1640
Number Of Taxa	9	11	15	11	18
Percent Dominant Taxa	50.7	41.6	63.0	21.4	42.6
Percent Diptera	14.9	11.5	11.9	6.4	10.4
EPT Taxa	0	1	2	0	2
Shannon-Wiener Diversity Index	1.40	1.76	1.29	2.08	2.00

(1) Hester Dendy samples incubated for 26 days (07/20/96 through 08/10/96). Source: Foster Wheeler Environmental, 1996.
(2) Station located on St. Marks River above all Purdom Station influences.
(3) Station located on St. Marks River downstream of the Purdom Station Unit 5 discharge.
(4) Station located on St. Marks River downstream of the Purdom Station Units 6/7 discharge.
(5) Station located on St. Marks River downstream of the discharge of the City of St. Marks WWTF.

Source: Foster Wheeler Environmental, 1996

algae. These fish are fed upon by larger fish (sunfish, bass, crappie), water snakes, and wading birds. The larger predatory fish are also the prey of many terrestrial predators including wading birds, raptors, mammals, and humans. The process begins again as organic material, predominantly dead vegetation, becomes reincorporated into the aquatic system.

Species Importance Criteria

Species importance is based on the following criteria:

- Threatened, endangered, or species of special concern status;
- Freshwater game or commercial fish;
- Indicator, endemic, and exotic species; or
- Species significant to local ecological systems.

Following is a discussion of site fisheries resources as they relate to the above criteria.

Threatened and Endangered Species and Species of Special Concern

No benthic macroinvertebrate or fish species listed as state or federally threatened or endangered species of special concern are known to occur in the aquatic habitats associated with or near the site (50 CFR 17; FGFWFC, 1987).

Freshwater Game or Commercial Fish

No commercial fishing occurs in the St. Marks River within the immediate area of the site. Commercial species may move up into the St. Marks from the Gulf of Mexico. Game and commercial fish species potentially occurring within the area of the Purdom Station are indicated in Appendix 10.5.5.

Indicator, Endemic, and Exotic Species

There are no indicator species thought to occur in the St. Marks River. There are no endemic or exotic fish species thought to be specific to the St. Marks River drainage. There are six native fish species which are endemic to Florida: Florida gar, banded killifish, marsh killifish, Seminole killifish, flagfish, and bluefin killifish. These species have natural distributions which mainly occur within Florida. All six of these species potentially occur within the St. Marks River near the Purdom Site.

Species Significant to Local Ecological Systems

In addition to the important game and commercial species discussed earlier, which function as the predominant predators living within the aquatic ecosystems on the site, several additional species are significant to the local ecological system. These species are presented in Appendix 10.5.5.

Baseline Terrestrial And Wetland Conditions

<u>Species Importance Criteria</u>

Descriptions of expected baseline vegetation community structure, vegetation species dominance, and floral species composition are presented in Section 2.3.5. Within these communities is the potential for occurrence of faunal and floral species which are of special importance. This special importance arises from species status as being either:

- Threatened, endangered, or species of special concern;
- Game animals or furbearers;
- Indicator and endemic species; or
- Vertebrate species significant to local ecological systems.

<u>Threatened or Endangered Plant Species</u>

Discussions of endangered or federally threatened plants whose habitat ranges include the site are listed below. Many of the plant species discussed are not expected to occur within the site. This is primarily due to an absence of a species suitable habitat. None of the species described below have been found at the site during several site reconnaissance visits conducted in all seasons.

Protected species importance is based on species lists of the USFWS (50 CFR 17.11-12), the Florida Game and Fresh Water Fish Commission (Rule 39-27.003-005, F.A.C.), and the Florida Department of Agriculture and Consumer Services (DACS) (Preservation of Native Flora Act, Section 581.185-187, F.S.).

Florida Brickell-Bush (*Brickellia eupatoriodes*) is listed as endangered by DACS. It is most commonly found in sandhills and pine-oak forests. Marginal habitat is present on the site. The species was not found on the site.

Wiregrass Gentian (*Gentiana pennelliana*) is an endangered species (DACS) that is found in flatwoods. Adequate habitat for this species does not occur at the site.

Godfrey's Blazing Star (*Liatris provincialis*) is listed as endangered by DACS. It is found on sandhills and dunes. Neither habitat occurs on the site.

Hummingbird Flower (*Macranthera flammea*) is listed as endangered by DACS and is found in bogs and acid swamps and along creek banks. Marginal habitat occurs on the site and the species was not observed on the site.

Ashe's Magnolia (*Magnolia ashei*) is listed as endangered by DACS. This species is found on bluffs, in hammocks, and in bayheads. Adequate habitat for this species is present on the site. The species was not observed on the site.

Pyramidal Magnolia (*Magnolia pyramodata*) is listed as endangered by DACS and is found on bluffs. This habitat type is not found on the site.

Panhandle Golden Aster (*Pityopsis flexuosa*) is listed as endangered by DACS and prefers sandhill habitat types. This habitat type is not present on the site.

Orange Azalea (*Rhododendron austrinum*) is listed as an endangered species by DACS. It is found on bluffs, hammocks, and in floodplains. Adequate habitat for this species is present on the site. The species was not observed on the site.

Threatened, Endangered, or Species of Special Concern (Animals)

Terrestrial vertebrate protected species status for the site is summarized below. No protected invertebrates occur in the site vicinity (Wood, 1996).

Florida Gopher Frog (*Rana areolata*) has been recorded throughout most of Florida. Its most common habitat association is in and around gopher tortoise burrows. The preferred habitat is dry but near enough to grassy ponds for breeding. The gopher frog feeds upon insects and toads. No habitat for the species currently exists on the site. Habitat loss and human disturbance are cause for this listing as a species of special concern (McDiarmid, 1978).

Gopher Tortoise (*Gopherus polyphemus*), a species of special concern in Florida, has large populations within the state of Florida. Species habitat includes dry, well drained soils covered with a variety of upland pine and oak species, as well as old field vegetation communities. Vegetation cover is usually a habitat requirement. Gopher tortoises feed on grasses, leaves, and other herbaceous matter. This species excavates long burrows for its own use. However, a variety of other species including the indigo snake (*Drymarchon coupari*) and gopher frog also use these burrows for shelter, although gopher tortoise burrows are not required. Potential habitat for the gopher tortoise would be found in open upland areas of the site. Areas with flat topography and a high wet season water table would limit burrowing habitat. Sandy soils versus soils with rock and solidified hard clays on the site will be preferred by the tortoise. The gopher tortoise has been recorded near the site area but not on the site (FNAI, 1996).

American Alligator (*Alligator mississippiensis*), federally classified as threatened through its similarity in appearance to the American crocodile (*Crocodylus acutus*), and a species of special concern in Florida, has populations existing throughout the state and over much of the southeastern United States coastal plain. This species is found in nearly all wetland and aquatic habitat types in Florida. Food for the alligator includes aquatic and wetland vertebrates and larger invertebrates (McDiarmid, 1978). Alligators are commonly observed in appropriate habitat in Wakulla County and have been observed in the on-site canals and treatment pond by plant personnel.

Florida Pine Snake (*Pituophis melanoleucus mugitus*) is found throughout most of northern and eastern Florida. It occupies sandy habitats such as longleaf pine and turkey oak communities. The pine snake feeds upon small mammals, birds, and other small vertebrates (Ashton and Ashton, 1988). Habitat loss is the primary reason for its population decline and listing as a species of special concern. No habitat for this species is currently on the site.

Eastern Indigo Snake (*Drymarchon corais couperi*), classified as threatened by Florida and the federal government, is generally found in Florida and southeastern Georgia. Species habitat includes dry sandy areas, as well as moist vegetation communities. The indigo snake frequently uses gopher tortoise burrows as shelter in xeric habitats, in part to avoid desiccation. Food for this species includes a wide range of small upland vertebrates including other snakes (McDiarmid, 1978). Potential habitat for the indigo snake occurs in the site area. No indigo snakes were observed at the site. The indigo snake has been observed in several areas of Wakulla County (FNAI, 1996).

Wood Stork (*Mycteria americana*) is considered endangered in Florida with nesting colonies occurring in South Carolina, southeastern Georgia, and Florida. Nesting and feeding occur in freshwater wetlands and brackish mangrove swamps. Food for this species includes small fish usually obtained from shallow water. Inland nesting is frequently in large cypress trees, while mangrove islands provide nesting habitat in estuarine and marine environments (Kale and Maehr, 1990). Shallow open water and isolated marsh lands represent potential feeding habitat for the wood stork, particularly under low water conditions when fish are concentrated. This habitat exists along ditches. No wood storks were observed feeding in these habitats on the site. No suitable freshwater swamp nesting habitat and minimal feeding habitat were found to occur at or near the site.

Southern Bald Eagle (*Haliaeetus leucocephalus*), considered threatened by the State of Florida and by the federal government, occurs throughout the state; however, nesting is concentrated in north central counties and along coastal portions of Charlotte, Lee, Collier, Monroe, and Dade Counties. Nesting usually occurs near feeding areas along shorelines and over shallow water bodies. Nests are solitary and are usually in tall pine or cypress trees often with good visibility over the surrounding countryside. Although fish are this species' primary food source, other vertebrate prey may be captured (Kale and Maehr, 1990). Feeding habitat for this species includes the St. Marks River. This species has been seen feeding at the St. Marks River near the site. The potential for nesting at the site is low.

Southeastern American Kestrel (*Falco sparverius paulus*), considered threatened by the State of Florida, is an open habitat bird preferring open pine forest and clearings with dead trees. However, it can also be found along the open edges of river bottoms, coastal regions, suburban areas, and even in large cities. Large insects are the primary food item with small rodents and reptiles also being important prey items. *Falco sparverius paulus* ranges from South Carolina south to southern Alabama and Florida with recent observations indicating that the Florida population is declining (Kale and Maehr, 1990). Minimal nesting habitat and some feeding habitat for this species occurs at the site. Kestrels were not observed at the site.

Osprey (*Pandion haliaetus*) occurs at and near rivers, lakes and wetlands throughout the state. The population in the Keys is listed as a species of special concern. It has received consideration here because of its protected status elsewhere in the state, its previous decline due to chlorinated insecticides, and its high position in the food chain. The osprey nests on tall structures near feeding areas or near the ground on islands with low predator populations (Kale and Maehr, 1990). The species feeds upon fish. No nesting by this species occurs on the site. The osprey has been observed feeding in the site area along the St. Marks River.

Florida Sandhill Crane (*Grus canadensis pratensis*) is classified as threatened in Florida and ranges from extreme southeastern Georgia (Okefenokee Swamp) southward through peninsular Florida, becoming scarce in Monroe and Dade Counties. The preferred habitat includes wet prairies, marshy lake margins, and low-lying improved cattle pastures. Nesting activity is related to water level with eggs hatching normally in March and April. Sandhill cranes feed on a wide range of plants. Besides eating various grains, they consume herbaceous foliage, underground stems, tubers, and roots. Invertebrates such as grasshoppers, beetles, caterpillars and snails along with certain amphibians and mammals make up the bulk of the animal portion of its diet (Kale and Maehr, 1990). Suitable feeding habitat exists in the on-site transmission line right-of-way and would likely be limited to herbaceous wetlands. No sandhill cranes were observed on the site.

Limpkin (*Aramus guarauna*), a species of special concern in Florida, can be found throughout peninsular Florida where they favor slow-moving freshwater rivers and streams, marshes and lake shores. Nesting in Florida probably occurs year-round and corresponds with the availability of foods. Various snails along with other freshwater mussels are the limpkin's primary foods. Lizards, insects, frogs, and worms are eaten in lesser amounts (Kale and Maehr, 1990). Limited limpkin feeding and nesting habitat was present at the site. This species was not observed on the site.

Little Blue Heron (*Egretta caerulea*), a Florida species of special concern, breeds along much of the Atlantic and Gulf coasts. In Florida, they range from the panhandle south to the Keys. Cypress (*Taxodium distichum*), southern willow (*Salix caroliniana*), and cabbage palm (*Sabal palmetto*) are among the more common trees used during the breeding season which, in Florida, spans the months of February to September. These three species occur in habitats ranging from fresh to saltwater. Little blue herons prefer to forage in freshwater habitats for the crustaceans, insects, small fish, frogs, and lizards which form the major portion of their diet (Kale and Maehr, 1990). The site contains suitable feeding habitat for the little blue heron in herbaceous and fringe wetlands. It was not observed at the site during site inspections but it was commonly observed in the site area.

Snowy Egret (*Egretta thula*), a Florida species of special concern, is typically restricted to coastal areas. It is found from Maine to Florida, along the Atlantic Coast, and to Texas along the Gulf. This small white egret nests in both inland and coastal colonies throughout peninsular Florida. The largest nesting colonies occur in coastal estuarine habitats often in association with tricolored heron. Woody plant species typically chosen for nest sites include willow, buttonbush, and wax myrtle stands. Small fish and various invertebrates are among the more common food items. The snowy egret has been observed feeding along the river shoreline at the site.

Tricolored Heron (*Egretta tricolor*), classified as a species of special concern in Florida, can be found along the entire Atlantic and Gulf coasts to include the Caribbean and West Indies to northern Brazil. In Florida, this large wader is most commonly found in estuarine colonies and occasionally in freshwater habitats. Willow, buttonbush, marsh elder, and wax myrtle are among the more common woody species used for nesting. Nesting may begin as early as February or as late as July (Kale and Maehr, 1990). Small fish are the primary food source while a variety of invertebrates are also consumed to a lesser extent. The tricolored heron has been observed feeding along the shoreline of the St. Marks River at the site.

Least Tern (*Sterna albifrons*) occurs in coastal areas throughout the state. Nesting colonies have occurred at widely scattered inland locations. Nesting generally occurs on open flat sandy areas. Feeding habitat includes aquatic areas where they feed upon small fish (Kale and Maehr, 1990). The St. Marks River in the vicinity of the site may be used sparingly by this species for feeding.

Habitat loss and human disturbance are the reasons for its listing as a threatened species. The least tern was not observed at the site.

Red-Cockaded Woodpecker (*Picoides borealis*), a species classified as endangered by the federal government and as threatened by Florida, has a range primarily restricted to coastal plain pine woods of the southeastern United States. In Florida, this bird is found throughout most of the state, south to the Homestead area. Historically, red-cockaded woodpecker cavities have been found in a variety of pine species. Trees chosen usually are advanced in age and infected by a fungus disease that softens their heartwood. Studies from different parts of the south found that the average cavity tree age ranged from 62 to 149 years in age with cavities rarely found in trees as young as 30 to 40 years (Lennartz and Henry, 1985). No habitat for the red-cockaded woodpecker is present at the site. No colonies were observed or are reported to exist at or near the site.

West Indian Manatee (*Trichechus manatus*), is listed by the both the State of Florida and the USFWS as endangered. This species occurs from coastal southeastern United States southward to Brazil. In Florida, the manatee is found naturally year-round in southern portions of the state and during the summer in the northern portion of the state as well. The manatee occupies a variety of marine, estuarine and fresh waters and is found in both turbid and clear water. Water depths of at least 3 feet are preferred. In coastal areas the manatee tends to travel in water up to 20 feet deep. It also tends to avoid swift currents. Manatees are primarily herbivorous and feed on seagrasses and their rhizomes, freshwater plants and plants along shorelines (Van Meter, 1987).

An active manatee watch program is in effect in Wakulla County. Observations of manatees are common in county waters during the summer months. Observations are published weekly to help boaters avoid or be alert for manatees in areas where they are likely to be present.

Manatees are regularly spotted in the area of the power plant during warm months and have been observed there during winter months. Plans are being formulated to discourage boaters from entering the Unit 7 discharge canal in order to provide a safe haven for manatees.

The northernmost warm water winter refuge for the manatee in the Gulf of Mexico is in the Citrus County area. Waters warmed or thermally moderated by power plant cooling water discharges and natural spring waters are the reasons for manatee use of this area (USFWS, 1996). The existing Purdom site discharge canal temperature range during the winter is 13° C to 17° C (Figure 2.3.4-19) . This compares to St. Marks River minimum water temperatures during the winter of 13° C (Figure 2.3.4-20).

Manatees that spend summers in northern Florida water may exhibit two migratory behavioral patterns. Most manatees that occupy this area during the summer migrate south to their traditional warm water refuges as winter approaches. A few manatees, however, may remain in the northern waters through the winter. These animals seem to be able to remember and find warm waters, including springs and thermal discharges. They leave warm water areas to feed and then return. During the winter they may travel many miles to feed, and may even resort to consuming undesirable food such as saltmarsh (*Spartina alterniflora*) (USFWS, 1997).

Freshwater springs are the dominant factor controlling the water temperature in the Wakulla River, while meteorological factors are the dominant factors for the St. Marks River. Wakulla

Springs discharges an average of 390 cfs (USGS, 1981) at temperatures no lower than 65° F (18.5° C). On a cold winter day, this water is expected to not cool below 62° F (16.8° C) by the time it reaches the confluence with the St. Marks River. Manatees having been observed in the Wakulla River during winter months by Foster Wheeler Environmental personnel. Thus, the Wakulla River is a natural attractant for manatees as well as a potential thermal refuge for them.

Florida Panther (*Felis concolor coryi*), is a species considered endangered by both the State of Florida and the USFWS. In Florida, this species is generally found in large undeveloped lands in the central parts of the state southward. It feeds primarily on large mammals, such as deer, rabbits, raccoons, etc. It may be diurnally active. The Florida panther has a large home range and may travel extensively, up to 25 miles, in a given night (Whitaker, 1980). The FNAI (1996) files show no records of the panther in the site region.

Florida Black Bear (*Ursus americanus floridanus*) has been recorded at scattered locations throughout the state. Records exist for the species occurring in Wakulla County. This species prefers dense vegetation cover and is omnivorous in its feeding habits. Habitat loss, hunting, and other human disturbance have contributed to the decline of populations of this species and its listing as threatened (Layne, 1978). Minimal habitat is present on or adjacent to the site for the bear. The bear occurs in the St. Marks National Wildlife Refuge east of the site (FNAI, 1996).

Sherman's Fox Squirrel (*Sciurus niger shermani*), a Florida species of special concern, prefers the longleaf pine-turkey oak vegetation association of the sandhills. Pine seeds and acorns along with a few insects are the primary food items (Layne, 1978). Suitable habitat does not exist on the site.

Game Animals and Furbearers

The site is relatively low in population levels of most game animals and furbearers. This condition is due to the relatively small size of the site, its location within the industrial use area of the City of St. Marks, relatively small habitat areas and the continued operation of the Purdom Station. It should be noted that no hunting has been allowed on the site.

Indicator and Endemic Vertebrate Species

No animal species endemic to Florida are likely to occur on the site. The following indicator species characteristic of a given habitat type may be present:

- Eastern Meadowlark - Rangeland and old field habitats
- Marsh Rice Rat - Herbaceous wetlands
- Southern Leopard Frog - Herbaceous wetlands
- Southern Cricket Frog - Ditches and herbaceous wetlands

Vertebrate Species Important to Local Ecological Systems

The importance of vertebrate species to ecological systems on the site is based upon roles species play in the local food chains and their ability to impact this energy flow by virtue of their numbers present. Seasonal shifts in faunal ecosystem roles can complicate site food chain characteristics. For example, breeding, migratory and wintering birds differ seasonally in their food requirements and use of site habitats. Additionally, during the dry season when many site wetland areas dry out for several months, these areas take on terrestrial characteristics. Consequently, habitat availability for species changes during the course of a year.

The following discussion of avian species important to local ecological systems focuses on winter and breeding season populations. During these periods of time, species populations are, at least in part, directly dependent on site habitats for food, cover and other life history requirements. During migratory seasons, avian populations have less of a dependence upon site resources. The combined ecological effects of migratory birds of all species likely influences populations of most site biota.

Birds significant to local ecological systems are generally those with larger population densities or those considered to be upper and top carnivore species. Upper and top carnivore species include raptors, shrikes, and large wading birds. For most of the smaller migratory bird species, dietary shifts occur in preparation for migration and winter occupation (when high energy content foods, such as grains, are required) and for nesting (when higher protein content foods are required for egg production and nestling growth). During the breeding season; therefore, many of these migratory species' position in the food chain will rise with more carnivorous diets and in the other seasons fall, at times when more herbivorous or graniverous diets are required.

Red-shouldered hawks would be observed more often in and near forested habitats. In open riverine systems, waterfowl, including ducks, coots, common moorhens, double-crested cormorants, brown pelicans, and anhingas would dominate the food chain systems at the upper trophic levels.

In wetlands and riverine habitats, river otters would likely be the most prominent mammals. Elsewhere, where there is adequate cover, the assortment of medium-sized mammals would occur. These include raccoons, opossum, armadillos, and bobcats. The white-tailed deer should also be present but in low numbers. In addition to the bobcat as a top carnivore, the gray and red fox could be present in adequate numbers to significantly influence the food chain. Other species which could be present include the eastern cottontail and marsh rabbits, and striped skunks. Small mammals which could be present include several rodents and shrews.

2.3.6.2 Pre-existing Stresses

Generally, stresses which would be expected at the site include the following categories:

- Effects of human activity
- Effects of previous site development
- Effects of site maintenance

Effects of Human Activity

Effects of human activity result from periodic movement of soils and machinery during maintenance and construction, and, in each case, degrades habitat value of the land. As noted, hunting and timber operations occur in the Aucilla Wildlife Management Area directly across the river from the site.

Effects of Previous Site Development

Effect of previous site development has included the addition of fill material to much of the site for purposes of site development. These activities date back to the early 1950s. Site development resulted in loss of natural habitat types.

Effects of Site Maintenance

The effect of site maintenance such as mowing and facility repair results in the control of ecological succession to protect the generation units and their associated facilities.

2.3.6.3 Measurement Program

Methods associated with aquatic ecology studies and terrestrial and wetlands ecological studies conducted at the site are described within Appendix 10.5.5.

2.3.6.4 References

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2.3.7 Meteorology and Ambient Air Quality

2.3.7.1 Meteorology

General Climatology

The climate in the vicinity of the Purdom Generating Station, approximately five air miles from the Gulf of Mexico, is mild and moist, characteristic of the Gulf Coast. The nearest National Weather Service "first-order" climatological station is located at the Tallahassee Regional Airport approximately 30 kilometers (km) (18 miles) northwest of the site. Data recorded at the Tallahassee Regional Airport should be representative of the conditions at the site since the terrain is fairly flat and the site is relatively close to the airport. However, since the Purdom Station is closer to the coast than Tallahassee, data from the Apalachicola Municipal Airport (about 90 km (55 miles) southwest in a coastal setting) are also presented.

Unlike Florida's southern peninsula, Tallahassee experiences four definitive seasons with considerable winter rainfall and diminished winter sunshine. The Tallahassee area climatic data summary based on the years 1951 to 1980 is shown in Table 2.3.7-1. Similar data from Apalachicola are presented in Table 2.3.7-2. Most climatological information presented in this section is taken from three publications by the U.S. Department of Commerce (1989, 1984, 1984a).

Winds

Wind speed is one of the important parameters in the dispersion of air emissions. Wind speeds below 2 meters/second (m/s) (4.5 miles per hour) are generally considered conducive to decreased air pollution dispersion. The mean wind speeds in the area exceed 5 mph in all 12 months at Tallahassee (Table 2.3.7-1) and 6 mph at Apalachicola (Table 2.3.7-2).

The prevailing wind directions are influenced locally by convectional forces. Consequently, seasonal wind directions tend to be from the north in fall and winter and from the south and east in spring and summer at Tallahassee. The pattern at Apalachicola is similar but with more of a southwesterly component in summer. The average annual wind speed is 6.4 mph at Tallahassee and 7.9 mph at Apalachicola. The average wind speed is typically lower than this value in the summer and higher in the winter. At Tallahassee, the maximum observed wind speed (one minute) recorded since 1959 was 58 mph from the north in August 1962. The highest gust of wind recorded since 1982 was 68 mph from the south in November 1985; it was associated with Hurricane Kate. High winds are infrequent and of short duration, usually associated with strong cold fronts in the late winter and early spring months and/or with tropical storms/hurricanes in the summer and fall.

The wind regime at the Purdom Station is undoubtedly similar to the Tallahassee and Apalachicola locations and is most probably characterized by directions and speeds in between those of the two locations where there are differences. Either location could be considered reasonably representative of the Purdom Station site. FDEP has requested that the Tallahassee

TABLE 2.3.7-1
TALLAHASSEE CLIMATOLOGICAL SUMMARY

NORMALS, MEANS, AND EXTREMES

TALLAHASSEE, FLORIDA

LATITUDE: 30°23'N LONGITUDE: 84°22'W ELEVATION: FT. GRND 55 BARO 58 TIME ZONE: EASTERN WBAN: 93805

	(a)	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	YEAR
TEMPERATURE °F:														
Normals														
-Daily Maximum		63.4	65.9	72.7	80.0	86.0	90.1	90.9	90.6	87.8	80.4	71.5	65.3	78.7
-Daily Minimum		39.9	41.2	47.7	54.0	62.0	68.8	71.5	71.6	68.8	56.4	46.0	40.7	55.7
-Monthly		51.6	53.6	60.2	67.1	74.0	79.5	81.2	81.1	78.3	68.4	58.8	53.0	67.2
Extremes														
-Record Highest	28	82	85	90	95	98	103	103	102	99	94	88	84	103
-Year		1972	1962	1967	1968	1962	1985	1980	1986	1962	1986	1961	1971	JUN 1985
-Record Lowest	28	6	14	20	29	34	46	57	61	40	30	13	10	6
-Year		1985	1971	1986	1987	1971	1984	1967	1986	1967	1973	1970	1962	JAN 1985
NORMAL DEGREE DAYS:														
Heating (base 65°F)		441	341	191	48	0	0	0	0	0	38	210	383	1652
Cooling (base 65°F)		25	22	42	111	279	435	502	499	399	143	24	11	2492
% OF POSSIBLE SUNSHINE														
MEAN SKY COVER (tenths)														
Sunrise - Sunset	27	6.2	5.9	5.9	5.2	5.5	5.9	6.4	6.1	5.9	4.6	5.2	5.9	5.7
MEAN NUMBER OF DAYS:														
Sunrise to Sunset														
-Clear	27	8.8	8.4	8.9	10.3	8.7	5.7	3.6	4.7	7.2	13.8	10.8	9.1	100.0
-Partly Cloudy	27	7.0	7.3	8.8	10.4	12.8	14.4	16.7	16.1	12.1	8.0	8.5	7.9	129.9
-Cloudy	27	15.1	12.5	13.3	9.3	9.6	9.9	10.7	10.2	10.7	9.3	10.7	13.9	135.3
Precipitation														
.01 inches or more	27	9.9	9.1	8.9	6.4	8.4	12.1	16.6	14.9	9.4	4.9	6.9	8.3	115.8
Snow, Ice pellets														
1.0 inches or more	27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Thunderstorms	27	1.6	2.3	4.0	3.4	7.9	13.0	19.6	16.7	8.3	2.0	1.6	1.7	82.2
Heavy Fog Visibility														
1/4 mile or less	27	6.9	5.2	5.8	4.9	4.7	2.8	2.3	1.8	1.7	2.7	5.1	6.2	50.0
Temperature °F														
-Maximum														
90° and above	27	0.0	0.0	0.*	1.5	7.5	19.2	22.6	21.4	14.4	1.6	0.0	0.0	88
32° and below	27	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.*	0.1
-Minimum														
32° and below	27	11.7	8.4	3.4	0.2	0.0	0.0	0.0	0.0	0.0	0.2	4.1	9.6	37.6
0° and below	27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AVG. STATION PRESS. (mb)	16	1018.4	1017.1	1015.2	1014.6	1013.2	1013.8	1015.0	1014.7	1014.1	1016.1	1017.1	1018.7	1015.7
RELATIVE HUMIDITY (%)														
Hour 01	27	85	84	86	88	89	90	93	93	91	88	88	87	89
Hour 07 (Local Time)	27	86	87	89	91	91	91	94	95	94	91	90	88	91
Hour 13	27	58	54	52	47	50	55	61	62	59	52	55	57	55
Hour 19	27	72	64	60	56	60	67	74	76	75	72	77	77	69
PRECIPITATION (inches):														
Water Equivalent														
-Normal		4.66	5.00	5.60	4.13	5.16	6.55	8.75	7.30	6.45	3.10	3.31	4.58	64.59
-Maximum Monthly	28	11.68	11.50	13.57	13.13	11.66	12.62	20.12	15.73	15.92	11.79	10.44	12.65	20.12
-Year		1975	1964	1973	1973	1976	1965	1964	1977	1969	1976	1976	1964	JUL 1964
-Minimum Monthly	28	0.40	1.21	1.29	0.39	T	2.09	2.35	2.45	0.11	T	0.88	0.89	T
-Year		1969	1976	1967	1986	1965	1977	1983	1983	1972	1987	1971	1980	OCT 1987
-Maximum in 24 hrs	28	3.75	6.04	7.16	4.73	4.50	6.75	8.94	3.70	9.47	5.95	4.98	9.26	9.47
-Year		1976	1991	1962	1964	1979	1966	1964	1987	1969	1964	1976	1964	SEP 1969
Snow, Ice pellets														
-Maximum Monthly	28	T	0.4	T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	T	0.4
-Year		1985	1973	1980									1976	FEB 1973
-Maximum in 24 hrs	28	T	0.4	T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	T	0.4
-Year		1985	1973	1980									1976	FEB 1973
WIND:														
Mean Speed (mph)	27	7.0	7.4	7.7	7.0	6.3	5.9	5.2	5.1	6.0	6.3	6.2	6.4	6.4
Prevailing Direction through 1963		N	S	S	S	E	S	SW	E	ENE	N	N	N	N
Fastest Obs. 1 Min.														
-Direction (!!)	29	23	09	27	27	29	03	23	02	36	34	16	15	02
-Speed (MPH)	29	46	40	48	35	40	44	36	58	44	30	40	32	58
-Year		1963	1969	1964	1961	1961	1966	1963	1962	1963	1961	1985	1969	AUG 1962
Peak Gust														
-Direction (!!)	5	S	S	S	N	S	SE	E	S	E	SE	S	NW	S
-Speed (mph)	5	33	51	47	35	41	47	43	39	44	31	68	29	68
-Date		1987	1984	1984	1987	1984	1987	1986	1986	1985	1986	1985	1984	NOV 1985

(a) Period of record 30 years (1951-1980) unless a shorter period is indicated.
Source: U.S. Department of Commerce, 1989

TABLE 2.3.7-2
APALACHICOLA CLIMATOLOGICAL SUMMARY

NORMALS, MEANS, AND EXTREMES

APALACHICOLA, FLORIDA

LATITUDE: 29°44'N LONGITUDE: 85°02' W ELEVATION: FT. GRND 19 BARO 22 TIME ZONE: EASTERN WBAN: 12832

	(a)	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	YEAR
TEMPERATURE °F:														
Normals														
-Daily Maximum		60.5	62.4	68.0	75.1	81.7	86.6	88.0	88.0	85.3	78.2	69.2	63.0	75.5
-Daily Minimum		45.1	46.9	53.4	60.7	67.3	72.9	75.0	74.7	72.3	62.1	52.7	47.0	60.8
-Monthly		52.8	54.7	60.7	67.9	74.5	79.8	81.5	81.4	78.9	70.2	61.0	55.0	68.2
Extremes														
-Record Highest	59	79	80	85	90	98	101	102	99	96	93	87	82	102
-Year		1957	1957	1982	1967	1986	1930	1932	1986	1932	1941	1935	1931	JUL 1932
-Record Lowest	59	9	21	22	36	47	48	63	62	50	39	24	13	9
-Year		1985	1951	1980	1987	1981	1984	1981	1986	1967	1977	1950	1962	JAN 1985
NORMAL DEGREE DAYS:														
Heating (base 65°F)		401	311	168	30	0	0	0	0	0	24	154	320	1408
Cooling (base 65°F)		23	23	35	117	295	444	512	508	417	185	34	10	2603
% OF POSSIBLE SUNSHINE	53	59	62	65	74	78	71	64	64	65	74	67	57	67
MEAN SKY COVER (tenths)														
Sunrise - Sunset	55	5.7	5.6	5.6	4.8	4.6	5.3	6.1	5.9	5.6	4.0	4.6	5.7	5.3
MEAN NUMBER OF DAYS:														
Sunrise to Sunset														
-Clear	58	10.2	9.7	10.7	12.5	12.9	9.1	6.5	7.2	9.7	16.2	13.4	10.0	128.1
-Partly Cloudy	58	7.7	6.8	8.3	8.7	10.4	13.0	13.1	13.0	9.7	7.6	7.6	7.7	113.4
-Cloudy	58	4.6	11.8	12.1	8.8	7.7	7.9	11.5	10.8	10.5	7.3	9.0	13.3	115.2
Precipitation														
.01 inches or more	59	8.9	8.6	7.9	5.6	5.4	9.6	14.6	13.7	11.2	5.4	6.3	8.1	105.3
Snow, Ice pellets														
1.0 inches or more	59	0.0	0.*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*
Thunderstorms	55	1.6	2.4	3.8	3.4	4.9	9.8	16.3	15.7	9.8	1.7	1.5	1.6	72.4
Heavy Fog Visibility														
1/4 mile or less	55	6.2	4.6	5.4	2.5	0.9	0.3	0.1	0.1	0.1	0.6	2.1	4.3	27.2
Temperature °F														
-Maximum														
90° and above	59	0.0	0.0	0.0	0.*	0.6	5.5	7.9	7.5	3.2	0.1	0.0	0.0	25.0
32° and below	59	0.*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.*	*
-Minimum														
32° and below	59	3.2	1.5	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	1.7	6.9
0° and below	59	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AVG. STATION PRESS. (mb)	13	1020.2	1019.0	1017.2	1016.3	1015.2	1015.9	1017.0	1016.4	1015.7	1017.4	1018.6	1020.5	1017.4
RELATIVE HUMIDITY (%)														
Hour 01	34	83	83	86	86	86	86	87	88	86	83	83	84	85
Hour 07 (Local Time)	38	85	86	86	86	84	85	86	88	88	86	85	86	86
Hour 13	34	66	65	65	64	64	67	71	76	69	62	64	67	67
Hour 19	38	78	77	76	73	72	74	76	77	78	76	78	78	76
PRECIPITATION (inches):														
Water Equivalent														
-Normal		3.51	3.64	4.04	3.25	2.94	4.81	7.09	7.53	8.66	3.19	2.82	3.50	54.98
-Maximum Monthly	59	8.25	9.19	14.33	12.14	8.70	18.32	18.07	21.08	22.55	12.09	9.00	9.68	22.55
-Year		1964	1960	1959	1983	1974	1965	1984	1970	1946	1959	1947	1986	SEP 1946
-Minimum Monthly	59	0.04	0.38	0.71	0.09	0.25	0.30	0.75	1.85	0.60	0.01	0.04	0.30	0.01
-Year		1957	1938	1939	1942	1983	1977	1976	1951	1972	1935	1931	1955	OCT 1935
-Maximum in 24 hrs	59	3.91	7.12	8.17	7.76	7.07	5.34	6.75	5.93	11.71	6.32	5.84	4.15	11.71
-Year		1985	1988	1948	1964	1959	1949	1975	1986	1932	1965	1930	1931	SEP 1932
Snow, Ice pellets														
-Maximum Monthly	59	0.4	1.2	T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	T	1.2
-Year		1977	1958	1980									1988	FEB 1958
-Maximum in 24 hrs	59	0.4	1.2	T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	T	1.2
-Year		1977	1958	1980									1988	FEB 1958
WIND:														
Mean Speed (mph)	40	8.3	8.7	8.9	8.6	7.7	7.2	6.4	6.5	7.9	8.0	8.0	8.0	7.9
Prevailing Direction through 1956		N	N	SE	SE	SE	SW	W	SW	NE	NE	N	N	N
Fastest Mile														
-Direction (!!)	47	E	E	E	SE	SE	E	N	NE	E	NW	SE	SE	E
-Speed (MPH)	47	48	42	54	51	47	55	63	59	67	56	47	42	67
-Year		1960	1969	1931	1933	1937	1972	1930	1939	1947	1941	1948	1945	SEP 1947
Peak Gust														
-Direction (!!)	3	N	W	NE	W	NW	NW	S	E	SE	SE	SW	E	SW
-Speed (mph)	3	41	46	40	43	39	38	41	68	68	44	85	47	85
-Date		1987	1986	1988	1988	1985	1986	1988	1985	1985	1985	1985	1986	NOV 1985

(a) Period of record 30 years (1951-1980) unless a shorter period is indicated.
Source: U.S. Department of Commerce, 1989

Regional Airport data for the years 1985 through 1989 be used for the dispersion modelling which supports the air impact assessment. Therefore, it is the Tallahassee wind data which are used to characterize the site. Additional Tallahassee wind information is depicted in the wind rose for 1985 through 1989 on Figure 2.3.7-1 and for the four seasons for that same period on Figure 2.3.7-2. A wind rose for a longer period of record (1948 through 1990) presented in the Plan of Study (COT, 1996) exhibited less dominance of the northerly component and more winds from the east than the wind rose on Figure 2.3.7-1. However, the wind instruments were moved in 1961 from Dale Mabry Field to the current location, which likely accounts for the differences.

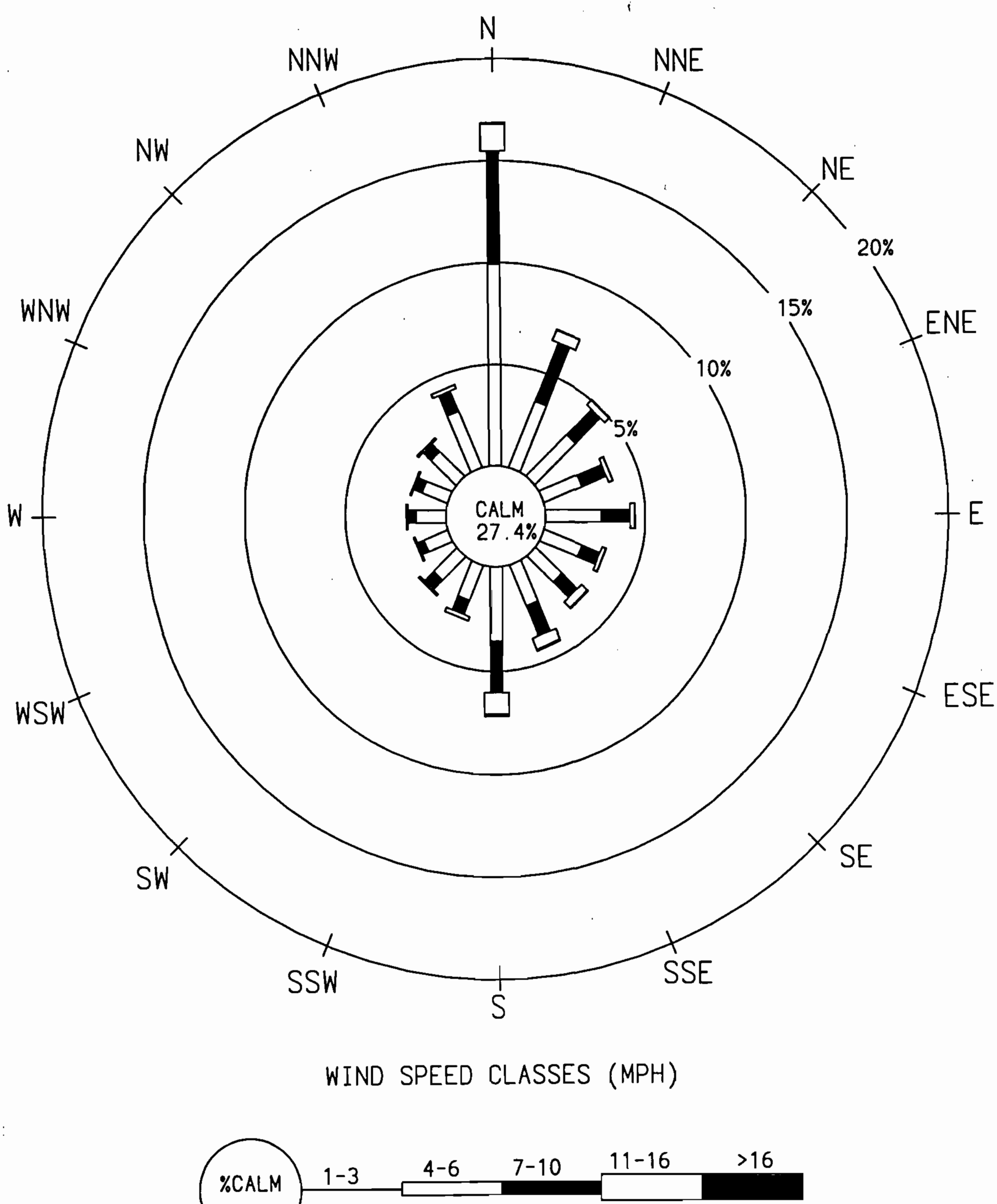
Atmospheric Stability

Another important factor in determining the impact of an emission source on air quality is the stability of the atmosphere. The American Society of Mechanical Engineers (ASME, 1968) defined the stability of the atmosphere as its "tendency to resist or enhance vertical motion, or alternatively to suppress or augment existing turbulence." Stability is related to both wind shear and vertical temperature structure, but it is generally the latter which is used as an indicator of the condition. The atmospheric dispersion models used to predict the impacts of the Project on air quality use atmospheric stability class as one of the key meteorological input parameters (along with wind speed, wind direction, and mixing height). The dispersion models are described briefly in Section 5.6 of the SCA, and additional information on them may be found in Appendix 10.6.6.

A system for classification of stability was developed by Pasquill (1961), who defined stability categories in terms of statistical plume spread in the horizontal and vertical directions. This technique permits the estimation of dispersion without direct measurement of turbulence. A revised stability classification system divides stability into Classes A (least stable) through F (most stable) and is commonly used today (Gifford, 1961). The stability categories are described along with typical plume behavior in Table 2.3.7-3. A summary of the joint frequency of occurrence of wind speed and wind direction categories according to stability class based on meteorological data for the Tallahassee Regional Airport for the period 1985 through 1989 is contained in Appendix 10.5.6.1. This is referred to as STAR (STability ARray) program data.

Mixing Height

An important parameter which describes the regional dispersion capability of the atmosphere is mixing height. Mixing height is simply the vertical extent of the surface layer within which relatively vigorous mixing of pollutants takes place. Holzworth (1972) has compiled statistical summaries for mixing height at various locations throughout the United States based on twice daily radiosonde measurements. The abundance of moisture from the ocean around Florida creates high humidities and low-level cloudiness that absorb heat, inhibit nighttime radiational cooling, and generally prevent the nighttime/early morning mixing height from subsiding below 400 meters. Because mixing heights are dependent upon surface temperatures, afternoon levels reach above 1,300 meters under intense solar insolation except in winter. Lesser diurnal mixing height fluctuations occur at coastal stations in Florida, as compared to inland locations, due primarily to moderating effects of the ocean and Gulf.



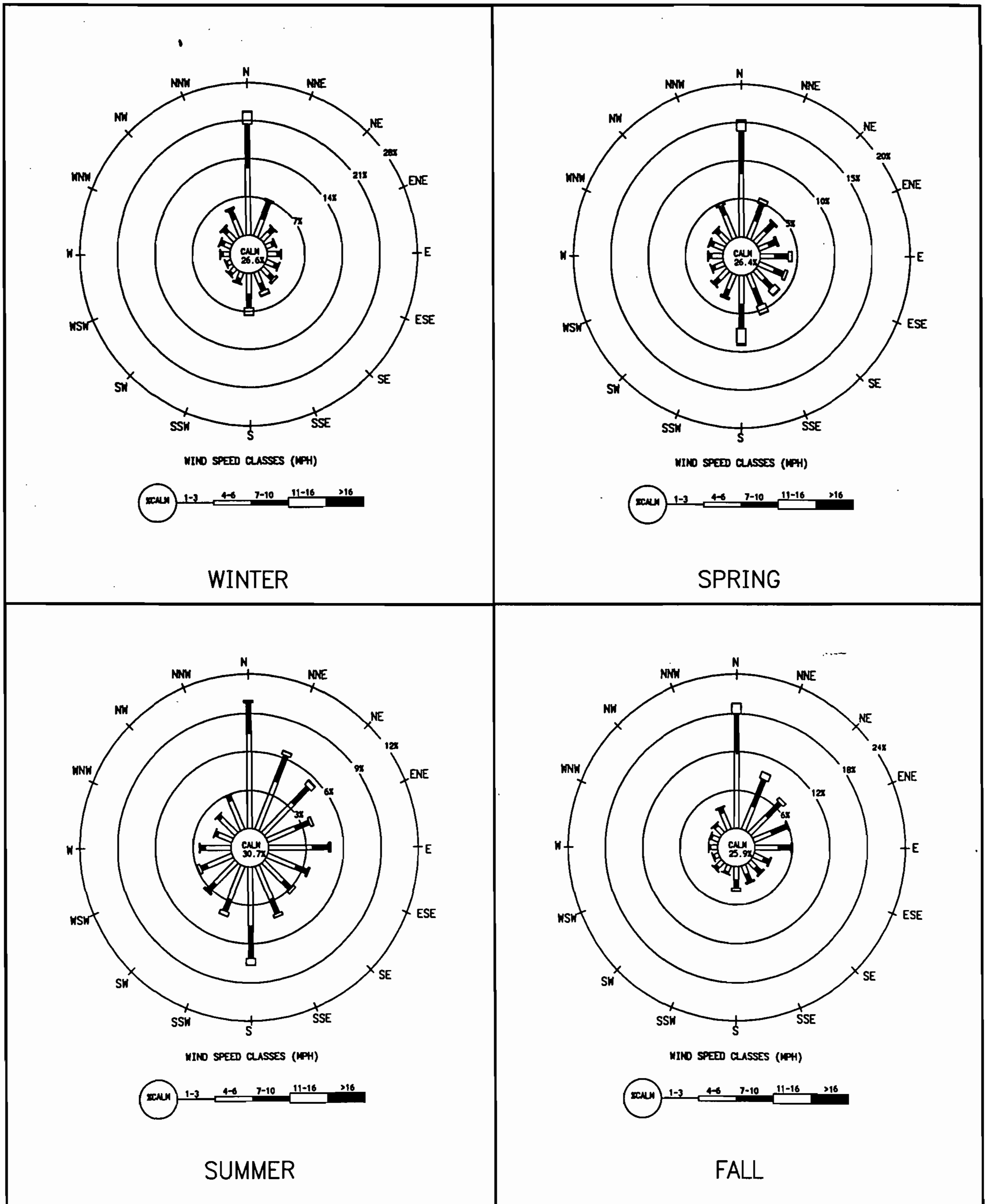
SOURCE: U.S. DEPARTMENT OF COMMERCE, 1993

PLOT DATE JAN 21, 1997 C:\15840002\---\00000-14.DWG

CITY OF TALLAHASSEE

WIND ROSE
TALLAHASSEE REGIONAL AIRPORT
(1985-89)
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.7-1



SOURCE: U.S. DEPARTMENT OF COMMERCE, 1993

CITY OF TALLAHASSEE

SEASONAL WIND ROSES
TALLAHASSEE REGIONAL AIRPORT
(1985-89)
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.7-2

PLOT DATE JAN 21, 1997 C:\15840002\---\00000-19.DWG

<table>
<tr><th colspan="3">TABLE 2.3.7-3
AIR EMISSION SOURCE PLUME BEHAVIOR</th></tr>
<tr><th>Stability Class</th><th>Description</th><th>Plume Behavior</th></tr>
<tr><td>A - Extremely Unstable</td><td>This classification is associated with conditions of low surface wind speeds and strong solar radiation.</td><td rowspan="3">There are rapid changes in wind direction with time. Surface heating has eliminated all temperature inversions near the ground. Wind speeds are generallly less than 4.9 m/s. Rapidly rising parcels of warm air from near the Earth's surface are replaced by equal amounts of air moving downward nearby. A plume is carried with this "looping" motion. It is typical that cumulus clouds will be seen above terrain. Highly cumulus clouds will be seen above terrain. Highly transitory maxima in ground-level concentration relatively near the source occur with this category.</td></tr>
<tr><td>B - Moderately Unstable</td><td>This stability class is most common when the wind speeds are slightly higher (1.8 to 2.7 m/s) and the solar radiation is still strong.</td></tr>
<tr><td>C - Slightly Unstable</td><td>This category is typified by wind speeds from 3.1 to 4.5 m/s with moderate to strong radiation or lower wind speeds coupled with slight radiation.</td></tr>
<tr><td>D - Neutral</td><td>Conditions which produce this class of stability are fairly high wind speeds during a period of slight solar radiation or at night.</td><td>This classification includes most cases with winds stronger than 5.4 m/s. Duration is two hours or more. The vertical temperature profile is near the adiabatic lapse rate. A plume is dispersed rapidly with a "coning" motion.</td></tr>
<tr><td>E - Slightly Stable</td><td>This classification is associated with wind speeds from 1.8 to 2.7 m/s at night.</td><td rowspan="2">Coolest air is located at the Earth's surface and stack plumes move horizontally at effective stack height. Almost no pollution can be measured at the ground.</td></tr>
<tr><td>F - Moderately Stable</td><td>This class of stability is found at night when wind speed is even lower than in Class E.</td></tr>
<tr><td>Transition</td><td>Conditions which change in a relatively short period of time from stable to neutral or unstable.</td><td>A portion of the plume will experience limited mixing prior to complete linkage of surface airflow to synoptic airflow, which is controlled by pressure pattern winds.</td></tr>
<tr><td colspan="3">Source: Gifford, 1961</td></tr>
</table>

The seasonal annual average mixing heights for the period 1960 to 1964 as observed at Jacksonville International Airport is presented in Table 2.3.7-4. The Jacksonville upper air station is the closest location analyzed and should be considered regionally representative of the area. Holzworth's (1972) comparison of morning and afternoon mixing heights based on data for 62 locations throughout the United States is shown on Figures 2.3.7-3 and 2.3.7-4. These data indicate that the site area experiences mixing heights that are typical of or higher than large areas of the eastern half of the United States. This information combined with wind speed was used by Holzworth (1974) to rank these 62 locations in order from lowest to highest dilutions (defined as mixing height times wind speed). For all episode lengths considered, Jacksonville ranked in the top 20 percent. It may be assumed that the site area experiences better than average dispersion conditions, especially since the Jacksonville station is also coastal.

TABLE 2.3.7-4
MEAN DIURNAL MIXING HEIGHTS
JACKSONVILLE, FLORIDA

Season	Morning	Afternoon
Winter	403	1,104
Spring	477	1,667
Summer	583	1,712
Fall	458	1,342
Annual Average	480	1,456

Note: Mixing heights are in meters
Period of Record: 1960-1964
Source: Holzworth, 1972

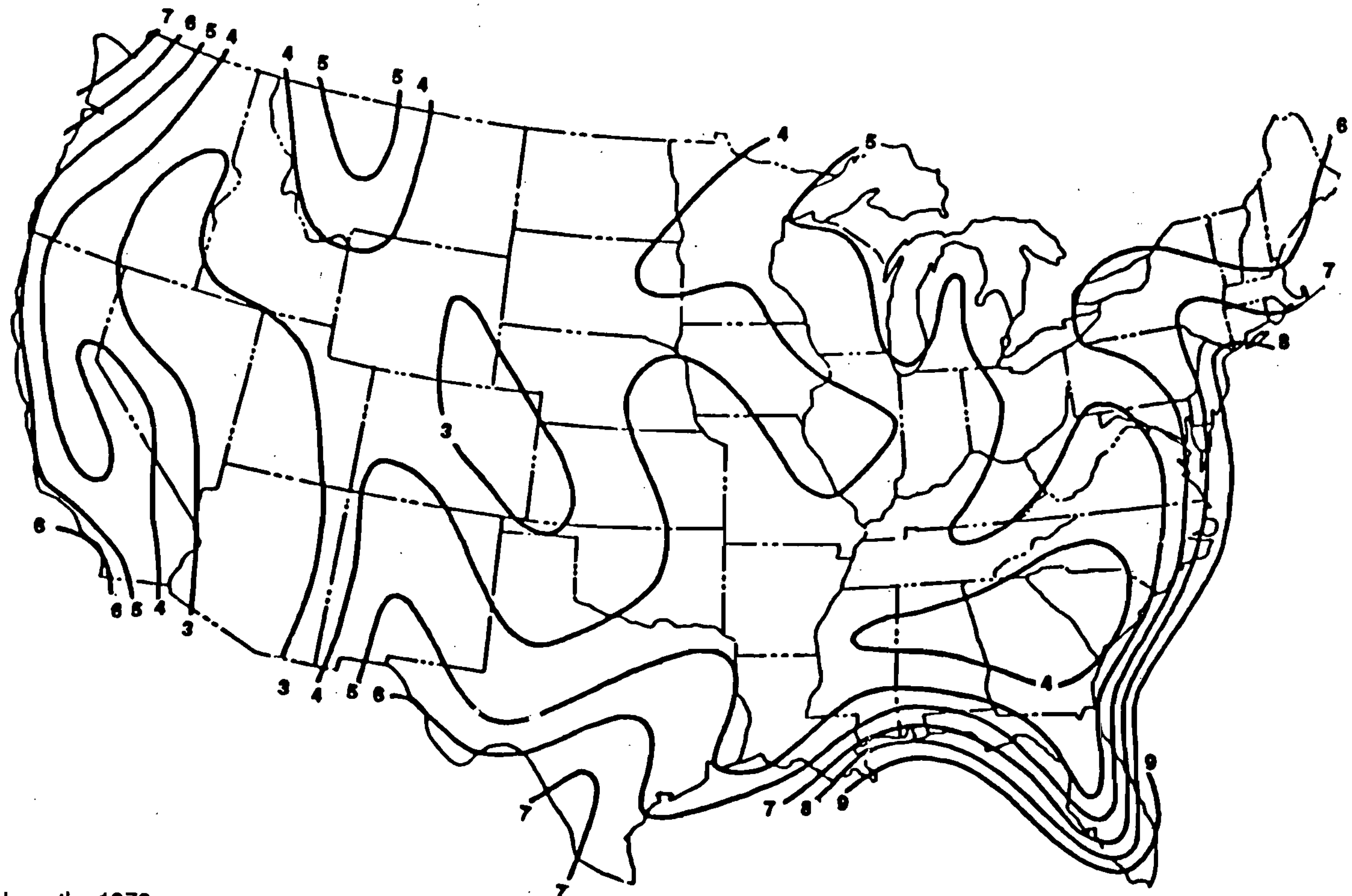
Precipitation

The average annual precipitation in Tallahassee is 64.6 inches based on the 1951 through 1980 period of record. July is the wettest month followed by August, June, and September. The driest months are October and November. Thunderstorms typically occur every other day during the summer. Snow may occur in the winter but it is very infrequent. The highest annual amount of precipitation recorded since 1894 was 104 inches in 1964. Measurable precipitation (24-hour precipitation exceeding 0.01 inch water equivalent) occurs approximately 116 days per year. Precipitation in Apalachicola is somewhat less than in Tallahassee, with an annual average of 55.0 inches based on the 1951 through 1980 period of record.

Temperature

The average annual temperature for Tallahassee is 67° F. Freezing temperatures at the airport average 38 occurrences each winter. Sub-zero temperatures are rarely recorded; however, the lowest recorded temperature for Florida is -2° F and occurred in Tallahassee on February 13, 1899. Although the Tallahassee Regional Airport may report anomalously cold temperatures on clear, calm nights (Elsner et al., 1996), its temperature data are considered reasonably representative of St. Marks. On average, temperatures in Apalachicola are about 1° F warmer than in Tallahassee; Tallahassee's highs are typically 3 to 4° F warmer and its lows typically 5° F lower than Apalachicola's. Occurrences of temperatures of 90° F or higher average 88 days per year. Temperatures occasionally reach 100° F. The highest temperature recorded in Tallahassee was 104° F in June 1933.

PLOT DATE JAN 23, 1997 C:\15840002\----\00000-13.DWG



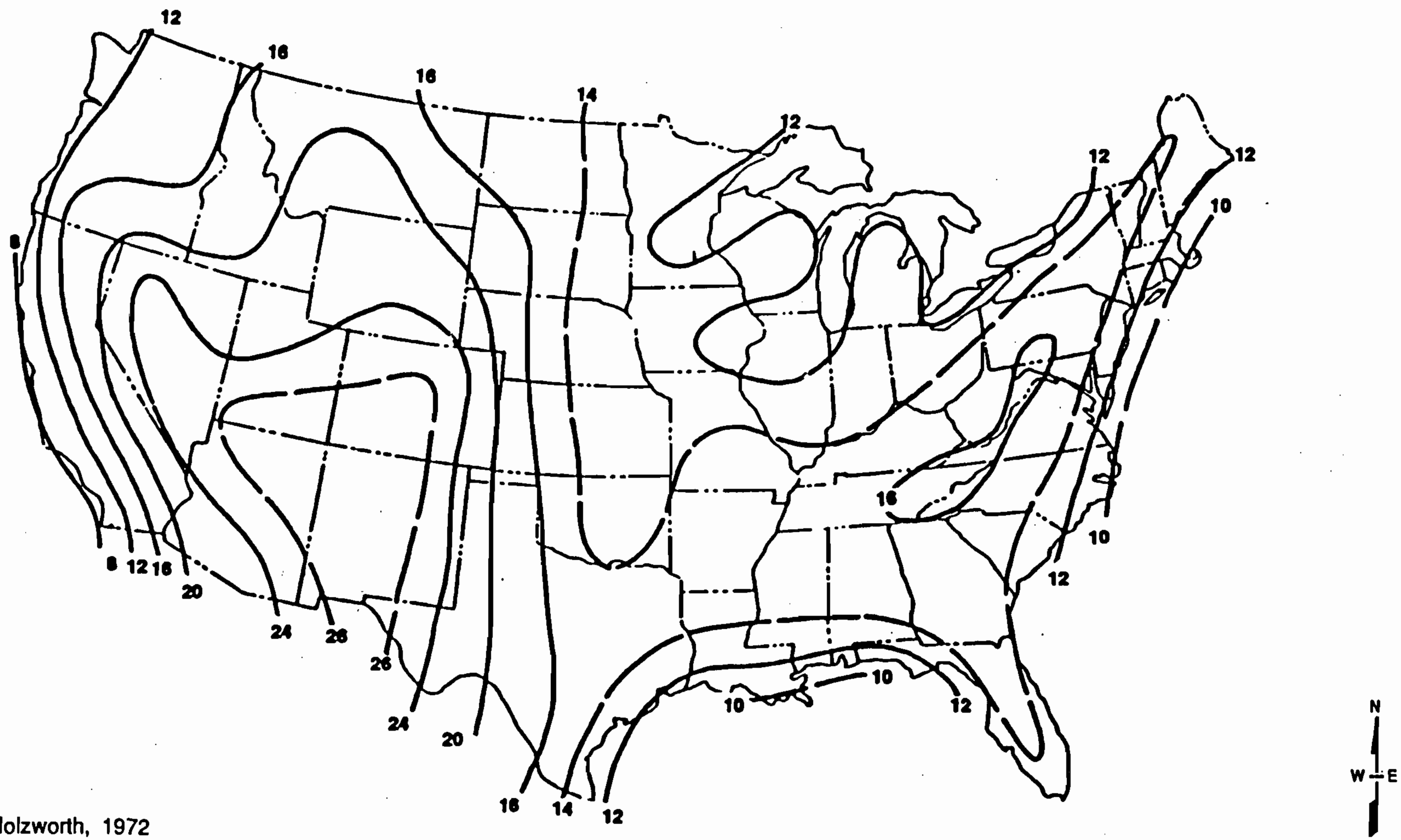
Source: Holzworth, 1972

CITY OF TALLAHASSEE

ISOPLETHS (mX10^2) OF MEAN
ANNUAL MORNING MIXING HEIGHTS

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure
2.3.7-3



Source: Holzworth, 1972

CITY OF TALLAHASSEE

ISOPLETHS (mX10^2) OF MEAN
ANNUAL AFTERNOON MIXING HEIGHTS

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.7-4

Relative Humidity

Relative humidity is the amount of water vapor in the air compared to the maximum water vapor the air will hold at a given temperature. Relative humidity in Tallahassee typically ranges from 50 to 75 percent during the afternoon hours to 85 to 95 percent during the night and early morning hours. Relative humidities in Apalachicola are generally somewhat lower than in Tallahassee in the night and early morning hours and somewhat higher in the afternoon.

Fog

Fog, by definition, reduces visibility below one kilometer (0.62 mile). Fog frequency is generally related to the microclimate (Huschke, 1970) and cannot be assumed to be the same for locations separated by even a few kilometers. Heavy fog (visibility less than or equal to 0.4 km or 0.25 mile) occurs about 50 days a year in the Tallahassee area and is usually confined to the night and early morning hours in the late fall, winter, and early spring. These fogs usually dissipate soon after sunrise. In Apalachicola, heavy fog occurs about 27 days per year.

Severe Weather

Thunderstorms occur on an average of more than 80 days per year. In June, July, and August, thunderstorms occur on an average of 16 days per month. Thunderstorms are rare during the winter.

Though annual rainfall amounts are relatively large, droughts of short duration are rather common. Prolonged dry periods are occasionally experienced and can lead to lowered water tables and lake levels, affecting the ecological communities dependent on these lakes. Droughts also may increase fire danger in the nearby forests.

Tornadoes, funnel clouds, and water spouts may occur statewide, and 10 to 15 are sighted each year. They are most frequent in the spring, but may occur in any season. Occasionally, waterspouts come inland, but usually dissipate after reaching land. Damage in Florida from tornadoes has historically not been extensive.

While other parts of the state are severely buffeted by hurricanes, the St. Marks area has a likelihood of a hurricane occurrence about once every 17 years. Fringe effects from tropical storms (wind speeds in excess of 40 mph) are felt about once every 5 years. According to a U.S. Department of Commerce (1971) publication, the probability of a tropical storm making landfall in a 50-mile segment of the coastline including the Apalachee Bay in any given year is 19 percent. The probability of a hurricane (wind speeds in excess of 74 mph) making landfall in this area is 7 percent and the probability of a "great hurricane" (i.e., sustained winds greater than 125 mph) is less than 1 percent.

Distributions of extreme winds (including the effects of hurricanes and other storms) have been computed by H.C.S. Thom (1968) for the United States. Based on Thom's estimates, the extreme fastest mile of wind (the same as the fastest 1 minute value at 60 mph) at 30 feet above ground level is about 60 mph for a 10-year recurrence interval, 70 mph for a 25-year recurrence interval, 80 mph for a 50-year recurrence interval, and 90 mph for a 100-year recurrence interval.

Maximum probable rainfall amounts have been computed by the Weather Bureau (Hershfield, 1961; Miller, 1964) for various durations and recurrence intervals for the contiguous United States. These estimates are presented in Table 2.3.7-5 for the St. Marks area.

TABLE 2.3.7-5
ESTIMATED MAXIMUM EXPECTED PRECIPITATION (INCHES) FOR THE ST. MARKS AREA

	Recurrence Interval (Years)					
Duration	1 Year	5 Years	10 Years	25 Years	50 Years	100 Years
30 minutes	1.5	2.1	2.4	2.7	3.0	3.3
1 hour	2.0	2.7	3.1	3.4	3.8	4.1
6 hours	3.0	4.7	5.5	6.5	7.0	8.0
12 hours	3.5	5.7	6.5	7.5	8.8	9.7
24 hours	4.2	6.7	7.9	9.0	10.0	11.5
2 days	N/A	7.5	8.5	10.0	11.5	13.0
10 days	N/A	11.0	13.0	15.0	17.0	18.0

Note: Values are interpolated and are not intended to be exact.
N/A - No calculations performed for these periods/recurrence intervals.

Source: Hershfield, 1961; Miller, 1964

Sunshine and Cloudiness

Statewide measurements indicate the sun shines about two-thirds of the possible sunlight hours during the year. Since 1959, the mean number of days which were clear from sunrise to sunset in Tallahassee is 100 per year. The number of days which were cloudy is approximately 135 per year. The remaining days were partly cloudy. In Apalachicola, there was more sunshine, with 128 clear, 115 cloudy, and 113 partly cloudy days per year, on average.

2.3.7.2 Ambient Air Quality

Regional Air Quality Data

The Purdom Station is located in an area that FDEP currently classifies as attainment for all criteria pollutants (Rule 62-204.210, F.A.C.). Wakulla County is an “attainment” or “unclassifiable/attainment” area for all National and Florida Ambient Air Quality Standards (NAAQS/FAAQS). Attainment is achieved when the maximum concentration of a pollutant for a specified averaging time does not exceed the NAAQS/FAAQS. The FAAQS are the same as the NAAQS except for SO_2, for which the Florida standard is more stringent than the national standard. The “unclassifiable/attainment” designation means that no data exist which would indicate that the area is not in compliance with the standards. Other areas of the country are classified as “non-attainment” for specific pollutants. However, there are no such areas within Wakulla County or the surrounding counties.

Most of Wakulla County is designated as Class II from a Prevention of Significant Deterioration (PSD) standpoint. The nearest Class I areas are the St. Marks National Wilderness Area, located approximately 0.6 km (0.4 mile) to the south of the site and the Bradwell Bay National Wilderness Area, located approximately 29 km (18 miles) to the west.

Ambient air monitoring data are available to characterize the existing conditions in the vicinity of the site. A map depicting the locations of selected ambient air quality monitoring sites is presented on Figure 2.3.7-5. The FDEP data from these monitors for 1995 (primarily) are summarized in Table 2.3.7-6. Data were obtained from FDEP (1995, 1996) and from EPA (1996, 1996a).

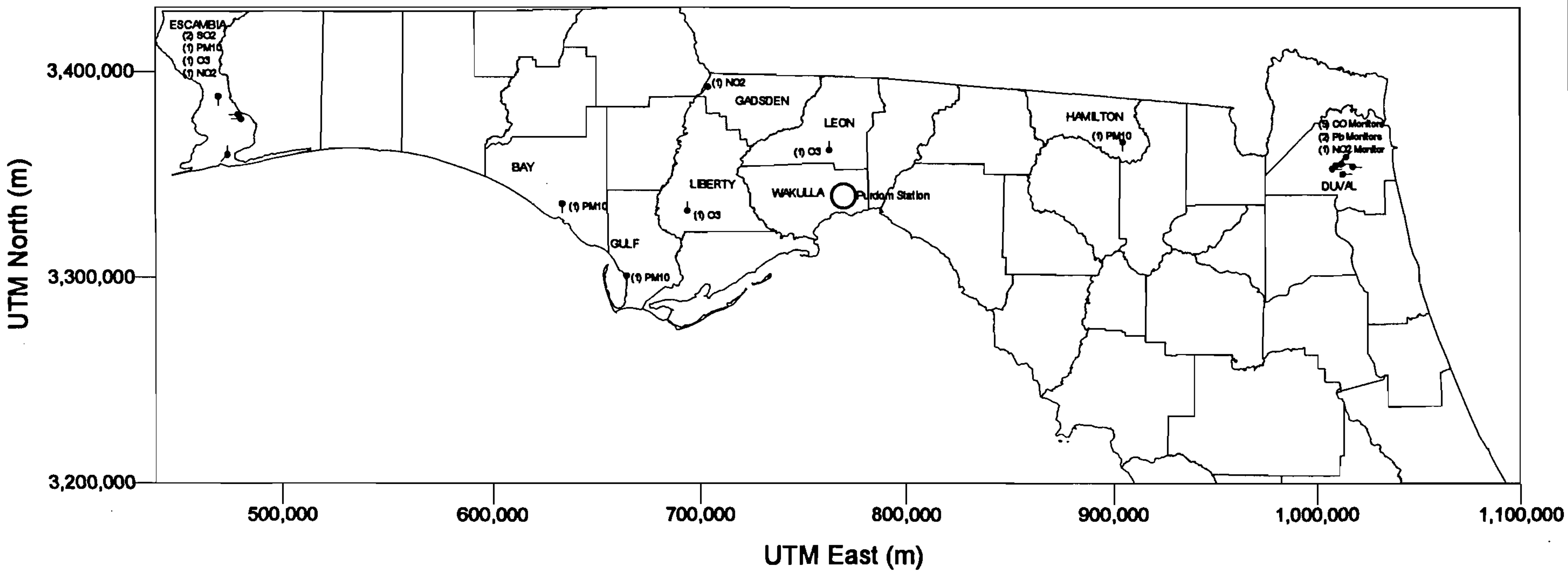
Ozone is monitored in neighboring Leon County, the most urban county of the region. Thus, Leon County data may be considered to overpredict ozone levels for the Project location. The NAAQS and FAAQS for ozone (O_3) is 0.12 parts per million (ppm) (235 micrograms per cubic meter ($\mu g/m^3$)). This is a daily maximum 1-hour concentration, which is not to be exceeded an average of more than 1 day per year, according to Rule 62-204.240(4), F.A.C. In 1995, the second highest 1-hour value observed in Leon County was approximately 80 percent of the standard at 0.096 ppm (188 $\mu g/m^3$). Data available for previous years show similar concentrations. An O_3 monitor in Escambia County, about 170 miles west of the site, had a 1995 second high concentration equal to the standard. Additional O_3 data are available from a closer station in Sumatra, in Liberty County, Florida, a distance of 45 miles from the site (EPA, 1996a). These data indicate a second high 1-hour value of 166 $\mu g/m^3$, or about 70 percent of the standard. Of the locations where O_3 is monitored, the data from the Sumatra location are probably most representative of the St. Marks area as this location is away from urbanized areas.

The FAAQS and NAAQS for nitrogen dioxide (NO_2) is 100 $\mu g/m^3$ averaged over the entire year. The average concentration monitored in Duval County, roughly 140 miles east of the site and the nearest location with NO_2 data for 1995, was 30 $\mu g/m^3$ or 30 percent of the standard. A closer monitor in Gadsden County, a distance of 55 miles from the site, has been discontinued. In January to June 1992 the average NO_2 concentration at the Gadsden monitor was 7 $\mu g/m^3$ or 7 percent of the standard. The average concentration in Escambia County in 1990 was 14 $\mu g/m^3$.

Respirable particulate matter less than 10 microns (PM_{10}) and sulfur dioxide (SO_2) are not monitored by FDEP in Wakulla, Leon, Jefferson, Taylor, or Gadsden Counties in Florida. The nearest monitoring locations for those pollutants are in Hamilton and Bay Counties, which are roughly 70 miles east and west of the site, respectively; in Gulf County, about 70 miles to the west, and Escambia County, about 170 miles to the west. In fact, at least the Hamilton and Bay County monitors are located near major air pollutant sources and the use of concentrations monitored there would be expected to overestimate "background" concentrations in the St. Marks area. Nevertheless, these data are being provided as they are the only data available.

The FAAQS and NAAQS for PM_{10} is 50 $\mu g/m^3$ annual arithmetic mean, with a second highest 24-hour average of 150 $\mu g/m^3$, according to Rule 62-204.240(2), F.A.C. The second highest short-term concentration measured in 1995 in Hamilton County was 48 $\mu g/m^3$ or 32 percent of the standard. The annual arithmetic mean was 23 $\mu g/m^3$ or 46 percent of the standard. In Bay, Gulf, and Escambia Counties, similar concentrations have been observed.

The FAAQS for SO_2 (which is more stringent that the NAAQS) is 1,300 $\mu g/m^3$ for a 3-hour average (not to be exceeded more than once per year), 260 $\mu g/m^3$ for a 24-hour period (not to be exceeded more than once per year), and 60 $\mu g/m^3$ for an annual average (Rule 62-204.240(1), F.A.C.). The second highest 3-hour average recorded in 1995 in Hamilton County was 318 $\mu g/m^3$ or 24 percent of the standard. The second highest 24-hour average for 1995 was



Legend

- OZONE
- SULFUR DIOXIDE
- PARTICULATE MATTER (10 MICRONS AND SMALLER)
- NITROGEN DIOXIDE
- CARBON MONOXIDE
- LEAD

Sources: Monitoring locations FDEP
Base Map Foster Wheeler Environmental, 1997

CITY OF TALLAHASSEE

SELECTED AMBIENT AIR QUALITY MONITORING LOCATIONS

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 2.3.7-5

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TABLE 2.3.7-6
MONITORING DATA SUMMARIES FOR
REGIONAL AIR QUALITY MONITORING SITES

Parameter	Year	Station	ID	1-Hr(1)	3-Hr(1)	8-Hr(1)	24-Hr(1)	Quarter	Annual
PM_{10}	1995	Bay	12-005-1004	-	-	-	58	-	23.8
	1995	Gulf	12-045-1003	-	-	-	47	-	22.4
	1995	Escambia	12-033-0003	-	-	-	54	-	23.4
	1995	Hamilton	12-047-0015	-	-	-	48	-	22.9
SO_2	1995	Escambia	12-033-0022	-	183	-	71	-	9
	1995	Escambia	12-033-0004	-	176	-	50	-	8
	1995	Hamilton	12-047-0015	-	318	-	102	-	13
O_3	1995	Escambia	12-033-0018	235	-	-	-	-	-
	1995	Leon	12-073-0003	188	-	-	-	-	-
	1995	Liberty	EPA SUM 156	166	-	-	-	-	-
NO_2	1995	Duval	12-031-0032	-	-	-	-	-	30
	1990	Escambia	12-033-0007	-	-	-	-	-	14
	1992	Gasden	0540002J02	-	-	-	-	-	7
CO	1995	Duval	12-031-0084	-	8050	5290	-	-	-
	1995	Duval	12-031-0082	-	7245	3910	-	-	-
	1995	Duval	12-031-0083	-	7245	4255	-	-	-
	1995	Duval	12-031-0095	-	7360	3795	-	-	-
	1995	Duval	12-031-0080	-	5520	3220	-	-	-
Pb	1995	Duval	12-031-0032	-	-	-	-	0.026	-
	1995	Duval	12-031-0032	-	-	-	-	0.030	-

(1) All short-term values are the second highest values in $\mu g/m^3$
- = Not applicable

Source: FDEP, 1995, 1996; EPA, 1996, 1996a

102 μg/m^3 or 39 percent of the standard. The annual average concentration for 1995 was 13 μg/m^3 or 22 percent of the standard. Since this monitor is close to a major source, background values from Escambia County may be more representative. Monitored values for Escambia County in 1995 were 191, 70, and 9 μg/m^3 for the 3-hour, 24-hour, and annual periods, respectively.

No background concentration data are available for lead (Pb) and carbon monoxide (CO) in the site area. Concentrations for both of these pollutants would be expected to be low in the site vicinity due to the limited number of emission sources. The nearest location where data for these pollutants is collected is Duval County (Jacksonville), which is roughly 140 miles east of the site. Data from the Duval County monitors are presented below.

The FAAQS and NAAQS for CO is 40,000 μg/m^3 for a 1-hour average and 10,000 μg/m^3 for an 8-hour average, neither to be exceeded more than once per year (Rule 62-204.240(3), F.A.C.). The second-highest 1-hour average recorded at a monitor in Duval County in 1995 was 8,050 μg/m^3 or 20 percent of the standard. The second highest 8-hour average was 5290 μg/m^3 or 53 percent of the standard.

The FAAQS and NAAQS for Pb is 1.5 μg/m^3 on a calendar quarter basis (Rule 62-204.240(6), F.A.C.). The highest quarterly average recorded at a monitor in Duval County in 1995 was 0.03 μg/m^3 or 2 percent of the standard.

On-Site Ambient Air Quality Monitoring Requirements

In accordance with the requirements of Rule 62-212.400(5)(f), F.A.C., any application for a PSD permit must contain an analysis of continuous ambient air quality monitoring data in the area affected by the proposed major stationary source or major modification for those pollutants subject to PSD review.

According to EPA's *Ambient Monitoring Guidelines for Prevention of Significant Deterioration* (EPA, 1987), ambient air monitoring for a period of up to one year is generally appropriate to satisfy the PSD monitoring requirements. A minimum of four months of data are generally 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.

The PSD regulations include an exemption in Rule 62-212.400(3)(e), F.A.C. which states that the Department will exempt a proposed major stationary source or major modification from the pre- and post-construction monitoring requirements of Rule 62-212.400(5)(f) and (g) with respect to a particular pollutant if the net emissions increase of the pollutant from the source or modification would cause air quality impacts less than certain *de minimis* air quality impact levels (Table 212.400-3 in Rule 62-212.400, F.A.C.).

As indicated elsewhere in this application, the Project will only trigger PSD review for the following pollutants: PM(TSP), PM_{10} and CO. A preliminary analysis was conducted of maximum potential impacts for these pollutants. The results indicated that projected impacts were below the *de minimis* air quality impact levels for PM_{10} and CO and that the *de minimis* level for PM(TSP) had been removed from Table 212.400-3 as the TSP ambient standard has been replaced by a PM_{10} standard. This analysis was provided to FDEP and it was confirmed that an ambient air quality monitoring program was not required under Rule 62-212.400(5)(f) and (g) (FDEP, 1997).

Background Air Quality Concentrations

Background air quality concentrations to be utilized in the modelling analyses were compiled from the data presented in Table 2.3.7-6 and from recommendations by FDEP (1996). A summary of the background values is presented in Table 2.3.7-7. Many of the values in Table 2.3.7-7 are considered to be very conservative estimates (i.e., overestimates) of background concentrations in the site vicinity because they are more representative of larger urban areas or of areas in the vicinity of major existing sources of air pollutants. All major sources in the vicinity of the Purdom Station are explicitly included in the modelling; adding background concentrations representative of locations near major sources is essentially "double-counting," an especially conservative approach.

2.3.7.3 References

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TABLE 2.3.7-7
MONITORING DATA TO BE USED AS
BACKGROUND AIR QUALITY IN NAAQS/FAAQS MODELLING

Parameter	Year	Station	ID	1-Hr[1]	3-Hr[1]	8-Hr[1]	24-Hr[1]	Quarter	Annual
PM_{10}	1995	Gulf	12-045-1003	-	-	-	47	-	22.4
SO_2	1995	Escambia	12-033-0022	-	183	-	71	-	9
NO_2	1990	Escambia	12-033-0007	-	-	-	-	-	14
CO	1995	Duval	12-031-0084	8050	-	5290	-	-	-
Pb	1995	Duval	12-031-0032	-	-	-	-	0.030	-

(1) All short-term values are the second highest value in $\mu g/m^3$
- = Not applicable

Source: FDEP, 1995, 1996; EPA, 1995

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2.3.8 Noise

This section is based on a comprehensive noise study of the Purdom Station, performed during October 1994 (FWENC, 1995). Conditions with respect to residences, other sources of noise, and plant facilities are essentially the same today as they were then, with a few exceptions. The exceptions are the public address system and the Unit 5, 6, and 7 hogging jets at the plant. Both of these plant noise sources have been modified to reduce noise.

The scope of the noise study included continuous noise monitoring over a 24-hour period at several boundary or receptor locations during normal and exceptional plant operating conditions, and comparison of the data with applicable assessment criteria. Normal plant operating conditions included operation of steam Units 5, 6 and 7. Exceptional plant operating conditions included start-up and operation of both existing combustion turbines (GT1 and GT2), along with the steam units, during the late-night hours. Operation of the existing combustion turbines is considered to be an exceptional condition because of their infrequent use (see Table 2.3.8-1), which is a function of their high operating cost.

TABLE 2.3.8-1
PURDOM STATION COMBUSTION TURBINE OPERATING HISTORY
1989 - 1996

Year	GT1 On-Line Hours	GT2 On-Line Hours
Mar - Dec 1989	71.2	87.6
1990	55.75	84.6
1991	83.8	107.6
1992	69	17
1993	305.9	308
1994	96.6	139.1
1995	157.4	112.6
1996 (thru Nov 13)	125.8	115.8
Average	**120.7**	**121.5**

Source: City of Tallahassee Electric Department, 1996

As indicated in Table 2.3.8-1, GT1 operated for an average of 120.7 hours and GT2 for 121.5 hours over the last 8 years. During the peak year of operation in 1993, only 36 hours of the combined total of 614 hours occurred at night between 10 p.m. and 7 a.m. Overall, the combustion turbine units are used less than 2 percent of the year and nighttime operation occurs during about 1 percent of the nighttime hours.

The existing combustion turbines are typically not operated late at night because peak air conditioning load conditions generally diminish by the early evening hours, after the sun sets. About the only condition which causes them to be operated late at night is very cold winter nights when the electric heating load is highest. During the hot weather peak, due to air conditioning usage, and the cold weather peak, due to electric heater usage, people are normally inside with their windows and doors closed. This tends to mitigate any impacts due to exterior noise.

2.3.8.1 Monitoring Location Selection

The general criteria for selecting the five monitoring locations include the following:

- Accessible now and in the future after any plant addition;
- Far enough from the plant to be representative of the whole plant;
- Greater than 50 feet from any large reflecting surface;
- Beyond the influence of any localized noise source; and
- Adjacent to the nearest residences or boundary lines in several directions from the plant.

The entire site was walked during the site visit on February 10, 1992, to find suitable monitoring locations. The identified locations will be useful for documenting any changes in plant noise levels in future years. Additionally, aerial photos and maps were reviewed to provide preliminary determinations of the nearest off-site receptors. A driving tour was then conducted to confirm the information and make final site selection determinations. Four off-site locations were selected to be representative of the nearest noise-sensitive receptors which are single family residences. One on-site location was also selected to be representative of plant operations near the boundary adjacent to the Wildlife Management Area on the east side of the river. The five locations are shown on the area map in Figure 2.3.8-1. A brief description of each location is presented below.

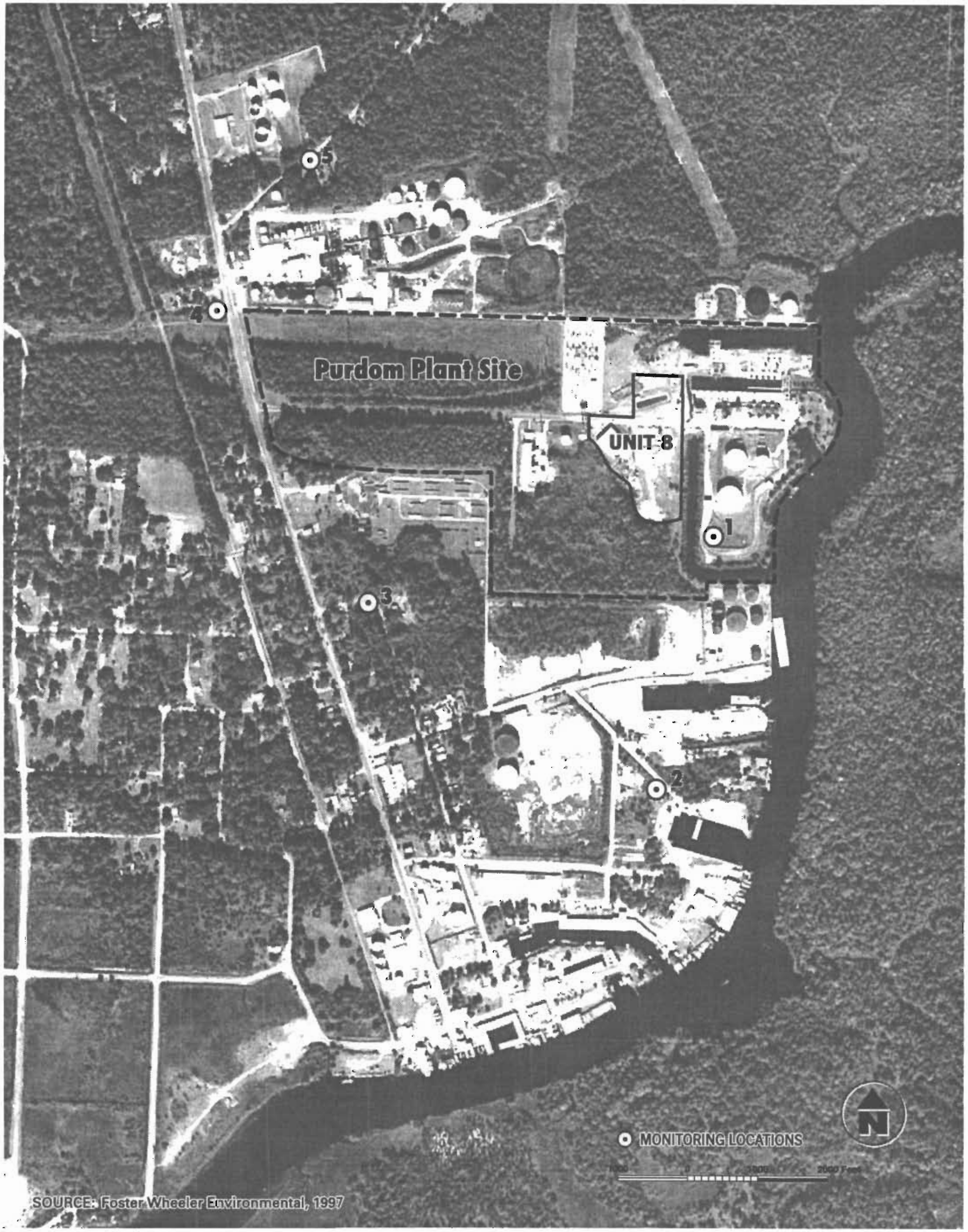
Location 1 - At the southwest corner of the oil storage tank area, about 25 feet southwest of the edge of the road, around the containment dike in a grassed area. Levels measured here are representative of those on the opposite side of the river near the plant.

Location 2 - Off-site near the nearest residence to the south. The monitor was at the double gates at the end of Public Road. A bulk handling operation is located between the Purdom Station and this location.

Location 3 - Adjacent to the nearest residence southwest of the plant. This is also the nearest residence to the combustion turbines. The monitor was mounted on a fence post on the outside corner of the intersection of 6th Street and Tallahassee Avenue. Both streets are unpaved and lightly traveled, serving only the residents.

Location 4 - Adjacent to SR 363, across from the nearest residence to the west, on the site fence underneath the transmission lines. This site is mostly affected by highway traffic.

Location 5 - At the nearest residence north of the plant on North Street (a dead-end dirt road). Southeastern Lubricants' facility lies between this location and the plant.



CITY OF TALLAHASSEE

NOISE MONITORING LOCATIONS (1 – 5)

PURDOM UNIT 8 PROJECT - ST MARKS FLORIDA

Figure 2.3.8-1

2.3.8.2 Monitoring Equipment

One Larson-Davis Laboratories (LDL) Model 700 and four LDL Model 820 precision integrating sound level meters, which meet ANSI Standard S1.4-1983 Type 1 requirements for precision meters, were used for the survey. They were programmed to store the equivalent or average noise level (L_{eq}) at 1-minute intervals throughout the 24-hour monitoring period. Hourly equivalent levels and the levels exceeded 10 and 90 percent of each hour (L_{10} and L_{90}, respectively) were also recorded. The L_{10} level is indicative of traffic and other intermittent type noises that have high levels over short durations. The L_{90} is indicative of constant level noise sources, such as a power plant, that operate continuously at a low noise level. The hourly L_{eq} levels are used to compute the day/night level (L_{dn}) used for comparison with U.S. Environmental Protection Agency (EPA) guidelines.

Weather-proof enclosures were provided for the instruments and the microphones were mounted, via 10-foot extension cables, at the standard monitoring height of about 4.5 feet above the ground. Foam windscreens 3.5 inches in diameter were placed over the microphones to reduce any wind-generated noise. The internal clocks of the monitors were synchronized to allow direct comparison of levels at all locations from discrete events at the plant, such as starting and stopping the combustion turbines.

A single LDL Model 2800 audio spectrum analyzer, meeting the same ANSI specification for precision sound level meters, plus ANSI S1.11 Type 0-AA for precision octave band filters was used on a rotating basis at all locations to obtain octave band levels. It also provided confirmatory measurements of the A-weighted levels.

The calibration of all instruments was verified before and after the monitoring period using a Bruel & Kjaer Type 4230 sound level calibrator.

2.3.8.3 Test Procedure

Noise levels were monitored continuously over a complete 24-hour period at the selected locations while the plant was operated in various modes ranging from normal operation to worst-case operation. Worst-case operations required that the test be performed during the late-night hours, when noise is perceived to be more of a problem and when atmospheric conditions generally enhance the transmission of sound. Human activity is also at a minimum resulting in lower levels of traffic noise which could interfere with the testing.

The monitors were installed and started at 10 a.m. on October 4, 1994, when all three steam generating units were on line and operating in a normal configuration. Both combustion turbines were started and run for about 1.5 hours during the day and again late at night. The two existing combustion turbines at the plant are identical in size and configuration.

Each monitoring location was visited four times during the 24 hours to obtain octave band data and to determine the source of sounds heard.

2.3.8.4 Data Analysis

Data were downloaded from the instruments via a computer interface. In general, steam plant (Units 5 through 7) noise levels were below the prevailing ambient noise levels at all off-site locations. However, noise levels produced by the combustion turbines and the hogging jets were above ambient levels. Silencers have since been installed on the hogging jets for all three units, and they are no longer a significant source of noise.

Annual day/night (L_{dn}) levels were computed for each monitoring location using the most recent historical record of the number of hours per year that the combustion turbine generating units operated along with the operating noise level as determined above. The 1993 operating record provided the worst-case assessment since it showed the greatest usage of both turbines.

2.3.8.5 Assessment Criteria

There are currently no federal, state or local laws governing noise levels from the Purdom Station. The U.S. Environmental Protection Agency (EPA) has published guidelines identifying acceptable noise levels for various types of land uses. Although they are not formal regulations, the EPA guidelines provide a good basis for comparison with the existing levels. A day/night level (L_{dn}) of 55 dBA is identified in the guidelines as acceptable for outside spaces at rural residences. The L_{dn} descriptor adds a 10 dBA penalty to measured noise levels between 10 p.m. and 7 a.m. to account for the greater sensitivity of people to noise at night. It is also based on long-term or annual averages of sound levels. An L_{dn} level of 55 dBA is equivalent to a constant level of 48.6 dBA because of the 10 dBA penalty added to nighttime levels, before the 24-hour average is computed.

The FDEP published a model community noise ordinance (FDEP, 1975) to assist local governments with their noise programs. The model ordinance was not intended to be used verbatim by any municipality/county in the State. Each government was to refine the ordinance to meet their individual local needs and conditions. Thus, the guidelines of this model ordinance are also not legally enforceable. The recommended levels applicable to residences around the Purdom Station are 60 dBA during the day and 55 dBA at night for continuous types of sounds. Short-term sounds can exceed these levels by 10 dBA during the day and 5 dBA at night for durations up to 10 percent of any measurement period.

The EPA guideline level of 55 dBA L_{dn} (equivalent to a constant level of 48.6 dBA) will be used as the basis for noise impact determination for this Project because it provides the greatest level of protection against excessive noise. This criterion has also been used in several other power plant licensing cases in Florida, thus setting a precedent. The proposed new unit will be designed such that the combined level of noise from it and the other existing units at the plant will not exceed a continuous operating level of 48.6 dBA at the nearest residence. This level is 11.4 dBA and 6.4 dBA below the FDEP day and night guideline levels, respectively.

The Wildlife Management Area on the east side of the river was considered in this assessment, but there are no noise standards or guidelines applicable to wildlife. Research has found that animals adapt quickly to high noise environments, such as around airports, and that continuous type noise, such as from power plants, has no demonstrated effect (EPA, 1971).

2.3.8.6 Results

Weather conditions were near ideal for the noise survey with mild temperatures, light to no wind and no precipitation. Noise produced by crickets and frogs was evident at many locations, particularly at night.

Steam generating Units 5, 6, and 7 were operating throughout the 24-hour survey at substantial load levels of 10 to 11 megawatts (MW) for Units 5 and 6, and 19 to 29 MW for Unit 7, which are indicative of maximum noise being produced. The noise level produced by the Purdom Station was essentially constant, except for a 5-minute test of the hogging jet on Unit 7, and occasional announcements on the public address system. The hogging jets are only used during start up of the steam units. The public address system appeared to be operating at a lower volume than during the 1992 site visit. Announcements were not as noticeable at off-site locations. Additionally, since the 1994 survey, about 30 percent of the exterior loud speakers have been disabled and paging is restricted at night.

Both Combustion Turbines Number 1 and 2 (GT1 and GT2, respectively) were run twice during the period for noise testing, once during the day and once at night, for about 1.5 hours each time. Due to a technical problem, GT2 could not be loaded although it could be run at normal speed. GT1 was started and loaded to 5 MW. Noise testing conducted around GT1 revealed a slight decrease in sound levels of about 0.5 dBA upon loading the generator. This indicates that the noise level produced is essentially constant, whether the unit is loaded or just running at full speed with no load. During start-up however, the sound level steadily increased with increasing rpm. Two events during start-up resulted in sudden drops in sound level. These are the cut out of the starting motor and the closing of the bleed valve. The two GTs are identical and produce the same levels of noise.

Ambient sounds not related to plant operations are also included in the data. These generally included road traffic, insects and frogs, barking dogs, and wind rustling nearby leaves. A synopsis of the data from each location is presented below.

Location 1 - Noise levels at this on-site location at the southwest corner of the oil tank yard were mostly controlled during normal operations by the operating steam units at a constant level of about 55 to 56 dBA. Noise levels during exceptional operations are about 58 to 61 dBA. The Unit 7 hogging jet noise peaked at 84 dBA at this location about 850 feet south of the jet, indicating that it was a very loud source of noise. Although confirming noise measurements of the now silenced hogging jets have not been made, it is understood that the silencers are very effective and the jets are no longer significant noise sources.

Location 2 - The most notable feature in the data from this off-site location well south of the plant was the nighttime rise in levels due to insects and frogs. The normal operation level was about 47 dBA at the lower end of most of the measured noise levels and the plant was barely audible. Under exceptional operating conditions, noise levels were barely above the background levels.

Location 3 - This location is at the nearest residence to the GTs, at about 1,000 feet, and only a thin line of trees provides any shielding. Thus, the exceptional operating condition data is more significant than at any other off-site location. The level was about 63 dBA with both combustion turbines operating. Noise levels during normal operating conditions were much lower, at about 45 dBA. Other sounds noted were a barking dog at the residence and infrequent car passages on the dirt road.

Location 4 - Traffic on SR 363, about 40 feet from the microphone, was the primary noise source at the location. Levels were typically as high as 63 dBA due to traffic. The noise level during normal operation was estimated to be 43 dBA at the lower end of the data. The plant was generally inaudible because of the higher background level from traffic. Data from the exceptional condition test conducted during the daytime is completely hidden in the background noise. The nighttime test is just barely discernible. The late night background levels were maintained at a minimum level of 48 to 49 dBA by insects and frogs, which were more active during this period.

Location 5 - This location on a dead-end dirt road at the nearest residence north of the station was still affected to a small degree by traffic on SR 363. Noise from the industrial facilities on the north and south sides of the road, primarily pumps and trucks, were heard at a higher level than the plant. Plant noise was never clearly distinguishable from the other noises during normal or exceptional operating conditions.

Table 2.3.8-2 presents a summary of noise levels attributable to the Purdom Station at each of the locations.

TABLE 2.3.8-2
PURDOM STATION NOISE LEVELS

	Normal Conditions	Exceptional Conditions	
Location	Purdom Station Units 5-7 (dBA)	Either GT1 or GT2 Plus Units 5 - 7 (dBA)	Both GT1 & GT2 Plus Units 5 - 7 (dBA)
1	55	55	58
2	47	52	55
3	45	60	63
4	43	47	50
5	43	45	48

Source: Foster Wheeler Environmental, 1995

The EPA guidelines, based on the annualized L_{dn}, considers the frequency of occurrence of higher level noises by looking at levels over the long-term. The L_{dn} was computed for each of the off-site locations using the above levels in conjunction with the operating history of the units. Table 2.3.8-1 presents the operating record of the two turbines for the last 8 years. Only the data from 1993 were used in the calculation because they produce the worst case or highest levels. It was assumed that Units 5 through 7 operate 50 percent of the time. This is not entirely accurate (they operate less than 50 percent of the year), but it makes little difference in the calculated levels. In fact, after Unit 8 is completed and goes on line, steam Units 5 and 6 will be decommissioned.

The resulting L_{dn} levels due to plant noise, including both normal and exceptional operations, are presented in Table 2.3.8-3 for each of the off-site locations. These levels ranged from a low of 47 dBA at Locations 4 and 5 to 53 dBA at Location 3. All of these levels are well within the EPA guideline level of 55 dBA.

Levels produced during normal operations at the off-site receptors (Locations 2 through 5) are all within the FDEP recommended level of 60 dBA for daytime operations and 55 dBA nighttime. Exceptional operation levels are within the nighttime FDEP recommended level of 55 dBA at all locations except Location 3 where the combined level is 63 dBA.

If exceptional operations were to be routinely conducted at night, the expected noise impact at this location would be significant. However, the infrequent late night operation minimizes the impact greatly.

TABLE 2.3.8-3
PURDOM STATION ANNUALIZED DAY/NIGHT LEVELS
(OFF-SITE LOCATIONS ONLY)

Location	Day/Night Level (L_{dn}) (dBA)
2 - Nearest Residence to South	51
3 - Nearest Residence to Southwest	53
4 - Nearest Residence to West	47
5 - Nearest Residence to North	47
Source: Foster Wheeler Environmental, 1995	

2.3.8.7 Conclusion

The Purdom Station noise levels, as currently operated, are within the 55 dBA L_{dn} noise level limit recommended by the EPA at all off-site receptors. The FDEP recommended levels are met at all locations during normal operations and at all locations except Location 3 during exceptional operations where the nighttime guideline of 55 dBA is exceeded by 8 dBA. However, exceptional operations occur very infrequently at night, and emergency situations required exceptional operations for only 36 hours during 1993, the worst-case year out of the last 8 years. Thus, the impact of noise produced during exceptional operations should be insignificant. Background noise levels due to frogs, crickets and other natural sounds, are frequently higher than plant noise levels at the receptors. These higher levels of sound often mask plant noise making it inaudible, particularly to the north and west. The installation of silencers on the hogging jets of the three steam units eliminated the jets as significant noise sources. Adjustments to the public address system, deactivation of about 30 percent of the speakers, and restricting nighttime paging have reduced the noise impact of that system considerably.

2.3.8.8 References

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2.3.9 Other Environment Features

All relevant environmental features have been discussed within the scope of the preceding topics in Chapter 2. There are no other environmental features.

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CHAPTER 3

THE PROJECT AND DIRECTLY ASSOCIATED FACILITIES

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3.1 BACKGROUND

3.1.1 Project Description

The City of Tallahassee proposes to construct Unit 8 at its Purdom Generating Station with a commercial operation date of May 15, 2000. Unit 8 is a new 250 MW combined cycle facility in a one-on-one (one combustion turbine/generator and one steam turbine/generator) configuration, primarily firing clean, pipeline quality natural gas. The addition of this highly efficient unit will provide for the City electric system needs in the year 2000 and beyond, in addition to significantly reducing the City's cost of producing electricity.

The addition of Unit 8 enables the City to permanently shut down Purdom Units 5 and 6 early. Units 5 and 6 are the two oldest and least efficient steam generating units still operated by the City. They were originally scheduled for retirement in 2003 and 2006, respectively. Units 5 and 6 utilize water from the St. Marks River for once-through cooling of the condensers. With the permanent shutdown of these units, the use of St. Marks River water for once through cooling at the Station will be reduced by approximately 50 percent (Unit 7 and the existing combustion turbines will continue to utilize once through cooling water from the St. Marks River).

The overall environmental impact from the addition of Unit 8 is minimal. Annual air emissions of sulfur dioxide (SO_2) and oxides of nitrogen (NO_x) for the remaining Purdom units plus Unit 8 will not increase over the historical average annual air emissions for these pollutants at the Purdom Station. This "netting out" is achievable due to the permanent shutdown of Units 5 and 6, the expected reduced utilization of Unit 7, and the improved technology and environmental efficiency of Unit 8. From a water perspective, Unit 8 will not result in any industrial wastewater discharge to surface or groundwater and, through reuse, will eliminate three existing waste streams that are currently being discharged to the St. Marks River. In addition, the existing deep wells that serve the Purdom Generating Station will be properly abandoned and the associated groundwater use eliminated. Thus, the City will install net additional generating capacity of more than 200 MW with no net increase, and indeed some decrease, in the principal types of environmental impact.

Unit 8 will consist of a combustion turbine/generator, a heat recovery steam generator, and a reheat steam turbine/generator. The design for Unit 8 is based on the standard configuration for a General Electric 7FA combined cycle unit. The unit performance on natural gas as the primary fuel and Number 2 (0.05% S) diesel fuel oil as the secondary fuel is set forth below:

Condition	Fuel	Winter (40°F)	Mean (67.5°F)	Summer (95°F)
Net Output (kW)	Gas	259,800	247,743	232,900*
Net Heat Rate (Btu/kWh, HHV)	Gas	6,960	6,940	7,040*
Net Output (kW)	Oil	271,900	263,300	250,100
Net Heat Rate (Btu/kWh, HHV)	Oil	7,142	7,061	7,061

* Guarantee Point

Source: GE, 1997

The combustion turbine will be a General Electric MS7231FA equipped with an evaporative cooler and a hydrogen cooled generator. The heat recovery steam generator (HRSG) will be an unfired, three pressure, reheat HRSG with "space-only" provisions for a Selective Catalytic Reduction (SCR) system. The HRSG will be equipped with a 200 foot above ground level (agl) stack. The nominal 90 MW steam turbine will be a General Electric single flow, reheat unit equipped with a totally enclosed water-to-air cooled generator.

The new unit will be equipped with a mechanical draft cooling tower to provide cooling water to the steam turbine condenser. Make-up water to the cooling tower will come from several sources. The primary source will be the St. Marks River. Additional makeup will be obtained from: (1) the City of St. Marks Wastewater Treatment Facility effluent; (2) the Purdom Station low volume and metal cleaning waste; and (3) the distilled water discharge from the zero discharge facility when not needed for process water.

Unit 8 will be equipped with a zero discharge wastewater treatment facility to avoid any water discharge from the unit to the St. Marks River. This facility will be designed with an evaporative system to process the cooling tower blowdown and produce high quality distillate and one to two truckloads per day of a dry filter cake. The distillate will be reused by Units 7 and 8 for process water and cooling tower makeup. The filter cake is comprised of the solids from the blowdown and is nonhazardous. This filter cake will be disposed of through commercial reuse or through a licensed off-site Class I landfill (independent of the Project). In addition to eliminating any new water discharge to the St. Marks River from Unit 8, this zero discharge facility will allow for the reuse of existing treated waste streams that are currently being discharged to the St. Marks River. These waste streams are the existing Purdom Station low volume and metal cleaning waste discharges and the City of St. Marks Wastewater Treatment Facility effluent. Due to the high quality of the distillate that will be produced by the zero discharge facility, the City will eliminate the need for the existing Purdom Station deep wells and the associated groundwater withdrawal.

The addition of Unit 8 will not require the addition of any new transmission lines for support. Currently, the City owns and operates three (3) 115 kV transmission lines between the Purdom Station and the City's electrical distribution network. Two of the three lines will have their conductors upgraded from 4/0 copper to 477 aluminum conductor, steel reinforced (ACSR) to support the addition of Unit 8. This reconductoring will take place on the existing structures and within the existing rights-of-way.

To support the additional natural gas requirements for Unit 8, the natural gas lateral (owned by Florida Gas Transmission (FGT)) will require relatively minor upgrades. The metering and regulation station located within the Purdom Station will require relocation and upgrading. In addition, there is the potential for up to approximately 3 miles of the lateral to be upgraded with the addition of a 12-inch loop. This 12-inch loop, to be permitted and installed by FGT, is anticipated to be located within or adjacent to the existing lateral right-of-way and have minimal impacts on the environment.

3.1.2 Design Commitments Resulting in Ecological Benefits

The proposed Project design reflects an appreciation for the environment in Wakulla County and attempts to protect that environment while providing for the growing electricity needs of the Tallahassee area. Commitments incorporated into the design include special protections, above and beyond regulatory requirements, for air quality, water resources, and habitat, taking into account the Purdom Station's location along the St. Marks River, its proximity to the St. Marks National Wildlife Refuge, and its proximity to the Bradwell Bay National Wilderness Area. With the use of a clean fuel, i.e., natural gas, and adaptation/retrofit of an existing facility, the Project emphasizes pollution prevention rather than pollution control. The installation of advanced, highly efficient generating technology, which produces a large amount of electricity per unit of fuel consumed, will also conserve scarce energy resources.

The City of Tallahassee, through its design approach, will practice stewardship by upgrading an existing facility and leaving the environment "better off". The Project will result in ecological benefits, as illustrated by the following design features:

- Air Quality

  Through the selection of a clean fuel, the installation of advanced combined cycle technology, and the permanent shutdown of Units 5 and 6 at the Purdom Generating Station, increases in air emissions will be kept to a minimum even though generating capacity at the station will increase by about 200 percent. Actual emissions of key pollutants, such as SO_2 and NO_x, will remain at or below historical average annual emission levels. Allowable (permitted) emission levels will be dramatically decreased.

- Water Use

  Water use will be minimized through water recycling in the zero discharge system and reuse of treated wastewater, both from the City of St. Marks Wastewater Treatment Facility and the Purdom Station's own waste streams, for make-up to the cooling tower. Existing Purdom Station wells will be properly abandoned, allowing groundwater levels to rebound, and withdrawals from the St. Marks River for once-through cooling will be cut in half due to the retirement of Units 5 and 6 and the use of a cooling tower for Unit 8.

- Water Quality

  The zero discharge system will eliminate the need for discharges to the St. Marks River from the new power plant unit. It will also remove existing permitted wastewater discharges to the St. Marks River from the City of St. Marks Wastewater Treatment Facility and the Purdom Station's waste treatment system.

- Wetland Protection

  Wetland impacts will be avoided through careful site layout.

- Aesthetics

  Aesthetics along the St. Marks River shoreline will be improved through landscaping and the removal of the old boilers from Units 1 through 4, which is already under way.

3.2 SITE LAYOUT

The conceptual layout of the proposed Purdom Unit 8 is depicted in plan view on Figure 3.2-1, and a detailed footprint of the combined cycle unit is shown on Figure 3.2-2. The conceptual design for the combined cycle unit upon which the layout is based includes an advanced combustion turbine/generator, an unfired HRSG, a steam turbine/generator, a closed cycle mechanical draft cooling tower for condenser cooling, and a zero discharge wastewater treatment system.

Unit 8 will be installed on the west side of the Unit 6/7 discharge canal, south of the facility access road. The combustion turbine/generator and the HRSG will be oriented north-south adjacent to the canal, and the steam turbine/generator and other equipment will be adjacent to the west. The cooling tower will be west of the steam turbine/generator. The zero discharge wastewater treatment system will be just north of the access road. A stormwater retention swale will be added to the southwest of the new unit to percolate as much uncontaminated stormwater as possible into the groundwater, and to release the remainder as a sheet flow to the southwest, as it presently flows. Other uncontaminated stormwater will use the existing stormwater outfalls. Potentially contaminated stormwater will be segregated and reused.

The combined cycle unit will utilize a stack (chimney) that meets state requirements for Good Engineering Practice (GEP), and is 200 feet tall. The GEP calculation is in Appendix 10.1.5.

New release points for air emissions will be the main stack from the combined cycle combustion turbine unit, and the cooling tower fan stacks, as shown on Figures 3.2-1 and 3.2-2. New release points for liquids are from the new retention swale, also shown on Figures 3.2-1 and 3.2-2.

A cross section of the combined cycle unit is shown on Figure 3.2-3.

As part of the Purdom Unit 8 Project, the City of Tallahassee will be permanently shutting down the existing Units 5 and 6, and ceasing all industrial wastewater discharges from Unit 7 except for the thermal discharge. This will result in the elimination of the air emission releases from Units 5 and 6 (see Section 5.6), the wastewater releases from Units 5 and 6, and the nonthermal effluents from Unit 7 (see Section 2.3.4).

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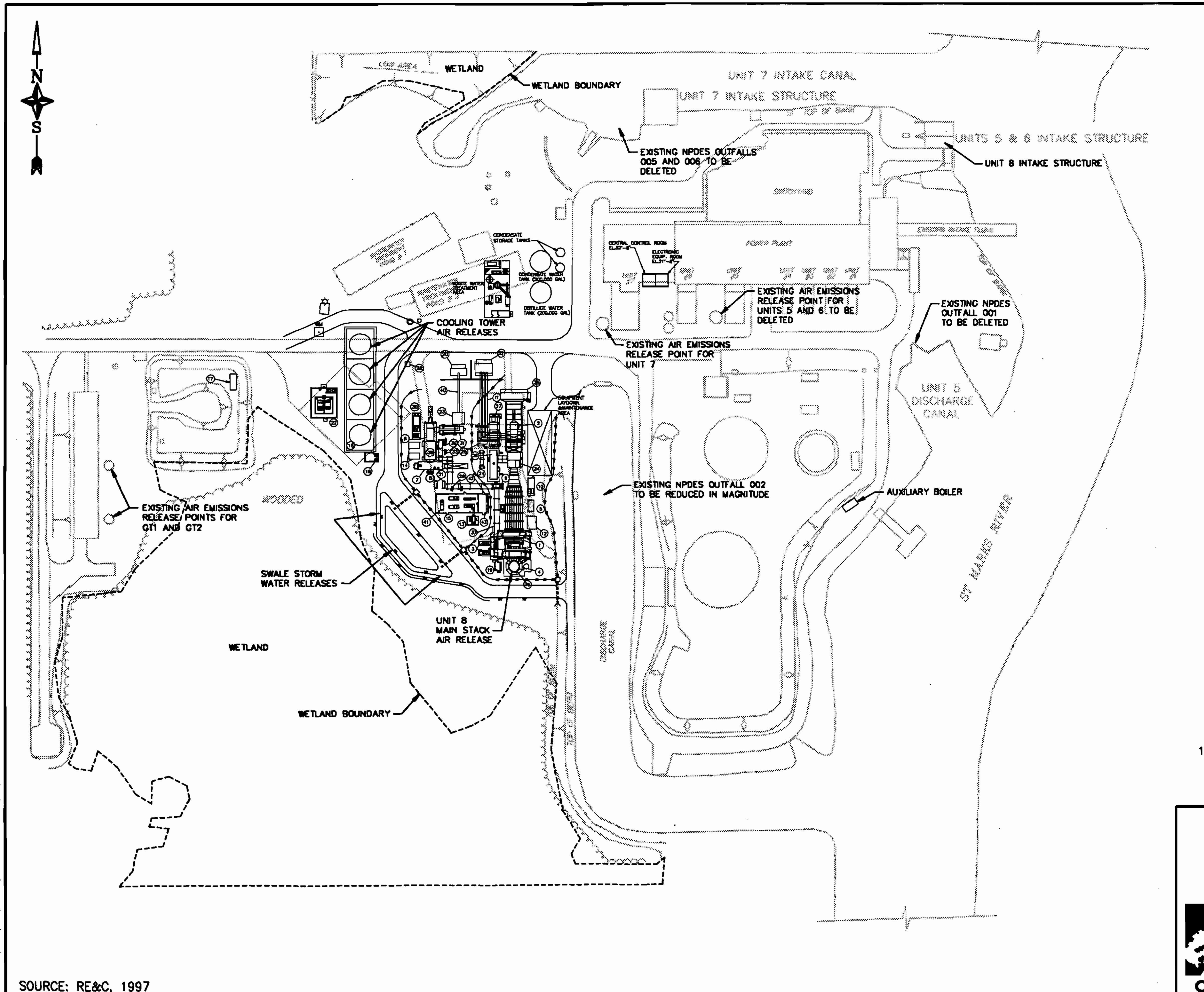

LEGEND:

1. HEAT RECOVERY STEAM GENERATOR
2. COMBUSTION TURBINE GENERATOR
3. FEEDWATER PUMPS
4. BLOWDOWN TANK
5. WATER WASH SKID
6. STEAM TURBINE GENERATOR
7. CONDENSER
8. CONDENSATE PUMPS
9. CO2 FIRE PROTECTION SKID
10. WATER INJECTION SKID
11. ISO PHASE BUS DUCT
12. HRSG CHEMICAL FEED SYSTEM
13. AUXILIARY TRANSFORMER
14. VACUUM PUMPS
15. SWITCHGEAR BUILDING
16. COOLING TOWER
17. FUEL OIL TRANSFER PUMPS
18. CIRCULATING WATER PUMPS
19. CONTINUOUS EMISSIONS MONITORING SYSTEM
20. STEAM TURBINE GENERATOR MAIN STEPUP TRANSFORMER
21. CLOSED COOLING WATER HEAT EXCHANGERS
22. COOLING TOWER CHEMICAL FEED SYSTEM
23. GENERATOR BREAKER
24. STATIC START SKID
25. COMBUSTION TURBINE GENERATOR BUS ACCESSORY COMPARTMENT
26. ACCESSORY MODULE
27. PACKAGED ELECTRICAL ELECTRONIC CONTROL CABINET
28. NATURAL GAS FILTER/SCRUBBER
29. CLOSED COOLING WATER PUMPS
30. STEAM TURBINE GENERATOR LUBE OIL SKID
31. STEAM TURBINE GENERATOR BUS ACCESSORY COMPARTMENT
32. COMBUSTION TURBINE GENERATOR MAIN STEPUP TRANSFORMER
33. GLAND STEAM CONDENSER
34. COMBUSTION TURBINE
35. INLET FILTER
36. STACK
37. SAMPLE PANEL
38. STEAM TURBINE
39. GLAND STEAM CONTROL VALVE SKID
40. NON SEGREGATED BUS DUCT
41. COOLING TOWER LOAD CENTER
42. BAILEY CONTROL CABINETS
43. STEAM TURBINE GENERATOR CONTROL CABINETS

150 0 150 300
SCALE IN FEET

CONCEPTUAL LAYOUT

PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

CITY OF TALLAHASSEE

Figure 3.2-1

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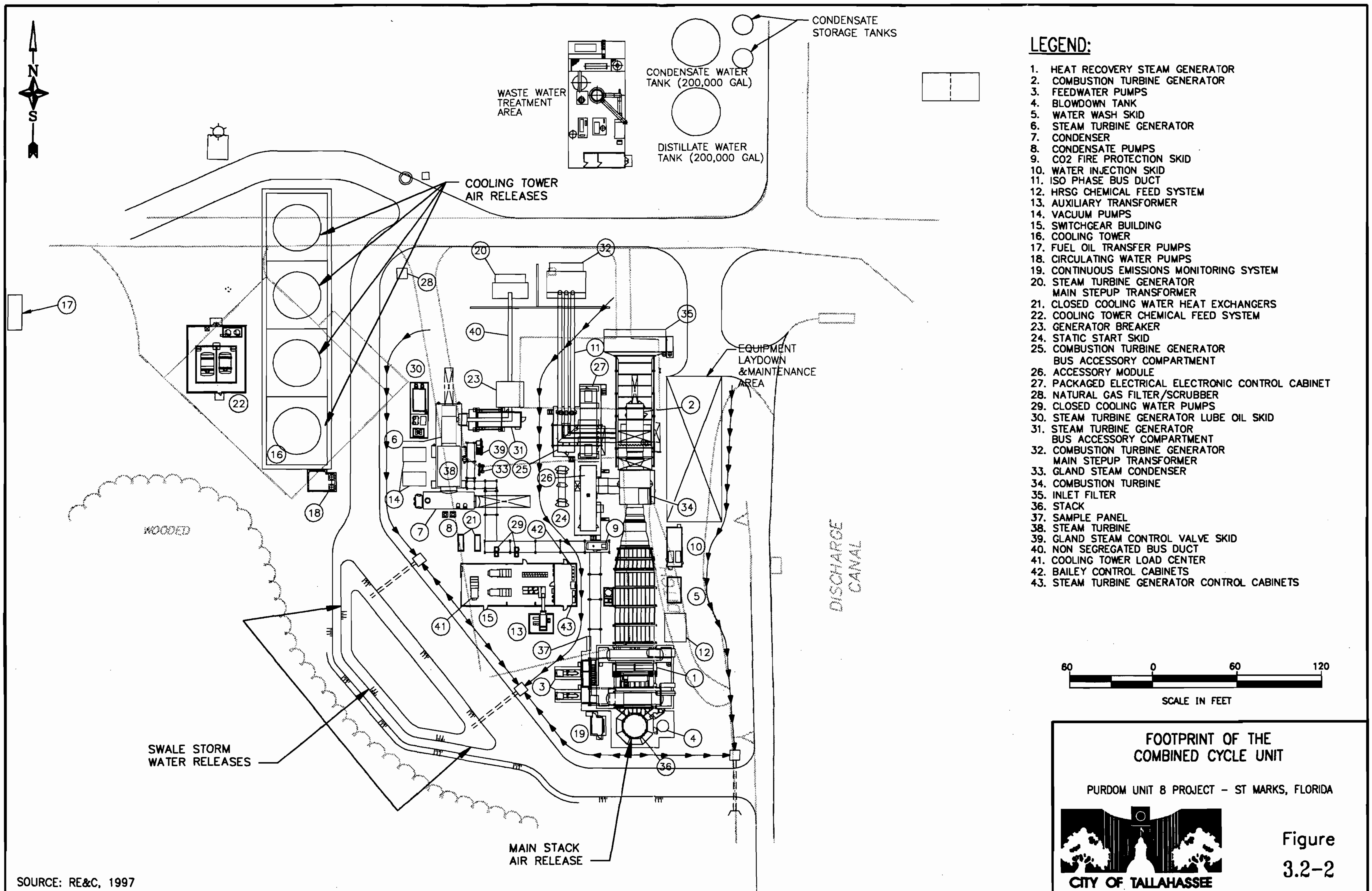

SOURCE: RE&C, 1997

FOOTPRINT OF THE COMBINED CYCLE UNIT

PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

Figure 3.2-2

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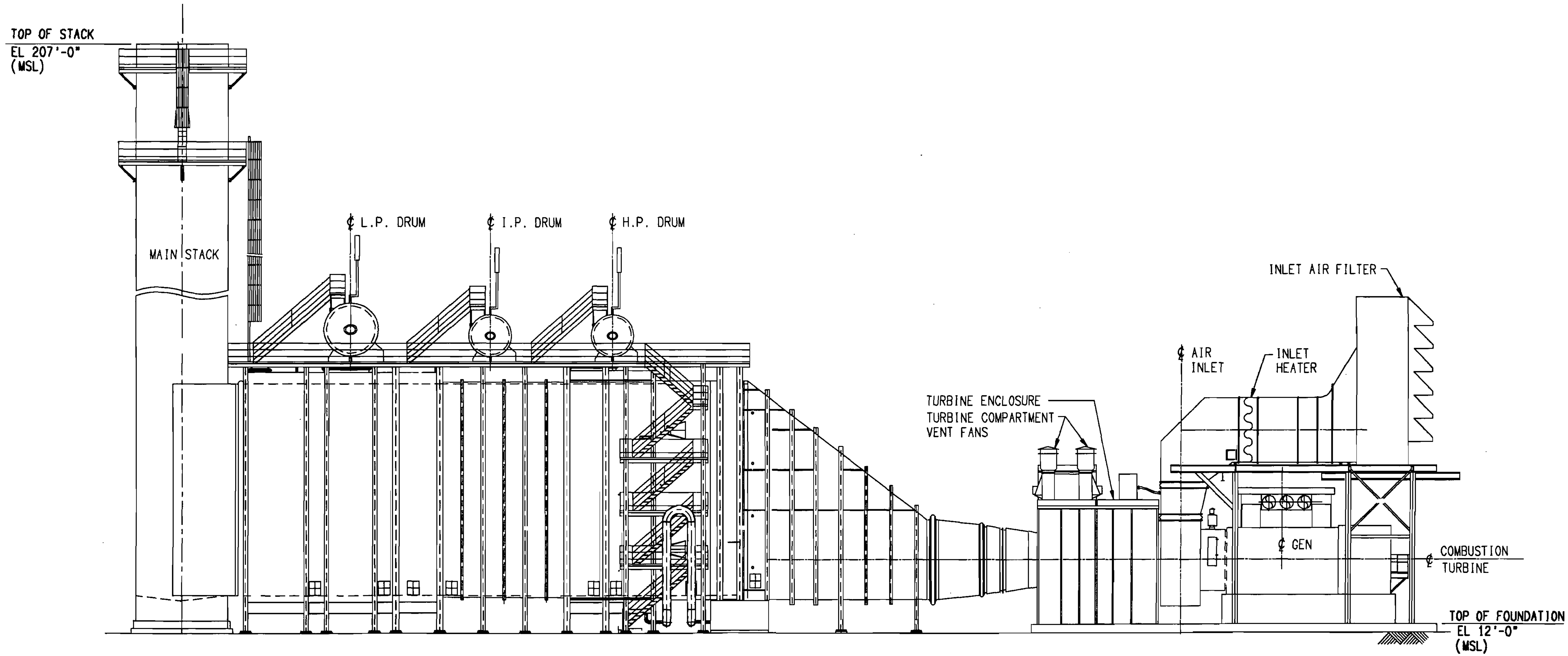

SOURCE: RE&C, 1997

CROSS SECTION
COMBINED CYCLE UNIT

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

CITY OF TALLAHASSEE

Figure 3.2-3

3.3 FUEL

3.3.1 Fuel Types

The primary fuel for Unit 8 will be natural gas, with low-sulfur (0.05%) Number 2 fuel (a.k.a. No. 2 distillate or diesel) oil as a secondary fuel. Startup and operation of the combined cycle combustion turbine over the full load range will be possible using either fuel. The combined cycle combustion turbine can be automatically switched to fuel oil in the event that natural gas pressure is lost, and manual switching from one fuel to the other is also possible.

3.3.2 Quantities

The fuel gas is supplied to the valve and metering station by the fuel supplier and regulated at 390 psig (± 10 psig), 40° F to 100° F and 78,200 pounds per hour (an ambient temperature of 20° F), to accommodate the gas turbine inlet requirements.

Approximately 103,200 pounds per hour of Number 2 (0.05% S) diesel fuel oil will be required for use at full load when natural gas is not being utilized. Occasional barge deliveries of Number 6 fuel oil will continue to be made at the Purdom Station. However, with the permanent shutdown of Units 5 and 6, the City's need for Number 6 fuel oil is expected to be reduced.

3.3.3 Transportation

Florida Gas Transmission Company (FGT) has two steel natural gas lines that run east-to-west between Capital Circle and Woodville. One of these lines has a 36-inch diameter and the other has a 30-inch diameter. The existing Purdom Station presently receives natural gas through the St. Marks lateral, which is an 8-inch steel line that enters the site at SR 363, and is buried along the south side of the facility access road (see Figure 3.3-1). The St. Marks lateral connects to the existing 30-inch diameter FGT line. As a part of FGT's upgrades to serve Purdom 8, they will: (1) connect the St. Marks lateral to the 36-inch diameter line at Woodville; (2) relocate and upgrade the existing valve and metering station to the new gas yard on site (see Figure 3.3-1); and (3) potentially install up to 3 miles of 12-inch loop to the St. Marks lateral. A new gas line will be installed from the new gas yard to the new Unit 8. The off-site portion of this work is described more fully in Section 6.3. The Number 2 (0.05% S) diesel fuel oil will continue to be supplied by truck delivery from local (most likely St. Marks) suppliers.

Number 6 fuel oil is presently delivered to the site by barge for use in Units 5, 6, and 7 and for delivery to the City of Tallahassee's Hopkins Plant. With the permanent shut-down of Units 5 and 6, the amount of Number 6 fuel oil delivered to the site and the related barge traffic on the river is expected to be reduced slightly.

3.3.4 Storage

The existing 10,000 barrel Number 2 (0.4% S) diesel fuel oil storage tank near the gas turbines will be used for the storage of the secondary Number 2 (0.05% S) diesel fuel oil (see Figure 3.2-1). Oil from this tank presently serves as the backup fuel for the existing combustion turbines (GT1 and GT2). The 20,000 barrel (Tank #1) and 80,000 barrel (Tank #3) heavy oil

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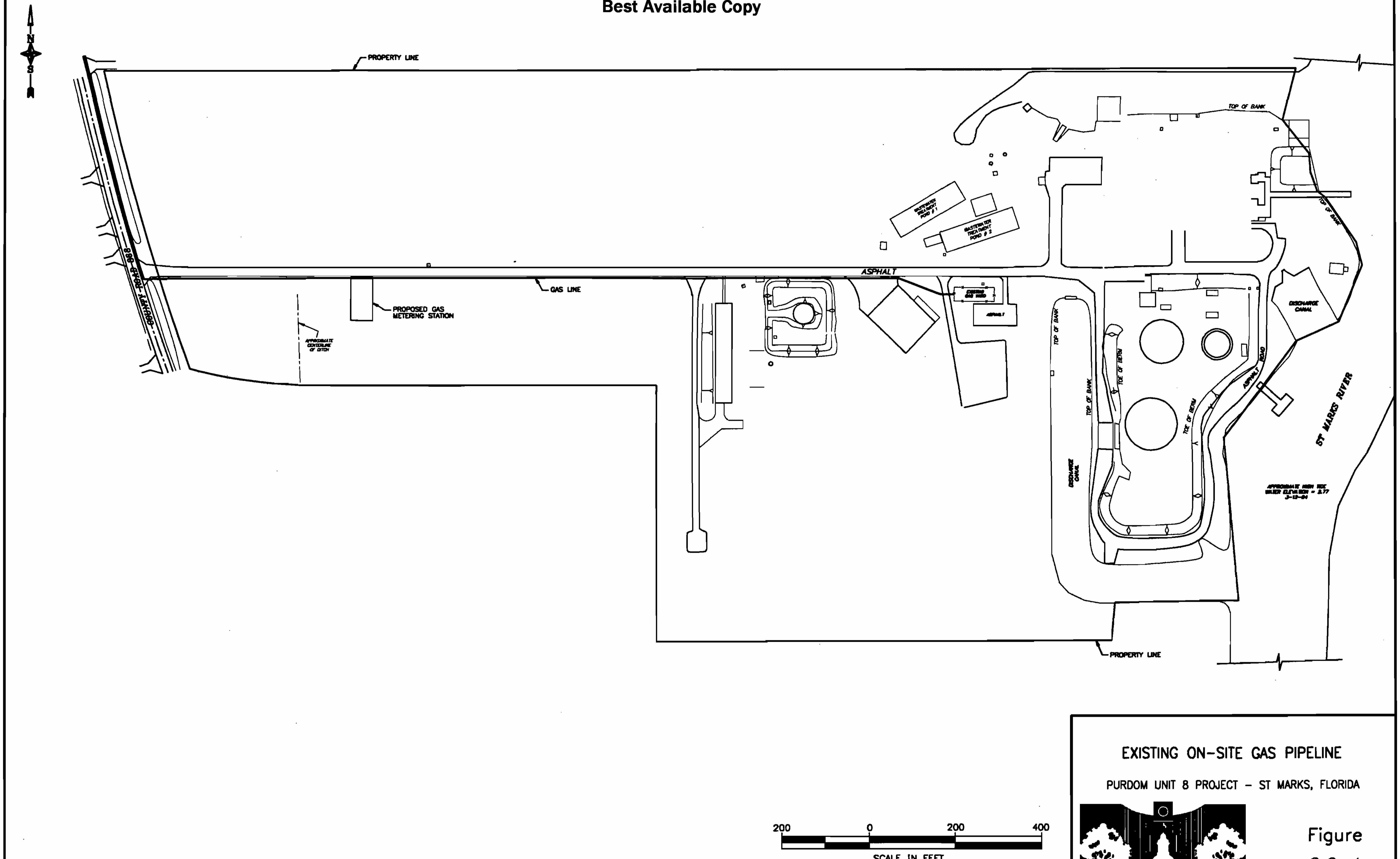

SOURCE: RE&C, 1997

EXISTING ON-SITE GAS PIPELINE

PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

CITY OF TALLAHASSEE

Figure 3.3-1

storage tanks (see Figure 3.2-1) will continue to store Number 6 fuel oil for use in Purdom Unit 7. All existing fuel oil tanks have been inspected and meet 17-762, F.A.C. Because of the permanent shutdown of Purdom Units 5 and 6, the 55,000 barrel (Tank #2) heavy oil storage tank will no longer be needed for fuel oil storage, and will be cleaned and recycled as a wastewater holding tank (see Sections 3.5 and 3.6). A small steel tank (100 gallons) will be installed near the natural gas filter/scrubber (item 28 on Figure 3.2-1) to store natural gas liquids that may occasionally come through the gas line and be removed by the filter. These liquids will be disposed off site by an appropriately licensed contractor.

3.3.5 Quality

Fuel quality estimates supplied herein are projected based on typical values in the literature adjusted for known changes to be required in the sulfur content (fuel oil only).

Two types of fuel quality analysis have been estimated: an ultimate analysis and a proximate analysis. An ultimate analysis is a gravimetric (i.e., weight-based) breakdown of a fuel to the following: carbon, hydrogen, sulfur, nitrogen, oxygen and ash. A proximate analysis is a gravimetric breakdown of a fuel to the following components: volatile matter, fixed carbon, moisture and ash.

The results of the estimated analyses are presented in Table 3.3.5-1 for natural gas and Table 3.3.5-2 for Number 2 (0.05% S) diesel fuel oil.

TABLE 3.3.5-1 TYPICAL NATURAL GAS ANALYSIS[1]	
Analysis	**Gravimetric Breakdown (%)**
Ultimate Analysis	
Carbon	64.84 - 75.25
Hydrogen	20.85 - 23.53
Oxygen	0 - 1.58
Nitrogen	0.76 - 12.90
Sulfur[2]	0 - 0.34
Ash	0.0
Proximate Analysis	
Volatile Matter	99.65 - 100.0
Fixed Carbon	0.0
Moisture	0.0 - 0.00138
Ash	0.0

(1) Heating value (HHV): 964 - 1129 Btu/ft^3
(2) Total sulfur (maximum) 10 grains/100 SCF

Source: Babcock & Wilcox, 1972 and RE&C, 1997

TABLE 3.3.5-2 TYPICAL NUMBER 2 (0.05% S) DIESEL FUEL OIL ANALYSIS[1]	
Analysis	**Gravimetric Breakdown (%)**
Ultimate Analysis	
Carbon	86.1 - 88.2
Hydrogen	11.8 - 13.9
Oxygen	0.0
Nitrogen	0.0 - 0.1
Sulfur[2]	0.0 - 0.05
Ash	0.0 - 0.05
Proximate Analysis	
Volatile Matter	99.05 - 99.5
Fixed Carbon	0.25 - 1.0
Moisture	0.0 - 0.1
Ash	0.0 - 0.05

(1) Heating value (HHV): 19,170 - 19,750 Btu/lb
(2) Total sulfur (maximum) 0.05%

Source: Babcock & Wilcox, 1972 and RE&C, 1997

3.4 AIR EMISSIONS AND CONTROLS

Upon completion of this Project, the Purdom Station will have increased its generating capacity from a nominal 113 megawatts (MW) to a nominal 319 MW. This new total reflects the addition of Unit 8 (nominal 250 MW), the continued operation of existing Unit 7 (nominal 44 MW) and two existing combustion turbines (nominal 12.5 MW each), and the permanent shutdown of Units 5 and 6. Appendix 10.1.5 of this SCA contains the complete application for Prevention of Significant Deterioration (PSD) and Title V air operation permits for the Project. The permit application further describes the Purdom Station's existing capacity, the proposed modifications, and issues associated with current and future air emissions.

This section of the SCA describes the proposed approach to the Project and the resulting air pollutant emissions and control strategies.

3.4.1 Emission Types and Sources

The SCA proposes the construction of a new Unit 8 at the Purdom Station which will consist of a nominal 160 MW combustion turbine/generator, a non-fired heat-recovery steam generator (HRSG), a nominal 90 MW reheat steam turbine/generator, and a multi-celled cooling tower. Therefore, the types of air pollutants expected to be emitted include the products of combustion resulting from burning clean pipeline quality natural gas and Number 2 (0.05% S) diesel fuel oil in the combustion turbine, and small quantities of particulate matter resulting from the cooling tower drift losses.

While the SCA proposes an increase of approximately 200 MW of generating capacity for the Purdom Station, annual facility-wide emissions of oxides of nitrogen (NO_x) and sulfur dioxide (SO_2) will not be increased above their current actual levels. This is possible through the use of efficient combined cycle technology, the permanent shutdown of existing Units 5 and 6, and reduced annual operation of the remaining units in conjunction with the proposed Unit 8. Through the NO_x and SO_2 caps, facility emissions of other regulated air pollutants will also be minimized. The following subsections describe the existing and future air emission units, including the proposed Unit 8 and cooling tower.

3.4.1.1 Emissions Sources

The entire list of future emission units at the Purdom Station (existing and proposed) is provided in Appendix 10.1.5. The existing emissions units of primary interest include the Unit 7 steam generator, which is capable of firing clean pipeline quality natural gas and/or fuel oil in various combinations; a new auxiliary boiler (currently being installed), which has authorization to fire only natural gas; and two existing combustion turbines, which can fire either Number 2 (0.4% S) fuel oil or clean pipeline quality natural gas. Unit 8, as proposed, would consist of a combustion turbine, capable of firing either clean pipeline quality natural gas or Number 2 (0.05% S) diesel fuel oil, and equipped with a non-fired heat recovery steam generator (HRSG). Following completion of the compliance testing on Unit 8, the existing combustion turbines will no longer fire the Number 2 (0.4% S) fuel oil and will also fire Number 2 (0.05% S) diesel fuel oil. In addition, a cooling tower will be installed at the site to supply cooling water for the Unit 8 steam turbine condenser. The locations of these units and their associated emission points were identified in Figures 3.2-1 and 3.2-2. Other emission units at the Purdom Station include emergency generators, fuel oil storage tanks, fuel dispensing operations, surface coating operations, and maintenance operations.

The proposed Unit 8 combustion turbine is an advanced GE MS7231FA equipped with an evaporative cooler. The combustion turbine exhausts through a single non-fired HRSG into a stack designed to meet good engineering practice (GEP) height requirements. The combustion turbine powers a nominal 160 MW generator with output varying based on ambient conditions and fuel input. The HRSG provides steam to a steam turbine which powers a nominal 90 MW generator. The combustion turbine is equipped with dry low-NO_x combustors and a water injection system for controlling NO_x emissions while firing clean pipeline quality natural gas and Number 2 (0.05% S) diesel fuel oil, respectively.

The cooling tower is a multi-cell mechanical draft evaporative cooling tower operating at five cycles of concentration. The unit will be equipped with drift eliminators to reduce drift losses associated with the normal operation of the cooling tower. The drift eliminators are primarily designed to reduce water usage but also result in the minimization of particulate matter emissions.

3.4.1.2 Emissions

The recent annual emissions for the existing regulated units at the Purdom Station have been estimated for the PSD regulated pollutants, and a summary is provided in Table 3.4.1-1. The future annual emissions for the Purdom Station after the proposed project have also been estimated, based on various worst-case scenarios for the facility operating under the SO_2 and NO_x caps, and these estimates are also included in Table 3.4.1-1. The emission rates for the Unit 8 combustion turbine and the cooling tower were based on Best Available Control Technology (BACT) evaluations, described below, which considered technical, economic, energy, and environmental factors. The net emission increases associated with the Project and the significant emission rate thresholds for the various PSD pollutants are also summarized in Table 3.4.1-1.

3.4.1.3 Emissions Inventory

The Purdom Station's complete emissions inventory is included in Appendix 10.1.5. Appendix 10.1.5 contains FDEP Form 62-210.900(1), *Application for Air Permit-Long Form*, for both the PSD and Title V permits.

3.4.2 Air Emission Controls

A review of the various control technologies and associated emission rates for Unit 8 and the cooling tower was completed for the proposed Project, The results of the review included the identification of the most efficient control technologies available and the most stringent emission limitations imposed for each of the PSD pollutants. The BACT analysis, which considered technical, economic, energy, and environmental factors, is presented in Section 3.4.3. This analysis resulted in the selection of the air emission controls for this Project, which include:

TABLE 3.4.1-1 PURDOM STATION PSD APPLICABILITY SUMMARY					
Pollutant	Current Actual Emissions (tons/year)[1]	Future Estimated Emissions (tons/year)[1]	Net Increase in Emissions (tons/year)	Applicable PSD Significance Criterion (tons/year)[3]	PSD Applicability Determination
Carbon Monoxide	66	193	127	0[2]	Yes
Nitrogen Oxides	467	467	0	0[2]	No
Sulfur Dioxide	80	80	0	0[2]	No
Ozone (VOCs)	2.8	14.7	11.9	40	No
Particulate Matter (TSP)	10.7	59.0	48.3	25	Yes
Particulate Matter (PM_{10})	10.7	59.0	48.3	15	Yes
Total Reduced Sulfur	NA	NA	NA	10	No
Reduced Sulfur Compounds	NA	NA	NA	10	No
Sulfuric Acid Mist	3.0	8.6	5.6	7	No
Fluorides	.08	1.64	1.56	3	No
Vinyl Chloride	NA	NA	NA	1	No
Lead	.091	.011	0.080	0.6	No
Mercury	.0020	.0024	0.0004	0.1	No
Asbestos	NA	NA	NA	0.007	No
Beryllium	.00052	.00030	0.00022	0.0004	No

NA - No emissions information available or no emissions expected.

(1) For information on these values see appendix B and C PSD report (section 10.1.5)

(2) Due to the proximity to the Class I area, lower criteria apply for those pollutants with a maximum projected 24-hour average impact of 1.0 microgram per cubic meter or more in the Class I area

(3) Table 212.400-2, Rule 62-212.400, F.A.C.

Source: Foster Wheeler Environmental, 1997

- Good Combustion Practices
- Combustion Controls
- Fuel Quality
- Dry-Low NO_x Combustion
- Water Injection
- Drift Eliminators

3.4.3 Best Available Control Technology (BACT)

3.4.3.1 Introduction

Under both federal and Florida PSD programs, PSD review is triggered for a modification to an existing major facility that results in a significant net emissions increase. As part of the proposed Project, federally enforceable facility-wide caps on the annual emissions of SO_2 and NO_x are being proposed to hold the facility's future emissions of these pollutants to their current actual levels. Because of this commitment, the Project will net out of PSD review for these pollutants. To determine the worst-case emissions of other pollutants from the Project under the proposed facility-wide caps, eleven potential operating scenarios were identified. These scenarios, while not intended to represent limits on the facility, bracket the expected operating ranges of the individual units within the facility. Based on the proposed SO_2 and NO_x caps and the various pollutant-specific worst-case operating scenarios within those caps, the Project will also net out of PSD review for volatile organic compounds (VOCs), sulfuric acid mist (H_2SO_4), lead (Pb), mercury (Hg), beryllium (Be), and total fluorides (Fl). PSD review was triggered only for carbon monoxide (CO) and particulate matter (TSP and PM_{10}). The PSD applicability analysis is summarized in Table 3.4.1-1, and the supporting calculations for the current actual emissions and future allowable emissions are contained in Appendix 10.1.5

Because PSD was triggered for CO and particulate matter (TSP and PM_{10}), the BACT requirements of Rule 62-213.400(6), F.A.C., will apply to new and modified emission units for which a net emissions increase of these pollutants is expected to occur. This BACT analysis therefore addresses control strategies for CO and particulate matter (TSP and PM_{10}) emissions from the Unit 8 combustion turbine, and for particulate matter (TSP and PM_{10}) emissions from the cooling tower. In addition, the BACT analysis includes an evaluation for all PSD pollutants emitted from the combustion turbine to ensure that the proposed Project incorporates the most appropriate control strategies, regardless of the applicability of the BACT requirements.

The Florida PSD regulations require, among other things, that a proposed new facility or major modification: (a) comply with all applicable emission limitations contained in Chapter 62-296, F.A.C., and Title 40 of the Code of Federal Regulations Parts 60 and 61 (40 CFR Parts 60 and 61); and (b) apply BACT for each pollutant subject to PSD review. As defined in Rule 62-210.200(40), F.A.C., BACT is:

> "An emission limitation, including a visible emissions standard, based on the maximum degree of reduction of each pollutant emitted which the Department, on a case by case basis, taking into account energy, environmental and economic impacts,

and other costs, determines is achievable through application of production processes and available methods, systems and techniques (including cleaning or treatment or innovative fuel combustion techniques) for control of each such pollutant."

In order to ensure consistent BACT determinations, and provide guidance to state and local regulatory programs as well as the regulated community, the EPA published guidance for conducting BACT determinations. The guidance includes the following documents:

- *Draft Top-Down BACT Summary* (EPA, 1990a)
- *Draft New Source Review Manual* (EPA, 1990b)
- *OAQPS Control Cost Manual, Fourth Edition* (EPA, 1990c)

Currently the FDEP requires applicants to follow the EPA's draft "top-down" procedures when conducting BACT evaluations, which are done on a case-by-case basis. These draft procedures have recently been formally proposed by EPA as part of the New Source Review Reform Package (61 Federal Register (FR) 38250, 7/23/96).

The "top-down" process requires initial consideration of the most stringent control technologies available, which may then be eliminated based on unacceptable source-specific energy, environmental, or economic impacts. This analysis includes technology transfers when applicable. For combustion turbines, the technical feasibility and economic impacts associated with the most stringent control technologies are typically the determinative factors. For the proposed Project, the economic impact analyses followed the procedures outlined in the above references.

The "top-down" process begins with the identification of various control technologies and strategies available to reduce emission levels of the pollutants subject to PSD review. The following sources were reviewed for identification of control technologies available for the proposed Project:

- California BACT Clearinghouse
- EPA BACT/LAER Clearinghouse
- Recent FDEP BACT Determinations
- EPA's Alternative Controls Techniques Document -- "Emissions from Stationary Gas Turbines" (EPA, 1993)

These sources provide the best information related to available control technologies and the most stringent emission limitations. The EPA BACT/LAER Clearinghouse data was downloaded from EPA's electronic bulletin board and a query was run on "internal combustion.". A separate query was run for the cooling tower. The results of the combustion turbine query are contained in Appendix 10.1.5.

The most stringent control technologies and strategies identified are as follows:

- Fuel Quality
- Good Combustion Practices

- Combustion Techniques
- Add-On Air Pollution Control Systems

The "top-down" evaluation included a review of each control technology and strategy including combinations, technology transfers, and the associated emission limitations.

Associated with each most stringent control technology is an emission limitation. These emission limitations form the basis of the BACT evaluation. For the proposed Unit 8 combustion turbine, the General Electric (GE) operating and emissions data are contained within Appendix 10.1.5.

3.4.3.2 Requirements and Assumptions

As required under the "top-down" process, the technical feasibility, economic impacts, energy impacts, and environmental impacts of each of the various control technologies and strategies were evaluated. These impacts were used to determine the most appropriate control strategies for the Unit 8 combustion turbine and the cooling tower.

For the pollutants requiring an economic impact evaluation, annual emissions from the Unit 8 combustion turbine were estimated based on 8,760 hours of operation and reasonably expected future operations of the unit. Because the short-term emission rates for the unit vary based on fuel type, load, and ambient temperature, certain assumptions were made. For CO and VOCs, the short-term emission rates increase with decreasing load; for all other pollutants, the short-term emission rates remain unchanged or increase with load. The short-term rates generally increase with lower ambient temperatures. An ambient temperature of 59° F was used, which is conservative since the average annual ambient temperature at the site is about 67° F. For the economic analyses that were required, base-case annual emissions from the Unit 8 combustion turbine were based on GE emissions data and the following reasonable assumptions:

> For CO and VOCs, the unit was assumed to operate for 8,260 hours on clean pipeline quality natural gas and 500 hours on Number 2 (0.05% S) diesel fuel oil. Based on future expected operations, the unit was conservatively assumed to operate at 50 percent load for 19 percent of those hours, and at 100 percent load for the remainder of the hours. At these emission levels, the unit can operate within the proposed facility-wide SO_2 and NO_x caps.
>
> For NO_x, the unit was assumed to operate at 100 percent load for 8,260 hours on clean pipeline quality natural gas and 500 hours on Number 2 (0.05% S) diesel fuel oil.

The cooling tower's conceptual design incorporates drift eliminators, allows for operation at five cycles of concentration, and reduces drift losses to 0.002 percent of the cooling tower water recirculation rate. Annual emissions of particulate matter (TSP and PM_{10}) were based on continuous (100 percent load) operation and the conceptual design.

3.4.3.3 Carbon Monoxide

CO is formed within a combustion turbine through the incomplete combustion of liquid and gaseous fuels. High temperatures, adequate excess air, and good fuel/air mixing during combustion minimize CO emissions. CO formation is therefore a function of the unit's overall combustion efficiency, which is a measure of the percentage of carbon and hydrogen within a fuel that is converted to carbon dioxide and water. Complete or 100 percent conversions are only theoretical, so that products of incomplete combustion, including CO, are formed. The Unit 8 combustion turbine, as proposed, includes advanced GE dry-low NO_x combustor technology that maximizes NO_x reductions while minimizing CO and VOC emissions by varying the parameters which impact combustion efficiency. For the BACT analysis, the base-case CO emissions were estimated at 167 tons per year from the combustion turbine.

The combined use of good combustion practices and an oxidation catalyst was identified as the most stringent control technology currently available to control CO emissions. Combustion turbines equipped with an oxidation catalyst have had CO emissions limited to levels of about 2 and 3 ppm while firing natural gas and Number 2 fuel oil, respectively. For the proposed Unit 8 combustion turbine, this control equipment is known to be technologically feasible, but has been shown to have unacceptable economic, energy, and environmental impacts. "Good combustion practices" are typically determined to be the appropriate control technology for projects not required to meet the most stringent control technology's "Lowest Achievable Emission Rate" (LAER) limits that apply in nonattainment areas. The impacts of the control strategies are discussed in the following subsections.

Summary of Technologies Evaluated

The following control technologies were evaluated based on their control effectiveness:

- Oxidation Catalyst to reduce CO emissions by 90 percent; and
- Combustion controls to ensure good combustion.

Combustion controls represent the base case. Emission reductions were based the emission levels associated with the base case and a 90 percent control level.

Energy Impacts

An oxidation catalyst will result in a reduction in a combined cycle combustion turbine's overall performance and output capacity. The main loss is associated with the additional pressure drop across the catalyst bed. This pressure drop can range from 1 to 2 inches of water and can also reduce the unit's overall output by as much as 0.5 percent (1.25 MW). Although the energy impact may be measurable, it is not, by itself, considered significant enough to reject the control technology. Costs associated with the energy loss are included within the economic analysis.

Environmental Impacts

The environmental impacts resulting from the use of an oxidation catalyst can include increases of sulfur trioxide (SO_3) emissions and waste disposal. Increased SO_3 emissions are a result of the conversion of SO_2 to SO_3 in the presence of the oxidation catalyst. Water vapor within the exhaust gases can react with this additional SO_3 to form H_2SO_4. In addition, the disposal of the spent catalyst every two years also would place additional burdens on available landfill space. These potential environmental impacts alone were not considered significant enough to reject the control technology.

Economic Impacts

The economic impacts were based on the costs of an oxidation catalyst in accordance with the procedures outlined in the EPA's "*Cost Control Manual*" (EPA, 1990c) and the draft '*New Source Review Workshop Manual*" (EPA, 1990b). Appendix 10.1.5 contains the capital and operating cost factors used in the oxidation catalyst and later selective catalytic reduction (SCR) analyses.

Engelhard provided an estimated oxidation catalyst system cost of $830,000 for the 90 percent reduction of CO emissions, with a warranty period of two years. Seventy-five percent of this system's cost was reported to be associated with the catalyst, including replacement. The design criteria were based on firing Number 2 (0.05 % S) diesel fuel oil at 50 percent load and meeting the 2 and 3 ppm LAER limits for gas and oil firing.

The economic analysis reduces capital and operating costs to annualized values based on a 20-year economic life of the Project and a 7.25 percent return. On this basis, an oxidation system would add approximately $1.5 million to the capital cost of the Project.

The total levelized annual costs for the Project would increase by about $1.2 million per year, resulting in an incremental removal cost of approximately $7,720 per ton. The cost per ton for controlling CO emissions through the use of an oxidation catalyst is prohibitively expensive. This result is consistent with other recent BACT determinations by FDEP where good combustion practices were determined to be BACT. The use of good combustion practices to minimize CO emissions is therefore proposed as BACT for the Unit 8 combustion turbine.

3.4.3.4 Particulate Matter (TSP) And PM_{10}

Combustion Turbine

Emissions of particulate matter (TSP) and PM_{10} result from inert materials within the fuel, products of incomplete combustion, and inert materials within the combustion turbine inlet air. The New Source Performance Standards (NSPS) for combustion turbines, 40 CFR 60 Subpart GG do not establish emission limits for particulate matter. All of the particulates emitted from the combustion turbine are expected to be less than 10 microns in diameter. Thus, the emissions of TSP equal the emissions of PM_{10} and further discussion of particulate matter will refer to PM_{10}.

The combustion turbine has PM_{10} emissions levels of 9 lb/hr (0.0058 lb/mmBtu) while firing clean pipeline quality natural gas and 17 lb/hr (0.0096 lb/mmBtu), while firing Number 2 (0.05% S) diesel fuel oil, exclusive of background concentrations per the GE data sheets. These factors are based more on the uncertainties in PM_{10} stack testing methods than on the expectation of large quantities of inert materials within the combustion turbine inlet air or the fuel (GE, 1996a). Since inert materials can cause turbine damage resulting in additional downtime and maintenance, combustion turbines are normally fired with clean fuels such as natural gas and Number 2 diesel fuel oil. Air filtration systems are also employed to avoid the introduction of inert materials into the combustion turbine through the inlet air. In addition, good combustion practices are followed for both environmental and economic reasons.

The most stringent control technology associated with combustion turbines for PM_{10} is a combination of fuel quality, good combustion practices, and combustion turbine inlet air filtration. Add-on air pollution control strategies such as baghouses, scrubbers, and electrostatic precipitators (ESPs) have not been used on combustion turbines and their use as a transfer technology has been deemed neither technically nor economically feasible for combustion turbines due to anticipated back pressure problems. The emission levels associated with the most stringent controls were based on a North Carolina BACT determination of 9 lb/hr and 17 lb/hr when firing natural gas and Number 2 fuel oil, respectively. The Unit 8 combustion turbine has PM_{10} emission levels equal to those associated with the most stringent technology. Therefore, no further energy, environmental, or economic analysis was required. For the combustion turbine, BACT for the PM_{10} emissions is proposed as combustion turbine inlet air filtration, good combustion practices, and the use of clean pipeline quality natural gas and Number 2 (0.05% S) diesel fuel oil.

Cooling Tower

Emissions of particulate matter (TSP and PM_{10}) result from the direct contact between the cooling water and the air passing through it. As the air and water make contact, some water may become entrained within the air stream and carried out of the tower as "drift" droplets, which is known as drift loss. The cooling water, and consequently the drift droplets, typically contain dissolved and suspended solids. These solids constitute the particulate matter within the droplet and are considered in calculating the total PM_{10} emissions. The amount of drift loss depends on the number and size of the droplets produced within the cooling tower and is related to the overall design of the cooling tower. Typically, larger droplets will fall to the ground near the tower while smaller droplets may evaporate, leaving the solids suspended within the atmosphere. The amount of particulate emissions including TSP and PM_{10} depends on the amount of drift loss and the concentration of solids within the cooling tower water.

To reduce drift losses from cooling towers, and therefore indirectly lower particulate emissions, drift eliminators can be incorporated into the tower design. A single BACT determination for a cooling tower was identified in the control technology review, establishing drift eliminators as BACT, with an emission limitation of 0.002 percent of the recirculating water flow. The proposed cooling tower for the Purdom Station will incorporate drift eliminators, operate at 5 cycles of concentration, and reduce drift losses to 0.002 percent of the cooling tower recirculation rate. BACT for particulate matter emissions from the cooling tower is therefore proposed as the use of drift eliminators.

3.4.3.5 Other Pollutants

In addition to the pollutants subject to BACT, evaluations of the Unit 8 combustion turbine's emissions of other PSD pollutants was also conducted, although not required by the applicable regulations. These other pollutants included SO_2, H_2SO_4, NO_x, VOC, Fl, and trace metals. The findings regarding each of these pollutants are discussed in the following sections.

Sulfur Dioxide and Sulfuric Acid Mist

Sulfur dioxide emissions are a direct result of the oxidation of the various sulfur compounds contained within the fuel stream. Both natural gas and Number 2 fuel oil contain some sulfur compounds. In either case, the oxidation process follows the general chemical reaction:

$$S + O_2 \Rightarrow SO_2$$

Sulfuric acid mist is the result of the oxidation of SO_2 to SO_3 and the subsequent reaction with moisture to form H_2SO_4. This process follows the following general chemical reactions:

$$2SO_2 + O_2 \Rightarrow 2SO_3$$

$$SO_3 + H_2O \Rightarrow H_2SO_4$$

Combustion of both clean pipeline quality natural gas and the Number 2 (0.05% S) diesel fuel oil will result in emissions of SO_2 and H_2SO_4. Because SO_2 and H_2SO_4 emissions are directly proportional to the sulfur content of the fuel, they can be controlled through fuel quality. The most stringent SO_2 and H_2SO_4 emission standards for combustion turbines are related to fuel quality. The SO_2 and H_2SO_4 emissions from the Unit 8 combustion turbine are based on GE data which Project that 95 percent of the sulfur in the fuel would be emitted as SO_2 and the remaining 5 percent emitted as H_2SO_4.

The Unit 8 combustion turbine will fire clean pipeline quality natural gas as the primary fuel with Number 2 (0.05% S) diesel fuel oil as the secondary fuel, which meets the most stringent emission levels reported. In addition, the use of the Number 2 fuel oil with a sulfur content of 0.05 percent by weight is well within the NSPS requirements of Subpart GG, which specifies a maximum sulfur content of 0.8 percent by weight.

Oxides of Nitrogen

Emissions of NO_x from combustion turbines are generated by two primary mechanisms known as "fuel NO_x" and "thermal NO_x." Fuel NO_x is related to the nitrogen content of the fuels fired in the combustion turbine. Most solid and liquid fuels contain some quantities of nitrogen within their chemical structure, known as fuel bound nitrogen (FBN), which when burned can produce NO_x emissions or "fuel NO_x." Within combustion turbines, FBN is only a concern when firing fuel oils, since clean pipeline quality natural gas typically contains little or no FBN. The production of fuel NO_x can follow the generalized chemical reaction:

$$C_xH_yN + zO_2 \Rightarrow xCO_2 + (y/2)H_2O + NO_x$$

Fuel NO_x represents a relatively small but measurable portion of the overall NO_x emissions generated by a combustion turbine. For combustion turbines, NSPS Subpart GG establishes a base NO_x emissions standard of 75 parts per million by volume on a dry basis (ppmvd) corrected to 15 percent oxygen at ISO ambient conditions. This standard includes additional allowances for the heat rate and for FBN.

The second mechanism by which NO_x emissions are formed within a combustion turbine is known as "thermal NOx" and is a result of the dissociation of nitrogen (N_2) and Oxygen (O_2) in the combustion air and the subsequent reactions to form NO_x. The Zeldovich mechanism has been proposed for this reaction and is based on the following general equations:

Dissociation

$$N_2 \Leftrightarrow 2N\bullet$$

$$O_2 \Leftrightarrow 2O\bullet$$

Reaction

$$N_2 + 3O\bullet \Leftrightarrow 2NO + O\bullet$$

$$O_2 + N\bullet \Leftrightarrow NO + O\bullet$$

$$N\bullet + O\bullet \Leftrightarrow NO$$

The dissociation reactions, which produce elemental nitrogen and oxygen, are favored under conditions of high temperatures and pressures. Combustion controls focus on reducing thermal NO_x production by reducing the peak flame temperatures within the combustion zone. Peak flame temperatures are controlled by either wet injection systems or by varying the stoicheometric ratio of the combustion air and fuels within the combustion zones. Wet injection systems involve the injection of either water or steam into the combustion zone to act as a heat sink and lower flame temperatures. Varying the stoicheometric ratios through staged combustion reduces flame temperatures and the nitrogen concentrations within the combustion zone. This later technique forms the basis of the dry low-NO_x combustors offered by various manufacturers. Appendix A of the PSD Report in Appendix 10.1.5 contains information provided by General Electric on its dry-low NOx development program, a technical paper on dry-low NOx technology, and the emissions data sheets for the proposed Unit.

For Unit 8, NO_x emission levels of 9 ppmvd (0.037 lb/mmBtu) while firing clean pipeline quality natural gas and 42 ppmvd (0.181 lb/mmBtu) while firing Number 2 (0.05% S) diesel fuel oil have been guaranteed up to a maximum of 0.015 percent FBN. Thermal NO_x emissions will be controlled by the use of an advanced dry low-NO_x combustor while firing clean pipeline quality natural gas and water injection while firing Number 2 (0.05% S) diesel fuel oil, respectively. The proposed emission limits are well below those of 40 CFR 60 Subpart GG and also below those considered BACT in recent FDEP determinations. However, the proposed combustion turbine's NO_x levels are above those associated with the most stringent emission limitations (3.5 ppmvd - natural gas and 10 ppmvd - fuel oil) placed on projects located within non-attainment areas. As such Foster Wheeler examined the costs associated with the installation of an add-on air pollution control technology were examined.

Add-on air pollution control systems for reducing emissions of NO_x from combustion sources include selective catalytic reduction (SCR) and selective noncatalytic reduction (SNCR). Currently, SCR in combination with either wet injection or dry low-NO_x technologies is the most efficient control technology employed to control NO_x emissions from combustion turbines. Combustion turbines equipped with SCR systems have demonstrated compliance with emission limits as low as 3.5 ppmvd and 10 ppmvd, corrected to 15 percent O_2, while firing natural gas and Number 2 fuel oil, respectively. Because of the current temperature limitations of the available SNCR systems, their use on combustion turbines is not considered to be technologically feasible. Therefore, the evaluation addressed only SCR as an available add-on control technology for NO_x.

As part of the evaluation, the economic impact of an SCR system was considered. The economic impact analysis followed EPA's suggested procedures. A vendor quote was received for an SCR system, with a three-year catalyst warranty. The quote estimated the initial capital cost for an SCR system to be $1,676,000. In addition to this initial cost, the vendor estimated additional costs of $300,000 to $350,000 per year for catalyst replacement. The SCR design criteria was based on meeting the 3.5 and 10 ppmvd LAER limits for all gas and oil firing.

The economic impacts analysis reduced capital and operating costs to annualized values based on a twenty-year economic life of the Project and a 7.25 percent return. The analysis indicated that an SCR system would add approximately $3.1 million to the overall capital cost of the Project. The total levelized annual costs for the Project would increase by about $1.5 million per year, resulting in an incremental removal cost of approximately $7,225 per ton. Based on the economics impacts alone, it was determined that controlling NO_x emissions through an SCR system would be prohibitively expensive, consistent with other recent BACT determinations by FDEP.

In addition to the economic impacts, the use of an SCR system would result in a reduction in the combined cycle combustion turbine's performance and output capacity. The main loss is associated with the additional pressure drop across the ammonia injection grid and the catalyst bed. This pressure drop can range from 2 to 5 inches of water and can reduce the overall unit output by as much as 0.5 percent. In addition, energy losses are associated with the pumps and instrumentation used to control and operate the ammonia injection system. Although these energy impacts may be measurable, they were not by themselves considered significant enough to reject the control technology. Costs associated with the energy loss have been included within the economic analysis.

Environmental impacts resulting from the use of an SCR system include emission increases of SO_3 and PM_{10} emissions, waste disposal, increased water usage, and the storage, handling, and emissions of ammonia and ammonia products. Increased SO_3 emissions are a result of the catalytic oxidation of SO_2 to SO_3 in the presence of the SCR catalyst. As discussed previously, SO_3 can be expected to form H_2SO_4 in the presence of water vapor within the exhaust gases. SO_3 can also be expected to react with ammonia to form either ammonium bisulfate or ammonium sulfate, which will be reflected as increased PM_{10} emissions and which could potentially cause fouling in the HRSG. In addition to the increases in SO_3 and PM_{10} emissions, the SCR system could also introduce ammonia emissions into the environment. Disposal of the spent catalyst every three years will place additional burdens on available landfill space. Water usage would increase by about 136,500 gallons per year through the use of the aqueous ammonia solution. The handling, storage, and use of aqueous ammonia does pose less of an environmental threat than that of anhydrous ammonia from the standpoint of an accidental air release. However, because of the Purdom Station's location along the banks of the St. Marks River, the potential handling and storage of an aqueous ammonia solution would have to be addressed from an accidental spill and release perspective.

Based on the various impact analyses, BACT for NO_x emissions from the combustion turbine is proposed to be the use of clean pipeline quality natural gas as the primary fuel and Number 2 (0.05% S) diesel fuel oil as the secondary fuel, and the use of dry-Low-NO_x combustors and a water injection system when firing clean pipeline quality natural gas and Number 2 (0.05% S) diesel fuel oil, respectively.

Volatile Organic Compounds

Within a combustion process, emissions of VOCs are related to the combustion efficiency of the unit. Combustion control strategies for VOCs are similar to those for CO which target high temperatures, long residence times, and adequate excess air. For combustion turbines, NSPS Subpart GG does not establish emission limits for VOC emissions.

The Unit 8 combustion turbine will have VOC levels of 2 parts per million volume on a wet basis (ppmvw) (0.0018 lb/mmBtu) and 5 ppmvw (0.0042 lb/mmBtu), while firing clean pipeline quality natural gas and Number 2 (0.05% S) diesel fuel oil, respectively, for loads above 75 percent. These values are representative of BACT for these loads. For loads below 75 percent, the VOC levels are higher, as reported in the GE data sheets. The most stringent control technology for VOCs have associated emission levels of 1.5 and 3 ppmvw for natural gas and Number 2 (0.05% S) diesel fuel oil firing, respectively.

For combustion turbines, add-on air pollution control strategies for VOCs include oxidation catalysts. The use of an oxidation catalyst for the reduction of CO emissions was evaluated for the Unit 8 combustion turbine. Since VOC emissions were not subject to BACT review, a separate cost analysis for an oxidation catalyst to reduce VOCs was not conducted. However, by assuming a 30 percent reduction of VOC emissions across the CO oxidation catalyst, and by adding the additional reduction in VOC emissions to those of CO, the additional benefit of a lower incremental cost of the system was identified. This lower incremental cost was estimated at $7,510 per ton of CO and VOC removed. Although the combination of VOC and CO reductions is slightly higher, making the incremental removal cost lower, the economic cost of an oxidation catalyst was still considered to be unreasonably expensive.

Trace Metals

Emissions of trace metals result from inert materials within the fuel and combustion turbine inlet air. Clean pipeline quality natural gas contains little, if any, noncombustible inert materials; trace metal emissions are considered negligible. For mercury, an emission factor of 0.078 lb/10^{12} Btu has been used for this analysis. Number 2 fuel oil has a reported ash content of less than 0.01 percent by weight (Perry, 1973). Emissions of trace metals from the use of Number 2 (0.05% S) diesel fuel oil are therefore expected to be higher when compared to clean pipeline quality natural gas, but are still relatively low. For the Unit 8 combustion turbine on fuel oil, emissions of trace metals have been estimated based on AP-42 emission factors (EPA, 1995) for lead (194 lb/10^{12} Btu), beryllium (4.2 lb/10^{12} Btu), and mercury (32 lb/10^{12} Btu).

As discussed under the section regarding PM_{10} emissions, BACT for trace metal emissions from combustion turbines has been determined to be fuel quality, good combustion practices, and combustion turbine inlet air filtration. NSPS Subpart GG does not contain any emission standards for trace metals nor did any of the reported BACT determinations. Consistent with other recent FDEP determinations of BACT for trace metal emissions from combustion turbines, the use of clean pipeline quality natural gas as the primary fuel with Number 2 (0.05% S) diesel fuel oil as the secondary fuel, good combustion practices, and combustion turbine inlet air filtration are proposed as BACT for Unit 8.

Total Fluorides

The review of the most stringent control technologies did not identify any emission limitations associated with fluoride emissions from combustion turbines. Fluoride emissions are associated with the use of fuel oil. Fuel quality is therefore proposed as BACT for fluoride emissions from the Unit 8 combustion turbine, with clean pipeline quality natural gas as the primary fuel and Number 2 (0.05% S) diesel fuel oil as the secondary fuel.

3.4.3.6 BACT Summary

The BACT evaluation examined the available fuels, combustion technologies, and add-on air pollution control systems. Based on the evaluations, BACT for the Project includes the following:

- For the primary control of CO and VOC emissions from the combustion turbine, good combustion practices, which maximize NO_x reductions while minimizing CO, VOCs, and PM_{10} emissions are proposed as BACT. For CO, the evaluation is based on the economic impacts of an oxidation catalyst, which represents the most stringent control technology.
- For the primary control of PM, PM_{10}, trace metals, and total fluorides emissions from the combustion turbine, inlet air filtration coupled with good combustion practices and fuel quality are proposed as BACT. The use of clean pipeline quality natural gas and Number 2 (0.05% S) diesel fuel oil is the most stringent control technology available.
- For the primary control of NO_x, combustion controls including dry-low NO_x combustors and wet injection techniques coupled with fuel quality are representative of BACT. The evaluation is based on the economic impacts associated with an SCR system, which represents the most stringent control technology available.
- For the primary control of SO_2 and H_2SO_4, and the secondary control of NO_x and PM_{10}, the use of clean pipeline quality natural gas and Number 2 (0.05% S) diesel fuel oil is the most stringent control technology available.
- For the primary control of PM and PM_{10} from the cooling towers, drift eliminators which reduce drift losses are proposed as BACT and are the most stringent control technology available.

3.4.4 Design Philosophy

The proposed Project design reflects an appreciation for the environment in Wakulla County. The Project's goals include the protection of that environment while providing for the growing electrical needs of the Tallahassee area. Design commitments include special protections for air quality due to the Purdom Station's proximity to the Bradwell Bay National Wilderness Area, and the St. Marks National Wildlife Refuge and its location along the St. Marks River.

These special protections are reflected in an overall plant-wide control strategy, which includes no net increases in annual emissions of SO_2 and NO_x above recent actual levels, the application of BACT for all PSD pollutants, the use of clean fuels including clean pipeline quality natural gas as the primary fuel and Number 2 (0.05% S) diesel fuel oil as the secondary fuel, the installation of advanced combined cycle technology, and the early retirement of two older units. The use of advanced combined cycle technology will allow the Purdom Station to run more efficiently with nearly triple the current plant capacity. In addition, Unit 8 will have the lowest NO_x emissions permitted to date for a major natural-gas-fired electric generating station in Florida.

3.4.5 References

EPA (U.S. Environmental Protection Agency). 1990a. "Top-Down" Best Available Control Technology Guidance Document (Draft). Office of Air Quality Planning and Standards, March 15. Research Triangle Park, North Carolina.

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EPA. 1995. Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources, AP-42, 5th Edition January. Research Triangle Park, North Carolina.

Perry, R. H., and C. H. Chilton. 1973. Chemical Engineer's Handbook, 5th Edition. McGraw-Hill Book Company. New York, New York.

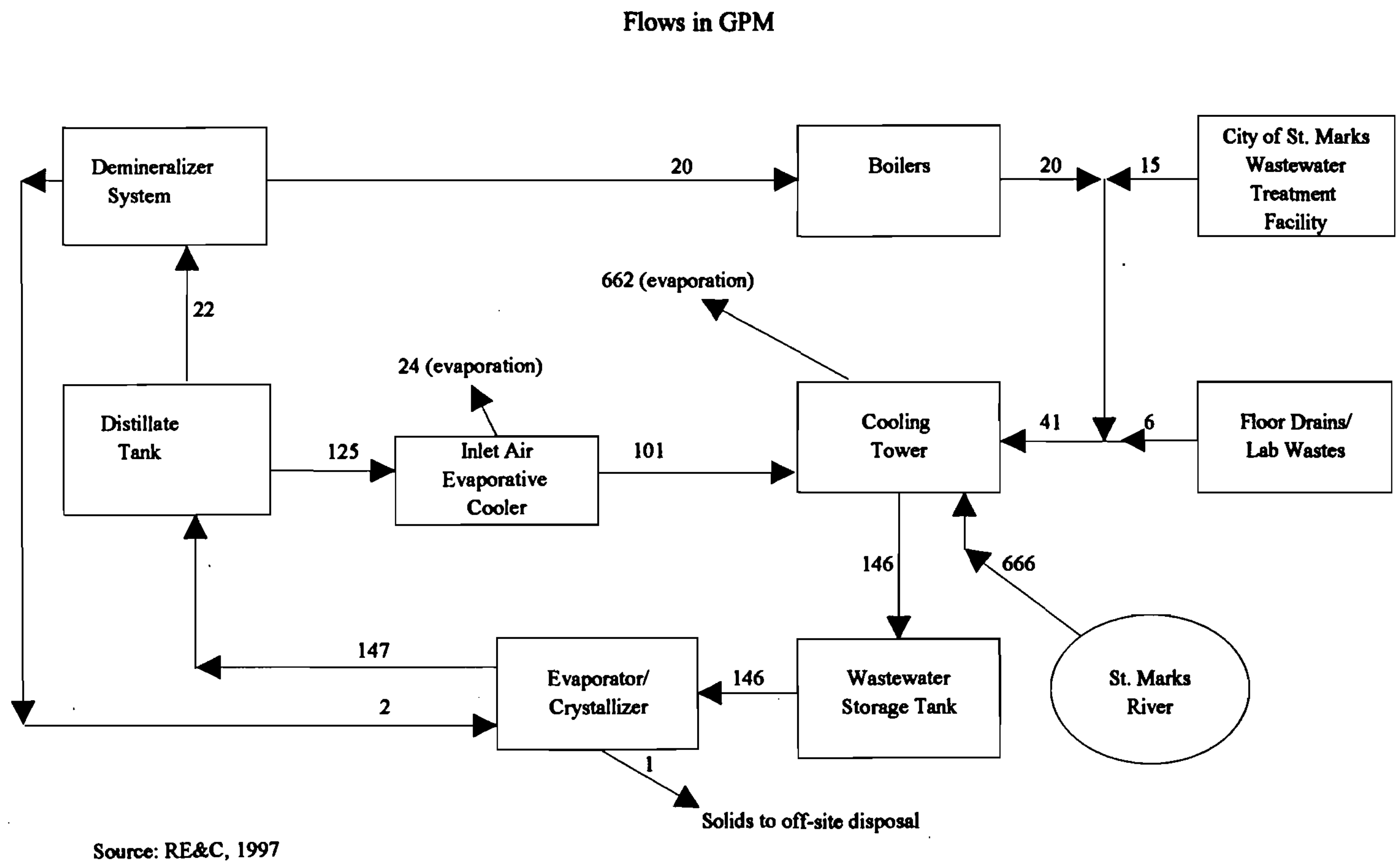
3.5 PROJECT WATER USE

Purdom Unit 8 has been designed to minimize impacts to the St. Marks River watershed. The existing plant currently uses St. Marks River water for once-through cooling, Floridan aquifer water for process makeup and auxiliary cooling, and water from the City of St. Marks municipal system for potable water. The City of Tallahassee looked at potential sources of wastewater as the first choice for makeup to the proposed Unit 8. The National Pollutant Discharge Elimination System (NPDES) permits in the site vicinity were examined. Those discharges that dealt primarily with stormwater flows to the river (e.g., Seminole Refining) were eliminated from consideration. The discharge from Primex Technologies (formerly Olin Corporation) was examined, but neither the City of Tallahassee nor Primex could justify the economics of pursuing reuse of that waste stream. This process of elimination left only the discharges from the St. Marks Wastewater Treatment Facility and the non-cooling, non-stormwater outfalls from the Purdom Station itself, as discharges to the river containing pollutants but suitable for use as cooling tower makeup. The City of Tallahassee is committed to reuse of these two waste streams, to improve the quality of the river, and to support the State's commitment to reuse wastewater.

Based on historical analysis of groundwater quality from the City of Tallahassee's wells, it was concluded that the use of groundwater should be discontinued with the start-up of Unit 8 to help prevent any further saline intrusion. This left the St. Marks River as the only remaining water source. Since the maximum facility demand was predicted to be approximately 2 cfs, or about 0.6 percent of the 7Q10 (347 cfs) at the Purdom Station, it was concluded that the utilization of such a quantity of surface water from the river would not have significant hydrological impact. Therefore, the Project proposes such a use. As the facility is already connected to the City of St. Marks municipal water system, and the proposed Project does not require any additional staff, potable water will continue to be withdrawn from the municipal system.

Purdom Unit 8 is proposed to be a zero discharge facility with respect to the NPDES program. This means it will have no point source discharges of wastewaters or contaminated stormwater to surface waters. The key feature of this design is the zero discharge wastewater treatment system. The City of Tallahassee is presently evaluating two different designs for this system. The first design consists of a falling film, vapor compression evaporator and a steam-driven forced circulation crystallizer and solids separator. The second design includes the use of heat exchangers and wastewater evaporating cooling tower cells. It is likely that the final design will be some combination of the two. In any case, use of the zero discharge wastewater treatment system will allow Unit 8 to use the reclaimed water from the City of St. Marks Wastewater Treatment Facility and the recycled process wastewaters from Purdom Units 7 and 8 to minimize the withdrawal of St. Marks River water for makeup to the cooling tower and to both boilers. This allows the Purdom Station to discontinue the use of groundwater at the site.

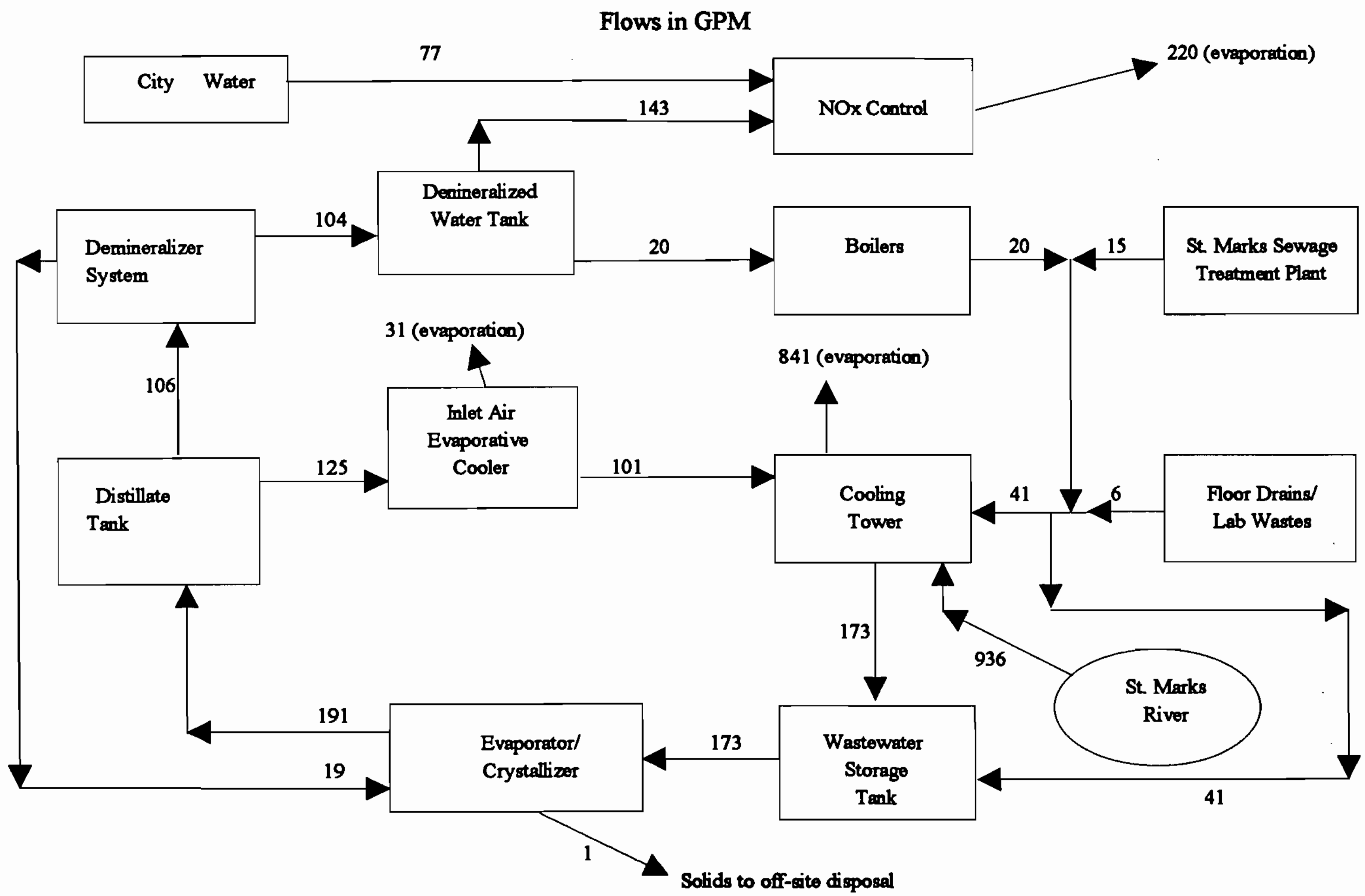
Based on this design, a quantitative water balance for the unit is shown on Figure 3.5-1 for firing natural gas under average annual meteorological conditions, and on Figure 3.5-2 for firing number 2 fuel oil under extreme meteorological conditions. Expected average conditions are represented on Figure 3.5-1, while peak water use at the plant under any conditions is represented on Figure 3.5-2



CITY OF TALLAHASSEE

AVERAGE WATER USE
100% CAPACITY FIRING NATURAL GAS
UNDER AVERAGE METEOROLOGICAL CONDITIONS
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 3.5-1



Source: RE&C, 1997

CITY OF TALLAHASSEE

PEAK WATER USE
100% CAPACITY FIRING OIL
DURING SUMMERTIME
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 3.5-2

3.5.1 Heat Dissipation System

The heat dissipation device will consist of a closed-cycle mechanical draft evaporative cooling tower.

3.5.1.1 System Design

The heat dissipation system will consist of a multi-cell cooling tower, two 50 percent capacity circulating water pumps, piping, valves, and instrumentation to provide cooling water to the condenser and the auxiliary cooling water system.

The cooling tower will be an evaporative mechanical draft type unit sized to accommodate the heat load and flow from the condenser and auxiliary cooling water system. The tower construction will be treated Douglas Fir. Each cell will be provided with a motor driven fan. The tower will be erected over a concrete basin.

The circulating water pumps will be of the vertical, wet pit type. The system will provide for independent pump isolation and protection from flow reversal using motor operated butterfly valves at each pump discharge.

Two 50 percent capacity cooling tower makeup pumps will be installed in the existing circulating water intake structure for Purdom Unit 5. These pumps will deliver makeup water to the Unit 8 cooling tower basin.

The auxiliary cooling water system will consist of the auxiliary cooling water pumps, suction strainers, piping, valves, and instrumentation to provide cooling water to the following:

- Combustion Turbine Generator Coolers
- Combustion Turbine Lube Oil Coolers
- Steam Turbine Lube Oil Coolers
- Steam Turbine Hydraulic Oil Coolers
- Miscellaneous Mechanical Equipment Coolers

The auxiliary cooling water pumps will be two 100 percent capacity horizontal centrifugal type pumps taking suction from the circulating water system. The auxiliary cooling water pumps provide cooling water to the various plant equipment at sufficient flow and pressure for cooling.

At its design condition of a 95° F dry bulb and 79° F wet bulb, the cooling tower will dissipate about 580 million Btu per hour. Consumptive use of water by evaporation in the cooling tower has been estimated under both average and extreme (peak) conditions, on a monthly basis. The results are presented in Table 3.5.1-1. The heat dissipation systems for Units 5, 6, 7, GT1 and GT2 have been described in Section 2.3.4.1.

TABLE 3.5.1-1 AVERAGE AND PEAK MONTHLY COOLING TOWER EVAPORATION (100% LOAD)				
	Extreme Conditions		Average Conditions	
Month	Wet Bulb (°F)	Evaporation (gpm)	Wet Bulb (°F)	Evaporation (gpm)
January	66.4	707	46.0	595
February	65.1	740	48.5	619
March	68.9	771	55.0	643
April	68.4	809	60.2	679
May	72.1	841	67.1	689
June	75.9	834	72.3	705
July	77.4	835	75.0	701
August	77.7	837	75.0	695
September	75.9	835	71.3	701
October	72.5	799	62.0	675
November	69.1	759	54.4	635
December	68.5	724	48.7	611
	Peak = 77.7	841.0	Average = 61.3	662.3
Source: Foster Wheeler Environmental, 1996, RE&C, 1997				

3.5.1.2 Source of Cooling Water

The main source of cooling water will be the St. Marks River. Its temperature range is described in Section 2.3.4.1. Minimum average cooling water quality characteristics to operate the heat dissipation system as proposed are estimated to be:

Silicon Dioxide	< 18 mg/l
Calcium	< 15 mg/l
Sulfate	< 12 mg/l
Iron	< 0.5 mg/l
Manganese	< 0.5 mg/l
Aluminum	< 0.125 mg/l
Sulfides	< 0.625 mg/l
Magnesium	< 54 mg/l
Total Dissolved Solids (TDS)	≤ 2500 mg/l
Source: RE&C, 1997	

3.5.1.3 Dilution System

There will be no dilution system associated with the heat dissipation system.

3.5.1.4 Blowdown, Screened Organisms, and Trash Disposal

The heat dissipation system will have no blowdown; it will be a zero discharge system. Wash water for the existing traveling water screens is supplied by screen-wash pumps which withdraw water from within the pump structure. The discharge from the screens is flushed into a collecting box where debris is retained for off-site disposal, and flush water is drained back to the source.

Unit 7 takes its water from the Unit 7 Intake Canal. Unit 8 will take its water from the St. Marks River, utilizing the existing Unit 5 intake structure.

3.5.1.5 Injection Wells

There will be no injection wells associated with the heat dissipation system.

3.5.2 Domestic/Sanitary Wastewater

Sanitary wastewater is currently sent to the City of St. Marks Wastewater Treatment Facility, at a rate estimated to be less than 1,500 gpd. Because there will not be any additional plant staff associated with the Project, no changes to these services are proposed.

3.5.3 Potable Water Systems

Potable water is currently provided to the site from the City of St. Marks municipal system at a rate estimated to be less than 1,500 gallons per day. Because there will not be any additional plant staff associated with the Project, no changes to these services are proposed.

3.5.4 Process Water Systems

The main usage of water at the site, after completion of the installation of Unit 8, will be as makeup to the cooling tower. The river water, the reclaimed water from the City of St. Marks Wastewater Treatment Facility, and the process wastewaters from the plant itself (both Units 7 and 8) will all be discharged directly to the cooling tower basin. Except for the continuation of chlorination (and the cessation of the dechlorination) of the Wastewater Treatment Facility effluent, the influent to the cooling tower basin will not be treated.

One of the large Number 6 fuel oil storage tanks (Tank No. 2) will be converted to a wastewater storage tank to facilitate recycling of all of the facility wastewaters. This tank will be closed in accordance with the procedures of Chapter 62-762, F.A.C. prior to being converted to a wastewater storage tank. This tank will then be the influent storage tank for the zero discharge wastewater treatment system, which will also serve as the pretreatment unit for the process water treatment system.

The tank normally will receive up to 173 gpm of cooling tower blowdown from Purdom Unit 8, and up to 19 gpm of demineralizer regeneration wastewater from Purdom Units 7 and 8, for a design inflow of 192 gpm. Design inflow TDS has been estimated to be 15,075 mg/l. If Unit 8 is not operational, the reclaimed water from the St. Marks Wastewater Treatment Facility and the recycled process wastewaters from the Purdom Station will be routed to this 2,310,000-gallon wastewater storage tank.

Water from the wastewater storage tank will be sent to the zero discharge wastewater treatment system, where the wastewater will be essentially distilled to produce feedwater for the existing demineralizer system. The existing demineralizer system consists of an anionic and a cationic ion exchanger, and is used to provide demineralized water for boiler makeup for the existing Units 5 through 7. Upon installation of Unit 8, and the retirement of Units 5 and 6, the demineralizer will have sufficient capacity to supply makeup water for the Unit 8 HRSG as well as the Unit 7 boiler.

Because Unit 8 will be a zero discharge system, the process water system will discharge no pollutants.

3.6 CHEMICAL AND BIOCIDE WASTE

Units 7 and 8 will produce various chemical wastewaters, none of which will be discharged to the environment. As indicated on Figures 3.5-1 and 3.5-2, these wastewaters include the following:

- Clean Floor Drains
- Potentially Oily Floor Drains
- Laboratory Wastes
- Boiler/HRSG Blowdown
- Demineralizer Regeneration Wastewaters
- Metal Cleaning Wastes

Metal cleaning will be performed by outside contractors who remove their waste products from the site. Water from potentially oily floor drains will be routed through oil/water separators, then sent to transfer sumps along with the other flows mentioned above, except for metal cleaning wastes. Water from the transfer sumps will be pumped to the cooling tower basin if Unit 8 is operating; otherwise, it will be pumped to the wastewater collection tank.

The wastewater treatment system will withdraw water from the wastewater collection tank for processing. It will normally produce 147 gpm of high purity distillate (<10 mg/l TDS) for reuse.

3.7 SOLID AND HAZARDOUS WASTE

3.7.1 Solid Wastes

Solid wastes generated from the Purdom Station will include the following:

1. Zero discharge wastewater treatment system solids,
2. Waste oils,
3. Plant refuse, and
4. Used air inlet filters.

The zero discharge wastewater treatment system will produce up to 50,000 pounds of solid waste per day, at a moisture content of approximately 28 percent. The solid waste stream will include 1,700 pounds/hour of crystallizer solids (solids content not less than 80 percent) and 383 pounds/hour of crystallizer purge (solids content approximately 35 percent). Solid waste will be disposed of off site.

A preliminary estimate indicates that this solid waste will be about 28 percent water and 72 percent solids. The solids portion is expected to have the following composition:

Constituent	Percent by Weight
Sodium	28.6
Chloride	45.1
Magnesium	1.8
Calcium	5.4
Potassium	0.3
Bicarbonate	15.8
Sulfate	2.9

Waste oil will be generated from the oil/water separators described in Section 3.6. The volume of this material is estimated to be less than 200 gallons per month. The material is presently being recovered and disposed of off site by an outside contractor. Future disposal is anticipated to be by the same process.

Plant refuse, including scrapings from the intake screens (mostly grass) and spent demineralizer resins, is collected on site and periodically removed by an outside contractor, who disposes of it at an off-site sanitary landfill. The quantity of this material is expected to decrease with the proposed Project, due to the elimination of Units 5 and 6.

It is estimated that inlet air filter elements will require changing about every 30 months, resulting in an annual average solid waste generation volume of about 10 cubic yards. These filter elements are very similar in nature to household air filters except that they are larger.

3.7.2 Hazardous Wastes

The Purdom Station does not routinely produce any hazardous wastes. Paints, solvents, and metal cleaning solutions are selected to produce nonhazardous wastes. Purdom Unit 8 will continue to avoid the production of hazardous wastes.

3.8 ON-SITE DRAINAGE SYSTEM

3.8.1 Environmental Regulations

On-site drainage is regulated by federal, state, and local regulations. Federal regulation is accomplished through general NPDES stormwater permits. As part of the operational general permit, the facility is required to update the plant Stormwater Pollution Prevention Plan (SWPPP) annually. Areas subject to construction activities are covered under a construction general permit, which calls for an erosion and sedimentation control plan to be implemented during construction.

State regulations are encoded in Chapter 62-25, F.A.C., rules of the FDEP. These rules generally require retention, or detention with filtration, of the first half-inch of runoff for projects such as this which affect less than 100 acres; or percolation of the runoff from a 3-year 1-hour storm. They also encourage the prevention of increasing flows or pollution loadings to existing stormwater management facilities.

Local regulations require the use of a 25-year 24-hour design storm, and the implementation of an erosion and sedimentation control plan during construction.

The Northwest Florida Water Management District (NWFWMD) has not been delegated authority by FDEP for stormwater management.

3.8.2 Design Parameters

Existing site drainage has been described in Section 2.3.4-1. The six drainage areas that comprise the site are shown on Figure 3.8.2-1 . Areas I, II, and III are unaffected by industrial activity, and drain respectively to outfalls OSN 007, OSN 010, and OSN 008 as described in Section 2.3.4-1. Area IV runoff is also unaffected by industrial activity, and drains mainly as sheet flow to the intake and discharge canals, and to the St. Marks River. Areas V and VI are the secondary containments for oil storage tanks. Runoff from Area V is detained and released through valved pipes, if it meets water quality limits, to the St. Marks River. Runoff from Area VI is similarly released to Wetlands Number VI (see Figure 2.3.4-41). The areas which will be affected by the Project are I, II, III and IV for construction, and II and III during operation. Based on the regulatory parameters discussed in Subsection 3.8.1, the design storm is the 24-hour event with a 25-year return frequency. This storm is about 9 inches (see Section 2.3.7). The design detention/retention volume is the first one-half inch of runoff. Based on the Unit 8 footprint area of about 2.4 acres, this volume is about 4,350 cubic feet.

3.8.3 Construction Phase Stormwater Runoff

Construction runoff in Area I will be that associated with the installation of the new effluent pipeline, the relocation of the gas yard, and the upgrading of the gas line (if required) along the plant road. Construction runoff in Area II will be that associated with the installation of the new effluent pipeline, the upgrading of the gas line (if required), the relocation of the gas yard, and the installation of the new unit. Construction runoff in Area III will be that associated with the installation of the new unit. Construction runoff in Area IV will be that associated with

CITY OF TALLAHASSEE

SITE DRAINAGE AREAS

PURDOM UNIT 8 PROJECT – ST MARKS FLORIDA

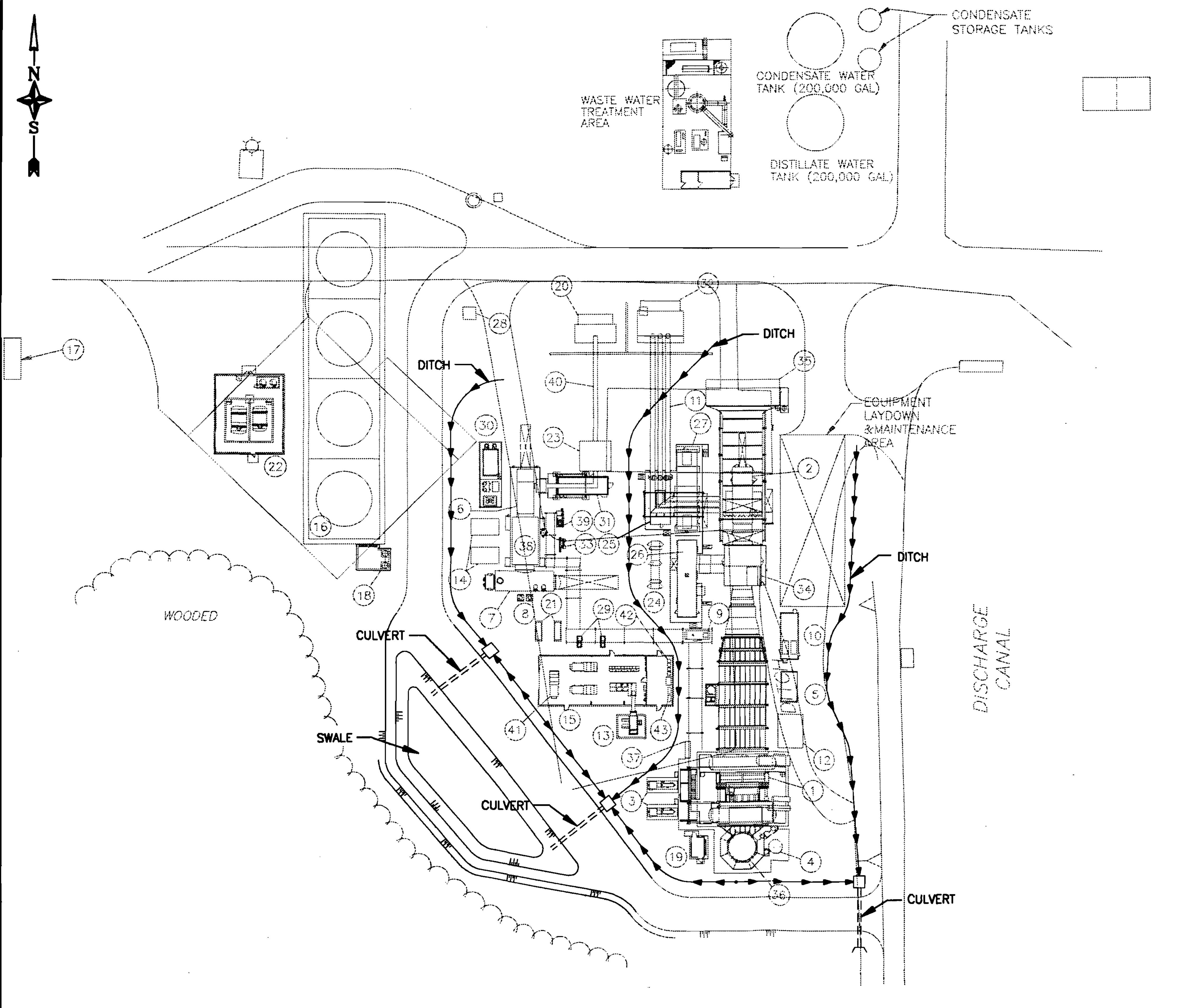
Figure

3.8.2-1

installation of the zero discharge wastewater treatment system. Construction-affected runoff will follow existing drainage patterns, and will be controlled through the use of silt fences and hay bales.

3.8.4 Operational Phase Stormwater Runoff

The Unit 8 stormwater management system is shown on Figure 3.8.4-1. Rainfall in potentially oily areas of the facility will be isolated and routed to the cooling tower basin via oil/water separators. Non-contaminated runoff from the western and central Unit 8 area will be collected by a ditch system and conveyed via culverts to the swale to the southwest. Non-contaminated runoff from the eastern portion of the Unit 8 area will be collected in a ditch and conveyed via a culvert to existing outfall OSN 008. The swale is trapezoidal in plan view with lengths of about 145 and 75 feet, and a width of about 50 feet. Its depth is about 1.5 feet. It will have a volume in excess of one-half inch of runoff from the Unit 8 footprint, and will detain the runoff and then disperse it as sheet flow to the existing Wetland Number VI. The volume and peak flow of runoff to be routed to OSN 008 are approximately equal to those presently being discharged to OSN 007. The increase in area to drain to Wetland Number VI due to the Project will be about 1.6 acres (from the existing 57.2 acres to about 58.8 acres), an increase of less than 3 percent.



LEGEND:

1. HEAT RECOVERY STEAM GENERATOR
2. COMBUSTION TURBINE GENERATOR
3. FEEDWATER PUMPS
4. BLOWDOWN TANK
5. WATER WASH SKID
6. STEAM TURBINE GENERATOR
7. CONDENSER
8. CONDENSATE PUMPS
9. CO2 FIRE PROTECTION SKID
10. WATER INJECTION SKID
11. ISO PHASE BUS DUCT
12. HRSG CHEMICAL FEED SYSTEM
13. AUXILIARY TRANSFORMER
14. VACUUM PUMPS
15. SWITCHGEAR BUILDING
16. COOLING TOWER
17. FUEL OIL TRANSFER PUMPS
18. CIRCULATING WATER PUMPS
19. CONTINUOUS EMISSIONS MONITORING SYSTEM
20. STEAM TURBINE GENERATOR MAIN STEPUP TRANSFORMER
21. CLOSED COOLING WATER HEAT EXCHANGERS
22. COOLING TOWER CHEMICAL FEED SYSTEM
23. GENERATOR BREAKER
24. STATIC START SKID
25. COMBUSTION TURBINE GENERATOR BUS ACCESSORY COMPARTMENT
26. ACCESSORY MODULE
27. PACKAGED ELECTRICAL ELECTRONIC CONTROL CABINET
28. NATURAL GAS FILTER/SCRUBBER
29. CLOSED COOLING WATER PUMPS
30. STEAM TURBINE GENERATOR LUBE OIL SKID
31. STEAM TURBINE GENERATOR BUS ACCESSORY COMPARTMENT
32. COMBUSTION TURBINE GENERATOR MAIN STEPUP TRANSFORMER
33. GLAND STEAM CONDENSER
34. COMBUSTION TURBINE
35. INLET FILTER
36. STACK
37. SAMPLE PANEL
38. STEAM TURBINE
39. GLAND STEAM CONTROL VALVE SKID
40. NON SEGREGATED BUS DUCT
41. COOLING TOWER LOAD CENTER
42. BAILEY CONTROL CABINETS
43. STEAM TURBINE GENERATOR CONTROL CABINETS

60 0 60 120

SCALE IN FEET

UNIT 8 STORM WATER MANAGEMENT SYSTEM

PURDOM UNIT 8 PROJECT – ST MARKS, FLORIDA

CITY OF TALLAHASSEE

Figure 3.8.4-1

SOURCE: RE&C, 1997

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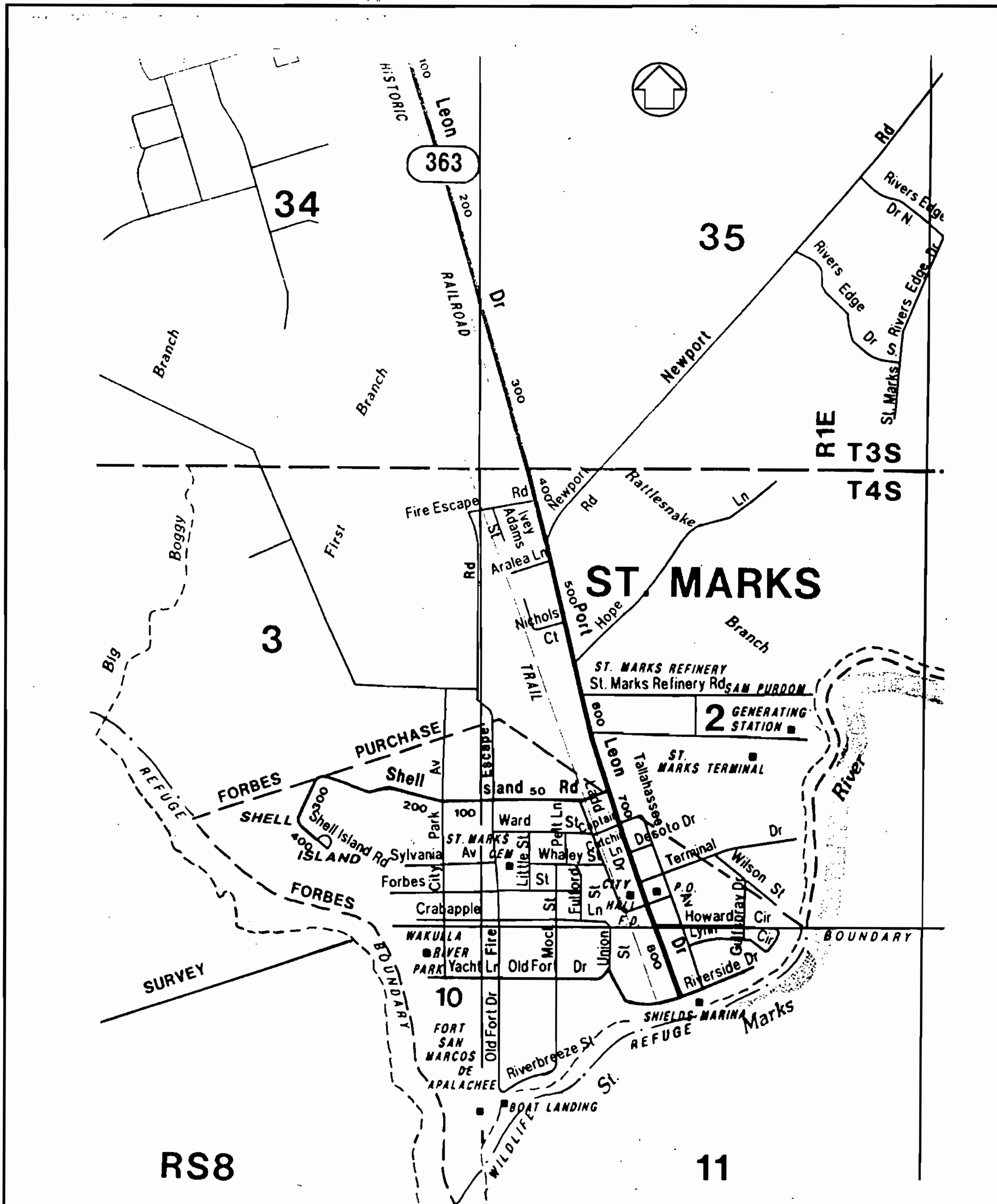
3.9 MATERIALS HANDLING

Roads within the site vicinity are shown on Figure 3.9-1, and in the Tallahassee region on Figure 3.9-2. Facility access for all traffic is via Port Leon Drive (SR 363). The site access road deadends at the west end of the site at Port Leon Drive.

Heavy equipment will ultimately be delivered to the site on trucks. This equipment is estimated to consist of one combustion turbine (about 400,000 pounds), one combustion turbine generator (about 450,000 pounds), several HRSG modules (about 300,000 pounds each) and two transformers (about 450,000 pounds each). This heavy equipment will be delivered to the site and immediately installed in its permanent location. The City of Tallahassee is pursuing the rental of up to 7 acres of cleared land within 1 mile of the site to serve as this temporary storage (laydown) area for smaller components. Upland portions of the site may also be used for equipment laydown.

Although ultimate site delivery will be by truck, much of the equipment will likely be shipped to the Tallahassee area by railroad, and then transferred to trucks for site delivery. The City may widen a short section of the existing plant entrance road near SR 363.



SOURCE: MAP & GLOBE STORES, INC, 1996
RE&C, 1997

0 1000 2000 3000
APPROX SCALE IN FEET

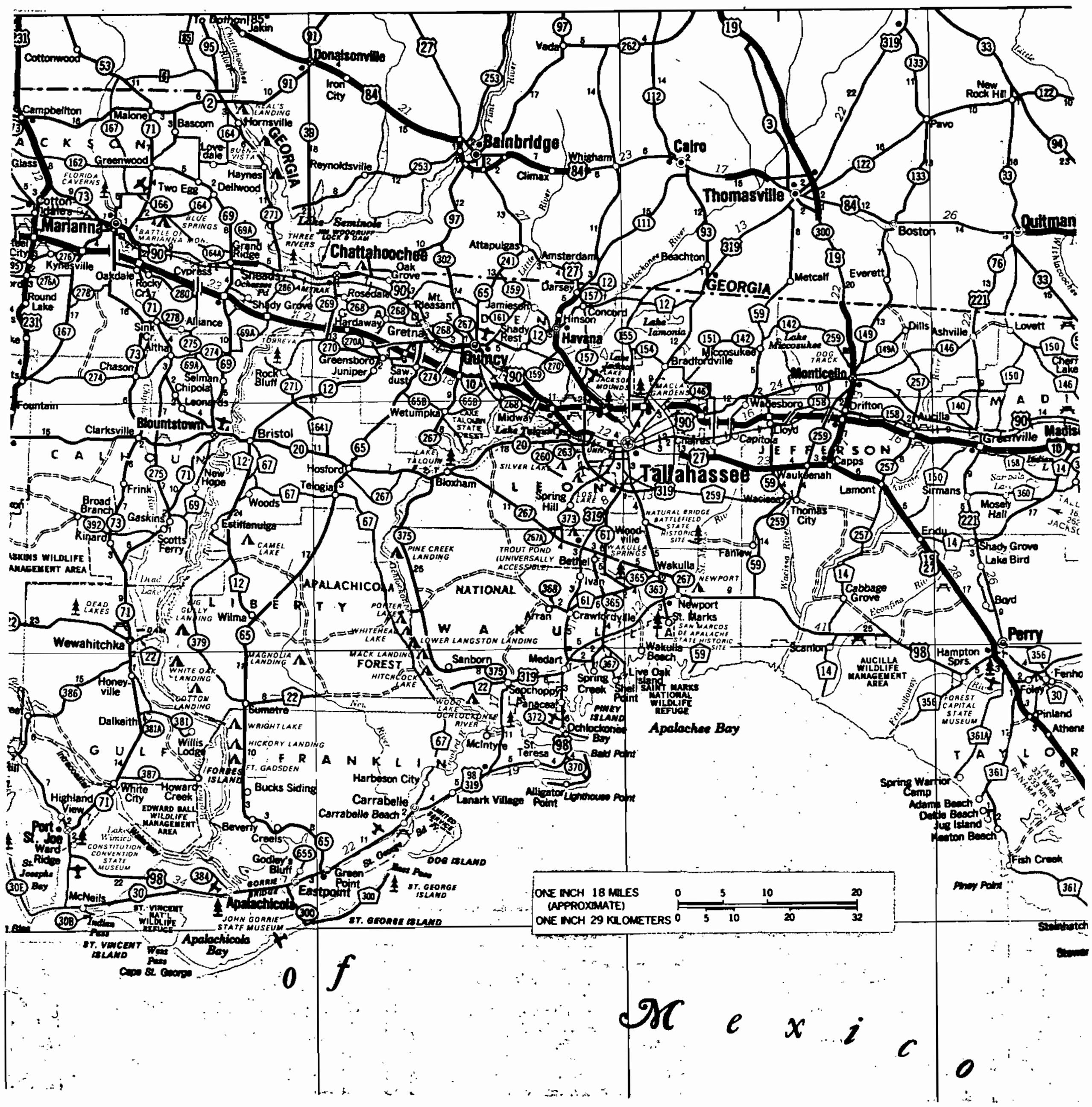
CITY OF TALLAHASSEE

ROADS WITHIN THE SITE VICINITY

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 3.9-1

PLOT DATE MAR 1, 1997 C:\15840002\----\00000-47.DWG



SOURCE : FlaDOT, 1995

CITY OF TALLAHASSEE

ROADS WITHIN THE TALLAHASSEE REGION

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 3.9-2

PLOT DATE FEB 28, 1997 C:\15840002\---\00000-46.DWG

3.10 OTHER PLANT FEATURES

3.10.1 Fire Protection and Detection Systems

A complete and integrated fire protection system will be provided for Unit 8. It will consist of an underground yard distribution system serving fire hydrants and water-based fire suppression systems, and portable fire extinguishers. The fire protection system will be engineered and designed in accordance with the requirements of the National Fire Protection Association (NFPA) codes and applicable Wakulla County codes and regulations.

3.10.1.1 Water Supplies

Water for the fire protection system will be provided from the existing facility fire protection system. A minimum of 1,850 gpm will be available at the interface point with the existing fire protection system.

3.10.1.2 Underground Fire Water Distribution System

The underground fire protection water distribution system will be installed in conformance with the requirements of NFPA Standard 24 and will extend to all Unit 8 operating areas, with local configuration around the unit to provide multi-directional supply for high reliability. Post indicating valves will be provided in the distribution system for adequate isolation of the loop and branch lines. The distribution piping will be designed and sized to provide required fire protection system water flows and pressures.

Wet barrel type hydrants, equipped with two 2.5-inch diameter outlets and one 5-inch pumper connection will be provided along the distribution system at approximately 250-foot intervals. Each fire hydrant will be provided with an individual gate valve in curb box. An adequate supply of fire hose, nozzles, auxiliary equipment, and tools in accordance with NFPA Standard 24 will be provided in an approved equipment hose enclosure located adjacent to each hydrant.

Hose threads will be National Standard Thread (NST), in accordance with NFPA. Approved fire protection pipe, fittings, and valves will be used for the distribution system piping.

3.10.1.3 Fire Suppression Systems

The following areas will be protected by water spray systems:

- Main and Auxiliary Transformers
- Steam Turbine Lube Oil Systems
- Steam Turbine Generator Bearings
- Cooling Tower

Water spray systems will comply with requirements of NFPA Standards 15, 13 and 214. The density of water coverage for all deluge systems will be 0.25 gpm per square foot of equipment area protected. Extinguishment will be by surface cooling and will provide 100 percent spray coverage of the surface area to be protected. The density of coverage for the cooling towers will be 0.50 gpm per square foot of area under the fan deck.

Alarm bell stations and manual breakglass pull stations for the transformer and cooling tower water spray systems will be located outdoors.

Each water spray system will be designed for automatic actuation through a heat-actuated fire detectors/pneumatic detection system located at and around the hazard areas, through manual actuation by a local pull station, or push-button actuation at the deluge system control panel. Nozzles will provide protection well in excess of the immediate hazard area and will be placed in position to obtain proper coverage. All spray nozzles near the transformer bushings will be carefully placed to avoid flash-overs at the bushings or to the piping. All nozzles will be supported on frames independent of the transformers and bus ducts.

3.10.1.4 Fire Detection and Alarm Systems

Fire detection, alarm, actuation, and signaling systems will be designed in accordance with NFPA 70, 72, and 72E. A main fire control panel (MFCP) will be provided from which the operator will monitor all fire protection and detection systems. It will indicate the condition of all fire alarm and detection circuits, water suppression system operation and readiness and have manual switches for overrides. The MFCP will be provided with emergency power upon loss of normal power.

3.10.1.5 Portable and Wheeled Fire Extinguishers

Portable fire extinguishers will be provided throughout Unit 8 and will be Underwriters Laboratory listed or Factory Mutual approved and will be labeled accordingly. Extinguishers will be provided in readily accessible locations in conformance with NFPA Standard 10. Four-wheeled fire extinguishers will be provided in the turbine area. Selection of extinguisher capacity and extinguishing agent type will be based on the review of the hazard to be protected, evaluation of typical fires which might be experienced, and the characteristics of the agent and its decomposition products, such as effectiveness on the hazard, effects on personnel or equipment, and cleanup after use.

3.10.2 Hurricane Evacuation Plan

The need for evacuation of the Purdom Station due to hurricanes and tropical storms is currently evaluated on a case-by-case basis and depends on the magnitude of the storm and where the storm is projected to make landfall in relation to tides. For example, if a hurricane is projected to make landfall east of the Purdom Station, or west but not in conjunction with a high tide, staffing will likely be maintained. This practice will not change.

If needed, evacuation occurs in stages. Nonessential staff are allowed to go home first. Operations and management staff will remain as long as some units continue to operate. First the steam units will be shut down, and staff will move to the gas turbine building, located on higher ground at the station site, and continue to operate the gas turbines. If roads are projected to become impassable, an evacuation order will be issued. The gas turbine units will be shut down, the site will be secured, and all staff will evacuate. In the event of an evacuation order, specific written procedures are in place to guide the Purdom operations staff through shutting down the units and securing the site.

3.10.3 St. Marks Oil Spill Cooperative

The Purdom Station is a member of a local cooperative for oil spill response known as the St. Marks Oil Spill Cooperative. The membership is comprised of seven businesses in the St. Marks area that are fixed base marine transportation-related operations capable of transferring oil from a vessel with a 250-barrel capacity or more. The purpose of the cooperative is to develop, maintain and improve procedures for mutual assistance and cooperation in the control of oil spill emergencies.

The cooperative is a not-for-profit organization, which is state-certified as a first responder for oil spills in Wakulla County. Each individual company stores and maintains spill response equipment to be used cooperatively in the event of an oil spill.

The co-op conducts drills and exercises on a continuous basis to sharpen response times and to ensure readiness of personnel and equipment at all times. Rapid response is the key factor in control of a spill. Current members are the City of Tallahassee, Stratus Oil, Murphy Oil USA, St. Marks Refinery, McKenzie Services, McKenzie Tank Lines, and Coastal Fuel Marketing, Inc. Barry Colvin of the City of Tallahassee is the current vice president of the organization.

Participation in the St. Marks Oil Spill Cooperative will continue with the operation of Unit 8.

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CHAPTER 4

EFFECTS ON SITE PREPARATION AND PROJECT AND ASSOCIATED FACILITIES CONSTRUCTION

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4.1 LAND IMPACT

4.1.1 General Construction Impacts

The portions of the site that will be affected by the construction of Purdom Unit 8 are discussed in Section 3.8 and are shown on Figure 4.1-1. As described in Section 3.8, a total of up to 4 acres will be affected by the construction of the combined cycle unit itself, about 0.1 acre will be affected by the construction of the zero discharge wastewater treatment system, about 0.1 acre will be affected by the new gas yard, and about 2 acres will be affected by the construction of the effluent and gas pipelines. East of State Road 363 on the northwest corner of the Purdom site, a temporary construction parking area will be constructed. Other on-site non-forested uplands may be used for construction laydown and/or construction parking. In addition, up to 7 acres of non-forested off-site land (see Section 3.9) may be rented for construction laydown and/or construction parking. Construction laydown and/or parking areas will be cleared of vegetation (if any exists), and heavily traveled areas will be stabilized with shell or rock. Other more lightly traveled areas will be seeded with grass to prevent erosion. They will be surrounded with erosion and sedimentation control features such as temporary berms, silt fences, and/or hay bales as required by the Project Erosion and Sedimentation Control Plan.

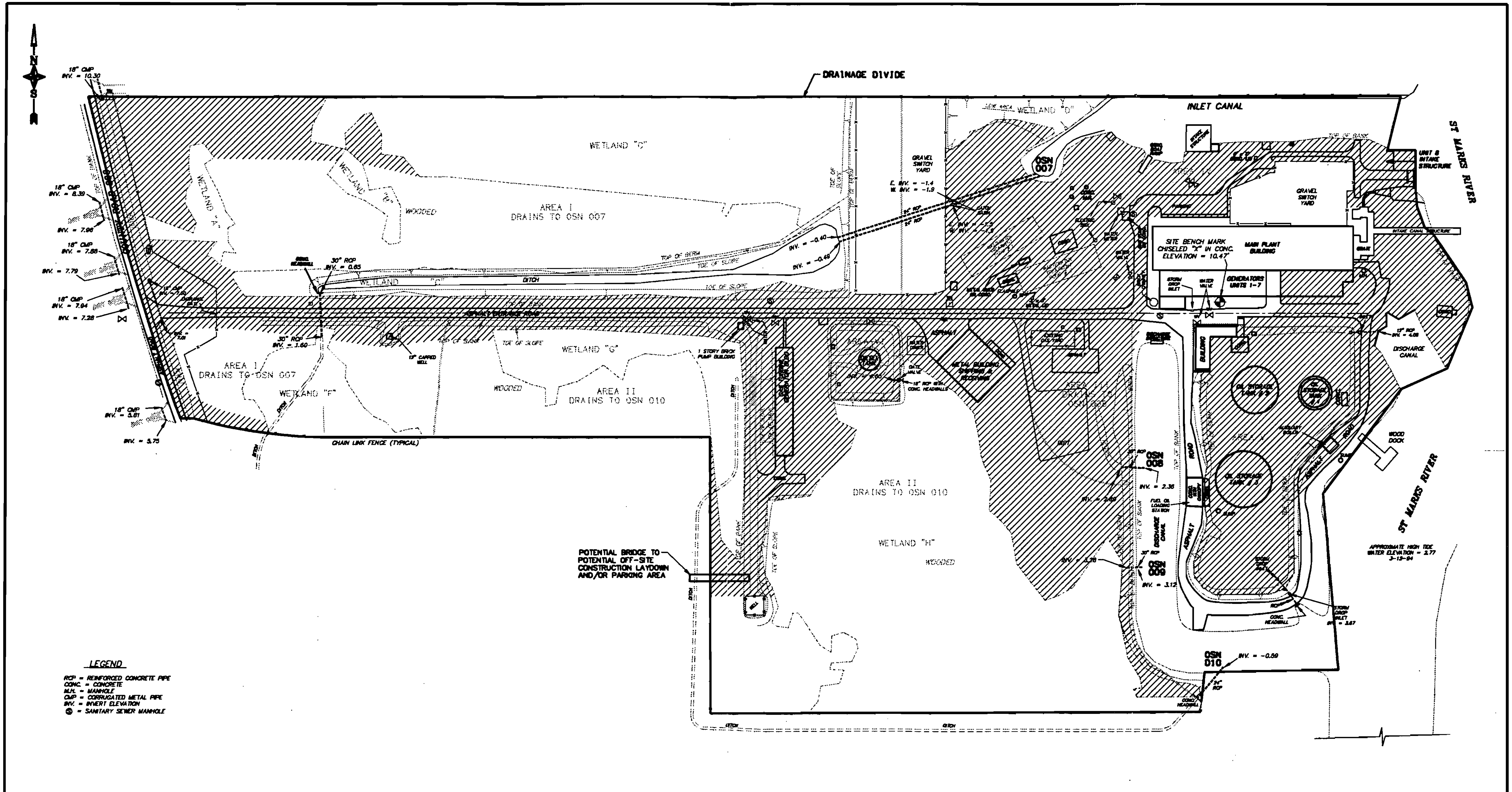
Permanently affected areas include the combined cycle unit footprint and the zero discharge wastewater treatment system. The pipeline construction areas will only be affected temporarily. None of these areas will require more than minimal clearing because they are within the vicinity of the existing Purdom Station. Wooded areas on site have intentionally been avoided to the greatest extent practicable in the design to preserve the natural habitat and maintain the natural buffer from adjoining properties. These areas will also be surrounded with erosion and sedimentation control features such as temporary berms, silt fences, and/or hay bales as required by the Project Erosion and Sedimentation Control Plan.

There will be no use of explosives during construction of Purdom Unit 8.

The impacts of creating on-site and off-site material laydown areas will be minimal, temporary, and associated mainly with minor clearing and grading for proper drainage, if necessary, and the installation of erosion and sedimentation controls.

There will be no construction of new permanent roads that connect off site. There will be no new on-site railroads. The existing facility access road will be modified slightly to allow installation of the cooling tower (see Figure 3.2-2) and extended around the Unit 8 footprint to provide access to the new equipment. The City also may widen a short segment of this road near State Road 363. Fugitive dust generation from traffic and/or excavation will be minimized through the use of water sprinkling, as necessary.

There will be no excavation or filling to change facility grade, except as required to achieve the desired drainage system. Major foundation mats will be supported by augured, cast-in-place concrete piles. Small amounts of excavation may be required in the Unit 8 footprint to allow for



AREAS POTENTIALLY AFFECTED BY CONSTRUCTION (NEW FACILITY CONSTRUCTION, PARKING OR LAYDOWN)

200 0 200 400
SCALE IN FEET

SOURCE: RE&C, 1997

ON-SITE AREAS POTENTIALLY AFFECTED BY CONSTRUCTION

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

CITY OF TALLAHASSEE

Figure 4.1-1

installation of piping, electrical duct banks, transformer and storage tank secondary containment structures, culverts and manholes. Any excess of this material should be clean debris.

Dewatering may be required during installation of below-grade equipment. This activity should be minimal so that dewatering effects from shallow well points or pumpage will be confined to a relatively small area surrounding the dewatering site. The effluent from the dewatering operation will be routed overland through grassed areas to existing permitted stormwater outfalls.

Waste materials will be disposed of in accordance with applicable regulations. Construction wastes, such as scrap wood and metal, will be transferred to a specified storage area on the site where they will be separated and stockpiled for salvage. General waste materials (i.e., typical of municipal solid wastes) will be collected in appropriate waste collection containers for disposal at an independently permitted off-site landfill.

During construction, the construction labor force will use portable chemical toilets. All sanitary sewage will be pumped frequently from the individual toilets as needed and transported to an approved disposal facility by a licensed contractor.

Waste oil from construction vehicles and equipment will be collected in appropriate containers and transported off-site for recycling or disposal at an approved facility. The approved disposal facility will be an existing facility that has been previously permitted for commercial recycling or disposal of waste oils.

Individual contractors will be responsible for handling any hazardous materials required to perform their tasks and hazardous wastes resulting from their use. This responsibility includes the proper off-site disposal of such wastes.

4.1.2 Roads

There will be no permanent new roads connecting the site to state roads. During the construction phase of the Project, temporary unpaved roads may be constructed with shell or gravel for access to temporary parking and material storage areas. The areas disturbed during the construction of these temporary roads will be restored after the construction of Unit 8.

4.1.3 Flood Zones

The 100-year flood elevation within the City of St. Marks has been set by FEMA in their Flood Insurance Study (FEMA, 1979), as described in Section 2.1.5. That elevation is 12.4 feet mean sea level (ft msl). All proposed facilities have been designed so that they are either above, or floodproofed to, that elevation. This design satisfies the requirements of the National Flood Insurance Act of 1968, the Flood Disaster Protection Act of 1973, and local regulations.

FEMA indicates that since 1843 (a period of 153 years), there has never been a flood in St. Marks that exceeded elevation 12 ft msl. They also describe the principal flood problem in St. Marks as surges upstream due to the influence of hurricanes in the Gulf of Mexico. As a result, they recommend that no structures be placed in the river channel as that would cause potential flood problems. As Purdom Unit 8 does not propose any construction in the river channel, it will not adversely impact adjacent surface water flood elevations or flows, and will not cause any adverse flooding or related impacts to off-site property.

4.1.4 Topography and Soils

Current topographic features at the Purdom Station reflect past and present power-plant-related activities. The existing grade is approximately 5 to 10 feet above msl, except for isolated wetland areas which will be preserved in their present state. The Project does not propose any filling that would require either a state or federal dredge and fill permit. Only minimal filling or excavation will be required, as described in Section 4.1.1 above.

No adverse impact to soil stability or bearing strength is anticipated because foundations will be supported by cast-in-place concrete piles; therefore, overall subsidence of the land area will be negligible. Slight settlement may take place in areas of construction, but this will be moderate and localized in extent. It is not anticipated that sinkhole formation will be enhanced.

Construction-related changes in site topography will not have any adverse effect on aesthetics or viewshed. Since the elevations after construction will not be increased, no significant topographical changes will be observable from off-site locations.

Construction activities will alter runoff in several parts of the site; however, no adverse effects are anticipated from this alteration. Surface water runoff will be controlled through the use of temporary berms, hay bales and silt fences, and then routed to the same locations it presently reaches. Because the area is relatively impermeable anyway, no significant changes in percolation rates are expected.

Groundwater levels will not be affected by modifications to soil percolation from construction activities at the site due to the close proximity of surface water canals and the interconnection between these surface water bodies and the underlying aquifer.

4.2 IMPACT ON SURFACE WATER BODIES AND USES

4.2.1 Impact Assessment

The surface waters which potentially could be affected by site preparation and construction activities include the St. Marks River, the intake and discharge canals, and the on-site wetlands. The primary potential impacts from site preparation and construction are erosion and sedimentation due to the exposure of unvegetated soils to rainfall.

Runoff from areas of the site not disturbed by construction activities (about 90% of the site or about 57 acres) will continue to be directed to the existing drainage systems within the area. Runoff from areas of the site disturbed by construction activities (about 6 acres), and construction laydown and/or parking areas (up to 7 acres), will be controlled through the use of Best Management Practices (BMPS) as described in Section 3.8, including the installation of temporary berms, silt fences, and hay bales between construction areas and receiving waters. These BMPS will be included in the site Erosion and Sedimentation Control Plan.

Erosion will be controlled by compaction of soils, construction of ditches and berms, maintenance of relatively flat grades, vegetation, and other appropriate erosion control techniques. Sedimentation will be controlled during construction by use of sediment control basins and traps, filter berms, hay or straw bales, and other applicable devices as appropriate.

Based on the limited discharge quantity and treated nature of runoff to surface water bodies associated with construction activities, adverse impacts to surface waters are anticipated to be negligible.

Following the completion of construction, laydown, parking, and other non-paved areas will be replanted with appropriate ground cover.

A final potential impact to surface waters from construction activities is related to dewatering. Dewatering activities may be required during below-grade construction and will be accomplished by localized pumping of the shallow aquifer to lower the water table. Discharge rates from dewatering will not exceed 500 gpm (0.72 MGD) and will not occur for more than 180 days. The quality of the dewatering release essentially will be identical to the groundwater currently discharging to the river naturally during the wet season. For this reason, no significant impact to water quality in the St. Marks River or the on-site wetlands is expected.

Impacts from the use of chemicals or cleanup of spillage of chemicals or oil and grease will be mitigated through proper handling and disposal practices. Until the zero discharge wastewater treatment system is operational, all wastewater resulting from preoperation and cleaning activities will be either treated in the existing station low volume waste treatment system, or disposed of off site by an appropriately licensed contractor. Construction contractors will be required to implement practices to assure spills are minimized. This will include the designation of specific areas for fueling and maintenance. These areas will be located so that any spills, if they do occur, will not be adjacent to surface waters. If any spills occur, immediate cleanup will be performed with ultimate disposal in an approved facility.

The Purdom Unit 8 Project does not include any construction activities within waters of the state. There will be no dredging or filling, and no construction of shoreside facilities since these facilities are already present at the site. The new makeup water pumps will be located in an existing intake structure.

4.2.2 Measuring and Monitoring Program

Because the Project is not expected to have any impacts on surface waters of the state, monitoring programs have not been proposed.

4.3 GROUNDWATER IMPACTS

4.3.1 Impact Assessment

Activities associated with construction of Purdom Unit 8 are not expected to have any adverse impacts on local groundwater resources. Because the Purdom Station will no longer utilize groundwater as its major source of process and equipment cooling water, the only construction activity affecting groundwater will be the abandonment of the existing well field.

Construction of Unit 8 may require short-term temporary dewatering to complete one or more of the following activities:

- Stormwater retention ponds and drainageways;
- Sumps, underground pipes, duct banks, transformer and storage tank secondary containment structures, culverts, and manholes; and
- Selected foundations.

The duration of these dewatering activities and the limited extent of the excavations will prevent off-site areas from being impacted. In addition, the clayey nature of near surface sediments above the deposits of the Floridan aquifer system will likely prevent significant quantities of water from being withdrawn during short-term dewatering activities.

As discussed in Section 4.2.1, construction contractors will be required to implement practices to minimize spills. Maintenance and refueling will be performed only in designated areas. Spills or hazardous material releases will be managed in an approved manner, in accordance with local, state, and federal regulations.

4.3.2 Measuring and Monitoring Programs

Groundwater monitoring is not proposed as part of construction for the Purdom Unit 8. Only very limited construction dewatering activities are planned which will have no off-site impacts. Additionally, impacts to wetland areas located on site are not expected. Assessment and recovery of any spills or hazardous materials releases will be conducted in accordance with Florida Department of Environmental Protection (FDEP) requirements.

4.4 ECOLOGICAL IMPACTS

4.4.1 Impact Assessment

4.4.1.1 Land Cover and Vegetation

Project development activities will almost exclusively involve land cover and vegetation community changes on those portions of the site which were previously filled and cleared or significantly disturbed by development of the existing Purdom Station. Dewatering activities will not affect wetlands on or adjacent to the site. A narrow area along the southwest portion of the site and land associated with the gas meter station will involve some clearing of shrub or tree vegetation. There is also the potential for some minor site clearing south of the proposed Unit 8 stack once the final design is complete. Project facilities and site areas included in these modifications are shown on Figures 3.2-1, and 3.3-1, and 4.1-1.

4.4.1.2 Environmental Protection Plans

Environmental management and protection plans will be prepared for construction activities. These plans will be used to protect ecological resources adjacent to the area where power plant facilities are to be constructed. Appropriate procedures include:

- Protection of wetlands and forested uplands adjacent to Project development, and
- Soil erosion and sedimentation control measures.

Protection of Wetlands and Forested Uplands Adjacent to Project Activities

The Project is designed to avoid these areas to the greatest extent practicable. Erosion control devices such as silt screens or hay bales will be utilized to prevent erosion that would affect wetlands and forested uplands.

Soil Erosion and Sedimentation Control Measures

In those areas where there is a potential for off-site runoff and soil erosion into site wetlands, the following procedures will be used:

- Barriers are planned and will be maintained for erosion control throughout construction. The proposed barriers will consist of anchored hay bales, a filter fabric, or other suitable material.
- Contractors will be required to implement temporary stabilization measures to control loss of topsoil, sedimentation in watercourses, and deterioration of water quality.
- Contractors will be required to submit erosion control plans to the construction manager prior to construction. These plans will detail the erosion controls for clearing and grubbing, excavation, and final grading within access roads, haul roads, the work site, and any temporary on-site staging areas.

- Disturbed areas not otherwise stabilized will be mulched and/or seeded as soon as practicable. Areas to be seeded will employ quick-germinating varieties such as rye grass which will provide cover and soil retention properties.
- Exposed drainages will be sodded or mulched and seeded immediately after each phase of disturbance.
- Physical soil stabilizers will be used where appropriate to protect exposed soil from rainfall or runoff; these might include straw, wood chips, netting or hay.
- Sediment filter devices will be installed to prevent siltation or accumulation of debris.

There will be a site environmental monitor to assure compliance with environmental control procedures.

4.4.1.3 Aquatic Ecology

An assessment of the environmental effects of the construction of Purdom Unit 8 on local aquatic habitats was conducted. Construction effects on aquatic ecosystems were assessed regarding:

- Habitat area loss or modification;
- Water quality changes in the vicinity of the site (e.g., turbidity, siltation); and
- Protected species effects.

Aquatic habitats will not be lost due to construction since construction will not occur within the St. Marks River or any other body of water. All project-related construction activities will be conducted at least 50 feet away from the St. Marks River. Increased turbidity and siltation in these waterbodies is possible during construction due to eroded materials being transported by surface runoff. By using proper construction techniques and erosion control (silt fencing, and hay bales) these increases in turbidity and siltation will be minimized. With these controls in place, aquatic or marine protected species will not be impacted by the construction activities of Unit 8.

4.4.1.4 Vegetation Communities

An assessment of Purdom Unit 8 construction effects on wetlands and terrestrial ecological resources was conducted. The effects were assessed on the basis of the following factors:

- Changes in quality and acreages of wildlife habitat; and
- Possible loss of rare, threatened, or endangered species or their habitats.

Areas to be developed for this project are almost entirely cleared and do not represent viable wildlife habitat. The only areas where some clearing will occur are a portion of the land for the natural gas meter station, the potential temporary bridge across a ditch near the existing gas turbine units (which would lead to a potential equipment laydown area and/or parking), and potentially the upland area south of the proposed Unit 8 stack. The total area to be cleared is expected to be less than 2 acres. Dominant land cover is pine and saw palmetto and old field vegetation. If installed, the bridge structure would be removed following construction, and the land would be allowed to revert to its natural pre-construction condition.

4.4.1.5 Threatened and Endangered Animal Species

Construction of this Project is not expected to affect protected animal species populations. No terrestrial or wetland threatened and endangered species or species of special concern that are listed by the U.S. Fish and Wildlife Service (USFWS) or the Florida Game and Fresh Water Fish Commission (FGFWFC) were found in the construction area. Likewise, habitat for these species was not found in these areas.

Considerable human activity occurs in the area to be developed. This activity is associated with existing routine site maintenance and operation. Construction activity will not significantly add to the effect of this activity on local ecological resources.

4.4.1.6 Threatened and Endangered Plant Species

Construction of this Project is not expected to affect protected plant species populations. Plants listed as endangered by the Florida Department of Agriculture and Consumer Services (FDACS) or USFWS were not found on the site. Plant species listed as threatened by the USFWS were not found on the proposed site.

4.4.2 Monitoring Programs

Monitoring programs are not needed because of the minimal impact to biota anticipated.

4.5 AIR IMPACTS

4.5.1 Air Quality Impacts

During the construction period, unavoidable air pollutant emissions are likely to occur from various construction-related activities. The most prevalent construction emissions are fugitive dust. However, minor emissions of oxides of nitrogen (NO_x), sulfur dioxide (SO_2), carbon monoxide (CO), particulate matter (TSP and PM_{10}), and volatile organic compounds (VOCs) are also likely during construction. Emissions of these pollutants generally are minimized through standard control measures.

4.5.1.1 Fugitive Dust

Fugitive emissions are defined in Rule 62-210.200(136), F.A.C., as "those emissions which could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening." Fugitive dust, one component of fugitive emissions, is generally defined as natural and/or man-associated dusts that become airborne due to the forces of wind or human activity. Construction-phase fugitive dust emissions will be generated during site grading and excavation, and due to vehicular activity.

The quantities of fugitive dust emitted by the site construction vehicular traffic will be dependent on a number of factors, including the frequency of operations, specific operations being conducted, weather, and soil conditions. During the earthwork operations, dust control measures will be in force and will typically require moisture conditioning of the soils in the excavation and compaction areas and along the defined roadways between these areas.

4.5.1.2 Other Air Pollutant Emissions

It is anticipated that total gaseous emissions during construction will be extremely small. Potential sources of VOC emissions include evaporative losses associated with on-site painting, refueling of construction equipment, and the application of adhesives and waterproofing chemicals. The frequency and extent of these activities are limited and they will have minimal impact on air quality.

Exhaust emissions from construction equipment will also contain small amounts of NO_x, SO_2, CO, TSP, PM_{10}, and VOCs resulting from incomplete combustion of fuel. However, due to the nature of heavy-duty diesel-powered construction vehicles, which allow for more complete combustion and less volatile fuels than spark-ignited engines, these emissions are relatively low.

Open burning is not anticipated since the site for Unit 8 is already cleared, and construction debris will be hauled off to a landfill rather than being burned. Thus, air pollutant emissions due to open burning are not anticipated. Also, since an on-site concrete batch plant is not planned, there will be no fugitive emissions from such a plant.

4.5.2 Air Quality Control Methods

The impact of heavy construction activities and site preparation on air quality will be short-term and confined to the immediate vicinity of the construction activity. This is primarily because most of the fugitive dust created by construction traffic consists of relatively large particles (i.e., larger than those which constitute PM_{10}). These large particles tend to settle quickly rather than remain suspended for transport over long distances.

Job site guidelines for minimizing emissions of fugitive dust from identifiable construction sources will include a combination of the following techniques:

- Contractors will be instructed to comply with any applicable state and local regulations governing open-bodied trucks hauling sand, gravel, or soil between on-site and off-site areas. This could include providing covers or moistening the load with water and wheel washing to reduce dusting.
- Areas disturbed during construction will be stabilized by mulching or seeding as soon as practicable.
- When construction occurs on bare ground, water (possibly together with non-hazardous wetting agents) will be used as necessary to help suppress dust.
- Temporary vehicular surfaces of crushed rock will be used in high traffic areas. Areas not subject to heavy traffic or continual disturbance will be wetted down as needed using nontoxic substances to help suppress dust.
- Sandblasting operations will be localized to minimize effects on adjacent work areas. Protective covers will also be utilized where practicable.

Because of mitigative measures which will be employed, it is not expected that vehicular emissions or fugitive dust will present any significant air quality problems during the construction period.

4.5.3 Ambient Air Quality Monitoring Program

Air quality monitoring for construction-related fugitive dust or other air pollutants is not proposed. Periodic visual inspections of the job site will be conducted to ensure compliance with guidelines for minimizing emissions of fugitive dust during construction of the proposed facility.

4.6 IMPACT ON HUMAN POPULATIONS

4.6.1 Introduction

The Purdom Generating Station is located in an industrial area of the City of St. Marks. It is bordered by lands designated for industrial use to the south, mixed use to the west, and industrial and agricultural use to the north. New construction will take place on the interior of the generating station about one quarter mile from the nearest residences. Access to the site is via a driveway which connects directly to State Road (SR) 363. Most of the residential and commercial areas of the City of St. Marks lie to the south of the Purdom Generating Station and will not be affected by traffic from the Project, except to the extent that construction workers eat and drink at local establishments or rent a place to stay locally.

The impact of construction traffic on Wakulla and Leon County roadways is discussed in Section 4.6.2. The impact of construction noise is discussed in Section 4.6.3. Construction employment and wages are discussed in Section 4.10.

The socioeconomic impact of project construction and operation is discussed in detail in Chapter 7. As discussed in Chapter 7, there will be a temporary increase in demand for housing by relocating construction workers. Although housing supply in Wakulla and Leon Counties would appear to be sufficient to accommodate those construction workers, available lodgings close to the Purdom Station are not sufficient. Therefore, it is possible that new development will occur in Wakulla County to take advantage of this short-term demand.

4.6.2 Construction Traffic Impacts

Traffic impacts during the Purdom Unit 8 construction phase consist of construction worker travel and associated construction deliveries. During the construction period, the existing facility will remain in operation and is not expected to create additional traffic. Therefore, construction traffic impacts exclude traffic from the existing Purdom Station operation.

The construction traffic impact analysis assumes commencement of construction in January 1999, and completion of construction in May 2000. On average, approximately 150 workers will be employed during the construction period, with a peak employment in the third quarter of 1999 of 225 construction workers and 15 management employees (RE&C, 1997).

The construction work force consists of daily commuters and weekly commuters. Daily commuters live within an approximately 1 to 1.5 hour drive, while weekly commuters will seek lodging in the area. The daily commuters make up approximately 60 percent of the work force at the peak, or 135 construction workers, while the weekly commuters are approximately 40 percent of the work force, or 90 construction workers. The weekly commuters will find local area lodging in campgrounds, trailer parks, motels, or other similar lodging facilities.

The management work force consists of daily commuters, with the majority residing in the Tallahassee area.

4.6.2.1 Study Area

Roadways and intersections included in this analysis were identified in a manner consistent with local, regional, and state policy. In Wakulla County, the traffic study area includes roadways under Florida Department of Transportation (FDOT) jurisdiction where the peak hour directional construction traffic may approximate 5 percent or more of the peak hour directional flow at Level of Service C. These flow values are defined by the FDOT *1995 Level of Service Standards and Guidelines Manual for Planning* (FDOT, 1995). The study area also includes roadways under the jurisdiction of Wakulla County, where project traffic may approximate 5 percent or more of their adopted peak hour directional Level of Service D standard. Furthermore, the study area includes Leon County roadways that carry construction related traffic of 1 percent or more of the peak hour peak direction service volume at the adopted level of service.

4.6.2.2 Year 1999 Construction Project Traffic Impact

Two separate conditions must be met before a project traffic impact is deemed to occur. First, there is a significance test and second, an adversity test. The significance test is met if a significant amount of project traffic occurs on a given roadway. As mentioned above, Wakulla County growth management defines their significance level as 5 percent of the service volume at the adopted transportation level of service. Leon County, however, defines a significant impact as 1 percent of the service volume at the adopted level of service in peak hour and in the peak direction. On a typical roadway section, for example, the adopted Level of Service D may establish a peak hour flow rate of 800 vehicles in one direction per hour. If a development loads 40 or more vehicles on a Wakulla County roadway (800 times 5%), this would constitute a "significant" impact on the roadway. In Leon County, 8 peak hour directional trips (800 times 1%) would constitute a "significant" impact.

Regarding the second part of the traffic impact analysis test, a roadway section must be operating in an adverse condition, meaning worse than the adopted level of service standard. Since the terms "above" or "below" the level of service standard can be somewhat ambiguous, the terms "better than" or "worse than" the level of service standard are used when discussing traffic flow issues. Using the roadway example, with an 800 vehicle per hour service volume at Level of Service D, if the road is operating at 810 vehicles per hour, then it is operating at a level of service condition that is worse than the adopted Level of Service D standard. For analysis purposes, the level of service is generally documented using current traffic counts along with background traffic growth rates and project traffic. These two volumes are summed to finally determine whether a project passes or fails the future adversity test.

In summary, for project traffic to have an impact on a roadway section, it must have a significant impact equal to or greater than the stated threshold and the roadway must be projected to operate in an adverse condition, worse than the adopted level of service standard.

In preparation for the traffic impact analysis, traffic volume data were collected on those Wakulla County roadways where the Project traffic is expected to be 5 percent or more of the adopted maximum service volume. These existing volumes, together with the expected construction Project traffic, were used to determine whether the Project will have an impact on area roadways.

The existing hourly traffic volumes on significantly impacted roadways were multiplied by FDOT's 1995 weekly volume adjustment factors to approximate average annual peak hour directional traffic volume for 1996. In addition, a growth rate was applied to Project future peak hour traffic volumes. These growth rates were determined by the Apalachee Regional Planning Council (ARPC) and are noted in Table 4.6.2-1.

TABLE 4.6.2-1
ARPC GROWTH FACTORS

Roadway	Segment	ARPC Annual Growth Rate	Annual Growth Rate Used in Study
SR 363	St. Marks to US 98	-0.59%	+2.00%
	US 98 to Leon County Line	+3.33%	+3.33%
US 98	US 319 to Spring Creek Road	+4.62%	+4.62%
	Spring Creek Road to SR 363	+4.62%	+4.62%
	SR 363 to Jefferson County Line	-1.58%	+2.00%

Source: ARPC, 1996

The ARPC growth factors noted in the table provide the present traffic volume trends, including two negative growth patterns. For the purpose of this study, however, a conservative growth factor of +2.0 percent was used for those roadway segments with a negative growth rate. This is due to unknown future economic conditions and other factors that may cause an increase in future traffic volumes. A projection of future background afternoon (PM) peak hour traffic volumes, based on the 1995 FDOT traffic volume adjustment factor and the annual growth rates is shown in Table 4.6.2-2.

4.6.2.3 Plant Construction Traffic

The PM peak hour directional traffic volumes during the construction phase of the project were estimated through a trip generation, distribution, and assignment process. As stated previously, the peak construction employment period will occur during the third quarter of 1999 with a maximum of 240 construction-related employees present at the site. The construction contractor, Raytheon Engineers and Constructors (RE&C, 1997), anticipates that the construction employees will normally work one shift from approximately 7:00 AM to 3:30 PM, Monday through Friday.

Trip Generation

Trip generation rates were estimated using information obtained from similar construction projects. The construction phase trip generation rate of the Florida Power Corporation (FPC) Polk County Site (FPC, 1992) was used for this traffic analysis. Their trip generation rate during the PM peak hour was based on an auto occupancy factor of 1.5 for construction employees as experienced at other construction sites. Therefore, the exiting construction traffic for the Purdom Unit 8 construction phase is approximately 160 vehicles during the PM peak hour. The FPC Polk County Site study indicated an entering traffic ratio of 8 percent compared to exiting

TABLE 4.6.2-2
1999 PM PEAK HOUR BACKGROUND TRAFFIC VOLUMES

Roadways	DIR(1)	State Road No.	Date of Count	1996 PM Peak Directional Hourly Vol.	1995 Weekly Adjustment Factor	ARPC Annual Growth Rate in %	1999 PM Peak Directional Hourly Vol.
Woodville Hwy.							
St. Marks to Project Site	SB	SR 363	6/24-28/96	66	0.92	2.00%	64
Project Site to US 98	NB	SR 363	9/10/96	105	1.04	2.00%	116
US 98 to SR 267	NB	SR 363	9/10/96	189	1.04	3.33%	217
SR 267 to Leon Co line	NB	SR 363	9/10/96	242	1.04	3.33%	277
US 98							
US 319 to Spring Creek Rd.	WB	SR 30	9/10/96	231	1.04	4.62%	275
Spring Creek Rd. to SR 363	WB	SR 30	9/10/96	231	1.04	4.62%	275
SR 363 to Jefferson Co line	EB	SR 30	9/10/96	115	1.04	2.00%	127

(1) NB = Northbound
SB = Southbound
EB = Eastbound
WB = Westbound

Source: Hall Planning and Engineering, 1997

traffic. Therefore, miscellaneous traffic entering the site is estimated at 13 vehicles prior to the PM peak hour, mainly consisting of deliveries or other miscellaneous traffic.

The traffic analysis for the Purdom Station focuses on the PM peak hour in accordance with requirements of Wakulla and Leon Counties. The end of the work shift at 3:30 PM occurs just prior to the PM peak hour. Therefore, only the trips exiting the plant will be analyzed during the PM peak hour. The entering trips arrive prior to the end of the work shift, before the PM peak hour. A summary of the roadway PM peak hour traffic is provided in Table 4.6.2-3.

TABLE 4.6.2-3
SITE TRIPS DURING PM PEAK HOUR OF ROADWAY

Employees	240
PM Peak:	
Enter	0
Exit	160
Total	160
Source: Hall Planning and Engineering, 1997	

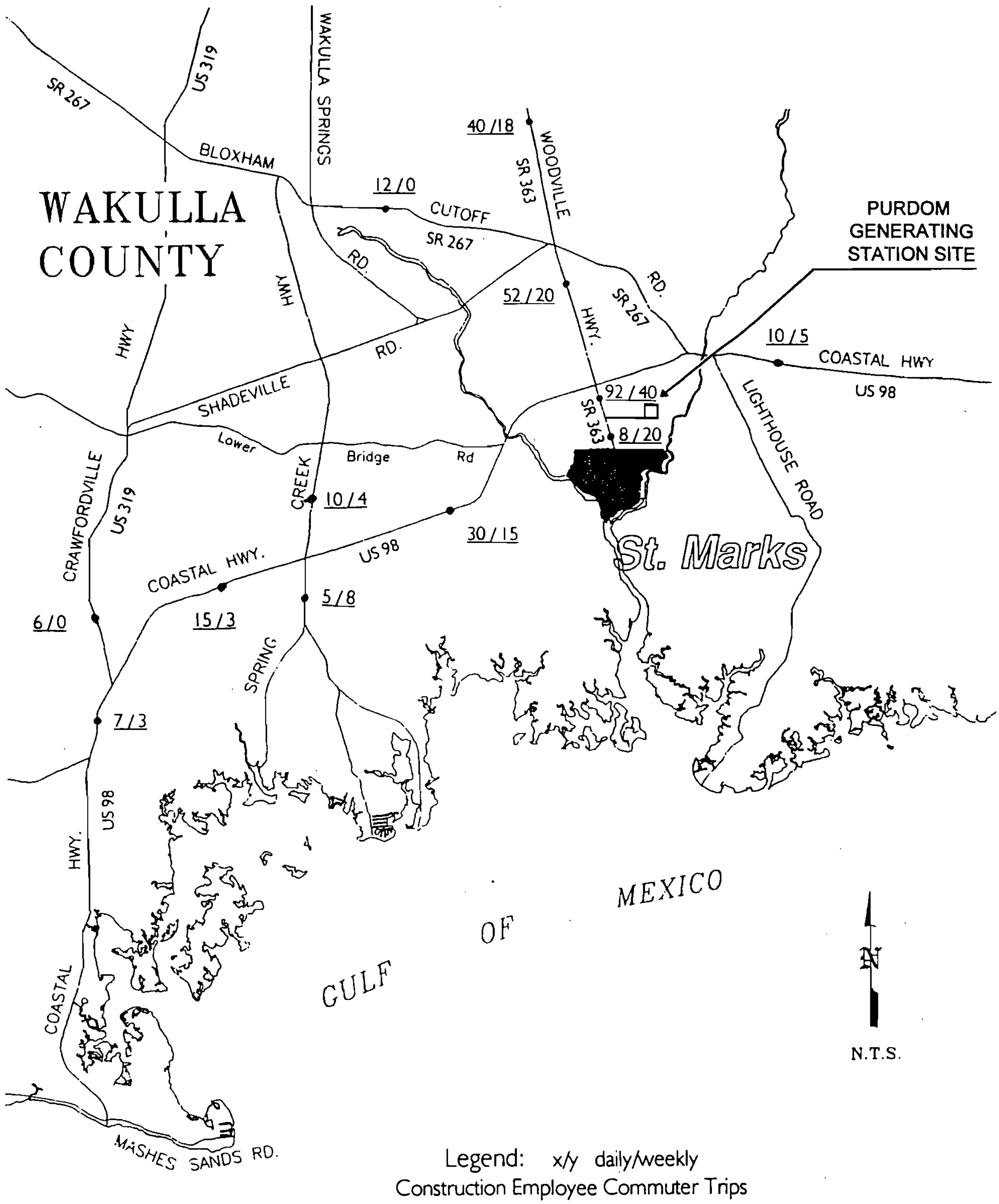
Distribution and Assignment

The distribution analysis of PM peak hour exiting trips is separated into daily commuters and weekly commuters due to their different travel patterns. It is expected that the daily commuters have a travel pattern similar to the existing facility workers which are distributed throughout the area. The daily commuters, however, may have a somewhat longer trip length than employees since they do not live in the immediate vicinity of the plant. The weekly commuters are expected to find lodging within one-half hour driving time from the construction site. These lodging facilities are expected to include motels in Shell Point, along Woodville Highway, and in south Tallahassee. They will also include campground and trailer parks in St. Marks or along US 98 near Wakulla Station.

Using this distribution process, trips were assigned to the roadway network as shown on Figures 4.6.2-1 and 4.6.2-2, and Tables 4.6.2-4, 4.6.2-5, and 4.6.2-6. The tables show the analysis results for each roadway segment.

The construction traffic impact in Wakulla County is summarized in Table 4.6.2-4. The estimated 1999 peak hour, directional, non-project traffic and PM peak project traffic are shown in the table. The Project trips are also shown as a percentage of the adopted level of service flow rate. The last columns show the cumulative nonproject and Project trips for all significantly affected roadways (Project impact equal to or greater than 5 percent of the adopted level of service flow rate) and the resulting level of service expected in the build-out year 1999. No data are shown for the non-significantly affected roadways, per the Wakulla County Comprehensive Plan standards.

The construction traffic impact in Leon County is summarized in Table 4.6.2-5 for Leon County controlled roadways and in Table 4.6.2-6 for City of Tallahassee controlled roadways in accordance with their Comprehensive Plan. As shown in the tables, only the Capital Circle segment from Woodville Highway to Crawfordville Road in Leon County carries Project traffic



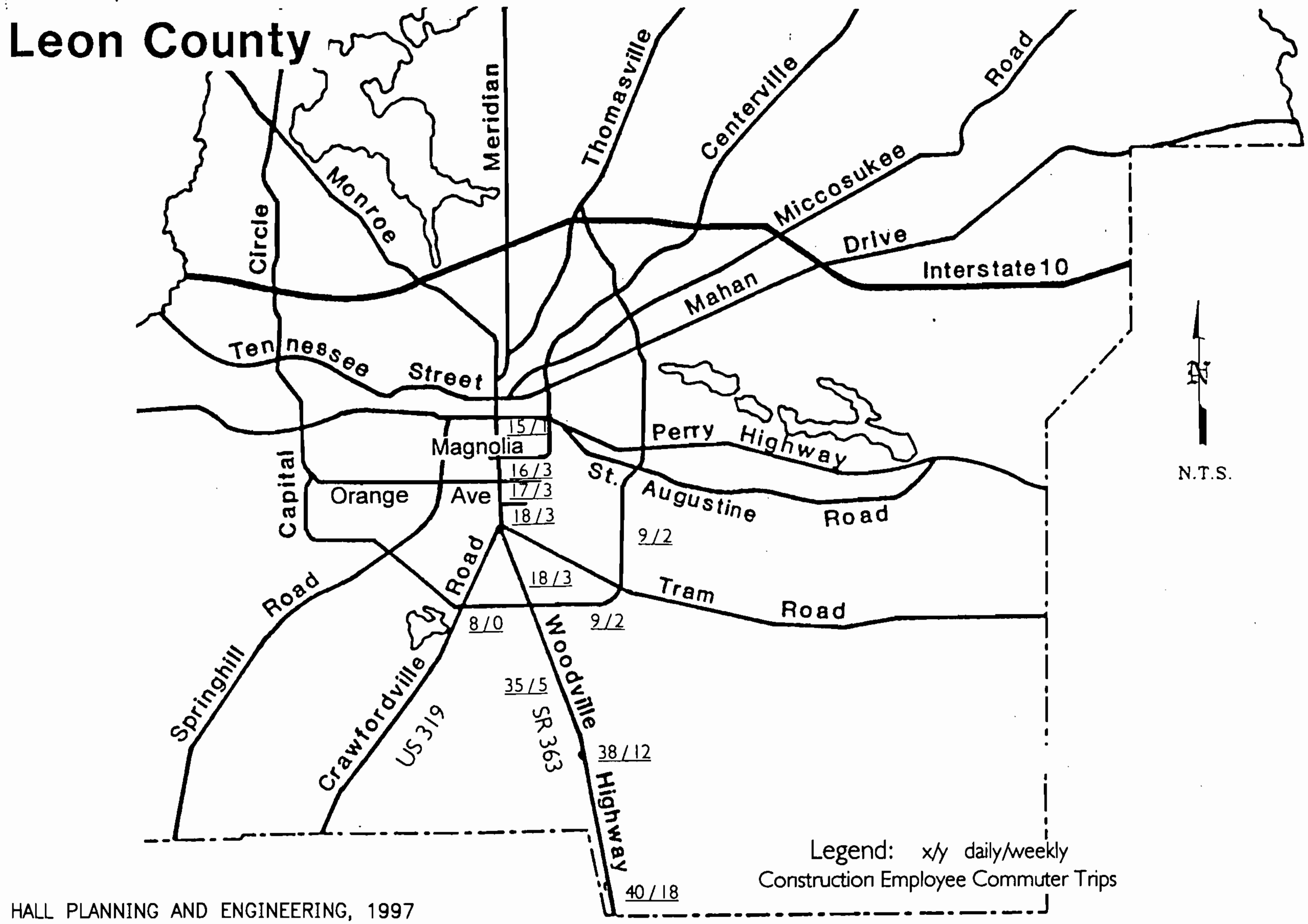
SOURCE: HALL PLANNING AND ENGINEERING, 1997

CITY OF TALLAHASSEE

PURDOM STATION
1999 CONSTRUCTION TRAFFIC
IN WAKULLA COUNTY
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 4.6.2-1

PLOT DATE FEB 25, 19976 C:\15840002\---\00000-22.DWG



SOURCE: HALL PLANNING AND ENGINEERING, 1997

CITY OF TALLAHASSEE

PURDOM STATION
1999 CONSTRUCTION TRAFFIC
IN LEON COUNTY
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure
4.6.2-2

TABLE 4.6.2-4
PM PEAK HOUR EXITING CONSTRUCTION TRAFFIC VOLUMES
(WAKULLA COUNTY ROADWAYS)

	DIR [1]	State Road No	Daily LOS C	Peak Directional Hourly Vol. @ LOS C	Non-Peak Directional Hourly Vol. @ LOS C	5% of Hourly LOS C	1999 PM Peak Directional Non-project Traffic	"Daily Commuter" PM Peak Project Traffic	"Weekly Commuter" PM Peak Project Traffic	Total PM Peak Project Trips	Project Trips as % of LOS	Background + Project Trips	Peak Directional LOS with Project Trips for Significantly Effected Roadways
FDOT Roadways:													
Woodville Highway.													
Project Site to St. Marks	SB	SR 363	8200		360	18	64	8	20	28	7.8%	92	B
Project Site to US 98	NB	SR 363	8200	460		23	116	92	40	132	28.7	248	B
US 98 to SR 267	NB	SR 363	8200		360	18	217	52	20	72	20.0%	289	C
SR 267 to Leon Co line	NB	SR 363	8200		360	18	277	40	18	58	16.1%	335	C
US 98													
SR 375 to US 319	WB	SR 30/61	9200		380	19	[2]	7	3	10	2.6%	[2]	
US 319 to Spring Creek Rd.	WB	SR 30	8200		360	18	275	15	3	18	5.0%	293	C
Spring Creek Rd. to SR 363	WB	SR 30	8200		360	18	275	30	15	45	12.5%	320	C
SR 363 to Jefferson Co line	EB	SR 30	8200		360	18	127	10	5	15	4.2%	142	B
SR 267													
SR 363 to US 319	WB	SR 267	8200		360	18	[2]	12	0	12	3.3%	[2]	
US 319													
SR 30 to Forest Tower	NB	SR 61	8200		360	18	[2]	6	0	6	1.7%	[2]	
Wakulla Co. Roadways:													
Spring Creek Highway:													
Shell Point Rd to US 98	SB	CR 365	10700	600	470	24	[2]	5	8	13	2.8%	[2]	
US 98 to Lower Bridge Rd.	NB	CR 365	10700	600	470	24	[2]	10	4	14	3.0%	[2]	

[1] NB = Northbound
SB = Southbound
EB = Eastbound
WB = Westbound

[2] Non-significant roadway, as impact is less than 5%.

Source: Hall Planning and Engineering, 1997

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TABLE 4.6.2-5
PM PEAK HOUR EXITING CONSTRUCTION TRAFFIC VOLUMES
(LEON COUNTY ROADWAYS)

Roadway	Segment	PK Dir	Seg #	1995-96 PM PK PK Dir[1]	LOS	"Daily Commuter" PM Peak Project Traffic	"Weekly Commuter" PM Peak Project Traffic	Total PM Peak Project Trips
Capital Circle	Blair Stone Ext. To Satellite Off.	PD	161	SB	D	0	0	0
Capital Circle	Satellite Off. To Blair Stone Ext.		161-1	NB	D	9	2	11
Capital Circle	Tram To Woodville	PD	170	WB	D	0	0	0
Capital Circle	Woodville To Tram		170-1	EB	D	9	2	11
Capital Circle	Woodville To Crawfordville	PD	180	WB	D	8	0	8
Capital Circle	Crawfordville To Woodville		180-1	EB	D	0	0	0
Capital Circle	Springhill To Crawfordville	PD	190	EB	D	0	0	8
Capital Circle	Crawfordville To Springhill		190-1	WB	D	8	0	0
Oak Ridge Road	Wakulla Springs To Woodville	PD	601	EB	C	0	0	0
Oak Ridge Road	Woodville To Wakulla Springs		601-1	WB	C	2	3	5
Woodville Highway	Four Points To Capital Circle	PD	840	SB	D	0	0	0
Woodville Highway	Capital Circle To Four Points		840-1	NB	D	18	3	21
Woodville Highway	Capital Circle To Oak Ridge	PD	850	SB	C	0	0	0
Woodville Highway	Oak Ridge To Capital Circle		850-1	NB	C	35	5	40
Woodville Highway	Oak Ridge To Natural Bridge Road	PD	860	SB	C	0	0	0
Woodville Highway	Natural Bridge Rd To Oak Ridge		860-1	NB	C	38	12	50
Woodville Highway	Natural Bridge Road To Wakulla Co.	PD	870	SB	C	0	0	0
Woodville Highway	Wakulla Co. To Natural Bridge Rd		870-1	NB	C	40	18	58

(1) NB = Northbound
SB = Southbound
EB = Eastbound
WB = Westbound
PD = Peak Direction

Source: Hall Planning and Engineering, 1997

TABLE 4.6.2-6
PM PEAK HOUR EXITING CONSTRUCTION TRAFFIC VOLUMES
(TALLAHASSEE ROADWAYS)

Seg #	PK Dir	Road	Segment	DIR[(1)]	LOS	"Daily Commuter" PM Peak Project Traffic	"Weekly Commuter" PM Peak Project Traffic	Total PM Peak Project Trips
2161	PD	Capital Circle	Blair Stone Ext to Cap Office Prk	SB	D	0	0	0
2160		Capital Circle	Cap Office Prk to Blair Stone Ext.	NB	D	9	2	11
2171	PD	Capital Circle	Cap Office Prk to Woodville Hwy	SW	D	0	0	0
2170		Capital Circle	Woodville Hwy to Cap Office Prk	NE	D	9	2	11
2180	PD	Capital Circle	Crawfordv. Rd to Woodv. Hwy	EB	D	0	0	0
2181		Capital Circle	Woodv. Hwy to Crawfordv. Rd	WB	D	8	0	8
4691	PD	Monroe Street	Paul Russell to Gaile Ave.	SB	D	0	0	0
4690		Monroe Street	Gaile Ave. to Paul Russell	NB	D	18	3	21
4701	PD	Monroe Street	Orange to Paul Russell	SB	D	0	0	0
4700		Monroe Street	Paul Russell to Orange	NB	D	17	3	20
4711	PD	Monroe Street	Magnolia to Orange	SB	D	0	0	0
4710		Monroe Street	Orange to Magnolia	NB	D	16	3	19
4721	PD	Monroe Street	Palmer to Magnolia	SB	D	0	0	0
4720		Monroe Street	Magnolia to Palmer	NB	D	15	1	16

(1) NB = Northbound
SB = Southbound
EB = Eastbound
WB = Westbound
PD = Peak Direction

Source: Hall Planning and Engineering, 1997

in the peak direction. For all other segments in Leon County or in the city limits of Tallahassee, the Project traffic is in the non-peak direction, and therefore not significant.

4.6.2.4 Construction Truck Traffic

During construction, the peak truck traffic days will coincide with the placing of concrete at the Project site. A maximum of 20 concrete trucks are expected to deliver concrete to the site in a single day (RE&C, 1997). During these same days, few other major deliveries will be scheduled as they would conflict with the concrete placement. To anticipate a worst-case scenario, however, 5 miscellaneous deliveries are included based on an assumption of 25 percent of the concrete truck traffic.

The construction truck trip impact is evaluated from 6:00 AM to 6:00 PM. Although these hours are in excess of the regular shift periods of the construction crews, these hours reflect a worst-case scenario during which the truck traffic deliveries could occur on the peak truck traffic days.

The truck classification count performed on September 9, 1996, has been adjusted to reflect projected truck volumes on SR 363 in the year 1999. The FDOT weekly adjustment factor and the expected traffic growth factor, discussed in Section 4.6.2.2, have been applied to arrive at the 1999 truck traffic volumes. Subsequently, the southbound and northbound volumes are projected at 157 and 143 truck trips respectively, resulting in a total of 300 non-project truck trips between the hours of 6:00 AM and 6:00 PM (see Appendix 10.6.2).

In summary, the increase of Project construction truck traffic on SR 363 will consist of 25 southbound and 25 northbound trips, over and above the projected 157 southbound and 143 northbound non-project truck trips on the roadway, a worst-case increase of about 17 percent.

4.6.2.5 Conclusion

Several roadway segments in Wakulla County meet the significance test of Project traffic equal to or exceeding 5 percent. These segments, however, do not meet the adversity test because the cumulative non-project and Project traffic volumes yield an acceptable level of service of C or higher.

One segment in Leon County carries Project construction traffic in the peak direction during the PM peak hour. This segment is on Capital Circle from Woodville Highway to Crawfordville Road. The Project traffic volume on this segment is, however, below the 1 percent significance level and, therefore, does not significantly impact this segment. All other segments within Leon County carry Project construction traffic in the non-peak direction; therefore, these segments are not considered to be significant either. Analysis is not required for segments where traffic is not significant in accordance with the Comprehensive Plan rules. Based on the application of significance thresholds and level of service analysis for those roadways where Project traffic exceeds the significance threshold, Project traffic during construction will not adversely impact area roadways, and no mitigation is required.

4.6.2.6 References

ARPC (Apalachee Regional Planning Council). 1996. City of St. Marks 1995 Levels of Service on State Roads. May 1996.

ARPC. 1996. Wakulla County 1995 Levels of Service on State Roads. May 1996.

City of Tallahassee. Concurrency Management System, Policy and Procedures Manual.

City of Tallahassee Electric Utilities. 1996. Telephone conversation between Gordon King, Plant Supervisor, City of Tallahassee, St. Marks, Florida, and Henk Koornstra, Hall Planning & Engineering, Tallahassee, Florida, December 19, 1996 and January 15, 1997.

FDOT (Florida Department of Transportation). 1995. Florida's Level of Service Standards and Guidelines Manual for Planning. Tallahassee, Florida.

FPC (Florida Power Corporation). 1992. Site Certification Application (SCA) for Polk County Site. St. Petersburg, Florida.

Hall Planning & Engineering. 1997. Project Data. Tallahassee, Florida.

Leon County Concurrency Management Policies and Procedures Manual.

RE&C (Raytheon Engineers and Constructors). 1997. Project Data. Norcross, Georgia.

Wakulla County Comprehensive Plan - Traffic Element.

4.6.3 Construction Noise Impacts

4.6.3.1 Analysis

The construction of a power plant can be divided into five distinct phases for purposes of assessing potential noise impacts (Barnes et al., 1976). These include:

- Site preparation, including grading and excavation;
- Concrete pouring;
- Steel erection;
- Machinery installation;
- Site cleanup and plant start-up.

During the initial site preparation and foundation excavation phase, heavy diesel-powered earth-moving equipment is the major source of noise. This equipment includes dozers, graders, sheepsfoot roller compactors, dump trucks, backhoes, and front-end loaders. The typical quantities for a project such as this, and noise levels of such equipment are presented in Table 4.6.3-1. Typical usage factors for each are also presented in the table. The usage factor is the fraction of time that equipment operates during a work shift.

TABLE 4.6.3-1 MAJOR NOISE SOURCES DURING PLANT CONSTRUCTION			
Equipment	Typical Number	Usage Factor[(1)]	Average Sound Level at 50 Feet (dBA)
Crawler Crane	4	0.16	83
Cherry Picker	10	0.16	79
Fork Lift	2	0.16	79
Bulldozer	2	0.40	80
Gradall	1	0.08	85
Compactor	2	0.10	74
Front-end Loader	4	0.40	79
Backhoe	2	0.16	85
Dump Truck	2-12	0.40	91
Flat Bed Truck	2-20	0.10	91
Concrete Truck	0-6	0.40	85
Tractor Trailers	0-4	0.10	91
Pickup Truck	10	0.40	58
Man Lift	4	0.16	79
Scissor Lift	4	0.16	74
Air Compressor	2	1.00	81
Welder	9	1.00	78
Track Loader	6	0.16	80

(1) Fraction of time equipment is operating during shift.

Source: Raytheon Engineers & Constructors, 1997 (for quantities)
EPA, 1971 (for usage factors and sound levels)

Equipment used during the concrete pouring stage includes concrete trucks, cranes, and some earth-moving equipment for backfilling foundations. The steel erection phase requires the use of cranes in varying sizes, air compressors, welders, material delivery trucks, concrete trucks, and front-end loaders. The machinery installation phase requires the same types of equipment as the steel erection phase.

The final phase, consisting generally of site cleanup and plant start-up activities, is typically about 10 decibels (dBA) quieter than the other phases (Barnes et al., 1976), except during the short periods of time when the steam lines are being cleaned. This activity requires that high pressure steam be blown through the lines to remove scale and welding debris in order to prevent such material from passing through the steam turbines where they could damage the blades. The steam is vented directly to the atmosphere through a temporary bypass line constructed specifically for that purpose. Cleaning of the steam lines will require multiple steam blows with a duration of 1 to 15 minutes per blow over a period of several weeks. A peak sound level at 50 feet of approximately 129 dBA will be produced. In setting the steam safety valves, steam will be released for about 6 minutes with a corresponding sound pressure level at 50 feet of 121 dBA.

The discharge pipe for the temporary steam blow activity will be directed horizontally to the east, away from the community, to reduce levels at the nearest residence to about 82 dBA. The activity will clearly attract attention, but the duration of the sound will be short, will only be performed during the day, and the levels will not be high enough to cause any hearing loss. Proper notification to area residents will alleviate any concern that might otherwise be generated.

In addition to this assessment of steam blowing impacts, the noise impacts have been assessed for the two generally loudest phases of construction which are the site preparation and steel erection stages. The estimated levels at the nearest residence are 68 and 66 dBA, respectively, based on a summation of equipment noise levels and quantities appropriate to each phase from Table 4.6.3-1. A conservative attenuation factor was then applied to determine the expected noise levels at the nearest residence. Each of these construction phases has a duration of 3 to 5 months. Noise levels during the other phases will be 5 to 10 dBA lower.

These levels are not sufficiently high to interfere with speech or cause any hearing loss. The state guideline recognizes that construction unavoidably produces more noise than normal and addresses it by restricting nighttime and weekend construction that would create a disturbance. Consequently, activities that could create a noise disturbance will be avoided at night between 10 p.m. and 7 a.m. Construction is by nature a temporary activity and any associated noise impacts will be short-term. Comparison with the EPA noise guidelines is not appropriate for construction noise because of its temporary, short-term nature.

The construction work force and material delivery vehicular traffic levels and, consequently, the traffic noise impact levels, will vary in relation to the size of the work force. The peak work force will occur during the third quarter of 1999 and consist of 240 personnel. The resulting 160 cars (at an occupancy factor of 1.5) represent an increase in traffic volume of 89 percent on SR 363 during the peak afternoon hour during the shift change (HPE, 1997). The resulting increase in traffic noise levels would be less than 3 dBA, which is insignificant and would be barely noticeable. Increases in traffic noise levels will be even less during the other hours.

Heavy trucks delivering materials to the site will produce noise that will add incrementally to noise from the existing truck traffic, which is primarily oil tankers associated with other enterprises in the City of St. Marks. It is estimated that during the peak construction delivery days, approximately 20 concrete delivery trucks and 5 other delivery trucks will enter and leave the site (RE&C, 1997). This represents an increase over existing truck traffic of about 17 percent which is equivalent to an increase in noise levels of less than 1 dBA. This small increase is also insignificant. None of the material delivery trucks are expected to go south of the facility entrance into the commercial/residential area of the City of St. Marks.

4.6.3.2 References

Barnes, J., Miller, L., and Wood E. 1976. Prediction of Noise from Power Plant Construction (Draft). Schenectady, New York. June 1976.

HPE (Hall Planning and Engineering). 1997. Project Data. Tallahassee, Florida.

RE&C (Raytheon Engineers and Constructors). 1997. Project Data. Norcross, Georgia.

EPA (U.S. Environmental Protection Agency). 1971. Noise from Construction Equipment and Operations, Building Equipment and Home Appliances. Washington, DC. Dec 31, 1971

4.7 IMPACT ON LANDMARKS AND SENSITIVE AREAS

Construction will occur in the interior of the existing Purdom Station. Therefore, no construction-related environmental impact is expected on those areas identified in Section 2.2.5. Long term, aesthetics along the St. Marks River shoreline will be improved with the removal of the old boilers from Units 1 through 4, which is ongoing, and with the installation of landscaping in accordance with the City of St. Marks Land Development Code (draft). As discussed in Section 4.5, fugitive dust emissions will be properly controlled so that no impact on visibility will occur in the vicinity of the nearby Aucilla Wildlife Management Area or the St. Marks National Wildlife Refuge. Likewise, due to attenuation with distance, construction noise will not affect the quality of the recreational experience at either of those locations.

4.8 IMPACTS ON ARCHEOLOGICAL AND HISTORIC SITES

4.8.1 Analysis

No archeological or historic sites have been identified within the Purdom Station site. The Division of Historical Resources (DHR) has stated that "conditioned upon the construction of the new pipeline within the existing road prisms, it is the opinion of this office that the proposed Project will have no effect on historic properties listed, or eligible for listing in the *National Register of Historic Places,* or otherwise of historical or architectural value" (DHR, 1996). The DHR has commented on two potential routes for the proposed reclaimed water pipeline (DHR, 1997) These routes are discussed in Section 6.1.

4.8.2 References

DHR (Division of Historical Resources, Florida Department of State). 1996. Letter from George W. Percy, Director, Division of Historical Resources and State Historic Preservation Officer, to Jennette Curtis, City of Tallahassee. September 23, 1996.

DHR (Division of Historical Resources, Florida Department of State). 1997. Letter from George W. Percy, Director, Division of Historical Resources and State Historic Preservation Officer, to Jennette Curtis, City of Tallahassee. January 30, 1997.

4.9 SPECIAL FEATURES

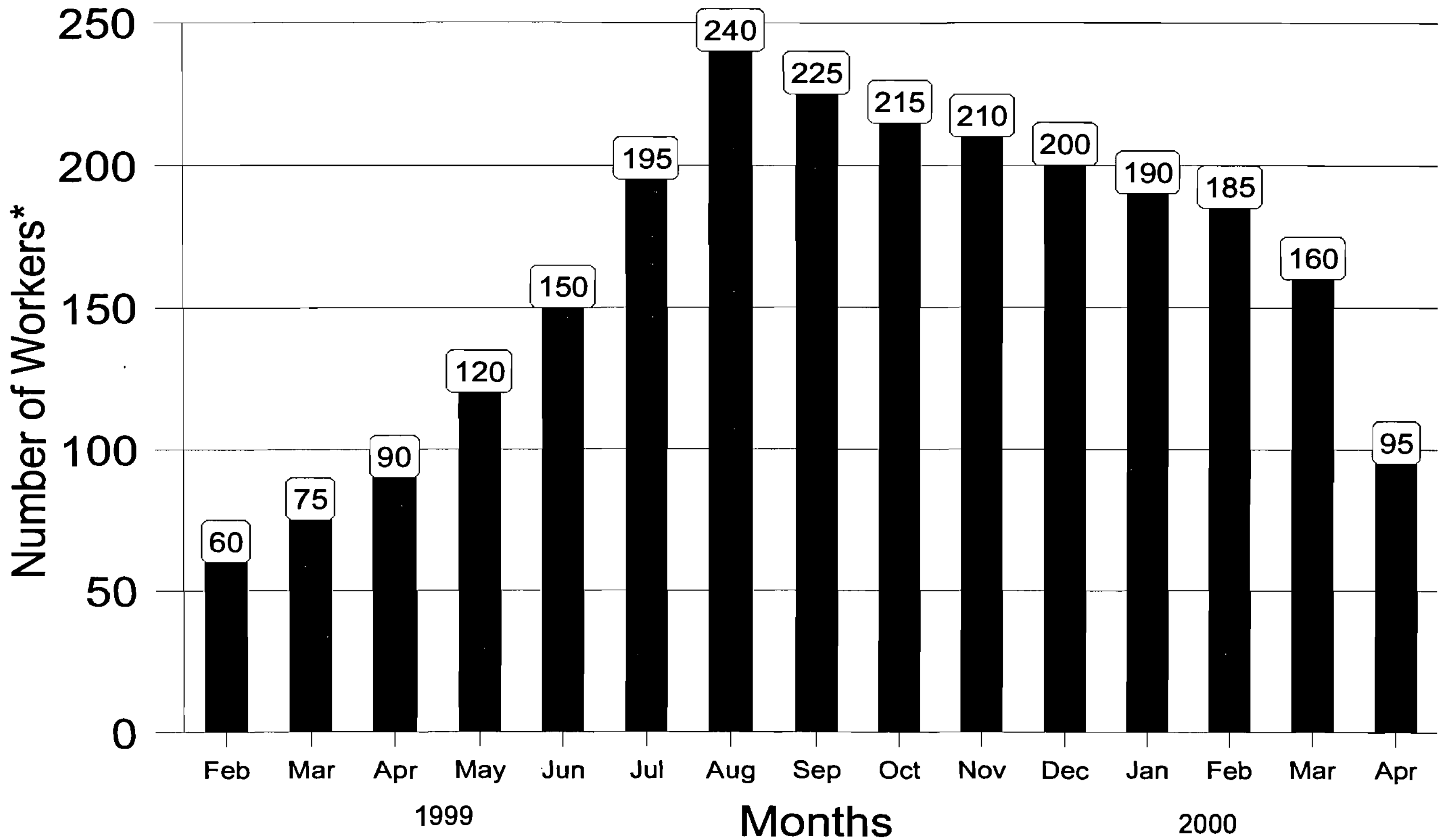
There are no unusual products, raw materials, garbage disposal services, incinerator effluents, or residues produced during construction that may have an influence on the environment and ecological systems of the Purdom Station site and the adjacent areas.

4.10 BENEFITS FROM CONSTRUCTION

The construction of Purdom Unit 8 will result in increased employment in the City of St. Marks through direct construction jobs, and in Wakulla and Leon Counties through indirect jobs in service and support industries. Construction is expected to begin in early 1999 and continue into the second quarter of 2000. Over the approximate 15-month construction period, construction employment will average 160 persons and peak at 240 persons (see Figure 4.10-1).

Construction wages will amount to approximately $7 million during 1999 and over $2 million in 2000 (nominal dollars). Indirect employment will occur primarily in the following sectors of the local economy: retail and wholesale trade, business services, health services, miscellaneous services, and eating and drinking establishments. According to the U.S. Department of Commerce's Regional Input-Output Modeling System (RIMS) II, 118 indirect jobs will be generated in Wakulla and Leon counties on average during the 1999-2000 construction period as a result of the construction of Purdom Unit 8. Indirect earnings are estimated at $6.6 million (1997 dollars).

Further discussion of the economic effects of the construction and operation of the Purdom Unit 8 Project is included in Chapter 7.



*Based upon single shift

Source: Raytheon Engineers & Constructors, 1996. Moore/Bowers, 1997.

CITY OF TALLAHASSEE

ESTIMATED CONSTRUCTION MANPOWER
BY MONTH

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure
4.10-1

4.11 VARIANCES

Construction related variances are not expected to be required. Construction of Purdom Unit 8 will meet all applicable local, state, and federal guidelines.

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CHAPTER 5

EFFECTS ON PROJECT OPERATION

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5.1 EFFECTS OF THE OPERATION OF THE HEAT DISSIPATION SYSTEM

The Purdom Unit 8 Project is designed with no thermal discharge to waters of the state. Information relative to 316 Demonstrations associated with the Purdom Station is presented in Appendix 10.1.1.

5.1.1 Temperature Effect on Receiving Body of Water

Unit 8 will have no thermal discharge to any receiving body of water. The only temperature effects will be from the permanent shut-down of Units 5 and 6. This will result in the shrinking of the thermal plume from that of Units 5 through 7, which crossed the full surface width of the river when measured on July 19, 1996 (see Figure 2.3.4-24), to less than half the width of the river when only Unit 7 operates, as measured on July 21, 1996 (see Figure 2.3.4-25). The existing combustion turbines (GT1 and GT2) will continue to operate; however, their impacts on the thermal plume are insignificant. Although the Florida Department of Environmental Protection (FDEP) and the U.S. Environmental Protection Agency (EPA) have found the existing thermal plume to result in acceptable environmental impacts, a lessening of that plume can only result in lesser impacts.

Unit 8 will have a withdrawal of makeup water from the St. Marks River; however, that withdrawal will be offset by the cessation of once-through cooling water withdrawals from the St. Marks River for Units 5 and 6. The amount of water withdrawn for Unit 8 for make-up to the cooling tower and boiler/HRSG, and for NO_x control when firing oil, will average approximately 343 million gallons per year. The amount withdrawn for once-through cooling for Units 5 and 6 during the last 12-month period of record was 13,543 million gallons.

The maximum Unit 8 withdrawal rate (936 gallons per minute (gpm)) will take water from the top 1.5 feet of the river, at an average velocity of about 0.14 feet per second. This is only about one-half to one-fourth of the 0.26 to 0.43 feet per second presently entering the Units 5 and 6 intake structures when those units are operating (see Section 2.3.4.1). This velocity will only occur over a cross-sectional area of about 15 square feet, as opposed to about 500 square feet now affected when Units 5 and 6 operate. Again, this reduction in velocity and area will result in a reduction in impacts.

5.1.2 Effects on Aquatic Life

The dominant factor controlling the water temperature in the Wakulla River is the discharge from Wakulla Springs. The spring water is believed to keep the river temperature above 62° F (16.8° C) all year, which provides suitable temperatures for manatees that remain in the area during winter. Thus, any manatees that might be influenced by the Unit 7 thermal discharge during autumn to remain in the area during winter will be able to find a natural thermal refuge in the Wakulla River at any time when Unit 7 does not operate.

5.1.2.1 References

Hydrologic Almanac of Florida. 1981. United States Geological Survey Open File Report 81-1107.

5.1.3 Biological Effects of Modified Circulation

The modifications conducted at the Purdom facility as described in Section 3.5.1 will result in a zero discharge closed loop cooling tower system to dissipate waste heat from Unit 8. The permanent shut-down of Units 5 and 6 and the replacement of the existing four high volume intake water pumps with one lower volume intake water pump (see Section 2.3.4) will reduce the cooling water intake from the St. Marks River to approximately one-twelfth of the current intake volumes at the location (see Section 3.5). Decreased intake volumes and pumping rates will reduce the amount of impingement and entrainment of aquatic organisms. Discharges from the Unit 5 discharge structure will be eliminated with the shutdown of the unit.

Intake rates at the Unit 7 intake structure would remain consistent with current volumes and velocities while the unit is in operation. In all likelihood, Unit 7 would operate at no more than current production levels (see Section 2.3.4). Impingement and entrainment of aquatic organisms will remain consistent with current levels or could be reduced due to a reduction in Unit 7 operation.

Flow rates within the Unit 6 and 7 discharge canal will be reduced with the shut-down of Unit 6 (see Section 2.3.4). Flows into the discharge canal would be limited to periods of Unit 7 and/or existing combustion turbines (GT1 and GT2) operation (peak demand periods) only. The reduction in flow rates should pose no adverse impact to the aquatic life of the St. Marks River.

The net overall effect of the Project on the Purdom Station impacts will be a reduction of impingement and entrainment of aquatic organisms.

In an agreement with the City of St. Marks, the Purdom Station has agreed to utilize the effluent from the City of St. Marks Wastewater Treatment Facility as a source of make-up water for the Unit 8 cooling water system. This will eliminate the discharge from the Wastewater Treatment Facility to the St. Marks River and improve water quality immediately downstream of that facility.

5.1.4 Effects of Offstream Cooling

The cooling tower will operate at temperatures ranging from about 12 to about 20° F above the ambient air wet bulb temperature. The cooling tower will produce plumes of saturated air that will cool and produce visible vapor plumes on some days. Because of the exit velocity imparted to the plumes from the mechanical draft fans of the cooling tower, and their buoyancy, they will only rarely reach ground level. Therefore, no significant impacts to transportation (either land or waterborne) are expected.

Cooling tower blowdown will be recycled in the zero discharge wastewater treatment system and will not be released to the environment.

Cooling tower drift emission rates and their control technology are presented in Section 3.4. Air quality impacts of cooling tower drift are presented in Section 5.6. Because the Purdom Station is within 4 miles of Appalachee Bay, natural airborne salt drift is expected to be present in significant quantities. This expectation is supported by the presence on and near the site of salt-tolerant vegetation. Therefore, impacts of salt drift on the on-site and off-site lands and water bodies are expected to be insignificant.

Purdom Unit 8 will recycle domestic wastewater from the City of St. Marks Wastewater Treatment Facility. Because all of the outflow from that Wastewater Treatment Facility will go to the Purdom Station, and none of it will be discharged to waters of the state, the effluent will no longer be de-chlorinated. The maintenance of a significant chlorine residual (greater than 2 mg/l) in the effluent pipeline will result in a chlorine contact time in excess of 1 hour. This disinfection will be sufficient to prevent any biological or health impacts from the cooling tower drift.

5.1.5 Measurement Program

Because Unit 8 is a zero discharge unit, no additional monitoring beyond that already required by the Purdom Station National Pollutant Discharge Elimination System (NPDES) Permit (see Appendix 10.1.2) is proposed.

5.2 EFFECTS ON CHEMICAL AND BIOCIDE DISCHARGES

5.2.1 Industrial Wastewater Discharges

After the installation and start-up of Purdom Unit 8, the Purdom Station will have no discharge of industrial wastewaters to waters of the state except for once through cooling water from Unit 7 and the existing combustion turbines (GT1 and GT2). The present discharge of non-thermal industrial wastewaters from Units 5 through 7 will cease, and those wastewaters from the remaining active Units (7 and 8) will be recycled for use within the units. Thus, the net impact from the Project will be positive (i.e., the elimination of existing industrial wastewater discharges).

5.2.2 Cooling Tower Blowdown

The Project will not discharge cooling tower blowdown to waters of the state. Consequently, this section is not applicable.

5.2.3 Measurement Programs

The proposed surface water measurement program is discussed in Section 5.1.5. No additional monitoring is proposed.

5.3 IMPACTS ON WATER SUPPLIES

5.3.1 Surface Water

The withdrawal of up to 936 gpm (2.1 cubic feet per second (cfs)) of surface water from the St. Marks River represents 0.6 % of the 7 consecutive day low flow with a 10 year recurrence interval (7Q10). That 7Q10 was presented in Section 2.3.4.1 as 347 cfs (155,734 gpm). The impact of this withdrawal will be insignificant.

The on-site drainage system (see Section 3.8) is designed to maintain existing stormwater runoff volumes at approximately the existing rate, while keeping peak runoff flows at or below existing levels. Therefore, no measurable changes to surface water flows in and out of on-site wetlands, or to off-site waterbodies, are expected.

5.3.2 Groundwater

Construction and operation of Purdom Unit 8 will have no adverse impacts to groundwater resources in the study area. During the last year, the Purdom Station utilized approximately 162,200 gallons per day (gpd) of groundwater for boiler makeup, service water, and small equipment auxiliary cooling. The water is withdrawn from the Upper Floridan aquifer system by two wells operating in tandem. To reduce groundwater impacts in the vicinity of their wellfield, the Purdom Station rotates the usage of wells 6 and 8 with wells 7 and 9 on a monthly basis. This groundwater withdrawal will be eliminated when Purdom Unit 8 is constructed. The existing Purdom Station wellfield will be retired from service and properly abandoned with operation of Purdom Unit 8. This reduction in groundwater use by the Purdom Station will have a positive impact on local groundwater resources and help to preserve the fresh groundwater resources which are available locally.

Although Purdom Unit 8 will be constructed in a recharge area for the Floridan aquifer system, the site is presently classified as industrial and the construction activities at the Purdom Station will not result in a significant increase in the paved acreage. A surface water recharge swale will be constructed to capture any additional site runoff and allow it to enter the ground as recharge and to prevent any significant new discharges to surface water bodies. Thus, there will not be a loss in aquifer recharge or a significant increase in surface water runoff due to construction of this new facility. The only waste storage facility will be a natural gas liquids storage tank (see Section 3.3). This tank will have impervious secondary containment to protect the groundwater (see Section 3.7).

The operation of Purdom Unit 8 will generate several waste streams as discussed in Sections 3.6 and 3.7. These wastes will include waste oil, steam generator blowdown, solvent parts cleaning waste, floor and laboratory drain waste, demineralizer regeneration waste, and solid waste such as dry filter cake from the zero discharge facility and air filters. Only the solid waste (dry filter cake) from the zero discharge wastewater treatment system is a new waste. All of the solid wastes will be temporarily stored on site in safe storage areas until they can be scheduled for pick-up and delivered off site to an approved disposal facility. Waste oil and solvent parts cleaning waste will be picked up for recycling by an approved contractor. Other liquid wastes will be recycled through the on-site wastewater treatment system.

5.3.2.1 Groundwater Impact Modeling Results

A simple groundwater flow model (described in Appendix 10.6.3) was constructed to model the expected impact of retiring the City of Tallahassee's Purdom Station wellfield. The model was constructed using the USGS's MODFLOW aquifer simulation model. A series of simulations were executed using this model to characterize the current groundwater usage and the expected groundwater impacts resulting from retiring the Purdom Station wellfield. The results of the model simulations executed without withdrawals from the existing Purdom Station wellfield predicted that potentiometric water levels of the Upper Floridan aquifer in the vicinity of the City's wellfield will be approximately 1 foot higher than they are currently with the wellfield operating. The model simulation also predicted that the size of the cone of depression created by several large water users in this area (including the Purdom Station) will be decreased (Figure 5.3.2-1). The current elliptical-shaped cone of depression near the Purdom Station wellfield is approximately 4,000 feet wide and 5,800 feet long, encompassing an area of approximately 360 acres (see Figure 2.3.2-5). When the Purdom Station wellfield is removed from service, this area of depressed potentiometric water levels will shrink to a more circular feature approximately 2,800 feet in diameter encompassing approximately 180 acres (Figure 5.3.2-1). After retirement of the Purdom Station wellfield, the local cone of depression will only be about 50 percent of its present size.

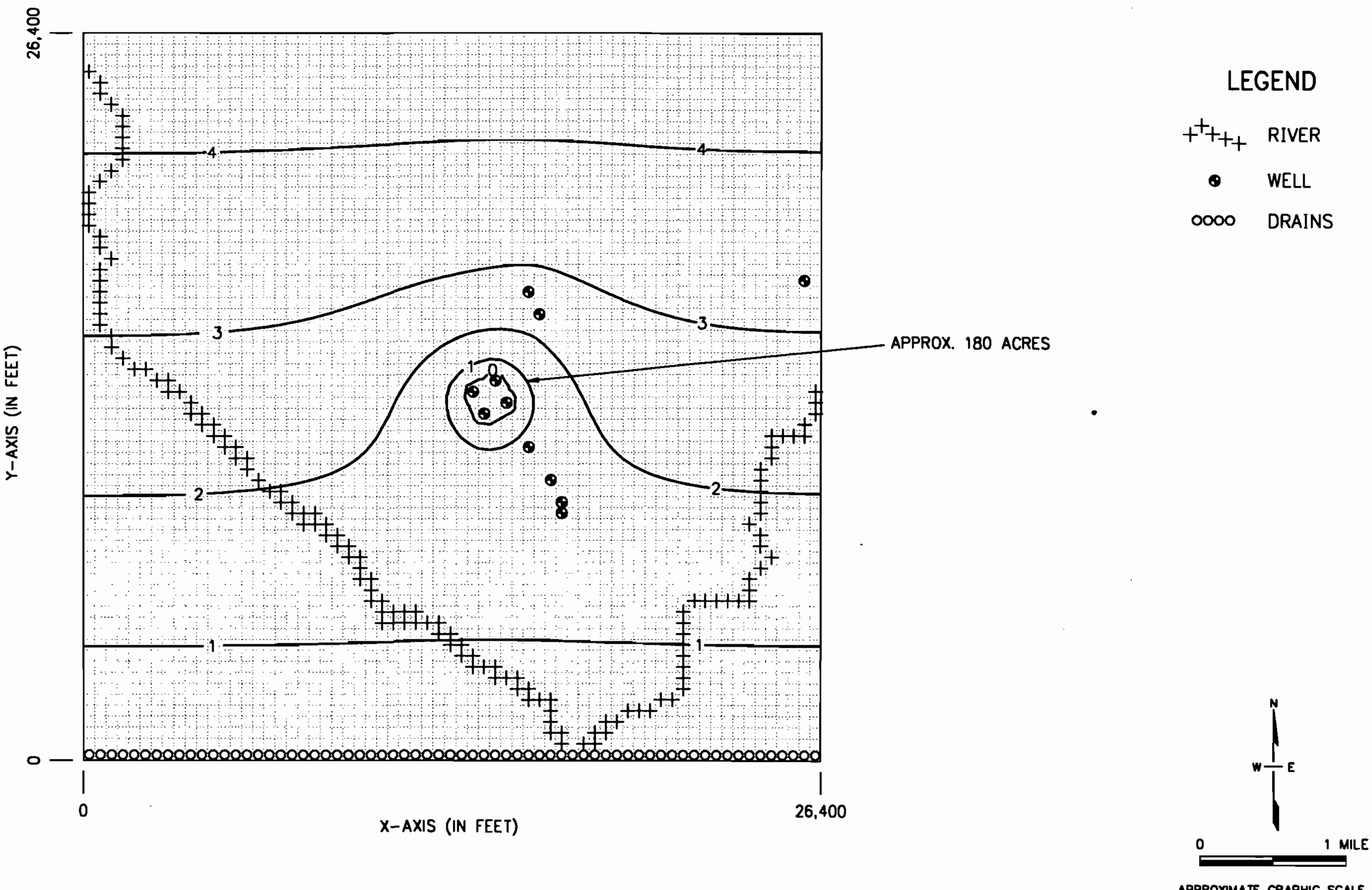
5.3.3 Drinking Water

The Floridan aquifer system provides the primary drinking water supply for areas surrounding the Purdom Station. The Purdom Station currently uses groundwater from the Floridan aquifer system for industrial purposes including boiler makeup water at the plant. The design of Purdom Unit 8 eliminates altogether the use of groundwater for industrial purposes. The existing City of Tallahassee wellfield owned and operated for the Purdom Station will be retired. This will result in an average of 162,200 gpd of additional water available in the Floridan aquifer system locally for other beneficial uses.

The Purdom Station currently obtains potable water from the City of St. Marks public supply system, which withdraws water from the Floridan aquifer. After the retirement of Units 5 and 6, and the addition of Unit 8, the number of personnel at the plant will be reduced slightly (see Section 7). Based on this slight staff reduction, a small reduction of potable water use at the Purdom Station will also occur.

5.3.4 Leachate and Runoff

The only potential aqueous groundwater discharge from the site will be stormwater from the retention swale and from the on-site wetlands. There are no proposed solid fuel or waste storage areas on site. There are no active septic tanks on site.



SOURCE: FOSTER WHEELER ENVIRONMENTAL, 1997

CITY OF TALLAHASSEE

GROUNDWATER MODEL
FUTURE CONDITIONS - OPERATION OF PURDOM UNIT 8

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 5.3.2-1

The oil handling and storage areas have spill containment. Physical and procedural methods for spill prevention and containment are identified in the Purdom Station's existing Facility Response Plan.

5.3.5 Measurement Programs

No measurement programs are proposed for either surface or groundwaters.

5.4 SOLID/HAZARDOUS WASTE DISPOSAL IMPACTS

5.4.1 Solid Waste

Generation of solid wastes is discussed in Section 3.7.1. Because all solid wastes generated on site will be disposed of at an off-site licensed landfill designed and permitted to accept such wastes, there will be no significant impacts from these wastes.

5.4.2 Hazardous Wastes

As described in Section 3.7.2, there are no hazardous wastes routinely generated at the Purdom Station, and there will be no hazardous wastes with the proposed Unit 8. During unusual events such as chemical metal cleaning of a boiler or heat recovery system generator (HRSG), the specialty contractor performing the special activity will be responsible for disposing of any hazardous wastes (not presently anticipated) resulting from their activities.

5.5 SANITARY AND OTHER WASTE DISCHARGES

Sanitary wastes from the Purdom Station will continue to be sent to the City of St. Marks Wastewater Treatment Facility. There will be no other waste discharge systems. As the Purdom Station work force will decline slightly with the operation of Unit 8, the generation of sanitary wastes will also decline slightly. Thus, there will be no impacts from the sanitary or other waste discharge systems.

If Unit 8 is not permitted and constructed, the City of St. Marks will continue to discharge their effluent to the St. Marks River.

5.6 AIR QUALITY IMPACTS

5.6.1 Impact Assessment

5.6.1.1 Introduction

This section provides an air quality impact assessment for the Project as described in Chapter 3. It is a summary of the more detailed air quality analysis presented in the PSD Report, which is provided in Appendix 10.1.5 (Attachment PGS-06 to the air permit application).

This section provides a discussion of the pollutants analyzed and indicates which pollutants are subject to the new source review requirements of Rule 62-212.400(5), F.A.C. The modelling methodology used in the air quality impact assessment is described along with the meteorological data used as input. The emission parameters for the proposed Unit 8 are provided as well as the emission changes to existing units and the resulting net emission changes. Listings of emissions information for other sources included in the analyses are provided. The receptor grids used in the modelling are presented and the background concentrations used in the ambient air quality standards (AAQS) analyses are specified. Finally, the results of the modelling analyses are provided, with comparisons to the allowable Prevention of Significant Deterioration (PSD) increments, AAQS, and draft Florida Ambient Reference Concentrations (FARCs) (FDEP, 1995a) for hazardous air pollutants. An additional impacts analysis is included which summarizes air quality impacts due to induced growth; air quality impacts on vegetation, soils, and wildlife; and air quality impacts on visibility.

5.6.1.2 Project Description

General Description

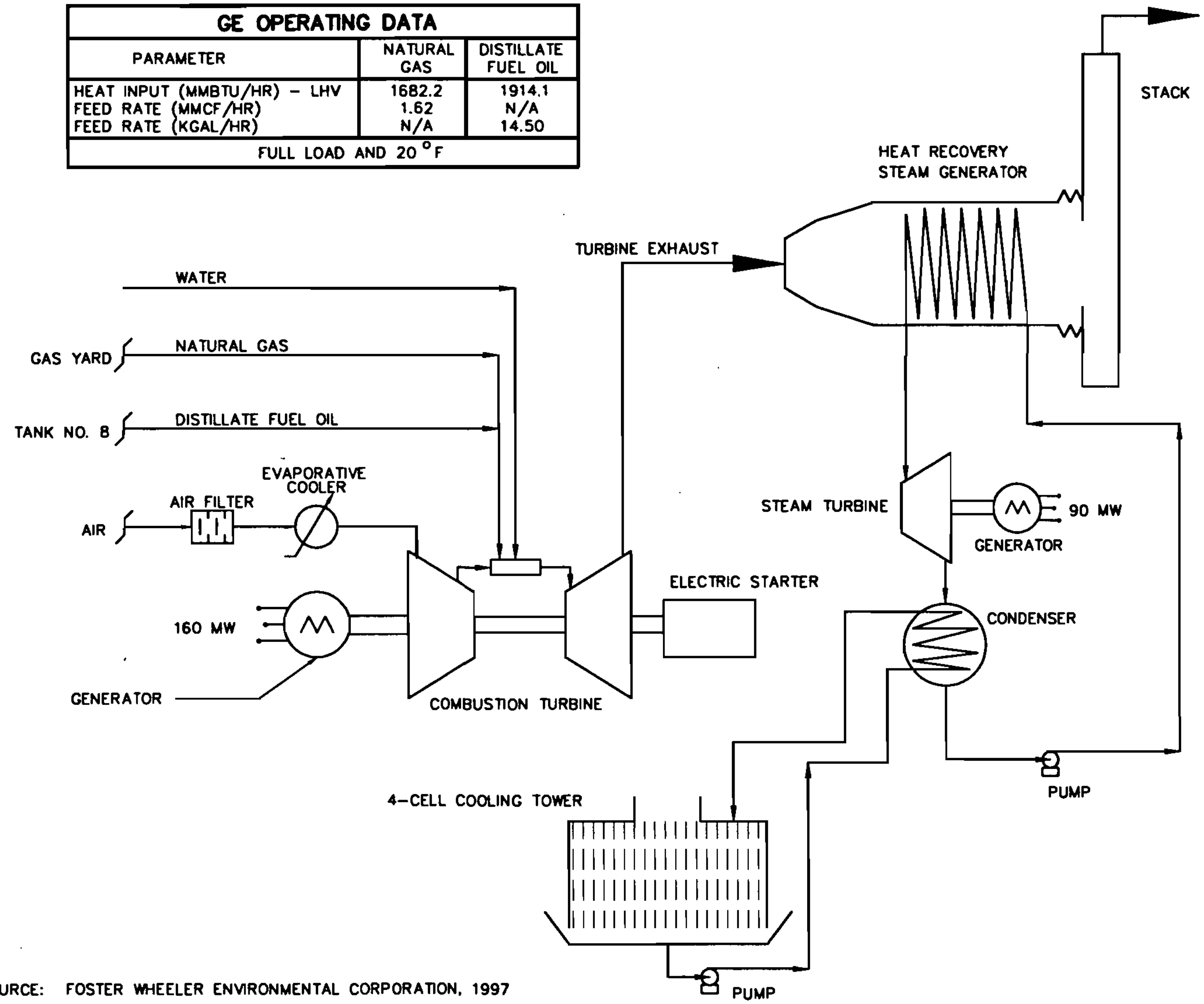
The proposed Purdom Unit 8 Project will consist of the construction of a new combined cycle combustion turbine and cooling tower at the existing Purdom Generating Station. The new unit will provide a nominal 250 MW of new generating capacity to the site. The unit will fire pipeline quality natural gas as the primary fuel, with Number 2 (0.05% S) diesel fuel oil as the secondary fuel and will function as a base load unit, operating as many as 8,760 hours per year. The combustion turbine selected is a General Electric (GE) Model MS7231FA dry low NO_x unit. A simplified flow diagram (20° F, 60% relative humidity, sea level pressure) is provided in Figure 5.6.1-1. The site layout is depicted on Figures 3.1-1 and 3.1-2. The profile of Unit 8 is depicted on Figures 3.1-3.

During natural gas firing operations, NO_x emissions will be controlled through the use of staged combustion with GE dry low NO_x combustors. During fuel oil firing, NO_x emissions will be controlled by use of water injection to reduce peak flame temperature. SO_2 and sulfuric acid mist (H_2SO_4) emissions will be limited through the primary use of pipeline quality natural gas, the secondary use of Number 2 (0.05% S) diesel fuel oil, and through the "facility-wide cap," such that emissions of SO_2 do not exceed 80 tons per year. Carbon monoxide (CO), volatile organic compounds (VOCs) and particulate matter (TSP and PM_{10}) emissions will be controlled through combustion inlet air filtration, good combustion practices, and the primary use of natural gas.

PLOT DATE MAR 1 G:\DARREL\PUNIT8.DWG

GE OPERATING DATA		
PARAMETER	NATURAL GAS	DISTILLATE FUEL OIL
HEAT INPUT (MMBTU/HR) – LHV	1682.2	1914.1
FEED RATE (MMCF/HR)	1.62	N/A
FEED RATE (KGAL/HR)	N/A	14.50
FULL LOAD AND 20 °F		

EU13 – EXHAUST PARAMETERS
EXHAUST TEMP. – 171 TO 203 °F
STACK HEIGHT – 200'
SO2 EMISSIONS – 80 TPY
NOx EMISSIONS – 467 TPY
OPACITY – 20% EXCEPT AS ALLOWED



SOURCE: FOSTER WHEELER ENVIRONMENTAL CORPORATION, 1997

CITY OF TALLAHASSEE

SIMPLIFIED PROCESS FLOW DIAGRAM

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 5.6.1-1

Trace metal emissions (e.g., lead (Pb), beryllium (Be), arsenic (As), mercury (Hg) and fluoride (Fl)) will be minimized by using natural gas as the primary fuel. Particulate matter emissions from the cooling tower will be controlled through the use of drift eliminators.

Proposed Unit 8 Emissions and Stack Parameters

The estimated stack emissions and exhaust parameters that are representative of the advanced combustion turbine design (General Electric, 1996) proposed for the Project are presented in Tables 5.6.1-1 through 5.6.1-6 for the nominal 160 MW combustion turbine unit. These tables present emissions and stack parameters for both the natural gas and fuel oil cases for three ambient temperatures: 20°F, 59°F, and 95°F. The GE data sheets which form the basis for these tables are contained in Appendix A of the PSD Report in SCA Section 10.1.5. These tables include emissions data for both the regulated criteria air pollutants (NO_x, CO, SO_2, PM_{10}, VOC and Pb) and the regulated noncriteria air pollutants listed in Table 212.400-2 of Rule 62-212.400, F.A.C. Together these are referred to as the PSD regulated pollutants.

A review of the combustion turbine design information in Tables 5.6.1-1 through 5.6.1-6 indicates that highest criteria air pollutant emission rates occur when burning Number 2 (0.05% S) diesel fuel oil. Combustion of natural gas and Number 2 (0.05% S) diesel fuel oil result in similar exhaust gas flow rates and stack exit temperatures, which directly influence plume rise.

The proposed Project will also include a cooling tower. The cooling tower will primarily utilize St. Marks River water for makeup and will emit some "drift" water droplets containing the same dissolved and suspended solids which exist in the makeup water, concentrated approximately 5 times. The drift droplets begin to evaporate as soon as they leave the cooling tower and some of the smaller droplets will evaporate completely before they hit the ground, leaving a very small particle (consisting of the dissolved and suspended solids from the makeup water). These particulates can be dispersed by the wind and are considered among the particulate matter emissions from the Project.

Proposed Project Emissions

The proposed Project includes the reduction of emissions from existing units as well as the addition of the Unit 8 combustion turbine and cooling tower. This section provides a summary of the Project emissions increases and decreases for the various PSD regulated pollutants. A discussion of the "facility-wide cap" for annual emissions of SO_2 and NO_x is also provided.

<u>Current Plant Permits and Emissions</u>

The Purdom Station currently has three valid FDEP air permits. Operation Permit No. A065-24827 establishes operating, testing, recordkeeping, and reporting requirements for the existing combustion turbines (GT1 and GT2), and limits maximum annual hours of operation for each combustion turbine. This permit does not establish any specific limitations on allowable emission rates, but it does so indirectly through a sulfur content limitation on the fuel which may be used. Permit No. AO65-242831 establishes operating, testing, recordkeeping and reporting requirements for Units 5, 6 and 7; establishes allowable emission rates for particulate matter (TSP) and SO_2; and provides for continuous operation of the boilers. The emission rate for particulate matter (TSP) is not to exceed 0.1 lb/mmBtu heat input during normal operation and

TABLE 5.6.1-1
COMBINED CYCLE UNIT 8
ESTIMATED[1] PERFORMANCE ON NATURAL GAS (100% LOAD)

CONDITIONS			
Ambient Temperature (°F)	20	59	95
Ambient Relative Humidity (%)	60	60	60
Ambient Pressure (lb/in^2)	14.7	14.7	14.7
Maximum Heat Input Rate (mmBtu/hr)[2]	1,682.2	1,563.2	1,467.7
Evaporative Cooler	Off	Off	On
EMISSIONS (lb/hr)			
Carbon Monoxide (CO)	31	29	26
Oxides of Nitrogen (NO_x) (at 15% O_2) (9ppmvd)	62	58	54
Sulfur Dioxide (SO_2) [3]	51	47	44
Particulate Matter (PM_{10})	9	9	9
Volatile Organic Compounds (non-methane HC)	3	2.8	2.6
Lead (Pb)	N/A	N/A	N/A
Asbestos	N/A	N/A	N/A
Beryllium (Be)	N/A	N/A	N/A
Mercury (Hg) [4]	1.31E-06	1.22E-06	1.14E-06
Vinyl Chloride	N/A	N/A	N/A
Total Fluorides (Fl)	N/A	N/A	N/A
Sulfuric Acid Mist (H_2SO_4)[5]	5.1	4.7	4.4
Reduced Sulfur Compounds	N/A	N/A	N/A
Total Reduced Sulfur	N/A	N/A	N/A
STACK PARAMETERS			
Stack Height (ft) (AGL)	200	200	200
Stack Diameter (ft)	16.5	16.5	16.5
Stack Gas Temperature (°F)	190	193	198
Stack Gas Exit Velocity (ft/sec)	80	75	70

(1) Emission estimates based on manufacturer's data (GE, 1996).
(2) The heat input rate is based on the lower heating value of the fuel.
(3) Sulfur dioxide emissions based on 10 grains/100 SCF total sulfur in natural gas and 95% conversion.
(4) Emission factor from (EPRI, 1994)
(5) H_2SO_4 emissions based on 5% of sulfur in fuel.

AGL = Above ground level
N/A = No emission factor available or no emissions expected.

Source: Foster Wheeler Environmental, 1997

TABLE 5.6.1-2 COMBINED CYCLE UNIT 8 ESTIMATED [1] PERFORMANCE ON NATURAL GAS (75% LOAD)			
CONDITIONS			
Ambient Temperature (°F)	20	59	95
Ambient Relative Humidity (%)	60	60	60
Ambient Pressure (lb/in^2)	14.7	14.7	14.7
Maximum Heat Input Rate (mmBtu/hr)[2]	1,360.7	1,274.4	1,202.1
Evaporative Cooler	Off	Off	Off
EMISSIONS (lb/hr)			
Carbon Monoxide (CO)	28	26	24
Oxides of Nitrogen (NO_x) (at 15% O_2) (9 ppmvd)	50	47	44
Sulfur Dioxide (SO_2)[3]	41	38	36
Particulate Matter (PM_{10})	9	9	9
Volatile Organic Compounds (non-methane HC)	2.4	2.2	2.2
Lead (Pb)	N/A	N/A	N/A
Asbestos	N/A	N/A	N/A
Beryllium (Be)	N/A	N/A	N/A
Mercury (Hg) [4]	1.06E-06	9.94E-07	9.38E-07
Vinyl Chloride	N/A	N/A	N/A
Total Fluorides (Fl)	N/A	N/A	N/A
Sulfuric Acid Mist (H_2SO_4)[5]	4.1	3.8	3.6
Reduced Sulfur Compounds	N/A	N/A	N/A
Total Reduced Sulfur	N/A	N/A	N/A
STACK PARAMETERS			
Stack Height (ft) (AGL)	200	200	200
Stack Diameter (ft)	16.5	16.5	16.5
Stack Gas Temperature (°F)	171	185	190
Stack Gas Exit Velocity (ft/sec)	63	61	57

(1) Emission estimates based on manufacturer's data (GE, 1996).
(2) The heat input rate is based on the lower heating value of the fuel.
(3) Sulfur dioxide emissions based on 10 grains/100 SCF total sulfur in natural gas and 95% conversion.
(4) Emission factor from (EPRI, 1994)
(5) H_2SO_4 emissions based on 5% of sulfur in fuel.

AGL = Above ground level
N/A = No emission factor available or no emissions expected.

Source: Foster Wheeler Environmental, 1997.

TABLE 5.6.1-3
COMBINED CYCLE UNIT 8
ESTIMATED [1] PERFORMANCE ON NATURAL GAS (50% LOAD)[4]

CONDITIONS			
Ambient Temperature (°F)	20	59	95
Ambient Relative Humidity (%)	60	60	60
Ambient Pressure (lb/in^2)	14.7	14.7	14.7
Maximum Heat Input Rate (mmBtu/hr)[2]	1,083.5	1,020.4	965
Evaporative Cooler	Off	Off	Off
EMISSIONS (lb/hr)			
Carbon Monoxide (CO)	56	53	50
Oxides of Nitrogen (NO_x) (at 15% O_2) (9 ppmvd)	39	37	35
Sulfur Dioxide (SO_2)[3]	23	31	29
Particulate Matter (PM_{10})	9	9	9
Volatile Organic Compounds (non-methane HC)	2.8	2.6	2.8
Lead (Pb)	N/A	N/A	N/A
Asbestos	N/A	N/A	N/A
Beryllium (Be)	N/A	N/A	N/A
Mercury (Hg) [5]	8.45E-07	7.96E-07	7.53E-07
Vinyl Chloride	N/A	N/A	N/A
Total Fluorides (Fl)	N/A	N/A	N/A
Sulfuric Acid Mist (H_2SO_4)[6]	3.3	3.1	2.9
Reduced Sulfur Compounds	N/A	N/A	N/A
Total Reduced Sulfur	N/A	N/A	N/A
STACK PARAMETERS			
Stack Height (ft) (AGL)	200	200	200
Stack Diameter (ft)	16.5	16.5	16.5
Stack Gas Temperature (°F)	171	176	183
Stack Gas Exit Velocity (ft/sec)	51	50	47

(1) Emission estimates based on manufacturer's data (GE, 1996).
(2) The heat input rate is based on the lower heating value of the fuel.
(3) Sulfur dioxide emissions based on 10 grains/100 SCF total sulfur in natural gas and 95% conversion.
(4) At 95°F, the minimum load at which 9 ppm can be achieved is approximately 55% rather than 50%.
(5) Emission factor from (EPRI, 1994).
(6) H_2SO_4 emissions based on 5% of sulfur in fuel.

AGL = Above ground level
N/A = No emission factor available or no emissions expected.

Source: Foster Wheeler Environmental, 1997.

TABLE 5.6.1-4
COMBINED CYCLE UNIT 8
ESTIMATED [1] PERFORMANCE ON NUMBER 2 (0.05% S) DIESEL FUEL OIL
(100% LOAD)

CONDITIONS			
Ambient Temperature (°F)	20	59	95
Ambient Relative Humidity (%)	60	60	60
Ambient Pressure (lb/in^2)	14.7	14.7	14.7
Maximum Heat Input Rate (mmBtu/hr)[2]	1,914.1	1,779.5	1,659.5
Evaporative Cooler	Off	Off	On
EMISSIONS (lb/hr)			
Carbon Monoxide (CO)	104	96	89
Oxides of Nitrogen (NO_x) (at 15% O_2) (42 ppmvd)[3]	347	322	297
Sulfur Dioxide (SO_2) [4]	98	92	85
Particulate Matter (PM_{10})	17	17	17
Volatile Organic Compounds (non-methane HC)	8	7.5	6.6
Lead (Pb)[5]	1.11E-01	1.03E-01	9.25E-02
Asbestos	N/A	N/A	N/A
Beryllium (Be)[5]	6.32E-04	5.87E-04	5.26E-04
Mercury (Hg)[5]	1.74E-03	1.62E-03	1.45E-03
Vinyl Chloride	N/A	N/A	N/A
Total Fluorides (Fl) [6]	2.03	1.89	1.69
Sulfuric Acid Mist (H_2SO_4)[4]	10	10	9
Reduced Sulfur Compounds	N/A	N/A	N/A
Total Reduced Sulfur	N/A	N/A	N/A
STACK PARAMETERS			
Stack Height (ft) (AGL)	200	200	200
Stack Diameter (ft)	16.5	16.5	16.5
Stack Gas Temperature (°F)	198	201	205
Stack Gas Exit Velocity (ft/sec)	85	80	75

(1) Emission estimates based on manufacturer's data (GE, 1996).
(2) The heat input rate is based on the lower heating value of the fuel.
(3) Based on FBN content of 0.015% or less. Maximum FBN content = 0.03% = an additional 12ppmvd NO_x above 42 ppmvd.
(4) Sulfur dioxide and sulfuric acid mist based on firing Number 2 (0.05% S) diesel fuel oil; 95% S conversion to SO_2, 5% conversion to H_2SO_4.
(5) Emission estimates from U.S. EPA (1993).
(6) Emission estimate based on City of Tallahassee oil analysis

AGL = Above ground level
N/A = No emission factor available or no emissions expected.

Source: Foster Wheeler Environmental, 1997

TABLE 5.6.1-5 COMBINED CYCLE UNIT 8 ESTIMATED [1] PERFORMANCE ON NUMBER 2 (0.05% S) DIESEL FUEL OIL (75% LOAD)			
CONDITIONS			
Ambient Temperature (°F)	20	59	95
Ambient Relative Humidity (%)	60	60	60
Ambient Pressure (lb/in^2)	14.7	14.7	14.7
Maximum Heat Input Rate (mmBtu/hr)[2]	1,567	1,465.5	1,313.3
Evaporative Cooler	Off	Off	Off
EMISSIONS (lb/hr)			
Carbon Monoxide (CO)	101	97	94
Oxides of Nitrogen (NO_x) (at 15% O_2) (42 ppmvd)[3]	281	263	235
Sulfur Dioxide (SO_2)[4]	80	75	67
Particulate Matter (PM_{10})	17	17	17
Volatile Organic Compounds (non-methane HC)	8.5	8	7.5
Lead (Pb)[5]	9.09E-02	8.05E-02	7.62E-02
Asbestos	N/A	N/A	N/A
Beryllium (Be)[5]	5.17E-04	4.84E-04	4.33E-04
Mercury (Hg)[5]	1.43E-03	1.33E-03	1.20E-03
Vinyl Chloride	N/A	N/A	N/A
Total Fluorides (Fl) [6]	1.66	1.55	1.39
Sulfuric Acid Mist (H_2SO_4)[4]	8	8	7
Reduced Sulfur Compounds	N/A	N/A	N/A
Total Reduced Sulfur	N/A	N/A	N/A
STACK PARAMETERS			
Stack Height (ft) (AGL)	200	200	200
Stack Diameter (ft)	16.5	16.5	16.5
Stack Gas Temperature (°F)	186	190	196
Stack Gas Exit Velocity (ft/sec)	65	62	59

(1) Emission estimates based on manufacturer's data (GE, 1996).
(2) The heat input rate is based on the lower heating value of the fuel.
(3) Based on FBN content of 0.015% or less. Maximum FBN content = 0.03% = an additional 12ppmvd NO_x above 42 ppmvd.
(4) Sulfur dioxide and sulfuric acid mist based on firing Number 2 (0.05% S) diesel fuel oil; 95% S conversion to SO_2, 5% conversion to H_2SO_4.
(5) Emission estimates from U.S. EPA (1993).
(6) Emission based on City of Tallahassee oil analysis

AGL = Above ground level
N/A = No emission factor available or no emissions expected.

Source: Foster Wheeler Environmental, 1997

TABLE 5.6.1-6
COMBINED CYCLE UNIT 8
ESTIMATED [1] PERFORMANCE ON NUMBER 2 (0.05% S) DIESEL FUEL OIL
(50% LOAD)

CONDITIONS			
Ambient Temperature (°F)	20	59	95
Ambient Relative Humidity (%)	60	60	60
Ambient Pressure (lb/in^2)	14.7	14.7	14.7
Maximum Heat Input Rate (mmBtu/hr)[2]	1,219.9	1,148.9	1027.3
Evaporative Cooler	Off	Off	Off
EMISSIONS (lb/hr)			
Carbon Monoxide (CO)	192	189	177
Oxides of Nitrogen (NO_x) (at 15% O_2) (42pmvd)[3]	217	204	182
Sulfur Dioxide (SO_2)[4]	62	60	53
Particulate Matter (PM_{10})	17	17	17
Volatile Organic Compounds	12.5	12.5	12.5
Lead (Pb)[5]	7.08E-02	6.6E-02	5.96E-02
Asbestos	N/A	N/A	N/A
Beryllium (Be)[5]	4.03E-04	3.79-04	3.39E-04
Mercury (Hg)[5]	1.11E-03	1.05E-03	9.35E-04
Vinyl Chloride	N/A	N/A	N/A
Total Fluorides (Fl) [6]	1.29	1.22	1.09
Sulfuric Acid Mist (H_2SO_4)[4]	7	6	6
Reduced Sulfur Compounds	N/A	N/A	N/A
Total Reduced Sulfur	N/A	N/A	N/A
STACK PARAMETERS			
Stack Height (ft) (AGL)	200	200	200
Stack Diameter (ft)	16.5	16.5	16.5
Stack Gas Temperature (°F)	176	181	188
Stack Gas Exit Velocity (ft/sec)	50	51	48

(1) Emission estimates based on manufacturer's data (GE, 1996).
(2) The heat input rate is based on the lower heating value of the fuel.
(3) Based on FBN content of 0.015% or less. Maximum FBN content = 0.03% = an additional 12ppmvd NO_x above 42 ppmvd.
(4) Sulfur dioxide and sulfuric acid mist based on firing Number 2 (0.05% S) diesel fuel oil; 95% S conversion to SO_2, 5% conversion to H_2SO_4.
(5) Emission estimates from U.S. EPA (1993).
(6) Emission based on City of Tallahassee oil analysis

AGL = Above ground level
N/A = No emission factor available or no emissions expected.

Source: Foster Wheeler Environmental, 1997

0.3 lb/mmBtu during certain operating conditions (soot blowing) when firing Number 6 fuel oil. The maximum allowable emission rate for SO_2 is 1.87 lb/mmBtu. The Title V Operating Permit Application requests an SO_2 emission limit of 1.3 lb/mmBtu for Units 5 and 6 applicable to the liquid fuel oil portion of total heat input. Permit No. 1290001-002-AC establishes operating, testing, recordkeeping and reporting requirements for the auxiliary boiler. It limits the boiler to operation when the existing Units 5, 6, and 7 are not operating and further limits annual operations to 2,000 hours. The NSPS recordkeeping and reporting requirements of 40 CFR 60, Subpart Dc apply to the auxiliary boiler.

Table 5.6.1-7 presents the permitted (allowable) emission rates in tons per year for Units 5 through 7 and the two existing combustion turbines (GT1 and GT2) in accordance with the particulate matter and SO_2 limitations contained in the respective operating permits. This table also presents past actual annual emissions of particulate matter, SO_2, NO_x, CO, VOC, and Pb, as well as the other pollutants covered by the PSD regulations (Rule 62-212.400 F.A.C.). This table includes emissions generated by the three boilers and two existing combustion turbines based on actual operation and fuel usage data averaged over the last two years.

Proposed Project Net Emission Changes

As indicated earlier, the Project includes the reduction of emissions from existing units to offset the emissions of some of the pollutants associated with Unit 8. Units 5 and 6 will be permanently shut down early and their emissions will cease. In addition, federally enforceable emissions caps for SO_2 and NO_x covering the proposed Unit 8, existing Unit 7, the existing combustion turbines (GT1 and GT2), and the new auxiliary boiler are being requested. These "facility-wide caps" will require annual emissions of SO_2 and NO_x to remain at or below current actuals of those pollutants from Units 5, 6 and 7, and from the existing combustion turbines (GT1 and GT2), as indicated in Table 5.6.1-7.

In order to determine the "worst case" annual emissions from the Project under the proposed facility-wide caps, eleven potential operating scenarios were identified. These scenarios, while not intended to represent limits on the facility, are believed to bracket the expected operating ranges of the individual units at the site. In all these scenarios, the two existing combustion turbines (GT1 and GT2) were assumed to operate at the same level as they have in the most recent two years (August 1994 through July 1996). Thus, their pollutant emissions have been assumed to be constant, except for SO_2 (where a decrease is expected as a result of a change from 0.4% S to 0.05% S fuel). The new auxiliary boiler was conservatively assumed to operate at its permitted limit of 2,000 hours per year and the cooling tower was conservatively assumed to operate at full capacity. The variables in these scenarios were fuel type and operating hours of Units 7 and 8. The hours of operation will be limited by the proposed facility-wide caps for SO_2 and NO_x. A summary of the scenarios is provided in Table 5.6.1-8. The details are presented in the PSD application which is included as Appendix 10.1.5. Table 5.6.1-9 presents a summary of the proposed Project net emission changes. Table 5.6.1-10 provides estimates of maximum future emissions of the hazardous air pollutants.

TABLE 5.6.1-7
Recent Air Pollutant Emissions (Allowables and Actuals)(14) (tons/year)

	UNIT 5				UNIT 6				UNIT 7				GT1 & GT2(16, 17)				UNITS 5, 6, 7 & GTs	
Pollutant	Actual Fuel Oil	Actual Nat. Gas	Actual Totals	Allowable Totals(1)	Actual Fuel Oil	Actual Nat. Gas	Actual Totals	Allowable Totals(1)	Actual Fuel Oil	Actual Nat. Gas	Actual Totals	Allowable Totals(1)	Actual Fuel Oil	Actual Nat. Gas	Actual Totals	Allowable Totals(1)	Actual Totals	Allowable Totals(1)
Particulate Matter (TSP)(2)(3)	0.01	1.24	1.25	164.30	0.17	1.22	1.39	164.30	2.30	5.28	7.58	340.00	0.04	0.39	0.43	NR	10.65	668.60(18)
PM_{10}	0.01	1.24	1.25	164.30	0.17	1.22	1.39	164.30	2.30	5.28	7.58	340.00	0.04	0.39	0.43	NR	10.65	668.60(18)
Sulfur Dioxide (5)	0.30	0.22	0.52	1710.00(4)	3.53	0.22	3.75	1710.00(4)	74.60	0.93	75.53	5100.00	0.23	0.01	0.24	687.61	80	9207.61
Nitrogen Oxides(6)	0.05	68.08	68.13	NR	1.44	139.22	140.66	NR	(15)	(15)	251.24	NR	0.50	5.96	6.46	NR	467	NR
Carbon Monoxide(7)	0.01	9.90	9.91	NR	0.11	10.13	10.24	NR	2.24	42.24	44.48	NR	0.04	1.49	1.53	NR	66.16	NR
Volatile Organic Compounds(8)	0.00	0.29	0.29	NR	0.02	0.30	0.32	NR	0.34	1.49	1.83	NR	0.01	0.32	0.33	NR	2.77	NR
Lead(9)	3.3E-5	NA	3.3E-5	NR	0.001	NA	0.001	NR	0.01	NA	0.01	NR	0.00	N/A	0.00	NR	0.011	NR
Asbestos	NA	NA	NA	NR	NA	NA	NA	NR	NA	NA	NA	NR	N/A	N/A	N/A	NR	NA	NR
Beryllium(10)	0.00	NA	0.00	NR	0.00	NA	0.00	NR	0.0003	NA	0.0003	NR	0.00	N/A	0.00	NR	0.0003	NR
Mercury(11)	5.4E-6	1.9E-7	5.6E-6	NR	1.0E-4	2.0E-7	1.0E-4	NR	0.002	8.2E-7	0.002	NR	6.59E-07	1.2-E-08	6.66E-07	NR	0.002	NR
Vinyl Chloride	NA	NA	NA	NR	NA	NA	NA	NR	NA	NA	NA	NR	NA	NA	NA	NR	NA	NR
Fluorides(12)	1.8E-4	NA	1.8E-4	NR	0.003	NA	0.003	NR	0.072	NA	0.072	NR	0.00	0.00	NA	NR	0.08	NR
Sulfuric Acid Mist(13)	0.01	0.03	0.04	NR	0.13	0.03	0.16	NR	2.71	0.11	2.82	NR	NA	NA	NA	NR	3.02	NR
Hydrogen Sulfide	NA	NA	NA	NR	NA	NA	NA	NR	NA	NA	NA	NR	NA	NA	NA	NR	NA	NR
Total Reduced Sulfur	NA	NA	NA	NR	NA	NA	NA	NR	NA	NA	NA	NR	NA	NA	NA	NR	NA	NR
Reduced Sulfur Compounds	NA	NA	NA	NR	NA	NA	NA	NR	NA	NA	NA	NR	NA	NA	NA	NR	NA	NR

Period of Record: August 1994-July 1996. All actual fuel usage data for Units 5 and 6 and data through March 1995 for Unit 7 is obtained from monthly generation reports. Fuel usage data for Unit 7 after March 1995 is based on the continuous emissions monitoring system (CEMS).

NR - No restrictions NA - No emissions information available or no emissions expected.

(1) Allowable totals based on emissions limitations contained in State of Florida Permit Numbers A065-242831 and A065-242827

(2) It is assumed that all PM emissions are that of PM_{10}.

(3) Actual PM emissions from the boilers for fuel oil are based on the most recent PM test results during both normal and sootblowing operations and actual fuel usage. PM emissions from the boilers for natural gas are based on an AP-42 factor and actual fuel usage.

(4) Allowable SO_2 emissions based on requested SO_2 emissions limitation of 1.3 lb/mmBtu.

(5) Actual SO_2 emissions for fuel oil are based on an AP-42 formula, percent sulfur in the fuel oil (as-burned analyses for the boilers) and actual fuel usage. SO_2 emissions for natural gas are based on the sulfur content (FGT data) and the actual natural gas usage.

(6) Actual NO_x emissions for fuel oil and natural gas for Units 5 and 6 are based on an AP-42 factor and actual fuel usage. NO_x emissions for Unit 7 are based on CEMS lb/mmBtu data and total actual fuel usage.

(7) Actual CO emissions are based on AP-42 factors and actual fuel usage.

(8) Actual VOC emissions are based on AP-42 factors and actual fuel usage.

(9) Actual lead emissions are based on AP-42 factors and actual fuel usage.

(10) Actual beryllium emissions are based on AP-42 factors and actual fuel usage.

(11) Actual mercury emissions for fuel oil are based on AP-42 factors and actual fuel usage. Actual mercury emissions for natural gas are based on an EPRI (1994) factor (no AP-42 factor available) and actual fuel usage.

(12) Actual fluoride emissions for boilers are based on an analysis of a fuel sample (no AP-42 factor available) for fluoride and actual fuel usage.

(13) Actual sulfuric acid mist emissions for boilers on fuel oil are based on the AP-42 factor for sulfur trioxide and actual fuel usage; actual sulfuric acid mist emission for boilers on natural gas are based on ten percent of sulfur dioxide and actual fuel usage.

(14) Actual emissions are based on current estimates and emission factors.

(15) The CEMS data on which actual NO_x emissions are based does not distinguish between oil and natural gas consumption.

(16) Actual fuel oil and natural gas emission rate values reflect the sum of emissions from both combustion turbines.

(17) Actual emissions are based on AP-42 factors and actual fuel usage

(18) Allowable totals shown do not include the particulate emissions from the two combustion turbines since Permit A065-242827 has no limit for particulates.

TABLE 5.6.1-8
FUTURE POTENTIAL OPERATING SCENARIOS
UNDER THE FACILITY-WIDE CAPS

Scenario	Hours of Operation				Controlling Pollutant[1]
	Unit 7		Unit 8		
	Fuel Oil	Natural Gas	Fuel Oil	Natural Gas	
1	126	0	0	8,760	SO_2
2	0	0	1,735	0	SO_2
3	137	0	0	0	SO_2
4	219	0	0	8,760	SO_2
5	0	2,852	0	8,760	NO_x
6	239	0	0	0	SO_2
7	0	6,409	0	0	NO_x
8	151	0	500	8,260	SO_2
9	0	1,928	500	8,260	NO_x
10	164	0	425	7,021	SO_2
11	0	2,600	425	7,021	NO_x

(1) Controlling pollutant is that pollutant whose emissions would reach the facility-wide cap under this scenario.
(2) Hours are estimated at full load operation.

Source: Foster Wheeler Environmental, 1997

Scenario 1	Unit 8 as controlling unit, operating 8,760 hours on natural gas/Unit 7 firing No. 6 oil SO_2 limit 1.87 lb/mmBtu (Unit 7 hours limited by SO_2 cap)
Scenario 2	Unit 8 as controlling unit, operating max hours on No. 2 fuel oil/no operation of Unit 7 (Unit 8 hours limited by SO_2 cap)
Scenario 3	Unit 7 as controlling unit, max hours on No. 6 fuel oil 1.87 lb/mmBtu/no operation of Unit 8 (Unit 7 hours limited by SO_2 cap)
Scenario 4	Unit 8 as controlling unit, operating 8,760 hours on natural gas/Unit 7 operating on No. 6 oil assume typical S content (approx 0.95 lb/mmBtu) (Unit 7 hours limited by SO_2 cap)
Scenario 5	Unit 8 as controlling unit, operating 8,760 hours on natural gas/Unit 7 operation on natural gas (Unit 7 hours limited by NO_x cap)
Scenario 6	Unit 7 as controlling unit, max hours on No. 6 fuel oil assume typical S content (approx 0.95 lb/mmBtu)/ no operation of Unit 8 (Unit 7 hours limited by SO_2 cap)
Scenario 7	Unit 7 as controlling unit, max hours on natural gas/ no operation of Unit 8 (Unit 7 hours limited by NO_x cap)
Scenario 8	Unit 8 as controlling unit, operating 8,260 hours on natural gas & 500 hr on No. 2 Oil/Unit 7 on No. 6 oil typical S content 1% (approx 0.95 lb/mmBtu) (Unit 7 hours limited by SO_2 cap)
Scenario 9	Unit 8 as controlling unit, operating 8,260 hours on natural gas & 500 hr on No. 2 oil/Unit 7 on natural gas (Unit 7 hours limited by NO_x cap)
Scenario 10	Unit 8 as controlling unit, operating 7,021 hrs on natural gas & 425 hr on No. 2 oil/Unit 7 on No. 6 oil assume typical S content 1% (approx 0.95 lb/mmBtu) (Unit 7 hours limited by SO_2 cap)
Scenario 11	Unit 8 as controlling unit (85% cap.) operating 7,021 hours on natural gas & 425 hr on No. 2 oil/Unit 7 on natural gas (Unit 7 hours limited by NO_x cap)

TABLE 5.6.1-9 MAXIMUM (WORST CASE) EMISSIONS AND NET EMISSIONS INCREASES FROM PROJECT			
Pollutant	**Annual Emissions (tons/year)**	**Scenario**	**Net Emissions Increase (tons/yr)**
Carbon Monoxide (CO)	193	9	127
Nitrogen Oxides (NO_x)	467	7	0.0
Sulfur Dioxide (SO_2)	80	6	0.0
Ozone (VOCs)	14.7	9	11.9
Particulate Matter (TSP)	59.0	4	48.3
Particulate Matter (PM_{10})	59.0	4	48.3
Total Reduced Sulfur	N/A	N/A	N/A
Reduced Sulfur Compounds	N/A	N/A	N/A
Sulfuric Acid Mist (H_2SO_4)	8.7	2	5.6
Fluorides (Fl)	1.64	2	1.56
Vinyl Chloride	NA	N/A	N/A
Lead (Pb)	0.091	2	0.08
Mercury (Hg)	0.0024	2	0.0004
Asbestos	NA	N/A	N/A
Beryllium (Be)	0.00052	2	0.00022
NA - No emissions information available or no emissions expected. Source: Foster Wheeler Environmental 1997			

TABLE 5.6.1-10 MAXIMUM (WORST CASE) EMISSIONS OF HAZARDOUS AIR POLLUTANTS (UNIT 7, UNIT 8, GT1, GT2, COOLING TOWER AND AUX BOILER)	
Pollutant	**Maximum Estimated Emissions (tons/yr)**
Arsenic (As)	8.59E-03
Cadmium (Cd)	3.53E-03
Chromium (Cr)	7.36E-02
Manganese (Mn)	5.17E-01
Nickel (Ni)	1.88E-00
Cobalt (Co)	1.43E-02
Antimony (Sb)	3.45E-02
Vanadium (V)	1.32E-01
Polycyclic Organic Material (POM)	3.76E-02
Benzo(a)pyrene (BaP)	6.36E-06
Benzene	6.21E-03
Toluene	2.01E-02
Selenium (Se)	8.30E-03
Hydrochloric Acid (HCl)	1.18E+01
Dioxin (2,378 TCDD)	1.39E-08
Formaldehyde (HCOH)	2.61E-01
Source: Foster Wheeler Environmental, 1997	

5.6.1.3 Air Quality Review Requirements and Applicability

The following discussion pertains to the federal and state air quality regulatory requirements and their applicability to the Project. These regulations must be satisfied before the proposed facility can be constructed and begin operation.

National and Florida Ambient Air Quality Standards (NAAQS/FAAQS)

The applicable federal (NAAQS) and Florida (FAAQS) ambient air quality standards and PSD increments are presented in Table 5.6.1-11. These ambient air quality standards have been promulgated for six pollutants, known as the "criteria" pollutants: NO_2, CO, SO_2, PM_{10}, O_3, and Pb. The primary NAAQS/FAAQS were promulgated to protect the public health, and the secondary NAAQS/FAAQS were promulgated to protect the public welfare from any known or anticipated adverse effects associated with the presence of pollutants in the ambient air. Wakulla County is an "attainment" area for all criteria pollutants, meaning that existing concentrations are below the primary and secondary standards.

PSD Increments/Classifications

In promulgating the 1977 Clean Air Act (CAA) Amendments, Public Law 95-95, Congress specified that certain increases above an air quality "baseline concentration" level for SO_2 and TSP would constitute "significant deterioration." The magnitudes of the allowable increases, or "increments," 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 of 1977. Initially, Congress designated PSD areas as Class I (international parks, national wilderness areas, 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). No Class III areas, which would allow greater deterioration than Class II areas, were designated. EPA subsequently incorporated the requirements for classifications and area designations into the PSD regulations.

On October 17, 1988, the EPA promulgated regulations to prevent significant deterioration due to NO_x emissions and established PSD increments for NO_2 concentrations. On June 3, 1993, EPA promulgated regulations which revised the PSD increments for particulate matter from TSP to PM_{10}. This change became effective on June 3, 1994. The allowable PSD increments for SO_2, PM_{10}, and NO_2 are presented in Table 5.6.1-11. The FDEP has adopted the EPA PSD classification system and the allowable PSD increments for SO_2, PM_{10}, and NO_2.

Most of Wakulla County and the surrounding counties are designated as PSD Class II areas for SO_2, PM_{10}, and NO_2. The Purdom Station is located approximately 0.6 km north of the nearest boundary of the St. Marks National Wilderness Area and 28.6 km east of the nearest boundary of the Bradwell Bay National Wilderness Area, the nearest PSD Class I areas. The National Wilderness Areas are those portions of the St. Marks National Wildlife Refuge and Apalachicola National Forest which have been officially designated as wilderness. The location of the Purdom Station with respect to these two Class I areas is depicted in Figure 5.6.1-2.

TABLE 5.6.1-11
AMBIENT AIR QUALITY STANDARDS
AND PSD INCREMENTS

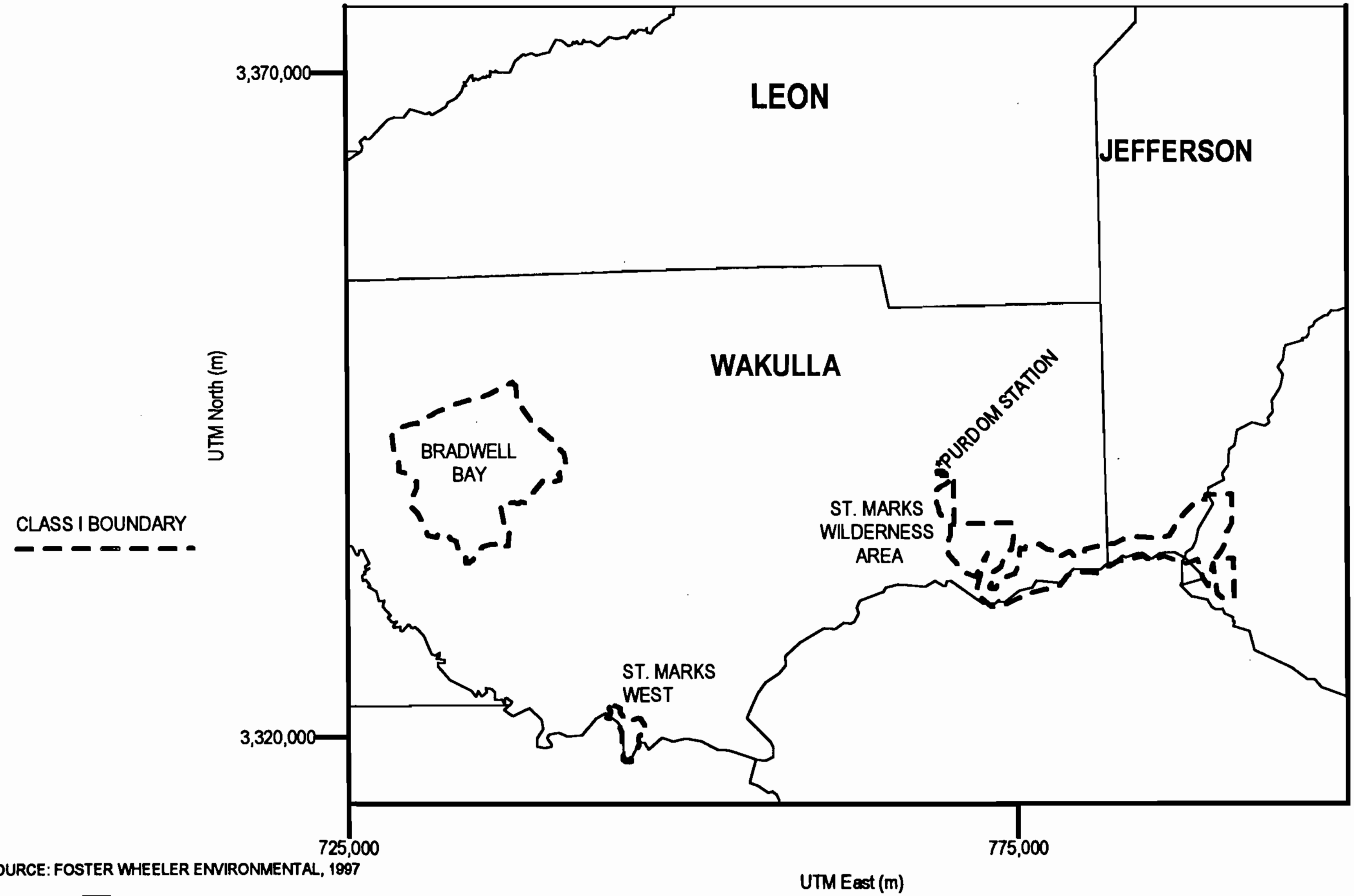
Pollutant	Averaging Time	Federal NAAQS (µg/m³)	Florida FAAQS (µg/m³)	Class I PSD Increment (µg/m³)	Class II PSD Increment (µg/m³)
Carbon Monoxide (CO)	1-hour	40,000	40,000	N/A	N/A
	8-hour	10,000	10,000	N/A	N/A
Nitrogen Dioxide (NO_2)	Annual	100	100	2.5	25
Sulfur Dioxide (SO_2)	3-hour	1,300	1,300	25	512
	24-hour	365	260	5	91
	Annual	80	60	2	20
Particulate Matter (PM_{10})	24-hour	150	150	8	30
	Annual	50	50	4	17
Ozone (O_3)[1]	1-hour	235	235	N/A	N/A
Lead (Pb)	Calendar Quarter	1.5	1.5	N/A	N/A

(1) Ozone values are associated with emissions of VOCs and NO_x.

Note: Short-term standards and increments (i.e., those with averaging times less than quarterly) can be exceeded once per year and still be in compliance.

N/A = No PSD increments exist for these pollutants.
µg/m³ = micrograms per cubic meter

Sources: 40 CFR 50; Rule 62-204.260, F.A.C.; Rule 62-204.240, F.A.C.



SOURCE: FOSTER WHEELER ENVIRONMENTAL, 1997

CITY OF TALLAHASSEE

PURDOM UNIT 8
CLASS I AREAS - LOCATION MAP
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 5.6.1-2

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PSD Review Requirements

Under the EPA and FDEP PSD permit review requirements, all major new or modified existing sources of air pollutants located in attainment areas and regulated under the Clean Air Act (CAA) must be reviewed and approved. A "major stationary source" is defined as any one of 28 specified 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 air pollutant regulated under the CAA. Fossil fuel-fired steam electric plants of more than 250 mmBtu/hr of heat input comprise one of the 28 specified source categories. Thus, the existing Purdom steam units meet the 100 TPY threshold criterion. The term "potential to emit" means the capability, at maximum design capacity, to emit a pollutant after the application of control equipment. The potential emissions from the existing units exceed 100 TPY. Therefore, the Purdom Station is considered an existing major stationary source. Modifications to major sources are considered "major modifications" if they will increase the potential to emit by more than the PSD significant emission rates listed in Table 212.400-2 of Rule 62-212.400, F.A.C., or by any amount if the source is located within 10 km of a Class I area and the impact would be greater than 1 $\mu g/m^3$ (24-hour average) in the Class I area (Rule 62-212.400(2)(d)4a(ii), F.A.C.). These PSD significance levels are summarized in Table 5.6.1-12. The net changes in emissions from the proposed Project will exceed the PSD significant emission thresholds for some pollutants (CO, PM_{10}, and TSP) and thus subject the Project to PSD review for these pollutants. Nevertheless, a PSD analysis is being done for all pollutants expected to be emitted.

PSD review is used to determine whether significant air quality deterioration will result from the new or modified source located in an attainment area. The PSD regulations are contained in Rule 62-212.400, F.A.C. Major sources and modifications are required to undergo the following analyses under PSD review for each air pollutant emitted in significant quantities:

- A control technology analysis;
- An air quality impacts analysis; and
- An additional impacts analysis.

In addition to these analyses, a new source must also be reviewed with respect to Good Engineering Practice (GEP) stack height regulations (EPA, 1985a) adopted by FDEP (Rule 62-210.550, F.A.C.), New Source Performance Standards (NSPS), and any state emission standards.

5.6.1.4 Air Quality Modelling Approach

This section summarizes the air quality modelling protocol and input parameters utilized in the air impact determinations presented in Section 5.6.1.12. Descriptions of the models, meteorology, options selected, listings of modelling parameters for the proposed Project, receptor locations, and step-by-step procedures that were used to develop the necessary projected impacts are discussed.

TABLE 5.6.1-12
MAXIMUM ANNUAL NET CHANGE IN EMISSIONS AND PSD SIGNIFICANCE VALUES

Pollutant	Net Increase In Emissions[1] (TPY)	PSD Significance Criterion (TPY)	PSD Review Required (Yes/No)
Carbon Monoxide (CO)	127	0[2]	Yes
Nitrogen Oxides (NO_x)	0	0[2]	No
Sulfur Dioxide (SO_2)	0	0[2]	No
Particulate Matter (PM_{10})	48.3	15	Yes
Total Suspended Particulates (TSP)	48.3	25	Yes
Volatile Organic Compounds (VOCs)	11.9	40	No
Lead (Pb)	0.08	0.6	No
Asbestos	N/A	0.007	No
Beryllium (Be)	0.00022	0.0004	No
Mercury (Hg)	0.0004	0.1	No
Vinyl Chloride	N/A	1	No
Total Fluorides (Fl)	1.6	3	No
Sulfuric Acid Mist (H_2SO_4)	5.6	7	No
Total Reduced Sulfur	N/A	10	No
Reduced Sulfur Compounds	N/A	10	No

(1) Based on worst case scenarios.
(2) Due to the proximity to the Class I area, lower criteria apply for those pollutants with a minimum projected 24-hour average impact of 1.0 mg/m^3 or more in the Class I area, as per Rule 62-212.400(2)(f)(1), F.A.C.

NA = No emissions information available or no emissions expected.
TPY = Tons per year

Source: Foster Wheeler Environmental, 1997

Pollutants Covered

The required modelling analysis is limited to those pollutants that were determined to be subject to PSD review. As indicated in Table 5.6.1-12, these pollutants include particulate matter (TSP and PM_{10}) and CO. Although the proposed source emissions of particulate matter (TSP) are shown in Table 5.6.1-12 to be above the PSD significant emission rates, there are no ambient air quality standards nor PSD significant impact levels or increments for that pollutant. Hence, there is no required air quality impact assessment for particulate matter (TSP). Required conventional modelling for compliance with AAQS and PSD increments was, therefore, restricted to PM_{10} and CO for AAQS, and to PM_{10} for PSD. However, in the interest of providing a more complete picture of Project impacts, the City voluntarily chose to model the proposed Project for all PSD regulated pollutants with quantifiable emissions for which ambient standards, PSD increments or draft FARCs exist. Therefore, the PSD regulated pollutants covered by some phase of the modelling analyses include: SO_2, NO_2, particulate matter (TSP and PM_{10}), CO, Pb, Be, Hg, and Fl. The PSD increment consumption modelling covered SO_2, NO_2, and PM_{10}. Modelling for compliance with AAQS covered SO_2, NO_2, PM_{10}, CO, and Pb. The remaining PSD regulated pollutants, Be, Hg, and Fl, were covered in the modelling of hazardous air pollutants (HAPs). Certain HAPs are not subject to PSD review but are covered by the draft FARCs (FDEP, 1995a). Those for which emission estimates were available for this Project (antimony, arsenic, cadmium, chromium, cobalt, manganese, nickel, selenium, vanadium, polycyclic organic matter, benzo-a-pyrene, benzene, toluene, hydrochloric acid, dioxin, and formaldehyde (HCOH)) were also included in the air quality impact analysis.

General Modelling Approach

A modelling protocol was prepared by the applicant and submitted to FDEP for review (COT, 1996). The FDEP approved the modelling protocol prior to commencement of the air quality impact assessment (FDEP, 1996c).

The air quality impact assessment consisted of a proposed source significant impact area analysis, a PSD increment consumption analysis, an ambient air quality standards impact analysis, and an additional impacts analysis. In addition, the need for ambient monitoring was evaluated. These analyses are discussed in greater detail below. The modelling approach followed EPA and FDEP modelling guidelines for determining compliance with applicable PSD increments, AAQS, and the draft FARCs. EPA modelling guidance is provided in the Guideline on Air Quality Models (40 CFR 51, Appendix W) as well as the Draft New Source Review Workshop Manual (EPA, 1990a). FDEP guidance on conducting the analyses is provided in Rule 62-212.400, F.A.C.

The general modelling approach for each air quality impact analysis commenced with a significance level impact phase. Then screening and refined multi-source modelling phases were conducted. The major difference between the latter two phases is the receptor grid used when predicting concentrations and the number of meteorological data periods evaluated. In general, concentrations for the screening phase were predicted using a coarse mesh receptor grid and a five-year meteorological data base. The screening phase identified the critical receptors associated with the highest and highest second-high short-term concentrations for all applicable pollutants and averaging periods. The predicted concentrations at those critical receptors were evaluated in greater detail in the refined phase of the analysis.

The refined phase of the analysis was performed by predicting concentrations using a fine mesh receptor grid centered over each of the critical receptors identified in the screening phase of the modelling analysis. This approach was used to ensure that valid highest second-high (critical) short-term concentrations were obtained for comparison to applicable air quality standards and PSD increments.

Dispersion Model Selection and Options

The most current version of the Industrial Source Complex (ISC3) dispersion model (Version 96113) available was used to evaluate the emissions from the proposed units. This model was downloaded from the EPA Technology Transfer Network (TTN), Support Center for Regulatory Air Models (SCRAM) bulletin board. The model and its use are covered in the Users Guide (EPA, 1995a). A description of the model is presented in Appendix 10.6.6.

The ISC3 short term (ISCST3) 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 surroundings (Auer, 1978). If the land use is classified as heavy industrial, light-moderate industrial, commercial, or compact residential for more than 50 percent of the area within a 3 km radius centered on the proposed source, the urban option should be selected. Otherwise, the rural option is more appropriate.

Based on the use of USGS topographic maps, it has been concluded that the land use within a 3 km radius of the Purdom Station is consistent with the use of the rural rather than the urban options.

The regulatory default mode for all of the program control parameters was used in the ISCST3 model as approved by FDEP. The ISCST3 model was applied without terrain adjustment data because the area in which the Purdom Generating Station is located has very little relief (e.g., a net change in ground level elevation in the range of only 10-20 feet). The ISCST3 model's building downwash options were applied to all on site sources, but since the stack for the proposed Unit 8 will be greater than calculated GEP stack height (but within the allowed 65 meter default value), downwash modelling was not required for Unit 8.

The air quality impact assessment for particulate matter assumed that all particulate matter emissions were PM_{10} emissions. This assumption simplified the particulate matter modelling analysis (i.e., no separate analyses for TSP and PM_{10}) and resulted in a potentially conservative approach to modelling PM_{10} impacts.

5.6.1.5 Meteorological Data

The air quality modelling analysis used hourly preprocessed National Weather Service (NWS) surface meteorological data from Tallahassee, Florida and concurrent twice-daily mixing heights from Apalachicola, Florida for the years 1985 to 1989. These are the locations and years recommended by FDEP. The preprocessed hourly meteorological data file for each year of record used in the analysis obtained from FDEP contained randomized wind direction, wind speed, ambient temperature, atmospheric stability using the Turner (1970) stability classification scheme, and mixing heights. The anemometer height of 6.7 meters, used in the modelling analysis, was obtained from NWS Local Climatological Data summaries for Tallahassee. A summary of wind direction and wind speed frequencies stratified by atmospheric stability class for this five year meteorological data set is contained in Appendix 10.5.6.

5.6.1.6 Emissions Inventory - Unit 8

Short-Term Emissions - PSD Regulated Pollutants

The emissions inventories for the proposed Unit 8 for both the primary fuel (natural gas) and the secondary fuel (Number 2 (0.05% S) diesel fuel oil) are presented in Tables 5.6.1-13 and 5.6.1-14. The pollutant emission rates shown in these tables are representative of BACT as demonstrated in Section 3.4.

The proposed source worst-case fuel/load/temperature scenarios were determined by first conducting preliminary modelling. Preliminary modelling runs were conducted using one year of meteorology (the first year of the data set provided by FDEP - 1985) at three ambient temperatures (95°F, 59°F, and 20°F) and three combustion turbine loads (100%, 75%, and 50%) for both clean pipeline quality natural gas and Number 2 (0.05% S) diesel fuel oil. Thus, there were a total of 18 preliminary modelling runs conducted using the 1985 meteorological data set. A summary of the preliminary modelling runs is presented in Section 5.6.1.12. As a result of these preliminary runs, it was determined that the 20°F and 50 percent load while firing Number 2 (0.05% S) diesel fuel oil combination produced the "worst case" predicted ground-level ambient air quality impacts for the short-term averaging periods for all pollutants. The emission rates and stack parameters for these conditions are highlighted in bold type in Table 5.6.1-14.

Long-Term Emissions - PSD Regulated Pollutants

The annual emissions from the proposed Unit 8 are limited by the need to maintain annual emissions of SO_2 and NO_x within facility-wide caps. Depending upon fuel choice, availability, and the need to run other units, Unit 8 could run continuously or very infrequently. If Unit 8 were to be utilized as much as possible, it could run the full year (8,760 hours) when firing natural gas or for up to 1,735 hours at full load when firing Number 2 (0.05% S) diesel fuel and stay within the facility-wide caps for SO_2 and NO_x. The annualized emissions for these two cases are presented in Table 5.6.1-15. As indicated, the stack parameters associated with 59°F and 100% load were used for these tables and the associated annual modelling, as they are more representative of annual average conditions than the 20°F, 50% load cases used for the short-term modelling.

Emissions of Hazardous Air Pollutants

The emission rates from Unit 8 for the draft FARCs were estimated for both short-term and long-term averaging periods. Short-term emission rates were based upon firing Number 2 (0.05% S) diesel fuel oil and the 20°F, 50% load stack parameters were used. Long-term emission rates were based on Number 2 (0.05% S) diesel fuel oil firing (up to 1,735 hours) and

TABLE 5.6.1-13
PROPOSED UNIT 8 SHORT-TERM EMISSIONS INVENTORY
NATURAL GAS FIRING

Load (%)	Ambient Temp (°F)	Ts (°K)	Vs (m/sec)	Emission Rates (grams/sec)								
				SO_2 [1]	PM/PM_{10} [2]	NO_x	CO [2]	Pb	Be	Fl	H_2SO_4	Hg
100	20	361	24.54	6.37	1.14	7.82	3.91	N/A	N/A	N/A	0.64	1.33E-06
	59	362	22.99	5.91	1.14	7.31	3.66	N/A	N/A	N/A	0.59	1.22E-06
	95	365	21.24	5.55	1.14	6.81	3.28	N/A	N/A	N/A	0.56	1.14E-06
75	20	356	19.34	5.15	1.14	6.31	3.53	N/A	N/A	N/A	0.52	1.06E-06
	59	358	18.59	4.82	1.14	5.93	3.28	N/A	N/A	N/A	0.48	9.94E-07
	95	361	17.52	4.55	1.14	5.55	3.03	N/A	N/A	N/A	0.46	9.38E-07
50	20	350	15.63	4.10	1.14	4.92	7.06	N/A	N/A	N/A	0.41	8.45E-07
	59	353	15.61	3.86	1.14	4.67	6.68	N/A	N/A	N/A	0.39	7.96E-07
	95	357	14.35	3.65	1.14	4.41	6.31	N/A	N/A	N/A	0.36	7.53E-07

(1) Based on 10 grains/100 SCF total sulfur in natural gas.

(2) Pollutants for which PSD is triggered.

Stack UTM Coordinates: 769.611 km - East
3,339.767 km - North

Stack height = 60.97 m
Ts - Stack exit temperature (see table above)
Vs - Stack exit velocity (see table above)
Stack diameter = 5.0 m

N/A = No emission factor available or no emissions expected.

Source: Foster Wheeler Environmental, 1996

TABLE 5.6.1-14
PROPOSED UNIT 8 SHORT-TERM EMISSIONS INVENTORY
NUMBER 2 (0.05% S) DIESEL FUEL OIL FIRING

Load (%)	Ambient Temp (°F)	Ts (°K)	Vs (m/sec)	Emission Rates (grams/sec) SO_2[1]	PM/PM_{10}[2]	NO_x	CO[2]	Pb	Be	Fl	H_2SO_4	Hg
100	20	365	25.90	12.36	2.14	43.76	13.12	1.40E-02	7.97E-05	2.56E-01	1.26	1.74E-03
	59	367	24.24	11.60	2.14	33.17	12.11	1.30E-02	7.41E-05	2.38E-01	1.26	1.62E-03
	95	368	22.20	10.34	2.14	29.64	10.97	1.17E-02	6.64E-05	2.13E-01	1.14	1.45E-03
75	20	359	19.66	10.09	2.14	35.44	12.74	1.15E-02	6.52E-05	2.10E-01	1.01	1.43E-03
	59	361	19.03	9.46	2.14	33.17	12.23	1.07E-02	6.10E-05	1.96E-01	1.01	1.33E-03
	95	364	18.01	8.45	2.14	29.64	11.85	9.61E-03	5.47E-05	1.76E-01	0.88	1.20E-03
50	**20**	**353**	**15.38**	**7.82**	**2.14**	**27.37**	**24.21**	**8.92E-03**	**5.08E-05**	**1.63E-01**	**0.88**	**1.11E-03**
	59	356	15.50	7.56	2.14	25.73	23.84	8.40E-03	4.78E-05	1.54E-01	0.76	1.05E-03
	95	360	14.77	6.68	2.14	22.95	22.32	7.51E-03	4.28E-05	1.37E-01	0.76	9.35E-04

(1) Based on 0.05% sulfur in fuel oil.

(2) Pollutants for which PSD is triggered.

Stack UTM Coordinates: 769.611 km - East
3,339.767 km - North

Stack height = 60.97 m
Ts - Stack exit temperature (see table above)
Vs - Stack exit velocity (see table above)
Stack diameter = 5.0 m

Source: Foster Wheeler Environmental, 1996

TABLE 5.6.1-15
PROPOSED UNIT 8 LONG-TERM EMISSIONS INVENTORY
NATURAL GAS AND NUMBER 2 (0.05% S) DIESEL FUEL OIL FIRING
(59° F 100% LOAD)

Pollutant	Natural Gas[1]			Fuel Oil[2]		
	tons/year	lb/hr	grams/sec	tons/year	lb/hr	grams/sec
Sulfur Dioxide (SO_2)	6[3]	1.4[3]	0.2[3]	80[4]	18.3[4]	2.3[4]
Particulate Matter (PM_{10})	39.4	9	1.1	14.7	3.4	0.4
Oxides of Nitrogen (NO_x)	254	58	7.3	279.3	63.8	8
Lead (Pb)	0	0	0.00	8.95E-02	2.04E-02	2.58E-03

(1) Assumes 8,760 hrs of operation.
(2) Assumes 1,735 hours of full load operation based on SO_2 facility-wide cap.
(3) Based on 0.32 grains/100 scf total sulfur in natural gas, annual average
(4) Based on 0.05% sulfur in fuel oil

Stack height = 60.97 m
Stack diameter = 5.0 m
Stack exit velocity = 22.99 m/s on natural gas
= 24.24 m/s on fuel oil
Stack exit temperature = 362°K on natural gas
= 367°K on fuel oil

Stack UTM Coordinates: 769.611 km East
3,339.767 km North

Source: Foster Wheeler Environmental, 1997

59°F, 100% load stack parameters. Emissions of formaldehyde were treated differently since emissions of this pollutant are higher on natural gas than on fuel oil. The estimated short-term and long-term emission rates for the draft FARC pollutants are summarized in Table 5.6.1-16.

5.6.1.7 Emissions Inventory - The Project

As indicated in Section 5.6.1.2, the "worst-case" emissions from the Project were determined based on an evaluation of 11 possible operating scenarios. The Project includes the permanent shut down of Units 5 and 6, reduced operation of existing Unit 7, and the continued operation of the existing combustion turbines (GT1 and GT2) and the auxiliary boiler, in addition to the operation of Unit 8. The 11 operating scenarios were developed to bracket the expected operating ranges of the individual operating units at the Purdom Station while maintaining compliance with the proposed facility-wide caps on emissions of SO_2 and NO_x. The existing combustion turbines, the auxiliary boiler, and the cooling tower were not included in the operating scenarios as their operations were assumed to remain constant for all scenarios.

The emission rates used in the different modelling analyses vary because these different analyses are based on comparisons of future emissions with current or PSD baseline emissions, as appropriate. The current emissions were based on the period August 1994 through July 1996, the latest two-year period for which data were available when this analysis commenced (see Appendix B of the PSD Report). The baseline emissions are pollutant specific due to differences in the baseline dates. For SO_2 and PM_{10}, the baseline period was calendar years 1976 and 1977, the two year period preceding the December 27, 1977 minor source PSD baseline date for SO_2 and PM_{10}. For NO_2, the baseline period was calendar years 1986 and 1987, the two year period preceding the March 28, 1988 PSD baseline date for NO_2. As Units 1 through 4 have been permanently shut down, Units 5 and 6 will be permanently shut down, and the existing combustion turbines will have their fuel sulfur content reduced, their emission reductions expand the increment for PSD modelling purposes.

Appendix C of the PSD Report contains copies of the spreadsheets and calculations used to determine the short-term and long-term emission rates for the various units associated with the Project for the various modelling analyses. These emission rates are summarized in Tables 5.6.1-17 and 5.6.1-18 for the PSD regulated pollutants and the FARCs, respectively.

5.6.1.8 Emissions Inventory - Off-site Sources

The results of the proposed source significant impact area analysis (which is described in Section 5.6.1.12) indicated that the proposed facility's air quality impacts could be above the significant impact levels only for PM_{10} and NO_2 at off-site locations. The ISCST3 projected impact area for PM_{10} and NO_2 was a 0.3 km radius circle from the proposed source. Typically only the background sources for these two pollutants would need to be considered, but the City of Tallahassee chose to expand this analysis to all the criteria pollutants. As a result, a full emissions inventory was requested from FDEP.

An inventory of sources in the surrounding counties of Gadsden, Leon, Jefferson, Wakulla and Taylor was provided by the FDEP (1996a).

TABLE 5.6.1-16
PROPOSED UNIT 8 DRAFT FARCS EMISSIONS INVENTORY

	Short-Term[1]		Long-Term[2]		
Pollutant	**lb/hr**	**grams/sec**	**tons/year**	**lb/hr**	**grams/sec**
Arsenic (As)	5.98E-03	7.54E-04	7.56E-03	1.73E-03	2.18E-04
Beryllium (Be)	4.03E-04	5.08E-05	5.09E-04	1.16E-04	1.47E-05
Cadmium (Cd)	5.12E-03	6.46E-04	6.48E-03	1.48E-03	1.87E-04
Chromium (Cr)	5.73E-02	7.23E-03	7.26E-02	1.66E-02	2.09E-03
Lead (Pb)	7.08E-02	8.92E-03	8.95E-02	2.04E-02	2.58E-03
Manganese (Mn)	4.15E-01	5.23E-02	5.25E-01	1.20E-01	1.51E-02
Mercury (Hg)	1.11E-03	1.40E-04	1.40E-03	3.21E-04	4.04E-05
Nickel (Ni)	1.46E+00	1.85E-01	1.85E+00	4.23E-01	5.33E-02
Cobalt (Co)	1.11E-02	1.40E-03	1.40E-02	3.21E-03	4.04E-04
Antimony (Sb)	2.68E-02	3.38E-03	3.40E-02	7.75E-03	9.78E-04
Vanadium (V)	5.37E-03	6.77E-04	6.79E-03	1.55E-03	1.96E-04
Polycyclic Organic Matter (POM)	2.93E-02	3.69E-03	3.71E-02	8.46E-03	1.07E-03
Benzo(a)Pyrene (BaP)	4.95E-06	6.24E-07	6.27E-06	1.43E-06	1.80E-07
Benzene	1.43E-03	1.81E-04	1.81E-03	4.14E-04	5.22E-05
Toluene	1.29E-02	1.63E-03	1.63E-02	3.73E-03	4.70E-04
Selenium (Se)	6.47E-03	8.15E-04	8.18E-03	1.87E-03	2.36E-04
Hydrochloric Acid (HCl)	9.22E+00	1.16E+00	1.17E+01	2.66E+00	3.36E-01
Hydrogen Fluoride (HF)	1.29E+00	1.63E-01	1.64E+00	3.74E-01	4.71E-02
Hydrogen Dioxin (378TCDD)	1.08E-08	1.36E-09	1.37E-08	3.12E-09	3.94E-10
Formaldehyde (HCOH)	2.61E-02	3.29E-03	4.96E-02	1.13E-02	1.43E-03

(1) Fuel oil firing at 20°F 50% load (worst case impact condition) except formaldehyde which is based on firing natural gas.

(2) Assumes 1,735 hours of operation on fuel at 59°F 100% load, except formaldehyde, which is based on firing natural gas 8,760 hours.

Stack height = 60.97 m
Stack diameter = 5.0 m
Stack exit velocity = 15.38 m/s on fuel oil (20°F 50% load)
Stack exit temperature = 353°K on fuel oil (20°F 50% load)

Stack UTM Coordinates: 769.611 km East
3,339.767 km North

Source: Foster Wheeler Environmental, 1996

TABLE 5.6.1-17
PURDOM STATION PSD REGULATED POLLUTANT EMISSION RATES USED FOR MODELLING (g/sec)

Analysis	Pollutant	Averaging Period	Unit 1	Unit 2	Unit 3	Units 4	Unit 5	Unit 6	Unit 7	GT1/ GT2[1]	Unit 8	Cooling Tower	Aux Boiler
Significant Impact	SO_2	Short	0.00	0.00	0.00	0.00	-49.18	-49.18	0.00	-10.29	7.82	NA	NA
	SO_2	Long	0.00	0.00	0.00	0.00	-0.01	-0.11	0.12	0.00	0.00	NA	2.89E-04
	PM_{10}	Short	0.00	0.00	0.00	0.00	-4.73	-4.73	0.00	0.00	2.14	0.30	NA
	PM_{10}	Long	0.00	0.00	0.00	0.00	-0.04	-.04	0.03	0.00	1.14	0.30	2.99E-03
	NO_2	Long	0.00	0.00	0.00	0.00	-1.96	-4.05	5.95	0.00	0.00	NA	6.75E-02
	CO	Short	0.00	0.00	0.00	0.00	-1.26	-1.26	0.00	0.00	12.11	NA	NA
Monitoring Exemption	PM_{10}	Short	0.00	0.00	0.00	0.00	-4.73	-4.73	0.00	0.00	2.14	0.30	NA
	CO	Short	0.00	0.00	0.00	0.00	-1.26	-1.26	0.00	0.00	12.11	NA	NA
PSD Class II	SO_2	Short	0.00	-39.88	-39.88	-39.88	-104.04	-104.04	-68.92	-10.29	7.82	NA	NA
	SO_2	Long	0.00	-0.31	-0.84	-0.79	-22.66	-26.08	-95.39	-0.03	0.00	NA	2.89E-04
	PM_{10}	Short	0.00	-1.81	-1.81	-1.81	-4.73	-4.73	0.00	0.00	2.14	0.30	NA
	PM_{10}	Long	0.00	-0.01	-0.04	-0.04	-1.04	-1.19	-4.46	0.01	2.30	0.30	2.99E-03
	NO_2	Long	0.00	0.00	0.00	0.00	-0.52	-1.25	11.98	0.17	0.00	NA	6.75E-02
PSD Class I	SO_2	Short	0.00	-39.88	-39.88	-39.88	-104.04	-104.04	-68.92	-10.29	7.82	NA	NA
	SO_2	Long	0.00	-0.31	-0.84	-0.79	-22.66	-26.08	-95.39	-0.03	0.00	NA	2.89E-04
	PM_{10}	Short	0.00	-1.81	-1.81	-1.81	-4.73	-4.73	0.00	0.01	2.14	0.30	NA
	PM_{10}	Long	0.00	-0.01	-0.04	-0.04	-1.04	-1.19	-4.46	0.17	2.30	0.30	2.99E-03
	NO_2	Long	0.00	0.00	0.00	0.00	-0.52	-1.25	11.98	0.00	0.00	NA	6.75E-02
AAQS	SO_2	Short	0.00	0.00	0.00	0.00	0.00	0.00	146.45	1.47	7.82	NA	NA
	SO_2	Long	0.00	0.00	0.00	0.00	0.00	0.00	2.30	0.01	0.00	NA	2.89E-04
	PM_{10}	Short	0.00	0.00	0.00	0.00	0.00	0.00	9.79	1.09	2.14	0.30	NA
	PM_{10}	Long	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.01	1.14	0.30	6.75E-02
	NO_2	Long	0.00	0.00	0.00	0.00	0.00	0.00	13.18	0.21	0.00	NA	2.99E-03
	CO	Short	0.00	0.00	0.00	0.00	0.00	0.00	2.61	1.38	12.11	NA	NA
	Pb	Short	0.00	0.00	0.00	0.00	0.00	0.00	0.0152	0.000167	0.0089	NA	NA
Stack Parameters:													
Height (m)			26	26	26	26	38.1	38.1	54.9	11.6	60.97	13.4	8.5
Diameter (m)			1.95	1.95	1.95	1.95	3.96	3.96	2.74	3.05	5	10.08	0.61
Temperature (°K)			478	478	478	478	447	447	422	744	varies[2]	305	450
Velocity (m/s)			5.89	5.89	5.89	5.89	7.23	7.23	14.44	25.56	varies[2]	7.09	6.47

(1) Short-term emission rate for GT1 and GT2 are for each unit and long-term emission rates are a total of GT1 and GT2.
(2) Temperature and velocity vary with ambient temperature and operating load (see Tables 5.6.1-1 through 5.6.1-6).

Source: Foster Wheeler Environmental, 1997

TABLE 5.6.1-18 PURDOM STATION DRAFT FARC POLLUTANT EMISSION RATES USED IN MODELLING (grams/sec)						
Pollutant	**Averaging Period**	**Unit 7**	**GT1/GT2(1)**	**Unit 8**	**Cooling Tower**	**Aux Boiler**
Arsenic (As)	Short	8.93E-03	1.41E-04	7.54E-04	NA	NA
Beryllium (Be)	Short	3.29E-04	9.49E-06	5.08E-05	NA	NA
Cadmium (Cd)	Short	3.62E-03	1.21E-04	6.46E-04	NA	NA
Chromium (Cr)	Short	1.00E-02	1.35E-03	7.23E-03	NA	NA
Lead (Pb)	Short	1.52E-02	1.67E-03	8.92E-03	NA	NA
Manganese (Mn)	Short	5.80E-03	9.49E-03	5.08E-02	NA	NA
Mercury (Hg)	Short	2.51E-03	2.62E-05	1.40E-04	NA	NM
Nickel (Ni)	Short	1.82E-01	3.45E-02	1.85E-01	NA	NA
Cobalt (Co)	Short	9.48E-03	2.62E-04	1.40E-03	NA	NA
Antimony (Sb)	Short	3.60E-03	6.32E-04	3.38E-03	NA	NA
Vanadium (V)	Short	1.39E-01	1.26E-04	6.77E-04	NA	NA
Polycyclic Organic Matter (POM)	Short	3.21E-04	6.90E-04	3.69E-03	NA	NA
Benzo (a) Pyrene (Ben(a)P)	Short	2.98E-07	1.17E-07	6.24E-07	NA	NA
Benzene	Short	8.61E-05	3.38E-05	1.81E-04	NA	NA
Toluene	Short	7.75E-04	3.04E-04	1.63E-03	NA	NA
Selenium (Se)	Short	2.98E-03	1.52E-04	8.15E-04	NA	NA
Hydrochloric Acid (HCl)	Short	4.40E-01	2.17E-01	1.16E+00	NA	NA
Hydrogen Fluoride (HF)	Short	8.35E-02	3.05E-02	1.63E-01	NA	NA
Dioxin (378TCDD)	Short	6.53E-10	2.55E-10	1.36E-09	NA	NA
Formaldehyde (HCOH)	Short	3.17E-02	6.14E-04	3.29E-03	NA	NA
Arsenic (As)	Long	2.44E-04	1.61E-06	0.00E+00	NA	NA
Beryllium (Be)	Long	0.00E+00	1.08E-07	1.47E-05	NA	NA
Cadmium (Cd)	Long	0.00E+00	1.38E-06	1.87E-04	NA	NA
Chromium (Cr)	Long	0.00E+00	1.54E-05	2.09E-03	NA	NA
Lead (Pb)	Long	2.66E-04	1.90E-05	2.58E-03	NA	NA
Manganese (Mn)	Long	0.00E+00	1.08E-04	1.47E-02	NA	NA
Mercury (Hg)	Long	6.85E-05	2.99E-07	0.00E+00	NA	3.76E-10
Nickel (Ni)	Long	0.00E+00	3.94E-04	5.33E-02	NA	NA
Cobalt (Co)	Long	0.00E+00	2.99E-06	4.04E-04	NA	NA
Antimony (Sb)	Long	0.00E+00	7.22E-06	9.78E-04	NA	NA
Vanadium (V)	Long	3.79E-03	1.44E-06	0.00E+00	NA	NA
Poly Cyclic Organic Matter (POM)	Long	0.00E+00	7.88E-06	1.07E-03	NA	NA
Benzo (a) Pyrene (Ben(a)P)	Long	0.00E+00	1.33E-09	1.80E-07	NA	NA
Benzene	Long	2.04E-05	3.85E-07	1.58E-04	NA	NA
Toluene	Long	5.73E-04	3.47E-06	0.00E+00	NA	NA
Selenium (Se)	Long	0.00E+00	1.74E-06	2.36E-04	NA	NA
Hydrochloric Acid (HCl)	Long	0.00E+00	2.48E-03	3.36E-01	NA	NA
Hydrogen Fluoride (HF)	Long	0.00E+00	3.47E-04	4.71E-02	NA	NA
Dioxin (378TCDD)	Long	0.00E+00	2.91E-12	3.94E-10	NA	NA
Formaldehyde (HCOH)	Long	8.02E-04	7.01E-06	6.70E-03	NA	NA

(1) Short-term emission rate for GT1 and GT2 are for each unit and long-term emission rates are a total of GT1 and GT2.

NA - No emission data available or no emissions expected.

NM - Not modified as the auxiliary boiler will not run simultaneously with Unit 7 or Unit 8.

Source: Foster Wheeler Environmental, 1997

A screening technique known as the "Screening Threshold" method (North Carolina DNR, 1985) was applied to sources located within 50 km from the Purdom Station. The method is described in the PSD Report (Appendix 10.1.5). The existing source emissions inventory was also sorted with respect to PSD increment consuming and expanding sources and all sources for the AAQS analysis.

The completed existing source emissions inventories were submitted to FDEP for review and were determined to be acceptable for input to the ISCST3 model (FDEP, 1997a). The AAQS source and PSD source emissions inventories used in the air quality modelling analysis are presented in Tables 5.6.1-19 and 5.6.1-20, respectively. The emissions for all applicable pollutants in those tables are in terms of maximum allowable or "potential" emissions in order to evaluate worst-case emissions scenarios for those sources from both AAQS and PSD increment impact standpoints.

5.6.1.9 Receptor Locations

Receptor Grids for Site Vicinity

Ambient concentrations were determined for the significant impact area and monitoring exemption analyses for receptors in a polar grid consisting of 36 radial directions at 10 degree intervals at distances listed below (in kilometers) from the site origin, the proposed stack location for Purdom Unit 8 (UTM coordinates 769.611 km East 3,339.767 km North):

1.0	3.5	6.0
1.5	4.0	7.0
2.0	4.5	8.0
2.5	5.0	9.0
3.0	5.5	10.0

Receptors from these polar grids which fell within the Project site boundaries were not included but 57 additional receptors were placed around the site boundary. A total of 632 receptors were used in the modelling. Figure 5.6.1-3 presents the location of the site boundary and polar receptors.

For the monitoring exemption request, Class II PSD, and AAQS analyses, an additional 11x11 (121 point) receptor grid with a spacing of 100m was placed over the critical impact receptor as determined from the preliminary runs. Special grids were used for the 3-hour, 24-hour, and annual SO_2 AAQS analyses covering receptors within the Primex Technologies (formerly Olin) site boundaries. The details of all of the receptor grids are depicted in figures in the PSD report.

Receptor Grid for Class I PSD Analysis

The modelling for the St. Marks and Bradwell Bay National Wilderness Areas analyses used receptor grids approved by FDEP (1996b). The St. Marks National Wilderness Area analysis used a total of 68 receptors, including receptors spaced at 75m intervals along the northern boundary as requested by the USFWS. A total of 18 receptors were used in the modelling analysis of the Bradwell Bay Wilderness Area. The receptors used in the Class I PSD analysis

TABLE 5.6.1-19
ADDITIONAL SOURCES SELECTED FOR PURDOM UNIT 8 AAQS MODELLING ANALYSIS

Owner	Zone	North (Km)	East (Km)	Eu Id	Description	Hs (Ft)	Ds (Ft)	Ts (Of)	Flow Acfm	Vs (Ft/S)		Lb/Hr	Tpy
Mckenzie Service Co	16	3338.4	769.3	1	North Boiler (300 hp)	21	1.7	375	3965	29	CO	0.1449	0.169
Mckenzie Service Co	16	3338.4	769.3	1	North Boiler (300 hp)	21	1.7	375	3965	29	NO_X	1.59	1.86
Mckenzie Service Co	16	3338.4	769.3	1	North Boiler (300 hp)	21	1.7	375	3965	29	PB	0.0001	0.0001
Mckenzie Service Co	16	3338.4	769.3	1	North Boiler (300 hp)	21	1.7	375	3965	29	PM	0.0087	0.0102
Mckenzie Service Co	16	3338.4	769.3	1	North Boiler (300 hp)	21	1.7	375	3965	29	SO_2	0.115	0.134
Mckenzie Service Co	16	3338.4	769.3	2	South Boiler (100 hp)	21	0.7	375	1322	57	CO	0.1449	0.169
Mckenzie Service Co	16	3338.4	769.3	2	South Boiler (100 hp)	21	0.7	375	1322	57	NO_X	1.59	1.86
Mckenzie Service Co	16	3338.4	769.3	2	South Boiler (100 hp)	21	0.7	375	1322	57	PB	0.0001	0.0001
Mckenzie Service Co	16	3338.4	769.3	2	South Boiler (100 hp)	21	0.7	375	1322	57	PM	0.0087	0.0102
Mckenzie Service Co	16	3338.4	769.3	2	South Boiler (100 hp)	21	0.7	375	1322	57	SO_2	0.05	0.07
Mckenzie Service Co	16	3338.4	769.3	3	Cleaver Brooks Package Boiler	39	1.7	430	5018	36	CO	0.45	1.97
Mckenzie Service Co	16	3338.4	769.3	3	Cleaver Brooks Package Boiler	39	1.7	430	5018	36	NO_X	3.16	13.8
Mckenzie Service Co	16	3338.4	769.3	3	Cleaver Brooks Package Boiler	39	1.7	430	5018	36	PB	.00013	.00057
Mckenzie Service Co	16	3338.4	769.3	3	Cleaver Brooks Package Boiler	39	1.7	430	5018	36	PM	1.27	5.56
Mckenzie Service Co	16	3338.4	769.3	3	Cleaver Brooks Package Boiler	39	1.7	430	5018	36	SO_2	15.06	66
Primex Technologies (formerly Olin)	16	3342.2	767.6	1	North Sweetie Barrel (Venturi Scrubber & 2nd Stage Packed Column	6	1.1	72	2640	46	PM	0.285	1.25
Primex Technologies (formerly Olin)	16	3342.2	767.6	2	Northeast Sweetie Barrel (Venturi Scrubber & 2nd Stage Packed Column	6	1.1	72	2640	46	PM	0.009	0.039
Primex Technologies (formerly Olin)	16	3342.2	767.6	3	Mixing Ventilation System	50	0.5	85	1000	84	PM	2.283	10
Primex Technologies (formerly Olin)	16	3342.2	767.6	4	Boiler #1, Cleaver-Brooks	35	2	322	10100	53	CO	0.6467	2.8325
Primex Technologies (formerly Olin)	16	3342.2	767.6	4	Boiler #1, Cleaver-Brooks	35	2	322	10100	53	NO_X	31.16	7.1136
Primex Technologies (formerly Olin)	16	3342.2	767.6	4	Boiler #1, Cleaver-Brooks	35	2	322	10100	53	PB	0.0002	0.001
Primex Technologies (formerly Olin)	16	3342.2	767.6	4	Boiler #1, Cleaver-Brooks	35	2	322	10100	53	PM	3.88	16.995
Primex Technologies (formerly Olin)	16	3342.2	767.6	4	Boiler #1, Cleaver-Brooks	35	2	322	10100	53	SO_2	51.82	224.62
Primex Technologies (formerly Olin)	16	3342.2	767.6	6	Boiler #2, Cleaver-Brooks	35	2	322	10100	53	CO	2.8325	0.6467
Primex Technologies (formerly Olin)	16	3342.2	767.6	6	Boiler #2, Cleaver-Brooks	35	2	322	10100	53	NO_X	7.1136	31.16
Primex Technologies (formerly Olin)	16	3342.2	767.6	6	Boiler #2, Cleaver-Brooks	35	2	322	10100	53	PB	0.0002	0.001
Primex Technologies (formerly Olin)	16	3342.2	767.6	6	Boiler #2, Cleaver-Brooks	35	2	322	10100	53	PM	3.88	16.995
Primex Technologies (formerly Olin)	16	3342.2	767.6	6	Boiler #2, Cleaver-Brooks	35	2	322	10100	53	SO_2	51.82	224.62
Primex Technologies (formerly Olin)	16	3342.2	767.6	7	Salt Coating & Glazing Facility (Venturi & Packed Scrubbers)	15	0.8	77	1350	44	PM	0.32	1.4
Primex Technologies (formerly Olin)	16	3342.2	767.6	9	Uncoated Powder (Wet Scrubber & Baghouse)	15	0.8	77	1350	44	PM	2.3	10
Primex Technologies (formerly Olin)	16	3342.2	767.6	10	Propellant Salt Coater Process Venturi Scrubber and 2nd Stag	26	0.7	70	1350	58	PM	4	16.8
St.Marks Refinery,Inc.	16	3340.1	769	6	Boiler #1 Fuel Oil #5	85	2	500	9990	52	CO	0.9272	4.0611
St.Marks Refinery,Inc.	16	3340.1	769	6	Boiler #1 Fuel Oil #5	85	2	500	9990	52	NO_X	10.2	44.68
St.Marks Refinery,Inc.	16	3340.1	769	6	Boiler #1 Fuel Oil #5	85	2	500	9990	52	PB	0.0007	0.0031
St.Marks Refinery,Inc.	16	3340.1	769	6	Boiler #1 Fuel Oil #5	85	2	500	9990	52	PM	1.8544	8.1223
St.Marks Refinery,Inc.	16	3340.1	769	6	Boiler #1 Fuel Oil #5	85	2	500	9990	52	SO_2	21.9	191.3
St.Marks Refinery,Inc.	16	3340.1	769	7	Boiler #2 Fuel Oil	85	1.7	500	9990	73	CO	0.9272	4.061
St.Marks Refinery,Inc.	16	3340.1	769	7	Boiler #2 Fuel Oil	85	1.7	500	9990	73	NO_X	10.2	44.67
St.Marks Refinery,Inc.	16	3340.1	769	7	Boiler #2 Fuel Oil	85	1.7	500	9990	73	PB	0.0007	0.0031

TABLE 5.6.1-19
ADDITIONAL SOURCES SELECTED FOR PURDOM UNIT 8 AAQS MODELLING ANALYSIS

Owner	Zone	North (Km)	East (Km)	Eu Id	Description	Hs (Ft)	Ds (Ft)	Ts (Of)	Flow Acfm	Vs (Ft/S)		Lb/Hr	Tpy
St.Marks Refinery,Inc.	16	3340.1	769	7	Boiler #2 Fuel Oil	85	1.7	500	9990	73	PM	10	43.83
St.Marks Refinery,Inc.	16	3340.1	769	7	Boiler #2 Fuel Oil	85	1.7	500	9990	73	SO_2	21.84	95.66
St.Marks Refinery,Inc.	16	3340.1	769	12	Crude Heater F 101	83	5	850	8719	7	CO	0.714	3.1273
St.Marks Refinery,Inc.	16	3340.1	769	12	Crude Heater F 101	83	5	850	8719	7	NO_X	7.854	34.4005
St.Marks Refinery,Inc.	16	3340.1	769	12	Crude Heater F 101	83	5	850	8719	7	PM	0.5141	2.2517
St.Marks Refinery,Inc.	16	3340.1	769	12	Crude Heater F 101	83	5	850	8719	7	SO_2	20.48	29.7596
St.Marks Refinery,Inc.	16	3340.1	769	13	Crude Heater F-201	87	3	850	8719	20	CO	0.714	3.1273
St.Marks Refinery,Inc.	16	3340.1	769	13	Crude Heater F-201	87	3	850	8719	20	NO_X	7.854	34.4005
St.Marks Refinery,Inc.	16	3340.1	769	13	Crude Heater F-201	87	3	850	8719	20	PM	0.5141	2.2517
St.Marks Refinery,Inc.	16	3340.1	769	13	Crude Heater F-201	87	3	850	8719	20	SO_2	20.48	29.7596
St.Marks Refinery,Inc.	16	3340.1	769	14	Crude Heater F-202	60	2.3	850	3500	14	CO	0.7	3.066
St.Marks Refinery,Inc.	16	3340.1	769	14	Crude Heater F-202	60	2.3	850	3500	14	NO_X	2.8	12.264
St.Marks Refinery,Inc.	16	3340.1	769	14	Crude Heater F-202	60	2.3	850	3500	14	PB	0.0012	0.0052
St.Marks Refinery,Inc.	16	3340.1	769	14	Crude Heater F-202	60	2.3	850	3500	14	PM	0.06	0.2628
St.Marks Refinery,Inc.	16	3340.1	769	14	Crude Heater F-202	60	2.3	850	3500	14	SO_2	20.48	24.97
Tallahassee City Hopkins Generating Station	16	3371.7	749.4	1	Boiler Hopkins #1 Nat Gas & Fuel Oil #6	200	11	260	226593	39	CO	29.61	129.7
Tallahassee City Hopkins Generating Station	16	3371.7	749.4	1	Boiler Hopkins #1 Nat Gas & Fuel Oil #6	200	11	260	226593	39	NO_X	396.9	1738.4
Tallahassee City Hopkins Generating Station	16	3371.7	749.4	1	Boiler Hopkins #1 Nat Gas & Fuel Oil #6	200	11	260	226593	39	PB	.175	.767
Tallahassee City Hopkins Generating Station	16	3371.7	749.4	1	Boiler Hopkins #1 Nat Gas & Fuel Oil #6	200	11	260	226593	39	PM	78.79	345.1
Tallahassee City Hopkins Generating Station	16	3371.7	749.4	1	Boiler Hopkins #1 Nat Gas & Fuel Oil #6	200	11	260	226593	39	SO_2	675.342	2958
Tallahassee City Hopkins Generating Station	16	3371.7	749.4	2	Combustion Turbine Hopkins #1 Gt Peaking Unit	29	9.2	803	457557	114	CO	3.52	15.4
Tallahassee City Hopkins Generating Station	16	3371.7	749.4	2	Combustion Turbine Hopkins #1 Gt Peaking Unit	29	9.2	803	457557	114	NO_X	51.28	224.6
Tallahassee City Hopkins Generating Station	16	3371.7	749.4	2	Combustion Turbine Hopkins #1 Gt Peaking Unit	29	9.2	803	457557	114	PM	2.78	12.2
Tallahassee City Hopkins Generating Station	16	3371.7	749.4	2	Combustion Turbine Hopkins #1 Gt Peaking Unit	29	9.2	803	457557	114	SO_2	14.75	64.6
Tallahassee City Hopkins Generating Station	16	3371.7	749.4	3	Combustion Turbine Hopkins #2 Gt Peaking Unit	30	14.7	875	698716	68	CO	5.75	25.2
Tallahassee City Hopkins Generating Station	16	3371.7	749.4	3	Combustion Turbine Hopkins #2 Gt Peaking Unit	30	14.7	875	698716	68	NO_X	83.54	365.9
Tallahassee City Hopkins Generating Station	16	3371.7	749.4	3	Combustion Turbine Hopkins #2 Gt Peaking Unit	30	14.7	875	698716	68	PB	0.026	0.113
Tallahassee City Hopkins Generating Station	16	3371.7	749.4	3	Combustion Turbine Hopkins #2 Gt Peaking Unit	30	14.7	875	698716	68	PM	4.54	19.9
Tallahassee City Hopkins Generating Station	16	3371.7	749.4	3	Combustion Turbine Hopkins #2 Gt Peaking Unit	30	14.7	875	698716	68	SO_2	24.06	105.4
Tallahassee City Hopkins Generating Station	16	3371.7	749.4	4	Unit #2	250	14	260	691358	74	CO	77.5	339
Tallahassee City Hopkins Generating Station	16	3371.7	749.4	4	Unit #2	250	14	260	691358	74	NO_X	750	3055
Tallahassee City Hopkins Generating Station	16	3371.7	749.4	4	Unit #2	250	14	260	691358	74	PB	0.451	1.976
Tallahassee City Hopkins Generating Station	16	3371.7	749.4	4	Unit #2	250	14	260	691358	74	PM_{10}	232.5	411.1
Tallahassee City Hopkins Generating Station	16	3371.7	749.4	4	Unit #2	250	14	260	691358	74	SO_2	3260	14300

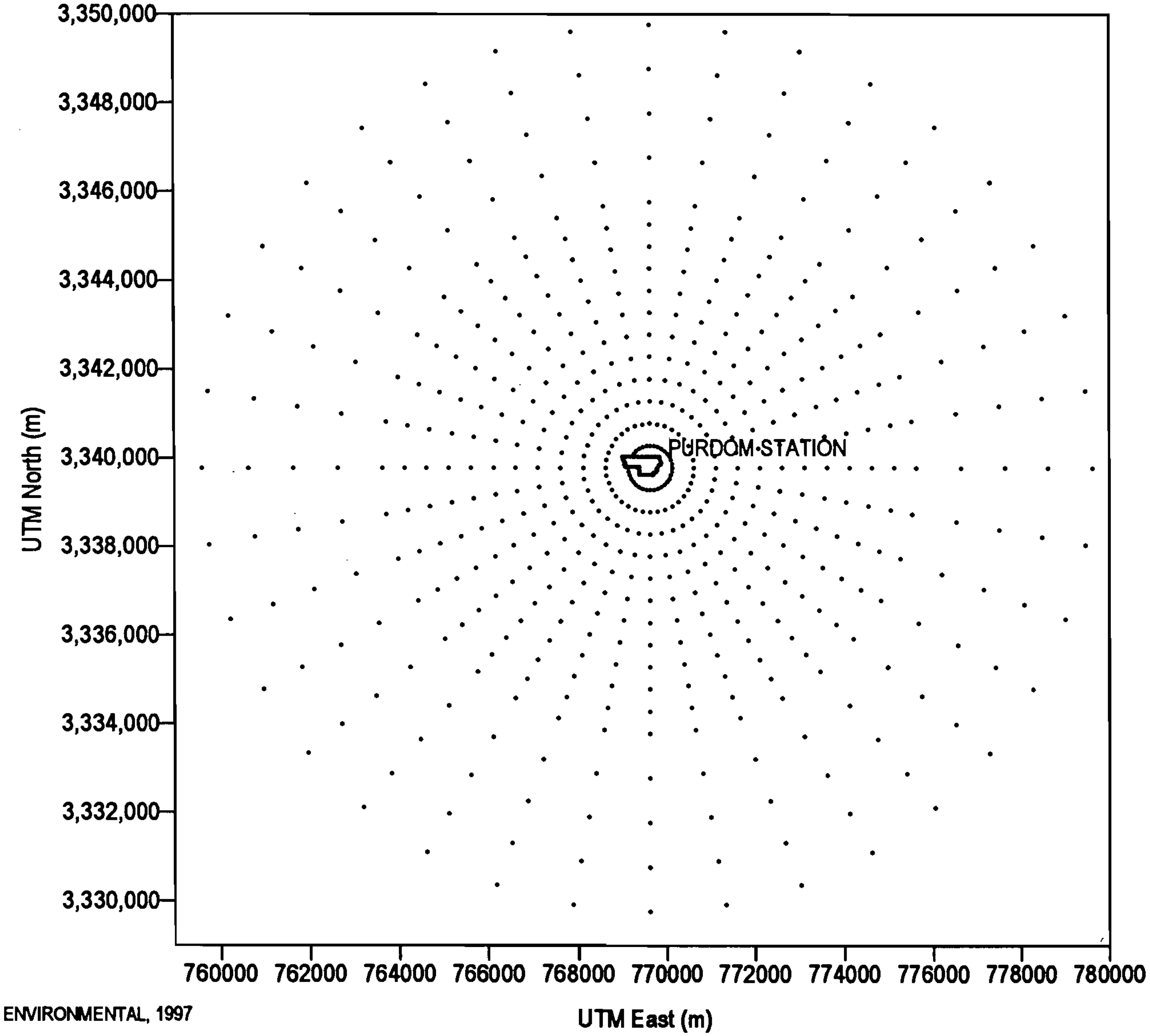
Note: See Table 5.6.1-17 for emission parameters for the Purdom Station.
Source: FDEP, 1996a

TABLE 5.6.1-20
ADDITIONAL SOURCES SELECTED FOR PURDOM UNIT 8 PSD MODELLING ANALYSIS

Owner	Zone	North (Km)	East (Km)	Eu Id	Description	Hs (Ft)	Ds (Ft)	Ts (Of)	Flow Acfm	Vs (Ft/S)		Lb/Hr	Tpy
Tallahassee City Hopkins Generating Station	16	3371.7	749.4	1	Boiler Hopkins #1 Nat Gas & Fuel Oil #6	200	11	260	226593	39	SO_2	-1806.3	-7912*
Tallahassee City Hopkins Generating Station	16	3371.7	749.4	4	Unit #2	250	14	260	691358	74	SO_2	3260	14300
Tallahassee City Hopkins Generating Station	16	3371.7	747.4	4	Unit #2	250	14	260	691358	74	PM_{10}	232.5	411.1

*Hopkins #1 is increment expanding; therefore emissions for the PSD modelling analysis are based on reducing emissions from 2.75 lb/mmBtu to 0.75 lb/mmBtu.
Note: See Table 5.6.1-17 for emission parameters for the Purdom Station.

Source: FDEP, 1996a



SOURCE: FOSTER WHEELER ENVIRONMENTAL, 1997

CITY OF TALLAHASSEE

PURDOM PROJECT
COARSE GRID - ISCST3 MODELLING RECEPTORS
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 5.6.1-3

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are depicted on Figures 5.6.1-4 and 5.6.1-5. The refined analysis included additional receptors to insure the maximum impact was determined. These additional receptors are specific to the pollutant modeled, and consisted of a grid of 121 points spaced 100 meters apart, centered over the location of the highest second-high impact. The exception to this 100m spacing was the northernmost boundary of the St. Marks National Wilderness Area. When the highest second-high impact was located there, the fine grid consisted of four additional receptors spaced 15m apart on each side of the highest second-high impact location.

5.6.1.10 Other Air Quality Modelling Issues

Building Downwash Effects

The procedures used for addressing the effects of building downwash are those recommended in the *User's Guide for the Industrial Source Complex (ISC3) Dispersion Models* (EPA, 1995a). The heights and coordinates of the major structures on the site along with the stack parameters of each source were input into the EPA Building Profile Input Program (BPIP) (EPA, 1995b). The program provides GEP stack height information as well as direction-specific building dimensions for each source. These direction-specific building dimensions for 36 radial directions (10 degree segments) are input into the ISCST3 model and are used in the determination of building downwash.

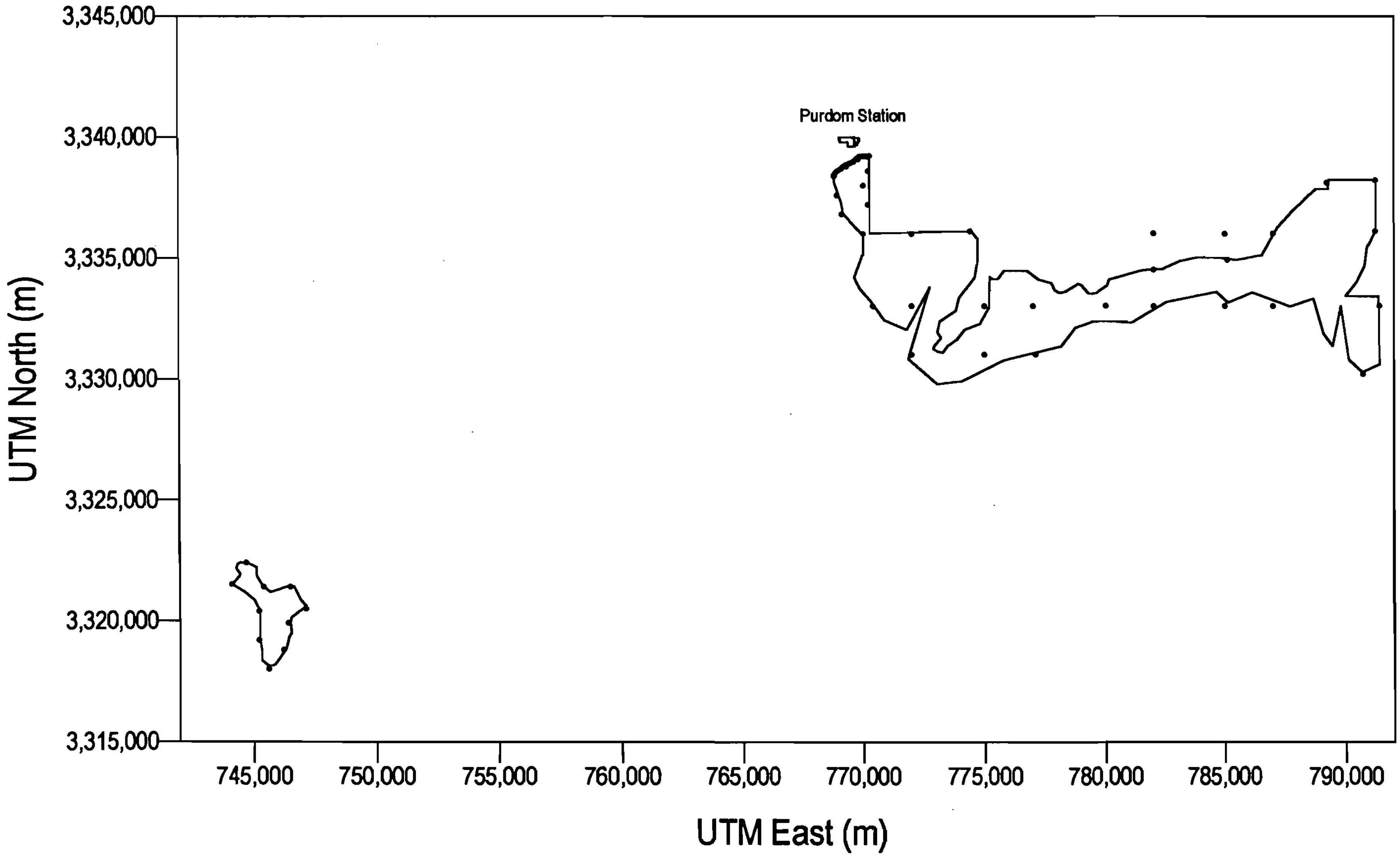
Based on the building dimensions of the proposed Unit 8 and existing structures at the Purdom Station, the proposed Unit 8 stack height of 60.97 meters was found to be above the calculated GEP height of 60.0 meters and within the allowable default GEP height of 65 meters determined by the BPIP Program, and therefore in compliance with the FDEP stack height policy.

FARCS Modelling

Rather than modelling the emissions from each current or proposed unit individually, a simpler approach to the FARCS modelling was chosen. Emissions from all future units (Unit 7, Unit 8, GT1 and GT2, and the auxiliary boiler) were grouped together and were assumed to be emitted from a single stack. The stack parameters for Unit 7 were chosen for the modelling after an analysis using the "merged stack parameters procedure" outlined in *The South Carolina Air Quality Modelling Guidelines* (SCDHEC, 1993). Modelling was initially done with a unit emission rate of 1 gram/second to identify a maximum concentration for the three averaging periods of interest (8-hours, 24-hours, and annual). Then the results were scaled using the emission rates contained in Table 5.6.1-18 to obtain predicted maximum concentrations for each hazardous air pollutant.

Auxiliary Boiler Modelling

Emissions from the recently permitted auxiliary boiler were modeled using the general procedures described in Section 5.6.1.4. For short-term model runs, the auxiliary boiler was modelled separately from Units 7 and 8 since an existing permit condition prohibits it from running at the same time as the existing steam generating units. Long-term analyses of the project did include the emissions from the auxiliary boiler along with the other sources. A



SOURCE: FOSTER WHEELER ENVIRONMENTAL CORPORATION

CITY OF TALLAHASSEE

PURDOM PROJECT - PSD CLASS I ANALYSIS
ISCST3 MODELLING RECEPTORS
ST. MARKS WILDERNESS AREA
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 5.6.1-4

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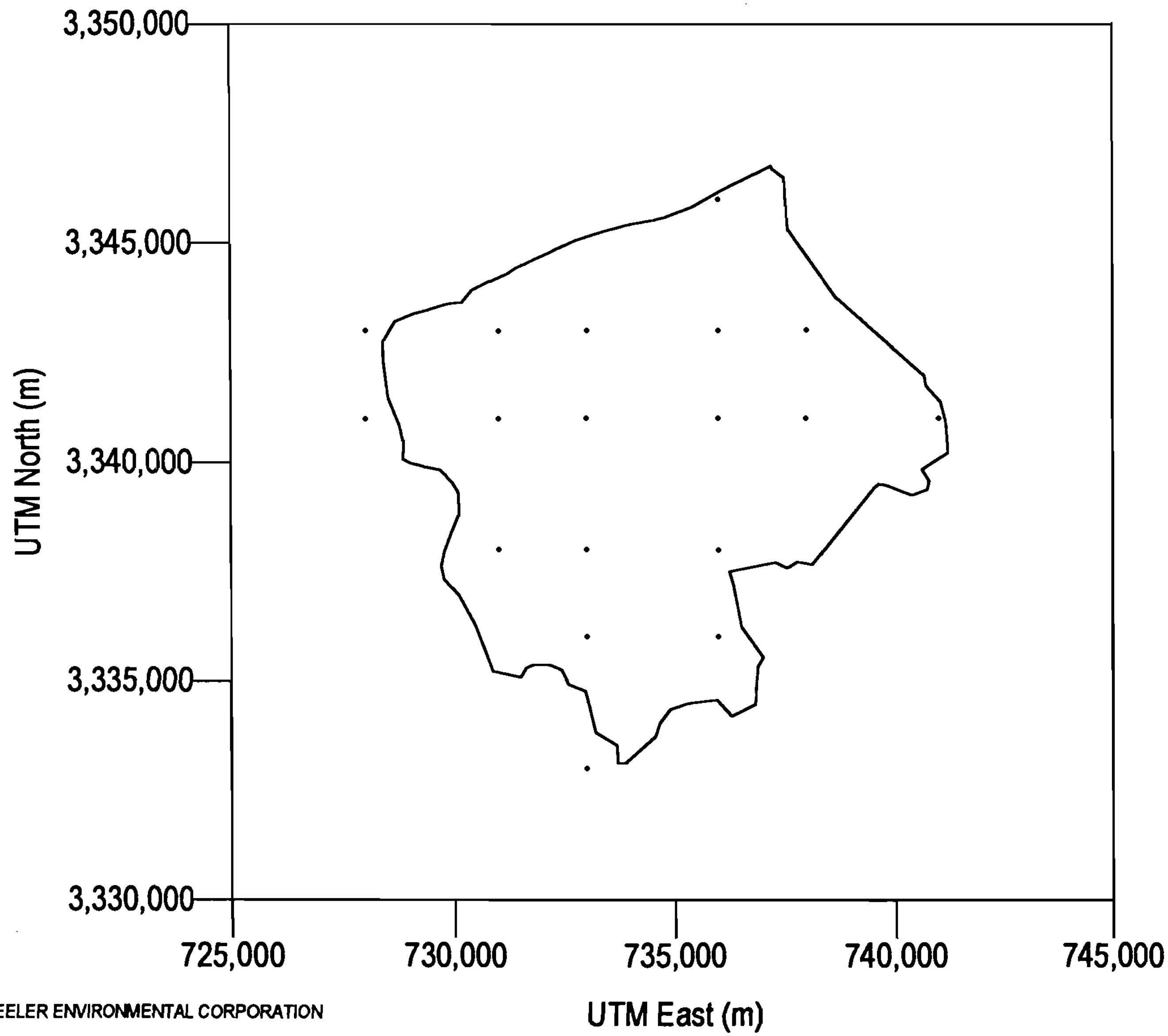

SOURCE: FOSTER WHEELER ENVIRONMENTAL CORPORATION

CITY OF TALLAHASSEE

PURDOM PROJECT - PSD CLASS I ANALYSIS
ISCST3 MODELLING RECEPTORS
BRADWELL BAY WILDERNESS AREA
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 5.6.1-5

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revised permit condition is proposed which would prohibit the operation of the auxiliary boiler simultaneously with Unit 7 or 8 after completion of compliance testing on Unit 8.

5.6.1.11 Background Air Quality Monitoring Data

Background air quality concentrations to be utilized in the modelling analyses were compiled from the data presented in Section 2.3.7 and from recommendations by FDEP (1996). A summary of the background values was presented in Table 2.3.7-7. Many of the values in Table 2.3.7-7 are considered to be very conservative estimates (i.e., overestimates) of background concentrations in the site vicinity because they are more representative of larger urban areas or of areas in the vicinity of major existing sources of air pollutants. All major sources in the vicinity of the Purdom Station are explicitly included in the modelling; adding background concentrations representative of locations near major sources is essentially "double-counting," an especially conservative approach.

5.6.1.12 Air Quality Impact Analysis Results

This section summarizes the results of the modelling analyses conducted. It is organized into subsections dealing with the predicted impacts of the proposed Project by itself, predicted PSD increment consumption, predicted concentrations with respect to the NAAQS/FAAQS, and predicted concentrations of hazardous air pollutants versus FDEP's draft FARC levels (FDEP, 1995a). A discussion of the potential air quality impacts of the auxiliary boiler is included.

Normally, this section would present the results of modelling Project impacts only for those pollutants which trigger PSD review in accordance with Rule 62-212.400(2)(f)2, F.A.C. However, in the interest of providing a more complete understanding of the air quality impacts of the proposed Project, modelling results are provided for all regulated pollutants for which emissions information is available.

Proposed Project Only

As indicated earlier, the Project is a major modification of a major stationary source. It consists of the addition of Unit 8, the permanent shut down of Units 5 and 6, and restrictions on other sources in order to maintain SO_2 and NO_x emissions within the requested facility-wide caps. Therefore, both emissions increases and decreases are considered in the analysis of impacts of the Project by itself.

Worst-Case Operation Analysis

As indicated in Section 5.6.1.6, the proposed Unit 8 was evaluated for both the primary fuel, clean pipeline quality natural gas, and the secondary fuel, Number 2 (0.05% S) diesel fuel oil, to determine the worst-case impacts. Modelling was done using one year (1985) of meteorology and three loads (100%, 75%, and 50%). Since emissions and stack parameters from combustion turbine units are temperature dependent, modelling was also conducted at temperatures of 20°F, 59°F, and 95°F to determine the worst-case operating scenarios. For the 95°F case on natural gas, the lowest load evaluated was 55 percent as the combustion turbine is not expected to operate below this load at that temperature on natural gas. The results of this analysis for the 18 combinations of temperature and load are presented in Table 5.6.1-21 for NO_2, SO_2, CO and PM_{10}.

As a result of these model runs, it was determined that the maximum off-site impacts occur when firing Number 2 (0.05% S) diesel fuel oil at 50 percent load at 20°F. Although some other load/temperature combinations come close, this combination produced the highest impacts for all pollutants modeled and all averaging times. As a result, the emission characteristics and stack parameters associated with this condition were used in all subsequent analyses for short-term impacts. However, this condition was not used for modelling annual average impacts as this condition is clearly not realistic for longer averaging times. Instead, the 100 percent load, 59°F case was selected as representing a more realistic annual average condition for the Project. Unit 8 is projected to be operated at base (100%) load as much as possible due to its efficiency, and the 59°F case is a conservative representation of the annual average site temperature of about 67°F.

Worst-case operation for the Project was based on the worst-case conditions as defined above for Unit 8 in combination with emissions and stack parameters associated with 100 percent load operation of the other units involved for short-term analyses. For long-term (annual average) analyses, the annual worst-case conditions defined above for Unit 8 were combined with annual average emissions and stack parameters consistent with 100 percent load operation of the other units. Thus, Units 5, 6, Unit 7; the existing combustion turbines (GT1 and GT2); the auxiliary boiler; and the cooling tower were modelled at 100 percent load.

Significant Impact Area Analysis

Once the worst-case operating scenarios were determined, the next step in the analysis was to determine the significant impact area for each pollutant with an associated PSD increment or FAAQS/NAAQS for the Project. The significant impact area is defined in the EPA draft New Source Review Workshop Manual (EPA, 1990b) as the circular area whose radius is equal to the greatest distance from the proposed source to which modelling shows that the proposed source will have a significant impact, based upon EPA-defined significance values, which are pollutant specific. The significant impact areas thus define the distances beyond which the impacts from the proposed source will be "insignificant" and need not be analyzed in conjunction with existing sources.

The results of the significant impact area analyses are presented in Table 5.6.1-22. As indicated in Table 5.6.1-22, the only pollutants for which there were predicted significant impacts off Purdom Station property are NO_2 and PM_{10} for Class II PSD purposes. They both have a significant impact area radius of less than 0.3 km. Thus, no further analysis is required for any of the other regulated pollutants. However, as indicated earlier, the City has chosen to provide the PSD and FAAQS/NAAQS analyses for all of the regulated pollutants despite the insignificance of the Project impacts.

Monitoring Exemption Analysis

As indicated earlier, the monitoring exemption request analysis was restricted to PM_{10} and CO. (There is no monitoring de minimis level for particulate matter (TSP)). After the "worst case" temperature/load condition was determined for Unit 8, the proposed Project (including the permanent shut down of Units 5 & 6) was modelled using all applicable sources

TABLE 5.6.1-21
PURDOM UNIT 8 WORST-CASE LOAD/TEMPERATURE ANALYSIS

Fuel	Load (%)	Temp (°F)	Maximum NO_2 ($\mu g/m^3$) Annual	Maximum SO_2 ($\mu g/m^3$) 3-Hour	24-Hour	Annual	Maximum CO ($\mu g/m^3$) 1-Hour	8-Hour	Maximum PM_{10} ($\mu g/m^3$) 24-Hour	Annual
Natural Gas	100	95	0.06	0.26	0.06	0.005	4.3	0.9	0.14	0.010
Natural Gas	100	59	0.06	0.28	0.06	0.005	4.7	1.0	0.14	0.010
Natural Gas	100	20	0.06	0.29	0.07	0.005	5.0	1.1	0.14	0.009
Natural Gas	75	95	0.06	0.24	0.06	0.005	4.5	1.0	0.17	0.012
Natural Gas	75	59	0.06	0.25	0.06	0.005	4.9	1.1	0.17	0.012
Natural Gas	75	20	0.07	0.27	0.07	0.005	5.3	1.1	0.17	0.012
Natural Gas	≈55	95	0.06	0.30	0.06	0.005	12.1	2.6	0.21	0.015
Natural Gas	50	59	0.06	0.28	0.06	0.005	12.8	2.8	0.21	0.015
Natural Gas	50	20	0.07	0.32	0.07	0.005	13.6	2.9	0.21	0.016
Number 2 (0.05%S) Diesel Fuel Oil	100	95	0.26	5.0	1.3	0.08	14.1	3.0	0.26	0.02
Number 2 (0.05%S) Diesel Fuel Oil	100	59	0.30	5.5	1.4	0.09	15.4	3.2	0.26	0.02
Number 2 (0.05%S) Diesel Fuel Oil	100	20	0.31	6.3	1.4	0.10	16.7	3.1	0.22	0.02
Number 2 (0.05%S) Diesel Fuel Oil	75	95	0.30	4.5	1.2	0.09	17.6	3.7	0.30	0.02
Number 2 (0.05%S) Diesel Fuel Oil	75	59	0.34	5.0	1.3	0.10	18.1	3.8	0.30	0.02
Number 2 (0.05%S) Diesel Fuel Oil	75	20	0.36	5.4	1.4	0.10	18.9	3.9	0.30	0.02
Number 2 (0.05%S) Diesel Fuel Oil	50	95	0.29	4.0	1.2	0.09	34.9	8.7	0.39	0.03
Number 2 (0.05%S) Diesel Fuel Oil	50	59	0.33	5.9	1.3	0.10	45.4	9.3	0.38	0.03
Number 2 (0.05%S) Diesel Fuel Oil	50	20	0.37	6.3	1.4	0.11	46.4	9.9	0.39	0.03

Results based on 1985 meteorological data.
Highest concentrations shaded.

Source: Foster Wheeler Environmental, 1997

TABLE 5.6.1-22
SUMMARY OF CLASS II PSD SIGNIFICANT IMPACT AREA CONCENTRATIONS

							Receptor Location[3]		Preliminary Maximum[1] Concentration by Year				
Pollutant	Averaging Period	Highest[1] Modelled Concentration ($\mu g/m^3$)	Significance Value[2] ($\mu g/m^3$)	Signficant Off-site Impact	Distance to Signficant Impact Value	Period (yymmddhh)	East (m)	North (m)	1985 ($\mu g/m^3$)	1986 ($\mu g/m^3$)	1987 ($\mu g/m^3$)	1988 ($\mu g/m^3$)	1989 ($\mu g/m^3$)
Sulfur Dioxide (SO_2)	3-hr	0.051	25	No	none	89051416	768670	3340109	0.038	0.035	0.042	0.034	0.051
Sulfur Dioxide (SO_2)	24-hr	0.023	5	No	none	89051424	768670	3340109	0.013	0.011	0.011	0.011	0.023
Sulfur Dioxide (SO_2)	Annual	0.024	1	No	none	87	769766	3339709	0.0046	0.013	0.024	0.023	0.013
Particulate Matter (PM_{10})	24-hr	6.5	5	Yes	< 0.3 Km	86112524	769399	3340018	3.8	6.5	5.4	5.5	3.9
Particulate Matter (PM_{10})	Annual	0.35	1	No	none	86	769766	3340018	0.17	0.35	0.28	0.35	0.18
Nitrogen Dioxide (NO_2)	Annual	6.1	1	Yes	< 0.3 Km	87	769766	3339709	1.7	3.3	6.1	5.6	3.7
Carbon Monoxide (CO)	1 hr	21.9	2000	No	none	89072611	768977	3340015	18.4	17.7	19.5	17.4	21.9
Carbon Monoxide (CO)	8-hr	5.1	500	No	none	87071216	769610	3337767	3.4	4.6	5.1	4.2	4.3

(1) Short-term values are highest rather than highest second high concentrations for this analysis.
(2) Rule 62-210.200(256), F.A.C.
(3) Unit 8 stack location 769,611 m East, 3,339,767 m North.

Source: Foster Wheeler Environmental, 1997

on site. The net changes in emission rates associated with the modification were determined by subtracting the current actual emission rates (August 1994 - July 1996) from the future emission rates. A summary of unit specific emission rates is included as Table 5.6.1-17. Each of the pollutants was modelled using five years of meteorological data and the receptors indicated in Section 5.6.1.5. The results of this preliminary modelling are presented in Table 5.6.1-23.

As indicated in the modelling protocol, an additional refined receptor grid was added, centered on the receptor which contained the highest predicted impact from the preliminary modelling runs.

These more refined receptor grids were used with the year of meteorological data which produced the highest preliminary impact. The "worst case" load and ambient temperature combinations described above were also used in the refined analysis. The results are also presented in Table 5.6.1-23. As indicated, the maximum predicted concentrations due to the Project are all below the monitoring de minimis levels and monitoring is not required.

Class II Area PSD Increment Analysis

In addition to the emissions from the proposed Project listed in Table 5.6.1-17, the emissions from the other PSD increment consuming and increment expanding sources identified in Table 5.6.1-20 were included in the modelling. The results are presented in Table 5.6.1-24. As indicated in the table, the maximum predicted Class II PSD increment consumption in the vicinity of the proposed Project is well within the allowable values for all averaging times.

Class I Area PSD Increment Analysis

As the proposed Project will be located close to both the St. Marks National Wilderness Area and the Bradwell Bay National Wilderness Area, both designated as Class I PSD areas by Rule 62-204.360(4)(b), F.A.C., the impacts of the proposed Project were modeled for both areas. An analysis was conducted with the ISCST3 model of Class I area impacts using the other PSD increment consuming and expanding sources contained in Table 5.6.1-20 in addition to the proposed Project. The results of that analysis are presented in Tables 5.6.1-25 and 5.6.1-26 for the two Class I areas. As indicated, the PSD Class I impacts are within the allowable increments for all pollutants and averaging times.

AAQS Analysis

The AAQS analysis consisted of modelling the impacts of the proposed source together with background concentrations to determine if the totals will be within the FAAQS and, therefore also within the NAAQS. Background concentrations consist of a modeled component (modeled impacts of significant existing sources) and a monitored component (based upon the concentrations presented in Table 2.3.7-7). The existing sources which were included in the modelling were identified in Table 5.6.1-19. The results of the analysis are summarized in Table 5.6.1-27. As indicated in the table, maximum concentrations for all pollutants for all averaging periods will be below the FAAQS, and therefore, also below the NAAQS.

TABLE 5.6.1-23
MONITORING EXEMPTION ANALYSIS

Pollutant	Averaging Period	Maximum[1] Refined Concentration ($\mu g/m^3$)	Monitoring De Minimis Level[2] ($\mu g/m^3$)	Monitoring Required	Preliminary Maximum[1] Concentration by Year				
					1985 ($\mu g/m^3$)	1986 ($\mu g/m^3$)	1987 ($\mu g/m^3$)	1988 ($\mu g/m^3$)	1989 ($\mu g/m^3$)
Particulate Matter (PM_{10})	24-hr	6.5	10	No	3.8	6.5	5.4	5.5	3.9
Carbon Monoxide (CO)	8-hr	5.4	575	No	3.4	4.6	5.1	4.2	4.3

(1) Short-term values are highest second high values for this analysis.
(2) Rule 62-212.400, F.A.C. - Table 212.400-3

Source: Foster Wheeler Environmental, 1997

TABLE 5.6.1-24
SUMMARY OF CLASS II PSD INCREMENT ANALYSIS

					Receptor Location[4]		Preliminary Maximum[1] Concentration by Year				
Pollutant	Avg Period	Max[1] Refined Conc ($\mu g/m^3$)	Class II PSD Increment[2] ($\mu g/m^3$)	Period (yymmddhh)	East (m)	North (m)	1985 ($\mu g/m^3$)	1986 ($\mu g/m^3$)	1987 ($\mu g/m^3$)	1988 ($\mu g/m^3$)	1989 ($\mu g/m^3$)
Sulfur Dioxide (SO_2)	3-hr	14.4	512	89121612	765689	3349564	9.4	12.3	9.1	7.4	13.5
Sulfur Dioxide (SO_2)	24-hr	2.4	91	86021524	768047	3348630	2.0	2.4	1.8	1.6	2.3
Sulfur Dioxide (SO_2)	Annual	<0.00001[3]	20	N/A	N/A	N/A	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Particulate Matter (PM_{10})	24-hr	3.3	30	87121424	769399	3340018	3.2	2.9	3.3	3.1	1.8
Particulate Matter (PM_{10})	Annual	0.32	17	86	769399	3340018	0.12	0.32	0.22	0.31	0.12
Nitrogen Dioxide (NO_2)	Annual	6.2	25	87	769766	3339709	1.9	3.5	6.2	5.8	4.0

(1) Short-term values are highest second high concentrations for this analysis.
(2) Rule 62-204.260, F.A.C.
(3) Maximum impact zero or negative due to increment expanding sources
(4) Unit 8 stack location 769,611 m East, 3,339,767 m North.

Source: Foster Wheeler Environmental, 1997

TABLE 5.6.1-25
SUMMARY OF ST. MARKS NWA CLASS I PSD INCREMENT ANALYSIS

					Receptor Location[4]		Preliminary Maximum[1] Concentration by Year				
Pollutant	Avg Period	Max[1] Refined Conc ($\mu g/m^3$)	Class I PSD Increment[2] ($\mu g/m^3$)	Period (yymmddhh)	East (m)	North (m)	1985 ($\mu g/m^3$)	1986 ($\mu g/m^3$)	1987 ($\mu g/m^3$)	1988 ($\mu g/m^3$)	1989 ($\mu g/m^3$)
Sulfur Dioxide (SO_2)	3-hr	10.7	25	86011106	774900	3336300	7.1	9.5	9.2	8.6	8.0
Sulfur Dioxide (SO_2)	24-hr	2.7	5	86110124	743600	3322000	1.3	2.3	2.1	2.4	1.6
Sulfur Dioxide (SO_2)	Annual	<0.00001[3]	2	NA	NA	NA	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Particulate Matter (PM_{10})	24-hr	0.73	8	88022424	745900	3321900	0.42	0.68	0.63	0.70	0.46
Particulate Matter (PM_{10})	Annual	0.11	4	87	744200	3322900	0.020	0.064	0.11	0.10	0.053
Nitrogen Dioxide (NO_2)	Annual	0.91	2.5	87	769760	3339160	0.36	0.58	0.91	0.79	0.60

(1) Short-term values are highest second high values for this analysis.
(2) Rule 62-204.260, F.A.C.
(3) Maximum impact zero or negative due to increment expanding sources
(4) Unit 8 stack location 769,611 m East, 3,339,767 m North.

Source: Foster Wheeler Environmental, 1997

TABLE 5.6.1-26
SUMMARY OF BRADWELL BAY NWA CLASS I PSD INCREMENT ANALYSIS

					Receptor Location[4]		Preliminary Maximum[1] Concentration by Year				
Pollutant	Avg Period	Max[1] Refined Conc ($\mu g/m^3$)	Class I PSD Increment[2] ($\mu g/m^3$)	Period (yymmddhh)	East (m)	North (m)	1985 ($\mu g/m^3$)	1986 ($\mu g/m^3$)	1987 ($\mu g/m^3$)	1988 ($\mu g/m^3$)	1989 ($\mu g/m^3$)
Sulfur Dioxide (SO_2)	3-hr	16.9	25	87110324	737500	3343500	8.2	15.6	16.2	11.1	10.7
Sulfur Dioxide (SO_2)	24-hr	4.9	5	86113024	736300	3343000	1.8	4.9	4.5	3.0	1.9
Sulfur Dioxide (SO_2)	Annual	<0.00001[3]	2	NA	NA	NA	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Particulate Matter (PM_{10})	24-hr	0.0023	8	85080224	736500	3346500	0.0023	0.0019	0.0013	0.0020	0.00039
Particulate Matter (PM_{10})	Annual	0.16	4	87	741500	3341100	0.030	0.10	0.15	0.12	0.066
Nitrogen Dioxide (NO_2)	Annual	0.57	2.5	87	741500	3341500	0.16	0.37	0.54	0.45	0.25

(1) Short-term values are highest second high values for this analysis.
(2) Rule 62-204.260, F.A.C.
(3) Maximum impact zero or negative due to increment expanding sources.
(4) Unit 8 stack location 769,611 m East, 3,339,767 m North.

Source: Foster Wheeler Environmental, 1997

TABLE 5.6.1-27
SUMMARY OF FAAQS ANALYSIS

Pollutant	Avg Period	Max[1] Refined Conc ($\mu g/m^3$)	Background ($\mu g/m^3$)	Max[1] Modelled + Background ($\mu g/m^3$)	FAAQS[2] ($\mu g/m^3$)	Period (yymmddhh)	Receptor Location[3]		Preliminary Maximum[1] Concentration by Year				
							East (m)	North (m)	1985 ($\mu g/m^3$)	1986 ($\mu g/m^3$)	1987 ($\mu g/m^3$)	1988 ($\mu g/m^3$)	1989 ($\mu g/m^3$)
Sulfur Dioxide (SO_2)	3-hr	402.1	183	585	1300	86031203	767338	3344831	296.6	306.9	289.3	304.9	253.6
Sulfur Dioxide (SO_2)	24-hr	137.2	71	208	260	86051824	767438	3342731	88.9	98.2	94.9	96.0	92.6
Sulfur Dioxide (SO_2)	Annual	25.7	9	35	60	87	768943	3339624	11.6	15.1	21.0	19.4	14.9
Particulate Matter (PM_{10})	24-hr	83.8	47	131	150	89061024	767881	3342365	40.0	40.1	402.0	49.7	51.4
Particulate Matter (PM_{10})	Annual	19.1	22.4	42	50	87	767611	33411995	5.6	5.5	6.6	5.6	6.5
Nitrogen Dioxide (NO_2)	Annual	21.4	14	35	100	87	767511	3341895	5.1	7.4	10.4	9.1	6.8
Carbon Monoxide (CO)	1 hr	103.1	8050	8153	40000	85090112	769362	3339793	103.1	28.2	28.1	27.0	28.7
Carbon Monoxide (CO)	8-hr	16.3	5290	5306	10000	86072916	767460	3342348	8.3	13.3	10.1	11.6	8.7
Lead (Pb)	24-hr	0.011	0.03	0.04	1.5	87062724	769610	3338267	0.0064	0.010	0.011	0.011	0.0084

(1) Short-term values are highest second high values for this analysis.
(2) Rule 62-204.240, F.A.C.
(3) Unit 8 stack location 769,611 m East, 3,339,767 m North.

Source: Foster Wheeler Environmental, 1997

Air Toxics Analysis

The analysis of Project impacts versus the draft FARCs involved combining all future Purdom Station emissions (Unit 7, Unit 8, GT1 and GT2 and the auxiliary boiler) as a single source and modelling at a unit emission rate (1 gram/second). These maximum impacts for the three averaging times were scaled using the short-term and annual expected emission rates for the various pollutant. Predicted concentrations are provided in Table 5.6.1-28. As indicated, all concentrations are below the draft FARCs.

Auxiliary Boiler

The auxiliary boiler was modelled separately from the other sources in the short-term analyses as it will not be permitted to operate in conjunction with Units 7 and 8. The results of modelling the auxiliary boiler alone are included in Table 5.6.1-29. As indicated, the maximum short-term impacts of the auxiliary boiler are very small in comparison with allowable PSD increments and FAAQS/NAAQS. Annual impacts were not computed as they were already included in all of the long-term impact analyses discussed above.

5.6.1.13 Additional Impacts Analysis

The PSD guidelines indicate that, in addition to demonstrating that the proposed source will neither cause nor contribute to violations of the applicable PSD increments and AAQS, an additional impacts analysis must be conducted for those pollutants subject to PSD review (CO and particulate matter (TSP and PM_{10})). However, the City has chosen to include other pollutants in the analysis to provide additional information. The additional impacts analysis includes an analysis of air quality impacts due to growth induced by the Project, an analysis of air quality impacts on soils and vegetation, and a discussion of Project impacts on visibility. These analyses are included in Section 8 of the PSD report (Appendix 10.1.5). A brief summary is included here.

Impacts Due to Growth

There may be some temporary residential growth associated with construction of the Purdom Unit 8 Project, but there is little potential for new residential or industrial development nearby as a result of the new facility. Although it is not possible to reliably quantify the emissions and impacts resulting from the new development, they are expected to be small and well-distributed throughout the area.

Vegetation, Soils, and Wildlife Analyses

The focus of the vegetation, soils, and wildlife portions of the additional impacts analysis section of a PSD application is typically on any nearby Class I areas. However, for this application, it has been broadened to constitute an air quality related values (AQRV) analysis covering the Class II area around the Purdom Station as well as pollutants in addition to those which trigger PSD review. As has been demonstrated earlier, the proposed Project will neither cause nor contribute to violations of the Class I PSD increments (nor the AAQS) in the St. Marks National Wilderness Area and the Bradwell Bay National Wilderness Area. The City has agreed to evaluate Project impacts on air quality-related values (AQRV) identified by the Federal Land Managers (FLMs)

TABLE 5.6.1-28
MAXIMUM MODELLED HAZARDOUS AIR POLLUTANT CONCENTRATIONS VERSUS DRAFT FARCS

Pollutant	8-Hour			24-Hour			Annual		
	Maximum[1] Modelled Conc ($\mu g/m^3$)	Draft FARC[2] ($\mu g/m^3$)	Acceptable	Maximum[1] Modelled Conc ($\mu g/m^3$)	Draft FARC[2] ($\mu g/m^3$)	Acceptable	Maximum[1] Modelled Conc ($\mu g/m^3$)	Draft FARC[2] ($\mu g/m^3$)	Acceptable
Arsenic (As)	9.85E-03	0.1	Yes	5.42E-03	0.02	Yes	1.78E-05	2.30E-04	Yes
Beryllium (Be)	3.94E-04	0.02	Yes	2.17E-04	0.005	Yes	1.07E-06	4.20E-04	Yes
Cadmium (Cd)	4.45E-03	0.02	Yes	2.45E-03	0.005	Yes	1.36E-05	5.60E-04	Yes
Chromium (Cr)	1.97E-02	0.5	Yes	1.09E-02	0.1	Yes	1.52E-04	N/A	Yes
Lead (Pb)	2.71E-02	0.5	Yes	1.49E-02	0.1	Yes	2.07E-04	9.00E-02	Yes
Manganese (Mn)	7.46E-02	50	Yes	4.11E-02	12	Yes	1.07E-03	5.00E-02	Yes
Mercury (Hg)	2.67E-03	0.1	Yes	1.47E-03	0.02	Yes	4.97E-06	3.01E-01	Yes
Nickel (Ni)	4.31E-01	10	Yes	2.37E-01	2.4	Yes	3.89E-03	4.20E-03	Yes
Cobalt (Co)	1.13E-02	0.5	Yes	6.20E-03	0.1	Yes	2.95E-05	N/A	Yes
Antimony (Sb)	8.15E-03	5	Yes	4.49E-03	1.2	Yes	7.14E-05	3.00E-01	Yes
Vandium (V)	1.38E-01	0.5	Yes	7.59E-02	0.1	Yes	2.73E-04	2.00E+01	Yes
Polycyclic Organic Matter (POM)	5.33E-03	N/A	Yes	2.93E-03	N/A	Yes	7.79E-05	N/A	Yes
Benzo(a)Pyrene (BaP)	1.14E-06	N/A	Yes	6.28E-07	N/A	Yes	1.32E-08	3.00E-04	Yes
Benzene	3.30E-04	30	Yes	1.82E-04	7	Yes	1.29E-05	1.20E-01	Yes
Toluene	2.97E-03	1880	Yes	1.64E-03	448	Yes	4.17E-05	4.00E+02	Yes
Selenium (Se)	4.05E-03	2	Yes	2.23E-03	0.5	Yes	1.72E-05	N/A	Yes
Hydrochloric Acid (HCl)	2.01E+00	70	Yes	1.11E+00	17	Yes	2.45E-02	7.00E+00	Yes
Hydrogen Fluoride (HF)	3.04E-01	26	Yes	1.67E-01	6.2	Yes	3.69E-03	N/A	Yes
Dioxin (378TCDD)	2.50E-09	N/A	Yes	1.37E-09	N/A	Yes	2.88E-11	2.20E-08	Yes
Formaldehyde (HCOH)	3.58E-02	3.7	Yes	1.97E-02	0.9	Yes	5.41E-04	7.70E-02	Yes

(1) Maximum values are highest rather than highest second-high values for this analysis.
(2) FDEP, 1995

Source: Foster Wheeler Environmental, 1997

TABLE 5.6.1-29
SUMMARY OF AUXILIARY BOILER ANALYSIS

Pollutant	Avg Period	Maximum Concentration (μg/m^3)	Preliminary Maximum[1] Concentration by Year				
			1985 (μg/m^3)	1986 (μg/m^3)	1987 (μg/m^3)	1988 (μg/m^3)	1989 (μg/m^3)
Sulfur Dioxide (SO_2)	3-hr	0.80	0.74	0.78	0.77	0.80	0.73
Sulfur Dioxide (SO_2)	24-hr	0.49	0.20	0.44	0.41	0.49	0.40
Particulate Matter (PM_{10})	24-hr	6.4	2.6	5.7	5.4	6.4	5.1
Carbon Monoxide (CO)	1 hr	161.0	161.0	109.4	77.1	81.2	156.4
Carbon Monoxide (CO)	8-hr	53.5	29.6	45.0	53.5	49.6	40.8

(1) Maximum values are highest second high concentrations for this analysis.

Source: Foster Wheeler Environmental, 1997

as a part of the application. AQRVs have not been specifically identified by the USFWS for the St. Marks NWA; however, the USFS has identified two AQRVs for the Bradwell Bay NWA, fresh air (lack of odor) and vegetation (FWENC, 1997a). Operation of the proposed Project will not result in any odors in the NWAs, hence the AQRV fresh air (lack of odor) is not addressed further in the following analysis. Since specific AQRVs have not been identified for the St. Marks NWA, this AQRV analysis evaluates the effects of air quality on general vegetation types and wildlife found on both the St. Marks NWA and the Bradwell Bay NWA.

The Project was designed such that there would be no increase in either NO_2 or SO_2 emissions and the following impacts analysis essentially evaluates how the existing ambient air quality (the Project and existing sources) would affect vegetation and soils.

For St. Marks NWA, vegetation type AQRVs and their representative species types have been defined as:

- Estuarine Habitat - black needlerush, salt marsh cordgrass
- Forested Wetland - red maple, swamp tupelo, sweet bay, and pond cypress
- Upland Forest - slash pine, blackberries, winged sumac, hollies, and saw palmetto

For Bradwell Bay, vegetation type AQRVs and their representative species types have been defined as:

- Upland Forest - slash pine, loblolly pine
- Forested Wetland - sweet gum, slash pine, water oak, red bay, black willow, pond cypress, bald cypress, saw palmetto

Wildlife AQRVs included: endangered species, waterfowl, marsh and water birds, shorebirds, reptiles and mammals.

A screening approach was used which compared the maximum predicted ambient concentrations of air pollutants of concern from the Project with "effect threshold limits" for both vegetation and wildlife as reported in the scientific literature. It was recognized that effect threshold information is not available for all species found in either the St. Marks NWA or Bradwell Bay NWA, although studies have been performed on a few of the common species and on other similar species which can be used as models. In conducting the assessment, both direct (fumigation) and indirect (soil accumulation/uptake) exposures were considered for flora, and direct exposure (inhalation) was considered for wildlife. Maximum concentrations and depositions were predicted using the ISCST3 model and five years of meteorological data as described earlier.

Since background air quality monitoring data are not available for either of the Class I Areas, background values for the criteria pollutants were estimated based on monitoring data from regional air quality monitoring locations as listed in Table 2.3.7-7. This is a conservative approach since the monitors are either near point sources or in more urban areas than the Class I Areas. These background concentrations were added to predicted future concentrations resulting from operation of the Project and totals are compared with the appropriate effect threshold limits. The detailed analysis is contained in Section 8.3 of the PSD report found in Appendix 10.1.5.

The following media were considered with respect to impacts of the following parameters:

Vegetation	Soil	Wildlife
Carbon Monoxide	Lead	Sulfur Dioxide
Particulates	Beryllium	Nitrogen Dioxide
Nitrogen Dioxide	Arsenic	Ozone
Sulfur Dioxide	Antimony	Particulates
Ozone	Cadmium	
SO_2 - NO_2 Synergism	Chromium	
SO_2 - O_3 Synergism	Cobalt	
Sulfur and Nitrogen Deposition	Manganese	
	Nickel	
	Vanadium	

Based on the analysis, the Project is not expected to cause any adverse impacts on vegetation, soils, or wildlife.

Visibility Impacts

Section 169A of the CAA Amendments of 1977 provides for implementation of guidelines to prevent visibility impairment in mandatory PSD Class I areas. The guidelines are intended to protect the aesthetic quality of these pristine areas from reduction in visual range and atmospheric discoloration due to various pollutants. As agreed to by the FDEP, the USFWS, and the USFS (USFWS, 1996), only emissions of PM_{10} were considered for the visibility analysis since there will be no net increase in annual emissions of SO_2 and NO_x. Further, the USFS agreed that due to the small increase in annual emissions of PM_{10} proposed, a regional haze analysis is not warranted (USFWS, 1997).

Potential Project impacts on visibility in the nearest Class I areas were to be evaluated using the VISCREEN Version 1.01 (88341) model (EPA, 1988b) in accordance with the modelling protocol (COT, 1996). However, it was determined that this and other more refined visibility models can only evaluate visibility impacts for short-term averaging periods using short-term emission rates. For the proposed Project, the future maximum short-term PM_{10} emission rates will be lower than the current values. Intuitively, this should result in some short-term improvement in visibility. However, since the VISCREEN model is not programmed to address emission reductions, the extent of the short-term improvements cannot be evaluated quantitatively.

5.6.2 Monitoring Programs

5.6.2.1 Ambient Monitoring

Air Quality Modelling Assessment

In order to determine if the proposed Project's impacts would be insignificant and therefore be eligible for both pre- and post-construction monitoring exemptions under the Prevention of Significant Deterioration (PSD) rules (Rule 62-212.400(3)(e) F.A.C.), a modelling analysis was conducted. This analysis used procedures described in EPA's New Source Review Workshop

Manual (Draft) (EPA, 1990), as well as the Project-specific modelling procedures and protocol accepted by FDEP. The FDEP approved the City's request for a preconstruction monitoring exemption on February 19, 1997 (FDEP, 1997).

Post-Construction Monitoring Exemption Request

As indicated in Table 5.6.1-23, the maximum modelled ambient impacts of the Project are below the monitoring de minimis levels of Table 212.400-3, which indicates that post-construction monitoring exemptions for PM_{10} and CO should be granted in accordance with Rule 62-212.400(3)(e), F.A.C.

5.6.2.2 Continuous Emissions Monitoring

This section describes the continuous emissions monitoring system (CEMS) proposed for Unit 8. The proposed monitoring system is consistent with the requirements of 40 CFR 75, Continuous Emissions Monitoring, and 40 CFR 60 Subpart GG (NSPS).

Oxides of Nitrogen

A CEMS for NO_x will be installed and operated in accordance with 40 CFR 75.10. The system will consist of a NO_x pollutant concentration monitor and an O_2 or CO_2 diluent gas monitor, with a data acquisition system capable of measuring and recording NO_x concentration (ppm) and NO_x emission rate (lb/mmBtu). Water to fuel ratio will also be recorded (by a separate monitoring system) in accordance with 40 CFR 60 Subpart GG.

Sulfur Dioxide

SO_2 will be monitored using the alternate method presented in 40 CFR 75.11(d)(2). This alternate method is detailed in 40 CFR 75 Appendix D. (SO_2 emissions will be calculated assuming a 95 percent conversion of sulfur to SO_2 in accordance with the GE data sheets for the purpose of demonstrating compliance with the facility-wide cap.) Fuel meters and an approved custom fuel monitoring schedule will be used to track fuel usage and sulfur content.

Other Pollutants

CO_2 will be monitored in accordance with 40 CFR 75 Appendix G. No other pollutants require monitoring under 40 CFR Part 75 nor FDEP rules.

Compliance with Facility-wide caps

These CEMS, fuel flow monitors, and the custom fuel monitoring schedule together with the existing Unit 7 CEMS for SO_2 and NO_x and existing combustion turbine fuel flow monitors (and emission factors) will be sufficient to demonstrate compliance with the requested facility-wide caps on annual emissions of SO_2 and NO_x.

5.6.2.3 Performance Tests

40 CFR 60 Subpart GG establishes limitations on NO_x and SO_2 emissions. Compliance with these limitations must be demonstrated within 60 days of achieving the maximum production

rate but not later than 180 days after the initial start-up. These performance tests include NO_x emissions, fuel nitrogen content and fuel sulfur content. Performance testing will be in accordance with the 40 CFR 60.335 test methods and procedures.

5.6.3 References

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5.7 NOISE

Potential noise impacts have been assessed for residential receptors around the project site considering the new Unit 8, the existing Unit 7, and the existing combustion turbines (GT1 and GT2). Unit 8 was conservatively assumed to operate 100 percent of the time, Unit 7 to operate for 30 percent of the time (also conservative), and the two combustion turbines to operate for 100 hours each per year, which is representative of the most recent two year period of record as well as expected future operations). Noise levels were annualized per the methodology employed by the EPA guideline document (EPA, 1974).

Noise levels were predicted for five receptor locations using a computer model (see Appendix 10.6.7) which employed the noise level specifications of the major plant components plus the existing noise levels from Unit 7 and the combustion turbines as input data (see Section 2.3.8). The model was also used as a design tool to aid in identifying equipment which required additional noise control to permit the total plant to meet the design noise limit. The design noise limit for Unit 8 was selected such that the noise, when combined with noise from the existing units, would not exceed the EPA guideline level at the nearest residence to the station. Various noise control measures have been incorporated into the project design to limit noise to the desired level.

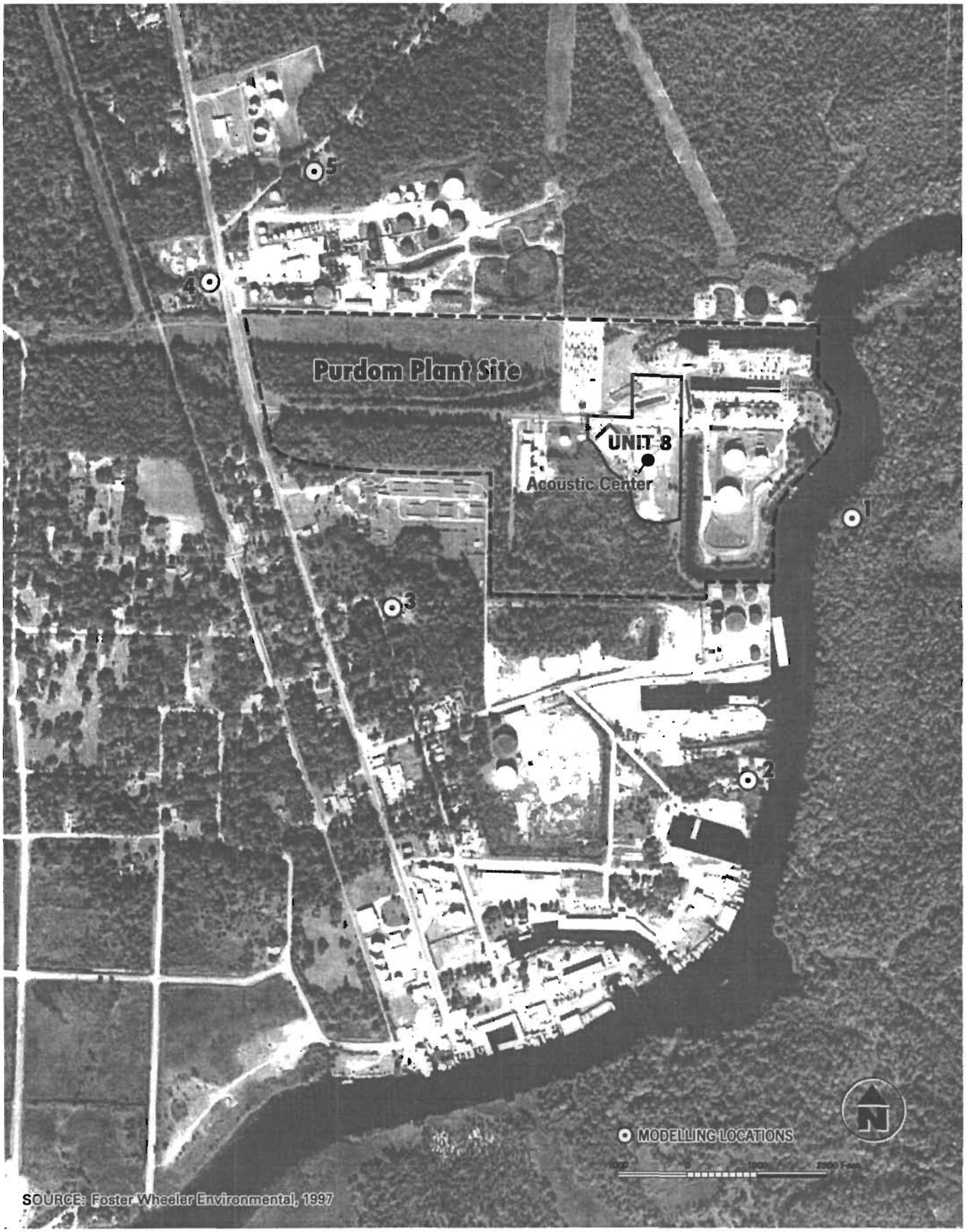
5.7.1 Design Noise Level

The EPA guideline is the most stringent of available guidelines that could be applied to the project. The next most applicable criteria, which were not selected, would have allowed levels up to 6.4 dBA higher. The EPA guideline is not a noise standard because it was developed without regard to cost or feasibility of compliance and does not have regulatory status. It is simply a goal that, if achieved, would provide low noise levels that would be found acceptable to most people living in quiet rural areas.

The EPA guideline level is an annualized day/night noise level (L_{dn}) of 55 decibel (dBA) (EPA, 1974). The L_{dn} level is computed by adding a 10 dBA adjustment to the nighttime hours between 10 p.m. and 7 a.m. to account for the greater sensitivity of people to noise at night. The adjusted nighttime levels are then averaged with the daytime levels to compute the L_{dn}. For sources of continuous noise, such as power plants, an L_{dn} of 55 dBA is equal to a continuous or "equivalent" level (L_{eq}) of 48.6 dBA. Thus, this 48.6 dBA level is used as the design noise level for the project. The project is designed to achieve this level at the nearest residence.

5.7.2 Receptors

The five locations used in the noise model as receptors are shown on the map of the area on Figure 5.7.2-1. The distances, in feet, between each receptor and the Unit 8 or Purdom Station acoustic center located in the proposed power island area are provided in Table 5.7.2-1.



CITY OF TALLAHASSEE

NOISE MODELLING LOCATIONS (1 – 5)

PURDOM UNIT 8 PROJECT – ST MARKS FLORIDA

Figure 5.7.2-1

TABLE 5.7.2-1 NOISE MODEL RECEPTOR LOCATIONS	
Receptor	**Distance from Plant Acoustic Center (ft)**
No. 1 - East Bank of St. Marks River	1,000
No. 2 - Nearest Residence to South	1,730
No. 3 - Nearest Residence to Southwest	1,500
No. 4 - Nearest Residence to West	2,300
No. 5 - Nearest Residence to Northwest	2,100
Source: Foster Wheeler Environmental, 1997	

Locations 2 through 5 are at the nearest residences in different directions from the Purdom Station. They are adjacent to the noise monitoring locations described in Section 2.3.8. Noise levels at the most distant residences shown on Figure 5.7.2-1 would be up to 6 dBA lower than those predicted in the following sections for the nearest residences.

Location 1 is across the St. Marks River from the Purdom Station at the nearest point within the Aucilla Wildlife Management Area from Unit 8. The location was selected to identify the highest noise level to which wildlife might be exposed. Noise levels further into this area would decrease rapidly. Since there are no residences in the Wildlife Management Area, the EPA guideline does not apply, but potential impacts to the wildlife are assessed.

5.7.3 Noise Sources

The noise sources for Unit 8 were divided into three different "groups" and seven individual equipment items based upon how the equipment is being bid and supplied. Noise levels of the existing units which will remain in operation after the startup of Unit 8 are also included. The locations of the new and existing facilities are shown on the Plot Plan (see Figure 3.2-1). Specified noise levels for the groups and the individual equipment items are presented in Table 5.7.3-1.

TABLE 5.7.3-1 PURDOM UNIT 8 PROJECT EQUIPMENT SOUND LEVELS	
Equipment	**Sound Level (dBA) @ Reference Distance (ft)**
Power Island (GT/STG + Auxiliaries)	58 @ 400 (550' from center)
Cooling Tower	54 @ 400 (430' from center)
Zero Discharge Wastewater Treatment System	60 @ 100 (150' from center)
Circulating Water Pumps	85 @ 3
Cooling Tower Makeup Pumps	85 @ 3
Boiler Feed Pumps	85 @ 3
Condensate Pumps	85 @ 3
Auxiliary Cooling Water Pumps	85 @ 3
Condenser Air Ejectors	85 @ 3
Fuel Oil Transfer Pumps	85 @ 3
Existing Unit 7	52/47[(1)] @ 750
Existing GT1 & GT2	63/44[(1)] @ 1030
[(1)] Measured Instantaneous Level/Calculated Annualized Level Source: Equipment specifications	

The first group is the Unit 8 power island which includes the new combustion turbine, the HRSG, the steam turbine, associated electrical generators and much of the support equipment. The entire group of equipment can be covered by a single noise specification since it will be supplied by only one vendor. A level of 58 dBA at 550 feet from the acoustic center was determined to be appropriate to allow the entire project to meet the design goal. Known noise control measures include a silencer on the turbine air inlet and an acoustic enclosure for the combustion turbine. The HRSG will act as an effective silencer for the exhaust gases. Any other measures required to meet the noise specification will be determined by the vendor.

The second group is the mechanical draft cooling tower. Noise sources include the four fans and motors and the waterfall noise. Since this will also be supplied by a single vendor, a single noise specification will cover the entire unit. A level of 54 dBA at 430 feet from the center of the tower was developed as the specification. Potential noise control measures include low-speed fans and/or splash baffles.

The zero discharge wastewater treatment system is the third group and its noise sources could include numerous pumps, a vapor compressor, an evaporator, a crystallizer, and a deaerator. As above, a single vendor will supply the complete facility. A level of 60 dBA at 150 feet from the center of the facility will be specified and will be met using standard noise control measures such as placing equipment in a building, providing low-noise components, insulating piping, and providing silencers on vents.

Seven individual equipment items for Unit 8 were identified as noise sources that were not included in any of the three groups described above. These items will be bid and supplied by various vendors and each includes its own noise specification. The items include the circulating water pumps, cooling tower makeup pumps, boiler feed pumps, condensate pumps, auxiliary cooling water pumps, condenser air ejector, and the fuel oil transfer pump. The first item will be located at the cooling tower, the second item will be at the Unit 8 intake structure, and the other five will be within the power island. All of these items are specified to have a noise limit of 85 dBA at 3 feet. Various methods are available for making the equipment meet this level and the respective suppliers will determine the most appropriate method. Each piece of equipment was treated individually in the noise modeling.

The last two groups of equipment are the existing Unit 7, which was treated as a single noise source, and the two existing combustion turbines which were also treated as a single source. The noise model input data for these two facilities were developed from data measured during the noise survey described in Section 2.3.8. The reduced operating times of these two facilities were factored into the noise levels produced to provide the annualized values needed for comparison with the EPA guideline.

Facility-related traffic was not included in the modeling because the noise will be insignificant. The traffic will include privately owned vehicles of the employees and service vehicles. Approximately one to two trucks per day will be required to haul away solid waste material produced by the zero discharge wastewater treatment system, and its impact on annualized noise will be insignificant.

The "NoiseCalc" computer model (Driscoll, 1984) that was used for this analysis requires octave band levels for each noise source. This is because different frequencies are attenuated at different rates by the atmosphere, trees, and other features. Octave band levels for the Unit 8 equipment were obtained from the *Electric Power Plant Environmental Noise Guide* (EEI, 1984). Octave band levels for the existing units were measured directly during the 1994 noise survey.

5.7.4 Noise Modeling Results

The results of the noise modeling at each of the five receptor locations are presented in Table 5.7.4-1. A day/night level is not shown for Receptor 1 on the east bank of the river because there are no residences in the wildlife area and the day/night measure is only applicable to people. The predicted level of 53.3 dBA is actually lower than the current level because Units 5 and 6 will not be operating and the new Unit 8 will be located farther from the river.

L_{eq} levels of 43.7 dBA to 48.6 dBA were calculated for the four residential locations. These are all equal to or below the design noise level of 48.6 dBA. The corresponding day/night levels range from 50.1 dBA to 55.0 dBA, which are also all equal to or below the EPA guideline of 55 dBA. As expected, the highest predicted level occurs at Receptor 3 which is the nearest residence to the plant. All other residential locations will experience even lower levels of noise.

TABLE 5.7.4-1
NOISE MODELING RESULTS

Receptor	Equivalent Sound Level (dBA)	Day/Night Sound Level (dBA)
No. 1 - East Bank of St. Marks River	53.3	N.A.
No. 2 - Nearest Residence to South	46.3	52.7
No. 3 - Nearest Residence to Southwest	48.6	55.0
No. 4 - Nearest Residence to West	43.7	50.1
No. 5 - Nearest Residence to Northwest	45.3	51.7
Source: Foster Wheeler Environmental, 1997		

5.7.5 Impact Assessment

No noise impact is expected at any residence in the City of St. Marks because the plant has been designed and will be built to comply with the most stringent appropriate noise guideline. The expected levels differ little from existing noise levels, and any change, if noticeable, will not be significant.

The wildlife area on the east side of the river will also experience little change, if any, in noise levels. Thus, no noise impact is expected. Furthermore, noise levels could increase substantially in the wildlife area without having an adverse impact. Research has found that animals adapt quickly to high noise environments, such as around airports, and that continuous type noise, such as that from power plants, has no demonstrated effects (EPA, 1971).

5.7.6 Compliance Determination

Since much of this analysis is based on noise specifications rather than actually selected equipment, a noise survey will be conducted soon after plant start-up to verify achievement of the design goal. Should the overall level exceed the design limit, additional noise control measures will be applied where necessary to achieve the goal.

5.7.7 References

Driscoll, D.A. 1984. NoiseCalc (A Computer Program for Sound Propagation Calculations). State of New York Department of Public Service. Albany, New York.

EEI (Edison Electric Institute). 1984. Electric Power Plant Environmental Noise Guide - 2nd Edition, Volume 1. Prepared by Bolt, Beranek and Newman, Inc., Cambridge, Massachusetts.

EPA (U.S. Environmental Protection Agency). 1971. Effects of Noise on Wildlife and Other Animals. NTID300.5. Prepared by Memphis State University, Memphis, Tennessee.

EPA. 1974. Levels of Environmental Noise Requisite to Protect the Public Health and Welfare with an Adequate Margin of Safety. EPA 550/9-74-004. Office of Noise Abatement and Control. Washington, D.C.

5.8 CHANGES IN NONAQUATIC SPECIES POPULATIONS

5.8.1 Impact Assessment

Long-term changes in populations of important wetland and upland species as a result of the Purdom Unit 8 Project are not expected. Power plant modifications will take place in previously disturbed areas.

5.8.2 Monitoring Program

Monitoring of site nonaquatic species will not be necessary.

5.9 OTHER PROJECT OPERATION EFFECTS (TRAFFIC)

Upon completion of the Purdom Unit 8 project construction, transportation-related effects of normal operation will be less than the current operating condition. This is due primarily to greater efficiency of the new unit and concurrent permanent shut-down of Units 5 and 6. A reduction in staff of approximately 25 percent is expected because of the Project (from 51 to 37 total staff).

5.9.1 Plant Operation Traffic

Trips associated with operation of the power station were analyzed using current employee and non-employee trip patterns resulting in a trip distribution and assignment impact. This procedure is adopted, as no changes in shift periods or shift work are expected.

5.9.1.1 Employee Trip Generation

Shifts at the Purdom Station consist of maintenance, staff support, and operations personnel. Maintenance and staff support personnel work either 8-hour or 10-hour shifts beginning at 7:00 AM and ending at 3:30 PM or 5:30 PM, respectively. Employees choosing the 10-hour shift have a Monday or Friday off each week. These day shifts consist of up to 25 people resulting in up to 50 commuting trips per day.

A separate and distinct "operating" shift occurs on a 24-hour basis with two 12-hour shifts. One shift operates the Purdom Station between 6:00 AM and 6:00 PM, consisting of 5 employees. The other shift works from 6:00 PM to 6:00 AM with the same number of employees. This results in 20 commuting trips per day for the operating staff.

After completion of the Purdom Unit 8 construction phase, it is expected that the permanent work force of the Purdom Station will be reduced by approximately 25 percent. This reduction yields a reduction in commuting and lunch hour trips of approximately 20 trips per day.

Existing traffic counts at the main gate yield approximately 200 one-way trips per day. With 35 employees making 2 trips per day, 70 commuting trips (50 maintenance and 20 operating) are expected. Traffic counts at the main gate also show approximately 10 trips occur during lunch periods. The 70 commuting trips plus 10 lunch trips equal 80 employee-related trips.

5.9.1.2 Non-Employee Trip Generation

Subtracting the employee trips from the total 200 daily trips counted at the driveway, this yields approximately 120 non-employee related trips to and from the Purdom Station per day. This non-employee trip making is expected to lower after construction of Unit 8 is completed. No specific data on this non-employee trip reduction is available at this time. Therefore, a worst-case scenario will be assumed for these trips to remain at the current level in the future.

5.9.1.3 Trip Distribution and Assignment

No change is expected between the distribution pattern of the Purdom Station employee and non-employee trips, prior to or after completion of Purdom Unit 8 construction.

The distribution and assignment process of the PM peak hour trips relied heavily on the residence locations of the current Purdom Station employees. This data was provided by zip codes, allowing for an areawide distribution and a subsequent trip assignment.

5.9.1.4 Operations Truck Traffic

The existing truck traffic pattern into and out of the site is not expected to change significantly after completion of the construction phase. The existing regular truck deliveries will continue to occur because most of them are not related to the number of employees employed on the site. They mainly consist of parcel deliveries, trash pick-up, vending machine restocking, uniform cleaning services, and other similar deliveries. Fuel deliveries would only occur in case of emergencies, thus are not part of a daily truck traffic pattern.

The only minor change in the truck traffic pattern is the daily removal of filter cake material to the off-site landfill. This is considered an insignificant increase in the truck activity (less than 1 percent) from a traffic perspective. Therefore, the operations truck traffic flow is not analyzed in detail.

5.9.2 Conclusion

With a reduction in total staffing at the upgraded Purdom Station and no significant change in trip distribution expected, the roadway impact will be somewhat reduced over current levels, because the existing 200 daily trips to and from the Purdom Station will be reduced to below 180 daily trips.

Therefore, the operation phase of the Project does not require any mitigation as its impact is presently existing on the roadway network.

5.10 ARCHEOLOGICAL SITES

In the event that during post-construction activities there is any reason to believe that an archeological site has been located on the Purdom Station site, all ground-disturbing activity within the immediate vicinity of the discovery will be halted and the Division of Historical Resources (DHR) will be notified. No ground-disturbing activities will take place in the immediate vicinity of the discovery until DHR has advised that they may resume.

5.11 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF STATE AND LOCAL RESOURCES

The addition of Purdom Unit 8 to the City's system will result in only minor additional commitments of environmental resources for the operating life of the Unit. The majority of environmental resources required by the Project are either already committed to use by the existing Purdom facility or will be balanced by environmental improvements. The principal resources used will be land, PSD increment, and surface waters for cooling.

Of the total Purdom Station site (63 acres), approximately 4 mostly cleared upland acres already used to support the Purdom facility will be used by the Project. In contrast to a new generating facility constructed on a green-field site, the Purdom Unit 8 Project will be significantly more efficient in the use of land per new MW generated. Indeed, the Project's use of land is, for the most part, a reuse of already committed resources.

Purdom Unit 8 will largely use PSD increments that will be freed up by the permanent shutdown of existing Purdom Units 5 and 6, the anticipated reduced utilization of Unit 7 and the existing gas turbines, and the City's commitment to burn clean fuels. The small increased consumption of PSD increment by particulate matter emissions will be partially the result of the Unit 8 cooling tower, which is balanced by the reduced thermal impact of the Purdom Station on the St. Marks River.

Finally, Purdom Unit 8 will result in a relatively small surface water consumptive use (maximum of only 0.6 percent of the flow of the St. Marks River) for process and cooling water. This increase in surface water consumption is balanced by the elimination of the consumptive use of groundwater from the existing wellfield by the Purdom Station and the recycling of domestic and industrial wastewater.

Given the need for the facility, as expressed in Section 1, the Purdom Unit 8 Project efficiently and effectively minimizes the use of state and local resources. Benefits of the project are discussed in Section 7.1.

5.12 VARIANCES

Variances from applicable federal, state, or local standards do not appear to be required.

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6.1 RECLAIMED WATER PIPELINE

6.1.1 Project Introduction

The Purdom Unit 8 Project will include a 0.9-mile, single 6-inch diameter reclaimed water pipeline to support its operations. The pipeline will originate at the City of St. Marks Wastewater Treatment Facility (WWTF) and terminate at the Purdom Station. Section 3.5 describes the methodology by which this waste stream was selected for reuse within the Project. The corridors were chosen to maximize the use of existing unpaved roadways. The entire preferred corridor follows existing road cross sections including the road shoulder, drainage features, etc. The alternative corridor is slightly shorter, but includes two short stretches of about 875 feet (total) that do not follow a roadway.

At the present time, the City of St. Marks discharges its treated wastewater into the St. Marks River. The mean flow of this discharge has been estimated at 0.02 million gallons per day (MGD).

Based on the full design flow rate of 0.05 MGD, a distance on the order of 0.9 mile, and a static lift of about 10 feet, a 6-inch diameter pipe will be adequate. For this pipe, a permanent right-of-way width of about 30 feet will be adequate.

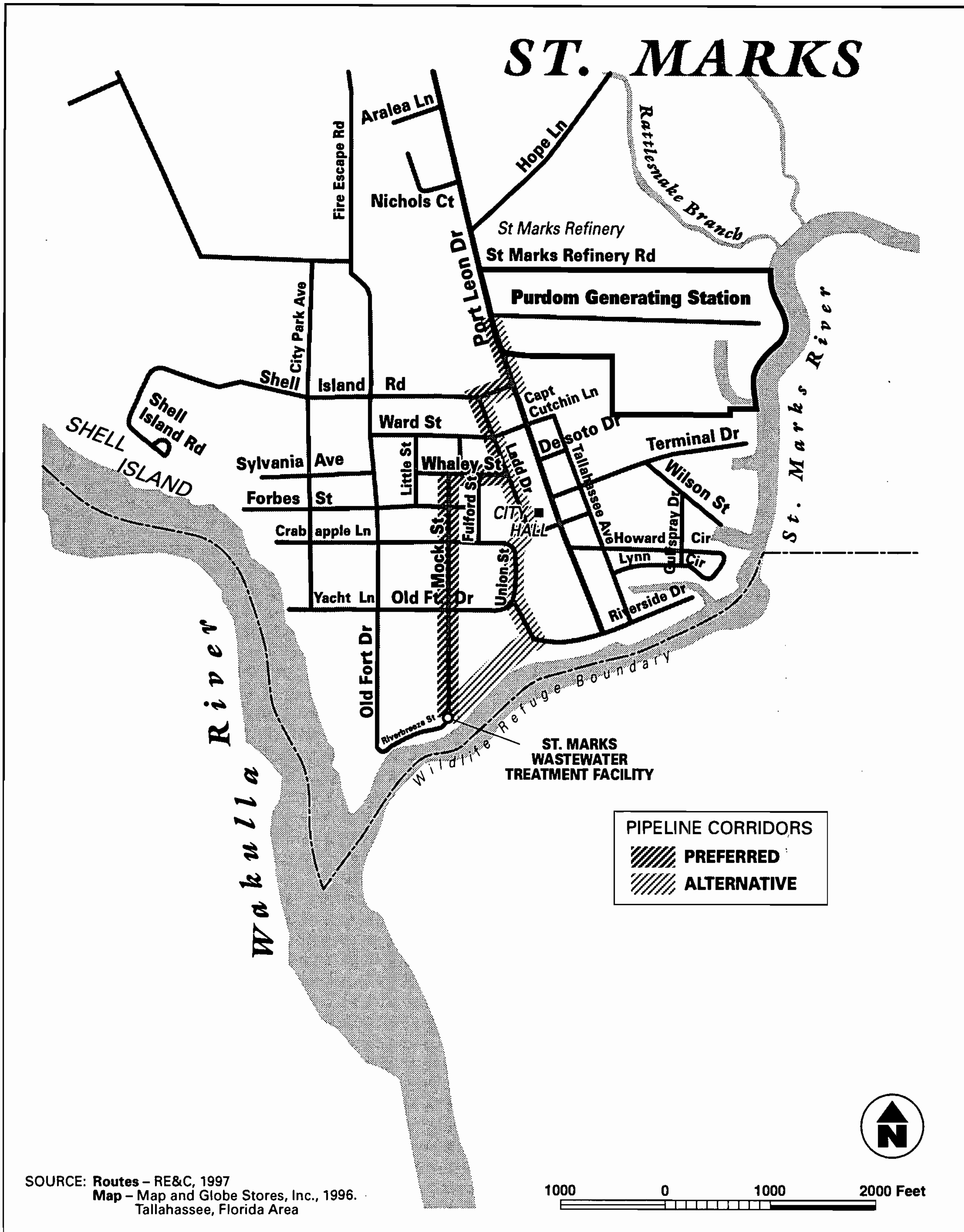
6.1.2 Corridor Location and Layout

The pipeline corridor proposed for certification is depicted on Figure 6.1.2-1. The preferred corridor route originates at the City of St. Marks WWTF and runs east about 200 feet to Mock Street. It then proceeds north on Mock Street for about 2,055 feet to Whaley Street, then turns east for about 590 feet to Ladd Drive. The corridor then heads northwest along Ladd Drive for about 747 feet to Shell Island Road, then turns east for about 300 feet to SR 363. The corridor then heads northwest along SR 363 for about 670 feet where it enters the Purdom Station. The total length of the reclaimed water pipeline is about 0.9 mile.

The alternate corridor route originates at the City of St. Marks WWTF and proceeds northeast about 745 feet to Riverside Drive and then northwest along Riverside Drive for about 470 feet to Union Street, then turns north for about 540 feet to Ladd Drive. The corridor then heads northwest along Ladd Dr. for about 1,360 feet to Shell Island Road, then turns east for about 300 feet to SR 363. The corridor then heads northwest along SR 363 for about 670 feet where it enters the Purdom Station. The total length of the reclaimed water pipeline is about 0.8 mile. A portion between Union Street and Ladd Drive (130 feet) is not along any roadway as is another portion (about 745 feet) between the City of St. Marks WWTF and Riverside Drive.

6.1.3 Reclaimed Water Pipeline and Road Design Characteristics

The pipe will be Schedule 80 polyvinyl chloride (PVC), or a similar design. Schedule 80 has a maximum outside diameter of 6.625 inches and a minimum wall thickness of 0.432 inch.



SOURCE: **Routes** – RE&C, 1997
Map – Map and Globe Stores, Inc., 1996.
Tallahassee, Florida Area

CITY OF TALLAHASSEE

PURDOM 8 PREFERRED AND ALTERNATIVE RECLAIMED WATER PIPELINE CORRIDOR ROUTE

PURDOM UNIT 8 PROJECT – ST MARKS FLORIDA

Figure 6.1.2-1

Because of the pipe material (PVC meeting ASTM Standard D-1785), neither coating (internal or external) nor cathodic protection will be required. The pipe will be buried under at least 30 inches of cover in a trench that will likely only be 12 inches wide. Burial will be deeper where required to pass under ditches or roads. The pipe will be contained within a steel or concrete sleeve where it passes under the Tallahassee-St. Marks Historic Railroad State Trail and SR 363. These sleeves will be installed by the jack and bore method.

An access road for construction and maintenance will not be needed for this facility.

6.1.4 Cost Projections

Cost projections for the pipeline on an average per foot basis are about $55.

6.1.5 Corridor Selection Process

The preferred corridor for this pipeline from the City of St. Marks WWTF to the Purdom Station was selected and evaluated by the following:

- Consultants with expertise in power plant engineering, routing of linear facilities, land use planning, and environmental permitting
- Representatives of City of Tallahassee Electric and Water Utilities
- Representatives of the State Historic Preservation Officer

The corridor selection process incorporated land use, environmental, engineering, and cost considerations. The selection methodology employed was designed to be:

- Sensitive to land use and environmental conditions
- Objective in decision making
- Responsive to regulatory requirements

The corridor selection process consisted of two stages: Identification of Corridor Selection Criteria, and Evaluation of Candidate Corridors.

6.1.5.1 Identification of Corridor Selection Criteria

A corridor study area was selected which was bounded on the west by Old Fort Drive/Fire Escape Road, on the south and on the east by the St. Marks River, and on the north by St. Marks Refinery Road. This study area encompassed the origin and termination points and provided a broad enough area within which two corridor routes could be identified for evaluation. The study area covered about 0.7 square mile.

Eleven criteria were identified as being the most relevant for selection and evaluation of routes for underground pipeline facilities in the study area. These criteria were applied in various levels of emphasis to the corridor selection process as noted below.

The exclusion criteria preclude routing of the corridor. Minimization and avoidance criteria represent those routing parameters where their presence or occurrence in the corridor is considered negative from an environmental, engineering, or licensing standpoint. Favorable criteria refer to locations where corridor alignments are generally preferred.

Exclusion

- Residences

Avoidance or Minimization Where Appropriate

- Wetlands
- Forested habitats
- Construction of new access roads
- Number of landowners
- Cost
- Length of corridor
- Commercial/industrial facilities with existing buried pipelines
- Cultural resources

Favorable

- Common corridor utilization
- Corridor along existing roadways

6.1.5.2 Evaluation of Candidate Corridors

Two general candidate corridor routes with small variations within each were identified (Figure 6.1.2-1). These corridor routes were selected based primarily upon the presence of existing linear facilities (i.e., roads, distribution lines, etc.). Rights-of-way were considered to be conducive to the collocation of, or adjacent positioning of, the pipeline, since this avoids any need to construct new access roads.

All alternative corridors share an existing linear facility. Distinctive features of each alternative corridor are as follows:

Preferred Corridor Route

The preferred corridor, beginning at the southern end, encompasses unpaved roads (Mock Street, Whaley Street, and Ladd Drive) for about 3,592 feet, and 970 feet of paved roads (Shell Island Road and SR 363). No crossing of wetlands or forested habitat is needed. All of the pipeline can be within City of St. Marks right-of-way except crossings under the Tallahassee-St. Marks Historic Railroad State Trail and under SR 363.

Alternate Corridor Route

The alternate corridor involves an additional section of paved road (540 feet) along Union Street. It also includes a crossing of a forested wetland area between Union Street and Ladd Drive. The alternate corridor is common with the preferred corridor from the junction of Whaley Street and Ladd Drive to the Purdom Station. It is shorter than the preferred corridor by about 317 feet.

Conclusion

After a review of these corridors, the preferred corridor was selected. This corridor is clearly superior to the other corridor from an ecological resources perspective. The alternate corridor was not preferred because of its forested land crossing, increased length along paved roads, and portion that is privately owned. The preferred corridor was the best route based on balancing all considerations, including engineering, cost, ecological resources, and land use.

6.1.6 Socio-Political Environment of the Corridor Area

6.1.6.1 Governmental Jurisdictions

Both the preferred and alternate routes for the proposed reclaimed water pipeline are located entirely within the corporate limits of the City of St. Marks. Parks and recreation areas located within one-half mile of the proposed corridors include the San Marco de Apalache Historic Site, the Wakulla River Park Area, the St. Marks River Park Area, the St. Marks National Wildlife Refuge, the Aucilla Wildlife Management Area, the Florida National Scenic Trail, and the Historic Big Bend Saltwater Paddling Trail. They are shown in relation to the proposed pipeline routes on Figure 6.1.6-1.

6.1.6.2 Zoning and Land Use Plans

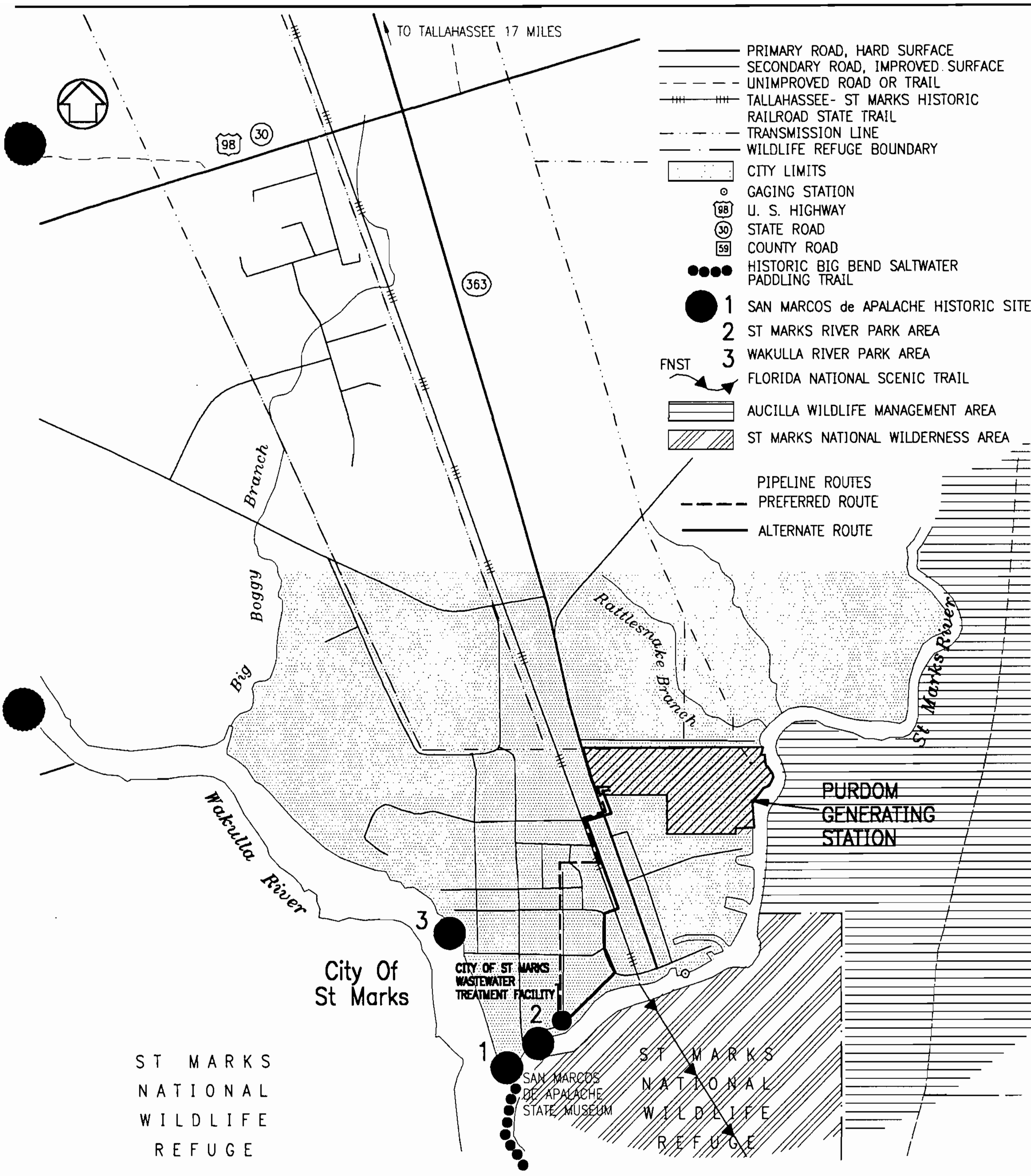
The effluent pipeline routes are shown in relation to the City of St. Marks Future Land Use Map on Figure 6.1.6-2. The pipeline is proposed to be located within or along city streets that follow the boundaries of Industrial, Commercial, Mixed, Public Buildings/Grounds, Recreation/ Conservation, and Residential future land use categories.

Policy 1.2.4 of the Future Land Use Element of the St. Marks Comprehensive Plan states:

> "Public Utilities needed to provide essential service to existing and future land uses in the City of St. Marks shall be permitted in all of the land use classifications established by this plan" (SMCC, 1990).

As discussed in Section 2.2.2 of this SCA, zoning districts in the City of St. Marks correspond to the Future Land Use Map of the St. Marks Comprehensive Plan. Thus, the zoning districts crossed by the proposed pipeline routes are the same as the future land use categories listed above. With respect to allowable uses within zoning districts, Section 2.01.01 of the St. Marks Land Development Code (draft) states:

> "The land use districts and classifications defined in the Future Land Use Element of the City Comprehensive Plan and delineated on the Future Land Use Map shall be the determinants of permissible activities on any parcel in the jurisdiction" (CSM, 1990).



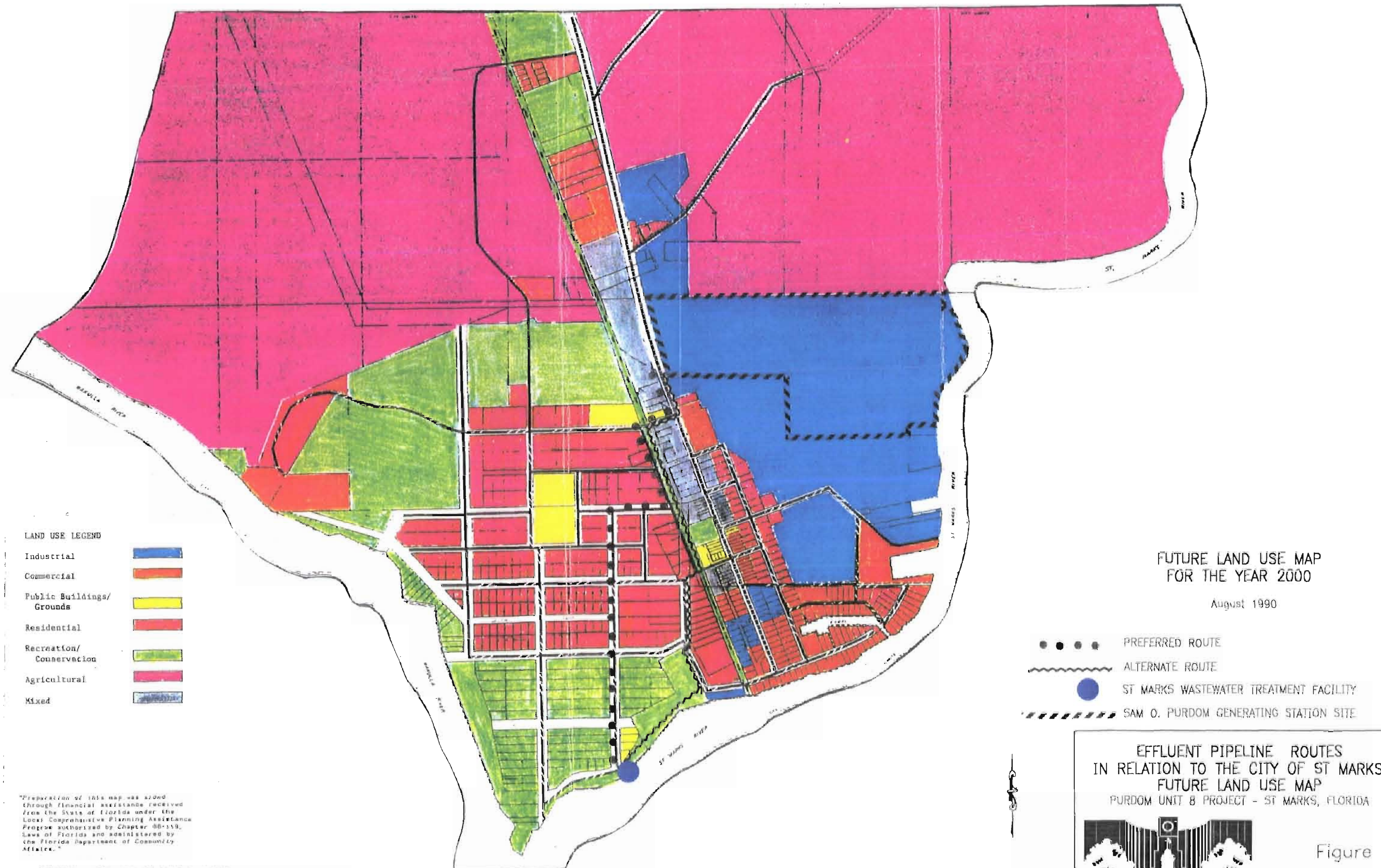
SOURCE: MOORE/BOWERS, 1997;
FOSTER WHEELER ENVIRONMENTAL, 1997;
RAYTHEON ENGINEERS AND CONSTRUCTORS, 1997

CITY OF TALLAHASSEE

GOVERNMENTAL JURISDICTIONS, PARKS, RECREATION AREAS AND CONSERVATION LANDS WITHIN .5 MILES

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 6.1.6-1



SOURCE: CITY OF ST MARKS, 1990
RAYTHEON ENGINEERS AND CONSTRUCTORS, 1997
MOORE/BOWERS, 1997

EFFLUENT PIPELINE ROUTES IN RELATION TO THE CITY OF ST MARKS' FUTURE LAND USE MAP
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 6.1.6-2

The St. Marks Land Development Code (draft) does not otherwise address utility facilities such as underground pipelines. Based on the language in the St. Marks Comprehensive Plan, public utilities such as the proposed pipeline are allowed in all zoning districts.

6.1.6.3 Easements, Title, Agency Works

When crossings of state roads are made, they must conform to the specifications outlined in FDOT's *Utility Accommodation Manual* (FDOT, 1993). SR 363 is the only state road to be crossed by the proposed pipeline. Approval to cross the Tallahassee-St. Marks Historic Railroad State Trail will need to be obtained from the State of Florida. Since the pipeline is expected to be within or along city streets, permission is required from the City of St. Marks. No other easements, title, or agency works permits are expected to be required.

6.1.6.4 Vicinity Scenic, Cultural, and Natural Landmarks

The significance of the parks, recreation areas, and the historic site located in the vicinity of the proposed pipeline is discussed in Section 2.2.5.

6.1.6.5 Archaeological and Historic Sites

Previously recorded archaeological sites WA406 and WA108 are located in close proximity to the preferred reclaimed water pipeline corridor (DHR, 1996). The former is a prehistoric site, the latter is a historic period military cemetery. According to the SHPO, no other historic or archaeological sites are known likely to exist within either the preferred or alternate pipeline corridors.

6.1.7 Bio-Physical Environment of the Corridor Area

6.1.7.1 Land Use/Vegetation

Land use and vegetation of the preferred corridor and the alternate route and vicinity are presented on Figure 6.1.7-1. Mapped information is labeled using the Florida Land Use and Cover Classification System (FLUCCS) (FDOT, 1985). An aerial photograph (scale 1 inch = 1,000 feet) showing the preferred corridor and the area extending at least 0.5 mile from each corridor edge is presented on Figure 6.1.7-2.

6.1.7.2 Affected Waters and Wetlands

No surface waters or wetlands will be affected by construction of this line. Water quality in the St. Marks and Wakulla Rivers will improve with elimination of discharge from the City of St. Marks WWTF.

6.1.7.3 Ecology

The pipeline will be constructed in existing roads through mostly developed areas of the City of St. Marks. Minimal natural habitat conditions will be encountered along the route.

CITY OF TALLAHASSEE

PURDOM 8 PREFFERED RECLAIMED WATER PIPELINE CORRIDOR ROUTE

PURDOM UNIT 8 PROJECT – STMARKS FLORIDA

Figure 6.1.7-2

6.1.7.4 Other Environmental Features

No other environmental features associated with the pipeline warrant discussion.

6.1.8 Effects of Right-of-Way Preparation and Pipeline Construction

6.1.8.1 Construction Techniques

Pipeline construction activities differ slightly from pipeline to pipeline but generally include the following which are described in more detail below:

- Surveying and right-of-way preparation
  - Ditching/trenching
  - Installation
  - Testing
  - Right-of-way restoration
- Other specialized activities may take place such as:
  - Boring and installation of road and ditch crossings
  - Installation of pumping station and two wooden utility poles
  - Installation of valve assemblies

Surveying and Right-of-Way Preparation

The only clearing required will be small bushes and brush. Where needed, the right-of-way will first be cleared in accordance with the contract specifications and permit or regulatory limitations.

Next, the top soil layer within the right-of-way will be stripped where excavation will occur with a dozer, grader, or backhoe and bermed to one side of the working strip. The work platform is then graded to provide smooth access to all equipment used in the following phases of construction.

Right-of-Way Restoration

During construction, topsoil will be saved to be spread back over the stripped area during right-of-way restoration following pipe installation. Once the pipeline is buried in place, the stripped topsoil, when present, will be spread back in place to its original location and topography. Mulching and/or seeding will be undertaken as necessary to quickly stabilize soils which formerly had a vegetation cover.

6.1.8.2 Impact on Water Bodies and Uses

No construction is proposed in Waters of the State. With erosion control measures, such as anchored hay bales, in effect, water bodies and their uses will not be impacted.

6.1.8.3 Solid Wastes

All construction solid wastes will be collected and removed for recycling or off-site disposal in compliance with all applicable regulations.

6.1.8.4 Changes to Vegetation, Wildlife, and Aquatic Life

No significant permanent changes to animal and plant populations are expected. Most of the corridor is currently in road right-of-way or early successional landcovers.

6.1.8.5 Impact on Human Populations

All facilities of the pipeline installed in a state road right-of-way will be designed and constructed in accordance with the FDOT *Utility Accommodation Manual*, 1993. Construction will begin in 1999 and is expected to take approximately 2 months to complete.

The pipeline routes follow city streets which are lightly traveled. The use of existing rights-of-way and the short duration of construction activities in any given location should minimize any inconvenience which might occur.

6.1.8.6 Impact on Regional Scenic, Cultural, and Natural Landmarks

Since the pipeline is an underground facility and will be constructed along or within city streets, there will be no impacts to regional scenic, cultural, or natural landmarks located near the route.

6.1.8.7 Impact on Archeological and Historic Sites

Both the preferred and alternate corridor routes have been reviewed by the Division of Historical Resources (DHR). The review included a January 28, 1997, on-site visit by DHR staff. Based on that review, DHR concluded (DHR, 1997) that use of the preferred route would have no effect on significant historic properties (including archeological sites) provided construction is confined to existing road and trail rights-of-way, and is located within the road surfaces or within 6 feet of road edges. It is anticipated that construction will conform to these requirements. Should construction require activities outside of these areas, pre-construction subsurface testing by a professional archeologist will be carried out in accordance with the recommendation of DHR.

DHR has also concluded that use of the alternate corridor would have no effect on significant historic properties provided construction in the area between Riverside Drive and the City of St. Marks WWTF is contained within existing fill deposits.

Both alternates include construction of a pumping station at the City of St. Marks WWTF. A previously recorded prehistoric archeological site may be located in the same general vicinity. It is anticipated that construction in this area will be confined to existing fill deposits. However, to insure that archeological remains are not disturbed, a professional archeologist will monitor construction in this area.

6.1.9 Post-Construction Impacts and Effects of Maintenance

6.1.9.1 Maintenance Techniques

The primary regular maintenance activity will consist of a visual inspection of the right-of-way. These patrols can be carried out on foot and by vehicle. These inspections will ensure that no activity detrimental to the safety of the pipeline is taking place within, or in the vicinity of, the right-of-way. During the life of a pipeline, repairs that would require heavy equipment and materials to be mobilized should not be necessary. If such repairs do become necessary, they would take place on an emergency basis and be of very short duration.

6.1.9.2 Right-of-Way Uses

No changes in right-of-way uses from those in effect now are expected.

6.1.9.3 Changes in Species Populations

The habitat types along the corridor are significantly disturbed. No important species populations occur in these habitats.

No threatened or endangered animals or species of special concern are known to require land occupied in the corridor. No known endangered plant populations occur in the corridor. Consequently, no measurable changes to populations of important species are expected as the result of right-of-way maintenance.

6.1.9.4 Effects of Public Access

Public access will remain unchanged from current conditions.

6.1.10 References

CSM (City of St. Marks). 1990. City of St. Marks Land Development Code (draft). Prepared for the City of St. Marks by Edward Waters Associates, Tallahassee, Florida.

DHR (Division of Historical Resources, Florida Department of State). 1997. Letter from George W. Percy, Director, Division of Historical Resources and State Historic Preservation Officer, to Jennette Curtis, City of Tallahassee. January 30, 1997.

DHR. 1996. Letter from George W. Percy, Director, Division of Historic Resources and State Historic Preservation Officer, to Jennette Curtis, City of Tallahassee. December 19, 1996.

FDOT (Florida Department of Transportation). 1993. Utility Accommodation Manual. Tallahassee, Florida.

FDOT. 1985. Florida Land Use and Cover Classification System. Tallahassee, Florida.

SMCC (St. Marks City Commission). 1990. St. Marks Comprehensive Plan. Prepared for the City of St. Marks by Edward Waters Associates, Tallahassee, Florida.

6.2 ELECTRIC TRANSMISSION LINES

6.2.1 Introduction

The addition of Unit 8 will not require the construction of new transmission lines. Currently, the City operates three 115 kV transmission lines (Lines 1, 2 and 3) from the Purdom Station to the City's electric distribution system (see Figure 6.2.1-1). The electric and magnetic fields associated with those transmission lines vary depending on right-of-way width, structure type and conductor type. In all cases, the maximum field strengths, within the entire rights-of-way, are below the edge of right-of-way standards established in Rule 62-814 F.A.C (i.e., 2 kilovolts per meter (kV/m) for an electric field and 150 milliGauss (mG) for a magnetic field at the edge of the right-of-way).

Lines 1 and 2 are currently conductored with 4/0 American Wire Gage (AWG) copper. Lines 1 and 2 were originally constructed using both single pole and H-frame structures. To prevent the disruption of the City's electric system if one of these lines were to fail following the addition of Purdom Unit 8, certain segments of Lines 1 and 2 will have to be reconductored with 477 mcm aluminum conductor steel reinforced (ACSR). Current plans are to reconductor segments 1A and 2A (see Figure 6.2.1-1). These segments of transmission line are constructed utilizing only H-frame structures.

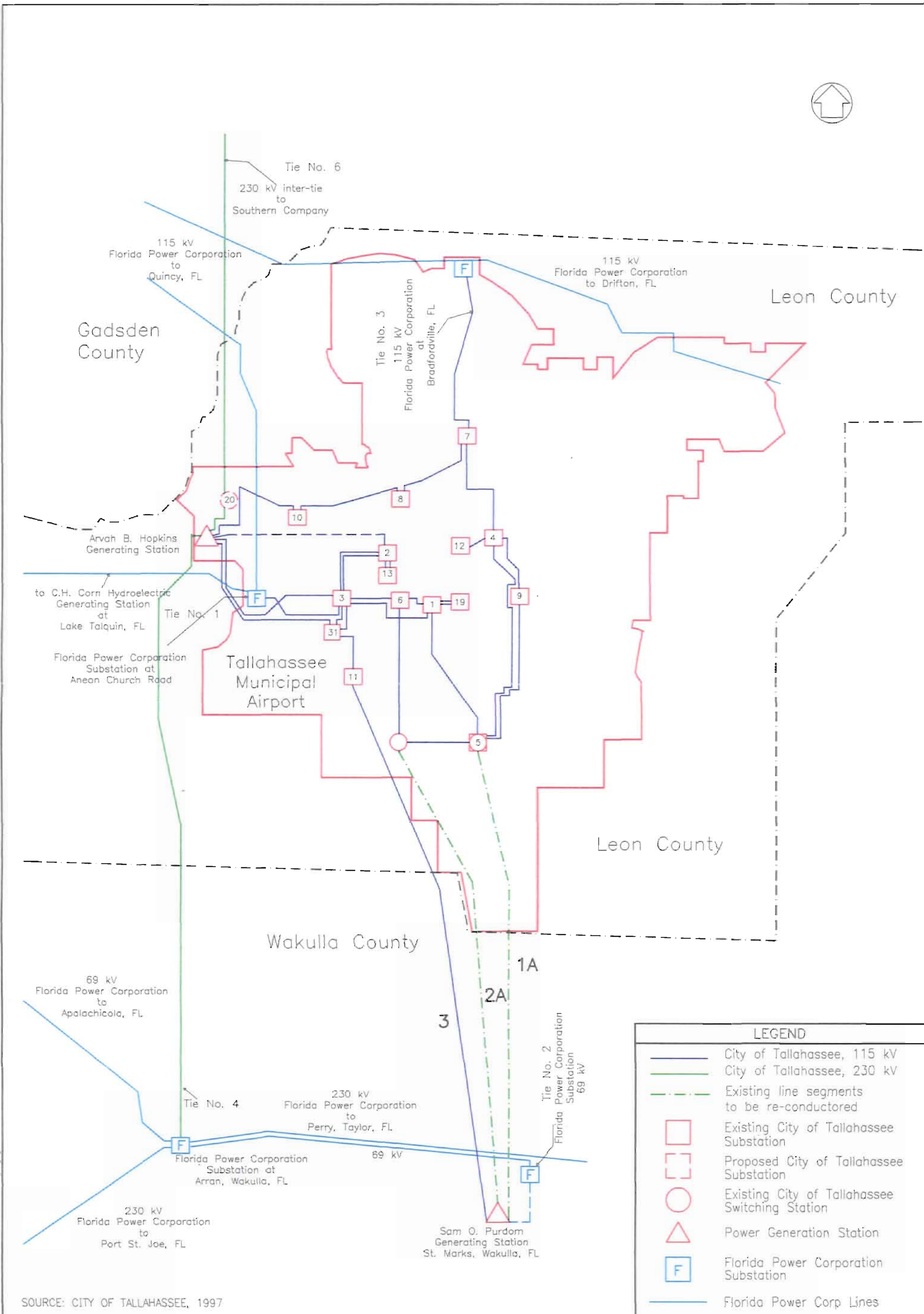
6.2.2 Existing Rights-of-Way

The planned reconductoring of existing transmission lines will not require the addition or expansion of any new rights-of-way nor will it require new structures. The normal operating voltage of these transmission lines will remain at the current 115 kV. The typical transmission line right-of-way for these segments is 100 feet with the structure located at the centerline of the right-of-way. However, in some areas, the transmission line is collocated adjacent to a road right-of-way. In these cases, the transmission line structure is located closer to the edge of the right-of-way.

6.2.3 Reconductoring Methods

Reconductoring will be accomplished in a phased approach using standard wire-pulling equipment. Access for the equipment will be obtained along the rights-of-way from public roads and existing access easements. It is not anticipated that any wetlands will have to be traversed by the wire pulling equipment. No clearing of mature trees or wetland vegetation will be required for the reconductoring of these transmission line segments. In the event ground cover is disturbed, appropriate turbidity prevention measures will be implemented in areas of potential runoff. All removed conductor and other debris within the right-of-way resulting from the wire pulling operation will be removed and recycled or disposed of in appropriate permitted facilities.

The transmission lines will be reconductored one at a time to allow for continued operation of the Purdom facility. There is no engineering requirement to replace or upgrade any of the existing structures during the reconductoring of these line segments. However, consistent with the City's



SOURCE: CITY OF TALLAHASSEE, 1997

CITY OF TALLAHASSEE

CITY OF TALLAHASSEE
TRANSMISSION LINE SYSTEM

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure
6.2.1-1

routine maintenance policies, some of the structures might be replaced prior to or during the reconductoring if they are found to be in a deteriorated condition.

6.2.4 Environmental Effects

6.2.4.1 Electric and Magnetic Fields

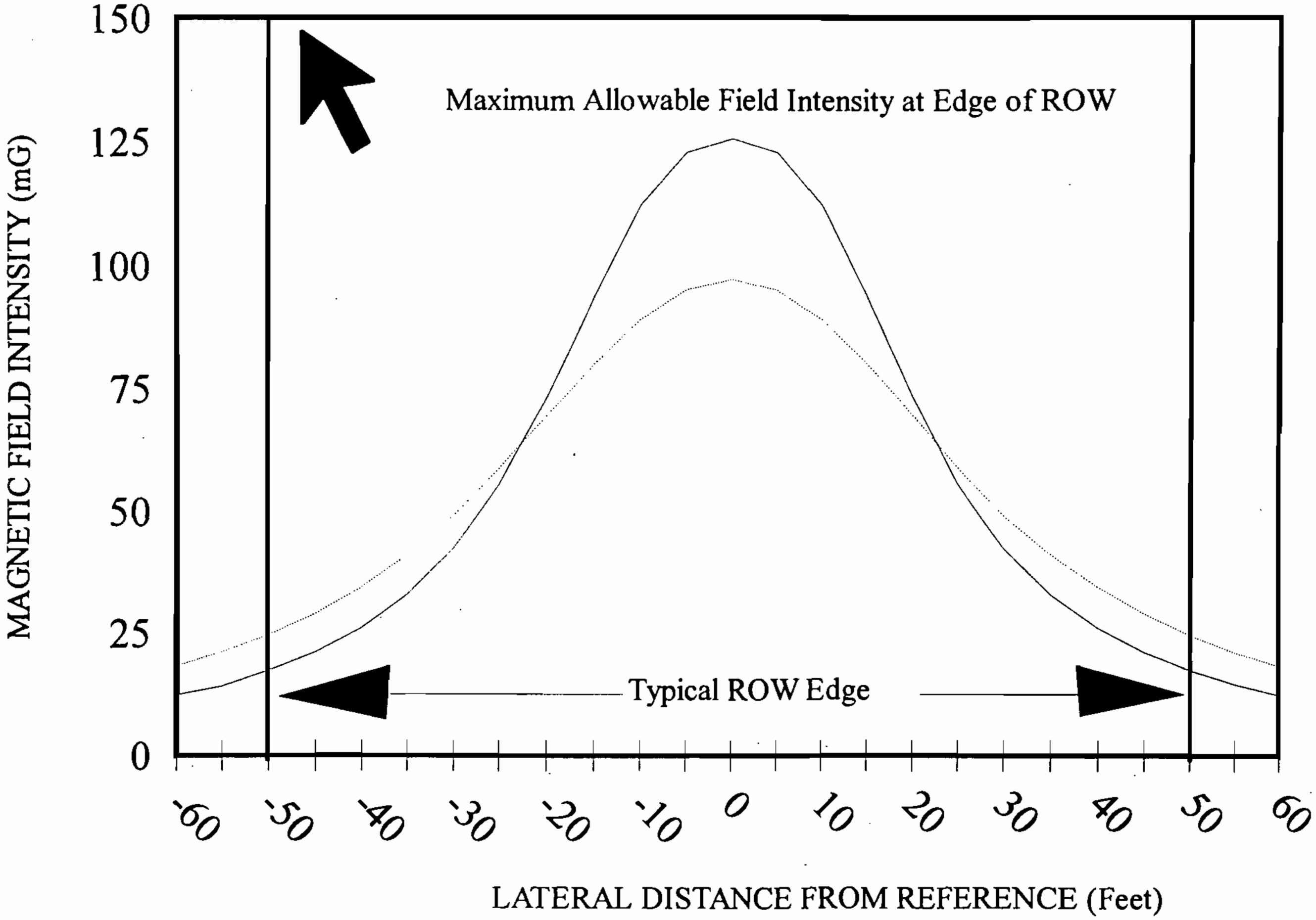
The City has performed modeling to determine the electric and magnetic fields (EMF) associated with the reconductored transmission lines in accordance with Rule 62-814 F.A.C. This modeling was completed utilizing The Southern California Edison (SCE) Electric and Magnetic Field (EMF) Program. Pursuant to Rule 62-814.460 (1) (c), on December 26, 1996, the City requested an Equivalency Determination for the use of the SCE EMF model from the Florida Department of Environmental Protection Office of Siting Coordination. On January 27, 1997, the Office of Siting Coordination advised the City that use of the SCE EMF model was approved as an alternative for demonstrating compliance with the provisions of Rule 62-814, F.A.C. (FDEP, 1997)

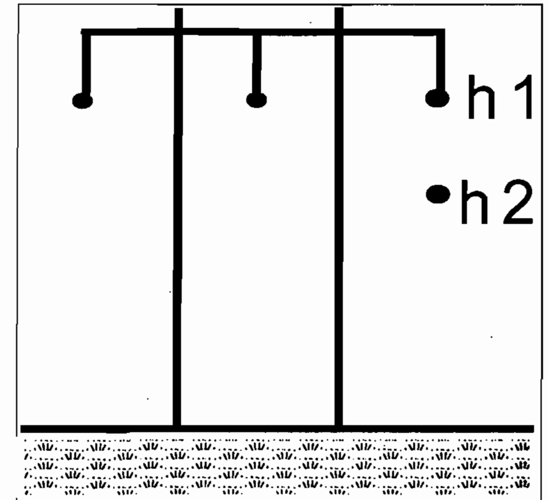
For the purposes of this modeling, a "worst case" determination was made by utilizing the manufacturer's maximum current rating (MCR) for the conductor in conjunction with the worst case temperature/loading combination and the minimum clearance to earth. This overstates the current loading for the line segments since the City designs the loading on transmission lines to be below the manufacturer's MCR. In all cases, the lines are constructed and will be reconductored to meet the applicable sections of the National Electrical Safety Code (ANSI C-2; 1992). Considering that transmission lines are seldom, if ever, operated at the City's maximum design current rating, much less the manufacturer's maximum current rating (the worst-case condition assumed for purposes of modeling), the actual electric and magnetic field levels actually experienced along these transmission lines will be well below the calculated results. The following cases were modeled for the electric and magnetic fields to show the potential change in field strength from the existing to the future conductors and operations:

- 4/0 copper - 380 amps MCR - H frame structure (horizontal configuration): represents existing conductor and operations for segments 1A & 2A.
- 477 ACSR - 640 amps MCR - H frame structure (horizontal configuration): represents future conductor and operations for segments 1A and 2A.

The results of the modeling cases are depicted in Figures 6.2.4-1 and 6.2.4-2.

The modeling results show that for all locations within the rights-of-way, both the maximum identified electric field and the maximum identified magnetic field for the reconductored transmission lines will be well below the maximum allowable field intensity at the edge of right-of-way limits established in Rule 62-814 F.A.C.





h1 = 41 feet
h2 = 29 feet (477 ACSR)
19 feet (4/0 Copper)

— 4/0 - Existing
···· 477 ACSR - Future

NOTE: Modeled worse case values. Actual values are likely to be lower.
0 -- Center of Structure
SOURCE: CITY OF TALLAHASSEE, 1997

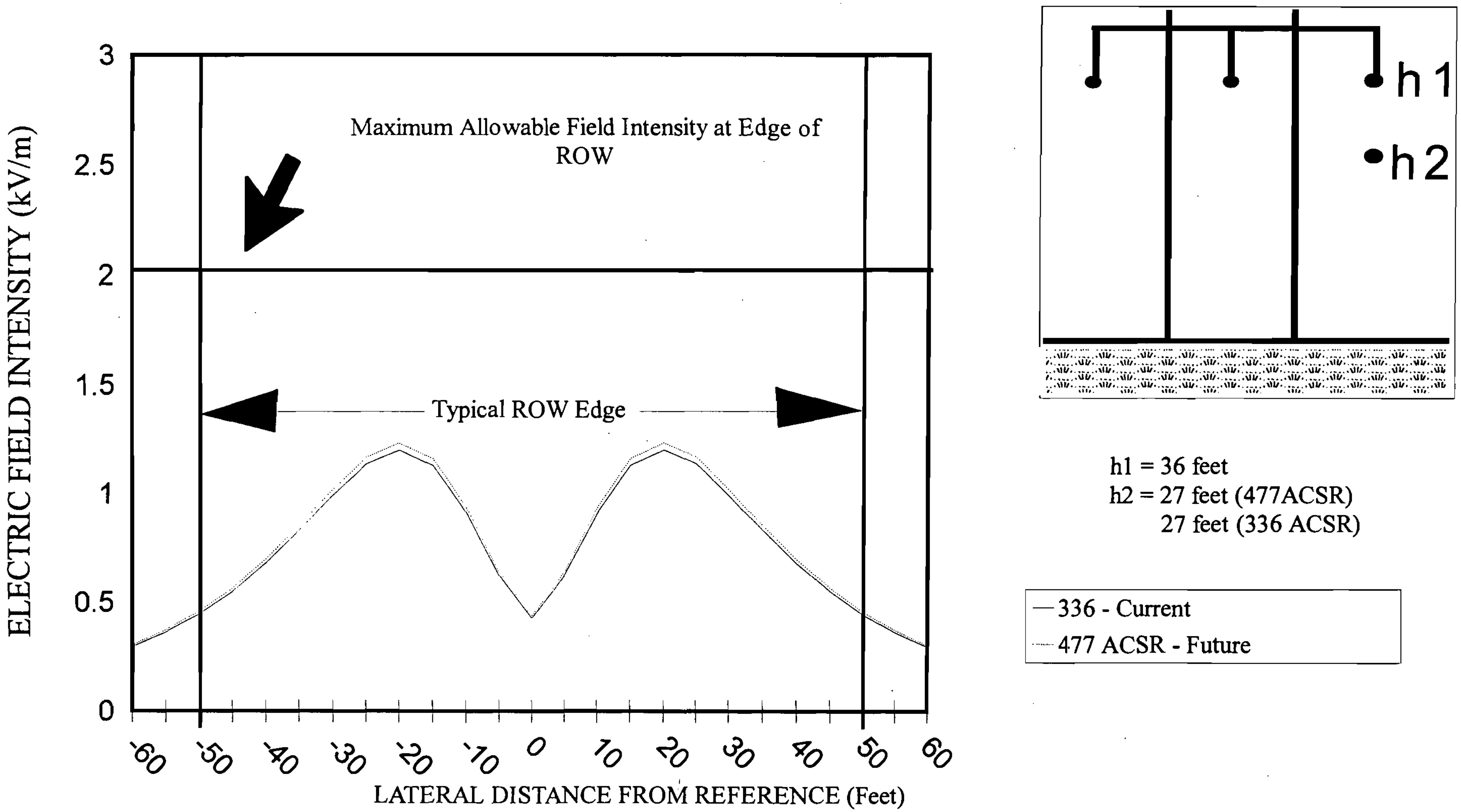
h1 -- height of conductor attachment to structure
h2 -- minimum conductor height

CITY OF TALLAHASSEE

LINES 1A AND 2A
H-FRAME STRUCTURES
MAGNETIC FIELDS
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure
6.2.4-1

PLOT DATE MAR 4, 1997 C:\15840002\----\00000-27.DWG



NOTE: Modeled worse case values. Actual values are likely to be lower.
0 -- Center of Structure
SOURCE: CITY OF TALLAHASSEE, 1997

h1 -- height of conductor attachment to structure
h2 -- minimum conductor height

CITY OF TALLAHASSEE

LINES 1A AND 2A
H-FRAME STRUCTURES
ELECTRIC FIELDS
PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 6.2.4-2

6.2.4.2 Transmission Line Maintenance

Maintenance of the City's transmission system consists of right-of-way maintenance and structure/line maintenance. Right-of-way mowing is performed annually and tree trimming is completed on a "cyclic" basis targeted at maintaining 20 foot clearance from the conductors in all directions. No broadcast application of herbicides is utilized; however, tree stumps are treated with a cut stump herbicide (currently Garlon 4) to prevent resprouting. Transmission line maintenance involves aerial inspection quarterly, inspections after major storms, and climbing inspections of each line every four years. Repairs of any structures or lines are performed during periods of off-peak loads.

The proposed reconductoring of the transmission lines will not require the City to alter its maintenance practices.

6.2.5 References

FDEP (Florida Department of Environmental Protection). 1997. Letter from Hamilton S. Oven, P.E., Administrator, Siting Coordination Office. January 27, 1997.

6.3 NATURAL GAS PIPELINE LATERAL

6.3.1 Project Introduction

Fuel for the Purdom 8 Project will be brought to the site from an existing natural gas pipeline lateral of the Florida Gas Transmission Company (FGT). It may be necessary for FGT to make some improvements at the existing lateral to provide gas at the required pressure to support Unit 8 at the Purdom Station under all ambient conditions. These improvements include a hot tap connection of the lateral to FGT's 36-inch main line and a hydrostatic testing of the existing lateral to certify it for the increased pressure. There is also a potential for increasing the existing lateral size or installing a "loop" on a portion of the existing lateral. A "loop" is essentially a parallel pipeline which is installed along an existing pipeline in order to decrease the overall pipeline system resistance and allow more gas to flow through the line. Any pipeline lateral upgrade permitting process would be separate from the Purdom 8 Site Certification process and would be performed by FGT. Hence, only a summary of potential lateral upgrade environmental effects is presented here.

6.3.2 Existing Right-of-Way

The existing pipeline extends south of US 319 and follows SR 363 on the east side and terminates at the Purdom facility. The existing pipeline passes through rural areas of Woodville and Wakulla, which contain residential (low density) areas, industrial areas, forested wetlands, and forested uplands (hardwood-conifer mixed). There are two meter stations south of US 319.

FGT may install a "loop" of about three miles in length along the lateral in an area between the meter station and the Purdom site. This "loop" is expected to be within the existing pipeline right-of-way, but its exact location has not been determined. It is the preference of the City of Tallahassee to have this structure along the existing pipeline south of US 98. This location of the "loop" will be in areas where minimal environmental impacts are likely to occur. As noted previously, permitting of this feature will be undertaken by FGT.

6.3.3 Construction Methods

The pipeline facilities will be designed, constructed, operated, and maintained in accordance with the U.S. Department of Transportation (DOT) regulations, *Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards*, *Guidelines to be Followed by Natural Gas Pipeline Companies in the Planning, Clearing, and Maintenance of Rights-of-Way and the Construction of Aboveground Facilities*, and other applicable federal and state regulations.

Prior to initiating any construction-related activities, FGT would survey the route within the existing right-of-way. Construction would occur in an existing right-of-way; the contractors would require minimal clearing.

If the "loop" is off of the Purdom site, FGT may install temporary bridges or culverts across creeks and ditches on the working side of the right-of-way. These features will not be encountered if the "loop" is on site.

Trenching includes excavation to provide a trench of specified width and depth for the pipe. Trenching would be completed using ditching machines, backhoes, or in some instances draglines. Hand digging may be used to locate and cross under buried utilities.

After ditching is complete, pipe sections would be strung along the trench, bent to fit the contour of the trench, aligned, welded together, and placed on temporary supports along the edge of the trench. The welded sections of pipe would then be lowered into the trench and the trench would be backfilled with previously excavated soil. Backfill would be compacted to avoid potential subsequent settling that could leave surface depressions.

Markers showing the location of the loop would be placed at fence crossings and road crossings. These markers would identify the owner of the pipeline and would contain emergency information. Special markers to provide information and guidance to aerial patrol pilots would also be erected.

As much restoration as possible would be accomplished during backfilling and grading operations. Grading would be performed in such a manner as to minimize effects on natural drainage. The pipeline would be hydrostatically tested to ensure its capability of withstanding the operating pressure for which it was designed.

6.3.4 Environmental Effects

The loss of rare, threatened, or endangered plant and animal species is not expected to occur. Vegetation along the right-of-way does not provide viable wildlife habitat. There would be only minimal clearing of the rights-of-way, thus minimal adverse effect on natural habitats. There would be no additional or expanded gas meter stations that would otherwise require more clearing.

The route follows existing rights-of-way. Disturbance to human populations is expected to be minimal. The short duration of construction activities in any given location should minimize any inconveniences due to noise, traffic, and fugitive dust. During the earthwork operation, dust control measures would be in force and would typically require moisture conditioning of the soils in the excavation and compaction areas.

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CHAPTER 7

ECONOMIC AND SOCIAL EFFECTS OF PROJECT CONSTRUCTION AND OPERATION

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7.1 SOCIOECONOMIC BENEFITS

Due to the limited availability of goods and services, the economic impact of the Project in Wakulla County is likely to be small. Except for the short-term impact on eating and drinking establishments and temporary housing during the construction phase of the Project, most goods and services supportive of power plant construction and operation will probably be purchased in Leon County and elsewhere. Leon County is, by far, the dominant economy of the region. For example, employment in Leon County in 1990 was almost 15 times greater than in Wakulla County. While jobs, goods, and services are more abundant in Leon County, Wakulla County is prized for its natural qualities and recreational amenities which are appreciated and used by residents of Leon and other surrounding counties. In addition, many Wakulla County residents hold jobs in Leon County. Over 60 percent of the Wakulla County workforce is estimated to commute to Tallahassee to work. Consequently, there exists a complementary relationship between Leon County, as the economic center of the region, and surrounding counties, including Wakulla, where a more natural, less developed rural environment is enjoyed by residents and visitors alike.

Accordingly, the City of Tallahassee has committed, with the Purdom Unit 8 Project, to spend significant Project resources not only to avoid adversely impacting the environment at the Purdom Station, but to improve it. By eliminating wastewater and reducing cooling water discharges to the St. Marks River, maintaining air quality, and improving the aesthetics of the Purdom Station along the St. Marks River shoreline, the Project will protect and enhance the chief economic asset of Wakulla County, its natural beauty and environmental character.

The economic impact analysis presented below focuses on the impact of Project construction on the local economy (i.e., the City of St. Marks and Wakulla County) and the long-term impact of the Project on the City of Tallahassee's fiscal resources. The long-term impact on the local economy will be to maintain employment at the Purdom Station at a higher level than would have occurred without the Project. Although some of the impact of the Project's construction phase is expected to be felt in Leon County, the magnitude of that impact relative to the Tallahassee economy is expected to be small.

For purposes of calculating the magnitude and distribution of the economic impacts of Project construction and operation, the following assumptions were made:

- Construction labor is expected to be drawn primarily from north Florida in the area between Tallahassee and Jacksonville. Union locals from which Raytheon Engineers & Constructors will requisition craftsmen are located in Jacksonville for most trades. The only exceptions are laborers, who will be drawn from a local in Orlando; electricians, who will be dispatched from a Gainesville local; and pipefitters, who will be dispatched from a Tallahassee local.
- Throughout the construction period, about half the construction craft workers are expected to commute daily to the Purdom Station from their current residences. The other half are expected to commute weekly to temporary residences in the City of St. Marks and Wakulla County. Based on the crafts that will be on site at the peak of construction

and their dispatch locations, the split is expected to be about 60 percent commuting daily and 40 percent commuting weekly.

- Approximately 15 construction management personnel will be assigned to the Project for the duration of the construction period. Those workers will likely relocate to Tallahassee and commute daily to the Purdom Station from Tallahassee.
- Due to the relatively low unemployment rate in Wakulla County, any new indirect jobs created during the Project's construction phase are expected to be filled by newcomers to the area (or by local residents who leave jobs that are then filled by newcomers). Therefore, the construction activity will likely attract new residents to Wakulla County; however, since the economic activity is temporary, the increase in population could also be temporary.
- Job retention at the Purdom Station is a long-term beneficial impact of the Project. However, since these jobs are already filled, there will be no population impact from the direct or indirect jobs associated with Project operation.
- The households of the Purdom Station employees whose jobs are retained after Unit 8 is operational will be geographically distributed according to the same pattern as the households of the current facility work force. Again, there will be no population impact from the direct or indirect jobs associated with Project operation.

Social and economic benefits of the Purdom Unit 8 Project include the following:

- Potential cost savings to City of Tallahassee electric customers
- Potential increases in City of Tallahassee revenues
- Increased St. Marks and Wakulla County revenues
- New construction jobs and payroll
- Retention of jobs and payroll at the Purdom Station
- Indirect effects of new and retained jobs and payroll spending
- Increased spending on goods and services during Project construction and operation

The following sections describe these benefits in greater detail and present estimates of their magnitude and duration.

7.1.1 Benefits to Electric System Ratepayers and/or City of Tallahassee Residents

The Purdom Unit 8 Project will increase the efficiency of the City of Tallahassee's electric system and result in cost savings. These cost savings can be used to reduce electric rates or increase the amount of the transfer of electric system revenues to the City of Tallahassee General Fund. No determination has yet been made as to the disposition of the projected cost savings. That decision will be made by the Tallahassee City Commission sometime in the future. For purposes of projecting ***potential*** benefits to electric system ratepayers and/or residents of the City of Tallahassee, the following analysis assumes, on the one hand, that 100 percent of the cost savings will be used for electric rate reduction, and, on the other hand, that 100 percent of the cost savings will be treated as excess revenues, allowing an increase in the contribution to the General Fund for enhanced municipal services, reduced taxes, or both.

Cost savings in the first year of operation of Purdom Unit 8 (2001) are estimated at about $12 million over the previous full year without the Project. If 100 percent of the cost savings were applied to rate reduction and evenly distributed among all classes of customers, the average residential customer could expect up to an 11 percent reduction in his or her monthly bill.

In fiscal year 1996 (ending September 30, 1996) the City electric system generated approximately $35.5 million for the General Fund. This amounted to approximately 35 percent of the total revenues for general government services including police and fire protection, parks and recreation, etc. Electric system revenues are vitally important to the City of Tallahassee since 55 percent of the property within the City limits is government-owned and, therefore, tax-exempt.

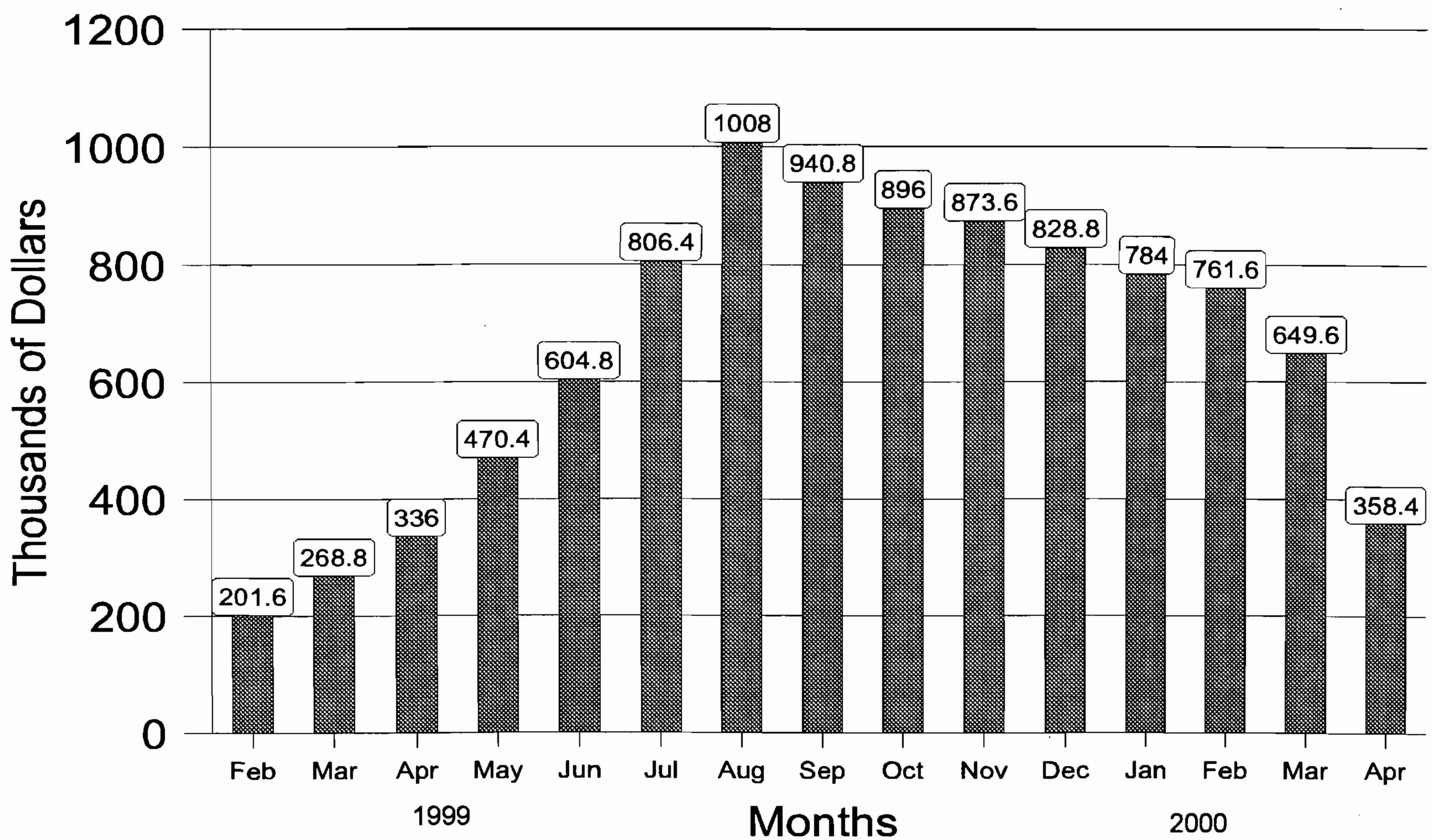
Assuming 100 percent of the cost savings from implementation of the Purdom Unit 8 Project goes to increase electric system revenues, the contribution to the General Fund could increase by about 24 percent over 1996 levels, or about $8.5 million in 1996 dollars.

7.1.2 Temporary and Permanent Jobs

The estimated direct construction employment by month during the period from February 1999 through April 2000 is shown on Figure 4.10-1. The average direct employment during construction is estimated at 160 workers, with the peak employment of 240 occurring in the third quarter of 1999. Using Regional Input-Output Modeling System (RIMS II) multipliers available from the U.S. Department of Commerce for a two-county area consisting of Leon and Wakulla Counties, it is estimated that 0.7378 indirect jobs will be created for every direct construction job. Therefore, on average, there will be approximately 118 indirect jobs during the 1999-2000 construction period. The industries in the two-county area likely to benefit most from this temporary employment increase include retail and wholesale trade, business services, health services, miscellaneous services, and eating and drinking places.

As shown on Figure 7.1.2-1, direct construction payroll is estimated at over $7.2 million during 1999 and about $2.6 million during the first quarter of 2000. (All payroll values are presented in nominal dollars.) According to the RIMS II, earnings associated with the indirect jobs in Wakulla and Leon Counties are expected to amount to approximately $6.6 million in 1997 dollars.

Employment at the Purdom Generating Station will actually be reduced with the installation of Unit 8 because of the coincident retirement of Units 5 and 6. Currently, about 50 people are employed at Purdom Generating Station. After Units 5 and 6 are retired and Unit 8 is operational, employment at the station is expected to be about 37. However, this 37-person work force will be larger than it would be if Unit 8 were not built (i.e., about 12 jobs will be saved as a result of the Project). Payroll at the station after Unit 8 is operational will be nearly $1.8 million per year (2001 dollars).



Source: Raytheon Engineers & Constructors, 1996. Moore/Bowers, 1997.

CITY OF TALLAHASSEE	ESTIMATED PAYROLL BY MONTH IN NOMINAL DOLLARS PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA	Figure 7.1.2-1

7.1.3 Sales Revenues

Construction purchases in the two-county area on hardware, small parts, lumber, and other similar supplies are conservatively estimated at $300,000 over the construction period. During 1996, the Purdom Generating Station purchased approximately $10,500 in goods and services from local businesses in Wakulla County. After Unit 8 is constructed, these purchases can be expected to decrease somewhat due to the fact that older facilities at the station will be replaced by newer facilities, requiring fewer of the type of small repairs which required spending in 1996. Also, with fewer personnel, spending on things like food and gasoline is likely to be a little less.

7.1.4 Government Revenues

Because of the tax-exempt status of the Purdom Generating Station, no property tax revenues are or will be generated from the facility. The City of Tallahassee and/or the construction contractor, Raytheon Engineers & Constructors, can be expected to pay some fees for services provided by the City of St. Marks and Wakulla County during the construction and operation of Unit 8. These fees will include charges for process water supplied by the City of St. Marks and building permit fees and payments for disposal of construction debris to Wakulla County.

Incremental increases in demand for municipal services such as law enforcement, fire protection and emergency medical services, ambulance service, and growth management may be expected because of the Project. The estimate of costs for these services is discussed in Section 7.2.

The City of Tallahassee will also donate its water tower at the Purdom Station to the City of St. Marks to enhance that city's water storage capabilities.

7.2 SOCIOECONOMIC COSTS

7.2.1 Temporary External Costs

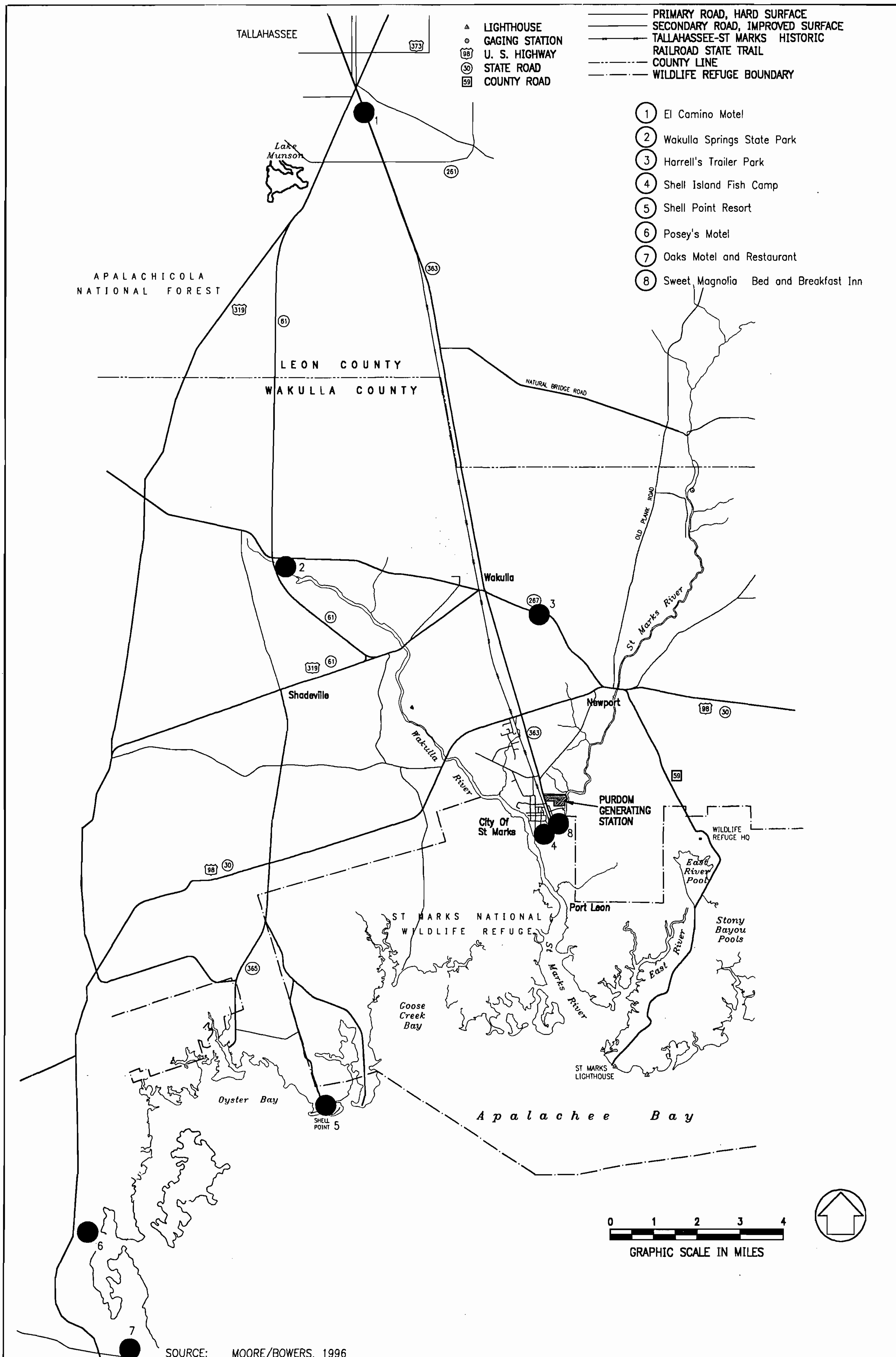
The average number of construction workers seeking temporary housing near the Purdom Station is estimated at 80. At or near the peak of construction, this number will probably be no greater than 110 to 120. The location of lodgings in and around the City of St. Marks is shown on Figure 7.2.1-1. According to a survey of seven motels and trailer parks in the area, the number of existing units is 164, and average year-round occupancy rates ranged from 15 to 95 percent. Considering those factors, it is estimated that about 60 units would be available for rental by the Purdom Unit 8 construction workers (see Table 7.2.1-1). Although there may be a shortage of temporary housing in the immediate vicinity of the Purdom Station, the 1996 Florida Statistical Abstract reports 18,812 apartment units and 24,710 hotel and motel units in Leon County. Therefore, no actual shortage of housing is expected.

TABLE 7.2.1-1
TEMPORARY HOUSING AVAILABILITY
IN ST MARKS AND VICINITY

Establishment	Total No. of Units	Avg Year-Round Occupancy Rate	No. of Units Available
Shell Point Resort Shell Point Road & Hwy 98, Shell Point	26 rooms	65% full	9
Shell Island Fish Camp Shell Island Road, St. Marks	24 rooms 4 cabins	80% full	5
El Camino Motel 3705 Woodville Hwy, Tallahassee	27 rooms	43% full	15
Oaks Motel & Restaurant 52 Coastal Highway, Panacea	19 rooms	62% full	7
Harrell's Trailer Park Near SR 267 and SR 363	5 Trailers	95% full	0
Posey's Motel US 98, Panacea	25 rooms	80% full	16
Wakulla Springs State Park SR 267 and CR 61	27 rooms	80% full	5
Sweet Magnolia Bed & Breakfast 803 Port Leon Drive, St. Marks	7 rooms	15% full	6
TOTAL	164	—	63

Source: Moore/Bowers, 1997

As indicated in Section 4.6.1, no roadway improvements are expected to be required to accommodate the construction traffic. Other public service fees and costs expected to be paid or incurred during construction of Unit 8 at the Purdom site include those for police protection, fire protection and emergency medical services, ambulance service, building inspection, solid waste disposal, and growth management. The following are hypothetical estimates of service



CITY OF TALLAHASSEE

LOCATIONS OF LODGINGS IN ST MARKS AND VICINITY
1" = 2 MILES

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 7.2.1-1

requirements attributable to the construction of the Purdom Unit 8 Project. They are intended to provide an order of magnitude estimate of short-term public service costs and fees. For example, estimates based on the full construction worker population as a percentage of the residential population of Wakulla County or the City of St. Marks are conservatively high since only about half the construction work force is expected to relocate and become temporary residents of Wakulla County.

- Police - Additional police services may be required due to the presence of the construction work force. Based on the 1996 calls for service to the Wakulla County Sheriff's Office and the budget for FY 1997, the average cost of a call for service was about $135. The number of calls for service, 23,881, in relation to the population of Wakulla County suggests a factor of 1.4 calls per person. Based on an average of 160 construction workers throughout the construction period, calls for police service may be expected to increase by about 224 per year times the duration of the construction period, which is 1.25 years, for a total cost of $37,800.

- Fire Protection and Emergency Medical Services - A similar methodology was used to estimate the cost of fire protection and emergency medical services during construction. No fire calls are expected at the station based on past history and the on-site safety features and fire fighting capability at Purdom Station. The City of St. Marks Volunteer Fire Department serves a population of about 1,000 and made 145 runs in Fiscal Year 1996. Based on the population of the service area, this amounted to 0.145 runs per person. With the average increase in population associated with the construction work force, fire runs can be expected to increase by 23 per year. At a cost of $147 per run, this cost would amount to about $3,400 per year, or about $4,200 for the entire construction period.

- Ambulance Service - Raytheon's accident history on similar construction projects was used to project the need for ambulance service during the construction of Purdom Unit 8. A first-aid station will be maintained on site to handle minor injuries. Based on Raytheon's experience, about one incident per month will require off-site medical treatment. At a cost of $680 per ambulance run, this cost would amount to approximately $10,200.

- Building Inspection - The City of St. Marks relies on Wakulla County for building inspection. Based on the square footage of buildings to be constructed (as opposed to the installation of power generating equipment) for Purdom Unit 8 and the Wakulla County schedule of permit fees, it is estimated building inspection costs could amount to approximately $1,300. Electrical and plumbing inspection fees are estimated at $900.

- Growth Management - Due to the fact that motels and trailer parks in the vicinity of St. Marks are insufficient to accommodate all the construction workers likely to seek temporary housing, new development may be proposed to capture a share of that temporary housing market. Based on the Wakulla County Planning Director's estimate of time spent on zoning and development review matters within the Wakulla County Planning Department, the estimated cost of a zoning case is $1,100. Assuming the Project will generate one new zoning case in Wakulla County, project-related costs for growth management could amount to $1,100.

- Solid Waste Collection and Disposal - During construction, the Project will require collection and disposal of office type waste and construction debris. Office waste will be collected by a private contractor. The estimated cost of collection and disposal of construction debris by Wakulla County is $3,700.
- General Administration - For an estimate of general administrative costs, a factor was developed using the county administration plus county commission budget as a percentage of the total budget for Fiscal Year 1997. That factor, approximately 4 percent, was applied to the total estimated cost of services that could be provided by Wakulla County. Using this method, the estimated project-related cost for general county administration in Wakulla County is $2,400.

In the City of St. Marks the cost of government per capita in Fiscal Year 1997 is approximately $283. Using this factor and counting the full construction work force as new residents of St. Marks, the cost of government could increase by about $41,500 in 1999 and by about $15,100 in 2000.

The total estimated costs of public services and facilities during Project construction, based on the methodology outlined in the paragraphs above, is approximately $61,600 for Wakulla County and $56,600 for the City of St. Marks.

7.2.2 Long-Term External Costs

7.2.2.1 Land Use and Demographics

Long term social and economic costs associated with Project operation will be minimal due to the fact that the Project consists of the installation of a new, efficient, natural gas fired unit at an existing generating station. There will be no changes in land use and no increase in population since employment at the Purdom Station will actually decline from about 50 persons to 37. However, since the population of the City of St. Marks is estimated to have declined from 1990 to 1995, the continued viability of the Purdom Station may have a long-term beneficial impact on the community by helping to stabilize employment and demographic trends.

7.2.2.2 Public Services and Facilities

Long-term continuing impact on public facilities and services is limited to costs incurred to upgrade the City of St. Marks water system to supply the new unit at the Purdom Station with back-up process water. There will be no other long-term costs to local government because there will be no increase in permanently employed workers at the Purdom Station.

Purdom Unit 8 will depend on the City of St. Marks water system for back-up process water supply. The incremental capital cost for system improvements necessary to provide the back-up water supply is estimated at $25,000 to $35,000, to be paid by the City of Tallahassee as part of the Purdom Unit 8 Project. In addition, the City of Tallahassee will be billed for water actually used. Current water rates are $15 for the first 6,000 gallons and $1.15 per 1,000 gallons over

6,000. Water will be stored on site at Purdom Station for use when the unit is run on diesel fuel. Since this is likely to occur only for short durations, the City of Tallahassee would only call on the back-up supply from the City of St. Marks in unusual circumstances. For example, one possible scenario would be similar to the situation that occurred during a winter freeze in 1989. Natural gas supplies were interrupted for three days due to extremely cold weather at the gas fields. Under that scenario, the on-site tank would supply necessary process water for the first day. For the next two days, the City of Tallahassee would draw on the City of St. Marks' back-up process water supply at the rate of 77 gpm. The total bill for this usage, based on current City of St. Marks rates, would be $263.

7.2.2.3 Aesthetic and Scenic Values

With one exception, the changes at the Purdom Station are not expected to significantly impact the visual environment. The new equipment is similar in form and shape to the existing equipment. All new equipment will be located in the existing facility area, set back from the road, property lines and the St. Marks River, and screened by existing vegetation and existing facility equipment from surrounding areas.

The proposed stack height is 200 feet. This is slightly taller than the two existing stacks located to the northeast of the proposed improvements. The following paragraphs present the results of a visual impact assessment, considering the potential opportunity for viewing of the proposed facilities from the St. Marks River.

With the City of Tallahassee committing to reuse the existing Unit 5 and 6 intake structure for the Unit 8 intake, no new intake structure is required. Therefore, there will not be an impact to the recreational use of the river.

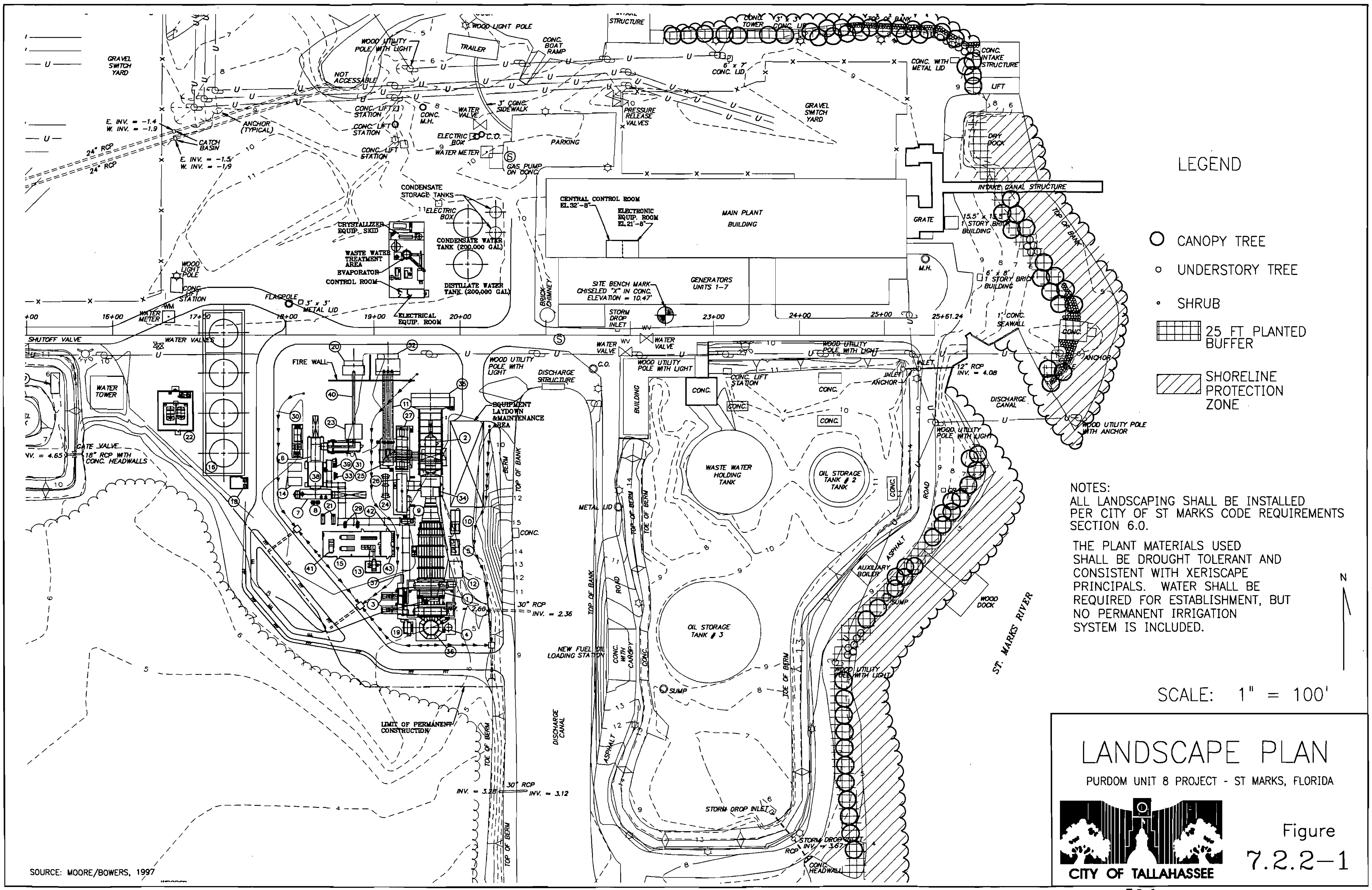
Landscape Description

The Purdom Station site is bounded by industrial uses to the north and south, SR 363 to the west and the St. Marks River and Aucilla Wildlife Management Area to the east. The existing station will be modified to include a new generating unit located between the existing equipment and a wooded area to the southwest. There is an existing forested area, 1,250 to 1,500 feet long (approximately 0.25 mile) and 500 to 650 feet wide, between the Purdom Station site and SR 363. Uses which occur fronting on SR 363 include auto repair, motel, and fuel storage and distribution facilities. Uses to the north and south consist primarily of fuel storage tanks and forested woodlands on either side of the generating station.

Landscape Plan

The landscape plan for the Project is presented in Figure 7.2.2-1. The site is already well buffered with native vegetation along most of its perimeter, including the frontage on SR 363. The only exception is the easterly portion of the north property line.

To further harmonize the Purdom Station with its surroundings and to satisfy any buffering, landscaping and planting requirements of the City of St. Marks, the landscape plan proposes the following:



LANDSCAPE PLAN

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

CITY OF TALLAHASSEE

Figure 7.2.2-1

- To buffer the easterly portion of the north property line: designation of a 10-foot wide buffer and planting of 28 canopy trees, 10 understory trees and 96 shrubs clustered near the St. Marks River to provide the maximum screening effect for recreational users of the River; and
- Planting along the shoreline of the St. Marks River: 43 canopy trees, 11 understory trees, and 114 shrubs in a 25-foot wide strip, 1,141 feet long.

(Note: Landscape quantities were derived based on the City of St. Marks Land Development Code (draft) buffer designs appropriate to this type of use and setting.)

Visual Impact Analysis

<u>Proposed Development Features</u>

The Purdom Station will add one new stack 200 feet in height. The site currently has two stacks, 180 and 125 feet in height. Unit 8 associated buildings and equipment are all expected to be less than 90 feet in height. The planned improvements are located west of existing facility equipment, reducing the visual impact from the St. Marks River, the nearest opportunity for viewing.

<u>Line-of-Sight Determinations</u>

The purpose of this analysis was to determine key viewpoint areas where the proposed Project would be seen, partially seen, and not seen. To determine these areas, line-of-sight drawings were prepared by establishing landscape control points. In order to determine the key viewpoints, the number of times the Project will be observed, the duration of the view, the number of observers viewing the Project, and the distance over which the Project will be seen were considered. Aerial photographs were used as a data source for existing vegetation.

<u>Key Viewpoint Analysis</u>

In addition to viewpoints from the St. Marks River, nearby locations which may have a view of the Project are expected to be limited to industrial use areas. Key viewpoints were determined based on analysis of available land use data and field observations. Prior to the field work, a copy of the Project site plan was superimposed on a current aerial photograph of the site in order to locate key viewpoints. Field observations provided a photographically documented observer's image of the Project site and surroundings from the various key viewpoints. Selected photographs were used in assessing potential visual impacts of the proposed Project on recreationists along the St. Marks River.

The recreationist's view from the St. Marks River east of the Purdom Station was determined to be the worst-case view and a visual simulation was prepared for that key viewpoint. Figure 7.2.2-2 is a photographic simulation of the view of the Project to observers from the worst-case viewpoint along the River. The simulation depicts existing conditions and vegetation with the addition of the Unit 8 improvements. At the time of this writing the existing Purdom Station is undergoing renovation which includes the elimination of a steel structure located along the riverfront. This will be a significant improvement to the visual environment. In addition, the visible structures are anticipated to be screened from view to a large extent along the river upon maturity of a 25-foot-wide landscape buffer. Once the buffer is in place, the view depicted in the

EXISTING CONDITIONS

PHOTOGRAPHIC SIMULATION
(UPON COMPLETION OF PURDOM UNIT 8 PROJECT)

A: DOCK FACILITY (PART OF INDUSTRIAL USE TO THE NORTH)

B: STORAGE TANK (PART OF INDUSTRIAL USE TO THE NORTH)

C: PURDOM GENERATING STATION'S WATER TOWER

D: EXISTING STACK

NOTE: VIEW LOOKING SOUTHWEST FROM ST. MARKS RIVER

SOURCE: RAYTHEON ENGINEERS & CONSTRUCTORS, 1997; MOORE/BOWERS, 1997

CITY OF TALLAHASSEE

PHOTOGRAPIC SIMULATION OF SAM O. PURDOM GENERATING STATION

PURDOM UNIT 8 PROJECT - ST MARKS, FLORIDA

Figure 7.2.2-2

simulation will be visible, primarily for the recreationist heading south on the river, for only a short distance. Since the river curves to the east north of the Purdom Station, a view of the facility is not possible until after the recreationist heads south, reducing the opportunity for viewing.

7.3 REFERENCES

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D. H. Melvin & Associates. 1997. Telephone Conversation between Robert George, Tallahassee, Florida, and A. Moore, Moore/Bowers, Tampa, Florida. January 15, 1997.

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Wakulla County Sheriff's Office. 1997. Telephone Conversation between Major Langston, Crawfordville, Florida, and A. Moore, Moore/Bowers, Tampa, Florida. January 9, 1997.

Wakulla County Community Services. 1996. Telephone Conversation between C. Murray, Crawfordville, Florida, and A. Moore, Moore/Bowers, Tampa, Florida. December 19, 1996.

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CHAPTER 8

SITE AND DESIGN ALTERNATIVES

8. SITE AND DESIGN ALTERNATIVES

This optional chapter is not being submitted as part of the Site Certification Application because it is not anticipated that an Environmental Impact Statement required by the National Environmental Policy Act will be necessary for this Project.

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CHAPTER 9

COORDINATION

LIST OF TABLES

9. COORDINATION

A list of individuals within federal, state, regional, and local government agencies who were contacted to provide input to this Project is presented in Table 9-1.

TABLE 9-1
FEDERAL, STATE, REGIONAL, AND LOCAL GOVERNMENT AGENCY CONTACTS

Date	Agency	Contact	Type of Contact	Subject	Project Representative
11/07/95	City of St. Marks	Mayor and City Manager	Meeting	Project overview	COT
12/05/95	Wakulla County	Commissioner Blanchard, Administrator J. McCue	Meeting	Project overview	COT
05/09/96	City of St. Marks	C. Shields, R. Leclere	Meeting	Overview of project and process	COT
05/15/96	FDEP	B. Oven	Telephone	Project briefing	COT
05/21/96	FDEP; FPSC	B. Oven, S. Palmer, W. Parker-Garvin, A. Rushanan, C. Holladay, A. Linero; L. Colson	Meeting	Overview of project and process	COT
05/22/96	FPSC	L. Colson	Telephone	Cost	COT
06/27/96	City of St. Marks	Commissioners	Meeting	St. Marks issues	COT
06/28/96	USFWS	S. Silva	Telephone	Air quality issues	COT
06/28/96	FGFWFC	Staff	Letter	Scientific collection permit	FWENC
07/02/96	USFWS	J. White, S. Meadows, J. Reinman, J. Fox, V. Urban, R. Will	Meeting	St. Marks National Wildlife Refuge issues	FWENC; COT; RE&C
07/02/96	USFWS	J. White et al	Telephone	St. Marks NWR issues	FWENC; COT; RE&C
07/03/96	USGS	Receptionist	Meeting	List of Publications, Pub. Order Forms	RE&C
07/03/96	FGS	Receptionist	Meeting	List of Publications, Pub. Order Forms	RE&C
07/09/96	USFWS	S. Silva	Telephone	Air quality issues	FWENC
07/10/96	FDEP	John Watt	Telephone	QAPP	COT, RE&C, FWENC
07/11/96	FDEP	Buck Oven	Telephone	QAPP and NPDES Information	COT, RE&C, FWENC
07/11/96	Wakulla County	J. C. Murray, B. Newman	Meeting	Wakulla County issues	COT
07/11/96	FDEP	B. Oven	Telephone	QAPP and NPDES permit information	FWENC
07/12/96	FGIF	C. Mesing	Telephone	St. Marks River Fisheries Collection Methods	FWENC
07/12/96	FDEP	S. Adams	Telephone	Marine Fisheries Collection Permit	FWENC
07/12/96	FGIF	D. Jones	Telephone	Scientific Collection Permit/Collection Methods	FWENC
07/15/96	FDEP	S. Adams	Telephone	Marine Fisheries Collection Permit	FWENC
07/16/96	City of St. Marks; Wakulla County	J. McCue, O. Vick	Meeting	Purdom site visit; effluent data	COT
07/16/96	St. Marks NWR	J. White	Letter	St. Marks NWR Issues	COT
07/18/96	FDEP	S. Adams	Meeting	Obtain Salt Water Sampling Permit	FWENC
07/22/96	FGFWFC	Charles Mesing	Meeting	Electro-shocking	FWENC

TABLE 9-1
FEDERAL, STATE, REGIONAL, AND LOCAL GOVERNMENT AGENCY CONTACTS

Date	Agency	Contact	Type of Contact	Subject	Project Representative
07/26/96	USFS	A. Colaninno, W. Ebaugh, D. Wergowske	Meeting/Follow-up Letter 8/2/96	USFS issues	FWENC; COT
07/26/96	FNAI	Staff	File Review	Protected species occurrence in site region	FWENC
07/29/96	City of St. Marks	C. Shields	Letter	Project Plans	COT
07/29/96	Wakulla Co.	J. McCue	Letter	Project Plans	COT
08/02/96	USFS	A. Colaninno	Letter	Apalachicola NF isues	COT
08/05/96	Wakulla County	Commissioners and Staff	Meeting	Wakulla County issues	COT
08/15/96	City of St. Marks; Wakulla County	O. Vick; J. McCue, E. Mills, C. Murray, R. Merrit (PSG)	Meeting/Follow-up Letter 8/12/96	St. Marks/Wakulla County issues	FWENC; COT; RE&C; HGSS; M/B
08/16/96	FPS	A. Gregory	Telephone & Letter	Outdoor Recreation Plan	M/B
08/19/96	NWFWMD; FDEP	A. Chelette; E. Hemment, D. Cairns, P. Ryan; T. Macmillan; M. Castellanos	Meeting	NWFWMD issues	FWENC; COT; RE&C
08/20/96	ARPC	B. Cambric	Telephone	Maps of regional resources	M/B
08/21/96	St. Marks NWR	J. White	Letter	RARE & Federal designated critical habitat areas	M/B
08/22/96	FDEP	C. Holladay	Telephone	Ambient values; Class I receptors	FWENC
08/23/96	BAR	S. Amiss	Letter	Archaeological landmarks or landmark zones	M/B
08/23/96	NWFWMD	G. Fisher	Telephone	Maps of Save Our Rivers land	M/B
08/23/96	FDEP Bureau of Coastal and Aquatic Managed Areas	L. Nall	Telephone	National estuarine sanctuaries	M/B
08/23/96	Fla Dept of Labor Economic Research	J. Homes	Telephone	Labor Force Summaries	M/B
08/27/96	City of St. Marks	J. Carlson	Telephone	Mailing list	COT
08/27/96	National Resource Conservation Service	Staff	Letter	Soil survey	FWENC
08/28/96	FDEP	R. Cantrell	Telephone	Wetlands jurisdictional determination	FWENC
08/29/96	FDEP	B. Oven	Telephone	Filing fee; associated facilities	HGSS
08/30/96	FDEP	R. Cantrell	Telephone	Wetlands jurisdictional determination	FWENC

TABLE 9-1
FEDERAL, STATE, REGIONAL, AND LOCAL GOVERNMENT AGENCY CONTACTS

Date	Agency	Contact	Type of Contact	Subject	Project Representative
08/30/96	FPSC; FGFWFC; ARPC; USFS; USFWS; City of St. Marks; Wakulla Co.; FDOS; Leon Co.; DCA; FDOT; NWFWMD; FPS	R. Floyd; D. Bailey; C. Blume; A. Colaninno; J. White; O. Vick; J. Carlson; J. McCue; L. Kammerer; P. Alam; P. Darst; S. Whitmire; D. Cairns; J. Jenkins	Letter	Permitting Process Kickoff Meeting	COT
09/04/96	FDEP	C. Holladay	Telephone	Class I receptor information	FWENC
09/05/96	FDOT; NWFWMD; DCA; FPSC; FGFWFC; ARPC; USFS; USFWS; City of St. Marks; Wakulla County: FDOS	S. Whitmire; T. Macmillan; P. Darst; R. Floyd; D. Bailey; C. Blume; W. Ebaugh; J. White; O. Vick; J. McCue; L. Kammerer	Telephone	Permitting Process Kick Off Meeting	COT
09/10/96	FDEP; FPSC; FDOT; ARPC; USFS; NWFWMD; USFWS; FGFWFC; City of St. Marks; Wakulla Cty; DCA; FDOS	B. Oven; R. Floyd; J. Campbell; S. Whitmire; M. Donovan; C. Blume; R. Cambric; W. Ebaugh; E. Hemmert; J. White; R. McCann; C. Shields, C. Daggett; O. Vick; P. Darst; L. Kammerer; T. Bell, F. Wettstein; W. Congdon; J. Mandrup; P. Ralleston; D. Griffin; C. Collette; C. Diltz; A. Linero; M Castello; M. Castellanos; A. Rushanan	Meeting/Follow-up Letters dated 9/10/96 and 9/18/96	Project overview and Preliminary Plan of Study	FWENC; COT; HGSS; M/B
09/10/96	FDEP	R. Hendrickson	Letter	Florida Wild and Scenic Rivers Act	M/B
09/10/96	USFS	D. Wergowske	Letter	Plan of Study/AQ Modeling Protocol	COT
09/10/96	USFWS	E. Porter	Letter	Plan of Study/AQ Modeling Protocol	COT

TABLE 9-1
FEDERAL, STATE, REGIONAL, AND LOCAL GOVERNMENT AGENCY CONTACTS

Date	Agency	Contact	Type of Contact	Subject	Project Representative
09/10/96	FDEP (copies to FDOT, DCA, ARPC, USFWS, Wakulla Co., FDOS, NWFWMD, FGFWFC, USFS, City of St. Marks, Leon Co)	B. Oven	Letter	Plan of Study	COT
09/11/96	Wakulla Co.	J. McCue	Letter	Plan of Study comments	COT
09/11/96	Leon Co.	P. Alam	Letter	Plan of Study comments	COT
09/11/96	Leon Co.	P. Alam	Letter	Plan of Study/AQ Modeling Protocol	COT
09/12/96	FDEP	A. Linero	Telephone	Air Modeling Protocol	COT
09/13/96	FNAI	B. Lenczewski	Letter	Land holdings	M/B
09/13/96	USFWS	J. White	Letter	Upcoming Air Quality Meeting	COT
09/17/96	Fla Dept of Labor Economic Research	S. Patterson	Telephone	Employment Figures	M/B
9/16-17/96	NWFWMD	Library	Review/Copy Documents	Documents	RE&C
9/17/96	City of St. Marks	City Manager	Deliver Letter	Map of City	RE&C
09/18/96	City of St. Marks; Wakulla County	C. Shields; O. Vick	Meeting	Community Open House	COT
09/20/96	NPS	J. Viemont	Telephone	Visibility Modeling	FWENC
09/24/96	Water Resources Data Collection	M. Arnesto	Telephone	Fla waters, aquatic preserves, estuarine sanctuaries	M/B
09/24/96	Wakulla Co Library System	D. Jones	Telephone	Library locations	M/B
09/24/96	Wakulla Co Sheriff's Office	Officer Slater	Telephone	Law enforcement coverage	M/B
09/25/96	FDEP; USFWS; USFS	B. Oven, M. Costello, C. Holladay, W. Leffler, J. Brown, A. Linero, H. Estevez; J. Reinman; E. Porter; W. Ebaugh, D. Wergowske	Meeting	Air quality	FWENC; COT; HGSS
09/27/96	Wakulla Co.	J. McCue	Telephone	Wakulla Co. budget	M/B

TABLE 9-1
FEDERAL, STATE, REGIONAL, AND LOCAL GOVERNMENT AGENCY CONTACTS

Date	Agency	Contact	Type of Contact	Subject	Project Representative
10/02/96	Wakulla Co Community Development	E. Mills	Telephone	Confirm status of data	M/B
10/03/96	FDEP	R. Cantrell	Letter	Wetlands jurisdictional	COT
10/07/96	FDEP	C. Diltz	Telephone	Plan of Study comments	FWENC
10/07/96	FGFWFC	D. Bailey	Telephone	Plan of Study comments	FWENC
10/07/96	USFS	W. Ebaugh	Telephone	Plan of Study comments	FWENC
10/07/96	FDEP	F. Wettstein	Telephone	Plan of Study comments	FWENC
10/07/96	DCA	P. Darst	Telephone	Plan of Study comments	FWENC
10/07/96	FDEP	D. Bickner	Telephone	Details of FDEP Wetlands delineation	FWENC
10/08/96	FDEP	D. Griffin	Telephone	Plan of Study comments	FWENC
10/08/96	St. Marks NWR	J. White	Telephone	Plan of Study comments	FWENC
10/09/96	FDEP	M. Castello	Telephone	Plan of Study comments	FWENC
10/09/96	NWFWMD	T. Macmillan	Telephone	Plan of Study comments	FWENC
10/11/96	City of St. Marks	City Manager	Telephone	Set Up Tour of WWTF	RE&C
10/11/96	DCA	P. Darst	Telephone	Plan of Study comments (noise)	FWENC
10/14/96	FDEP	R. Clarke	Telephone	Plan of Study comments	COT
10/14/96	FDEP	R. Cantrell	Letter	Wetlands jurisdictional	COT
10/15/96	FDEP	J. Brown, P. Comer, J. Holtom	Meeting	Air quality - Title V	FWENC; COT; HGSS
10/16/96	DCA	P. Darst	Telephone	Plan of Study comments	FWENC
10/16/96	FDEP	Fred Noble	Telephone	NPDES Permits	RE&C
10/17/96	City of St. Marks	City Manager	Meeting	Tour of WWTF	RE&C
10/17/96	USFS	D. Wergowske	Telephone	Plan of Study comments	FWENC
10/17/96	FDEP	A. Rushanan	E-mail	Plan of Study comments	FWENC
10/17/96	FDEP	J. Holtom	Letter	Plan of Study	COT
10/18/96	FDEP	Bill Evans/Neil Rogers	Telephone	NPDES Permits	RE&C
10/18/96	FDEP	F. Noble, B. Evans, N. Rogers	Telephone	Potential sources of reclaim/reuse water for cooling tower	RE&C
10/21/96	FDEP	C. Holladay	Telephone	Class I Significant Impact levels	FWENC
10/24/96	FDEP	D. Bickner	Telephone	Scheduling of FDEP site visit	FWENC
10/24/96	USFS	K. Siderits	Fax	Plan of Study comments	FWENC
10/28/96	FDOT	A. Roberts	Telephone	FAA requirements	FWENC
10/28/96	FAA	W. Carpenter	Telephone	FAA requirements	FWENC
10/29/96	FDEP	Rachel Mills/ Joe Hand	Telephone	305b Report	RE&C

TABLE 9-1
FEDERAL, STATE, REGIONAL, AND LOCAL GOVERNMENT AGENCY CONTACTS

Date	Agency	Contact	Type of Contact	Subject	Project Representative
10/31/96	ARPC; Wakulla County	Planning Council Members, J. McCue	Meeting/Follow-up Letter dated 11/15/96	Project briefing	COT
11/01/96	FGFWFC	A. Williams	Letter	Federally Designated Critical Habitat areas	M/B
11/04/96	FDEP	C. Holladay	Telephone	Emissions inventory	FWENC
11/04/96	FDEP	Receptionist	Meeting	305b Report	RE&C
11/06/96	FDEP (copies to FDOT, DCA, USFWS, NWFWMD, ARPC, FGFWFC, FDOS, Wakulla Co., USFS, City of St. Marks, Leon Co.)	B. Oven	Letter	Responses to comments/Final Plan of Study	COT
11/07/96	FDEP	Joe Hand	Meeting	305b Report	RE&C
11/12/96	ACOE	J. Hendricks	Telephone	Corps jurisdictional wetlands determination needs by the project and protocol for implementing the determination	FWENC
11/14-15/96	ACOE	Jacqueline Griffin	e-mail	Data Request	RE&C
11/18/96	SWFWMD	Sid Flannery	Telephone	Reclaimed Water	RE&C
11/19/96	Wakulla Co. Community Development	F. Evans	In Person	Maps	M/B
11/21/96	ACOE	Paul Bradley	Telephone	Data Request	RE&C
11/21/96	FDEP	S. Labie	Letter	QAPP	COT
11/27/96	NWFWMD	S. Barrett	Telephone	Revised printout of well users in Wakulla Co.	FWENC
11/27/96	Wakulla Co Fire/EMS	C. Murray	Telephone	Schedule for public input	M/B
12/96	FDEP-Quality Assurance	A. Tindle	Telephone	QAPP	FWENC
12/03/96	FGFWFC	B. Ftys	Telephone	Critical habitat areas See 11/1/96 Williams	M/B

TABLE 9-1
FEDERAL, STATE, REGIONAL, AND LOCAL GOVERNMENT AGENCY CONTACTS

Date	Agency	Contact	Type of Contact	Subject	Project Representative
12/3/96	FDEP	Trudy Bell	Telephone	Plan of Study	RE&C
12/06/96	FACIR	Kaye	Telephone	Local Govt Financial Information Handbook	M/B
12/06/96	USDOC - Bureau of Economic Analysis	E. Repice	Telephone	RIMS II Multipliers	M/B
12/13/96	FDEP	C. Holladay	Telephone	Emissions inventory/background data	FWENC
12/16/96	USFS	D. Caffin	Telephone	Florida National Scenic Trail	M/B
12/16/96	Wakulla Co Engineering	C. Fleming	Telephone	Solid Waste, Wastewater & Water	M/B
12/17/96	City of St. Marks; Wakulla Co.	O. Vick, C. Shields; E. Mills, Commissioner Nettles	Meeting	St. Marks/Wakulla County issues	FWENC; COT; RE&C; HGSS
12/17/96	FDEP	A. Allen	Telephone	Emissions inventory missing data	FWENC
12/19/96	Wakulla Co. Health Dept	Helen	Telephone	Medical Services	M/B
12/19/96	Wakulla Co.	C. Murray	Telephone	Ambulance service costs	M/B
12/20/96	FDEP	C. Holladay	Letter	Emission inventory	FWENC
12/26/96	City of St. Marks	O. Vick	Telephone	Land Use Map	M/B
12/26/96	FDEP	T. Singleton	Telephone	SWMM Plan Monitoring	RE&C
12/30/96	FDEP	T. Rogers	Telephone	Visibility SIP	FWENC
01/02/97	City of St. Marks	O. Vick	Letter	Volunteer Fire Dept.	M/B
01/06/97	FDEP	T. Egan	Telephone	Air quality monitoring	FWENC
01/07/97	Wakulla Co.	E. Mills	Telephone	Impact fees	M/B
01/07/97	City of St. Marks	O. Vick	Telephone	St. Marks Land Development Code	M/B
01/08/97	USFWS	L. Zussy	Telephone	Hunting status on refuge	FWENC
01/08/97	St. Marks NWR	V. Urban	Telephone	Hunting status on refuge and Aucilla Wildlife Mgmt Area	FWENC
01/08/97	St. Marks NWR	J. Fort	Telephone	Hunting status on refuge and Aucilla Wildlife Mgmt Area	FWENC
01/09/97	FDEP (copies to USFWS, USFS)	B. Oven	Letter	Air quality approach	COT
01/09/97	Wakulla Co. Sheriff	Major M. Langston	Telephone	Public service costs	M/B
01/10/97	Wakulla Co.	S. Burke	Telephone	Public service costs - Wakulla Co. Landfill	M/B
01/10/97	Wakulla Co. Sheriff	K. Day	Telephone	Public service costs	M/B

TABLE 9-1
FEDERAL, STATE, REGIONAL, AND LOCAL GOVERNMENT AGENCY CONTACTS

Date	Agency	Contact	Type of Contact	Subject	Project Representative
01/13/97	Wakulla Co.	J. Ross	Telephone	Public service costs - building permit feees	M/B
01/15/97	FDEP (copies to USFWS, USFS)	B. Oven	Letter	Monitoring exemption request	COT
01/15/97	USFWS	E. Porter	Telephone	Air quality approach	COT
01/15/97	FDEP	C. Holladay	Telephone/Fax	Emission inventory, modelling negative emission sources for PSD	FWENC
01/15/97	City of St. Marks	O. Vick	Telephone	Land development code adoption	M/B
01/15/97	City of St. Marks	O. Vick	Letter	Landscaping ordinances	M/B
01/15/97	Wakulla Co.	E. Mills	Letter	Development fee schedule	M/B
01/16/97	City of St. Marks	O. Vick	Telephone	Service area population	M/B
01/17/97	USDOC, Bureau of Economic Analysis	E. Repice	Letter	RIMS II multipliers - Leon and Wakulla Counties	M/B
01/28/97	Wakulla Co.	S. Burke	Telephone	Solid waste	M/B
01/28/97	Wakulla Co.	E. Mills	Telephone	Land development code & comp plan updates	M/B
01/28/97	City of St. Marks	O. Vick	Telephone	Solid waste collection	M/B
02/19/97	FDEP	C. Holladay	Telephone	Follow-up on Monitoring Exemption Request & Emission Inventory approval	FWENC
02/06/97	FDEP	B. Oven	Telephone	Need application for SCA	FWENC
02/19/97	EPA	J. Touma	Telephone	Use of negative emission rates in the VISCREEN Model	FWENC
02/24/97	USFWS	R. Turner	Telephone	Thermal attractant to manatees from the Purdom site following operation of Unit 8	FWENC

Key:

COT	City of Tallahassee
FWENC	Foster Wheeler Environmental Corporation
HGSS	Hopping Green Sams & Smith
M/B	Moore/Bowers
RE&C	Raytheon Engineers and Constructors

ACOE	U.S. Army Corps of Engineers
ARPC	Apalachee Regional Planning Council
BAR	Bureau of Archaeological Research
DCA	Department of Community Affairs
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
FACIR	Florida Advisory Commission on Intergovernmental Relations
FDEP	Florida Department of Environmental Protection
FDOS	Florida Department of State
FDOT	Florida Department of Transportation
FGFWFC	Florida Game & Fresh Water Fish Commission
FGIF	Florida Game & Inland Fish
FGS	Florida Geological Survey
FNAI	Florida Natural Areas Inventory
FPS	Florida Park Service
FPSC	Florida Public Service Commission
NPS	National Park Service
NWFWMD	NorthWest Florida Water Management District
NWR	National Wildlife Refuge
USDOC	U.S. Department of Commerce
USFWS	U.S. Fish and Wildlife Service
USFS	U.S. Forest Service
USGS	U.S. Geological Service