REQUEST FOR MODIFICATION OF SITE CERTIFICATION PA 74-03

Arvah B. Hopkins Generating Station
Unit 2 Repowering Project

City of Tallahassee
300 South Adams Street
Tallahassee, FL 32301

June, 2006

City of Tallahassee
Your Own Utilities

300 South Adams Street, Box A-2, Tallahassee, Florida 32301, (850) 891-4YOU (4968), talgov.com

June 6, 2006

Hamilton S. Oven, Administrator
Siting Coordination Office
Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Hand Delivered

Re: City of Tallahassee
Arvah B. Hopkins Generating Station
Hopkins Unit 2
Request for Modification of Site Certification
No. PA 74-03

Dear Mr. Oven:

Pursuant to Section 403.516, Florida Statutes, the City of Tallahassee (City) hereby requests a modification of the Site Certification for Unit No. 2 at the City's Arvah B. Hopkins Electric Generating Station (Hopkins). By this request, the City is seeking approval to "repower" the existing, certified Hopkins Unit 2 by retiring the existing oil and gas-fired boiler and installing a new combustion turbine and heat recovery steam generator.

The repowering project will not result in an increase in steam electric generating capacity at the Hopkins site. Therefore, a modification of the site certification is necessary. Detailed information regarding the repowering project is provided in the attached application for modification of site certification. The factual reasons supporting the modification and the anticipated effects of the proposed modification on the City, the public and the environment are addressed in this application.

Enclosed, please find a check in the amount of $10,000 made payable to the Department of Environmental Protection as required under Rule 62-17.293(1)(c)2., Florida Administrative Code.

The City requests that the Florida Department of Environmental Protection (Department) undertake a review of this request for modification by consulting with the other affected agencies. Upon conclusion of that review, the City requests that the Department issue a Proposed Order of Modification for review by the parties and the public, and ultimately, a Final Order granting the requested modification of certification.

The City looks forward to working with the Department and the various agencies that will be involved in reviewing this requested modification. Should you have any questions or concerns regarding this modification request, please do not hesitate to contact me at (850) 891-8851, or Rob McGarrah, Manager of Power Production at (850) 891-5534.

Sincerely,

John K. Powell, P.E.
Interim Environmental and Safety Manager

Attachments

cc: Scott Goorland, Esq., FDEP
Parties to Hopkins Unit 2 Certification
FDEP Bureau of Air Regulation (P.E. Sealed Air Permit)

APPLICANT INFORMATION

Applicant's Official Name _____City of Tallahassee, Florida_________________

Address_____300 S. Adams Street, Tallahassee, Florida 32301______________

Address of Official Headquarters ____Same_______________________________

Business Entity (corporation, partnership, co-operative) _Electric Department,__ _City of Tallahassee____

Names, owners, etc. ____City of Tallahassee______________________________

Name and Title of Chief Executive Officer __Anita Favors Thompson, City Manager

Name, Address, and Phone Number of Official Representative responsible for obtaining certification: _____John Powell, Interim Environmental and Safety_ ________________________Manager_____________________________

________________________City of Tallahassee________________________

________________________Utility Customer and Business Services________

________________________300 South Adams Street____________________

________________________Tallahassee, FL 32301_____________________

________________________850-891-8851____________________________

Site Location (county) ____________Leon______________________________

Nearest Incorporated City _____Tallahassee, Florida____________________

Latitude and Longitude ____30° 27' 17"N 84° 24' 00°W_________________

UTM's Northerly __________3371 km____________________________

Easterly ________________749.5 km___________________________

Section, Township, Range _____Sections 25 and 26, T1N, R2W____________

Location of any directly associated transmission facilities (counties) __None__

Name Plate Generating Capacity______259 MW___________________________

Capacity of Proposed Additions and Ultimate Site Capacity (where applicable) ____________No increase in steam electric generating capacity___________

Remarks (additional information that will help identify the applicant): ____

Licensing Attorney: Douglas S. Roberts
Hopping Green & Sams, P.A.
Post Office Box 6526
Tallahassee, FL 32314
850-222-7500

LIST OF PREPARERS

- City of Tallahassee, Electric Department
- Sargent & Lundy, L.L.C.
- Golder & Associates
- Hopping Green & Sams, P.A.

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KEY TERMS

Key/Term	Description
City	City of Tallahassee, Florida (applicant)
Arvah B. Hopkins Generating Station (Hopkins Generating Station; the Station)	Existing generating facilities consisting of two steam electric units (Units 1 and 2) and four combustion turbine units (Units GT-1 through GT-4)
Hopkins Generating Station Site (Hopkins Site; the Site)	Existing 232-acre site in Leon County, where Hopkins Generating Station is located
Unit 2 Repowering Project (the Repowering Project; the Project)	Retirement of the existing Hopkins Unit 2 steam generating equipment and installation of new combustion turbine(s), heat recovery steam generator(s), and associated facilities
Phase 1 of the Repowering Project (Phase 1 repowering)	Installation of one combustion turbine, one heat recovery steam generator, and associated facilities, forming a 1-on-1 combined cycle configuration
Phase 2 of the Repowering Project (Phase 2 repowering)	Installation of a second combustion turbine and a second heat recovery steam generator, forming a 2-on-1 combined cycle configuration
Hopkins Unit 2 (Unit 2)	Existing Unit 2
Repowered Hopkins Unit 2 (repowered Unit 2; repowered unit)	Unit 2 after completion of Phase 1 repowering
Repowering Project area (Project area)	The area on the Hopkins Site that will be used for construction of new combustion turbine(s), heat recovery steam generator(s), and associated facilities, including construction laydown and parking areas

ABBREVIATIONS AND ACRONYMS

Abbreviation/Acronym	Description
%	percent
°C	degrees Celsius
°F	degrees Fareneheit
µPa	micropascals
AAQS	Ambient Air Quality Standards
AMSL	above mean sea level
ANSI	American National Standards Institute
AOR	annual operating report
API	American Petroleum Institute
ARPC	Apalachee Regional Planning Council
BACT	Best Achievable Control Technology
BMP	Best Management Practices
BPIP	(EPA's) Building Profile Input Program
CAA	Clean Air Act
CEMS	continuous emission monitoring system
CFR	Code of Federal Regulations
cfs	cubic feet per second
CN	Curve Runoff Number
CO	carbon monoxide
CO_2	carbon dioxide
COT	City of Tallahassee
CTG	combustion turbine generator
dB	decibel
DHR	Division of Historical Resources
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
FAA	Federal Aviation Administration
FD	forced draft

Abbreviation/Acronym	Description
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FFWCC	Florida Fish and Wildlife Conservation Commission
FGD	flue gas desulfurization
FGT	Florida Gas Transmission
FLUCFCS	Florida Land Use, Cover and Forms Classification System
FM	Factory Mutual
FPSC	Florida Public Service Commission
FRP	fiberglass reinforced pipe
ft^2	square feet
GE	General Electric
GIS	Global Information System
gpd/GPD	gallon(s) per day
gpm/GPM	gallon(s) per minute
GT	gas turbine
H_2SO_4	sulfuric acid
HAP	hazardous air pollutants
HHV	high heating value
HRSG	heat recovery steam generator
hz	hertz
ID	induced draft
IRP	integrated resource planning
JCAHO	Joint Commission on Accreditation of Healthcare Organizations
km	kilometer
km/hr	kilometer per hour
kV	kilovolt
kWh	kilowatt hours
lb/hr	pound per hour
LCEMS	Leon County Emergency Medical Service
L_{eq}	equivalent sound pressure level
LOS	levels of service

Abbreviation/Acronym	Description
LPG	liquefied petroleum gas
m	meter
MACT	Maximum Achievable Control Technology
MCFH	million cubic feet per hour
MGD	million gallons per day
mph	miles per hour
MSA	(Tallahassee) Metropolitan Statistical Area
MSL	mean sea level
MW	megawatt
MW-hr	megawatt-hour
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NO_X	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NSPS	New Source Performance Standards
NWA	National Wilderness Area
NWFWMD	Northwest Florida Water Management District
NWS	National Weather Service
O_2	oxygen
O_3	ozone
PM	particulate matter
PM_{10}	particulate matter 10 microns or less
POD	point of discharge
ppm	parts per million
ppmvd	parts per million volume dry
ppmvw	parts per million volume wet
PPSA	Florida Electrical Power Plant Siting Act
PSD	Prevention of Significant Deterioration

Abbreviation/Acronym	Description
psig	pounds per square inch gauge
RCRA	Resource Conservation and Recovery Act
ROW	right-of-way
SCR	selective catalytic reduction
SELS	Severe Local Storms
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SO_2	sulfur dioxide
SPL	sound pressure level
TLCGIS	Tallahassee-Leon County Geographic Information System
TPY	tons per year
TTN	Technical Transfer Network
ug/m^3	micrograms per cubic meter
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geolographical Survey
UTM	Universal Transverse Mercator
VFD	Volunteer Fire Department
VOC	volatile organic compounds
WMA	Wildlife Management Area

1.0 INTRODUCTION

1.1 BACKGROUND

The City of Tallahassee (City) has determined that in order to continue to provide reliable, cost-effective, and environmentally friendly service to its electric customers, the conversion of the City's Arvah B. Hopkins Generating Station Unit 2 (Unit 2) from a conventional steam-generating unit to a combined cycle generating unit is warranted. This repowering of Unit 2 will result in an improvement in fuel efficiency (heat rate) for Unit 2 of approximately 30% as compared to its current design. The repowering will be accomplished by retiring the existing Unit 2 boiler and auxiliaries, and repowering the existing steam turbine generator with "F" class combustion turbine generators and heat recovery steam generators. The existing Unit 2 steam turbine generator and auxiliaries will be utilized, demonstrating that there will be no increase in steam electric generation at the facility.

The repowered Unit 2 will have an immediate and positive impact on the City's ability to provide reliable, cost-effective, and environmentally sound electric utility service. As a result of the 30% improvement in unit efficiency, the City has projected fuel cost savings in the range of $12 to $24 million per year depending upon the cost of natural gas. The repowered unit will be capable of utilizing either natural gas or No. 2 distillate fuel oil (diesel oil) as its fuel source. While the primary fuel is anticipated to be natural gas, the dual fuel capability will allow for the unit to continue to operate on diesel oil during periods in which it is less expensive than natural gas or when natural gas is unavailable. While the primary justification for the Repowering Project is the immediate fuel cost savings, the City's customers will also benefit from a modest increase in non-steam electric generating capacity and a significantly improved environmental signature for the facility.

Since the Repowering Project will convert an existing steam generating unit to a combined cycle generating unit, there will be an overall benefit to the environment. This is due to the advanced technology associated with the "F" class combustion turbine and the environmental controls being proposed for the Repowering Project. As a result of using advanced technology and an existing power plant site with existing infrastructure, there will be no significant adverse impacts to the environment as a result of this Repowering Project. The benefits include, but are not limited to the following:

- Decrease in permitted air pollution emission rates while increasing the unit output.
- Decrease in actual annual emissions of nitrogen oxides (NO_X) and sulfur dioxide (SO_2).
- Approximately 30% reduction in fuel used per megawatt of electricity generated.
- No significant changes in the water use or wastewater discharge from the Hopkins Station.

As discussed more fully in this application, the Unit 2 repowering can be accomplished in two phases. Phase 1 will repower Unit 2 to a 1-on-1 combined cycle unit and Phase 2 will repower Unit 2 to a 2-on-1 combined cycle generating unit. At this time, the City is seeking approval for the Phase 1 repowering and certain common features that will also support the Phase 2 repowering. Phase 2 will be addressed in future submittals.

The Hopkins Generating Station, exclusive of Unit 1 and combustion turbine Units GT-1 and GT-2, is currently licensed under Site Certification PA 74-03 in accordance with the Florida Electrical Power Plant Siting Act (PPSA) and Chapter 403, Part II, Florida Statutes. This application for modification to the Site Certification is being filed with the Florida Department of Environmental Protection (FDEP) as the lead agency for coordination of the siting process. Since there will be no change in steam electric capacity associated with this Repowering Project, there is no requirement for the City to file a Need for Power Application with the Florida Public Service Commission (FPSC) nor is there a need to obtain a new Site Certification under the PPSA.

1.2 THE APPLICANT

The City of Tallahassee is a municipal corporation that 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 all its utilities is to provide reliable, cost-effective, and environmentally sound service to its customers. The City has been in the electric utility business since 1902 and is one of over 2,000 Public Power utilities in the U.S.

The City currently serves approximately 106,000 customers located within a 221-square mile service territory. The City has two fossil fuel generating stations, each of which contain both steam and gas turbine electric generating facilities, and one hydroelectric generating facility. In addition to these facilities, the City has an 11 MW firm power contract with Progress Energy Florida. Together, these power supply resources provide approximately 757 MW (net) of summer capacity. Table 1.2-1 below outlines the current information of the City's electric generating facilities.

Table 1.2-1 Current Electric Generating Facilities Owned by the City of Tallahassee (February 2006)

Plant	Unit	Type	Summer Net	Winter Net
Sam O. Purdom	7	Conventional Steam	48	50
	8	Combined Cycle	233	262
	GT-1	Simple Cycle Combustion Turbine	10	10
	GT-2	Simple Cycle Combustion Turbine	10	10
Arvah B. Hopkins	1	Conventional Steam	76	78
	2 *	Conventional Steam	228	238
	GT-1	Simple Cycle Combustion Turbine	12	14
	GT-2	Simple Cycle Combustion Turbine	24	26
	GT-3	Simple Cycle Combustion Turbine	47	47
	GT-4	Simple Cycle Combustion Turbine	47	47
C. H. Corn Hydro	1	Hydro	4	4
	2	Hydro	4	4
	3	Hydro	3	3

* This is the current HP 2 configuration

1.3 PROJECT OVERVIEW

The current Hopkins Unit 2 (Unit 2) is a conventional steam turbine generating unit that began commercial operations in 1977. The unit has a summer net output of approximately 228 MW and a winter net output of approximately 238 MW.

As a part of the City power supply planning process, the option of repowering Unit 2 to convert it from a conventional steam-generating unit to a combined cycle generating unit was identified as a project that would have significant financial benefit as well as providing additional capacity to the City. This repowering of Unit 2 will result in an improvement in fuel efficiency (heat rate) for Unit 2 of approximately 30% as compared to its current design. As a result of the 30% improvement in unit efficiency, the City has projected fuel cost savings in the range of $12 to $24 million per year depending upon the cost of natural gas. The repowered unit will be capable of utilizing either natural gas or diesel oil as its fuel source. While the primary fuel is anticipated to be natural gas, the dual fuel capability will allow for the unit to continue to operate on diesel oil during periods in which diesel oil is less expensive than natural gas or when natural gas is unavailable.

Based on a scoping study prepared by Sargent & Lundy, the City's engineer for power generation facilities, the existing Unit 2 steam turbine generator is of sufficient size to allow for a 2-on-1 combined cycle configuration using two "F" class combustion turbines. The study identified that the repowering could be performed in phases, with Phase 1 being the retirement of the existing Unit 2 boiler and auxiliaries and the installation of one General Electric (GE) 7FA combustion turbine generator and one heat recovery steam generator (HRSG) with supplemental duct firing and related auxiliaries to convert Unit 2 to a 1-on-1 combined cycle unit. Based on this scoping study, the net summer capacity (natural gas firing at 95°F ambient temperature and 50% relative humidity) for the 1-on-1 configuration is approximately 301 MW, with approximately 64 MW being derived from the supplemental duct firing. Phase 2 would include the addition of a second combustion turbine generator and HRSG, producing a 2-on-1 configuration. This configuration would have a natural gas-fired summer net capacity of approximately 475 MW. Supplemental duct firing would not normally be used in the 2-on-1 configuration. All of the incremental capacity increases associated with both phases are due to the addition of the combustion turbine generators. As a result of the repowering project, there will be no increase in steam electric generating capacity at the Hopkins Station.

The Phase 1 and Phase 2 HRSGs will be equipped with Selective Catalytic Reduction (SCR) systems to control emissions of nitrogen oxides (NO_X). The HRSGs will be equipped with a steam bypass system to allow operation of one combustion turbine in simple cycle mode with the exhaust gases still being vented to the HRSG and SCR system. However, in the event of a major unplanned forced outage that makes the HRSG or steam turbine unavailable, the ability to use the steam bypass is not an alternative. As a result, the electrical output associated with the combustion turbine would not be available to meet system reliability needs. In order to mitigate the system reliability impacts from such a major unplanned forced outage event, the repowered unit will be equipped with an emergency HRSG bypass system, including a separate bypass stack.

This application for modification of the existing Hopkins Site Certification is seeking approval of Phase 1 of the Repowering Project. The new facilities planned for Phase 1 will occupy approximately 6 acres within the existing approximately 232-acre Hopkins Site. Phase 1 includes the following major activities:

- Installation of one dual fueled GE 7FA combustion turbine generator with dry low NO_X combustors when firing natural gas and water injection when firing diesel oil.
- Installation of one heat recovery steam generator with supplemental duct firing and SCR system.

- Modifications to the existing steam turbine generator and auxiliaries that will continue to be utilized post repowering.
- Modifications to the fuel storage and delivery facilities at the Hopkins Generating Station.
- Expansion of the existing 230-kV switchyard.
- Installation of related auxiliaries and facility improvements required to support the repowered unit.
- Certain common facility modifications that will support Phase 2 repowering.

The current Project schedule targets a commercial operation date of June 2008 for Phase 1 of the Unit 2 repowering. To support this commercial operation date, the City anticipates permitting being completed in the fall of 2006 and construction activities to commence immediately upon approval of the Site Certification modification and issuance of any federally required permits. While the permitting process is ongoing, the City is moving forward with the acquisition of certain major equipment and services required for the Repowering Project.

The repowered Unit 2 will have an immediate and positive impact on the City's ability to provide reliable, cost-effective, and environmentally sound electric utility service. While the primary justification for the Repowering Project is the immediate fuel cost savings, the City's customers will also benefit from a modest increase in non-steam electric generating capacity and an improved environmental signature for the facility.

1.4 NEED FOR THE PROJECT

The City's load forecast shows that summer peak demand is projected to grow at a rate of approximately 1.4 percent (%) over a 20-year planning horizon. Based on this growth rate, the City identified a need for additional capacity to meet the continued growth in customer demand. During 2004, the City initiated an Integrated Resource Planning (IRP) process to identify the most cost effective means to meet this need. This IRP process evaluated a variety of power supply and demand side management alternatives to identify the most cost effective means to meet the City's electric customer demand.

One of the alternatives identified for consideration in the IRP process was the repowering of Unit 2 from a conventional steam-generating unit to a combined cycle generating unit. In the fall of 2005, the preliminary IRP base case results were presented to the Tallahassee City Commission. There were five base case alternatives that had been identified as cost effective alternatives that should receive further consideration and analysis in the IRP process. The Phase 1

Unit 2 repowering was included as a component in four of the five cases, with the repowered unit beginning commercial operation in the summer of 2010. The preliminary analysis conducted on these base cases identified that the Repowering Project could provide fuel cost savings between $12 and $24 million per year depending upon the cost of natural gas. Based on these potential cost savings, the City Commission requested information on whether the Phase 1 repowering could be accelerated. City staff provided information that the commercial operation date could potentially be accelerated to summer of 2008. In October of 2005, the City Commission authorized the Phase 1 Unit 2 Repowering Project to move forward with a target commercial operation date of June 2008.

1.5 BENEFITS OF THE PROJECT

The immediate and most significant benefit of this Project is the savings in fuel costs for the City's electric customers. As noted previously, the planning studies conducted to date indicate fuel cost savings between $12 and $24 million each year of operation depending upon the cost of natural gas. In addition to the immediate fuel cost savings, this Repowering Project will provide an incremental non-steam electric generating capacity increase of approximately 70 MW (natural gas-fired summer net generating capacity) from the addition of the combustion turbine generator.

Since this Repowering Project involves the repowering of an existing unit, certain environmental benefits will be realized as a result of the advanced technology and environmental controls that are being proposed with the Repowering Project. These benefits include, but are not limited to:

- Decrease in permitted air pollution emission rates while increasing the unit output.
- Decrease in actual annual emissions of NO_X and SO_2.
- Approximately 30% reduction in fuel used per megawatt of electricity generated.

1.6 PSC APPROVAL

As a municipal utility, the FPSC has jurisdiction over need for power determinations and certain rate design issues. A need for power determination is required when a utility increases steam electric capacity at an existing certified site. The Unit 2 Repowering Project does not increase the steam electric capacity from its current rating. As a result, there is no requirement for the City to file a Need for Power Application with the FPSC. There are no other FPSC reviews or approvals required for this Project.

2.0 SITE AND VICINITY CHARACTERIZATION

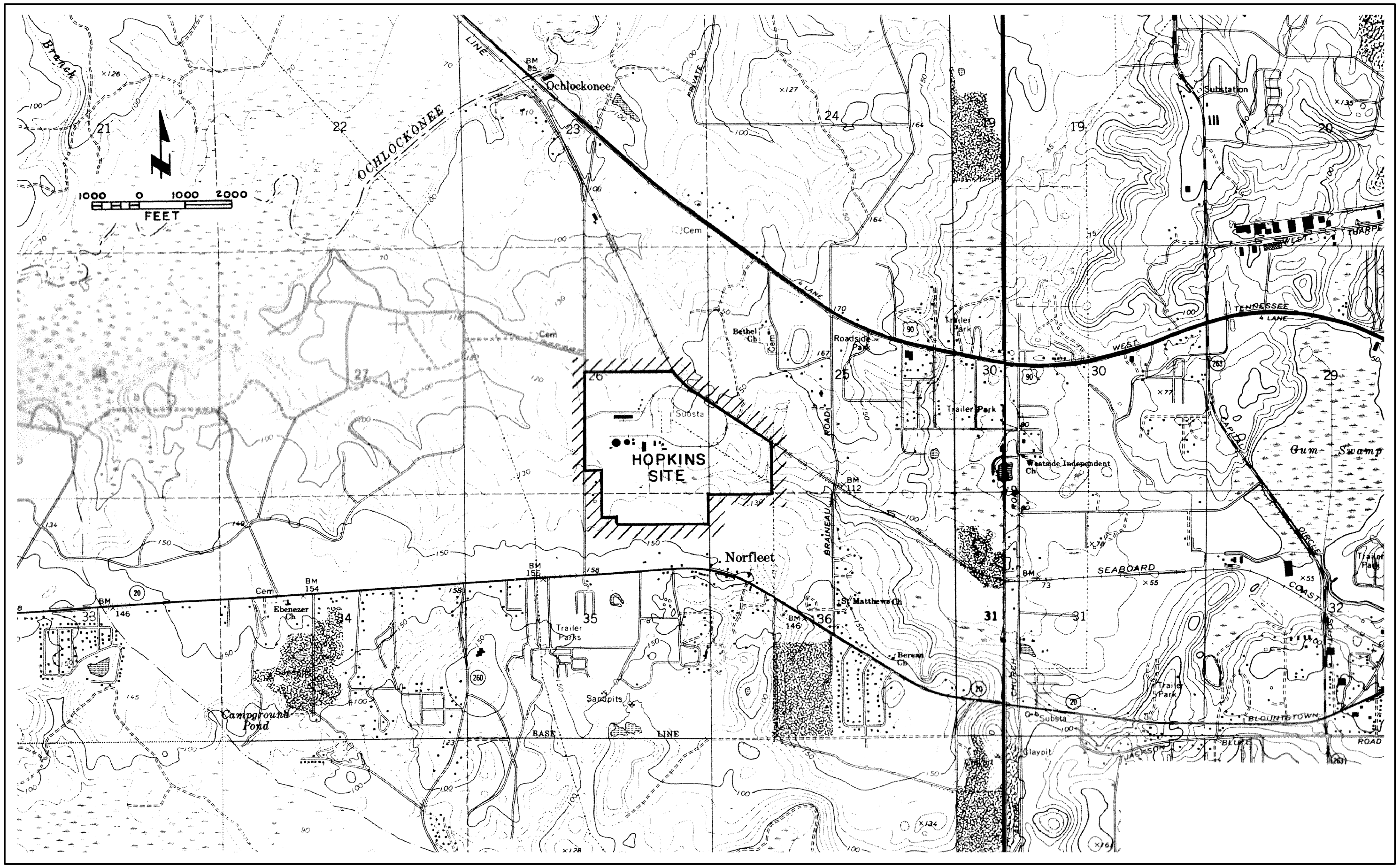
This chapter presents basic information that characterizes the existing physical, biological, and socioeconomic environment for the Hopkins Generating Station Site and the surrounding area. Accurate delineation of existing environmental conditions and trends is critical, since they are the points of comparison for measuring incremental impacts. Baseline environmental data in this chapter reflect the fact that the Hopkins Site is an existing, certified power plant site, containing operating electric generating facilities. The baseline environment, therefore, includes impacts resulting from operation of these facilities at the Site since the early 1970s. The Hopkins Generating Station has continuously operated in compliance with all applicable environmental requirements, with no adverse impact on the surrounding area.

2.1 SITE DELINEATION

This section describes the location and size of the Hopkins Site and summarizes expected acreage requirements for Site alterations needed to accommodate the repowering of Hopkins Unit 2.

2.1.1 Site Location

The Hopkins Site is located approximately 7 miles west of the center of the City of Tallahassee in Leon County, Florida. The Universal Transverse Mercator (UTM) coordinates for the center of the Site are 749.4 kilometers (km) east and 3371.7 km north. The Site is in Section 25 and 26, Township 1 North, Range 2 West. The western boundary of the Hopkins Site is Geddie Road (County Road 1585), and part of the eastern boundary is the CSX railroad. South of the Site is State Road 20 and north of the Site is U.S. Highway 90. Figure 2.1.1-1 shows the Site boundaries and surrounding area.



SITE VICINITY MAP

Sargent & Lundy LLC

FIGURE NUMBER

2.1.1–1

SOURCE:

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

2.1.2 Existing Site Uses

The existing Hopkins Generating Station, which has been generating electrical power since the early 1970s, consists of two steam boilers driving two steam turbine-generators (Units 1 and 2), and four simple cycle combustion turbine-generators (Units GT-1 through GT-4). Table 2.1.2-1 below outlines the current unit capacity, type of operation, and fuels utilized.

Table 2.1.2-1 Unit Capacity and Fuels at the Hopkins Generating Station

Unit	Primary Type of Operation	Commercial Operation Year	Net Output (MW) (winter/summer)	Primary Fuel	Secondary Fuel
1	Intermediate/ Base	1971	76/78	Natural Gas	#6 Fuel Oil
2	Intermediate/ Base	1977	228/238	Natural Gas	#6 Fuel Oil
GT-1	Peaking	1970	12/14	Natural Gas	#2 Fuel Oil
GT-2	Peaking	1972	24/26	Natural Gas	#2 Fuel Oil
GT-3	Peaking	2005	47/47	Natural Gas	#2 Fuel Oil
GT-4	Peaking	2005	47/47	Natural Gas	#2 Fuel Oil

Existing facilities at the Hopkins Site include the Units 1 and 2 boiler and turbine buildings, the Units 1 and 2 cooling towers, the Units GT-1 through GT-4 combustion turbines, electric switchyards, a natural gas letdown/metering station, No. 6 and No. 2 fuel oil storage tanks, water supply wells, water storage tanks, wastewater treatment ponds, office and warehouse buildings, and storage/maintenance areas. The Site comprises a total area of approximately 232 acres. The certified portion of the Site includes the areas associated with Unit 2 and Units GT-3 and GT-4. Unit 1 and Units GT-1 and GT-2 are located on uncertified portions of the same Site.

The City of Tallahassee is proposing to repower Unit 2 by taking the existing boiler out of service and adding a combustion turbine generator and an HRSG. This Repowering Project will impact approximately 19 acres of the existing certified portions of the Site.

2.1.3 Adjacent Properties

The properties adjacent to the Hopkins Site include a mixture of public and private ownership and uses. The adjacent properties are shown in Figure 2.1.3-1. There is a mix of rural and recreational land to the west and north, and residential properties to the north, south and east. There are also scattered parcels of commercial properties to the south.

Lake Talquin State Forest, a 17,000-acre recreational area managed by the FDEP - Division of Forestry, is located due west and north of the Hopkins Site. The State Forest includes the 8,800-acre Lake Talquin reservoir, which was created in 1927, when the Jackson Bluff Dam was constructed on the Ochlockonee River. A 3,053-acre portion of the State Forest has been designated as a “Talquin Wildlife Management Area” (WMA). The Talquin WMA borders the Hopkins Site (its main entrance is on Geddie Road, across from the Site) and is mainly used for hunting, fishing, and archery. Further to the east is the 400-acre Lake Talquin State Park, which is managed by the FDEP - Division of Parks and Recreation. Both the State Forest and the State Park feature camping, hiking, and horseback riding.

Immediately to the south of the Hopkins Site, there is both forested land and a commercial trucking firm that extends all the way to Blountstown Highway. A portion of the forested land between the Site and Blountstown Highway is currently being permitted for residential development. South of Blountstown Highway is a residential subdivision with approximately 120 parcels, some with homes and some undeveloped. Farther to the southeast, approximately 1.5 miles from the Hopkins Site, is the 564,000-acre Apalachicola National Forest.

To the northeast of the Hopkins Site, there are larger residential parcels. According to satellite imagery, there are only about 30 to 40 homes in this area, although the property has been subdivided into many more parcels. The Tallahassee-Leon County Global Information System (GIS) shows that the majority of these parcels are listed as “vacant.”

Directly to the east of the Hopkins Site, there is forested land that is bisected by a transmission line. This area has not yet been subdivided into individual parcels. There are a few scattered homes in this area.

REFERENCE

Projection: Transverse Mercator Datum: NAD 27 Coordinate System: UTM Zone 16

500 0 500 Meters

Figure 2.1.3-1 Project Site and Adjacent Areas
Arvah B. Hopkins Generating Station
Unit 2 Repowering Project
City of Tallahassee
Source: Golder, 2006.

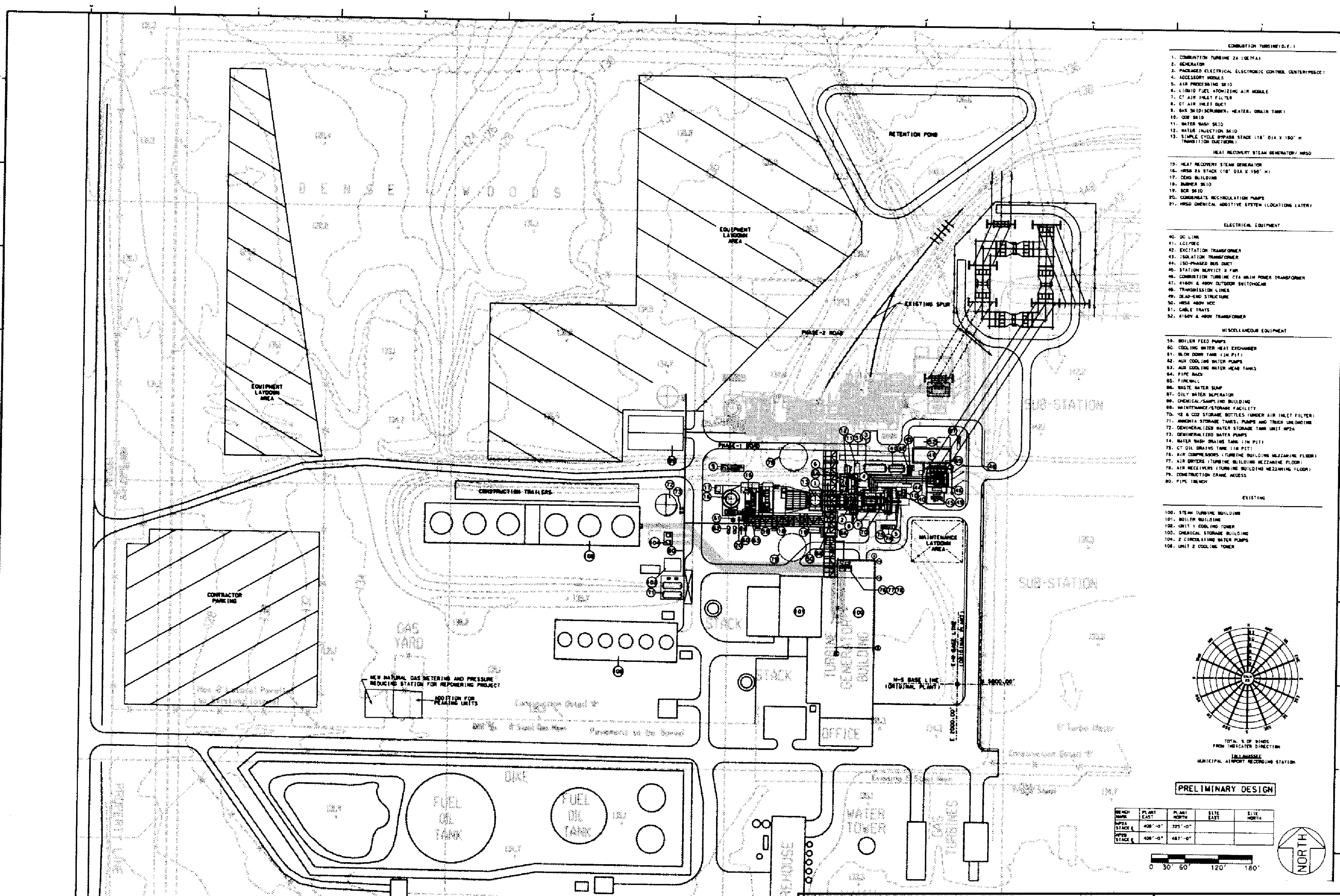
Golder Associates

2.1.4 Planned Site Uses

As stated previously, the City of Tallahassee is proposing to repower Unit 2 by taking the existing boiler out of service and adding a combustion turbine generator and a HRSG. Construction of these facilities will require a new stormwater detention pond and a temporary construction laydown and parking area. In addition, the existing 230-kV switchyard will be expanded, and a new natural gas metering and regulating station will be installed immediately adjacent to the existing gas metering and regulating station. The new combustion turbine generator, HRSG, stormwater detention pond, gas metering and regulating station, and 230-kV switchyard expansion will occupy a total area of approximately 6 acres on the approximately 232-acre Hopkins Site. The construction laydown and parking area will temporarily occupy approximately 10 acres. For Phase 2, an additional 3 acres would be impacted.

Electricity will be produced by the combustion turbine generator, and steam produced by the HRSG will drive the existing steam turbine-generator to produce additional electricity. The existing steam turbine-generator is sufficiently sized to accept steam from a second combined cycle unit (Phase 2), so it is expected that a second combustion turbine generator and HRSG will be constructed at a future date. These facilities would be located immediately north of the Phase 1 combustion turbine generator and HRSG. The stormwater detention pond and construction laydown and parking area for Phase 1 will be sufficient to serve Phase 2. Figure 2.1.4-1 shows the basic arrangement of the existing Hopkins Site, as well as Phase 1 and Phase 2.

The primary alterations to the Site will be the removal of a small number of existing structures (described in Subsection 2.1.2) and construction of the new combustion turbines, HRSGs, stormwater detention pond, and gas metering and regulating station. Since these facilities will be located on previously cleared and graded areas within the existing Hopkins Site, no significant vegetation clearing will be required.



GENERAL ARRANGEMENT OF THE HOPKINS SITE

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

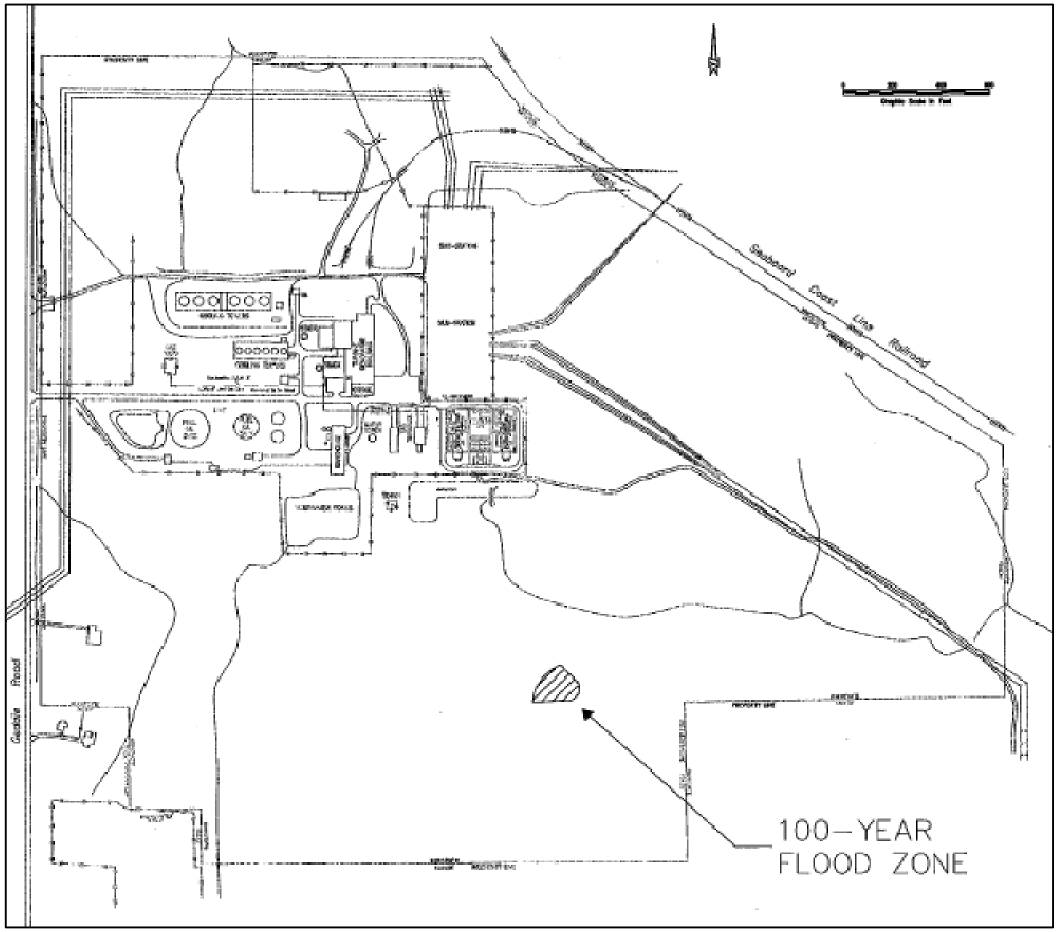
Sargent & Lundy LLC

FIGURE NUMBER

2.1.4–1

2.1.5 100-Year Flood Zone

Although a small amount of land at the Hopkins Site is within a 100-year flood zone (as defined by the Federal Emergency Management Agency), none of this land will be affected by the Repowering Project. The 100-year flood zone area covers approximately 12 acres in the southeast quadrant of the Site, as shown in Figure 2.1.5-1. The flood zone area will not be affected by construction or operation of the Repowering Project, which is in a different drainage basin than the flood zone.



100-YEAR FLOOD ZONE

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

Sargent & Lundy LLC

FIGURE NUMBER

2.1.5-1

SOURCE:

2.2 SOCIO-POLITICAL ENVIRONMENT

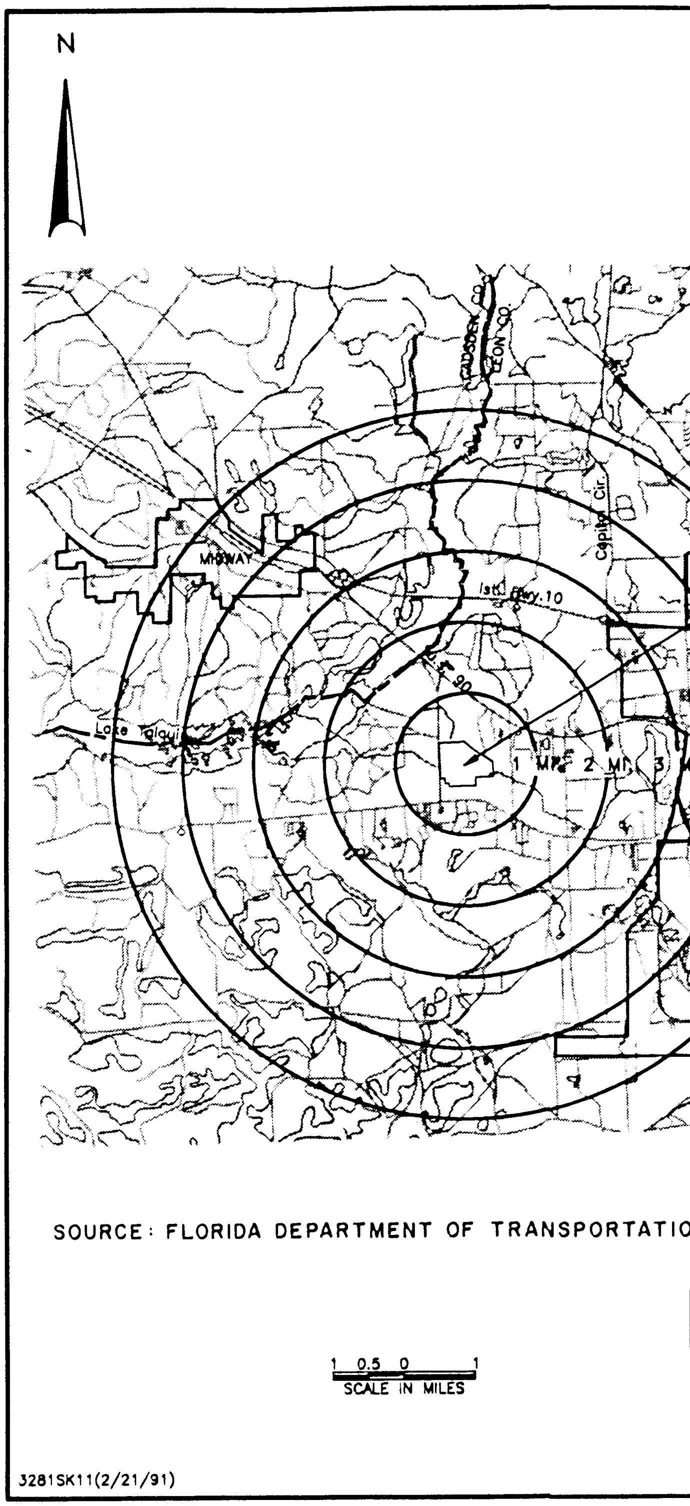
2.2.1 Governmental Jurisdictions

The Hopkins Generating Station is located in the unincorporated portion of western Leon County, Florida. Leon County is the only governmental agency in whose jurisdiction the Repowering Project will be located. The station is within the regional jurisdiction of the Apalachee Regional Planning Council (ARPC) and the Northwest Florida Water Management District (NWFWMD). Figure 2.2.1-1 identifies the local governmental jurisdictions within a five-mile radius of the station. The local government jurisdictions within the five-mile radius include Leon County, Gadsden County, the City of Tallahassee and the City of Midway.

The Hopkins Site is bounded on the west by Geddie Road (County Road 1585) and is adjacent to the CSX Railroad, which parallels the northeastern boundary of the Site. The Ochlockonee River runs approximately 1.2 miles to the north and northwest of the Site.

Parks, recreation areas, and environmentally sensitive lands within five miles of the Hopkins Site are shown on Figure 2.2.1-2. The northern boundary of the Apalachicola National Forest, managed by the U.S. Forest Service, is approximately one-half mile south of the Site. The forest boundary also delineates the state Apalachicola Wildlife Management Area, managed by the Florida Fish and Wildlife Conservation Commission (FFWCC). Other state wildlife management areas within five miles of the Site include the Joe Budd, Talquin and Ochlockonee Wildlife Management Areas. These areas are depicted on Figure 2.2.1-3 and 2.2.1-4. In addition to these areas, there are several state and city recreational areas near the Site. Lake Talquin, located to the west of the station, is a state recreational area. The City of Tallahassee has the Palmer Monroe Park and Messer Field located to the east of the Site.

Figure 2.2.1-1 Governmental Jurisdictions – Five-Mile Radius



CITY OF TALLAHASSEE
ARVAH B. HOPKINS PLANT
HP2 REPOWERING

FIGURE 2.2.1-1
GOVERNMENTAL JURISDICTIONS
5-MILE RADIUS

Figure 2.2.1-2 Site Locations – One-Mile Radius

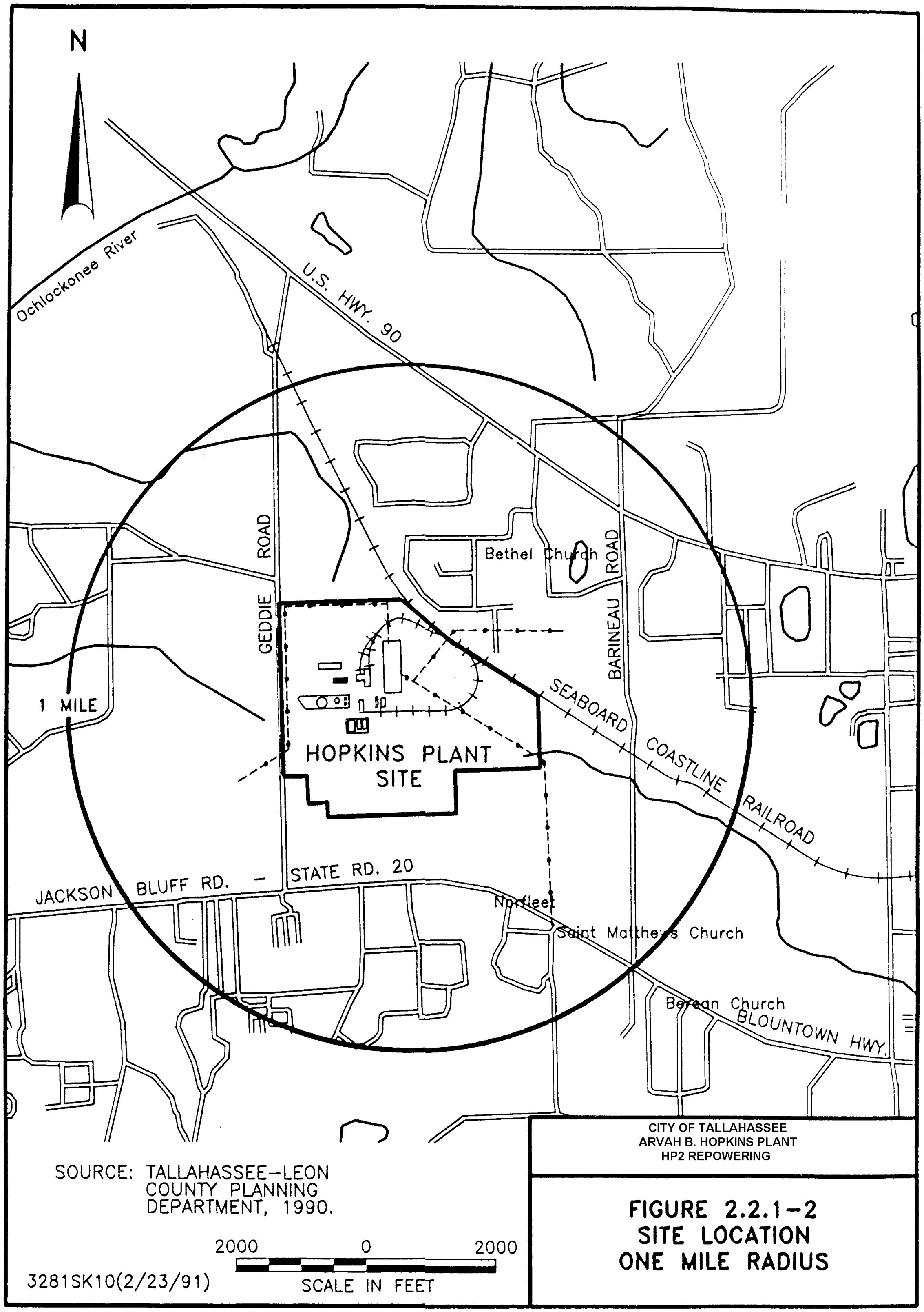


Figure 2.2.1-3 Outstanding Florida Waters and State Recreation Areas

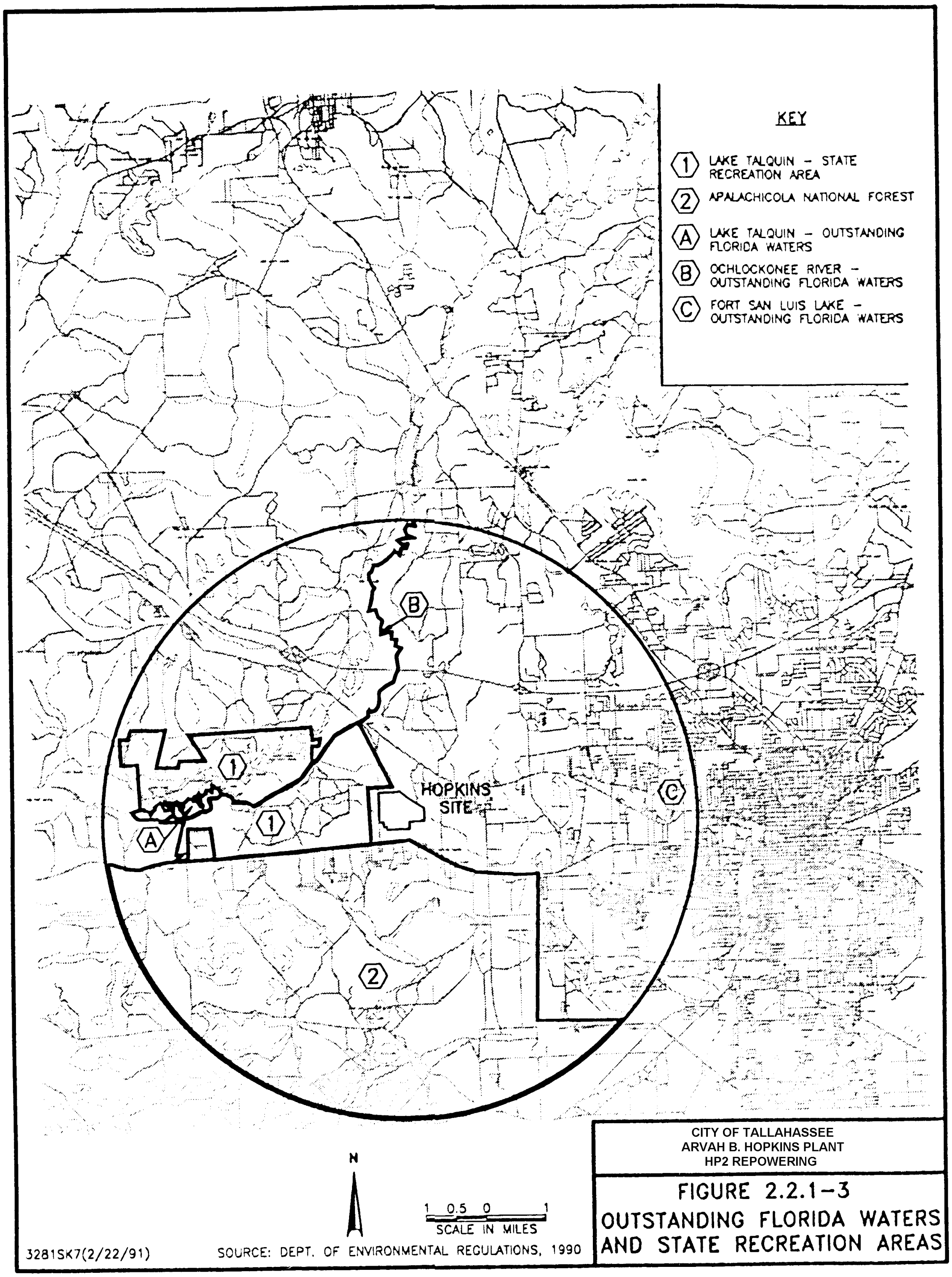
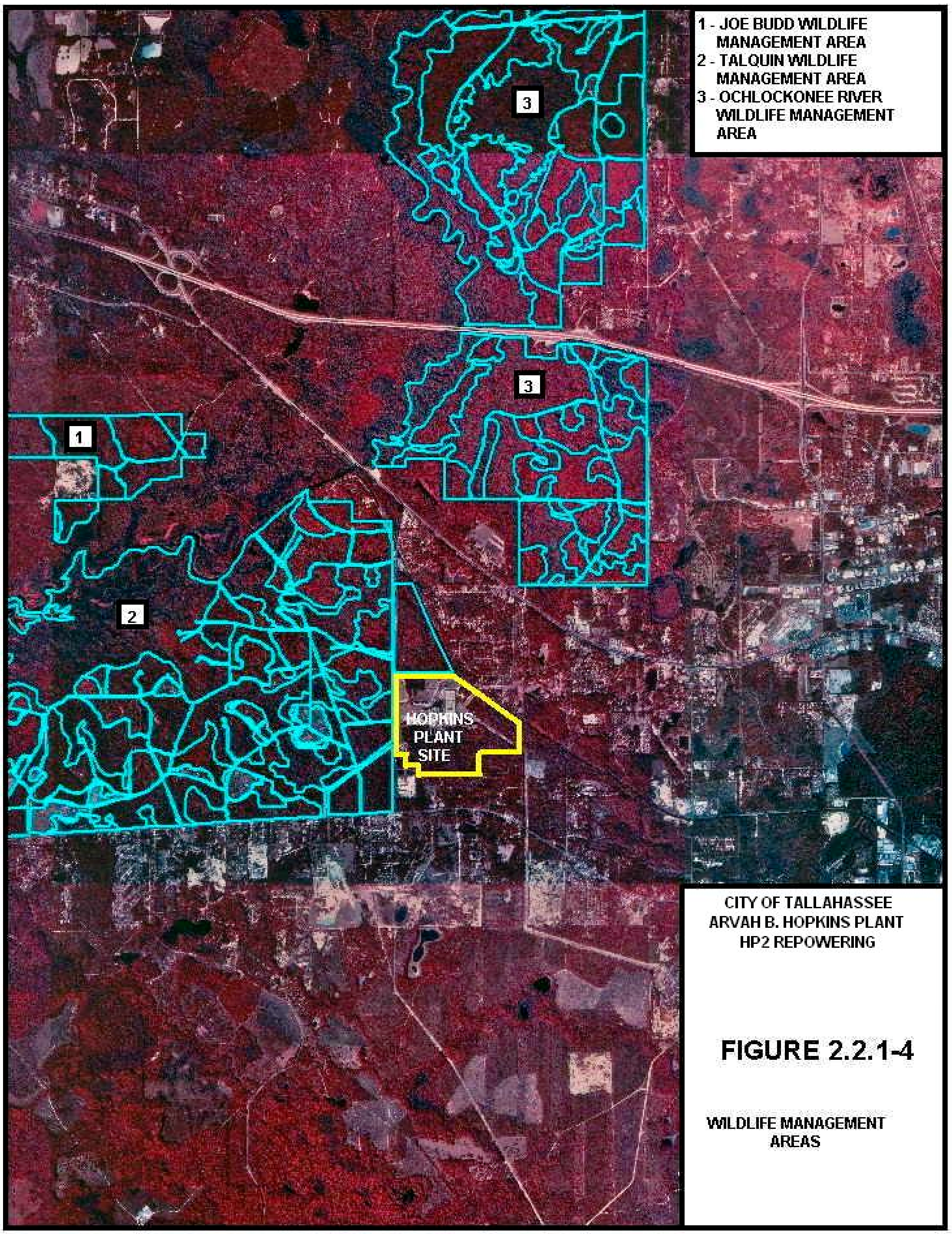


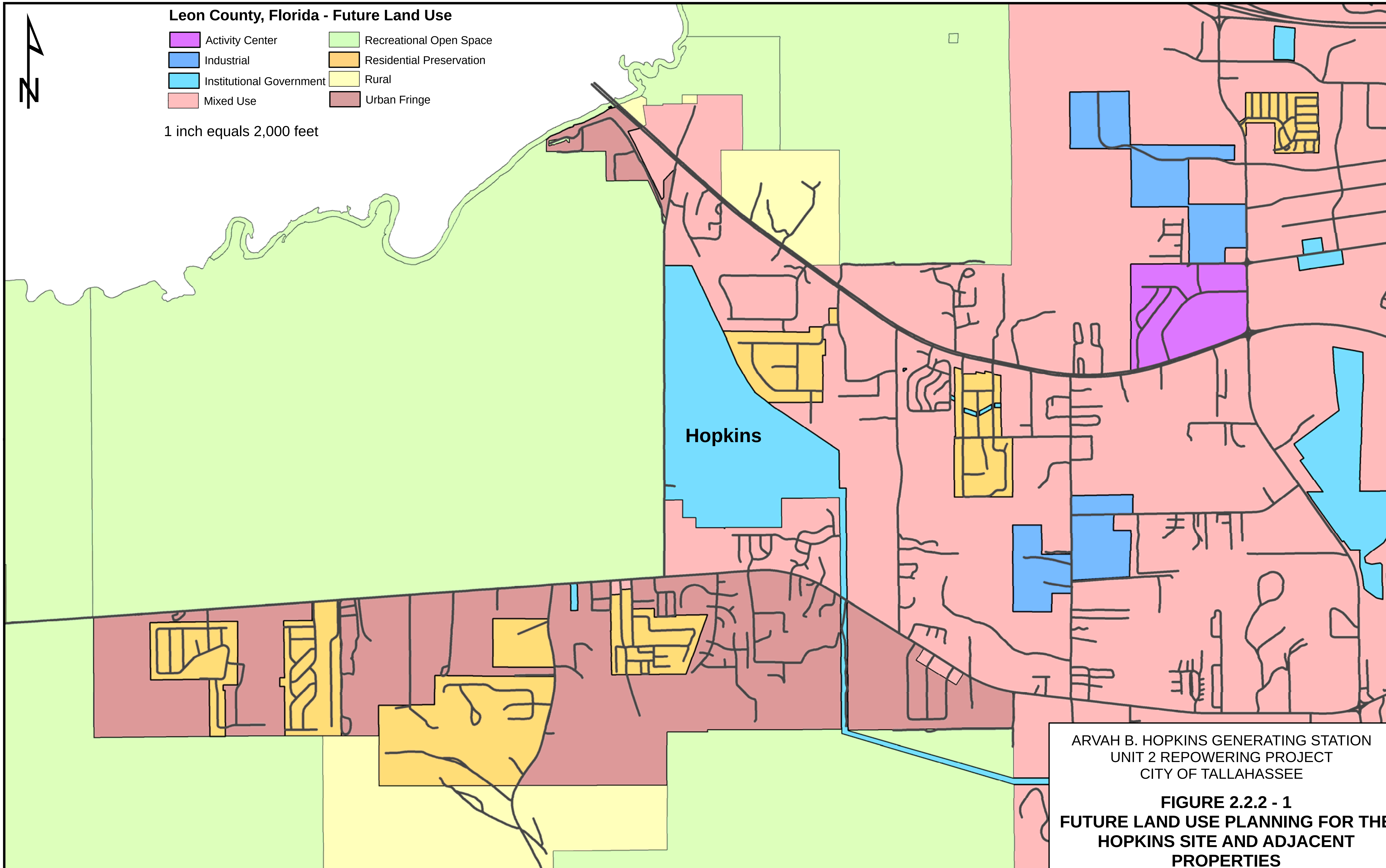
Figure 2.2.1-4 Wildlife Management Areas



2.2.2 Zoning and Land Use Plans

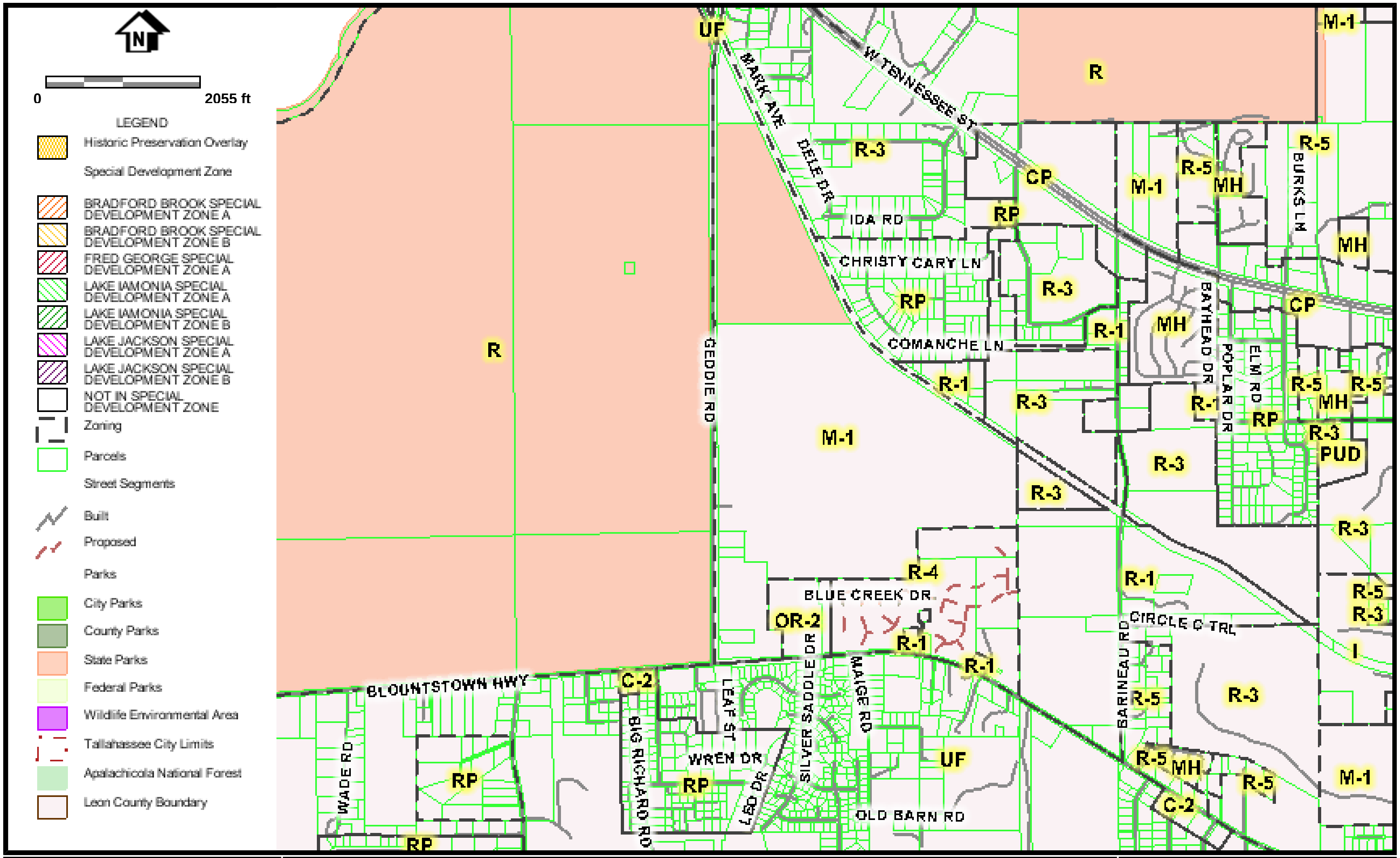
During the original 1974-75 Site Certification proceeding for Hopkins Unit 2, the Hopkins Site was determined to be consistent with the applicable land use plans and zoning ordinances of Leon County, Florida. The zoning and land use orders from the then-Pollution Control Board (the predecessor to the Siting Board) are included in Sections 10.2 and 10.3 of this application. Subsequent to that determination of consistency, a local government may not alter its local comprehensive plan or zoning ordinance so as to affect the power plant site, according to section 403.508 (2) FS. The entire Hopkins Site is certified under the PPSA except for the area of Unit 1, associated facilities, and combustion turbine Units GT-1 and GT-2. The Unit 2 Repowering Project will not expand the boundaries of the certified Hopkins Site. There will be no change in the fuel types used in the certified units as a result of the Project.

The Hopkins Site is located in a Future Land Use category of “Government Operations” under Leon County’s adopted comprehensive plan and is currently zoned M-1, “Light Industrial.” These land use and zoning classifications allow for power generating facilities. See Figures 2.2.2-1 and 2.2.2-2 for future land use and zoning respectively.



ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

FIGURE 2.2.2 - 1
FUTURE LAND USE PLANNING FOR THE HOPKINS SITE AND ADJACENT PROPERTIES



Tallahassee-Leon County GIS
WWW.TLCGIS.ORG

Figure 2.2.2-2

Zoning Of Properties Adjacent To The Hopkins Site

TLCGIS
Leon County Courthouse
301 S. Monroe St. P3 Level
Tallahassee, FL 32301
850/606-5504

Date Created: 5/14/2006

2.2.3 Demography and Ongoing Land Use

The Tallahassee Metropolitan Statistical Area (MSA), effective June 6, 2003, includes Leon, Jefferson, Wakulla and Gadsden Counties (Florida Statistical Abstract 2005). These counties comprise the demographic and socioeconomic study area since the majority of direct and indirect benefits and costs will occur within that geographic area. The total population for the Tallahassee MSA is 320,304 (U.S. Bureau of Census 2000). Figures 2.2.3-1 and 2.2.3-2 present the populations within the Tallahassee MSA and land use within 5 miles from the Hopkins Site, respectively. There have been no significant changes in population or land use since the Units 3 and 4 Resource Addition Project (2004).

Figure 2.2.3-1 Surrounding Counties Showing Estimated 2004 Population

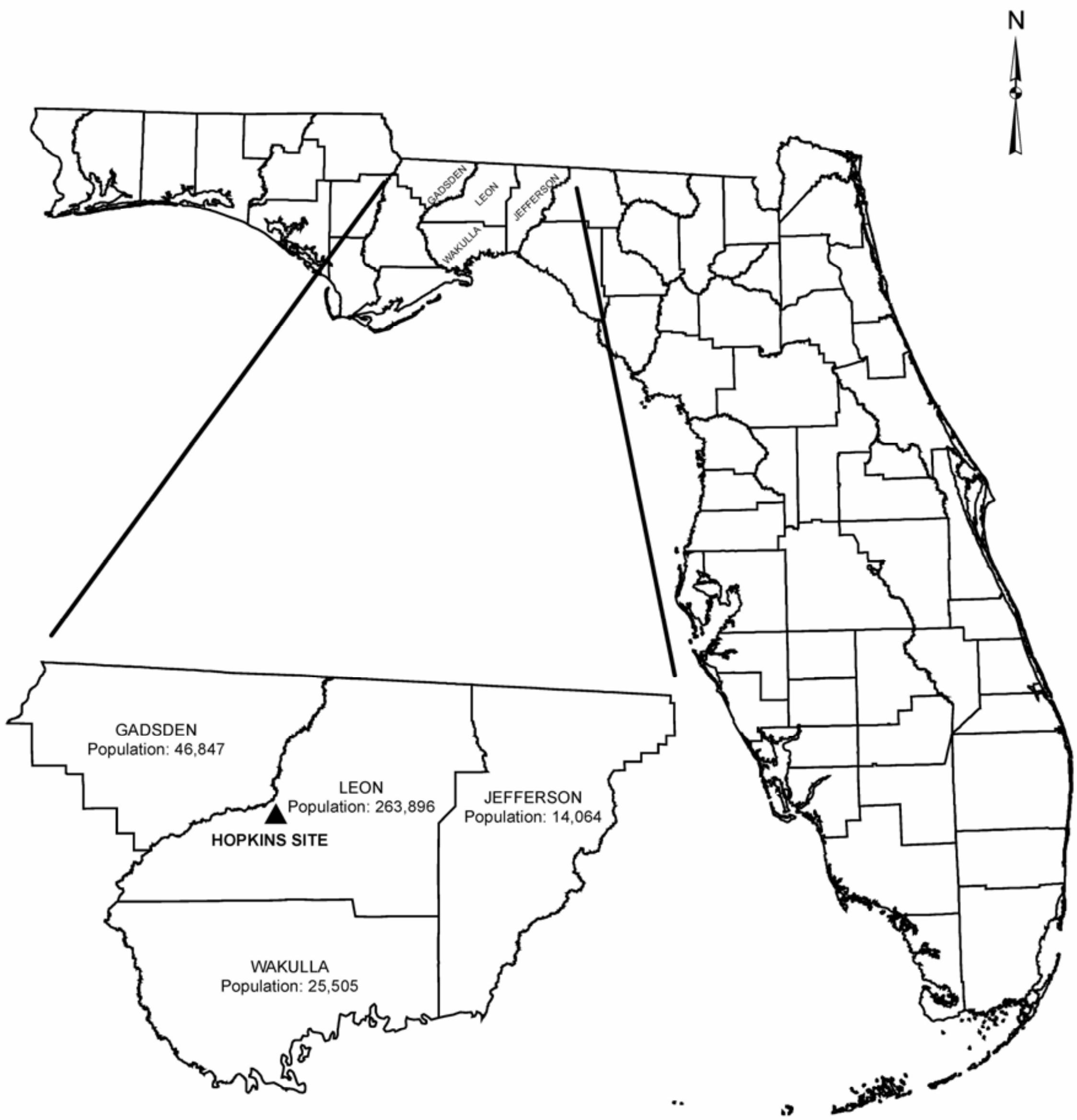


Figure 2.2.3-1. Tallahassee MSA
Arvah B. Hopkins Generating Station
Unit 2 Repowering Project
City of Tallahassee
Source: Golder, 2006.

0637522/4.2/Figure 2.2.3-1.doc

Figure 2.2.3-2 Land Use Within 5 Miles of the Plant Site

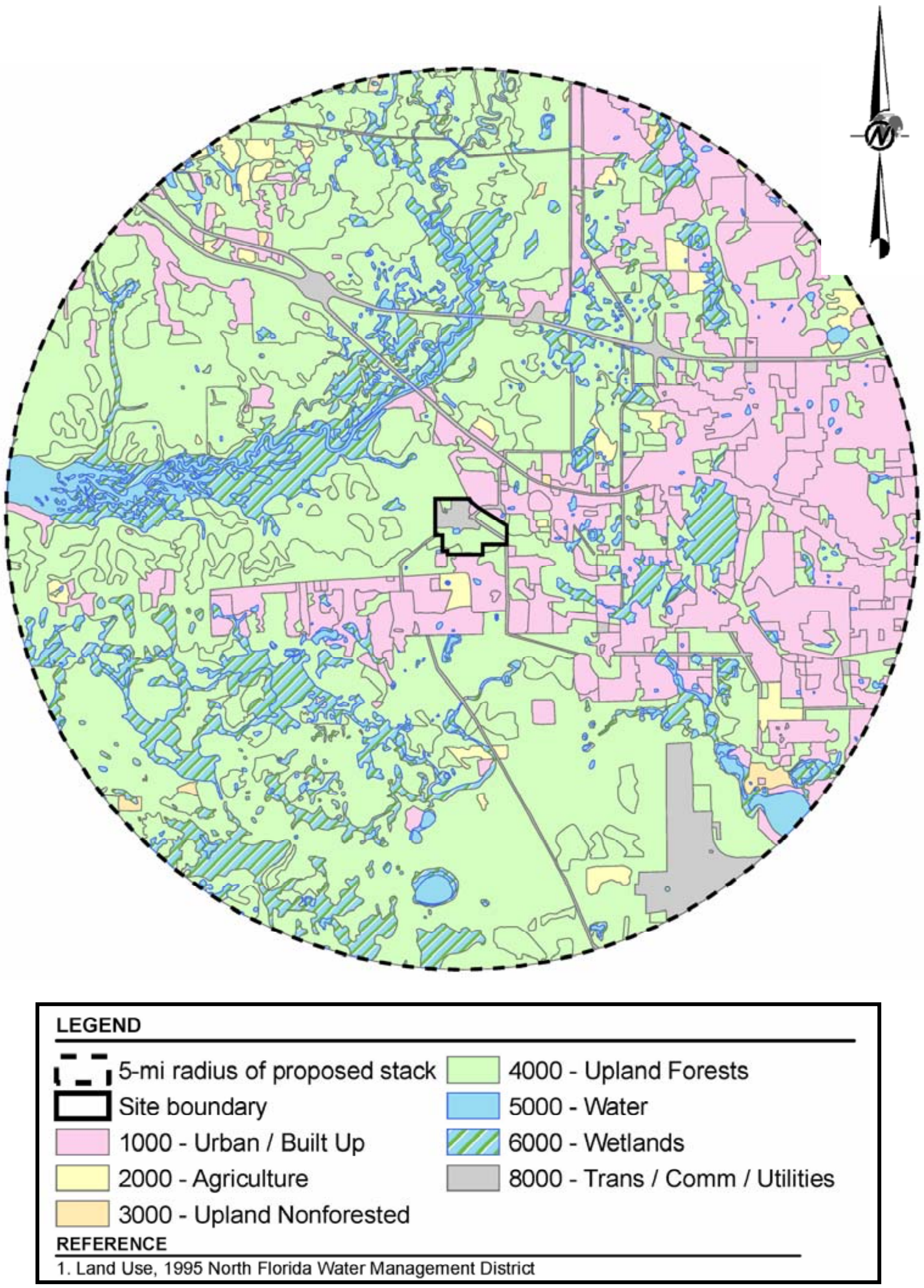


Figure 2.2.3-2. Land Use Within 5 Miles of the Plant Site
Arvah B. Hopkins Generating Station
Unit 2 Repowering Project
City of Tallahassee
Source: Golder, 2006. 0637522/4.2/Figure 2.2.3-2.doc

2.2.4 Easements, Titles, Agency Works

There have been no significant changes in easements, titles, and agency works since the Resource Addition Project SCA (2004). The Repowering Project will not affect such facilities.

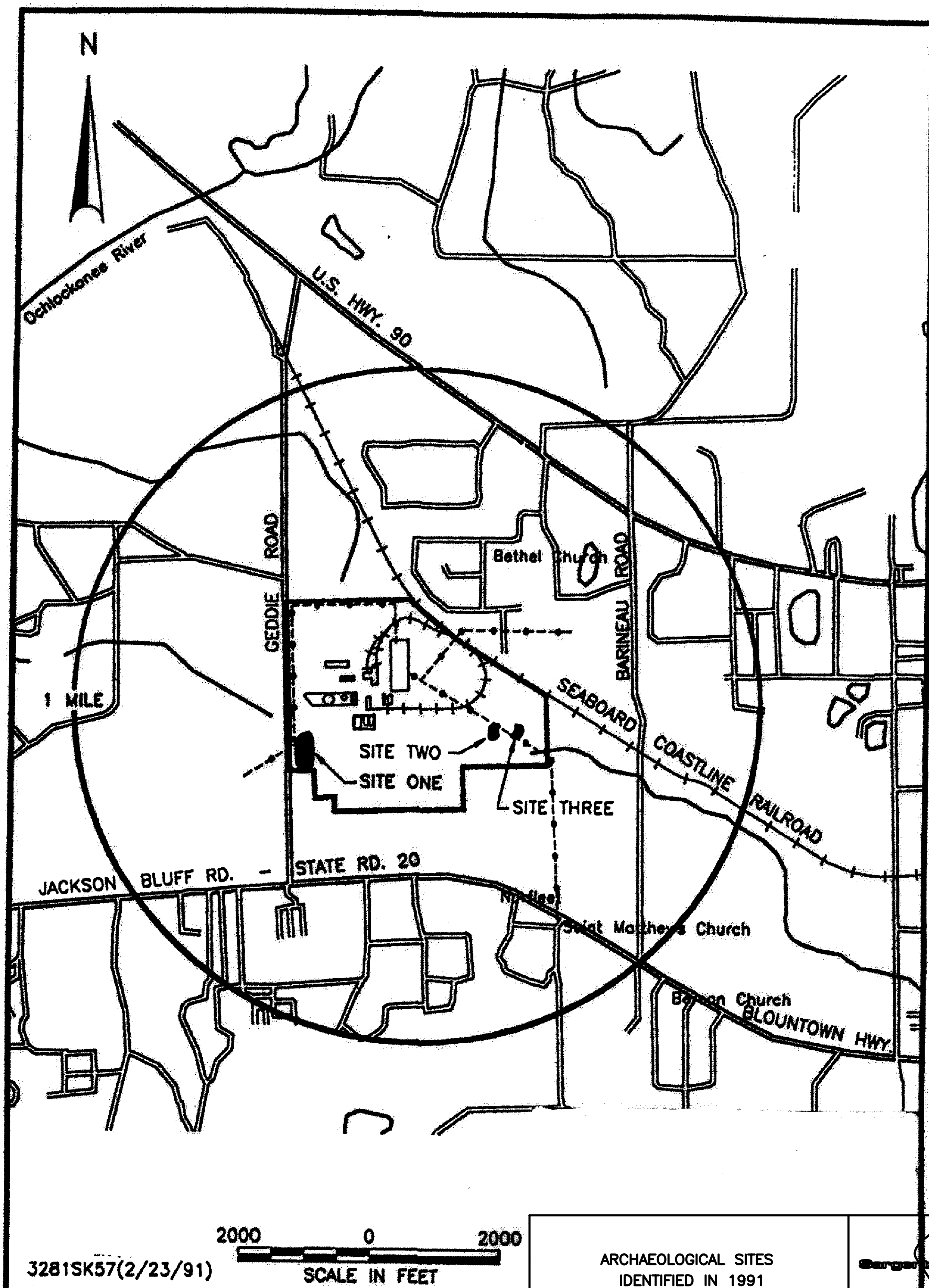
2.2.5 Regional Scenic, Cultural and Natural Landmarks

There are no National Natural Landmarks or scenic areas located within the Hopkins Site or in the vicinity of the Site, as discussed in the Resource Addition Project SCA (2004).

2.2.6 Archaeological and Historic Sites

A review of the Florida Master Site File maintained by the Florida Department of State, Division of Historic Resources indicates that there are no recorded archaeological or historic sites within the Hopkins Generating Station. In April 1991, the undeveloped portions of the Hopkins Site were subjected to a professional archaeological site assessment. The primary field technique used for the survey was based on transect subsurface shovel testing at fifty meter intervals across most of the high ground areas. In addition to this technique, surface reconnaissance of selected areas and subsurface shovel testing at ten to twenty five meter intervals were also performed. Approximately 100 subsurface shovel tests were conducted on the Site. Field survey methods were in compliance with established standards and guidelines.

This investigation resulted in the discovery of three previously unrecorded archaeological sites (see Figure 2.2.6-1). Based on the completion of all fieldwork activities and analysis, the results of this investigation were assessed in terms of National Register Criteria. None of the archaeological deposits identified by the survey appears to be eligible or potentially eligible for inclusion in the National Register of Historic Places. In accordance with 36 Code of Federal Regulations (CFR) 800, Procedures for the Protection and Enhancement of Historic and Cultural Properties, the recommendation for the Hopkins archaeological sites is for no further archaeological work. See Section 10.5.1 for documentation on the 1991 investigation.



ARCHAEOLOGICAL SITES
IDENTIFIED IN 1991

Sargent & Lundy

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

FIGURE NUMBER
2.2.6–1

2.2.7 Socioeconomic and Public Service

a. Labor Force

The total labor force in Leon County for 2004 was 134,146 with employment of 128,989. Unemployment in 2004 was 5,157 or 3.8%. For the State of Florida the unemployment rate was 4.8% and the United States unemployment rate was 5.5% (Florida Statistical Abstract 2005).

The average monthly private-sector employment by major industry group in Leon County for December 2004 is depicted in Table 2.2.7-1 below.

Table 2.2.7-1 Major Employment Categories in Leon County (December 2004)

Major Industry Group	Employment
Agriculture, Forestry, Fishing, and Hunting	184
Mining	Not Available
Utilities	Not Available
Construction	6,654
Manufacturing	2,263
Transportation and Warehousing	1,381
Wholesale Trade	2,609
Retail Trade	17,318
Finance and Insurance	4,893
Information	3,633
Real Estate, Rental and Leasing	2,152
Professional Scientific and Technical Services	9,411
Management Companies and Enterprises	463
Administrative and Support, Waste Mgnt. and Remediation Services	5,110
Educational Services	884
Health Care and Social Assistance	14,339
Arts, Entertainment & Recreation	910
Accommodation and Food Services	13,022
Other Services	5,718
Unclassified	21

Source: State of Florida, Labor Market Statistics, “Quarterly Census of Employment and Wages” (ES-202), Annual NAICS files.

The retail industry group and the heath care and social assistance group provided the most employment in Leon County with about 35% of the total employment between the two groups. The construction group provides about 6,654 jobs.

Employment projections for construction and extraction trades in Florida have been estimated for the year 2012. Statewide, construction employment is estimated to increase from 486,332 in 2004 to 601,950 in 2012 (Source: Florida Statistical Abstract 2005).

Based on this information, there have been no significant changes in employment by occupation since the Units 3 and 4 Resource Addition Project (2004).

b. General Income

Leon County had a per capita income of $28,109 for 2003 compared to the State of Florida and United States per capita income of $30,098 and $31,472, respectively (US Department of Commerce, Bureau of Economic Analysis, Regional Economic Information, 2004). This income level ranked 18th out of the 67 counties in Florida.

The median household income in Leon County was $37,760 in 2002. This income level is a 2.7% decrease when compared to the 2000 median household income. Florida had a median household income of $38,226 in 2002, which was a decline of 1.4% from 2000 (Florida Statistical Abstract, 2004). An average wage and salary earnings in Leon County in 2002 was $35,499, less than 1% lower than the statewide average.

There has been no significant change in income or income projections since the Units 3 and 4 Resource Addition Project (2004).

c. Housing

The average house purchase price in Leon County in 2005 was $211,973 (Florida Statistical Abstract, 2005).

There are 22 hotels licensed in Leon County and 37 motels. The hotels have a total of 2,468 units and the motels have a total of 2,835 units. A total of 490 licensed lodging existed in 2005, representing 26,001 lodging units. This includes 24,882 apartment building units, 360 rooming house units, 98 rental condominiums and 661 transient apartment building units (Florida Statistical Abstract, 2005).

There have been no significant changes in building activity and housing costs since the Units 3 and 4 Resource Addition Project (2004). The current capacity of the housing market should be adequate to meet the demands of the additional workforce due to the Project.

d. Education

Primary public education in Florida is operated on a countywide basis. Each county's respective school district establishes policies and staffing requirements. According to the Florida Department of Education Statistical Brief Bureau of Education Information and Accountability Services 2006, Leon County had total student membership of 32,316 for the fall of 2005 school year. Leon County schools employed approximately 4,330 full time staff employees in the fall of 2005.

A total of 24 elementary schools, 9 middle schools, 11 high schools, 7 combination schools, 1 community college, 2 universities and 8 other schools are within Leon County. The current capacity of the school system should be adequate to meet the demands of the students associated with the additional workforce required for the Project.

e. Transportation

The existing access to the Hopkins Generating Station is provided by County Road 1585, Geddie Road. There are no traffic count locations for County Road 1585 in the Florida Department of Transportation 2004 Annual Average Daily Traffic Report for Leon County. Station traffic will increase temporarily during the 20-month construction period for the Repowering Project, but the increase is not expected to generate any unacceptable delays in traffic movement on local roads. Traffic during operation of the repowered unit will be less than the existing station traffic, so an analysis is not warranted.

f. Medical Facilities

Licensed medical practitioners in Leon County include 637 physicians, 353 dentists, dental hygienists, and dental radiographers, 836 health practitioners, 3,062 registered and practical nurse, 39 optician, and 761 pharmacists and pharmacists interns. (Florida Statistical Abstract, 2005)

There are 96 employees working for Leon County Emergency Medical Service (LCEMS), composed of the chief, the medical director, the deputy chief in charge of operations, the deputy chief in charge of administration, four shift supervisors (captains), 78 field personnel including paramedics, emergency medical technicians, FTOs (sergeants), four LCEMS system controllers (lieutenants), two administrative assistants, a billing coordinator, the MIS systems coordinator, two supply technicians, and the training/quality assurance coordinator (major). LCEMS uses fixed stations and System Status Management, which matches supply with demand. This program improves response time and patient care as well as using state of the art technology, including electronic ambulance reports, which allow for a more efficient tracking of patient conditions and treatment. The vehicles used by LCEMS are Type I ambulances. The LCEMS facility is co-located at the Leon County Public Works Operations Center at the corner of Miccosukee Rd. and Blair Stone Rd.

Leon County has four hospital centers, which contain over 991 licensed beds. Capital Regional Medical Center has 180 state-licensed beds and serves residents of North Florida and South Georgia. A full range of specialties and services are provided. The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) accredits Health South Rehabilitation Hospital. The facility offers a wide range of specialized medical and therapeutic services. The Health South Rehabilitation Hospital is a 76-bed facility located in Tallahassee. Southeast Regional Cancer Center offers state of the art cancer treatment and a variety of patient services. Tallahassee Memorial Hospital, Inc. is a 735-licensed-bed hospital that offers a variety of different services to its patients.

The current capacity of the medical facilities should be adequate to meet the demands of the additional patients associated with the additional workforce required for the Project.

g. Firefighting Facilities

The Tallahassee Fire Department and the Leon County Volunteer Fire Departments (VFD) provide service to Leon County. The Tallahassee Fire Department provides service for the City of Tallahassee as well as the entire county, while the VFD only provides service for county residents. If an emergency occurs in the county, both the Tallahassee Fire Department and the VFD will be dispatched. There are six VFDs located throughout Leon County. The VFDs are administered by the LCEMS.

i. Police Protection

The Leon County Sheriff’s Office provides law enforcement in the vicinity of the Hopkins Site. There has been no significant change in law enforcement personnel since the Resource Addition Project SCA (2004).

j. Other Services

There have been no significant changes in recreational, electricity and gas, water supply, and solid waste disposal facilities since the Resource Addition Project SCA (2004).

2.3 BIOPHYSICAL ENVIRONMENT

2.3.1 Geohydrology

This section presents the major geological characteristics of the Hopkins Site, including descriptions of geological and soil studies conducted to assess the suitability of the Site for the Repowering Project. Included in this section is a geological description of the Site, information on the geological structures and stratigraphy, a detailed lithologic description, geological maps, and geotechnical information on soil properties.

Two types of geologic data were used to characterize the subsurface conditions affecting the proposed Repowering Project: (1) published literature providing regional information for northwest Florida and Leon County's geologic setting; and (2) onsite surface and subsurface field investigations. Those reports provided information on Site stratigraphy, aquifers, and soil engineering properties. Copies of reports, maps and data from the 1991 field investigations are included in Sections 10.5.6 and 10.5.7. Similar information from the Resource Addition Project SCA is included in Section 10.5.10. Information from those sources, combined with the regional geologic features affecting the Site, was evaluated to assess Site-specific geology. The following sections describe the regional and Site-specific geologic features.

2.3.1.1 Geological Description of Site Area

Reports listed in the reference section at the end of Section 2 were reviewed to develop a regional framework for the southeastern United States, Florida, Leon County, and the general area comprising the Site. Those reports provide information on physiography, soils, geologic structure, stratigraphy, and hydrogeology. Using this information, regional geologic features, which may affect the Project, were evaluated to develop a description of the Site geology. Regional geology and its relevance to the Site are summarized in the following subsections.

a. Physiography

Leon County, Florida, exhibits expressions of three major physiographic divisions which are illustrated in Figure 2.3.1-1: (1) the Northern Highlands which include the Tallahassee Hills, primarily in northern Leon County; (2) the Gulf Coastal Lowlands, which include the Apalachicola Coastal Lowlands and the Woodville Karst Plain in southern Leon County; and (3) the River Valley Lowlands which include the stream valleys of the Ochlockonee and St. Marks Rivers. The Hopkins Site is located within the Okefenokee Dune region of the Apalachicola Coastal Lowlands. A ridge of loose quartz sands which forms a terrace north of the Cody scarp, the Okefenokee Dunes are associated with an ancient shoreline which existed during the Pleistocene Yarmouth interglacial period (Hendry and Sproul, 1966). The Site is located on a hydrologic divide, and has terraces, which are dissected by streams that flow into Lake Munson drainage basin (southeast of the topographic divide) and toward the lower Ochlockonee River drainage basin (northwest of the topographic divide).

b. Soils

Soils in the vicinity of the Hopkins Site are represented according to the Soil Survey of Leon County, Florida (Sanders, 1981), primarily as Albany, Blanton, and Plummer series which are characteristically poorly to moderately well drained soils on slopes ranging from 0-5%. Figure 2.3.1-2 illustrates the distribution of these soil types at the Site. Blanton soils dominate the northern half of the Site, which is the development area of the Unit 2 Repowering Project, with a small sector of Plummer soils in the northwest corner of the Site. Albany soils predominate in the southern half of the Site. Soils at the Site are fine sands, loamy sands, sandy loams, and clay loams. The soils are characterized as having only a slight erosional risk hazard with low to very low shrink-swell potential. Albany and Blanton soils have a relatively high permeability to water in their upper profile (0 to 50 inches) at 6 to 20 inches per hour. The lower soil profile (50 to 80 inches) is less permeable at 0.6 to 6 inches per hour for Albany soils and 0.6 to 2 inches per hour for Blanton. The Plummer soils have a permeability range from 0.6 to 6 inches per hour.

c. Geologic Structure

Figure 2.3.1-3 illustrates the location and orientation of several regional geologic structural features which have influenced the subsurface structure of Leon County and adjacent areas (Rupert, 1990):

Peninsular Arch — The Peninsular Arch forms the axis of peninsular Florida. It is a southeast-trending structure high in pre-Mesozoic sediments. Although no direct structural relationships are known to exist between the arch and the Tertiary sediments of Leon County, the downwarped western flank of the Peninsular Arch extends beneath the Site.

Apalachicola Embayment — Leon County is situated southeast of the axis of a broad sedimentary basin known as the Apalachicola Embayment. The northeast-southwest trending axis passes through adjacent Gadsden County to the west and is approximately 15 to 20 miles to the northwest of the Site. Oil test wells have shown the sediment fill of the basin to be about 13,000 feet of Triassic to Holocene-age deposits, all resting on Paleozoic age metamorphic rocks. Effects of this structural feature on subsurface hydrologic conditions are described in Subsection 2.3.2.1.

Chattahoochee Anticline — North and northwest of the Apalachicola Embayment is a minor structural high called the Chattahoochee Anticline. This structure is an elongate anticline trending northeast-southwest. Oligocene and Eocene rocks are exposed at the surface in the vicinity of the crest. Oligocene and younger sediments erosionally pinch-out or are truncated against it.

Gulf Trough — Leon County lies near the transitional area between the carbonate-evaporite facies to the southeast and terrigenous siliciclastic facies to the north and west. Structure maps on different stratigraphic horizons indicate the axis of the trough migrated over time. Throughout its existence as an open connection between the embayments, the trough was an area of slow deposition or non-deposition. Although its influence as a sediment barrier apparently waned by the end of the Oligocene, 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.

Ocala Arch — The Ocala Arch is a gentle, post-Oligocene flexure in west-central peninsular Florida. This structural high has an axis parallel to that of the Peninsular Arch, but the two features are unrelated. The arch exposes the Eocene Ocala and Claiborne Groups near its crest; Oligocene and younger sediments are erosionally truncated against the flanks of the structure. The effects that this structural feature has had upon the Site are described in subsection 2.3.2.1.

d. Stratigraphy

Florida's stratigraphy consists of unconsolidated sediments overlying a sedimentary rock sequence which overlies basement rocks, defined as pre-Middle Jurassic rocks beneath the Mesozoic post-rift unconformity (Arthur, 1988). The sedimentary stratigraphic sequence of Leon County consists of several thousand feet of marine, littoral, and terrestrial deposits of post-Middle Jurassic age. Quaternary and Tertiary strata extend to approximately 2,500 feet below the ground surface at the Site (Miller, 1986). These strata contain all of the geologic and hydrologic formations of primary importance to the Repowering Project.

Table 2.3.1-1 shows the relevant stratigraphy (Holocene through Paleocene age sediments) at the Site. The table describes the lithologic character of these sediments as well as their approximate thickness and depth at the Site, and provides the hydrologic unit to which the stratigraphic units belong. Figure 2.3.1-4 shows a generalized geologic cross-section of Tertiary and younger stratigraphic units over portions of Leon and Gadsden Counties.

The cross-section shows a relatively thin layer of post-Hawthorn deposits overlying the Hawthorn Formation, the confining unit to the Floridan Aquifer. The St. Marks, Suwannee, and Ocala limestones are shown to make up the upper portion of the Floridan Aquifer, which extends to deeper deposits of undifferentiated Claiborne and Wilcox formations. Well No. 125 on the cross-section is the existing No. 4 Supply Well at Hopkins Station. Figure 2.3.1-5 is a geologic map of Leon County showing Tertiary outcrops in the county and Tertiary subcrops below Pleistocene or younger sediments. The map shows that the Miocene Hawthorn Formation subcrops below Pleistocene sediments at the Site. The No. 4 well encountered approximately four feet of post-Hawthorn deposits, 152 feet of Miocene Hawthorn, 100 feet of Miocene St. Marks, and penetrated approximately 210 feet of Eocene and Oligocene strata to a total depth of 466 feet below the surface. Its location is shown in Figure 2.3.1-7.

2.3.1.2 Detailed Site Lithologic Description

Several subsurface investigations and studies have been completed from 1968 to 2004, during original design and construction of the Hopkins Station and its proposed and completed additions. The description of the Site lithologic conditions detailed in this section is based on the Site-specific subsoil information generated during the period of 1991 through 2004. Records of earlier borings were not available to be included in this discussion.

Table 2.3.1-2 summarizes the type of data collected and completion dates for 15 borings on the south and east sides of the Site, five "geotechnical" borings drilled in 1991, as well as 14 borings drilled in 2004. The locations and descriptions of soil borings associated with this geotechnical work are indicated on, Figure 2.3.1-6 and Figure 2.3.1-7. Borings were advanced by mudded rotary bit drilling, split-spoon sampler, and Shelby tube sampler.

Borings Drilled in 1991: Subsurface investigations were conducted for purposes of defining the Hawthorn Formation and conducting piezometric studies. The investigations included 21 borings, collection of soil and groundwater sample for laboratory analyses, installation of piezometers, slug tests and a limited geophysical survey using direct current electrical resistivity. Nine of these borings were converted into groundwater monitoring wells (MW Series). Six of the borings (VB-1 through VB-6) were drilled to confirm the locations of suspected subsurface voids. One boring (DB-1) was drilled into the Floridan Aquifer. Five borings (TH-101 through TH-105) were drilled to collect detailed geotechnical data (Figure 2.3.1-7).

The deepest boring, drilled to a depth of 140 feet, penetrated the St. Marks Formation at 128 feet below ground surface. Geophysical well surveys (gamma ray, electrical, and caliper logs) were run in the well. This well encountered a thin veneer of soil above the top of the Hawthorn at seven feet below ground surface. The thickness of the Hawthorn Formation is 121 feet at the DB-l boring. This well was grouted back to the surface after completion of geophysical well surveys.

Generally, the borings encountered between 6 feet and 25 feet of loose to dense, fine to medium grained, argillaceous to silty, brown, tan and white sands near the surface overlying clayey sediments of the Hawthorn. Clays of the Hawthorn Formation were primarily soft to medium stiff and sticky in the upper samples, usually becoming stiff to hard to very hard and dry and crumbly in the deeper samples. The clays were often silty or sandy and were variable in color from grey, green and brown to cream, tan, white and red. Several samples were iron-stained and contained traces of phosphates and limestone fragments. Seven undisturbed clay samples in six borings were obtained by Shelby Tube and were evaluated for vertical hydraulic conductivity analysis. Limestones were logged in some of the wells. Loss of circulation was encountered in two borings (MW-l, MW-4) at depths greater than 38 feet below ground surface, which may be evidence of a local zone of high permeability. Following geotechnical studies to characterize these subsurface features are further described in Section 2.3.2.3.

<u>Borings Drilled in 2004:</u> A series of 12 borings were drilled in 2004 in order to investigate the ground conditions within the Reciprocating Engine and Combustion Turbine Generator area south of the existing substation (Ardaman, 2004). Additionally, two borings were drilled within the substation area. The location of this group of borings is shown in Figure 2.3.1-6. All borings were extended a minimum of 15 feet into the limestone rock. The groundwater was observed in the boreholes at the approximate depth of 30 feet. Gradation, plasticity, and consolidation tests were performed on disturbed (split-spoon) and relatively undisturbed (Shelby Tube) soil samples. The subsoil conditions encountered in these borings were generally similar to the conditions observed in the 1991 borings, except for consistently low blow counts taken in the clay throughout its entire thickness. In several borings, 100% loss of drilling fluid was observed within

the clayey soil overlying the rock, or within the upper sections of the limestone rock. In five of the borings sinking of drill rods under their own weight occurred while drilling within the limestone. Table 2.3.1-2 summarizes the type of data collected from these borings. The report of this investigation is included in Section 10.5.10.

The lithology of the soils and sediments described by the recent subsurface investigations match well with the lithologic descriptions of borings from the previous investigations. Most of these borings were drilled beneath existing structures at the Hopkins Station area prior to construction. A review of these borings indicates that no subsurface voids were found in this area, which is substantiated by the results of the five updated borings in the same general area. This topic is discussed further in Section 2.3.2.3.

2.3.1.3 Geologic Maps

Regional and county geologic and soil maps (Figures 2.3.1-1 through 2.3.1-5) show physiography, major structural features, stratigraphy and surface geology affecting the Site.

2.3.1.4 Bearing Strength

In order to assess the criteria for allowable foundation pressures at the Site, the following sources for the Site-specific subsurface information were reviewed:

- Leon County Soil Survey Report to establish the general character of the near-surface soils.
- Results of the 1991 subsurface exploration program
- Results of the 2004 subsurface exploration program performed in the area of the Reciprocating Engine and Combustion Turbine Generator structures.

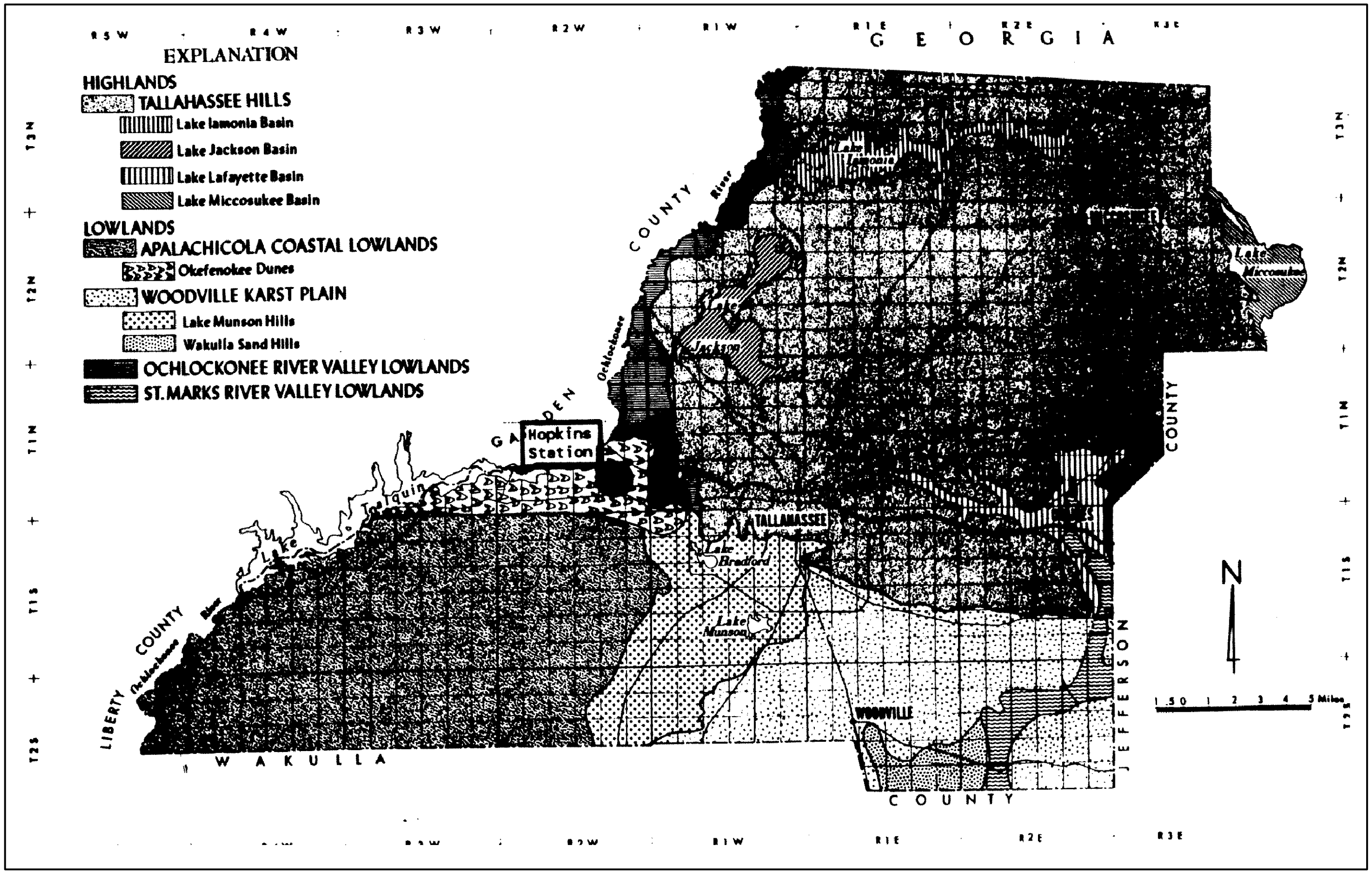
A general description of the near-surface soils was given in Section 2.3.1.1. The Blanton soil series, which cover the area of the proposed major structures for the Unit 2 Repowering Project are classified as poorly-graded silty and clayey sands (SP-SM, SM, SC, SM-SC) according to the Unified Soil Classification System. Blanton soils are free-draining; therefore, the foundation problems associated with the prolonged wetness in the ground are not anticipated in these materials. The maximum depth of evaluation associated with the county soil survey report is approximately seven feet below the existing grade.

The results of the 1991 investigation indicate a soil profile predominantly consisting of sands and silty sands within the upper 6 to 25 feet. The sand is underlain by clays of the Hawthorn

Formation. The bedrock beneath the clays consists of the weathered Hawthorn limestone. The SPT N-values in the sand range from 3 to 30 within the upper 5 feet. There is a general improvement in the N values with depth. The clays are generally stiff, with SPT N-values ranging from about 10 to 20 blows per foot. The underlying weathered limestone is hard, with SPT N-values generally greater than 50 blows per foot. The results are consistent with the previous investigations performed for the existing Hopkins Station.

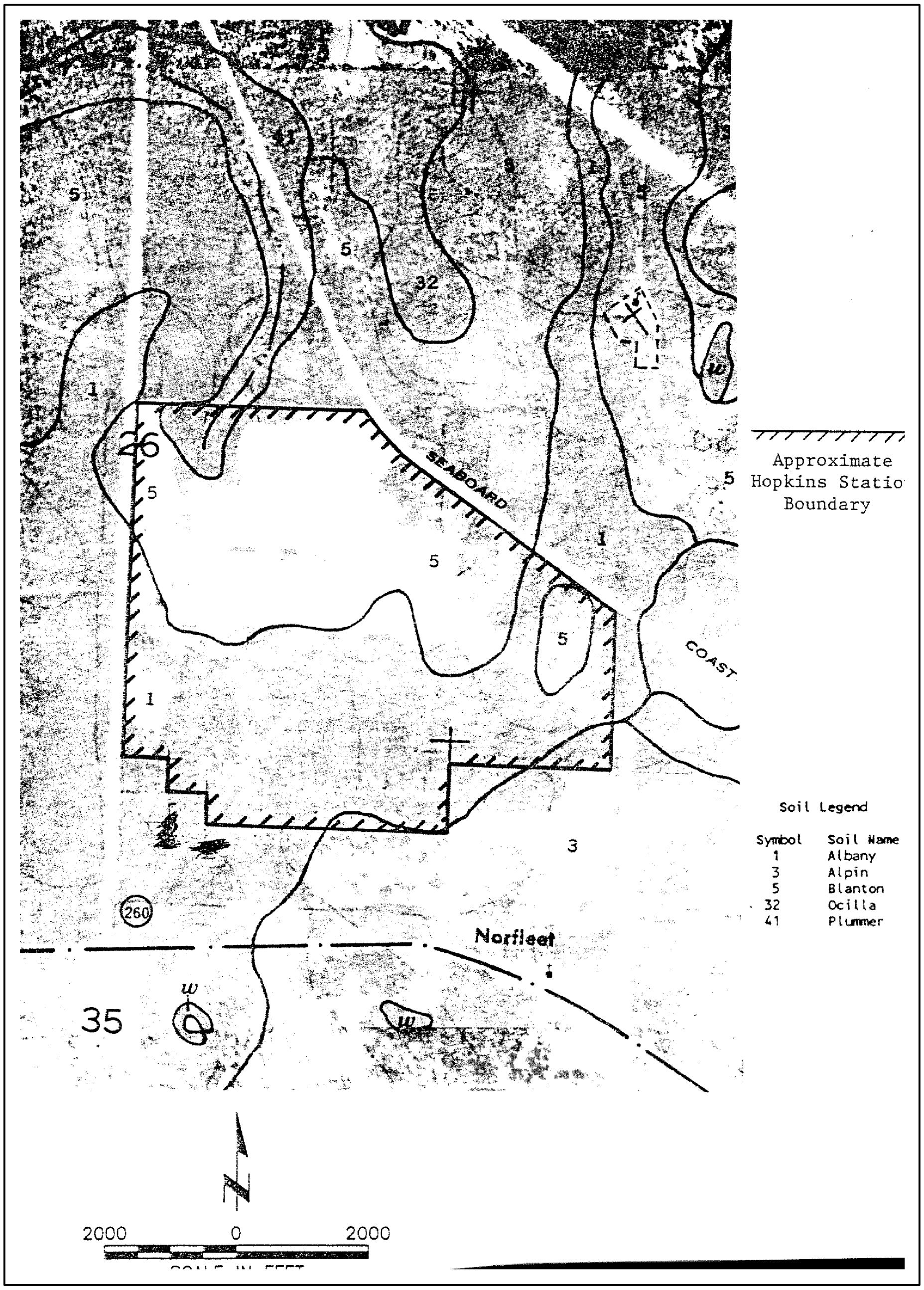
The borings drilled for the 2004 investigation showed a similar soil profile within the area of the Reciprocating Engine and Combustion Turbine Generator structures. The SPT N-values were generally low (2 to 12) both within the sands and clays throughout the soil profile overlying the limestone bedrock. Occasionally, blow counts within the range of 14 to 23 blows were obtained in the sand between depths of 5 to 10 feet. The cohesive strength of the clay samples determined from the unconfined compression tests ranged between 0.3 to 1.2 k/ft^2.

Based on the subsoil data obtained to date from the geotechnical investigation programs at the Site, light to medium foundation loads (less than approximately 2 kips per square foot) can be accommodated by shallow spread foundations for the Repowering Project area. For shallow foundations, the controlling factor for foundation acceptability will be the allowable bearing pressure to be calculated based on the ultimate bearing capacity of the foundation soil, or the potential immediate and long-term settlements of the foundations. For heavily loaded structures, deep foundation systems such as piles or drilled piers may be required to transfer the foundation loads onto the underlying limestone. For deep foundations bearing on rock, the allowable end-bearing capacity is usually based on the ultimate bearing capacity of the rock reduced by an appropriate factor of safety.



EXPLANATION
HIGHLANDS
TALLAHASSEE HILLS
Lake Iamonia Basin
Lake Jackson Basin
Lake Lafayette Basin
Lake Miccosukee Basin
LOWLANDS
APALACHICOLA COASTAL LOWLANDS
Okefenokee Dunes
WOODVILLE KARST PLAIN
Lake Munson Hills
Wakulla Sand Hills
OCHLOCKONEE RIVER VALLEY LOWLANDS
ST. MARKS RIVER VALLEY LOWLANDS
GEORGIA
GADSDEN COUNTY
LIBERTY COUNTY
WAKULLA
JEFFERSON COUNTY
Hopkins Station
TALLAHASSEE
WOODVILLE
Lake Bradford
Lake Munson
Lake Talquin
Lake Miccosukee
Ochlockonee River
N
0 1 2 3 4 5 Miles

PHYSIOGRAPHIC SUBDIVISIONS IN
LEON COUNTY
ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE
Sargent & Lundy LLC
FIGURE NUMBER
2.3.1-1
SOURCE:
HENDRY, 1966



DISTRIBUTION OF SOIL TYPES
AT THE HOPKINS STATION

Sargent & Lundy LLC

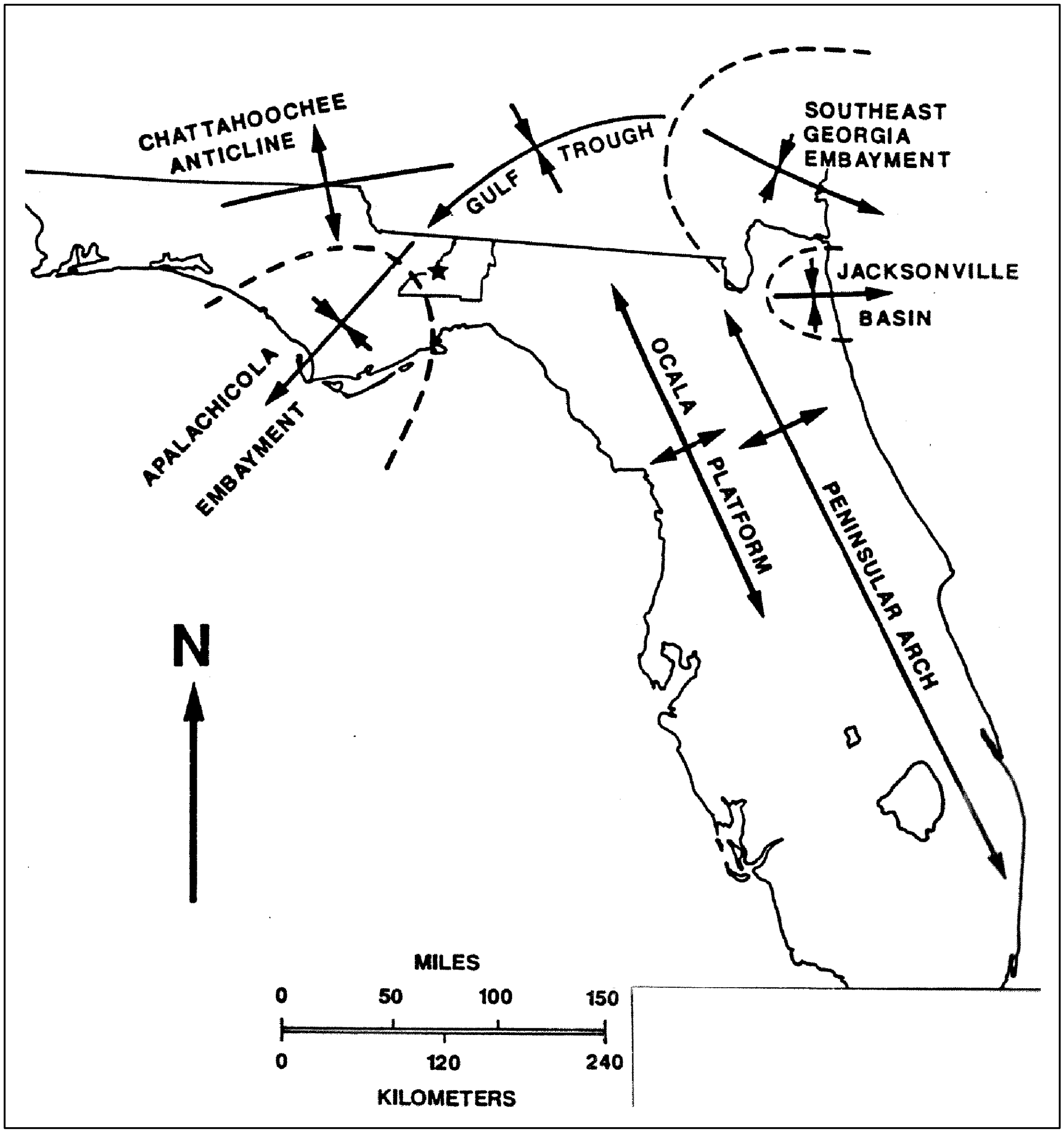
ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

FIGURE NUMBER

2.3.1–2

SOURCE:

SANDERS, 1981



SOURCE:
RUPERT, 1990, FLORIDA GEOLOGICAL SURVERY BULLETIN No. 62

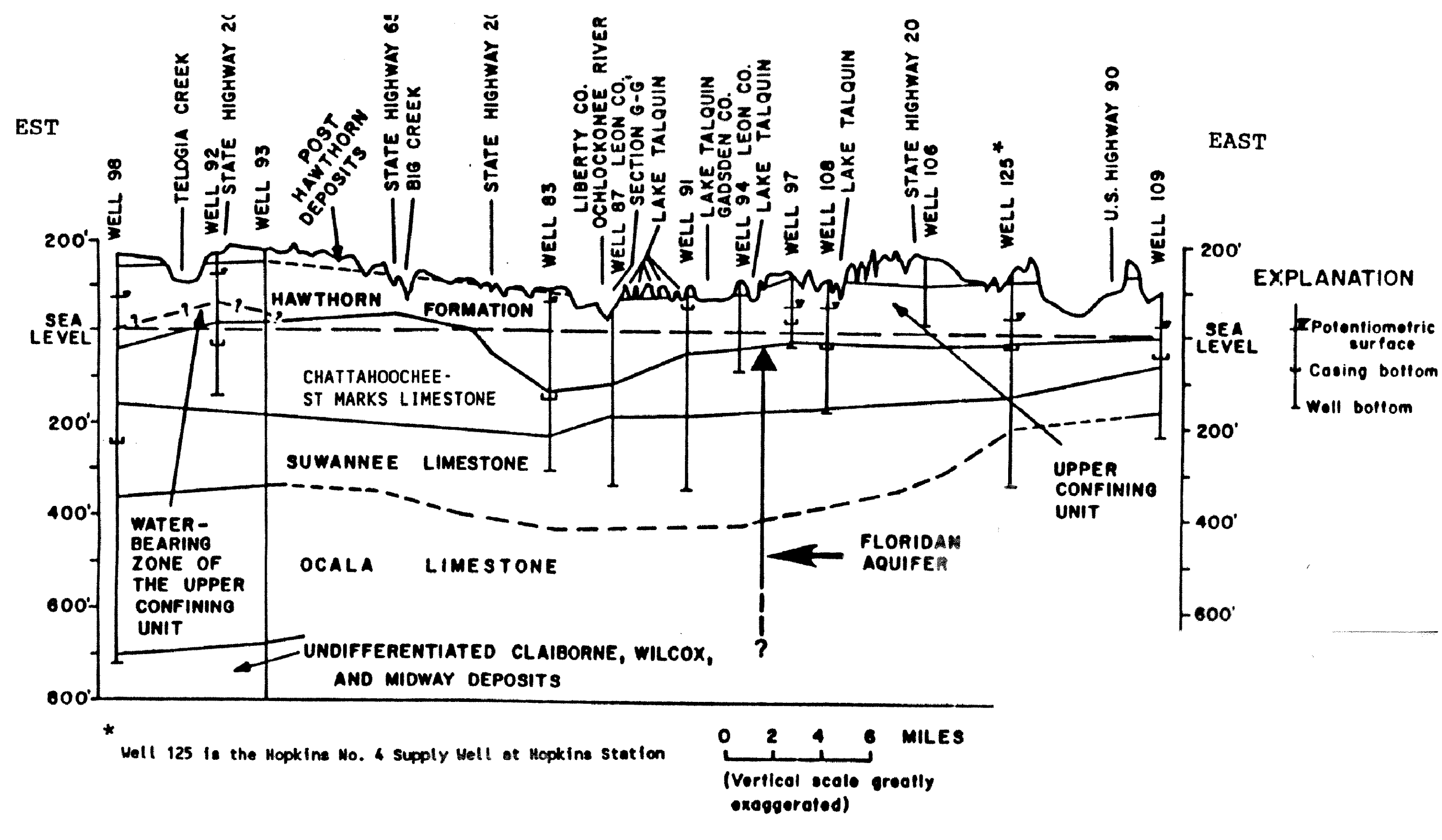
PRINCIPAL SUBSURFACE STRUCTURES
OF NORTH FLORIDA

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

Sargent & Lundy LLC

FIGURE NUMBER

2.3.1-3



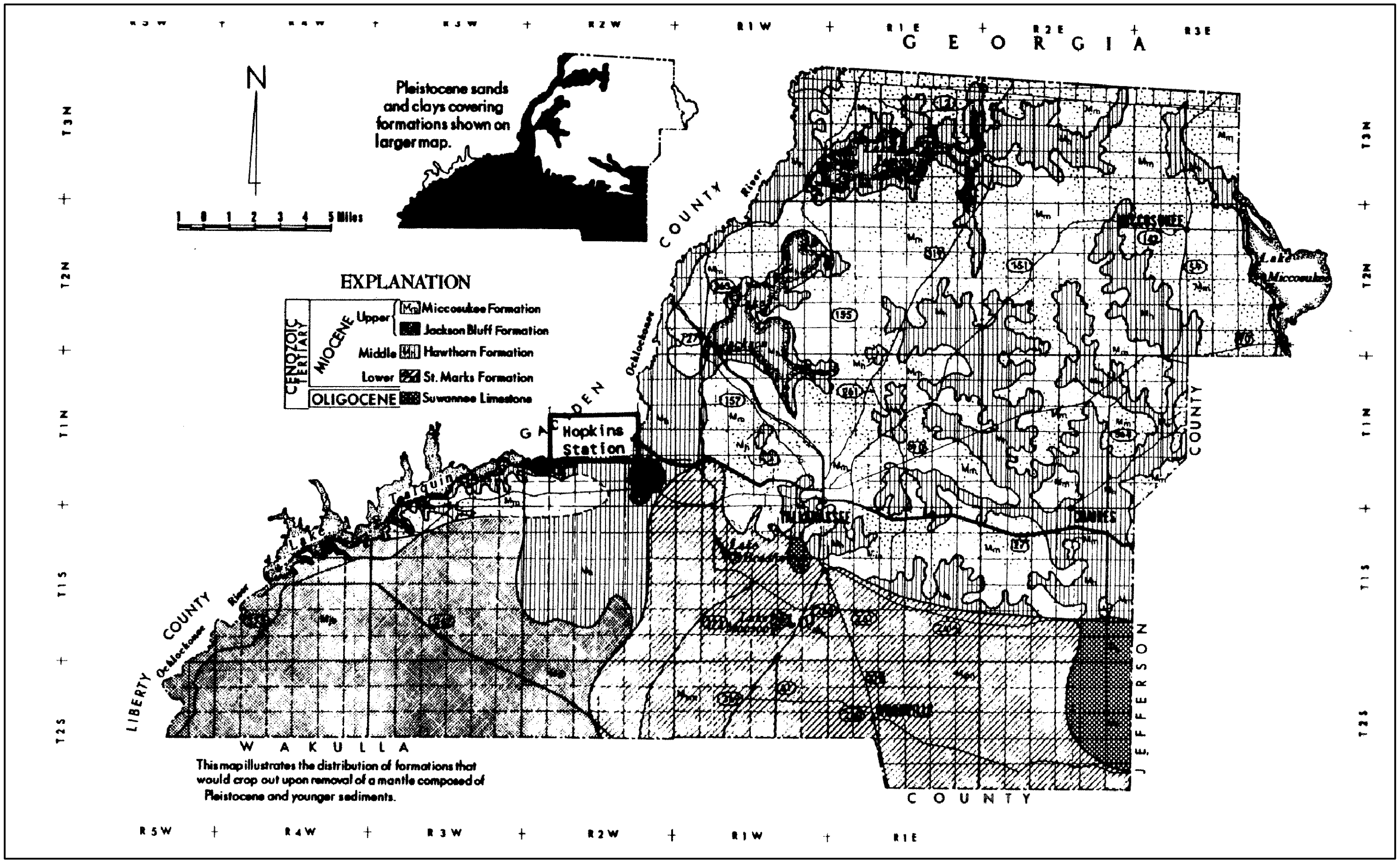
SOURCE:
PASCALE AND WAGNER, 1982, U.S.G.S. WATER–RESOURCES INVESTIGATIONS OPEN–FILE REPORT 81–1121

GEOHYDROLOGIC SECTION THROUGH THE OCHLOCKONEE RIVER AREA AND THE HOPKINS STATION

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

Sargent & Lundy LLC

FIGURE NUMBER
2.3.1–4



GEOLOGIC MAP OF LEON COUNTY

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

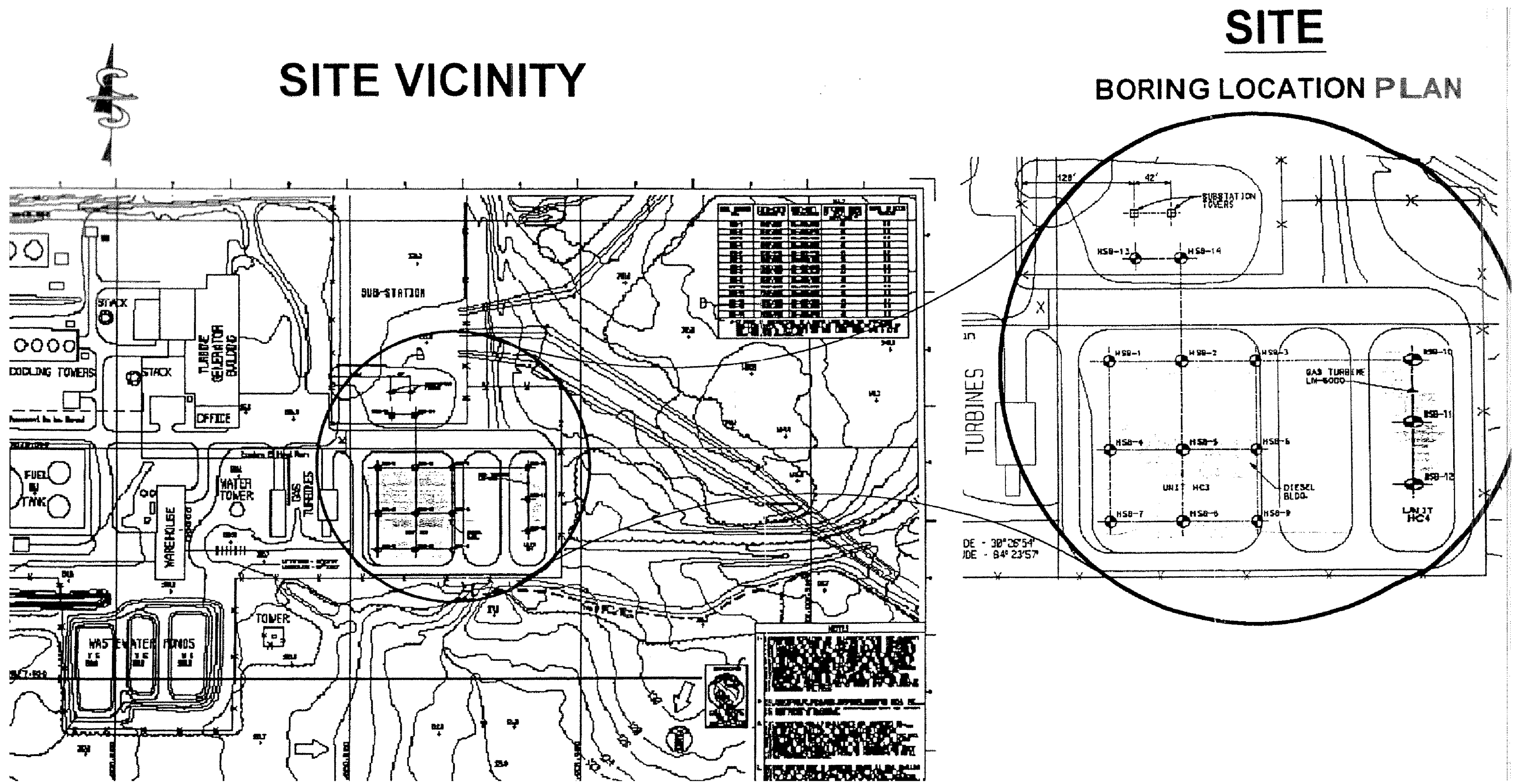
Sargent & Lundy LLC

FIGURE NUMBER

2.3.1–5

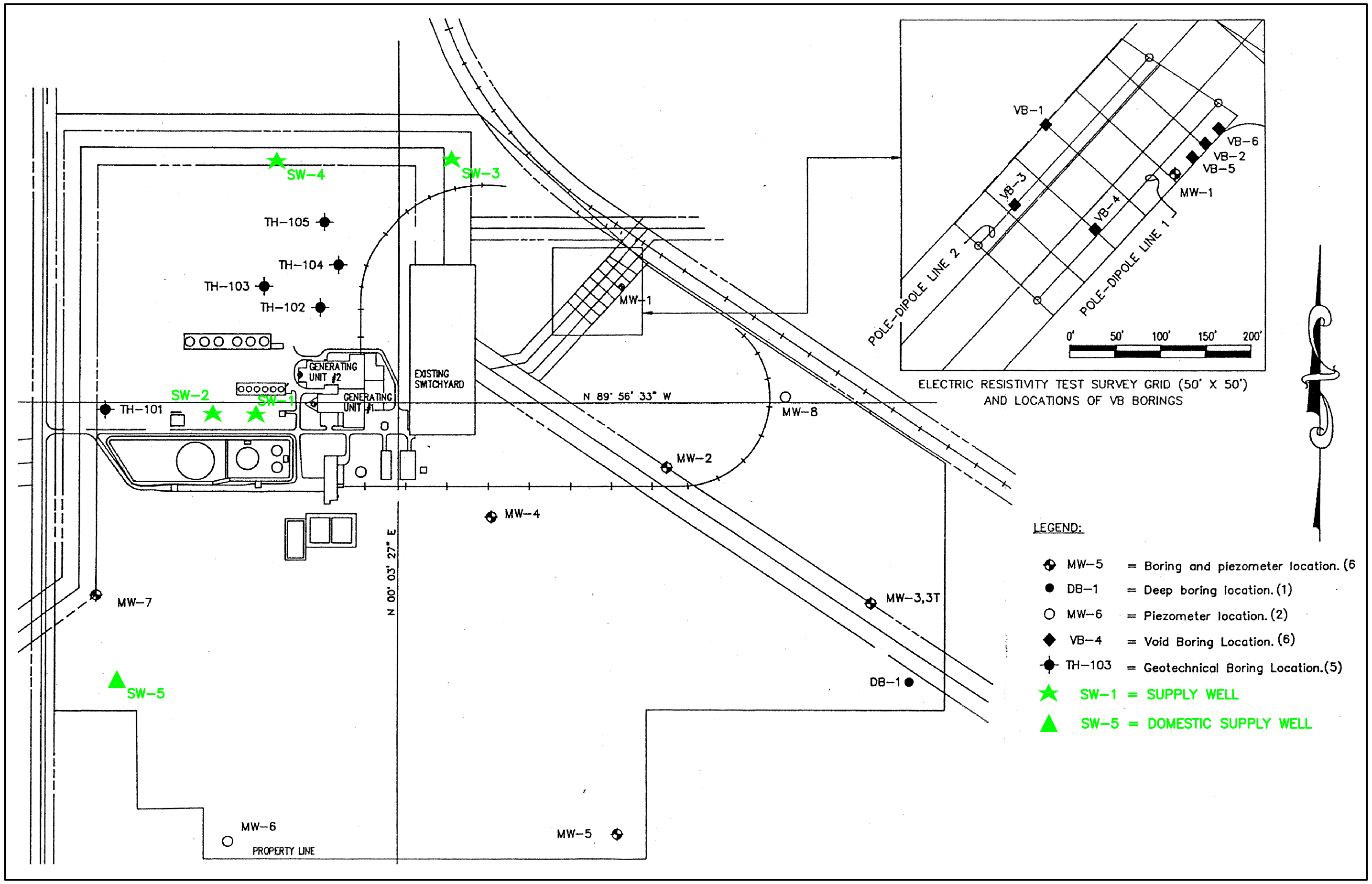
SOURCE:

HENDRY, 1966



HOPKINS STATION BORING LOCATIONS 2004	Sargent & Lundy LLC
ARVAH B. HOPKINS GENERATING STATION UNIT 2 REPOWERING PROJECT CITY OF TALLAHASSEE	FIGURE NUMBER 2.3.1–6

SOURCE:
ARDAMAN & ASSOCIATES, INC.



SOURCE:

HOPKINS SITE BORINGS AND SUPPLY WELLS

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

Sargent & Lundy LLC

FIGURE NUMBER

2.3.1-7

Table 2.3.1-1 Stratigraphy and Aquifer Systems at the Hopkins Station

	Geologic Age	Stratigraphic Unit	Thickness (feet)	Average Depth (MSL)	Lithologic Character	Hydrologic Unit	
QUARTERNARY	Holocene and Pleistocene	Undifferentiated	0-25	+135	Soil, brown to gray, fine to medium sands, argillaceous sand, sandy clay, and clay.		Surficial Aquifer System
TERTIARY	Miocene	Hawthorn	80-160	+125	Greenish gray to yellowish gray montmorillonite clay and gray sandy phosphatic clay; thin argillaceous sand lenses and limestone seams; pale orange to light gray phosphatic limestone.		Intermediate System (Confining layer and Aquifer)
		St. Marks	100	0	Pale to grayish orange silty to sandy dolomitic limestone.	A	Floridan Aquifer System
	Oligocene	Suwannee	200	-100	Pale orange dolomitic limestones and dolomites.	B	
	Eocene	Ocala Group	1900	-300	Pale to grayish orange dolomitic limestone and dolomite.	B	
		Claiborne Group			Pale orange, cream to tan dolomitic limestone.	C	
		Wilcox			Pale orange, dolomitic, argillaceous limestone with interstitial gypsum; grayish green limy clay.		Sub-Floridan (Confining Unit)
	Paleocene	Midway	200	-2200	Yellowish green silty, limy clay and argillaceous limestone.		

Table 2.3.1-2 Summary of Borings/Monitor Wells Drilled at the Hopkins Site, January – February 1991

Geotechnical Borings Drilled in January/February 1991
(See Figure 2.3.1-7)

BORING	DATE COMPLETED	GROUND EL. (FEET)	DEPTH (FEET)	COMMENTS
MW-1	1/21/1991	145.61	57.5	1,2,3,4,5,8,10,11,12
MW-2	1/22/1991	143.63	52.5	1,2,3,4,5,8,11,12
MW-3	1/22/1991	121.74	52	1,2,4,5,8,11,12
MW-3T	2/7/1991	122 (estimated)	20	3,9
MW-4	1/23/1991	128.29	42	1,2,3,4,5,8,10,11,12
MW-5	1/23/1991	137.95	55	1,2,3,4,5,8,11,12
MW-6	2/12/1991	144.31	13	4,8,14
MW-7	1/28/1991	132.27	55.1	1,2,3,4,5,8,11,12
MW-8	2/12/1991	140.78	13	4,8,14
DB-1	1/25/1991	115.09	140	6,9,13
VB-1	2/7/1991	146.18	54	7,9,13
VB-2	2/7/1991	146.55	60	7,9,13
VB-3	2/8/1991	145.13	56	7,9,13
VB-4	2/8/1991	143.63	49	7,9,10,13
VB-5	2/19/1991	-	53.5	7,9
VB-6	2/19/1991	-	56.5	7,9
TH-101	_1/29/1991_	129.01	61	5,16
TH-102	_2/4/1991_	135.15	60.5	5,16
TH-103	_2/4/1991_	135.45	65.5	5
TH-104	_2/5/1991_	137.8	67	5,16
TH-105	_2/5/1991_	137.41	70	5,16

Geotechnical Borings Drilled in May 2004
(See Figure 2.3.1-6)

BORING	DATE COMPLETED	GROUND EL. (FEET)	DEPTH (FEET)	COMMENTS
HSB-1	May-04	N/A	62.5	2,9,11,15,16,17,18
HSB-2	May-04	N/A	58.5	2,9,11,15,17,18,18
HSB-3	May-04	N/A	60	2,9,11,15,16,17
HSB-4	May-04	N/A	68.5	2,5,9,11,15,17,18
HSB-5	May-04	N/A	68	2,9,11,16,17,18
HSB-6	May-04	N/A	52	2,9,11,15,161,17,18
HSB-7	May-04	N/A	68.5	2,9,11,15,17,18
HSB-8	May-04	N/A	69	2,9,11,15,16,17,18
HSB-9	May-04	N/A	68.5	2,9,11,16,17,18
HSB-10	May-04	N/A	62.5	1,2,9,11,15,16,17,18
HSB-11	May-04	N/A	58.8	1,2,9,11,15,16,17
HSB-12	May-04	N/A	58	1,2,9,11,15,16,17,18
HSB-13	May-04	N/A	58.5	2,5,9,11,15,16,17,18
HSB-13	May-04	N/A	61	2,5,9,11,15,17,18

COMMENTS AND BORING CODES:

1. CONTINUOUS SPLIT SPOON SAMPLES FROM 0-10 FEET.
2. SPLIT SPOON SAMPLES ATTEMPTED ON 5-FOOT CENTERS TO TOTAL DEPTH.
3. SHELBY TUBE SAMPLE OF HAWTHORN SUBMITTED FOR VERTICAL HYDRAULIC CONDUCTIVITY ANALYSIS.
4. STATIC WATER LEVELS TAKEN FROM INSTALLED PIEZOMETER.
5. SIEVE ANALYSIS ON PLEISTOCENE SANDS.
6. "DEEP" BORING INTO FLORIDAN AQUIFER. RAN GAMMA RAY, ELECTRIC AND CALIPER LOGS.
7. BORING DRILLED FOR SUBSURFACE VOID CONFORMATION.
8. PIEZOMETER SET FROM 3' - 13'.
9. WELL PLUGGED BY GROUTING BACK TO SURFACE.
10. VOID ENCOUNTERED IN BORING.
11. STANDARD PENETRATION TESTS TAKEN IN BORING.
12. GROUNDWATER SAMPLE TAKEN FOR LABORATORY ANALYSIS.
13. SCATTERED SPLIT SPOON SAMPLES TAKEN IN BORING.
14. NOT A BORING, MONITOR WELL ONLY.
15. PERCENT PASSING THE #200 SIEVE TEST.
16. ATTERBERG LIMITS TEST.
17. ROCK CORING.
18. LOSS OF DRILL FLUID RECIRCULATION AND/OR DRILL RODS SINKING UNDER THEIR OWN WEIGHT.

MW = MONITORING WELL
DB = FLORIDAN AQUIFER "DEEP" BORING
T = TWIN
VB = BORING DRILLED FOR SUBSURFACE VOID CONFORMATION/TEST SURVEY
HSB = BORING DRILLED WITHIN THE COMBUSTION TURBINE GENERATOR OR SUBSTATION AREA.

2.3.2 Subsurface Hydrology

2.3.2.1 Subsurface Hydrology

This section reviews the physical, chemical, and hydrological aspects of subsurface waters that could be affected by the construction or operation of the Repowering Project. Topics covered include subsurface hydrogeologic data, background water quality, and karst hydrogeology. Regional hydrogeologic information and data acquired to date from recent subsurface investigations indicate that the Site is appropriate for the development of the Project. The current Site Certification for Unit 2 establishes the Hopkins Station as an existing installation in effect operating under a pre-1984 FDER water discharge permit, as per FAC Rule 62-28.700. Pursuant to this rule, the subsurface waters within the zone of discharge potentially affected by the Hopkins Station extend to the Site property boundary.

Three aquifer systems and two major confining units underlie most of Leon County and the entire Site. The aquifers are: the Surficial Aquifer, limestones within the Intermediate System, and the Floridan Aquifer. Low permeability clays within the Intermediate System act as the first confining unit, separating the Floridan from the Surficial Aquifer. The base of the Floridan Aquifer, formed by the Sub-Floridan confining unit, is the second confining unit.

The Floridan Aquifer is the most significant groundwater system within Florida and Leon County; it contains groundwater under artesian and water table conditions. According to the U.S.G.S. Scientific Investigation Report 2004-5151, virtually all of the freshwater used in Leon County during 2000 came from the Floridan Aquifer (44.93 MGD). Only 0.43 MGD is pumped from the surficial aquifer in Leon County. Water uses and sources are shown in Tables 2.3.3-3 and 2.3.3-4.

a. <u>Floridan Aquifer</u>

The Floridan Aquifer underlies all of Florida and parts of southern Alabama and Georgia (Hendry and Sproul, 1966). It is the principal groundwater source for municipal, industrial and domestic water supplies in Florida and Leon County. It is the sole groundwater source for Hopkins Station. The thickness of the Floridan ranges from 950 feet in northern Leon County, to 1950 feet in the southern part of the county (Figure 2.3.2-1). The aquifer is approximately 1400 feet thick at the Site and consists predominantly of a thick sequence of marine carbonate sediments of lower Miocene through lower Eocene age, which act as a single hydrologic unit. The principal water-bearing units of the aquifer are the St. Marks, Suwannee, and Ocala limestones (Bartel and Benoit, 1988). The Floridan is overlain and confined by low permeability members of the Miocene Hawthorn Formation within the Intermediate System, causing the Floridan to exhibit artesian pressure at the Site. Figure 2.3.2-2 shows that the Site is located at the transition between confined and semi-confined conditions for the Floridan Aquifer. These conditions conform to the general thickness distribution of the Hawthorn Formation (the confining layer) which thins to the south and east.

As part of the on-going monitoring program for the Hopkins Station, monthly and semi-annual water quality data is collected from the four Floridan Aquifer supply wells, which withdraw water for Station use. The raw data for the four wells is presented in Section 10.5.8 and includes five-years of data from January 2001 through December 2005. Table 2.3.2-1 presents a summary of these data and shows the ranges of values encountered for each parameter. As indicated by the analysis in the table, the four supply wells are below the secondary groundwater standards listed.

The Supply Well No. 4 (Floridan Aquifer) was sampled in 1990 for the FDER's Statewide Groundwater Quality Monitoring Network, a cooperative project of the NWFWMD and the FDER. The parameters and contaminants tested and the analytical results for those which are covered by primary and secondary groundwater standards established by FAC Chapter 62-550 and are shown in Table 2.3.2-2. The analyses indicated that all values were below the primary and secondary groundwater standards.

Additional analyses recently were conducted on the groundwater that will continue to serve as cooling tower makeup. The results of those analyses are summarized in Table 2.3.2-3. The raw data are included in Section 10.5.8.

b. Intermediate System

The Intermediate System at the Site is defined as the hydrogeologic unit or units composed of low permeability materials which act to confine and to separate the Surficial Aquifer from the Floridan Aquifer (Table 2.3.1-1). At the Site, the Intermediate System comprises the Miocene age Hawthorn Formation, which is approximately 80 to 160 feet thick. The confining layers within the Hawthorn consist of clays, silty clays, sandy clays, and low permeability limestones. The hydraulic conductivity of the Intermediate System is estimated to range from 1E-2 to 1 E-5 feet/day (Allen and Wagner, 1984).

c. Surficial Aquifer

The Intermediate System is overlain by Pleistocene age sediments, comprised of clays, sandy clays, and unconsolidated sands. These uppermost water-bearing Pleistocene sands in the area are termed surficial aquifers and are in unconfined conditions. The surficial Pleistocene sediments vary in thickness near the Site due to surface erosion and the nature of the underlying unconformable contact with the Hawthorn Formation. As much as 25 feet may be present beneath hills, with complete erosion within low-areas of stream valleys.

The Site lies on a drainage basin flow divide with the southeastern portion of the Site draining to Gum Swamp and the northwestern portion of the Site draining to the Ochlockonee River basin. The Repowering Project area is situated directly on the topographic flow divide, with the majority of the improvements area draining to the northwest. In this position, perched groundwater flow directions are likely to vary slightly in either direction, depending on soil composition and frequency of precipitation events.

Lithological variabilities and the general thinness of the Surficial Aquifer restrict its use as a primary source of potable water in the area. However, the Surficial Aquifer is important in its ability to store and transmit quantities of water to the water-bearing units below (Allen and Wagner, 1984).

Recharge to the Surficial Aquifer is from rainfall. Water infiltrating the soil horizon moves downward into the sands of the Aquifer until the vertical gradient is impeded by the clays of the Intermediate System. At this point, the potential exists for downward leakage into the water-bearing zones of the Intermediate System. However, due to the permeability contrasts at the base of the Aquifer and the underlying confining unit, most water within this Aquifer tends to move laterally. Virtually all of the water that enters the Surficial Aquifer is lost to evapotranspiration or moves laterally toward points of discharge (Allen and Wagner, 1984). At the Hopkins Site, discharge occurs to natural streams and creeks on the Site, which are intermittent in nature.

2.3.2.2 Karst Hydrogeology

Karst features are a natural and common geologic feature in Florida due to the abundance of water-soluble carbonates (limestones and dolomites) susceptible to dissolution. The most common natural sources of stress that cause formation of sink features are fluctuations of water levels or water pressures resulting from torrential rains and flooding or severe drought with lowered groundwater levels (Lane, 1986). The primary stratigraphic interval subject to formation of sink features is the Hawthorn Formation. The low permeability sequence of rocks and sediments within the Hawthorn normally provides protection from sink formations, which can act as conduits for potential contamination to the Floridan Aquifer from surface sources. However, where portions of the Hawthorn are thin or absent, formation of voids within this zone creates the potential for dissolution of the limestone and subsequent subsidence or collapse of the overburden. This characteristic, i.e., thin or absent Hawthorn Formation, does not occur at the Site.

General karst regions in Florida are presented in Figure 2.3.2-4. Based on Figure 2.3.2-4 the Tallahassee area and in particular the Site is situated near the border of two types of karst areas. The map area summaries are as follows:

AREA III – COVER IS 30 TO 200 FEET THICK. Consists mainly of cohesive sediments of low permeability. Sinkholes are most numerous of varying size, and develop abruptly. Cover-collapse sinkholes dominate.

AREA IV – COVER IS MORE THAT 200 FEET THICK. Consists of cohesive sediment interlayered with discontinuous carbonate beds. Sinkholes are very few, but several large diameter, deep sinkholes occur. Cover-collapse sinkholes dominate.

Based on boring logs completed in the Project area in 1991, and logs completed in 2004 for a simple cycle combustion turbine study (Section 10.5.10), the thickness of the surficial soils over the bedrock is approximately 30 feet. This result confirms the location of the Site within the Area III Region.

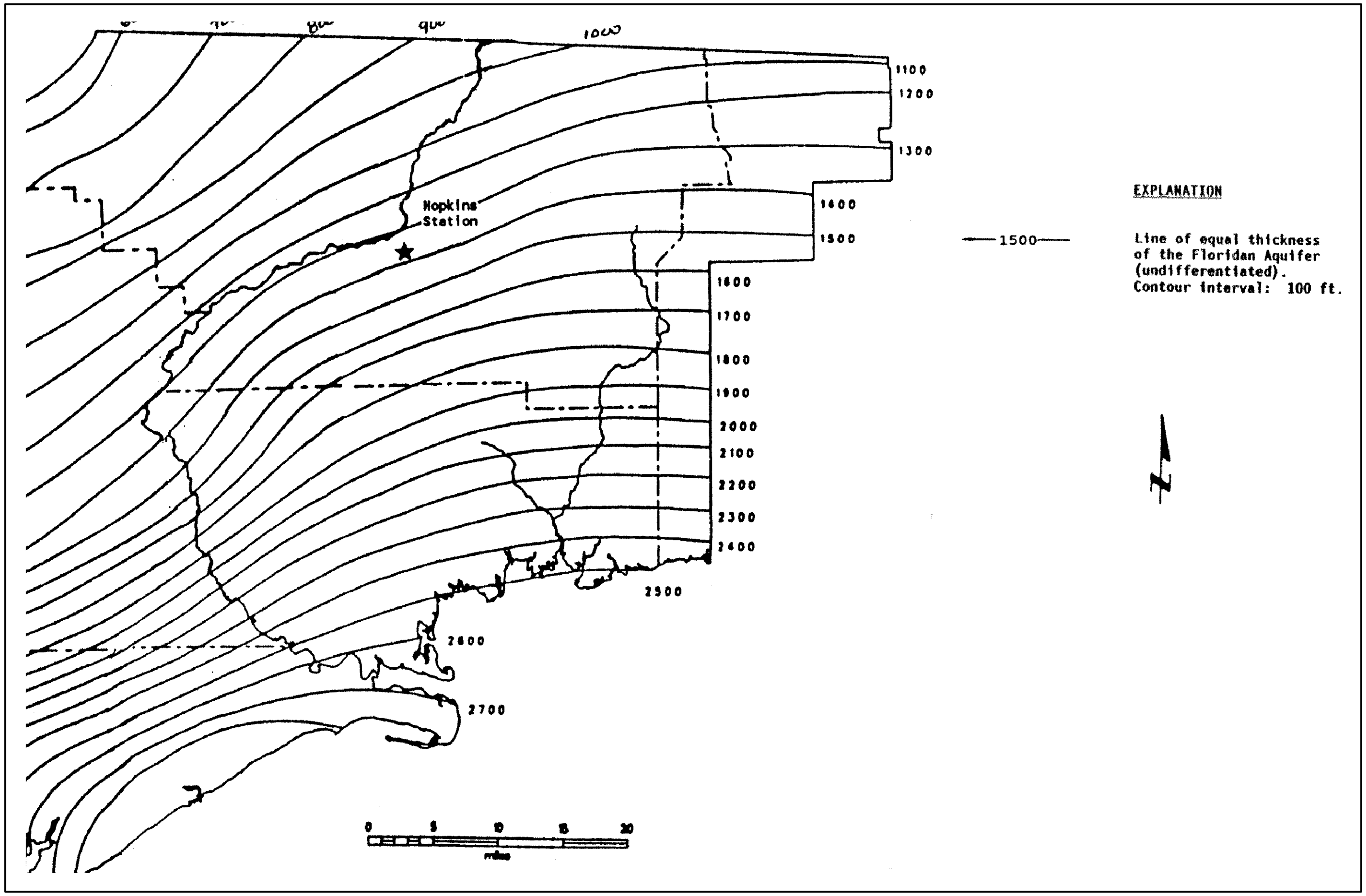
Based on the pattern of the visual surface water features on Figure 2.3.2-5 and Figure 2.3.2-6, it appears there is surficial evidence of potential sinkholes approximately 4,000 feet to the south and east of the Site. In the immediate Site vicinity there is little surficial evidence of sinkholes, however vegetation changes in undeveloped areas in the immediate Site vicinity could indicate shallow, cover-subsidence areas.

A potential cover subsidence area has been identified by the Tallahassee-Leon County GIS Web site and is shown in Figure 2.3.2-7. They designate this area as an "Environmentally Sensitive Karst Area." No other karst features are known on the property.

The Hopkins Site lies just within the boundary of increasing solution activity occurring within limestones of the Hawthorn Formation. The boundary lies approximately along the Ochlockonee River, about 1.5 miles northwest of the Site. North and west of this boundary sink features do occur, but are very few in number (Sinclair and Stewart, 1985). As shown by Figure 2.3.2-3, sink features are evident less than one mile from the Site to the southeast and northeast. The frequency of these sink features decreases closer to Site. However, no surface expressions of karst features are known to exist in the Repowering Project area.

During development of the simple cycle combustion turbine project in the spring of 2004, 14 borings were completed to an average depth of 68 feet. Bedrock was located at 34 to 45 feet below the surface. Five of the 14 borings indicated the potential presence of voids or calcareous limestone bedrock, ranging from 4 to 9 feet thick. Based on the locations of the borings the potential void areas are likely discontinuous and very localized, similar to the void identified in the 1991 investigation.

During installation of the peaking generation units more than 200 driven-pipe piles were installed. All of the piles were driven to refusal (five blows per inch or more) demonstrating structurally stable bedrock.



THICKNESS OF THE FLORIDAN AQUIFER SYSTEM (UNDIFFERENTIATED)

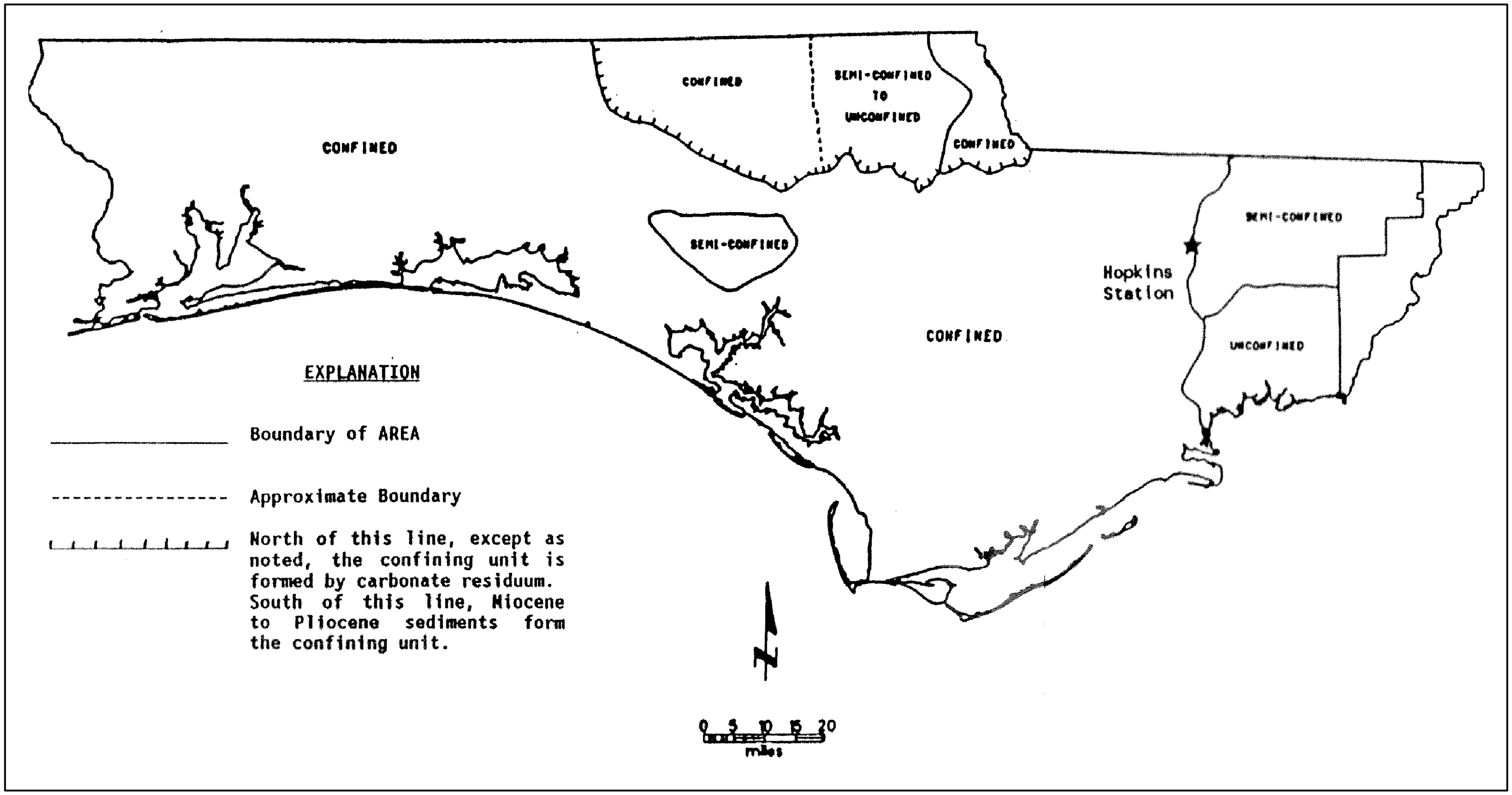
ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

Sargent & Lundy LLC

FIGURE NUMBER

2.3.2–1

SOURCE:
UNPUBLISHED REPORT, NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT



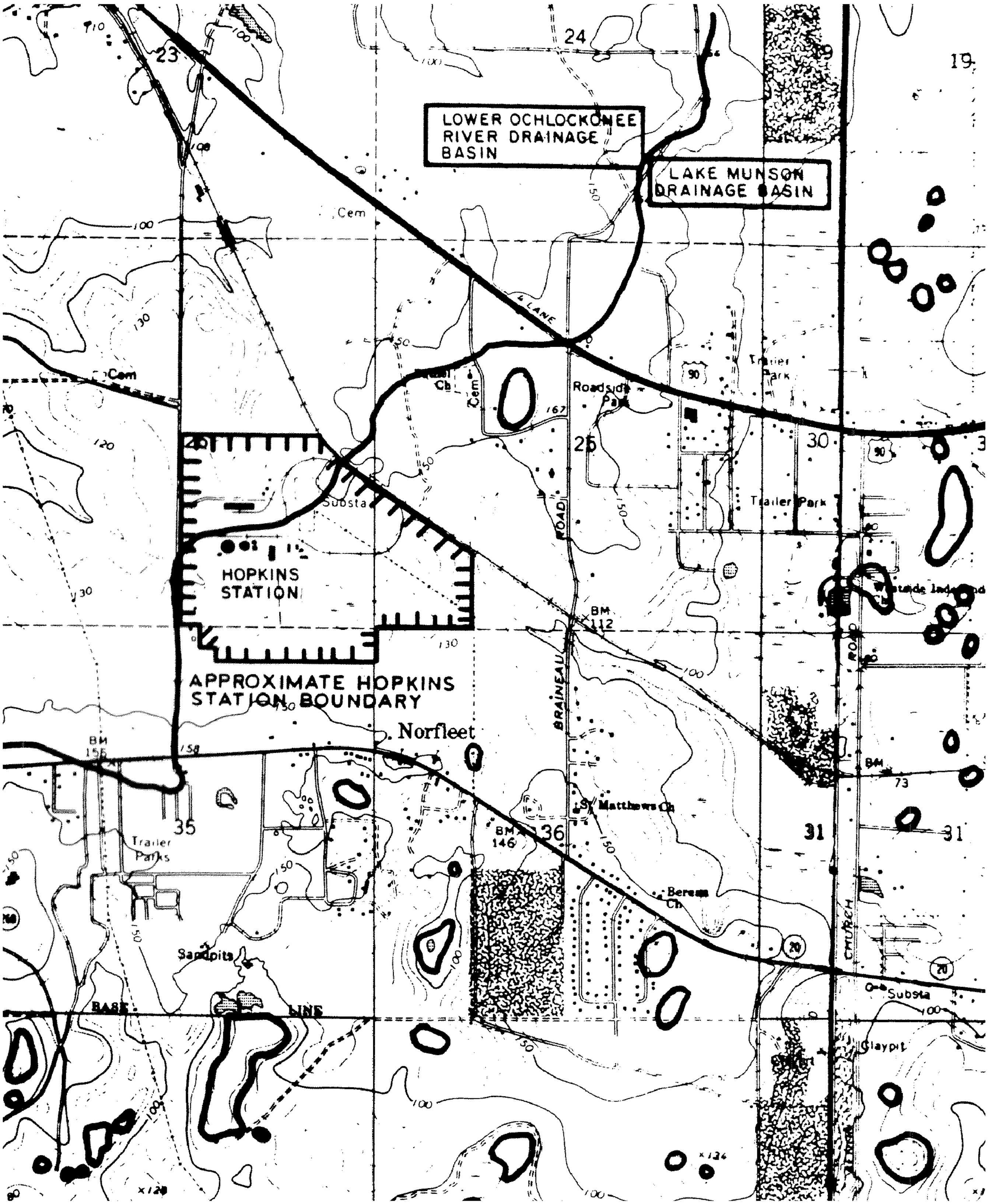
SOURCE:
UNPUBLISHED REPORT, NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT

DEGREE OF CONFINEMENT FOR THE FLORIDAN AQUIFER SYSTEM

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

Sargent & Lundy LLC

FIGURE NUMBER
2.3.2-2



KARST FEATURES NEAR THE HOPKINS STATION WITHIN THE LAKE MUNSON DRAINAGE BASIN

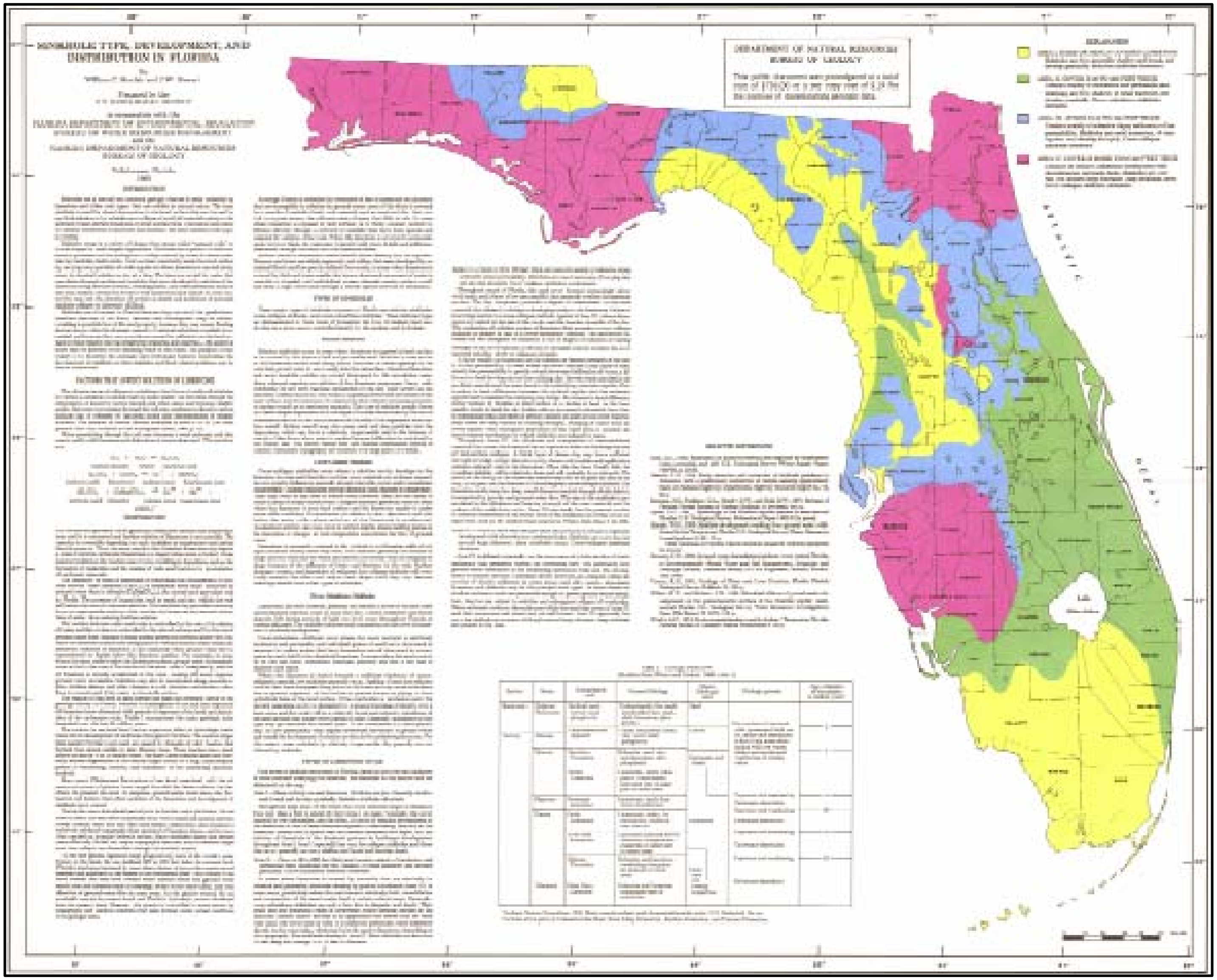
ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

Sargent & Lundy LLC

FIGURE NUMBER

2.3.2-3

SOURCE:
DEPARTMENT OF GROWTH AND ENVIRONMENTAL MANAGEMENT, LEON COUNTY, 1988



GENERAL KARST REGIONS

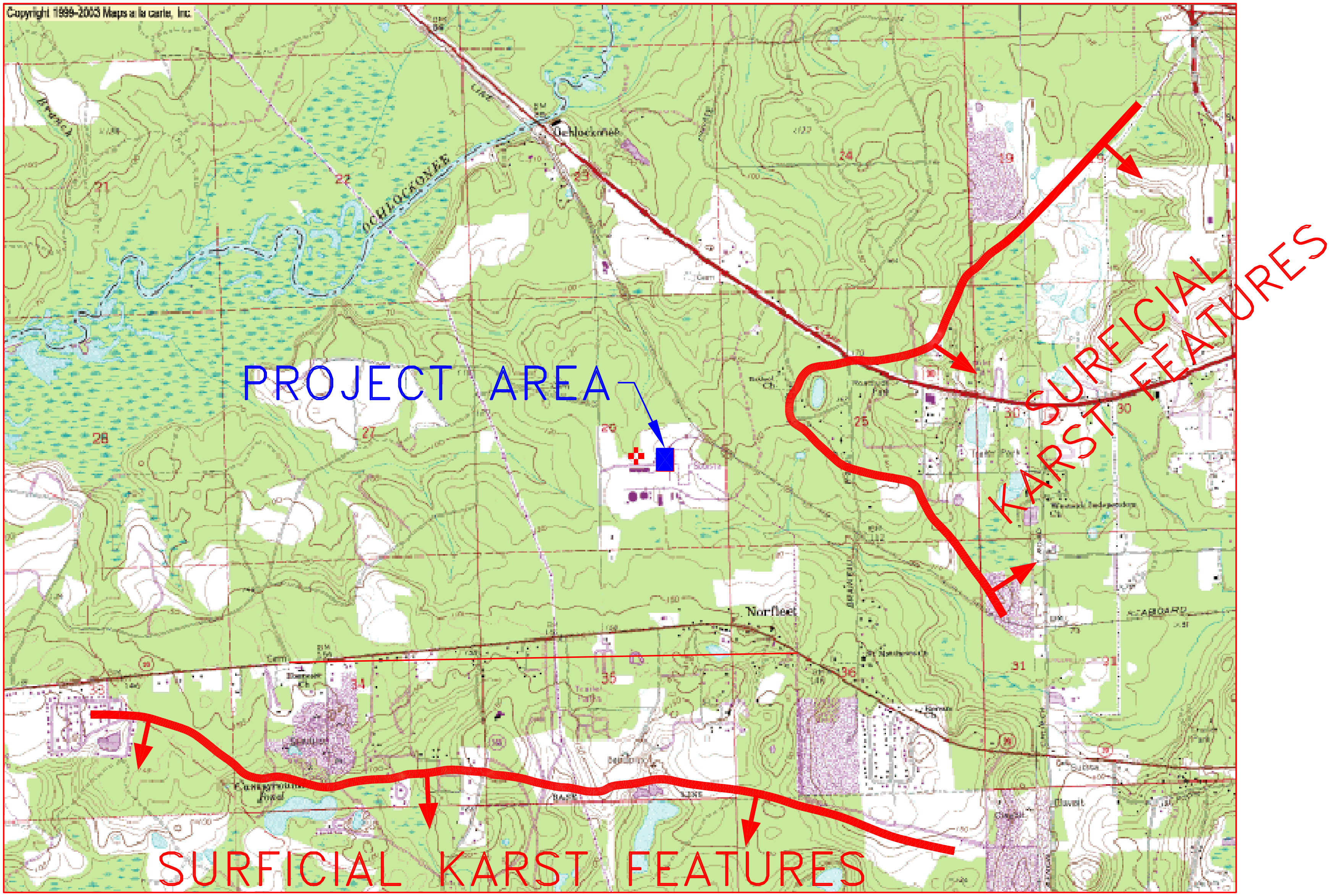
ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

Sargent & Lundy LLC

FIGURE NUMBER

2.3.2-4

SOURCE:
U.S.G.S. MAP SERIES No. 110



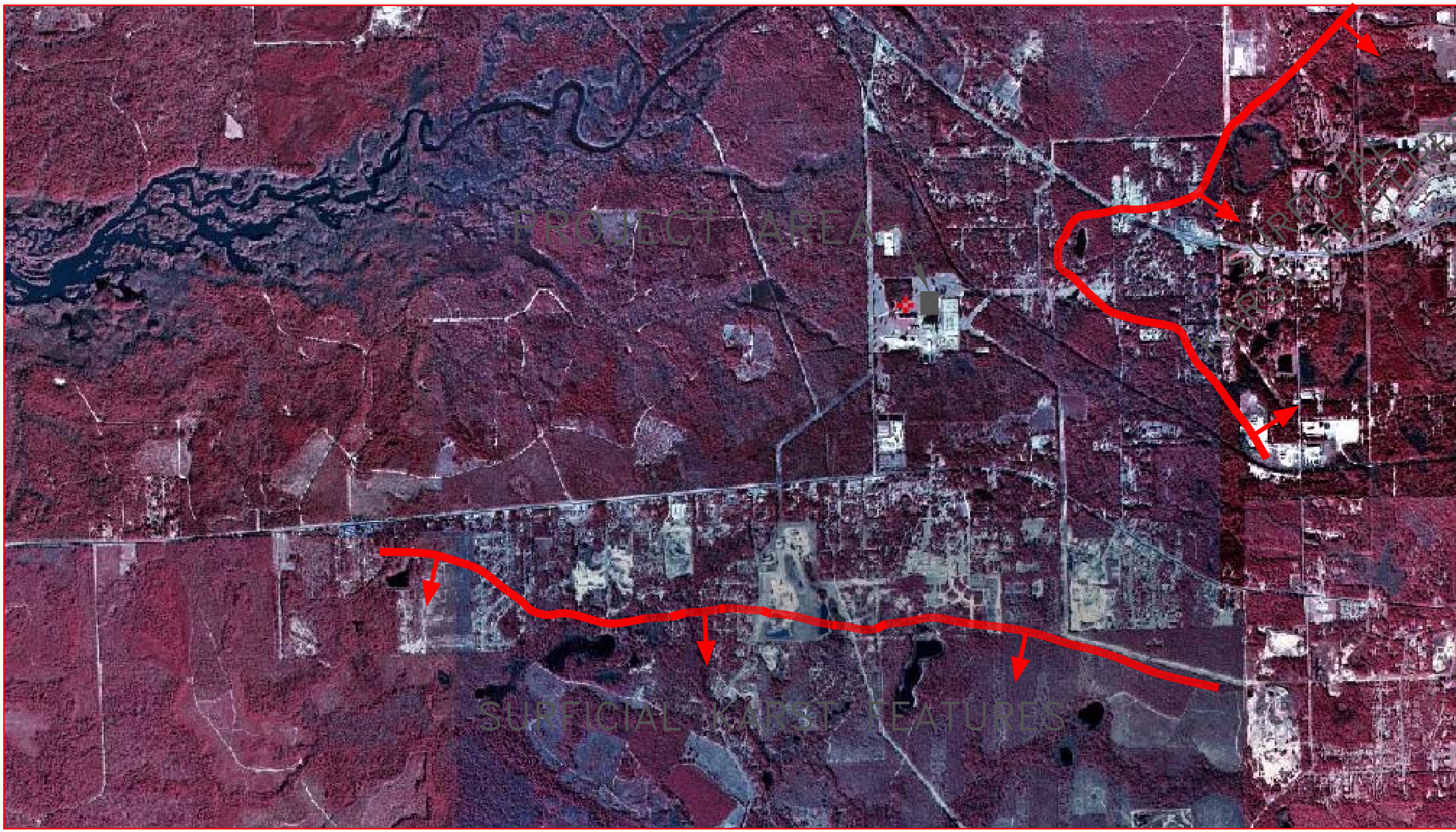
SURFICIAL KARST FEATURES

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

Sargent & Lundy

FIGURE NUMBER
2.3.2–5

SOURCE:
BACKGROUND: TOPO ZONE, WWW.TOPOZONE.COM



SOURCE:
BACKGROUND: TOPO ZONE, WWW.TOPOZONE.COM

SURFICIAL KARST FEATURES

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

Sargent & Lundy LLC

FIGURE NUMBER
2.3.2–6

SOURCE:
TALLAHASSEE-LEON COUNTY GIS WEBSITE
WWW.TLCGIS.ORG

POTENTIAL KARST AREA
ACCORDING TO TLCGIS

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

Sargent & Lundy LLC

FIGURE NUMBER
2.3.2-7

Table 2.3.2-1 Analytical Range of Water Quality Parameters for January 2001 - December 2005 for Supply Wells 1-4, Floridan Aquifer

		SUPPLY WELL	SUPPLY WELL	SUPPLY WELL	SUPPLY WELL	SECONDARY GROUND
PARAMETERS	UNITS	No. 1	No. 2	No. 3	No. 4	WATER STANDARD
MONTHLY ANALYSIS						
SULFATE	mg/l	N/A	N/A	N/A	N/A	250
CHLORIDE	mg/l	N/A	N/A	N/A	N/A	250
pH	S.U.	7.7 - 8.24	7.8 - 8.2	7.6 - 8.3	7.9 - 8.2	6.0 - 8.5
CONDUCTIVITY	umhos	245-365	142-373	121-446	192-464	N/A
SEMI-ANNUAL ANALYSIS						
TOTAL HARDNESS	mg/l	110-157	110-144	125-242	112-260	N/A
ALKALINITY	mg/l	110-142	100-119	114-187	110-157	N/A
TOTAL SOLIDS	**mg/l**					**500**

SOURCE: DATA PROVIDED BY COT.

* SECONDARY GROUNDWATER STANDARDS FROM FAC CHAPTER 17-3.

Table 2.3.2-2 Hopkins No. 4 Supply Well Groundwater Sample Test Results

Contaminant	Concentration	Primary Ground Water Standard
Arsenic	0.0046	0.0500
Barium	<0.2500	1.0000
Cadmium	<0.0002	0.0100
Chromium	<0.0100	0.0500
Fluoride	0.3400	4.0000
Lead	<0.0050	0.0500
Mercury	<0.0002	0.0020
Nitrate	<0.0500	10.0000
Selenium	<0.0020	0.0100
Silver	<0.0001	0.0500
Sodium	0.0032	160.0000
2,4-D	<0.0001	0.1000
Total trihalomethanes	<0.0040	0.1000
Trichloroethene	<0.0010	0.0030
Tetrachloroethene	<0.0010	0.0030
Carbon Tetrachloride	<0.0010	0.0030
Vinyl Chloride	<0.0010	0.0010
1,1,1 Trichloroethane	<0.0010	0.2000
1,2 Dichloroethane	<0.0010	0.0030
Benzene	<0.0010	0.0010
Ethylene dibromide	<0.00002	0.00002
p-dichlorobenzene	<0.0010	0.0750
1,1 dichloroethene	<0.0010	0.0070
		Secondary Ground Water Standard
Chloride	1.000	250.000
Copper	<0.010	1.000
Fluoride	0.340	2.000
Iron	0.048	0.300
Manganese	<0.010	0.050
pH	7.75	6.5-8.5
Sulfate	6.000	250.000
Total Dissolved Solids	160.000	500.000
Zinc	0.018	5.000

Notes:

1) Groundwater Sample Test Results from the No. 4 Supply Well at Hopkins Station, Sampled February 9 and 12, 1990, for FDER's Groundwater Quality Monitoring Network.
2) All concentration levels and standards are in mg/l (milligrams per liter) except pH, which is in standard units.
3) < means "less than"; i.e., contaminant concentration, if present, was less than the detection limit.
4) Primary and Secondary Groundwater Standards are from FAC Rule 17.550.310.

Table 2.3.2-3 Summary of Hopkins Station Groundwater Quality Measured in 2006

	Units	Well # 1	Well # 2	Well # 3	Well # 4
Carbon, Total Organic	mg/L	U	U	U	1.93
Fecal Coliform	#/100 ml	<1	<1	<1	<1
Arsenic, Total	ug/L	12.80	9.51	2.12	2.69
Lead, Total	ug/L	U	U	U	U
Barium, Total	ug/L	5.54	4.64	25.70	30.30
Chromium, Total	ug/L	U	U	U	U
Copper, Total	ug/L	U	U	0.38	U
Iron, Total	ug/L	4.70	U	30.20	6.01
Manganese, Total	ug/L	U	U	1.88	U
Molybdenum, Total	ug/L	74.30	38.60	5.40	7.49
Nickel, Total	ug/L	U	U	U	U
Nitrogen, Nitrite plus Nitrate	mg/L as N	U	U	U	U
Nitrogen, Total Kjeldahl	mg/L as N	U	U	U	U
Nitrogen, Total Organic	mg/L as N	U	U	U	U
Phosphorus, Total	mg/L as P	U	U	U	U

Notes:

Data based on grab samples taken from Hopkins Station water supply wells in April 2006.

U indicates "undetected."

The following were also undetected in all four wells:
1,2,4-Trichlorobenzene;1,2-Dichlorobenzene; 1,3-Dichlorobenzene; 1,4-Dichlorobenzene;
2,6-Dinitrotoluene; 2-Chloronaphthalene; 4-Chlorophenylphenyl ether; Acenaphthene
Acenaphthylene; Anthracene; Benzidiene; Benzo(a)anthracene; Benzo(a)pyrene
Benzo(b)fluoranthene; Benzo(ghi)perylene; Benzo(k)fluoranthene; Bis(2-chloroethoxy)methane
Bis(2-chloroethyl)ether; Bis(2-chloroisopropyl)ether, Bis(2-ethylhexyl)phthalate;
Butylbenzylphthalate; Chrysene; Dibenzo(ah)anthracene; Diethylphthalate; Dimethylphthalate
Di-n-butylphthalate; Di-n-octylphthalate; Fluoranthene; Fluorene; Hexachlorobenzene
Hexachlorobutadiene; Hexachlorocyclopentadiene; Hexachloroethane; Indeno(123cd)pyrene
Isophorone; Naphthalene; Nitrobenzene; N-nitrosodimethylamine; N-nitroso-di-n-propylamine
N-nitrosodiphenylamine; Phenanthrene; Pyrene

2.3.3 Site Water Budget and Area Users

The following meteorological data was compiled from information taken from the National Oceanic and Atmospheric Administration's National Climatic Data Center Web site for the city of Tallahassee. The Tallahassee area has a humid to subtropical climate with a yearly average temperature being 68°F. The highest monthly average of 82°F occurs during July and August, while the low monthly average of 52°F occurs during the month of January. Temperature extremes measured at the Tallahassee Regional Airport since 1961 reached a high of 103°F in July of 2000 and a low of 6°F in January of 1985. The average annual rainfall in the area is approximately 63 inches. Average monthly rainfall ranges between 8-inches in July to 3.25 inches in October. The wettest measured 24-hour period occurred from June 11-12, 2001 and produced 10.13 inches of rainfall. Average and extreme data for temperature and rainfall are provided in Tables 2.3.7-1 and 2.3.7-2, respectively.

2.3.3.1 Estimated Annual Runoff Change from the Repowering Project Area

Existing or Pre-Development Conditions

The total estimated annual runoff from the Repowering Project area under the existing conditions is estimated using the USDA, Soil Conservation Service Technical Release Number 55 methodology. Using a Soil Classification of "C" (Blanton series), a Curve Runoff Number (CN) of 71 for "meadow" is obtained (majority of the Project area).

Summarized data from the Tallahassee airport from 1959 to 1995 provides a weighted-average, effective rainfall event. Applying this value to the CN value yields an average annual runoff of 5.25 acre-feet.

The calculation prepared for the StormWater Management Plan utilizes a pre-development CN of 45, as is required by Leon County regulations when determining the maximum permissible peak discharge.

Post-Development Conditions

Following construction, the CN value for the Repowering Project area is effectively 98, with the pond area initially performing as a grassed area. To be conservative, the entire area will be assumed to have a net effective CN of 98.

Applying the previously discussed precipitation data to the post-construction conditions yields a total annual runoff of 16.8 acre-feet.

This total runoff value will actually be reduced because of the detention basin. Although the purpose of the detention basin is to reduce the peak discharge, and filter the water with the infiltration gallery, by nature of holding the water to reduce the peak, time is allowed for detained water to infiltrate and recharge the local ground water.

Estimated Maximum Peak Runoff

As required by Leon County, the pre-development peak runoff, calculated using a TR-55, will use a CN of 45.

Current FDEP and Leon County permit requirements mandate that storms be modeled from 2-year up to 25-year events. For this evaluation, the maximum, 25-year event is used.

Pre-Development Peak Runoff

Pre-development conditions would consist of sheet flow for 300 feet and shallow concentrated flow for 400 feet. Using applicable factors from the rational and SCS methods yields a pre-development flow from the repowered area of 1.5 cubic feet per second (cfs).

Post-Development Peak Runoff

Post-development conditions would consist of sheet flow to the nearest catch basin (average of 100 feet) and storm sewer flow to the detention pond. Neglecting the function of the detention basin, the post-development peak for the area would be in the range of 13 cfs over the peak one-hour period. However, development of the detention pond will only allow a discharge peak that matches the calculated 1.5 cfs.

To reduce the post-development discharge from 13 cfs to 1.5 cfs, approximately 3.7 acre-feet of stormwater runoff will be detained in the pond and released at the required 1.5 cfs peak over a total of 80 hours. This estimate does not consider infiltration capacity.

In addition, the filtration system will pass, at a minimum, 0.5 inches of runoff from the Repowering Project area. However, due to the stored water depth and detention time, filtration is expected to exceed the required values.

Additional detention/infiltration pond features include an emergency spillway, an overflow weir, and rip rap pads at discharge locations. The discharged water flows several hundred feet through a wooded area before entering Three Pole Creek, an intermittent stream that flows to the Ochlockonee River.

A detailed calculation complying with the Leon County and FDEP regulations is included in Section 10.5.4.

2.3.3.2 Estimated Groundwater Use

In the Tallahassee area, groundwater from the Floridan Aquifer is the principal source of water for meeting industrial, municipal and domestic water supply needs.

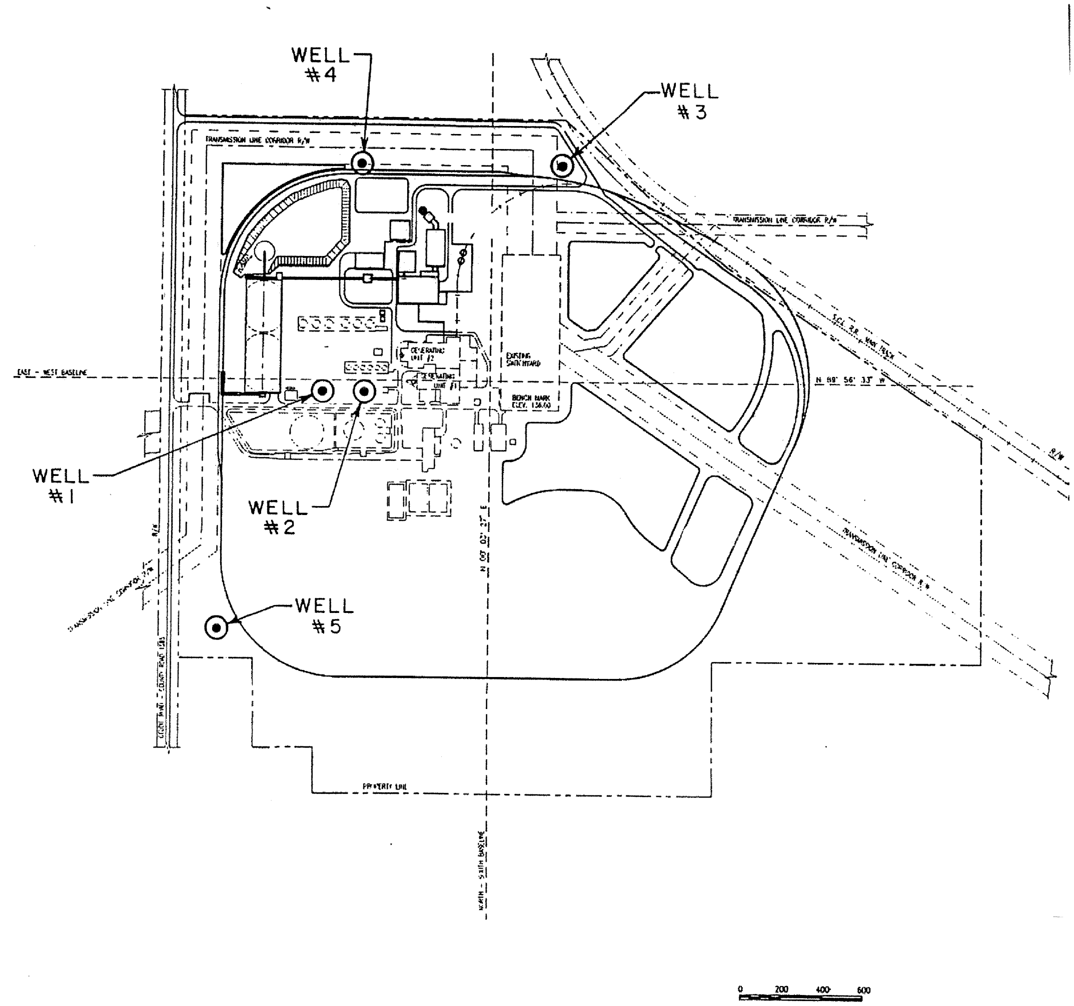
Based on the original Hopkins Station Site Certification, as amended, the Station operates four groundwater wells. Figure 2.3.3-1 illustrates the location of these four wells on the Hopkins Site. The four main wells have a combined pumping capacity of approximately 6100 gpm or 8.78 MGD. An inventory showing individual well depth, casing depth and pumping capacity is presented in Table 2.3.3-1 and a table showing the average daily water withdrawal from 2001 through 2005 is shown in Table 2.3.3-4.

Section 10.5.3 contains an NWFWMD listing of the groundwater wells and their uses within a 5-mile radius of the Site. Wells slightly outside of the five-mile radius may be included on the list because the exact well location from the NWFWMD public record is limited. The sources of water for those wells are the Surficial Aquifer, the Intermediate Aquifer and the Floridan Aquifer.

Of the 286 wells that may exist within a one-mile radius of Hopkins Station, 144 are designated for domestic use. Wells are identified by the NWFWMD for each township, range, and section. The number of wells for all sections within one mile of the Hopkins Site is indicated on Figure 2.3.3-2. Domestic wells (144 of the total of 286 wells) are typically four inches in diameter, and most extend to the Floridan Aquifer, which is the primary source of potable water for area users. The remaining 142 wells are reportedly used for groundwater monitoring, landscape irrigation and public use (the majority being used for groundwater monitoring). The one-mile from the Site radius was estimated as being all of Township 1 north, Range 2 west, Sections 25, 26, 35 and 36.

Water usage information for Leon County shown in Tables 2.3.3-2 and 2.3.3-3 came from U.S.G.S. Scientific Investigation Report 2004-5151 and the NWFWMD Water Supply Assessment, respectively. These tables illustrate fresh water use by user category, its source, quantity, and projected usage rates through 2020.

Some recharge to the Surficial Aquifer from infiltration of rainfall and runoff is expected to occur on the Hopkins Site. Due to the presence of an effective confining layer between the Surficial Aquifer and the Floridan Aquifer in Leon County, essentially no recharge to the Floridan Aquifer occurs. Recharge is described more fully in Section 2.3.2.1.



HOPKINS STATION WELLS	
WELL No.	CAPACITY (gpm)
1	1300
2	1300
3	2000
4	1500
5	UNMETERED

EXISTING WATER WELL LOCATIONS AT THE HOPKINS SITE

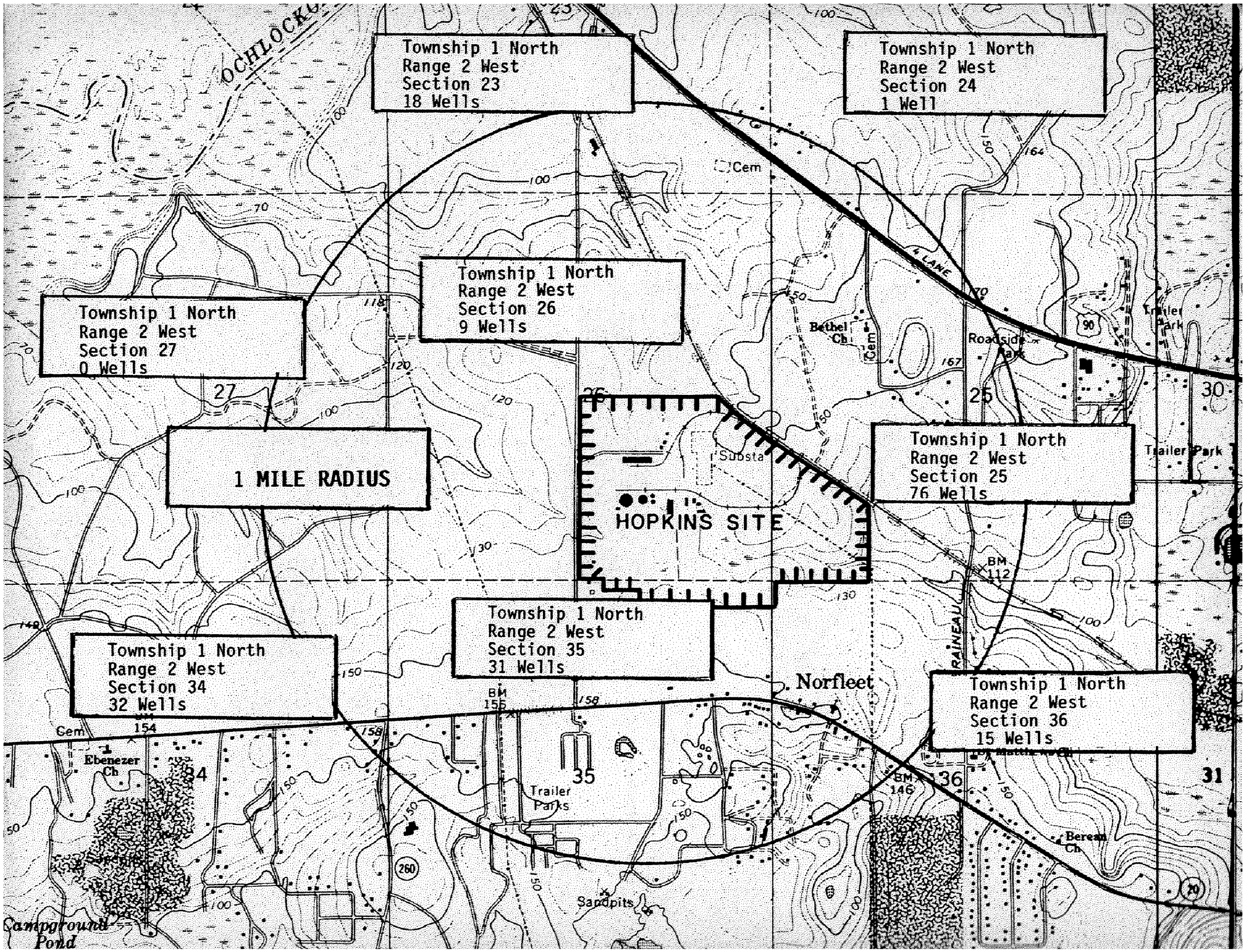
Sargent & Lundy LLC

FIGURE NUMBER

2.3.3-1

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

SOURCE:



GROUNDWATER WELLS WITHIN THE SITE AREA IN 1991

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

SOURCE:
NWFWMD WELL DATA

FIGURE NUMBER
2.3.3-2

Table 2.3.3-1
Hopkins Site Well Inventory

WELL	CASING DEPTH	TOTAL DEPTH	CAPACITY
	(FEET)	(FEET)	(gpm)
No. 1 (EAST)	159	375	1300
No. 2 (WEST)	150	375	1300
No. 3 (EAST)	226	406	2000
No. 4 (WEST)	152	466	1500
DOMESTIC USE WELL	142	305	NOTE 1

Note 1: This is a small unmetered potable well.

Table 2.3.3-2 Total Fresh Water Withdrawal in 2000, By Use for Leon County, Florida

Purpose	Public Supply	Domestic	Industrial	Agricultural Irrigation	Recreational Irrigation		Thermoelectric	Total	
Source	Ground	Ground	Ground	Ground	Ground	Surface	Ground	Ground	Surface
	35.7	4.29	0.12	1.27	1.24	0.3	2.74	45.36	0.3

*All units in millions of gallons per day, MGD.
*Source: U.S.G.S. Scientific Investigation Report 2004-5151

Table 2.3.3-3 Leon County Water Demand Estimated (1995) and Projected (2000 – 2020)

AVERAGE DAILY FLOW (MGD)

WATER USE CATEGORY	1995	2000	2005	2010	2015	2020
PUBLIC SUPPLY	27.66	30.91	34.43	38.19	42.53	47.16
DOMESTIC SS/ SMALL PUBLIC SS	4.61	6.01	6.19	6.40	5.91	5.18
COMMERCIAL-INDUSTRIAL SS	0.23	0.23	0.23	0.23	0.23	0.23
RECREATIONAL IRRIGATION	0.95	1.08	1.14	1.27	1.39	1.46
AGRICULTURAL IRRIGATION	1.01	0.70	0.75	0.82	0.88	0.96
POWER GENERATION	2.64	2.90	3.00	3.10	3.45	3.80
TOTAL	37.10	41.83	45.74	50.01	54.39	58.79

LARGE PUBLIC SUPPLY SYSTEM WATER USE

	1995	2000	2005	2010	2015	2020
TOTAL POPULATION SERVED	186,440	202,032	225,270	248,008	273,832	299,654
PERCENT OF TOTAL POPULATION	86	84	85	86	88	90
PER CAPITA (GAL/DAY)	148	153	153	154	155	157

AVERAGE DAILY FLOW OF LARGE PUBLIC SUPPLY SYSTEMS (MGD)

	1995	2000	2005	2010	2015	2020
UTILITY						
CITY OF TALLAHASSEE	25.32	27.38	29.94	32.73	35.78	39.12
BRADFORDVILLE REGIONAL	0.79	1.09	1.39	1.70	2.00	2.31
MEADOWS AT WOODRUN	0.32	0.39	0.48	0.57	0.66	0.75
PINE RIDGE ESTATES	0.06	0.70	1.08	1.47	2.18	2.89
LAKE JACKSON AREA W/S	1.17	1.35	1.54	1.72	1.91	2.09
TOTAL	27.66	30.91	34.43	38.19	42.53	47.16

*SOURCE: NWFWMD WATER SUPPLY ASSESSMENT FOR REGION VII: JEFFERSON COUNTY, LEON COUNTY AND WAKULLA COUNTY

Table 2.3.3-4
Hopkins Generating Station -
Average Daily Water Withdrawal (2001-2005)

	2001	2002	2003	2004	2005
Jan	2.78	0.41	1.47	1.60	1.72
Feb	1.50	0.51	0.98	1.41	1.96
Mar	0.71	0.90	1.54	1.74	0.74
Apr	1.33	2.32	1.14	2.12	2.87
May	2.86	2.01	1.82	2.25	3.31
Jun	2.61	1.81	1.9	3.64	3.18
Jul	3.09	2.52	2.08	3.55	3.26
Aug	2.75	2.39	2.3	3.48	3.15
Sep	2.51	1.60	2.04	2.93	2.74
Oct	0.60	1.28	1.94	2.90	2.45
Nov	0.65	1.47	1.00	1.64	0.85
Dec	0.95	1.48	1.35	2.11	3.83

Source: Data submitted by the COT.
All values in MGD.

2.3.4 Surficial Hydrology

This section describes the baseline (existing) physical, chemical, and hydrological characteristics that may be affected by construction and operation of the Repowering Project. Descriptions of the watershed and drainage areas are presented, including classifications, the quantity and quality of surface water, and information on surface water monitoring relative to operation of Hopkins Station.

2.3.4.1 Hydrologic Characterization

The proposed Repowering Project will not have any impacts on surface water hydrology. The following general information on surface water hydrology is commensurate with the Project's lack of inpacts.

Leon County is characterized by many solutional depressions that usually contain water as small ponds or lakes. Commonly, there are small streams of relatively short length that empty into those ponds and lakes. Those small streams have dendritic patterns, and their upper reaches are often dry except during storms and for a short period following the rainy season. The major drainage basins for Leon County are shown in Figure 2.3.4-1. Leon County surface water features are shown in Figure 2.3.4-2.

The Hopkins Site is located atop a low northeast/northwest trending ridge. Site drainage is divided between two major drainage basins. Runoff to the north and west enters the Ochlockonee Drainage Basin, and runoff to the south and east enters the Lake Munson Drainage Basin as shown in Figure 2.3.4-1. Runoff from Hopkins Site to the north and west involves two headwater drainage basins. Stormwater from the north part of the Site flows off-site in an intermittent stream-channel onto adjacent property to the north. Stormwater from the west side of the Site is collected in a man-made drainage ditch, which also conveys the Hopkins Station wastewater discharge. Runoff to the south and east flows through wetland areas down an intermittent stream channel, and off-site near the southeast corner of Hopkins Site to the Lake Munson Drainage Basin.

The existing Hopkins Station already discharges a combination of waste streams to surface waters. The Station's Industrial Waste Facility Permit requires that concentrations of numerous constituents be measured and reported every 5 years for the permit renewal application. The most recent values of that data of detected constituents are presented in Table 2.3.4-1. Note that the discharge constituent values all are below the Class III Surface Water Quality Criteria presented in FAC Chapter 62-302.530.

The Station effluent is conveyed into a man-made drainage ditch which discharges under Geddie Road (County Road 1585) at the western Site boundary through an unnamed natural drainage channel into Beaver Pond and then into the Ochlockonee River just above Lake Taiquin.

2.3.4.2 Measurement Programs

Available data on Hopkins Station and nearby surface water resources were used. No additional measurement programs were conducted for this section.

2.3.4.3 Chemical Treatment and Processing

The purpose of the present chemical treatment system at Hopkins Station is to prevent corrosion and chemical or biological fouling of plant equipment. The following discussion presents the chemical treatment regime for the make-up for the existing cooling tower and boiler, as well as sanitary wastewater treatment, demineralizer regeneration wastes, and chemical cleaning.

a. Cooling Tower Circulating Water Treatment and Blowdown

Chemical addition to the cooling tower make-up water is implemented using the chemicals listed below to prevent corrosion and chemical and biological fouling:

- Depositrol: This product contains the scale inhibitor phosphonate HEDP. This product is fed continuously at a recommended concentration of 3-5 ppm and prevents the deposition of iron and calcium scale until they can be removed in the blowdown.
- HRA: A proprietary copper halogen resistant corrosion inhibitor, which has been approved for use by EPA and FDEP. This chemical treatment is performed continuously during tower operation.
- Sulfuric acid: This acid feed program is utilized to maintain the pH of circulating water at 8.0-8.5. At this pH range, the carbon steel components of the cooling system are less susceptible to corrosion and the copper alloy corrosion inhibitor has improved effectiveness.
- Sodium hypochlotite and Spectrus 1300 biocide are used to control algal growth in the cooling tower.

The Unit 2 cooling tower operates at approximately 2.5 cycles of concentration on an annual average basis. The limiting factor in the number of cycles is the concentration of dissolved solids in the circulating cooling tower water. This type of operation results in a continuous blowdown of approximately 1.0 MGD. The cooling tower blowdown discharge and the Hopkins Station combined wastewater discharge, which includes the cooling tower blowdown, are characterized in Table 2.3.4-1.

b. Steam Cycle Water Treatment and Blowdown

Chemical addition to the boiler make-up water is implemented to control corrosion and deposition of the boiler system. Caustic is added to maintain pH in a range of 9.5-10.0. A Hydroquinone (Cortrol) is added to protect the preboiler and boiler equipment from chemical oxidation. Also condensate/pre-boiler system protection is achieved by the addition of a neutralizing amine.

c. Sanitary Wastewater Treatment

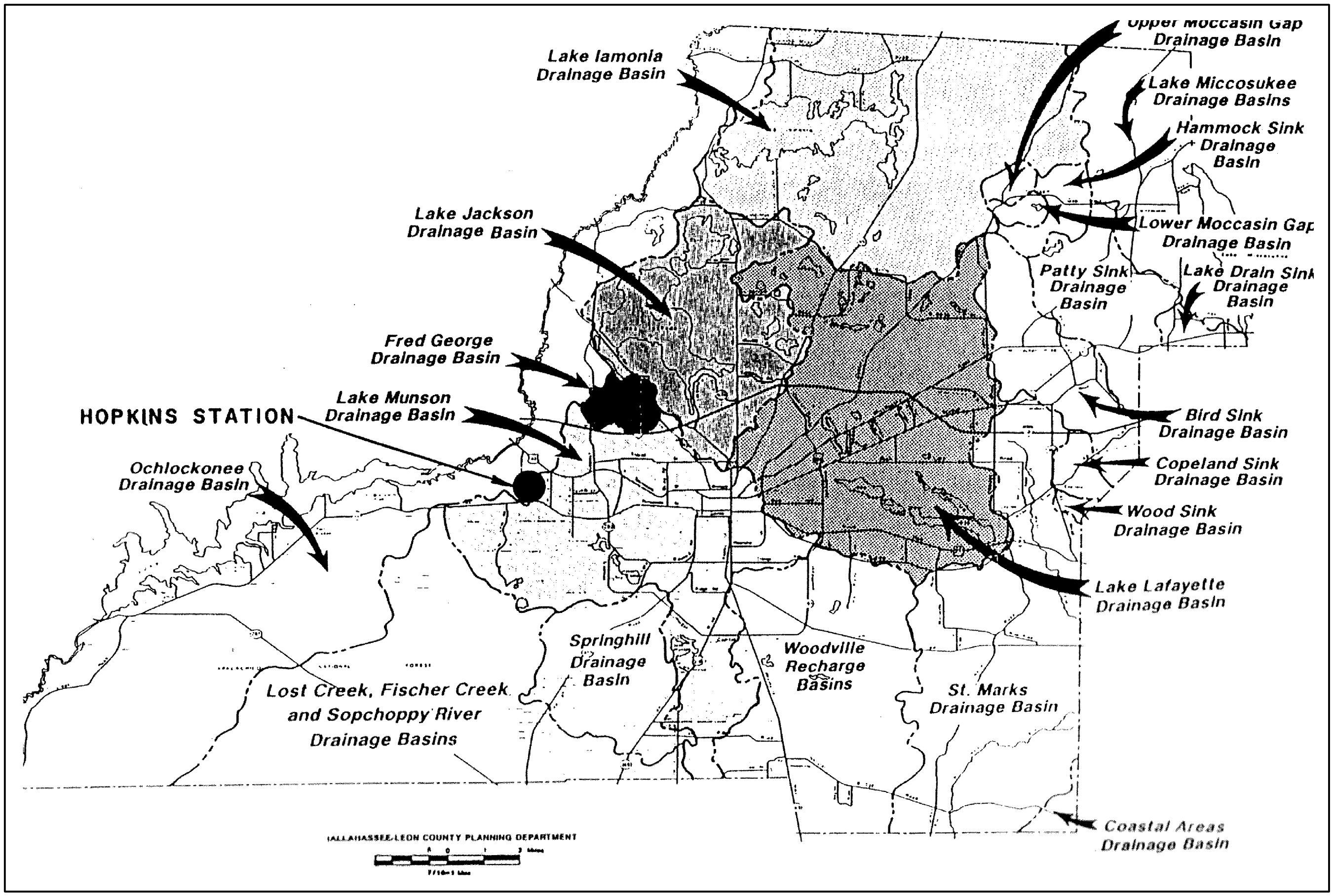
The service and potable groundwater is chlorinated prior to use to prevent algal growth and for disinfection. Waste service water is sent to the existing treatment ponds and the sanitary wastewater is disposed of via a municipal sanitary waste sewer.

d Ion Exchange Regeneration Wastes

Backwash of the ion exchange resins used in the existing demineralizer results in wastewater of varying pH and a high concentration of dissolved solids. The pH variation results from feeding sulfuric acid and sodium hydroxide to the cation and anion columns respectively during regeneration. The regenerate waste stream from the demineralizer is pH adjusted and allowed to settle to remove suspended solids in a separate treatment pond. The treated wastewater is then discharged to the receiving stream.

e. Chemical Cleaning

Chemical cleaning of the boiler occurs approximately once every three to five years depending on water usage and the effectiveness of the boiler water treatment program. An independent contractor performs the boiler cleaning and is responsible for disposal of all resultant wastes and wastewater at a licensed facility in accordance with Resource Conservation and Recovery Act (RCRA). The wastes can also be evaporated in Hopkins boilers, if determined non-hazardous.



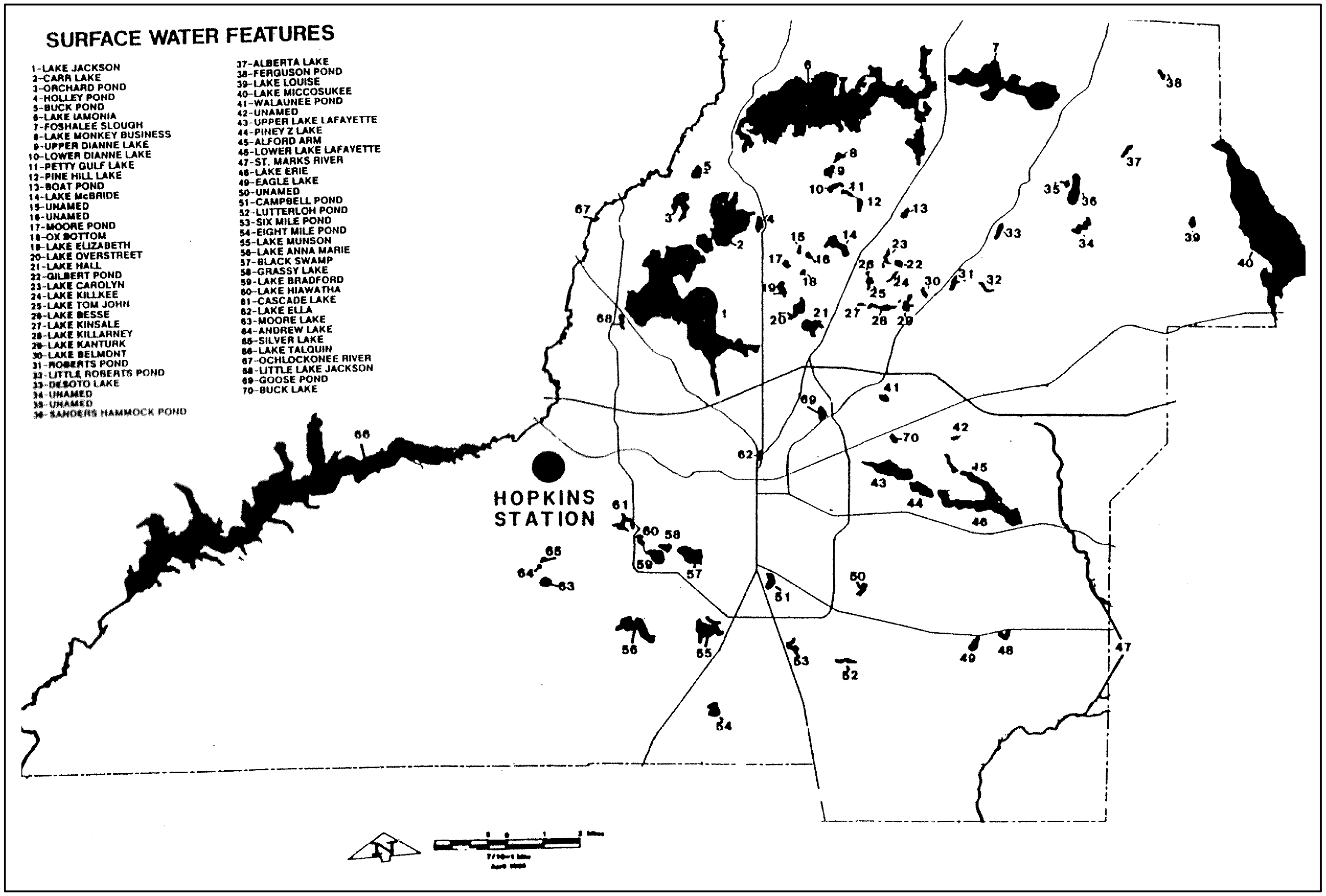
SOURCE:
TALLAHASSEE–LEON COUNTY PLANNING DEPARTMENT

MAJOR DRAINAGE BASINS FOR LEON COUNTY

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

Sargent & Lundy LLC

FIGURE NUMBER
2.3.4–1



SOURCE:
TALLAHASSEE–LEON COUNTY PLANNING DEPARTMENT

SURFACE WATER FEATURES OF
LEON COUNTY

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

Sargent & Lundy LLC

FIGURE NUMBER
2.3.4–2

Table 2.3.4-1 Composition of Existing Hopkins Station Waste Streams (Detected Constituents Only)

		Waste Stream				
Parameter	**Units**	**Plant Discharge**	**Unit 2 Blowdown**	**Unit 1 Blowdown**	**Low Volume Waste**	**Metal Cleaning Waste***
Nitrogen, Total Organic	mg/L	0.292	0.37	0.292	7.01	1.79
Nitrogen, Total Kjeldahl as N	mg/L	0.3	0.37	0.3	0.78	1.8
Phosphorus, Total as P	mg/L	0.37	0.44	0.54	0.38	0.12
Nitrogen, Nitrite plus Nitrate as N	mg/L	0.77	0.054	0.16	ND	ND
Chromium, Total by ICP	ug/L	3.2	3.3	ND	ND	16.2
Nickel, Total by ICP	ug/L	3.2	6.1	ND	13.3	7602
Arsenic, Total by Furnace	ug/L	5.41	4.81	8.61	4.84	2.7
Carbon, Total Organic	mg/L	6.82	7.03	6.33	5.45	6.86
Total Oil (HEM)	mg/L	8.67	7.11	6.22	6.22	ND
Zinc, Total by ICP	ug/L	9.6	ND	ND	ND	5754
Molybdenum, Total	ug/L	17.7	14.3	34.1	75.5	ND
Copper, Total by ICP	ug/L	23.1	29.9	31.1	39.6	1305
Fecal Coliform MF	#/100mL	61	60	11	75	ND
Barium, Total by ICP	ug/L	78.7	89.5	55.1	18	36
Iron, Total by ICP	ug/L	128	137	103	435	4484
Lead, Total	ug/L	ND	0.58	0.93	1.71	12.5
Manganese, Total by ICP	ug/L	ND	3.4	ND	9.5	6057
Bis(2-ethylhexyl)phthalate	ug/L	ND	3.65	ND	ND	ND
Cadmium, Total	ug/L	ND	ND	ND	ND	8.8
Chemical Oxygen Demand	mg/L	ND	ND	ND	66	38
Cobalt, Total	ug/L	ND	ND	ND	0.73	393
Aluminum, Total by ICP	ug/L	ND	ND	ND	ND	3904
Nitrogen, Ammonia as N	mg/L	ND	ND	ND	0.079	ND
Thallium, Total	ug/L	ND	ND	ND	ND	1.8
Residue, Total Nonfilt @ 103-105	mg/L	ND	ND	ND	ND	21
1,2-Dichloroethane	ug/L	ND	ND	ND	0.61	ND

Notes:

Data based on grab samples taken from Hopkins Station waste streams in April 2006.

ND indicates "not detected."

*Values represent concentrations in the metal cleaning waste pond, not in the discharge.

2.3.5 Vegetation/Land Use

Vegetative habitats in the approximately 232-acre Hopkins Generating Station Site were classified according to the Florida Land Use, Cover and Forms Classification System (FLUCFCS) (FDOT 1999), as identified on Figure 2.3.5-1. Habitats within the approximately 18-acre Repowering Project area include open land (FLUCFCS 190), while the surrounding area to remain undisturbed includes hardwood-conifer mixed forest (FLUCFCS 434), mixed wetland hardwood forest (FLUCFCS 617), ditches (FLUCFCS 511), transmission lines/improved pasture (FLUCFCS 832/211), and the existing power generation facility (FLUCFCS 831). Dominant species and habitat characteristics for each community type are described below.

a. Open Land (FLUCFCS 190)

The area proposed for the Repowering Project is currently cleared and maintained primarily as an open, sparsely grassed area with large areas of bare soil (see Figure 2.3.5-2). Small areas supporting slash pine (*Pinus elliottii*) and wax myrtle (*Myrica cerifera*), blackberry (*Rubus*), bluestem (*Andopogon*), and deermoss (*Cladonia*) are located adjacent to abandoned rail spurs from the north.

b. Hardwood-Conifer Mixed Forest (FLUCFCS 434)

Areas of pine and oak forest occur to the east of the switchyard (see Figure 2.3.5-3) and to the west of the area proposed for the new stormwater pond (see Figure 2.3.5-4). Dominant species include a canopy of laurel oak (*Quercus laurifolia*), southern red oak (*Quercus falcata*), water oak (*Quercus nigra*), live oak (*Quercus virginiana*), southern magnolia (*Magnolia grandiflora*), and sweetgum (*Liquidambar styraciflua*), with common understory and herbaceous species including wax myrtle, winged sumac (*Rhus coppalina*), greenbrier (*Smilax* sp.), deerberry (*Vaccinium stamineum*), yellow jessamine (*Gelsemium sempervirens*), blackberry (*Rubus* sp.), and oak mistletoe (*Phoradendron leucarpum*).

c. Ditches (FLUCFCS 511)

A ditch is located along the northern and eastern edge of the existing switchyard (see Figure 2.3.5-5). Vegetation within this man-made ditch is dominated by woolgrass (*Scirpus cyprinus*), bushy bluestem (*Andropogon glomeratus*), willow (*Salix caroliniana*), red maple (*Acer rubrum*), wax myrtle, and slash pine.

d. Mixed Wetland Hardwood Forest (FLUCFCS 617)

Areas classified as wetland hardwood forest occur within the floodplain of a small creek located to the west of the Unit 2 Repowering Project area (see Figure 2.3.5-6). A canopy comprised of red maple, sweetgum, and water oak, with shrub, dominates this area and groundcover species including Virginia willow (*Itea virginica*), wax myrtle, elderberry (*Sambucus canadensis*), netted chain fern (*Woodwardia aereolata*), Virginia chain fern (*Woodwardia virginica*), soft rush (*Juncus effusus*), and a small area of cattail (*Typha latifolia*) near a culvert adjacent to an access road. A summary of wetland surveys conducted at the Hopkins Site in 2004 and 2006 is provided in Section 10.5.5.

e. Transmission Lines/Improved Pasture (FLUCFCS 832/211)

Transmission line right-of-ways (ROW) in the vicinity of the Hopkins Site are cleared of canopy species and support low grasses and occasional shrubs characteristic of improved pasture habitat. Occasional live oaks occur within the transmission line corridors. The improved pasture areas provide habitat for the gopher tortoise (*Gopherus polyphemus*), classified by the Florida Fish and Wildlife Conservation Commission (FFWCC) as a Species of Special Concern (see Figure 2.3.5-7).

f. Electric Utilities (FLUCFCS 831)

Most of the existing Hopkins Site historically has been cleared, graded, and modified for the construction and operation of the generating station (see Figure 2.3.5-2). The active power plant areas do not support any significant native vegetation or habitat for wildlife.

Figure 2.3.5-1. Vegetative Habitats Classified According to the Florida Land Use, Cover and Forms Classification System (Florida Department of Transportation, 1999)

Legend:

FLUCFCS 190 – Open Land
FLUCFCS 434 – Hardwood-Conifer Mixed Forest
FLUCFCS 511 – Ditches
FLUCFCS 617 – Mixed Wetland Hardwood Forest
FLUCFCS 831 – Electric Utility Facilities
FLUCFCS 832/211 – Transmission line ROW/Improved Pasture

Source: Leon County Property Appraiser 2001 aerial photography; Golder, 2006

Figure 2.3.5-2 Open Land (FLUCFCS 190) Area Proposed for Unit 2 Repowering Project Location Directly North of Existing Hopkins Station Facility (FLUCFCS 831)

Figure 2.3.5-3 Hardwood-Conifer Mixed Forest (FLUCFCS 434) Located East of Switchyard

Source: Golder, 2006

Figure 2.3.5-4 Hardwood-Conifer Mixed Forest (FLUCFCS 434) Located West of Area Proposed Location of New Stormwater Pond

Figure 2.3.5-5 Ditch (FLUCFCS 511) Located North and East of Switchyard

Source: Golder, 2006

Figure 2.3.5-6 Mixed Wetland Hardwoods (FLUCFCS 617) Within Floodplain of Small Natural Drainageway Located West/Northwest of Unit 2 Repowering Project Area

Figure 2.3.5-7 Gopher Tortoise Burrow Within Transmission Line ROW/Improved Pasture Habitat (FLUCFCS 832/211)

Source: Golder, 2006

2.3.6 Ecology

Ecological surveys of the Hopkins Site conducted in February 2006 indicate that the vegetative habitats in the area are as described previously, and the information provided in the original Hopkins SCA (1974) and the Resource Addition Project SCA (2004) remains applicable.

Information regarding wildlife utilization and presence of threatened and endangered species provided in the original Hopkins SCA and the Resource Addition SCA were reviewed and updated during field surveys conducted in 2006. The flora and fauna within the vicinity of the Repowering Project area are typical of north Florida upland pine/oak forest and mixed wetland hardwoods. The Florida Natural Areas Inventory was consulted to obtain a county-specific list of plants and animals classified by the United States Fish and Wildlife Service (USFWS) and/or the FFWCC as threatened, endangered, or as a species of special concern (see Table 2.3.6-1). No listed animal or plant species known to occur in Leon County were observed within the Repowering Project area, with the exception of the gopher tortoise. During an April 2006 field survey, Phoenix Environmental Group found four gopher tortoise burrows near the northeastern corner of the Project area, as documented in Section 10.4.4. These burrows were considered to be close enough so that the tortoises might be affected by Project construction, and the City has applied for a permit from FFWCC to relocate these four tortoises (see Section 10.4.4 for information copy of permit application).

The gopher tortoise is not classified as threatened or endangered by the USFWS, but is considered a species of special concern by the FFWCC. The gopher tortoise prefers dry sandy habitats, which are favorable for excavation of burrows, and which are occasionally utilized as refugia by several commensal species within Leon County such as the eastern indigo snake (*Drymarchon corais*), Florida pine snake (*Pituophis melanoleucus mugitus*), and gopher frog (*Rana areolata*). The eastern indigo snake is classified as threatened by both the USFWS and the FFWCC, while the gopher frog and Florida pine snake are classified by the FFWCC as species of special concern, but are not listed federally.

2.3.6.1 Pre-existing Stresses

The greatest pre-existing stress to the ecology of the Hopkins Site is the historical clearing of the area for construction and operation of the existing Hopkins Generating Station. The natural topography, hydrology, and vegetative cover have been altered to create an area favorable for construction and operation of the power plant, reducing the suitability of the area for threatened and endangered species of plants or animals.

2.3.6.2 Measurement Programs

No impacts to wildlife resources are anticipated; therefore, no measurement programs are proposed.

Table 2.3.6-1

FLORIDA NATURAL AREAS INVENTORY
1018 Thomasville Road, Suite 200-C
Tallahassee, FL 32303
(850) 224-8207, FAX (850) 681-9364

Leon County Summary

Rare Species and Natural Communities Documented or Reported

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status
FISH					
Acantharchus pomotis	Mud Sunfish	G5	S3	N	N
Ameiurus serracanthus	Spotted Bullhead	G3	S3	N	N
Cyprinella leedsi	Bannerfin Shiner	G4	S3	N	N
Micropterus notius	Suwannee Bass	G3	S3	N	LS
Notropis cummingsae	Dusky Shiner	G5	S4	N	N
AMPHIBIANS					
Ambystoma tigrinum	Tiger Salamander	G5	S3	N	N
Amphiuma pholeter	One-toed Amphiuma	G3	S3	N	N
Desmognathus apalachicolae	Apalachicola Dusky Salamander	G3G4	S3	N	N
Hemidactylium scutatum	Four-toed Salamander	G5	S2	N	N
Notophthalmus perstriatus	Striped Newt	G2G3	S2S3	N	N
Rana capito	Gopher Frog	G3	S3	N	LS
REPTILES					
Alligator mississippiensis	American Alligator	G5	S4	T(S/A)	LS
Clemmys guttata	Spotted Turtle	G5	S3?	N	N
Crotalus adamanteus	Eastern Diamondback Rattlesnake	G4	S3	N	N
Drymarchon couperi	Eastern Indigo Snake	G3	S3	N	LT
Gopherus polyphemus	Gopher Tortoise	G3	S3	N	LS
Graptemys barbouri	Barbour's Map Turtle	G2	S2	N	LS
Macrochelys temminckii	Alligator Snapping Turtle	G3G4	S3	N	LS
Pituophis melanoleucus mugitus	Florida Pine Snake	G4T3?	S3	N	LS
Pseudemys concinna suwanniensis	Suwannee Cooter	G5T3	S3	N	LS
BIRDS					
Accipiter cooperii	Cooper's Hawk	G5	S3	N	N
Aimophila aestivalis	Bachman's Sparrow	G3	S3	N	N
Aramus guarauna	Limpkin	G5	S3	N	LS
Ardea alba	Great Egret	G5	S4	N	N
Egretta caerulea	Little Blue Heron	G5	S4	N	LS
Egretta thula	Snowy Egret	G5	S3	N	LS
Egretta tricolor	Tricolored Heron	G5	S4	N	LS
Elanoides forficatus	Swallow-tailed Kite	G5	S2	N	N
Eudocimus albus	White Ibis	G5	S4	N	LS
Falco columbarius	Merlin	G5	S2	N	N
Falco peregrinus	Peregrine Falcon	G4	S2	N	LE
Falco sparverius paulus	Southeastern American Kestrel	G5T4	S3	N	LT
Haliaeetus leucocephalus	Bald Eagle	G4	S3	LT	LT
Ixobrychus exilis	Least Bittern	G5	S4	N	N
Laterallus jamaicensis	Black Rail	G4	S2	N	N
Mycteria americana	Wood Stork	G4	S2	LE	LE
Nyctanassa violacea	Yellow-crowned Night-heron	G5	S3	N	N
Nycticorax nycticorax	Black-crowned Night-heron	G5	S3	N	N
Pandion haliaetus	Osprey	G5	S3S4	N	LS*
Picoides borealis	Red-cockaded Woodpecker	G3	S2	LE	LS
Picoides villosus	Hairy Woodpecker	G5	S3	N	N
Plegadis falcinellus	Glossy Ibis	G5	S3	N	N
Seiurus motacilla	Louisiana Waterthrush	G5	S2	N	N
Sitta carolinensis	White-breasted Nuthatch	G5	S2	N	N
Sterna antillarum	Least Tern	G4	S3	N	LT

Rare Species and Natural Communities Documented or Reported

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status
MAMMALS					
Corynorhinus rafinesquii	Rafinesque's Big-eared Bat	G3G4	S2	N	N
Lasiurus cinereus	Hoary Bat	G5	SU	N	N
Mustela frenata olivacea	Southeastern Weasel	G5T4	S3?	N	N
Myotis austroriparius	Southeastern Bat	G3G4	S3	N	N
Myotis grisescens	Gray Bat	G3	S1	LE	LE
Neofiber alleni	Round-tailed Muskrat	G3	S3	N	N
Sciurus niger shermani	Sherman's Fox Squirrel	G5T3	S3	N	LS
Ursus americanus floridanus	Florida Black Bear	G5T2	S2	N	LT*
INVERTEBRATES					
Alasmidonta wrightiana	Ochlockonee Arc-mussel	GH	SH	N	N
Crangonyx hobbsi	Hobbs' Cave Amphipod	G2G3	S2S3	N	N
Elliptoideus sloatianus	Purple Bankclimber	G2	S1S2	LT	N
Lampsilis subangulata	Shiny-rayed Pocketbook	G2	S1S2	LE	N
Medionidus simpsonianus	Ochlockonee Moccasinshell	G1	S1	LE	N
Megalonaias nervosa	Washboard	G5	S3	N	N
Pleurobema pyriforme	Oval Pigtoe	G2	S1S2	LE	N
Procambarus orcinus	Woodville Karst Cave Crayfish	G1	S1	N	N
Procambarus youngi	Florida Longbeak Crayfish	G2	S2	N	N
Utterbackia peggyae	Florida Floater	G3	S3	N	N
PLANTS					
Baptisia simplicifolia	Scare-weed	G3	S3	N	LT
Calycanthus floridus	Sweet-shrub	G5	S2	N	LE
Drosera intermedia	Spoon-leaved Sundew	G5	S3	N	LT
Erythronium umbilicatum	Trout Lily	G5	S2	N	LE
Gentiana pennelliana	Wiregrass Gentian	G3	S3	N	LE
Hexastylis arifolia	Heartleaf	G5	S3	N	LT
Lilium superbum	Turk's Cap Lily	G5	S1	N	LE
Litsea aestivalis	Pondspice	G3	S2	N	LE
Magnolia ashei	Ashe's Magnolia	G2	S2	N	LE
Magnolia pyramidata	Pyramid Magnolia	G4	S3	N	LE
Malaxis unifolia	Green Adder's-mouth	G5	S3	N	LE
Najas filifolia	Narrowleaf Naiad	G1	S1	N	LT
Pityopsis flexuosa	Bent Golden Aster	G3	S3	N	LE
Polygonum meisnerianum var. beyrichianum	Mexican Tear-thumb	G5T5	S1	N	LE
Pycnanthemum floridanum	Florida Mountain-mint	G3	S3	N	LT
Rhexia salicifolia	Panhandle Meadowbeauty	G2	S2	N	LT
Rhododendron alabamense	Alabama Rhododendron	G4	S2	N	LE
Rhododendron austrinum	Florida Flame Azalea	G3	S3	N	LE
Schwalbea americana	Chaffseed	G2	S1	LE	LE
Stachydeoma graveolens	Mock Pennyroyal	G2	S2	N	LE
Stachys hyssopifolia var. lythroides	Tallahassee Hedge-nettle	G5T1Q	S1	N	N
Uvularia floridana	Florida Merrybells	G3	S1	N	LE
Xyris longisepala	Karst Pond Xyris	G2	S2	N	LE
NATURAL COMMUNITIES					
Alluvial stream		G4	S2	N	N
Aquatic cave		G3	S3	N	N
Blackwater stream		G4	S3	N	N
Clastic upland lake		G3	S2	N	N
Sandhill		G3	S2	N	N
Sandhill upland lake		G3	S2	N	N
Slope forest		G3	S2	N	N
Terrestrial cave		G3	S2	N	N
Upland hardwood forest		G5	S3	N	N
OTHER ELEMENTS					
Bird rookery		GNR	SNR	N	N
Geological feature		GNR	SNR	N	N

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status

Total count:

Number of tracked elements: 97
Number of distinct occurrences: 300

2.3.7 Meteorological and Ambient Air Quality

a. Climate

The closest existing meteorological station to the Hopkins Site with complete meteorological data is the primary National Weather Service (NWS) station located at Tallahassee Municipal Airport situated approximately 5 km (3 miles) to the southeast of the Hopkins Site. NWS has recorded weather observations for more than 40 years at this location, and these data are the most complete for and representative of the region surrounding the Hopkins Site.

The Tallahassee area, including the Hopkins Site, has weather that features all four seasons with considerable winter rainfall and quite a bit less winter sunshine in contrast to the southern part of the Florida Peninsula. The monthly and annual average temperatures for this area are presented in Table 2.3.7-1. The mean annual temperature is approximately 68.0°F with monthly daily temperatures varying from a maximum of 92°F to a minimum of 39.7°F. Record extreme temperatures range from a low of 6°F to a record high of 103°F.

The monthly and annual average precipitation data for the area are presented in Table 2.3.7-2. The mean annual precipitation is approximately 63 inches, but this has varied from as little as 45 inches to over 89 inches in the past 30 years. The majority of rain is in the form of short-lived convection showers. Approximately 56% of the annual precipitation falls during the six warmest months, May through October, but rainfall is generally consistent throughout the year.

Monthly and annual average relative humidities, which indicate the amount of moisture in the air at a given temperature, are presented in Table 2.3.7-2 for the morning hours of 1:00 a.m. and 7:00 a.m. and early afternoon and evening hours of 1:00 p.m. and 7:00 p.m. The highest humidities are coincident with the coolest ambient temperatures, which generally occur at 0700, or near dawn. The lowest humidities coincide with the highest ambient temperatures.

The predominant winds in the Site area are from the north. Annual and seasonal wind roses for the 5-year period from 1986 through 1990 are given in Figures 2.3.7-1 and 2.3.7-2a through 2.3.7-2d. Summaries of the seasonal and annual average wind directions and wind speeds, including calm conditions, are presented in Table 2.3.7-3.

Atmospheric stability is a measure of the atmosphere's capability to disperse pollutants. During the daytime with strong insolation, the atmosphere can disperse pollutants very quickly for a relatively short period of time. This condition is considered as very unstable and generally occurs infrequently during the year. During the nighttime under clear skies and light wind speeds, the atmosphere is considered stable with minimal potential to disperse pollutants. Under moderate to high wind speeds, pollutants are dispersed at moderate rates under neutral conditions, which are generally more prevalent throughout the year and can occur any time throughout the day. The seasonal and annual average occurrences of atmospheric stability classes for this area for 1986 to 1990 are shown in Table 2.3.7-4.

During the summer months, unstable stability occurs 38% of the time due to strong insolation, whereas unstable stability occurs only 16% of the time in the winter months. Neutral stability occurs most frequently during the winter months due to the higher wind speeds in this season. The occurrence of stable stability is nearly uniform throughout the year, with a maximum occurrence of approximately 48% in the fall.

The mixing height is a parameter used to define the vertical height to which pollutants can disperse and, therefore, is used in estimating the volume of air in which pollutants are emitted and can be dispersed. In general, the higher the mixing height the greater the potential for the pollutants to be dispersed. The seasonal and annual average morning and afternoon mixing heights for this area for 1986 to 1990 determined using the Holzworth method are listed in Table 2.3.7-5. The annual morning mixing depth is about 800 m while the annual afternoon mixing depth is about 1,300 m. The highest afternoon mixing depths occur in the spring and the lowest morning depths occur in mid-winter.

Thunderstorms are the most frequent of severe storms, occurring an average of about 80 days per year. These storms occur throughout the year, but about 81% occur from May through October.

In the 80-km (50-mile) coastal strip along the Gulf of Mexico from the east boundary of Franklin County to Taylor County, there is a 19% chance that a tropical storm will pass through that area during any given year. For storms of hurricane strength [i.e., wind speeds exceeding 117 km/hr (73 mph)], the chance decreases to 7% with a less than 1 percent chance that the winds will be greater than 200 km/hr (124 mph), (i.e., wind speeds of a great hurricane).

Statistics compiled by the Severe Local Storms (SELS) branch of the National Severe Storms Forecast Center show that 21 tornadoes were spotted within the 1-degree latitude by 1-degree longitude square centered just south of the Tallahassee area from 1955 to 1967. This averages less than one tornado per year. The mean annual frequency of occurrence of tornadoes for any specific point location within the 1-degree square was estimated to be 0.9 years. Therefore, the mean recurrence interval for a tornado striking a point within this square is more than 1,500 years. The most common tornado month in Florida is June.

b. Ambient Air Quality

The existing applicable national and Florida AAQS are presented in Table 2.3.7-6. Primary national AAQS were promulgated to protect the public health, and secondary national AAQS were promulgated to protect the public welfare from any known or anticipated adverse effects associated with the presence of pollutants in the ambient air. Areas of the country in violation of AAQS are designated as nonattainment areas, and new sources to be located in or near these areas may be subject to more stringent air permitting requirements.

The Repowering Project is located in Leon County, which has been designated by EPA and FDEP as an attainment area for all criteria pollutants. Monitoring has been performed by FDEP at several stations in Leon County measuring criteria air pollutants. The criteria pollutants include PM_{10} and ozone. A summary of the pollutant concentrations measured in Leon County from 2001 to 2005 is presented in Table 2.3.7-7. The annual average PM_{10} concentration is 17 ug/m^3 or less measured through 2003, compared with the AAQS of 50 ug/m^3. The maximum 24-hour average concentration of PM_{10} was about 50 ug/m^3 or less compared to the AAQS of 150 ug/m^3. Because the PM_{10} measurements were relatively low over the last several years, this monitoring station was discontinued in 2004. The maximum ozone measurements in Leon County indicate that the ozone levels are lower than the 1-hour and 8-hour average AAQS of 0.12 and 0.08 ppm, respectively.

Leon County and surrounding counties are designated as PSD Class II areas for SO_2, PM_{10}, and NO_2. The Site is located approximately 28 km from the PSD Class I area of the Bradwell Bay National Wilderness Area (NWA) and 38 km from the closest part of the PSD Class I area of the St. Marks NWA.

Under federal and State of Florida PSD review requirements, all major new or modified sources of air pollutants regulated under the Clean Air Act (CAA) must be reviewed and a pre-construction permit issued. Florida's State Implementation Plan (SIP), which contains Prevention of Significant Deterioration (PSD) regulations, has been approved by EPA; therefore, PSD approval authority has been granted to FDEP. PSD review is used to determine whether significant air quality deterioration will result from the new or modified facility. Federal PSD requirements are contained in 40 CFR 52.21, Prevention of Significant Deterioration of Air Quality. The State of Florida has adopted PSD regulations that are identical to federal regulations (Rule 62-212.400, FAC). Major facilities and major modifications are required to undergo the technical analyses, such as control technology review and source impact analyses, related to PSD for each pollutant emitted in significant amounts.

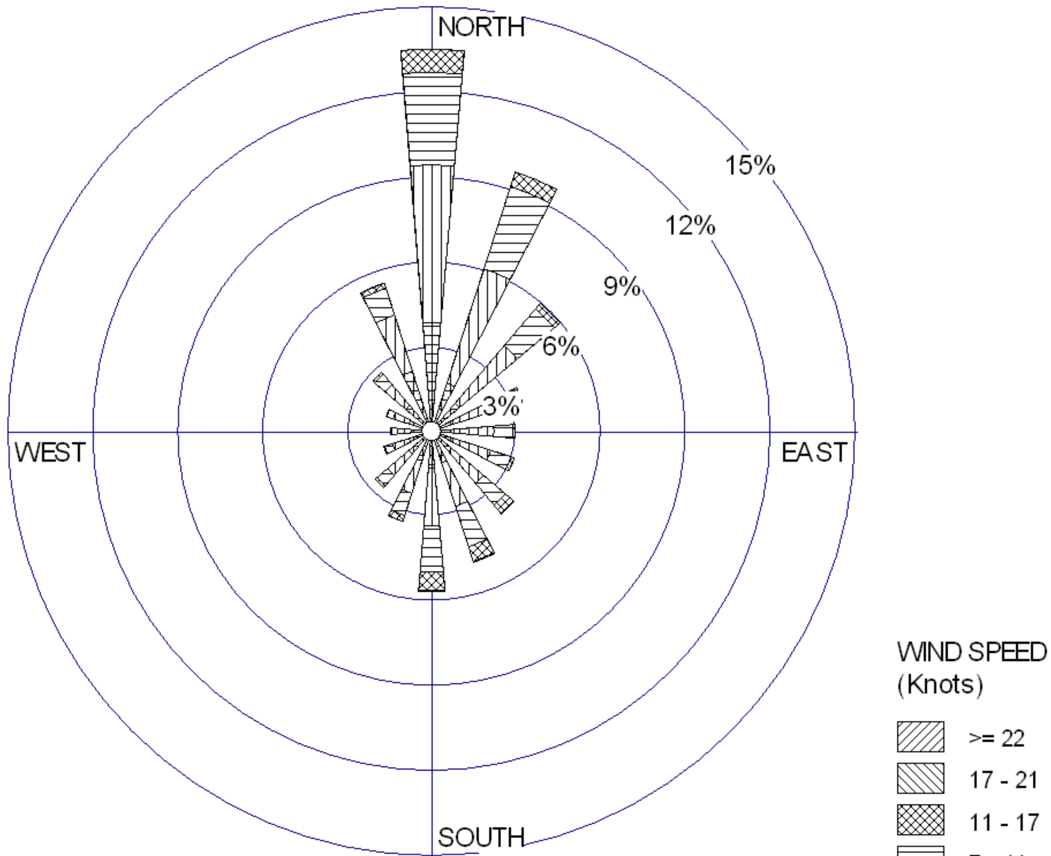
EPA has promulgated as regulations certain increases above an air quality baseline concentration level of SO_2, PM_{10}, and NO_2 concentrations that would constitute significant deterioration. The EPA class designations and allowable PSD increments are presented in Table 2.3.7-6. The State of Florida has adopted the EPA class designations and allowable PSD increments for SO_2, PM_{10}, and NO_2 increments.

Because this Project will be a minor modification at a major source, the new source review requirements under the PSD regulations do not apply. As a result, the Project will not be required to undergo PSD review. Instead, as part of this application, the Project is requesting an air construction permit review under the general pre-construction review requirements in Rule 62-212.300, F.A.C. and the PPSA Site Certification modification process.

c. Measurement Programs

Because the Repowering Project does not trigger PSD review, ambient monitoring is not required to be submitted as part of the air permit application. As a result, no measurement programs for air quality are proposed for the Project.

Figure 2.3.7-1 Annual Wind Rose for 1986 to 1990 (Tallahassee Municipal Airport, Station No. 93805)

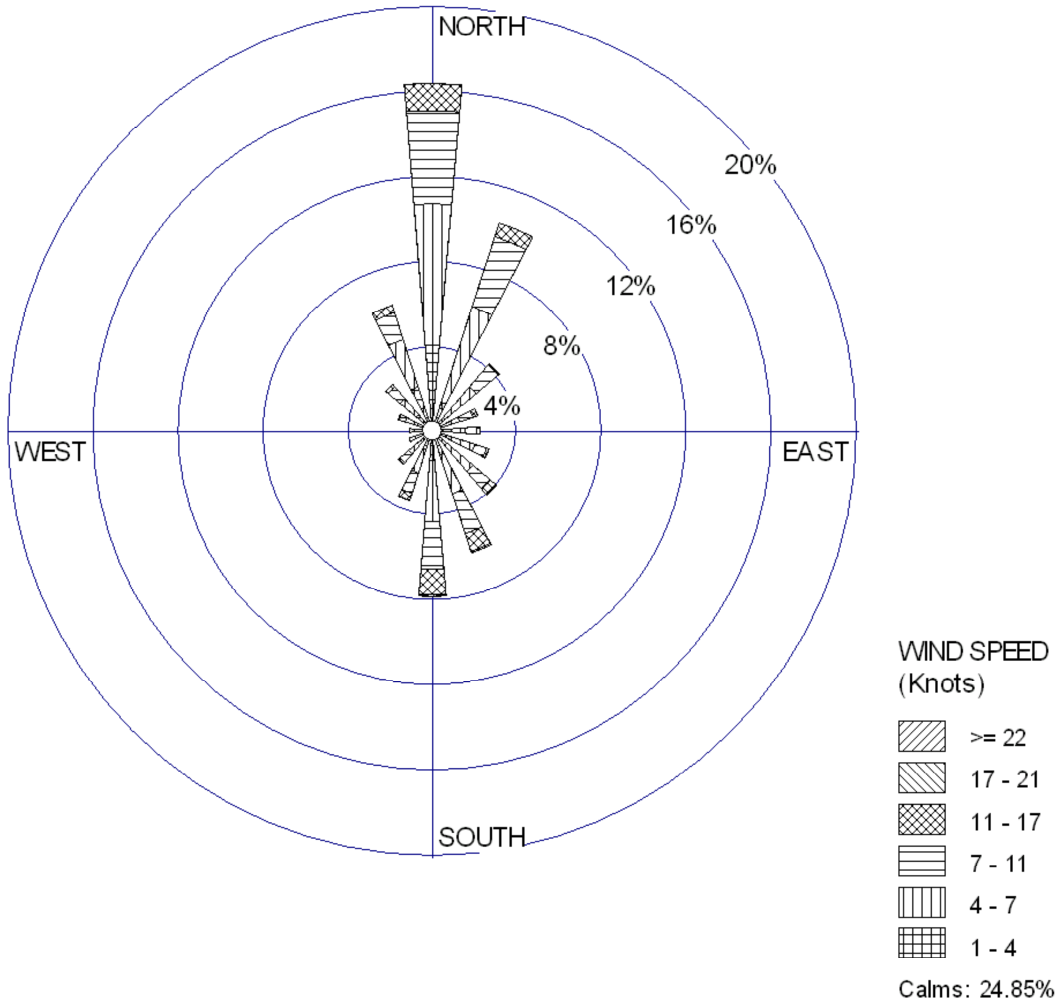


Average Wind Speed	4.65 Knots
Calm Winds	27.6%

Note: 1 knot = 1.151 miles per hour.

Source: National Climatic Data Center, 1986-1990; Golder, 2006.

Figure 2.3.7-2a Winter Wind Rose for 1986 to 1990 (Tallahassee Municipal Airport, Station No. 93805)

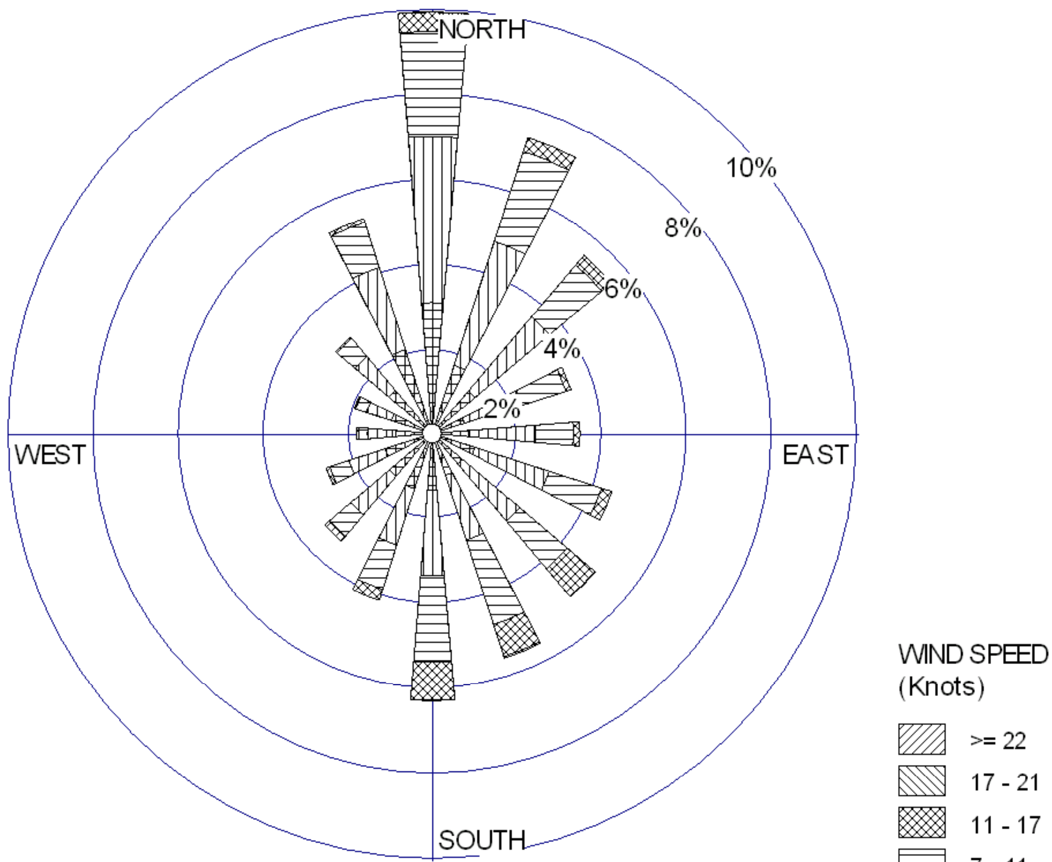


Average Wind Speed	4.65 Knots
Calm Winds	24.9%

Note: 1 knot = 1.151 miles per hour.

Source: National Climatic Data Center, 1986-1990; Golder, 2006.

Figure 2.3.7-2b Spring Wind Rose for 1986 to 1990
(Tallahassee Municipal Airport, Station No. 93805)

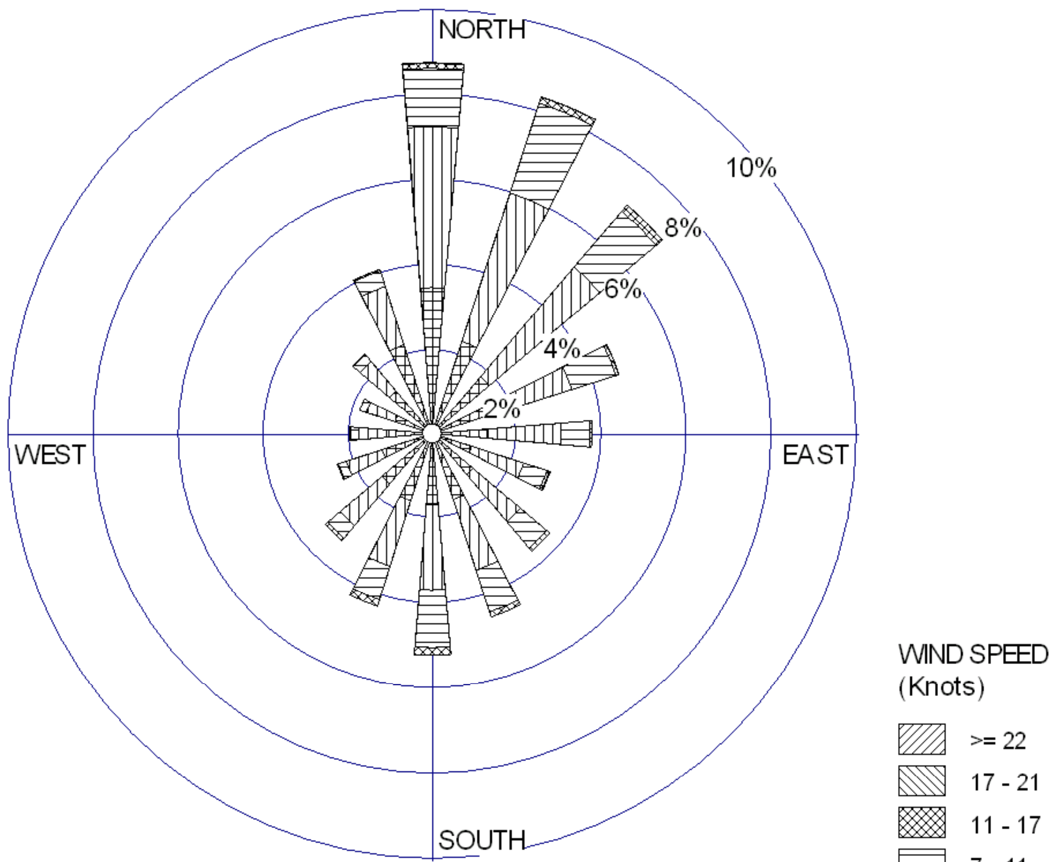


Average Wind Speed	4.79 Knots
Calm Winds	26.8%

Note: 1 knot = 1.151 miles per hour.

Source: National Climatic Data Center, 1986-1990; Golder, 2006.

Figure 2.3.7-2c Summer Wind Rose for 1986 to 1990
(Tallahassee Municipal Airport, Station No. 93805)

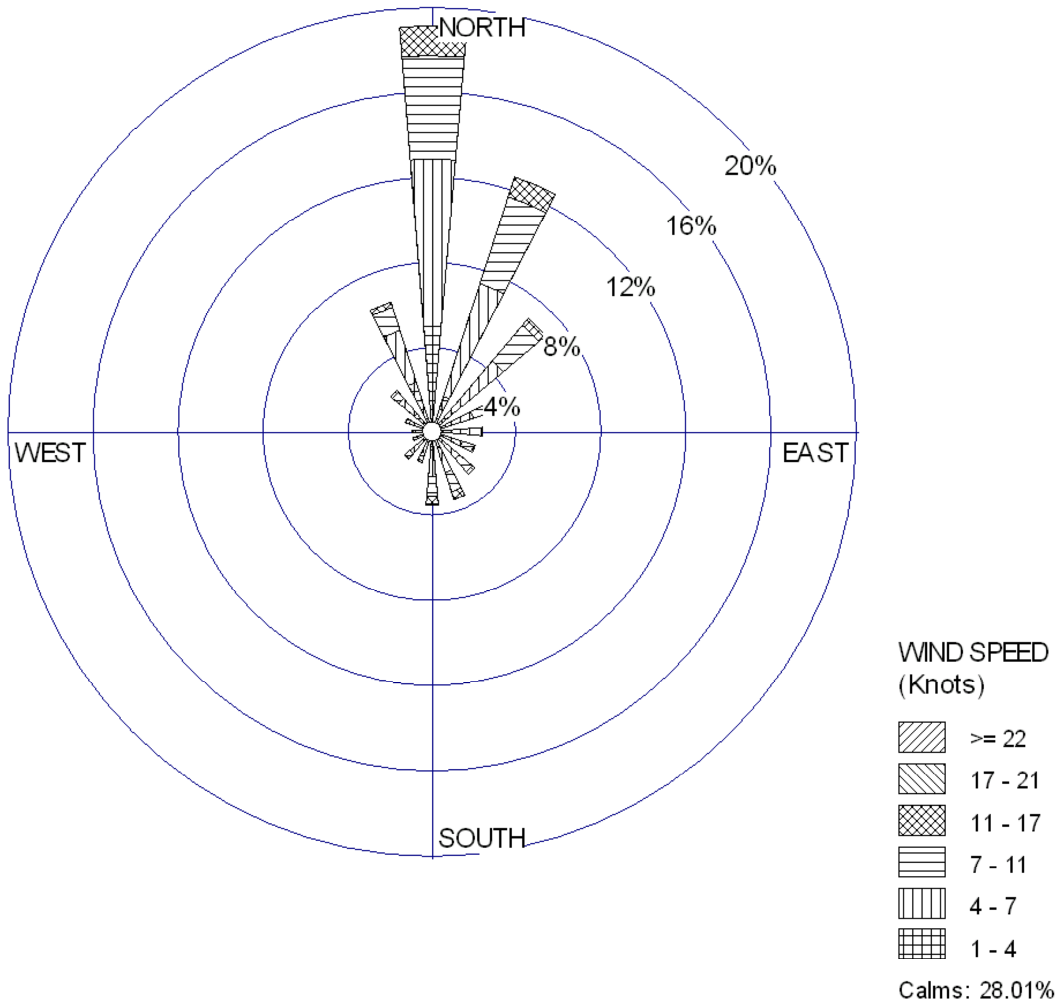


Average Wind Speed	3.95 Knots
Calm Winds	30.8%

Note: 1 knot = 1.151 miles per hour.

Source: National Climatic Data Center, 1986-1990; Golder, 2006.

Figure 2.3.7-2d Fall Wind Rose for 1986 to 1990 (Tallahassee Municipal Airport, Station No. 93805)



Average Wind Speed	4.73 Knots
Calm Winds	28.0%

Note: 1 knot = 1.151 miles per hour.

Source: National Climatic Data Center, 1986-1990; Golder, 2006.

TABLE 2.3.7-1
MONTHLY AND ANNUAL AVERAGE TEMPERATURES MEASURED AT THE TALLAHASSEE MUNICIPAL AIRPORT

	Daily Temperatures (°F)[a]			Extremes (°F)[b]	
Month	Average	Maximum	Minimum	Maximum	Minimum
January	51.8	63.8	39.7	82	6
February	54.8	67.4	42.1	86	14
March	61.1	74.0	48.2	90	20
April	66.4	80.0	52.8	95	29
May	74.4	86.5	62.3	100	34
June	80.4	90.9	69.8	103	46
July	82.4	92.0	72.7	103	57
August	82.1	91.5	72.7	103	57
September	78.9	88.5	69.2	99	40
October	69.1	81.2	56.9	94	30
November	60.4	72.9	47.9	88	13
December	53.7	65.8	41.6	84	10
Annual	68.0	79.5	56.3	103	6

[a] 30-year period of record, climatological normal, 1971 to 2000.
[b] 44-year period of record, 1961 to 2004.

Source: National Oceanic and Atmospheric Administration (NOAA), 2004.

TABLE 2.3.7-2
MONTHLY AND ANNUAL AVERAGE PRECIPITATION AND RELATIVE HUMIDITY MEASURED AT THE TALLAHASSEE MUNICIPAL AIRPORT

Month	Precipitation (inches)			Humidity (%) hour (LT) [a]			
	Average[a]	Maximum[b]	Minimum[b]	1 a.m.	7 a.m.	1 p.m.	7 p.m.
January	5.36	18.94	0.34	85	87	58	72
February	4.63	11.50	0.64	84	87	54	64
March	6.47	13.57	0.24	86	89	51	60
April	3.59	13.13	0.33	87	90	47	56
May	4.95	11.66	< 0.01	89	91	51	60
June	6.92	17.41	1.95	91	92	56	68
July	8.04	20.12	2.35	93	94	61	74
August	7.03	15.73	2.45	93	95	61	76
September	5.01	15.92	0.11	91	93	58	74
October	3.25	11.79	< 0.01	88	91	53	72
November	3.86	10.44	0.55	89	90	56	77
December	4.10	12.65	0.78	87	88	58	77
Annual	63.2			89	91	55	69

[a] 30-year period of record, climatological normal, 1971 to 2000.
[b] 44-year period of record, 1961 to 2004.

Note: LT = local time.

Source: NOAA, 2004.

TABLE 2.3.7-3
SEASONAL AND ANNUAL AVERAGE WIND DIRECTION AND WIND SPEED MEASURED AT THE TALLAHASSEE MUNICIPAL AIRPORT

			Prevailing Wind	
Season [a]	Average Wind Speed (mph)	Calm (%)	Direction	Average Wind Speed (mph)
Winter	5.6	25.9	North	7.7
Spring	5.8	25.9	North	7.6
Summer	4.6	31.0	North	6.3
Fall	5.4	27.8	North	7.5
Annual	5.3	27.6	North	7.4

[a] 5-year period of record, 1986 to 1990. The data for this period were also used in the air quality impact analyses for the Project.

Source: NOAA, 1990.

TABLE 2.3.7-4
SEASONAL AND ANNUAL AVERAGE ATMOSPHERIC STABILITY CLASSES DETERMINED AT THE TALLAHASSEE MUNICIPAL AIRPORT

	Occurrence (%) of Stability Class [a]					
Season [a]	Very Unstable	Moderately Unstable	Slightly Unstable	Neutral	Slightly Stable	Moderately Stable
Winter	0.0	4.6	11.2	42.9	8.3	33.0
Spring	1.6	13.2	16.326.0	7.4	35.5	
Summer	4.9	18.9	15.214.4	7.6	39.0	
Fall	0.5	9.6	15.026.7	9.3	39.0	
Annual	1.8	11.6	14.427.4	8.1	36.6	

[a] 5-year period of record, 1986 to 1990 using the Pasquill-Gifford stability scheme. The data for this period were also used in the air quality impact analyses for the Project.

Source: NOAA, 1990.

TABLE 2.3.7-5
SEASONAL AND ANNUAL AVERAGE MORNING AND AFTERNOON MIXING HEIGHTS DETERMINED AT THE TALLAHASSEE MUNICIPAL AIRPORT

Season [a]	Mixing Height (m)	
	Morning	Afternoon
Winter	700	1,259
Spring	868	1,429
Summer	840	1,372
Fall	868	1,307
Annual	819	1,342

[a] 5-year period of record, 1986 to 1990. The data for this period were also used in the air quality impact analyses for the Project. Mixing heights based on surface temperatures and upper-air data from the NWS stations at Tallahassee Municipal Airport and Apalachicola, respectively.

Source: NOAA, 1990.

Table2.3.7-6

NATIONAL AND STATE AAQS, ALLOWABLE PSD INCREMENTS, AND SIGNIFICANT IMPACT LEVELS

Pollutant	Averaging Time	AAQS (µg/m³) National Primary Standard	AAQS (µg/m³) National Secondary Standard	AAQS (µg/m³) State of Florida	PSD Increments (µg/m³) Class I	PSD Increments (µg/m³) Class II	Significant Impact Levels [d] (µg/m³) Class I (proposed)	Significant Impact Levels [d] (µg/m³) Class I I
Particulate Matter[a]	Annual Arithmetic Mean	50	50	50	4	17	0.2	1
Particulate Matter (PM_{10})	24-Hour Maximum[b]	150[b]	150[b]	150[b]	8	30	0.3	5
Sulfur Dioxide	Annual Arithmetic Mean	80	NA	60	2	20	0.1	1
	24-Hour Maximum[e]	365[b]	NA	260[b]	5	91	0.2	5
	3-Hour Maximum[b]	NA	1,300[b]	1,300[b]	25	512	1.0	25
Carbon Monoxide	8-Hour Maximum[b]	10,000[b]	10,000[b]	10,000[b]	NA	NA	NA	500
	1-Hour Maximum[b]	40,000[b]	40,000[b]	40,000[b]	NA	NA	NA	2,000
Nitrogen Dioxide	Annual Arithmetic Mean	100	100	100	2.5	25	0.1	1
Ozone[a]	1-Hour Maximum	235[c]	235[c]	235[c]	NA	NA	NA	NA
	1-Hour Maximum	235	235	NA	NA	NA	NA	NA
Lead	Calendar Quarter Arithmetic Mean	1.5	1.5	1.5	NA	NA	NA	NA

Note: NA = Not applicable, i.e., no standard exists.
PM_{10} = particulate matter with aerodynamic diameter less than or equal to 10 micrometers.

[a] On July 18, 1997, the EPA promulgated revised AAQS for particulate matter and ozone. For particulate matter, $PM_{2.5}$ standards were introduced with a 24-hour standard of 65 µg/m³ (3-year average of 98th percentile) and an annual standard of 15 µg/m³ (3-year average at community monitors). Implementation of these standards has not yet occurred. The ozone standard was modified to be 0.08 ppm for 8-hour average; achieved when 3-year average of 99th percentile is 0.08 ppm or less. The FDEP has not yet adopted these standards.

[b] Short-term maximum concentrations are not to be exceeded more than once per year except for the PM_{10} AAQS (these do not apply to significant impact levels). The PM_{10} 24-hour AAQS is attained when the expected number of days per year with a 24-hour concentration above 150 µg/m³ is equal to or less than 1. For modeling purposes, compliance is based on the sixth highest 24-hour average value over a 5-year period.

[c] Achieved when the expected number of days per year with concentrations above the standard is fewer than 1.

[d] Maximum concentrations.

Sources: Federal Register, Vol. 43, No. 118, June 19, 1978. 40 CFR 50. 40 CFR 52.21. Rule 62-204, F.A.C.

Table 2.3.7-7 Summary of Maximum Measured PM_{10} and O_3 Concentrations Observed from Monitoring Stations in Leon County, 2001 Through 2005

AIRS/ Saroad Site No.	Operator	Location	Measurement Period Year	Measurement Period Months	Concentration 1-Hour Highest	Concentration 1-Hour 2nd Highest	Concentration 8-Hour 3-year Average 4th Highest	Concentration 24-Hour Highest	Concentration 24-Hour 2nd Highest	Concentration Annual Average
PM_{10} [a]		**Florida AAQS**			**NA**	**NA**	**NA**	**NA**	**150 µg/m³**	**50 µg/m³**
12-069-0001	Leon County	Route 16, 3000 Tallahassee	2004	Jan-Dec	NA	NA	NA	[b]	[b]	[b]
		Wakulla Work Station	2003	Jan-Dec	NA	NA	NA	47	47	17
			2002	Jan-Dec	NA	NA	NA	38	35	15
			2001	Jan-Dec	NA	NA	NA	52	50	17
Ozone [a]		**Florida AAQS**			**NA**	**0.12 ppm**	**0.08 ppm**	**NA**	**NA**	**NA**
12-073-0012	Leon County	110 Century Park, Tallahassee	2005	Jan-Jul	0.098	0.088	0.070	NA	NA	NA
			2004	Jan-Dec	0.083	0.080	0.070	NA	NA	NA
			2003	Jan-Dec	0.090	0.087	0.071	NA	NA	NA
			2002	Jan-Dec	0.092	0.087	0.072	NA	NA	NA
			2001	Jan-Dec	0.092	0.083	0.077	NA	NA	NA
12-073-0013	Leon County	MICC Greenways, Tallahassee	2005	Jan-Jul	0.104	0.084	0.070	NA	NA	NA
			2004	Jan-Dec	0.081	0.081	0.070	NA	NA	NA
			2003	Jan-Dec	0.087	0.085	0.071	NA	NA	NA
			2002	Jan-Dec	0.088	0.087	0.069	NA	NA	NA
			2001	Jan-Dec	0.087	0.085	NAV	NA	NA	NA

Note: NA = not applicable; NAV not available
AAQS = ambient air quality standard.

[a] On July 18, 1997, EPA promulgated revised AAQS for particulate matter and ozone. For particulate matter, $PM_{2.5}$ standards were introduced with a 24-hour average standard of 65 µg/m³ (based on the 3-year averages of the 98th percentile values) and an annual standard of 15 µg/m³ (3-year averages at community monitors). The form of the 24-hour PM_{10} standard was changed; compliance is based on 3-year average of 99th percentile concentrations that is 150 µg/m³ or less. The O_3 standard was modified to be 0.08 ppm for the 8-hour average; achieved when the 3-year average of 99th percentile values is 0.08 ppm or less.

[b] Monitoring discontinued at this site.

Source: EPA Aerametric Information Retrieval System, Air Quality Subsystem, Quick Look Report, Florida 2003

2.3.8 Noise

General Procedures

Noise resulting from human activities can impact the health and welfare of both workers and the general public. The level of impact is related to the magnitude of noise, which is referred to as sound pressure level (SPL) with units in decibels (dB). Decibels are calculated as a logarithmic function of SPL in air to a reference effective pressure, which is considered the hearing threshold, or:

$$SPL = 20 \log_{10} (Pe/Po)$$

where: Pe = measured effective pressure of sound wave in micropascals (µPa), and
Po = reference effective pressure of 20 µPa.

To account for the effect of how the human ear perceives sound pressure, sound pressure level is adjusted for frequency. This is referred to as A-weighting (dBA), which adjusts measurements for the approximated response of the human ear to low-frequency SPLs (i.e., levels below 1,000 hertz [Hz] and high-frequency SPLs (i.e., levels above 1,000 Hz).

Typically environmental baseline sound levels may vary over short periods of time (minutes to hours). Long-term continuous measurements shall be made with the integrating sound level meters set up to measure the equivalent SPLs (L_{eq}). The measured values are expressed both using the A-weighted filter, as well as octave band frequencies, for determining the content of environmental noise during the monitoring period.

The SPLs and octave band data were collected using measurement techniques set forth by American National Standard Institute S12.9-1993/Part 3, *Quantities and Procedures for Description and Measurement of Environmental Sound, Part 3: Short-term measurements with an observer present* (ANSI, 1993).

Noise Measurement Locations

A comprehensive ambient noise-monitoring program was performed on February 7 and 8, 2006 to assess the existing ambient noise levels in the Project areas. The Hopkins Power Plant Unit 1 was not operating, but Unit 2 was fully operational along with the four combustion turbines which were operated for two consecutive hours during the daytime periods and two consecutive hours during the nighttime periods.

The SPLs and octave band data were collected at four distinct locations around the existing Hopkins Site. The four sampling locations were selected to delineate the existing background noise levels at or near the north, south, east and west perimeters of the facility. The noise monitoring location details are shown in Table 2.3.8-1 below, and a map of these monitoring locations is shown in Figure 2.3.8-1.

Table 2.3.8-1 Noise Monitoring Locations

Site Number	Grid Coordinates	Location Description
Site 1	N 30º 26’ 47.7” W 84º 24’ 00.8”	Located on the southern property boundary due south of the main turbine building.
Site 2	N 30º 27’ 10.9” W 84º 24’ 12.6”	Located on the western property boundary adjacent to Geddie Road by contractor gate.
Site 3	N 30º 27’ 15.7” W 84º 23’ 46.5”	Located northeast of the turbine building next to the CSX railroad and the transmission line.
Site 4	N 30º 26’ 54.7” W 84º 23’ 27.1”	Located to the southeast on the transmission corridor.

Noise monitoring was continuously performed at the four sites so that the daytime (7 a.m. to 10 p.m.) and nighttime (10 p.m. to 7:00 a.m.) hours were measured. It should be noted that the traffic traveling along Geddie Road influenced the background noise levels at the monitoring locations along the Project’s western property boundary.

Noise Measurement Procedures

The equipment used to monitor the baseline noise levels operated in the slow response mode to obtain accurate, integrated, A-weighted sound pressure levels. A windscreen was used because all measurements were taken outdoors. The microphone was positioned so that a random incidence response, as specified by the American National Standard Institute (ANSI), was achieved. The sound level meter and octave band analyzer were calibrated immediately prior to and just after the sampling period to provide a quality control check of the sound level meter’s operation during monitoring.

The noise monitoring equipment used during the study included:

1. Continuous Noise Monitoring Equipment
   a. Larson Davis Model 824 Precision Integrating Sound Level Meter with Real Time Frequency Analyzer
   b. Larson Davis Model PRM902 Microphone Preamplifier
   c. Larson Davis Model 2560 Prepolarized 1/2" Condenser Microphone
   d. Windscreen, tripod, and various cables
2. Sound Level Meter Calibration Unit
   a. Larson Davis Model CAL200 Sound Level Calibrator, 94/114 dB at 1,000 Hz.

The Larson Davis sound level meter complies with Type I--Precision requirements set forth for sound level meters and for one-third octave filters.

Integrated SPL data consisting of the following noise parameters were collected at each location:

L_{eq} The sound pressure level averaged over the measurement period; this parameter is the continuous steady sound pressure level that would have the same total acoustic energy as the real fluctuating noise over the same time period;

Max The maximum sound pressure level for the sampling period, and;

Min The minimum sound pressure level for the sampling period.

Ln The sound pressure levels which were exceeded n% of the time during the sampling period.

The SPL averages were calculated using the following formula:

$$\text{Average SPL} = 10 \text{ Log} \frac{\sum_{i-1}^{N} 10^{(SPLi/10)}}{N}$$

where: N = number of observations.

SPL_i = individual sound pressure level in data set.

The measured noise levels also will be expressed as percentiles of occurrence (L_n), where *n* is a user-selected value, ranging from 0.01 to 99.99. For this study, the percentiles of occurrences will be L_1, L_{10}, L_{50}, L_{90} L_{95} and L_{99}, which correspond to SPLs that are exceeded 1%, 10%, 50%, 90% 95% and 99% of the time.

Monitoring was conducted using the sound level meter mounted on a stanchion at a height of 1.2-m (4-ft) above grade. Local meteorological conditions (wind speed, wind direction, temperature, and relative humidity) were measured during the monitoring periods. The operator recorded detailed field notes during monitoring and included major noise sources in the area.

Figure 2.3.8-1. Noise Monitoring Locations
Arvah B. Hopkins Generating Station
Unit 2 Repowering Project
City of Tallahassee
Source: Golder, 2006.

Golder Associates

Monitoring Results

The results of the ambient sound pressure level statistical descriptor percentiles measured at the four monitoring locations, with Unit 2 and Gas Turbine Units 1 through 4 operating, are provided in Figures 2.3.8-2 and 2.3.8-3 below.

Figure 2.3.8-2 Baseline Daytime Sound Level Data

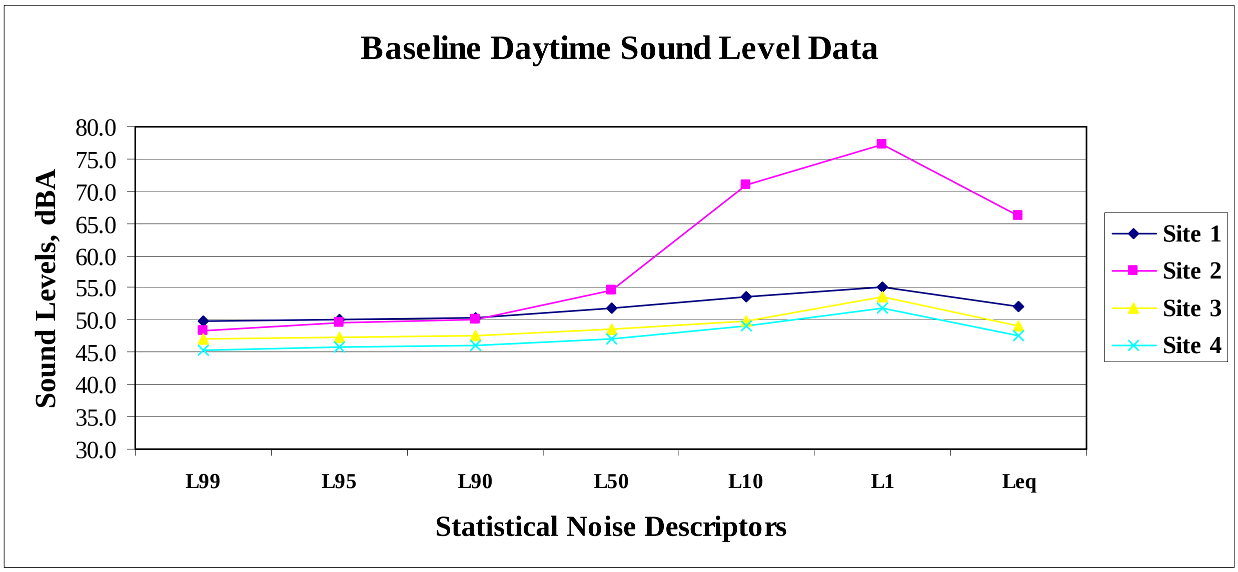
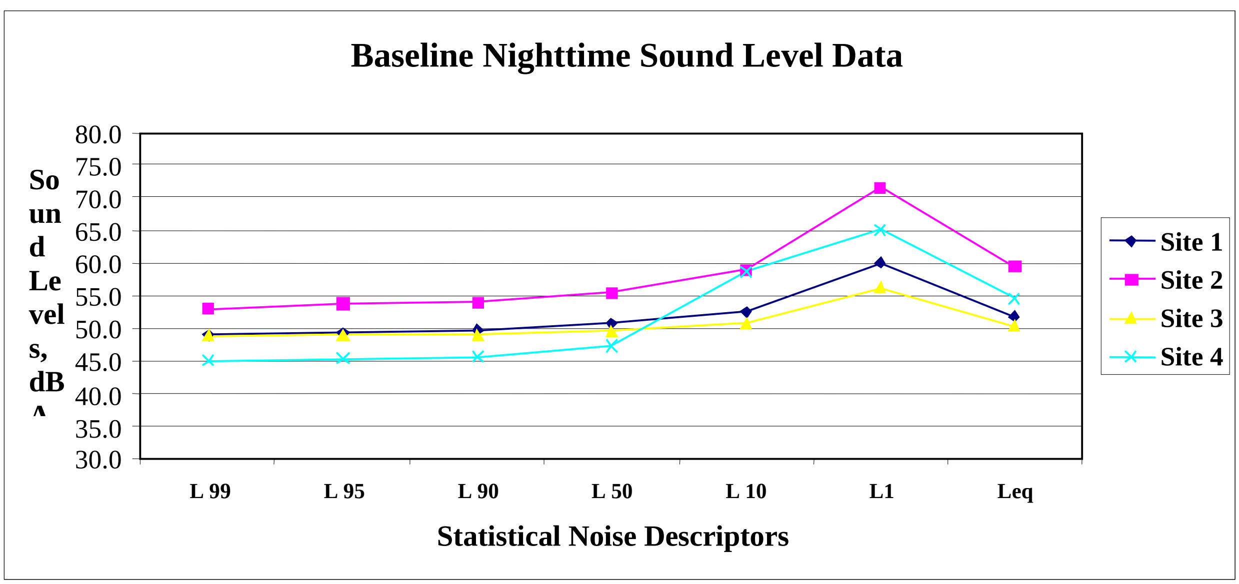


Figure 2.3.8-3 Baseline Nighttime Sound Level Data



It should be noted that the elevated values for the L_{10}, L_1 and overall L_{eq} at Site 2 during the daytime is due to the noise caused by the vehicular traffic on Geddie Road. Additionally, the elevated L_1 and L_{eq} values at all sites during the nighttime measurement period were due to frogs and other nocturnal fauna activity.

2.3.9 Other Environmental Features

There has been no significant change in other environmental features on or near the Hopkins Site since the Resource Addition Project SCA (2004).

2.4 REFERENCES

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3.0 PROJECT DESCRIPTION

This chapter describes the key characteristics of the Repowering Project.

3.1 BACKGROUND

The City of Tallahassee is proposing to repower Hopkins Unit 2 by retiring the existing Unit 2 boiler and adding a new combustion turbine generator (CTG) and a heat recovery steam generator (HRSG). The CTG will generate electricity, and the steam produced by the HRSG will be used with the existing Unit 2 steam turbine generator to generate electricity. Existing Unit 2 steam generating equipment, such as the boiler and feedwater heaters, will be taken out of service.

The repowering of Unit 2 will be accomplished in two phases. Phase 1 will include the addition of one General Electric 7FA CTG and one HRSG as a single train forming a 1-on-1combined cycle unit. Phase 2, which may be added at a future date, will consist of a second 1-on-1 combined cycle train that will generate electricity via the CTG and send additional high-energy steam to the existing Unit 2 steam turbine generator. Upon completion of Phase 2, the final configuration of the repowered Unit 2 will be a 2-on-1 combined cycle facility.

The combustion turbines will be designed to burn natural gas and No. 2 distillate fuel oil. Dry low-NO_X combustors will control NO_X emissions when burning fuel gas, and water injection will control NO_X emissions when burning fuel oil. The HRSG will be equipped with duct burners to provide supplemental firing by burning natural gas. After passing through the HRSG, the exhaust gas will be routed through a Selective Catalytic Reduction (SCR) system to provide additional NO_X control. The combustion turbines will be equipped with evaporative coolers to cool the inlet air to improve combustion turbine performance during high ambient temperatures.

Each combined cycle train will utilize a natural circulation HRSG to recover the waste heat exhausted from the combustion turbine to generate steam, which will produce electric power in the existing steam turbine generator.

Cooling of the existing condenser will continue to be accomplished with the existing Unit 2 mechanical draft cooling tower. The existing well water system will continue to provide cooling tower makeup water. While there will be no increase in water use as a result of the Repowering Project, modifications may be required to the existing groundwater wells and piping system to support the repowered Unit 2. These modifications will not increase the number of wells, or the water use, but will restore the wells to their original capacities.

As stated previously, the combustion turbines will be designed to burn either natural gas or No. 2 distillate fuel oil. The exhaust gas leaving the combustion turbine will pass through the HRSG to produce steam for use by the steam turbine generator. The HRSG will be equipped with supplemental duct burners to produce additional steam during periods of peak demand. The duct burners will be designed to burn natural gas.

The estimated net electric generating capacity (at 59°F ambient temperature with 78% relative humidity) for the Phase 1 and Phase 2 repowering configurations is as follows:

	Approximate MW Generated	
	Phase 1 (1-on-1)	**Phase 2 (2-on-1)**
Natural Gas - without duct firing	253	506
Natural Gas - with duct firing	320	Not applicable
Fuel Oil - without duct firing	268	532
Fuel Oil - with duct firing	334	Not applicable

Supplemental duct firing will not normally be used in the final 2-on-1 combined cycle configuration.

As stated previously, the flue gas from the HRSG will pass through an SCR system to control concentrations of NO_X generated by the combustion turbine and HRSG duct firing. The design and installation of the SCR reactor and catalyst will be in full accordance with all applicable air quality regulations, as discussed in Section 3.4. Ammonia slip will be limited to 10 ppmvd @ 15% oxygen.

The final flue gas from each combined cycle train will discharge through a steel stack. Each stack will be approximately 18 feet in diameter, with a height approximately 150 feet above grade. The stacks will be lighted or painted in accordance with the Federal Aviation Administration (FAA) requirements, as necessary. The new stacks will be well below the height of the existing Hopkins Unit 2 stack, which is approximately 250 feet high and the existing Unit 1 stack, which is approximately 200 feet high. Both of the existing stacks are currently marked in accordance with FAA requirements.

The repowered unit will be equipped with a steam bypass system to allow operation of one combustion turbine in simple cycle mode with the exhaust gases still being vented to the HRSG and SCR system. However, in the event of a major unplanned forced outage event that makes the HRSG or steam turbine unavailable, the ability to use the steam bypass is not an alternative. As a result, the electrical output associated with the combustion turbine would not be available to meet system reliability needs. In order to mitigate the system reliability impacts from such a major unplanned forced outage event, the repowered unit will be equipped with an emergency HRSG bypass system, including a separate bypass stack for each CTG. This added operating flexibility will avoid the complete loss in generating capacity of the repowered unit. During these emergency situations, the unit would operate on natural gas only, and the FDEP will be notified of the operation of the bypass stack.

The bypass stack for each CTG will be the same height and diameter as the HRSG stacks. The diversion of the normal flow path of the CTG exhaust will occur at the ductwork between the CTG and HRSG. This diversion will be achieved through mechanical means that will require a physical change to the ductwork flow path. To prevent flue gas leakage to the bypass stack during normal plant operations, a leak tight barrier such as a blind plate will be used. Since the emergency bypass would be utilized only under rare emergency conditions, the bypass stack will not be equipped with an SCR system or continuous emission monitors.

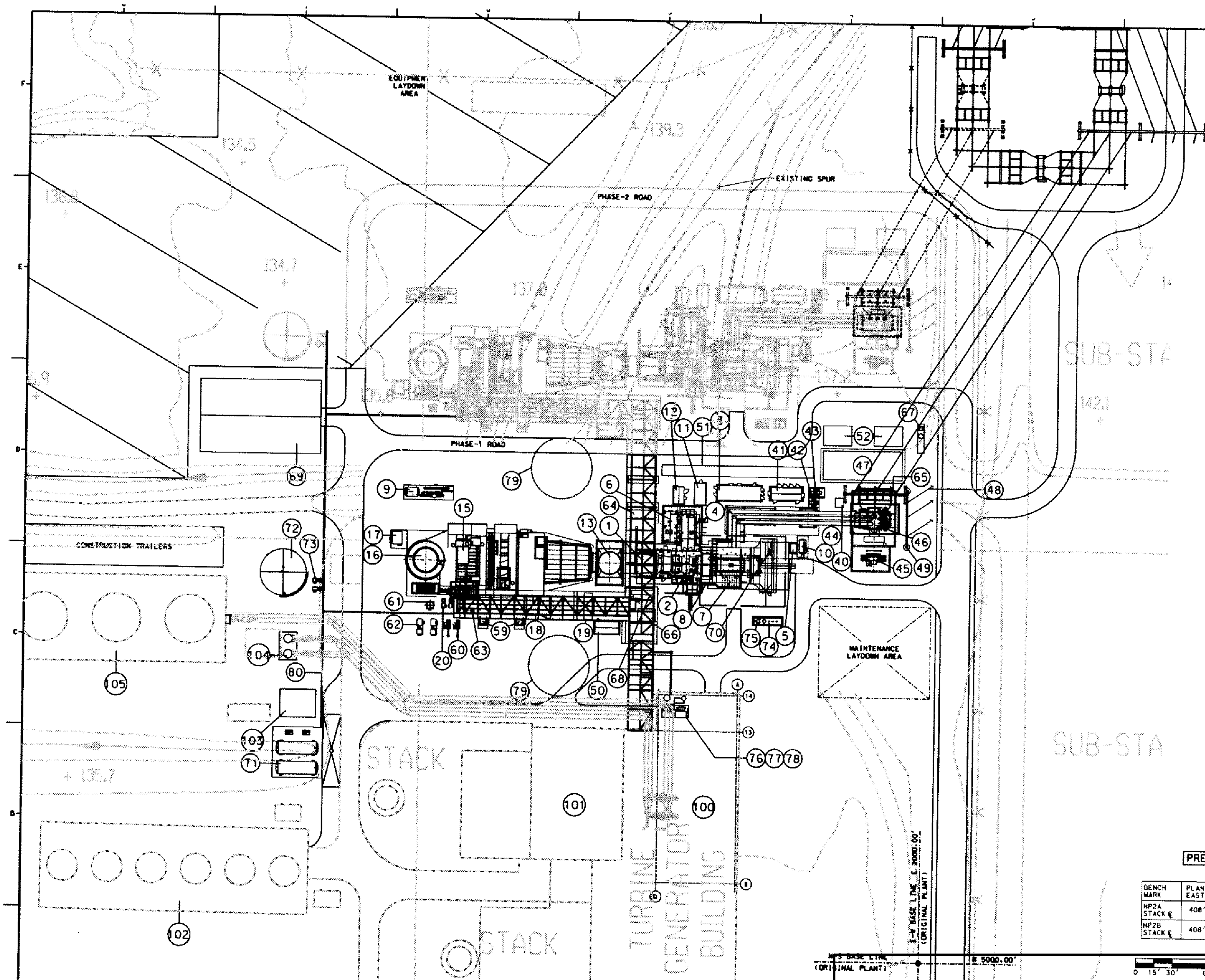
In addition to the existing steam turbine generator and cooling tower, other existing steam cycle equipment (e.g., condenser, circulating water system, liquid fuel oil storage system, piping, valves and other miscellaneous existing Site infrastructure) will service the Repowering Project. Initially, the existing Unit 2 boiler, boiler building, and stack will be abandoned in place, with minimal demolition only where necessary to accommodate the new combined cycle units. In the future, following completion of Phase 1 repowering, the existing abandoned Unit 2 facilities may be demolished. The City has not established a definitive schedule for this demolition, but expects it to be completed within 5 years after the commercial operation date of the Phase 1 repowering. The demolition scope may include the boiler, boiler building, forced draft (FD) and induced draft (ID) fans, boiler auxiliaries, and stack. The City currently plans on retaining the existing Unit 2 boiler elevator and support structures where it will be modified for continued operation and remain in place. An appropriately licensed demolition contractor will conduct the demolition. The materials will be either reused or disposed in an appropriately licensed facility. Based on current information, the City anticipates that no hazardous waste will be generated as a result of the demolition. No asbestos insulation exists in Unit 2. Should a hazardous waste be discovered during the demolition, it will be removed by an appropriately licensed contractor and disposed of in an appropriately licensed facility. The City anticipates that the majority of the demolition activities will be performed by mechanical means, but there is the potential that explosives may be utilized for a portion of the demolition, including, but not limited to, the existing stack.

3.2 SITE LAYOUT

The Site layout of the existing Hopkins Generating Station is depicted in Figure 2.1.4-1, which shows all of the current major buildings, storage tanks, electric power producing power blocks, administrative building, warehouses, cooling towers, roadways, Site ingress/egress and water treatment. In addition, Figure 2.1.4-1 depicts the new Phase 1 and future Phase 2 power blocks, the 230-kV switchyard expansion, demineralized water storage tanks, aqueous ammonia storage/unloading station, piperack that connects the new combined cycle power block(s) to the existing Unit 2 power block, and stormwater detention pond.

A more detailed depiction of the Phase 1 and Phase 2 power block area is shown in Figure 3.2-1. The Phase 1 CTG/HRSG train will be located directly to the north of the existing Unit 2 boiler and turbine buildings. The future Phase 2 CTG/HRSG train will be located to the north of the Phase 1 train. To the north of the Phase 2 train is the new stormwater detention pond.

The current main entrance to the Hopkins Generating Station will remain the same. An additional access road entrance exists for construction traffic located to the north of the main entrance. This entrance will be the primary ingress and egress for construction access and parking during construction of the Repowering Project.



COMBUSTION TURBINE(G.E.)

1. COMBUSTION TURBINE 2A (GE7FA)
2. GENERATOR
3. PACKAGED ELECTRICAL ELECTRONIC CONTROL CENTER(PEECC)
4. ACCESSORY MODULE
5. AIR PROCESSING SKID
6. LIQUID FUEL ATOMIZING AIR MODULE
7. CT AIR INLET FILTER
8. CT AIR INLET DUCT
9. GAS SKID(SCRUBBER, HEATER, DRAIN TANK)
10. CO2 SKID
11. WATER WASH SKID
12. WATER INJECTION SKID
13. SIMPLE CYCLE BY PASS STACK (18' DIA X 150' H TRANSITION DUCTWORK)

HEAT RECOVERY STEAM GENERATOR/ HRSG

15. HEAT RECOVERY STEAM GENERATOR
16. HRSG 2A STACK (18' DIA X 150' H)
17. CEMS BUILDING
18. BURNER SKID
19. SCR SKID
20. CONDENSATE RECIRCULATION PUMPS
21. HRSG CHEMICAL ADDITIVE SYSTEM (LOCATIONS LATER)

ELECTRICAL EQUIPMENT

40. DC LINK
41. LCI/GEC
42. EXCITATION TRANSFORMER
43. ISOLATION TRANSFORMER
44. ISO-PHASED BUS DUCT
45. STATION SERVICE X FMR
46. COMBUSTION TURBINE CTA MAIN POWER TRANSFORMER
47. 4160V & 480V OUTDOOR SWITCHGEAR
48. TRANSMISSION LINES
49. DEAD-END STRUCTURE
50. HRSG 480V MCC
51. CABLE TRAYS
52. 4160V & 480V TRANSFORMER

MISCELLANEOUS EQUIPMENT

59. BOILER FEED PUMPS
60. COOLING WATER HEAT EXCHANGER
61. BLOW DOWN TANK (IN PIT)
62. AUX COOLING WATER PUMPS
63. AUX COOLING WATER HEAD TANKS
64. PIPE RACK
65. FIREWALL
66. WASTE WATER SUMP
67. OILY WATER SEPERATOR
68. CHEMICAL/SAMPLING BUILDING
69. MAINTENANCE/STORAGE FACILITY
70. H2 & CO2 STORAGE BOTTLES (UNDER AIR INLET FILTER)
71. AMMONIA STORAGE TANKS, PUMPS AND TRUCK UNLOADING
72. DEMINERALIZED WATER STORAGE TANK UNIT HP2A
73. DEMINERALIZED WATER PUMPS
74. WATER WASH DRAINS TANK (IN PIT)
75. CT OIL DRAINS TANK (IN PIT)
76. AIR COMPRESSORS (TURBINE BUILDING MEZZANINE FLOOR)
77. AIR DRYERS (TURBINE BUILDING MEZZANINE FLOOR)
78. AIR RECEIVERS (TURBINE BUILDING MEZZANINE FLOOR)
79. CONSTRUCTION CRANE ACCESS
80. PIPE TRENCH

EXISTING

100. STEAM TURBINE BUILDING
101. BOILER BUILDING
102. UNIT 1 COOLING TOWER
103. CHEMICAL STORAGE BUILDING
104. 2 CIRCULATING WATER PUMPS
105. UNIT 2 COOLING TOWER

PRELIMINARY DESIGN

BENCH MARK	PLANT EAST	PLANT NORTH	SITE EAST	SITE NORTH
HP2A STACK ℄	408'-0"	325'-0"		
HP2B STACK ℄	408'-0"	487'-0"		

NORTH

0 15' 30' 60' 90

PRELIMINARY REPOWERING PROJECT
EQUIPMENT LAYOUT

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

Sargent & Lundy LLC

FIGURE NUMBER

3.2-1

3.3 FUEL

The fuels that will be used by the repowered unit (both Phase 1 and Phase 2) will be natural gas or No. 2 distillate fuel oil.

The quantity of fuel used will depend on the operating load of the unit. The normal unit operating range will vary from 35% to 100% load. It is estimated that the total natural gas heat input in the Phase 1 configuration at 100% load with supplemental duct firing will be approximately 2,258 MMBtu/hr, which is equivalent to gas consumption of approximately 109,000 lb/hr (with a lower heating value of 20,700 Btu/lb at 59°F ambient temperature and 78% relative humidity). When burning fuel oil at 100% load with supplemental duct firing, the heat input will be approximately 2,568 MMBtu/hr, which is equivalent to oil consumption of approximately 140,500 lb/hr (with a lower heating value of 18,300 Btu/lb at 59°F ambient temperature and 78% relative humidity).

3.3.1 Natural Gas and Fuel Oil Systems

The existing fuel systems at Hopkins Generating Station include natural gas, No. 2 distillate fuel oil, and No. 6 fuel oil. Hopkins Unit No. 2 is currently permitted to burn natural gas, No. 2 through No. 6 fuel oil, and/or on-specification used oil. In case of a natural gas curtailment, liquefied petroleum gas (LPG) may be used as an igniter fuel for the fuel oil. Fuel additives typically consisting of a magnesium oxide, hydroxide, sulfonate, or calcium nitrate origin may also be used.

The fuel gas system consists of piping, valving, metering, pressure regulation, instrumentation and controls. The fuel oil systems consist of tanker truck fuel unloading facility, storage tanks, pump forwarding system, piping, valves, instrumentation, and controls. The No. 6 fuel oil is heated and atomized prior to combustion in the existing Unit 1 and Unit 2 furnaces.

The existing fuel gas supply to the Site is via a tap off of a 30-inch approximately 900 psig gas pipeline, where the pressure is reduced for use by the existing Hopkins generating units. In order to support the Repowering Project, certain modifications and additions to the fuel gas supply will be required. Florida Gas Transmission's (FGT) modifications will be designed to provide the Hopkins Site with 5,500 million cubic feet per hour (MCFH) at a pressure of 750 psig or above. The on-site modifications will include a short run of new gas lateral and a new metering and regulating station to be installed immediately adjacent to the existing FGT metering and regulating station. In addition, FGT will be separately permitting and installing a new lateral run from the 30-36-inch mainline to the Hopkins Site. It is anticipated that FGT will run the new lateral parallel to, and the in the same right-of-way as, the existing 6 inch diameter lateral. A portion of the existing FGT metering and regulating station will be removed from the Site following cut over to the new station. The FGT metering and regulating station that was installed in 2005 as a part of the City's Peaking Resource Addition Project will remain in service as a limited (approximately 2,000 MCFH) back up natural gas supply. The City will install new on-site gas supply piping to the new combustion turbines, as well as make the appropriate piping connections to provide fuel from this new metering and regulating station to the existing generating units. At the conclusion of the repowering modifications, the fuel gas burned in the new combustion turbines and existing units will be reduced as follows:

- Unit 1 – 250 psig
- Unit 2A (repowered unit) – 475 psig
- GT- 1 – 250 psig
- GT-2 – 250 psig
- GT-3 – 750 psig
- GT-4 – 750 psig

The permitting for all of the FGT facilities outside of the Hopkins Site will be performed by FGT and are not a part of this Site Certification Modification Application. The FGT onsite modifications (gas piping and metering and regulating station), as well as the City's onsite gas supply piping are included in this application.

3.3.2 Fuel Oil Unloading and Storage

Fuel oil will continue to be delivered to the Hopkins Generating Station via fuel oil tanker trucks. Tanker truck unloading stations for the fuel oil currently exist. However, to more efficiently accommodate faster unloading, the unloading station may be expanded from a single unloading to multiple unloading stations. The final determination will be made during the detailed design phase of the Repowering Project. All unloading stations will comply with the applicable environmental and design requirements, including spill containment.

The existing fuel oil storage Tank #4, which was placed into service circa 1975, will be converted from storing No. 6 fuel oil to No. 2 distillate fuel oil. The tank is an American Petroleum Institute (API) 650 design having a capacity rating of approximately 75.8 million gallons. To accommodate the storage tank conversion, the tank will have to be re-certified and containment modified for the storage of distillate fuel oil in accordance with the requirements of FDEP, National Fire Protection Association (NFPA), Factory Mutual (FM), and API. Modifications will consist of, but not limited to the following:

- Flame arrestor
- Secondary emergency venting
- Secondary bottom tank boundary
- Impermeable boundary within diked area
- Additional impermeable dike modifications for 110% capacity, as required.

These modifications to the fuel unloading stations and tanks will be included in the updated Hopkins Station SPCC and Facility Response plans.

3.3.3 Fuel Analysis

Tables 3.3-1(a), 3.3-1(b), and 3.3-2 provide typical analyses for the natural gas and No. 2 distillate fuel oil used at the Hopkins Generating Station.

Table 3.3-1 (a) Natural Gas Fuel Analysis

Attribute	Unit of Measure	Minimum Value	Maximum Value	Average Value
Heat Content	Btu per SCF	1,033	1,061	1,047
Specific Gravity	--	0.586	0.608	0.600
Methane	Mole %	92.775	95.633	94.41
Ethane	Mole %	2.328	3.994	3.07
Propane	Mole %	0.403	1.003	0.70
1-butane	Mole %	0.086	0.239	0.16
N-butane	Mole %	0.082	0.225	0.14
1-pentane	Mole %	0.031	0.063	0.05
N-pentane	Mole %	0.02	0.039	0.03
Hexane	Mole %	0.053	0.096	0.07
Heptane	Mole %	0.0	0.0	0.0
Hydrogen	Mole %	0.0	0.0	0.0
Helium	Mole %	0.0	0.0	0.0
Oxygen	Mole %	0.0	0.0	0.0
Nitrogen	Mole %	0.334	0.505	0.42
Carbon dioxide	Mole %	0.871	1.139	0.96

Table 3.3-1 (b) Natural Gas Fuel Analysis (30" Main)

Attribute	Unit of Measure	Minimum Value	Maximum Value	Average Value
Heat Content	Btu per SCF	1,021	1,050	1,030
Specific Gravity	--	0.569	0.5981	0.575
Methane	Mole %	95.335	97.685	96.880
Ethane	Mole %	1.513	2.585	1.988

Attribute	Unit of Measure	Minimum Value	Maximum Value	Average Value
Propane	Mole %	0.035	0.725	0.205
1-butane	Mole %	0.010	0.150	0.340
N-butane	Mole %	0.012	0.538	0.049
1-pentane	Mole %	0.011	0.064	0.024
N-pentane	Mole %	0.000	0.062	0.019
Hexane	Mole %	0.014	0.116	0.036
Heptane	Mole %	0.0	0.0	0.0
Hydrogen	Mole %	0.0	0.0	0.0
Helium	Mole %	0.0	0.0	0.0
Oxygen	Mole %	0.0	0.0	0.0
Nitrogen	Mole %	0.255	0.548	0.278
Carbon dioxide	Mole %	0.379	0.858	0.487

Table 3.3-1(c) Natural Gas Fuel Analysis (36" Main)

Attribute	Unit of Measure	Minimum Value	Maximum Value	Average Value
Heat Content	Btu per SCF	1,030	1,039	1,035
Nitrogen	--	0.304	0.397	0.335
Specific Gravity	Mole %	0.582	0.589	0.586
Methane	Mole %	95.361	96.193	95.758
Ethane	Mole %	1.964	2.559	2.246
Propane	Mole %	0.348	0.539	0.445
I-butane	Mole %	0.079	0.127	0.103
N-butane	Mole %	0.074	0.118	0.096
I-pentane	Mole %	0.029	0.044	0.036

Attribute	Unit of Measure	Minimum Value	Maximum Value	Average Value
N-pentane	Mole %	0.018	0.027	0.022
Hexane	Mole %	0.049	0.068	0.060
Heptane	Mole %	0.000	0.000	0.000
Hydrogen	Mole %	0.000	0.000	0.000
Helium	Mole %	0.000	0.000	0.000
Oxygen	Mole %	0.000	0.000	0.000
Carbon dioxide	Mole %	0.797	0.992	0.900

Table 3.3-2 No. 2 Distillate Fuel Oil Analysis

Attribute	Unit of Measure	Minimum Value	Maximum Value	Typical Value
API Gravity (60^oF)	--	28.0	40.0	33.9
Specific Gravity (60^oF)	--	--	--	0.855
Viscosity (100^oF)	--	--	40.0	--
Kinematic Viscosity (100^oF)	--	1.8	5.8	2.58
Flash Point	^oF	100	--	158
Pour Point	^oF	--	20	0
Sulfur	mass %	--	0.050	0.037
Fuel Bound Nitrogen	mass %	--	0.030	0.016
Sediment	mass %	--	0.1	0.0
Water	mass %	--	0.1	<0.05
Sodium Plus Potassium	ppm	--	1	<0.1
Lead	ppm	--	1	<0.1
Vanadium	ppm	--	0.5	<0.1
Calcium	ppm	--	2	<0.1
Other Trace Metals (>5 ppm)		--	--	None

Attribute	Unit of Measure	Minimum Value	Maximum Value	Typical Value
Ash	%	--	0.005	<0.001
Distillation Temperature (90% Point)	^oF	--	650	605
Gross Heat Content	MMBtu per Barrel	5.9	--	5.913
Hydrogen Content	wt %	12	--	12.51
Carbon Residue (10% bottoms)	wt %	--	0.25	0.19
Carbon Residue (100% bottoms)	wt %	--	1	0.12

3.4 AIR POLLUTANT EMISSIONS AND CONTROLS

3.4.1 Air Emissions Types And Sources

Except for emissions that may occur temporarily during Project construction, the only air pollution emissions sources associated with the Repowering Project are the CTs and the duct burners in the HRSGs. Because the Project is located at an existing power plant site, there will be no need to install new auxiliary boilers, cooling towers, materials handling equipment, or other equipment that will emit air pollutants.

Air pollutants will be emitted from the CT/HRSG when firing natural gas and distillate oil. Air emissions result from either the combustion process or impurities in the fuel. The primary pollutants emitted by the CT/HRSG will be nitrogen oxides (NO_X), carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter (PM), particulate matter with an aerodynamic diameter of 10 microns or less (PM10), and volatile organic compounds (VOC). The expected emission rates and proposed emission control technologies for these pollutants are discussed in Section 3.4.3. The expected emissions are summarized in Tables 3.4.1-1 through 3.4.1-4.

Tables 3.4.1-1 and 3.4.1-2 present the maximum estimated hourly emission rates of regulated pollutants for combined cycle operation with the CT and duct burner firing natural gas. Table 3.4.1-2 also presents the estimated maximum hourly emission rates when the CT is firing fuel oil and the duct burners are firing natural gas. The same emission rates will be achieved during simple cycle operation when the exhaust gases are routed through the HRSG and SCR system. Table 3.4.1-3 presents the maximum estimated hourly emission rates of regulated pollutants for simple cycle operation when the exhaust gases are routed through the emergency bypass stack instead of the HRSG. Only natural gas will be fired when the emergency bypass stack is used. The maximum estimated emission rates were determined using the manufacturer's information for the equipment proposed for the Project. The design parameters were provided for operating loads of 100-percent (baseload), 75-percent, and 60-percent capacity and for ambient temperatures of 25°F, 59°F, and 95°F.

Annual emissions were based on emissions expected for baseload and ambient temperatures of 59°F. The annual operation of the repowered unit will be limited so that the net emission increase of all pollutants will be less than the Prevention of Significant Deterioration (PSD) significant emission rates. The allowable annual operation was determined from an analysis of the emissions for various operating scenarios. These scenarios are reflected in the range of operating hours and fuels (natural gas and distillate oil) shown in Table 3.4.1-4 for the CT operating alone and the CT operating with maximum duct firing. The operating envelope being proposed consists of three parts that are discussed below:

1. CT operation when firing natural gas in combined cycle mode or simple cycle mode with the exhaust gases routed through the HRSG and SCR system is not limited (see Operating Scenarios A and E in Table 3.4.1-4). CT operation in simple cycle mode with the emergency bypass stack will be limited to natural gas firing. The emissions during this operational mode are not higher than in the combined cycle mode for any pollutant.

2. Duct firing with natural gas is proposed to be limited to 2,598,800 MMBtu/yr (HHV), which is equivalent to 3,650 hours/yr at the maximum duct firing rate of 712 MMBtu/hr (see Operating Scenarios B and C).

3. The maximum amount of distillate oil firing in the CT is proposed to be limited to 6,926,500 MMBtu/yr, which equivalent to 3,500 hours/yr at full load as shown in Table 3.4.1-4 as Operating Scenarios C and D. Operating Scenario D also includes duct firing with natural gas.

The potential annual emissions are based on the 59°F turbine inlet temperature at 100% load condition, which is conservative since the annual average temperatures are slightly higher than 70°F. Appendix 10.1.5, the Air Permit Application, presents the basis for the emission rates and maximum annual emissions of regulated and non-regulated pollutants.

The annual potential emissions for the Repowering Project compared to the PSD significant emission rates, which are thresholds for PSD review, are presented in Table 3.4.1-4. The actual past emissions for the existing Hopkins Unit 2 are also presented in this table. The actual emissions are based on the highest consecutive 2-year average emissions over the last five years using continuous emission monitoring system (CEMS) data, annual operating report (AOR) data fuel use data, and other data. A more detailed description of the methods used to estimate the actual emissions is presented in Section 10.1.5, the Air Permit Application.

If a project located at an existing major source results in an increase in emissions of a pollutant greater than the listed PSD significant emission rate, then, PSD review is required for that pollutant. PSD review requires a determination of Best Achievable Control Technology (BACT).

As shown in Table 3.4.1-4, Phase 1 of the Repowering Project (one CT/HRSG), after accounting for the shutdown of the existing Unit No. 2, will not produce a net increase in emissions above the PSD significant emission rate for any pollutants. The net emissions of most pollutants will decrease significantly. As a result, PSD review is not required for Phase 1 of the Repowering Project, and a BACT review is also not required.

Phase 2 of the Repowering Project, which may be permitted at some point in the future, would add a second CT/HRSG. Phase 2 may produce a net increase in emissions above the PSD significant emission rate for certain pollutants. Therefore, PSD review may be required when Phase 2 is permitted.

Emission factors for hazardous air pollutants (HAP) were evaluated based on the AP-42 emission factors, the EPA Combustion Turbine Emissions Database, and the combustion turbine Maximum Achievable Control Technology (MACT) standards. The HAP emissions are based on emission factors from the April 2000 revision of EPA’s AP-42 emission factors for large stationary combustion turbines. The HAPs emissions from Phase 1 of the Repowering Project will be less than 10 TPY for any single HAP and less than 25 TPY for all HAPs. However, the Hopkins Plant is a major source of HAP emissions since emissions exceed 10 TPY of a single HAP and exceed 25 TPY for all HAPs and will remain a major source of HAPs after the Repowering Project. Therefore, the Project would be subject to the MACT standard.

TABLE 3.4.1-1
STACK, OPERATING, AND EMISSION DATA FOR THE PROPOSED HOPKINS UNIT 2 REPOWERING PROJECT
FOR NATURAL GAS-FIRING FOR BASELOAD COMBINED CYCLE OPERATIONS WITH NATURAL GAS DUCT FIRING

Parameter	Units	Natural Gas-Firing [a]					
		CT Only			CT with Duct Burner on Gas		
		25 °F	59 °F	95 °F	25 °F	59 °F	95 °F
Combustion Turbine Performance							
Power output (MW)	MW	187.8	174.4	160.3	187.8	174.4	160.3
Heat rate	Btu/kWh, LHV	9,110	9,270	9,495	9,110	9,270	9,495
	Btu/kWh, HHV	10,112	10,290	10,539	10,112	10,290	10,539
Heat Input	MMBtu/hr, LHV	1,711	1,617	1,522	1,711	1,617	1,522
	MMBtu/hr, HHV	1,899	1,795	1,689	1,899	1,795	1,689
Relative Humidity	%	87	78	50	87	78	50
Fuel heating value	Btu/lb, LHV	20,714	20,714	20,714	20,714	20,714	20,714
	Btu/lb, HHV	22,993	22,993	22,993	22,993	22,993	22,993
Duct Burner							
Heat Input	MMBtu/hr, LHV	0.0	0.0	0.0	765	712	663
	MMBtu/hr, HHV	0.0	0.0	0.0	689	641	597
CT/HRSG Stack Data							
Height	ft	150	150	150	150	150	150
Diameter	ft	18	18	18	18	18	18
100 Percent Load							
Temperature (oF)	°F	203	202	201	189	188	190
Velocity (ft/sec)	ft/sec	70.9	67.0	63.2	70.4	66.5	63.0
Maximum Hourly Emissions							
SO_2	lb/hr	10.47	9.90	9.32	14.7	13.8	13.0
PM/PM_{10}	lb/hr	11.1	11.0	10.9	21.1	20.3	19.6
NOx	lb/hr	34.3	32.4	30.5	47.8	45.0	42.2
	ppmvd @ 15% O2	5	5	5	5	5	5
CO	lb/hr	41.7	39.1	36.2	96.8	90.3	83.9
	ppmvd	12.0	12.0	12.0	28.6	28.5	28.6
	ppmvd @ 15% O2	10.0	9.9	9.7	16.8	16.7	16.5
VOC (as methane)	lb/hr	7.52	7.12	6.72	16.70	15.66	14.67
	ppmvw	3.50	3.50	3.50	8.64	8.66	8.76
	ppmvd @ 15% O2	3.15	3.16	3.16	5.67	5.71	5.80
Lead	lb/hr	NA	NA	NA	NA	NA	NA
Sulfuric Acid Mist	lb/hr	1.05	0.99	0.93	1.89	1.77	1.66

[a] Refer to Air Construction Permit Application (Appendix 10.1.5) for detailed information on basis of pollutant emission rates and operating data.
Includes simple cycle operation with exhaust gases routed to the HRSG and SCR system.

Source: GE, 2006

TABLE 3.4.1-2
STACK, OPERATING, AND EMISSION DATA FOR THE PROPOSED HOPKINS UNIT 2 REPOWERING PROJECT
FOR DISTILLATE OIL-FIRING FOR BASELOAD COMBINED CYCLE OPERATIONS WITH NATURAL GAS AND OIL DUCT FIRING

Parameter	Units	Distillate Oil-Firing [a]					
		CT Only			CT with Duct Burner on Gas		
		25 °F	59 °F	95 °F	25 °F	59 °F	95 °F
Combustion Turbine Performance							
Power output (MW)	MW	198.9	187.9	172.4 #	198.9	187.9	172.4
Heat rate	Btu/kWh, LHV	9,860	9,935	10,090	9,860	9,935	10,090
	Btu/kWh, HHV	10,452	10,531	10,695	10,452	10,531	10,695
Heat Input	MMBtu/hr, LHV	1,961	1,867	1,740	1,961	1,867	1,740
	MMBtu/hr, HHV	2,079	1,979	1,844	2,079	1,979	1,844
Relative Humidity	%	87	78	50	87	78	50
Fuel heating value	Btu/lb, LHV	18,300	18,300	18,300	18,300	18,300	18,300
	Btu/lb, HHV	19,398	19,398	19,398	19,398	19,398	19,398
Duct Burner							
Heat Input	MMBtu/hr, LHV	0.0	0.0	0.0	765	712	663
	MMBtu/hr, HHV	0.0	0.0	0.0	689	641	597
CT/HRSG Stack Data							
Height	ft	150	150	150	150	150	150
Diameter	ft	18	18	18	18	18	18
100 Percent Load							
Temperature (oF)	°F	248	248	247	206	204	201
Velocity (ft/sec)	ft/sec	79.5	75.1	70.3	75.8	71.4	66.6
Maximum Hourly Emissions							
SO_2	lb/hr	107	102	95	111	106	99
PM/PM_{10}	lb/hr	38.7	37.6	36.2	48.7	47.0	44.9
NOx	lb/hr	81.4	77.5	72.2	108.4	102.6	95.6
	ppmvd @ 15% O2	10.0	10.0	10.0	10.0	10.0	10.0
CO	lb/hr	87.8	82.2	76.1	142.9	133.4	123.8
	ppmvd	25.0	25.0	25.0	41.9	41.8	41.9
	ppmvd @ 15% O2	17.7	17.4	17.3	21.4	21.2	21.1
VOC (as methane)	lb/hr	7.89	7.46	6.99	17.1	16.0	14.9
	ppmvw	3.5	3.5	3.5	7.6	7.5	7.5
	ppmvd @ 15% O2	2.8	2.8	2.8	5.2	5.2	5.3
Lead	lb/hr	0.029	0.028	0.026	0.029	0.028	0.026
Sulfuric Acid Mist	lb/hr	21.4	20.4	19.0	22.3	21.2	19.7

[a] Refer to Air Construction Permit Application (Appendix 10.1.5) for detailed information on basis of pollutant emission rates and operating data. Includes simple cycle operation with exhaust gases routed to the HRSG and SCR system.

Source: GE, 2006

TABLE 3.4.1-3
STACK, OPERATING, AND EMISSION DATA FOR THE PROPOSED HOPKINS UNIT 2 REPOWERING PROJECT FOR NATURAL GAS-FIRING FOR BASELOAD SIMPLE CYCLE OPERATIONS

Parameter	Units	Natural Gas-Firing [a]		
		CT Only		
		25 °F	59 °F	95 °F
Combustion Turbine Performance				
Power output (MW)	MW	187.8	174.4	160.3
Heat rate	Btu/kWh, LHV	9,110	9,270	9,495
	Btu/kWh, HHV	10,112	10,290	10,539
Heat Input	MMBtu/hr, LHV	1,711	1,617	1,522
	MMBtu/hr, HHV	1,899	1,795	1,689
Relative Humidity	%	87	78	50
Fuel heating value	Btu/lb, LHV	20,714	20,714	20,714
	Btu/lb, HHV	22,993	22,993	22,993
CT/Bypass Stack Data				
Height	ft	150	150	150
Diameter	ft	18	18	18
100 Percent Load				
Temperature (oF)	°F	1,081	1,114	1,144
Velocity (ft/sec)	ft/sec	164.9	159.4	153.3
Maximum Hourly Emissions				
SO_2	lb/hr	10.5	9.90	9.32
PM/PM_{10}	lb/hr	9.0	9.0	9.0
NOx	lb/hr	61.8	58.4	55.0
	ppmvd @ 15% O2	9.0	9.0	9.0
CO	lb/hr	41.7	39.1	36.2
	ppmvd	12.0	12.0	12.0
	ppmvd @ 15% O2	10.0	9.9	9.7
VOC (as methane)	lb/hr	7.52	7.12	6.72
	ppmvw	3.50	3.50	3.50
	ppmvd @ 15% O2	3.15	3.16	3.16
Lead	lb/hr	NA	NA	NA
Sulfuric Acid Mist	lb/hr	1.05	0.99	0.93

[a] Refer to Air Construction Permit Application (Appendix 10.1.5) for detailed information on basis of pollutant emission rates and operating data.

Source: GE, 2006

TABLE 3.4.1-4
SUMMARY OF MAXIMUM POTENTIAL ANNUAL EMISSIONS FOR THE PROPOSED HOPKINS UNIT 2 REPOWERING PROJECT
COMPARED TO THE PSD SIGNIFCANT EMISSION RATES

	Annual Emissions (TPY)								
	Maximum Potential Annual Emissions (TPY) for CT and DB Operating Scenarios [a]					Actual Emissions from Existing Unit 2 [b]	Emission Changes- Proposed Project with Existing Unit 2 Shutdown	PSD Significant Emission Rate (tons/year)	PSD Review Required?
Pollutant	A	B	C	D	E				
SO_2	43.4	50.5	211.7	211.7	43.4	1642.0	-1,430	40	No
PM	48.2	65.2	111.8	111.8	39.4	136.3	-25	25	No
PM_{10}	48.2	65.2	111.8	111.8	39.4	97.5	14	15	No
NOx	142.0	164.9	243.7	265.7	255.6	843.3	-578	40	No
CO	171.1	264.6	340.1	340.1	171.1	241.1	99	100	No
VOC (as methane)	31.2	46.8	47.4	47.4	31.2	19.7	28	40	No
Sulfuric Acid Mist	4.3	5.8	39.7	39.7	4.3	73.0	-33	7	No
Lead	0.00	0.00	0.05	0.05	0.00	0.019	0	0.6	No
Mercury	0.00	0.00	0.00	0.00	0.00	0.0014	0	0.1	No

[a] Based on the following hours of operation for each operating scenario:

	A	B	C	D	E
Combined Cycle Operation					
CT, natural gas-firing	8,760	5,110	1,610	5,110	0
CT and duct burner, natural gas-firing	0	3,650	3,650	150	0
CT, fuel oil-firing	0	0	3,500	0	0
CT, fuel oil-firing; duct burner, natural gas-firing	0	0	0	3,500	0
Simple Cycle Operation					
CT, natural gas-firing	0	0	0	0	8,760

[b] Based on maximum annual average PM, PM10, CO, VOC, lead, and mercury emissions based on AOR data for the 24-month consecutive period from 2001 to 2005.
For SO_2 and NO_x, based on the maximum annual average emissions from monthly CEM data from March 2001 to February 2006.

3.4.2 Air Emission Controls

The use of clean fuel (i.e., natural gas and low sulfur distillate fuel oil) and combustion controls will minimize air emissions and ensure compliance with applicable emission-limiting standards. Using clean fuels will minimize emissions of SO_2, PM/PM10, and other fuel-bound contaminants. Combustion controls will minimize the formation of NO_X and the formation of CO and VOCs by combustor design. Further NO_X reduction will be achieved by SCR when operating in combined cycle mode. The combination of these techniques are proposed for the Repowering Project and have been determined to represent BACT on previous projects based on an evaluation of economic, energy, and environmental impacts. The following section summarizes the proposed air pollution control technology for each pollutant, which is presented in more detail in Section 10.1.5, the Air Permit Application.

3.4.3 Best Available Control Technology

The existing applicable federal New Source Performance Standards (NSPS) for the combustion turbine are those promulgated by EPA for stationary gas turbines. These NSPS (40 CFR Part 60, Subpart GG) establish emission-limiting standards for NO_X and SO_2. The applicable NSPS are:

- NO_X 75 ppmvd corrected to 15% oxygen and heat rate plus adjustment to fuel-bound nitrogen
- SO_2 no more than 0.8% sulfur in the fuel

However, on February 18, 2005, EPA proposed new NSPS for Stationary Combustion Turbines that will commence construction after February 18, 2005. These NSPS, Subpart KKKK, will replace Subpart GG and Da for combustion turbines in combined cycle mode. When finalized, the Subpart KKKK requirements will supersede the Subpart GG requirements and apply to units with a gross capacity of greater than 1 MW. The proposed Subpart KKKK requirements that would apply to the Project when finalized by EPA are applicable to combustion turbines greater than 30 MW. The NO_X emissions are limited to 0.39 lb/MW-hr for gas-firing and 1.2 lb/MW-hr for light oil firing. Based on a typical simple cycle CT efficiency, these emission rates are approximately equivalent to 10 ppmvd corrected to 15% O_2 when firing natural gas and 30 ppmvd corrected to 15% O_2 when firing light oil. For SO_2 emissions, the proposed Subpart KKKK requirements limit emissions to 0.58 lb/MW-hr or a fuel sulfur content of 0.05%.

For the Repowering Project, the NO_X emissions from the combustion turbine will be less than 0.2 lb/MW-hr for gas-firing and less than 0.42 lb/MW-hr for light oil firing for combined cycle operation and for simple cycle operation when the exhaust gases are routed through the HRSG and SCR system. For simple cycle operation with the emergency bypass stack, the NO_X emissions from the combustion turbine will be approximately 0.3 lb/MW-hr for gas-firing. All of these emission rates comply with the applicable NSPS Subpart KKKK requirements. For SO_2, the Project's emissions will be limited by firing only natural gas or No. 2 fuel oil with sulfur content no greater than 0.05%.

The existing applicable federal NSPS for the duct burner are those promulgated by EPA for electric utility steam generating units capable of combusting more than 250 MMBtu/hr of fossil fuel for which construction is commenced after September 18, 1978. These NSPS (40 CFR Part 60, Subpart Da) establish emission-limiting standards for PM, NO_X and SO_2. On February 18, 2005, EPA proposed new NSPS for these units that establish emission-limiting standards for NO_X and SO_2. However, HRSG and duct burners subject to the proposed NSPS, Subpart KKKK (see above) would be exempt from the requirements of NSPS, Subpart Da.

The Maximum Achievable Control Technology (MACT) standard in 40 CFR, Subpart YYYY is potentially applicable to the Project. The Hopkins Plant is a major source of HAP emissions since emissions exceed 10 TPY of a single HAP and exceed 25 TPY for all HAPs. Since low sulfur light oil is proposed to be fired in the proposed CT for up to 4,000 hr/yr, the proposed CT is defined as "stationary diffusion flame oil-fired combustion turbines" under the Subpart YYYY requirements and would have the potential for an aggregate total potential of 1,000 hours or more of oil firing during any calendar year. Actual applicability of Subpart YYYY is based on actual oil fuel used in a calendar year. The proposed Project will be required to demonstrate compliance with the combustion turbine MACT of 91-ppbvd formaldehyde corrected to 15% oxygen if the aggregate 1,000 hr/yr is exceeded. Based on the applicability of Subpart YYYY, compliance will be determined upon initial operation and annually (40 CFR Part 63, Section 63.6120, Table 3).

Section 10.1.5 of the Site Certification Application for the Project contains the air permit application. The remainder of this section briefly describes those control technologies that are proposed for the Project.

3.4.3.1 Nitrogen Oxides

During combustion, two primary types of NO_X are formed: fuel NO_X and thermal NO_X. Fuel NO_X emissions are formed through the oxidation of a portion of the nitrogen contained in the fuel. Thermal NO_X emissions are generated through the oxidation of a portion of the nitrogen contained in the combustion air. NO_X formation can be limited by lowering combustion temperatures (through water or steam injection) and/or staging combustion (a reducing atmosphere followed by an oxidizing atmosphere, known as dry NO_X control).

Dry low-NO_X combustor technology has been offered and installed by CT manufacturers to reduce NO_X emissions by inhibiting thermal NO_X formation through premixing fuel and air prior to combustion and providing pre-mix combustion to reduce flame temperatures. GE has guaranteed NO_X emissions of 9 ppmvd (corrected to 15% O_2) for new CTs firing natural gas and 42 ppmvd (corrected to 15% O_2) for distillate oil firing.

The NO_X emissions will be controlled using state-of-the-art dry low-NO_X combustors in the CTs when firing natural gas and water injection when firing distillate oil. NO_X emissions will be further controlled by SCR systems when firing either natural gas or distillate oil. The dry low-NO_X combustors have premixed fuel zones plus a standard diffusion flame pilot burner for startup. Low-NO_X levels are achieved by introducing fuel primarily to the pre-mix zones and reducing the amount of fuel being combusted from the pilot nozzle. To further reduce emissions of NO_X, SCR systems will be installed within the HRSGs. SCR is a post-combustion process where NO_X in the gas stream is reacted with ammonia in the presence of a catalyst to form nitrogen and water. The reaction occurs typically between 316 and 399 degrees Celsius (°C) (600 and 750°F), where such temperatures occur within the HRSG. Ammonia will be stored in two 20,000-gallon tanks. The SCR system is designed for approximately 65% reduction of flue gas NO_X emissions to 5 parts per million volume dry (ppmvd), corrected to 15% O_2 when firing natural gas and approximately 76% reduction to 10 ppmvd when firing fuel oil.

For the combined cycle operation, dry low-NO_X combustors and SCR will be used, with proposed NO_X emission levels of 5 and 10 ppmvd, corrected to 15% oxygen, when firing natural gas and distillate fuel oil, respectively. For the simple cycle operation with the exhaust gases routed through the HRSG and SCR system, the same emission rates will be achieved. For the simple cycle operation with the emergency bypass stack, the proposed NO_X emission level is 9 ppmvd, corrected to 15% oxygen, which will be achieved by the dry low-NO_X combustors. Only natural gas will be fired when the emergency bypass stack is used.

3.4.3.2 Carbon Monoxide

Carbon monoxide is formed by incomplete combustion of fuel. High combustion temperatures, adequate excess air, and good fuel/air mixing during combustion will minimize CO formation.

Carbon monoxide formation is limited by ensuring complete efficient combustion of the fuel in the turbines. Recent improvements in CT combustor technology allow for both reduced NO_X emissions and low CO emissions.

The proposed emission rates for CO are 12 ppmvd when firing natural gas and 25 ppmvd when firing distillate oil. The maximum emission rate proposed is 23 ppmvd for natural gas-firing when duct firing and 37 ppmvd for distillate oil-firing when duct firing. The CTs would utilize advanced combustion technology.

3.4.3.3 Sulfur Oxides (SO_2 and H_2SO_4 Mist)

Post-combustion controls for SO_2 emissions comprise various wet and dry flue gas desulfurization (FGD) processes. However, FGD alternatives are not feasible for use on CT facilities due to high-pressure drops across the control device. The only feasible control for combined cycle facilities are clean fuels, i.e., natural gas and low-sulfur light oil. The distillate oil proposed for the Project will be limited to 0.05%. Additionally, sulfuric acid mist production will be limited by the use of low sulfur fuels.

3.4.3.4 Particulate Matter and Other Regulated Pollutants

Post-combustion alternatives such as baghouses, scrubbers, and electrostatic precipitators are not feasible due to the high pressure drops associated with the units and the small amount of PM reduction, which would occur since the CT PM emissions are minimal (i.e., these emissions are already lower than most baghouses emit). Clean-burning fuels that have low PM and trace contaminant contents are being proposed for the Project. The proposed emission rates for filterable PM_{10} for the CT are 9 lb/hr when firing natural gas and 17 lb/hr when firing distillate oil. The maximum filterable PM_{10} emission rate proposed when duct firing is approximately 15 lb/hr for natural gas-firing in the duct burners and 60 lb/hr for distillate oil-firing in the duct burners. These emission rates also include PM_{10} attributable to the SCR system.

VOCs will be emitted by the CTs as a result of incomplete combustion. The proposed emission rates for VOC emissions are based on the use of combustion technology and the use of clean fuels. The proposed emission rates for VOC are 3.5 parts per million volume wet (ppmvw) when firing natural gas and 3.5 ppmvw when firing distillate oil. The maximum emission rate proposed when duct firing is 5.4 ppmvw.

3.4.4 Design Data For Control Equipment

Design data for the air pollution control equipment is presented in Section 2.0 of Appendix 10.1.5, the Air Permit Application.

Emissions of other pollutants, such as lead, for the Project are expected to be minimal and require no additional control technology. Therefore, analysis of alternative emission controls for these other pollutants is not necessary.

3.4.5 Design Philosophy

The Project minimizes air pollutant emissions by using the most efficient and pollutant-preventing generating technology. This concept has been incorporated with the selection of a combined cycle process utilizing advanced CTs. Combined cycle plants can be expected to achieve fuel conversion rates on the order of 7,000 Btu/kilowatt hours (kWh), as opposed to values in the 9,000 to 10,000 Btu/kWh range for more conventional generating plants. This is an improvement of about 30%. Thus, by maximizing the megawatt output per unit of fuel consumed, the air pollutant emissions per megawatt output are minimized. Pollution prevention is incorporated in the design by the use of clean fuels and combustion technology. Natural gas and low sulfur content distillate oil will be used. Moreover, advanced dry low-NO_X combustion technology will be used to minimize NO_X emissions while ensuring that CO and VOC emissions are within accepted limits. SCR will be installed to further reduce NO_X emissions. Taken together with the reductions due to the shutdown of the existing Hopkins Unit No. 2 boiler, the design of the Project will incorporate features that will make the repowered unit efficient and one of the lower polluting power plants in the State of Florida.

3.5 PLANT WATER USE

This section describes the use of water during operation of the repowered Unit 2, including sanitary, potable water and cycle water. The major use of water at the existing Hopkins Station is associated with the cooling water needs for the Unit 2 steam turbine condenser and cooling tower. Since the repowered Unit 2 will make use of these existing components, there will be no significant change in Station water use as a result of the Repowering Project.

Figure 3.5-1 is a water balance diagram illustrating peak demand water use at the existing Hopkins Generating Station. Figures 3.5-2 and 3.5-3 illustrate the proposed peak demand water use after completion of the Phase 1 repowering. Since water usage is dependent upon weather, unit commitment (which units are in operation), fuel use, and customer demands, water balance diagrams depicting typical peak and off-peak operations are also provided in this section. Figures 3.5-4 and 3.5-5 illustrate the typical average water use during the peak seasons (winter and summer), and Figures 3.5-6 and 3.5-7 illustrate the typical water use during off-peak periods (spring and fall) after completion of the Phase 1 repowering. As shown in these figures, the maximum amount of water withdrawn and the maximum amount of wastewater discharged are not expected to change significantly after completion of the Phase 1 repowering compared with the existing station configuration.

As a result of the Repowering Project, there will be no increase in water use as compared to that characterized in the original Site Certification for the Hopkins Site.

3.5.1 Heat Dissipation System

The Repowering Project will not result in any material changes to the existing heat dissipation system. The heat dissipation system for the main cycle will be the existing mechanical draft wet cooling tower, which uses well water as the primary source of makeup. The cooling water will continue to be circulated from the tower collection basin through the existing surface type condenser and returned to the tower. The existing 84-inch buried fiberglass reinforced pipe (FRP) will be replaced with a steel pipe to ensure reliable operation of the repowered unit. The closed pipe loop system (circulating water piping system) dissipates excess heat from the existing turbine generator steam condenser. The warmed water returned to the tower is cooled primarily by evaporation of a portion of the water being circulated and to a lesser degree by conduction to the air. As shown in Figure 3.5-1, the existing Hopkins Generating Station under peak demand conditions discharges approximately 1,250 gpm of cooling tower blowdown (Unit 1 and Unit 2 together) in order to maintain the proper chemical balance of the circulating water in the closed loop system. As shown in Figures 3.5-2 and 3.5-3, the repowered Hopkins Generating Station under peak demand conditions will continue to discharge approximately 1,250 gpm of cooling tower blowdown.

An evaluation will be performed to address the need for condenser tube replacement. Other than the possibility of retubing, the Unit 2 condenser and cooling tower units comprising the heat dissipation system will remain physically unchanged for the Repowering Project. The existing condenser will be modified to allow for the steam bypass system. This will not change the heat dissipation function of the condenser.

The existing cooling tower is a multi-celled mechanical draft tower. The cooling tower is designed for a maximum wet bulb temperature of 76°F. This is based on historical wet bulb temperature variation recorded at the Tallahassee Municipal Airport. While there are no modifications required for the existing cooling tower, plans are to refurbish the tower to ensure continued reliable operation. This refurbishment may include replacement of the tower fill and siding. The existing fill material contains asbestos material and will be removed by an appropriately licensed contractor and disposed of in an appropriately licensed disposal facility.

The existing steam condenser, which will serve the combined cycle units, has a design temperature rise of 17°F with an approach temperature of 10°F. The design circulating cooling water flow rate is 127,000 gpm. The rate of heat dissipation by the tower is approximately 1.08E9 Btu/hr. As a result of the evaporative heat dissipation, an estimated 2,800,000 gallons per day typically will be lost to evaporation. The values of these design parameters reflect the present maximum operation capacity of the existing heat dissipation system. The maximum daily temperature of the cooling tower blowdown at the point of discharge is expected to remain at 32.2°C, with an annual average of approximately 25°C.

The existing Unit 2 cooling tower operates at approximately 2.5 cycles of concentration on an annual average basis and approximately 2.9 cycles of concentration on a peak demand basis. After repowering, the cooling tower is expected to operate at between approximately 1.9 and 2.8 cycles of concentration, maintaining the existing maximum blowdown flow of 1,000 gpm when firing either natural gas or fuel oil. There will be no significant change to the existing cooling tower operations or the cooling tower blowdown discharge quality.

3.5.2 Domestic Sanitary Wastewater

Sanitary wastewater is presently discharged to the City of Tallahassee's municipal sewer system via a force main. This system and the flow rate of sanitary wastewater are not anticipated to change because of the Repowering Project.

3.5.3 Potable Water Systems

The Hopkins Station potable water system for domestic and sanitary uses is not anticipated to change because of the Repowering Project. Potable water will continue to be supplied from the City of Tallahassee Water Utility.

3.5.4 Process Water Systems

Process water systems for the repowered Unit 2 will include the following streams:

a. Service Water

b. Auxiliary Cooling Water

c. Fire Protection Water

d. Demineralized Water

e. Closed Cooling Water

3.5.4.1 Service Water

Service water will include general maintenance and housekeeping uses, such as equipment washdown and general area washdown. Equipment washdown for new systems will be included for the ammonia storage/unloading area, HRSG blowdown tank quenching, CTG general area and skids, and HRSG general area and skids.

3.5.4.2 Auxiliary Cooling Water

The auxiliary cooling water (well water) currently being used on Hopkins Unit 2 will no longer be needed. Unit 1 will continue to utilize auxiliary cooling water (well water).

3.5.4.3 Closed Cooling Water

For the repowered Unit 2, a closed cooling water system will be used for equipment cooling. This water will be in a closed circuit having heat exchanger(s). To prevent the possibility of freezing, the demineralized water in the Closed Cooling Water System will be mixed with a glycol mixture.

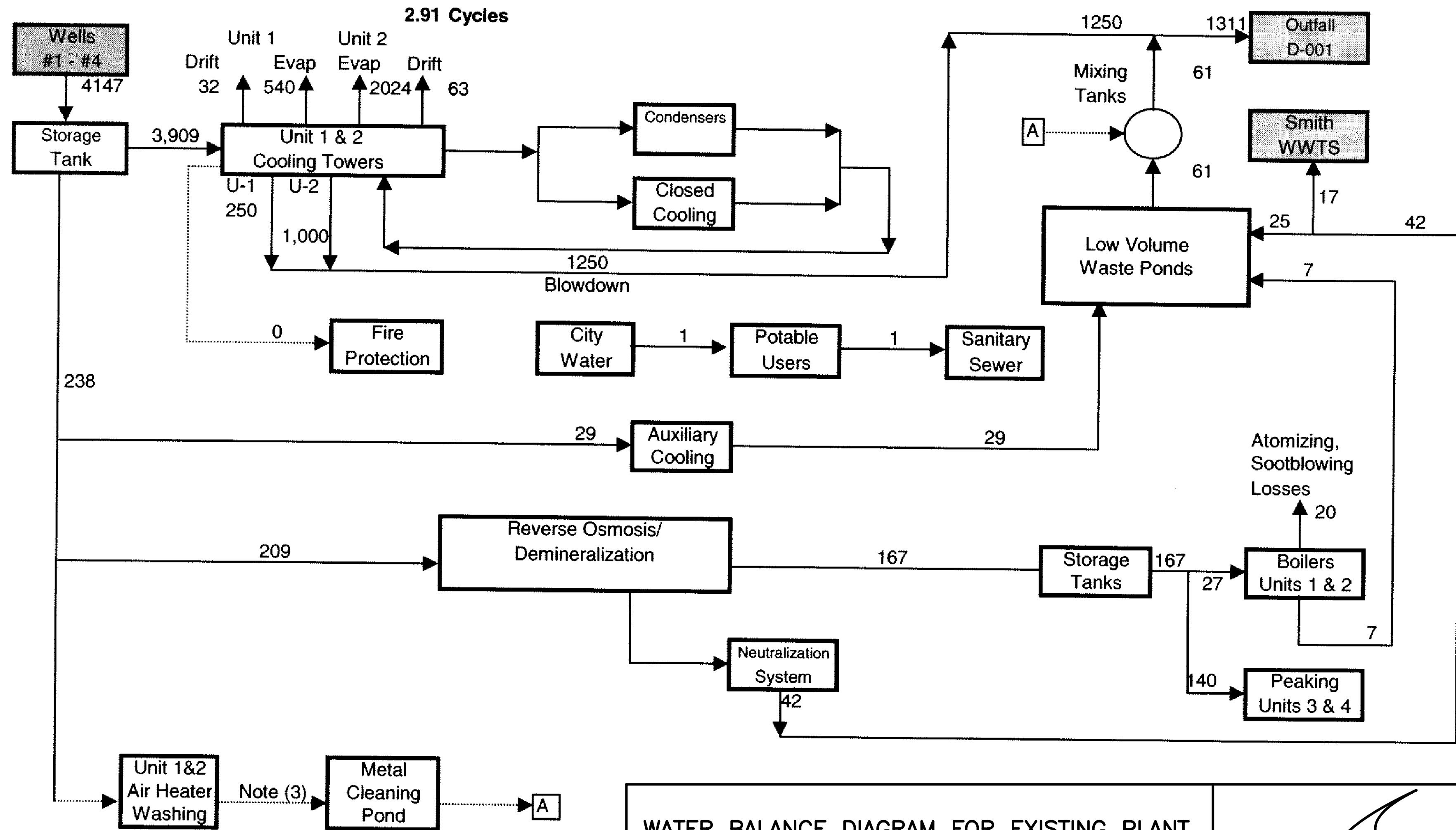
3.5.4.4 Fire Protection Water

Fire protection for the new structures and systems associated with the Repowering Project will be provided by expansion of the existing fire protection yard hydrant system. A ring header with strategically located fire hydrants will be extended to cover the new Phase 1 power block area. Provisions will be included to allow further expansion of the fire loop to cover the future Phase 2 power block.

3.5.4.5 Demineralized Water

A combination of a mixed bed demineralizer and a reverse osmosis system currently provides demineralized water at the Hopkins Generating Station. For the Repowering Project, the reverse osmosis system will be replaced with a larger mixed bed demineralizer system. Additional demineralized water storage tank(s) will be part of the repowering design. The storage tank(s) will provide water to various equipment uses, such as HRSG feedwater, water wash, NO_X control, and makeup to the closed cooling water system.

Water for the above five process water systems will be furnished from the current water supply sources used at the Hopkins Generating Station. This is essentially equivalent to the present approximately 136,000 gpd process water system demands for Hopkins Unit 2.



Notes: 1. All flows in gpm
2. Flows based on operation at 100% load
3. Intermittent flow

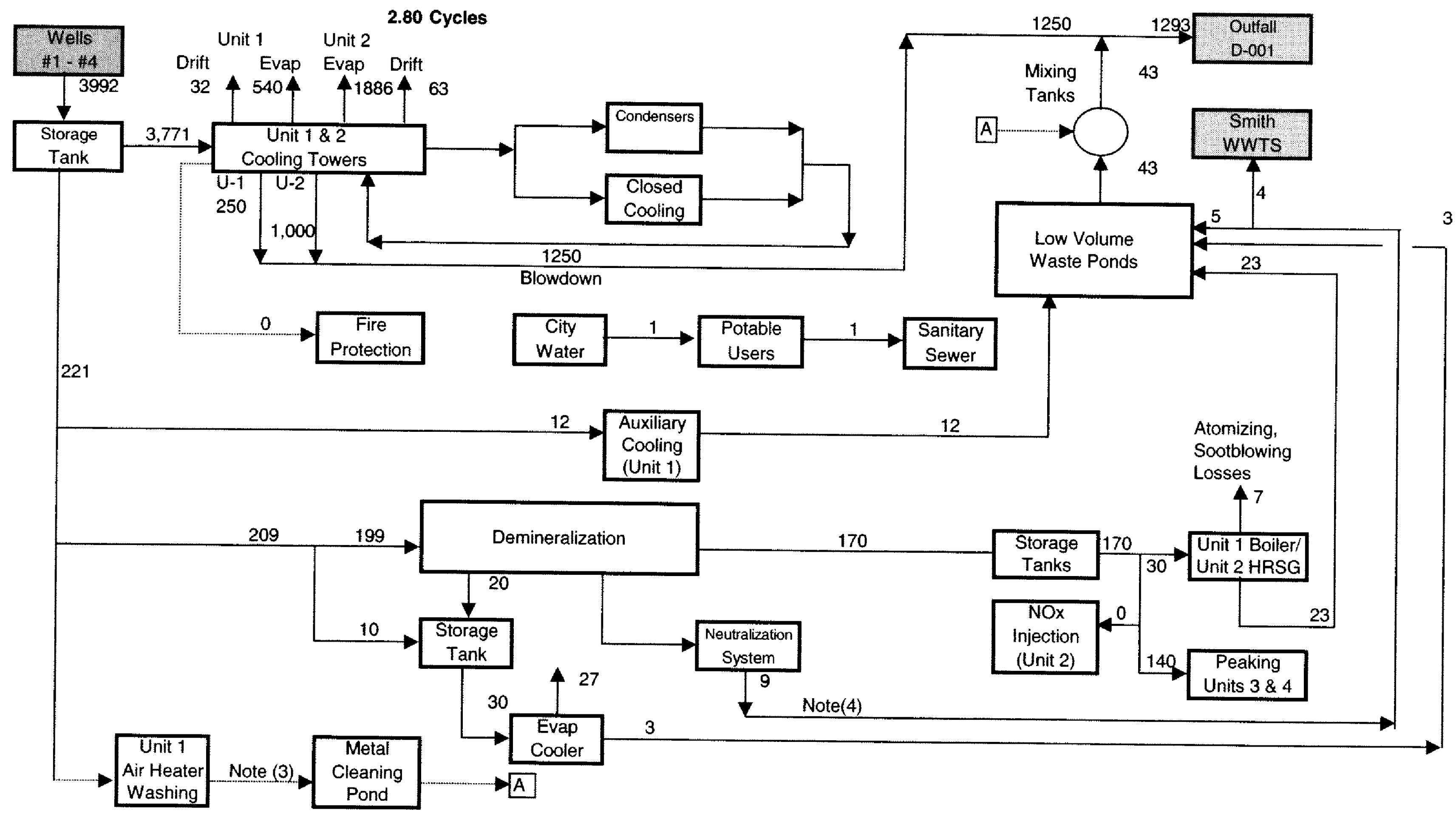
WATER BALANCE DIAGRAM FOR EXISTING PLANT CONFIGURATION AT PEAK DEMAND

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

Sargent & Lundy LLC

FIGURE NUMBER

3.5-1



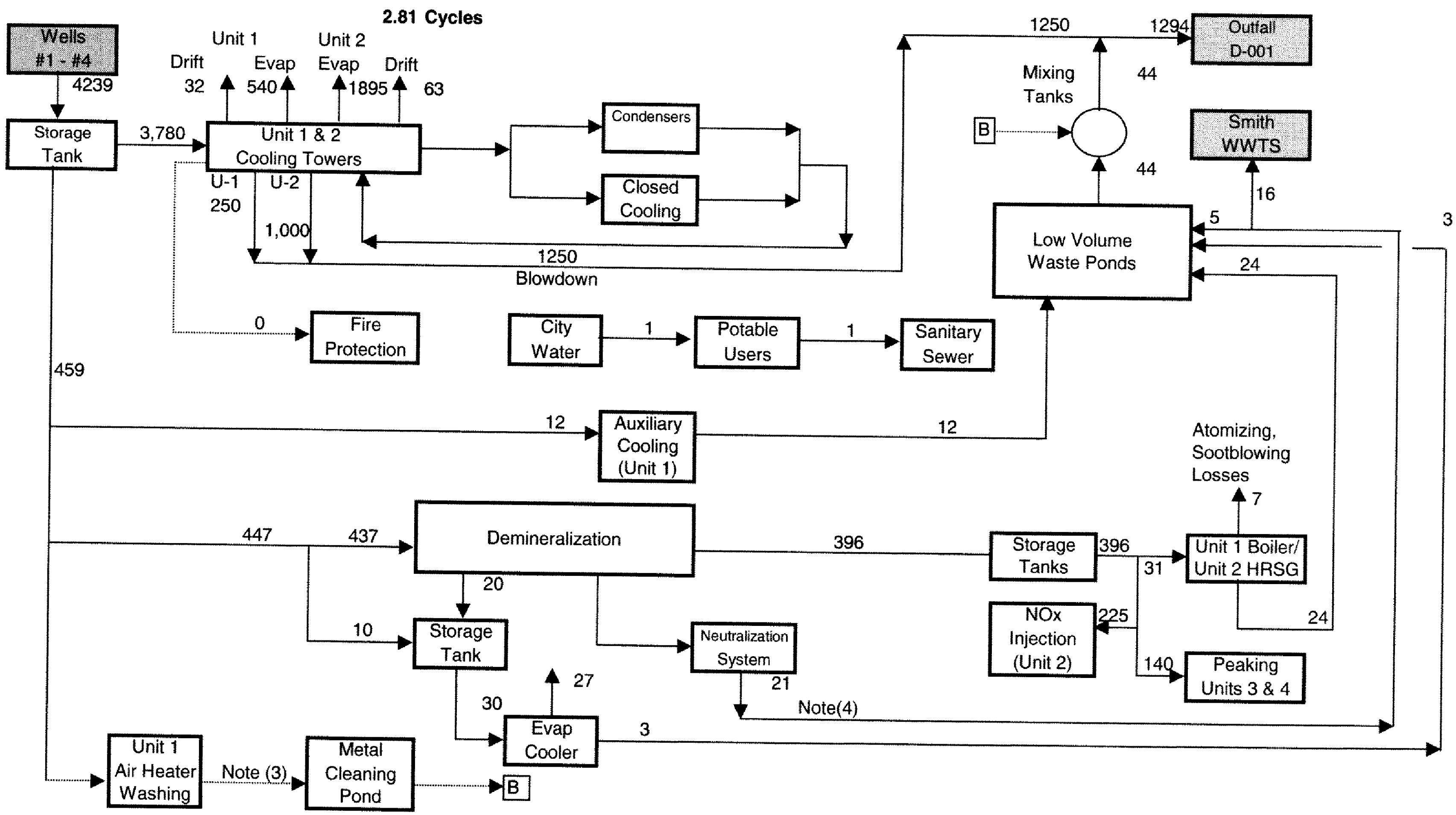
Notes: 1. All flows in gpm
2. Flows based on operation at 100% load and 95 deg F per S&L heat balances for repowered Unit 2
3. Intermittent flow
4. 7520 gal per day or ~5.2 gpm to LVW. Additional waste to Smith WWTS

WATER BALANCE DIAGRAM FOR 1-ON-1 REPOWERING CONFIGURATION WITH NATURAL GAS FIRING AT PEAK DEMAND

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

Sargent & Lundy LLC

FIGURE NUMBER
3.5-2



Notes: 1. All flows in gpm
2. Flows based on operation at 100% load and 95 deg F per S&L heat balances for repowered Unit 2
3. Intermittent flow
4. 7520 gal per day or ~5.2 gpm to LVW. Additional waste to Smith WWTS

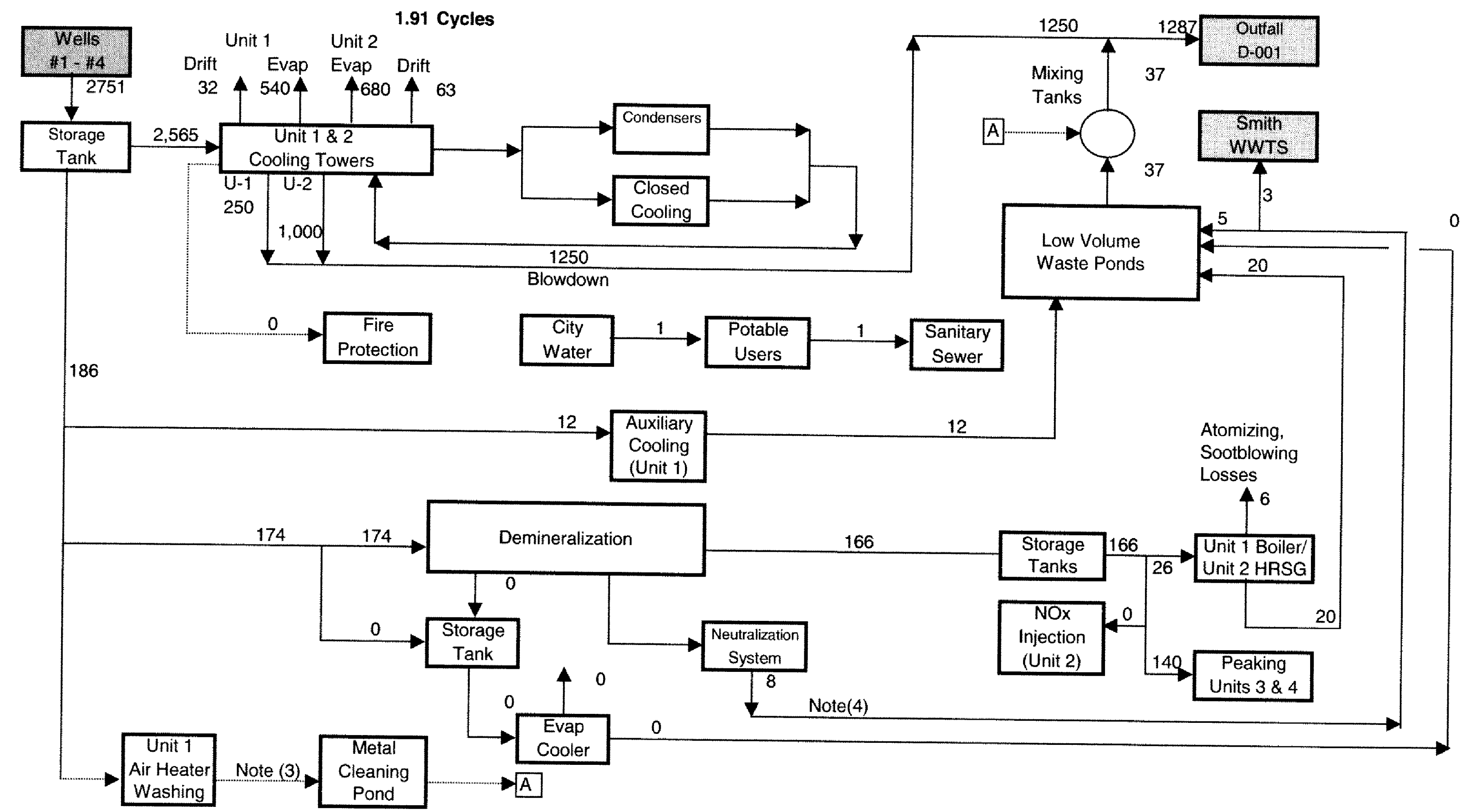
WATER BALANCE DIAGRAM FOR 1-ON-1
REPOWERING CONFIGURATION WITH
FUEL OIL FIRING AT PEAK DEMAND

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

Sargent & Lundy LLC

FIGURE NUMBER

3.5–3



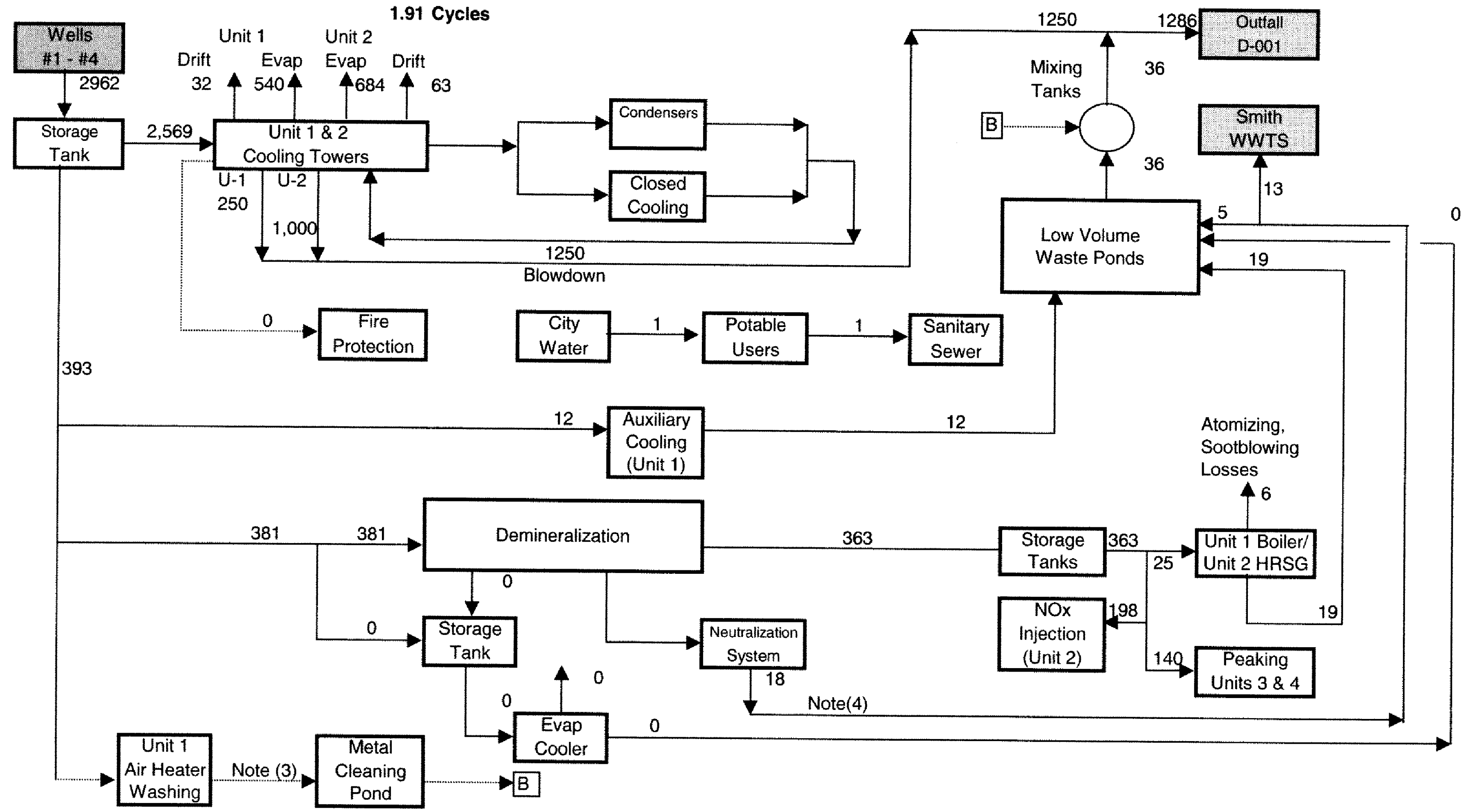
Notes: 1. All flows in gpm
2. Flows based on operation at 75% load and 59 deg F per S&L heat balances for repowered Unit 2
3. Intermittent flow
4. 7520 gal per day or ~5.2 gpm to LVW. Additional waste to Smith WWTS

WATER BALANCE DIAGRAM FOR 1–ON–1 REPOWERING CONFIGURATION WITH NATURAL GAS FIRING DURING AVERAGE PEAK SEASON CONDITIONS (WINTER AND SUMMER)

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

Sargent & Lundy

FIGURE NUMBER
3.5–4



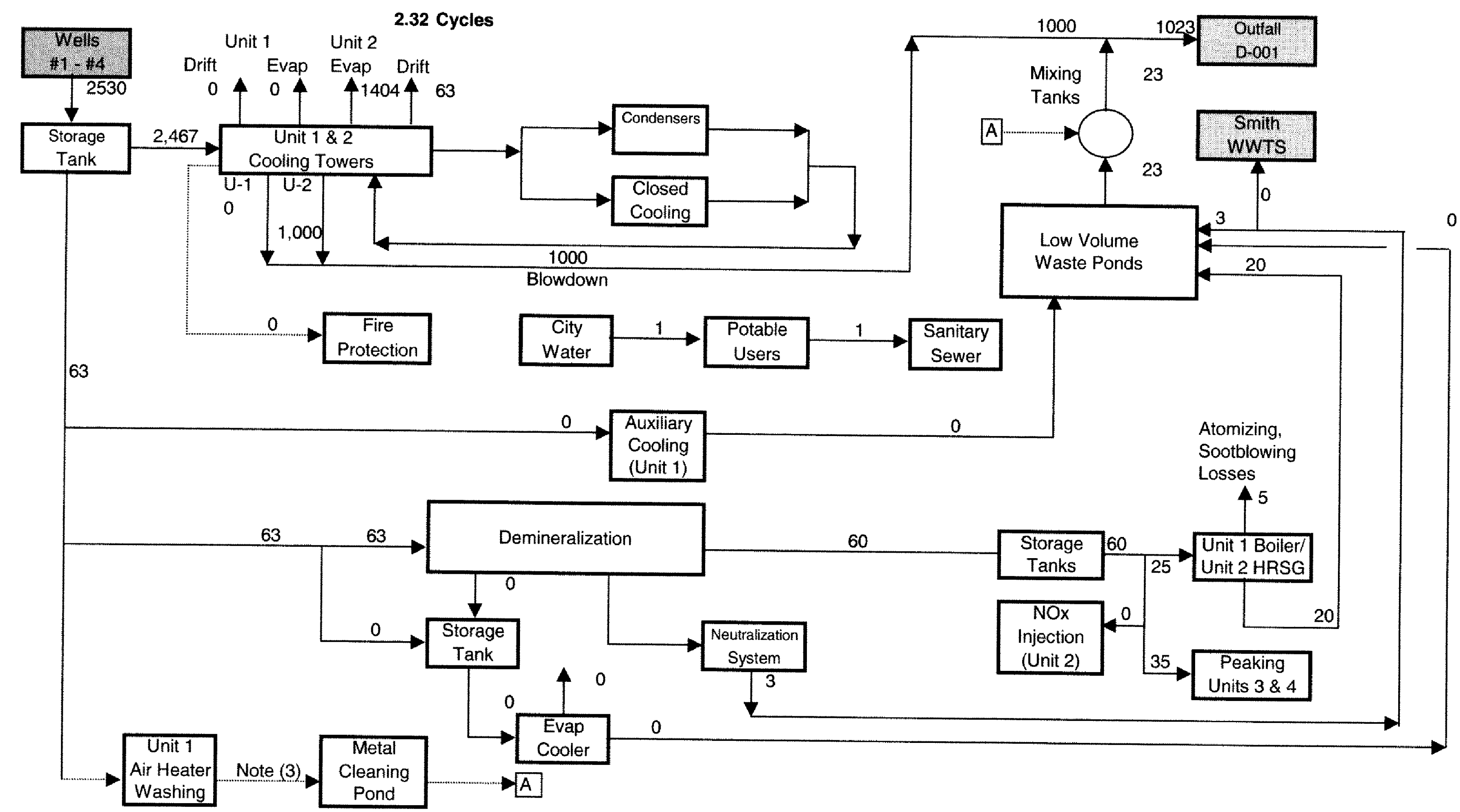
Notes: 1. All flows in gpm
2. Flows based on operation at 75% load and 59 deg F per S&L heat balances for repowered Unit 2
3. Intermittent flow
4. 7520 gal per day or ~5.2 gpm to LVW. Additional waste to Smith WWTS

WATER BALANCE DIAGRAM FOR 1-ON-1 REPOWERING CONFIGURATION WITH FUEL OIL FIRING DURING AVERAGE PEAK SEASON CONDITIONS (WINTER AND SUMMER)

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

Sargent & Lundy

FIGURE NUMBER
3.5-5



Notes: 1. All flows in gpm
2. Flows based on operation at 100% load and 59 deg F per S heat balances for repowered Unit 2
3. Intermittent flow

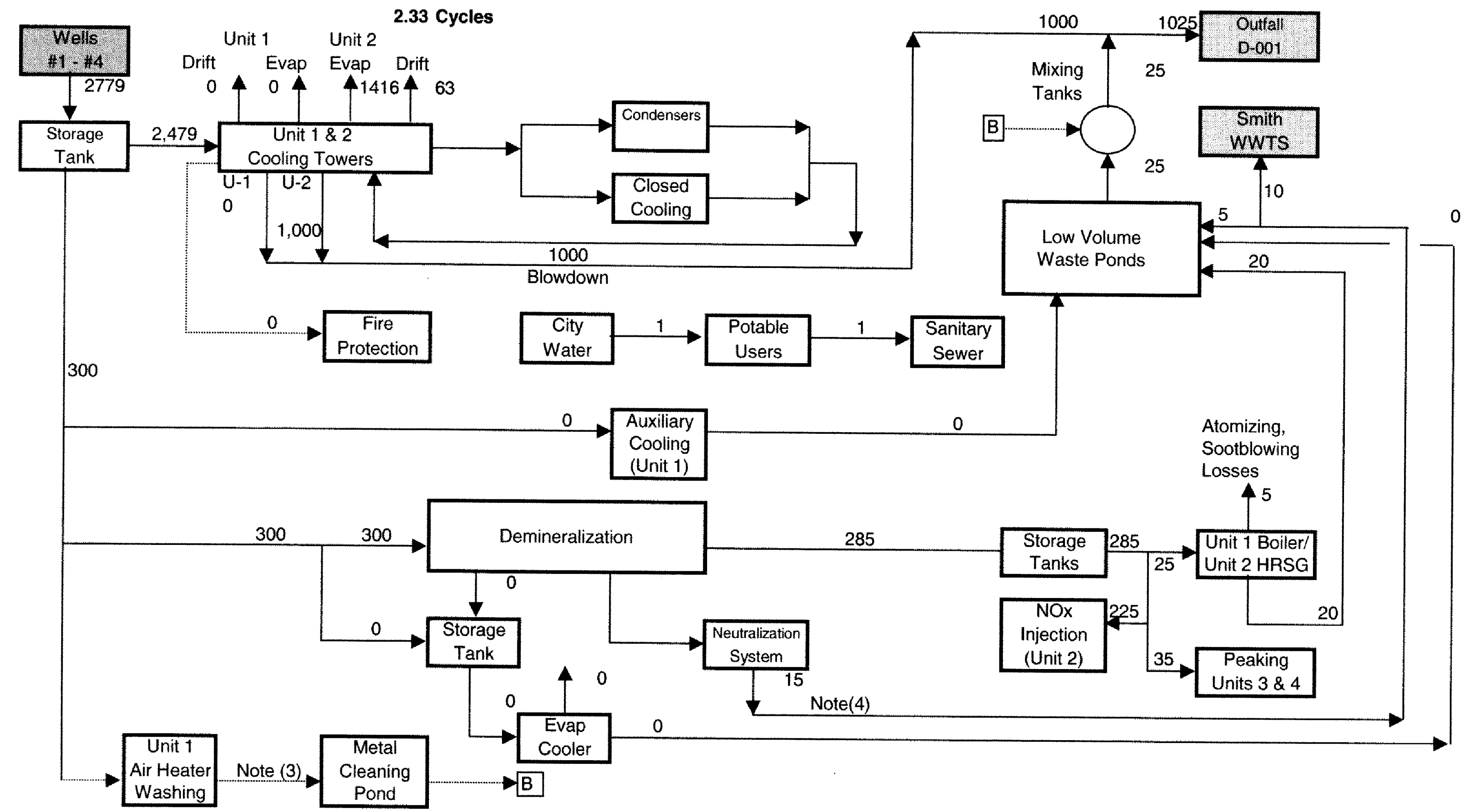
WATER BALANCE DIAGRAM FOR 1–ON–1 REPOWERING CONFIGURATION WITH GAS FIRING DURING TYPICAL OFF–PEAK CONDITIONS (FALL AND SPRING)

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

Sargent & Lundy LLC

FIGURE NUMBER

3.5–6



Notes: 1. All flows in gpm
2. Flows based on operation at 100% load and 59 deg F per S heat balances for repowered Unit 2
3. Intermittent flow
4. 7520 gal per day or ~5.2 gpm to LVW. Additional waste to Smith WWTS

WATER BALANCE DIAGRAM FOR 1–ON–1 REPOWERING CONFIGURATION WITH OIL FIRING DURING TYPICAL OFF–PEAK CONDITIONS (FALL AND SPRING)

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

Sargent & Lundy LLC

FIGURE NUMBER

3.5–7

3.6 CHEMICAL AND BIOCIDE WASTE

3.6.1 Biocides

Biocide waste will continue to be generated by the existing circulating water/cooling tower system. The quantity of biocide waste is not anticipated to change because of the Repowering Project.

3.6.2 Aqueous Ammonia

A waste stream could result from the storage and unloading areas for the 29% aqueous ammonia system. The aqueous ammonia will be stored in two tanks with a total capacity of approximately 40,000 gallons. This storage capacity represents the quantity required to have on-hand a 30-day supply. To control this possible discharge, the storage area will be protected with a spillage containment area in accordance with applicable environmental regulations. The unloading area will be sloped, and any spillage will be directed for proper collection and disposal, thereby keeping any ammonia stream from entering the storm drain system.

3.6.3 Chemical Feeds

To control water quality, the condensate used in the HRSGs will be treated with various chemicals such as amine, phosphate, and oxygen scavengers. The chemicals (final selection to be determined) will be stored within a contained area to control potential accidental releases to the surroundings. The chemicals will be fed into the condensate stream at the feedwater pumps. The chemicals will be supplied to the Site as either dry powder or concentrated liquids.

3.6.4 Oils and Lubricants

Any potential for oil spillage will be controlled by the use of curbed areas and controlled drains to prevent the contamination of stormwater run-off. The area around equipment containing lubricating oil will be controlled with retention curbs. The transfer of lubricating oils and fuel oils via pipelines will be protected with a means of secondary containment, in accordance with applicable environmental regulations. Rain or other water that falls inside of curbed areas will be routed through an oil separator and then to the stormwater detention pond discussed in Section 3.8.

3.7 SOLID AND HAZARDOUS WASTES

Waste with levels of oil residue, detergent and small amount of solids will result from the periodic on-line and off-line washing of the combustion turbines. This waste stream will be collected in a water wash drain tank for eventual off-site disposal. The same collection and disposal methods currently are used for the existing simple cycle combustion turbines. Trash and other solid wastes generated at the Hopkins Generating Station will continue to be hauled off site for proper disposal, as is currently done.

3.8 SITE DRAINAGE SYSTEM

Refer to Section 2.3.3.1 for the pre-development and post-development runoff volume analysis.

For final buildout of the Repowering Project area, the on-site stormwater drainage system will consist of a series of reinforced concrete catch basins distributed at approximate 10,000 square-foot intervals. The subsequent stormwater piping will be constructed from corrugated high-density polyethylene pipe beginning at a 12-inch minimum diameter and expanding as required up to an estimated maximum diameter of 24 inches. The catch basins will be connected to header pipes that will extend east and west, away from the centerline of the equipment area, and then to stormwater main pipes that will extend north to the stormwater detention pond. Manholes will be placed at a maximum interval of 400 feet, and at locations where pipes change size, direction, or slope.

The stormwater detention pond is designed, first, to infiltrate the first ½-inch of a rainfall event into a filter gallery, in order to improve the discharge quality of the "first flush" from a storm event (FDEP requirement). The second design condition is to reduce the peak stormwater discharge of a post-construction rainfall to that of a pre-construction peak discharge (Leon County requirement). Leon County requires, however, that the pre-construction condition is represented by a Curve Number (CN) value of 45, regardless of existing surfacing. CN is a measure of a soil's ability to infiltrate water. A CN equal to 0 would infiltrate 100% of the water, and a CN of 100 would represent 100% runoff of stormwater (0% infiltration). The design of the detention pond will consider 24-hour storm duration events ranging from 2-year to 25-year recurrence frequencies. For each design condition, the event with the greatest impact will be applied.

A discharge structure manhole imbedded in the sidewall of the detention pond will control the peak discharge to the aforementioned conditions. A side slope, gravel-surfaced road will provide access to the detention pond base for sediment removal and associated maintenance.

A spillway, or overflow structure, will be installed at a constructed low point of the perimeter pond dike to limit the potential for erosion in the event of a storm beyond the required design conditions. However, the detention pond will effectively be below the Site grade, making erosion of the small 1-foot to 2-foot perimeter dike used to control potential stormwater run-on, a relatively minor potential impact.

The design criteria for the stormwater conveyance system (including the catch basins, piping, and detention pond) will be no equipment damage at the 100-year, 24-hour storm event, moderate ponding of water around catch basins at the 50-year, 24-hour storm event, and no ponding water during the 25-year, 24-hour storm event.

Compliance with additional design criteria and requirements, outlined in Leon County Regulations and FAC Chapter 62-25, administered by Florida Department of Environmental Protection, are presented in the detailed stormwater calculations (see Section 10.5.4).

During construction of the Repowering Project, Best Management Practices (BMPs) in accordance with the Generic Stormwater Permit for Construction Activities (FLR10Z249) will be developed and utilized to address surface water runoff. As documented in Section 10.4.5, construction activities at the Hopkins Site are already covered by this permit.

3.9 MATERIALS HANDLING

In addition to expansion of the existing natural gas and fuel oil systems (discussed in Section 3.3.1) and water treatment chemicals (discussed in Section 3.6.3), the only material handling required for the Repowering Project will be the 29% aqueous ammonia used in the SCR system. Aqueous ammonia will be delivered to the Site via trucks on an as needed basis. An average of approximately 5 trucks per month is expected to be required for Phase 1 operation, and 10 trucks per month for Phase 2 operation. The ammonia storage and unloading system for the new combined cycle units is expected to be very similar to the system currently used for the existing simple cycle combustion turbines GT-3 and GT-4. Storage for the new units will require two tanks with a total capacity of approximately 40,000 gallons of 29% aqueous ammonia by weight.

4.0 EFFECTS OF SITE PREPARATION AND PLANT CONSTRUCTION

This chapter discusses the expected environmental effects of site preparation and construction of the Repowering Project and the City of Tallahassee's plans and programs for monitoring the environmental effects during Project construction.

4.1 LAND IMPACTS

The Hopkins Site is characteristic of a power plant setting. Construction activities for the Repowering Project will be contained on the existing Site in previously graded areas, and thus will have minimal land impacts.

4.1.1 General Construction Impacts

a. Disturbance Areas

Construction disturbance areas will be limited as much as is practical. The primary disturbance areas include the locations of the combined cycle equipment and the stormwater detention pond. These areas, which are shown in Figure 2.1.4-1, will occupy approximately 6 acres during Phase 1 of the Repowering Project and an additional 3 acres during Phase 2. Approximately 10 acres of previously developed laydown and parking areas will be utilized for construction laydown and parking, but these areas are not expected to experience significant additional disturbance.

b. Laydown and Parking Areas

The equipment laydown and parking areas will consist of areas that have previously been used similarly for previous projects. These areas are currently level to nearly level, primarily open fields planted with grass. Due to the existing supportive surficial soil types, no preparation to these areas was necessary during previous improvement projects. Should isolated areas need additional support for vehicles or equipment storage, crushed stone or fine aggregate will be placed on the ground surface. If required by the soil type, a non-woven geotextile soil separator will be added for strength. Once Project construction is complete, the parking and laydown areas generally will be restored by surface soil preparation and reseeding. However, some of the areas may continue to be used for ongoing equipment storage.

c. Temporary/Permanent Roads

The only permanent road surfacing planned for the Repowering Project is the on-site repowering equipment area perimeter road. Temporary roads may be created in currently open areas by placement of crushed stone, extending to equipment laydown and parking areas as required. The final disposition of on-site temporary roads, whether removed or maintained, will be at the discretion of the City of Tallahassee, based on anticipated future use of the areas.

d. Railroads

Two onsite rail spurs currently extend into the Project area, bifurcating from a single spur off the main CSX Rail Line. The rail spurs may be used for delivery of some required equipment for the Repowering Project. The eastern spur will be removed back to the switch, while the western spur will be rebuilt within the existing rail right of way and will be utilized for equipment deliveries. There will be no environmental impacts from this reconstruction. Material salvaged from the rail removal will either be stockpiled on-site or sent off-site for reuse, resale, or recycling.

e. Trash, Oil Disposal, and Chemical Wastes

Trash, oil, and chemical waste disposal from existing power plant operations at the Hopkins Site are handled under existing contracts. Trash is currently taken off site by Waste Management, Inc. The Hopkins Generating Station currently is permitted to burn waste oils that meet certain criteria. Therefore, waste oils are either burned at the facility or are taken off site by a local oil recycling company. The facility has a program to minimize hazardous material usage by substituting non-hazardous chemicals for all practical applications. However, if hazardous waste is generated, a licensed hazardous waste contractor will remove it from the Site. The preferred waste handling vendors may be changed when contracts expire and need to be renewed.

Contractors working on the Hopkins Site during Project construction will be required to collect, control, isolate, and dispose of any on-site generated wastes, on their own. Only licensed vendors will be utilized, and a waste manifest system will be used to track all shipments.

f. Land Clearing

No significant land clearing is anticipated for this Project. Open fields, simple structures, or railroad spurs/ditches currently occupy the Repowering Project area. All of the subject land was disturbed during the original plant construction. Since the original construction, a few trees have grown along the ditches that border the rail spurs and the ditch that drains to the north. The trees along these ditches will be removed and the ditches improved to allow for installation of the stormwater detention pond. There are no Patriarch Trees that would have to be addressed under the Leon County Land Development Code.

g. Earthwork

No significant earthwork cutting or filling is anticipated for the Repowering Project. The final grade of the Repowering Project area will be at elevation 136 feet above mean sea level (AMSL), with current elevations ranging from 140 feet to 136 feet AMSL. To achieve the final grade elevation, minor earthwork cutting will be required in some areas, and filling will be needed in the ditches along the railroad spurs that will be removed. Cutting excavation will also be required for construction of the stormwater detention pond. Approximately 18,000 cubic yards of excavation will be required to create the pond. Much of the excavated material will be used to fill in the existing drainage ditches and create a perimeter berm for the pond. Any remaining material will either be stockpiled on-site or disposed of off site.

The ditches being removed will be replaced by the stormwater conveyance system described in Section 3.8.

The Stormwater Management Plan included in Section 10.5.4 provides detailed information regarding Best Management Practices (BMP) to be employed during construction.

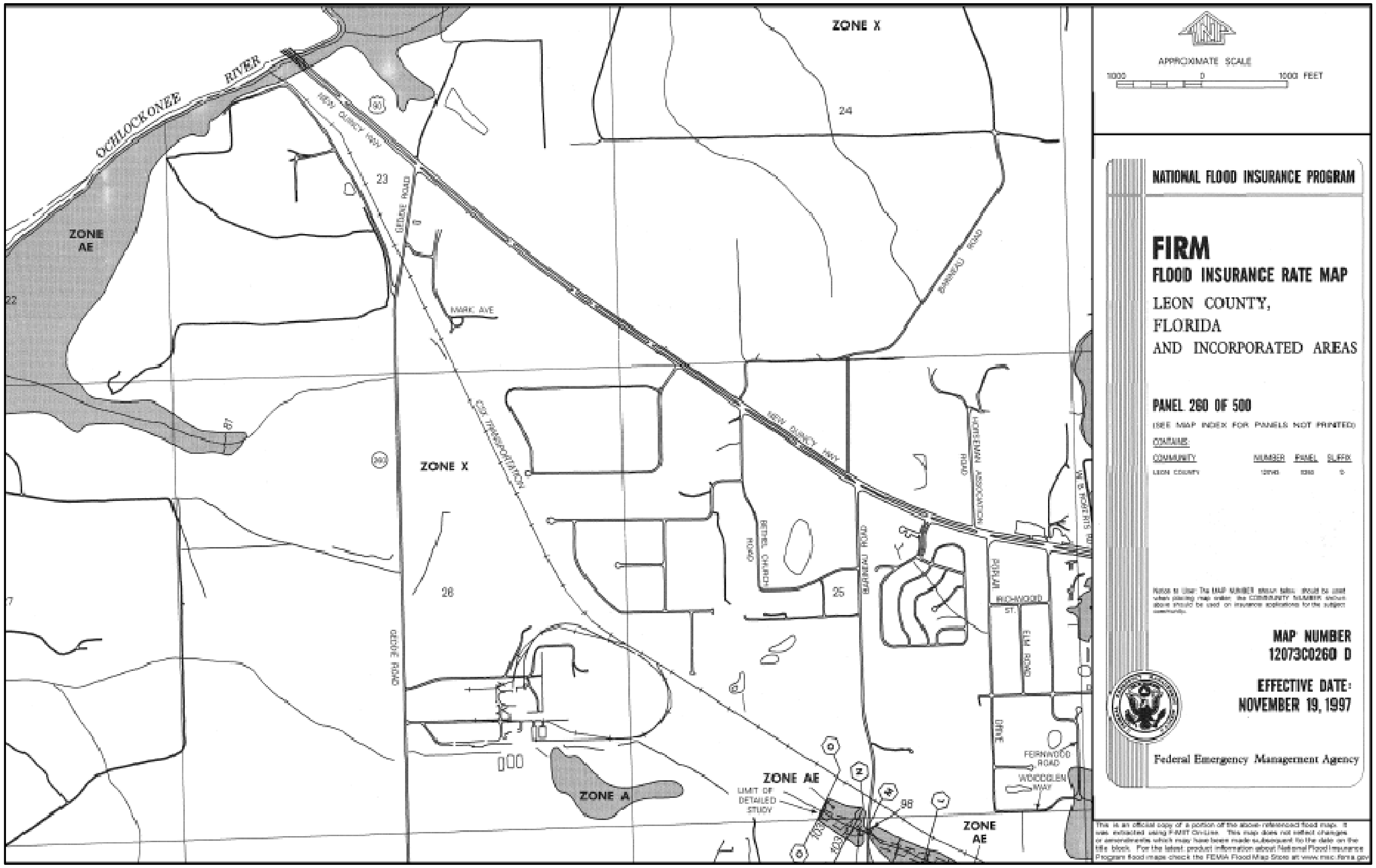
4.1.2 Roads

Currently, no new roads with connections to public roads are proposed.

Current plans are to have the major pieces of equipment delivered via rail to the Site. Should this not occur, and truck delivery be required, the City or its contractor(s) will obtain the appropriate FDOT hauling permits.

4.1.3 Flood Zones

There are no mapped flood zones that will be impacted by this Project. Figure 4.1.3-1 reproduces part of the National Flood Insurance Program, Federal Emergency Management Agency, Flood Insurance Rate Map, Panel 260 of 500, Leon County, Number 120143, Panel 0260, Suffix D. As shown in this figure, the nearest mapped floodplain is an approximately 12-acre area located about 1,000 feet south from the Repowering Project area. This floodplain is in a different drainage pattern than the repowering site. The nearest mapped floodplain in the same drainage pattern is approximately 2,650 feet northwest (downstream) from the repowering site. This area is shown in more detail in Figure 4.1.3-2. The general location and area of proposed land surface changes with drainage patterns can be seen in Figures 4.1.3-3 and 4.1.3-4.



FEMA FLOODPLAIN MAP

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

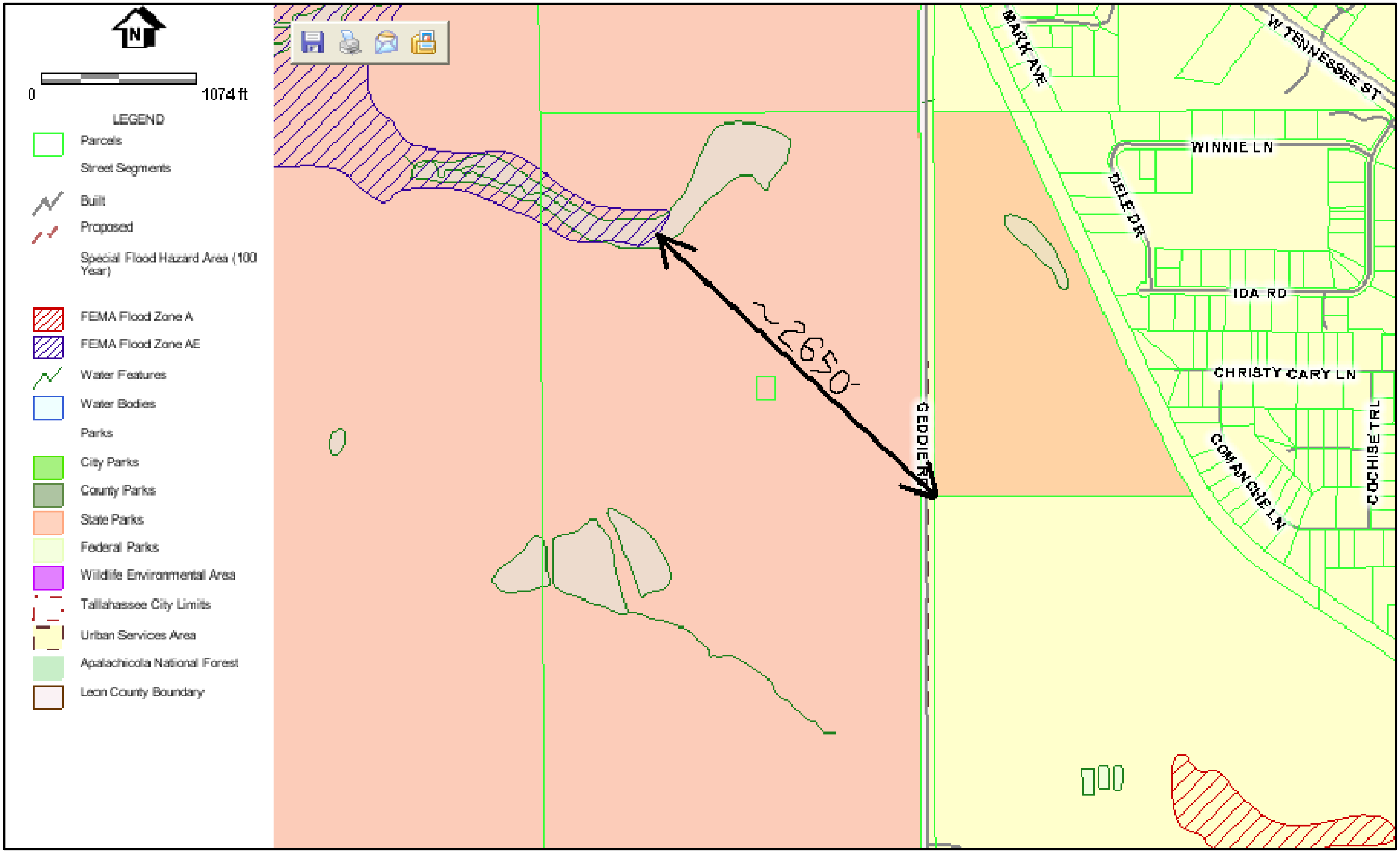
Sargent & Lundy LLC

FIGURE NUMBER

4.1.3–1

SOURCE:

FEMA, WWW.FEMA.GOV



SOURCE:
TALLAHASSEE–LEON COUNTY GIS WEBSITE
WWW.TLCGIS.ORG

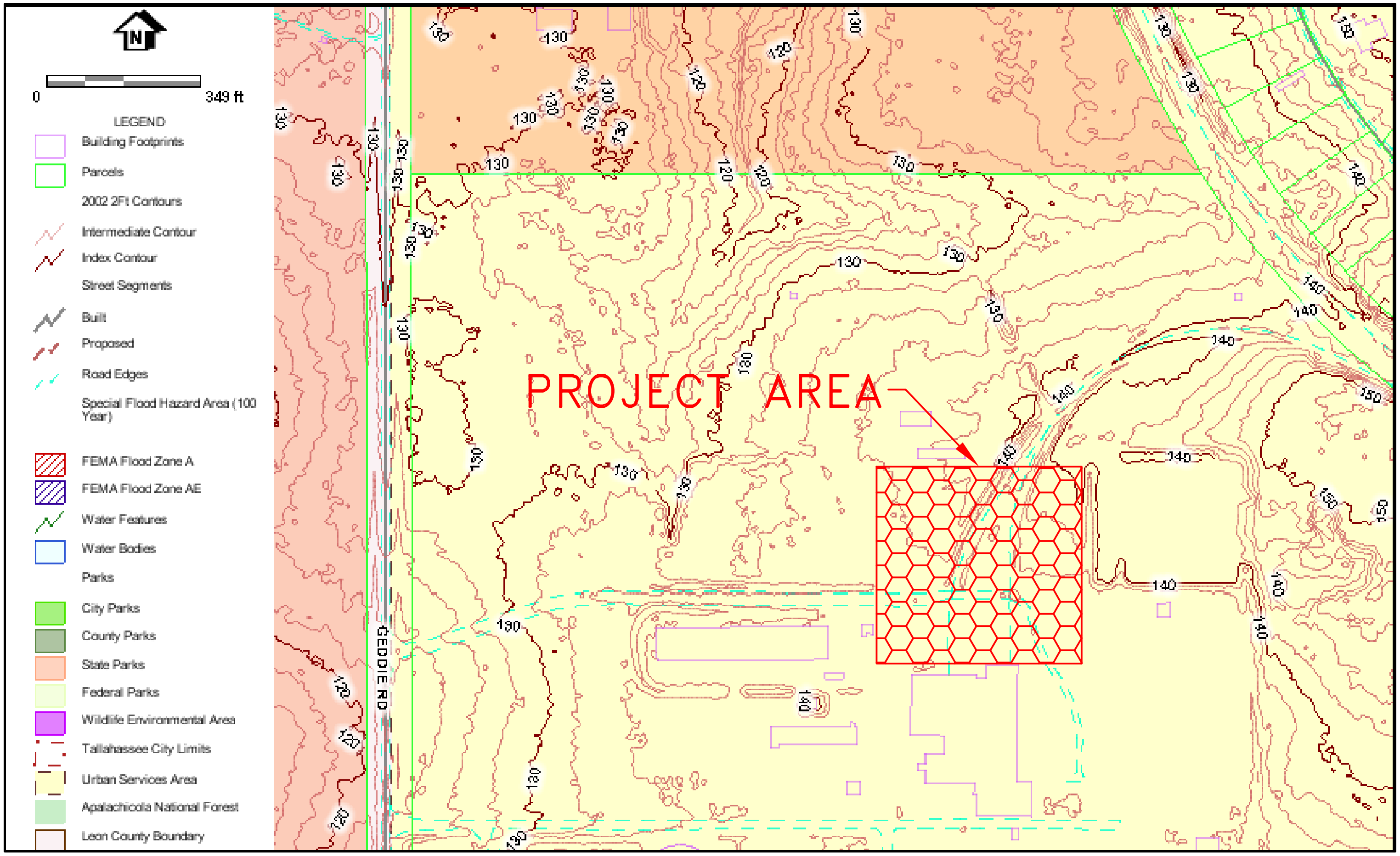
FLOODPLAIN MAP

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

Sargent & Lundy

FIGURE NUMBER

4.1.3–2



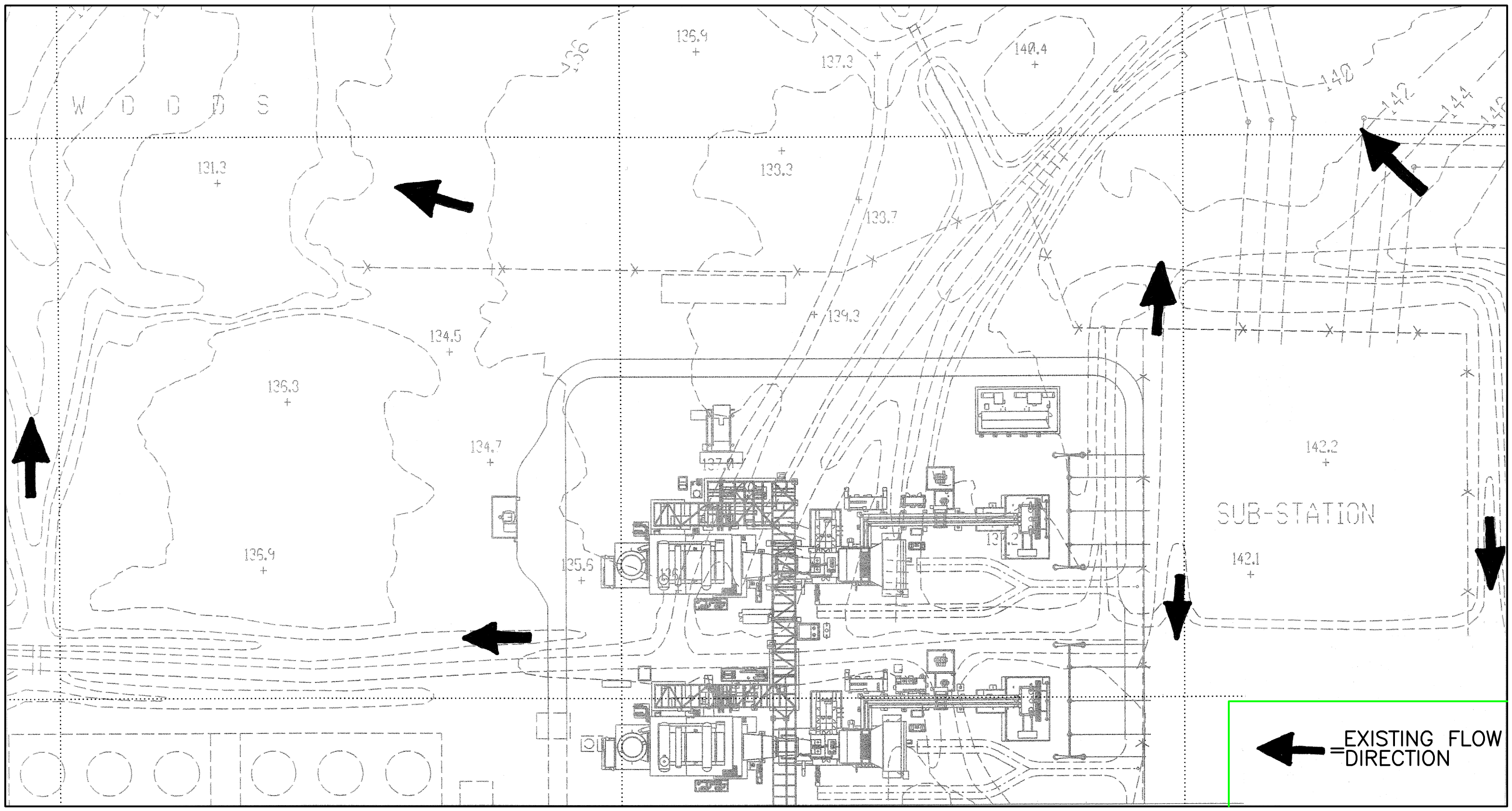
SOURCE:
TALLAHASSEE–LEON COUNTY GIS WEBSITE
WWW.TLCGIS.ORG

HYDROLOGIC FEATURES

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

Sargent & Lundy LLC

FIGURE NUMBER
4.1.3–3



EXISTING DRAINAGE PATTERNS

ARVAH B. HOPKINS GENERATING STATION
UNIT 2 REPOWERING PROJECT
CITY OF TALLAHASSEE

SOURCE:

Sargent & Lundy LLC

FIGURE NUMBER

4.1.3-4

4.1.4 Topography and Soils

a. Aesthetics of Viewshed

Natural-growth wooded lands on the north, south, and east sides of the Hopkins Site visually screen the Repowering Project area. These wooded area visual buffers are on the Station property and are approximately 200 feet wide to the north, 100 feet wide to the north-northeast, 50 feet wide to the northeast (with an additional 50 feet on rail road right-of-way), 400 to 800 feet wide to the east, and a minimum of 800 feet wide to the south east, south, and south west.

From the area surrounding the Hopkins Site, the only clear view of the Repowering Project area is from the west along Geddie Road. However, of the approximately 3,000 feet of frontage on Geddie Road, trees block the view from about two-thirds of the area. Of the unblocked portions of Geddie Road, the only two visual access points to the Project area include a 100-foot-wide opening between the existing cooling towers and a 100-foot-wide opening between a wooded area and existing cooling towers.

A photograph of the existing Hopkins Site from a Station entrance on Geddie Road is shown in Figure 4.1.4-1. The same view with a photographic simulation of the repowered Unit 2 is shown in Figure 4.1.4-2. Photographs of the existing Hopkins Site taken at other locations along Geddie Road are shown in Figures 4.1.4-3 through 4.1.4-5.

Based on the relative available view of the Repowering Project area compared to the balance of the wooded areas, and the presence of the existing Hopkins Station structures, the Project will have very little visual impact on the public.

b. Site Topography

The previously-disturbed Repowering Project area is level to nearly level, sloping at approximately 2% to the north by northwest direction, from a high point of 140 feet AMSL to a low point of 136 feet AMSL. The only other elevation variations are in the surface water drainage ditches constructed during the original plant development, along the incoming railroad spurs. These ditches extend to the northern portion of the property, where the flow spreads out into a 100-foot-wide wooded area before the water collects into an existing dry-run drainage way. The distance from the dry run to the existing ditch termination is approximately 1,200 feet. At the ditch outlet there is no observable erosion into the wooded area, indicating any stormwater discharge spreads out into the dense underbrush vegetation.

Stormwater runoff from the areas disturbed during construction will be routed in accordance with the BMPs to be developed in accordance with the Generic Stormwater Permit for Construction Activities (see Section 10.4.5). Surface water from the entire Repowering Project area currently drains to the northwest, first via the dry run/drainage pattern to Three Pole Creek, and eventually to the Ochlockonee River. During and after construction, this pattern will remain the same.

Overall, the Hopkins Site is situated on a surface water flow divide. The northern and western portions of the Site drain to Three Pole Creek. The southwestern portion of the Site flows to a former dry run known as Beaver Creek. The balance of the Site, consisting of the eastern and southeastern portions, drain via a dry run to Gum Swamp.

c. Soils

Construction will require that the power block and proposed road areas be stripped to remove vegetation and topsoil from the surface. The topsoil will be stockpiled and surrounded by silt fencing to ensure proper erosion control. This will be used as topsoil surfacing during the final grading following construction.

To improve soil stability and bearing strength beneath the permanent roads and building foundations, the soil will require subgrade compaction of the existing soils. Since the proposed areas above the soil will be considered to be impervious, the compaction will not change the permeability of the Site.

Figure 4.1.4-1 Existing View from Geddie Road Secondary Access Road

Figure 4.1.4-2 Proposed View from Geddie Road Secondary Access Road

Source: S&L, 2006

Figure 4.1.4-3 Existing View from Geddie Road South of Main Entrance

Figure 4.1.4-4 Existing View from Geddie Road Main Entrance Road

Source: S&L, 2006

Figure 4.1.4-5 Existing View from Geddie Road North of Main Entrance Road

Source: S&L, 2006

4.2 IMPACT ON SURFACE WATER BODIES AND USES

4.2.1 Impact Assessment

Overall, no impacts on surface water bodies or surface water uses are anticipated due to the Repowering Project. Stormwater runoff from the construction areas will be addressed in accordance with the Generic Stormwater Permit for Construction Activities (see Section 10.4.5).

4.2.2 Measuring And Monitoring Programs

Stormwater monitoring, as currently required under the existing SWPPP, will be continued during and after construction of the Repowering Project.

Surface water discharges from the plant waste water ponds and cooling tower blowdown is currently monitored in compliance with the existing Industrial Waste Facility (NPDES) Permit FL0025518 permit, as described in Section 5.1.5. Since the anticipated discharge from the Repowering Project area will be similar to the current discharge, no monitoring changes are planned. Weekly inspections and/or inspections after a ½-inch of rainfall will be conducted under the Generic Stormwater Permit for Construction Activities to ensure the effectiveness of the implemented BMPs.

4.3 GROUNDWATER IMPACTS

4.3.1 Impact Assessment

Dewatering of foundation excavations may be required during construction. The dewatering effluent will be addressed in accordance with the Generic Stormwater Permit for Construction Activities (see Section 10.4.5) before discharge to the environment. Because of the surficial sand layer, much of the dewatering discharge, as well as surface water runoff from relatively small rainfalls, is likely to infiltrate and be reintroduced as ground water.

The only other construction activity that will encounter groundwater will be the installation of the foundation piles. These piles are expected to extend down to the limestone-confining layer to provide support for the equipment foundations. Therefore, they will not penetrate through the confining layer and will pose no threat to the Floridan Aquifer.

Construction will result in approximately 8acres being covered with materials such as asphalt, concrete, buildings, and crushed stone or aggregate surfacing. The lower permeability of these materials (when compared to the in-situ surficial sand) will locally reduce the quantity of rainwater that will immediately infiltrate the soil. However, this will only affect the localized, perched ground water. Overall, no noticeable impact to the local groundwater is anticipated.

No onsite disposal is proposed for any wastes or by-products generated during construction. In addition, all hazardous material handling and storage areas will be protected from rainfall and will be contained by curbs to reduce the potential for a release to the environment. Therefore, contamination of groundwater is not a significant possibility.

4.3.2 Measuring And Monitoring Programs

Because there will not be any on-site activities that would be expected to affect local groundwater levels or chemistry, no specific groundwater monitoring programs are proposed.

Ongoing monitoring of the existing on-site makeup water supply wells will continue under the current program.

4.4 ECOLOGICAL IMPACT

4.4.1 Impact Assessment

4.4.1.1 Terrestrial Systems

The Hopkins Site comprises approximately 232 acres, of which approximately 6 acres will be occupied by the Phase 1 combustion turbine, HRSG, stormwater detention pond, 230-kV switchyard expansion, and gas metering and regulating station, while an additional 10 acres will be used for construction laydown and parking. The future Phase 2 combustion turbine and HRSG would occupy approximately 3 additional acres. Terrestrial systems in the Phase 1 and Phase 2 construction areas are dominated by the existing power plant facility (FLUCFCS 831) and open land (FLUCFCS 190), as described in Section 2.3.5 and illustrated in Figure 2.3.5-1. Additional terrestrial habitats in the vicinity, which will not be disturbed by construction, include areas of hardwood-conifer mixed forest (FLUCFCS 434), mixed wetland hardwood forest (FLUCFCS 617), ditches (FLUCFCS 511), and transmission lines/improved pasture (FLUCFCS 832/211).

The construction of the Repowering Project will be located on cleared open lands immediately north of the existing Units 1 and 2. No forested areas will be impacted, nor will any jurisdictional wetlands be dredged or filled. The areas designated for the new combustion turbines, HRSGs, stormwater detention pond, gas metering and regulating station, and construction laydown and parking does not provide significant habitat for any species of wildlife; therefore, no adverse impacts are anticipated.

Fugitive dust generated by construction activities will be minimized through BMPs, such as spraying water in heavily traveled areas. Any localized fugitive dust will not adversely affect the terrestrial systems surrounding the Repowering Project area.

Noise (including human disturbance from construction activities) will not result in significant adverse impacts on wildlife in the vicinity of the Repowering Project. Currently, the Hopkins Site experiences noise associated with the existing Hopkins Generating Station, and wildlife, such as birds, that occur in the vicinity are acclimated to this noise. No noise-sensitive wildlife is known to occur at the Hopkins Site or its vicinity, since wildlife in the area would have been acclimated to noise associated with the existing operational activities and past construction activities.

4.4.1.2 Aquatic Systems/Wetlands

The Repowering Project has been designed to avoid encroaching upon or discharging to any aquatic systems/wetlands. No impacts to aquatic systems or wetlands will occur as a result of Project construction.

4.4.1.3 Endangered and Threatened Species

The area designated for construction of the Repowering Project is previously-cleared open land that does not support any threatened or endangered flora; therefore, no adverse impacts to federally or state listed plant species will occur as a result of construction. No federally listed animal species occur within the Repowering Project construction area; however, the state-listed gopher tortoise has been found near the northeastern corner of the Project construction area. The gopher tortoise is not threatened or endangered, but is classified as a species of special concern by the Florida Fish and Wildlife Conservation Commission (FFWCC). The City has applied to the FFWCC for a separate permit to relocate four tortoises that could be affected by Project construction, as documented in Section 10.4.4. During construction, fencing will prevent these tortoises from re-entering the construction area, and impacts on other gopher tortoises will be avoided through burrow avoidance, in accordance with FFWCC regulations and guidelines. These measures will ensure that no adverse impacts to gopher tortoises or to any threatened or endangered species of animals will occur as a result of the Repowering Project.

4.4.2 Measuring and Monitoring Programs

4.4.2.1 Terrestrial Systems

No significant impacts to terrestrial systems will occur as a result of the Repowering Project; therefore, no monitoring program is necessary.

4.4.2.2 Aquatic Systems/Wetlands

No significant impacts to aquatic/wetland systems will occur as a result of the Repowering Project; therefore, no monitoring program is necessary.

4.5 AIR IMPACT

4.5.1 Air Emissions

Construction activities will result in the generation of fugitive particulate matter (PM) emissions and vehicle exhaust emissions. Fugitive PM emissions will result primarily from land clearing and grubbing, ground excavation, grading, cut and fill operations, and vehicular travel over paved and unpaved roads. Vehicular traffic will include heavy-equipment traffic and traffic due to construction workers entering and leaving the Hopkins Site. Construction personnel and equipment will enter the Site through the dedicated construction entrance road. Exposed land areas may also generate fugitive dust due to wind erosion. There will be no open burning associated with land clearing activities.

Emissions of fugitive PM from these activities are extremely difficult to quantify because of their variable nature. They can only be estimated, since emissions are dependent upon a number of factors, including the specific activities conducted, level of activity, meteorological conditions, and control measures utilized.

From an air quality standpoint, particulate matter with a diameter of less than 10 microns (PM_{10}) is the issue of greatest concern. During construction of the Repowering Project, PM_{10} emissions are estimated to be less than 5 TPY, 38 lb/day (5 days/week), or 3.8 lb/hr (10 hr/day). A PM_{10} emission rate of 5 TPY is well below the Prevention of Significant Deterioration significant emission rate of 15 TPY. As a result, the estimated fugitive PM_{10} emissions are not expected to significantly affect air quality outside the Hopkins Site boundary.

Air pollution emissions will also result from on-site construction equipment (cranes, trucks, compressors, etc.) operating with diesel oil and gasoline engines. This equipment will produce emissions of PM, CO, NO_X, VOC, and SO_2. Based on U.S. EPA exhaust emission factors for diesel engines and the estimated maximum number of construction vehicles, the PM, CO, NO_X, VOC, and SO_2 emissions are estimated to be less than 10 TPY for each pollutant, over the construction period. These levels of emissions will not cause significant impacts to air quality in the vicinity of the Hopkins Site.

4.5.2 Control Measures

A number of control measures will be implemented during the construction period in order to minimize air emissions and potential impacts. Clearing within the Repowering Project construction area will be kept to a minimum, thereby reducing air emissions due to wind erosion of exposed surfaces. Reasonable precautions such as watering on an as-needed basis will be utilized to minimize or control fugitive dust. The existing plant entrance road is paved, which minimizes dust emissions from vehicles entering the Hopkins Site.

4.6 IMPACT ON HUMAN POPULATIONS

The Hopkins Station is an existing power plant with controlled access. Construction activities for the Repowering Project will occur primarily on the interior of the Hopkins Site. The nearest residence is located approximately 1,200 feet from the Project construction area. There is a nearly continuous wooded buffer between the construction area and the nearest residences, which will tend to screen the residences from both visual and noise impacts. Therefore, Project construction will have minimal impacts on the surrounding community.

As discussed in Section 4.10, Phase 1 repowering is expected to require a peak construction workforce of 109 employees, with an average of approximately 79 employees during the 20-month construction period. Phase 2 repowering is expected to require a peak construction workforce of 96 employees, with an average of approximately 70 employees during the 20-month construction period. Workers for a number of the required trades can be provided by the local and regional construction workforce, thereby minimizing the need for relocation into the area. Tallahassee and Leon County have sufficient housing and transient accommodations to meet the housing requirements of the limited number of construction employees expected to relocate to the area for all or a portion of the construction phase.

The predicted impact on ambient noise levels due to construction of the Repowering Project is discussed below.

4.6.1 Construction Noise Impacts

The impacts of noise on human populations are dependent upon the proximity of institutional and residential land uses to construction activities and the type and extent of noise sources. The nearest location that could potentially be impacted by noise from Project construction (i.e., the nearest critical receptor) is located approximately 1,200 feet northeast of the center of the proposed power block. This location is a residence located near Noise Monitoring Site 3 (see Section 2.3.8).

Project construction will require installation of foundations and erection of major combined cycle components such as the combustion turbines, HRSGs, and associated equipment. The use of equipment such as dump trucks, cranes, bulldozers, graders, front-end loaders, and air compressors will be required during construction. The need for a pile driver during the foundation construction activities has not been determined, so the construction impacts were modeled with and without a pile driver. These sources have maximum noise levels ranging from about 70 dBA to more than 90 dBA (measured at a distance of 50 feet).

The evaluation of noise impacts from construction activities was performed using previous results from a noise propagation computer program (CADNA A, a computer-aided noise propagation model developed by DataKustik) to estimate noise levels. Noise source levels are entered as octave band sound power levels (SPLs). The user can specify coordinates, either rectangular or polar. All noise sources are assumed to be point sources; line sources can be simulated by several point sources. Sound propagation is calculated by accounting for hemispherical spreading and three other user-identified attenuation options: atmospheric attenuation, path-specific attenuation, and barrier attenuation. Atmospheric attenuation is calculated using the data specified by the American National Standard Institute Method for the Calculation of the Absorption of Sound by the Atmosphere (ANSI, 1999). Path specific attenuation can be specified to account for the effects of vegetation, foliage, and wind shadow. Direction source characteristics and reflection can be simulated using path-specific attenuation. Giving the coordinates and height of the barrier can specify attenuation due to barriers. Barrier attenuation is calculated by assuming an infinitely long barrier perpendicular to the source-receptor path. Total and A-weighted SPLs (filtered to approximate human hearing) are calculated. Background noise levels can be incorporated into the program and are used to calculate overall SPLs.

To determine noise impacts from construction of the Repowering Project, the receptor grid used for the modeling was 10 x 10 meters out to a distance of 4 kilometers. The modeling was performed so as to predict the maximum noise levels produced by a combination of likely noise sources with and without background noise levels. A conservative estimate of the number and types of construction equipment was assumed. Table 4.6.1-1 lists the major types of equipment assumed to be used during the construction and their associated noise characteristics.

Table 4.6.1-1 Construction Equipment Noise Sources

Name	ID	Result PWL		Height		Coordinates (Relative)		
		Day	Night			X	Y	Z
		(dBA)	(dBA)	(m)		(m)	(m)	(m)
Pile Driver	Constr_PD	127.5	127.5	8.00	r	749,658.05	3,371,650.87	8.00
Bulldozer 1	BD1	105.3	105.3	2.00	r	749,712.49	3,371,687.47	2.00
Crane 1	CR1	115.6	115.6	2.00	r	749,645.29	3,371,696.40	2.00
Truck 1	T1	115.3	115.3	2.00	r	749,683.09	3,371,696.92	2.00
Truck 2	T2	115.3	115.3	2.00	r	749,710.92	3,371,705.32	2.00
Backhoe	B1	115.6	115.6	2.00	r	749,715.12	3,371,651.77	2.00
Crane 2	CR2	115.6	115.6	2.00	r	749,678.37	3,371,643.37	2.00

Table 4.6.1-2(a) Calculated Noise Impact Levels for Repowering Project Construction With Pile Driver

Noise Receptors		X (m)	Y (m)	Z (m)	Project Only	Background L_{90}	Project Total
North-East	Day	749,984.2	3,371,898.9	2	59.5	50.4	60.0
	Night				59.5	49.7	59.9
North-West	Day	749,295.1	3,371,939.7	2	49.1	50.1	52.6
	Night				49.1	54.1	55.3
South-West	Day	749,393.0	3,371,225.6	2	42.4	47.7	48.8
	Night				42.4	49.1	49.9
South	Day	749,792.4	3,370,939.4	2	38.2	46.1	46.8
	Night				38.2	45.7	46.4

Table 4.6.1-2(b) Calculated Noise Impact Levels for Repowering Project Construction Without Pile Driver

Noise Receptors		X (m)	Y (m)	Z (m)	Project Only	Background L_{90}	Project Total
North-East	Day	749,984.2	3,371,898.9	2	53.6	50.4	55.3
	Night				53.6	49.7	55.1
North-West	Day	749,295.1	3,371,939.7	2	43.0	50.1	50.9
	Night				43.0	54.1	54.4
South-West	Day	749,393.0	3,371,225.6	2	38.2	47.7	48.2
	Night				38.2	49.1	49.4
South	Day	749,792.4	3,370,939.4	2	31.7	46.1	46.3
	Night				31.7	45.7	45.9

For the purpose of the construction noise impact analyses, all of the equipment was conservatively assumed to be operating simultaneously at peak power. In actuality, it is unlikely that all the equipment would be operating simultaneously and continuously. Heavy construction activities are expected to occur primarily during the daytime hours, and most heavy construction activities will occur during the first 6 to 8 months of construction. Mechanical and electrical installation activities may occur at night; however, these activities have minimal noise levels and are much less than the existing plant. Therefore, this impact assessment is considered conservative.

The noise levels resulting from the combination of equipment were input as multiple sources to the model. Octave bands were estimated from Noise from Construction Equipment and Operations, Building Equipment, and Home Appliance (EPA, 1971). Only the atmospheric and foliage attenuation options were enabled during the noise modeling.

Figures 4.6.1-1 and 4.6.1-2 provide the sound level isopleths generated during construction activities with and without the pile driver, respectively. Tables 4.6.1-2(a) and 4.6.1-2(b) provide the calculated noise impact levels generated during construction activities with and without the pile driver, respectively. The probable maximum construction-only noise impact at the nearest critical receptor (the North-East location in Figures 4.6.1-1 and 4.6.1-2) is 59.5 dBA if a pile driver is used and 53.6 dBA if a pile driver is not used.

While there are no numerical noise standards applicable to the Repowering Project, the predicted maximum sound level values are well within generally accepted limits for construction activities. Furthermore, as discussed above, these values include only atmospheric and foliage attenuation, and they are considered conservative. The actual noise levels due to construction are expected to be lower than predicted, due to the fact that the modeling assumed all of the construction equipment was operating simultaneously at peak power, which is not likely to occur in practice.

During the initial startup of the repowered unit, steam blows will be conducted to clean piping. Steam blows result in elevated noise levels for short durations. Prior notification will be made to locations that may be able to notice any elevated noise levels from the steam blows.

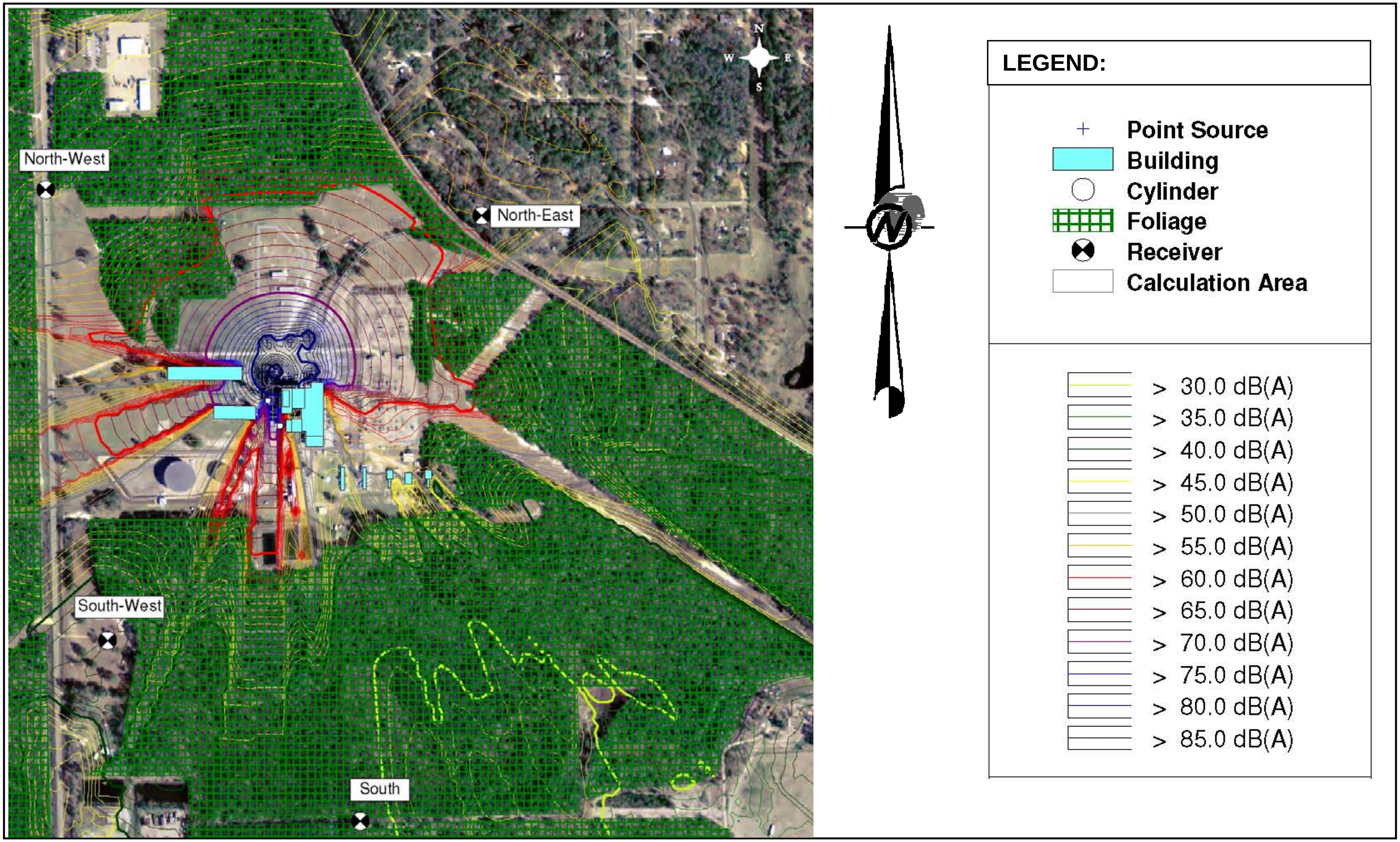


Figure 4.6.1-1. Construction Noise Map with Pile Driver
Arvah B. Hopkins Generating Station
Unit 2 Repowering Project
City of Tallahassee
Source: Golder, 2006.

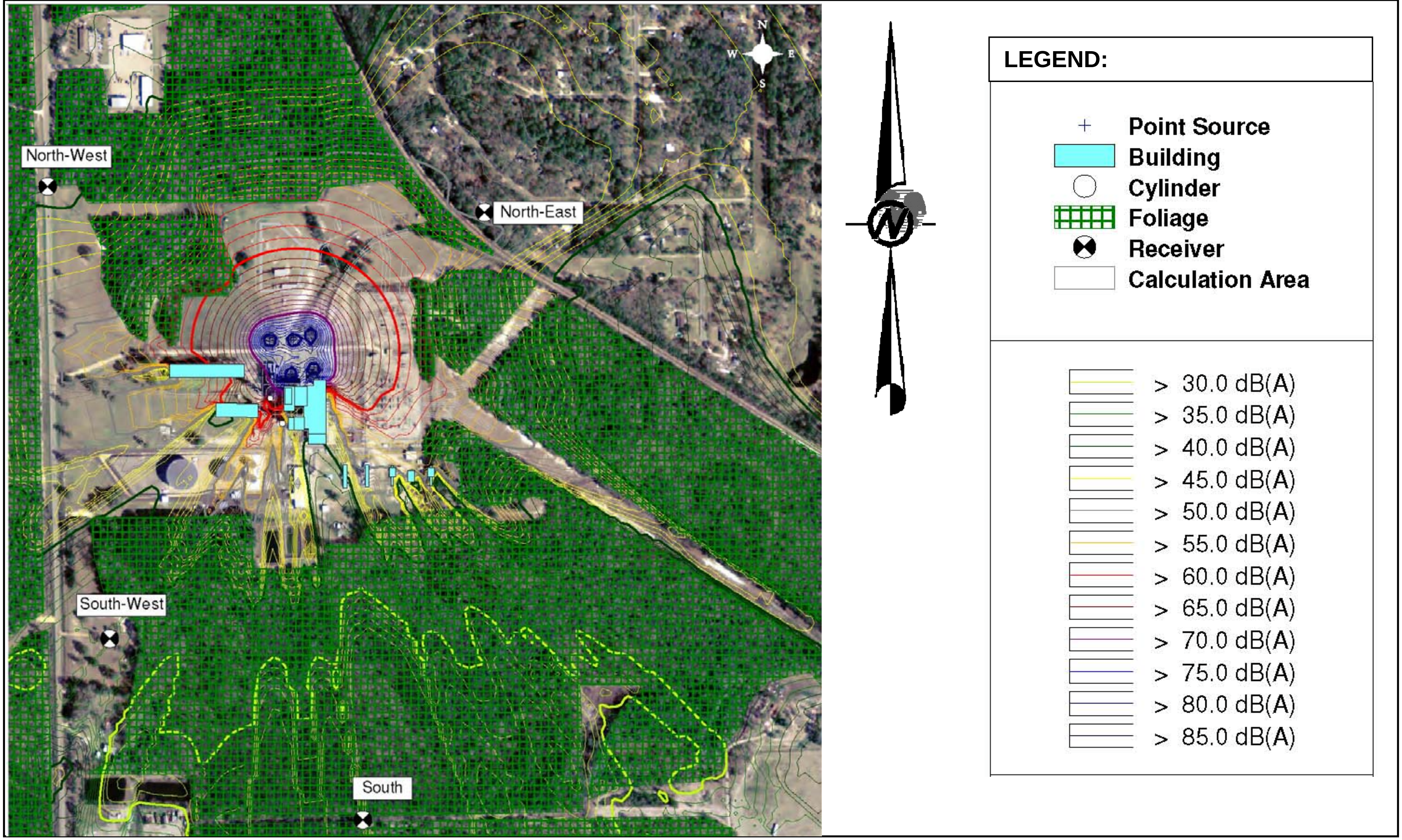


Figure 4.6.1-2. Construction Noise Map without Pile Driver
Arvah B. Hopkins Generating Station
Unit 2 Repowering Project
City of Tallahassee
Source: Golder, 2006.

Golder Associates

0637522/4.2/Figure 4.6.1-2.doc

4.7 IMPACT ON LANDMARKS AND SENSITIVE AREAS

Construction of the Repowering Project will not affect any landmarks or sensitive areas. There are no National Natural Landmarks, scenic areas, or sensitive areas located within the Hopkins Site or in the immediate vicinity. Since construction will take place entirely within the existing Hopkins Site, access to and use of regional recreational or cultural facilities will be unaffected.

The Talquin Wildlife Management Area (WMA), which is used for hunting, fishing, and archery, is located immediately west of the Hopkins Site, across Geddie Road. This WMA has coexisted with the construction and operation of the existing Hopkins Generating Station for many years, and continued use of the WMA should not be affected by the Repowering Project.

4.8 IMPACT ON ARCHAEOLOGICAL AND HISTORIC SITES

Construction impacts to archaeological resources are not expected. The previous cultural resource survey of the Hopkins Site did not identify any historical or prehistoric resources eligible for the National Register of Historic Places, and the Division of Historical Resources (DHR) approved development of the Site without further coordination from their office. Much of the Repowering Project construction will occur in areas previously disturbed during prior construction for the Hopkins Generating Station. No such resources have been previously discovered in these areas, and the occurrence of such resources is not expected.

Should construction activities for the Repowering Project uncover any archaeological deposits, activities in the immediate area will be suspended while a professional archaeologist evaluates the deposits. In the event that human remains are found during construction or maintenance activities, the provisions of Chapter 872.05 will apply. Chapter 872.05 states that, when human remains are encountered, all activity that might disturb the remains shall cease and may not resume until authorized by the District Medical Examiner or the State Archaeologist. The District Medical Examiner has jurisdiction if the remains are less than 75 years old or if the remains are involved in a criminal investigation. The State Archaeologist has jurisdiction if the remains are more than 75 years of age.

4.9 SPECIAL FEATURES

No special features (as described in the FDEP SCA Instruction Guide) that may have an influence on the environment and ecological systems of the Hopkins Site or adjacent areas are expected to be included in the Repowering Project.

4.10 BENEFITS FROM CONSTRUCTION

Principal benefits related to construction of the Repowering Project will be associated with short-term increases in local employment, disposable income, and taxes or other payments.

Tables 4.10-1 and 4.10-2 summarize the projected manpower loading during construction of Phase 1 and Phase 2, respectively. As shown in Table 4.10-1, Phase 1 repowering is expected to require a peak construction workforce of 109 employees, with an average of approximately 79 employees during the 20-month construction period. Phase 1 construction is expected to begin in 2007 and conclude in 2008. Phase 1 construction workers are expected to earn a total of approximately $17 million (in 2005 dollars) with a large portion of the wages anticipated to be spent in the local market area. As shown in Table 4.10-2, Phase 2 repowering is expected to require a peak construction workforce of 96 employees, with an average of approximately 70 employees during the 20-month construction period. Phase 2 construction has not been scheduled, and a payroll has not been established.

In addition to the construction worker wages, equipment and materials are expected to cost a total of approximately $74 million (in 2005 dollars) in Phase 1. It is anticipated that consumable materials (wood, concrete, etc.), services, and rentals associated with construction will likely be purchased in the local area.

Since the Hopkins Generating Station is owned by the City of Tallahassee, it is exempt from all property tax payments and sales tax payments for most equipment and material. Equipment directly purchased by the City is exempt from sales tax as a result of the City ownership. In addition, Section 212 of the Florida Statutes exempts from sales tax purchases of machinery and equipment necessary in the production of electric or steam energy from the burning of boiler fuels other than residual oil. The Repowering Project will utilize natural gas and distillate fuel oil. Other than material costs associated with new roads and Site drainage, and costs associated with consumables, rentals, and temporary facilities, most purchases of equipment and material for the Repowering Project will be exempt from sales tax.

An additional benefit of the Repowering Project will be creation of construction employment opportunities in the Tallahassee area. This positive effect is expected to be at its greatest during the months of peak construction employment shown in Tables 4.10-1 and 4.10 -2.

Socioeconomic benefits from construction are discussed in Section 7.1.1 of this application.

Table 4.10-1 Phase 1 Repowering Estimated Construction Workforce

Month After Construction Start																					
Craft	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Man-months
Laborers	8	8	12	12	10	10	10	10	10	10	8	8	6	6	6	6	6	8	4	2	160
Carpenters	8	8	12	12	10	10	8	8	8	8	6	6	6	6	6	6	6	4	2	2	142
Operating engineers	6	6	6	6	6	6	6	6	6	6	6	6	6	6	4	2	2	2			94
Surveyors	2	2	2	2	2	2	2	2	2	2	2	2									24
Boilermakers			6	6	12	12	14	16	16	16	18	18	18	20	20	20	18	18	16	14	278
Pipefitters	6	8	8	8	8	8	10	10	10	10	12	12	14	14	14	12	10	10	8	8	200
Insulators						4	6	6	6	6	6	6	6	6	6	6	6	2	2		74
Millwrights							4	4	4	4	4	4	4	6	6	6	6	6	2		60
Painters															2	2	2	2	2	2	12
Sheetmetal workers						1	1	1	1	2	2	2	4	4	4	3	2	2	2	2	33
Pile drivers										6	6	6									18
Teamsters	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2						28
Electricians	2	5	7	9	10	14	14	16	16	24	24	24	24	24	24	24	22	16	16	14	329
Ironworkers	1	2	4	4	6	6	6	6	6	6	4	4									55
Cement Finishers		2	4	4	4	4	2	2	2	1	1	1									27
Manual	34	42	63	65	70	79	85	89	89	103	101	39	90	94	94	87	80	70	54	44	1472
Non-Manual	3	3	4	5	5	5	6	6	6	6	7	6	6	5	5	5	5	4	4	4	100
Total	37	45	67	70	75	84	91	95	95	109	108	45	96	99	99	92	85	74	58	48	1572

Note: Based on union labor, 40 hours/week, 176 hours/month. Non-manual labor includes clerks, bookkeepers, etc.

Table 4.10-2 Phase 2 Repowering Estimated Construction Workforce

Month After Construction Start																					
Craft	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Man-months
Laborers	6	6	8	8	8	8	8	6	6	6	8	6	4	4	4	6	6	8	4	2	122
Carpenters	8	8	10	10	10	10	6	6	6	6	6	6	4	4	4	4	4	4	2	2	120
Operating engineers	4	4	6	6	6	6	6	6	6	6	6	6	6	6	2	2	2	2			88
Surveyors	2	2	2	2	2	2	2	2	2	2	2	2									24
Boilermakers				6	10	12	14	16	16	16	18	16	16	20	20	20	18	18	16	14	266
Pipefitters	4	6	6	6	6	6	8	10	10	10	12	12	14	14	14	12	10	10	8	8	186
Insulators						4	6	6	6	6	4	4	4	4	4	4	4	2	2		60
Millwrights							4	4	4	4	4	4	4	6	6	6	6	6	2		60
Painters															2	2	2	2	2	2	12
Sheetmetal workers						1	1	1	1	2	2	2	4	4	4	3	2	2	2	2	33
Pile drivers																					0
Teamsters	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2						28
Electricians	2	5	7	9	10	14	14	14	14	14	20	20	20	22	22	22	16	16	16	14	291
Ironworkers	1	2	4	4	2	4	4	4	4	4	4	4									41
Cement Finishers				2	2	2	2	2	2	1	1	1									15
Manual	28	34	45	55	58	71	77	79	79	79	89	29	78	86	84	81	70	70	54	44	1290
Non Manual	3	3	4	5	5	5	6	6	6	6	7	6	6	5	5	5	5	4	4	4	100
Total	31	37	49	60	63	76	83	85	85	85	96	35	84	91	89	86	75	74	58	48	1390

Note: Based on union labor, 40 hours/week, 176 hours/month. Non-manual labor includes clerks, bookkeepers, etc.

4.11 VARIANCES

No variances from applicable standards are required as a result of the Repowering Project construction activities.

5.0 EFFECTS OF PLANT OPERATION

This chapter discusses the expected environmental effects of operation of the Repowering Project (that is, the operational interaction of the repowered Hopkins Unit 2 with the environment) and the City of Tallahassee's plans and programs for monitoring the environmental effects of operation.

5.1 EFFECTS OF THE OPERATION OF THE HEAT DISSIPATION SYSTEM

Heat is a necessary byproduct of the generation of electricity using fossil fuels. While a significant portion of the thermal energy produced from the fuel is converted to electrical energy by the turbine generators, a portion is absorbed by cooling water flowing through the condenser tubes. The heat from the existing Hopkins Units 1 and 2 is dissipated in the existing closed cycle recirculating cooling tower system, primarily to the atmosphere. That system also has a permitted discharge to the Class III surface water Beaver Creek via an onsite man-made ditch. The operating temperatures and discharge flow rate from that system are regulated by the plant's existing Industrial Waste Facility (NPDES) Permit FL0025518 (see Section 10.4.3).

The repowered Unit 2 will have a closed cycle recirculating heat dissipation system, utilizing the existing Unit 2 mechanical draft cooling tower. The cooling tower will continue to receive makeup water from the Upper Floridan Aquifer, and will continue to release blowdown to the existing on-site man-made ditch. The Repowering Project will not result in any material changes to the existing heat dissipation system.

5.1.1 Temperature Effect on Receiving Body of Water

Repowered Unit 2 will discharge cooling tower blowdown via Outfall D-0172 at virtually the same temperatures as the existing station. Further, the repowered Unit 2 will still meet the Condition of Certification temperature requirement XIV C. : " The licensee shall install and operate a heat exchanger to insure that the cooling tower effluent never exceeds an instantaneous maximum temperature shall be [sic] 85^{o} F. during the months of May, June, July, August, and September, and shall be 80^{o} F. during all other months. The maximum daily average shall be 80^{o} F. at all times, calculated as the mean of all temperature readings on a daily (24-hour) basis." Therefore, the temperature of the receiving water body will be unchanged by the repowering of Unit 2.

5.1.2 Effects On Aquatic Life

No effects on aquatic life are expected to result from the Project, because there will be no changes in discharge volume, temperature, or water quality.

5.1.3 Biological Effects Of Modified Circulation

The repowered Unit 2 will still meet the Condition of Certification flow requirement XIV C: "The total discharge from the cooling tower of Unit 2 shall not exceed 2.9 cubic feet per second (1,300 gallons per minute.)" As shown in Figure 3.5-1, the maximum cooling tower discharge flow (Unit 1 and Unit 2 together) under the current plant configuration is approximately 1,250 gallons per minute. As shown in Figures 3.5-2 and 3.5-3, the maximum cooling tower discharge flow after repowering of Unit 2 will continue to be approximately 1,250 gallons per minute. Therefore, the Repowering Project will not significantly modify circulation of any water bodies, and no associated detrimental effects are expected.

There will be no anticipated thermal shocks to the aquatic species from periodic shutdown of the repowered Unit 2, as the waters in Florida are well above freezing for most of the year.

5.1.4 Effects of Offstream Cooling

Because the existing Unit 2 cooling tower will continue to be utilized by the Repowering Project, with the same source water for makeup and the same approximate heat load, there will be no change in the effects of off-stream cooling from the existing.

5.1.5 Measurement Programs

The existing Conditions of Certification (and NPDES permit FL0025518) require monitoring of the following constituents at the locations and frequency specified in Table 5.1.5-1 below.

Table 5.1.5-1 Hopkins Discharge Monitoring Requirements

Constituent	Outfall D-0172-Cooling Tower Blowdown	Outfall D-013-Low Volume Wastes	Point of Discharge (POD) (D-001)	Frequency
Flow	X			Daily
Flow		X		Total per discharge
Flow			X	Continuous
Free Available Chlorine	X			Each Application
Total Residual Chlorine			X	Once a month when chlorinating
Time of Chlorine Discharge	X			Each Application
Total Recoverable (TR) ZINC	X			Quarterly

Constituent	Outfall D-0172- Cooling Tower Blowdown	Outfall D-013- Low Volume Wastes	Point of Discharge (POD) (D-001)	Frequency
TR Chromium	X		X	Quarterly
TR Copper	X		X	Quarterly
pH	X			Monthly
pH		X		Daily when discharging
pH			X	Continuous
Spectrus 1300/Clam-trol CT-2	X			Each Application
Total Suspended Solids		X		Daily when discharging
Oil & Grease		X		Daily when discharging
Oil & Grease			X	Monthly
Temperature			X	Continuous
Conductivity			X	Continuous
Dissolved Oxygen			X	Monthly
Total Iron			X	Quarterly
Total Mercury			X	Quarterly
Total Lead			X	Quarterly

The City of Tallahassee proposes to continue the existing monitoring program during operation of the repowered Unit 2. Since the anticipated heat dissipation system discharge from the repowered Unit 2 will be very similar to the current discharge, no monitoring changes are necessary. No ecological monitoring is presently required, and none is proposed for the repowered Unit 2.

5.2 EFFECTS OF CHEMICAL AND BIOCIDE DISCHARGES

5.2.1 Industrial Wastewater Discharges

The only new industrial wastewater streams that will be generated at the Hopkins Station after Unit 2 repowering are the evaporative cooler blowdown and the Heat Recovery Steam Generator (HRSG) blowdown. The former is simply concentrated ground water, similar to the existing cooling tower blowdown. As indicated on Figures 3.5-2 and 3.5-3 (diagrams showing peak demand water use after completion of Phase 1 repowering), makeup to the evaporative coolers is 1/3 ground water and 2/3 demineralized water. Essentially, this makeup is water whose constituents are at concentrations approximately 1/3 of their concentration in the ground water. The evaporative coolers operate at about 10 cycles of concentration; i.e. they evaporate 90% of the incoming water and concentrate the constituents to ten times their level in the incoming makeup water. Since the incoming makeup water is at 1/3 the levels of the ground water, the discharge from the evaporative coolers will contain constituents at a level 3.33 times (1/3 * 10) the levels in the incoming makeup (ground) water.

HRSG blowdown is very pure water, and quite similar to boiler blowdown from the existing units, with TDS measured in parts per billion. As indicated on Figures 3.5-1 and 3.5-5, there will be an increase in flow rate of HRSG blowdown relative to the existing Unit 2 boiler blowdown of at least 12 gpm. Combining this 12 gpm of HRSG blowdown with the maximum of 3 gpm from the evaporative coolers gives an additional dilution of 5 times, thus reducing the concentrations of constituents within the combined flow to only 0.667 times the makeup groundwater levels. Therefore, these two discharges will not increase the concentrations of any constituents at the existing Outfall D-001, the Hopkins Station Point of Discharge (POD).

The only existing wastewater stream which will be changed as a result of Unit 2 repowering is the wastewater from the Process Water Treatment System (the demineralizer system) to the Low Volume Waste Ponds (LVWP). The current combination of reverse osmosis/electrodeionization (RO/EDI) and demineralization (ion exchange) produces a wastewater, which is a combination of RO reject water and demineralizer regeneration wastewater. The system will be changed to eliminate the RO/EDI system and treat all the inflow by larger demineralizer units. The resultant system will produce less volume of wastewater at higher concentrations of constituents.

The dissolved constituents in the demineralizer wastewater sent to the LVWP come from two sources:

1. Dissolved solids in the influent or raw water, and
2. Dissolved solids from the regeneration chemicals.

The constituents from dissolved solids in the influent water are strictly a function of the volume of influent water processed, and the portion of the regeneration wastewater which is sent to the LVWP. Figure 3.5-1 shows that the existing system processes 209 gpm of influent water and produces 42 gpm of wastewater, of which 25 gpm is sent to the LVWP. Therefore, the LVWP currently receives 59.5% (100 * 25/42) of the total influent dissolved solids, or the equivalent of 100% of 124.4 gpm (59.5% of 209 gpm) of influent water. For the purpose of this analysis, that quantity is called the Equivalent Inflow Rate.

Table 5.2-1 tabulates the Equivalent Inflow Rate for each of the proposed repowered cases shown in Figures 3.5-2 through 3.5-7. All of the calculated Equivalent Inflow Rates are less than the Equivalent Inflow Rate for the existing plant configuration (124.4 gpm); therefore, none of the proposed discharges will cause an increase in the discharge concentration at the Hopkins Station POD of any constituent present because it is present in the influent (raw) water.

The constituents which are increased due to their use as demineralizer regenerants are sodium (from sodium hydroxide) and sulfate (from sulfuric acid). The City of Tallahassee estimates that these constituents will be present in the post-repowering regeneration wastewater at levels of approximately 3,803 and 7,661 mg/L, respectively. At these concentrations, and a maximum flow rate of 5 gpm to the LVWP, the resultant mass loading to the LVWP is 228 lbs/day for sodium and 459 lbs/day for sulfate. The resultant increases in concentration in the discharge at the POD are shown on Table 5.2-2. These increases will not cause any exceedances of either the existing permit limits at the POD, or of Class III water quality standards in the receiving water body.

5.2.2 Cooling Tower Blowdown

There will be no significant change to the heat dissipation system of either Unit 1 or Unit 2, including the operating characteristics of the cooling towers, associated with the repowering project. Therefore, the cooling tower blowdown quantities and chemistry will be essentially unchanged from the existing condition.

Table 5.2-1 Equivalent Inflow Rates to the Low-Volume Waste Pond After Phase 1 Repowering

Water Balance Case	Inflow to Demineralizer - gpm	Outflow from Neutralization System	% of Outflow Sent to LVWP	Equivalent Inflow Rate - gpm
Figure 3.5-2	209	9	56%	116.1
Figure 3.5-3	437	21	24%	104.0
Figure 3.5-4	174	8	63%	108.8
Figure 3.5-5	381	18	28%	105.8
Figure 3.5-6	63	3	100%	63.0
Figure 3.5-7	300	15	33%	100.0

Table 5.2-2 Expected Concentrations of Sodium and Sulfate After Phase 1 Repowering

Parameter	Sodium	Sulfate
Concentration in Demineralizer Regeneration Wastewater - mg/L	3,803	7,661
Mass Loading to the Low Volume Waste Pond - lb/day	228	459
Increase in Concentration at the Point of Discharge - mg/L *	19.0	38.3
* Assumes worst case discharge flow with existing Unit 1 shut down and repowered Unit 2 firing fuel oil at 100% load.		

5.2.3 Measurement Programs

Chemical and biocide discharges are currently monitored in compliance with the existing Conditions of Certification and the existing NPDES permit, as described in Section 5.1.5. The City of Tallahassee proposes to continue the existing monitoring program during operation of the repowered Unit 2. Since the anticipated discharges from the repowered Unit 2 will be very similar to the current discharges, no monitoring changes are necessary.

5.3 WATER SUPPLIES

5.3.1 Surface Water

The existing Hopkins Unit 2 does not cause changes in hydrologic or water quality conditions due to diversion or interception of surface water flow; the repowered Unit 2 will continue to avoid such changes in hydrologic and water quality conditions.

There will be no increase in the volume of industrial wastewater discharged from the Hopkins Generating Station as a result of the Repowering Project. The repowered Unit 2 will continue to maintain virtually the same discharge rate to Beaver Creek, and will cause only minor changes to the water quality of Beaver Creek, as discussed in Section 5.2. While there is no expected increase in the volume of wastewater discharged as a result of the Project, the repowered Unit 2 will generate two new waste streams, HRSG blowdown and evaporative cooler blowdown, and one modified waste stream, demineralizer regeneration waste. These waste streams may be sent to the existing Hopkins Station outfall or to the City's T.P. Smith Wastewater Treatment Plant via an existing sanitary sewer system. However, the Hopkins Station discharge to Beaver Creek will continue to meet the limits of the facility's NPDES Permit (see Section 10.4.3). Should there ever be a need to discharge wastewater in volumes greater than allowed by the NPDES permit, the excess flow will be routed to the T.P. Smith Wastewater Treatment Plant.

Stormwater from the repowered Unit 2 will be treated by detention in accordance with the performance standards of the local, regional, state, and federal requirements (Leon County, NWFWMD, FDEP, and USEPA). Therefore, the applicable water quality standards will continue to be met. Information on the design of the stormwater detention pond is provided in Section 3.8.

5.3.2 Impacts on Groundwater Supplies

The repowering of Unit 2 will not result in any increase in water use as compared to that characterized in the original Site Certification for the Hopkins Site. The proposed use of water is for a reasonable beneficial use and is in the public interest.

5.3.3 Drinking Water

Drinking water for the existing Hopkins Station is provided by the City of Tallahassee public water supply system. The Hopkins Station is expected to consume the same volume of drinking water after repowering as it presently consumes. Therefore, no impacts on drinking water supplies are expected.

5.3.4 Leachate and Runoff

Operation of the repowered Unit 2 will not generate leachate. The Repowering Project has been designed to minimize direct discharge to surface waters. All waters that could come in contact with oil or other contaminants will be routed through an oil/water separator and then routed to the stormwater detention pond. Non-contact stormwater runoff is collected and routed to the stormwater detention pond. The stormwater system will be designed to meet applicable standards, as described in Section 3.8. Therefore, no significant impacts to water supplies are expected due to runoff or leachate.

5.3.5 Measurement Programs

No additional monitoring is proposed beyond that discussed in Section 5.1.5 above.

5.4 SOLID AND HAZARDOUS WASTES

5.4.1 Solid Wastes

As explained in Section 3.7, all solid wastes generated during operation of the repowered Unit 2 will be disposed of in licensed off-site facilities. The operation of the repowered Unit 2 will generate minor amounts of solid waste (e.g., used combustion turbine air inlet filters), but will not significantly change the volume or types of solid waste currently generated at the Hopkins Generating Station. Furthermore, the number of operational plant employees is not expected to increase. Therefore, no adverse impacts will result from solid wastes generated by the Repowering Project.

5.4.2 Hazardous Wastes

The types of hazardous wastes generated at the Hopkins Generating Station are not anticipated to change as a result of the Repowering Project. The City of Tallahassee has a comprehensive pollution prevention and waste minimization program at the Hopkins Generating Station to minimize the amount of hazardous waste generated. The City has a contract with a licensed contractor to transport and dispose of hazardous wastes from the station at licensed facilities in a manner that complies with environmental regulations. Therefore, no impacts are anticipated due to any hazardous wastes generated from operation of the repowered Unit 2.

5.5 SANITARY AND OTHER WASTES

The existing Hopkins Generating Station is connected through an on-site lift station to the City of Tallahassee sanitary sewer system. The Repowering Project will not result in any changes to the existing sanitary waste treatment system approved under the Site Certification.

As discussed in Section 3.7, waste containing some amount of oil residue, detergent, and solids will result from the periodic on-line and off-line washing of the new combustion turbines. This waste stream will be collected in a water wash drain tank for eventual off-site disposal. The same collection and disposal methods currently are used for the existing simple cycle combustion turbines at the Hopkins Generating Station.

5.6 AIR QUALITY IMPACT ANALYSIS

5.6.1 Significant Impact Analysis Approach

As discussed in Section 3, the Repowering Project does not involve any increase in emissions above the PSD significant emission levels and, therefore, does not trigger PSD review, including a source impact analysis. However, an air impact modeling analysis was conducted for this application for Site Certification modification, since the stack and operating parameters for the repowered Unit 2 will be different than those for the existing Unit 2 boiler. The stack height for the existing Unit 2 boiler is 250 ft while the proposed CT/HRSG stack and emergency bypass stack heights both are 150 ft.

The general modeling approach for this Project followed EPA and FDEP modeling guidelines for determining compliance with AAQS and PSD increments. A significant impact analysis was performed to determine whether the emission and/or stack configuration changes due to the Project would result in predicted impacts greater than the EPA significant impact levels at any location beyond the Hopkins Site restricted boundaries. If these maximum impacts were predicted to be greater than the significant impact levels, an additional analysis would be performed with the emission reductions from retirement of the existing Unit 2 boiler.

If the Project-only impacts were above the significant impact levels in the vicinity of the Hopkins Site, then two additional and more detailed air-modeling analyses would be performed. The first analysis demonstrates compliance with federal and Florida AAQS, and the second analysis demonstrates compliance with allowable PSD Class II increments.

Generally, if a project undergoing modification is located within 200 km of a PSD Class I area, then a significant impact analysis is also performed to evaluate the impact due to the project alone at the PSD Class I area. The maximum predicted impacts are compared to EPA's proposed significant impact levels for PSD Class I areas. These recommended levels have never been promulgated as rules but are the currently accepted criteria to determine whether a proposed project should perform a more detailed modeling analysis at a PSD Class I area.

If the project-only impacts at the PSD Class I area are above the proposed EPA PSD Class I significant impact levels, then an analysis is performed to demonstrate compliance with allowable PSD Class I increments at the PSD Class I area.

The nearest PSD Class I area to the Hopkins Generating Station is the Bradwell Bay National Wilderness Area (NWA), located approximately 28 kilometers (km) southwest of the Station, and the St. Marks NWA, located about 38 km to the south and southeast. Air impacts were not predicted at other PSD Class I areas since they are located more than 200 km from the Station.

5.6.2 Model Selection

The selection of an air quality model to predict air quality impacts for the Repowering Project was based on the ability of the model to simulate impacts in areas surrounding the Project, as well as at the PSD Class I areas. The American Meteorological Society and EPA Regulatory Model (AERMOD) dispersion model was selected since the EPA and FDEP recommend its use to predict pollutant concentrations at receptors located within 50 km from an emission source.

The AERMOD dispersion model (Version 04300) is available on the EPA's Internet web site, Support Center for Regulatory Air Models (SCRAM), within the Technical Transfer Network (TTN).

On November 9, 2005, the EPA implemented AERMOD into its *Guideline of Air Quality Models (Appendix W to 40 CFR Part 51)* as the recommended model for regulatory modeling applications. The FDEP is allowing the use of AERMOD for air permitting projects as a replacement for the Industrial Source Complex Short-Term Model (ISCST3), which will no longer be in effect as of December 2006.

The AERMOD model calculates hourly pollutant concentrations based on hourly meteorological data. The AERMOD model is applicable for most applications since it is recognized as containing the latest scientific algorithms for simulating plume behavior in all types of terrain. For evaluating plume behavior within the building wake of structures, the AERMOD model incorporates the Plume Rise Model Enhancement (PRIME) downwash algorithm developed by the Electric Power Research Institute (EPRI). AERMOD can predict pollutant concentrations for averaging times of annual and 24, 8, 3, and 1 hour.

For this analysis, the EPA regulatory default options were used to predict all maximum impacts. These options include:

- Final plume rise at all receptor locations,
- Stack-tip downwash,
- Buoyancy-induced dispersion,
- Default wind speed profile coefficients,
- Default vertical potential temperature gradients, and
- Calm wind processing.

Meteorological data used in the AERMOD model to determine air quality impacts consisted of a concurrent 5-year period of hourly surface weather observations and twice-daily upper air soundings from the National Weather Service (NWS) offices located at the Tallahassee International Airport and in Waycross, Georgia, respectively. Concentrations were predicted using five years of hourly meteorological data from 1990 through 1994. The NWS office at Tallahassee is located approximately 5 km (3 miles) southeast of the Hopkins Site. The FDEP considers this station to have surface meteorological data representative of the Site.

The data for these stations were processed into a format that can be input to the AERMOD model using the meteorological preprocessor program AERMET. The data were processed using the Lakes Environmental graphical interface using the latest version of AERMET (04300). The hourly surface data were obtained from the Solar and Meteorological Observation Network (SAMSON) CD. Upper air sounding data were obtained in the required NCDC TD-6201 format from the Lakes Web site (www.webmet.com).

A unique feature of AERMOD is its incorporation of land use parameters for the processing of boundary layer parameters used for the dispersion. Based on the most recent regulatory guidance, the land use parameters should be representative of the data measurement site (i.e., NWS at Tallahassee). Land use data, representing the average surface roughness, albedo, and Bowen ratio that exist within a 3-km radius of the NWS station at Tallahassee were extracted from 1-degree land use files from the U.S. Geographical Survey (USGS) using the AERSURFACE program. AERSURFACE currently extracts land use data in 12 wind direction sectors covering 360 degrees. The land use values for each wind direction sector were input into Stage 3 of the AERMET preprocessor program to create the surface and profile meteorological files that AERMOD requires.

5.6.3 Source Data

Summaries of the Repowering Project criteria pollutant emission rates, physical stack, and stack operating parameters used in the air modeling analysis are presented in Tables 3.4-1 through 3.4-3 and in Appendix 10.1.5. In an effort to obtain the maximum air quality impacts for a range of possible operating conditions, operating loads at 100%, 75%, and 60% for the range of ambient temperatures of 25°F and 95°F were modeled. A total of 16 modeling scenarios were considered for the combined cycle operation and simple cycle operation with exhaust gases routed through the HRSG and SCR system, for the following conditions:

- CT firing natural gas for ambient temperatures of 25 and 95°F at:
  - 100% operating load with duct firing (natural gas-firing);
  - 100% operating load;
  - 75% operating load; and
  - 60% operation load.
- CT firing oil for ambient temperatures of 25°F and 95°F at:
  - 100% operating load with duct firing (natural gas-firing);
  - 100% operating load;
  - 75% operating load; and
  - 60% operation load.

A total of 6 modeling scenarios were considered for the simple cycle operation with exhaust gases routed to the emergency bypass stack (instead of the HRSG and SCR system), for the following conditions:

- CT firing natural gas for ambient temperatures of 25°F and 95°F at:
  - 100% operating load;
  - 75% operating load; and
  - 60% operation load.

The AERMOD model was used to predict maximum concentrations for the annual and 24-, 8-, 3-, and 1-hour averaging times in the near-field areas and at the PSD Class I areas near the Hopkins Site.

All significant building structures in the Project area were identified by the facility plot plan. The building structures were processed in the EPA Building Profile Input Program ([BPIP], Version 95086) to determine direction-specific building heights and widths for each 10-degree azimuth direction for each source that was included in the modeling analysis. A listing of dimensions for each structure is presented in Table 5.6-1.

SO_2 modeling was also performed to address the reduction in SO_2 impacts associated with the shutdown on the existing Unit 2 boiler since the repowered unit's impacts alone were predicted to be greater than the significant impact levels for certain operating conditions and averaging periods as discussed in Section 5.6.5. The stack, operating, and emission data for the existing Unit 2 boiler used in the modeling are presented in Table 5.6-2.

5.6.4 Receptor Locations

To determine the maximum impact for all pollutants and averaging times in the vicinity of the Project, concentrations were predicted at receptors located in detailed receptor grids centered on the CT/HRSG stack and extending from the Hopkins Site boundary out to 20 km.

Along the Site boundary, a Cartesian receptor grid was used to predict concentrations at 90 receptors spaced at 50-m intervals.

In addition, a general Cartesian grid was used to predict concentrations beyond the Site boundary out to 10 km. Receptors were located at the following intervals and distances from the Site boundary:

- Every 100 m from the Site boundary to 2,000 m
- Every 150 m from 2,000 to 3,500 m
- Every 500 m from 3,500 to 5,000 m
- Every 1,000 m from 5,000 to 10,000 m

More than 3,700 receptors were used in the analysis to determine the maximum impacts for the Project.

For determining the Project impacts at the PSD Class I areas, pollutant concentrations were predicted in an array of 132 and 101 discrete receptors located at the PSD Class I areas of the Bradwell Bay and St. Marks NWA, respectively. These receptors were provided by the National Park Service (NPS).

5.6.5 Model Results

The maximum pollutant concentrations predicted for the repowered unit are given in Tables 5.6-3 through 5.6-5. The maximum concentrations predicted by operating load and range of ambient temperatures for the combined cycle operation and simple cycle operation with exhaust gases routed through the HRSG and SCR system are presented in Table 5.6-3. The maximum concentrations predicted by operating load and range of ambient temperatures for the simple cycle operation with exhaust gases routed to the emergency bypass stack are presented in Table 5.6-4. The overall maximum pollutant concentrations compared to the PSD significant impact levels are presented in Table 5.6-5.

As shown in Table 5.6-5, the maximum concentrations due to the repowered unit alone are predicted to be less than the PSD significant impact levels, except for the 24-hour average SO_2 impacts for the CT firing oil and duct burners firing natural gas with exhaust gases routed through the HRSG and SCR system. For the 24-hour average SO_2 concentration, additional analyses were performed that included the SO_2 emission reductions from retirement of the existing Unit 2 boiler. The maximum SO_2 concentrations for these analyses, presented in Table 5.6-6, are predicted to be less than the applicable PSD Class II significant impact levels.

As a result, the Repowering Project's impacts are predicted to comply with the AAQS and PSD Class II increments.

For the Bradwell Bay and St. Marks PSD Class I areas, the maximum pollutant concentrations predicted for the repowered unit are given in Tables 5.6-7 through 5.6-9. The maximum concentrations predicted by operating load and range of ambient temperatures for the combined cycle operation and simple cycle operation with exhaust gases routed through the HRSG and SCR system are presented in Table 5.6-7. The maximum concentrations predicted by operating load and range of ambient temperatures for the simple cycle operation with exhaust gases routed to the emergency bypass stack are presented in Table 5.6-8. The overall maximum pollutant concentrations compared to the PSD Class I significant impact levels are presented in Table 5.6-9.

As shown in Table 5.6-9, the maximum concentrations due to the repowered unit alone at the PSD Class I areas are predicted to be less than the PSD Class I significant impact levels, except for the 24-hour average SO_2 impacts at Bradwell Bay for the CT firing oil and duct burners firing natural gas with exhaust gases routed through the HRSG and SCR system. For the 24-hour average SO_2 concentration, additional analyses were performed that included the SO_2 emission reductions from retirement of the existing Unit 2 boiler. The maximum SO_2 concentrations for these analyses, presented in Table 5.6-10, are predicted to be less than the applicable PSD Class I significant impact levels.

As a result, the Repowering Project's impacts are predicted to comply with the PSD Class I increments.

Table 5.6-1 Project Building Dimensions Used in Modeling Analysis

Stucture	Tier	Height ft	Height m	Length ft	Length m	Width ft	Width m
Proposed Combined Cycle Unit							
CT Inlet Sructure		66.9	20.4	45.3	13.8	17.4	5.3
HRSG Structure		97.1	29.6	101.7	31.0	38.0	11.6
Existing Boiler Buildings							
Main Building	1	31.2	9.5	91.8	28.0	49.2	15.0
	2	73.8	22.5	282.1	86.0	114.8	35.0
Unit Boiler 2	1	185.3	56.5	105.0	32.0	72.2	22.0
	2	106.6	32.5	85.3	26.0	36.1	11.0
	3	73.8	22.5	127.9	39.0	55.8	17.0
Unit Boiler 1	1	126.3	38.5	65.6	20.0	55.8	17.0
	2	31.2	9.5	65.6	20.0	29.5	9.0

Note: CT= combustion turbine; HRSG= heat recovery steam generator

Table 5.6-2 Stack, Operating and SO_2 and PM_{10} Emission Data for the Existing Unit 2 Boiler

Parameter	Values for Unit 2	
General Data		
Operating Load	100%	
Maximum Heat Input, MMBtu/hr	2,325	(fuel oil)
SO_2 Emissions		
Emission Rate, lb/MMBtu	0.76	[a]
lb/hr (g/s)	1,775	(223.7)
Stack Parameters		
Height, ft (m)	250	(76.2)
Exit Diameter, ft (m)	14.0	(4.3)
Operating Parameters		
Gas Flow Rate, acfm	636,706	
Gas Exit Temperature, °F (K)	260	(400)
Gas Exit Velocity, ft/sec (m/s)	68.9	(21.0)

[a] Maximum emissions over a 24-hour averaging period from 2001-2005. Maximum allowable emission rate is 1.4 lb/MMBtu.

Golder Associates

TABLE 5.6-3
MAXIMUM POLLUTANT CONCENTRATIONS PREDICTED FOR THE FOR CT WITH DUCT BURNER AND HRSG BY OPERATING LOAD AND AIR INLET TEMPERATURE, CT/HRSG STACK= 150 FT

Pollutant	Averaging Time	Maximum Predicted Concentration (ug/m^3) Unit 2A: 100% Load with Duct Burner		100% Load		75% Load		50% Load	
		25 °F	95 °F	25 °F	95 °F	25 °F	95 °F	25 °F	95 °F
Natural Gas Operation									
SO_2	Annual	0.17	0.16	0.11	0.11	0.12	0.11	0.12	0.11
	24-Hour	1.29	1.21	0.89	0.85	0.88	0.83	0.86	0.79
	3-Hour	2.67	2.50	1.86	1.76	1.79	1.68	1.77	1.63
PM_{10}	Annual	0.24	0.24	0.12	0.13	0.15	0.16	0.17	0.17
	24-Hour	1.85	1.83	0.94	0.99	1.11	1.13	1.21	1.21
NO_2	Annual	0.55	0.53	0.37	0.36	0.39	0.37	0.40	0.37
CO	8-Hour	14.69	13.65	6.13	5.75	5.84	5.49	5.71	5.31
	1-Hour	24.59	23.35	10.23	9.83	10.16	9.61	10.97	9.90
Fuel Oil Operation									
SO_2	Annual	1.12	1.12	0.90	0.89	0.96	0.92	0.97	0.92
	24-Hour	8.96	8.72	7.45	7.47	7.63	7.22	7.47	6.97
	3-Hour	18.94	18.19	16.74	15.99	16.06	14.94	15.35	14.38
PM_{10}	Annual	0.49	0.51	0.32	0.34	0.38	0.39	0.42	0.42
	24-Hour	3.91	3.97	2.69	2.84	3.05	3.05	3.19	3.15
NO_2	Annual	1.09	1.09	0.68	0.67	0.72	0.69	0.73	0.69
CO	8-Hour	19.86	19.04	10.91	10.38	10.52	10.08	10.32	9.92
	1-Hour	32.48	32.24	17.31	17.28	18.22	17.69	18.22	17.62

[a] Concentrations are based on highest concentrations predicted using five years of meteorological data from 1990 to 1994 of surface and upper air data from the National Weather Service stations at Tallahassee and Waycross, Georgia, respectively.

TABLE 5.6-4
MAXIMUM POLLUTANT CONCENTRATIONS PREDICTED FOR THE CT WITH EMERGENCY BYPASS STACK BY OPERATING LOAD AND AIR INLET TEMPERATURE, BYPASS STACK= 150 FT

		Maximum Predicted Concentration (ug/m^3)					
		Unit 2A					
	Averaging	100% Load		75% Load		50% Load	
Pollutant	Time	25 °F	95 °F	25 °F	95 °F	25 °F	95 °F
Natural Gas Operation							
SO_2	Annual	0.02	0.02	0.02	0.02	0.02	0.02
	24-Hour	0.22	0.21	0.21	0.19	0.20	0.18
	3-Hour	0.63	0.59	0.60	0.56	0.57	0.53
PM_{10}	Annual	0.01	0.02	0.02	0.02	0.02	0.02
	24-Hour	0.19	0.20	0.22	0.23	0.24	0.24
NO_2	Annual	0.10	0.10	0.10	0.10	0.10	0.09
CO	8-Hour	1.57	1.43	1.47	1.38	1.43	1.35
	1-Hour	3.28	2.96	2.93	2.72	2.76	2.58

[a] Concentrations are based on highest concentrations predicted using five years of meteorological data from 1990 to 1994 of surface and upper air data from the National Weather Service stations at Tallahassee and Waycross, Georgia, respectively.

TABLE 5.6-5
SUMMARY OF MAXIMUM POLLUTANT CONCENTRATIONS PREDICTED FOR THE REPOWERED UNIT 2 PROJECT
COMPARED TO THE EPA CLASS II SIGNIFICANT IMPACT LEVELS (CT/HRSG STACK & EMERGENCY BYPASS STACK= 150 FT)

		Maximum Predicted Concentration (ug/m^3)					EPA Class II Significant Impact Levels	PSD Class II Increment
		Unit 2A						
Pollutant	Averaging Time	CT and Duct Burner firing Natural Gas	CT firing Natural Gas	CT firing Oil and Duct Burner firing Natural Gas	CT firing Fuel Oil	MAXIMUM[a]	(ug/m^3)	(ug/m^3)
Unit 2A- CT/HRSG Stack								
SO_2	Annual	0.17	0.12	1.12	0.97	0.52	1	20
	24-Hour	1.29	0.89	9.0	7.6	9.0	5	91
	3-Hour	2.67	1.86	18.9	16.7	18.9	25	512
PM_{10}	Annual	0.24	0.17	0.51	0.42	0.31	1	17
	24-Hour	1.85	1.21	4.0	3.2	4.0	5	30
NO_2	Annual [b]	0.41	0.30	0.82	0.55	0.51	1	25
CO	8-Hour	14.7	6.1	19.9	10.9	19.9	500	10,000
	1-Hour	24.6	11.0	32.5	18.2	32.5	2,000	40,000
Unit 2A- CT with Emergency Bypass Stack								
SO_2	Annual	NA	0.02	NA	NA	0.02	1	20
	24-Hour	NA	0.22	NA	NA	0.22	5	91
	3-Hour	NA	0.63	NA	NA	0.63	25	512
PM_{10}	Annual	NA	0.02	NA	NA	0.02	1	17
	24-Hour	NA	0.24	NA	NA	0.24	5	30
NO_2	Annual [b]	NA	0.08	NA	NA	0.08	1	25
CO	8-Hour	NA	1.57	NA	NA	1.57	500	10,000
	1-Hour	NA	3.28	NA	NA	3.28	2,000	40,000

[a] For the CT/HRSG stack operation, the maximum annual average concentrations are based on prorating the maximum impacts for each operation by the following maximum number of hours requested for that operation:

	Hours for Each Operation				
Pollutant	Natural Gas w/DB	Natural Gas	Fuel Oil w/DB	Fuel Oil	Total
SO_2	150	5,110	3,500	0	8,760
PM_{10}	150	5,110	3,500	0	8,760
NO_2	150	5,110	3,500	0	8,760

For the CT with the bypass stack operation, the maximum annual average concentrations are based on 8,760 hours.

[b] NO_2 concentration based on NO_x to NO_2 conversion rate of 75%.

TABLE 5.6-6
SUMMARY OF MAXIMUM 24-HOUR AVERAGE SO2 CONCENTRATIONS PREDICTED
FOR THE CT WITH DUCT BURNER AND HRSG
COMPARED TO THE EPA CLASS II SIGNIFICANT IMPACT LEVELS

Pollutant	Averaging Time	Maximum Predicted Concentration (ug/m3) a CT firing Fuel Oil and Duct Burner firing Natural Gas	EPA Class II Significant Impact Levels (ug/m^3)	PSD Class II Increment (ug/m^3)
Unit 2A- CT/HRSG Stack				
SO_2	24-Hour	1.58	5	91

[a] Maximum predicted concentration due to the CT with duct burner with emission reductions from the existing Unit 2 boiler.

TABLE 5.6-7
MAXIMUM POLLUTANT CONCENTRATIONS PREDICTED FOR THE CT WITH DUCT BURNER AND HRSG BY OPERATING LOAD AND AIR INLET TEMPERATURE AT THE PSD CLASS I AREAS, CT/HRSG STACK= 150 FT

		Maximum Predicted Concentration (ug/m^3)							
		Unit 2A							
		100% Load with Duct Burner		100% Load		75% Load		50% Load	
Pollutant	Averaging Time	25 °F	95 °F	25 °F	95 °F	25 °F	95 °F	25 °F	95 °F
BRADWELL BAY NWA									
Natural Gas Operation									
SO_2	Annual	0.0038	0.0034	0.0027	0.0024	0.0023	0.0021	0.0021	0.0019
	24-Hour	0.046	0.042	0.032	0.030	0.029	0.026	0.026	0.024
	3-Hour	0.13	0.12	0.09	0.08	0.08	0.08	0.08	0.07
PM_{10}	Annual	0.0055	0.0052	0.0028	0.0028	0.0029	0.0029	0.0029	0.0029
	24-Hour	0.067	0.063	0.034	0.035	0.036	0.036	0.037	0.036
NO_2	Annual	0.012	0.011	0.009	0.008	0.007	0.007	0.007	0.006
CO	8-Hour	0.48	0.42	0.20	0.18	0.17	0.16	0.16	0.14
	1-Hour	1.37	1.21	0.58	0.51	0.49	0.45	0.48	0.44
Fuel Oil Operation									
SO_2	Annual	0.028	0.025	0.025	0.023	0.022	0.020	0.020	0.018
	24-Hour	0.33	0.31	0.30	0.28	0.27	0.24	0.24	0.22
	3-Hour	0.93	0.88	0.80	0.75	0.75	0.69	0.70	0.64
PM_{10}	Annual	0.012	0.012	0.009	0.009	0.009	0.008	0.009	0.008
	24-Hour	0.15	0.14	0.11	0.11	0.11	0.10	0.10	0.10
NO_2	Annual	0.027	0.025	0.019	0.018	0.017	0.015	0.015	0.014
CO	8-Hour	0.68	0.61	0.40	0.36	0.33	0.31	0.30	0.29
	1-Hour	1.93	1.74	1.12	1.00	0.94	0.88	0.88	0.83
ST. MARKS NWA									
Natural Gas Operation									
SO_2	Annual	0.0027	0.0025	0.0019	0.0017	0.0017	0.0015	0.0015	0.0014
	24-Hour	0.0235	0.0211	0.0165	0.0150	0.0154	0.0142	0.0154	0.0138
	3-Hour	0.0906	0.0885	0.0631	0.0597	0.0662	0.0616	0.0662	0.0598
PM_{10}	Annual	0.0039	0.0037	0.0020	0.0020	0.0021	0.0021	0.0021	0.0021
	24-Hour	0.0338	0.0319	0.0175	0.0176	0.0194	0.0195	0.0216	0.0212
NO_2	Annual	0.0089	0.0080	0.0063	0.0057	0.0054	0.0049	0.0049	0.0044
CO	8-Hour	0.33	0.31	0.13	0.12	0.14	0.13	0.15	0.13
	1-Hour	1.15	1.06	0.46	0.44	0.46	0.43	0.47	0.43
Fuel Oil Operation									
SO_2	Annual	0.020	0.018	0.018	0.017	0.016	0.014	0.014	0.013
	24-Hour	0.172	0.158	0.157	0.144	0.136	0.124	0.123	0.112
	3-Hour	0.659	0.604	0.598	0.548	0.522	0.486	0.522	0.493
PM_{10}	Annual	0.009	0.008	0.007	0.006	0.006	0.006	0.006	0.006
	24-Hour	0.075	0.072	0.057	0.055	0.054	0.052	0.053	0.051
NO_2	Annual	0.019	0.018	0.014	0.013	0.012	0.011	0.011	0.010
CO	8-Hour	0.400	0.405	0.219	0.195	0.206	0.201	0.216	0.212
	1-Hour	1.49	1.44	0.76	0.72	0.74	0.72	0.75	0.73

[a] Concentrations are based on highest concentrations predicted using five years of meteorological data from 1990 to 1994 of surface and upper air data from the National Weather Service stations at Tallahassee and Waycross, Georgia, respectively.

TABLE 5.6-8
MAXIMUM POLLUTANT CONCENTRATIONS PREDICTED FOR THE CT WITH EMERGENCY BYPASS STACK BY OPERATING LOAD AND AIR INLET TEMPERATURE, AT THE PSD CLASS I AREAS, CT/HRSG STACK= 150 FT

Pollutant	Averaging Time	Maximum Predicted Concentration (ug/m^3) Unit 2A 100% Load 25 °F	100% Load 95 °F	75% Load 25 °F	75% Load 95 °F	50% Load 25 °F	50% Load 95 °F
BRADWELL BAY NWA							
Natural Gas Operation							
SO_2	Annual	0.0015	0.0013	0.0013	0.0012	0.0012	0.0011
	24-Hour	0.015	0.013	0.013	0.012	0.012	0.011
	3-Hour	0.038	0.034	0.033	0.030	0.030	0.027
PM_{10}	Annual	0.0013	0.0013	0.0014	0.0014	0.0014	0.0014
	24-Hour	0.013	0.013	0.014	0.014	0.014	0.015
NO_2	Annual	0.0087	0.0079	0.0075	0.0069	0.0068	0.0062
CO	8-Hour	0.11	0.10	0.09	0.09	0.09	0.08
	1-Hour	0.29	0.26	0.25	0.23	0.23	0.22
ST. MARKS NWA							
Natural Gas Operation							
SO_2	Annual	0.0011	0.0010	0.0010	0.0009	0.0009	0.0008
	24-Hour	0.0081	0.0074	0.0073	0.0066	0.0067	0.0061
	3-Hour	0.021	0.020	0.021	0.019	0.020	0.018
PM_{10}	Annual	0.0010	0.0010	0.0010	0.0010	0.0011	0.0011
	24-Hour	0.0069	0.0072	0.0077	0.0078	0.0081	0.0082
NO_2	Annual	0.0067	0.0061	0.0057	0.0052	0.0052	0.0047
CO	8-Hour	0.048	0.042	0.039	0.036	0.037	0.035
	1-Hour	0.17	0.15	0.14	0.13	0.13	0.12

[a] Concentrations are based on highest concentrations predicted using five years of meteorological data from 1990 to 1994 of surface and upper air data from the National Weather Service stations at Tallahassee and Waycross, Georgia, respectively.

TABLE 5.6-9
SUMMARY OF MAXIMUM POLLUTANT CONCENTRATIONS PREDICTED FOR THE REPOWERED UNIT 2 PROJECT
COMPARED TO THE EPA CLASS I SIGNIFICANT IMPACT LEVELS (CT/HRSG AND EMERGENCY BYPASS STACKS = 150 FT)

		Maximum Predicted Concentration (ug/m^3)					EPA Class II Significant Impact Levels	PSD Class II Increment
		Unit 2A						
Pollutant	Averaging Time	CT and Duct Burner firing Natural Gas	CT firing Natural Gas	CT firing Oil and Duct Burner firing Natural Gas	CT firing Fuel Oil	Maximum[a]	(ug/m^3)	(ug/m^3)
Unit 2A- CT/HRSG Stack								
BRADWELL BAY								
SO_2	Annual	0.0038	0.0027	0.028	0.025	0.013	0.1	2
	24-Hour	0.046	0.032	0.33	0.30	0.33	0.2	5
	3-Hour	0.13	0.09	0.93	0.80	0.93	1	25
PM_{10}	Annual	0.0055	0.0029	0.012	0.009	0.007	0.2	4
	24-Hour	0.067	0.037	0.15	0.11	0.15	0.3	8
NO_2	Annual [b]	0.0093	0.0066	0.020	0.014	0.012	0.1	2.5
ST. MARKS								
SO_2	Annual	0.0027	0.0019	0.020	0.018	0.009	0.1	2
	24-Hour	0.024	0.0165	0.172	0.157	0.17	0.2	5
	3-Hour	0.091	0.066	0.66	0.60	0.66	1	25
PM_{10}	Annual	0.0039	0.0021	0.009	0.007	0.005	0.2	4
	24-Hour	0.0338	0.0216	0.075	0.057	0.08	0.3	8
NO_2	Annual [b]	0.0067	0.0047	0.015	0.010	0.009	0.1	2.5
Unit 2A- CT with Emergency Bypass Stack								
BRADWELL BAY								
SO_2	Annual	NA	0.0015	NA	NA	0.0015	0.1	2
	24-Hour	NA	0.015	NA	NA	0.015	0.2	5
	3-Hour	NA	0.038	NA	NA	0.038	1	25
PM_{10}	Annual	NA	0.0014	NA	NA	0.0014	0.2	4
	24-Hour	NA	0.015	NA	NA	0.015	0.3	8
NO_2	Annual [b]	NA	0.0087	NA	NA	0.0087	0.1	2.5
ST. MARKS								
SO_2	Annual	NA	0.0011	NA	NA	0.0011	0.1	2
	24-Hour	NA	0.0081	NA	NA	0.0081	0.2	5
	3-Hour	NA	0.021	NA	NA	0.021	1	25
PM_{10}	Annual	NA	0.0011	NA	NA	0.0011	0.2	4
	24-Hour	NA	0.0082	NA	NA	0.0082	0.3	8
NO_2	Annual [b]	NA	0.0067	NA	NA	0.0067	0.1	2.5

[a] For the CT/HRSG stack operation, the maximum annual average concentrations are based on prorating the maximum impacts for each operation by the following maximum number of hours requested for that operation:

	Hours for Each Operation				
Pollutant	Natural Gas w/DB	Natural Gas	Fuel Oil w/DB	Fuel Oil	Total
SO_2	150	5,110	3,500	0	8,760
PM_{10}	150	5,110	3,500	0	8,760
NO_2	150	5,110	3,500	0	8,760

For the CT with the bypass stack operation, the maximum annual average concentrations are based on 8,760 hours.

[b] NO_2 concentration based on NO_x to NO_2 conversion rate of 75%.

TABLE 5.6-10
SUMMARY OF MAXIMUM 24-HOUR AVERAGE SO2 CONCENTRATIONS PREDICTED FOR THE PROJECT COMPARED TO THE EPA CLASS I SIGNIFICANT IMPACT LEVELS

Pollutant	Averaging Time	Maximum Predicted Concentration (ug/m3) [a] CT firing Oil and Duct Burner firing Natural Gas	EPA Class II Significant Impact Levels (ug/m^3)	PSD Class II Increment (ug/m^3)
BRADWELL BAY				
Unit 2A- CT/HRSG				
SO_2	24-Hour	0.00	0.2	5

[a] Maximum predicted concentration due to the CT with duct burner with emission reductions from the existing Unit 2 boiler.

5.7 NOISE

5.7.1 Existing And Proposed Noise Sources

Noise levels of the existing Hopkins Generating Station noise sources were measured using the procedures described in Section 2.3.8 during the baseline noise measurement portion of the impact evaluation. The existing Unit 1 and combustion turbines GT-1 through GT-4 at the Hopkins Generating Station will continue to operate and emit noise after the Repowering Project is complete. The Unit 2 steam generating equipment will be retired and taken out of service, but new equipment added for the Repowering Project will also emit noise. These new noise sources include the combustion turbine air inlets, the load compartment vent fans, the exhaust ducts, the HRSGs and their stacks, the boiler feed pumps, and the power transformers. Unlike the existing Unit 1 and 2 boilers, the HRSGs do not have induced draft (ID) fans that generate noise; the combustion turbine exhaust and steam noise will be attenuated through the HRSG thermal insulation. The proposed new noise sources and their octave band and overall sound power levels (SPLs) for normal operations and bypass operations are listed in Tables 5.7-1 and 5.7-2, respectively.

5.7.2 Noise Impact Methodology

Sound propagation involves three principal components: a noise source, a person or a group of people, and the transmission path. While two of these components, the noise source and the transmission path, are easily quantified (i.e., through direct measurements or predictive calculations), the effects of noise to humans is the most difficult to determine due to the varying responses of humans to the same or similar noise patterns. The perception of sound (noise) by humans is very subjective and, just like odors and taste, is very difficult to predict a response from one individual to another.

The impact evaluation of the Repowering Project was performed using CADNA A, an environmental noise propagation computer program that was developed to assist with noise abatement calculations for major noise sources and projects. Noise sources are entered as octave band sound power levels, Lw. Locations of the noise sources, buildings, and receptors are input directly on the base map and can be edited throughout the modeling process. All noise sources are assumed to be a point, line, area or vertical area source, and can be specified by the user. Sound propagation is calculated by accounting for hemispherical spreading and three other user-identified attenuation options: atmospheric attenuation, path-specific attenuation, and barrier attenuation. Atmospheric attenuation is calculated using the data specified by the Calculation of the Absorption of Sound by the Atmosphere (ANSI, 1999). Path-specific attenuation can be specified to account for the effects of vegetation, foliage, and wind shadow. Directional source characteristics and reflection can be simulated using path-specific attenuation. Barrier attenuation is calculated by assuming an infinitely long barrier perpendicular to the source-receptor path. Total and A-weighted SPLs are calculated.

The SPLs for the major noise sources during normal operation of the repowered Unit 2 are provided in Table 5.7-1. Table 5.7-2 provides data for the major noise sources during bypass operations. The noise sources in both tables include both Phase 1 and Phase 2 repowering (that is, two combustion turbines and two HRSGs).

The noise impact modeling was performed to predict the maximum noise levels produced by the proposed and existing noise sources. Background L90 levels, measured during the baseline noise study, were included in the predicted maximum SPLs calculated for four critical receptors. These critical receptors consisted of residential and agricultural land use areas where ambient noise measurements were taken (refer to Section 2.3.8). Atmospheric and foliage attenuation was used in the model for all receptors.

5.7.3 Results

Tables 5.7-3 and 5.7-4 present the existing background and predicted noise levels at the four impact locations for normal operations and bypass operations, respectively. The measured noise levels include the operation of existing the Unit 2 and GT1 through GT4, and are the L90 noise levels considered to be background for the area around the Hopkins Site.

Figure 5.7-1 illustrates the sound level isopleths developed for normal operations of the repowered Unit 2 from the results of the noise model. Table 5.7-3 provides the normal operations sound levels and compares the existing sound levels (pre-repowering) with the Project sound levels (post-repowering). The nearest residential receptor (the North-East location in Figure 5.7-1) is approximately 1,200 feet to the northeast of the repowered Unit 2 location. As shown in Table 5.7-3, the predicted noise level impact at this receptor, due to the repowered unit only, is 53.7 dBA. The noise level at this receptor with background noise included is 55.4 dBA for the daytime and 55.2 dBA for the nighttime. All of these values are well within sound levels normally associated with residential land use. There are no federal, state or county numeric noise standards applicable to the Project.

Under certain conditions, the repowered Unit 2 may have to operate in simple cycle mode utilizing the bypass stacks described previously. Table 5.7-4 provides the bypass operations sound levels and compares the existing sound levels (pre-repowering) with the Project sound levels (post-repowering). The noise level impact during bypass operations, due to the repowered unit only, is calculated to be 53.8 dBA at the North-East receptor. Figure 5.7-2 illustrates the predicted noise levels for bypass operations. As previously stated, the predicted values are well within sound levels normally associated with residential land use.

It should be noted that the predicted noise levels shown in Figures 5.7-1 and 5.7-2 and in Tables 5.7-3 and 5.7-4 are based on two combustion turbines and two HRSGs, which represents the final Project configuration after completion of Phase 2 repowering. When the Project is operating with one combustion turbine and one HRSG (the Phase 1 configuration), the predicted noise levels will be approximately 3 dBA lower than with the Phase 2 configuration.

Intermittent noise sources during routine startup, testing and maintenance, and emergency conditions will include steam venting. Such activities would not normally occur simultaneously and would last for a short duration.

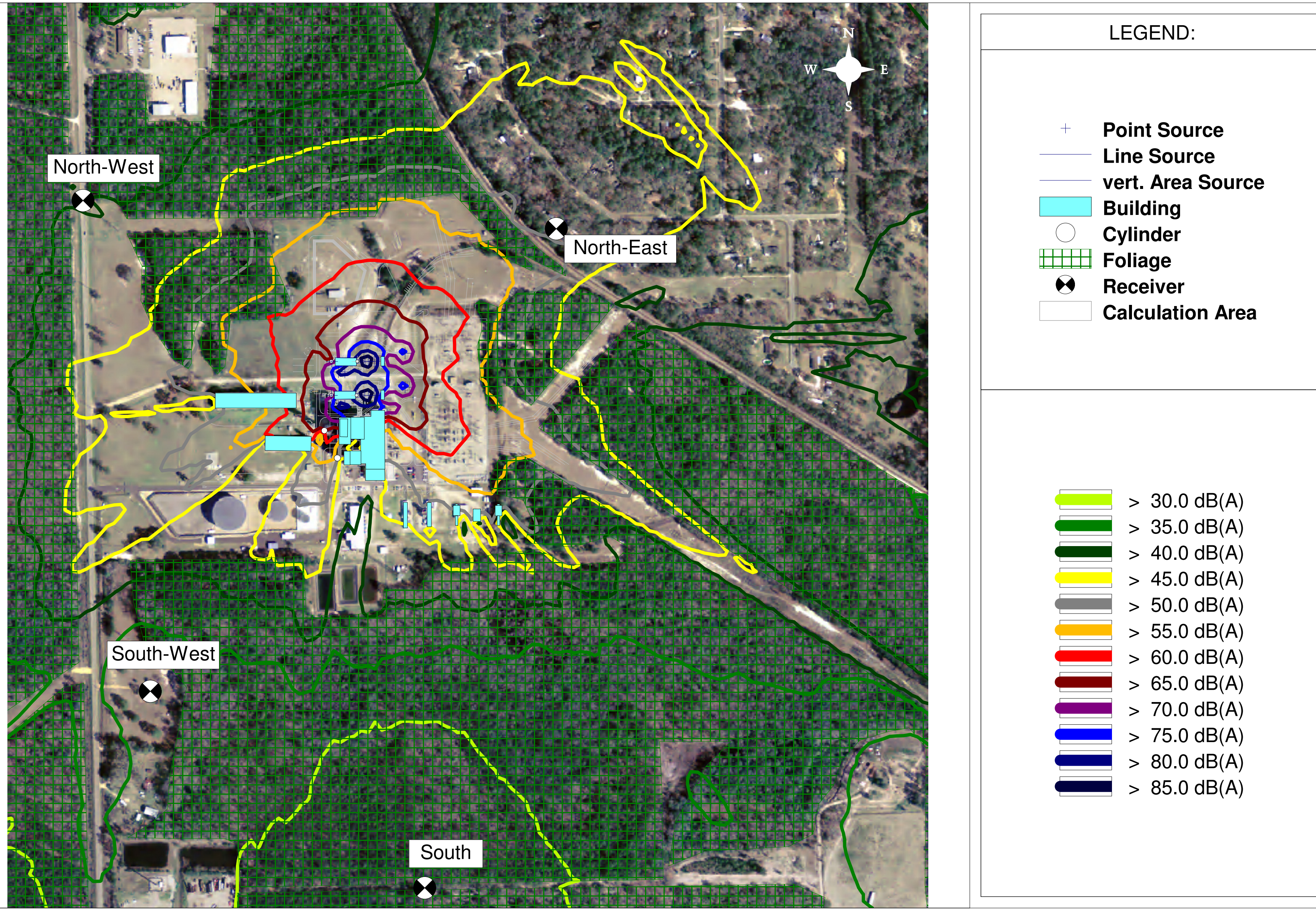


Figure 5.7-1. Normal Operations Noise Map
Arvah B. Hopkins Generating Station
Unit 2 Repowering Project
City of Tallahassee

Golder Associates

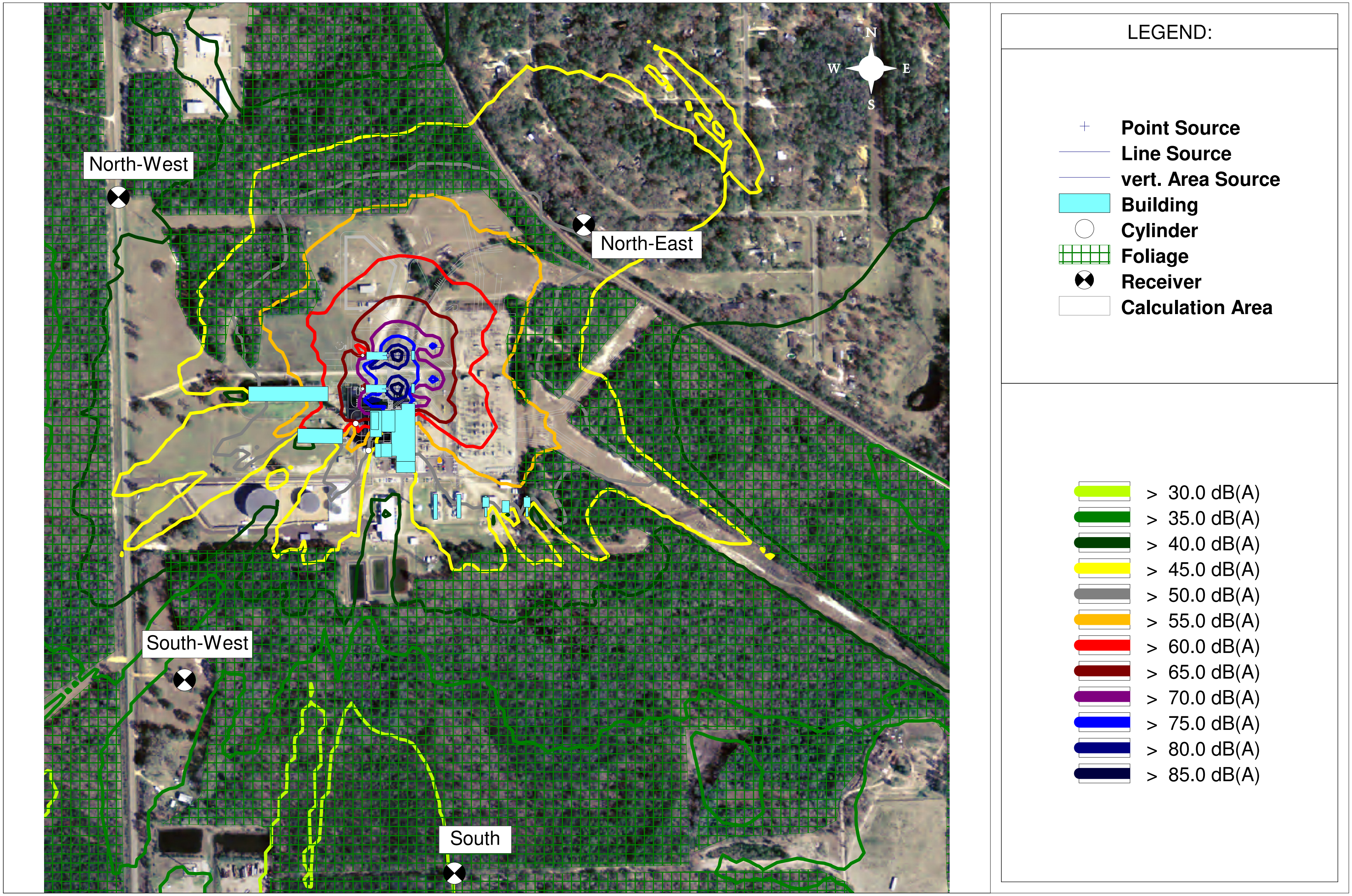


Figure 5.7-2. Bypass Operations Noise Map
Arvah B. Hopkins Generating Station
Unit 2 Repowering Project
City of Tallahassee

Golder Associates

Table 5.7-1 Summary of Noise Source Data Used in the Normal Operations Impact Analysis

Sources	Source Location		Source Height	Sound Power Level (dB) for Octave Band Center Frequency (Hz)									Overall Sound Power Level
	X (m)	Y (m)	(m)	31.5	63	125	250	500	1000	2000	4000	8000	(dBA)
1 HRSG Stack	749657.1	3371705.7	45.4	107	114	102	101	81	61	51	43	30	94.5
2 HRSG Stack	749657.0	3371656.3	45.4	107	114	102	101	81	61	51	43	30	94.5
1 CT Transformer	749763.7	3371717.6	2.0	102	108	110	109	105	99	94	89	82	106.1
2 CT Transformer	749763.9	3371668.2	2.0	102	108	110	109	105	99	94	89	82	106.1
1a Boiler Feed Pump	749667.0	3371690.4	2.0	109	106	103	102	103	102	103	95	83	107.7
1b Boiler Feed Pump	749676.2	3371690.4	2.0	109	106	103	102	103	102	103	95	83	107.7
2a Boiler Feed Pump	749667.0	3371640.9	2.0	109	106	103	102	103	102	103	95	83	107.7
2b Boiler Feed Pump	749676.2	3371641.0	2.0	109	106	103	102	103	102	103	95	83	107.7
Turbine Vent Fan 1A	749705.4	3371705.7	8.5	110	110	115	108	105	99	110	112	113	117.2
Turbine Vent Fan 1B	749710.4	3371705.6	8.5	110	110	115	108	105	99	110	112	113	117.2
Turbine Vent Fan 2A	749705.1	3371656.3	8.5	110	110	115	108	105	99	110	112	113	117.2
Turbine Vent Fan 2B	749710.4	3371656.3	8.5	110	110	115	108	105	99	110	112	113	117.2
Load Comp Vent Fan 1	749719.0	3371705.8	6.5	107	109	109	105	100	98	101	97	90	106.2
Load Comp Vent Fan 2	749719.2	3371656.2	6.5	107	109	109	105	100	98	101	97	90	106.2
Exhaust Duct North 1	--	--	--	119	116	114	107	106	104	102	101	98	124.4
Exhaust Duct South 1	--	--	--	119	116	114	107	106	104	102	101	98	124.4
Exhaust Duct North 2	--	--	--	119	116	114	107	106	104	102	101	98	124.4
Exhaust Duct South 2	--	--	--	119	116	114	107	106	104	102	101	98	124.4
HRSG North 1	--	--	--	117	122	118	110	100	99	87	67	37	136.1
HRSG South 1	--	--	--	117	122	118	110	100	99	87	67	37	136.1
HRSG North 2	--	--	--	117	122	118	110	100	99	87	67	37	136.0
HRSG South 2	--	--	--	117	122	118	110	100	99	87	67	37	136.0
Air Inlet 1	--	--	--	102	106	99	94	86	78	74	82	77	111.3
Air Inlet 2	--	--	--	102	106	99	94	86	78	74	82	77	111.3

Source: Golder, 2006; Sargent and Lundy, 2006.

Table 5.7-2 Summary of Noise Source Data Used in the Bypass Operations Impact Analysis

Sources	Source Location		Source Height	Sound Power Level (dB) for Octave Band Center Frequency (Hz)									Overall Sound Power Level
	X (m)	Y (m)	(m)	31.5	63	125	250	500	1000	2000	4000	8000	(dBA)
1 Bypass Stack	749694.4	3371705.7	45.4	120	127	113	115	97	87	88	87	75	108.1
2 Bypass Stack	749693.3	3371656.2	45.4	120	127	113	115	97	87	88	87	75	108.1
1 CT Transformer	749763.7	3371717.6	2.0	102	108	110	109	105	99	94	89	82	106.1
2 CT Transformer	749763.9	3371668.2	2.0	102	108	110	109	105	99	94	89	82	106.1
1a Boiler Feed Pump	749667.0	3371690.4	2.0	109	106	103	102	103	102	103	95	83	107.7
1b Boiler Feed Pump	749676.2	3371690.4	2.0	109	106	103	102	103	102	103	95	83	107.7
2a Boiler Feed Pump	749667.0	3371640.9	2.0	109	106	103	102	103	102	103	95	83	107.7
2b Boiler Feed Pump	749676.2	3371641.0	2.0	109	106	103	102	103	102	103	95	83	107.7
Turbine Vent Fan 1A	749705.4	3371705.7	8.5	110	110	115	108	105	99	110	112	113	117.2
Turbine Vent Fan 1B	749710.4	3371705.6	8.5	110	110	115	108	105	99	110	112	113	117.2
Turbine Vent Fan 2A	749705.1	3371656.3	8.5	110	110	115	108	105	99	110	112	113	117.2
Turbine Vent Fan 2B	749710.4	3371656.3	8.5	110	110	115	108	105	99	110	112	113	117.2
Load Comp Vent Fan 1	749719.0	3371705.8	6.5	107	109	109	105	100	98	101	97	90	106.2
Load Comp Vent Fan 2	749719.2	3371656.2	6.5	107	109	109	105	100	98	101	97	90	106.2
Air Inlet 1	--	--	--	102	106	99	94	86	78	74	82	77	111.3
Air Inlet 2	--	--	--	102	106	99	94	86	78	74	82	77	111.3

Source: Golder, 2006; Sargent and Lundy, 2006.

Table 5.7-3 Measured Background and Calculated Noise Impact Levels for Normal Operations

Site		X (m)	Y (m)	Z (m)	Project Only	Background L_{90}	Project Total
North-East	Day	749,984.2	3,371,898.9	2	53.7	50.4	55.4
	Night				53.7	49.7	55.2
North-West	Day	749,295.1	3,371,939.7	2	43.6	50.1	51.0
	Night				43.6	54.1	54.5
South-West	Day	749,393.0	3,371,225.6	2	37.3	47.7	48.1
	Night				37.3	49.1	49.4
South	Day	749,792.4	3,370,939.4	2	31.6	46.1	46.3
	Night				31.6	45.7	45.9

Table 5.7-4 Measured Background and Calculated Noise Impact Levels for Bypass Operations

Site		X (m)	Y (m)	Z (m)	Project Only	Background L_{90}	Project Total
North-East	Day	749,984.2	3,371,898.9	2	53.8	50.4	55.4
	Night				53.8	49.7	55.2
North-West	Day	749,295.1	3,371,939.7	2	43.3	50.1	50.9
	Night				43.3	54.1	54.4
South-West	Day	749,393.0	3,371,225.6	2	41.5	47.7	48.6
	Night				41.5	49.1	49.8
South	Day	749,792.4	3,370,939.4	2	34.9	46.1	46.4
	Night				34.9	45.7	46.0

5.8 CHANGES IN NON-AQUATIC SPECIES POPULATIONS

5.8.1 Impacts

No adverse impacts to non-aquatic species are anticipated during operation of the Repowering Project, as the area proposed for the Project is directly adjacent to the existing Hopkins Generating Station facilities and does not provide significant suitable natural habitat for wildlife. The Project area has been significantly disturbed during construction and operation of the existing Hopkins facilities, including removal of forested vegetative communities and topographic grading. The open, cleared field designated for location of the repowered Unit 2 is not considered critical habitat for any species of wildlife. The surrounding forested parcels will continue to provide habitat for wildlife; therefore, construction and operation of the Project is not anticipated to result in the reduction of any populations of non-aquatic species.

No adverse impacts to federal- or state-listed terrestrial plants or animals are expected, due to the existing developed nature of the habitat within the Repowering Project area. As described in Section 2.3.6, the Repowering Project area does not support listed species of plants or animals, except for a small number of gopher tortoises. During Project operation, this species will be avoided in accordance with FFWCC guidelines. No change in the populations of any threatened or endangered species is anticipated as a result of the Project.

No changes in wildlife populations, including listed species, are anticipated in the undeveloped areas adjacent to the Repowering Project. Noise and lighting impacts due to the Project are expected to be minimal and consistent with current levels of impacts, and are not anticipated to deter the continued wildlife utilization of the forested areas surrounding the Hopkins Site based upon evidence from existing power facilities in Florida. Natural areas adjacent to existing power plants such as the Hopkins Generating Station continue to provide suitable habitat for wildlife, including threatened and endangered species, which in many cases utilize habitats directly adjacent to plant facilities. The evidence indicates that construction and operation of power plant facilities do not render adjacent areas unsuitable for wildlife, which become acclimated to the low level of noise and lighting impacts.

No impacts to listed species of plants or wildlife will occur as a result of the Repowering Project's air pollution emissions, which will be below the levels designed to prevent adverse impacts to human health, wildlife, and vegetation. The emission levels for several pollutants will be lower than the current emission levels from Hopkins Unit 2.

5.8.2 Monitoring

Because no significant impacts to non-aquatic species populations are anticipated, no monitoring program is proposed.

5.9 OTHER PLANT OPERATION EFFECTS

Vehicle traffic during operation of the repowered Hopkins Unit 2 is likely to be less than the traffic generated from the existing Hopkins facility, for the following reasons:

- Truck deliveries of fuel oil will decrease from an average of 52 trucks per day under current permitted conditions when firing 100% fuel oil to an average of 19 trucks per day after Phase 1 repowering and 38 trucks per day after Phase 2 repowering assuming proposed fuel oil firing conditions.
- Operations employment will not increase as a result of repowering.

During operation of the repowered Unit 2, trip distribution is anticipated to be spilt evenly on Geddie Road, with approximately 50% of the traffic departing to the south and 50 percent departing to the north. Most (80% assumed) of the operation traffic will turn east on either SR 20 or SR 90.

Based on the trip generation and distribution presented above, no significant changes in the level of service on area roads are anticipated.

Views of the repowered Unit 2 will generally be limited from all public locations to the upper portions of the new stacks except for the two Hopkins Station entrances on Geddie Road. At these entrances, most of the new facilities will be visible, but this view already includes the existing Hopkins Station facilities, as illustrated in the photographic simulation in Figure 5.9-1.

Figure 5.9-1 Photographic Simulation of Hopkins Generating Station After Phase 2 Repowering

Source: S&L, 2006

5.10 ARCHAEOLOGICAL SITES

Operation of the repowered Hopkins Unit 2 is expected to have no effect on archaeological resources. No significant or potentially significant archaeological properties are located within the area that would be affected by normal operation.

In the event that post-construction activities result in the discovery of archaeological materials, activities that have the potential to disturb those materials will be halted until an evaluation of their potential significance is made by a professional archaeologist. If the materials are believed to be significant, the State Historic Preservation Officer (SHPO) will be consulted to identify appropriate measures.

5.11 RESOURCES COMMITTED

The major irreversible and irretrievable commitments of national, state and local resources due to the Repowering Project are the use of land, water, natural gas, No. 2 fuel oil, and aqueous ammonia. For the most part, these resource commitments will not increase above existing levels of commitments already occurring at the Hopkins Generating Station.

The Repowering Project will affect about 19 acres of land within the existing Hopkins Site. All of this land has already been significantly impacted by construction and operation of the existing power plant.

The use of water by the repowered unit will be for condenser cooling, power augmentation, water injection for NO_X control when firing fuel oil, other process water requirements, and potable water. This will not increase the amount of water required as compared with that characterized in the original Site Certification for the Hopkins Site.

Natural gas and No. 2 fuel oil will be consumed during operation of the repowered unit. The amounts are described in Section 3.3. While this is an irreversible and irretrievable commitment of a national energy resource, the Repowering Project will result in a 30% reduction in the amount of fuel required for each megawatt of electricity produced, resulting in a more efficient use of this resource.

Aqueous ammonia will be required for the operation of the SCR systems, with the amount depending upon the overall operation of the repowered unit. While ammonia will be consumed, emissions of NO_X will be substantially reduced (approximately 50% or greater) as a result.

The repowered unit will decrease air pollution levels from those existing in the vicinity of the Hopkins Generating Station.

The Repowering Project will effectively utilize national, State, and local resources, given the production of efficient electric power, low environmental impacts, and the use of a previously impacted site.

5.12 VARIANCES

No variances are being requested as part of this application for Site Certification modification.

6.0 TRANSMISSION LINES AND OTHER LINEAR FACILITIES

The Repowering Project will not require certification of any associated linear facilities, such as transmission lines or rail lines. Therefore, Chapter 6 is not necessary for this application for Site Certification modification.

7.0 ECONOMIC AND SOCIAL EFFECTS OF PLANT CONSTRUCTION AND OPERATION

The purpose of this chapter is to identify the economic and social effects of construction and operation of the proposed Repowering Project and describe the Project's benefits and costs to the Leon County economy and to the State of Florida.

Socioeconomic effects can be classified as either direct or indirect effects. Direct effects are those that are the direct result of the construction or operation of the Project. Indirect effects are costs and benefits that affect people and business interests in the vicinity of the Project who, because of their relative proximity to the Project, may experience changes in their local socioeconomic environment, such as increased spending due to Project construction and operation. Some of these effects are estimated through the use of economic models that rely on generally accepted assumptions to assess the relative values of expected costs and benefits.

This chapter is divided into two sections. Section 7.1 addresses the socioeconomic benefits of the Repowering Project and includes an analysis of the plant construction and operational expenditures. Section 7.2 addresses the temporary and long-term indirect costs involving the construction and operation of the Project, as well as the use of private and public services in Leon County and surrounding counties. All cost and benefit values are based on 2005-dollar values.

7.1 SOCIOECONOMIC BENEFITS

7.1.1 Direct Socioeconomic Benefits

The Repowering Project is expected to have a net benefit on the local community. Direct economic benefits from the Project include employment opportunities created during the construction phase of the Project. Employment opportunities will result from construction job opportunities as well as jobs indirectly generated through the purchase of goods and services in the area. There will be no increase in the number of operational employees at the Hopkins Generating Station due to the Repowering Project.

Another major direct economic benefit will be associated with the improved efficiency gained as a result of repowering the existing Unit 2. Repowering is expected to improve the Unit 2 heat rate (amount of fuel consumed to generate a kW-hr of electricity) by approximately 30%. This improved efficiency will result in a reduction in total fuel cost to the City's electric customers. Depending upon the cost of fuel, these savings are estimated at between $12 million and $24 million per year. These savings more than offset the additional fixed costs (debt service and operation/maintenance costs) associated with the Repowering Project.

7.1.1.1 Project Economic Profile

Construction of Phase 1 of the Repowering Project is anticipated to begin in 2007 and conclude in 2008. The peak construction workforce during Phase 1 construction is estimated to be 109 people, with an average construction workforce of approximately 79. Phase 2 construction has not yet been scheduled. The peak construction workforce during Phase 2 construction is estimated to be 96 people, with an average construction workforce of approximately 70. The estimated construction workforce by trade is presented in Tables 4.10-1 and 4.10-2.

The total development cost for Phase 1 of the Repowering Project will be approximately $120 million. The major components of this costs include equipment and materials (about $74 million) construction workforce wages (about $17 million), and other construction costs such as consumables, insurance, benefits, etc. (about $19 million). Remaining costs for development of the Repowering Project are associated with engineering, permitting, financing, contingencies, and other miscellaneous costs.

Another significant, direct benefit of the Project is the savings in fuel costs for the City’s electric customers. As noted in Chapter 1.0, the planning studies conducted to date indicate fuel cost savings between $12 million and $24 million per year of operation, depending on the cost of natural gas.

7.1.1.2 Fiscal Impacts

Since the City of Tallahassee is exempt from ad valorem taxes, the Repowering Project will not generate significant new tax revenues. However, because the Hopkins Generating Station is largely self-sufficient, the Repowering Project will not require additional public utilities or services as compared to the current level of services provided to the station.

7.1.1.3 Economic Impacts

Among the primary direct benefits of Repowering Project construction will be the increase in job opportunities for Leon County and adjacent areas. It is anticipated that construction employment will average 79 workers over the 20-month Phase 1 construction period commencing in 2007. The total payroll for Phase 1 construction is estimated to be $17 million. Direct benefits of

Project construction and will result from those materials purchased in the local market area and the wages expended in the in the local market area.

7.1.2 Indirect Socioeconomic Benefits

Employment opportunities and the purchase of goods and services to support construction of Phase 1 of the Repowering Project are anticipated to occur over a 20-month period beginning in 2007 and ending in 2008. It is expected that a large portion of the construction wages paid by City contractors for Repowering Project construction will be spent within Leon County and the surrounding counties. These expenditures will create additional demands for goods and services. As the money is spent, it will create a multiplier effect within the area, thereby generating economic activity, including additional jobs and earnings. These are indirect or secondary benefits of the Repowering Project, which will be enjoyed by other companies whose payrolls will increase. It is anticipated that, consumable materials (wood, concrete, etc.), services, and rentals associated with construction will likely be purchased in the local area.

The average number of jobs directly created during Phase 1 construction is estimated at 79 employees. Due to the multiplier effect described above, an indirect employment increase from the Project will also occur, and will result in additional jobs in Leon County and surrounding areas.

7.1.3 Other Economic Benefits

The major costs of operating the repowered Unit 2 will be associated with fuel, aqueous ammonia, and water treatment chemicals. These costs include not only the cost of the commodity, but also the cost of transportation to the Hopkins Site.

7.1.4 Recreational and Environmental Values

Construction and operation of the Repowering Project will not cause a significant impact on the recreational and environmental value and visual quality of the area.

Disturbance during construction of the Project will be insignificant to minor at the closest recreation facilities. During Project operation, impacts are anticipated to be non-existent to minimal due to the following reasons:

- Collocation of the Repowering Project with existing power plant facilities;
- Adherence to County-required setbacks for the Project facilities from the Hopkins Site boundaries;
- Extensive air pollution controls and reductions for point source emissions and fugitive dust;
- No change in use of groundwater resources;
- A stormwater management system that includes design for retention of the 25-year, 24-hour storm event;
- An outdoor lighting plan that incorporates lighting standards and fixtures to minimize upward light spill and glare; and
- Views of the Repowering Project will generally be limited from all public locations to the upper portions of the new stacks except for two plant entrances on Geddie Road. At these entrances, most of the new facilities will be visible, but the view will be from a location in a viewshed that already includes the existing Hopkins Generating Station structures.

7.1.5 Onsite Enhancements

The use of extensive air pollution control equipment, stormwater controls, and other design features, combined with the location of the Repowering Project within the existing Hopkins Site boundary, will ensure minimal impacts to the surrounding areas and the scattered residential developments to the north, east, and south of the Site. Both the Project location on the Hopkins Site and the design features of the Project will minimize the impacts to aesthetics, ambient noise levels, and transportation.

7.1.6 Off-site Enhancements

Based on overall Project impacts, no off-site enhancement are proposed or warranted.

7.1.7 Environmental Benefits

The proposed Project will provide a wide variety of environmental benefits for Leon County and the State of Florida. The Project maximizes beneficial use of an existing power plant site. This minimizes the potential environmental impacts associated with the generation of electric power. The Project also capitalizes on the use of existing linear facilities and utilities serving the existing power plant, including transmission lines, rail lines, and water, wastewater and some stormwater infrastructure. The use of this existing infrastructure minimizes the extent of off-site infrastructure development, which would otherwise have the potential to impact wetlands or wildlife habitat.

7.1.7.1 Summary of Benefits

Impacts to the economy associated with construction and operation of the Repowering Project are expected to be positive. Labor demands associated with the construction and operation of the Project are not expected to create any labor shortages. Expenditures for Project materials and expenditures by newly hired workers will boost economic activity and incomes in Leon County and surrounding counties. Population and housing impacts associated with the Project will be slight due to minimal in-migration into the area.

Transportation impacts are expected to be related primarily to increased traffic associated with the daily commute of construction workers to and from the Hopkins Site. Construction worker traffic will vary with the Project staging, with peak traffic expected to occur during mid-2007. The levels of service (LOS) will decline on local roadway segments and intersections during morning and afternoon peak hours below LOS standards. Once the repowered unit is operational, transportation impacts on area roads will be negligible and will actually be reduced by a decrease in truck traffic. As presented in Subsection 5.9.1, truck traffic and automobile traffic from operations and maintenance activities should not impact other traffic using roadways or impact levels of service on local roadways.

Overall land use impacts from the construction and operation of the Repowering Project are expected to be minor due to the on-site buffer of the Project and its overall size, bulk and density. No direct land use impacts are anticipated to be associated with the operation and maintenance of the repowered Unit 2.

Visual impacts from the construction and operation of the Project will be minimal and localized.

Cultural and historical resources in the vicinity of the Hopkins Site will be unaffected by construction and operation of the Project. No resources of historic or cultural significance are located on the Hopkins Site.

Overall, socioeconomic impacts associated with the construction and operation of the Repowering Project generally will be favorable. Although the local community may experience some temporary impacts during peak construction periods, economic impacts are expected to be positive.

7.2 SOCIOECONOMIC COSTS

7.2.1 Temporary External Costs

The Repowering Project will create job opportunities for local construction workers. It is anticipated that there will also be a percentage of the construction workforce that will travel to the Site from outside of the area. These transient workers may choose to live in short term accommodations (motels, hotels, campgrounds, recreational vehicle (RV) parks) on a weekly/monthly basis. It is not anticipated that construction workers will create any new or unusual impacts or demands on housing, public facilities or services.

Temporary external costs include the generation of construction traffic and noise from delivery trucks each day. Construction of Phase 1 will last approximately 20 months, with a peak period in mid-2007.

7.2.2 Long-Term External Costs

The Repowering Project's long-term external cost impacts will be minimal and localized. The Project is located on an existing power plant site, adjacent to existing power generation units. With the incorporation of environmental mitigation measures, the operation of the repowered unit will not cause any impairment to recreational values, result in any deterioration of aesthetic and scenic values, or restrict access to areas of scenic value. The Project also will not displace persons from the land or result in any significant net costs to local government.

8.0 SITE AND DESIGN ALTERNATIVES

This optional chapter is not included as part of this application for Site Certification modification, because an Environmental Impact Statement (EIS) under the National Environmental Policy Act (NEPA) is not expected to be required for the Repowering Project.

9.0 COORDINATION

9.1 FEDERAL COORDINATION

No Federal contacts were made in the preparation of this application for SCA Modification

9.2 STATE COORDINATION

Kathleen Breland
Florida Department of Environmental Protection – Stormwater Department
Meeting on 1/19/06 concerning stormwater detention requirements

Laren Connell and Vanessa Morrill
Northwest Florida Water Management District
Phone conversations on 2/03/06 and 2/08/06 concerning well searches
E-mail correspondence on 2/03/06 and 2/08/06 concerning well searches

9.3 LOCAL COORDINATION

Bing Xu
Leon County Stormwater Engineer
Meeting on 1/19/06 concerning stormwater detention requirements