Florida Municipal Power Agency

Roger A. Fontes
General Manager and CEO

April 1, 2008

Mr. Michael P. Halpin, P.E.
Administrator, Siting Coordination Office
Department of Environmental Protection
2600 Blair Stone Road
Suite 649, MS-48
Tallahassee, FL 32399-2400

Re: Florida Municipal Power Agency and
Kissimmee Utility Authority
Site Certification Application
Cane Island Power Park Unit 4
PA-98-38

Dear Mr. Halpin:

On behalf of the Florida Municipal Power Agency (FMPA) and Kissimmee Utility Authority (KUA), I am pleased to submit this Site Certification Application (SCA) for a new unit, Unit 4, at the existing Cane Island Power Park located near Kissimmee in Osceola County. Certification is sought under the procedures of the Florida Electrical Power Plant Siting Act and Chapter 62-17 of the Florida Administrative Code (FAC). Units 1-3 at the site are certified units (PA 98-38); Unit 4 is proposed for certification as a nominal 300 MW one-on-one, combined cycle combustion turbine unit firing natural gas as the only fuel. No new associated offsite facilities are required to support Unit 4 or the existing units.

Twenty (20) hard copies of the application (plus one electronic copy) and a check in the amount of $100,000 for the filing fee are enclosed to initiate the Department's completeness review. As requested, four (4) copies have been sent to Ms. Vivian Garfein at the FDEP-Central District office. Additional copies are being submitted to the other statutory and affected agencies, as well as the parties to the original certification and the Osceola County Public Library. As required under Rule 62-17.051(4)(c) FAC, we have been in contact with each agency identified in Section 403.507(2)(a), F.S., regarding the appropriate contact person for that agency and the number of SCA copies requested. The service and distribution information is provided in the

8553 Commodity Circle | Orlando, FL 32819-9002
T. (407) 355-7767 | Toll Free (888) 774-7606
F. (407) 355-5794 | www.fmpa.com
roger@fmpa.com

attached list. As required under Section 403.5064, F.S., we will provide a copy of the SCA to any additional agencies or persons entitled to notice that that the Department identifies for us.

Also by copy of this letter, we are also submitting the SCA along with one signed and sealed original and three copies of the Prevention of Significant Deterioration (PSD) air permit application to the Department's Bureau of Air Regulation. The PSD application is identified as Volume 3 of the SCA. We are sending a separate check in the amount of $7,500 to the Bureau of Air Regulation to cover the processing of this application.

A petition to determine the need for the combined cycle unit will be filed with the Public Service Commission on May 1, 2008.

We look forward to working with you and your staff as this application progresses through the certification process. If you have any questions concerning the project or this application, please do not hesitate to call me at (407) 355-7767.

Sincerely,

Roger Fontes
GM and CEO, FMPA

Enclosures

cc: Ms. Trina Vielhauer, Chief , FDEP-Bureau of Air Regulation (w/1 copy of full SCA and 3 copies of Vol. 3)
Ms. Vivian Garfein, Director, FDEP-Central District Office (w/4 copies)
Service and Distribution List

Florida Electrical Power Plant Siting Act
Site Certification Application

Volume 1 of 3

Cane Island Power Park – Unit 4

Submitted by:

Florida Municipal Power Agency
Kissimmee Utility Authority

April 2008

FMPA
Florida Municipal Power Agency
Community Power. Statewide Strength.

KUA
KISSIMMEE UTILITY AUTHORITY

FMPA – KUA Cane Island Unit 4
Site Certification Application Service and Distribution List

Mike Halpin, Administrator
Siting Coordination Office
Department of Environmental Protection
2600 Blair Stone Road, MS 48
Tallahassee, FL 32399

Toni L. Sturtevant
Office of General Counsel
Department of Environmental Protection
3900 Commonwealth Boulevard
Tallahassee, FL 32399-3000

Trina Vielhauer, Chief
Bureau of Air Regulation
Department of Environmental Protection
2600 Blair Stone Road, MS 5505
Tallahassee, FL 32399-2400

Vivian Garfein, Administrator
Central Florida District Office
Department of Environmental Protection
3319 Maguire Boulevard, Suite 232
Orlando, FL 32803-3767

James Bradner, P.E.
Air Program Administrator
Central Florida District Office
Department of Environmental Protection
3319 Maguire Boulevard, Suite 232
Orlando, FL 32803-3767

David Herbster, Administrator
Wetland Resource Management
Central Florida District Office
Department of Environmental Protection
3319 Maguire Boulevard, Suite 232
Orlando, FL 32803-3767

Chris Ferraro, Administrator
Water Resource Program
Central Florida District Office
Department of Environmental Protection
3319 Maguire Boulevard, Suite 232
Orlando, FL 32803-3767

Mary Anne Poole, Director
Office of Policy and Stakeholder Coordination
Florida Fish and Wildlife Conservation Commission
620 S. Meridian Street
Tallahassee, FL 32399-1600

Forrest Watson, Planner III
Division of Forestry
Department of Agriculture and Consumer Services
3125 Conner Boulevard
Tallahassee, FL 32399-1650

Frederick Gaske
Deputy State Historic Preservation Officer
Department of State
R.A. Gray Building, 4th Floor
500 S. Bronough Street
Tallahassee, FL 32399-0250

Barton Bibler, Chief
Bureau of Water
Department of Health
4052 Bald Cypress Way, Bin #C22
Tallahassee, FL 32399-1708

Samantha Cibula, OGC
Public Service Commission
Gerald Gunter Building
2450 Shumard Oak Boulevard
Tallahassee, FL 32399-0850

Ruth Holmes, OGC
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, FL 32406

Jim Golden
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, FL 32406

FMPA – KUA Cane Island Unit 4
Site Certification Application Service and Distribution List

Phil Laurien, Executive Director
East Central Florida Regional Planning Council
681 N Wyman Road
Maitland, FL 32751

Michael Freilinger, County Manager
Osceola County
1 Courthouse Square, Suite 4700
Kissimmee, FL 34741

Osceola County Public Library
211 East Dakin Street
Kissimmee, FL 34741

Larry Mattern
Kissimmee Utility Authority
Post Office Box 423219
Kissimmee, FL 34742-3219

Susan Schumann
Florida Municipal Power Agency
8553 Commodity Circle
Orlando, FL 32819-9002

Gary V. Perko
Hopping Green & Sams, P.A.
123 S. Calhoun Street
Tallahassee, FL 32301

Lea Crandall, Clerk
Department of Environmental Protection
2600 Blair Stone Road, MS 5505
Tallahassee, Florida 32399-2400

Jennifer Brubaker, OGC
Public Service Commission
Gerald Gunter Building
2450 Shumard Oak Blvd.
Tallahassee, FL 32399-0850

Judy Harlow
Public Service Commission
Gerald Gunter Building
2450 Shumard Oak Blvd.
Tallahassee, FL 32399-0850

Ed Yaun
South Florida Water Management District
Orlando Regional Service Center
1701 Orlando Central Parkway
Suite 200
Orlando, FL 32809

Kelly Martinson, Asst. Gen. Counsel
Department of Community Affairs
2555 Shumard Oak Blvd.
Tallahassee, FL 32399-0850

Barbara Lenczewski, Planner
Department of Community Affairs
2555 Shumard Oak Blvd.
Tallahassee, FL 32399-0850

James V. Antista, General Counsel
FL Fish & Wildlife Conservation Commission
620 S. Meridian St.
Tallahassee, FL 32399-1600

Emily Norton, OGC
FL Fish & Wildlife Conservation Commission
620 S. Meridian Street
Tallahassee, FL 32399-1600

Jennifer Davis
FL Fish & Wildlife Conservation Commission
South Regional Office
8535 Northlake Blvd
West Palm Beach, FL 33412

Connie Mitchell
Dept. of Transportation
605 Suwannee St., MS 58
Tallahassee, FL 32399-0450

John Hatfield
Dept. of Transportation
Contracts and Permits Administrator
420 W. Landstreet Road
Orlando, FL 32399-0450

FMPA – KUA Cane Island Unit 4
Site Certification Application Service and Distribution List

Laura Kammerer, Deputy
Division of Historical Resources, SHPO
Dept. of State
R.A. Gray Building
500 S. Bronough St., Room 423
Tallahassee, FL 32399-0250

James Golden, Sr. Planner
Environmental Resource Regulation
SFWMD
3301 Gun Club Road
West Palm Beach, FL 33406

Brian Wheeler
Toho Water Authority
101 N. Church Street
Kissimmee, FL 34741-5054

Stanley Armbruster
Black & Veatch
11401 Lamar
Overland Park, KS 66211

Site Certification Application

Engineering Certification Statement

Cane Island Power Park - Unit 4

I, the undersigned, hereby certify that:

The engineering features of Cane Island Power Park – Unit 4 as described in this Site Certification Application, have been prepared, designed, or examined by me or individuals under my direct supervision and found to be in conformity with sound engineering principles; and,

To the best of my knowledge, this information submitted in support of this application is true, accurate, and complete based on reasonable techniques, estimates, materials, and information gathered and evaluated by qualified personnel; and,

To the best of my knowledge, there is reasonable assurance that the Unit 4 project described in this application, when properly operated and maintained, will comply with all applicable rules of the Department of Environmental Protection and South Florida Water Management District.

Stanley A. Armbruster **April 1, 2008**
Florida License No. 30562
Black & Veatch
11401 Lamar
Overland Park, Kansas

Applicant Information

Applicants' Official Name

Florida Municipal Power Agency (FMPA)
Kissimmee Utility Authority (KUA)

Address

FMPA	KUA
8553 Commodity Circle	1701 West Carroll Street
Orlando, FL 32819-9002	Kissimmee, FL 34741

Address of Official Headquarters

FMPA	KUA
8553 Commodity Circle	1701 West Carroll Street
Orlando, FL 32819-9002	Kissimmee, FL 34741

Business Entity

FMPA: Joint Action Agency
KUA: Municipality

Names, Owners, etc.

Not applicable

Name and Title of Chief Executive Officers

FMPA: Mr. Roger A. Fontes, General Manager and CEO
KUA: Mr. James C. Welsh, President and General Manager

Name, Address, and Telephone Number of Official Representative Responsible for Obtaining Certification

Ms. Susan Schumann, Cane Island Power Park - Unit 4 Licensing and Permitting Manager
8553 Commodity Circle
Orlando, FL 32819-9002
407-355-7767

Site Location

Cane Island Power Park
6075 Old Tampa Highway
Intercession City, Florida
Osceola County

Nearest Incorporated City

Kissimmee

Latitude and Longitude (center of site)

Lat: 28^0, 16 min, 50 sec N Long: 81^0, 32 min, 00 sec W

UTM 27 Coordinates (center of site; km)

North: 3128000 East: 447500

Section, Township, and Range

Sections 29 and 32, Township 25 South, Range 28 East

Location of Any Directly Associated Transmission Facilities

Not applicable

Nameplate Generating Capacity (Existing units)

Unit 1: Nominal 40 MW Simple Cycle Combustion Turbine Unit
Unit 2: Nominal 120 MW Combined Cycle Combustion Turbine Unit
Unit 3: Nominal 250 MW Combined Cycle Combustion Turbine Unit

Capacity of Proposed Additions

Unit 4: Nominal 300 MW Combined Cycle Combustion Turbine Unit (150 MW Combustion Turbine Generator and 150 MW Steam Turbine Generator)

Remarks:

FMPA is a nonprofit, joint action agency formed by 30 municipal electric utilities serving approximately 2 million Floridians. FMPA's primary purpose is to develop competitive power supply and related services for its members.

KUA is a body politic organized and existing under the laws of the State of Florida. By City Ordinance, the City of Kissimmee, Florida, established the KUA as part of the government of the City of Kissimmee. KUA owns, operates, and manages the municipal electric system established by the City of Kissimmee. KUA serves approximately 58,000 customers in Kissimmee and surrounding areas.

The Cane Island Power Park is a certified site under the Florida Electrical Power Plant Siting Act, Site Certification PA 98-38.

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Preface

This Site Certification Application (SCA) is submitted by the Florida Municipal Power Agency (FMPA) and the Kissimmee Utility Authority (KUA) for certification of Unit 4 at the Cane Island Power Park (CIPP) site. This application addresses all state, regional, and local permitting requirements under review of the Florida Electrical Power Plant Siting Act (Act), Sections 403.501 – 403.518, Florida Statutes, as amended. The application includes the following major section headings:

- 1.0, Background Information.
- 2.0, Site and Vicinity Characterization.
- 3.0, The Plant and Directly Associated Facilities.
- 4.0, Effects of Site Preparation, and Plant and Associated Facility Construction.
- 5.0, Effects of Plant Operation.
- 6.0, Transmission Lines and Other Linear Facilities.
- 7.0, Economic and Social Effects of Plant Construction and Operation.
- 8.0, Site and Plant Design Alternatives.
- 9.0, Coordination.
- 10.0, Permit Applications.
- Appendices.

Project Information

The CIPP site is an existing power plant site located at 6075 Old Tampa Highway near Intercession City, Osceola County, Florida. The three existing units (Units 1, 2, and 3) at the site were certified under the Act in 1999. Unit 4 is proposed as a nominal 300 megawatt (MW) one-on-one combined cycle generating unit consisting of an F-class combustion turbine generator (CTG), a heat recovery steam generator (HRSG), a condensing steam turbine generator (STG), and a mechanical draft cooling tower. Duct burners will be installed in the HRSG inlet to provide increased steam turbine generator output for peaking capacity. Unit 4 will have the capability to operate in steam bypass mode. Natural gas will be the only fuel for the combustion turbine and the HRSG duct burners. Unit 4 will be installed with modern pollution control devices and will use reuse water for cooling. Unit 4 will be added to the existing certified CIPP site.

Unit 4 is scheduled for commercial operation in May 2011. Unit 4 will be interconnected to Progress Energy's transmission system for transmission access by FMPA's members. FMPA is the owner and project manager for Unit 4 permitting, certification, and construction. KUA will operate the unit on behalf of FMPA.

Project Impacts

Air

Unit 4, as proposed, qualifies as a major source under the Prevention of Significant Deterioration (PSD) program, because it will emit more than 100 tons per year (tpy) of at least one regulated pollutant. The CIPP is located in an attainment area for all criteria pollutants, except PM_{10} and lead, which are unclassifiable.

Unit 4 has the potential to emit nitrogen oxides (NO_x), sulfur dioxide (SO_2), carbon monoxide (CO), sulfuric acid mist (H_2SO_4 [SAM]), and particulate matter (PM/PM_{10}) above PSD significance thresholds. Accordingly, a full PSD analysis was performed for those pollutants emitted above the PSD thresholds, including the following:

- Best Available Control Technology (BACT) Analysis.
- Ambient Air Quality Impact Analysis.
- Additional Impact Analysis.

The technology proposed to control emissions from Unit 4 includes dry low-NO_x burners and selective catalytic reduction (SCR) for the control of NO_x, the use of natural gas, and good combustion controls to reduce CO, PM/PM_{10}, SO_2, and SAM emissions.

An air dispersion modeling analysis was performed to determine the Unit 4 maximum SO_x, NO_x, CO, and PM/PM_{10} air quality impacts. The maximum air quality impacts at all modeled receptors were less than the applicable PSD significant impact levels, and consequently below the less stringent de minimis ambient background monitoring levels. As such, multi-source modeling of nearby existing sources for PSD increment consumption and ambient air quality standards (AAQS) comparison was not required.

The Unit 4 predicted pollutant impact concentrations are well below the threshold levels above which the air quality may be significantly affected. Moreover, an additional impact assessment determined that the Unit 4 visual impacts, PSD Class I regional haze impacts, air quality impacts on vegetation and soils, and air quality impacts due to growth, are inconsequential as the predicted levels are well below threshold levels.

Water Use

The Unit 4 cooling tower will use approximately 2.8 million gallons of treated sewage effluent (or reuse water) per day when firing natural gas at full load and average ambient conditions. This effluent will be supplied from the Toho Water Authority (Toho) reuse water pipeline adjacent to the southern boundary of the CIPP site. At full load operation, approximately 865,000 gallons per day (gpd) of process wastewaters will be returned to the Toho pipeline for reuse downstream or disposal.

Service, potable, and fire water will be supplied by onsite groundwater wells. Under full load operation, Unit 4 will require 134,000 gallons of service water per day in addition to the currently authorized amount. The majority of this amount is required for power cycle demineralized makeup water supply and evaporative cooler makeup supply. The Upper Floridan Aquifer is the water source.

In addition to the normal service water demand, KUA/FMPA also requests the use of 2.8 million gpd of groundwater for short-term/emergency supply (30 days/year) to the cooling tower, if needed, in the event reuse water is unavailable.

Land

The 1,027 acre CIPP site was issued Conditional Use Permit (CU/SDP 92-86) for electrical power plant use of the site by the Osceola County Board of Commissioners in 1993, and certified under the Florida Electrical Power Plant Siting Act in 1999. Unit 4 will be located within the previously certified CIPP site. In 1998, the Siting Board determined the CIPP site to be in compliance with the then-existing land use plans and zoning ordinances of Osceola County, Florida. See Section 403.508, F.S. In all respects, the proposed electrical power plant remains consistent and in compliance with those local land use plans and zoning ordinances.

A complete biophysical assessment of the property during Units 1 and 2 permitting, and subsequent monitoring, concluded that the property is not inhabited by any federal- or state-listed threatened or endangered species, with the exception of the recently listed gopher tortoise (state threatened). The majority of the site (860 acres) was placed in conservation easements granted to the South Florida Water Management District (SFWMD) and the Florida Fish and Wildlife Conservation Commission (FFWCC).

The Department of Historical Resources had cleared the site for development during Units 1 and 2 permitting, stating that there are no archaeological, historic, or cultural sites present on the property or in the immediate vicinity that are considered eligible for listing on the *National Register of Historic Places*.

Wastewater and Solid Waste

Unit 4 process wastewaters will be collected, treated, and discharged at two locations onsite. Potentially oil-contaminated wastewaters are routed to an oil/water separator for treatment prior to groundwater discharge through a new percolation pond. Cooling tower and evaporative cooler blowdown, neutralization basin effluent, and boiler blowdown are collected and returned to the Toho reuse pipeline after pH adjustment. All wastewaters returned to the Toho pipeline are treated to meet applicable Toho agreement limits prior to discharge. Licensed contractors remove boiler and combustion turbine cleaning wastewaters, and spent SCR modules.

Sanitary wastewaters will be discharged to an existing, onsite septic tank/tile field system. Uncontaminated stormwaters will be directed to an onsite storm water detention basin.

Office trash and other low-volume solid wastes will be collected and managed onsite for disposal at an approved facility by a licensed contractor.

Socioeconomics

Operation of Unit 4 should have positive incremental socioeconomic impacts in Osceola County through employment and associated tax revenues. During the peak period of Unit 4 construction, approximately 313 jobs will be created by the construction project. The net direct employment effect from Unit 4 will be the creation of approximately two additional full-time operations positions. Unit 4 is not anticipated to adversely impact the local or regional services or infrastructure.

Need for Power

FMPA will file a separate Need for Power petition and application with the PSC for Cane Island Unit 4 in accordance with the Act, Section 403.519, Florida Statutes.

Schedule

The anticipated Unit 4 site certification major milestone schedule is as follows:

- SCA filed April 1, 2008.
- Need for Power Petition filed May 1, 2008.
- Florida Department of Environmental Protection (FDEP) Issues Completeness Statement in May 2008.
- Land Use Hearing in July 2008.
- Need for Power Order Issued by PSC in September 2008.
- Land Use Order Issued in October 2008.
- FDEP Issues Project Analysis in December 2008.

- Certification Hearing in January 2009.
- Siting Board Hearing in April 2009.
- Site Certification Order and PSD Permit Issued in April 2009.
- Start of Construction in July 2009.
- Unit 4 Commercial Operation in May 2011.

Acronyms and Abbreviations

AADT	Average Annual Daily Traffic
AAQIA	Ambient Air Quality Impact Analysis
AAQS	Ambient Air Quality Standards
Act	Florida Electrical Power Plant Siting Act
amsl	Above mean sea level
ANL	Argonne National Laboratory
ANSI	American National Standard Institute
AQCS	Air Quality Control System
ARP	All-Requirements Project
BACT	Best Available Control Technology
bcf	Billion cubic feet
BEA	Bureau of Economic Analysis
bgs	Below ground surface
bls	Below land surface
BOD	Biochemical oxygen demand
BOR	Basis of Review
Btu	British thermal unit
Btu/h	British thermal units per hour
cfs	Cubic feet per second
$CaCO_3$	Calcium carbonate
CIPP	Cane Island Power Park
CN	Curve Number
CO	Carbon monoxide
COD	Chemical oxygen demand
COE	US Army Corps of Engineers
CTG	Combustion turbine generator
CU/SDP	Conditional Use/Site Development Plan
dBA	Decibels (A-weighted)
dBC	Decibels (C-weighted)
DCIS	Distributed Control and Information System
DHR	Division of Historical Resources, Florida Department of State
ECF	East Central Florida
EIS	Environmental Impact Statement
EPA	US Environmental Protection Agency
ERP	Environmental Resource Permit

EPRI	Electric Power Research Institute
F	Degrees Fahrenheit
FAA	Federal Aviation Administration
FAS	Floridan Aquifer System
FAAQS	Florida Ambient Air Quality Standards
FAC	Florida Administrative Code
FCREPA	Florida Committee on Rare and Endangered Plants and Animals
FDA	Florida Department of Agriculture
FDEP	Florida Department of Environmental Protection
FDHR	Florida Division of Historical Resources
FDOT	Florida Department of Transportation
FFWCC	Florida Fish and Wildlife Conservation Commission
FGFWFC	Florida Game and Fresh Water Fish Commission
FGT	Florida Gas Transportation Company
FMPA	Florida Municipal Power Agency
FNAI	Florida Natural Areas Inventory
FS	Florida Statutes
GEP	Good Engineering Practice
gpd	Gallons per day
gpm	Gallons per minute
GPR	Ground Penetrating Radar
gr/dscf	Grains per dry standard cubic foot
H_2SO_4	Sulfuric acid mist (SAM)
HAP	Hazardous Air Pollutant
HgA	Mercury, absolute
HRSG	Heat recovery steam generator
HHV	Higher Heating Value
IPP	Independent Power Producers
IRP	Integrated Resource Plan
ISCST	Industrial Source Complex Short-Term
ISM	Kissimmee (Municipal) Gateway Airport
ISO	International Organization for Standardization
JCAHO	Joint Commission on the Accreditation of Healthcare Organizations
kg	Kilogram(s)
kg/s	Kilograms per second
km	Kilometer(s)

KUA	Kissimmee Utility Authority
kWh	kilowatt-hour
LAER	Lowest achievable emission rate
lb/h	Pounds per hour
lb/MBtu	Pounds per million British thermal units
LFA	Lower Floridan Aquifer
LNG	Liquefied natural gas
LPG	Liquefied petroleum gas
m	Meters
MBtu	Million British thermal units
MCO	Orlando International Airport
mgd	Million gallons per day
mg/L	Milligrams per liter
mg/m^3	Milligrams per cubic meter
mm	Millimeters
MSA	Metropolitan Statistical Area
MSDS	Material Safety Data Sheet
msl	Mean sea level
MW	Megawatt(s)
MWh	Megawatt-hour
NEMA	National Electrical Manufacturers Association
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NGVD	National Geodetic Vertical Datum
NML	Noise monitoring location
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NO_x	Nitrogen oxides
NP	Natural Electrical Potential
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NSPS	New Source Performance Standards
NSR	New Source Review
NWS	National Weather Service
O&M	Operations and Maintenance
ORL	Orlando Executive Airport
OSHA	Occupational Safety and Health Administration

OUC	Orlando Utilities Commission
PE	Progress Energy
PM/PM_{10}	Particulate matter/particulate matter less than 10 microns
ppm	Parts per million
ppmvd	Parts per million by volume dry
PSC	Florida Public Service Commission
PSD	Prevention of Significant Deterioration
psig	Pounds per square inch, gauge
PTE	Potential to Emit
PTPLU-2	Screening level point source dispersion model
RIMS II	Regional Input-Output Modeling System
RO	Reverse osmosis
SACTI	Seasonal/annual cooling tower impact
SAM	Sulfuric acid mist (H_2SO_4)
SAS	Surficial aquifer system
SCA	Site Certification Application
scfm	Standard cubic feet per minute
SCR	Selective catalytic reduction
SFWMD	South Florida Water Management District
SIP	State Implementation Plan
SJRWMD	St. Johns River Water Management District
SOCDS	State of the Cities Data Systems
SO_2	Sulfur dioxide
SOR	Save Our Rivers
SPT	Standard Penetration Test
SQG	Small Quantity Generator
STG	Steam turbine generator
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total dissolved solids
TOC	Total organic carbon
Toho	Toho Water Authority (formerly City of Kissimmee Water and Sewer Department
tpy	Tons per year
TRPH	Total Residual Petroleum Hydrocarbons
TRS	Total reduced sulfur
TSP	Total suspended particulate
TSS	Total suspended solids

UFA	Upper Floridan Aquifer
$\mu g/m^3$	Micrograms per cubic meter
ULSD	Ultra-low sulfur diesel
ULSFO	Ultra-low sulfur fuel oil
UNAMAP	User's Network for the Applied Modeling of Air Pollution
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
UTM	Universal Transverse Mercator
VOC	Volatile organic compound
WWTP	Wastewater treatment plant

1.0 Background Information

The Cane Island Power Park (CIPP) currently includes three existing units and associated support facilities, certified under the Act in 1999. Unit 1 is a nominal 40 MW simple cycle combustion turbine unit; Unit 2 is a nominal 120 MW combined cycle combustion turbine unit; Unit 3 is a nominal 250 MW combined cycle combustion turbine unit. Units 1 and 2 began commercial operation in 1995; and Unit 3 began commercial operation in 2001. Units 1, 2, and 3 fire natural gas as the primary fuel; No. 2 fuel oil is stored onsite as backup fuel. The electricity generated is stepped up in voltage for distribution to the power grid.

Unit 4 is proposed as a nominal 300 MW one-on-one combined cycle combustion turbine unit that will fire natural gas and liquid natural gas (LNG) as the only fuels. FMPA and KUA also request that LNG be one of the certified fuels for Units 1-3 and future units at the CIPP. The electricity generated by Unit 4 will be stepped up in voltage for distribution to the power grid and FMPA members. Unit 4 is scheduled for commercial operation in May 2011.

1.1 Need for Power Application

FMPA and KUA will submit a Petition to Determine Need for Electrical Power Plant and accompanying Need for Power Application to the Florida Public Service Commission (PSC) for the CIPP Unit 4 Project on May 1, 2008.

1.2 FMPA, the All Requirements Project, and KUA

FMPA is a nonprofit, public, joint action agency consisting of a group of 30 municipal electric utilities with the primary purpose of developing competitive power supply and related services.

FMPA's mission is to develop economical and competitive power supply projects, to be proactive in providing member services, and to promote the image of public power, enabling its member utilities to succeed in a rapidly changing environment. Each member appoints one representative to FMPA's Board of Directors, which governs the Agency's activities.

Each member utility is locally owned and operated; however, municipal utilities share common concerns that can best be solved by working together. This helps reduce the cost of power, as municipal utilities can obtain power from several power plants rather than depending on a few. Through FMPA, municipals have been successful in reducing power costs, diversifying power supply resources, and providing a measure of competition in the wholesale market.

FMPA is specifically authorized under the Joint Power Act to undertake joint projects for its members and to issue tax-exempt bonds and other obligations to finance the costs of such projects. Pursuant to that authority, FMPA developed the All Requirements Project (ARP) to secure an adequate, economical, and reliable supply of electric capacity and energy to meet the needs of the ARP members who include 15 municipal utilities serving approximately 180,000 customers throughout Florida. ARP members purchase all their capacity and energy from the ARP. FMPA meets the ARP's needs through electricity generated by FMPA owned or co-owned facilities, as well as power purchases from generating ARP members (i.e., members with their own generating capacity and purchases) and other, non-ARP member utilities.

KUA is a member of FMPA and the ARP. KUA owns, operates, and manages the municipal electric system established by the City of Kissimmee, and is the sixth largest municipal utility in Florida. KUA serves approximately 58,000 customers in Kissimmee and surrounding areas.

2.0 Site and Vicinity Characterization

To assess the potential impacts a project may have on the social and biological environment, it is necessary to establish a set of baseline or existing conditions for the project area. This section provides that characterization for the CIPP. This section describes the CIPP and Osceola County sociopolitical and biophysical environment.

2.1 Site and Associated Facilities Delineation

This section provides information concerning the physical, biological, and sociological characteristics of the existing site and project area that might be affected by the construction and operation of CIPP Unit 4 (Unit 4).

2.1.1 Site Location

The CIPP is located within rural northwest Osceola County, Florida. Figure 2.1-1 shows the general location of the CIPP, which is 20 miles southwest of Orlando, 5 miles west of Kissimmee, and 1 mile northwest of Intercession City. The CIPP address is 6075 Old Tampa Highway, Intercession City.

The CIPP occupies 1,027 acres in Section 29 and a portion of Section 32, Township 25 South, Range 28 East, in Osceola County. Figure 2.1-2 shows the CIPP boundaries and identifies adjacent properties. Table 2.1-1 provides the names and addresses of the adjacent property owners. Unit 4 will be a new unit located north of Unit 3 as shown on Figure 2.1-3. Approximately 167 acres have been permitted for power development and support facilities at the CIPP.

2.1.2 Site Modification

Proposed site modifications will consist of construction and operation of Unit 4, a 300 MW (nominal) combined cycle combustion turbine generating unit. The development of the Unit 4 power block area will occupy approximately 9 acres north of the existing Units 1, 2, and 3.

New major equipment associated with Unit 4 will include a CTG, HRSG, steam generator, and cooling tower. Unit 4 will be interconnected to the existing CIPP substation, approximately 500 feet from the new unit. As explained in Section 6.0, a few of the existing transmission poles in the power block area will be relocated to accommodate Unit 4. There will also be wastewater treatment facilities, water storage tanks, and a storm water detention area for Units 3 and 4. Similar facilities associated with the operation of Units 1, 2, and 3 exist onsite.

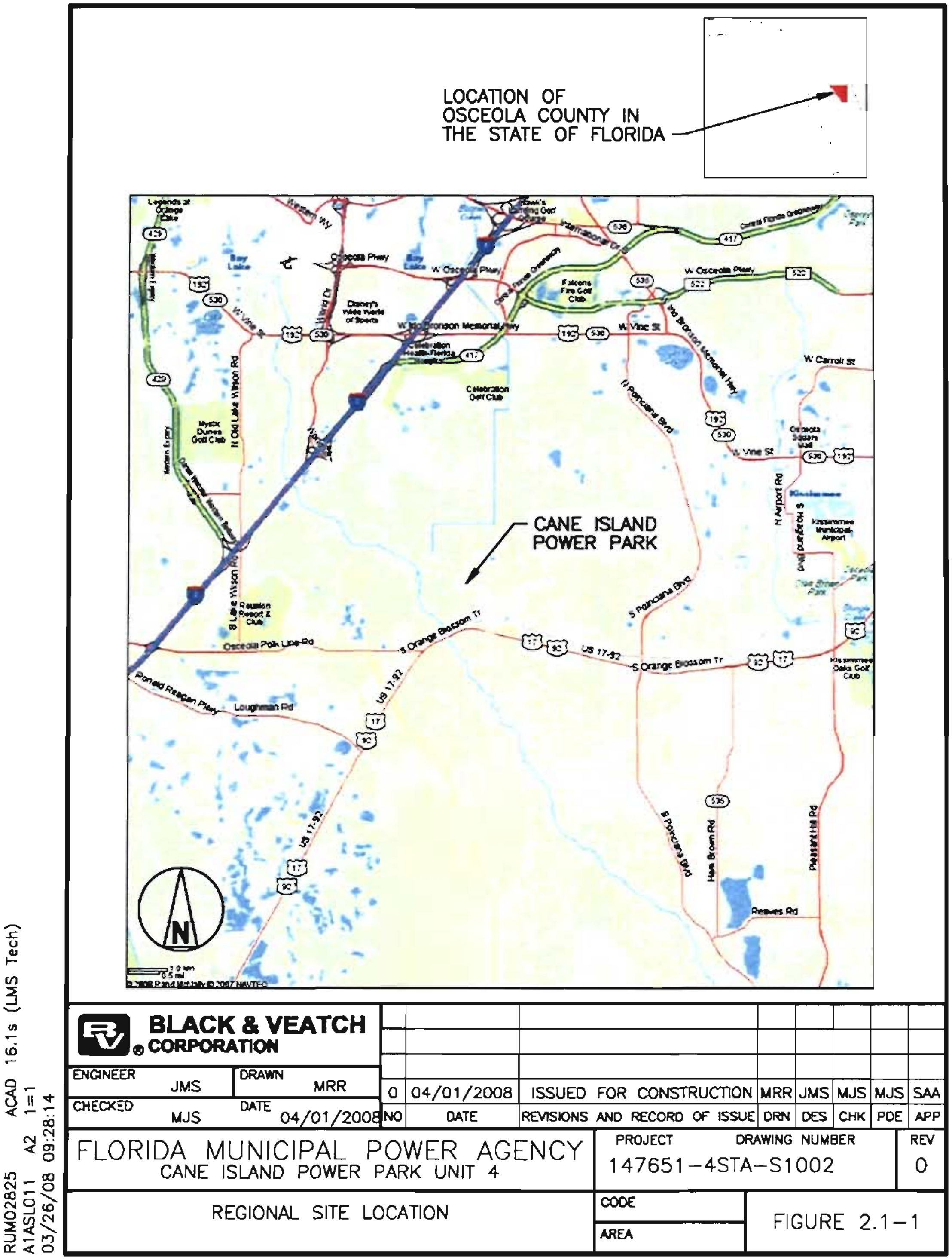
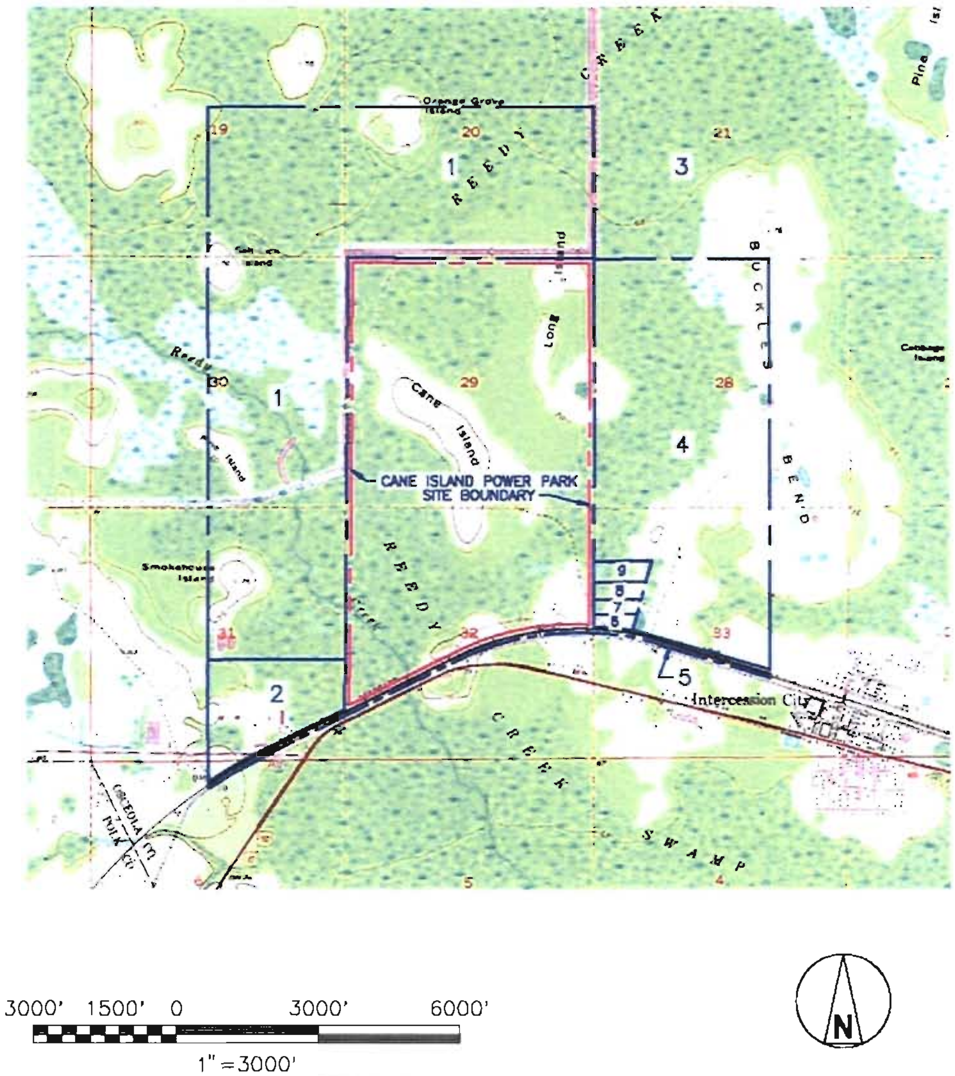


Figure 2.1-1
Regional Site Location



BLACK & VEATCH CORPORATION

0	04/01/2008	ISSUED FOR CONSTRUCTION	MRR	JMS	MJS	MJS	SAA
NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP

ENGINEER JMS | DRAWN MRR
CHECKED MJS | DATE 04/01/2008

FLORIDA MUNICIPAL POWER AGENCY
CANE ISLAND POWER PARK UNIT 4

PROJECT DRAWING NUMBER 147651-4STA-S1003 | REV 0

SITE VICINITY

CODE
AREA

FIGURE 2.1-2

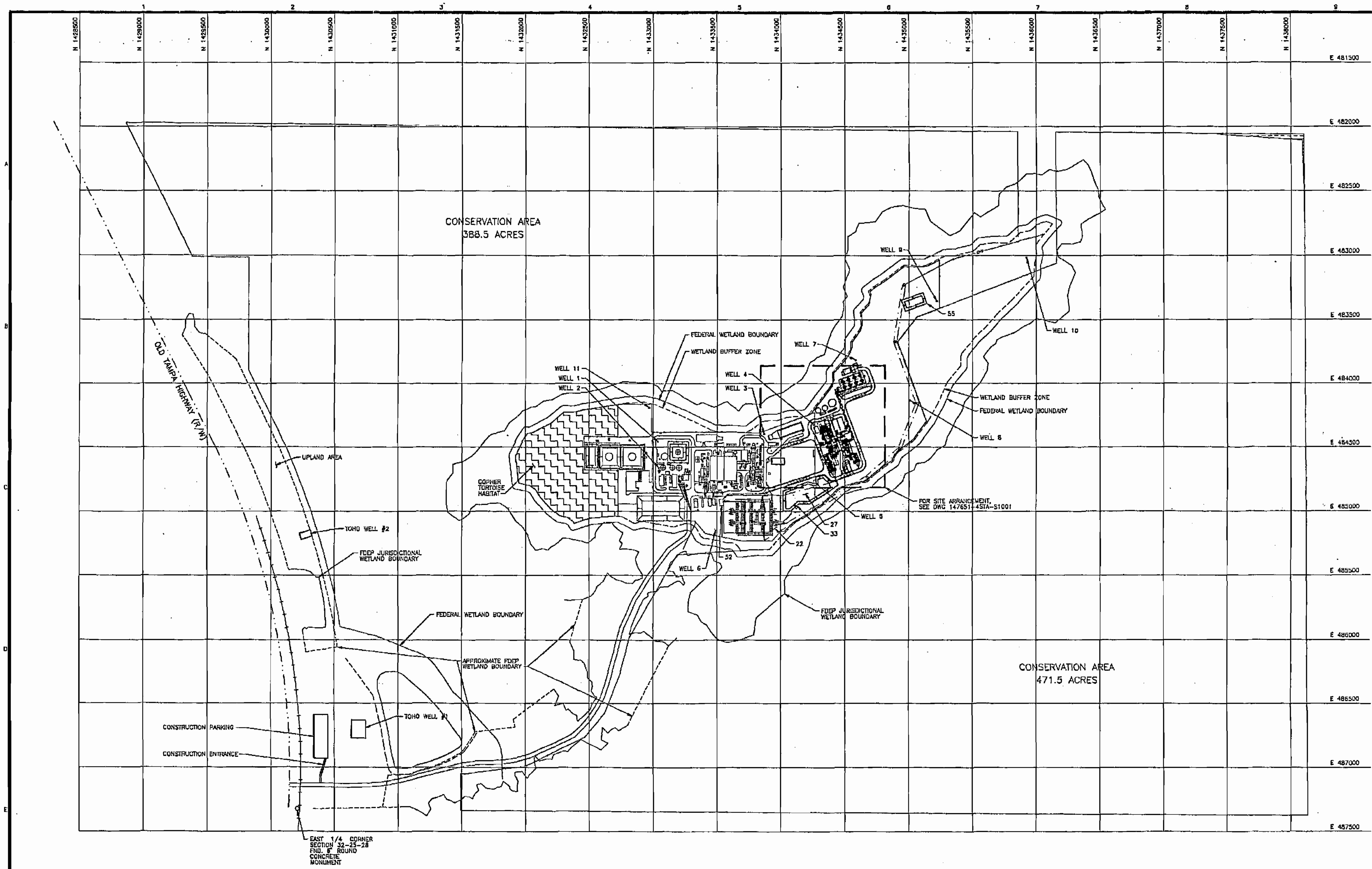
ACAD 16.1s (LMS Tech)
RUM02825 A2 1=1
A1ASL011
03/26/08 10:05:43

Figure 2.1-2
Site Vicinity

Table 2.1-1
Adjacent Property Owners
Cane Island Power Park

Parcel Number	Map ID	Property Owner
21-25-28-0000-0010-0000	3	Ecosystems Mitigation Bank P. O. Box 540285 Orlando, FL 32854
28-25-28-0000-0010-0000 33-25-28-0000-0010-0000	4	BK Ranch LC (1200 Wooten Rd./1301 Wooten Rd.) 2003 Via Tuscany Winter Park, FL 32789
33-25-28-0000-0047-0000	9	Matt L. Joiner 1356 Montzen Rd. Davenport, FL 33837
33-25-28-0000-0040-0000	8	William Dampier (1364 Montzen Rd.) P. O. Box 336 Intercession City, FL 33848
33-25-28-0000-0050-0000	7	David Haley 1386 Montzen Rd. Davenport, FL 33837
33-25-28-0000-0060-0000	6	Freda Poppleton (1398 Montzen Rd.) 3300 S. Indiana Ave. Saint Cloud, FL 34769
N/A	5	CSX Transportation 3701 Causeway Blvd. Tampa, FL 33619
31-25-28-0000-0040-0000	2	Florida Power Corp. (6525 Osceola Polk Line Rd.) P. O. Box 14042 St. Petersburg, FL 33733
19-25-28-0000-0010-0000 20-25-28-0000-0010-0000 20-25-28-0000-0020-0000 30-25-28-0000-0010-0000 30-25-28-0000-0020-0000 31-25-28-0000-0010-0000	1	Reedy Creek Improvement District 1900 Hotel Plaza Blvd. P. O. Box 10170 Lake Buena Vista, FL 32830

0970043-014 (1)



FACILITIES LEGEND

ID	FACILITY
22	SUBSTATION
27	DETENTION POND
33	DETENTION POND DISCHARGE
52	SWITCHYARD CONTROL BUILDING (EXISTING)
55	PERC POND

LEGEND

- WETLAND BUFFER ZONE
- OVERHEAD TRANSMISSION LINE
- FDEP JURISDICTIONAL WETLAND BOUNDARY
- FENCE LINE
- GOPHER TORTOISE HABITAT

NOTES

FOR PERMITTING PURPOSE ONLY APPROVED FOR CONSTRUCTION

NO	DATE	REVISIONS AND RECORD OF ISSUE
0	04/01/2008	ISSUED FOR CONSTRUCTION

SCALE: 1"=300'

I HEREBY CERTIFY THAT THIS DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF FLORIDA.
SIGNED ______
DATE ______ REG NO. ______

BLACK & VEATCH CORPORATION
DRAWN MRR
DATE 04/01/2008

FLORIDA MUNICIPAL POWER AGENCY
CANE ISLAND POWER PARK UNIT 4

SITE PLAN

PROJECT / DRAWING NUMBER: 147651-4STA-S1000 REV 0

FIG 2.1-3

2.1.3 Existing and Proposed Uses

Through negotiations with the SFWMD and the Florida Game and Fresh Water Fish Commission (FGFWFC), which is now called the Florida Fish and Wildlife Conservation Commission (FFWCC), 860 acres of CIPP uplands and wetlands were dedicated as a conservation area during the permitting of Units 1 and 2. Copies of these easement agreements are provided in Subsection 10.5.1, Appendix F. The remaining 167 acres are designated for power generation and support uses. Approximately 47 of these 167 acres are on the central portion of the geographic feature known as Cane Island where Units 1, 2, and 3 are located and where Unit 4 will be located. Unit 4 will occupy approximately 9 acres, while construction of the project will require impacts to approximately 24.2 acres. Utility corridors comprise the remaining development acreage. No new offsite transmission facilities will be required for Unit 4. Further details are found in Section 4.1.

2.1.4 Flood Zones

The SFWMD required during the permitting of Units 1 and 2 that the site access road be located 2 feet above the 10 year, 24 hour storm elevation, which is 69 feet National Geodetic Vertical Datum (NGVD). The access road center line is at 71 feet NGVD. Roads in the power block area were required to be located 4.5 feet above the 10 year, 24 hour storm elevation, which is 76.25 feet NGVD. Road crown elevations are and will continue to be at or above 80.75 feet NGVD.

The SFWMD also requires that the finished floor elevations in the power block area be located at or above the 100 year, 72 hour storm elevation. The 100 year, 72 hour storm elevation is 79.97 feet NGVD. The finished floor elevations for Unit 4 will be at 82.00 feet NGVD.

2.2 Sociopolitical Environment

2.2.1 Governmental Jurisdictions

CIPP is located within an unincorporated area of Osceola County. The southern boundary of Orange County is 4.5 miles north of the power block (site). The northeast boundary of Polk County is 2 miles southwest of the site. The western city limit of Kissimmee is 5 miles east of the site. The incorporated town of Campbell is 4.5 miles southeast of the site. The unincorporated town of Intercession City is 1 mile southeast of the site. The unincorporated town of Loughman is 3.5 miles southwest of the site.

2.2.2 Demography and Ongoing Land Use

2.2.2.1 Land Use. Osceola County is a 1,506 square mile area that serves as the south/central boundary of the Central Florida Region and the Greater Metropolitan Area.

It constitutes 2.8 percent of the state land area of 53,927 square miles. The CIPP is located in rural northwest Osceola County.

Located at the headwaters of the Lake Okeechobee/Florida Everglades ecosystem, Osceola County is bounded by the Kissimmee River and is home to the Kissimmee Chain of Lakes, which includes some of Florida's finest fishing and recreational attractions. The county is also home to three federal wildlife management preserves at Bull Creek, Prairie Lakes, and Three Lakes. Osceola County's economic base is dominated by tourism, because it is a gateway to Walt Disney World and other Central Florida attractions. The area's historical investments in ranching and citrus are still very strong, while light industry and service enterprises are growing.

The two major cities in Osceola County are Kissimmee and St. Cloud. The City of Kissimmee, the county seat, is 18 miles due south of Orlando. Well known for its year-round desirable climate and abundant recreational opportunities, Kissimmee covers roughly 17 square miles. Its current population of 59,364 makes it the largest city in Osceola County although it is relatively small when compared to Florida's largest municipalities.

Osceola County's only other incorporated city, St. Cloud, is 9 miles east of Kissimmee, and approximately 45 miles west of the City of Melbourne on the Atlantic Coast. St. Cloud has 2.5 miles of lakefront and an extensive park program. St. Cloud is adjacent to the Florida Turnpike, making travel to Orlando and the International Airport only a 25 minute drive away.

The topography of the CIPP is unpronounced and considered relatively flat. It consists primarily of grassland with a few scattered trees and is situated on a slightly elevated ridge of dry sand (the geographic feature known as Cane Island) surrounded by the wetlands of Reedy Creek Swamp. The nearest Federal PSD Class I Area is the Chassahowitzka National Wildlife Refuge located 85 miles to the northwest.

The site is located 1 mile northwest of Intercession City, north of Old Tampa Highway. The southern border is determined by a CSX Transportation railroad line that parallels Osceola Polk Line Road. The site is surrounded on all sides by a significant buffer of trees (Reedy Creek Swamp), with the western boundary border also bordering Davenport Creek Swamp.

Interstate 4 is anticipated to be the predominant route that temporary construction workers from outside Osceola County will use to commute to the site. To get to the site from Interstate 4, workers will exit the interstate onto Osceola Polk Line Road and travel onto South Orange Blossom Trail/US Highway 17-92 and will then turn north onto Old Tampa Highway, where the site access road, Bobroff Blvd, is reached.

2.2.2.2 Land Use Plans and Zoning. The CIPP site is designated as Rural/Agriculture under the existing future land use map of the Osceola County Comprehensive Plan's future land use element. Electric utility facilities are permitted uses as an Institutional use in that future land use designation. The CIPP site is zoned as Agriculture/Conservation under the existing Osceola County zoning ordinances. Electrical power plants are a conditional use in this zoning district. The property was approved for use as an electrical power plant in 1993 by the Osceola Board of Commissioners and KUA was issued a Conditional Use Permit (CU/SDP 92-86) authorizing power plant construction and operation on the property. The Conditional Use permit recognized the site could support up to 1,000 MW of generating capacity, comprised of multiple electrical generating units on the portion of the site to be occupied by Unit 4 Refer to Sections 10.3 and 10.4 related to existing zoning and land use plans.

In 1999, the Siting Board determined that the Power Park site was consistent with the existing land use plans and zoning ordinances of Osceola County. The Siting Board found that the use of the 1,027 acre CIPP site for electrical generating facilities was consistent with the County's zoning for the CIPP site and with the Conditional Use permit issued by the County for the CIPP site. In all respects, the proposed Unit 4 electrical power plant is consistent and in compliance with local land use plans and zoning ordinances.

Osceola County future land use maps indicate no change in the anticipated land use pattern for the CIPP site or the adjacent land area in the future, confirming that the CIPP site will continue to be compatible with the predominant land use in the immediate project vicinity. As the land surrounding the site is not developed, the construction of Unit 4 will not create any negative visual impacts or disturb any residential areas.

2.2.2.3 Population Statistics. The population of Osceola County was estimated to be 235,153 in 2005 by the University of Florida's Florida Housing Data Clearinghouse. Osceola County's population constituted roughly 1.3 percent of the estimated 2005 state population of 17,918,453. The Osceola County population increased by 36.3 percent between 2000 and 2005, compared to a 12.1 percent growth for Florida. The respective 1990 to 2000 growth rate was 60.1 percent for Osceola County compared to 23.5 percent at the state level.

Table 2.2-1 lists the projected population levels for Florida and the counties surrounding the CIPP. The Osceola County population is expected to increase to 346,699 in 2015, a growth of 47 percent over 2005 estimates. This is above the 21.5 percent overall growth projected for the state.

Table 2.2-2 indicates that the age distribution of the Osceola County population is comparable to that of the state, with the largest difference occurring in the 65 years old and over category, where only 11.3 percent of the Osceola County population was classified in 2005 versus 16.8 percent at the state level.

Table 2.2-1
State of Florida, Osceola County and Surrounding Counties
Population Projections 2005 -2020
(in thousands)

Location	2005	2010	2015	2020	Annual Average Growth Rate, 2005-2020
Brevard County	532.0	583.8	632.1	677.2	1.6%
Highlands County	93.5	101.4	108.8	115.8	1.4%
Indian River County	130.0	147.0	162.5	177.0	2.1%
Lake County	263.0	313.2	359.9	403.8	2.9%
Okeechobee County	37.8	39.5	41.2	42.8	0.8%
Orange County	1,043.4	1,197.7	1,340.6	1,473.6	2.3%
Osceola County	235.1	292.7	346.7	397.7	3.6%
Polk County	541.8	599.0	651.2	699.0	1.7%
Seminole County	411.7	460.0	504.1	544.7	1.9%
Florida Population	17,918.5	19,920.2	21,767.0	23,475.4	1.8%

Source: Florida Housing Data Clearinghouse, University of Florida
http://flhousingdata.shimberg.ufl.edu/a/profiles?action=results&nid=3400

Table 2.2-2
Age Distribution in State of Florida, Osceola County,
and Surrounding Counties in 2005

Location	Population under 5 Years Old	Population under 18 Years Old	Population 65 Years or Older
Brevard County	5.1%	20.9%	20.1%
Highlands County	5.0%	19.2%	31.0%
Indian River County	4.9%	18.9%	27.0%
Lake County	5.4%	19.9%	26.7%
Okeechobee County	7.3%	24.9%	16.1%
Orange County	7.7%	26.0%	9.5%
Osceola County	7.3%	26.2%	11.3%
Polk County	6.9%	24.5%	17.6%
Seminole County	6.0%	24.2%	10.8%
Florida Population	6.3%	22.9%	16.8%

Source: US Government Federal Statistics,
http://www.fedstats.gov/qf/states/12000.html

Table 2.2-3 presents population information for Kissimmee and Orlando for selected years. Kissimmee had an estimated 2000 population of 47,814, and the median age for the city's population was 30.6. The 2000 population of Orlando was 185,951 with a median age of 35.4, which was still below the Florida average of 38.7

Table 2.2-3
Population Statistics for Kissimmee and Orlando, 1990 and 2000

Year	Kissimmee	Orlando
1990	30,050	164,693
2000	47,814	185,951

Source: US Census Bureau, http://factfinder.census.gov/servlet/SAFFPopulation?_event=Search&geo_id=01000US&_geoContext=&_street=&_county=kissimmee&_cityTown=kissimmee&_state=04000US12&_zip=&_lang=en&_sse=on&ActiveGeoDiv=geoSelect&_useEV=&pctxt=fph&pgsl=010&_submenuId=population_0&ds_name=null&_ci_nbr=null&qr_name=null&reg=null%3Anull&_keyword=&_industry=

2.2.3 Easements, Title, Agency Works

There are no easements or titles to be obtained for the CIPP or Unit 4. The entire site is owned by KUA and FMPA. There are no new offsite linear facilities proposed for this project.

2.2.4 Regional Scenic, Cultural, and Natural Landmarks

There are more than 30 recorded scenic, cultural, or natural landmarks within 5 miles of the CIPP. The National Registry of Natural Landmarks does not list any sites for Osceola County.

The cultural resources within 5 miles of the CIPP include the FDEP/Disney Conservation Easement north and west of the site, and the playground/park in Intercession City. Another cultural resource is the Fletcher Park Monument on the US 17/92 bridge over Reedy Creek. Two historical bridges, the South Orange Blossom Trail Bridge and the Disney 5000 13 Bridge, are located in the Intercession City area.

Homely Cow Dip, an historical structure, is located near the junction of US Highways 192 and I 4. Other historic structures that occur within the 5 mile radius include the following: (1) Lake Wilson Boy Scout Camp, Oak Island Road, Kissimmee; (2) Homestead Cemetery, Kinney Harmon Road, Davenport; and (3) Rodgers House, Old Wilson Lake, Loughman.

Two historic residences are in Campbell, and 20 historic structures (mainly residences) are present near Intercession City. These structures are as follows:

- 4480 Old Tampa Highway, Campbell.
- 4489 Old Tampa Highway, Campbell.
- 5552 Old Tampa Highway, Intercession City.
- 5618 Old Tampa Highway, Intercession City.
- 531 Tallahassee Blvd, Intercession City.
- 5958 Tomoka Road, Intercession City.
- 4936 South Orange Blossom Trail, Intercession City.
- 4955 South Orange Blossom Trail, Intercession City.
- 5508 South Orange Blossom Trail, Intercession City.
- 5505 South Orange Blossom Trail, Intercession City.
- 5510 South Orange Blossom Trail, Intercession City.
- 4955 South Orange Blossom Trail, Intercession City.
- 5515 South Orange Blossom Trail (Rainbow Trailer Park Office), Intercession City.
- 5540 South Orange Blossom Trail, Intercession City.
- 5544 South Orange Blossom Trail, Intercession City.
- 5548 South Orange Blossom Trail, Intercession City.
- 5535 South Orange Blossom Trail, Intercession City.
- 5551 South Orange Blossom Trail, Intercession City.
- 5581 South Orange Blossom Trail, Intercession City.
- 5599 South Orange Blossom Trail, Intercession City.
- 5605 South Orange Blossom Trail, Intercession City.
- 5637 South Orange Blossom Trail, Intercession City.

The CIPP conservation easement is not a Save Our Rivers (SOR) property. However, approximately 500 to 600 acres south of Highway 92 and approximately 1,000 acres north of the CIPP are SOR properties.

2.2.5 Archaeological and Historic Sites

The *National Register of Historic Places* lists seven sites in Osceola County. These sites include the Colonial Estate, First United Methodist Church, the Kissimmee Historic District, the Old Holy Redeemer Catholic Church, and the Osceola County Courthouse, all located in Kissimmee. The remaining two sites include the Desert Inn in Yeehaw Junction and the Grand Army of the Republic Memorial Hall in St. Cloud.

In January 1992, in association with construction and operation of Units 1 and 2, the Florida Division of Historical Resources (FDHR) was requested to conduct an assessment of known or potential cultural resources onsite and in the project area. The FDHR indicated in February 1992 that there were no known archeological or historical resources onsite or within the project area listed on the *National Register of Historic Places*, but recommended that a systematic survey of the site and project area be conducted prior to any project land disturbing activities.

A Phase I cultural resources investigation of the CIPP and associated corridors was conducted by Janus Research/Piper Archaeology of St. Petersburg, Florida, in May 1992. The investigation discovered 13 previously unrecorded sites, seven prehistoric and six historic. It was the consultant's opinion that none of the sites were eligible for listing on the *National Register of Historic Places*. All of the historic sites were outside of direct impact areas. The Phase I report was submitted to the FDHR for review in June 1992. On July 23, 1992, the FDHR issued a clearance letter concurring with the consultant's opinion and approving the project for construction.

Correspondence to the FDHR in March 2008 provides a description of the project and requests up-to-date information about archaeological and cultural resources. A copy of the project review letter to FDHR is included in Subsection 10.5.4.

2.2.6 Socioeconomics and Public Services

2.2.6.1 Labor Force. Labor force statistics for Florida, Osceola County, and the surrounding counties are shown in Table 2.2-4. According to the Florida Research and Economic Database, Osceola County had a September 2007 total civilian labor force of 126,946, of which 4.5 percent were unemployed. Osceola County's unemployment rate was in line with those of surrounding counties, which ranged from 3.7 to 7.0 percent. Osceola County's unemployment rate was only slightly higher than the overall state unemployment rate of 4.3 percent for September 2007 and matched the national unemployment rate of 4.5 percent. Annual figures for 2006 show a similar pattern, with the Osceola County unemployment rate at 3.4 percent, a 3.3 percent rate for Florida, and a 4.6 percent rate nationally.

2.2.6.2 Employment by Occupation. Employment figures by occupation for the Orlando-Kissimmee Metropolitan Statistical Area (MSA) for May 2006 are shown in Table 2.2-5. This MSA includes not only Orlando and Kissimmee, but also towns from Osceola, Orange, Seminole, and Lake counties. There were 1,019,280 people employed among all occupations within this MSA; the largest occupation category was in the office and administrative support occupation (191,350 or 18.8 percent). This category was followed by sales and related occupation (132,160 or 13.0 percent), and the food preparation and serving occupation (110,350 or 10.8 percent).

Table 2.2-4
Labor Force Statistics for Osceola County, Area Counties Surrounding the Cane Island, Florida, and the US

Area	Civilian Labor Force	Employment	Unemployment	Unemployment Rate
September 2007 Labor Force Statistics				
Brevard County	266,773	254,833	11,940	4.5%
Highlands County	43,133	40,883	2,250	5.2%
Lake County	61,597	57,292	4,305	7.0%
Indian River County	128,959	123,235	5,724	4.4%
Okeechobee County	18,439	17,287	1,152	6.2%
Orange County	601,260	578,008	23,252	3.9%
Osceola County	126,946	121,236	5,710	4.5%
Polk County	278,180	264,756	13,424	4.8%
Seminole County	246,515	237,487	9,028	3.7%
Florida	9,297,000	8,901,000	396,000	4.3%
US	153,400,000	146,448,000	6,952,000	4.5%
Annual 2006 Labor Force Statistics				
Brevard County	261,417	252,864	8,553	3.3%
Highlands County	41,684	40,194	1,490	3.6%
Lake County	59,596	57,102	2,494	4.2%
Indian River County	123,126	119,036	4,090	3.3%
Okeechobee County	17,497	16,786	711	4.1%
Orange County	575,990	558,312	17,678	3.1%
Osceola County	121,189	117,105	4,084	3.4%
Polk County	269,119	259,755	9,364	3.5%
Seminole County	236,170	229,395	6,775	2.9%
Florida	8,989,000	8,693,000	296,000	3.3%
US	151,428,000	144,427,000	7,001,000	4.6%

Source: Florida Research and Economic Database, http://fred.labormarketinfo.com/analyzer/seltime.asp?cat=LAB&session=LABFORCE&subsession=99&tableused=LABFORCE&rollgeo=04&defaultcode=&time=&currsubsessavail=&siclevel=3&naicslvl=6&incsource=&sgltime=0&AreaAbr=cnty&blnFirstGeog=True&geo=1204000097&areaname=Osceola%20County

Table 2.2-5
Employment by Occupation for Orlando-Kissimmee MSA and Florida, May 2006

Occupation	Orlando-Kissimmee MSA		Florida	
	Employment Level	Percent of Total	Employment Level	Percent of Total
All Occupations	1,019,280	100	7,869,210	100
Management	29,750	2.9	231,960	3.0
Business and Financial Operations	47,300	4.6	360,270	4.6
Computer and Mathematical Science	22510	2.2	149,660	1.9
Architecture and Engineering Occupations	19040	1.9	127,420	1.6
Life, Physical, and Social Science	6,710	0.7	50,050	0.6
Community and Social Services	7,110	0.7	80,800	1.0
Legal	7,070	0.7	69,320	0.9
Education, Training, and Library	52,160	5.1	390,160	5.0
Arts, Design, Entertainment, Sport, and Media	14,480	1.4	94,400	1.2
Healthcare Practitioner and Technical Occupations	42,520	4.2	413,180	5.3
Healthcare Support Operations	20,280	2.0	200,440	2.6
Protective Service	22,270	2.2	208,240	2.7
Food Preparation and Serving	110,350	10.8	739,750	9.4
Building and Grounds Cleaning and Maintenance	46,510	4.6	311,490	4.0
Personal Care and Service	36,590	3.6	205,230	2.6
Sales and Related	132,160	13.0	984,230	12.5
Office and Administrative Support	191,350	18.8	1,508,910	19.2
Farming, Fishing, and Forestry	2,930	0.3	38,740	0.5
Construction and Extraction	64,580	6.3	513,750	6.5
Installation, Maintenance, and Repair	41,170	4.0	322,170	4.1
Production Occupations	37,010	3.6	353,550	4.5
Transportation and Material Moving	65,420	6.4	515,490	6.6

Source: Bureau of Labor Statistics, http://stats.bls.gov/oes/current/oes_36740.htm

In the Orlando-Kissimmee MSA, the largest employer, by far, is the Walt Disney World Company with 56,800 employees. Orange County Public Schools employs the next largest number of employees, with 24,063, followed by Florida Hospital (19,220) and Universal Orlando (12,500). Other major employers in the area include Orlando Regional Healthcare (11,093), the University of Central Florida (8,946), Central Florida Investments (8,300), and Orange County Government (7,426).

2.2.6.3 Employment by Industrial Sector. Table 2.2-6 lists the employment by industrial sector for the Orlando-Kissimmee MSA, Osceola County, and Florida in 2006. Major employment sectors in the county included the leisure and hospitality sector (21.6 percent) as well as the trade, transportation, and utilities sector (21.4 percent). Education and health services (11.1 percent) and professional and business services (8.9 percent) also made up a significant portion of the Osceola County employment by industry in 2006.

Compared to the state, Osceola County had a relatively higher concentration of employment in the leisure and hospitality sector (21.6 percent versus 11.5 percent). The county was well below the state percentage in the professional and business services sector (8.9 percent versus the state's 17.1 percent), and education and health services (11.1 percent for the county versus 18.4 percent in the state).

2.2.6.4 Baseline Employment Projections. Employment projections are available by sector for the Orlando-Kissimmee MSA employment region and for the state through the Florida Research and Economic Database. Projections covering 2007 and 2015 are shown in Table 2.2-7. For this period, the community and social services sector in the Orlando-Kissimmee region is expected to experience the largest annual average growth rate (5.0 percent per year). The life, physical, and social science sector (4.1 percent), healthcare support sector (3.5), and the healthcare practitioners and technical sector (3.4 percent) also are expected to increase at an annual average rate of more than 3.3 percent.

Compared to the state of Florida in general, the Orlando-Kissimmee MSA is expected to realize higher growth rates in most sectors. These include the community and social services sector (5.0 percent versus 2.2 percent) and the life, physical, and social sciences sector (4.1 percent versus 2.1 percent). The following sectors also have 0.7 percent more growth each, in the MSA versus the state of Florida: education, training and library; building and grounds cleaning and maintenance; healthcare practitioners, and technical.

Table 2.2-6
Employment by Industry in Osceola County and Florida, 2006

Industry	Orlando-Kissimmee MSA		Osceola County		Florida	
	Percent	Number	Percent	Number	Percent	Number
Education and Health Services	10.5	110,474	11.1	13,452	18.4	1,425,582
Information	2.6	27,097	0.8	969.512	2.2	170,450
Trade, Transportation, and Utilities	20	211,408	21.4	25,934	20.8	1,611,528
Manufacturing	4.3	45,085	2.4	2,909	5.2	402,882
Natural Resources and Mining	0.7	7,130	N/D	N/D	1.3	100,720
Other Services	2.8	29,674	2.3	2,787	3.1	240,180
Leisure and Hospitality	17.5	184,734	21.6	26,177	11.5	890,989
Construction	8.9	94,490	9	10,907	7.6	588,827
Financial Activities	6.4	67,388	5.4	6,544	6.8	526,846
Professional and Business Services	15.6	165,258	8.9	10,786	17.1	1,324,862
Public Administration	4.4	46,695	6.4	7,756	5.8	449,368
Unclassified	5.5	58,079	0.1	121.189	0.1	7,748

Source: Enterprise Florida, http://www.eflorida.com/profiles/CountyReport.asp?County1D=30&Display=all

Table 2.2-7
Baseline Employment Projections, 2007-2015

Industry	Orlando-Kissimmee MSA Employment Region 2007 Estimate	Orlando-Kissimmee MSA Employment Region 2015 Projected	Orlando-Kissimmee MSA Employment Region Annual Average Growth Rate	Florida 2007 Estimate	Florida 2015 Projected	Florida Annual Average Growth Rate
Office and Administrative Support	188,261	214,319	1.6	1,573,303	1,727,537	1.2
Sales and Related	133,261	156,936	2.1	1,150,570	1,308,450	1.6
Food Preparation and Serving Related	97,954	119,956	2.6	764,151	907,275	2.2
Construction and Extraction	63,735	70,031	1.2	621,154	680,431	1.1
Transportation and Material Moving	63,026	71,851	1.7	547,915	619,819	1.6
Education, Training, and Library	53,888	68,909	3.1	440,598	531,404	2.4
Building and Grounds Cleaning and Maintenance	49,019	60,006	2.6	381,876	459,634	2.3
Business and Financial Operations	48,840	60,450	2.7	419,642	498,847	2.2
Personal Care and Service	44,076	54,146	2.6	288,952	341,312	2.1
Installation, Maintenance, and Repair Occupations	43,808	51,715	2.1	364,679	417,534	1.7
Management Occupations	39,323	46,259	2.1	365,363	415,208	1.6
Healthcare Practitioners and Technical	38,494	50,258	3.4	452,600	560,170	2.7
Production	34,921	38,558	1.2	369,718	392,120	0.7
Computer and Mathematical	27,700	35,950	3.3	170,453	218,588	3.2
Arts, Design, Entertainment, Sports, and Media	23,524	27,595	2.0	149,436	170,877	1.7
Healthcare Support	18,375	24,180	3.5	222,697	282,378	3.0
Protective Support	16,674	19,025	1.7	219,695	248,090	1.5
Architecture and Engineering	11,618	13,374	1.8	137,294	160,722	2.0
Legal	11,485	14,627	3.1	92,018	115,668	2.9
Community and Social Services	9,903	12,234	5.0	111,221	132,498	2.2
Life, Physical, and Social Science	6,380	8,804	4.1	59,014	69,864	2.1
Farming, Fishing, and Forestry	4,865	4,951	0.2	85,092	86,682	0.2
Total	1,029, 098	1,223,414	2.2	8,987,444	10,345,108	1.8

Source: Florida Research and Economic Database, http://fred.labormarketinfo.com/lmi/area/area_occupations.asp?session=areadeatail&geo=1201000000

2.2.6.5 General Income Characteristics. Total and per capita income information for Osceola County and for Florida are listed in Table 2.2-8. According to the US Bureau of Economic Affairs, Osceola County, the total personal income in 2005 was $5.10 billion and the state total was $616.77 billion; these figures constituted increases of 10.7 percent and 9.1 percent, respectively, from 2004. The per capita income level for the county was $22,008 per person in 2005, and compared to a per capita income of $20,901 the previous year, and $20,260 in 2003. The 2005 per capita income in the county was significantly below that at the state level, which was $34,712. According to the 2004 US Census, 12.2 percent of the population in Osceola County lived in poverty. The corresponding figure for the state was 11.9 percent.

Table 2.2-8
Total and Per Capita Personal Income ($000s), 2003-2005

	Orlando-Kissimmee		Osceola County		Florida	
Year	Per Capita Income	Total Personal Income	Per Capita Income	Total Personal Income ($000s)	Per Capita Income	Total Personal Income ($000s)
2003	$28,387	$51,110,355	$20,260	$4,175,478	$30,290	$514,377,645
2004	$30,068	$55,966,086	$20,901	$4,602,693	$32,546	$565,211,107
2005	$31,557	$60,951,385	$22,008	$5,094,559	$34,712	$616,766,729

Source: US Bureau of Economic Affairs, http://www.bea.gov/regional/REMDmap/REMDMap.aspx

2.2.6.6 Source of Income. Information on sources of income for the area surrounding the CIPP is listed in Table 2.2-9 for 2004 and 2005. According to the US Bureau of Economic Analysis, personal income was the largest source of county income in both years: personal current transfer receipts; retirement benefits; and dividends, interest, and rent also each generated more than 1 billion dollars in income.

2.2.6.7 Average Wage and Salary Income, by Sector. Table 2.2-10 lists the average annual wage by industry in Osceola County in 2006. The manufacturing industry had the highest average annual wage at $45,055. The next highest paid sectors were information at $43,408 and public administration at $40,383. The leisure and hospitality sector ($19,754) and other services ($23,853) had the lowest recorded average annual wages for 2006.

Table 2.2-9
Source of Income for 2004 and 2005[1]
(in thousands of dollars)

	Orlando – Kissimmee MSA		Osceola County, Florida		Florida	
Category	2004	2005	2004	2005	2004	2005
Personal Income[2]	$55,966,086	$60,951,385	$4,602,693	$5,094,559	$564,997,468	$604,131,000
Net Earnings	$39,311,164	$43,476,708	$3,152,845	$3,530,529	$333,089,178	$362,586,955
Personal Current Transfer Receipts	$8,587,307	$8,724,433	$1,026,401	$1,003,628	$94,828,431	$98,667,268
Income Maintenance[3]	$852,670	$869,699	$71,786	$82,079	$8,385,252	$8,956,379
Unemployment Insurance Benefit Payments	$113,494	$88,492	$19,427	$27,412	$1,176,540	$918,857
Retirement and Other	$7,621,143	$7,766,242	$1,009,461	$1,095,584	$85,266,639	$88,792,032
Dividends, Interest, and Rent	$8,067,615	$8,750,244	$423,447	$560,401	$137,079,859	$142,876,777

(1)Source: US Bureau of Economic Affairs, http://www.bea.gov/regional/index.htm
(2)Net earning by place of residence is earnings by place of work less contributions for government social insurance, plus an adjustment to convert earnings by place of work to a place of residence basis. Earnings by place of work is the sum of wage and salary disbursements, supplements to wages and salaries, and proprietors' income.
(3)Income Maintenance payments consist largely of supplemental security income payments, family assistance, food stamp payments, and other assistance payments, including general assistance.

Table 2.2-10
Average Annual Wage by Industry, 2006 ($)

Industry	Osceola County
Construction	$34,975
Education and Health Services	$38,894
Financial Activities	$37,405
Information	$43,408
Leisure and Hospitality	$19,754
Manufacturing	$45,055
Natural Resources and Mining	N/D
Other Services	$23,853
Professional and Business Services	$27,958
Public Administration	$40,383
Trade, Transportation, and Utilities	$26,201
Unclassified	$28,191

Source: Enterprise Florida,
http://www.eflorida.com/floridasregionsSubpage.aspx?id=284

Table 2.2-11 lists the income by occupation for the Orlando-Kissimmee MSA in May 2006. For all occupations, the average income was $34,930 in the MSA, though there was significant variation among individual occupations. The highest income category was in the management occupation ($93,420), followed by the legal occupation ($88,370), and the computer and mathematical science occupation ($61,650).

2.2.6.8 Baseline Income Projections. Table 2.2-12 contains baseline income projections through 2011 for Osceola County and Florida. The projected categories include per capita income and total personal income, and the projections assume that the 2002 through 2005 average annual growth rate for these categories continues to apply through 2011 at the county and state level. Projections indicate that under the assumptions made, the per capita income in Osceola County would increase to $22,008 in 2005 and to $33,028 in 2011. This compares to respective figures of $34,001 and $40,599 for Florida. The total personal income in Osceola County increases to $5.09 billion in 2005 and to $10.06 billion in 2011 under the forecast, while the state income would increase from $604.13 billion in 2005 to $809.59 billion in 2011.

2.2.6.9 Housing. According to the US Census Bureau, there were 89,902 occupied housing units in Osceola County in 2006; this was approximately 1.0 percent of the 8,533,419 units in the state. Osceola County's total number of housing units in 2006 grew by 52 percent in the 6 years between the 2000 census, when 72,293 units were reported. Over 62 percent of the county housing unit stock consisted of single units, while multi-units and mobile homes were approximately 25 percent and 12 percent of the total units, respectively. Approximately 82 percent of the 2006 housing units were built in 1980 or later, with 5.5 percent built before 1960. Approximately 69 percent of residents moved into units after 2000; nearly 91 percent have moved to their residence in 1990 or later.

The Orlando-Kissimmee MSA had a total of 749,928 housing units in 2006, and this constituted 8.8 percent of the total state's overall units. Additional statistics shown in Table 2.2-13 indicate that single units made up two-thirds of the MSA housing stock in 2006, with 7.8 percent classified as mobile homes and 25.5 percent as multi-units. The housing unit stock around Orlando and Kissimmee is relatively young, reflecting the recent population growth. Approximately 68 percent of the housing stock in 2006 was built in 1980 or later, and only 10 percent of the housing units were built before 1960. Approximately 64 percent of the 2006 population moved into their housing unit in 2000 or later, and approximately 86 percent moved into the unit in 1990 or later.

Table 2.2-11
Mean Annual Average Wages
Income by Occupation for Orlando-Kissimmee MSA and Florida
May 2006 (in Dollars)

Occupation	Orlando-Kissimmee	Florida
All Occupations	34,930	35,820
Management	93,420	94,650
Business and Financial Operations	55,380	55,550
Computer and Mathematical Science	61,650	60,310
Architecture and Engineering Occupations	59,220	58,980
Life, Physical, and Social Science	51,370	52,630
Community and Social Services	36,950	37,060
Legal	88,370	78,830
Education, Training, and Library	40,230	43,940
Arts, Design, Entertainment, Sport, and Media	42,800	42,430
Healthcare Practitioner and Technical Occupations	57,930	59,780
Healthcare Support Occupations	24,120	23,940
Protective Service	32,450	34,730
Food Preparation and Serving	19,300	19,010
Building and Grounds Cleaning and Maintenance	20,670	20,780
Personal Care and Service	21,000	22,740
Sales and Related	33,660	34,710
Office and Administrative Support	27,940	28,050
Farming, Fishing, and Forestry	21,370	19,740
Construction and Extraction	32,860	32,680
Installation, Maintenance, and Repair	35,510	35,360
Production Occupations	27,300	27,700
Transportation and Material Moving	26,920	27,220

Source: US Department of Labor, Bureau of Labor Statistics, May 2006 Metropolitan Area Occupational Employment and Wage Estimates, http://stats.bls.gov/cew/home.htm

Table 2.2-12
Projection of Baseline Income Figures for Osceola County and Florida

Year	Osceola County		Florida	
	Per Capita Income	Total Personal Income ($1,000s)	Per Capita Income	Total Personal Income ($1,000s)
2003	$20,260	$4,175,478	$30,290	$514,377,645
2004	$20,901	$4,602,693	$32,534	$564,997,468
2005	$22,008	$5,094,559	$34,001	$604,131,000
2006	$23,549	$5,705,906	$35,021	$634,337,550
2007	$25,197	$6,390,615	$36,072	$666,054,428
2008	$26,961	$7,157,489	$37,154	$699,357,149
2009	$28,848	$8,016,387	$38,268	$734,325,006
2010	$30,867	$8,978,354	$39,416	$771,041,257
2011	$33,028	$10,055,756	$40,599	$809,593,319

Sources: Projections made by Black & Veatch.
Enterprise Florida,
http://www.eflorida.com/profiles/CountyReport.asp?CountyID=30&Display=all

Table 2.2-13
Profile of Selected Housing Characteristics in 2006

Category	Orlando-Kissimmee MSA Number (out of 749,928 occupied housing units)	Orlando-Kissimmee MSA Percent	Osceola County Number (out of 89,902 occupied housing units)	Osceola County Percent
Units in Structure				
Single-Unit, Detached	467,205	62.3	56,369	62.7
Single-unit, Attached	32,997	4.4	2,517	2.8
Two Apartments	13,499	1.8	1,708	1.9
Three or Four Apartments	27,747	3.7	3,506	3.9
Five to Nine Apartments	47,995	6.4	7,282	8.1
Ten or More Apartments	101,240	13.5	7,462	8.3
Mobile Home or other Type of Housing	58,494	7.8	11,058	12.3
Year Structure Built				
2000 or Later	153,735	20.5	25,982	28.9
1990-1999	169,484	22.6	26,611	29.6
1980-1989	182,982	24.4	21,217	23.6
1960-1979	167,984	22.4	11,148	12.4
1940-1959	60,744	8.1	3,147	3.5
1939 or Earlier	14,249	1.9	1,708	1.9
Rooms				
One Room	2,250	0.3	90	0.1
Two or Three Rooms	81,742	10.9	7,282	8.1
Four or Five Rooms	293,222	39.1	36,680	40.8
Six or Seven Rooms	255,725	34.1	32,634	36.3
Eight or More Rooms	116,239	15.5	13,216	14.7
Year Householder Moved into Unit				
2005+	206,355	27.5	25,622	28.5
2000 - 2004	276,981	36.9	36,244	40.3
1990 to 1999	163,052	21.7	19,579	21.8
1980-1989	63,014	8.4	6,137	6.8
1970 to 1979	24,595	3.3	1,890	2.1
1969 or Earlier	15,931	2.1	430	0.5

Source: US Census Bureau, 2000 and 2006 Census data, S2504 Physical Housing Characteristics for Occupied Housing Units, http://factfinder.census.gov

2.2.6.10 Existing Housing Stock. Table 2.2-14 lists additional Census Bureau data about the Orlando-Kissimmee MSA and Osceola County housing units. Of the total 749,928 housing units in the MSA, 0.4 percent of the housing units were classified as lacking complete plumbing facilities, and 0.7 percent were lacking complete kitchen facilities. Approximately 9 percent had no telephone service.

The vast majority of homes (91.6 percent) in the Orlando-Kissimmee MSA were heated by electricity in 2006, while only 5.9 percent were heated by utility gas. Use of other fuel sources was marginal.

Osceola County's housing characteristics looked similar to those in the MSA. Of the MSA housing units, approximately 8.0 percent had no telephone, 0.6 percent lacked plumbing, and 0.4 percent did not have complete kitchen facilities.

The number of persons per household was essentially the same at the MSA and state levels according to US Census data. Of the occupied housing units in the Orlando-Kissimmee area, 97.5 percent contained 1.00 or fewer occupants per room. For Osceola County, 97.9 percent had 1.00 or fewer occupants to each room.

Of the total number of houses in the Orlando-Kissimmee MSA, 84.3 percent were occupied and 15.7 percent were vacant, with 9.9 percent of vacant houses designated for seasonal, recreational, or occasional use. In Osceola County, 91.5 percent of houses were occupied, leaving 8.5 percent vacant. A smaller percentage (3.2 percent) was for seasonal or recreational use.

2.2.6.11 Building Activity. Table 2.2-15 indicates that the building activity for Osceola County has continued at a rapid pace during the recent past, as reflected in the number of housing unit building permits issued. According to the US Department of Housing and Urban Development, in 2006, a total of 8,006 permits were issued for the county, and this was equal to approximately 2.6 percent of the 2002 existing housing stock. From 2002 through 2006, the type of housing unit for which a building permit was issued was primarily for single family structures, although five+ unit multi-family structures also comprised a significant percentage in 2002 (32 percent) and in other years.

2.2.6.12 Housing Costs. Osceola County features a diversity of residential areas and a wide range of housing prices. The average home prices for Osceola County in 2005 are shown in Table 2.2-16, based on information from the Florida Housing Data Clearing-house of the University of Florida. The cost of housing was relatively affordable in 2005. A single family home averaged $144,976, and mobile homes cost an average of $73,475. Condominiums, on the other hand, were considerably more expensive averaging over $400,000.

Table 2.2-14
Selected Housing Characteristics for the Orlando-Kissimmee MSA and Osceola County from the 2006 Census

Category	Orlando- Kissimmee MSA		Osceola County	
	Number	Percent	Number	Percent
Lacking Complete Plumbing Facilities	3,013	0.40	575	0.64
Lacking Complete Kitchen Facilities	5,123	0.68	375	0.42
No Telephone Service	66,260	8.84	7,253	8.07
Occupants Per Room				
1.00 or less	731,379	97.53	87,980	97.86
1.01 to 1.50	15,329	2.04	1,799	2.00
1.51 or More	3,220	0.43	123	0.14
House Heating Fuel				
Utility Gas	39,205	5.9	N/A	N/A
Bottled, Tank, or Liquified Petroleum Gas (LPG)	7,444	1.1	N/A	N/A
Electricity	604,718	91.6	N/A	N/A
Fuel Oil, Kerosene, etc.	3,898	0.6	N/A	N/A
Coal or Coke	0	0.0	N/A	N/A
All Other Fuels	1,649	0.3	N/A	N/A
No Fuel Used	3,112	0.5	N/A	N/A
Types of Houses Orlando-Kissimmee MSA and Osceola County from the 2000 Census				
Total Number of Houses	683,551	100.0	72,293	100.0
Total Number of Vacant Houses	58,303	8.5	11,316	15.7
Total Number of Seasonal/ Recreational Houses	21,534	3.2	6,599	9.1

Source: US Census Bureau, 2006 Census data, S2504 Physical Housing Characteristics for Occupied Housing Units, http://factfinder.census.gov

Table 2.2-15
Housing Unit Building Permits
2002-2006

Units	2002	2003	2004	2005	2006
Osceola County, FL					
Single-Family Structures	3,541	4,692	6,316	5,841	5,772
Multi-Family Structures	1,772	823	2,754	2,155	2,234
Two-Unit Multi-Family Structures	36	8	26	8	4
Three- and Four-Unit Multi-Family Structures	58	19	37	40	154
Five+ Unit Multi-Family Structures	1,678	796	2,691	2,107	2,076
Total	5,313	5,515	9,070	7,996	8,006
Orlando-Kissimmee MSA, FL					
Single-Family Structures	15,914	20,751	25,049	24,802	23,646
Multi-Family Structures	8,068	5,602	6,047	9,231	7,338
Two-Unit Multi-Family Structures	148	152	148	32	96
Three- and Four-Unit Multi-Family Structures	122	88	183	322	421
Five+ Unit Multi-Family Structures	7,798	5,362	5,716	8,877	6,821
Total	23,982	26,353	31,096	34,033	30,984

Source: US Dept. of Housing and Urban Development, State of the Cities Data Systems (SOCDS), http://socds.huduser.org/permits/index.html

Table 2.2-16
Average Home and Rental Prices in Osceola County

Average Home Prices, 2005	
Description	
Single Family Home	$144,976
Mobile Home	$73,475
Condominium	$421,269
Average Price of Rentals, 2000	
Studio One Bedroom Apartment	$655
Two Bedroom Apartment	$814
Three Bedroom	$1,019

Source: Florida Housing Data Clearinghouse, http://flhousingdata.shimberg.ufl.edu/a/profiles?action=results&nid=4900

Additional housing cost information is available from the 2000 US Census. Table 2.2-17 shows that in 2000, 47.7 percent of the housing in Osceola County had a value of between \$50,000 and \$99,999. The second highest percentage of owner-occupied housing units was in the \$100,000 to \$149,000 range (32.2 percent of the units). The 2000 US Census also reported that 18.7 percent of the housing units were not mortgaged and, of those units mortgaged, 31.9 percent had monthly owner costs between \$700 and \$999 per month; 26.5 percent had a monthly mortgage between \$1,000 and \$1,499 per month; and 10.4 percent had a monthly mortgage between \$500 and \$699 per month. According to US Census data, 43.1 percent of the county population spent less than 20 percent of household income on monthly owner costs.

For rental units, the 2000 US Census reported that 43.2 percent of the renter-occupied units in Osceola County had a gross rent between \$500 and \$749 per month, 32.1 percent were between \$750 and \$999 per month, and 10.3 percent were between \$300 and \$499 per month. According to the 2000 Census, 24.0 percent of renters spent less than 20 percent of their income on rent and 38.4 percent of renters spent 35 percent or more on rent.

In addition to the housing and rental stock, Orlando and Kissimmee offer a wide variety of temporary lodging, reflecting the area's status as a destination for recreational seekers. The Kissimmee Convention and Visitors' Bureau Web site lists 144 motels, inns, hotels, RV parks, and short-term apartments in the area.

2.2.6.13 Education. According to the School District of Osceola County Web site, the county has a total of 42 public schools. Of these, 26 are elementary schools, 10 are middle schools, and the remaining 17 are high schools. The public schools serve over 51,000 students. Parents have the option of choosing their child's school in accordance with certain rules and limits.

There are several options for higher education in the county. There are three community colleges: Valencia (53,800 students), Seminole (29,500 students), and Lake-Sumter (4,650 students). In addition, there are five vocational/technical schools and several alternative school options.

A wide variety of colleges and universities also help to meet the region's educational needs. With an enrollment of nearly 47,000 students, the University of Central Florida (UCF) ranks as the seventh largest university in the nation. Its research facilities have been fundamental in supporting the region's growing technology clusters. The adjacent Central Florida Research Park is known as one of the top research parks for industry/university research collaboration and technology commercialization.

Table 2.2-17
Selected Housing Cost Characteristics for Osceola County, 2000

Category	Number (out of 72,293)	Percent
Value of Specified Owner-Occupied Units		
Less than $50,000	1,043	3.3
$50,000 to $99,999	15,275	47.7
$100,000 to $149,999	10,311	32.2
$150,000 to $199,000	2,874	9.0
$200,000 to $299,999	1,691	5.3
$300,000 to $499,000	584	1.8
$500,000 to $999,999	196	0.6
$1,000,000 plus	48	0.1
Median	$99,300	N/A
Selected Monthly Owner Costs as a Percent of Household Income		
Less than 15 percent	8,254	25.8
15 to 19 percent	5,551	17.3
20 to 24 percent	5,361	16.7
25 to 29 percent	3,450	10.8
30 to 34 percent	2,590	8.1
35 percent or more	6,573	20.5
Not computed	243	0.8
Gross Rent of Specified Renter-Occupied Units		
Less than $200	260	1.3
$200 to $299	276	1.4
$300 to $499	2,016	10.3
$500 to $749	8,478	43.2
$750 to $999	6,297	32.1
$1,000 to $1,499	1,436	7.3
$1,500 or more	155	0.8
No cash rent	725	3.7
Median	714	N/A
Gross Rent as a Percent of Household Income		
Less than 15 percent	1,859	9.5
15 to 19 percent	2,852	14.5
20 to 24 percent	2,806	14.3
25 to 29 percent	2,334	11.9
30 to 34 percent	1,844	9.4
35 percent or more	6,904	35.1
Not computed	1,044	5.3

Source: US Census Bureau, 2000 Census, DP-4 Profile of Selected Housing Characteristics: 2000 (SF 3), Osceola County, Florida, http://www.census.gov

Several other top-rated colleges and technical schools provide a constant supply of talented graduates to local employers. Full Sail Real World Education is a 4 year private school that enrolls 4,500 students annually. Rollins, a private liberal arts college, enrolls 3,475 students per year. The Florida Hospital College, which is both private and independent, has the next highest enrollment of 1,000 students annually.

According to the Florida Legislature's Office of Economic and Demographic Research, 15.7 percent of Osceola County's population had a bachelor's degree or higher in 2006, to the state percentage 22.3.

2.2.6.14 Transportation. The project area's transportation system is highly developed because of the region's popularity as a tourist destination.

Airports. The three airports that serve the area are Kissimmee Municipal, Orlando International, and the Orlando Executive. The Kissimmee (Municipal) Gateway Airport (ISM) accommodates general aviation air service 24 hours a day with two paved airport runways of 5,000 and 6,000 feet. A number of flight training schools, hangars, and a variety of recreational activities are located on the airport property. The Gateway Airport is owned and operated by the City of Kissimmee, and its air traffic control tower operates from 7:00 a.m. to 10:00 p.m. daily.

According to its Web site, the Orlando International Airport (MCO), located 12 miles from Orlando, is one of the 30 busiest airports in the world. It is the third largest airport in the United States and covers 23 square miles. MCO has four parallel runways, two of which are 12,000 feet in length, one of which is 10,000 feet, and the last is 9,000 feet. It has an airfield capacity of 140 operations per hour through its one landside terminal and four airside terminals. The airport serves 74 domestic and 16 international airlines. These airlines utilize MCO to fly in and out of over 80 US and numerous international destinations. The airport accommodates 35 million passengers annually.

The Orlando Executive Airport (ORL) is located near downtown Orlando, but is a general aviation airport and is not served by commercial airlines. It has a Federal Aviation Administration (FAA) Staffed Control Tower and two paved runways, which are 6,003 feet and 4,638 feet. The ORL offers many services to the community - including law enforcement, air ambulance, and search/rescue capabilities. Its central location, quality approaches, and the ability to handle quick take-off demands make ORL ideally suited for these operations.

Port Canaveral. Port Canaveral is major deepwater port of entry in the state of Florida, located 50 miles east of Orlando. With depths of 39 to 41 feet, it is the world's first quadramodal foreign trade zone, interchanging freight among land, air, water, and space. The port encompasses 4,160 acres, making it one of the largest general purpose foreign trades zones in the country. Port Canaveral provides uncongested highway access in all directions to all markets. More than 4.5 million short tons of cargo passed through the port in 2006, and over 4.5 million cruise passengers passed through its six terminals in 2006, making it the second biggest cruise port in the world.

Highway Transportation. Because the impact area is a major business and tourist hub, the area transportation network includes several high capacity volume highways. Among the busiest of these are Interstate 4 and the Florida Turnpike. Other important highways include State Road 417 (GreeneWay State Road 408 /East-West Expressway) and State Road 528 (Beachline Expressway). US 17/92, 27, and 441 are also major routes in the area.

2.2.6.15 Medical Facilities. Orlando and Kissimmee benefit from a number of modern health care facilities offering a wide diversity of care as outlined in the Kissimmee/Osceola County Chamber of Commerce Relocation Guide.

The Osceola Regional Medical Center is a 235 bed hospital located in Osceola County, Florida, and 7.4 miles east of the power plant site. Completed in April 1997, and with a recent $55 million expansion, the hospital is designed to be patient friendly and blends state-of-the-art technology with comfort and convenience for patients and visitors. The hospital features all private rooms, Level 2 neonatal care, and an open heart program. It also offers a wide variety of health care programs and specialties, wound care center, community education programs, and a mammography center. The hospital is Joint Commission on the Accreditation of Healthcare Organizations (JCAHO) accredited.

Florida Health Kissimmee, part of the Florida Hospital System and located near the plant, has recently updated its surgical and ICU departments. Plans are for the facility to double the size of its emergency department and build a new 50 bed patient tower, as well as a new multi-specialty physician office. The facility is located approximately 12 miles northeast of the Cane Island site.

The Lakeland Regional Medical Center, the Lake Wales Medical Centers, and Winter Haven Hospital are farther to the west and south of the CIPP. Lakeland Regional Medical Center has the second busiest emergency room in the state. As Polk County's only state-designated Level 2 trauma center, it is equipped with state-of-the-art, life saving equipment; a dedicated chest pain management staff to expedite cardiac cases; and a 10 bed pediatric emergency center with tools specific to a child's needs. It is 32.5 miles southwest of the Cane Island site.

The Lake Wales Medical Center is 26 miles almost directly south of the Cane Island site and consists of a 154 bed acute care hospital committed to delivering essential medical care to residents living in the Greater Lake Wales area. With over 50 active physicians, it provides a comprehensive range of inpatient and outpatient services.

Winter Haven Hospital was established in 1926 and serves as the major medical center for east Polk County. The hospital is a division of Mid-Florida Medical Services, a locally owned and operated 501(C)(3) not-for-profit organization that is governed by an independent Board of Trustees made up of local business and civic leaders who serve without pay. The hospital has 527 licensed hospital beds and is almost 24 miles southwest of the CIPP.

In addition to the above full-service hospitals, there are several "walk-in" facilities available to serve the impact area, and there are various entities that provide paramedic/ambulance services. For example, each of the fire stations within the City of Kissimmee has an ambulance. All city firefighters are also trained as Emergency Medical Technicians (EMTs) or paramedics.

2.2.6.16 Firefighting Facilities. The Osceola County Department of Public Safety provides fire protection for the CIPP, as well as all unincorporated areas within Osceola County. Many other political jurisdictions also employ professional and volunteer firefighting personnel. The Intercession City volunteer fire station is closest in proximity to the CIPP and is roughly 1-1/2 miles from the site. The County also has stations in several nearby locations, and the City of Kissimmee has staff firefighters on call at all times. The City of Orlando also has officers and firefighters in its many stations.

2.2.6.17 Police Protection. The CIPP is unincorporated and, therefore, receives its police protection from the Osceola County Sheriff's Department. The Sheriff's Department headquarters is located between Kissimmee and St. Cloud. It has a professional staff of more than 500 men and women who deliver a range of community-based law enforcement and crime prevention programs to local citizens. Other parts of the impact area divide police protection responsibilities amongst local municipal police forces, the Florida Highway Patrol, and other county sheriff's departments.

The Orlando Police Department has over 1,000 employees to serve residents through crime prevention, criminal investigations and apprehension, neighborhood policing, and involvement through the schools.

The Kissimmee Police Department's Patrol Division is comprised of eight patrol squads that are responsible for providing police services to six patrol beats, 7 days a week, 24 hours a day. The Patrol Division, the largest division within the Agency, has an authorized strength of 55 police officers, eight civilian community service officers, and nine sergeants, four lieutenants also called Watch Commanders, one Captain, and one Deputy Chief. Three of the officers are assigned to K-9 and two to full-time DUI enforcement. Patrol officers are State of Florida certified and are prepared to deal with medical emergencies, to arrest criminal offenders, and to provide assistance to those in need.

The Florida Highway Patrol also has jurisdiction within the area. One troop of officers handles the Florida Turnpike operations, and the district troops are responsible for 30 other subdivided areas of the state. In total, the state has 2,360 patrol officers of which 1,813 are sworn and 547 are non-sworn.

2.2.6.18 Recreation Facilities. The Orlando-Kissimmee area offers numerous recreational activities and attractions; many are related to nature and the outdoors. Some of the main recreational activities include golf, fishing and hunting, parks and hiking trails, and nature tours.

Given the region's relatively temperate climate, many people take advantage of the 130 golf courses surrounding Orlando. The more than 800 indoor and outdoor tennis courts in the area also provide easy access to recreational opportunities.

Hiking is also a popular activity within Osceola County. There are over 25 parks, preserves, and hiking trails just around Kissimmee. These allow for all-day hikes complete with woods, water, and wildlife or simply a relaxing stroll along the lakefront. Roughly 20 area nature tour businesses are available to assist with planning more structured activities. These can include: photographing native Florida wildlife from an airboat, horseback riding on trails along a cattle ranch, having photographs taken with alligators, or picking oranges in local citrus groves. Osceola County has a very active parks division that supports activities as diverse as frogging in Upper Reedy Creek to wildflower viewing along Lake Russell. Local public parks also offer over 3,000 acres of campground.

Kissimmee offers some of the best freshwater fishing in the world. The Kissimmee Chain-of-Lakes is recognized worldwide for its trophy largemouth bass, and it holds several bass tournament world records. Fishing and hunting guides are available year-round to accommodate individual and group excursions. The Orlando-Kissimmee region has almost 20 fishing charters and guide services. The more than 2,000 area freshwater lakes also offer ample opportunity for boating and sailing.

The area is also famous for its theme and water parks; it is home to the Walt Disney World® Resort, SeaWorld® Orlando, and Universal Orlando® Resort. The Walt Disney World Resort includes Animal Kingdom, Downtown Disney, Disney's Hollywood Studios, Magic Kingdom Park, and the Epcot Center. SeaWorld Orlando features Orca whale, sea lion, and dolphin shows, zoological displays featuring various other marine animals, and a variety of thrill rides. Universal Orlando Resort is the number one movie and TV-based theme park in the world and offers a variety of family friendly rides, dining, and shopping.

The region hosts several cultural events and festivals. These include the EPCOT International Flower and Garden Festival, Jazzfest Kissimmee, the Kissimmee Bluegrass Festival, and the Osceola Art Festival.

There are also a variety of museums in the area, which include: G.A.R. Museum (St. Cloud), Kissimmee Air Museum, Orange County Regional History Center (Orlando), Orlando Fire Museum, Orlando Museum of Art, Orlando Science Center, Osceola County Historical Society and Pioneer Museum (Kissimmee), St. Cloud Heritage Museum, St. Cloud Historical Museum, USSSA Sports Museum and Hall of Fame (Kissimmee), Veterans Tribute Museum (Kissimmee), White 1 Foundation Focke Wulf 190 Project and Museum (Kissimmee).

The Orlando-Kissimmee MSA offers several opportunities to watch sports. The Arena Football League (AFL) Orlando Predators and the Orlando Magic basketball team are both based in the area. The Atlanta Braves and Houston Astros baseball teams conduct spring training in the vicinity. The University of Central Florida hosts Division 1 football in the area, and Kissimmee hosts the Silver Spurs Rodeo twice a year.

Other recreational and cultural activities include events with the Central Florida Zoo, Orlando Opera Company, Jai-Alai, and the Southern Ballet Company. The Osceola County Historical Society features an 1898 house, a 1900 general store, a pole-barn, blacksmith shop, and sugar cane mill. The Museum of Pioneer Artifacts portrays the history of Osceola County of Florida. The authentic Medieval Life Village is the only permanent medieval village existing in the United States. The Grand Ceremonial Arena seats 1,100 guests and offers performances each evening plus matinee shows during certain times of the year.

2.2.6.19 Electricity and Gas. Electric service in Osceola County is provided by the Florida Power Corporation, KUA, and the City of St. Cloud. Natural gas service is provided by TECO Energy, an S&P 500 energy company headquartered in Tampa, Florida.

Because the Cane Island project is near Intercession City and will help meet the power requirements of the FMPA, the focus of this section will be on FMPA. The FMPA is a nonprofit, joint action agency formed by 30 municipal electric utilities. It is a public agency, whose primary purpose is to develop competitive power supply and related services.

FMPA currently has five power supply projects. The All-Requirements project is the largest of these, supplying more than 1,500 MW of wholesale power during peak demand to 15 cities. The other four projects consist of both nuclear and coal fired plants.

CIPP currently receives fuel from Florida Gas Transmission (FGT) and Gulfstream pipelines in the area. FGT is an approximately 5,000 mile pipeline extending from south Texas to south Florida with a mainline capacity of 2.3 billion cubic feet (bcf)/day. FGT provides natural gas transportation services to customers in peninsular Florida.

Existing lines to the site are adequate for Unit 4, and no new lines are required. The line into the site is 20 inches in diameter. The unit will run on only natural gas, and there will be no backup fuel.

KUA partners with the City of Kissimmee, Sanitation Division, and Toho to do its billing. The partnership provides benefit to customers who receive electric service by receiving a single bill for electric, water, refuse, and wastewater services. Average service fees for the Orlando Metro area is provided in Table 2.2-18.

Table 2.2-18
Average Residential Monthly Charges in Metro Orlando by System, Fiscal Year 2007

System	2006
Electric	$52.33
Water	$26.54
Wastewater	NA
Gas	$88.03

Source: The Metro Orlando Economic Development Commission, http://www.orlandoedc.com/Data%20Center/Utilities

Table 2.2-19 lists the FMPA Statement of Revenues, Expenses, and Changes in Net Assets for fiscal years 2006 and 2007. The utility realized $704.7 million in operating revenues, compared to operating expenses of nearly $651.4 million for 2006. This resulted in non-operating loss before capital contributions and extraordinary items of $19.9 million. The largest operating expense category was fuel expense ($291.3 million) followed by purchased power expenses ($238.7 million). As a public entity, FMPA is not subject to property or sales tax.

KUA is the FMPA member that serves much of the area surrounding the CIPP. KUA is the sixth largest utility in Florida, and its system extends over 85 square miles. Its services include electricity, wastewater, water, internet access, Web hosting and design, telephone, and security. In 2006, KUA supplied approximately 58,000 electric customers with 305 MW of power.

Table 2.2-19
FMPA Statement of Revenues, Expenses, and Changes in Net Assets for Fiscal Years 2007 and 2006 ($000s)

FMPA Activity	Fiscal Year 2007	Fiscal Year 2006
Operating Revenues:		
Billings to Participants	$671,885	$646,014
Amounts to be Recovered		
(Refunded to) Participants	(18,950)	(33,438)
Sales to Others	51,811	19,869
Interest Income		17,986
Total Operating Revenues	**$704,746**	**$651,371**
Operating Expenses		
Operation and Maintenance (O&M)	69,277	58,989
Fuel Expense	291,271	247,332
Nuclear Fuel Amortization	2,375	2,208
Spent Fuel Fees	359	432
Purchased Power	238,690	231,792
Transmission Services	22,003	23,174
General and Administrative	26,411	24,431
Interest Expense	3,919	3,476
Depreciation	26,439	24,676
Decommissioning	2,526	2,660
Capitalized Development Projects and Allocated Costs	(8,975)	(8,477)
Total Operating Expense	**$674,295**	**$610,693**
Total Operating Income (Loss)	30,451	$21,752
Non-Operating Income (Expense)		
Interest Expense	(40,315)	(35,903)
Amortization of Debt-Related Costs	(6,422)	(6,479)
Investment Income	31,745	17,986
Development Fund Fees	930	940
Write Off of Coal Project	(5,880)	
Total Non-Operating Income (Expense)	**(19,942)**	**(23,456)**
Change in Net Assets Before Regulatory Asset Adjustment	10,509	(1,704)
Regulatory Asset Adjustment	(9,298)	2,922
Change in Net Assets After Regulatory Adjustments	1,211	1,218
Net Assets at Beginning of Year	11,129	9,911
Net Assets at End of Year	12,430	11,129

Source: "Florida Municipal Power Annual Report Year Ended September 30,,2007,"

2.2.6.20 Water Supply. Many small-scale independent water treatment systems serve a small network of customers within the impact area. If a customer does not have access to a small water treatment network, potable water service is typically provided by either a local municipality (e.g., Kissimmee, Orlando, St. Cloud) or Florida Water Services, Inc.

Toho is the local water provider serving the corporate limits of Kissimmee as well as parts of central and northwest Osceola County. Toho produces, treats, and distributes approximately 22.5 million gallons per day (mgd) of potable water and treats approximately 12 mgd of wastewater for its customers. It currently serves 45,000 water, 40,000 wastewater, and 7,000 reuse water customers. Toho maintains 500 miles of water mains, 466 miles of sewer mains, as well as 84 miles of reuse water mains, and has a staff of 135 employees.

Toho owns and operates 11 water and 6 wastewater plants. It has distributed public access reuse water since 1992 to selected parts of the service area.

2.2.6.21 Wastewater Treatment Facilities. There will be five major sources of wastewater: sanitary waste, oil/water separator effluent, cooling tower blowdown, treated chemical wastewaters, and evaporative cooler blowdown. Sanitary wastes will be routed to the existing site septic system. Oil/water separator effluent will be directed to a new onsite percolation pond. Other wastewaters, consisting primarily of cooling tower blowdown, will be returned to the Toho pipeline for additional reuse or disposal.

2.2.6.22 Solid Waste Disposal. Solid waste collection and disposal is often handled by local governments within the project impact area. In the past, these services have been provided to CIPP not through a municipality, but by a licensed contractor. The current contractor for the CIPP may or may not be the service provider by the time Unit 4 is fully operational.

2.3 Biophysical Environment

2.3.1 Geohydrology

Several types of geologic data were used to identify the subsurface conditions at the CIPP:

(1) Published literature providing regional geologic information for Florida's Osceola County geologic setting performed by and for the US Geological Survey, the Florida Geologic Survey, the SJRWMD, and the SFWMD.

(2) Onsite subsurface investigations performed under the supervision of Black & Veatch.

(3) Installation of two production wells to the deep Floridan Aquifer. These data sources provide information on the CIPP stratigraphy, aquifers, geomorphology and soil engineering properties.

(4) Pump tests at four deep wells located within the site performed under supervision of Black & Veatch.

(5) A Floridan Aquifer System (FAS) test site near Intercession City, east of the CIPP.

Information from these sources was used to evaluate regional geologic features affecting development at the CIPP and to determine the site-specific geology.

2.3.1.1 Geologic Description of the CIPP Area. The following discussion of regional geology has been condensed from the references cited in this report, but principally from Shaw and Trost (1984), Miller (1986), Tibbals (1990), and McGurk and Presley (2001).

The CIPP lies within the transitional physiographic boundary between the Lake Wales Ridge and the Osceola Plain. Regional geology for this area consists of Pleistocene Age undifferentiated surficial deposits underlain by the Miocene Age Hawthorne Formation underlain by Eocene Age limestone deposits.

In 2001 to 2003, under the direction of the SFWMD, three wells were drilled and completed within the deep FAS at a test site located near Intercession City in northwest Osceola County (Bennett and Rectenwald, 2003). These wells are located approximately 4 miles southeast of the CIPP.

Geologic information obtained from the test wells indicates that two major aquifer systems underlie the region, the surficial aquifer system (SAS), and the FAS. These aquifer systems are composed of multiple, discrete aquifers separated by low permeability "confining" units that occur throughout this Tertiary/Quaternary-aged sequence. A stratigraphic section based on these test wells is presented on Figure 2.3-1.

The FAS consists of a series Tertiary Age limestone and dolostone units. The system includes permeable sediments of the Ocala Limestone, Avon Park Formation, and the Oldsmar Formation. The Paleocene Age Cedar Keys Formation with evaporitic gypsum and anhydrite forms the lower boundary of the FAS (Miller, 1986), which was not penetrated at the test site.

The uppermost hydrogeologic unit is the SAS, which consists of Pliocene to Holocene Age sediments as described by Tibbals (1990). The lithology of the SAS deposits consist of sand, clay, and shell. The upper horizon is composed of fine- to medium-grained quartz sand with organic material and iron staining. Below this horizon are shell beds intermixed with clay layers. The thickness of the SAS ranges from less than 20 feet in places where pre-Pleistocene sediments lie near the surface to as much as 100 feet where sands have filled sinkhole depressions in karstic areas.

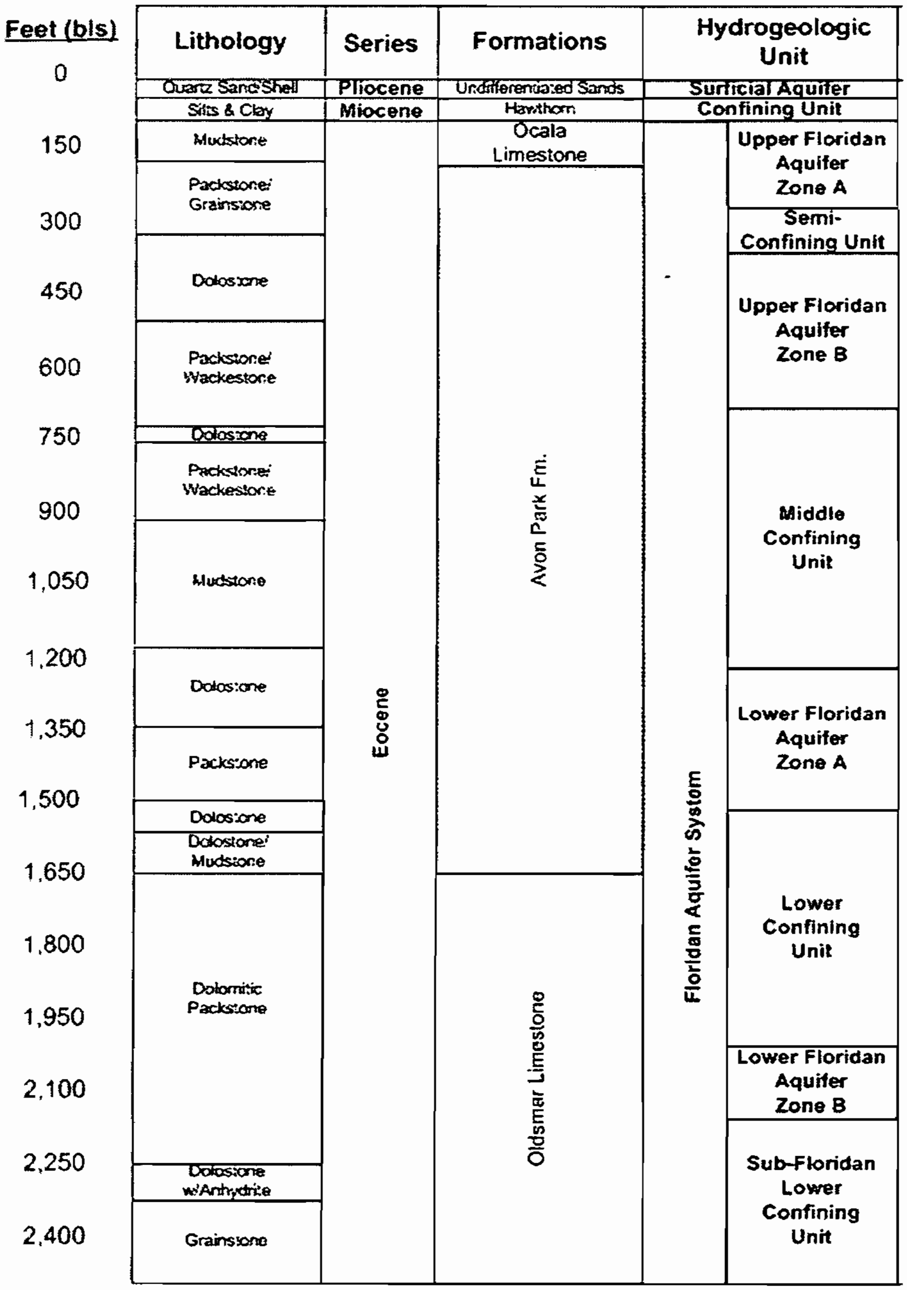


Figure 2.3-1
Geologic, Lithologic, and Hydrogeologic Section based on a Test Well near Intercession City (Modified from Bennett and Rectenwald, 2003)

The Hawthorne Formation includes sandy phosphatic limestones and sandy calcareous clays. The calcareous clays are light greenish-gray to dark green with black to brown phosphoritic sand. The limestone is white to yellow and becomes harder and more phosphatic towards the base. The top of the Hawthorne Formation in the region is generally about elevation 50 feet NGVD, approximately 30 feet below ground surface (bgs). Thickness varies considerably, but is approximately 50 feet in the northwest corner of the county.

Limestone found below the Hawthorne Formation consists of the Ocalla Group and Avon Park Limestone. The Ocalla Group is composed of a white to cream, chalky, soft coquina of foraminifera. The top of the Ocalla Group is an eroded surface that underlies the Hawthorne Formation. The deposition of the Ocalla Group is believed to have occurred in an open, shallow, marine environment. The Ocalla Group is easily recognizable by the abundance of flat and saddle shaped foraminifera.

Underlying the Ocalla Group is the Avon Park Limestone. The limestone is dark brown to cream, very hard to soft, finely crystalline to chalky, fossiliferous dolomite and limestone. It is believed that the Avon Park Limestone was a shallow marine deposit that received little clastic material. The formation is distinguished from overlying formations by the abundance of sand-sized, cone-shaped forams.

The CIPP is located in Seismic Risk Zone 0, one of the most seismically stable areas of the United States. The potential for damage from a seismic event is minimal. All of the earthquakes that have occurred in Florida have had a Modified Mercalli Intensity of VI or less, and have caused very minor damage.

2.3.1.2 Detailed Lithologic Description.

Summary of Field Investigations. A subsurface investigation was performed for Cane Island Units 1 and 2 from July 1992 to September 1992. The Subsurface Investigation Data Report for Units 1 and 2 was completed in November 1992 and revised in March 1993 (Black & Veatch, 1992).

The 1992 subsurface investigation included 11 soil borings with depths ranging from 50 feet to 122 feet bgs. Rock coring was performed in three of the 11 borings. A total of five test pits were excavated by a backhoe at the site. Two test pits were excavated on the Cane Island site, two pits were excavated adjacent to the plant access road, and one pit was excavated in the proposed borrow area. The test pits ranged in depth from approximately 5 feet to 8 feet bgs. Four piezometers were installed onsite to an approximate depth of 25 feet. Slug tests were performed in two piezometers to determine the horizontal coefficient of permeability. Cone penetrometer soundings were performed at 12 locations with a truck-mounted electric cone penetrometer rig. Total depths ranged from 60 feet to 114 feet. A total of three infiltrometer tests were completed using a double-ring infiltrometer. One test was performed onsite at the proposed location of the surface water detention pond and two were performed along the plant access road. Soil resistivity tests were completed at 10 locations using the Wenner Four-Pin method. A series of laboratory tests were performed on samples obtained during the 1992 subsurface investigation. The tests included natural moisture content, density, Atterberg limits, organic content, specific gravity, sieve and hydrometer analysis, triaxial and unconfined compression strength, consolidation, California Bearing Ratio, and modified proctor compaction. The 1992 subsurface investigation revealed subsurface anomalies at the northern end on Units 1 and 2.

In 1993, P.E. Lamoreaux (PELA) performed an assessment of sinkhole development at the power block area under the direction of Black & Veatch. The study consisted of a review of background literature, an evaluation of the 1992 Standard Penetration Test (SPT) borings and cone penetrometer soundings, a review of aerial photography of the site, a site reconnaissance, a detailed geophysical study of the site, and a report of the investigation (PELA, 1993). PELA utilized ground penetrating radar (GPR) to determine the extent of the buried sinkholes and generated a large scaled map delineating areas where raveling zones were most likely present. PELA indicated the buried areas of karstic erosion shown on the map were significant long-term foundation dangers for heavy structures, and design modifications were necessary to correct the problem.

In August 1999, a subsurface investigation program was performed to determine the site stratigraphy and pertinent geotechnical engineering properties of the soil, which underlie the proposed Unit 3 plant facilities (Black & Veatch, 1999b). This subsurface investigation consisted of the following activities:

- Eight rotary wash boreholes.
- One hollow stem auger borehole.
- Fifteen static cone penetrometer tests.
- Three soil resistivity tests.
- Laboratory tests on selected samples.

Depths for the borings ranged from 47.0 feet to 76.0 feet bgs. SPT samples were collected during drilling. Groundwater levels were recorded in all eight rotary wash borings at the completion of the drilling activities and/or after 24 hours had past since the completion of the boring.

Fifteen static cone penetrometers were performed using 5,000 kg capacity hydraulic penetrometer equipment. Depths for the cone penetrometers ranged from 78 feet to 109 feet bgs. Several of the cone penetrometer soundings encountered the top of the limestone deeper than the typical elevation of +10 feet msl and very loose to loose material above the limestone.

Three soil resistivity tests (R-1, R-2, and R-3) were performed at three specific locations (Boring BV-1, Cone C-5, and Cone C-12), respectively. Resistances were measured using a Werner Configuration of four electrodes in accordance with ASTM G57.

A laboratory testing program was performed in order to classify the soil layers and to estimate engineering properties. The tests included natural moisture content, grain size analysis, and Atterberg limits.

For the construction of additional power plant facilities (Unit 4) to the north of Units 1, 2, and 3, PELA was engaged in 2007 to conduct a karst hazard investigation of the site expansion (PELA, 2007). The core of the investigation was to be an extension of the earlier 1993 GPR grid of the site, but the new phase also included natural electrical potential (NP) measurements over possible areas of subsidence indicated on the radar graphs. NP responds to the downward leakage of water and is used to indicate recharge areas that are most at risk for future collapse or subsidence. SPT borings were also made in the larger areas of potential subsidence and in nearby, undisturbed locations.

Three wells were constructed near Intercession City to facilitate aquifer testing and long-term monitoring of the FAS (Bennett and Rectenwald, 2003). The first well, a telescoping style, multi-zone monitor well (referred to as OSF-97, 98, 99), was drilled to a total depth of 2,480 feet below land surface (bls) and completed in three distinct hydrogeologic units. The second well is a 4 inch diameter single zone monitor well (referred to as OSF-100) completed between 110 and 260 feet bls, which monitors the uppermost production unit (Zone A) of the Upper Floridan Aquifer (UFA). The third well, a telescoping style tri-zone, test-production well (referred to as IC_PW), was completed to 1,500 feet, with a final 8 inch diameter casing set at 1,210 feet in depth. In addition, two shallow monitor wells (2 inch diameter - PVC) were completed in the surficial aquifer (referred to as IC_SAS) and the Hawthorn Confining Unit (referred to as IC_HCU).

Results of the Investigations. Several of the cone penetrometer soundings encountered the top of limestone deeper than the typical elevation of +10 feet msl and very loose to loose material above the limestone. This very loose soil is similar to soil found in previous investigations, which indicates the presence of paleokarst sinkholes within the construction area of Unit 3. Sinkholes are characteristic of a karst terrain, most frequently found in limestone. Downward internal drainage causes dissolved channels in the limestone. Sediments overlaying the limestone may be eroded downward through the channels. The subsurface zone, which is undermined by the karstic erosion, is called a "raveling" zone. It is characterized by very low bearing strength sediments, as indicated by 0 to 1 or 2 blowcounts in the SPT test. The depth to limestone is greater in the raveling zones because the material is located over channels where the limestone has been intensely dissolved.

The 1999 subsurface investigation encountered a larger raveling zone than detected in the ground penetrating radar study performed in 1993. The larger area suggests the 1993 radar study was not able to detect the complete limits of the raveling zones. The existing topography for Cane Island Unit 3 varies from approximately Elevation +87 feet to +76 feet msl. The highest elevation is located along the elevated berms of the existing containment areas on the southern end of the site. The lowest elevation is located in northwest corner of the Unit 3 construction area. A general description of the site-specific geology is described below, followed by a detailed description of the soil profile generated for the main power block.

The surface stratum consists of a topsoil layer generally less than 1 foot thick consisting of grassy sand with some roots. Underlying the topsoil is 25 feet to 50 feet of loose to medium dense sand. Color varied from orangish tan to whitish light gray. Ground water was recorded at the completion of the borehole and/or 24 hours after the completion of the borehole. The static water level at the time of the investigation was estimated at Elevation +71 feet msl.

Borings BV-1, BV-2, and BV-3 encountered a "hardpan" layer at approximately Elevation +65 feet msl. This layer is approximately 5 feet thick and was most evident at the northwest corner of the site (Boring BV-2) and became less evident heading southeast (Boring BV-3). This layer consisted of dark brown, dense sand with a strong sulfur odor. This layer may perch water during periods of heavy rainfall.

Underlying the surficial deposits is a loose to very loose zone. The zone consists of sands intermixed with clayey sands and was identified by its white to light gray color and low blowcounts. The sands are very loose, fine in grain size, and poorly graded. The fines are a silty clay with low plasticity. This layer varies from 15 feet to 50 feet thick.

The white to light gray clayey sand is underlain by the Hawthorne Formation that consists of dark olive green clayey sand with some clay and silt. The formation is identified by its color and presence of shell fragments. This material varies from soft to stiff and from low to medium plasticity. The thickness of this layer varies from 5 to 15 feet and is considered part of the loose zone within the main power block. A light gray to brown sand was encountered below the Hawthorne Formation in Borings BV-1 and BV-2. This material is loose to very loose and is approximately 5 feet thick. The presence of this layer between the Hawthorne Formation and bedrock indicates the presence of karstic erosion in the northwest comer of Unit 3. This is also evident in static cone penetrometer soundings C-2.

A dense to very dense layer of highly weathered limestone, logged as calcareous sand, was encountered from 63 to 108 feet bgs. This layer was encountered immediately below the Hawthorne Formation in Borings BV-3, BV-4, BV-5, BV-7, and BV-9.

Predominant soil layers within the main power block profile are, in descending order from the surface, as follows:

(1) Loose Sand from 12 to 17 feet thick. Color is predominately orangish tan with some iron oxide staining. Black sand (topsoil), less than 1 foot thick, noted in Borings BV-5 and BV-6. The sand is considered loose, fine in grain size, and poorly graded. The ground water table was encountered approximately 7 feet bgs or Elevation +71 feet msl. The average standard penetration blowcount is 7.

(2) Medium Dense Sand to Clayey Sand lies below Layer 1 and is approximately 20 feet thick. This layer is predominantly fine in grain size and poorly graded. Color varies from brown to gray to whitish light gray. The average standard penetration blowcount is 12.

(3) Very Loose Clayey Sand lies below Layer 2 and ranges in thickness from 25 feet to 60 feet. The static cone penetrometer soundings encountered the maximum thickness of this layer. This layer is intermixed with thin layers of silt and clay. The sand is very loose and fine in grain size. The average standard penetration blowcount is 4.

(4) Very Dense Limestone lies below Layer 3 and is considered a highly weathered limestone. This layer was logged as a calcareous sand. The average standard penetration blowcount exceeds 50.

The 2007 karst hazard investigation identified five significant areas, and numerous smaller or less definite areas of karstic undermining were detected by GPR. The NP data indicated several areas where downward leakage was probable and several areas where such leakage was possible, but less definite. The 1993 PELA report did not include NP measurements or analysis of water levels. Therefore, it is unknown whether similar areas of leakage existed on the Units 1 and 2 site.

Geologic information obtained from the three wells installed near Intercession City identified two discrete zones in the UFA, separated by a semi-confining unit (Bennett and Rectenwald, 2003). These two productive horizons are designated as "Zone A and Zone B." Zone A corresponds to the upper one-third of the aquifer and coincides with the Ocala Limestone and upper part of the Avon Park Formation. The top of this interval is marked by a lost circulation horizon (permeable zone) at 110 feet bls near the contact between the Hawthorn Group and Ocala Limestone. Low permeable mudstones and inter-bedded bluish-gray clays define the lower limits of Zone A at 260 feet bls.

Low permeable mudstone units inter-bedded with poorly indurated bluish-gray clays and dense, microcrystalline dolostone units from 260 to 360 feet bls act as an intervening, semi-confining unit separating Zone A from Zone B in the UFA. Zone B corresponds to the lower two-thirds of the UFA. This zone corresponds to fractured and cavernous dolostone units in the upper portion of the Avon Park Formation.

2.3.1.3 Bearing Strength. The subsurface investigation programs performed by Black & Veatch in 1993 and 1999 determined the power block area stratigraphy and material properties. The subsurface soils were sampled by split barrel tests recording standard penetration blowcounts. In addition to the soil classification tests, consolidation and triaxial strength tests were performed on selected samples to determine the engineering properties of the clayey materials.

The performance of the foundation systems for the project must have an acceptable factor of safety against failure of the foundation element or bearing soils, and limit total and differential settlements to an acceptable level that will not result in damage to, or loss of service of, the supported facility.

The results of the subsurface investigations indicated that several foundation types would need to be used to support different portions of the project. The main criterion was the settlement limitations that bearing capacity will not support. This is based on the thickness of the upper sands. For heavily loaded, settlement sensitive structures (such as the main power block structures) deep foundations consisting of friction piling or thick mat foundations supported onsite soils densified by ground modification techniques such as vibro replacement or compaction grouting were to be used to meet design constraints. Shallow mat or individual spread footings were to be used for lightly loaded facilities.

The existing units were constructed using shallow foundations consisting of mats and spread and strip footings. However, ground improvement methods consisting of stone columns, deep dynamic compaction, and compaction grouting were utilized to prepare the subsurface materials for the constructed facilities. Facilities constructed in areas outside of the mapped buried karstic features employed the use of stone columns and deep dynamic compaction. Facilities constructed within areas of the mapped buried karstic features employed the use of compaction grouting and deep dynamic compaction. The compaction grouting was successful in mitigating the karstic hazards at the site. The Units 1 and 2 foundations have been performing very satisfactorily since installation in 1994, and the Unit 3 foundations have been performing very satisfactorily since 2000; it is anticipated that similar construction methods will be used for Unit 4.

2.3.2 Subsurface Hydrology

The regional hydrogeologic system beneath the CIPP consists of a surficial aquifer and the FAS. The surficial aquifer is separated from the Floridan Aquifer by the relatively low permeable deposits of the Hawthorn Formation.

2.3.2.1 Subsurface Investigation Program. The subsurface hydrology of the power block area was determined by a review of existing reference documents, installation of shallow piezometers, ground water levels collected in 2007 to 2008 from eight borings, and two surface ponds installed in the vicinity of Unit 4. Surface water infiltration was determined using double ring infiltrometer tests. Infiltrometer Test I-1 was performed in 1993 at the location of the Units 1 and 2 surface water detention pond; Tests I-2 and I-3 were performed along the entrance corridor.

In addition to the temporary piezometers installed during the investigation, three monitoring wells were installed for the purpose of long-term monitoring of the surficial aquifer. Four production water wells were installed into the Floridan Aquifer for use in Unit 3 (in addition to the two deep wells installed to support Unit 1 and 2 operations). The wells were cased to a depth of 150 feet bgs. All six wells are completed; total well depths ranged from 300 to 360 feet bgs.

The Surficial Aquifer. The surficial aquifer at the CIPP consists of the upper unconfined sands of the Pleistocene and Recent age. The fine grained sand layer extends to approximately 35 feet bgs. Underlying the sand layer is the Hawthorne Formation, a silty clay/clayey sand layer that acts as a separation or confining unit for the Floridan Aquifer.

The surficial aquifer is recharged by precipitation and discharges into lakes, streams, and occasionally to the Floridan Aquifer by downward percolation. The surficial aquifer will have a tendency to mirror ground surface elevation. This is readily seen at the CIPP because the installed piezometers indicate a higher water table at the raised elevation of Cane Island compared to the surrounding wetlands. The surrounding wetlands are very flat. Overall local gradient would seem to be slightly influenced by the Bonnet Creek Canal located to the north and northwest of Cane Island, causing a very slight gradient to the north. Localized surficial aquifer gradient below Cane Island consists of radial outward flow caused by recharge during precipitation events.

Ground water levels measured from piezometers installed in the proposed Unit 4 area of the CIPP are given in Table 2.3-1.

Table 2.3-1
Water Level Data Collected at Unit 4

Monitoring Well and Infiltration Pond Number	Ground Elevation	Water Level Elevation 11/2/07	Water Level Elevation 11/7/07	Water Level Elevation 11/9/07	Water Level Elevation 11/16/07	Water Level Elevation 11/29/07	Water Level Elevation 12/21/07	Water Level Elevation 1/9/08	Water Level Elevation 1/24/08
B4-1a	78.82	71.6	73.12	73.4	73.3	72.62	72.23	71.80	71.70
B4-4a	79.20	73	[1]NA	73.7	73.6	73.17	73.16	73.00	73.00
B4-5	77.41	71.9	72.51	72.T	72.3	71.83	71.54	71.17	71.41
B4-6	77.43	NA	NA	72.3	72.4	71.91	71.43	71.03	71.66
B4-7S	77.54	NA	NA	NA	NA	NA	NA	71.20	72.05
B4-8	77.76	71.7	NA	72.9	72.6	71.99	71.70	71.29	71.66
B4-9	78.06	NA	73.81	73.8	73.4	72.81	72.41	71.99	72.73
I-1 (Unit 4 pond)	77.85	NA	NA	NA	NA	NA	NA	NA	73.12
I-2 (Unit 5 pond)	79.70	NA	NA	NA	NA	NA	NA	NA	72.51

(1)NA - Not available.

The highest ground water table encountered during the 2007 to 2008 investigation was in Boring B4-1a at Elevation +73.4 feet msl. The lowest ground water table was encountered in Borings B4-5 and B4-7 at Elevation +71 feet msl. The average ground water level was estimated as Elevation +72 feet msl. The elevation of the ground water table will fluctuate because of local seasonal conditions. The rainy season in Central Florida is normally between June and September. It is anticipated that ground water levels will vary between 2 to 3 feet, with the seasonal high occurring near the time of the current subsurface investigation. The ground water is not anticipated to be brackish.

In 1993, surface water infiltration was determined using double ring infiltrometer tests. Infiltrometer Test I-1 was performed on Cane Island at the location of the Units 1 and 2 surface water detention pond. Tests I-2 and I-3 were performed along the entrance corridor. Test results are as follows:

Test No.	Steady-State Infiltration Rate (in/h)
I-1	21.5
I-2	10.2
I-3	7.3

As part of the Unit 4 subsurface investigation, Ardaman and Associates performed three additional double ring infiltrometer tests (Ardaman and Associates, 2007). Test results are as follows:

Test No.	Steady-State Infiltration Rate (in/h)
I-1	6.5
I-2	10.0
I-3	8.5

Results of the infiltrometer tests confirm the very high permeability of the surficial sands encountered on Cane Island. Permeabilities conducted at locations along the entrance corridor were much lower in the silty materials associated with the near surface soils of the wetlands.

As a result of these investigations, the following characteristics were established for the surficial aquifer in the immediate power block vicinity. Maximum high ground water was estimated to be at approximately Elevation 74 feet. Low ground water elevation was estimated to be Elevation 69.5 feet. It could be expected during the course of seasons for the surficial aquifer water levels to vary by 3 to 4 feet. Vertical permeability of the surficial sands is estimated to be 30 feet/day.

The Floridan Aquifer. The Floridan Aquifer is the principal aquifer of the Florida Peninsula. The aquifer is typically confined by the Hawthorne Formation with variable potentiometric head across the state. Within the Orange and Osceola county areas, the potentiometric surface of the aquifer ranges from Elevation 70 to 80 feet msl, which correlates closely with measured data within the installed wells. This very productive aquifer can have yields from the upper zone as high as 4,000 gpm. Yields vary with location.

Well development data from the installation and testing of the four wells installed into the Floridan Aquifer is presented in Table 2.3-2. Based upon the pumping rates and drawdowns, the transmissivity is relatively high in two of the wells (Wells 3 and 5) and moderately high in Wells 4 and 6.

Table 2.3-2
Units 3 and 4 Production Well Information

Well ID	Total Depth (feet)	Pumping Rate (gpm)	Length of Test (hours)	Final Drawdown	Well Diameter (inches)
Cane Island Well 3	360	450-460	24 hrs	10 ft. 10 in.	10
Cane Island Well 4	360	450	24 hrs	57 ft. 1 in	10
Cane Island Well 5	360	460	24 hrs	3 ft 2 in	10
Cane Island Well 6	360	470	24 hrs	31 ft 1 in	10

Several aquifer tests were conducted at the three wells installed near Intercession City (Bennett and Rectenwald, 2003). The first aquifer performance test was conducted on the interval between 110 and 260 feet bls (Zone A). Analysis of data yielded a transmissivity value of 115,000 gallons per day per foot (gpd/ft) of aquifer and a storage coefficient of 2.2×10^{-5}.

Water levels in the overlying confining unit and Zone B of the UFA declined during the drawdown phase of the aquifer performance test, indicating semi-confined conditions. Zone B corresponds to the lower two-thirds of the UFA with the majority of water production from 360 to 425 feet bls. This zone corresponds to fractured and cavernous dolostone units in the upper portion of the Avon Park Formation. Smaller, less productive intervals continue from 425 to 680 feet bls. A second aquifer performance test was conducted on the interval between 360 and 680 feet bls. Analysis of test data yielded a transmissivity of 510,000 gpd/ft and a storage coefficient of 6.1×10^{-5}.

From a regional consideration, surficial deposits for the area consist of unconsolidated clastic deposits to a depth of approximately 150 feet. These undifferentiated deposits consist of sands, clays, clayey sands, and sandy phosphatic clays. The age of these materials ranges from middle Miocene to Recent. Some small irrigation and domestic water supplies are obtained from this zone. Underlying the clastic deposits is the Inglis Formation, from the Ocalla Group. This is the uppermost limestone member of the Floridan Aquifer, all other members having been eroded in this area. This formation consists of partially to highly dolomitized, highly fossiliferous limestone with some local soft chalky zones. Thickness of the Inglis Formation in this area is approximately 75 feet.

The principal water bearing unit for the Floridan Aquifer in this region is the Avon Park Limestone. The Avon Park stratum is described as dark brown to cream, very hard to soft, granular to chalky to finely crystalline, highly fossiliferous limestone. This aquifer is the source of all major public, industrial, and irrigation water supplies for this region. The CIPP is located on the northernmost fringe of flowing artesian conditions for the Floridan Aquifer. This study assumed that the aquifer was confined by the clay present in the clastic deposits above the Inglis Formation.

On Cane Island, the Hawthorne Formation thickness varies, but is approximately 35 feet. The Floridan Aquifer was encountered below the Hawthorne Formation at approximately 70 feet bgs. Piezometric head for the Floridan Aquifer is approximately 14 feet bgs, but is confined by the Hawthorne Formation. Measured piezometric head within the surficial aquifer was approximately 10 feet bgs.

Water required for Units 1 and 2 operations is obtained from the Floridan Aquifer by two wells constructed into the aquifer. Water is pumped from one well, with the second well acting as a backup well. The ground water wells were designed to each pump 200 gpm. The wells consist of 8 inch diameter black steel casing grouted to 150 feet bgs, with a 6 inch diameter open hole to 300 feet in PW-1 and 360 feet in PW-2. The wells were permitted and constructed to standards as specified by the SFWMD. Well and aquifer characteristics determined from pump tests conducted on the wells at the time of installation resulted in a predicted yield of 90 gpm per foot of drawdown, with a maximum recommended pumping rate of 450 gpm per well. Additional aquifer characteristics determined for wellfield studies indicate a confined aquifer with a transmissivity of 26,740 ft^3/day/ft.

2.3.2.2 Karst Hydrology. A description of the karst conditions encountered at the site is presented in Subsection 2.3.1.

2.3.3 Site Water Budget and Area Users

A summary of the requested information is included in this subsection.

2.3.3.1 Orlando Climatological Conditions. The following meteorological information was collected from the Orlando International Airport. This is the closest National Weather Service (NWS) office to the CIPP, approximately 20 miles northeast of the CIPP, at Elevation 96 feet msl. The Orlando airport data are considered to be representative of long-term, CIPP conditions due to the proximity to the CIPP.

2.3.3.2 Temperature and Precipitation. Normal monthly and annual temperatures are presented in Table 2.3-3. The annual average temperature for the period of record is 72.8° F. The warmest month is typically August; the coldest month is typically January.

Table 2.3-3
Monthly and Annual Temperatures and Rainfall

Monthly Mean:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Max Temp (F)	71.8	73.9	78.8	83	88.2	91	92.2	92	90.3	85	78.9	73.3
Min Temp (F)	49.9	51.3	55.9	59.9	65.9	71.3	72.6	73	71.9	65.5	58.7	52.6
Mean Temp (F)	60.9	62.6	67.4	71.5	77.1	81.2	82.4	82.5	81.1	75.3	68.8	63
Rainfall (inches)	2.43	2.35	3.54	2.42	3.74	7.35	7.15	6.25	5.76	2.73	2.32	2.31

Source: http://www.srh.noaa.gov/mlb/normals.html.

Normal monthly and annual rainfall totals are presented in Table 2.3-2. The annual average for the period of record is approximately 48 inches. Rainfall is greatest in the summer months, May through September. April has the lowest average rainfall.

2.3.3.3 Evapotranspiration and Runoff. Rainfall averages about 48 inches per year in the Orlando area. A portion of this rainfall is intercepted by vegetation or stored in small depressions on the surface, a portion infiltrates into the soil, and the remainder directly runs off during storm events. Base flow in streams is sustained by ground water inflow from the shallow aquifer system, which is recharged from storm water infiltration. The Natural Resource Conservation Service (NRCS) estimates evaporation of 50 inches per year in this area from shallow lakes and reservoirs. Evaporation also occurs to a lesser degree from soil surfaces and as transpiration from vegetation. The total evaporation and transpiration is known as evapotranspiration, which varies with surface conditions.

2.3.3.4 Water Use. There are five major well users located approximately 4 miles from the CIPP. These users are Polk and Orange County utilities, City of St. Cloud, Reedy Creek Improvement District, and the City of Kissimmee (SWWMD, 2006). A summary of their past and projected water use is provided in Table 2.3-4.

Table 2.3-4
Water Use at Potable Water Treatment Facilities
(within a 4 mile radius)

Facility	2000 Average Daily Flow (mgd)	Projected 2010 Average Daily Flow (mgd)	Raw Water Sources
Polk County Utilities	2.19	4.03	FAS[1]
Orange County Utilities	15.12	30.13	FAS
City of St. Cloud	3.28	8.17	FAS
Reedy Creek Improvement District	19.54	21.18	FAS
City of Kissimmee	21.87	44.65	FAS

[1]Florida Aquifer System

2.3.4 Surficial Hydrology

The geographic feature Cane Island is crowned in the central portion and drains to the east or to the west into Reedy Creek Swamp. The elevation at the site is 5 to 15 feet higher than that of the surrounding swamp.

Reedy Creek Swamp has very little gradient. The eastern portion of the swamp is drained by Shingle Creek, which discharges into Lake Tohopekaliga. The western portion of the swamp, which includes the plant site, drains to Reedy Creek.

Reedy Creek flows from northwest to southeast. It is located approximately 3,000 feet southwest of the power block. The gradient of Reedy Creek in the vicinity of the plant site is approximately 0.023 percent. Reedy Creek discharges into Lake Russell, approximately 13 miles downstream from the CIPP.

The native soil in the power bock area is predominantly classified as Candler sand by the NRCS. This material is excessively drained, with very rapid permeability. The water table in this soil is typically in excess of 72 inches.

The native soil in the swamp surrounding the site is predominately classified as Pompano fine sand by the NRCS. This material is nearly level and typically covered with standing water. Permeability of this soil is very rapid.

The water surface elevation in Reedy Creek Swamp is subject to seasonal variation, with rising water during the summer rainy season. The swamp is considered a Class III body of water, as defined in Florida Administrative Code (FAC) 62-302.400.

Since May 1970, the flow in Reedy Creek has been regulated by Reedy Creek Improvement District Structure 40 (S-40), which is located 3,500 feet west of the power block. The peak flow rate in Reedy Creek at the US Geological Survey (USGS) gauging station 1.0 mile downstream from S-40 is 790 cfs. The minimum flow rate at this gauging station is 0.0 cfs. The highest annual mean and lowest annual mean flows at this station are 182 cfs and 15.2 cfs, respectively.

Limited water quality data are available at S-40 for portions of the period from January 1985 to 1992. For this period of record, the maximum daily mean specific conductance was 308 microsiemens. The minimum daily mean specific conductance was 93 microsiemens/cm. The maximum daily mean dissolved oxygen content was 9.1 milligrams per liter (mg/L). The minimum daily mean dissolved oxygen content was 0.0 mg/L. The maximum and minimum daily mean water temperatures were 28.9 and 6.8 degrees Celsius, respectively.

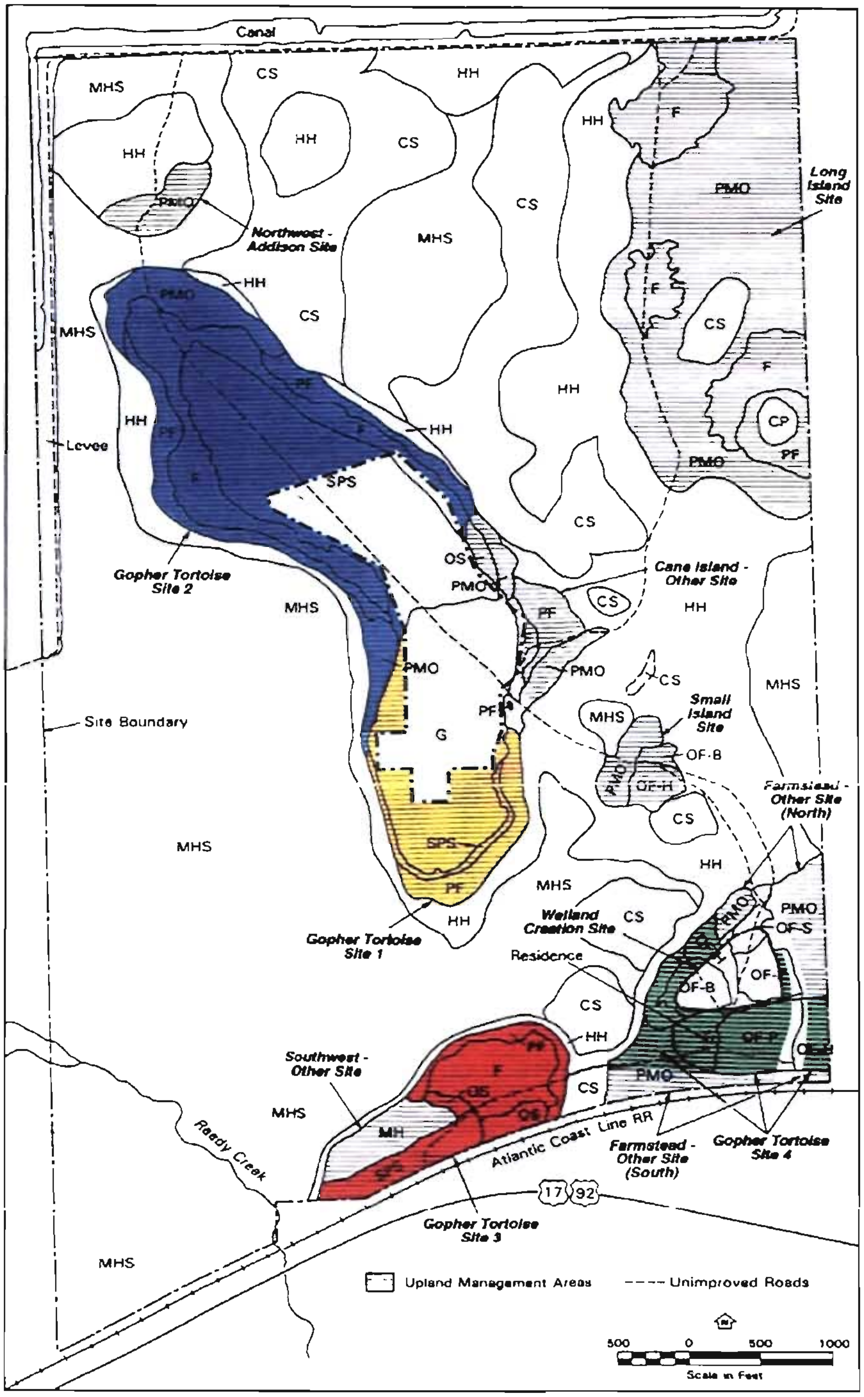
Additional water quality data are presented in the Water Resources Atlas of Florida for Lake Tohopekaliga, which is approximately 7.5 miles east of the CIPP. The mean pH of the water is 8. The mean conductivity is 300 micromhhos. The mean color is 80 PTC (Psuedo True Color). Mean turbidity is 7.5 NTU (Nephlometric Turbidity Unit). The mean total phosphorus is 0.3 mg/L, and the mean total nitrogen is 2.0 mg/L. These values are typical for surface waters in central Florida.

The CIPP is not required to monitor any surface waters in the project area.

2.3.5 Vegetation/Land Use

Cane Island lies within the Osceola Plain physiographic section of central Florida. The local relief of the area ranges from 65 to 75 feet NGVD. The Bonnet Creek Canal borders the Cane Island site on the north and west boundaries, Reedy Creek crosses the southwest corner of the property, SR-17/92 and the CSX railroad border the Cane Island site on the south, and undeveloped land borders the site on the east. The geographic feature of Cane Island is essentially surrounded by Reedy Creek mixed hardwood swamp.

A botanical survey was conducted on CIPP property in January 1991, prior to site development. Plants identified during the 1991 survey and subsequent surveys are listed in Appendix C1 of Subsection 10.5.1. Figure 2.3-2 shows vegetation and land use of the CIPP .



Plant Communities

MH	Mesic Hammock	PF	Pine Flatwoods	G	Improved Grassland
HH	Hydric Hammock	PMO	Pine Mesic Oak	OF-B	Old Field – Broomsedge
CS	Cypress Strand	MHS	Mixed Hardwood Swamp	OF-H	Old Field – Mixed Hardwood
CP	Cypress Pond	OS	Oak Scrub	OF-P	Old Field – Saw Palmetto
F	Flatwoods	SPS	Sand Pine Scrub	OF-S	Old Field – Slash Pine

LOCATION OF GOPHER TORTOISE AND OTHER UPLAND MANAGEMENT AREAS

Figure 2.3-2
Plant Communities and Gopher Tortoise Management Areas

Units 1 and 2 were constructed primarily in the improved grassland plant community; Unit 3 in the improved grassland and sand pine scrub. The plant communities adjacent to the improved grassland and the sand pine scrub include flatwoods, pine flatwoods, pine mesic oak, and hydric hammock.

Improved grassland is an artificial plant community that occurs on the southern half of Cane Island. The original vegetation, sand pine scrub, was removed and exotic grasses were planted by the previous owner. The soils are well-drained and the topography is flat. The vegetation consists of sparse overstory and understory with dense ground cover. The overstory and understory species include sand live oak (*Quercus geminata*), Florida hickory (*Carya floridana*), cabbage palm (*Sabal palmetto*), beauty bush (*Callicarpa americana*), and coralbeans (*Erythrina herbacea*). The ground cover is dominated by grasses: *Eustachys glauca* (no common name), bahiagrass (*Paspalum notatum*), thin paspalum (*Paspalum setaceum*), natal grass (*Rhynchyletrum repens*), and broomsedge (*Andropogon virginicus*). Other species observed in the ground cover are prickly-pear cactus (*Opuntia humifusa*), sedge (*Cyperus retrorsus*), hairy indigo (*Indigoifera hirsuta*) and cottonweed (*Froelichia floridana*).

Sand pine scrub is a natural upland community that occurs on the northern half of Cane Island on flat terrain with well-drained soils. The overstory is dominated by sand pine *(Pinus clausa)*, sand live oak *(Quercus geminata)*, Chapman's oak *(Quercus chapmanii)*, and scrub oak *(Quercus inopina)*. The shrubby understory includes rusty lyonia *(Lyonia ferruginea)*, fetterbush *(Lyonia lucida)*, *palmetto (Serenoa repens)*, and *rosemary (Ceratiola ericoides)*. Ground cover is typically sparse with few species, including: wire-grass *(Aristida stricta)*, golden aster *(Heterotheca graminifolia)*, yellow buttons *(Balduina angustifolia)*, several *Cladonia* spp., beak rush *(Rhynchospora megalocarpa)*, white-head bogbuttons *(Lachnocaulon anceps)*, yellow-eyed grass *(Xyris brevifolia)*, and broomsedge.

Pine-mesic oak is an upland community on flat to sloping terrain with well-drained soils. It is associated with most of the plant communities at the study area. This community is dominated by slash pine (*Pinus elliottii),* laurel oak (*Quercus laurifolia*), and Virginia live oak (*Quercus virginiana*), which form a dense canopy often reaching 60 to 80 feet in height. The midstory is usually open, but may approach closure. It includes cabbage palm, loblolly bay (*Gordonia lasianthus*), wax myrtle (*Myrica cerifera*), dahoon holly (*Ilex cassine*), sweet gum (*Liquidambar styraciflua*), and swamp honeysuckle (*Rhododendron viscosum*). The understory and ground cover tend to be sparse, but may be somewhat thick in transitional zones with other communities.

Hydric hammock is a wetland community with a flat to slightly sloping topography, which may be inundated for up to 6 months per year. It is often situated between xeric upland communities and wetlands that are flooded for longer periods. The vegetation is characterized by a canopy of cabbage palm, Virginia live oak, laurel oak, slash pine, water oak, red maple. The sparse understory and ground cover include wax myrtle, loblolly bay, greenbrier (*Smilax bona-nox*), grapevines (*Vitis* sp.), golden polypodium (*Poypodium aureum*), marsh fern (*Thelypteris palustris*), cinnamon fern (*Osmunda cinnamonca*), Florida shield fern (*Dryopteris indoviciana*), longleaf chasmanthium (*Chasmanthium sessilfolium*), and cypress witchgrass (*Dicantheleum dichotomum*).

Flatwoods is a natural upland community found on flat topography and well-drained soils. Under the right conditions, this community should mature into pine flatwoods. Characteristically, it is associated with sand pine scrub, sandhills (not at the project site), oak scrub, pine flatwoods, and hydric hammock. Onsite, flatwoods are found on Long Island and to the south near the site entrance. This community encircles the northern half of Cane Island. At Cane Island, flatwoods canopy cover is sparse to nonexistent with an occasional slash pine encroaching from the pine flatwoods. The understory is dense and includes inkberry (*Ilex glabra*), fetterbush, rusty lyonia, sand live oak, and palmetto. Ground cover ranges from sparse to somewhat dense and includes seedlings of the understory, as well as wire-grass, prickly-pear cactus, white-head bogbuttons, British soldier moss (*Cladonia leporina*), shiny blueberry (*Vaccinium myrsinites*), needle-leaf witchgrass (*Dichanthelium aciculare*), and Atlantic St. John's wort (*Hypericum reductum*).

Pine flatwoods is an upland community with flat to slightly sloping topography and well to moderately drained soils. Canopy cover consists of primarily slash pine and may be dense or open. Mid-canopy, which often approaches closure includes loblolly bay, wax myrtle, water oak, and cabbage palm. Typical understory species include inkberry, palmetto, fetterbush, and dahoon holly. Ground cover is sparser than the understory and includes shiny blueberry, cinnamon fern, grapevines (*Vitis* sp.), and greenbrier.

2.3.6 Ecology

This section identifies endangered, threatened, and other sensitive species that have the potential to occur in the project area which might reasonably be expected to be affected by the construction and operation of Unit 4. Sensitive species include plants and animals listed as endangered or threatened by the USFWS; species listed by the FFWCCC as endangered, threatened, or of special concern; species listed as game, fur-bearers, or freshwater game fish,; and, species which are indicators of, endemic to, or are unique to specific plant communities and habitat types.

The USFWS and FFWCCC were consulted during the permitting efforts for Units 1 through 3. The USFWS was contacted in March 2008 to advise them of the proposed Unit 4. A copy of this letter is included in Subsection 10.2.4. The FFWCC is a statutory party to the certification process.

Field surveys for endangered, threatened, and other sensitive species were conducted in 1991 and 1992 prior to site development. Additionally, qualitative vegetation and wildlife surveys are performed once every 5 years (beginning in 2005), as monitoring efforts required by the FFWCC and SFWMD for construction of the CIPP.

No federally listed plant or animal species have been recorded onsite, none have been observed during surveys, and no critical habitat for federally listed species occurs within the CIPP boundaries (refer to Figure 2.3-3 for the USFWS letter dated July 20, 1998). Marginal habitat for the Florida scrub jay (federally threatened) was discovered on the northern half of Cane Island, but no scrub jays have been observed during surveys.

Table 2.3-5 lists federally-protected plant species that are known to occur in Osceola County. However, these species are not known to occur on CIPP property. Additionally, there is state and federally-listed species that occur either on the CIPP property or in adjacent habitats (Table 2.3-5). These particular species include birds, amphibians, reptiles, and mammals. However, only two state listed animals have been found onsite. The gopher tortoise (*Gopherus polyphemus*), a state threatened species and the Florida mouse (*Podomys floridanus*), a state species of special concern.

The gopher tortoise occurs in high concentrations in the improved grassland on the southern end of Cane Island. It is also found in the sand pine scrub community on the northern half of Cane Island, but in much lower concentrations (Black & Veatch, 1998), and in other upland areas of the property designated as management areas as shown on Figure 2.3-2. The diet of the gopher tortoise typically consists of broad-leaved grasses, wiregrass and legumes but may include other plant materials, animals, and organic matter (Cox et. al., 1987). The improved grassland provides an abundant supply of grasses, including wiregrass and the open canopy of the improved grassland provides sunlight necessary for proper egg incubation.

The Florida mouse is commonly associated with the gopher tortoise. It often excavates its den along the burrow shaft and will center much of its foraging activities around the burrow of the gopher tortoise. Food of the Florida mouse consists principally of seeds, but includes leaves and an occasional insect.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecosystem Office
P.O. Box 2676
Vero Beach, Florida 32961-2676

July 20, 1998

RECEIVED
JUL 2 ? 1998
EAS

J. Michael Soltys, Licensing Manager
Black and Veatch
P.O. Box 8405
Kansas City, Missouri 64114

Dear Mr. Soltys:

Thank you for your letter to the U.S. Fish and Wildlife Service (FWS) requesting information on the presence of federally listed species in the vicinity of the site described in your letter. The project site is located in Intercession City, Osceola County, Florida.

The FWS has reviewed the information in your letter as well as information available to us on the presence of threatened or endangered species in the vicinity of the project site. From this review, we find no evidence of federally listed species on the project site. Additionally, Wesley Shockley (FWS biologist) conducted a preliminary site inspection on July 10, 1998. No threatened or endangered species were observed during that visit, though inclement weather reduced the probability of encountering wildlife during the inspection. Therefore, we would appreciate the opportunity to revisit the site by attending the upcoming interagency site inspection. No critical habitat has been designated on the project site.

We have provided for your consideration a list of species that are protected as either threatened or endangered under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*), as well as candidates for listing which may be present in Osceola County. Since this list does not include State-listed species, the Florida Game and Fresh Water Fish Commission should be contacted to identify those species potentially present in the vicinity.

In addition, we are providing you with a list of species that we would consider during our review of any proposal associated with this project. This list represents species that the FWS is required to protect and conserve under other authorities, such as the Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq.*) and the Migratory Bird Treaty Act (16 U.S.C. 701 *et seq.*). We are providing this list as technical assistance only. If you would like to discuss means and methods to conserve these species, please contact this office.

Figure 2.3-3 (Page 1 of 2)
Copy of USFWS Letter dated July 20, 1998

Thank you for the opportunity to provide this information. If you have any questions, please contact Mr. Shockley at (561) 562-3909.

Sincerely,

James J. Slack
Project Leader
South Florida Field Office

Enclosures

cc: COE, Tampa, FL (w/o enclosures)
GFC, Punta Gorda, FL (w/o enclosures)

Figure 2.3-3 (Page 2 of 2)
Copy of USFWS Letter dated July 20, 1998

Table 2.3-5
State and Federally-Listed Species in Osceola County

Federally-Protected Plants

Nolina brittoniana (Britton's beargrass, Federal Endangered)

Polygala lewtonii (Lewton's polygala, Federal Endangered)

Paronychia chartacea (Papery whitlow-wort, Federal Threatened)

Encyclia tampensis (butterfly orchid, Commercially Exploited)

Clitoria fragrans (Pigeon wings, Federal Threatened)

Chionanthus pygmaeus (Pygmy fringe-tree, Federal Endangered)

Polygonella myriophylla (Sandlace, Federal Endangered)

Eriogonum longifolium var. gnaphalifolium (Scrub buckwheat, Federal Threatened)

Lupinus aridorum (Scrub lupine, Federal Endangered)

Warea amplexifolia (Wide-leaf warea, Federal Endangered)

Federal and State-Protected Animals

Florida scrub jay (*Aphelocoma coerulescens*, State Threatened, Federally Threatened)

Gopher frog (*Rana capito*, State Species of Special Concern)

American alligator (*Alligator mississippiensis*, State Species of Special Concern, Federally Threatened)

Eastern Indigo snake (*Drymarchon corais couperi*, State Threatened, Federally Threatened)

Gopher Tortoise (*Gopherus polyphemus*, State Threatened)

Bald eagle (*Haliaeetus leucocephalus*, State Threatened)

Red-cockaded woodpecker (*Picoides borealis*, State Species of Special Concern, Federally Endangered)

Florida panther (*Felis concolor coryi*, State Endangered, Federally Endangered)

Florida mouse (*Podomys floridanus*, State Species of Special Concern)

Florida black bear (*Ursus americanus floridanus*, State Threatened)

2.3.6.1 Species-Environmental Relationships. It is possible that all of the animals mentioned above use CIPP as habitat for feeding. This habitat is likely used by eastern cottontails, squirrels, and gopher tortoises as habitat for breeding. Eastern cottontails and squirrels usually occur in forested areas and are known to nest very close to human activity. Gopher tortoises occur in areas that have well-drained, sandy soils, which allow easy burrowing, support an abundance of herbaceous ground cover, and generally have an open canopy with sparse shrub cover (Cox et. al., 1987).

Several common animals classified as fur bearers and game animals occur or could potentially occur in the CIPP area. However, the potential for the game and furbearer species to occur in the power block area is low because of the disturbances and human presence during operation and maintenance of the facilities. Prior to any construction at theCIPP, and on a regular basis since operation, wildlife monitoring efforts have recorded over 100 species. A list of the animal species observed at the CIPP is included in Appendix C2 of Subsection 10.5.1.

2.3.6.2 Pre-Existing Stresses. Prior to KUA acquiring the property and prior to construction of any power generation facilities on Cane Island, pre-existing stresses were caused by the alteration and removal of habitat on the southern end of Cane Island. The alteration and removal of habitat was done in an attempt to attract game animals for hunters.

Environmental stresses existing prior to construction of Unit 4 include removal of habitat for project construction, noise from operation, and activity of pedestrian and vehicular traffic for maintenance of Units 1-3 facilities. The remaining vegetation on the southern end of Cane Island has been granted to the SFWMD in a conservation easement. This area is monitored and managed according to the *Cane Island Project Mitigation Plan*. The remaining vegetation on the north end of Cane Island is also in conservation easement and is monitored and managed. The conservation and exclusion areas are shown on Figure 2.1-3.

2.3.6.3 Measurement Programs. Initial vegetation and wildlife investigations of the CIPP site began in 1991 as part of an Environmental Assessment for the proposed simple cycle combustion turbine facility (Unit 1). Environmental studies were conducted by Black & Veatch and its consultant, Alvarez, Lehman & Associates, Inc. (Gainesville, Florida). Studies consisted of protected species surveys, general wildlife surveys, plant species identification, plant community assessments, and wetland delineations.

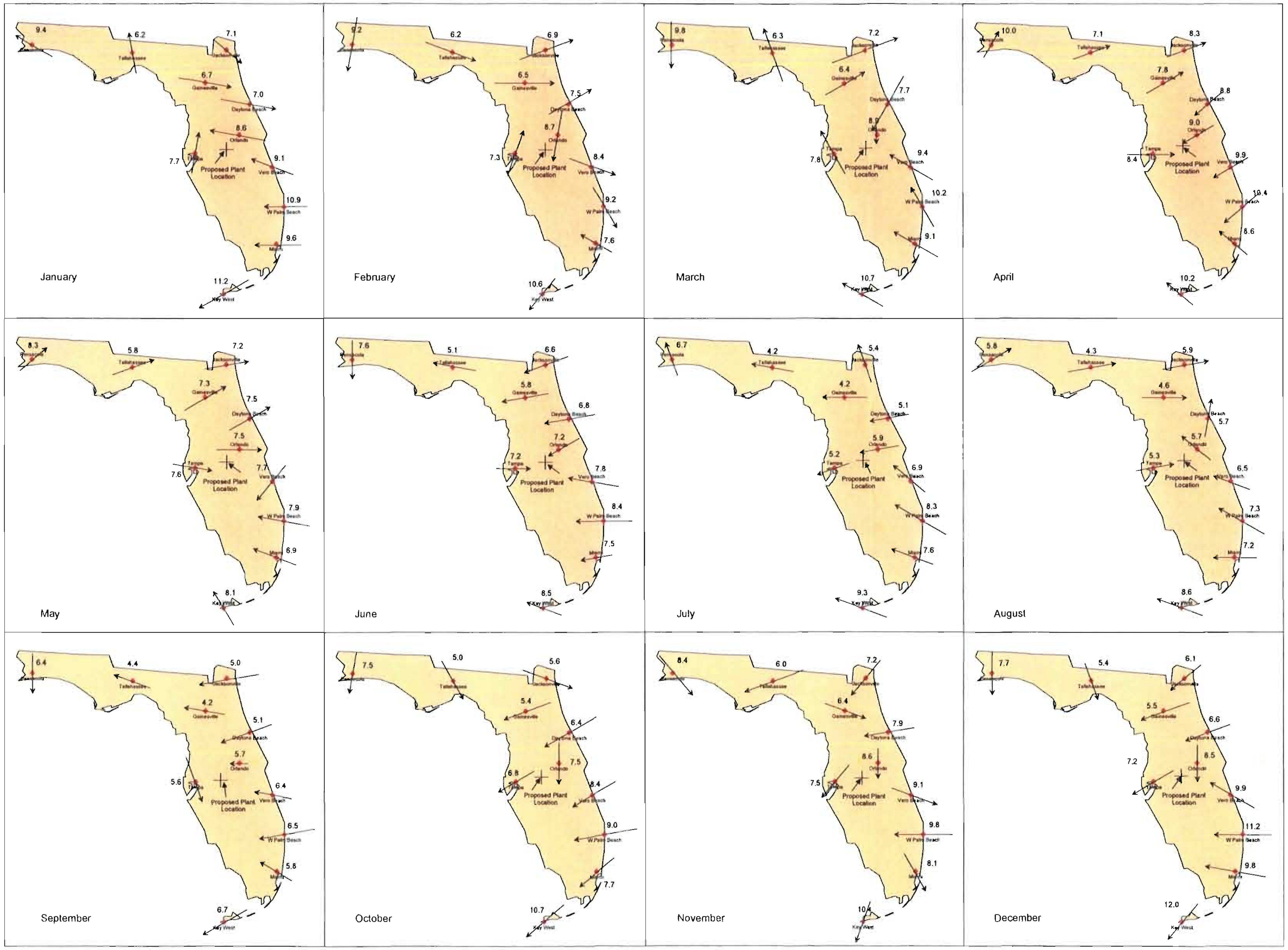
Measurement programs were established to assess floral and faunal characteristics resulting from development of the power generation facilities. The *Cane Island Project Mitigation Plan* describes the original measurement and monitoring programs in detail. Line transects, nested quadrats, and meter square quadrats were originally used to assess the composition of the upland and wetland vegetation. Quantitative vegetation and wildlife monitoring was conducted as required until 2005. In 2004, KUA requested and was granted release from the quantitative (direct) monitoring requirements in effect over the upland and wetland management areas and created wetland, which had been in effect since 1993. In exchange for that release, KUA committed to conducting appropriate annual habitat management and maintenance activities, and qualitative habitat assessments once every 5 years beginning in September 2005. The results of the 2005 assessment indicated that the habitats were in good condition, and the 2006-2007 field observations support this conclusion. Growth and abundance of the trees originally planted in the created wetland as mitigation were quantitatively assessed from 1993-1996. The created wetland was declared successful in 1997 by the Corps of Engineers and subsequently incorporated into the SFWMD conservation easement. Since 1998, this wetland has been monitored and managed annually for exotics.

Wildlife is recorded by opportunistic observations. Quantitative wildlife monitoring efforts were conducted in 1993 and 1997. Monitoring efforts are now in accordance with the 2004 modification of the CIPP Mitigation Plan. Annual habitat monitoring reports are submitted to the SFWMD and FFWCC.

2.3.7 Meteorology and Ambient Air Quality

2.3.7.1 Regional Climatology/Meteorology. The prevailing subtropical marine climate of the central Florida region results from the influence of the warm waters of the Atlantic Ocean and the Bermuda high-pressure system. Long, warm, humid summers and short, mild winters prevail. Because of the southerly location and marine influences, this area has a climate characterized by small annual and diurnal temperature variations. Rainfall is moderate to heavy during the summer (rainy season) and light during the winter (dry season). Well developed extratropical migratory high- and low-pressure centers usually travel north of the region.

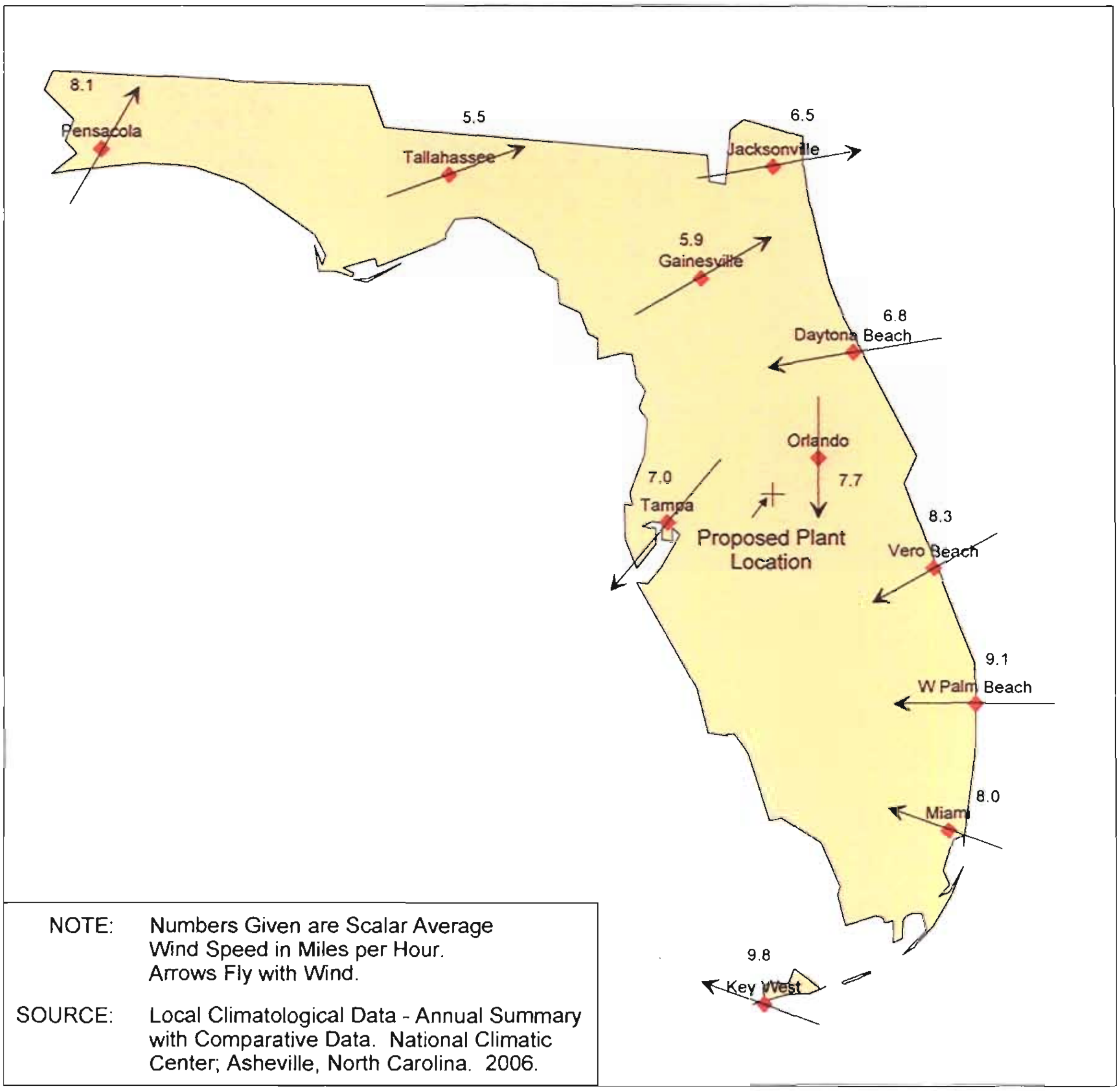
Winds are of moderate speed and blow predominantly from the south to southeast during the spring and summer (March through August). During the fall and winter months (September through February), the predominant direction is from the north. Monthly and annual wind speed and prevailing direction for selected Florida locations are given on Figures 2.3-4 and 2.3-5, respectively. According to the NOAA Coastal Services Center, there is a 26 percent chance per year (or about one in 4 years) that a hurricane will track within 50 nautical miles of CIPP. Of the hurricanes that pass the CIPP area, the origin of the hurricane is mainly from the southeast or southwest.



NOTE: Numbers Given are Scalar Average Wind Speed in Miles per Hour. Arrows Fly with Wind.

SOURCE: Local Climatological Data – Annual Summary with Comparative Data. National Climatic Center; Asheville, North Carolina. 2006.

Figure 2.3-4
Monthly Average Wind Speed and Prevailing Direction for Selected Florida Cities



NOTE: Numbers Given are Scalar Average Wind Speed in Miles per Hour. Arrows Fly with Wind.

SOURCE: Local Climatological Data - Annual Summary with Comparative Data. National Climatic Center; Asheville, North Carolina. 2006.

Figure 2.3-5
Annual Average Wind Speed and Prevailing
Direction for Selected Florida Cities

The average annual rainfall in this region is approximately 50 inches. Summer precipitation due to frequent afternoon thundershowers exceeds winter precipitation due to frontal systems, pre-frontal squall lines, and wave disturbances along fronts stalled over the Florida peninsula. Summer precipitation is mostly of the convective type, resulting in frequent summertime afternoon thundershowers in this region. Thunderstorms are present approximately 80 days a year. Tropical disturbances periodically cause significant precipitation during the summer and fall seasons.

Extremely hot weather is rare because of the ocean influence; maximum temperatures over a summer average near 90° F in the CIPP region. Winter temperatures are mild, slightly above 60° F, interrupted only a few times each season by the northerly or northwesterly advection of polar air. The record lows for the region are near 20° F. Only rarely do temperatures fall below freezing. Inland locations generally display a greater range of temperatures because of the rapid heating and cooling of ground surfaces as compared with water bodies. With the abundance of lakes in this region, average annual humidities are high, ranging in percent from the mid-50s during the afternoon to the upper-80s at night.

The dispersion characteristics of the region are generally good because of land-sea and lake breeze circulations, good ventilation, mixing due to convective instability, and flat terrain.

2.3.7.2 Site Climatology. The CIPP is located in central Florida approximately 45 miles inland from the Atlantic Ocean. This region of the United States is subject to a subtropical climate that is partly influenced by the Atlantic Ocean. This results in small to moderate variations in temperature and relative humidity throughout the year. Monthly precipitation is fairly consistent, with a peak in the summer months. The summers are long and rather warm, with periods of hot and humid weather. The winters are mild with occasional cool mornings due to invasion of cool northern air.

There are no existing local meteorological data with long periods of record for the CIPP. However, there is a location with meteorological data covering long periods of record that are considered representative of the CIPP. This location is the NWS office in Orlando, Florida. The NWS office is approximately 20 miles northwest of the CIPP at an elevation of 95 feet above msl. A detailed discussion of the site climatology follows.

Temperatures and Humidity. The temperature variation from season to season is slight, with warm, humid summers and mild winters. Table 2.3-6 presents a summary of the means and extremes of monthly and daily dry-bulb temperatures. Temperatures around 80° F occur during the summer months. The hottest months are July and August, with a mean monthly temperature of 82.4° F. The daily minimum and maximum

Table 2.3-6
Dry-Bulb Temperature Data

Month	Normal Temperature			Extreme Temperature	
	Monthly[a] (°F)	Daily Minimum[b] (°F)	Daily Maximum[b] (°F)	Lowest[c] (°F)	Highest[c] (°F)
January	60.2	48.9	70.4	19	87
February	62.2	51.4	72.9	26	90
March	66.8	55.8	77.4	25	92
April	71.6	60.4	82.5	38	96
May	77.2	66.4	87.5	48	102
June	81.0	71.5	89.9	53	100
July	82.4	73.3	91.1	64	101
August	82.4	73.7	90.9	64	100
September	80.9	72.5	88.9	56	98
October	74.9	65.9	83.6	43	95
November	68.0	57.9	77.7	29	89
December	62.2	51.6	72.1	20	90
Annual	72.5	62.4	82.1	19	102
Season					
Summer	81.9	72.8	90.6	53	101
Fall	74.6	65.4	83.4	29	98
Winter	61.5	50.6	71.8	19	90
Spring	71.9	60.9	82.5	25	102

Notes:
Source: United States Department of Commerce. Local Climatological Data – Annual Summary with Comparative Data – Orlando, Florida (KMCO, WBAN: 12815). National Climatic Center; Asheville, North Carolina. 2006.
[a]Period of record: 1953 – 2006.
[b]Period of record: 1957 – 2006.
[c]Period of record: 1943 – 2006.

temperature averages are 73.3° F and 91.1° F, respectively, for July and 73.7° F and 90.9° F, respectively, for August. Subfreezing temperatures rarely occur (i.e., approximately 3 days per year), and subzero temperatures have never been recorded. In some years, no freezing temperatures occur.

January is the coldest month, with a mean monthly temperature of 60.2° F. Average January daily minimum and maximum temperatures are 48.9° F and 70.4° F, respectively. The absolute temperature range is from 102° F (May) to 19° F (January).

Table 2.3-7 presents a summary of the wet-bulb and dry-bulb design temperatures. The 1 and 2 percent wet-bulb temperatures for June through September are 79° F and 78° F, respectively. The 1 and 2 percent dry-bulb temperatures, based on historical data from June through September, are 92° F and 91° F, respectively. The 1 percent temperatures are exceeded only 1 percent of the time, and the 2 percent temperatures are exceeded 2 percent of the time. Table 2.3-7 also includes other design temperatures for percentages of 0.4, 97.5, 99.0, and 99.6.

Table 2.3-7
Wet-Bulb and Dry-Bulb Design Temperatures
for Orlando, Florida

Percent of Time	Temperatures (°F)	
	Wet-Bulb	Dry-Bulb
0.4	80	93
1.0	79	92
2.0	78	91
97.5	--	45
99.0	--	40
99.6	--	36

Notes:
Source: "Engineering Weather Data." AFCCC/DOC1. Published by NCDC. Version 1.0. December 23, 1999. Orlando, FL. WMO No. 722050. (Period of record: 1967 – 1996).

Average relative humidities are presented in Table 2.3-8. The table shows that the average annual relative humidity is approximately 76 percent. Hourly average minimum and maximum values are 48 percent and 93 percent and occur at 1300 in April and 0700 in August and September, respectively. The relative humidity does not vary significantly from season to season, with spring days being slightly drier. Heavy fog visibility (1/4 mile or less) averages only 18 days per year at Orlando.

Table 2.3-8
Normal Relative Humidity Data

Month	Hour (Local Standard Time)				
	0100 (percent)	0700 (percent)	1300 (percent)	1900 (percent)	Normal (percent)
January	86	89	57	70	75
February	85	89	53	64	72
March	85	90	51	62	71
April	85	88	48	60	69
May	87	89	50	64	72
June	90	91	58	73	77
July	91	92	59	76	79
August	92	93	60	78	80
September	92	93	61	79	80
October	89	91	57	76	77
November	89	91	57	75	77
December	88	90	59	74	77
Annual	88	91	56	71	76
<u>Season</u>					
Summer	91	92	59	76	79
Fall	90	92	58	77	78
Winter	86	89	56	69	75
Spring	86	89	50	62	71

Notes:
Source: United States Department of Commerce. Local Climatological Data – Annual Summary with Comparative Data – Orlando, Florida (KMCO, WBAN: 12815). National Climatic Center; Asheville, North Carolina. 2006. (Period of record: 1977 – 2006).

Heating and Cooling Degree-Days. Units of degree-days can be used as an indicator of heating or cooling requirements. One heating degree-day is accumulated for each degree that the daily mean temperature drops below the base temperature of 65° F. Cooling degree-days are accumulated when the daily mean temperature is above 65° F. Table 2.3-9 gives mean monthly and annual degree-day totals considered representative of the Project area.

Precipitation. Normal monthly and annual precipitation (rain) totals are shown in Table 2.3-10. As shown in the table, precipitation is highest during the summer and into the fall months. During the period 1977 to 2006, the annual precipitation ranged from 30.38 inches to 67.85 inches. Only a trace of snowfall was recorded during the same period. Extreme monthly precipitation totals are listed in Table 2.3-11. The highest recorded 24 hour rainfall total in Orlando was 9.67 inches (September 1945). Maximum recorded rainfall totals for various time periods are presented in Table 2.3-12. Precipitation maximums and intensities for various return periods and durations are shown in Table 2.3-13.

Wind Characteristics. Five years of wind data (1999 to 2003) were used to generate the monthly, annual, and seasonal wind roses from Orlando, Florida, as shown on Figures 2.3-6 through 2.3-22. These wind roses are considered appropriate in describing the general wind flow at the Project. Table 2.3-14 includes the annual percent frequency of occurrence of the wind speed categories for each of the 16 wind directions. The annual wind rose shows a predominance of a northerly wind. The fall and winter months show a predominance of winds from the north at a maximum speed of 11 to 17 knots. The spring months show an abundance of easterly winds. Summer months show a predominance of winds from the south and east.

The Orlando fastest observed 2 minute and 5 second wind speeds on record are 79 and 105 miles per hour, respectively. The periods of record for the fastest 2 minute and 5 second wind speeds are both 10 years.

2.3.7.3 Atmospheric Dispersion. Atmospheric dispersion depends primarily on four meteorological parameters:

- Height of the mixing layer (mixing height).
- Wind speed within the mixing layer.
- Frequency of low level temperature inversions.
- Atmospheric stability.

Table 2.3-9
Heating and Cooling Degree-Day Data

Month	Normal Degree-Day	
	Heating	Cooling
January	204	44
February	124	59
March	58	128
April	11	202
May	0	378
June	0	486
July	0	545
August	0	547
September	0	484
October	4	318
November	42	150
December	149	64
Annual	593	3,405

Notes:
Source: Southeast Regional Climate Center. Historical Climate Summaries – General Climate Summary Tables. Orlando, Florida (86628). Base 65° F. http://www.sercc.com/climateinfo/historical/historical.html (Period of record: 1974 – 2006).

Table 2.3-10
Total Precipitation Data

Month	Normal Precipitation (inches)
January	2.43
February	2.35
March	3.54
April	2.42
May	3.74
June	7.35
July	7.15
August	6.25
September	5.76
October	2.73
November	2.32
December	2.31
Annual	48.35

Notes:
Source: United States Department of Commerce. Local Climatological Data – Annual Summary with Comparative Data – Orlando, Florida (KMCO, WBAN: 12815). National Climatic Center; Asheville, North Carolina. 2006. (Period of record: 1977 – 2006).

Table 2.3-11
Extreme Precipitation Data

Month	Extreme Precipitation[a]			Extreme Snowfall[b]	
	Maximum 24 Hour (inches)	Maximum Monthly (inches)	Minimum Monthly (inches)	Maximum 24 Hour (inches)	Maximum Monthly (inches)
January	4.19	7.23	0.15	Trace	Trace
February	4.38	8.74	0.10	0	0
March	5.03	11.38	0.02	Trace	Trace
April	5.65	9.10	0.14	Trace	Trace
May	3.18	10.36	0.43	Trace	Trace
June	8.40	18.28	1.58	0	0
July	8.19	19.57	2.60	Trace	Trace
August	5.29	16.11	2.83	Trace	Trace
September	9.67	15.87	0.43	0	0
October	7.74	14.51	0.35	0	0
November	5.87	10.29	0.03	0	0
December	3.61	12.63	Trace	0	0
Annual	9.67	19.57	Trace	Trace	Trace

Notes:
Source: United States Department of Commerce. Local Climatological Data – Annual Summary with Comparative Data – Orlando, Florida (KMCO, WBAN: 12815). National Climatic Center; Asheville, North Carolina. 2006.
[a] Period of record: 1943 – 2006.
[b] Period of record: 1973 – 2006.

Table 2.3-12
Maximum Recorded Rainfall Data for Orlando, Florida

Duration	Rainfall (inches)	Date
5 minutes[a]	0.82	April 13, 1952
10 minutes[a]	1.25	July 25, 1960
15 minutes[a]	1.80	July 23, 1958
30 minutes[a]	3.42	July 25, 1960
60 minutes[b]	5.75	July 25, 1960
2 hours[b]	7.95	July 25, 1960
3 hours[b]	8.16	July 25, 1960
6 hours[b]	8.19	July 25, 1960
12 hours[b]	8.19	July 25, 1960
24 hours[b]	9.67	September 15, 1943

Notes:
Source: United States Weather Bureau, Maximum Recorded United States Point Rainfall for 5 Minutes to 24 Hours at 296 First-Order Stations, Technical Paper No. 2, Washington, D.C., 1963.

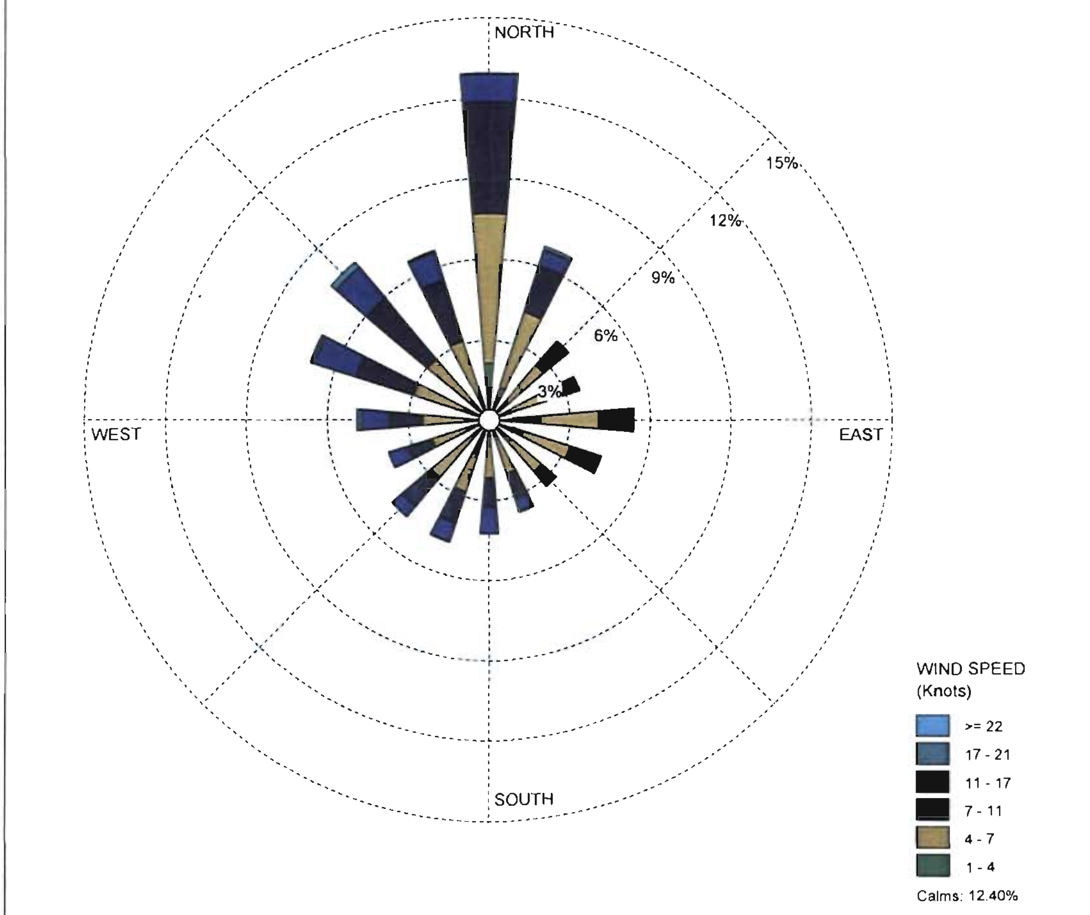
[a]Period of record: 1952-1961.
[b]Period of record: 1941-1961.

Table 2.3-13
Precipitation Amounts and Intensities for
Selected Durations and Return Periods
Expected in the CIPP Area

Precipitation Amounts							
	Return Period						
Duration (hours)	1 Year (inches)	2 Year (inches)	5 Year (inches)	10 Year (inches)	25 Year (inches)	50 Year (inches)	100 Year (inches)
1/2	1.55	1.80	2.15	2.40	2.81	3.01	3.25
1	2.00	2.22	2.78	3.08	3.40	3.80	4.10
2	2.31	2.72	3.30	3.70	4.30	4.80	5.35
3	2.53	2.80	3.65	4.25	4.80	5.40	5.95
6	2.90	3.45	4.45	5.25	5.90	6.30	7.50
12	3.25	4.25	5.25	6.25	7.50	8.30	8.90
24	3.70	4.70	6.20	7.50	8.50	9.50	10.50
Precipitation Intensities							
	Return Period						
Duration (hours)	1 Year (inches)	2 Year (inches)	5 Year (inches)	10 Year (inches)	25 Year (inches)	50 Year (inches)	100 Year (inches)
1/2	3.10	3.60	4.30	4.80	5.62	6.02	6.50
1	2.00	2.22	2.78	3.08	3.40	3.80	4.10
2	1.16	1.36	1.65	1.85	2.15	2.40	2.68
3	0.84	0.93	1.22	1.42	1.60	1.80	1.98
6	0.48	0.58	0.74	0.88	0.98	1.05	1.25
12	0.27	0.35	0.44	0.52	0.63	0.69	0.74
24	0.15	0.20	0.26	0.31	0.35	0.40	0.44

Notes:
Source: United States Weather Bureau, Rainfall Frequency Atlas of the United States for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years, Technical Paper No. 40, Washington, DC, May 1961.

WIND ROSE PLOT:	DISPLAY:
Station #12815 - ORLANDO/INT'L ARPT, FL	Wind Speed Direction (blowing from)



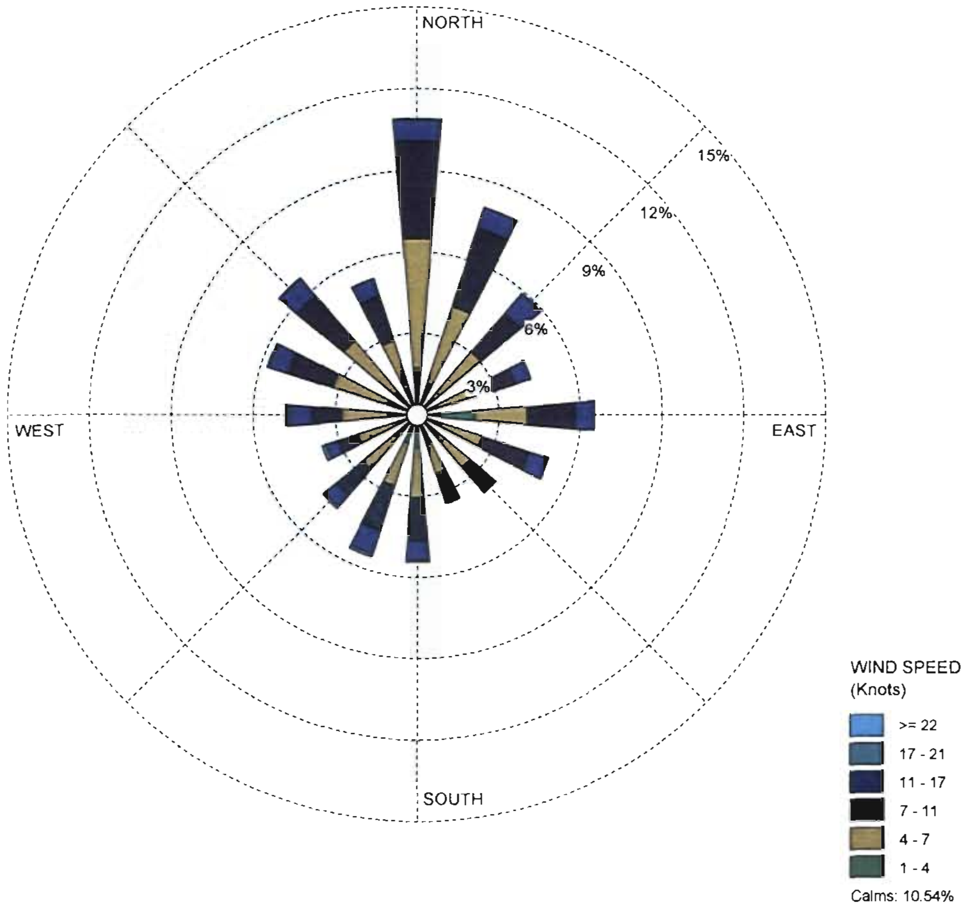
COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	1999-2003 Jan 1 - Jan 31 00:00 - 23:00	MODELER:	
	CALM WINDS: 12.40%	TOTAL COUNT: 3701 hrs.	
	AVG. WIND SPEED: 6.62 Knots	DATE: 2/13/2008	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Figure 2.3-6
January Wind Rose for Orlando, Florida
Period: 1999-2003

WIND ROSE PLOT:
Station #12815 - ORLANDO/INT'L ARPT, FL

DISPLAY:
Wind Speed
Direction (blowing from)



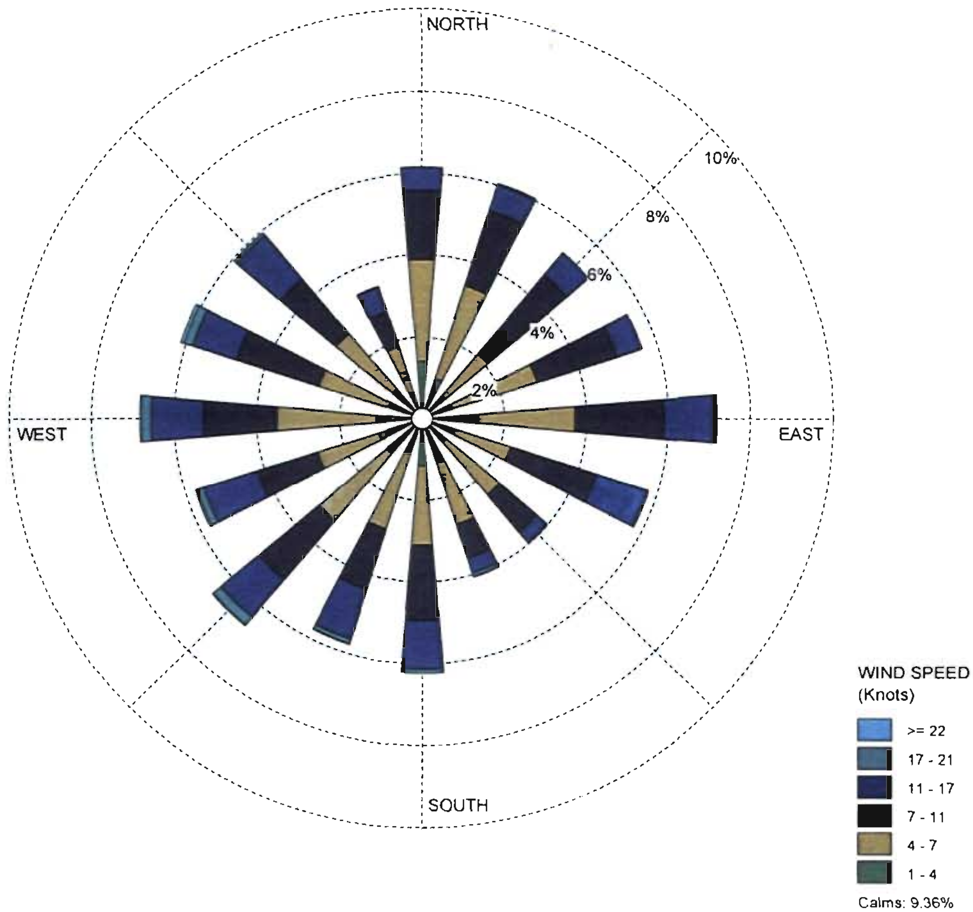
COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	1999-2003 **Feb 1 - Feb 28** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **10.54%**	TOTAL COUNT: **3341 hrs.**	
	AVG. WIND SPEED: **6.71 Knots**	DATE: **2/13/2008**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Figure 2.3-7
February Wind Rose for Orlando, Florida
Period: 1999-2003

WIND ROSE PLOT:
Station #12815 - ORLANDO/INT'L ARPT, FL

DISPLAY:
Wind Speed
Direction (blowing from)

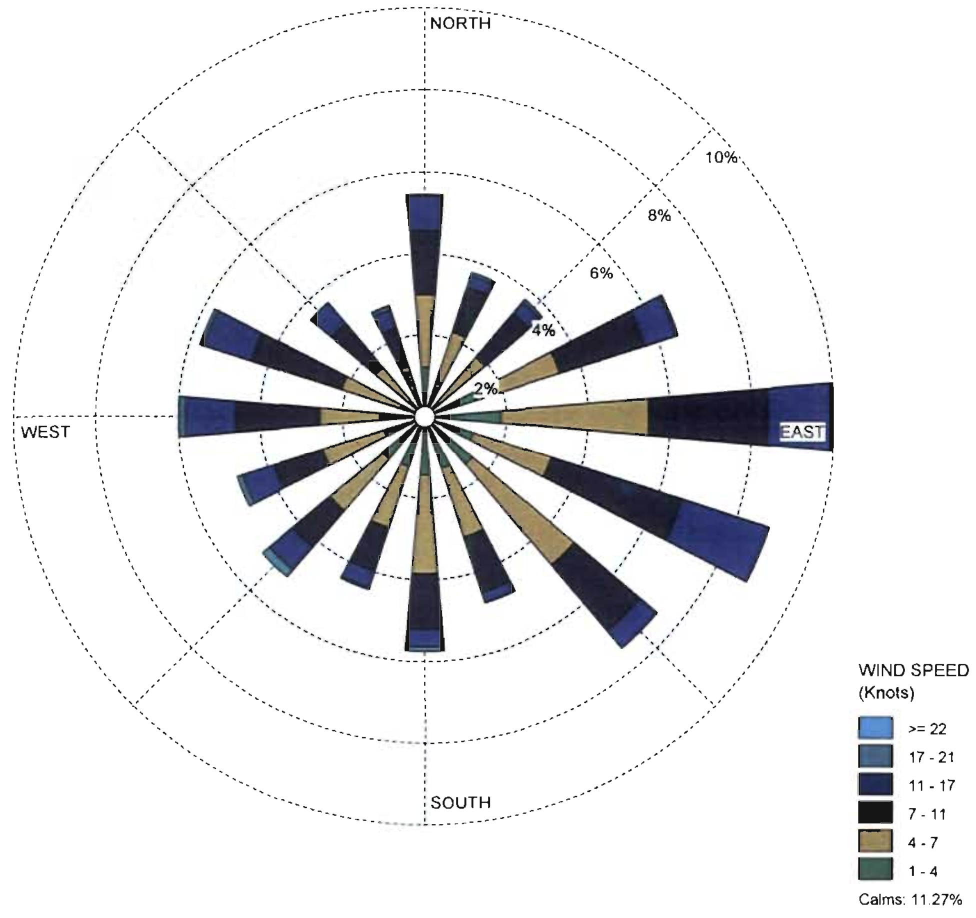


COMMENTS:	DATA PERIOD: **1999-2003** **Mar 1 - Mar 31** **00:00 - 23:00**	COMPANY NAME:	
		MODELER:	
	CALM WINDS: **9.36%**	TOTAL COUNT: **3696 hrs.**	
	AVG. WIND SPEED: **7.36 Knots**	DATE: **2/13/2008**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Figure 2.3-8
March Wind Rose for Orlando, Florida
Period: 1999-2003

WIND ROSE PLOT:	DISPLAY:
Station #12815 - ORLANDO/INT'L ARPT, FL	**Wind Speed** **Direction (blowing from)**

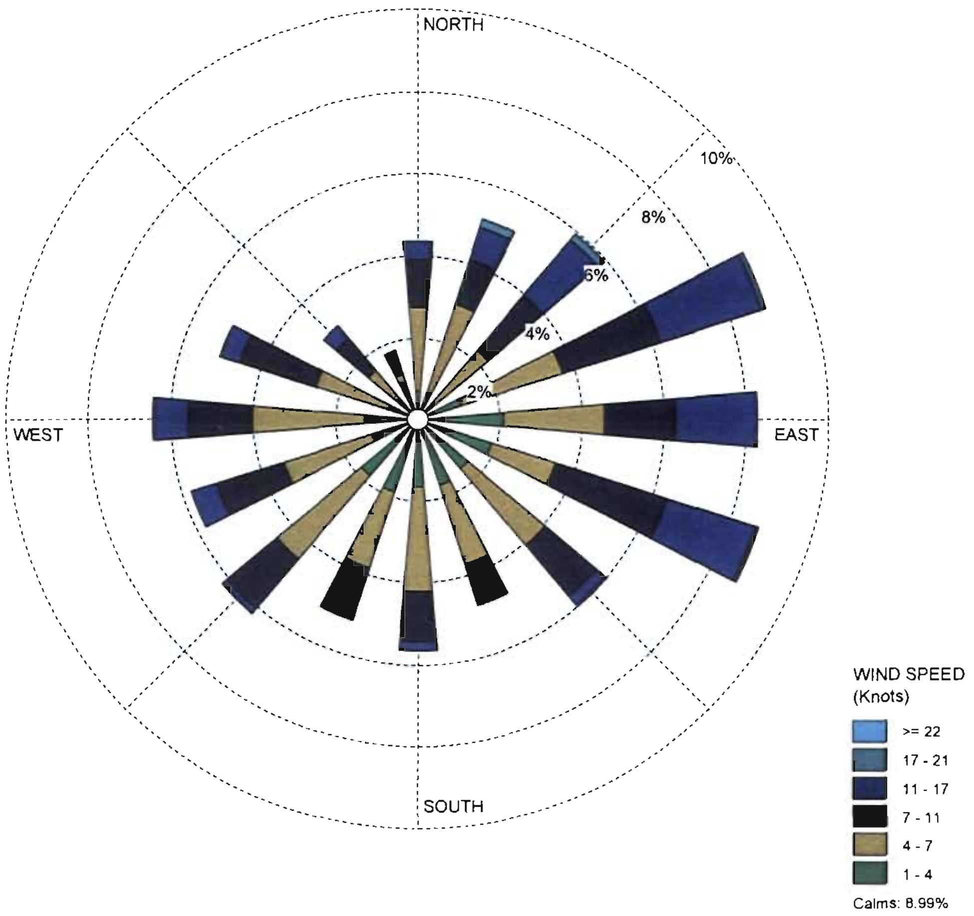


COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	1999-2003 **Apr 1 - Apr 30** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **11.27%**	TOTAL COUNT: **3575 hrs.**	
	AVG. WIND SPEED: **6.94 Knots**	DATE: **2/13/2008**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Figure 2.3-9
April Wind Rose for Orlando, Florida
Period: 1999-2003

WIND ROSE PLOT:	DISPLAY:
Station #12815 - ORLANDO/INT'L ARPT, FL	**Wind Speed** **Direction (blowing from)**



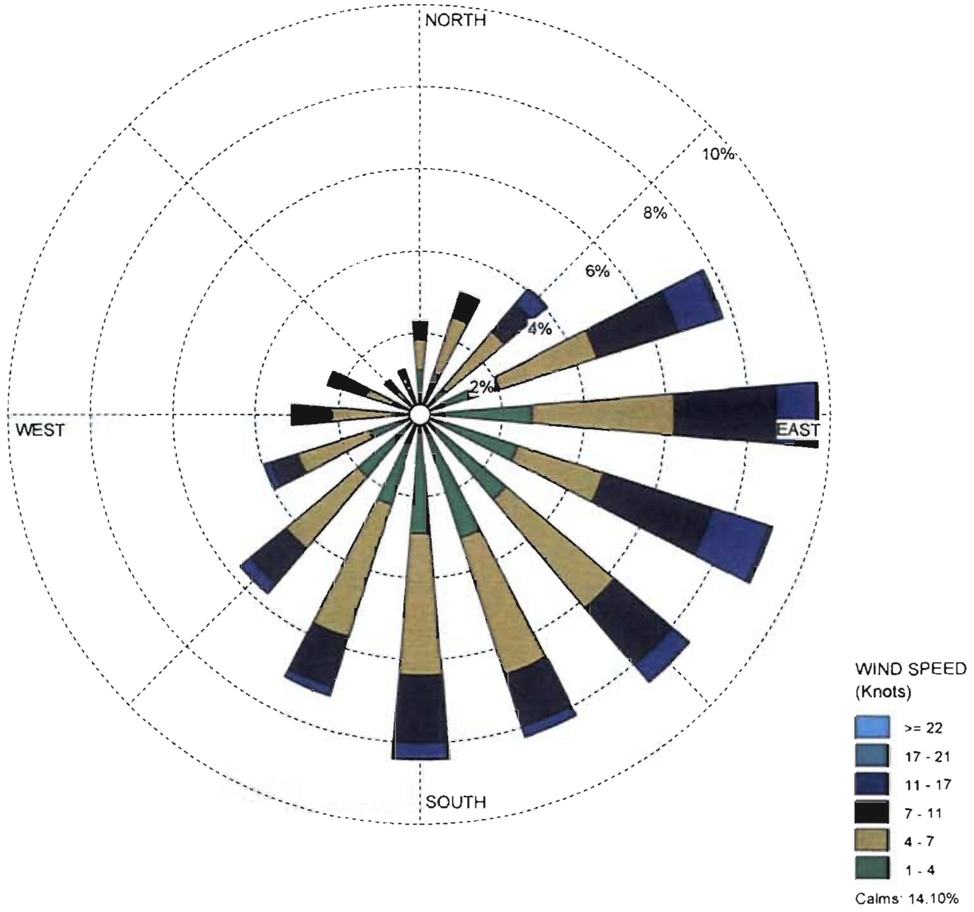
COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	1999-2003 **May 1 - May 31** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **8.99%**	TOTAL COUNT: **3693 hrs.**	
	AVG. WIND SPEED: **6.85 Knots**	DATE: **2/13/2008**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Figure 2.3-10
May Wind Rose for Orlando, Florida
Period: 1999-2003

WIND ROSE PLOT:
Station #12815 - ORLANDO/INT'L ARPT, FL

DISPLAY:
Wind Speed
Direction (blowing from)

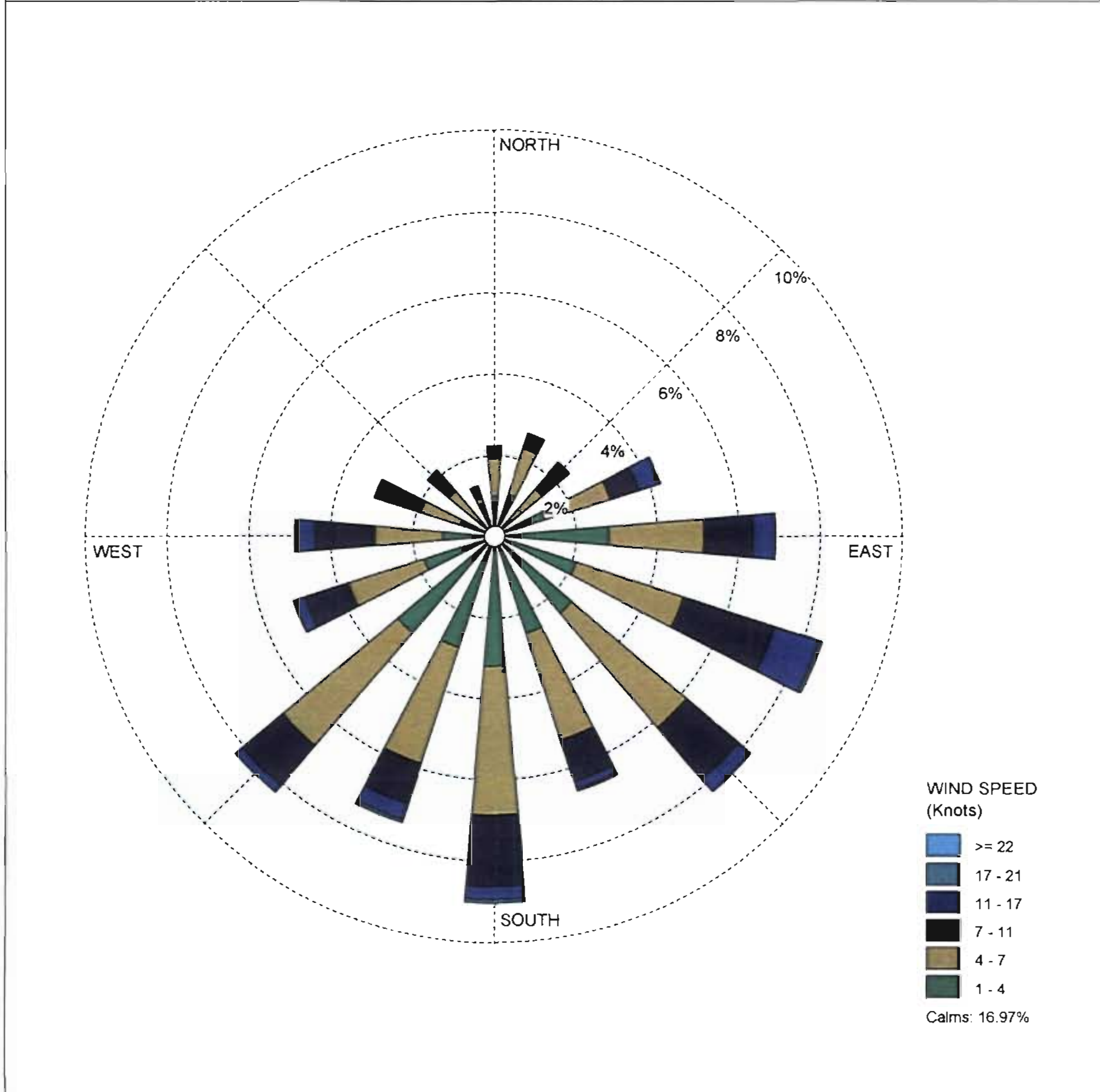


COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	1999-2003 **Jun 1 - Jun 30** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **14.10%**	TOTAL COUNT: **3582 hrs.**	
	AVG. WIND SPEED: **5.62 Knots**	DATE: **2/13/2008**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Figure 2.3-11
June Wind Rose for Orlando, Florida
Period: 1999-2003

WIND ROSE PLOT:	DISPLAY:
Station #12815 - ORLANDO/INT'L ARPT, FL	**Wind Speed** **Direction (blowing from)**



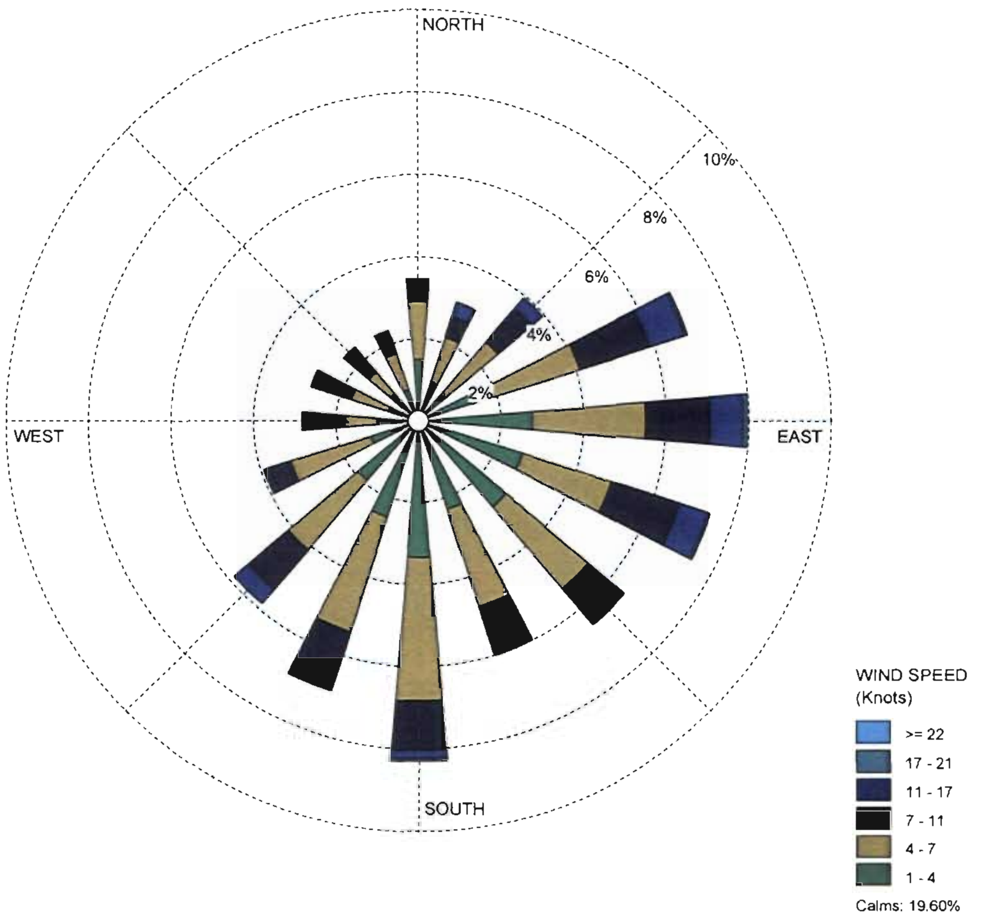
COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	1999-2003 **Jul 1 - Jul 31** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **16.97%**	TOTAL COUNT: **3689 hrs.**	
	AVG. WIND SPEED: **5.25 Knots**	DATE: **2/13/2008**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Figure 2.3-12
July Wind Rose for Orlando, Florida
Period: 1999-2003

WIND ROSE PLOT:
Station #12815 - ORLANDO/INT'L ARPT, FL

DISPLAY:
Wind Speed
Direction (blowing from)

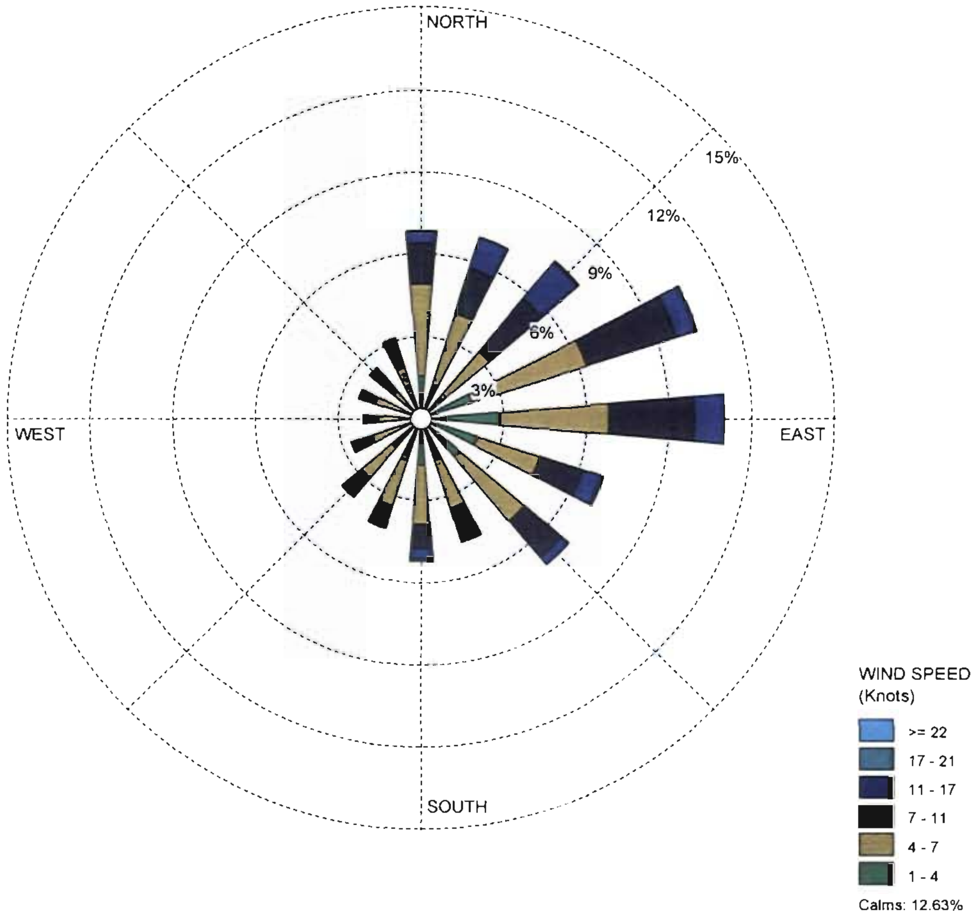


COMMENTS:	DATA PERIOD: **1999-2003** **Aug 1 - Aug 31** **00:00 - 23:00**	COMPANY NAME:	
		MODELER:	
	CALM WINDS: **19.60%**	TOTAL COUNT: **3688 hrs.**	
	AVG. WIND SPEED: **5.10 Knots**	DATE: **2/13/2008**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Figure 2.3-13
August Wind Rose for Orlando, Florida
Period: 1999-2003

WIND ROSE PLOT:	DISPLAY:
Station #12815 - ORLANDO/INT'L ARPT, FL	**Wind Speed** **Direction (blowing from)**



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	1999-2003 **Sep 1 - Sep 30** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **12.63%**	TOTAL COUNT: **3588 hrs.**	
	AVG. WIND SPEED: **6.11 Knots**	DATE: **2/13/2008**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Figure 2.3-14
September Wind Rose for Orlando, Florida
Period: 1999-2003

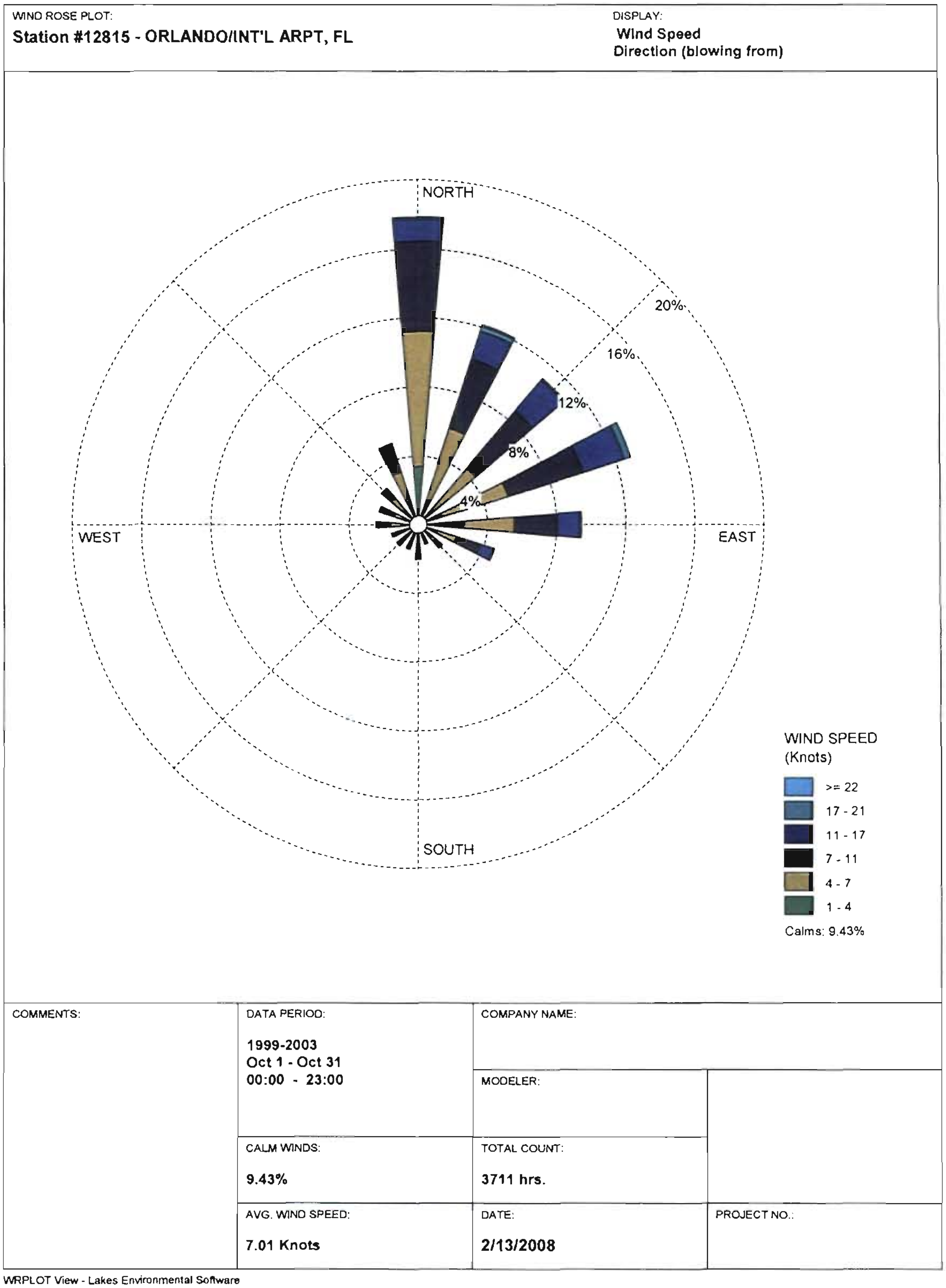
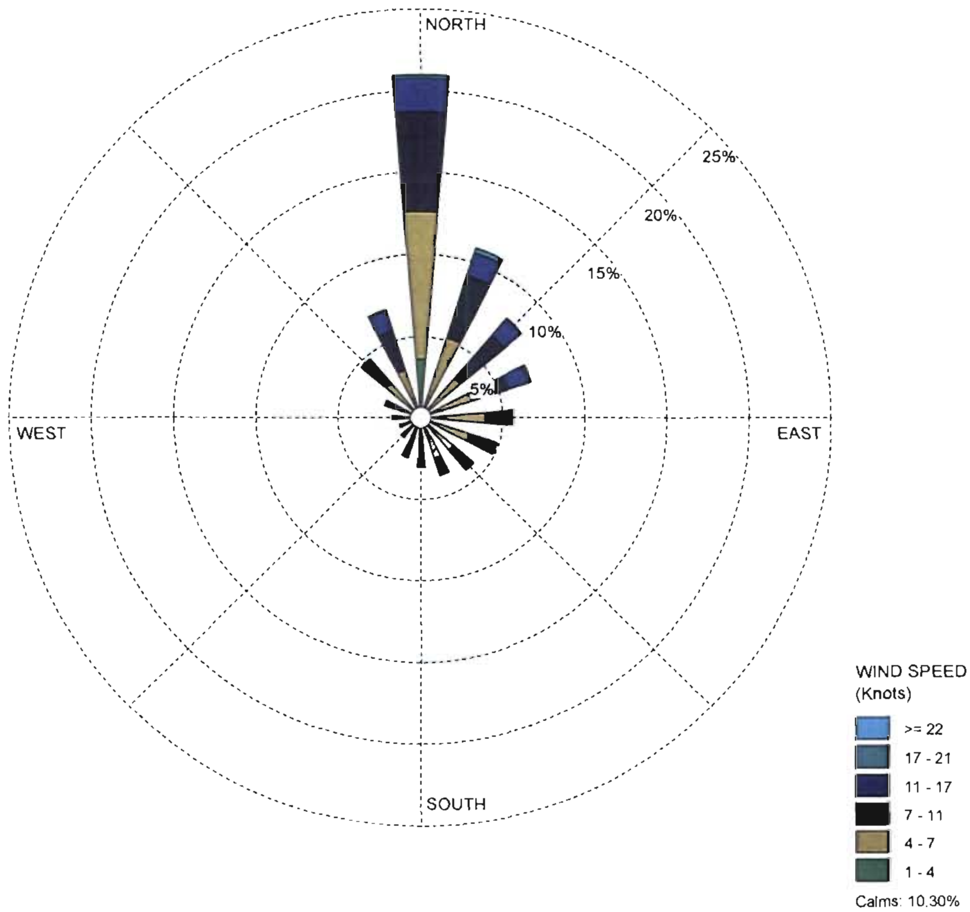


Figure 2.3-15
October Wind Rose for Orlando, Florida
Period: 1999-2003

WIND ROSE PLOT:
Station #12815 - ORLANDO/INT'L ARPT, FL

DISPLAY:
Wind Speed
Direction (blowing from)



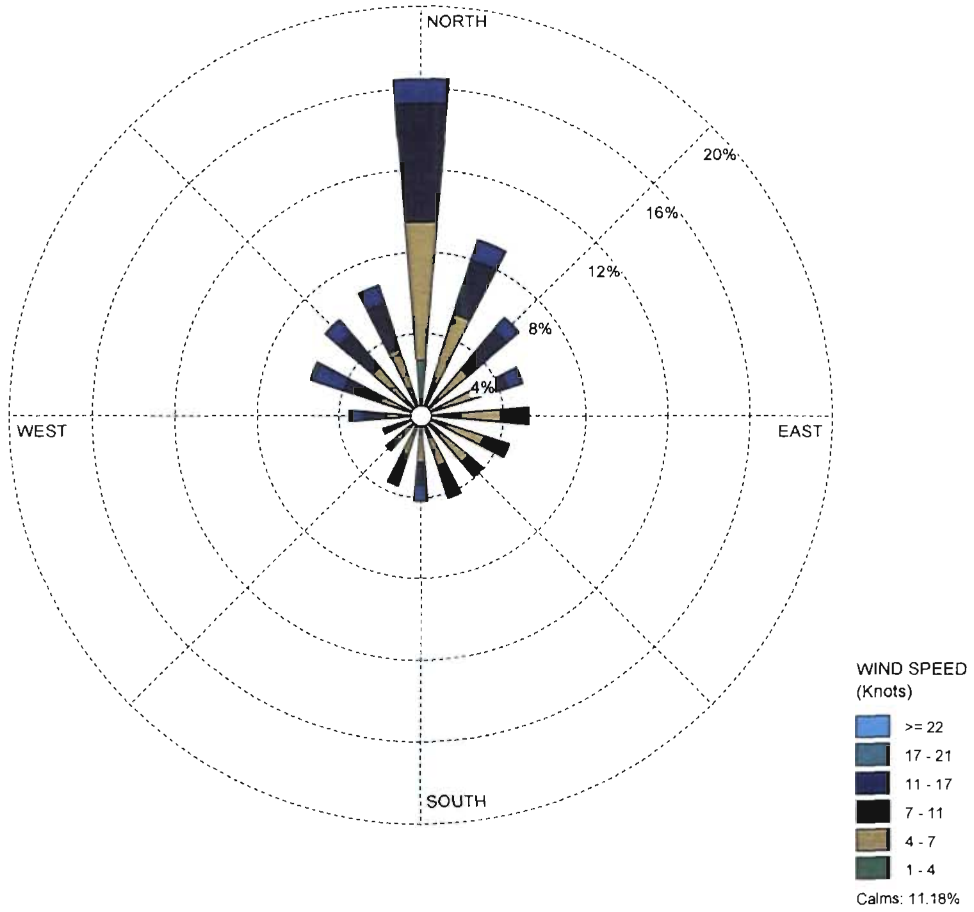
COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	1999-2003 **Nov 1 - Nov 30** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **10.30%**	TOTAL COUNT: **3592 hrs.**	
	AVG. WIND SPEED: **6.97 Knots**	DATE: **2/13/2008**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Figure 2.3-16
November Wind Rose for Orlando, Florida
Period: 1999-2003

WIND ROSE PLOT:
Station #12815 - ORLANDO/INT'L ARPT, FL

DISPLAY:
Wind Speed
Direction (blowing from)



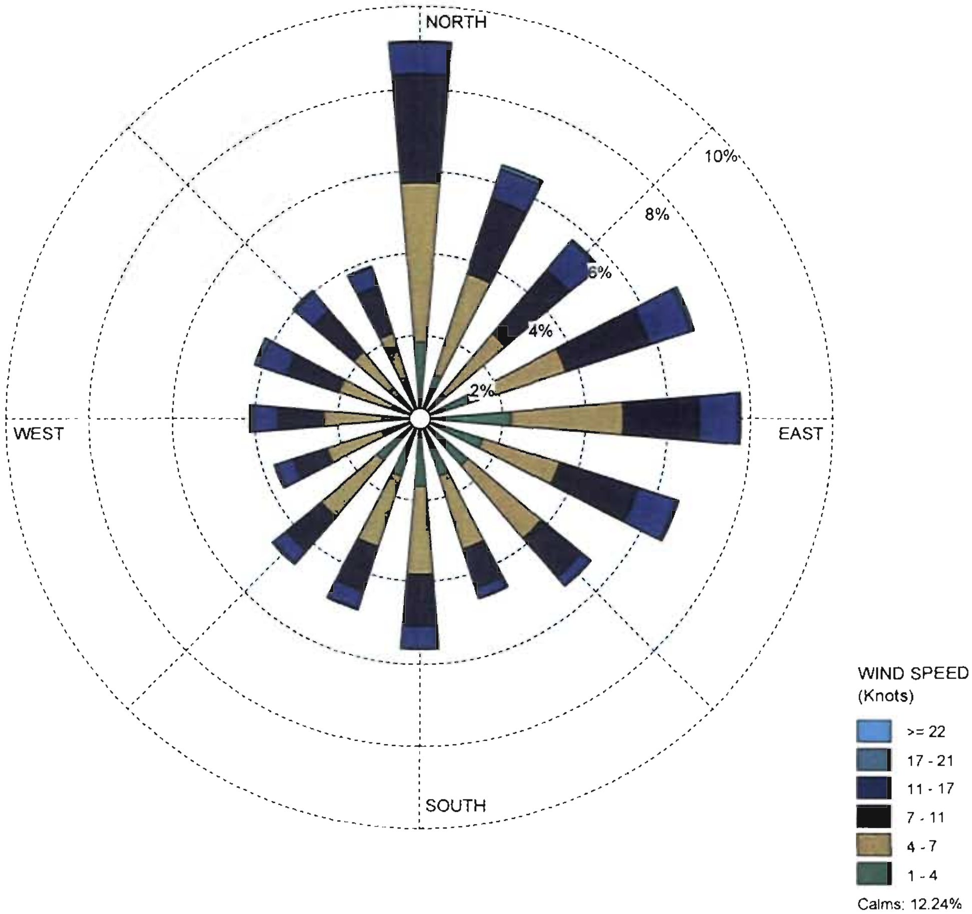
COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	1999-2003 **Dec 1 - Dec 31** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **11.18%**	TOTAL COUNT: **3711 hrs.**	
	AVG. WIND SPEED: **6.64 Knots**	DATE: **2/13/2008**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Figure 2.3-17
December Wind Rose for Orlando, Florida
Period: 1999-2003

WIND ROSE PLOT:
Station #12815 - ORLANDO/INT'L ARPT, FL

DISPLAY:
Wind Speed
Direction (blowing from)



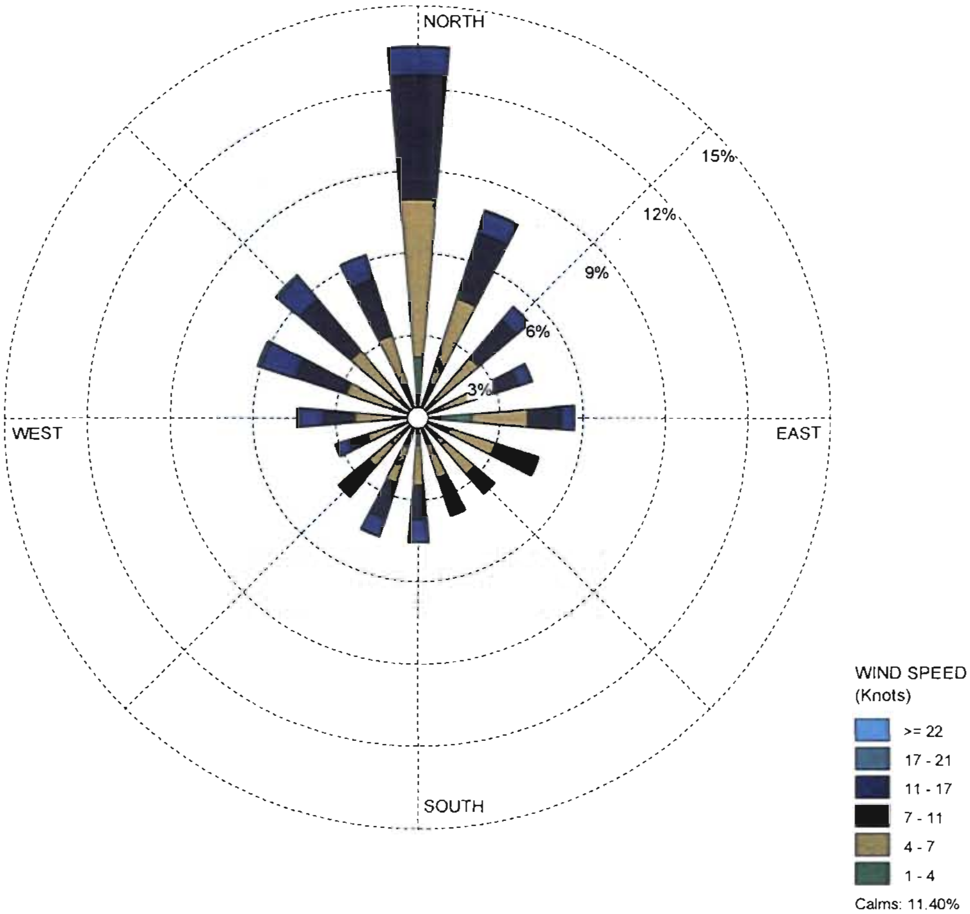
COMMENTS:	DATA PERIOD: **1999-2003** **Jan 1 - Dec 31** **00:00 - 23:00**	COMPANY NAME:	
		MODELER:	
	CALM WINDS: **12.24%**	TOTAL COUNT: **43591 hrs.**	
	AVG. WIND SPEED: **6.43 Knots**	DATE: **2/13/2008**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Figure 2.3-18
Annual Wind Rose for Orlando, Florida
Period: 1999-2003

WIND ROSE PLOT:
Station #12815 - ORLANDO/INT'L ARPT, FL

DISPLAY:
Wind Speed
Direction (blowing from)



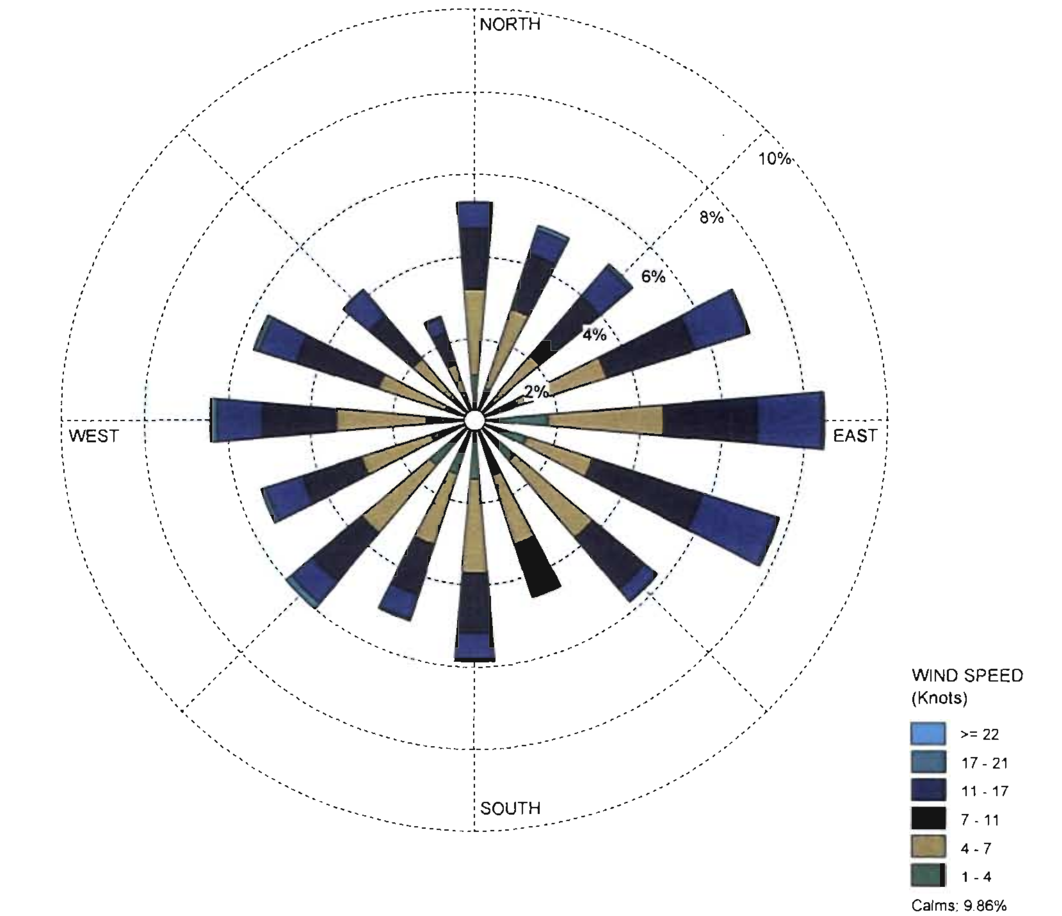
COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	1999-2003 **Check Date Range Report** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **11.40%**	TOTAL COUNT: **10753 hrs.**	
	AVG. WIND SPEED: **6.66 Knots**	DATE: **2/13/2008**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Figure 2.3-19
Winter Wind Rose for Orlando, Florida
Period: 1999-2003 (December, January, February)

WIND ROSE PLOT:
Station #12815 - ORLANDO/INT'L ARPT, FL

DISPLAY:
Wind Speed
Direction (blowing from)

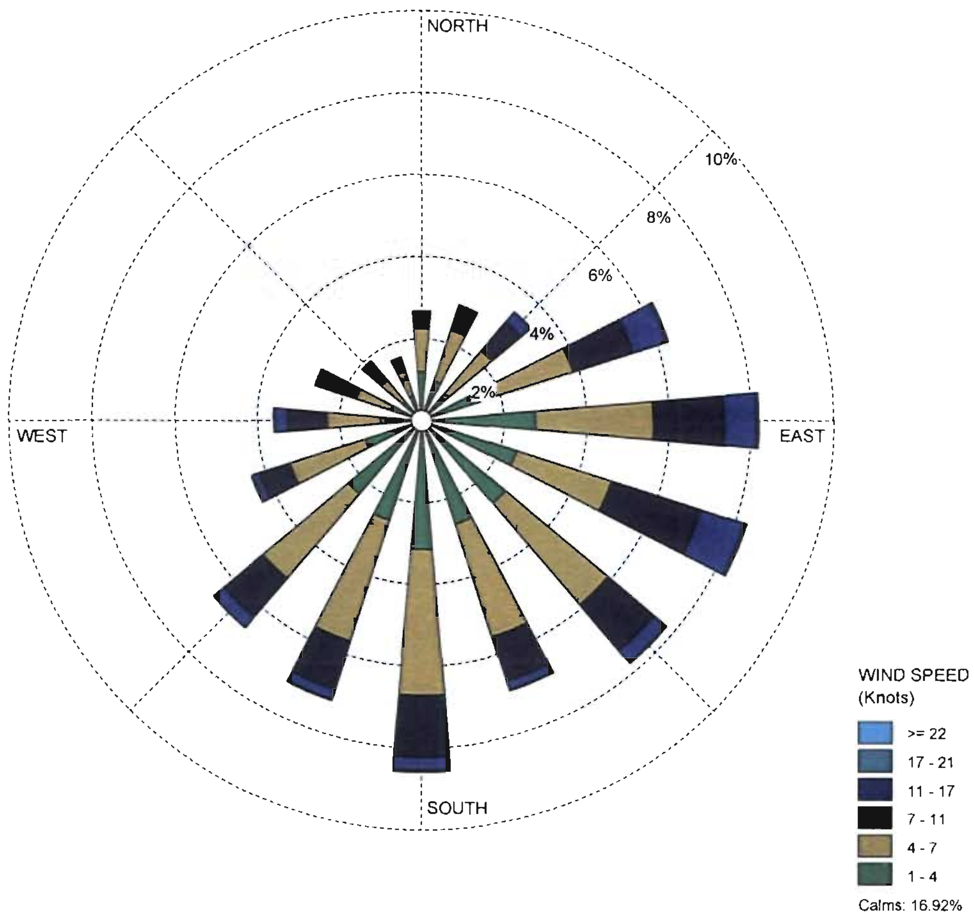


COMMENTS:	DATA PERIOD: **1999-2003** **Mar 1 - May 31** **00:00 - 23:00**	COMPANY NAME:	
		MODELER:	
	CALM WINDS: **9.86%**	TOTAL COUNT: **10964 hrs.**	
	AVG. WIND SPEED: **7.05 Knots**	DATE: **2/13/2008**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Figure 2.3-20
Spring Wind Rose for Orlando, Florida
Period: 1999-2003 (March, April, May)

WIND ROSE PLOT:	DISPLAY:
Station #12815 - ORLANDO/INT'L ARPT, FL	**Wind Speed** **Direction (blowing from)**



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	1999-2003 **Jun 1 - Aug 31** **00:00 - 23:00**	MODELER:	
	CALM WINDS: **16.92%**	TOTAL COUNT: **10959 hrs.**	
	AVG. WIND SPEED: **5.32 Knots**	DATE: **2/13/2008**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Figure 2.3-21
Summer Wind Rose for Orlando, Florida
Period: 1999-2003 (June, July, August)

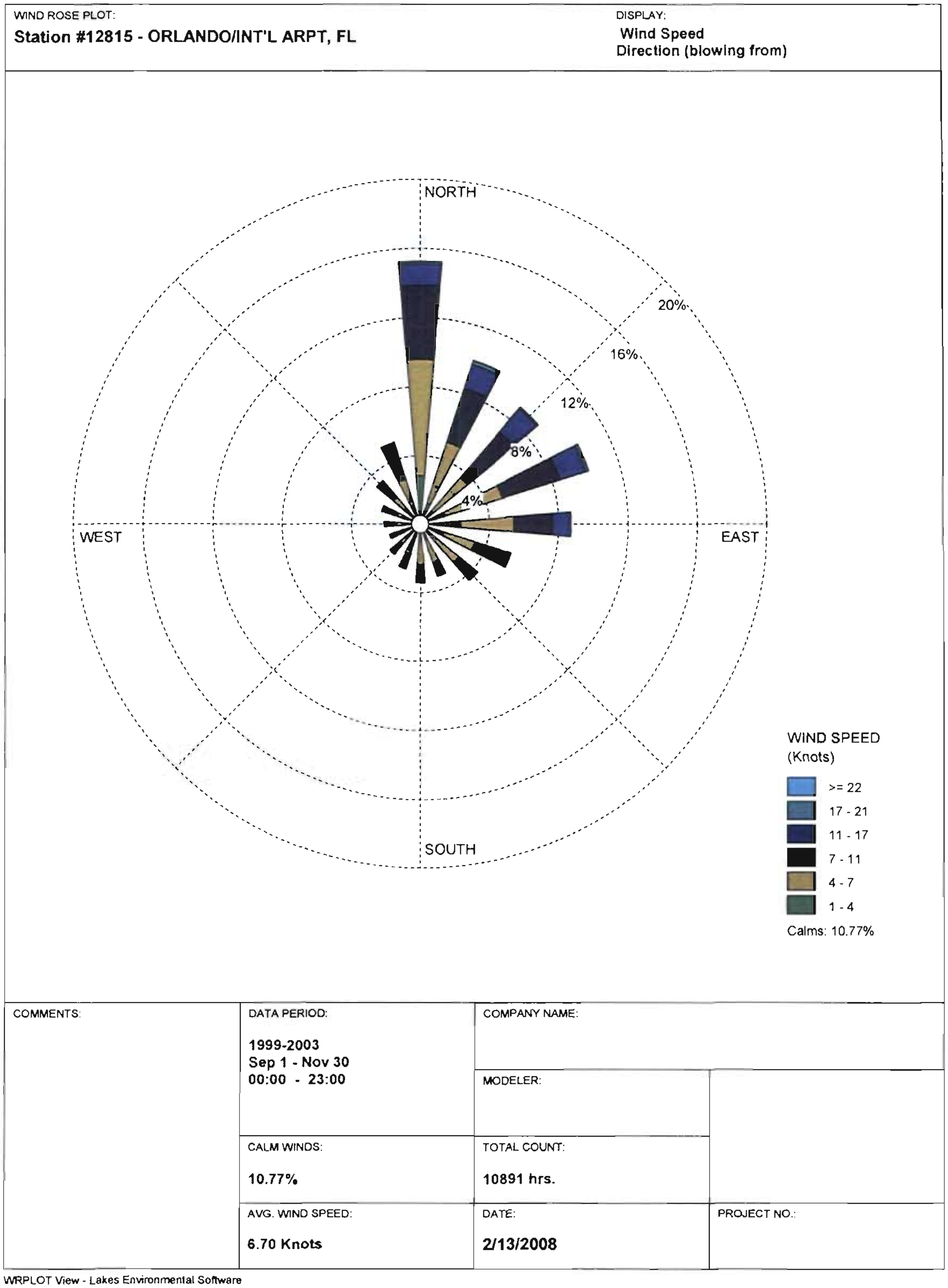


Figure 2.3-22
Fall Wind Rose for Orlando, Florida
Period: 1999-2003 (September, October, November)

Table 2.3-14
Annual Wind Rose
Percent Frequency Distribution

Direction Sector	Wind Speed Categories[a] (knots)							Total (percent)
	Calms	0-3	3-7	7-12	12-18	18-24	>24	
E	0.080	0.064	1.093	5.426	3.941	0.436	0.014	11.053
ENE	0.041	0.052	0.812	3.884	2.978	0.392	0.016	8.176
ESE	0.121	0.084	1.634	5.586	3.927	0.276	0.007	11.635
N	0.112	0.228	1.342	1.326	0.671	0.046	0.000	3.724
NE	0.030	0.084	0.771	2.373	1.803	0.199	0.000	5.260
NNE	0.027	0.123	0.621	1.079	0.737	0.039	0.002	2.629
NNW	0.335	0.429	2.928	2.588	0.931	0.059	0.002	7.272
NW	0.303	0.500	2.971	2.729	1.070	0.075	0.000	7.649
S	0.192	0.258	2.038	1.584	0.671	0.073	0.009	4.824
SE	0.210	0.180	2.229	5.084	4.144	0.301	0.018	12.167
SSE	0.178	0.201	1.618	2.029	1.686	0.251	0.002	5.965
SSW	0.162	0.210	1.673	1.015	0.402	0.082	0.011	3.555
SW	0.219	0.315	1.899	1.141	0.438	0.087	0.021	4.119
W	0.201	0.340	1.609	1.031	0.413	0.052	0.009	3.656
WNW	0.178	0.402	1.748	1.239	0.447	0.034	0.011	4.059
WSW	0.299	0.347	1.951	1.223	0.383	0.048	0.007	4.258
Total	2.688	3.818	26.935	39.337	24.642	2.451	0.130	100.000

Notes:
Source: Derived from hourly Orlando, Florida (Station No. 12815). Period: 1999-2003.

[a]Calms = 0 knots
Categories are grouped by the following scheme: 0 - 3 means greater than 0 knots and less than or equal to 3 knots, 3 - 7 means greater than 3 knots and less than or equal to 7 knots, etc.

Holzworth has estimated mean mixing depths and average wind speed within the mixing layer for 62 NWS radiosonde stations within the 48 contiguous states. The morning and afternoon mixing depths are calculated from the twice daily vertical temperature profiles and the morning and afternoon surface temperatures. Within the mixing depth, relatively vigorous mixing occurs. Diffusion within layers above this height is inhibited because of thermal buoyancy considerations (i.e., neutral or slightly stable conditions). The worst dispersion conditions occur when both the mixing depth and wind speed are low. In general, Holzworth's data show that Florida has the best combinations of greater mixing depths and higher wind speeds than other areas. Table 2.3-15 presents values of seasonal and annual morning and afternoon mixing depths and wind speed representative of the Project area.

Table 2.3-15
Estimated Average Mixing Heights and Average Wind Speeds Through the Mixed Layer Representative of the CIPP Area

Season	Morning		Afternoon	
	Mixing Height (m)	Wind Speed (m/s)	Mixing Height (m)	Wind Speed (m/s)
Winter	436	6.1	1,079	6.6
Spring	526	5.8	1,544	6.8
Summer	674	4.3	1,526	5.3
Fall	439	5.6	1,429	6.8
Annual	519	5.4	1,394	6.4

Notes:
Source: Holzworth, G.C. "Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution throughout the Contiguous United States." Washington DC, USEPA. January 1972. Table B-1; Tampa, Florida.

Atmospheric stability, in conjunction with general wind patterns, indicates the potential of the atmosphere to disperse airborne pollutants. Atmospheric conditions are typically categorized as unstable, neutral, or stable. An unstable atmosphere is one in which relatively rapid dispersion takes place in both the horizontal and vertical direction. Viewed in terms of changes in temperature with height, an unstable atmosphere is characterized by a sharp decrease in temperature with height. Neutral conditions are common in the atmosphere and are associated with moderate diffusion rates. Temperatures also decrease with height in a neutral atmosphere, but not as rapidly as under unstable conditions (neutral conditions are associated with the adiabatic lapse rate).

A stable atmosphere is characterized by slight decreases, or even increases of temperature with height, and greatly reduced dispersion rates in comparison with unstable or neutral atmospheres.

The stability classifications presented in this subsection are based on the well known Pasquill, Gifford, Turner method, which assigns a stability on the basis of surface wind speed, cloud cover, and solar altitude (Turner). Stability classes range from Class A (most unstable) to Class G (most stable). Class D represents a neutral stability condition. The joint frequency distribution of wind speed, wind direction, and stability at Orlando, Florida, is summarized in Tables 2.3-16 through 2.3-22.

2.3.7.4 Ambient Air Quality. One requirement in obtaining site certification and applicable air quality permits is to demonstrate that the operation of the proposed facility will not cause or contribute to a violation of any federal or state AAQS or allowable air quality increment. This demonstration is included in Section 5.6 of Volume 1 and in Volume 3 (PSD Application), which also addresses many of the requirements of the PSD permit application. One necessary part of the application is to establish representative values for background air quality for applicable pollutants. The existing air quality in the vicinity of the Project is described in this subsection, including applicable standards and allowable incremental effects. The impact predictions resulting from the consideration of the proposed source emissions are also described in Volume 3 of this SCA.

Air Quality Standards. AAQS have been set to protect public health (primary standards) and public welfare (secondary standards). In addition, the state of Florida has adopted AAQS. The federal and state AAQS are given in Table 2.3-23.

In addition to ambient standards, the operation of the unit must not cause air quality incremental impacts beyond those specified by PSD criteria. The CIPP area is classified as PSD Class II. Class II PSD increments will be applicable for this analysis in all areas surrounding the CIPP.

Existing Air Quality. The state of Florida has been conducting air quality monitoring for criteria pollutants at locations throughout the state for many years. The USEPA AIRS Data, accessed on the Internet, provides the most recent monitoring data for use in establishing background concentrations for applicable criteria pollutants. FDEP and EPA guidance would generally require the use of the highest or second highest monitored concentrations to establish conservative background concentrations for the Project area. The most recent data (2007 data), along with the maximum recorded value during the period of record available (1997-2007) from the nearest monitoring location, are presented in Table 2.3-24. The 2007 data represents the background air quality levels at the CIPP site, while the maximum recorded values are presented for a historical perspective. Pursuant to a pre-application meeting with FDEP-BAR, site-specific ambient air monitoring and data collection were not required.

Table 2.3-16
Distribution of Hours of Occurrence of Wind Speed and Wind Direction for Stability Class A

Direction Sector	Wind Speed Categories[a] (knots)							Total Hours
	Calms	0-3	3-7	7-12	12-18	18-24	>24	
E	0	0	5	0	0	0	0	5
ENE	0	0	3	0	0	0	0	3
ESE	0	0	1	0	0	0	0	1
N	0	1	1	0	0	0	0	2
NE	0	1	3	0	0	0	0	4
NNE	2	0	4	0	0	0	0	6
NNW	1	0	1	0	0	0	0	2
NW	1	0	2	0	0	0	0	3
S	1	1	5	0	0	0	0	7
SE	0	1	5	0	0	0	0	6
SSE	1	1	1	0	0	0	0	3
SSW	1	1	5	0	0	0	0	7
SW	0	1	3	0	0	0	0	4
W	0	0	4	0	0	0	0	4
WNW	2	0	1	0	0	0	0	3
WSW	0	1	8	0	0	0	0	9
Total	9	8	52	0	0	0	0	69

Notes:
Source: Derived from hourly Orlando, Florida (Station No. 12815). Period: 1999-2003.

[a]Calms = 0 knots
Categories are grouped by the following scheme: 0 - 3 means greater than 0 knots and less than or equal to 3 knots, 3 - 7 means greater than 3 knots and less than or equal to 7 knots, etc.

Table 2.3-17
Distribution of Hours of Occurrence of Wind Speed
and Wind Direction for Stability Class B

Direction Sector	Wind Speed Categories[a] (knots)							Total Hours
	Calms	0-3	3-7	7-12	12-18	18-24	>24	
E	1	2	56	77	0	0	0	136
ENE	0	1	47	36	0	0	0	84
ESE	0	0	56	88	2	0	0	146
N	0	5	44	6	0	0	0	55
NE	0	6	55	28	0	0	0	89
NNE	0	6	39	16	0	0	0	61
NNW	2	4	54	5	0	0	0	65
NW	5	5	57	8	0	0	0	75
S	1	4	36	14	0	0	0	55
SE	0	2	62	42	1	0	0	107
SSE	1	4	41	19	0	0	0	65
SSW	0	3	44	8	0	0	0	55
SW	0	5	65	9	1	0	0	80
W	2	3	54	9	0	0	0	68
WNW	2	7	54	10	0	0	0	73
WSW	2	2	38	15	0	0	0	57
Total	16	59	802	390	4	0	0	1,271

Notes:
Source: Derived from hourly Orlando, Florida (Station No. 12815). Period: 1999-2003.

[a]Calms = 0 knots
Categories are grouped by the following scheme: 0 - 3 means greater than 0 knots and less than or equal to 3 knots, 3 - 7 means greater than 3 knots and less than or equal to 7 knots, etc.

Table 2.3-18
Distribution of Hours of Occurrence of Wind Speed and Wind Direction for Stability Class C

Direction Sector	Wind Speed Categories[a] (knots)							Total Hours
	Calms	0-3	3-7	7-12	12-18	18-24	>24	
E	2	5	45	489	165	5	0	711
ENE	2	2	43	329	86	1	0	463
ESE	3	5	47	556	256	8	0	875
N	8	10	73	125	11	0	0	227
NE	2	5	35	242	55	6	0	345
NNE	0	7	27	110	32	1	0	177
NNW	14	11	93	156	7	0	0	281
NW	9	13	85	188	12	2	0	309
S	0	5	84	106	21	3	0	219
SE	0	7	50	446	294	18	0	815
SSE	7	5	44	152	83	6	0	297
SSW	1	11	32	88	9	3	0	144
SW	9	7	47	136	29	6	1	235
W	4	8	45	109	18	1	1	186
WNW	7	10	67	117	14	1	0	216
WSW	2	7	44	126	16	0	0	195
Total	70	118	861	3,475	1,108	61	2	5,695

Notes:
Source: Derived from hourly Orlando, Florida (Station No. 12815). Period: 1999-2003.

[a]Calms = 0 knots
Categories are grouped by the following scheme: 0 - 3 means greater than 0 knots and less than or equal to 3 knots, 3 - 7 means greater than 3 knots and less than or equal to 7 knots, etc.

Table 2.3-19
Distribution of Hours of Occurrence of Wind Speed and Wind Direction for Stability Class D

Direction Sector	Wind Speed Categories[a] (knots)							Total Hours
	Calms	0-3	3-7	7-12	12-18	18-24	>24	
E	2	4	105	1,346	1,561	186	6	3,210
ENE	1	1	84	965	1,218	171	7	2,447
ESE	3	3	144	1,250	1,461	113	3	2,977
N	6	17	138	365	282	20	0	828
NE	0	6	77	622	735	81	0	1,521
NNE	2	5	65	290	291	16	1	670
NNW	10	12	234	681	400	26	1	1,364
NW	16	19	252	650	454	31	0	1,422
S	4	9	167	381	271	29	4	865
SE	1	7	188	1,206	1,517	114	8	3,041
SSE	4	10	143	524	656	104	1	1,442
SSW	4	8	157	254	165	33	5	626
SW	8	9	181	248	162	32	8	648
W	9	8	120	219	163	22	3	544
WNW	7	11	165	282	182	14	5	666
WSW	1	10	135	252	152	21	3	574
Total	78	139	2,355	9,535	9,670	1,013	55	22,845

Notes:
Source: Derived from hourly Orlando, Florida (Station No. 12815). Period: 1999-2003.

[a]Calms = 0 knots
Categories are grouped by the following scheme: 0 - 3 means greater than 0 knots and less than or equal to 3 knots, 3 - 7 means greater than 3 knots and less than or equal to 7 knots, etc.

Table 2.3-20
Distribution of Hours of Occurrence of Wind Speed and Wind Direction for Stability Class E

Direction Sector	Wind Speed Categories[a] (knots)							Total Hours
	Calms	0-3	3-7	7-12	12-18	18-24	>24	
E	4	3	160	464	1	0	0	632
ENE	2	2	126	372	1	0	0	503
ESE	4	4	284	553	2	0	0	847
N	7	19	178	84	1	0	0	289
NE	3	3	98	148	0	0	0	252
NNE	0	8	74	57	0	0	0	139
NNW	17	19	402	291	1	0	0	730
NW	25	30	410	346	2	0	0	813
S	7	16	308	192	2	0	0	525
SE	7	9	365	531	4	0	0	916
SSE	9	11	222	194	0	0	0	436
SSW	10	8	218	94	2	0	0	332
SW	9	14	245	105	0	0	0	373
W	8	18	214	115	0	0	0	355
WNW	8	17	219	134	0	0	0	378
WSW	17	8	264	142	0	0	0	431
Total	137	189	3,787	3,822	16	0	0	7,951

Notes:
Source: Derived from hourly Orlando, Florida (Station No. 12815). Period: 1999-2003.

[a]Calms = 0 knots
Categories are grouped by the following scheme: 0 - 3 means greater than 0 knots and less than or equal to 3 knots, 3 - 7 means greater than 3 knots and less than or equal to 7 knots, etc.

Table 2.3-21
Distribution of Hours of Occurrence of Wind Speed and Wind Direction for Stability Class F

Direction Sector	Wind Speed Categories[a] (knots)							Total Hours
	Calms	0-3	3-7	7-12	12-18	18-24	>24	
E	9	8	108	2	0	0	0	127
ENE	5	6	53	0	0	0	0	64
ESE	15	13	184	1	0	0	0	213
N	7	16	154	1	0	0	0	178
NE	4	7	70	0	0	0	0	81
NNE	4	15	63	0	0	0	0	82
NNW	26	40	499	1	0	0	0	566
NW	32	40	496	4	1	0	0	573
S	27	25	293	1	0	0	0	346
SE	23	18	307	3	0	0	0	351
SSE	12	28	258	0	0	0	0	298
SSW	18	21	277	1	0	0	0	317
SW	15	35	291	2	0	0	0	343
W	14	27	268	0	0	0	0	309
WNW	19	50	260	0	0	0	0	329
WSW	31	45	366	1	0	0	0	443
Total	261	394	3,947	17	1	0	0	4,620

Notes:
Source: Derived from hourly Orlando, Florida (Station No. 12815). Period: 1999-2003.

[a]Calms = 0 knots
Categories are grouped by the following scheme: 0 - 3 means greater than 0 knots and less than or equal to 3 knots, 3 - 7 means greater than 3 knots and less than or equal to 7 knots, etc.

Table 2.3-22
Distribution of Hours of Occurrence of Wind Speed and Wind Direction for Stability Class G

Direction Sector	Wind Speed Categories[(a)] (knots)							Total Hours
	Calms	0-3	3-7	7-12	12-18	18-24	>24	
E	17	6	0	0	0	0	0	23
ENE	8	11	0	0	0	0	0	19
ESE	28	12	0	0	0	0	0	40
N	21	32	0	0	0	0	0	53
NE	4	9	0	0	0	0	0	13
NNE	4	13	0	0	0	0	0	17
NNW	77	102	0	0	0	0	0	179
NW	45	112	0	0	0	0	0	157
S	44	53	0	0	0	0	0	97
SE	61	35	0	0	0	0	0	96
SSE	44	29	0	0	0	0	0	73
SSW	37	40	0	0	0	0	0	77
SW	55	67	0	0	0	0	0	122
W	51	85	0	0	0	0	0	136
WNW	33	81	0	0	0	0	0	114
WSW	78	79	0	0	0	0	0	157
Total	607	766	0	0	0	0	0	1,373

Notes:
Source: Derived from hourly Orlando, Florida (Station No. 12815). Period: 1999-2003.

[(a)]Calms = 0 knots
Categories are grouped by the following scheme: 0 - 3 means greater than 0 knots and less than or equal to 3 knots, 3 - 7 means greater than 3 knots and less than or equal to 7 knots, etc.

Table 2.3-23
Ambient Air Quality Standards

Pollutant	Less Than 24 Hour Average	24 Hour Average	Annual Average
Carbon Monoxide (μg/m^3)			
Federal primary and secondary	10,000 (8 hour)[a]	--	--
Federal primary and secondary	40,000 (1 hour)[a]	--	--
Florida	Same as Federal	--	--
Lead (Pb) (μg/m^3)			
Federal primary and secondary	--	--	1.5 (3 mo)[b]
Florida	--	--	1.5 (3 mo)[b]
Nitrogen Dioxide (μg/m^3)			
Federal primary and secondary	--	--	100[b]
Florida	--	--	100[b]
Particulate Matter (PM_{10}) (μg/m^3)			
Federal primary and secondary	--	150[c]	50[b, g]
Florida	--	150[c]	50[b]
Particulate Matter ($PM_{2.5}$) (μg/m^3)			
Federal primary and secondary	--	35[d]	15[e]
Ozone (μg/m^3)			
Federal primary and secondary	157 (8-hour)[f]	--	--
Florida	235 (1-hour)[c]	--	--
Sulfur Dioxide (μg/m^3)			
Federal primary	--	365[a]	80[b]
Federal secondary	1,300 (3-hour)[a]	--	--
Florida	1,300 (3-hour)[a]	260[a]	60[b]

Notes:
[a]Not to be exceeded more than once per year.
[b]Arithmetic mean.
[c]Not to be exceeded an average of more than 1 day per year over a 3 year period.
[d]Not to be exceeded by the 3 year average of the 98th percentile of 24 hour concentrations.
[e]Not to be exceeded by the 3 year average of the annual arithmetic mean.
[f]Not to be exceeded by the 3 year average of 4th highest daily maximum 8 hour concentration.
[g] EPA's 1997 interim $PM_{2.5}$ implementation policy for New source Review (NSR) instructs that PM_{10} should be used as a surrogate for $PM_{2.5}$ until the EPA sets a final implementation rule for $PM_{2.5}$.

μg/m^3 -- micrograms per cubic meter (at 25° C and 760 mm Hg)

Table 2.3-24
Background Ambient Air Quality

Standard	Background Concentration[a] (μg/m³) 2007	Maximum	Year	Location	AIRS Site ID
CO				Orlando	120951005
8 hour	2.3	5.5[b]	1997		
1 hour	4.2	8.7[b]	1997		
Lead				Tampa	120571066
Calendar quarter	1.65	2.01[b]	2000		
Nitrogen Dioxide				Winter Park	120952002
Annual	0.0058	0.144[b]	2001		
PM_{10}				Orlando	120951004
Annual	20	23[b]	1999		
24 hour	56	56[b]	2007		
$PM_{2.5}$				Orlando	120951004
Annual	9	12[c]	2000		
24 hour	80	80[c]	2007		
Ozone				Kissimmee	120972002
8 hour	0.083	0.094[b]	1998		
1 hour	0.092	0.127[b]	1998		
SO_2				Winter Park	120952002
Annual	0.001	0.003[b]	2000		
24 hour	0.003	0.014[b]	2001		
3 hour	0.009	0.042[b]	2000		

Notes:
[a]Source: USEPA AIRS Data. Data is conservative and represents the 1st highest concentration. http://www.epa.gov/air/data/.
[b]Represents maximum reported values for the period 1997 – 2007.
[c]Represents maximum reported values for the period 1999 – 2007.

2.3.8 *Existing Acoustical Environment*

In order to characterize the existing acoustical environment surrounding the CIPP, an ambient sound level survey was conducted. This subsection describes the results of the survey and the nature of the existing acoustical environment surrounding the project site.

2.3.8.1 Acoustical Terminology. A variety of terms are used in the field of acoustics. In order to familiarize the reader with the terminology included in this report, this subsection briefly introduces general acoustical terminology and describes basic acoustical parameters.

Sound Energy. Sound is generated by the propagation of energy in the form of pressure waves. Being a wave phenomenon, sound is characterized by amplitude (sound level) and frequency (pitch). Sound amplitude is measured in decibels (dB). The decibel is the logarithmic ratio of a sound pressure to a reference sound pressure. Typically, 0 dB corresponds to the threshold of human hearing. A 3 dB change in a continuous broadband noise is generally considered "just barely perceptible" to the average listener. A 5 dB change is generally considered "clearly noticeable," and a 10 dB change is generally considered a doubling (or halving) of the apparent loudness. For reference, the sound pressure levels and subjective loudness associated with common noise sources are shown in Table 2.3-25.

Frequency is measured in hertz (Hz) (cycles per second). Most sound sources (except those with pure tones) contain sound energy over a wide range of frequencies. In order to analyze sound energy over the range of frequencies, the sound energy is typically divided into sections called octave bands. Octave bands are identified by their center frequencies including 31.5, 63, 125, 250, 500, 1,000, 2,000, 4,000, and 8,000 Hz. For more detailed analyses, narrow bands such as one-third octave band or one-twelfth octave bands are employed. The sum of the sound energy in all of the octave bands for a source represents the overall sound level of the source.

A person with normal hearing can hear frequencies ranging from 20 Hz to 20,000 Hz. At typical sound pressure levels, the human ear is more sensitive to sounds in the middle and high frequencies (1,000 to 8,000 Hz) than sounds in the low frequencies. Various weighting networks have been developed to simulate the frequency response of the human ear. The A-weighting network was developed to simulate the frequency response of the human ear to sounds at typical environmental levels. The A-weighting network emphasizes sounds in the middle to high frequencies and deemphasizes sounds in the low frequencies. Most sound level instruments can apply these weighting networks automatically. Any sound level to which the A-weighting network has been applied is expressed in A-weighted decibels, (dBA).

Table 2.3-25
Typical Sound Pressure Levels Associated with Some Common Noise Sources

Sound Pressure Level (dBA)	Subjective Evaluation	Common Noise Source and/or Environment	
		Outdoor	Indoor
140	Deafening	Jet aircraft at 75 feet	
130	Threshold of Pain	Jet aircraft during takeoff at a distance of 300 feet	
120	Threshold of Feeling	Elevated train	Hard rock band
110	Extremely Loud	Jet flyover at 1,000 feet	Inside propeller plane
100	Very Loud	Power mower, motorcycle at 25 feet, auto horn at 10 feet	
90	Very Loud	Propeller plane flyover at 1,000 feet, noisy urban street	Full symphony or band, food blender, noisy factory
80	Moderately Loud	Diesel truck (40 mph) at 50 feet	Inside auto at high speed, garbage disposal, dishwasher
70	Loud	B-757 cabin during flight	Close conversation, vacuum cleaner, electric typewriter
60	Moderate	Air-conditioner condenser at 15 feet, near highway traffic	General office
50	Quiet		Private office
40	Quiet	Farm field with light breeze, birdcalls	Soft stereo music in residence
30	Very Quiet	Quiet residential neighborhood	Bedroom, average residence (without TV and stereo)
20	Very Quiet	Rustling leaves	Quiet theater, whisper
10	Just Audible		Human breathing
0	Threshold of Hearing		

Environmental Noise Metrics. Noise in the environment is constantly fluctuating, such as when a car drives by, a dog barks, or a plane passes overhead. Several noise metrics have been developed to quantify fluctuating noise levels. These metrics include the equivalent-continuous sound level and the exceedance sound levels.

The equivalent-continuous sound level, Leq, is the level of a hypothetical steady sound that has the equivalent sound energy as the actual fluctuating sound over a given time duration. For example, Leq (1h) is the equivalent-continuous sound level measured over a 1 hour period and provides an indication of the average (mean) sound energy over the 1 hour period.

The exceedance sound level, Lx, is the sound level exceeded "x" percent of the sampling period and is referred to as a statistical sound level. The most common Lx values are L90, L50, and L10. L90 is the sound level exceeded 90 percent of the sampling period. L90 is referred to as the residual sound level because it measures the background sound level without the influence of loud, transient noise sources. L50 is the sound level exceeded 50 percent of the sampling period or the median sound level. L10 is the sound level exceeded 10 percent of the sampling period. L10 is often referred to as the intrusive sound level because it measures the occasional louder noises. Typical background (residual) sound levels in various types of communities are outlined in Table 2.3-26 for reference. However, it is important to remember that each community is unique with regard to the sources of noise that contribute to the background sound levels.

The variation between the L90, L50, and L10 sound levels can provide an indication of the variability and distribution of the noise environment. If the noise environment were perfectly steady, all values would be identical. A large variation between the values would indicate a large range of sound levels within the environment. For instance, measurements near a roadway with frequent (but not constant) passing vehicles would cause a large variation in the statistical sound levels.

Human Response to Sound. Human response to sound is highly individualized. Annoyance is the most common issue regarding community noise. The percentage of people claiming to be annoyed by noise will generally increase as environmental sound levels increase. However, many other factors will also influence people's response to noise. These factors can include the character of the noise, the variability of the sound level, the presence of tones or impulses, and the time of day of the occurrence. Additionally, nonacoustical factors, such as the person's opinion of the noise source, the ability to adapt to the noise, the attitude towards the noise and those associated with it, and the predictability of the noise can also influence people's response.

Table 2.3.26
Typical Daytime Residual (Background) Sound Levels
in Various Types of Communities

Type of Community	Typical Daytime Residual (Background) Sound Pressure Level
Very Quiet Rural Areas	31 to 35 dBA
Quiet Suburban Residential	36 to 40 dBA
Normal Suburban Residential	41 to 45 dBA
Urban Residential	46 to 50 dBA
Noisy Urban Residential	51 to 55 dBA
Very Noisy Urban Residential	56 to 60 dBA
Adjacent Freeway or Major Airport	>> 60 dBA

2.3.8.2 General Community Noise. The environment around the CIPP site is characterized as a predominantly rural area with major traffic arterials. Noise sensitive areas within the vicinity include residential areas located south of the CIPP property along Old Tampa Highway and southeast along Wooten Road. The primary sources of noise include traffic on South Orange Blossom Trail (Highway 17) and Old Tampa Highway. Other primary sources of noise include natural sounds such as insects, birds, and dogs. Secondary noise sources include occasional aircraft and rail traffic. Significant noise sources located approximately 2 miles southeast of the CIPP site include light industrial noise from the Pepsi/Gatorade plant and semi-truck related noise from the various industrial parks.

2.3.8.3 Survey Procedure and Conditions. An ambient sound level survey was conducted on February 4 and 5, 2008, to characterize the existing acoustical environment at nearby noise sensitive receptors. The ambient sound level survey procedure was based on general industry test standards including American National Standards Institute (ANSI) S12.9, ANSI S12.18, and ANSI S1.13. The sound level survey was conducted at three locations surrounding the project site. These locations were selected to capture acoustical environments representative of the nearby noise-sensitive receptors (i.e., residences). Each measurement location is identified on Figure 2.3-23.

Weather conditions during the February 4 and 5, 2008, survey were favorable for sound level measurements. Temperatures ranged from approximately 60° F to 87° F, and the relative humidity ranged from approximately 47 to 97 percent. Winds were calm ranging from 0 to 6 mph, and skies were mostly clear.

Figure 2.3-23
Noise Measurement Locations NML1, NML2, and NML3

All sound level measurements were conducted using Type 1 or Type 2 sound level meters that met the requirements of ANSI S1.4. The sound level meters had integrating capabilities to determine the average and statistical sound levels over the measurement duration. The microphones were equipped with windscreens provided by the manufacturer. The equipment used for the survey is listed in Table 2.3-27. Calibration certificates are kept on file, and copies can be made available upon request.

Table 2.3-27
Noise Survey Test Equipment

Model	Serial Number	Last Calibration Date
Rion Model NA-27	01191119	8/10/2007
Rion Type UC-53A Microphone	99858	8/10/2007
Norsonic Type 1251 Acoustic Calibrator	25762	8/10/2007
Rion Model NL-22	00362605	8/10/2007
Rion Model NL-22	01110133	8/10/2007
Rion Model NL-22	01110135	8/10/2007
Rion Model NC-73 Acoustic Calibrator	10527795	8/10/2007

Existing Facility Operation. Simultaneous operation of the existing CIPP Units 1, 2, and 3 are typically limited to peak summer periods. Additionally, CIPP Unit 2 operation depends upon the operation of other facilities in the power pool. From 2003 through 2006, Units 1, 2, and 3 were in operation for an average of 2 percent, 22 percent, and 58 percent of the year, respectively. Only CIPP Unit 3 was operating at the time of the ambient noise survey, which is typical of the operating characteristics. However, Unit 3 was not audible at any period during the ambient sound level survey. Figure 2.3-24 shows a summary of the load trend data for the existing CIPP Unit 3 in operation during the survey period.

Continuous Monitoring. Continuous noise monitoring was conducted at locations NML1, NML2, and NML3 to capture typical ambient daytime and nighttime sound levels. Several sound level metrics were used to quantify the fluctuating noise levels. The measurements included the Leq, L1, L10, L50, and L90 sound pressure levels, which provided an indication of the daily trends in the ambient sound level.

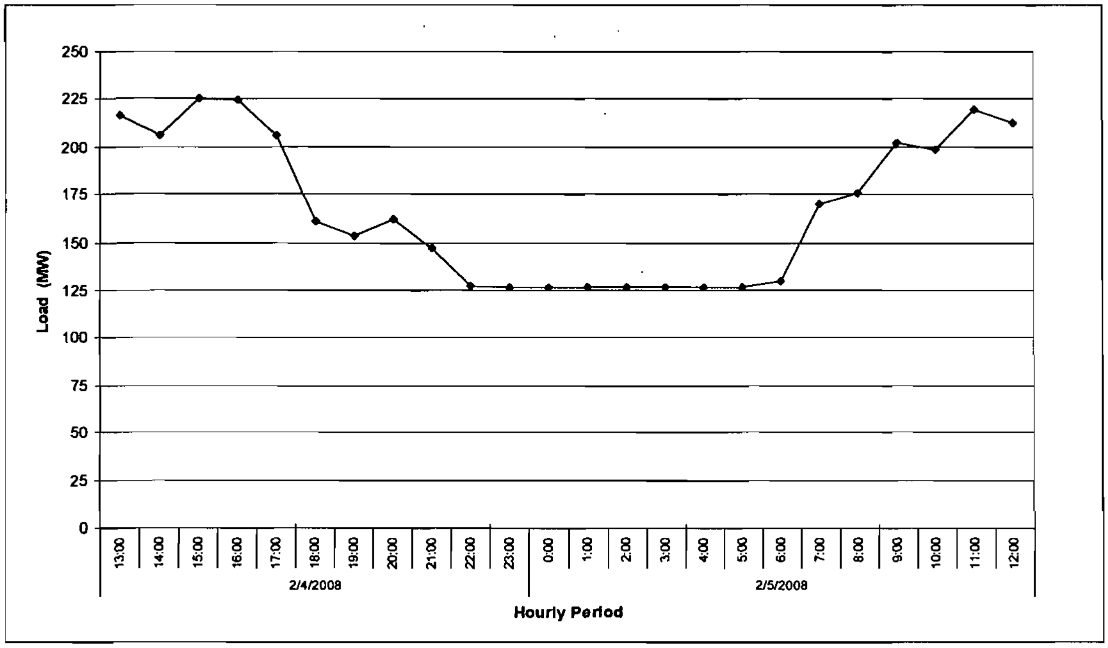


Figure 2.3-24
CIPP Unit 3 Load Trend Data During Ambient Survey

The continuous noise monitoring results are summarized in Table 2.3-28 as the range of hourly L90 sound levels and on Figure 2.3-24. As previously discussed, the L90 sound level is generally considered representative of the residual or background sound level (e.g., absent of discrete noise events such as occasional traffic, aircraft, dogs, etc.).

The continuous monitoring results indicated that the quietest times of the day occur during very early morning hours when predominant noise sources are at a minimum (e.g., traffic), as expected. At the three monitoring locations, the average hourly background sound levels (L90) ranged from 33 dBA to 54 dBA. Each location was primarily influenced by traffic noise and insect noise. As would be expected, sound levels increased during daytime hours and decreased during nighttime hours.

Location 1 (NML1). NML1 is representative of the residential properties located along South Orange Blossom Trail and provides an indication of traffic-related noise experienced at these residences. As shown on Figure 2.3-24, the quietest background periods occurred during the early morning hours from 12:53 a.m. to 2:53 a.m. The acoustical environment at this location is primarily influenced by traffic on South Orange Blossom Trail and natural sounds (e.g., insects). The existing CIPP units were not audible at this location. Traffic-related noise is represented on Figure 2.3-24 as the periods of elevated *background* sound levels (L90) centered at typical rush hour periods around 5:00 p.m. and 6:00 a.m. It should be noted that South Orange Blossom Trail includes heavy commercial truck traffic. The existing CIPP units were not audible at this location.

Table 2.3-28
Summary of Continuous Monitoring Results

Location	Range of Hourly L_{90} Background Sound Levels, dBA	
	Daytime[a]	Nightime[b]
NML1	49 - 54	35 - 54
NML2	37 - 42	33 - 43
NML3	36 - 43	33 - 41

Notes:
Daytime : 7:00 a.m. to Sunset (7:00 p.m.) per the Osceola Code of Ordinances
Nighttime: One minute after Sunset (7:01 p.m.) to 6:59 a.m. per the Osceola Code of Ordinances

Location 2 (NML2). NML2 is representative of the nearest residences located south of the CIPP site along Old Tampa Highway. As shown on Figure 2.3-25, the quietest background periods occurred from 1:13 a.m. to 3:12 a.m. This location was primarily influenced by noise from traffic on South Orange Blossom Trail, occasional traffic on Old Tampa Highway, and natural sounds (e.g., insects, dogs). The existing CIPP units were not audible at this location. Traffic noise influence at this location was less than NML1 and, as a result, the *background* sound levels (L90) shown on Figure 2.3-25 fluctuate less at the typical rush hour periods.

Location 3 (NML3). NML3 is representative of the nearest residences located south of the project site along Montzen Road. As shown on Figure 2.3-25, the quietest background periods occurred between 12:30 a.m. and 3:30 a.m. This location was primarily influenced by traffic on the South Orange Blossom Trail, occasional traffic along Old Tampa Highway, and insects. The existing CIPP units were not audible at this location. The small variation between the L90, L50, and L10 sound levels seen on Figure 2.3-26 suggest that the noise environment is fairly steady and the traffic-related noise influence is minimal, as compared to NML1. The acoustical environment at NML 3 is similar to that at NML2.

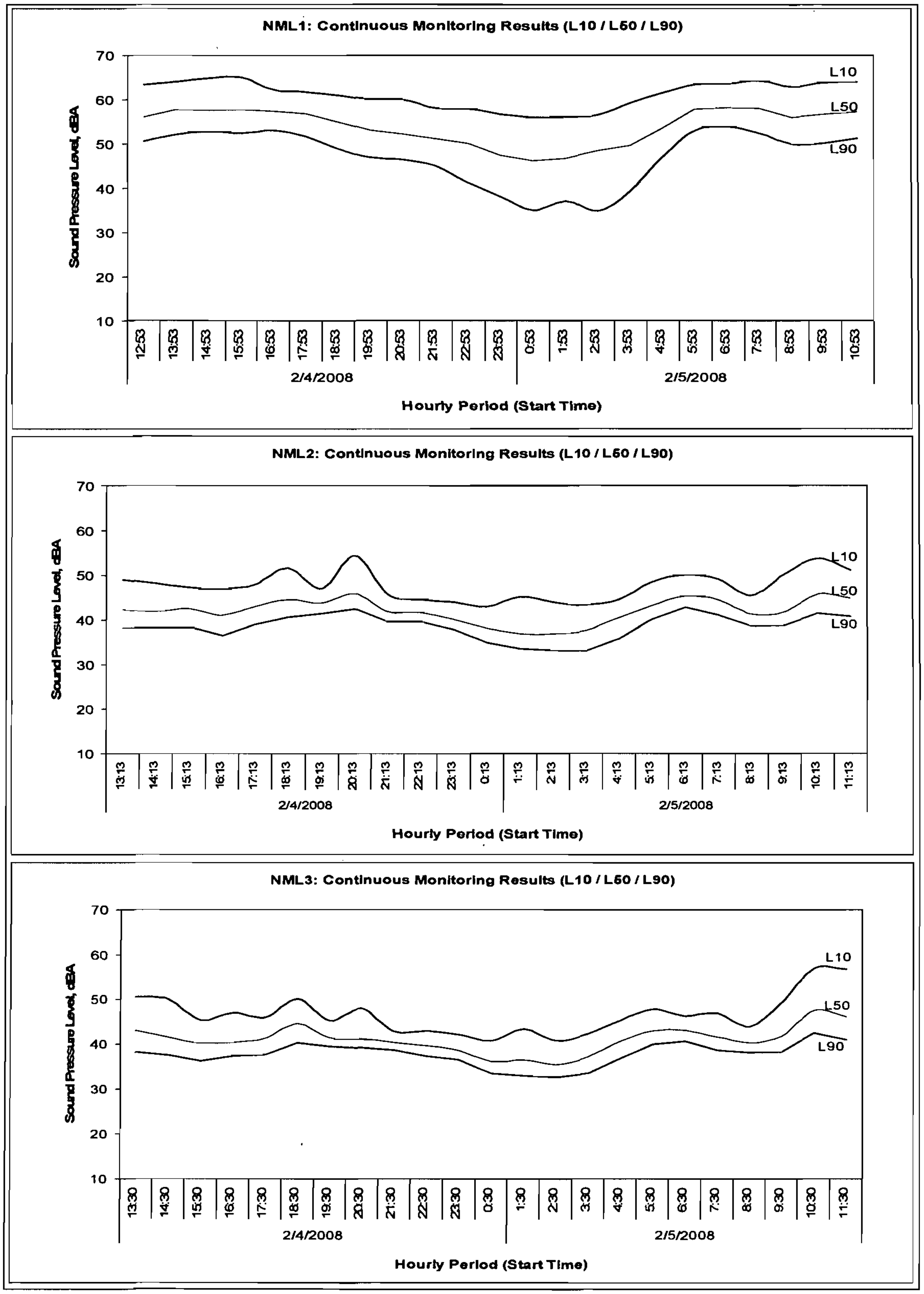


Figure 2.3-25
Results of Continuous Noise Monitoring

Short-Term Measurements. In addition to the continuous monitoring, manned, short-term noise measurements were conducted at each of the three monitoring locations. The short-term measurements were conducted to supplement the monitoring results and provide additional information. Specifically, these measurements helped to qualify the surrounding noise sources and provide an indication of the spectral content of the existing acoustical environment. Each measurement period lasted 20 minutes in order to capture sound levels representative of each location during different time periods throughout the day.

The short-term measurement results for each location are listed in Table 2.3-29 and are detailed on Figures 2.3-26 through 2.3-28. The results listed in Table 2.3-29 are consistent with the continuous monitoring results previously discussed. The figures show the background (L90) octave band sound pressure levels for each location at varying times throughout the day.

2.3.9 Other Environmental Features

Ultimate CIPP development was delineated during the permitting of Units 1 and 2; mitigation was provided for the access road and natural gas pipeline corridor, ultimate power block area, and Clay Street transmission lines impacts. As a result, development areas have been restricted to approximately 167 acres of the total 1,027 CIPP acres. The remaining 860 acres have been granted to the SFWMD and FGFWFC (now FFWCC) as conservation easements, which are actively managed by KUA for the benefit of wildlife. In addition, the CIPP habitats were identified as a "regionally significant resource" by the SFWMD. KUA is committed to preserving, monitoring, and managing these habitats to provide an environmentally safe and responsible project.

Table 2.3-29
Short-Term Measurement Results

Location	Time	Duration (min)	Measured Sound Levels, dBA			Audible Sources
			L_{90}	L_{50}	L_{10}	
NML1	2:22 p.m.	20	54	60	66	Traffic on S. Orange Blossom Trail (approx. 1,000 cars/hr), idling semi
	8:12 p.m.	20	48	55	61	Traffic on S. Orange Blossom Trail (approx. 400 cars/hr), insects, aircraft
	2:30 a.m.	20	41	50	57	Traffic on S. Orange Blossom Trail (approx. 120 cars/hr) *mostly heavy truck traffic*, insects
NML2	1:58 p.m.	20	40	43	48	Traffic, aircraft, insects, CIPP gate operation, T-line crackle
	8:38 p.m.	20	45	46	49	Traffic, Insects, T-line crackle (faint), CIPP gate operation, aircraft, dogs barking
	2:56 a.m.	20	34	38	44	Traffic, Insects, T-line crackle
NML3	1:32 p.m.	20	39	44	50	Traffic, Birds, Aircraft, Train (x2), Train crossing warning
	9:06 p.m.	20	41	43	55	Train (65 dBA max), traffic, dogs barking, aircraft
	3:21 a.m.	20	33	36	42	Traffic, insects, dogs barking, rooster crowing

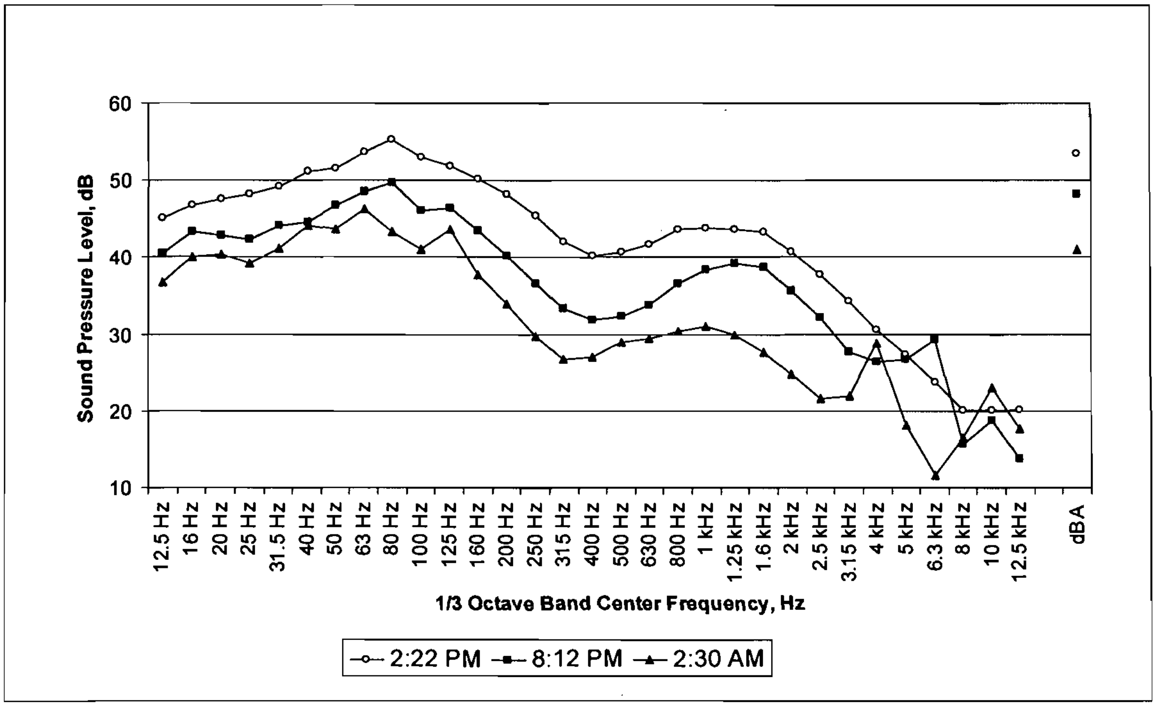


Figure 2.3-26
NML1: Measured Background One-Third Octave Band Sound Pressure Levels

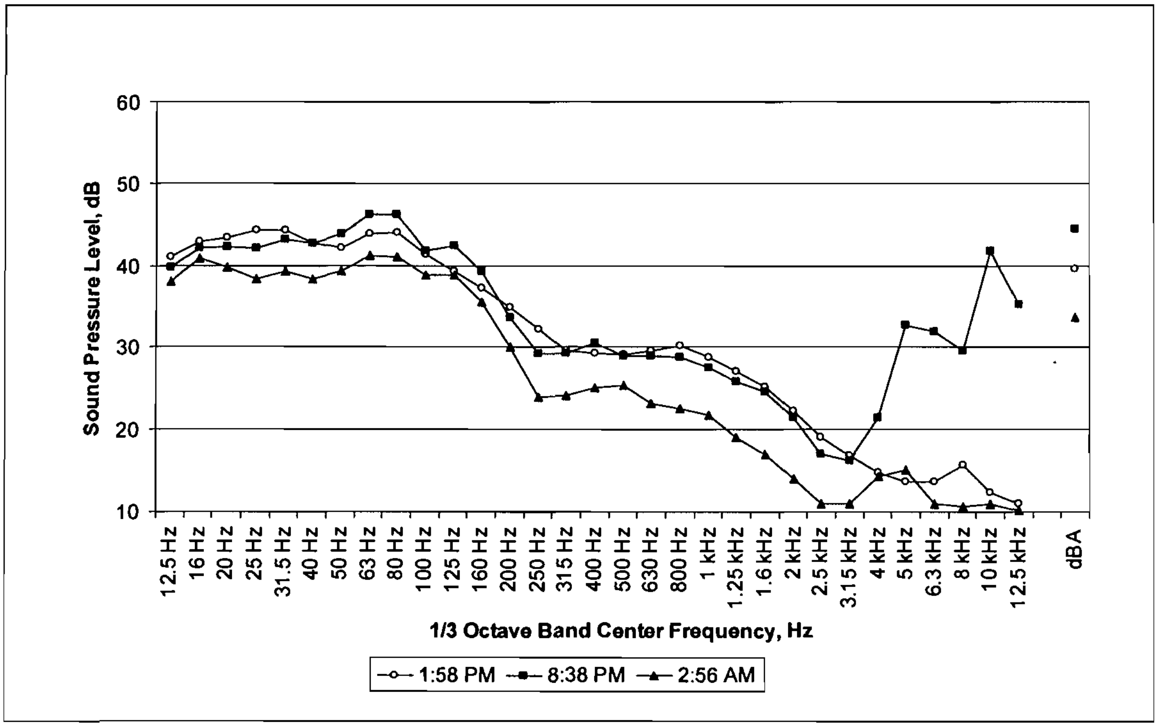


Figure 2.3-27
NML2: Measured Background One-Third Octave Band Sound Pressure Levels

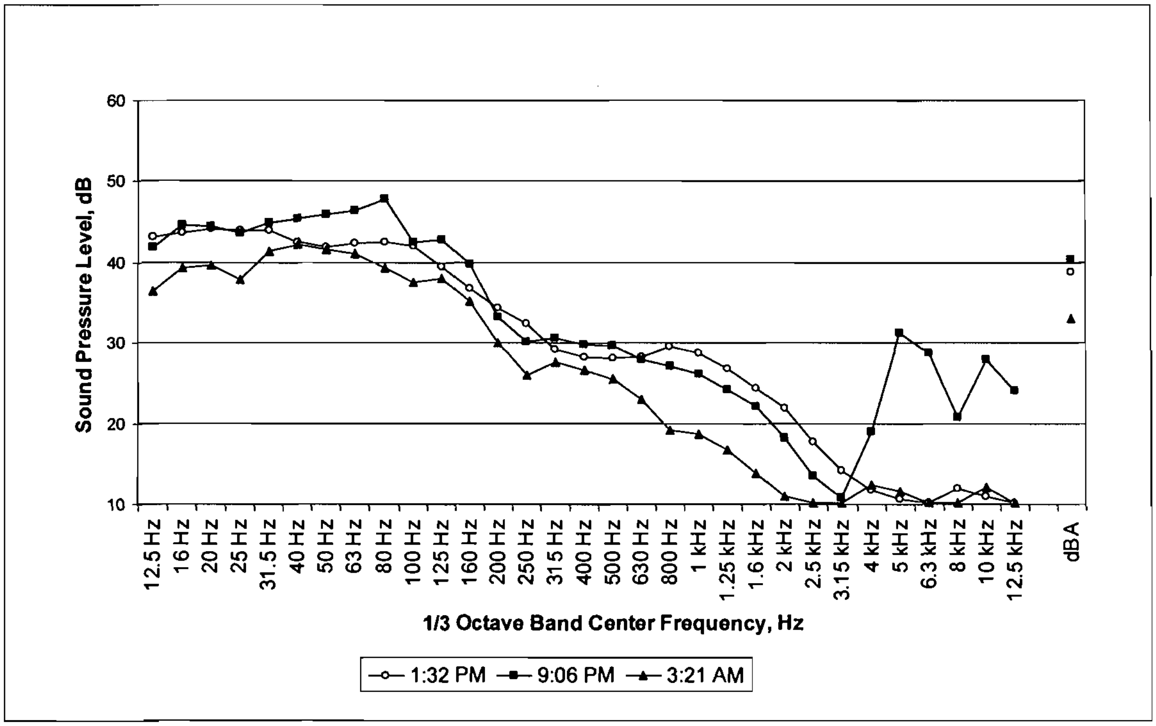


Figure 2.3-28
NML3: Measured Background One-Third Octave Band Sound Pressure Levels

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3.0 The Plant and Directly Associated Facilities

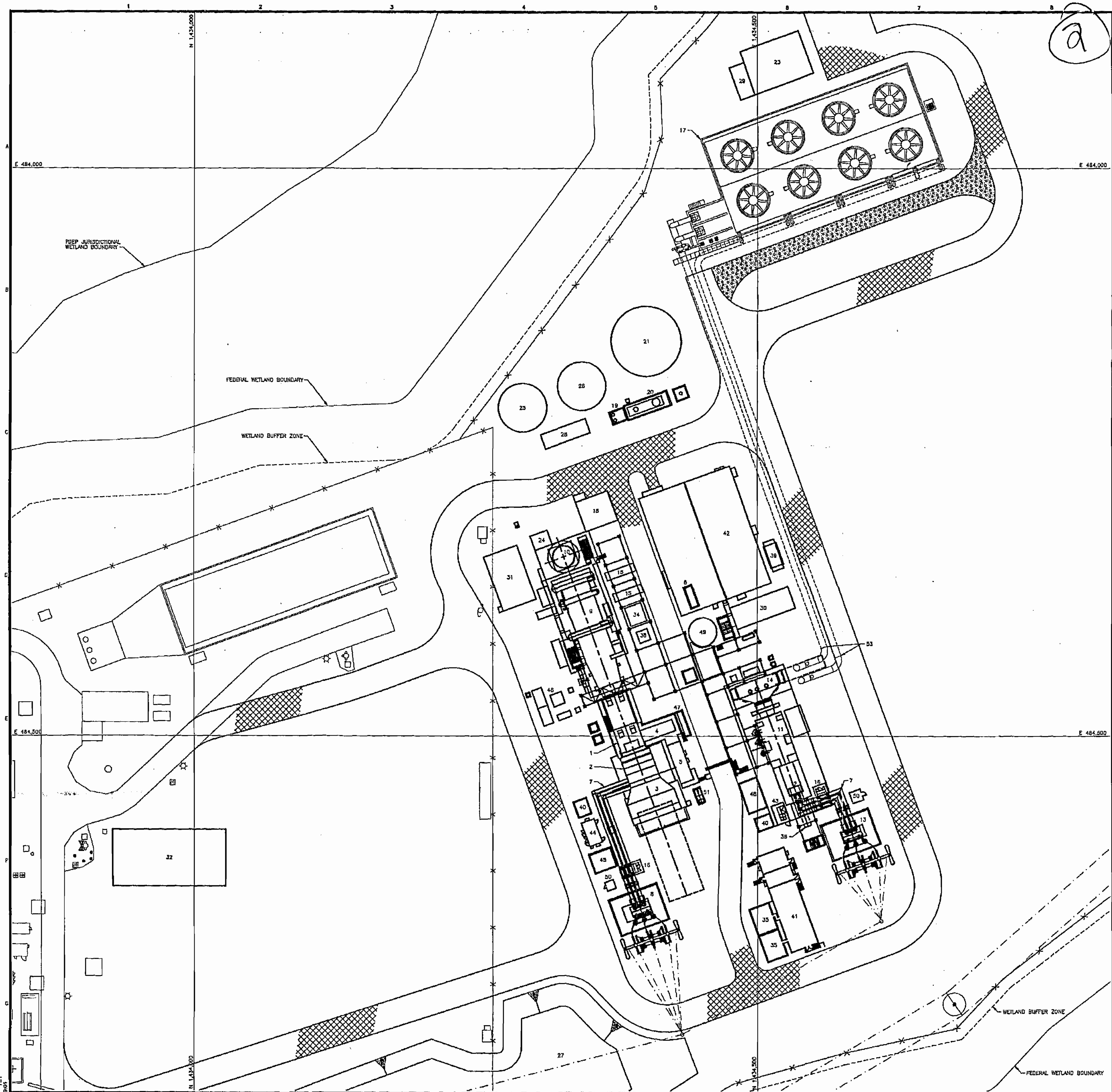
3.1 General Plant Description

The CIPP currently includes three existing units (Units 1, 2, and 3) and support facilities as shown on the site plan (Figure 2.1-3). The proposed location and detailed arrangement of Unit 4 is shown on Figure 3.1-1.

CIPP Unit 4 (Unit 4) will be a one-on-one F-class combined cycle unit with a nominal rating of 300 MW at average temperature conditions. Unit 4 will include a natural gas fueled CTG, HRSG, STG, a condenser cooled by a mechanical draft cooling tower, and associated facilities typical for a combined cycle unit. Table 3.1-1 presents the conceptual site design conditions for the CIPP site.

Table 3.1-1
Conceptual Design Conditions for the CIPP Site

Condition	Value or Range	Reference
Maximum Temperature Coincident Relative Humidity	102° F 33%	National Climatic Data Center
Minimum Temperature Coincident Relative Humidity	19° F 58%	National Climatic Data Center
Average Temperature Coincident Relative Humidity	73° F 80%	National Climatic Data Center
Wind Loading	Basic Wind Speed: 110 mph, Windborne Debris Region, Importance Factor (Iw): 1.15, Exposure C	ASCE 7-05
Seismic Zone	Seismic Use Group/Seismic Design Category III A, Site Classification (stiff soil): D,S_{ds}=0.089g, S_{d1}=0.056g	Florida Building Code does not consider seismic loads for building codes. Seismic design criteria in accordance with ASCE 7-98.
Site Elevation	Average 82.0 feet above msl	Site Arrangement Drawing
Location	Outdoors, Corrosive Environment	Site Arrangement Drawing



FACILITIES LEGEND

ID	FACILITY
1	COMBUSTION TURBINE
2	COMBUSTION TURBINE GENERATOR
3	COMBUSTION TURBINE INLET AIR FILTER
4	COMBUSTION TURBINE ACCESSORY MODULE
5	COMBUSTION TURBINE ELECTRICAL PACKAGE
6	COMBUSTION TURBINE WASH WATER SKID
7	ISOLATED PHASE BUS DUCT
8	CT GENERATOR STEPUP TRANSFORMER
9	HEAT RECOVERY STEAM GENERATOR
10	HEAT RECOVERY STEAM GENERATOR EXHAUST STACK
11	STEAM TURBINE
12	STEAM TURBINE GENERATOR
13	STEAM TURBINE GENERATOR STEPUP TRANSFORMER
14	CONDENSER
15	BOILER FEED PUMPS
16	GENERATOR BREAKER
17	COOLING TOWER
18	CO2, HYDROGEN, & NITROGEN STORAGE
19	WASTEWATER COLLECTION SUMP
20	OIL/WATER SEPARATOR
21	DEMINERALIZED WATER TANK
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24	CEMS ENCLOSURE
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42	MISCELLANEOUS SERVICES BUILDING
43	STATIC EXCITATION ENCLOSURE
44	LOAD COMMUTATED INVERTER (LCI)
45	ISOLATION TRANSFORMER
46	FUEL GAS CONDITIONING EQUIPMENT
47	ACCESSORY MODULE CONTAINMENT TRENCH AND VAULT
48	STEAM TURBINE LUBE OIL SKID AREA
49	CONDENSATE STORAGE TANK
50	DELUGE HOUSE
51	CO2 FIRE PROTECTION SKID
53	CIRCULATING WATER PIPE

LEGEND

- WETLAND BUFFER ZONE
- OVERHEAD TRANSMISSION LINE
- FDEP JURISDICTIONAL WETLAND BOUNDARY
- FENCE LINE
- GOPHER TORTOISE HABITAT

NOTES

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SCALE: 1" = 30'

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SIGNED ____ DATE ____ REG NO. ____

BLACK & VEATCH CORPORATION

ENGINEER — DRAWN MRR — CHECKED — DATE 04/01/2008

FLORIDA MUNICIPAL POWER AGENCY
CANE ISLAND POWER PARK UNIT 4

UNIT 4 SITE ARRANGEMENT

PROJECT DRAWING NUMBER 147651-4STA-S1001 REV 0

FIGURE 3.1-1

3.1.1 Mode of Operation

Unit 4 will be designed, subject to FDEP PSD permit approval, for unlimited operation on natural gas and LNG, including an unlimited number of starts annually. The new unit will be designed for cycling load operation. The STG will be selected in combination with the HRSG to provide a reasonable design throttle pressure to ensure satisfactory cycling operation. The HRSG will be designed with duct burners for peaking power operation. The CTG will have an evaporative cooler to increase warm weather power generation by increasing the CTG inlet air density. Power augmentation systems for the CTG are not included. Unit 4 will be designed to allow CTG operation with the STG out of service by providing a means for the steam from the HRSG to bypass the steam turbine and flow directly to the condenser.

3.1.2 Combustion Turbine Generator

The CTG will be a General Electric PG7241FA enhanced CTG. The CTG will have enclosures for installation outdoors and will include the following major features:

- Dry low NO_x combustion system.
- Direct connected generator with static excitation.
- Acoustic enclosure for turbine.
- Inlet air filter system with silencers and evaporative coolers.
- Lube oil systems.
- Static starting system.
- Fire detection/carbon dioxide fire protection systems.
- Mark VIe control system with remote work station.
- Off-line/on-line water wash system.
- Package electrical and electronics control compartment.

3.1.3 Heat Recovery Steam Generator

The HRSG will be installed outdoors and will convert waste heat from the combustion turbine exhaust to steam for use in driving the STG. The HRSG will be a natural circulation, three-pressure, reheat unit with supplemental duct firing to maximize unit output. Cycle operating pressure will be a nominal 2,100 pounds per square inch, gauge (psig). SCR for NO_x control is included within the HRSG. The HRSG will discharge to a metal exhaust stack. A stack damper will be included to minimize heat loss during shutdowns. Two 100 percent capacity condensate pumps and boiler feedwater pumps will be included. The design includes natural gas and LNG heating, utilizing HRSG intermediate-pressure feedwater as the heating source during normal operation and an electric heater for startup.

3.1.4 Steam Turbine Generator

The steam turbine will be a tandem-compound, single reheat, condensing turbine operating at 3,600 rpm. The steam turbine will have one high-pressure section with a nominal 2,100 psig throttle pressure, one intermediate-pressure section, and one low-pressure section. Turbine suppliers' standard auxiliary equipment; lubricating oil system; hydraulic oil system; and supervisory, monitoring, and control systems will be utilized. A surface condenser will be provided for condensing steam from the turbine exhaust and will utilize a recirculating cooling tower system for cooling. The condenser will be designed for full steam flow bypass around the steam turbine. A blanking plate will be provided to allow isolation of the steam turbine from the condenser, to allow operation of the combustion turbine during an extended steam turbine outage. A single synchronous generator will be direct coupled to the steam turbine. Generator suppliers' standard auxiliary equipment; supervisory, monitoring, and control systems; and static excitation system will be utilized. The steam turbine will be provided with enclosures as required for outdoor installation.

3.1.5 Cooling Tower

A multiple cell, mechanical draft, counterflow cooling tower will be used for plant cooling. The cooling tower will be of fiberglass construction and installed on a reinforced concrete basin that will include a pump intake structure housing two 50 percent capacity circulating water pumps and one 100 percent capacity auxiliary cooling water pump. A circulating water chemical feed system will be included. Makeup water to the cooling tower will be treated sewage plant effluent (reuse water) provided by Toho regional pipeline. Ground water will be requested as an emergency source of cooling tower makeup. The cooling tower will be equipped with drift eliminators with a design drift rate of 0.0005 percent. The Unit 4 cooling tower will be approximately 1,500 feet from the nearest CIPP property line.

A new (second) reuse supply pipeline from Toho to the CIPP may be required if the existing pipeline is inadequate to supply all units. Detailed design and supply information from Toho will determine the need for this second pipeline.

3.1.6 Control System

The unit will be designed for control through a plant distributed control and information system (DCIS). Mark VIe control systems for control of the CTG and STG will also be included. The DCIS control screens will be located in the existing main plant control room.

3.1.7 Transmission Interconnection

Unit 4 will be interconnected to the existing CIPP substation. The CIPP substation is connected to the KUA, Orlando Utilities Commission (OUC), Tampa Electric Company, and Progress Energy 230 kV transmission systems through four existing transmission lines. The CTG and STG will each connect to separate 18 kV/ 230 kV generator step-up transformers. The CTG and the STG will each have generator breakers. Auxiliary power will be provided by auxiliary transformers connected to each generator's 18 kV isolated phase bus duct. A new 230 kV breaker and one-half bay will be constructed in the CIPP substation to interconnect, via a collector bus, the combustion turbine and steam turbine to the substation. The existing transmission lines in the proposed Unit 4 location will be rerouted in the power block area to accommodate the new unit

3.2 Site Layout

The site plan depicts the proposed Unit 4, construction laydown/parking for Unit 4, and the existing Units 1, 2, and 3 (Figure 2.1-3). Figure 3.1-1 depicts the proposed arrangement of Unit 4. The site profile, shown on Figure 3.2-1, is based on preliminary elevations and dimensions and may change during detailed design and equipment selection. Figures 3.2-2 and 3.2-3 present computer generated renderings of the entire Unit 4 imposed on a photograph of the existing CIPP facility. Figure 3.2-4 depicts the proposed locations and elevations for the Unit 4 gaseous and liquid release points.

The site is an existing, certified site that has been cleared for construction and operation of the existing three units. FMPA proposes to clear and develop an additional 24 acres onsite, including a new wastewater percolation basin and construction laydown/parking for Unit 4.

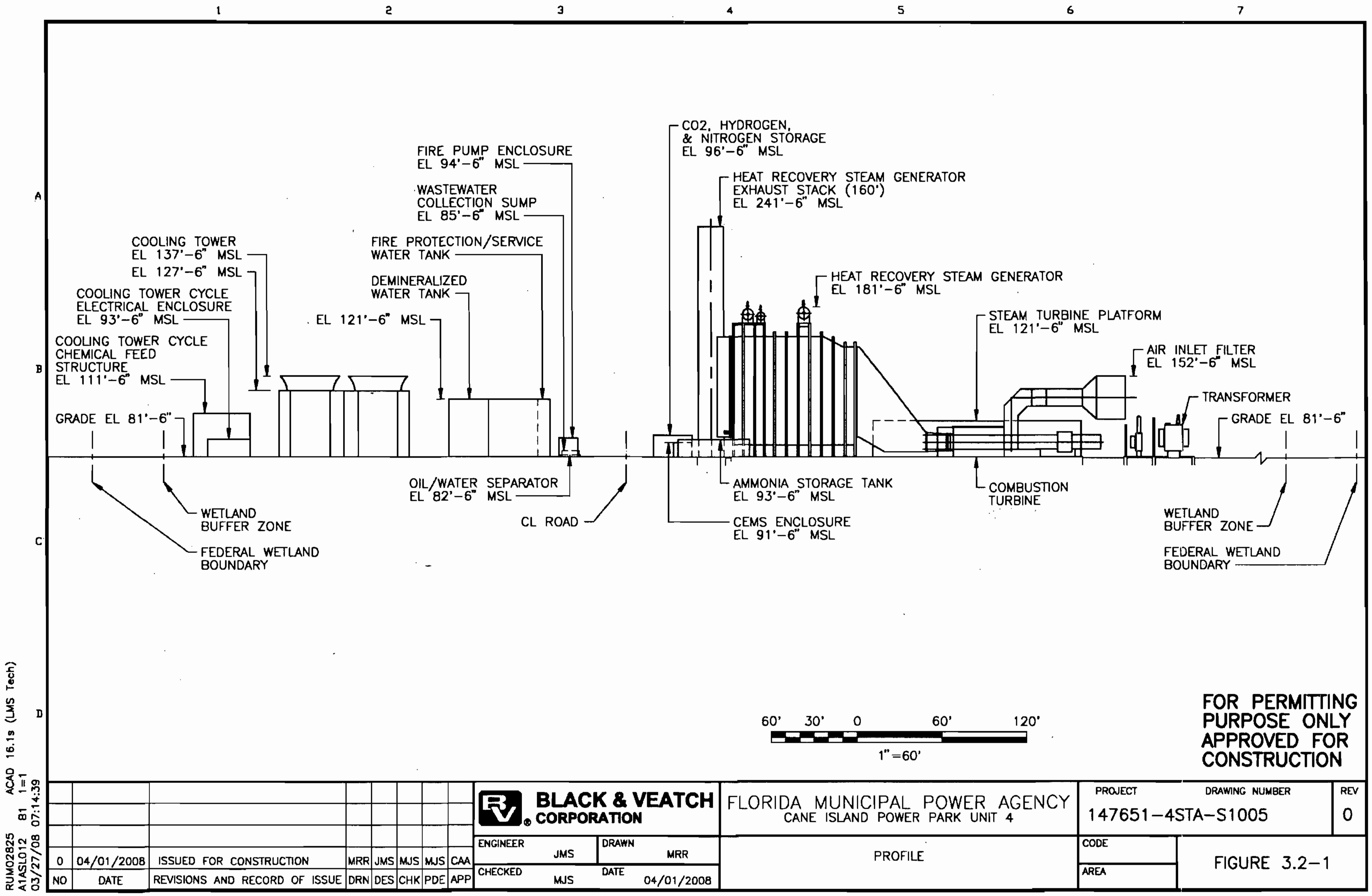
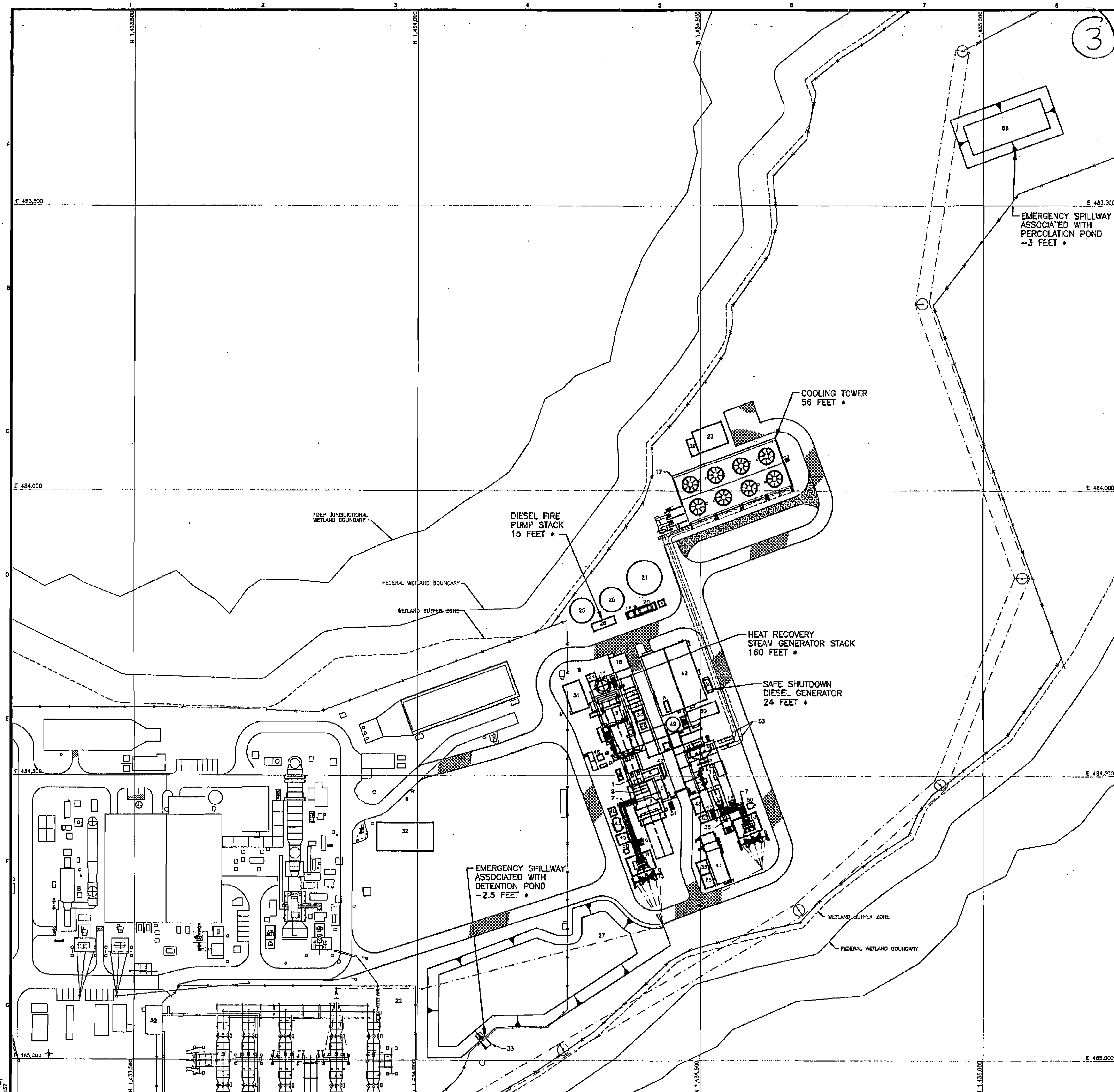


Figure 3.2-1
Unit 4 Site Profile

Figure 3.2-2
Computer Generated Rendering of the CIPP Four-Unit Facility

Figure 3.2-3
Computer Generated Rendering of CIPP Unit 4



FACILITIES LEGEND

ID	FACILITY
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25	FIRE PROTECTION/SERVICE WATER TANK
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30	CLOSED CYCLE COOLING WATER PUMPS/HEAT EXCHANGER
31	AMMONIA STORAGE TANK
32	GAS METERING & AIR PRESSURE REGULATION STATION
33	DETENTION POND DISCHARGE
34	HRSG BLOWDOWN TANK
35	UNIT AUXILIARY TRANSFORMER
36	STEAM TURBINE GENERATOR ROTOR REMOVAL
37	EMERGENCY MAKE-UP WELL
38	BLOWDOWN TANK SUMP & PUMPS
39	SAFE SHUTDOWN DIESEL GENERATOR
40	EXCITATION TRANSFORMER
41	POWER DISTRIBUTION CENTER
42	MISCELLANEOUS SERVICES BUILDING
43	STATIC EXCITATION ENCLOSURE
44	LOAD COMMUTATED INVERTER (LCI)
45	ISOLATION TRANSFORMER
46	FUEL GAS CONDITIONING EQUIPMENT
47	ACCESSORY MODULE CONTAINMENT TRENCH AND VAULT
48	STEAM TURBINE LUBE OIL SKID AREA
49	CONDENSATE STORAGE TANK
50	DELUGE HOUSE
51	CO2 FIRE PROTECTION SKID
52	SWITCHYARD CONTROL BUILDING (EXISTING)
53	CIRCULATING WATER PIPE
55	PERC POND

LEGEND

WETLAND BUFFER ZONE — OVERHEAD TRANSMISSION LINE

FDEP JURISDICTIONAL WETLAND BOUNDARY — FENCE LINE

* INDICATES ELEVATION REFERENCE ABOVE OR BELOW POWER BLOCK ELEVATION OF 81.50 FT.

NOTES

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BLACK & VEATCH CORPORATION

DRAWN MRR DATE 04/01/2008

FLORIDA MUNICIPAL POWER AGENCY
CANE ISLAND POWER PARK UNIT 4

UNIT 4 RELEASE POINTS FOR LIQUID AND GASEOUS POINTS

PROJECT / DRAWING NUMBER: 147651-4STA-S1004 REV 0

FIGURE 3.2-4

3.3 Fuel

3.3.1 Fuel Types and Qualities

The primary fuel for Unit 4 will be natural gas from existing Florida Gas Transmission Company (FGT) and Gulfstream Natural Gas System L.L.C (Gulfstream) pipelines. These pipelines may also include vaporized LNG, which is similar to natural gas except that it has been refrigerated to minus 259° F. At this temperature, natural gas becomes a clear, colorless, and odorless liquid. LNG occupies only a fraction of its gaseous volume and can be transported economically between regions in special tankers. Table 3.3-1 presents typical natural gas properties.

Table 3.3-1
Natural Gas Properties

Parameter	Mole, %
C 6 +	0.054
Propane	0.506
I-Butane	0.110
N-Butane	0.100
I-Pentane	0.036
N-Pentane	0.022
Nitrogen	0.356
Methane	95.513
CO_2	0.853
Ethane	2.450
Totals	100.0

Note: Heating Value, Btu/cubic foot (HHV) is 1,037.

3.3.2 Fuel Quantities

Hourly fuel consumption rates will depend on plant load, ambient conditions, and whether supplemental firing is being used. Table 3.3-2 provides indicative estimates of average fuel consumption rates.

Table 3.3-2
Indicative Hourly Fuel Consumption Rates

Description of Operating Mode	Million MBtu/h
Average ambient, natural gas fuel, supplemental firing off, full load.	1,743
Average ambient, natural gas fuel, supplemental firing on, full load.	2,308

MBtu = Million British thermal units per hour.

3.3.3 Fuel Transportation, Delivery, and Metering

Natural gas will be delivered to the site by existing pipelines from FGT and Gulfstream and will be regulated, metered, and conditioned onsite. The gas supply pipelines are of adequate size. An existing onsite stub-up for Unit 4 is present to the north of Unit 3. The natural gas conditioning equipment includes a fuel gas scrubber, coalescing gas filters, and a performance fuel gas heater.

3.3.4 Alternate Fuel Types

FMPA has determined that combustion turbines firing natural gas will be the most efficient technology for power generation at the CIPP. Natural gas does not require delivery vehicles, storage facilities, secondary containment structures, or large dedicated acreages. Natural gas is also the cleanest burning fossil fuel available and its use results in minimal air quality impacts. Incremental additions of natural gas fired combustion turbine capacity are also more flexible than additions of oil or coal fired capacity. The CIPP is not suitable to accommodate coal fired generating units with coal storage and handling systems.

3.4 Air Emissions and Control

Unit 4 will be considered a major source by the FDEP. Subject to regulatory approval, emission control for NO_x will be by use of combustion turbine dry low NO_x burners and SCR when firing natural gas (no other fuels are proposed for this unit). Control of other pollutants will be by good combustion control and use of natural gas. The anticipated air emissions and proposed control technologies are fully described and presented in Volume 3, the PSD Application, which is included with this SCA under separate cover.

3.4.1 Air Emissions Types and Sources

Air pollutants will be emitted from the combustion turbine/HRSG when firing natural gas (no other fuels are proposed for this unit). Air emissions result from either the combustion process or impurities in the fuel. Fuel combustion generally results in the emissions of NO_x, CO, SO_2, VOC, PM/PM_{10}, sulfuric acid mist (SAM), and small amounts of hazardous air pollutants (HAPs). During combustion, two primary types of NO_x emissions 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. SO_2 and SAM emissions result from conversion of sulfur in the fuel and are minimized by the very low sulfur content in the fuels proposed for the Project.

Potential annual emissions are based on emissions expected for baseload operation while firing natural gas at International Organization for Standardization (ISO) conditions of 59° F and 60 percent relative humidity. The potential annual emissions also include emissions from firing natural gas in the HRSG duct burner and with the evaporative cooling. Volume 3, the PSD Application, presents the basis for the emission rates and potential annual emissions.

Particulate emissions from the mechanical draft cooling tower result from dissolved solids contained in water drift from the cooling tower. High efficiency mist eliminators will be used to minimize PM/PM_{10} emissions from the mechanical draft cooling tower.

Combustion emissions will also result from the operation of an emergency generator and an emergency fire pump. While the use of these pieces of equipment will be infrequent given their purpose, emissions will further be controlled by good combustion control and use of ultra-low sulfur fuel oil (ULSFO). These controls are considered BACT for these two sources; given their small and infrequent nature of operation, these units are not discussed further in this section.

Table 3.4-1 presents the annual potential emissions for the Project compared to the PSD significant emission rates, which are thresholds for PSD review. If a project is located at an existing major source, then PSD review is required for any pollutant with emissions that are greater than the listed PSD significant emission rate for that pollutant. PSD review requires a determination of BACT, an ambient air quality impact analysis (AAQIA), and an additional impact analysis.

Table 3.4-1
PSD Applicability

Pollutant	Project Potential to Emit (PTE)[a] (tpy)	PSD Significant Emission Rate (tpy)	PSD Review Required
NO_x	78.1	40	Yes
SO_2	45.3 [b]	40	Yes
CO	178.8	100	Yes
PM	176.8 [c, d]	25	Yes
PM_{10}	176.8 [c, d]	15	Yes
VOC	23.3	40	No
SAM	24.3 [b, e]	7	Yes
Total Reduced Sulfur	Negligible	10	No
Hydrogen Sulfide	Negligible	10	No
Vinyl Chloride	Negligible	1	No
Total Fluorides	Negligible	3	No
Mercury	Negligible	0.1	No
Lead	Negligible	0.6	No

[a]Combustion turbine emissions are based on operation of the combustion turbine at 100 percent load and at ISO conditions of 59° F and 60 percent relative humidity and include emissions from the duct burner. PTE also includes emissions from the operation of the emergency generator and the emergency fire pump.
[b]Based on a natural gas sulfur content of 2 grains/100 standard cubic feet (scf).
[c]Includes the effects of SO_2 oxidation and formation of ammonium sulfates.
[d]Includes front and back half PM/PM_{10} emissions from Unit 4. In addition, includes the noncombustion particulate emissions from the operation of the cooling tower.
[e]Includes the effects of SO_2 oxidation and assumes 100 percent conversion of SO_3 to SAM.

Note: PTE calculations are provided in a spreadsheet included in Appendix C of Volume 3.

3.4.2 Air Emission Controls for the Combustion Turbine

The use of clean fuel (i.e., natural gas) and combustion controls will minimize air emissions and ensure compliance with applicable emission-limiting standards. The use of natural gas will also minimize emissions of SO_2, SAM, PM/PM_{10}, 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 use of an SCR system. The combination of these techniques are proposed for Unit 4 and have been determined to represent BACT, based on an evaluation of economic, energy, and environmental impacts. The following subsection summarizes the Air Pollution Control Technology and BACT analysis, which is presented in the PSD permit application, located in Volume 3.

3.4.3 Best Available Control Technology Summary for the Combustion Turbine

BACT review is required under FDEP and US Environmental Protection Agency (EPA) regulations pertaining to PSD. BACT is applicable to all pollutants for which PSD review is required and is pollutant specific. It is an emission limitation that is based on the maximum degree of reduction for each regulated pollutant, which is determined to be appropriate after taking into account energy, environmental, economic impacts, and other costs. BACT cannot be any less stringent than the federal New Source Performance Standards (NSPS) applicable to the source under evaluation. For Unit 4, BACT is applicable for emissions of NO_x, CO, PM, PM_{10}, SO_2, and SAM. The emissions of VOC did not exceed the thresholds for PSD review, and therefore, do not warrant a BACT analysis.

3.4.3.1 Nitrogen Oxides. Dry low NO_x combustor technology has been offered and installed by combustion turbine manufacturers to reduce NO_x emissions by inhibiting thermal NO_x formation by premixing fuel and air prior to combustion and providing pre-mix combustion to reduce flame temperatures. The GE PG7241FA DLN combustion turbine produces NO_x emissions of 9.0 parts per million by volume dry (ppmvd), corrected to 15 percent O_2 for new combustion turbines firing natural gas.

NO_x emissions from Unit 4 will be controlled using state-of-the-art dry, low NO_x combustors in the combustion turbines when firing natural gas. To further reduce emissions of NO_x, an SCR system will be installed within the HRSG. The SCR system is designed for reduction of flue gas NO_x emissions to 2.0 ppmvd at 15 percent O_2.

Ammonia will be required for use in the SCR. Vaporized ammonia is injected into the combustion turbine exhaust gases prior to passage through the catalyst bed, which is installed in the HRSG. The onsite ammonia system will include unloading facilities, an ammonia storage tank, forwarding system, and vaporizing facilities.

Aqueous ammonia will be used, and delivered to the site by tanker trucks that include integral unloading pumps. The aqueous ammonia (19 percent solution) will be stored as a liquid in a nominal 40,000 gallon tank large enough for four full tanker truck deliveries. The liquid ammonia will be forwarded to the HRSG, vaporized, and injected upstream of the catalyst.

3.4.3.2 Carbon Monoxide. The combustion turbine will utilize advanced combustion technology and good combustion control to minimize CO emissions. Proposed CO emission rates are consistent with those recently established as BACT.

3.4.3.3 Sulfur Oxides (SO_2 and H_2SO_4 Mist). The only reasonable SO_2 and SAM control method for combined cycle facilities is the use of clean fuels (i.e., natural gas).

3.4.3.4 Particulate Matter and Other Regulated Pollutants. Clean-burning fuel (i.e., natural gas) having low PM and trace contaminant contents is being proposed as BACT for Unit 4. PM emissions will be emitted from the mechanical draft cooling tower in the form of drift. Cooling tower drift will be controlled through the use of high efficiency mist eliminators designed to limit drift to 0.0005 percent of the circulating water flow rate of the cooling tower.

3.4.4 Design Data for Control Equipment

Design data for the air pollution control equipment is presented in Volume 3 (PSD Application). Emissions of other pollutants from Unit 4 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

Unit 4 minimizes air pollutant emissions by using efficient generating and pollution prevention technologies. This concept has been incorporated with the selection of a combined cycle process utilizing advanced combustion turbines. Combined cycle plants can be expected to achieve fuel conversion rates on the order of 7,000 British thermal units (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 percent. Thus, by maximizing the MW output per unit of fuel consumed, the air pollutant emissions per MW output are minimized. Pollution prevention is incorporated in the design by the use of clean fuels, efficient combustion technology, and post-combustion control. Natural gas will be used at the facility for the Unit 4, and ULSFO for the emergency equipment. Moreover, advanced dry low NO_x combustion technology will minimize NO_x emissions during the combustion process while ensuring that CO emissions are within accepted limits. SCR will be installed post-combustion to further reduce NO_x emissions. Taken together, these design features will make Unit 4 one of the most efficient and least polluting power producers in the state of Florida.

3.5 Plant Water Use

In an effort to use Florida's water resources efficiently and minimize the quantity of ground water withdrawals requested for Unit 4, FMPA and KUA propose to use water from several sources. Treated sewage effluent (reuse water) will be used as the primary source for cooling tower makeup water, the largest single use of water for Unit 4 and facility operation. KUA has an agreement with Toho for the delivery, use, and return of this reuse water. The existing Toho reuse water supply pipeline in the CIPP area has adequate capacity to provide the required makeup water flow. The existing onsite pipelines appear to have adequate capacity, but a new supply line along the plant access road may be required. If a new supply line is installed, the existing supply line may be converted to a return line.

Unit 4 potable, service, and fire protection water will be supplied from the existing and proposed wells located on the CIPP site. Upgrades to the existing chlorination equipment will be required.

FMPA and KUA request the use of 2.786 mgd of ground water as an emergency source of cooling tower makeup for a total of 30 days per year in the event Toho is unable to supply reuse water. Although this scenario is unlikely, and has occurred only rarely in the past, the ground water withdrawals will be used to maintain power generation. Four new 500 gpm onsite wells are requested to provide the emergency water supply for cooling tower makeup. The wells will be sized so that all of the wells will be required to provide the required water flow at full load conditions. The CIPP site is currently authorized for maximum withdrawal of 2.865 mgd for 30 days for emergency makeup to the existing Unit 2 and 3 cooling towers. These new wells, in combination with the existing four wells, will be used to supply the presently authorized withdrawals and the requested withdrawal needs for Unit 4, which together total 5.651 mgd for CIPP Units 2 through 4. The cooling water is used to condense steam from the STGs. The STG of Unit 4 is slightly larger in capacity than the combined capacity of Units 2 and 3.

Process water demand for Unit 4, excluding cooling tower makeup, will be approximately 134,000 gpd. The site is currently authorized a maximum withdrawal of 780,000 gpd for 30 days. A new 250 gpm well, in combination with the existing two 200 gpm wells, will supply the present authorized withdrawals and the maximum withdrawal needs for Unit 4, which total 914,000 gpd for CIPP Units 1 through 4.

Maximum reuse water demand for Unit 4 cooling tower makeup will be approximately 2.8 gpd. Typical water quality of the reuse water is provided in Table 3.5-1 which meets all of the requirements of Chapter 62-610, Part III, of the FAC. Floridan Aquifer ground water is requested as the source of cooling tower makeup emergency supply for up to 30 days per year in the event that reuse water is unavailable due to events such as disruptions in the water supply from the sewage treatment plant, water quality upsets, or outages in the transfer pump and piping system.

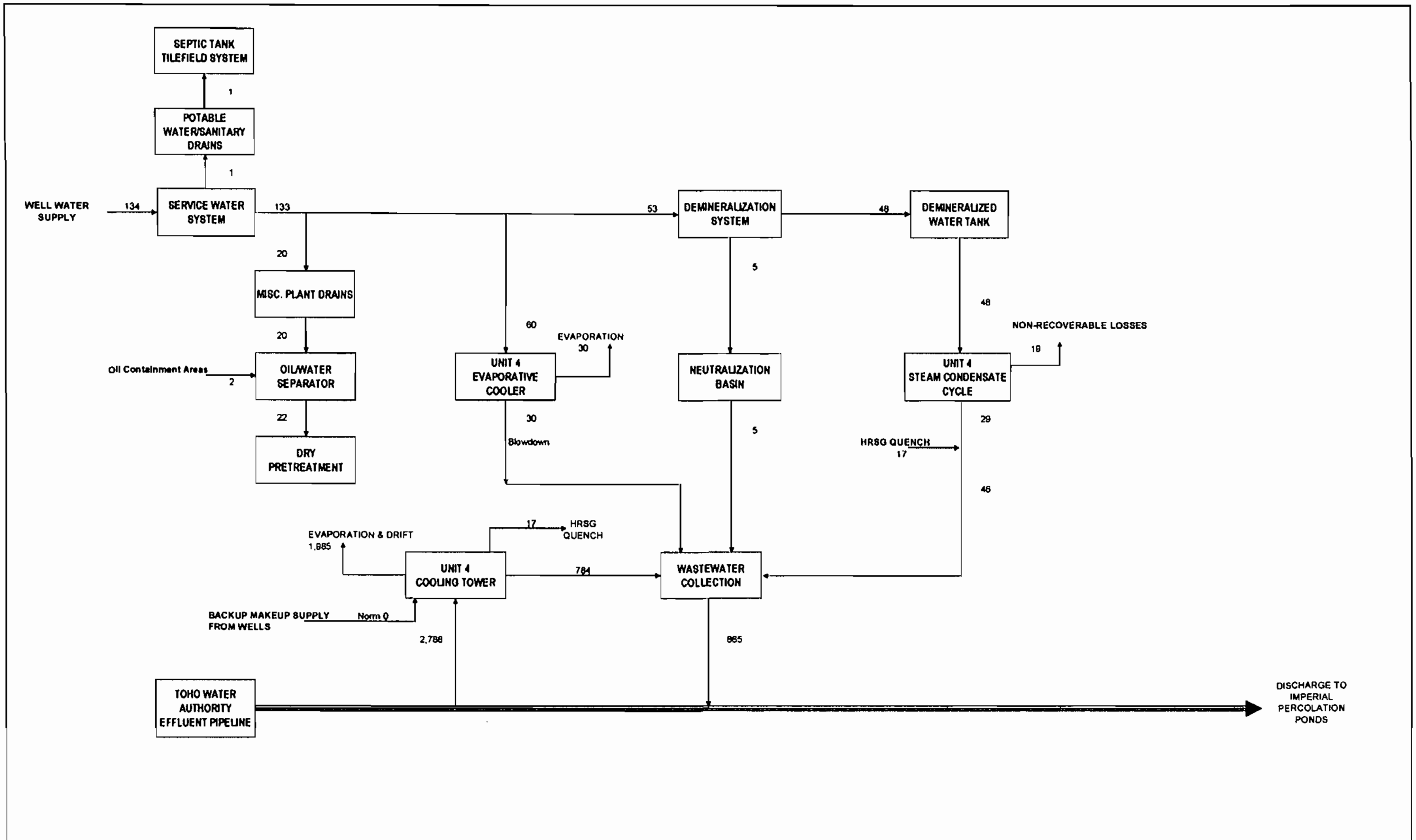
Table 3.5-1
Typical Water Quality of
Reuse Water and Well Water Supplies

Constituent	Reuse Water*	Well Water**
Calcium, mg/L as Calcium Carbonate ($CaCO_3$)	115	68
Magnesium, mg/L as $CaCO_3$	43	29
Sodium, mg/L as $CaCO_3$	156	6
Potassium, mg/L as $CaCO_3$	22	1
Alkalinity, mg/L as $CaCO_3$	131	70
Sulfate, mg/L as $CaCO_3$	35	6
Chloride, mg/L as $CaCO_3$	116	10
Silica, mg/L as SiO_2	21	14
Total Dissolved Solids, mg/L	417	119

*Based on samples taking of the present reuse water inflow to CIPP during June 2007.
**Based on data from existing Floridan Aquifer Wells 1 and 2 onsite.

In addition to the reuse water and well water sources, a tie-in may be made to the Toho raw water pipeline supplying the CIPP site. In accordance with the Toho and KUA agreement, this water may also be used for the service water/fire water system, cooling water system, and a short-term emergency supply to the cooling water makeup system.

Water mass balance diagrams depicting the natural gas case that results in average water consumption for Unit 4 and all units are shown on Figures 3.5-1 and 3.5-2, respectively. Figure 3.5-3 shows the expected water usage with Unit 4 operating on natural gas and Units 1 to 3 operating on fuel oil to show the maximum expected water usages at full load and average ambient conditions.



NOTE: 1. FLOWS ARE IN 1000 GALLONS PER Day (gpd). 2. FLOWS DO NOT INCLUDE UNITS 1-3	COMBUSTION TURBINE FUEL	Natural Gas			BLACK & VEATCH LLP	KISSIMMEE UTILITY AUTHORITY CANE ISLAND POWER PARK UNIT 4 WATER MASS BALANCE
	GROSS UNIT 4 OUTPUT (MW)	327.4	DEMINERALIZER EFFICIENCY	90%		Project 147651
	UNIT 4 TURBINE CONFIGURATION	1 x 1	CYCLE MAKEUP RATE	2.00%		Drawing WMB-1
	AMBIENT TEMP (°F)	73	LOAD FACTOR	100%	Eng: KRW / Dwg: KRW	Rev 0
	DUCT FIRING UNIT 4	On	CYCLES OF CONCENTRATION	3.5	Check: / Date:	73 °F AMBIENT, FIRED, 100% LOAD, Gas

Figure 3.5-1
Water Mass Balance – Unit 4 Operation

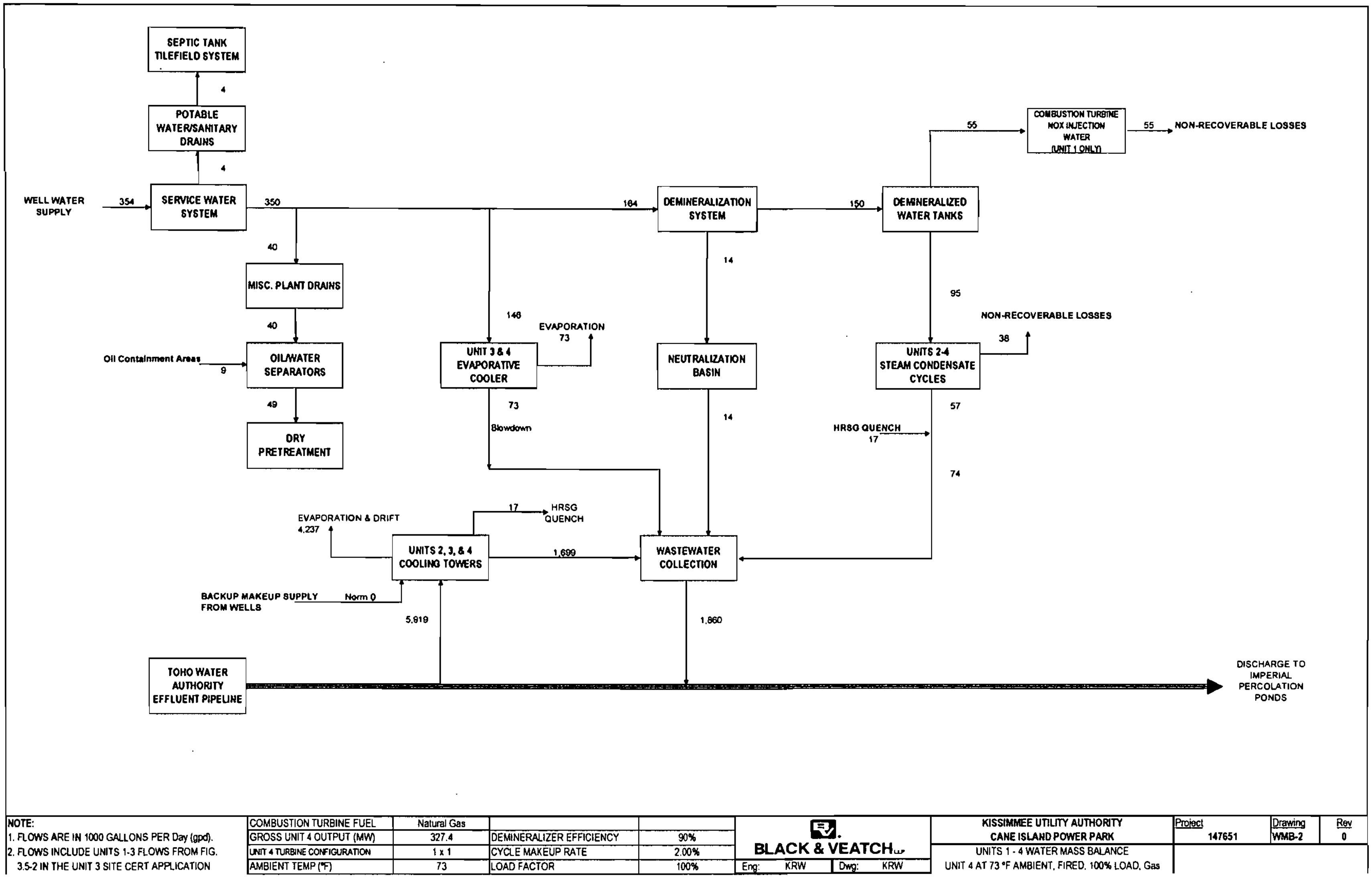
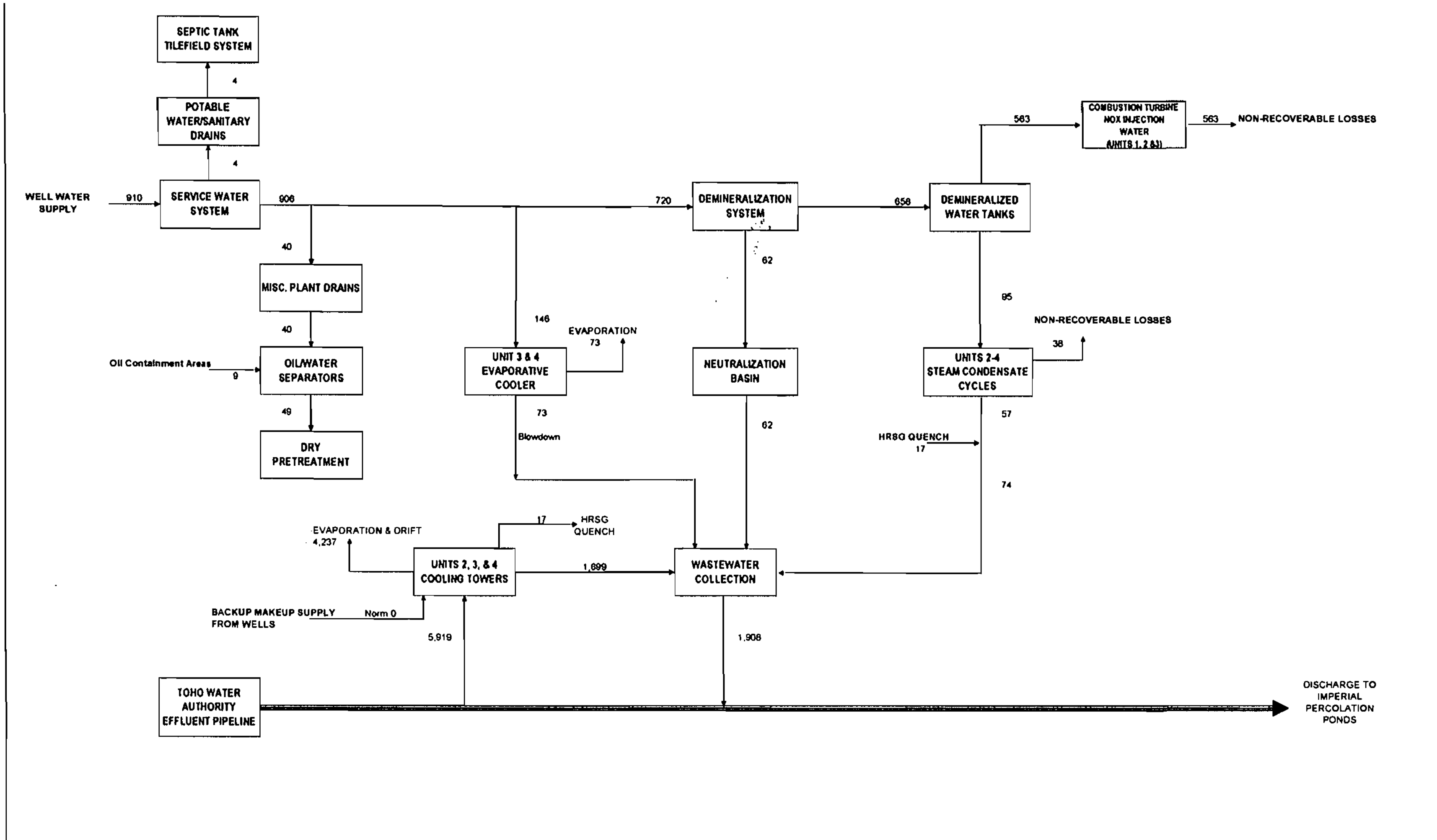


Figure 3.5-2
Water Mass Balance – All Units Operating on Natural Gas



NOTE:						
1. FLOWS ARE IN 1000 GALLONS PER Day (gpd).	COMBUSTION TURBINE FUEL	Units 1-3 Oil, Unit 4 Natural Gas			BLACK & VEATCH	KISSIMMEE UTILITY AUTHORITY CANE ISLAND POWER PARK
2. FLOWS INCLUDE UNITS 1-3 FLOWS FROM FIG.	GROSS UNIT 4 OUTPUT (MW)	327.4	DEMINERALIZER EFFICIENCY	90%		Project 147651 / Drawing WMB-3 / Rev 0
3.5-4 IN THE UNIT 3 SITE CERT APPLICATION	UNIT 4 TURBINE CONFIGURATION	1 x 1	CYCLE MAKEUP RATE	2.00%		UNITS 1 - 4 WATER MASS BALANCE
EXCEPT CLG TWR CYCLES ADJUSTED TO 3.5	AMBIENT TEMP (°F)	73	LOAD FACTOR	100%	Eng: KRW / Dwg: KRW	UNIT 4 AT 73 °F AMBIENT, FIRED, 100% LOAD, Gas
	DUCT FIRING UNIT 4	On	CYCLES OF CONCENTRATION	3.5	Check: / Date: 2/13/2007	UNITS 1, 2 & 3 OIL FIRED

Figure 3.5-3
Water Mass Balance – Unit 4 Operating on Natural Gas, Units 1 to 3 on Fuel Oil

The water mass balances represent operation at 100 percent load conditions during average temperatures. Actual average annual flows will be less, dependent upon the electrical loading of the generators and ambient temperature. Maximum flows for cooling tower makeup will be more (up to approximately 10 percent) depending on the ambient temperature and humidity.

3.5.1 Heat Dissipation System (Cooling Towers)

Waste heat from the Unit 4 steam turbine condenser and auxiliary cooling system will be rejected to the atmosphere by a cooling cycle using linear mechanical draft cooling towers. The primary source of cooling water makeup will be reuse water from Toho. The estimated maximum cooling water makeup to Unit 4 is approximately 2.8 mgd at full load and average ambient conditions.

Cooling tower blowdown will be returned to the Toho reuse water pipeline for downsteam reuse or disposal. The wastewater return to the Toho system from Unit 4 is estimated to be 865,000 gpd at full load and average ambient conditions.

3.5.1.1 Dilution System. The CIPP Unit 4 project does not propose the use of a cooling water stream dilution system.

3.5.1.2 Blowdown, Screened Organisms, and Trash Disposal. Cooling tower blowdown will be returned to Toho reuse water pipeline. No biological organisms or trash will be present in the blowdown.

3.5.1.3 Injection Wells. The CIPP Unit 4 project will not install any injection wells.

3.5.2 Domestic/Sanitary Wastewater

Domestic/sanitary wastewater is generated by showers, lavatories, sinks, toilets, urinals, and drinking fountains. It is estimated that there will be two new permanent Unit 4 employees at the site who will generate approximately 80 gpd of sanitary wastewater. Sanitary wastes will be routed to an existing septic tank/tile field system on the CIPP site.

3.5.3 Potable Water System

Potable water uses will include showers, lavatories, sinks, toilets, urinals, eye wash stations, and drinking fountains. The existing potable water treatment system will be modified to treat the additional water from the new well. Onsite facilities will be in accordance with Chapter 62-555, FAC. The typical well water chemical analysis from the existing wells is indicated in Table 3.5-1. An extension of the potable water system will be provided to the new Miscellaneous Services Building and Power Distribution Center to supply eye wash stations.

3.5.4 Process Water Systems

Service/process water will be obtained from the service/fire water tank for washdown purposes, pump and equipment seal water and flushing, evaporative cooler makeup, and cycle makeup treatment system water supply. The major systems and uses are indicated on the water mass balances.

Demineralized water will be required for use as makeup to the steam-condensate-feedwater cycle associated with the HRSGs. The makeup is required to replace cycle losses and boiler blowdown. Demineralized water will be supplied by the existing demineralization system. The present system is an ion exchange demineralizer system that treats service water. As water passes through the system, it is progressively demineralized until the effluent contains essentially no dissolved solids. Exhausted ion exchange is regenerated using sulfuric acid and sodium hydroxide. The resulting chemical wastewater flows are treated as described in Section 3.6. A new 1 million gallon demineralized water storage tank will be installed for Unit 4. The tank will be filled from the existing demineralized water storage and supply system.

Fire water will be obtained from well water via the existing service water system. There will be two new 500,000 fire/service water storage tanks, with 300,000 gallons dedicated to fire water in each tank. Two new fire water pumps (one electric motor driven and one diesel engine driven) will provide water by means of an underground piping loop which serves fire hydrants, hose racks and reels, and automatic suppression systems. The Unit 4 underground piping loop will be interconnected to the existing underground loop piping.

3.5.5 Water Use Variations

All water requirements described in the preceding sections are based on operation of the facility at 100 percent load and average annual ambient conditions. When the units operate at less than 100 percent load, the evaporation rate from the cooling towers, and consequently the cooling tower makeup and blowdown rates, will vary proportionately. There are also smaller variations in cooling tower evaporation resulting from ambient conditions such as temperature and humidity. Cooling tower makeup (reuse water) is the major water use.

Demineralized water used as makeup to the steam cycle also generally varies proportionately to unit loading. Evaporative cooler operation is dependent upon the ambient temperature and humidity conditions as well as unit load. The balance of water uses will be basically independent of the operating load.

In the event of temporary unit shutdown, no main cooling tower or steam cycle makeup will be required, but other systems may continue to operate.

3.6 Chemical and Biocide Waste

The Unit 4 startup and operations will require the use of different chemical and biocides. Chemicals are used in the steam cycle water treatment, the cycle makeup water treatment, and as cleaning agents. Biocides are used in the cooling tower to prevent bacterial growth. Chemicals or biocides may be present in the sanitary wastewater, the oil/water separator effluent, evaporative cooler blowdown, and the cooling tower blowdown. These waste streams are shown on the water mass balances.

3.6.1 Cooling Tower Blowdown

The cooling tower blowdown will be transferred via the existing pipeline to the Toho reuse water pipeline. Chemicals used in cooling tower water treatment will include sulfuric acid for alkalinity reduction (pH adjustment), sodium hypochlorite solution for biological control, and feed of a commercial scale inhibitor. Capability is also included for feed of a commercial non-oxidizing biocide to supplement chlorination for biological control.

3.6.2 Sanitary Wastes

Sanitary wastes will be collected and treated by an existing septic tank/tile field system on the CIPP site.

3.6.3 Steam Cycle Water Treatment

The steam cycle water will be treated with an oxygen scavenger for dissolved oxygen control and with an amine, such as ammonia solution, for pH control. The oxygen scavenger will break down to ammonia at the system operating temperature. A phosphate solution will be fed to the HRSG for control scaling, corrosion, and boiling water pH in the steam generator. The phosphate will react with any calcium hardness in the steam generators to form a non-adherent precipitate.

Boiler blowdown will be relatively high purity water with small amounts of suspended solids and phosphate. Boiler blowdown will be routed to a sump, where it will be quenched using cooling tower water, and then routed along with the cooling tower blowdown to the existing pipeline to the Toho reuse water pipeline.

A condensate polisher will be installed in the condensate system to reduce the time needed to achieve the required water quality during startups. The polisher with be of the powdered resin type. The resin will be renewed through a precoat process. Wastewater from the process will consist of condensate quality water with spent precoat material and will be filtered and then routed to blowdown sump for return to the Toho pipeline.

3.6.4 Cycle Makeup Water Treatment

As discussed in Subsection 3.5.4, the makeup water to the steam cycle will be generated by additional operation of the existing demineralization system which consists of ion exchange resin beds. The demineralization system uses sulfuric acid for cation resin regeneration and sodium hydroxide for anion resin regeneration. The sulfuric acid and sodium hydroxide are stored in tanks located in curbed concrete containment areas in or near the treatment areas. Any spillage of chemicals in the curbed areas is routed to the neutralization basin for treatment. The use of these chemicals is dependent on demineralized water requirements.

Wastewater from the cation resin regeneration includes regenerant water containing unreacted sulfuric acid and dissolved sulfate salts of cations removed from the resin during regeneration. Wastewater from anion resin regeneration includes regenerant water containing unreacted sodium hydroxide and dissolved sodium salts of anions removed from the resin during regeneration.

The estimated increase in regenerate waste with the addition of Unit 4 will be a maximum of approximately 5,000 gpd. The additional demineralizer regenerant wastes will be routed to the existing neutralization basin, as described in Subsection 3.6.7, for pH adjustment prior to discharge to the Toho reuse pipeline.

3.6.5 Chemical Cleaning Wastes

The Unit 4 HRSG and preboiler piping will be chemically cleaned during commissioning. The steam generator will also be cleaned infrequently during the life of the unit. Chemicals used for these cleanings will not be stored onsite and will be administered utilizing a temporary system. The chemical cleaning solutions to be used for cleaning of the HRSG will be dependent to a limited extent on the HRSG manufacturer. Chemicals typically used in HRSG and preboiler piping chemical cleaning include the following:

- Inhibited citric acid.
- Disodium phosphate.
- Trisodium phosphate.
- Nonfoaming wetting agents.
- Foam inhibitors.
- Chelates, such as EDTA (ethylenediaminetetraacetic acid).

Chemical cleaning wastewaters will consist of the cleaning solutions and material removed during the cleaning process. Since chemical cleaning is a maintenance operation, it will not contribute to the liquid wastes produced by the normal operation of the plant. Cleaning solutions will be neutralized onsite if required and transported offsite by a licensed waste disposal contractor.

3.6.6 *Miscellaneous Chemical Drains*

Chemical wastewater can result from draining a chemical storage tank, overflowing a chemical tank during filling, or from maintenance operations such as hosing down chemical storage areas. Any additional miscellaneous chemical drains will be contained for neutralization, if necessary, and disposed to the existing plant wastewater system. Large chemical leaks will be scavenged and disposed offsite by a licensed commercial service. Flows from miscellaneous chemical drains will be intermittent and will not normally contribute to the wastewater flows.

3.6.7 *Neutralization Basin*

An existing neutralization basin provides for treatment of chemical wastes prior to discharge to the Toho reuse pipeline. The basin accommodates the wastewaters produced during the regeneration of the makeup demineralizer. The neutralization basin is constructed of reinforced concrete with chemical resistant liner. A chemical waste mixer, mounted on a walkway spanning the basin, is provided to hasten the pH adjustment of the chemical wastes. Sulfuric acid and sodium hydroxide, as required for neutralization, are available from the makeup demineralizer regeneration equipment. Neutralized water is directed to the Toho reuse pipeline.

3.7 Solid and Hazardous Waste

Unit 4 will not generate any solid waste, such as combustion ash or flue gas desulfurization scrubber waste, from the electric generation process. The firing of natural gas does not create significant combustion byproducts. CIPP operations will not require any onsite landfills or solid waste disposal areas. The existing commercial trash services will be contracted to haul off typical solid wastes that result from plant operations, such as increased office debris.

Waste oil is the major potentially hazardous substance generated by plant operation. Two processes generate waste oil: combustion turbine cleaning and oil/water separator operation. The internal components of the combustion turbines are periodically cleaned using a solvent solution. This wash water may contain oily residues and metal particles. The wash water is collected in an underground combustion turbine drain tank and hauled offsite as needed by a licensed contractor for ultimate disposal.

Oily wastewaters that are generated will be conveyed to the oil/water separator. Waste oil collected in the oil/water separators will be hauled offsite as needed by a licensed contractor for ultimate disposal.

Small quantities of other hazardous wastes, such as paints and cleaners, are used in maintenance and will be segregated from the plant drainage system and disposed offsite to a licensed contractor.

Spent SCR modules will be removed from the CIPP by a licensed contractor.

3.8 Onsite Drainage System

3.8.1 Uncontaminated Areas

The existing geographic feature known as Cane Island is fairly flat and is crowned in the center. Generally, the existing drainage is directed in easterly and westerly directions into Reedy Creek Swamp. Storm water runoff from the existing Units 1 and 2 area is directed to an existing storm water pond. Storm water runoff from existing Unit 3 and Unit 4 will be directed to a separate, modified storm water pond.

The onsite drainage facilities will be designed in accordance with the requirements of the SFWMD Chapter 40 E-4 and Basis of Review, Chapter 7.0 Water Management System Design and Construction Criteria and the FDEP regulations in Chapter 62-621, FAC. Open channels and drainage structures (culverts, trench drains) will be designed to collect and direct the runoff resulting from a 25 year, 72 hour storm event. Site runoff facilities (i.e., ditches, detention basin) will provide storage to satisfy criteria for maintenance of water quality and quantity, and to provide storage to attenuate peak discharge rates.

The requirements for quality treatment include retention of the first inch of runoff from the developed portions of the site. This volume will be provided in the onsite storm water detention basin. The 1/2 inch of the retained runoff and direct precipitation on the onsite storm water detention basin will percolate from the basin in less than 24 hours due to the highly permeable soils.

The requirements for quantity treatment include the limitation that the post-development peak discharge does not exceed the predevelopment peak discharge. The detention basin will assist in attenuating the peak discharge flows from the developed site to meet this requirement.

Runoff from areas of the site not disturbed by construction activities or plant operations will be maintained in the existing state to the greatest extent possible. Runoff from areas of the site disturbed by construction activities or plant operations will be collected in a ditch system and directed to the onsite detention basin as described below. Drainage systems will be designed for gravity flow wherever site conditions allow. Generally, the drainage in the areas of the new unit will be directed away from the structures and routed to the onsite storm water detention basin. Figure 3.8-1 indicates the general flow paths at the CIPP site once construction is completed.

3.8.2 Drainage Areas

Limited construction will be required in the existing Unit 3 area. In this area, the existing drainage facilities will be used as much as possible; storm water runoff will continue to be directed to the east to the modified Unit 3 storm water detention basin, now the Units 3 and 4 basin. The existing facilities will be reviewed to ensure that capacities are sufficient to handle any additional impact from the new construction.

Most of the construction will occur in the Unit 4 power block area. A construction lay-down/staging area to the south of the power block will also be used during construction. These areas and the Unit 3 power block will drain into the modified 1.41 acre onsite runoff basin during construction and operation of Unit 4. The combined area of the Unit 3 power block, Unit 4 power block, construction lay-down/staging area, and storm water facilities is approximately 24.2 acres.

The new runoff basin will serve as a dry detention basin to provide both quality and quantity treatment to the storm water. The quality treatment will be accomplished by detention and reduction of suspended solids load. The basin will also provide quantity treatment by providing surge capacity to attenuate the maximum discharge rate into Reedy Creek Swamp.

Again, there will be no source of leachate associated with the CIPP or Unit 4, thereby eliminating this potential pollution source.

3.8.3 Design Criteria

The surface water management and storage of surface waters system will be designed in accordance with the regulations and requirements of Chapter 40E-4, FAC, the SFWMD's *Environmental Resource Permit Information Manual Volume IV (including the Basis of Review),* and the FDEP's *The Florida Manual--A Guide to Sound Land and Water Management Land Development.* Areas subject to potential contamination of storm water runoff will be designed for zero discharge.

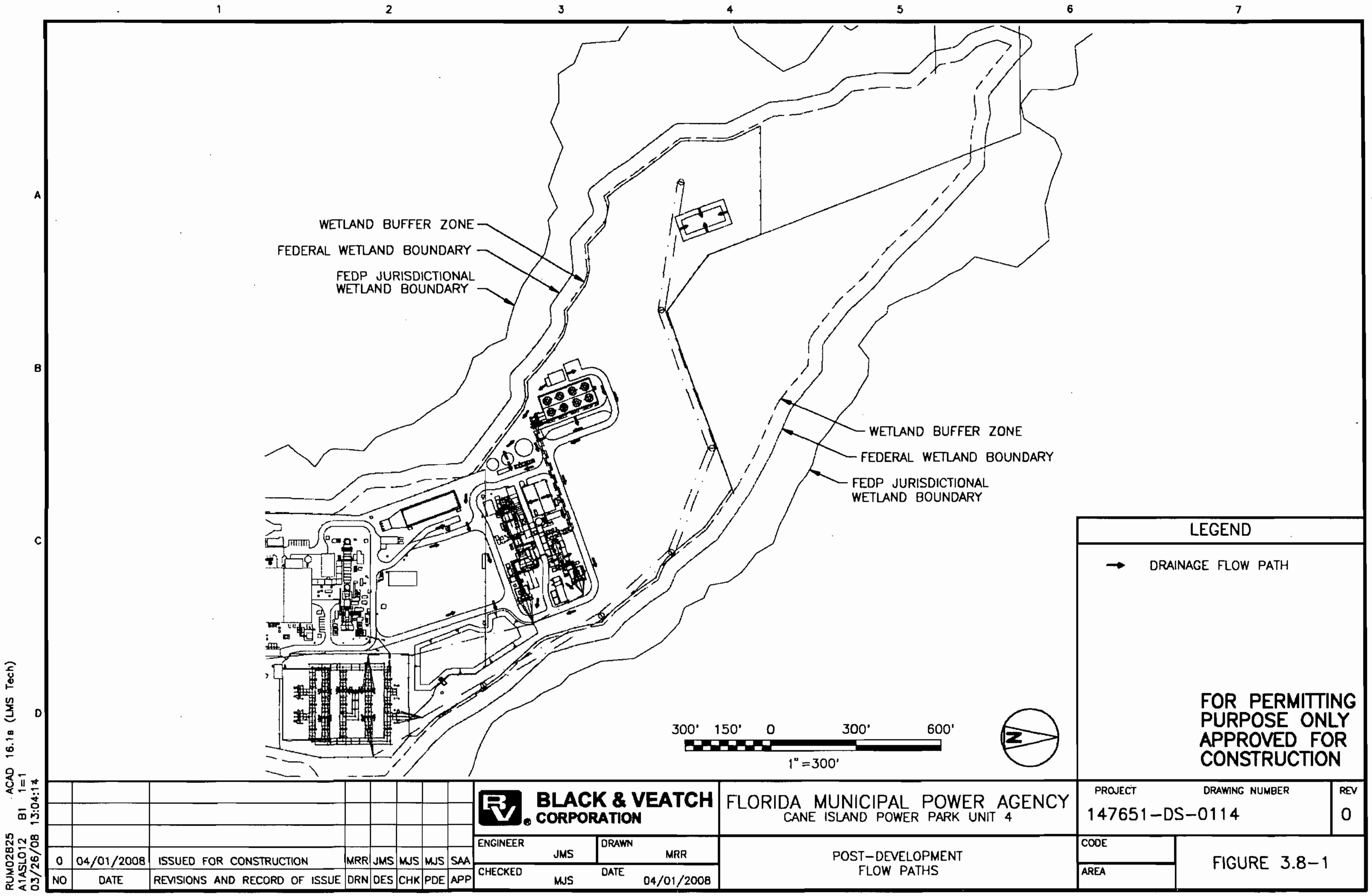


Figure 3.8-1
Preliminary Grading and Drainage

The surface water management system at the site is designed to maintain the existing drainage patterns wherever possible. The existing drainage patterns generally flow to the east or west from the units.

The surface water management system for the developed areas of the CIPP will be designed to ensure that the post-development peak discharge will not exceed that of the predevelopment peak discharge at the project site boundary.

The following design criteria are specified in the SFWMD Permit Manual:

- Design Storm: 25 year, 72 hour.
- Rainfall frequencies obtained from the SFWMD Permit Manual are as follows:
  - 10 year, 24 hour--5.48 inches.
  - 10 year, 72 hour--7.59 inches.
  - 25 year, 24 hour--6.57 inches.
  - 25 year, 72 hour--10.29 inches.
  - 100 year, 72 hour--11.27 inches.
- Rainfall Distribution: SFWMD 72 Hour Synthetic Storm Distribution.
- Outlet structures:
  - Emergency spillways are designed to pass the 100 year recurrence interval storm event.
  - Existing grading and drainage in Units 1, 2 and 3 areas have been permitted by SFWMD.

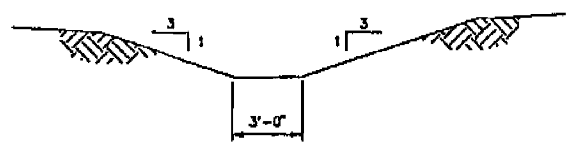
3.8.4 Runoff Analysis

The area associated with the Unit 3 power block, Unit 4 power block, and construction lay-down/staging area consists of approximately 5.0 acres of aggregate area and 7.9 acres of impervious area. These areas will drain into the modified Unit 3 storm water detention basin. The 25 year, 72 hour rainfall event was used to size the onsite runoff detention basin. The predevelopment curve number (CN) was estimated to be 45.0, with a predevelopment time of concentration of 0.41 hours. The post-development CN and time of concentration were estimated to be 89.5 and 0.13 hours, respectively. The post-development time lag is estimated at 0.08 hour. The curve numbers and time of concentrations were determined using the methods outlined in the Soil Conservation Service TR-55 manual.

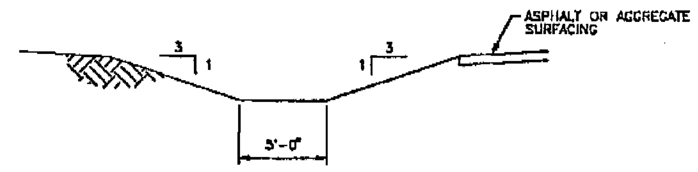
The storm water collection system will consist of ditches, drainage structures, and a site runoff detention basin. This system will function as a storm water quality and quantity treatment facility. The quality treatment of runoff will be accomplished through percolation and detention in the site detention basin. Grading and drainage plans (storm water management system) are shown on Figures 3.8-2 through 3.8-5.

CULVERT TABLE											
CULVERT NO.	CENTERLINE COORDINATES				LENGTH	INLET INV ELEVATION	OUTLET INV ELEVATION	END TYPE	PIPE DIAMETER	NUMBER OF BARRELS	PIPE MATERIAL
	INLET END		OUTLET END								
	NORTH	EAST	NORTH	EAST							
C-1A	1434199.95	484409.35	1434216.50	484454.82	48.4'	77.75	77.50	PROJECTING	24"	1	CHDPE
C-1B	1434197.13	484410.38	1434213.68	484455.85	48.4'	77.75	77.50	PROJECTING	24"	1	CHDPE
C-2A	1434294.38	484680.29	1434311.58	484733.58	56.0'	76.75	76.33	PROJECTING	24"	1	CHDPE
C-2B	1434291.52	484681.21	1434308.72	484734.50	56.0'	76.75	76.33	PROJECTING	24"	1	CHDPE
C-2C	1434288.67	484682.13	1434305.87	484735.42	56.0'	76.75	76.33	PROJECTING	24"	1	CHDPE

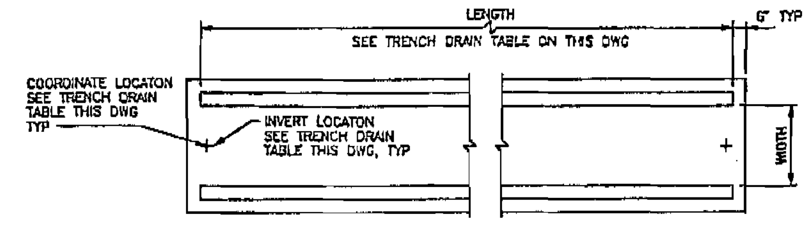
DRAINAGE TRENCH TABLE											
TRENCH DRAIN NO.	DRAWING NO.	CENTERLINE COORDINATES				LENGTH	INSIDE TRENCH WIDTH "A"	INLET TRENCH INV ELEVATION	OUTLET TRENCH INV ELEVATION	TOP OF CONCRETE ELEVATION	REMARKS
		INLET END		OUTLET END							
		NORTH	EAST	NORTH	EAST						
T-1	S3002	1434480.42	484114.96	1434439.91	484129.71	43.12	1'-6"	79.88	79.66	81.50	–
T-2	S3001	1434597.44	484671.00	1434608.86	484702.38	33.40	2'-0"	79.60	79.42	81.00	–
T-3	S3001	1434399.02	484342.22	1434364.49	484247.35	100.95	2'-0"	80.50	80.00	81.50	–
T-4	S3001	1434291.54	484452.77	1434262.24	484463.44	31.19	2'-0"	80.27	80.10	81.50	–
T-5	S3001	1434316.56	484527.31	1434291.09	484536.58	27.10	2'-0"	80.85	80.70	81.50	–
T-6	S3001	1434441.36	484727.53	1434452.43	484757.93	32.36	2'-0"	80.03	79.85	81.50	–
EXIST. T-3	S3001	–	–	1433960.44	484837.42	70.06	1'-0"	78.92	78.55	MATCH EXISTING	EXISTING TRENCH DRAIN TO BE EXTENDED



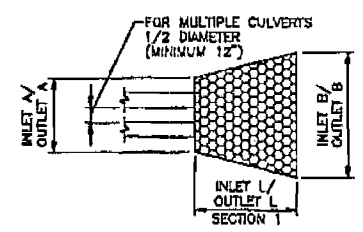
SECTION 1
NO SCALE
SEE DWG S3002



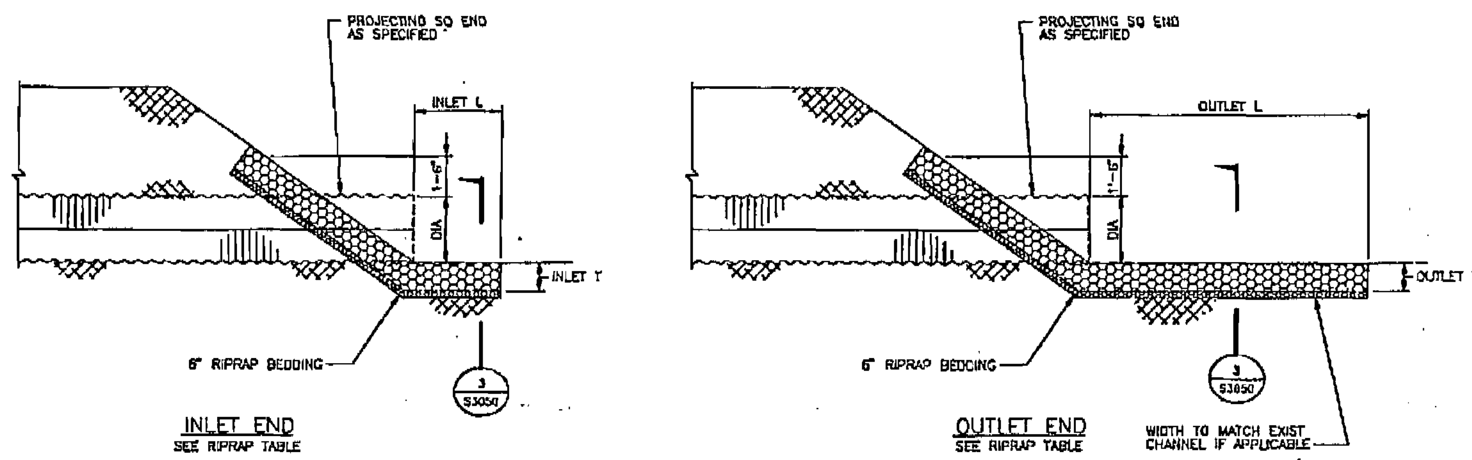
SECTION 2
NO SCALE
SEE DWGS S3001 & S3002



PLAN



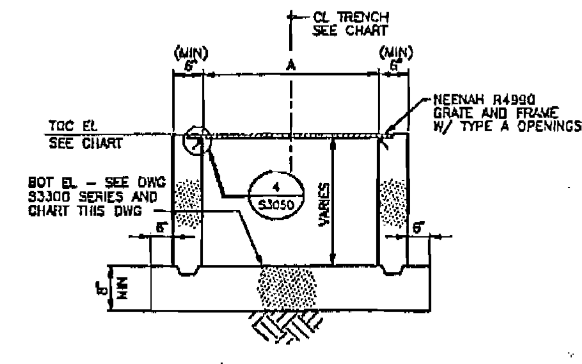
SECTION 3
CULVERT RIPRAP PLAN
NO SCALE



INLET END
SEE RIPRAP TABLE

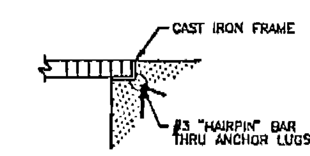
OUTLET END
SEE RIPRAP TABLE

TYPICAL CULVERT RIPRAP
NO SCALE



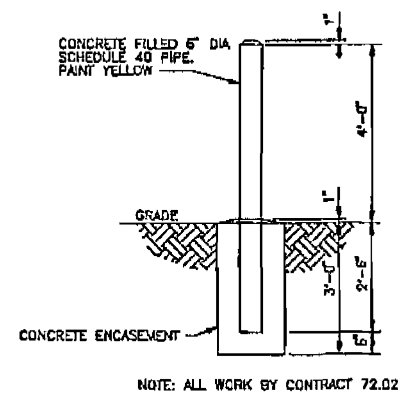
SECTION

TYPICAL DRAINAGE TRENCH DETAIL
NO SCALE
SEE DWGS S3001 & S3002



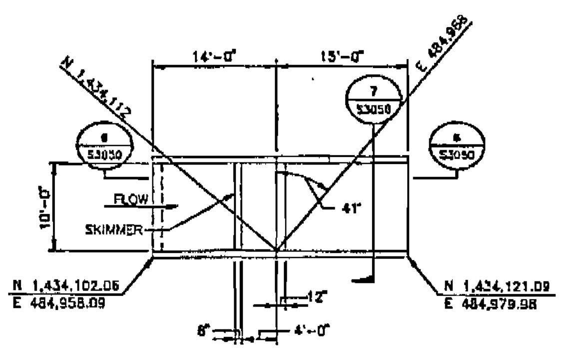
DETAIL 4
NO SCALE
SEE THIS DWG

RIPRAP TABLE											
CULVERT NO.	INLET L	OUTLET L	INLET A	INLET B	OUTLET A	OUTLET B	INLET T	OUTLET T	INLET D50	OUTLET D50	REMARKS
C-1	5	12.67	8	10	8	20	9"	9"	6"	6"	SEE DWG 147651-4STF-S3001 FOR PLAN
C-2	5	37	11	11	11	24.25	9"	9"	6"	6"	SEE DWG 147651-4STF-S3001 FOR PLAN
T-1	5	9.5	4.5	10	4.5	10	9"	9"	6"	6"	SEE DWG 147651-4STF-S3002 FOR PLAN
T-2	–	10	–	–	5	20	–	9"	–	6"	SEE DWG 147651-4STF-S3001 FOR PLAN
T-3	–	6.38	–	–	5	12.75	–	9"	–	6"	SEE DWG 147651-4STF-S3001 FOR PLAN
T-4	–	9	–	–	5	18	–	9"	–	6"	SEE DWG 147651-4STF-S3001 FOR PLAN
T-5	–	10	–	–	5	20	–	9"	–	6"	SEE DWG 147651-4STF-S3001 FOR PLAN
T-6	–	11	–	–	5	22	–	9"	–	6"	SEE DWG 147651-4STF-S3001 FOR PLAN
T-7	–	10	–	–	5	20	–	9"	–	6"	SEE DWG 147651-4STF-S3001 FOR PLAN
T-8	–	11.5	–	–	5	23	–	9"	–	6"	SEE DWG 147651-4STF-S3001 FOR PLAN



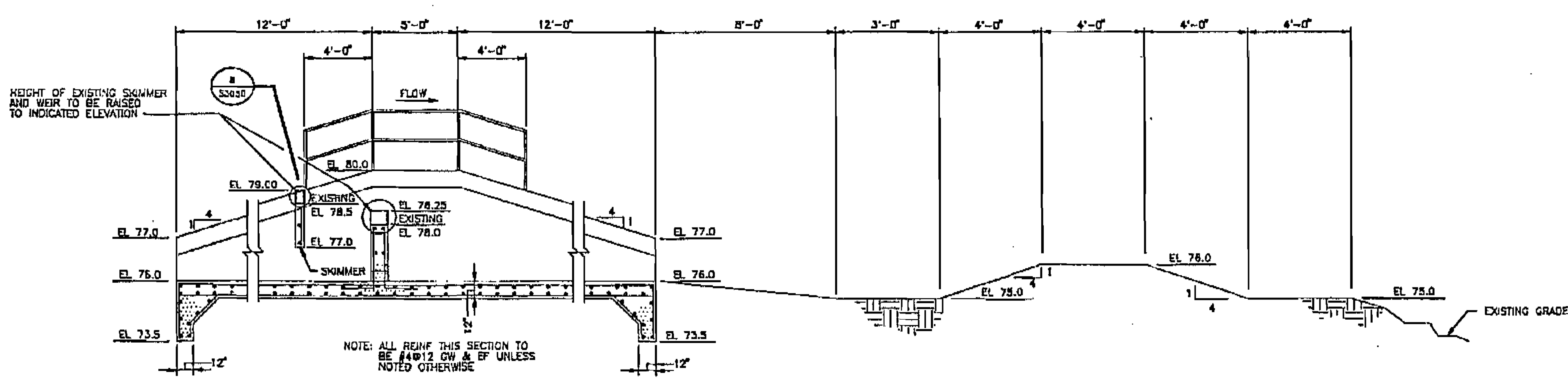
NOTE: ALL WORK BY CONTRACT 72.0201

TYPICAL GUARD POST
NO SCALE

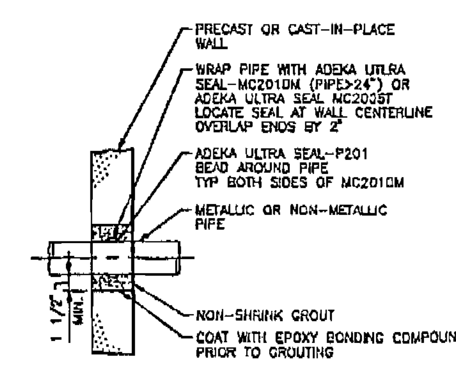


PLAN

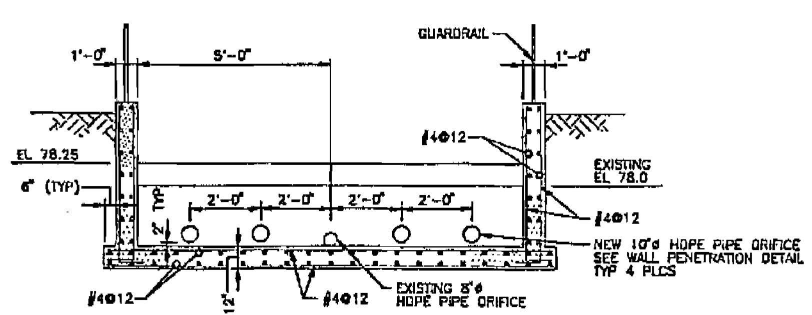
DETAIL 5
EXISTING DISCHARGE STRUCTURE NO. 2
SCALE: 1"=10'
SEE DWG S3003



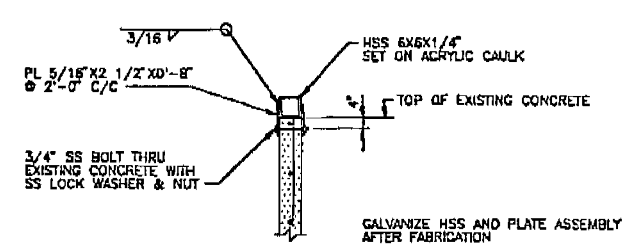
SECTION 6
NO SCALE
SEE THIS DWG



WALL PENETRATION DETAIL
NO SCALE



SECTION 7
NO SCALE
SEE THIS DWG



SECTION 8
NO SCALE
SEE THIS DWG

NOTES

1. SEE DWG S3000 FOR GENERAL NOTES, LEGEND, ABBREVIATIONS AND KEY PLAN.

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APPROVED FOR CONSTRUCTION

NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP
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BLACK & VEATCH CORPORATION
ENGINEER ___ DRAWN MRR
CHECKED ___ DATE 04/01/2008

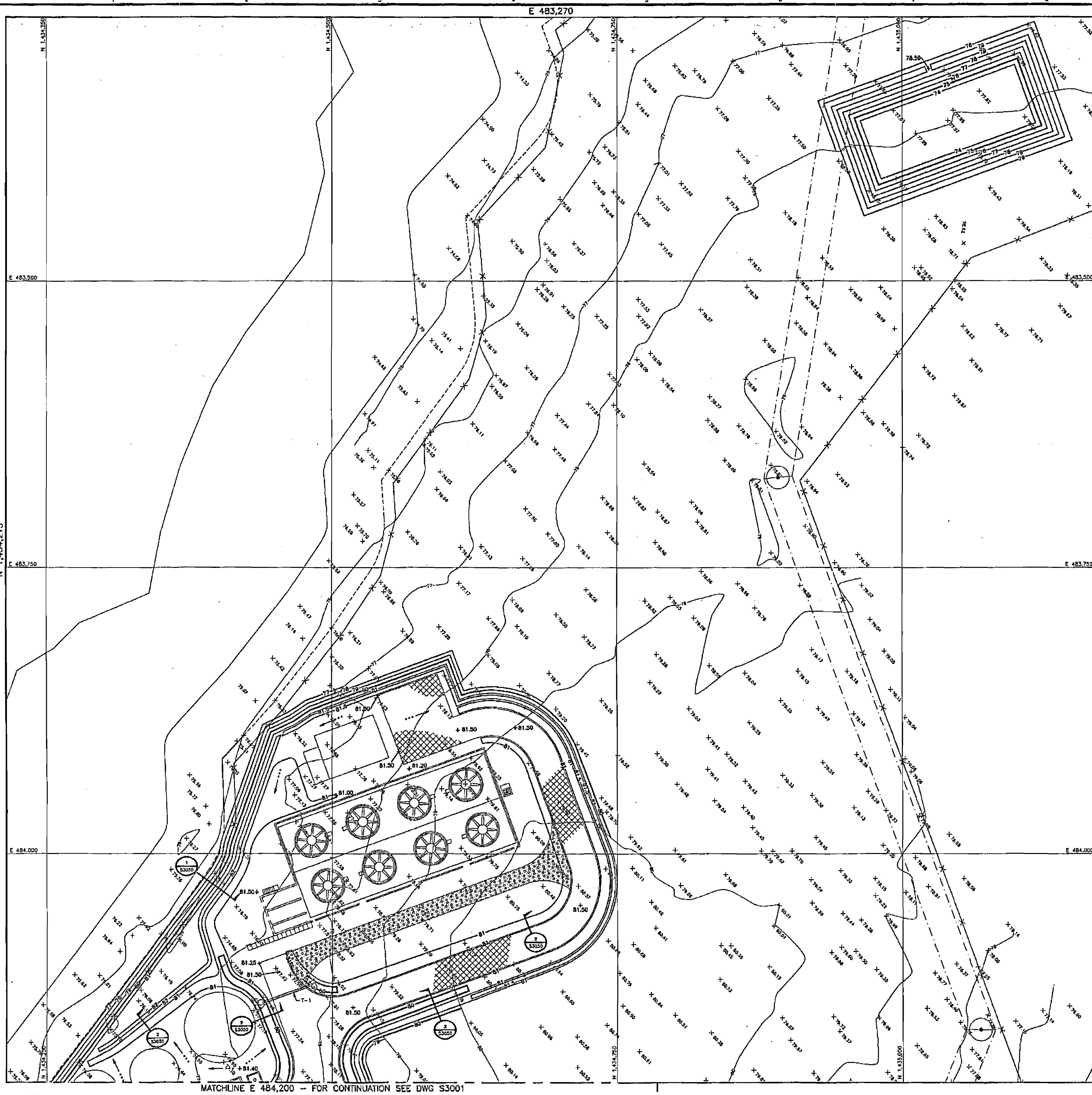
FLORIDA MUNICIPAL POWER AGENCY
CANE ISLAND POWER PARK UNIT 4

GRADING AND DRAINAGE – SITE
SECTIONS AND DETAILS

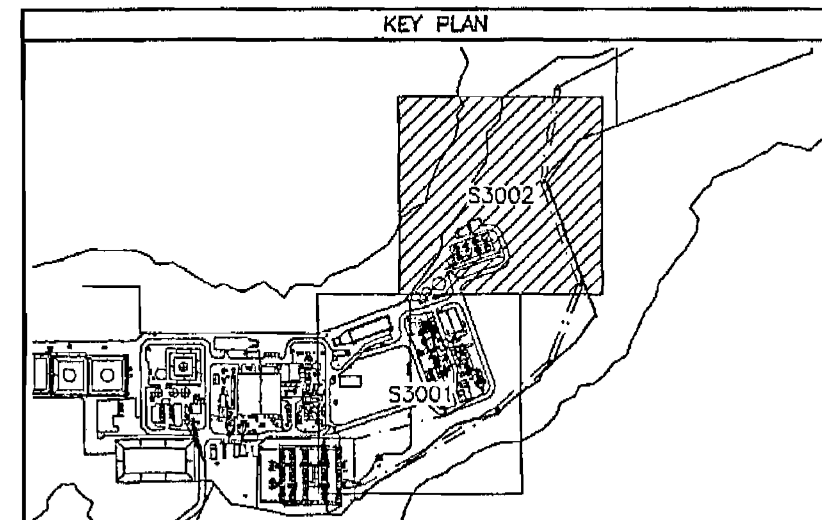
PROJECT / DRAWING NUMBER: 147651-4STF-S3050 REV 0

CODE / AREA

FIGURE 3.8-5



KEY PLAN



NOTES

1. SEE DWG S3000 FOR GENERAL NOTES, LEGEND, ABBREVIATIONS AND KEY PLAN.

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0	04/01/2008	ISSUED FOR CONSTRUCTION	MRR	JMS	JMS	JJS	SAA

SCALE: 1"=30'

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BLACK & VEATCH CORPORATION

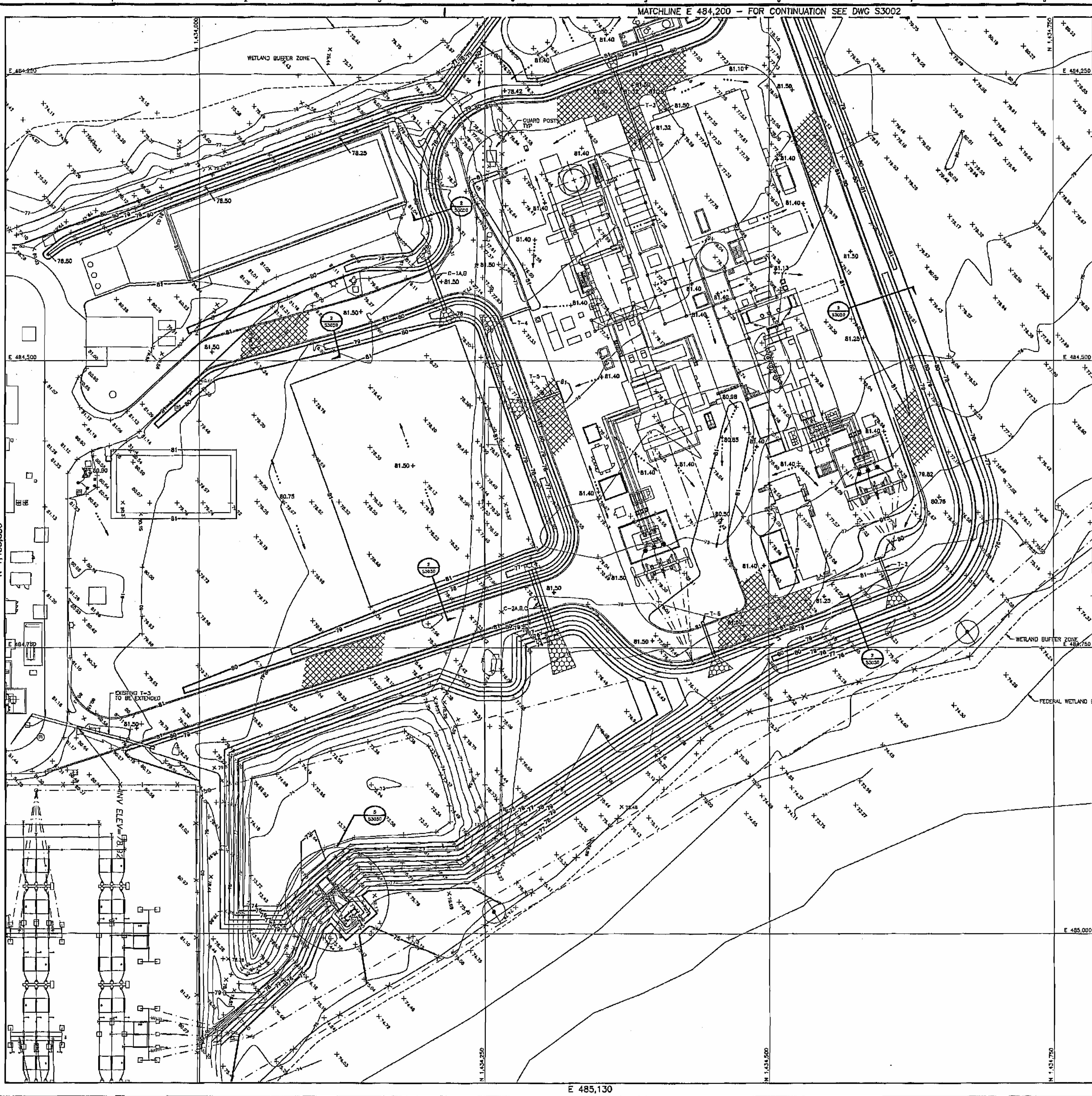
DRAWN MRR DATE 04/01/2008

FLORIDA MUNICIPAL POWER AGENCY
CANE ISLAND POWER PARK UNIT 4

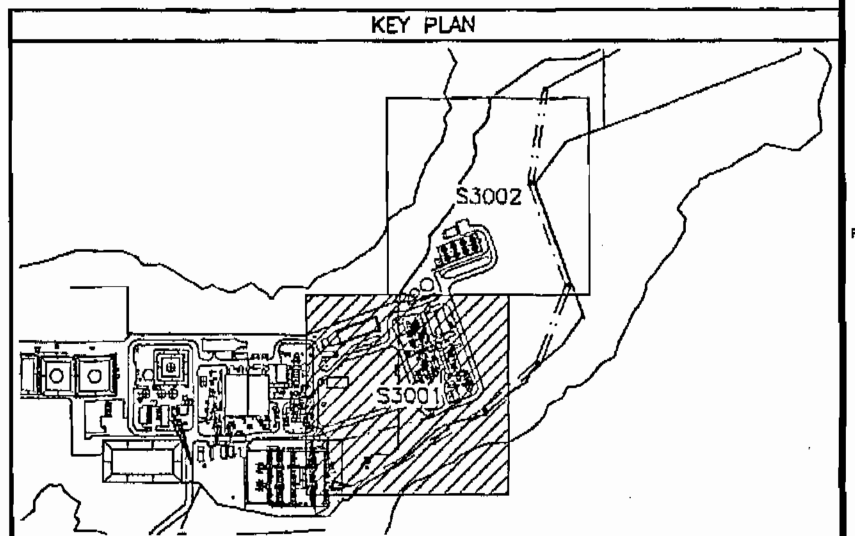
GRADING AND DRAINAGE - SITE
SHEET 2

PROJECT / DRAWING NUMBER: 147651-4STF-S3002 REV 0

FIGURE 3.8-4



KEY PLAN



NOTES

1. SEE DWG S3000 FOR GENERAL NOTES, LEGEND, ABBREVIATIONS AND KEY PLAN.

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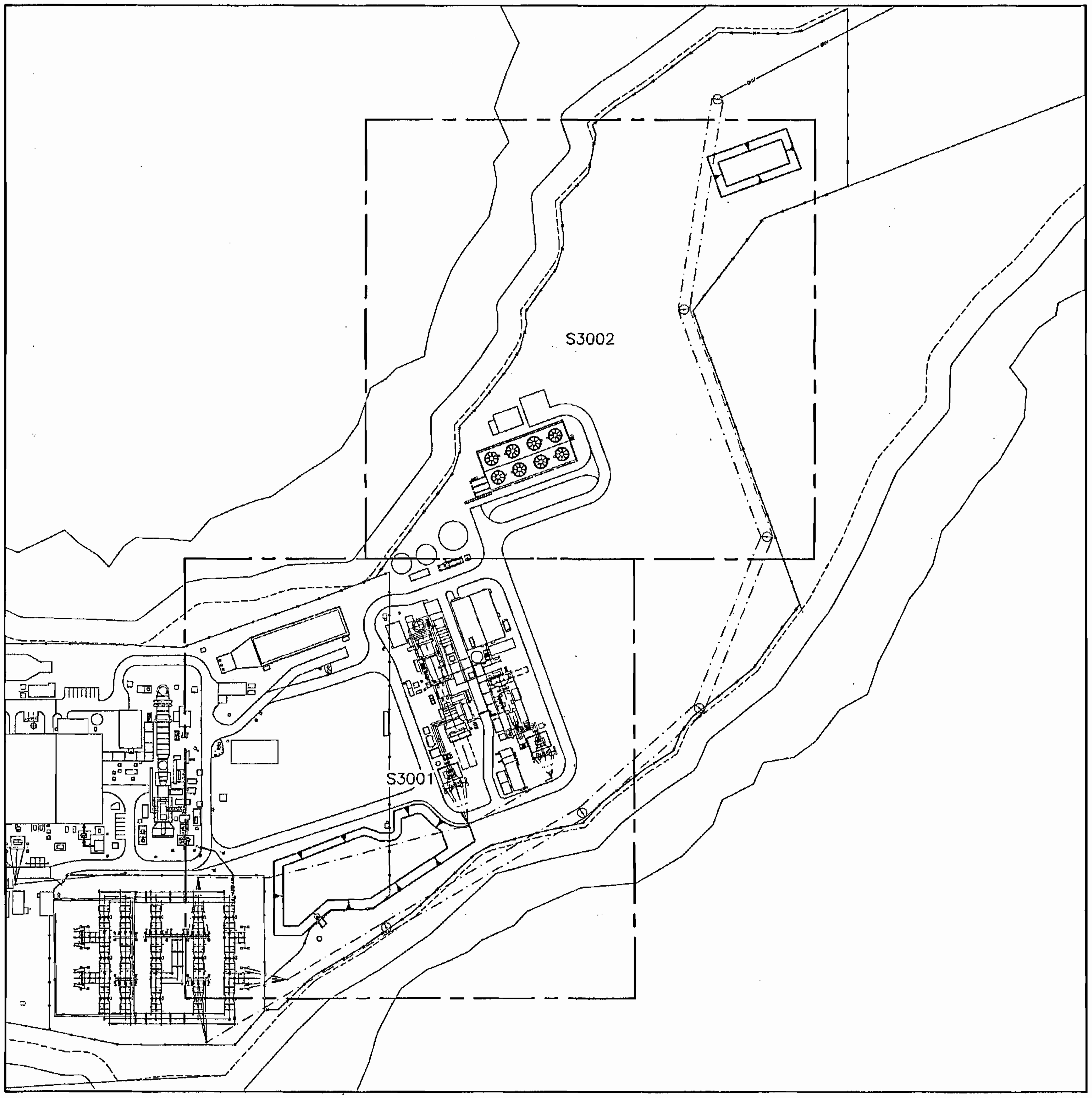
ENGINEER: JHS DRAWN: MAR
CHECKED: JHS DATE: 04/01/2008

FLORIDA MUNICIPAL POWER AGENCY
CANE ISLAND POWER PARK UNIT 4

GRADING AND DRAINAGE – SITE
SHEET 1

PROJECT / DRAWING NUMBER: 147651–4STF–S3001 REV: 0

FIGURE 3.8–3



KEY PLAN

GENERAL NOTES

1. GENERAL NOTES APPLICABLE TO ALL S3000 SERIES DRAWINGS.
2. THE PLANT GRID SYSTEM USED FOR HORIZONTAL CONTROL IS STATE PLANE COORDINATE SYSTEM, FLORIDA EAST ZONE 901, NAD83.
3. INTERSECTIONS OF PAVED ROADS SHALL HAVE A 40 FOOT TURNING RADIUS MEASURED FROM THE EDGE OF PAVEMENT UNLESS NOTED OTHERWISE. A SMOOTH VERTICAL TRANSITION SHALL BE PROVIDED AT ROAD INTERSECTIONS.
4. THE LOCATIONS OF THE EXISTING FACILITIES AND UNDERGROUND UTILITIES SHOWN ON THIS SERIES OF DRAWINGS REPRESENT THE BEST KNOWLEDGE OF THE ENGINEER. BEFORE ANY WORK IS STARTED IN THE AREA OF THE EXISTING FACILITIES AND UNDERGROUND UTILITIES, THE SUBCONTRACTOR SHALL CONFIRM THEIR LOCATION AND NOTIFY THE OWNER THAT WORK IS PLANNED IN THIS AREA.
5. CONSTRUCTION SEQUENCE SHALL BE SCHEDULED TO MINIMIZE UNCONTROLLED RUNOFF AND OFFSITE SEDIMENTATION DURING GRADING OPERATIONS. SEDIMENTATION BARRIERS SHALL BE INSTALLED IN EACH AREA BEFORE GRADING OPERATIONS BEGIN. GRADED AREAS SHALL BE SEEDED IMMEDIATELY FOLLOWING COMPLETION OF FINAL GRADING IN EACH AREA.
6. SPOT ELEVATION AND CONTOURS ON THESE DRAWINGS ARE TOP OF FINISHED GRADE. SUBTRACT FINISHED SURFACING MATERIAL THICKNESS TO OBTAIN TOP OF SUBGRADE.
7. GRADE SHALL SLOPE UNIFORMLY BETWEEN SPOT ELEVATIONS AND CONTOURS SHOWN ON THE PLANS. SLOPE GRADE TO DRAIN IN THE DIRECTION OF FLOW ARROWS.
8. THE FINISHED GRADE SHALL BE SET 6 INCHES BELOW TOP OF CONCRETE UNLESS NOTED OTHERWISE. FINISHED GRADE SHOULD SLOPE AWAY FROM THE STRUCTURE AT A MINIMUM SLOPE OF 1% FOR THE FIRST 10 FEET.
9. ALL CUT AND FILL SLOPES SHALL BE 3 HORIZONTAL TO 1 VERTICAL OR FLATTER, UNLESS NOTED OTHERWISE.
10. BUMPER POSTS ARE TO BE FIELD LOCATED.
11. SEE DWG 147651-4STF-S3050 FOR GRADING AND DRAINAGE SECTIONS AND DETAILS.
12. SEE 147651-4STF-S3100 SERIES DRAWINGS FOR THE EROSION CONTROL PLAN AND DETAILS.
13. SEE DWGS 147651-4STA-S1000 AND S1001 FOR SITE ARRANGEMENT.

LEGEND APPLICABLE TO ALL S3000 DRAWINGS

- PROPERTY LINE
- R/W — LIMIT OF RIGHT-OF-WAY
- NEW SECURITY FENCE
- 99 — NEW CONTOUR
- AREA INLET
- NEW STORM WATER SYSTEM
- NEW CULVERT
- GRADE SURFACE FLOW INDICATOR
- 123.45 + — NEW SPOT ELEVATION
- SURVEY CONTROL MONUMENT
- NEW TRENCH DRAIN
- EXISTING FENCE
- 99 — EXISTING CONTOUR
- WETLAND BUFFER ZONE
- OVERHEAD TRANSMISSION LINE
- FDEP JURISDICTIONAL WETLAND BOUNDARY
- ASPHALT SURFACING
- AGGREGATE SURFACING
- CONCRETE
- EARTH
- RIPRAP
- SAND/BEDDING MAT'L
- GRASS
- WETLANDS
- 1 / S3000 — SECTION OR DETAIL NUMBER / DRAWING DESIGNATION NUMBER

ABBREVIATIONS APPLICABLE TO ALL S3000 DRAWINGS

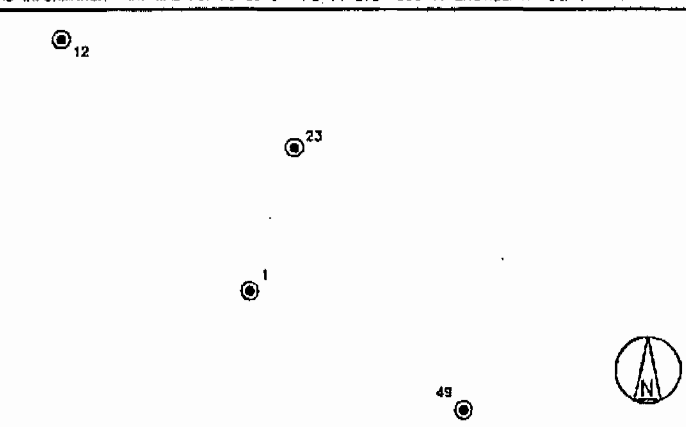
A	ARC LENGTH	LS	LIFT STATION
AGG	AGGREGATE	LTR	LATER
APPROX	APPROXIMATE	MATL	MATERIAL
ASPH	ASPHALT	MH	MANHOLE
AVG	AVERAGE	MSL	MEAN SEA LEVEL
BLDG	BUILDING	MW	MONITORING WELL
B/MH	BOTTOM OF MANHOLE ELEVATION	N	NORTH
BOD	BOTTOM OF ELECTRICAL DUCT BANK	NO.	NUMBER
BOP	BOTTOM OF PIPE	NTS	NOT TO SCALE
BU	BELL UP	OD	OUTSIDE DIAMETER
CHDPE	CORRUGATED HIGH DENSITY POLYETHYLENE PIPE	OWS	OIL/WATER SEPARATOR
CJ	CONTRACTION JOINT	PC	POINT OF CURVATURE
CL	CENTERLINE	PE	PLAIN END
CMP	CORRUGATED METAL PIPE	PI	POINT OF INTERSECTION
CO	CLEAN OUT	PL	PROPERTY LINE
D	DEGREE OF CURVE	PLCS	PLACES
Δ	DELTA ANGLE OF HORIZONTAL CURVE	PRC	POINT OF REVERSE CURVE
DI	DUCTILE IRON	PT	POINT OF TANGENT
DIA	DIAMETER	PVC	POINT OF VERTICAL CURVE
DIM	DIMENSION	PVI	POINT OF VERTICAL INTERSECTION
DWG	DRAWING	PVT	POINT OF VERTICAL TANGENT
E	EAST	R	RADIUS
EA	EACH	RCP	REINFORCED CONCRETE PIPE
EF	EACH FACE	RD	ROOF DRAIN
EOP	EDGE OF PAVEMENT	RED	REDUCER
EOS	EDGE OF SHOULDER	REQ'D	REQUIRED
EHH	ELECTRICAL HANDHOLE	REV	REVISION
EL	ELEVATION	R/W	RIGHT-OF-WAY
EJ	EXPANSION JOINT	S	SOUTH
EW	EACH WAY	SE	SUPERELEVATION
EXP	EXPANSION	SIM	SIMILAR
FD	FLOOR DRAIN	STA	STATION
FDN	FOUNDATION	T	TANGENT LENGTH
FF	FINISHED FLOOR	TMH	TOP OF MANHOLE
FG	FINISHED GRADE	TOC	TOP OF CONCRETE
FRP	FIBER REINFORCED PIPE	TOG	TOP OF GRATING
FT	FOOT	TOP	TOP OF PAVEMENT
HC	HANDICAPPED	TYP	TYPICAL
HDPE	HIGH DENSITY POLYETHYLENE	UNO	UNLESS NOTED OTHERWISE
HVCM	HORIZ & VERT CONTROL MONUMENT	V	DESIGN SPEED
HP	HIGH POINT	VERT	VERTICAL
ID	INSIDE DIAMETER	W	WEST
IN	INCH	W/	WITH
INV	INVERT	W/O	WITHOUT
L	LENGTH	WP	WORK POINT
LC	LENGTH OF VERTICAL CURVE		

PROJECT SURVEY CONTROL

CONTROL MONUMENT LOCATIONS

MONUMENT NO.	STATE PLANE COORDINATES		ELEVATION
	EASTING	NORTHING	
1	484,953.765	1,432,348.949	78.05
12	482,862.646	1,435,905.858	73.59
23	485,217.602	1,433,848.406	74.15
49	487,224.814	1,430,143.646	71.39

NOTE:
BENCHMARKS ARE 5' x 12"Ø CONCRETE MONUMENTS WITH BRASS DISC IN THE TOP. HORIZONTAL CONTROL IS BASED ON THE FLORIDA STATE PLANE COORDINATE – EAST ZONE (1983/90 N.A.D.) SYSTEM. THE ELEVATIONS ARE BASED ON THE NGVD 1929 DATUM FROM BENCHMARKS SET BY THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT AND INFORMATION THAT WAS FURNISHED BY THE OSCEOLA COUNTY ENGINEERING DEPARTMENT.



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SCALE: 1"=100' (100' 50' 0 100' 200')

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DATE ________ REG NO. ________

BLACK & VEATCH CORPORATION
ENGINEER: JMS DRAWN: MRR
CHECKED: JMS DATE: 04/01/2008

FLORIDA MUNICIPAL POWER AGENCY
CANE ISLAND POWER PARK UNIT 4
GRADING AND DRAINAGE – SITE
GENERAL NOTES, ABBREVIATIONS AND LEGEND

PROJECT / DRAWING NUMBER: 147651–4STF–S3000 REV 0

FIGURE 3.8–2

The discharge structure of the detention basin is designed for the 25 year, 72 hour event peak flow. The discharge structure will also safely pass the 100 year, 72 hour storm event without overtopping the detention basin perimeter berms. The storm water detention basin and discharge structure are sized to meet the design criteria outlined in Subsection 3.8.3. Storm water enters the detention basin through direct precipitation and from ditches conveying runoff from the Unit 3 power block, Unit 4 power block and construction staging/lay-down areas.

The predevelopment discharge in response to the 25 year, 72 hour storm event is approximately 31 cfs. The post-development discharge in response to the 25 year, 72 hour storm event is approximately 18 cfs. Storm water discharges will enter Reedy Creek Swamp through a spreader swale that will distribute the flow and prevent erosion.

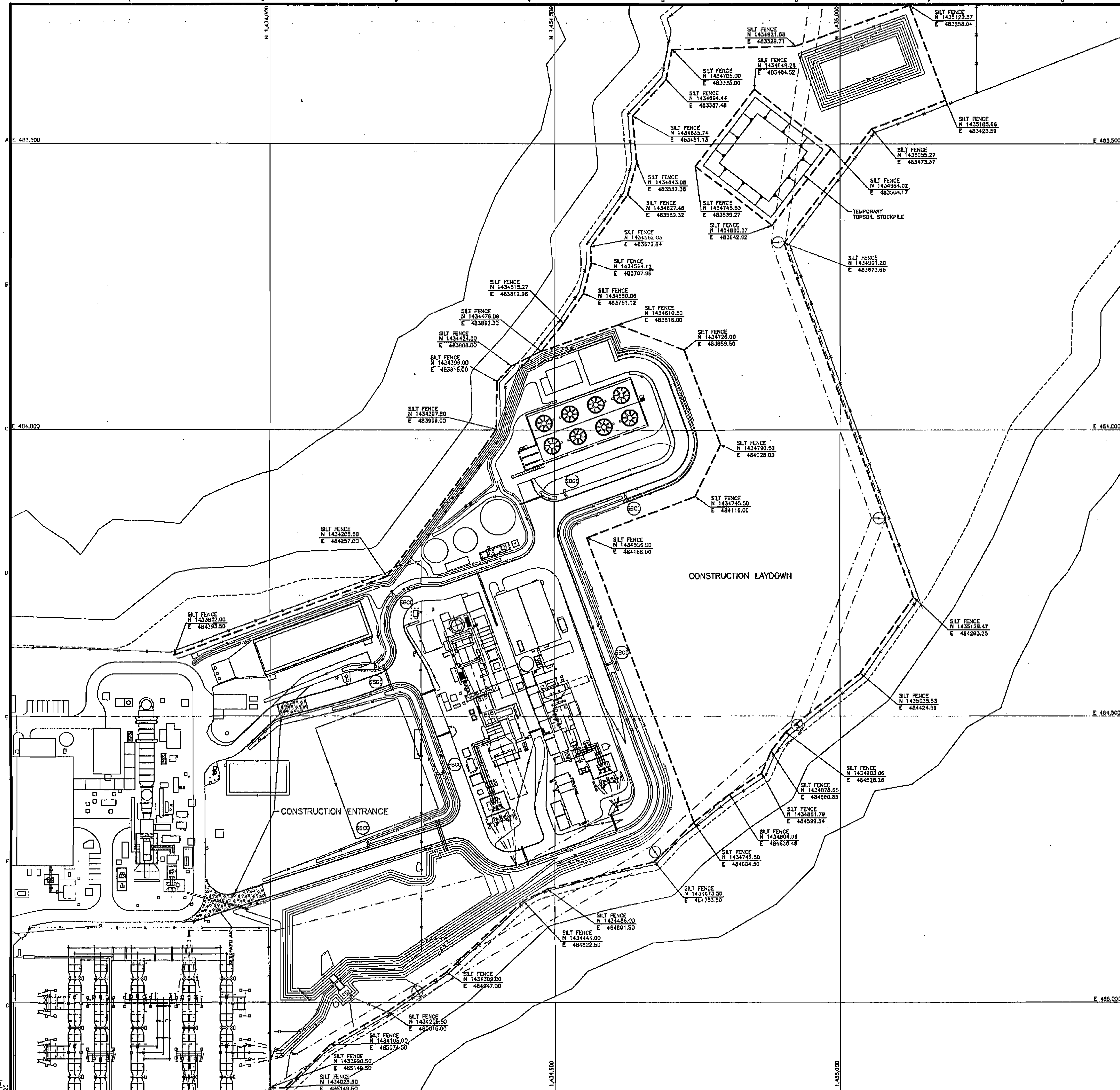
HEC-1 hydrologic analytic model was completed to predict runoff rates, storm water detention basin size, and site storm water drainage facilities. The predictive results from this analytic model are included in Subsection 10.5.1.

3.8.5 Erosion and Sediment Control Measures

Erosion and sediment control measures will be installed as necessary during construction to control sediment disposition. The primary destination of construction runoff will be to the Unit 3 and 4 storm water detention basin. The Unit 3 and 4 storm water detention basin will provide reduction of suspended solids load through detention.

Before construction begins, a silt fence or other appropriate control measures will be installed around the perimeter of construction areas. Figures 3.8-6 and 3.8-7 show erosion control plans and details. Diversion ditches will be equipped with straw bale dikes to aid in minimizing the amount of sediments flowing into the onsite runoff basin and offsite. Construction accessways and parking areas will be surfaced with aggregate to provide a stabilized subgrade. Erosion control measures will also include minimizing fugitive dust through the periodic spraying of water.

3.8.5.1 Staging of Earthmoving Activities. Initial construction will remove all significant vegetation (trees and brush). If possible, some trees will be retained in the construction lay-down/staging area. The runoff basin and associated drainageways will be constructed concurrently with initial clearing activities. Topsoil will be removed and stockpiled for finished grading and site restoration after construction is completed. Once the topsoil has been removed, site preparation will be directly related to the construction of specific power plant facilities. Once the earthmoving and construction are completed, the stockpiled topsoil will be used for finished grading. Seeding and mulching activities will begin immediately upon completion of construction.



GENERAL NOTES APPLICABLE TO ALL S3100 DRAWINGS

1. FOR GENERAL NOTES, LEGEND, AND ABBREVIATIONS SEE DWG S3000.
2. ALL EROSION CONTROL WORK SHALL BE IN ACCORDANCE WITH THE CONSTRUCTION SITE EROSION CONTROL PLAN.
3. SILT FENCE SHALL BE LOCATED AND INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF THE CONSTRUCTION SITE EROSION CONTROL PLAN.
4. SEE DWG S3150 FOR EROSION CONTROL SECTIONS AND DETAILS.
5. STRAW BALE CHECK DAMS SHALL BE USED IN ALL DITCHES PER DETAIL ON DWG S3150.
6. SILT FENCE INLET PROTECTION SHALL BE USED AT ALL CULVERT AND TRENCH DRAIN INLETS.

(8)

LEGEND APPLICABLE TO ALL S3100 DRAWINGS

- SBCD — STRAW BALE CHECK DAM
- 250 — EXISTING CONTOUR
- 250 — NEW CONTOUR
- SILT FENCE
- STORM WATER FLOW INDICATOR
- PROPERTY BOUNDARY
- CONSTRUCTION ENTRANCE

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SCALE: 1" = 60'

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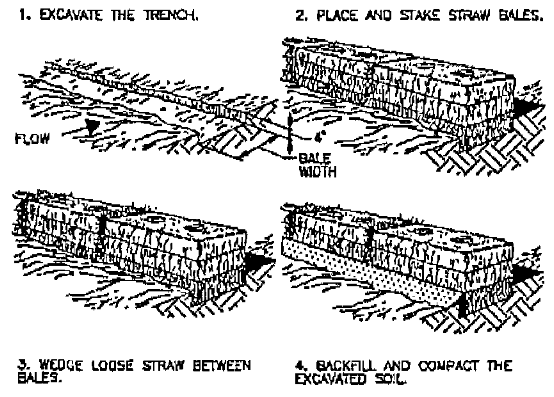
ENGINEER / DRAWN MAR / CHECKED / DATE 04/01/2008

FLORIDA MUNICIPAL POWER AGENCY
CANE ISLAND POWER PARK UNIT 4

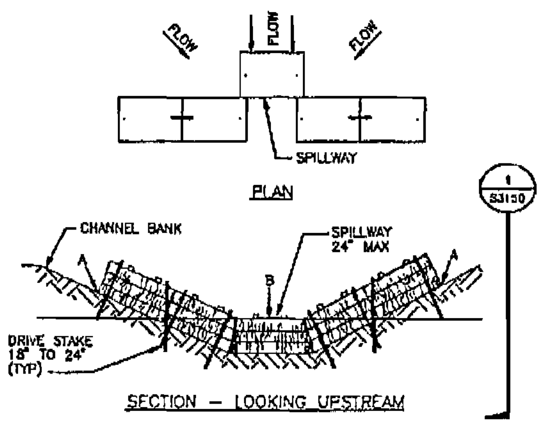
EROSION CONTROL PLAN SHEET

PROJECT / DRAWING NUMBER: 147651-4STE-S3100 REV 0

FIGURE 3.8-6

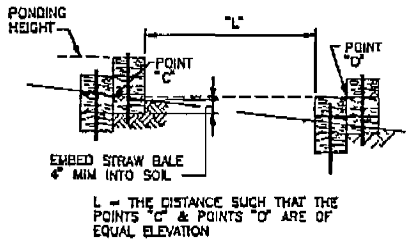


STRAW BALE BARRIER CONSTRUCTION DETAIL
NO SCALE



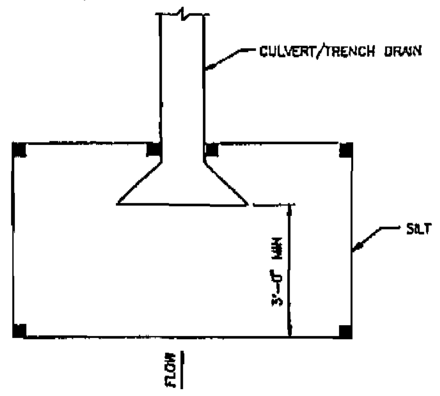
NOTES:
1. EMBED BALES 4" INTO SOIL AND "KEY" BALES INTO CHANNEL BANKS.
2. POINT "A" MUST BE HIGHER THAN POINT "B" (SPILLWAY HEIGHT)
3. PLACE BALES PERPENDICULAR TO THE FLOW WITH ENDS TIGHTLY ABUTTING.
4. SPILLWAY HEIGHT SHALL NOT EXCEED 24".
5. INSPECT AFTER EACH SIGNIFICANT STORM, MAINTAIN AND REPAIR PROMPTLY.

STRAW BALE CHECK DAM IN DRAINAGE WAY
NO SCALE

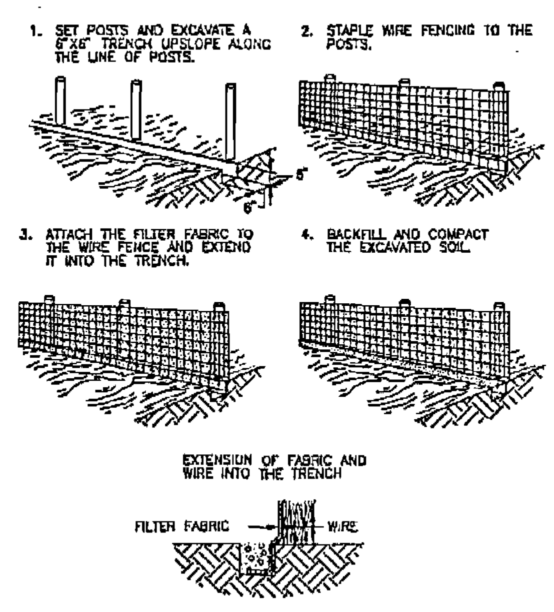


SECTION 1

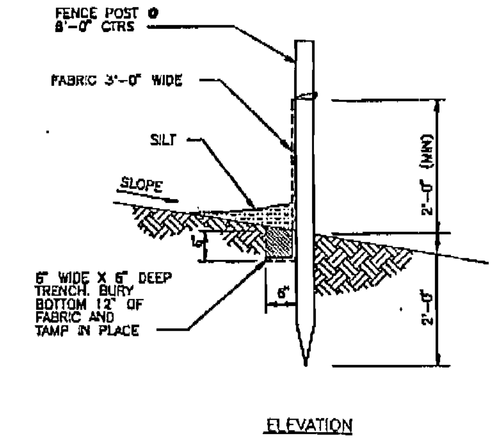
SPACING BETWEEN CHECK DAMS
NO SCALE



SILT FENCE
CULVERT/TRENCH DRAIN
INLET PROTECTION
NO SCALE

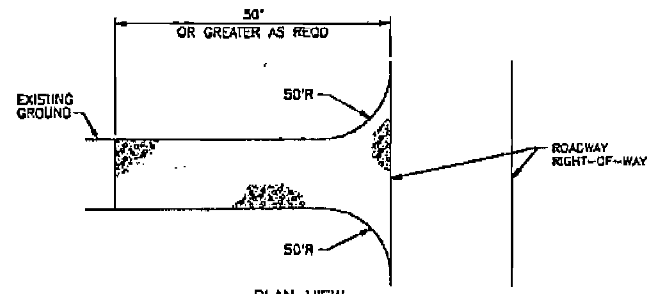


PLANS

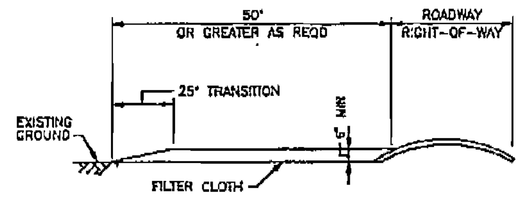


ELEVATION

SILT FENCE DETAIL
NO SCALE



PLAN VIEW



PROFILE

TYPICAL STABILIZED CONSTRUCTION ENTRANCE
NO SCALE
SEE NOTES 2 & 3

NOTES

1. SEE DWG S3000 FOR GENERAL NOTES, LEGEND, AND ABBREVIATIONS.
2. PROVIDE APPROPRIATE TRANSITION BETWEEN STABILIZED CONSTRUCTION ENTRANCE AND PUBLIC R.O.W.
3. DESIGN CRITERIA FOR STABILIZED CONSTRUCTION ENTRANCE.
   A. STONE SIZE – USE ASTM C-33, SIZE NO 2 OR 3, USE CRUSHED STONE.
   B. THICKNESS – NOT LESS THAN 8 INCHES.
   C. WIDTH – NOT LESS THAN FULL WIDTH OF POINTS OF INGRESS OR EGRESS.
   D. LENGTH – 50 FEET MINIMUM WHERE THE SOILS ARE SANDS OR GRAVEL OR 100 FEET MINIMUM WHERE SOILS ARE CLAYS OR SILTS, EXCEPT WHERE THE TRAVELED LENGTH IS LESS THAN 50 OR 100 FEET RESPECTIVELY. THESE LENGTHS MAY BE INCREASED WHERE FIELD CONDITIONS DICTATE.
   E. FILTER CLOTH – WILL BE PLACED OVER ENTIRE AREA PRIOR TO PLACING OF STONE.
   F. MAINTENANCE – THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ON TO PUBLIC RIGHT-OF-WAY THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE OR ADDITIONAL LENGTH AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHT-OF-WAY MUST BE REMOVED IMMEDIATELY.

FOR PERMITTING PURPOSE ONLY
APPROVED FOR CONSTRUCTION

NO	DATE	REVISIONS AND RECORD OF ISSUE
0	04/01/2008	ISSUED FOR CONSTRUCTION

I HEREBY CERTIFY THAT THIS DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF FLORIDA.
SIGNED
DATE REG NO.

BLACK & VEATCH CORPORATION
ENGINEER · DRAWN MRR
CHECKED · DATE 04/01/2008

FLORIDA MUNICIPAL POWER AGENCY
CANE ISLAND POWER PARK UNIT 4

EROSION CONTROL
SECTIONS AND DETAILS

PROJECT · DRAWING NUMBER: 147651–4STE–S3150 · REV 0
CODE
AREA

FIGURE 3.8–7

3.8.5.2 Construction Monitoring and Maintenance. In general, all erosion and sedimentation control measures will be checked weekly and after each significant rainfall event. Items, including the following, will be checked:

- Silt fences and straw bale dikes will be inspected after each significant rainfall and during prolonged periods of rainfall. Required repairs will be made within 24 hours.
- Sediment deposits at barriers will be removed when the deposit depth reaches approximately one-half the height of the barrier.

An FDEP issued, but federally required, National Pollution Discharge Elimination System (NPDES) General Permit for construction storm water discharges and accompanying Storm Water Pollution Prevention Plan will be required. A partially completed NOI is included in Subsection 10.2.1.2.

3.8.5.3 Permanent Control Measures. Permanent erosion and sedimentation control measures within the CIPP will include the runoff collection system (i.e., ditches, culverts, and trenches), surfaced traffic and work areas, nonworking areas with established vegetation, and the site runoff detention basin. These measures will minimize erosion and potential sedimentation into Reedy Creek Swamp.

The permanent erosion and sediment control system will be installed as early as possible during construction and will remain in service throughout the life of the project. The primary components of this system will be established vegetation, surfacing, aggregate and concrete ditches, culverts, and trenches that will collect the site runoff and direct it to the site runoff basin. The system will be maintained and monitored during construction and operation. When Unit 4 is constructed, uncontaminated storm water will flow into the storm water detention basin. In the event that the storm water detention basin overflows, the overflow will be directed through a weir and the storm water will then be allowed to sheet flow.

The drainage system will require periodic inspection, maintenance, cleaning, and occasional repair work. Inspection will be completed on a seasonal basis and after any severe rainfall event. The condition of the ditches, culverts, and weirs will be noted. Cleaning or repair of the drainage structures will be completed as required.

The existing Storm Water Pollution Prevention Plan prepared for Units 1, 2, and 3 operations will be amended to include Unit 4 facilities.

3.8.6 Potentially Contaminated Areas

Flows originating from potentially contaminated areas, and any storm water runoff generated in these areas, will not be collected in the surface water management system. These flows, which include miscellaneous plant drains and drainage from oil containment areas, will be routed through the oil/water separators for treatment prior to discharge.

After passing through the separator, these flows are routed to an onsite percolation pond. Operation of the percolation pond is discussed in detail in Section 5.3 Impacts for Water Supplies.

The following potentially contaminated areas currently exist and will be added with the construction of Unit 4:

- Steam Turbine Step-up Transformer.
- Combustion Turbine Step-up Transformer.
- Auxiliary Transformers.
- CTG and STG Lube Oil Pumping Units.
- Circulating Water Acid Storage Tank.

All of the transformers will be constructed with a curbed secondary containment area. The containment area will be sized to confine 110 percent of the volume of oil stored within the equipment and a sufficient allowance for the design rainfall storm event. The discharge from the containment areas will be conveyed to a new oil/water separator.

The secondary containment associated with the circulating water acid storage tank will be designed in accordance with Chapter 62-762, FAC, aboveground storage tank systems. The containment area will discharge all rainwater to the neutralization basin. Refer to Subsection 3.6.6 for descriptions of the miscellaneous chemical drains and neutralization basin.

The lube oil pumping units secondary containment areas are designed such that all of the rainwater is collected and conveyed to the oil/water separator for treatment prior to discharge. The containment areas are sloped to a drainage collection point (a gate valved discharge pipe). The discharge pipe from each containment area is interconnected and routed to the oil/water separator by gravity.

An oil/water separator is provided for separation of any oil and grease from contaminated wastewaters and storm waters. Treated separator effluent (water) will be discharged to an onsite percolation pond. The oil phase will be periodically pumped from the separator and disposed offsite by a licensed waste management contractor. The effluent from the separator will be low in the structure to allow the water to underflow while the oil is retained for later removal. The separator is sized to contain the volume of oil produced by the total failure of the single largest source served by the separator, with the exception of the valved step-up transformer and lube oil pumping unit containment areas.

3.9 Construction Materials and Equipment Handling

The major components associated with the Unit 4 installation include the following:

- CTG.
- HRSG.
- Generator Step-up Transformers.
- Cooling Tower.
- STG.
- Miscellaneous Services Building.
- Power Distribution Center.
- Water Storage Tanks.

The major components and all other required equipment and materials will be delivered to the CIPP by truck. All deliveries associated with construction and operation will utilize the site access road that connects to Old Tampa Highway. All deliveries will be cleared through a call-box at the main gate. Once onsite, construction materials and equipment will be directed to the construction lay-down area or its permanent location for offloading.

3.10 References

United States Department of Agriculture; Soil Conservation Service, *Urban Hydrology for Small Watersheds,* Technical Release 55, Washington, D.C., June 1986.

US Department of Commerce; Weather Bureau, *Rainfall Intensity-Duration-Frequency Curves,* Technical Paper No. 25, Washington D.C., December 1955.

United States Weather Bureau, *Rainfall Frequency Atlas of the United States for Durations from 30 Minutes to 24-Hour and Return Periods from 1 to 100 Years,* Technical Paper No. 40, Washington, D.C., May 1961.

South Florida Water Management District, *Environmental Resources Permit Information Manual Volume IV,* West Palm Beach, Florida, 2000.

4.0 Effects of Site Preparation and Plant and Associated Facilities Construction

This section identifies and describes the potential impacts from construction of the proposed CIPP Unit 4 Project (Unit 4) and site development on the social, physical, and natural resources of the site and vicinity. The potential impacts of Unit 4 and site development are assessed on the basis of the existing site and vicinity conditions described in Section 2.0, as well as in terms of compliance with applicable regulations and standards.

4.1 Land Impact

Construction of Unit 4 will occur entirely within the previously permitted 47 acre power block area on the central portion of Cane Island. Approximately 24.2 acres of this area will be temporarily impacted during construction of Unit 4; 9 acres will be permanently impacted. As discussed in Section 6.0, no new offsite transmission facilities will be required for construction or operation of Unit 4, which will be interconnected to the existing CIPP substation, approximately 500 feet southeast of the new unit.

4.1.1 General Construction Impacts

The power block facilities will be located on 9 acres, which will include several buildings and equipment pads. Concrete or aggregate surfacing will be used around the unit, with asphalt paved roads around the perimeter. The cooling tower, demineralized water tank, fire protection/service water tanks, and surrounding equipment are within an aggregate surfaced area. The area between the Unit 3 cooling tower and the storm water detention basin will be converted from a grass/lawn-like cover to aggregate surface. The storm water detention basin will be located southeast of Unit 4 and will occupy 1.41 acres. The area north of Unit 4 and the new cooling tower will be used for construction laydown and parking. This area will be seeded when construction is complete. As discussed in Section 6.0, no new offsite transmission facilities will be required for construction or operation of Unit 4, which will be interconnected to the existing CIPP substation. A few of the existing transmission poles in the power block area will be relocated to accommodate Unit 4.

The area proposed for the Unit 4 facilities is, for the most part, the construction equipment/materials lay-down area that was used during construction of Unit 3. This area is generally grassland with scattered trees located north of Unit 3. The 1.41 acre storm water pond associated with Units 3 and 4 will be located immediately north of the existing switchyard and will encroach into the sand pine scrub area. A new 12.5 acre construction equipment/materials lay-down area for Unit 4 will be located immediately north of the Unit 4 power block and cooling tower. The area of the existing transmission line corridor along the southern part of the CIPP, outside of the conservation area, may also be used for construction parking. Facility locations are shown on Figure 2.1-3 in Section 2.0.

No explosives will be used during construction. No paved roads will be required for Unit 4 construction access. Unimproved trails are available in the construction area so that new roads will not be needed for CIPP or Unit 4 construction area access. No railroad spur will be required. The CSX Railroad operates a track adjacent to the southern property boundary that could be used for deliveries.

Construction of Unit 4 will modify the existing terrain. The Unit 4 facilities areas will be cleared and grubbed. The power block area will be raised to the minimum floor elevation of 82 feet NGVD. The Units 3 and 4 storm water pond will require modification to accommodate Unit 4 runoff. Construction materials, such as concrete, steel, and aggregate, will be delivered to the site by trucks.

4.1.2 Roads

No new roads connecting to state roads will be required for Unit 4 construction or operation. Therefore, the "Utility Accommodation Guide" assessment is not required.

A new paved road will be constructed around the Unit 4 power block and connected to the existing plant road system as shown on Figure 2.1-3 in Section 2.0.

4.1.3 Flood Zones

The plant access road and Units 1, 2, and 3 buildings were placed above the 10 year, 24 hour and 100 year, 72 hour design rainfall events, respectively, as required by the SFWMD regulations. Unit 4 buildings will also be placed above the 100 year, 72 hour design rainfall event. Compensating storage volume to offset the loss of flood storage capacity from Unit 4 will be provided by expanding the Unit 3 storm water detention pond.

4.1.4 Topography and Soils

As described in Subsection 4.1.1 above, the proposed construction area is, for the most part, the construction lay-down area used during construction of Unit 3. This area is a relatively flat, grassland with scattered trees. The storm water detention basin associated with Units 3 and 4 will be located in a relatively flat sand pine scrub area. The soils in both of these areas are generally sandy.

Construction will begin with the installation of erosion and sedimentation control structures at the perimeter of the construction areas. The construction areas will then be cleared, grubbed, and prepared for buildings and foundations. The storm water detention basin will be excavated early to collect storm water runoff from the construction area and provide fill material. Additional offsite fill will be required to facilitate drainage. A minimal amount of fill will be required in the construction area to match elevations and facilitate drainage. Final paving, grading, and landscaping will complete Unit 4 construction. In addition to the erosion and sedimentation control measures, water sprays will be used to control fugitive dust.

Subsurface modifications may also be required in the power block area, after testing, because of the karst topography of the project area. Modification techniques may include vibroflotation, vibroreplacement, or possibly, sinkhole grouting. The purpose of these modifications is to increase the load bearing strength of the in situ soils and subsoils.

The modifications will minimize the potential for sinkhole formation in the power block area. The results of the modifications and construction will increase the amount of impervious area, reduce the permeability and percolation rates of the site, and increase the site runoff rate. As described above, the purpose of the storm water detention basin is to compensate for the loss of pervious area and provide runoff/flood storage capacity. These modifications will not alter the aesthetics or viewshed features of the project area because of the flat terrain and extensive buffer surrounding the power block.

4.1.5 Solid Wastes and Wastewater Disposal

Waste oils, greases, hydraulic fluids, construction wastes, and garbage will be collected, stored, and removed for disposal at a properly licensed landfill or resource recovery facility by the general contractor or individual construction contractors. Such activities will be supervised and controlled by the Construction Manager. Table 4.1-1 indicates the treatment and disposal methods of these wastes and wastewaters generated during construction.

Clearing existing vegetation will generate vegetation wastes that will be disposed of by the construction contractor in either a permitted solid waste landfill, a permitted composting facility, or burned in accordance with state and local requirements.

Table 4.1-1
Waste Streams and Wastewater Streams Associated with Construction

Potential Waste Streams	Quantity	Quality	Discharge Point	Treatment Prior to Discharge	Hazardous
Stone Column Pile Installation Water	11,000,000 gallons	Well water	Infiltration into surficial aquifer where piles install with some runoff to storm water pond or general construction area drainage	Best management practices used for construction storm water	No[(a)]
Well Development and Test Water	15,000,000 gallons	Well water	Storm water runoff pond and existing cooling towers	None	No
HRSG Hydro	200,000 gallons	Ammoniated demin water (pH 9-10) 2 ppm ammonia	Toho Water Authority reclaim water line or percolation pond	pH adjustment	No[(b)]
Condenser Hydro	200,000 gallons	Demin water (pH 6-8)	Storm water detention basin	Filter before discharge	No[(a)]
Misc. Hydro and Flush Water	5,000,000 gallons	Service or well water with trace oil/grease	Percolation pond or Storm water detention basin	Filter before discharge	No[(a)]
Cooling Tower Drain and Clean	800,000 gallons	Service or well water	Storm water detention basin	None	No[(a)]
Cooling System Water Flush	50,000 gallons	Demin water	Storm water detention basin	Filter before discharge	No[(a)]
Steam Blow Quench Water	300,000 gallons	Service or well water	Storm water detention basin	Filter before discharge	No[(a)]
HRSG and Preboiler Piping Chem Cleaning	250,000 gallons	Demin water; expected to be nonhazardous	Offsite	Perform toxicity characteristic leaching procedure (TCLP) test. If non-hazardous, to percolation pond. If hazardous, hauled off by a licensed contractor.	No[(b)]
Service/Fire Water Tank Hydro	1,000,000 gallons	Well or Service water	Storm water detention basin	Filter before discharge	No[(a)]
Demin Storage Tank Hydro	1,000,000 gallons	Service or well water	Storm water detention basin	Filter before discharge	No[(a)]
Preservatives in Tubes	150,000 gallons	Water soluble corrosion inhibitor	Offsite	Labeled, sealed container properly stored for disposal by licensed contractor	Yes[(c)]

Table 4.1-1 (Continued)
Waste Streams and Wastewater Streams Associated with Construction

Potential Waste Streams	Quantity	Quality	Discharge Point	Treatment Prior to Discharge	Hazardous
Oily Solid Wastes	Conditionally Exempt SQG	Hazardous	Offsite	Labeled, sealed container properly stored for disposal by licensed contractor	Yes[c]
Oily Rags	Conditionally Exempt Small Quantity Generator (SQG)	Hazardous	Offsite	Labeled, sealed container properly stored for disposal by licensed contractor	Yes[c]
Non-Oily Rags	Conditionally Exempt SQG	Hazardous	Offsite	Labeled, sealed container properly stored for disposal by licensed contractor	Yes[c]
Punctured Aerosol Cans	Varies	Empty cans	Offsite by approved scrap metal contractor	Metal recycling container	No[c]
Captured Paint Residues from Punctured Aerosol Cans	Conditionally Exempt SQG	Hazardous	As hazardous waste in accordance with 40 CFR 261	Labeled, sealed container properly stored for disposal by licensed contractor	Yes[c]
Fluorescent Bulbs and Batteries	Conditionally Exempt SQG	Not applicable	Offsite	Contained onsite; recycled as universal waste	No[a]
Wood	Varies	Not applicable	Offsite	Contained onsite: recycled or disposed in landfill	No[a]
Metals	Varies	Not applicable	Offsite	Contained onsite; approved scrap metal contractor	No[a]
Plastics	Varies	Not applicable	Offsite	Contained onsite; transported offsite by an FDEP approved recycle facility or disposal facility	No[a]

[a] Assessment based on process knowledge.
[b] Assessment based on analytical test.
[c] Assessment based on regulation, material safety data sheets (MSDSs), or manufacturer's recommendation.

Vegetative matter removed during site clearing may be burned onsite after receiving the proper authorizations from Osceola County. The majority of the uncleared area will be totally cleared. In the very northern part of the site, some trees may be removed from the proposed construction/lay-down area, but this area may not require total clearing.

Wastewater will be generated from vibroflotation and vibroreplacement of the site soils from hydrostatic testing and cleaning of various items of equipment, such as the HRSG, piping, and tanks and from well water development and testing. Most of these wastewaters will be nonhazardous and will be released to either the storm water detention basin or conveyed to the onsite percolation pond. The well test water may be used as cooling tower makeup for the existing units. Waste and wastewater stream information is presented in Table 4.1-1. Any wastewater streams determined to be hazardous will be transported offsite by a licensed contractor. Many of the processes that generate wastewater during construction are the same wastewater streams identified on Figure 3.5-1, Water Mass Balance - Unit 4 Operation. However, construction will generate additional wastewater streams and solid wastes that are identified in Table 4.1-1. FMPA requests approval of these wastewaters and solid waste disposal methods during Unit 4 construction.

The well water or plant service water system will provide water for chemical cleaning of the HRSG and steam piping, as well as for the steam blow processes. Chemical cleaning involves cleaning the HRSG and piping systems prior to operation. The steam blow process involves cleaning steam piping systems to remove accumulated weld spatter, slag, filings, and other debris. If this material is not removed prior to steam turbine operation, the steam turbine will be damaged by the metal particles, which would strike the blades and steam path at very high velocities. Blowing through the piping system with steam removes these materials, rust, grease, and other fabrication and construction residues prior to commencement of combined cycle operation. The steam blow process requires treated water from the existing demineralization system and may require an additional portable demineralization unit for a short period of time. Chemical cleaning residuals will be hauled offsite by a licensed transporter and disposed of accordingly. Potable demineralization units generate spent resins that will be regenerated offsite. The wastewater generated from the existing demineralization system will be treated and discharge to the Toho reclaim water line south of the site as during normal plant operation.

4.2 Impact on Surface Water Bodies and Uses

Reedy Creek crosses the southwest portion of the CIPP, more than 1/2 mile from the power block area. The Bonnet Creek Canal is adjacent to the CIPP on the north and west, 1/2 mile from the power block area at its nearest point. Reedy Creek Swamp wetlands buffer these surface waters from the power block area.

4.2.1 Impact Assessment

Construction of Unit 4 will have no adverse impact on Reedy Creek, the Bonnet Creek Canal, or the onsite wetlands. The erosion and sedimentation control measures will control and minimize such impacts beyond the 15.2 acre construction zone. The Units 3 and 4 storm water pond and temporary drainage ditches will be developed early in the construction sequence to serve as the construction drainage system, providing treatment of storm waters and dewatering discharges through detention. In the event of storm water pond overflow, treated waters could enter the wetlands surrounding Cane Island.

4.2.2 Measuring and Monitoring Programs

If required during construction, water quality grab samples will be collected from storm water pond overflow discharges. The sample will be tested in accordance with FDEP standards.

The size of the construction area will require an NPDES Storm Water General Permit for storm water discharges associated with construction activity. One condition of this permit is the preparation and implementation of a pollution prevention plan specific to the construction site. In addition to a description of the project, potential pollutant sources, and the storm water management control plan, the pollution prevention plan must include spill prevention and system maintenance/inspection procedures.

4.3 Ground Water Impacts

Construction of various facilities for Unit 4 will involve dewatering excavated areas to support construction activities.

4.3.1 Impact Assessment

Ground water impact during construction will result from dewatering activities and the use of ground water during construction.

4.3.1.1 Dewatering. During Unit 4 construction, numerous facilities will be constructed below the surface of the upper unconfined ground water system in the power block area. It will be necessary to dewater the excavations for construction of the new oil/water separator, wastewater sump, circulating water lines, circulating water pump pit, blowdown tank pit and sump, Miscellaneous Services Building vault, accessory module containment sump, wash water collection sump, power distribution center vault, and other minor structures. The locations of these facilities are shown on Figure 3.1-1.

The majority of the underground utilities, miscellaneous pits, and sumps will be constructed above the ground water surface and will have no impact on the ground water at the site.

Dewatering for the above noted structures will be completed with a series of well points installed around the perimeter of the excavation. The dewatering activity duration will be short term, less than 6 months. The dewatering will be to a depth of approximately 15 feet below ground surface in some areas and 10 feet in others. Total withdrawal volumes will be less than 1.3 mgd during the initial 2 week dewatering period. After this period, flows should drop to less than 0.6 mgd. Discharge from the dewatering activities will be directed to the Units 3 and 4 storm water pond and possibly to the Units 1 and 2 storm water pond. Much of the discharge into the storm water pond is expected to percolate through the base of the pond.

The dewatering effects will be temporary and limited to the power block area. The ground water system will return to its original state after completion of the dewatering.

4.3.1.2 Well Water Usage. Water from the existing wells and the new wells will be used to support construction activities. Well water will be used for dust suppression, installation of stone column piles, hydrostatic testing of piping systems, tanks and equipment, flushing/cleaning activities, tank filling, and other miscellaneous usages. It is expected that 20 to 25 million gallons of well water will be used during the construction and commissioning of Unit 4. Maximum usage rate should be less than 1 mgd. During construction, this water usage is requested from the Unit 4 emergency cooling water allocation.

In addition, the development and testing of the new wells will require pumping of water from the Upper Floridan Aquifer. The wells will be developed and tested as they are completed. Pumping from each well should not exceed 1 mgd during the development and testing.

The above well water usages will have insignificant impacts to the ground water as shown on the operational modeling presented in Section 5.3, which has much higher usage rates and insignificant impacts.

4.4 Ecological Impacts

Site preparation and construction of Unit 4 facilities will impact upland habitats and resident wildlife. Site preparation and construction of Units 1, 2, and 3 previously impacted upland and wetland habitats, and resident wildlife. No wetlands impacts are anticipated, nor are any adverse impacts to federal or state threatened or endangered species. Black & Veatch, at the request of KUA and as required by resource agencies, acquired the necessary permits for Units 1 and 2 construction and prepared and implemented the *Cane Island Project Mitigation Plan* (1993) to mitigate and compensate for ecological impacts associated with ultimate site development. Upon certification of Unit 3, many of the environmental and ecological conditions from these permits were transferred to the CIPP Site Certification and remain in effect today.

4.4.1 *Impact Assessment*

Site preparation for construction of the Unit 4 facilities will permanently impact wildlife and wildlife habitat. All vegetation will be permanently removed from the Unit 4 power block and construction lay-down area location during site preparation. As a result, there will be a decrease of wildlife habitat, which will reduce the primary productivity at CIPP and displace wildlife from the impact areas. Additionally, wildlife species may also be temporarily displaced from adjacent communities by the noise, fugitive dust, and activity caused by construction.

Unit 4 construction will clear 24.2 acres within the permitted ultimate development area on Cane Island. Gopher tortoises may require relocation during site preparation and construction of Unit 4 and associated facilities. The FGFWFC, now the FFWCC, issued Permit No. OSC-6 for the incidental "take" of gopher tortoises and their burrows during Units 1 and 2 construction. The FFWCC has confirmed that this permit is still valid, which allows the CIPP staff to relocate tortoises to the appropriate management areas onsite. A copy of this permit is included in Subsection 10.5.7.

4.4.2 *Measuring and Monitoring Programs*

Vegetation, wildlife, and wetlands monitoring and management is required by the resource agencies as mitigation for CIPP development and operation. These efforts are conducted in compliance with the *Cane Island Project Mitigation Plan* (1993) and subsequent approved modifications to the plan. Qualitative habitat monitoring efforts began in 2005 and will be conducted once every 5 years for the life of the project. Wildlife and vegetation are now sampled at CIPP by opportunistic observations. Prescribed burns and treatment of exotic vegetation are the major habitat management programs used at the CIPP. Annual management and monitoring reports are submitted to the SFWMD and FFWCC.

4.5 Air Impacts

During the Unit 4 construction phase, atmospheric dust (i.e., particulate matter) will be generated from the mechanical disturbance of granular material that becomes exposed to the wind at the construction site. This material is often referred to as fugitive dust, as its source is particulate matter that cannot be reasonably discharged to the atmosphere in a confined flow stream.

4.5.1 Sources of Construction Fugitive Dust

Construction activities, including material moving activities, site preparation, and vehicle traffic, if not properly monitored and controlled, have the potential to generate large amounts of fugitive dust. The construction activities at CIPP may be generally broken down into the following three phases as related to generating fugitive dust:

- Phase 1 - Debris Removal--Debris removal consists of removing any manmade or natural obstructions from the site. Under extreme circumstances, this phase of construction may require blasting, explosion, or mechanical dismemberment of the obstructions to clear the site. However, this level of debris removal is not anticipated and will likely be limited to material loading/unloading, small disturbed areas, and vehicular travel on unpaved surfaces.
- Phase 2 - Site Preparation--Site development includes the general site grading and soil stabilization techniques used to bring the site to a final or near final grade. These techniques will typically include cut and fill as well as aggregate surfacing operations. Typical fugitive dust emission sources of this phase include movement of large earth moving equipment (e.g., scrapers and dozers) over disturbed surfaces, material/aggregate loading and unloading, and vehicular travel on unpaved surfaces.
- Phase 3 - General Construction--The construction phase is the final, but generally the longest, phase of the construction activities. This phase includes everything from foundation work, structural and reinforcing steel erection, exterior/interior operations, to piping/electrical work and final landscaping. In contrast to Phases 1 and 2, fugitive dust emissions during Phase 3 are somewhat sporadic in nature, depending on the delivery schedule of parts and materials, with many simultaneous operations throughout the construction site.

Within each of the major construction phases described above, there may be one or more specific construction activities occurring during that phase that can be a source(s) of fugitive dust. The fugitive dust emission sources resulting from these construction activities are typically assigned into one of four categories that include: disturbed surface areas, open storage piles, earth moving, and vehicular traffic. The following sections describe each of these fugitive dust emission sources as applicable to the Unit 4 construction site.

4.5.1.1 Disturbed Surface Areas. Many of the construction activities will result in disturbed surface areas in the power block area that may be subject to wind erosion. A disturbed surface refers to a portion of the earth's surface which has been physically moved, uncovered, destabilized, or otherwise modified from its undisturbed natural soil condition, thereby increasing the potential for emissions of fugitive dust. Disturbed surfaces do not include those areas which have been restored to a natural state such that the vegetative ground cover is similar to any adjacent natural conditions, or which have been paved or covered by a permanent structure.

4.5.1.2 Storage Piles. A storage pile is any accumulation of bulk material, generally with a 5 percent or greater silt content, that is not fully enclosed or otherwise covered or chemically stabilized. The storage pile may be composed of soil, stored temporarily during cut and fill operations, or may be composed of aggregate used in foundation work and construction materials. Storage piles of this nature are typically left uncovered because of the frequent need to transfer material into and out of storage. Fugitive dust emissions may occur at several points in the storage pile cycle, including material loading or unloading (material handing), and dust entrainment in wind currents on the exposed slopes of the storage pile.

4.5.1.3 Earth Moving. Earth moving refers to a broad range of construction activities using heavy equipment to clear land, excavate, cut and fill, etc. The activities may directly expose material to wind erosion through excavation, scraping, hauling, loading, transferring, and other material moving activities.

4.5.1.4 Vehicular Traffic. Vehicular traffic associated with the construction activities will include worker vehicles, equipment deliveries, and heavy construction vehicle traffic over unpaved surfaces. When a vehicle travels on an unpaved surface, the force of the wheels on the surface causes the material on the road to become lifted, dropped, and then entrained into the turbulent air currents caused by the velocity of the vehicle. As such, the vehicle's speed and size, silt content of the road surface, and material moisture content all play a role in determining the magnitude of the fugitive dust emissions from unpaved roads.

4.5.2 Available Control Methods

Fugitive dust emissions may result from a variety of activities that can require a multitude of different emission control alternatives. Additionally, the relatively short-term nature of construction activities makes some fugitive dust control methods more cost-effective and practical than others. Tables 4.5-1 through 4.5-4 describe several available fugitive dust control methods and practices associated with disturbed surfaces, storage piles, earth moving, and vehicular traffic that may be employed to control fugitive dust during construction. The available control methods identified in each table are summarized in the following subsections. The control methods ultimately used will be agreed upon by the Contractor and Construction Manager.

4.5.2.1 Watering. Watering is an effective stabilizing tool that controls fugitive dust by using water (or water combined with a surfactant) as a binder by either maintaining soil moisture content or establishing a crust that prevents soil movement under windy conditions. The water can be applied by any suitable means such as trucks, hoses, and/or sprinklers appropriate for site characteristics and size. Watering is most effective when an area or road surface is prewatered, with frequent reapplication as necessary.

4.5.2.2 Chemical Stabilizers. Chemical stabilizers are commercially available and contain approved chemical soil binding agents to artificially crust soil and prevent soil movement during windy conditions. Stabilizers are effective for temporary periods. Depending on the application rates and/or materials involved, stabilizer use may extend the durability and longevity of the artificial soil crust for longer periods. As such, stabilizers are best suited for areas not subject to daily disturbance.

4.5.2.3 Physical Barriers. Physical barriers provide a sheltered region behind the barrier to allow gravitational settling of larger fugitive dust particles, as well as a reduction in the wind's erosion potential. Physical barriers reduce the mechanical turbulence generated by the ambient winds for a downwind distance proportional to the height of the barrier and porosity. Physical barriers include portable wind screens and fences, partial enclosures, straw bales, tree lines, and terraces. Wind screens and fences can be used to control a wide variety of fugitive dust sources at a construction site, including disturbed areas and storage piles, and to provide shelter for material handling operations such as storage pile loading or unloading. Furthermore, fences and screens are portable and, thus, capable of being relocated around the construction site as necessary.

Table 4.5-1
Available Fugitive Dust Control Methods for Disturbed Surface Areas

Control Method	Description/Remarks
Work Practice Controls	Paving identified roads and access points early in the construction process, phasing of earth moving activities to reduce disturbed surface extent, compaction and/or stabilization of disturbed surfaces as quickly as practical. Onsite traffic control program to direct, control, and restrict unnecessary traffic.
Watering	Use of water or water plus a wetting agent to suppress fugitive dust over disturbed areas. Typically applied with spray nozzles attached to a special truck adapted for this purpose. Temporary in nature, but cost-effective even with frequent reapplication.
Graveling	Graveling of high volume traffic areas within the disturbed area of the construction site provides a physical stabilization of the exposed surface and covers the surface with a material having a lower silt content.
Wind Fencing	Wind fencing provides a sheltered region behind the fence line, which reduces the mechanical turbulence generated by the ambient winds. The sheltered area of dust control is proportional to the physical height of the fence around the disturbed surface.
Physical Stabilization	Physical stabilization methods involve the application of materials such as rock, bark, wood chips, straw, or other suitable materials to cover the exposed surface, thus preventing the wind from disturbing the surface particles. Graveling is one example of physical stabilization.
Vegetative Stabilization	Vegetative cover provides a physical stabilization and wind shelter of the disturbed surface. However, it is effective only on inactive areas of the disturbed surfaces where frequent mechanical (i.e., earth moving) activities are not anticipated. As such, it is typically not implemented during short-term construction activities.
Chemical Stabilization	Chemical stabilization is a dust suppressant method that uses binding agents that, upon application, bind the surface particles to form a protective crust over the disturbed surface. Typically, the temporary nature of construction activities does not warrant their use as they are not cost-effective over such a small scale of application and reapplication.

Table 4.5-2
Available Fugitive Dust Control Methods for Storage Piles

Control Method	Description/Remarks
Work Practice Controls	Minimize temporary material storage pile(s) size and number by utilizing phased earth moving activities. Minimize drop height when adding material to the pile(s) and perform loading and unloading operations on the leeward (down wind) side of the pile. Cleanup spillage and maintain material to the confines of the pile.
Watering	Use of water or water plus a wetting agent to suppress fugitive dust from the storage pile. Temporary in nature, but cost-effective even with frequent reapplication.
Wind Fencing/ Barriers	Wind fencing or partial temporary barriers or enclosures provide a sheltered region in the vicinity of the storage pile, which reduces the mechanical turbulence generated by the ambient winds. The sheltered area of dust control is proportional to the physical height of the fence or barrier.
Chemical Stabilization	Chemical stabilization is a dust suppressant method that uses binding agents that, upon application, bind the surface particles to form a protective crust over the disturbed surface. Typically, the temporary nature of construction activities does not warrant their use as they are not cost-effective over such a small scale of application and reapplication.

Table 4.5-3
Available Fugitive Dust Control Methods for Earthmoving

Control Method	Description/Remarks
Work Practice Control	Onsite traffic control program to direct, control speed, and restrict unnecessary traffic. Reduce offsite hauling with balanced cut and fill operations and construction management. Cover truck beds during material hauling operations.
Watering	Preapplication of water or water plus a wetting agent to suppress fugitive dust prior to and, to the extent possible, during earth moving operations. Temporary in nature, but cost-effective even with frequent reapplication.
Wheel Washing	Water washing of heavy construction equipment wheels and undercarriages at construction site egress points to prevent material trackout and deposition outside of the construction site. System may include automatic or manual sprayers and/or drive-though wheel washing basins.
Wind Fencing/ Barriers	Wind fencing or partial temporary barriers or enclosures provide a sheltered region in the vicinity of the earth moving, which reduces the mechanical turbulence generated by the ambient winds. The sheltered area of dust control is proportional to the physical height of the fence or barrier.
Chemical Stabilization	Chemical stabilization is a dust suppressant method that uses binding agents that, upon application, bind the surface particles to form a protective crust over the disturbed surface. Typically, the temporary nature of construction activities does not warrant their use as they are not cost-effective over such a small scale of application and reapplication.

Table 4.5-4
Available Fugitive Dust Control Methods for Vehicular Traffic

Control Method	Description/Remarks
Work Practice Controls	Onsite traffic control program to direct, control speed, and restrict unnecessary traffic. Reduce offsite hauling with balanced cut and fill operations and construction management. Cover truck beds during material hauling operations.
	Unpaved Roads
Watering	Application of water or water plus a wetting agent to suppress fugitive dust prior to, and to the extent possible, during earth moving operations. Temporary in nature, but cost-effective even with frequent reapplication.
Graveling	Graveling of high volume unpaved traffic areas provides a physical stabilization of the exposed surface and covers the surface with a material having a lower silt content.
Chemical Stabilization	Chemical stabilization is a dust suppressant method that uses binding agents that, upon application, bind the surface particles to form a protective crust over the disturbed surface. Typically, the temporary nature of construction activities does not warrant their use as they are not cost-effective over such a small scale of application and reapplication.

4.5.2.4 Vegetative Stabilization. Vegetative stabilization uses established cover or locally recommended varieties and seeding rates that approximate native cover to stabilize soil against wind erosion and emission of fugitive dust. Either temporary or permanent cover can be established using standard agricultural methods, hydroseeding, or hand seeding. Temporary cover, for areas that will be disturbed again after a short period, is best established by using rapidly emerging varieties of vegetation with rapid initial growth. Maintenance of the original vegetative cover and opportunistic vegetation such as weeds and native species are also options, but may require some watering to establish.

Vegetative stabilization as a fugitive dust control method is most effective only on inactive areas of the disturbed surfaces where frequent mechanical (i.e., earth moving) activities are not anticipated. As such, it is typically not implemented on a large scale for control of fugitive dust emissions during short-term construction activities.

4.5.2.5 Work Practice Controls. There are a number of work practice controls that can be applied to reduce the fugitive dust emissions during construction activities. These work practices include both active and preventive fugitive dust control methods, which are typically integrated into a comprehensive construction management plan. The following list contains several common work practice activities that may be applied to reduce fugitive dust emissions during construction:

- Pave designated roads, construction parking areas, and site access points early on in the construction project.
- Compact or stabilize disturbed areas as quickly as practical.
- Phase earth moving activities to reduce disturbed surface extent.
- Maintain original vegetative ground cover as long as practical.
- Establish a traffic control plan to decrease disturbance of soil and fugitive dust generated from unnecessary vehicle traffic by posting speed limit signs (generally less than 10 mph), erecting fencing and/or placing barriers to direct traffic, designating specific haul and/or access roads, designating offsite or limited access onsite parking for construction workers, and limiting public vehicle access.
- Reduce offsite hauling via balanced cut and fill operations.

4.5.2.6 Physical Stabilization. Physical stabilization methods, which involve covering a disturbed surface with a material that prevents the wind from entraining the surface particles, may be used during many phases of the construction project. Common physical stabilizing materials include rock, gravel, crushed or granulated slag, bark, wood chips, straw, or hay that are harrowed into the top few inches of the disturbed surface.

4.6 Impact on Human Populations

This section evaluates the impact on human population because of the construction of Unit 4. Areas of potential impact include those on land use, employment, traffic, housing, and public facilities and services. The assumed construction period for the 300 MW unit is from July 2009 through April 2011, a 22 month construction period.

4.6.1 Land Use Impacts

The CIPP is an existing site and is well suited for power generation. The project renderings in Section 3.2 illustrate that the site is surrounded by dense forest and is generally not visible from offsite areas.

Unit 4 will not require an expansion of the CIPP site and will not impact the land use of the surrounding area, which consists of hardwood swamp, rendering commercial or residential development unlikely in the foreseeable future. This is especially true since the land north, northeast, and west of the project site has been reserved for nature conservation. Furthermore, no alternative land uses have been proposed for the site.

No housing units will be affected by the site expansion. No lost income will result from any reduction of regional products or productivity whether due to displacement of persons from the land proposed for the site or otherwise.

4.6.2 Construction Employment and Income

The construction of Unit 4 will provide direct employment and wage benefits to the area through the significant construction workforce required at the site. Figure 4.6-1 shows the projected Unit 4 monthly workforce during the 22 month construction period. At peak, a total of 313 construction workers are projected to be onsite, and this figure includes 280 direct laborers and 33 construction management and utility personnel. This peak is expected to occur in month 15 of construction, which is projected to occur in September 2010. Over the 22 month construction period, an average of 160 direct craft construction workers and an average total workforce (also including indirect craft workers, construction management, and local utility staff) of 182 workers is expected. In all, a total of 4,010 man-months (334 man-years) of construction employment are expected, and 3,526 man-months (294 man-years) are expected to be direct craft employment.

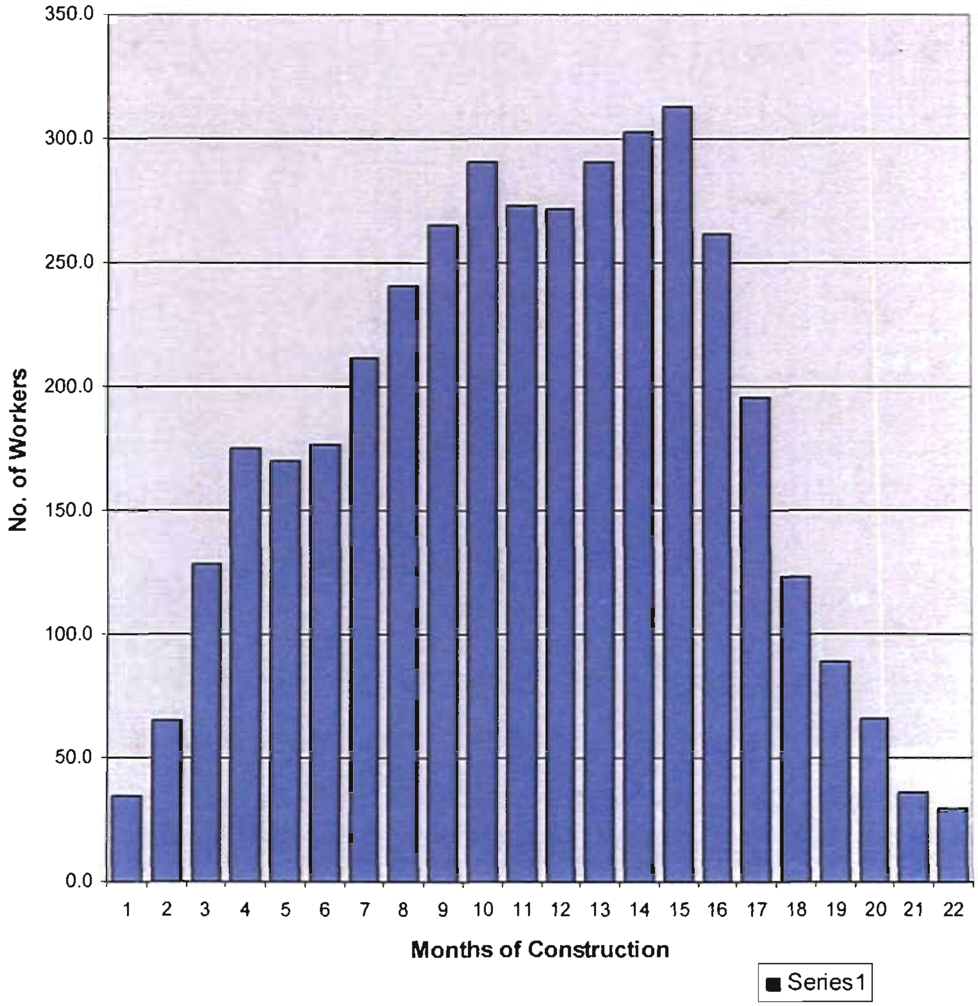


Figure 4.6-1
Unit 4 Site Manpower by Month

The wage benefits caused by Unit 4 construction are significant, given the 4,010 man-months of employment that will be required and the relatively high hourly wages paid to skilled construction workers and construction management staff. Total Unit 4 construction wages are budgeted at $42.75 million, of which $36.90 million is expected to be for direct labor. The multiplier impacts expected to result from these employment and income benefits are outlined in Section 7.0.

4.6.3 Construction Traffic

The CIPP is located off of Old Tampa Highway, 1 mile northwest of Intercession City. The CIPP is near Interstate 4, which will facilitate quick and easy access during the construction period. Other nearby routes include State Roads 535, 528 (Beachline Expressway), 408 (the East-West Expressway), and 417 (the GreeneWay). US 17/92, and 441 are also major highways in the area, and the likely commuting routes to the site are described in Section 2.0. Given the proximity of the CIPP to Orlando and Kissimmee, the entire Orlando-Kissimmee MSA is considered to be within easy commuting distance of the site.

Figure 4.6-2 shows the projected number of round trips that are anticipated to the site during construction. Included in the total round trips are those made by the construction workforce, as well as those needed to deliver supplies and equipment to the lay-down area, which will be entirely onsite. During the anticipated peak month of worker construction (month 15), it is anticipated that 7,076 round trips will be made to the site. This is equal to approximately 337 trips per day, on average, assuming 21 work days in the peak month. The additional trips to the site will present a small and temporary increase in the traffic flow near the site. Deliveries will be dispersed throughout the day, while worker trips will be linked to the morning and evening commute.

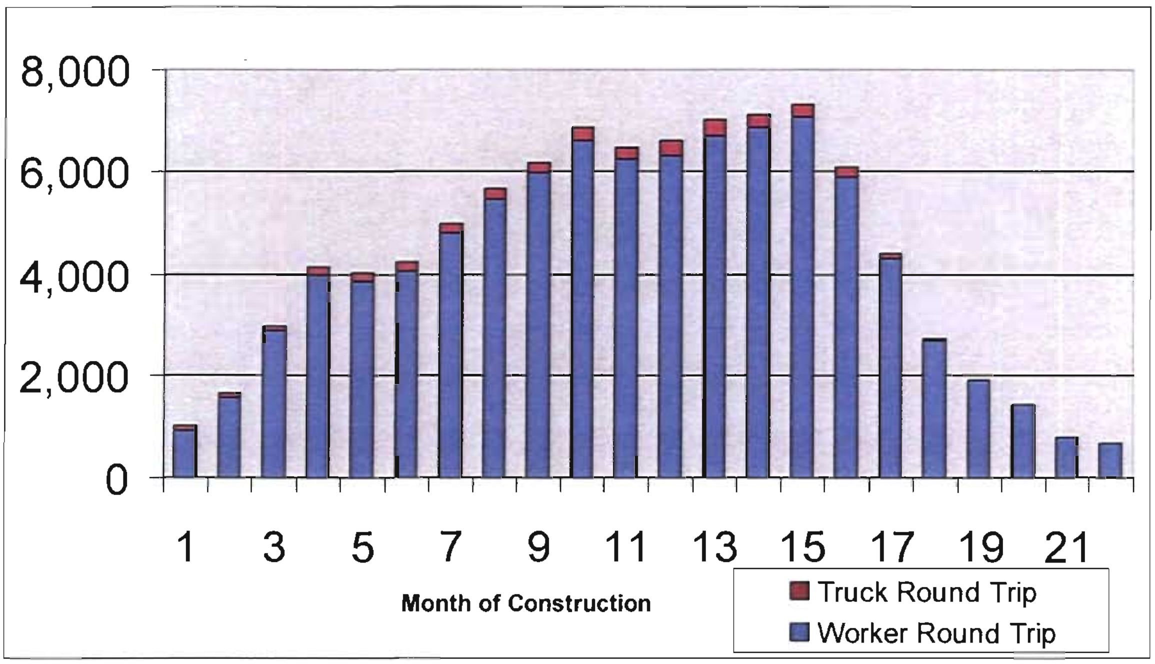


Figure 4.6-2
Projected Monthly Round Trips to the Site

4.6.4 Housing Impacts

Power plant construction can have the potential to impact area housing. Potential impacts could include the direct removal of housing units, visual impacts due to the location of the project near residential areas, and a housing shortage if an influx of workers requires long-term lodging during construction. As explained below, however, none of these potential impacts will occur because of the construction of the Unit 4 project.

The Unit 4 facility will not require any housing units to be removed at the site because the site is already used for power generation. Incremental visual impacts will also be minor because of the remote location of the site, which is surrounded by a significant tree buffer.

The potential for housing shortages has historically been an issue with large coal plant construction in sparsely populated areas of the western United States. However, experience has shown that smaller (i.e., noncoal plant) projects located in or around urban areas typically do not have a noticeable impact on the housing market. This is because housing impacts are mainly a function of the size of the construction workforce and its need for relocation throughout construction. The need to relocate is a function of the workforce available within a reasonable commuting distance of the work site. The Electric Power Research Institute (EPRI) has found that the construction workforce for a power plant project can be reasonably expected to commute without relocating during construction from a distance of over 70 miles, with instances of more than 100 miles commuting distance found in each of the construction projects studied. When a radius of 70 miles around the CIPP is considered, the large metropolitan areas of Kissimmee, Orlando, Palm Bay, Deltona, Lakeland, and portions of Tampa are within commuting distance of the site. Given these relatively large nearby population areas and the size of the construction force in the nine counties adjacent to the site, it is likely that nearly all craft workers will remain residing in their permanent residences during the 22 month construction period.

This conclusion is supported by the fact that most workers will not be onsite for the entire 22 month construction time frame, which further reduces the likelihood that relocation of a significant number of workers will occur. If occasional or short-term lodging is needed by some of the workforce, Osceola County has several hotels or other short-term lodging options, because it is a destination for vacationers and recreational enthusiasts. The Orlando area also has dozens of lodging options, and the Census data in Subsection 2.2.6.10 indicate a rental vacancy rate of 8.53 percent (in 2000). Assuming this vacancy pattern has remained fairly consistent, there would be ample housing rental options available should some of the craft workforce choose to relocate during construction. There may be a small number of specialized construction management staff that would relocate to the area on a temporary basis during construction, but there will be ample accommodations for this small number, and the economic benefits to the community will be positive.

4.6.5 Public Facilities and Services

Potential areas of impact from construction of Unit 4 may include fire and police protection, hospital services, the demand for water, wastewater, electricity, and natural gas supplies, the demand for landfill and trash removal services, and impacts on school facilities. Overall, however, construction practices will be planned to minimize or eliminate negative impacts on community facilities and services. Furthermore, the cost of services that are likely to be required is included in the construction budget and will be paid for on a user fee basis.

A construction safety plan will be developed for the site. This plan will help to ensure a safe working environment for the construction workforce. The safety plan will comply with all Occupational Safety and Health Administration (OSHA) requirements, and workers will have training to familiarize themselves with the training plan. Each member of the construction workforce will be required to abide by the requirements. Examples of proven safety measures include the use of hard hats in construction areas, and the required use of hard hats for people working at elevated heights.

Controlled access to the CIPP, Unit 4 footprint and lay-down area for equipment and supplies will be provided. This will include a badge system to control staff access and a security guard onsite. The facility will also have security lighting, some security fencing, and fire suppression equipment. First aid stations will be established and maintained throughout the construction area. Selected individuals in the construction workforce will receive first aid training. Standard procedures will also be adopted for spill prevention and containment, injury response, and requests for assistance for local police, fire, and ambulance service.

The construction safety plan is expected to mitigate safety risks, creating a minimal need for police, fire, and hospital support or services. Should a worker require hospitalization as a result of an onsite injury, the Orlando-Kissimmee area has complete hospital care facilities capable of handling almost any type of medical need, as described in Subsection 2.2.6.15.

The primary emergency responders to the CIPP will be the Osceola County Sheriff and the Intercession City Fire Department. The backup emergency responders to the site will be from the Osceola County Fire Department based in Kissimmee, approximately 9 miles from the CIPP.

The educational system is not expected to feel any impacts from the construction of the facility. Construction workers are expected to commute to their existing residences instead of relocating to the area. Therefore, area school enrollment should not rise significantly because of Unit 4 construction.

Water requirements during the construction will be supplied from onsite wells. The site will also reduce the need for an interconnected wastewater system through the use of portable restrooms for construction workers.

Waste produced by Unit 4 construction will be placed in large industrial dumpsters that will be obtained from and serviced by a contracted provider. The dumpsters will be emptied on a schedule that will avoid overfilling during the construction phase, and fees will be paid to cover all disposal costs.

4.6.6 Impacts from Construction Noise

Noise emissions attributable to construction activities are highly variable, depending on the location and operating load of the construction equipment and the construction phase activities. The following subsections discuss the methodology for estimating the construction activity noise emissions, the offsite noise levels associated with Unit 4 construction, and the evaluation of the noise levels and potential impacts to nearby receptors.

4.6.6.1 Construction Activities. Major construction phases will consist of site preparation, foundation construction, building and equipment erection, and site clean-up/facility startup. Noise emissions will vary with each phase of construction depending on the construction activity and the associated equipment required for each phase.

Site preparation will require the use of heavy diesel-powered earth moving equipment. Examples of this equipment include bulldozers, scrapers, dump trucks, graders, and front-end loaders. Noise emissions during site preparation will be dominated by the diesel engine noise.

Foundation construction primarily will involve concrete handling equipment such as concrete trucks, mixers, vibrators, pumps, and pile installation (if necessary) equipment. Some earth moving equipment will also be required to backfill the foundations. Foundation construction activities will primarily be centered at the power block and cooling tower equipment areas.

The equipment and building installation will involve diesel-powered earth moving equipment, mobile cranes, equipment delivery, impact wrenches, saws, drills, and air compressors. Again, these activities will primarily be centered at the power block and cooling tower equipment areas.

Site cleanup and facility startup will generally result in lower noise emissions than the preceding construction phases with the exception of steam blowout of the HRSG and steam lines. At the end of construction, low-pressure steam is passed through the HRSG to remove any debris within the steam lines prior to connecting with the steam turbine. Noise is produced when the steam is vented to the atmosphere. Typical steam blow schedules will involve several steam releases lasting several hours each, occurring within a 2 week period. While vent silencers are often employed, the steam blow noise is still easily discernable at offsite locations.

4.6.6.2 Construction Noise Ordinance. The Osceola County noise ordinance includes an exemption for noise resulting from construction activities occurring during daytime hours (7:00 a.m. to sunset). Construction activities resulting in offsite noise emissions during nighttime hours (1 minute after sunset to 6:59 a.m.) are subject to a sound level limit of 45 dBA at the CIPP property boundary. Construction activities will be scheduled during daytime periods (7:00 a.m. to sunset) to the fullest extent possible. Some activities will require extended hours of operation because of scheduling constraints or to maintain structural integrity of concrete pours. Nighttime construction will be limited to low-noise activities to the fullest extent possible. All construction activities will be conducted in accordance with the applicable local noise regulations.

At the end of construction, low-pressure steam is passed through the HRSG to remove any debris within the steam lines prior to connecting to the steam turbine. Noise is produced when the steam is vented to the atmosphere. Typical steam blow schedules will involve several steam releases lasting several hours each, occurring within a 2 week period. While vent silencers are often employed, the steam blow noise is still easily discernable at offsite locations. Local residents will be notified through correspondence sent through the U.S. Postal Service by FMPA, in advance of the steam blow period, to minimize adverse impacts related to steam blows.

4.6.6.3 Construction Noise Impacts. The variable nature of construction noise is best represented by an average noise level. The average noise levels account for the type and quantity of equipment, the typical usage of each piece of equipment, and typical noise levels of the equipment used during each phase of construction. The typical types of equipment, equipment usage, and equipment noise emissions for each phase of construction are listed in Table 4.6-1. Estimates of the construction equipment usage and noise levels are based on information provided in the EPA Document PB-250 430, Noise Emission Standards for Construction Equipment (EPA 1975) and the Power Plant Construction Noise Guide, Report No. 3321, prepared by Bolt Beranek and Newman Inc. (1977).

Table 4.6-1
Typical Construction Equipment Noise Emissions

Phase	Equipment	Lp[a] (50 ft) (dBA)	Qty	Usage[b]	Usage Factor[b]	Acoustic Max Factor[b]	L_{av}[c] (50 ft) (dBA)
Road Construction/ Site Preparation	Backhoe	82	1	0.04	-14	-5	63
	Concrete Vibrator	70	2	0.16	-8	-3	62
	Drill	83	1	0.16	-8	-3	72
	Grader	86	1	0.30	-5	-7	74
	Diesel Generator	76	1	0.16	-8	-3	65
	Trencher	86	1	0.21	-7	-3	76
	Mobile Crane	80	1	0.16	-8	-11	61
	Dozer	77	2	0.60	-2	-6	72
	Front End Loader	77	2	0.33	-5	-6	69
	Compactor/Roller	79	1	0.50	-3	-4	72
	Truck, Large	84	3	0.16	-8	-10	71
	Water Truck	84	1	0.35	-5	-10	69
Foundation	Mobile Crane	80	1	0.16	-8	-11	61
	Front End Loader	77	2	0.33	-5	-6	69
	Concrete Vibrator	70	3	0.16	-8	-3	64
	Pile Driver	81	2	0.04	-14	-3	67
	Drill	83	1	0.16	-8	-3	72
	Saw	70	2	0.21	-7	-3	63
	Torque Wrench	78	2	0.05	-12	-3	66
	Concrete Deliv. Truck	81	3	0.25	-6	-10	70
	Concrete Pump	74	1	0.08	-12	-3	59
	Concrete Saw	96	1	0.04	-14	-3	79
	Chop Saw	82	1	0.04	-14	-3	65
	Bush Hammer	85	1	0.25	-6	-3	76
	Dozer	77	1	0.50	-3	-6	68
	Stationary Crane	79	2	0.33	-5	-15	62
	Backhoe	82	2	0.40	-4	-5	76
	Truck, Large	84	3	0.16	-8	-10	71
	Diesel Generator	76	1	0.16	-8	-3	65
	Compactor/Roller	79	2	0.35	-5	-4	73
	Air Compressor	82	1	0.25	-6	-9	67
Equipment Erection	Mobile Crane	80	2	0.50	-3	-11	69
	Backhoe	82	1	0.20	-7	-5	70
	Truck, Large	84	2	0.16	-8	-10	69
	Stationary Crane	86	2	0.50	-3	-15	71
	Diesel Generator	76	1	0.33	-5	-3	68
	Welder, Diesel	81	1	0.65	-2	-3	76
	Grinder	80	1	0.25	-6	-3	71
	Chop Saw	82	1	1.00	0	-3	79
	Drill	83	1	0.16	-8	-3	72
	Torque Wrench	78	3	0.16	-8	-3	72
	Air Compressor	82	1	0.25	-6	-9	67

Table 4.6-1 (Continued)
Typical Construction Equipment Noise Emissions

Phase	Equipment	Lp[a] (50 ft) (dBA)	Qty	Usage[b]	Usage Factor[b]	Acoustic Max Factor[b]	L_{av}[c] (50 ft) (dBA)
Startup	Grader	86	1	0.10	-10	-7	69
	Trencher	86	1	0.10	-10	-3	73
	Drill	83	1	0.16	-8	-3	72
	Torque Wrench	78	5	0.16	-8	-3	74
	Diesel Generator	76	1	0.16	-8	-3	65
	Truck, Large	84	4	0.05	-12	-10	68
	Mobile Crane	80	1	0.05	-12	-11	57
	Air Compressor	82	1	0.25	-6	-9	67

Notes:
[a]Average sound pressure level at 50 feet (15 m) horizontal distance from the equipment.
[b]Based on information provided in the Power Plant Construction Noise Guide prepared by Bolt Beranek and Newman Inc. and information available from previous similar projects.
[c]Energy average sound pressure level at 50 feet (15 m) horizontal distance from the equipment for work shift of 7 to 10 hours.

Sources:
Power Plant Construction Noise Guide, 1977.
US EPA, *Noise emission standards for construction equipment*, 1975.

Table 4.6-2 shows the potential sound level increase caused by construction activities at each of the three nearest noise sensitive locations shown in Figure 4.6-3. In general, noise emissions associated with the construction of Unit 4 may cause short-term (temporary) increases in the daytime sound levels at the nearest noise sensitive locations of 0 to 5 dBA. While these sound level increases are typically considered "imperceptible" to "clearly noticeable," the construction noise is temporary in nature and these impacts are anticipated to be less than significant, particularly after sunset.

Table 4.6-2
Estimated Average Construction Noise at
Receptor Location for Each Construction Phase

Construction Phase	Nearest Receptor	Estimated Construction Noise Level L_{av}, dBA	Measured Average Daytime Background Sound Level L_{90}, dBA[(a)]	Estimated Future Background Sound Level During Construction, dBA[(b)]	Potential Temporary Sound Level Increase, dBA
Site Preparation	R1	40	52	52	0
	R2	40	39	43	4
	R3	40	38	42	4
Foundation	R1	41	52	52	0
	R2	41	39	43	4
	R3	41	38	43	5
Equipment Erection	R1	40	52	52	0
	R2	40	39	43	4
	R3	40	38	42	4
Startup[(a)]	R1	38	52	52	0
	R2	38	39	42	3
	R3	38	38	41	3

[(a)]Based on the median sound level recorded between the hours of 7:00 a.m. and 7:00 p.m.
[(b)]Sound level estimates do not include the influence of steam blows.

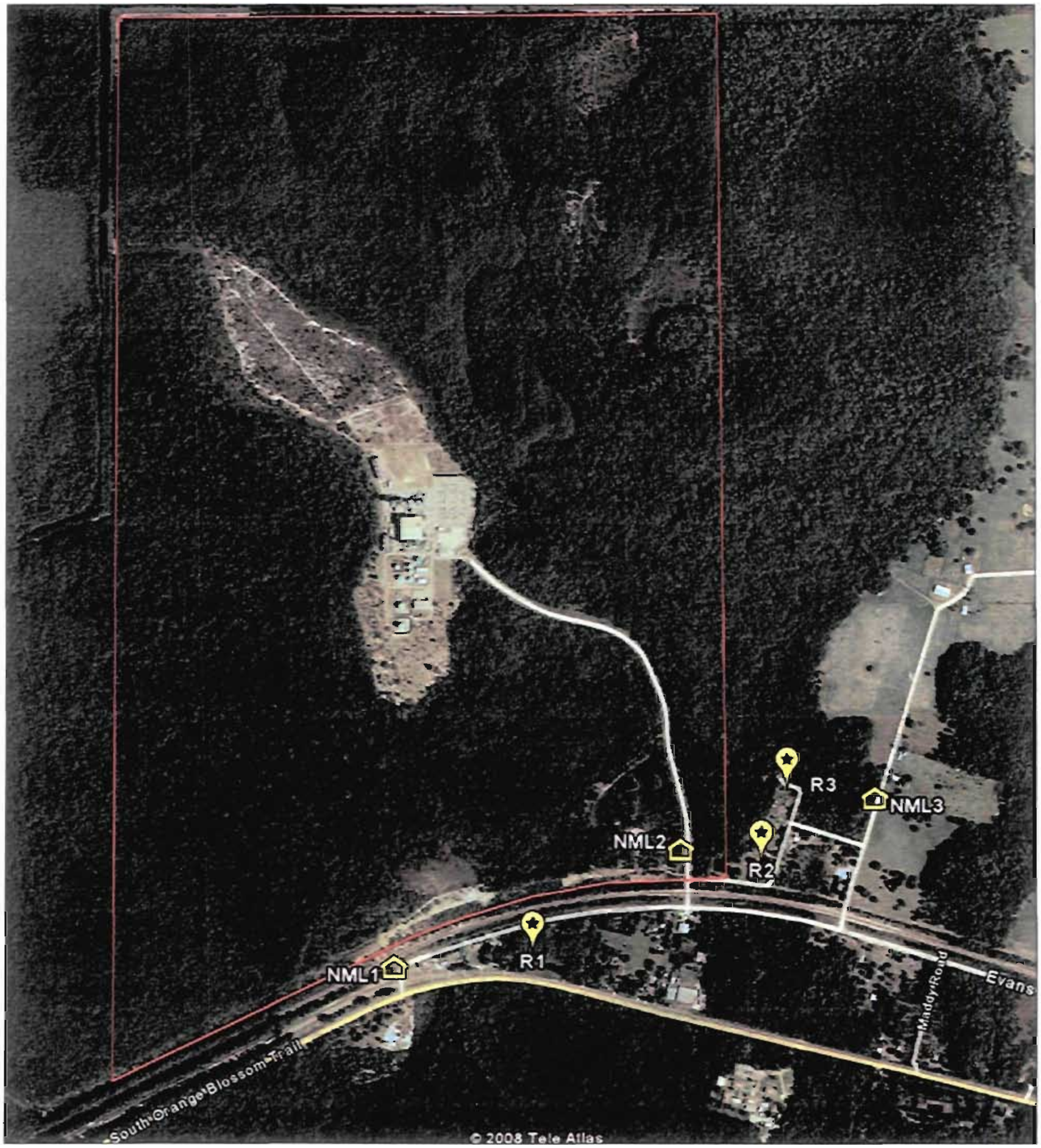


Figure 4.6-3
Nearest Noise Sensitive Receptors R1, R2, and R3

4.6.7 Storm Water Impacts

The construction phase will disturb more than 5 acres of land and will alter the amount of storm water discharged from the site. However, the amount of additional runoff from the construction site is not expected to be sufficient to negatively affect any of the nearby residences. This is due to the fact that storm water runoff control efforts will be designed and installed, including grading, a storm water detention pond, and strategically placed barriers of silt fences and/or straw bales to control runoff speeds and avenues. Even without control efforts, the distance to the nearest residence and the intervening swamp would prevent any additional runoff from the construction site from creating any negative impact on residents.

4.6.8 Visual Impacts

No adverse visual impacts are anticipated from the Unit 4 construction project. The new combined cycle unit will be located entirely within the established CIPP boundaries. Heavy forest vegetation exists between the power block area and Old Tampa Highway, the closest public thoroughfare, and the location of the nearest residences. The combination of the setback distance and the type and density of the buffer vegetation renders the power block nearly invisible from public view. The heights and locations of the Unit 4 facilities will not significantly alter the aesthetics of CIPP or the region.

Potentially, the most visible aspect of the Unit 4 project will be the stack. The HRSG stack will be approximately 160 feet tall and will be located in the north end of the power block. With the 100 foot Unit 2 and 130 foot Unit 3 stacks already in this area, the net visual effect is not expected to be significant. However, the top of the stack may be visible from Old Tampa Highway or US-17/92 directly south of the CIPP. No fogging or visible plume is anticipated from the new Unit 4 cooling tower under normal operating conditions. Exhaust stack plume visibility is expected to be minimal.

Trees will need to be removed for Unit 4 construction. In compliance with Osceola County Ordinance 87-15, which is designed to preserve and maintain a minimum amount of tree canopy, the CIPP received a tree removal permit during construction of Units 1 and 2 for ultimate site development. Therefore, a tree removal permit is not required for Unit 4 or future unit development.

4.7 Impact on Landmarks and Sensitive Areas

There are four recorded sensitive areas within 5 miles of the CIPP. These areas include Parcel 3 of the FDEP/Disney Conservation Easement north and west of the site, the playground/park in Intercession City, and the SOR properties south of Highway 92 and north of the CIPP. The location of the Intercession City playground is shown on Figures 2.2-1 and 2.2-2.

The Fletcher Park Monument and the South OBT Bridge occur within 1 mile of the CIPP as shown on Figure 2.2-2. The Rodgers House and the Homely Cow Dip area are within 5 miles of the CIPP as shown on Figure 2.2-1. In addition, the Disney 5000 13 Bridge in Intercession City, the Lake Wilson Boy Scout Camp in Kissimmee, and the Homestead Cemetery in Davenport are also within 5 miles of the CIPP. Sixteen historic residences occur along the South Orange Blossom Trail, four residences occur along the Old Tampa Highway, one residence occurs along Tallahassee Boulevard, and one residence occurs along Tomoka Road.

There should be no significant impacts on the FDEP/Disney Conservation Easement or the SOR properties resulting from construction of Unit 4. The distances, buffer zones, and onsite measures to control erosion, sedimentation, fugitive dust, and noise will effectively mitigate potential impacts. The construction workforce traffic may have a minimal impact on traffic through Intercession City, particularly during the rush hours. Although the playground/park in Intercession City fronts the Old Tampa Highway, construction traffic will be requested to use Highway 17/92 to avoid travel on the secondary streets of Intercession City.

The historic landmarks in the project area will not be impacted by project construction. Construction traffic will be requested to use Highway 17/92 to avoid travel on secondary streets and bridges in Intercession City. Therefore, these landmarks will be avoided.

4.8 Impact on Archaeological and Historic Sites

A Phase I cultural resources investigation of the CIPP property was conducted in May 1992, as described in Subsection 2.2.5. None of the discovered sites were considered eligible for listing on the *National Register of Historic Places.* The FDHR concurred and indicated that project construction could proceed without further involvement from the FDHR. Therefore, construction of Unit 4 is not expected to impact any known or recorded archeological or historic resources. If any such resources are discovered during construction, work in that area will stop, and the FDHR will be contacted within 24 hours for an appropriate plan of action.

4.9 Special Features

Construction debris, trash, and garbage will be collected in appropriate containers and removed from the site by a contractor for disposal at an approved landfill or resource recovery facility.

4.10 Benefits from Construction

The benefits associated with the construction of Unit 4 will include increased employment for regional workers. Attendant to this employment will be the benefits of increased sales tax revenue for Osceola County and the City of Kissimmee.

Increased income due to economic activity will also accrue to the region. Among these benefits are the increased revenue that will be enjoyed by the owners/operators of temporary housing facilities in the area. Although most of the construction employees are expected to commute daily from their established, permanent residences within the impact areas, some workers will be traveling into the impact area from more distant residences. Even though EPRI studies have indicated that these workers travel without their families, their individual housing needs will have to be satisfied. They will predictably patronize the hotels and recreation vehicle campgrounds that already exist in the area. Although this theoretically could cause a shortage of short-term housing, this situation is more optimistically interpreted as meaning that the owners of short-term housing will enjoy an increase in business. Realistically, a shortage of short-term housing is not anticipated since the area is a major tourist destination that has a tremendous amount of short-term housing capacity.

A detailed and comprehensive analysis of the benefits created by the site preparation, plant construction, and operation of the proposed CIPP expansion is contained in Section 7.0 of this application.

4.11 Variances

No variances from applicable codes or standards are requested for or during construction of Unit 4.

5.0 Effects of Plant Operation

5.1 Effects of the Operation of the Heat Dissipation System

Unit 4 will use a mechanical draft cooling tower as the major equipment heat dissipation/cooling method. Cooling tower makeup water is taken from, and blowdown is returned to, the Toho reuse water pipeline adjacent to the site.

5.1.1 Temperature Effect on Receiving Body of Water

Cooling towers are used to dissipate heat produced during power generation. There will be no discharge of cooling waters from the heat dissipation system to surface waters or wetlands. Blowdown from the heat dissipation system is combined with evaporative cooler blowdown, neutralization basin effluent, and steam cycle blowdown and returned to the Toho reuse water pipeline. The pipeline provides water to other downstream users and ultimately discharges to the Imperial site regional percolation pond treatment facility. Temperature of effluent from the CIPP is not anticipated to affect the regional percolation ponds.

5.1.2 Effect on Aquatic Life

There will be no discharge of effluent from the site into surface waters; no impacts to aquatic life are expected.

5.1.3 Biological Effects of Modified Circulation

Unit 4 will use municipal reuse water for cooling water. Modified circulation of a water body will not occur; therefore, there will be no biological effects.

5.1.4 Effects of Offstream Cooling

The purpose of this section is to assess the potential environmental impacts associated with the operation of the new eight-cell mechanical draft cooling tower associated with Unit 4. Potential impacts from the cooling towers include plume induced fogging and icing, deposition from circulating water drift, and visible plume formation. The following subsections describe the new cooling tower, explain the methodology and assumptions used to quantify the magnitude and extent of the impacts, present the results of the modeling, and discuss the potential environmental effects.

5.1.4.1 Cooling Tower Description. The new proposed combined cycle unit necessitates the construction and operation of a new cooling tower. The proposed cooling tower will be a mechanical draft, counterflow, wet design cooling tower incorporating plume abatement features. The preliminary design consists of one tower consisting of eight cells arranged along a north-northwest/south-southeast axis.

5.1.4.2 Technical Approach. A computer modeling analysis was performed to evaluate the magnitude and extent of the potential environmental impacts resulting from the operation of the new cooling tower. The Electric Power Research Institute (EPRI)-sponsored Seasonal/Annual Cooling Tower Plume Impact (SACTI, Version 11-1-90) model was used to quantify the cooling tower impacts. This computer code is an outgrowth of an earlier model evaluation study carried out by A. J. Policastro of the Argonne National Laboratory (ANL). Improved plume and drift models in the code have been calibrated with existing field and laboratory data and then subsequently verified with new data not included in the calibration process. The SACTI model has been widely used by electric utilities and their consultants to assess cooling tower plume impacts for incorporation into various types of environmental impact studies.

The methodology used in the SACTI model is based on the assumption that up to 35 distinct plume categories, based on the local ambient meteorological conditions and cooling tower design characteristics, can be identified at any given site. For mechanical draft cooling tower designs, the SACTI code assumes that 10 additional distinct plume categories may exist which are characteristic of plume induced ground level fogging and icing. In other words, depending on the type of cooling tower and the specific site conditions, a cooling tower plume may exhibit up to 45 distinctly different sets of plume characteristics (e.g., plume height, plume spread, plume downwash, and plume dispersion). In the case of mechanical draft cooling tower arrangements, the effects of the orientation of the tower with respect to merging cell plumes and structure induced downwash are simulated through the use of representative wind directions and the specific tower configuration.

The cooling tower plume in each of the aforementioned categories is produced by a different set of ambient meteorological conditions. Hourly meteorological data are used by the SACTI model to compute frequency distributions of the meteorological conditions responsible for each plume type within the assumed plume category. The SACTI model performs the following computational functions in a sequential manner to determine the representative plume categories and plume impacts:

- <u>Meteorological Data Preprocessor</u>--The meteorological data preprocessor performs three subtasks to delineate plume categories and calculate representative parameters for each category. In the first subtask, hourly surface meteorological data are read and invalid or missing parameters and hours are discarded. For each valid record, the model uses cooling tower parameters such as tower height, tower effective exit diameter, tower effective heat rejection, and tower effective air flow to calculate additional exit parameters including temperature and velocity, and some nondimensional parameters which characterize the buoyancy of the plume and the stability and saturation of the ambient air.

The second subtask generates frequency distribution tables for ranges of tower, meteorological, and nondimensional parameters as a function of the standard 16 wind directions. These meteorological variables represent the full range of atmospheric conditions affecting plume dispersion and drift deposition. For example, the SACTI model selects temperature ranges from -49° F to 113° F in 9° F intervals. The frequency of actual dry-bulb temperatures occurring in each of those ranges for each of the standard 16 wind directions is tabulated. Likewise, the model tabulates relative humidity values falling between 0 and 100 percent in intervals of 10 percent.

Subtask three uses the frequency distributions from Subtask two to delineate the distinctly different plume categories that could occur from cooling tower operation. Categories are selected so that all categories are roughly equally populated. A single set of representative tower and ambient conditions is then calculated from the range of conditions in each category, and then reassigned to each category.

- Plume Calculations--Using the preprocessor's representative conditions and cooling tower design data (e.g., tower orientation, number of cells, drift droplet spectrum, and salt concentrations), the plume code calculates fogging/icing and the plume's dimensions and depositional characteristics for each plume category and each representative wind direction. For example, assuming 45 total drift and fogging categories and four representative wind directions, a total of 225 plume cases are simulated.

As previously stated, the representative wind directions are used to simulate tower-induced downwash. Therefore, specific output showing the nature and extent of the downwash is not generated by the program. Rather, output is generated for each representative wind direction, and the downwash effects can be inferred from the deposition/fogging/icing gradients.

- Impact Calculations--The various plume code prediction results are used in conjunction with the meteorological data preprocessor's frequency distribution of plume categories and actual wind directions to calculate impacts. The resulting cumulative impacts from all plume categories are tabulated and plotted in the SACTI model output as a function of wind direction and distance from the cooling tower.

5.1.4.2.1 Cooling tower plume model input. The SACTI cooling tower model requires certain site-specific, tower-specific, and circulating water-specific data as input. The input data used in this SACTI cooling tower modeling analysis are discussed below and summarized in Table 5.1-1 with the documented source of the data:

- Site-specific data includes the site's latitude and longitude, time zone, surface roughness height, monthly clearness indices, daily solar insolation values, representative hourly recorded surface meteorological data, and seasonal average morning and afternoon mixing heights.
- Tower-specific data includes information pertaining to the type of cooling tower, dimensions of the tower housing, cell exhaust diameter, heat load, drift rate, design air flow rate, and orientation of the cooling tower cells with respect to the 16 representative wind directions.
- Water-specific data includes the circulating water salt concentration, salt density, and the size distribution of the water droplets in the cooling tower drift.

The latitude, longitude, time zone, and surface roughness height were either directly measured or estimated. The monthly clearness indices and solar insolation values were obtained from Appendix B of the User's Manual for the SACTI Computer Code for a representative location at approximately the same latitude (EPRI 1984).

Five years (1999-2003) of surface meteorological data from Orlando, Florida, collected by the National Weather Service (NWS) and distributed by the National Climatic Data Center (NCDC) were used in the SACTI modeling analysis. These data contained the complete set of surface meteorological parameters (originally in ISH format; subsequently converted to TD-1440 format) necessary to conduct the cooling tower modeling analysis, and are considered representative of the site.

The type of cooling tower, dimensions of the tower housing, cell exhaust diameter, heat load, drift rate, design air flow rate, and orientation of the cooling tower cells were all based on design data.

Table 5.1-1
SACTI Cooling Tower Modeling Input Parameters

		Data Source/Notes
Site-Specific Data		
Site Latitude	28.28 ° N	Measured
Site Longitude	81.53 ° E	Measured
Time Zone	5	Measured
Surface Roughness Height	10 cm	Estimated
Monthly Clearness Indices (K_T)	0.61, 0.61, 0.62, 0.62, 0.63, 0.59, 0.56, 0.55, 0.56, 0.60, 0.64, 0.60	SACTI User's Manual for Tampa, FL
Monthly Average Daily Total Solar Flux (MJ/m^2)	13.76, 16.35, 19.95, 22.79, 24.88, 23.96, 22.29, 20.70, 18.99, 16.94, 14.93, 12.63	SACTI User's Manual for Tampa, FL
Meteorological Data (hourly surface data)	Orlando (1999-2003)	NCDC
Seasonal Average Mixing Heights	436 m (Winter morning) 1,079 m (Winter afternoon) 526 m (Spring morning) 1,524 m (Spring afternoon) 439 m (Summer morning) 1,429 m (Summer afternoon) 436 m (Fall morning) 1,079 m (Fall afternoon)	SACTI User's Manual for Tampa, FL
Wind Instrument Reference Height	10 m (anemometer height)	NCDC
Tower-Specific Data		
Tower Type	Linear Mechanical Draft	Design Criteria
Number of Towers	1	Design Criteria
Total Number of Cells	8	Design Criteria
Effective Exhaust Diameter	25.86 m	Note 1
Tower Height	17.07 m	Design Criteria
Tower Width	25.70 m	Design Criteria
Tower Length	58.60 m	Design Criteria
Total Heat Dissipation Rate	252 MW	Design Criteria
Total Circulating Water	126,000 gpm	Note 2
Total Drift Loss Rate	39.72 g/s	Note 2, based on 0.0005% drift rate.
Total Airflow Rate	4,346.60 kg/s	Note 2

Table 5.1-1 (Continued)
SACTI Cooling Tower Modeling Input Parameters

			Data Source/Notes
Water-Specific Data			
Cooling Tower Salt Concentration	0.002380 g Salt/g Soln		Preliminary Design
Salt Density	2.17 g/cm^3		Estimated
Drift Droplet Spectrum	Drop Size (µm)	Mass Fraction	Estimated, based on EPRI Study *Calculating Realistic PM_{10} from Cooling Towers.*
	0-10	0.0000	
	10-20	0.0020	
	20-30	0.0003	
	30-40	0.0029	
	40-50	0.0130	
	50-60	0.0389	
	60-70	0.1565	
	70-90	0.2846	
	90-110	0.2070	
	110-130	0.1151	
	Drop Size (µm)	Mass Fraction	
	130-150	0.0599	
	150-180	0.0302	
	180-210	0.0144	
	210-240	0.0162	
	240-270	0.0060	
	270-300	0.0160	
	300-350	0.0072	
	350-400	0.0133	
	400-450	0.0073	
	450-500	0.0000	
	500-600	0.0093	

Note 1: Effective exhaust diameter is calculated using an equation from the SACTI User's Manual where the square-root of the total number of cells is multiplied by the actual diameter of a single cell. The total number of cells is eight. The actual diameter of a single cell is 9.14 meters.
Note 2: These values represent the total from the tower and not individual cells as required by the SACTI model.

The size distribution of drift droplets from the cooling tower is required as input to the SACTI model. The size distribution of drift droplets depends on the details of the interior construction, air and water flow through the fill, and the efficiency of the drift eliminators. The cooling tower drift droplet size spectrum data used in this study are based on representative data of other towers with similar drift eliminators. These drift droplet size data are representative of best available technology (BAT) currently utilized in cooling tower drift eliminator design. The concentration of total dissolved solids (TDS) in the cooling tower circulating water was based on using the Toho reuse water as the water supply with the cooling tower operating at 5 cycles of concentration.

5.1.4.3 Cooling Tower Impact Modeling Results. The SACTI cooling tower model was used to predict the magnitude of the cooling tower induced fogging and icing, deposition, and plume length frequency of occurrence while conservatively assuming the cooling tower is operating the entire year under peak conditions. The cooling tower system will dissipate waste heat by evaporating water and releasing the water vapor into the atmosphere. If the ambient air is cold and/or moist, a portion of the emitted water vapor will condense to form small water droplets. This condition is seen as a visible white plume emanating from the cooling tower.

Potential environmental impacts such as fogging, icing, and deposition associated with the cooling tower plumes may arise depending on the meteorological conditions and the environmental setting.

5.1.4.3.1 Plume fogging modeling results. Ground level fogging occurs when the visible plume from a cooling tower contacts the ground. Meteorological conditions favorable for ground level fogging from a mechanical draft cooling tower are generally associated with strong winds (generally greater than 20 mph) which bend the plume to intercept the ground, and high relative humidity (small dew point depression) for easy plume saturation. The cooling tower fogging results are calculated by the SACTI cooling tower model as the maximum number of hours plume induced fogging from a cooling tower could occur for each wind direction. Table 5.1-2 presents the total hours (based on the 5 year meteorological database) of predicted plume fogging associated with the cooling tower. The 16 wind direction labels in the columns of the table represent the direction from the cooling towers that the plume is headed. The data represent the total hours (over the 5 year data base) that the cooling tower plume could induce fogging conditions for a particular direction and distance from the cooling tower.

Table 5.1-2
Total Hours of Predicted Plume Induced Fogging

Distance From Tower (m)	Fogging in the Direction Plume is Headed (Hours)*																
	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	AVG
100.	0.1	0.0	0.1	0.8	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.8	0.1	0.0	0.1	0.8	2.8
200.	0.0	0.0	0.5	0.7	0.0	0.0	0.0	0.0	0.0	1.0	0.5	0.7	0.0	1.0	0.5	1.0	5.9
300.	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.5	0.0	0.0	0.7	0.5	0.6	3.8
400.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5
500.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5
600.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5
700.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2
800.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
900.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1000.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1100.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1200.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1300.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1400.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1500.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1600.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

*Total hours of fogging over 5 years. Average annual hours of cooling tower induced fogging is obtained by dividing the table value by 5.

Source: SACTI cooling tower model.

As the data in Table 5.1-2 indicate, the SACTI model predicts that, on average, fogging would occur approximately 1 hour per year regardless of wind direction and would not extend past 700 meters (2,297 ft) in any direction from the cooling towers. The closest property boundary to the new cooling tower is approximately 615 meters indicating that the small fraction of hours predicted at 700 meters barely reaches past the nearest property boundary.

5.1.4.3.2 Plume icing modeling results. Ground level plume icing (fog ice) is a semi-opaque coating of small granules of ice formed when small water droplets in the visible cooling tower fog freeze rapidly on the ground during conditions of high relative humidity and below freezing temperatures. The SACTI cooling tower model predicted no occurrences of cooling tower plume induced icing based on the 5 year meteorological database. This is consistent with the climate of the area, as records indicate that freezing temperatures occur less than 1 percent of the year on average.

5.1.4.3.3 Water deposition modeling results. Water deposition from a cooling tower occurs when the airborne water droplets coalesce and precipitate downwind of the cooling tower. The pattern of water deposition and the distance of maximum water deposition from the cooling tower are a function of the physical size of the water droplets in the drift, prevailing wind direction, orientation of the cooling tower cells, and the airflow rate.

Table 5.1-3 presents the SACTI model predicted average monthly (based on the 5 year meteorological database) water deposition rate in scientific notation in units of kg/km^2/month associated with the proposed cooling tower. The 16 wind direction labels in the columns of the table represent the direction from the cooling towers that the water deposition is predicted to occur.

Table 5.1-3
Average Monthly Predicted Cooling Tower Water Deposition

Distance From Tower	Water Deposition in the Direction Plume is Headed (kg/km2-month)																
(m)	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	AVG
100.	.48E+03	.13E+03	.65E+02	.28E+02	.42E+02	.24E+03	.26E+03	.34E+03	.56E+03	.31E+03	.21E+03	.23E+02	.23E+02	.12E+03	.12E+03	.99E+02	.19E+03
200.	.79E+04	.43E+04	.41E+04	.32E+04	.69E+04	.58E+04	.45E+04	.34E+04	.62E+04	.38E+04	.35E+04	.25E+04	.42E+04	.37E+04	.30E+04	.23E+04	.43E+04
300.	.71E+04	.31E+04	.25E+04	.53E+04	.97E+04	.32E+04	.27E+04	.24E+04	.45E+04	.27E+04	.24E+04	.31E+04	.54E+04	.20E+04	.19E+04	.19E+04	.37E+04
400.	.12E+04	.89E+03	.10E+04	.79E+03	.16E+04	.17E+04	.13E+04	.71E+03	.12E+04	.90E+03	.86E+03	.48E+03	.89E+03	.11E+04	.73E+03	.37E+03	.98E+03
500.	.22E+04	.11E+04	.10E+04	.13E+04	.22E+04	.14E+04	.10E+04	.81E+03	.15E+04	.98E+03	.82E+03	.70E+03	.11E+04	.79E+03	.70E+03	.56E+03	.12E+04
600.	.19E+04	.87E+03	.73E+03	.12E+04	.20E+04	.90E+03	.71E+03	.68E+03	.13E+04	.71E+03	.62E+03	.67E+03	.11E+04	.55E+03	.51E+03	.50E+03	.94E+03
700.	.14E+04	.63E+03	.47E+03	.84E+03	.14E+04	.58E+03	.49E+03	.42E+03	.83E+03	.54E+03	.46E+03	.45E+03	.71E+03	.37E+03	.37E+03	.32E+03	.64E+03
800.	.11E+04	.45E+03	.33E+03	.69E+03	.12E+04	.41E+03	.36E+03	.32E+03	.62E+03	.38E+03	.32E+03	.37E+03	.58E+03	.25E+03	.25E+03	.25E+03	.49E+03
900.	.97E+03	.39E+03	.27E+03	.37E+03	.71E+03	.33E+03	.30E+03	.28E+03	.54E+03	.33E+03	.28E+03	.24E+03	.34E+03	.20E+03	.21E+03	.21E+03	.37E+03
1000.	.84E+03	.28E+03	.19E+03	.16E+03	.36E+03	.26E+03	.23E+03	.24E+03	.47E+03	.26E+03	.21E+03	.11E+03	.16E+03	.15E+03	.16E+03	.17E+03	.27E+03
1100.	.48E+03	.18E+03	.13E+03	.15E+03	.33E+03	.20E+03	.17E+03	.17E+03	.33E+03	.20E+03	.16E+03	.98E+02	.14E+03	.10E+03	.11E+03	.95E+02	.19E+03
1200.	.37E+03	.13E+03	.86E+02	.12E+03	.24E+03	.15E+03	.13E+03	.14E+03	.27E+03	.16E+03	.12E+03	.71E+02	.11E+03	.68E+02	.76E+02	.67E+02	.14E+03
1300.	.28E+03	.99E+02	.59E+02	.11E+03	.22E+03	.11E+03	.10E+03	.11E+03	.22E+03	.14E+03	.98E+02	.66E+02	.10E+03	.46E+02	.59E+02	.53E+02	.12E+03
1400.	.18E+03	.68E+02	.43E+02	.90E+02	.19E+03	.66E+02	.60E+02	.64E+02	.12E+03	.84E+02	.61E+02	.59E+02	.90E+02	.33E+02	.39E+02	.35E+02	.81E+02
1500.	.17E+03	.61E+02	.38E+02	.89E+02	.19E+03	.57E+02	.51E+02	.59E+02	.12E+03	.72E+02	.54E+02	.58E+02	.88E+02	.30E+02	.34E+02	.31E+02	.75E+02
1600.	.18E+03	.61E+02	.37E+02	.83E+02	.18E+03	.56E+02	.50E+02	.59E+02	.12E+03	.72E+02	.54E+02	.55E+02	.82E+02	.29E+02	.34E+02	.31E+02	.74E+02
1700.	.18E+03	.54E+02	.29E+02	.52E+02	.99E+02	.50E+02	.48E+02	.58E+02	.12E+03	.68E+02	.50E+02	.33E+02	.50E+02	.23E+02	.30E+02	.30E+02	.61E+02
1800.	.17E+03	.50E+02	.26E+02	.33E+02	.73E+02	.47E+02	.46E+02	.57E+02	.12E+03	.67E+02	.48E+02	.24E+02	.32E+02	.20E+02	.28E+02	.29E+02	.54E+02
1900.	.16E+03	.47E+02	.24E+02	.33E+02	.73E+02	.45E+02	.44E+02	.55E+02	.11E+03	.65E+02	.46E+02	.24E+02	.32E+02	.19E+02	.27E+02	.26E+02	.52E+02
2000.	.95E+02	.40E+02	.21E+02	.33E+02	.73E+02	.36E+02	.35E+02	.24E+02	.53E+02	.50E+02	.37E+02	.24E+02	.32E+02	.16E+02	.22E+02	.15E+02	.38E+02
2100.	.92E+02	.29E+02	.15E+02	.33E+02	.73E+02	.21E+02	.20E+02	.24E+02	.52E+02	.29E+02	.24E+02	.24E+02	.32E+02	.11E+02	.15E+02	.14E+02	.32E+02
2200.	.92E+02	.29E+02	.15E+02	.32E+02	.71E+02	.21E+02	.20E+02	.23E+02	.52E+02	.28E+02	.24E+02	.23E+02	.31E+02	.11E+02	.15E+02	.14E+02	.31E+02
2300.	.87E+02	.28E+02	.14E+02	.31E+02	.71E+02	.19E+02	.18E+02	.22E+02	.48E+02	.27E+02	.23E+02	.23E+02	.31E+02	.10E+02	.14E+02	.13E+02	.30E+02
2400.	.85E+02	.27E+02	.14E+02	.31E+02	.70E+02	.19E+02	.18E+02	.21E+02	.47E+02	.27E+02	.22E+02	.23E+02	.31E+02	.98E+01	.13E+02	.12E+02	.29E+02
2500.	.84E+02	.25E+02	.13E+02	.26E+02	.61E+02	.19E+02	.17E+02	.21E+02	.46E+02	.26E+02	.21E+02	.20E+02	.26E+02	.97E+01	.13E+02	.12E+02	.28E+02
2600.	.78E+02	.25E+02	.13E+02	.21E+02	.52E+02	.18E+02	.17E+02	.21E+02	.44E+02	.26E+02	.21E+02	.16E+02	.22E+02	.96E+01	.13E+02	.12E+02	.26E+02
2700.	.77E+02	.25E+02	.13E+02	.17E+02	.47E+02	.18E+02	.17E+02	.20E+02	.43E+02	.25E+02	.20E+02	.14E+02	.18E+02	.95E+01	.12E+02	.12E+02	.24E+02
2800.	.77E+02	.23E+02	.12E+02	.11E+02	.26E+02	.17E+02	.16E+02	.20E+02	.43E+02	.24E+02	.20E+02	.80E+01	.11E+02	.89E+01	.12E+02	.12E+02	.21E+02
2900.	.74E+02	.21E+02	.11E+02	.78E+01	.17E+02	.16E+02	.15E+02	.20E+02	.42E+02	.23E+02	.18E+02	.52E+01	.82E+01	.82E+01	.11E+02	.11E+02	.19E+02
3000.	.61E+02	.15E+02	.78E+01	.76E+01	.16E+02	.13E+02	.12E+02	.17E+02	.37E+02	.19E+02	.15E+02	.50E+01	.80E+01	.58E+01	.83E+01	.88E+01	.16E+02
3100.	.49E+02	.16E+02	.77E+01	.72E+01	.16E+02	.13E+02	.12E+02	.15E+02	.33E+02	.19E+02	.16E+02	.49E+01	.76E+01	.56E+01	.81E+01	.65E+01	.15E+02
3200.	.49E+02	.14E+02	.69E+01	.63E+01	.14E+02	.12E+02	.11E+02	.14E+02	.33E+02	.18E+02	.15E+02	.44E+01	.66E+01	.48E+01	.74E+01	.60E+01	.14E+02
3300.	.49E+02	.13E+02	.59E+01	.50E+01	.11E+02	.11E+02	.11E+02	.14E+02	.32E+02	.17E+02	.14E+02	.27E+01	.49E+01	.39E+01	.66E+01	.60E+01	.13E+02
3400.	.46E+02	.13E+02	.59E+01	.41E+01	.96E+01	.11E+02	.11E+02	.13E+02	.30E+02	.17E+02	.14E+02	.24E+01	.43E+01	.39E+01	.66E+01	.54E+01	.12E+02
3500.	.32E+02	.11E+02	.52E+01	.39E+01	.93E+01	.11E+02	.10E+02	.68E+01	.18E+02	.16E+02	.12E+02	.23E+01	.41E+01	.37E+01	.60E+01	.35E+01	.97E+01
3600.	.25E+02	.72E+01	.33E+01	.39E+01	.93E+01	.50E+01	.46E+01	.57E+01	.14E+02	.76E+01	.72E+01	.23E+01	.41E+01	.21E+01	.34E+01	.29E+01	.67E+01
3700.	.23E+02	.70E+01	.31E+01	.39E+01	.93E+01	.48E+01	.44E+01	.50E+01	.13E+02	.75E+01	.70E+01	.23E+01	.41E+01	.20E+01	.32E+01	.23E+01	.63E+01
3800.	.22E+02	.64E+01	.27E+01	.39E+01	.93E+01	.41E+01	.36E+01	.49E+01	.13E+02	.67E+01	.63E+01	.23E+01	.41E+01	.15E+01	.26E+01	.21E+01	.59E+01
3900.	.22E+02	.61E+01	.25E+01	.32E+01	.81E+01	.37E+01	.33E+01	.48E+01	.13E+02	.64E+01	.60E+01	.21E+01	.35E+01	.13E+01	.24E+01	.21E+01	.56E+01
4000.	.22E+02	.61E+01	.25E+01	.32E+01	.81E+01	.37E+01	.33E+01	.48E+01	.13E+02	.64E+01	.60E+01	.21E+01	.35E+01	.13E+01	.24E+01	.21E+01	.56E+01
4100.	.22E+02	.61E+01	.25E+01	.32E+01	.81E+01	.37E+01	.33E+01	.48E+01	.13E+02	.64E+01	.60E+01	.21E+01	.35E+01	.13E+01	.24E+01	.21E+01	.56E+01
4200.	.22E+02	.61E+01	.25E+01	.32E+01	.81E+01	.37E+01	.33E+01	.48E+01	.13E+02	.64E+01	.60E+01	.21E+01	.35E+01	.13E+01	.24E+01	.21E+01	.56E+01
4300.	.22E+02	.50E+01	.21E+01	.32E+01	.81E+01	.34E+01	.31E+01	.48E+01	.13E+02	.57E+01	.50E+01	.21E+01	.34E+01	.12E+01	.21E+01	.21E+01	.54E+01
4400.	.20E+02	.46E+01	.20E+01	.30E+01	.78E+01	.33E+01	.31E+01	.46E+01	.11E+02	.54E+01	.46E+01	.20E+01	.33E+01	.12E+01	.20E+01	.20E+01	.50E+01
4500.	.17E+02	.46E+01	.20E+01	.30E+01	.77E+01	.33E+01	.31E+01	.43E+01	.10E+02	.54E+01	.46E+01	.20E+01	.33E+01	.12E+01	.20E+01	.18E+01	.47E+01
4600.	.17E+02	.46E+01	.20E+01	.30E+01	.77E+01	.33E+01	.31E+01	.43E+01	.10E+02	.54E+01	.46E+01	.20E+01	.33E+01	.12E+01	.20E+01	.18E+01	.47E+01
4700.	.17E+02	.46E+01	.20E+01	.30E+01	.77E+01	.33E+01	.31E+01	.43E+01	.10E+02	.54E+01	.46E+01	.20E+01	.33E+01	.12E+01	.20E+01	.18E+01	.47E+01
4800.	.17E+02	.46E+01	.20E+01	.26E+01	.71E+01	.33E+01	.31E+01	.43E+01	.10E+02	.54E+01	.46E+01	.19E+01	.29E+01	.12E+01	.20E+01	.18E+01	.46E+01
4900.	.13E+02	.46E+01	.20E+01	.25E+01	.70E+01	.33E+01	.31E+01	.35E+01	.86E+01	.54E+01	.46E+01	.19E+01	.28E+01	.12E+01	.20E+01	.13E+01	.42E+01
5000.	.13E+02	.46E+01	.20E+01	.25E+01	.70E+01	.33E+01	.31E+01	.35E+01	.84E+01	.54E+01	.46E+01	.19E+01	.28E+01	.12E+01	.20E+01	.13E+01	.42E+01

Source: SACTI cooling tower model.

The SACTI model predicted that the maximum cooling tower water deposition will occur approximately 300 meters (984 ft) west of the cooling tower at a rate of 9,700 kg/km^2/month. The average water deposition at a 300 meters (984 ft) radius from the cooling tower (considering all directions of plume travel) is predicted to be 3,700 kg/km^2/month.

5.1.4.3.4 Salt deposition modeling results. Salt deposition is primarily a function of the salt concentration in the circulating cooling water and the water deposition rate. Table 5.1-4 presents the SACTI model predicted average monthly (based on the 5 year meteorological database) salt deposition rate in units of kg/km^2/month associated with the proposed cooling tower. The 16 wind direction labels in the columns of the table represent the direction from the proposed cooling tower that the salt deposition is predicted to occur.

The maximum salt deposition occurs approximately 300 meters (984 ft) west of the cooling tower at a rate of 26.41 kg/km^2/month. The average salt deposition at a radius of 300 meters (984 ft) from the cooling tower (considering all directions of plume travel) is predicted to be 9.79 kg/km^2/month. Beyond 300 meters (984 ft) from the cooling towers, the salt deposition significantly decreases. In fact, the average salt deposition beyond 300 meters (984 ft) from the cooling towers in all directions is less than 4 kg/km^2/month.

5.1.4.3.5 Plume length modeling results. The cooling tower plume lengths are calculated by the SACTI model as the frequency of occurrence of a given plume length from the cooling tower for each wind direction. Table 5.1-5 presents the average annual (based on the 5 year meteorological database) predicted plume length frequency of occurrence associated with the cooling tower. The 16 wind direction labels in the columns of the table represent the direction from the cooling tower that the plume is headed. The data represent the probability (by percent of the year) that the cooling tower plume will be as long or longer than the length defined in the table for a particular direction and distance from the cooling tower.

As the data in Table 5.1-5 indicates, the SACTI model predicts the plume length to be less than 300 meters (984 ft) 95 percent of the year considering all directions of plume travel. The median plume length, or that length which the plume is predicted to be longer or shorter than for 50 percent of the year considering all directions of plume travel, is approximately 153 meters (502 ft).

Table 5.1-4
Average Monthly Predicted Cooling Tower Salt Deposition

Distance From Tower (m)	Salt Deposition in the Direction Plume is Headed (kg/km2-month)																
	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	AVG
100.	1.18	0.31	0.16	0.07	0.10	0.59	0.64	0.87	1.42	0.74	0.51	0.06	0.06	0.30	0.29	0.25	0.47
200.	20.04	10.98	10.48	8.21	17.70	14.92	11.56	8.99	16.22	9.69	9.03	6.33	10.90	9.46	7.71	6.14	11.15
300.	17.95	7.92	6.36	13.69	26.41	8.18	6.91	6.33	11.70	6.99	6.13	8.21	14.81	5.22	4.99	4.80	9.79
400.	3.49	2.58	2.95	2.23	5.14	5.34	4.30	2.25	3.78	2.68	2.75	1.50	3.00	3.63	2.32	1.13	3.07
500.	6.22	3.34	3.19	3.75	6.67	4.51	3.29	2.52	4.58	2.87	2.50	2.13	3.47	2.57	2.16	1.70	3.47
600.	5.55	2.63	2.31	3.68	6.19	3.03	2.38	2.11	3.84	2.20	1.99	2.02	3.34	1.92	1.67	1.55	2.90
700.	4.07	1.97	1.60	2.67	4.61	2.04	1.66	1.40	2.66	1.69	1.48	1.43	2.34	1.31	1.22	1.05	2.07
800.	3.27	1.48	1.20	2.19	3.91	1.57	1.31	1.14	2.13	1.29	1.10	1.18	1.92	0.96	0.91	0.85	1.65
900.	2.85	1.34	1.07	1.19	2.34	1.40	1.14	0.91	1.70	1.09	0.93	0.76	1.15	0.83	0.78	0.67	1.26
1000.	2.52	1.01	0.83	0.55	1.25	1.18	0.92	0.81	1.52	0.88	0.74	0.37	0.58	0.66	0.63	0.57	0.94
1100.	1.59	0.71	0.62	0.51	1.17	0.97	0.75	0.63	1.19	0.72	0.58	0.33	0.53	0.50	0.47	0.38	0.73
1200.	1.24	0.53	0.44	0.46	1.01	0.71	0.57	0.50	0.93	0.59	0.45	0.28	0.47	0.36	0.34	0.27	0.57
1300.	1.01	0.35	0.23	0.45	0.97	0.37	0.34	0.44	0.80	0.45	0.32	0.27	0.46	0.19	0.21	0.23	0.44
1400.	0.75	0.27	0.19	0.35	0.84	0.28	0.25	0.29	0.54	0.32	0.24	0.24	0.40	0.15	0.16	0.16	0.34
1500.	0.68	0.26	0.18	0.34	0.77	0.26	0.22	0.25	0.47	0.30	0.22	0.22	0.35	0.14	0.15	0.13	0.31
1600.	0.69	0.25	0.17	0.33	0.72	0.25	0.22	0.25	0.48	0.29	0.22	0.21	0.32	0.14	0.15	0.13	0.30
1700.	0.68	0.21	0.12	0.26	0.53	0.21	0.21	0.24	0.47	0.27	0.20	0.16	0.24	0.11	0.13	0.13	0.26
1800.	0.67	0.21	0.12	0.22	0.48	0.21	0.21	0.24	0.47	0.27	0.19	0.14	0.21	0.10	0.12	0.12	0.25
1900.	0.64	0.20	0.12	0.22	0.48	0.20	0.20	0.23	0.45	0.27	0.19	0.14	0.21	0.10	0.12	0.11	0.24
2000.	0.45	0.19	0.11	0.22	0.48	0.18	0.18	0.14	0.28	0.23	0.17	0.14	0.21	0.09	0.11	0.08	0.20
2100.	0.46	0.16	0.10	0.22	0.48	0.14	0.14	0.15	0.28	0.16	0.13	0.14	0.21	0.08	0.09	0.08	0.19
2200.	0.46	0.16	0.10	0.21	0.47	0.14	0.14	0.15	0.28	0.16	0.13	0.14	0.20	0.08	0.09	0.08	0.19
2300.	0.46	0.16	0.09	0.21	0.47	0.14	0.14	0.15	0.28	0.16	0.13	0.14	0.20	0.08	0.09	0.08	0.19
2400.	0.45	0.15	0.09	0.21	0.47	0.13	0.13	0.14	0.28	0.16	0.13	0.14	0.20	0.07	0.08	0.08	0.18
2500.	0.45	0.14	0.08	0.19	0.42	0.13	0.13	0.14	0.28	0.16	0.12	0.12	0.18	0.07	0.08	0.08	0.17
2600.	0.44	0.14	0.08	0.16	0.37	0.13	0.13	0.14	0.27	0.16	0.12	0.11	0.15	0.07	0.08	0.08	0.17
2700.	0.43	0.14	0.08	0.14	0.34	0.13	0.13	0.14	0.27	0.15	0.12	0.09	0.13	0.07	0.08	0.08	0.16
2800.	0.42	0.14	0.08	0.09	0.20	0.12	0.12	0.14	0.26	0.15	0.12	0.06	0.08	0.07	0.08	0.08	0.14
2900.	0.41	0.12	0.07	0.07	0.14	0.12	0.12	0.13	0.25	0.14	0.11	0.04	0.06	0.06	0.07	0.07	0.13
3000.	0.36	0.10	0.06	0.07	0.14	0.10	0.10	0.12	0.23	0.13	0.10	0.04	0.06	0.05	0.06	0.06	0.11
3100.	0.29	0.09	0.06	0.06	0.14	0.10	0.10	0.11	0.20	0.12	0.10	0.04	0.06	0.05	0.06	0.05	0.10
3200.	0.26	0.08	0.05	0.06	0.13	0.10	0.10	0.10	0.19	0.12	0.09	0.04	0.06	0.05	0.05	0.04	0.09
3300.	0.26	0.07	0.04	0.06	0.12	0.09	0.09	0.10	0.19	0.11	0.08	0.03	0.05	0.04	0.05	0.04	0.09
3400.	0.23	0.07	0.04	0.03	0.08	0.09	0.09	0.09	0.17	0.11	0.08	0.02	0.03	0.04	0.05	0.04	0.08
3500.	0.14	0.07	0.04	0.03	0.07	0.09	0.08	0.05	0.10	0.11	0.08	0.02	0.03	0.04	0.05	0.02	0.06
3600.	0.11	0.04	0.02	0.03	0.07	0.04	0.04	0.04	0.08	0.05	0.04	0.02	0.03	0.02	0.02	0.02	0.04
3700.	0.10	0.03	0.02	0.03	0.07	0.04	0.04	0.04	0.07	0.05	0.04	0.02	0.03	0.02	0.02	0.02	0.04
3800.	0.09	0.03	0.02	0.03	0.07	0.03	0.03	0.03	0.07	0.04	0.03	0.02	0.03	0.01	0.02	0.01	0.03
3900.	0.09	0.03	0.01	0.03	0.07	0.03	0.03	0.03	0.06	0.04	0.03	0.02	0.03	0.01	0.01	0.01	0.03
4000.	0.09	0.03	0.01	0.03	0.07	0.03	0.03	0.03	0.06	0.04	0.03	0.02	0.03	0.01	0.01	0.01	0.03
4100.	0.09	0.03	0.01	0.03	0.07	0.03	0.03	0.03	0.06	0.04	0.03	0.02	0.03	0.01	0.01	0.01	0.03
4200.	0.09	0.03	0.01	0.03	0.07	0.03	0.03	0.03	0.06	0.04	0.03	0.02	0.03	0.01	0.01	0.01	0.03
4300.	0.09	0.03	0.01	0.03	0.07	0.03	0.03	0.03	0.06	0.04	0.03	0.02	0.03	0.01	0.01	0.01	0.03
4400.	0.09	0.02	0.01	0.02	0.07	0.03	0.03	0.03	0.06	0.04	0.03	0.02	0.03	0.01	0.01	0.01	0.03
4500.	0.09	0.02	0.01	0.02	0.07	0.03	0.03	0.03	0.06	0.04	0.03	0.02	0.03	0.01	0.01	0.01	0.03
4600.	0.09	0.02	0.01	0.02	0.07	0.03	0.03	0.03	0.06	0.04	0.03	0.02	0.03	0.01	0.01	0.01	0.03
4700.	0.09	0.02	0.01	0.02	0.07	0.03	0.03	0.03	0.06	0.04	0.03	0.02	0.03	0.01	0.01	0.01	0.03
4800.	0.08	0.02	0.01	0.02	0.07	0.03	0.03	0.03	0.06	0.04	0.03	0.02	0.03	0.01	0.01	0.01	0.03
4900.	0.07	0.02	0.01	0.02	0.07	0.03	0.03	0.03	0.06	0.04	0.03	0.02	0.03	0.01	0.01	0.01	0.03
5000.	0.07	0.02	0.01	0.02	0.07	0.03	0.03	0.03	0.06	0.04	0.03	0.02	0.03	0.01	0.01	0.01	0.03

Source: SACTI cooling tower model.

Table 5.1-5
Average Annual Predicted Plume Length Frequency of Occurrence

Probability the Plume is Longer in a Given Direction Than the Distance Indicated (percent)

Distance From Tower (m)	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	SUM
100.	12.48	5.92	5.12	6.61	11.99	6.76	5.54	4.70	6.67	5.05	4.66	4.05	6.57	4.43	3.90	3.56	100.00
200.	0.43	0.27	0.21	0.64	1.33	0.11	0.14	0.10	0.29	0.24	0.16	0.61	0.71	0.08	0.11	0.04	5.48
300.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
400.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
500.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
600.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
700.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
800.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
900.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
1000.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
1100.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
1200.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
1300.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
1400.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
1500.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
1600.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
1700.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
1800.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
1900.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
2000.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
2100.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
2200.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
2300.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
2400.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
2500.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
2600.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
2700.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
2800.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
2900.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
3000.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
3100.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
3200.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
3300.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
3400.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
3500.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
3600.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
3700.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
3800.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
3900.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
4000.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
4100.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
4200.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
4300.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
4400.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
4500.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
4600.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
4700.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
4800.	0.43	0.18	0.10	0.53	0.98	0.05	0.09	0.10	0.29	0.21	0.13	0.52	0.58	0.03	0.07	0.04	4.31
4900.	0.08	0.18	0.10	0.32	0.58	0.05	0.09	0.01	0.04	0.21	0.13	0.28	0.35	0.03	0.07	0.00	2.52
5000.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: SACTI cooling tower model.

As indicated in Table 5.1-5, the percent frequency of occurrence of long cooling tower plumes in any particular direction is very small. The highest probability of a visible plume over a particular location is approximately 12.48 percent of the year in an area 100 meters (328 ft) south of the cooling tower. Neither the most frequent plume length (less than 300 meters), nor the median plume length (153 meters), nor the highest probability plume length (100 meters) is predicted to extend beyond the nearest property boundary to the new cooling tower.

5.1.4.4 Environmental Impact. The following subsections discuss the potential environmental impacts associated with the operation of the new cooling tower. The relative magnitudes of the impacts are based on the results of the numerical modeling studies presented in Subsection 5.1.4.3. The environmental impacts are assessed with respect to the transportation arteries, vegetation, aesthetics, and land use.

In addition to assessing the environmental impacts associated with each of the aforementioned categories, this subsection also discusses many naturally occurring meteorological and atmospheric phenomena such as fog, cloud cover, and precipitation that may tend to mitigate the actual or perceived environmental impacts resulting from the operation of the cooling towers.

5.1.4.4.1 Impact on transportation arteries. Cooling towers may at times produce plume induced fogging and icing in the vicinity of the cooling tower structures which may have an affect on nearby transportation arteries such as roads, highways, bridges, airports, or navigable waters. Several factors influence the cooling tower plume as it leaves the tower, which to varying degrees, determine the location and magnitude of these phenomena.

The cooling tower plume will have thermal buoyancy and momentum as it is exhausted from the cooling tower. Under calm conditions, the plume will ascend vertically due to these forces. However, prolonged periods of calm and stable conditions do not frequently occur in the atmosphere, and are somewhat infrequent along the central Florida peninsula. In fact, winds in the vicinity of Cane Island are calm for a small percentage of the year, and the subtropical humid climate is frequently unstable. As such, the cooling tower plume's trajectory becomes modified almost immediately as it leaves the cooling tower by persistent winds and atmospheric instability.

As the wind speed increases, the cooling tower plume begins to assume a trajectory that is sloped in the direction of the wind vector, bringing the plume closer to the ground. The plume will likely undergo further trajectory modification as the result of turbulent airflow over and around terrain features, buildings, or the cooling tower structure itself. This effect, known as structure or building induced downwash, occurs when the trajectory modification is such that the plume is forced to the ground in the vicinity of the cooling tower. If the plume becomes supersaturated during this process (i.e., becomes visible), then the result is a phenomenon known as cooling tower induced ground level fogging (Ovard and Reisman).

Cooling tower induced fogging can occur at any time during the year, but it is most commonplace during periods of moderate wind speeds (which bend the plume to intercept the ground), high relative humidity, and cool temperatures. These meteorological conditions frequently occur during the late evening and early morning periods of the day.

A topographic map of the area was reviewed to determine the major transportation arteries in the vicinity of the site. Apart from the entrance road, which is mostly restricted from public access, the nearest transportation arteries include portions of Old Tampa Highway, South Orange Blossom Trail, and the CSX Railroad immediately south of the CIPP boundary. While these arteries are nearly adjacent to the southern property boundary, these facilities are located approximately 1,421 meters (4,662 ft) from the new cooling tower. As discussed in Subsection 5.1.4.3.1, on average fogging is predicted to occur approximately 1 hour per year and no amount of fogging is predicted to extend beyond a radius of 700 meters feet (2,297 ft) from the new cooling tower.

Figure 5.1-1 illustrates the minimal extent and duration of the predicted cooling tower induced fogging. The outermost contour represents 0.05 hours per year of possible plume fogging, with increasing contours of fogging at 0.5 hour per year intervals. Based on the results of the modeling, the cooling tower plume induced fogging is not predicted to extend beyond the property boundary, and is not predicted to cause fogging conditions near the transportation corridors that lie to the south.

Many of the meteorological conditions that are favorable for the occurrence of cooling tower plume induced fogging are conducive to natural fog. As such, the two events may occur simultaneously and thereby mitigate the relative impact potentially caused by cooling tower plume induced events. Climatologically, natural fog (that which restricts visibility to less than 1/4 of a mile) occurs an average of 18 days a year based on meteorological data from Orlando. This means that there are, at a minimum, 18 hours of naturally occurring fog in the vicinity of the CIPP (conservatively assuming that reported fogging events last for only 1 hour per day). This indicates that the area sees more naturally occurring fog events than predicted to be initiated by the cooling tower. Therefore, if these events occur simultaneously due to the meteorological conditions conducive to fog, then no additional fogging over what the area experiences normally is expected due to operation of the cooling tower.

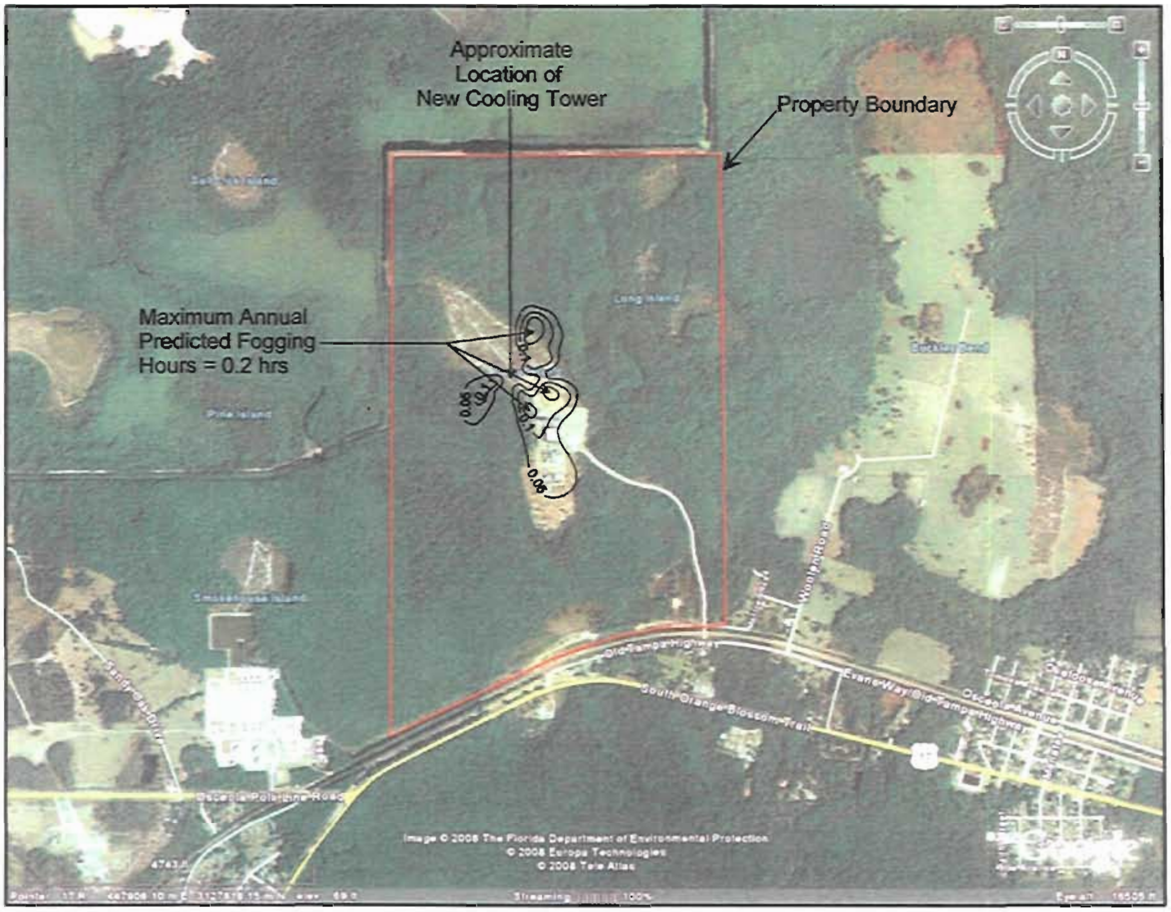


Figure 5.1-1
SACTI Annual Predicted Hours of Cooling Tower Induced Fogging

A secondary effect of cooling tower fogging is the formation of cooling tower induced ground level icing. However, as temperatures rarely fall below freezing in the area, no cooling tower plume induced icing is predicted to occur.

5.1.4.4.2 Impact on vegetation. The plume exhaust from cooling towers may affect the vegetation in the vicinity as the result of drift deposition. Drift deposition from a cooling tower occurs when airborne water droplets, caused by cooling tower drift, coalesce and precipitate in the vicinity of the cooling tower. The pattern of drift deposition and the distance from the cooling tower to the areas of maximum deposition concentrations are a function of many variables, which include: cooling tower type, prevailing wind direction and speed, orientation of the cooling tower, airflow rate, drift rate, water chemistry, and the physical size of the water droplets (drift droplet size spectrum) in the cooling tower drift. The potential effects associated with cooling tower drift deposition are primarily associated with water and salt deposition. The response of the vegetation to salt and water deposition will vary from year to year depending on the rate of deposit and precipitation patterns during the growing season.

An area map depicting the project location overlaid with an isopleth analysis of the SACTI predicted average monthly water deposition rate is presented on Figure 5.1-2. The predicted location of the maximum water deposition rate occurs approximately 300 meters (984 ft) west of the cooling tower at a deposition rate of 9,700 kg/km^2/month.

A potential effect of water deposition on vegetation species is the increased threat of plant fungal diseases associated with the increased precipitation. Based on historical meteorological data for Orlando, the average monthly rainfalls for the driest month (December) and the wettest month (June) are 59 and 187 mm, respectively. If one conservatively assumes no evaporation of the falling cooling tower drift droplets, then the precipitation rate equivalent of the maximum SACTI model predicted water deposition rate (9,700 kg/km^2/month) is approximately 0.01 mm per month. By comparison, this precipitation rate is less than 0.02 percent of the average monthly rainfall of the driest month.

Dr. Walter Stevenson, a crop pathologist at the University of Wisconsin has experience with plant disease prediction models that consider precipitation and leaf wetness. Dr. Stevenson's research shows that a slight increase in disease occurrence is sometimes observed by US Midwestern potato growers when irrigation at a rate of approximately 50 mm per week is applied. A 50 mm per week irrigation rate is equivalent to a water deposition rate of approximately 2×10^8 kg/km^2/month, which is more than 20,000 times greater than the maximum water deposition rate predicted by the SACTI model. This suggests that the water deposition from the new cooling tower on vegetation and crops species is insignificant when compared to normal wetting associated

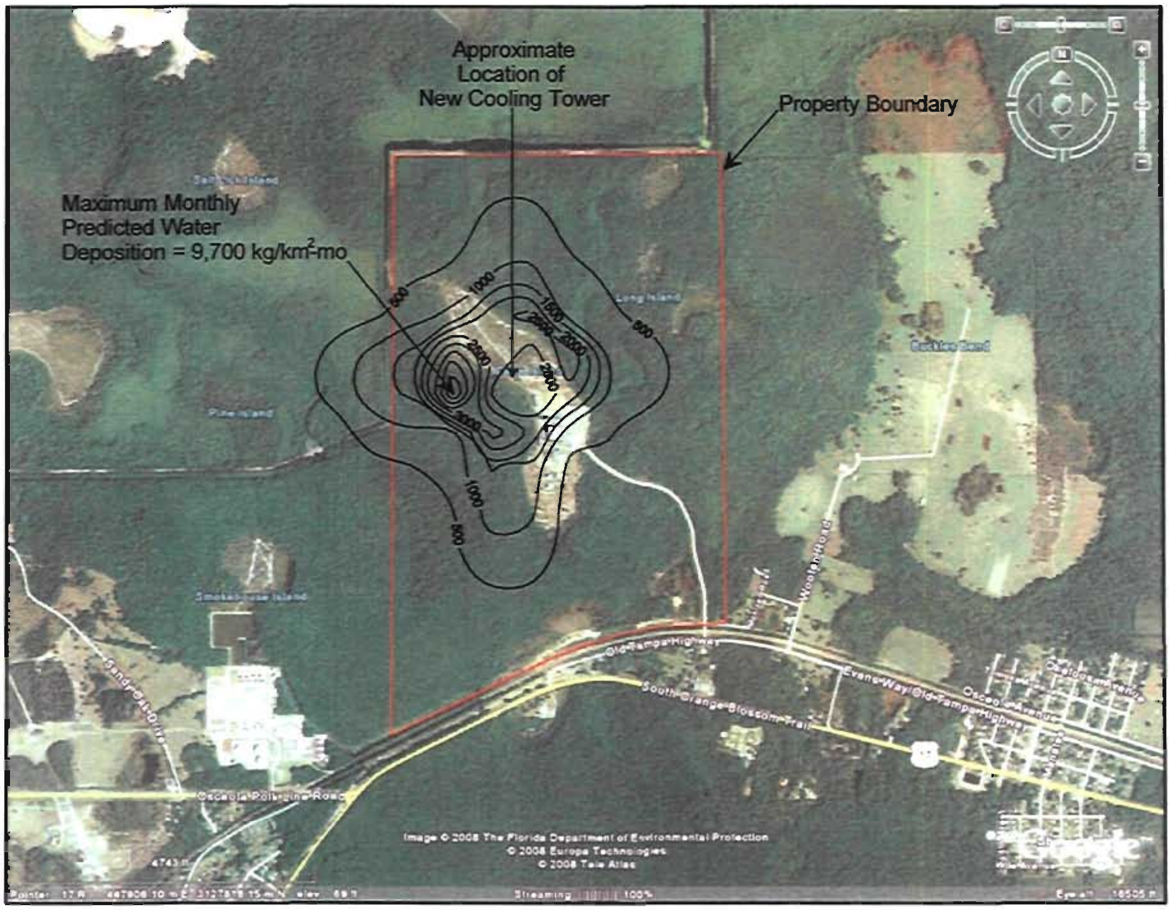


Figure 5.1-2
SACTI Predicted Average Monthly Water Deposition Rate (kg/km^2/month)

with dew, precipitation, and irrigation. Furthermore, because water deposition will occur in conjunction with salt deposition, the additional deposition of salt may be toxic to any pathogenic microorganisms or fungi, and thus negate the effects of water deposition by itself.

An area map overlaid with an isopleth analysis of the SACTI predicted average monthly salt deposition rate is presented on Figure 5.1-3. The predicted location of the maximum salt deposition rate occurs 300 meters (984 ft) west of the cooling tower at a deposition rate of 26.41 kg/km^2/month.

Research studies on salt deposition effects have been conducted in response to known or observed cases of vegetation damage. From these studies, it is known that the local climate plays a significant role in increasing or reducing the stress that such deposition can have on vegetation. For example, a species growing in an area with high rainfall during the growing season tends to be less stressed from salt deposition than the same species growing in an area with less rainfall due to the dilution of the deposited salt on the leaf surface. Additionally, vegetation species growing along coastal regions have a higher tolerance for salt deposition because of the relatively high ambient airborne concentration of sea salts in the marine environment.

As salinity levels increase, growth of intolerant plants declines, and yields are reduced. Some plant families tend to show either high or low limits of salt survival. The limit is low in legumes, (pea, beans), medium in cereal grasses (rye, oats, wheat barley), and high in some forage and other crop plants (alfalfa, sunflower, sugar beet, forage beet) (Maianu et al. 1965). Growth suppression is sometimes accompanied by leaf injury. Leaves become smaller and deeper blue-green than normal, and leaf tips or margins become bleached, tan, or brownish in proportion to the degree of salt deposition. Bronzing and early defoliation may also be prominent. Leaf injury may be the most prominent symptom of salt deposition, but is not nearly important to yield reductions as the growth suppression (Treshow 1970).

Dr. Charles Mulchi of the University of Maryland at College Park has conducted extensive research on cooling tower salt deposition effects and toxicity levels in several vegetation species. According to Dr. Mulchi (1991), a salt deposition rate of 400 kg/km^2/month or greater is sufficient to cause damage to vegetation. The amount and type of damage is dependent on the species involved. For example, one species of pine may show signs of damage while another species may show no signs of damage. The 400 kg/km^2/month salt deposition rate is the threshold level for most vegetation species and has been used in many environmental assessments as a screening or trigger level of potentially significant salt deposition rates. Salt deposition rates less than

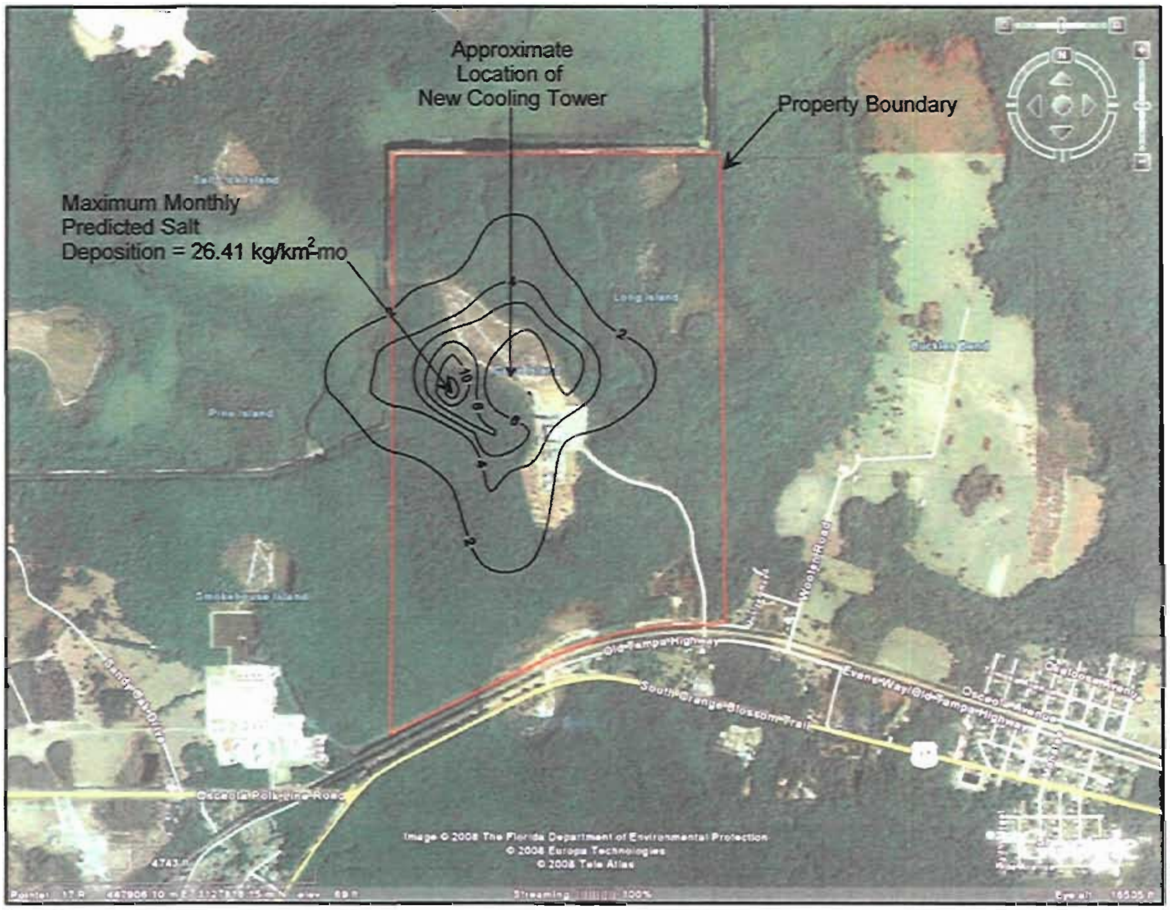


Figure 5.1-3
SACTI Predicted Average Monthly Salt Deposition Rate (kg/km^2/month)

400 kg/km^2/month are generally not considered to have a significant impact on vegetation. The maximum predicted salt deposition rate from the new cooling tower is 26.41 kg/km^2/month. Therefore, salt deposition from the cooling tower is expected to have a negligible impact on vegetation.

5.1.4.4.3 Impact on aesthetics and land use. A cooling tower contributes to the impacts on the aesthetics of an area by forming a visible, at times completely opaque, vapor condensate plume emanating from the cooling tower exhaust. The presence of a visible plume and cooling tower are often perceived as a distraction or debasement to the otherwise scenic quality or functional use of an area. This is particularly true if the cooling tower plume and tower structure are in the background or foreground of a view with a particular scenic quality or land use type. The potential impacts on aesthetics and land use as the result of visible plume formation and the cooling tower structure are discussed below.

Perhaps the most obvious environmental impact from a cooling tower is the formation of a visible plume extending out from the cooling tower cell exhaust ports. The visible plume may extend several hundred yards downwind, potentially obstructing visibility on the site and at nearby locations. The factors that affect visible cooling tower plume formation are discussed in the following paragraphs.

Cooling towers are simple fluid heat exchange systems that dissipate waste heat to the atmosphere through mass and convective heat transfer of water vapor. The exhaust from a cooling tower is essentially a saturated air-water vapor mixture which is warmer than the ambient air as it leaves the tower. Depending on the ambient air temperature and the wet-bulb temperature, a portion of the saturated air-water vapor mixture will become supersaturated and begin to condense into small water droplets as heat transfer with the atmosphere begins to cool the plume. With time, more small water droplets continue to form and grow through condensation and coalescence until the cooling tower exhaust becomes visible as a white plume emanating from the tower. The cooling tower plume will continue to be visible until it is dispersed and evaporated, or until meteorological conditions are no longer favorable for its formation. In the former case, the visible cooling tower plume is transported downwind until turbulent mixing in the atmosphere with the abundant and relatively dryer ambient air causes the small water droplets to disperse and evaporate. As the visible plume becomes thoroughly mixed with the ambient air, the small water droplets completely disperse and evaporate until the plume is no longer visible and becomes transparent.

The frequency, persistence, and size of the visible cooling tower plume depends primarily on the cooling tower type, heat load, orientation of the cooling tower, and the prevailing meteorological conditions. Mechanical draft towers typically present less of a visual distraction because of the relatively low plume exhaust height and profile.

Visible plume formation from cooling towers is more frequent during the cooler seasons when ambient air conditions are capable of rapidly condensing the cooling tower exhaust and allowing only minimal evaporation of the condensed water droplets. Similar conditions exist on a diurnal scale that are also more suitable for visible plume formation. These periods occur during the early morning hours, shortly before and after sunrise, when relatively low ambient air temperatures and high relative humidity make the environment particularly conducive to visible plume formation.

Figure 5.1-3 illustrates the site location overlaid with an isopleth analysis of the average annual predicted plume length frequency of occurrence. The highest probability of a visible plume is predicted to occur in the area just south of the new cooling tower for approximately 12 percent of the year on average. Over the remaining portions of the site and the immediate vicinity, the frequency of occurrence of a visible plume for a particular location generally ranges from about 1 to 9 percent of the year. Based on these results, it is concluded that the presence of a visible plume from the cooling tower will only minimally contribute to the visible and aesthetic impacts in the area.

As given in the SACTI output presented back in Table 5.1-5, the visible plume from the cooling tower is also predicted to periodically extend offsite. However, as shown on Figure 5.1-3, this is predicted to occur only less than 1 percent of the year on average, and therefore will have little or no impact on nearby businesses, residences, or transportation facilities.

It should be noted that the probability of visible plume lengths predicted by the SACTI model are conservative overestimates of actual plume lengths. This is primarily because the SACTI model does not distinguish prevailing meteorological conditions such as haze, overcast skies, fog, and precipitation, which may render the cooling tower plume indiscernible. In certain cases, especially as the distance from the cooling tower increases, the model may predict saturation (thus a visible plume by modeling standards), but due to spreading of the plume it may only be visible as a slight haze. If this is the case, then from an aesthetic perspective, the plume may not be discernible against the background haze that may already exist due to the high humidity, smog, or suspended particulate matter. In other cases, the plume may be dense, but it would not be discernable against the existing cloud deck.

5.1.5 Measurement Program

The CIPP Conditions of Certification authorize the discharge of wastewaters from the heat dissipation system to the Toho pipeline. The FDEP has set limits for effluent discharges and requires the monitoring of discharges. Monitoring parameters and the frequency and sample type are listed in Table 5.1-6. No monitoring of surface waters is required.

Table 5.1-6
Monitoring Requirements for Effluent Discharges

Parameters (Units)	Frequency of Sampling	Sample Type
Flow (mdg)	Daily	Metered
TDS (mg/L)	2/Month	Grab
Chlorides (mg/L)	2/Month	Grab
Nitrates as N (mg/l)	Weekly	Grab
Nitrates as N (#/day)	Weekly	Grab
Total Nitrogen (mg/L)	Weekly	Grab
Total Nitrogen (#/day)	Weekly	Grab
Sodium (mg/L)	2/Month	Grab
Sulfates (mg/L)	2/Month	Grab
TRPH (mg/L)	Monthly	Grab
pH (Std. Units)	2/Week	Grab

5.2 Effects of Chemical and Biocide Discharges

5.2.1 Industrial Wastewater Discharge

As shown on the water mass balances (Figures 3.5-1 through 3.5-3) in Section 3.0, and as described below, there will be one new industrial wastewater discharge point from operations at CIPP due to Unit 4: a new percolation pond. There are no discharges to wetlands or surface waters under normal operating conditions.

Unit 4 wastewaters potentially contaminated with grease or oil from the plant floor drain system and oil containment areas are treated by an oil/water separator and dry pretreatment (percolation pond) prior to onsite discharge to ground water. Effluent from the oil/water separators will contain no more than 10 ppm oil/grease.

5.2.2 *Cooling Tower Blowdown*

Cooling tower blowdown, boiler blowdown, evaporative cooler blowdown, condensate polisher backwash, and neutralization basin effluent will be collected in a sump and returned to the Toho pipeline for additional reuse or ultimate disposal at the regional Imperial percolation pond facility. Unit 4 water quantity estimates are provided on the water mass balance (Figure 3.5-1). No violation of water quality standards are expected at the Imperial site due to the CIPP facilities.

Potential effluent delivery emergency situations include disruption of effluent delivery due to an upstream treatment facility or pipeline problem, or low effluent supply; therefore, approval to use ground water as cooling tower makeup under emergency conditions is requested. If the Toho pipeline is not available, blowdown during such an emergency will be directed to the onsite storm water ponds. In the unlikely event that the storm water pond capacities are exceeded, the wastewaters will be discharged into the Reedy Creek swamp. FMPA and KUA will apply for an NPDES Wastewater Discharge Permit for this emergency situation. The impacts of this discharge scenario are described in Subsection 5.3.2 below. The CIPP will not require cooling water during non-operating periods such as for maintenance or repair.

5.2.3 *Measurement Program*

The Conditions of Certification require the monitoring of inflows, discharges, and ground water. It is anticipated that similar monitoring will be required with the addition of Unit 4.

Samples must be collected from the Toho pipeline and the well water supply system prior to use. Wastewater samples must be collected prior to return to the Toho pipeline and discharge to the percolation pond.

5.3 Impacts for Water Supplies

5.3.1 *Surface Water*

Surface waters in the CIPP area include Reedy Creek and the Bonnet Creek Canal. Reedy Creek discharges into Lake Russell approximately 13 miles downstream of the CIPP. The Bonnet Creek Canal discharges into Reedy Creek near the west CIPP boundary. There are no natural surface water bodies onsite. CIPP operations do not withdraw or discharge to these waters; therefore, no impacts to these surface waters are expected as a result of CIPP operations.

The CIPP drainage system will be designed to comply with all applicable federal, state, and local regulations regarding discharge into surface waters. Runoff from areas not disturbed by construction or operations will be directed to natural drainage systems within the area. Runoff from disturbed areas will be collected and directed into a drainage system consisting of ditches, swales, and runoff basins for treatment. The runoff from uncontaminated areas will be directed through a detention basin for reduction of the suspended solids load and equalization of peak flows. At the property boundary, the post development peak flow rate will not exceed the predevelopment peak discharge rate during the applicable design storm event. A detailed description of the onsite drainage system is provided in Section 3.8.

CIPP operations are not expected to affect surface water quality within the area. Undisturbed areas will remain in its existing state. Runoff water quality should at least remain unchanged and is expected to be improved as a result of detention in the storm water pond. CIPP water use and consumption are described in Section 3.5.

5.3.2 Ground Water

The following describes the effects of plant operations on the aquifers underlying the CIPP.

5.3.2.1 Surficial Aquifer. Under normal operating conditions, the CIPP will not have a significant effect on the surficial aquifer quality. No water will be withdrawn from this water table zone. Wastewaters are treated prior to ground water discharge as described in Subsection 5.3.4.

In the event that the Toho effluent pipeline is disabled, the combined cooling tower blowdown, neutralization basin effluent, evaporative cooler blowdown, and boiler blowdown will be temporarily discharged to the storm water runoff ponds. Total discharge is estimated to be 1,039,000 gpd, for a duration of 3 days. The 3 day period is assumed to be the maximum duration that the Toho effluent pipeline could be out of operation.

The two ponds are currently sized for storm water runoff and have a weir overflow structure to control the discharge of water. The discharge structure for the Unit 1 and 2 pond provides a 2.5 feet storage capacity from the bottom of the pond to the overflow structure. The structure has a 4 inch diameter orifice located at the base of the structure meant to dampen the discharge of storm water from the facility to predevelopment conditions. The Unit 3 and 4 pond will have approximately 4.25 feet storage capacity from the bottom of the pond to the overflow structure and has one 8 inch and four 10 inch diameter orifices. A detailed description of the storm water runoff pond operation is presented in Section 3.8. The orifices will be closed in the case that the pond must be utilized as a storage facility for emergency cooling tower blowdown. After closure of the orifices, the ponds will be used as a storage facility that allows percolation through the pond bottom. This disposal method is preferred over release of the blowdown to wetlands adjacent to the power block.

The ponds will be able to store and percolate the total volume for a period of 3 days of discharge. Storage volumes and percolation rates are estimated as follows:

Facility	Storage Volume	Percolation Rate Through Pond Bottom	Total for 3 Day Period
Unit 1 and 2 Storm Water Runoff Pond	734,210 gal	118,120 gal/day	1,088,800 gal
Unit 3 and 4 Storm Water Runoff Pond	1,522,500 gal	371,400 gal/day	2,636,700 gal
Total capacity for 3 days.			3,725,500 gal

Total discharge for 3 days at 1,039,000 gpd is 3.1 million gallons which is less than the available storage and percolation capacity for the two ponds. The two storm water ponds are capable of holding and percolating the total blowdown volume for a period of 4 days. If the effluent line is out of service for longer than 4 days, the daily flow of 1,039,000 gpd, minus the 489,520 gpd percolation capacity of the two storm water ponds, will be discharged over the ponds' overflow structures into Reedy Creek Swamp. However, the effluent line has only been out of service twice, for less than 24 hours each time, since the CIPP has been in operation.

During these rare events when there is an interruption in the effluent flow, ground water from the UFA will be used as cooling tower makeup. The ground water quality is better than the effluent quality, and therefore, the cooling tower can be operated at additional cycles of concentration. The blowdown water quality is estimated as follows:

	Typical Well Water (ppm)	Cooling Tower Blowdown at Six Cycles (ppm)
Ca, as $CaCO_3$	68	408
MG, as $CaCO_3$	29	174
Na, as $CaCO_3$	6	36
K, as $CaCO_3$	1	6
Alkalinity, as $CaCO_3$	70	150
SO_4, as $CaCO_3$	6	306
Cl, as $CaCO_3$	10	60
SiO_2, as such	14	84
TDS, as such	119	836

5.3.2.2 Floridan Aquifer. Water for service water, demineralizer water, miscellaneous drains, emergency cooling tower makeup, and potable water requirements will be supplied by the UFA system. The FAS, as defined for CIPP, comprises two confined units, the Upper and the Lower Floridan aquifers. Hydrogeological data for the FAS are presented in Subsection 2.3.2.

5.3.2.2.1 Floridan Aquifer Ground Water Model Selection and Development. An existing numerical transient ground water flow model known as the STOPR model (Parsons Brinckerhoff 2006) was utilized to assess impacts of ground water withdrawals from the UFA. The STOPR model is a calibrated model created using the widely accepted MODFLOW code developed by the USGS (McDonald and Harbaugh 1988). The STOPR model was developed in support of water use permitting for the SFWMD and has been accepted by the SFWMD as a calibrated model.

The STOPR model is based on the existing SJRWMD ECF regional steady-state ground water flow model (McGurk and Presley 2002). It covers parts or all of Orange, Osceola, Seminole, Lake, Polk, and Brevard counties. The calibrated numerical STOPR model conceptualizes the fresh ground water flow field as three horizontal aquifers: the surficial aquifer, the UFA, and the Lower Floridan Aquifer (LFA) separated by two semi-confining units, with the LFA underlain by a confining unit (Parsons Brinckerhoff 2006). The conceptualization and input parameters used in the STOPR and ECF models have been extensively reviewed and used in several studies and permitting impact assessments. The STOPR model completely encompasses the CIPP as shown on Figure 5.3-1. For these reasons, the STOPR model was deemed appropriate to be utilized as the modeling tool for impact assessment. The SFWMD provided the model and indicated it should be used to model the impacts of new wells at CIPP.

The STOPR model uses a model grid size of 2,500 feet by 2,500 feet. To appropriately represent the drawdown at and around the CIPP, horizontal grid spacing was refined in and around the area of interest. Grid refinement was performed approximately in an area of 16 square miles covering eight grid cells in the east-west direction and eight grid cells in the north-south direction. The minimum grid size used for impact assessment of ground water extraction is 125 feet by 125 feet. The STOPR model was first run with the refined grid to verify that the model with the refined grid is consistent with the model with the original grid. It was found that the simulation results based on the refined grid were almost identical to those generated by the STOPR model with the original grid spacing.

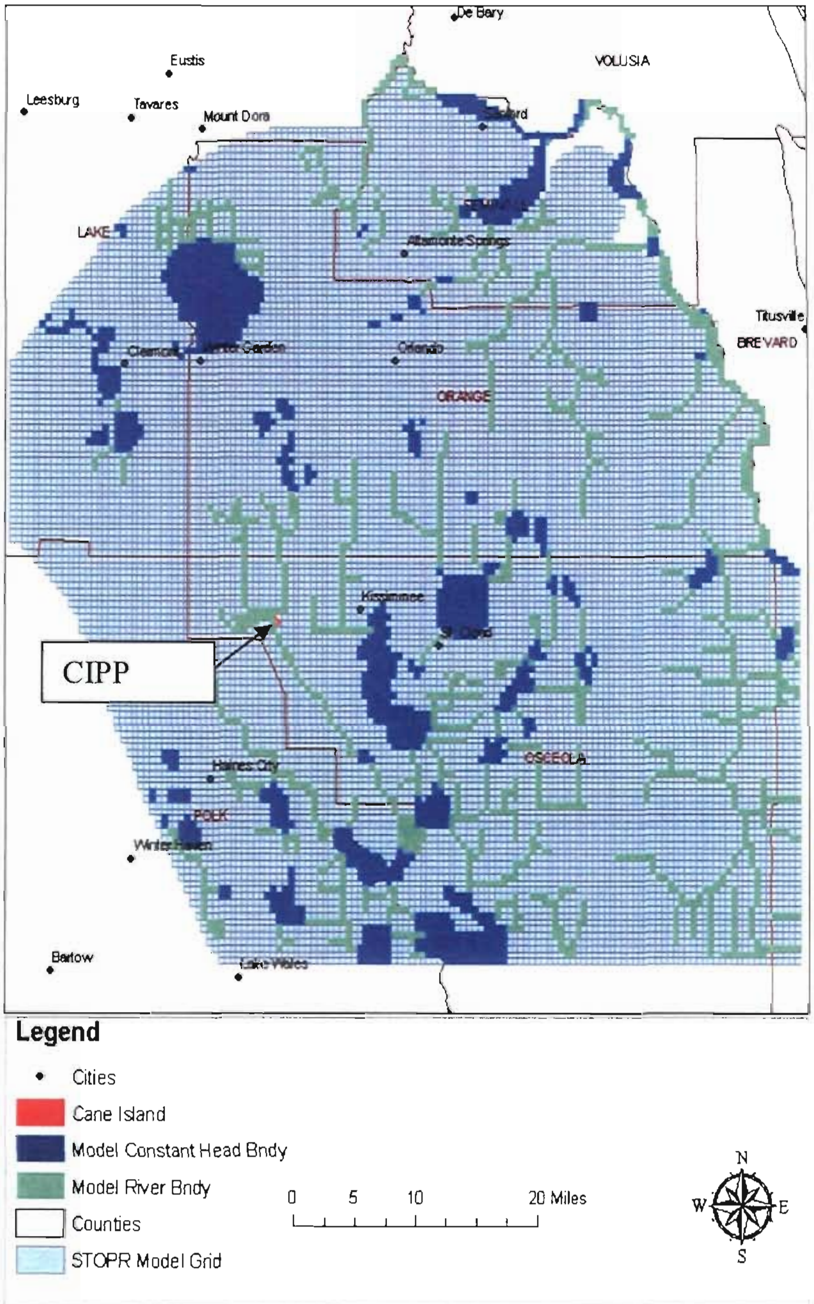


Figure 5.3-1
Location of the CIPP within the STOPR Model Domain

The STOPR model was utilized to assess the change in hydraulic head and associated radius of influence in response to anticipated additional ground water withdrawals required for Unit 4. The present permitted ground water withdrawals authorizations have annual limits with sub-limits of certain rates for a certain number of days in a calendar year for certain operating conditions. It is expected that the revised permit will contain similar limits. The present permitted limits and proposed revised limits are presented in Table 5.3-1. The potential current operating conditions under these limits in eight sequential periods covering 21 months for the currently permitted Wells 1 to 6 are shown in Table 5.3-2. The proposed incremental pumping rates during the same sequential operational periods as in Table 5.3-2 for a new well for Unit 4 are given in Table 5.3-3. It should be noted that in the tables, the total pumping rates during the first three periods are relatively small (below 1 mgd) compared to the fourth and fifth periods between Days 336 to 395, during which the combined pumping rate is 6.565 mgd (of which 2.92 mgd will be extracted from the hypothetical Unit 4 well).

Three different scenarios were used for impact assessment purposes. The three scenarios are listed below:

- Pre-CIPP Scenario--Pre-CIPP pumping based on the existing wells in the STOPR model
- Baseline Scenario--Pre-CIPP pumping and all water withdrawals for Units 1 through 3 from the UFA.
- Scenario 1--Baseline Scenario and all water withdrawal for Unit 4 from the UFA.

The Baseline Scenario was established by superposing the pumping rates and sequence in Table 5.3-2 on the existing STOPR model, which is based on the 1995 average recharge and pumping conditions (the Pre-CIPP Scenario). Scenario 1 was simulated by superposing the pumping conditions in Table 5.3-3 to the Baseline Scenario.

The ground water simulations were performed in accordance with the Basis of Review (BOR) for Water Use Applications within the SFWMD (2008). As required by the SFWMD BOR, all predictive scenarios were simulated under the following conditions:

- 3 months of average conditions.
- 12 months of 1 in 10 year drought conditions.
- 6 months of average conditions.

The monthly drought recharge rates were determined by Parsons Brinckerhoff (2006) utilizing the SFWMD, Part B Water Use Management System Design and Evaluation Aids, Part V, Supplemental Crop Requirement and Withdrawal Calculation, which is within Volume 3, Permit Information Manual for Water Use Permit

Table 5.3-1
Present Permit and Proposed Revised Permit Limits on Authorized Withdrawals*

Operating Conditions**	Number of Days per Year	Unit 1 through 3 Daily Flow, mgd	Unit 4 Daily Flow, mgd	New Total Daily Flow, mgd
Process Flows				
1	323	0.22	0.134	0.354
2	12	0.55	0.134	0.684
3	30	0.78	0.134	0.914
Emergency Cooling Flows				
4	30	2.865	2.786	5.651

*Present annual withdrawal limit is 186.8 mgy and proposed new limit is 319.8 mgy.
**Operating Conditions:
1. Operation of all units on natural gas.
2. Operation of Units 1 and 2 on fuel oil and Units 3 and 4 on natural gas.
3. Operation of Units 1, 2, and 3 on fuel oil and Unit 4 on natural gas.
4. Operation of Unit 2, 3, and 4 cooling tower with well water as makeup. This can occur with any of the Process Flow operating conditions.

Table 5.3-2
Pumping Rates for Wells Associated with Units 1, 2, and 3

Operating Conditions	Days	Well 1 (mgd)	Well 2 (mgd)	Well 3 (mgd)	Well 4 (mgd)	Well 5 (mgd)	Well 6 (mgd)	Total for Units 1-3 (mgd)
All Units Running, Units 1 and 2 on Oil, Unit 3 on Gas, No Emergency Cooling Tower Makeup Used	1 to 12	0.275	0.275	0	0	0	0	0.55
All Units Running on Gas, No Emergency Cooling Tower Makeup Used	13 to 90	0.11	0.11	0	0	0	0	0.22
All Units Running on Gas, No Emergency Cooling Tower Makeup Used	91 to 335	0.11	0.11	0	0	0	0	0.22
All Units Running, Units 1 to 3 on Oil, Emergency Cooling Tower Makeup Used	336 to 365	0.39	0.39	0.71625	0.71625	0.71625	0.71625	3.645
All Units Running, Units 1 to 3 on Oil, Emergency Cooling Tower Makeup Used	366 to 395* (1 to 30)**	0.39	0.39	0.71625	0.71625	0.71625	0.71625	3.645
All Units Running, Units 1 and 2 on Oil, Unit 3 on Gas, No Emergency Cooling Tower Makeup Used	396 to 407 (31 to 42)	0.275	0.275	0	0	0	0	0.55
All Units Running on Gas, No Emergency Cooling Tower Makeup Used	408 to 455 (43 to 90)	0.11	0.11	0	0	0	0	0.22
All Units Running on Gas, No Emergency Cooling Tower Makeup Used	456 to 638 (91 to 273)	0.11	0.11	0	0	0	0	0.22

*Days in the second calendar year.
**Days in a calendar year.

Table 5.3-3
Pumping Rates for Wells Associated with Unit 4 Only

Operating Conditions	Days	Total Incremental Pumping for Unit 4 (mgd)
Unit 4 Running on Gas, No Emergency Cooling Tower Makeup Used	1 to 12	0.134
Unit 4 Running on Gas, No Emergency Cooling Tower Makeup Used	13 to 90	0.134
Unit 4 Running on Gas, No Emergency Cooling Tower Makeup Used	91 to 335	0.134
Unit 4 Running on Gas, Emergency Cooling Tower Makeup Used	336 to 365	2.92
Unit 4 Running on Gas, Emergency Cooling Tower Makeup Used	366 to 395* (1 to 30)**	2.92
Unit 4 Running on Gas, No Emergency Cooling Tower Makeup Used	396 to 407 (31 to 42)	0.134
Unit 4 Running on Gas, No Emergency Cooling Tower Makeup Used	408 to 455 (43 to 90)	0.134
Unit 4 Running on Gas, No Emergency Cooling Tower Makeup Used	456 to 638 (91 to 273)	0.134

*Days in the second calendar year.
**Days in a calendar year.

Applications (refer to Section 1.7.5.2, SFWMD, 2008). The method in the manual was employed to determine the 1 in 10 year drought and average rainfall conditions for the purpose of evaluating monthly drought recharge rates. The average and drought recharge rate distributions were available as part of the STOPR model package developed by Parsons Brinckerhoff (2006).

To satisfy the BOR requirements, all scenarios were simulated for 21 months. For the Baseline Scenario, the first 12 month pumping (based on a calendar year authorized maximum withdrawals) follows the schedule presented in Table 5.3-2, Rows 1 through 4, and the pumping schedule of the following 9 months is presented in Table 5.3-2, Rows 5 through 8. Similarly, the pumping schedules for the first 12 months and the following 9 months for Scenario 1 are given in Table 5.3-3, Rows 1 through 4 and 5 through 8, respectively. The simulations in both scenarios were designed to capture the maximum impact due to heavy pumping. In both scenarios, the heavy pumping periods were conservatively assumed to occur consecutively during the 12th and 13th months (Days 336 to 365 and Days 366 to 395 of Tables 5.3-2 and 5.3-3) which, based on the above mentioned sequence of average and drought conditions, are within the 1 in 10 year drought period.

Impacts in terms of drawdown for both scenarios were estimated using the difference between the STOPR model 1995 potentiometric elevation and simulated ground water elevations from respective scenarios. Details of impacts are discussed below.

5.3.2.2.2 Baseline Impact Due to Pumping from the Existing Wells. Presented in Figure 5.3-2a is the maximum drawdown in the UFA resulting from pumping at Wells 1 to 6 over the entire simulation period of 638 days. The maximum drawdown at any point in time was always observed in the UFA at Well 4, which is one of the existing wells (refer to Figure 5.3-3a for its location). For the first 335 days of the year, the maximum drawdown remains small at approximately 0.5 foot, reflecting relatively light pumping rates (0.22 to 0.55 mgd) during this period. As shown in Figure 5.3-2a, the maximum drawdown, which occurs on the 395th day, is approximately 4.9 feet. In the figure, it can be seen that large drawdown is confined to the last 60 day period of heavy pumping within the entire simulation period of 638 days. After the heavy pumping period, the drawdown decreases to a near-constant value of 0.5 foot at the end of the simulation period of 638 days.

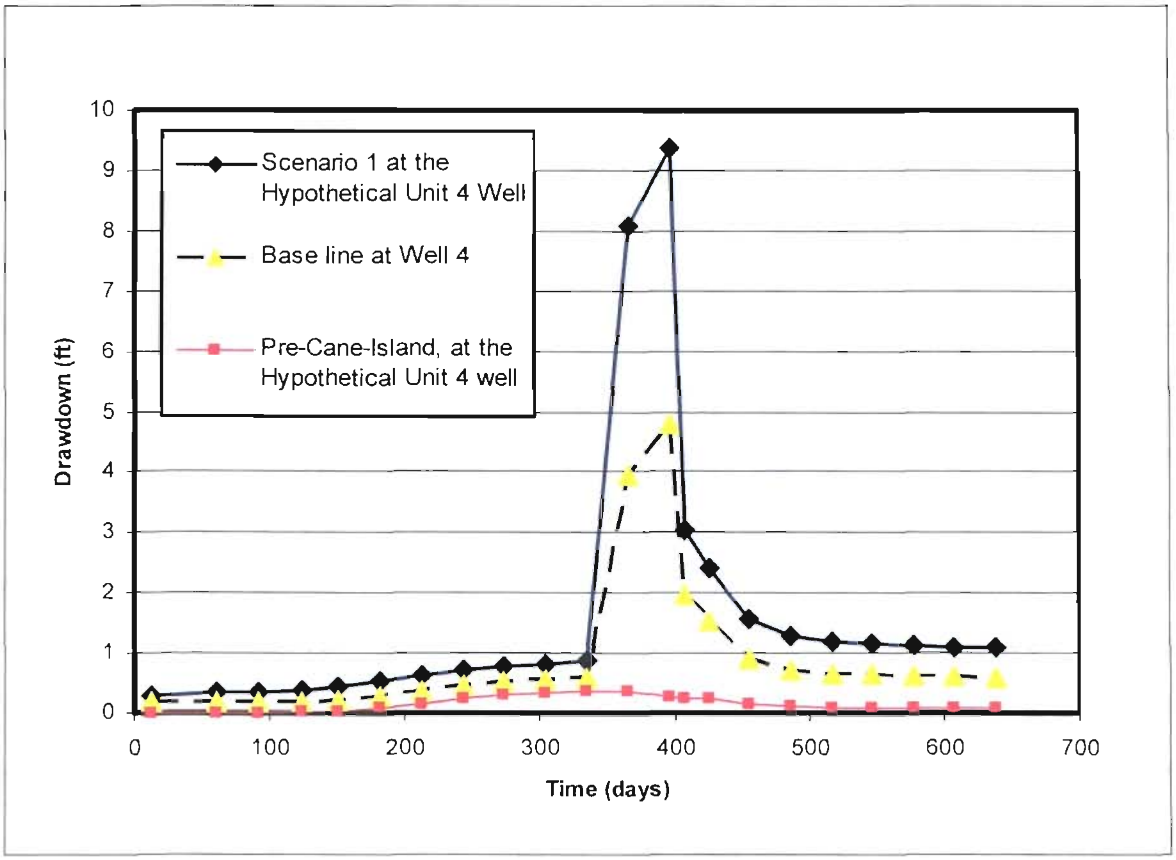


Figure 5.3-2a
Maximum Drawdowns Observed in the UFA (at Well 4 for the Baseline Scenario and at the Proposed Unit 4 Well for Scenario 1)

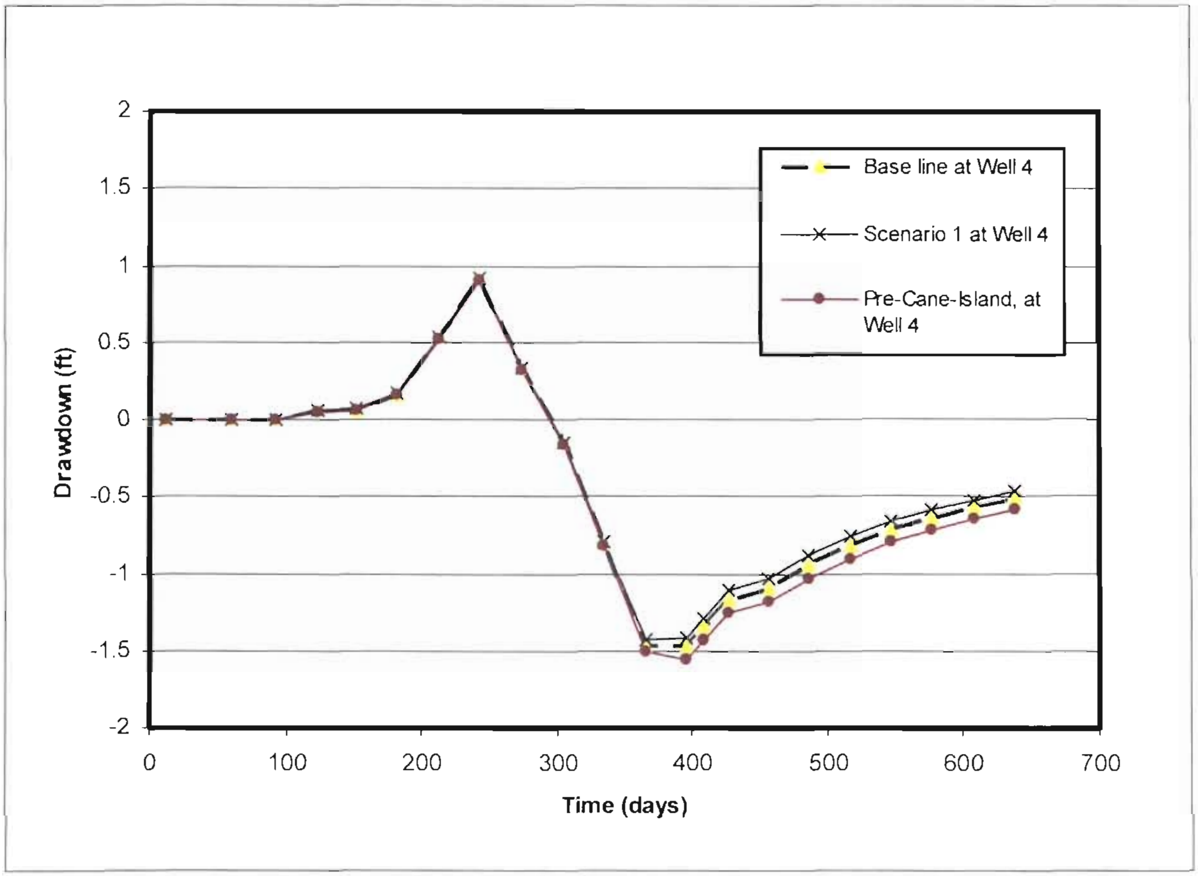


Figure 5.3-2b
Drawdowns Observed in the SAS at the location above Well 4

Presented on Figures 5.3-2b and 5.3-2c are drawdowns in the SAS at the locations above Well 4 and the hypothetical well for Unit 4 (refer to Figure 5.3-3a for their locations), respectively. As shown, the time variation of drawdowns in the SAS does not correspond to that of the UFA drawdown on Figure 5.3-2a. This observation indicates that lowering of water level in the SAS is in response not to the pumping for Units 1 to 3 in the UFA, but to the drought conditions (recharge and other surficial conditions). In fact, the ground water in the SAS rises in response to the change in recharge (drawdown is negative) during the period that maximum drawdown in observed in the UFA. Note that recharge increases and decreases according to precipitation during the drought period (Parsons and Brinkerhoff, 2006). As shown on Figure 5.3-3a, the maximum drawdown, which occurs on the 243rd day of the simulation period, is approximately 1 foot and regionally pervasive, indicating that the changes in ground water level in the SAS are in response to the drought conditions and that pumping in the UFA has negligible impact on the SAS. For comparison purposes, drawdown curves for the SAS above Well 4 and the hypothetical Unit 4 well from the Pre-Cane Island Scenario are also shown on Figures 5.3-2b and 5.3-2c, respectively. In the figures, it can be seen that the additional impact due to pumping for Units 1-3 is on the order of 0.05 foot near the two pumping wells.

The distribution of drawdown in the UFA on the 395th day is shown on Figure 5.3-3b. As can be observed in the figure, the cone of depression (defined by the 1 foot drawdown contour) is confined to within a 1 mile radius from the site center.
The distribution of drawdown in the LFA on the 395 day is shown on Figure 5.3-3c. The maximum UFA pumping-induced drawdown in the LFA is on the order of 0.6 foot. The drawdown in the LFA, compared to the drawdown in the UFA, shown on Figure 5.3 3b, appears to skew slightly to the west of the site area. The apparent skewness is due to the fact that pumping in the UFA diverts ground water, which would otherwise recharge the LFA, toward the wells, especially from the upgradient side or west of the site area (ground water flow in both the UFA and the LFA is from west to east). Because of the diversion of ground water flow in the UFA west of site area, the drawdown in the LFA tends to skew slightly toward the upgradient part of the regional ground water flow or west of the site area.

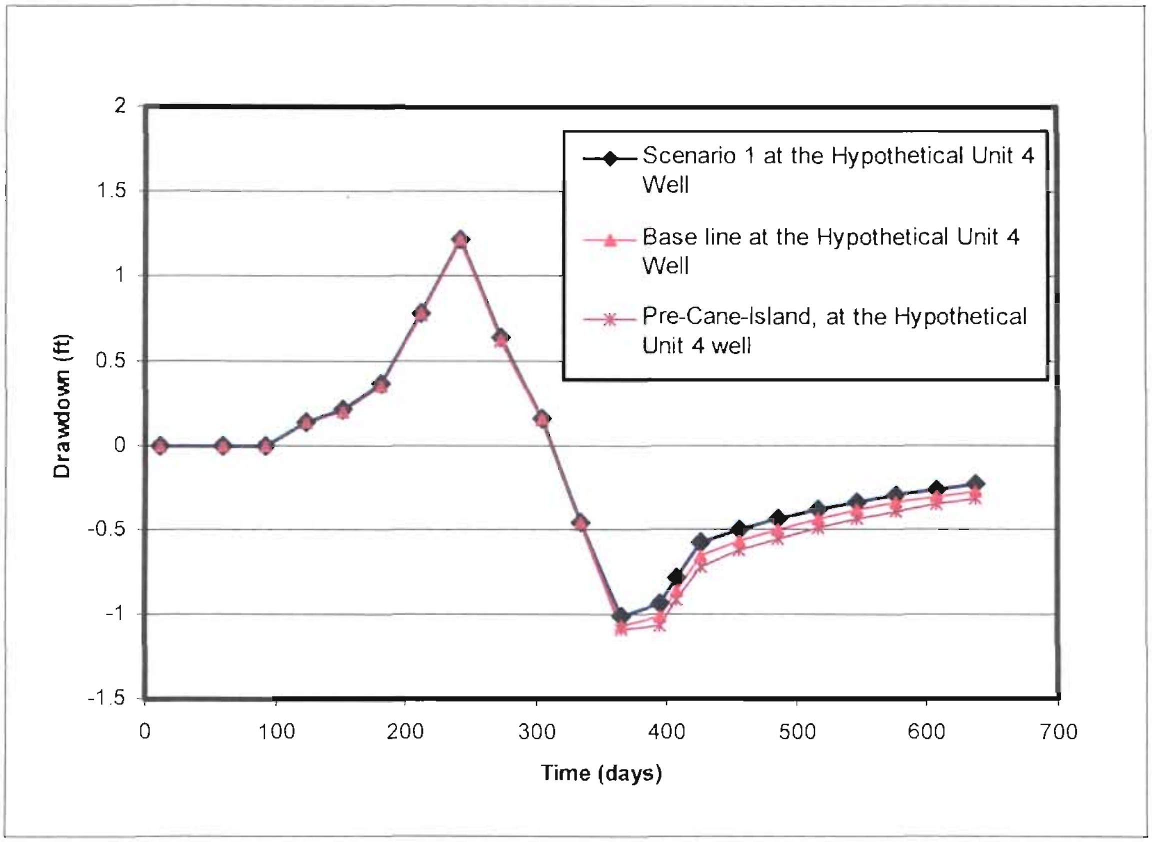


Figure 5.3-2c
Drawdowns Observed in the SAS at the location above the Hypothetical Unit 4 Well

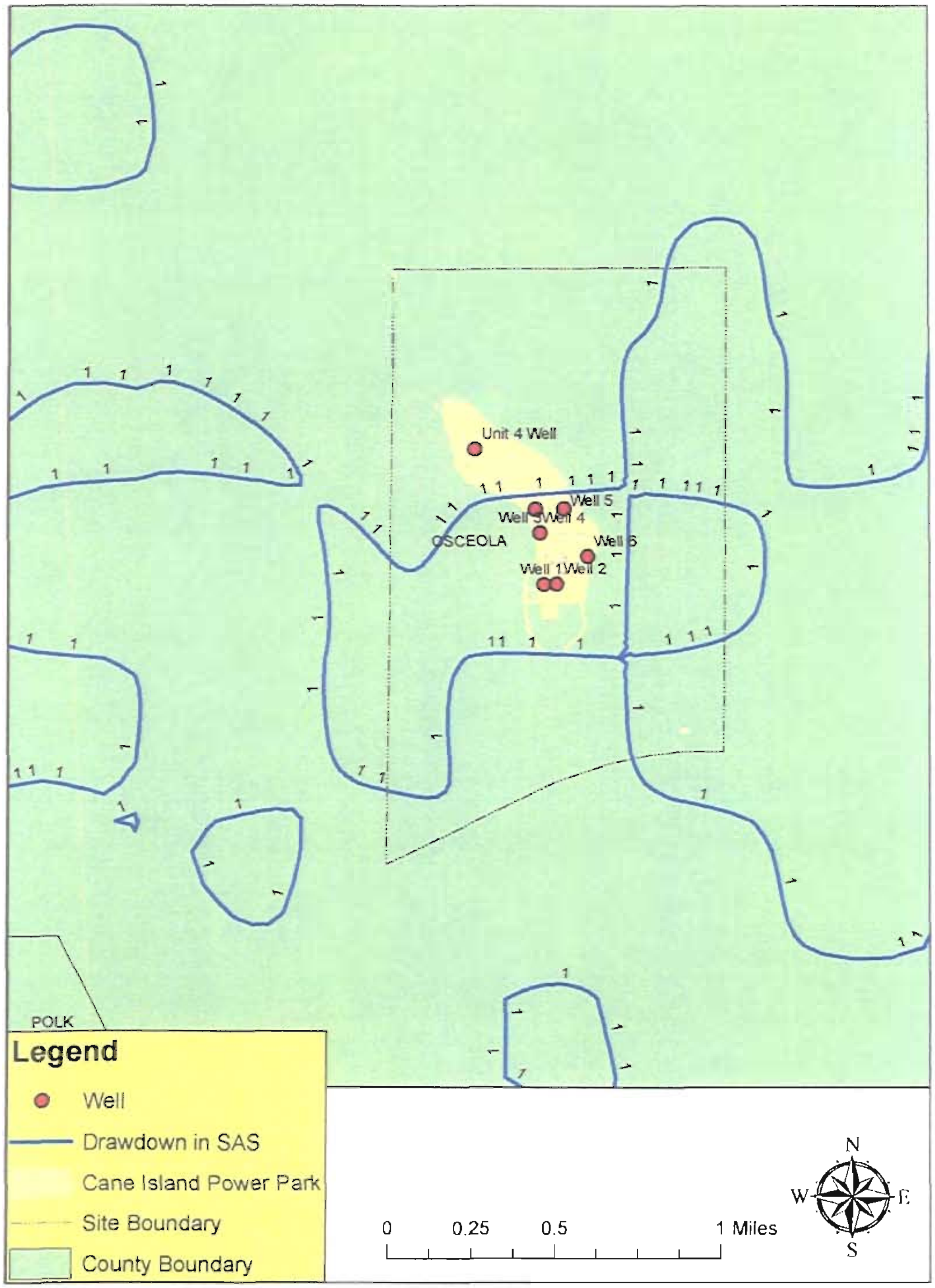


Figure 5.3-3a
Drawdown in the SAS on Day 243: Baseline Scenario

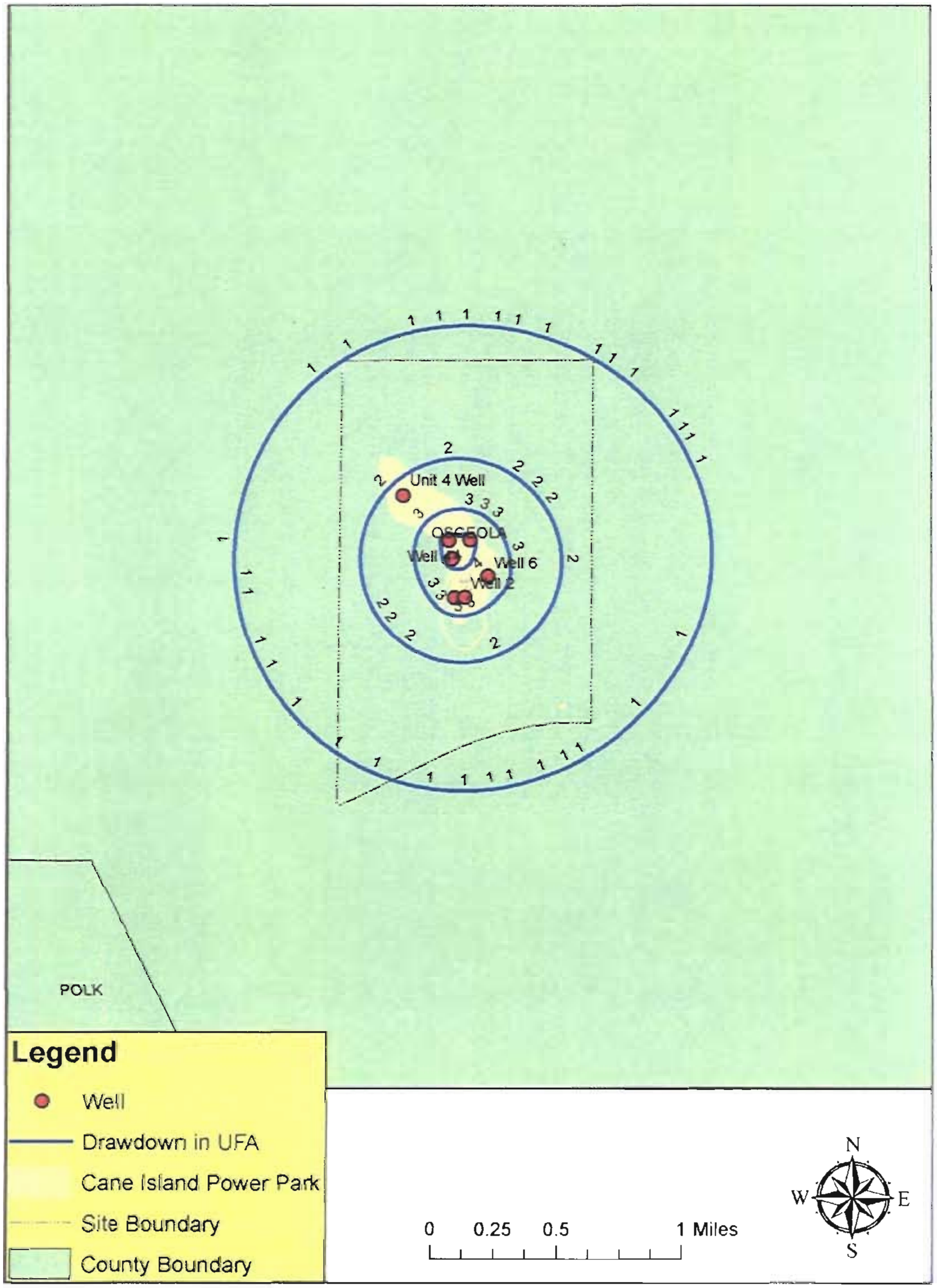


Figure 5.3-3b
Drawdown in the UFA on day 395: Baseline Scenario

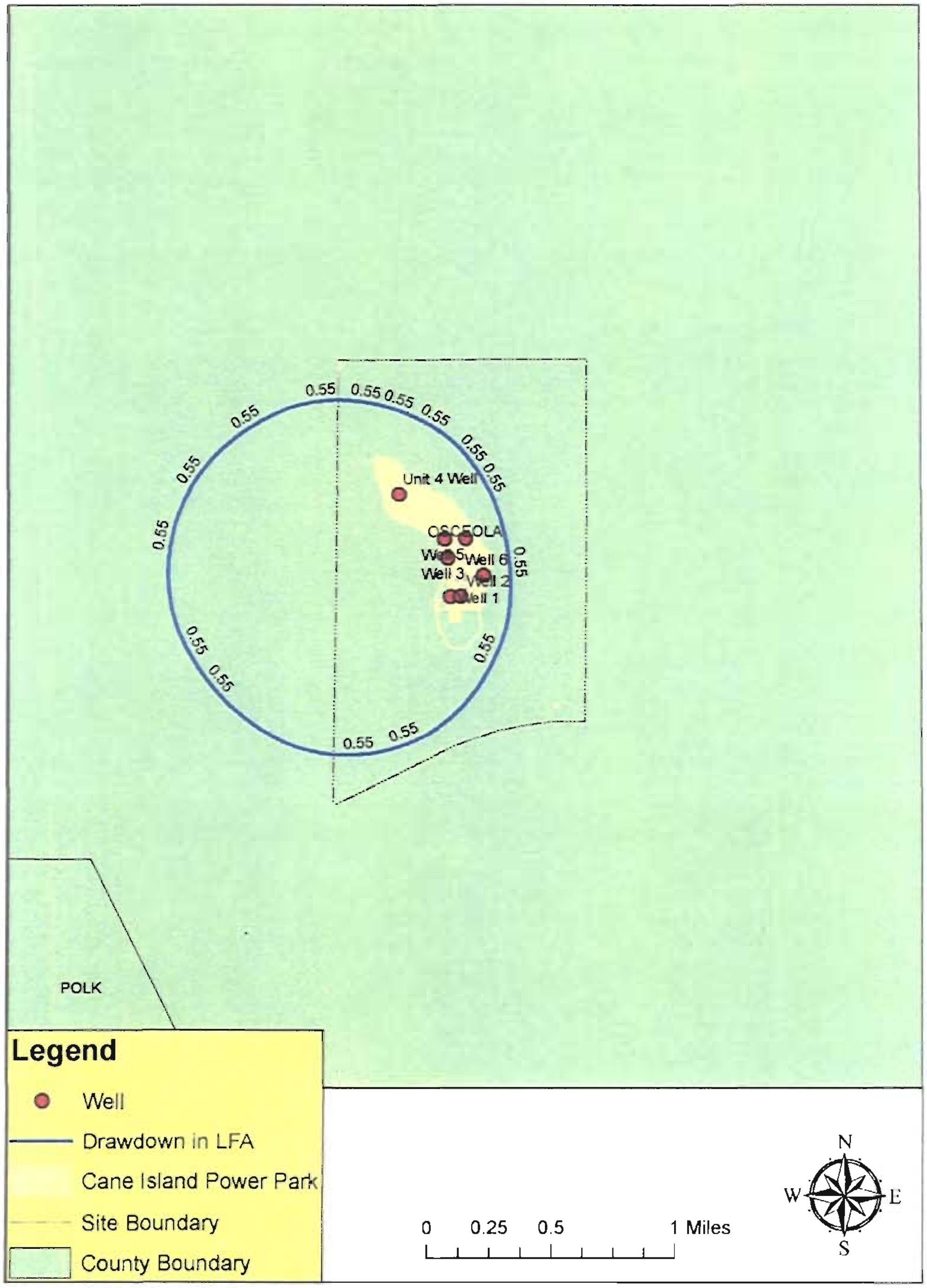


Figure 5.3-3c
Drawdown in the LFA on Day 395: Baseline Scenario
(Maximum drawdown is below 1 ft)

5.3.2.2.3 Impact Due to Units 1 to 4 Pumping with Existing and New Wells. Presented on Figure 5.3-2a is the maximum drawdown in the UFA resulting from pumping at Wells 1 to 6 and the hypothetical well for Unit 4 (refer to Figure 5.3-3a for their locations) over the entire simulation period of 638 days. The maximum drawdown at any point in time was always observed in the UFA at the hypothetical Unit 4 well. For the first 335 days of the year, the maximum drawdown remains less than 1 foot, reflecting relatively light pumping rates (0.35 to 0.68 mgd) during this period. As shown on Figure 5.3-2a, the maximum drawdown, which occurs on the 395th day, is approximately 9.5 feet. In the figure, it can be seen that large drawdown is confined to the 60 day period of heavy pumping within the entire simulation period of 638 days. After the heavy pumping period, the drawdown decreases to a near-constant value of 1 foot at the end of the simulation period of 638 days. For comparison purposes, a drawdown curve at the hypothetical Unit 4 well for the Pre-CIPP Scenario is also shown on Figure 5.3-2a. In the figure, it can be seen that the drought conditions have small effects on the UFA as they result in lowering the UFA water level by less than 1/2 foot.

Presented on Figures 5.3-2b, and 5.3-2c are drawdowns in the SAS at the locations above Well 4 and the hypothetical well for Unit 4, respectively. Similar to the Baseline Scenario, the time variation of drawdowns in the SAS does not mimic that of the corresponding UFA drawdown on Figure 5.3-2a. As shown on Figure 5.3-4a, the maximum drawdown, which occurs on the 243rd day of the simulation period, is approximately 1 foot and regionally pervasive, indicating that the changes in ground water level in the SAS is in response to the drought conditions and that pumping in the UFA has negligible impact on the SAS. For comparison purposes, drawdown curves for the SAS above Well 4 and the hypothetical Unit 4 well from the Pre-CIPP Scenario are also shown on Figures 5.3-2b and 5.3-2c, respectively. In the figures, it can be seen that the additional impact due to pumping for Units 1 to 4 is on the order of 0.1 foot near the two pumping wells. The distribution SAS impact above the Pre-CIPP Scenario was found to be on the order of 0.02 to 0.04 foot within a 1/2 mile radius from the site center and is considered negligible.

The distribution of drawdown in the UFA on the 395th day is shown on Figure 5.3-4b. As can be observed in the figure, the cone of depression (defined by the 1 foot drawdown contour) is confined to within a 1.75 mile radius from the site center.

The distribution of drawdown in the LFA on the 365th day is shown on Figure 5.3-4c. The maximum UFA pumping-induced drawdown in the LFA is on the order of 0.7 foot. Similar to the drawdown shown on Figure 5.3-3c, the drawdown in the LFA shown on Figure 5.3-4c, also skews slightly to the west of the site area. The reason for the skewness is given and discussed in Subsection 5.3.2.2.2.

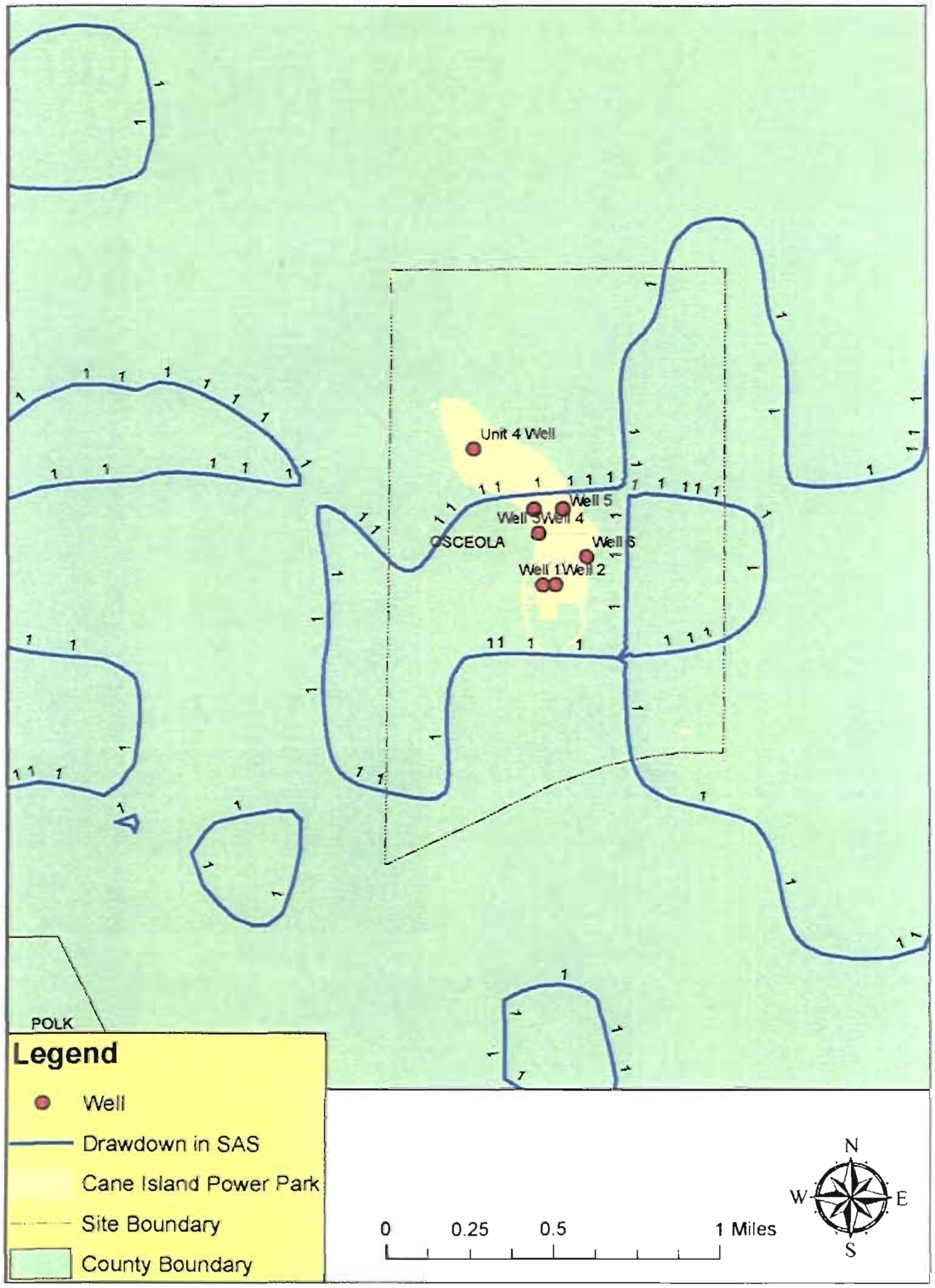


Figure 5.3-4a
Drawdown in the SAS on Day 243: Scenario 1 - Incremental Pumping in the UFA
(Maximum drawdown is below 0.1 ft)

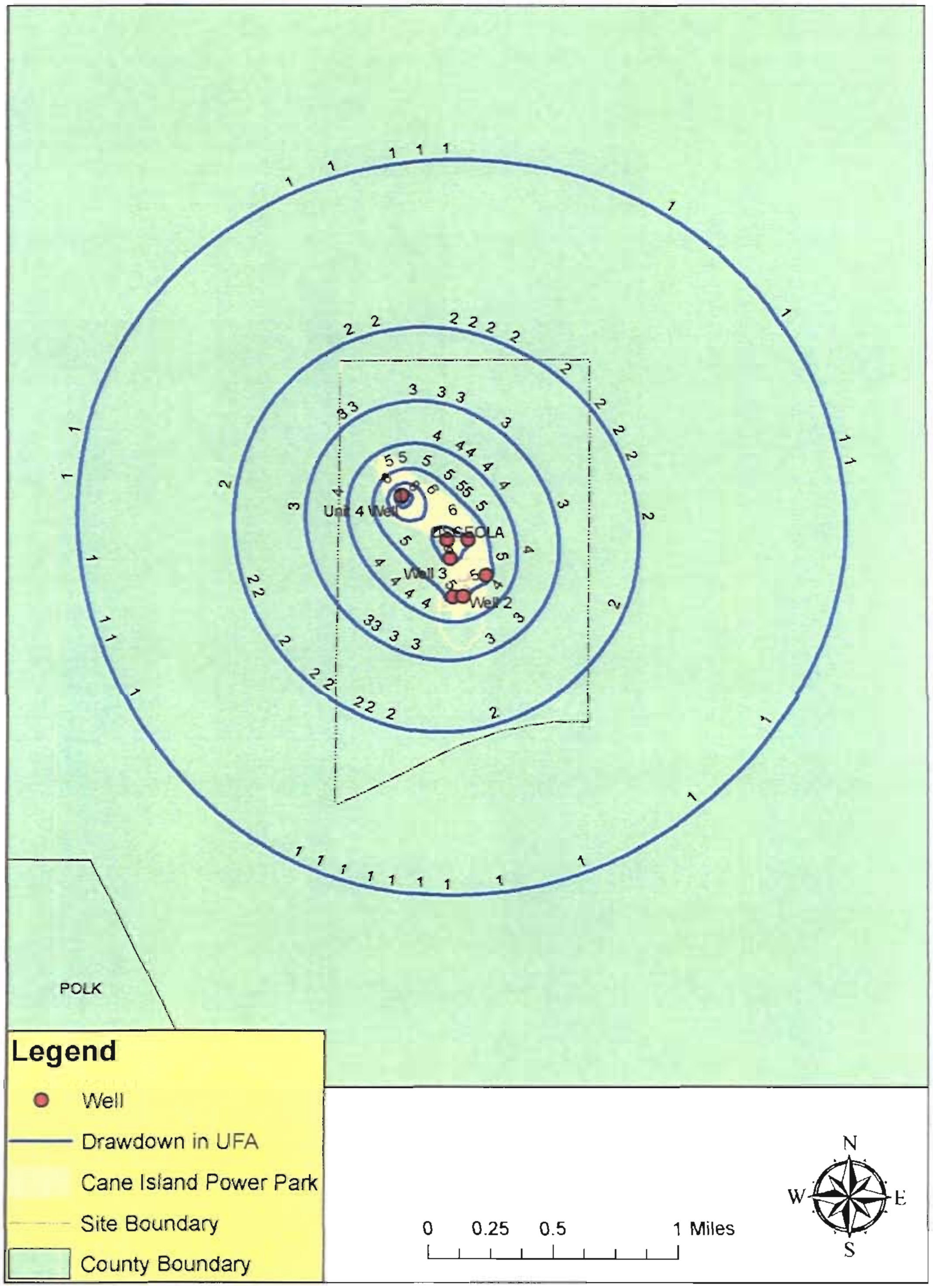


Figure 5.3-4b
Drawdown in the UFA on Day 395:
Scenario 1 - Incremental Pumping in the UFA

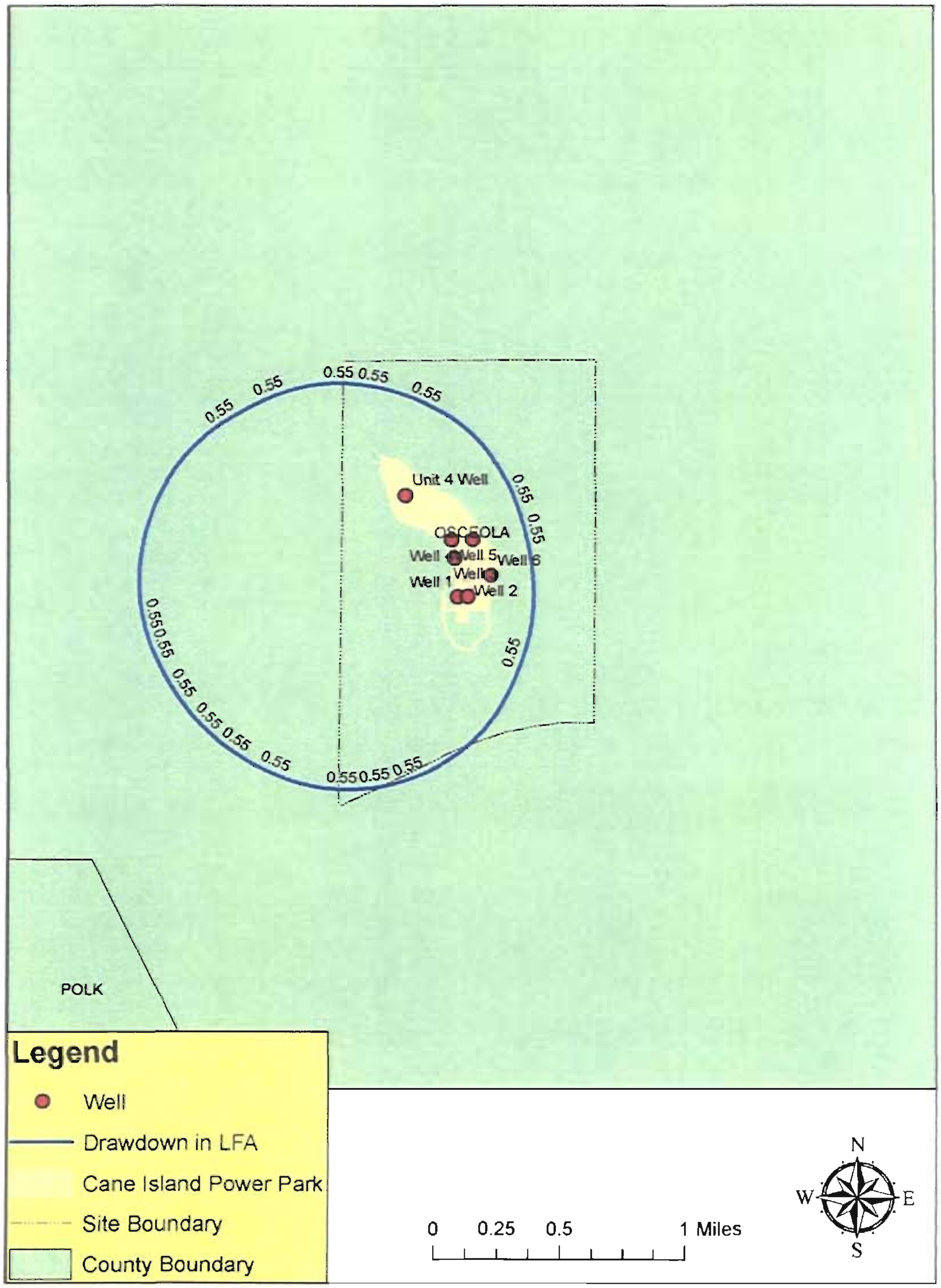


Figure 5.3-4c
Drawdown in the LFA on Day 395:
Scenario 1 - Incremental Pumping in the UFA (Maximum drawdown is below 1 ft)

5.3.2.2.4 Ground Water Impacts. The approach presented and discussed in Subsections 5.3.2.1, 5.3.2.2, and 5.3.2.3 is conservative, because of the following:

- Ground water for Unit 4 is assumed to be extracted from a single well. This type of analysis yields worst-case local drawdowns in all aquifers within the site area. Refer to Figure 2.1-3 for the proposed location of five new wells to provide the Unit 4 added water requirements.
- The analysis is designed to show the maximum impact. In the Baseline Scenario and Scenario 1, the heavy pumping periods were conservatively assumed to occur consecutively during the 12th and 13th months (Days 336 to 395 in Tables 5.3-2 and 5.3-3), which, based on the above-mentioned sequence of average and drought conditions, are within the 1 in 10 year drought period.

The cumulative impact on the surficial aquifer is relatively negligible and overwhelmed by the surficial conditions during the drought period. The maximum impact above the Pre-CIPP Scenario is expected to be from 0.02 to 0.06 foot within a 1 mile radius from the site center. The maximum drawdown in the UFA is expected to be approximately a foot close to the pumping wells and under a foot outside the pumping area, during light pumping periods (335 days of a calendar year). During two consecutive heavy pumping periods, under the 1 in 10 year drought conditions, the cone of depression as defined by a 1 foot drawdown contour is approximately within a 1.75 mile radius from the site center.

As indicated earlier, the impact due to pumping during the light pumping periods is expected to be very small for 335 days in a year. Even with the maximum impact during the heavy pumping periods, the predicted drawdown in the vicinity of the wells indicates that pumping from the existing wells for Units 1 to 3 and the proposed incremental pumping for Unit 4 will have no effects on existing domestic, irrigation, or other public water supply wells due to ground water withdrawal.

5.3.3 Drinking Water

The effects of CIPP ground water withdrawals during operation on drinking water supplies are discussed in Subsection 5.3.2. The effects of leachate and runoff are discussed in Subsection 5.3.4.

5.3.4 Leachate and Runoff

Effluent from the oil/water separators is routed to a new percolation pond dedicated for Unit 4 for discharge to the surficial aquifer. The percolation pond will operate as a single cell, dry pretreatment pond with berms to prevent overflow and divert general site runoff. The pond will be used to collect water that has been routed to the oil/water separators for treatment. Water sources includes rainfall water collected in secondary containment areas, plant and equipment drains, and nonchemical floor drains. Oil/water separator effluent quality is not to exceed 10 ppm of oil and grease. Collected waters will percolate down to the surficial aquifer below the pond. Water will also percolate into the surficial ground water from the storm water detention pond. The location of the new percolation pond, the detention pond, and surrounding structures is shown on Figure 5.3-5.

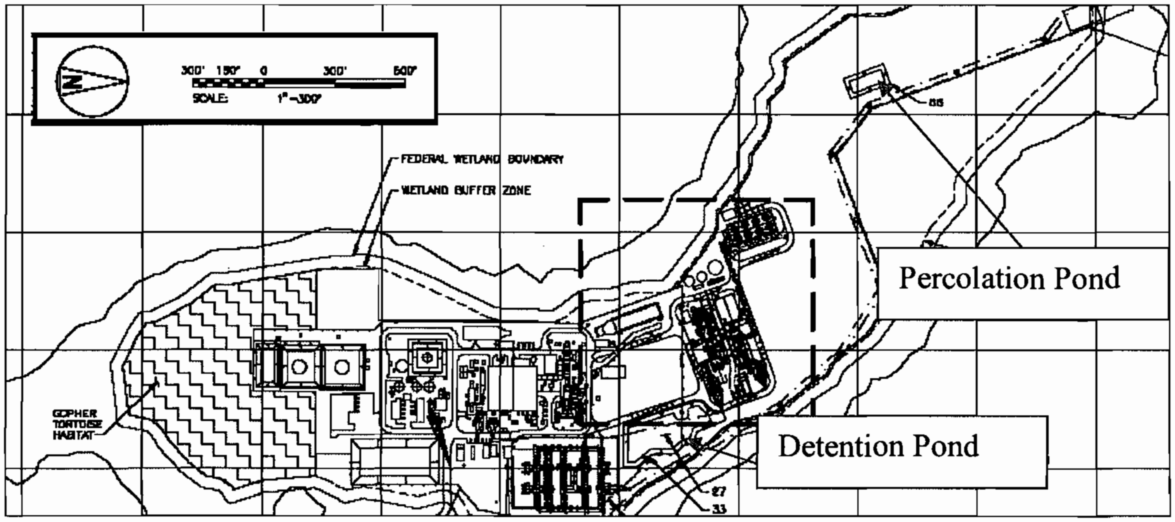


Figure 5.3-5
Locations of New Percolation Pond and Detention Pond

5.3.4.1 Mounding Study. A mounding study was performed to determine the impact of the operations of the percolation and the detention ponds to the water table in the underlying surficial aquifer. The mounding study was performed to simulate the daily flow as well as the maximum flow conditions predicted to occur at the percolation pond. Maximum daily flow condition includes storm water runoff from the secondary containment areas for a 24 hour, 10 year storm event including the average daily flow from the plant and equipment drain. Maximum flow also includes the rainfall occurring on the percolation pond.

The base of the percolation pond as well as the detention pond is at Elevation 74.0 feet above mean sea level (amsl). Maximum berm height is at Elevation 79.0 feet amsl for the two ponds. Effective size of the percolation pond at Elevation 74.0 feet is 90 feet by 180 feet. The total storage capacity for the new percolation pond, with a 1 foot design freeboard, is approximately 621,618 gallons. Storage volumes and areas for the detention pond at different elevations are presented in Table 5.3-4.

Table 5.3-4
Depth Versus Area Relation for Detention Pond

Stage	Pond Area (sq ft)	Total Area (acres)	Pond Incremental Detention volume (cu yd)	Accumulative Detention volume (cu yd)	Accumulative Detention volume (ac ft)
74	38,490	0.884	0.0	0.0	0.000
75	42,793	0.982	1,505.2	1,505.2	0.940
76	47,210	1.084	1,666.7	3,171.9	1.970
77	51,777	1.189	1,833.1	5,005.0	3.110
78	56,500	1.297	2,005.1	7,010.1	4.350
78.25	57,647	1.323	528.5	7,538.6	4.680
78.5	58,801	1.350	539.1	8,077.7	5.010
78.75	59,962	1.377	549.8	8,627.5	5.350
79	71,519	1.642	608.7	9,236.2	5.730

The maximum flow condition accounts for an average daily flow of 20,000 gpd from the plant and equipment drain; 10 year, 24 hour rainfall runoff of 28,806 gpd from containment areas; and 10 year, 24 hour rainfall amounting to 97,694 gpd occurring on the percolation pond. Total flow from the storm event collected by the percolation pond is 146,500 gpd. Based on the same 10 year, 24 hour precipitation event, the detention pond was analyzed for a given percolation rate of 193,868 gpd.

As discussed in Subsection 2.3.2.1 of this report, various infiltrometer tests were conducted at the Cane Island site. Based on the recent double ring infiltrometer tests (Ardaman and Associates 2007), a conservative value of 6.5 inches per hour was used as the infiltration rate for calculating the time it would take for both ponds to lose the estimated amount of water to the surficial aquifer.

The total maximum daily flow into the percolation pond is estimated at 146,500 gpd. It will take about 2.3 hours to percolate this amount of water. The detention pond storage capacity is approximately 1,866,999 gallons. It will take approximately 1.2 hours to percolate the water entering the detention pond. The inflow volumes entering the percolation and the detention ponds are much smaller than the storage capacity of the respective ponds.

Based on recent water level observations presented in Subsection 2.3.2, the highest ground water table encountered during the 2007-2008 investigation was in Boring B4-9 at Elevation +73.8 feet amsl. The lowest ground water table was encountered in Boring B4-7 at Elevation +70 feet amsl. The average ground water level was estimated as Elevation +72 feet amsl or approximately 6 feet bgs.

5.3.4.2 Mounding Simulations. An existing numerical transient ground water flow model known as the STOPR model (Parsons Brinckerhoff 2006) was utilized to assess impacts of percolation on the SAS. The STOPR model is a calibrated model created using the widely accepted MODFLOW code developed by the USGS (McDonald and Harbaugh 1988). The STOPR model was developed in support of water use permitting for the SFWMD and has been accepted by the SFWMD as a calibrated model. The STOPR model is based on the existing SJRWMD ECF regional steady-state ground water flow model (McGurk and Presley 2002).

The STOPR model uses a model grid size of 2,500 feet by 2,500 feet. To appropriately represent the mounding resulting from percolation from the percolation and the detention ponds, horizontal grid spacing was refined in and around the area of interest. Grid refinement was performed in an area of approximately 16 square miles covering eight grid cells in the east-west direction and eight grid cells in the north-south direction. The minimum grid size used for impact assessment of percolation from the percolation and detention ponds is 62.5 feet by 125 feet. The STOPR model was first run with the refined grid to verify that the model with refined grid is consistent with the model with the original grid. It was found that the simulation results based on the refined grid were almost identical to those generated by the STOPR model with the original grid spacing.

Three transient simulations were performed to assess the impacts of percolation from the percolation and the detention ponds into the SAS. The first simulation, the baseline scenario, was simulated with the average 1995 recharge and well pumping conditions (based on the 1995 calibrated conditions) applied to all stress periods. The baseline scenario hydraulic head distribution was then used to compute the mounding resulting from percolation in subsequent simulations. The remaining two simulations, representing the mounding scenarios, were also simulated with the recharge and pumping conditions identical to those in the first simulation. The first mounding scenario was simulated to assess the impacts due to loading from average daily conditions by adding average daily percolation rates, anticipated to occur for the percolation pond, to the recharge rates applied on to the grid cells that represent the percolation pond. The second mounding scenario was simulated to assess the impacts of percolation for maximum flow conditions resulting from a 10 year, 24 hour rainfall event. The maximum flow conditions were simulated for the percolation pond as well as the detention pond. Initial conditions used in all simulations represent the 1995 steady-state conditions. Mounding simulation performed for daily flow conditions was carried out until the hydraulic head achieved a steady-state condition. In the case of the maximum flow condition, the simulation was performed for a period of 1 day to detect the maximum rise. After the occurrence of the maximum rise, the mound would dissipate laterally subsequent to the mounding.

The percolation pond in the model is represented by one grid cell of size 125 feet by 125 feet and an area of approximately 15,625 square feet representing the area of the base of the percolation pond. The base of the percolation pond is 90 feet by 180 feet, an area of 16,200 square feet. The detention pond is represented by two grid cells of size 125 feet by 125 feet and one grid cell of size 125 feet by 62.5 feet, for a total area of 39,062.5 square feet. The area at the base of the detention pond is approximately 39,147 square feet. The maximum daily flow is based on the 10 year, 24 hour precipitation event. The rainfall collected by the percolation pond occurs during the day of the event.

Mounding was calculated by subtracting the hydraulic head results obtained from the baseline scenario from the hydraulic head results obtained from the mounding scenarios to assess the impact of percolation on the SAS ground water levels. Predicted mounding contours due to the average daily flow conditions are shown on Figure 5.3-6 and those for the maximum flow conditions are shown on Figure 5.3-7. In this analysis, which involves the unconfined SAS, the extent of the ground water mound caused by pond percolation is defined by the 0.1 foot contour.

The maximum rise of 1.0 foot was noted to occur underneath the percolation pond for the daily flow conditions. In the case of maximum flow conditions (without the daily flow), a maximum mounding of 1.4 feet is predicted for the SAS hydraulic head under the percolation pond, and a maximum mounding of 1.2 feet is predicted for the SAS hydraulic head under the detention pond. The combined impact in the event of maximum and average daily loadings is 2.4 feet (1.0 foot from average daily loading and 1.4 feet from the precipitation event) and may cause the ground water table to be in direct hydraulic communication with the water in the percolation pond because the average water table elevation, prior to the operation of the pond, is approximately 2 feet below the bottom of the percolation pond. During the wet season, after a 10 year, 24 hour precipitation event, the percolation pond may remain wet for a few days.

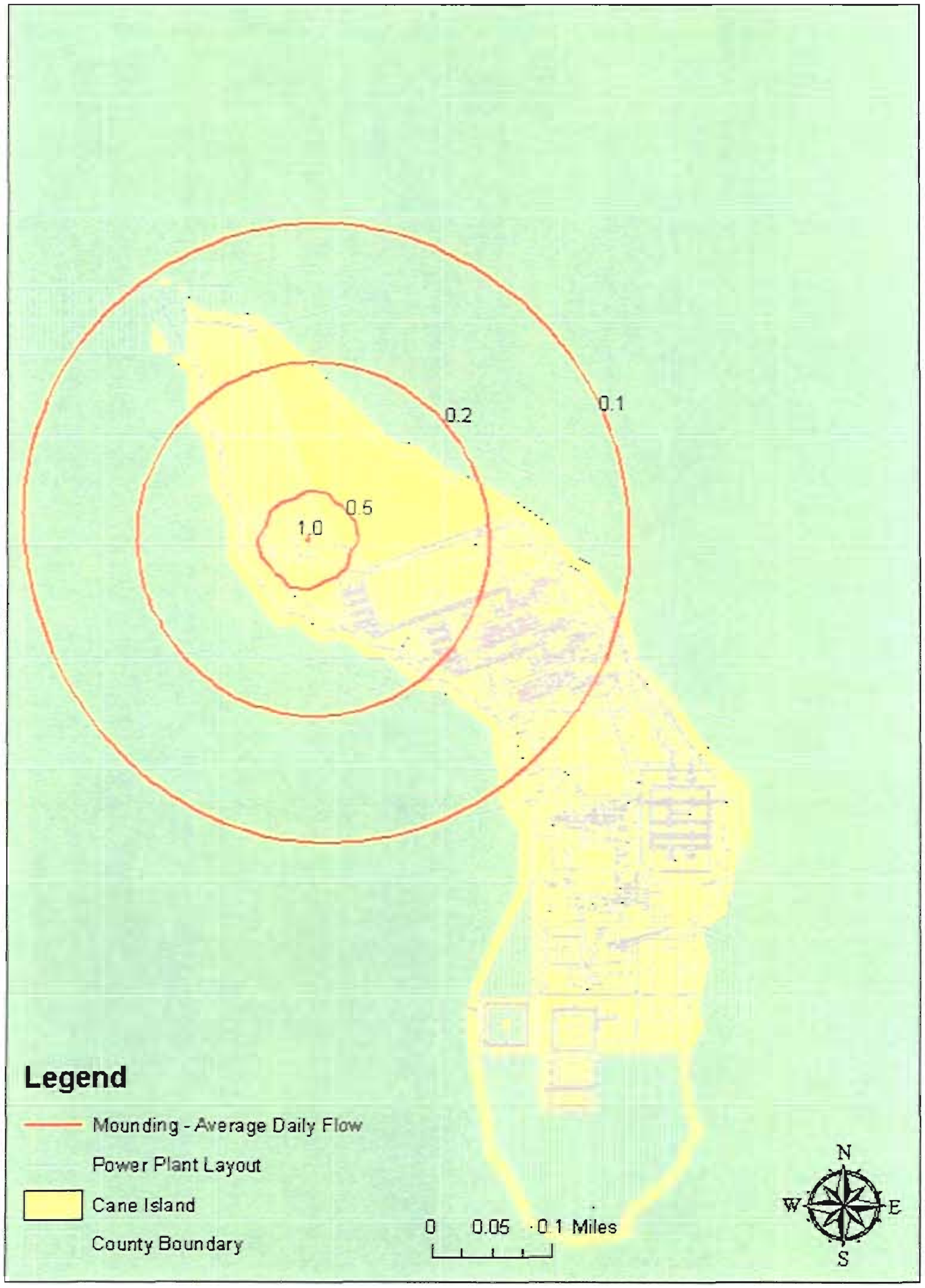


Figure 5.3-6
Surficial Aquifer Mounding For Average Daily Flow Conditions

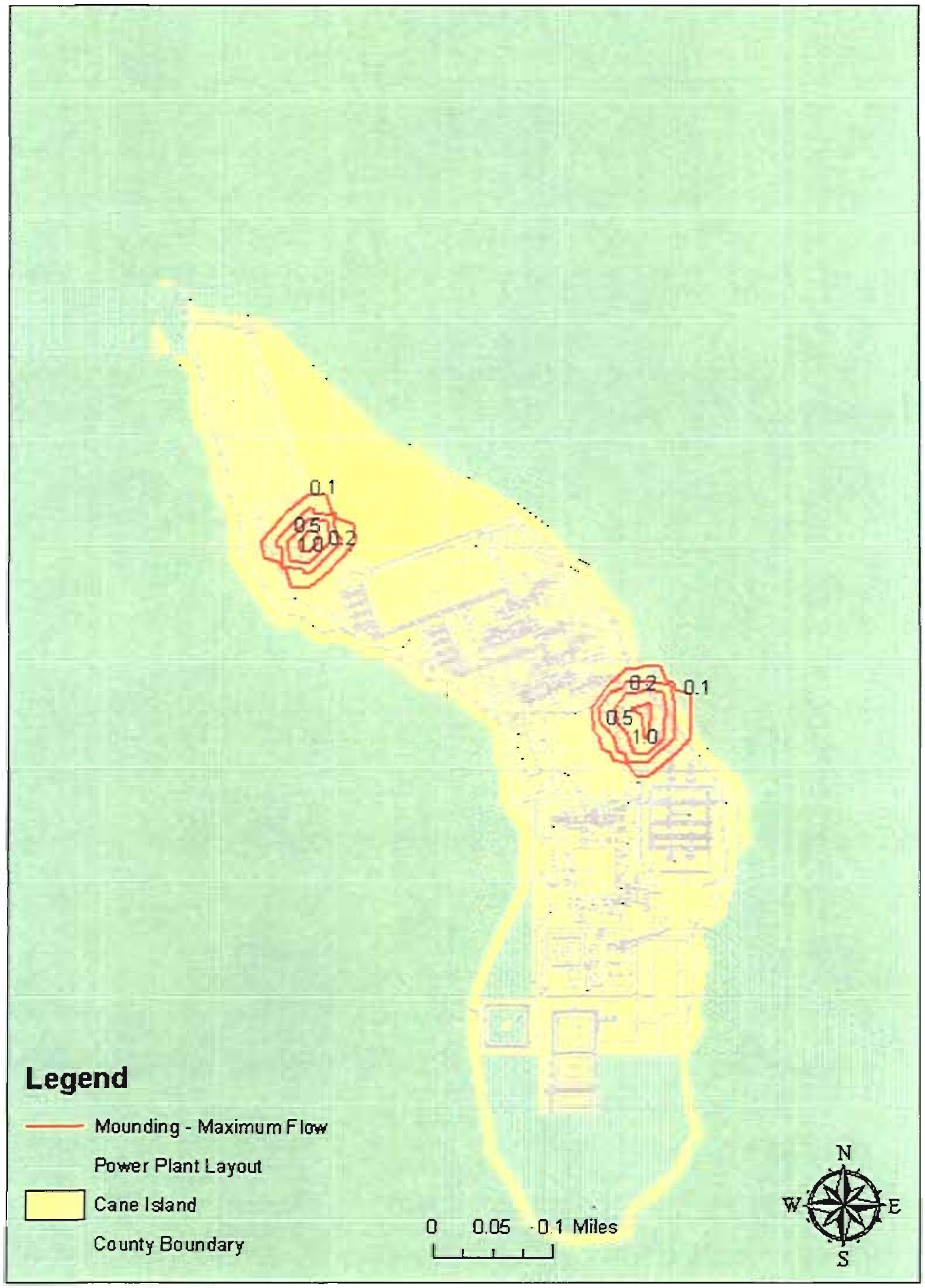


Figure 5.3-7
Surficial Aquifer Mounding After 1 Day Maximum Flow Condition

The contours of ground water rises due to average daily loading and precipitation events are presented on Figures 5.3-6 and 5.3-7, respectively. As shown on Figure 5.3-6, the rise decreases radially away from the percolation pond. Near to the pond, the rise is approximately 0.5 foot on average. Beyond the site boundary, the rise is less than 0.2 foot. On Figure 5.3-7, it can be observed that the rise due to the precipitation event is relatively small (on the order of 0.5 foot on average) and confined to areas around the two ponds. After the cessation of precipitation, the additional rise caused by the precipitation event at the two ponds will eventually decay completely, and the total ground water rise will revert to that due to the long-term average daily loading shown on Figure 5.3-6. As shown in the two figures, ground water rise is not expected to exceed 1 foot beyond the ponds and 0.2 foot outside the site boundary.

5.3.4.3 Conclusion. The mounding study demonstrates that the Unit 4 percolation pond design has sufficient capacity to percolate the maximum design flow. There will be no surface water discharges ("daylighting") due to ground water mounding. There will be no significant impacts to the surficial aquifer. Discharge to the percolation pond will not affect the adjacent surface water bodies.

5.3.5 Measurement Programs

5.3.5.1 Surface Water Monitoring. The general site runoff will be monitored during a rainfall event that causes discharge from the site runoff collection system at the site runoff detention overflow weir. A grab sample will be collected during the event in the vicinity of the basin overflow. The sample will be tested in accordance with applicable local, state, and federal requirements.

5.3.5.2 Ground Water Monitoring. No monitoring program is proposed for the new groundwater discharge through the new percolation pond. The existing percolation pond is operating as designed and has had no violations of ground water quality standards. The wastewater going to the new percolation pond will be essentially the same as that going to the existing percolation pond: same source water, same use/operation, same pre-treatment, similar pond design.

5.4 Solid/Hazardous Waste Disposal Impacts

Operation as a combustion turbine facility burning natural gas will not generate solid or hazardous wastes through the combustion process. Consequently, there are no onsite landfills or disposal areas.

Limited amounts of hazardous wastes (acidic and caustic wastes) from the regeneration of the demineralizers will be treated by pH adjustment in the neutralization basin prior to return to the Toho pipeline. A licensed contractor will be provided for the disposal of boiler cleaning wastes, wash waters collected in the combustion turbine drain tank, and spent SCR catalysts.

Miscellaneous office trash and maintenance wastes are collected in dumpsters and removed from the site by a licensed contractor. Small amounts of paints, cleaners, and solvents used in maintenance will be segregated and disposed using licensed contractors.

5.5 Sanitary and Other Waste Discharges

Sanitary wastes are collected and treated by an onsite septic tank/tile field system approved by the Osceola County Health Department. Unit 4 operations will increase the staff at the site, from approximately 30 to 32 people. However, the existing septic system is oversized, and capable of treating the additional load due to Unit 4 staff. The staff numbers and septic system capacity will be confirmed during detailed design, and in the unlikely event that it is determined that the existing system cannot handle the additional load, a second septic system will be incorporated in the Unit 4 design.

There are no other wastes or wastewater discharges from the site other than those previously described.

5.6 Air Quality Impacts

The air quality impacts associated with the addition of Unit 4 and ancillary equipment are addressed in detail in the PSD Air Permit Application attached to this Site Certification Application as Volume 3 under separate cover. The estimated air quality impacts associated with Unit 4 and the associated Florida Ambient Air Quality Standards (FAAQS) are shown in Table 5.6-1. As indicated in Table 5.6-1, the Unit 4 maximum model-predicted concentrations are less than the PSD Class II SILs for each pollutant and applicable averaging period. Therefore, under the PSD program, no further air quality impact analyses (i.e., PSD increment and Ambient Air Quality Standards analyses) are required.

Furthermore, as discussed in the PSD application (Volume 3), the Unit 4 modeled air quality impacts are well below the monitoring de minimis concentrations. Therefore, no pre-construction or post-construction air quality monitoring is required.

Table 5.6-1
AERMOD Model-Predicted Class II Impacts

Pollutant	Averaging Period	Model-Predicted Impact* (μg/m³)	FAAQS (μg/m³)	Predicted FAAQS Exceedance
NO_x	Annual	0.90	100	NO
SO_2	Annual	0.08	60	NO
	24 Hour	0.95	260	NO
	3 Hour	2.10	1,300	NO
PM/PM_{10}	Annual	0.31	50	NO
	24 Hour	4.92	150	NO
CO	8 Hour	33.78	10,000	NO
	1 Hour	103.38	40,000	NO

*Impacts represent the highest first high model-predicted concentration from all five years of meteorological data modeled and includes the operation of the combustion turbine/HRSG, cooling tower, safe shutdown generator, and emergency fire pump.

5.7 Noise

This section describes the potential facility noise emissions associated with the normal operation of Unit 4. In addition, a discussion of the potential impacts and compliance with local noise regulations related to Unit 4 operation, as well as mitigation, is included.

5.7.1 Noise Impact Significance Thresholds

Unit 4 will include the installation of a combustion turbine combined cycle arrangement. Specifically, the major equipment will include one frame 7FA CTG, one HRSG, one STG, and one eight-cell mechanical draft cooling tower. These major equipment components are expected to be the primary noise contributors to Unit 4 noise emissions. Secondary noise sources are expected to include generator step-up transformers, major pumps (e.g., boiler feedwater, circulating water, condensate, closed-cycle cooling water), and other associated equipment. Equipment sound levels were based on available data.

5.7.2 Noise Emissions Modeling

Unit 4 environmental noise emissions were modeled using noise prediction software (CadnaA version 3.6.119). The model simulated the outdoor propagation of sound from each noise source and accounted for sound wave divergence, atmospheric and ground sound absorption, sound directivity, and sound attenuation due to interceding barriers. A database was developed that specified the location, octave band sound levels, and sound directivity of each noise source. A receptor grid was specified that covered the entire area of interest. The model calculated the overall A-weighted sound pressure levels and the octave band sound levels within the receptor grid based on the octave band sound level contribution of each noise source. Finally, a noise contour plot was produced based on the overall sound pressure levels within the receptor grid, including specific receptor locations.

The environmental noise emissions are modeled to simulate normal Unit 4 operation, which excludes intermittent activities such as startup, shutdown, and any other abnormal or upset operating conditions. Also, these levels represent only the noise associated with Unit 4 and do not include the influence of any nonproject-related background noise.

The predicted facility noise emissions are presented on Figure 5.7-1 as overall, A-weighted noise contours. Unit 4 noise emissions are at or below 45 dBA at the facility property boundary. Also shown on Figure 5.7-1 are the nearest noise sensitive receptors, R1, R2, and R3. As shown, the overall sound pressure levels at the nearest noise sensitive receptors due to the normal operation of the project range from approximately 37 dBA to 38 dBA.

5.7.3 Project Noise Impacts

As referenced in CU/SDP 92-86, the Cane Island electrical generation facility has been approved as a Conditional Use. Due to this classification, sound limits are goverened under Special Condition 15 of CU/SDP 92-86. According to Special Condition 15, the maximum sound level measured at the facility property boundary cannot exceed 55 dBA.

5.7.3.1 CU/SDP 92-86 Special Condition 15 Compliance. As shown on Figure 5.7-1, the maximum predicted sound level at the property boundary is expected to be 45 dBA. Unit 4 is expected to be in compliance with Special Condition 15 with a margin of at least 10 dBA at all facility property boundaries. Additionally, the highest property boundary sound levels are predicted to occur along the west property line among areas where forested wetlands preclude the possibility of development.

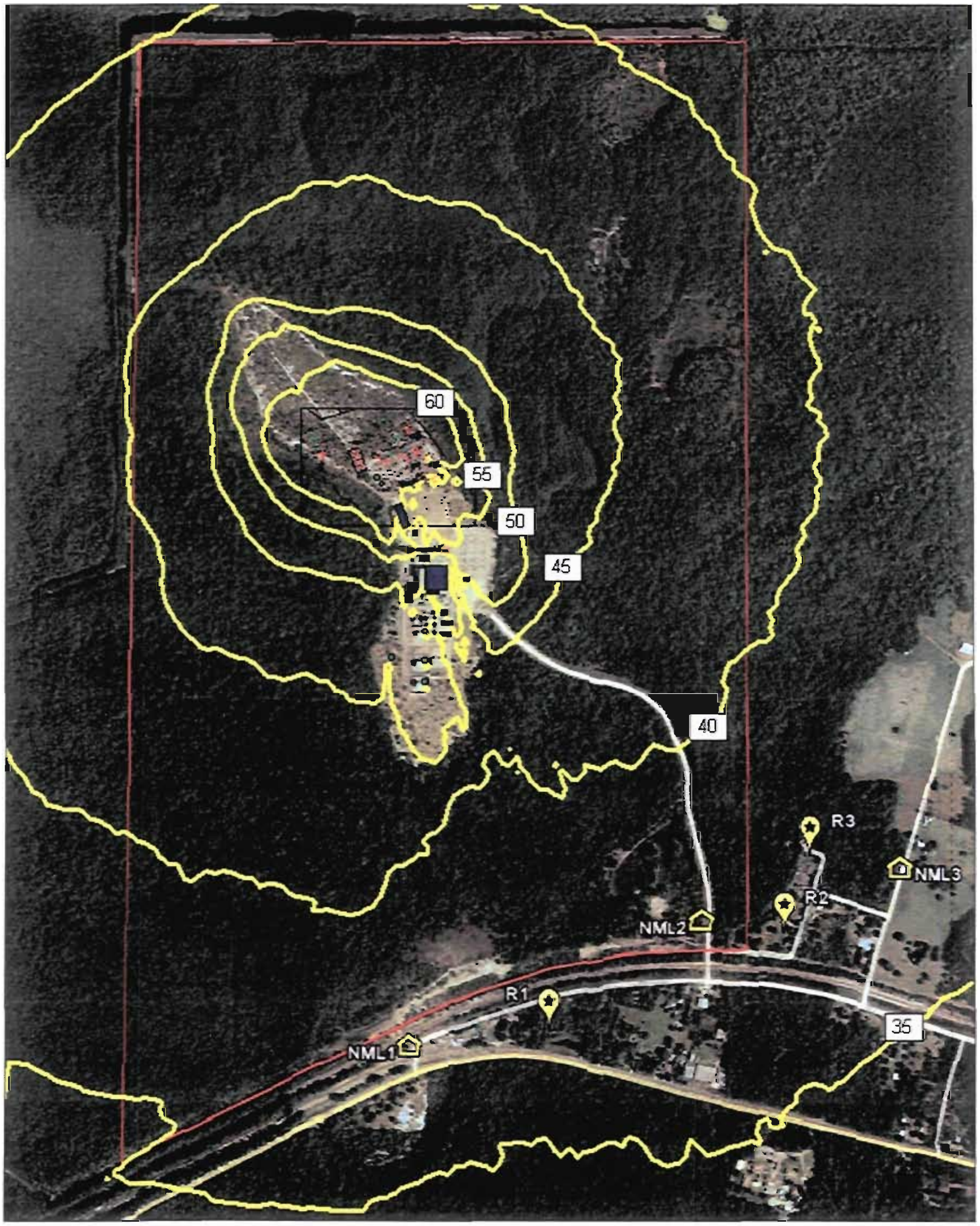


Figure 5.7-1
Predicted Unit 4 Project Noise Emissions

The property boundary sound levels shown on Figure 5.7-1 only represent the expected sound levels associated with the operation of Unit 4 and exclude the influence of background noise and noise generated from the existing facility (Units 1, 2, and 3). However, since Unit 4 sound levels at the property boundary have a margin of at least 10 dBA, it is anticipated that the overall facility sound levels (i.e., Units 1, 2, 3, and 4) will also be compliant with the 55 dBA property boundary limits.

In addition to regulatory limits, potential impacts to nearby receptors can also be evaluated against the existing background sound levels measured during the ambient noise survey to qualify the relative increase in background sound levels. It is important to note that evaluating the potential increase to background sound levels due to project noise emissions is subjective in nature and, therefore, lacks the measurable regulatory criteria previously discussed. However, such an evaluation provides additional criteria that can identify potential impacts that may occur despite compliance with regulatory limits. For reference, a 3 dB increase to the background sound level is generally considered "just barely perceptible" and a 5 dB increase to the background sound level is generally considered "clearly noticeable." Similarly, a 10 dB change in the background sound level is generally considered to be a doubling (or halving) of the apparent loudness. Typically, an increase in the background sound level of 5 dB or less is generally not considered to be a significant increase.

The increase in the existing background sound level due to the operation of Unit 4 is provided in Table 5.7-1. As shown, the increase is expected to range from 0 to 3 dB at the nearest noise sensitive receptors based on the measured background sound levels.

Table 5.7-1
Increase in Ambient Sound Level due to the Operation of Unit 4

Noise Sensitive Receptor	Measured Average Daytime Background Sound Level (Hourly L_{90}), dBA[(1)]	Predicted Project Sound Levels, dBA	Future Background Sound Levels with the Project, dBA	Future Background Sound Level Increase due to the Project
R1	52	38	52	0
R2	39	37	41	2
R3	38	38	41	3

[(1)]Based on the median sound level recorded between the hours of 7:00 a.m. and 7:00 p.m. during the operation of CIPP Unit 3.

The future sound levels presented in Table 5.7-1 are based on combining the existing background sound level measured during the survey with the predicted Unit 4 sound level. The future background sound levels are based on the median sound level measured during the ambient sound level survey detailed in Subsection 2.3.8; the actual future sound level will fluctuate throughout the day depending on variation in significant nonfacility noise sources (i.e., traffic). Furthermore, it is expected the project will not be audible at the nearest receptor locations, R1, R2, and R3, due to the existing nonfacility (i.e., background) noise.

5.7.4 Noise Impact Summary and Mitigation

The noise emissions associated with the normal operation of the project are expected to comply with the property boundary sound levels specified in Special Condition 15 of CU/SDP 92-86. The project is expected to meet these requirements by including standard equipment packages.

Although not required by noise regulations applicable to CIPP, potential impacts to nearby receptors were evaluated by comparing the existing background sound level with the new background sound level expected to result from operation of Unit 4. The new future background sound level is expected to be below a level that is typically considered "clearly noticeable." As such, significant impacts to nearby receptors are not expected.

5.8 Changes in Nonaquatic Species Populations

5.8.1 Impacts

The operation of Unit 4 may potentially decrease the relative abundance of non-aquatic species in the vicinity of these facilities. Wildlife habitat will be permanently removed from the facility locations, and there may be some loss of individual animals. The activity and noise of plant operation may also temporarily or permanently displace wildlife. Therefore, changes in species diversity, composition, and dominance may occur, but no long-term changes in populations will result from operation of Unit 4 or its associated facilities.

5.8.2 Monitoring

The monitoring plan currently used, as described in Subsection 2.3.5.3 for monitoring vegetation and wildlife at the CIPP, will be sufficient to monitor impacts in the nonaquatic species populations near the Unit 4 power generation facility. No changes in the monitoring plan are proposed.

5.9 Other Plant Operation Effects

The primary effect of operating Unit 4 will be the additional energy capability it will provide to all FMPA members, including KUA. Other positive results of the plant will be the continued stable employment in well paying jobs for plant operations staff. Two full-time staff positions will be created in anticipation of Unit 4 operation. The annual salary of these operating personnel is estimated to be $133,000 per person, all inclusive of benefits and operations. This will be in addition to the roughly 30 staff members currently at the CIPP. Local purchases of certain site services and plant supplies made by these employees will in turn provide additional community employment and income benefits. There will also be maintenance personnel brought in for scheduled outages. The fixed operations and maintenance (O&M) budget for Unit 4 is approximately $1.4 million per year (2008 dollars), and the variable O&M purchases of water, wastewater, contract maintenance, various site services, as well as office supplies and consumables are expected to be approximately $5.8 million per year, assuming a 65 percent unit capacity factor (2008 dollars).

As further outlined below, Unit 4 will have minimal, if any, negative operational effects on the local community in terms of traffic, water and wastewater requirements, housing, labor force, and community facilities and services.

5.9.1 Traffic Impacts

Usual vehicular traffic to the site will consist of only two more operation staff members. In addition, there will also be occasional plant supply deliveries and support services associated with Unit 4. Plant access will not back up normal traffic flows in this rural area.

Natural gas, the only fuel for the plant, will be delivered through an underground natural gas pipeline. There will not be any increase in fuel deliveries by truck as the unit will not be dual fueled. The existing transmission system will be utilized and no increase in traffic will be associated with maintaining the transmission network now in place.

5.9.2 Water

Unit 4 will use reuse water (treated wastewater) for cooling tower makeup. This water will be supplied by Toho via an existing pipeline. In addition, five new onsite wells are requested for process/service water supply and backup cooling tower makeup supply. Approximately 2.8 mgd will be required for the cooling tower, with an additional 134,000 gpd of well water for process and service uses.

5.9.3 Wastewater

Wastewaters will be created from sanitary waste, oil/water separator effluent, cooling tower blowdown, treated chemical wastewaters, and evaporative cooler blowdown. Sanitary waste will be routed to an existing site septic system; oil/water separator effluent will be directed to a new onsite percolation pond; and, other wastewaters will returned to the Toho pipeline.

5.9.4 Power

The operation of Unit 4 will supply FMPA and its members with a safe, adequate, and reliable source of energy in an acceptable, environmental manner. This will be achieved with minimal impacts on the surrounding land uses and community, while creating employment in Osceola County.

5.9.5 Landfill

A negligible amount of landfill waste will be generated during the unit's operation. The waste that is created will come from standard office operations, packaging of supplies and materials. The overall amount of landfill waste should not be significant given the small incremental staff associated with Unit 4. It is likely that the existing dumpster capacity will suffice, with an additional dumpster or more frequent servicing as an option to handle any increased waste generation. FMPA will pay user fees for all site services instead of creating external costs to the surrounding community.

5.10 Landmarks, Sensitive Areas, and Archaeological Sites

No landmark, sensitive areas, or archaeological site will be adversely impacted by the operation of Unit 4.

The previous cultural resources investigation of the CIPP site revealed no significant historical or archaeological resources. The distances and buffer zones between the power block and the sensitive areas (i.e., FDEP/Disney Conservation Easement, the SOR properties, and the Intercession City playground), mitigation and pollution control measures will effectively minimize any impacts from project operation. Operations staff will be requested to use US Highway 17/92 to avoid travel on secondary streets in Intercession City.

5.11 Resources Committed

The CIPP site includes 1,027 acres of Reedy Creek Swamp wetlands and uplands. However, 860 acres onsite have been impressed with conservation easements, preserving valuable wildlife habitat. Plant and associated onsite facilities have 167 acres permitted for power development. The developed land may be mostly returned to its original use after the plant ceases operations.

The materials used to construct Unit 4 are, and will be, dedicated resources. It is possible that some of the materials may be reclaimed after plant closure.

The natural gas burned as fuel will be a permanent commitment of resources. It is estimated that approximately 792 billion cubic feet of natural gas will be consumed annually over the 30 year operating period.

5.12 Variances

No variances are requested.

5.13 References

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Parsons Brinckerhoff, 2006. Documentation of Regional Transient Groundwater Flow Modeling in Support of SFWMD Water Use Permitting for the STOPR Group, Orlando, Florida.

SFWMD, 2008. Basis of Review for Water Use Applications within the South Florida Water Management District. Rules of the South Florida Water Management District, February 13, 2008.

6.0 Transmission Lines and Other Linear Facilities

6.1 Transmission Lines

No new offsite transmission facilities will be required for construction or operation of Unit 4. Unit 4 will be interconnected to the existing CIPP substation, approximately 500 feet from the new unit. A few of the existing transmission poles in the power block area will be relocated in the power block area to accommodate Unit 4. A portion of the relocated lines will cross (i.e., aerial crossing) approximately 400 feet of the wetland buffer zone upland of federal and state wetlands (Reedy Creek Swamp) as shown on the Site Plan Drawing. Trees in this upland buffer area will be trimmed to maintain required electrical safety code clearances. These impacts to the buffer zone will require modification of the SFWMD Conservation Easement.

6.2 Associated Linear Facilities

No new offsite linear facilities will be required for construction or operation of Unit 4.

7.0 Economic and Social Effects of Plant Construction and Operation

7.1 Socioeconomic Benefits

7.1.1 Creation of Temporary and Permanent Jobs

Unit 4 will create a significant number of jobs for Osceola County and the surrounding area during construction and operation. As outlined in Subsection 4.6.3, benefits during the construction of Unit 4 include 4,010 man-months (334 man-years) of employment and $42.75 million in total wage benefits.

Osceola County and the region will not only benefit from direct project labor, but also from the purchase of materials and supplies used in construction. Local purchases associated with power plant construction typically include lumber, concrete and gravel, fuel for onsite motors and vehicles, office supplies and site services such as security, trash hauling, and the installation of security fencing. In addition, the construction workforce will purchase supplemental fuel, food, and other consumables as they commute during plant construction. The overall impacts of these indirect benefits are estimated as part of the multiplier impact analysis in Subsection 7.1.2.

During operation, Unit 4 will have a minor direct employment impact, because it will employ two additional operational staff members. The annual anticipated payroll for Unit 4 operators is estimated at a total of $266,000, inclusive of all benefits and operations, because these are part of the fixed O&M costs of Unit 4. Other benefits will be generated when contract maintenance workers are brought into the area to maintain the unit, and operation of Unit 4 will generate further advantages in the form of continued purchases of consumables for onsite use. These variable O&M purchases include expenditures for water, wastewater, contract maintenance, various site services, as well as office supplies and consumables. Total fixed O&M for Unit 4 is estimated to be about $1.4 million per year (2008 dollars), and variable O&M is estimated to be approximately $5.8 million (2008 dollars) based on an assumed 65 percent capacity factor.

7.1.2 Additional Job Creation/Stimulation of Local Economies

A multiplier effect will be created in the local economy as a result of the additional employment, income, and output associated with the construction and operation of Unit 4. Osceola County and the Orlando area will experience the most impact because these areas will supply much of the Unit 4 workforce. This subsection estimates the multiplier impacts associated with Unit 4.

One method of estimating the multiplier impact of a new investment in a region is through the use of a regional input-output model, which can estimate an expected industry multiplier to be applied to the direct impact estimates. Input-output models typically use an accounting matrix that shows the change in output, earnings, or employment in all industries due to a change in investment in one industry. For estimating the impact of Unit 4, the Regional Input-Output Modeling System (RIMS II model) developed and maintained by the US BEA was used. The RIMS II model also includes multipliers for roughly 500 industry classifications and, as a static equilibrium model, can predict the total impact associated with an initial investment, though it does not predict the timing of impacts.

The RIMS II model requires the user to select a geographical area of study for which multipliers will be estimated. Typically, this will consist of contiguous counties near the investment location, sometimes referred to as the primary impact area. For the Unit 4 analysis, the primary impact area was defined as including the counties of Osceola, Brevard, Highlands, Indian River, Lake, Okeechobee, Orange, and Polk and Seminole.

After the primary impact area was selected, the RIMS II model simulation produced direct-effect multipliers for earnings and employment. These multipliers can then be applied to the direct employment and earnings associated with the construction and operational phases, and the result will produce a projection of the total regional impact arising from the two phases.

The analysis of the multiplier results is summarized in Table 7.1-1. Listed within the table are the direct earnings and employment figures associated with Unit 4, the projected indirect effects on earnings and employment, and the total estimated impact on regional earnings and employment. In total, the $42.75 million in direct construction earnings is projected to generate $78.1 million in regional earnings, and the direct man-years of employment will help generate a total of 654 man-years of regional employment. During operation, if the yearly earnings are assumed to consist of the $1.4 million in annual fixed O&M expenses, total associated annual earnings would equal $2.3 million, and employment would equal a minimum of 5.6 job-years each year, applying the employment multiplier only to the two additional full-time staff at the site.

The indirect economic effect of a new, large investment is always difficult to project with certainty. However, it can be safely concluded that the construction and operation of Unit 4 will create substantial economic benefits to the primary impact area in the form of added earnings and employment. A majority of these benefits will impact those not directly involved with the plant's construction and operation. This is an important factor when weighing the overall costs and benefits from the project to the region. The projected regional economic benefits outlined above are in addition to the already stated benefit that the Cane Island facility has been determined as the best option for the project. Its attractiveness as a future plant site is based on its prime ability to provide a safe and reliable electricity supply for FMPA and KUA members at the lowest reasonable cost and in an environmentally acceptable manner.

Table 7.1-1
Projected Multiplier Impacts Associated with Cane Island Unit 4

Period	Impact Category	Earnings ($ millions)	Employment (job-years)
Construction	Direct	$42.75	334
	Indirect	$35.4	320
	Total	**$78.1**	**654**
Operation (annual impacts based on fixed O&M expenditures)	Direct	$1.4	2.0
	Indirect	$0.9	3.6
	Total	**$2.3**	**5.6**

7.1.3 Revenue Generation for State and Local Governments

Unit 4 will be owned by FMPA for the benefit of its members. As a public/municipal tax exempt agency, FMPA will not be required to pay property taxes. The local economy and public agency revenues will gain from the additional well paying jobs within the community.

7.1.4 Creation or Improvement of Local Roads, Waterways, or Other Local Transportation Facilities

No new or upgraded public roadways or other transportation facilities will be needed for Unit 4, given CIPP's established infrastructure and minimal need for heavy, long-term traffic. The unit will utilize existing power transmission facilities and will not create significant disruptions to the transportation network offsite.

7.1.5 Increased Knowledge of the Environment

Unit 4 is not expected to significantly contribute to an increased knowledge of the environment. Its overall positive impact will be due the use of proven technology at an existing site.

7.1.6 Increased Land Use Efficiency

Unit 4 increases the efficiency of area land use. The increased productivity from a given parcel of land is especially beneficial in areas of high economic growth, such as the impact area, as this allows other parcels of land to remain available for other uses.

7.2 Socioeconomic Costs

7.2.1 Temporary External Costs

Section 4.6 outlined the possibility of short-term external costs during the period of construction. This section summarizes key points of that discussion.

7.2.1.1 Housing. There are no anticipated negative housing impacts during the Unit 4 construction or operation periods. The primary factor in determining the level of impact is the proximity of the construction workforce. Because there is a sizable construction workforce that is able to commute from Osceola County and the Orlando region, it is safe to conclude that most craft workforce requirements will be met through workers living within reasonable commuting distance for power plant construction. The potential for negative external impacts on many community facilities and services will be largely nonexistent since the construction workforce will be able to commute from existing residences.

7.2.1.2 Traffic. Traffic flow will increase temporarily near the site during Unit 4 construction. There will also be a minor increase in traffic through the operational period. These impacts should be manageable because the concentration of commuting vehicles at the site occurs in a rural area experiencing relatively low traffic levels.

7.2.1.3 Aesthetic Disturbances. Unit 4 will not result in noticeable aesthetic disturbances to Kissimmee or the Intercession City community. This site is located in a relatively remote area that is surrounded by trees. Other than the temporary elevation in traffic during construction, there should be very minimal aesthetic impacts.

7.2.1.4 Use of Water and Sewage Treatment Facilities. Unit 4 will use approximately 2.8 mgd of reuse water for cooling tower makeup supplied by Toho via an existing pipeline. In addition, five new onsite wells are proposed to the UFA for service/process water supply and backup cooling tower makeup water supply for Unit 4. Such uses include plant drains, evaporative cooler, demineralized water, potable water, and fire protection water for total of 134,000 gpd to be supplied from the new well system.

Wastewaters will be created from sanitary waste, oil/water separator effluent, cooling tower blowdown, treated chemical wastewaters, and evaporative cooler blowdown. Sanitary wastes will be routed to an existing septic system onsite; oil/water separator effluent will be directed to a new onsite percolation pond; and, other process wastewaters will be returned to the Toho reuse pipeline.

7.2.1.5 Crowding of Public Facilities and Services. The construction workforce for Unit 4 is expected to live within reasonable commuting distances of the CIPP. Consequently, there are no expected adverse effects on local schools or other public facilities as a result of the additional influx from the worker population.

Hospital and emergency service needs are also expected to be minimal because a safety plan will be developed for the construction and operation phase. Osceola County and the Orlando area have several hospitals and health care facilities capable of treating all levels of medical needs, should there become a need for these services. Unit 4 is not expected to otherwise demand a significant increase in the area's services and facilities but, instead, will add needed power infrastructure.

7.2.2 Long-Term External Costs

Unit 4 is not anticipated to create long-term external impairments to recreational values, restrictions of access to land or water areas preferred for recreational use; deterioration of aesthetic and scenic values; restrictions on access to areas of scenic, historic, cultural, natural, or archeological value; or the removal of land from present or contemplated alternative uses. Unit 4 will not create locally adverse meteorological conditions; reduction of regional products due to displacement of persons from the land proposed from the site; lost income from reduced tourism, commercial fishing, and real estate values in areas adjacent to the proposed facility; or increased costs to local government for services required by the permanently employed workers and their families.

Section 8.0 Tab

8.0 Site and Plant Design Alternatives

This optional chapter of the SCA will not be submitted as part of this application. An alternatives analysis is not anticipated, because neither a Section 404 permit from the COE nor an EIS under the National Environmental Policy Act (NEPA) would be required for Unit 4.

The CIPP is an existing power plant site with area available for expansion. The Unit 4 systems will be similar to and use several of the existing facilities and systems onsite.

9.0 Coordination

The following is a list of individuals within federal, state, regional and local government agencies contacted for guidance or information concerning the Unit 4 project.

9.1 Federal

US Fish and Wildlife Service

Mr. Paul Souza
South Florida Ecological Services Office
Vero Beach, Florida

9.2 State

Department of Community Affairs, Tallahassee

Mr. Paul Darst
Ms. Kelly Martinson

Department of Environmental Protection

Power Plant Siting Coordination, Tallahassee

Mr. Michael Halpin, Administrator
Ms. Cindy Mulkey

Air Resources Management Division, Bureau of Air Regulation, Tallahassee

Ms. Trina Vielhauer, Bureau Chief
Mr. Al Linero
Ms. Debbie Nelson

Central District Office, Orlando

Ms. Vivian Garfein, Director
Mr. Ali Kazi
Mr. Jim Bradner
Ms. Caroline Shine

Fish and Wildlife Conservation Commission, Vero Beach

Ms. Chance Cowan

Department of Transportation, Tallahassee

Ms. Connie Mitchell

Department of State, Historic Preservation, Tallahassee

Ms. Laura Kammerer, Deputy State Historic Preservation Officer

South Florida Water Management District

Mr. Jim Golden, W. Palm Beach
Mr. Ed Yaun, Orlando Service Center
Mr. Marc Ady, Orlando Service Center
Mr. George Ogden, Orlando Service Center

East Central Florida Regional Planning Council, Maitland

Mr. Andrew Landis
Ms. Kimberly Loewen

9.3 Local

Osceola County Administration, Kissimmee

Mr. Mike Freilinger, County Manager
Mr. Jim Murray
Mr. Don Fisher
Mr. Richard Keck
Ms. Kate Stangle

Toho Water Authority, Kissimmee

Mr. Brian Wheeler, Executive Director