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BUREAU OF AIR REGULATION

KENNEDY GENERATING STATION
UNIT 8 COMBUSTION TURBINE
PROJECT

CLASS I AND CLASS II
AIR DISPERSION MODELING PROTOCOL

PREPARED BY
BLACK & VEATCH

FOR
JEA

OCTOBER 2006

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Called Bob Holmes and said could not use Method 7

1.0 Introduction

This Ambient Air Quality Impact Analysis Protocol (hereinafter referred to as the Protocol) describes the air quality impact analysis methodology for obtaining a Construction Permit for the proposed project. After Florida Department of Environmental Protection (FDEP) review and approval, this Protocol will provide the basis of a mutually agreed upon procedure for the final ambient air quality impact analysis in support of the air construction permit application.

This Protocol describes site and source characteristics, determination of pollutants applicable to the air quality review, and the analytical procedures that will be used to conduct the ambient air quality impact analysis. The construction permit application and supporting ambient air quality impact analysis (AAQIA) will include a determination of compliance with the National Ambient Air Quality Standards (NAAQS), New Source Performance Standards (NSPS), the Prevention of Significant Deterioration (PSD) increments, and an assessment of additional impacts.

JEA is proposing to construct and operate a new combustion turbine at their Kennedy Generating Station (KGS). This combustion turbine will be Unit 8 at the facility (heretofore referred to as CT8).

2.0 Project Characterization

The following sections briefly characterize the project including a general description of the facility, location, and emission unit, as well as an overview of the local air quality status and NSR and NSPS applicability.

2.1 Project Location

The KGS is located in Jacksonville, Florida on the west bank of the St. Johns River within Duval County. The general location of the project is illustrated in Figure 2-1. The site location has a sub-tropical climate with hot summers and mild winters.

2.2 Project Description

KGS is the oldest plant within the JEA system, dating back more than 80 years. The steam-electric units have all been retired. The remaining generation comprises simple cycle combustion turbine (SCCT) generators of varying ages. The older units (CT 3, 4 and 5) may be decommissioned in the near term in coordination with the installation of CT8. The newest existing unit, CT7 is a General Electric (GE) Frame 7FA that was installed in 1999. JEA is planning to install an additional GE 7FA SCCT, to be designated CT8, at the KGS site. No other sources of criteria pollutants are associated with this project.

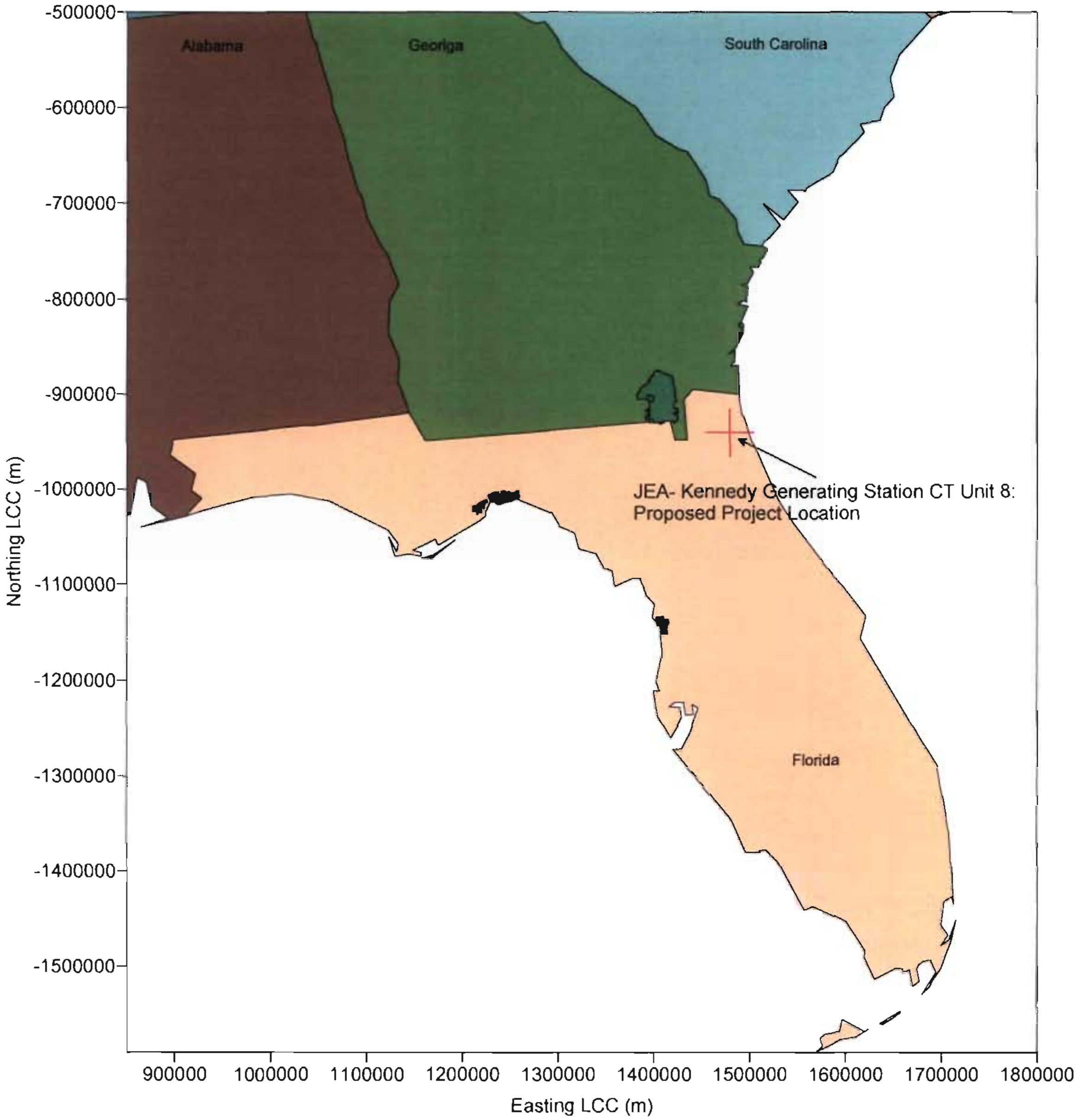

Figure 2-1
Proposed Project Location

2.3 Project Emissions

CT8 is the project's only new source of criteria pollutants. Therefore, only emissions from CT8 will be included in the air dispersion modeling analysis (unless cumulative source modeling is required). Emissions from CT8 will be based on direct lb/hr emissions to the atmosphere. Combustion turbine performance data will be used to develop representative worst-case stack parameters and emission rates for the air dispersion modeling analysis.

For the proposed Unit #8 CT, emissions and stack parameters will be developed for unit loads of 100, 75 and 50 percent of maximum capacity over a range of representative ambient temperatures (7, 59, 69, and 105°F) for both natural gas and fuel oil firing. This range of temperatures represents the site minimum, ISO, site average, and site maximum temperatures.

A process called enveloping may be used in the modeling. Enveloping allows multiple operating scenarios to be conservatively considered in an AAQIA, while keeping the actual air dispersion modeling runs to a minimum. However, it is possible that because of the specific characteristics of the source, this analysis approach could result in overly conservative modeling impacts. In this case, the AAQIA may be performed without enveloping.

2.4 Local Air Quality Attainment/Nonattainment Status

The air quality in a given area is generally designated as being in attainment for a pollutant if the monitored concentrations of that pollutant are less than the applicable National Ambient Air Quality Standards (NAAQS). Likewise, a given area is generally classified as nonattainment for a pollutant if the monitored concentrations of that pollutant in the area are above the NAAQS. A review of the air quality status in the region reveals that Duval County is in attainment or unclassifiable for all pollutants.

2.5 New Source Review/PSD Applicability

The federal Clean Air Act (CAA) NSR provisions are implemented for new major stationary sources and major modifications at existing major sources under two programs;

the PSD program outlined in 40 CFR 52.21 for areas in attainment, and the NSR program outlined in 40 CFR 51 and 52 for areas considered nonattainment for certain pollutants. As noted in Section 2.4, the KGS is located in an attainment or unclassifiable area with respect to all pollutants. As such, the PSD program will apply to the proposed project, which will be a major modification for PSD because the potential annual emissions will be greater than the respective significant emission rate (SER) for at least one regulated pollutant.

The PSD regulations are designed to ensure that the air quality in existing attainment areas does not significantly deteriorate or exceed the NAAQS while providing a margin for future industrial and commercial growth. The primary provisions of the PSD regulations require that major modifications and new major stationary sources be carefully reviewed prior to construction to ensure compliance with the NAAQS, the applicable PSD air quality increments, and the requirements to apply Best Available Control Technology (BACT) to minimize the emissions of air pollutants.

A major stationary source is defined as any one of the listed major source categories which emits, or has the potential to emit (PTE), 100 tons per year (tpy) or more of any regulated pollutant, or 250 tpy or more of any regulated pollutant if the stationary source does not fall under one of the listed major source categories. While the existing KGS facility is not one of the listed 100 tpy major source category, it has a PTE greater than 250 tpy for at least one PSD pollutant, therefore, it is considered an existing major PSD source.

Because the proposed project is locating at an existing major stationary source, PSD applicability will be determined on a pollutant by pollutant basis by comparing the emissions increase of each pollutant against the PSD significant emission rates (SERs).

<u>PSD SERs</u>

- NO_x – 40 tpy
- SO_2 – 40 tpy
- PM – 25 tpy
- PM_{10} – 15 tpy
- CO – 100 tpy
- VOC – 40 tpy
- Lead – 0.6 tpy
- Fluorides – 3 tpy
- Sulfuric Acid Mist (H_2SO_4) – 7 tpy
- Hydrogen Sulfide (H_2S) – 10 tpy

- Total Reduced Sulfur Compounds -- 10 tpy

The project emissions increase and the project net emissions increase must be above the PSD SER for PSD to apply to the project. This is determined on a pollutant by pollutant basis. The first step in determining PSD applicability is to ascertain which pollutants the project itself will result in an emissions increase greater than the SERs. For those pollutants for which the project results in an emissions increase greater than the respective SER, a second step may be used to determine if the net emissions increase is greater than the respective SER. Determining the net emissions increase is commonly referred to as netting. Under netting one looks at the emission decreases and increases (including the project emission increases) over what is referred to as the project contemporaneous period. The contemporaneous period will encompass a period beginning five years prior to submittal of a complete permit application for the project and ending on the date the facility begins operations after the project is complete. If the netting analysis shows that the net emissions increase is less than the respective SER for a specific pollutant that pollutant is not subject to PSD permitting for the project.

JEA is exploring the possibility of using emission decreases associated with the shut down of existing emission units at the KGS as part of a netting analysis used to determine PSD applicability for CT8. The results of this netting analysis will be used to determine PSD applicability for each PSD pollutant. Only those criteria pollutants that are subject to PSD permitting will be included in the air dispersion modeling analysis. It is anticipated that the shutdown of some existing KGS emission units (CT3, CT4, and CT5) will result in a net emissions decrease of SO_2 and NO_x for the CT8 project. This protocol is based on SO_2 and NO_x not being applicable to PSD permitting.

2.6 New Source Performance Standards

The New Source Performance Standards (NSPS) established in the 1970 CAA, were developed for specific industrial categories and are promulgated in 40 CFR 60. The applicable category for the proposed project fall under Subpart KKKK of 40 CFR 60. Specifically, this category is the NSPS for stationary combustion turbines. The criteria for this NSPS will be met or exceeded by the proposed project.

3.0 Class I Ambient Air Quality Analysis

As part of the air impact evaluation for the addition to the KGS site, analyses of the proposed project's effect on all Class I areas within 300km will be performed. Okefenokee (OW), Wolf Island (WIW), Chassahowitzha (CW), and Saint Marks (SMW) Wilderness areas are the Class I areas of concern for this project. The wilderness areas are PSD Class I areas located in Florida and Southern Georgia with the closest area, OW, approximately 55 km northwest of the proposed project site. Federal Class I areas are afforded special environmental protection through the use of Air Quality Related Values (AQRVs). The AQRVs of interest in this protocol is regional haze. Additionally, Class I Significant Impact Levels (SILs) will be evaluated and compared to the recommended thresholds. Figure 3-1 presents the location of the proposed project site with respect to the Class I areas.

The methodology of the refined CALPUFF analysis will closely follow those procedures recommended in the *Interagency Workgroup on Air Quality Modeling (IWAQM) Phase II* report dated December 1998 and the *Phase I Federal Land Managers' Air Quality Related Values Workgroup (FLAG)* report dated December 2000 where appropriate for model option selections. This protocol includes a discussion of the meteorological and geophysical databases to be used in the analysis, the preparation of those databases for introduction into the modeling system, and the air modeling approach to assess impacts at OW, WIW, CW, and SMW.

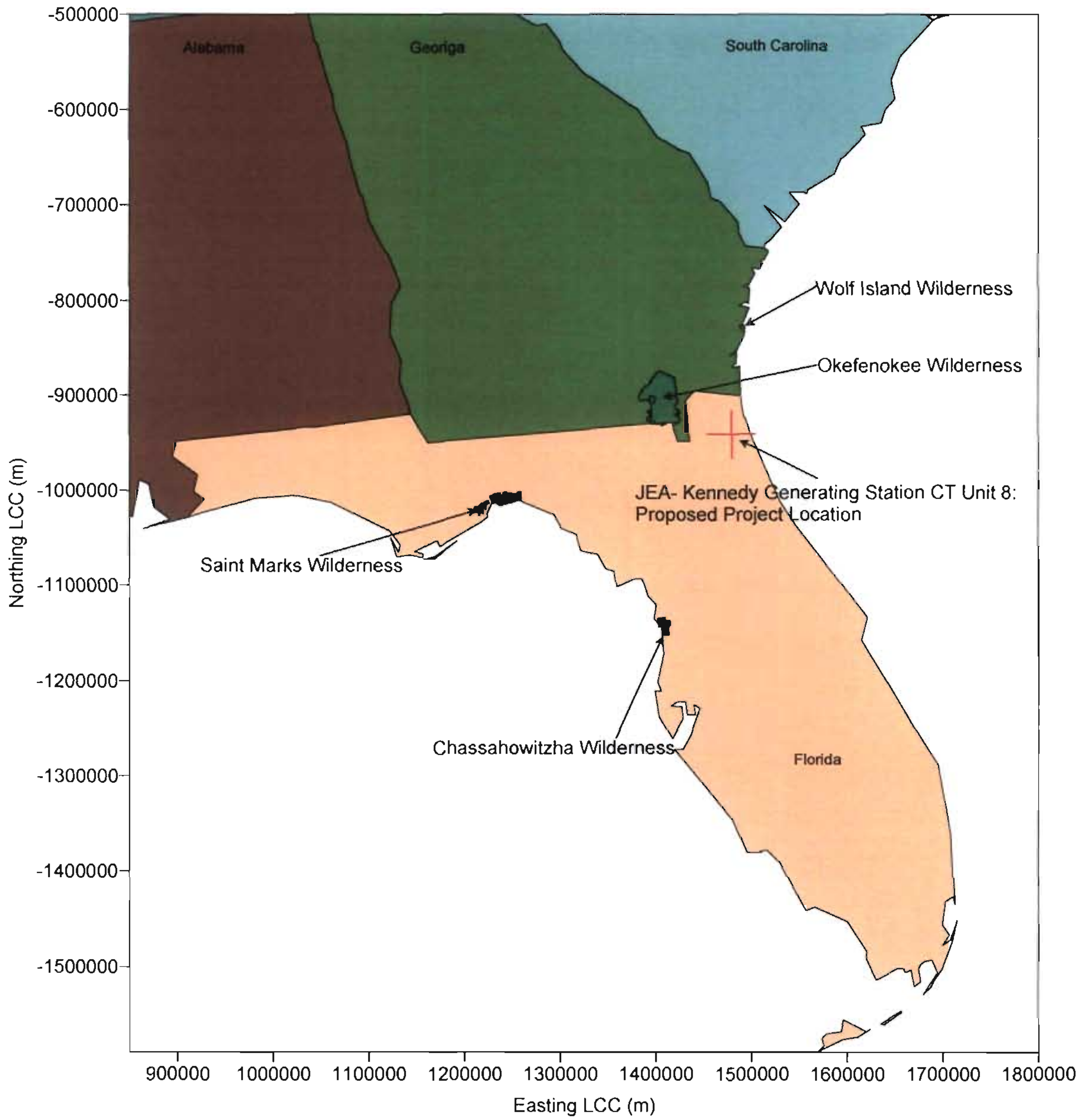

Figure 3-1

Proposed Project Location and Class I areas

MM5 Won't accept just prognostic
actual surface obs need
to be included

Can use VISTAS version?
Fraction of SILS
Regulatory VISTAS
CALPUFF screening
screening level
analyses

3.1 Class I Model Selection and Inputs

3.1.1 Model Selection

The California Puff (CALPUFF, Version 5.754, Level 060202) air modeling system will be used to model the proposed project and assess the AQRVs at the Class I areas. CALPUFF is a non-steady state Lagrangian Gaussian puff long-range transport model that includes algorithms for building downwash effects as well as chemical transformations (important for visibility controlling pollutants), and wet/dry deposition. The CALMET model (Version 5.724, Level 060414), a preprocessor to CALPUFF, is a diagnostic meteorological model that produces three-dimensional fields of wind and temperature and two-dimensional fields of other meteorological parameters. CALMET was designed to process raw meteorological, terrain, and land-use databases to be used in the air modeling analysis. However, VISTAS, the Regional Planning Organization responsible for assisting with regional haze issues in the southeast, contracted Earth Tech to produce CALPUFF ready, CALMET meteorological data files, thus bypassing the need to run the resources intensive CALMET processor. VISTAS has provided 2001-2003 CALMET files for five 4-km sub-regional domains as illustrated in Figure 3-2. The modeling proposed in this protocol will use the CALMET files prepared for sub-domain 2.

3.1.2 CALPUFF Model Settings

The CALPUFF settings contained in Table 3-1 will be used for the modeling analyses.

3.1.3 Building Wake Effects

The CALPUFF analysis will include the facility's building dimensions to account for the effects of building-induced downwash on the emission sources. Dimensions for all significant building structures will be processed with the Building Profile Input Program (BPIPPRM), Version 04274, and included in the CALPUFF model input.

3.1.4 Receptor Locations

The CALPUFF analyses will use an array of discrete receptors over each Class I area, which were created and distributed by the NPS. Specifically, the array consists of

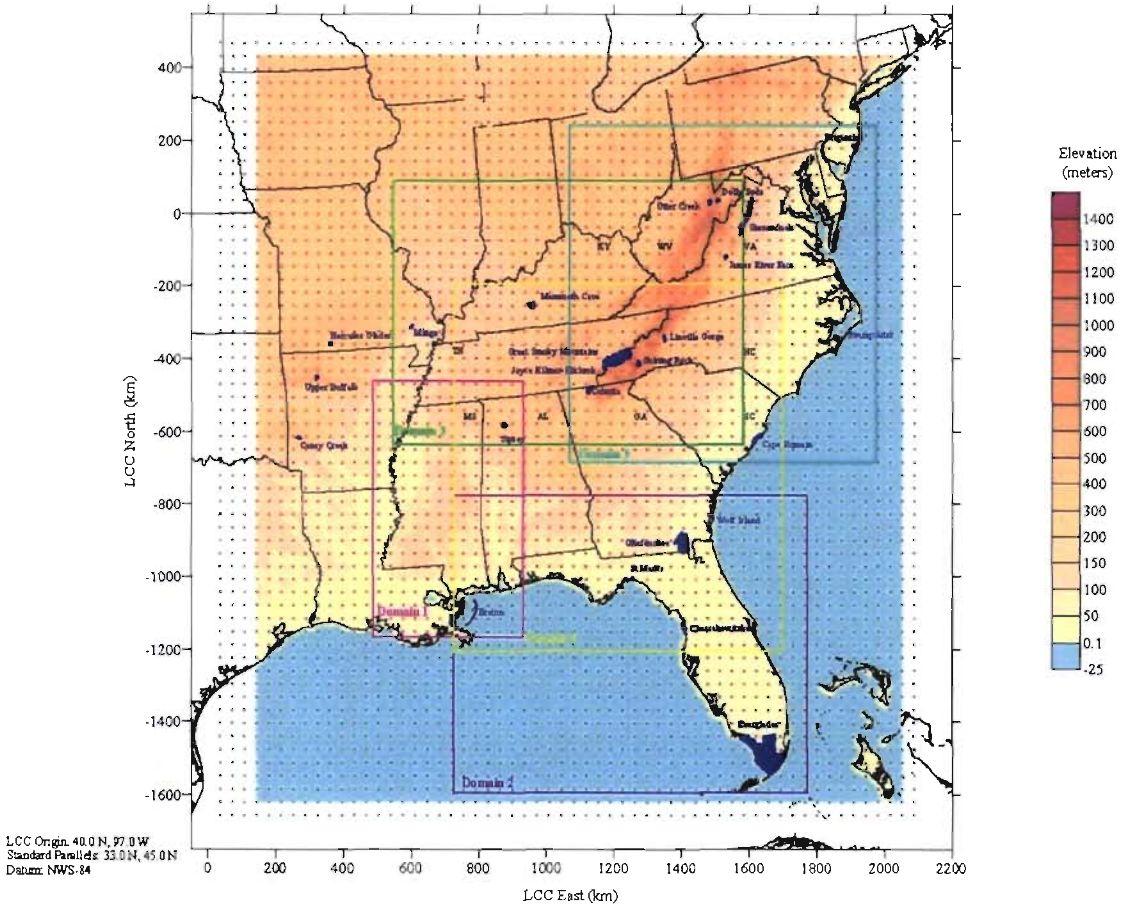

Figure 3-2
VISTAS 4-km CALMET Sub domains

Met Data

AERMOD

lots of missing data

Class I Regulatory

Table 3-1

CALPUFF Model Settings

Parameter	Setting
Pollutant Species	PM_{10}
Chemical Transformation	MESOPUFF II scheme
Deposition	Include both dry and wet deposition, plume depletion
Meteorological/Land Use Input	VISTAS CALMET Files
Plume Rise	Transitional plume rise, Stack-tip downwash, Partial plume penetration
Dispersion	Puff plume element, PG/MP coefficients, rural ISC mode, PRIME building downwash scheme
Terrain Effects	Partial plume path adjustment
Output	Create binary concentration and wet/dry deposition files including output species for all pollutants.
Model Processing	Regional Haze: Highest predicted 24-hour change as processed by CALPOST. Class I SILs: Highest predicted concentrations at the applicable averaging periods for those pollutants that exceed the respective PSD Significant Emission Rates (SERs).
Background Values	Monthly Ammonia: 0.5 ppb; Monthly background ozone will be based on a review of the available monitoring stations' values averaged for each month. Additionally, hourly background ozone values from several reporting stations may be assessed for inclusion into the CALPUFF modeling.

Regulatory

CALPUFF version in
Screening Mode
single station
Met data
Ring of receptors
360 encompass the
project
More simplistic mode

receptors spaced to cover the extent of the Class I areas. Receptor elevations are included in the same NPS- provided receptor files.

3.1.5 Meteorological Data Processing

The 4-km resolution VISTAS CALMET files from sub-domain 2 will be used as the meteorological and geophysical data for CALPUFF. These high resolution CALPUFF-ready, CALMET files were composed of available surface and upper air observations in addition to the highest resolution MM5 data available for each year (i.e., 12-km MM5 data for 2001 and 2002 and 36-km MM5 data for 2003).

3.1.5.1 CALMET Settings

The major features of CALMET used by Earth Tech to develop the CALMET files are listed below.

- Modeling period: 3 years (2001-2003)
- Meteorological inputs: MM5 data provide initial guess fields in CALMET, surface and upper air data.
- CALMET grid resolution: 4-km
- CALMET vertical layers: 10 layers. Cell face heights (meters): 0, 20, 40, 80, 160, 320, 640, 1200, 2000, 3000, 4000.
- CALMET mode: MM5 data was used for initial guess field, in addition hourly surface data, twice daily upper air soundings, precipitation data, and over water data was used.
- Diagnostic options: IWAQM default values, except as follows: diagnostic terrain blocking and slope flow algorithms used for 2003 simulations (using 36-km MM5 data), but no diagnostic terrain adjustments in 2001 and 2002 simulation (using 12-km MM5 data)
- CALMET options dealing with radius of influence parameters (R1, R2, RMAX1, RMAX2, RMAX3), BIAS, ICALM parameters were predetermined by Earth Tech for each sub-domain.
- TERRAD (terrain scale) is required for runs with diagnostic terrain adjustments (i.e., the 2003 simulations).
- Land use defining water: JWAT1 = 55, JWAT2 = 55 (large bodies of water). This feature allows the temperature field over large bodies of water such as the

Atlantic Ocean and the Great Lakes to be properly characterized by buoy observations.

- Mixing height averaging parameter (MNMDAV) was determined by Earth Tech for the regional simulations based on sensitivity tests.

- Geophysical data for regional runs: USGS 3-arcsec terrain data, Composite Theme Grid (CTG) USGS 200m land use dataset.

- References for these and other CALMET datasets can be found on the CALPUFF data page of the official CALPUFF site (www.src.com).

3.1.6 Modeling Domain

The CALPUFF modeling domain will be a subset of the CALMET domain. The size of the domain used for the modeling will be based on the distances needed to cover the area from the proposed project to the receptors at the Class I areas with at least a 50-km buffer zone in each direction. The modeling analysis will be performed in the Lambert Conformal Conic (LCC) coordinate system with standard parallels of 33 and 45 degrees north latitude and reference latitude and longitude of 40.0 and 97.0 degrees, respectively. A rectangular modeling domain extending 384 km in the east-west (x) direction and 428 km in the north-south (y) direction will be used for the refined modeling analysis. The southwest corner of the domain is located at 1,157.995 km Easting and -1,206 km Northing (LCC, World Geodetic System (WGS) 1984 coordinates). The grid resolution for the domain will be 4 km. A grid spacing of 4 km yields 96 grid cells in the x-direction and 107 grid cells in the y-direction. Figure 3-3 illustrates the size and location of the modeling domain.

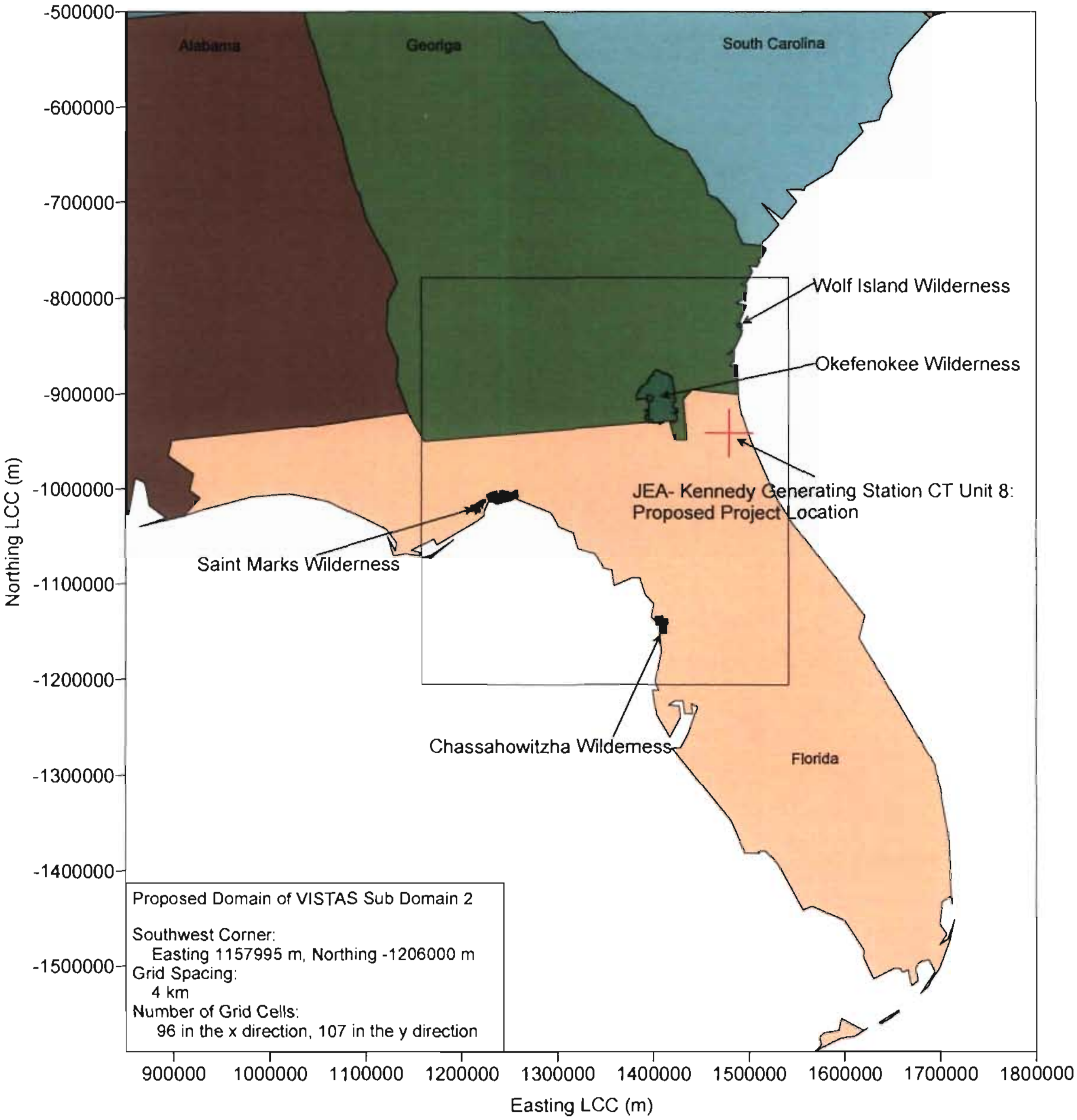

Figure 3-3
Modeling Domain

3.2 CALPUFF Analyses

The preceding model inputs and settings for the CALPUFF modeling system will be used to complete the Class I analyses on the Class I areas, including regional haze and Class I SILs.

3.2.1 Regional Haze Analysis

A regional haze analysis will be performed for the Class I areas for particulate matter by appropriately characterizing model predicted outputs of PM_{10} concentrations. Particulate matter will be the only pollutant modeled in this analysis since NO_x and SO_2 are not expected to be subject to PSD and, moreover, are projected to have a net decrease in emissions at the facility with the shut down of CT 3, 4, and 5.

3.2.1.1 Visibility

Visibility is an AQRV for all the Class I areas. Visibility can take the form of plume blight for nearby areas, or regional haze for long distances (e.g., distances beyond 50 km). Because all the Class I areas lie beyond 50 km from the proposed project, the change in visibility is analyzed as regional haze. Regional haze impairs visibility in all directions over a large area by obscuring the clarity, color, texture, and form of what is seen. Current regional haze guidelines characterize a change in visibility by either of the following methods:

1. Change in the visual range, defined as the greatest distance that a large dark object can be seen, or
2. Change in the light-extinction coefficient (b_{ext}).

Visual range can be related to extinction with the following equation:

$$b_{ext}(Mm^{-1}) = 3912 / vr(Mm^{-1})$$

Visual range (vr) is a measure of how far away a large black object can be seen in the atmosphere under several severe assumptions including: an absolutely dark target, uniform lighting conditions (cloud free skies), uniform extinction in all directions, a limiting contrast discrimination level, a target high enough in elevation to account for earth curvature, and several other factors. Visual range is, at best, a limited concept that allows relatively simple comparisons between visual air quality levels and should not be thought of as the absolute distance that can be seen through the atmosphere.

The b_{ext} is the attenuation of light per unit distance due to the scattering (light reduced away from the site path) and absorption (light captured by aerosols and turned into heat energy) by gases and particles in the atmosphere. A change in the extinction coefficient produces a perceived visual change that is measured by a visibility index called the deciview. The deciview (dv) is defined as:

$$dv = 10 \ln (1 + b_{exts} / b_{extb})$$

where: b_{exts} is the extinction coefficient calculated for the source, and
b_{extb} is the background extinction coefficient

A uniform incremental change in b_{extb} or visual range does not necessarily result in uniform changes in perceived visual air quality. In fact, perceived changes in visibility are best related to a percent change in extinction. Based on NPS guidance, if the change in extinction is less than 5 percent, no further analysis is required. An index similar to the deciview that simply quantifies the percent change in visibility due to the operation of a source is calculated as:

$$\Delta\% = (b_{exts} / b_{extb}) \times 100$$

3.2.1.2 Background Visual Ranges and Relative Humidity Factors

The background visual range is based on data representative of historical conditions at the Class I areas. The background visual range, or constituents thereof, for the Class I areas will be obtained from the Phase I FLAG Report, December 2000. The average relative humidity factor for each day will be computed by determining the relative humidity factor for each hour's relative humidity for the 24-hour period that the impact occurred. This factor, based on each hour's relative humidity can be obtained by using Table 2.A-1 of Appendix 2.A of the Phase I FLAG Report. These factors (a relative humidity factor for each hour of relative humidity) will then be used to determine the average relative humidity factor for that day (24-hour period). All of this is accomplished with the use of the CALPOST post-processor.

3.2.1.3 Interagency Workgroup On Air Quality Modeling (IWAQM) Guidelines

The CALPUFF air modeling analysis will closely follow the recommendations contained in the *IWAQM Phase II Summary Report and Recommendations for Modeling Long Range Transport Impacts*, (EPA, 12/98) where appropriate. Table 3-2 summarizes the IWAQM Phase II recommendations. The methodology in Table 3-2 will be used to compute the results of the regional haze analysis (Recall that no nitrogen or sulfur emissions will be modeled and the calculations will reflect that). However, CALPOST now possesses the ability to post-process the modeling results specific to the regional haze analysis through the selection of one of seven modeling options. The post-processing selection will be made to calculate regional haze based on the appropriate available data/resources. Specifically, regional haze will be calculated using Method 2, which consists of computing extinctions from speciated PM measurements using hourly relative humidity adjustments for observed and modeled sulfate and nitrates, which will be zero. The relative humidity will be capped at 95 percent. Method 7, which eliminates hours during which visibility limiting weather events occur, may be explored as necessary. While this process occurs within CALPOST, a typical calculation methodology is illustrated below.

Table 3-2

Outline of IWAQM Refined Modeling Analyses Recommendations *

Meteorology	Use CALMET (minimum 6 to 10 layers in the vertical; top layer must extend above the maximum mixing depth expected); horizontal domain extends 50 to 80 km beyond outer receptors and source being modeled; terrain elevation and land-use data is resolved for the situation.
Receptors	Within Class I area(s) of concern; NPS will provide the modeling receptors.
Dispersion	1. CALPUFF with default dispersion settings. 2. Use MESOPUFF II chemistry with wet and dry deposition 3. Define background values for ozone and ammonia for area
Processing	Use highest predicted 24-hr SO_4, PM_{10}, and NO_3 value; compute a day-average relative humidity factor (f(RH)) for the worst day for the predicted specie, calculate extinction coefficients and compute percent change in extinction using the FLAG supplied background extinction where appropriate. This can all now be accomplished with the use of Method 2 in the CALPOST post-processor.

* *IWAQM Phase II Summary Report and Recommendations for Modeling Long Range Transport Impacts* (EPA, 12/98).

Calculation

Refined impacts will be calculated as follows:

1. Obtain 24-hour SO_4, NO_3, and PM_{10} impacts, in units of micrograms per cubic meter ($\mu g/m^3$).
2. Convert the SO_4 impact to $(NH_4)_2SO_4$ by the following formula:

   $(NH_4)_2SO_4$ (μg/m3) = SO_4 ($\mu g/m^3$) x molecular weight $(NH_4)_2SO_4$ / molecular weight SO_4

   $(NH_4)_2SO_4$ ($\mu g/m^3$) = SO_4 ($\mu g/m^3$) x 132/96 = SO_4 ($\mu g/m^3$) x 1.375

   Convert the NO_3 impact to NH_4NO_3 by the following formula:

   NH_4NO_3 (μg/m3) = NO_3 ($\mu g/m^3$) x molecular weight NH_4NO_3 / molecular weight NO_3

   NH_4NO_3 ($\mu g/m^3$) = NO_3 ($\mu g/m^3$) x 80/62 = NO_3 ($\mu g/m^3$) x 1.29
3. Compute b_{exts} (extinction coefficient calculated for the source) with the following formula:

   b_{exts} = 3 x NH_4NO_3 x f(RH) + 3 x $(NH_4)_2SO_4$ x f(RH) + 1 x PM_{10}

   (Note: As previously discussed, based on discussions with FDEP, because there will be a facility net emissions decrease of SO_2 and NO_x, SO_2 and NO_x emissions will not be included in the Regional Haze Modeling)
4. Compute b_{extb} (background extinction coefficient) using the background visual range (km) from the FLAG document with the following formula:

   b_{extb} = 3.912 / Visual range (km)
5. Compute the change in extinction coefficients:

in terms of deciviews:

$$dv = 10 \ln (1 + b_{exts} / b_{extb})$$

in terms of percent change of visibility:

$$\Delta\% = (b_{exts} / b_{extb}) \times 100$$

Based on the predicted PM_{10} concentration, the proposed project's emissions will be compared to a 5 percent change in light extinction of the background levels. This is equivalent to a change in deciview of 0.5.

3.2.2 Class I Impact Analysis

PM10

Ground-level impacts (in $\mu g/m^3$) to the Class I areas will be calculated for the appropriate criteria pollutants subject to PSD for each applicable averaging period (particulate matter is the only pollutant expected to be subject to PSD). The results of this analysis will be compared with the Class I Significant Impact Levels (SILs) calculated as 4 percent of the Class I Increment values. Should the model predicted impacts onto the Class I areas exceed the Class I SILs, an appropriately derived inventory of PSD increment consuming sources will be developed through FDEP and modeled with the CALPUFF modeling system for comparison to the Class I Increment values.

4.0 Class II Ambient Air Quality Analysis

The following sections discuss the air dispersion modeling methodology and AAQIA that are proposed for those regulated pollutants which are determined to have a project emissions increase and net emissions increase greater than the PSD SER and thus subject to PSD review. The AAQIA will be conducted in accordance with United States Environmental Protection Agency's (USEPA) air dispersion modeling guidelines (incorporated as Appendix W of 40 CFR 51), as well as a mutually agreed upon modeling methodology initiated by this Protocol.

4.1 Class II Model Selection

Consistent with the Appendix W *Guideline on Air Quality Models*, the American Meteorological Society/Environmental Protection Agency (AMS/EPA) Regulatory Model (AERMOD) (Version 04300) air dispersion model will be used to predict maximum ground-level concentrations associated with the proposed project's emissions. AERMOD is the product of AMS/EPA Regulatory Model Improvement Committee (AERMIC), formed to introduce state-of-the-art modeling concepts into USEPA's air quality models. AERMOD incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain. The AERMOD model includes a wide range of options for modeling air quality impacts of pollution sources.

4.2 Model Inputs

The AERMOD model will be used to determine the maximum predicted ground-level concentration for each appropriate pollutant and applicable averaging period resulting from the emission sources at the proposed project location.

4.2.1 Good Engineering Practice and Building Downwash Evaluation

The dispersion of a plume can be affected by nearby structures when the stack is short enough to allow the plume to be significantly influenced by surrounding building turbulence. This phenomenon, known as structure-induced downwash, generally results in higher model predicted ground-level concentrations in the vicinity of the influencing structure. Sources included in a PSD permit application are subject to Good Engineering Practice (GEP) stack height requirements outlined in 40 CFR Part 51, Sections 51.100 and 51.118. For these analyses, the buildings and structures of the KGS facility and the new CT8 addition will be analyzed to determine the potential to influence the plume dispersion from the combustion turbine stack. Structure dimensions and relative locations will be entered into the USEPA's Building Profile Input Program Prime (BPIPPRM) to produce an AERMOD input file with direction specific building downwash parameters

4.2.2 Model Default Options

Since the AERMOD model is especially designed to support the USEPA's regulatory modeling programs, the regulatory modeling options are considered the default mode of operation for the model. These options include the use of stack-tip downwash and a routine for processing averages when calm winds or missing meteorological data occur.

4.2.3 AERMOD Receptor Grid and Terrain Considerations

The air dispersion modeling receptor locations will be established at appropriate distances to ensure sufficient density and aerial extent to adequately characterize the pattern of pollutant impacts in the area. Specifically, a nested rectangular grid network that extends out 10 km from the center of the proposed location will be used. The nested rectangular grid network consists of three tiers: the first tier extends from the center of the site to 1 km with 100 m spacing; the second tier extends from 1 km to 5 km with 500 m spacing; and the third tier extends from 5 km to 10 km with 1,000 m spacing. 50 m

Given terrain typical of Florida and commensurate with previous air dispersion modeling studies for FDEP, terrain elevations will not be incorporated in this analysis.

On SCRAM 08/25/2006

4.2.4 Meteorological Data

The AERMOD model utilizes a file of surface boundary layer parameters and a file of profile variables including wind speed, wind direction, and turbulence parameters. These two types of meteorological inputs are generated by the meteorological preprocessor for AERMOD, which is called AERMET (Version 04300). AERMET includes three stages of preprocessing of the meteorological data. The first two stages extract, quality check, and merge the available meteorological data. The third stage requires input of certain surface characteristics (surface roughness, Bowen ratio, and Albedo) from the area of concern.

AERMET requires hourly input of specific surface and upper air meteorological data. These data at a minimum include the wind flow vector, wind speed, ambient temperature, cloud cover, and morning radiosonde observation, including height, pressure, and temperature. Surface characteristics in the vicinity of the proposed emissions sources are important in determining the boundary layer parameter estimates. Obstacles to the wind flow, amount of moisture at the surface, and reflectivity of the surface affect the calculations of the boundary layer parameters and are quantified by the following variables: surface roughness length, surface Albedo, and Bowen ratio, respectively.

The meteorological data that will be used in this analysis is a five year set of AERMET processed meteorological data with parameters input for the Jacksonville area. This data set was processed for the data period of 2001-2005 by Florida Department of Environmental Protection (FDEP) and is AERMOD ready.

4.3 Model Predicted Impacts

Based on the air dispersion modeling methodology outlined in the previous sections, the maximum model predicted ground-level concentrations associated with the proposed combustion turbine will be determined for each regulated pollutant that is subject to PSD review and for which a significant impact level exists. From the modeling results, any significant impact area, preconstruction monitoring requirements, and needs for a NAAQS and PSD increment consumption analysis will be determined.

4.3.1 Significant Impact Area

The predicted impacts for all PSD significant pollutants will be compared to the applicable PSD significant impact levels. If the model predicted maximum concentrations are less than the PSD significant impact levels for all pollutants and applicable averaging periods, then no further air dispersion modeling analyses need be performed. However, if the predicted impact of one or more pollutants and applicable averaging periods are greater than the PSD significant impact levels, then a significant impact area (SIA) will be determined and interactive cumulative source modeling will be performed for those pollutants to determine compliance with PSD increment limits. In this event, the proposed project will develop a methodology for compiling a cumulative source inventory and submit to the agency that methodology for approval.