Preston
Called
David Lefebvre
11/18/91 and requested
Chuck - He
said Kissimmee
would send it

BLACK & VEATCH

8400 Ward Parkway, P.O. Box No. 8405, Kansas City, Missouri 64114, (913) 339-2000

RECEIVED

NOV 15 1991

Bureau of
Air Regulation

Kissimmee Utility Authority
Cane Island Combustion Turbine Project

B&V Project 17645
B&V File 32.0402
November 14, 1991

Florida Department of Environmental Regulation
Bureau of Air Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Subject: Authority To Construct/PSD Permit Application

Attention: Mr. C. H. Fancy

Gentlemen:

Enclosed are the original and five copies of the Authority To Construct/PSD Permit Application for the Cane Island Combustion Turbine Project proposed by the Kissimmee Utility Authority. We have also enclosed a hard copy and a disk containing various output files from the dispersion modeling performed for the project. We believe this application and modeling results provides sufficient information for you to find this application complete and initiate processing of the application.

Please call me at (913) 339-2164 if you have any questions concerning the application. Thank you for your cooperation in this matter.

Very truly yours,

BLACK & VEATCH

David M Lefebvre

David M. Lefebvre

Enclosures

cc: Mr. Ben Sharma, Kissimmee Utility Authority
J. Reynolds
C. Holladay
J. Zahm, C Dist.
J. Harper, EPA
C. Shaver, NPS

**BEST AVAILABLE COPY**

NO. 037672

KISSIMMEE UTILITY AUTHORITY

11/26/91

| AMOUNT |
|---|
| ******7,500.00 |

| PAY TO |
|---|
| FL DEPT OF ENVIRONMENTAL REGULATION |

Sun Bank, N.A.
Downtown Office
200 S. Orange Ave.
Orlando, FL 32801

CHAIRMAN

PRESIDENT & G.M.-C.E.O.

⑈037672⑈ ⑆063108389⑆0215252036267⑈

Florida Department of Environmental Regulation
Bureau of Air Regulation
Twin Towers Office Building

FEDERAL EXPRESS

QUESTIONS? CALL 800-238-5355 TOLL FREE.

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1100244950

**RECIPIENT'S COPY**

Date: 11-14-91

From (Your Name) Please Print: David M. Lefebvre
Your Phone Number (Very Important): (913) 339-2164
Company: BLACK & VEATCH
Department/Floor No.
Street Address: 11401 LAMAR
City: OVERLAND PARK
State: KS
ZIP Required: 66211

To (Recipient's Name) Please Print: C. H. Fancy
Recipient's Phone Number (Very Important): ( )
Company: Florida Dept. Environmental Regulation, Bureau of Air Regulation
Department/Floor No.
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): Twin Towers Office Bldg., 2600 Blair Stone Rd
City: Tallahassee
State: FL
ZIP Required: 32399-2400

YOUR INTERNAL BILLING REFERENCE INFORMATION (First 24 characters will appear on invoice.)

IF HOLD FOR PICK-UP, Print FEDEX Address Here
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City State ZIP Required

PAYMENT 1 ☐ Bill Sender 2 ☐ Bill Recipient's FedEx Acct. No. 3 ☐ Bill 3rd Party FedEx Acct. No. 4 ☐ Bill Credit Card 5 ☐ Cash/Check

SERVICES (Check only one box)

Priority Overnight (Delivery by next business morning†)
- 11 ☒ YOUR PACKAGING
- 16 ☐ FEDEX LETTER *
- 12 ☐ FEDEX PAK *
- 13 ☐ FEDEX BOX
- 14 ☐ FEDEX TUBE

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Economy Two-Day (Delivery by second business day†)
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** Call for delivery schedule

DELIVERY AND SPECIAL HANDLING (Check services required)
1. ☐ HOLD FOR PICK-UP (Fill in Box H)
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3. ☐ DELIVER SATURDAY (Extra charge) (Not available to all locations)
4. ☐ DANGEROUS GOODS (Extra charge)
5. ☐
6. ☐ DRY ICE ___ Lbs
7. ☐ OTHER SPECIAL SERVICE
8. ☐
9. ☐ SATURDAY PICK-UP (Extra charge)
10. ☐
11. ☐
12. ☐ HOLIDAY DELIVERY (If offered) (Extra charge)

PACKAGES / WEIGHT In Pounds Only
Total 1 Total

DIM SHIPMENT (Chargeable Weight) ☐ ______ lbs.
___ x ___ x ___ = ___

Received At: 1 ☐ Regular Stop 2 ☐ On-Call Stop 3 ☐ Drop Box 4 ☐ BSC 5 ☐ Station

Emp. No. Date
☐ Cash Received
☐ Return Shipment
☐ Third Party ☐ Chg. To Del. ☐ Chg. To Hold
Street Address
City State Zip
Received By: X
Date/Time Received FedEx Employee Number
7 Release Signature:
FedEx Emp. No. Date/Time

Federal Express Use
Base Charges
Declared Value Charge
Other 1
Other 2
Total Charges

REVISION DATE 4/91
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David M. Lefebvre, Black & Veatch
James C. Welsh

Serving the Kissimmee Area Since 1901

Kissimmee Utility Authority
Ambient Air Quality Impact Analysis
For the Cane Island Combustion Turbine Project
In Support of the
Prevention of Significant Deterioration
Permit Application

B&V Project 17645

November 1991

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List of Forms

# 1.0 Introduction

Kissimmee Utility Authority (KUA) proposes to expand their system capability by installing and operating approximately 80 megawatts (MW) of simple cycle combustion turbine (SCCT) capacity. The Combustion Turbine Project will consist of two units in the 40 MW size range. It is planned that a first SCCT phase consisting of a nominal 40 MW block is to be completed and operational on or about October 1, 1993 and the additional nominal 40 MW block be completed and available for service on or about October 1, 1995. The additional capacity is necessary to meet the growing load requirements of its system.

The SCCTs will fire natural gas as the primary fuel with No. 2 fuel oil as the secondary fuel. Water injection will be used to control nitrogen oxides ($NO_x$) emissions and "clean" fuels will be fired to control sulfur dioxide ($SO_2$) emissions. The project will be subject to the provisions of New Source Performance Standards, Prevention of Significant Deterioration regulations, and the Florida Air Pollution Regulations and Permit Rules.

This ambient air quality impact assessment (AAQIA) was done in support of the Prevention of Significant Deterioration (PSD) permit application. This AAQIA follows the methodology proposed in the modeling protocol that was submitted to the Florida Department of Environmental Regulation (FDER) on September 9, 1991. The modeling protocol was approved via telephone conversation by the FDER on September 30, 1991. This telephone memorandum is given in Appendix A.

The AAQIA describes pollutant applicability, modeling methodologies, the best available control technology analysis, source impact analyses, and additional impact analyses that were performed in support of the PSD permit application. The State of Florida forms follow this page.

BEST AVAILABLE COPY

Florida Department of Environmental Regulation
Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

DER Form # ____
Form Title ____
Effective Date ____
DER Application No. ____ (Filled in by DER)

## APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

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

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

COMPANY NAME: Kissimmee Utility Authority COUNTY: Osceola

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

SOURCE LOCATION: Street N/A City Intercession City

UTM: East 447.692 North 3127.923

Latitude ___° ___' ___"N Longitude ___° ___' ___"W

APPLICANT NAME AND TITLE: ____

APPLICANT ADDRESS: ____

### SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of Kissimmee Utility Authority

I certify that the statements made in this application for a construction permit are true, correct and complete to the best of my knowledge and belief. Further, I agree to maintain and operate the pollution control source and pollution control facilities in such a manner as to comply with the provision of Chapter 403, Florida Statutes, and all the rules and regulations of the department and revisions thereof. I also understand that a permit, if granted by the department, will be non-transferable and I will promptly notify the department upon sale or legal transfer of the permitted establishment.

*Attach letter of authorization

Signed: AK Sharma

A. K. Sharma Director of Power Supply
Name and Title (Please Type)
Kissimmee Utility Authority
Date: 11/14/91 Telephone No. 407-847-6011

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

This is to certify that the engineering features of this pollution control project have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgment, that

[1] See Florida Administrative Code Rule 17-2.100(57) and (104)



Northwest District, 160 Governmental Center, Pensacola, Florida 32501-5794, 904-436-8300
Northeast District, 3426 Bills Rd., Jacksonville, Florida 32207, 904-798-4200
Central District, 3319 Maguire Blvd., Suite 232, Orlando, Florida 32803-3767, 407-894-7555
Southwest District, 4520 Oak Fair Blvd., Tampa, Florida 33610-7347, 813-623-5561
South District, 2269 Bay St., Fort Myers, Florida 33901-2896, 813-332-2667
Southeast District, 1900 S. Congress Ave., Suite A, West Palm Beach, Florida 33406, 407-964-9668

the pollution control facilities, when properly maintained and operated, will discharge an effluent that complies with all applicable statutes of the State of Florida and the rules and regulations of the department. It is also agreed that the undersigned will furnish, if authorized by the owner, the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.

Signed Mohamed M. Moussa

Mohamed M. Moussa
Name (Please Type)

Black & Veatch
Company Name (Please Type)

8400 Ward Parkway, Kansas City, MO 64114
Mailing Address (Please Type)

Florida Registration No. 44537 Date: Nov. 14, 1991 Telephone No. 913-339-2487

## SECTION II: GENERAL PROJECT INFORMATION

A. Describe the nature and extent of the project. Refer to pollution control equipment, and expected improvements in source performance as a result of installation. State whether the project will result in full compliance. Attach additional sheet if necessary.

Kissimmee Utility Authority proposes to expand its system capability by installing and operating approximately 80 MW of simple cycle combustion turbine (SCCT) capacity. The first SCCT is to be operational by October 1, 1993, and the second SCCT operational by October 1, 1995. The SCCTs, firing natural gas or No. 2 fuel oil 8,760 hours per year, will comply with applicable PSD increments, ambient air quality standards, and toxic pollutant acceptable ambient levels.

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

Start of Construction July 1, 1992 Completion of Construction October 1, 1993

C. Costs of pollution control system(s): (Note: Show breakdown of estimated costs only for individual components/units of the project serving pollution control purposes. Information on actual costs shall be furnished with the application for operation permit.)

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

E. Requested permitted equipment operating time: hrs/day 24 ; days/wk 7 ; wks/yr 52 ;

if power plant, hrs/yr 8760 ; if seasonal, describe: ____

F. If this is a new source or major modification, answer the following questions. (Yes or No)

1. Is this source in a non-attainment area for a particular pollutant? No

   a. If yes, has "offset" been applied? N/A

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

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

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

3. Does the State "Prevention of Significant Deterioriation" (PSD) requirement apply to this source? If yes, see Sections VI and VII. Yes

4. Do "Standards of Performance for New Stationary Sources" (NSPS) apply to this source? Yes

5. Do "National Emission Standards for Hazardous Air Pollutants" (NESHAP) apply to this source? No

H. Do "Reasonably Available Control Technology" (RACT) requirements apply to this source? No

   a. If yes, for what pollutants? N/A

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

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

2. See Section 4.0 of PSD permit application (KUA-AAQIA)
3. See Section 3.0 of PSD permit application (KUA-AAQIA)
4. See Section 3.0 of PSD permit application (KUA-AAQIA)

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

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

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

B. Process Rate, if applicable: (See Section V, Item 1)

1. Total Process Input Rate (lbs/hr): N/A
2. Product Weight (lbs/hr): N/A

C. Airborne Contaminants Emitted: (Information in this table must be submitted for each emission point, use additional sheets as necessary)

See Table 3-3 of KUA-AAQIA

| Name of Contaminant | Emission[1] Maximum lbs/hr | Emission[1] Actual T/yr | Allowed[2] Emission Rate per Rule 17-2 | Allowable[3] Emission lbs/hr | Potential[4] Emission lbs/yr | Potential[4] Emission T/yr | Relate to Flow Diagram |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

[1] See Section V, Item 2.

[2] Reference applicable emission standards and units (e.g. Rule 17-2.600(5)(b)2. Table II, E. (1) - 0.1 pounds per million BTU heat input)

[3] Calculated from operating rate and applicable standard.

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

D. Control Devices: (See Section V, Item 4)

| Name and Type (Model & Serial No.) | Contaminant | Efficiency | Range of Particles Size Collected (in microns) (If applicable) | Basis for Efficiency (Section V Item 5) |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

E. Fuels

| Type (Be Specific) | Consumption* | | Maximum Heat Input (MMBTU/hr) |
|---|---|---|---|
| | avg/hr | max./hr | |
| No. 2 Fuel Oil | | 2,640 | 361.7 (LHV) |
| Natural Gas | | 0.35 | 356.8 (LHV) |
| | | | |
| | | | |

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

Fuel Analysis:

Percent Sulfur: Gas 0 / No. 2 Oil 0.3 Percent Ash: Gas 0 / No. 2 Oil 0.01

Density: Gas 0.13 lb/ft$^3$ / No. 2 Oil 7.1 lbs/gal Typical Percent Nitrogen: Gas 0.345 / No. 2 Oil N/A

Heat Capacity: Gas 1034 Btu/SCF / No. 2 Oil 19300 BTU/lb No. 2 Oil 137,028 BTU/gal

Other Fuel Contaminants (which may cause air pollution): ______

F. If applicable, indicate the percent of fuel used for space heating.

Annual Average N/A Maximum N/A

G. Indicate liquid or solid wastes generated and method of disposal.

Sanitary wastes - tile field

Demineralizer regeneration waste - neutralized and directed to sewer system

. Emission Stack Geometry and Flow Characteristics (Provide data for each stack):

Stack Height: 40 ft. Stack Diameter: 10 ft.

Gas Flow Rate: 450,000 ACFM ________ DSCFM Gas Exit Temperature: 718 °F.

Water Vapor Content: ________ % Velocity: 95.48 FPS

## SECTION IV: INCINERATOR INFORMATION

N/A

| Type of Waste | Type O (Plastics) | Type I (Rubbish) | Type II (Refuse) | Type III (Garbage) | Type IV (Patholog-ical) | Type V (Liq.& Gas By-prod.) | Type VI (Solid By-prod.) |
|---|---|---|---|---|---|---|---|
| Actual lb/hr Inciner-ated | | | | | | | |
| Uncon-trolled (lbs/hr) | | | | | | | |

Description of Waste ________

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

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

Manufacturer ________

Date Constructed ________ Model No. ________

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

Stack Height: ________ ft. Stack Diamter: ________ Stack Temp. ________

Gas Flow Rate: ________ ACFM ________ DSCFM* Velocity: ________ FPS

*If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

Type of pollution control device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify) ________

Brief description of operating characteristics of control devices: ____________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

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

______________________________________________

______________________________________________

______________________________________________

______________________________________________

**NOTE:** Items 2, 3, 4, 6, 7, 8, and 10 in Section V must be included where applicable.

## SECTION V: SUPPLEMENTAL REQUIREMENTS

Please provide the following supplements where required for this application.

1. Total process input rate and product weight -- show derivation [Rule 17-2.100(127)]

2. To a construction application, attach basis of emission estimate (e.g., design calculations, design drawings, pertinent manufacturer's test data, etc.) and attach proposed methods (e.g., FR Part 60 Methods 1, 2, 3, 4, 5) to show proof of compliance with applicable standards. To an operation application, attach test results or methods used to show proof of compliance. Information provided when applying for an operation permit from a construction permit shall be indicative of the time at which the test was made.

3. Attach basis of potential discharge (e.g., emission factor, that is, AP42 test).

4. With construction permit application, include design details for all air pollution control systems (e.g., for baghouse include cloth to air ratio; for scrubber include cross-section sketch, design pressure drop, etc.)

5. With construction permit application, attach derivation of control device(s) efficiency. Include test or design data. Items 2, 3 and 5 should be consistent: actual emissions = potential (1-efficiency).

6. An 8 1/2" x 11" flow diagram which will, without revealing trade secrets, identify the individual operations and/or processes. Indicate where raw materials enter, where solid and liquid waste exit, where gaseous emissions and/or airborne particles are evolved and where finished products are obtained.

7. An 8 1/2" x 11" plot plan showing the location of the establishment, and points of airborne emissions, in relation to the surrounding area, residences and other permanent structures and roadways (Example: Copy of relevant portion of USGS topographic map).

8. An 8 1/2" x 11" plot plan of facility showing the location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.

9. The appropriate application fee in accordance with Rule 17-4.05. The check should be made payable to the Department of Environmental Regulation.

10. With an application for operation permit, attach a Certificate of Completion of Construction indicating that the source was constructed as shown in the construction permit.

## SECTION VI: BEST AVAILABLE CONTROL TECHNOLOGY

A. Are standards of performance for new stationary sources pursuant to 40 C.F.R. Part 60 applicable to the source?

[X] Yes [ ] No

| Contaminant | Rate or Concentration |
|---|---|
| $NO_x$ | 75 ppmvd |
| $SO_2$ | 0.015 percent S (volume) |
| | 0.8 percent S (weight) |
| | |

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

[ ] Yes [X] No

| Contaminant | Rate or Concentration |
|---|---|
| | |
| | |
| | |
| | |

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

| Contaminant | Rate or Concentration |
|---|---|
| $SO_2$ | 0.30 percent sulfur in fuel |
| $NO_x$ | 42/25 ppmvd (No. 2 fuel oil/natural gas) |
| CO | 63/30 ppmvd (No. 2 fuel oil/natural gas) |
| VOC | 15/12 ppmvd (No. 2 fuel oil/natural gas) |

D. Describe the existing control and treatment technology (if any). See Section 4.0 of the KUA-AAQIA.

1. Control Device/System:
2. Operating Principles:
3. Efficiency:*
4. Capital Costs:

*Explain method of determining

5. Useful Life:

6. Operating Costs:

7. Energy:

8. Maintenance Cost:

9. Emissions:

| Contaminant | Rate or Concentration |
|---|---|
| | |
| | |
| | |
| | |

10. Stack Parameters

a. Height: ft.

b. Diameter: ft.

c. Flow Rate: ACFM

d. Temperature: °F.

e. Velocity: FPS

E. Describe the control and treatment technology available (As many types as applicable, use additional pages if necessary). See Section 4.0 of the KUA-AAQIA.

1.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

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

2.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

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

j. Applicability to manufacturing processes:

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

3.

a. Control Device: b. Operating Principles:

c. Efficiency:[1] d. Capital Cost:

e. Useful Life: f. Operating Cost:

g. Energy:[2] h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

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

4.

a. Control Device: b. Operating Principles:

c. Efficiency:[1] d. Capital Costs:

e. Useful Life: f. Operating Cost:

g. Energy:[2] h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

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

F. Describe the control technology selected: See Section 4.0 of the KUA-AAQIA.

1. Control Device: 2. Efficiency:[1]

3. Capital Cost: 4. Useful Life:

5. Operating Cost: 6. Energy:[2]

7. Maintenance Cost: 8. Manufacturer:

9. Other locations where employed on similar processes:

a. (1) Company:

(2) Mailing Address:

(3) City: (4) State:

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

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

| Contaminant | Rate or Concentration |
| --- | --- |
| | |
| | |
| | |

(8) Process Rate:[1]

b. (1) Company:

(2) Mailing Address:

(3) City: (4) State:

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

| Contaminant | Rate or Concentration |
| --- | --- |
| | |
| | |
| | |

(8) Process Rate:[1]

10. Reason for selection and description of systems:

[1]Applicant must provide this information when available. Should this information not be available, applicant must state the reason(s) why.

## SECTION VII - PREVENTION OF SIGNIFICANT DETERIORATION

A. Company Monitored Data N/A

1. ____________no. sites ____________ TSP ____________( ) $SO^2$* ____________ Wind spd/dir

Period of Monitoring ______/______/______ to ______/______/______
month day year month day year

Other data recorded ________________________________________

Attach all data or statistical summaries to this application.

*Specify bubbler (B) or continuous (C).

2. Instrumentation, Field and Laboratory

a. Was instrumentation EPA referenced or its equivalent? [ ] Yes [ ] No

b. Was instrumentation calibrated in accordance with Department procedures?

[ ] Yes [ ] No [ ] Unknown

Meteorological Data Used for Air Quality Modeling

1. 5 Year(s) of data from 01 / 01 / 82 (month / day / year) to 12 / 31 / 86 (month / day / year)

2. Surface data obtained from (location) Orlando, Florida

3. Upper air (mixing height) data obtained from (location) Tampa, Florida

4. Stability wind rose (STAR) data obtained from (location) N/A

Computer Models Used

1. ISCST Modified? If yes, attach description.

2. ______ Modified? If yes, attach description.

3. ______ Modified? If yes, attach description.

4. ______ Modified? If yes, attach description.

Attach copies of all final model runs showing input data, receptor locations, and principle output tables.

Applicants Maximum Allowable Emission Data

| Pollutant | Emission Rate | |
|---|---|---|
| TSP | 3.02 | grams/sec (both turbines) |
| $SO^2$ | 29.48 | grams/sec (both turbines) |

Emission Data Used in Modeling

Attach list of emission sources. Emission data required is source name, description of point source (on NEDS point number), UTM coordinates, stack data, allowable emissions, and normal operating time.

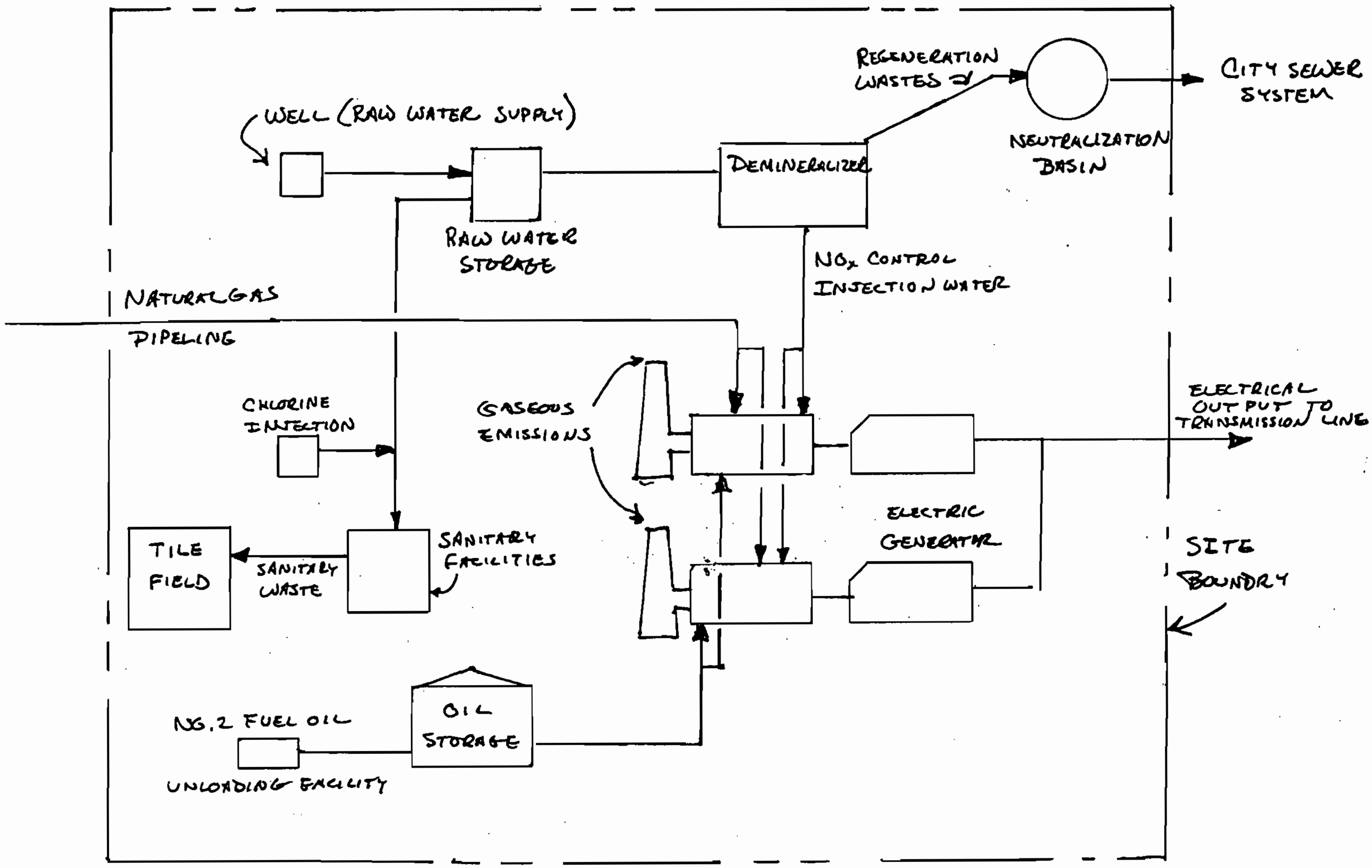
Attach all other information supportive to the PSD review.

Discuss the social and economic impact of the selected technology versus other applicable technologies (i.e., jobs, payroll, production, taxes, energy, etc.). Include assessment of the environmental impact of the sources.

Attach scientific, engineering, and technical material, reports, publications, journals, and other competent relevant information describing the theory and application of the requested best available control technology.

## Process Flow Diagram

In Support of the Florida Department of Environmental Regulation Permit to Construct



# 2.0 Site Characterization

## 2.1 Project Location/Terrain

The Cane Island site is located approximately 10 kilometers west of Kissimmee, Florida, near Intercession City. The proposed location of the facilities development would be on the central area of Cane Island. The site location is shown in Figure 2-1. Topography in the vicinity of the site is relatively flat.

## 2.2 Land Use Classification

EPA's Guideline on Air Quality Models (Revised), 1986, defines the method for determining whether rural or urban dispersion techniques should be used. Two procedures, the land use procedure and the population-based procedure can be used; however, the former is preferred.

(1) Land Use Procedure: The land use is considered within a 3 kilometer radius of the site. The following describes the land use types that are considered to represent an urban environment.

- I1: Heavy Industrial - Major chemical, steel and fabrication industries; generally 3-5 story buildings, flat roofs; grass and tree growth extremely rare; < 5 percent vegetation.
- I2: Light-Moderate Industrial - Rail yards, truck depots, warehouses, industrial parks, minor fabrication; generally 1-3 story buildings, flat roofs; very limited grass, trees almost totally absent; < 5 percent vegetation.
- C1: Commercial- Office and apartment buildings, hotels; > 10 story heights, flat roofs; limited grass and trees; < 15 percent vegetation.
- R2: Compact Residential - Single, some multiple, family dwelling with close spacing; generally < 2 story, pitched roof structures; garages (via alley), no driveways; limited lawn sizes and shade trees; < 30 percent vegetation.
- R3: Compact Residential - Old multi-family dwellings with close (<2 m) lateral separation; generally 2 story, flat roof structures; garages (via alley) and ashpits, no driveways; limited lawn sizes, old established shade tress; <35 percent vegetation.

If these land use types account for 50 percent of more of the 3 kilometer radius area, then the urban modeling (McElroy-Pooler) option should be chosen.

(2) Population Density Procedure: The population density is considered in the area within three kilometers of the site. If the population density is greater than 750 people per square kilometer, then urban coefficients should be used.

As shown in Figure 2-1, the area in the vicinity of the site is predominantly undeveloped, unpopulated, and heavily vegetated. Therefore, the Cane Island site qualifies for treatment as "rural" under either the land use procedure or population density procedure.

## 2.3 Air Quality Nonattainment/Attainment Status

The site is located in Osceola County, which is currently designated as attainment or unclassifiable for all of the criteria pollutants, i.e., $SO_2$, nitrogen dioxide ($NO_2$), carbon monoxide (CO), particulate matter less than 10 microns ($PM_{10}$), ozone, and lead (Pb).

# 3.0 Source Characterization

## 3.1 Project Facility

The project will consist of two General Electric LM6000 SCCTs with an approximate capacity of 40 MW each. The first unit is planned for initial operation on or about October 1993 followed by the second unit planned for initial operation on or about October 1995. The plant may be used as backup for other KUA capacity and, therefore, will be designed to operate on an as-needed and on an economic basis.

The SCCTs will have the capability to fire either natural gas or No. 2 fuel oil. Fuel oil will be fired only when the natural gas supply is interrupted or restricted or if the firing of fuel oil becomes economically advantageous.

Approximately 30 gallons per minute (gpm) of water will be required by each combustion turbine for the control of $NO_x$ emissions during full load operation. This represents worst-case total plant needs. Approximately 450,000 gallons of onsite demineralized water storage will be provided for each combustion turbine installation. This volume will provide approximately 10 days of water consumption at continuous full load operation.

## 3.2 Project Applicability to Regulations

The Clean Air Act (CAA) is a federal environmental statue that regulates varying aspects of air pollution. Three Title I provisions, promulgated subsequent to the Act, must be included in the analysis of project applicability to the CAA regulations. The provisions include New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAPs), and Prevention of Significant Deterioration (PSD).

### *3.2.1 NSPS*

NSPS were promulgated under Section 111 of the CAA to develop standards of performance for new or modified major sources. The proposed project is subject to NSPSs for Stationary Gas Turbines (40 CFR 60, Subpart GG). These standards define the minimum level of performance for operation of industrial sources and removal of regulated pollutants. The applicable NSPSs are given in Table 3-1.

Table 3-1
New Source Performance Standards Applicable to the Project

| Pollutant | Corresponding Standard | Definitions |
|---|---|---|
| $NO_x$ | $= 0.0075 \frac{(14.4)}{Y} + F$<br><br>(corrected to 15 percent oxygen on a dry basis) | F = $NO_x$ emission allowance for fuel bound nitrogen.<br><br>Y = manufacturer's rated heat rate at manufacturer's rated load (KJ/Wh) |
| $SO_2$ | = 0.015 percent S by volume<br><br>(corrected to 15 percent oxygen on a dry basis)<br><br>and,<br>= 0.8 percent S by weight | |

### 3.2.2 National Emission Standards for Hazardous Air Pollutants

Pursuant to Section 112 of the CAA, national emission standards for eight hazardous air pollutants, have been promulgated. Under these rules, radon-222, beryllium (Be), mercury (Hg), vinyl chloride, radionuclides, benzene, asbestos, and arsenic are regulated for specific sources. The proposed facility is not listed as one of the applicable sources regulated under the current NESHAPS. Thus, the project is not subject to NESHAPS.

### 3.2.3 Prevention of Significant Deterioration

PSD regulations were promulgated as a result of the 1977 CAA Amendments to protect airshed air quality, ensuring that air quality in existing attainment areas does not significantly deteriorate or exceed national ambient air quality standards while providing a margin for future industrial growth. EPA has delegated administration of the PSD Program in Florida to the FDER.

PSD regulations apply to major stationary sources and major modifications undergoing construction in areas designated as attainment or unclassifiable under Section 107 of the CAA for any criteria pollutant.

A new major stationary source is defined as any one of 28 listed source categories which emits, or has the potential to emit, 100 tons per year or more of any regulated pollutant. In addition, any stationary source not listed which emits 250 tons per year or more of any regulated pollutant is also considered a major stationary source. Currently, 15 pollutants consisting of six criteria (those pollutants for which NAAQS have been established) and nine noncriteria pollutants are regulated by various federal programs. These pollutants are listed in Table 3-2.

The estimated emissions for the project are listed in Table 3-3. The annual emissions for the criteria pollutants are based on manufacturer's performance data for two worst-case combustion turbines firing natural gas or fuel oil for 8,760 hours per year at base load and average annual conditions (i.e., 72 F dry bulb). The lead (Pb), Be, and Hg emission factors for fuel oil firing were obtained from the EPA document, <u>Toxic Air Pollutant Emission Factors - A Compilation for Selected Air Toxic Compounds and Sources</u> (EPA-450/2-88-006a). Pb, Be, and Hg emission factors of $2.8 \times 10^{-5}$ pounds per million Btus (lb/MBtu), $2.5 \times 10^{-6}$ lb/MBtu, and $3.0 \times 10^{-6}$ lb/MBtu, respectively, were used with the worst-case heat input rate for fuel oil firing at base load and average annual conditions to

Table 3-2
List of Regulated Pollutants

| Criteria Pollutants | Noncriteria Pollutants |
|---|---|
| Carbon monoxide (CO) | Asbestos |
| Nitrogen oxides ($NO_x$) | Beryllium |
| Sulfur dioxide ($SO_2$) | Fluorides |
| Total particulate | Hydrogen sulfide ($H_2S$) |
| Particulates less than 10 microns in size ($PM_{10}$) | Mercury |
| Ozone (regulated through volatile organic compound [VOC]) | Reduced sulfur compounds (including $H_2S$) |
| Lead | Sulfuric acid mist |
| | Total reduces sulfur (including $H_2S$) |
| | Vinyl chloride |

## Table 3-3
## Significant and Proposed Emission Rates*

| Pollutant | Project Emissions (tpy) Natural Gas | No. 2 Oil | Significant Emissions tpy | PSD Review Required? yes/no |
|---|---|---|---|---|
| Carbon Monoxide | 228 | 482 | 100 | Yes |
| Nitrogen Dioxide | 290 | 500 | 40 | Yes |
| Sulfur Dioxide | <<40 | 951 | 40 | Yes |
| Particulate Matter (TSP) | 70.1 | 105 | 25 | Yes |
| Particulate Matter ($PM_{10}$) | 70.1 | 105 | 15 | Yes |
| VOCs | 10.5 | 51.0 | 40 | Yes |
| Lead | neg | 0.08 | 0.6 | No |
| Beryllium | neg | 0.007 | 0.0004 | Yes |
| Mercury | neg | 0.01 | 0.1 | No |
| Fluorides | neg | neg | 3 | No |
| Sulfuric Acid Mist | 0.1 | 28.5 | 7 | Yes |
| Asbestos | neg | neg | 0.007 | No |
| Vinyl Chloride | neg | neg | 1.0 | No |
| Total Reduced Sulfur | neg | neg | 10 | No |
| Reduced Sulfur | neg | neg | 10 | No |
| Hydrogen Sulfide | neg | neg | 10 | No |

*Based on two turbines operating 8,760 hours per year at average annual ambient conditions.

determine annual emissions. Sulfuric acid mist emissions were calculated as three percent of total sulfur dioxide emissions.

SCCTs are not one of the 28 listed source categories. However, the project is located in an attainment area and will emit at least one regulated pollutant in excess of 250 tons per year. Thus, the source is considered a new major stationary source and is subject to PSD regulations.

Once a source is determined to be a major source, then each criteria and noncriteria pollutant must be compared to the PSD significant emission rates to determine PSD pollutant applicability. Table 3-3 also shows the PSD significant emission rates used to define specific pollutant applicability. The regulated pollutants emitted above the PSD significant emission rates (i.e, CO, $NO_x$, $SO_2$, TSP, $PM_{10}$, VOCs, Be, and sulfuric acid mist) are subject to PSD review, including a best available control technology (BACT) assessment, source impact analysis, air quality analysis, and additional impact analyses.

## 3.3 Proposed Source Parameters

The methodology used to determine the stack height and other stack parameters/emission rates required for the dispersion modeling is discussed in the following two subsections.

### *3.3.1 GEP Stack Height Determination*

A good engineering practice (GEP) stack height analysis was conducted for the proposed buildings and structures at the facility. Pollutant dispersion from stacks built to the maximum GEP height will not be influenced by surrounding building turbulence. If stacks are built lower than GEP stack height, special air quality modeling techniques, such as downwash and cavity analysis, are required to demonstrate compliance with air quality standards. EPA's Guideline For Determination of Good Engineering Practice Stack Height (1985) was used as a basis for this GEP analysis.

A GEP stack height is defined as the height at which emissions are not significantly influenced by downwash from nearby buildings (i.e., the building height plus 1.5 times the lesser of the building height or maximum projected width). A nearby building is generally defined as one which is located within five times the lesser of its height or maximum projected width from the stack. A GEP stack height based upon all the nearby buildings was calculated using Trinity Consultant's BREEZEWAKE program for each radial direction.

The resultant GEP stack height is the highest calculated stack height based on all influencing building dimensions. However, EPA's guideline allows air dispersion modeling using the greater of the calculated GEP stack height or 65 meters.

The buildings and equipment located at the site that influence building downwash include the plant service building (17 feet high), the fire and water tanks (40 feet high), oil storage tank (48 feet high), and the turbine housings (34 feet high).

The GEP analysis is given in Appendix B. The analysis demonstrated that the GEP stack height for the combustion turbines is 110 feet, based upon the oil tank with a height of 48 feet and a maximum projected width of 38 feet. The combustion turbine stacks will be 40 feet high. Therefore, direction-specific building downwash parameters were input into the model.

### *3.3.2 Proposed Stack Parameters and Source Emission Rates*

The stack parameters and source emission rates were based on engineering data and manufacturer's performance data.

The following assumptions were made regarding the combustion parameters for the air quality analysis.

- The SCCTs will fire No. 2 fuel oil or natural gas for a total of 8,760 hours per year.
- Each SCCT stack was modeled as a separate emission point.
- No fugitive sources of $TSP/PM_{10}$ or any other criteria pollutant were considered in the analysis due to enclosed fuel storage tanks, natural gas delivery by pipeline, and infrequent plant traffic.
- Operating parameters for the following ambient conditions were used to determine worst-case modeling parameters.
  - -- 20 F dry bulb (extreme minimum temperature)
  - -- 72 F dry bulb (average annual temperature)
  - -- 102 F dry bulb (extreme maximum temperature)

The stack parameters are given in Table 3-4.

Table 3-4
Proposed Stack and Emission Parameters

| Stack Parameters | GE LM6000 | |
|---|---|---|
| Stack Height, feet | 40 | |
| Stack Diameter, feet | 10 | |
| Stack Velocity, fpm | 5,729 | |
| Stack Temperature, F | 718 | |
| | | |
| Downwash Parameters* | | |
| Building Height, feet | 48 | |
| Maximum Projected Width, feet | 38 | |
| | | |
| Location | SCCT 1 | SCCT 2 |
| UTM East, Km | 447.6923 | 447.6771 |
| UTM North, Km | 3127.923 | 3127.925 |
| | | |
| Emission Parameters** | Fuel Oil | Natural Gas |
| $SO_2$, lb/h | 117 | nil |
| $NO_x$, lb/h | 61 | 35 |
| PM, lb/h | 12 | 8 |
| VOC, lb/h | 8 | 1.8 |
| CO, lb/h | 205 | 108 |

*Based on fuel oil tank.

**Per each turbine.

# 4.0 Best Available Control Technology Analysis

## 4.1 Introduction

The KUA Cane Island Project will consist of two General Electric (GE) LM-6000 combustion turbines operating in simple cycle. Natural gas will be the primary fuel and No. 2 fuel oil will be used as a secondary fuel. Section 3.0 concluded that the project's emissions of the following regulated pollutants are subject to the provisions of the PSD Program.

- Nitrogen oxides ($NO_x$).
- Particulate (total and $PM_{10}$).
- Carbon monoxide (CO).
- Volatile organic compounds (VOC).
- Sulfur dioxide ($SO_2$).
- Sulfuric Acid Mist ($H_2SO_4$).
- Beryllium.

Consequently, this Best Available Control Technology (BACT) Analysis will address the control of emissions of these PSD applicable pollutants when burning natural gas or fuel oil. Also included are evaluations of the effects that systems selected as BACT will have on the emissions of unregulated hazardous pollutants.

Under the federal Clean Air Act, BACT represents the maximum degree of pollutant reduction determined on a case-by-case basis considering technical, economic, energy, and environmental factors. However, BACT cannot be less stringent than the emission limits established by the applicable New Source Performance Standards (NSPS) Subpart GG for stationary combustion turbines. The NSPS applicable to the project are given in Table 3-1. There are no NSPS limiting the emission of particulate, CO, or VOC from combustion turbines.

This BACT Analysis follows the general requirements of EPA's draft "top down" BACT guidance document (dated March 15, 1990). This approach requires that the BACT Analysis start by assuming the use of the lowest achievable emission rate (LAER) control alternative. Other, less efficient emission control technologies are subsequently evaluated if LAER is determined to be unreasonable considering the above factors.

This BACT analysis is based on the pollutant emission rate of two GE LM-6000 combustion turbines.

## 4.2 Nitrogen Oxides Emissions Control

During combustion, two types of $NO_x$ are formed; fuel $NO_x$ and thermal $NO_x$. Fuel $NO_x$ emissions are formed through the oxidation of a portion of the nitrogen contained in the fuel. Thermal $NO_x$ emissions are generated through the oxidation of a portion of the nitrogen contained in the combustion air. Nitrogen oxides formation can be limited by lowering combustion temperatures, and staging combustion (a reducing atmosphere followed by an oxidizing atmosphere).

The following subsections describe the potential $NO_x$ control technologies, associated costs for the feasible technologies, and energy/environmental considerations.

### *4.2.1 Alternative $NO_x$ Emission Reduction Systems*

A review of EPA's BACT/LAER Clearinghouse--A Compilation of Control Technology Determinations (1985 and 1990 editions) was performed to determine the control technology resulting in the lowest $NO_x$ emission levels established to date for simple cycle combustion turbines. The identified technology was the use of water or steam injection with an improved low $NO_x$ burner design.

For this BACT analysis, three potential control technologies are evaluated: selective catalytic reduction, selective non-catalytic reduction, and improved low $NO_x$ burner design with water injection.

***4.2.1.1 Selective Catalytic Reduction (SCR).*** SCR is a post-combustion method for the control of $NO_x$ emissions. The SCR process combines vaporized ammonia with $NO_x$ in the presence of a catalyst to form nitrogen and water. The vaporized ammonia is injected into the exhaust gases prior to passage through the catalyst bed. The SCR process can achieve up to 90 percent reduction of $NO_x$ with a new catalyst. An aged catalyst will provide $NO_x$ reduction of approximately 80 to 85 percent.

The optimum flue gas temperature range for SCR operation is approximately 650 to 750 F. Flue gas from the simple cycle combustion turbines will typically be 710 F to 850 F. Therefore, when the flue gas is above 750 F, it must be cooled prior to the injection of ammonia.

The most economical method to reduce the flue gas temperature is through humidification with water. The water quality for humidification must be free of sodium and salt deposits to protect the SCR catalyst. The project's proposed water treatment system is designed to provide only enough water to the CT units for turbine water injection. Therefore, an expansion of the water treatment facility would be required to demineralize the additional water required for humidification prior to the SCR.

***4.2.1.2 Selective Non-catalytic Reduction (SNCR).*** $NO_x$ emissions from a number of coal-fired fluidized bed combustion sources have been controlled through the installation of a SNCR systems such as Thermal $DeNO_x$ or $NO_x$ OUT. A SNCR system requires gas temperatures of at least 1,500 F for $NO_x$ reduction. The temperature at the outlet of a GE LM-6000 combustion turbine is too low (710 F to 850 F) for such systems. Raising the flue gas exit temperature to 1,500 F would require supplemental heating of the flue gas resulting in increased total emissions. Therefore, this alternative is judged technically and environmentally unacceptable for a combustion turbine application and will not be evaluated further.

***4.2.1.3 Improved Low $NO_X$ Burner Design.*** Combustion turbine manufacturers are marketing an improved low $NO_x$ burner design. These burners provide improved air/fuel mixing and reduced flame temperatures. This burner technology along with water injection result in lower concentrations of $NO_x$ in comparison to standard combustion chamber design with water injection (25 versus 42 ppmvd when firing natural gas). Accordingly, the capital and annual cost of a low $NO_x$ combustor to meet a 25/42 (natural gas/No. 2 fuel oil) ppmvd $NO_x$ emission limit is considered base for this evaluation.

### 4.2.2 Capital and Operating Costs of Alternatives

Tables 4-1 and 4-2 present the capital and levelized annual costs for the two viable $NO_x$ control systems for natural gas and No. 2 fuel oil combustion. The evaluation criteria used to calculate these costs are listed in Table 4-3. The annual reduction of $NO_x$ emissions is based on two GE LM-6000 turbines operating 8,760 hours per year. The base system consists of two GE LM-6000 combustion turbines using the improved low-$NO_x$ burner design described in Section 4.2.1.3 of this report. The capital costs for the SCR system include the

Table 4-1

Comparative Capital Costs of Alternative $NO_x$ Control Technology*

| | Low $NO_x$ Burner with Water Injection Plus SCR |
|---|---|
| SCR Reactors | $2,250,000 |
| Ammonia Storage and Injection Equipment | $375,000 |
| Water Treatment, Storage and Injection Equipment | $1,428,000 |
| Balance-of-Plant | $71,000 |
| Direct Capital Cost (1991) | $4,124,000 |
| Contingency | $620,000 |
| Escalation | $686,000 |
| Direct Capital Cost | $5,430,000 |
| Indirects | $869,000 |
| Interest During Construction | $1,050,000 |
| Total Capital Costs (1993) | $7,349,000 |

*Based on two GE LM-6000 turbines firing either natural gas or fuel oil.

Table 4-2

Comparative Levelized Annual Costs of Alternative $NO_x$ Control Technology During Natural Gas and Fuel Oil Firing*

| | Natural Gas | Fuel Oil |
|---|---|---|
| | Low $NO_x$ Burner Design Plus SCR ($1,000) | Low $NO_x$ Burner Design Plus SCR ($1,000) |
| Operation and Maintenance Costs | $1,615 | $2,130 |
| Ammonia | $30 | $52 |
| Energy | $66 | $66 |
| Generating Cost Adjustment | $673 | $633 |
| Fixed Charges on Capital | $800 | $800 |
| Total Annual Costs | $3,184 | $3,680 |
| Annual $NO_x$ Emissions | 58 tons | 100 tons |
| Incremental Annual $NO_x$ Emission Reduction** | 232 tons | 400 tons |
| Incremental Levelized Cost per Ton of $NO_x$ Removed | $13,700 | $9,200 |

*Based on two GE LM-6000 turbines and 8,760 hours/year of 100 percent load operation at average annual conditions (72 F and 60 percent relative humidity.)

**Based on a base emission of 25 ppmvd at 15 percent oxygen.

Table 4-3
Evaluation Criteria

| Criteria | Value |
|---|---|
| Contingency, percent | 15 |
| Indirects, percent | 16 |
| Escalation, percent | 7 |
| Present Worth Discount Rate, percent | 8 |
| Interest During Construction, percent | 8 |
| Fixed Charges on Capital | 10.87 |
| Economic Life, yr | 25 |
| Capacity Factor, percent | 100 |
| Ammonia, $/ton | 250 |
| Labor, $/yr | 45,000 |
| 1991 Energy, mills/kwh | 70 |
| Commercial Operation | Unit 1: 10/1/93<br>Unit 2: 10/1/95 |
| Catalyst Life, yrs | 2 |

costs of the catalytic reactors, ammonia storage/injection system, expansion of the water treatment facilities, and balance of plant equipment which includes foundations and erection of the ammonia storage system.

In addition to the equipment costs, the total capital costs include a contingency charge, escalation, indirect costs, and interest during construction. Contingency is added to account for uncertainties associated with estimating the capital costs for a project. Escalation is added to account for the increase in equipment and labor costs between the time of the evaluation and the midpoint of construction when the equipment costs are assumed to be paid. Indirects are added to account for general costs, engineering services, field construction management services, and owner costs. Interest during construction accounts for interest paid to construct the facility and assumes that all payments are made in a lump sum at the midpoint of the construction period. Interest therefore, accrues from the midpoint of construction until commercial operation. The sum of all these items then represents the total capital cost for the installation.

Levelized annual costs include operating and maintenance costs (including catalyst replacement), ammonia additive, energy, lost generating capacity and fixed charges on the capital investment. The differential energy cost and lost generating capacity for the SCR alternative are the result of the reduced net output of the turbine due to the additional back pressure added by the SCR and the energy requirements of the associated equipment.

In Table 4-2, the incremental costs are presented for both natural gas and No. 2 fuel oil firing. For natural gas, a \$3.2 million/year levelized annual cost for a SCR results in an incremental removal cost of approximately \$13,700 per ton of $NO_x$ reduction. This incremental cost is based on $NO_x$ emissions reduction of 232 tons per year (80 percent removal). In comparison, an SCR for No. 2 fuel oil firing is estimated to have a \$3.7 million/year levelized annual cost. This cost and a reduction of 400 tons of $NO_x$ per year (80 percent removal) results in an incremental cost of about \$9,200 per ton of $NO_x$ reduction.

### *4.2.3 Energy and Environmental Considerations*

The BACT Analysis also considers energy and environmental factors. Compared to the improved low $NO_x$ burner design with water or steam injection, the energy requirements of the SCR system would reduce the output of the combustion turbines by approximately 0.5 percent. This output loss directly affects the potential revenue for the facility.

An environmental consideration is that the catalyst can be contaminated because of the continued exposure to trace elements in the flue gas. Therefore, a spent catalyst must be handled and disposed of following hazardous waste procedures. Some catalytic elements are toxic and have to be replaced periodically. A toxic catalyst will require hazardous waste disposal procedures to be followed.

The use of an SCR system could result in a negative environmental impact. Ammonia is considered a hazardous material and must be handled and stored with extreme care. This facility site is located proximate to wetland areas. An accidental release of ammonia could potentially result in serious impacts on the plant and animal life in this area.

Additionally, ambient air quality modeling demonstrated that the project's ambient air quality impacts are less than the PSD significant criteria for $NO_x$ (annual average) of 1.0 $ug/m^3$ and also less than 1 percent of the Florida AAQS, when burning natural gas or No. 2 fuel oil. Therefore, meaningful improvements in ambient air quality cannot be achieved through use of an SCR system.

#### *4.2.4 Conclusions*

Installation of an SCR system with approximately 80 percent reduction would have a $NO_x$ emission level of 5/9 ppmvd (natural gas/No. 2 fuel oil) and would add approximately $7.4 million to the capital cost of the project. This additional equipment increases the total project levelized annual costs by between 3.2 million dollars for natural gas and 3.7 million dollars for No. 2 fuel oil. The associated incremental removal cost is approximately $13,700 to $9,200 per ton of $NO_x$ removed while burning natural gas or No. 2 fuel oil, respectively, assuming 8,760 hours per year of facility operation.

Environmentally, ambient air quality modeling has indicated that the project's ambient air quality impacts will be below $NO_x$ increments and air quality standards significance levels. Also, there are potential environmental risks associated with the use of an SCR system due to unreacted ammonia being released to the atmosphere and disposal methods required for spent catalysts. Therefore, the $NO_x$ BACT proposed for the combustion turbines is the use of low

$NO_x$ burner design with water injection to achieve $NO_x$ emissions of 25/42 ppmvd (at 15 percent $O_2$) when burning natural gas or No. 2 fuel oil, respectively.

## 4.3 Sulfur Dioxide and Sulfuric Acid Mist Emissions

The NSPS established by EPA for emissions from combustion turbines sets a maximum $SO_2$ level in the flue gas of 150 ppmvd (at 15 percent $O_2$) and a maximum fuel sulfur content of 0.8 percent by weight. EPA has not established a combustion turbine NSPS for sulfuric acid mist ($H_2SO_4$). The turbine manufacturers' emission data indicate that approximately 3 percent of the $SO_2$ in the flue gas is oxidized to $SO_3$ which combines with water to form sulfuric acid.

Current BACT/LAER Clearinghouse documents do not list any natural gas, or No. 2 fuel oil fired combustion turbines that are required to use flue gas desulfurization (FGD) systems to meet $SO_2$ emission requirements. The addition of an FGD system would be an excessive method of $SO_2$ emission control. The significant capital and operating cost associated with FGD systems could seriously impact the economic feasibility of this project.

Most PSD permits for No. 2 fuel oil fired combustion turbines have limits for maximum allowable fuel sulfur contents. The use of low sulfur No. 2 fuel oil (maximum of 0.30 percent sulfur) would impose no significant differential capital costs on the project. Additionally ambient air quality dispersion modeling indicated that the facility will comply with PSD increments and air quality standards when burning 0.30 percent sulfur No. 2 fuel oil.

Based on economic, energy, and environmental considerations, the limitation of No. 2 fuel oil sulfur content to 0.30 percent by weight and firing natural gas are proposed as BACT for the $SO_2$ emissions.

## 4.4 Particulate Matter Emissions

The emission of particulates from the combustion turbine facility will be controlled by ensuring as complete combustion of the fuel as possible. The NSPS for combustion turbines do not establish an emission limit for particulates. A review of the EPA's BACT/LAER Clearinghouse documents did not reveal any post-combustion particulate matter control technologies being used on gas/oil fueled combustion turbines.

The natural gas and No. 2 fuel oil used for the facility will only contain small quantities of particulates. Therefore, the proposed BACT for total suspended particulate (TSP) and particulate matter smaller than 10 microns ($PM_{10}$) is complete combustion of the fuel.

## 4.5 Beryllium Emissions

The emissions of beryllium (Be) from the combustion turbine facility will be determined by the Be content of the fuels. Natural gas has no measurable Be content and No. 2 fuel oil typically contains a trace amount of Be. This amount is on the order of $2.5 \times 10^{-6}$ pounds per million Btu (lb/MBtu). The annual Be emissions when firing No. 2 fuel oil for 8,760 hours/year are predicted to be 0.007 tons per year. This is above the PSD significance level for beryllium of 0.0004 tons/yr. Therefore, Be is a significant PSD pollutant for the project.

Review of the EPA's BACT/LAER Clearinghouse documents did not reveal any combustion turbine project which has been required to install supplemental pollution control equipment to reduce Be emissions. Accordingly, complete combustion of the No. 2 fuel oil is proposed as BACT for Be emissions.

## 4.6 Carbon Monoxide and Volatile Organic Compounds

Carbon monoxide and VOC are formed during the combustion of the fuel. High combustion temperatures, adequate excess air and good fuel/air mixing during combustion will minimize CO and VOC emissions. Therefore, $NO_x$ control methods of combustion staging and lowering combustion temperature by water injection can be counterproductive with regard to CO and VOC emissions.

To achieve the proposed $NO_x$ BACT levels requires that these control techniques be used. Therefore, this turbine design will have significantly higher CO and VOC emissions than associated with a standard combustor. At the proposed BACT $NO_x$ emissions of 25/42 ppmvd (gas/oil), the turbine will be capable of maintaining CO and VOC emission rates of 30 ppmvd and 12 ppmvd, respectively, while burning natural gas. For fuel oil firing, the CO emission rate will be 63 ppmvd and the VOC emission rate will be 15 ppmvd.

Based on a review of EPA's BACT/LAER Clearinghouse--A Compilation of Control Technology Determinations (1985 and 1990 editions), a combustion turbine with proper combustion control and an oxidizing catalyst that limits CO emissions to 2 ppmvd represents LAER. An oxidizing catalyst is also LAER technology for VOC emissions but the specific ppmvd emission rate was not specified in the clearinghouse document.

### 4.6.1 Catalytic Reduction

Catalytic reduction is a post-combustion method for reduction of CO and VOC emissions. The process uses a precious metal to oxidize CO to $CO_2$ with the use of a catalyst and VOC hydrocarbons to $CO_2$ and $H_2O$. None of the catalyst components are considered toxic. The optimum flue gas temperature range for CO/VOC catalyst operation is between 720 F and 850 F. Flue gas from the combustion turbine will typically be between 950 F to 1,100 F. Therefore, a CO/VOC catalyst could be installed at the discharge of the combustion turbine, although supplemental heating may be required when the flue gas temperature is below 850 F.

### 4.6.2 Capital and Operating Costs

Table 4-4 and Table 4-5 present the capital and levelized annual costs of a CO/VOC catalyst system. The CO and VOC emissions are based on firing No. 2 fuel oil for a maximum of 8,760 hours per year.

A levelized annual cost for the catalyst system is calculated to be about $1.8 million/year. This system will result in a net total combined reduction of 491 tons per year of CO/VOC (92 percent removal), while burning No. 2 fuel oil. This reduction results in an incremental removal cost of approximately $3,750 per ton of CO/VOC removed. This system is designed to limit CO emissions to 5 ppmvd and VOC emissions to 7.5 ppmvd.

### 4.6.3 Other Considerations

A CO/VOC catalyst located downstream of the combustion turbine exhaust will produce an additional back pressure on the combustion turbine. The added back pressure will reduce the electrical output capability of the turbine. Additional back pressure of 3 to 4 inches of water gage would reduce turbine output by approximately 188 kW per turbine (0.5 percent). Lost generating capacity translates directly into lost project revenue. A CO/VOC catalyst will also oxidize $SO_2$ to $SO_3$ which upon condensation will form sulfuric acid. This formation will result in increased sulfuric acid emissions to the atmosphere.

Table 4-4

Comparative Capital Costs of Alternative CO/VOC Control Technology*

| | Improved Low $NO_x$ Burner Design With Complete Combustion Plus Oxidation Catalyst ($1,000) |
|---|---|
| Differential Combustion Turbine Costs | |
| | Base |
| Oxidation Reactor | $1,542 |
| Balance of Plant | $51 |
| Direct Capital Cost (1991) | $1,593 |
| Contingency | $239 |
| Escalation | $266 |
| Direct Capital Cost | $2,098 |
| Indirects | $336 |
| Interest During Construction | $405 |
| Total Capital Costs (1993) | $2,839 |

*Based on two GE LM-6000 turbines and 8,760 hours/year of natural gas fired operation at average annual conditions (72 F and 60 percent relative humidity.)

Table 4-5

Comparative Levelized Annual costs of Alternative CO/VOC Control Technology*

| | Improved Low $NO_x$ Burner Design With Complete Combustion Plus Oxidation Catalyst ($1,000) |
|---|---|
| Operation and Maintenance Costs | $690 |
| Heat Rate Penalty | $26 |
| Generating Cost Adjustment | $817 |
| Fixed Charges | $295 |
| Total Annual Costs | $1,828 |

| | |
|---|---|
| Annual CO Emissions | 38 tons |
| Annual VOC Emissions | 4 tons |
| Annual Combined CO and VOC Emissions | 42 tons |
| Incremental Annual CO/VOC Emission Reduction** | 491 tons |
| Incremental Levelized Cost per Ton of CO/VOC Removed | $3,750 |

*Based on two turbines and 8,760 hours/year of No. 2 fuel oil fired operation at annual average conditions (72 F and 60 percent relative humidity.)

**Based on CO/VOC catalytic reduction emissions of 5/7.5 ppm while burning No. 2 fuel oil.

#### *4.6.4 Conclusions*

For natural gas, VOC emissions are already quite low (5 ppmvd) and no further control technology could be feasibly applied.

A CO/VOC catalyst control system designed to meet a CO and VOC emission limits on oil of 5 ppmvd and 7.5 ppmvd, respectively, would add approximately $2.8 million to the capital cost of the project. The total levelized annual costs for the project increase by $1.8 million resulting in an incremental removal cost of approximately $3,750 per ton of CO/VOC removed while burning No. 2 fuel oil for 8,760 hours per year (at 100 percent capacity). This catalyst control system would also be effective at reducing CO emissions on natural gas by the same percentage as for oil.

Based on economic, energy, and environmental considerations, the CO and VOC BACT proposed for the project modification is the use of good combustion controls to achieve CO emissions of 63 ppmvd and VOC emissions of 15 ppmvd when burning No. 2 fuel oil and operating the unit for 8,760 hours per year.

## 4.7 Other Emissions

The project will emit trace quantities of other pollutants at levels which are below the significant emission levels established for the PSD program. Federal and state regulations do not require that BACT be applied for these pollutants, but the effects of the proposed BACT determinations on these pollutants must be considered.

#### *4.7.1 Other Regulated and Hazardous Pollutants*

Table 4-6 presents uncontrolled emission estimates for other regulated (mercury, and lead) and hazardous pollutants when firing No. 2 fuel oil. These emission rates have been developed based on manufacturers' information and on information contained in the EPA publications Toxic Air Pollutant Emission Factors--A Compilation For Selected Air Toxic Compounds and Sources (EPA-450/2-88-006a).

The only identified methods of controlling the emission of these pollutants are complete combustion of the fuel and the inherent quality of the fuel. Injection of water into the turbines to control $NO_x$ emissions is not expected to have a

Table 4-6
Other Regulated and Hazardous Pollutant Emissions

| Pollutant | Emission Rate (lb/MBtu) | Annual Emission* (tons) |
|---|---|---|
| Arsenic | 4.2 E-6 | 0.012 |
| Beryllium | 2.5 E-6 | 0.007 |
| Cadmium | 1.1 E-5 | 0.032 |
| Chromium | 4.8 E-5 | 0.141 |
| Copper | 2.8 E-4 | 0.824 |
| Formaldehyde** | 4.1 E-4 | 1.207 |
| Lead | 2.8 E-5 | 0.082 |
| Manganese | 2.6 E-5 | 0.077 |
| Mercury | 3.0 E-6 | 0.009 |
| Nickel | 1.7 E-4 | 0.500 |

*Annual emissions are total for two combustion turbines and are based on annual operation of 8,760 hours/year firing No. 2 fuel oil at annual average conditions (72 F and 60 percent relative humidity), and a fuel burn rate of 336 MBtu/h.

**Formaldehyde is also found in natural gas combustion. The emission rates are 8.8 E-5 lb/MBtu or 0.259 tpy.

significant effect on controlling these pollutants. Complete combustion will be required to achieve the identified emission rates of formaldehyde.

# 5.0 Modeling Methodology

This section describes the modeling methodology used to determine the ambient air quality impacts for the proposed project. The methodology is based on EPA guidelines and uses EPA's UNAMAP 6 dispersion models. The dispersion models have been revised to include the most recent changes associated with EPA dispersion modeling guidelines. The modeling methodology includes a determination of the appropriate dispersion models and a listing of modeling assumptions and input data.

The air dispersion modeling input and output computer files supporting the PSD permit application are being submitted to the FDER with this application.

## 5.1 Model Selection and Description

EPA's modeling guideline document, Guideline on Air Quality Models (Revised), was used for model and option selection. Based on this document, the Industrial Source Complex Short-Term (ISCST) dispersion model was used to assess the project's impacts. The ISCST model is a steady-state Gaussian plume model which can be used to assess pollutant concentrations from a wide variety of sources associated with an industrial source complex. This model accounts for rural land use, calculations of short-term and annual impacts, plume rise as a function of downwind distance, buoyancy induced dispersion, stack tip downwash, adjustment for calm periods, building downwash effects, separation of sources, and limited terrain adjustment. ISCST was used with five years (1982-1986) of sequential hourly meteorological data to estimate the project's air quality impacts and perform interacting source modeling.

## 5.2 Model Options and Assumptions

The following modeling assumptions were made for the air dispersion analyses:

- Standard EPA default modeling options were applied. Specifically, the default options include the following parameters.
  - -- Final plume rise at all downwind receptor locations.
  - -- Stack-tip downwash.
  - -- Parameterization of buoyancy induced dispersion effects.

- -- Vertical wind profile coefficients of 0.07, 0.07, 0.10, 0.15, 0.35, and 0.5 for A, B, C, D, E, and F stability classes, respectively.
  -- Vertical potential temperature gradient of 0.0, 0.0, 0.0, 0.0, 0.02, and 0.035 for the above stability classes.
  -- Calm processing option to handle periods of low wind speeds.
  -- No decay half-life for any pollutant.
- The highest concentrations were used to represent project impacts for comparison with PSD significant impact levels and de minimis monitoring criteria.
- The highest, second-highest short-term and highest annual concentrations were used to represent impacts for comparison to ambient air quality standards and PSD increments.
- The site was considered rural based on actual land use within 3 kilometers.
- Building downwash for the proposed sources was considered.
- Terrain elevations were not incorporated.

## 5.3 Receptor Locations

The ISCST model allows the use of either a polar or rectangular receptor grid to predict ground-level concentrations. Polar receptor coordinates were used for the ISCST modeling analysis with one of the proposed stacks located at the center of the receptor array.

ISCST receptor locations were established at appropriate distances to ensure sufficient density and aerial extent to adequately characterize the pattern of pollutant impacts, identify the maximum project concentrations, and establish pollutant significant impact areas. Specifically, the polar receptor grid used for the determination had offsite receptors placed at 10 degree radials at downwind intervals of 100 meters from 200 to 1,500 meters, 250 meters from 1,500 to 3,000 meters, 500 meter intervals from 3 to 5 kilometers, 1 kilometer intervals from 5 to 15 kilometers, and rings at 20 and 25 kilometers. Some of the receptors along the 100-meter polar ring also fell offsite. These locations were modeled as discrete receptors. In addition, rectangular receptors were placed in 250-meter intervals along the property boundary where public access is restricted. The receptor density used for the interacting source modeling was identical to that described above. However, the outermost ring modeled was the boundary of the project's significant impact area.

## 5.4 Meteorological Data

ISCST was used with five years (1982-1986) of sequential hourly surface and twice-daily mixing height meteorological data. The surface and mixing height data was selected from a location most representative of the general area being modeled. A representative location corresponds to the station closest to the location being modeled which is in the same climatic regime.

The hourly surface data and upper air data used for this modeling analysis were recorded at the Orlando, Florida, and Tampa, Florida, National Weather Service stations, respectively. These data were obtained and processed into a form compatible with Trinity Consultant's personal computer version of the dispersion models.

# 6.0 Ambient Air Quality Impact Analysis

Modeling was performed with the SCREEN and ISCST dispersion models. The modeling was based on the stack parameters and modeling assumptions given in Sections 3.0 and 5.0, respectively. The analysis was performed to determine the pollutants which have the potential to impact ambient air quality above PSD ambient air quality significance levels. In addition, a significant impact area was defined, preconstruction monitoring requirements examined, and ambient air quality standards (AAQS), PSD increment consumption, and air toxics analyses performed for PSD pollutants with significant impacts.

## 6.1 Project Impacts

The air dispersion modeling results were used to determine the project's maximum impacts for comparison with PSD significant impact levels and de minimis monitoring criteria.

### *6.1.1 Determination of Worst-Case Operational Parameters*

Air dispersion is enhanced by low emission rates, high thermal buoyancy (i.e., temperature), and high momentum buoyancy (i.e., stack velocity). Conversely, the worst-case ground level impacts will occur with high emission rates, low stack exhaust temperature, and low flow velocities.

Ambient temperature affects the efficiency of combustion turbines. Lower ambient temperatures require higher heat input rates (and consequently, higher pollutant emission rates) in order to keep a uniform combustion temperature. The highest heat input is predicted to result from a historically low ambient temperature of 20 F. At this temperature, the maximum pollutant emissions and the minimum stack exit temperature will occur. At higher ambient temperatures, lower emission rates, lower stack exit temperatures, but higher stack exit flow volumes occur.

For air dispersion modeling, a set of worst-case conditions was conservatively compiled based on the highest pollutant emission rates, lowest stack exit temperature, and lowest flow volume for the range of ambient conditions (i.e., 20 F to 102 F ambient dry bulb temperatures).

Unlike steam generating plants, gas turbines typically operate at near maximum (100 percent) load and generally do not operate at intermediate load conditions for extended periods of time. Maximum design capacity was defined as the normal operating condition of the turbine. It is anticipated that operation at reduced loads will be only for short-term transient conditions. In addition, the LM6000 peak and base load are coincident. Therefore, only the base load was modeled with refined techniques to determine project impacts for comparison with the PSD significant impact criteria.

### 6.1.2 Determination of Significant Impact Area

A significant impact area was determined for each applicable pollutant and averaging period for which an AAQS exists. The ISCST model, with 5 years of meteorological data and the receptor grid described in Section 3, was used to determine the project's highest predicted $SO_2$ impacts. The impacts for $NO_x$, PM, and CO were calculated by multiplying the $SO_2$ impacts by a ratio of the other pollutant emission to $SO_2$ emissions. The maximum project $SO_2$ impacts are given in Table 6-1. The project impacts for $SO_2$, $NO_x$, PM, and CO, and the PSD significant impact criteria are given in Table 6-2.

The radius of significant impact was established by determining the most distant receptors in every radial direction with significant impacts. The boundary of the circular significant impact area was placed at a radius one receptor ring beyond the furthest significant impact receptor.

The dispersion modeling demonstrated that only $SO_2$ had a modeled significant impact area. $NO_x$, PM, and CO impacts were below PSD significant impact levels. Therefore, no further analyses for $NO_x$, PM, or CO impacts was performed. Ozone (as VOCs) and Pb do not have established PSD significant impact levels. However, AAQS have been established for both of these pollutants. Therefore, the project's VOC and Pb impacts were compared to the applicable AAQS. Further air quality assessments incorporating an interacting source emissions inventory for $SO_2$ were performed to determine compliance with PSD Class II increments and AAQS.

### 6.1.3 Determination of Preconstruction Monitoring Requirements

EPA promulgated revised PSD regulations on August 7, 1980. Portions of these regulations discuss the applicability and requirements of preconstruction and

Table 6-1
Maximum Project $SO_2$ Impacts

| Year | Averaging Period | Maximum Impact ug/m$^3$ | Location km/deg | Period day, hour |
|---|---|---|---|---|
| 1982 | 1-hour | 299.02 | 1([a]) | 169,8 |
| | 3-hour | 99.67 | 1 | 169,3 |
| | 8-hour | 37.38 | 1 | 169,1 |
| | 24-hour | 12.46 | 1 | 169,1 |
| | Annual | 0.27 | 7/220 | -- |
| 1983 | 1-hour | 144.58 | 0.2/290 | 188,17 |
| | 3-hour | 70.95 | 3([b]) | 83,6 |
| | 8-hour | 18.07 | 0.2/290 | 188,3 |
| | 24-hour | 8.87 | 3 | 83,1 |
| | Annual | 0.22 | 7/180 | -- |
| 1984 | 1-hour | 104.89 | 0.2/150 | 218,15 |
| | 3-hour | 34.96 | 0.2/150 | 218,5 |
| | 8-hour | 13.67 | 4([c]) | 89,2 |
| | 24-hour | 5.83 | 0.2/150 | 218,1 |
| | Annual | 0.29 | 6/240 | -- |

[a]Refers to boundary receptor. UTM E: 447.692 UTM N: 3127.995.
[b]Refers to boundary receptor. UTM E: 447.814 UTM N: 3127.944.
[c]Refers to boundary receptor. UTM E: 447.839 UTM N: 3127.902.

Table 6-1 (Continued)
Maximum Project $SO_2$ Impacts

| Year | Averaging Period | Maximum Impact ug/m$^3$ | Location km/deg | Period day, hour |
|---|---|---|---|---|
| 1985 | 1-hour | 111.37 | 4 | 43,16 |
| | 3-hour | 40.71 | 4 | 43,6 |
| | 8-hour | 16.31 | 4 | 43,1 |
| | 24-hour | 10.59 | 4 | 43,1 |
| | Annual | 0.25 | 6/240 | -- |
| 1986 | 1-hour | 113.88 | 4 | 27,14 |
| | 3-hour | 41.55 | 4 | 27,5 |
| | 8-hour | 15.58 | 4 | 27,2 |
| | 24-hour | 5.68 | 4 | 27,11 |
| | Annual | 0.24 | 4/240 | -- |

Table 6-2
Project Impacts and PSD Significant Ambient Air Quality Impacts

| Pollutant | Averaging Period | Maximum $SO_2$ Impacts ug/m$^3$ | Pollutant/$SO_2$ Emissions | Maximum Pollutant Impacts ug/m$^3$ | Significant Impact Level ug/m$^3$ | Significant Impact Area meters |
|---|---|---|---|---|---|---|
| $SO_2$ | 3-hour | 99.67 | 1 | 99.67 | 25 | 500 |
| | 24-hour | 12.46 | 1 | 12.46 | 5 | 400 |
| | annual | 0.29 | 1 | 0.29 | 1 | -- |
| CO | 1-hour | 299.02 | 1.75 | 523.29 | 2000 | -- |
| | 8-hour | 37.38 | 1.75 | 65.42 | 500 | -- |
| PM | 24-hour | 12.46 | 0.103 | 1.28 | 5 | -- |
| | annual | 0.29 | 0.103 | 0.03 | 1 | -- |
| $NO_x$ | Annual | 0.29 | 0.52 | 0.15 | 1 | -- |

postconstruction ambient air quality monitoring. According to the regulations, an ambient air quality analysis must be done to determine monitoring applicability for each regulated pollutant emitted above significant emission rates.

Monitoring applicability is determined by comparing the ambient impacts from each applicable pollutant to the PSD de minimis monitoring criteria. De minimis monitoring criteria exist for those pollutants with an AAQS. Table 6-3 lists the de minimis monitoring criteria and the project's predicted impacts.

The PSD regulations exempt on a pollutant-specific basis those pollutants with impacts below de minimis criteria from preconstruction monitoring requirements. As shown in Table 6-3, the project's impacts will be below the de minimis monitoring criteria for all pollutants. Therefore, a waiver of preconstruction monitoring requirements is included as Appendix C.

### *6.1.4 Determination of Toxic Pollutant Impacts*

An analysis was conducted to assess compliance with Florida toxic air pollutant impacts regulations. The emission factors for the toxic pollutants were obtained from Toxic Air Pollutant Emission Factors- A Compilation for Selected Air Toxic Compounds and Sources (EPA-450/2-88-006a). Both natural gas and fuel oil firing were assessed to determine worst-case emission rates.

The toxic pollutant impacts were derived by multiplying the modeled $SO_2$ impacts by a ratio of the toxic pollutant emissions to $SO_2$ emissions.

The impacts for each of the toxic air pollutants emitted by the combustion turbines were compared to the FDER-provided acceptable ambient concentrations (AAC). The proposed emissions factors emission rates, project impacts, and the AAC are given in Table 6-4. As shown in the table, the project's impacts are well below the AACs.

## 6.2 Interacting Source Modeling Analysis

Air dispersion modeling was performed, incorporating the impacts from other pollutant sources, to determine compliance with PSD increments and AAQS.

Table 6-3
PSD De Minimis Monitoring Criteria

| Pollutant | Averaging Period | Project Impacts ug/m³ | PSD de Minimis Criteria ug/m³ | State Criteria ug/m³ |
|---|---|---|---|---|
| Carbon Monoxide | 8-hour | 65.42 | 575 | 575 |
| Nitrogen dioxide | Annual | 0.15 | 14 | 14 |
| Sulfur dioxide | 24-hour | 12.46 | 13 | 13 |
| Particulate matter ($PM_{10}$) | 24-hour | 1.28 | 10 | 10 |
| Particulate matter (TSP) | 24-hour | 1.28 | 10 | 10 |
| Ozone* | Annual | 51.0 tpy | 100 tpy | 100 tpy |
| Lead | Calendar Quarter | 0.001 | 0.1 | 0.1 |
| Beryllium | 24-hour | 0.0001 | 0.001 | 0.001 |
| Mercury | 24-hour | 0.0001 | 0.25 | 0.25 |
| Vinyl Chloride | 24-hour | neg | 15 | 15 |
| Fluorides | 24-hour | neg | 0.25 | 0.25 |
| Hydrogen Sulfide | 1-hour | neg | 0.2 | 0.2 |
| Total Reduced Sulfur | 1-hour | neg | 10 | -- |
| Reduced Sulfur Compounds | 1-hour | neg | 10 | -- |

*Ozone preconstruction monitoring applicability is determined on the basis of annual emission rates.

Table 6-4
Trace Pollutant Emissions Impacts and
Acceptable Ambient Concentrations (AAC)

| Pollutant | Emission Factor lb/MBtu | Emission Rate(a) lb/h | Averaging Period | Maximum Impacts(b) ug/m$^3$ | AAC ug/m$^3$ |
|---|---|---|---|---|---|
| Arsenic | $4.2 \times 10^{-6}$ | 0.0015 | 8-Hour | 0.0005 | 2.0 |
| | | | 24-Hour | 0.0002 | 0.5 |
| | | | Annual | $4 \times 10^{-6}$ | 0.0002 |
| Beryllium | $2.5 \times 10^{-6}$ | 0.0009 | 8-Hour | 0.0003 | 0.02 |
| | | | 24-Hour | 0.0001 | 0.005 |
| | | | Annual | $2 \times 10^{-6}$ | 0.0004 |
| Benzene[c] | $7.1 \times 10^{-4}$ | 0.257 | 24-Hour | 0.027 | 7.2 |
| Cadmium | $1.1 \times 10^{-5}$ | 0.004 | 8-Hour | 0.001 | 0.5 |
| | | | 24-Hour | 0.0004 | 0.12 |
| | | | Annual | $1 \times 10^{-5}$ | 0.0006 |
| Chromium | $4.8 \times 10^{-5}$ | 0.017 | Annual | 0.00004 | 0.000083 |
| Copper | $2.8 \times 10^{-4}$ | 0.10 | 8-Hour | 0.03 | 10 |
| | | | 24-Hour | 0.01 | 2.4 |
| Formaldehyde[d] | $4.1 \times 10^{-4}$ | 0.15 | 8-Hour | 0.05 | 12 |
| | | | 24-Hour | 0.02 | 2.9 |
| Lead | $2.8 \times 10^{-5}$ | 0.010 | 8-Hour | 0.003 | 1.5 |
| | | | 24-Hour | 0.001 | 0.36 |
| | | | Annual | 0.00002 | 0.09 |
| Manganese | $2.6 \times 10^{-5}$ | 0.0094 | 8-Hour | 0.003 | 50 |
| | | | 24-Hour | 0.001 | 12 |
| Mercury | $3.0 \times 10^{-6}$ | 0.0011 | Annual | $2.7 \times 10^{-6}$ | 0.3 |
| | | | | | 0.024 |
| Nickel | $1.7 \times 10^{-4}$ | 0.061 | 8-Hour | 0.02 | 1 |
| | | | 24-Hour | 0.006 | 0.24 |
| | | | Annual | 0.0002 | 0.0042 |

[a] Emission rate per turbine.
[b] Impact for both turbines.
[c] Natural gas only.
[d] For fuel oil combustion. Natural gas emission factor equivalent to $8.8 \times 10^{-5}$ lb/MBtu.

### 6.2.1 *Emissions Inventories*

In order to evaluate PSD increment and AAQS compliance, interacting sources were included in the air dispersion modeling analysis for $SO_2$. The source emissions inventory for $SO_2$ was obtained from the FDER.

Modeling parameters for the major stationary existing and permitted sources located within the project's significant impact and screening areas were obtained from the FDER. The screening area is defined as the annular area extending 50 kilometers beyond the outer boundary of significant impact.

The sources located in the screening area were evaluated using a "screening threshold" method developed by the North Carolina Bureau of Air Quality. The North Carolina method is based on a relationship between the allowable source emissions given in tpy (Q) and the distance to the proposed project site in kilometers (D). If the "ratio" (Q/D) was calculated to be less than 20, then the source was eliminated from the inventory. In the case where a single facility has multiple sources, facility emissions, instead of source emissions, were used to determine ratios.

Multiple sources at any facility with similar stack parameters and locations, but varying emission rates, were modeled as a single source with the combined emission rates. The $SO_2$ interacting source emissions inventory is given in Table 6-5.

### 6.2.2 *Compliance with PSD Increments*

PSD regulations classify all attainment areas of the country as either Class I, II, or III. The PSD program limits the amount of allowable air quality degradation (increment) depending of the classification of the affected lands. Class I areas are the most restrictive area quality regions because air quality impacts could be more detrimental. National parks and primitive wilderness areas are classified in this group. The nearest PSD Class I area (Chassahowitzha Wilderness Area) is over 150 kilometers from the proposed site.

The remaining PSD air quality regions are Class II or Class III (currently, there are no Class III areas). The project is located in a Class II area. At this time, $SO_2$, $NO_2$, and TSP are the only pollutants for which PSD increments have been promulgated. According to the PSD requirements, an analysis of the consumption of PSD Class II increment is required if $SO_2$, $NO_2$, and TSP impacts are greater than the PSD significant ambient air quality impact levels. Only the

Table 6-5

$SO_2$ Emissions Inventory

| Source ID | UTM E km | UTM N km | $SO_2$ Emissions g/s | Stack Height m | Stack Diameter m | Stack Velocity m/s | Stack Temperature K | PSD Source Yes/No |
|---|---|---|---|---|---|---|---|---|
| KUA SCCT 1 | 447.6923 | 3127.923 | 14.74 | 12.19 | 3.05 | 29.11 | 654 | Yes |
| KUA SCCT 2 | 447.6771 | 3127.925 | 14.74 | 12.19 | 3.05 | 29.11 | 654 | Yes |
| FPC | 446.3 | 3126.0 | 273.38 | 6.10 | 3.96 | 53.34 | 677.59 | No |
| | | | 310.80 | 15.24 | 4.22 | 49.23 | 847.04 | Yes |
| | | | 253.03 | 15.24 | 7.04 | 27.62 | 874.82 | Yes |
| Standard Sand and Silica Company | 441.5 | 3118.2 | 4.27 | 9.14 | 0.43 | 26.52 | 351 | No |
| | | | 8.06 | 25.91 | 1.22 | 8.84 | 315 | No |
| Holly Hill Fruit Products | 441.0 | 3115.4 | 11.45 | 17.98 | 0.85 | 18.90 | 344 | No |
| Kissimmee Electric Utilities | 460.1 | 3129.3 | 48.96 | 18.29 | 3.66 | 19.81 | 422 | No |
| | | | 1.14 | 8.53 | 0.91 | 2.13 | 505 | No |
| Reedy Creek Energy Services | 443.1 | 3144.3 | 0.97 | 36.58 | 1.37 | 9.14 | 491 | Yes |
| | | | 14.87 | 19.81 | 3.41 | 15.54 | 414 | No |
| AT+T Information Services | 459.7 | 3146.6 | 6.30 | 10.67 | 1.01 | 32.61 | 644 | No |
| Alad Construction Company | 433.0 | 3152.9 | 5.42 | 9.14 | 1.16 | 11.28 | 339 | No |
| National Linen Service | 462.2 | 3155.6 | 9.68 | 36.58 | 1.22 | 8.53 | 533 | No |
| Citrus World | 441.0 | 3087.3 | 25.20 | 22.86 | 0.98 | 10.67 | 323 | No |
| Lakeland City Power-McIntosh | 409.2 | 3106.2 | 341.32 | 45.72 | 2.74 | 23.77 | 419 | No |
| | | | 526.79 | 76.20 | 4.88 | 32.61 | 350 | No |
| Lakeland City Power-Larsen | 409.0 | 3106.2 | 115.54 | 50.29 | 3.05 | 5.49 | 433 | No |

Table 6-5 (Continued)
$SO_2$ Emissions Inventory

| Source ID | UTM E km | UTM N km | $SO_2$ Emissions g/s | Stack Height m | Stack Diameter m | Stack Velocity m/s | Stack Temperature K | PSD Source Yes/No |
|---|---|---|---|---|---|---|---|---|
| FPC-Rio Pinar | 475.2 | 3156.8 | 31.37 | 12.50 | 3.69 | 19.20 | 789 | No |
| OUC-Stanton Energy Center | 483.5 | 3150.6 | 621.92 | 167.64 | 5.79 | 21.55 | 326 | Yes |
| | | | 459.00 | 167.64 | 5.79 | 23.47 | 324 | Yes |

project's $SO_2$ impacts were above PSD significant impact levels. Therefore, a PSD increment consumption analysis was only performed for $SO_2$.

The PSD sources listed in Table 6-5 were modeled with five years of meteorological data, the ISCST dispersion model, and the 500-meter significant impact area grid. The results of the modeling and the applicable PSD increments are given in Table 6-6. As shown in the table, the impacts are well below PSD Class II increments. In fact, only 8, 13, and 10 percent of the 3-hour, 24-hour, and annual $SO_2$ increment are consumed, respectively, in the site vicinity.

The site is located over 100 kilometers from the nearest PSD Class I area. Therefore, a Class I increment consumption analysis was not performed.

### 6.2.3 Compliance with AAQS

An interacting source modeling assessment was performed to show compliance with the applicable $SO_2$ AAQS. The air quality assessment evaluated the combined impacts from potential interacting sources and the proposed new sources. The combined impact was then added to a representative background pollutant concentration to arrive at a total maximum pollutant impact concentration. The total impacts were compared with the applicable AAQS given in Table 6-7. In addition, the project's ozone (as VOC) and Pb impacts were compared to the applicable AAQS. The VOC and Pb impacts were determined by multiplying the highest $SO_2$ impacts in Table 6-1 by a ratio of pollutant emissions to $SO_2$ emissions.

The background concentrations collected at the Winter Park $SO_2$ monitoring site during 1990 were used for the AAQS analysis. Background concentrations of 53 ug/m$^3$, 28 ug/m$^3$, and 4 ug/m$^3$ were used to represent the $SO_2$ 3-hour, 24-hour, and annual averages, respectively. As shown in the table, the $SO_2$ impacts are well below the AAQS. The total $SO_2$ impacts are less than 21 percent of the AAQS for all averaging periods. The VOC and Pb impacts represent less than 12 and 0.1 percent of the AAQS, respectively.

Table 6-6
$SO_2$ Modeling Results and PSD Increments

| Year | Averaging Period | Maximum Impact ug/m$^3$ | Location meter/deg | Period day, hour | PSD Class II Increments ug/m$^3$ |
|---|---|---|---|---|---|
| 1982 | 3-hour | 36.0 | 500/330 | 2,5 | 512 |
| | 24-hour | 11.0 | 447.7/3128.0* | 305,1 | 91 |
| | Annual | 1.9 | 500/360 | -- | 20 |
| 1983 | 3-hour | 34.3 | 200/80 | 19,7 | 512 |
| | 24-hour | 8.8 | 500/140 | 137,1 | 91 |
| | Annual | 1.6 | 500/80 | -- | 20 |
| 1984 | 3-hour | 38.5 | 300/300 | 263,4 | 512 |
| | 24-hour | 12.0 | 500/330 | 265,1 | 91 |
| | Annual | 1.9 | 500/110 | -- | 20 |
| 1985 | 3-hour | 39.1 | 447.8/3127.9* | 43,1 | 512 |
| | 24-hour | 11.5 | 300/140 | 50,1 | 91 |
| | Annual | 1.8 | 500/10 | -- | 20 |
| 1986 | 3-hour | 38.7 | 447.8/3127.9* | 105,3 | 512 |
| | 24-hour | 9.9 | 500/100 | 105,1 | 91 |
| | Annual | 1.8 | 500/360 | -- | 20 |

*Rectangular UTM coordinates.

Table 6-7

$SO_2$, Ozone, and Pb Modeling Results and Ambient Air Quality Standards (AAQS)

| Year | Averaging Period | Maximum Impact ug/m³ | Location meters/deg | Period day, hour | AAQS ug/m³ |
|---|---|---|---|---|---|
| 1982 | 3-hour | 140.9 | 447.7/3128.0 | 128,8 | 1,300 |
| | 24-hour | 48.3 | 500/100 | 237,1 | 260 |
| | Annual | 8.3 | 500/360 | -- | 60 |
| 1983 | 3-hour | 140.9 | 400/300 | 204,8 | 1,300 |
| | 24-hour | 51.8 | 500/80 | 241,1 | 260 |
| | Annual | 8.0 | 500/310 | -- | 60 |
| 1984 | 3-hour | 142.4 | 500/110 | 289,2 | 1,300 |
| | 24-hour | 51.1 | 500/360 | 180,1 | 260 |
| | Annual | 8.4 | 500/90 | -- | 60 |
| 1985 | 3-hour | 146.2 | 500/230 | 363,1 | 1,300 |
| | 24-hour | 46.6 | 400/220 | 153,1 | 260 |
| | Annual | 8.4 | 500/20 | -- | 60 |
| 1986 | 3-hour | 142.7 | 500/270 | 324,7 | 1,300 |
| | 24-hour | 52.2 | 500/250 | 159,1 | 260 |
| | Annual | 8.9 | 500/360 | -- | 60 |
| Ozone (as VOCs) | 1-hour | 28.1 | 447.692/3127.995* | 169,8 | 235 |
| Lead | Calendar Quarter** | 0.001 | 447.692/3127.995* | 169,1 | 1.5 |

*UTM coordinates (in kilometers) for boundary receptors.

**Conservatively used 24-hour impact.

# 7.0 Additional Impact Analyses

PSD regulations require that project impacts on visibility, soils and vegetation, and growth be examined.

## 7.1 Visibility

The nearest PSD Class I area is the Chassahowitzha Wilderness Area. The Chassahowitzha Wilderness Area is located approximately 150 km west of the project site. A screening Level-1 visibility assessment was performed to determine project impacts on PSD Class I visibility. Emission rates for the SCCTs firing fuel oil at 100 percent load were used with the EPA-approved VISCREEN model to determine the project's maximum visual impacts. The results of the analysis are given in Table 7-1.

The maximum visual impacts were compared to the visual criteria for assessing plume contrast and Delta E. Delta E is a color difference parameter developed to specify the perceived magnitude of changes in the color and brightness of the sky due to the plume. The analysis demonstrated that the project's visual impacts are well below the criteria levels.

## 7.2 Vegetation and Soils

Simple cycle combustion turbine projects are typically considered "clean facilities" that result in very low predicted ground-level pollutant impacts. The low predicted impacts are the direct result of complete combustion and very effective pollutant dispersion. Dispersion is enhanced by the thermal and momentum buoyancy characteristics of the combustion turbine exhaust.

The AAQS have been established to protect public health and welfare from any adverse effects of air pollutants. The public welfare includes vegetation and soils. The project impacts were compared to the secondary AAQS as the primary basis for assessing project impacts. The modeling in Section 6.0 demonstrated that the $SO_2$ impacts from all interacting sources will be well below the AAQS. Air dispersion modeling also demonstrated that the other criteria and toxic pollutant impacts will be well below the PSD significant impact levels and environmentally acceptable levels, respectively.

## Table 7-1
## Cane Island Project Visibility Impacts

Visual Effects Screening Analysis for
Source: KUA CANE ISLAND SCCTS
Class I Area: CHASSAHOWITZHA NWA

*** Level-1 Screening ***

Input Emissions for

| | | |
|---|---|---|
| Particulates | 24.00 | LB /HR |
| NOx (as NO2) | 122.00 | LB /HR |
| Primary NO2 | .00 | LB /HR |
| Soot | .00 | LB /HR |
| Primary SO4 | .00 | LB /HR |

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

| | |
|---|---|
| Background Ozone: | .04 ppm |
| Background Visual Range: | 25.00 km |
| Source-Observer Distance: | 150.00 km |
| Min. Source-Class I Distance: | 150.00 km |
| Max. Source-Class I Distance: | 165.00 km |
| Plume-Source-Observer Angle: | 11.25 degrees |
| Stability: | 6 |
| Wind Speed: | 1.00 m/s |

R E S U L T S

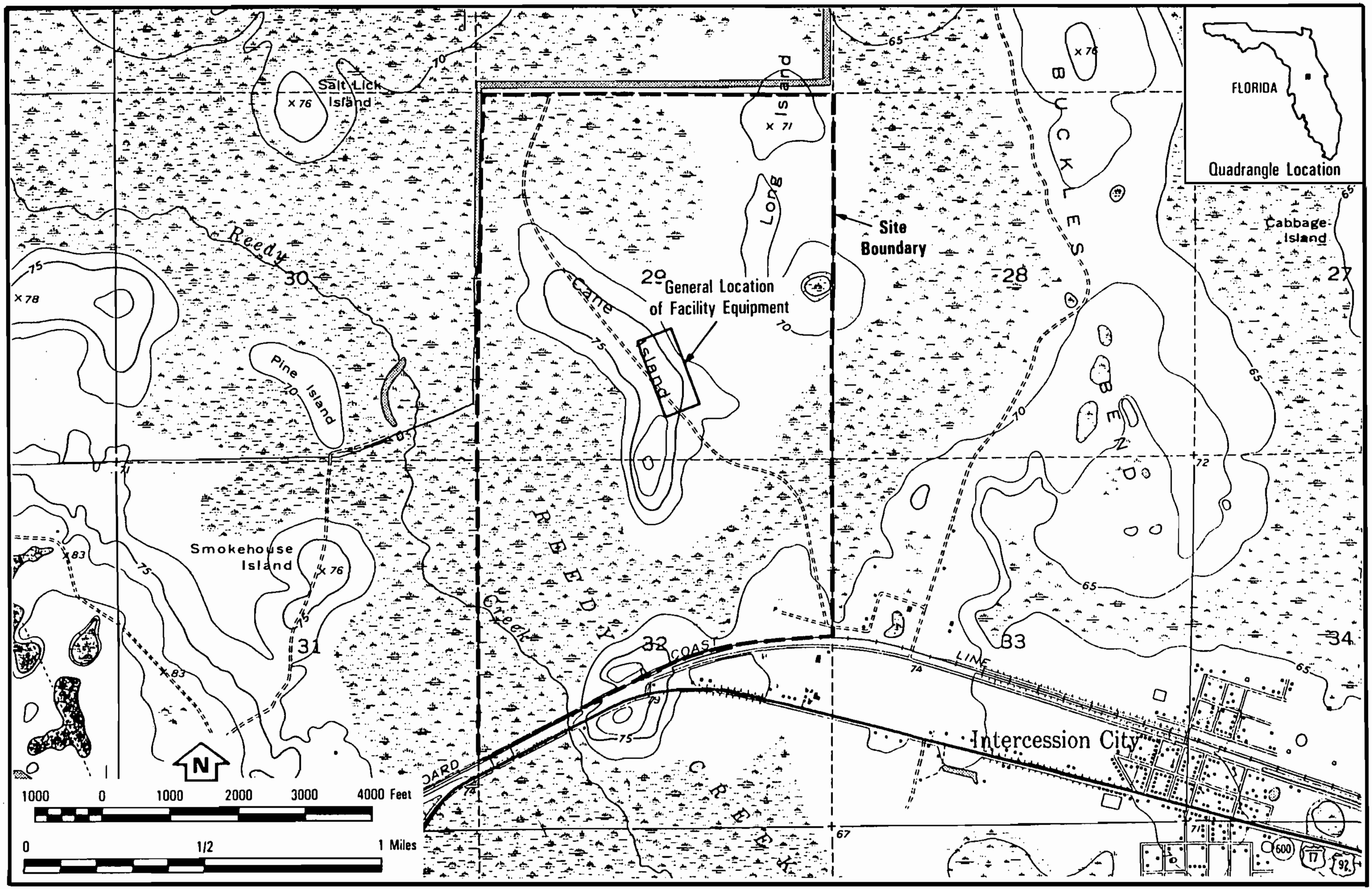
Asterisks (*) indicate plume impacts that exceed screening criteria

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

| | | | | | Delta E | | Contrast | |
|---|---|---|---|---|---|---|---|---|
| Backgrnd | Theta | Azi | Distance | Alpha | Crit | Plume | Crit | Plume |
| SKY | 10. | 84. | 150.0 | 84. | 2.00 | .003 | .05 | .000 |
| SKY | 140. | 84. | 150.0 | 84. | 2.00 | .001 | .05 | .000 |
| TERRAIN | 10. | 85. | 150.3 | 84. | 2.00 | .000 | .05 | .000 |
| TERRAIN | 140. | 85. | 150.3 | 84. | 2.00 | .000 | .05 | .000 |

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

| | | | | | Delta E | | Contrast | |
|---|---|---|---|---|---|---|---|---|
| Backgrnd | Theta | Azi | Distance | Alpha | Crit | Plume | Crit | Plume |
| SKY | 10. | 75. | 145.2 | 94. | 2.00 | .003 | .05 | .000 |
| SKY | 140. | 75. | 145.2 | 94. | 2.00 | .001 | .05 | .000 |
| TERRAIN | 10. | 60. | 137.2 | 109. | 2.00 | .000 | .05 | .000 |
| TERRAIN | 140. | 60. | 137.2 | 109. | 2.00 | .000 | .05 | .000 |




Base Map Source: USGS, Intercession City, Fl, 1970, quad.

CANE ISLAND SITE LOCATION

Figure 2-1

Therefore, as a result of the low pollutant emission rates and effective pollutant dispersion characteristics, the project impacts on soils and vegetation will be minimal.

## 7.3 Growth

Economic, population, industrial, and other types of growth are occurring in the vicinity of the project. The associated growth cannot be directly attributed to growth induced by the operation of the new combustion turbines. In addition, it is expected that only one maintenance and operations personnel will be added due to the project. Therefore, the addition of the combustion turbines is not expected to induce any secondary growth in the surrounding area.

# Appendix A
# FDER Protocol Approval

BLACK & VEATCH

TELEPHONE MEMORANDUM

Kissimmee Utility Authority
Cane Island Combustion Turbine Project
Comments on Ambient Air Quality
Analysis Workplan

B&V Project 17645.130
B&V File 15.1200
September 30, 1991

To: Cleve Holiday
Company: Florida Department of Environmental Regulation
Phone No.: 904-488-1344

Recorded by: A. L. Carlson

I contacted Cleve to check on the status of the workplan review. (I had called Cleve on September 24, but he had not reviewed the workplan yet). Cleve stated that he had only minor comments on the workplan, including the following:

- The FDER has recently adopted the draft New Source Review Workshop Manual (October 1990) recommendation of using the **highest** impacts for comparison with PSD significant impact levels and de minimis monitoring levels. Previously, the highest, second-highest values were allowed for comparison to the above levels for short-term averaging periods.

- The Acceptable Ambient Concentrations (AACs) for toxic pollutants has recently been revised. Cleve will confirm the AACs with John Glunn (FDER-toxics).

- The EPA may require modeling of PSD Class I increment consumption at the nearest PSD Class I boundary. The FDER would suggest using the model MESOPUFF2 for this application because ISCST results typically show PSD Class I increment exceedances at Chassahowitzha Wilderness Area (CWA).

  I stated that the project site is located at least 150 km east of the CWA, and the project impacts are minimal. Therefore, Cleve thought that the EPA would not require PSD Class I increment modeling.

- 1982-1986 meteorological data should be used in lieu of the 1981-1985 data set. Cleve will send the 1986 data set to Black & Veatch.

Cleve called at 3:55 p.m. on October 4, 1991, to inform me of the revised AACs. The recently revised AACs include the following:

| | | |
|---|---|---|
| • Nickel | 8 hour | 1 $ug/m^3$ |
| | 24 hour | 0.24 $ug/m^3$ |
| | Annual | 0.0042 $ug/m^3$ |
| • Benzene | 24 hour | 7.2 $ug/m^3$ |
| • Chromium | Annual | $8.3E^{-5}$ $ug/m^3$ |
| • Formaldehyde | 8 hour | 12 $ug/m^3$ |
| | 24 hour | 2.9 $ug/m^3$ |
| • Mercury | Annual | 0.3 $ug/m^3$ |

All other averaging periods for these pollutants have been eliminated.

dlm

cc: H. L. Jacobs
D. M. Lefebvre

Appendix B

GEP Stack Height Analysis

1 RBRZWAKE
IBM-PC VERSION (2.1 )

SERIAL NUMBER 6440 SOLD TO BLACK & VEATCH CONSULTING ENGINEERS
RUN NAME: KM40S1
RUN BEGAN ON 09-13-91 AT 10:22:10

1

BREEZE WAKE DOWNWASH ANALYSIS

The following options have been chosen:

(1) Calculations are made for the ISCST model.
(2) All stacks must be within 5L to be considered for direction specific downwash.
(3) Downwash is calculated in 36 radial directions.
(4) Buildings are combined.

Note: This analysis determines the direction specific downwash parameters for the flow vector pointing in the direction listed.

Round figures are converted into 8-sided figures for the downwash analysis.

Algorithms:

0 = No Downwash
1 = Huber-Snyder Downwash
2 = Schulman-Scire Downwash

1

Input Buildings

| Description | Bldg # | Bldg Ht(m) | # of Corners | X(m) | Y(m) |
|---|---|---|---|---|---|
| TURBINE HOUSE 1 | 1 | 10.36 | 4 | | |
| | | | | 447698.40 | 3127935.00 |
| | | | | 447688.60 | 3127893.00 |
| | | | | 447680.10 | 3127896.00 |
| | | | | 447691.40 | 3127938.00 |
| TURBINE HOUSE 2 | 2 | 10.36 | 4 | | |
| | | | | 447686.20 | 3127942.00 |
| | | | | 447673.40 | 3127899.00 |
| | | | | 447666.40 | 3127900.00 |
| | | | | 447677.10 | 3127944.00 |
| FIRE TANK 1 | 3 | 12.19 | 8 | | |
| | | | | 447632.55 | 3127950.85 |
| | | | | 447634.56 | 3127946.00 |
| | | | | 447632.55 | 3127941.15 |
| | | | | 447627.70 | 3127939.14 |
| | | | | 447622.85 | 3127941.15 |
| | | | | 447620.84 | 3127946.00 |
| | | | | 447622.85 | 3127950.85 |
| | | | | 447627.70 | 3127952.86 |
| FIRE TANK 2 | 4 | 12.19 | 8 | | |
| | | | | 447628.55 | 3127938.85 |
| | | | | 447630.56 | 3127934.00 |
| | | | | 447628.55 | 3127929.15 |
| | | | | 447623.70 | 3127927.14 |
| | | | | 447618.85 | 3127929.15 |
| | | | | 447616.84 | 3127934.00 |
| | | | | 447618.85 | 3127938.85 |
| | | | | 447623.70 | 3127940.86 |
| WATER TANK 1 | 5 | 12.19 | 8 | | |
| | | | | 447619.45 | 3127942.85 |
| | | | | 447621.46 | 3127938.00 |
| | | | | 447619.45 | 3127933.15 |
| | | | | 447614.60 | 3127931.14 |
| | | | | 447609.75 | 3127933.15 |
| | | | | 447607.74 | 3127938.00 |
| | | | | 447609.75 | 3127942.85 |
| | | | | 447614.60 | 3127944.86 |
| WATER TANK 2 | 6 | 12.19 | 8 | | |
| | | | | 447620.95 | 3127953.85 |
| | | | | 447622.96 | 3127949.00 |
| | | | | 447620.95 | 3127944.15 |
| | | | | 447616.10 | 3127942.14 |
| | | | | 447611.25 | 3127944.15 |
| | | | | 447609.24 | 3127949.00 |

| | | | | | |
|---|---|---|---|---|---|
| | | | | 447611.25 | 3127953.85 |
| | | | | 447616.10 | 3127955.86 |
| OIL STORAGE | 7 | 14.63 | 8 | | |
| | | | | 447732.99 | 3127903.09 |
| | | | | 447734.69 | 3127899.00 |
| | | | | 447732.99 | 3127894.91 |
| | | | | 447728.90 | 3127893.21 |
| | | | | 447724.81 | 3127894.91 |
| | | | | 447723.11 | 3127899.00 |
| | | | | 447724.81 | 3127903.09 |
| | | | | 447728.90 | 3127904.79 |
| WATER TREATMENT | 8 | 5.18 | 4 | | |
| | | | | 447654.20 | 3127946.00 |
| | | | | 447646.60 | 3127927.00 |
| | | | | 447637.40 | 3127929.00 |
| | | | | 447645.10 | 3127948.00 |
| PLANT SERVICE | 9 | 5.18 | 4 | | |
| | | | | 447658.20 | 3127904.00 |
| | | | | 447654.20 | 3127885.00 |
| | | | | 447642.90 | 3127889.00 |
| | | | | 447646.60 | 3127908.00 |

1

Input Stacks

| Stack ID # | Stack # | Stack Ht(m) | X(m) | Y(m) |
|---|---|---|---|---|
| 1 | 1 | 12.19 | 447692.00 | 3127923.00 |
| 2 | 2 | 12.19 | 447677.00 | 3127925.00 |

1

Downwash Structures

Structure 1: Ht= 14.63 m, MPW= 11.58 m, GEP= 32.00 m

Contains the following buildings:
Building # 7: OIL STORAGE
The following stacks are within 5L:
Stack # 1: 1
Stack # 2: 2

Structure 2: Ht= 12.19 m, MPW= 30.15 m, GEP= 30.48 m

Contains the following buildings:
Building # 3: FIRE TANK 1
Building # 4: FIRE TANK 2
Building # 5: WATER TANK 1
Building # 6: WATER TANK 2
The following stacks are within 5L:
Stack # 2: 2

Structure 3: Ht= 10.36 m, MPW= 52.28 m, GEP= 25.90 m

Contains the following buildings:
Building # 1: TURBINE HOUSE 1
Building # 2: TURBINE HOUSE 2
The following stacks are within 5L:
Stack # 1: 1
Stack # 2: 2

Structure 4: Ht= 5.18 m, MPW= 47.14 m, GEP= 12.95 m

Contains the following buildings:
Building # 3: FIRE TANK 1
Building # 4: FIRE TANK 2
Building # 5: WATER TANK 1
Building # 6: WATER TANK 2
Building # 8: WATER TREATMENT
The following stacks are within 5L:

Structure 5: Ht= 5.18 m, MPW= 72.09 m, GEP= 12.95 m

Contains the following buildings:
Building # 1: TURBINE HOUSE 1
Building # 2: TURBINE HOUSE 2
Building # 9: PLANT SERVICE
The following stacks are within 5L:
Stack # 1: 1
Stack # 2: 2

NUMBER OF SOURCES = 2

1 Stack ID # 1, Stack # 1

The Dominant Structure Within 5L is:
STRUC= 1 H= 14.63 W= 11.58 GEP= 32.00

Direction Specific Building Downwash

| Degree | Structure # | Height | Width | GEP | Algorithm |
|---|---|---|---|---|---|
| 10 | 3 | 10.36 | 25.44 | 25.90 | 2 |
| 20 | 3 | 10.36 | 28.25 | 25.90 | 2 |
| 30 | 3 | 10.36 | 35.46 | 25.90 | 2 |
| 40 | 3 | 10.36 | 41.59 | 25.90 | 2 |
| 50 | 3 | 10.36 | 46.46 | 25.90 | 2 |
| 60 | 3 | 10.36 | 49.92 | 25.90 | 2 |
| 70 | 3 | 10.36 | 51.86 | 25.90 | 2 |
| 80 | 3 | 10.36 | 52.22 | 25.90 | 2 |
| 90 | 3 | 10.36 | 51.00 | 25.90 | 2 |
| 100 | 3 | 10.36 | 48.23 | 25.90 | 2 |
| 110 | 3 | 10.36 | 46.24 | 25.90 | 2 |
| 120 | 3 | 10.36 | 46.31 | 25.90 | 2 |
| 130 | 3 | 10.36 | 47.38 | 25.90 | 2 |
| 140 | 3 | 10.36 | 47.01 | 25.90 | 2 |
| 150 | 3 | 10.36 | 45.21 | 25.90 | 2 |
| 160 | 3 | 10.36 | 42.04 | 25.90 | 2 |
| 170 | 3 | 10.36 | 37.59 | 25.90 | 2 |
| 180 | 3 | 10.36 | 32.00 | 25.90 | 2 |
| 190 | 3 | 10.36 | 25.44 | 25.90 | 2 |
| 200 | 3 | 10.36 | 28.25 | 25.90 | 2 |
| 210 | 3 | 10.36 | 35.46 | 25.90 | 2 |
| 220 | 3 | 10.36 | 41.59 | 25.90 | 2 |
| 230 | 3 | 10.36 | 46.46 | 25.90 | 2 |
| 240 | 3 | 10.36 | 49.92 | 25.90 | 2 |
| 250 | 3 | 10.36 | 51.86 | 25.90 | 2 |
| 260 | 3 | 10.36 | 52.22 | 25.90 | 2 |
| 270 | 3 | 10.36 | 51.00 | 25.90 | 2 |
| 280 | 3 | 10.36 | 48.23 | 25.90 | 2 |
| 290 | 1 | 14.63 | 10.88 | 30.96 | 2 |
| 300 | 1 | 14.63 | 11.19 | 31.41 | 2 |
| 310 | 1 | 14.63 | 11.54 | 31.94 | 2 |
| 320 | 3 | 10.36 | 47.01 | 25.90 | 2 |
| 330 | 3 | 10.36 | 45.21 | 25.90 | 2 |
| 340 | 3 | 10.36 | 42.04 | 25.90 | 2 |
| 350 | 3 | 10.36 | 37.59 | 25.90 | 2 |
| 360 | 3 | 10.36 | 32.00 | 25.90 | 2 |

1 Stack ID # 2, Stack # 2

The Dominant Structure Within 5L is:
STRUC= 1 H= 14.63 W= 11.58 GEP= 32.00

Direction Specific Building Downwash

| Degree | Structure # | Height | Width | GEP | Algorithm |
|---|---|---|---|---|---|
| 10 | 3 | 10.36 | 25.44 | 25.90 | 2 |
| 20 | 3 | 10.36 | 28.25 | 25.90 | 2 |
| 30 | 3 | 10.36 | 35.46 | 25.90 | 2 |
| 40 | 3 | 10.36 | 41.59 | 25.90 | 2 |
| 50 | 3 | 10.36 | 46.46 | 25.90 | 2 |
| 60 | 3 | 10.36 | 49.92 | 25.90 | 2 |
| 70 | 3 | 10.36 | 51.86 | 25.90 | 2 |
| 80 | 3 | 10.36 | 52.22 | 25.90 | 2 |
| 90 | 2 | 12.19 | 28.72 | 30.48 | 2 |
| 100 | 2 | 12.19 | 26.96 | 30.48 | 2 |
| 110 | 2 | 12.19 | 25.53 | 30.48 | 2 |
| 120 | 2 | 12.19 | 26.73 | 30.48 | 2 |
| 130 | 3 | 10.36 | 47.38 | 25.90 | 2 |
| 140 | 3 | 10.36 | 47.01 | 25.90 | 2 |
| 150. | 3 | 10.36 | 45.21 | 25.90 | 2 |
| 160 | 3 | 10.36 | 42.04 | 25.90 | 2 |
| 170 | 3 | 10.36 | 37.59 | 25.90 | 2 |
| 180 | 3 | 10.36 | 32.00 | 25.90 | 2 |
| 190 | 3 | 10.36 | 25.44 | 25.90 | 2 |
| 200 | 3 | 10.36 | 28.25 | 25.90 | 2 |
| 210 | 3 | 10.36 | 35.46 | 25.90 | 2 |
| 220 | 3 | 10.36 | 41.59 | 25.90 | 2 |
| 230 | 3 | 10.36 | 46.46 | 25.90 | 2 |
| 240 | 3 | 10.36 | 49.92 | 25.90 | 2 |
| 250 | 3 | 10.36 | 51.86 | 25.90 | 2 |
| 260 | 3 | 10.36 | 52.22 | 25.90 | 2 |
| 270 | 3 | 10.36 | 51.00 | 25.90 | 2 |
| 280 | 3 | 10.36 | 48.23 | 25.90 | 2 |
| 290 | 1 | 14.63 | 10.88 | 30.96 | 2 |
| 300 | 1 | 14.63 | 11.19 | 31.41 | 2 |

| | | | | | |
|---|---|---|---|---|---|
| 310 | 3 | 10.36 | 47.38 | 25.90 | 2 |
| 320 | 3 | 10.36 | 47.01 | 25.90 | 2 |
| 330 | 3 | 10.36 | 45.21 | 25.90 | 2 |
| 340 | 3 | 10.36 | 42.04 | 25.90 | 2 |
| 350 | 3 | 10.36 | 37.59 | 25.90 | 2 |
| 360 | 3 | 10.36 | 32.00 | 25.90 | 2 |

1

```
                    Stack #    1
Stack ID:  1,    Building Height: 14.630,    Building Width: 11.582
10.36010.36010.36010.36010.36010.36010.36010.36010.36010.36010.36010.360
10.36010.36010.36010.36010.36010.36010.36010.36010.36010.36010.36010.360
10.36010.36010.36010.36014.63014.63014.63010.36010.36010.36010.36010.360
25.43628.24935.45941.59246.46049.91751.85852.22251.00048.22846.23946.311
47.38147.01145.21342.04137.59232.00025.43628.24935.45941.59246.46049.917
51.85852.22251.00048.22810.88411.18711.53847.01145.21342.04137.59232.000
                    Stack #    2
Stack ID:  2,    Building Height: 14.630,    Building Width: 11.582
10.36010.36010.36010.36010.36010.36010.36010.36012.19212.19212.19212.192
10.36010.36010.36010.36010.36010.36010.36010.36010.36010.36010.36010.360
10.36010.36010.36010.36014.63014.63010.36010.36010.36010.36010.36010.360
25.43628.24935.45941.59246.46049.91751.85852.22228.71626.96025.53326.727
47.38147.01145.21342.04137.59232.00025.43628.24935.45941.59246.46049.917
51.85852.22251.00048.22810.88411.18747.38147.01145.21342.04137.59232.000
```

1 RUN ENDED ON 09-13-91 AT 10:22:14

# Appendix C
## Waiver of Preconstruction Monitoring Requirements

BLACK & VEATCH

8400 Ward Parkway, P.O. Box No. 8405, Kansas City, Missouri 64114, (913) 339-2000

Kissimmee Utility Authority
Cane Island Combustion Turbine Project

B&V Project 17645
B&V File 32.0600
November 1, 1991

Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Subject: Request for Waiver of Preconstruction Monitoring

Attention: Mr. Clair H. Fancy
Chief-Bureau of Air Regulation

Gentlemen:

Kissimmee Utility Authority (KUA) proposes the phased installation and operation of two simple cycle combustion turbines (40 MW each) at the Cane Island site located near Intercession City, Florida.

The project, a new major stationary source, is subject to Prevention of Significant Deterioration regulations. As part of the PSD requirements, a preconstruction ambient air quality monitoring applicability analysis must be conducted for all applicable PSD pollutants. Carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter, volatile organic compounds, beryllium, and sulfuric acid mist are pollutants emitted by the project that are subject to a preconstruction monitoring applicability analysis.

Air dispersion modeling performed in support of the PSD permit application demonstrated that the project will have maximum impacts below the PSD de minimis monitoring levels. Therefore, Black & Veatch, on behalf of KUA, requests that ambient air quality preconstruction monitoring for these pollutants be waived.

Florida Department of Environmental Regulation
Mr. Clair H. Fancy

B&V Project 17645
November 1, 1991

Additional supporting documentation is given in the Kissimmee Utility Authority Cane Island Project PSD permit application. If you have any questions, please call Amy Carlson at Black & Veatch (319) 339-7425 or me (319) 339-2164.

Very truly yours,

BLACK & VEATCH

David M Lefebvre

David M. Lefebvre

alc

NOTE

The follwoing pages describe and list the dispersion modeling computer output provided to FDER with this application.

INFORMATION ON THE PROGRAMS PKARC.COM AND PKXARC.COM

To conserve disks, computer files are often archived using the PKARC program. This process redistributes data within a file to eliminate formatted space, thus alleviating the storage problems inherent with the large list files.

One or more files may be stored as a single archive file. Likewise, individual files may be retrieved from an archive file.

To retrieve these files the PKARC and PKXARC programs have been included on a disk. To view the name of the files contained in an archive file, you will need to enter PKARC V XXXXX.ARC where XXXXX is the archive file name. The various archive names and related information are provided on the enclosed log sheet. To retrieve all files from a single archive file, type PKXARC XXXXX.ARC *.*. This not only produces files that can be accessed to view or print, but also leaves the archive file intact. The retrieved files will have the same names as the file names in the archive file. An individual file may be retrieved from an archive file by typing PKXARC XXXXX.ARC xxxxx.lst. Where xxxxx is the file name. Additional information about the PKARC program is available by typing PKARC.

ARCHIVE LISTING OF KISSIMMEE UTILITY AUTHORITY
CANE ISLAND COMBUSTION TURBINE AIR DISPERSION MODELING RUNS

| Archive File | Pnt File | Bld File | Dat/Lst File | Year | Description |
|---|---|---|---|---|---|
| KUASIA | KGM40R | KUA | KM40S2<br>KM40S3<br>KM40S4<br>KM40S5<br>KM40S6 | 1982<br>1983<br>1984<br>1985<br>1986 | ISCST modeling runs to determine project impacts from two proposed CTs. Model was performed for SO2 and with receptors out to 25 kilometers. |
| KUASIA | KGM40R | KUA | KM40S2R<br>KM40S3R<br>KM40S4R<br>KM40S5R<br>KM40S6R | 1982<br>1983<br>1984<br>1985<br>1986 | ISCST modeling runs to determine project impacts from two proposed CTs. Model was performed for SO2 and with receptors along the property boundary. |
| KUAPSD | KUAPSD | KUA | 1PSD2<br>1PSD3<br>1PSD4<br>1PSD5<br>1PSD6 | 1982<br>1983<br>1984<br>1985<br>1986 | ISCST modeling runs to determine compliance with PSD SO2 increments. Modeling performed with interacting sources. Impacts calculated within the SO2 significant impact area (500 meters). |
| KUANQS | KUANQS | KUA | 1NQS2<br>1NQS3<br>1NQS4<br>1NQS5<br>1NQS6 | 1982<br>1983<br>1984<br>1985<br>1986 | ISCST modeling runs to determine compliance with SO2 AAQS. Modeling performed with interacting sources. Impacts calculated within the SO2 significant impact area (500 meters). |