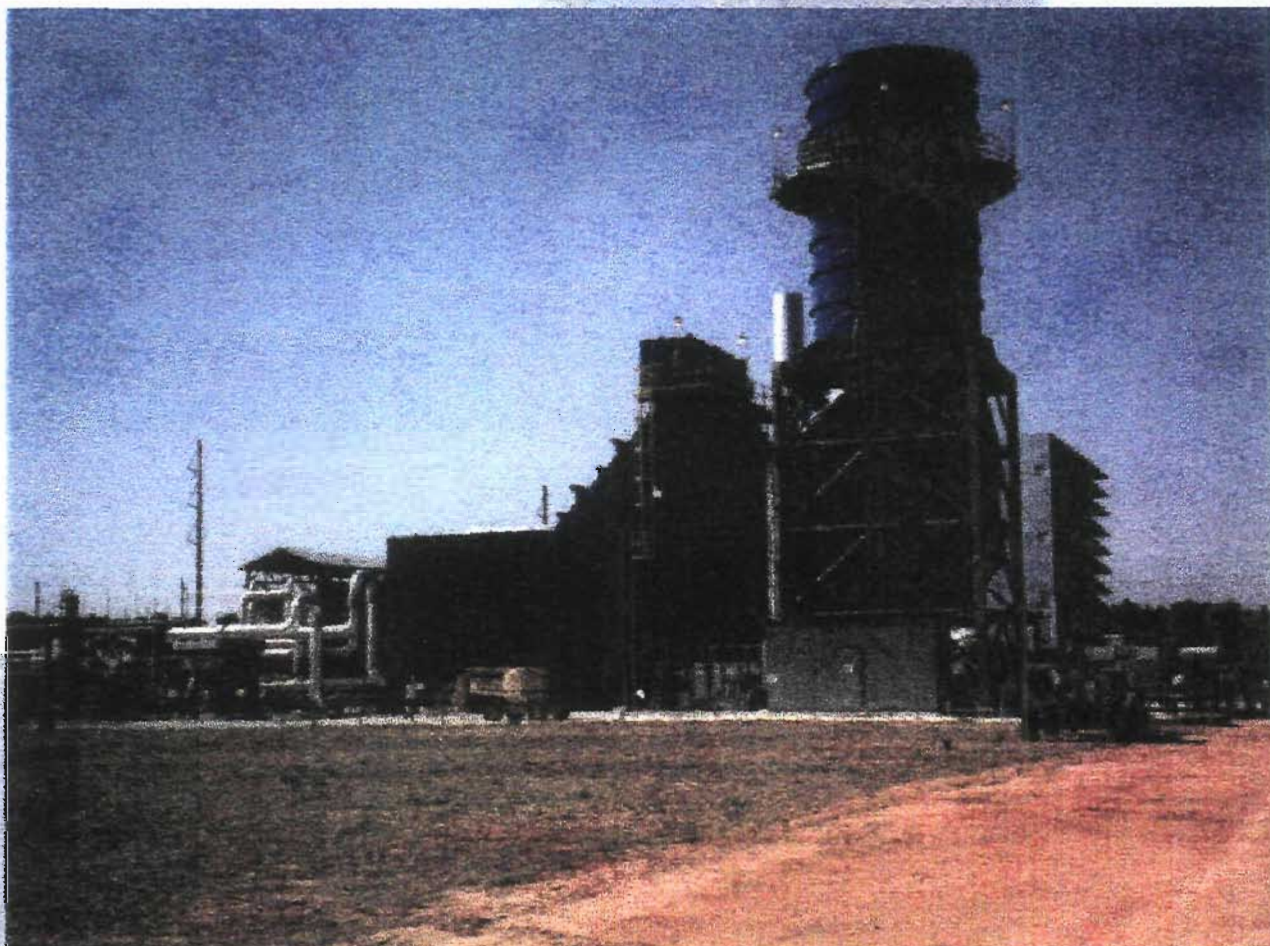

Site Certification Application
for
McIntosh Unit No. 5 Steam Cycle

Prepared By:

Golder Associates
6241 NW 23rd Street, Suite 500
Gainesville, Florida 32653-1500

June 1999

9937510C

CITY OF LAKELAND
DEPARTMENT OF ELECTRIC UTILITIES

SITE CERTIFICATION APPLICATION
FOR
McINTOSH UNIT NO. 5 STEAM CYCLE

Ronald W. Tomlin, Assistant Managing Director
City of Lakeland Department of Electric Utilities
501 East Lemon Street
Lakeland, Florida 33801-5079

Kennard F. Kosky, P.E.
Florida Professional Engineer No. 14996

Golder Associates Inc.
6241 NW 23rd Street, Suite 500
Gainesville, Florida 32653-1500

June 1999
9937510C

APPLICANT INFORMATION

Please supply the following information:

Applicant's Official Name *City of Lakeland, Department of Electric Utilities*

Address *501 East Lemon Street, Lakeland, Florida 33801-5050*

Address of Official Headquarters *501 East Lemon Street, Lakeland, Florida 33801-5050*

Business Entity (corporation, partnership, co-operative) *Municipality*

Names, owners, etc. *City of Lakeland*

Name and Title of Chief Executive Officer *Ronald W. Tomlin, Asst. Managing Director*

Name, Address, and Phone Number of Official Representative responsible for obtaining certification: *Ms. Farzie Shelton, Manager of Licensing and Permitting, 3030 East Lake Parker Drive, Lakeland, FL 33805 Phone: (941) 834-6603 Fax: (941) 603-6335*

Site Location (county) *Polk County, 3030 East Parker Drive, City of Lakeland, Florida*

Nearest Incorporated City *City of Lakeland, Florida*

Latitude and Longitude *28° 5' 12" N 81° 55' 45" E*

UTM's Northerly *3106.8 km N*

Easterly *17,408.8 km E*

Section, Township, Range *Sec. 32, Twnshp. 27S, Rnge 24E: (see attached Legal Description)*

Location of any directly associated transmission facilities (counties) *None Required*

Name Plate Generating Capacity *Unit No. 5- net nominal 249 MW for Existing Permitted Unit*

Capacity of Proposed Additions and Ultimate Site Capacity (where applicable) *Addition of a net nominal 120MW steam electric turbine for use of steam from an existing Westinghouse 501G Combustion Turbine; Total net nominal capacity of 369MW*

Remarks (additional information that will help identify the applicant): *Project Name: McIntosh Unit No. 5 combined cycle*

McIntosh Plant Legal Description

That part of fractorial East ½ of West ½ of Northwest ¼ which lies Southwesterly of Lake Parker Dr. and also the West ¼ of the Northwest ¼, all being in Section 4, Township 28 South, Range 24 East, and also U.S. Government Lots 1 and 2 in Section 5, Township 28S, Range 24 East, Less and except: Begin at the Northwest corner of said U.S. Government Lot 2, the same being the Northwest corner of the Northeast ¼ of said Section 5, run thence East along the North line thereof a distance of 664.25 feet, thence South 1365.59 feet, thence East 330.0 feet, thence South to Lake Parker, thence Westerly along Lake Parker to the West line of said Northeast ¼, thence North along said West line 2640 feet more or less to the point of beginning, **and** also including the Southeast ¼ of the Southeast ¼ of Section 32, Township 27 South, Range 24 East, **and** also beginning 664.25 feet East of the Northwest corner of U.S. Government Lot 2 in Section 5, Township 28 South, Range 24 East, run thence North 660.0 feet, thence East 1417.38 feet to the West line of the Southeast ¼ of the Southeast ¼ of Section 32, Township 27 South, Range 24 East, thence South along said West line a distance of 660.0 feet to the Southeast corner of said Southeast ¼ of Southeast ¼, thence West 1412.14 feet to the point of beginning, being in Section 32, Township 27 South, Range 24 East, **and** also the Southwest ¼ of the Southwest ¼ of Section 33, Township 27 South, Range 24 East, all of the above described property being subject to that certain road right-of-way as deeded to Polk County, Florida, and described in Official Record Book 1098, pages 947 and 948, of the Public Records of Polk County, Florida, **and** also all that part of the Northeast ¼ of the Southeast ¼ of Section 32 Township 27 South, Range 24 East, lying East of East Lake Parker Drive, **and** also that part of the East ½ of the Northwest ¼ of the Northwest ¼, lying North and East of East Lake Parker Drive and the Northeast ¼ of the Northwest ¼ and the Northwest ¼ of the Northeast ¼, all being in Section 4, Township 28 South, Range 24 East, **and** also the Southeast ¼ of the Southwest ¼ **and** the West ½ of the Southwest ¼ of the Southeast ¼ **and** the Northeast ¼ of the Southwest ¼ **and** the Northwest ¼ of the Southwest ¼, all in Section 33, Township 27 South, Range 24 East, **and** also a strip of land 150.0 feet in width lying 75.0 feet each side of the following described centerline: Begin at the Northeast corner of the Southeast ¼ of the Southeast ¼ of Section 33, Township 27 South, Range 24 East, run thence South 00°06'14" West along the East line thereof a distance of 463.50 feet to the point of beginning for this description, run thence South 89°44'35" West a distance of 7.12 feet to the beginning of a curve to the left having a radius of 716.78 feet, run thence Southwesterly around said curve through a central angle of 34°57'50" an arc distance of 437.05 feet, to the end of said curve, run thence South 54°46'40" West a distance of 391.05 feet to the beginning of a curve to the right having a radius of 819.02 feet, run thence Southwesterly around said curve through a central angle of 34°50'00" an arc distance of 497.62 feet to the end of said curve, run thence South 89°36'40" West a distance of 800.60 feet to the point of intersection with the East line of the West ½ of the Southwest ¼ of the Southeast ¼ of said Section 33, said point being the end of said centerline, **and** also that part of the Southwest ¼ of the Southwest ¼ of Section 34, Township 27 South, Range 24 East , more fully described as follows: Begin at the Northwest corner of said Southwest ¼ of Southwest ¼, run thence South 00°06'14" West along the West line of said Southwest ¼ of Southwest ¼ a distance of 388.50 feet to the point of beginning for this description, continue thence South 00°06'14" West along said West line a distance of 125.0 feet, run thence North 89°44'35" East and parallel with the North line of said Southwest ¼ of Southwest ¼ a distance of 1076.12 feet to the beginning of a curve to the right having a radius of 637.55 feet, run thence Southeasterly around said curve through a central angle of 24°13'44" and arc distance of 269.60 feet to the intersection with the East line of said Southwest ¼ of Southwest ¼, run thence North 00°10'50" West along said East line a distance of 181.17 feet to a point 388.50 feet South of the Northeast corner of Said Southwest ¼ of Southwest ¼, run thence South 89°44'35" West and parallel with the North line of said Southwest ¼ of Southwest ¼ a distance of 1337.22 feet to the point of beginning, less right-of-way for State Road No. 33-A (Combee Road), **and** also all that part of the South 500.0 feet of the North 888.50 feet of the Southeast ¼ of the Southwest ¼ of Section 34, Township 27 South, Range 24 East , lying West of Seaboard Coast Line Railroad right-of-way.

AND (O.R. 2411, Pg.330)

Commence at the Northwest corner of the Southeast ¼ of the Northwest ¼ of Section 4, Township 28 South, Range 24 East, Polk County, Florida; thence North 89°55'56" East along the North line of said Southeast ¼ of the Northwest ¼ and the Southwest ¼ of the Northeast ¼ of said Section 4 a distance of 1332.48 feet; thence South 58°29'24" West 520.58 feet; thence South 60°52'07" West 431.05 feet; thence South 04°50'43" West 516.02 feet; thence South 40° 05' 28" East 281.45 feet; thence South 49°54'32" West 498.42 feet to the East right-of-way line of Lake Parker Drive; thence North 40°05'28" West along said right-of-way line 219.22 feet to the point of curvature of a curve concave to the Northeasterly having a central angle of 20°20'00" and a radius of 596.62 feet; thence along said curve and right-of-way line 211.73 feet to the point of tangency; thence North 19°45'30" West still along said right-of-way line 367.82 feet to a point of a curve concave to the Southwesterly having a central angle of 10°21'13", a radius of 2904.79 feet, a chord bearing of North 24°13'05" West and a chord distance of 524.20 feet; thence along said curve and right-of-way line 524.91 feet to the point of tangency; thence North 29°23'41" West still along said right-of-way line 408.29 feet to the North line of the Southwest ¼ of the Northwest ¼ of said Section 4; thence North 89°55'56" East along said North line 517.53 feet to the Point of Beginning.

LESS AND EXCEPT (O.R. 2411, Pg.332)

Begin at the Northeast corner of the Northeast ¼ of the Southwest ¼ of Section 33, Township 27 South, Range 24 East, thence South 00°27'18" West along the East line of said Northeast ¼ of the Southwest ¼ a distance of 1436.27 feet to the Southeast corner of said Northeast ¼ of the Southwest ¼; thence North 89°57'09" East along the North line of the West ½ of the Southwest ¼ of the Southeast ¼ of said Section 33 a distance of 666.55 feet to the Northeast corner of said West ½; thence South 00°23'41" West along the East line of said West ½ a distance of 894.97 feet to a point being 75.00 feet North of the center line of and existing railroad track; thence South 89°36'43" West and parallel to said railroad tracks 502.45 feet to the point of a curvature of a curve concave to the Northeasterly having a radius of 1071.30 feet and a central angle of 19°59'59"; thence along said curve and still parallel to said railroad tracks 373.95 feet to the point of tangency; thence North 70°23'21" West still parallel to said railroad tracks 466.68 feet to the point of curvature of a curve concave to the Northeasterly having a radius of 880.10 feet and a central angle of 15°04'05"; thence along said curve and still parallel to said railroad tracks 231.45 feet; thence North 34°33'08" East 192.25 feet; thence North 41°41'05" West 216.78 feet; thence North 33°26'28" East 187.53 feet; thence North 54°47'22" West 605.46 feet; thence North 04°22'22" West 521.55 feet; thence North 33°41'53" East 331.33 feet; thence North 32°41'20" West 351.11 feet; thence North 68°43'36" West 254.37 feet to the North line of the Northwest ¼ of the Southwest ¼ of said Section 33; thence North 89°58'27" East along said North line and the North line of aforesaid Northeast ¼ of the Southwest ¼ a distance of 1574.29 feet to the point of beginning.

CERTIFICATION:

I hereby certify that this drawing correctly reflects the results of a recent survey made under my direction and this survey was made in accordance with minimum technical standards adopted by the Florida Department of Professional Regulation, Board of Land Surveyors, Chapter 21 HH-6 of the Florida Administrative Code, effective September 1, 1981.

Date of Survey: September 14, 1989 original signed by

Henley Lee Burton, P. L. S.

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1.0 INTRODUCTION

1.1 INTRODUCTION

The City of Lakeland Department of Electric Utilities (Lakeland) proposes to convert its existing McIntosh Unit No. 5 simple cycle combustion turbine (CT) to a combined cycle unit through the addition of a heat recovery steam generator (HRSG). The conversion will also require construction of a HRSG stack, a net nominal 120-megawatt (MW) steam electric turbine, and cooling towers. No supplemental duct firing is proposed for the steam cycle. The existing simple cycle portion of Unit No. 5 is a Westinghouse 501G CT with a net nominal capacity of about 250 MW. The conversion to combined cycle will add another 120 MW, for a total net nominal capacity of about 370 MW from Unit 5. The City of Lakeland intends to convert this unit to combined cycle for January 1, 2002 commercial operation. (Note: designation of capacities in this application are net nominal ratings.)

The addition of the 120 MW steam turbine/electrical generator, which will increase the facility's steam-electric output, requires that the unit be certified under the Florida Electrical Power Plant Siting Act, Chapter 403, Part II, Florida Statutes (PPSA). No additional transmission lines or other associated off-site facilities are required for the conversion to combined cycle operation. Construction and operation of the Unit 5 simple cycle CT was previously approved as a modification of certification to Unit No. 3 at the McIntosh Power Plant site by the Florida Department of Environmental Protection (FDEP) on July 9, 1998, pursuant to Section 403.516, F.S. DEP issued a separate Prevention of Significant Deterioration permit for the CT on July 10, 1998. These approvals are included in Appendix 10.4.

This document represents Lakeland's request for certification of the combined cycle addition for McIntosh Unit No. 5 as required pursuant to Section 403.506, Florida Statutes (F.S.), and Rule 62-17.051 Florida Administrative Code (F.A.C.). This document is a comprehensive site certification application as prescribed by DEP Form 62-1.211(1) F.A.C. In addition, Lakeland is requesting several changes to the current PPSA conditions of certification for the previously certified McIntosh Unit 3, as discussed below.

1.2 THE APPLICANT

The applicant is the City of Lakeland, Department of Electric Utilities, 501 E. Lemon St., Lakeland, Florida 33801-5079. The applicant information page provides further information on the applicant.

The project is located at the city's existing McIntosh Power Plant on the northeastern shore of Lake Parker in the City of Lakeland, within Polk County (Figure 1-1). The area is more specifically described as within Section 32, Township 27S, Range 24E, and Sections 4-5, Township 28S, Range 24E, at longitude 81°56'59" and latitude 28°1'48".

1.3 PROJECT OVERVIEW

Lakeland Electric's service area is located within Polk County, Florida. There are over 106,000 customers being served in this service area, using over 2.3 million megawatt hours of electricity per year. Lakeland's existing generating units are located at two sites, the Charles Larsen Memorial (Larsen) Power Plant and the C.D. McIntosh Jr. (McIntosh) Power Plant. The Larsen plant has five existing operating units, which burn natural gas and oil. The McIntosh Plant currently consists of seven generating units and support facilities as shown on the overall site plan (Figure 1-2). The Unit No. 5 Westinghouse 501G CT with a nominal rating of about 250 MW in simple cycle operation, is completing construction and is scheduled for commercial operation July 1999.

The project, referred to as McIntosh Unit No. 5 Combined Cycle, will consist of the addition of a HRSG and associated stack, a 120 MW steam electric turbine, and cooling towers. The simple cycle Unit No. 5 is comprised of one Westinghouse 501G, a nominal 250 MW advanced combustion turbine (CT), with dry low-nitrogen oxide (NO_x) combustors, a once-through steam generator (OTSG), and associated equipment. The 501G is the most efficient combustion turbine in the world. The primary fuel for the combustion turbine will be natural gas with distillate fuel oil containing a maximum sulfur content of 0.05 percent as emergency backup fuel. The CT contains a blanking plate that will be removed, and the heat recovery steam generator will be connected to the CT. The conversion to combined cycle will require a new stack for the flue gas exhaust. The new stack would be approximately 300 feet tall versus the permitted 85-foot stack for simple cycle CT operations. A simplified diagram of the existing and new equipment is shown in Figure 1-3. No additional fuel will be combusted as part of the steam cycle addition, even though the electric power will increase by over 30 percent.

1.4 NEED FOR THE PROJECT

Since the unit will be generating additional electricity using steam when operating in a combined cycle mode, it was necessary for Lakeland to file a petition for a need determination by the Florida Public Service Commission, pursuant to Section 403.519 F.S. Lakeland's 10 Year Site Plan, submitted to the Florida Public Service Commission (FPSC), indicates a capacity need in the year 1999 through 2006 based on forecasted energy demand, conservation and demand management programs, reserve margins, existing and future purchases, and unit retirements. The City of Lakeland Department of Electric Utilities determined that the demand for electricity in their service territory is increasing at a rate of 15-20 MW annually. In addition, several older units are scheduled for retirement in the coming years, creating additional generating deficits. The evaluation indicated the need for up to 250 MW in the 1999 timeframe. The total capacity deficiency including both increases in demand and unit retirements is forecasted to be 493 MW in 2008.

Lakeland's previously-issued air permit for the simple cycle 501G combustion turbine establishes an initial emission limit of 237 lb/hr (24-hr average; basis: 25 ppmvd corrected to 15 percent oxygen) for NO_x when firing natural gas, effective through June 30, 2002. However, by May 30, 2002, Lakeland must demonstrate full load operation with emissions not exceeding 85 lb/hr (24-hr average; basis: 9 ppm) NO_x when firing natural gas. Lakeland intends to convert the unit to combined cycle operation and will achieve the lower emissions rate. The conversion of the Westinghouse 501G to a combined cycle unit will result in one of the most efficient units operating in the state of Florida and will add 120 MW of new generating capacity without increasing fuel costs or air emissions.

1.5 BENEFITS OF THE PROJECT

With the conversion to combined cycle, Lakeland will realize several benefits, including:

- A 120 MW increase in generation with no additional fuel requirements;
- The combined cycle unit that will meet the emission standards specified in the existing permit (9 ppm NO_x by May 2002);
- The Project site is located on previously cleared industrial land, therefore yielding an increase in power capacity with no new impacts;
- The Unit No. 5 combined cycle will be one of the most efficient units in the state of Florida; and will meet the forecasted energy requirements for the service territory.

1.6 PSC APPROVAL

A petition for need was filed with the Public Service Commission on January 6, 1999. The PSC approved the City's request at a hearing on April 1, 1999 and issued its affirmative determination of need for the Project on May 10, 1999 (attached in Appendix 10.4.3). In its order determining need, the PSC found that the combined cycle conversion Project is the most cost effective alternative for Lakeland both to meet its need for reliability of its electrical system and to meet the established environmental permitting requirements. Conversion of Unit 5 to combined cycle operation will expand Lakeland's natural gas-fired generating capacity to 76 percent of the City's total electrical generating capacity. Use of oil as a backup fuel will reduce the risk that may occur with a shortage of natural gas or spikes in the price of natural gas. No energy conservation measures exist that would affect the need for the Plant.

By this application, Lakeland is requesting the following:

- That the Siting Board issue an order approving the construction and operation of McIntosh Unit 5 as a combined cycle unit, by conversion of the existing simple cycle CT, pursuant to Section 403.509, F.S.;
- That the existing conditions of certification be modified, pursuant to Section 403.516, F.S., to delete Condition of Certification XV for McIntosh Unit 3, concerning evaluation of the reuse water used in the Unit 3 cooling tower, because Lakeland has recently improved the domestic wastewater treatment plants that supply reuse water to Unit 3 and Rule 62-610 F.A.C. does not require such studies for existing cooling towers; or new cooling towers with a 300 ft. property boundary setback utilizing secondary treated reuse water; and
- That the existing conditions of certification for McIntosh Unit 3 be modified, pursuant to Section 403.516, F.S., to clarify that the use of refuse as a fuel in that Unit includes the use of biomass delivered to Unit 3.

Lakeland requests that the conditions of certification for McIntosh Unit 3 be modified to authorize the use of "biomass" as a fuel to supplement refuse/refuse-derived fuel, which may constitute no more than 10 percent of the total heat input for the unit. Currently refuse/refuse-derived fuel up to 10 percent of the total heat input is authorized under the certification for Unit 3, and refuse/refuse-derived fuel includes yard wastes (e.g., tree trimmings, yard clippings, etc.). The type of biomass that Lakeland requests approval to use as a fuel in Unit 3 is virtually identical to yard wastes but may not be considered a refuse/refuse-derived fuel since it could include energy crops (plants specifically planted and harvested for energy recovery) as well as agricultural and wood wastes. The use of "biomass" as a fuel is known as a "renewable" energy form and is currently being promoted by the United States Department of Energy (DOE). In fact, Lakeland plans to participate in DOE's financial incentive program entitled "The Renewable Energy Production Incentive" that is part of the Federal Energy Policy Act of 1992. This DOE program promotes increases in the generation and utilization of electricity from renewable energy sources, such as biomass, and provides financial incentive payments to qualifying facilities.

The use of biomass as a fuel for energy production is favored not only by DOE as an alternate fuel source but also by EPA because of the reductions in sulfur dioxide emissions which cause acid deposition and because of the low carbon content which reduces greenhouse gas emissions that may lead to global warming. The use of biomass in Unit 3 would displace the use of coal, which has much higher carbon and sulfur contents. While Unit 3 is authorized to utilize refuse/refuse-derived fuel in quantities up to 10 percent of the total heat input rate and the biomass would be part of this 10 percent, historically lower quantities of refuse/refuse-derived fuels have been utilized in McIntosh Unit 3 and those quantities are not anticipated to decrease as a result of the use of biomass. Rather, the quantity of refuse/refuse-derived fuel used is expected to remain constant, allowing the use of biomass to displace the use of coal.

Because air emissions are not expected to increase as a result of combusting biomass in Unit 3, no additional air quality analyses have been performed, and Lakeland requests that the Conditions of Certification be revised to reflect biomass as an alternative fuel for Unit 3. A separate request to revise the Prevention of Significant Deterioration (PSD) permit for Lakeland's McIntosh Unit 3 will be submitted.

11-26-97

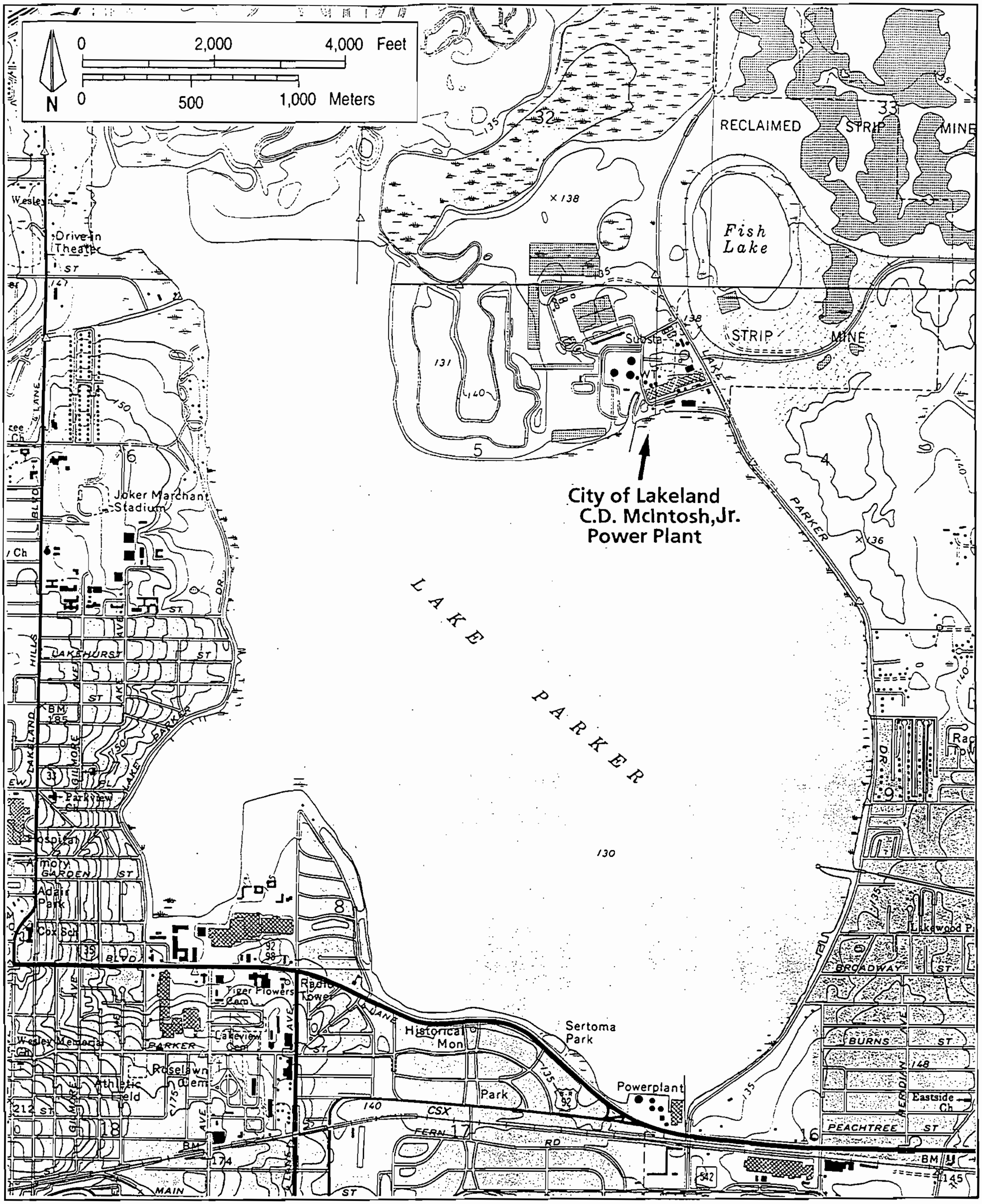

Figure 1-1
Location of McIntosh Plant

Sources: USGS, 1987; Golder, 1997.

Golder Associates

Figure 1-2. McIntosh Power Plant Unit No. 5 Overall Site Plan

LAKELAND ELECTRIC

DESCRIPTION	DIVISION PRODUCTION ENGINEERING	CAD	SCALE 1" = 300'
McINTOSH POWER PLANT UNIT NO. 5 OVERALL SITEPLAN	ENGINEER A. 0000	PROJ. NO. WESTINGHOUSE 5010	
	DRN. BY: MOSEGER — DATE 04-05-99	DWG. NO. Site2.dgn	REV.
	APPR. BY:		

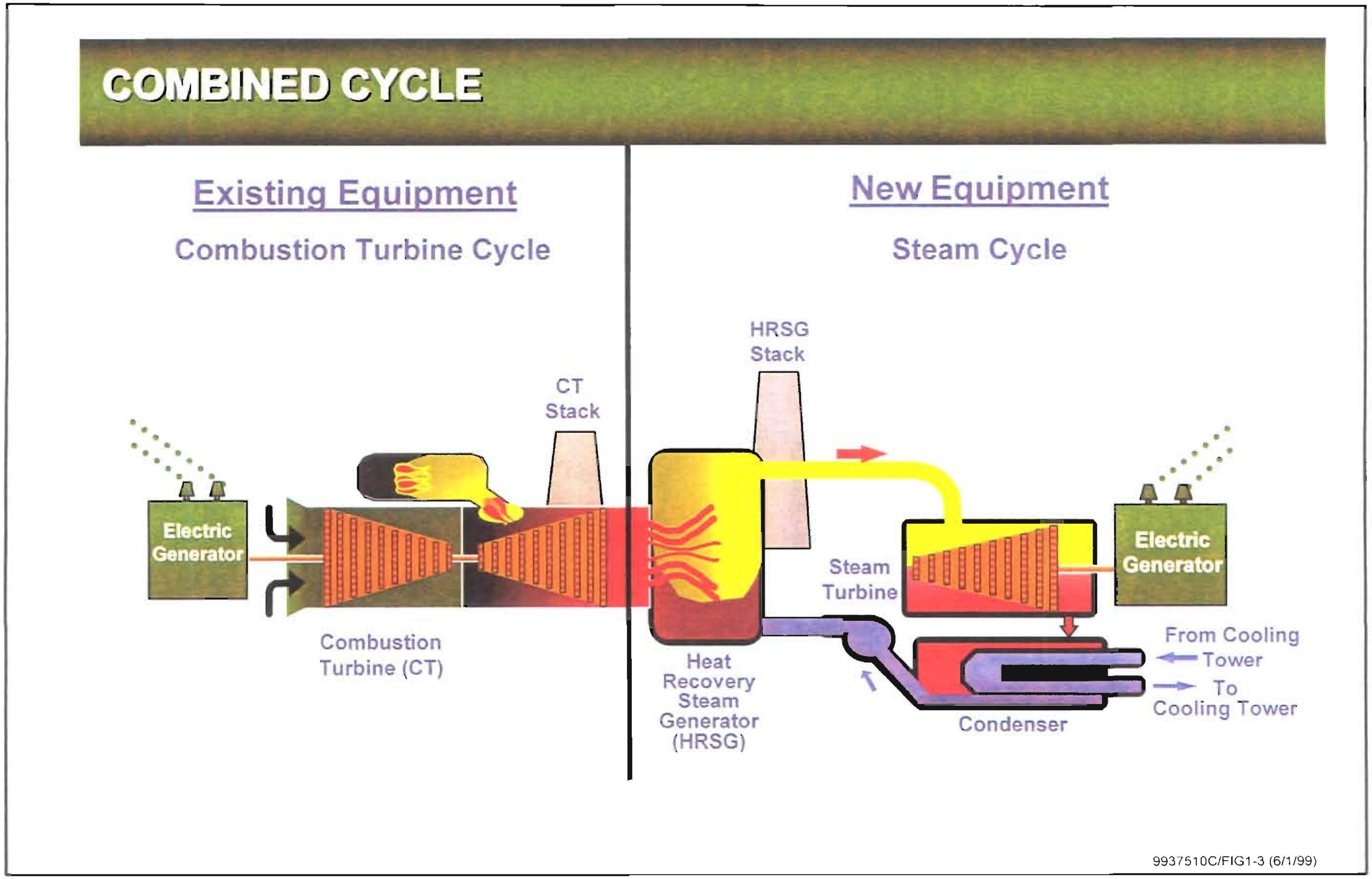

Figure 1-3

Simplified Diagram of McIntosh Unit No. 5 Combined Cycle

Filename:	9937510/fig1-3
Date:	06/10/99

Golder Associates

2.0 SITE AND VICINITY CHARACTERIZATION

2.1 SITE DELINEATION AND LAND USE

2.1.1 SITE LOCATION

The proposed project will be located at the existing McIntosh power plant, which comprises approximately 530 acres. The area for the Unit No. 5 steam cycle will occupy about 3 acres. No transmission line additions will be required. Figure 1-1 presented the plant site location in a regional context. Figure 1-2 depicted the property boundaries of the McIntosh plant site.

The McIntosh plant is located in Polk County on the northeastern shore of Lake Parker at 3030 East Lake Parker Drive in the City of Lakeland (latitude 28°1′48″ and longitude 81°56′59″). Site access is by East Lake Parker Drive that bisects the site separating the coal storage and by-product storage areas from the generating and process facilities. Access to the north is along East Lake Parker Drive at Old Combee Road to Interstate 4, a distance of approximately 3 miles. Access to the south is along East Lake Parker Drive to Memorial Blvd. (US Highway 92), a distance of about 2.2 miles.

The area for the steam cycle equipment associated with McIntosh Unit No. 5 will be adjacent to the existing simple cycle unit (see Figure 1-2).

2.1.2 EXISTING SITE USES

The 530-acre site currently includes seven existing generating units and support facilities (including Unit No. 5 simple cycle). These include three fossil fuel fired steam generating units, two peaking diesel units, one simple cycle gas turbine, and Unit No. 5 simple cycle. Unit GT1 is a natural gas fired General Electric gas turbine with a nameplate rating of 20 MW. Unit No. 1 is a natural gas and No. 6 fuel oil-fired unit with a General Electric steam turbine with a nameplate rating of 90 MW. Unit No. 2 is a natural gas and No. 6 fuel oil (low sulfur)-fired unit with a Westinghouse steam turbine with a nameplate rating of 114.7 MW. Unit No. 3, a pulverized coal (primary fuel) fired unit, has a nameplate rating of 365 MW, with Lakeland retaining 60 percent ownership and Orlando Utilities Commission (OUC) retaining 40 percent. Unit No. 3

also fires natural gas, fuel oil, up to 10 percent refuse/biomass fuel and up to 20 percent petroleum coke. Unit No. 3 includes a wet flue gas scrubber for SO_2 removal. Both Units 2 and 3 use reuse water for cooling tower makeup. Unit No. 5 consists of an existing 250 MW simple cycle combustion turbine. The existing units also include two small diesel units primarily used for emergency system startup purposes, with nameplate ratings of 2.5 MW each. To support these generating units there are fuel handling/processing facilities (natural gas service, oil storage tanks, coal and petroleum coke storage, and refuse/biomass fuel processing), water treatment facilities, wastewater treatment facilities, and by-product processing and storage facilities. Unit No. 5 combined cycle will be located in the northwestern portion of the site (refer to Figure 1-2). Construction laydown for the steam cycle will be located directly east of the Unit No. 5 site.

2.1.3 ADJACENT PROPERTIES

Properties abutting the McIntosh plant site include the city-owned wastewater treatment plant to the north, reclaimed and vacant phosphate land to the east and west, Lake Parker to the south and southwest. There are no residential or commercial properties adjacent to the plant site.

2.1.4 PLANNED SITE USES

The portion of the plant site that will be used for the steam cycle equipment is approximately 3 acres. All of the proposed area has been historically altered by the construction of McIntosh Unit No. 3 and more recently impacted by the construction of the simple cycle portion of Unit No. 5. The steam-cycle equipment will be built on vacant land located south and west of the existing Unit No. 5 simple cycle.

2.1.5 100-YEAR FLOOD ZONE

The site for the equipment associated with the combined cycle equipment for Unit No. 5 is not located within the 100-year flood zone (Federal Emergency Management Agency).

2.2 SOCIO-POLITICAL ENVIRONMENT

2.2.1 GOVERNMENTAL JURISDICTIONS

The McIntosh Plant site is located in the City of Lakeland. No other incorporated municipality is located within 5 miles of the plant site. Figure 2-1 depicts the city limits and city property boundaries in the vicinity of the site. Unincorporated communities within 5 miles include:

- Gibsonia, located approximately 4 miles to the north;
- Galloway, located approximately 5 miles to the northwest;
- Griffin, located approximately 4 miles to the northwest;
- Winston, located approximately 4 miles to the east;
- Eaton Park, located approximately 3.5 miles to the southeast; and
- Carters, located approximately 5 miles to the east.

None of the following local, regional, state, and federal areas, listed in the FDEP Instruction Guide, are within a 5-mile radius of the Project include:

- National Parks
- National Forests
- National Seashores
- National Wilderness Areas
- National Memorials or Monuments
- National Marine and Estuarine Sanctuaries
- Roadless Areas Review and Evaluation Areas
- National Wild and Scenic Areas
- State Forests
- State Archaeological Landmarks
- Areas of Critical State Concern
- Conservation and Recreation Lands
- State Scenic and Wild Rivers
- Indian Reservations

- Military Lands
- Major Private Landholdings for Environmental Protection
- Licensed Public Airports

2.2.2 ZONING AND LAND USE PATTERNS

The Lakeland Year 2000 Future Land Use Map (FLUM) classifies the McIntosh plant site (site) as Industrial. Based on the long-term use of the site as a power plant, it is concluded that this designation is appropriate. The Future Land Use Element of the City's adopted Comprehensive Plan also identifies land that is subjected to environmental limitations. These limitations include soils, topography, natural resources, conservation/preservation areas, archaeological areas, development or redevelopment flood hazard areas, and geology. The area for the combined cycle equipment for Unit No. 5 site is not identified on any environmental limitations map.

The site for Unit 5 is zoned I-3, Heavy Industrial by the City of Lakeland. This zoning district permits utility and essential service facilities, Levels II and III as a conditional use. The definition of utility and essential service facilities, Levels II and III includes Standard Industrial Classification (SIC) groups 491 and 493 which are classifications for electric power facilities. The City of Lakeland's Community Development Department has confirmed the appropriateness of these designations for the Project in a letter dated April 26, 1999 (see Appendix 10.2). A conditional use permit (CUP) was filed with the City of Lakeland in June 1999, to demonstrate that the project is consistent with the City's zoning requirements for conditional use. It is anticipated that the CUP will be granted in 90 days. See Appendix 10.3 for a compilation of information on the FLUM designation, site zoning, and other information.

The City has designated the site and adjacent land as a Utility Abatement Zone in the City's adopted comprehensive plan, in recognition of the presence of the power plant ("with plans for expansion", domestic wastewater treatment plants, and other utility and community service activities). The Zone was established to facilitate controls that would allow only utility tolerant land uses in the Zone and discourage residential uses.

During the certification of McIntosh Unit 3, the site was determined to be in compliance with local land use plans and zoning ordinances. Because Lakeland is not proposing to expand the site boundaries or to add a new fuel that has not already been approved for use at the site, this prior determination of land use and zoning consistency for the entire McIntosh site continues to be in effect.

2.2.3 DEMOGRAPHY AND ONGOING LAND USE

The population of the City of Lakeland from the 1990 Census Bureau counts was 70,576. Lakeland is the largest city in Polk County which had a population of 405,382 people in 1990. Population in the next largest city in Polk County, Winter Haven, was 24,725 in 1990. Population growth in Polk County, predicted by the University of Florida Bureau of Economic and Business Research, is about 2 percent per year. The City of Lakeland population growth is projected to be about 1 percent per year.

2.2.4 EASEMENTS, TITLE, AGENCY WORKS

No easements, titles, or approvals of agency works are required for the combined cycle equipment associated with Unit No. 5. There are no associated transmission lines required for the project.

2.2.5 REGIONAL SCENIC, CULTURAL AND NATURAL LANDMARKS

Lake Parker, located south and west of the McIntosh Plant site, is the largest lake in the city and is used for recreational purposes. Several boat ramps are located along the lake including at Sertoma Park. Sertoma Park is maintained by the City of Lakeland. There are no regionally significant cultural or natural landmarks in the vicinity of the McIntosh Plant site.

2.2.6 ARCHAEOLOGICAL AND HISTORIC SITES

The site associated with the combined cycle equipment for Unit No. 5 does not contain any significant archaeological or historic sites. The Florida Department of State, Division of Historical Resources has determined that the potential for any portion of the site to contain cultural resources is low and there is no need for a survey with subsurface testing (Appendix 10.5.1).

2.2.7 SOCIO-ECONOMICS AND PUBLIC SERVICES

2.2.7.1 SOCIAL AND ECONOMIC CHARACTERISTICS

2.2.7.1.1 Labor Force

Polk County's labor force totaled approximately 196,596 in 1998, which represents a decrease of 0.02 percent from a 1995 labor force of 196,632. Unemployment in Polk County is 6.2 percent (1997). Lakeland's labor force totaled 34,301 in 1998, which represents an increase of 0.8 percent from a 1996 labor force of 34,015. Current unemployment in Lakeland is 5.6 percent. Preliminary estimates of current total labor force, employment, and unemployment are presented in Table 2-1.

2.2.7.1.2 Employment

Total employment in Florida has been projected to grow by almost 1.4 million from 1995 through 2005, indicating an average annual growth rate of 2.0 percent, which is lower than the 3.5 percent annual rate of growth rate for 1985 through 1995. In Florida, this growth in employment will be concentrated in the service-producing industries; almost 90 percent of the new jobs created between 1995 and 2005 will be in this sector. {*Florida Industry and Occupational Employment Projections 1995 - 2005*, Florida Department of Labor and Employment Security, Division of Jobs and Benefits, Bureau of Labor Market Information, September 1997}.

1997 employment statistics by major industry groups in Polk County are presented in Table 2-2. Between 1995 and 2005, employment is projected to increase in each industry. However, the highest annual growth rate is projected to occur in the wholesale trade sector. The services, construction, and retail trade industries are expected to play a relatively large role in the Polk County economy.

General Income

Personal income data for Polk County for 1990 through 1996 is presented in Table 2-3. The per capita income earned by residents of Polk County rose throughout the period 1990 to 1996 by 29.2 percent. Per capita income in the State of Florida rose 26.1 percent during the same period. The average annual increase in per capita income in Polk County between 1990 and 1996 was 4.4 percent, compared with 4.0 percent for the entire State of Florida. The average wage in Polk County was $23,208 in 1995 and $24,070 in 1996.

Housing

Sales of existing, single-family homes increased in the state of Florida by 2 percent from 1996 to 1997, while the median sales price rose by 4 percent. The Lakeland-Winter Haven metropolitan area experienced a 7.8 percent increase in number of homes sold and a 1.9 percent increase in median sales price between 1996 and 1997. The median sales price of single-family homes in the Lakeland-Winter Haven in 1997 was $76,000, 20 percent below the state average of $98,500. When comparing Lakeland to all other Florida metropolitan areas, only Ocala had a lower median sales price of single family homes in 1997 ($64,300). The 1997 median price for a new 1,200 to 1,600-square-foot home in Polk County was $93,303, a 4.6 percent increase from 1996.

2.2.7.2 AREA PUBLIC SERVICES AND UTILITIES

The McIntosh Plant site and surrounding area has public services and utilities that are provided by the City of Lakeland and Polk County. The primary public infrastructure important to the construction and operation of the combined cycle equipment for Unit No. 5 include transportation, gas supply, water supply, wastewater treatment and solid waste disposal.

The McIntosh Plant site is accessed via East Lake Parker Drive from both the north and south. From the north, access to Interstate 4 (I-4) is about 3 miles away via E. Lake Parker Drive to Old

Combee Road and then to SR 33. For the south, access to U.S. Highway 92 is about 2.3 miles away via E. Lake Parker Drive. Access to State Road 33A is available for trucks and heavy equipment via a plant access road located east of the site. The site is served by CSX railroad.

The site is served by a 16 inch gas pipeline owned by the City and connected to the Florida Gas Transmission Company's St. Petersburg lateral. The existing simple cycle Unit No. 5 combustion turbine is connected to this line.

Potable water is available at the McIntosh Plant site from the City. Lakeland uses refuse/refuse-derived fuel (including waste biomass) collected in the area in McIntosh Unit No. 3 as fuel.

2.3 BIO-PHYSICAL ENVIRONMENT

2.3.1 GEOHYDROLOGY

2.3.1.1 GEOLOGIC DESCRIPTION OF THE SITE VICINITY

The soils and geology of the proposed location of Unit No. 5 have not changed since the original application for Site Certification of Unit No. 3, dated 1975. The area was previously cleared and used as part of the in-plant wastewater treatment facilities. These facilities have been abandoned and the area is maintained by mowing. The McIntosh plant site surface soils are medium to fine sands with sandy clays and limestone fragments at greater depths.

2.3.1.2 DETAILED SITE LITHOLOGIC DESCRIPTION

The McIntosh plant is located in the southwestern section of the Lakeland 15-minute quadrangle. The project site is surrounded by several miles of reclaimed phosphate mining land to the north, east, and west. Loose quartz sand of Pleistocene and recent age covers the area. The Tampa Limestone of early Miocene age, the Hawthorn Formation of the Middle Miocene age, and the Bone Valley Formation of the Pliocene age crop out in the mining pits. Older formations including the Ocala Limestone of Eocene age, and the Suwannee Limestone of the Oligocene age are known only from drilling. The Ocala Limestone underlies the entire Lakeland quadrangle, and it is close to the surface only on the upthrown side of the Polk City fault. The formation ranges in thickness from 160 to 265 feet. The Ocala is overlain unconformably by the Hawthorn Formation on the east side of the Polk City fault and elsewhere by the Suwannee Limestone or the Tampa Limestone. The Suwannee Limestone ranges in thickness from 0 to 170 feet and is unconformably overlain by either the Tampa Limestone or the Hawthorn Formation. The Tampa Limestone ranges in thickness from 0 to 105 feet and is thickest over low spots on the surface of the Suwannee Limestone, but the formation tends to thicken toward the south and southwest. The Tampa Limestone forms the bedrock at the Tenoroc mine, where the Hawthorn and Bone Valley Formations are thin. All these pre-Hawthorn formations are limestone, but each stratigraphically higher formation contains more impurities than the one below.

The Hawthorn Formation consists of two parts; a calcareous lower part ranging in thickness from 0 to 120 feet, and a clastic upper part ranging from 0 to 10 feet in thickness.

The Bone Valley Formation of the Pliocene age consists of lower and upper units. The lower unit unconformably overlies the Hawthorn Formation except in the northern and eastern parts of the quadrangle where the upper unit overlies the Hawthorn Formation or the Tampa Limestone. The lower unit of the Bone Valley Formation ranges in thickness from 0 to 35 feet, and averages about 10 feet. It consists of unconsolidated sand, clayey sand, and sandy clay; all of which contain abundant phosphate nodules. The lower unit is not present in the northern and eastern thirds of the quadrangle except as scattered outliners. The lower unit pinches out to the north on the flank of the Hillsborough high. To the east, the unit is restricted by a ridge of calcareous material from the Hawthorn Formation. The upper limit of the Bone Valley Formation is present throughout the Lakeland quadrangle and aside from the slight dip to the south is the northwestward-striking Polk City fault. The northeast side of the fault is upthrown, and on this side of the fault both the Suwannee and Tampa limestones are absent.

2.3.1.3 BEARING STRENGTH

A definitive change in subsurface geological strata exists south of a line parallel to and about 150 feet north of the shoreline of Lake Parker. North of this boundary, the soil is stable and has excellent load bearing capabilities; south of the boundary, there are limestone caverns approximately 80 to 100 feet below the surface, ranging in height from 4 to 8 feet. Construction of concentrated loads in the area south of the boundary would require piles driven to a depth of approximately 125 feet. The Unit No. 5 Combined Cycle project is located north of the boundary, within the area of stable soils. Soil borings performed by PSI in the vicinity of Unit No. 5 encountered weathered limestone rock at depths ranging from 38.5 to 53.5 ft, and supported the expectations that the soil conditions will present no special problems with construction in the area.

2.3.2 SUBSURFACE HYDROLOGY

Four aquifers supply groundwater to Polk County. The uppermost of the four aquifers is in the unconsolidated sand and clay-sand just below the land surface. This aquifer is used for domestic supplies and irrigation purposes requiring relatively small amounts of water. The second uppermost artesian aquifer, formed immediately below the surficial sands, is in the coarse, sandy phosphatic gravel zone of the phosphate deposits and is confined above by the dense clays of the Bone Valley formation and below by clays which may be either of the Bone Valley or Hawthorn formation. Beneath this aquifer, the secondary artesian aquifer is formed in the limestone of the Hawthorn formation and is used much more than either of the aquifers previously mentioned. The fourth aquifer, the Floridan aquifer, is where the major portion of the Lakeland water system supply is derived. It is composed of various formations of water bearing limestone, grouped together because of their hydraulic characteristics. In Polk County, this aquifer occurs at depths of 300-500 feet below the land surface and is, on the average, approximately 700 feet thick.

Values have been reported which indicate a high water transmitting potential of the Floridan aquifer near the plant site. The values determined from these tests indicate a transmissivity of

750,000 to 1,000,000 gallons per day per foot. Comparison of potentiometric maps over many years indicate that water levels are nearly unchanged in the vicinity of the plant site.

Most of the deep ground waters in Polk County would be classified as bicarbonate waters. Wells penetrating the Eocene and Oligocene limestones in Polk and surrounding counties obtain water with average hardness ranging from 50 to 200 mg/L, chlorides ranging from 5 to 20 mg/L, and sulfates rarely exceeding 20 mg/L. Many of the deep wells will produce hydrogen sulfide. Most of the shallow wells produce water that is very soft and high in soluble iron. A typical analysis of Lakeland ground water is presented in Table 2-4.

2.3.2.1 SUBSURFACE HYDROLOGIC DATA FOR THE SITE AQUIFERS

The plant has an existing water use permit from the Southwest Florida Water Management District (SWFWMD; Permit No. 200047.03) for an average industrial use of 2,881,900 gallons per day (gpd) and a maximum peak monthly use of 4,032,000 gpd). The SWFWMD authorization includes water use from Lake Parker (a total of 1,369,900 gpd average at two locations) and 2 groundwater wells (1,512,000 gpd average) located in the Floridan Aquifer. Three wells are maintained as standby supplies for Unit 2. Two wells (SWFWMD, well numbers 5 and 8) in the Floridan aquifer are permitted at 756,000 gpd, average and 864,000 gpd, peak monthly. These wells will be used as the service water source for Unit No. 5. To insure well availability, an additional well identical to Wells 5 and 8 will be requested from SWFWMD as a permit amendment to Permit No. 200047.03. This additional well would be for backup purposes only since all service water for the McIntosh plant depends on the two existing wells. If one well should fail or become inoperable, a major part of the power generation would be affected.

As a backup to the reuse water that will be used for cooling tower makeup, Unit 5 will utilize the existing 3 well system established for Unit No. 3. The major source of water to Unit 3 is secondary treated wastewater from the City's treatment plant. Three backup wells were established in the event of a temporary interruption of the supply of reuse water. These wells are authorized through Site Certification for Unit 3 to use 0.2166 million gallons per day (mgd) annual average and 5.271 mgd maximum. These wells are identified as Wells 31, 32 and 33. Similar to the conditions for Unit 3, Lakeland is requesting the use of standby Wells 31, 32, and 33 as a backup supply for cooling tower makeup for Unit No. 5 in the event reuse water supply is interrupted. Lakeland is proposing 0.8 mgd annual average and 3.24 mgd maximum withdrawal.

2.3.3 SITE WATER BUDGET AND AREA USERS

2.3.3.1 SITE WATER BUDGET

Components of the existing site water budget include precipitation, evaporation and evapotranspiration (ET), runoff, and groundwater recharge. 30-year average, minimum, and maximum monthly temperatures and precipitation data were collected in the vicinity of the site at Lakeland. The nearest pan evaporation data station is located in Lisbon, FL, approximately 80 miles from the site.

Long-term monthly precipitation and temperature averages, maximums, and minimums are summarized in Table 2-5. The annual precipitation averages 47.73 inches per year with the highest precipitation in the summer months (June, July, and August). The annual temperature averages 72.5 degrees Fahrenheit (°F) with the highest temperature in July and the lowest in January.

2.3.3.2 AREA USERS

The current water use permits issued by SWFWMD (SWFWMD, 1999) for the area within 5 miles of the McIntosh plant are presented in Table 2-6. The table lists permitted water users, sorted numerically by permit number.

2.3.4 SURFICIAL HYDROLOGY

No surface water bodies are located on the 3-acre project site. The McIntosh plant site is located on the northeast shore of 2,300-acre Lake Parker. Lake Parker is designated a Class III water, with associated water quality criteria established for the dual purposes of recreation and the propagation and maintenance of a healthy, well-balanced population of fish and wildlife. Maximum depth is 9.5 feet and is regulated by the Southwest Florida Water Management District's dam on the east shore. The operating level of the lake has been maintained at 130.5 feet MSL since the dam's inception in 1968. The majority of the inflow to Lake Parker is from direct and run-off rainfall from the lake's 12,600 acre drainage area.

Fish Lake is a small (55-acre), closed basin lake located within the eastern property line of the McIntosh plant site. The lake has an average depth of 5 feet, and receives recharge primarily from rainfall and runoff. Because of the low topographic gradients around the lake due to phosphate strip mining and subsequent reclamation of the land to the north, east, and south of the lake, it is estimated that the area of runoff into Fish Lake is approximately 3 to 4 times the surface area. Little interaction occurs between Fish Lake and the shallow groundwater table. Runoff from the coal storage area adjacent to Fish Lake is collected and conveyed to a process wastewater pond to prevent it from entering the lake. On the northern portion of the McIntosh plant site, a 3.5-acre pond identified as Mud Lake, is used and authorized by SWFWMD as part of the existing Unit No. 5 stormwater management system.

The combined cycle unit will not have any liquid waste discharges to any body of water. Adjacent surface water bodies, including Lake Parker, Fish Lake, and Mud Lake, will not be impacted.

2.3.5 VEGETATION/LAND USE

The location of Unit No. 5 consists of about 3 acres of open land (FLUCFCS Code 190). Originally, the site was a laydown area for existing Unit Nos. 1, 2, and 3. It was later turned into a wastewater treatment pond area. Finally, these wastewater treatment ponds were abandoned and planted in Bahia grass (*Paspalum notatum*). The site is surrounded by electrical power facilities (FLUCFCS Code 831), Lake Parker (FLUCFCS Code 522), and reclaimed phosphate mined lands (FLUCFCS 1633). The area designated for the combined cycle additions is adjacent to Unit No. 5 in a previously-cleared parcel of open land currently planted in grass.

Surrounding vegetative communities include small areas of slash pine/mesic oak flatwoods (FLUCFCS Code 414) and xeric oak (FLUCFCS Code 421), located to the north and west of the site. Immediately to the northeast of the site is a 3.5-acre pond (Mud Lake - FLUCFCS Code 542) surrounded by a near-monoculture of cat-tails (*Typha latifolia*).

2.3.6 ECOLOGY

Lake Parker is located south of the McIntosh Plant site. Fish Lake, a lake owned by the City, is to the east surrounded by coal and petroleum coke storage facilities. Fish Lake and the fuel storage facilities are separated from the generating units by East Lake Parker Drive. Both water bodies, although located in a highly urbanized environment, provide habitat for a variety of wetland-dependent bird species. Great blue heron, little blue heron, white ibis, and osprey are commonly observed utilizing these areas. The proposed combined cycle site is a previously-cleared upland planted in grass. Because of the disturbed nature of the land and surrounding industrial land use, the ecological importance and habitat value of the project site is very low. No impacts to the adjacent aquatic habitats are anticipated.

2.3.6.1 SPECIES-ENVIRONMENTAL RELATIONSHIPS

No significant species-environmental relationships occur on the site. Since the site is an upland site, no aquatic organisms are reported to occur on site. The site does not contain any unique upland wildlife species. No federally or state listed species are known to breed or reside on the site. It is possible that opportunistic wading birds including some state listed species of special concern such as white ibis (*Eudocimus albus*) from the nearby Lake Parker may temporarily use the grassy area for feeding on common invertebrate animals. The area for Unit No. 5 is regularly mowed and not unique to the area nor is it a critical food source for wading birds.

2.3.6.2 PRE-EXISTING STRESSES

Pre-existing stresses on the ecology of the McIntosh plant and surrounding area include the conversion of native vegetation to planted Bahia grass, large-scale strip mining conducted by the phosphate industry in the 1940s, construction of roads, and general urbanization of the area.

2.3.6.3 MEASUREMENT PROGRAMS

No ecological impacts are anticipated as a result of the conversion to combined cycle, therefore no measurement programs are required.

2.3.7 METEOROLOGICAL AND AMBIENT AIR QUALITY

The approval for McIntosh Unit No. 5 (both simple cycle and combined cycle operation) was included in the air construction and prevention of significant deterioration (PSD) permit issued by the FDEP (DEP File No. 1050004-004-AC; PSD-FL-245) and a modification to the certification for McIntosh Unit No. 3 (see Appendix 10.4). The important aspects of the PSD approval include the air quality impact analyses performed using an air dispersion model and the best available control technology (BACT) performed to evaluate the selected emission control technology.

The U.S. Environmental Protection Agency (EPA) and FDEP have implemented regulations requiring a PSD review for new or modified sources that increase air emissions above certain threshold amounts. PSD regulations are promulgated under 40 Code of Federal Regulations (CFR) Part 52.21 and implemented through approval of FDEP's program. Florida's PSD regulations are codified in Rule 62-212.400, F.A.C. FDEP regulations incorporate the EPA PSD regulations. The combined cycle portion of McIntosh Unit No. 5 will not be required to undergo PSD review and approval because no increases in emissions are proposed for this emission unit. The emissions from the proposed cooling tower will be below the PSD review thresholds.

2.3.7.1 METEOROLOGY

The closest existing meteorological station to the site with complete meteorological data is the primary National Weather Service (NWS) station located at the Tampa International Airport situated approximately 64 km (40 miles) to the west-southwest of the McIntosh site. NWS has recorded weather observations for more than 40 years at this site, and these data are the most complete for and representative of the region surrounding the proposed project.

The climate in the Tampa area, including the project site, is subtropical with a marine influence from the Gulf of Mexico. The mean annual temperature is approximately 22°C (72°F) with monthly temperatures varying from a maximum of 32.2°C (90.0°F) to a minimum of 10.7°C (51.3°F). Record extreme temperatures range from a low of -7.8°C (18°F) to a record high of 37°C (99°F). Although the sun's elevation is nearly zenith during the summertime, temperatures do not exceed 38°C (100°F). The reason can be attributed to the high relative humidities with subsequent cloud cover formation and the abundant convective-type precipitation.

Relative humidities indicate the amount of moisture in the air at a given temperature. The highest humidities are coincident with the coolest ambient temperatures, which generally occur at 0700, or near dawn. The lowest humidities coincide with the highest ambient temperatures.

The mean annual precipitation is approximately 122 cm (48 inches), but this has varied from as little as 74 cm (29 inches) to over 193 cm (76 inches) in the past 46 years. The majority of rain is in the form of short-lived convection showers. Approximately 69 percent of the annual precipitation falls during the 6 warmest months, May through October.

The Tampa area lies entirely within the trade wind belt (i.e., below 30 N latitude), resulting in predominant winds from the east. However, because of the location of the Gulf of Mexico, moderate to strong late afternoon sea breezes occur on days with strong land heating producing local onshore winds (i.e., wind with a westerly component). Annual and seasonal windroses for the 5-year period from 1988 through 1989 are given in Figure 2-2.

Atmospheric stability is a measure of the atmosphere's capability to disperse pollutants. During the daytime with strong insolation, the atmosphere can disperse pollutants very quickly for a relatively short period of time. This condition is considered as very unstable and generally occurs infrequently during the year. During the nighttime under clear skies and light wind speeds, the atmosphere is considered stable with minimal potential to disperse pollutants.

Under moderate to high wind speeds, pollutants are dispersed at moderate rates under neutral conditions, which are generally more prevalent throughout the year and can occur any time throughout the day.

During the summer months, unstable stability occurs nearly 40 percent of the time due to strong insolation, whereas unstable stability occurs only 16 percent of the time in the winter months. Neutral stability occurs most frequently during the winter months due to the higher wind speeds in this season. The occurrence of stable stability is nearly uniform throughout the year, with a maximum occurrence of approximately 47 percent in the fall.

The mixing height is a parameter used to define the vertical height to which pollutants can disperse and, therefore, is used in estimating the volume of air in which pollutants are emitted and can be dispersed. In general, the higher the mixing height, the greater the potential for pollutants to be dispersed. The annual morning mixing depth is about 600 m while the annual afternoon mixing depth is about 1,300 m. The highest afternoon mixing depths occur in the spring (1,500 m) and the lowest morning depths occur in mid-winter (500 m).

Thunderstorms are the most frequent of severe storms, occurring an average of 87 days per year. These storms occur throughout the year, but about 88 percent occur from May through October.

In the 80-km (50-mile) coastal strip from above Pinellas County to Tampa Bay, there is less than a 10 percent chance that a tropical storm will pass over the Bay area during any given year. For storms of hurricane strength [i.e., wind speeds exceeding 117 km/hr (73 mph)], the chance decreases to 1 in 16 (i.e., 6.2 percent) with a 1 percent chance that the winds will be greater than 200 km/hr (124 mph) (i.e., wind speeds of a great hurricane).

Statistics compiled by the Severe Local Storms (SELS) branch of the National Severe Storms Forecast Center show that 42 tornadoes were spotted within the 1E latitude by 1E longitude square centered just south of the Tampa area from 1955 to 1967. This averages approximately two tornadoes per year. The tornado recurrence interval for any specific point location within the 1E square was estimated to be 740 years. Therefore, the mean recurrence interval for a tornado striking a point within this square is 740 years. The most common tornado month is June.

2.3.7.2 AMBIENT AIR QUALITY

The existing applicable national and Florida AAQS are presented in Table 2-7. Primary national AAQS were promulgated to protect the public health, and secondary national AAQS were promulgated to protect the public welfare from any known or anticipated adverse effects associated with the presence of pollutants in the ambient air. Areas of the country in violation of AAQS are designated as nonattainment areas, and new sources to be located in or near these areas may be subject to more stringent air permitting requirements.

The project site is located in Polk County, which has been designated by EPA and FDEP as an attainment or unclassifiable area for all criteria pollutants. Monitoring has been performed by FDEP at several stations in Polk County measuring criteria air pollutants. This included PM_{10}, ozone and sulfur dioxide. The annual average PM10 concentrations are about 25 $\mu g/m^3$ or less over the last several years, compared to the AAQS of 50 $\mu g/m^3$. The maximum observed 24-hour concentrations of PM10 were in the range from about 30 to 80 $\mu g/m^3$ compared to the AAQS of 150 $\mu g/m^3$. For sulfur dioxide the annual average concentrations were less than 20 $\mu g/m^3$ compared to the AAQS of 60 $\mu g/m^3$, while the maximum observed 24-hour concentrations were in the range from about 50 to 90 $\mu g/m^3$, compared to the AAQS of 260 $\mu g/m^3$. Hillsborough and Pinellas Counties were redesignated by EPA from a moderate ozone nonattainment area to an air quality maintenance area. The maximum ozone measurements in Lakeland indicate that the ozone levels are lower than those in the more urbanized counties.

The EPA PSD increment classifications were designated based on criteria established in the 1977 Clean Air Act Amendments. Specified numerical increments of net air pollution increases were permitted under each Class up to a level considered to be significant for that area. Class I areas allow only minor air quality deterioration, and include national parks, national wilderness areas, and memorial parks larger than 5,000 acres. Class II areas allow for moderate deterioration, and include all areas that are not designated as Class I areas.

Polk County and surrounding counties are designated as PSD Class II areas for SO_2, PM_{10}, and NO_2. The site is located approximately 90 km (60 miles) from the closest part of the Chassahowitzka National Wilderness Area (NWA), a PSD Class I area.

Under Federal and State of Florida PSD review requirements, all major new or modified sources of air pollutants regulated under the Clean Air Act (CAA) must be reviewed and a preconstruction permit issued. Florida's State Implementation Plan (SIP), which contains PSD regulations, has been approved by EPA; therefore, PSD approval authority has been granted to FDEP.

EPA has established, through rules, allowable "increments," which are increases above an air quality baseline concentration level of SO_2, PM10, and NO_2, above which would constitute significant deterioration. The EPA PSD class designations and allowable PSD increments are presented in Table 2-7. The State of Florida has adopted the EPA PSD class designations and allowable PSD increments for SO_2, PM10, and NO_2 increments. Table 2-7 presents the EPA and FDEP significant impact levels; impact from sources less than these levels are not required to conduct detailed modeling analyses.

The EPA has proposed significant impact levels for Class I areas. The National Park Service (NPS), USFWS, or US Forest Service are the designated agencies for oversight in air quality impacts to Class I areas. The proposed levels are shown below:

Pollutant	Averaging Time	Proposed EPA PSD Class I Significant Impact Levels (ug/m^3)
SO_2	3-hour	1
	24-hour	0.2
	Annual	0.1
PM10	24-hour	0.3
	Annual	0.2
NO_2	Annual	0.1

[a] $\mu g/m^3$ = micrograms per cubic meter.

Although these levels have not been officially promulgated as part of the PSD review process and may not be binding for states in performing PSD review, the proposed levels serve as a guideline in assessing a source's impact in a Class I area. The EPA action to incorporate Class I significant impact levels in the PSD process is part of implementing NSR provisions of the 1990 CAA Amendments. Because the process of developing the regulations will be lengthy, EPA believes that the proposed rules concerning the significant impact levels is appropriate in order to assist states in implementing the PSD permit process.

PSD review is used to determine whether significant air quality deterioration will result from the new or modified facility. Federal PSD requirements are contained in 40 CFR 52.21, Prevention of Significant Deterioration of Air Quality. The State of Florida has adopted PSD regulations that are similar to federal regulations (Rule 62-212.400, F.A.C.). Major facilities and major modifications are required to undergo the following analyses related to PSD for each pollutant emitted in significant amounts:

1. Control technology review including Best Available Control Technology,
2. Source impact analysis,
3. Air quality analysis (monitoring),

4. Source information, and
5. Additional impact analyses.

These analyses were conducted for McIntosh Unit No. 5 with the exception of a modeling analysis for the combined cycle configuration. In addition to these analyses, a new facility also must be reviewed with respect to GEP stack height regulations. The 1977 CAA Amendments require that the degree of emission limitation required for control of any pollutant not be affected by a stack height that exceeds GEP or any other dispersion technique. On July 8, 1985, EPA promulgated final stack height regulations (EPA, 1985a). Identical regulations have been adopted by FDEP (Rule 62-210.550, F.A.C.). GEP stack height is defined as the highest of:

1. 65 meters (m); or
2. A height established by applying the formula:

$$Hg = H + 1.5L$$

where: Hg = GEP stack height,
H = Height of the structure or nearby structure, and
L = Lesser dimension (height or projected width) of nearby structure(s); or

3. A height demonstrated by a fluid model or field study.

"Nearby" is defined as a distance up to five times the lesser of the height or width dimensions of a structure or terrain feature, but not greater than 0.8 km.

Ambient air monitoring for a period of up to 1 year generally is appropriate to satisfy the PSD monitoring requirements. A minimum of 4 months of data is required. Existing data from the vicinity of the proposed source may be used if the data meet certain quality assurance requirements; otherwise, additional data may need to be gathered. The regulations include an exemption that excludes or limits the pollutants for which an air quality analysis must be conducted. This rule provides an exemption for a proposed major stationary facility or major modification from the monitoring requirements with respect to a particular pollutant if the emissions increase of the pollutant from the facility or modification would cause, in any area, air quality impacts less than the *de minimis* levels. The impacts for both the simple cycle and combined cycle configurations are less than *de minimis* levels (see Section 5.6 for combined cycle impacts).

The air quality impacts for the simple cycle portion of Unit No. 5 are presented in Tables 2-8 and 2-9. As shown in these tables, the impacts of the existing unit are below the EPA and FDEP significant impact levels and the proposed EPA significant impact levels for Class I areas, and therefore the emissions do not cause or contribute to any exceedance of an AAQS or PSD increment.

2.3.7.3 MEASUREMENT PROGRAMS

Ambient air quality monitoring was not required for the simple cycle portion of Unit No. 5. PSD review is not required for conversion to steam cycle, and therefore monitoring is not required.

2.3.8 NOISE

2.3.8.1 Noise Standards and Guidelines

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

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

where: Pe = measured effective pressure of sound wave in micropascals (Pa), and

Po = reference effective pressure of 20 μPa.

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

The City of Lakeland has a qualitative noise control ordinance adopted January 5, 1998 and codified in Chapter 70, Article II. Noise Control. The ordinance prohibits noise disturbance. Noise disturbance is defined as:

1. Excessive in amount of such duration, wave frequency or intensity as may be or is injurious to human or animal life or property;
2. Excessive or unnecessary in amount, level or duration as to unreasonably interfere with the comfortable enjoyment of life, property or the conduct of business; or
3. Of such character and in such quantity or level as to be detectable by a considerable number of persons or the public, so as to interfere with such persons' or the public health, repose or safety, or to cause severe annoyance or discomfort, or which interferes with normal conduct of business, or is otherwise detrimental or harmful to the health, comfort, living conditions, welfare and safety of the inhabitants of Lakeland.

The ordinance also provides for certain exemptions, which includes maintenance of public service facilities. This exemption would apply to the McIntosh Unit No. 5 when maintenance is being performed.

The State of Florida has not promulgated noise standards. The U.S. Environmental Protection Agency has developed indoor and outdoor noise criteria for various land use as a guide for protecting public health and welfare. The noise criteria relate to the short-term to short-term and day-night average sound pressure levels (SPLs). The two criteria are the L_{eq} and the L_{dn}. The L_{eq} is the equivalent sound energy over a measurement period that includes the varying sound energy over the same period. The Ldn is the 24-hour average SPL calculated for two periods of a day. These include daytime noise from 7:00 A.M. to 10:00 P.M. which is based on the actual SPL and the nighttime noise from 10:00 P.M. to 7:00 A.M. which is based on the SPL plus 10 dBA. For industrial, commercial, recreational and general unpopulated land EPA recommends an Leq of 70 dBA. For residential areas EPA recommends an Ldn of 55 dBA.

2.3.8.2 Noise Measurement Procedures

A comprehensive ambient noise monitoring program was performed at nine locations on or near the McIntosh site. The equipment used to monitor the baseline noise levels operated in the slow response mode to obtain accurate, integrated, A-weighted sound pressure levels. A windscreen was used because all measurements were taken outdoors. The microphone was positioned so that a random incidence response, as specified by the American National Standard Institute (ANSI), was achieved. The sound level meter and octave band analyzer were calibrated immediately prior to and just after the sampling period to provide a quality control check of the sound level meter's operation during monitoring. Integrated sound pressure level (SPL) data consisting of the following noise parameters were collected at each location:

- L_{eq} The sound pressure level averaged over the measurement period; this parameter is the continuous steady sound pressure level that would have the same total acoustic energy as the real fluctuating noise over the same time period;
- Max The maximum sound pressure level for the sampling period; and
- Min The minimum sound pressure level for the sampling period.

Monitoring was conducted using the sound level meter mounted on a tripod at a height of 1.2 m (4 ft) above grade. Local wind speed and temperature were measured by a hand-held anemometer and thermometer during the monitoring period. Detailed field notes were recorded by the operator during monitoring and included the local meteorological parameters and major noise sources.

A comprehensive baseline noise analysis survey to assess the existing ambient noise levels in the project area was conducted on February 18 and 19, 1999. SPL data were collected at nine different locations for 15 minutes at each site using ASTM measurement techniques. The noise monitoring equipment used during the survey included:

1. Continuous Noise Monitoring Equipment
   a. Bruel & Kjaer (B&K) Type 2230 Precision Integrating Sound Level Meter
   b. B&K Type 1624 Octave Band Filter
   c. B&K Type 2639 Microphone Preamplifier
   d. B&K Type 4155 Prepolarized Condenser Microphone
   e. Windscreen, tripod, and various cables
2. Sound Level Meter Calibration Unit
   a. B&K Type 4230 Sound Level Calibrator, 94 decibels (dB @ 1,000 hertz (Hz).

The B&K Type 2230 sound level meter complies with Type I--Precision requirements set forth by ANSI S1.4 for sound level meters.

Of the nine monitoring locations, three (Sites 1, 2, and 3) were chosen to delineate the nearfield noise levels from the existing plant operations. The other six monitoring sites (Sites 4, 5, 6, 7, 8 and 9) were selected to determine the baseline noise levels at various receiving land use categories (e.g., residential and commercial). Noise monitoring was performed during the daytime (7 a.m. to 10 p.m.) and nighttime (10 p.m. to 7 a.m.) at each site to determine the existing background noise levels.

Ambient SPLs were measured at various daytime and nighttime hours for a minimum of 15 consecutive minutes at each of the nine sites. The L_{eq} (equivalent sound pressure level averaged for the sampling period) as well as the maximum and minimum SPLs during each monitoring episode were recorded and are presented in Table 2-10. The average minimum, maximum, and L_{eq} SPLs for each site were calculated. The SPL averages were calculated using the following formula:

$$\text{Average SPL} = 10\ \text{Log}\ \frac{\sum_{i-1}^{N} 10^{(SPL1/10)}}{N}$$

where: N = number of observations.

SPL_i = individual sound pressure level in data set.

Also included in Appendix 10.5.2, are the noise monitoring data field sheets and show the wind speed, wind direction, and microphone orientation as well as comments on events and observations occurring during the monitoring program. The steam units associated with the McIntosh plant were operating but Unit No. 5 simple-cycle was still being constructed. The SPL data were analyzed and reported in A-weighted decibels (dBA). The higher the decibel value, the louder the sound.

2.3.8.3 EXISTING AMBIENT SOUND PRESSURE LEVEL CONDITIONS

The daytime and nighttime ambient noise levels, measured as an equivalent sound pressure level (L_{eq}), for each of the monitoring sites are indicated in Table 2-10. The highest L_{eq} noise levels measured during the study at location off the McIntosh site, for the daytime and nighttime periods were 65.4 dBA and 56.0 dBA at Site 7. The elevated daytime and nighttime noise levels at Site 7 were due to the persistent vehicular traffic on Lake Parker Drive. Indeed, without the influence of the traffic, the L_{eq} for Site 7 drops from the measured value of 65.4 dBA to 45.8 dBA in the daytime and from 56.0 dBA to 40.1 dBA in the nighttime. Site 7 is located adjacent to a retirement community, and can be considered the most sensitive area in the vicinity of the plant with respect to noise impacts.

The daytime noise levels (Leq) on the McIntosh plant site ranged from 64.0 dBA at the northern plant entrance to 50.6 at the western boundary. The nighttime noise levels on the McIntosh plant site ranged from 58.2 dBA at administration building to 47.3 at the western boundary. The noise levels observed at the plant site generally did not fluctuate as greatly as the offsite receptors. The continuous noise sources at the plant, such as the power plant operations and cooling towers, produce steady noise levels compared to traffic related noise observed at the other sites.

2.3.9 OTHER ENVIRONMENTAL FEATURES

As an existing generating plant, the McIntosh Plant has ongoing programs of renovation and upgrading existing facilities that will be ongoing prior to commencement of construction of the steam cycle for Unit No. 5.

2.4 REFERENCES

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Table 2-1. 1998 Labor Force, Employment, and Unemployment in Polk County, Florida, and the United States

Location	Labor Force	Employment	Unemployment	Unemployment Rate (%)
Polk County	196,596	184,467	12,129	6.2
Florida	7,213,000	6,901,000	311,000	4.3
United States	136,967,000	130,150,000	6,816,000	5.0

Source: 1998 Florida Statistical Abstract, Bureau of Economic and Business Research, Warrington College of Business Administration, University of Florida. 1998.

Table 2-2. Industry Employment for Polk County, 1996-1997

Industry	1996 Employment	1997 Employment	Annual Growth Rate (%)	National Average (%)
Agriculture, Forestry, and Fishing	10,140	9,660	-4.73	-0.10
Mining	3,392	3,035	-10.5	NA
Construction	8,463	8,760	3.5	0.90
Manufacturing	20,970	20,624	-1.6	-0.20
Transportation and Public Utilities	8,422	8,293	-1.5	1.30
Wholesale Trade	7,950	8,338	4.9	1.10
Retail Trade	37,552	38,197	1.7	1.00
Finance, Insurance and Real Estate	7,397	7,553	2.1	1.00
Services	40,389	41,488	2.7	2.90
TOTAL	144,675	145,948	0.88	1.30

Source: *1998 Florida Statistical Abstract.* Bureau of Economic and Business Research, Warrington College of Business Administration, University of Florida.

Table 2-3. Personal Income Data for Polk County, 1990-1996.

Year	Per Capita Income (Polk County)	Annual Increase (Percent)	Per Capita Income (State of Florida)	Annual Increase (Percent)
1996	$19,905	4.9	$24,198	4.6
1995	$18,977	5.1	$23,139	5.3
1994	$18,061	5.5	$21,979	3.0
1993	$17,121	4.4	$21,340	6.4
1992	$16,396	4.1	$20,060	2.5
1991	$15,749	2.3	$19,569	2.0
1990	$15,401	-	$19,185	-
AVERAGE	$17,373	4.4	$21,353	4.0

Source: Bureau of Economic and Business Research, *1998 Florida Statistical Abstract*, University of Florida Warrington College of Business Administration, 1998.

Table 2-4. Florida Department of Environmental Protection Floridan Aquifer Groundwater Quality Monitoring for Polk County (1991)

Surficial Aquifer Parameters	Units	Groundwater Quality Standard	Average Value	Standard Deviation	Range	
					Minimum	Maximum
pH	SU	-	7.5749	0.488	6.400	8.300
Arsenic	mg/L	0.05	0.0005	0.001	0.000	0.002
Chloride	μg/L	250	8.3770	3.151	4.460	17.500
Fluoride	mg/L	2.0	0.2069	0.150	0.000	0.589
Nitrate	mg/L	10.0	0.0139	0.024	0.000	0.110
Selenium	μg/L	0.01	0.0000	0.000	0.000	0.000
Sodium	mg/L	160	7.4638	5.652	3.000	32.600
Sulfate	mg/L	250	6.5738	14.434	0.000	81.500
TDS	mg/L	500	152.3439	61.543	58.000	289.000
Other Metals						
Barium	mg/L	1.0	0.0034	0.012	0.000	0.052
Cadmium	mg/L	0.010	0.0005	0.001	0.000	0.003
Chromium	mg/L	0.05	0.0000	0.000	0.000	0.002
Copper	mg/L	1.0	0.0044	0.007	0.000	0.029
Iron	mg/L	0.3	0.6904	1.106	0.000	4.550
Lead	mg/L	0.05	0.0147	0.042	0.000	0.190
Manganese	mg/L	0.05	0.0193	0.029	0.000	0.110
Mercury	mg/L	0.002	0.0001	0.000	0.000	0.001
Silver	mg/L	0.05	0.0006	0.003	0.000	0.014
Zinc	mg/L	5.0	0.0176	0.021	0.000	0.092
Organics						
Endrin	μg/L	0.2	0.0000	0.000	0.000	0.000
Methoxychlor	μg/L	100.0	0.0000	0.000	0.000	0.000
Toxaphene	μg/L	5.0	0.0000	0.000	0.000	0.000
2,4-D	μg/L	100	0.0000	0.000	0.000	0.000
2,4,5-TP, silvex	μg/L	10	0.0000	0.000	0.000	0.000
Benzene	μg/L	1.0	0.0649	0.321	0.000	1.900
Carbon tetrachloride	μg/L	3.0	0.0135	0.082	0.000	0.500
Ethylene dibromide	μg/L	0.02	0.0000	0.000	0.000	0.000
Tetrachloroethene	μg/L	3.0	0.0135	0.082	0.000	0.500
Trichloroethene	μg/L	3.0	0.0135	0.082	0.000	0.500
Vinyl chloride	μg/L	1.0	0.0135	0.082	0.000	0.500
1,2-Dichloroethane	μg/L	3.0	0.0135	0.082	0.000	0.500
1,1,1-Trichloroethane	μg/L	0.2	0.0135	0.082	0.000	0.500

Note: SU = standard units

Table 2-5. Normal Precipitation and Temperature, Measured at Lakeland, Florida 1960-1991

Month	Temperature (°F)			Precipitation (inches)
	Average	Minimum	Maximum	Average
January	60.1	49.6	70.6	2.22
February	62.1	51.2	72.9	3.04
March	67.2	56.3	78.1	3.44
April	71.9	60.8	83.1	1.35
May	77.1	66.4	87.8	4.26
June	80.8	71.2	90.5	6.76
July	82.2	72.6	91.7	7.11
August	82.2	72.9	91.5	7.63
September	80.7	71.8	89.7	5.74
October	74.8	65.4	84.2	1.95
November	67.9	58.0	77.7	2.05
December	62.5	52.2	72.7	2.18
Annual	72.5	62.4	82.5	47.73

Source: NCDC, 1999.

Table 2-6. List of Water Use Permits Within 5 Miles of the McIntosh Power Plant

Permit #	Withdrawal Use Description	Section	Township	Range	Ground/Surface	Permitted Quantity (Gallons/day)
4705	INDUSTRIAL & COMMERCIAL	5	28S	24E	G	1
4705	INDUSTRIAL & COMMERCIAL	4	28S	24E	S	1
4705	INDUSTRIAL & COMMERCIAL	4	28S	24E	S	1
4705	INDUSTRIAL & COMMERCIAL	5	28S	24E	G	1
13703	RECREATION/AESTHETIC	36	28S	23E	G	44700
16702	AGRICULTURAL	23	29S	24E	G	32600
22502	INDUSTRIAL & COMMERCIAL	17	28S	23E	G	488000
22502	INDUSTRIAL & COMMERCIAL	20	28S	23E	G	262000
29503	INDUSTRIAL & COMMERCIAL	16	28S	24E	S	100000
29503	INDUSTRIAL & COMMERCIAL	16	28S	24E	S	410000
29503	INDUSTRIAL & COMMERCIAL	16	28S	24E	S	410000
29503	INDUSTRIAL & COMMERCIAL	16	28S	24E	S	410000
46902	AGRICULTURAL	16	29S	24E	G	23300
53302	AGRICULTURAL	12	29S	23E	G	24000
64803	AGRICULTURAL	11	29S	24E	G	41500
76502	AGRICULTURAL	16	29S	24E	G	95000
76502	AGRICULTURAL	15	29S	24E	G	110000
76502	AGRICULTURAL	15	29S	24E	G	110000
84902	AGRICULTURAL	17	29S	24E	G	28300
86104	AGRICULTURAL	8	29S	24E	G	700
88102	AGRICULTURAL	16	29S	24E	G	58900
106804	INDUSTRIAL & COMMERCIAL	14	29S	24E	G	18700
127402	AGRICULTURAL	23	29S	24E	G	75200
128702	AGRICULTURAL	20	29S	24E	G	16500
128803	AGRICULTURAL	8	29S	24E	G	2000
129103	AGRICULTURAL	9	29S	24E	G	1600
129402	AGRICULTURAL	14	29S	24E	G	14700
129702	AGRICULTURAL	15	29S	24E	G	30100
129903	AGRICULTURAL	9	29S	24E	G	8700
130104	AGRICULTURAL	10	29S	24E	G	17900
139602	AGRICULTURAL	17	29S	24E	G	58000
152702	AGRICULTURAL	16	29S	24E	G	600

Table 2-6. List of Water Use Permits Within 5 Miles of the McIntosh Power Plant

Permit #	Withdrawal Use Description	Section	Township	Range	Ground/Surface	Permitted Quantity (Gallons/day)
153703	AGRICULTURAL	15	28S	23E	G	14300
155402	INDUSTRIAL & COMMERCIAL	28	28S	24E	G	8000
176102	AGRICULTURAL	2	29S	24E	G	29700
182402	AGRICULTURAL	21	29S	24E	G	27000
182502	RECREATION/AESTHETIC	9	29S	24E	G	2300
183202	AGRICULTURAL	10	29S	24E	G	52000
183303	RECREATION/AESTHETIC	16	29S	24E	G	2300
186203	RECREATION/AESTHETIC	35	27S	24E	G	1000
186203	PUBLIC SUPPLY	34	27S	24E	G	1000
186203	RECREATION/AESTHETIC	35	27S	24E	G	1740
188002	AGRICULTURAL	13	29S	23E	G	22100
195404	AGRICULTURAL	35	27S	23E	G	486400
195404	AGRICULTURAL	35	27S	23E	G	227000
195404	AGRICULTURAL	34	27S	23E	G	23000
206701	AGRICULTURAL	7	29S	24E	G	2400
265502	AGRICULTURAL	34	28S	24E	G	7900
265602	AGRICULTURAL	2	29S	24E	G	237600
293203	AGRICULTURAL	3	35S	23E	G	233400
323304	RECREATION/AESTHETIC	4	29S	24E	G	18000
323304	RECREATION/AESTHETIC	4	29S	24E	G	3000
329102	AGRICULTURAL	28	28S	24E	G	47600
354202	RECREATION/AESTHETIC	13	29S	23E	G	20000
363802	INDUSTRIAL & COMMERCIAL	28	28S	24E	G	28800
491203	PUBLIC SUPPLY	12	28S	23E	G	4000000
491203	PUBLIC SUPPLY	10	28S	23E	G	4000000
491203	PUBLIC SUPPLY	2	28S	23E	G	4000000
491203	PUBLIC SUPPLY	2	28S	23E	G	4000000
491203	PUBLIC SUPPLY	2	28S	23E	G	4000000
491203	PUBLIC SUPPLY	2	28S	23E	G	4000000
491203	PUBLIC SUPPLY	2	28S	23E	G	4000000
491203	PUBLIC SUPPLY	2	28S	23E	G	4000000
491203	PUBLIC SUPPLY	2	28S	23E	G	4000000

Table 2-6. List of Water Use Permits Within 5 Miles of the McIntosh Power Plant

Permit #	Withdrawal Use Description	Section	Township	Range	Ground/Surface	Permitted Quantity (Gallons/day)
491203	PUBLIC SUPPLY	2	28S	23E	G	4000000
491203	PUBLIC SUPPLY	2	28S	23E	G	4000000
491203	PUBLIC SUPPLY	2	28S	23E	G	4000000
491203	PUBLIC SUPPLY	11	28S	23E	G	4000000
579805	INDUSTRIAL & COMMERCIAL	16	28S	23E	G	11200
579805	INDUSTRIAL & COMMERCIAL	21	28S	23E	G	471900
579805	INDUSTRIAL & COMMERCIAL	21	28S	23E	G	600800
579805	INDUSTRIAL & COMMERCIAL	16	28S	23E	S	34300
592702	INDUSTRIAL & COMMERCIAL	20	28S	23E	G	1000
592702	INDUSTRIAL & COMMERCIAL	20	28S	23E	G	1000
606902	AGRICULTURAL	34	27S	23E	G	11600
615603	PUBLIC SUPPLY	34	27S	23E	G	6500
644202	AGRICULTURAL	33	27S	24E	G	21500
648502	AGRICULTURAL	21	29S	24E	G	14800
648602	AGRICULTURAL	11	29S	24E	G	22200
650603	PUBLIC SUPPLY	23	29S	24E	G	110500
650603	PUBLIC SUPPLY	24	29S	24E	G	31600
650603	PUBLIC SUPPLY	16	29S	24E	G	234000
675202	AGRICULTURAL	15	28S	24E	G	23400
685801	AGRICULTURAL	3	28S	23E	G	41700
685902	AGRICULTURAL	3	28S	23E	G	25800
709201	AGRICULTURAL	4	28S	23E	G	33000
709201	AGRICULTURAL	4	28S	23E	G	11000
715401	AGRICULTURAL	11	29S	24E	G	58000
733701	AGRICULTURAL	18	29S	24E	G	200
736002	AGRICULTURAL	14	29S	24E	G	14000
736002	AGRICULTURAL	14	29S	24E	G	15500
739301	AGRICULTURAL	3	29S	24E	G	5000
739301	AGRICULTURAL	2	29S	24E	G	35000
751401	AGRICULTURAL	22	29S	24E	G	13000
753401	AGRICULTURAL	10	29S	24E	G	11000
756201	AGRICULTURAL	24	28S	23E	G	12000

Table 2-6. List of Water Use Permits Within 5 Miles of the McIntosh Power Plant

Permit #	Withdrawal Use Description	Section	Township	Range	Ground/Surface	Permitted Quantity (Gallons/day)
759001	RECREATION/AESTHETIC	2	29S	24E	G	12000
764501	AGRICULTURAL	7	29S	24E	G	13000
789105	AGRICULTURAL	7	33S	21	G	100000
796302	RECREATION/AESTHETIC	35	27S	23E	G	94000
796302	RECREATION/AESTHETIC	35	27S	23E	G	24000
800401	AGRICULTURAL	29	28S	24E	G	18400
809903	AGRICULTURAL	17	29S	23E	G	272900
811601	RECREATION/AESTHETIC	15	28S	24E	G	25200
830101	RECREATION/AESTHETIC	14	28S	23E	G	53800
830101	INDUSTRIAL & COMMERCIAL	23	28S	23E	G	11300
830101	INDUSTRIAL & COMMERCIAL	23	28S	23E	G	11300
830101	INDUSTRIAL & COMMERCIAL	14	28S	23E	G	2800
830101	INDUSTRIAL & COMMERCIAL	14	28S	23E	G	3900
837102	RECREATION/AESTHETIC	22	28S	24E	S	67000
837102	RECREATION/AESTHETIC	22	28S	24E	S	1000
846702	RECREATION/AESTHETIC	30	28S	24E	G	416600
864502	AGRICULTURAL	34	27S	24E	G	153000
864502	AGRICULTURAL	34	27S	24E	G	115000
864502	AGRICULTURAL	34	27S	24E	G	1200
879603	RECREATION/AESTHETIC	35	27S	23E	G	26400
879603	RECREATION/AESTHETIC	35	27S	23E	G	7000
889001	INDUSTRIAL & COMMERCIAL	25	28S	24E	G	2000
891802	AGRICULTURAL	23	29S	24E	G	46600
894301	AGRICULTURAL	22	29S	24E	G	31100
897601	RECREATION/AESTHETIC	2	28S	23E	G	19400
900701	RECREATION/AESTHETIC	12	28S	24E	G	196000
912302	RECREATION/AESTHETIC	21	29S	23E	G	16500
913101	INDUSTRIAL & COMMERCIAL	28	28S	23E	G	6800
922501	RECREATION/AESTHETIC	36	28S	23E	G	22500
923601	AGRICULTURAL	12	29S	23E	G	16300
925701	AGRICULTURAL	10	29S	24E	G	77500
948201	AGRICULTURAL	16	29S	24E	G	15800

Table 2-6. List of Water Use Permits Within 5 Miles of the McIntosh Power Plant

Permit #	Withdrawal Use Description	Section	Township	Range	Ground/Surface	Permitted Quantity (Gallons/day)
996100	RECREATION/AESTHETIC	26	28S	23E	G	284000
1015600	AGRICULTURAL	9	29S	24E	G	22000
1016300	PUBLIC SUPPLY	14	28S	24E	G	3000
1027300	RECREATION/AESTHETIC	9	29S	24E	G	1300
1062400	INDUSTRIAL & COMMERCIAL	28	28S	24E	G	5000
1065500	AGRICULTURAL	20	29S	24E	G	1100
1073102	MINING & DEWATERING	8	29S	23E	S	155000
1073102	MINING & DEWATERING	8	29S	23E	S	24000
1077001	INDUSTRIAL & COMMERCIAL	28	28S	24E	G	152000
1082600	RECREATION/AESTHETIC	15	28S	23E	G	29000
1082600	RECREATION/AESTHETIC	15	28S	23E	S	145000
1082600	RECREATION/AESTHETIC	16	28S	23E	S	145000
1111301	RECREATION/AESTHETIC	35	27S	23E	G	17000
1119500	AGRICULTURAL	14	29S	23E	G	12200
1120400	AGRICULTURAL	8	29S	24E	G	15900
1141900	INDUSTRIAL & COMMERCIAL	32	28S	23E	G	7200
1145600	AGRICULTURAL	7	29S	24E	G	14300
1146801	RECREATION/AESTHETIC	31	27S	24E	S	475000
1166200	AGRICULTURAL	16	28S	24E	S	14000
1167101	RECREATION/AESTHETIC	35	27S	23E	S	16600
1167101	RECREATION/AESTHETIC	35	27S	23E	S	16600
1169300	RECREATION/AESTHETIC	11	29S	24E	G	244900
1169300	AGRICULTURAL	2	29S	24E	G	27000
1174000	RECREATION/AESTHETIC	34	27S	23E	G	60700

Table 2-7. National and State AAQS, Allowable PSD Increments, and Significant Impact Levels

Pollutant	Averaging Time	National AAQS ($\mu g/m^3$) Primary Standard	National AAQS ($\mu g/m^3$) Secondary Standard	Florida AAQS [a] ($\mu g/m^3$)	PSD Increments ($\mu g/m^3$) [a] Class I	PSD Increments ($\mu g/m^3$) [a] Class II	Significant Impact Levels[b] ($\mu g/m^3$) Class II	Significant Impact Levels[b] ($\mu g/m^3$) Class I (Proposed)
Particulate Matter [c] (PM10)	Annual Arithmetic Mean	50	50	50	4	17	1	0.2
	24-Hour Maximum	150	150	150	8	30	5	0.3
Sulfur Dioxide	Annual Arithmetic Mean	80	NA	60	2	20	1	0.1
	24-Hour Maximum	365	NA	260	5	91	5	0.2
	3-Hour Maximum	NA	1,300	1,300	25	512	25	1
Carbon Monoxide	8-Hour Maximum	10,000	10,000	10,000	NA	NA	500	NA
	1-Hour Maximum	40,000	40,000	40,000	NA	NA	2,000	NA
Nitrogen Dioxide	Annual Arithmetic Mean	100	100	100	2.5	25	1	0.1
Ozone [c]	1-Hour Maximum [d]	235	235	235	NA	NA	NA	NA
Lead	Calendar Quarter Arithmetic Mean	1.5	1.5	15	NA	NA	NA	NA

Note: Particulate matter (PM10) = particulate matter with aerodynamic diameter less than or equal to 10 micrometers.
NA = Not applicable, i.e., no standard exists.

[a] Short-term maximum concentrations are not to be exceeded more than once per year.

[b] Maximum concentrations are not to be exceeded.

[c] On July 18, 1997, EPA promulgated revised AAQS for particulate matter and ozone. For particulate matter, PM2.5 standards were introduced with a 24-hour average standard of 65 $\mu g/m^3$ (based on the 3-year averages of the 98th percentile values) and an annual standard of 15 $\mu g/m^3$ (3-year averages at community monitors). The form of the 24-hour PM10 standard was changed; compliance is based on 3-year average of 99th percentile concentrations that is 150$\mu g/m^3$ or less. The O_3 standard was modified to be 0.08 ppm for the 8-hour average; achieved when the 3-year average of 99th percentile values is 0.08 ppm or less. The rules establishing these standards became effective in November 1997 but they will not require state controls through approved State Implementation Plans for O_3 until 2004 and for PM2.5 until 2005. Compliance will not be enforced until 2007 for O_3 and 2008 for PM2.5. FDEP has not yet adopted these standards. On June 5, 1998, EPA issued the final rule identifying areas where the 1-hour national AAQS for O_3 is no longer applicable.

[d] 0.12 ppm; achieved when the expected number of days per year with concentrations above the standard is fewer than 1.

Sources: Federal Register, Vol. 43, No. 118, June 19, 1978.
Federal Register, Vol. 63, No. 108, June 5, 1998.
40 CFR 50; 40 CFR 52.21.
Chapter 62-204, F.A.C.

Table 2-8. Maximum Pollutant Concentrations Predicted for City of Lakeland- McIntosh Unit No. 5 Simple Cycle

Pollutant	Averaging Time	Maximum Impact (µg/m³)- Natural gas-Firing (1)	Maximum Impact (µg/m³)- Fuel oil-Firing (1)	PSD Class II Significant Impact Levels (µg/m³)	PSD Class II Increments (µg/m³)	Ambient Air Quality Standards (µg/m³)
Specific Pollutant Impacts						
PM/PM10	Annual	0.0016	0.0333	1	17	50
	24-Hour	0.0188	0.3997	5	30	150
SO_2	Annual	0.0010	0.0193	1	20	60
	24-Hour	0.0141	0.2522	5	91	260
	3-Hour	0.0720	1.2726	25	512	1300
NO_2	Annual	0.0669	0.1096	1	25	100
CO	8-Hour	7.8018	8.6074	500	NA	10000
	1-Hour	38.6753	39.4199	2000	NA	40000

Note: Sulfur content of fuel oil is assumed to be 0.05 percent; for modeling purposes, oil assumed to be fired for entire year.
NA= not applicable

Table 2-9. Maximum Pollutant Concentrations Predicted at the Chassahowitzka National Wilderness Area, PSD Class I Area
City of Lakeland- McIntosh Unit No. 5 Simple Cycle

Pollutant	Averaging Time	Maximum Impact (μg/m³)- Natural gas-Firing (1)	Maximum Impact (μg/m³)- Fuel oil-Firing (1)	Proposed EPA PSD Class I Significant Impact Levels (μg/m³)	Recommended NPS Class I Significant Impact Levels (μg/m³)	PSD Class I Increments (μg/m³)
Specific Pollutant Impacts						
PM/PM10	Annual	0.0003	0.0074	0.2	0.08	4
	24-Hour	0.0059	0.1261	0.3	0.27	5
SO_2	Annual	0.0003	0.0050	0.1	0.03	3
	24-Hour	0.0046	0.0823	0.2	0.07	5
	3-Hour	0.0283	0.5066	1	0.48	25
NO_2	Annual	0.0150	0.0243	0.1	0.03	2.5

Note: Sulfur content of fuel oil is assumed to be 0.05 percent; for modeling purposes, oil assumed to be fired for entire year.
NA= not applicable

(1) Concentrations were predicted using the ISCST3 model for 5 years (1987-1991) of meteorological data from National Weather Service station in Tampa.

2-40

Table 2-10. Baseline Noise Measurements at Selected Receptors from the City of Lakeland McIntosh Plant Site

Site	Location	Distance and Direction From McIntosh Unit 5		Measurement Period	Sound Pressure Level			Predominate Noise Sources
		Distance (ft)	Direction		Minimum	Maximum	L_{eq}	
1	Plant Site - near administration bldg.	2800	SE	Daytime	55.3	76.4	62.1	Traffic and Power Plant
				Nighttime	56.1	60.3	58.2	Power Plant
2	Plant Site - near northern entrance	1,300	ESE	Daytime	58.5	79.7	64.0	Coal conveyor; Plant
				Daytime	52.3	72.5	58.8	Power Plant
				Nighttime	53.0	66.1	55.8	Cooling Tower; Plant
3	Plant Site - near west boundary	500	SW	Daytime	44.8	66.5	50.6	Power Plant
				Daytime	43.6	56.8	49.9	Power Plant
				Nighttime	45.6	53.0	47.3	Power Plant
4	E. Lake Parker Drive	5,800	SE	Daytime	44.9	76.5	56.0	Traffic and Power Plant
				Daytime	46.5	80.1	63.4	Traffic and Power Plant
				Nighttime	43.2	66.3	47.0	Power Plant and Traffic
5	E. Lake Parker Drive	7,000	SE	Daytime	45.1	79.5	60.1	Traffic and Power Plant
				Daytime	44.5	80.9	62.8	Traffic and Power Plant
				Nighttime	42.1	69.3	45.5	Power Plant
6	Sertoma Park	11,500	S	Daytime	51.0	79.8	61.8	Traffic
				Nighttime	46.1	65.0	54.1	Traffic
7	Lake Parker Dr.	5,800	WSW	Daytime	45.8	80.3	65.4	Traffic
				Nighttime	40.1	75.1	56.0	Traffic
8	Near Lakeland Hills Blvd.	7,500	WNW	Daytime	45.3	74.1	55.0	Traffic
				Nighttime	40.6	61.0	48.3	Traffic
9	Lakeland Harbor Trailer Park	7,000	NNW	Daytime	47.5	62.8	51.4	Traffic I-4
				Nighttime	45.2	58.8	49.0	Traffic I-4

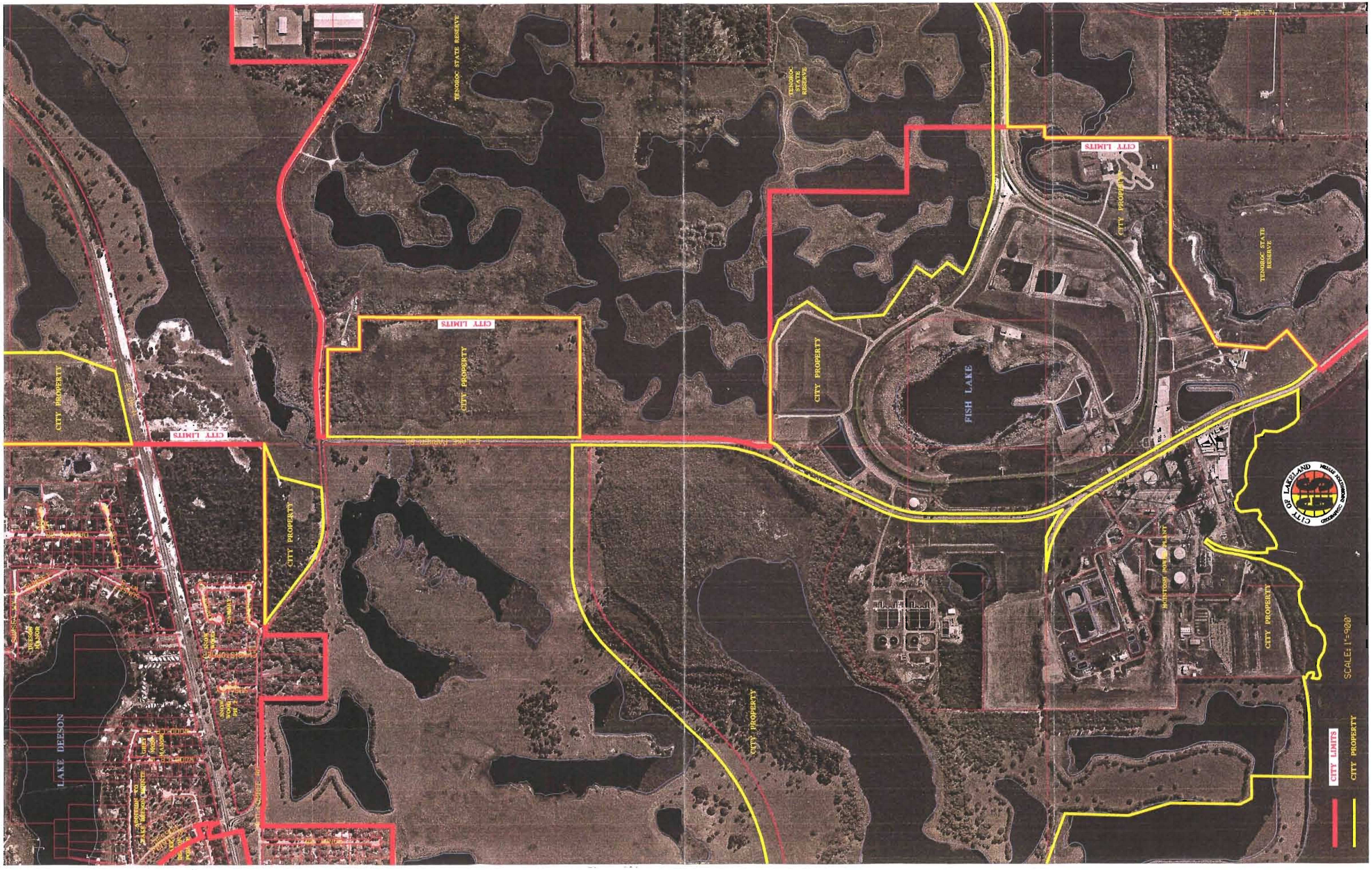


Figure 2-1. City Property and City Limits in the Vicinity of the McIntosh Plant Site

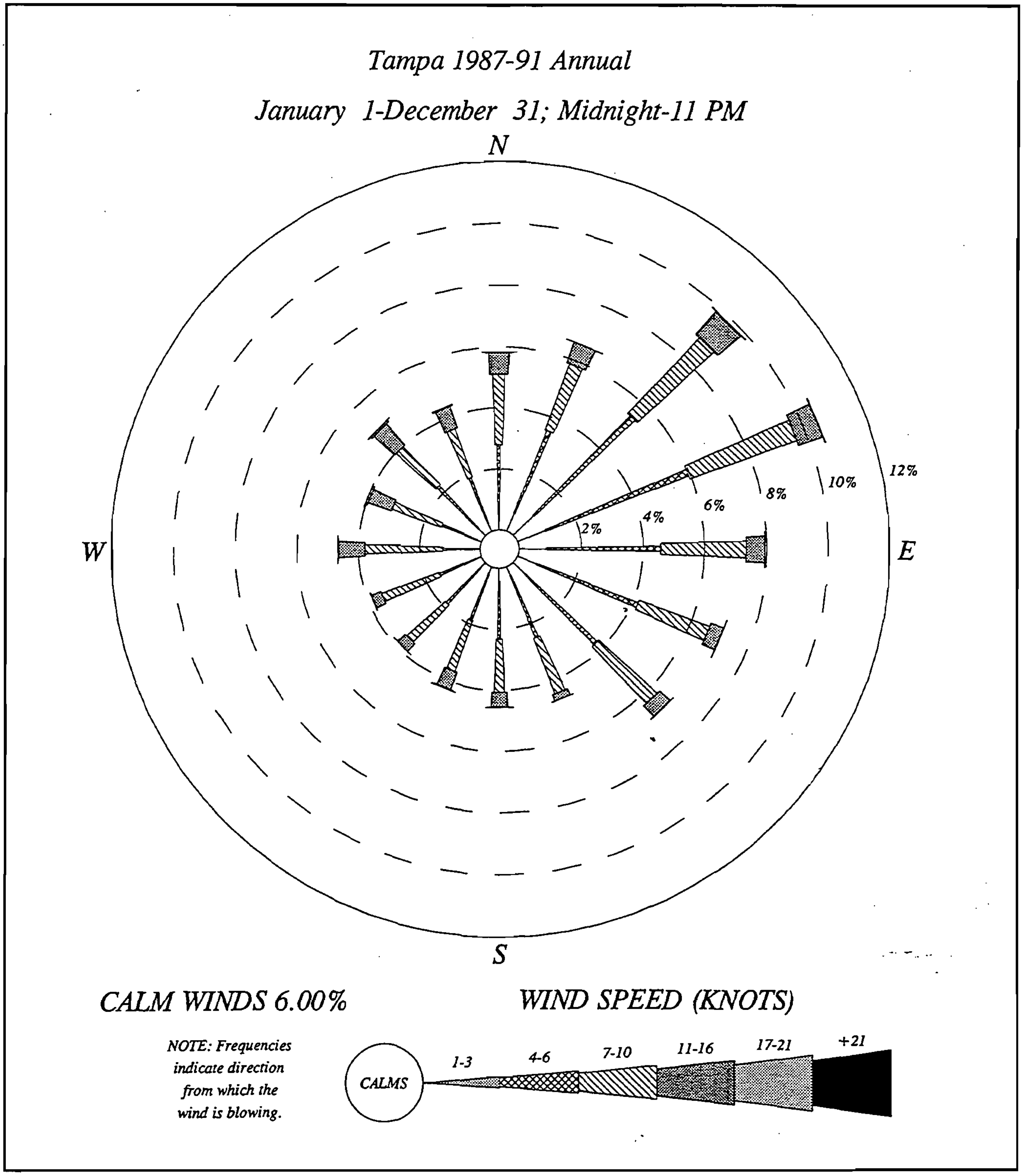


Figure 2-2 **Annual Windrose** **(1987 - 1991)**	Filename: 9937510c/fig2-2 Date: 06/10/99	Golder Associates

3.0 PROJECT DESCRIPTION

3.1 BACKGROUND

The McIntosh Power Plant consists of 3 fossil fuel-fired steam generators (FFFSG), 2 diesel power generators and 2 simple cycle gas turbines. The size and fuels used by these units are as follows:

Unit No. 1 - 90-MW FFFSG; No. 6 fuel oil, natural gas

Unit No. 2 - 115-MW FFFSG; No. 6 fuel oil, natural gas

Unit No. 3 - 365-MW FFFSG; coal, petroleum coke, fuel oil (residual and distillate), natural gas, refuse/biomass fuel

Gas Turbine Peaking Unit No. 1 - 20-MW; distillate oil, natural gas

Diesel Peaking Unit Nos. 2 and 3 - 2.5-MW (each); distillate oil

Unit No. 5 - 250 MW Simple Cycle Combustion Turbine; natural gas, distillate oil

Unit No. 5 simple-cycle consists of a Westinghouse Model 501G advanced combustion turbine (CT) and ancillary facilities. The Westinghouse 501G CT is the most efficient 60-hertz industrial turbine in the world. With a net heat rate of 8,725 Btu/kWh (LHV, ISO conditions and gas firing), it is 10 percent more efficient than the nominal 150 MW "F" Class CT machines (9,600 Btu/kWh LHV, ISO, natural gas-firing). The approval for McIntosh Unit No. 5 (both simple cycle and combined cycle operation) was included in the air construction and prevention of significant deterioration (PSD) permit issued by the FDEP (DEP File No. 1050004-004-AC; PSD-FL-245) and a modification to the certification for McIntosh Unit No. 3 (see Appendix 10.4). The important aspects of the PSD approval include the air quality impact analyses performed using an air dispersion model and the best available control technology (BACT) performed to evaluate the selected emission control technology. The proposed steam-cycle project will include the installation of a heat recovery steam generator (HRSG), 120 MW steam turbine generator, mechanical draft cooling tower and ancillary equipment. Steam is produced in the HRSG from the exhaust gases of the 501G and will be used for electric power production. Electric power production is increased from about 250 MW to about 370 MW with the steam electric turbines.

3.2 SITE LAYOUT

Location of Unit No. 5 at the McIntosh site and selection of the technology maximized the beneficial use of the site while minimizing environmental, land use, and cost impacts associated with development of an additional 120-MW power plant at an undeveloped site. The area for the existing simple cycle portion of Unit No. 5 is of sufficient size to accommodate the HRSG and steam electric turbine. The cooling tower will be located in an area of the McIntosh site that presently has other cooling towers. The proposed steam-cycle project will utilize a number of the existing facilities, including the water source and discharges, and transmission lines, and will increase the ultimate generating capacity without increasing the overall size of the McIntosh site. A plot plan of the proposed steam-cycle facility is presented in Figures 3-1 and 3-2. These figures show two alternative arrangements for the steam turbine with condenser and control building and parking. These different arrangements will not result in different environmental impacts for the project, i.e. air, water, or land. The profiles of the McIntosh Unit No. 5 buildings and structures are presented in Figure 3-3.

3.3 FUEL

The primary fuel for the existing Unit No. 5 is natural gas with a nominal heat content of 23,194 Btu/lb high heating value (HHV) and 1,050 BTU/cubic foot (cf). As backup, the unit is capable of firing distillate fuel oil with a nominal heat content of 19,430 Btu/lb and 0.05 percent sulfur. Natural gas is supplied by an existing 16-inch high pressure pipeline owned by the City of Lakeland and connected to the Florida Gas Transmission (FGT) St. Petersburg lateral operating at 650 to 950 pounds per square inch-gage (psig). The City's pipeline is approximately 10 miles long and can supply natural gas that can generate in excess of 800 MW. The City's 16-inch pipeline is connected to a 10-inch pipeline located under East Lake Parker Drive, north of the plant main gate, and terminates at an isolation valve and blind flange. A new 16-inch pipeline was permitted and connected to the 10-inch terminus and follows along the east edge of the site access road to serve Unit No. 5. The distance for this existing connection is about 1000 ft. The necessary safety relief valves and cathodic protection were installed. No changes to the existing gas supply facilities are required for this project.

Distillate oil is used in the event that natural gas supply is interrupted through the pipeline or is necessary due to some other condition (e.g., unit outages, hurricane damages, etc.). The oil is stored in an existing 1.05 million gallon tank that can supply about 62 hours of full load operation for simple-cycle Unit No. 5. The City currently obtains all of its fuel oil and diesel fuel through purchases via spot market. This strategy provides the lowest cost for fuel oil consistent with usage, current price stabilization, and on-site storage. The oil is delivered by truck and stored within existing containment areas. Oil storage tank systems conform to regulations and rules of the FDEP governing petroleum products.

3.4 AIR POLLUTANT EMISSIONS AND CONTROLS

3.4.1 AIR EMISSIONS TYPES AND SOURCES

The air construction permit and Prevention of Significant Deterioration (PSD) approval including the Best Available Control Technology (BACT) determination for simple-cycle Unit No. 5 was issued in contemplation of combined cycle operation (see Appendix 10.4.1). The emission rates for combined cycle operation, established by FDEP in the PSD approval, reflect lower emissions for NO_x than that authorized for the first several years of simple cycle operation of Unit No. 5. The primary change from simple cycle to combined cycle operation will be the reduction in exhaust temperature (from about 1,150°F to about 200°F), construction of a new 300 ft stack, and construction of a mechanical draft cooling tower. The GEP stack height is 250 ft based on a HRSG height of 100 ft and a projected width of 117 ft; therefore, GEP is 2.5 x 100 ft = 250 ft (see Section 2.3.7.2 for discussion of GEP).

The maximum hourly emissions and exhaust parameters that are representative of combined-cycle Unit No. 5 operating at baseload conditions (100-percent load) and 50-percent load conditions are presented in Tables 3-1 through 3-4. The data presented here concerning air emissions reflect the specific conditions in the previously issued PSD permit and PPSA certification. The information presented in these tables for combined cycle operations based on natural gas combustion (Tables 3-1 and 3-3), and fuel oil combustion (Tables 3-2 and 3-4) reflect changes in the stack parameters due to the HRSG. The emissions reflect the highest emissions permitted for combined cycle operation. The emission limitations for combined cycle operation of the CT primarily involve the use of either dry low-NO_x (DLN) combustion technology or the use of selective catalytic reduction (SCR) for NO_x control. The emission data presented in Tables 3-1 through 3-4 reflect the DLN technology on the CT under Combined cycle operation when firing natural gas and water injection when firing distillate oil. The data are presented for turbine inlet temperatures of 30, 59, and 90°F. These temperatures represent the approximate range of ambient temperatures that the unit is most likely to experience. A process flow diagram of the facility operating in combined cycle mode is presented in Appendix 10.1.5. The addition of the steam cycle will include a cooling tower which is a minor source of particulate matter (see Appendix 10.1.5).

3.4.2 AIR EMISSIONS CONTROLS

The air emission controls for the Unit No. 5 CT in combined cycle mode have been identified in the air construction permit issued in 1998 (see Appendix 10.4.1). Depending upon the development of DLN to achieve NO_x and CO emission limits, add-on controls may include SCR if the NO_x emission limits cannot be achieved through DLN, and an oxidation catalyst may be utilized if the CO emission limits cannot be achieved. The use of natural gas and use of distillate oil as backup for a maximum of 250 hours per year in the CT will be used to limit emissions of particulate matter and sulfur dioxide. The mechanical draft cooling towers will be equipped with high efficiency drift eliminators.

3.4.3 BEST AVAILABLE CONTROL TECHNOLOGY

A determination of BACT was made by FDEP in 1998 for the Unit No. 5 CT including the CT in combined cycle operation. A BACT determination is not required for the addition of the steam cycle that includes the cooling tower.

3.4.4 DESIGN DATA FOR CONTROL EQUIPMENT

A description of the DLN technology is presented in the air construction permit (see Appendix 10.4.1). SCR uses ammonia (NH_3) to react with NO_x in the gas stream in the presence of a catalyst. NH_3, which is diluted with air to about 5 percent by volume, is introduced into the gas stream at reaction temperatures between 600°F and 750°F. The reactions are as follows:

$$4NH_3 + 4NO + O_2 = 4N_2 + 6H_2O$$
$$4NH_3 + 2NO_2 + O_2 = 3N_2 + 6H_2O$$

SCR operating experience, as applied to gas turbines, consists primarily of baseload natural-gas-fired installations either of simple-cycle or combined cycle configuration; only a few simple cycle facilities have SCR. Exhaust gas temperatures of simple cycle CTs generally are in the range of 1,000°F, which exceeds the optimum range for SCR with base metal catalysts. All current SCR applications have the catalyst placed in the HRSG to achieve proper reaction conditions. This allows a relatively constant temperature for the reaction of NH_3 and NO_x on the catalyst surface. Removal efficiencies of 70 percent and greater can be achieved. Not all the ammonia that is injected is reacted with NO_x and results as ammonia slip leaving the stack. Typical manufacturer guarantee ammonia slip levels are 10 ppm at 15 percent oxygen. With new systems, ammonia slip is minimized due to the amount of active surface area available in a new catalyst. As the catalyst wears, ammonia slip increases. Ammonia slip can be reduced by adding more catalyst but at a considerable cost. Lowering the ammonia from 10 ppm to 5 ppm can increase the cost of the SCR system by about 25 percent. At the present time, the use of DLN to achieve the permitted emission levels for NO_x is being assumed.

3.4.5 DESIGN PHILOSOPHY

The design philosophy for this Project minimizes air pollutant emissions by using the most efficient and pollutant-preventing generating technology. This concept has been incorporated with the selection of a combined-cycle process utilizing the existing advanced CT. Combined-cycle plants can now be expected to achieve fuel conversion rates on the order of

7,000 Btu/kWh, as opposed to values in the 9,000 to 10,000 Btu/kWh range for more conventional steam-generating plants. This is an improvement of about 25 percent. Thus, by maximizing the megawatt output per unit of fuel consumed, the air pollutant emissions per megawatt output will be minimized with the conversion to combined cycle. The selection of the most efficient CT (the advanced "G") also minimizes emissions with respect to power output. Pollution prevention is incorporated in the design by the use of clean fuels and combustion technology. Moreover, advanced dry low-NO_x combustion technology or SCR will be used to further minimize NO_x emissions while ensuring that CO and VOC emissions are within permitted limits. The design of the Project incorporates features that will make the project one of the most efficient and lowest emitting power plants in the State of Florida.

3.5 PLANT WATER USE

3.5.1 EXISTING UNIT NO. 5 SIMPLE CYCLE

Existing Unit No. 5 in simple cycle operation requires the use of water for component cooling and subsequent discharge through the combustor. Existing groundwater supplies provide between 445 to 820 gallons per minute of raw water as input to a trailer mounted demineralizer system. About 445 gpm is required during normal operation for CT cooling when firing natural gas; about 50 gpm is required for evaporative cooling. Evaporative cooling is used to cool the inlet air reducing the temperature and increasing mass flow and power in the turbine. Evaporative cooling is used when ambient temperatures exceed ISO conditions (i.e., 59°F). When firing distillate oil, about 820 gpm of raw water is required. The increased raw water requirements are necessary for NO_x control known as water injection. About 50 percent of total requirements are required for cooling steam and water injection, when firing distillate oil. However, as noted in previous sections, oil will be fired as a back up fuel. Figure 3-4 presents the existing water balance for simple-cycle Unit No. 5.

A fire protection system has been installed around the unit and consists of fire hydrants appropriately placed. This system will be supplied from the existing McIntosh fire protection system.

The existing service water supply and treatment system consists of two groundwater wells (Wells 5 and 8), three backup wells for Unit 2 (Wells 1, 2, and 3), an elevated water tank and associated piping. A booster pump and about 1,250 ft of 6-inch HDPE pipe will be added from the existing system to the Unit No. 5 area. Water treatment consists of a leased reverse osmosis (RO) unit, an RO treated water storage tank, a trailer mounted demineralizer, and a 450,000 gallon demineralized water tank. The demineralized water tank has sufficient storage for about 30 hours of full load operation on gas and 5 hours on oil. The regeneration of the demineralizer system will be contracted and performed offsite.

The existing Unit No. 5 wastewater sources include the RO brine wastewater (135 gpm), inlet air evaporative cooler system discharge (about 10 gpm) and contact stormwater from equipment areas (i.e., potential oil contaminated stormwater). These wastewaters are discharged to the existing plant process wastewater ponds and then after treatment to the City's Water Utilities Department. This is the current approved practice for the McIntosh Plant and these systems have the capacity and ability of handling the additional wastewater resulting from the operation of Unit No. 5.

The RO brine wastewater is the result of reducing the mineral content of raw groundwater and concentrating these minerals in the RO brine. RO brine is discharged to the existing process wastewater ponds (through an existing combined sump) currently used for this purpose for Unit Nos. 1, 2, 3, and 5 in simple-cycle. Contribution of wastewater from operation of Unit No. 5 is relatively minor compared to the amount of wastewater currently treated in the process wastewater ponds.

Process area contact stormwater is routed to one oil water separator prior to discharge to the process wastewater ponds. Any oily wastes are put in existing used oil tanks. The distillate oil storage tank was constructed as provided by FDEP regulations (Rule 62-762 F.A.C.).

The existing McIntosh Plant potable and sanitary systems will be used for operation. No new demands on these systems will occur as the result of conversion to combined-cycle operation. During construction, portable sanitary facilities were provided for the limited amount of construction workers.

3.5.2 COMBINED CYCLE PLANT WATER USE

The plant water use for the combined cycle operation is presented in Figure 3-5. During normal operation, the use of groundwater will be about 130 gpm which is about 315 gpm less than the existing water use when operating in simple cycle mode (i.e., 445 gpm). When operating in peaking mode and when firing distillate oil with power augmentation, water use will increase above the present load to 880 gpm. This is similar to the existing water use when firing oil. However, these operating conditions are limited by the demand for peaking power and the authorized use of oil (i.e., oil is limited to 250 hours/year). (See Table 3-5 for summary of maximum raw water requirements for service water under simple and combined cycle operation). Reuse water (2,250 gpm) from the adjacent City of Lakeland's Northside Wastewater Treatment Facility will be used for condenser cooling.

As a backup to the reuse water, Unit 5 will utilize the existing 3 well system established for Unit No. 3. These wells are currently permitted through Site Certification for Unit 3 to use 0.2166 million gallons per day average and 5.271 mgd maximum. These wells are identified as Wells 31, 32 and 33. For the steam cycle for Unit No. 5, an additional water use as backup to reuse water of 0.8 mgd annual average and 3.24 mgd maximum is required. The latter annual average is based on 90 days usage in the event reuse water is not available. The total withdrawal would be 1.0166 mgd annual average and 8.51 mgd maximum for both Unit No. 3 and Unit No. 5. This water will be provided from the existing Wells 31, 32, and 33 which have a combined capacity of 7,200 gpm and 10.368 million gallons per day.

3.5.3 HEAT DISSIPATION SYSTEM

The addition of a steam cycle to Unit No. 5 will require the addition of condenser cooling. A mechanical draft cooling tower will be utilized for this purpose. Table 3-6 presents information on a specific cooling tower design and a typical range in designs that will be considered. Data for the specific design was used for determining impacts. The cooling tower blowdown for Unit No. 5 will be discharged in the same manner as the existing cooling tower blowdown for Units No. 2 and No. 3. This discharge is to existing facilities operated by the City's Water Utilities Department.

3.5.4 DOMESTIC/SANITARY WASTEWATER

The existing sanitary wastewater systems available at Unit No. 5 and the McIntosh Plant will be used. No new or expanded sanitary systems will be required or constructed.

3.5.5 POTABLE WATER SYSTEMS

The existing potable water systems available at Unit No. 5 will be used. No new or expanded systems will be required.

3.5.6 PROCESS WATER SYSTEMS

The existing water treatment systems and process water discharge systems will not change when converted to combined cycle configuration. Process water volume will increase by about 20 gpm with the addition of the steam cycle during normal operation. The increase is a result of boiler (HRSG) blowdown.

3.6 CHEMICAL AND BIOCIDE WASTE

Unit No. 5 will not have chemical or biocide wastewaters. The HRSG may be initially cleaned with chemical treated washwater during construction. The steam-condensate-feedwater cycle will be chemically treated to prevent corrosion or scaling of the condensate piping, the feedwater piping, and the HRSG (boiler drum, downcomer, header, etc.). The condensate will be treated with an oxygen scavenger, such as hydrazine, for dissolved oxygen control and with ammonia or an amine for pH control. Phosphate, typically in a sodium form, will be fed to the HRSG for control of pH and hardness. Residual phosphate in the boiler will react with hardness to form a non-adherent precipitate. On occasion, in order to maintain the proper chemistry, steam will be released to atmosphere from the HRSG boiler(s) and demineralized water will be added to the system. The steam is routed to a flash tank where some of it is vented to the atmosphere. The remaining liquid will be routed to a collection basin for retreatment and reuse. The blowdown can be expected to have trace amounts of phosphate, sodium, and iron. On-line continuous analyzers will be used to monitor the boiler condensate and feedwater chemistry. These monitors have a continuous stream of condensate or feedwater running through them that is discharged to the plant floor drains.

HRSG boiler and related feedwater and steam piping may be chemically cleaned periodically during the life of the plant. The chemicals used will not be permanently stored onsite but will be delivered to the site by a licensed contractor at the time of the scheduled periodic cleanings. The chemical cleaning solutions to be used for cleaning of the HRSG will be dependent on the HRSG manufacturer selected. The actual cleaning solutions used must be consistent with the HRSG manufacturer's recommendations. Chemicals typically used in HRSG and related feedwater piping cleaning include, but are not limited to, the following:

1. Inhibited hydrochloric acid,
2. Ammonium bifluoride,
3. Hydroxyacetic acid,
4. Formic acid,
5. Disodium phosphate,
6. Trisodium phosphate,
7. Soda ash,
8. Nonfoaming wetting agents, and
9. Foam inhibitors.

Wastewaters will consist of the cleaning solutions and material removed during the cleaning process. The wastewater resulting from this cleaning will either be used as supplemental feed water into the desulfurization system for Unit No. 3 or disposed offsite by a licensed chemical cleaning contractor. Subsequent rinse waters, which will essentially be demineralized water quality, will be routed to the existing process wastewater ponds.

Since chemical cleaning is an infrequent maintenance operation, it does not contribute to the liquid wastes produced by the normal operation of the plant.

Prior to commencing startup of each HRSG, it is necessary to remove small amounts of conventional oils that were used during the fabrication of the steam tubes that comprise much of the HRSG. The process to remove this oil is called an alkaline boil-out and typically consists of filling the HRSG with a solution of sodium phosphate and an antifoaming agent, heating the water, then allowing it to soak. This solution is then drained and the HRSG is rinsed several times with demineralized water and visually inspected to verify that the oil has been removed. The water drained from the HRSG is expected to have minimal amounts of oil and grease, typically less than 100 mg/L in the initial drain and less with each successive rinse. This water will be routed to an oil water separator to remove any oil and grease and then discharged to the existing process wastewater ponds or offsite.

3.7 SOLID AND HAZARDOUS WASTES

During construction small amounts of recyclable and solid wastes may be generated. These will be recycled or disposed of according to FDEP regulations. Unit No. 5 will not generate hazardous wastes during operations. Any small amount of paints or solvents used during construction activities will be handled within the existing system. All lubrication oils and solvents used for maintenance during operation are non-hazardous.

3.8 ON-SITE DRAINAGE SYSTEM

The existing onsite drainage system will be used. A drainage system has been designed for the project site and consists of an existing 1.6 acre pond and associated drainage systems. Appendix 10.5.4 presents the drainage calculations.

3.9 MATERIALS HANDLING

There are no materials handling required for operation of Unit No. 5 in combined cycle operation. During construction all materials will be delivered by truck or rail for large components. Site access is north along East Lake Parker Drive to Old Combee Road then to I-4.

Table 3-1. Stack, Operating, and Emission Data for the Unit No. 5 (501G Combustion Turbine) with Dry Low-NOx Combustors firing Natural Gas -- Base Load for Combined Cycle Operation

	Operating and Emission Data[a] for Ambient Temperature		
Parameter	90°F	59°F	30°F
Stack Data (ft)			
Height	300	300	300
Diameter	20	20	20
Operating Data[b]			
Temperature(°F)	190	187	182
Velocity (ft/sec)	63.2	67.5	69.7
Maximum Hourly Emission Data (lb/hr) per Unit[c]			
SO_2 (1 grain S per 100 cf)	6.4	6.9	7.2
PM/PM10	8.5	8.8	9.1
NO_x (9 ppmvd at 15% O_2)	74.4	80.1	84.1
CO (25 ppmvd)	89.3	99.0	104.4
VOC (4 ppmvd)	9	10	10
Sulfuric Acid Mist	0.97	1.05	1.10

a Information on combined cycle operation at 100% load.
b Includes heat recovery steam generator (HRSG).
c Emissions currently authorized by FDEP PSD permit (see Appendix 10.4.1). The addition of the steam cycle for Unit No. 5 will not increase emissions. Other regulated pollutants have negligible emissions. These pollutants include lead, reduced sulfur compounds, fluorides, and mercury.

Table 3-2. Stack, Operating, and Emission Data for the Unit No. 5 (501G Combustion Turbine) with Water Injection Firing Fuel Oil-- Base Load for Combined Cycle Operation

	Operating and Emission Data[a] for Ambient Temperature		
Parameter	90°F	59°F	30°F
Stack Data (ft)			
Height	300	300	300
Diameter	20	20	20
Operating Data[b]			
Temperature(°F)	196	188	178
Velocity (ft/sec)	64.6	68.5	70.2
Maximum Hourly Emission Data (lb/hr) per Unit[c]			
SO_2 (0.05% S Fuel)	111.7	120.9	126.7
PM/PM_{10}	89.4	92.8	95.8
NO_x (42 ppmvd at 15% O_2)	359.2	388.5	407.4
CO (90 ppmvd)	327.0	363.1	382.4
VOC (10 ppmvd)	20.8	23.1	24.3
Lead	0.012	0.013	0.014
Beryllium	0.0004	0.0005	0.0005
Fluoride	0.071	0.076	0.080
Mercury	0.0022	0.0024	0.0025
Sulfuric Acid Mist	17.1	18.5	19.4

a Information on the combined cycle operation at 100% load.

b Includes HRSG.

c Emissions currently authorized by FDEP PSD permit (see Appendix 10.4.1). The addition of the steam cycle for Unit No. 5 will not increase emissions. Other regulated pollutants have negligible emissions. These pollutants include reduced sulfur compounds.

Table 3-3. Stack, Operating, and Emission Data for the Unit No. 5 (501G Combustion Turbine) with Dry Low-NO_x Combustors firing Natural Gas-- 50% Load for Combined Cycle Operation

	Operating and Emission Data[a] for Ambient Temperature		
Parameter	90°F	59°F	30°F
Stack Data (ft)			
Height	300	300	300
Diameter	20	20	20
Operating Data[b]			
Temperature(°F)	190	187	182
Velocity (ft/sec)	50.0	52.2	53.4
Maximum Hourly Emission Data (lb/hr) per Unit[c]			
SO_2	3.9	4.2	4.3
PM/PM_{10}	6.5	6.6	6.7
NO_x (9 ppmvd at 15% O_2)	45.3	48.3	50.2
CO (20 ppmvd)	58	63	66
VOC (4 ppmvd)	6.7	7.2	7.5
Sulfuric Acid Mist	0.60	0.64	0.66

[a] Information on combined cycle operation at 50% load.

[b] Includes HRSG.

[c] Emissions currently authorized by FDEP PSD permit (see Appendix 10.4.1). The addition of the steam cycle for Unit No. 5 will not increase emissions. Other regulated pollutants are assumed to have negligible emissions. These pollutants include lead, reduced sulfur compounds, fluorides, and mercury.

Table 3-4. Stack, Operating, and Emission Data for the Unit No. 5 (501G Combustion Turbine) with Water Injection Firing Fuel Oil-- 50% Load for Combined Cycle Operation

	Operating and Emission Data[a] for Ambient Temperature		
Parameter	90°F	59°F	30°F
Stack Data (ft)			
Height	300	300	300
Diameter	20	20	20
Operating Data[b]			
Temperature(°F)	196	188	178
Velocity (ft/sec)	50.6	52.4	53.2
Maximum Hourly Emission Data (lb/hr) per Unit[c]			
SO_2	68.1	72.1	75.8
PM/PM_{10}	135.1	136.9	139.6
NO_x (42 ppmvd at 15% O_2)	218.0	230.9	242.7
CO (90 ppmvd)	266	288	301
VOC (10 ppmvd)	16.9	18.3	19.1
Lead	0.007	0.008	0.008
Fluoride	0.043	0.046	0.048
Mercury	0.0013	0.0014	0.0015
Sulfuric Acid Mist	10.43	11.04	11.61

[a] Information on the combined cycle operation at 50% load.

[b] Includes HRSG.

[c] Emissions currently authorized by FDEP PSD permit (see Appendix 10.4.1). The addition of the steam cycle for Unit No. 5 will not increase emissions. Other regulated pollutants have negligible emissions. These pollutants include reduced sulfur compounds.

Table 3-5. Annual Average Raw Water Usage for McIntosh Unit 5 Service Water

Simple Cycle		Hours	Raw Water Usage (gpm)	Raw Water Usage (gpd)
Base – Natural Gas		8,510	445	640,800
Oil Firing		250	820	1,180,800
	Total:	8,760		
	Average:		456	656,211

Combined Cycle		Hours	Raw Water Usage (gpm)	Raw Water Usage (gpd)
Base – Natural Gas		5,510	130	187,200
Power Augmentation		3,000	505	727,000
Oil Firing		250	880	1,267,200
	Total:	8,760		
	Average:		280	402,953

Note: Power augmentation requires demineralized water of 250 gpm for injection, 40 gpm for HRSG, and 20 gpm for evap cooler. Ratio of raw water: demin. water = 3:2. 310 gpm of demineralized water requires 465 gpm of raw water (i.e., 310 + 155). 40 gpm is required for evaporative cooler and miscellaneous uses. Total is 505 gpm.

Table 3-6. Physical, Performance and Emissions Data for McIntosh Unit 5 Cooling Tower

	Typical[a]	Typical Range
Physical Data		
Tower Type: Mechanical Rectangular		
Number of Cells:	7	7 to 8
Deck Dimensions, ft:		
Length:	336	192 to 378
Width:	48.00	48 to 96
Height:	31	31 to 61
Stack Dimensions:		
Height, ft:	45	45 to 73
Stack Top Effective Inner Diameter, per cell, ft:	32.00	30 to 34
Effective Diameter, all cells, ft.	84.66	80 to 90
Performance Data		
Discharge Velocity, ft/min	1,422	1,200 to 1,920
Circulating Water Flow Rate (CWFR), gpm :	125,000	125,000
Design hot water temperature, °F:	103	103
Design cold water temperature, °F:	91	91
Heat Rejected, million Btu/hr:	730	730 to 810
Design Air Flow Rate per cell, acfm:	1,116,700	1 to 1.6 x 10^6
L/G Ratio:	1.87	2.1 to 1.3
Emission Data		
Drift Rate[b] (DR), percent:	0.001	0.0005 to 0.005
TDS Concentration[c] ,maximum, ppm:	5,000	
Solution Drift[d] (SD), lb/hr:	625.50	
PM Drift[e] , lb/hr:	3.13	
, tons/year	13.70	

Notes: a - data used in the impact analyses

b - drift rate is the percent of circulating water

c - TDS assumed for modeling

d - Includes water

e - PM calculated based on TDS and drift rates (CWFR x DR x SD x TDS)

125,000 gpm x 0.001/100 x 8.34 lb/g x 5,000ppm/1,000,000 x 60 min/hr = 3.13 lb/hr

PM_{10} is conservatively assumed to be 50% of PM; hourly and annual emissions are 1.6 lb/hour and 6.9 tons/year.

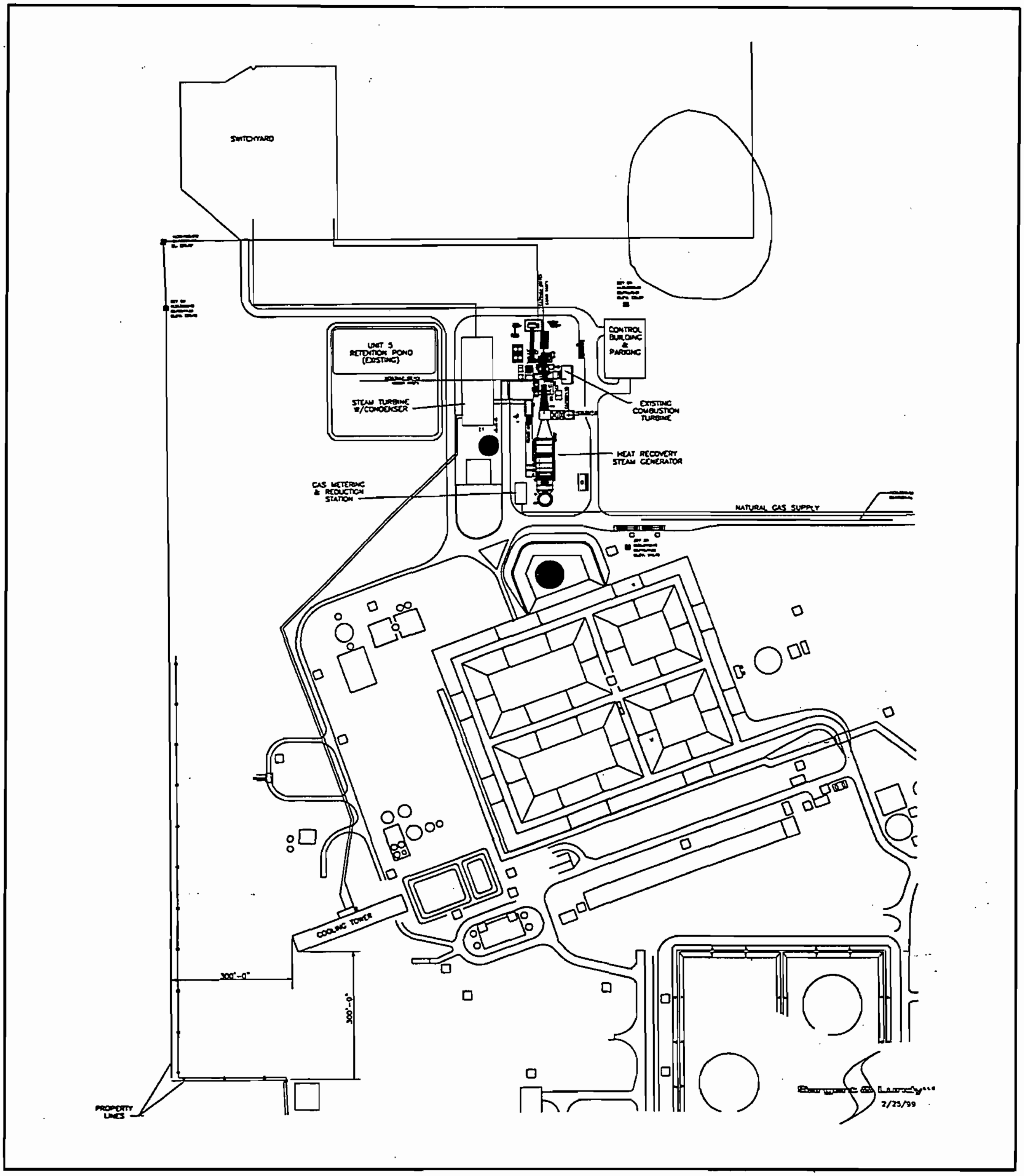


Figure 3-1

Site Arrangement for Unit No. 5
(Steam Turbine West of CT)

Filename:	9937510c/fig3-1
Date:	06/10/99

Golder Associates

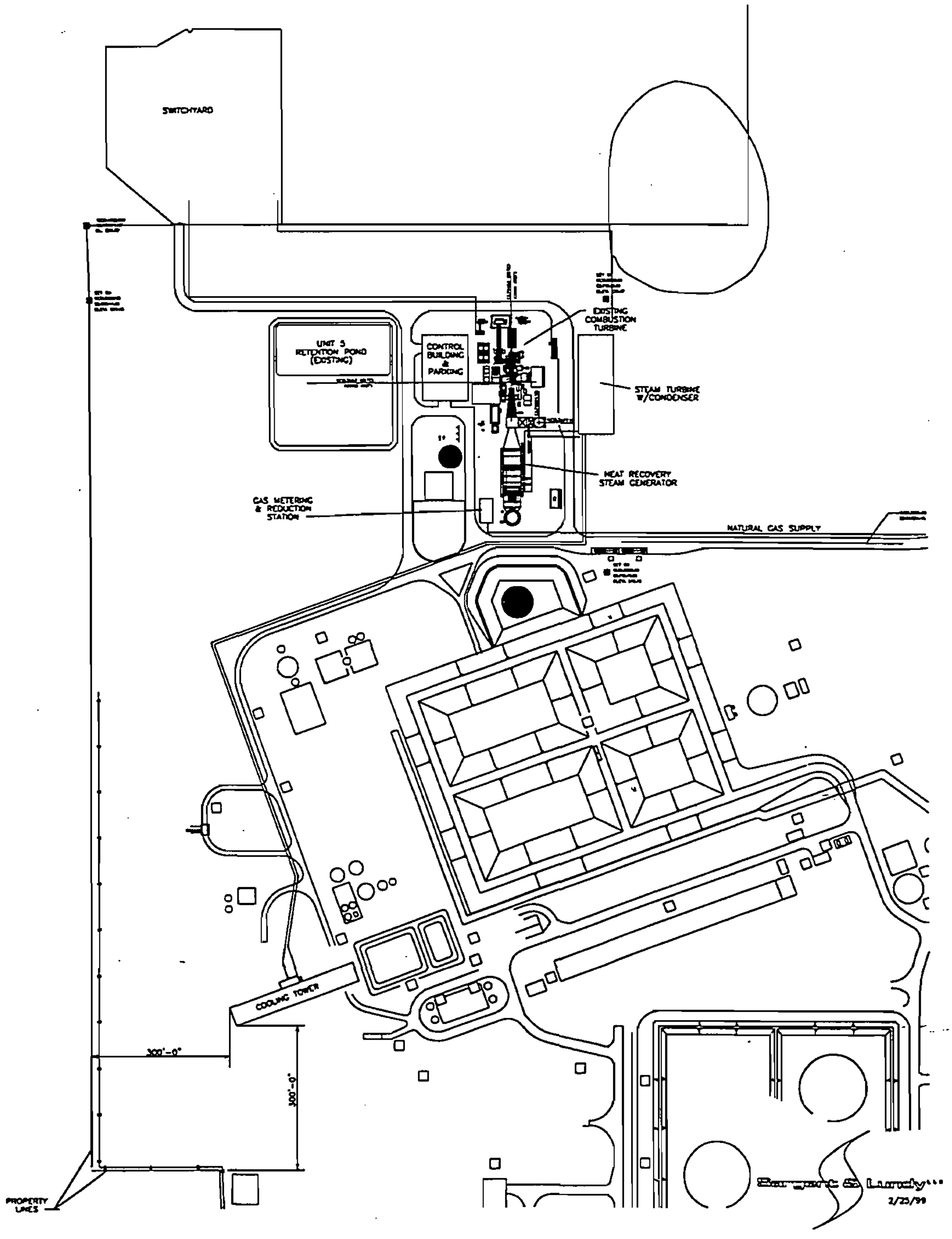
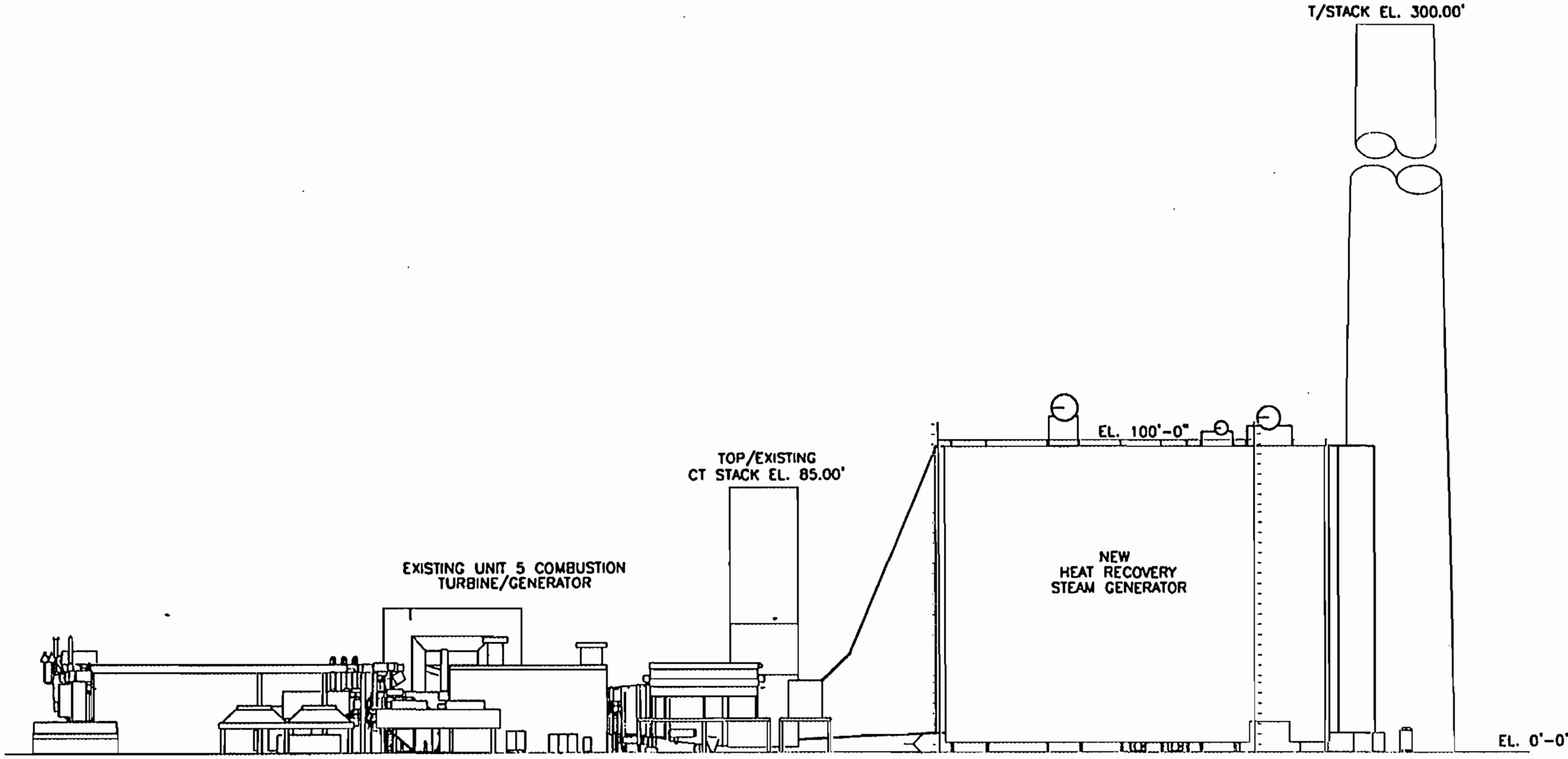


Figure 3-2 Site Arrangement for Unit No. 5 (Steam Turbine East of CT)	Filename: 9937510c/fig3-2 Date: 06/10/99	Golder Associates



VIEW LOOKING EAST

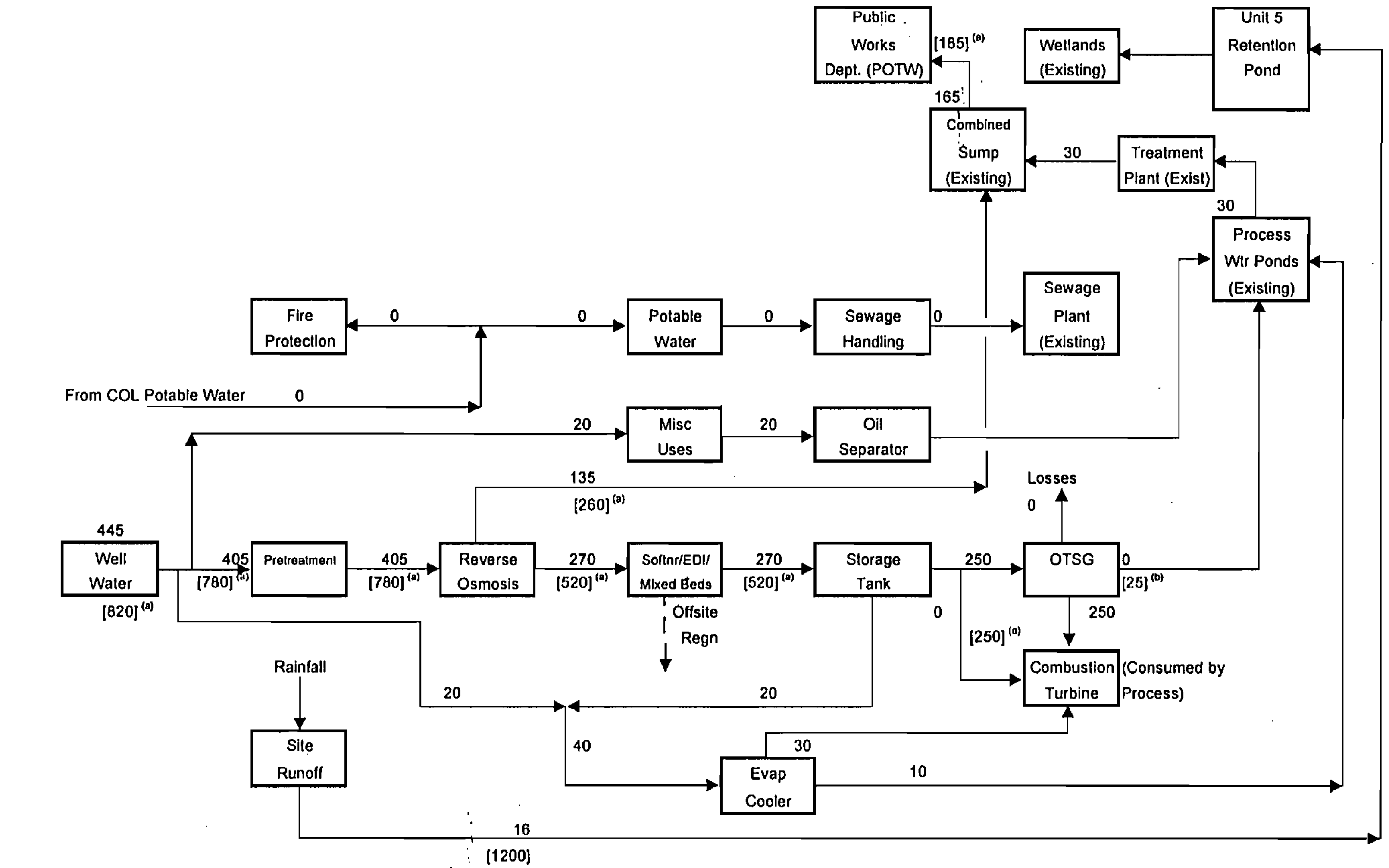
EXISTING COMBUSTION TURBINE W/NEW HEAT RECOVERY STEAM GENERATOR

Figure 3-3

Profile of McIntosh Plant Buildings and Structures

Filename:	9937510c/fig3-2
Date:	06/10/99

Golder Associates



Notes:

1. All flows in gpm and representative of average continuous values.
2. Flows in brackets [n] indicate maximums, for following modes of operation:
   (a) Firing fuel oil
   (b) Start-up

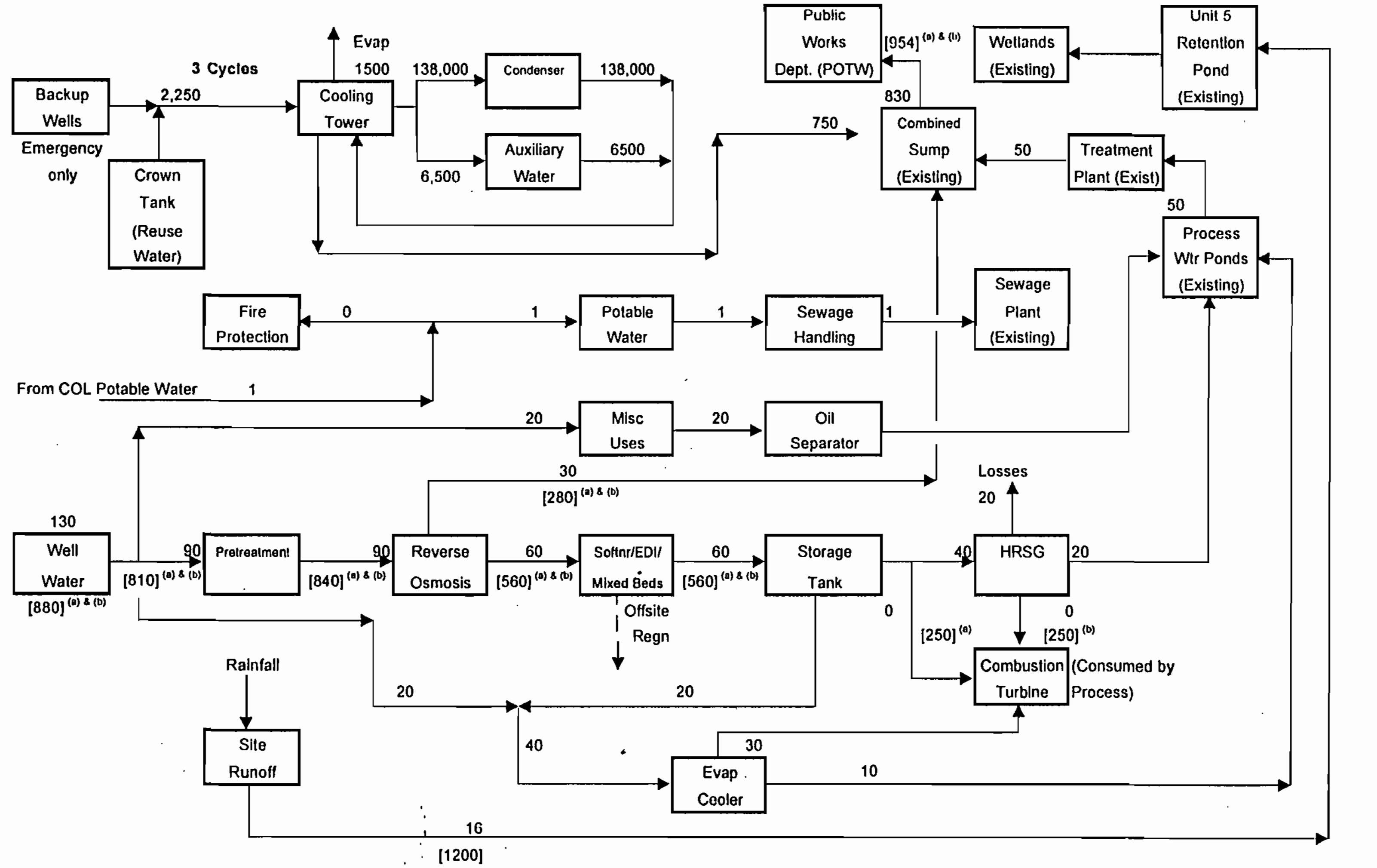
Figure 3-4

Simple Cycle Water Balance

Filename: 9937510c/fig3-4

Date: 06/10/99

Golder Associates



Notes:

1. All flows in gpm and representative of average continuous values.
2. Flows in brackets [n] indicate maximums, for following modes of operation:
   (a) Firing fuel oil
   (b) Power Augmentation

Figure 3-5

Combined Cycle Water Balance

Filename: 9937510c/fig3-5

Date: 06/10/99

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4.0 EFFECTS OF SITE PREPARATION AND PLANT AND ASSOCIATED FACILITIES CONSTRUCTION

4.1 LAND IMPACTS

As discussed in Section 2.0, the area in the vicinity of the proposed Unit No. 5 steam cycle site is currently being used for simple cycle operation. The land in the general area has already been disturbed by activities associated with the construction of Unit 5. The area proposed for the steam cycle is located on about 3 acres adjacent to the existing units within the existing McIntosh site. Therefore, general site preparation and construction will have minimal land impacts.

4.1.1 GENERAL CONSTRUCTION IMPACTS

The steam cycle for Unit No. 5 will be constructed primarily on land that has been disturbed by previous activities associated with construction and operation of simple cycle Unit No. 5. Other Unit No. 5 steam cycle structures will be located on both unmined and mined land. No new off-site access roads will be constructed. A gate and onsite road was constructed from East lake Parker Drive for simple cycle Unit No. 5. The Unit No. 5 steam cycle area is relatively flat; local site grading and leveling has already occurred for construction and laydown areas associated with the simple cycle portion of the unit. Impacts to terrain will be minor. No blasting is anticipated for construction of the steam cycle for Unit No. 5.

Laydown areas for equipment and supplies are available as a result of the construction of the simple cycle unit. The areas have been graded and surfaced with aggregate. These areas will be used for the storage of construction materials for the conversion to combined cycle.

No impacts from disposal of construction wastes are anticipated. Combustible construction wastes (e.g., paper, wood, etc.) will be recycled or disposed of in accordance with applicable regulations. Other construction wastes will be removed from the site for disposal at a facility approved by the Florida Department of Environmental Protection (FDEP). Any garbage (food containers, papers, etc.) will be collected in appropriate waste collection containers and disposed in accordance with FDEP and local regulations. Any waste oils or other chemical wastes generated during construction will be removed from the site and disposed in accordance with FDEP regulations.

During construction, the construction labor force (about 200 at maximum) will utilize portable chemical toilets. All sanitary sewage will be frequently pumped from the individual toilets for transportation to an approved disposal facility by a licensed contractor.

Potable water for consumption during construction will be obtained from the City of Lakeland Water Utilities Department.

4.1.2 ROADS

Access to Unit No. 5 is available from the existing onsite road connected to East Lake Parker Drive. From East Lake Parker Drive, site access is available with I-4 north of the site via Old Combee Road and U.S. Highway 92 south of the site. Therefore, no new access roads to either county- or state-maintained roads will be required.

4.1.3 FLOOD ZONES

All Unit No. 5 facilities have been designed to comply with all applicable Southwest Florida Water Management District (SWFWMD), Polk County, and FDEP requirements regarding flood protection and control. No structures or fill will be placed in the floodplain; therefore, no reduction in cross-section flow-way or flood storage will occur. No adverse impact on the 100-year flood elevations or flood flows are anticipated. Stormwater design will comply with SWFWMD regulations that restrict post-development peak flow rates to pre-development flow rates.

4.1.4 TOPOGRAPHY AND SOILS

Bearing strengths of the fine sands are sufficient, and shearing failures of the foundations will not occur. Appropriate geotechnical designs (i.e., pilings) have been used to support heavily loaded major equipment foundations for the simple cycle portion of Unit No. 5. Similar techniques will be used for the steam cycle equipment. Where compaction is necessary for construction, a densification program will be instituted.

Construction runoff from the site is collected in the existing detention pond upgradient of Mud Lake. Areas not covered by structures and roads will be left in a natural state so that rainfall will percolate into the surficial aquifer. During construction of the simple cycle portion of Unit No. 5, an erosion control and sedimentation plan has been implemented to prevent discharge of sediment from the site and will continue to be used for the combined cycle conversion. This plan includes detention pond, silt nets, straw baling, and other techniques to retain sediments onsite. Construction-related changes in site topography or soils should have no adverse effect on aesthetics or viewshed based on elevations and relative distance from roads.

4.2 IMPACT ON SURFACE WATER BODIES AND USES

Runoff from areas of the site disturbed by construction activities, including material laydown areas, and dewatering flows, will continue to be collected and directed to the existing site stormwater detention pond. This 1.6 acres pond is located adjacent to the existing facilities for Unit No. 5. Sediments which are trapped by and accumulate in the stormwater detention pond will be removed as necessary. The construction drainage system follows the layout of the existing ditch system where possible.

No direct impacts to the aquatic systems of Lake Parker or its associated floodplain will occur from construction activities associated with Unit No. 5 steam cycle because no structures will be placed in the flowing creeks or in the floodplain.

4.3 GROUNDWATER IMPACTS

Some dewatering may be required during excavation for construction of plant structures. It is expected to be of short duration and require removal of minor quantities of water. The site facilities requiring dewatering include:

- Foundations,
- Circulating water piping, and
- Miscellaneous underground utilities.

The primary impact of dewatering is that groundwater from the surficial aquifer will be withdrawn and the aquifer phreatic line will be depressed locally. To minimize the impact of dewatering, the pumpage from wellpoints in the CT area will be directed to the existing Unit No. 5 detention pond, which provides for natural infiltration and replenishment of the surficial aquifer. Thus, the dewatering flows removing groundwater are balanced a short distance away by recharge from the detention pond. Dewatering can cause increases in vertical stresses. In this case, the increase will not be significant enough to cause settlement or depressions. Foundations in the CT area will not be at risk because they will be constructed following the completion of dewatering activities. Chemical effects of dewatering will result primarily from oxidation of the groundwaters. The sands of the surficial aquifer are predominantly quartzitic, although soluble calcite will liberate calcium ions and bicarbonate anions, which will increase the hardness of the water. No impacts to the intermediate aquifer are predicted since the excavation/dewatering will be limited to the surficial aquifer groundwater regime, and only for the period of construction. The necessary permit for dewatering will be obtained from SWFWMD.

4.4 ECOLOGICAL IMPACTS

During construction, surface runoff, including water from construction dewatering, will be routed into an existing approved stormwater management system, and erosion prevention measures will be used. No adverse ecological impacts to the Lake Parker aquatic system are anticipated.

The area for Unit No. 5 steam cycle occupies approximately 3 acres of land, located adjacent to the Unit No. 5 simple cycle. In addition, all of this area is located on land that has been used previously for facilities associated with McIntosh Unit No. 3 and Unit No. 5 CT.

Uncontrolled stormwater runoff will be prevented by the implementation of temporary water collection and detention measures. Erosion and sediment control measures employed during construction of the simple cycle that includes seeding and mulching exposed areas, minimizing unnecessary clearing of vegetation, and redirecting stormwater runoff will continue to be used for the construction of the steam cycle. The existing detention basin will be used for control and treatment of stormwater.

No significant effects to surface water areas are anticipated because of the short duration of dewatering and such areas in the vicinity of Unit No. 5 are currently receiving surface water from areas upgradient and offsite.

Wildlife habitat has been altered by previous construction activities associated with existing Unit Nos. 5 and 3. Therefore, no significant impacts on local or regional wildlife habitats will occur. The increased noise from construction equipment may cause temporary avoidance behavior in area wildlife. This behavior is expected to be minimal since existing wildlife are acclimated to the noise generated by existing power plant operations. Wildlife habitats such as wetlands, water bodies, etc., are currently accessible by existing roads. Any additional traffic to these areas will not affect wildlife conditions in these habitats. No unique species or habitats or significant populations of recreationally and commercially important species will be affected during construction.

4.5 AIR IMPACT

The air quality impacts during the construction phase of the project will be associated primarily with the site preparation and construction activities. These activities will result in the generation of fugitive particulate matter (PM) and an increase in the level of exhaust emissions from construction equipment. Air emissions will be temporary and will vary substantially from day to day during each phase of construction depending on the level of activity, the specific operations, and prevailing weather conditions.

Some fugitive PM emissions will be associated with construction of the facility. Most of the fugitive emissions will likely result from vehicular traffic over areas at the construction site (e.g., heavy-equipment traffic and traffic due to construction workers entering and leaving the site).

Wind erosion from the exposed land areas may also be a source of fugitive dust. Because of the variable nature of such emissions, emissions of fugitive PM are extremely difficult to quantify. The emissions are dependent upon a number of factors, including specific activities conducted, level of activity, and meteorological conditions.

The maximum impacts from vehicular exhaust emissions will occur during the construction phase when equipment will be onsite for concrete placement and major equipment installation. Vehicle exhausts include primarily nitrogen oxide (NO_x) and carbon monoxide (CO) emissions as well as particulate matter (PM), sulfur dioxide (SO_2), and volatile organic compounds (VOCs). However, air quality impacts from construction-related vehicle exhaust emissions are expected to be negligible.

The local air quality impact from fugitive PM will be minimized by the use of appropriate dust suppression control methods pursuant to FDEP Rule 62-296.320(4)(c), F.A.C. The impacts will cease when construction activities are terminated and the facilities are ready for operation. Area disturbed by construction will be revegetated after completion of construction. The major roads surrounding and leading to the plant site are paved.

Based on the limited amount of construction associated with the steam cycle for Unit No. 5, the air quality impacts are expected to be minimized by the control measures implemented during construction. Most of the construction activities will be conducted during daylight hours. As a result, the scheduling of the construction activities will act to reduce impacts since better atmospheric dispersion conditions exist during the daytime as opposed to nighttime. Also, many of the construction operations, site filling and grading, and foundation work, will be intermittent and of short duration. No significant air quality impacts are expected off plant property locations due to construction activities, based upon the intermittent nature of construction activities and the control measures implemented to reduce emissions.

4.6 IMPACT ON HUMAN POPULATIONS

Noise associated with the construction of the steam cycle for Unit No. 5 are a result of equipment used during foundation, erection, and start-up. Construction of foundation structures includes pouring of concrete and the placement of supporting piles, whereas erection of equipment typically includes the use of cranes and heavy equipment to move and secure power plant equipment and structures. Startup activities include site finishing and cleanup and plant startup. During the initial startup activities, steam pipe blowing and steam venting may be required. These activities will occur for only a short duration. Given the distance to residential areas and the short construction period for the unit, significant noise impacts are not expected.

Unit No. 5 steam cycle construction will take about 24 months. At peak construction activities, employment will be about 200 people over 2 to 3 months. The amount of traffic associated with this activity will not significantly affect the local access roads as evidenced from the experience with the construction of the simple cycle portion for Unit No. 5.

4.7 IMPACT ON LANDMARKS AND SENSITIVE AREAS

No federal, state, regional, or local scenic, cultural, or natural landmarks are located within five miles of the McIntosh facility. Consequently, the construction of steam cycle Unit No. 5 will have no effect on any such resources.

4.8 IMPACT ON ARCHAEOLOGICAL AND HISTORIC SITES

No significant archaeological and historic sites or sites recommended for preservation occur on the McIntosh site (see Appendix 10.5.1). Therefore, no impact mitigation is expected to be required for construction and operation of steam cycle Unit No. 5.

4.9 SPECIAL FEATURES

There will be no unusual products, raw materials, garbage disposal services, incinerator effluents, or residues produced during construction that will have an influence on the environment or ecological systems of the plant site and the adjacent areas.

4.10 BENEFITS FROM CONSTRUCTION

Numerous benefits will result directly from site preparation and construction activities. Site construction will create job opportunities within Polk and surrounding counties.

4.11 VARIANCES

No variances from applicable standards due to construction of the steam cycle for Unit No. 5 are necessary.

5.0 EFFECTS OF PLANT OPERATION

5.1 EFFECTS OF THE OPERATION OF THE HEAT DISSIPATION

The cooling system for the combined cycle configuration will use a closed cycle system with a new mechanical draft cooling tower. Makeup water for the cooling tower will be reuse water from the City of Lakeland Northside Waste Water Treatment Plant with backup from existing wells. The cooling tower blowdown discharge will be to the City Water Utilities Department with no direct discharge to surface waters. Therefore, Sections 5.1.1 and 5.1.2 of DEP Form 62-1.211 (1) are not applicable. There are no measurement programs proposed since there are no ground or surface water use for the cooling system and no direct discharges [Section 5.1.5 of DEP Form 62-1.211 (1)].

5.1.1 TEMPERATURE EFFECT ON RECEIVING BODY OF WATER

There is no thermal discharge associated with the operation of Unit No. 5.

5.1.2 EFFECTS ON AQUATIC LIFE

There is no surface water intake or discharge associated with the operation of Unit No. 5.

5.1.3 BIOLOGICAL EFFECTS OF MODIFIED CIRCULATION

There is no intake or discharge to surface waters associated with the operation of Unit No. 5.

5.1.4 EFFECTS OF OFFSTREAM COOLING

The impacts of the cooling tower were addressed by performing atmospheric plume dispersion analyses that predicted the potential impacts of the cooling tower plume with respect to:

- Plume length
- Fogging
- Icing
- Plume visibility

- Plume shadowing
- Aerosol deposition

Assessments of maximum and average annual cooling tower impacts of potential plume-induced fogging and icing, drift deposition, and shadowing were predicted with the cooling tower impact model (SACTI), which was developed through the Electric Power Research Institute (EPRI, 1984). Standard hourly meteorological data of surface weather observations and coincident twice-daily mixing height data are used in the analysis and processed with cooling tower data (e.g., tower size, height, latitude/longitude) by a preprocessor program. The output meteorological record is utilized by the SACTI model to predict the increase in annual frequencies of meteorological events due to a particular cooling tower's design and configuration. Icing and fogging frequencies at a particular location are based on the prediction of the cooling tower's visible plume length under various ambient meteorological conditions. The impacts of the visible plumes are evaluated in the model through use of physical plume dispersion in conjunction with an algorithm to take into account the thermodynamic interactions of the plume as well as any potential wake effects. The SACTI model can also determine the potential drift and deposition frequencies by wind direction and distance category from a cooling tower.

The general parameters used in the modeling are presented in Table 3-5. A distribution of the predicted drift droplet sizes for the cooling tower design is presented in Table 5-1. The drift emissions from the cooling tower were based on the maximum concentration of total dissolved solids (TDS) in the circulating water. The maximum TDS was based on data from Unit 2 and Unit 3 cooling towers. The maximum TDS was conservatively assumed to be 5,000 parts per million (ppm).

Hourly surface meteorological data and twice-daily mixing height data from the Tampa International Airport were provided for the years 1987 through 1991. This 5-year record coincides with the meteorological data used for other air impact analyses. Long-term monthly clearness indices and daily solar insolation values were also furnished.

The SACTI model calculations utilized a polar coordinate receptor grid system centered on the tower. Receptors were placed surrounding the source at 22.5-degree intervals and at varying distance intervals. For the salt deposition and plume length computations, 100-m intervals out to 10,000 m were used; for plume fogging and icing computations, 100-m intervals out to 1,600 m were used; for plume height, 10-m intervals up to 1,000 m were used; and for plume shadowing, 200-m intervals out to 8,000 m were used.

In order to estimate impacts conservatively, it was assumed that the tower operated year-round. This would produce conservative estimates of plume length, fogging, icing, plume shadowing, and deposition.

5.1.4.1 METEOROLOGICAL IMPACTS

The frequencies of visible plume length and height, fogging, and plume shadowing resulting from the cooling tower are presented in Appendix 10.5.5. The plume length will be 100 m or less about 98.9 percent of the time. An elevated visible plume with a maximum length of 400 m is predicted to occur only 3.74 percent of the time. The highest frequency of this occurrence is in the northern direction (wind blowing from the north) occurring 1.25 percent. However, at this length, it is expected that the plume would be barely perceptible. Due to the low frequency of occurrence of the visible plume, the effect on local meteorology is expected to be insignificant.

The nearest main road to the site is East Lake Parker Drive, which runs in an approximately north-south direction approximately 2,000 ft to the east of the cooling tower center. Localized, temporary, ground-level fogging may occur infrequently during plume downwash conditions. This locally induced fog would dissipate rapidly due to the high winds associated with plume downwash conditions. The total hours per year of induced fogging surrounding the cooling tower is estimated to be 3.8 percent (100 m from the cooling tower), all on plant property. It is possible that Lake Parker Drive could experience up to 0.5 percent of intermittent fogging per year due to downwash (assuming that the fog occurrences for west northwest directions at 600 m are used). Icing is not predicted to occur from cooling tower drift.

Plume shadowing was estimated to decrease significantly with increasing distance from the cooling tower. Beyond 400 m (1,300 ft) from the tower, the annual average number of hours of plume shadowing in any direction is estimated to be less than 100 hours per year. While the plume visibility is related to plume shadowing, the effect occurs primarily close to the cooling tower. In addition, plume heights are predicted to be less than 50 m (164 ft) 93 percent of the time. This height coupled with the tower height of about 40 ft would be considerably less (about 207 ft) than the height of the proposed stack for Unit No. 5 (300 ft). Plume shadowing due to the cooling tower is not expected to have a significant adverse effect on visibility in the surrounding area.

5.1.4.2 Deposition Impacts

The maximum deposition predicted from the cooling tower proposed for Unit No. 5 is presented in Table 5-2. The maximum average monthly deposition from the cooling tower is 35.8 kg/km^2/month and occurs 0.3 km from the tower toward the south. At a distance of 0.5 km, the maximum average deposition drops by about 50 percent to about 18 kg/km^2/month. At 1 km, the maximum deposition is less than 4 kg/km^2/month in all directions. At 2 km, the maximum deposition is less than 1.5 kg/km^2/month.

There are no direct data on the background deposition levels in the Lakeland area. However, baseline monitoring studies were conducted for the Florida Acid Deposition Study (FADS) and measured wet and dry deposition over many locations in Florida and included determining sodium and chloride concentrations. Data from FADS suggest a background level of total deposition ranges from about 150 to 400 kg/km^2/month. Since rainfall concentrations of salts are extremely dilute and rainfall effectively washes leaves of accumulated deposition, dry deposition is more important in determining relative impacts. The annual deposition in rainfall is about 120 kg/km^2/month, leaving dry deposition at about 130 to 280 kg/km^2/month. As noted from Table 5-2, the average maximum deposition is only about 27 percent of the expected dry deposition.

Vegetation may be affected by absorbing salts that accumulate in the soil. Accumulation will occur if the annual deposition rate of salt exceeds the rate at which salt is leached from the soil by rainfall. However, it is difficult to predict which plant species would be most affected by soil salinity, as tolerance to salt spray does not necessarily parallel known plant tolerances to soil salinity, but is governed by rate of foliage absorption. Most of the soils onsite are quite sandy throughout the profile and exhibit high permeability and leaching capability. Thus, accumulation of salt is not anticipated. Moreover, the deposition is small relative to the natural deposition of salts and will occur primarily onsite.

5.2 EFFECT OF CHEMICAL AND BIOCIDE DISCHARGES

The only waste waters generated from the operation of the Unit No. 5 Project are associated with air inlet evaporative cooler blowdown and cooling tower blowdown. Demineralizer regeneration will continue to be handled by a contractor offsite. RO brine (decreases from 135 gpm with simple cycle to 30 gpm with combined cycle during normal operation) will be discharged to the City's Water Utilities Department. Evaporative cooler and HRSG blowdown of approximately 30 gpm is discharged to the existing process wastewater ponds. The cooling tower blowdown will be discharged to the City's Water Utilities Department.

5.3 WATER SUPPLIES

The proposed maximum raw water usage for Unit No. 5 will be 880 gpm or a peak usage of 1,267,200 gpd and normal usage of 130 gpm and 187,200 gpd. The normal usage is a reduction in water use from simple cycle operation of 445 gpm to 130 gpm. Including peak water usage that includes 250 hours of oil firing and 3,000 hours of power augmentation, the annual maximum usage with the steam cycle will be 280 gpm (403,200 gpd). In contrast, the annual usage for simple cycle is 456 gpm (656,640 gpd). Wells permitted as No. 5 and 8 will supply this raw water and are currently authorized by SWFWMD to withdraw an annual average of 1,512,000 gpd. Monthly service water use for the entire McIntosh Plant is presented in Tables 5-3 and 5-4 for 1997 and 1998, respectively. For 1997, the peak monthly usage was 940,250 gpd for Wells No. 5 and 8. The average daily usage was 920,711 gpd for Wells No. 5 and 8. For 1998, the peak monthly usage for Wells No. 5 and 8 was 681,933 gpd. The average daily usage was 666,807 gpd. The combined current service water usage and the maximum usage for Unit No. 5 will be approximately 1.2 million gpd which is less than the SWFWMD authorization. The addition of the steam cycle will reduce service water usage from 656,640 gpd annual average maximum to 403,200 gpd annual average maximum; a reduction of about 40 percent. Impacts on existing water supplies would not be significant since the raw water requirements associated with Unit No. 5 are within the permitted SWFWMD authorization.

As discussed in Section 3.5.2, reuse water will be used as the primary source of cooling tower makeup. An allocation of 3.24 million gallons per day (mgd) maximum and 0.8 mgd annual average of groundwater is requested for Unit No. 5. Groundwater would be used as backup for cooling tower makeup when reuse water is not available. The requested annual average is based on 90 days emergency usage. Unit 3 is currently permitted to use 5.271 mgd maximum and 0.2166 mgd annual average as cooling water makeup as backup to reuse water. In 1997 and 1998, the annual average usage for Unit 3 backup Wells 31, 32, and 33 was 42,278 and 13,705 gpd, respectively, which was within the current authorization. The existing wells 31, 32, and 33 would also be used for Unit 5 and have sufficient capacity to provide the back-up supply. Each of these wells are rated at 2,400 gpm and could furnish 3.46 mgd.

5.3.1 DRAWDOWN ANALYSIS

Drawdown modeling was performed for the most recent renewal of the McIntosh Plant consumptive use permit issued by SWFWMD in 1996 (see Appendix 10.4.4). A summary of the results are in Appendix 10.5.3. These simulations, using calibrated and literature data concerning the hydraulic parameters, show that no adverse impacts will occur to off-site existing legal users.

5.3.2 DRINKING WATER

Potable water use at the McIntosh plant will remain the same after the completion of the conversion of Unit 5 to combined cycle. The City's Water Utilities Department supplies potable water to the McIntosh Plant.

5.3.3 STORMWATER RUNOFF

The existing stormwater management system includes a 1.6 acre storm water pond designed to discharge one half of the model storm event within 24 hours and no more than one half of the water quality volume (the first 1.0 inch of runoff) in the first 60 hours. Additional design parameters include:

- Maintain 35 percent of surface area 1 foot deep below seasonal high water,
- Set bleeder elevation at the elevation for the volume of 100-year storm event
- Store the water quality volume (1" runoff from site); set weir at the corresponding elevation
- Maintain the same peak discharge pre- and post-development

Stormwater pond design calculations for the SWFWMD approved stormwater system are included as Appendix 10.5.4.

5.4 SOLID/HAZARDOUS WASTES

Operation of Unit No. 5 will not generate any solid or hazardous wastes. Any solid wastes (e.g., air inlet filters) or potential hazardous wastes resulting from maintenance activities (e.g., painting or solvent usage), will be disposed of in an approved manner and according to regulations.

5.5 SANITARY AND OTHER WASTE DISCHARGES

Sanitary wastes will be handled by existing plant systems.

5.6 AIR QUALITY IMPACT ANALYSIS

The steam cycle for Unit No. 5 does not involve any increase in emissions from the combustion of fuel and is authorized by FDEP under a PSD air construction permit and PPSA certification. Additional modeling was conducted for this application since the stack parameters for the combined cycle unit change from the simple cycle design, even though PSD review is not required. The addition of the HRSG extracts CT exhaust heat, reducing plume temperature and velocity. However, the HRSG GEP stack height is higher; i.e., GEP of 250 ft compared to CT stack of 85 ft. The actual stack height will be 300 ft with lower air quality impacts.

The general modeling approach followed EPA and FDEP modeling guidelines for determining compliance with AAQS and PSD increments. For all applicable pollutants that have emission increases that will exceed the PSD significant emission rates due to a proposed project, a significant impact analysis is performed to determine whether the project alone will result in predicted impacts that will exceed the EPA significant impact levels at any off-plant property areas in the vicinity of the plant.

Generally, if the project undergoing the modification also is within 150 to 200 kilometers of a PSD Class I area, then a significant impact analysis is also performed for the PSD Class I area. Currently, EPA has recommended significant impact levels for PSD Class I areas. The recommended levels have not been promulgated as rules but are being used by FDEP until the rules are final.

If the project's impacts are above the significant impact levels, then a more detailed air modeling analysis that includes background sources is performed. Current FDEP policies stipulate that the highest annual average and highest short-term (i.e., 24 hours or less) concentrations are to be compared to the applicable significant impact levels. Based on the screening modeling analysis results, additional modeling refinements with a denser receptor grid are performed, as necessary, to obtain the maximum concentration. Modeling refinements are performed with a receptor grid spacing of 100 meters (m) or less.

An impact analysis was conducted according to the FDEP and EPA requirements and presented with the air permit application for simple cycle Unit No. 5 (City of Lakeland Department of Electric and Water Utilities Air Permit Application and PSD Analysis 501G, December 1997). The Industrial Source Complex Short-term (ISCST3, Version 96113) dispersion model (EPA, 1996) was used to evaluate the pollutant impacts due to the proposed CT. The ISCST3 model is applicable to sources located in either flat or rolling terrain where terrain heights do not exceed stack heights. The ISCST3 model is designed to calculate hourly concentrations based on hourly meteorological parameters (i.e., wind direction, wind speed, atmospheric stability, ambient temperature, and mixing heights). Meteorological data used in the ISCST3 model to determine air quality impacts consisted of a concurrent 5-year period of hourly surface weather observations and twice-daily upper air soundings from the National Weather Service (NWS) stations at Tampa International Airport and Ruskin, respectively. The 5-year period of meteorological data was from 1987 through 1991. The NWS station at Tampa International Airport, located approximately 59 km (37 miles) west of the proposed plant site, was selected for use in the study because it is the closest primary weather station to the study area that is representative of the plant site.

In an effort to obtain the maximum air quality impacts for a range of possible operating conditions of simple cycle Unit No. 5, the air modeling analysis used a range of emission rates and stack parameter data to predict air quality impacts for natural gas- and fuel oil-firing. For each fuel, four modeling scenarios were considered. The proposed project was modeled for baseload and 50-percent load conditions with two ambient temperatures, 30°F and 90°F, for each load. The combined cycle project will have a stack height of 300 ft, and an inner stack diameter of 20 ft. The only significant structure in the vicinity of the proposed HRSG stack is the proposed HRSG. This structure is proposed to be 100 ft high and will have horizontal dimensions of 100 ft by 50 ft. Since the GEP stack height based on these dimensions is 250 ft, the modeling analysis used the GEP stack height. For the air modeling analysis, the height of this structure and the building diagonal were entered into the ISCST3 model as the building height and width for each of 36 ten-degree wind sectors.

For predicting maximum concentrations in the vicinity of the plant, a polar receptor grid comprised of 648 grid receptors was used. These receptors included 36 receptors located on radials extending out from the proposed stack location. Modeling refinements were performed, as needed, by employing a polar receptor grid with a maximum spacing of 100 m along each radial and an angular spacing between radials of 2 degrees. For predicting impacts at the Chassahowitzka National Wilderness Class I Area (CNWA), 13 discrete receptors located along the border of the PSD Class I area were used.

Even though there are no significant increases in emissions associated with the addition of the steam cycle and PSD review is not required, additional modeling was conducted. The modeling analysis results for Unit No. 5 in combined cycle mode in the vicinity of the plant are summarized in Table 5-5. The maximum predicted PM_{10}, SO_2, NO_2, and CO impacts due to the proposed project are all well below the EPA Significant Impact Levels (SIL). The addition of the steam cycle will not have a significant impact upon the air quality in the vicinity of the plant site.

The maximum predicted concentrations due to Unit No. 5 in combined cycle mode alone at the CNWA are presented in Table 5-6. The maximum predicted impacts are below both the proposed EPA PSD Class I SIL for all applicable pollutants. All maximum predicted values are at or below the recommended EPA PSD SILs. The addition of the steam cycle will not have a significant impact upon the air quality in the PSD Class I area. Therefore, the combined cycle Unit 5 does not cause or contribute to any exceedance of AAQS or PSD increments.

5.7 NOISE

The operation of the proposed project will involve the generation of noise. The potential noise impacts from the addition of the combined cycle configuration for Unit No. 5 was determined based on the manufacturers far-field noise level of 70 dBA at 400 feet. The noise impacts were determined by decreasing the far-field noise level by 6 dBA for each doubling of distance from Unit No. 5. This noise reduction accounts for hemispheric spreading, but does not account for the molecular absorption, terrain, vegetation and barriers (such as the tall structures Unit Nos. 1, 2 and 3). Therefore, the noise level estimates are conservative. The noise contribution for Unit No. 5 was determined for the nine noise monitoring locations that determined daytime and nighttime noise levels. This included the three locations on McIntosh Plant site and the six locations offsite.

The results of the noise impacts for Unit No. 5 are presented in Table 5-7. This table presents the baseline measurements, the maximum impact for Unit No. 5 and the maximum noise levels with Unit No. 5. The results of the analyses show that the actual increase in Leq as a result of this project is very low at all offsite receptors. Human recognition to noise levels generally does not occur unless the additive noise is 3 dBA over the baseline noise levels. Maximum noise levels exceeding the baseline by 3 dBA would occur only at night at the closest offsite receptor (Site 4), which is greater than 1 mile SE of Unit No. 5. At the closest residential areas (Sites 5, 8 and 9) the maximum increases in noise levels are estimated to be 3 dBA or less at night and 1 dBA or less during the day. The maximum estimated nighttime L_{eq} at the closest residential sites are less than 57 dBA.

The L_{dn} was estimated for Sites 4 through 9 for comparison to the maximum estimated noise impacts with the EPA recommended guidelines. The minimum baseline noise levels were used since the traffic noise dominated much of the total sound energy (i.e. high maximum with concomitant L_{eq} increases). This would also estimate the impacts when the continuous operation of the plant can potentially impact conditions when the transient noise sources (e.g., traffic, birds, insects, etc.) are not occurring and the plant noise would be most noticeable. The maximum L_{dn} using these data are 54.6 dBA for Site 4, 53.3 dBA for Site 5, 54.5 dBA for Site 6, 54.1 dBA for Site 7, 52.6 dBA for Site 8 and 54.6 dBA for Site 9. Without the traffic noise the estimated L_{dn} are still all less than the EPA recommend L_{dn} of 55 dBA. Moreover, the analysis is conservative based on the assumed noise reductions.

The Site Certification issued for McIntosh Unit No. 3 (PA 74-06) ordered that sound levels between the hours of 7 a.m. and 10 p.m. must be maintained at 70 dBA or less, 99 percent of the time and 60 dBA or less, 90 percent of the time. Between the hours of 10 p.m. and 7 a.m., sound levels must be maintained at 65 dBA or less, 99 percent of the time, and 60 dBA, 90 percent of the time. The location for these noise levels is the nearest residence.

The results of the analysis, as shown in Table 5-7, indicate Unit No. 5 will not impact the noise levels at residential areas in the vicinity of the McIntosh Plant site and be within the ordered noise limits prescribed by the Site Certification.

5.8 CHANGES IN NON-AQUATIC SPECIES POPULATIONS

5.8.1 IMPACTS

No sensitive wildlife or vegetation occurs on the plant site or in the immediate vicinity of the site. Therefore, no effects, including long-term changes to non-aquatic species populations, are expected to occur for operation of the steam cycle for Unit No. 5.

5.8.2 MONITORING

Because of the lack of impacts, post-operational programs to monitor non-aquatic species populations are not required.

5.9 OTHER PLANT OPERATION EFFECTS

There will be no net increase in the number of employees as a result of the operation of the Project. Therefore, no impacts to the level of service are anticipated.

5.9.1 VISUAL/AESTHETIC IMPACTS

The potential for visual impacts of the project depends on two primary factors: the visual character and quality of the views or vistas that may be obstructed by structures, and the degree of viewer exposure and sensitivity. The visual character is related to the existing visual characteristics in the immediate area of the site. Viewer exposure is related to the number of viewers, the distance between the viewer and the structures, the view duration, and the areas from which the structures can be viewed.

As discussed in Section 3.1, the McIntosh Plant has three existing steam generating units. These steam generators are not enclosed in a building, resulting in the exposure of the steel beams supporting the boiler, piping and vents, and guardrails. The existing Unit 1 is 125 ft high, with a stack 148 ft high; Unit 2 is 142 ft high, with a stack 157 ft high; and Unit 3 is 208 ft high, with a stack height of 252 ft. The steam generators and stacks associated with Units 1 and 2 have existed at the site since the early-1970s.

The proposed structures that potentially influence the visual character of the McIntosh Plant area include one 300-ft-high stack, and the one 100-ft-high HRSGs.

The visual character of the area surrounding the structures associated with the steam cycle project will not be altered as a result of the project. The addition of the steam cycle facilities will be visually consistent with the zoning and the general land use designations of the area.

The potential impacts to viewer exposure will not be increased. Since the number of viewers exposed, the areas of exposure, and the view duration will not change significantly as a result of the project, overall viewer exposure will not be adversely affected. This conclusion is based on the current visual opportunities the of existing Units 1, 2, 3, and 5 and the distance of viewers.

The existing units are currently visible from US Highway 92 to the south of the plant, and several residential areas located southeast of the site along East Lake Parker Drive. The stack for the steam cycle and HRSG will be visible from US Highway 92 (about 2 miles away) but less noticeable than the existing units due to its orientation on the site. The viewer exposure in this area will be of short duration. For the residential areas, the plant will be less visible due to the existing structure heights. Indeed, the steam cycle units will not be visible from many residences due to vegetation and distances.

5.9.2 OTHER POTENTIAL IMPACTS

Potential impacts associated with the demand for services and available infrastructure are discussed in Section 7.0. That section addresses long-term external costs (impacts) related to the operational demands on housing, education, medical facilities, fire fighting facilities, police protection, recreation, electricity, natural gas, water supply, sewage treatment, and solid waste disposal.

5.10 ARCHAEOLOGICAL SITES

Post-construction monitoring is not anticipated since there are no significant archaeological or historical sites in the project vicinity that will be impacted by operation of the Project. A letter from the Florida Department of State, Division of Historical Resources dated April 7, 1999 states "the proposed project will have no effect on any site listed, or eligible for listing, in the *National Register of Historic Places*, or otherwise of historical or archaeological value" (see Appendix 10.5.1).

5.11 RESOURCES COMMITTED

There are no major irreversible and irretrievable commitments of state and local resources due to the operation of the steam cycle.

The addition of the steam cycle for Unit No. 5 provides an additional 120 MW without any additional fuel usage; thus, making Unit No. 5 one of the most efficient power plants in Florida. The increased power production will also be accomplished without any increase in air emissions. Only about 3 acres of previously impacted land is committed for the steam cycle equipment. Service water use will decrease by 40 percent compared to simple cycle use. Reuse water will be used for cooling tower makeup with only emergency backup from existing wells.

5.12 VARIANCES

No variances from federal, state, or local regulations are anticipated for the operation of the McIntosh Unit No. 5.

Table 5-1. Estimated Drift Emission Spectrum for the Cooling Tower for the City of Lakeland, McIntosh Unit No. 5

Particle Size Range (micrometers)	Total in Size Range (percent)
0 - 50	50.00
51 - 100	25.00
101 - 150	12.00
151 - 250	9.10
251 - 400	3.15
401 - 500	0.48
>500	0.27

Source: Golder Associates Inc., 1998.

Table 5-2. Maximum TDS Deposition for McIntosh Unit No. 5

Direction	Average Deposition[a] (kg/km^2/month) at Distance (km) from Center of Cooling Tower				
	0.3	0.5	1.0	1.5	2.0
North	22.8	8.3	3.0	0.9	0.6
Northeast	6.8	3.4	0.3	0.3	0.2
East	17.3	4.3	0.4	0.4	0.3
Southeast	11.8	8.3	0.9	0.5	0.4
South	35.8	9.9	3.6	0.9	0.7
Southwest	16.1	12.0	1.3	1.3	1.0
West	27.4	18.4	2.0	2.0	1.4
Northwest	11.4	8.5	0.9	0.7	0.4

[a] Based on a maximum TDS of 5,000 ppm.

Source: Golder Associates Inc., 1998.

Table 5-3. Monthly Water Use (1997 data) at the McIntosh Power Plant, Lakeland, FL

MONTH	READING (gallons)	TOTAL YTD (gallons)	AVERAGE YTD (gallons)	ANNUAL AVERAGE DAILY WITHDRAWAL (gallons)
#5 Service Water Well (Well #11)				
January	9,618,000	9,618,000	9,618,000	310,258
February	9,624,500	19,242,500	9,621,250	326,144
March	7,428,000	26,668,500	8,889,500	293,060
April	10,035,500	36,704,000	9,176,000	305,867
May	7,840,000	44,544,000	8,908,800	294,993
June	16,256,000	60,800,000	10,133,333	335,912
July	18,172,000	76,972,000	11,281,714	372,509
August	17,408,000	96,380,000	12,047,500	396,626
September	16,763,000	113,143,000	12,571,444	414,443
October	17,149,000	130,292,000	13,029,200	477,260
November	16,533,000	146,825,000	13,347,727	439,596
December	12,944,000	159,769,000	13,314,083	437,723
Peak Month	18,172,000 (July)			
Peak Month Daily Average	586,194			
#8 Service Water Well (Well #12)				
January	9,618,000	9,618,000	9,618,000	310,528
February	9,624,500	19,242,500	9,621,250	326,144
March	7,426,000	26,668,500	8,889,500	293,060
April	10,035,500	36,704,000	9,176,000	305,867
May	7,840,000	44,544,000	8,908,800	294,993
June	0	44,544,000	7,424,000	246,099
July	0	44,544,000	6,363,429	210,113
August	0	44,544,000	5,568,000	183,309
September	0	44,544,000	4,949,333	163,165
October	0	44,544,000	4,454,400	165,165
November	0	44,544,000	4,049,455	133,365
December	0	44,544,000	3,712,000	122,038
Peak Month	10,035,500 (April)			
Peak Month Daily Average	334,517			

Table 5-4. Monthly Water Use (1998 data) at the McIntosh Power Plant, Lakeland, FL.

Month	Reading (gallons)	Total YTD (gallons)	Average YTD (gallons)	Annual average daily withdrawal (gallons)
#5 Service Water Well (Well #11)				
January	14,472,000	14,472,000	14,472,000	466,839
February	15,704,000	30,173,000	15,088,000	511,458
March	20,338,000	50,513,000	16,838,333	555,110
April	5,402,000	55,917,000	13,979,250	465,975
May	11,164,000	67,081,000	13,416,200	444,245
June	20,447,000	87,528,000	14,588,000	483,580
July	20,115,000	107,643,000	15,377,571	507,750
August	19,257,000	126,900,000	15,862,500	522,222
September	19,234,000	146,134,000	16,237,111	535,289
October	15,713,000	161,847,000	16,184,700	592,846
November	14,491,000	176,338,000	16,030,727	527,958
December	14,465,000	190,803,000	15,900,250	522,748
Peak Month		20,447,000 (June)		
Peak Month Daily Average		659,581		
#8 Service Water Well (Well #12)				
January	224,000	224,000	224,000	7,226
February	53,000	277,000	138,500	4,695
March	120,000	397,000	132,333	4,363
April	113,000	510,000	127,500	4,250
May	0	510,000	102,000	3,377
June	0	510,000	85,000	2,818
July	0	510,000	72,857	2,406
August	3,000	513,000	64,125	2,111
September	0	513,000	57,000	1,879
October	0	513,000	51,300	1,879
November	0	513,000	46,636	1,536
December	0	513,000	42,750	1,405
Peak Month		224,000 (January)		
Peak Month Daily Average		7,226		

Table 5-5. Maximum Pollutant Concentrations Predicted for City of Lakeland- McIntosh Unit No. 5, Combined Cycle Project (250-ft stack height)

Pollutant	Averaging Time	Maximum Impact (µg/m³)- Natural gas-Firing (1)	Maximum Impact (µg/m³)- Fuel oil-Firing (1)	PSD Class II Significant Impact Levels (µg/m³)	Ambient Air Quality Standards (µg/m³)
Specific Pollutant Impacts					
PM/PM10	Annual	0.0089	0.1790	1	50
	24-Hour	0.1192	2.3600	5	150
SO_2	Annual	0.0071	0.1290	1	60
	24-Hour	0.0945	1.7000	5	260
	3-Hour	0.3890	6.9700	25	1300
NO_2	Annual	0.0824	0.4150	1	100
CO	8-Hour	3.0400	11.6000	500	10000
	1-Hour	14.6000	53.6000	2000	40000

Note: Sulfur content of fuel oil is assumed to be 0.05 percent; for modeling purposes, oil assumed to be fired for entire y
NA= not applicable

Table 5-6. Maximum Pollutant Concentrations Predicted at the Chassahowitzka National Wilderness Area, PSD Class I Area
City of Lakeland- McIntosh Plant, Unit No. 5 Combined Cycle Project (250-ft stack height)

Pollutant	Averaging Time	Maximum Impact (µg/m³)- Natural gas-Firing (1)	Maximum Impact (µg/m³)- Fuel oil-Firing (1)	Proposed EPA PSD Class I Significant Impact Levels (µg/m³)	PSD Class I Increments (µg/m³)
<u>Specific Pollutant Impacts</u>					
PM/PM10	Annual	0.0007	0.0118	0.2	4
	24-Hour	0.0116	0.1910	0.3	5
SO_2	Annual	0.0006	0.0010	0.1	3
	24-Hour	0.0092	0.1630	0.2	5
	3-Hour	0.0396	0.7000	1	25
NO_2	Annual	0.0065	0.0320	0.1	2.5

Note: Sulfur content of fuel oil is assumed to be 0.05 percent; for modeling purposes, oil assumed to be fired for entire year.
NA= not applicable

(1) Concentrations were predicted using the ISCST3 model for 5 years (1987-1991) of meteorological data from National Weather Service station in Tampa.

Table 5-7. Baseline and Impacts at Selected Receptors for the City of Lakeland McIntosh Unit 5

Site	Location	Distance and Direction From McIntosh Unit 5: Distance (ft)	Distance and Direction From McIntosh Unit 5: Direction	Measurement Period	Baseline Sound Pressure Level (dBA): Minimum	Baseline Sound Pressure Level (dBA): Maximum	Baseline Sound Pressure Level (dBA): L_{eq}	Maximum Impact (dBA) for Unit 5	Impacts Sound Pressure Level (dBA): Minimum	Impacts Sound Pressure Level (dBA): Maximum	Impacts Sound Pressure Level (dBA): L_{eq}	Impacts Sound Pressure Level (dBA): L_{eq} Increase
1	Plant Site - near administration bldg.	2800	SE	Daytime	55.3	76.4	62.1	56.5	59.0	76.4	63.2	1.1
				Nighttime	56.1	60.3	58.2	56.5	59.3	61.8	60.4	2.2
2	Plant Site - near northern entrance	1,300	ESE	Daytime	58.5	79.7	64.0	60.3	62.5	79.7	65.5	1.5
				Daytime	52.3	72.5	58.8	60.3	60.9	72.8	62.6	3.8
				Nighttime	53.0	66.1	55.8	60.3	61.0	67.1	61.6	5.8
3	Plant Site - near west boundary	500	SW	Daytime	44.8	66.5	50.6	68.5	68.5	70.6	68.6	18.0
				Daytime	43.6	56.8	49.9	68.5	68.5	68.8	68.6	18.7
				Nighttime	45.6	53.0	47.3	68.5	68.5	68.6	68.5	21.2
4	E. Lake Parker Drive	5,800	SE	Daytime	44.9	76.5	56.0	47.1	49.2	76.5	56.5	0.5
				Daytime	46.5	80.1	63.4	47.1	49.8	80.1	63.5	0.1
				Nighttime	43.2	66.3	47.0	47.1	48.6	66.4	50.1	3.1
5	E. Lake Parker Drive	7,000	SE	Daytime	45.1	79.5	60.1	45.4	48.3	79.5	60.2	0.1
				Daytime	44.5	80.9	62.8	45.4	48.0	80.9	62.9	0.1
				Nighttime	42.1	69.3	45.5	45.4	47.1	69.3	48.5	3.0
6	Sertoma Park	11,500	S	Daytime	51.0	79.8	61.8	41.2	51.4	79.8	61.8	0.0
				Nighttime	46.1	65.0	54.1	41.2	47.3	65.0	54.3	0.2
7	Lake Parker Dr.	5,800	WSW	Daytime	45.8	80.3	65.4	47.1	49.5	80.3	65.5	0.1
				Nighttime	40.1	75.1	56.0	47.1	47.9	75.1	56.5	0.5
8	Near Lakeland Hills Blvd.	7,500	WNW	Daytime	45.3	74.1	55.0	45.0	48.1	74.1	55.4	0.4
				Nighttime	40.6	61.0	48.3	45.0	46.3	61.1	50.0	1.7
9	Lakeland Harbor Trailer Park	7,000	NNW	Daytime	47.5	62.8	51.4	45.4	49.6	62.9	52.4	1.0
				Nighttime	45.2	58.8	49.0	45.4	48.3	59.0	50.6	1.6

6.0 TRANSMISSION LINES AND OTHER LINEAR FACILITIES

No new linear facilities are required as part of the conversion of Unit No. 5 from simple cycle to combined cycle operation.

7.0 ECONOMIC AND SOCIAL EFFECTS OF PLANT CONSTRUCTION AND OPERATION

7.1 SOCIO-ECONOMIC BENEFITS

The conversion of McIntosh Unit No. 5 to combined cycle will generate positive economic impacts on Polk County and the State of Florida as a whole. Directly, the construction and operation of the plant will have a positive impact on employment, labor income, gross domestic product and government revenues. The effect of these variables will be even higher once the impacts resulting from the procurement of goods and services and the spending of additional income are taken into account.

Economic benefits of the Unit No. 5 Combined Cycle Project are anticipated to include the following:

- Cost savings to Lakeland Electric ratepayers
- New construction jobs with associated payroll
- Increased sales of goods and services in industries supporting the construction and operation and maintenance phases of the project

The proposed Unit No. 5 Combined Cycle will have significant economic and environmental benefits for the City of Lakeland. The Unit No. 5 simple cycle 501G, with a capital cost of about $63 million, is scheduled for release to Lakeland for commercial operation in July 1999. The conversion to combined cycle will result in an additional 120 MW of generating capacity without increasing fuel costs. The total project cost of the conversion to combined cycle is $80.5 million. The project schedule is based on a 20 to 24 month construction period beginning in the summer of 2000 in order to meet a January 2002 commercial operation date. When completed, Unit No. 5 will be the most efficient operating unit in the state of Florida.

The economic effects of the Unit No. 5 steam cycle project were examined for both the construction and operating phases of the project. For purposes of calculating the magnitude and distribution of the economic effects of the project construction and operation, the following information was taken into consideration.

7.1.1 CONSTRUCTION PHASE

The total capital cost for the construction of the McIntosh Unit No. 5 Combined Cycle is estimated at $80.5 million. Construction will commence in the summer of 2000, with start-up scheduled for the first quarter (January) of 2002. Table 7-1 provides a breakdown of capital expenditures for the proposed project.

Construction of the Project facilities requires a significant amount of labor and involves workers with a variety of skills. Construction labor requirements peak in the third quarter of 2001 at 200 persons, with the average direct labor averaging 150 persons during the construction phase. The typical construction labor force will consist primarily of engineers/designers, pipefitters, welders, field supervision/support, instrument fitters, mill wrights and equipment operators.

7.1.2 OPERATIONS PHASE

In addition to the construction capital expenditures, there will be ongoing expenditures associated with the operation and maintenance of the Unit No. 5 Combined Cycle Project. It is expected that the combined cycle will begin operations by the first quarter of 2002. The plant is anticipated to operate for a minimum of 30 years.

The current workforce at the McIntosh plant is 218 persons. Once the construction is complete, it is anticipated that total employees required to operate the plant will be the same. Some new positions will be created for specialized needs. The City of Lakeland will not necessarily recruit locally. From an employment perspective, this is acceptable since some of the operating positions are highly specialized, and may need to be filled by individuals from other parts of the state of Florida, who will relocate to the Lakeland area with their families. Therefore, the net effect is a very slight increase in population in Polk County. However, given the relatively small number of new persons required to work at the plant, the overall impact on population will be minimal.

7.2 SOCIO-ECONOMIC COSTS (IMPACTS)

The changes in resident population in Polk County due to the construction and operation of the proposed repowering project are negligible. Because construction duration is short (18 months), any construction trades needed that cannot be supplied locally will be met by workers relocating to Polk County for a short period of time. As a result, their temporary residences will be met by transient accommodations and/or rental units (both apartment and single family residential rentals). Population changes as a result of the construction of the proposed project will be further reduced by the fact that temporary construction employment often results in workers relocating without bringing their families.

Population change during operation of the plant will not result since there will be no net change in operation employment needs when compared to existing employment levels.

As a result of the minimal changes in population, no perceptible changes are anticipated to occur in most of the other community services or facilities. The present housing stock and transient accommodations are expected to be able to supply the needs of the construction employees as well as overall community needs. Because construction workers rarely bring families to temporary job sites and no operation employment increases are anticipated, no impacts to schools or other education or recreation facilities are expected.

Medical facilities and services are likewise not expected to be affected by the temporary construction workforce or operation employees. First aid provisions are presently available for plant operational staff and similar provisions will be made for the duration of construction for construction workers. The existing County EMS services that provide emergency response to the existing facilities will be available to provide services both during and after construction.

Police and fire protection is presently available onsite and will continue to be available during construction and operation of the plant.

Impacts to water and wastewater utilities will also be negligible. The McIntosh plant presently obtains potable water from the City of Lakeland and will continue to obtain potable water for the steam cycle project. No significant increase in potable water needs is anticipated.

Reverse osmosis (RO) brine wastewater generated at the plant is presently discharged to existing plant process wastewater ponds and then after treatment to the City's Water Utilities Department.

A temporary increase in solid waste generation will occur during construction from equipment and supply containers. Additional dumpsters will be provided for collection and offsite transport to approved disposal facilities. Solid waste generation rates after the completion of the project will remain approximately the same when compared to existing generation rates. Unit No. 5 will not generate hazardous wastes during operations

Table 7-1. Capital Expenditures for the McIntosh Unit No. 5 Conversion to Combined Cycle (Costs in 1998 Dollars)

Procurement Contracts			
Mechanical		$39,570,000	
Electrical		$5,360,000	
Control		$1,380,000	
Chemical		$360,000	
	Subtotal		$46,670,000
Furnish & Erect Contracts			
Structural		$1,240,000	
	Subtotal		$1,240,000
Construction Contracts			
Civil/Structural		$3,835,000	
Mechanical/Chemical		$3,760,000	
Electrical/Control		$1,810,000	
Construction Services		$7,085,000	
	Subtotal		$16,490,000
Total for Direct Costs			$64,400,000
Indirect Costs			
General Indirect Costs		$1,400,000	
Outside Engineering		$7,000,000	
Construction Management		$4,700,000	
Contingency		$3,000,000	
	Total Indirect Cost		$16,100,000
Total Project Cost			**$80,500,000**

8.0 SITE AND DESIGN ALTERNATIVES

This section is optional and is not being provided. It should be noted, however, that the steam cycle for Unit No. 5 will be designed to recover waste heat from the existing combustion turbine. While there are two alternative locations for the steam turbine on the project site, the same total areas are affected and no change in environmental impacts result from either location.

9.0 COORDINATION

The City of Lakeland filed with the Florida Public Service Commission a petition on January 6, 1999, for a determination of need for the steam cycle for Unit No. 5. Approval was issued May 10, 1999 by the PSC in Order No. PSC-99-0931-FOF-EM. Representatives of the City also met with the FDEP Office of Siting Coordination and the Bureau of Air Regulation regarding technical aspects of the project. In addition, the City has met with representatives of the Southwest Florida Water Management District.

10.0 LIST OF APPENDICES

10.1 FEDERAL PERMIT APPLICATIONS OR APPROVALS

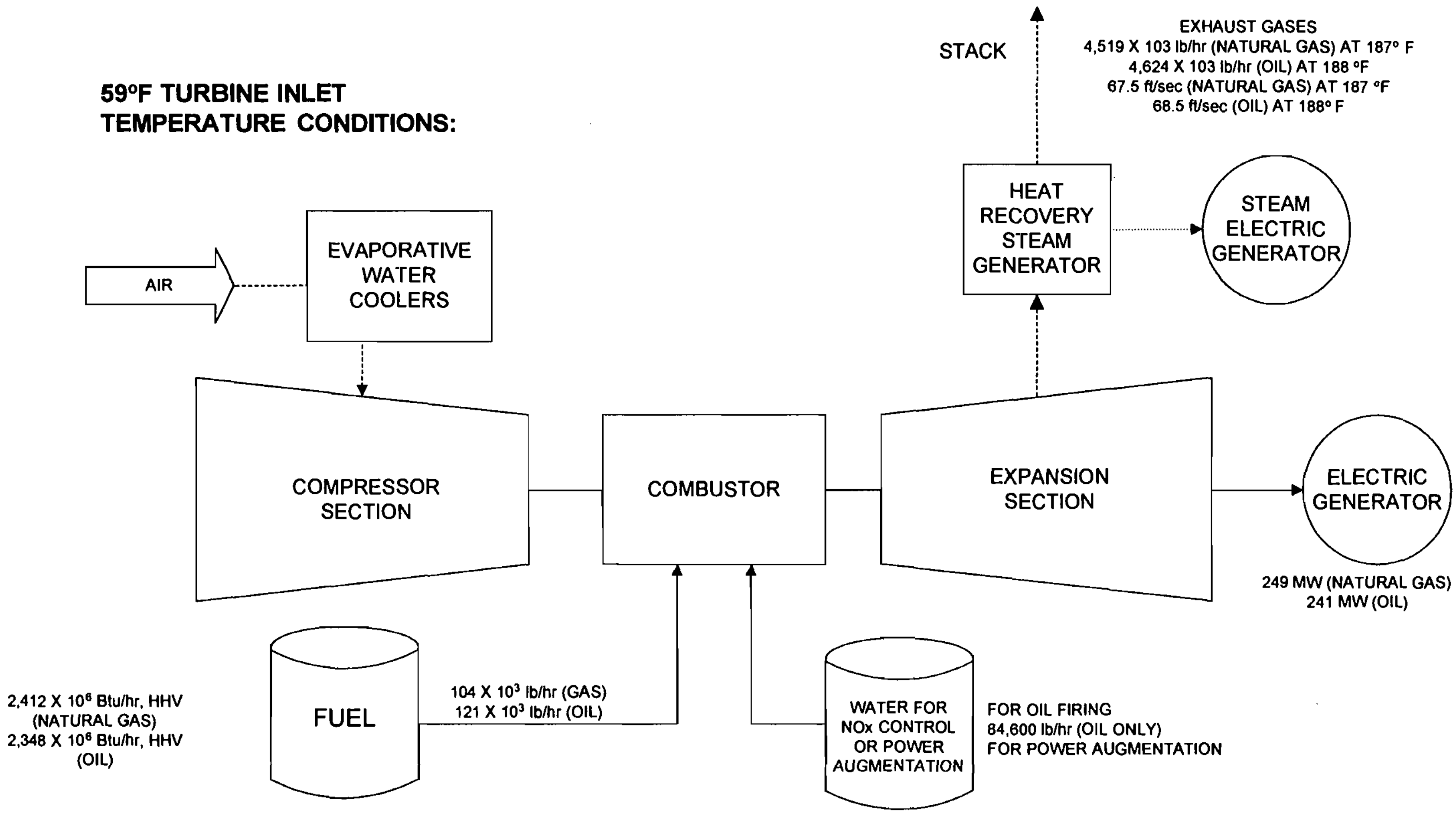
10.1.1 THROUGH 10.1.4 NOT REQUIRED

10.1.5 AIR PERMIT INFORMATION

COOLING TOWER INFORMATION AND
PERFORMANCE AND EMISSION INFORMATION
ON "G" CLASS COMBUSTION TURBINE
IN COMBINED CYCLE

(Note: SO_2 based on 0.2 gr/100 cf of H_2S. Actual total sulfur based on 1 gr/100 cf to account for odorant (mercaptans) in pipeline gas.)

59°F TURBINE INLET TEMPERATURE CONDITIONS:



NOTE: SEE SCA FOR DESIGN INFORMATION AND STACK PARAMETERS FOR EACH FUEL. BASED ON FLOW RATES PROVIDED BY WESTINGHOUSE.

Attachment USDB-EU1-L1
Simplified Flow Diagram of McIntosh Unit 5
City of Lakeland

Process Flow Legend
Solid/Liquid
Gas
Steam

Filename: 9937510Y/F1/WP/FIGURE.VSD
Date: 06/10/99

Golder Associates

Table A-1. Design Information and Stack Parameters for City of Lakeland- McIntosh Plant
Unit 5 Combined Cycle, Natural Gas, Base Load

Parameter	Base Load for Temperature 90 °F	59 °F	30 °F
Combustion Turbine Performance			
Net power output (MW) (based on LHV)	223.68	249.09	264.38
Net heat rate (Btu/kWh, LHV)	9,005	8,725	8,620
(Btu/kWh, HHV)	9,995	9,685	9,565
Heat Input (MMBtu/hr, LHV)	2,014	2,174	2,279
(MMBtu/hr, HHV)	2,235	2,412	2,529
Fuel heating value (Btu/lb, LHV)	20,904	20,904	20,904
(Btu/lb, HHV)	23,194	23,194	23,194
Simple Cycle (SC) Exhaust Flow			
Mass Flow (lb/hr)	4,166,368	4,518,595	4,725,245
Temperature (°F)	1,128	1,095	1,080
Moisture (% Vol.)	15.35	12.44	11.38
Oxygen (% Vol.)	10.66	11.23	11.4
Molecular Weight	27.65	27.97	28.09
Fuel Usage			
Fuel usage (lb/hr)= Heat Input (MMBtu/hr) x 1,000,000 Btu/MMBtu (Fuel Heat Content, Btu/lb (LHV))			
Heat input (MMBtu/hr, LHV)	2,014	2,174	2,279
Heat content (Btu/lb, LHV)	20,904	20,904	20,904
Fuel usage (lb/hr)- calculated	96,345	103,999	109,022
(lb/hr)- provided	96,360	103,990	109,040
Stack Design - Combined Cycle (CC)			
Stack height (ft)	300	300	300
Diameter (ft)	20	20	20
SC-Volume Flow (acfm)= [(Mass Flow (lb/hr) x 1,545 x (Temp. (°F)+ 460°F)] / [Molecular weight x 2116.8] / 60 min/hr			
Mass flow (lb/hr)	4,166,368	4,518,595	4,725,245
Temperature (°F)	1,128	1,095	1,080
Molecular weight	27.65	27.97	28.09
Volume flow (acfm)- calculated	2,911,153	3,055,750	3,151,297
(ft3/s)- calculated	48,519	50,929	52,522
CC-Velocity (ft/sec)= Volume flow (acfm) / [((diameter)^2 /4) x 3.14159] / 60 sec/min			
Temperature (°F)	190	187	182
Volume flow (acfm)	1,191,593	1,271,428	1,313,723
Diameter (ft)	20	20	20
Velocity (ft/sec)- calculated	63.2	67.5	69.7

Note: Universal gas constant= 1,545 ft-lb(force)/°R; atmospheric pressure= 2,116.8 lb(force)/ft^2

Source: Westinghouse, 1997.

Table A-1A. Molecular Weight of CT Exhaust

Compound	Molecular Weight	Volume (Fraction)	Molecular Weight (Percent)
Molecular Weight 90 °F			
Argon	39.95	0.0087	0.35
Nitrogen	28.01	0.6907	19.35
Oxygen	32.00	0.1066	3.41
Carbon Dioxide	44.01	0.0403	1.77
Water	18.02	0.1535	2.77
Carbon Monoxide	28.01	0	0.00
Nitrogen Dioxide	30.00	0	0.00
TOTAL		0.9998	27.65
Molecular Weight 59 °F			
Argon	39.95	0.009	0.36
Nitrogen	28.01	0.7136	19.99
Oxygen	32.00	0.1123	3.59
Carbon Dioxide	44.01	0.0406	1.79
Water	18.02	0.1244	2.24
Carbon Monoxide	28.01	0	0.00
Nitrogen Dioxide	30.00	0	0.00
TOTAL		0.9999	27.97
Molecular Weight 30 °F			
Argon	39.95	0.0091	0.36
Nitrogen	28.01	0.7221	20.23
Oxygen	32.00	0.114	3.65
Carbon Dioxide	44.01	0.0409	1.80
Water	18.02	0.1138	2.05
Carbon Monoxide	28.01	0	0.00
Nitrogen Dioxide	30.00	0	0.00
TOTAL		0.9999	28.09

Table A-2. Maximum Emissions for Criteria Pollutants for City of Lakeland- McIntosh Plant
Unit 5 Combined Cycle, Natural Gas, Base Load

Parameter	Base Load for Temperature 90 °F	59 °F	30 °F
Hours of Operation	8760	8760	8760
Particulate (lb/hr)= Emission rate (lb/hr) from manufacturer			
Basis (excludes H_2SO_4), lb/hr	8.5	8.8	9.1
Emission rate (lb/hr)- provided	8.5	8.8	9.1
(TPY)	37.2	38.5	39.9
Sulfur Dioxide (lb/hr)= Natural gas (cf/hr) x sulfur content(gr/100 cf) x 1 lb/7000 gr x (lb SO_2 /lb S) /100			
Fuel density (lb/ft^3)	0.0432	0.0432	0.0432
Fuel use (cf/hr)	2,230,213	2,407,390	2,523,662
Sulfur content (grains/ 100 cf)	1	1	1
lb SO_2 /lb S (64/32)	2	2	2
Emission rate (lb/hr)- calculated	6.4	6.9	7.2
(TPY)	27.9	30.1	31.6
Nitrogen Oxides (lb/hr)= NOx(ppm) x {[20.9 x (1 - Moisture(%)/100)] - Oxygen(%)} x 2116.8 x Volume flow (acfm) x 46 (mole. wgt NOx) x 60 min/hr / [1545 x (CT temp.(°F) + 460°F) x 5.9 x 1,000,000 (adj. for ppm)]			
Basis, ppmvd @15% O_2	9	9	9
Moisture (%)	15.35	12.44	11.38
Oxygen (%)	10.66	11.23	11.4
Volume Flow (acfm)	2,911,153	3,055,750	3,151,297
Temperature (°F)	1,128	1,095	1,080
Emission rate (lb/hr)- calculated	74.4	80.1	84.1
(TPY) - calculated	325.7	351.0	368.2
Carbon Monoxide (lb/hr)= CO(ppm) x [1 - Moisture(%)/100] x 2116.8 lb/ft2 x Volume flow (acfm) x 28 (mole. wgt CO) x 60 min/hr / [1545 x (CT temp.(°F) + 460°F) x 1,000,000 (adj. for ppm)]			
Basis, ppmvd	25	25	25
Moisture (%)	15.35	12.44	11.38
Volume Flow (acfm)	2,911,153	3,055,750	3,151,297
Temperature (°F)	1,128	1,095	1,080
Emission rate (lb/hr)- calculated	89.3	99.0	104.4
(TPY) - calculated	391.1	433.7	457.1
VOCs (lb/hr)= VOC(ppm) x [1 - Moisture(%)/100] x 2116.8 lb/ft2 x Volume flow (acfm) x 16 (mole. wgt as methane) x 60 min/hr / [1545 x (CT temp.(°F) + 460°F) x 1,000,000 (adj. for ppm)]			
Basis, ppmvd	4	4	4
Moisture (%)	15.35	12.44	11.38
Volume Flow (acfm)	2,911,153	3,055,750	3,151,297
Temperature (°F)	1,128	1,095	1,080
Emission rate (lb/hr)- calculated	8.2	9.1	9.5
(TPY) - calculated	35.8	39.7	41.8
Lead (lb/hr)= NA			
Emission Rate Basis	NA	NA	NA
Emission rate (lb/hr)	NA	NA	NA
(TPY)	NA	NA	NA

Note: ppmvd= parts per million, volume dry; O2= oxygen.

Source: Westinghouse, 1997; Sargent & Lundy, 1999; Golder Associates, 1999

Table A-3. Maximum Emissions for Other Regulated PSD Pollutants for City of Lakeland- McIntosh Plant
Unit 5 Combined Cycle, Natural Gas, Base Load

Parameter	Base Load for Temperature 90 °F	59 °F	30 °F
Hours of Operation	8,760	8,760	8,760
Arsenic (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	0	0	0
Heat Input Rate (MMBtu/hr)	2,235	2,412	2,529
Emission Rate (lb/hr)	0	0	0
(TPY)	0	0	0
Berryllium (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	0	0	0
Heat Input Rate (MMBtu/hr)	2,235	2,412	2,529
Emission Rate (lb/hr)	0	0	0
(TPY)	0	0	0
Fluoride (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[b], lb/10^{12} Btu	0	0	0
Heat Input Rate (MMBtu/hr)	2,235	2,412	2,529
Emission Rate (lb/hr)	0	0	0
(TPY)	0	0	0
Mercury (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	0.00078	0.00078	0.00078
Heat Input Rate (MMBtu/hr)	2,235	2,412	2,529
Emission Rate (lb/hr)	1.7433E-06	1.88136E-06	1.97262E-06
(TPY)	7.63565E-06	8.24036E-06	8.64008E-06
Sulfuric Acid Mist = Fuel Use (lb/hr) x sulfur (S) content (fraction) x conversion of S to H_2SO_4 (%) x MW H_2SO_4 /MW S (98/32)			
Fuel Usage (lb/hr)	96,360	103,990	109,040
Sulfur Content (%)	3.30E-03	3.30E-03	3.30E-03
lb H_2SO_4 /lb S (98/32)	3.0625	3.0625	3.0625
Conversion to H_2SO_4 (%)[c]	10	10	10
Emission Rate (lb/hr)	0.97	1.05	1.10
(TPY)	4.27	4.60	4.83

Sources: a-KBN Engineering and Applied Sciences, Inc. 1995; b-EPA, 1981; Westinghouse, 1994.

Table A-3A. Molecular Weight of CT Exhaust

Compound	Molecular Weight	Volume (Fraction)	Molecular Weight (Percent)
Molecular Weight 90 °F			
Argon	39.95	0.0088	0.35
Nitrogen	28.01	0.7048	19.74
Oxygen	32.00	0.1284	4.11
Carbon Dioxide	44.01	0.0311	1.37
Water	18.02	0.1268	2.28
Carbon Monoxide	28.01	0	0.00
Nitrogen Dioxide	30.00	0	0.00
TOTAL		0.9999	27.86
Molecular Weight 59 °F			
Argon	39.95	0.0091	0.36
Nitrogen	28.01	0.7285	20.41
Oxygen	32.00	0.1337	4.28
Carbon Dioxide	44.01	0.0317	1.40
Water	18.02	0.0968	1.74
Carbon Monoxide	28.01	0	0.00
Nitrogen Dioxide	30.00	0	0.00
TOTAL		0.9998	28.19
Molecular Weight 30 °F			
Argon	39.95	0.0093	0.37
Nitrogen	28.01	0.7371	20.65
Oxygen	32.00	0.1354	4.33
Carbon Dioxide	44.01	0.032	1.41
Water	18.02	0.0861	1.55
Carbon Monoxide	28.01	0	0.00
Nitrogen Dioxide	30.00	0	0.00
TOTAL		0.9999	28.31

Table A-4. Maximum Emissions for Hazardous Air Pollutants for City of Lakeland- McIntosh Plant Unit 5 Combined Cycle, Natural Gas, Base Load

Parameter	Base Load for Temperature 90 °F	59 °F	30 °F
Hours of Operation	8,760	8,760	8,760
Antimony (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	0	0	0
Heat Input Rate (MMBtu/hr)	2,235	2,412	2,529
Emission Rate (lb/hr)	0	0	0
(TPY)	0	0	0
Benzene (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	0.8	0.8	0.8
Heat Input Rate (MMBtu/hr)	2,235	2,412	2,529
Emission Rate (lb/hr)	0.001788	0.0019296	0.0020232
(TPY)	0.00783144	0.008451648	0.008861616
Cadmium (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	0	0	0
Heat Input Rate (MMBtu/hr)	2,235	2,412	2,529
Emission Rate (lb/hr)	0	0	0
(TPY)	0	0	0
Chromium (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	0	0	0
Heat Input Rate (MMBtu/hr)	2,235	2,412	2,529
Emission Rate (lb/hr)	0	0	0
(TPY)	0	0	0
Formaldehyde (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	34	34	34
Heat Input Rate (MMBtu/hr)	2,235	2,412	2,529
Emission Rate (lb/hr)	0.07599	0.082008	0.085986
(TPY)	0.3328362	0.35919504	0.37661868
Cobalt (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	0	0	0
Heat Input Rate (MMBtu/hr)	2,235	2,412	2,529
Emission Rate (lb/hr)	0	0	0
(TPY)	0	0	0
Manganese (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	0	0	0
Heat Input Rate (MMBtu/hr)	2,235	2,412	2,529
Emission Rate (lb/hr)	0	0	0
(TPY)	0	0	0
Nickel (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	0	0	0
Heat Input Rate (MMBtu/hr)	2,235	2,412	2,529
Emission Rate (lb/hr)	0	0	0
(TPY)	0	0	0
Phosphorous (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[b], lb/10^{12} Btu	0	0	0
Heat Input Rate (MMBtu/hr)	2,235	2,412	2,529
Emission Rate (lb/hr)	0	0	0
(TPY)	0	0	0
Selinium (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	0	0	0
Heat Input Rate (MMBtu/hr)	2,235	2,412	2,529
Emission Rate (lb/hr)	0	0	0
(TPY)	0	0	0
Toluene (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	10	10	10
Heat Input Rate (MMBtu/hr)	2,235	2,412	2,529
Emission Rate (lb/hr)	0.02235	0.02412	0.02529
(TPY)	0.097893	0.1056456	0.1107702

Sources: a-KBN Engineering and Applied Sciences, Inc. 1995; b-EPA,1996 (AP-42,Table 3.1-4)

Table A-5. Design Information and Stack Parameters for City of Lakeland- McIntosh Plant
Unit 5 Combined Cycle, Natural Gas, 50 Percent Load

Parameter	Base Load for Temperature 90 °F	59 °F	30 °F	
Combustion Turbine Performance				<ok read
Net power output (MW) (based on LHV)	110.99	123.77	131.47	
Net heat rate (Btu/kWh, LHV)	11,090	10,620	10,400	
(Btu/kWh, HHV)	12,305	11,785	11,540	
Heat Input (MMBtu/hr, LHV)	1,231	1,315	1,367	<
(MMBtu/hr, HHV)	1,366	1,459	1,517	
Fuel heating value (Btu/lb, LHV)	20,904	20,904	20,904	<
(Btu/lb, HHV)	23,194	23,194	23,194	<
Simple Cycle (SC) Exhaust Flow				
Mass Flow (lb/hr)	3,322,052	3,522,381	3,646,193	
Temperature (°F)	984	960	944	
Moisture (% Vol.)	12.68	9.68	8.61	
Oxygen (% Vol.)	12.84	13.37	13.54	
Molecular Weight	27.86	28.19	28.31	
Fuel Usage				
Fuel usage (lb/hr)= Heat Input (MMBtu/hr) x 1,000,000 Btu/MMBtu (Fuel Heat Content, Btu/lb (LHV))				
Heat input (MMBtu/hr, LHV)	1,231	1,315	1,367	
Heat content (Btu/lb, LHV)	20,904	20,904	20,904	
Fuel usage (lb/hr)- calculated	58,888	62,907	65,394	
(lb/hr)- provided	58,880	62,890	65,410	
Stack Design - Combined Cycle (CC)				
Stack height (ft)	300	300	300	
Diameter (ft)	20	20	20	
SC-Volume Flow (acfm)= [(Mass Flow (lb/hr) x 1,545 x (Temp. (°F)+ 460°F)] / [Molecular weight x 2116.8] / 60 min/hr				
Mass flow (lb/hr)	3,322,052	3,522,381	3,646,193	
Temperature (°F)	984	960	944	
Molecular weight	27.86	28.19	28.31	
Volume flow (acfm)- calculated	2,094,759	2,158,484	2,199,524	
(ft3/s)- calculated	34,913	35,975	36,659	
CC-Velocity (ft/sec)= Volume flow (acfm) / [((diameter)^2 /4) x 3.14159] / 60 sec/min				
Temperature (°F)	190	187	182	
Volume flow (acfm)	942,932	983,478	1,005,765	
Diameter (ft)	20	20	20	
Velocity (ft/sec)- calculated	50.0	52.2	53.4	

Note: Universal gas constant= 1,545 ft-lb(force)/°R; atmospheric pressure= 2,116.8 lb(force)/ft^2

Source: Westinghouse, 1997; Sargent & Lundy, 1999; Golder Associates, 1999

Table A-5A. Molecular Weight of CT Exhaust

Compound	Molecular Weight	Volume (Fraction)	Molecular Weight (Percent)
Molecular Weight 90 °F			
Argon	39.95	0.0086	0.34
Nitrogen	28.01	0.6813	19.09
Oxygen	32.00	0.1058	3.39
Carbon Dioxide	44.01	0.0542	2.39
Water	18.02	0.1499	2.70
Carbon Monoxide	28.01	0	0.00
Nitrogen Dioxide	30.00	0	0.00
TOTAL		0.9998	27.90
Molecular Weight 59 °F			
Argon	39.95	0.0088	0.35
Nitrogen	28.01	0.7044	19.73
Oxygen	32.00	0.1114	3.56
Carbon Dioxide	44.01	0.0547	2.41
Water	18.02	0.1205	2.17
Carbon Monoxide	28.01	0	0.00
Nitrogen Dioxide	30.00	0	0.00
TOTAL		0.9998	28.23
Molecular Weight 30 °F			
Argon	39.95	0.0089	0.36
Nitrogen	28.01	0.7125	19.96
Oxygen	32.00	0.113	3.62
Carbon Dioxide	44.01	0.0551	2.42
Water	18.02	0.1103	1.99
Carbon Monoxide	28.01	0	0.00
Nitrogen Dioxide	30.00	0	0.00
TOTAL		0.9998	28.34

Table A-6. Maximum Emissions for Criteria Pollutants for City of Lakeland- McIntosh Project
Unit 5 Combined Cycle, Natural Gas, 50 Percent Load

Parameter	Base Load for Temperature 90 °F	59 °F	30 °F
Hours of Operation	8,760	8,760	8,760
Particulate (lb/hr)= Emission rate (lb/hr) from manufacturer			
Basis (excludes H_2SO_4), lb/hr	6.5	6.6	6.7
Emission rate (lb/hr)- provided	6.5	6.6	6.7
(TPY)	28.5	28.9	29.3
Sulfur Dioxide (lb/hr)= Natural gas (cf/hr) x sulfur content(gr/100 cf) x 1 lb/7000 gr x (lb SO2/lb S) /100			
Fuel density (lb/ft3)	0.0432	0.0432	0.0432
Fuel use (cf/hr)	1,363,154	1,456,172	1,513,754
Sulfur content (grains/ 100 cf)	1	1	1
lb SO_2 /lb S (64/32)	2	2	2
Emission rate (lb/hr)- calculated	3.9	4.2	4.3
(TPY)	17.1	18.2	18.9
Nitrogen Oxides (lb/hr)= NOx(ppm) x {[20.9 x (1 - Moisture(%)/100)] - Oxygen(%)} x 2116.8 x Volume flow (acfm) 46 (mole. wgt NOx) x 60 min/hr / [1545 x (CT temp.(°F) + 460°F) x 5.9 x 1,000,000 (adj. for ppm)]			
Basis, ppmvd @15% O_2	9	9	9
Moisture (%)	12.68	9.68	8.61
Oxygen (%)	12.84	13.37	13.54
Volume Flow (acfm)	2,094,759	2,158,484	2,199,524
Temperature (°F)	984	960	944
Emission rate (lb/hr)- calculated	45.3	48.3	50.2
(TPY) - calculated	198.3	211.5	220.1
Carbon Monoxide (lb/hr)= CO(ppm) x [1 - Moisture(%)/100] x 2116.8 lb/ft2 x Volume flow (acfm) x 28 (mole. wgt CO) x 60 min/hr / [1545 x (CT temp.(°F) + 460°F) x 1,000,000 (adj. for ppm)]			
Basis, ppmvd	20	20	20
Moisture (%)	12.68	9.68	8.61
Volume Flow (acfm)	2,094,759	2,158,484	2,199,524
Temperature (°F)	984	960	944
Emission rate (lb/hr)- calculated	58	63	66
(TPY) - calculated	255.4	276.8	288.7
VOCs (lb/hr)= VOC(ppm) x [1 - Moisture(%)/100] x 2116.8 lb/ft2 x Volume flow (acfm) x 16 (mole. wgt as methane) x 60 min/hr / [1545 x (CT temp.(°F) + 460°F) x 1,000,000 (adj. for ppm)]			
Basis, ppmvd	4	4	4
Moisture (%)	12.68	9.68	8.61
Volume Flow (acfm)	2,094,759	2,158,484	2,199,524
Temperature (°F)	984	960	944
Emission rate (lb/hr)- calculated	6.7	7.2	7.5
(TPY) - calculated	29.2	31.6	33.0
Lead (lb/hr)= NA			
Emission Rate Basis	NA	NA	NA
Emission rate (lb/hr)	NA	NA	NA
(TPY)	NA	NA	NA

Note: ppmvd= parts per million, volume dry; O2= oxygen.

Sources: Westinghouse, 1997; EPA, 1996

Table A-7. Maximum Emissions for Other Regulated PSD Pollutants for City of Lakeland- McIntosh Plant
Unit 5 Combined Cycle, Natural Gas, 50 Percent Load

Parameter	Base Load for Temperature 90 °F	59 °F	30 °F
Hours of Operation	8,760	8,760	8,760
Arsenic (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a] , lb/10^{12} Btu	0	0	0
Heat Input Rate (MMBtu/hr)	1,366	1,459	1,517
Emission Rate (lb/hr)	0	0	0
(TPY)	0	0	0
Berryllium (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a] , lb/10^{12} Btu	0	0	0
Heat Input Rate (MMBtu/hr)	1,366	1,459	1,517
Emission Rate (lb/hr)	0	0	0
(TPY)	0	0	0
Fluoride (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[b] , lb/10^{12} Btu	0	0	0
Heat Input Rate (MMBtu/hr)	1,366	1,459	1,517
Emission Rate (lb/hr)	0	0	0
(TPY)	0	0	0
Mercury (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a] , lb/10^{12} Btu	0.000748	0.000748	0.000748
Heat Input Rate (MMBtu/hr)	1,366	1,459	1,517
Emission Rate (lb/hr)	1.02177E-06	1.09133E-06	1.13472E-06
(TPY)	4.47534E-06	4.78003E-06	4.97006E-06
Sulfuric Acid Mist = Fuel Use (lb/hr) x sulfur (S) content (fraction) x conversion of S to H_2SO_4 (%) x MW H_2SO_4 /MW S (98/32)			
Fuel Usage (lb/hr)	58,880	62,890	65,410
Sulfur Content (%)	3.30E-03	3.30E-03	3.30E-03
lb H_2SO_4 /lb S (98/32)	3.0625	3.0625	3.0625
Conversion to H_2SO_4 (%)[c]	10	10	10
Emission Rate (lb/hr)	0.60	0.64	0.66
(TPY)	2.61	2.78	2.90

Sources: a-KBN Engineering and Applied Sciences, Inc. 1995; b-EPA, 1981; Westinghouse, 1994.

Table A-7A. Molecular Weight of CT Exhaust

Compound	Molecular Weight	Volume (Fraction)	Molecular Weight (Percent)
Molecular Weight 90 °F			
Argon	39.95	0.0088	0.35
Nitrogen	28.01	0.702	19.67
Oxygen	32.00	0.1286	4.12
Carbon Dioxide	44.01	0.0422	1.86
Water	18.02	0.1183	2.13
Carbon Monoxide	28.01	0	0.00
Nitrogen Dioxide	30.00	0	0.00
TOTAL		0.9999	28.12
Molecular Weight 59 °F			
Argon	39.95	0.0091	0.36
Nitrogen	28.01	0.7259	20.33
Oxygen	32.00	0.1344	4.30
Carbon Dioxide	44.01	0.0426	1.87
Water	18.02	0.0878	1.58
Carbon Monoxide	28.01	0	0.00
Nitrogen Dioxide	30.00	0	0.00
TOTAL		0.9998	28.46
Molecular Weight 30 °F			
Argon	39.95	0.0092	0.37
Nitrogen	28.01	0.7342	20.57
Oxygen	32.00	0.1355	4.34
Carbon Dioxide	44.01	0.0434	1.91
Water	18.02	0.0775	1.40
Carbon Monoxide	28.01	0	0.00
Nitrogen Dioxide	30.00	0	0.00
TOTAL		0.9998	28.58

Table A-8. Maximum Emissions for Hazardous Air Pollutants for City of Lakeland- McIntosh Plant Unit 5 Combined Cycle, Natural Gas, 50 Percent Load

Parameter	Base Load for Temperature 90 °F	59 °F	30 °F
Hours of Operation	8,760	8,760	8,760
Antimony (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	0	0	0
Heat Input Rate (MMBtu/hr)	1,366	1,459	1,517
Emission Rate (lb/hr)	0	0	0
(TPY)	0	0	0
Benzene (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	0.8	0.8	0.8
Heat Input Rate (MMBtu/hr)	1,366	1,459	1,517
Emission Rate (lb/hr)	0.0010928	0.0011672	0.0012136
(TPY)	0.004786464	0.005112336	0.005315568
Cadmium (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	0	0	0
Heat Input Rate (MMBtu/hr)	1,366	1,459	1,517
Emission Rate (lb/hr)	0	0	0
(TPY)	0	0	0
Chromium (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	0	0	0
Heat Input Rate (MMBtu/hr)	1,366	1,459	1,517
Emission Rate (lb/hr)	0	0	0
(TPY)	0	0	0
Formaldehyde (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	34	34	34
Heat Input Rate (MMBtu/hr)	1,366	1,459	1,517
Emission Rate (lb/hr)	0.046444	0.049606	0.051578
(TPY)	0.20342472	0.21727428	0.22591164
Cobalt (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	0	0	0
Heat Input Rate (MMBtu/hr)	1,366	1,459	1,517
Emission Rate (lb/hr)	0	0	0
(TPY)	0	0	0
Manganese (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	0	0	0
Heat Input Rate (MMBtu/hr)	1,366	1,459	1,517
Emission Rate (lb/hr)	0	0	0
(TPY)	0	0	0
Nickel (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	0	0	0
Heat Input Rate (MMBtu/hr)	1,366	1,459	1,517
Emission Rate (lb/hr)	0	0	0
(TPY)	0	0	0
Phosphorous (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[b], lb/10^{12} Btu	0	0	0
Heat Input Rate (MMBtu/hr)	1,366	1,459	1,517
Emission Rate (lb/hr)	0	0	0
(TPY)	0	0	0
Selinium (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	0	0	0
Heat Input Rate (MMBtu/hr)	1,366	1,459	1,517
Emission Rate (lb/hr)	0	0	0
(TPY)	0	0	0
Toluene (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	10	10	10
Heat Input Rate (MMBtu/hr)	1,366	1,459	1,517
Emission Rate (lb/hr)	0.01366	0.01459	0.01517
(TPY)	0.0598308	0.0639042	0.0664446

Sources: a-KBN Engineering and Applied Sciences, Inc. 1995; b-EPA,1996 (AP-42,Table 3.1-4)

Table A-9. Design Information and Stack Parameters for City of Lakeland- McIntosh Plant
Unit 5 Combined Cycle, Distillate Fuel Oil, Base Load

Parameter	Base Load for Temperature 90 °F	59 °F	30 °F
Combustion Turbine Performance			
Net power output (MW) (based on LHV)	215.65	241.17	256.02
Net heat rate (Btu/kWh, LHV)	9,585	9,270	9,155
(Btu/kWh, HHV)	10,065	9,740	9,615
Heat Input (MMBtu/hr, LHV)	2,067	2,236	2,344
(MMBtu/hr, HHV)	2,170	2,348	2,462
Fuel heating value (Btu/lb, LHV)	18,500	18,500	18,500
(Btu/lb, HHV)	19,430	19,430	19,430
Simple Cycle (SC) Exhaust Flow			
Mass Flow (lb/hr)	4,258,331	4,624,761	4,833,896
Temperature (°F)	1,084	1,051	1,037
Moisture (% Vol.)	14.99	12.05	11.03
Oxygen (% Vol.)	10.58	11.14	11.3
Molecular Weight	27.90	28.23	28.34
Fuel Usage			
Fuel usage (lb/hr)= Heat Input (MMBtu/hr) x 1,000,000 Btu/MMBtu (Fuel Heat Content, Btu/lb (LHV))			
Heat input (MMBtu/hr, LHV)	2,067	2,236	2,344
Heat content (Btu/lb, LHV)	18,500	18,500	18,500
Fuel usage (lb/hr)- calculated	111,730	120,865	126,703
(lb/hr)- provided	111,710	120,860	126,710
Stack Design - Combined Cycle (CC)			
Stack height (ft)	300	300	300
Diameter (ft)	20	20	20
SC-Volume Flow (acfm)= [(Mass Flow (lb/hr) x 1,545 x (Temp. (°F)+ 460°F)] / [Molecular weight x 2116.8] / 60 min/hr			
Mass flow (lb/hr)	4,258,331	4,624,761	4,833,896
Temperature (°F)	1,084	1,051	1,037
Molecular weight	27.90	28.23	28.34
Volume flow (acfm)- calculated	2,866,635	3,011,513	3,105,774
(ft3/s)- calculated	47,777	50,192	51,763
CC-Velocity (ft/sec)= Volume flow (acfm) / [((diameter)^2 /4) x 3.14159] / 60 sec/min			
Temperature (°F)	196	188	178
Volume flow (acfm)	1,217,949	1,291,502	1,323,636
Diameter (ft)	20	20	20
Velocity (ft/sec)- calculated	64.6	68.5	70.2

Note: Universal gas constant= 1,545 ft-lb(force)/°R; atmospheric pressure= 2,116.8 lb(force)/ft^2

Source: Westinghouse, 1997; Sargent & Lundy, 1999; Golder Associates, 1999

Table A-10. Maximum Emissions for Criteria Pollutants for City of Lakeland- McIntosh Plant
Unit 5 Combined Cycle, Distillate Fuel Oil, Base Load

Parameter	Base Load for Temperature 90 °F	59 °F	30 °F
Hours of Operation	250	250	250
Particulate (lb/hr)= Emission rate (lb/hr) from manufacturer			
Basis (excludes H_2SO_4), lb/hr	89.4	92.8	95.5
Emission rate (lb/hr)- provided	89.4	92.8	95.5
(TPY)	11.2	11.6	11.9
Sulfur Dioxide (lb/hr)= Fuel oil (lb/hr) x sulfur content(fraction) x (lb SO_2 /lb S)			
Fuel Oil (lb/hr)	111,730	120,865	126,703
Sulfur content (%)	0.05	0.05	0.05
lb SO_2 /lb S (64/32)	2	2	2
Emission rate (lb/hr)- calculated	111.7	120.9	126.7
(TPY)	14.0	15.1	15.8
Nitrogen Oxides (lb/hr)= NOx(ppm) x {[20.9 x (1 - Moisture(%)/100)] - Oxygen(%)} x 2116.8 x Volume flow (acfm) x 46 (mole. wgt NOx) x 60 min/hr / [1545 x (CT temp.(°F) + 460°F) x 5.9 x 1,000,000 (adj. for ppm)]			
Basis, ppmvd @15% O_2	42	42	42
Moisture (%)	14.99	12.05	11.03
Oxygen (%)	10.58	11.14	11.3
Volume Flow (acfm)	2,866,635	3,011,513	3,105,774
Temperature (°F)	1,084	1,051	1,037
Emission rate (lb/hr)- calculated	359.2	388.5	407.4
(TPY) - calculated	44.9	48.6	50.9
Carbon Monoxide (lb/hr)= CO(ppm) x [1 - Moisture(%)/100] x 2116.8 lb/ft2 x Volume flow (acfm) x 28 (mole. wgt CO) x 60 min/hr / [1545 x (CT temp.(°F) + 460°F) x 1,000,000 (adj. for ppm)]			
Basis, ppmvd	90	90	90
Moisture (%)	14.99	12.05	11.03
Volume Flow (acfm)	2,866,635	3,011,513	3,105,774
Temperature (°F)	1,084	1,051	1,037
Emission rate (lb/hr)- calculated	327.0	363.1	382.4
(TPY) - calculated	40.9	45.4	47.8
VOCs (lb/hr)= VOC(ppm) x [1 - Moisture(%)/100] x 2116.8 lb/ft2 x Volume flow (acfm) x 16 (mole. wgt as methane) x 60 min/hr / [1545 x (CT temp.(°F) + 460°F) x 1,000,000 (adj. for ppm)]			
Basis, ppmvd	10	10	10
Moisture (%)	14.99	12.05	11.03
Volume Flow (acfm)	2,866,635	3,011,513	3,105,774
Temperature (°F)	1,084	1,051	1,037
Emission rate (lb/hr)- calculated	20.8	23.1	24.3
(TPY) - calculated	2.6	2.9	3.0
Lead (lb/hr)= Lead (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) / 1,000,000 MMBtu/10E+12 Btu			
Basis[a] , lb/10^{12} Btu	5.8	5.8	5.8
HIR (MMBtu/hr)	2,067	2,236	2,344
Emission rate (lb/hr)- calculated	0.012	0.013	0.014
(TPY)	0.001	0.002	0.002

Note: ppmvd= parts per million, volume dry; O2= oxygen.

Sources: Westinghouse, 1997; a-EPA, 1996

Table A-11. Maximum Emissions for Other Regulated PSD Pollutants for City of Lakeland- McIntosh Plant Unit 5 Combined Cycle, Distillate Fuel Oil, Base Load

Parameter	Base Load for Temperature 90 °F	59 °F	30 °F
Hours of Operation	250	250	250
Arsenic (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	4.2	4.2	4.2
Heat Input Rate (MMBtu/hr)	2,170	2,348	2,462
Emission Rate (lb/hr)	0.009114	0.0098616	0.0103404
(TPY)	0.00113925	0.0012327	0.00129255
Berryllium (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	0.2	0.2	0.2
Heat Input Rate (MMBtu/hr)	2,170	2,348	2,462
Emission Rate (lb/hr)	0.000434	0.0004696	0.0004924
(TPY)	0.00005425	0.0000587	0.00006155
Fluoride (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[b], lb/10^{12} Btu	32.54	32.54	32.54
Heat Input Rate (MMBtu/hr)	2,170	2,348	2,462
Emission Rate (lb/hr)	0.0706118	0.07640392	0.08011348
(TPY)	0.008826475	0.00955049	0.010014185
Mercury (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	1	1	1
Heat Input Rate (MMBtu/hr)	2,170	2,348	2,462
Emission Rate (lb/hr)	0.00217	0.002348	0.002462
(TPY)	0.00027125	0.0002935	0.00030775
Sulfuric Acid Mist = Fuel Use (lb/hr) x sulfur (S) content (fraction) x conversion of S to H_2SO_4 (%) x MW H_2SO_4 /MW S (98/32)			
Fuel Usage (lb/hr)	111,710	120,860	126,710
Sulfur Content (%)	0.05	0.05	0.05
lb H_2SO_4 /lb S (98/32)	3.0625	3.0625	3.0625
Conversion to H_2SO_4 (%)[c]	10	10	10
Emission Rate (lb/hr)	17.11	18.51	19.40
(TPY)	2.14	2.31	2.43

Sources: a-KBN Engineering and Applied Sciences, Inc. 1995; b-EPA, 1981; Westinghouse, 1994.

Table A-12. Maximum Emissions for Hazardous Air Pollutants for City of Lakeland- McIntosh Plant
Unit 5 Combined Cycle, Distillate Fuel Oil, Base Load

Parameter	Base Load for Temperature 90 °F	59 °F	30 °F
Hours of Operation	250	250	250
Antimony (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	35	35	35
Heat Input Rate (MMBtu/hr)	2,170	2,348	2,462
Emission Rate (lb/hr)	0.07595	0.08218	0.08617
(TPY)	0.00949375	0.0102725	0.01077125
Benzene (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	1.1	1.1	1.1
Heat Input Rate (MMBtu/hr)	2,170	2,348	2,462
Emission Rate (lb/hr)	0.002387	0.0025828	0.0027082
(TPY)	0.000298375	0.00032285	0.000338525
Cadmium (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	1.3	1.3	1.3
Heat Input Rate (MMBtu/hr)	2,170	2,348	2,462
Emission Rate (lb/hr)	0.002821	0.0030524	0.0032006
(TPY)	0.000352625	0.00038155	0.000400075
Chromium (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	4	4	4
Heat Input Rate (MMBtu/hr)	2,170	2,348	2,462
Emission Rate (lb/hr)	0.00868	0.009392	0.009848
(TPY)	0.001085	0.001174	0.001231
Formaldehyde (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	20	20	20
Heat Input Rate (MMBtu/hr)	2,170	2,348	2,462
Emission Rate (lb/hr)	0.0434	0.04696	0.04924
(TPY)	0.005425	0.00587	0.006155
Cobalt (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	37	37	37
Heat Input Rate (MMBtu/hr)	2,170	2,348	2,462
Emission Rate (lb/hr)	0.08029	0.086876	0.091094
(TPY)	0.01003625	0.0108595	0.01138675
Manganese (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	13	13	13
Heat Input Rate (MMBtu/hr)	2,170	2,348	2,462
Emission Rate (lb/hr)	0.02821	0.030524	0.032006
(TPY)	0.00352625	0.0038155	0.00400075
Nickel (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	170	170	170
Heat Input Rate (MMBtu/hr)	2,170	2,348	2,462
Emission Rate (lb/hr)	0.3689	0.39916	0.41854
(TPY)	0.0461125	0.049895	0.0523175
Phosphorous (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[b], lb/10^{12} Btu	300	300	300
Heat Input Rate (MMBtu/hr)	2,170	2,348	2,462
Emission Rate (lb/hr)	0.651	0.7044	0.7386
(TPY)	0.081375	0.08805	0.092325
Selinium (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	2	2	2
Heat Input Rate (MMBtu/hr)	2,170	2,348	2,462
Emission Rate (lb/hr)	0.00434	0.004696	0.004924
(TPY)	0.0005425	0.000587	0.0006155
Toluene (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	9.9	9.9	9.9
Heat Input Rate (MMBtu/hr)	2,170	2,348	2,462
Emission Rate (lb/hr)	0.021483	0.0232452	0.0243738
(TPY)	0.002685375	0.00290565	0.003046725

Sources: a-KBN Engineering and Applied Sciences, Inc. 1995; b-EPA,1996 (AP-42,Table 3.1-4)

Table A-13. Maximum Emissions for Non-Regulated Air Pollutants for City of Lakeland- McIntosh Plant Unit 5 Combined Cycle, Distillate Fuel Oil, Base Load

Parameter	Base Load for Temperature 90 °F	59 °F	30 °F
Hours of Operation	250	250	250
Barium (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a] , lb/10^{12} Btu	20	20	20
Heat Input Rate (MMBtu/hr)	2,170	2,348	2,462
Emission Rate (lb/hr)	0.0434	0.04696	0.04924
(TPY)	0.005425	0.00587	0.006155
Copper (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a] , lb/10^{12} Btu	1300	1300	1300
Heat Input Rate (MMBtu/hr)	2,170	2,348	2,462
Emission Rate (lb/hr)	2.821	3.0524	3.2006
(TPY)	0.352625	0.38155	0.400075
Vanadium (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a] , lb/10^{12} Btu	4.4	4.4	4.4
Heat Input Rate (MMBtu/hr)	2,170	2,348	2,462
Emission Rate (lb/hr)	0.009548	0.0103312	0.0108328
(TPY)	0.0011935	0.0012914	0.0013541
Zinc (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a] , lb/10^{12} Btu	680	680	680
Heat Input Rate (MMBtu/hr)	2,170	2,348	2,462
Emission Rate (lb/hr)	1.4756	1.59664	1.67416
(TPY)	0.18445	0.19958	0.20927

Sources: a-EPA,1996 (AP-42,Table 3.1-4)

Table A-14. Design Information and Stack Parameters for City of Lakeland- McIntosh Plant
Unit 5 Combined Cycle, Distillate Fuel Oil, 50 Percent Load

Parameter		Base Load for Temperature 90 °F	59 °F	30 °F
Combustion Turbine Performance				
Net power output (MW) (based on LHV)		106.95	119.79	127.27
Net heat rate (Btu/kWh, LHV)		11,675	11,140	10,915
(Btu/kWh, HHV)		12,380	11,700	11,575
Heat Input (MMBtu/hr, LHV)		1,248	1,334	1,389
(MMBtu/hr, HHV)		1,324	1,402	1,473
Fuel heating value (Btu/lb, LHV)	***>	18,323	18,500	18,323
(Btu/lb, HHV)		19,430	19,430	19,430
Simple Cycle (SC) Exhaust Flow				
Mass Flow (lb/hr)		3,363,240	3,567,013	3,695,548
Temperature (°F)		968	945	928
Moisture (% Vol.)		11.83	8.78	7.75
Oxygen (% Vol.)		12.86	13.44	13.55
Molecular Weight		28.12	28.46	28.58
Fuel Usage				
Fuel usage (lb/hr)= Heat Input (MMBtu/hr) x 1,000,000 Btu/MMBtu (Fuel Heat Content, Btu/lb (LHV))				
Heat input (MMBtu/hr, LHV)		1,248	1,334	1,389
Heat content (Btu/lb, LHV)		18,323	18,500	18,323
Fuel usage (lb/hr)- calculated		68,111	72,108	75,806
(lb/hr)- provided		68,130	72,130	75,800
Stack Design - Combined Cycle (CC)				
Stack height (ft)		300	300	300
Diameter (ft)		20	20	20
SC-Volume Flow (acfm)= [(Mass Flow (lb/hr) x 1,545 x (Temp. (°F)+ 460°F)] / [Molecular weight x 2116.8] / 60 min/hr				
Mass flow (lb/hr)		3,363,240	3,567,013	3,695,548
Temperature (°F)		968	945	928
Molecular weight		28.12	28.46	28.58
Volume flow (acfm)- calculated		2,077,593	2,142,441	2,183,474
(ft3/s)- calculated		34,627	35,707	36,391
CC-Velocity (ft/sec)= Volume flow (acfm) / [((diameter)² /4) x 3.14159] / 60 sec/min				
Temperature (°F)		196	188	178
Volume flow (acfm)		954,412	988,115	1,003,643
Diameter (ft)		20	20	20
Velocity (ft/sec)- calculated		50.6	52.4	53.2

Note: Universal gas constant= 1,545 ft-lb(force)/°R; atmospheric pressure= 2,116.8 lb(force)/ft²

Source: Westinghouse, 1997; Sargent & Lundy, 1999; Golder Associates, 1999

Table A-15. Maximum Emissions for Criteria Pollutants for City of Lakeland- McIntosh Plant
Unit 5 Combined Cycle, Distillate Fuel Oil, 50 Percent Load

Parameter	Base Load for Temperature 90 °F	59 °F	30 °F
Hours of Operation	250	250	250
Particulate (lb/hr)= Emission rate (lb/hr) from manufacturer			
Basis (excludes H_2SO_4), lb/hr	135.1	136.9	139.6
Emission rate (lb/hr)- provided	135.1	136.9	139.6
(TPY)	16.9	17.1	17.5
Sulfur Dioxide (lb/hr)= Fuel oil (lb/hr) x sulfur content(fraction) x (lb SO_2 /lb S)			
Fuel Oil (lb/hr)	68,111	72,108	75,806
Sulfur content (%)	0.05	0.05	0.05
lb SO_2 /lb S (64/32)	2	2	2
Emission rate (lb/hr)- calculated	68.1	72.1	75.8
(TPY)	8.5	9.0	9.5
Nitrogen Oxides (lb/hr)= NOx(ppm) x {[20.9 x (1 - Moisture(%)/100)] - Oxygen(%)} x 2116.8 x Volume flow (acfm) x 46 (mole. wgt NOx) x 60 min/hr / [1545 x (CT temp.(°F) + 460°F) x 5.9 x 1,000,000 (adj. for ppm)]			
Basis, ppmvd @15% O_2	42	42	42
Moisture (%)	11.83	8.78	7.75
Oxygen (%)	12.86	13.44	13.55
Volume Flow (acfm)	2,077,593	2,142,441	2,183,474
Temperature (°F)	968	945	928
Emission rate (lb/hr)- calculated	218.0	230.9	242.7
(TPY) - calculated	27.3	28.9	30.3
Carbon Monoxide (lb/hr)= CO(ppm) x [1 - Moisture(%)/100] x 2116.8 lb/ft2 x Volume flow (acfm) x 28 (mole. wgt CO) x 60 min/hr / [1545 x (CT temp.(°F) + 460°F) x 1,000,000 (adj. for ppm)]			
Basis, ppmvd	90	90	90
Moisture (%)	11.83	8.78	7.75
Volume Flow (acfm)	2,077,593	2,142,441	2,183,474
Temperature (°F)	968	945	928
Emission rate (lb/hr)- calculated	266	288	301
(TPY) - calculated	33.2	36.0	37.6
VOCs (lb/hr)= VOC(ppm) x [1 - Moisture(%)/100] x 2116.8 lb/ft2 x Volume flow (acfm) x 16 (mole. wgt as methane) x 60 min/hr / [1545 x (CT temp.(°F) + 460°F) x 1,000,000 (adj. for ppm)]			
Basis, ppmvd	10	10	10
Moisture (%)	11.83	8.78	7.75
Volume Flow (acfm)	2,077,593	2,142,441	2,183,474
Temperature (°F)	968	945	928
Emission rate (lb/hr)- calculated	16.9	18.3	19.1
(TPY) - calculated	2.1	2.3	2.4
Lead (lb/hr)= Lead (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) / 1,000,000 MMBtu/10E+12 Btu			
Basis[a] , lb/10^{12} Btu	5.8	5.8	5.8
HIR (MMBtu/hr)	1,248	1,334	1,389
Emission rate (lb/hr)- calculated	0.007	0.008	0.008
(TPY)	0.001	0.001	0.001

Note: ppmvd= parts per million, volume dry; O2= oxygen.

Sources: Westinghouse, 1997; a-EPA, 1996

Table A-16. Maximum Emissions for Other Regulated PSD Pollutants for City of Lakeland- McIntosh Plant
Unit 5 Combined Cycle, Distillate Fuel Oil, 50 Percent Load

Parameter	Base Load for Temperature 90 °F	59 °F	30 °F
Hours of Operation	250	250	250
Arsenic (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	4.2	4.2	4.2
Heat Input Rate (MMBtu/hr)	1,324	1,402	1,473
Emission Rate (lb/hr)	0.0055608	0.0058884	0.0061866
(TPY)	0.0006951	0.00073605	0.000773325
Berryllium (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	0.2	0.2	0.2
Heat Input Rate (MMBtu/hr)	1,324	1,402	1,473
Emission Rate (lb/hr)	0.0002648	0.0002804	0.0002946
(TPY)	0.0000331	0.00003505	0.000036825
Fluoride (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[b], lb/10^{12} Btu	32.54	32.54	32.54
Heat Input Rate (MMBtu/hr)	1,324	1,402	1,473
Emission Rate (lb/hr)	0.04308296	0.04562108	0.04793142
(TPY)	0.00538537	0.005702635	0.005991428
Mercury (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	1	1	1
Heat Input Rate (MMBtu/hr)	1,324	1,402	1,473
Emission Rate (lb/hr)	0.001324	0.001402	0.001473
(TPY)	0.0001655	0.00017525	0.000184125
Sulfuric Acid Mist = Fuel Use (lb/hr) x sulfur (S) content (fraction) x conversion of S to H_2SO_4 (%) x MW H_2SO_4 /MW S (98/32)			
Fuel Usage (lb/hr)	68,130	72,130	75,800
Sulfur Content (%)	0.05	0.05	0.05
lb H_2SO_4 /lb S (98/32)	3.0625	3.0625	3.0625
Conversion to H_2SO_4 (%)[c]	10	10	10
Emission Rate (lb/hr)	10.43	11.04	11.61
(TPY)	1.30	1.38	1.45

Sources: a-KBN Engineering and Applied Sciences, Inc. 1995; b-EPA, 1981; Westinghouse, 1994.

Table A-17. Maximum Emissions for Hazardous Air Pollutants for City of Lakeland- McIntosh Plant Unit 5 Combined Cycle, Distillate Fuel Oil, 50 Percent Load

Parameter	Base Load for Temperature 90 °F	59 °F	30 °F
Hours of Operation	250	250	250
Antimony (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	35	35	35
Heat Input Rate (MMBtu/hr)	1,324	1,402	1,473
Emission Rate (lb/hr)	0.04634	0.04907	0.051555
(TPY)	0.0057925	0.00613375	0.006444375
Benzene (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	1.1	1.1	1.1
Heat Input Rate (MMBtu/hr)	1,324	1,402	1,473
Emission Rate (lb/hr)	0.0014564	0.0015422	0.0016203
(TPY)	0.00018205	0.000192775	0.000202538
Cadmium (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	1.3	1.3	1.3
Heat Input Rate (MMBtu/hr)	1,324	1,402	1,473
Emission Rate (lb/hr)	0.0017212	0.0018226	0.0019149
(TPY)	0.00021515	0.000227825	0.000239363
Chromium (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	4	4	4
Heat Input Rate (MMBtu/hr)	1,324	1,402	1,473
Emission Rate (lb/hr)	0.005296	0.005608	0.005892
(TPY)	0.000662	0.000701	0.0007365
Formaldehyde (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	20	20	20
Heat Input Rate (MMBtu/hr)	1,324	1,402	1,473
Emission Rate (lb/hr)	0.02648	0.02804	0.02946
(TPY)	0.00331	0.003505	0.0036825
Cobalt (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	37	37	37
Heat Input Rate (MMBtu/hr)	1,324	1,402	1,473
Emission Rate (lb/hr)	0.048988	0.051874	0.054501
(TPY)	0.0061235	0.00648425	0.006812625
Manganese (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	13	13	13
Heat Input Rate (MMBtu/hr)	1,324	1,402	1,473
Emission Rate (lb/hr)	0.017212	0.018226	0.019149
(TPY)	0.0021515	0.00227825	0.002393625
Nickel (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	170	170	170
Heat Input Rate (MMBtu/hr)	1,324	1,402	1,473
Emission Rate (lb/hr)	0.22508	0.23834	0.25041
(TPY)	0.028135	0.0297925	0.03130125
Phosphorous (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[b], lb/10^{12} Btu	300	300	300
Heat Input Rate (MMBtu/hr)	1,324	1,402	1,473
Emission Rate (lb/hr)	0.3972	0.4206	0.4419
(TPY)	0.04965	0.052575	0.0552375
Selinium (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	2	2	2
Heat Input Rate (MMBtu/hr)	1,324	1,402	1,473
Emission Rate (lb/hr)	0.002648	0.002804	0.002946
(TPY)	0.000331	0.0003505	0.00036825
Toluene (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a], lb/10^{12} Btu	9.9	9.9	9.9
Heat Input Rate (MMBtu/hr)	1,324	1,402	1,473
Emission Rate (lb/hr)	0.0131076	0.0138798	0.0145827
(TPY)	0.00163845	0.001734975	0.001822838

Sources: a-KBN Engineering and Applied Sciences, Inc. 1995; b-EPA,1996 (AP-42,Table 3.1-4)

Table A-18. Maximum Emissions for Non-Regulated Air Pollutants for City of Lakeland- McIntosh Plant Unit 5 Combined Cycle, Distillate Fuel Oil, 50 Percent Load

Parameter	Base Load for Temperature 90 °F	59 °F	30 °F
Hours of Operation	250	250	250
Barium (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a] , lb/10^{12} Btu	20	20	20
Heat Input Rate (MMBtu/hr)	1,324	1,402	1,473
Emission Rate (lb/hr)	0.02648	0.02804	0.02946
(TPY)	0.00331	0.003505	0.0036825
Copper (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a] , lb/10^{12} Btu	1300	1300	1300
Heat Input Rate (MMBtu/hr)	1,324	1,402	1,473
Emission Rate (lb/hr)	1.7212	1.8226	1.9149
(TPY)	0.21515	0.227825	0.2393625
Vanadium (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a] , lb/10^{12} Btu	4.4	4.4	4.4
Heat Input Rate (MMBtu/hr)	1,324	1,402	1,473
Emission Rate (lb/hr)	0.0058256	0.0061688	0.0064812
(TPY)	0.0007282	0.0007711	0.00081015
Zinc (lb/hr) = Basis (lb/10^{12} Btu) x Heat Input (MMBtu/hr) / 1,000,000 MMBtu/10^{12} Btu			
Basis[a] , lb/10^{12} Btu	680	680	680
Heat Input Rate (MMBtu/hr)	1,324	1,402	1,473
Emission Rate (lb/hr)	0.90032	0.95336	1.00164
(TPY)	0.11254	0.11917	0.125205

Sources: a-EPA,1996 (AP-42,Table 3.1-4)

Department of
Environmental Protection

DIVISION OF AIR RESOURCES MANAGEMENT

APPLICATION FOR AIR PERMIT - LONG FORM

See Instructions for Form No. 62-210.900(1)

I. APPLICATION INFORMATION

This section of the Application for Air Permit form identifies the facility and provides general information on the scope and purpose of this application. This section also includes information on the owner or authorized representative of the facility (or the responsible official in the case of a Title V source) and the necessary statements for the applicant and professional engineer, where required, to sign and date for formal submittal of the Application for Air Permit to the Department. If the application form is submitted to the Department using ELSA, this section of the Application for Air Permit must also be submitted in hard-copy.

Identification of Facility Addressed in This Application

Enter the name of the corporation, business, governmental entity, or individual that has ownership or control of the facility; the facility site name, if any; and the facility's physical location. If known, also enter the facility identification number.

1. Facility Owner/Company Name: **Lakeland Electric & Water Utilities**	
2. Site Name: **C.D. McIntosh, Jr. Power Plant**	
3. Facility Identification Number: **1050004** [ ] Unknown	
4. Facility Location Information: Street Address or Other Locator: **3030 East Lake Parker Drive** City: **Lakeland** County: **Polk** Zip Code: **33805**	
5. Relocatable Facility? [ ] Yes [x] No	6. Existing Permitted Facility? [x] Yes [ ] No

Application Processing Information (DEP Use)

1. Date of Receipt of Application:	
2. Permit Number:	
3. PSD Number (if applicable):	
4. Siting Number (if applicable):	

Owner/Authorized Representative or Responsible Official

1. Name and Title of Owner/Authorized Representative or Responsible Official:

   Ronald W. Tomlin, Assistant Managing Director

2. Owner/Authorized Representative or Responsible Official Mailing Address:

   Organization/Firm: **Lakeland Electric & Water Utilities**
   Street Address: **501 East Lemon Street**
   City: **Lakeland** State: **FL** Zip Code: **33801-5079**

3. Owner/Authorized Representative or Responsible Official Telephone Numbers:

   Telephone: **(941) 499-6300** Fax: **(941) 499-6344**

4. Owner/Authorized Representative or Responsible Official Statement:

   I, the undersigned, am the owner or authorized representative of the non-Title V source addressed in this Application for Air Permit or the responsible official, as defined in Rule 62-210.200, F.A.C., of the Title V source addressed in this application, whichever is applicable. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements made in this application are true, accurate and complete and that, to the best of my knowledge, any estimates of emissions reported in this application are based upon reasonable techniques for calculating emissions. The air pollutant emissions units and air pollution control equipment described in this application will be operated and maintained so as to comply with all applicable standards for control of air pollutant emissions found in the statutes of the State of Florida and rules of the Department of Environmental Protection and revisions thereof. I understand that a permit, if granted by the Department, cannot be transferred without authorization from the Department, and I will promptly notify the Department upon sale or legal transfer of any permitted emissions unit.*

   Ronald W. Tomlin 6-10-99
   Signature Date

* Attach letter of authorization if not currently on file.

Scope of Application

This Application for Air Permit addresses the following emissions unit(s) at the facility. An Emissions Unit Information Section (a Section III of the form) must be included for each emissions unit listed.

Emissions Unit ID		Description of Emissions Unit	Permit Type
Unit #	Unit ID		
1		Mechanical Draft Cooling Tower	AC1E

See individual Emissions Unit (EU) sections for more detailed descriptions.
Multiple EU IDs indicated with an asterisk (*). Regulated EU indicated with an "R".

Purpose of Application and Category

Check one (except as otherwise indicated):

Category I: All Air Operation Permit Applications Subject to Processing Under Chapter 62-213, F.A.C.

This Application for Air Permit is submitted to obtain:

[ ] Initial air operation permit under Chapter 62-213, F.A.C., for an existing facility which is classified as a Title V source.

[ ] Initial air operation permit under Chapter 62-213, F.A.C., for a facility which, upon start up of one or more newly constructed or modified emissions units addressed in this application, would become classified as a Title V source.

Current construction permit number: ______________________

[ ] Air operation permit renewal under Chapter 62-213, F.A.C., for a Title V source.

Operation permit to be renewed: ______________________

[ ] Air operation permit revision for a Title V source to address one or more newly constructed or modified emissions units addressed in this application.

Current construction permit number: ______________________

Operation permit to be renewed: ______________________

[ ] Air operation permit revision or administrative correction for a Title V source to address one or more proposed new or modified emissions units and to be processed concurrently with the air construction permit application. Also check Category III.

Operation permit to be revised/corrected: ______________________

____

[ ] Air operation permit revision for a Title V source for reasons other than construction or modification of an emissions unit. Give reason for the revision e.g., to comply with a new applicable requirement or to request approval of an "Early Reductions" proposal.

Operation permit to be revised: ______________________

Reason for revision: ______________________

____

Category II: All Air Construction Permit Applications Subject to Processing Under Rule 62-210.300(2)(b),F.A.C.

This Application for Air Permit is submitted to obtain:

[ ] Initial air operation permit under Rule 62-210.300(2)(b), F.A.C., for an existing facility seeking classification as a synthetic non-Title V source.

Current operation/construction permit number(s): ______________________

[ ] Renewal air operation permit under Rule 62-210.300(2)(b), F.A.C., for a synthetic non-Title V source.

Operation permit to be renewed: ______________________

[ ] Air operation permit revision for a synthetic non-Title V source. Give reason for revision; e.g.; to address one or more newly constructed or modified emissions units.

Operation permit to be revised: ______________________

Reason for revision: ______________________

Category III: All Air Construction Permit Applications for All Facilities and Emissions Units.

This Application for Air Permit is submitted to obtain:

[x] Air construction permit to construct or modify one or more emissions units within a facility (including any facility classified as a Title V source).

Current operation permit number(s), if any: ______________________

1050004-004AC; PSD-FL-245

[ ] Air construction permit to make federally enforceable an assumed restriction on the potential emissions of one or more existing, permitted emissions units.

Current operation permit number(s): ______________________

[ ] Air construction permit for one or more existing, but unpermitted, emissions units.

Application Processing Fee

Check one:

[ ] Attached - Amount: $ ________________ [x] Not Applicable.

Construction/Modification Information

1. Description of Proposed Project or Alterations: **Addition of cooling tower to facility. See Section 3.4 in Site Certifiction Application (SCA).**
2. Projected or Actual Date of Commencement of Construction : **1 Jan 2000**
3. Projected Date of Completion of Construction : **1 Jan 2001**

Professional Engineer Certification

1. Professional Engineer Name: **Kennard F. Kosky** Registration Number: **14996**
2. Professional Engineer Mailing Address: Organization/Firm: **Golder Associates Inc.** Street Address: **6241 NW 23rd Street, Suite 500** City: **Gainesville** State: **FL** Zip Code: **32653-1500**
3. Professional Engineer Telephone Numbers: Telephone: **(352) 336-5600** Fax: **(352) 336-6603**

4. Professional Engineer's Statement:

I, the undersigned, hereby certify, except as particularly noted herein, that:*

(1) To the best of my knowledge, there is reasonable assurance that the air pollutant emissions unit(s) and the air pollution control equipment described in this Application for Air Permit, when properly operated and maintained, will comply with all applicable standards for control of air pollutant emissions found in the Florida Statutes and rules of the Department of Environmental Protection; and

(2) To the best of my knowledge, any emission estimates reported or relied on in this application are true, accurate, and complete and are either based upon reasonable techniques available for calculating emissions or, for emission estimates of hazardous air pollutants not regulated for an emissions unit addressed in this application, based solely upon the materials, information and calculations submitted with this application.

If the purpose of this application is to obtain a Title V source air operation permit (check here [ ] if so), I further certify that each emissions unit described in this Application for Air Permit, when properly operated and maintained, will comply with the applicable requirements identified in this application to which the unit is subject, except those emissions units for which a compliance schedule is submitted with this application.

If the purpose of this application is to obtain an air construction permit for one or more proposed new or modified emissions units (check here [X] if so), I further certify that the engineering features of each such emissions unit described in this application have been designed or examined by me or individuals under my direct supervision and found to be in conformity with sound engineering principles applicable to the control of emissions of the air pollutants characterized in this application.

If the purpose of this application is to obtain an initial air operation permit or operation permit revision for one or more newly constructed or modified emissions units (check here [ ] if so), I further certify that, with the exception of any changes detailed as part of this application, each such emissions unit has been constructed or modified in substantial accordance with the information given in the corresponding application for air construction permit and with all provisions contained in such permit.

Thomas F. Kosky — 6/11/99

Signature — Date

(seal)

STATE OF FLORIDA

* Attach any exception to certification statement.

Application Contact

1. Name and Title of Application Contact: **Ms. Farzie Shelton, Mgr. of Env. Licensing & Permitting**	
2. Application Contact Mailing Address: Organization/Firm: **Lakeland Electric & Water Utilities** Street Address: **501 East Lemon Street** City: **Lakeland** State: **FL** Zip Code: **33801-5079**	
3. Application Contact Telephone Numbers: Telephone: **(941) 834-6603** Fax: **(941) 603-6335**	

Application Comment

The emissions from the combustion turbine for both simple cycle and combined cycle have been authorized under air construction permit and PSD approval. The proposed emissions from the cooling tower will remain under the PSD significant emission levels and PSD review is not applicable.

II. FACILITY INFORMATION

A. GENERAL FACILITY INFORMATION

Facility Location and Type

1. Facility UTM Coordinates: Zone: 17	East (km): 409.0	North (km): 3106.2	
2. Facility Latitude/Longitude: Latitude (DD/MM/SS): 28 / 4 / 50	Longitude: (DD/MM/SS): 81 / 55 / 32		
3. Governmental Facility Code: 4	4. Facility Status Code: A	5. Facility Major Group SIC Code: 49	6. Facility SIC(s): 4911

7. Facility Comment (limit to 500 characters):

The McIntosh Power Plant consists of 3 fossil fuel fired-steam generators (FFFSG), 2 diesel powered generators, and 2 gas turbines. FFFSG Units 1 and 2 are fired with No.6 fuel oil and natural gas (distillate oil is used as an ignitor). FFFSG Unit 3 is primarily fired with coal, refuse biomass and petroleum coke. Gas turbine 1 is a 20MW peaking unit. Unit 5 is a newly constructed Westinghouse 501G combustion turbine operating in simple cycle. See SCA.

Facility Contact

1. Name and Title of Facility Contact:
Ms. Farzie Shelton, Mgr. of Env. Licensing & Permitting

2. Facility Contact Mailing Address:
Organization/Firm: **Lakeland Electric & Water Utilities**
Street Address: **501 East Lemon Street**
City: **Lakeland** State: **FL** Zip Code: **33801-5079**

3. Facility Contact Telephone Numbers:
Telephone: **(941) 834-6603** Fax: **(941) 603-6335**

Facility Regulatory Classifications

1. Small Business Stationary Source? [ ] Yes [x] No [ ] Unknown
2. Title V Source? [x] Yes [ ] No
3. Synthetic Non-Title V Source? [ ] Yes, [x] No
4. Major Source of Pollutants Other than Hazardous Air Pollutants (HAPs)? [x] Yes [ ] No
5. Synthetic Minor Source of Pollutants Other than HAPs? [ ] Yes [x] No
6. Major Source of Hazardous Air Pollutants (HAPs)? [x] Yes [ ] No
7. Synthetic Minor Source of HAPs? [ ] Yes [x] No
8. One or More Emissions Units Subject to NSPS? [x] Yes [ ] No
9. One or More Emissions Units Subject to NESHAP? [ ] Yes [x] No
10. Title V Source by EPA Designation? [ ] Yes [x] No
11. Facility Regulatory Classifications Comment (limit to 200 characters):

B. FACILITY REGULATIONS

Rule Applicability Analysis (Required for Category II applications and Category III applications involving non Title-V sources. See Instructions.)

The facility regulations identified in Title V permit will not change as a result of this application. The Title V permit for the McIntosh Power Plant is 105004-003-AV.

List of Applicable Regulations (Required for Category I applications and Category III applications involving Title-V sources. See Instructions.)

Not Applicable

C. FACILITY POLLUTANTS

Facility Pollutant Information

1. Pollutant Emitted	2. Pollutant Classification

D. FACILITY POLLUTANT DETAIL INFORMATION

Facility Pollutant Detail Information:

1. Pollutant Emitted:		
2. Requested Emissions Cap:	(lb/hr)	(tons/yr)
3. Basis for Emissions Cap Code:		
4. Facility Pollutant Comment (limit to 400 characters):		

Facility Pollutant Detail Information:

1. Pollutant Emitted:		
2. Requested Emissions Cap:	(lb/hr)	(tons/yr)
3. Basis for Emissions Cap Code:		
4. Facility Pollutant Comment (limit to 400 characters):		

E. FACILITY SUPPLEMENTAL INFORMATION

Supplemental Requirements for All Applications

1. Area Map Showing Facility Location:
   [x] Attached, Document ID: SCA
   [ ] Not Applicable [ ] Waiver Requested

2. Facility Plot Plan:
   [x] Attached, Document ID: SCA
   [ ] Not Applicable [ ] Waiver Requested

3. Process Flow Diagram(s):
   [ ] Attached, Document ID(s): ______
   [x] Not Applicable [ ] Waiver Requested

4. Precautions to Prevent Emissions of Unconfined Particulate Matter:
   [ ] Attached, Document ID: ______
   [x] Not Applicable [ ] Waiver Requested

5. Fugitive Emissions Identification:
   [ ] Attached, Document ID: ______
   [x] Not Applicable [ ] Waiver Requested

6. Supplemental Information for Construction Permit Application:
   [x] Attached, Document ID: SCA
   [ ] Not Applicable

Additional Supplemental Requirements for Category I Applications Only

7. List of Proposed Exempt Activities:
   [ ] Attached, Document ID: ______
   [ ] Not Applicable

8. List of Equipment/Activities Regulated under Title VI:
   [ ] Attached, Document ID: ______
   [ ] Equipment/Activities On site but Not Required to be Individually Listed
   [ ] Not Applicable

9. Alternative Methods of Operation:
   [ ] Attached, Document ID: ______
   [ ] Not Applicable

10. Alternative Modes of Operation (Emissions Trading):
    [ ] Attached, Document ID: ______
    [ ] Not Applicable

11. Identification of Additional Applicable Requirements: [ ] Attached, Document ID: ______________ [ ] Not Applicable
12. Compliance Assurance Monitoring Plan: [ ] Attached, Document ID: ______________ [ ] Not Applicable
13. Risk Management Plan Verification: [ ] Plan Submitted to Implementing Agency - Verification Attached Document ID: ______________ [ ] Plan to be Submitted to Implementing Agency by Required Date [ ] Not Applicable
14. Compliance Report and Plan [ ] Attached, Document ID: ______________ [ ] Not Applicable
15. Compliance Statement (Hard-copy Required) [ ] Attached, Document ID: ______________ [ ] Not Applicable

III. EMISSIONS UNIT INFORMATION

A separate Emissions Unit Information Section (including subsections A through L as required) must be completed for each emissions unit addressed in this Application for Air Permit. If submitting the application form in hard copy, indicate, in the space provided at the top of each page, the number of this Emissions Unit Information Section and the total number of Emissions Unit Information Sections submitted as part of this application. Some of the subsections comprising the Emissions Unit Information Section of the form are intended for regulated emissions units only. Others are intended for both regulated and unregulated emissions units. Each subsection is appropriately marked.

A. TYPE OF EMISSIONS UNIT
(Regulated and Unregulated Emissions Units)

Type of Emissions Unit Addressed in This Section

1. Regulated or Unregulated Emissions Unit? Check one:

[ ] The emissions unit addressed in this Emissions Unit Information Section is a regulated emissions unit.

[x] The emissions unit addressed in this Emissions Unit Information Section is an unregulated emissions unit.

2. Single Process, Group of Processes, or Fugitive Only? Check one:

[x] This Emissions Unit information Section addresses, as a single emissions unit, a single process or production unit, or activity, which produces one or more air pollutants and which has at least one definable emission point (stack or vent).

[ ] This Emissions Unit Information Section addresses, as a single emissions unit, a group of process or production units and activities which has at least one definable emission point (stack or vent) but may also produce fugitive emissions.

[ ] This Emissions Unit Information Section addresses, as a single emissions unit, one or more process or production units and activities which produce fugitive emissions only.

B. GENERAL EMISSIONS UNIT INFORMATION
(Regulated and Unregulated Emissions Units)

Emissions Unit Description and Status

1. Description of Emissions Unit Addressed in This Section (limit to 60 characters):
   Mechanical Draft Cooling Tower

2. Emissions Unit Identification Number: [ ] No Corresponding ID [X] Unknown

3. Emissions Unit Status Code: **C**	4. Acid Rain Unit? [ ] Yes [X] No	5. Emissions Unit Major Group SIC Code: **49**

6. Emissions Unit Comment (limit to 500 characters):
   A mechanical draft cooling tower will be constructed which will reuse water with a maximum total dissolved solids content up to 5,000 ppm when concentrated. A small portion of the water will be emitted as drift which will form particulate matter.

Emissions Unit Control Equipment Information

A.

1. Description (limit to 200 characters): **Mist Eliminator**
2. Control Device or Method Code: **14**

B.

1. Description (limit to 200 characters):
2. Control Device or Method Code:

C.

1. Description (limit to 200 characters):
2. Control Device or Method Code:

F. SEGMENT (PROCESS/FUEL) INFORMATION
(Regulated and Unregulated Emissions Units)

Segment Description and Rate: Segment 1 of 1

1. Segment Description (Process/Fuel Type and Associated Operating Method/Mode) (limit to 500 characters): **Circulating Water Rate**	
2. Source Classification Code (SCC):	
3. SCC Units:	
4. Maximum Hourly Rate: **7,500**	5. Maximum Annual Rate: **65,700,000**
6. Estimated Annual Activity Factor:	
7. Maximum Percent Sulfur:	8. Maximum Percent Ash:
9. Million Btu per SCC Unit:	
10. Segment Comment (limit to 200 characters): **Maximum Hourly and Annual Rate in 1,000 gallons**	

Segment Description and Rate: Segment _____ of _____

1. Segment Description (Process/Fuel Type and Associated Operating Method/Mode) (limit to 500 characters):	
2. Source Classification Code (SCC):	
3. SCC Units:	
4. Maximum Hourly Rate:	5. Maximum Annual Rate:
6. Estimated Annual Activity Factor:	
7. Maximum Percent Sulfur:	8. Maximum Percent Ash:
9. Million Btu per SCC Unit:	
10. Segment Comment (limit to 200 characters):	

G. EMISSIONS UNIT POLLUTANTS
(Regulated and Unregulated Emissions Units)

1. Pollutant Emitted	2. Primary Control Device Code	3. Secondary Control Device Code	4. Pollutant Regulatory Code
PM	014		NS
PM10	014		NS

K. PREVENTION OF SIGNIFICANT DETERIORATION (PSD) INCREMENT TRACKING INFORMATION (Regulated and Unregulated Emissions Units)

PSD Increment Consumption Determination

1. Increment Consuming for Particulate Matter or Sulfur Dioxide?

If the emissions unit addressed in this section emits particulate matter or sulfur dioxide, answer the following series of questions to make a preliminary determination as to whether or not the emissions unit consumes PSD increment for particulate matter or sulfur dioxide. Check the first statement, if any, that applies and skip remaining statements.

[ ] The emissions unit is undergoing PSD review as part of this application, or has undergone PSD review previously, for particulate matter or sulfur dioxide. If so, emissions unit consumes increment.

[ ] The facility addressed in this application is classified as an EPA major source pursuant to paragraph (c) of the definition of "major source of air pollution" in Chapter 62-213, F.A.C., and the emissions unit addressed in this section commenced (or will commence) construction after January 6, 1975. If so, baseline emissions are zero, and the emissions unit consumes increment.

[ ] The facility addressed in this application is classified as an EPA major source and the emissions unit began initial operation after January 6, 1975, but before December 27, 1977. If so, baseline emissions are zero, and the emissions unit consumes increment.

[ ] For any facility, the emissions unit began (or will begin) initial operation after December 27, 1977. If so, baseline emissions are zero, and emissions unit consumes increment.

[x] None of the above apply. If so, the baseline emissions of the emissions unit are nonzero. In such case, additional analysis, beyond the scope of this application, is needed to determine whether changes in emissions have occurred (or will occur) after the baseline date that may consume or expand increment.

2. Increment Consuming for Nitrogen Dioxide?

If the emissions unit addressed in this section emits nitrogen oxides, answer the following series of questions to make a preliminary determination as to whether or not the emissions unit consumes PSD increment for nitrogen dioxide. Check first statement, if any, that applies and skip remaining statements.

[ ] The emissions unit addressed in this section is undergoing PSD review as part of this application, or has undergone PSD review previously, for nitrogen dioxide. If so, emissions unit consumes increment.

[ ] The facility addressed in this application is classified as an EPA major source pursuant to paragraph (c) of the definition of "major source of air pollution" in Chapter 62-213, F.A.C., and the emissions unit addressed in this section commenced (or will commence) construction after February 8, 1988. If so, baseline emissions are zero, and the source consumes increment.

[ ] The facility addressed in this application is classified as an EPA major source and the emissions unit began initial operation after February 8, 1988, but before March 28, 1988. If so, baseline emissions are zero, and the source consumes increment.

[ ] For any facility, the emissions unit began (or will begin) initial operation after March 28, 1988. If so, baseline emissions are zero, and the emissions unit consumes increment.

[x] None of the above apply. If so, baseline emissions of the emissions unit are nonzero. In such case, additional analysis, beyond the scope of this application, is needed to determine whether changes in emissions have occurred (or will occur) after the baseline date that may consume or expand increment.

3.	Increment Consuming/Expanding Code:			
	PM	[ ] C	[x] E	[ ] Unknown
	SO_2	[ ] C	[ ] E	[ ] Unknown
	NO_2	[ ] C	[ ] E	[ ] Unknown
4.	Baseline Emissions:			
	PM	lb/hour		tons/year
	SO_2	lb/hour		tons/year
	NO_2			tons/year
5.	PSD Comment (limit to 200 characters):			
	The facility will have an insignificant increase in PM.			

10.2 ZONING DESCRIPTIONS

City of Lakeland

CITY HALL
228 S. MASSACHUSETTS AVE.
LAKELAND, FLORIDA 33801-5086
(941) 499-6011 (941) 499-6021
FAX: (941) 499-8432 TDD 499-8333

JAMES S. VERPLANCK, AICP
Director
Community Development Department

April 26, 1999

Ms. Farzie Shelton
Lakeland Electric
501 East Lemon Street
Lakeland, Florida 33801

Re: Zoning Confirmation
McIntosh Power Plant
Unit No. 5 Combined Cycle

Dear Ms. Shelton:

This letter is in response to your request for zoning confirmation on the above-referenced property. The property is located within the City of Lakeland Corporate Limits and is zoned I-3 (heavy industrial). The I-3 zoning district classification permits offices, utility and essential service facilities, warehouses and industrial uses.

The City of Lakeland Future Land Use Map classifies the subject property as Industrial (I). The I designation permits the full range of I-3 uses. Therefore, the McIntosh Power Plant Unit No. 5 Combined Cycle is a permitted within the I-3 zoning district.

I trust this information adequately responds to your request. Should you need additional information, please feel free to contact me at the Community Development Department, 941-499-6011.

Sincerely,

Lorenzo Thomas

Lorenzo Thomas, Senior Planner
Community Development Department

22.07.00.00 I-3 (HEAVY INDUSTRIAL) DISTRICT INTENT

The intent of the I-3 District is to permit the establishment of industrial activities which often have significant external impacts because of their appearance and/or their potential for generating noise, vibration, odor, glare, fire, explosion, or air or water quality threats. Uses permitted in the I-3 District can create an appreciable nuisance or hazard. In addition to these uses, the I-3 district also permits the same light industrial uses and non-industrial uses permitted in the I-2 District.

The I-3 District is intended for mapping in areas designated R and I by the City of Lakeland Future Land Use Plan.

22.08.00.00 USE RESTRICTIONS

22.08.01.00 PRINCIPAL USES PERMITTED BY RIGHT

Office uses, government, including U.S. Postal Service facilities and administrative offices of city, county, state and federal government agencies

Office uses, non-government

Office-type research and development facilities

Travel agencies

Outdoor storage of boats, motor homes and trailers, retail service

Mobile home sales, rental and service agencies

Motor vehicle repair, retail

Recycling collection centers

Retail building material sales, Level II

Veterinary clinics and hospitals, kennels and animal shelters, with all facilities in a completely enclosed building

Industrial-type service establishments, Levels I and II

Industrial uses, Levels I and II

Transit storage and maintenance facilities for passenger transportation operations

Transit terminal facilities for passenger transportation operations

Warehousing and motor freight transportation uses, Levels I and II

Wholesale trade uses, Levels I and II

Communication studios and towers

Parking lots and garages

Utility and essential service facilities, Level I

Agricultural services

Industrial marine establishments

22.08.02.00 PRINCIPAL USES PERMITTED AS CONDITIONAL USES

Outdoor commercial recreation
Industrial-type service establishments, Level III
Industrial uses, Level III
Research and development facilities of an industrial nature
Scrap, waste and reclaimed materials trade
Private and public airports, landing fields and heliports
Railroad marshalling yards
Warehousing and motor freight transportation uses, Level III
Wholesale trade uses, Level III
Utility and essential service facilities, Levels II and III

22.08.03.00 ACCESSORY USES, BUILDINGS AND STRUCTURES PERMITTED BY RIGHT

Amend. 2

Any use typically incidental to a principal use permitted by right when conducted as an accessory to such a principal use

Private concession uses operated on land owned by the City of Lakeland in furtherance of public policy with the contractual approval of the City Commission

Certain accessory buildings and structures shall be permitted in accordance with the provisions of Sections 30.02.02.00 and 30.02.04.00

Dwelling unit wholly within a principal building for watchman/caretaker in warehouse or industrial facility

22.08.04.00 ACCESSORY USES, BUILDINGS AND STRUCTURES PERMITTED AS CONDITIONAL USES

Any use typically incidental to a principal use permitted as a conditional use when conducted as an accessory to such a principal use

22.08.05.00 PROHIBITED USES

Any use not listed as permitted shall be prohibited unless it is determined to be essentially the same as a permitted use pursuant to the provisions of Section 22.08.00.00.

22.09.00.00 DEVELOPMENT REGULATIONS

22.09.01.00 MINIMUM LOT SIZE REGULATIONS

Minimum lot area	2 acres
Minimum lot width	200 feet
Minimum lot depth	300 feet
Minimum street frontage	60 feet

22.09.02.00 BUILDING BULK REGULATIONS

Minimum front and street side setback .... 75 feet
Minimum interior side setback .... 30 feet
Minimum rear setback .... 50 feet
Minimum interior side or rear setback
from any residential lot line .... 75 feet
Maximum building height .... 50 feet or 2 feet in height for each 1 foot in setback, whichever is greater
Maximum lot coverage .... 35 percent

22.09.03.00 MAXIMUM PERMITTED PROJECTIONS INTO REQUIRED SETBACKS

Awnings, cornices, eaves, lintels, planter boxes, roof overhangs, gutters, belt courses and similar ornamental features that are completely supported by a building:

Maximum projection into any required setback .... 5 feet

Amendment No. 1: Ord. 3500, 1/94
Amendment No. 2: Ord. 3633, 6/5/95

10.3 LAND USE DESCRIPTIONS

LEGEND

RL	RESIDENTIAL LOW
RM	RESIDENTIAL MEDIUM
RH	RESIDENTIAL HIGH
LCC	LINEAR COMMERCIAL CORRIDOR
CC	CONVENIENCE CENTER
NAC	NEIGHBORHOOD ACTIVITY CENTER
CAC	COMMUNITY ACTIVITY CENTER
RAC	REGIONAL ACTIVITY CENTER
IAC	INTERCHANGE ACTIVITY CENTER
BP	BUSINESS PARK
I	INDUSTRIAL
PI	PUBLIC AND INSTITUTIONAL
R	RECREATION
C	CONSERVATION
P	PRESERVATION
RM	SUGGESTED LAND USE (not within corporate limits)
——	1996 CORPORATE LIMITS

BEST AVAILABLE COPY

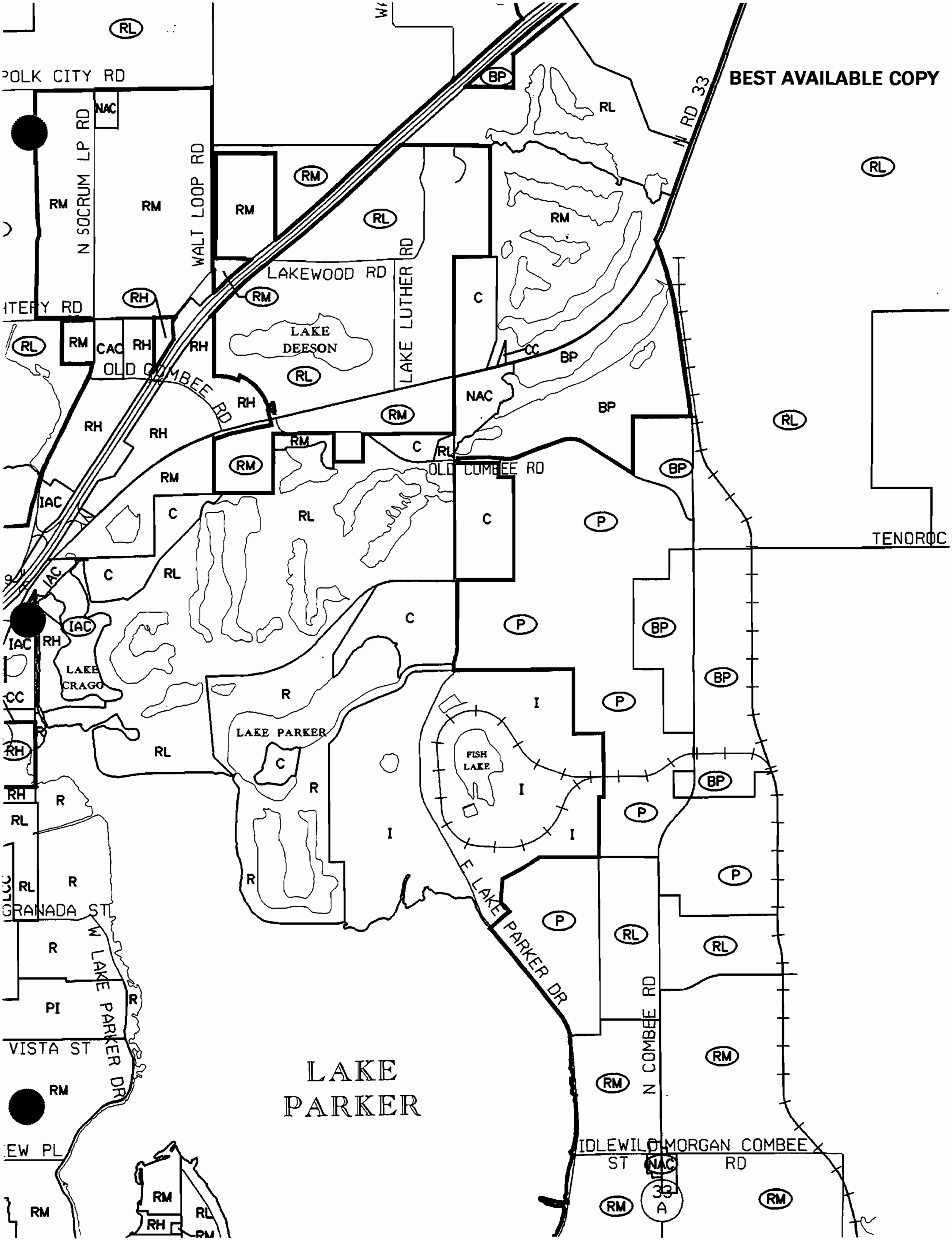
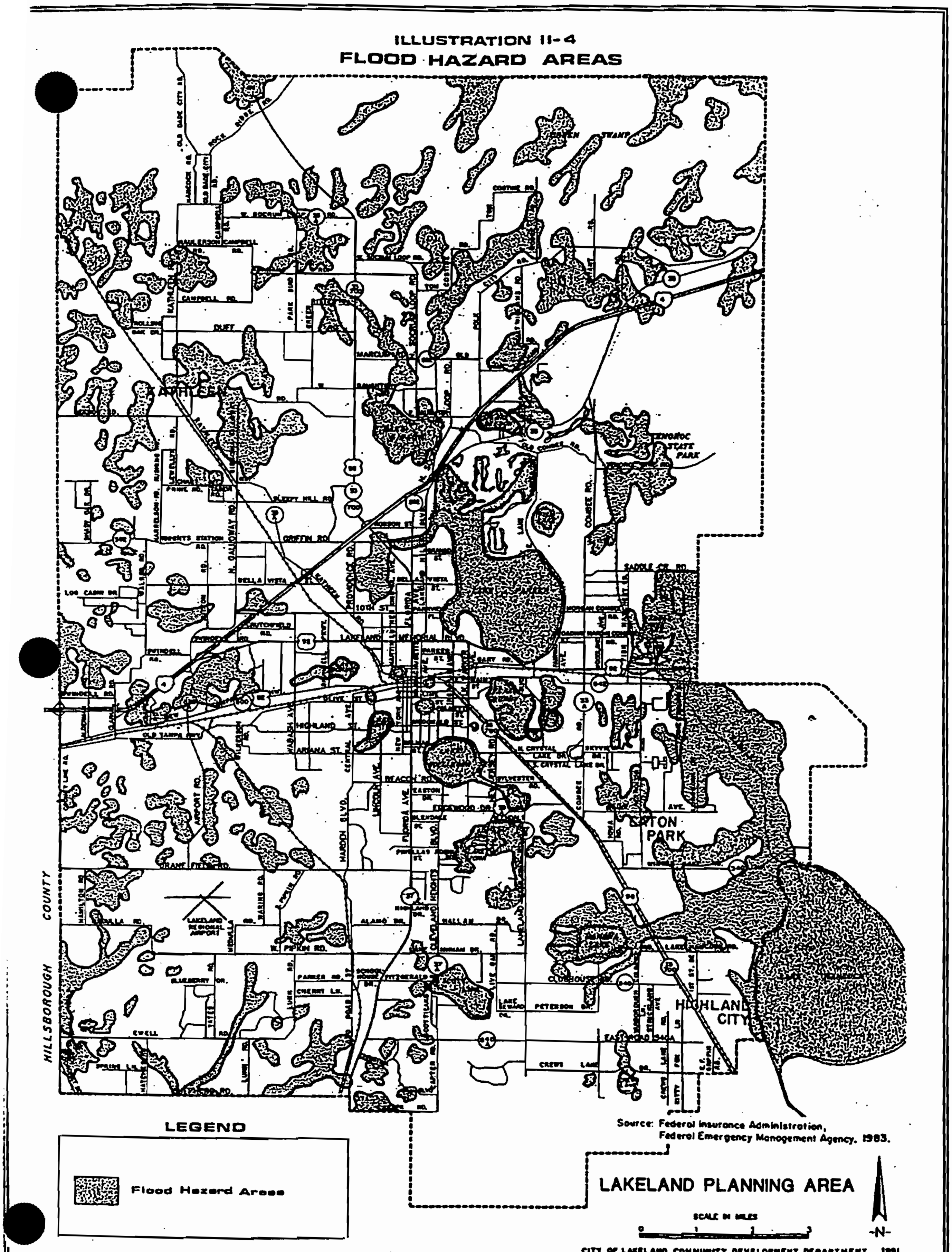


ILLUSTRATION II-4

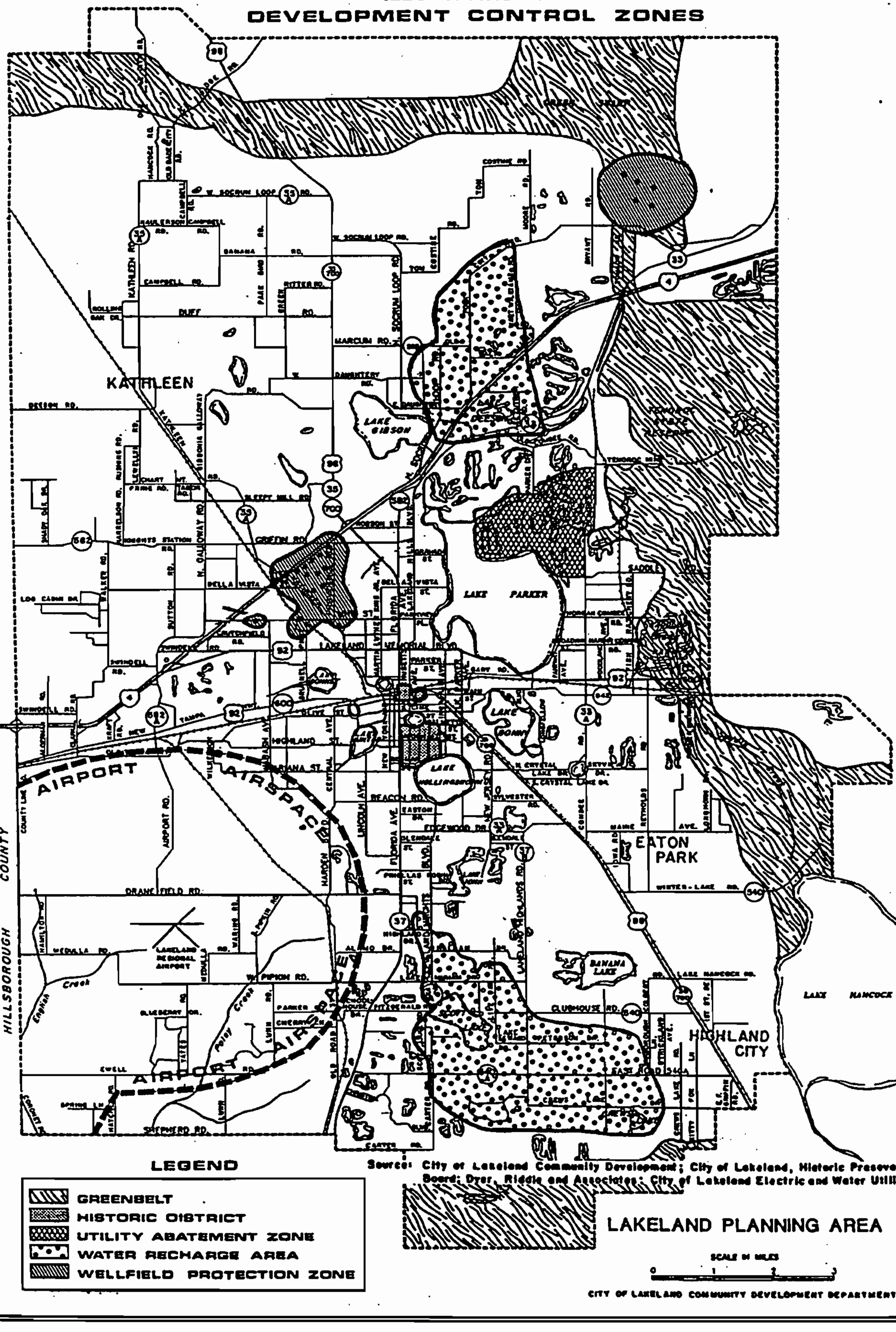
FLOOD HAZARD AREAS



Source: Federal Insurance Administration, Federal Emergency Management Agency, 1983.

CITY OF LAKELAND COMMUNITY DEVELOPMENT DEPARTMENT, 1991

ILLUSTRATION II-8
DEVELOPMENT CONTROL ZONES



A Business Park is intended to provide for the placement of establishments to accommodate employment centers including light-assembly, manufacturing, warehouse, distribution, showroom and non-local office needs of the Planning Area. General characteristics of Business Park Centers are:

<u>Location:</u>	Intersection of or contiguous to an arterial road, preferably with the capability to accommodate a fixed route mass transit line.
<u>Useable Site Area:</u>	40 acres or more.
<u>Typical Square Footage:</u>	500,000 to 2,000,000 square feet.
<u>Employment Area Radius:</u>	20 miles or more.

The Business Park category, to a great degree, replaces the broad industrial category and is a reflection of the changing types of businesses in the local economy which are neither industrial or retail. The Business Park category is not intended for general retail uses or commercial offices but for major employment centers. Limited retail uses will be allowed in the category where it is related to or supportive of the primary employers and businesses in a Business Park Center. Uses such as office supply, convenience retail, hotel, limited restaurant uses and day care centers can be allowed based on meeting adequate buffering, access, and performance criteria established in Land Development Regulations. Not more then 5% of the total land area in a Business Park category on the future land use map can be utilized for these commercial uses. Such uses will typically occur only in the larger Business Park areas where access is adequate. No residential uses are permitted in the Business Park category.

<u>Industrial (IND):</u> Future Industrial may be located within the Central City Area, the Urban Development Area, the Suburban Area, and the Rural Area. Industrial land uses are generally characterized as uses engaged in the manufacturing, processing, assembly and/or treatment of finished or semi-finished products. Industrial uses often create impacts external to the site such as noise, dust, excessive truck traffic and should be buffered from residential uses whenever possible. Businesses which do not have such significant external impacts can usually be accommodated in the Business Park category and the number of industrial designations will be reduced through the use of the Business Park Category for less impactive employment operations. Also included in the industrial category are distribution and warehousing facilities, airports and rail yards. Location of Industrial uses within any overlay is contingent upon the availability of adequate public facilities and services and the ability to meet additional zoning or performance requirements. General retail, general office and residential uses will be prohibited in the Industrial Land Use Category.

The improvement program was coordinated with property owners in South Lake Morton through a series of surveys and neighborhood meetings. Rezoning the neighborhood was a response to the desire to reverse the trend of converting single family residences to duplex or multi-family units and also to allow special zoning concessions such as making garage apartments conforming zoning, and reducing front yard setbacks below the City minimum in order to conform with existing structure setbacks. Development controls in this district are aimed at preserving the historic bungalow style and single family character, and thus encourage reinvestment in the neighborhood.

The third concentration of historic structures in Lakeland is the campus of Florida Southern College. The portion which contains the structures designed by the famous American architect Frank Lloyd Wright is listed in the National Register of Historic Places. Though the campus structures appear ultra modern, they were designed in 1938. The campus holds the world's largest collection of this historic architecture with its many engineering breakthroughs and uniquely designed furnishings.

Under the Florida Certified Local Government Program, the Lakeland Historic Preservation Board reviews changes requiring a building permit within this district including historic renovations, new construction and demolitions.

<u>Utility Abatement Zone:</u> To the north of Lake Parker, along East Lake Parker Drive, the City of Lakeland maintains various operations which impact the immediate environment in several ways. Because of these impacts, the City has identified the surrounding environs as a utility abatement zone. This means that certain regulatory and land use controls need to be established which would allow only utility tolerant land uses within the zone. Generally, this would encourage industrial uses and discourage residential uses.

The utility abatement zone is uniquely identified because of the presence of a major power plant with plans for expansion, two sewage treatment plants, activity by refuse trucks hauling solid waste to the power plant for burning, storage of large quantities of materials, such as coal & pozzuolanic material (fly ash) which require special handling, and the activities occurring at the
police weapons range. Impacts within this zone can be divided into two groups. There are environmental impacts which include degraded air quality from the power plant and sewer plants, water impacts from lake water usage by the power plant, and runoff from the coal pile and pozzuolanic material. There are aesthetic impacts not only from the visual presence of large utility structures and train and truck support traffic, but also from odors, noise, smoke, and extensive lighting.

10.4 EXISTING PERMITS AND AUTHORIZATIONS

10.4.1 AIR CONSTRUCTION PERMIT AND PREVENTION OF SIGNIFICANT DETERIORATION (PSD) APPROVAL INCLUDING THE BEST AVAILABLE CONTROL TECHNOLOGY (BACT) DETERMINATION FOR SIMPLE-CYCLE UNIT NO. 5 INCLUDING DESCRIPTION OF THE DLN TECHNOLOGY

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOTICE OF PERMIT

In the Matter of application for Permit Modification by:

Mr. Ronald W. Tomlin, Assistant Managing Director
City of Lakeland Electric & Water Utilities
501 East Lemon Street
Lakeland, Florida 33801-5079

DEP File No. 1050004-004AC
Permit No. PSD-FL-245
C.D. McIntosh, Jr. Power Plant, Unit No. 5
Polk County

______________________________/

Enclosed is the Final Permit Number PSD-FL-245 to construct a 250 megawatt simple cycle combustion turbine with a once-through heat generator and a 1.05 million gallon fuel oil storage tank at the C.D. McIntosh, Jr. Power Plant, located at 3030 East Lake Parker Drive, Lakeland, Polk County. This permit is issued pursuant to Chapter 403, Florida Statutes.

Any party to this order (permit) has the right to seek judicial review of the permit pursuant to Section 120.68, F.S., by the filing of a Notice of Appeal pursuant to Rule 9.110, Florida Rules of Appellate Procedure, with the Clerk of the Department in the Legal Office; and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The Notice of Appeal must be filed within 30 (thirty) days from the date this Notice is filed with the Clerk of the Department.

Executed in Tallahassee, Florida.

A A Linero, P.E.
for C.H. Fancy, P.E., Chief
Bureau of Air Regulation

CERTIFICATE OF SERVICE

The undersigned duly designated deputy agency clerk hereby certifies that this NOTICE OF FINAL PERMIT (including the FINAL permit) was sent by certified mail (*) and copies were mailed by U.S. Mail before the close of business on 7/10/98 to the person(s) listed:

Mr. Ronald W. Tomlin, City of Lakeland *
Ms. Farzie Shelton, City of Lakeland
Mr. Brian Beals, EPA
Mr. John Bunyak, NPS
Mr. Bill Thomas, SWD
Mr. Buck Oven, DEP
Mr. Ken Kosky, P.E., Golder Associates
Mr. Joe King, Polk County

Clerk Stamp

FILING AND ACKNOWLEDGMENT FILED, on this date, pursuant to §120.52, Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Charlotte J. Hayes 7/10/98
(Clerk) (Date)

Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

PERMITTEE:

City of Lakeland
Department of Electric & Water Utilities
501 East Lemon Street
Lakeland, Fl 33801-5079

File No.	1050004-004-AC
FID No.	1050004-004
SIC No.	4911
Permit No.	PSD-FL-245
Expires:	June 30, 2002

Authorized Representative:
Ronald W. Tomlin
Assistant Managing Director

PROJECT AND LOCATION:

Permit for the construction of 250 megawatt (MW) simple cycle, gas-fired, stationary combustion turbine (CT), a once-through steam generator, and a 1.05 million gallon storage tank for back-up distillate fuel oil. Conditions are included for possible future conversion to a 350 megawatt combined cycle installation including a heat recovery steam generator provided there are no increases in emissions associated with the conversion. The turbine is designated as Unit No. 5 and will be located at the C.D. McIntosh, Jr., Power Plant, 3030 East Lake Parker Drive, Lakeland, Polk County. UTM coordinates are: Zone 17; 409.0 km E; 3106.2 km N.

STATEMENT OF BASIS:

This construction permit is issued under the provisions of Chapter 403 of the Florida Statutes (F.S.), and Chapters 62-4, 62-204, 62-210, 62-212, 62-296, and 62-297 of the Florida Administrative Code (F.A.C.). The above named permittee is authorized to modify the facility in accordance with the conditions of this permit and as described in the application, approved drawings, plans, and other documents on file with the Department of Environmental Protection (Department).

Attached appendices and Tables made a part of this permit:

Appendix BD	BACT Determination
Appendix GC	Construction Permit General Conditions

Howard L. Rhodes

Howard L. Rhodes, Director
Division of Air Resources
Management

SECTION I. FACILITY INFORMATION

SUBSECTION A. FACILITY DESCRIPTION

The existing facility includes: two small diesel powered electric generators; one small gas and distillate-fired combustion turbine; one 90 MW gas and fuel oil-fired steam generator; one 115 MW gas and fuel oil-fired steam generator; and one 364 MW multiple (primarily coal) fuel-fired steam generator. This permit is for the installation of: a 250 MW simple cycle, gas-fired, stationary combustion turbine; a once-through steam generator; a 1.05 million gallon storage tank for back-up (0.05 percent sulfur) distillate fuel oil; and an 85-foot stack. It is possible that in the future the turbine will be converted by the addition of a heat recovery steam generator and a new stack to a 350 MW combined cycle operation without increases in emissions.

Emissions from the McIntosh Unit 5 will be initially controlled by Dry Low NO_X combustors, wet injection when firing fuel oil, use of inherently clean fuels, and good combustion practices. Ultimately the combustors will be replaced and nitrogen oxides emissions reduced by more sophisticated Ultra Low NO_X burners. Otherwise emissions will be reduced by the addition of a selective catalytic reduction (SCR) system.

SUBSECTION B. EMISSION UNITS

This permit addresses the following emission units:

ARMS EMISSION UNIT NO.	SYSTEM	EMISSION UNIT DESCRIPTION
028	Power Generation	250 Megawatt Combustion Turbine and Once Through Steam Generator
029	Fuel Storage	1.05 Million Gallon Fuel Oil Storage Tank

SUBSECTION C. REGULATORY CLASSIFICATION

The facility is classified as a Major or Title V Source of air pollution because emissions of at least one regulated air pollutant, such as particulate matter (PM/PM_{10}), sulfur dioxide (SO_2), nitrogen oxides (NO_X), carbon monoxide (CO), or volatile organic compounds (VOC) exceeds 100 tons per year (TPY).

This facility is within an industry included in the list of the 28 Major Facility Categories per Table 62-212.400-1, F.A.C. Because emissions are greater than 100 TPY for at least one criteria pollutant, the facility is also a Major Facility with respect to Rule 62-212.400, Prevention of Significant Deterioration (PSD). Per Table 62-212.400-2, modifications (such as the construction of Unit 5) at the facility resulting in emissions increases greater than 40 TPY of NO_X or SO_2, 25/15 TPY of PM/PM_{10}, or 3 TPY of fluorides (F) require review per the PSD rules and a determination for Best Available Control Technology (BACT) per Rule 62-212.400, F.A.C.

This facility is also subject to the provisions of Title IV, Acid Rain, Clean Air Act as amended in 1990.

SECTION I. FACILITY INFORMATION

SUBSECTION D. PERMIT SCHEDULE

- 04/22/98 Notice of Intent published in The Ledger
- 04/23/98 Distributed Intent to Issue Permit
- 04/01/98 Application deemed complete
- 12/08/97 Received Application

SUBSECTION E. RELEVANT DOCUMENTS:

The documents listed below are the basis of the permit. They are specifically related to this permitting action, but not all are incorporated into this permit. These documents are on file with the Department.

- Application received on December 8, 1997
- Department letters dated January 5, January 12, March 9, 1998, and April 27, 1998
- Comments and letters from the National Park Service dated January 6, January 12, April 2 and April 15, 1998.
- EPA letters dated February 10 and March 6, 1998.
- City of Lakeland letters dated March 4, March 11, March 31, and May 6, 1998.
- Letters from Westinghouse dated March 25, March 30, and March 31, 1998.
- Department's Intent to Issue and Public Notice Package dated April 22, 1998.
- Department's Final Determination and Best Available Control Technology Determination issued concurrently with this permit.

SECTION II. EMISSION UNIT(S) GENERAL REQUIREMENTS

GENERAL AND ADMINISTRATIVE REQUIREMENTS

1. Regulating Agencies: All documents related to applications for permits to construct, operate or modify an emissions unit should be submitted to the Bureau of Air Regulation (BAR), Florida Department of Environmental Protection (FDEP), at 2600 Blairstone Road, Tallahassee, Florida 32399-2400 and phone number (850)488-1344. All documents related to reports, tests, and notifications should be submitted to the DEP Southwest District office (DEPSW), 3804 Coconut Palm Drive, Tampa, Florida 33619 and phone number 813/744-6100.
2. General Conditions: The owner and operator is subject to and shall operate under the attached General Permit Conditions G.1 through G.15 listed in Appendix GC of this permit. General Permit Conditions are binding and enforceable pursuant to Chapter 403 of the Florida Statutes. [Rule 62-4.160, F.A.C.]
3. Terminology: The terms used in this permit have specific meanings as defined in the corresponding chapters of the Florida Administrative Code.
4. Forms and Application Procedures: The permittee shall use the applicable forms listed in Rule 62-210.900, F.A.C. and follow the application procedures in Chapter 62-4, F.A.C. [Rule 62-210.900, F.A.C.]
5. Modifications: The permittee shall give written notification to the Department when there is any modification to this facility. This notice shall be submitted sufficiently in advance of any critical date involved to allow sufficient time for review, discussion, and revision of plans, if necessary. Such notice shall include, but not be limited to, information describing the precise nature of the change; modifications to any emission control system; production capacity of the facility before and after the change; and the anticipated completion date of the change. [Chapters 62-210 and 62-212]
6. Expiration: Approval to construct shall become invalid if construction is not commenced within 18 months after receipt of such approval, or if construction is discontinued for a period of 18 months or more, or if construction is not completed within a reasonable time. The Department may extend the 18-month period upon a satisfactory showing that an extension is justified. [40 CFR 52.21(r)(2)].
7. BACT Determination: In accordance with paragraph (4) of 40 CFR 52.21(j) the Best Available Control Technology (BACT) determination shall be reviewed and modified as appropriate in the event of a conversion to combined cycle operation. This paragraph states: "For phased construction project, the determination of best available control technology shall be reviewed and modified as appropriate at the latest reasonable time which occurs no later than 18 months prior to commencement of construction of each independent phase of the project. At such time, the owner or operator of the applicable stationary source may be required to demonstrate the adequacy of any previous determination of best available control technology for the source."

SECTION II. EMISSION UNIT(S) GENERAL REQUIREMENTS

This reassessment will be conducted for this project only if the conversion to combined cycle operation is accompanied by any increases in heat input limits, hours of operation, oil firing, low or baseload operation, short-term or annual emission limits, annual fuel heat input limits or similar changes. At a minimum, conversion to combined cycle operation will require a modification of this permit to reflect the ultimate facility description, the higher power production rates and review of the actual control equipment design. [40 CFR 52.21(j)(4), Rule 62-4.070 F.A.C.]

8. Application for Title V Permit: An application for a Title V operating permit, pursuant to Chapter 62-213, F.A.C., must be submitted to the DEP's Bureau of Air Regulation, and a copy to the Department Southwest District office (DEPSW). [Chapter 62-213, F.A.C.]

9. New or Additional Conditions: Pursuant to Rule 62-4.080, F.A.C., for good cause shown and after notice and an administrative hearing, if requested, the Department may require the permittee to conform to new or additional conditions. The Department shall allow the permittee a reasonable time to conform to the new or additional conditions, and on application of the permittee, the Department may grant additional time. [Rule 62-4.080, F.A.C.]

10. Annual Reports: Pursuant to Rule 62-210.370(2), F.A.C., Annual Operation Reports, the permittee is required to submit annual reports on the actual operating rates and emissions from this facility. Annual operating reports shall be sent to the DEP's Southwest District office by March 1st of each year.

11. Stack Testing Facilities: Stack sampling facilities shall be installed in accordance with Rule 62-297.310(6), F.A.C.

12. Permit Extension: The permittee, for good cause, may request that this construction permit be extended. Such a request shall be submitted to the Bureau of Air Regulation prior to 60 days before the expiration of the permit (Rule 62-4.080, F.A.C.).

13. Quarterly Reports: Quarterly excess emission reports, in accordance with 40 CFR 60.7 (a)(7) (c) (1997 version), shall be submitted to the DEP's Southwest District office.

SECTION III. EMISSION UNIT(S) SPECIFIC CONDITIONS

APPLICABLE STANDARDS AND REGULATIONS:

1. Unless otherwise indicated in this permit, the construction and operation of the subject emission unit(s) shall be in accordance with the capacities and specifications stated in the application. The facility is subject to all applicable provisions of Chapter 403, F.S. and Florida Administrative Code Chapters 62-4, 62-103, 62-204, 62-210, 62-212, 62-213, 62-214, 62-296, 62-297; and the applicable requirements of the Code of Federal Regulations Section 40, Parts 60, 72, 73, and 75.

2. Issuance of this permit does not relieve the facility owner or operator from compliance with any applicable federal, state, or local permitting requirements or regulations. [Rule 62-210.300, F.A.C.]

3. These emission units shall comply with all applicable requirements of 40CFR60, Subpart A, General Provisions including:
   - 40CFR60.7, Notification and Recordkeeping
   - 40CFR60.8, Performance Tests
   - 40CFR60.11, Compliance with Standards and Maintenance Requirements
   - 40CFR60.12, Circumvention
   - 40CFR60.13, Monitoring Requirements
   - 40CFR60.19, General Notification and Reporting requirements

4. ARMS Emission Unit 028, Power Generation, consisting of a 250 megawatt combustion turbine with a once-through steam generator shall comply with all applicable provisions of 40CFR60, Subpart GG, Standards of performance for Stationary Gas Turbines, adopted by reference in Rule 62-204.800(7)(b), F.A.C. The Subpart GG requirement to correct test data to ISO conditions applies. However, such correction is not used for compliance determinations with the BACT standard(s).

5. ARMS Emission Unit 029, Fuel Storage, consisting of a 1.05 million gallon distillate fuel oil storage tank shall comply with all applicable provisions of 40CFR60, Subpart Kb, Standards of Performance for Volatile Organic Liquid Storage Vessels, adopted by reference in Rule 62-204.800, F.A.C.

6. All notifications and reports required by the above specific conditions shall be submitted to the DEP's Southwest District office.

GENERAL OPERATION REQUIREMENTS

7. Fuels: Only pipeline natural gas or maximum 0.05 percent sulfur fuel oil No. 2 or superior grade of distillate fuel oil shall be fired in this unit. [Applicant Request, Rule 62-210.200, F.A.C. (Definitions - Potential Emissions)]

SECTION III. EMISSION UNIT(S) SPECIFIC CONDITIONS

8. Capacity: The maximum heat input rates, based on the lower heating value (LHV) of each fuel to Unit 5 at ambient conditions of 59°F temperature, 60% relative humidity, 100% load, and 14.7 psi pressure shall not exceed 2,174 million Btu per hour (mmBtu/hr) when firing natural gas, nor 2,236 mmBtu/hr when firing No. 2 or superior grade of distillate fuel oil. These maximum heat input rates will vary depending upon ambient conditions and the combustion turbine characteristics. Manufacturer's curves corrected for site conditions or equations for correction to other ambient conditions shall be provided to the Department of Environmental Protection (DEP) within 45 days of completing the initial compliance testing. [Design, Rule 62-210.200, F.A.C. (Definitions - Potential Emissions)]

9. Unconfined Particulate Emissions: During the construction period, unconfined particulate matter emissions shall be minimized by dust suppressing techniques such as covering and/or application of water or chemicals to the affected areas, as necessary.

10. Plant Operation - Problems: If temporarily unable to comply with any of the conditions of the permit due to breakdown of equipment or destruction by fire, wind or other cause, the owner or operator shall notify the DEP Southwest District office as soon as possible, but at least within (1) working day, excluding weekends and holidays. The notification shall include: pertinent information as to the cause of the problem; the steps being taken to correct the problem and prevent future recurrence; and where applicable, the owner's intent toward reconstruction of destroyed facilities. Such notification does not release the permittee from any liability for failure to comply with the conditions of this permit and the regulations. [Rule 62-4.130, F.A.C.]

11. Operating Procedures: Operating procedures shall include good operating practices and proper training of all operators and supervisors. The good operating practices shall meet the guidelines and procedures as established by the equipment manufacturers. All operators (including supervisors) of air pollution control devices shall be properly trained in plant specific equipment. [Rule 62-4.070(3), F.A.C.]

12. Circumvention: The owner or operator shall not circumvent the air pollution control equipment or allow the emission of air pollutants without this equipment operating properly. [Rules 62-210.650, F.A.C.]

13. Maximum allowable hours of operation for the stationary gas turbine and once-through steam generator are 8760. Fuel usage as heat input, while burning natural gas in the stationary gas turbine, shall not exceed 15.639×10^{12} BTU (LHV) per year (rolled monthly) until the unit achieves the NO_X emission limits (other than the initial ones) given in Specific Condition 21. Thereafter, only the hourly heat input limits given in Specific Condition 8 apply. [Applicant Request, Rule 62-210.200, F.A.C. (Definitions - Potential Emissions)]

14. Fuel usage as heat input, while burning fuel oil in the stationary gas turbine, shall not exceed 559×10^9 BTU (LHV) per year (rolled monthly). [Applicant Request, Rule 62-210.200, F.A.C. (Definitions - Potential Emissions)]

Control Technology

15. Westinghouse Dry Low NO_X (DLN) combustors shall be installed on the stationary combustion turbine to control nitrogen oxides (NO_X) emissions while firing natural gas. [Design, Rule 62-4.070, F.A.C.]

16. The Dry Low NO_X (DLN) combustors shall be replaced with Westinghouse Ultra Low NO_X (ULN) combustors to accomplish further NO_X control in order to achieve the emission limits specified in Specific Condition 20 and 21. A high temperature selective catalytic reduction (Hot SCR) system or a low temperature SCR system shall be installed and in operation (together with DLN or ULN combustors) not later than May 1, 2002 if the emission limits specified in Specific Condition No 20 and 21 are not achievable by ULN combustors by this date. [Design, Rules 62-4.070 and 62-212.400, F.A.C.]

17. The permittee shall design the stationary gas turbine, ducting, possible future heat recovery steam generator, and stack(s) to accommodate installation of SCR equipment and/or oxidation catalyst in the event that the ULN technology fails to achieve the NO_X limits given in Specific Condition No. 20 and 21 or the carbon monoxide (CO) limits given in Specific Condition 22 are not met. [Rule 62-4.070, F.A.C.]

18. A water injection system shall be installed for use when firing No. 2 or superior grade distillate fuel oil for control of NO_X emissions. [Design, Rules 62-4.070 and 62-212.400, F.A.C.]

19. The permittee shall provide manufacturer's emissions performance versus load diagrams for the DLN and ULN systems prior to their installation. DLN and ULN systems shall each be tuned upon initial operation to optimize emissions reductions and shall be maintained to minimize NO_X emissions and CO emissions. Operation of the DLN or ULN systems in the diffusion firing mode shall be minimized when firing natural gas. [Rule 62-4.070, and 62-210.650 F.A.C.]

EMISSION LIMITS AND STANDARDS

20. The following table is a summary of the BACT determination and is followed by the applicable specific conditions. Values for NO_X are corrected to 15% O_2. Values for CO are corrected to 15% O_2 only until May 1, 2002. [Rule 62-212.400, F.A.C.]

Operational Mode	NO_X (ppm)	CO (ppm)	VOC (ppm)	PM/Visibility (% Opacity)	Technology and Comments
Simple Cycle	25 - NG (basis) 237 lb/hr (24-hr avg) 42 - FO (3 hr avg)	25 - NG or 10 - Ox Cat 90 - FO	4 - NG 10 - FO	10	DLN on gas, WI on oil. Applies until 05/1/2002 . Clean fuels, good combustion
Simple Cycle	9 - NG (basis) 85 lb/hr (24-hr avg) 42 - FO (3 hr avg)	25 - NG or 10 - Ox Cat 90 - FO	4 - NG 10 - FO	10	ULN on gas, WI on oil. Applies after 05/1/2002 Clean fuels, good combustion
Simple Cycle	9 - NG (3 hr avg) 15 - FO (3-hr avg)	25 - NG or 10 - Ox Cat 90 - FO	4 - NG 10 - FO	10	Hot SCR. Applies not later than 05/1/2002 if 9 ppm NO_X not achievable by ULN. Clean fuels, good combustion.
Combined Cycle	7.5 - NG (3 hr avg) 15 - FO (3-hr avg)	25 - NG or 10 - Ox Cat 90 - FO	4 - NG 10 - FO	10	Conventional SCR unless simple cycle limits are achieved on or before 05/01/2002. Clean fuels, good combustion

21. Nitrogen Oxides (NO_X) Emissions:

- When NO_X monitoring data is not available, substitution for missing data shall be handled as required by Title IV (40 CFR 75) to calculate any specified average time.
- Until May 1, 2002, the concentration of NO_X in the exhaust gas shall not exceed 237 lb/hr (at ISO conditions) on a 24 hr block average (basis 25 ppm @ 15% O_2, full load) when firing natural gas and 42 ppmvd at 15% O_2 when firing fuel oil on the basis of a 3 hr average as measured by the continuous emission monitoring system (CEMS). In addition, NO_X emissions calculated as NO_2 (at ISO conditions) shall exceed neither 25 ppm @15% O_2 nor 237 lb/hr (when firing natural gas) and shall exceed neither 42 ppm @15% O_2 nor 413 lb/hr (when firing fuel oil) to be demonstrated by stack test. [Rule 62-212.400, F.A.C.]
- Not later than May 1, 2002, the concentration of NO_X concentrations in the exhaust gas shall not exceed 85 lb/hr (at ISO conditions) on a 24 hr block average (basis 9 ppm @ 15% O_2) when firing natural gas and 42 ppmvd at 15% O_2 when firing fuel oil on the basis of a 3 hr average as measured by the CEMS. In addition, NO_X emissions calculated as NO_2 (at ISO conditions) shall exceed neither 9 ppm @15% O_2 nor 85 lb/hr (when firing natural gas) and shall exceed neither 42 ppm @15% O_2 nor 413 lb/hr (when firing fuel oil) to be demonstrated by stack test. [Rule 62-212.400, F.A.C.]
- If Hot SCR is installed, achievable short-term NO_X concentrations in the exhaust gas shall be demonstrated at baseload during the first compliance test following installation not to exceed 9 ppmvd at 15% O_2 when firing natural gas. NO_X emissions shall not exceed 9 ppmvd at 15% O_2 when firing natural gas and 15 ppmvd at 15% O_2 when firing fuel oil on the basis of a 3-hr average, as measured by the CEMS. In addition, NO_X emissions calculated as NO_2 (at ISO conditions) shall not exceed 85 lb/hr (when firing natural gas) and 148 lb/hr (when firing fuel oil) to be demonstrated by stack test. [Rule 62-212.400, F.A.C.]
- If conventional SCR is installed in conjunction with conversion to combined cycle operation, achievable short-term NO_X concentrations in the exhaust gas shall be demonstrated at baseload during the first compliance test following installation not to exceed 7.5 ppmvd at 15% O_2 when firing natural gas. If conventional SCR catalyst is installed, NO_X emissions shall not exceed 7.5 ppmvd at 15% O_2 when firing natural gas and 15 ppmvd at 15% O_2 when firing fuel oil on the basis of 3-hr average, as measured by the CEMS. In addition, NO_X emissions calculated as NO_2 (at ISO conditions) shall not exceed 71.1 lb/hr (when firing natural gas) and 148 lb/hr (when firing fuel oil) to be demonstrated by stack test. [Rule 62-212.400, F.A.C.]

SECTION III. EMISSION UNIT(S) SPECIFIC CONDITIONS

22. Carbon Monoxide (CO) emissions: Prior to May 1, 2002, the concentration of CO (@15% O_2 in the exhaust gas when firing natural gas shall not exceed 25 ppmvd when firing natural gas and 90 ppmvd when firing fuel oil as measured by EPA Method 10. CO emissions (at ISO conditions) shall not exceed 145 lb/hr (when firing natural gas) and 539 lb/hr (when firing fuel oil). [Rule 62-212.400, F.A.C.]

    After May 1, 2002, the concentration of CO in the exhaust gas when firing natural gas shall not exceed 25 ppmvd when firing natural gas and 90 ppmvd when firing fuel oil as measured by EPA Method 10. CO emissions (at ISO conditions) shall not exceed 106 lb/hr (when firing natural gas) and 386 lb/hr (when firing fuel oil). [Rule 62-212.400, F.A.C.]

23. Sulfur Dioxide (SO_2) emissions: SO_2 emissions (at ISO conditions) shall not exceed 7.2 pounds per hour when firing pipeline natural gas and 127 pounds per hour when firing maximum 0.05 percent sulfur No. 2 or superior grade distillate fuel oil as measured by applicable compliance methods described below. Emissions of SO_2 shall not exceed 38.4 tons per year. [Rules 62-4.070 and 62-212.400, F.A.C. to avoid PSD Review]

24. Visible emissions (VE): VE emissions shall not exceed 10 percent opacity when firing natural gas or No. 2 or superior grade of fuel oil.

25. Volatile Organic Compounds (VOC) Emissions: The concentration of VOC in the exhaust gas when firing natural gas shall not exceed 4 ppmvd when firing natural gas and 10 ppmvd when firing fuel oil as assured by EPA Methods 18, and/or 25 A. VOC emissions (at ISO conditions) shall not exceed 10 lb/hr (when firing natural gas) and 25 lb/hr (when firing fuel oil). [Rule 62-212.400, F.A.C.]

EXCESS EMISSIONS

26. Excess emissions resulting from startup, shutdown, malfunction or fuel switching shall be permitted provided that best operational practices are adhered to and the duration of excess emissions shall be minimized. Excess emissions occurrences shall in no case exceed four hours in any 24-hour period for cold startup or two hours in any 24-hour period for other reasons unless specifically authorized by DEP for longer duration.

27. Excess emissions entirely or in part by poor maintenance, poor operation, or any other equipment or process failure that may reasonably be prevented during startup, shutdown or malfunction, shall be prohibited pursuant to Rule 62-210.700, F.A.C.

28. Excess Emissions Report: If excess emissions occur due to malfunction, the owner or operator shall notify DEP's Southwest District office within (1) working day of: the nature, extent, and duration of the excess emissions; the cause of the excess emissions; and the actions taken to correct the problem. In addition, the Department may request a written summary report of the incident. Pursuant to the New Source Performance Standards, excess emissions shall also be reported in accordance with 40 CFR 60.7, Subpart A. [Rules 62-4.130 and 62-210.700(6), F.A.C.]

COMPLIANCE DETERMINATION

29. Compliance with the allowable emission limiting standards shall be determined within 60 days after achieving the maximum production rate, for each fuel, at which this unit will be operated, but not later than 180 days of initial operation of the unit for that fuel, and annually thereafter as indicated in this permit, by using the following reference methods as described in 40 CFR 60, Appendix A (1997 version), and adopted by reference in Chapter 62-204.800, F.A.C. Emission limits compliance dates shall conform to the timetable specified on Specific Condition No. 20.

30. Initial (I) performance tests shall be performed on Unit 5 while firing natural gas as well as while firing fuel oil. Initial tests shall also be conducted after any modifications (and shake down period not to exceed 100 days after re-starting the CT) of air pollution control equipment, including installation of Ultra Low NO_X burners, Hot SCR, or conventional SCR. Annual (A) compliance tests shall be performed during every federal fiscal year (October 1 - September 30) pursuant to Rule 62-297.310(7), F.A.C., on Unit 5 as indicated. The following reference methods shall be used. No other test methods may be used for compliance testing unless prior DEP approval is received in writing.

- EPA Reference Method 9, "Visual Determination of the Opacity of Emissions from Stationary Sources" (I, A).
- EPA Reference Method 10, "Determination of Carbon Monoxide Emissions from Stationary Sources" (I, A).
- EPA Reference Method 20, "Determination of Oxides of Nitrogen Oxide, Sulfur Dioxide and Diluent Emissions from Stationary Gas Turbines." Initial test only for compliance with 40CFR60 Subpart GG and (I, A) short-term NO_X BACT limits (Method 7E or RATA test data may be used to demonstrate compliance for annual test requirement)
- EPA Reference Method 18, and/or 25A, "Determination of Volatile Organic Concentrations." Initial test only.

31. <u>Continuous compliance with the NO_X emission limits</u>: Continuous compliance with the NO_X emission limits shall be demonstrated with the CEM system based on the applicable averaging time of 24-hr block average (DLN or ULN technology) or a 3-hr average (if SCR is used). Based on CEMS data, a separate compliance determination is conducted at the end of each operating day (or 3-hr period when applicable) and a new average emission rate is calculated from the arithmetic average of all valid hourly emission rates from the previous operating day (or 3-hr period when applicable). Valid hourly emission rates shall not included periods of startup (including fuel switching), shutdown, or malfunction as defined in Rule 62-210.200 F.A.C., where emissions exceed the applicable NO_X standard. These excess emissions periods shall be reported as required in Condition 28.

A valid hourly emission rate shall be calculated for each hour in which at least two NO_X concentrations are obtained at least 15 minutes apart. [Rules 62-4.070 F.A.C., 62-210.700, F.A.C., and 40 CFR 75]

32. Compliance with the SO_2 and PM/PM_{10} emission limits: Not withstanding the requirements of Rule 62-297.340, F.A.C., the use of pipeline natural gas and maximum 0.05 percent sulfur (by weight) No. 2 or superior grade distillate fuel oil, is the method for determining compliance for SO_2 and PM_{10}. For the purposes of demonstrating compliance with the 40 CFR 60.333 SO_2 standard and the 0.05% S limit, fuel oil analysis using ASTM D2880-71 or D4294 (or equivalent) for the sulfur content of liquid fuels and D1072-80, D3031-81, D4084-82 or D3246-81 (or equivalent) for sulfur content of gaseous fuel shall be utilized in accordance with the EPA-approved custom fuel monitoring schedule. The applicant is responsible for ensuring that the procedures above are used for determination of fuel sulfur content. Analysis may be performed by the owner or operator, a service contractor retained by the owner or operator, the fuel vendor, or any other qualified agency pursuant to 40 CFR 60.335(e) (1997 version).

33. Compliance with CO emission limit: An initial test for CO, shall be conducted concurrently with the initial NO_X test, as required. The initial NO_X and CO test results shall be the average of three valid one-hour runs. Annual compliance testing for CO may be conducted concurrent with the annual RATA testing for NO_X required pursuant to 40 CFR 75 (required for gas only).

34. Compliance with the VOC emission limit: An initial test is required to demonstrate compliance with the BACT VOC emission limit. Thereafter, CO emission limit will be employed as surrogate and no annual testing is required.

35. Testing procedures: Testing of emissions shall be conducted with the combustion turbine operating at permitted capacity. Permitted capacity is defined as 95-100 percent of the maximum heat input rate allowed by the permit, corrected for the average ambient air temperature during the test (with 100 percent represented by a curve depicting heat input vs. ambient temperature). If it is impracticable to test at permitted capacity, the source may be tested at less than permitted capacity. In this case, subsequent operation is limited by adjusting the entire heat input vs. ambient temperature curve downward by an increment equal to the difference between the maximum permitted heat input (corrected for ambient temperature) and 105 percent of the value reached during the test until a new test is conducted. Once the unit is so limited, operation at higher capacities is allowed for no more than 15 consecutive days for the purposes of additional compliance testing to regain the permitted capacity. Test procedures shall meet all applicable requirements (i.e., testing time frequency, minimum compliance duration, etc.) of Chapter 62-204.800 F.A.C.

36. Test Notification: The DEP's Southwest District office shall be notified, in writing, at least 30 days prior to the initial performance tests and at least 15 days before annual compliance test(s).

37. Special Compliance Tests: The DEP may request a special compliance test pursuant to Rule 62-297.310(7), F.A.C., when, after investigation (such as complaints, increased visible

emissions, or questionable maintenance of control equipment), there is reason to believe that any applicable emission standard is being violated.

38. Test Results: Compliance test results shall be submitted to the DEP's Southwest District office no later than 45 days after completion of the last test run.

NOTIFICATION, REPORTING, AND RECORDKEEPING

39. Records: All measurements, records, and other data required to be maintained by the City of Lakeland Department of Electric & Water Utilities shall be recorded in a permanent form and retained for at least five (5) years following the date on which such measurements, records, or data are recorded. These records shall be made available to DEP representatives upon request.

40. Emission Compliance Stack Test Reports: A test report indicating the results of the required compliance tests shall be filed with the DEP SW District Office as soon as practical, but no later than 45 days after the last sampling run is completed. [Rule 62-297.310(8), F.A.C.]. The test report shall provide sufficient detail on the tested emission unit and the procedures used to allow the Department to determine if the test was properly conducted and if the test results were properly computed. At a minimum, the test report shall provide the applicable information listed in Rule 62-297.310(8), F.A.C.

MONITORING REQUIREMENTS

41. Continuous Monitoring System: The permittee shall install, calibrate, maintain, and operate a continuous emission monitor in the stack to measure and record the nitrogen oxides emissions from Unit 5. Periods when NO_X emissions (ppmvd @ 15% oxygen) are above the BACT standards, listed in Specific Condition No 20 and 21, shall be reported to the DEP Southwest District Office pursuant to Rule 62-4.160(8), F.A.C. Following the format of 40 CFR 60.7, periods of startup, shutdown, malfunction, and fuel switching shall be monitored, recorded, and reported as excess emissions when emission levels exceed the BACT standards listed in Specific Condition No. 20 and 21. [Rule 62-204.800 and 40 CFR 60.7 (1997 version)]

42. CEMS in lieu of Water to Fuel Ratio: Subject to EPA approval, the NO_X CEMS shall be used in lieu of the water/fuel monitoring system for reporting excess emissions in accordance with 40 CFR 60.334(c)(1), Subpart GG (1997 version). Subject to EPA approval, the calibration of the water/fuel monitoring device required in 40 CFR 60.335 (c)(2) (1997 version) will be replaced by the 40 CFR 75 certification tests of the NO_X CEMS. Upon request from DEP, the CEMS emission rates for NO_X on Unit 5 shall be corrected to ISO conditions to demonstrate compliance with the NO_X standard established in 40 CFR 60.332.

43. Continuous Monitoring System Reports: The monitoring devices shall comply with the certification and quality assurance, and any other applicable requirements of Rule 62-297.520, F.A.C., 40 CFR 60.13, including certification of each device in accordance with 40 CFR 60, Appendix B, Performance Specifications and 40 CFR 60.7(a)(5) or 40 CFR Part 75.

Quality assurance procedures must conform to all applicable sections of 40 CFR 60, Appendix F or 40CFR75. Data on CEM equipment specifications, manufacturer, type, calibration and maintenance needs, and its proposed location shall be provided to the Department's Southwest District Office (DEPSWD) for review at least 90 days prior to installation.

44. Fuel Oil Monitoring Schedule: The following monitoring schedule for No. 2 or superior grade fuel oil shall be followed: For all bulk shipments of No. 2 or superior grade fuel oil received at the C.D. McIntosh , Jr. Power Plant, an analysis which reports the sulfur content and nitrogen content of the fuel shall be provided by the fuel vendor. The analysis shall also specify the methods by which the analyses were conducted and shall comply with the requirements of 40 CFR 60.335(d).

45. Natural Gas Monitoring Schedule: The following custom monitoring schedule for natural gas is approved (pending EPA concurrence) in lieu of the daily sampling requirements of 40 CFR 60.334 (b)(2):

- Monitoring of natural gas nitrogen content shall not be required.
- Analysis of the sulfur content of natural gas shall be conducted using one of the EPA-approved ASTM reference methods in Specific Condition No. 32 for the measurement of sulfur in gaseous fuels, or an approved alternative method. Once Unit 5 becomes operational, monitoring of the sulfur content of the natural gas shall be conducted twice monthly for six months. If this monitoring shows little variability in the fuel sulfur content, and indicates consistent compliance with 40 CFR 60.333, then fuel sulfur monitoring shall be conducted once per quarter for six quarters and after that, semiannually.
- Should any sulfur analysis indicate noncompliance with 40 CFR 60.333, the City shall notify DEP of such excess emissions and the customized fuel monitoring schedule shall be reexamined. The sulfur content of the natural gas will be monitored weekly during the interim period while the monitoring schedule is reexamined.
- The City shall notify DEP of any change in natural gas supply for reexamination of this monitoring schedule. A substantial change in natural gas quality (i.e., sulfur content variation of greater than 1 grain per 100 cubic foot of natural gas) shall be considered as a change in the natural gas supply. Sulfur content of the natural gas will be monitored weekly by the natural gas supplier during the interim period when this monitoring schedule is being reexamined.
- Records of sampling analysis and natural gas supply pertinent to this monitoring schedule shall be retained by the City for a period of five years, and shall be made available for inspection by the appropriate regulatory personnel.
- The City may obtain the sulfur content of the natural gas from the fuel supplier (Florida Gas Transmission) provided the test methods listed in Specific Condition E.4 are used.

46. Determination of Process Variables:

- The permittee shall operate and maintain equipment and/or instruments necessary to determine process variables, such as process weight input or heat input, when such data is needed in conjunction with emissions data to determine the compliance of the emissions unit with applicable emission limiting standards.
- Equipment and/or instruments used to directly or indirectly determine such process variables, including devices such as belt scales, weigh hoppers, flow meters, and tank scales, shall be calibrated and adjusted to indicate the true value of the parameter being measured with sufficient accuracy to allow the applicable process variable to be determined within 10% of its true value [Rule 62-297.310(5), F.A.C]

APPENDIX BD

BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION (BACT)

C. D. McIntosh, Jr. Power Plant
City of Lakeland Electric & Water Utilities
PSD-FL-245 and 1050004-004AC
Lakeland, Polk County, Florida

BACKGROUND

The applicant, The City of Lakeland (City), proposes to install a nominal 250 megawatt (MW) (net) new simple cycle combustion turbine at the existing C.D. McIntosh, Jr. Power Plant located at 3030 East Lake Parker Drive in Lakeland, Polk County. The proposed project will result in "significant increases" with respect to Table 62-212.400-2, Florida Administrative Code (F.A.C.) of emissions of particulate matter (PM and PM_{10}), carbon monoxide (CO), volatile organic compounds (VOC), and nitrogen oxides (NO_X). The project is therefore subject to review for the Prevention of Significant Deterioration (PSD) and a determination of Best Available Control Technology (BACT) in accordance with Rules 62-212.400, F.A.C.

The unit to be installed is a 230 MW Westinghouse 501 G combustion turbine and includes a once through steam generator (OTSG) which provides steam for steam cooling of critical components and injection for further cooling and power augmentation to 250 MW. Descriptions of the process, project, air quality effects, and rule applicability are given in the Technical Evaluation and Preliminary Determination dated April 22, 1998, accompanying the Department's Intent to Issue.

DATE OF RECEIPT OF A BACT APPLICATION:

The application was received on December 8, 1997 and included a proposed BACT proposal prepared by the applicant's consultant, Golder Associates Inc.

REVIEW GROUP MEMBERS:

A. A. Linero, P.E., and Teresa Heron, Review Engineer

BACT DETERMINATION REQUESTED BY THE APPLICANT:

POLLUTANT	CONTROL TECHNOLOGY	PROPOSED BACT LIMIT
Particulate Matter	Pipeline Natural Gas No. 2 Distillate Oil Use (250 hr/yr) Combustion Controls	9.1 lb/hr (Gas) 140 lb/hr, 0.05% sulfur (Oil)
Volatile Organic Compounds	As Above	4 ppm (Gas) 10 ppm (Oil)
Visibility	As Above	20 percent
Carbon Monoxide	As Above	50 ppm (Gas, baseload) 90 ppm (Oil, baseload)
Nitrogen Oxides	Dry Low NO_X Burners (Gas) Water Injection (Oil)	25 ppm @ 15% O_2 (Gas, baseload) 42 ppm @ 15% O_2 (Oil, baseload)

The unit, as described above, would emit approximately 852-863 tons per year (TPY) of NO_X, 761-1,264 TPY of CO, 37-94 TPY of VOC, 39 TPY of SO_2, and 41 TPY of PM/PM_{10}. The basis is 7,008 hours of operation including 250 hours of oil firing and 1050 hours at 50% load.

BACT DETERMINATION PROCEDURE:

In accordance with Chapter 62-212, F.A.C., this BACT determination is based on the maximum degree of reduction of each pollutant emitted which the Department of Environmental Protection (Department), on a case by case basis, taking into account energy, environmental and economic impacts, and other costs, determines is achievable through application of production processes and available methods, systems, and techniques. In addition, the regulations state that, in making the BACT determination, the Department shall give consideration to:

- Any Environmental Protection Agency determination of BACT pursuant to Section 169, and any emission limitation contained in 40 CFR Part 60 - Standards of Performance for New Stationary Sources or 40 CFR Part 61 - National Emission Standards for Hazardous Air Pollutants.
- All scientific, engineering, and technical material and other information available to the Department.
- The emission limiting standards or BACT determination of any other state.
- The social and economic impact of the application of such technology.

The EPA currently stresses that BACT should be determined using the "top-down" approach. The first step in this approach is to determine, for the emission unit in question, the most stringent control available for a similar or identical emission unit or emission unit category. If it is shown that this level of control is technically or economically unfeasible for the emission unit in question, then the next most stringent level of control is determined and similarly evaluated. This process continues until the BACT level under consideration cannot be eliminated by any substantial or unique technical, environmental, or economic objections.

STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES:

The minimum basis for a BACT determination is 40 CFR 60, Subpart GG, Standards of Performance for Stationary Gas Turbines (NSPS). Subpart GG was adopted by the Department by reference in Rule 62-204.800, F.A.C. The key emission limits required by Subpart GG are 75 ppm NO_X @ 15% O_2. (assuming 25 percent efficiency) and 150 ppm SO_2 @ 15% O_2.(or <0.8% sulfur in fuel). The BACT proposed by the City is consistent with the NSPS which allows NO_X emissions over 110 ppm for the higher efficiency unit purchased by the City of Lakeland. No National Emission Standard for Hazardous Air Pollutants exists for stationary gas turbines.

DETERMINATIONS BY EPA AND STATES:

Most recent stationary gas turbine BACT determinations made to-date by EPA and the states, including the State of Florida, have been much more stringent than the requirements of the NSPS. The following table is a sample of information on recent BACT and a few Lowest Achievable Emission Rate (LAER) determinations made by EPA and the States for stationary gas turbine projects as large or larger than the one under review. LAER is required in areas where the ambient air (unlike that Florida) does not attain the National Ambient Air Quality Standards (NAAQS).

Project Location	Power Output and Duty	NO_X Limit ppm @ 15% O_2 and Fuel	Technology	Comments
Cataula, GA	1200 MW **SC PKR**	25 - NG 42 - No. 2 FO	DLN WI	4x300 MW **WH 501G** CTs CTs rated 230 MW @ ISO, NG
Mid-GA Cogen, GA	308 MW CC **CON**	9 - NG 20 - No. 2 FO	DLN & SCR	2x119 MW **WH 501D5A** CTs
CCC, VA	398 MW **SC PKR**	42/65 - No. 2 FO	WI	3x132.5 MW CTs 2000 (500 @ Peak) hr/yr/CT
PREPA, PR	248 MW **SC CON**	10 - No. 2 FO	WI & Hot SCR	3x83 MW CTs
Tiger Bay, **FL**	270 MW CC **CON**	15/10 - NG 42 - No. 2 FO	DLN &/or SCR WI	184 MW GE MS7001FA CT DLN/15 ppm or SCR/10 ppm
Hines Polk, **FL**	485 MW CC **CON**	12 - NG 42 - No. 2 FO	DLN WI	2x165 MW **WH 501**FC CTs Canceled GE CTs
Tallahassee, **FL**	260 MW CC **CON**	12 - NG 42 - No. 2 FO	DLN WI	160 MW GE MS 7231FA CT DLN Guarantee is 9 ppm
Eco-Electrica, PR	461 MW CC **CON**	7 - NG 9 - LPG, No. 2 FO	DLN & SCR	2x160 MW **WH 501**F CTs
Sithe/IPP, NY	1012 MW CC **CON**	4.5 - NG	DLN & SCR	4 x160 MW GE 7FA CTs
Hermiston, OR	474 MW CC **CON**	4.5 - NG	SCR	2x160 MW GE 7FA CTs
Berkshire, MA	272 MW CC **CON**	3.5 - NG (LAER) 9.0 - No. 2 FO	DLN & SCR WI & SCR	178 MW ABB GT24 CT

SC = Simple Cycle
CC = Combined Cycle
NG = Natural Gas
CT = Combustion Turbine

CON = Continuous
PKR = Peaking Unit
FO = Fuel Oil
ISO = 59°F

DLN = Dry Low NO_X Combustion
SCR = Selective Catalytic Reduction
LPG = Liquefied Propane Gas
WI = Water or Steam Injection

GE = General Electric
WH = Westinghouse
ABB = Asea Brown Bovari
ppm = parts per million

Factors in Common with City of Lakeland Project are bolded. All determinations are BACT unless denoted as LAER.

Project Location	CO - ppm (or lb/mmBtu)	VOC - ppm (or lb/mmBtu)	PM - lb/mmBtu (or gr/dscf or lb/hr)	Technology and Comments
Cataula, GA	25 - NG @15% O_2 75 - FO@ 15% O_2	0.01 lb/mmBtu	0.005 - NG 0.03 - FO	Clean Fuels Good Combustion
Mid-GA Cogen, GA	10 - NG 30 - FO	6 - NG 30 - FO	18 lb/hr - NG 55 lb/hr - FO	Clean Fuels Good Combustion
CCC, VA	Not PSD	Not PSD	0.0216 - FO	Clean Fuels Good Combustion
PREPA, PR	9 - FO @15% O_2	11 - FO @15% O_2	0.0171 gr/dscf	Clean Fuels Good Combustion
Tiger Bay, FL	0.045 lb/mmBtu-NG 0.053 lb/mmBtu-FO		0.053 - NG 0.009 - FO	Clean Fuels Good Combustion
Hines Polk, FL	25 - NG 30 - FO	7 - NG 7 - FO	0.006 - NG 0.01 - FO	Clean Fuels Good Combustion
Tallahassee, FL	25 - NG 90 - FO			Clean Fuels Good Combustion
Eco-Electrica, PR	33 - NG/LPG @15% O_2 33 - FO @15% O_2	1.5/2.5 - NG/LPG 6 - FO	0.0053 - NG/LPG 0.0390 - FO	Clean Fuels Good Combustion
Sithe/IPP, NY	13 - NG			Clean Fuels Good Combustion
Hermiston, OR	15 - NG			Clean Fuels Good Combustion
Berkshire, MA	4 - NG (LAER) 5 - FO (LAER)	4 - NG 16 - FO	0.0105 - NG 0.0468 - FO	Clean Fuels CO Catalyst

OTHER INFORMATION AVAILABLE TO THE DEPARTMENT:

Besides the information submitted by the applicant and that mentioned above, other information available to the Department consists of:

- Comments from the National Park Service dated January 6 and 12, April 2 and 15, 1998
- Letters from EPA Region IV dated February 10 and March 6, and May 21, 1998
- Decisions by the Environmental Appeals Board
- Papers and letters written by Westinghouse on the development of the 501 G combustion turbine and nitrogen oxides control technologies
- DOE website information on Advanced Turbine Systems Project
- Mitsubishi website
- City of Lakeland Website, City Commission Meeting Minutes
- Alternative Control Techniques Document - NO_X Emissions from Stationary Gas Turbines
- General Electric 39th Turbine State-of-the-Art Technology Seminar Proceedings

REVIEW OF NITROGEN OXIDES CONTROL TECHNOLOGIES:

Much of the discussion in this section is based on a 1993 EPA document on Alternative Control Techniques for NO_X Emissions from Stationary Gas Turbines. Project-specific information is included where applicable.

Nitrogen Oxides Formation

Nitrogen oxides form in the gas turbine combustion process as a result of the dissociation of molecular nitrogen and oxygen to their atomic forms and subsequent recombination into seven different oxides of nitrogen. Thermal NO_X forms in the high temperature area of the gas turbine combustor. Thermal NO_X increases exponentially with increases in flame temperature and linearly with increases in residence time. Flame temperature is dependent upon the ratio of fuel burned in a flame to the amount of fuel that consumes all of the available oxygen.

By maintaining a low fuel ratio (lean combustion), the flame temperature will be lower, thus reducing the potential for NO_X formation. Prompt NO_X is formed in the proximity of the flame front as intermediate combustion products. The contribution of Prompt to overall NO_X is relatively small in lean, near-stoichiometric combustors and increases for leaner fuel mixtures. This provides a practical limit for NO_X control by lean combustion.

Fuel NO_X is formed when fuels containing bound nitrogen are burned. This phenomenon is not important when combusting natural gas. It is not important for the Lakeland project because natural gas will be the primary fuel and low sulfur fuel oil will be used only for 250 hours per year.

Uncontrolled emissions range from about 100 to over 600 parts per million by volume, dry, corrected to 15 percent oxygen (ppm @15% O_2). For large modern turbines, the Department estimates uncontrolled emissions at approximately 200 ppm @15% O_2.

NO_X Control Techniques

Wet Injection

Injection of either water or steam directly into the combustor lowers the flame temperature and thereby reduces thermal NO_X formation. Typical emissions achieved by wet injection are about 25 ppm when firing gas and 42 ppm when firing fuel oil in large combustion turbines. These values often form the basis for further reduction to BACT limits by other techniques. Carbon monoxide (CO) and hydrocarbon (HC) emissions are relatively low for most gas turbines. However steam and (more so) water injection increase emissions of both of these pollutants.

Combustion Controls

The excess air in lean combustion, cools the flame and reduces the rate of thermal NO_X formation. Lean premixing of fuel and air prior to combustion can further reduce NO_X emissions. This is accomplished by minimizing localized fuel-rich pockets (and high temperatures) that can occur when trying to achieve lean mixing within the combustion zones.

The above principle is depicted in Figure 1 for a can-annular combustor operating on gas. For ignition, warm-up, and acceleration to approximately 20 percent load, the first stage serves as the complete combustor. Flame is present only in the first stage, which is operated as lean stable combustion will permit. With increasing load, fuel is introduced into the secondary stage, and combustion takes place in both stages. When the load reaches approximately 40 percent, fuel is cut off to the first stage and the flame in this stage is extinguished. The venturi ensures the flame in the second stage cannot propagate upstream to the first stage. When the fuel in the first-stage flame is extinguished (as verified by internal flame detectors), fuel is again introduced into the first stage, which becomes a premixing zone to deliver a lean, unburned, uniform mixture to the second stage. The second stage acts as the complete combustor in this configuration.

Combustors used in Westinghouse products are shown in Figure 2. These operate according to the same principles as described above. However they have different characteristics and do not reach the so-called fully pre-mixed operation until the load is over 50 percent.

The emission characteristics of General Electric's Dry Low NO_X (DLN 2) combustors are given in Figure 3. NO_X concentrations are higher in the exhaust at lower loads because at lower loads, the combustor do not operate in the lean pre-mix mode. Therefore such a combustor emits NO_X at concentrations of 25 parts per million (ppm) at loads between 40 and 100 percent of capacity, but concentrations as high as 100 ppm at less than 50 percent of capacity. GE has since upgraded its combustors and this description is not precise for its more advanced DLN 2.6

In all but the most recent gas turbine combustor designs, the high temperature combustion gases are cooled to an acceptable temperature with dilution air prior to entering the turbine (expansion) section. The sooner this cooling occurs, the lower the thermal NO_X formation. Cooling is also required to protect the first stage nozzle. When this is accomplished by air cooling, the air is injected into the component and is ejected into the combustion gas stream, causing a further drop in combustion gas temperature. This, in turn, results in a lower achievable thermal efficiency for the unit.

By using steam in a closed loop system, the fluid is circulated through the internal portion of the nozzle component or around the transition piece between the combustor the nozzle and does not enter the exhaust stream. Instead it is normally sent back to the steam generator. The difference between flame temperature and firing temperature into the first stage is minimized and higher.

Another important result of steam cooling is that a higher firing temperature can be attained with no increase in flame temperature. Flame temperatures and NO_X emissions can therefore be maintained at comparatively low levels even at high firing temperatures. At the same time, thermal efficiency should be greater when employing steam cooling. A similar analysis applies to steam cooling around the transition piece between the combustor and first stage nozzle.

The relationship between flame temperature, firing temperature, unit efficiency, and NO_X formation can be appreciated from Figure 4 which is from a General Electric discussion on these principles. In addition to employing pre-mixing and steam cooling, further reductions are accomplished through design optimization of the burners, testing, further evaluation, etc.

At the present time, emissions achieved by combustion controls are low as 9 ppm (and even lower) from gas turbines smaller than about 200 MW (simple cycle). Initial guarantees of 25 ppm by combustion controls are proposed for turbines larger than larger than 200 MW. The guaranteed values are expected to be reduced for the reasons given above. As in the case of wet injection, higher CO and hydrocarbon emissions can occur as a result of employing combustion controls to minimize NO_X.

Selective Catalytic Combustion

Selective catalytic reduction (SCR) is an add-on NO_X control technology that is employed in the exhaust stream following the gas turbine. SCR reduces NO_X emissions by injecting ammonia into the flue gas. As of early 1992, over 100 gas turbine installations already used SCR in the United States. No combustion turbines in Florida employ SCR. Virtually all SCR units are used in combination with wet injection or combustion controls.

Ammonia reacts with NO_X in the presence of a catalyst and excess oxygen yielding molecular nitrogen and water. The catalyst used in combined cycle, low temperature applications (conventional SCR), is usually vanadium or titanium oxide and accounts for almost all installations. For high temperature applications (Hot SCR up to 1100 °F), such as simple cycle turbines, zeolite catalysts are available but used in few applications to-date.

In the past, sulfur was found to poison the catalyst material. Sulfur-resistant catalyst materials are now available, however, and catalyst formulation improvements have proven effective in resisting performance degradation with fuel oil in Europe and Japan, where conventional SCR catalyst life in excess of 4 to 6 years has been achieved, versus 8 to 10 years with natural gas.

In a manner analogous to balancing control of NO_X from the combustor with emissions of CO and hydrocarbon, similar balancing is required when controlling NO_X by SCR. Excessive ammonia use tends to increase emissions of CO, ammonia (slip), and particulate matter (when sulfur bearing fuels are used). Permit limits as low as 3.5 ppm NO_X have been specified for certain conventional SCR applications in ozone non-attainment areas. Recently, Southern Company proposed a 3.5 ppm NO_X limit for a project in an attainment area in Alabama.

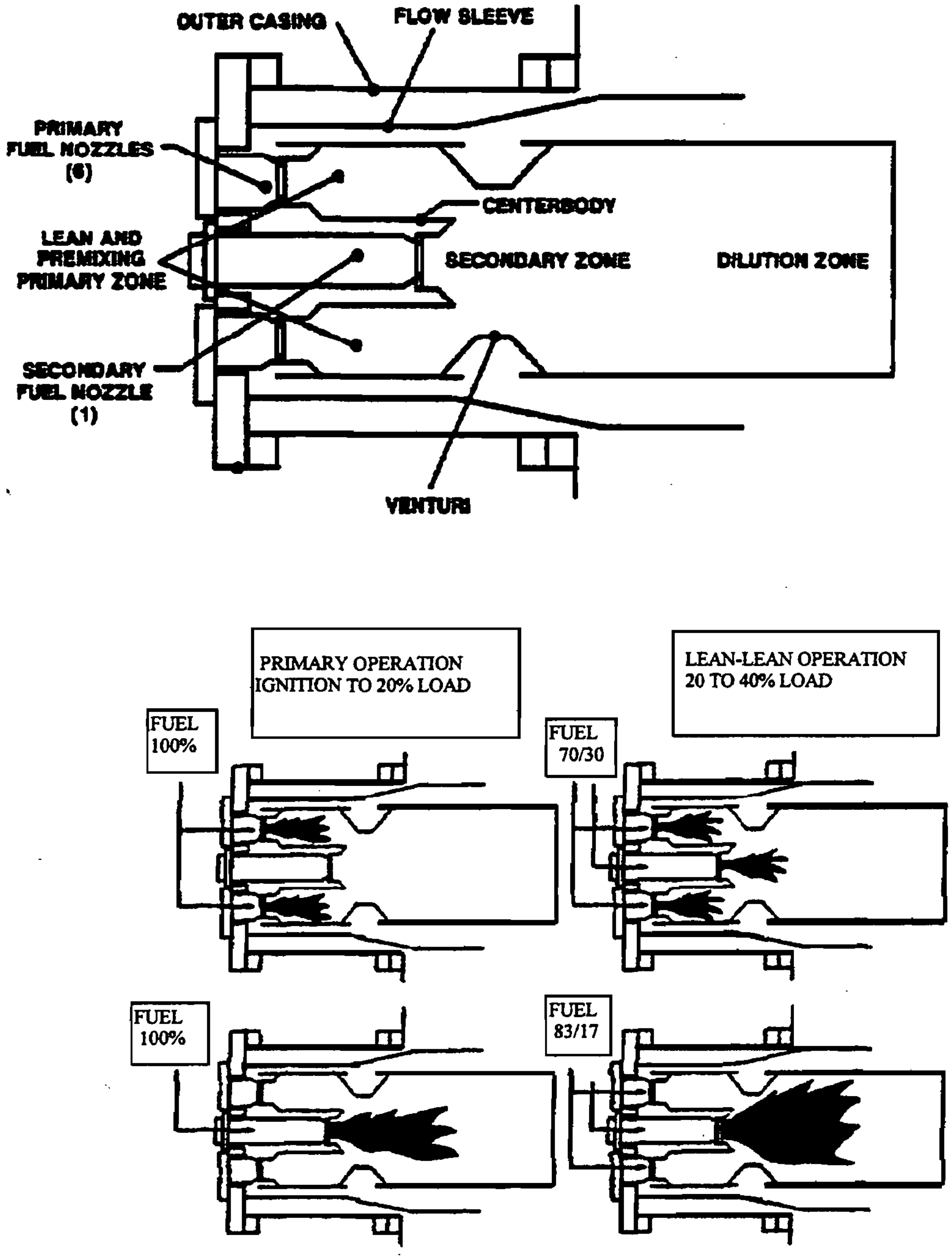


Figure 1 - Cross Sections of a Lean Premixed Can-annular Combustor

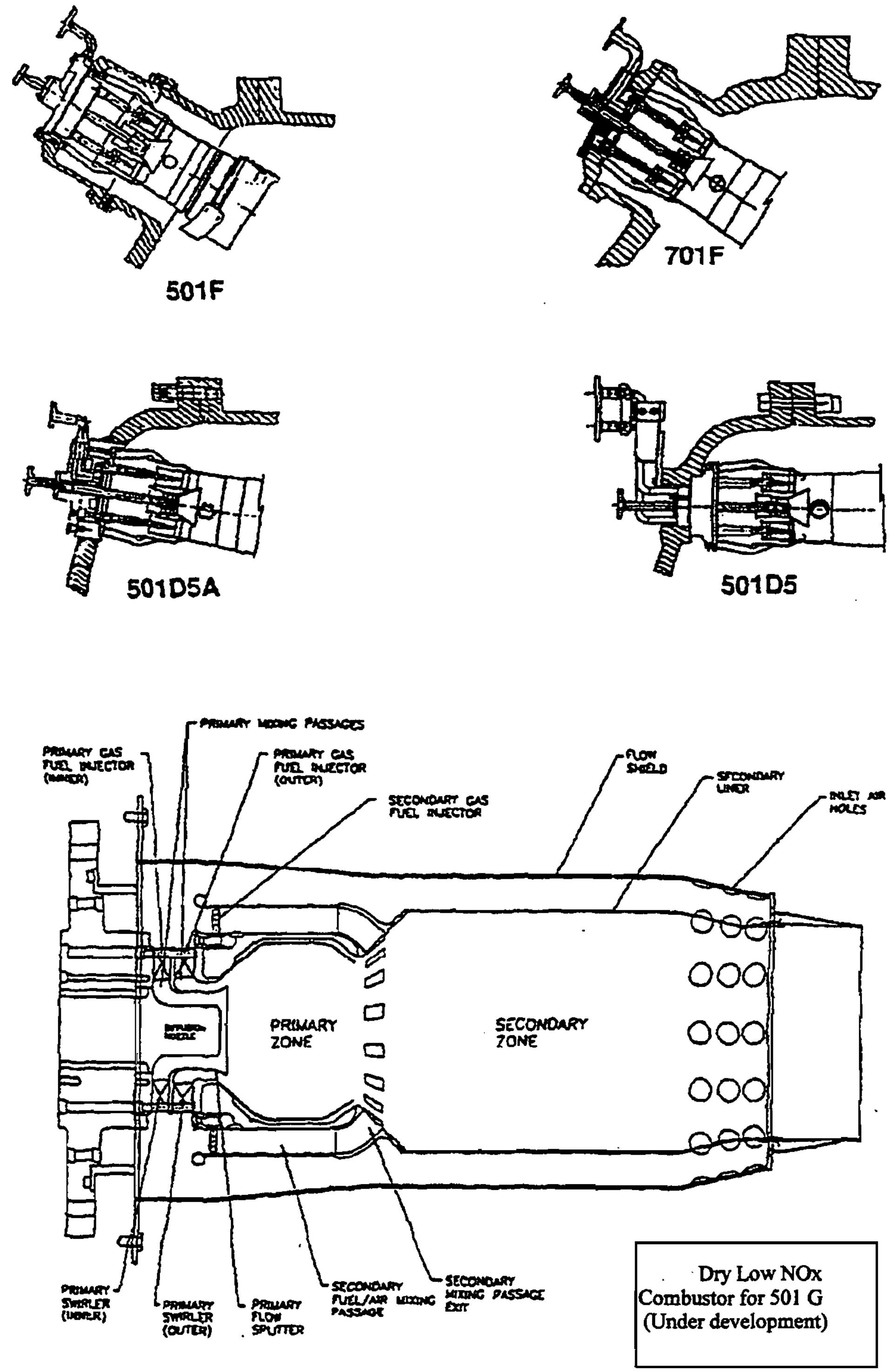


Figure 2 - Westinghouse Dry Low NOx Combustors

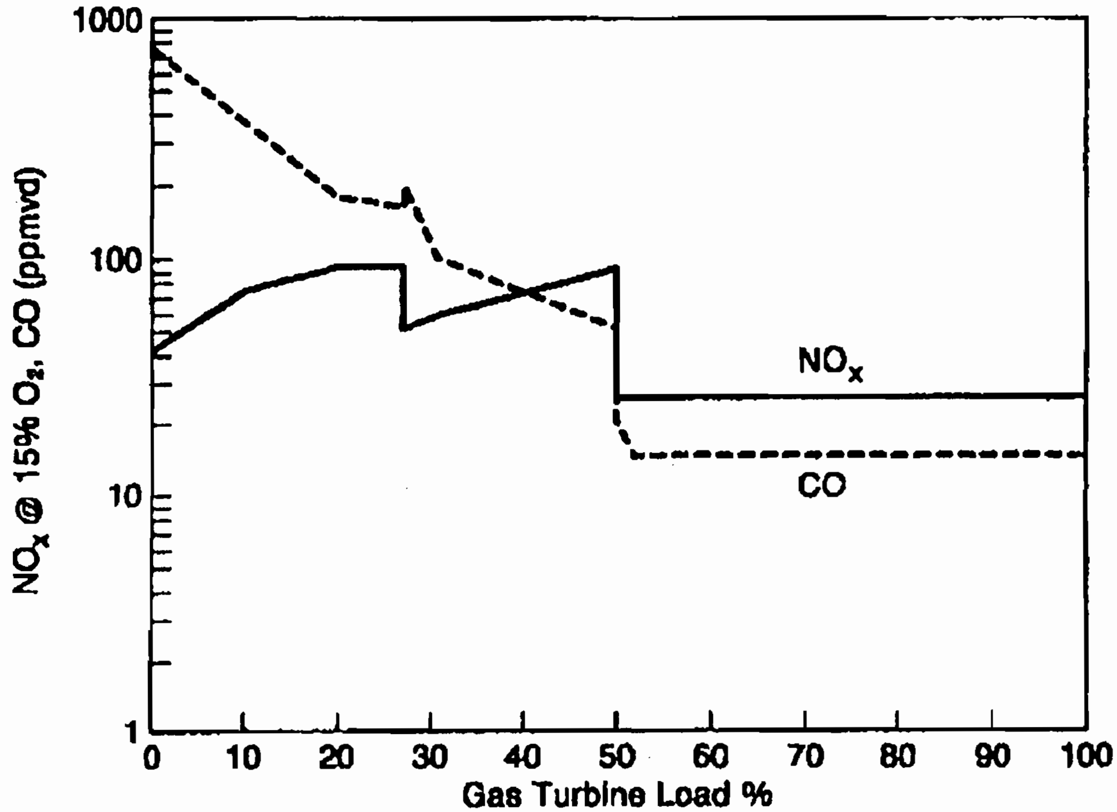


Figure 3 Emissions performance for DLN-2 combustors firing natural gas

Source: General Electric GER-3568E, 1996

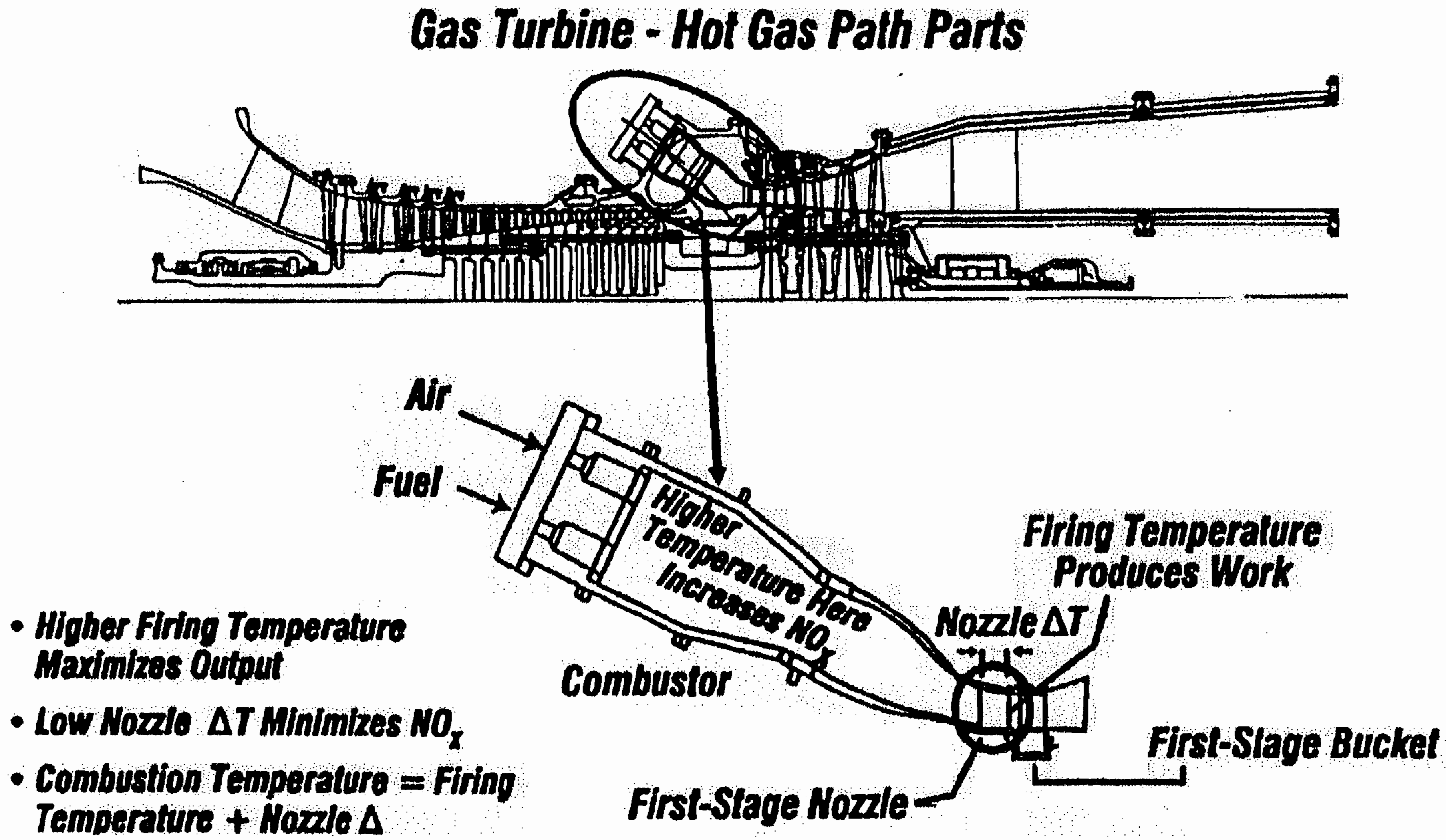


Figure 4. Relationship — combustion temperature to firing temperature

REVIEW OF PARTICULATE MATTER (PM/PM_{10}) CONTROL TECHNOLOGIES:

Particulate matter is generated by various physical and chemical processes during combustion and will be affected by the design and operation of the NO_X controls. The particulate matter emitted from this unit will mainly be less than 10 microns in diameter (PM_{10}).

Natural gas and 0.05 percent sulfur No. 2 (or superior grade) distillate fuel oil will be the only fuels fired and are efficiently combusted in gas turbines. Such fuels are necessary to avoid damaging turbine blades and other components already exposed to very high temperature and pressure. Natural gas is an inherently clean fuel and contains no ash. The fuel oil to be combusted contains a minimal amount of ash and will be used for approximately 250 hours per year making any conceivable add-on control technique for PM/PM_{10} either unnecessary or impractical.

A technology review indicated that the top control option for PM_{10} is a combination of good combustion practices, fuel quality, and filtration of inlet air. The City indicated that the PM_{10} emissions will not exceed 0.01 gr/scf when firing natural gas and pointed out that such a value is equal to a typical specification for baghouse design. Annual emissions of PM_{10} are expected to be approximately 30 tons for natural gas and less than 15 tons for fuel oil.

REVIEW OF CARBON MONOXIDE(CO) CONTROL TECHNOLOGIES

CO is emitted from combustion turbines due to incomplete fuel combustion. Combustion design and catalytic oxidation are the control alternatives that are viable for the project. The most stringent control technology for CO emissions is the use of an oxidation catalyst.

Most installation using catalytic oxidation are located in the Northeast. Besides the Berkshire installation listed above, CO oxidation catalyst has been installed at the 240 MW Brooklyn Navalyard Facility, the 240 MW Masspower facility, the 165 MW Pittsfield Generating Plant in Massachusetts, and the 345 MW Selkirk Generating Plant in New York. Catalytic oxidation was recently installed at a cogeneration plant at Reedy Creek (Walt Disney World), Florida to avoid PSD review which would have been required due to increased operation at low load.

Most combustion turbines incorporate good combustion to minimize emissions of CO. These installations typically achieve emissions between 10 and 30 at full load, even as they achieve relatively low NO_X emissions by SCR or dry low NO_X means. By comparison, the values of 50 and 90 ppm for gas and oil respectively at baseload proposed in the City's application appear high.

REVIEW OF VOLATILE ORGANIC COMPOUND (VOC) CONTROL TECHNOLOGIES

Volatile organic compound (VOC) emissions, like CO emissions, are formed due to incomplete combustion of fuel. There are no viable add-on control techniques as the combustion turbine itself is very efficient at destroying VOC. The limits proposed for this project are 4 and 10 ppm for gas and oil firing respectively.

BACKGROUND ON SELECTED GAS TURBINE

The City has already committed to the purchase of a 230 MW Westinghouse 501 G simple cycle gas turbine.[1] The unit was already under construction by Westinghouse and awaiting sale. The contract for the unit includes NO_X emission guarantees of 25 ppm on gas and 42 ppm on fuel oil.

The choice satisfies the City's immediate power needs and reserve capacity. If it is ultimately converted to combined cycle operation, the power generating capacity will be about 350 MW.[2] A contract was recently awarded to Sargent and Lundy to prepare bid specifications to convert the unit to combined cycle operation at the earliest opportunity.[3]

The conceptual and basic designs for the 501 G were jointly developed by Westinghouse and Mitsubishi Heavy Industries (MHI). Detailed designs were developed separately by the two companies and the units are not identical.[4] The first 501 G started operation in April of 1997 in Japan at the MHI Takasago Machinery Works 330 MW Demonstrator Combined Cycle Plant. The unit has the "highest firing temperature (1500 °C, 2732 °F) ever recorded, and a combined cycle efficiency of over 58 percent."[5] The efficiency is also the highest ever demonstrated for combined cycle turbine. NO_X emissions are controlled by multi-nozzle DLN combustor, followed by a selective catalytic reduction (SCR) system located within the heat recovery steam generator (HRSG).

The first commercial operation (i.e. not within MHI subsidiaries) of a "1500 °C" combined cycle unit will begin trial operation at the Tohoku Electric Higashui Niigata Power Plant in October, 1998.[6] The specific unit will be the "701 G," which is a larger, 50 Hertz version of the 501 G. Commercial operation will begin in July, 1999.

Westinghouse and General Electric continue to work on even larger and more efficient turbines. Westinghouse has already tested the compressor for its planned "H" Class turbine capable of achieving 60 percent efficiency while operating in combined cycle mode.[7] General Electric does not have an entry in the "G" class. However it is conducting trials in Greenville, South Carolina on the MS9001H, which is its 50 Hertz entry into the H Class. GE expects a combined cycle efficiency of 60 percent and generation of over 400 MW. GE plans to make its similar 60 Hertz MS7001H version available in 2001 or 2002.[8]

Westinghouse and General Electric are counting on further advancement and refinement of DLN technology to provide sufficient NO_X control for their turbines. In the case of the 501 G, steam cooling of the transition piece allows the unit the maintain the same NO_X formation potential as the 501 F while achieving a higher turbine inlet (firing) temperature. Examples of Westinghouse combustors are shown in Figure 2. These include their second generation of Dry Low NO_X combustors including their fully pre-mixed Piloted Ring Combustor.[9] Where required by BACT or LAER determinations of certain states, both companies incorporate SCR in combined cycle projects.[10,11]

The approach of progressively refining such technology is a proven one, even on some relatively large units. Basically this was the strategy adopted in Florida throughout the 1990's. Recently GE Frame 7 FA units (160 MW gas turbines with firing temperatures of 2400) met performance guarantees of 9 ppm with "DLN-2.6" burners at Fort St. Vrain, CO and Clark County, WA.[12]

Westinghouse will conduct two phases of testing in 1998 in its effort to develop Ultra Low NO_X (ULN) technology for its "F" Class to meet a NO_X level of 9-12 ppm by mid-2000.[13]

Both Westinghouse and General Electric are partners with the Department of Energy (DOE) in the Advanced Turbine Systems (ATS) Program.[14] The Mission/Vision Statement of ATS is to "develop base-load advanced turbine systems for commercial offering in the year 2000." Among the goals of the Program are 60 percent combined cycle efficiency while achieving NO_X emissions of 9 ppm or less.[15] The cost of producing the prototypes is estimated at \$435,000,000 and \$300,000,000 for the GE and Westinghouse projects respectively.[16] The goals of the ATS are reflected in the "H" Class units described above.

In simple cycle, continuous duty mode, the Westinghouse 501 G achieves an admirable efficiency of approximately 38 percent.[17] However this efficiency is much lower than what can be realized with the same unit (58 percent) when operating in combined cycle.[18] As discussed above, Sargent and Lundy have been contracted to prepare bid specifications to convert the unit to combined cycle.

The 25 ppm initial NO_X guarantee on natural gas appears high when compared with BACT determinations for continuous-duty or combined cycle units, such as those previously listed. It is also higher than the stated goal of the ATS Program. The simple cycle mode with the flexibility of switching (or not switching) to combined cycle operation, presents constraints in evaluating the feasibility and costs of various emission reduction options otherwise available. For this reason, the Department does not constrain itself to any presumed historical cost-effectiveness criteria or cost estimating procedures such as might apply to a project with a clearly defined staging schedule and final configuration. At the same time, however, the Department has a full appreciation of the goals of the ATS Program and does not want to arbitrarily impede progress toward its goals.

Westinghouse provided a technology update of the Westinghouse family of combustion turbines. It includes a schedule for the 501 G to reach low NO_X levels of 9-12 by Ultra Low NO_X. The structure of the schedule is similar to that described for their 501 F class unit. According to Westinghouse, the experience gained from the 501 F will be employed in development of Ultra LN for the 501 G. Basic design and laboratory testing of Piloted Ring Combustors (a candidate design for Ultra LN) for the 501 G is already underway. Initial field verification will be conducted beginning in mid-1999. Design modification and retesting will occur from mid-1999 through mid 2000. Additional design changes/tests will be carried out from mid-2000. Full commercial application will be implemented from 2001 through 2004.[8]

Westinghouse provided the City with a more specific schedule for the 501 G to be installed at Lakeland.[19] Westinghouse "fully anticipates having a combustion system available that meets the 9-12 NO_X requirement for the McIntosh No. 5 Unit within the next four years." That will occur in early 2002 and is within the general schedule given above. According to the same document, "since McIntosh Unit No. 5 is the demonstration project for the 501 G, there is a high probability that some field verification testing will be performed on the unit."

The proximity of Westinghouse technical staff in Orlando to the project site in Lakeland should enhance the probability of meeting Westinghouse's goal at an early date.

DEPARTMENT BACT DETERMINATION

Following are the BACT limits determined for the Lakeland project assuming full load. Values for NO_X are corrected to 15% O_2. These limits or their equivalents in terms of pounds per hour, as well as the applicable averaging times, are given in the permit Specific Conditions. The rationale for the averaging times is discussed in the Final Determination addressing comments by the City and EPA and which is being issued concurrently with this determination.

Operational Mode	NO_X (ppm)	CO (ppm)	VOC (ppm)	PM/Visibility (% Opacity)	Technology and Comments
250 MW SC CON	25 - NG 42 - FO	25 - NG or 10 by Ox Cat 90 - FO	4 - NG 10 - FO	10	DLN on gas, WI on oil. Applies through April 30, 2002. Clean fuels, good combustion
250 MW SC CON	9 - NG 42 - FO	25 - NG or 10 by Ox Cat 90 - FO	4 - NG 10 - FO	10	ULN on gas, WI on oil. Applies after April 30, 2002. Clean fuels, good combustion
250 MW SC CON	9 - NG 15 - FO	25 - NG or 10 by Ox Cat 90 - FO	4 - NG 10 - FO	10	Hot SCR. Applies after April 30, 2002 if 9 ppm NO_X not achievable by ULN as described above. Clean fuels, good combustion.
350 MW CC CON	7.5 - NG 15 - FO	25 - NG or 10 by Ox Cat 90 - FO	4 - NG 10 - FO	10	Conventional SCR if converted to combined cycle, unless 9 ppm is attained by ULN or Hot SCR as described above. Clean fuels, good combustion

RATIONALE FOR DEPARTMENT'S DETERMINATION

- The initial 25 and 42 ppm NO_X limits are guaranteed by Westinghouse.
- There is a clear plan for achieving emissions of 9-12 ppm at the Lakeland location within 4 years of April, 1998. This will occur in early 2002 - about 3 years after an early-1999 startup.
- The unit will be operated in simple cycle mode while maintaining the flexibility to expand at a future date to combined cycle operation through the addition of a 100 MW heat recovery steam generator. Therefore control options which are feasible for combined cycle units are not immediately applicable at commencement of operation. At project inception, this rules out Low Temperature (conventional) SCR which achieves a 4.5 ppm NO_X BACT limit at the Hermiston and Sithe/IPP projects above.
- The turbine has a very high exhaust temperature of about 1100 ^oF.[17] This is at the higher limit of the present operational temperature of Hot SCR zeolite catalyst.[20] Therefore the catalyst would have to placed *after* the OTSG. The PREPA simple cycle turbines have exhaust temperatures ranging from 824 to 1024 ^oF and the Hot SCR catalyst (which must achieve 10 ppm NO_X) is located *between* the turbine and the OTSG.[21]

- Hot SCR is technically feasible for gas.[22] The same evaluation states that the technology has not been demonstrated for oil. However the PREPA units have since been installed.[23] These operate solely on 0.15 percent sulfur fuel oil.[24] The Lakeland unit is proposed to operate only 250 hours per year on fuel oil of 0.05 percent sulfur.
- The levelized costs of NO_X removal by Hot SCR were estimated by the City as $5,236 per ton of NO_X removed. Other Hot and conventional SCR cost estimates submitted by the applicant are not considered in this evaluation because they are based on many conditional assumptions regarding possible ultimate project phasing scenarios which are not typically encountered when applying the methodology used by the applicant. Also the cost estimates do not consider a continuation of the actual downward trend in catalyst prices, progressively improving performance, and typically longer-than-expected life.
- The levelized costs derived in the application for Hot SCR at Lakeland are based on a quote from Engelhard. The vendor based the proposal on design operation on <u>fuel oil</u> with <u>guaranteed</u> NO_X reduction of 70 percent to 12.6 ppm @15% O_2.[25]
- In order to avoid allowing control on fuel oil to become the main design consideration, the Department obtained a budgetary estimate from Engelhard to guarantee reduction of NO_X emissions while operating on <u>gas</u> by 64 percent (from 25 to 9 ppm).[26] The replacement cost of the Hot SCR catalyst designed for gas is $1,600,000 versus the $2,800,000 estimated for the Lakeland project designed for oil. During the very few hours of operation on oil, <u>estimated</u> NO_X emissions from the 501 G controlled by Hot SCR will be approximately 13 ppm @15% O_2.
- The cost effectiveness for NO_X removal given for the PREPA simple cycle project is $2,200 per ton. The main reason for the relatively low levelized cost is that total costs are applied over a reduction of 40 ppm whereas the reduction in the Lakeland case is over a smaller reduction. The cost per ton of NO_X removed by Hot SCR at the PREPA project can be rescaled for the Lakeland project. This would involve a significant increase due lower removal. However there would be decreases due to the natural gas design, application on one large unit versus three smaller ones, and lower ammonia requirements. The resulting costs would be less than $4,000 per ton.
- Using much of the basic capital cost information developed by Lakeland, The National Park Service estimated the cost of NO_X removal by Hot SCR at $3,802 per ton (excluding the energy penalty) for the continuous duty 501 G. A further refinement of the Park Service estimate by including the energy penalty, using the revised catalyst cost data obtained by the Department, and assuming a five year <u>estimated</u> life for the catalyst (per Engelhard) would yield a cost-effectiveness closer to $3,500 per ton of NO_X removed.
- The Department concludes that Hot SCR is both technically and economically feasible now. The probability of success using this technology is at least as high as it is using the Ultra LN technology under development.
- According to Westinghouse, a heat exchange surface is required between the turbine and Hot SCR catalyst to insure an operational temperature less than 1100 ^oF is maintained. If a future HRSG is installed, Westinghouse indicates that the OTSG (which provides the steam for

cooling and power augmentation) will be removed. This would expose the Hot SCR system (if installed) to unacceptable temperatures. Westinghouse does not believe relocation of catalyst to the HRSG is feasible and thus the Hot SCR system would be written off and possibly replaced by a conventional SCR system in the HRSG.

- The Department notes that the specifications under development by Sargent and Lundy for conversion to combined cycle operation are not yet available to the Department for evaluation. Therefore the Department does not concur that Hot SCR is not feasible based on conceivable future development scenarios.
- According to Westinghouse, the ultimate design of their ATS-based gas turbine has options for "recuperative cycles" working within combined cycles. These cycles can lower the gas temperature entering the steam cycle and appear to provide heat exchange surface to cool the gases and protect the Hot SCR system before the HRSG.
- There are various kinds of recuperative cycles - some of which make the combined cycle less efficient and others that which make it more efficient. According to a paper heralding the arrival of the 501 G, the author writes that "what is more significant is that the 501 G has been designed to incorporate the technology advances planned in the ATS program, such as intercooling and reheat, humidification and *chemical recuperation*, as and when they are good and ready."[2]
- The Department is not aware of actual plans to incorporate recuperation cycles in Westinghouse 501 products, the likely combined cycle efficiency benefits (or penalties), or their applicability to the Lakeland project by the time of conversion to combined cycle operation. The point is that ultimate wasting of Hot SCR equipment installed at startup, is not a foregone conclusion considering that many developments can occur within the time horizon of possible future project expansion scenarios.
- It is possible, and even likely, that Hot SCR catalysts will be improved (similar to refinement of Ultra LN) and can be used to replace the initial catalyst as it degrades. By the time the OTSG is removed for combined cycle conversion (e.g. 3-5 years), replacement catalyst might be able to withstand the higher temperature regime.
- Hot SCR has environmental and energy impacts including increased particulate emissions, undesirable (though unregulated) ammonia emissions, and energy penalties. All factors being equal, Ultra LN is a better control strategy than Hot SCR. A three year period to refine this technology to achieve similar emissions as Hot SCR is reasonable and not unprecedented.
- The Department does not conclude at this time that achieving 9-12 ppm of NO_X in three years by Ultra LN is an overall better strategy than immediately achieving 4.5 - 7.5 ppm by conventional SCR in a combined cycle unit. However, if the 9-12 ppm value can be achieved by ULN within the three years, subsequent installation of conventional SCR during a conversion to combined cycle may not be cost-effective.
- Three years after startup is equal to the longest period of time provided to any previous applicant to achieve Department BACT limits by DLN technologies. With the accumulated knowledge and experience from DLN technologies for smaller units, it should be possible to

achieve the Department's BACT limit for this project within three years after startup (if it achievable by Ultra LN technology on the 501G).

- The approach promotes further progress of the DOE ATS Program and falls within the realm of BACT determinations made by the Department in recent years.
- The Hot SCR scenario has, nevertheless, been included in the Department's determination for implementation in case that the Ultra LN strategy fails to reach the objectives within a reasonable period of time. If the City converts the unit to combined cycle mode in the near future, conventional SCR (with the catalyst in a low temperature regime within a HRSG) becomes immediately feasible, particularly if progress is slow on Ultra LN. Conventional SCR now rather than Ultra LN in three years, would be BACT at this time if the City planned to operate the unit in combined cycle mode at startup.
- BACT for PM_{10} was determined to be good combustion practices consisting of: inlet air filtering; use of clean, low ash, low sulfur fuels; and operation of the unit in accordance with the manufacturer-provided manuals.
- PM_{10} emissions will be very low and difficult to measure at the high temperature exiting the stack in simple cycle operation. Additionally, the higher emission mode will involve fuel oil firing which will occur only approximately 250 hours per year. It is not practical to require running the turbine on oil, simply to conduct tests. Therefore, the Department will set a Visible Emission standard of 10 percent opacity as BACT for both natural gas and fuel oil firing, consistent with the definition of BACT. Examples of installations with similar VE limits include the City of Tallahassee, Florida and the Berkshire, Massachusetts projects in the above table.
- CO emission estimates from the City's project are higher than for any pollutant. However the impact on ambient air quality is lower compared to other pollutants because the allowable concentrations of CO are much greater than for NO_X, SO_2, or PM_{10}.
- The City evaluated the use of an oxidation catalyst designed for 90 percent reduction and having a two year catalyst life. The oxidation catalyst control system was estimated by the City to increase the total capital cost of the project by "about $2,000,000, with an annualized cost of $980,000 per year." The City estimated levelized costs for CO catalyst control at about $800 per ton to control CO emission to 10 ppm. This company operates three of the previously-mentioned facilities where CO catalyst is used. Catalytic CO control appears to be cost-effective for the Lakeland unit..
- In the 501 G Application Overview prepared by Westinghouse and included in the City's application for permit, the combustors have "initial emission levels less than the following:"[17]

Pollutant (ppm)	Natural Gas (no injection)	Distillate Oil (water injection)
Nitrogen Oxides	25	42
Carbon Monoxide	10	90
Unburned Hydrocarbons	5	20

- In an article included in the permit application, the author states "NO_X levels of less than 25 ppm on natural gas, less than 42 ppm on oil, while maintaining CO at less than 10 ppm will be specified for introductory machines."[2]
- Westinghouse tables of "expected performance" in the permit application for the specific unit, however, estimate CO emissions while burning natural gas as 50, 100, and 350 ppm when operating at baseload, 75% load, and 50% load respectively. While operating on oil the estimated values are 90, 125, and 350 ppm at baseload, 75%, and 50% respectively.
- The permit application states that the high emission limits are "a result of uncertainty associated with maintaining low NO_X emissions while keeping emissions of CO as low as possible over the load range of the machine." It also mentions that the Westinghouse Application Overview estimate is 10 ppm for CO and accordingly calculates a much higher alternative cost per ton of removal based on the lower expected starting point prior for catalytic oxidation.
- The Department will set CO limits achievable by good combustion equal to those set for the City of Tallahassee project of 25 ppm on gas and 90 ppm on oil. For reference, the FPC Hines Westinghouse 501 F project is limited to 25 ppm on natural gas and 30 ppm on oil. The Mid-Georgia Cogen Westinghouse 501 D5A project achieved its CO limits of 10 ppm on gas and 30 ppm on fuel oil.
- At the relatively high initial NO_X emission rate of 25 ppm, there should not be technical difficulties in achieving 25 ppm of CO with Dry Low NO_X technology. These values remain as appropriate objectives to meet with the Ultra Low NO_X technology under development. The oil case is relatively insignificant because of the limited firing time.
- It is up to the City to evaluate whether to meet the CO limits by combustion optimization or alternative lower limits achievable by catalytic oxidation. A plan describing how the limits will be met should be submitted prior to construction of the unit.
- VOC emission limits proposed by the City are at the lower end of values determined as BACT. Good Combustion is sufficient to achieve these low levels.

COMPLIANCE PROCEDURES

Pollutant	Compliance Procedure
Visible Emissions	Method 9
Volatile Organic Compounds	Method 18, 25, or 25A (initial tests only)
Carbon Monoxide	Annual Method 10 (can use RATA if at capacity)
NO_X (3 and 24-hr averages)	NO_X CEMS, O_2 or CO_2 diluent monitor, and flow device as needed
NO_X (performance)	Annual Method 20 (can use RATA if at capacity)

DETAILS OF THE ANALYSIS MAY BE OBTAINED BY CONTACTING:

A. A. Linero, P.E. Administrator, New Source Review Section
Teresa Heron, Review Engineer, New Source Review Section
Department of Environmental Protection
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Recommended By:	Approved By:
A A Linero, P.E.	Howard L Rhodes
for C. H. Fancy, P.E., Chief Bureau of Air Regulation	Howard L. Rhodes, Director Division of Air Resources Management
Date: 7/10/98	Date: 7/10/98

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[1] Minutes of City of Lakeland Commission Meeting of October 26, 1997
[2] MPS Review. "Steam Cooled 60 Hz W501G Generates 230 MW, Modern Power Systems." August 1994.
[3] Minutes of City of Lakeland Commission Meeting of February 16, 1998
[4] Letter from Akita, E, Mitsubishi Heavy Industries, Ltd to Linero, A.A., Florida DEP. April 28, 1998. Gas Turbine 501G Question.
[5] Mitsubishi Heavy Industries. www.mhi.co.jp/annual/htm/mprod.html "Takasago 330-MW Demonstrator Combined Cycle Plant."
[6] Mitsubishi Heavy Industries. www.mhi.co.jp/tech/htm/e835101a.htm
[7] DOE Techline. "Major Test of Utility Turbine Compressor Sets Stage for Westinghouse to advance in DOE Turbine Program." October 14, 1996.
[8] Telecon. Swanson, D., GE, with Linero, A.A., DEP. Inquiry on GE turbine sizes. April, 1998.
[9] Westinghouse. "Combustion Technology Update - 501 G and Westinghouse Family of combustion turbines." March 30, 1998
[10] EPA Region 2. PSD Permit, Eco-Electrica Cogeneration Project (Westinghouse 501F).
[11] New York State. PSD Permit, Sithe/IPP (GE 7FA).
[12] Telecon. Schorr, M., GE, and Costello, M., Florida DEP. March 31, 1998. Status of DLN2.6 Program.
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[16] DOE Techline. "DOE, U.S. Turbine Developers poised to take Next Step Toward 21st Century." August 8, 1995.
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[18] Diakunchak, I.S., Bannister, R.L., Huber, D.J., and Roan, D.F. "Technology Development Programs for the Advanced Turbine Systems engine." September 3, 1996.
[19] Letter from Gibson, J.L., Westinghouse Electric Corporation to Shelton, F., City of Lakeland. Ultra Low NO_X Combustion Technology. March 31, 1998.
[20] Snyder, R.B., "Alternative Control Techniques Document--NO_X Emissions from stationary Gas Turbines." EPA-453/R-93-007. January, 1993.
[21] SBE Environmental Company. PSD Application, Puerto Rico Electric Power Authority Proposed 248 MW Combustion Turbine Facility, Cambalache, Puerto Rico. January, 1994.
[22] Golder and Associates. Air Permit Application and PSD Analysis, City of Lakeland 501G Project. Table 4-2.
[23] Telecon. Claudio, F., EPA Region 2, CEPD, with Linero, A.A., Florida DEP. March 10, 1998. Status of PREPA Cambalache Project.
[24] EPA Region 2. PSD Permit, PREPA Cambalache Electric generating Facility. July 31, 1995.
[25] Letter from Booth, F.A., Engelhard to Kosky, K., Golder Associates. Budgetary Proposal 97616. November 10, 1997.
[26] Letter from Booth, F.A., Engelhard to Linero, A.A., Florida DEP. Budgetary Proposal EPB98154. April 10, 1998.

G.1 The terms, conditions, requirements, limitations, and restrictions set forth in this permit are "Permit Conditions" and are binding and enforceable pursuant to Sections 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of these conditions.

G.2 This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings or exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.

G.3 As provided in Subsections 403.087(6) and 403.722(5), Florida Statutes, the issuance of this permit does not convey and vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations. This permit is not a waiver or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in the permit.

G.4 This permit conveys no title to land or water, does not constitute State recognition or acknowledgment of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the State. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title.

G.5 This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, or plant life, or property caused by the construction or operation of this permitted source, or from penalties therefore; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department.

G.6 The permittee shall properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit, as required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.

G.7 The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law and at a reasonable time, access to the premises, where the permitted activity is located or conducted to:

a) Have access to and copy and records that must be kept under the conditions of the permit;
b) Inspect the facility, equipment, practices, or operations regulated or required under this permit, and,
c) Sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

Reasonable time may depend on the nature of the concern being investigated.

G.8 If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Department with the following information:

a) A description of and cause of non-compliance; and
b) The period of noncompliance, including dates and times; or, if not corrected, the anticipated time the non-compliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the non-compliance.

The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or for revocation of this permit.

G.9 In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except where such use is prescribed by Sections 403.73 and 403.111, Florida Statutes. Such evidence shall only be used to the extend it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules.

G.10 The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance, provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules.

G.11 This permit is transferable only upon Department approval in accordance with Florida Administrative Code Rules 62-4.120 and 62-730.300, F.A.C., as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department.

G.12 This permit or a copy thereof shall be kept at the work site of the permitted activity.

G.13 This permit also constitutes:

a) Determination of Best Available Control Technology (X)
b) Determination of Prevention of Significant Deterioration (X); and
c) Compliance with New Source Performance Standards (X).

G.14 The permittee shall comply with the following:

a) Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department.

b) The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application or this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.

c) Records of monitoring information shall include:

1. The date, exact place, and time of sampling or measurements;
2. The person responsible for performing the sampling or measurements;
3. The dates analyses were performed;
4. The person responsible for performing the analyses;
5. The analytical techniques or methods used; and
6. The results of such analyses.

G.15 When requested by the Department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be corrected promptly.

10.4.2 PPSA MODIFICATION FOR UNIT NO. 5

BEFORE THE STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

In Re: City of Lakeland	)	
C.D. McIntosh Power Plant	)	
Unit No. 3	)	OGC CASE NO. 98-1994
Modification of Conditions	)	DEP FILE NO. PA74-06F
of Certification	)	
Polk County, Florida	)	
	)	

FINAL ORDER MODIFYING CONDITIONS OF CERTIFICATION

On December 7, 1978, the Governor and Cabinet, sitting as the Siting Board, issued a final order approving certification for the Lakeland McIntosh Power Plant Unit Number 3. The site certification order approved the construction and operation of a 334 MW (net) coal fired unit and associated facilities in Polk County, Florida. The certification has been previously modified on October 5, 1980, August 10, 1983, August 15, 1988 and February 13, 1996.

On March 16, 1998, Lakeland filed a request with the Florida Department of Environmental Protection ("Department") to amend the conditions of certification pursuant to Section 403.516(1)(b), Florida Statutes. Lakeland requested that the conditions be modified to allow the construction and operation of Unit 5, a 250 megawatt, natural gas fired combustion turbine on the McIntosh Plant site.

Copies of Lakeland's proposed modifications were made available for public review on April 3, 1998, on which date a Notice of Intent to Issue Proposed Modification of Power Plant Certification was also published in the Florida Administrative Weekly. On March 16, 1998, all parties to the original proceeding were served by mail with copies of the intent to modify and supporting documentation. The notice specified that a hearing would be held if a party to the original certification hearing objected within 45 days from receipt of the proposed modifications or if any other person, whose interests would be substantially affected, objected in writing within 30 days after issuance of the public notice. No written objection to the proposed modifications has been received by the Department. Accordingly, in the absence of any timely objection,

IT IS ORDERED:

The proposed changes to the Lakeland McIntosh Power Plant Unit Number 3 as described in its March 13, 1998, request for modification are APPROVED. Pursuant to Section 403.516(1)(b), F.S., the conditions of certification for the Lakeland McIntosh Power Plant Unit Number 3 are **MODIFIED** as follows:

I. Air Unit 3 - No change

II. Air Unit No. 5

A. EMISSION UNITS

This permit addresses the following emission units:

ARMS EMISSION UNIT NO.	SYSTEM	EMISSION UNIT DESCRIPTION
028	Power Generation	250 Megawatt Combustion Turbine and Once Through Steam Generator
029	Fuel Storage	1.05 Million Gallon Fuel Oil Storage Tank

B. REGULATORY CLASSIFICATION

The facility is classified as a Major or Title V Source of air pollution because emissions of at least one regulated air pollutant, such as particulate matter (PM/PM_{10}), sulfur dioxide (SO_2), nitrogen oxides (NO_X), carbon monoxide (CO), or volatile organic compounds (VOC) exceeds 100 tons per year (TPY). This facility is also subject to the provisions of Title IV, Acid Rain, Clean Air Act as amended in 1990.

C. GENERAL AND ADMINISTRATIVE REQUIREMENTS

1. Regulating Agencies: All documents related to applications for permits to construct, operate or modify an emissions unit should be submitted to the Bureau of Air Regulation (BAR), Florida Department of Environmental Protection, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, telephone number (850) 488-1344. All

documents related to reports, tests, and notifications should be submitted to the Department's Southwest District office (DEPSW), 3804 Coconut Palm Drive, Tampa, Florida 33619, telephone number (813) 744-6100.

2. General Conditions: The owner and operator is subject to and shall operate under the General Permit Conditions G.1 through G.15 listed in Appendix GC attached to Permit No. PSD-FL-245. General Permit Conditions are binding and enforceable pursuant to Chapter 403 of the Florida Statutes. [Rule 62-4.160, F.A.C.]

3. Terminology: The terms used in this permit have specific meanings as defined in the corresponding chapters of the Florida Administrative Code.

4. Forms and Application Procedures: The permittee shall use the applicable forms listed in Rule 62-210.900, F.A.C. and follow the application procedures in Chapter 62-4, F.A.C. [Rule 62-210.900, F.A.C.]

5. Modifications: The permittee shall give written notification to the Department when there is any modification to this facility. This notice shall be submitted sufficiently in advance of any critical date involved to allow sufficient time for review, discussion, and revision of plans, if necessary. Such notice shall include, but not be limited to, information describing the precise nature of the change; modifications to any emission control system; production capacity of the facility before and after the change; and the anticipated completion date of the change. [Chapters 62-210 and 62-212, F.A.C.]

6. Expiration: Approval to construct shall become invalid if construction is not commenced within 18 months after receipt of such approval, or if construction is discontinued for a period of 18 months or more, or if construction is not completed within a reasonable time. The Department may extend the 18-month period upon a satisfactory showing that an extension is justified. [40 CFR 52.21(r)(2)]

7. BACT Determination: In accordance with 40 CFR 52.21(j)(4), the Best

Available Control Technology (BACT) determination shall be reviewed and modified as appropriate in the event of a conversion to combined cycle operation. This paragraph states: "For phased construction projects, the determination of best available control technology shall be reviewed and modified as appropriate at the latest reasonable time which occurs no later than 18 months prior to commencement of construction of each independent phase of the project. At such time, the owner or operator of the applicable stationary source may be required to demonstrate the adequacy of any previous determination of best available control technology for the source." [40 CFR 52.21(j)(4)] This reassessment will be conducted for this project only if the conversion to combined cycle operation is accompanied by any increases in heat input limits, hours of operation, oil firing, low or baseload operation, short-term or annual emission limits, or similar changes. [40 CFR 52.21(j)(4)]

8. Application for Title V Permit: An application for a Title V operating permit, pursuant to Chapter 62-213, F.A.C., must be submitted to the Department's Bureau of Air Regulation, and a copy to the Department's Southwest District office (DEPSW). [Chapter 62-213, F.A.C.]

9. New or Additional Conditions: Pursuant to Rule 62-4.080, F.A.C., for good cause shown and after notice and an administrative hearing, if requested, the Department may require the permittee to conform to new or additional conditions. The Department shall allow the permittee a reasonable time to conform to the new or additional conditions, and on application of the permittee, the Department may grant additional time. [Rule 62-4.080, F.A.C.]

10. Annual Reports: Pursuant to Rule 62-210.370(2), F.A.C., Annual Operation Reports, the permittee is required to submit annual reports on the actual operating rates and emissions from this facility. Annual operating reports shall be sent to the Department's Southwest District office by March first of each year.

11. Stack Testing Facilities: Stack sampling facilities shall be installed in

accordance with Rule 62-297.310(6), F.A.C.

12. Permit Extension: The permittee, for good cause, may request that this construction permit be extended. Such a request shall be submitted to the Bureau of Air Regulation prior to 60 days before the expiration of the permit (Rule 62-4.090, F.A.C.).

13. Quarterly Reports: Quarterly excess emission reports, in accordance with 40 CFR 60.7(a)(7)(c) (1997 version), shall be submitted to the Department's Southwest District office.

D. APPLICABLE STANDARDS AND REGULATIONS

1. Unless otherwise indicated in this permit, the construction and operation of the subject emission unit(s) shall be in accordance with the capacities and specifications stated in the application. The facility is subject to all applicable provisions of Chapter 403, F.S. and Florida Administrative Code Chapters 62-4, 62-103, 62-204, 62-210, 62-212, 62-213, 62-214, 62-296, 62-297; and the applicable requirements of the Code of Federal Regulations Section 40, Parts 60, 72, 73, and 75.

2. Issuance of this permit does not relieve the facility owner or operator from compliance with any applicable federal, state, or local permitting requirements or regulations. [Rule 62-210.300, F.A.C.]

3. These emission units shall comply with all applicable requirements of 40CFR60, Subpart A, General Provisions including:

- 40CFR60.7, Notification and Record keeping
- 40CFR60.8, Performance Tests
- 40CFR60.11, Compliance with Standards and Maintenance Requirements
- 40CFR60.12, Circumvention

- 40CFR60.13, Monitoring Requirements
- 40CFR60.19, General Notification and Reporting requirements

4. ARMS Emission Unit, Power Generation, consisting of a 250 megawatt combustion turbine with a once-through steam generator shall comply with all applicable provisions of 40 CFR 60, Subpart GG, Standards of performance for Stationary Gas Turbines, adopted by reference in Rule 62-204.800(7)(b), F.A.C. The Subpart GG requirement to correct test data to ISO conditions applies. However, such correction is not used for compliance determinations with the BACT standard(s).

5. ARMS Emission Unit 029, Fuel Storage, consisting of a 1.05 million gallon distillate fuel oil storage tank shall comply with all applicable provisions of 40 CFR 60, Subpart Kb, Standards of Performance for Volatile Organic Liquid Storage Vessels, adopted by reference in Rule 62-204.800, F.A.C.

6. All notifications and reports required by the above specific conditions shall be submitted to the Department's Southwest District office.

E. GENERAL OPERATION REQUIREMENTS

1. Fuels: Only pipeline natural gas or maximum 0.05 percent sulfur No. 2 distillate fuel oil shall be fired in this unit. [Applicant Request, Rule 62-210.200, F.A.C. (Definitions - Potential Emissions)]

2. Capacity: The maximum heat input rates, based on the lower heating value (LHV) of each fuel to Unit 5 at ambient conditions of 59°F temperature, 60% relative humidity, 100% load, and 14.7 psi pressure shall not exceed 2,174 million Btu per hour (MMBTU/hr) when firing natural gas, nor 2,236 MMBTU/hr when firing No. 2 fuel oil. These maximum heat input rates will vary depending upon ambient conditions and the combustion turbine characteristics. Manufacturer's curves corrected for site

conditions or equations for correction to other ambient conditions shall be provided to the Department of Environmental Protection (DEP) within 45 days of completing the initial compliance testing. [Design, Rule 62-210.200, F.A.C. (Definitions - Potential Emissions)]

3 . Unconfined Particulate Emissions: During the construction period, unconfined particulate matter emissions shall be minimized by dust suppressing techniques such as covering of and/or application of water or chemicals to the affected areas, as necessary.

4. Plant Operation - Problems: If temporarily unable to comply with any of the conditions of the permit due to breakdown of equipment or destruction by fire, wind or other cause, the owner or operator shall notify the Department's Southwest District Office as soon as possible, but at least within one (1) working day, excluding weekends and holidays. The notification shall include: pertinent information as to the cause of the problem; the steps being taken to correct the problem and prevent future recurrence; and where applicable, the owner's intent toward reconstruction of destroyed facilities. Such notification does not release the permittee from any liability for failure to comply with the conditions of this permit and the regulations. [Rule 62-4.130, F.A.C.]

5. Operating Procedures: Operating procedures shall include good operating practices and proper training of all operators and supervisors. The good operating practices shall meet the guidelines and procedures as established by the equipment manufacturers. All operators (including supervisors) of air pollution control devices shall be properly trained in plant specific equipment. [Rule 62-4.070(3), F.A.C.]

6. Circumvention: The owner or operator shall not circumvent the air pollution control equipment or allow the emission of air pollutants without this equipment operating properly. [Rules 62-210.650, F.A.C.]

7. Maximum allowable hours of operation for the stationary gas turbine and once-through steam generator are 8760. Fuel usage as heat input, while burning natural gas in the stationary gas turbine, shall not exceed 15.639 x 10^{12} BTU (LHV) per year (rolled monthly) until the unit achieves the NO_X emission limits (other than the initial ones) given in Specific Condition 21. Thereafter, only the hourly heat input limits given in Specific Condition 8 apply. [Applicant Request, Rule 62-210.200, F.A.C. (Definitions - Potential Emissions)]

8. Fuel usage as heat input while burning fuel oil in the stationary gas turbine shall not exceed 559 x 10^9 BTU (LHV) per year (rolled monthly). [Applicant Request. Rule 62-210.200, F.A.C. (Definitions - Potential Emissions)]

CONTROL TECHNOLOGY

9. Westinghouse Second Generation Advanced Dry Low NO_X (DLN) combustors (or equivalent) shall be installed on the stationary combustion turbine to control nitrogen oxides (NO_X) emissions while firing natural gas. [Design, Rule 62-4.070, F.A.C.]

10. The Dry Low NO_X (DLN) combustors shall be replaced with Westinghouse Ultra Low NO_X (ULN) combustors to accomplish further NO_X control in order to achieve the emission limits specified in Specific Conditions 20 and 21. A high temperature selective catalytic reduction (Hot SCR) system or a low temperature SCR system shall be installed and in operation (together with DLN or ULN combustors) not later than May 1, 2002 if the emission limits specified in Specific Condition Nos. 20 and 21 are not achievable by ULN combustors by this date. [Design, Rules 62-4.070 and 62-212.400, F.A.C.]

11. The permittee shall design the stationary gas turbine, ducting, possible future heat recovery steam generator, and stack(s) to accommodate installation of SCR

equipment and/ or oxidation catalyst in the event that the ULN technology fails to achieve the NO_X limit given in Specific Condition Nos. 20 and 21 or if carbon monoxide (CO) limits given in Specific Condition No. 22 are not met. [Rule 62-4.070, F.A.C.]

12. A water injection system shall be installed for use when firing No. 2 fuel oil or superior grade distillate fuel oil for control of NO_X emissions. [Design, Rules 62-4.070 and 62-212.410, F.A.C.]

13. The permittee shall provide manufacturer's emissions performance versus load diagrams for the DLN and ULN systems prior to their installation. DLN and ULN systems shall each be tuned upon initial operation to optimize emissions reductions and shall be maintained to minimize NO_X emissions and CO emissions. Operation of the DLN or ULN systems in the diffusion firing mode shall be minimized when firing natural gas. [Rule 62-4.070, and 62-210.650 F.A.C.]

F. EMISSION LIMITS AND STANDARDS

1. The following emission limits shall apply upon completion of the initial performance tests: Best Available Control Technology (BACT). Following is a summary of the BACT determination by DEP. Values for NO_X are corrected to 15% O_2. Values for CO are corrected to 15% O_2 only until May 1, 2002. [Rule 62-212.400, F.A.C.]

Operational Mode	NO_X (ppm)	CO (ppm)	VOC (ppm)	PM/Visibility (% Opacity)	Technology and Comments
Simple Cycle	25 - NG (basis) 237 lb/hr (24-hr avg) 42 - FO (3 hr avg)	25 - NG or 10 - Ox Cat 90 - FO	4 - NG 10 - FO	10	DLN on gas, WI on oil. Applies until 05/1/2002. Clean fuels, good combustion.

Simple Cycle	9 - NG (basis) 85 lb/hr (24-hr avg) 42 - FO (3 hr avg)	25 - NG or 10 - Ox Cat 90 - FO	4 - NG 10 - FO	10	ULN on gas, WI on oil. Applies after 05/1/2002 Clean fuels, good combustion.
Simple Cycle	9 - NG (3 hr avg) 15 - FO (3-hr avg)	25 - NG or 10 - Ox Cat 90 - FO	4 - NG 10 - FO	10	Hot SCR. Applies not later than 05/1/2002 if 9 ppm NO_X not achievable by ULN. Clean fuels, good combustion.
Combined Cycle	7.5 - NG (3 hr avg) 15 - FO (3-hr avg)	25 - NG or 10 - Ox Cat 90 - FO	4 - NG 10 - FO	10	Conventional SCR unless simple cycle limits are achieved on or before 05/01/2002. Clean fuels, good combustion.

2. Nitrogen Oxides (NO_X) Emissions:

a. When NO_X monitoring data is not available, substitution for missing data shall be handled as required by Title IV (40 CFR 75) to calculate any specified average time.

b. Until May 1, 2002, the concentration of NO_X in the exhaust gas shall not exceed 237 lb/hr (at ISO conditions) on a 24 hr block average (basis 25 ppm @ 15% O_2, full load) when firing natural gas and 42 ppmvd at 15% O_2 when firing fuel oil on the basis of a 3 hr average), as measured by the continuous emission monitoring system (CEMS). In addition, NO_X emissions calculated as NO_2 (at ISO conditions) shall exceed neither 25 ppm @15% O_2 nor 237 lb/hr (when firing natural gas) and shall exceed neither 42 ppm @15% O_2 nor 413 lb/hr (when firing oil) to be demonstrated by stack test. [Rule 62-212.400, F.A.C.]

c. Not later than May 1, 2002, NO_X concentrations in the exhaust gas shall not exceed 85 lb/hr (at ISO conditions) on a 24 hr block average (basis 9 ppm @ 15% O_2) when firing natural gas and 42 ppmvd at 15% O_2 when firing fuel oil on the basis of a 3 hr average as measured by the CEMS. In addition, NO_X emissions calculated as NO_2 (at ISO conditions) shall exceed neither 9 ppm @15% O_2 nor 85 lb/hr (when firing natural gas) and shall exceed neither 42 ppm @15% O_2 nor 413 lb/hr (when firing oil) to be demonstrated by stack test. [Rule 62-212.400, F.A.C.]

d. If Hot SCR is installed, achievable short-term NO_X concentrations in the exhaust gas shall be demonstrated at baseload during the first compliance test following installation not to exceed 9 ppmvd at 15% O_2 when firing natural gas. NO_X emissions shall not exceed 9 ppmvd at 15% O_2 when firing natural gas and 15 ppmvd at 15% O_2 when firing fuel oil on the basis of a 3-hr average as measured by the CEMS. NO_X emissions calculated as NO_2 (at ISO conditions) shall not exceed 85 lb/hr (when firing gas) and 148 lb/hr (when firing oil) to be demonstrated by stack test. [Rule 62-212.400, F.A.C.]

e. If conventional SCR is installed in conjunction with conversion to combined cycle operation, achievable short-term NO_X concentrations in the exhaust gas shall be demonstrated at baseload during the first compliance test following installation not to exceed 7.5 ppmvd at 15% O_2 when firing natural gas and 15 ppmvd @ 15% O_2 when firing fuel oil on the basis of a 3-hr average as measured by the CEMS. If conventional SCR catalyst is installed, NO_X emissions shall not exceed 7.5 ppmvd at 15% O_2 when firing natural gas and 15 ppmvd at 15% O_2 when firing fuel oil on the basis of a 3-hr average as measured by the CEMS. NOx emissions calculated as NO_2 (at ISO conditions) shall not exceed 71.1 lb/hr (when firing gas) and 148 lb/hr (when firing oil) to be demonstrated by stack test. [Rule 62-212.400, F.A.C.]

3. Carbon Monoxide (CO) emissions: Prior to May 1, 2002,the concentration of CO at 15% O_2 in the exhaust gas when firing natural gas shall not exceed 25 ppmvd when firing natural gas and 90 ppmvd when firing fuel oil as measured by EPA Reference Method 10 test. CO emissions (at ISO conditions) shall not exceed 145 lb/hr (when firing gas) and 539 lb/hr (when firing oil). [Rule 62-212.400, F.A.C.] After May 1, 2002, the concentration of CO in the exhaust gas when firing natural gas shall not exceed 25 ppmvd when firing natural gas and 90 ppmvd when firing fuel oil as measured by EPA Method 10. CO emissions (at ISO conditions) shall not exceed 106 lb/hr (when

firing gas) and 386 lb/hr (when firing oil). [Rule 62-212.400, F.A.C.]

4. Sulfur Dioxide (SO_2) emissions: SO_2 emissions (at ISO conditions) shall not exceed 7.2 pounds per hour when firing pipeline natural gas and 127 pounds per hour when firing maximum 0.05 percent sulfur No. 2 or superior grade distillate fuel oil as measured by applicable compliance methods described below. Emissions of SO_2 shall not exceed 38.4 tons per year. [Rules 62-4.070 and 62-212.400, F.A.C. to avoid PSD Review]

5. Visible emissions (VE): VE emissions shall not exceed 10 percent opacity when firing natural gas or No. 2 or superior grade of fuel oil.

6. Volatile Organic Compounds (VOCs) Emissions: The concentration of VOC in the exhaust gas when firing natural gas shall not exceed 4 ppmvd when firing natural gas and 10 ppmvd when firing fuel oil as measured by EPA Methods 18, and/or 25 A. VOC emissions (at ISO conditions) shall not exceed 10 lb/hr (gas) and 25 lb/hr (oil). - [Rule 62-212.400, F.A.C.]

G. EXCESS EMISSIONS

1. Excess emissions resulting from startup, shutdown, malfunction or fuel switching shall be permitted provided that best operational practices are adhered to and the duration of excess emissions shall be minimized. Excess emissions occurrences shall in no case exceed four hours in any 24-hour period for cold startup or two hours in any 24-hour period for other reasons unless specifically authorized by DEP for longer duration.

2. Excess emissions entirely or in part by poor maintenance, poor operation, or any other equipment or process failure that may reasonably be prevented during startup, shutdown or malfunction, shall be prohibited pursuant to Rule 62-210.700, F.A.C.

3. Excess Emissions Report: If excess emissions occur due to malfunction, the owner or operator shall notify the Department's Southwest District office within one (1) working day of: the nature, extent, and duration of the excess emissions; the cause of the excess emissions; and the actions taken to correct the problem. In addition, the Department may request a written summary report of the incident. Pursuant to the New Source Performance Standards, excess emissions shall also be reported in accordance with 40 CFR 60.7, Subpart A. [Rules 62-4.130 and 62-210.700(6), F.A.C.]

H. COMPLIANCE DETERMINATION

1. Compliance with the allowable emission limiting standards shall be determined within 60 days after achieving the maximum production rate, for each fuel, at which this unit will be operated, but not later than 180 days after initial operation of the unit for that fuel, and annually thereafter as indicated in this permit, by using the following reference methods as described in 40 CFR 60, Appendix A (1997 version), and adopted by reference in Chapter 62-204.800, F.A.C. Emission limits compliance dates shall conform to the timetable specified on Condition No. II.F.1.

2. Initial (I) performance tests shall be performed on Unit 5 while firing natural gas as well as while firing fuel oil. Initial tests shall also be conducted after any modifications (and shake down period not to exceed 100 days after re-starting the CT) of air pollution control equipment, including installation of Ultra Low NOX burners, Hot SCR, or conventional SCR. Annual (A) compliance tests shall be performed during every federal fiscal year (October 1 - September 30), pursuant to Rule 62-297.310(7), F.A.C., on Unit 5 as indicated. The following reference methods shall be used. No other test methods may be used for compliance testing unless prior DEP approval is received in writing.

- EPA Reference Method 9, "Visual Determination of the Opacity of Emissions from

Stationary Sources" (I, A).

- EPA Reference Method 10, "Determination of Carbon Monoxide Emissions from Stationary Sources" (I, A).
- EPA Reference Method 20, "Determination of Oxides of Nitrogen Oxide, Sulfur Dioxide and Diluent Emissions from Stationary Gas Turbines." Initial test only for compliance with 40 CFR 60 Subpart GG and short-term NO_X BACT limits (I,A) (Method 7E or RATA test data may be used to demonstrate compliance for annual test requirement.)
- EPA Reference Method 18, and/or 25A, "Determination of Volatile Organic Concentrations." Initial test only.

3. Continuous compliance with the NO_X emission limits shall be demonstrated with the CEM system based on the applicable averaging time of 24-hr block average (DLN or ULN technology) or a 3-hr average (if SCR is used). Based on CEMS data, a separate compliance determination is conducted at the end of each operating day (or 3-hr period when applicable) and a new average emission rate is calculated from the arithmetic average of all valid hourly emission rates from the previous operating day (or 3-hr period when applicable). Valid hourly emission rates shall not include periods of startup (including fuel switching), shutdown, or malfunction as defined in Rule 62-210.200 F.A.C., where emissions exceed the applicable NO_X standard. These excess emissions periods shall be reported as required in Condition 28. A valid hourly emission rate shall be calculated for each hour in which at least two NO_X concentrations are obtained at least 15 minutes apart. [Rule 62-4.070, F.A.C., 40 CFR 75]

4. Compliance with the SO_2 and PM/PM_{10} emission limits: Not withstanding the requirements of Rule 62-297.310, F.A.C., the use of pipeline natural gas and the use of no more than 250 hours per year of maximum 0.05 percent sulfur (by weight)No. 2 or superior grade distillate fuel oil, is the method for determining compliance for SO_2

and PM_{10}. For the purposes of demonstrating compliance with the 40 CFR 60.333 SO_2 standard and the 0.05% S limit, fuel oil analysis using ASTM D2880-71 or D4294 (or equivalent) for the sulfur content of liquid fuels and D1072-80, D3031-81, D4084-82 or D3246-81 (or equivalent) for sulfur content of gaseous fuel shall be utilized in accordance with the EPA-approved custom fuel monitoring schedule. The applicant is responsible for ensuring that the procedures above are used for determination of fuel sulfur content. Analysis may be performed by the owner or operator, a service contractor retained by the owner or operator, the fuel vendor, or any other qualified agency pursuant to 40 CFR 60.335(e) (1997 version).

5. Compliance with CO emission limit: An initial test for CO, concurrent with the initial NO_X test, is required. The initial NO_X and CO test results shall be the average of three valid one-hour runs. Annual compliance testing may be conducted concurrent with the annual RATA testing required pursuant to 40 CFR 75 (required for gas only).

6. Compliance with the VOC emission limit: An initial test is required to demonstrate compliance with the BACT VOC emission limit. Thereafter, CO emission limit will be employed as surrogate.

7. Testing procedures: Testing of emissions shall be conducted with the combustion turbine operating at permitted capacity. Permitted capacity is defined as 95-100 percent of the maximum heat input rate allowed by the permit, corrected for the average ambient air temperature during the test (with 100 percent represented by a curve depicting heat input vs. ambient temperature). If it is impracticable to test at permitted capacity, the source may be tested at less than permitted capacity. In this case, subsequent operation is limited by adjusting the entire heat input vs. ambient temperature curve downward by an increment equal to the difference between the maximum permitted heat input (corrected for ambient temperature) and 105 percent of the value reached during the test until a new test is conducted. Once the unit is so

limited, operation at higher capacities is allowed for no more than 15 consecutive days for the purposes of additional compliance testing to regain the permitted capacity. Test procedures shall meet all applicable requirements (i.e., testing time frequency, minimum compliance duration, etc.) of Chapter 62-297 F.A.C.

8. Test Notification: The Department's Southwest District office shall be notified, in writing, at least 30 days prior to the initial performance tests and at least 15 days before annual compliance test(s).

9. Special Compliance Tests: The DEP may request a special compliance test pursuant to Rule 62-297.310, F.A.C., when, after investigation (such as complaints, increased visible emissions, or questionable maintenance of control equipment), there is reason to believe that any applicable emission standard is being violated.

10. Test Results: Compliance test results shall be submitted to the DEP's Southwest District office no later than 45 days after completion of the last test run.

I. NOTIFICATION, REPORTING, AND RECORD KEEPING

1. Records: All measurements, records, and other data required to be maintained by the City of Lakeland Department of Electric & Water Utilities shall be recorded in a permanent form and retained for at least five (5) years following the date on which such measurements, records, or data are recorded. These records shall be made available to Department representatives upon request.

2. Emission Compliance Stack Test Reports: A test report indicating the results of the required compliance tests shall be filed with the Department's Southwest District Office as soon as practical, but no later than 45 days after the last sampling run is completed. [Rule 62-297.310(8), F.A.C.]. The test report shall provide sufficient detail on the tested emission unit and the procedures used to allow the Department to

determine if the test was properly conducted and if the test results were properly computed. At a minimum, the test report shall provide the applicable information listed in Rule 62-297.310(8), F.A.C.

I. MONITORING REQUIREMENTS

1. Continuous Monitoring System: The permittee shall install, calibrate, maintain, and operate a continuous emission monitor in the stack to measure and record the nitrogen oxides emissions from Unit 5. Periods when NO_X emissions (ppmvd @ 15% oxygen) are above the BACT standards listed in Subsection C. Specific Condition C.1. shall be reported to the Department's Southwest District Office pursuant to Rule 62-4.160(8), F.A.C. Periods of startup, shutdown, malfunction, and fuel switching shall be monitored, recorded, and reported as excess emissions when emission levels exceed the BACT standards following the format of 40 CFR 60.7 (1997 version).

2. CEMS in lieu of Water to Fuel Ratio: Subject to EPA approval, the NO_X CEMS shall be used in lieu of the water/fuel monitoring system for reporting excess emissions in accordance with 40 CFR 60.334(c)(1), Subpart GG (1997 version). Subject to EPA approval, the calibration of the water/fuel monitoring device required in 40 CFR 60.335 (c)(2) (1997 version) will be replaced by the 40 CFR 75 certification tests of the NO_X CEMS. Upon request from the Department, the CEMS emission rates for NO_X on Unit 5 shall be corrected to ISO conditions to demonstrate compliance with the NO_X standard established in 40 CFR 60.332.

3. Continuous Monitoring System Reports: The monitoring devices shall comply with the certification and quality assurance, and any other applicable requirements of Rule 62-297.520, F.A.C., 40 CFR 60.13, and 40 CFR 60.7(a)(5) including certification of each device in accordance with 40 CFR 60, Appendix B, Performance Specifications and 40 CFR 60.7(a)(5). Quality assurance procedures must conform to

all applicable sections of 40 CFR 60, Appendix F or 40 CFR75. Data on CEM equipment specifications, manufacturer, type, calibration and maintenance needs, and its proposed location shall be provided to the Department's Southwest District Office (DEPSW) for review at least 90 days prior to installation.

4. Fuel Oil Monitoring Schedule: The following monitoring schedule for No. 2 fuel oil shall be followed: For all bulk shipments of No. 2 fuel oil received at the C.D. McIntosh, Jr. Power Plant, an analysis which reports the sulfur content and nitrogen content of the fuel shall be provided by the fuel vendor. The analysis shall also specify the methods by which the analyses were conducted and shall comply with the requirements of 40 CFR 60.335(d).

5. Natural Gas Monitoring Schedule: The following custom monitoring schedule for natural gas is approved (pending EPA concurrence) in lieu of the daily sampling requirements of 40 CFR 60.334 (b)(2):

- Monitoring of natural gas nitrogen content shall not be required.
- Analysis of the sulfur content of natural gas shall be conducted using one of the EPA-approved ASTM reference methods in Specific Condition No.32 for the measurement of sulfur in gaseous fuels, or an approved alternative method. Once Unit 5 becomes operational, monitoring of the sulfur content of the natural gas shall be conducted twice monthly for six months. If this monitoring shows little variability in the fuel sulfur content, and indicates consistent compliance with 40 CFR 60.333, then fuel sulfur monitoring shall be conducted once per quarter for six quarters and after that, semiannually.
- Should any sulfur analysis indicate noncompliance with 40 CFR 60.333, the City of Lakeland shall notify the Department of such excess emissions and the customized fuel monitoring schedule shall be re-examined. The sulfur content of the natural gas

will be monitored weekly during the interim period while the monitoring schedule is re-examined.

- The City of Lakeland shall notify the Department of any change in natural gas supply for re-examination of this monitoring schedule. A substantial change in natural gas quality (i.e., sulfur content variation of greater than 1 grain per 100 cubic foot of natural gas) shall be considered as a change in the natural gas supply. Sulfur content of the natural gas will be monitored weekly by the natural gas supplier during the interim period when this monitoring schedule is being re-examined.

- Records of sampling analysis and natural gas supply pertinent to this monitoring schedule shall be retained by the City of Lakeland for a period of five years, and shall be made available for inspection by the appropriate regulatory personnel.

- The City of Lakeland may obtain the sulfur content of the natural gas from the fuel supplier (Florida Gas Transmission) provided the test methods listed in Specific Condition E.4 are used.

6. Determination of Process Variables:

a. The permittee shall operate and maintain equipment and/or instruments necessary to determine process variables, such as process weight input or heat input, when such data is needed in conjunction with emissions data to determine the compliance of the emissions unit with applicable emission limiting standards.

b. Equipment and/or instruments used to directly or indirectly determine such process variables, including devices such as belt scales, weigh hoppers, flow meters, and tank scales, shall be calibrated and adjusted to indicate the true value of the parameter being measured with sufficient accuracy to allow the applicable process variable to be determined within 10% of its true value [Rule 62-297.310(5), F.A.C.J.

III. ~~II.~~ WATER DISCHARGES - No change

IV. ~~III.~~ GROUNDWATER

A. and B. - No change

C. Groundwater Use Limitations

1. and 2. - No Change

3. Well Numbers 5 and 8, as identified in the Southwest Florida Water Management District (SWFWMD) Permit 200047.03 (dated August 27, 1996) may be used for raw makeup water for Unit 5.

4. Groundwater used for Unit 5, in simple cycle operation shall not exceed 500 gpm or a peak usage of 720,000 gallons/day (gpd) and an annual usage of 576,000 gpd, respectively.

V. ~~IV.~~ LEACHATE - No change

VI. ~~V.~~ CONTROL MEASURES DURING CONSTRUCTION - No change

VII. ~~VI.~~ SOLID WASTES - No change

VIII. ~~VII.~~ OPERATION SAFEGUARDS - No change

IX. ~~VIII.~~ SOLID WASTE UTILIZATION SYSTEM - No change

X. ~~IX.~~ SCREENING - No change

XI. ~~X.~~ POTABLE WATER SUPPLY SYSTEM - No change

XII. ~~XI.~~ TRANSFORMER AND ELECTRIC SWITCHING GEAR - No change

XIII. ~~XII.~~ TOXIC, DELETERIOUS OF HAZARDOUS MATERIALS -No change

XIV. ~~XIII.~~ TRANSMISSION LINE - No change

XV. ~~XIV.~~ CONSTRUCTION IN WATERS OF THE STATE - No change

XVI. ~~XV.~~ COOLING WATER TREATMENT - No change

XVII. ~~XVI.~~ SANITARY WASTE DISPOSAL - No change

XVIII. SURFACE WATER AND STORMWATER MANAGEMENT FACILITIES

The City of Lakeland shall construct all aspects of the surface water management system in accordance with the construction plans received by the Southwest Florida Water Management District (SWFWMD) on June 23, 1998. This certification for the surface water management systems is valid only for the specific processes and operations applied for and indicated in the approved drawing or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or Conditions of Certification may constitute grounds for modification, revocation or enforcement action.

A. General

1. City of Lakeland Confirmation.

The operational phases of the surface water management systems authorized under this certification shall not become effective until the City of Lakeland confirms in writing, upon completion of each phase, that these facilities have been constructed consistent with the conditions of certification. Such confirmation shall include a certification by an engineer (practicing in the State of Florida, having the appropriate experience in surface water management design and construction, and in compliance with Chapter 471, Florida Statutes, unless exempt thereunder), that the facilities have been constructed in accordance with the approved project design. Within 30 days after completion of construction of the surface water management system, the City of Lakeland shall submit the confirmation, including "as-built" construction drawings with the engineer's certification and a description of any deviations; and notify the SWFWMD that the facilities are ready for inspection for consistency with the conditions of certification and information submitted hereunder.

2. Discharges.

The discharges from the surface water management system shall meet state water quality standards as set forth in Chapter 62-302, F.A.C. for class waters equivalent to the receiving waters.

3. Minimum Standards.

This certification is predicated on the City of Lakeland's submitted information to SWFWMD which reasonably demonstrates that adverse off-site water resource related impacts will not be caused by the authorized activities. The plans, drawings, and design specifications submitted shall be considered minimum standards for compliance.

4. Post-Certification Information Submittal.

Information submitted to the SWFWMD subsequent to certification, in compliance with the conditions of this certification, shall be for the purpose of water management district monitoring and confirming compliance with the conditions of certification and the criteria contained in Rule 40D-4, F.A.C., as applicable, prior to the commencement of the subject construction, operation and/or maintenance activity, covered thereunder.

5. Liability.

Permittee shall hold and save SWFWMD harmless from any an all damages, claims, or liabilities which may arise by reason of the construction, operation, maintenance and/or use of any facility authorized by this certification, to the extent allowed under Florida law.

6. Enforcement.

Authorized representatives of the SWFWMD shall be allowed reasonable escorted access to the project site to inspect and observe any activities associated with the project construction or the operation and/or maintenance of the surface water management system(s) and stormwater facilities in order to determine compliance with the conditions of this certification.

7. Monitoring.

Post-certification monitoring requirements may be determined and specified as a result of technical review of construction information, where necessary, to demonstrate compliance with water management district regulations. If monitoring data is required by the SWFWMD in conjunction with post-certification review, it shall be submitted to the SWFWMD and to the Florida Department of Environmental Protection. Parameters to be monitored may include those listed in Chapter 62-302, Florida Administrative Code. The City of Lakeland shall, if required, provide data to SWFWMD regarding: Construction, operation, and maintenance of surface water management systems; NGVD levels; volumes and timing of water discharged, including total volume discharge during period of sampling and total and discharges from the property.

B. Construction Conditions

1. This project must be constructed in compliance with and meet all applicable requirements set forth in Chapter 373, Florida Statutes, and Chapter 40D-4, Florida Administrative Code.

2. Any surface water discharged from the site during construction of the project shall meet State water quality standards at the property boundary or point of discharge to wetlands or State waters. If the discharge does not meet these standards, the discharge will be immediately stopped and the SWFWMD shall be notified of corrective action(s) taken to correct the violation(s). Turbidity shall not exceed 29 N.T.U. above background level. Turbidity shall be monitored at least once during discharge, or more often as

determined by the project engineer or SWFWMD if needed, to ensure compliance.

3. Except as authorized by this certification for the surface water management system, any further land development, wetlands disturbance or other construction within the total land area of this site will require additional certifications in accordance with the SWFWMD's rules (Chapter 40D-4, F.A.C.).

4. All rights-of way and easement locations necessary to construct, operate, and maintain all facilities, including uplands conservation/buffer areas and wetlands, which constitute the certified surface water management system, shall be reserved for water management purposes.

5. Construction of the discharge control and water quality treatment facilities which are part of the certified surface water management system shall be completed and operational prior to beneficial occupancy and use of the project development being served.

6. Establishment and survival of littoral areas provided for stormwater quality treatment in wet detention systems shall be assured by proper and continuing maintenance procedures designed to promote viable wetlands plant growth of natural diversity and character. As-built drawings depicting the established wet detention treatment areas shall be submitted to the SWFWMD for inspection and approval upon completion of construction. Following as-built approval, perpetual maintenance shall be provided for the certified system.

7. Any existing wells in the path of construction shall be properly plugged and abandoned by a licensed water well contractor in accordance with Chapter 40D-3, and Rule 62-532.500(4), F.A.C.

8. All retention/detention pond side slopes shall be sodded and staked as necessary to prevent erosion.

9. Any system alteration, including for augmentation into or withdrawal of water from

the certified surface water management system, other than as specifically authorized by this certification, will require additional District certification consideration. The water level of stormwater detention ponds shall not be augmented by pumping or diversion of water into the ponds to artificially control their level above the design normal or beginning storage level.

10. The City of Lakeland shall perform the construction authorized in a manner so as to minimize any adverse impact on the system on fish, wildlife, natural environmental values, and water quality. The City of Lakeland shall institute necessary measures during the construction period, including full compaction of any fill material placed around newly installed structures, to reduce erosion, turbidity, nutrient loading and sedimentation in the receiving waters.

11. Off-site discharges of surface water during construction and development shall be made only through the facilities authorized by this certification.

12. In order to insure that the person who will construct the proposed work is identified as required by 373.413(2)(f), F.S., once the contract is awarded, the name, address, and telephone number of the contractor shall be submitted to the SWFWMD prior to construction.

13. The City of Lakeland shall immediately provide written notification to the SWFWMD upon beginning any construction authorized by this certification.

14. The City of Lakeland shall retain the design engineer, or other Professional Engineer registered in Florida, to conduct on-site observations of construction and assist with the as-built certification requirements of this project. The City of Lakeland shall inform the SWFWMD in writing and prior to beginning construction of the name, address, and telephone number of the Professional Engineer so employed by the City of Lakeland.

15. The operation and maintenance entity shall submit inspection reports for the

surface water management system in the form required by the SWFWMD. For systems utilizing wet detention, the inspections shall be performed two (2) years thereafter.

16. The SWFWMD verified wetland boundaries shall be clearly delineated on the site prior to initial clearing and grading activities. The delineation shall endure throughout the construction period and be readily discernable to construction personnel and SWFWMD staff.

C. Project Information Requirements

1. Subsequent modifications to the drawings and supporting calculation submitted to SWFWMD which may significantly alter the quantity and/or quality of waters discharged off site shall also be submitted to the water management district for a determination that the modifications are in compliance with Chapter 40D-4, Florida Administrative Code, as appropriate, prior to the commencement of construction. However minor deviations from construction plans deemed necessary in the field, including, but not necessarily limited to changes in the number, size, and location of culverts and other structures, shall be allowed.

2. The SWFWMD and the City of Lakeland may mutually agree to vary the information requirements.

Any party to this Notice has the right to seek judicial review of the Order pursuant to Section 120.68, Florida Statutes, by the filing of a Notice of Appeal pursuant to Rule 9.110, Florida Rules of Appellate Procedure, with the Clerk of the Department of Environmental Protection, M.S.35, Office of General Counsel, 3900 Commonwealth Boulevard, Tallahassee, Florida 32399-3000, and by filing a copy of the Notice of Appeal accompanied by the applicable filing fee with the appropriate District Court of Appeal. The Notice of Appeal must be filed within 30 days from the date that this Final Order is filed with the Department of Environmental Protection.

DONE AND ENTERED this 9th day of July, 1998 in Tallahassee, Florida.

STATE OF FLORIDA, DEPARTMENT OF ENVIRONMENTAL PROTECTION

FILING AND ACKNOWLEDGEMENT
FILED, on this date, pursuant to §120.52 Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

7/9/98

Clerk **Date**

for VIRGINIA B. WETHERELL
SECRETARY
3900 Commonwealth Boulevard
Tallahassee, FL 32399-3000
Telephone: (850) 488-1554

~~**CERTIFICATE OF SERVICE**~~

~~I HEREBY CERTIFY this ____ day of July 1998, that a true and correct copy of the foregoing Final Order Modifying Conditions of Certification has been sent by mail to the following listed persons:~~

~~David S. Dee, Esq.~~
~~Landers & Parsons~~
~~P.O. Box 271~~
~~Tallahassee, FL 32302~~

~~Richard T. Tschantz, Esq.~~
~~SWFWMD~~
~~2379 Broad Street~~
~~Brooksville, FL 34609-6899~~

~~Andrew Grayson, Esq.~~
~~Department of Community Affairs~~
~~2555 Shumard Oak Boulevard~~
~~Tallahassee, FL 32399-2100~~

~~Pinellas County Building Trades Council~~
~~c/o G. Wallace~~
~~2165 Country Club Court North~~
~~St. Petersburg, FL 33710~~

~~Plumbers and Pipe Fitters Local No. 111~~
~~c/o Fred Stiles~~
~~4020 80th Avenue North~~
~~Pinellas Park, FL 33565~~

~~Pinellas County Department of Environmental Management~~
~~315 Court Street~~
~~Clearwater, FL 34616~~

* CORRECTED CERTIFICATE OF SERVICE ATTACHED

CORRECTED CERTIFICATE OF SERVICE

I HEREBY CERTIFY this 10th day of July 1998, that a true and correct copy of the foregoing Final Order Modifying Conditions of Certification has been sent by U.S. mail or interagency mail to the following listed persons:

Gary P.Sams, Esq.
Hopping Green Sams & Smith
P.O. Box 6526
Tallahassee, FL 32314

Norman White, Esq.
Central Florida Regional
Planning Council
555 East Church Street
Bartow, FL 33830

Stephanie G. Kruer, Esq.
General Counsel
Dept. of Community Affairs
2555 Shumard Oak Blvd
Tallahassee, FL 32399-2100

Richard Tschantz, Esq.
Assistant General Counsel
Southwest Florida Water
Management District
2379 Broad Street
Brooksville, FL 34609-6899

Pamela S. Leslie, Esq.
General Counsel
Department of Transportation
Haydon Burns Building
605 Suwannee Street, M.S. 58
Tallahassee, FL 32399-0450

Mark Carpanini, Esq.
Office of County Attorney
Post Office Box 60
Bartow, FL 33830-0060

Robert V. Elias, Esq.
Florida Public Service Commission
Gerald Gunter Building
2540 Shumard Oak Blvd
Tallahassee, FL 32399-0850

Andrew R. Reilly, Esq.
East Lake Parker Residents
Post Office box 2039
Lakeland, FL 33845-2039

James V. Antista
General Counsel
Game and Fresh Water Fish Comm.
Bryant Bldg.
620 S. Meridian Street
Tallahassee, FL 32399-1600

Thomas B. Tart, Esq.
Orlando Utilities Commission
500 South Orange Street
Orlando, FL 32801

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION

SCOTT GOORLAND
Assistant General Counsel
Florida Bar No. 0066834

3900 Commonwealth Boulevard, MS 35
Tallahassee, Florida 32399-3000

PPSA CERTIFICATION FOR MCINTOSH UNIT NO. 3

BEFORE THE GOVERNOR AND CABINET
OF THE STATE OF FLORIDA

In Re: The application for Power Plant Site Certification submitted by the City of Lakeland and the Orlando Utilities Commission. (DER Case No. PA 74-06-SR)	)	DOAH Case No. 78-679

The following persons were present and participated in the disposition of this matter:

Honorable Reubin O'D. Askew
Governor

Honorable Jesse J. McCrary
Secretary of State

Honorable Robert L. Shevin
Attorney General

Honorable Gerald A. Lewis
Comptroller

Honorable Doyle Conner
Commissioner of Agriculture

Honorable Ralph D. Turlington
Commissioner of Education

CERTIFICATION ORDER

BY THE GOVERNOR AND CABINET:

The Governor and Cabinet, having heard presentations by the parties; having reviewed the Recommended Order dated November 14, 1978, (attached and incorporated as Exhibit I), as well as the conditions of certification referred to therein and attached thereto and the exceptions taken therefrom; having considered the evidence of record; and being otherwise fully advised herein, it is

ORDERED:

1. The present application seeking authority to construct and operate Unit 3 as a joint venture between the City of Lakeland and the Orlando Utilities Commission replaces a prior application for a smaller unit submitted solely by the City of Lakeland. Accordingly, the previous certification issued in December of 1976 is revoked and the instant site certification is substituted in its place and stead.

2. The suggestion submitted by the East Lake Parker residents appears meritorious. Sound levels of 60 dBA (L_{10}) and 70 dBA (L_1) between the hours of 7 a.m. and 10 p.m., and of 60 dBA (L_{10}) and 65 dBA (L_1) between 10 p.m. and 7 a.m. at the nearest existing residential boundary are imposed upon Unit 3. The applicants, the Department of Environmental Regulation and the East Lake Parker Residents are directed to agree upon a reasonable program of non-continuous monitoring in order to insure compliance therewith, specifically including the time durations for sound measurements required to be taken.

The results of that monitoring program are to be submitted to the Department of Environmental Regulation at intervals to be determined in the program. The authority to modify the noise standards imposed upon Unit 3 is specifically delegated to the Secretary of the Department of Environmental Regulation.

No citation, however, will be issued against Unit 3 for violation of these noise standards without prior approval of the Board.

3. In all other regards, the Hearing Officer's Findings of Fact, Conclusions of Law, and Recommended Order are approved and adopted. The conditions of certification referenced therein and

attached thereto are approved and the certification of McIntosh Unit 3, including the transmission line, is made specifically subject to those conditions as well as to the condition relating to noise imposed above.

DONE AND ORDERED this 7th day of December, 1978, subsequent to a vote of the Governor and Cabinet at a duly constituted Cabinet meeting of December 5, 1978.

FOR THE GOVERNOR AND FLORIDA
CABINET:

Reubin O'D. Askew

REUBIN O'D. ASKEW

Vote:

For:

Unanimous

Against:

Copies Furnished to all Parties

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that a true copy of the foregoing CERTIFICATION ORDER has been furnished by United States Mail to the following: Barrett G. Johnson, Public Service Commission, 101 E. Gaines Street, Tallahassee, Florida 32304; William Schoup, City of Orlando, Post Office Box 3193, Orlando, Florida 32803; Don Feaster, Southwest Florida Water Management District, Brooksville, Florida 33511; Mike Opalinski, City of Lakeland, Post Office Box 368, Lakeland, Florida 33802; Hal Roberts, City Attorney, Post Office Box 368, Lakeland, Florida 33802; Larry Keesey, Division of State Planning, 530 Carlton Building, Tallahassee, Florida 32304; Wings Benton, Department of Natural Resources, Crown Building, Tallahassee, Florida 32304; Andrew Reilly, Post Office Box 203, Haines City, Florida; Ervin Cowie, Attorney for Polk County, Post Office Box 60, Bartow, Florida 33830; Russell Blain, Blain & Cone, Post Office Box 399, Tampa, Florida 33601; Thomas B. Tart, Post Office Box 1273, Orlando, Florida; and East Lake Parker Residents, c/o 1735 East Lake Parker Drive, Lakeland, Florida, this 11th day of December, 1978.

Sheri Smallwood

SHERI W. SMALLWOOD
Assistant General Counsel

Department of Environmental Regulation
2600 Blair Stone Road
Twin Towers Office Building
Tallahassee, Florida 32301

STATE OF FLORIDA
DIVISION OF ADMINISTRATIVE HEARINGS

RE: Application for site certification of McIntosh Unit 3 submitted by the City of Lakeland and the Orlando Utilities Commission	)	Case No. 78-679

RECOMMENDED ORDER

Pursuant to proper notice, an administrative hearing was held before Diane D. Tremor, Hearing Officer with the Division of Administrative Hearings, on August 15 and 16, 1978, in Lakeland, Florida. The purpose of this certification hearing held pursuant to F.S.§403.508(3) was to determine whether the location and operation of the proposed power plant and associated 46-mile transmission line will produce minimal adverse effects on human health, the environment, the ecology of the land and its wildlife and the ecology of state waters and their aquatic life. A land use hearing as required by F.S. §403.508(1) and (2) has previously been conducted by the undersigned. By Final Order dated October 12, 1978, the Governor and Cabinet, sitting as the Board for purposes of the Electrical Power Plant Siting Act, determined that the applicant had demonstrated that the proposed facilities could comply with all existing land use plans and zoning ordinances.

APPEARANCES

City of Lakeland:	Stephen C. Watson and Hal Roberts Post Office Box 368 Lakeland, Florida 32802
Orlando Utilities Commission:	Thomas B. Tart Gurney, Gurney and Handley Post Office Box 1273 Orlando, Florida 32802

ATTACHMENT

Department of Environmental Regulation:	Sheri W. Smallwood Twin Towers Office Building 2600 Blair Stone Road Tallahassee, Florida
Division of State Planning:	C. Lawrence Keesey Room 530 Carlton Bldg. Tallahassee, Florida
Public Service Commission:	Barrett G. Johnson 104 E. Gaines Street Tallahassee, Florida
Southwest Florida Water Management District:	Russell Blain Blain and Cone Post Office Box 1363 Tampa, Florida
Polk County:	Ervin Cowie Post Office Box 60 Bartow, Florida
East Lake Parker Residents:	Andrew R. Reilly Post Office Box 2039 Haines City, Florida

FINDINGS OF FACT

Upon consideration of the oral and documentary evidence adduced at the hearing, the following relevant facts are found:

1. Pursuant to a joint venture agreement, the City of Lakeland and the Orlando Utilities Commission propose to construct and operate Unit No. 3 at the C.D. McIntosh, Jr. Power Plant in Lakeland, Florida. The site is located on 275 acres of land on the north shore of Lake Parker to the northeast of the Lakeland urban area. Access to the site is by State Road 600A. The land surrounding the site is primarily mined-out phosphate land, some of which is being reclaimed. There is a residential area approximately one mile southeast of the site. The plant site has previously been certified by the Governor and Cabinet, sitting as the Board for purposes set forth in the Electric Power Plant Siting Act. This occurred

in December of 1975 upon a prior application for a 250 megawatt steam electric generating unit fueled by coal, processed solid waste or oil. The present supplemental application for the 364 megawatt, coal-fired unit was submitted in April of 1978 to increase the size of the unit and to provide for a joint venture between the City of Lakeland and the Orlando Utilities Commission.

2. There presently exists near the proposed site two operating units. Unit No. 1 is a 100 megawatt oil-fired generating facility which utilizes Lake Parker water for a once-through cooling system. Unit No. 2 is a 115 megawatt facility with a cooling tower which utilizes make-up water from Lake Parker. Other facilities associated with the existing units include deep wells, water and oil storage tanks, electrical switchyards, parking areas and roadways.

3. Proposed to be constructed in the immediate vicinity of the existing units are the 364 megawatt unit and the following associated facilities: a railroad spur and tressel, coal storage areas and handling equipment, solid waste treatment and handling facilities, a flue gas desulfurization sludge stabilization system, a 250 foot high stack, and access roads. In addition, the applicants propose to construct and utilize a 46 mile 230 kilovolt transmission line connecting the proposed Unit 3 in Lakeland to the Taft substation in Orlando, Florida. The transmission line route largely parallels Interstate 4.

4. The construction of Unit 3 will involve extensive grading and removal of vegetation, and it will reduce the area available for animal habitation. However, the impact of Unit 3 upon vegetation and wildlife is minimal primarily because the site is already in use as a generating facility and has been subjected to man-related activities.

5. It was stipulated by all parties that there exists a need for expanded electrical generating capacity in the area to be served by the proposed new unit. The larger unit is economically beneficial to the two cities and the joint enterprise

approach is unique and highly recommended by the state agencies involved. The Florida Public Service Commission and the Division of State Planning have filed reports with the Department of Environmental Regulation concluding that additional electrical generating capacity will be required in the Lakeland and Orlando service areas in 1981 when the proposed unit is to become operational.

6. The proposed 364 megawatt facility will have the capacity to use three types of fuel. Its primary fuel will be medium to high sulfur bituminous coal. It may also burn low sulfur oil and prepared residential and commercial refuse. If refuse is used as a supplemental fuel, there will be no stockpiling of such refuse in a raw state at the plant site. Each load will be processed immediately upon arrival.

7. The proposed unit will employ a high efficiency electrostatic precipitator to remove fly ash from the burning of coal and refuse, followed by a flue gas scrubber to further reduce particulate matter and to remove sulfur oxide from the exhaust gases. Remaining gases and particulates will be discharged from a 250 foot stack which will disperse pollutants in small concentrations over a wide area. It is anticipated that, as a result of these control measures, Unit No. 3 will comply with state and federal emission limitations and ambient air quality standards.

8. It is proposed that Unit No. 3 will utilize waste water treatment plant effluent pumped from the present facilities of the Lakeland Sanitary Sewage System for cooling tower makeup. Three deep wells in the Florida aquifer will be used as backup in case of a failure of the primary cooling water supply. Most of the cooling water tower blowdown will be used as makeup for the flue gas desulfurization process, and

excess blowdown will be returned to the Lakeland Sanitary Sewage System. Waste water from the proposed unit will be chemically treated in a retention basin and then pumped to a spray pond for evaporation. This system of handling waste water and blowdown will effectively eliminate any discharges from the unit to Lake Parker.

9. The 46 mile 230 KV transmission line will traverse the Green Swamp area for approximately 20 miles. The majority of the proposed route parallels Interstate 4 and thus utilizes an existing corridor which is already in a disturbed state. Some culverts and fill will be necessary. The impact of constructing access and maintenance roads for the lines could have serious adverse effects upon the creeks, swamps and marshes traversed, as well as upon plant and animal life. The applicants are endeavoring to minimize the environmental impact to the greatest extent possible consistent with good engineering design practices. The application and the testimony adduced at the hearing does not provide sufficient information to fully access the amount of fill, spacing of culverts or environmental impact associated with the transmission corridor as it crosses the Green Swamp area. As site plans are specifically developed by the applicants, they should be reviewed and approved by the appropriate Polk County agencies responsible for the Green Swamp area, the Division of State Planning and the Department of Environmental Regulation.

10. The Florida Department of Environmental Regulation, the Public Service Commission and the Division of State Planning have all recommended that Unit No. 3 be certified subject to certain general and special conditions which are attached to this Recommended Order.[1] The applicants have stipulated and agreed

[1] The Division of State Planning did not specifically recommend certification of the transmission line.

that these conditions of certification should be imposed if certification is granted.

11. At the conclusion of the presentation by the parties to this proceeding, opportunity was given to the general public to comment upon the application for site certification. The main issue raised was that of noise produced by the present facilities. However, there was expert testimony presented by the applicants to the effect that the new proposed addition would not materially raise the ambient noise level in the area. There was also some public testimony on the question of aesthetics. The applicants, however, testified that they would make every effort to minimize any adverse aesthetic effects by the planting of additional trees and foliage.

CONCLUSIONS OF LAW

1. This proceeding was held pursuant to the Florida Electrical Power Plant Siting Act, Chapter 403, Part II, Florida Statutes, and Chapter 17-17, Florida Administrative Code, to consider the subject application for site certification.

2. Notice, in accordance with Chapter 403 and Chapter 120, Florida Statutes, and Chapter 17-17, Florida Administrative Code, has been given to all persons and parties entitled thereto as well as to the general public.

3. The purpose of the site certification hearing was to receive testimony and evidence concerning whether the location and operation of the proposed facilities will produce minimal adverse effects on human health, the environment, the ecology of the land and its wildlife, and the ecology of State waters and their aquatic life, and to fully balance the increased demand for electrical power plant location and operation with the broad interests of the public as provided in Chapter 403, Florida Statutes.

4. The record of this hearing consists of all pleadings and papers filed herein, the transcripts of all hearings, all orders entered by the Hearing Officer, and all evidence and exhibits properly admitted to the record.

5. The studies, reports and recommendations required by F.S.§403.507 have been made by the Division of State Planning, the Public Service Commission and the Department of Environmental Regulation. Each agency, with the exception of State Planning concerning the transmission lines, has recommended that the proposed Unit 3 be certified, subject to the special and general conditions attached hereto.

6. The location and operation of Unit 3 and its associated facilities will produce minimal adverse effects on human health, the environment, the ecology of the land and its wildlife and the ecology of state waters and their aquatic life, provided that the applicants comply with the conditions attached hereto and seek review and approval from Polk County, State Planning and DER of the construction plans for its transmission corridor as it crosses the Green Swamp area.

7. The operational safeguards for proposed Unit 3 are technically sufficient for the welfare and protection of the citizens of Florida.

8. The certification of proposed Unit 3 is consonant with the premise of abundant, low-cost electrical energy.

9. Proposed Unit 3, if certified pursuant to the conditions attached, will comply with the pertinent State and Federal Regulations concerning the prevention of significant deterioration of air quality, Section 17-2.04, Florida Administrative Code, and the application of the best available control technology, Section 17-2.03, Florida Administrative Code.

RECOMMENDED ORDER

Having reviewed the record of this proceeding, and based upon the Findings of Fact and Conclusions of Law set forth herein, it is hereby RECOMMENDED that certification, pursuant to Chapter 403, Part II, Florida Statutes, be granted to the City of Lakeland and the Orlando Utilities Commission for the construction and operation of McIntosh Unit No. 3. It is further recommended that this certification be made subject to the conditions of certification attached. It is also recommended that certification of the proposed transmission line be granted pursuant to review and approval of the construction plans for the corridor as it crosses the Green Swamp by Polk County, the Division of State Planning, and the Department of Environmental Regulation.

Done and entered this 14th day of November, 1978, in Tallahassee, Florida.

Diane D. Tremor

DIANE D. TREMOR
Hearing Officer
Division of Administrative Hearings
530 Carlton Building
Tallahassee, Florida 32304
(904) 488-9675

Copies furnished:

See Attached Page

Copies furnished:

Stephen C. Watson
and Hall Roberts
Post Office Box 368
Lakeland, Florida 33802

Thomas B. Tart
Gurney, Gurney and Handley
Post Office Box 1273
Orlando, Florida 32802

Sheri W. Smallwood
Twin Towers Office Bldg.
2600 Blair Stone Road
Tallahassee, Florida 32301

C. Lawrence Keesey
Room 530 Carlton Building
Tallahassee, Florida 32304

Barrett G. Johnson
104 East Gaines Street
Tallahassee, Florida 33601

Ervin Cowie
Post Office Box 60
Bartow, Florida 33830

Andrew R. Reilly
Post Office Box 2039
Haines City, Florida 33844

Hamilton Oven
Department of Environmental
Regulation
2600 Blair Stone Road
Tallahassee, Florida 32301

Russell Blain
Blain and Cone
Post Office Box 1363
Tampa, Florida

Honorable Reubin O'D Askew
Governor, State of Florida
The Capitol
Tallahassee, Florida

Honorable Robert L. Shevin
Attorney General
The Capitol
Tallahassee, Florida

Honorable Doyle Conner
Commissioner of Agriculture
The Capitol
Tallahassee, Florida

Honorable Ralph Turlington
Commissioner of Education
The Capitol
Tallahassee, Florida

Honorable Gerald A. Lewis
Comptroller
The Capitol
Tallahassee, Florida

Honorable William Gunter
State Treasurer
The Capitol
Tallahassee, Florida

Honorable Jesse McCrary
Secretary of State
The Capitol
Tallahassee, Florida

BEST AVAILABLE COPY

State of Florida Department of Environmental Regulation
City of Lakeland
C.D. McIntosh, Jr. Power Plant - Unit No. 3
Case No. PA 74-06-SR
CONDITIONS OF CERTIFICATION

GENERAL

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Appendix A

State of Florida Department of Environmental Regulation
City of Lakeland
C.D. McIntosh, Jr. Power Plant - Unit No. 3
Case No. PA 74-06-SR
CONDITIONS OF CERTIFICATION

GENERAL

1. Change in Discharge

All discharges or emissions authorized herein shall be consistent with the terms and conditions of this certification. The discharge of any pollutant not identified in the application, or any discharge more frequent than, or at a level in excess of that authorized herein, shall constitute a violation of the certification. Any anticipated facility expansions, production increases, or process modifications which will result in new, different or increased discharges or expansion in steam generating capacity will require a submission of a new or supplemental application pursuant to Chapter 402, Florida Statutes.

2. Noncompliance Notification

If, for any reason, the permittee does not comply with or will be unable to comply with any limitation specified in this certification, the permittee shall notify the Southwest District Manager of the Department by telephone during the working day during which said noncompliance occurs and shall confirm this situation in writing within seventy-two (72) hours of first becoming aware of such conditions, supplying the following information:

a. A description and cause of noncompliance; and

b. The period of noncompliance, including exact dates and times: or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate and prevent recurrence of the noncomplying event.

3. Facilities Operation

The permittee shall at all times maintain in good working order and operate as efficiently as possible all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this certification. Such systems are not to be bypassed without prior department approval.

4. Adverse Impact

The permittee shall take all reasonable steps to minimize any adverse impact resulting from noncompliance with any limitation specified in this certification, including but not limited to such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying event.

5. Right of Entry

The permittee shall allow the Secretary of the Florida Department of Environmental Regulation and/or authorized representatives, upon the presentation of credentials:

a. To enter upon the permittee's premises where an effluent source is located or in which records are required to be kept under the terms and conditions of this permit; and

b. To have access to and copy all records required to be kept under the conditions of this certification; and

c. To inspect and test any monitoring equipment or monitoring method required in this certification and to sample any discharge or pollutants, and

d. To assess any damage to the environment or violation of ambient standards.

6. Revocation or Suspension

This certification may be suspended or revoked pursuant to Section 403.512, Florida Statutes, or for violations of any General or Special Condition.

7. Civil and Criminal Liability

This certification does not relieve the permittee from civil or criminal responsibility or liability for noncompliance with any conditions of this certification, applicable rules or regulations of the Department, or Chapter 403, Florida Statutes, or regulations thereunder.

Subject to Section 403.511, Florida Statutes, this certification shall not preclude the institution of any legal action or relieve the permittee from any responsibilities or penalties established pursuant to any other applicable State Statutes or regulations.

8. Property Rights

The issuance of this certification does not convey any property rights in either real or personal property tangible or intangible, nor any exclusive privileges, nor does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations. The applicant will obtain title, lease or right of use from the State of Florida, to any sovereign submerged lands occupied by plant, transmission line structures, or appurtenant facilities.

9. Severability

The provisions of this certification are severable, and if any provision of this certification, or the application of any provision of this certification to any circumstances, is held invalid, the application of such provision to other circumstances and the remainder of the certification shall not be affected thereby.

10. Definitions

The meaning of terms used herein shall be governed by the definitions contained in Chapter 403, Florida Statutes, and any regulation adopted pursuant thereto. In the event of any dispute over the meaning of a term used in these general or special conditions which is not defined in such statutes or regulations, such dispute shall be resolved by reference to the most relevant definitions contained in any other state or federal statute or regulation or, in the alternative by the use of the commonly accepted meaning as determined by the Department.

11. Review of Site Certification

The certification shall be final unless revised, revoked or suspended pursuant to law. At least every five years from the date of issuance of this certification or any National Pollutant Discharge Elimination System Permit issued pursuant to the Federal Water Pollution Control Act Amendments of 1972, for the plant units, the Department shall review all monitoring data that has been submitted to it during the preceding five-year period, for the purposes of determining the extent of the permittee's compliance with the conditions of this certification and the environmental impact of this facility. The Department shall submit the results of its review and recommendations to the permittee. Such review will be repeated at least every five years thereafter.

12. Modification of Conditions

The conditions of this certification may be modified in the following manner:

a. The Board hereby delegates to the Secretary the authority to modify, after notice and opportunity for hearing, any conditions pertaining to monitoring or sampling.

b. All other modifications shall be made in accordance with Section 403.516, F.S.

State of Florida Department of Environmental Regulation
City of Lakeland
C. D. McIntosh, Jr. Power Plant Unit No. 3
Case No. PA 74-06-SR
CONDITIONS OF CERTIFICATION

SPECIAL

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State of Florida Department of Environmental Regulation
City of Lakeland
Power Plant No. 3 - Unit No. 3
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CONDITIONS OF CERTIFICATION

SPECIAL

I. Air

The construction and operation of the Unit No. 3 at the McIntosh Plant shall be in accordance with all applicable provisions of Chapters 17-2, 17-5, and 17-7, Florida Administrative Code. The permittee shall comply with the following conditions of certification:

A. Emission Limitations

1. Stack emissions shall not exceed those specified in Chapter 17-2.04(6)(e) 1., FAC.

2. The permittee shall not burn a fuel oil containing more than an average of 0.7% sulfur unless it can be demonstrated that either, a) heat efficiency is such as to insure compliance with all applicable emission limitations, or b) that a flue gas desulfurization unit is installed that will insure compliance with applicable emission limitations.

3. The height of the boiler exhaust stack for Unit 3 shall be not less than 250 feet above grade. The height of stacks for future units shall be determined after review of supplemental applications.

4. Particulate emissions from the coal handling facilities:

a. The applicant shall not cause to be discharged into the atmosphere from any coal processing or conveying equipment, coal storage system or coal transfer and loading system processing coal, visible emissions which exceed 20 percent opacity.

b. The applicant must submit to the Department within five (5) working days after it becomes available, copies of technical data pertaining to the selected particulate emissions control for the coal handling facility. These data should include, but not be limited to, a copy of the formal bid from the successful bidder, guaranteed efficiency and emission rates, and major design parameters such as air/cloth ratio and flow rate. The Department may, upon review of these data, disapprove the use of such device if the Department determines the selected control device to be inadequate to meet the visible emission limit specified in 5 (a) above.

B. Air Monitoring Program

1. The permittee shall install and operate continuously monitoring devices for the Unit No. 3 boiler exhaust for sulfur dioxide, nitrogen dioxide and opacity. The monitoring devices shall meet the applicable requirements of 17-2.08, FAC.

2. The permittee shall operate two ambient monitoring device for sulfur dioxide in accordance with EPA reference methods in 40 CFR, Part 53 and two ambient monitoring device for suspended particulates. New and existing monitoring devices shall be located as designated by the Department. The frequency of operation shall be every six days or as specified by the Department.

3. The permittee shall maintain a daily log of fuels used and copies of fuel analyses containing information on sulfur content, ash content and heating values to facilitate calculations of emissions.

4. The permittee shall provide sampling ports into the stack and shall provide access to the sampling ports, in accordance with Standard Sampling Techniques and Methods of Analysis for The Determination of Air Pollutants from Point Sources, July 1975.

5. The ambient monitoring program may be reviewed annually beginning two years after start-up of Unit No. 2 by the Department and the permittee.

6. Emission Control Systems:

   Prior to operation of the source, the owner or operator shall submit to the Department a standardized plan or procedure that will allow the company to monitor emission control equipment efficiency and enable the company to return malfunctioning equipment to proper operation as expeditiously as possible.

C. Stack Testing:

1. Within 60 days after achieving the maximum capacity at which the facility will be operated, but no later than 180 days after initial startup, the owner or operator shall conduct performance tests for particulates and SO_2 and promptly furnish the Department a written report of the results of such performance tests.

2. Performance tests shall be conducted and data reduced in accordance with methods and procedures in accordance with <u>Standard Sampling Techniques and Methods of the Determination on Air Pollutants from Point Sources</u>, July 1975.

3. Performance tests shall be conducted under such conditions as the Department shall specify based on representative performance of the facility. The owner or operator shall make available to the Department such records as may be necessary to determine the conditions of the performance tests.

4. The owner or operator shall provide the Department with 30 days prior notice of the performance tests and afford the Department the opportunity to have an observer present.

5. Stack tests for particulates NO_x and SO_2 shall be performed annually in accordance with conditions 2, 3 and 4 above.

D. <u>Reporting</u>

1. Stack monitoring, fuel usage and fuel analysis data shall be reported to the Department on a quarterly basis in accordance with 40 CFR, Part 60, Section 60.7 and in accordance with 17-2.08, FAC.

2. Ambient air monitoring data shall be reported to the Department quarterly by the last day of the month following the quarterly reporting period utilizing the SAROAD or other format approved by the Department in writing.

E. <u>Coal Characteristics and Contracts</u>

Before approval can be granted by the Department for use of control devices, characteristics of the coal to be fired must be known. Therefore, before these approvals are granted, the applicant must submit to the Department copies of coal contracts which should include the expected sulfur content, ash content, and heat content of the coal to be fired. These data will be used by the Department in its evaluation of the adequacy of the control devices.

F. <u>Coal Information</u>

As an alternative to the submittal of contracts for purchase of coal under condition ~~F~~ E above, the applicant may submit the following information:

1. The name of the coal supplier;

2. The sulfur content, ash content, and heat content of the coal as specified in the purchase contracts;

3. The location of the coal deposits covered by the contract (including mine name and seam);

4. The date by which the first delivery of coal will be made;

5. The duration of the contract; and

6. An opinion of counsel for the applicant that the contract(s) are legally binding enforceable.

G. Reporting:

Beginning one month after certification the applicant shall submit to the Department a quarterly status report briefly outlining progress made on engineering design and purchase of major pieces of equipment (including control equipment). All reports and information required to be submitted under this condition shall be submitted to Mr. Hamilton S. Oven, Jr., Administrator of Power Plant Siting, Department of Environmental Regulation, 2500 Blair Stone Road, Tallahassee, Florida 32301.

II. Water Discharges

Discharges during construction and operation of the Unit No. 3 shall be in accordance with all applicable provisions of Chapter 17-3, Florida Administrative Code and 40 CFR 423, Effluent Guidelines and Standards for Steam Electric Power Generating Point Source Category. In addition, the permittee shall comply with the following conditions of certification:

A. Pretreatment Standards

Wastewater discharged from Unit No. 3 to the Lakeland municipal sewerage system shall comply with the pretreatment standards for new sources as contained in 40 CFR, Part 423.16 and amendments. The specific standards applicable to the facilities as planned are:

1. Cooling Tower Blowdown

There shall be no detectable amounts of materials added for corrosion inhibition, including but not limited to zinc and chromium in cooling tower blowdown discharged to the sewer system.

2. pH

The pH of all discharges shall be within the range of 6.0 to 9.0.

3. Polychlorinated Biphenyl Compounds

There shall be no release to the environment of polychlorinated biphenyl compounds.

4. Chemical Wastes and Boiler Blowdown

All low volume wastes (demineralizer regeneration, cooling tower basin cleaning wastes, floor drainage, sample drains and similar wastes), metal cleaning wastes (including preheater and fireside wash) and boiler blowdown shall be treated as required for pH adjustment and removal of chemical constituents. These wastewaters will be discharged to an adequately sized and constructed spray evaporation basin.

5. Sluice Pond Overflow

Sluice pond overflow (coal pile runoff from less than 10-year, 24-hour rainfall and bottom and fly ash transport water) shall be treated if required (detention basin) and discharged to an adequately sized and constructed spray evaporation pond.

6. Flue Gas Desulfurization Sludge Pond Overflow

The flue gas desulfurization sludge pond overflow shall be discharged to an adequately sized and constructed spray evaporation pond.

B. In-Plant Water Monitoring Program

A monitoring program shall be undertaken by the City of Lakeland on the effluent streams within the facility to determine compliance by Unit 3 with the applicable pretreatment standards for those wastes discharged to the Lakeland municipal sewerage system.

III. Groundwater

A. General

The use of groundwater shall be minimized to the greatest extent practicable.

B. Well Criteria

The well locations shall be approved by the Southwest Florida Water Management District. Design and construction of new wells shall be in accordance with the applicable rules of the Department of Environmental Regulation and Southwest Florida Water Management District.

C. Groundwater Use Limitations

1. Groundwater used for makeup for the cooling tower for Unit No. 3 shall be limited to emergency use only, not to exceed 0.2166 million gallons per day on an average annual basis or 5.271 mgd on a maximum daily basis from 3 new wells.

2. Daily water use from the new wells shall be reported quarterly to the Southwest Florida Water Management District.

IV. Leachate

A. Compliance

Leachate from coal storage piles, settling and spray ponds and flue gas desulfurization sludge ponds (FGD) shall not contaminate waters of the State (including both surface and groundwaters) in excess of the limitations of Chapter 17-3, FAC.

B. Monitoring

A monitoring well system shall be used to determine whether or not leachate from the spray evaporation pond, as sluice ponds, and the flue gas desulfurization sludge ponds is reaching the groundwater. The permittee shall keep a monthly record of the monitoring results and shall notify the Central Subdistrict Office of the Department and the Southwest Florida Water Management District when said measurements become abnormal or excessive. A quarterly summary of the results of monitoring shall be provided to the Central Subdistrict Manager.

C. Corrective Action

When the leachate monitoring system indicates significant leakage to the groundwater in the shallow aquifer, the appropriate ponds (settling spray or sludge) shall be sealed, relocated or closed, or the operation of the affected pond shall be altered in such a manner as to assure the Department that no significant contamination of the groundwater will occur.

V. Control Measures During Construction

A. Stormwater Runoff

During construction and plant operation, necessary measures shall be used to settle, filter, treat or absorb silt containing or pollutant laden stormwater runoff to limit the suspended solids to 50 mg/l or less during rainfall periods not exceeding the 10-year, 24-hour rainfall, and to prevent an increase in turbidity to more than 50 Jackson Turbidity Units above background in waters of the State.

Control measures shall consist at the minimum, of filters, sediment traps, barriers, berms or vegetative planting. Exposed or disturbed soil shall be protected as soon as possible to minimize silt and sediment laden runoff. The pH shall be kept within the range of 6.0 to 8.5.

B. Sanitary Wastes

Disposal of sanitary wastes from construction toilet facilities shall be in accordance with applicable regulations of the Department and appropriate local health agency.

C. Environmental Control Program

An environmental control program shall be established under the supervision of a qualified person to assure that all construction activities conform to good environmental practices and the applicable conditions of certification.

The permittee shall notify the Department if unexpected harmful effects or evidence of irreversible environmental damage are detected during construction, shall immediately cease work and shall provide an analysis of the problem and a plan to eliminate or significantly reduce the harmful effects or damage, and to prevent reoccurrence.

VI. Solid Wastes

Solid Wastes resulting from construction or operation shall be disposed of in accordance with the applicable regulations of Chapter 17-7, FAC.

Open burning in connection with land clearing shall be in accordance with Chapter 17-5, FAC, no additional permits shall be required, but the Division of Forestry shall be notified. Open burning shall not occur if the Division of Forestry has issued a ban on burning due to fire hazard conditions.

VII. Operation Safeguards

The overall design and layout of the facilities shall be such as to minimize hazards to humans and the environment. Security control measures shall be utilized to prevent exposure of the public to hazardous conditions.

VIII. Solid Waste Utilization System

The solid waste utilization facility shall be designed and operated in compliance with all applicable regulations of the Department, including but not limited to Chapter 17-7, FAC.

IX. Screening

The permittee shall provide screening of the site through the use of aesthetically acceptable structures, vegetated earthen walls and/or existing or planted vegetation.

X. Potable Water Supply System

The potable water supply system shall be designed and operated in conformance with Chapter 17-22, FAC. Information as required in 17-22.05 shall be submitted to the Department prior to construction and operation. The operator of the potable water supply system shall be certified in accordance with Chapter 17-23, FAC.

. Transformer and Electric Switching Gear

The foundations for transformers, capacitors, and switching gear necessary for McIntosh Unit 3 to the existing distribution system shall be constructed of an impervious material and shall be constructed in such a manner to allow complete collection and recovery of any spills or leakage of oily, toxic, or hazardous substances.

XII. Toxic, Deleterious, or Hazardous Materials

The spill of any toxic, deleterious, or hazardous materials shall be reported in the manner specified by General Condition 2.

XIII. Transmission Line

Directly associated transmission lines shall be constructed and maintained in a manner to minimize environmental impacts in accordance with Chapter 403, F.S., and Chapter 22F-6, FAC.

A. Construction

1. Filling and construction in waters of the State shall be minimized to the extent practicable. No such activities shall take place without obtaining lease or title from the Department of Natural Resources.

2. Placement of fill in wetland areas shall be minimized by spanning such areas with the maximum transmission lines span practicable. Such areas should be bridged by maintenance or access roads.

3. Construction and access roads should avoid wetlands and be located in surrounding uplands. Any fill required in wetlands for construction but not required for maintenance purposes shall be removed and the ground restored to its original contours after transmission line placement.

4. Keyhole fills from upland areas are preferable to a single road and should be oriented as nearly parallel to surface water flow lines as possible.

5. Sufficient culverts shall be placed through fill causeways to maintain sheet flow. The number and locations of such culverts will be determined in the field by consultation with DER field inspectors.

6. Maintenance roads shall be planted with native species to prevent erosion and subsequent water quality degradation.

7. Construction activities should proceed as much as possible during the dry season.

8. Turbidity control measures, where needed, shall be employed to prevent violation of water quality standards.

9. Good environmental practices as described in Environmental Criteria for Electric Transmission Systems or published by the U.S. Department of Interior and the U.S. Department of Agriculture should be followed.

10. Any archaeological sites discovered during construction of the transmission line shall be disturbed as little as possible and such discovery shall be communicated to the Department of State, Division of Archive History and Records Management.

B. Maintenance

1. Vegetative removal for maintenance should be carried out in the following manner:

   Vegetative clearing operations to be carried out within the corridor should follow the general standards for clearing rights-of-way for overhead transmission lines, thus preserving immature tree species along the peripheries of the right-of-way. These standards define the zone that shall be cleared of all tree growth as the area between structures 10 ft. to either side of the outside conductor. The remainder of the right-of-way from the cleared area to the right-of-way limit shall be screened. This translates to mean that only trees in excess of 10 ft. in height would be removed from the outer zone.

2. Herbicides shall not be used for vegetation control along the transmission line without prior approval of the Department.

XIV. Construction in Waters of the State

No construction in waters of the State shall commence without obtaining lease or title from the Department of Natural Resources.

XV. Cooling Water Treatment

A study to determine the presence of pathogenic organisms in the sewage treatment plant effluent shall be performed to determine the degree of treatment required prior to use in cooling towers. A plan or study will be developed by the Department and the Department of Health & Rehabilitative Services. Based on the number of pathogenic organisms detected, the final degree of treatment and amount of chlorination to be required will be determined by the Department.

A petition for need was filed with the Public Service Commission on January 6, 1999. PSC approved the City's request April 1, 1999 and provided an approval which is attached in Appendix 10.4.3

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Petition by City of Lakeland for determination of need for McIntosh Unit 5 and proposed conversion from simple to combined cycle.	DOCKET NO. 990023-EM ORDER NO. PSC-99-0931-FOF-EM ISSUED: May 10, 1999

The following Commissioners participated in the disposition of this matter:

J. TERRY DEASON
SUSAN F. CLARK
JULIA L. JOHNSON

FINAL ORDER GRANTING PETITION
TO DETERMINE NEED FOR ELECTRICAL POWER PLANT

APPEARANCES:

Roy Young, Esquire, Young VanAssenderp & Varnadoe, Post Office Box 1833, Tallahassee, Florida 32302
On behalf of the City of Lakeland (Lakeland).

Wm. Cochran Keating, IV, Esquire, Florida Public Service Commission, Gerald L. Gunter Building, 2540 Shumard Oak Boulevard, Tallahassee, Florida 32399
On behalf of the Florida Public Service Commission (Staff).

BY THE COMMISSION:

I. CASE BACKGROUND

The City of Lakeland, through its Department of Electric Utilities (Lakeland) is a municipal electric utility engaged in the generation, transmission, and distribution of electric power to retail customers within the State of Florida. Pursuant to Section 403.519, Florida Statutes, Lakeland filed a petition on January 6, 1999, for determination of need for the proposed addition of a 120 MW steam turbine to its present McIntosh Unit 5, a 249 MW simple cycle combustion turbine currently under construction. This unit is located at Lakeland's existing C.D. McIntosh Power Plant in Polk County, Florida. The simple cycle combustion turbine is scheduled for commercial operation by July 10, 1999, and the 369 MW combined cycle unit which would result from addition of the steam turbine is scheduled for commercial operation on January 1, 2002.

An administrative hearing on the petition was conducted April 1, 1999. No person intervened in this docket. The positions adopted by Lakeland, as set forth in the prehearing order for this proceeding (Order No. PSC-99-0592-PHO-EM, issued March 31, 1999), were presented for our approval at hearing and serve as the basis for our findings of fact and conclusions of law below.

II. STANDARD FOR APPROVAL

Section 403.519, Florida Statutes, sets forth the matters that this Commission must consider in determining the need for an electrical power plant. The statute states, in pertinent part:

> In making its determination, the commission shall take into account the need for electric system reliability and integrity, the need for adequate electricity at a reasonable cost, and whether the proposed plant is the most cost effective alternative available. The commission shall also expressly consider the conservation measures taken by or reasonably available to the applicant or its members which might mitigate the need for the proposed plant and other matters within its jurisdiction which it deems relevant.

III. FINDINGS OF FACT

In 1997, Lakeland issued an Invitation for Proposals (IFP) for approximately 200 MW of capacity starting in the year 2002. Lakeland began negotiations with the lowest of the 13 bidders who responded. During these negotiations, Westinghouse submitted an unsolicited proposal to provide Lakeland the first 501G simple cycle combustion turbine (McIntosh Unit 5) at a discounted price for operation in 1999, upon the condition that the unit be operated in simple cycle mode for a period of at least 18 months from start-up. After this initial period, Lakeland would be free to convert the unit to combined cycle operation.

Lakeland studied alternative generating technologies and evaluated the purchase power alternatives identified in its IFP process and Westinghouse's unsolicited proposal. Lakeland selected McIntosh Unit 5 and its proposed conversion to combined cycle as the least-cost of all feasible alternatives under both base case and sensitivity analyses. In late 1997, Lakeland, with the City of Lakeland City Commission's approval, chose to purchase the Westinghouse 501G simple cycle unit and began construction of the unit. As part of its environmental permitting process for the simple cycle unit, Lakeland agreed to reduce NOx emissions from the unit to a certain level by the year 2002. In order to satisfy this requirement and to meet its system reliability needs, Lakeland proposes to convert McIntosh Unit 5 to combined cycle operation in 2002 using proven technology to reduce emissions.

Upon consideration of the record evidence, as discussed below, we find that Lakeland's petition should be granted. The proposed conversion is the most cost-effective alternative for Lakeland to meet its system reliability needs and to satisfy its environmental permitting requirements in 2002. We recognize that without the proposed conversion Lakeland could meet its reliability needs for retail load in 2002 with its existing units, but retiring certain existing units and making the proposed conversion is more cost-effective.

A. Need for Electric System Reliability and Integrity

The need for the proposed conversion of McIntosh Unit 5 to maintain system reliability and integrity is a result of it providing cost-effective replacement power while allowing Lakeland to meet its environmental permitting requirements. Further, the proposed conversion will provide Lakeland with the capacity needed to meet its obligations under a recently signed wholesale contract to provide 100 MW of power to the Florida Municipal Power Agency (FMPA) starting in June 2001.

We are cognizant that the proposed conversion is not necessary to satisfy a reliability need for Lakeland's retail load at the planned in-service date. We note that if no units on Lakeland's system are retired beyond 2002, Lakeland's retail reliability needs could be met through 2007 without the proposed conversion. Assuming that all of Lakeland's planned unit retirements are made, we find that Lakeland will need additional capacity in 2003 to maintain its 15% reserve margin to serve retail load. Considering Lakeland's obligations under its contract with FMPA, however, the proposed conversion is needed to maintain a 15% reserve margin for Lakeland's system in 2002. In addition, the proposed conversion will enhance reliability for Lakeland's system and Peninsular Florida.

We find reasonable the energy and peak demand forecasts used by Lakeland to determine the need for the capacity to be provided by the proposed conversion of McIntosh Unit 5. Given the planned retirements, Lakeland has demonstrated a need for 13 MW of additional capacity in 2003 to adequately serve its retail load while meeting its 15% minimum reserve criteria. Considering Lakeland's obligations under its contract with FMPA, Lakeland has demonstrated a system need for 6 MW of capacity in 2002.

Based upon Lakeland's fuel price forecast and its underlying assumptions, we find that Lakeland has provided adequate assurances regarding the availability of primary and secondary fuel to serve McIntosh Unit 5 at a reasonable cost. Lakeland intends to make contract and spot purchases of natural gas to provide the primary fuel for McIntosh Unit 5. Lakeland also plans to increase its on-site storage capacity for No. 2 fuel oil, the unit's secondary fuel, to allow full load operation of McIntosh Unit 5 for 2.5 days. Further, we find that Lakeland has provided adequate assurances that sufficient natural gas pipeline capacity will be available to transport natural gas to the McIntosh Unit 5 site.

Lakeland's system currently consists of approximately 70% natural gas powered capacity and 30% coal powered capacity, with a minimal amount of fuel oil capacity. McIntosh Unit 5 will increase Lakeland's natural gas powered capacity to approximately 76% of its total capacity. Thus, the unit will not enhance Lakeland's fuel diversity. However, we note that the use of No. 2 fuel oil as the unit's backup fuel will reduce the risk associated with potential natural gas shortages or price spikes. Further, we note that Lakeland's resource plan includes the addition of a 238 MW fluidized bed coal unit in 2004 which will improve fuel diversity on Lakeland's system.

B. Need for Adequate Electricity at Reasonable Cost

As stated above, Lakeland has demonstrated that the proposed conversion of McIntosh Unit 5 will provide Lakeland with capacity to reliably serve its retail and wholesale load and to satisfy its environmental permitting requirements in 2002. We find that the proposed conversion will allow Lakeland to meet these needs at a reasonable cost. McIntosh Unit 5 and the proposed conversion have an estimated installed cost of $361.8/kW, or approximately $133.5 million total. McIntosh Unit 5 will be the first 501G plant in commercial operation and, when converted to combined cycle operation, will be the most efficient generating unit on Lakeland's system. As discussed below, we find that McIntosh Unit 5 and the proposed conversion to combined cycle operation is the most cost-effective alternative available to satisfy Lakeland's environmental and reliability needs.

C. Cost-Effectiveness

We find that McIntosh Unit 5 and the proposed conversion to combined cycle operation is the most cost-effective alternative available to Lakeland to meet its environmental permitting requirements and its future reliability needs. The proposed conversion will allow Lakeland to accelerate the retirement of some of the older, less efficient generating units on its system. In addition, revenues from Lakeland's contract with FMPA will offset some of the conversion costs.

Lakeland's economic analysis demonstrated that its proposed expansion plan, which includes the conversion of McIntosh Unit 5 to combined cycle, the contract with FMPA, and the retirement of certain units, is approximately $21 million less costly than an expansion plan which included the apparent low bid from its IFP process. Lakeland's analysis also demonstrated that its proposed expansion plan is approximately $28 million less costly than an expansion plan which included Lakeland's next lowest self-build option.

We find that Lakeland adequately explored and evaluated the availability of purchase power options through its IFP process. As suggested above, none of the responsive proposals was more cost-effective than Lakeland's proposed expansion plan. Further, as discussed below, we note that no demand-side management programs or other conservation measures proved to be cost-effective alternatives.

Lakeland provided sufficient information on the site, design, and engineering characteristics of McIntosh Unit 5 and the proposed conversion for this Commission to evaluate all aspects of the proposed addition. We find that the economic and financial assumptions used by Lakeland in their resource planning studies are reasonable. We also find that Lakeland's fuel price forecasts for coal, No. 6 oil, No. 2 oil, nuclear energy, and natural gas are reasonable.

Further, we find that Lakeland adequately considered the costs of environmental compliance in estimating the costs for McIntosh unit 5 and the proposed conversion. Lakeland included a contingency for increased environmental compliance costs in the event that its planned Ultra Low NOx burners are ineffective and it is required to use more costly emissions technology. We note that no associated facilities or transmission improvements are required in conjunction with the proposed addition, and, thus, no cost is attributed to those items.

D. Conservation Measures

We find no cost-effective conservation measures taken by or reasonably available to Lakeland that might mitigate the need for all or part of the proposed addition. Lakeland evaluated 66 potential conservation and demand-side management programs, but none were found to be more cost-effective than McIntosh Unit 5 and the proposed conversion.

IV. CONCLUSIONS OF LAW

Pursuant to Section 403.519, Florida Statutes, this Commission is the sole forum for the determination of need for an electrical power plant subject to the Florida Electrical Power Plant Siting

Act. The electrical power plant for which Lakeland seeks approval is subject to the Florida Electrical Power Plant Siting Act. Upon consideration of the record evidence in light of the criteria set forth in Section 403.519, Florida Statutes, as discussed above, we find that Lakeland has demonstrated the need for the proposed conversion of McIntosh Unit 5 to combined cycle operation. Thus, we hereby grant Lakeland's petition for determination of need for an electrical power plant.

Pursuant to Section 403.519, Florida Statutes, this order constitutes final agency action and shall serve as our report required by Section 403.507(2)(a)2, Florida Statutes. Since no other action is necessary, this docket shall be closed.

Based on the foregoing, it is

ORDERED by the Florida Public Service Commission that the City of Lakeland's petition for determination of need for a proposed electrical power plant is hereby granted. It is further

ORDERED that this docket shall be closed.

By ORDER of the Florida Public Service Commission this 10th day of May, 1999.

/s/ Blanca S. Bayó
BLANCA S. BAYÓ, Director
Division of Records and Reporting

This is a facsimile copy. A signed copy of the order may be obtained by calling 1-850-413-6770.

(S E A L)

WCK

NOTICE OF FURTHER PROCEEDINGS OR JUDICIAL REVIEW

The Florida Public Service Commission is required by Section 120.569(1), Florida Statutes, to notify parties of any administrative hearing or judicial review of Commission orders that is available under Sections 120.57 or 120.68, Florida Statutes, as well as the procedures and time limits that apply. This notice should not be construed to mean all requests for an administrative hearing or judicial review will be granted or result in the relief sought.

Any party adversely affected by the Commission's final action in this matter may request: 1) reconsideration of the decision, pursuant to Rule 25-22.080(2), Florida Administrative Code, by filing a motion for reconsideration with the Director, Division of Records and Reporting, 2540 Shumard Oak Boulevard, Tallahassee, Florida 32399-0850, within five (5) days of the Commission's decision in the form prescribed by Rule 25-22.060, Florida Administrative Code; or 2) judicial review by the Florida Supreme Court in the case of an electric, gas or telephone utility or the First District Court of Appeal in the case of a water and/or wastewater utility by filing a notice of appeal with the Director, Division of Records and reporting and filing a copy of the notice of appeal and the filing fee with the appropriate court. This filing must be completed within thirty (30) days after the issuance of this order, pursuant to Rule 9.110, Florida Rules of Appellate Procedure. The notice of appeal must be in the form specified in Rule 9.900(a), Florida Rules of Appellate Procedure.

10.4.4 SFWMD COMSUMPTIVE USE

FILE 3112

Southwest Florida Water Management District

5060 U.S. HIGHWAY 41, SOUTH — BROOKSVILLE, FLORIDA 33512
PHONE (904) 796-7211

April 10, 1980

RECEIVED
APR 14 1980
R. W. TOMLIN, Mech. Eng.
POWER GENERATION DIVISION
LAKELAND ELECTRIC & WATER UTILITIES

Mr. Ronald Tomlin, P.E.
McIntosh Plant Construction Office
Power Generation Division
Post Office Box 3523
Lakeland, FL 33802

Re: Consumptive Use Permit No. 7600293 - City of Lakeland, C. D. McIntosh, Power Plant No. 3

Dear Mr. Tomlin:

The sites of the three backup, cooling water wells have been reviewed by staff and approved. Enclosed are copies of these well construction permits for the specified approved sites. The City of Lakeland, C. D. McIntosh Power Plant, is expected to comply with special condition Groundwater III, of the Power Plant Site Certification. This is noted on the bottom of each construction permit.

If you have any questions, please contact our office.

Very truly yours,

RAND R. BALDWIN
Hydrologist
Regulatory Division

RRB:eab
Enclosures

cc: L. M. Blain
J. T. Ahern
J. E. Curren
G. W. Kuhl

Post-it® Fax Note 7671	Date 6/8/98 # of pages 7
To FARZIE SHELTON	From BILL RODRIGUEZ
Co./Dept. McINTOSH PLANT	Co. ADM/ENV
Phone # 6603	Phone # 6589
Fax # 603-6335	Fax # 499-6362

FARZIE!
EACH WELL IS
RATED AT
2,000 GPM CAPACITY

Bill

I HOPE THIS INFORMATION WILL HELP.

Date: 3/12/80

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT (REGULATORY)

APPLICATION FOR A PERMIT TO CONSTRUCT A WELL 352837-2C

To: Chief, Permits Department
5060 U.S. Hwy. 41 South
Brooksville, Florida 33512
Phone (904) 796-7211

If the withdrawal is from a well having an inside diameter of six inches (6") or more or if the withdrawal during any single day is to exceed one million (1,000,000) gallons or if the average annual daily withdrawal is to exceed one hundred thousand (100,000) gallons average per day on an annual basis, then A CONSUMPTIVE USE PERMIT MUST BE APPROVED PRIOR TO THE CONSTRUCTION PERMIT BEING AUTHORIZED.

(TYPE OR USE BALLPOINT PEN AND PRESS HARD)

In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

LOCKE WELL & PUMP CO. (DRILLING CONTRACTOR) 1242 (NUMBER) 3685 Old Winter Garden Road (ADDRESS)

requests authorization to construct a well for City of Lakeland - McIntosh Power Plant (NAME OF WELL OWNER)

1140 East Parker Street (ADDRESS (MAILING) STREET OR BOX NO.) Lakeland (CITY) 33801 (ZIP CODE)

TYPE OF EQUIPMENT Cable Tool

LOCATION SKETCH
(NEAREST MAIN INTERSECTION)

DEPTH: 400' DIAMETER 24"

CASED: DEPTH 200' MATERIAL 30x24 steel pipe

SEAL grout

GPM 2,000 COUNTY Polk

PURPOSE: Emergency cooling water to Power Plant

LEGAL DESCRIPTION:
QTR ___ QTR ___ SEC. 4 TWP 28 S. Range 24 E.

LOT BLK UNIT SUBDIVISION

I agree to furnish a log within 30 days after drilling operations cease and to comply with all provisions of the Rules and Regulations of the SWFWMD(R) and with local health regulations relative to well construction.

Signature of Drilling Contractor Edmund A. Rogers, Vice President
Edmund A. Rogers, Vice President

Signature of Owner or his authorized Agent Ronald W. Tomlin

DO NOT WRITE BELOW THIS LINE — FOR OFFICIAL USE ONLY

All drilling shall be preformed by, or in the presence of, a certified driller and a copy of the well log will be submitted to this office within 30 days after drilling operations cease. In addition to these provisions, compliance with the special item number(s) BR COD, as described on the reverse side of this form, shall be required.

Granted by: [signature] Date: 4/7/80

Title: Permit Administrator

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED BY AN AUTHORIZED OFFICER OF SWFWMD(R) AND SHALL BE PROMINENTLY DISPLAYED AT THE WELL SITE DURING ALL DRILLING OPERATIONS.

Subject to Special Cond. to CUP 8? Certificate
City of Lakeland
C.D. McIntosh, Jr. Power Plant Unit #3
DRR No 74-06-SR

Water Management ... Regulatory ... 1980

SWFWMD(R)
SF 1710 Rev. 02/78

Date: 3/12/80

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT (REGULATORY)

APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

3528 38-20

To: Chief, Permits Department
5060 U.S. Hwy. 41 South
Brooksville, Florida 33512
Phone (904) 796-7211

If the withdrawal is from a well having an inside diameter of six inches (6") or more or if the withdrawal during any single day is to exceed one million (1,000,000) gallons or if the average annual daily withdrawal is to exceed one hundred thousand (100,000) gallons average per day on an annual basis, then A CONSUMPTIVE USE PERMIT MUST BE APPROVED PRIOR TO THE CONSTRUCTION PERMIT BEING AUTHORIZED.

(TYPE OR USE BALLPOINT PEN AND PRESS HARD)

In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

LOCKE WELL & PUMP CO. — DRILLING CONTRACTOR; 1242 — NUMBER; 3685 Old Winter Garden Road — ADDRESS

requests authorization to construct a well for City of Lakeland - McIntosh Power Plant — NAME OF WELL OWNER

1140 East Parker Street — ADDRESS (MAILING) STREET OR BOX NO.; Lakeland — CITY; 33801 — ZIP CODE

TYPE OF EQUIPMENT Cable Tool

LOCATION SKETCH
(NEAREST MAIN INTERSECTION)

DEPTH: 400' DIAMETER 24"

CASED: DEPTH 200' MATERIAL 30x24 steel pipe

SEAL grout

GPM 2,000 COUNTY Polk

PURPOSE: Emergency cooling water to Power Plant

LEGAL DESCRIPTION
QTR ___ QTR ___ SEC. 4 TWP 28 S. Range 24 E.

LOT BLK UNIT SUBDIVISION

I agree to furnish a log within 30 days after drilling operations cease and to comply with all provisions of the Rules and Regulations of the SWFWMD(R) and with local health regulations relative to well construction.

Signature of Drilling Contractor [signature]
Edmund A. Rogers, Vice President
Signature of Owner or his authorized Agent [signature]

DO NOT WRITE BELOW THIS LINE -- FOR OFFICIAL USE ONLY

All drilling shall be performed by, or in the presence of, a certified driller and a copy of the well log will be submitted to this office within 30 days after drilling operations cease. In addition to these provisions, compliance with the special item number(s) Below, as described on the reverse side of this form, shall be required.

Granted by: [signature] Date: 4/7/80

Title: Permit Administrator

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED BY AN AUTHORIZED OFFICER OF SWFWMD(R) AND SHALL BE PROMINENTLY DISPLAYED AT THE WELL SITE DURING ALL DRILLING OPERATIONS.

Subject to Special Conditions III of Certification 1 1080
City of Lakeland
C. D. McIntosh, Jr., Power Plant Unit #3
DER No 74-06-SR-

SWFWMD(R)
SF 1710 Rev. 02/78

District Regulation

Date: 3/12/80

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT (REGULATORY)

APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

352839-20

To: Chief, Permits Department
5060 U.S. Hwy. 41 South
Brooksville, Florida 33512
Phone (904) 796-7211

If the withdrawal is from a well having an inside diameter of six inches (6") or more or if the withdrawal during any single day is to exceed one million (1,000,000) gallons or if the average annual daily withdrawal is to exceed one hundred thousand (100,000) gallons average per day on an annual basis, then A CONSUMPTIVE USE PERMIT MUST BE APPROVED PRIOR TO THE CONSTRUCTION PERMIT BEING AUTHORIZED.

(TYPE OR USE BALLPOINT PEN AND PRESS HARD)

In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

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requests authorization to construct a well for City of Lakeland - McIntosh Power Plant — NAME OF WELL OWNER

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TYPE OF EQUIPMENT Cable Tool

DEPTH: 400' DIAMETER 24"

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SEAL grout

GPM 2,000 COUNTY Polk

PURPOSE: Emergency cooling water to Power Plant

LOCATION SKETCH
(NEAREST MAIN INTERSECTION)

LEGAL DESCRIPTION:
QTR ____ QTR ____ SEC. 4 TWP 28 S. Range 24 E.

LOT BLK UNIT SUBDIVISION

I agree to furnish a log within 30 days after drilling operations cease and to comply with all provisions of the Rules and Regulations of the SWFWMD(R) and with local health regulations relative to well construction.

Signature of Drilling Contractor: Edmund A. Rogers, Vice President

Signature of Owner or his authorized Agent: Ronald W. Tomlinson

DO NOT WRITE BELOW THIS LINE -- FOR OFFICIAL USE ONLY

All drilling shall be preformed by, or in the presence of, a certified driller and a copy of the well log will be submitted to this office within 30 days after drilling operations cease. In addition to these provisions, compliance with the special item number(s) B,C,4,L , as described on the reverse side of this form, shall be required.

Granted by: [illegible] Date: 4/7/80

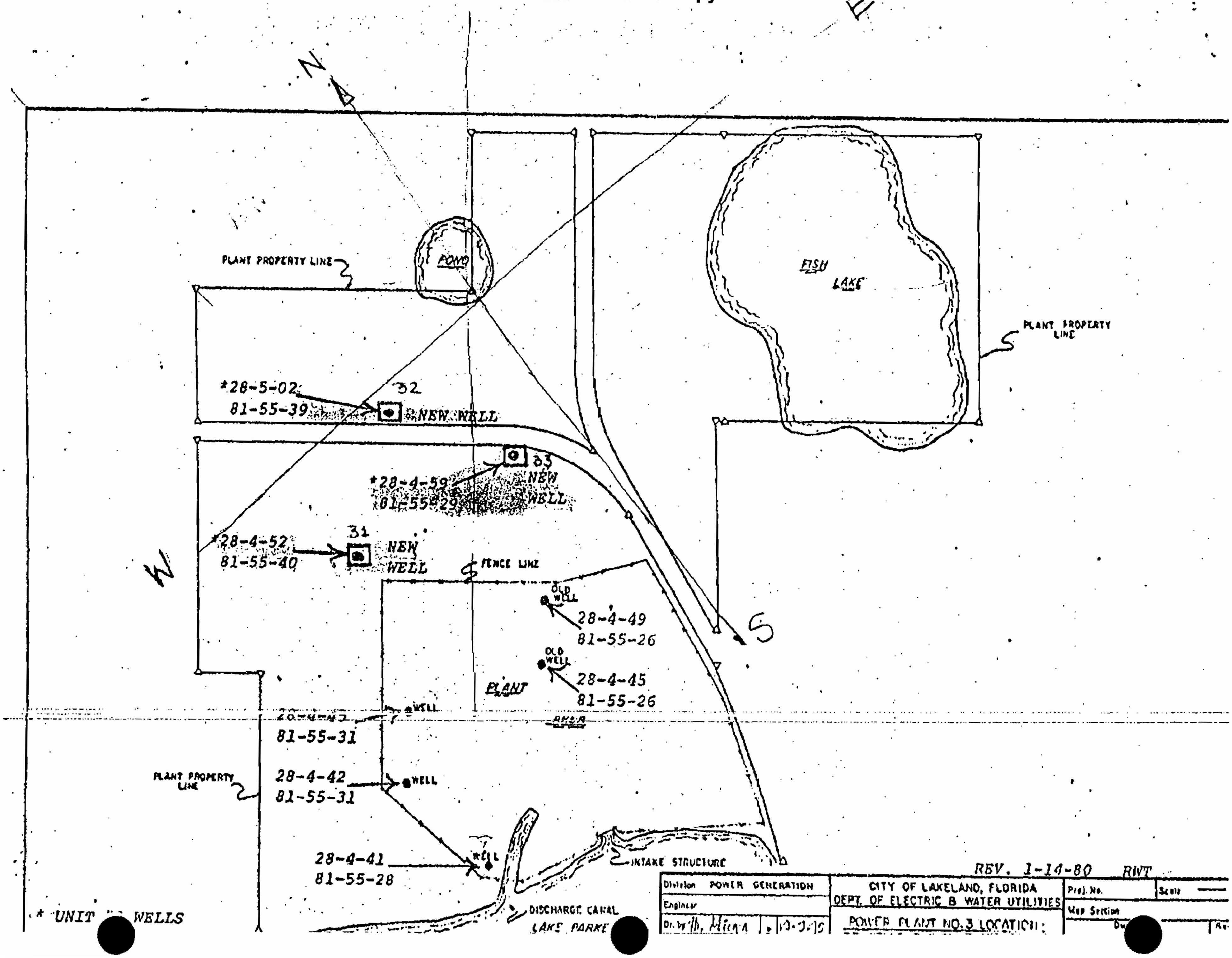
Title: [illegible]

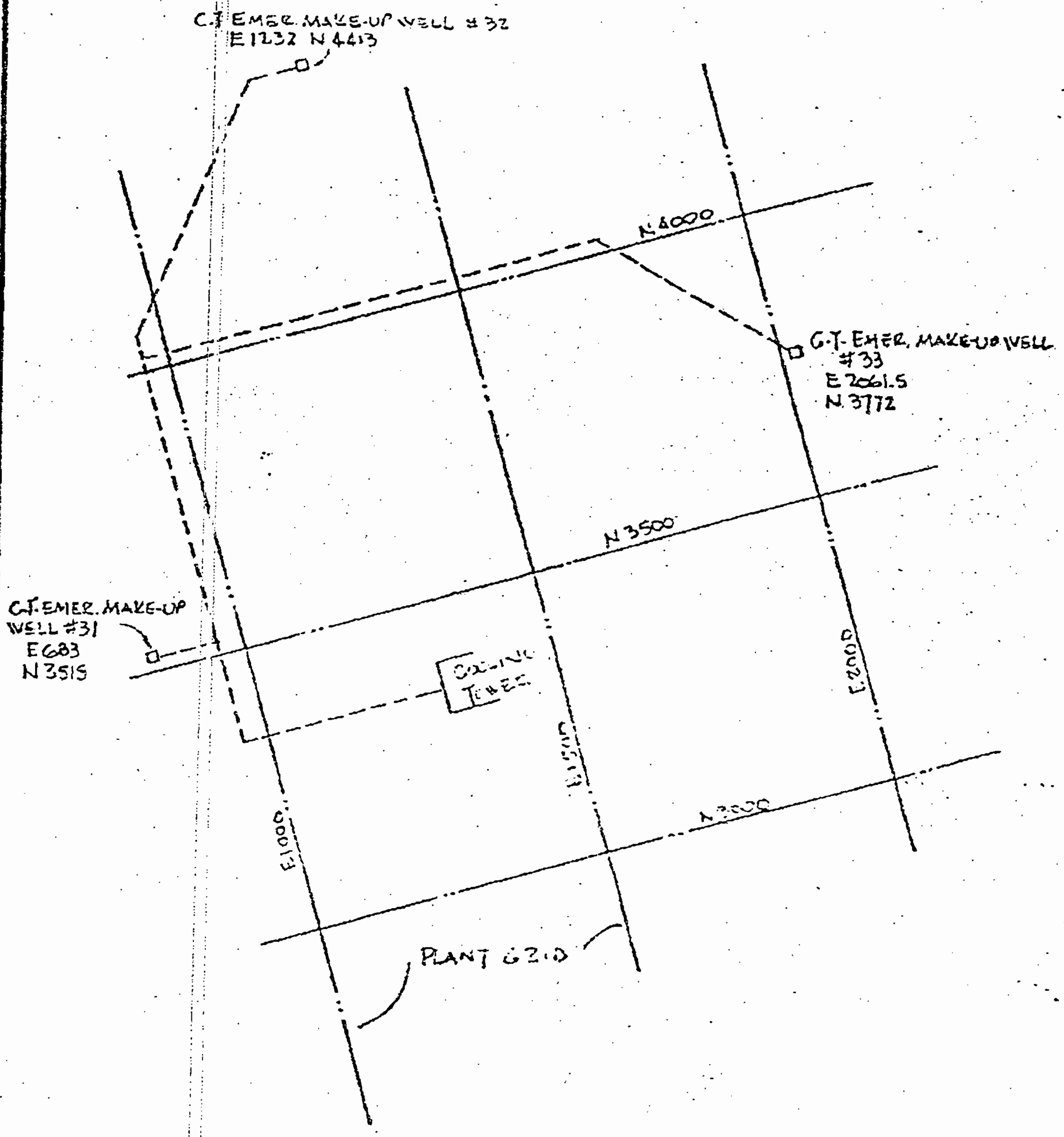
THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED BY AN AUTHORIZED OFFICER OF SWFWMD(R) AND SHALL BE PROMINENTLY DISPLAYED AT THE WELL SITE DURING ALL DRILLING OPERATIONS.

SUBJECT TO SPECIAL CONDITION III OF CERTIFICATION
CITY OF LAKELAND
C. D. McINTOSH JR., POWER PLANT UNIT #3
DER No. 74-06-SR.

SWFWMD(R)
SF 1710 Rev. 02/78

Best Available Copy





Division POWER GENERATION	CITY OF LAKELAND, FLORIDA DEPT. OF ELECTRIC & WATER UTILITIES	Proj. No.	Scale NONE
Engineer		Map Section	
Dr. by [illegible] 1-14-80	COOLING TOWER EMERGENCY MAKE-UP WELL WATER LOCATIONS	Dwg. No.	R

1. SERVICE: WELL WATER PUMPS DISCHARGE FLOW
2. TAG: SEE BELOW

3 LOCATION: OUTDOORS

4 OPERATING CONDITIONS
FLUID: WATER
PRESS: 60 PSIG
TEMP: AMBIENT
FLOW: 2000 GPM

5 METER
MANUFACTURER: BROOKS
TYPE: POSITIVE DISPLACEMENT
MODEL: 3322-10A31AA
RANGE: 0-2200 GPM
SCALE: GALLONS
ELEMENT MATERIAL: EBONITE
CASE MATERIAL: CAST IRON
CONN SIZE & RATING: 10" 150# R.F FLANGE
BODY RATING: 230 PSIG
ACCURACY: ±0.2%

6. LINE SIZE: 10" RATING, 150 PSIG, FIBERGLASS REINFORCED PIPE
FLANGE: FF 125#

TAG NO'S

3-SW-511-FIQ WELL WATER PUMP-31 DISCH.	3-SW-512-FIQ WELL WATER PUMP-32 DISCH	3-SW-513-FIQ WELL WATER PUMP-33 DISCH.

REV	DATE	BY	
0	7-12-80	RFF	FOR PROCUREMENT
A	2-29-80	RFF	FOR APPROVAL

MAIN
CHAS. T. MAIN, INC.
BOSTON

JOB NO 3297-1

CITY OF LAKELAND
DEPARTMENT OF ELECTRIC & WATER UTILITIES
C. D McINTOSH Jr. POWER PLANT UNIT 3

INSTRUMENT DATA SHEET

FLOW METER

DATA SHEET NO. FIQ-2

DWG NO 528001 | CLIENT REF NO. | REV 0 | SH 1 OF 1

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
WATER USE
INDIVIDUAL
PERMIT NO. 200047.03

EXPIRATION DATE: August 27, 2002

PERMIT ISSUE DATE: August 27, 1996

THE PERMITTEE IS RESPONSIBLE FOR APPLYING FOR A RENEWAL OF THIS PERMIT PRIOR TO THE EXPIRATION DATE WHETHER OR NOT THE PERMITTEE RECEIVES PRIOR NOTIFICATION BY MAIL. FAILURE TO DO SO AND CONTINUED USE OF WATER AFTER EXPIRATION DATE IS A VIOLATION OF DISTRICT RULES AND MAY RESULT IN A MONETARY PENALTY AND/OR LOSS OF WATER. APPLICATION FOR RENEWAL PRIOR TO THE EXPIRATION DATE IS SUBJECT TO DISTRICT EVALUATION AND APPROVAL.

This permit, issued under the provision of Chapter 373, Florida Statutes and Florida Administrative Code 40D-2, authorizes the Permittee to withdraw the quantities outlined herein, and may require various activities to be performed by the Permittee as outlined by the Special Conditions. This permit, subject to all terms and conditions, meets all District permitting criteria.

GRANTED TO:

City of Lakeland C. D. McIntosh Power Plant
3030 East Lake Parker Drive
Lakeland, FL 33805

ABSTRACT: This is a renewal to decrease the permitted quantities for an existing power plant in west-central Polk county. The project is located in the Southern Water Use Caution Area (SWUCA). The Annual Average quantity decreased from 3,000,000 gallons per day (gpd) to 2,881,900 gpd (decrease: 118,100 gpd). The existing Maximum quantity of 4,360,000 gpd is replaced with a Peak Month quantity of 4,032,000 gpd. The existing permit did not contain a Peak Month Daily quantity. The proposed quantities are for boiler water makeup and the cooling requirements of the power plant. The Permittee utilizes approximately 738,100 gpd of reuse water for cooling which reduces the demand on water resources. The proposed quantities are based on historical pumpage data and the city's projections of the amount of reuse water that will be available for cooling. Special conditions address: submittal of monthly pumpage reports; maintenance of existing flow meters; maintenance of existing staff gauge; compliance with minimum lake levels; capping of wells not in use; determining actual well construction characteristics of three existing wells; and, reporting of industrial pumpage (total quantities withdrawn from the lake) as well as the permitted pumpage (consumptively used quantities).

TOTAL QUANTITIES AUTHORIZED UNDER THIS PERMIT (in gpd)

AVERAGE: 2,881,900 PEAK MONTHLY: 4,032,000

Use	Average	Peak Monthly
Industrial:	2,881,900 gpd	4,032,000 gpd

See Withdrawal Table for quantities permitted for each withdrawal point.

Southwest Florida
Water Management District
2379 Broad Street • Brooksville, Florida 34609-6899 • 1-800-423-1476 (Florida Only) or
(352) 796-7211 • SUNCOM 628-4150 • T.D.D. Number Only (Florida Only): 1-800-231-6103

An Equal Opportunity Employer

7601 Highway 301 North
Tampa, Florida 33637-6759
1-800-836-0797 or (813) 985-7481
SUNCOM 578-2070

170 Century Boulevard
Bartow, Florida 33830-7700
1-800-492-7862 or (941) 534-1448
SUNCOM 572-6200

115 Corporation Way
Venice, Florida 34292-3524
1-800-320-3503 or (941) 486-1212
SUNCOM 526-6900

2303 Highway 44 West
Inverness, Florida 34453-3809
(352) 637-1360

August 27, 1996

City of Lakeland C. D. McIntosh Power Plant
(C. D. McIntosh Power Plant)
3030 East Lake Parker Drive
Lakeland, FL 33805

Subject: Final Agency Action Transmittal Letter
Individual Water Use Permit No(s). 200047.03

Your Water Use Permit(s) was/were approved by the District Governing Board subject to all terms and conditions set forth in the approved Permit(s).

Please be advised that the Governing Board has formulated a water shortage plan as referenced in Condition 4 of the Standard Water Use Permit Conditions (Exhibit A), and will implement such a plan during periods of water shortage. You will be notified during a declared water shortage of any change in the conditions of your Permit(s) or any suspension of your Permit(s), or of any restriction on your use of water for the duration of any declared water shortage.

One of the enclosed ID tags must be affixed in a prominent location on each permitted withdrawal facility. The necessary tags(s) and instructions are enclosed. If you have any questions or concerns about your Permit, please contact the Regulation Department or contact this office at Extension 4338.

Sincerely,

Annie L. Taylor

ANNIE L. TAYLOR
Processing & Records Section

ALT:kat

Enclosures: 1. Approved Permit
2. Surface Water and/or Well Tags (7)
3. Instructions for Applying Water Use Tag

cc: Lakeland Electric and Water, G. A. "Bill" Rodriguez

Excellence Through Quality Service

WUPINAPR.FAA
R.3-23-92

PROPERTY LOCATION: Polk County, within the City of Lakeland and 2.22 miles north of the intersection of United States Highway 92 and east of Lake Parker Drive.

TYPE OF APPLICATION: Renewal

WATER USE CAUTION AREA: Southern

APPLICATION FILED: August 1, 1995

ACRES: 601 Owned

APPLICATION AMENDED: March 25, 1996

WATER USE: INDUSTRIAL OR COMMERCIAL

FACILITY NAME	USE TYPE
C. D. McIntosh Power Plant	Boiler Makeup-Water Consumptive Cooling (chemical/power/cement plants)

I.D. NO. PERMITTEE/ DISTRICT	LOCATION LAT/LONG	DIAM. (INCHES)	DEPTH TOTAL/CASED	USE	GALLONS PER DAY AVERAGE	GALLONS PER DAY PEAK MONTHLY
1 / 1	280442/815535	10	600 / UNK	I/C	361,900	1,080,000 Standby
2 / 2	280442/815540	10	600 / UNK	I/C	361,900	1,080,000 Standby
3 / 3	280444/815540	10	600 / UNK	I/C	361,900	1,080,000 Standby
5 / 5	280449/815530	10	600 / UNK	I/C	756,000	864,000
6 / 6	280444/815527	36	N/A	I/C	1,008,000	1,152,000 Lake Parker
7 / 7	280444/815528	36	N/A	I/C	361,900	1,152,000 Lake Parker
8 / 8	280451/815531	10	650 / 310	I/C	756,000	864,000

I/C=Industrial or Commercial

DISTRICT I.D. NO.	SECTION/TOWNSHIP/RANGE
1, 2, 3, 5 & 8	05/28/24
6 & 7	04/28/24

SPECIAL CONDITIONS:

1. All reports required by the permit shall be submitted to the District on or before the tenth day of the month following data collection and shall be addressed to:

   Permit Data Section, Records and Data Department
   Southwest Florida Water Management District
   2379 Broad Street
   Brooksville, Florida 34609-6899

   Unless otherwise indicated, three copies of each plan or report, with the exception of pumpage, rainfall, evapotranspiration, water level or water quality data which require one copy, are required by the permit.

2. The Permittee shall continue to maintain and operate the existing non-resettable, totalizing flow meter(s), or other flow measuring device(s) as approved by the Regulation Department Director, Resource Regulation, for District ID No(s). 1, 2, 3, 5, 6, 7 & 8, Permittee ID No(s). 1, 2, 3, 5, 6, 7, & 8. Such device(s) shall maintain an accuracy within five percent of the actual flow as installed. Total withdrawal and meter readings from each metered withdrawal shall be recorded on a monthly basis and reported to the Permit Data Section, Records and Data Department, (using District forms) on or before the tenth day of the following month. If a metered withdrawal is not utilized during a given month, a report shall be submitted to the Permit Data Section, Records and Data Department, indicating zero gallons.

3. The Permittee shall continue to maintain the District-approved staff gauge(s) and report measurements of water levels, as indicated in the table below. Water levels shall be recorded and reported to the Permit Data Section, Records and Data Department, (on District forms) on or before the tenth day of the following month. To the maximum extent possible, water levels shall be recorded as indicated in the table below. The frequency of recording may be modified by the Regulation Department Director, Resource Regulation, as necessary to ensure the protection of the resource.

District ID No.	Permittee ID No.	Water Body/ Wetland	Latitude/ Longitude	Recording Frequency
50	SG-1	Lake Parker	280259/815522	Weekly

Water Level Recording Timetable:

Daily	Same time of each day
Weekly	Same day of each week
Monthly	Same week of each month
Quarterly	Same week of months specified

4. Withdrawals from **Lake Parker** shall be allowed only when the water levels are above the applicable minimum management water level, in accordance with Chapter 40D-8, F.A.C. The applicable minimum management water level will be equivalent to either the Low Management* or Extreme Low Management Level**, depending upon historic water levels which have occurred in the lake during previous years. Determination of whether withdrawals are allowed at any particular time shall be based upon Chapter 40D-8.605(2) F.A.C. in conjunction with water levels read from the District-approved gauge at **280259/815522** Chapter 40D-8.605(2) F.A.C. indicates which Management Level applies at any particular time based upon historic water level conditions, as follows: "The Low Management Level shall be the applicable minimum management water level for such lake or other impoundment until four (4) consecutive years have passed during which the actual water level has failed to recede to the Extreme Low Management Level; in which event the Extreme Low Management Level shall become the applicable minimum water level for the lake or impoundment until the actual water level recedes to or below the extreme low management level."

   Management levels for the lake are as follows:

   *Low Management Level = 128.75 ft. NGVD
   **Extreme Low Management Level = 127.5 ft. NGVD

5. Any wells not in use, and in which pumping equipment is not installed shall be capped or valved in a water tight manner in accordance with Chapter 17-532.500(3)(a)(4), F.A.C.

6. By **August 31, 2001** or prior to modification of this permit, Permittee shall caliper or video log District ID No(s). **1, 2 & 3**, Permittee ID No(s). **1, 2 & 3**, to verify the casing depth and total depth of the well. If the well(s) or pump(s) are to be accessed for maintenance work prior to the above time constraints, the logging shall be done at that time. Results of the logging shall be submitted to the District within 30 days of the logging event. The log shall at a minimum indicate the casing depth, diameter, and total depth of the aforementioned well(s). A valid well completion report may be submitted in lieu of the caliper or video log.

7. The total Annual Average Daily withdrawal rate from Lake Parker, **District ID No. 6**, Permittee ID No. 6, shall not exceed 100,800,000 gpd. In addition:

   a. The Permittee shall convert monthly pumpage from District ID No. 6, Permittee ID No. 6, to actual water use by multiplying by a factor of 1.0% (0.1) and report this converted value as total flow from District ID No. 6, Permittee ID No. 6. Total flow shall be reported to the Permits Data Section on District forms on or before the tenth day of the following month.
   b. Total monthly recorded pumpage from District ID Nos. 6 shall be reported as <u>Industrial Pumpage.</u> Industrial Pumpage shall be reported to the Permits Data Section on District Forms on or before the tenth day of the following month.

STANDARD CONDITIONS:

1. The Permittee shall comply with the Standard Conditions attached hereto, incorporated herein by reference as Exhibit "A" and made a part hereof.

B. Jarvis

Authorized Signature
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

40D-2
Exhibit "A"

WATER USE PERMIT CONDITIONS

STANDARD CONDITIONS

1. If any of the statements in the application and in the supporting data are found to be untrue and inaccurate, or if the Permittee fails to comply with all of the provisions of Chapter 373, F.S., Chapter 40D, or the conditions set forth herein, the Governing Board shall revoke this permit in accordance with Rule 40D-2.341, following notice and hearing.

2. This permit is issued based on information provided by the Permittee demonstrating that the use of water is reasonable and beneficial, consistent with the public interest, and will not interfere with any existing legal use of water. If, during the term of the permit, it is determined by the District that the use is not reasonable and beneficial, in the public interest, or does impact an existing legal use of water, the Governing Board shall modify this permit or shall revoke this permit following notice and hearing.

3. The Permittee shall not deviate from any of the terms or conditions of this permit without written approval by the District.

4. In the event the District declares that a Water Shortage exists pursuant to Chapter 40D-21, the District shall alter, modify, or declare inactive all or parts of this permit as necessary to address the water shortage.

5. The District shall collect water samples from any withdrawal point listed in the permit or shall require the Permittee to submit water samples when the District determines there is a potential for adverse impacts to water quality.

6. The Permittee shall provide access to an authorized District representative to enter the property at any reasonable time to inspect the facility and make environmental or hydrologic assessments. The Permittee shall either accompany District staff onto the property or make provision for access onto the property.

7. Issuance of this permit does not exempt the Permittee from any other District permitting requirements.

8. The Permittee shall cease or reduce surface water withdrawal as directed by the District if water levels in lakes fall below applicable minimum water level established in Chapter 40D-8 or rates of flow in streams fall below the minimum levels established in Chapter 40D-8.

9. The Permittee shall cease or reduce withdrawal as directed by the District if water levels in aquifers fall below the minimum levels established by the Governing Board.

10. The Permittee shall practice water conservation to increase the efficiency of transport, application, and use, as well as to decrease waste and to minimize runoff from the property. At such time as the Governing Board adopts specific conservation requirements for the Permittee's water use classification, this permit shall be subject to those requirements upon notice and after a reasonable period for compliance.

11. The District may establish special regulations for Water Use Caution Areas. At such time as the Governing Board adopts such provisions, this permit shall be subject to them upon notice and after a reasonable period for compliance.

12. The Permittee shall mitigate, to the satisfaction of the District, any adverse impact to existing legal uses caused by withdrawals. When adverse impacts occur or are imminent, the District shall require the Permittee to mitigate the impacts. Adverse impacts include:

    a. A reduction in water levels which impairs the ability of a well to produce water;
    b. Significant reduction in levels or flows in water bodies such as lakes, impoundments, wetlands, springs, streams or other watercourses; or
    c. Significant inducement of natural or manmade contaminants into a water supply or into a usable portion of any aquifer or water body.

13. The Permittee shall mitigate to the satisfaction of the District any adverse impact to environmental features or offsite land uses as a result of withdrawals. When adverse impacts occur or are imminent, the District shall require the Permittee to mitigate the impacts. Adverse impacts include the following:

    a. Significant reduction in levels or flows in water bodies such as lakes, impoundments, wetlands, springs, streams, or other watercourses;
    b. Sinkholes or subsidence caused by reduction in water levels;
    c. Damage to crops and other vegetation causing financial harm to the owner; and
    d. Damage to the habitat of endangered or threatened species.

14. When necessary to analyze impacts to the water resource or existing users, the District shall require the Permittee to install flow metering or other measuring devices to record withdrawal quantities and submit the data to the District.

15. A District identification tag shall be prominently displayed at each withdrawal point by permanently affixing the tag to the withdrawal facility.

16. The Permittee shall notify the District within 30 days of the sale or conveyance of permitted water withdrawal facilities or the land on which the facilities are located.

17. All permits issued pursuant to these Rules are contingent upon continued ownership or legal control of all property on which pumps, wells, diversions or other water withdrawal facilities are located.

10.5 MONITORING PROGRAMS

10.5.1 ARCHAEOLOGICAL RESOURCE ASSESSMENT

DIVISIONS OF FLORIDA DEPARTMENT OF STATE

Office of the Secretary
Office of International Relations
Division of Elections
Division of Corporations
ision of Cultural Affairs
ion of Historical Resources
sion of Library and Information Services
Division of Licensing
Division of Administrative Services

MEMBER OF THE FLORIDA CABINET

State Board of Education
Trustees of the Internal Improvement Trust Fund
Administration Commission
Florida Land and Water Adjudicatory Commission
Siting Board
Division of Bond Finance
Department of Revenue
Department of Law Enforcement
Department of Highway Safety and Motor Vehicles
Department of Veterans' Affairs

FLORIDA DEPARTMENT OF STATE
Katherine Harris
Secretary of State
DIVISION OF HISTORICAL RESOURCES

April 7, 1999

GOLDER ASSOCIATES INC.
APR 12
GAINESVILLE

Mr. Karl Bullock
Golder Associates Inc.
6241 NW 23rd Street, Suite 500
Gainesville, FL 32653-1500

RE: DHR No.: 992284
Cultural Resource Assessment Request
McIntosh Plant Unit 5
City of Lakeland Department of Electric and Water Utilities
Polk County, Florida

Dear Mr. Bullock:

In accordance with the procedures contained in Chapter 403, *Florida Statutes*, we have reviewed the above referenced project for possible impact to archaeological and historical sites or properties listed, or eligible for listing, in the National Register of Historic Places, or otherwise of archaeological, historical or architectural value.

A review of the Florida Master Site File indicated that no significant archaeological or historical sites are recorded for or likely to be present within the project area. It is the opinion of this agency that because of the project nature and/or location the proposed project will have no effect on any sites listed, or eligible for listing in the *National Register of Historic Places*, or otherwise of historical, architectural or archaeological value.

If you have any questions concerning our comments, please do not hesitate to contact Stacey Hopper, Historic Sites Specialist (850)487-2333 or (800)847-7279. Your interest in protecting Florida's historic properties is appreciated.

Sincerely,

Laura A. Kammerer
for
George W. Percy, Director
Division of Historical Resources
and
State Historic Preservation Officer

GWP/Hsh

R.A. Gray Building • 500 South Bronough Street • Tallahassee, Florida 32399-0250 • http://www.flheritage.com

- ☐ Director's Office (850) 488-1480 • FAX: 488-3355
- ☐ Archaeological Research (850) 487-2299 • FAX: 414-2207
- ☑ Historic Preservation (850) 487-2333 • FAX: 922-0496
- ☐ Historical Museums (850) 488-1484 • FAX: 921-2503
- ☐ Historic Pensacola Preservation Board (850) 595-5985 • FAX: 595-5989
- ☐ Palm Beach Regional Office (561) 279-1475 • FAX: 279-1476
- ☐ St. Augustine Regional Office (904) 825-5045 • FAX: 825-5044
- ☐ Tampa Regional Office (813) 272-3843 • FAX: 272-2340

10.5.2 NOISE DATA SHEETS

noise monitoring data field sheets and show the wind speed, wind direction, and microphone orientation as well as comments on events and observations occurring during the monitoring program.

Golder Associates

NOISE MONITORING DATA FIELD SHEET

DAY

Project/Task No.: 993-7510-0200 Project Name: LAKELAND UNIT 5

Sample Site: 1 Sample Date: 18 FEB 99

Time Start: 1400 Time Stop: 1415 / 1419 Microphone Orientation: SE °FSD: 100

Wind Speed: 7-12 mph Wind Direction: SW ° Temperature: 78 ° RH: 60 %

Field Data:

Minimum 55.3 dBA L_{eq} 62.1 dBA

Maximum 76.4 dBA SEL 91.4 dBA

OCTAVE BAND ANALYSIS:

Hz	31.5	63	125	250	500	1K	2K	4K	8K	16K	LIN	A wt.
dB	78.3	70.0	63.9	55.4	53.3	51.7	50.2	43.5	34.2	24.4	81.9	58.6

PRE CAL 93.8 POST CAL 93.7

COMMENTS/NOTES (Reason and Time): LOCATED AT SE FENCE CORNER OF PROPERTY (ADMINISTRATION AREA). BASELINE W/O TRAFFIC @ 56db-58db TRAFFIC NOISE FAIRLY SUBSTANTIAL UP ~70db INTERMITTENT TRAFFIC 5-10 CARS/MINUTE. POWER BLOCK CONSTITUTES MOST STEADY NOISE. PLANT LOUDSPEAKER ~75db SOME PLANT CONSTRUCTION NOISE OCCURING PERIODICALLY

M. ARRANTS 18 FEB 99

Name Date

Golder Associates Inc.

6241 NW 23rd Street, Suite 500
Gainesville, FL 32653-1500
Telephone (352) 336-5600

Best Available Copy

Golder Associates

NOISE MONITORING DATA FIELD SHEET

DAY

Project/Task No.: 993-7510-0200 Project Name: LAKELAND UNIT 5

Sample Site: 2 Sample Date: 18 FEB 99

Time Start: 1933 Time Stop: 1948/ 1953 Microphone Orientation: NE °FSD: 100

Wind Speed: 3-7 mph Wind Direction: SW ° Temperature: 69 ° RH: 80 %

Field Data:

Minimum 52.3 dBA L_{eq} 58.8 dBA

Maximum 72.5 dBA SEL 87.7 dBA

OCTAVE BAND ANALYSIS:

NO TRAFFIC IN OBA

Hz	31.5	63	125	250	500	1K	2K	4K	8K	16K	LIN	A wt.
dB	68.9	66.5	60.8	51.3	49.5	50.4	48.4	39.7	32.4	18.4	76.2	53.3

PRECAL 93.7 POST CAL 93.7

COMMENTS/NOTES (Reason and Time): SOME TRAFFIC STILL PRESENT 5-10 CPM

POWER BLOCK AND COOLING TOWERS VERY OBVIOUS.

WORK IN COAL STORAGE STOPPED. BASELINE w/o TRAFFIC

5~~8~~-56 d/o TRAFFIC - SLOWING 2-5 CPM

10/13 PAUSED PLANE,

M. ARRANTS 18 FEB 99

Name Date

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NOISE MONITORING DATA FIELD SHEET

NIGHT

Project/Task No.: 993-7510-0200 Project Name: LAKELAND UNIT 5

Sample Site: 1 Sample Date: 19 FEB 99

Time Start: 0052 Time Stop: 0107 Microphone Orientation: E °FSD: 100

Wind Speed: 0-3 mph Wind Direction: SW ° Temperature: 59 ° RH: 90 %

Field Data:

Minimum 56.1 dBA L_{eq} 58.2 dBA

Maximum 60.3 dBA SEL 87.6 dBA

OCTAVE BAND ANALYSIS:

Hz	31.5	63	125	250	500	1K	2K	4K	8K	16K	LIN	A wt.
dB	78.7	71.1	67.6	55.0	54.4	52.0	51.9	46.2	35.7	27.1	81.5	58.1

PRECAL 93.7 POST CAL 93.7

COMMENTS/NOTES (Reason and Time): POWER BLOCK MAJOR NOISE SOURCE. VERY LIMITED TRAFFIC 0-2 CPM. SOME BUZZING EVIDENT FROM TRANSMISSION LINES OVER HEAD, MOST VEHICLE NOISE PAUSED OUT BASELINE ~ 58 db - 59 db TRAIN HORN IN DISTANCE — NO PAUSE —NOTHIN BUT PLANT— 3 CARS DURING SAMPLING PERIOD PAUSED OUT!

M. ARRANTS 19 FEB 99

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NOISE MONITORING DATA FIELD SHEET

DAY

Project/Task No.: 993-7510-0200 Project Name: LAKELAND UNIT 5

Sample Site: 2 Sample Date: 19 FEB 99

Time Start: 1428 Time Stop: 1443/1446 Microphone Orientation: S °FSD: 100

Wind Speed: 10-15 (20 GUSTS) mph Wind Direction: SW-W ° Temperature: 79° ° RH: 60 %

Field Data:

Minimum 58.5 dBA L_{eq} 64.0 dBA

Maximum 79.7 dBA SEL 93.5 dBA

OCTAVE BAND ANALYSIS:

Hz	31.5	63	125	250	500	1K	2K	4K	8K	16K	LIN	A wt.
dB	73.2	69.6	70.5	69.9	70.4	52.4	52.9	51.0	53.0	51.5	90.0	61.2

PRECAL 93.8 POST CAL 93.9

COMMENTS/NOTES (Reason and Time): SITE 2 LOCATED ~ 140' DUE WEST OF CONVEYOR TOWER FOR CARRYING COAL OVER PARKER LAKE ROAD. MOST NOISE COMING FROM COAL STORAGE AREA AND CONVEYOR, TRAFFIC RUNNING 10-15 CARS/MINUTE. SOME NOISE AUDIBLE FROM POWER PLANT. SOME NOISE COMING FROM HRSG PROJECT SITE OCCASIONALLY. BASE LINE ~66 db (65-67), USING TRUCK AS WIND SCREEN ~6' AWAY. WHEN CONVEYOR STOPS BASE LINE DROPS TO 60-61 db. R/R TRACK REPAIRS IN COAL YARD DIESEL MOTORIZED TIE PULLER RAN ENTIRE SAMPLING PERIOD.

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Golder Associates Inc.
6241 NW 23rd Street, Suite 500
Gainesville, FL 32653-1500
Telephone (352) 336-5600

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NOISE MONITORING DATA FIELD SHEET

NIGHT

Project/Task No.: 993-7510-0200 Project Name: LAKELAND UNIT 5

Sample Site: 2 Sample Date: 19 FEB 99

Time Start: 0119 Time Stop: 0134/0138 Microphone Orientation: E °FSD: 100

Wind Speed: 0-3 mph Wind Direction: SW ° Temperature: 59 ° RH: 90 %

Field Data:

Minimum 53.0 dBA L_{eq} 55.8 dBA

Maximum 66.1 dBA SEL 85.0 dBA

OCTAVE BAND ANALYSIS:

Hz	31.5	63	125	250	500	1K	2K	4K	8K	16K	LIN	A wt.
dB	69.8	67.8	61.8	51.1	49.4	52.5	48.1	43.2	29.4	15.7	76.1	56.3

PRECAL 93.7 POST CAL 93.7 RUNNING

COMMENTS/NOTES (Reason and Time): UNIT 3 212 MW, LARGE PRIMARY FORCED DRAFT COOLING TOWER AND 2 CELL SMALL FORCED COOLING TWR. TRAFFIC PRETTY MUCH NON-EXISTANT AT THIS POINT. BASELINE ~55 db 0124 PAUSED TRUCK ALL PLANT NOISE

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DAY

Project/Task No.: 993-7510-0200 Project Name: LAKELAND UNIT 5

Sample Site: 3 Sample Date: 18 FEB 99

Time Start: 1910 Time Stop: 1925/ 1920 Microphone Orientation: E °FSD: 100

Wind Speed: 3-7 mph Wind Direction: SW ° Temperature: 69 ° RH: 80 %

Field Data:

Minimum 43.6 dBA L_{eq} 49.9 dBA

Maximum 56.8 dBA SEL 79.2 dBA

OCTAVE BAND ANALYSIS:

Hz	31.5	63	125	250	500	1K	2K	4K	8K	16K	LIN	A wt.
dB	62.0	61.4	54.8	44.5	42.0	39.1	35.9	48.1	28.2	18.5	70.7	50.0

PRECAL 93.8 POSTCAL 93.7

COMMENTS/NOTES (Reason and Time): WINDS HAVE CALMED. CONSTRUCTION STOPPED. MOST NOISE FROM POWER PLANT AND COOLING TOWERS, BASELINE 47 db. HEAR GENERATOR RUNNING TO NORTH AT SUBSTATION AREA. SOME VEHICLE NOISE FROM I 4 TO NW

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Gainesville, FL 32653-1500
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DAY

Project/Task No.: 993-7510-0200 Project Name: LAKELAND UNIT 5

Sample Site: 3 Sample Date: DAY FEB 99

Time Start: 1454 Time Stop: 1509/1517 Microphone Orientation: E °FSD: 10c

Wind Speed: 10-15 mph (GUSTS TO 20) Wind Direction: SW ° Temperature: 78 ° RH: 60 %

Field Data:

Minimum 44.8 dBA L_{eq} 50.6 dBA

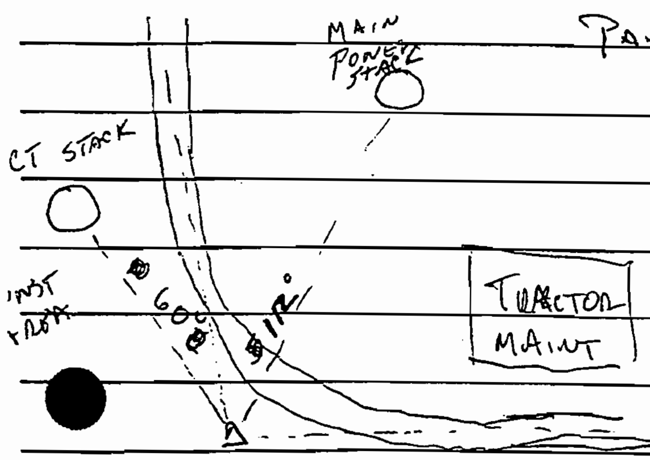
Maximum 66.5 dBA SEL 79.1 dBA

OCTAVE BAND ANALYSIS:

Hz	31.5	63	125	250	500	1K	2K	4K	8K	16K	LIN	A wt.
dB	63.2	61.9	57.2	48.9	41.9	41.5	36.7	31.9	32.0	22.1	78.9	49.2

PRE CAL 93.9 POST CAL 94.0

COMMENTS/NOTES (Reason and Time): SITE 3 LOCATED @ INTERSECTION OF PROJECTIONS OF CENTERLINES OF SERVICE ROADS. MOST NOISE FROM CONSTRUCTION VEHICLES. BASELINE 47-49 db w/ NO CONSTRUCTION TRAFFIC. CAN HEAR FORCED DRAFT COOLING TOWERS TO SE. FRONT END LOADER LOADING DIRT INTO DUMP TRUCK TO SOUTH WARNING BEEPER ON AND OFF. TRUCK PASSES BACK/FORTH PAUSED WHEN GOING BY.



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Gainesville, FL 32653-1500
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NOISE MONITORING DATA FIELD SHEET

NIGHT

Project/Task No.: 993-7510-0200 Project Name: LAKELAND UNIT 5

Sample Site: 3 Sample Date: 19 FEB 99

Time Start: 0144 Time Stop: 0159/0203 Microphone Orientation: E °FSD: 100

Wind Speed: 0-3 mph Wind Direction: SW ° Temperature: 59 ° RH: 95 %

Field Data:

Minimum 45.6 dBA L_{eq} 47.3 dBA

Maximum 53.0 dBA SEL 76.8 dBA

OCTAVE BAND ANALYSIS:

Hz	31.5	63	125	250	500	1K	2K	4K	8K	16K	LIN	A wt.
dB	64.5	63.4	55.2	45.0	47.1	43.6	39.3	32.4	24.2	14.1	71.1	49.0

PRE CAL 93.7 POST CAL 93.8

COMMENTS/NOTES (Reason and Time): POWER BLOCK & FORCED DRAFT COOLING TOWERS MAJOR NOISE SOURCE. SOME I4 NOISE TO NW. (VERY LITTLE). BASELINE STEADY 47 db — ALL PLANT NOISE →

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DAY

Project/Task No.: 993-7510-0200 Project Name: LAKELAND UNIT 5

Sample Site: 4 Sample Date: 18 FEB 99

Time Start: 2020 Time Stop: 2039/2041 Microphone Orientation: W °FSD: 100

Wind Speed: 3-7 mph Wind Direction: SW ° Temperature: 63 ° RH: 80 %

Field Data:

Minimum 44.9 dBA L_{eq} 56.0 dBA

Maximum 76.5 dBA SEL 84.0 dBA

OCTAVE BAND ANALYSIS: NO TRAFFIC ~ OBA

Hz	31.5	63	125	250	500	1K	2K	4K	8K	16K	LIN	A wt.
dB	69.5	58.9	55.0	44.9	42.7	39.7	35.2	38.5	35.4	36.7	72.3	48.2

PRECAL 93.8 POST CAL 93.8

COMMENTS/NOTES (Reason and Time): POWER BLOCK STILL VERY OBVIOUS.

TRAFFIC RATES HIGHEST DB LEVEL WHEN PASSING BY

BASELINE w/o TRAFFIC ~48 db. TRAFFIC COUNT ~ 2-5 CPM

TRAFFIC COUNT 5-10 CPM

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DAY

Project/Task No.: 993-7510-0200 Project Name: LAKELAND UNIT 5

Sample Site: 4 Sample Date: 18 FEB 99

Time Start: 1544 Time Stop: 1559 / 1603 Microphone Orientation: SW °FSD: 180

Wind Speed: ~~[illegible]~~ 10-15 mph Wind Direction: ~~[illegible]~~ SW ° Temperature: 78 ° RH: 60 %

Field Data:

Minimum 46.5 dBA L_{eq} 63.4 dBA

Maximum 80.1 TRAFFIC dBA SEL 92.8 dBA

OCTAVE BAND ANALYSIS: NO TRAFFIC DURING OBA

Hz	31.5	63	125	250	500	1K	2K	4K	8K	16K	LIN	A wt.
dB	70.8	65.6	61.8	46.2	44.7	41.9	42.2	37.2	42.0	30.5	83.3	48.4

PRECAL 93.8 POST CAL 93.8

COMMENTS/NOTES (Reason and Time): BASE LINE ~51db TRAFFIC MAJOR NOISE SOURCE WINDY TRAFFIC COUNT 16-20 CAR/MIN SITE 4 LOCATED ~ 0.5 MILES SOUTH OF SE CORNER OF PLANT SITE AT EAST R/W OF LAKE PARKER ROAD ~15' EAST OF FIRE HYDRANT. W/NO WIND DOWN TO 49db

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NOISE MONITORING DATA FIELD SHEET

NIGHT

Project/Task No.: 993-7510-0200 Project Name: LAKELAND UNIT 5

Sample Site: 4 Sample Date: 19 FEB 99

Time Start: 0026 Time Stop: 0041 Microphone Orientation: NW °FSD: 100

Wind Speed: 0-3 mph Wind Direction: SW ° Temperature: 60 ° RH: 80 %

Field Data:

Minimum 43.2 dBA L_{eq} 47.0 dBA

Maximum 66.3 dBA SEL 75.7 dBA

OCTAVE BAND ANALYSIS:

Hz	31.5	63	125	250	500	1K	2K	4K	8K	16K	LIN	A wt.
dB	70.7	59.9	57.2	46.7	46.7	39.0	35.8	35.8	25.8	17.6	73.6	50.0

PRE CAL 93.8 POST CAL 93.7

COMMENTS/NOTES (Reason and Time): BASE LINE ~46 db POWER BLOCK MAJOR NOISE SOURCE TRAFFIC COUNT DOWN TO 0-5 CPM. SOME TRAFFIC NOISE FROM OTHER SIDE OF LAKE. FROGS, BUGS & BIRDS MAKING OCCASSIONAL NOISE. MOST CLOSE TRAFFIC EXCLUDED DURING TWA. TRAFFIC COUNT 0-2 CPM @ 0040

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6241 NW 23rd Street, Suite 500
Gainesville, FL 32653-1500
Telephone (352) 336-5600

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DAY

Project/Task No.: 993-7510-0200 Project Name: LAKELAND UNIT 5

Sample Site: 6 Sample Date: 18 FEB 99

Time Start: 2045 Time Stop: 2055/2100 Microphone Orientation: W °FSD: 100

Wind Speed: 3-7 mph Wind Direction: SW ° Temperature: 63 ° RH: 80 %

Field Data:

Minimum 45.1 dBA L_{eq} 60.1 dBA

Maximum 79.5 dBA SEL 87.2 dBA

OCTAVE BAND ANALYSIS: No CARS IN OBA

Hz	31.5	63	125	250	500	1K	2K	4K	8K	16K	LIN	A wt.
dB	66.4	58.7	56.7	45.8	39.8	41.9	31.7	40.4	34.4	16.2	70.5	47.1

PRECAL 93.8 POST CAL 93.8

COMMENTS/NOTES (Reason and Time): POWER BLOCK STILL QUITE OBVIOUS.

TRAFFIC STILL LOUDER WHEN PASSING. TRAFFIC COUNT 3-7 per

INTERMITTENT. DOG BARKING TO SOUTH NO PAUSES

SOME TRAFFIC NOISE AUDIBLE ACROSS LAKE PARKER,

BASELINE w/o TRAFFIC ~47 db. TRAFFIC COUNT 2-8 per

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DAY

Project/Task No.: 993-7510-0200 Project Name: LAKELAND UNIT 5

Sample Site: 5 Sample Date: 18 FEB 99

Time Start: 1614 Time Stop: 1629 / 1635 Microphone Orientation: SW °FSD: 100

Wind Speed: 10-15 mph Wind Direction: SW-W ° Temperature: 78 ° RH: 60 %

Field Data:

Minimum 44.9 dBA L_{eq} 62.8 dBA

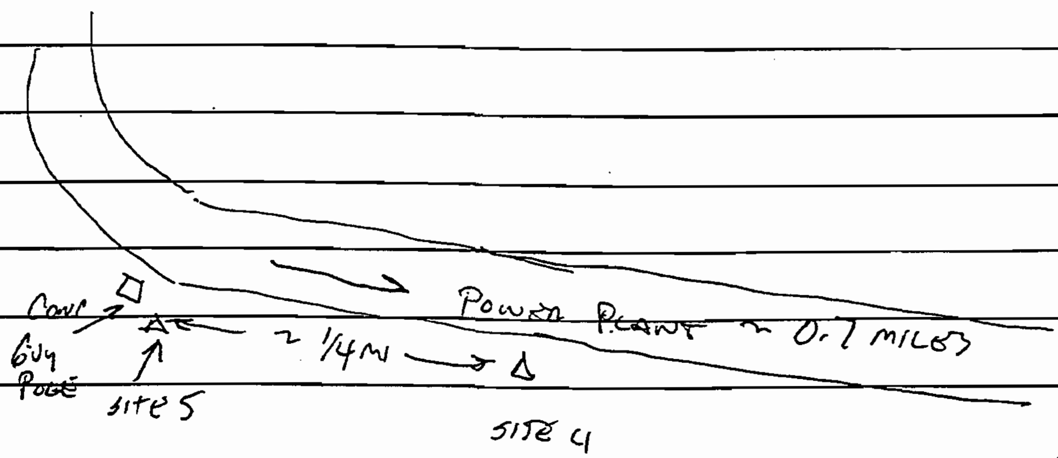
Maximum 80.9 dBA SEL 92.2 dBA

OCTAVE BAND ANALYSIS: NO TRAFFIC INCLUDED ONLY WIND

Hz	31.5	63	125	250	500	1K	2K	4K	8K	16K	LIN	A wt.
dB	73.9	64.6	57.2	48.2	47.7	49.2	49.5	42.5	42.8	34.5	88.1	55.1

PRECAL: 93.8 POST CAL 93.8

COMMENTS/NOTES (Reason and Time): SITE 5 LOCATED ~ 1/4 MILE SOUTH OF SITE 4 WHERE LAKE PARKER ROAD P.C ON E R/W. TRAFFIC PRODUCING MOST NOISE. BASELINE w/o TRAFFIC ~ 47 dB TRAFFIC BOOSTS TO OVER 75 d/b. TRAFFIC COUNT 10-15 CPM SOME WIND NOISE IN TREES. NEVER MIND ~~WIND NOT AS GUSTY NOW~~ WIND NOISE UP TO +56.6 d/b. TRAFFIC COUNT 20-30 CPM



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NOISE MONITORING DATA FIELD SHEET

NIGHT

Project/Task No.: 993-7510-0200 Project Name: LAKELAND UNIT 5

Sample Site: 5 Sample Date: 19 FEB 99

Time Start: 0002 Time Stop: 0017 / ~~[illegible]~~ 0021 Microphone Orientation: NW °FSD: 100

Wind Speed: 0-3 mph Wind Direction: SW ° Temperature: 61 ° RH: 80 %

Field Data:

Minimum 42.1 dBA L_{eq} 45.5 dBA

Maximum 69.3 dBA SEL 73.9 dBA

OCTAVE BAND ANALYSIS:

Hz	31.5	63	125	250	500	1K	2K	4K	8K	16K	LIN	A wt.
dB	67.7	59.4	53.8	44.2	42.3	37.6	31.3	32.5	23.2	18.7	71.5	44.5

COMMENTS/NOTES (Reason and Time): POWER BLOCK VERY OBVIOUS, SOME TRAFFIC NOISE FROM ACROSS LAKE. TRAFFIC COUNT 0-5 CPM
BASELINE ~ 44 dB

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Day

Project/Task No.: 993-7510-0200 Project Name: LAKELAND UNIT 5

Sample Site: 6 Sample Date: 18 FEB 99

Time Start: 1646 Time Stop: 1703 / 1709 Microphone Orientation: NW °FSD: 100

Wind Speed: 10-15 mph Wind Direction: SW ° Temperature: 78 ° RH: 60 %

Field Data:

Minimum 51.0 dBA L_{eq} 61.8 dBA

Maximum 79.8 BACKFIRE dBA SEL 91.9 dBA

OCTAVE BAND ANALYSIS:

Hz	31.5	63	125	250	500	1K	2K	4K	8K	16K	LIN	A wt.
dB	66.0	72.2	64.5	53.3	54.9	57.7	54.5	48.4	44.4	18.5	73.2	59.0

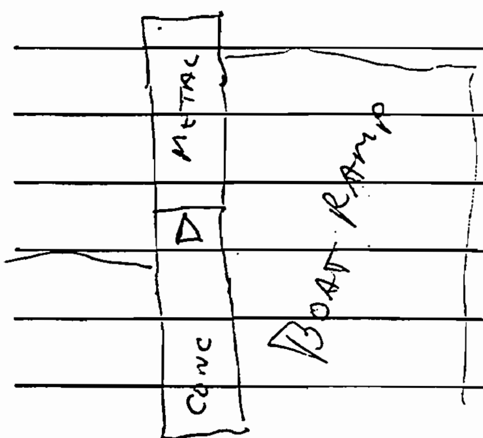
PRECAL 93.8 POST CAL 93.7 EDGE CONC

COMMENTS/NOTES (Reason and Time): SITE 6 LOCATED AT WEST END OF BOAT DOCK AT SERTOMA PARK / PUBLIC BOAT RAMP

BASELINE ~57db w/o TRAFFIC ~63-64 w/TRAFFIC

TRAFFIC MOST NOISE ~80 CPM

WIND NOT BAD @ LOCATION



SERTOMA PK
BOAT RAMP

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6241 NW 23rd Street, Suite 500
Gainesville, FL 32653-1500
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NIGHT

Project/Task No.: 993-7510-0200 Project Name: LAKELAND UNIT 5

Sample Site: 6 Sample Date: 18 FEB 99

Time Start: 2334 Time Stop: 2349 / 2353 Microphone Orientation: N °FSD: 100

Wind Speed: 0-3 mph Wind Direction: SW ° Temperature: 61 ° RH: 80 %

Field Data:

Minimum 46.1 dBA L_{eq} 54.1 dBA

Maximum 65.0 dBA SEL 83.1 dBA

OCTAVE BAND ANALYSIS:

Hz	31.5	63	125	250	500	1K	2K	4K	8K	16K	LIN	A wt.
dB	57.5	63.9	57.1	47.3	48.7	48.7	44.8	43.8	26.2	13.7	65.5	53.7

PRECAL 93.8 POST CAL 93.8

COMMENTS/NOTES (Reason and Time): MOST NOISE FROM TRAFFIC, BASELINE ~53db

TRAFFIC COUNT: 0-21 CPM

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NOISE MONITORING DATA FIELD SHEET

DAY

Project/Task No.: 993-7510-0200 Project Name: LAKELAND UNIT 5

Sample Site: 7 Sample Date: 18 FEB 99

Time Start: 1725 Time Stop: 1740/1744 Microphone Orientation: NS °FSD: 100

Wind Speed: 5-10 mph Wind Direction: SW ° Temperature: 73/65 ° RH: ____ %

Field Data:

Minimum 45.8 dBA L_{eq} 65.4 dBA

Maximum 80.3 dBA SEL 94.8 dBA

OCTAVE BAND ANALYSIS:

Hz	31.5	63	125	250	500	1K	2K	4K	8K	16K	LIN	A wt.
dB	60.2	65.4	56.2	47.9	43.9	60.2	57.0	45.8	46.5	27.9	76.5	68.4

PRECAL 93.8 POST CAL 93.8

COMMENTS/NOTES (Reason and Time): SITE 7 LOCATED AT INTERSECTION OF
℄ EAST BELLAVISTA STREET AND EAST R/W OF LAKE PARKER DR.
TRAFFIC MAJOR (MOST) NOISE CONTRIBUTER
BASELINE W/TRAFFIC ~70 db BASE LINE W/O TRAFFIC ~50db
TRAFFIC COUNT 15-25 CPM. GRACKLES AND GALINULES SQUACKING
MOST WIND BLOCKED OUT. END TRAFFIC COUNT 30-45 CPM

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NIGHT

Project/Task No.: 993-7510-0200 Project Name: LAKELAND UNIT 5

Sample Site: 7 Sample Date: 18 FEB 99

Time Start: 2305 Time Stop: 2320 / 2325 Microphone Orientation: NE °FSD: 180

Wind Speed: 0-3 mph Wind Direction: SW ° Temperature: 61° ° RH: 80 %

Field Data:

Minimum 40.1 dBA L_{eq} 56.0 dBA

Maximum 75.1 dBA SEL 85.5 dBA

OCTAVE BAND ANALYSIS: NO TRAFFIC IN OBA

Hz	31.5	63	125	250	500	1K	2K	4K	8K	16K	LIN	A wt.
dB	51.8	54.3	51.7	43.8	38.1	37.5	37.8	29.3	27.2	20.1	61.4	43.3

PRECAL 93.7 POSTCAL 93.8

COMMENTS/NOTES (Reason and Time): NO PLANT NOISE AUDIBLE. TRAFFIC NOISE AND BUGS, BIRDS. I4 IN DISTANCE AND LAKE PARKER. BASELINE 42-44 db. TRAIN HORN IN DISTANCE SW.

TRAFFIC COUNT 3-12 CPM 0 CPM - 5 CPM

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Project/Task No.: 993-7510-0200 Project Name: LAKELAND UNIT 5

Sample Site: 8 Sample Date: 18 FEB 99

Time Start: 1754 Time Stop: 1809 Microphone Orientation: E °FSD: 100

Wind Speed: 5-10 mph Wind Direction: SW ° Temperature: 72 ° RH: ____ %

Field Data:

Minimum 45.3 dBA L_{eq} 55.0 dBA

Maximum 74.1 dBA SEL 84.5 dBA

OCTAVE BAND ANALYSIS:

Hz	31.5	63	125	250	500	1K	2K	4K	8K	16K	LIN	A wt.
dB	66.0	67.0	60.3	50.1	46.8	50.6	44.0	36.1	33.1	26.8	85.7	47.5

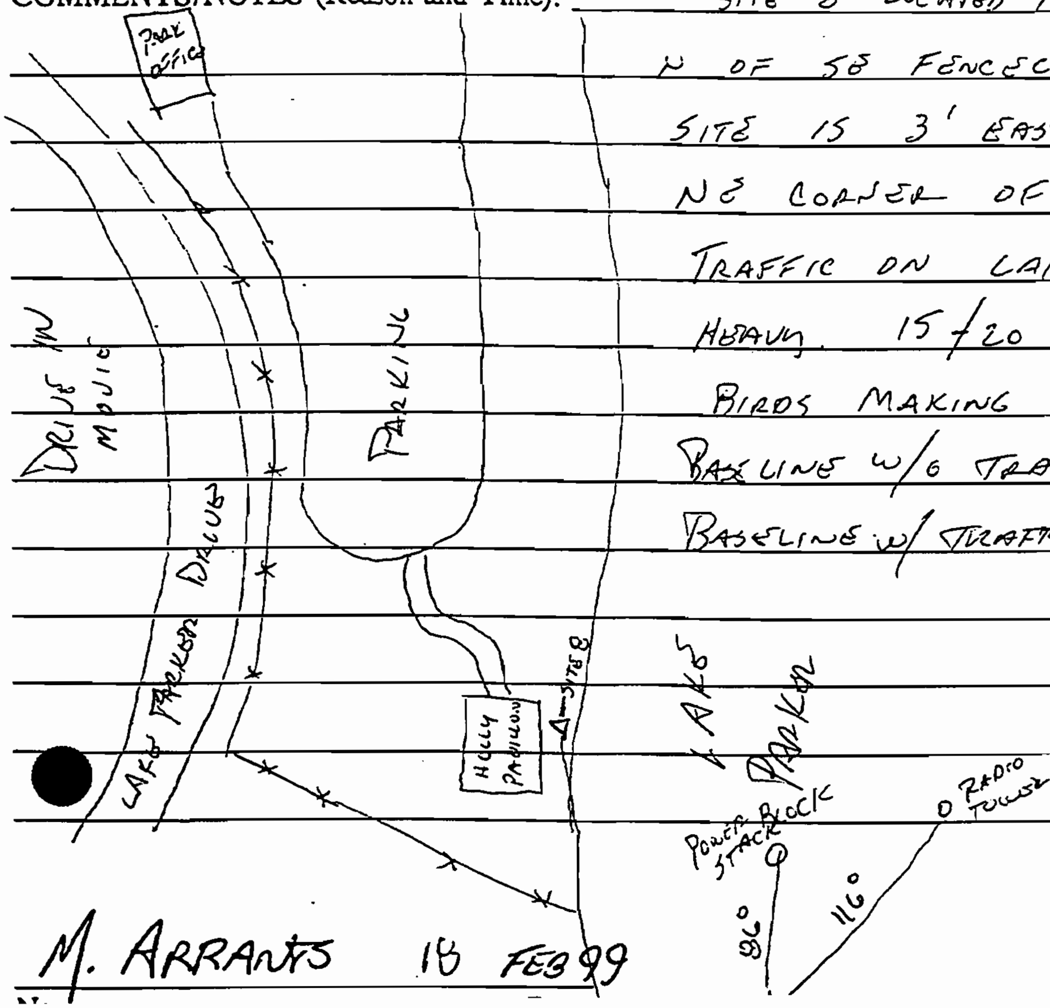
PRECAL 93.8 POST CAL 93.8

COMMENTS/NOTES (Reason and Time): SITE 8 LOCATED IN LAKE PARKER PARK 30' N OF SE FENCE CORNER AND LAKE. SITE IS 3' EAST AND 8' SOUTH OF NE CORNER OF THE HOLLY PAVILLON TRAFFIC ON LAKE PARKER DRIVE STILL HEAVY. 15/20 CARS/MIN.

BIRDS MAKING LOT OF NOISE SQUAWK

BASELINE w/o TRAFFIC 46-47 db

BASELINE w/ TRAFFIC ~56 db



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NOISE MONITORING DATA FIELD SHEET

NIGHT

Project/Task No.: 993-7510-0200 Project Name: LAKELAND UNIT 5

Sample Site: 8 Sample Date: 18 FEB 99

Time Start: 2200 Time Stop: 2215 / 2219 Microphone Orientation: E °FSD: 100

Wind Speed: 3-5 mph Wind Direction: SW ° Temperature: 66 ° RH: 80 %

Field Data:

Minimum 40.6 dBA L_{eq} 48.3 dBA

Maximum 61.0 dBA SEL 77.5 dBA

OCTAVE BAND ANALYSIS: NO TRAFFIC IN OBA

Hz	31.5	63	125	250	500	1K	2K	4K	8K	16K	LIN	A wt.
dB	55.4	53.8	50.8	44.4	40.4	40.2	36.2	30.6	24.3	13.3	60.6	46.1

PRECAL 93.8 POSTCAL 93.8

COMMENTS/NOTES (Reason and Time): MOST NOISE FROM LAKE PARKER DRIVE TO WEST. TRAFFIC COUNT 3-5 CPM BASELINE ~43 db NO POWER PLANT NOISE APPARENT. SOME I4 TRAFFIC NOISE APPARENT. TRAIN HORN TO SOUTH

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NOISE MONITORING DATA FIELD SHEET

DAY

Project/Task No.: 993-7510-0200 Project Name: LAKELAND UNIT 5

Sample Site: 9 Sample Date: 10 FEB 99

Time Start: 1834 Time Stop: 1849/1854 Microphone Orientation: S °FSD: 100

Wind Speed: 3-7 mph Wind Direction: WSW ° Temperature: 70 ° RH: ___ %

Field Data:

Minimum 47.5 dBA L_{eq} 51.4 dBA

Maximum 62.8 dBA SEL 80.8 dBA

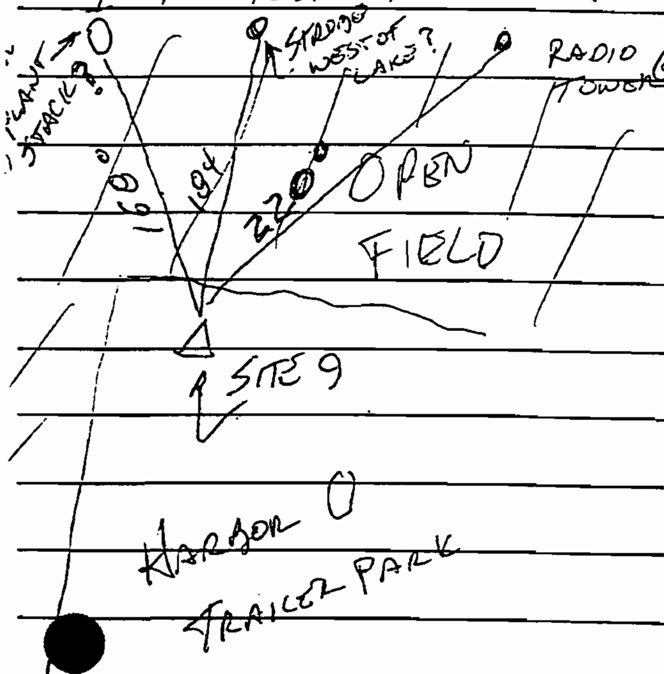
OCTAVE BAND ANALYSIS:

Hz	31.5	63	125	250	500	1K	2K	4K	8K	16K	LIN	A wt.
dB	57.8	59.3	53.8	47.9	48.0	46.1	39.8	40.5	34.7	19.5	66.2	52.2

PRECAL 93.8 POSTCAL 93.9

COMMENTS/NOTES (Reason and Time): SITE 9 LOCATED AT SE CORNER OF LAKELAND HARBOR TRAILER PARK. SE COL LOT 333 TRAFFIC NOISE FROM I-4 MOST PREVALENT TO WEST & NW BASE LINE 51-52 db

@FHP AIR PLANE IN DISTANCE NO PAUSE



M. ARRANTS 10 FEB 99

Golder Associates Inc.
6241 NW 23rd Street, Suite 500
Gainesville, FL 32653-1500

Best Available Copy

Golder Associates

NOISE MONITORING DATA FIELD SHEET

NIGHT

Project/Task No.: 993-7510-0200 Project Name: LAKELAND UNIT 5

Sample Site: 9 Sample Date: 18 FEB 99

Time Start: 2233 Time Stop: 2248/2253 Microphone Orientation: S °FSD: 100

Wind Speed: 0-3 mph Wind Direction: SW ° Temperature: 63 ° RH: 79 %

Field Data:

Minimum 45.2 dBA L_{eq} 49.0 dBA

Maximum 58.8 dBA SEL 78.6 dBA

OCTAVE BAND ANALYSIS: PRECAL 93.8 POST CAL 93.8

Hz	31.5	63	125	250	500	1K	2K	4K	8K	16K	LIN	A wt.
dB	56.8	55.3	49.4	42.7	45.2	43.3	34.7	34.2	27.3	13.8	62.8	46.5

COMMENTS/NOTES (Reason and Time): TRAFFIC NOISE PREDOMINANT MOSTLY I4 TO NW. BUGS CHIRPING. BASELINE 47-50 db

M. ARRANTS 18 FEB 99

Name

Golder Associates Inc.

6241 NW 23rd Street, Suite 500

Gainesville, FL 32653-1500

10.5.3 WELL INFORMATION

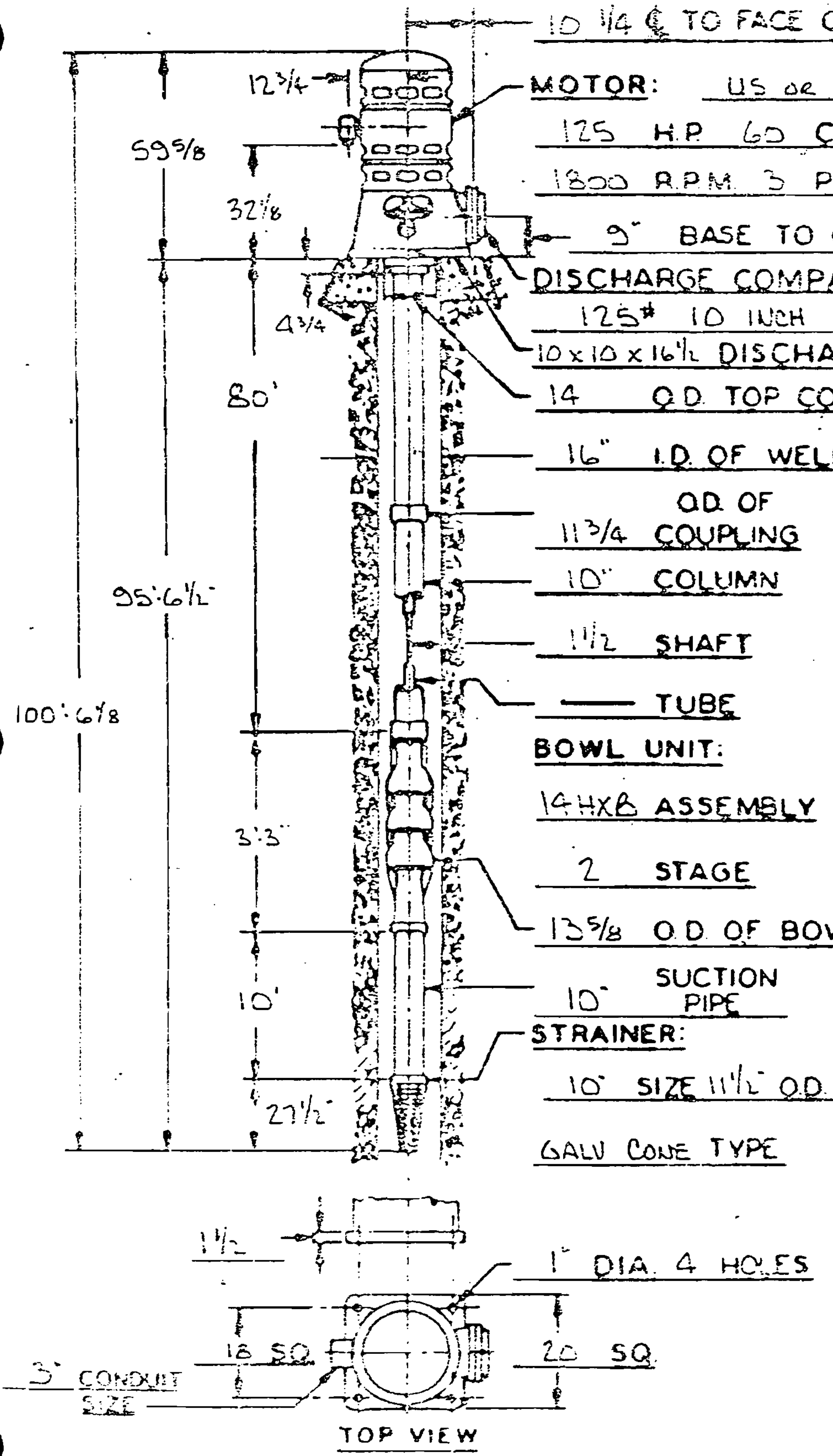
INFORMATION ON WELLS 31, 32, AND 33
DESIGN AND PUMP TESTS

BEST AVAILABLE COPY

U-3
Emergency
make-up

PEERLESS PUMP

SURFACE DISCHARGE



PUMP RATING

G.P.M. 2400

FT. BOWL HD. 144

SO NO. TI-24570

SOLD TO: LOCKE WELL & PUMP CO

ORDER NO. 4581

USER: CITY OF LAKELAND

ITEM NO. WELL PUMP #31

PUMP IDENTIFICATION #31

EMERGENCY WELL PUMP

McINTOSH PWR PLT UNIT #3

THIS CERTIFIED PRINT

☑ FOR APPROVAL

BY [signature] DATE 4-16-80

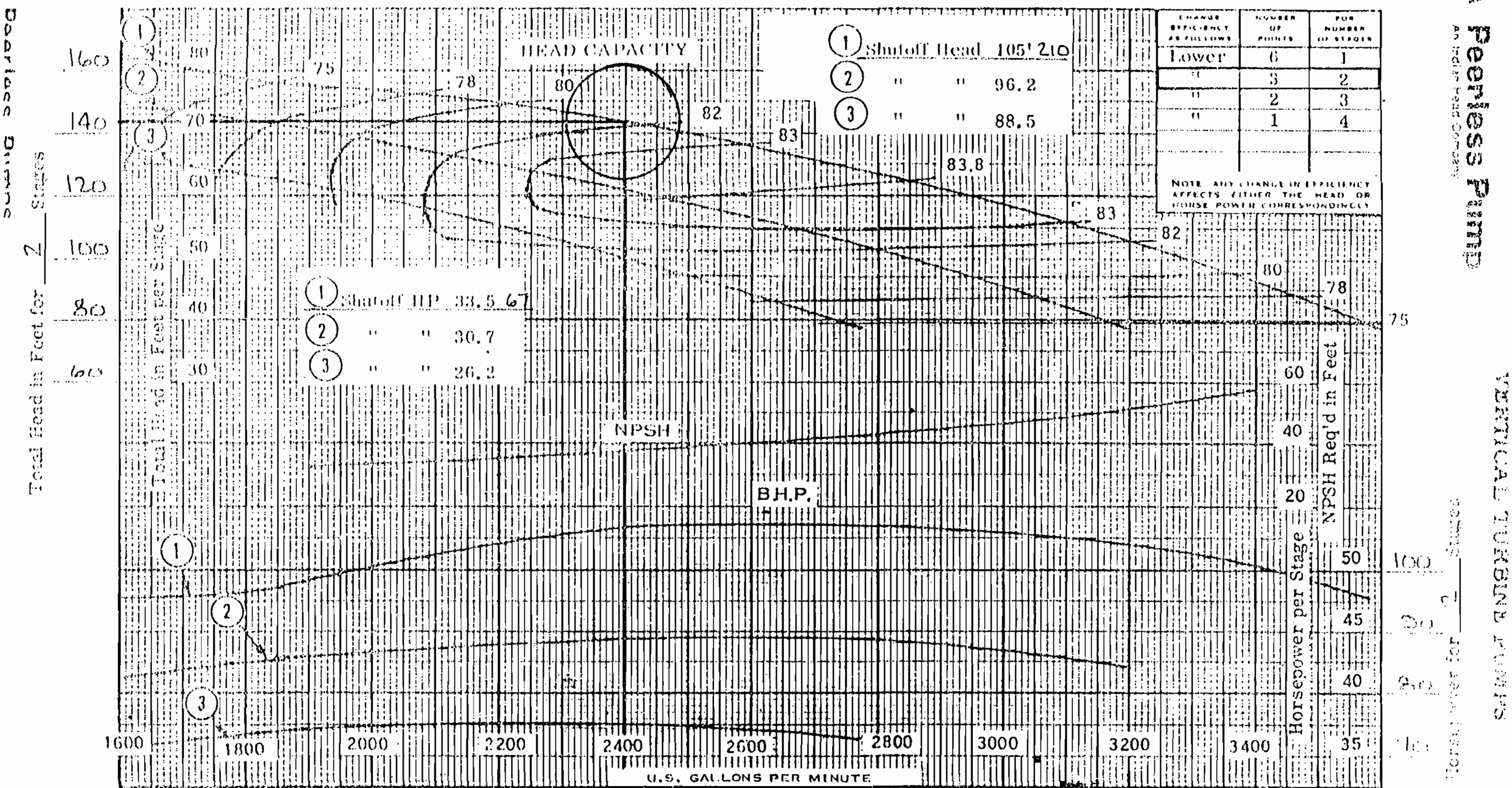
☑ FOR CONSTRUCTION

BY [signature] DATE 7-15-80

Peerless Pump
An Indian Head Company

DRN. BY JLWB CHK'D BY: DATE: 4-16-80

BEST AVAILABLE COPY



HYDRAULIC PERFORMANCE WARRANTY	CURVE NO.	IMPELLER NO.	IMPELLER DIA.	TAKEN FROM
Guaranteed at designated point only, and contingent on:	1	V4400C	9 7/16" x 10 13/16"	27677
Proper flow to pump suction Proper submergence	2	V4400C	9 1/16" x 10 7/16"	27807
Fluid free of gas, air & abrasives	3	V4400C	8 11/16" x 10 1/16"	
Proper lateral setting of impeller	4			

Customer: CITY OF LAKELAND
C.D. McINTOSH POWER PLANT UNIT #3
Item No: EMERGENCY WELL PUMP #32
Peerless Ref. No: TI- 24570

Laboratory Performance		BOWL	V4404-C-E
SIZE 14 HXB	RPM 1760	CURVE	28 12677

PUMP DESCRIPTION: Driver 125 HP 3/60/460 WP-I VHS WURL; Head 10 x 10 x 16½; Column 10 x 1½ S/S

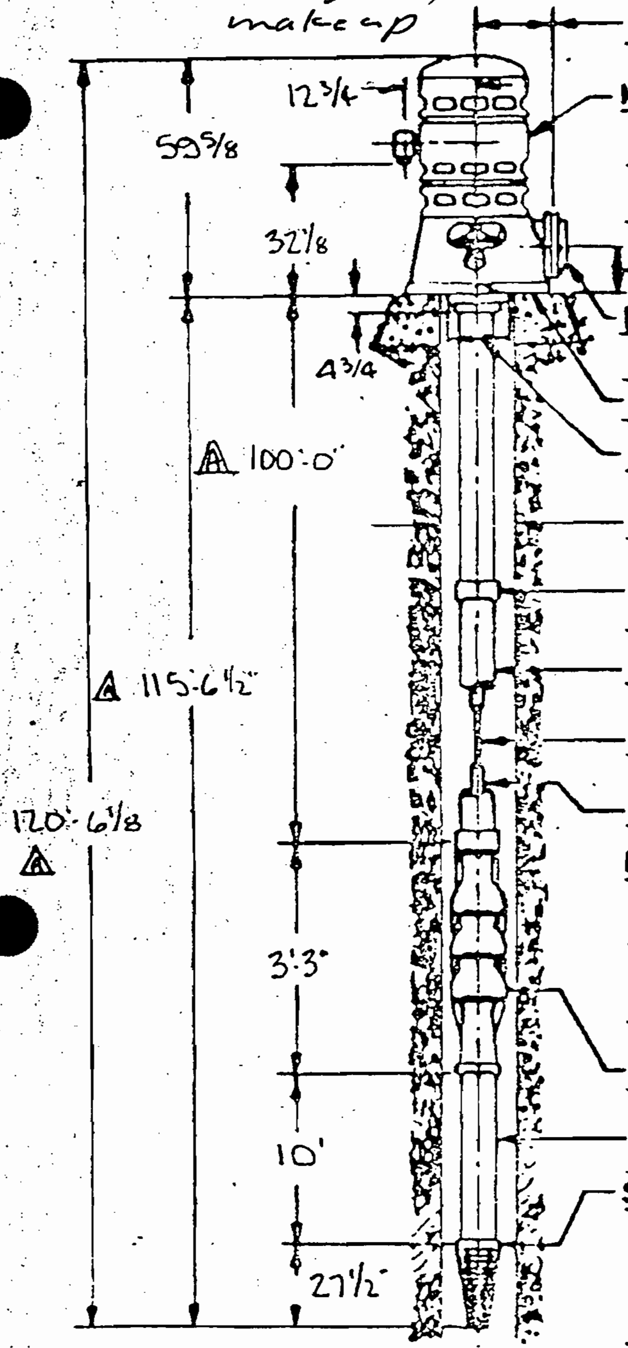
GUARANTEED BOWL PERFORMANCE: Capacity 2400 gpm; Head 144 ft; Eff 79 %; BHP 110.47

U-3

Emergency makeup

PEERLESS PUMP

SURFACE DISCHARGE



10 1/4 ℄ TO FACE OF FLANGE

MOTOR: US or GE MFR. VHS TYPE

100 H.P. 60 CY. 460 VOLTS

1800 R.P.M. 3 PH. 404TP FRAME

9" BASE TO ℄ OF DISCHARGE

DISCHARGE COMPANION FLANGE FOR:

125# 10 INCH

10x10x16 1/2 DISCHARGE HEAD

14" O.D. TOP COL. FLANGE

16" I.D. OF WELL

11 3/4 O.D. OF COUPLING

10" COLUMN

1 1/2 SHAFT

—— TUBE

BOWL UNIT:

14HXB ASSEMBLY

2 STAGE

13 5/8 O.D. OF BOWLS

10" SUCTION PIPE

STRAINER:

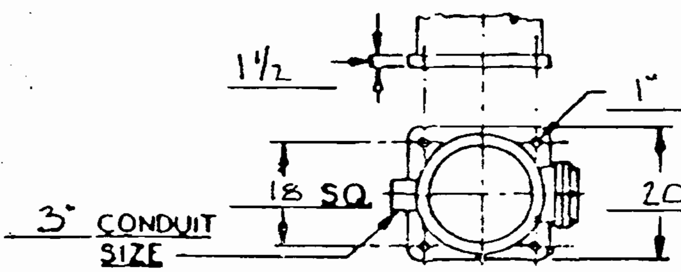
10" SIZE 11 1/2" O.D.

GALV CONE TYPE

PUMP RATING

G.P.M. 2400

FT. BOWL HD. 126'



TOP VIEW

A REV 8-12-81

SO NO. TI-25787

SOLD TO: LOCKE WELL

ORDER NO. 4581

USER: CITY OF LAKELAND

ITEM NO. WELL PUMP # 32

PUMP IDENTIFICATION # 32

EMERGENCY WELL PUMP

McINTOSH PWR PLT UNIT #3

THIS CERTIFIED PRINT

☒ FOR APPROVAL

BY [signature] DATE 4-16-86

☐ FOR CONSTRUCTION

BY ________ DATE ________

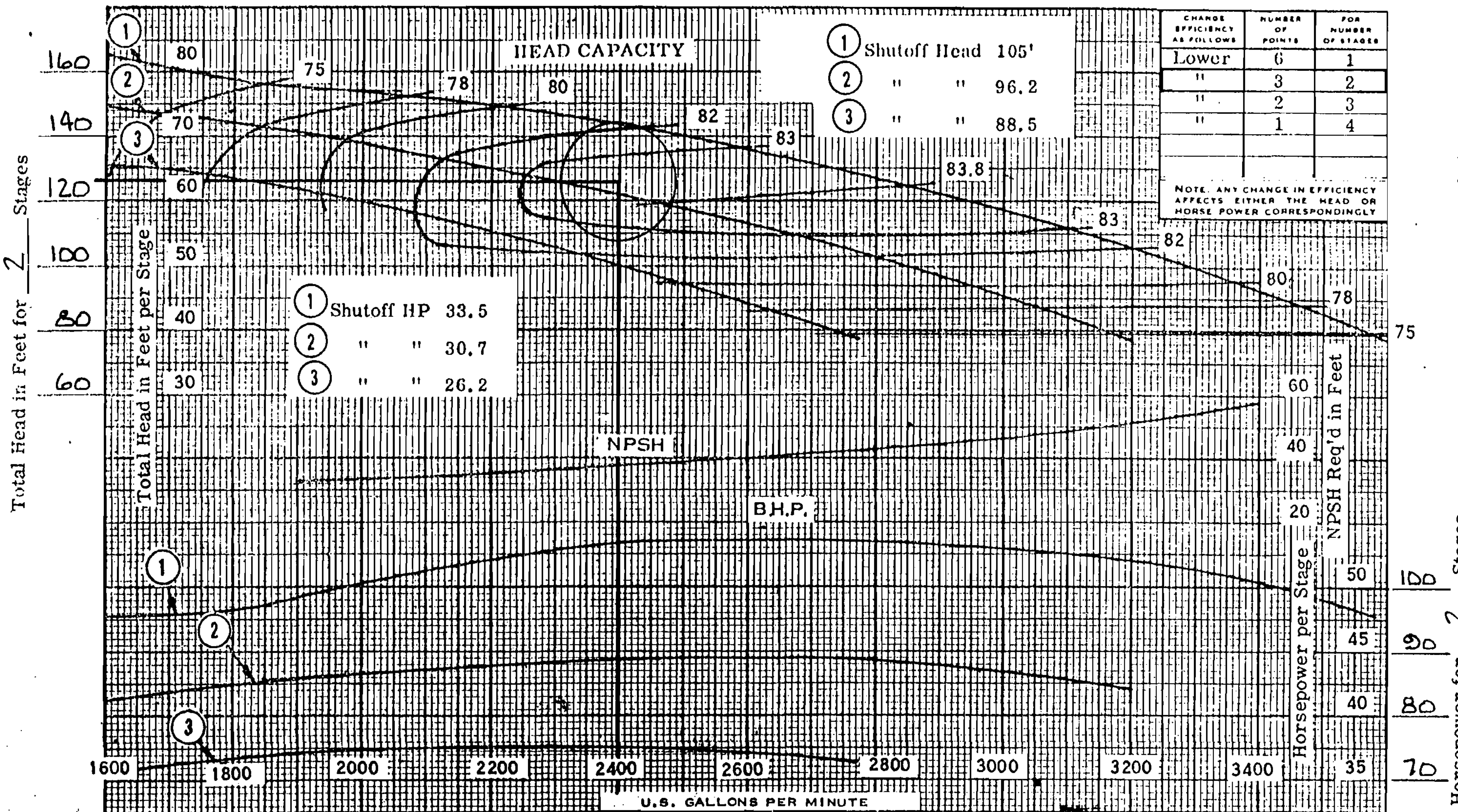
Peerless Pump
An Indian Head Company

DRN. BY JLWB CHK'D BY ________ DATE: 4-16-80

PUMP NO TI-25787

Peerless Pump
An Indian Head Company

VERTICAL TURBINE PUMPS



CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF POINTS	FOR NUMBER OF STAGES
Lower	6	1
"	3	2
"	2	3
"	1	4

NOTE: ANY CHANGE IN EFFICIENCY AFFECTS EITHER THE HEAD OR HORSE POWER CORRESPONDINGLY

HYDRAULIC PERFORMANCE WARRANTY	CURVE NO.	IMPELLER NO.	IMPELLER DIA.	TAKEN FROM
Guaranteed at designated point only, and contingent on:	1	V4400C	9 7/16" x 10 13/16"	27677
Proper flow to pump suction	2	V4400C	9 1/16" x 10 7/16"	27807
Proper submergence; Fluid free of gas, air & abrasives; Proper lateral setting of impeller	3	V4400C	8 11/16" x 10 1/16"	
	4			

Customer: CITY OF LAKELAND
C.D. McINTOSH POWER PLANT UNIT #3
Item No: EMERGENCY WELL PUMP ~~#31~~ 32
Peerless Ref. No: TI-25787

Laboratory Performance BOWL V4404-C-E

SIZE 14 HXB RPM 1760 CURVE 2812677

PUMP DESCRIPTION: Driver 100HP 3/60/460 WP-I VHS w/NRR; Head 10 x 10 x 16 1/2; Column 10 x 1 1/2 S/S

GUARANTEED BOWL PERFORMANCE: Capacity 2400 gpm; Head 126 ft; Eff 80 %; BHP 95.45

Section 140
10-74

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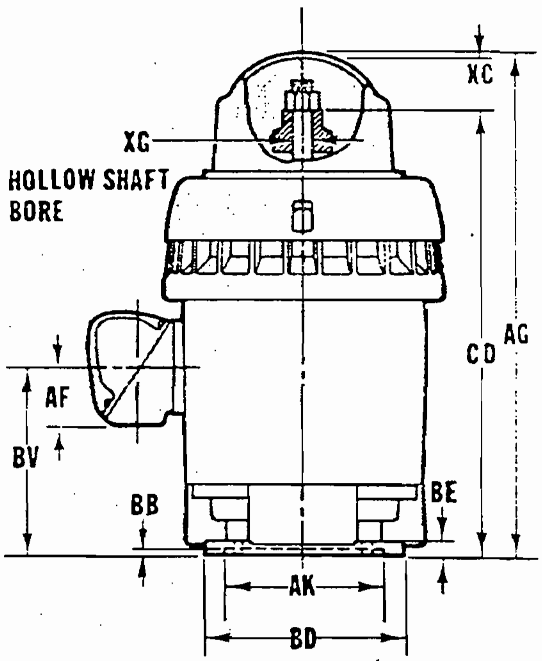
CUST No. LOCKE WELL 4581	U.S. No.
MARK: CITY OF LAKELAND - McINTOSH PWR PLT	
UNIT #3 WELL PUMP #31	
QTY 1 HP 100 FRAME 404TP	PHASE 3
CYCLE 60 RPM 1775	VOLTS 460

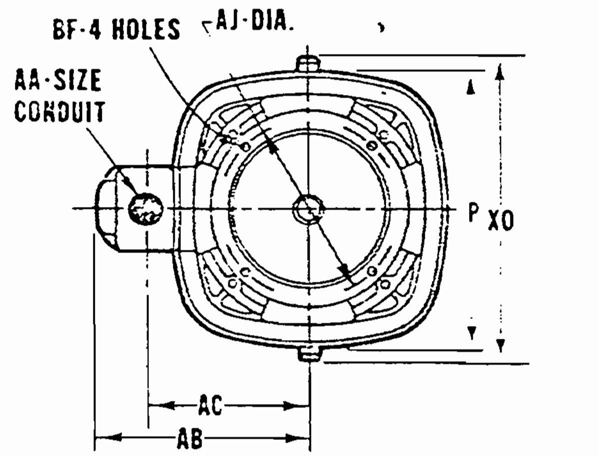
Vertical Motors

Section 505
Page 3

WEATHER PROTECTED TYPE I, TYPE RU FRAMES 284TP THRU 445TPA	HIGH THRUST VERTICAL HOLLOSHAFT NEMA P-BASE	DIMENSIONS

FEATURES NON-REVERSE RATCHET. BOLTED COUPLING (1½") 1.15 SF
SHORT COMMERCIAL TEST. SPACE HEATERS 1/60/220 V 120 W





Conduit opening may be located in steps of 90°. Standard as shown with conduit down.

ALL DIMENSIONS ARE IN INCHES

FRAME	*P	AA	AB	AC	AF	AG	AJ DIA.	AK	BB	BD MAX.	BE	BF SIZE HOLE	BV	CD	XC	XG	XO	BRACKET PART NO.
284TP	15	2	12-[illegible]	9-1/16	3-1/4	27-1/8	[illegible]	8-1/4	[illegible]	[illegible]	13/[illegible]	[illegible]	[illegible]4	23-2[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
284TPH	15	2	12-7/16	9-1/16	3-1/4	27-1/8	[illegible]-3/4	13-1/2	[illegible]	[illegible]-1/2	13/[illegible]	11/[illegible]	[illegible]-1/4	23-2[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
284TPA	15	2	12-7/16	9-[illegible]16	3-1/4	27-[illegible]8	[illegible]/8	8-1/4	[illegible]	[illegible]	13/16	[illegible]	[illegible]	23-2[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
286TP	15	2	12-[illegible]	9-[illegible]	3-1/4	27-1/8	[illegible]/8	8-1/4	[illegible]	[illegible]	13/16	7[illegible]	[illegible]-1/4	23-2	[illegible]	[illegible]	[illegible]	[illegible]
286TPH	15	2	12-7/[illegible]	9-1/16	3-1/4	27-1/8	1-3/4	13-1/2	[illegible]	[illegible]-1/2	13/[illegible]	[illegible]	[illegible]	23-2	[illegible]	[illegible]	[illegible]	[illegible]
286TPA	15	2	12-7/[illegible]	9-[illegible]	3-1/4	27-1/8	[illegible]-1/8	8-1/4	[illegible]	12	[illegible]	7/[illegible]	[illegible]	23-2[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
324TP	16-3/8	3	15-3/16	11-5/8	4	32-5[illegible]	[illegible]-3/4	13-1/2	[illegible]	[illegible]-1/2	11/16	11/[illegible]	[illegible]/16	2[illegible]-7[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
324TPH	16-3/8	3	15-3[illegible]	11-5/8	4	32-5[illegible]	[illegible]-1/8	8-1/4	[illegible]	12	11/16	7/[illegible]	[illegible]/16	2[illegible]-7[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
326TP	18-[illegible]/8	3	15-3[illegible]	11-5/8	4	32-5[illegible]	[illegible]-3/4	13-1/2	[illegible]	[illegible]-1/2	11/16	11/[illegible]	[illegible]/16	25-7[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
326TPH	16-3/8	3	15-3[illegible]	11-5/8	4	32-5[illegible]	[illegible]-1/8	8-[illegible]	[illegible]	12	11/[illegible]	7/16	[illegible]/16	25-7[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
364TP	18-3/8	3	15-3[illegible]	11-5/8	4	3[illegible]-9[illegible]	1-3/4	13-1/2	[illegible]	[illegible]-1/2	11/16	[illegible]	[illegible]	31-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
364TPA	16-3/8	3	15-3/16	11-5/8	4	3[illegible]	[illegible]-1/8	8-1/4	[illegible]	12	11/16	7/[illegible]	[illegible]	31-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
365TP	18-3/8	3	15-3/16	11-5/8	4	3[illegible]-9[illegible]	[illegible]-3/4	13-1/2	[illegible]	[illegible]-1/2	11/16	[illegible]	[illegible]	31-5/[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
365TPA	16-3/8	3	15-3[illegible]	11-5/8	4	3[illegible]	[illegible]-1/8	8-1/4	[illegible]	12	11/[illegible]	7/[illegible]	[illegible]	31-5/[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
☒ 404TP	20-[illegible]	3	16-3/[illegible]	12-3/4	4	4[illegible]-5/8	[illegible]-3/4	13-1/2	[illegible]	[illegible]/2	3/4	11/[illegible]	[illegible]-1/8	36-15[illegible]	[illegible]	[illegible]	[illegible]	23-[illegible]	[illegible]
404TPA	20-1/2	3	16-3[illegible]	12-3/4	4	[illegible]	[illegible]-3/4	13-1/2	[illegible]	20	3/4	11/[illegible]	[illegible]-1/8	36-1[illegible]	[illegible]	[illegible]	[illegible]	23-3/[illegible]	[illegible]
405TP	2[illegible]-1/2	3	16-3[illegible]	12-3[illegible]	4	4[illegible]-5/8	[illegible]-3/4	13-1/2	[illegible]	[illegible]-1/2	3/4	11/[illegible]	[illegible]-1/8	36-15[illegible]	[illegible]	[illegible]	[illegible]	23-3/[illegible]	[illegible]
405TPA	20-1/2	3	16-3[illegible]	12-3[illegible]	4	4[illegible]-5/8	[illegible]-3/4	13-1/2	[illegible]	20	3/4	[illegible]	[illegible]-1/8	36-15	[illegible]	[illegible]	[illegible]	23-3/[illegible]	[illegible]
444TP	23-1/8	3	18-[illegible]	13-7/8	4-7/8	47-23/32	1-3/4	13-1/2	[illegible]	[illegible]-1/2	3/4	11/[illegible]	[illegible]-5/32	42-2[illegible]32	[illegible]	[illegible]	[illegible]-5/16	25-7/8	[illegible]
444TPA	23-1/8	3	18-[illegible]	13-7/8	4-7/8	47-23/32	[illegible]-3/4	13-1/2	[illegible]	20	3/4	11/[illegible]	[illegible]-5/32	42-2[illegible]32	[illegible]	[illegible]	[illegible]-5/16	25-7/8	[illegible]
445TP	23-1/8	3	18-[illegible]	13-7/8	4-7/8	47-23/32	1-3/4	13-1/2	[illegible]	[illegible]-1/2	3/4	11/[illegible]	[illegible]-5/32	42-2[illegible]	[illegible]	[illegible]	[illegible]/16	25-7/8	[illegible]
445TPA	23-1/8	3	18-1/8	13-7/8	4-7/8	47-23/32	[illegible]-3/4	13-1/2	[illegible]	20	3/4	11/[illegible]	[illegible]-5/32	42-2	[illegible]	[illegible]	[illegible]-5/16	25-7/8	[illegible]

All tapped holes are Unified National Course, right hand thread.

All rough casting dimensions may vary by 1/4" due to casting variations.

*Largest motor diameter.

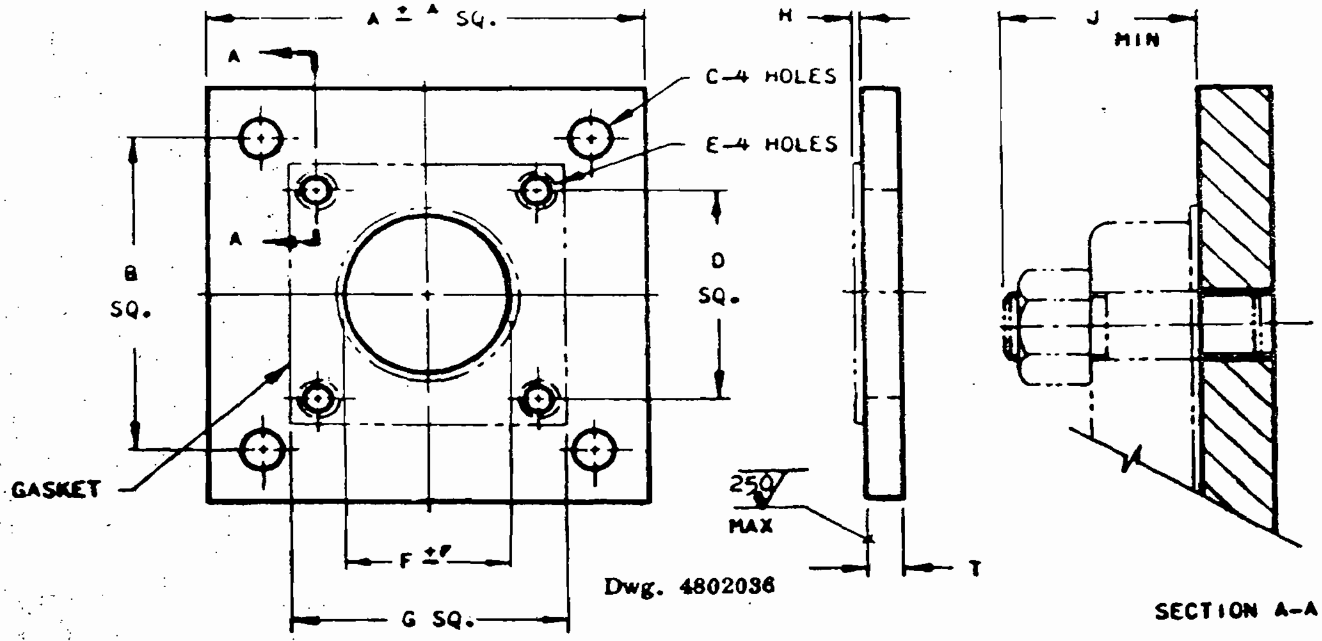
TOLERANCES
AK Dimension: 8-1/4, +.003. 13-1/2. +.005
Face Runout: 8-1/4 AK. .004 F.I.R. 13-1/2 AK. .007 F.I.R.
Permissible eccentricity of mounting rabbet: 8-1/4 AK. .004 F.I.R. 13-1/2 AK. .007 F.I.R.

U. S. ELECTRICAL MOTORS DIVISION EMERSON ELECTRIC CO. EMERSON PRINTED IN USA	Effective: OCTOBER 1, 1979 Supersedes: AUGUST 1, 1977	If properly endorsed this print is correct for frame & assembly positions indicated By________ Date________

Sole Plates

(Carbon Steel Blanchard Ground One Side)

For cast iron discharge assemblies only.



Dwg. 4802036

HEAD SIZE	DIMENSIONS IN INCHES									
	A	B	C	D	E	F	G	H	J	T
2 x 2½ x 10	14½	13	3/4	9-1/4	3/8-16 UNC	9	13	1/16	1-3/8	1/2
2½ x 2½ x 10	14½	13	3/4	9-1/4	3/8-16 UNC	9	13	1/16	1-3/8	1/2
2½ x 3 x 10	14½	13	3/4	9-1/4	3/8-16 UNC	9	13	1/16	1-3/8	1/2
4 x 4 x 10C	18	16	7/8	8-5/16	3/4-10 UNC	9	13-1/2 (1)	1/16	2-1/8	5/8
6 x 6 x 12	21	18	7/8	13-1/4	5/8-11 UNC	13	15-1/2	1/16	1-7/8	5/8
8 x 8 x 12	24	21½	7/8	15	5/8-11 UNC	14½	17-1/2	1/16	1-7/8	3/4
6 x 8 x 16½	26	23	1-1/8	18	3/4-10 UNC	16½	20-1/2	1/16	2-1/4	7/8
8 x 8 x 16½	26	23	1-1/8	18	3/4-10 UNC	16½	20-1/2	1/16	2-1/4	7/8
10 x 10 x 16½	28	25	1-1/8	18	3/4-10 UNC	18	20-1/2	1/16	2-1/2	7/8
10 x 10 x 20	28	25	1-1/8	18	3/4-10 UNC	18	20-1/2	1/16	2-1/2	7/8
12 x 12 x 20	32	29	1-1/4	21	3/4-10 UNC	20½	23-1/2	1/16	2-3/4	7/8
14 x 14 x 24½	36	32	1-1/4	25	3/4-10 UNC	24½	28-3/4	1/8	2-7/8	1
16 x 16 x 30½	42	39	1-1/4	32	3/4-10 UNC	28	38-3/4	1/8	4-3/4	1

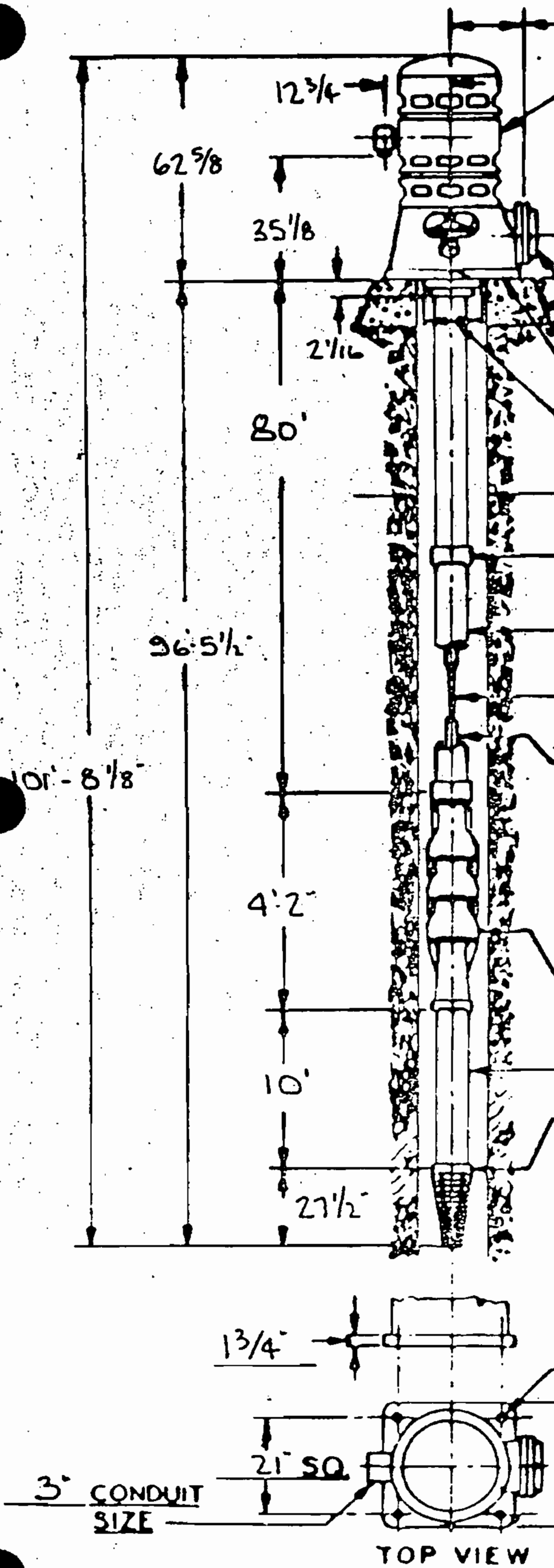
(1) This gasket is round all others are square.

BEST AVAILABLE COPY

U-3
Emergency
make up

PEERLESS PUMP

SURFACE DISCHARGE



12 1/4 ℄ TO FACE OF FLANGE

MOTOR: US or GE MFR. VHS TYPE
125 H.P. 60 CY. 460 VOLTS
1800 R.P.M. 3 PH. 405TPA FRAME

10 1/2 BASE TO ℄ OF DISCHARGE

DISCHARGE COMPANION FLANGE FOR:
125# 12 INCH

12x12x20 DISCHARGE HEAD

16 1/4 O.D. TOP COL. FLANGE

16" I.D. OF WELL

11 3/4 O.D. OF COUPLING

10" COLUMN

1 1/2 SHAFT

—— TUBE

BOWL UNIT:
14HXB ASSEMBLY
3 STAGE

13 5/8 O.D. OF BOWLS

10" SUCTION PIPE

STRAINER:
10" SIZE 11 1/2" O.D.
GALV. CONE TYPE

PUMP RATING

G.P.M. 2400
FT. BOWL HD. 160

SO. NO. TI 26155
SOLD TO: LOCKE WELL
ORDER NO. 4581
USER: CITY OF LAKELAND
ITEM NO. WELL PUMP #33
PUMP IDENTIFICATION: #33
EMERGENCY WELL PUMP
McINTOSH PWR PLT UNIT #3

THIS CERTIFIED PRINT
☑ FOR APPROVAL
BY [signature] DATE 4-16-80
☐ FOR CONSTRUCTION
BY ________ DATE ________

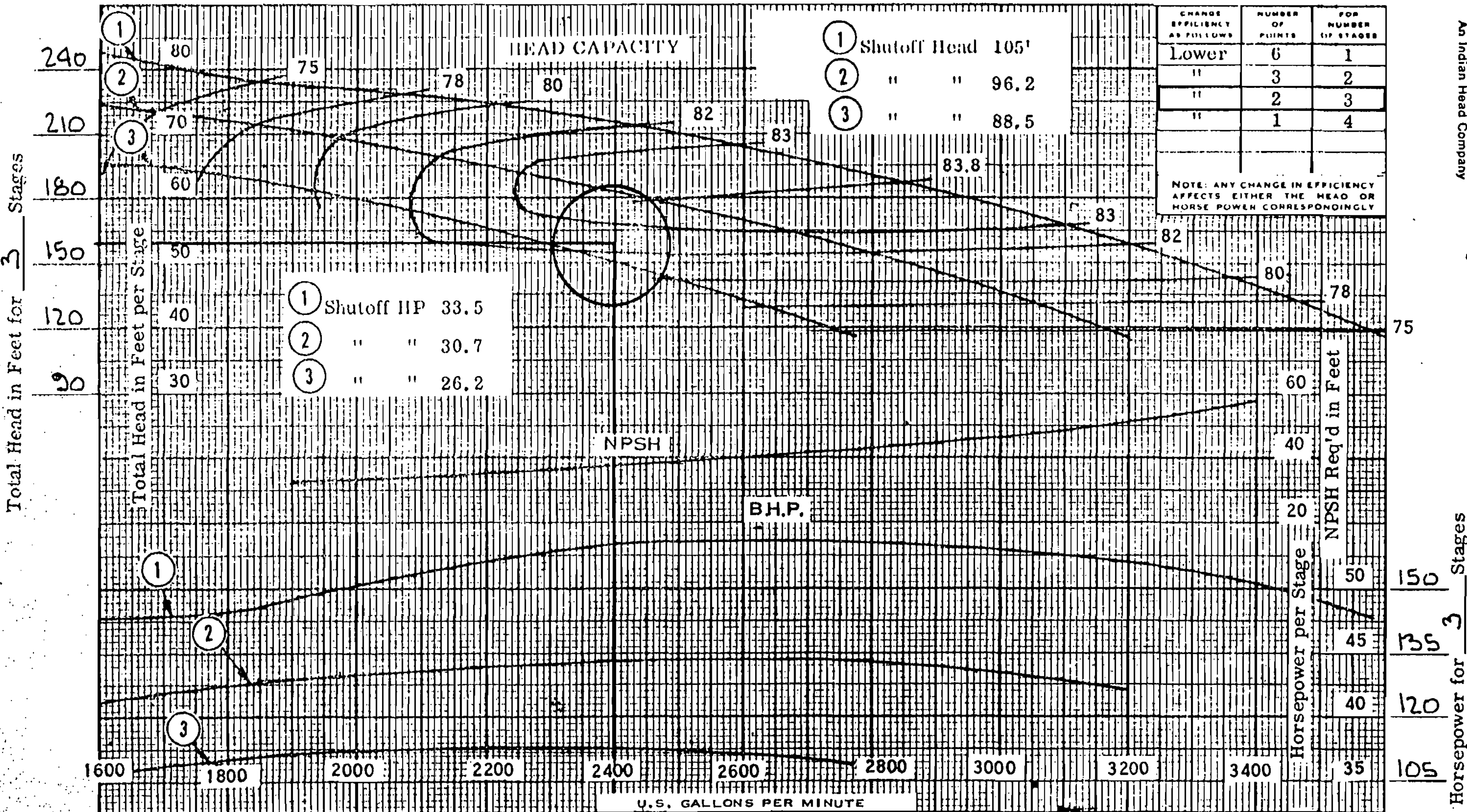
Peerless Pump
An Indian Head Company

DRN. BY JWB CHK'D BY: ________ DATE: 4-16-80

PUMP NO. TI 26155

Peerless Pump
An Indian Head Company

VERTICAL TURBINE PUMPS



CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF POINTS	FOR NUMBER OF STAGES
Lower	6	1
"	3	2
"	2	3
"	1	4

NOTE: ANY CHANGE IN EFFICIENCY AFFECTS EITHER THE HEAD OR HORSE POWER CORRESPONDINGLY

HYDRAULIC PERFORMANCE WARRANTY	CURVE NO.	IMPELLER NO.	IMPELLER DIA.	TAKEN FROM
Guaranteed at designated point only, and contingent on:	1	V4400C	9 7/16" x 10 13/16"	27677
Proper flow to pump suction	2	V4400C	9 1/16" x 10 7/16"	27807
Proper submergence; Fluid free of gas, air & abrasives	3	V4400C	8 11/16" x 10 1/16"	
Proper lateral setting of impeller	4			

Customer: CITY OF LAKELAND
C.D. McINTOSH POWER PLANT UNIT #3
Item No: EMERGENCY WELL PUMP #33
Peerless Ref. No:

Laboratory Performance		BOWL V4404-C-E
SIZE 14 HXB	RPM 1760	CURVE 28 12677

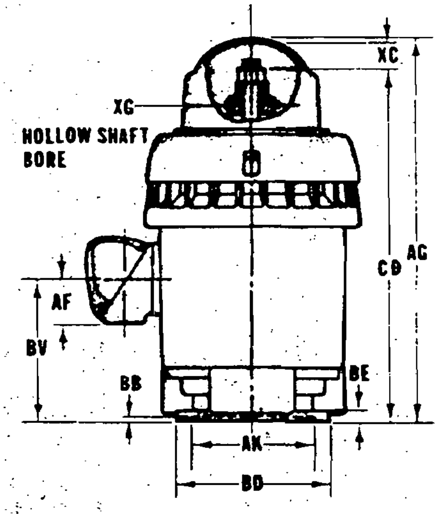
PUMP DESCRIPTION: Driver 125HP 3/60/460 WP-I VHS w/NRR ; Head 12x12 x20 ; Column 10x1½ s/s

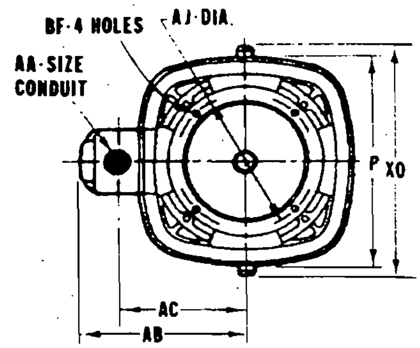
GUARANTEED BOWL PERFORMANCE: Capacity 2400 gpm; Head 160 ft; Eff 80 %; BHP 121.21

BEST AVAILABLE COPY

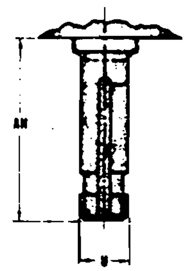
U.S. VERTICAL HIGH-THRUST MOTORS

WEATHER PROTECTED TYPE 1 — TYPES AU, RU, HU, AV-4, RV-4 & HV-4





Solid Shaft - VSS Detail



High Thrust Vertical Solid-Shaft Motors have the same dimensions as the Holloshaft with the addition of the "U" and "AH" dimensions. The coupling is omitted. NEMA designation changes from TP to VP for Solid-Shaft.

Conduit Box can be located in 4 directions by turning in steps of 90°. Standard as shown with conduit down. Standard conduit opening is listed above. When specified on the order a smaller conduit opening will be provided.

All rough casting dimensions may vary 1/4" due to casting variations.

FRAME	P	AA	AB	AC	AF	AG	AJ DIA.	AK	BB	BD	BE	BF TAP SIZE	BV	CD	XC	XG	XO	BRKT. PART NO.
182TP	12-7/16	1	6-5/16	5-3/8	2-5/8	20-7/8	9-1/8	8-1/4	3/16	10	3/4	7/16	8	17-9/16	3	1-1/16	–	170303
184TP	12-7/16	1	6-5/16	5-3/8	2-5/8	20-7/8	9-1/8	8-1/4	3/16	10	3/4	7/16	8	17-9/16	3	1-1/16	–	170303
213TP	12-7/16	1	7-5/8	6-7/16	3-5/16	20-7/8	9-1/8	8-1/4	3/16	10	3/4	7/16	8	17-9/16	3	1-1/16	–	170303
[illegible]15TP	12-7/16	1	7-5/8	6-7/16	3-5/16	20-7/8	9-1/8	8-1/4	3/16	10	3/4	7/16	8	17-9/16	3	1-1/16	–	170303
[illegible]TP	14-7/16	1-1/4	8-15/16	7-3/4	3-11/16	26-1/4	9-1/8	8-1/4	3/16	10	1	7/16	10	22-15/16	2-15/16	1-5/16	–	171613
[illegible]6TP	14-7/16	1-1/4	8-15/16	7-3/4	3-11/16	26-1/4	9-1/8	8-1/4	3/16	10	1	7/16	10	22-15/16	2-15/16	1-5/16	–	171613
254TPH	14-7/16	1-1/4	8-15/16	7-3/4	3-11/16	26-1/4	9-1/8	8-1/4	3/16	12	1	7/16	10	22-15/16	2-15/16	1-5/16	–	171611
256TPH	14-7/16	1-1/4	8-15/16	7-3/4	3-11/16	26-1/4	9-1/8	8-1/4	3/16	12	1	7/16	10	22-15/16	2-15/16	1-5/16	–	171611
254TPA	14-7/16	1-1/4	8-15/16	7-3/4	3-11/16	26-1/4	14-3/4	13-1/2	1/4	16-1/2	3/4	11/16	10	22-15/16	2-15/16	1-5/16	–	183309
256TPA	14-7/16	1-1/4	8-15/16	7-3/4	3-11/16	26-1/4	14-3/4	13-1/2	1/4	16-1/2	3/4	11/16	10	22-15/16	2-15/16	1-5/16	–	183309
284TP	15	2	12-7/16	9-1/16	3-1/4	27-1/8	9-1/8	8-1/4	3/16	10	13/16	7/16	10-1/4	23-21/32	3-5/16	1-5/16	17-3/4	148270
284TPH	15	2	12-7/16	9-1/16	3-1/4	27-1/8	14-3/4	13-1/2	1/4	16-1/2	13/16	11/16	10-1/4	23-21/32	3-5/16	1-5/16	17-3/4	148305
284TPA	15	2	12-7/16	9-1/16	3-1/4	27-1/8	9-1/8	8-1/4	3/16	12	13/16	7/16	10-1/4	23-21/32	3-5/16	1-5/16	17-3/4	148317
286TP	15	2	12-7/16	9-1/16	3-1/4	27-1/8	9-1/8	8-1/4	3/16	10	13/16	7/16	10-1/4	23-21/32	3-5/16	1-5/16	17-3/4	148270
286TPH	15	2	12-7/16	9-1/16	3-1/4	27-1/8	14-3/4	13-1/2	1/4	16-1/2	13/16	11/16	10-1/4	23-21/32	3-5/16	1-5/16	17-3/4	148305
286TPA	15	2	12-7/16	9-1/16	3-1/4	27-1/8	9-1/8	8-1/4	3/16	12	13/16	7/16	10-1/4	23-21/32	3-5/16	1-5/16	17-3/4	148317
324TP	18-3/8	3	16-11/16	12-9/16	4-5/8	32-5/8	14-3/4	13-1/2	1/4	16-1/2	11/16	11/16	11-5/32	28-1/4	4-1/4	1-9/16	21	132402
324TPH	18-3/8	3	16-11/16	12-9/16	4-5/8	32-5/8	9-1/8	8-1/4	3/16	12	11/16	7/16	11-5/32	28-1/4	4-1/4	1-9/16	21	132587
326TP	18-3/8	3	16-11/16	12-9/16	4-5/8	32-5/8	14-3/4	13-1/2	1/4	16-1/2	11/16	11/16	11-5/32	28-1/4	4-1/4	1-9/16	21	132402
326TPH	18-3/8	3	16-11/16	12-9/16	4-5/8	32-5/8	9-1/8	8-1/4	3/16	12	11/16	7/16	11-5/32	28-1/4	4-1/4	1-9/16	21	132587
364TP	18-3/8	3	16-11/16	12-9/16	4-5/8	35-5/8	14-3/4	13-1/2	1/4	16-1/2	11/16	11/16	14-1/32	31-3/16	4-1/4	1-9/16	21	132402
364TPA	18-3/8	3	16-11/16	12-9/16	4-5/8	35-5/8	9-1/8	8-1/4	3/16	12	11/16	7/16	14-1/32	31-3/16	4-1/4	1-9/16	21	132587
365TP	18-3/8	3	16-11/16	12-9/16	4-5/8	35-5/8	14-3/4	13-1/2	1/4	16-1/2	11/16	11/16	14-1/32	31-3/16	4-1/4	1-9/16	21	132402
365TPA	18-3/8	3	16-11/16	12-9/16	4-5/8	35-5/8	9-1/8	8-1/4	3/16	12	11/16	7/16	14-1/32	31-3/16	4-1/4	1-9/16	21	132587
404TP	20-1/2	3	18	13-7/8	4-5/8	41-5/8	14-3/4	13-1/2	1/4	16-1/2	3/4	11/16	18-5/32	36-15/16	4-9/16	1-7/8	23-3/8	132015
404TPA	20-1/2	3	18	13-7/8	4-5/8	41-5/8	14-3/4	13-1/2	1/4	20	3/4	11/16	18-5/32	36-15/16	4-9/16	1-7/8	23-3/8	132011
405TP	20-1/2	3	18	13-7/8	4-5/8	41-5/8	14-3/4	13-1/2	1/4	16-1/2	3/4	11/16	18-5/32	36-15/16	4-9/16	1-7/8	23-3/8	132015
405TPA	20-1/2	3	18	13-7/8	4-5/8	41-5/8	14-3/4	13-1/2	1/4	20	3/4	11/16	18-5/32	36-15/16	4-9/16	1-7/8	23-3/8	132011
444TP	23-1/8	3	18-3/16	13-15/16	4-7/8	47-7/8	14-3/4	13-1/2	1/4	16-1/2	3/4	11/16	21-5/32	42-21/32	5-1/8	2-5/16	25-7/8	148039
444TPA	23-1/8	3	18-3/16	13-15/16	4-7/8	47-7/8	14-3/4	13-1/2	1/4	20	3/4	11/16	21-5/32	42-21/32	5-1/8	2-5/16	25-7/8	148038
445TP	23-1/8	3	18-3/16	13-15/16	4-7/8	47-7/8	14-3/4	13-1/2	1/4	16-1/2	3/4	11/16	21-5/32	42-21/32	5-1/8	2-5/16	25-7/8	148039
445TPA	23-1/8	3	18-3/16	13-15/16	4-7/8	47-7/8	14-3/4	13-1/2	1/4	20	3/4	11/16	21-5/32	42-21/32	5-1/8	2-5/16	25-7/8	148038
5006P	28-3/4	3-1/2	19-3/4	16	5-5/16	56-3/8	14-3/4	13-1/2	1/4	24-1/2	1	11/16	19-1/2	50-17/32	5-1/2	2.505	32	113303
5006PH	28-3/4	3-1/2	19-3/4	16	5-5/16	56-1/4	14-3/4	13-1/2	1/4	20	1	11/16	19-3/8	50-13/32	5-1/2	2.505	32	118952
5008P	28-3/4	3-1/2	19-3/4	16	5-5/16	56-3/8	14-3/4	13-1/2	1/4	24-1/2	1	11/16	19-1/2	50-17/32	5-1/2	2.505	32	113303
5008PH	28-3/4	3-1/2	19-3/4	16	5-5/16	56-1/4	14-3/4	13-1/2	1/4	20	1	11/16	19-3/8	50-13/32	5-1/2	2.505	32	118952
5808P	34	3-1/2	23-5/8	19-13/16	5-5/16	66-15/16	26	22	1/4	30-1/2	1	13/16	24-3/4	58-1/4	8-3/8	2.755	39-1/2	143207
5808PH	34	3-1/2	23-5/8	19-13/16	5-5/16	69-15/16	14-3/4	13-1/2	1/4	24-1/2	7/8	11/16	27-3/4	61-1/4	8-3/8	2.755	39-1/2	143218
5809P	34	3-1/2	23-5/8	19-13/16	5-5/16	70-15/16	26	22	1/4	30-1/2	1	13/16	24-3/4	62-1/4	8-3/8	2.755	39-1/2	143207
5809PH	34	3-1/2	23-5/8	19-13/16	5-5/16	73-15/16	14-3/4	13-1/2	1/4	24-1/2	7/8	11/16	27-3/4	65-1/4	8-3/8	2.755	39-1/2	143218
5810P	34	3-1/2	26-13/16	21-5/16	8-1/16	74-15/16	26	22	1/4	30-1/2	1	13/16	28-3/4	66-1/4	8-3/8	2.755	39-1/2	143207
5810PH	34	3-1/2	26-13/16	21-5/16	8-1/16	74-15/16	26	22	1/4	24-1/2	1	13/16	28-3/4	66-1/4	8-3/8	2.755	39-1/2	191183
6808P	40-1/4	3-1/2	25	21-1/4	5-5/16	81-11/16	26	22	1/4	30-1/2	1	13/16	29-1/4	72-5/16	9-1/8	2.755	44-1/4	120460
[illegible]08PH	40-1/4	3-1/2	25	21-1/4	5-5/16	81-11/16	14-3/4	13-1/2	1/4	24-1/2	1	11/16	29-1/4	72-5/16	9-1/8	2.755	44-1/4	120461
[illegible]09P	40-1/4	3-1/2	25	24-1/4	8-1/16	92-9/16	26	22	1/4	30-1/2	1	13/16	37	88-3/16	9-1/8	2.755	44-7/8	120460
6810PHZ	42-1/2	3-1/2	33-13/16	28-15/16	10-1/8	96-3/8	32	26	1/4	36	1-1/2	1	43-1/16	88-27/32	7-5/32	3.875	48-1/4	178614

Dimensions shown are for Reference Only.

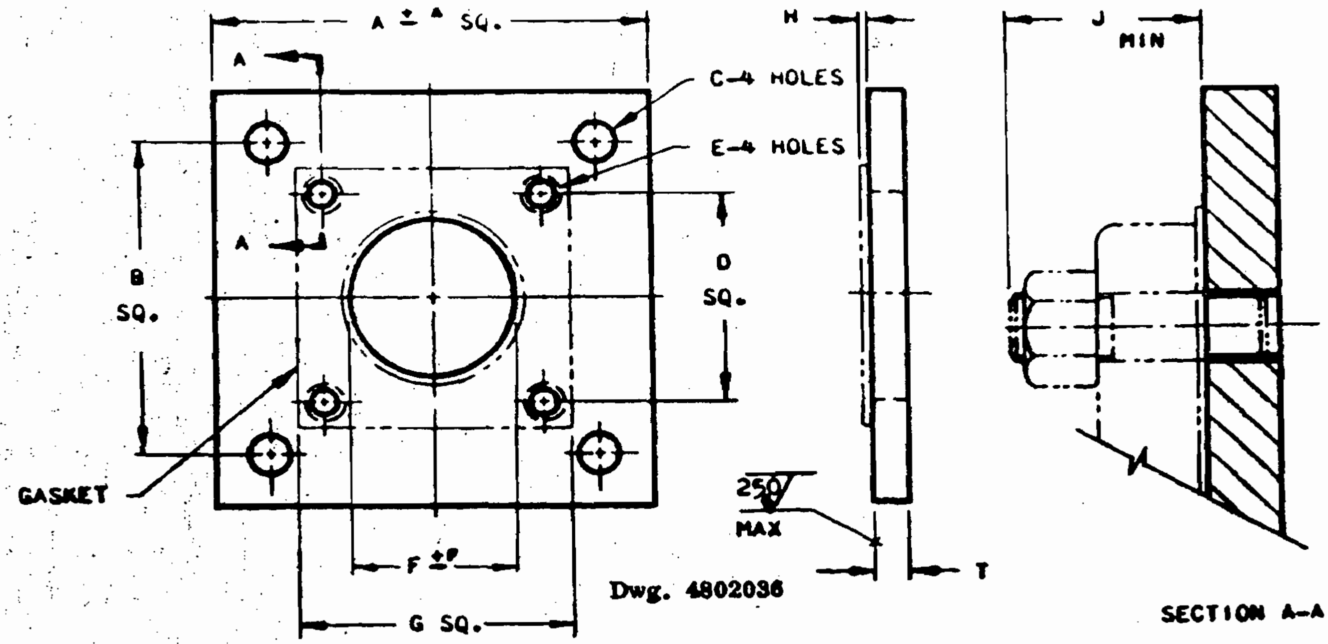
U.S. ELECTRICAL MOTORS
DIVISION OF EMERSON ELECTRIC CO.
125 OLD GATE LANE
MILFORD, CONNECTICUT 06460
EMERSON

LITHO IN U.S.A.

Sole Plates

(Carbon Steel Blanchard Ground One Side)

For cast iron discharge assemblies only.



Dwg. 4802036

HEAD SIZE	DIMENSIONS IN INCHES									
	A	B	C	D	E	F	G	H	J	T
2 x 2½ x 10	14½	13	3/4	9-1/4	3/8-16 UNC	9	13	1/16	1-3/8	1/2
2½ x 2½ x 10	14½	13	3/4	9-1/4	3/8-16 UNC	9	13	1/16	1-3/8	1/2
2½ x 3 x 10	14½	13	3/4	9-1/4	3/8-16 UNC	9	13	1/16	1-3/8	1/2
4 x 4 x 10C	18	16	7/8	8-5/16	3/4-10 UNC	9	13-1/2 (1)	1/16	2-1/8	5/8
6 x 6 x 12	21	18	7/8	13-1/4	5/8-11 UNC	13	15-1/2	1/16	1-7/8	5/8
8 x 8 x 12	24	21½	7/8	15	5/8-11 UNC	14½	17-1/2	1/16	1-7/8	3/4
6 x 8 x 16½	26	23	1-1/8	18	3/4-10 UNC	16½	20-1/2	1/16	2-1/4	7/8
8 x 8 x 16½	26	23	1-1/8	18	3/4-10 UNC	16½	20-1/2	1/16	2-1/4	7/8
10 x 10 x 16½	28	25	1-1/8	18	3/4-10 UNC	18	20-1/2	1/16	2-1/2	7/8
10 x 10 x 20	28	25	1-1/8	18	3/4-10 UNC	18	20-1/2	1/16	2-1/2	7/8
12 x 12 x 20	32	29	1-1/4	21	3/4-10 UNC	20½	23-1/2	1/16	2-3/4	7/8
14 x 14 x 24½	36	32	1-1/4	25	3/4-10 UNC	24½	28-3/4	1/8	2-7/8	1
16 x 16 x 30½	42	39	1-1/4	32	3/4-10 UNC	28	38-3/4	1/8	4-3/4	1

(1) This gasket is round all others are square.

BEST AVAILABLE COPY

WELL PUMP TEST

CONTRACTOR: PROJECT NO. ____

NAME Locke Well & Pump Company

ADDRESS: 3685 Old Winter Garden Road Orlando, Fl. 32805

TELEPHONE NO.: 305/299-8888

CONTRACTOR REPRESENTATIVE AT TEST: Randy Everhart

OWNER: Well # 33 DATE: 5/25/81

ENGINEER: ____ INSPECTOR: ____

LOCATION: Lakeland, Fl. Well # 33

STATIC WATER LEVEL, BEFORE TEST: 39' AFTER: 39'

TEST REQUIREMENTS: ____

PUMPING EQUIPMENT USED: ____

TIME	ORIFICE READING IN INCHES	FLOW RATE IN G.P.M.	DEPTH TO PUMPING W.L.	DRAWDOWN	CONDITION OF WATER
2:15	26	2513	42	3	Milky
2:16	26.5	2539	44	5	"
2:17	27	2565	44.5	5.5	"
2:18	27	2565	44.5	5.5	"
2:19	27	2565	44.5	5.5	"
2:20	27	2565	44.5	5.5	"
2:21	27	2565	44.5	5.5	"
2:22	27.5	2590	44.5	5.5	"
2:23	26	2513	45	6	"
2:24	26	2513	46	6	"
2:25	26	2513	45	6	"
2:30	26	2513	45	6	"
2:35	26	2513	45	6	"
2:40	26	2513	45	6	"
2:45	26	2513	45	6	"
2:50	26	2513	45	6	"
2:55	26	2513	45	6	"
3:00	26	2513	45	6	"
3:10	26.5	2539	45	6	Hazy & Clearing
3:20	26	2513	45	6	"
3:30	26.5	2539	45	6	"

REMARKS:

3:40	26	2513	45	6	"
4:00	26	2513	45	6	"
5:00	26	2513	45	6	"

2:

WELL PUMP TEST

CONTRACTOR:

NAME Locke Well & Pump Company

PROJECT NO.

ADDRESS: 3685 Old Winter Garden Road Orlando, Fl. 32805

TELEPHONE NO.: 305 -299/8888

CONTRACTOR REPRESENTATIVE AT TEST: Randy Everhart

OWNER: Well # 33 DATE: 5/26/81

ENGINEER: INSPECTOR:

LOCATION: Lakeland Florida Well # 33

STATIC WATER LEVEL, BEFORE TEST: 39' AFTER: 39'

TEST REQUIREMENTS:

PUMPING EQUIPMENT USED:

TIME	ORIFICE READING IN INCHES	FLOW RATE IN G.P.M.	DEPTH TO PUMPING W.L.	DRAWDOWN	CONDITION OF WATER
9:00	26	2513	42	3	Hazy
9:01	26.5	2539	42.5	3.5	"
9:02	27	2565	44	4	"
9:03	27	2565	44.5	4.5	Hazy & Cleari
9:04	27.5	2590	44.5	4.5	"
9:05	27.5	2590	44.5	4.5	"
9:06	27	2565	44.5	4.5	"
9:07	27	2565	44.5	4.5	"
9:08	27.5	2590	44.5	4.5	"
9:09	27	2565	44.5	4.5	"
9:10	27	2565	44.5	4.5	"
9:15	27	2565	44.5	4.5	"
9:20	27.5	2590	44.5	4.5	"
9:25	26.5	2539	44.5	4.5	"
9:30	26	2513	44.5	4.5	"
9:35	26	2513	44.5	4.5	"
9:40	26	2513	44.5	4.5	"
9:50	26	2513	45	5	"
10:00	26	2513	45	5	"
10:10	26	2513	45.5	5.5	Clearing
10:20	26	2513	45.5	5.5	"

REMARKS:

11:00	26.5	2539	46	7	Clear
12:00 noon	27.5	2590	46	7	"

Shut down 12:05 - 3 hours testing (Water Pit full) water level 39.6

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FLORIDA
[illegible]IRONMENTAL REGULATION
[illegible]COMPLETION REPORT

City of Lakeland
Mc Intosh Power
Last Name / First Name / Initial

410 Kelt Parker St.
Number / Street

Lakeland Florida
City / State

Area Code [ ] Phone Number [ ] Zip Code 33801

WELL LOCATION: ¼ ¼ ¼ of Section [ ]
Township [ ] (N-S) Range [ ] (E-W)
Latitude [ ] Deg. [ ] Min. [ ] Sec. N
Longitude [ ] Deg. [ ] Min. [ ] Sec. W
Locate in Section

3
Number / Street/Road

Lot No. / Subdivision

City / County: Polk

OWNER WELL NUMBER OR NAME: 33

DRILL METHOD: [ ] Rotary [X] Cable Tool [ ] Jet [ ] Auger
[ ] Other:

SURFACE CASING, CASING, AND LINER MATERIAL:

Steel Dia. (In.) Black	Galv.	S. Steel	Steel Wt. (lb./Ft.)	Dia. (In.) PVC	Other†	From (Ft.)	To (Ft.)	Schedule No.	Joints*
~~30"~~			~~X~~			~~0~~	~~181~~	~~11"~~	~~W~~
~~24"~~			~~X~~			~~0~~	~~200~~		~~W~~

† Describe Material:
* TC = Threaded and Coupled, TCW = Threaded, Coupled, and Welded, W = Welded, B = Bonded (PVC), O = Other:

GROUT: [ ] None [X] Neat Cement [ ] Other:

Type and Percent of Additives and Grout Volume or Number of 94 lb. Sacks	From (Ft.)	To (Ft.)
~~325 bags~~	~~0~~	~~200~~

FINISH: [X] Open Hole [ ] Perforated or Slotted Casing [ ] Gravel Pack
[ ] Sandpoint or Screen Attached to Well Casing [ ] Sandpoint or Screen Telescoped with Packer Inside Casing (Packer Material:)

Sandpoint/Screen Material	Dia. (In.)	Slot Size (In.)	From (Ft.)	To (Ft.)

[ ] Other Finish:

QUALITY TEST: [X] None [ ] Bacteria ___ Date [ ] Chemical ___ Date
By: [ ] Health Dept. [ ] USGS [ ] Other
[X] Clear [ ] Colored [ ] Sulphur [ ] Salty [ ] Iron [ ] Other
Conductance (Micromhos) [ ] Chloride [ ] ppm
Hardness [ ] ppm as calcium carbonate pH [ ] Temp [ ] °F
Well Disinfected: [ ] No [ ] Yes ___ (Date)

WELL TEST, by: [ ] Natural Flow [ ] G.P.M. [ ] Airlift
[ ] Bailer [ ] Permanent Pump [X] Test Pump [ ] None
Discharge Measured By: [ ] Bailer [ ] Estimated [ ] Current Meter
[ ] Orifice [ ] Trajectory [ ] Venturi [ ] Volumetric [ ] Other

Measured Static Water Level [ ] + [ ] - [38] Ft.
Measured Pumping Water Level [ ] + [ ] - [ ] Ft.
After [ ] Hours At [ ] G.P.M.
Specific Capacity [ ] G.P.M./Ft. of Drawdown
Measuring Pt. (Describe):
Which is [ ] Ft. [XX] Above [ ] Below Land Surface
Elevation of Measuring Pt. = [ ] Ft. [ ] Above [ ] Below MSL

WELL EQUIPMENT: [ ] Open [X] Capped [ ] Valved
[ ] Permanent Pump [ ] Temporary Pump
Type Pump: [ ] Centrifugal [ ] Cylinder [ ] Jet [ ] Submersible
[ ] Turbine [ ] Other:
Power: [ ] Diesel [ ] Electric [ ] Gasoline [ ] Other:
Horsepower [ ] Capacity [ ] G.P.M.
Intake/Injection Depth [ ] Ft.

DER Form PERM 13-10 (Oct 77)

TYPE OF WORK: [X] New Construction [ ] Repair [ ] Deepening [ ] Plugging
[ ] Other:

PERMIT NUMBER

WELL NUMBER

TYPE OF WELL: [X] Water Well [ ] Test Well [ ] Recharge - [ ] Drainage
[ ] Waste Disposal [X] Observation [ ] Other

USE: [ ] Domestic [ ] Irrigation [XX] Industrial [ ] Livestock [ ] Public Supply
[ ] Other:

SKETCH LOCATION OF WELL in relation to local landmarks, giving distance and direction from nearest town, road, or other reference point.

North

GEOPHYSICAL LOGS: Type: By:

Bore Hole (In.)	Casing Size (In.)	Depth (Ft.) From	To	WELL LOG — Examine cuttings at 20 ft. or smaller intervals and at changes. Give color, grain-size and type of material. Note any cavities. Indicate producing zones. Attach additional sheets if necessary.
30"/24"	30"/24"	~~0~~	~~30~~	~~Sandy clay- Brown- Soft~~
		~~30~~	~~48~~	~~Clay - Brown - Muddy~~
		~~48~~	~~55~~	~~Lime & Clay - Gray - Muddy~~
		~~55~~	~~64~~	~~Lime & Clay - Brown - Muddy~~
		~~64~~	~~75~~	~~Lime & Clay - Blue - Muddy/Har~~
		~~75~~	~~90~~	~~Lime&Clay-Blue-Muddy~~
		~~90~~	~~96~~	~~Lime&Clay-Gray-Hard/Muddy~~
		~~96~~	~~100~~	~~Lime&Clay-Gray-Muddy~~
		~~100~~	~~102~~	~~Lime&Clay-Gray-Muddy~~
		~~102~~	~~110~~	~~Lime&Clay-Gray-Muddy~~
		~~110~~	~~115~~	~~Lime&Clay-Brown-Soft~~
		~~115~~	~~117~~	~~Lime-Brown-Soft~~
		~~117~~	~~122~~	~~Lime-Brown-Soft~~
		~~122~~	~~132~~	~~Lime-Brown&Gray-Hard~~
		~~132~~	[illegible]	~~Porous Lime-White-Soft~~
		[illegible]	[illegible]	~~Porous Lime-White-Soft~~
		[illegible]	[illegible]	~~Porous Lime-Cream-Soft~~
		[illegible]	[illegible]	~~Porous Lime-Cream-Soft~~
		[illegible]	[illegible]	[illegible] - Hard
		[illegible]	[illegible]	[illegible] White-Hard
		[illegible]	[illegible]	[illegible] Cream-[illegible]
		[illegible]	[illegible]	[illegible] Cream-Soft
		[illegible]	[illegible]	[illegible] Hard
		[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible] Rock-White-Soft
		[illegible]	[illegible]	[illegible] Rock-White-Soft

Total Depth [ ] Ft. Producing Zone Material: [ ] Sand [ ] Shell
[ ] Broken Shell [ ] Limestone [ ] Other:
Top of Producing Zone [ ] Ft., Bottom of Producing Zone [ ] Ft.
[ ] Drill Cuttings Sent to Bureau of Geology

License No. / Contractor Signature / Position
Completion Date / Driller Signature

Depth		Formation	Color	Hardness
230	340	Porous Lime & Shell-Cream-Soft		
340	410	Rock with shell-Brown-Soft with thin hard layers		
410	482	Rock with Sea Shell-Brown-Soft with hard layers		
482	500	Rock-Brown-Hard		
500	510	Rock-Brown-Hard with soft layers		
510	520	Lime & Shell-Brown-Soft		
520	530	Lime & Shell-Brown-Soft		
530	540	Rock-Brown-Hard		
540	567	Rock-Brown-Hard		
567	594	Rock with shell loose layers - Brown-Hard		
594	602	Honeycomb & Water-No cuttings-Soft		
602	607	Rock-No cuttings-Hard		
607	609	Rock with loose cutting-None-Hard		

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Moddy

WELL PUMP TEST

JUL 6 1981

CONTRACTOR: PROJECT NO. [illegible]

NAME Locke Well & Pump Company

ADDRESS: 3685 Old Winter Garden Road Orlando, Fl. 32805

TELEPHONE NO.: 305/299-8888

CONTRACTOR REPRESENTATIVE AT TEST: Everhart

OWNER: McIntosh Power Co. Well #31 DATE: 2-20-81

ENGINEER: INSPECTOR:

LOCATION:

STATIC WATER LEVEL, BEFORE TEST: 31'10" AFTER: 31'10"

TEST REQUIREMENTS:

PUMPING EQUIPMENT USED:

3½ Hr. Standby

	TIME	ORIFICE READING IN INCHES	FLOW RATE IN G.P.M.	DEPTH TO PUMPING W.L.	DRAWDOWN	CONDITION OF WATER
.M.	11:00	11"	1635	52'	20'2"	Muddy Brown
	11:05	11"	1635	52'	20'2"	Muddy Brown
	11:10	11"	1635	52'	20'2"	Muddy Brown
	11:15	11"	1635	52'	20'2"	Muddy Brown
	11:20	11"	1635	52'	20'2"	Muddy Brown
	11:25	12"	1705	52'	20'2"	Muddy Brown
	11:30	13"	1775	52'	20'2"	Muddy Brown
.M.	12:30	13"	1775	52'	20'2"	Muddy Brown
	1:30	13"	1775	52'	20'2"	Muddy Clearing
	2:30	13"	1775	52'	20'2"	Muddy Clearing
	3:30	13"	1775	52'	20'2"	Muddy Clearing
	4:30	13"	1775	52'	20'2"	Muddy Clearing
	5:30	13"	1775	52'	20'2"	Muddy Clearing

REMARKS:

WELL PUMP TEST

CONTRACTOR: PROJECT NO.

NAME Locke Well and Pump Company

ADDRESS: 3685 Old Winter Garden Road Orlando, Fl. 32805

TELEPHONE NO.: 305/299-8888

CONTRACTOR REPRESENTATIVE AT TEST: Everhart

OWNER: McIntosh Power Co. Well #31 DATE: 2-23-81

ENGINEER: INSPECTOR:

LOCATION:

STATIC WATER LEVEL, BEFORE TEST: 31'10" AFTER: 31'10"

TEST REQUIREMENTS:

PUMPING EQUIPMENT USED:

Started Test 8:00 A.M.

TIME	ORIFICE READING IN INCHES	FLOW RATE IN G.P.M.	DEPTH TO PUMPING W.L.	DRAWDOWN	CONDITION OF WATER
8:05	13"	1775	42'	10'2"	Brown
8:10	13"	1775	48'	16'2"	Brown
8:15	13"	1775	49'	17'2"	Brown
8:20	13"	1775	50'	18'2"	Brown
8:30	13"	1775	52'	20'2"	Brown
9:00	13"	1775	52'	20'2"	Brown
10:00	13"	1775	52'	20'2"	Brown
11:00	13"	1775	52'	20'2"	Brown
12:00	13"	1775	52'	20'2"	Brown Clearing
4 hour	stand-by added	20' to pump			
4-5 P.M.	25"	2461	79'	47'2"	Brown

REMARKS:

WELL PUMP TEST

CONTRACTOR: PROJECT NO.

NAME Locke Well & Pump Co.

ADDRESS: 3685 Old Winter Garden Road - Orlando, Fl. 32805

TELEPHONE NO.: 305/299-8888

CONTRACTOR REPRESENTATIVE AT TEST: Everhart

OWNER: McIntosh Power Co. DATE: 2/25/81

ENGINEER: INSPECTOR:

LOCATION:

STATIC WATER LEVEL, BEFORE TEST: 31'10" AFTER: 31'10"

TEST REQUIREMENTS:

PUMPING EQUIPMENT USED:

Started test 8:00 A.M.

	TIME	ORIFICE READING IN INCHES	FLOW RATE IN G.P.M.	DEPTH TO PUMPING W.L.	DRAWDOWN	CONDITION OF WATER
A.M.	8:01	25"	2461	70'	28'2"	Milky
	8:02	25"	2461	72'	40'2"	Milky
	8:03	25"	2461	72'	40'2"	Milky
	8:04	25"	2461	74'	42'2"	Milky
	8:05	25"	2461	74'6"	42'8"	Milky
	8:06	25"	2461	75'	43'2"	Milky
	8:07	25"	2461	74'6"	42'8"	Milky
	8:08	25"	2461	74'6"	42'8"	Milky
	8:09	25"	2461	75'	43'2"	Milky
	8:10	25"	2461	75'	43'2"	Milky
	8:15	25"	2461	75'	43'2"	Milky
	8:20	25"	2461	75'	43'2"	Milky
	8:25	25.5"	2487	75'^{6}	43'8"	Milky Clearing
	8:30	25.5"	2487	75'^{6}	43'8"	Milky Clearing
	9:30	26"	2513	76^{6}	44'8"	Milky Clearing
	10:30	26"	2513	76^{6}	44'8"	Milky Clearing
	11:30	26"	2513	76^{6}	44'8"	Clear
	12:30	26"	2513	78	46'2"	Clear
	1:30	26"	2513	78	46'2"	Clear
	2:30	26"	2513	79	47'2"	Clear
	3:30	26"	2513	79	47'5"	Clear
	4-5 P.M.	24"	2409	77	45'2"	Clear

REMARKS:

WELL PUMP TEST

CONTRACTOR: PROJECT NO.

NAME Locke Well & Pump Co.

ADDRESS: 3685 Old Winter Garden Road Orlando, Fl. 32805

TELEPHONE NO.: 305/299-8888

CONTRACTOR REPRESENTATIVE AT TEST: Everhart

OWNER: McIntosh Power Co. DATE: 2/24/81

ENGINEER: INSPECTOR:

LOCATION: Lakeland, Florida

STATIC WATER LEVEL, BEFORE TEST: 31'10" AFTER: 31'10"

TEST REQUIREMENTS:

PUMPING EQUIPMENT USED:

Started test at 8:00 A.M.

	TIME	ORIFICE READING IN INCHES	FLOW RATE IN G.P.M.	DEPTH TO PUMPING W.L.	DRAWDOWN	CONDITION OF WATER
A.M	8:00	25"	2461	60'	28'2"	Brown
	8:05	25"	2461	65'	33'2"	Brown
	8:10	25"	2461	70'	38'2"	Brown
	8:20	25"	2461	79'	47'2"	Brown
	8:25	25"	2461	79'	47'2"	Brown-Clearing
	8 45	25"	2461	79'	47'2"	Brown-Clearing
	9:00	25"	2461	79'	47'2"	Milky
	10:00	25.5"	2487	79'	47'2"	Milky
	11:00	25"	2461	78½'	46'8"	Milky-Clearing
	12 00	25"	2461	78½	46'8"	Milky-Clearing
P.M.	1:00	25"	2461	79'	47'2"	Milky-Clearing
	2:00	25.5"	2487	79'	47'2"	Milky-Clearing
	3 00	26"	2513	79½'	47'8"	Milky-Clearing
	4:00	26"	2513	80'	48'2"	Milky-Clearing
	4:45	26"	2513	80'	48'2"	Clearing
		Cut pump - checked recovery				
		Recovered to 40' immediately				
		40' 36'	@ 1 35^2 @ 7 @ 2 35^2 @ 8			
		36' 36'	@ 3 35 @ 9 @ 4 35 @ 10			
		35^6 35^2	@ 5 @ 6			

REMARKS:

WELL PUMP TEST

CONTRACTOR: PROJECT NO. Well #32 Well #1

NAME Locke WEll & Pump Company

ADDRESS: 3685 Old Winter Garden Road Orlāndo, Florida 32805

TELEPHONE NO.: 305 299-8888

CONTRACTOR REPRESENTATIVE AT TEST:

OWNER: City of Lakeland McIntosh Power Plant DATE: 11-5-80

ENGINEER: INSPECTOR:

LOCATION:

STATIC WATER LEVEL, BEFORE TEST: 30 feet AFTER: 30 feet

TEST REQUIREMENTS:

PUMPING EQUIPMENT USED: 70 feet of 12" column

TIME	ORIFICE READING IN INCHES	FLOW RATE IN G.P.M.	DEPTH TO PUMPING W.L.	DRAWDOWN	CONDITION OF WATER
9:30	37"	3000	50'	20'	Cloudy
10:00	37"	3000	50'	20'	"
10:30	37"	3000	50'	20'	"
11:00	37"	3000	50'	20'	Clearing
11:30	37"	3000	50'	20'	Clear
12:00	37"	3000	50'	20'	"
12:30	26"	2500	46'	16'	"
1:00	26"	2500	46'	16'	"
1:30	26"	2500	46'	16'	"
2:00	26"	2500	46'	16'	"
2:30	26"	2500	46'	16'	"
3:00	26"	2500	46'	16'	"
3:30	26"	2500	46'	16'	"
4:00	26"	2500	46'	16'	"
4:30	26"	2500	46'	16'	"
5:00	26"	2500	46'	16'	"
5:30	25"	2500	46'	16'	"
8HOURS					

REMARKS:

WELL PUMP TEST

CONTRACTOR: PROJECT NO. Well #32 Well #1

NAME Locke well & pump Company

ADDRESS: 3685 Old Winter Garden Road Orlando, Florida 32805

TELEPHONE NO.: 305 299-8888

CONTRACTOR REPRESENTATIVE AT TEST:

OWNER: City of Lakeland McIntosh Power Plant DATE: 11-6-80

ENGINEER: INSPECTOR:

LOCATION:

STATIC WATER LEVEL, BEFORE TEST: 30' AFTER: 30'

TEST REQUIREMENTS:

PUMPING EQUIPMENT USED:

TIME	ORIFICE READING IN INCHES	FLOW RATE IN G.P.M.	DEPTH TO PUMPING W.L.	DRAWDOWN	CONDITION OF WATER
9:30	26"	2500	46'	16'	Clear
9:31	"	"	"	"	"
9:32	"	"	"	"	"
9:33	"	"	"	"	"
9:34	"	"	"	"	"
9:35	"	"	"	"	"
9:36	"	"	"	"	"
9:37	"	"	"	"	"
9:38	"	"	"	"	"
9:39	"	"	"	"	"
9:40	"	"	"	"	"
9:50	"	"	"	"	"
10:00	"	"	"	"	"
10:10	"	"	"	"	"
10:20	"	"	"	"	"
10:50	"	"	"	"	"
11:20	"	"	"	"	"
11:50	"	"	"	"	"
12:20	"	"	"	"	"
1:20	"	"	"	"	"
2:20	"	"	"	"	"

REMARKS: Cond't on next page

WELL PUMP TEST

CONTRACTOR: PROJECT NO. Well #32 Well #1

NAME Locke Well & Pump Company

ADDRESS: 3685 Old Winter Garden Rd. Orlando, Florida 32805

TELEPHONE NO.: 305 299-8888

CONTRACTOR REPRESENTATIVE AT TEST:

OWNER: DATE: 11-6-80

ENGINEER: INSPECTOR:

LOCATION:

STATIC WATER LEVEL, BEFORE TEST: 30' AFTER: 30'

TEST REQUIREMENTS:

PUMPING EQUIPMENT USED:

	TIME	ORIFICE READING IN INCHES	FLOW RATE IN G.P.M.	DEPTH TO PUMPING W.L.	DRAWDOWN	CONDITION OF WATER
	~~3:20~~	26"	2500	46'	16'	Clear
	4:20	"	"	"	"	"
	5:20	"	"	"	"	"

REMARKS:

Cond't.

Summary of Groundwater Modeling Analysis

Modeling Analysis

The modeling was based on a previously completed calibrated groundwater model created for use in the permitting of the City of Lakeland's existing Northeast and Northwest wellfields and submitted to the SWFWMD in 1993. The model was calibrated against APT data collected from each wellfield and was accepted by the SWFWMD as documenting or demonstrating the extent of predicted impacts. This model was modified as needed to simulate the drawdown impacts from the existing power plant wells. The only modification to the model was made in the grid spacing and inclusion of the McIntosh wells. Additional rows and columns were added in the vicinity of the McIntosh plant to allow for more accurate assessment of potential impacts made by the power plant's process, emergency, and make-up water wells, and their impact on existing legal users. These considerations were made to anticipate the worst case scenario for impacts caused by the plant's existing wells over a 90 day period with no recharge to the Floridan aquifer. MODFLOW, the USGS modular numerical modeling code, was used to construct the numerical model in support of the previous Water Use Permit Application.

The aquifer system in the Polk County area was simulated using three layers representing the Surficial Aquifer System, the Intermediate Aquifer System, and the Floridan Aquifer System. Flow between layers was represented by vertical conductance. Layer 1 was simulated as an unconfined aquifer and Layers 2 and 3 were simulated as confined aquifers. As a result, for Layers 2 and 3, only transmissivity, storage, and vertical conductance were required as model inputs. Input for Layer 1 included storage, hydraulic conductivity, and bottom of the model layer. The initial head was set to 0.0 in all layers, and all model edge boundaries were simulated as constant head boundaries.

Hydraulic Parameters

Transmissivity in Layer 3 of the Floridan aquifer varied between 80,000 to 140,000 ft^2/day. These values were taken from existing APT data for the Northeast and Northwest wellfields. The range of transmissivity values reflects the two values used in the previous modeling efforts modified to show a smooth, linear, variation from the Northeast Wellfield to the Northwest Wellfield. Likewise, the leakance values for Layers 1 and 2 were varied in a smooth and linear manner from the values used for the Northwest Wellfield simulation to the values used for the Northeast Wellfield simulation. The leakance values for Layer 1 ranged from 2.5×10^{-6} $days^{-1}$ to 6×10^{-5} $days^{-1}$. Leakance for Layer 2 ranged from 1×10^{-4} to 2.4×10^{-3} $days^{-1}$. A storage of 0.1 was used in Layer 1, 0.001 was used in Layer 2, and 0.001 was used in Layer 3. Existing McIntosh power plant supply wells 5 and 8, backup wells 1, 2, and 3 are all listed with pumping rates of 600 gpm. Power plant backup wells 31, 32, and 33 are for emergency backup should reuse water temporarily be unavailable. Wells No. 31, 32, and 33 are designed to supply water at a rate of 2,400 gpm each. Simulations depicting drawdown results from the existing wells and an additional well rated at 600 gpm were conducted for several pumping scenarios for 90 days with no recharge to create values indicative of worst-case situations. The additional well was evaluated as a worst-case analysis.

Results of Drawdown Impact Analysis

The first scenario showed drawdown results from the pumping of the existing McIntosh supply wells 5 and 8 at 600 gpm each. This resulted in just over 1.1 feet of drawdown at wells 5 and 8 and between 1.1. and 0.9 feet at the property boundaries. The second scenario included pumping of wells 5 and 8 in addition to another 600 gpm well. All three wells were pumped at 600 gpm for 90 days without recharge. The results show that the additional well increased drawdown in the immediate vicinity of the plant by approximately 0.7 ft and moves the drawdown contour out to approximately 5,000 ft from the property boundary. The backup wells were not turned on during the simulations. The wells not used in the simulations are intended for short-term use and would not be used except in an emergency.

10.5.4 BROWN AND CALDWELL STORMWATER POND DESIGN CALCULATIONS

BROWN AND
CALDWELL

ENGINEERING CALCULATIONS

CITY OF LAKELAND McINTOSH POWERPLANT

UNIT 5 STORMWATER DESIGN

WET POND DESIGN

SUBMITTED TO CITY OF LAKELAND, FL

JUNE 22, 1998

June a. Smith
June 23, 199?
PE 004936

Brown and Caldwell Consultants

REFERENCES/NOTES

McIntosh Unit-5 Hydrology / Stormwater Design

Wet Pond Design   DA = 6.4 Ac.   Tc – pp 4+6

Discharge ½ the ~~de~~ design storm event within 24 hrs

Discharge the water quality volume within 60 hrs.

Discharge no more than ½ of WQ volume in the 1st 60 hrs.

Ref: Talk with Brian Hunter, SWFWMD, 6/22/98

Have 35% of surface area 1 foot deep below seasonal high water

~~Store~~ Set bleeder elevation at the elevation for the volume of 100 year Post – Pre

Store the water Quality Volume (1" RO from site) set weir at that elevation

Have post development peak Q = pre-development peak Q.

(This requirement is not that important, since there is no downstream development).

U64100PR ~~U73100PR~~.INP is hydrology input file for pre-development 100 yr event

hydrograph name = ~~U3~~ ~~U73100PR~~ U64100PR

Area = ~~7.3~~ 6.4 A.   Shape factor 484

CN = 79

Tc = 41   peak Q = ~~28 cfs~~ ~~27.55~~ 24.2 cfs

Rain = 10"   V total = ~~186,322 ft³~~ 172118 ft³

~~U5-73100~~ U64100PO is post development hydrograph for 100 yr storm

peak Q = ~~29.88~~ 26.0 cfs   V total = ~~258,995~~ 226,940 ft³

DATE CHECKED	CHECKED BY	JOB NUMBER	BY	DATE	CALC. NO.	SHEET NO.
			RSC	6/14/98		1/21

PROJECT	SUBJECT
Lakeland McIntosh	Unit 5

GEN-021-3/5/85

Brown and Caldwell
Consultants

100 yr Post - Pre Volume = 226,940 ft³ - 172,118 ft³
= 54,822 ft³

Try Pond = 1.5 Ac. at 138.5

		Area, ft²	Incre Vol. ft³	Cumulative Vol, ft³
138.5	Area = 256 × 256	= 65,536		
			33,025	
139.0	258 × 258	= 66,564		33,025
			33,541	
139.5	260 × 260	= 67,600		66,566
			34,061	
140.0	262 × 262	= 68,644		100,627
			52,076	
140.75	265 × 265	= 70,225		152,703
			17,623	
141.0	266 × 266	= 70,756		170,326

Set the bleeder orfice elev. = 139.5 to trap 100 yr Post - Pre

WQ volume = 23,232 ft³ (1" RO from 6.4 Ac.)

set weir at elev. 140.0 which is above the WQ vol.

RUN MODRET using data that causes low infiltration.
MODRET results will give us outflow volumes, peak outflow, and max WL for 25 yr storm.

File U64WET provides results of pond flow routing

Outflow peak = 4.5 cfs   Pre-develop 25 yr peak = 15 cfs   OK
Max WL = 140.4
Volume discharged at 24 hrs = 112,900 ft³; WL = 140.13
Total RO volume = 157,218 ft³
Regulations require ½ the design storm event routed within 24 hrs. OK

See next page for orifice calculations to check drawdown through orfice within 60 hrs.

Discharge only ½ of WQ volume w/in 1st 60 hrs.

DATE CHECKED	CHECKED BY	JOB NUMBER	BY	DATE	CALC. NO.	SHEET NO.
			RSC	6/14/98		2 / 21

PROJECT	SUBJECT
Lakeland MacIntosh	Unit 5

GEN-021-3.5.85

Brown and Caldwell Consultants

REFERENCES/NOTES

Drawdown Analysis

Bleeder orifice at 139.5 (centerline elev.)

Volume/stage table

Stage	Area, ft^2	Incremental Volume, ft^3
140.0	68,644	
		6,854
139.9	68,435	
		6,833
139.8	68,225	
		13,603
139.6	67,808	
		6,770
139.5	67,600	

WQ vol = 34,063 ft^3

50% of WQ Vol = 17,031 ft^3

Orifice flow equation $Q = 4.8 \times A \times H^{0.5}$

Assume 2" ϕ orifice, centroid is 2/3 above orifice invert

Set centerline at 139.5 Centroid = 139.53

A for 2" orifice $= \pi\left(\frac{1}{12}\right)^2 = 0.022\ ft^2$ $4.8(A) = 0.105$

Stage	Equation	Q	interval vol		Drain Time, hrs
140.0	Q at H=0.47 = $0.105\,(0.47)^{0.5}$	= 0.07 cfs	6854 ft^3	13,687 ft^3	28 hrs
139.9	Q at H=0.37 = $0.105\,(0.37)^{0.5}$	= 0.064 cfs	6833 ft^3		32 hrs
139.8	Q at H = 0.27 = $0.105\,(0.27)^{0.5}$	= 0.054 cfs			
139.6	Q at H=0.17 = $0.105\,(0.17)^{0.5}$	= 0.043 cfs			

pond orifice drains 13,687 ft^3 in 60 hrs,
which is 40% of WQ Vol.

OK

DATE CHECKED	CHECKED BY	JOB NUMBER	BY	DATE	CALC. NO.	SHEET NO.
			RSC	4/22/98		3/21

PROJECT: Lakeland

SUBJECT: Unit 5

GEN-02--3 5/85

Worksheet 3: Time of concentration (T_c) or travel time (T_t)

Project UNIT 5 By RSC Date 5/8/98

Location Lakeland Checked ____ Date ____

Circle one: Present Developed PRE-DEVELOPMENT

Circle one: T_c T_t through subarea

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c only)		Segment ID			
1. Surface description (table 3-1)		grass			
2. Manning's roughness coeff., n (table 3-1) ..		0.15			
3. Flow length, L (total L $\leq$ 300 ft)	ft	300			
4. Two-yr 24-hr rainfall, P_2	in	4.5			
5. Land slope, s 3' over 900'	ft/ft	0.0033			41 min
6. $T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}} = \frac{.147}{0.21578}$ Compute T_t	hr	0.68	+	=	

Shallow concentrated flow		Segment ID			
7. Surface description (paved or unpaved)					
8. Flow length, L	ft				
9. Watercourse slope, s	ft/ft				
10. Average velocity, V (figure 3-1)	ft/s				
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr		+		=

Channel flow		Segment ID			
12. Cross sectional flow area, a	ft^2				
13. Wetted perimeter, p_w	ft				
14. Hydraulic radius, $r = \frac{a}{p_w}$ Compute r	ft				
15. Channel slope, s	ft/ft				
16. Manning's roughness coeff., n					
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V	ft/s				
18. Flow length, L	ft				
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr		+		=

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) .... hr

4/21

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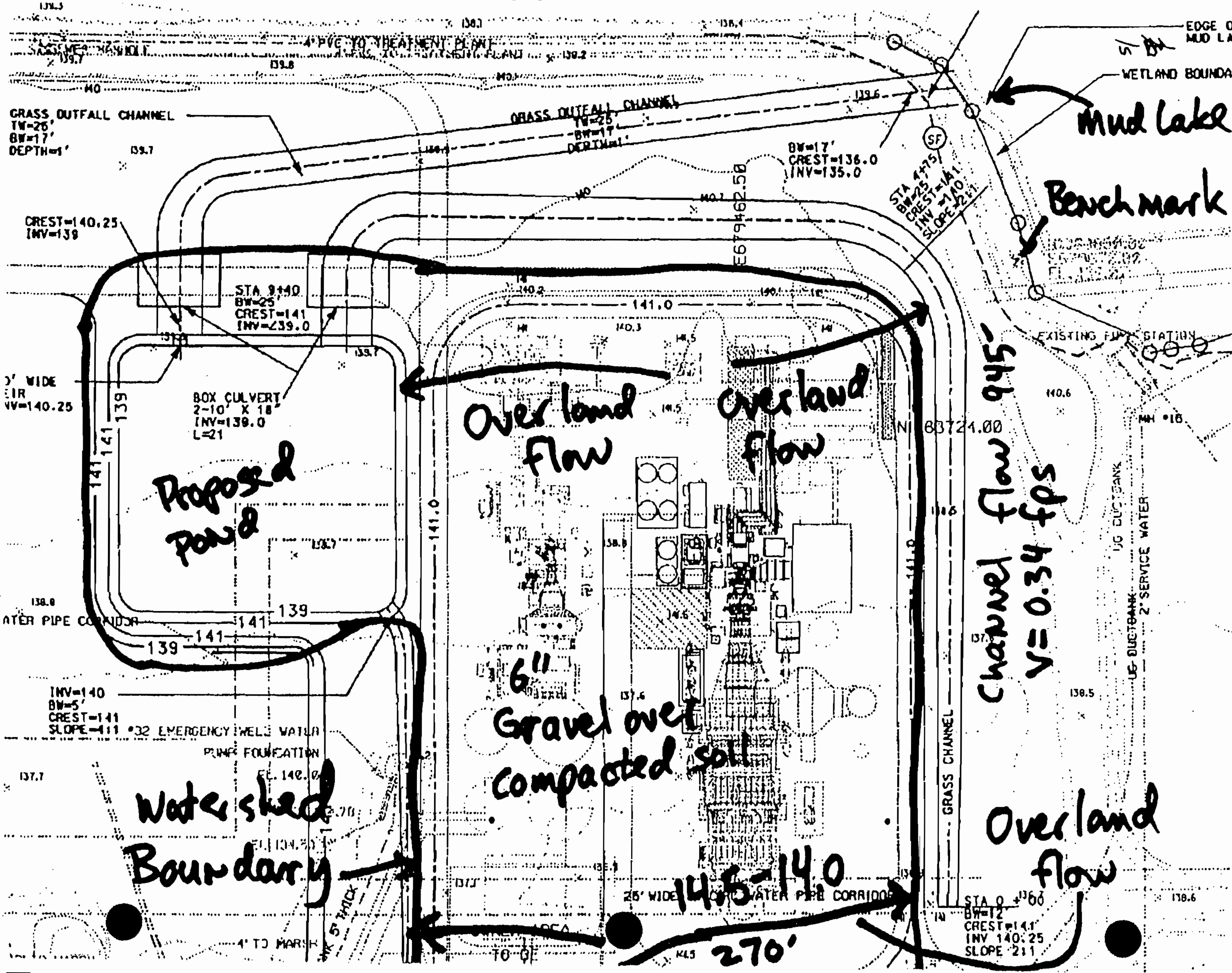


MAY-11-98 14:03 FROM:BROWN & CALDWELL ID:5109379326 PAGE 2

Worksheet 3: Time of concentration (T_c) or travel time (T_t)

Project UNIT 5 By RSC Date 5/8/98

Location Lakeland Checked ____ Date ____

Circle one: Present Developed Developed

Circle one: T_c ~~T_t through subarea~~

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c only)

	Unit	Segment ID		
1. Surface description (table 3-1)		gravel		
2. Manning's roughness coeff., n (table 3-1)		.011		
3. Flow length, L (total L ≤ 300 ft)	ft	210		
4. Two-yr 24-hr rainfall, P_2	in	4.5		
5. Land slope, s — 0.5'/210'	ft/ft	0.0024		
6. $T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}} = \frac{0.0137}{0.190}$ Compute T_t	hr	0.07	+	= 0.07

Shallow concentrated flow

	Unit	Segment ID		
7. Surface description (paved or unpaved)				
8. Flow length, L	ft			
9. Watercourse slope, s	ft/ft			
10. Average velocity, V (figure 3-1)	ft/s			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr		+	=

Channel flow Sta 0+00 to Sta 9+50 (see Fig. B-1)

see swale spreadsheet sheet 21/21

	Unit	Segment ID		
12. Cross sectional flow area, a	ft^2	29		
13. Wetted perimeter, p_w	ft	33.25		
14. Hydraulic radius, $r = \frac{a}{p_w}$ Compute r	ft	0.872		
15. Channel slope, s	ft/ft	0.00105		
16. Manning's roughness coeff., n		0.13		
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V	ft/s	0.34		
18. Flow length, L	ft	950'		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr	0.78	+	= 0.78

50 min

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) .... hr 0.84

MODRET

HYDROGRAPH DATA INPUT - SCS UNIT METHOD

100 yr
Pre Development

Hydrograph Name : U64100PR
Rainfall Distribution : SWFWMD(24 hrs)-TYPE II FL Modified

Contributing Basin Area	6.40 ac.
SCS Curve Number	79.00
Time of Concentration	41.00 min
Rainfall Depth	10.00 "
Shape Factor	484

7/21

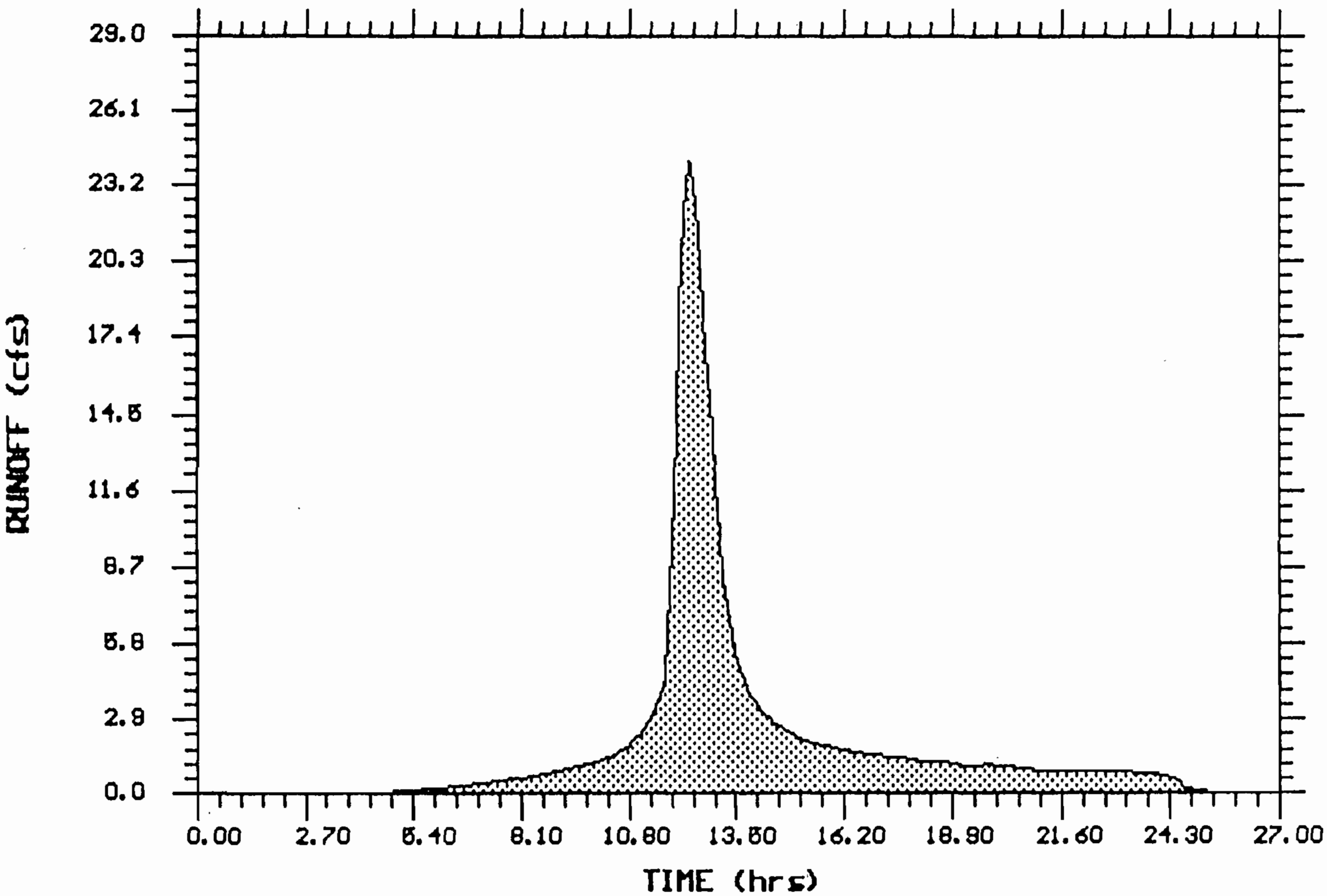
Sunday, 6/14/1998

8/21

100 yr Q
Predevelopment

MODRET

RESULTS OF RUNOFF HYDROGRAPH
NAME OR NODE ID : U64100PR



Q max : 24.16 cfs Time of Qmax : 12.30 hrs V_total : 172118.3 ft3

MODRET

HYDROGRAPH DATA INPUT - SCS UNIT METHOD

100 yr
Post Development

Hydrograph Name : U64100PO
Rainfall Distribution : SWFWMD(24 hrs)-TYPE II FL Modified

Contributing Basin Area	6.40 ac.
SCS Curve Number	98.00
Time of Concentration	51.00 min
Rainfall Depth	10.00 "
Shape Factor	484

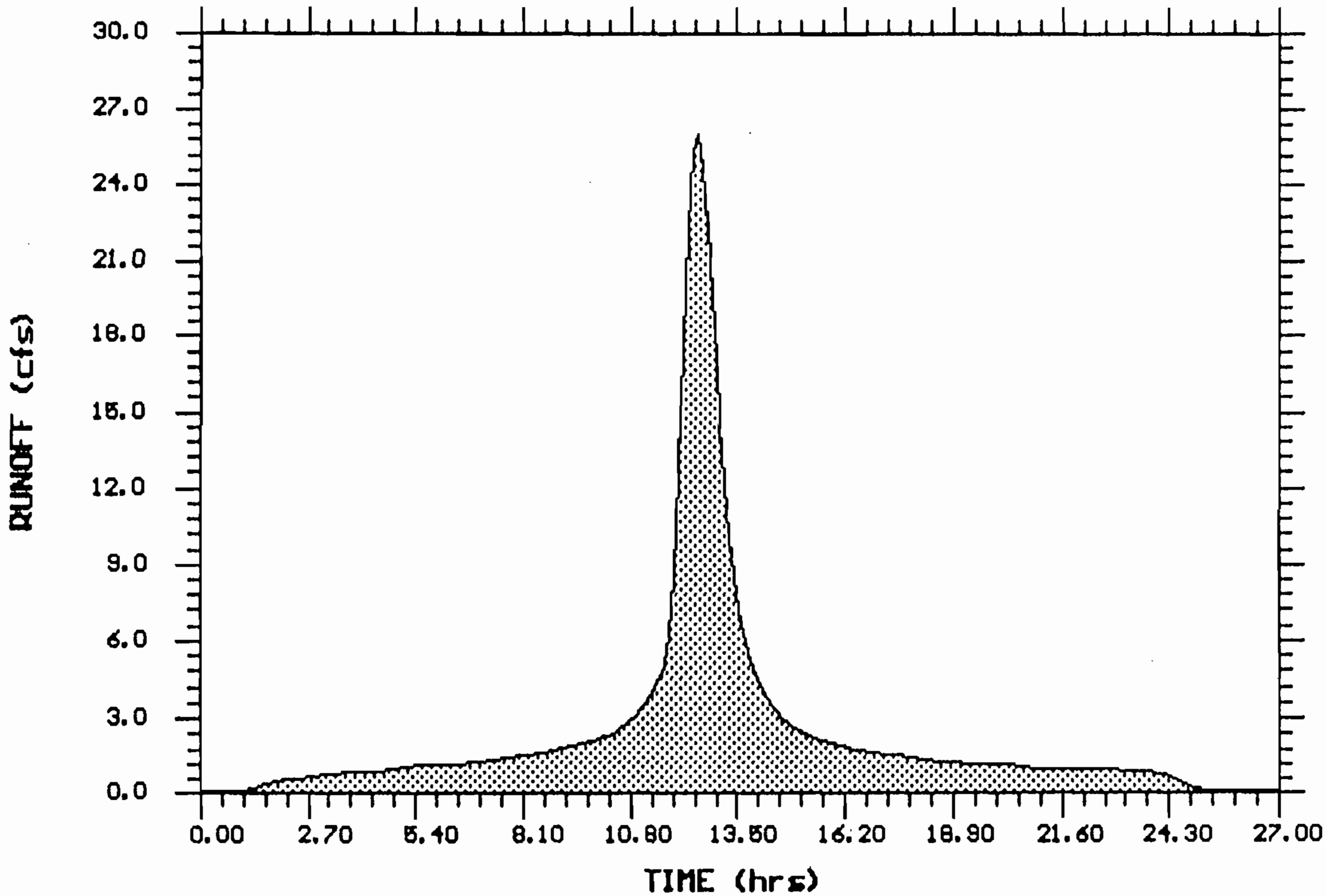
Sunday, 6/14/1998

10/21

100 yr Q
Post Development

MODRET

RESULTS OF RUNOFF HYDROGRAPH
NAME OR NODE ID : U64100PO



Q max : 25.88 cfs Time of Qmax : 12.48 hrs V_total : 226838.8 ft3

MODRET

HYDROGRAPH DATA INPUT - SCS UNIT METHOD

25 yr
Pre-Development

Hydrograph Name : U64_25PR
Rainfall Distribution : SWFWMD(24 hrs)-TYPE II FL Modified

Contributing Basin Area	6.40 ac.
SCS Curve Number	79.00
Time of Concentration	41.00 min
Rainfall Depth	7.00 "
Shape Factor	484

Sunday, 6/14/1998

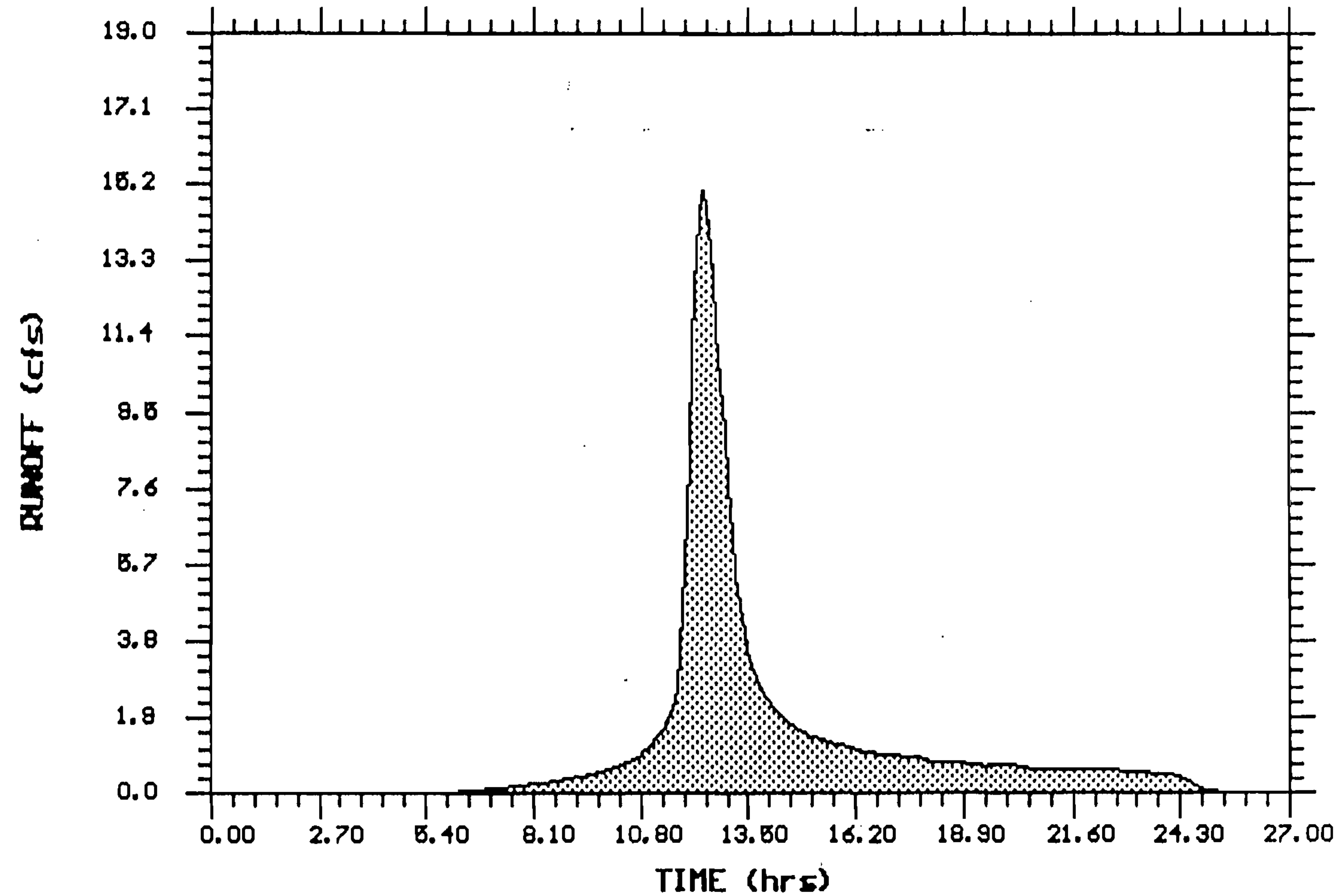
11/21

12/21

MODRET

25 yr
Pre Development

RESULTS OF RUNOFF HYDROGRAPH
NAME OR NODE ID : U64_25PR



Q max : 15.03 cfs Time of Qmax : 12.40 hrs V_total : 106732.3 ft3

MODRET

HYDROGRAPH DATA INPUT - SCS UNIT METHOD

25 yr
Post Development

Hydrograph Name : U64H
Rainfall Distribution : SWFWMD(24 hrs)-TYPE II FL Modified

Contributing Basin Area	6.40 ac.
SCS Curve Number	98.00
Time of Concentration	51.00 min
Rainfall Depth	7.00 "
Shape Factor	484

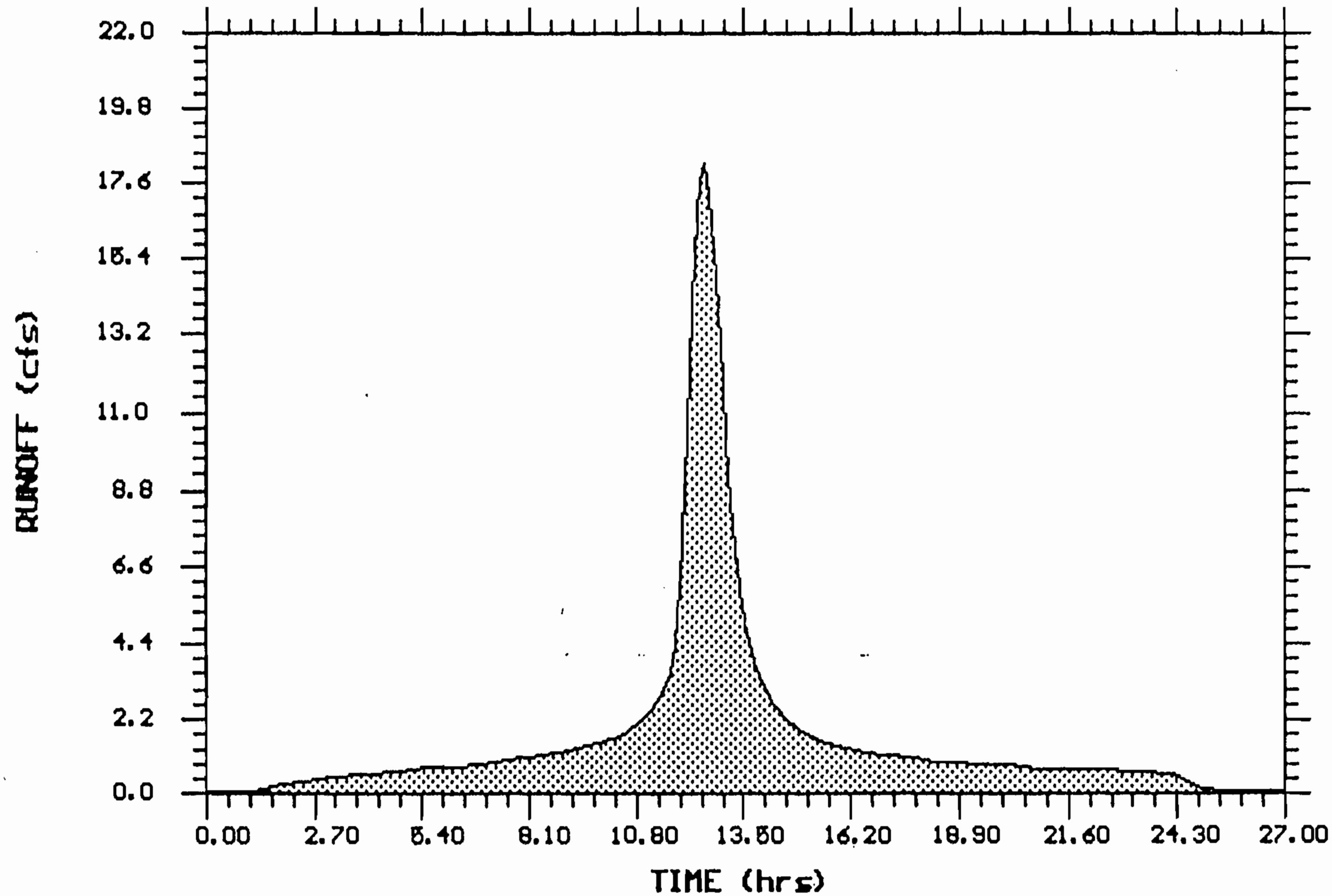
Sunday, 6/14/1998

14/21

MODRET

RESULTS OF RUNOFF HYDROGRAPH
NAME OR NODE ID : U64H

25 yr Post Development



Q max : 18.16 cfs Time of Qmax : 12.48 hrs V_total : 157218.0 ft3

MODRET

SUMMARY OF UNSATURATED & SATURATED INPUT PARAMETERS

POND NAME/No. : U64WET
HYDROGRAPH RUNOFF DATA
UNSATURATED ANALYSIS INCLUDED

25 yr
Post Development

Pond Bottom Area		67600.00 ft²
Pond Volume between Bottom & DHWL		103767.00 ft3
Pond Length to Width Ratio (L/W)		1.00
Elevation of Effective Aquifer Base	Actual = 120.9	135.00 ft
Elevation of Seasonal High Groundwater Table	Actual SHGW = 138.5	139.50 ft
Elevation of Pond Bottom	Actual = 138.5 Use higher values to minimize infil.	139.50 ft
Is there overflow ?		Y
Ave. Effective Storage Coefficient of Soil for Unsaturated Analysis		0.01
Unsaturated Vertical Hydraulic Conductivity		13.00 ft/d
Factor of Safety		2.00
Saturated Horizontal Hydraulic Conductivity		29.10 ft/d
Ave. Effective Storage Coefficient of Soil for Saturated Analysis		0.04
Average Effective Storage Coefficient of Pond		1.00
Time Increment during Storm Event		2.00 hrs
Time Increment after Storm Event		12.00 hrs
Total Number of Increments after Storm Event		6.00

Hydrograph File Name: U64H

Time of Peak Discharge : 12.48 hrs
Rate of Peak Discharge : 18.16 cfs

Hydraulic Control Features:

	Top	Bottom	Left	Right
Groundwater Control-Y/N	N	N	N	N
Distance to Edge of Pond	0.00	0.00	0.00	0.00
Elevation of Water Level	0.00	0.00	0.00	0.00
Impervious Barrier - Y/N	N	N	N	N
Elevation of Barrier Bottom	0.00	0.00	0.00	0.00

15/21

Sunday, 6/14/1998

MODRET

ELEVATION VS OVERFLOW RELATIONSHIP

V_NOTCH, SHARP & BROAD CRESTED WEIRS

Structure Type : BROAD CRESTED

Crest Elevation	140.00 ft
Crest Length	5.00 ft
Coefficient of Discharge	3.31
Weir Flow Exponent	1.50
Number of Contractions	2.00
Design High Water Level Elevation	141.00 ft

Sunday, 6/14/1998

MODRET

SUMMARY OF RESULTS - TABLE FORMAT

25 yr
Post Development

Pond Name / No.: U64WET

CUMULATIVE TIME (hrs)	WATER ELEVATION (feet)	INSTANTANEOUS INFILTRATION RATE (cfs)	AVERAGE INFILTRATION RATE (cfs)	CUMULATIVE OVERFLOW (ft³)
00.00 - 0.60	139.500	0.000 *		
			0.00	
0.60	139.500	-0.00340		
			-0.00061	0.00
2.64	139.516	0.00217		
			0.00495	0.00
4.68	139.567	0.00613		
			0.00731	0.00
6.72	139.641	0.00839		
			0.00946	0.00
8.76	139.743	0.01313		
			0.01681	0.00
10.80	139.899	0.02782		
			0.03884	28053.00
12.84	140.380	0.04057		
			0.04231	61249.00
14.88	140.426	0.03449		
			0.02667	80460.00
16.92	140.294	0.02164		
			0.01662	92747.00
18.96	140.218	0.01542		
			0.01422	101380.00
21.00	140.172	0.01475		
			0.01529	107970.00
23.04	140.143	0.01348		

17/21

MODRET

SUMMARY OF RESULTS - TABLE FORMAT

25 yr
Post Development

Pond Name / No.: U64WET

CUMULATIVE TIME (hrs)	WATER ELEVATION (feet)	INSTANTANEOUS INFILTRATION RATE (cfs)	AVERAGE INFILTRATION RATE (cfs)	CUMULATIVE OVERFLOW (ft³)
			0.01167	112900.00
25.08	140.117	0.01113		
			0.00793	118230.00
37.08	140.035	0.00750		
			0.00707	119700.00
49.08	140.010	0.00657		
			0.00606	119980.00
61.08	140.002	0.00623		
			0.00641	119980.00
73.08	139.998	0.00614		
			0.00587	119980.00
85.08	139.994	0.00547		
			0.00507	119980.00
97.08	139.991			

Max. WL : 140.426 @ 14.88 h	* Ø RO = Ø INF	Max.OVF : 4.520cfs @ 14.9 h

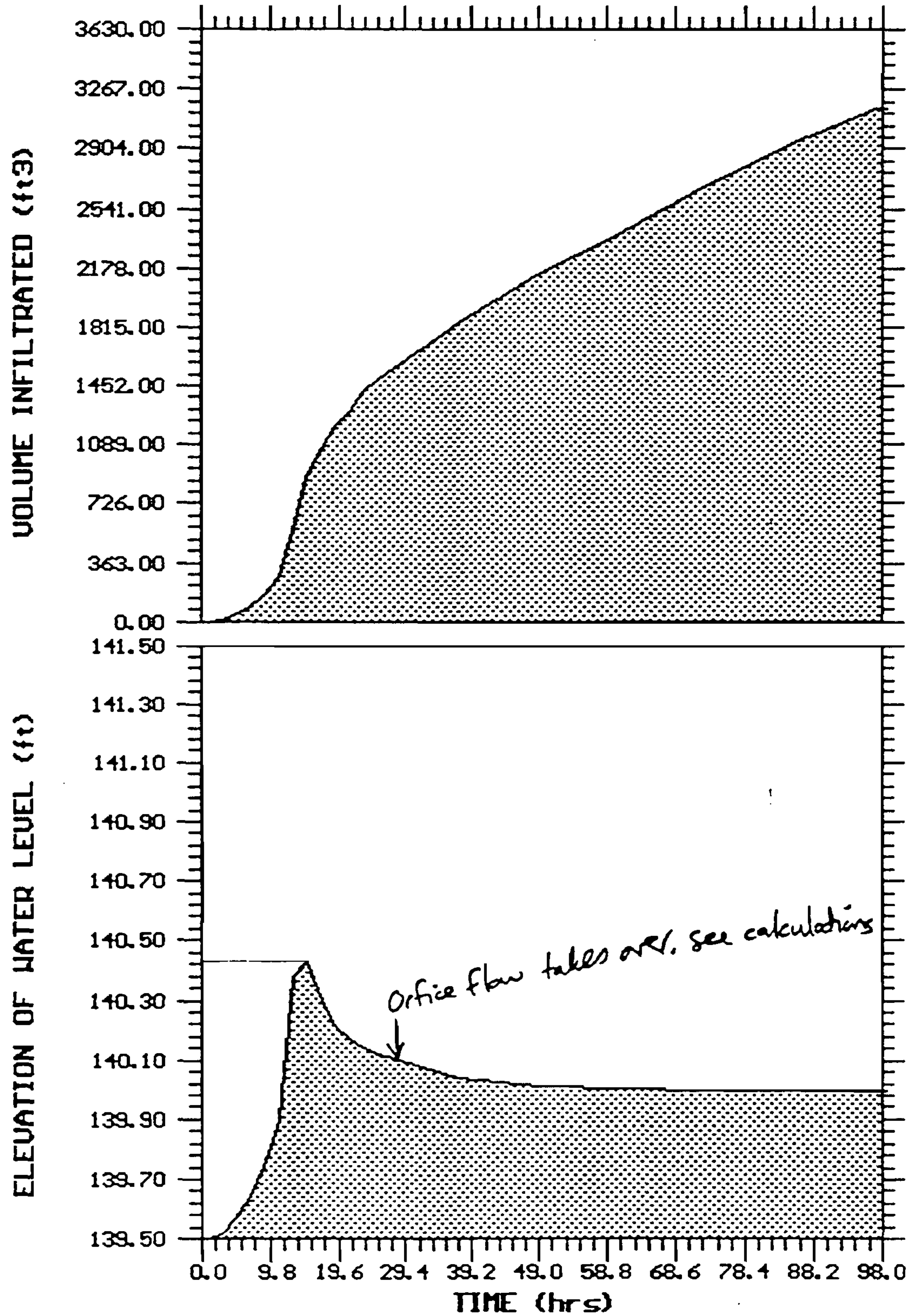
4

 18/21

25 yr Post Develop.

MODRET GRAPHICAL RESULTS

POND NAME/No. U64WET



Sunday, 6/14/1998

REFERENCES/NOTES

Determine size of Channels for Inflow to Pond and Outflow from pond.

25 yr peak Q = 20.87 cfs — 14/21 ~~sheet 7/21~~

Station 2+25 on east ditch is 225′ from ~~the~~ upstream end of channel. Area = 225′ x 270′ = 1.4 Ac. — see map sheet 2/21

peak $Q = \frac{1.4 \text{ Ac}}{7.3 \text{ Ac}} \times 20.87$ cfs = 4 cfs — Go with grass channels

Station 4+75 on east ditch area = 270′ x 475′ = 2.9 Ac.

peak $Q = \frac{2.9 \text{ Ac}}{7.3 \text{ Ac}} \times 20.87$ cfs = 8.4 cfs

~~See next page for~~ Detailed Calculations p. 21/21.

Outflow Channel L = 645 slope = 0.0062

25-yr Peak Q = ~~0 cfs~~ 4.5 cfs — 11/21

100-yr peak Q = ~~1.06 cfs~~ — 18/21

Station	Slope (ft/ft)	Flow (cfs)	Bottom width (ft)	Side slopes H:V	Water Depth (ft)	Velocity (fps)
2+25		4	10	4	0.95	0.30
4+75		8.4	21	4	1.0	0.33
outlet	0.0062	~~1.0 8~~ 4.5	5	4	~~0.70~~ 0.50	~~0.18~~ 0.48

DATE CHECKED	CHECKED BY	JOB NUMBER	BY	DATE	CALC. NO.	SHEET NO.
		6504	RSC	5/14/98		20/21

PROJECT: Lakeland McIntosh Power Plant

SUBJECT: Stormwater Calculations

Design Table for Grass Swales

Design Aide:

1. Determine flow, channel slope, and channel side slopes.
2. Estimate the expected depth and the Manning's n coefficient
3. The program uses this information in the columns labeled "Calculated" to determine WP, A, R, and V
4. The user has to adjust expected depth until the Calculated cross section area (A) is equal to the Area at the Predicted Velocity (Column M)
5. Note that for grass swales, Manning's n is obtained from a nomograph using the product VR See US DOT Design Charts for Open-Channel Flow HDS No. 3, Fig. 5 for nomograph

Select	Select	Select	Select	Select	Calculated			Select	Calculated		
Flow, cfs	Channel Slope ft/ft	Channel Dimensions Bottom Width, ft.	Channel Dimensions Side Slope H:V	Expected Depth, ft	WP Wetted Perimeter Ft	A Cross-Sectional Area, ft2	R Hydraulic Radius Ft	Mannings n	V Predicted Velocity ft/sec	VR	Area at Predicted Velocity
Gravel Channels for Inflow:											
4	0.00105	4	2	0.7	7.13	3.78	0.530	0.03	1.05	0.56	3.79
8.4	0.00105	8	2	0.75	11.35	7.13	0.628	0.03	1.18	0.74	7.12
Grass Channels for Inflow:											
4	0.00105	10	4	0.95	17.83	13.11	0.735	0.13	0.30	0.22	13.22
8.4	0.00105	21	4	1	29.25	25.00	0.855	0.13	0.33	0.29	25.11

Decision is to go with grass channels since they are less expensive and increase time-of-concentration for watershed.

Outflow grass channel:											
1	0.0062	5	4	0.1	5.82	0.54	0.093	0.13	0.18	0.02	5.41
4.5	0.0062	5	4	0.5	9.12	3.50	0.384	0.13	0.48	0.18	9.44

12/12

10.5.5 COOLING TOWER MODELING RESULTS

****

EPRI PLUME AND DRIFT ANALYSIS SYSTEM PREPROCESSOR CODE, PRE-RELEASE VERSION 09-01-90

CASE STUDY: CITY OF LAKELAND MACINTOSH UNIT 5 MECHANICAL COOLING TOWER -SACTI MODEL 1987-91

****

INPUT INFORMATION

SURFACE TAPE TYPE:	CD144
TOWER TYPE:	LINEAR MECHANICAL DRAFT
TOWER HEIGHT (M):	13.72
TOWER DIAMETER (M):	25.80
TOWER HEAT (KW):	213900.00
TOWER AIR FLOW (KG/S):	4170.50
SITE LATITUDE:	28.08
SITE LONGITUDE:	81.93
SITE TIME ZONE:	EASTERN
ROUGHNESS HEIGHT (CM):	20.00
REFERENCE HEIGHT (M):	6.70
RECORD STOPPING SWITCH:	0
RECORD SKIPPING FACTOR:	1
HOURLY RECORD PRINT LOG:	NOT SELECTED
BI-DAILY MIXING HEIGHT TAPE:	SELECTED
MIXING HEIGHT TYPE:	RURAL
FOGGING/ICING OPTION:	SELECTED
DRIFT OPTION:	SELECTED

MONTHLY CLEARNESS INDEX

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
.610	.610	.620	.620	.630	.590	.560	.550	.560	.600	.640	.600

TOTAL DAILY SOLAR ENERGY DEPOSITION
(LONG-TERM AVERAGE FOR MONTH)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
13.67	16.35	19.95	22.79	24.88	23.96	22.29	20.70	18.99	16.94	14.93	12.63

1 **************************************WIND SPEED FREQUENCY TABLE**

CITY OF LAKELAND MACINTOSH UNIT 5 MECHANICAL COOLING TOWER -SACTI MODEL 1987-91

WIND SPEED RANGE (M/S)	N / S	NNE / SSW	NE / SW	ENE / WSW	E / W	ESE / WNW	SE / NW	SSE / NNW	S / N	SSW / NNE	SW / NE	WSW / ENE	W / E	WNW / ESE	NW / SE	NNW / SSE	SUM
0 TO 1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1 TO 2	0.004	0.003	0.008	0.014	0.014	0.007	0.004	0.002	0.004	0.002	0.002	0.002	0.002	0.002	0.003	0.002	0.075
2 TO 3	0.013	0.010	0.027	0.045	0.040	0.029	0.016	0.011	0.015	0.008	0.009	0.009	0.010	0.010	0.014	0.007	0.275
3 TO 4	0.016	0.011	0.024	0.040	0.032	0.026	0.017	0.012	0.013	0.010	0.011	0.014	0.019	0.010	0.013	0.008	0.276
4 TO 5	0.011	0.007	0.015	0.023	0.026	0.014	0.015	0.009	0.010	0.007	0.006	0.011	0.022	0.007	0.008	0.006	0.198
5 TO 6	0.006	0.004	0.009	0.011	0.012	0.008	0.007	0.004	0.006	0.004	0.003	0.004	0.014	0.006	0.006	0.004	0.107
6 TO 7	0.003	0.002	0.003	0.004	0.007	0.002	0.001	0.001	0.003	0.003	0.001	0.000	0.006	0.003	0.004	0.002	0.047

7 TO 8	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.015
8 TO 9	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.005
9 TO 10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
[illegible] 11	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
[illegible] 12	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12 TO 13	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13 TO 14	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
14 TO 15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15 TO 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
20 TO 25	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
25 TO 30	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
30 TO OVER	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

AVERAGE 3.72888 VARIANCE 2.04269 STD DEV 1.42923
STD ERR 0.01115 SKEWNESS 1.20996 KURTOSIS 1.63384

1 RELATIVE HUMIDITY FREQUENCY TABLE

CITY OF LAKELAND MACINTOSH UNIT 5 MECHANICAL COOLING TOWER -SACTI MODEL 1987-91

RELATIVE HUMIDITY RANGE(%)	WIND FROM: N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
	WIND HEADED: S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	SUM
0 TO 10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10 TO 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
20 TO 30	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
30 TO 40	0.003	0.002	0.002	0.002	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.021
40 TO 50	0.005	0.004	0.005	0.009	0.011	0.004	0.003	0.003	0.002	0.001	0.002	0.003	0.006	0.003	0.003	0.003	0.067
[illegible] TO 60	0.007	0.005	0.010	0.014	0.015	0.007	0.005	0.004	0.005	0.004	0.005	0.008	0.019	0.006	0.006	0.003	0.123
[illegible] TO 70	0.009	0.006	0.008	0.016	0.017	0.009	0.007	0.004	0.007	0.008	0.006	0.010	0.022	0.010	0.009	0.006	0.155
70 TO 80	0.010	0.006	0.013	0.020	0.021	0.017	0.011	0.008	0.010	0.008	0.007	0.008	0.014	0.010	0.013	0.007	0.182
80 TO 90	0.009	0.007	0.018	0.028	0.024	0.020	0.015	0.008	0.012	0.006	0.007	0.006	0.009	0.008	0.009	0.005	0.191
90 TO 100	0.009	0.007	0.026	0.045	0.039	0.025	0.017	0.010	0.015	0.007	0.005	0.003	0.004	0.004	0.007	0.004	0.229
100 TO OVER	0.001	0.000	0.002	0.005	0.005	0.003	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.027

AVERAGE 75.13261 VARIANCE 308.88611 STD DEV 17.57516
STD ERR 0.13707 SKEWNESS 1.06934 KURTOSIS 1.17958

1 DEW POINT TEMPERATURE FREQUENCY TABLE

CITY OF LAKELAND MACINTOSH UNIT 5 MECHANICAL COOLING TOWER -SACTI MODEL 1987-91

DEW POINT TEMP RANGE (C)	WIND FROM: N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
	WIND HEADED: S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	SUM
-45 TO -40	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-40 TO -35	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-35 TO -30	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-30 TO -25	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-25 TO -20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-20 TO -15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-15 TO -10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
[illegible] TO -5	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
[illegible] TO 0	0.002	0.003	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0 TO 5	0.006	0.004	0.004	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.001	0.024
5 TO 10	0.012	0.008	0.011	0.012	0.006	0.002	0.000	0.000	0.000	0.000	0.001	0.001	0.003	0.004	0.006	0.006	0.073
10 TO 15	0.011	0.008	0.020	0.029	0.023	0.009	0.005	0.004	0.002	0.002	0.001	0.002	0.005	0.006	0.010	0.007	0.146
15 TO 20	0.010	0.007	0.021	0.041	0.042	0.025	0.020	0.016	0.020	0.012	0.010	0.008	0.018	0.008	0.012	0.007	0.276

20 TO 25	0.012	0.007	0.025	0.054	0.061	0.050	0.035	0.018	0.030	0.020	0.021	0.029	0.048	0.022	0.019	0.009	0.461
25 TO 30	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.005
30 TO 35	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
35 TO 40	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
40 TO 45	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
45 TO OVER	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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AVERAGE 17.72018 VARIANCE 35.29821 STD DEV 5.94123

STD ERR 0.04634 SKEWNESS 1.09556 KURTOSIS 1.23626

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1 ********************************DRY BULB TEMPERATURE FREQUENCY TABLE********************************

CITY OF LAKELAND MACINTOSH UNIT 5 MECHANICAL COOLING TOWER -SACTI MODEL 1987-91

DRY BULB TEMP RANGE (C)	WIND FROM: N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
	WIND HEADED: S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	SUM
-45 TO -40	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-40 TO -35	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-35 TO -30	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-30 TO -25	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-25 TO -20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-20 TO -15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-15 TO -10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-10 TO -5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-5 TO 0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0 TO 5	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
5 TO 10	0.005	0.006	0.006	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022
10 TO 15	0.012	0.008	0.016	0.013	0.006	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.006	0.005	0.073
15 TO 20	0.014	0.010	0.021	0.033	0.023	0.011	0.006	0.005	0.005	0.003	0.003	0.002	0.004	0.007	0.013	0.008	0.167
20 TO 25	0.011	0.007	0.025	0.054	0.058	0.038	0.025	0.016	0.025	0.013	0.009	0.007	0.014	0.009	0.013	0.008	0.333
25 TO 30	0.007	0.004	0.012	0.027	0.038	0.030	0.024	0.015	0.019	0.014	0.015	0.017	0.031	0.015	0.013	0.007	0.289
30 TO 35	0.004	0.003	0.005	0.009	0.008	0.005	0.004	0.003	0.004	0.005	0.007	0.013	0.027	0.007	0.004	0.003	0.113
35 TO 40	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
40 TO 45	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
45 TO OVER	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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AVERAGE 23.13986 VARIANCE 35.46340 STD DEV 5.95512

STD ERR 0.04644 SKEWNESS 1.08113 KURTOSIS 1.21127

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1 ***********************************STABILITY CLASS FREQUENCY TABLE***********************************

CITY OF LAKELAND MACINTOSH UNIT 5 MECHANICAL COOLING TOWER -SACTI MODEL 1987-91

STABILITY CLASS	WIND FROM: N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
	WIND HEADED: S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	SUM
1	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.011
2	0.004	0.003	0.005	0.007	0.007	0.005	0.006	0.005	0.005	0.006	0.007	0.011	0.012	0.004	0.002	0.002	0.089
3	0.008	0.005	0.009	0.018	0.019	0.013	0.012	0.009	0.010	0.006	0.007	0.011	0.028	0.007	0.004	0.005	0.170
4	0.018	0.011	0.025	0.037	0.039	0.020	0.019	0.010	0.019	0.014	0.008	0.007	0.024	0.017	0.019	0.012	0.299
5	0.012	0.009	0.021	0.031	0.032	0.021	0.014	0.008	0.010	0.005	0.005	0.005	0.006	0.007	0.011	0.007	0.204
6	0.011	0.009	0.022	0.038	0.030	0.022	0.009	0.006	0.008	0.003	0.005	0.004	0.005	0.007	0.012	0.005	0.195
7	0.002	0.001	0.004	0.008	0.007	0.003	0.001	0.001	0.001	0.000	0.001	0.000	0.001	0.001	0.001	0.001	0.032

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AVERAGE 4.30941 VARIANCE 1.80249 STD DEV 1.34257

STD ERR 0.01047 SKEWNESS 1.12101 KURTOSIS 1.32305

1 **K FREQUENCY TABLE**

CITY OF LAKELAND MACINTOSH UNIT 5 MECHANICAL COOLING TOWER -SACTI MODEL 1987-91

(K)	WIND FROM N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
RANGE	WIND HEADED S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	SUM
0.0 TO 0.1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.1 TO 0.2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.2 TO 0.3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.3 TO 0.4	0.001	0.001	0.000	0.001	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.007
0.4 TO 0.5	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.002	0.000	0.001	0.000	0.019
0.5 TO 0.6	0.002	0.002	0.004	0.008	0.010	0.006	0.003	0.002	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.054
0.6 TO 0.7	0.004	0.002	0.005	0.008	0.006	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.002	0.002	0.001	0.001	0.042
0.7 TO 0.8	0.002	0.002	0.007	0.013	0.014	0.011	0.007	0.004	0.005	0.003	0.004	0.005	0.005	0.004	0.004	0.002	0.091
0.8 TO 0.9	0.006	0.005	0.011	0.017	0.013	0.009	0.005	0.005	0.005	0.003	0.004	0.006	0.007	0.003	0.004	0.002	0.106
0.9 TO 1.0	0.002	0.001	0.005	0.010	0.010	0.009	0.007	0.004	0.005	0.003	0.003	0.005	0.006	0.003	0.004	0.001	0.080
1.0 TO 1.2	0.009	0.007	0.016	0.028	0.024	0.019	0.012	0.008	0.010	0.007	0.007	0.008	0.016	0.007	0.010	0.005	0.192
1.2 TO 1.4	0.010	0.006	0.014	0.019	0.017	0.010	0.008	0.005	0.006	0.004	0.003	0.005	0.012	0.006	0.007	0.005	0.135
1.4 TO 1.6	0.006	0.005	0.008	0.013	0.014	0.008	0.007	0.004	0.005	0.003	0.002	0.003	0.010	0.004	0.005	0.004	0.101
1.6 TO 1.8	0.004	0.003	0.006	0.007	0.008	0.005	0.004	0.002	0.003	0.002	0.001	0.001	0.005	0.002	0.004	0.002	0.059
1.8 TO 2.0	0.003	0.002	0.005	0.005	0.006	0.003	0.003	0.001	0.001	0.002	0.001	0.000	0.004	0.003	0.003	0.002	0.044
2.0 TO 2.5	0.004	0.004	0.004	0.005	0.009	0.002	0.002	0.002	0.004	0.004	0.001	0.001	0.004	0.003	0.004	0.003	0.055
2.5 TO 3.0	0.001	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.001	0.001	0.001	0.010
3.0 TO OVER	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.002

AVERAGE 1.18580 VARIANCE 0.23642 STD DEV 0.48623

STD ERR 0.00379 SKEWNESS 1.24681 KURTOSIS 1.76708

1 **VSTAR FREQUENCY TABLE**

CITY OF LAKELAND MACINTOSH UNIT 5 MECHANICAL COOLING TOWER -SACTI MODEL 1987-91

VSTAR	WIND FROM N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
RANGE	WIND HEADED S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	SUM
0 TO 1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1 TO 2	0.038	0.024	0.049	0.084	0.090	0.060	0.046	0.029	0.037	0.028	0.028	0.036	0.072	0.037	0.040	0.025	0.724
2 TO 3	0.005	0.005	0.012	0.015	0.013	0.012	0.006	0.004	0.005	0.002	0.002	0.001	0.001	0.002	0.003	0.002	0.090
3 TO 4	0.003	0.003	0.007	0.010	0.007	0.003	0.002	0.002	0.003	0.001	0.001	0.001	0.000	0.001	0.002	0.001	0.045
4 TO 5	0.001	0.001	0.003	0.004	0.003	0.002	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.001	0.021
5 TO 6	0.001	0.001	0.003	0.005	0.005	0.003	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.023
6 TO 7	0.001	0.001	0.004	0.006	0.005	0.002	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022
7 TO 8	0.001	0.001	0.001	0.002	0.002	0.001	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.011
8 TO 9	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.013
9 TO 10	0.001	0.000	0.001	0.002	0.001	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
10 TO 11	0.000	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
11 TO 12	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
12 TO 13	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
13 TO 14	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
14 TO 15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
15 TO 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
20 TO 25	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
25 TO 30	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
30 TO OVER	0.001	0.000	0.002	0.005	0.005	0.003	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.027

AVERAGE 3.23168 VARIANCE 31.97859 STD DEV 5.65496

STD ERR 0.04410 SKEWNESS 4.41801 KURTOSIS 22.75050

1 PLUME LENGTH PARAMETER FREQUENCY TABLE

CITY OF LAKELAND MACINTOSH UNIT 5 MECHANICAL COOLING TOWER -SACTI MODEL 1987-91

LENGTH RANGE (M)	WIND FROM N / WIND HEADED S	NNE / SSW	NE / SW	ENE / WSW	E / W	ESE / WNW	SE / NW	SSE / NNW	S / N	SSW / NNE	SW / NE	WSW / ENE	W / E	WNW / ESE	NW / SE	NNW / SSE	SUM
0.0 TO 0.2	0.029	0.018	0.034	0.062	0.071	0.046	0.035	0.023	0.029	0.025	0.026	0.034	0.069	0.032	0.033	0.020	0.584
0.2 TO 0.4	0.003	0.001	0.004	0.004	0.005	0.004	0.003	0.002	0.002	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.036
0.4 TO 0.6	0.002	0.001	0.002	0.004	0.003	0.002	0.002	0.001	0.001	0.000	0.000	0.000	0.001	0.000	0.002	0.001	0.022
0.6 TO 0.8	0.001	0.001	0.002	0.003	0.002	0.002	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.018
0.8 TO 1.0	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.000	0.001	0.000	0.000	0.001	0.001	0.001	0.018
1.0 TO 1.2	0.001	0.001	0.002	0.003	0.002	0.002	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.019
1.2 TO 1.4	0.001	0.001	0.002	0.004	0.003	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.018
1.4 TO 1.6	0.001	0.001	0.002	0.003	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013
1.6 TO 1.8	0.001	0.001	0.002	0.002	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
1.8 TO 2.0	0.001	0.001	0.002	0.002	0.001	0.001	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010
2.0 TO 2.2	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009
2.2 TO 2.4	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008
2.4 TO 2.6	0.000	0.000	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009
2.6 TO 2.8	0.001	0.001	0.001	0.002	0.002	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009
2.8 TO 3.0	0.000	0.001	0.001	0.002	0.002	0.002	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
3.0 TO 3.2	0.000	0.000	0.001	0.002	0.001	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009
3.2 TO 3.4	0.000	0.000	0.001	0.003	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009
3.4 TO 3.6	0.000	0.001	0.001	0.002	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.009
3.6 TO 3.8	0.000	0.001	0.001	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
3.8 TO 4.0	0.000	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
4.0 TO 4.2	0.000	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
4.2 TO 4.4	0.000	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
4.4 TO 4.6	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
4.6 TO 4.8	0.000	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
4.8 TO 5.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
5.0 TO 5.2	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
5.2 TO 5.4	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
5.4 TO 5.6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
5.6 TO 5.8	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
5.8 TO 6.0	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
6.0 TO 6.2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
6.2 TO 6.4	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
6.4 TO 6.6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
6.6 TO 6.8	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
6.8 TO 7.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
7.0 TO 7.2	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
7.2 TO 7.4	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
7.4 TO 7.6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
7.6 TO 7.8	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
7.8 TO 8.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
8.0 TO 8.2	0.000	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
8.2 TO 8.4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
8.4 TO 8.6	0.000	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
8.6 TO 8.8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
8.8 TO 9.0	0.000	0.000	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
9.0 TO 9.2	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
9.2 TO 9.4	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
9.4 TO 9.6	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
9.6 TO 9.8	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
9.8 TO 10.0	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003

1 PLUME LENGTH PARAMETER FREQUENCY TABLE

CITY OF LAKELAND MACINTOSH UNIT 5 MECHANICAL COOLING TOWER -SACTI MODEL 1987-91

PLUME LENGTH RANGE (M)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
(WIND HEADED)	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	SUM
10.0 TO 10.4	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
10.4 TO 10.8	0.000	0.000	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
10.8 TO 11.2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
11.2 TO 11.6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
11.6 TO 12.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
12.0 TO 12.4	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
12.4 TO 12.8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
12.8 TO 13.2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
13.2 TO 13.6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
13.6 TO 14.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
14.0 TO 14.4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
14.4 TO 14.8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
14.8 TO 15.2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
15.2 TO 15.6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
15.6 TO 16.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
16.0 TO 16.4	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
16.4 TO 16.8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
16.8 TO 17.2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17.2 TO 17.6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
17.6 TO 18.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
18.0 TO 18.4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
18.4 TO 18.8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18.8 TO 19.2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
[illegible] TO 19.6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
[illegible] TO 20.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
20.0 TO 21.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
21.0 TO 22.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
22.0 TO 23.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
23.0 TO 24.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
24.0 TO 25.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
25.0 TO 26.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
26.0 TO 27.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
27.0 TO 28.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
28.0 TO 29.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
29.0 TO 30.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
30.0 TO 31.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
31.0 TO 32.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
32.0 TO 33.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
33.0 TO 34.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
34.0 TO 35.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
35.0 TO 36.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
36.0 TO 37.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
37.0 TO 38.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
38.0 TO 39.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
39.0 TO 40.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
40.0 TO OVER	0.001	0.000	0.002	0.005	0.005	0.003	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.027

AVERAGE 2.41969 VARIANCE 26.66543 STD DEV 5.16386
[illegible]RR 0.04027 SKEWNESS 3.37857 KURTOSIS 13.04285

1 PLUME HEIGHT PARAMETER FREQUENCY TABLE

CITY OF LAKELAND MACINTOSH UNIT 5 MECHANICAL COOLING TOWER -SACTI MODEL 1987-91

PLUME WIND FROM

HEIGHT	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
RANGE (M)	***************WIND HEADED***************																
	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	SUM
0.0 TO 0.1	0.031	0.019	0.038	0.065	0.074	0.048	0.037	0.024	0.031	0.026	0.026	0.035	0.070	0.034	0.034	0.021	0.614
0.1 TO 0.2	0.003	0.003	0.004	0.008	0.007	0.005	0.003	0.002	0.003	0.001	0.001	0.001	0.001	0.002	0.003	0.002	0.049
0.2 TO 0.3	0.003	0.002	0.004	0.006	0.004	0.003	0.003	0.002	0.002	0.001	0.001	0.000	0.001	0.001	0.002	0.001	0.036
0.3 TO 0.4	0.002	0.002	0.005	0.005	0.005	0.004	0.003	0.002	0.002	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.036
0.4 TO 0.5	0.002	0.002	0.004	0.005	0.003	0.003	0.001	0.001	0.002	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.028
0.5 TO 0.6	0.001	0.001	0.003	0.004	0.003	0.003	0.002	0.001	0.001	0.001	0.000	0.000	0.001	0.001	0.001	0.000	0.024
0.6 TO 0.7	0.001	0.001	0.002	0.004	0.004	0.003	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.7 TO 0.8	0.001	0.001	0.003	0.004	0.003	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.020
0.8 TO 0.9	0.001	0.001	0.003	0.005	0.003	0.002	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.001	0.001	0.000	0.020
0.9 TO 1.0	0.001	0.000	0.001	0.003	0.003	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.014
1.0 TO 1.1	0.001	0.001	0.002	0.003	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
1.1 TO 1.2	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.009
1.2 TO 1.3	0.001	0.000	0.001	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008
1.3 TO 1.4	0.000	0.001	0.001	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009
1.4 TO 1.5	0.001	0.000	0.001	0.002	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009
1.5 TO 1.6	0.000	0.000	0.001	0.002	0.002	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009
1.6 TO 1.7	0.000	0.000	0.001	0.003	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009
1.7 TO 1.8	0.000	0.000	0.001	0.001	0.001	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
1.8 TO 1.9	0.000	0.000	0.001	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008
1.9 TO 2.0	0.000	0.000	0.001	0.001	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
2.0 TO 2.1	0.000	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
2.1 TO 2.2	0.000	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
2.2 TO 2.3	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
2.3 TO 2.4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
2.4 TO 2.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
2.5 TO 2.6	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
2.6 TO 2.7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
2.7 TO 2.8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
2.8 TO 2.9	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
2.9 TO 3.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
3.0 TO 3.1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.1 TO 3.2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
3.2 TO 3.3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.3 TO 3.4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.4 TO 3.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.5 TO 3.6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.6 TO 3.7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.7 TO 3.8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.8 TO 3.9	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.9 TO 4.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.0 TO 4.1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.1 TO 4.2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.2 TO 4.3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.3 TO 4.4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.4 TO 4.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.5 TO 4.6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.6 TO 4.7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.7 TO 4.8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.8 TO 4.9	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.9 TO 5.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

1 ********************************PLUME HEIGHT PARAMETER FREQUENCY TABLE********************************

CITY OF LAKELAND MACINTOSH UNIT 5 MECHANICAL COOLING TOWER -SACTI MODEL 1987-91

PLUME	***************WIND FROM***************																
HEIGHT	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
RANGE (M)	***************WIND HEADED***************																
	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	SUM

5.0 TO 5.2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5.2 TO 5.4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5.4 TO 5.6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5.6 TO 5.8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5.8 TO 6.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6.0 TO 6.2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6.2 TO 6.4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6.4 TO 6.6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6.6 TO 6.8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6.8 TO 7.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7.0 TO 7.2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7.2 TO 7.4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7.4 TO 7.6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7.6 TO 7.8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7.8 TO 8.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8.0 TO 8.2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8.2 TO 8.4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
8.4 TO 8.6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
8.6 TO 8.8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
8.8 TO 9.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
9.0 TO 9.2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
9.2 TO 9.4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
9.4 TO 9.6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
9.6 TO 9.8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
9.8 TO 10.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
10.0 TO 10.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
10.5 TO 11.0	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
11.0 TO 11.5	0.000	0.000	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
11.5 TO 12.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
12.0 TO 12.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
12.5 TO 13.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
13.0 TO 13.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
13.5 TO 14.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
14.0 TO 14.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
14.5 TO 15.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15.0 TO 15.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15.5 TO 16.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
16.0 TO 16.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
16.5 TO 17.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17.0 TO 17.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17.5 TO 18.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18.0 TO 18.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18.5 TO 19.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
19.0 TO 19.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
19.5 TO 20.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
20.0 TO OVER	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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AVERAGE 0.61420 VARIANCE 3.03698 STD DEV 1.74269

STD ERR 0.01359 SKEWNESS 5.37446 KURTOSIS 32.74522

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1 ******************************PLUME LENGTH-K-STABILITY FREQUENCY TABLE********************************

CITY OF LAKELAND MACINTOSH UNIT 5 MECHANICAL COOLING TOWER -SACTI MODEL 1987-91

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PLUME LENGTH RANGE (M)	STABILITY CATEGORY 1			STABILITY CATEGORY 2			STABILITY CATEGORY 3		
	K1	K2	K3	K1	K2	K3	K1	K2	K3

	--	--	--	--	--	--	--	--	--
0.0 TO 0.2	0.142	0.118	0.001	0.045	0.169	0.057	0.033	0.020	0.000
0.2 TO 0.4	0.002	0.001	0.000	0.005	0.015	0.002	0.008	0.003	0.000
0.4 TO 0.6	0.001	0.001	0.000	0.003	0.010	0.001	0.005	0.002	0.000
0[illegible] 0.8	0.001	0.001	0.000	0.002	0.009	0.000	0.002	0.003	0.000
0.[illegible]O 1.0	0.000	0.000	0.000	0.003	0.008	0.001	0.005	0.002	0.000
1.0 TO 1.2	0.000	0.000	0.000	0.003	0.008	0.001	0.005	0.003	0.000
1.2 TO 1.4	0.000	0.000	0.000	0.002	0.006	0.000	0.006	0.003	0.000
1.4 TO 1.6	0.000	0.000	0.000	0.002	0.005	0.000	0.004	0.002	0.000
1.6 TO 1.8	0.000	0.000	0.000	0.001	0.006	0.000	0.002	0.001	0.000
1.8 TO 2.0	0.000	0.000	0.000	0.001	0.004	0.000	0.002	0.002	0.000
2.0 TO 2.2	0.000	0.000	0.000	0.001	0.005	0.000	0.002	0.001	0.000
2.2 TO 2.4	0.000	0.000	0.000	0.001	0.003	0.000	0.002	0.001	0.000
2.4 TO 2.6	0.000	0.000	0.000	0.001	0.004	0.000	0.002	0.001	0.000
2.6 TO 2.8	0.000	0.000	0.000	0.001	0.003	0.000	0.004	0.001	0.000
2.8 TO 3.0	0.000	0.000	0.000	0.002	0.004	0.000	0.004	0.002	0.000
3.0 TO 3.2	0.000	0.000	0.000	0.001	0.003	0.000	0.003	0.001	0.000
3.2 TO 3.4	0.000	0.000	0.000	0.002	0.002	0.000	0.004	0.001	0.000
3.4 TO 3.6	0.000	0.000	0.000	0.001	0.003	0.000	0.003	0.002	0.000
3.6 TO 3.8	0.000	0.000	0.000	0.000	0.002	0.000	0.002	0.001	0.000
3.8 TO 4.0	0.000	0.000	0.000	0.001	0.002	0.000	0.002	0.001	0.000
4.0 TO 4.2	0.000	0.000	0.000	0.001	0.001	0.000	0.001	0.000	0.000
4.2 TO 4.4	0.000	0.000	0.000	0.000	0.002	0.000	0.001	0.001	0.000
4.4 TO 4.6	0.000	0.000	0.000	0.001	0.001	0.000	0.001	0.001	0.000
4.6 TO 4.8	0.000	0.000	0.000	0.001	0.002	0.000	0.001	0.001	0.000
4.8 TO 5.0	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.001	0.000
5.0 TO 5.2	0.000	0.000	0.000	0.000	0.002	0.000	0.002	0.001	0.000
5.2 TO 5.4	0.000	0.000	0.000	0.000	0.002	0.000	0.001	0.001	0.000
5.4 TO 5.6	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000
5.[illegible]TO 5.8	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.001	0.000
5[illegible]O 6.0	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.001	0.000
6.0 TO 6.2	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
6.2 TO 6.4	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.000
6.4 TO 6.6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6.6 TO 6.8	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.001	0.000
6.8 TO 7.0	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.000
7.0 TO 7.2	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000
7.2 TO 7.4	0.000	0.000	0.000	0.001	0.001	0.000	0.002	0.000	0.000
7.4 TO 7.6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7.6 TO 7.8	0.000	0.000	0.000	0.001	0.001	0.000	0.002	0.000	0.000
7.8 TO 8.0	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
8.0 TO 8.2	0.000	0.000	0.000	0.001	0.001	0.000	0.002	0.000	0.000
8.2 TO 8.4	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
8.4 TO 8.6	0.000	0.000	0.000	0.001	0.000	0.000	0.002	0.000	0.000
8.6 TO 8.8	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000
8.8 TO 9.0	0.000	0.000	0.000	0.001	0.001	0.000	0.002	0.000	0.000
9.0 TO 9.2	0.000	0.000	0.000	0.001	0.001	0.000	0.002	0.000	0.000
9.2 TO 9.4	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000
9.4 TO 9.6	0.000	0.000	0.000	0.000	0.001	0.000	0.002	0.000	0.000
9.6 TO 9.8	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.000
9.8 TO 10.0	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000

1 ******************************PLUME LENGTH-K-STABILITY FREQUENCY TABLE******************************

CITY OF LAKELAND MACINTOSH UNIT 5 MECHANICAL COOLING TOWER -SACTI MODEL 1987-91

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[illegible]UME LENGTH RANGE (M)	STABILITY CATEGORY 1			STABILITY CATEGORY 2			STABILITY CATEGORY 3		
	K1	K2	K3	K1	K2	K3	K1	K2	K3
	--	--	--	--	--	--	--	--	--

10.0 TO 10.4	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000
10.4 TO 10.8	0.000	0.000	0.000	0.001	0.001	0.000	0.001	0.001	0.000
10.8 TO 11.2	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
11.2 TO 11.6	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
11[illegible] 12.0	0.000	0.000	0.000	0.001	0.001	0.000	0.001	0.000	0.000
12.[illegible] 12.4	0.000	0.000	0.000	0.001	0.001	0.000	0.001	0.000	0.000
12.4 TO 12.8	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000
12.8 TO 13.2	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.000
13.2 TO 13.6	0.000	0.000	0.000	0.001	0.001	0.000	0.001	0.000	0.000
13.6 TO 14.0	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000
14.0 TO 14.4	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
14.4 TO 14.8	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.001	0.000
14.8 TO 15.2	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
15.2 TO 15.6	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000
15.6 TO 16.0	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.000
16.0 TO 16.4	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
16.4 TO 16.8	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
16.8 TO 17.2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17.2 TO 17.6	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
17.6 TO 18.0	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
18.0 TO 18.4	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
18.4 TO 18.8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18.8 TO 19.2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
19.2 TO 19.6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
19.6 TO 20.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
20.0 TO 21.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
21.0 TO 22.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
22.0 TO 23.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
23.0 TO 24.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
24.[illegible] 25.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
25[illegible] 26.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
26.0 TO 27.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
27.0 TO 28.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
28.0 TO 29.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
29.0 TO 30.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
30.0 TO 31.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
31.0 TO 32.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
32.0 TO 33.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
33.0 TO 34.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
34.0 TO 35.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
35.0 TO 36.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
36.0 TO 37.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
37.0 TO 38.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
38.0 TO 39.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
39.0 TO 40.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
40.0 TO OVER	0.000	0.000	0.000	0.007	0.009	0.001	0.007	0.002	0.000

1 REFERENCE HEIGHT= 7. M

CAT NUM	TYPE	UH	WX	DBT	DTDZ	DPT	VE	TE	MXHT	PLGT	FREQ
1	FOG	10.0	0.25	263.1	-0.010	262.6	6.6	289.4	500.	148.57	0.0000
2	FOG	15.0	0.25	263.1	-0.010	262.6	6.6	289.4	500.	179.38	0.0000
3	FOG	12.0	0.25	263.1	-0.010	261.1	6.6	289.2	500.	41.50	0.0000
4	FOG	17.0	0.25	263.1	-0.010	261.1	6.6	289.2	500.	40.19	0.0000
5	FOG	15.0	0.25	263.1	-0.010	258.6	6.6	289.0	500.	14.09	0.0000
6	FOG	12.5	0.25	273.1	-0.010	272.4	6.8	294.0	500.	57.62	0.0000
7	FOG	16.5	0.25	273.1	-0.010	269.4	6.8	293.5	500.	4.04	0.0000
8	FOG	15.0	0.25	283.1	-0.010	282.4	6.9	299.0	500.	20.81	0.0001
9	FOG	16.5	0.25	283.1	-0.010	279.4	6.9	298.2	500.	0.00	0.0000
10	FOG	15.5	0.25	293.1	-0.010	291.1	7.1	304.1	500.	0.00	0.0002
11	PLUME	3.0	0.15	302.1	-0.018	293.3	7.2	306.6	1178.	0.02	0.1417

12	PLUME	2.3	0.25	299.4	-0.010	294.1	7.2	306.4	1380.	0.01	0.0448
13	PLUME	2.1	0.30	298.5	0.030	294.5	7.2	306.5	1629.	0.01	0.0330
14	PLUME	4.8	0.15	300.6	-0.018	291.0	7.2	305.4	1219.	0.00	0.1182
15	PLUME	4.3	0.25	297.6	-0.010	290.8	7.1	304.8	1425.	0.01	0.1687
16	PLUME	3.0	0.30	296.2	0.030	290.9	7.1	304.6	1583.	0.01	0.0203
17	PLUME	8.2	0.15	299.7	-0.018	290.9	7.1	305.3	1138.	0.00	0.0008
18	PLUME	6.8	0.25	295.9	-0.010	287.5	7.1	303.3	1260.	0.01	0.0565
19	PLUME	7.2	0.30	284.3	0.030	277.0	6.9	297.9	50.	0.00	0.0001
20	PLUME	2.5	0.15	298.7	-0.018	293.8	7.2	306.2	837.	0.01	0.0016
21	PLUME	2.2	0.25	297.6	-0.010	295.1	7.2	306.6	997.	0.21	0.0046
22	PLUME	2.0	0.30	297.3	0.030	294.6	7.2	306.3	1497.	0.19	0.0080
23	PLUME	4.6	0.15	298.4	-0.018	289.4	7.1	304.5	1149.	0.01	0.0010
24	PLUME	4.1	0.25	293.4	-0.010	289.5	7.1	303.5	1163.	0.15	0.0154
25	PLUME	2.9	0.30	292.9	0.030	288.7	7.1	303.2	1455.	0.12	0.0033
26	PLUME	6.4	0.25	288.3	-0.010	283.1	7.0	300.4	962.	0.00	0.0018
27	PLUME	2.6	0.15	294.1	-0.018	288.5	7.1	303.3	580.	0.01	0.0005
28	PLUME	2.3	0.25	296.2	-0.010	293.5	7.1	305.7	1144.	0.31	0.0030
29	PLUME	2.1	0.30	295.9	0.030	293.1	7.1	305.5	1559.	0.36	0.0046
30	PLUME	4.1	0.15	290.7	-0.018	286.2	7.0	301.9	368.	0.25	0.0006
31	PLUME	4.1	0.25	293.0	-0.010	289.4	7.1	303.5	1164.	0.43	0.0102
32	PLUME	2.9	0.30	292.5	0.030	288.5	7.1	303.0	1566.	0.30	0.0025
33	PLUME	3.1	0.25	294.0	-0.010	290.9	7.1	304.2	1242.	0.47	0.0268
34	PLUME	3.4	0.25	293.2	-0.010	290.1	7.1	303.8	1209.	0.76	0.0266
35	PLUME	2.8	0.30	294.0	0.030	291.4	7.1	304.4	1298.	1.06	0.0274
36	PLUME	3.4	0.25	292.0	-0.010	289.4	7.1	303.2	1224.	1.40	0.0285
37	PLUME	2.9	0.25	292.9	-0.010	290.7	7.1	303.9	1195.	2.07	0.0310
38	PLUME	2.9	0.25	293.8	-0.010	292.0	7.1	304.6	1162.	2.55	0.0278
39	PLUME	2.8	0.30	293.1	0.030	291.5	7.1	304.3	1315.	3.23	0.0283
40	PLUME	2.9	0.25	291.0	-0.010	289.5	7.1	303.1	1208.	4.41	0.0288
41	PLUME	2.8	0.30	290.4	0.030	289.1	7.1	302.8	1148.	6.03	0.0291
42	PLUME	2.5	0.30	293.1	0.030	292.3	7.1	304.6	1196.	8.36	0.0288
43	PLUME	3.0	0.25	292.0	-0.010	291.3	7.1	304.0	1106.	11.61	0.0286
44	PLUME	2.7	0.25	290.5	-0.010	290.2	7.1	303.2	1077.	24.20	0.0350
45	PLUME	3.7	0.25	292.8	-0.010	292.8	7.1	304.8	994.	158.38	0.0123

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MET RECORDS READ :    43824
RECORDS DISCARDED:    26303
CALM RECORDS:          1080
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TOTAL TO NEW FILE:    17521
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1

ELECTRIC POWER RESEACH INSTITUTE MULTIPLE TOWER PLUME AND DRIFT PROGRAM, VERSION 11-01-90

COL MCINTOSH 1 LMDCT, 1987-91 TPA MET DATA

SUMMARY OF PHYSICAL PARAMETERS AND USER OPTIONS:

PLUME ENTRAINMENT COEFFICIENTS ARE ALPHA= 0.125 BETA= 0.575

WAKE ENTRAINMENT AND PRESSURE FACTOR ARE ENTFAC= 0.400 PFAC= 0.100

ASYMPTOTIC AREA RATIOS FOR MOISTURE AND MOMENTUM ARE LAMBDA= 0.510 NU= 1.200

THE BRIGGS ENTRAINMENT FOR RISING PHASE IS CB= 0.340

THE TEMPERATURE FOR ICE NUCLEATION IS TICE=-10.000

INTEGRATOR NUMERICAL TOLERANCE = 0.12500000E-05

THE USER-SELECTED PRINT CONTROL FLAG IOUT= 2

THE USER-SELECTED FOGING/ICING SWITCH IS IFOG= 1

THE USER-SELECTED DRIFT SWITCH IS IDRIFT= 1

PLUMES WILL BE COMPUTED TO A MAXIMUM CENTERLINE DISTANCE OF SMAX= 10000.000

THE CODE WILL BE RUN AS A MULTIPLE SOURCE MODEL WITH 7 OUTPUT PORTS

1** **** **** **** **** **** **** **** **** **** ** DROP SPECTRUM ** **** **** **** **** **** **** **** **** **** **

COL MCINTOSH 1 LMDCT -- SACTI DRIFT EMISSION SPECTRUM

DRIFT RATE	7.8810E+01 GM/SEC
SALT CONC IN COOLING WATER	5.000E-03 GM/GM
DENSITY OF DRY SALT	2.170E+00 GM/GM

DROP BIN	DIAMETER MICRONS	MASS FRACTION	SALT CONC. GM/GM
1	50.0	5.000E-01	5.000E-03
2	100.0	2.500E-01	5.000E-03
3	150.0	1.200E-01	5.000E-03
4	250.0	9.100E-02	5.000E-03
5	400.0	3.150E-02	5.000E-03
6	500.0	4.800E-03	5.000E-03
7	1000.0	2.700E-03	5.000E-03

1

TOTAL RECORDS FOR SEASON ANNUAL = 17521

NUMBER OF STAGNANT CASES = 1080

1 ************************ FREQUENCY PERCENTAGE BY CATEGORY AND WIND DIRECTION ************************

COL MCINTOSH 1 LMDCT, 1987-91 TPA MET DATA

SEASON=ANNUAL

CATEGORY NUMBER	WIND FROM N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
PLUME HEADED	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	SUM
11	0.66	0.45	0.83	1.19	1.23	1.03	0.93	0.78	0.81	0.76	0.99	1.39	1.49	0.48	0.31	0.35	13.69
12	0.17	0.13	0.33	0.58	0.54	0.45	0.37	0.22	0.34	0.16	0.19	0.25	0.38	0.36	0.36	0.11	4.94
13	0.35	0.24	0.44	0.60	0.99	0.86	0.36	0.15	0.28	0.21	0.48	0.28	0.37	0.51	0.87	0.25	7.25
14	0.42	0.25	0.53	1.09	1.19	0.78	0.76	0.55	0.57	0.42	0.37	0.80	2.31	0.51	0.29	0.25	11.09
15	0.89	0.41	1.00	1.99	2.26	1.32	0.86	0.44	0.56	0.53	0.47	0.58	1.66	0.99	1.21	0.67	15.83
16	0.10	0.06	0.14	0.33	0.28	0.19	0.08	0.03	0.02	0.01	0.11	0.08	0.13	0.11	0.15	0.07	1.91
17	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.01	0.01	0.00	0.01	0.01	0.01	0.07
18	0.33	0.30	0.27	0.49	0.85	0.26	0.17	0.11	0.42	0.37	0.11	0.05	0.43	0.42	0.43	0.30	5.30
19	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
20	0.00	0.01	0.01	0.01	0.03	0.02	0.01	0.01	0.02	0.01	0.00	0.02	0.01	0.00	0.00	0.01	0.15
21	0.01	0.01	0.04	0.06	0.08	0.04	0.04	0.04	0.04	0.01	0.01	0.02	0.02	0.01	0.01	0.02	0.45
22	0.02	0.04	0.06	0.14	0.16	0.18	0.06	0.05	0.08	0.03	0.02	0.04	0.02	0.07	0.02	0.02	1.03
23	0.01	0.01	0.00	0.02	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.01	0.01	0.01	0.00	0.01	0.09
24	0.14	0.06	0.22	0.16	0.16	0.12	0.14	0.06	0.09	0.05	0.02	0.02	0.04	0.03	0.07	0.06	1.45
25	0.01	0.01	0.01	0.05	0.03	0.05	0.01	0.02	0.01	0.01	0.01	0.01	0.00	0.03	0.04	0.02	0.31
[illegible]	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.01	0.01	0.02	0.01	0.17
[illegible]	0.01	0.01	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.05
28	0.02	0.01	0.02	0.03	0.05	0.07	0.01	0.02	0.02	0.01	0.01	0.00	0.01	0.01	0.02	0.00	0.29
29	0.01	0.02	0.05	0.10	0.10	0.05	0.03	0.04	0.01	0.01	0.00	0.01	0.02	0.01	0.04	0.00	0.51
30	0.01	0.01	0.01	0.01	0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
31	0.09	0.03	0.08	0.17	0.10	0.06	0.09	0.05	0.07	0.02	0.02	0.02	0.02	0.03	0.06	0.06	0.95
32	0.01	0.03	0.03	0.06	0.01	0.02	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.04	0.01	0.23
33	0.13	0.14	0.21	0.41	0.34	0.25	0.23	0.09	0.15	0.07	0.07	0.04	0.04	0.09	0.16	0.10	2.51
34	0.18	0.15	0.31	0.36	0.31	0.23	0.22	0.10	0.11	0.06	0.06	0.03	0.06	0.06	0.11	0.13	2.50
35	0.21	0.11	0.26	0.53	0.39	0.32	0.16	0.13	0.09	0.02	0.03	0.03	0.05	0.08	0.10	0.07	2.57
36	0.20	0.21	0.45	0.44	0.34	0.25	0.17	0.15	0.11	0.06	0.05	0.01	0.05	0.06	0.10	0.03	2.67
37	0.16	0.14	0.39	0.43	0.43	0.34	0.18	0.16	0.24	0.06	0.05	0.05	0.06	0.05	0.13	0.07	2.91
38	0.14	0.13	0.30	0.51	0.36	0.41	0.22	0.11	0.10	0.07	0.06	0.05	0.04	0.05	0.05	0.04	2.61
39	0.14	0.13	0.32	0.71	0.58	0.28	0.11	0.03	0.07	0.07	0.02	0.03	0.04	0.05	0.12	0.08	2.77
40	0.23	0.20	0.54	0.55	0.39	0.18	0.12	0.20	0.25	0.07	0.07	0.04	0.02	0.07	0.10	0.08	3.09
41	0.18	0.17	0.39	0.59	0.51	0.25	0.12	0.08	0.11	0.07	0.03	0.01	0.04	0.06	0.07	0.06	2.73
42	0.11	0.09	0.39	0.65	0.58	0.28	0.18	0.05	0.07	0.06	0.02	0.02	0.05	0.03	0.06	0.06	2.71
43	0.11	0.15	0.34	0.42	0.35	0.21	0.14	0.09	0.35	0.09	0.10	0.06	0.07	0.04	0.10	0.07	2.68
44	0.30	0.13	0.47	0.83	0.53	0.23	0.15	0.07	0.12	0.07	0.05	0.04	0.02	0.07	0.15	0.06	3.29
TOTALS	5.40	3.81	8.45	13.51	13.20	8.72	5.98	3.81	5.13	3.39	3.43	3.97	7.46	4.31	5.19	3.07	98.85

1 ********************************* STABILITY CLASS BY WIND DIRECTION *********************************

COL MCINTOSH 1 LMDCT, 1987-91 TPA MET DATA

SEASON=ANNUAL

STABILITY CLASS	WIND FROM N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
PLUME HEADED	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	STAG.
1	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.03	0.03	0.01	0.00	0.00	0.01	0.02
2	0.07	0.08	0.06	0.05	0.05	0.06	0.10	0.13	0.09	0.16	0.20	0.28	0.15	0.08	0.04	0.05	0.02

3	0.14	0.12	0.11	0.13	0.14	0.15	0.20	0.22	0.19	0.18	0.20	0.28	0.37	0.17	0.09	0.15	0.03
4	0.32	0.29	0.29	0.26	0.29	0.23	0.31	0.27	0.37	0.40	0.24	0.18	0.31	0.39	0.39	0.37	0.04
5	0.22	0.25	0.24	0.22	0.24	0.25	0.22	0.20	0.18	0.13	0.15	0.13	0.08	0.16	0.23	0.24	0.08
[illegible]	0.20	0.22	0.25	0.28	0.22	0.26	0.15	0.14	0.15	0.10	0.15	0.10	0.06	0.17	0.23	0.15	0.27
[illegible]	0.03	0.04	0.04	0.06	0.05	0.04	0.01	0.02	0.01	0.01	0.02	0.00	0.01	0.03	0.03	0.02	0.54

*************** WIND SPEED DISTRIBUTION BY DIRECTION AT REFERENCE HEIGHT OF 200. METERS **************

COL MCINTOSH 1 LMDCT, 1987-91 TPA MET DATA

SEASON=ANNUAL

WIND FROM →	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
WIND RANGE / PLUME HEADED →	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	STAG.
1	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.00	0.00	0.02	1.00
2	0.27	0.29	0.34	0.35	0.34	0.35	0.30	0.34	0.31	0.32	0.42	0.43	0.25	0.30	0.24	0.23	0.00
3	0.71	0.70	0.66	0.64	0.65	0.64	0.68	0.65	0.68	0.67	0.56	0.55	0.74	0.70	0.75	0.75	0.00

******************************** COMBINED FACTORS BY WIND DIRECTION ********************************

COL MCINTOSH 1 LMDCT, 1987-91 TPA MET DATA

SEASON=ANNUAL

WIND FROM →	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
COMBINED CLASS* / PLUME HEADED →	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	STAG.
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.06
[illegible]	0.06	0.06	0.06	0.06	0.07	0.08	0.09	0.13	0.09	0.12	0.18	0.25	0.13	0.07	0.03	0.05	0.00
[illegible]	0.16	0.14	0.12	0.12	0.13	0.14	0.21	0.24	0.19	0.24	0.24	0.32	0.39	0.18	0.10	0.16	0.00
4	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.12
5	0.15	0.15	0.18	0.17	0.18	0.17	0.16	0.16	0.17	0.17	0.17	0.14	0.10	0.16	0.15	0.14	0.00
6	0.38	0.38	0.35	0.31	0.34	0.31	0.36	0.30	0.37	0.35	0.22	0.17	0.29	0.39	0.46	0.46	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.81
8	0.06	0.07	0.10	0.12	0.09	0.10	0.05	0.06	0.05	0.03	0.07	0.04	0.02	0.06	0.06	0.04	0.00
9	0.17	0.18	0.19	0.21	0.18	0.19	0.11	0.10	0.11	0.07	0.10	0.06	0.05	0.14	0.19	0.13	0.00

* COMBINED CLASSES ARE DEFINED AS FOLLOWS:
1=UNSTABLE, LOW WIND 2=UNSTABLE, MODERATE WIND 3=UNSTABLE, HIGH WIND
4=NEUTRAL, LOW WIND 5=NEUTRAL MODERATE WIND 6=NEUTRAL, HIGH WIND
7=STABLE, LOW WIND 8=STABLE, MODERATE WIND 9=STABLE, HIGH WIND

1 ************************************ PLUME LENGTH FREQUENCY TABLE ************************************

COL MCINTOSH 1 LMDCT, 1987-91 TPA MET DATA

SEASON=ANNUAL

DISTANCE FROM TOWER (M) / WIND FROM →	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	ALL
PLUME HEADED →	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	SUM
100.	5.40	3.81	8.45	13.51	13.20	8.72	5.98	3.81	5.13	3.39	3.43	3.97	7.46	4.31	5.19	3.07	98.85
200.	2.53	0.01	0.00	0.00	0.00	0.01	0.01	1.48	2.06	0.01	0.00	0.00	0.00	0.01	0.02	1.11	7.24
300.	2.13	0.00	0.00	0.00	0.00	0.00	0.00	1.28	1.91	0.00	0.00	0.00	0.00	0.00	0.00	0.92	6.25
[illegible]00.	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.82	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.42	3.74
500.	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.62	1.06	0.00	0.00	0.00	0.00	0.00	0.00	0.32	2.94
600.	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.62	1.06	0.00	0.00	0.00	0.00	0.00	0.00	0.32	2.94
700.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
800.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31

900.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
1000.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
1100.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
12[illegible]	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
1[illegible]	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
1400.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
1500.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
1600.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
1700.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
1800.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
1900.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
2000.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
2100.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
2200.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
2300.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
2400.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
2500.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
2600.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
2700.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
2800.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
2900.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
3000.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
3100.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
3200.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
3300.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
3400.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
3500.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
3600.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
3700.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
[illegible]	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
[illegible].	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
4000.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
4100.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
4200.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
4300.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
4400.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
4500.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
4600.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
4700.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
4800.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
4900.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
5000.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31

1 ************************************ PLUME LENGTH FREQUENCY TABLE ************************************

COL MCINTOSH 1 LMDCT, 1987-91 TPA MET DATA

SEASON=ANNUAL

DISTANCE FROM TOWER (M)	WIND FROM N / PLUME HEADED S	NNE / SSW	NE / SW	ENE / WSW	E / W	ESE / WNW	SE / NW	SSE / NNW	S / N	SSW / NNE	SW / NE	WSW / ENE	W / E	WNW / ESE	NW / SE	NNW / SSE	ALL / SUM
5100.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
5200.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
[illegible]00.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
[illegible]0.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
5500.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
5600.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
5700.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
5800.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31

5900.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
6000.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
6100.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
6200.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
[illegible]	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
6400.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
6500.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
6600.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
6700.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
6800.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
6900.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
7000.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
7100.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
7200.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
7300.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
7400.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
7500.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
7600.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
7700.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
7800.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
7900.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
8000.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
8100.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
8200.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
8300.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
8400.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
8500.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
8600.	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.21	1.92
8700.	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.21	1.92
[illegible].	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.21	1.92
[illegible]0.	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.21	1.92
9000.	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.13	1.16
9100.	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.13	1.16
9200.	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.13	1.16
9300.	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.13	1.16
9400.	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.13	1.16
9500.	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.13	1.16
9600.	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.13	1.16
9700.	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.13	1.16
9800.	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.13	1.16
9900.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10000.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

1 ************************************* PLUME HEIGHT FREQUENCY TABLE ************************************

COL MCINTOSH 1 LMDCT, 1987-91 TPA MET DATA

SEASON=ANNUAL

HEIGHT	************************							WIND FROM	************************								
FROM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	ALL
TOWER	************************							PLUME HEADED	************************								
(M)	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	SUM
10.	5.40	3.81	8.45	13.51	13.20	8.72	5.98	3.81	5.13	3.39	3.43	3.97	7.46	4.31	5.19	3.07	98.85
20.	5.02	3.26	7.66	11.92	11.14	7.67	5.04	3.70	4.71	2.59	2.95	3.11	4.70	3.36	4.45	2.76	84.04
30.	3.69	0.01	0.47	0.83	0.53	0.01	0.01	2.71	3.58	0.01	0.05	0.04	0.02	0.01	0.02	1.83	13.81
40.	3.03	0.00	0.00	0.00	0.00	0.00	0.00	1.93	2.77	0.00	0.00	0.00	0.00	0.00	0.00	1.48	9.22
50.	2.19	0.00	0.00	0.00	0.00	0.00	0.00	1.49	2.21	0.00	0.00	0.00	0.00	0.00	0.00	0.97	6.86
[illegible]0.	1.77	0.00	0.00	0.00	0.00	0.00	0.00	1.15	1.71	0.00	0.00	0.00	0.00	0.00	0.00	0.72	5.35
70.	1.47	0.00	0.00	0.00	0.00	0.00	0.00	1.02	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.60	4.60
80.	1.16	0.00	0.00	0.00	0.00	0.00	0.00	0.82	1.24	0.00	0.00	0.00	0.00	0.00	0.00	0.38	3.60
90.	1.16	0.00	0.00	0.00	0.00	0.00	0.00	0.82	1.24	0.00	0.00	0.00	0.00	0.00	0.00	0.38	3.60
100.	0.96	0.00	0.00	0.00	0.00	0.00	0.00	0.67	1.12	0.00	0.00	0.00	0.00	0.00	0.00	0.34	3.09

110.	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.62	1.06	0.00	0.00	0.00	0.00	0.00	0.00	0.32	2.94
120.	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.62	1.06	0.00	0.00	0.00	0.00	0.00	0.00	0.32	2.94
130.	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.62	1.06	0.00	0.00	0.00	0.00	0.00	0.00	0.32	2.94
[illegible]	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
[illegible]	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
160.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
170.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
180.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
190.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
200.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
210.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
220.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
230.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
240.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
250.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
260.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
270.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
280.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
290.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
300.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
310.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
320.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
330.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
340.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
350.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
360.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
370.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
380.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
390.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
[illegible]	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
[illegible]	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
420.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
430.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
440.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
450.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
460.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
470.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
480.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
490.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
500.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31

1 ************************************ PLUME HEIGHT FREQUENCY TABLE ************************************

COL MCINTOSH 1 LMDCT, 1987-91 TPA MET DATA

SEASON=ANNUAL

HEIGHT	WIND FROM																
FROM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	ALL
TOWER	PLUME HEADED																
(M)	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	SUM
510.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
520.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
530.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
540.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
550.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
560.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
[illegible]70.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
[illegible]0.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
590.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
600.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
610.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
620.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31

630.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
640.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
650.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
[illegible].	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
[illegible].	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
680.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
690.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
700.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
710.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
720.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
730.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
740.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
750.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
760.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
770.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
780.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
790.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
800.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
810.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
820.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
830.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
840.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
850.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
860.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
870.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
880.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
890.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
900.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
910.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
[illegible]0.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
[illegible]30.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
940.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
950.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
960.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
970.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
980.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
990.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
1000.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31

1 ************************************ PLUME RADIUS FREQUENCY TABLE ************************************

COL MCINTOSH 1 LMDCT, 1987-91 TPA MET DATA

SEASON=ANNUAL

MAXIMUM	**********	**********	**********	**********	**********	**********	**********	WIND FROM	**********	**********	**********	**********	**********	**********	**********	**********	**********
FROM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	ALL
TOWER	**********	**********	**********	**********	**********	**********	**********	PLUME HEADED	**********	**********	**********	**********	**********	**********	**********	**********	**********
(M)	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	SUM
5.	5.40	3.81	8.45	13.51	13.20	8.72	5.98	3.81	5.13	3.39	3.43	3.97	7.46	4.31	5.19	3.07	98.85
10.	5.40	3.81	8.45	13.51	13.19	8.72	5.98	3.81	5.13	3.37	3.43	3.97	7.46	4.30	5.17	3.07	98.78
15.	5.40	0.88	1.76	2.40	1.78	1.11	0.73	3.81	5.13	0.36	0.25	0.15	0.16	0.31	0.53	3.07	27.83
20.	4.65	0.45	0.81	1.26	0.88	0.68	0.42	3.15	4.15	0.22	0.15	0.10	0.09	0.17	0.31	2.52	20.00
25.	3.03	0.13	0.47	0.83	0.53	0.23	0.15	1.93	2.77	0.07	0.05	0.04	0.02	0.07	0.15	1.48	11.96
30.	2.62	0.00	0.47	0.83	0.53	0.00	0.00	1.61	2.32	0.00	0.05	0.04	0.02	0.00	0.00	1.24	9.73
35.	1.84	0.00	0.00	0.00	0.00	0.00	0.00	1.19	1.66	0.00	0.00	0.00	0.00	0.00	0.00	0.67	5.36
40.	1.37	0.00	0.00	0.00	0.00	0.00	0.00	0.77	1.31	0.00	0.00	0.00	0.00	0.00	0.00	0.52	3.98
45.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
50.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
55.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
60.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
65.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
70.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31

75.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
80.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
85.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
[illegible]0.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
[illegible].	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
100.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
105.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
110.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
115.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
120.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
125.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
130.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
135.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
140.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
145.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
150.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
155.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
160.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
165.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
170.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
175.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
180.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
185.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
190.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
195.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
200.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
205.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
210.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
215.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
[illegible].	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
[illegible]5.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
230.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
235.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
240.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
245.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
250.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31

1 ************************************ PLUME RADIUS FREQUENCY TABLE ************************************

COL MCINTOSH 1 LMDCT, 1987-91 TPA MET DATA

SEASON=ANNUAL

MAXIMUM	************							WIND FROM	************							
FROM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	ALL
TOWER	************							PLUME HEADED	************								
(M)	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	SUM
255.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
260.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
265.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
270.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
275.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
280.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
285.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
290.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
295.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
300.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
[illegible]05.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
[illegible]0.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
315.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
320.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
325.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
330.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31

335.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
340.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
345.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
[illegible]	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
[illegible]	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
360.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
365.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
370.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
375.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
380.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
385.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
390.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
395.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
400.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
405.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
410.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
415.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
420.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
425.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
430.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
435.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
440.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
445.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
450.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
455.	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.31
460.	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.18	1.69
465.	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.18	1.69
470.	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.18	1.69
475.	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.18	1.69
[illegible]	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.18	1.69
[illegible]	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.18	1.69
490.	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.18	1.69
495.	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.12	1.15
500.	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.12	1.15

1 ******************************** HOURS OF PLUME SHADOWING TABLE ********************************

COL MCINTOSH 1 LMDCT, 1987-91 TPA MET DATA

SEASON=ANNUAL

DISTANCE FROM TOWER (M)	WIND FROM N / PLUME HEADED S	NNE / SSW	NE / SW	ENE / WSW	E / W	ESE / WNW	SE / NW	SSE / NNW	S / N	SSW / NNE	SW / NE	WSW / ENE	W / E	WNW / ESE	NW / SE	NNW / SSE	ALL / AVG
200.	93.4	100.7	106.2	178.8	330.6	372.5	204.1	173.3	126.9	102.8	151.7	281.3	235.8	176.3	98.3	80.2	175.8
400.	31.0	29.9	35.0	96.3	70.7	76.0	55.9	52.2	21.1	10.7	10.2	56.0	25.1	82.9	9.3	19.7	42.6
600.	15.2	23.5	24.2	43.5	26.5	12.4	36.5	23.0	7.2	7.1	5.1	20.1	11.9	27.3	4.1	10.0	18.6
800.	11.3	20.4	21.8	23.4	15.7	8.5	25.4	19.0	2.0	4.1	4.5	7.6	4.6	10.9	2.0	8.0	11.8
1000.	11.3	17.4	21.0	17.9	11.0	4.8	23.8	12.8	2.0	3.1	3.3	3.6	2.5	5.1	1.0	7.0	9.2
1200.	10.3	15.3	19.0	14.4	9.2	5.4	19.1	11.8	1.0	2.1	3.3	2.9	1.0	5.1	1.0	7.0	8.0
1400.	10.3	14.3	18.0	13.2	6.3	4.6	13.3	10.8	1.0	2.1	3.3	1.8	1.0	3.7	1.0	7.0	7.0
1600.	9.3	14.3	17.2	12.5	5.2	5.2	13.3	9.8	1.0	1.1	2.1	1.8	1.0	3.1	1.0	7.0	6.5
1800.	9.3	14.3	16.2	12.5	4.3	5.2	13.3	8.8	1.0	1.1	2.1	1.2	1.0	2.5	1.0	7.0	6.3
2000.	8.3	14.3	16.2	12.5	4.3	4.6	11.1	8.8	1.0	1.1	1.0	0.7	1.0	2.0	1.0	7.0	5.9
2200.	8.3	12.3	16.2	10.2	4.3	5.1	11.1	8.8	1.0	1.1	1.0	0.7	1.0	2.0	1.0	6.0	5.6
2400.	8.3	12.3	15.2	10.2	4.3	5.1	11.1	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	6.0	5.5
[illegible]	8.3	12.3	15.2	9.5	4.3	4.6	11.1	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	6.0	5.4
[illegible]	8.3	12.3	15.2	9.5	4.3	4.6	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	6.0	5.3
3000.	8.3	11.4	14.3	8.8	4.3	4.6	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	6.0	5.2
3200.	7.3	11.4	14.3	8.8	3.8	4.6	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	6.0	5.1
3400.	7.3	11.4	14.3	8.8	3.8	5.1	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	6.0	5.1
3600.	7.3	11.4	14.3	8.8	3.8	4.4	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	6.0	5.1

3800.	7.3	10.2	12.8	8.8	3.8	4.4	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	6.0	4.9
4000.	7.3	10.2	12.8	8.8	3.8	4.9	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	6.0	4.9
4200.	7.3	10.2	12.8	8.8	3.8	4.4	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	6.0	4.9
4400.	7.3	10.2	11.8	8.8	3.8	4.4	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	6.0	4.9
[illegible]	7.3	9.1	11.8	8.8	3.8	4.4	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	6.0	4.8
4800.	7.3	9.1	11.8	8.8	3.8	3.8	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	6.0	4.8
5000.	7.3	7.8	10.7	7.9	3.8	3.8	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	6.0	4.5
5200.	6.0	7.8	10.7	7.9	3.8	3.8	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	6.0	4.5
5400.	6.0	7.8	10.7	7.9	2.9	3.8	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	6.0	4.4
5600.	6.0	7.8	10.7	7.9	2.9	3.3	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	6.0	4.4
5800.	5.0	7.8	10.7	7.9	2.9	3.3	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	6.0	4.3
6000.	5.0	7.8	10.7	6.7	2.9	3.3	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	5.0	4.2
6200.	5.0	7.8	10.7	6.7	2.9	3.3	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	5.0	4.2
6400.	5.0	6.8	10.7	6.7	2.9	3.3	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	5.0	4.1
6600.	5.0	6.8	10.7	6.7	2.9	2.7	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	5.0	4.1
6800.	5.0	6.8	10.7	6.7	2.9	2.7	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	5.0	4.1
7000.	5.0	6.8	10.7	6.7	2.9	2.2	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	3.0	3.9
7200.	5.0	5.5	10.7	6.7	2.9	2.2	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	3.0	3.8
7400.	4.0	5.5	10.7	6.7	2.9	2.2	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	3.0	3.8
7600.	3.0	3.0	10.7	6.7	2.9	2.2	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	2.0	3.5
7800.	3.0	3.0	10.7	6.7	2.9	2.2	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	2.0	3.5
8000.	2.0	3.0	9.4	6.7	2.9	2.2	9.6	8.8	1.0	1.1	1.0	0.0	1.0	2.0	1.0	2.0	3.4

1 ************************************ PLUME SALT DEPOSITION TABLE (KG./(KM.**2-MO.)) ************************************

COL MCINTOSH 1 LMDCT, 1987-91 TPA MET DATA

SEASON=ANNUAL

DISTANCE	WIND FROM																
FROM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	ALL
TOWER	PLUME HEADED																
(M)	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	AVG
[illegible]	163.43	12.11	52.32	83.27	82.28	29.14	19.92	79.53	175.87	11.83	24.10	26.60	42.47	15.79	18.29	124.51	60.09
200.	176.04	13.01	30.37	49.18	47.49	30.20	20.41	73.48	190.50	12.46	11.86	14.05	27.96	16.46	19.55	140.65	54.61
300.	35.76	7.98	16.08	27.04	27.39	18.19	11.44	17.85	22.82	6.79	6.78	8.02	17.28	9.34	11.83	19.13	16.48
400.	14.59	6.78	14.50	23.74	22.95	16.90	10.18	8.77	11.05	5.17	5.15	5.42	9.64	7.48	9.79	8.04	11.26
500.	9.94	6.41	12.03	19.83	18.44	15.34	8.45	6.90	8.25	4.15	3.40	3.09	4.28	5.82	8.33	6.16	8.80
600.	9.89	5.54	8.45	14.87	13.77	13.51	7.10	6.93	8.24	3.55	1.96	1.45	2.14	4.92	7.12	6.20	7.23
700.	8.22	3.10	7.43	13.06	12.05	7.83	3.87	5.39	6.61	2.04	1.84	1.29	1.97	3.40	5.20	5.02	5.52
800.	4.40	1.59	3.24	5.43	5.57	4.25	2.07	2.61	3.56	1.24	1.46	0.93	1.40	2.38	3.67	2.19	2.87
900.	3.58	0.85	2.25	3.47	4.03	1.69	0.99	2.28	3.03	0.64	1.26	0.78	1.16	0.87	1.11	1.78	1.86
1000.	3.58	0.75	1.34	2.21	1.98	1.39	0.86	2.28	3.03	0.62	0.26	0.20	0.39	0.68	0.87	1.78	1.39
1100.	2.85	0.75	1.34	2.21	1.98	1.39	0.86	1.95	2.58	0.62	0.26	0.20	0.39	0.68	0.87	1.54	1.28
1200.	2.66	0.75	1.34	2.21	1.98	1.39	0.86	1.85	2.45	0.62	0.26	0.20	0.39	0.68	0.87	1.47	1.25
1300.	2.05	0.75	1.34	2.21	1.98	1.39	0.86	1.36	1.73	0.62	0.26	0.20	0.39	0.68	0.87	1.11	1.11
1400.	1.16	0.70	1.34	2.21	1.98	1.34	0.83	0.89	1.10	0.55	0.26	0.20	0.39	0.61	0.79	0.64	0.94
1500.	0.92	0.49	1.33	2.19	1.96	1.16	0.71	0.66	0.87	0.29	0.25	0.20	0.38	0.31	0.48	0.53	0.80
1600.	0.74	0.49	1.24	1.96	1.76	1.16	0.71	0.48	0.68	0.29	0.17	0.14	0.29	0.31	0.48	0.42	0.71
1700.	0.74	0.49	1.24	1.96	1.76	1.16	0.71	0.48	0.68	0.29	0.17	0.14	0.29	0.31	0.48	0.42	0.71
1800.	0.73	0.47	1.24	1.96	1.76	1.11	0.68	0.47	0.67	0.28	0.17	0.14	0.29	0.30	0.47	0.42	0.70
1900.	0.70	0.34	1.24	1.96	1.76	0.71	0.42	0.42	0.57	0.19	0.17	0.14	0.29	0.25	0.38	0.39	0.62
2000.	0.69	0.34	0.97	1.52	1.38	0.71	0.42	0.37	0.56	0.19	0.16	0.13	0.26	0.25	0.38	0.39	0.54
2100.	0.60	0.34	0.71	1.09	1.00	0.71	0.42	0.31	0.46	0.19	0.14	0.11	0.23	0.25	0.38	0.35	0.46
2200.	0.43	0.34	0.71	1.09	1.00	0.71	0.42	0.20	0.32	0.19	0.14	0.11	0.23	0.25	0.38	0.29	0.43
2300.	0.43	0.34	0.71	1.09	1.00	0.71	0.42	0.20	0.32	0.19	0.14	0.11	0.23	0.25	0.38	0.29	0.43
2400.	0.38	0.32	0.71	1.09	1.00	0.66	0.36	0.18	0.28	0.17	0.14	0.11	0.23	0.23	0.34	0.25	0.40
2500.	0.17	0.31	0.70	1.06	0.98	0.65	0.35	0.10	0.12	0.17	0.14	0.11	0.23	0.23	0.34	0.10	0.36
[illegible]	0.17	0.31	0.63	1.00	0.93	0.65	0.35	0.10	0.12	0.17	0.13	0.10	0.21	0.22	0.33	0.10	0.35
2700.	0.17	0.31	0.63	1.00	0.93	0.65	0.35	0.10	0.12	0.17	0.13	0.10	0.21	0.22	0.33	0.10	0.35
2800.	0.17	0.31	0.63	1.00	0.93	0.65	0.35	0.10	0.12	0.17	0.13	0.10	0.21	0.22	0.33	0.10	0.35
2900.	0.17	0.31	0.63	1.00	0.93	0.65	0.35	0.10	0.12	0.17	0.13	0.10	0.21	0.22	0.33	0.10	0.35
3000.	0.17	0.25	0.63	1.00	0.93	0.56	0.30	0.10	0.12	0.14	0.13	0.10	0.21	0.20	0.31	0.10	0.33

3100.	0.17	0.22	0.63	1.00	0.93	0.52	0.28	0.10	0.12	0.13	0.13	0.10	0.21	0.19	0.30	0.10	0.32
3200.	0.17	0.22	0.63	1.00	0.93	0.52	0.28	0.10	0.12	0.13	0.13	0.10	0.21	0.19	0.30	0.10	0.32
3300.	0.17	0.22	0.63	1.00	0.93	0.52	0.28	0.10	0.12	0.13	0.13	0.10	0.21	0.19	0.30	0.10	0.32
3400.	0.17	0.22	0.63	1.00	0.93	0.52	0.28	0.10	0.12	0.13	0.13	0.10	0.21	0.19	0.30	0.10	0.32
[illegible]	0.17	0.22	0.54	0.87	0.81	0.52	0.28	0.10	0.12	0.13	0.13	0.10	0.20	0.19	0.30	0.10	0.30
3600.	0.17	0.22	0.48	0.78	0.73	0.52	0.28	0.10	0.12	0.13	0.12	0.10	0.20	0.19	0.30	0.10	0.28
3700.	0.17	0.22	0.48	0.78	0.73	0.52	0.28	0.10	0.12	0.13	0.12	0.10	0.20	0.19	0.30	0.10	0.28
3800.	0.17	0.22	0.45	0.75	0.71	0.51	0.28	0.10	0.12	0.13	0.12	0.10	0.19	0.19	0.29	0.10	0.28
3900.	0.17	0.16	0.43	0.72	0.69	0.41	0.24	0.10	0.12	0.10	0.12	0.10	0.19	0.17	0.25	0.10	0.25
4000.	0.17	0.16	0.43	0.72	0.69	0.41	0.23	0.10	0.12	0.10	0.12	0.10	0.19	0.17	0.25	0.10	0.25
4100.	0.17	0.16	0.43	0.72	0.69	0.41	0.23	0.10	0.12	0.10	0.12	0.10	0.19	0.17	0.25	0.10	0.25
4200.	0.17	0.16	0.43	0.72	0.69	0.41	0.23	0.10	0.12	0.10	0.12	0.10	0.19	0.17	0.25	0.10	0.25
4300.	0.16	0.15	0.41	0.70	0.67	0.40	0.23	0.09	0.11	0.10	0.11	0.09	0.19	0.17	0.25	0.10	0.25
4400.	0.14	0.14	0.40	0.69	0.66	0.38	0.21	0.08	0.09	0.10	0.11	0.09	0.18	0.17	0.24	0.08	0.24
4500.	0.14	0.14	0.35	0.61	0.60	0.38	0.21	0.08	0.09	0.10	0.10	0.09	0.18	0.17	0.24	0.08	0.22
4600.	0.14	0.13	0.28	0.49	0.51	0.37	0.20	0.08	0.09	0.09	0.10	0.08	0.18	0.16	0.23	0.08	0.20
4700.	0.14	0.13	0.28	0.49	0.51	0.37	0.20	0.08	0.09	0.09	0.10	0.08	0.18	0.16	0.23	0.08	0.20
4800.	0.13	0.13	0.27	0.47	0.49	0.37	0.20	0.06	0.09	0.09	0.10	0.08	0.17	0.16	0.23	0.07	0.19
4900.	0.13	0.13	0.26	0.46	0.48	0.37	0.20	0.06	0.09	0.09	0.09	0.08	0.17	0.16	0.23	0.07	0.19
5000.	0.13	0.13	0.26	0.46	0.48	0.37	0.20	0.06	0.09	0.09	0.09	0.08	0.17	0.16	0.23	0.07	0.19

1 ************************************ PLUME SALT DEPOSITION TABLE (KG./(KM.**2-MO.)) ************************************

COL MCINTOSH 1 LMDCT, 1987-91 TPA MET DATA

SEASON=ANNUAL

DISTANCE	********	********	********	********	********	********	********	WIND FROM	********	********	********	********	********	********	********	********	********
FROM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	ALL
TOWER	********	********	********	********	********	********	********	PLUME HEADED	********	********	********	********	********	********	********	********	********
(M)	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	AVG
5100.	0.13	0.13	0.26	0.46	0.48	0.37	0.20	0.06	0.09	0.09	0.09	0.08	0.17	0.16	0.23	0.07	0.19
[illegible]	0.13	0.11	0.26	0.46	0.48	0.31	0.16	0.06	0.09	0.07	0.09	0.08	0.17	0.13	0.19	0.07	0.18
[illegible]	0.13	0.09	0.25	0.45	0.47	0.26	0.13	0.06	0.09	0.05	0.09	0.08	0.17	0.10	0.15	0.07	0.17
5400.	0.13	0.09	0.20	0.36	0.38	0.26	0.13	0.06	0.09	0.05	0.08	0.06	0.11	0.10	0.15	0.07	0.14
5500.	0.13	0.09	0.18	0.32	0.32	0.26	0.13	0.06	0.09	0.05	0.06	0.04	0.07	0.09	0.15	0.07	0.13
5600.	0.13	0.07	0.18	0.32	0.32	0.22	0.10	0.06	0.09	0.05	0.06	0.04	0.07	0.08	0.13	0.07	0.12
5700.	0.13	0.06	0.18	0.32	0.32	0.17	0.08	0.06	0.09	0.04	0.06	0.04	0.07	0.07	0.12	0.07	0.12
5800.	0.13	0.06	0.18	0.31	0.32	0.16	0.08	0.06	0.09	0.04	0.06	0.04	0.07	0.07	0.12	0.07	0.11
5900.	0.13	0.06	0.17	0.29	0.30	0.16	0.08	0.06	0.09	0.04	0.06	0.04	0.07	0.07	0.12	0.07	0.11
6000.	0.13	0.06	0.16	0.28	0.29	0.16	0.08	0.06	0.09	0.04	0.06	0.04	0.07	0.07	0.12	0.07	0.11
6100.	0.13	0.06	0.16	0.27	0.28	0.16	0.08	0.06	0.09	0.04	0.06	0.04	0.06	0.07	0.12	0.07	0.11
6200.	0.13	0.06	0.15	0.25	0.25	0.16	0.08	0.06	0.09	0.04	0.05	0.04	0.05	0.07	0.12	0.07	0.10
6300.	0.13	0.06	0.15	0.25	0.24	0.16	0.08	0.06	0.09	0.04	0.05	0.03	0.05	0.07	0.12	0.07	0.10
6400.	0.13	0.06	0.12	0.20	0.21	0.16	0.08	0.06	0.09	0.04	0.05	0.03	0.04	0.07	0.12	0.07	0.09
6500.	0.12	0.06	0.12	0.19	0.20	0.16	0.08	0.06	0.08	0.04	0.05	0.03	0.04	0.07	0.12	0.06	0.09
6600.	0.10	0.06	0.12	0.19	0.20	0.16	0.08	0.04	0.06	0.04	0.05	0.03	0.04	0.07	0.12	0.05	0.09
6700.	0.10	0.06	0.12	0.19	0.20	0.16	0.08	0.04	0.06	0.04	0.05	0.03	0.04	0.07	0.12	0.05	0.09
6800.	0.10	0.06	0.12	0.19	0.20	0.16	0.08	0.04	0.06	0.04	0.05	0.03	0.04	0.07	0.12	0.05	0.09
6900.	0.08	0.06	0.12	0.19	0.20	0.16	0.08	0.04	0.05	0.04	0.05	0.03	0.04	0.07	0.12	0.04	0.09
7000.	0.08	0.05	0.12	0.19	0.20	0.14	0.07	0.04	0.05	0.03	0.05	0.03	0.04	0.06	0.09	0.04	0.08
7100.	0.08	0.04	0.12	0.19	0.20	0.09	0.05	0.04	0.05	0.02	0.05	0.03	0.04	0.03	0.05	0.04	0.07
7200.	0.08	0.04	0.12	0.19	0.20	0.09	0.05	0.04	0.05	0.02	0.05	0.03	0.04	0.03	0.05	0.04	0.07
7300.	0.08	0.04	0.12	0.19	0.20	0.09	0.05	0.04	0.05	0.02	0.05	0.03	0.04	0.03	0.05	0.04	0.07
7400.	0.08	0.03	0.12	0.19	0.20	0.09	0.05	0.04	0.05	0.02	0.05	0.03	0.04	0.03	0.04	0.04	0.07
7500.	0.08	0.03	0.11	0.18	0.19	0.09	0.05	0.04	0.05	0.02	0.04	0.03	0.04	0.02	0.04	0.04	0.07
7600.	0.08	0.03	0.09	0.15	0.13	0.09	0.05	0.04	0.05	0.02	0.02	0.01	0.02	0.02	0.04	0.04	0.05
7700.	0.08	0.03	0.09	0.15	0.13	0.09	0.05	0.04	0.05	0.02	0.02	0.01	0.02	0.02	0.04	0.04	0.05
[illegible]	0.07	0.03	0.09	0.15	0.13	0.09	0.05	0.03	0.04	0.02	0.02	0.01	0.02	0.02	0.04	0.04	0.05
7900.	0.04	0.03	0.09	0.15	0.13	0.09	0.05	0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.04	0.02	0.05
8000.	0.04	0.03	0.09	0.15	0.13	0.09	0.05	0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.04	0.02	0.05
8100.	0.04	0.03	0.09	0.15	0.13	0.09	0.05	0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.04	0.02	0.05
8200.	0.04	0.03	0.09	0.15	0.13	0.09	0.05	0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.04	0.02	0.05

8300.	0.04	0.03	0.09	0.15	0.13	0.09	0.05	0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.04	0.02	0.05
8400.	0.03	0.03	0.09	0.15	0.13	0.09	0.05	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.04	0.01	0.05
8500.	0.02	0.03	0.09	0.14	0.13	0.09	0.05	0.01	0.01	0.02	0.02	0.01	0.02	0.02	0.04	0.01	0.04
8600.	0.02	0.03	0.09	0.14	0.13	0.09	0.05	0.01	0.01	0.02	0.02	0.01	0.02	0.02	0.04	0.01	0.04
[illegible]	0.02	0.03	0.08	0.14	0.13	0.09	0.05	0.01	0.01	0.02	0.02	0.01	0.02	0.02	0.04	0.01	0.04
8800.	0.02	0.03	0.08	0.13	0.12	0.07	0.04	0.01	0.01	0.02	0.02	0.01	0.02	0.02	0.04	0.01	0.04
8900.	0.02	0.03	0.08	0.13	0.12	0.06	0.03	0.01	0.01	0.01	0.02	0.01	0.02	0.02	0.03	0.01	0.04
9000.	0.02	0.03	0.08	0.13	0.12	0.06	0.03	0.01	0.01	0.01	0.02	0.01	0.02	0.02	0.03	0.01	0.04
9100.	0.02	0.03	0.08	0.13	0.12	0.06	0.03	0.01	0.01	0.01	0.02	0.01	0.02	0.02	0.03	0.01	0.04
9200.	0.02	0.03	0.08	0.13	0.12	0.06	0.03	0.01	0.01	0.01	0.02	0.01	0.02	0.02	0.03	0.01	0.04
9300.	0.02	0.03	0.08	0.13	0.12	0.06	0.03	0.01	0.01	0.01	0.02	0.01	0.02	0.02	0.03	0.01	0.04
9400.	0.02	0.03	0.05	0.09	0.08	0.06	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.03	0.01	0.03
9500.	0.02	0.03	0.05	0.09	0.08	0.06	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.03	0.01	0.03
9600.	0.02	0.03	0.05	0.09	0.08	0.06	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.03	0.01	0.03
9700.	0.02	0.03	0.05	0.09	0.08	0.06	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.03	0.01	0.03
9800.	0.02	0.03	0.05	0.09	0.08	0.06	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.03	0.01	0.03
9900.	0.02	0.03	0.05	0.09	0.08	0.06	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.03	0.01	0.03
10000.	0.02	0.03	0.05	0.09	0.08	0.06	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.03	0.01	0.03

1 ********************************** PLUME WATER DEPOSITION TABLE (KG./(KM.**2-MO.)) **********************************

COL MCINTOSH 1 LMDCT, 1987-91 TPA MET DATA

SEASON=ANNUAL

DISTANCE	************	************	************	************	************	************	************	WIND	FROM	************	************	************	************	************	************	************	************
FROM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	ALL
TOWER	************	************	************	************	************	************	************	PLUME	HEADED	************	************	************	************	************	************	************	************
(M)	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	AVG
100.	.33E+05	.24E+04	.10E+05	.16E+05	.16E+05	.57E+04	.39E+04	.16E+05	.35E+05	.23E+04	.46E+04	.51E+04	.81E+04	.31E+04	.36E+04	.25E+05	.12E+05
200.	.34E+05	.25E+04	.58E+04	.93E+04	.89E+04	.58E+04	.40E+04	.14E+05	.37E+05	.24E+04	.22E+04	.25E+04	.51E+04	.32E+04	.38E+04	.27E+05	.11E+05
300.	.63E+04	.15E+04	.29E+04	.48E+04	.48E+04	.34E+04	.21E+04	.31E+04	.40E+04	.13E+04	.11E+04	.13E+04	.29E+04	.17E+04	.22E+04	.33E+04	.29E+04
[illegible]	.25E+04	.11E+04	.24E+04	.39E+04	.37E+04	.26E+04	.16E+04	.15E+04	.19E+04	.82E+03	.73E+03	.78E+03	.15E+04	.11E+04	.14E+04	.14E+04	.18E+04
[illegible]	.16E+04	.97E+03	.18E+04	.30E+04	.27E+04	.21E+04	.12E+04	.12E+04	.13E+04	.61E+03	.40E+03	.37E+03	.54E+03	.75E+03	.10E+04	.10E+04	.13E+04
600.	.16E+04	.80E+03	.12E+04	.21E+04	.19E+04	.18E+04	.98E+03	.12E+04	.13E+04	.49E+03	.18E+03	.14E+03	.22E+03	.58E+03	.81E+03	.10E+04	.10E+04
700.	.12E+04	.37E+03	.10E+04	.18E+04	.16E+04	.84E+03	.43E+03	.86E+03	.10E+04	.24E+03	.16E+03	.12E+03	.19E+03	.34E+03	.49E+03	.81E+03	.72E+03
800.	.49E+03	.14E+03	.28E+03	.50E+03	.47E+03	.31E+03	.16E+03	.31E+03	.42E+03	.13E+03	.96E+02	.63E+02	.96E+02	.20E+03	.29E+03	.25E+03	.26E+03
900.	.39E+03	.93E+02	.15E+03	.23E+03	.26E+03	.14E+03	.90E+02	.27E+03	.35E+03	.87E+02	.76E+02	.48E+02	.70E+02	.11E+03	.12E+03	.20E+03	.17E+03
1000.	.39E+03	.87E+02	.92E+02	.15E+03	.13E+03	.12E+03	.82E+02	.27E+03	.35E+03	.86E+02	.15E+02	.12E+02	.23E+02	.94E+02	.11E+03	.20E+03	.14E+03
1100.	.33E+03	.87E+02	.92E+02	.15E+03	.13E+03	.12E+03	.82E+02	.24E+03	.31E+03	.86E+02	.15E+02	.12E+02	.23E+02	.94E+02	.11E+03	.18E+03	.13E+03
1200.	.31E+03	.87E+02	.92E+02	.15E+03	.13E+03	.12E+03	.82E+02	.23E+03	.30E+03	.86E+02	.15E+02	.12E+02	.23E+02	.94E+02	.11E+03	.17E+03	.13E+03
1300.	.23E+03	.87E+02	.92E+02	.15E+03	.13E+03	.12E+03	.82E+02	.17E+03	.21E+03	.86E+02	.15E+02	.12E+02	.23E+02	.94E+02	.11E+03	.12E+03	.11E+03
1400.	.12E+03	.76E+02	.92E+02	.15E+03	.13E+03	.11E+03	.75E+02	.10E+03	.12E+03	.72E+02	.15E+02	.12E+02	.23E+02	.78E+02	.91E+02	.64E+02	.84E+02
1500.	.74E+02	.34E+02	.91E+02	.15E+03	.13E+03	.77E+02	.51E+02	.63E+02	.84E+02	.21E+02	.14E+02	.11E+02	.22E+02	.19E+02	.30E+02	.44E+02	.57E+02
1600.	.40E+02	.34E+02	.86E+02	.13E+03	.12E+03	.77E+02	.51E+02	.30E+02	.50E+02	.21E+02	.93E+01	.79E+01	.17E+02	.19E+02	.30E+02	.24E+02	.47E+02
1700.	.40E+02	.34E+02	.86E+02	.13E+03	.12E+03	.77E+02	.51E+02	.30E+02	.50E+02	.21E+02	.93E+01	.79E+01	.17E+02	.19E+02	.30E+02	.24E+02	.47E+02
1800.	.40E+02	.33E+02	.86E+02	.13E+03	.12E+03	.73E+02	.49E+02	.29E+02	.50E+02	.20E+02	.93E+01	.79E+01	.17E+02	.18E+02	.29E+02	.24E+02	.46E+02
1900.	.38E+02	.22E+02	.86E+02	.13E+03	.12E+03	.40E+02	.26E+02	.26E+02	.45E+02	.12E+02	.93E+01	.79E+01	.17E+02	.13E+02	.20E+02	.22E+02	.40E+02
2000.	.37E+02	.22E+02	.64E+02	.99E+02	.86E+02	.40E+02	.26E+02	.24E+02	.44E+02	.12E+02	.80E+01	.67E+01	.14E+02	.13E+02	.20E+02	.22E+02	.34E+02
2100.	.29E+02	.22E+02	.43E+02	.65E+02	.56E+02	.40E+02	.26E+02	.18E+02	.29E+02	.12E+02	.68E+01	.55E+01	.12E+02	.13E+02	.20E+02	.18E+02	.26E+02
2200.	.16E+02	.22E+02	.43E+02	.65E+02	.56E+02	.40E+02	.26E+02	.95E+01	.12E+02	.12E+02	.68E+01	.55E+01	.12E+02	.13E+02	.20E+02	.13E+02	.23E+02
2300.	.16E+02	.22E+02	.43E+02	.65E+02	.56E+02	.40E+02	.26E+02	.95E+01	.12E+02	.12E+02	.68E+01	.55E+01	.12E+02	.13E+02	.20E+02	.13E+02	.23E+02
2400.	.14E+02	.19E+02	.43E+02	.65E+02	.56E+02	.34E+02	.20E+02	.86E+01	.10E+02	.10E+02	.68E+01	.55E+01	.12E+02	.11E+02	.16E+02	.11E+02	.21E+02
2500.	.55E+01	.18E+02	.42E+02	.62E+02	.54E+02	.34E+02	.19E+02	.50E+01	.34E+01	.97E+01	.64E+01	.52E+01	.12E+02	.11E+02	.16E+02	.51E+01	.19E+02
2600.	.55E+01	.18E+02	.38E+02	.58E+02	.50E+02	.34E+02	.19E+02	.50E+01	.34E+01	.93E+01	.60E+01	.46E+01	.11E+02	.11E+02	.15E+02	.51E+01	.18E+02
2700.	.55E+01	.18E+02	.38E+02	.58E+02	.50E+02	.34E+02	.19E+02	.50E+01	.34E+01	.91E+01	.60E+01	.46E+01	.11E+02	.11E+02	.15E+02	.51E+01	.18E+02
2800.	.55E+01	.18E+02	.38E+02	.58E+02	.50E+02	.34E+02	.19E+02	.50E+01	.34E+01	.91E+01	.60E+01	.46E+01	.11E+02	.11E+02	.15E+02	.51E+01	.18E+02
2900.	.55E+01	.18E+02	.38E+02	.58E+02	.50E+02	.34E+02	.19E+02	.50E+01	.34E+01	.91E+01	.60E+01	.46E+01	.11E+02	.11E+02	.15E+02	.51E+01	.18E+02
[illegible]	.55E+01	.14E+02	.38E+02	.58E+02	.50E+02	.27E+02	.16E+02	.50E+01	.34E+01	.73E+01	.60E+01	.46E+01	.11E+02	.90E+01	.14E+02	.51E+01	.17E+02
3100.	.55E+01	.12E+02	.38E+02	.58E+02	.50E+02	.25E+02	.14E+02	.50E+01	.34E+01	.65E+01	.60E+01	.46E+01	.11E+02	.84E+01	.13E+02	.51E+01	.17E+02
3200.	.55E+01	.12E+02	.38E+02	.58E+02	.50E+02	.25E+02	.14E+02	.50E+01	.34E+01	.65E+01	.60E+01	.46E+01	.11E+02	.84E+01	.13E+02	.51E+01	.17E+02
3300.	.55E+01	.12E+02	.38E+02	.58E+02	.50E+02	.25E+02	.14E+02	.50E+01	.34E+01	.65E+01	.60E+01	.46E+01	.11E+02	.84E+01	.13E+02	.51E+01	.17E+02
3400.	.55E+01	.12E+02	.37E+02	.58E+02	.50E+02	.25E+02	.14E+02	.50E+01	.34E+01	.65E+01	.60E+01	.46E+01	.11E+02	.84E+01	.13E+02	.51E+01	.17E+02

3500.	.55E+01	.12E+02	.31E+02	.48E+02	.42E+02	.25E+02	.14E+02	.50E+01	.34E+01	.65E+01	.54E+01	.44E+01	.99E+01	.84E+01	.13E+02	.51E+01	.15E+02
3600.	.55E+01	.12E+02	.27E+02	.42E+02	.37E+02	.25E+02	.14E+02	.50E+01	.34E+01	.65E+01	.51E+01	.43E+01	.95E+01	.84E+01	.13E+02	.51E+01	.14E+02
3700.	.55E+01	.12E+02	.27E+02	.42E+02	.37E+02	.25E+02	.14E+02	.50E+01	.34E+01	.65E+01	.51E+01	.43E+01	.95E+01	.84E+01	.13E+02	.51E+01	.14E+02
3800.	.55E+01	.12E+02	.25E+02	.40E+02	.35E+02	.24E+02	.14E+02	.50E+01	.34E+01	.64E+01	.48E+01	.43E+01	.93E+01	.83E+01	.13E+02	.51E+01	.13E+02
[illegible]	.55E+01	.84E+01	.23E+02	.38E+02	.34E+02	.18E+02	.11E+02	.50E+01	.34E+01	.49E+01	.47E+01	.43E+01	.92E+01	.71E+01	.99E+01	.51E+01	.12E+02
[illegible]	.55E+01	.79E+01	.23E+02	.38E+02	.34E+02	.17E+02	.11E+02	.50E+01	.34E+01	.48E+01	.47E+01	.43E+01	.92E+01	.70E+01	.97E+01	.51E+01	.12E+02
4100.	.55E+01	.79E+01	.23E+02	.38E+02	.34E+02	.17E+02	.11E+02	.50E+01	.34E+01	.48E+01	.47E+01	.43E+01	.92E+01	.70E+01	.97E+01	.51E+01	.12E+02
4200.	.55E+01	.79E+01	.23E+02	.38E+02	.34E+02	.17E+02	.11E+02	.50E+01	.34E+01	.48E+01	.47E+01	.43E+01	.92E+01	.70E+01	.97E+01	.51E+01	.12E+02
4300.	.49E+01	.77E+01	.22E+02	.37E+02	.33E+02	.17E+02	.11E+02	.47E+01	.30E+01	.47E+01	.44E+01	.41E+01	.89E+01	.69E+01	.96E+01	.48E+01	.11E+02
4400.	.40E+01	.70E+01	.21E+02	.36E+02	.32E+02	.16E+02	.97E+01	.44E+01	.24E+01	.44E+01	.43E+01	.41E+01	.88E+01	.66E+01	.90E+01	.43E+01	.11E+02
4500.	.40E+01	.70E+01	.18E+02	.30E+02	.27E+02	.16E+02	.97E+01	.44E+01	.24E+01	.44E+01	.39E+01	.37E+01	.85E+01	.66E+01	.90E+01	.43E+01	.99E+01
4600.	.40E+01	.54E+01	.13E+02	.22E+02	.21E+02	.14E+02	.87E+01	.44E+01	.24E+01	.39E+01	.34E+01	.33E+01	.82E+01	.61E+01	.83E+01	.43E+01	.83E+01
4700.	.37E+01	.52E+01	.13E+02	.22E+02	.21E+02	.14E+02	.86E+01	.40E+01	.23E+01	.38E+01	.34E+01	.33E+01	.82E+01	.60E+01	.82E+01	.40E+01	.82E+01
4800.	.17E+01	.52E+01	.12E+02	.20E+02	.20E+02	.14E+02	.86E+01	.63E+00	.92E+00	.38E+01	.32E+01	.32E+01	.80E+01	.60E+01	.82E+01	.63E+00	.73E+01
4900.	.17E+01	.52E+01	.11E+02	.19E+02	.19E+02	.14E+02	.86E+01	.63E+00	.92E+00	.38E+01	.31E+01	.31E+01	.80E+01	.60E+01	.82E+01	.63E+00	.71E+01
5000.	.17E+01	.52E+01	.11E+02	.19E+02	.19E+02	.14E+02	.86E+01	.63E+00	.92E+00	.38E+01	.31E+01	.31E+01	.80E+01	.60E+01	.82E+01	.63E+00	.71E+01

1 *********************************** PLUME WATER DEPOSITION TABLE (KG./(KM.**2-MO.)) ***********************************

COL MCINTOSH 1 LMDCT, 1987-91 TPA MET DATA

SEASON=ANNUAL

DISTANCE	WIND FROM																
FROM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	ALL
TOWER	PLUME HEADED																
(M)	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	AVG
5100.	.17E+01	.52E+01	.11E+02	.19E+02	.19E+02	.14E+02	.86E+01	.63E+00	.92E+00	.38E+01	.31E+01	.31E+01	.80E+01	.60E+01	.82E+01	.63E+00	.71E+01
5200.	.17E+01	.39E+01	.11E+02	.19E+02	.19E+02	.10E+02	.60E+01	.63E+00	.92E+00	.25E+01	.31E+01	.31E+01	.80E+01	.39E+01	.56E+01	.63E+00	.62E+01
5300.	.17E+01	.30E+01	.11E+02	.19E+02	.19E+02	.71E+01	.42E+01	.63E+00	.92E+00	.14E+01	.31E+01	.30E+01	.79E+01	.19E+01	.32E+01	.63E+00	.54E+01
5400.	.17E+01	.30E+01	.74E+01	.13E+02	.13E+02	.71E+01	.42E+01	.63E+00	.92E+00	.14E+01	.19E+01	.17E+01	.43E+01	.19E+01	.32E+01	.63E+00	.41E+01
5500.	.17E+01	.29E+01	.60E+01	.11E+02	.96E+01	.70E+01	.41E+01	.63E+00	.92E+00	.14E+01	.13E+01	.91E+00	.20E+01	.19E+01	.31E+01	.63E+00	.34E+01
[illegible]	.17E+01	.19E+01	.60E+01	.11E+02	.96E+01	.46E+01	.25E+01	.63E+00	.92E+00	.95E+00	.13E+01	.91E+00	.20E+01	.13E+01	.21E+01	.63E+00	.30E+01
[illegible]	.17E+01	.12E+01	.60E+01	.11E+02	.96E+01	.24E+01	.15E+01	.63E+00	.92E+00	.69E+00	.13E+01	.91E+00	.20E+01	.71E+00	.15E+01	.63E+00	.26E+01
5800.	.17E+01	.11E+01	.59E+01	.11E+02	.94E+01	.23E+01	.14E+01	.63E+00	.92E+00	.65E+00	.13E+01	.86E+00	.20E+01	.69E+00	.13E+01	.63E+00	.26E+01
5900.	.17E+01	.11E+01	.55E+01	.98E+01	.87E+01	.22E+01	.13E+01	.63E+00	.92E+00	.64E+00	.11E+01	.74E+00	.19E+01	.69E+00	.13E+01	.63E+00	.24E+01
6000.	.17E+01	.11E+01	.51E+01	.90E+01	.81E+01	.22E+01	.13E+01	.63E+00	.92E+00	.64E+00	.10E+01	.66E+00	.18E+01	.69E+00	.13E+01	.63E+00	.23E+01
6100.	.17E+01	.11E+01	.49E+01	.86E+01	.74E+01	.22E+01	.13E+01	.63E+00	.92E+00	.64E+00	.91E+00	.63E+00	.15E+01	.69E+00	.13E+01	.63E+00	.22E+01
6200.	.17E+01	.11E+01	.44E+01	.76E+01	.57E+01	.22E+01	.13E+01	.63E+00	.92E+00	.64E+00	.71E+00	.53E+00	.66E+00	.69E+00	.13E+01	.63E+00	.19E+01
6300.	.17E+01	.11E+01	.43E+01	.74E+01	.56E+01	.22E+01	.13E+01	.63E+00	.92E+00	.64E+00	.71E+00	.52E+00	.63E+00	.69E+00	.13E+01	.63E+00	.19E+01
6400.	.17E+01	.11E+01	.34E+01	.57E+01	.43E+01	.22E+01	.13E+01	.63E+00	.92E+00	.64E+00	.60E+00	.43E+00	.46E+00	.69E+00	.13E+01	.63E+00	.16E+01
6500.	.17E+01	.11E+01	.32E+01	.52E+01	.39E+01	.22E+01	.13E+01	.62E+00	.91E+00	.64E+00	.57E+00	.40E+00	.42E+00	.69E+00	.13E+01	.62E+00	.16E+01
6600.	.15E+01	.11E+01	.32E+01	.52E+01	.39E+01	.22E+01	.13E+01	.48E+00	.72E+00	.64E+00	.57E+00	.40E+00	.42E+00	.69E+00	.13E+01	.53E+00	.15E+01
6700.	.15E+01	.11E+01	.32E+01	.52E+01	.39E+01	.22E+01	.13E+01	.48E+00	.72E+00	.64E+00	.57E+00	.40E+00	.42E+00	.69E+00	.13E+01	.53E+00	.15E+01
6800.	.15E+01	.11E+01	.32E+01	.52E+01	.39E+01	.22E+01	.13E+01	.48E+00	.72E+00	.64E+00	.57E+00	.40E+00	.42E+00	.69E+00	.13E+01	.53E+00	.15E+01
6900.	.13E+01	.11E+01	.32E+01	.52E+01	.39E+01	.22E+01	.13E+01	.46E+00	.66E+00	.64E+00	.57E+00	.40E+00	.42E+00	.69E+00	.13E+01	.45E+00	.15E+01
7000.	.13E+01	.11E+01	.32E+01	.52E+01	.39E+01	.22E+01	.13E+01	.46E+00	.66E+00	.62E+00	.57E+00	.40E+00	.42E+00	.64E+00	.12E+01	.45E+00	.15E+01
7100.	.13E+01	.10E+01	.32E+01	.52E+01	.39E+01	.20E+01	.12E+01	.44E+00	.65E+00	.58E+00	.57E+00	.40E+00	.42E+00	.54E+00	.11E+01	.45E+00	.14E+01
7200.	.13E+01	.10E+01	.32E+01	.52E+01	.39E+01	.20E+01	.12E+01	.44E+00	.65E+00	.58E+00	.57E+00	.40E+00	.42E+00	.54E+00	.11E+01	.45E+00	.14E+01
7300.	.13E+01	.10E+01	.32E+01	.52E+01	.39E+01	.20E+01	.12E+01	.44E+00	.65E+00	.58E+00	.57E+00	.40E+00	.42E+00	.54E+00	.11E+01	.45E+00	.14E+01
7400.	.13E+01	.98E+00	.32E+01	.52E+01	.39E+01	.19E+01	.12E+01	.44E+00	.65E+00	.57E+00	.57E+00	.40E+00	.42E+00	.51E+00	.96E+00	.45E+00	.14E+01
7500.	.13E+01	.98E+00	.32E+01	.52E+01	.39E+01	.19E+01	.12E+01	.44E+00	.65E+00	.56E+00	.55E+00	.39E+00	.40E+00	.50E+00	.95E+00	.45E+00	.14E+01
7600.	.13E+01	.98E+00	.31E+01	.51E+01	.37E+01	.19E+01	.12E+01	.44E+00	.65E+00	.56E+00	.45E+00	.34E+00	.33E+00	.50E+00	.95E+00	.45E+00	.14E+01
7700.	.13E+01	.98E+00	.31E+01	.51E+01	.37E+01	.19E+01	.12E+01	.44E+00	.65E+00	.56E+00	.45E+00	.34E+00	.33E+00	.50E+00	.95E+00	.45E+00	.14E+01
7800.	.13E+01	.98E+00	.31E+01	.51E+01	.37E+01	.19E+01	.12E+01	.43E+00	.63E+00	.56E+00	.45E+00	.34E+00	.33E+00	.50E+00	.95E+00	.44E+00	.14E+01
7900.	.12E+01	.98E+00	.31E+01	.51E+01	.37E+01	.19E+01	.12E+01	.38E+00	.55E+00	.56E+00	.45E+00	.34E+00	.33E+00	.50E+00	.95E+00	.36E+00	.13E+01
8000.	.12E+01	.98E+00	.31E+01	.51E+01	.37E+01	.19E+01	.12E+01	.38E+00	.55E+00	.56E+00	.45E+00	.34E+00	.33E+00	.50E+00	.95E+00	.36E+00	.13E+01
8100.	.12E+01	.98E+00	.31E+01	.51E+01	.37E+01	.19E+01	.12E+01	.38E+00	.55E+00	.56E+00	.45E+00	.34E+00	.32E+00	.50E+00	.95E+00	.36E+00	.13E+01
[illegible]	.12E+01	.98E+00	.31E+01	.50E+01	.37E+01	.19E+01	.12E+01	.38E+00	.55E+00	.56E+00	.45E+00	.34E+00	.31E+00	.50E+00	.95E+00	.36E+00	.13E+01
[illegible]	.12E+01	.98E+00	.31E+01	.50E+01	.37E+01	.19E+01	.12E+01	.38E+00	.55E+00	.56E+00	.45E+00	.34E+00	.31E+00	.50E+00	.95E+00	.36E+00	.13E+01
8400.	.11E+01	.98E+00	.31E+01	.50E+01	.37E+01	.19E+01	.12E+01	.35E+00	.53E+00	.56E+00	.45E+00	.34E+00	.31E+00	.50E+00	.95E+00	.34E+00	.13E+01
8500.	.11E+01	.98E+00	.30E+01	.50E+01	.37E+01	.19E+01	.12E+01	.33E+00	.52E+00	.56E+00	.45E+00	.33E+00	.31E+00	.50E+00	.95E+00	.34E+00	.13E+01
8600.	.11E+01	.98E+00	.30E+01	.50E+01	.37E+01	.19E+01	.12E+01	.33E+00	.52E+00	.56E+00	.45E+00	.33E+00	.31E+00	.50E+00	.95E+00	.34E+00	.13E+01

8700.	.11E+01	.98E+00	.26E+01	.42E+01	.32E+01	.19E+01	.12E+01	.33E+00	.52E+00	.56E+00	.41E+00	.30E+00	.30E+00	.50E+00	.95E+00	.34E+00	.12E+01
8800.	.11E+01	.68E+00	.16E+01	.24E+01	.20E+01	.13E+01	.80E+00	.33E+00	.52E+00	.39E+00	.31E+00	.21E+00	.26E+00	.33E+00	.61E+00	.34E+00	.82E+00
8900.	.11E+01	.51E+00	.16E+01	.24E+01	.20E+01	.90E+00	.55E+00	.33E+00	.52E+00	.29E+00	.31E+00	.21E+00	.26E+00	.24E+00	.44E+00	.34E+00	.75E+00
9000.	.11E+01	.51E+00	.16E+01	.24E+01	.20E+01	.90E+00	.55E+00	.33E+00	.52E+00	.29E+00	.31E+00	.21E+00	.26E+00	.24E+00	.44E+00	.34E+00	.75E+00
[illegible]	.11E+01	.51E+00	.16E+01	.24E+01	.20E+01	.90E+00	.55E+00	.33E+00	.52E+00	.29E+00	.31E+00	.21E+00	.26E+00	.24E+00	.44E+00	.34E+00	.75E+00
9200.	.11E+01	.51E+00	.16E+01	.24E+01	.20E+01	.90E+00	.55E+00	.33E+00	.52E+00	.29E+00	.31E+00	.21E+00	.26E+00	.24E+00	.44E+00	.34E+00	.75E+00
9300.	.11E+01	.51E+00	.15E+01	.24E+01	.20E+01	.90E+00	.55E+00	.33E+00	.52E+00	.29E+00	.31E+00	.21E+00	.26E+00	.24E+00	.44E+00	.34E+00	.74E+00
9400.	.11E+01	.51E+00	.12E+01	.18E+01	.15E+01	.90E+00	.55E+00	.33E+00	.52E+00	.29E+00	.29E+00	.19E+00	.22E+00	.24E+00	.44E+00	.34E+00	.65E+00
9500.	.11E+01	.51E+00	.12E+01	.18E+01	.15E+01	.90E+00	.55E+00	.33E+00	.52E+00	.29E+00	.29E+00	.19E+00	.22E+00	.24E+00	.44E+00	.34E+00	.65E+00
9600.	.11E+01	.51E+00	.12E+01	.18E+01	.15E+01	.90E+00	.55E+00	.33E+00	.52E+00	.29E+00	.29E+00	.19E+00	.22E+00	.24E+00	.44E+00	.34E+00	.65E+00
9700.	.11E+01	.51E+00	.12E+01	.18E+01	.15E+01	.90E+00	.55E+00	.33E+00	.52E+00	.29E+00	.29E+00	.19E+00	.22E+00	.24E+00	.44E+00	.34E+00	.65E+00
9800.	.83E+00	.51E+00	.12E+01	.18E+01	.15E+01	.90E+00	.55E+00	.27E+00	.40E+00	.29E+00	.29E+00	.19E+00	.22E+00	.24E+00	.44E+00	.28E+00	.62E+00
9900.	.42E+00	.51E+00	.12E+01	.18E+01	.15E+01	.90E+00	.55E+00	.17E+00	.23E+00	.29E+00	.29E+00	.19E+00	.22E+00	.24E+00	.44E+00	.20E+00	.57E+00
10000.	.42E+00	.51E+00	.12E+01	.18E+01	.15E+01	.90E+00	.55E+00	.17E+00	.23E+00	.29E+00	.29E+00	.19E+00	.22E+00	.24E+00	.44E+00	.20E+00	.57E+00

1 ************************************ HOURS OF PLUME FOGGING TABLE ************************************

COL MCINTOSH 1 LMDCT, 1987-91 TPA MET DATA

SEASON=ANNUAL

DISTANCE	*******	*******	*******	*******	WIND	FROM	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
FROM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	ALL
TOWER	*******	*******	*******	*******	PLUME	HEADED	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
(M)	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	SUM
100.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	1.9	0.6	0.0	0.0	0.0	0.8	0.0	0.0	3.8
200.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0
300.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0
400.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.5
500.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.5
600.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.5
700.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.5
800.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1
[illegible]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1000.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1100.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1200.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1300.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1400.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1500.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1600.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1 ************************************** HOURS OF RIME ICING TABLE **************************************

COL MCINTOSH 1 LMDCT, 1987-91 TPA MET DATA

SEASON=ANNUAL

DISTANCE	*******	*******	*******	*******	WIND	FROM	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
FROM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	ALL
TOWER	*******	*******	*******	*******	PLUME	HEADED	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
(M)	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	SUM
100.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
200.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
300.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
400.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
500.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
600.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
700.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
800.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
900.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
[illegible]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1100.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1200.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1300.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1400.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1500.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1600.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0