Georgia-Pacific Corporation
133 Peachtree Street NE (30303)
P.O. Box 105605
Atlanta, Georgia 30348-5605
Telephone (404) 652-4000

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DEC 08 2004
BUREAU OF AIR REGULATION

December 6, 2004

Ms. Trina Vielhauer
Chief, Bureau of Air Regulation
Florida Department of Environmental Protection
Division of Air Resource Management
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Re: Georgia-Pacific Palatka Mill
Title V Permit No. 1070005-023-AV
Request to Replace the Lime Kiln Shell and Associated Tube Coolers
Project No.: 1070005-030-AC/PSD-FL-345

Dear Ms. Vielhauer:

Please find enclosed Georgia-Pacific Corporation's response to the Request for Additional Information for the above-referenced project. Please contact me at (404) 652-4293 or Myra Carpenter at (386) 329-0918 if you have any additional concerns for this request. Georgia-Pacific Corporation greatly appreciates your assistance for this project.

Sincerely,

Mark A. Aguilar

Mark Aguilar P.E.
Senior Environmental Engineer
Georgia-Pacific Corporation
P.E. 522248

Cc: Myra Carpenter, GP
ma/ma B. Mitchell
C. Holladay
C. Kirts
G. Worley, EPA
J. Bunyak, NPS

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Georgia-Pacific

Palatka Pulp and Paper Operations
Consumer Products Division

P.O. Box 919
Palatka, FL 32178-0919
(386) 325-2001

December 7, 2004

RECEIVED
DEC 08 2004
BUREAU OF AIR REGULATION

Ms. Trina Vielhauer
Chief, Bureau of Air Regulation
Florida Department of Environmental Protection
Division of Air Resource Management
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Re: Georgia-Pacific Palatka Mill
Title V Permit No. 1070005-023-AV
Request to Replace the Lime Kiln Shell and Associated Tube Coolers
Project No.: 1070005-030-AC/PSD-FL-345

Dear Ms. Vielhauer:

Georgia-Pacific Corporation (GP) has received the Florida Department of Environmental Protection's (FDEP's) request for additional information (RAI), dated October 1, 2004. Responses to each of the Department's requests are provided in the remainder of this letter.

1. **Please provide the cost analysis for this project, which is the replacement of a portion of the existing lime kiln shell and the ten (10) tube coolers. Also, please provide the cost analysis of a new lime kiln with tube coolers of like-and-kind pursuant to the definition of an "affected facility" in accordance to 40 CFR 60, Subpart BB.**

As shown in the attached Cost Table, the approximate project cost is estimated at $1.7 million. According to Allis-Chalmers, the replacement cost for a new lime kiln system equivalent to the existing kiln is approximately $17-20 million.

2. **Will the replacement portion of the lime kiln shell be exactly the same size and diameter as the existing section that is being replaced?**

Yes. The new section will be exactly the same size and diameter as the existing section.

3. **Based on the write-up in the Executive Summary, you are claiming that the "existing coolers are causing excessive stress on the Kiln shell," therefore all of the coolers need to be replaced and the new bracket will relieve the stress on the new Kiln shell.**
   a. **With the knowledge that the coolers have caused the stress on the Kiln shell, then why are you going to replace the equipment with more of the same that could potentially cause damage to the new section being replaced? Please explain.**

Improvements have been made to the design of the mounting brackets and spout welds to reduce thermal stress and weld failures in the future.

Although the cooler brackets have caused some stress on the shell, the situation has been aggravated by the fact that the lime kiln is 30 years old (installed October 1974) and the shell is failing from fatigue. The coolers are also beyond their useful life.

b. **Why can't the existing coolers be used and just replace their attachment bracket?**

See above.

c. **What are the manufacturer's original design criteria for the existing tube coolers? For each existing tube cooler, please include the processing throughput rates, the inlet air temperature and the exit temperature, the diameter and length, and the volumetric flow rates.**

For each existing tube cooler the original design specifications are as follows:

Production throughput - 320 TPD lime (for cooler system)
Inlet temperature - 70°F (average)
Lime Exit temperature - 600°F
Diameter and length – 4 ft. diameter by 12 ft. long
Volumetric flow rate – 27,000 actual cubic feet per minute, acfm (for cooler system) Note: Only a portion of the total volumetric air flow passes through the coolers.

d. **For the new tube coolers, what are the manufacturer's design criteria? For each new tube cooler, please include the processing throughput rates, the inlet air temperature and the exit temperature, the diameter and length, and the volumetric flow rates.**

Plans are to fabricate and use similar metallurgy to match the design described in the response to 3.c. above.

4. For PSD purposes, please provide the daily production rate of the lime kiln for the last two years (24-months) in order to determine the baseline production rate of the lime kiln; and, please include 2004 data.

A large volume of data would be required to satisfy this request (1035 individual days of information). The essential production facts are summarized as follows:

- The maximum daily production rate of 389 TPD (as CaO), as calculated by the stoichiometric conversion between lime mud and lime, 90% lime availability, and 20% recycle rate, occurred on April 18, 2004; it should be noted that this time period is outside of the baseline period that was used for this application.
- The maximum daily production rate for the lime kiln for the best month during this time period averaged 365 TPD (as CaO) during the month of February 2003.
- The maximum annual production for the Lime Kiln for the best year from 1999 to present was 124,950 tons (as CaO) produced in the year 2000.

5. With the proposed activity of the lime kiln and its associated coolers, are there any other changes being made to the burner, the induced draft fan, the control device, or any other part of the lime kiln operation? If any, please provide a detailed description of the proposed changes.

The project does not include any of these changes.

However, please note that we replaced the ID fan during the May 2004 annual outage. The design parameters for the replacement fan have been consistent with the original fan that was purchased in 1974. Note that the volumetric flow rates measured during stack tests before and after the fan change were not significantly different. (See Table in response to Question 8 below.) Although the original design capacity (at the time of initial construction) was 100,000 acfm at 36" static pressure, the optimum fan operation is significantly below this flow rate as evidenced by stack testing.

Additionally, plans are to replace the burner during a routine 12-hour maintenance outage this month. The manufacturer recommends replacement on a 10 to 15 year cycle. The burner alone is not a major component of the overall facility or the lime kiln; *i.e.*, the equipment cost is less than $100,000. The existing burner is scheduled to be replaced due to its condition and unavailability of acceptable replacement parts. While the new burner is of the same size and rating as the existing burner, it may allow for lower and more efficient fuel usage and will provide a greater margin of safety for the overall burner management system. Thus, air emissions would not be increased.

6. **Even though the presentation is attempting to state that the Kiln shell portion and tube coolers that are being replaced are part of a maintenance project, will the proposed changes allow for an increase in production from its present configuration and operation?**

We do not anticipate an increase in production as a result of this maintenance work. As stated in responses to 2 and 3.d above, the design for the new shell and coolers is the same as the original design, although less maintenance downtime is anticipated after this maintenance work is complete.

7. **Will there be an increased production from the baseline production rate (see No. 4, above) felt after the proposed changes are completed?**

No increase is expected as a result of these maintenance activities. Any incremental increase would be based on market conditions and would be totally unrelated. As stated above, and more completely in the application, the Mill considers this project to involve only activities needed to maintain existing equipment in working order. See response to Question No. 6.

8. **Please provide an explanation as to why the volumetric flow rate increased in the lime kiln between the years 1991 to 1995 to present years. Did the mill do anything to the control system, including changes to the induced draft fan system? What was the manufacturer's design flow rate? Please provide the specifications from the original vendor on the design flow rate.**

This issue was addressed in detail in Section 4 of our application. That information is repeated here in response to this question for your convenience.

The design flow rate for the Lime Kiln was presented as 24,200 dscfm at 4% oxygen (O_2) in the 1991 PSD permit application. The calculation of the corrected design flow rate, based on this value, is as follows:

$$24{,}200\ (21-4.0)/\ (21-10) = 37{,}400\ \text{dscfm @ } 10\%\ O_2$$

This corrected flow rate was the basis of the mass emission limits that were established in the 1991 PSD permit (Permit No. AC54-192551/PSD-FL-171). In preparing the 1995 PSD permit application; stack test data for prior years was reviewed to determine if the Lime Kiln design flow rate was still representative. These data are presented in the following table:

Lime Kiln Stack Flow Rate Data (1992 – 1994)

Stack Test Date	Stack Flow Rate (dscfm)	Corrected Stack Flow Rate @ 10% O_2
1994	33,700 @ 6.4 % O_2	44,700
1993	32,000 @ 5.7 % O_2	44,500
1992	29,500 @ 6.4 % O_2	39,200

This review concluded that the previous design flow of 37,400 dscfm @ 10% O_2 was no longer appropriate. Therefore, the 1995 PSD application presented updated maximum flow rates of 56,000 actual cubic feet per minute (acfm) and 32,000 dscfm (both uncorrected) in the Lime Kiln emission unit information section of the application form. Although not specified on the application form, the 1993 stack test was the basis of the flow rate that was provided in the application forms for the Lime Kiln. As shown in the table above, the associated oxygen content was 5.7%. The uncorrected flow rate of 32,000 dscfm (from the 1995 application) corresponds to the following rate when corrected to 10% O_2:

$$32{,}000\ (21-5.7)/(21-10) = 44{,}500 \text{ dscfm @ } 10\%\ O_2$$

Even though this issue was brought forward in the 1995 PSD application, GP elected to retain the same allowable mass emission limits for the Lime Kiln as contained in the previous 1991 PSD permit. Therefore, the basis of the allowable emissions was still shown as 37,400 dscfm @ 10% O_2, even though this flow rate was no longer appropriate (permit No. AC54-266676/ PSD-FL-226). In other words, the mill was willing to accept the same mass emission limits that were previously in place, although the stack flow rate had increased.

The emission calculations associated with the application at hand utilize the 44,500 dscfm flow rate. In order to demonstrate that this flow rate is still representative, the following table presents the actual measured stack flow rates for the period 1992 through 2004 based on past compliance test data. As shown, including the recent 2004 stack test information, the corrected, average flow rates range from 33,100 to 54,200 dscfm @ 10% O_2. As part of the analysis of these flow rate data values, a student-t test was conducted to compare the average flow rates from 1992 to 1998 to the average flow rates from 1999 to 2004. The result of the t-test is that there is not a statistically significant difference between the 1992/1998 flow rates compared to the 1999/2004 flow rates. It is GP's intent to update the permit application in order to document the most recent flow rate values from 2004.

Average Flow Rates for Testing Performed 1992-2004

Year Tested	Test Description	Average Flow Rate (dscfm @ 10% Oxygen)	LIME Throughput Tons/hr
1992	PM	39,200	39.0
1993	PM	44,500	40.1
1994	PM	44,700	39.8
1995	PM	42,300	37.0
1996	PM	40,300	36.7
1997	PM	39,500	36.0
1998	CO, NO_x, SO_2, VOC	33,100	37.2
	PM	35,600	38.0
1999	CO, NO_x, SO_2, VOC	37,000	34.4
	PM	38,500	34.4
2000	CO, NO_x, SO_2, VOC, PM	42,600	36.5
2001	PM	43,300	39.8
2002	CO, NO_x, SO_2, VOC, PM	38,300	36.6
2003	CO, NO_x, SO_2, VOC, PM	42,800	38.8
2004 (Feb 04)	CO, NO_x, SO_2, VOC, PM	49,900	39.3
	TRS	54,200	40.3
2004 (Aug 04)	PM	51,300	38.2

The control system was replaced in 1998 during the lime kiln's routine annual outage because replacement parts were unavailable for the pre-existing control system. The control system is not a major component of the overall facility or the lime kiln

For a discussion on the ID fan and the manufacturer's design flow rate see response to question 5 above.

9. **Due to our awareness of the proposed upcoming applications for the Combination Boiler No. 4 and the No. 4 Recovery Boiler, we consider them to be contemporaneous with this project as a Phased PSD project. We also consider the changes made to the mill for the last five years to be contemporaneous to this project. Therefore, for significant impact analyses, increment consumption and ambient air quality impact analyses; please combine these projects with this project for these evaluations.**

This project is being performed as part of regular mill maintenance activities, not as part of some multi-phase project designed to achieve an overall production expansion. There is no relationship between this activity and the other projects described above other than their proximity in time. Over the years, EPA has developed criteria that may be used by regulatory agencies in determining if projects are related, and should therefore be aggregated for PSD applicability purposes. These criteria include, but are not limited to, (1) filing of more than one minor source permit application associated with emissions increases at a single plant within a short time period, (2) application of funding (*e.g.*, viability of projects in the absence of the other projects), (3) reports regarding consumer demand and production levels, and (4) statements of authorized representatives of the source regarding plans for operation.

All of the projects described by FDEP either have, or will, go through PSD permitting. As such, it is clear that GP has not attempted to separate projects in order to avoid major permit review. Furthermore, these projects are all under separate funding mechanisms. Finally, the Company has not represented this project as a component of some overall mill expansion project. The ONLY common element between these projects is their proximity in time, and that alone is not a sufficient basis to conclude that projects are related and should be addressed in a single permit application.

It is true that this project will improve the reliability of lime kiln operations, and hence the reliability of overall mill production. But the same could be said for every other maintenance project at every other manufacturing facility. The function of maintenance is exactly that; to maintain manufacturing assets so that breakdowns and malfunctions can be minimized and the safe continuity of production assured as best as possible within resource constraints. Every successful manufacturing facility has an active preventive maintenance program with multiple independent projects competing for funding, and the fact that multiple independent projects in fact receive funding approval does not mean that the projects are interdependent or integrally related and should therefore be lumped together for permitting review. In fact, most such projects are not interdependent and routinely go forward on their own. The same is true for this lime kiln shell project and the other projects mentioned; the fact that they may each have an effect on overall reliability does not mean that they are part of the same project.

With specific regard to the No.4 Combination Boiler and No. 4 Recovery Boiler projects, those are projects for which the Mill has not even completed its internal evaluation and permitting analysis, let alone completed the applications. It is therefore not appropriate to include information for such unrelated future projects in current permitting activities.

10. Pursuant to Rule 62-212.400(5)(h)5., F.A.C., please provide the information relating to the air quality impacts of, and the nature and extent of, all general commercial, residential, industrial and other growth that has occurred since August 7, 1977, in the area the facility or modification would affect.

Response to this question is provided in Appendix A as an attachment to this letter.

11. For the potential applicability of 40 CFR 60, Subpart BB, please use Appendix C, 40 CFR 60, to determine if there is/are an emissions rate increase for the pollutants affected by this project.

In the General Provisions to the NSPS, at 40 CFR 60.14(b)(1), it is stated that, "The Administrator shall use the following to determine emission rate...Emission factors as specified in the latest issue of "Compilation of Air Pollutant Emission Factors, " EPA Publication No. AP-42, or other emission factors determined by the Administrator to be superior to AP-42 emission factors, in cases where utilization of emission factors demonstrate that the emission level resulting from the physical or operational change will either clearly increase or clearly not increase." In a subsequent paragraph (40 CFR 60.14(b)(2), the regulation goes on to state, "Material balances, continuous monitor date, or manual emission tests..." may be used "...in cases where utilization of emission factors as referenced in paragraph (b)(1) of this section does not demonstrate to the Administrator's satisfaction whether the emission level resulting from the physical or operational change will either clearly increase, or clearly not increase..." This same section goes on to state that Appendix C will be followed in cases where manual emission tests are required by the Administrator.

As described in detail in our application, and as detailed above, this is a maintenance project that involves the replacement of a portion of the shell and the coolers with equipment of the same size and design. The only change noted (see 3.a above) is an improvement in the design of the mounting brackets and spout welds for the coolers in order to reduce thermal stress and weld failures in the future.

The detailed testing required by Appendix C is both costly and time consuming. GP feels that the information provided in the application, and discussed in greater detail in this letter, should be sufficient to demonstrate to FDEP that there will not be an increase in the maximum hourly emission rates of the kiln following completion of this maintenance activity. As such, we respectively request that, in light of this additional information, that FDEP withdraw this request.

If you have any questions please call Myra Carpenter at (386) 329-0918.

Sincerely,
R.R. Hamilton For TDK
Operations Manager
Theodore D. Kennedy
Vice President

mjc
cc: T.D. Kennedy, W.M. Jernigan, S.D. Matchett, T. Wyles

Cost Table

Description	Cost
Materials	**($000)**
New 61-ft. long section, 10 cooler spouts, Brick retainer, Tire, Shipping	**$291.3**
Refractory, Castable	**$265.0**
Coolers	**$302.3**
Miscellaneous	**$51.4**
Labor	**$820**
Total	**$1,730**

APPENDIX A - LK SHELL RAI

PROJECT NO.: 1070005-030-AC/PSD-FL-345

1.0 ADDITIONAL IMPACT ANALYSIS FOR THE VICINITY OF THE GP PALATKA MILL

1.1 IMPACTS TO SOILS, VEGETATION, AND VISIBILITY IN THE VICINITY OF THE GP PALATKA MILL

1.1.1 PREDICTED AIR QUALITY IMPACTS

The results of the ambient air quality modeling for the proposed GP modification, in the vicinity of the plant, are presented in Table 1-1. The predicted maximum increase in pollutant concentrations due to the proposed project arc presented for the annual, 24-hour, 8-hour, 3-hour, and 1-hour averaging times.

Table 1-1. Summary of Maximum Pollutant Concentrations Predicted for the Lime Kiln Project to Address Impacts to Soils and Vegetation in the GP Mill Vicinity

Pollutant and Averaging Time	Emission Rate[a] (g/s)	Concentration[b] ($\mu g/m^3$)	Receptor Location[c] x (m)	Receptor Location[c] y (m)	Time Period[d] YYMMDDHH
SO_2					
Annual	0.85	0.1	800	-600	--------
24-hour	0.85	1.5	500	-400	86082424
8-hour	0.85	3.8	500	-500	87071416
3-hour	0.85	5.9	500	-300	86060212
1-hour	0.85	9.6	500	-800	86062110
PM_{10}					
Annual	2.84	0.340	800	-600	--------
24-hour	2.84	4.97	500	-400	86082424
NO_2					
Annual	8.14	0.97	800	-600	--------
24-hour	8.14	14.2	500	-400	86082424
8-hour	8.14	36.0	500	-500	87071416
3-hour	8.14	56.9	500	-300	86060212
1-hour	8.14	91.7	500	-800	86062110
CO					
Annual	1.52	0.2	800	-600	--------
24-hour	1.52	2.7	500	-400	86082424
8-hour	1.52	6.8	500	-500	87071416

Table 1-1. Summary of Maximum Pollutant Concentrations Predicted for the Lime Kiln Project to Address Impacts to Soils and Vegetation in the GP Mill Vicinity

Pollutant and Averaging Time	Emission Rate [a] (g/s)	Concentration [b] (μg/m³)	Receptor Location [c] x (m)	Receptor Location [c] y (m)	Time Period [d] YYMMDDHH
3-hour	1.52	10.7	500	-300	86060212
1-hour	1.52	17.2	500	-800	86062110
SAM					
Annual	0.043	0.005	800	-600	--------
24-hour	0.043	0.076	500	-400	86082424
8-hour	0.043	0.191	500	-500	87071416
3-hour	0.043	0.302	500	-300	86060212
1-hour	0.043	0.486	500	-800	86062110

[b] Based on the highest concentrations predicted from the generic modeling analysis (modeled using 10 g/s emissions)

[c] Relative to the old TRS Incinerator stack.

[d] YY = Year; MM = Month; DD = Day; HH = Hour ending.

1.1.2 IMPACTS TO SOILS

Air contaminants can affect soils through fumigation by gaseous forms, accumulation of compounds transformed from the gaseous state, or by the direct deposition of PM or PM to which certain contaminants are absorbed. According to the Putnam County Soil Survey (1990), the soils in the vicinity of the GP Palatka Mill are dominated by Terra Ceia muck, with Cassia fine sand and Pamona fine sand also present. The Terra Ceia muck, Cassia fine sand, and Pomona fine sand series are described in the Putnam County Soil Survey as follows:

Terra Ceia muck, frequently flooded – This soil is nearly level and very poorly drained, found on broad to narrow plains along the St. Johns River and its tributaries. Typically the upper part of this organic soil is dark reddish brown muck approximately 28 inches thick, while the lower portion to a depth of approximately 80 inches is black muck. This soil has a high water table at the surface except during extended dry periods. The available water capacity is very high, permeability is rapid, and natural fertility is moderate. Typical vegetation includes wetlands forested with sweetgum, red maple, cypress, bay, and cabbage palm. The soil reaction for Terra Ceia muck is classified as slightly acid within the top 28 inches, and mildly alkaline between 28 and 80 inches below the surface.

Pomona fine sand – This soil is nearly level and poorly drained, found in broad flatwoods areas. Typically this soil has a surface layer of black fine sand approximately 6 inches thick underlain by a subsurface layer of gray and light gray fine sand to a depth of 20 inches. In most years this soil has a high water table at a depth of less than 12 inches for 1 to 3 months. The available water capacity is very low, permeability is rapid, and natural fertility is low. Typical vegetation is pine flatwoods. The soil reaction for Pomona fine sand is classified as extremely acid within the top 6 inches, very strongly acidic between 6 to 10 inches, and strongly acidic between 10 and 20 inches below the surface.

Cassia fine sand – This soil is nearly level and somewhat poorly drained, found on small knolls within flatwoods and in low positions on uplands. Typically, this soil has a surface layer of gray fine sand approximately 4 inches thick, and a subsurface layer of light gray fine sand to a depth of 28 inches. In most years, this soil has a water table at a depth of 15 to 40 inches for about 6 months. The available water capacity is very low, permeability is rapid, and natural fertility is low. Natural vegetation includes pine flatwoods and oak. Cassia fine sand is classified as extremely acid within the top 4 inches, very strongly acidic between 4 to 9 inches, and strongly acidic between 9 and 24 inches below the surface.

The dominant soil in the vicinity of the GP facility, Terra Ceia muck, is a highly organic wetland soil and has an extremely high buffering capacity based on the cation exchange capacity, base saturation, and bulk density. Therefore, this soil would be relatively insensitive to atmospheric inputs. The maximum predicted concentrations for all pollutants in the vicinity of the site as a result of the proposed project are below the significant impact levels. Further, the maximum predicted SO_2 concentrations in the vicinity of the site are below the AAQS. Since the AAQS are designed to protect the public welfare, including effects on soils and vegetation, no detrimental effects on soils should occur in the vicinity of the GP Palatka Mill due to the proposed project.

1.1.3 IMPACTS TO VEGETATION

1.1.3.1 Vegetation Analysis

In general, the effects of air pollutants on vegetation occur primarily from SO_2, NO_2, O_3, and PM. Effects from minor air contaminants such as fluoride, chlorine, hydrogen chloride, ethylene, ammonia, hydrogen sulfide, CO, and pesticides have also been reported in the literature. The effects of air pollutants are dependent both on the concentration of the contaminant and the duration of the exposure. The term "injury," as opposed to damage, is commonly used to describe all plant responses to air contaminants and will be used in the context of this analysis. Air contaminants are thought to interact primarily with plant foliage which is considered to be the major pathway of exposure. For purposes of this analysis, it was assumed that 100 percent of each air contaminant of concern is accessible to the plants.

Injury to vegetation from exposure to various levels or air contaminants can be termed acute, physiological, or chronic. Acute injury occurs as a result of a short-term exposure to a high contaminant concentration and is typically manifested by visible injury symptoms ranging from chlorosis (discoloration) to necrosis (dead areas). Physiological or latent injury occurs as the result of a long-term exposure to contaminant concentrations below that which results in acute injury symptoms. Chronic injury results from repeated exposure to low concentrations over extended periods of time, often without any visible symptoms, but with some effect on the overall growth and productivity of the plant. In this assessment, 100 percent of the particular air pollutant in the ambient air was assumed to interact with the vegetation. This is a conservative approach.

Sulfur Dioxide

Sulfur is an essential plant nutrient usually taken up as sulfate ions by the roots from the soil solution. When SO_2 in the atmosphere enters the foliage through pores in the leaves, it reacts with water in the leaf interior to form sulfite ions. Sulfite ions are highly toxic. They interact with enzymes, compete with normal metabolites, and interfere with a variety of cellular functions (Horsman and Wellburn, 1976). However, within the leaf, sulfite is oxidized to sulfate ions, which can then be used by the plant as a nutrient. Small amounts of sulfite may be oxidized before they prove harmful.

SO_2 gas at elevated levels has long been known to cause injury to plants. Acute SO_2 injury usually develops within a few hours or days of exposure, and symptoms include marginal, flecked, and/or intercoastal necrotic areas that appear water-soaked and dullish green initially. This injury generally occurs to younger leaves. Chronic injury usually is evident by signs of chlorosis, bronzing, premature senescence, reduced growth, and possible tissue necrosis (EPA, 1982). Observed SO_2 effect levels for several plant species and plant sensitivity groupings are presented in Tables 1-2 and 1-3, respectively.

Table 1-2. SO_2 Effects Levels for Various Plant Species

Plant Species	Observed Effect Level ($\mu g/m^3$)	Exposure (Time)	Reference
Sensitive to tolerant	920 (20 percent displayed visible injury)	3 hours	McLaughlin and Lee, 1974
Lichens	200-400	6 hr/wk for 10 weeks	Hart *et al.*, 1988
Cypress, slash pine, live oak, mangrove	1,300	8 hours	Woltz and Howe, 1981
Jack pine seedlings	470-520	24 hours	Malhotra and Kahn, 1978
Black oak	1,310	Continuously for 1 week	Carlson, 1979

Table 1-3. Sensitivity Groupings of Vegetation Based on Visible Injury at Different SO_2 Exposures[a]

Sensitivity Grouping	SO_2 Concentration 1-Hour	SO_2 Concentration 3-Hour	Plants
Sensitive	1,310 - 2,620 $\mu g/m^3$ (0.5 - 1.0 ppm)	790 - 1,570 $\mu g/m^3$ (0.3 - 0.6 ppm)	Ragweeds, Legumes Blackberry , Southern pines Red and black oaks White ash Sumacs
Intermediate	2,620 - 5,240 $\mu g/m^3$ (1.0 - 2.0 ppm)	1,570 - 2,100 $\mu g/m^3$ (0.6 - 0.8 ppm)	Maples, Locust Sweetgum, Cherry Elms, Tuliptree Many crop and garden species.
Resistant	>5,240 $\mu g/m^3$ (>2.0 ppm)	>2,100 $\mu g/m^3$ (>0.8 ppm)	White oaks, Potato Upland cotton, Corn Dogwood, Peach

[a] Based on observations over a 20-year period of visible injury occurring on over 120 species growing in the vicinities of coal-fired power plants in the southeastern United States.

Source: EPA, 1982a.

Many studies have been conducted to determine the effects of high-concentration, short-term SO_2 exposure on natural community vegetation. Sensitive plants include ragweed, legumes, blackberry, southern pine, and red and black oak. These species are injured by exposure to 3-hour average SO_2 concentrations of 790 to 1,570 µg/m^3. Intermediate plants include locust and sweetgum. These species are injured by exposure to 3-hour average SO_2 concentrations of 1,570 to 2,100 µg/m^3. Resistant species (injured at concentrations above 2,100 µg/m^3 for 3 hours) include white oak and dogwood (EPA, 1982).

A study of native Floridian species (Woltz and Howe, 1981) demonstrated that cypress, slash pine, live oak, and mangrove exposed to 1,300 µg/m^3 SO_2 for 8 hours were not visibly damaged. This finding supports the levels cited by other researchers on the effects of SO_2 on vegetation. A corroborative study (McLaughlin and Lee, 1974) demonstrated that approximately 20 percent of a cross-section of plants ranging from sensitive to tolerant was visibly injured at 3-hour average SO_2 concentrations of 920 µg/m^3.

Jack pine seedlings exposed to SO_2 concentrations of 470 to 520 µg/m^3 for 24 hours demonstrated inhibition of foliar lipid synthesis; however, this inhibition was reversible (Malhotra and Kahn, 1978). Black oak exposed to 1,310 µg/m^3 SO_2 for 24 hours a day for 1 week demonstrated a 48 percent reduction in photosynthesis (Carlson, 1979).

Two lichen species indigenous to Florida exhibited signs of SO_2 damage in the form of decreased biomass gain and photosynthetic rate as well as membrane leakage when exposed to concentrations of 200 to 400 µg/m^3 for 6 hours/week for 10 weeks (Hart et al., 1988).

The predicted maximum 3- and 24-hour average SO_2 concentrations due to the proposed project are 31.4 and 10.1 Φg/m^3, respectively, which are well below the injury threshold of sensitive species of vegetation.

Nitrogen Dioxide

A review of the literature indicates great variability in NO_2 dose-response relationship in vegetation. Acute NO_2 injury symptoms are manifested as water-soaked lesions, which first appear on the upper surface, followed by rapid tissue collapse. Low-concentration, long-term exposures as frequently encountered in polluted atmospheres often do not induce the lesions associated with acute exposures but may still result in some growth suppression. Citrus trees exposed to 470 Φg/m^3 of NO_2 for

290 days showed injury (Thompson *et al.*, 1970). Sphagnum exposed for 18 months at an average concentration of 11.7 Φg/m^3 showed reduced growth (Press *et al.*, 1986)

The maximum increase in ground-level 1-hour and annual average NO_2 concentrations predicted to occur in the vicinity of the plant during the operation of the proposed project are 3.3 and 0.10 Φg/m^3, respectively (see Table 1-1). These maximum predicted concentrations are well below reported effects levels.

Carbon Monoxide

Concentrations of CO even in polluted atmospheres are not detrimental to vegetation (EPA, 1976). CO has not been found to produce detrimental effects on plants at concentrations below 100 ppm (114,500 Φg/m^3) for exposures from 1 to 3 weeks (EPA, 1976). The predicted maximum concentrations shown in Table 1-1 are well below levels reported to cause detrimental effects.

Particulate Matter (PM_{10})

Although information pertaining to the effects of particulate matter on plants is scarce, some threshold concentrations are available. Mandoli and Dubey (1998) exposed ten species of native Indian plants to levels of particulate matter ranging from 210 to 366 µg/m^3 for an 8-hour averaging period. Damage in the form of a higher leaf area/dry weight ratio was observed at varying degrees for most plants tested. Concentrations of particulate matter lower than 163 µg/m^3 did not appear to be injurious to the tested plants. The maximum predicted 24-hour and annual average PM_{10} concentrations due to the proposed project of 4.86 and 0.50 µg/m^3, respectively, are well below the injury thresholds reported in the literature.

VOC Emissions and Impacts on Ozone

It is difficult to predict what effect the proposed project's emissions of VOC will have on ambient O_3 concentrations from either a local or regional scale. VOC and NO_x emissions are precursors to the formation of O_3. O_3 is formed down-wind from emission sources when VOC, and NO_x emissions from the facility react in the presence of sunlight. Background (without man-made sources) ambient concentrations of O_3 are normally in the range of 20 to 39 µg/m^3 (0.01 to 0.02 ppm) (Heath, 1975).

O_3 can cause various damage to broad-leaved plants including: tissue collapse, interveinal necrosis and markings on the upper surface of leaves known as stippling (pigmented yellow, light tan, red brown, dark brown, red, or purple), flecking (silver or bleached straw white), mottling, chlorosis or bronzing, and bleaching. O_3 can also stunt plant growth and bud formation. On certain plants such as citrus, grape, and tobacco, it is common for leaves to wither and drop early. A literature review suggests that exposure for 4 hours at levels of 0.04 to 11.0 ppm of O_3 will result in plant injury for sensitive plants. The extent of the injury depends on the plant species and environmental conditions prior to and during exposure.

Given that the O_3 measurements in the region comply with the AAQS (see Sections 4.0 and 7.2.5) and the increase in VOC emissions for the project represents less than a 1-percent change in regional VOC emissions, no adverse effects on vegetation due to the project's VOC emissions are expected.

Sulfuric Acid Mist

Acidic precipitation or acid rain is coupled to SO_2 emissions mainly formed during the burning of fossil fuels. This pollutant is oxidized in the atmosphere and dissolves in rain forming SAM, which falls as acidic precipitation (Ravera, 1989). Although concentration data are not available, SAM has been reported to yield necrotic spotting on the upper surfaces of leaves (Middleton *et al.*, 1950).

No significant adverse effects on vegetation are expected from the project's emissions because SO_2 concentrations, which lead directly to the formation of SAM concentrations, are predicted to be well below levels that have been documented as negatively affecting vegetation.

1.1.4 IMPACTS UPON VISIBILITY

All air emission sources affected by the proposed modification are existing sources. No increase in permitted emissions is requested, although actual emissions are predicted to increase. All these sources are in compliance with opacity regulations and should remain in compliance after the modification. As a result, no adverse impacts upon visibility are expected.

1.2 IMPACTS DUE TO ASSOCIATED DIRECT GROWTH

1.2.1 INTRODUCTION

Rule 62-212.400(3)(h)(5), F.A.C., states that an application must include information relating to the air quality impacts of, and the nature and extent of all general, residential, commercial, industrial and other growth which has occurred since August 7, 1977, in the area the facility or modification would affect. This growth analysis considers air quality impacts due to emissions resulting from the industrial, commercial, and residential growth associated with the proposed expansion at the GP Palatka Mill. This information is consistent with the EPA Guidance related to this requirement in the *Draft New Source Review Workshop Manual* (EPA, 1990).

In general, there has been minimal growth in the GP Palatka Mill area since 1977. Putnam County is surrounded by Marion County to the south and west, Alachua County to the west, Clay County to the north, St. John's County to the north and east, Flagler County to the east, and Volusia County to the south. Putnam County encompasses an 827-square mile area including 733-square miles of land area.

The Lime Kiln Shell is being repaired to replace coolers and mounting brackets. As the kiln has developed cracks form thermal stress, the proposed project will improve the reliability of the kiln and maintain a safe operation. Additional growth as a direct result of the proposed modification is not expected.

The project will not require any additional operational workers once the project is completed.

There are also expected to be no air quality impacts due to associated commercial and industrial growth given the location of the existing GP Palatka Mill. The existing commercial and industrial infrastructure should be adequate to provide any support services that the project might require and would not increase with the operation of the project.

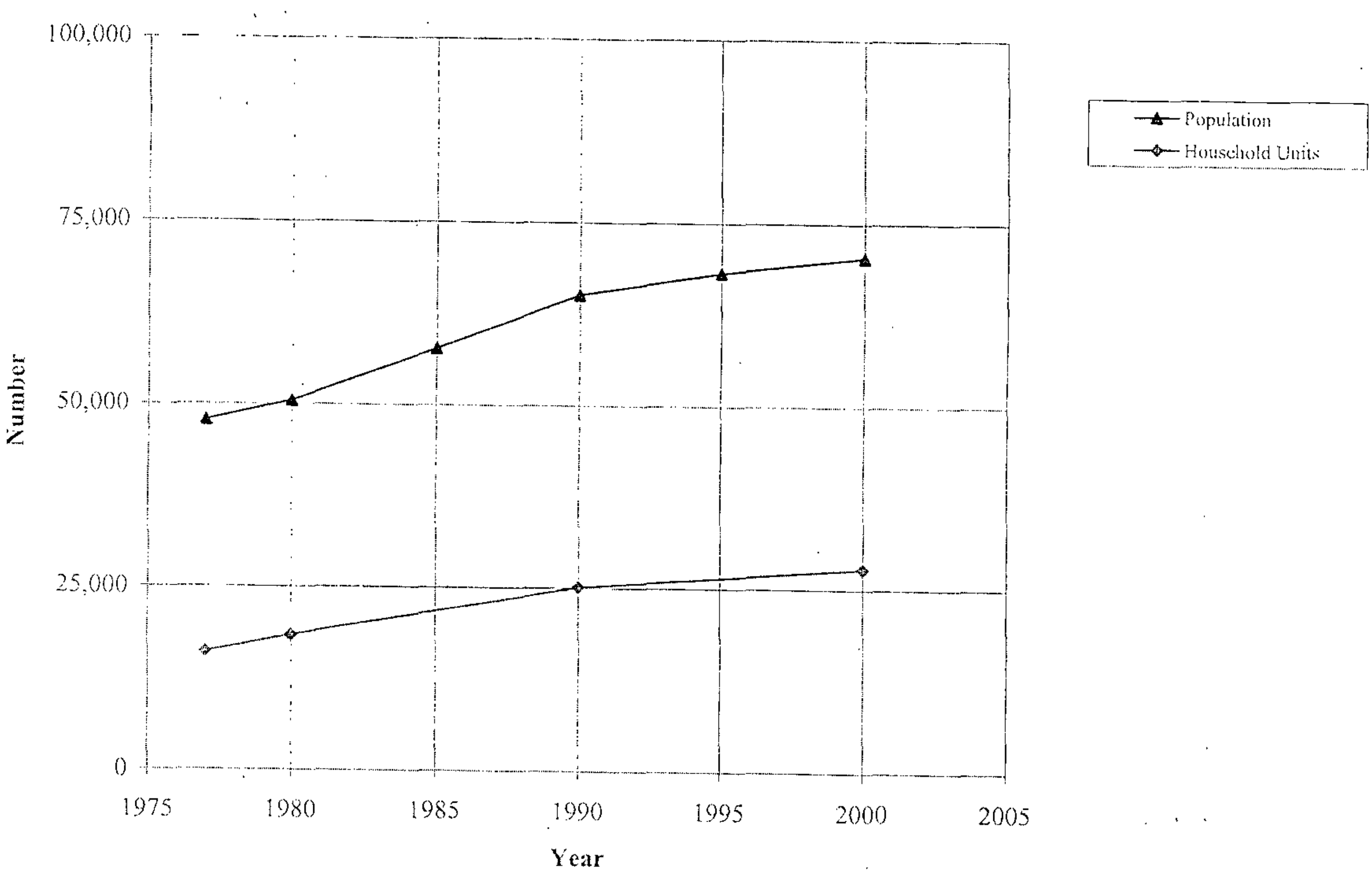
The following discussion presents general trends in residential, commercial, industrial, and other growth that has occurred since August 7, 1977, in Putnam County. As such, the information presents information available from a variety of sources (*i.e.*, Florida Statistical Abstract, FDEP, etc.) that characterize Putnam County as a whole.

1.2.2 RESIDENTIAL GROWTH

1.2.2.1 Population and Household Trends

As an indicator of residential growth, the trend in the population and number of household units in Putnam County since 1977 are shown in Figure 1-1. The county experienced a 47-percent increase in population for the years 1977 through 2000. During this period, there was an increase in population of about 22,600. Similarly, the number of households in the county increased by about 12,000, or 73 percent, since 1977.

Figure 1-1. Population and Household Unit Trends in Putnam County



1.2.2.2 Growth Associated with the Operation of the Project

Because there will be no additional workers needed to operate the project, there will be no residential growth due to the project.

1.2.3 COMMERCIAL GROWTH

1.2.3.1 Retail Trade and Wholesale Trade

As an indicator of commercial growth in Putnam County, the trends in the number of commercial facilities and employees involved in retail and wholesale trade are presented in Figure 1-2. The retail trade sector comprises establishments engaged in retailing merchandise. The retailing process is the final step in the distribution of merchandise. Retailers are, therefore, organized to sell merchandise in small quantities to the general public. The wholesale trade sector comprises establishments engaged in wholesaling merchandise. This sector includes merchant wholesalers who buy and own the goods they sell; manufacturers' sales branches and offices that sell products manufactured domestically by their own company; and agents and brokers who collect a commission or fee for arranging the sale of merchandise owned by others.

Since 1977, retail trade has increased by about 14 establishments and 2,000 employees or 6 and 118 percent, respectively. For the same period, wholesale trade has increased by 28 establishments and 346 employees, or 82 and 126 percent, respectively.

1.2.3.2 Labor Force

The trend in the labor force in Putnam County since 1977 is shown in Figure 1-3. The greatest number of persons employed in Putnam County has been in the manufacturing, government, and retail trade sectors. Between 1977 and 1999, approximately 5,000 persons were added to the available work force, for an increase of 34 percent.

1.2.3.3 Tourism

Another indicator of commercial growth in Putnam County is the tourism industry. As an indicator of tourism growth in the county, the trend in the number of hotels and motels and the number of units at the hotels and motels are presented in Figure 1-4.

Figure 1-2. Retail and Wholesale Trade Trends in Putnam County

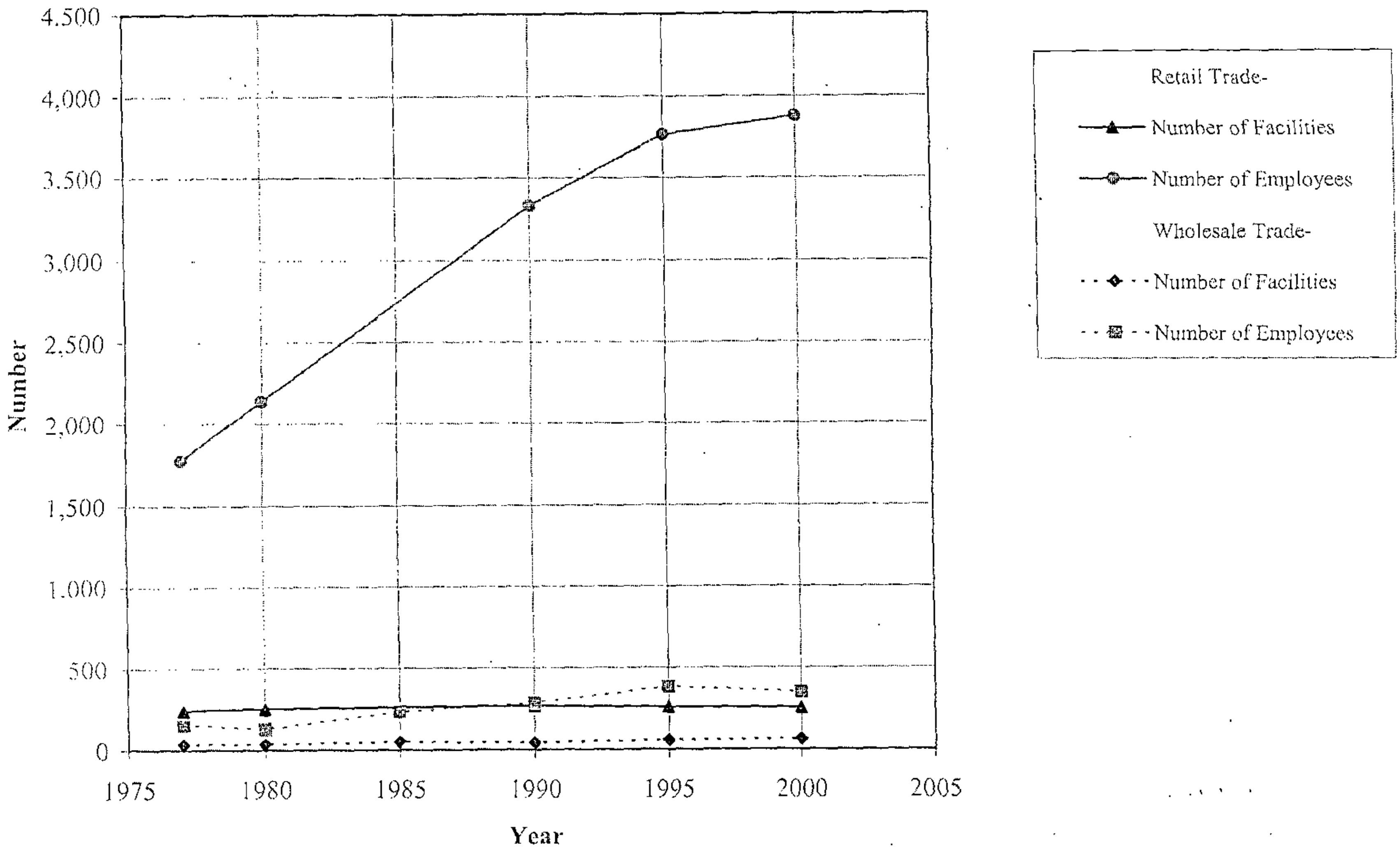


Figure 1-3. Labor Force Trend in Putnam County

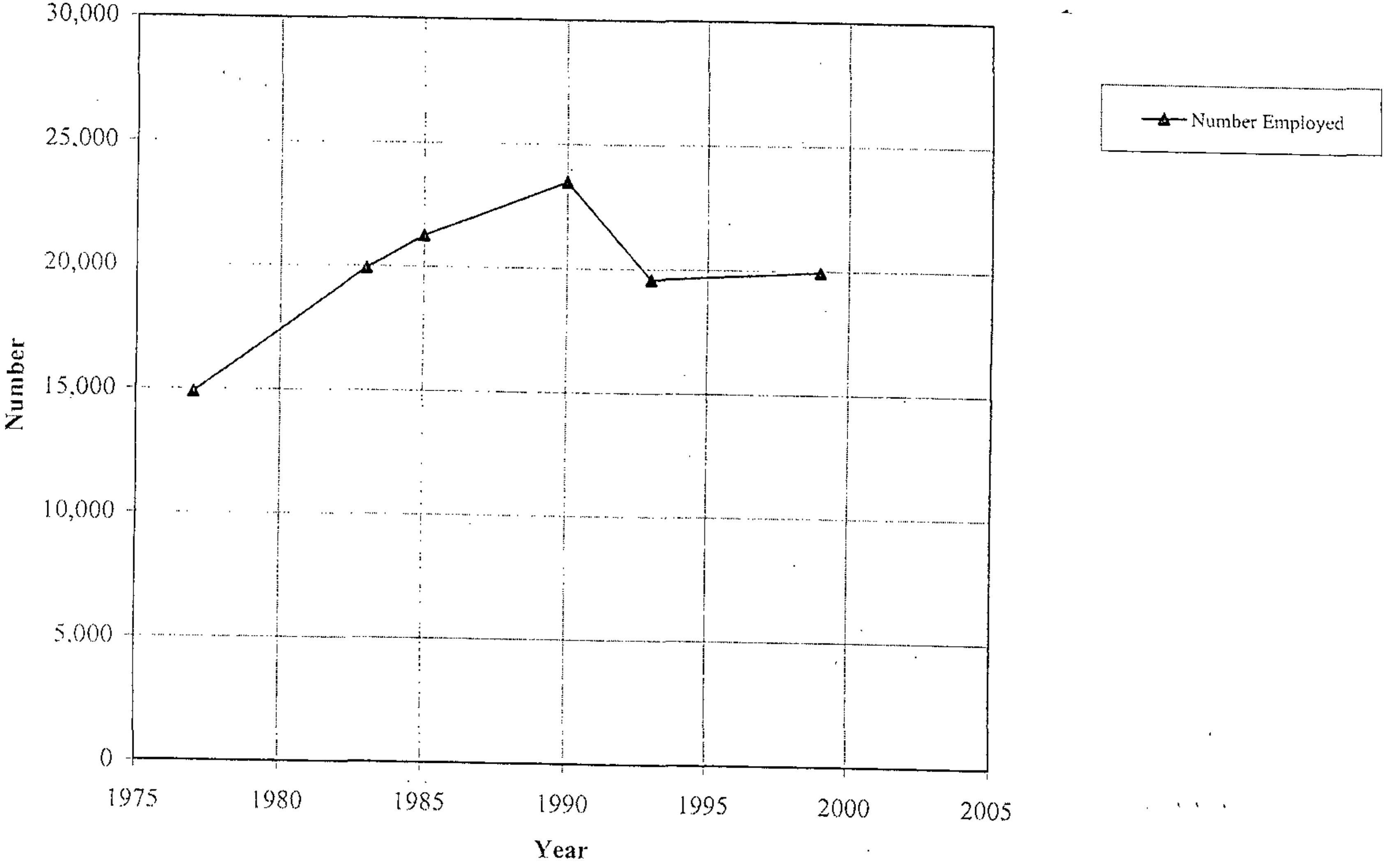
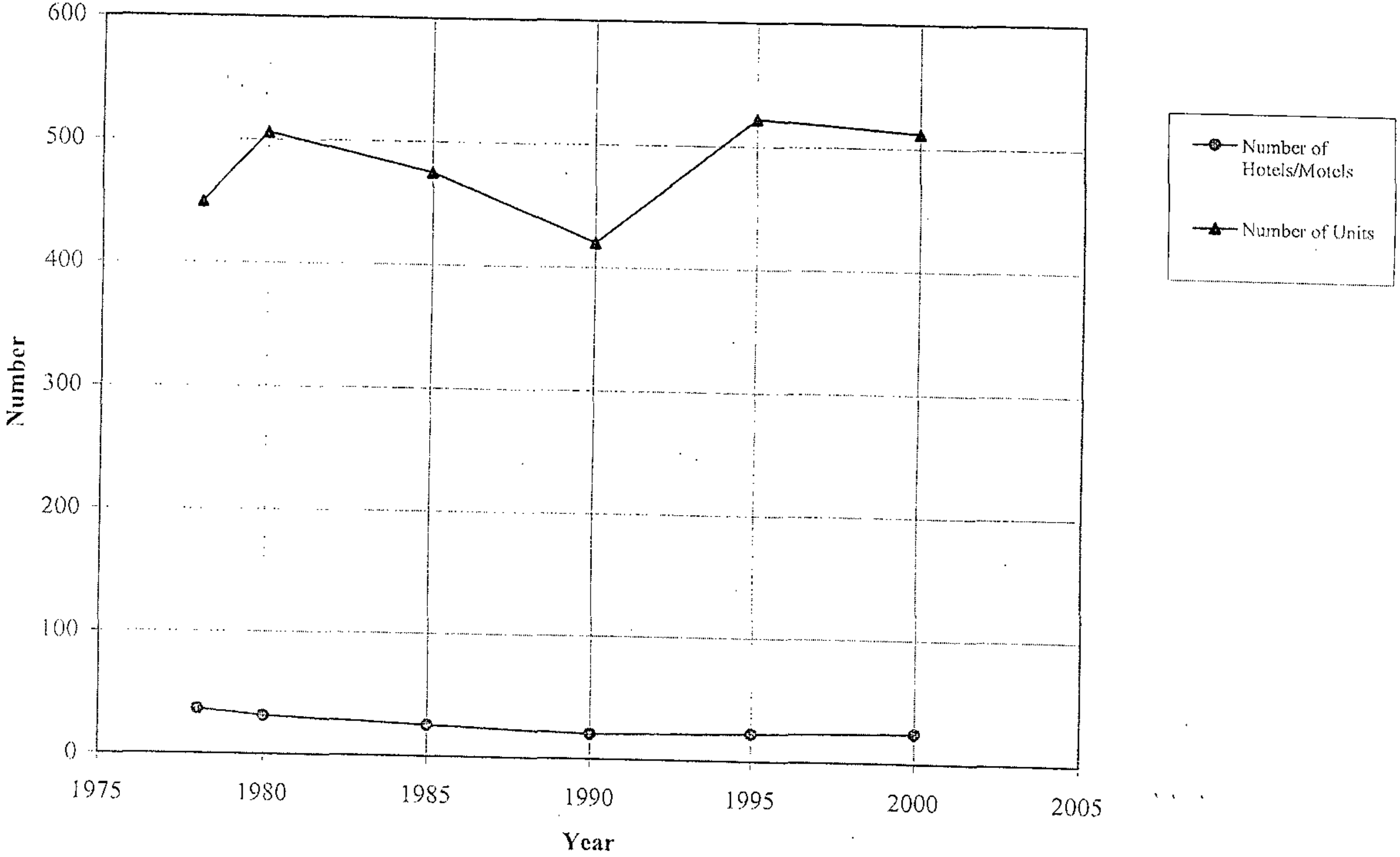


Figure 1-4. Hotel and Motel Trend in Putnam County



This industry comprises establishments primarily engaged in marketing and promoting communities and facilities to businesses and leisure travelers through a range of activities, such as assisting organizations in locating meeting and convention sites; providing travel information on area attractions, lodging accommodations, restaurants; providing maps; and organizing group tours of local historical, recreational, and cultural attractions.

Between 1978 and 2000, there was a decrease of 12 percent in the number of hotels and motels, and an increase of 14 percent in the number of units at those establishments in the county.

1.2.3.4 Transportation

As an indicator of transportation growth, the trend in the number of vehicle miles traveled (VMT) by motor vehicles on major roadways in Putnam County is presented in Figure 1-5. The county's main roadways are U.S. Route 17 and SR 100.

Between 1977 and 2001, there was an increase of about 1,560,000 VMT, or 113 percent, on major roadways in the county.

1.2.3.5 Growth Associated with the Operation of the Project

The existing commercial and transportation infrastructure should be adequate to provide any support services that might be required during construction and operation of the project. The workforce needed to operate the proposed project represents a small fraction of the labor force present in the immediate and surrounding areas.

1.2.4 INDUSTRIAL GROWTH

1.2.4.1 Manufacturing and Agricultural Industries

As an indicator of industrial growth, the trend in the number of employees in the manufacturing industry in Putnam County since 1977 is shown in Figure 1-6. As shown, the manufacturing industry experienced a slight decrease in employees from 1977 through 2000.

As another indicator of industrial growth, the trend in the number of employees reported in the agricultural industry in Putnam County since 1977 is also shown in Figure 1-6. As shown, the agricultural industry experienced an increase of about 400 employees from 1977 through 2000.

Figure 1-5. Vehicle Miles Traveled (VMT) Estimates for Motor Vehicles for Putnam County

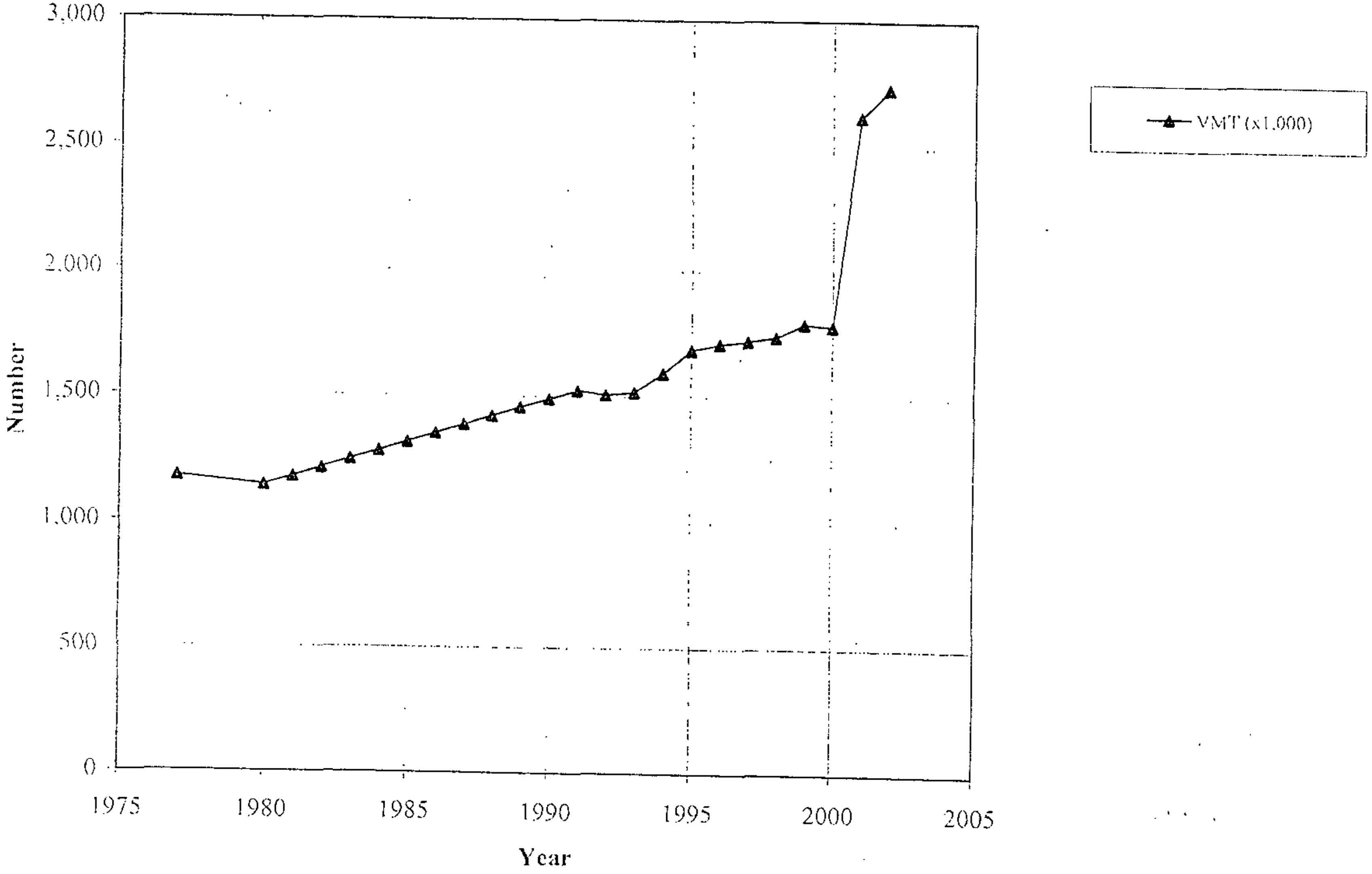
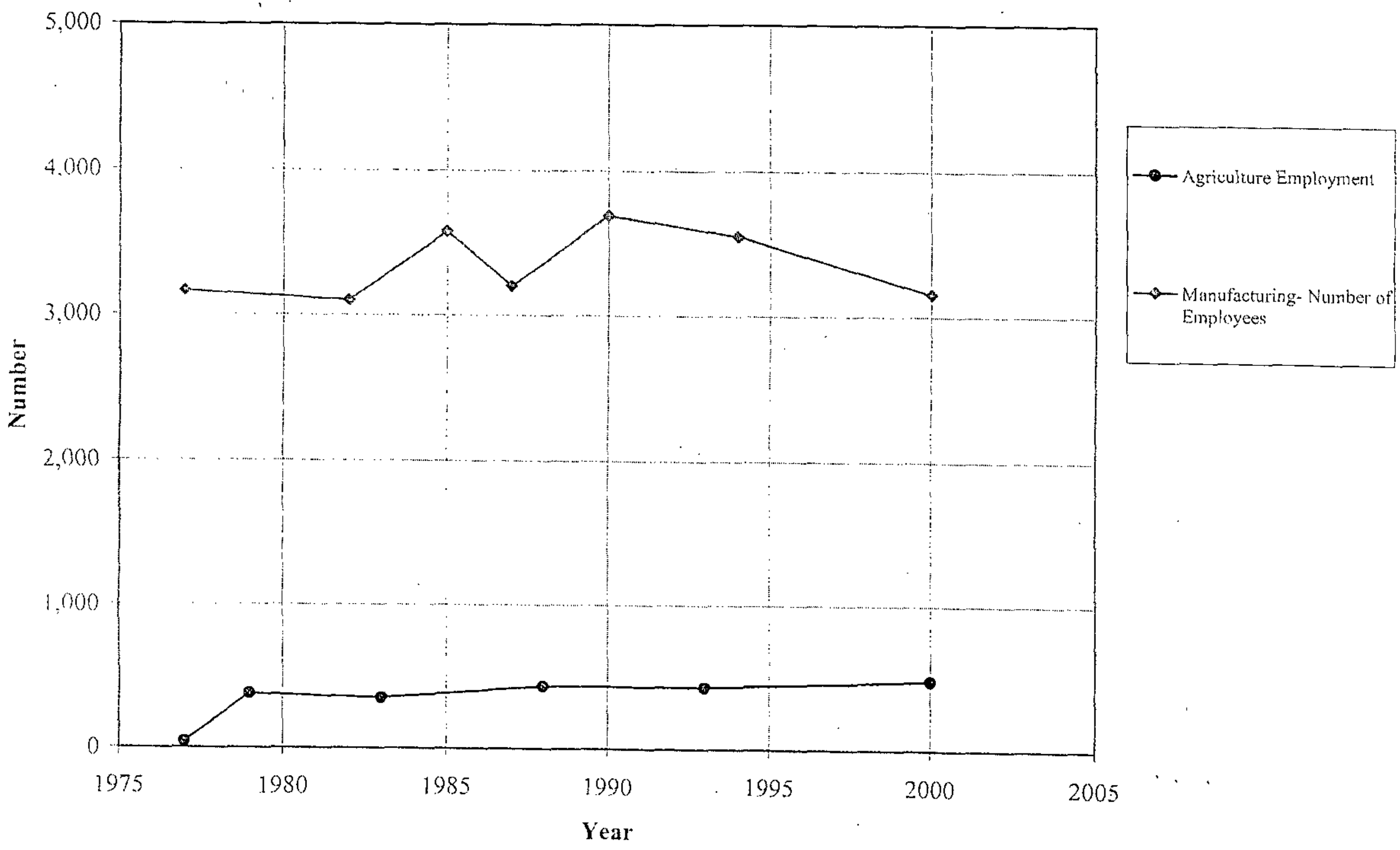


Figure 1-6. Manufacturing and Agriculture Trends in Putnam County



1.2.4.2 Utilities

Existing power plants in Putnam County include the following:

- Florida Power & Light's Putnam Plant;
- Seminole Electric Cooperative, Inc.'s Seminole Power Plant; and
- Georgia-Pacific Corporation's Palatka Operations.

Together, these power plants have an electrical nameplate generating capacity of over 1,800 megawatts (MW).

As an indicator of electrical utility growth, the electrical nameplate generating capacity in Putnam County since 1977 is shown in Figure 1-7. As shown, the electrical nameplate generating capacity has increased by 1,585 MW, or 521 percent since 1977.

1.2.4.3 Growth Associated with the Operation of the Project

Since the PSD baseline date of August 7, 1977, there has been only one major facility built within a 35-km radius of the GP Palatka Mill site. This was the Seminole Electric Power Plant. There are a limited number of facilities located throughout the 35-km radius area surrounding the site. Based on the locations of nearby air emission sources, there has not been a concentration of industrial and commercial growth in the vicinity of the GP Palatka Mill site.

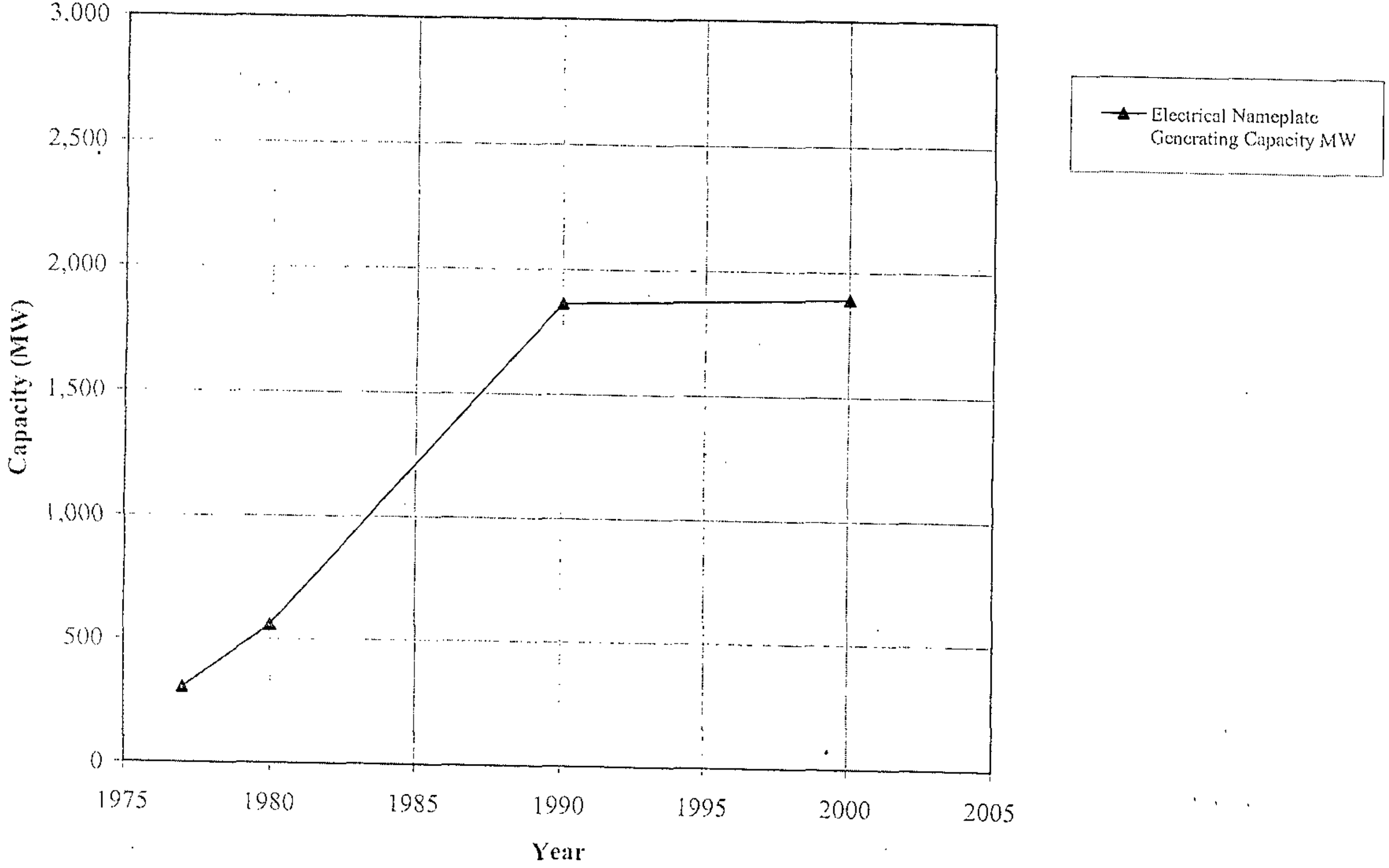
1.2.5 AIR QUALITY DISCUSSION

1.2.5.1 Air Emissions of Major Facilities

Based on actual emissions reported for 1999 (latest year of available data) by EPA on its AIRSdata website, total emissions from stationary sources in the county are as follows:

SO_2:	43,000 TPY
PM_{10}:	1,700 TPY
NO_x:	28,900 TPY
CO:	4,640 TPY
VOC:	800 TPY

Figure 1-7. Electrical Power Generation Capacity in Putnam County



1.2.5.2 Air Emissions from Mobile Sources

The trends in the air emissions of CO, VOC, and NO_x from mobile sources in Putnam County are presented in Figure 1-8. Between 1977 and 2002, there were significant decreases in CO and VOC emissions, and there was only a slight increase in NO_x emissions during that same time period. The decrease in CO and VOC emissions were about 41 and 5 tons per day, respectively, which represent decreases from 1977 emissions of 48 and 42 percent, respectively. The increase in NO_x emissions was less than one half of a ton per day, which represents an increase of about 5 percent since 1977.

1.2.5.3 Air Monitoring Data

Since 1977, Putnam County has been classified as attainment for all criteria pollutants. Air quality monitoring data have been collected in Putnam County, primarily in the central portion of the county in and around the city of Palatka. For this evaluation, the air quality monitoring data collected at the monitoring station nearest to the GP Palatka Mill were used to assess air quality trends since 1977. Air quality monitoring data were based on the following monitoring stations:

- SO_2 and PM_{10} concentrations – Palatka,
- NO_2 concentrations – Palatka and Jacksonville,
- CO concentrations – Jacksonville, and
- O_3 concentrations – Gainesville and Jacksonville.

Data collected from these stations are considered to be generally representative of air quality in Putnam County. Because the monitoring stations in Jacksonville (NO_2, CO, and O_3) are located in more urbanized areas than the GP Palatka Mill, the reported concentrations for those stations are likely to be higher than that experienced at the site.

The air monitoring data indicate that the maximum air quality concentrations currently measured in the region comply with and are well below the applicable AAQS. These monitoring stations are located in areas where the highest concentrations of a measured pollutant are expected due to the combined effect of emissions from stationary and mobile sources, as well as the effects of meteorology. Therefore, the ambient concentrations in areas not monitored should have pollutant concentrations less than the monitored concentrations from these sites.

In addition, since 1988, PM in the form of PM_{10} has been collected at the air monitoring stations due to the promulgation of the PM_{10} AAQS. Prior to 1989, the AAQS for PM was in the form of total suspended particulates (TSP) concentrations, and this form was measured at the stations.

1.2.5.4 SO_2 Concentrations

The trends in the 3-hour, 24-hour, and annual average SO_2 concentrations measured in Putnam County since 1977 are presented in Figures 1-9 through 1-11, respectively. As shown in these figures, measured SO_2 concentrations have been and continue to be well below the AAQS.

1.2.5.5 PM_{10}/TSP Concentrations

The trends in the 24-hour and annual average PM_{10} and TSP concentrations since 1977 are presented in Figures 1-12 and 1-13, respectively. TSP concentrations are presented through 1988 since the AAQS was based on TSP concentrations through that year. In 1988, the TSP AAQS was revoked and the PM standard was revised to PM_{10}.

As shown in these figures, measured TSP concentrations were generally below the TSP AAQS. Since 1988 when PM_{10} concentrations have been measured, the PM_{10} concentrations have been and continue to be below the AAQS.

1.2.5.6 NO_2 Concentrations

The trends in the annual average NO_2 concentrations measured at the nearest monitors to the GP Palatka Mill are presented in Figure 1-14. As shown in this figure, measured NO_2 concentrations have been well below the AAQS.

1.2.5.7 CO Concentrations

The trends in the 1-hour and 8-hour average CO concentrations measured since 1977 in Jacksonville are presented in Figures 1-15 and 1-16, respectively. As shown in these figures, measured CO concentrations have been well below the AAQS for the past several years.

1.2.5.8 Ozone Concentrations

The trends in the 1-hour average O_3 concentrations since 1977 are presented in Figure 1-17. The trends in the 8-hour average O_3 concentrations since 1995 are presented in Figure 1-18. As shown in these figures, even in the more urbanized areas of Jacksonville and Gainesville, the measured O_3 concentrations have primarily been below the 1-hour average AAQS and the new 8-hour average AAQS.

1.2.5.9 Air Quality Associated with the Operation of the Project

The air quality data measured in the region of the GP Palatka Mill indicate that the maximum air quality concentrations are well below and comply with the AAQS. Also, based on the trends presented of these maximum concentrations, the air quality has generally improved in the region since the baseline date of August 7, 1977. Because the maximum concentrations for the proposed modification at the Mill are predicted to be below the significant impact levels except for SO_2, air quality concentrations in the region are expected to remain below and comply with the AAQS when the project becomes operational. For SO_2, the accompanying modeling report demonstrates compliance with AAQS.

Figure 1-8. Mobile Source Emissions (Tons per Day) of CO, VOC, and NO_x in Putnam County

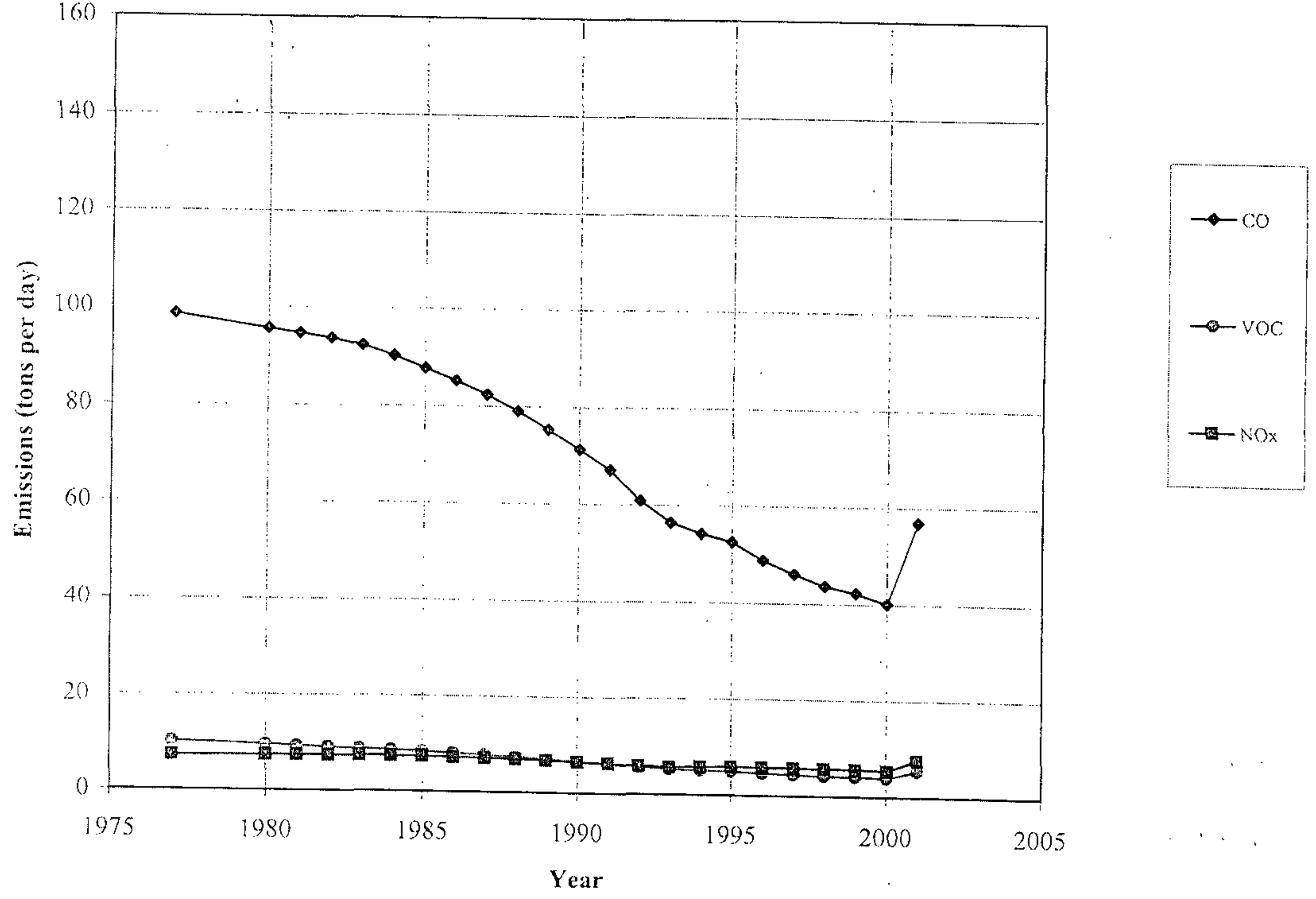


Figure 1-9. Measured 3-Hour Average Sulfur Dioxide Concentrations (2nd Highest Values) from 1984 to 2002- Putnam County

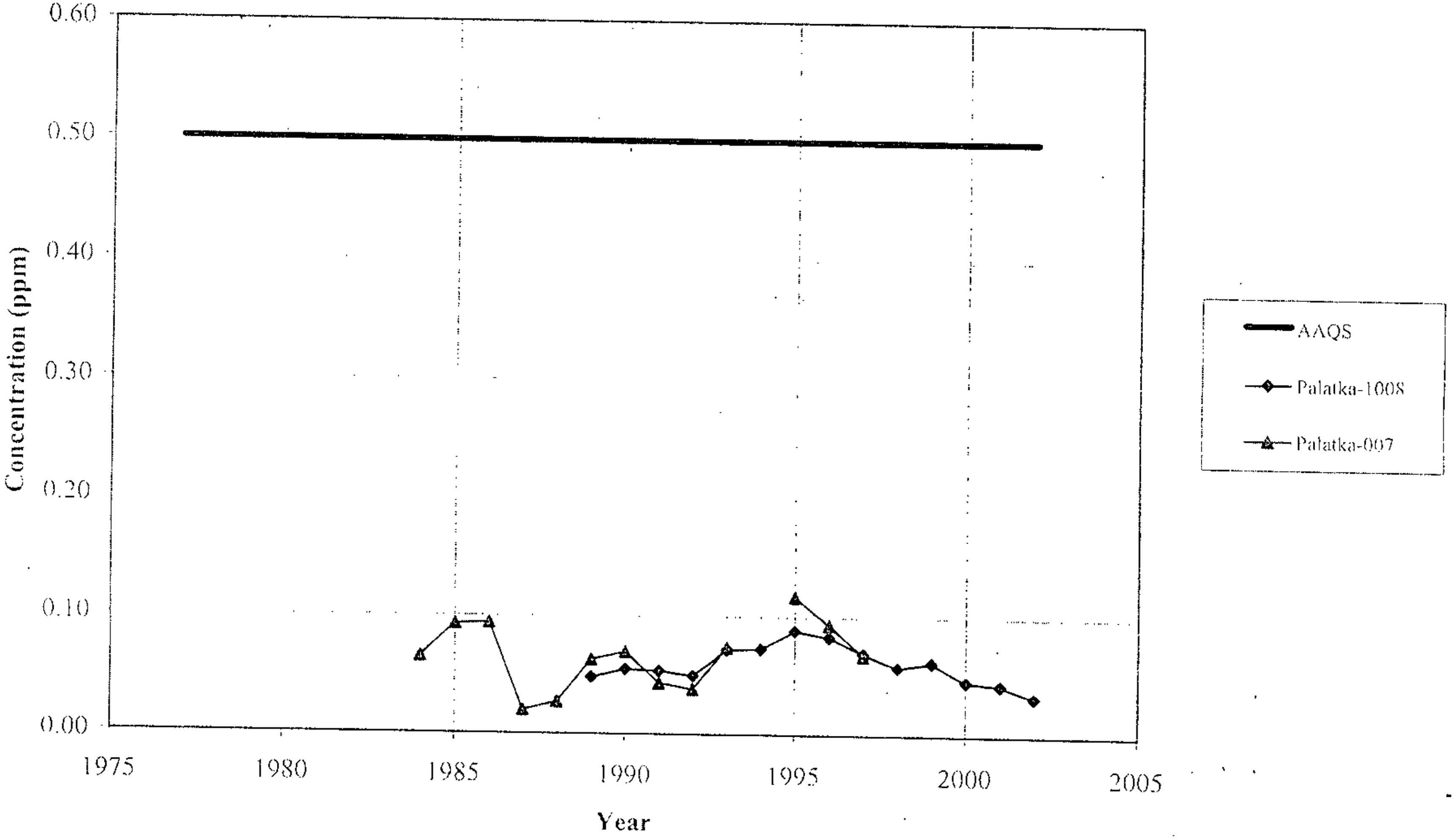


Figure 1-10. Measured 24-Hour Average Sulfur Dioxide Concentrations (2nd Highest Values) from 1984 to 2002- PutnamCounty

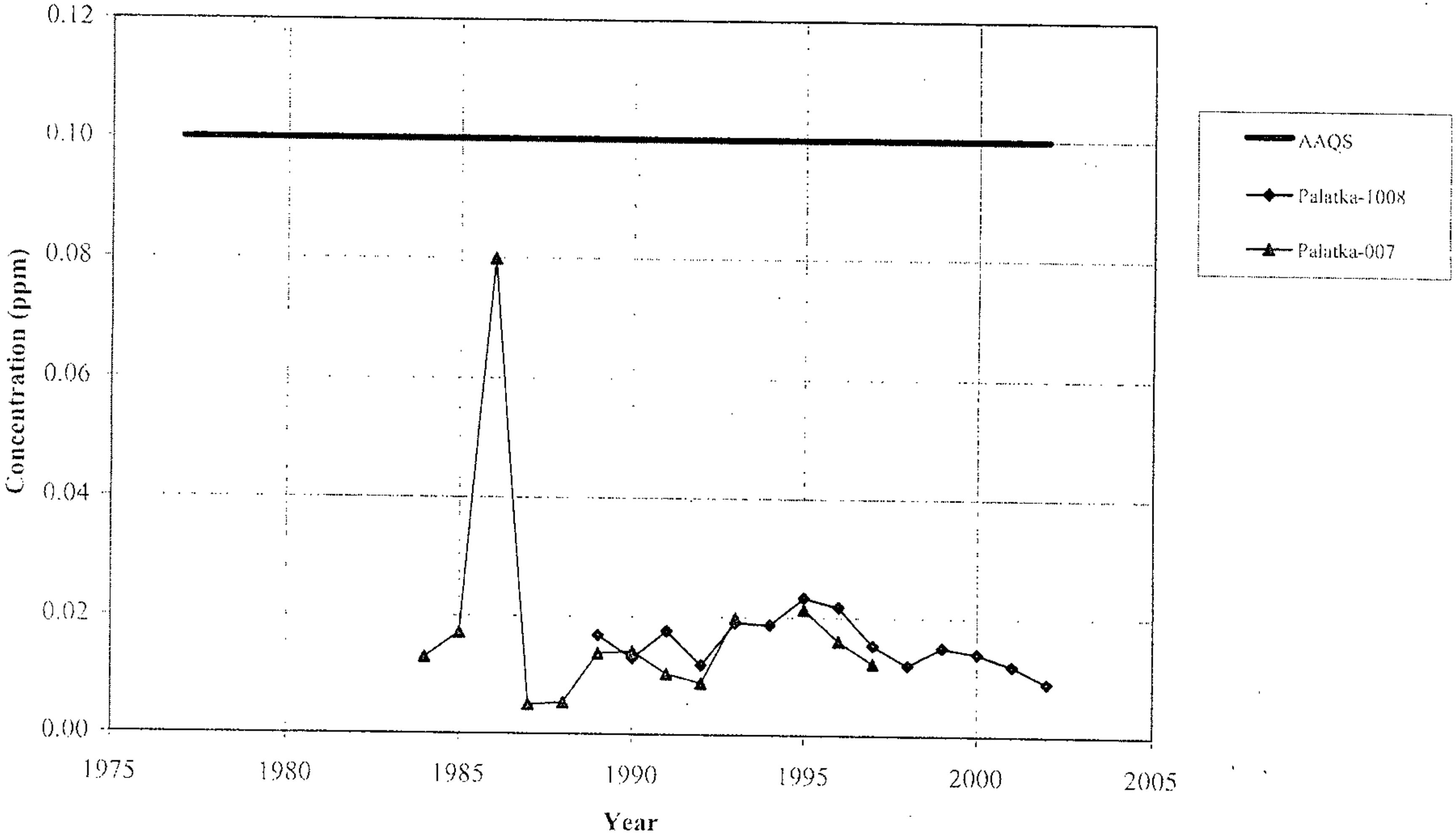


Figure 1-11. Measured Annual Average Sulfur Dioxide Concentrations from 1984 to 2002- Putnam County

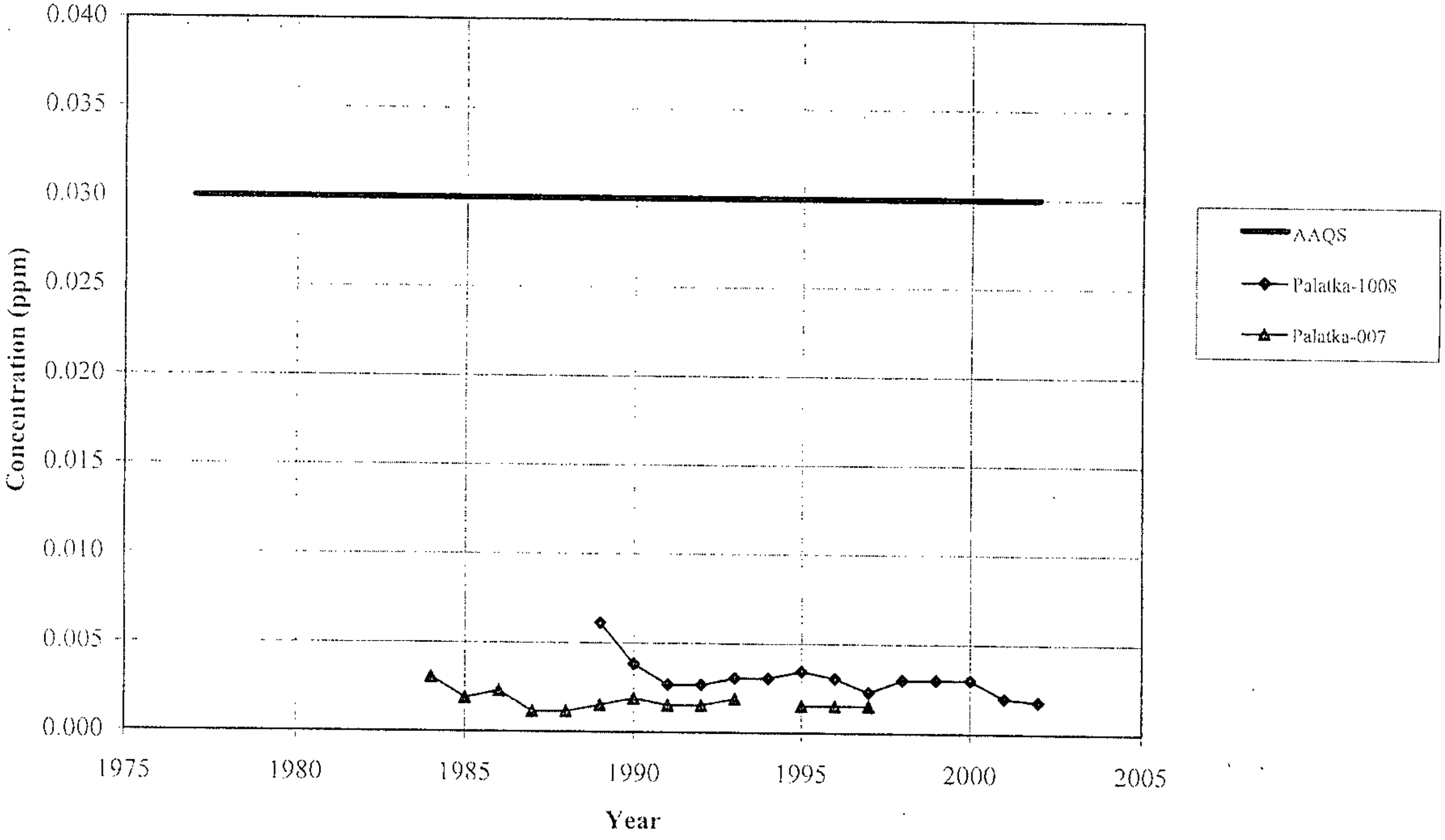


Figure 1-12. Measured 24-Hour Average PM_{10} Concentrations (1988 to 2002) and Total Suspended Particulate Concentrations (1981 to 1987) (2nd Highest Values) - Putnam County

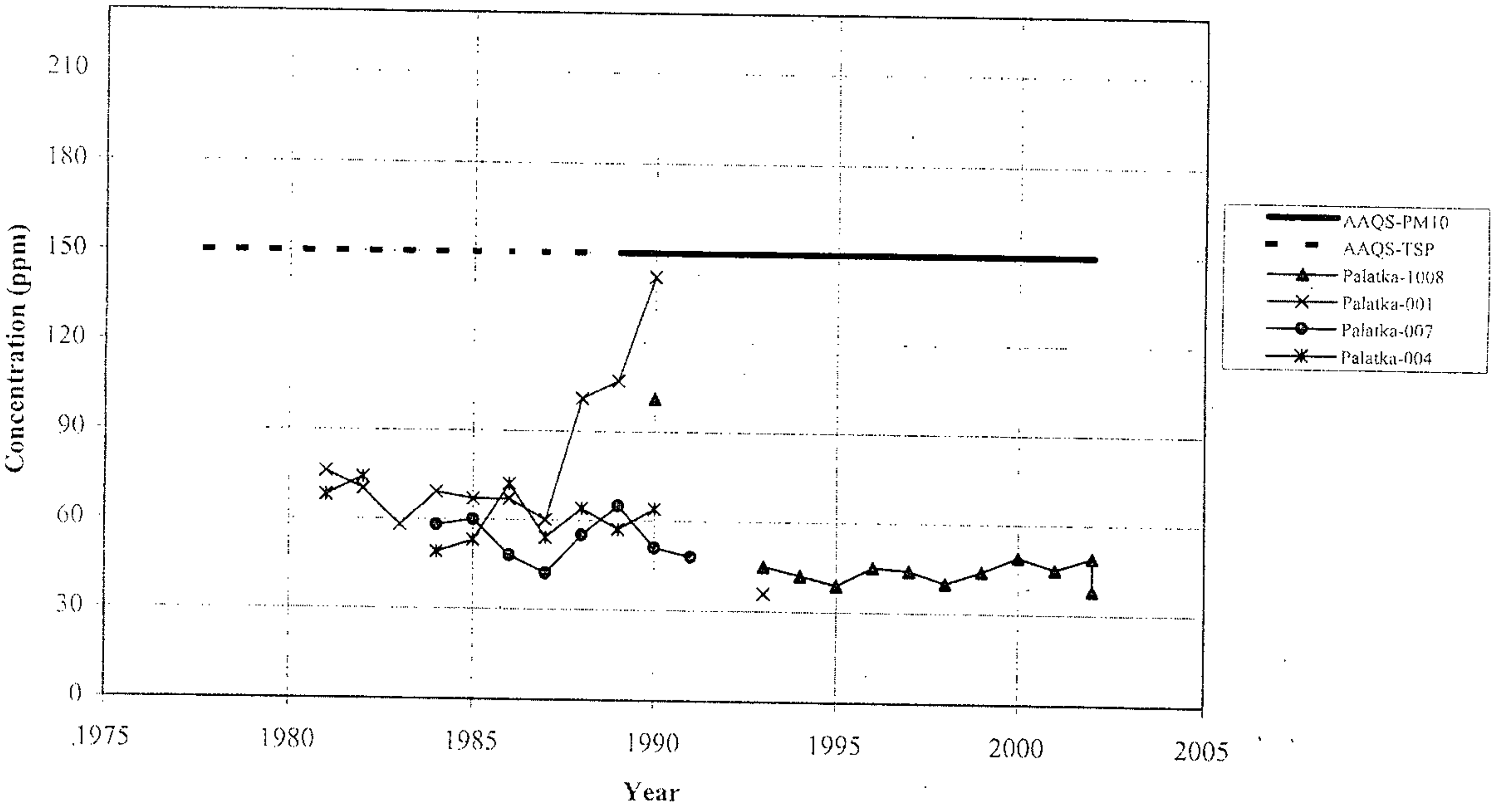


Figure 1-13. Measured Annual Average PM_{10} Concentrations (1988 to 2002) and Total Suspended Particulate Concentrations (1981 to 1987) - Putnam County

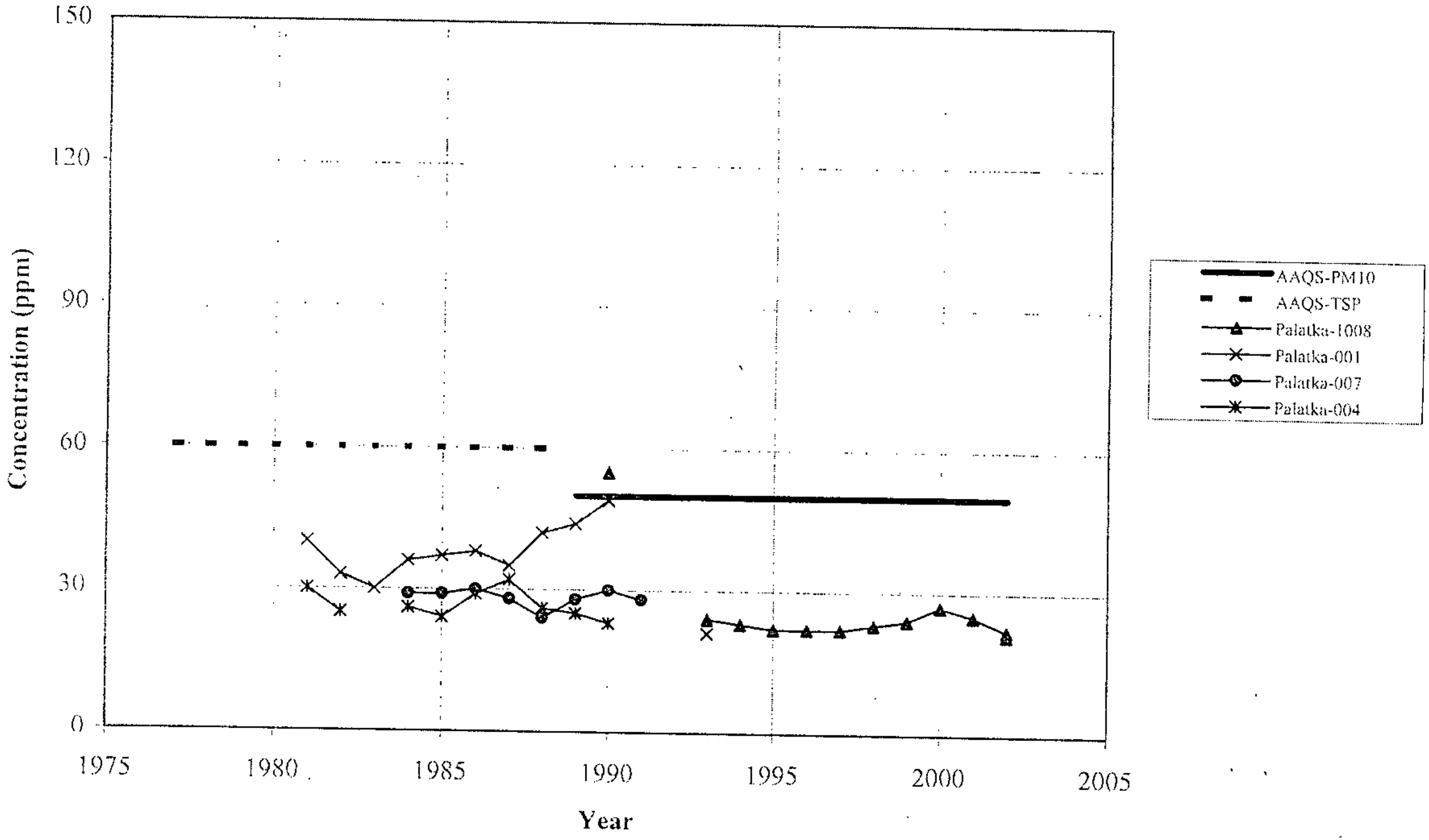


Figure 1-14. Measured Annual Average Nitrogen Dioxide Concentrations from 1981 to 2002 - Putnam County

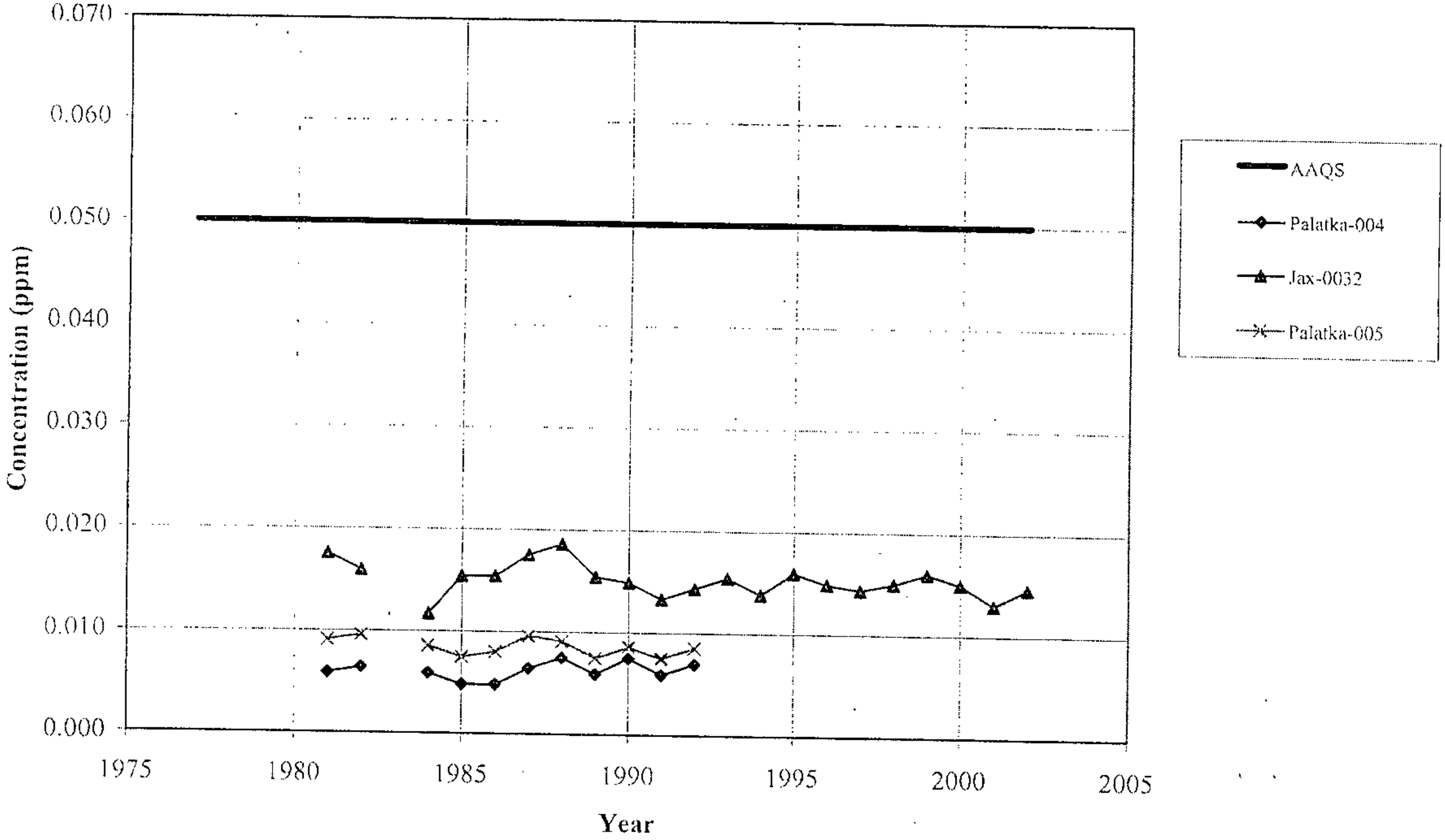


Figure 1-15. Measured 1-Hour Average Carbon Monoxide Concentrations (2nd Highest Values) from 1981 to 2002 - Putnam County

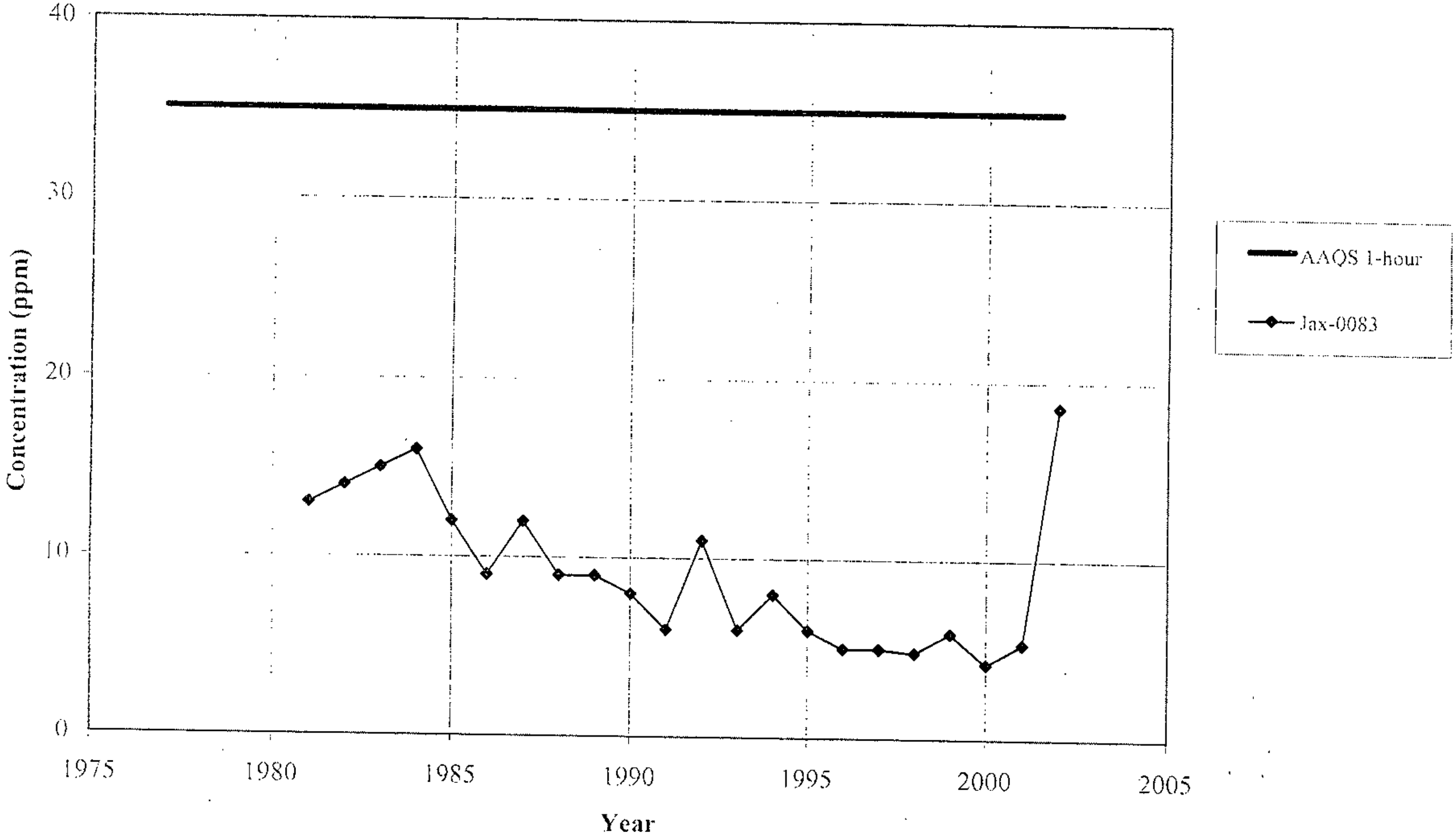


Figure 1-16. Measured 8-Hour Average Carbon Monoxide Concentrations (2nd Highest Values) from 1981 to 2002 - Putnam County

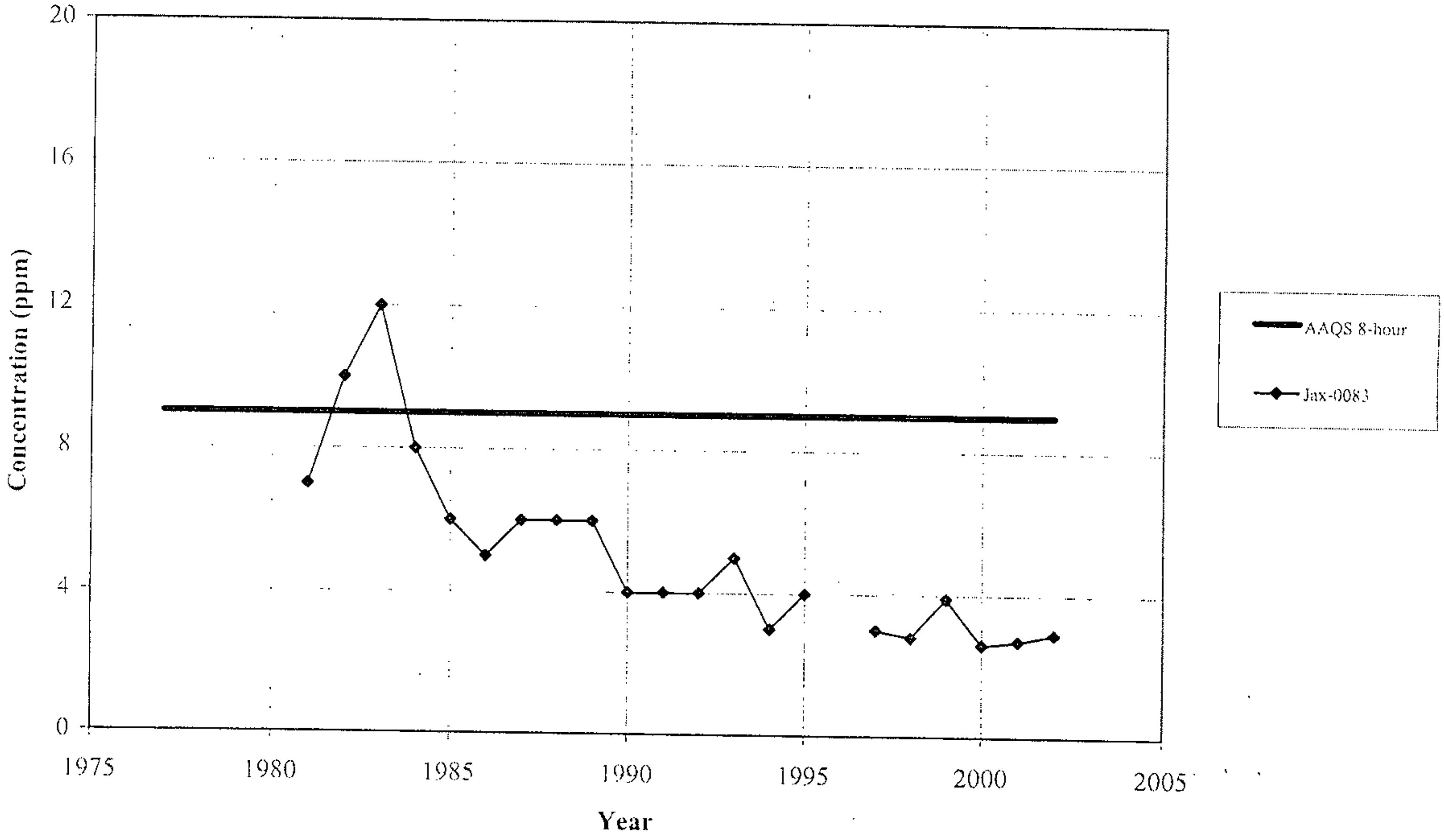


Figure 1-17. Measured 1-Hour Average Ozone Concentrations (2nd Highest Values) from 1981 to 2002 - Putnam County

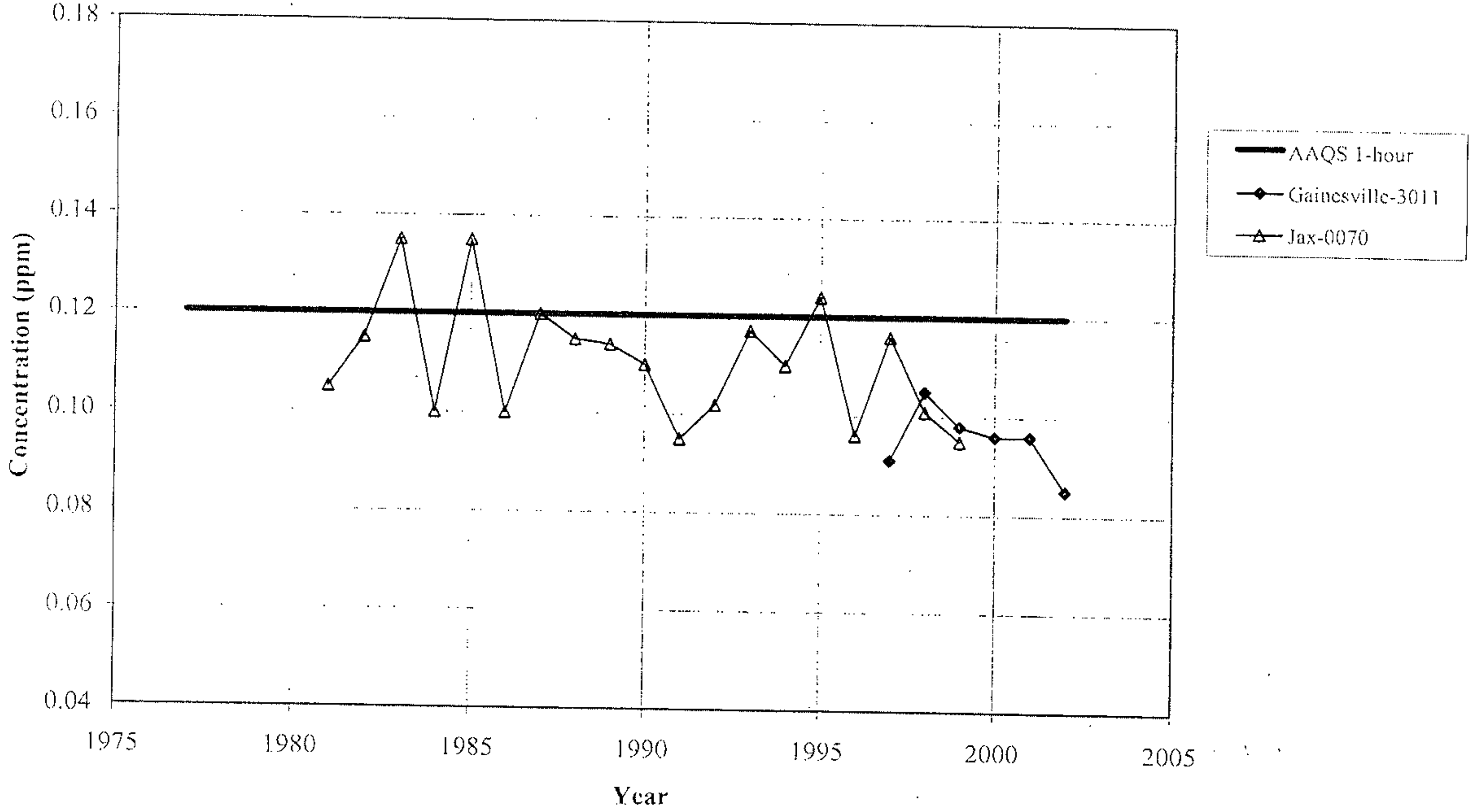
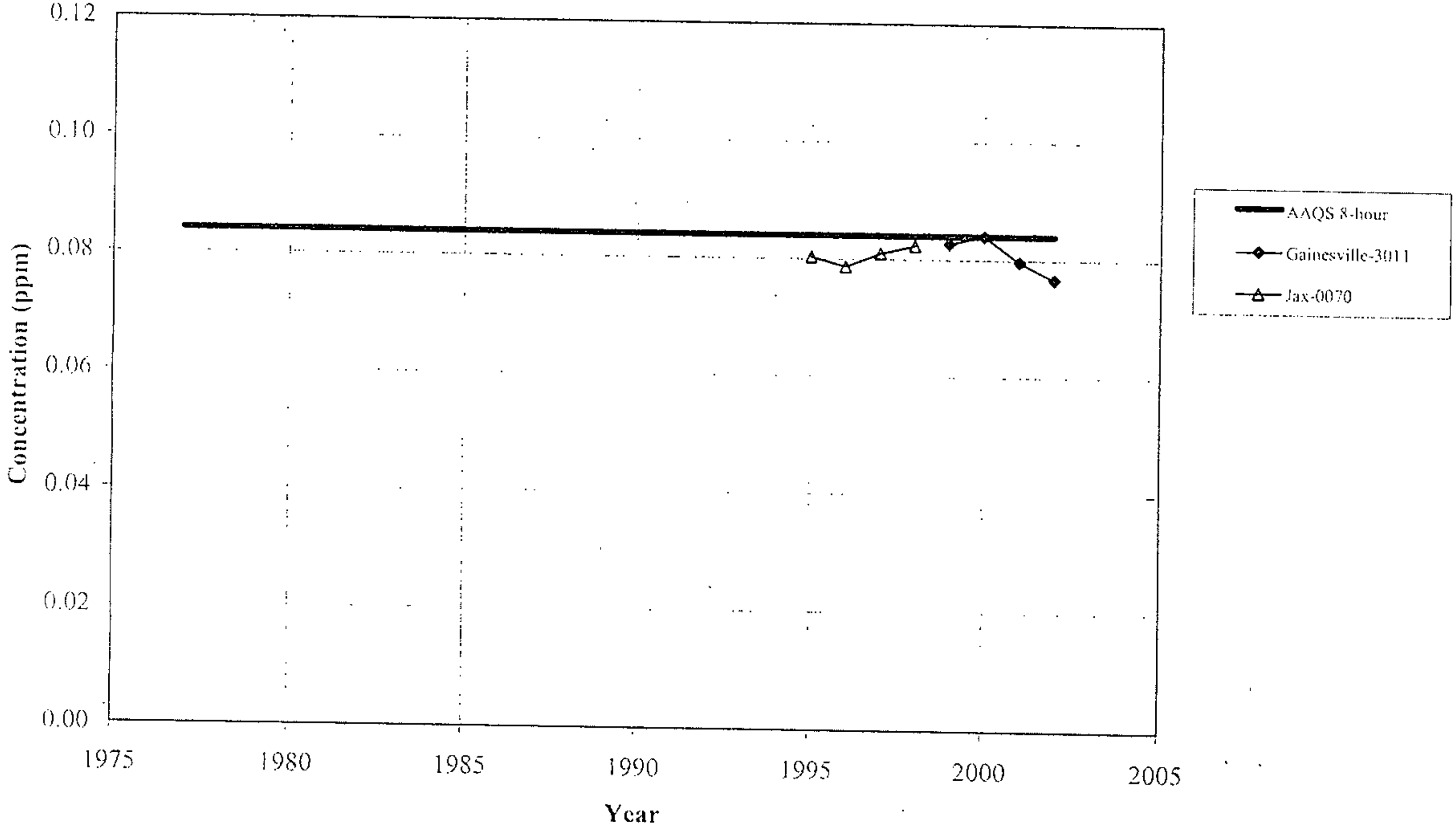


Figure 1-18. Measured 8-Hour Average Ozone Concentrations (3-Year Average of the 4th Highest Values) from 1995 to 2002 - Putnam County



2.0 ADDITIONAL IMPACT ANALYSIS ON THE OFKEFENOKEE CLASS I AREA

2.1 INTRODUCTION

GP has proposed changes to its pulp mill located in Putnam County, near Palatka, Florida. The changes were described in Section 2.0. The facility is subject to the PSD new source review requirements for SO_2, NO_x, PM, PM_{10}, CO, VOC, and SAM. The Class I area analysis addresses these pollutants.

The analysis addresses the potential impacts on vegetation, soils, and wildlife of the Okefenokee NWA Class I area due to the proposed project. In addition, potential impacts upon visibility resulting from the proposed project are assessed. The Okefenokee NWA Class I area is located approximately 108 km north of the GP Palatka Mill. Although the Wolf Island NWA Class I area is located approximately 186 km north of the GP Palatka Mill, only the Okefenokee NWA Class I area was evaluated since it is much closer to the Mill than Wolf Island, and both have similar AQRVs.

The analysis demonstrates that the increase in impacts due to the proposed project is extremely low. Regardless of the existing conditions in the vicinity of the Class I area, the proposed project will not cause any significant adverse effects due to the predicted low impacts upon that area.

2.2 SOILS, VEGETATION, AND AQRV ANALYSIS METHODOLOGY

This analysis uses the maximum air quality impacts predicted to occur in the Class I area due to the proposed increase in emissions. These impacts are summarized in Attachment C of the PSD permit application.

The analysis involved predicting worst-case maximum short- and long-term concentrations of pollutants in the Class I area and comparing the maximum predicted concentrations to lowest observed effect levels for AQRVs or analogous organisms. In conducting the assessment, several assumptions were made as to how pollutants interact with the different matrices, *i.e.*, vegetation, soils, wildlife, and aquatic environment.

A screening approach was used to evaluate potential effects by comparison of the maximum predicted ambient concentrations with effect threshold limits for the pollutants of concern, for both vegetation and wildlife, as reported in the scientific literature. A literature search was conducted which specifically addressed the effects of air contaminants on plant species reported to occur in the vicinity of the plant and the Class I area. It is recognized that effects threshold information is not available for all species found in the Okefenokee NWA, although studies have been performed on other similar species that may be used as models.

2.3 IDENTIFICATION OF AQRVS AND METHODOLOGY

An AQRV analysis was conducted to assess the potential risk to AQRVs of the Okefenokee NWA due to the proposed GP project. The U.S. Department of the Interior in 1978 administratively defined AQRVs to be:

> *All those values possessed by an area except those that are not affected by changes in air quality and include all those assets of an area whose vitality, significance, or integrity is dependent in some way upon the air environment. These values include visibility and those scenic, cultural, biological, and recreational resources of an area that are affected by air quality.*
>
> *Important attributes of an area are those values or assets that make an area significant as a national monument, preserve, or primitive area. They are the assets that are to be preserved if the area is to achieve the purposes for which it was set aside (Federal Register 1978).*

Except for visibility, AQRVs were not specifically defined. However, odor, soil, flora, fauna, cultural resources, geological features, water, and climate generally have been identified by land managers as AQRVs. Since specific AQRVs have not been identified for the Okefenokee NWA, this AQRV analysis evaluates the effects of air quality on general vegetation types and wildlife found in the Class I area.

Vegetation type AQRVs and their representative species types have been defined as:

- Freshwater Marsh - sawgrass, pickerelweed, and sand cordgrass
- Marsh Islands - cabbage palm and eastern red cedar
- Estuarine Habitat - black needlerush, salt marsh cordgrass, and wax myrtle
- Hardwood Swamp - red maple, red bay, sweet bay, and cabbage palm
- Upland Forests - live oak, scrub oak, longleaf pine, slash pine, wax myrtle, and saw palmetto

Wildlife AQRVs have been identified as endangered species, waterfowl, wading birds, shorebirds, reptiles, and mammals.

The maximum pollutant concentrations predicted for the project in the Okefenokee NWA are presented in the 2004 Lime Kiln PSD application. These results were compared with effect threshold limits for both vegetation and wildlife as reported in the scientific literature. While the literature search focused on such species as cabbage palm, eastern red cedar, lichens, and species of the hardwood swamplands and mangrove forest, no specific citations that addressed these species were found. Threshold information is not available for all species found in the Class I area, although studies have been performed on a few of the common species and on other similar species that can be used as indicators of effects.

2.4 IMPACTS TO SOILS

For soils, the potential and hypothesized effects of atmospheric deposition include:

- Increased soil acidification,
- Alteration in cation exchange,
- Loss of base cations, and
- Mobilization of trace metals.

The potential sensitivity of specific soils to atmospheric inputs is related to two factors. First, the physical ability of a soil to conduct water vertically through the soil profile is important in influencing the interaction with deposition. Second, the ability of the soil to resist chemical changes, as measured in terms of pH and soil cation exchange capacity (CEC), is important in determining how a soil responds to atmospheric inputs.

The soils of the Okefenokee NWA are generally classified as histosols. Histosols (peat soils) are organic and have extremely high buffering capacities based on their CEC, base saturation, and bulk density. Therefore, they would be relatively insensitive to atmospheric inputs.

The relatively low sensitivity of the soils to atmospheric inputs coupled with the extremely low ground-level pollutant concentrations due to the project for the Okefenokee NWA precludes any significant impact on soils.

2.5 IMPACTS TO VEGETATION

In general, the effects of air pollutants on vegetation occur primarily from SO_2, NO_2, O_3, and PM_{10}. Effects from minor air contaminants such as fluoride, chlorine, hydrogen chloride, ethylene, ammonia, hydrogen sulfide, CO, and pesticides have also been reported in the literature. The effects of air pollutants are dependent both on the concentration of the contaminant and the duration of the exposure. The term "injury," as opposed to damage, is commonly used to describe all plant responses to air contaminants and will be used in the context of this analysis. Air contaminants are thought to interact primarily with plant foliage, which is considered to be the major pathway of exposure.

Injury to vegetation from exposure to various levels or air contaminants can be termed acute, physiological, or chronic. Acute injury occurs as a result of a short-term exposure to a high contaminant concentration and is typically manifested by visible injury symptoms ranging from chlorosis (discoloration) to necrosis (dead areas). Physiological or latent injury occurs as the result of a long-term exposure to contaminant concentrations below that which results in acute injury symptoms. Chronic injury results from repeated exposure to low concentrations over extended periods of time, often without any visible symptoms, but with some effect on the overall growth and productivity of the plant. In this assessment, 100 percent of the particular air pollutant in the ambient air was assumed to interact with the vegetation. This is a conservative approach.

The response of vegetation and wildlife to atmospheric pollutants is influenced by the concentration of the pollutant, duration of exposure, and frequency of exposures. The pattern of pollutant exposure expected from the facility is that of a few episodes of relatively high ground-level concentration which occur during certain meteorological conditions interspersed with long periods of extremely low ground-level concentrations. If there are any effects of stack emissions on plants or animals, they will likely arise from the short-term, higher doses. A dose is the product of the concentration of the pollutant and duration of the exposure.

2.5.1 NITROGEN DIOXIDE

NO_2 can injure plant tissue with symptoms usually appearing as irregular white to brown collapsed lesions between the leaf veins and near the margins. Conversely, non-injurious levels of NO_2 can be absorbed by plants, enzymatically transformed into ammonia, and incorporated into plant constituents such as amino acids (Matsumaru *et al.*, 1979).

Plant damage can occur through either acute (short-term, high concentration) or chronic (long-term, relatively low concentration) exposure. For plants that have been determined to be more sensitive to NO_2 exposure than others, acute (1-, 4-, and 8-hour) exposure caused 5 percent predicted foliar injury at concentrations ranging from 3,800 to 15,000 $\mu g/m^3$ (Heck and Tingey, 1979). Chronic exposure of selected plants (some considered NO_2-sensitive) to NO_2 concentrations of 2,000 to 4,000 $\mu g/m^3$ for 213 to 1,900 hours caused reductions in yield of up to 37 percent and some chlorosis (Zahn, 1975).

The maximum 8-hour average NO_2 concentration due to the increase in emissions resulting from the proposed project in the Okefenokee Class I area is predicted to be less of the levels that cause foliage injury in acute exposure scenarios. By comparison of published toxicity values for NO_2 exposure to long-term (annual averaging time) modeled concentrations, the possibility of plant damage in the Class I areas can be examined for chronic exposure situations. For a chronic exposure, the maximum annual average NO_2 concentration due to the proposed project in the Okefenokee NWA Class I area is less than 0.01 $\mu g/m^3$.

2.5.2 SULFUR DIOXIDE

Sulfur is an essential plant nutrient usually taken up as sulfate ions by the roots from the soil solution. When sulfur dioxide in the atmosphere enters the foliage through pores in the leaves, it reacts with water in the leaf interior to form sulfite ions. Sulfite ions are highly toxic. They interact with enzymes, compete with normal metabolites, and interfere with a variety of cellular functions (Horsman and Wellburn, 1976). However, within the leaf, sulfite is oxidized to sulfate ions, which can then be used by the plant as a nutrient. Small amounts of sulfite may be oxidized before they prove harmful.

SO_2 gas at elevated levels has long been known to cause injury to plants. Acute SO_2 injury usually develops within a few hours or days of exposure, and symptoms include marginal, flecked, and/or intercoastal necrotic areas that appear water-soaked and dullish green initially. This injury generally occurs to younger leaves. Chronic injury usually is evident by signs of chlorosis, bronzing, premature senescence, reduced growth, and possible tissue necrosis (EPA, 1982). Observed SO_2 effect levels for several plant species and plant sensitivity groupings are presented in Tables 1-2 and 1-3, respectively.

Many studies have been conducted to determine the effects of high-concentration, short-term SO_2 exposure on natural community vegetation. Sensitive plants include ragweed, legumes, blackberry, southern pine, and red and black oak. These species are injured by exposure to 3-hour average SO_2

concentrations of 790 to 1,570 μg/m^3. Intermediate plants include locust and sweetgum. These species are injured by exposure to 3-hour average SO_2 concentrations of 1,570 to 2,100 μg/m^3. Resistant species (injured at concentrations above 2,100 μg/m^3 for 3 hours) include white oak and dogwood (EPA, 1982).

A study of native Floridian species (Woltz and Howe, 1981) demonstrated that cypress, slash pine, live oak, and mangrove exposed to 1,300 μg/m^3 SO_2 for 8 hours were not visibly damaged. This finding supports the levels cited by other researchers on the effects of SO_2 on vegetation. A corroborative study (McLaughlin and Lee, 1974) demonstrated that approximately 20 percent of a cross-section of plants ranging from sensitive to tolerant was visibly injured at 3-hour average SO_2 concentrations of 920 μg/m^3. Jack pine seedlings exposed to SO_2 concentrations of 470 to 520 μg/m^3 for 24 hours demonstrated inhibition of foliar lipid synthesis; however, this inhibition was reversible (Malhotra and Kahn, 1978). Black oak exposed to 1,310 μg/m^3 SO_2 for 24 hours a day for 1 week demonstrated a 48 percent reduction in photosynthesis (Carlson, 1979). Two species of lichens exhibited signs of SO_2 damage in the form of decreased biomass gain and photosynthetic rate as well as membrane leakage when exposed to concentrations of 200 to 400 μg/m^3 for 6 hours/week for 10 weeks (Hart *et al.*, 1988).

The maximum 24-hour average SO_2 concentration due to the increase in emissions resulting from the proposed project at the Okefenokee NWA Class I area is presented in the 2004 Lime Kiln PSD application. The maximum 24-hour average SO_2 concentration is predicted for the project at the Class I area is less than 1 percent of those that caused damage to the most sensitive lichens. The modeled annual incremental increase in SO_2 adds slightly to background levels of this gas and poses only a minimal threat to area vegetation.

2.5.3 PARTICULATE MATTER (PM_{10})

Although information pertaining to the effects of PM on plants is scarce, some threshold concentrations are available. Mandoli and Dubey (1998) exposed ten species of native Indian plants to levels of PM ranging from 210 to 366 μg/m^3 for an 8-hour averaging period. Damage in the form of a higher leaf area/dry weight ratio was observed at varying degrees for most plants tested. Concentrations of PM lower than 163 μg/m^3 did not appear to be injurious to the tested plants.

By comparison of these published toxicity values for PM exposure (*i.e.*, concentrations for an 8-hour averaging time), the possibility of plant damage in the Okefenokee NWA can be determined. The maximum predicted short term PM_{10} concentration due to the increase in emissions resulting from the proposed project at the Class I area is presented in the 2004 Lime Kiln PSD applicaiton. These concentrations are less than 1 percent of the lower threshold value that reportedly affects plant foliage. As a result, no effects to vegetative AQRVs are expected from the project's emissions.

2.5.4 CARBON MONOXIDE

As with PM_{10}, information pertaining to the effects of CO on plants is scarce. The main effect of high concentrations of CO is the inhibition of cytochrome *c* oxidase, the terminal oxidase in the mitochondrial electron transfer chain. Inhibition of cytochrome *c* oxidase depletes the supply of adenosine triphosphate (ATP), the principal donor of free energy required for cell functions. However, this inhibition only occurs at extremely high concentrations of CO. Pollok *et al.* (1989) reported that exposure to $CO:O_2$ ratio of 25 (equivalent to an ambient CO concentration of 6.85×10^6 $\mu g/m^3$) resulted in stomatal closure in the leaves of the sunflower (*Helianthus annuus*). Naik *et al.* (1992) reported cytochrome *c* oxidase inhibition in corn, sorghum, millet, and Guinea grass at $CO:O_2$ ratios of 2.5 (equivalent to an ambient CO concentration of 6.85×10^5 $\mu g/m^3$). These plants were considered the species most sensitive to CO-induced inhibition of cytochrome *c* oxidase. GP estimates that the predicted impact of CO to be much less than 685,000 $\mu g/m^3$.

2.5.5 SULFURIC ACID MIST

Acidic precipitation or acid rain is coupled to SO_2 emissions mainly formed during the burning of fossil fuels. This pollutant is oxidized in the atmosphere and dissolves in rain forming SAM, which falls as acidic precipitation (Ravera, 1989). Although concentration data are not available, SAM has been reported to yield necrotic spotting on the upper surfaces of leaves (Middleton *et al.*, 1950).

No significant adverse effects on vegetation are expected from the project's emissions because SO_2 concentrations, which lead directly to the formation of SAM concentrations, are predicted to be well below levels which have been documented as negatively affecting vegetation. During the last decade, much attention has been focused on acid rain. Acidic deposition is an ecosystem-level problem that affects vegetation because of some alterations of soil conditions such as increased leaching of essential base cations or elevated concentrations of aluminum in the soil water (Goldstein *et al.*, 1985). Although effects of acid rain in eastern North America have been well published and publicized, detrimental effects of acid rain on Florida vegetation are lacking documentation.

2.5.6 VOC EMISSIONS AND IMPACTS ON OZONE

It is difficult to predict what effect the proposed increase in emissions of VOC will have on ambient O_3 concentrations on a regional scale. VOC and NO_x emissions are precursors to the formation of O_3. O_3 is not directly emitted from fuel combustion, but is formed down-wind from emission sources when VOC and NO_x emissions react in the presence of sunlight. Natural (without man-made sources) ambient concentrations of O_3 are normally in the range of 20 to 39 $\mu g/m^3$ (0.01 to 0.02 ppm) (Heath, 1975).

The nearest monitors to the GP Palatka Mill that measure O_3 concentrations are located in Gainesville (AIRS No. 12-001-0025 and 12-001-3011). These stations measure concentrations according to EPA procedures. Based on the O_3 monitoring concentrations measured over the last several years in Gainesville , the region is in attainment of the existing 1-hour O_3 AAQS as well as the new 8-hour O_3 AAQS.

O_3 can cause various damage to broad-leaved plants including: tissue collapse, interveinal necrosis and markings on the upper surface leaves know as stippling (pigmented yellow, light tan, red brown, dark brown, red, or purple), flecking (silver or bleached straw white), mottling, chlorosis or bronzing, and bleaching. O_3 can also stunt plant growth and bud formation. On certain plants such as citrus, grape, and tobacco, it is common for leaves to wither and drop early.

As described in Section 1.3.1, the VOC emissions due to the proposed GP project represents less than a 1-percent increase in regional VOC emissions. Therefore, the effects of O_3, as a result of VOC emissions from the project, are expected to be insignificant.

2.5.7 SUMMARY

In summary, the phytotoxic effects from the project's emissions are minimal. It is important to note that the elements were conservatively modeled with the assumption that 100 percent was available for plant uptake. This is rarely the case in a natural ecosystem.

2.6 IMPACTS TO WILDLIFE

The major air quality risk to wildlife in the United States is from continuous exposure to pollutants above the National AAQS. This occurs in non-attainment areas, *e.g.*, Los Angeles Basin. Risks to wildlife also may occur for wildlife living in the vicinity of an emission source that experiences frequent upsets or episodic conditions resulting from malfunctioning equipment, unique meteorological conditions, or startup operations (Newman and Schreiber, 1988). Under these conditions, chronic effects (*e.g.*, particulate contamination) and acute effects (*e.g.*, injury to health) have been observed (Newman, 1981).

A wide range of physiological and ecological effects to fauna has been reported for gaseous and particulate pollutants (Newman, 1981; Newman and Schreiber, 1988). The most severe of these effects have been observed at concentrations above the secondary AAQS. Physiological and behavioral effects have been observed in experimental animals at or below these standards.

For impacts on wildlife, the lowest threshold values of NO_2, PM_{10}, and SO_2 that are reported to cause physiological changes discussed above. These values are up to orders of magnitude larger than maximum concentrations predicted due to the GP project in the Okefenokee NWA Class I area. No effects on wildlife AQRVs from SO_2, NO_2, and particulates are expected. The proposed project's contribution to cumulative impacts is expected to be negligible.

Research with primates shows that O_3 penetrates deeper into non-ciliated peripheral pathways and can cause lesions in the respiratory bronchioles and alveolar ducts as concentrations increase from 0.2 to 0.8 ppm (Paterson, 1997). These bronchioles are the most common site for severe damage. In rats, the Type I cells in the proximal alveoli (where gas exchange occurs) were the primary site of action at concentrations between 0.5 and 0.9 ppm (Paterson, 1997). Work with rats and rabbits suggest that the mucus layer that lines the large airways does not protect completely against the effects of O_3, and desquamated cells were found from acute exposures at 0.25, 0.5, and 1.0 ppm. In animal research, O_3 has been found to increase the susceptibility to bacterial pneumonia (Paterson, 1997). During the last decade, there has also been growing concern with the possibility that repeated or long-term exposure to elevated O_3 concentrations may be causing or contributing to irreversible chronic lung injury.

The project's contribution to ground level O_3 is expected to be very low and dispersed over a large area. Coupled with the historical ambient data, mobility of wildlife, the potential for exposure of wildlife to the facility's impacts that lead to high concentration is extremely unlikely.

2.7 IMPACTS ON VISIBILITY

2.7.1 GENERAL

The CAA Amendments of 1977 provide for implementation of guidelines to prevent visibility impairment in mandatory Class I area. The guidelines are intended to protect the aesthetic quality of these pristine areas from reduction in visual range and atmospheric discoloration due to various pollutants. Sources of air pollution can cause visible plumes if emissions of PM_{10} and NO_x are sufficiently large. A plume will be visible if its constituents scatter or absorb sufficient light so that the plume is brighter or darker than its viewing background (e.g., the sky or a terrain feature, such as a mountain). PSD Class I areas, such as national parks and wilderness areas, are afforded special visibility protection designed to prevent plume visual impacts to observers within a Class I area.

Visibility is an AQRV for the Okefenokee NWA. Visibility can take the form of plume blight for nearby areas, or regional haze for long distances (e.g., distances beyond 50 km). Because the Okefenokee NWA lies more than 50 km from the GP Palatka Mill, the change in visibility is analyzed as regional haze.

Currently, there are several air quality modeling approaches recommended by the Interagency Workgroup on Air Quality Models (IWAQM) to perform these analyses. The IWAQM consists of EPA and Federal Land Managers (FLM) of Class I areas responsible for ensuring that AQRVs are not adversely impacted by new and existing sources. These recommendations have been summarized in two documents:

- *Interagency Workgroup on Air Quality Models (IWAQM), Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts* (EPA, 1998), referred to as the IWAQM Phase 2 report.
- *Federal Land Managers' Air Quality Related Values Workgroup (FLAG), Phase I Report;* U.S. Forestry Service (USFS), National Park Service (NPS), and U.S. Fish and Wildlife Service (USFWS) (December 2000); referred to as the FLAG document.

The methods and assumptions recommended in these documents were used to assess visibility impairment due to the project.

2.7.2 METHODOLOGY

Based on the FLAG document, current regional haze guidelines characterize a change in visibility by the change in the light-extinction coefficient (b_{ext}). The b_{ext} is the attenuation of light per unit distance due to the scattering and absorption by gases and particles in the atmosphere. A change in the extinction coefficient produces a perceived visual change. An index that simply quantifies the percent change in visibility due to the operation of a source is calculated as:

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

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

The purpose of the visibility analysis is to calculate the extinction at each receptor for each day (24-hour period) of the year due to the proposed project. The criteria to determine if the project's impacts are potentially significant are based on a change in extinction of 5 percent or greater for any day of the year.

Processing of visibility impairment for this study was performed with the CALPUFF model (see Appendix C) and the CALPUFF post-processing program CALPOST. The analysis was conducted in accordance with the most recent guidance from the FLAG report (December 2000). The CALPUFF postprocessor model CALPOST is used to calculate the combined visibility effects from the different pollutants that are emitted from the proposed project. Daily background extinction coefficients are calculated on an hour-by-hour basis using hourly relative humidity data from CALMET and hygroscopic and non-hygroscopic extinction components specified in the FLAG document. For the Okefenokee NWA, the hygroscopic and non-hygroscopic components are 0.9 and 8.5 inverse megameter (Mm^{-1}). CALPOST then calculates the percent extinction change for each day of the year.

2.7.3 RESULTS

As discussed in the 2004 Lime Kiln PSD application, the project's maximum visibility impairment is predicted at Okefenokee NWA to be below the FLM's screening criteria of 5 percent change. As a result, since the proposed project's regional haze maximum impacts are below the FLM's screening criteria at the PSD Class I area, it is expected the proposed project would not have an adverse impact on the existing regional haze at the PSD Class I area of the Okefenokee NWA.

2.8 NITROGEN AND SULFUR DEPOSITION

2.8.1 GENERAL METHODS

As part of the AQRV analyses, total nitrogen (N) and sulfur (S) deposition rates were predicted for the proposed project at the Okefenokee NWA. The deposition analysis criterion is based on the annual averaging period. The total N and S deposition is estimated in units of kilogram per hectare per year (kg/ha/yr). The CALPUFF model is used to predict wet and dry deposition fluxes of various oxides of these elements.

For N deposition, the species include:

- Particulate ammonium nitrate (from species NO_3), wet and dry deposition;
- Nitric acid (species HNO_3), wet and dry deposition;
- NO_x dry deposition; and
- Ammonium sulfate (species SO_4), wet and dry deposition.

For S deposition, the species include:

- SO_2 wet and dry deposition, and
- SO_4 wet and dry deposition.

The CALPUFF model produces results in units of micrograms per square meter per second ($\mu g/m^2/s$). The modeled deposition rates are then converted to N and S deposition in kilograms per hectare, respectively, by using a multiplier equal to the ratio of the molecular weights of the substances (refer to the IWAQM Phase 2 report, Section 3.3).

The deposition analysis threshold (DAT) for N of 0.01 kg/ha/yr was provided by the USFWS (January 2002). A DAT is the additional amount of N or S deposition within a Class I area, below which estimated impacts from a proposed new or modified source are considered insignificant. The maximum N and S deposition predicted for the proposed GP project is, therefore, compared to these DAT or significant impact levels.

2.8.2 RESULTS

The maximum predicted N and S depositions predicted for the project in the PSD Class I area of the Okefenokee NWA are summarized in the 2004 Lime Kiln PSD Application. The maximum N and S deposition rates for the project are predicted to below the DAT of 0.01 kg/ha/yr.

In addition, although the project's impacts are predicted to be above the DAT for S deposition at the Class I area, the soils and vegetation are not sensitive to the very low deposition rates predicted for the project. As discussed above, the dominant soil of the Okefenokee NWA is the organic histosols with extremely high buffering capacities. This soil is resistant to acidic atmospheric inputs. The average buffering capacity of histosols is 765,000 equivalence per hectare (eq/ha) [Florida Acid Deposition Study (FADS), 1986]. As acid inputs (*e.g.*, HNO_3^{-1} and $H_2SO_4^{-2}$), the maximum predicted N and S deposition rates are extremely small compared to the buffering capacity of the soils in the Okefenokee NWA. These deposition rates are also small compared to the observed N and S deposition obtained from the FADS. Measurements taken at a rural site in Jefferson County, about 120 miles west-southwest of the Okefenokee NWA, found total (*i.e.*, wet and dry) N and S deposition rates of 304 and 474 eq/ha/yr, respectively, over a 3-year period (FADS, 1986).

The relatively low sensitivity of the soils to acid inputs coupled with the extremely low ground level concentrations of contaminants projected for the Okefenokee NWA from the project emissions precludes any significant impact on soils. Similarly, the total annual N and S deposition rates at the Okefenokee NWA as a result of the project are not expected to alter soil and/or groundwater pH that may result in adverse effects on vegetation.

3.0 ADDITIONAL IMPACT ANALYSIS ON THE CHASSAHOWITZKA NWA CLASS I AREA

3.1 INTRODUCTION

As discussed above, the GP Palatka Mill is subject to the PSD new source review requirements for SO_2, NO_x, PM, PM_{10}, CO, VOC, and SAM. The analysis presented in this section addresses the potential impacts on vegetation, soils, and wildlife of the Chassahowitzka NWA Class I area due to the proposed GP Palatka Mill project. The Chassahowitzka NWA is located approximately 137 km southwest of the GP Palatka Mill. In addition, potential impacts upon visibility resulting from the proposal modification are assessed.

The analysis demonstrates that the increase in impacts due to the proposed project is extremely low. Regardless of the existing conditions in the vicinity of the Class I area, the proposed project will not cause any significant adverse effects due to the predicted low impacts upon these areas.

3.2 SOIL, VEGETATION, AND AQRV ANALYSIS METHODOLOGY

This analysis uses the maximum air quality impacts predicted to occur in the Chassahowitzka NWA Class I area due to the increase in the proposed project's emissions. These impacts are summarized in the 2004 Lime Kiln PSD application

The analysis involved predicting worst-case maximum short- and long-term concentrations of pollutants in the Class I area and comparing the maximum predicted concentrations to lowest observed effect levels for AQRVs or analogous organisms. In conducting the assessment, several assumptions were made as to how pollutants interact with the different matrices, *i.e.*, vegetation, soils, wildlife, and aquatic environment.

A screening approach was used to evaluate potential effects by comparison of the maximum predicted ambient concentrations with effect threshold limits for the pollutant of concern, for vegetation and wildlife, as reported in the scientific literature. A literature search was conducted which specifically addressed the effects of air contaminants on plant species reported to occur in the Class I area. It was recognized that effects threshold information is not available for all species found in the Chassahowitzka NWA, although studies have been performed on a few of the common species and on other similar species, which can be used as models.

3.3 IDENTIFICATION OF AQRVS AND METHODOLOGY

An AQRV analysis was conducted to assess the potential risk to AQRVs of the Chassahowitzka NWA due to the proposed emissions from the GP project. The U.S. Department of the Interior in 1978 administratively defined AQRVs to be:

> *All those values possessed by an area except those that are not affected by changes in air quality and include all those assets of an area whose vitality, significance, or integrity is dependent in some way upon the air environment. These values include visibility and those scenic, cultural, biological, and recreational resources of an area that are affected by air quality.*
>
> *Important attributes of an area are those values or assets that make an area significant as a national monument, preserve, or primitive area. They are the assets that are to be preserved if the area is to achieve the purposes for which it was set aside (Federal Register, 1978).*

Except for visibility, AQRVs were not specifically defined. However, odor, soil, flora, fauna, cultural resources, geological features, water, and climate generally have been identified by land managers as AQRVs. Since specific AQRVs have not been identified for the Chassahowitzka NWA, this AQRV analysis evaluates the effects of air quality on general vegetation types and wildlife found in the Chassahowitzka NWA.

Vegetation type AQRVs and their representative species types have been defined by the USFWS as:

- Marshlands - black needlerush, saw grass, salt grass, and salt marsh cordgrass
- Marsh Islands - cabbage palm and eastern red cedar
- Estuarine Habitat - black needlerush, salt marsh cordgrass, and wax myrtle
- Hardwood Swamp - red maple, red bay, sweet bay, and cabbage palm
- Upland Forests - live oak, scrub oak, longleaf pine, slash pine, wax myrtle, and saw palmetto
- Mangrove Swamp - red, white, and black mangrove

Wildlife AQRVs have been identified as endangered species, waterfowl, marsh and waterbirds, shorebirds, reptiles, and mammals.

The maximum pollutant concentrations predicted for the project in the Chassahowitzka NWA are presented in Table 9-1. These results were compared with effect threshold limits for both vegetation and wildlife as reported in the scientific literature. A literature search was conducted that specifically addressed the effects of air contaminants on plant species reported to occur in the Chassahowitzka NWA. While the literature search focused on such species as cabbage palm, eastern red cedar, lichens, and species of the hardwood swamplands and mangrove forest, no specific citations that addressed these species were found. It is recognized that effect threshold information is not available for all species found in the Chassahowitzka NWA, although studies have been performed on a few of the common species and on other similar species that can be used as indicators of effects.

3.4 IMPACTS TO SOILS

For soils, the potential and hypothesized effects of atmospheric deposition include:

- Increased soil acidification,
- Alteration in cation exchange,
- Loss of base cations, and
- Mobilization of trace metals.

The potential sensitivity of specific soils to atmospheric inputs is related to two factors. First, the physical ability of a soil to conduct water vertically through the soil profile is important in influencing the interaction with deposition. Second, the ability of the soil to resist chemical changes, as measured in terms of pH and soil cation exchange capacity (CEC), is important in determining how a soil responds to atmospheric inputs.

The soils of the Chassahowitzka NWA are generally classified as histosols. According to the U.S. Department of Agriculture (USDA) Soil Surveys of Citrus and Hernando Counties, nine soil complexes are found in the Chassahowitzka NWA. These include Aripeka fine sand, Aripeka-Okeelanta-Lauderhill, Hallendale-Rock outcrop, Homosassa mucky fine sandy loam, Lacooche, Okeelanta mucks, Okeelanta-Lauderdale-Terra Ceia mucks, Rock outcrop-Homosassa-Lacoochee, and Weekiwachee-Durbin mucks (Porter, 1996). The majority of the soil complexes found in the Chassahowitzka NWA are inundated by tidal waters, contain a relatively high organic matter content, and have high buffering capacities based on their CEC, base saturation, and bulk density. The regular flooding of these soils by the Gulf of Mexico regulates the pH and any change in acidity in the soil would be buffered by this activity. Therefore, they would be relatively insensitive to atmospheric inputs. However, Terra Ceia, Okeelanta, and Lauderdale freshwater mucks are present along the eastern border of the Chassahowitzka NWA, and may be more sensitive to atmospheric sulfur deposition (Porter, 1996). Although not tidally influenced, these freshwater mucks are highly organic and, therefore, have a relatively high intrinsic buffering capacity.

The relatively low sensitivity of the soils to atmospheric inputs coupled with the extremely low ground-level pollutant concentrations due to the project at the Chassahowitzka NWA precludes any significant impact on soils.

3.5 IMPACTS TO VEGETATION

In general, the effects of air pollutants on vegetation occur primarily from SO_2, NO_2, O_3, and PM. Effects from minor air contaminants, such as fluoride (F), chlorine, hydrogen chloride, ethylene, ammonia, hydrogen sulfide, CO, and pesticides, have also been reported in the literature. The effects of air pollutants are dependent both on the concentration of the contaminant and the duration of the exposure. The term "injury," as opposed to damage, is commonly used to describe all plant responses to air contaminants and will be used in the context of this analysis. Air contaminants are thought to interact primarily with plant foliage, which is considered to be the major pathway of exposure. For purposes of this analysis, it was assumed that 100 percent of each air contaminant of concern is accessible to the plants.

Injury to vegetation from exposure to various levels or air contaminants can be termed acute, physiological, or chronic. Acute injury occurs as a result of a short-term exposure to a high contaminant concentration and is typically manifested by visible injury symptoms ranging from chlorosis (discoloration) to necrosis (dead areas). Physiological or latent injury occurs as the result of a long-term exposure to contaminant concentrations below that which results in acute injury symptoms. Chronic injury results from repeated exposure to low concentrations over extended periods of time, often without any visible symptoms, but with some effect on the overall growth and productivity of the plant. In this assessment, 100 percent of the particular air pollutant in the ambient air was assumed to interact with the vegetation. This is a conservative approach.

The concentrations of the pollutants, duration of exposure and frequency of exposures influence the response of vegetation and wildlife to atmospheric pollutants. The pattern of pollutant exposure expected from the facility is that of a few episodes of relatively high ground-level concentrations, which occur during certain meteorological conditions interspersed with long periods of extremely low ground-level concentrations. If there are any effects of stack emissions on plants and animals they will be from the short-term, higher doses. A dose is the product of the concentration of the pollutant and duration of the exposure.

3.5.1 NITROGEN DIOXIDE

NO_2 can injure plant tissue with symptoms usually appearing as irregular white to brown collapsed lesions between the leaf veins and near the margins. Conversely, non-injurious levels of NO_2 can be absorbed by plants, enzymatically transformed into ammonia, and incorporated into plant constituents such as amino acids (Matsumaru *et al.*, 1979).

Plant damage can occur through either acute (short-term, high concentration) or chronic (long-term, relatively low concentration) exposure. For plants that have been determined to be more sensitive to NO_2 exposure than others, acute (1, 4, 8 hours) exposure caused 5 percent predicted foliar injury at concentrations ranging from 3,800 to 15,000 $\mu g/m^3$ (Heck and Tingey, 1979). Chronic exposure of selected plants (some considered NO_2-sensitive) to NO_2 concentrations of 2,000 to 4,000 $\mu g/m^3$ for 213 to 1,900 hours caused reductions in yield of up to 37 percent and some chlorosis (Zahn, 1975).

The maximum NO_2 concentration due to the increase in emissions from the GP project is predicted to be less than 0.1 percent of the levels that cause foliar injury in acute exposure scenarios. By comparison of published toxicity values for NO_2 exposure to long-term (annual averaging time) modeled concentrations, the possibility of plant damage in the Chassahowitzka NWA Class I area can be examined for chronic exposure situations. For a chronic exposure, the maximum annual average NO_2 concentration due to the project in the Chassahowitzka NWA Class I area is less than 0.01 percent of the levels that caused minimal yield loss and chlorosis in plant tissue. Average and maximum background 24-hour average concentrations of NO_2 reported in the Chassahowitzka NWA are 0.006 and 0.104 $\mu g/m^3$, respectively.

Although it has been shown that simultaneous exposure to SO_2 and NO_2 results in synergistic plant injury (Ashenden and Williams, 1980), the magnitude of this response is generally only 3 to 4 times greater than either gas alone and usually occurs at unnaturally high levels of each gas. Therefore, the concentrations within the Chassahowitzka NWA are still far below the levels that potentially cause plant injury for either acute or chronic exposure.

3.5.2 SULFUR DIOXIDE

Sulfur is an essential plant nutrient usually taken up as sulfate ions by the roots from the soil solution. When sulfur dioxide in the atmosphere enters the foliage through pores in the leaves, it reacts with water in the leaf interior to form sulfite ions. Sulfite ions are highly toxic. They interact with enzymes, compete with normal metabolites, and interfere with a variety of cellular functions (Horsman and Wellburn, 1976). However, within the leaf, sulfite is oxidized to sulfate ions, which can then be used by the plant as a nutrient. Small amounts of sulfite may be oxidized before they prove harmful.

SO_2 gas at sufficiently elevated levels has long been known to cause injury to plants. Acute SO_2 injury usually develops within a few hours or days of exposure, and symptoms include marginal, flecked, and/or intercoastal necrotic areas that appear water-soaked and dullish green initially. This injury generally occurs to younger leaves. Chronic injury usually is evident by signs of chlorosis, bronzing, premature senescence, reduced growth, and possible tissue necrosis (EPA, 1982). Background levels of SO_2 in the Chassahowitzka NWA average 1.3 $\mu g/m^3$, with a maximum 24-hour average concentration of 14.5 $\mu g/m^3$ (IMPROVE, 2002). Observed SO_2 effect levels for several plant species and plant sensitivity groupings are presented in Tables 1-2 and 1-3, respectively.

Many studies have been conducted to determine the effects of high-concentration, short-term SO_2 exposure on natural community vegetation. Sensitive plants include ragweed, legumes, blackberry, southern pine, and red and black oak. These species are injured by exposure to 3-hour average SO_2 concentrations of 790 to 1,570 $\mu g/m^3$. Intermediate plants include locust and sweetgum. These species are injured by exposure to 3-hour average SO_2 concentrations of 1,570 to 2,100 $\mu g/m^3$. Resistant species (injured at concentrations above 2,100 $\mu g/m^3$ for 3 hours) include white oak and dogwood (EPA, 1982).

A study of native Floridian species (Woltz and Howe, 1981) demonstrated that cypress, slash pine, live oak, and mangrove exposed to 1,300 $\mu g/m^3$ SO_2 for 8 hours were not visibly damaged. This finding supports the levels cited by other researchers on the effects of SO_2 on vegetation. A corroborative study (McLaughlin and Lee, 1974) demonstrated that approximately 20 percent of a cross-section of plants ranging from sensitive to tolerant was visibly injured at 3-hour average SO_2 concentrations of 920 $\mu g/m^3$.

Jack pine seedlings exposed to SO_2 concentrations of 470 to 520 $\mu g/m^3$ for 24 hours demonstrated inhibition of foliar lipid synthesis; however, this inhibition was reversible (Malhotra and Kahn, 1978). Black oak exposed to 1,310 $\mu g/m^3$ SO_2 for 24 hours a day for 1 week demonstrated a 48 percent reduction in photosynthesis (Carlson, 1979).

Two lichen species indigenous to Florida exhibited signs of SO_2 damage in the form of decreased biomass gain and photosynthetic rate as well as membrane leakage when exposed to concentrations of 200 to 400 $\mu g/m^3$ for 6 hours/week for 10 weeks (Hart *et al.*, 1988).

The maximum 24-hour average SO_2 concentration increase that is predicted for the proposed project at the Chassahowitzka NWA Class I area is less than 1 $\mu g/m^3$. When added to the maximum 24-hour average background concentration of 14.5 $\mu g/m^3$ at the Chassahowitzka NWA, the maximum worst-case total SO_2 concentration is less than 15 $\mu g/m^3$, which is much lower than those known to cause damage to test species. The modeled annual incremental increase in SO_2 adds slightly to background levels of this gas and poses only a minimal threat to area vegetation.

3.5.3 PARTICULATE MATTER (PM_{10})

Although information pertaining to the effects of PM on plants is scarce, some threshold concentrations are available. Mandoli and Dubey (1998) exposed ten species of native Indian plants to levels of PM ranging from 210 to 366 $\mu g/m^3$ for an 8-hour averaging period. Damage in the form of a higher leaf area/dry weight ratio was observed at varying degrees for most plants tested. Concentrations of PM lower than 163 $\mu g/m^3$ did not appear to be injurious to the tested plants.

By comparison of these published toxicity values for PM exposure (*i.e.*, concentrations for an 8-hour averaging time), the possibility of plant damage in the Chassahowitzka NWA can be determined. The maximum predicted short term PM_{10} concentration due to the increase in emissions resulting from the proposed project at the Chassahowitzka NWA Class I area is less than 0.1 $\mu g/m^3$. This concentration is less than 1 percent of the lower threshold value that reportedly affects plant foliage. As a result, no effects to vegetative AQRVs are expected from the project's emissions.

3.5.4 CARBON MONOXIDE

As with PM_{10}, information pertaining to the effects of CO on plants is scarce. The main effect of high concentrations of CO is the inhibition of cytochrome *c* oxidase, the terminal oxidase in the mitochondrial electron transfer chain. Inhibition of cytochrome *c* oxidase depletes the supply of

ATP, the principal donor of free energy required for cell functions. However, this inhibition only occurs at extremely high concentrations of CO. Pollok *et al.* (1989) reported that exposure to CO:O_2 ratio of 25 (equivalent to an ambient CO concentration of 6.85 x 10^6 μg/m^3) resulted in stomatal closure in the leaves of the sunflower (*Helianthus annuus*). Naik *et al.* (1992) reported cytochrome *c* oxidase inhibition in corn, sorghum, millet, and Guinea grass at CO:O_2 ratios of 2.5 (equivalent to an ambient CO concentration of 6.85 x 10^5 μg/m^3). These plants were considered the species most sensitive to CO-induced inhibition of cytochrome *c* oxidase.

By comparison of published effect values for CO exposure, the possibility of plant damage in the Class I area can be determined. The maximum 1-hour (most conservative) estimated CO concentration due to the increase in emissions resulting from the proposed project in the Chassahowitzka NWA Class I area is less than 1 μg/m^3. This concentration is less than 0.01 percent of the value that caused inhibition in laboratory studies. The amount of damage sustained at this level (if any) for 1 hour would have negligible effects over an entire growing season. The predicted maximum annual CO concentration is less than 0.001 percent of the value that caused cytochrome *c* oxidase inhibition.

3.5.5 SULFURIC ACID MIST

Acidic precipitation or acid rain is coupled to SO_2 emissions mainly formed during the burning of fossil fuels. This pollutant is oxidized in the atmosphere and dissolves in rain forming SAM, which falls as acidic precipitation (Ravera, 1989). Although concentration data are not available, SAM has been reported to yield necrotic spotting on the upper surfaces of leaves (Middleton *et al.*, 1950).

No significant adverse effects on vegetation are expected from the project's emissions because SO_2 concentrations, which lead directly to the formation of SAM concentrations, are predicted to be well below levels that have been documented as negatively affecting vegetation. During the last decade, much attention has been focused on acid rain. Acidic deposition is an ecosystem-level problem that affects vegetation because of some alterations of soil conditions such as increased leaching of essential base cations or elevated concentrations of aluminum in the soil water (Goldstein *et al.*, 1985). Although effects of acid rain in eastern North America have been well published and publicized, detrimental effects of acid rain on Florida vegetation are lacking documentation.

3.5.6 VOC EMISSIONS AND IMPACTS ON OZONE

It is difficult to predict what effect the proposed increase in emissions of VOC will have on ambient O_3 concentrations on a regional scale. VOC and NO_x emissions are precursors to the formation of O_3. O_3 is not directly emitted from fuel combustion, but is formed down-wind from emission sources when VOC and NO_x emissions react in the presence of sunlight. Natural (without man-made sources) ambient concentrations of O_3 are normally in the range of 20 to 39 $\mu g/m^3$ (0.01 to 0.02 ppm) (Heath, 1975).

The nearest monitors to the GP Palatka Mill that measure O_3 concentrations are located in Gainesville (AIRS No. 12-001-0025 and 12-001-3011). These stations measure concentrations according to EPA procedures. Based on the O_3 monitoring concentrations measured over the last several years in Gainesville (see Table 4-1), the region is in attainment of the existing 1-hour O_3 AAQS as well as the new 8-hour O_3 AAQS.

O_3 can cause various damage to broad-leaved plants including: tissue collapse, interveinal necrosis and markings on the upper surface leaves know as stippling (pigmented yellow, light tan, red brown, dark brown, red, or purple), flecking (silver or bleached straw white), mottling, chlorosis or bronzing, and bleaching. O_3 can also stunt plant growth and bud formation. On certain plants such as citrus, grape, and tobacco, it is common for leaves to wither and drop early.

As described in above, the VOC emissions due to the proposed GP project represent less than 1-percent increase in regional VOC emissions. Therefore, the effects of O_3, as a result of VOC emissions from the project, are expected to be insignificant.

3.5.7 SUMMARY

In summary, the phytotoxic effects from the project's emissions are minimal. It is important to note that the emissions were conservatively modeled with the assumption that 100 percent was available for plant uptake. This is rarely the case in a natural ecosystem.

3.6 <u>IMPACTS TO WILDLIFE</u>

The major air quality risk to wildlife in the United States is from continuous exposure to pollutants above the NAAQS. This occurs in non-attainment areas, *e.g.*, Los Angeles Basin. Risks to wildlife also may occur for wildlife living in the vicinity of an emission source that experiences frequent upsets or episodic conditions resulting from malfunctioning equipment, unique meteorological conditions, or startup operations (Newman and Schreiber, 1988). Under these conditions, chronic effects (*e.g.*, particulate contamination) and acute effects (*e.g.*, injury to health) have been observed (Newman, 1981).

A wide range of physiological and ecological effects to fauna has been reported for gaseous and particulate pollutants (Newman, 1981; Newman and Schreiber, 1988). The most severe of these effects have been observed at concentrations above the secondary AAQS. Physiological and behavioral effects have been observed in experimental animals at or below these standards.

For impacts on wildlife, the lowest threshold values of SO_2, NO_2, and particulates that are reported to cause physiological changes are shown in Table 2-2. These values are orders of magnitude larger than maximum concentrations predicted for the GP project at the Chassahowitzka NWA Class I area. No effects on wildlife AQRVs from SO_2, NO_2, and particulates are expected. The proposed project's contribution to cumulative impacts is expected to be negligible.

3.7 IMPACTS ON VISIBILITY

3.7.1 INTRODUCTION

The CAA Amendments of 1977 provide for implementation of guidelines to prevent visibility impairment in mandatory Class I areas. The guidelines are intended to protect the aesthetic quality of these pristine areas from reduction in visual range and atmospheric discoloration due to various pollutants. Sources of air pollution can cause visible plumes if emissions of PM_{10} and NO_x are sufficiently large. A plume will be visible if its constituents scatter or absorb sufficient light so that the plume is brighter or darker than its viewing background (e.g., the sky or a terrain feature, such as a mountain). PSD Class I areas, such as national parks and wilderness areas, are afforded special visibility protection designed to prevent plume visual impacts to observers within a Class I area.

Visibility is an AQRV for the Chassahowitzka NWA. Visibility can take the form of plume blight for nearby areas or regional haze for long distances (e.g., distances beyond 50 km). Because the Chassahowitzka NWA is more than 50 km from the GP Palatka Mill, the potential change in visibility is analyzed as regional haze.

Currently, there are several air quality modeling approaches recommended by the Interagency Workgroup on Air Quality Models (IWAQM) to perform these analyses. The IWAQM consists of EPA and FLM of Class I areas who are responsible for ensuring that AQRVs are not adversely impacted by new and existing sources. These recommendations have been summarized in two documents:

- *Interagency Workgroup on Air Quality Models (IWAQM), Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts* (EPA, 1998), referred to as the IWAQM Phase 2 report; and
- *Federal Land Managers' Air Quality Related Values Workgroup (FLAG), Phase I Report,* USFS, NPS, USFWS (December 2000), referred to as the FLAG document.

The methods and assumptions recommended in these documents were used to assess visibility impairment due to the project.

3.7.2 METHODOLOGY

Based on the FLAG document, current regional haze guidelines characterize a change in visibility by the change in the light-extinction coefficient (b_{ext}). The b_{ext} is the attenuation of light per unit distance due to the scattering and absorption by gases and particles in the atmosphere. A change in the extinction coefficient produces a perceived visual change. An index that simply quantifies the percent change in visibility due to the operation of a source is calculated as:

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

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

The purpose of the visibility analysis is to calculate the extinction at each receptor for each day (24-hour period) of the year due to the proposed project. The criteria to determine if the project's impacts are potentially significant are based on a change in extinction of 5 percent or greater for any day of the year.

Processing of visibility impairment for this study was performed with the CALPUFF model (see Appendix D) and the CALPUFF post-processing programs POSTUTIL and CALPOST. The analysis was conducted in accordance with the most recent guidance from the FLAG report (December 2000). The CALPUFF postprocessor model CALPOST is used to calculate the combined visibility effects from the different pollutants that are emitted from the project. Daily background extinction coefficients are calculated on an hour-by-hour basis using hourly relative humidity data from CALMET and hygroscopic and non-hygroscopic extinction components specified in the FLAG document. For the Chassahowitzka NWA Class I area evaluated, the hygroscopic and non-hygroscopic components are 0.9 and 8.5 inverse mega meter (Mm^{-1}). CALPOST then predicts the percent extinction change for each day of the year.

3.7.3 RESULTS

The results of the refined analysis for regional haze are presented in the 2004 Lime Kiln.PSD permit application. As shown in this table, the project's maximum visibility impairment is predicted at Chassahowitzka NWA, to be less than the FLM's screening criteria of 5 percent change. As a result, since the proposed project's regional haze maximum impacts are below the FLM's screening criteria at the PSD Class I area, it is expected the proposed project would not have an adverse impact on the existing regional haze at the PSD Class I area of the Chassahowitzka NWA.

3.8 NITROGEN AND SULFUR DEPOSITION

3.8.1 GENERAL METHODS

As part of the AQRV analyses, total nitrogen (N) and total sulfur (S) deposition rates were predicted at the Chassahowitzka NWA Class I area. The deposition analysis threshold is based on the annual averaging period. The total nitrogen and sulfur deposition is estimated in units of kilogram per hectare per year (kg/ha/yr). The CALPUFF model is used to predict wet and dry deposition fluxes of various oxides of these elements.

For N deposition, the species include:

- Particulate ammonium nitrate (from species NO_3), wet and dry deposition;
- Nitric acid (species HNO_3), wet and dry deposition;
- NO_x, dry deposition; and
- Ammonium sulfate (species SO_4), wet and dry deposition.

For S deposition, the species include:

- SO_2, wet and dry deposition; and
- SO_4, wet and dry deposition.

The CALPUFF model produces results in units of $\mu g/m^2/s$. The modeled deposition rates are then converted to N and S deposition in kg/ha, respectively, by using a multiplier equal to the ratio of the molecular weights of the substances (refer to IWAQM Phase 2 report, Section 3.3).

The DAT for nitrogen of 0.01 kg/ha/yr was provided by the USFWS (January 2002). A DAT is the additional amount of N or S deposition within a Class I area, below which estimated impacts from a proposed new or modified source are considered insignificant. The maximum N and S deposition predicted for the proposed GP project is, therefore, compared to these DAT or significant impact levels.

3.8.2 RESULTS

The maximum predicted N and S depositions predicted for the Project in the PSD Class I area of the Chassahowitzka NWA are summarized in the 2004 Lime Kiln PSD application. The maximum N and S deposition rates for the project are predicted to be below the DAT of 0.01 kg/ha/yr. Although the project's impacts are predicted to be above the DAT for S deposition at the Class I area, the soils and vegetation are not sensitive to the very low deposition rates predicted for the project.

As discussed in above, the dominant soil of Chassahowitzka NWA is the organic histosols with extremely high buffering capacities. This soil is resistant to acidic atmospheric inputs. The average buffering capacity of histosols is 765,000 eq/ha (FADS, 1986). The predicted deposition rates are extremely small compared to the buffering capacity of the soils in the Chassahowitzka NWA. These deposition rates are also small compared to the observed N and S deposition obtained from the FADS. Measurements taken at a rural site in Pasco County, about 60 miles southeast of the Chassahowitzka NWA, found total (*i.e.*, wet and dry) N and S deposition rates of 366 and 491eq/ha/yr, respectively, over a 3-year period (FADS, 1986). The relatively low sensitivity of the soils to acid inputs coupled with the extremely low ground-level concentrations of contaminants projected for the Chassahowitzka NWA from the project emissions precludes any significant impact on soils. Similarly, the total annual N and S deposition rates as a result of the project at the Chassahowitzka NWA are not expected to alter soil and/or groundwater pH that may result in adverse effects on vegetation.

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Department of
Environmental Protection

Jeb Bush
Governor

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

Colleen M. Castille
Secretary

October 1, 2004

CERTIFIED MAIL – Return Receipt Requested

Mr. Theodore D. Kennedy
Vice President – Palatka Operations
Georgia-Pacific
Palatka Mill
P.O. Box 919
Palatka, Florida 32178-0919

RE: Request to Replace the Lime Kiln Shell and Associated Tube Coolers
Project No.: 1070005-030-AC/PSD-FL-345

Dear Mr. Kennedy:

On September 4, 2004, the Department received a request to replace a portion of the lime kiln shell and all of the associated tube coolers. Based on our review of the proposed project, we have determined that the following additional information is needed in order to continue processing this application package. Please provide all assumptions, calculations, and reference material(s), that are used or reflected in any of your responses to the following issues:

1. Please provide the cost analysis for this project, which is the replacement of a portion of the existing lime kiln shell and the ten (10) tube coolers. Also, please provide the cost analysis of a new lime kiln with tube coolers of like-and-kind pursuant to the definition of an "affected facility" in accordance to 40 CFR 60, Subpart BB.

2. Will the replacement portion of the lime kiln shell be exactly the same size and diameter as the existing section that is being replaced?

3. Based on the write-up in the Executive Summary, you are claiming that the "existing coolers are causing excessive stress on the Kiln shell," therefore all of the coolers need to be replaced and the new bracket will relieve the stress on the new Kiln shell.
    a. With the knowledge that the coolers have caused the stress on the Kiln shell, then why are you going to replace the equipment with more of the same that could potentially cause damage to the new section being replaced? Please explain.
    b. Why can't the existing coolers be used and just replace their attachment bracket?
    c. What are the manufacturer's original design criteria for the existing tube coolers? For each existing tube cooler, please include the processing throughput rates, the inlet air temperature and the exit temperature, the diameter and length, and the volumetric flow rates.
    d. For the new tube coolers, what are the manufacturer's design criteria. For each new tube cooler, please include the processing throughput rates, the inlet air temperature and the exit temperature, the diameter and length, and the volumetric flow rates.

4. For PSD purposes, please provide the daily production rate of the lime kiln for the last two years (24-months) in order to determine the baseline production rate of the lime kiln; and, please include 2004 data.

5. With the proposed activity of the lime kiln and its associated coolers, are there any other changes being made to the burner, the induced draft fan, the control device, or any other part of the lime kiln operation? If any, please provide a detailed description of the proposed changes.

"More Protection, Less Process"

6. Even though the presentation is attempting to state that the Kiln shell portion and tube coolers that are being replaced are part of a maintenance project, will the proposed changes allow for an increase in production from its present configuration and operation?

7. Will there be an increased production from the baseline production rate (see No. 4, above) felt after the proposed changes are completed?

8. Please provide an explanation as to why the volumetric flow rate increased in the lime kiln between the years 1991 and 1995 to present years. Did the mill do anything to the control system, including changes to the induced draft fan system? What was the manufacturer's design flow rate? Please provide the specifications from the original vendor on the design flow rate.

9. Due to our awareness of the proposed upcoming applications for the Combination Boiler No. 4 and the No. 4 Recovery Boiler, we consider them to be contemporaneous with this project as a Phased PSD project. We also consider the changes made to the mill for the last five years to be contemporaneous to this project. Therefore, for significant impact analyses, increment consumption and ambient air quality impact analyses, please combine these projects with this project for these evaluations.

10. Pursuant to Rule 62-212.400(5)(h)5., F.A.C., please provide the information relating to the air quality impacts of, and the nature and extent of, all general commercial, residential, industrial and other growth that has occurred since August 7, 1977, in the area the facility or modification would affect.

11. For the potential applicability of 40 CFR 60, Subpart BB, please use Appendix C, 40 CFR 60, to determine if there is/are an emissions rate increase for the pollutants affected by this project.

The Department will resume processing this application after receipt of the requested information. If you have any questions regarding this matter, please call Bruce Mitchell at (850)413-9198.

Sincerely,

Trina L Vielhauer

Trina L. Vielhauer
Chief
Bureau of Air Regulation

TLV/bm

cc: Gregg Worley, U.S. EPA, Region 4
Chris Kirts, NED
Myra J. Carpenter, GP
David A. Buff, P.E., GAI
John Bunyak, NPS
Bruce
Cleve

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Mr. Theodore D. Kennedy
Vice President - Palatka Oper.
Georgia-Pacific
Palatka Mill
P. O. Box 919
Palatak, FL 32178-0919

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