ANALYSIS FOR BEST AVAILABLE RETROFIT TECHNOLOGY –
EXEMPTION ANALYSIS
GEORGIA-PACIFIC CEDAR SPRINGS LLC

August 1, 2008 (Revised)

1.0 INTRODUCTION

1.1. Overview of the Regional Haze BART Process

Under regional haze regulations, the Environmental Protection Agency (EPA) has issued final guidelines dated July 6, 2005 for Best Available Retrofit Technology (BART) determinations (70 FR 39104-39172). The regional haze rule includes a requirement for BART for certain large stationary sources, such as Georgia-Pacific Cedar Springs LLC's (GP) pulp & paper facility in Cedar Springs, Georgia. Sources are BART-eligible if they meet three criteria concerning (1) potential emissions of visibility-impairing pollutants, (2) the date when the source was put in operation, and (3) whether they fall within one of the source categories listed in the guidance. The guidance requires a BART engineering evaluation using five statutory factors for any BART-eligible source that can be reasonably expected to cause or contribute to impairment of visibility in any Class I areas protected under the regional haze rule. (Note that, depending on the five factors, the evaluation may result in no control.) Air quality modeling is an important tool available to the States to determine whether a source can be reasonably expected to contribute to visibility impairment in a Class I area.

The process of making a BART determination consists of four steps:

> 1) Identify whether a source is "BART-eligible" based on its source category, when it was put in service, and the magnitude of its emissions of one or more "visibility-impairing" air pollutants. The BART guidelines list 26 categories of stationary sources that are BART-eligible. Sources must have been put in service between August 7, 1962 and August 7, 1977. Finally, a source is eligible for BART if potential emissions of visibility-impairing air pollutants are greater than 250 tons per year. Qualifying pollutants include primary particulate matter (PM_{10}) and gaseous precursors to secondary fine particulate matter, such as SO_2 and NO_x. Georgia Environmental Protection Division (EPD) has determined that neither ammonia nor volatile organic compounds (VOCs) should be included as visibility-impairing pollutants for BART eligibility.

2) Determine whether a BART-eligible source can be excluded from BART controls by demonstrating that the source cannot be reasonably expected to cause or contribute to visibility impairment in a Class I area. The preferred approach is an assessment with an air quality model such as CALPUFF or other appropriate model followed by comparison of the estimated 24-hour visibility impacts against a threshold above estimated natural conditions to be determined by the States. The threshold to determine whether a single source "causes" visibility impairment is set at 1.0 deciview (dv) change from natural conditions over a 24-hour averaging period in the final BART rule (70 FR 39118). The guidance also states that the proposed threshold at which a source may "contribute" to visibility impairment should not be higher than 0.5 dv although, depending on factors affecting a specific Class I area, it may be set lower than 0.5 dv. The test against the threshold is "driven" by the contribution level, since if a source "causes", by definition it "contributes".

3) Determine BART controls for the source by considering various control options and selecting the "best" alternative, taking into consideration:

a) Any pollution control equipment in use at the source (which affects the availability of options and their impacts),

b) The costs of compliance with control options,

c) The remaining useful life of the facility,

d) The energy and non air-quality environmental impacts of compliance, and

e) The degree of improvement in visibility that may reasonably be anticipated to result from the use of such technology.

If a source agrees to apply the most stringent controls available to BART-eligible units, the BART analysis is essentially complete and no further analysis is necessary (70 FR 39165).

4) Incorporate the BART determination into the State Implementation Plan for Regional Haze.

Step 2 described above reflects 40 CFR Part 51 Appendix Y which states that an eligible source "*can use dispersion modeling to determine that an individual source cannot reasonably be anticipated to cause or contribute to visibility impairment in a Class I area and thus is not subject to BART*." (70 FR 39162) This "individual source attribution approach" determines if a BART-eligible source (*i.e.,* collection of eligible emission units at a source) is predicted to cause or contribute to visibility impairment in a Class I area. As mentioned above, a predicted impact of 1.0 dv change or more is considered to "cause" visibility impairment, and a predicted impact of 0.5 dv change or more is considered to "contribute". Any source determined to cause or contribute to visibility impairment in any Class I area is subject to BART and will also complete additional visibility impact analyses.

1.2. Organization of the Report

Section 2 presents facility-specific information. Section 3 presents the contribution by VISTAS for the BART analyses. Section 4 summarizes the modeling approach, and model configuration. Section 5 presents the criteria and processing of model results to demonstrate what impairment, if any, the facility is predicted to create in the Class I areas. The CALPUFF model input and output files are provided on electronic media enclosed with this report, a file index for which is presented in the appendix.

2.0 SITE DESCRIPTION AND EMISSION INVENTORY

GP operates the Cedar Springs Mill in Early County. The facility is located in the southwestern portion of Georgia, approximately two miles west of the intersection of Highways 370 and 273, along the east bank of the Chattahoochee River. The facility manufactures unbleached linerboard and corrugating medium with virgin pulp using both the Kraft and neutral sulfite semi-chemical (NSSC) processes. Additional pulp is produced from recycled fiber sources, specifically old corrugated containers (OCC) and double-lined Kraft clippings (DLK). The facility is located in a rural area, with almost no residential areas are near the Mill. Figure 1 depicts the location of the Mill and illustrates the adjacent terrain. Table 1 presents the BART-eligible emission unit inventory for the BART exemption analysis.

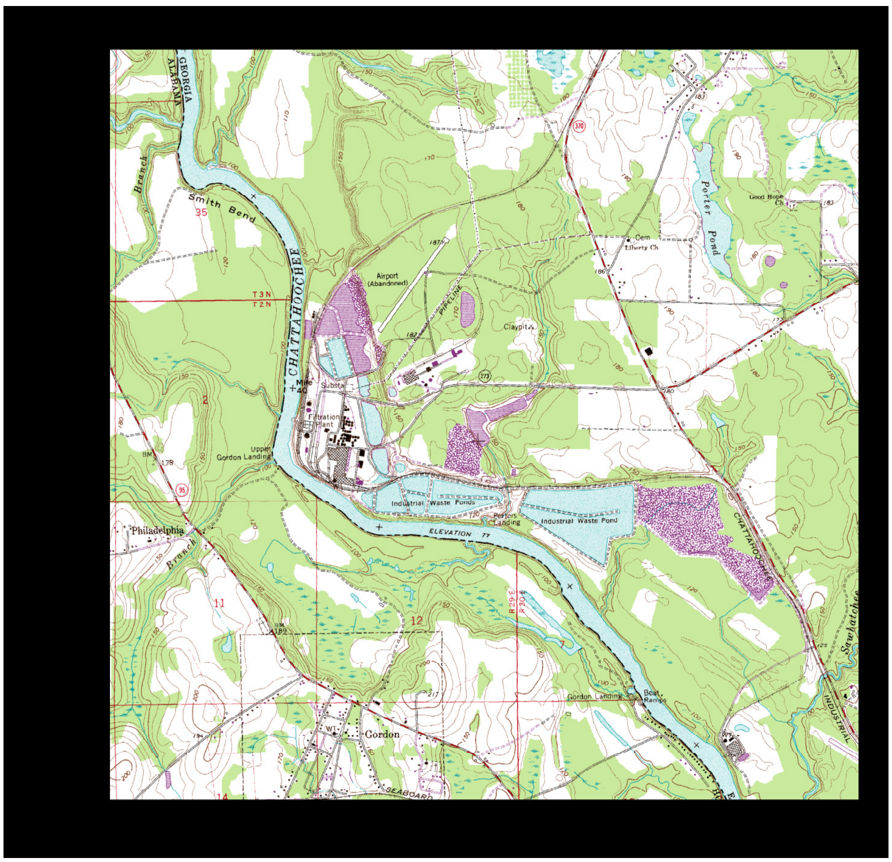
Table 1. Model Parameters for BART-Eligible Sources at GP Cedar Springs

Permit ID	Source Description	Stack Ht (ft)	LLC (km) ref: VISTAS		Elevation (ft)	Stack Diameter (ft)	Exit Velocity (ft/sec)	Exit Temp (deg F)
			East	North				
R402N	Recovery Boiler No. 3	247	1133.484	-905.071	117.1	9	44.7	413
R402S	Recovery Boiler No. 3	247	1133.483	-905.075	117.1	9	44.7	413
R406	Smelt Dissolving Tank No. 3	247	1133.500	-905.074	117.1	6	23.1	157
U500	Power Boiler No. 1	350	1133.491	-905.178	117.1	14.5	34.1	140
U501	Power Boiler No. 2	350	1133.501	-905.179	117.1	14.5	34.1	128
L600	Lime Kiln No. 1	82	1133.574	-904.843	117.1	6	31.7	170
L601	Lime Kiln No. 2	90	1133.558	-904.835	117.1	6	31.7	170

Table 2 presents the worst-case 24-hour average emissions for worst case 24-hr actual for existing sources submitted to EPD in July 2007. Emission rates for the smelt dissolving tank and recovery boiler reflect actual operating history during the baseline years evaluated by the Mill. Other sources have been modified since the baseline period as follows:

- Power Boiler 1 and 2 completed modifications in 2007 and 2008 for an overfire air system (by Mobotec), new Foster&Wheeler Low-NOx burners and wet scrubber improvements under existing permits. The Mill installed Continuous Emission Monitors (CEM) for sulfur dioxide and nitrogen oxides on Power Boiler 1 and 2 over the past 24 months.

- Lime Kiln 1 and 2 completed modifications with a lime mud dryer in June 2007. The mill installed a new wet scrubber on Lime Kiln 2 and accepted lower PM_{10} emission rates for both kilns.



The Mill has operated a CEM on Recovery Boiler No. 3 for sulfur dioxide periodically since November 2004 and nitrogen oxides for approximately 30 days in December 2006. Short-term emissions of SO_2 ranged from near zero to above 250 parts per million (ppm). For periods when black liquor is fired continuously at capacity, the average daily emission rates are lower.

Table 2. Base Case Emissions Inventory of Cedar Springs Mill BART Sources, Prepared July 2007

	24-hour Average Emission Rate (lb/hr)		
Emission Unit	**SO_2**	**NO_x**	**PM / PM_{10}**
Lime Kiln Nos. 1 and 2	30	30.93	29.8
Recovery Furnace No. 3	120	85	52.2
Smelt Dissolving Tank	14.1	2.6	15.2
Power Boiler No. 1	1377	262	63
Power Boiler No. 2	1377	262	63
Total	**2918**	**642.5**	**223.2**

Since early 2007, the Mill has been developing construction plans and an air permit application for the evaporator and recovery areas. The list of modified equipment includes the evaporation stage prior to the recovery boiler. In considering recovery boiler physical modifications, the Mill reviewed the BACT limits for its other two existing recovery boilers. The current air permit limits SO_2 emissions for Recovery Boiler Nos. 1 and 2 to 300 ppm. In addition, the Mill has continued to operate a SO_2 CEM for Recovery Boiler No. 3. The additional CEM data shows that the maximum daily emissions in the current operations can exceed 200 ppm. However, the mill expects that after the proposed evaporator are repairs are completed, that the boiler will be consistently run with higher solids content and thus more controllable for SO_2 emissions.

After discussions with EPD in September 2007, the Mill reviewed the hourly CEM data and the CALPUFF analyses. The Mill has determined that two operating scenarios are feasible following modifications to the evaporator, recovery and power boiler areas. These scenarios represent the range of SO_2 emission rates from the Recovery Boiler No. 3 and Power Boilers Nos. 1 and 2 that are being evaluated to demonstrate that the BART-eligible source at CSO does not cause or contribute to visibility impairment.

Scenario 1 - Improve evaporation and add caustic to existing wet scrubbers: Limit daily average Recovery Boiler No. 3 SO_2 emissions to 350 ppm when liquor is in the boiler.

Limit daily average Power Boiler Nos. 1 and 2 SO_2 emissions to 135 lbs/hr each.

Scenario 2 – Improve combustion on Recovery Boiler No. 3 and add caustic to existing wet scrubbers:

Limit daily average Recovery Boiler No. 3 SO_2 emissions to 90 ppm when liquor is in the boiler

Limit daily average Power Boiler Nos. 1 and 2 SO_2 emissions to 350 lbs/hr each.

Table 3 summarizes the emission rates for the two scenarios.

Table 3. Alternate Operating Scenarios: Emissions Inventory of Cedar Springs Mill

	Model ID	**SO_2 (lbs / hr)**
Scenario 1:		
Power Boiler No. 1	U500	135
Power Boiler No. 2	U501	135
Recovery Boiler No. 3 – North Stack	R402N	411
Recovery Boiler No. 3 – South Stack	R402S	411
Subtotal		**1,091**
Scenario 2:		
Power Boiler No. 1	U500	350
Power Boiler No. 2	U501	350
Recovery Boiler No. 3 – North Stack	R402N	106
Recovery Boiler No. 3 – South Stack	R402S	106
Subtotal		**911**

Optional equipment modifications for Scenario 1 include repaired concentrator sets, a new caustic day tank and control system with CEM for Power Boilers Nos. 1 and 2, and a new lift station to connect power boiler scrubber blowdown to the waste water treatment system.

Optional equipment modifications for Scenario 2 include new concentrator sets (potentially new evaporators and a crystallizer), a new multi-level air system for Recovery Boiler No. 3, a new caustic day tank and control system with CEM for Power

Boilers Nos. 1 and 2, and a new lift station to connect power boiler scrubber blowdown to the waste water treatment system. For normal operating times when liquor is in the boiler, Recovery Boiler No. 3 typically achieves the emission rates under Scenario 2 using the existing equipment.

Tables 4 and 5 summarize the emission rates modeled in the two BART exemption scenarios on a tons per year and pound per hour basis, respectively. SO_2 emissions represent potential emissions after the previously described modifications to the Recovery Boiler No. 3 and Power Boilers Nos. 1 and 2. SO_4 emissions are estimated as a percentage of the SO_2 mass emission rate based no the characteristics of fuel combusted in each emission unit. NO_X and PM_{10} emissions represent allowable emissions established by enforceable Emission Caps, Federal Rule Standards, and SIP Rule Standards in the current Title V Operating Permit No. 2631-099-0001-V-02-0 (February 21, 2007) and V-02-2 (April 18, 2007). Allowable emissions were modeled instead of actual emissions to confirm that these operating scenarios do not cause or contribute to visibility impairment and are therefore exempt from BART.

Table 4. Summary of BART Exemption Scenarios

	Emission Rate (tpy)			
Scenario	**SO_2**	**SO_4**	**NO_X**	**PM_{10}**
Base Case	12,781	569	2,814	978
Alternative Scenario 1	5,104	164	2,824	1,238
Alternative Scenario 2	4,136	166	2,824	1,238

Table 5. Summary of Modeled BART Exemption Alternative Scenarios

	24-hour Average Emission Rate (lb/hr)			
Source	**SO_2**	**SO_4***	**NO_X**	**PM_{10}**
Smelt Dissolving Tank No. 3	47.0	0	2.6	45.0
Lime Kiln No. 1	13.54	0.32	14.06	29.8†
Lime Kiln No. 2	16.25	0.36	16.87	29.8†
Subtotal	**76.8**	**0.68**	**33.53**	**104.6**
Scenario 1				
Recovery Boiler No. 3 – North	410.6	12.46	45	26.0
Recovery Boiler No. 3 – South	410.6	12.46	45	26.0
Power Boiler No. 1	135.0	5.94	262	63.0
Power Boiler No. 2	135.0	5.94	262	63.0
Scenario 2				
Recovery Boiler No. 3 – North	105.6	3.20	45	26.0
Recovery Boiler No. 3 – South	105.6	3.20	45	26.0
Power Boiler No. 1	350.0	15.4	262	63.0
Power Boiler No. 2	350.0	15.4	262	63.0
Total Scenario 1	**1167.9**	**37.5**	**647.5**	**282.6**
Total Scenario 2	**987.9**	**37.9**	**647.5**	**282.6**

* SO_4 emissions are estimated as a fixed percentage of the SO_2 mass emission rate based on the characteristics of fuels combusted. The SO_4/SO_2 fractions utilized are approximately 2.3% for lime kilns, 3.0% for recovery boilers, and 4.4% for power boilers.

† PM_{10} emissions from each lime kiln were conservatively modeled as the total allowable emission rate from both lime kilns (i.e., 17.62 lb/hr for Lime Kiln No.1 and 12.28 lb/hr for Lime Kiln No. 2).

The analysis applied PM_{10} speciation profiles provided by National Council for Air & Stream Improvement[1] and the National Park Service[2] to determine emission rates for all other visibility affecting pollutants modeled in CALPUFF. Table 6 presents speciated emission rates for each emission unit. Note that the speciation profile was applied using the POSTUTIL module to the total PM_{10} emission rate that was modeled in CALPUFF.

1 NCASI guidance document.

2 National Park Service PM_{10} Speciation Profile for Utility Oil Boiler with Scrubber, http://www.nature.nps.gov/air/permits/ect/ectOilFiredBoiler.cfm

Table 6. Characteristic PM_{10} Speciation Profiles

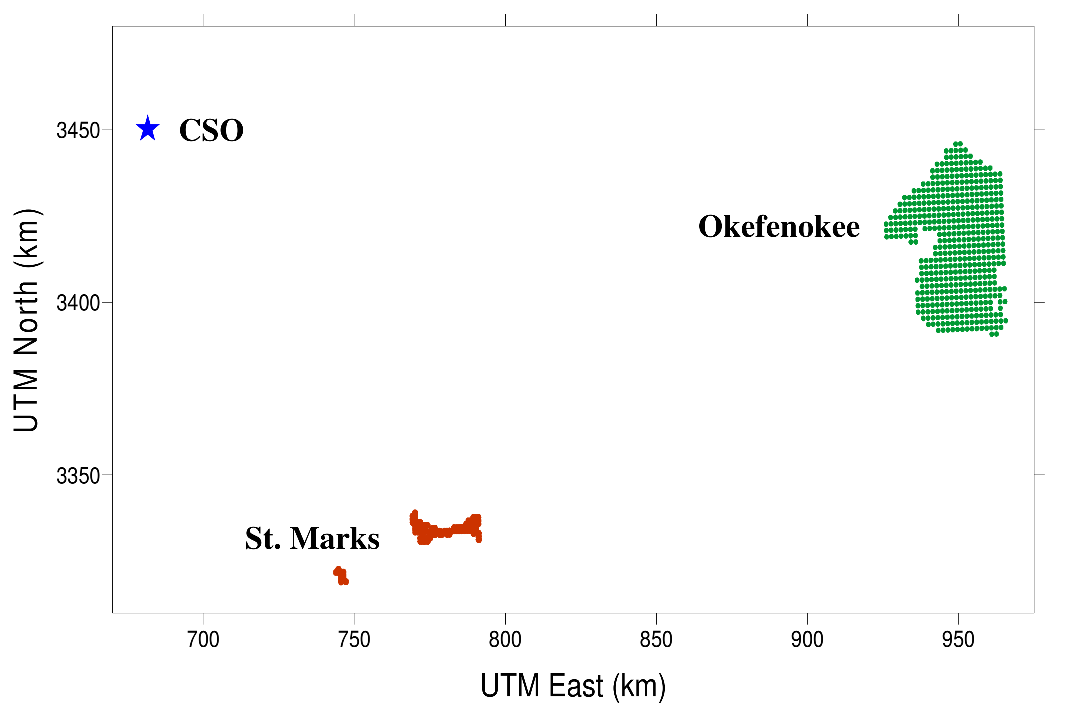
Source	PMC	PMF	EC	SOA
Smelt Dissolving Tank	10.8%	81.3%	3.4%	4.2%
Lime Kiln	8.9%	82.8%	3.4%	4.6%
Recovery Boiler	27.3%	63.8%	2.7%	6.3%
Power Boiler	3.6%	79.3%	6.3%	10.8%

Within 300 kilometers of the Mill two Class I Areas have been identified with visibility as an important air quality related value:

1. St. Marks National Wilderness Area (112 km from Mill)
2. Okefenokee National Wilderness Area (244 km from Mill)

Figure 2 presents a simplified map in the UTM NAD27 projection with the arrangement of the Mill and the two Class I areas.

Figure 2. Mandatory Class I Area Receptors within 300km of GP Cedar Springs



3.0 VISTAS CONTRIBUTION TO CALPUFF MODELING

For this application of BART Modeling, VISTAS and EPD have made available the following data bases developed by the VISTAS Technical Contractor:

- VISTAS version of the CALPUFF modeling system, maintained on the VISTAS Technical Contractor website.
- 4-km CALMET output files for 2001, 2002, and 2003 produced as described in the VISTAS Common Protocol.
- CALMET with a software modification to allow the meteorological data inputs into CALMET to be used to generate finer grid CALMET files without having to go back to the original MM5 output files
- File with CALPUFF model configuration and settings sufficient to replicate CALPUFF modeling done for VISTAS using 12 km CALMET.

4.0 MODEL DISCUSSION

4.1 General Procedures

GP is beginning with the most refined dataset available from VISTAS. The fine grid analyses use the 98th percentile impact value for the 24-hr average at each Class I area. The analysis will use either the 8th highest day in each year or the 22nd highest day in the 3-year period, whichever is more conservative.

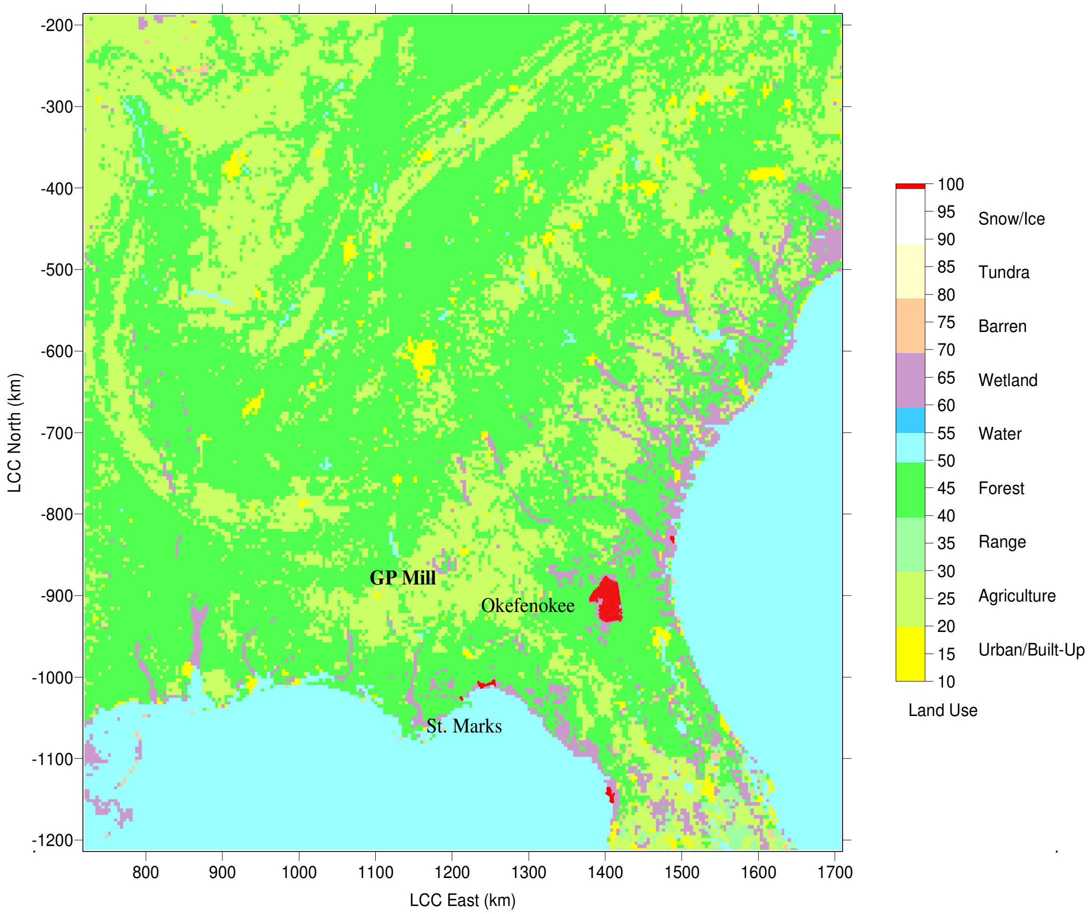
The VISTAS Common Modeling Protocol consistently recommends conservative assumptions. Individual States ultimately have responsibility to determine which, if any, BART controls are recommended in their State Implementation Plans (SIPs). The VISTAS protocol presents additional detailed information on the meteorological fields, and specific settings for CALPUFF and CALPOST (see section 4.33 of the VISTAS Common Modeling Protocol).

4.2 CALPUFF Configuration

Source emissions should be defined using the maximum 24-hour actual emission rate during normal operation for the most recent 3 or 5 years. If maximum 24-hr actual emissions are not available, continuous emissions data, permit allowable emissions, potential emissions, and emissions factors from AP-42 source profiles may be used as available. As described in Section 2 of this report, GP used allowable emissions to demonstrate that two alternative operating scenarios neither cause nor contribute to visibility impairment.

GP completed the analysis with the Domain #4 4-km refined grid meteorological datasets provided by VISTAS. Figure 3 presents the modeling domain, the Class I Area model receptors and Mill.

Figure 3. CALPUFF Modeling Domain, Source and Receptors, GP Cedar Springs BART Analyses



The major features and options of the meteorological and dispersion model are summarized and discussed in the VISTAS Common Modeling Protocol. Specific configuration settings presented in the VISTAS Common Modeling Protocol are listed below:

- Use default data provided by VISTAS for background concentrations of SO_4 and total NO_3 (HNO_3 + NO_3). GP utilized the more conservative default approach and also implemented the "ammonia limiting method" (ALM) with the POSTUTIL post-processor to re-partition the distribution of HNO_3 and NO_3 concentrations at each Class I area as a function of the temperature, relative humidity, and free ammonia during each hour. ALM re-partitioning using the default ammonia background level of 0.5 ppb was conducted in refined analyses.

- Use spatially- and temporally-variable hourly ozone data for observation stations within Domain 4 as prepared by VISTAS. A representative background value of 50 ppb was entered into CALPUFF to substitute during hours for which no valid ozone concentrations were measured throughout the domain.

- Use the Pasquill-Gifford dispersion method.

- In CALPOST, use Method 6 with monthly average relative humidity for calculating extinction, as recommended by the EPA. Class I-area specific values of the relative humidity adjustment function were obtained from the U.S. EPA's *Guidance for Estimating Natural Visibility Conditions under the Regional Haze Rule* (EPA-454/B-03-005), October 2003.

- Use EPA default calculations of light extinction under average background conditions. The annual average natural background conditions were obtained from Appendix B of U.S. EPA's *Guidance for Estimating Natural Visibility Conditions under the Regional Haze Rule* and were used to calculate the monthly equivalent fine particle (as soil) background concentration for each of Okefenokee and St. Marks as shown in the following equations.

$$b_{back} = 10\exp\left(\frac{7.61}{10}\right) = 21.40\,\text{Mm}^{-1} = b_{ray} + b_{soil} = 10\,\text{Mm}^{-1} + b_{soil} \Rightarrow b_{soil} = 11.40\,\text{Mm}^{-1} \text{ for Okefenokee}$$

$$b_{back} = 10\exp\left(\frac{7.67}{10}\right) = 21.53\,\text{Mm}^{-1} = b_{ray} + b_{soil} = 10\,\text{Mm}^{-1} + b_{soil} \Rightarrow b_{soil} = 11.53\,\text{Mm}^{-1} \text{ for St. Marks}$$

CALPOST calculates the 24-hour average visibility impairment as a function of the concentration of visibility-affecting pollutants using the default IMPROVE light extinction formula, which is summarized in the following equation.

$$b_{ext,background}\left(Mm^{-1}\right) = b_{SO_4} + b_{NO_3} + b_{OC} + b_{Soil} + b_{Coarse} + b_{ap} + b_{Ray}\text{, where}$$

$b_{SO_4} = 3[(\mathrm{NH_4})_2\mathrm{SO_4}]f(RH)$ — $[(\mathrm{NH_4})_2\mathrm{SO_4}]$ denotes the ammonium sulfate concentration

$b_{NO_3} = 3[\mathrm{NH_4NO_3}]f(RH)$ — $[\mathrm{NH_4NO_3}]$ denotes the ammonium nitrate concentration

$b_{OC} = 4[\mathrm{OC}]$ — $[\mathrm{OC}]$ denotes the concentration of organic carbon

$b_{Soil} = 1[\mathrm{Soil}]$ — $[\mathrm{Soil}]$ denotes the concentration of fine soils

$b_{Coarse} = 0.6[\mathrm{Coarse\ Mass}]$ — $[\mathrm{Coarse\ Mass}]$ denotes the concentration of coarse dusts

$b_{ap} = 10[\mathrm{EC}]$ — $[\mathrm{EC}]$ denotes the concentration of elemental carbon

$b_{Ray} = \text{Rayleigh Scattering } (10\ \mathrm{Mm^{-1}} \text{ by default})$ — Rayleigh Scattering is scattering due to air molecules

$f(RH) = \text{Relative Humidity Function}$

$[\ ] = \text{Concentration in } \mu\mathrm{g/m^3}$

As noted in the VISTAS BART Modeling Protocol, the U.S. EPA and the Regional Planning Organizations (including VISTAS) are evaluating whether refinements are warranted to the methods recommended in U.S. EPA's guidance to calculate estimates of natural background visibility. For the purposes of calculating current, future, and natural background visibility at Class I areas as part of its reasonable progress analyses, VISTAS intends to present regional air quality modeling results using both the default and the newly revised IMPROVE light extinction formula. GP applied the revised IMPROVE formula to the analysis of visibility impairment at St. Marks to calculate a more refined result.

In December 2005, the IMPROVE workgroup issued a report describing an alternative to the default formula used to estimate extinction from particle concentration measurements (referred to as the "2005 IMPROVE Report" hereafter). A final report was issued in March 2006 to present a thorough survey of estimates of mass scattering efficiencies from recent peer-reviewed literature and provisional recommendations for refinements to the IMPROVE equation (referred to as the "2006 IMPROVE Report" hereafter). Refinements in the revised IMPROVE formula include:

- Distinguishing the size (i.e., age) of secondary pollutants and growth factors for different sizes of particle species

- Adding a site-specific Rayleigh scattering term to the formula to represent the dependence of Rayleigh scattering on air density (i.e., elevation)

- Adding a sea salt term, including a growth factor due to relative humidity
- Adding a term for visibility impairment resulting from gaseous nitrogen dioxide (NO_2)

The revised IMPROVE light extinction algorithm takes the following form:

$$b_{ext} \approx \begin{array}{l} 2.2 f_S(RH)[NH_4(SO_4)_2]_{Small} + 4.8 f_L(RH)[NH_4(SO_4)_2]_{Large} + \\ 2.4 f_S(RH)[NH_4NO_3]_{Small} + 5.1 f_L(RH)[NH_4NO_3]_{Large} + \\ 2.8[OC]_{Small} + 6.1[OC]_{Large} + 10[EC] + 1[PMF] + 0.6[PMC] + \\ 1.4 f_{SS}(RH)[\text{Sea Salt}] + b_{\text{Site-specific Rayleigh Scattering}} + 0.33[NO_2] \end{array}$$

To facilitate the use of the revised IMPROVE algorithm for assessing BART applicability, the VISTAS Technical Contractor developed and distributed a spreadsheet tool to implement the revised IMPROVE light extinction algorithm, designated as the CALPOST-IMPROVE Processor Version 2 (September 29, 2006). This processor calculates the reconstructed light extinction using the revised IMPROVE algorithm and output from the current version of the CALPOST postprocessor. To implement the CALPOST-IMPROVE tool, three additional data points are required: background concentration of gaseous NO_2, Rayleigh scattering parameter corrected for site-specific elevation, and an estimate of the average background sea salt aerosol concentration.

Although other anthropogenic (stationary and mobile) sources contribute to background levels of NO_2 at Class I areas, for the purposes of this analysis, the background NO_2 concentration was assumed to be attributable only to BART-eligible sources at the CSO. The 24-hour average NO_2 concentration for each day and receptor was calculated by separate CALPOST processing analyses, and converted from units of $\mu g/m^3$ (default model output) to parts per billion as required by the tool. The NO_2 concentration entered into the CALPOST-IMPROVE tool for each 24-hour average visibility impacts corresponded to the day and receptor at which the visibility impact occurs. CALPOST analyses for NO_2 are included on the electronic media provided with this updated report. The NO_2/NO_X ratio was conservatively entered as 1.0 in the CALPOST-IMPROVE tool.

The 2005 IMPROVE Report describes the justification for using a site-specific Rayleigh scattering parameter in the revised light extinction algorithm. Rayleigh scattering refers to the scattering of light from the molecules of the air and is therefore dependent on the air density, which varies with temperature and pressure. Site-specific Rayleigh scattering was calculated using the standard atmospheric pressure corresponding to the monitoring site elevation and an estimated annual mean temperature. The temperature data were obtained from the nearest weather stations for time periods encompassing ten to thirty years and were interpolated to the monitoring site location. The 2005 IMPROVE Report tabulated site-specific values of Rayleigh scattering for locations at which IMPROVE monitors visibility, including St. Marks for which a value of 11 Mm^{-1} was calculated. Compared to the default Rayleigh scattering value of 10 Mm^{-1}, the corrected values reflect the near-sea level elevation of Class I area evaluated in this analysis.

The 2005 IMPROVE Report identified sea salt aerosols as an important component of natural visibility conditions, particularly in humid coastal environments such as the Class I areas potentially affected by GP's CSO. The 2006 IMPROVE Report identifies sea salt as a statistically significant component of fine particle mass at St. Marks. Representative natural background sea salt concentrations were estimated for implementation in the CALPOST-IMPROVE processor for BART applicability analyses, including a concentration of 0.03 $\mu g/m^3$ for St. Marks.

5.0 RESULTS AND DETERMINATION OF IMPAIRMENT

5.1 Impact Threshold

The final BART guidance recommends a threshold value of 0.5 dv change from natural conditions to define whether a source "contributes" to visibility impairment. The 98th percentile, 24-hour average predicted impact at the Class I area, as calculated using CALPOST Method 6 (monthly average relative humidity values), is to be compared to this contribution threshold value. For this comparison, the predicted impact at the Class I area on any day is taken to be the highest 24-hr average impact at any receptor in the Class I area on that day. Because three meteorological data years (i.e., 2001 through 2003) were evaluated, VISTAS recommends that the 98th percentile value be determined as the highest, 8th-high 24-hour average visibility impairment among three years or the 22nd-highest 24-hour average visibility impairment over three years, whichever result is more conservative.

5.2 Presentation of Modeling Results

Tables 7 and 8 summarize the CALPOST results for the 98th percentile, 24-hour average visibility impairment at Okefenokee and St. Marks, respectively. Each summary table presents the results from the two operating scenarios evaluated as well as the default and non-default processing methods described in this report. The default processing method does not utilize the ALM and utilizes CALPOST for the default IMPROVE light extinction calculation. Results for both Class I areas are also presented using the ALM with the default IMPROVE light extinction calculation. GP applied the refined IMPROVE equation to calculate refined impacts at St. Marks using the CALPOST results from the ALM analysis.

Table 7. Summary of CALPUFF Results, Okefenokee NWR

Model Run	2001-2003	98th Percentile, 24-hour Average Change in Visibility (Δdv) 2001	2002	2003
Operating Scenario 1				
Default Processing Without ALM		0.309	0.305	0.288
Processing With ALM	0.30	0.306	0.300	0.281
Operating Scenario 2				
Default Processing Without ALM		0.270	0.272	0.248
Processing With ALM	0.266	0.267	0.266	0.241

Table 8. Summary of CALPUFF Results, St. Marks NWR

Model Run	2001-2003	98th Percentile, 24-hour Average Change in Visibility (Δdv) 2001	2002	2003
Operating Scenario 1				
Default Processing Without ALM		0.495	0.622	0.469
Processing With ALM	0.493	0.487	0.616	0.455
Processing With ALM and Revised IMPROVE	0.408	0.403	0.499	0.368
Operating Scenario 2				
Default Processing Without ALM		0.452	0.556	0.422
Processing With ALM	0.463	0.451	0.550	0.404
Processing With ALM and Revised IMPROVE	0.387	0.352	0.446	0.340

The results presented in Tables 7 and 8 confirm GP's determination that the Mill is exempt from BART because emissions from the BART-eligible source neither cause nor contribute to visibility impairment at any Class I area when operating in either of the two analyzed operating scenarios.

APPENDIX
Electronic Media File Index

Electronic media enclosed with this report contain the input and output files from all CALPUFF, POSTUTIL, and CALPOST processing analyses. Each analysis is contained within its own appropriately named compressed file, which includes model executable files and batch files to manage the runstream. A consistent file naming convention is used throughout with the following general structure. Note that refined meteorological data files are not provided due to file size. Note also that path names in input files will need to be modified to represent the user's directory structure when replicating these analyses.

The following processing sequence was used for each meteorological data year:

- **CALPUFF** was run separately for each source type (i.e., Power Boilers Nos. 1 and 2, Recovery Boiler No. 3, Lime Kilns Nos. 1 and 2, and Smelt Dissolving Tank No. 3) because each source has a distinct PM_{10} speciation profile.
- The total PM_{10} emission rate was modeled in CALPUFF and was subsequently speciated using the **POSTUTIL** post-processor.
- **CALSUM** was then used to combine the concentrations of all pollutants (including speciated PM_{10} components) into a single concentration file.
- **POSTUTIL** was run a second time to apply the "ammonia limiting method" (ALM), which calculates the HNO_3/NO_3 re-partitioning. The ALM analyses are run in three, 4-month blocks (A, B, C) due to an inherent limitation in the number of meteorological periods that can be processed when the ALM calculations are enabled in POSTUTIL.
- Therefore, the **APPEND** utility must be run to concatenate the output files comprising these three blocks of data.
- **CALPOST** was subsequently run three times for each Class I area
    1. Utilizing the "default" concentration output file without ALM processing
    2. Utilizing the concentration output file from ALM processing
    3. Computing daily average NO_2 concentrations for use in the revised CALPOST-IMPROVE post-processing tool.

CALPUFF Runstream Files

*uu*PUFF*yy*.*fff*

uu = PB (Power Boilers Nos. 1 and 2), RB (Recovery Boiler No. 3), LK (Lime Kilns Nos. 1 and 2), SDT (Smelt Dissolving Tank No. 3)
yy = 01, 02, and 03 denotes data analysis years 2001, 2002, and 2003, respectively
fff = inp denotes input files
fff = lst denotes CALPUFF output summary files
fff = con denotes CALPUFF output concentration files

Domain 4 Ozone Data Files

4OZ*yyyy*.dat

yyyy = 2001, 2002, and 2003 denotes respective data analysis years

PM Speciation POSTUTIL Processing Files

*uu*UTIL*yy*.*fff*

uu = PB (Power Boilers Nos. 1 and 2), RB (Recovery Boiler No. 3), LK (Lime Kilns Nos. 1 and 2), SDT (Smelt Dissolving Tank No. 3)
yy = 01, 02, and 03 denotes data analysis years 2001, 2002, and 2003, respectively
fff = inp denotes input files
fff = lst denotes POSTUTIL output summary files
fff = con denotes POSTUTIL output concentration files

CALSUM Processing Files

CALSUM*yy*.inp denotes CALSUM processing input file
ALLSRC*yy*.con denotes output concentration files

yy = 01, 02, and 03 denotes data analysis years 2001, 2002, and 2003, respectively

Ammonia Limiting Method POSTUTIL Processing Files

Note that in refined analyses for which the ammonia limiting method (ALM) was run, POSTUTIL is run in two separate steps, the first of which applies PM speciation for analysis in CALPOST, the second of which calculates the HNO_3/NO_3 re-partitioning. The ALM analyses are run in three, 4-month blocks (A, B, C) due to an inherent limitation in the number of meteorological periods that can be processed when the ALM calculations are enabled in POSTUTIL. Therefore, the APPEND utility must be run to concatenate the output files comprising these three blocks of data. CALPOST is subsequently run using this appended file.

ALMUTIL_*yyb.fff*

yy = 01, 02, and 03 denotes data analysis years 2001, 2002, and 2003, respectively
b = A, B, and C denoting 4-month blocks January-April, May-August, September-December, respectively
fff = inp denotes input files
fff = lst denotes POSTUTIL output summary files
fff = con denotes POSTUTIL output concentration files

ALMAPPEND*yy.fff*

yy = 01, 02, and 03 denotes data analysis years 2001, 2002, and 2003, respectively
fff = inp denotes input files
fff = lst denotes APPEND output summary files

CONCEN*yy*.con = Appended POSTUTIL-ALM concentration file for year *yy*.

CALPOST Runstream Files

POST_*aa_pp_yy.fff*

yy = 01, 02, and 03 denotes data analysis years 2001, 2002, and 2003, respectively
fff = inp denotes CALPOST input files
fff = lst denotes CALPOST output summary files

aa denotes the Class I areas considered in the analyses:

STMK = St. Marks NWR
OKEF = Okefenokee NWR

pp denotes the processing method considered in the analyses:

NOALM = processing using concentration files from CALSUM step without ALM
VIS = processing using concentration files from POSUTIL-ALM step with ALM
NO2 = processing for daily average NO_2 concentrations for CALPOST-IMPROVE

CALPOST-IMPROVE Microsoft Excel Spreadsheet Analyses

CALPOST-NewIMPROVE_St_Marks_*yyyy*.xls

This spreadsheet comprises the VISTAS Revised CALPOST-IMPROVE spreadsheet tool calculations using CALPOST outputs for visibility impacts and calculated NO_2 concentrations at St. Marks, where *yyyy* = 2001, 2002, and 2003, for data years 2001, 2001, and 2003, respectively.