BART EXEMPTION MODELING SUMMARY REPORT FOR

PCS Nitrogen

AUGUSTA, GEORGIA

Submitted to:

GEORGIA ENVIRONMENTAL PROTECTION DIVISION

Prepared for:

PCS Nitrogen

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EXIBIT A

Exhibit A: CD diskette of model runs

1. INTRODUCTION

MACTEC Engineering and Consulting, Inc. (MACTEC) is submitting the following Best Available Retrofit Technology (BART) Exemption Modeling summary report on behalf of the PCS Nitrogen Inc. (PCS) located in Augusta, Georgia. This summary report demonstrates that the PCS facility can be excluded from any additional assessment under the BART rule since modeling demonstrates that the facilities emissions have an insignificant impact on all surrounding Class I areas.

1.1 BACKGROUND

BART represents EPA's first regulatory step towards eliminating any visible impairments from industrial sources of pollutions by the year 2064. It is aimed at reducing emissions from old "grandfathered" sources of emissions of pollutants that impact visibility. There are three criteria to determine if a source is part of the BART group of sources:

1. Is a source within the 26 listed industrial categories?
2. Was the source constructed within the time frame of August 1962 to August 1977?
3. Does the source emit more than 250 TPY of any visual impairment pollutant?

It is that select group that EPA has decided to focus attention on. Of that select group if modeling shows that the facility does not have a significant impact on a Class I area (meaning less than 0.5 deciview change in visibility on a Class I area receptor) then the unit need not go through the BART process. Otherwise a BART assessment must be completed which must look at adding controls to reduce emissions and evaluate their overall impact on the Class I area(s). The conclusion of a BART analysis is an optimum solution of controls versus impact and the implementation of this solution written into the state regulations by Dec 2007. In PCS's case, for the most part the entire facility qualifies under all three criteria, and all emission sources must be evaluated.

1.2 OBJECTIVES

Once a particular source and emission unit is determined to be BART eligible the first step is to 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-hr 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 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 deciviews (perhaps lower for some particular Class I area). EPA recommends that the 98^{th} percentile value from the modeling be compared to the contribution threshold of 0.5 deciviews to determine if a source does not contribute to visibility impairment, and therefore is not subject to BART. Whether or not the 98^{th} percentile value exceeds the threshold must be determined at each Class I area. Over an annual period, this implies the 8th highest 24-hr value at a particular Class I area is compared to the contribution threshold. Over a 3-year modeling period, the 98^{th} percentile value may be interpreted as the highest of the three annual 98th percentile values at a particular Class I area or the 22nd highest value in the combined three year record, whichever is more conservative. The objective of this modeling summary report is to demonstrate that the PCS site located in August, Georgia does not contribute to visibility impairment in any Class I area and further assessment under BART is not required.

1.3 LOCATION OF SOURCE VS. RELEVANT CLASS I AREAS

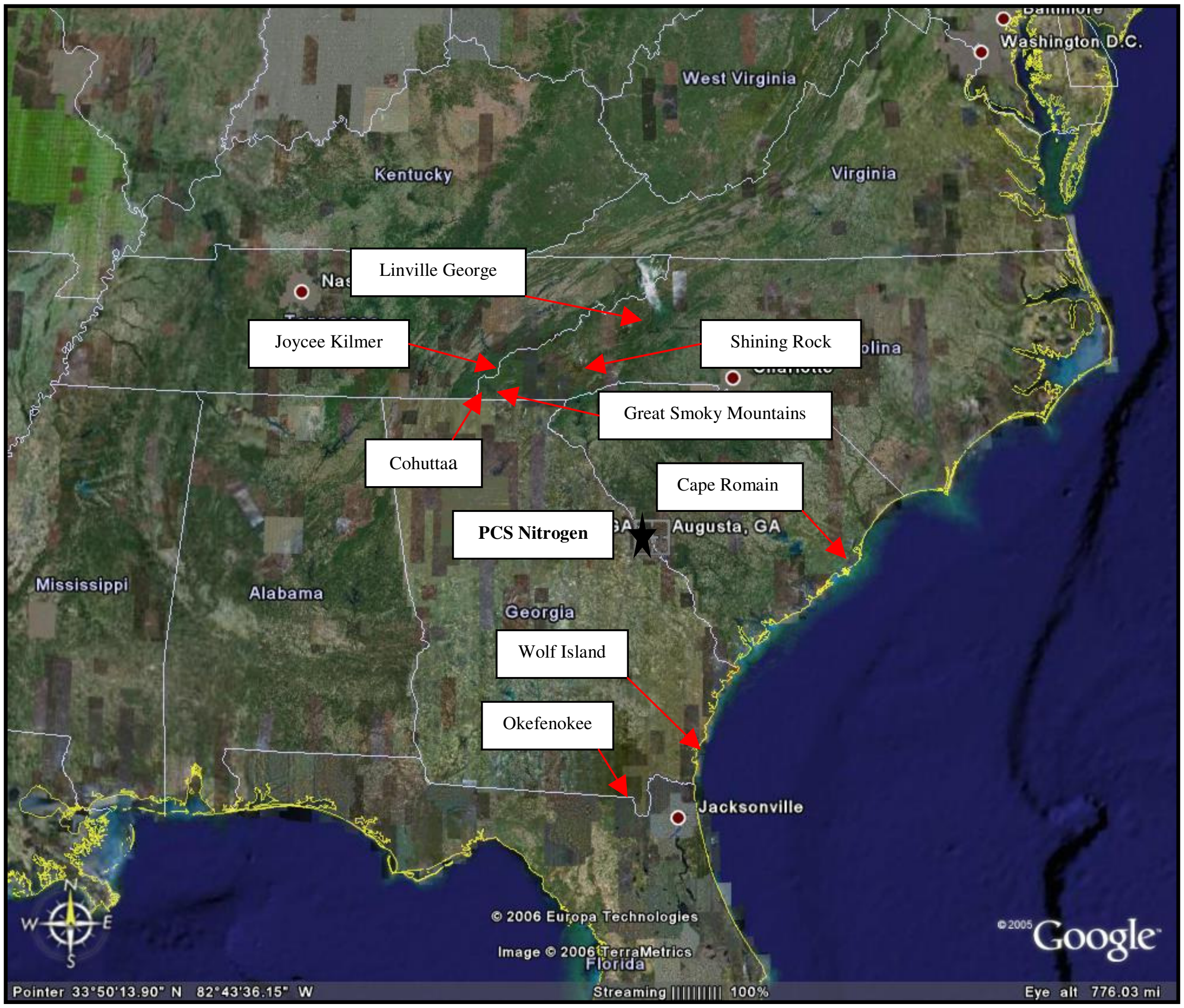
Table 1 below provides the location of the PCS facility and the Class I areas near the site. The distance from PCS to the nearby class I areas was determined by calculating the distance from the modeled stack at the site to each of the receptor locations, which represent the Class I area boundary. These boundary receptors (taken from the National Park Service website) were used to determine the shortest distance between the PCS Nitrogen site to the nearby Class I areas. As shown in Table 1, and Figure 1, PCS site is within 300 km of eight Class I areas. All eight Class I areas were evaluated as part of the exemption modeling.

Table 1: PCS Location and Distance to Class I Areas

Site/ Class I Area	LCC (Easting) – km	LCC (Northing) – km	Shortest Distance to Flomaton (km)
PCS	1390.6	-610.4	--
Cape Romain	1610.2	-627.0	220
Cohutta	1131.5	-484.1	288
Wolf Island	1485.8	-828.1	238
Great Smokey Mountains	1241.2	-400.0	258
Joyce Kilmer - Slickrock	1177.1	-429.2	280
Shining Rock Wilderness	1276.4	-416.0	225
Okeefenokee	1401.4	-877.3	267
Linville Gorge	1349.5	-350.9	263

1.4 SOURCE IMPACT EVALUATION CRITERIA

The maximum 24 hour results from the CALPOST model for each modeled year using a 12 km meteorological grid spacing were compared to the 0.5 deciview (DV) significant impact level. If the results of this CALPOST analysis show that the impact is below this level, then the site qualifies as an exempted source and no additional evaluation is needed. If this criteria is not meet, then the model is rerun using a finer meteorological grid spacing (4 km) and the 98th percentile result for each year is compared to the 0.5 dv value. For this assessment, the 98th percentile level is the 8th highest deciview value of all receptors. If this second criteria is meet, then the facility is determined to be an exempted source, otherwise a full BART analysis is required.



Source: Google Earth

Figure 1 Location of PCS Nitrogen and respective Class I areas

2. SOURCE DESCRIPTION

PCS owns and operates a nitrogenous fertilizer manufacturing facility in Augusta, Georgia. The plant produces ammonia, nitric acid, urea, carbon dioxide, ammonium nitrate, and urea-ammonium nitrate solutions. In the ammonia plant, natural gas is reformed and mixed with atmospheric air to form ammonia in a series of reaction steps. The plant operates two nitric acid plants, which combust the ammonia in the presence of air to form NOx, which is routed through absorption columns to form nitric acid. Ammonium nitrate is formed at the plant by mixing gaseous ammonia with nitric acid. The neutralized solution is then concentrated in prill towers to form a solid. The plant also operates a Urea production facility which combines carbon dioxide (produced from the ammonia plant) with ammonia to form urea. The urea is then concentrated in a Prill Tower. The ammonia plant, nitric acid plants, ammonium nitrate operations, and urea plant were built between the eligibility dates of August 1962 to August 1977; the processes are on the list of 26 listed processes (chemical plants); and the units have the potential NOx emissions greater than 250 tpy. All these units are therefore BART eligible. The boilers on site were not built during the BART eligibility dates, however, they are in place to support the chemical plant operations (in terms of supplying steam), therefore they are conservatively included as BART eligible sources to be modeled even though some interpretations state that just supplying steam is not considered supporting the operation.

2.1 UNIT SPECIFIC SOURCE DATA

The exemption modeling used the stacks parameters for the PCS plant as summarized in Table 2. The stack exhaust gas velocities and exhaust temperatures are based on results from recent stack tests conducted on the individual stacks. The modeled emission rates were based on emission factors that were derived from either stack testing or preferably CEM data multiplied by the maximum production day that occurred for the particular process unit during the study period. Where neither stack data nor CEM data was available engineering judgment was used to generate an emission limit that corresponded to the expected maximum emission rate.

Table 2: Modeled Stack Parameters and modeled emissions rates

No.	Unit ID	Stack ID	Process Description	Base Elevation (m)	Stack Height (m)	Diameter (m)	Velocity (m/s)	Exhaust Temp. (K)	SO_2 g/sec	NO_x g/sec	PM_{10} g/sec	NH_3 g/sec
1	A 103	ST03	C1 AN Dryer	0	31.1	0.98	16.15	302.6	0	0	0.87	0.76
2	A104	ST04	C1 AN Cooler	0	29.6	0.76	17.98	302	0	0	2.18	1.05
3	A105	ST05	C1 AN Prill Tower	0	36.3	1.9	0.001**	322	0	0	0.6	0.64
4	AN01	ST01	C1 AN Neutralizer	0	35.7	0.6	19.56	372	0	0	1.03	6.82
5	A201	ST09	C2 AN Prill Tower	0	61	2.63	25.55	300.6	0	0	0.37	0.43
6	A201	ST06	C2 AN Prill Tower	0	65*	1.21	24.68	302.6	0	0	0.1	1.56
7	A202	ST07	C2 AN Cooler	0	29	1.82	15.24	305.6	0	0	0.49	3.15
8	A204	ST10	C2 AN LD Dryer	0	29	1.82	12.31	302.6	0	0	0.16	1.69
9	AN02	ST02	C2 AN Neutralizer	0	29	0.79	19.55	371.5	0	0	0.9	14.93
10	U201	ST11	Urea Prill Tower-Inner	0	65*	1.4	15.05	327.6	0	0	0.2	2.8
11	U201	ST33	Urea Prill Tower-Outer	0	65*	2.63	24.99	316.5	0	0	0.94	2.86
12	N101	ST18	C1 Nitric Acid Plant	0	41.9	0.96	31.69	309.1	0	56.86	0	0
13	N201	ST19	C2 Nitric Acid Plant	0	21	1.52	31.69	448.6	0	12.68	0	15.03
14	NST1	ST20	Nitric Acid tanks	0	3.7	0.3	0.001**	294	0	0.02	0	0
15	AB01	ST21	H-6531 Oil	0	38.6	1.52	3.77	422	0.69	1.82	0.18	0
16	AB01	ST21	H-6531 NG	0	38.1	1.52	3.77	422	0	3.58	0.18	0
17	AB03	ST24	H-6532	0	31.7	1.52	1.28	438.7	0	1	0.18	0
18	AM01	ST12	Primary Reformer NG	0	32.9	4.23	12.8	455.4	0	1.14	0.29	0
19	AM01	ST12	Primary Reformer PG	0	32.9	4.23	12.8	455.4	0	1.51	0.27	0
20	FL01	ST36	NH3 Storage Flare	0	30.5	0.07	5.36	422	0	0.0037	0	0
21	AM04	ST15	Solution Regenerator	0	65*	0.46	30.48	380.4	0	0	0	0.38
22	U202	ST27	Urea Plant Low P Vent	0	65*	0.52	0.61	313.7	0	0	0	0.025
23	U203	ST28	Urea Plant High P Vent	0	65*	0.15	13.47	331.5	0	0	0	6.5
24	U204	ST29	Dust Washer	0	65*	3.5	1.43	380.9	0	0	0.14	0.59

Note: LCC Easting 1390.554 Km (Assumed for all sources)
LCC Northing -610.375 KM (Assumed for all sources)
** Horizontal duct so modeled with a very low velocity
* Actual stack height exceeds 65 meters

Table 2 (continued)

No.	Unit ID	Stack ID	Process Description	Base Elevation (m)	Stack Height (m)	Diameter (m)	Velocity (m/s)	Exhaust Temp. (K)	SO_2 g/sec	NO_x g/sec	PM_{10} g/sec	NH_3 g/sec
25	U205	ST30	Urea Process Tanks	0	65*	0.5	0.61	313.7	0	0	0	0.08
26	U206		Urea Warehouse	0	0	2	4.8	273	0	0	0	0.22
27	AM02	ST13	Startup Vent for Ammonia Plant	0	65*	1.06	61.26	338.7	0	0	0	0.75
28	U207	ST31	Urea Compressor	0	27.4	0.3	55.3	314.7	0	0	0	0.03
29	ACI2	ST17	ACI Skids	0	13.7	0.4	24.39	299.7	0	0	0	0.61
30	CT1		6-Cell Cooling Tower	0	5	2	6.1	300	0	0	0.27	0
31	AM05		NH3 Plant Fugitives	0	9.14	2	0.001**	273	0	0	0	2.26
32	CT5		2-Cell Cooling Tower	0	5	2	6.1	300	0	0	0.01	0
33	A203	ST08	C2 AN Cooler By-pass	0	29	1.22	16.31	310.8	0	0	0.87	0.07
34	A 205	ST35	AN Pond Evaporator	0	28.96	1.22	4.87	300	0	0	0	0.67
35	CT2		4-Cell Cooling Tower	0	5	2	6.1	300	0	0	0.05	0
36	CT3		2-Cell Cooling Tower	0	5	2	6.1	300	0	0	0.01	0
37	CT4		1-Cell Cooling Tower	0	5	2	6.1	300	0	0	0.04	0
38	GT01	ST12	Gas Turbine	0	32.92	4.237	12.8	455	0	10.15	0.25	0

Note: LCC Easting 1390.554 Km (Assumed for all sources)
LCC Northing -610.375 KM (Assumed for all sources)

As per the common VISTAS modeling protocol (page 42), the modeling evaluation did not included building downwash, because all Class 1 areas being evaluated are greater than 50 km away from the site.

The following stacks have actual stack heights that exceed 65 meters and were installed after 1970:

- ST09
- ST11
- ST33
- ST15
- ST27
- ST28
- ST29
- ST30
- ST13

Therefore in the modeling these stacks were given the height 65 meters rather than the true height (as shown in the table) which exceeded the allowable GEP height according to 40 CFR 51.100.

2.2 BOUNDARY CONDITIONS

Model options and switches were used as set in the example models as provided on the Earth Tech website (www.src.com).

3. GEOGRAPHICAL AND METEOROLOGICAL DATA

3.1 MODELING DOMAIN AND TERRAIN

The modeling data to be utilized for the modeling evaluation is the CALMET data provided by VISTAS via Georgia EPD. The modeling domain consists of the area which includes the site, all eight class 1 areas being evaluated, with an additional 50 km buffer around this area. The area around the site is primarily flat terrain.

3.2 LAND USE

The area around the site is rural and is primarily agricultural land use.

3.3 METEOROLOGICAL DATA BASE

All the met data used was provided by the VISTAS.

3.3.1 MM5 Simulations

As provided by VISTAS.

3.3.2 Measurements and Observations

None.

3.4 AIR QUALITY DATA BASE

3.4.1 Ozone Concentrations – Measured or Modeled

The ozone concentrations were modeled using the three years of ozone data as provided by Earth Tech on their website (http://www.src.com/verio/download/download.htm). The OZONE.DAT file used in each year of the model runs was extracted from the corresponding year data taken from the Earth Tech website. The CALPRO GUI was used to extract the data by providing the domain being used for the CALPUFF model.

3.4.2 Ammonia Concentrations – Measured or Modeled

As noted in the VISTAS common protocol (page 42) a constant ammonia background concentration of 0.5 ppb was used for the CALPUFF modeling. For modeling ammonia emissions from the plant, physical properties of ammonia inserted in the model were taken from University of South Florida professor Dr. Noreen Poor, who provided the following data which we have confirmed as being representative:

Diffusivity - (cm^2/s) = 0.234,
Alpha Star=176,
Reactivity =30,
Mesophyll Resistance. =0 s/cm,
Henry's Law =7.20 x 10-4,
Wet (liquid) scavenging coefficient (1/s) = 7 x 10-4

These are dry and wet deposition parameters of which only the wet deposition values were used.

3.4.3 Concentrations of Other Pollutants – Measured or Modeled

Per the "Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Phase I report (December 2000)" the background SO_4 concentration (BKSO4) was calculated based on the reported hygroscopic value for each of the Class I areas divided by 3. The hygroscopic value for all of the Class I areas being studied is 0.9 (taken from the FLAG document), therefore a 0.3 value was used for the BKSO4 variable for all months. The soil background (BKSOIL) concentration was set to the non-hygroscopic value as set by the FLAG document. This value is 8.5 for all eight of the Class 1 areas.

3.4.4 β-Extinction Coefficients for Particulates and Ammonia

The modeling was completed using two worst case assumptions. First, it was assumed that all the particulate emitted from the facility is fine particulate which has a β extinction coefficient of 1.0 (versus 0.6 for larger particulate). Second, it was assumed that all the ammonia emitted from the facility that is transported to the Class I area is converted into either ammonium sulfate or nitrate. To accomplish this in the ammonia species was given in CALPOST run was given a β extension coefficient equivalent to those compounds of 3.0 which is the second worst case assumption.

3.5 NATURAL CONDITIONS AT CLASS I AREAS

The relative humidity used for each Class I area being modeled was based on data taken from the FLAG document. Table 3 below provides the monthly relative humidity that was used for each of the eight Class I areas.

Table 3: Relative Humidity Factor Data

Month	Cape Romain	Cohutta	Wolf Island	Great Smokey Mountains	Joyce Kilmer	Shining Rock Wilderness	Okefenokee	Linville Gorge
January	2.9	3	3.1	3	3	2.9	3.2	2.9
February	2.9	3	3.1	3	3	2.9	3.2	2.9
March	3.3	3.1	3.3	3.1	3.1	3.1	3.4	3.1
April	3.3	3.1	3.3	3.1	3.1	3.1	3.4	3.1
May	3.3	3.1	3.3	3.1	3.1	3.1	3.4	3.1
June	3.9	3.6	3.9	3.6	3.6	3.7	3.9	3.7
July	3.9	3.6	3.9	3.6	3.6	3.7	3.9	3.7
August	3.9	3.6	3.9	3.6	3.6	3.7	3.9	3.7
September	3.3	3.3	3.6	3.2	3.2	3.2	3.6	3.1
October	3.3	3.3	3.6	3.2	3.2	3.2	3.6	3.1
November	3.3	3.3	3.6	3.2	3.2	3.2	3.6	3.1
December	2.9	3	3.1	3	3	2.9	3.2	2.9

4. AIR QUALITY MODELING METHODOLOGY

4.1 PLUME MODEL SELECTION

The modeling was completed using the VISTAS recommended CALPUFF version 5.754 for BART modeling as posted on the Earth Tech website. The modeling was completed using the 12-km and 4-Km meteorological data files provided by VISTAS (via Georgia EPD). The sample CALPUFF model and CALPOSTL input files posted on the Earth Tech website was used for the modeling assessment.

4.1.1 Major Relevant Features of CALMET

CALMET was not run for this application as all met data has been provided by VISTAS. VISTAS supplied met data was generated using CALMET version 5.7.

4.1.2 Major Relevant Features of CALPUFF

The modeling utilized the MESOPUFF II module for chemical mechanism portion of the model. The integrated puff sampling methodology options were chosen. For running the CALPOST processor, the visibility Method 6 option was used using the monthly relative humidity values identified above. The species considered in the visibility analysis included SO4, NO3, EC, SOA, soil, and coarse PM.

4.2 MODELING DOMAIN CONFIGURATION FOR 12 KM

The domain consists of the area which included the site, all eight class 1 areas, with an additional 50 km buffer around this area. Table 5 provides the coordinates of the area bounded by the modeling domain.

Table 4: Modeling Domain Coordinates for 12 Km grid

Location	LCC (Easting) – km	LCC (Northing) – km
Southwest Corner	1037.973	-1001.974
Southeast Corner	1709.973	-1001.974
Northeast Corner	1709.973	-269.974
Northwest Corner	1037.973	-269.974

Table 5 Modeling Domain Coordinates for 4 Km grid

Location	LCC (Easting) – km	LCC (Northing) – km
Southwest Corner	718.005	-1214.003
Southeast Corner	1706.005	-1214.003
Northeast Corner	1706.005	-562.003
Northwest Corner	718.005	-562.003

Figure 2a depicts the modeling domain on a map for the 12 km met grid spacing and Figure 2b depicts the modeling domain on a map for the 4 km met grid spacing.

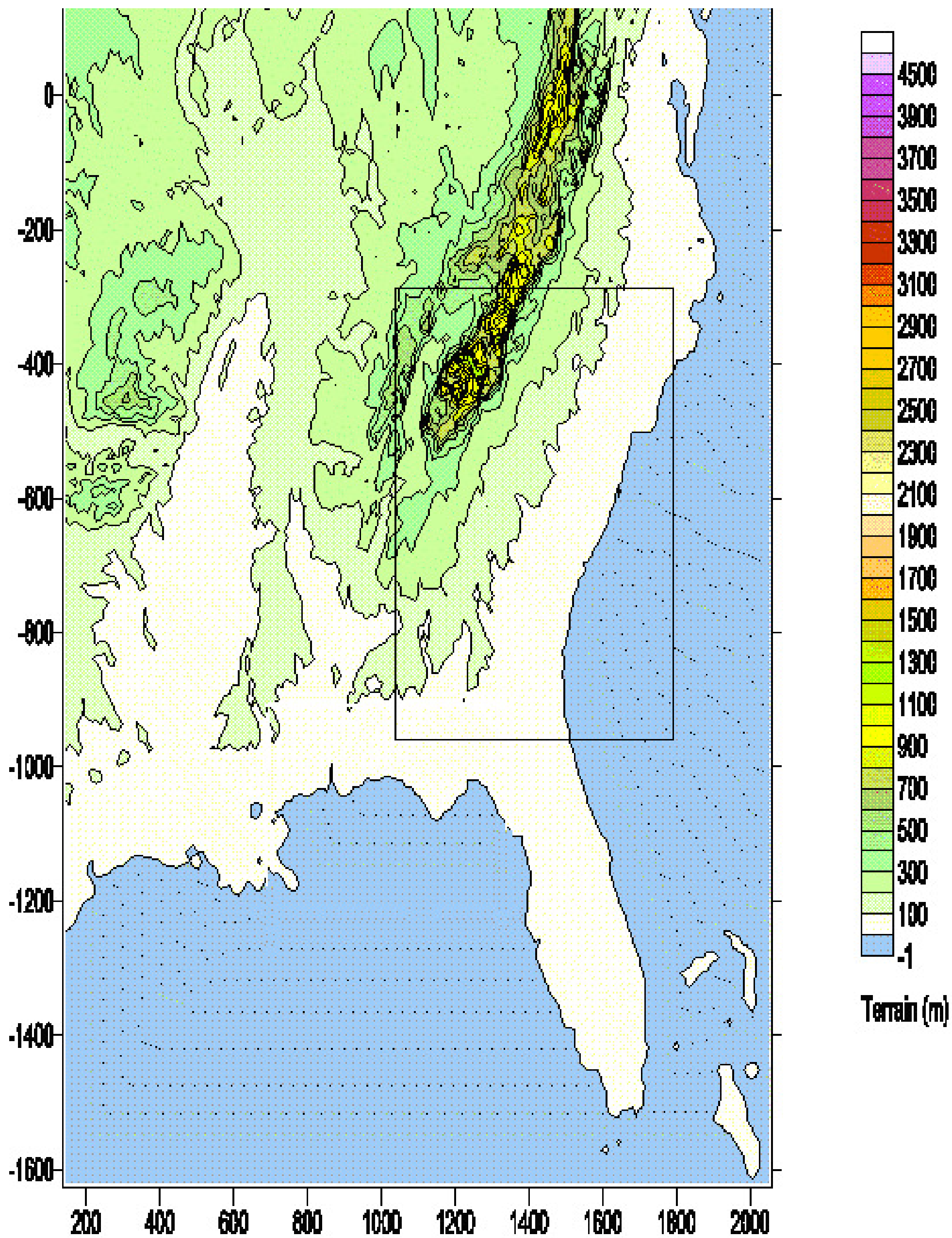


Figure 2a. Modeling Domain for 12 km Grid Spacing

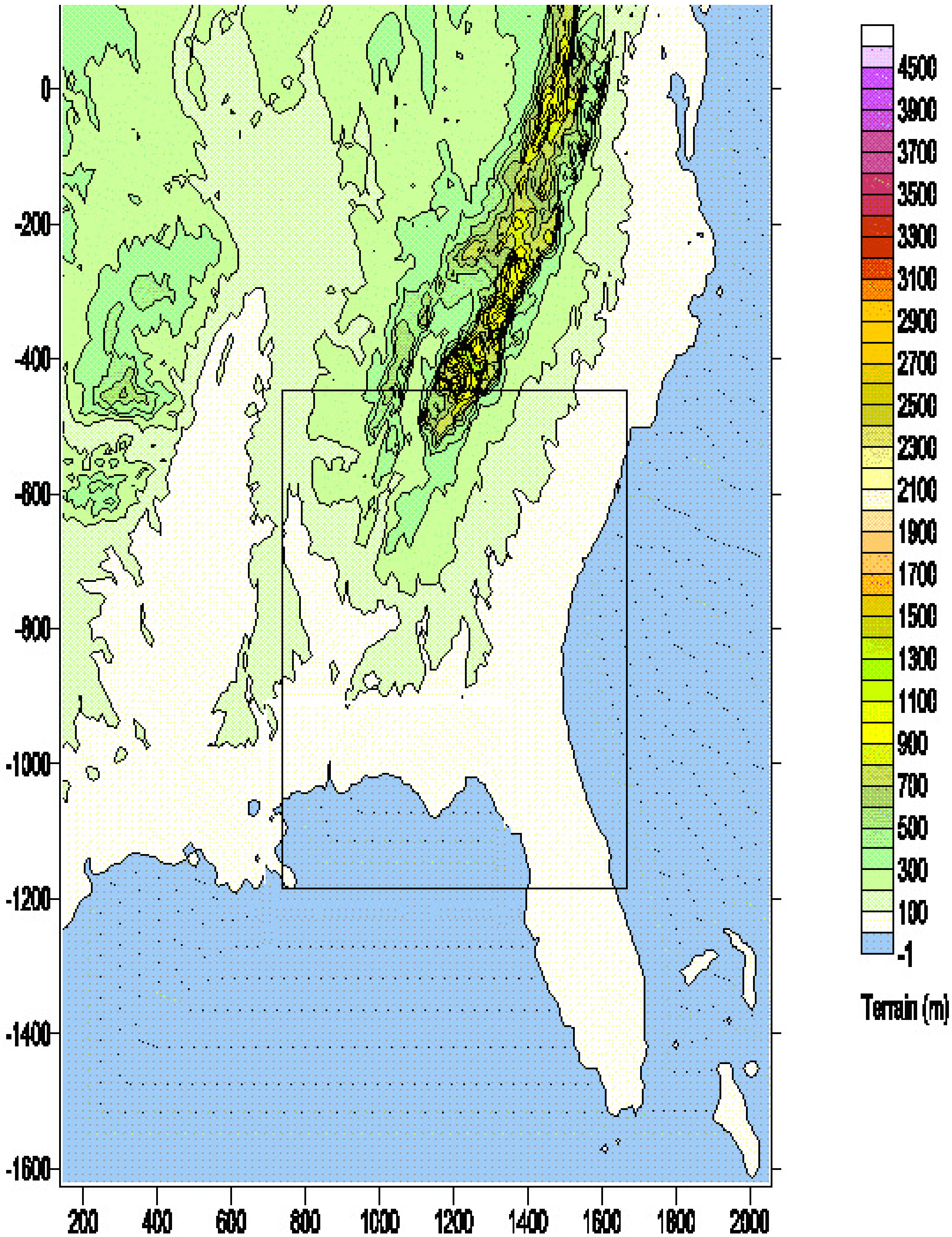


Figure 2b. Modeling Domain for 4 km Grid Spacing

4.3 CLAMET METEOROLOGICAL MODELING

No CALMET modeling was completed since VISTAS has provided the meteorological data used in the CALPUFF modeling. The CALMET modeling has already been completed by the Earth Tech.

4.4 CALPUFF COMPUTATIONAL DOMAIN AND RECEPTORS

The computational domain is the same as the modeling domain as indicated above. The CALPUFF model included the Class I receptors for each site as taken from the National Park Service Website. The website conversion program was used to convert the receptor set into Lambert Conformal Coordinates (LCC) for use in the CALPUFF model.

4.5 CALPUFF MODELING OPTIONS SELECTIONS

The CALPUFF model was run using model options listed in Section 4.3.3 of the VISTA's Final Protocol The following list discusses the primary option selections:

- The CALPUFF model configuration for the regional CALPUFF follow the recommended IWAQM guidance (EPA, 1998; Pages B-1 through B-8), except as noted below:

- CALPUFF domain configured to include the source and all Class I areas within 300km of the source plus 50km buffer zone in each direction. CALPUFF is recommended for all source-receptor distances to be considered in the BART analyses.

- Chemical mechanism: MESOPUFF II module
- Background ammonia concentration: In CALPUFF, use constant (0.5 ppb) value for ammonia.

- Puff representation: integrated puff sampling methodology.

- Use IWAQM (EPA, 1998) default guidance, including Pasquill-Gifford dispersion coefficients.

- Ozone dataset – use observed ozone data for 2001-2003 from CASTNet and AIRS stations. Only non-urban ozone stations should be used in the OZONE.DAT file. Monthly average ozone (backup) background values are to be computed based on daytime average ozone concentrations from the OZONE.DAT file (6am-6pm average ozone concentrations computed by month).

4.6 LIGHT EXTINCTION AND HAZE IMPACT CALCULATIONS

The light extinction and haze impact calculations were computed using the CALPUFF post processor CALPOST adhering to the model options listed in Section 4.3.3 of the VISTAs Final Protocol. The major options listed as follows:.

- Species considered in visibility analysis: SO4, NO3, soil, fine PM, NH_3 (modeled as NO_3)
- Natural background light extinction: calculated by CALPOST under Method 6, based on annual average default natural conditions component concentrations and monthly average f(RH) values for the Class I area taken from the FLAG document. , from Table A-3 in the natural conditions guidance document,
- Light extinction efficiencies: Use of EPA (2003a) values.

4.7 MODELING RESULTS

Table 6 summarizes the output of the CALPOSTL modeling results for 12 Km domain.

Table 6 Modeling Results for 12 Km grid

		Modeling Results in Deciview (DV)		
Site/ Class I Area	**Shortest Distance to PCS (km)**	**2001**	**2002**	**2003**
PCS	--	-	-	-
Cape Romaine	220	0.457	**0.596**	**0.571**
Cohutta	288	0.269	0.175	0.409
Wolf Island	238	0.236	0.283	0.294
Great Smokey Mountains	258	0.209	0.153	0.163
Joyce Kilmer	280	0.120	0.154	0.175
Shining Rock Wilderness	225	0.362	0.238	0.220
Okefenokee	267	0.269	0.366	0.393
Linville Gorge	263	0.490	0.248	0.393

This table demonstrates that of the eight Class I areas, seven are not have significantly impacted by PCS emissions. The remaining Class I area (Cape Romain) was further evaluated using a 4-Km Met Grid spacing for comparison of the 98th percentile or 8th highest value to the 0.5 DV value. Table 7 provides the 4-Km modeling results which demonstrate that all 8th highest values are well below 0.5 DV.

Table 7 Modeling results for 4-Km grid

Class I Area	Model Year	1st High (DV)	8th High (DV)
Cape Romaine	2001	0.492	0.196
Cape Romaine	2002	0.417	0.250
Cape Romaine	2003	0.571	0.359

5. SUMMARY

Based on the modeling results provided in Tables 6 and 7, it can be concluded that PCS does not have a significant visibility impairment on any Class I area and can be excluded from further BART analysis. This modeling was completed under very conservative assumptions:

1) All ammonia reacts to form ammonium sulfate or nitrate,

2) All particulate emitted from the site is fine particulate with a β extinction value of 1.0 and

3) Includes emissions from the facilities boilers which just provide steam to the BART eligible units.

4) Includes highest emissions from different days for each emission unit instead of the single highest emission day.

Even with these conservative assumptions the modeling clearly demonstrates that visibility impacts on all Class I areas are insignificant (<0.5 DV). PCS therefore plans no further submittals regarding this BART rule.

6. REFERENCES

Protocol for the Application of the CALPUFF Model for Analyses of Best Available Retrofit Technology (BART)" December 22, 2005 revised March 9th, 2006.

Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Phase I report (December 2000).

EXHIBIT A