APPENDIX D - EPD'S PSD Dispersion Modeling and Air Toxics Assessment Review

August 13, 2009
MEMORANDUM

To: Purva Prabhu
Thru: Jim Boylan
From: Pete Courtney
Subj: PSD Dispersion Modeling Review: Plant Washington, Washington County

Air dispersion modeling was conducted by MACTEC Engineering and Consulting, Inc. (MACTEC) for the single-boiler 850 MW (8,300 MMBtu/hr heat input capacity) electrical generating facility known as Plant Washington. The modeling was to assess conformance of proposed emission limits of the subject emission sources on site with the Georgia Air Toxics Guideline and applicable federal Prevention of Significant Deterioration (PSD) air quality standards. These standards include applicable National Ambient Air Quality Standards (NAAQS), and PSD Class I and Class II Increments. Modeling was also conducted to assess the potential impacts of Plant Washington emissions at 7 PSD Class I areas managed by Federal Land Managers (FLMs) with the U.S. Fish and Wildlife Service (U.S. F&WS), the National Park Service (NPS), and the U.S. Forest Service (U.S.F.S.). This memo discusses the procedures used to review the supporting dispersion modeling. The criteria air contaminants projected to be emitted by the project in excess of respective PSD Significant Emission Rates are NO_2, SO_2, CO, VOC, PM10, PM2.5 (by PM10 surrogate), sulfuric acid mist, and fluorides.

Plant Washington has been proposed for development by Power4Georgians, LLC, a consortium of several electric membership cooperatives (EMCs). The electrical generating facility is to be sited on 1,641 acres located about 10 km northeast of the City of Sandersville, in Washington County, GA. The results of this modeling evaluation are summarized in the attached Tables I through VII and indicate that air emissions associated with the proposed project will comply with applicable state and federal regulations. All modeling input and output files generated in conducting this review are available on DVD. A discussion of the PSD modeling analysis follows.

INPUT DATA

1_ **Meteorological Data:**

a. AERMET – Hourly pre-processed meteorological data from the Middle GA Regional (Macon, or Lewis B. Wilson) Airport, GA National Weather Service (NWS) surface station and the Centreville, AL NWS upper air station for the period 1987-1991 were used to evaluate proposed criteria pollutant emission rates for conformance with the federal standards cited above. The surface station data available during this period was nearly complete as obtained from the NWS, and the remaining few missing observations were filled-in under the guidance of a GA EPD meteorologist. The upper air data were also nearly complete. Missing upper air observations were replaced by observations from the same station on adjacent days noted to have consistent meteorological patterns with the missing observation periods. More recent data, as provided by the NWS, cannot be processed through the current version of the AERMET processor without resolving extensive periods of missing data, many of which are affiliated with low wind speeds (which are ordinarily associated with higher modeled concentrations). For this reason, the older, more complete data set was considered more appropriate for use in this analysis.

The AERMET processor (06341) was used to convert the data into AERMOD model-ready meteorological data files. Values of the surface characteristics (albedo, Bowen Ratio, and surface roughness) surrounding the Middle GA Regional NWS surface station were derived in 2007 on an annual basis in each of four sectors in accordance with the contemporaneous AERMOD Implementation Guide (dated March 9, 2005). Land-use classifications of each sector were derived from the interpretation of aerial photographs taken during the period over which the meteorological observations were recorded. The land-use classifications were correlated with albedo and Bowen Ratio characteristics on Tables 4-1 through 4-2b of the AERMET User's Guide (EPA-454/B-03-002, 11/04). Surface roughness in each sector was estimated based on interpretation of the USGS 7.5 minute Warner Robbins NW topographic map, and the information on Table 4-3 of the AERMET User's Guide.

MACTEC provides Figure 5-3 indicating the current land-use of the area within 3 km of the Middle GA Regional Airport. MACTEC further provides Figure 5-4 indicating the current land-use within 3 km of the proposed location of the Plant Washington Main boiler. Both figures indicate the sectors used to process the airport meteorological data. The 2005 guidance requested sector-by-sector assessment of albedo and Bowen Ratio within 3 km of the meteorological station and the project site. Current guidance (AERMOD Implementation Guidance, dated March 19, 2009) indicates the albedo and Bowen Ratio for both the meteorological tower and the project site should be based on values derived for a 10-km square located about each site. MACTEC has superimposed the outline of the proposed facility on Figure 5-4. GA EPD agrees the Bowen Ratio and albedo of the two areas, as interpreted from the figures, should be very similar over a 3-km circular, or a 10-km square area. GA EPD would expect that the albedo in the immediate vicinity of the developed site will closely resemble that of the Middle GA Regional Airport, since the extensive ash and gypsum storage piles will be located on the site and will consist of material roughly the color of concrete.

The 2009 guidance seeks the surface roughness to be determined within 1-km of the meteorological tower and the main boiler, respectively. The guidance also indicates that surface roughness should be categorized by sectors of similar roughness. It appears to GA EPD that, due largely to the flat-topped ash and gypsum storage piles and the plant grade elevation of 139.3 m in the vicinity of the emission equipment, the project surface roughness will be minimal to the east, south, and west of the main boiler, similar to the surface roughness in those sectors at the airport. The developed site north of the boiler will consist of power plant structures, and coal and limestone storage piles, closely simulating the increase in surface roughness in that sector at the airport. GA EPD also finds that the facility is located near the top of a gently sloping knoll, and as a result, the land surface falls below emission source base elevation with increasing distance from the facility in all sectors within 3 km of the main boiler. This decreases the effects of potential surface roughness differences between the sites. Therefore, GA EPD agrees with the MACTEC conclusion that the surface characteristics of the two sites will be very similar.

b. PCRAMMET- Hourly pre-processed meteorological data from the Middle GA Regional Airport, GA NWS surface station and the Centreville, AL NWS upper air station for the period 1974-1978 were used with the ISCST3 model (version 02035) to refine preliminary concentration estimates made with the SCREEN3 model (version 96043). These models were used to evaluate proposed air toxics emission rates for conformance with the Georgia Air Toxics Guideline. These meteorological data appear to have been downloaded from the GA EPD website, and the modeling review employed the website data.

c. CALMET - Class I modeling was completed using the 2007 U.S. Fish & Wildlife Service (F&WS) re-processed CALMET 5.8 (level 070623) output files for 2001-2003. These files were initially created under sponsorship of the Visibility Improvement State and Tribal Association of the Southeast (VISTAS) Regional Planning Organization from 12- or 36-km gridded MM4/MM5 prognostic meteorological model output files. As used on this project, the VISTAS Meteorological Domain 4 grid cells were 4 km on a side. A smaller, computational domain was implemented during the Class I Significance modeling which included the 7 potentially impacted Class I areas and Plant Washington, and a buffer of at least 50 km around each. A larger computational grid, still smaller than the extent of the meteorological grid, was implemented during cumulative SO_2 Increment modeling to the Wolf Island Wildlife Management Area (WMA) in order to include sources within 300 km of Wolf Island. This domain provides a 50 km outward buffer beyond the most distant sources modeled, and Wolf Island.

2_ Source Data: Stack emissions parameters and emission rates are provided by MACTEC in the BACT section of the application and have been subjected to GA EPD engineering review. These data were supplemented with hour-by-hour emissions and stack parameters to characterize the start-up scenario on May 26, 2009. On July 2, 2009, MACTEC re-submitted all Class I and Class II modeling to account for adjustment of the Auxiliary Boiler stack height and location, and the implementation of North American Datum 1983 (NAD83) during AERMAP processing of receptor elevations and hill heights from Digital Elevation Model (DEM) files which are based on NAD27. On July 28, 2009, MACTEC re-submitted all Class I and Class II modeling to account for offsite NAAQS and PSD Increment inventory modifications. On August 4, 2009, MACTEC submitted Class I modeling employing a 24-hour SO2 emission rate which was specifically requested to avoid cumulative Class I Increment modeling.

Modeling review conservatively employed the maximum potential project emission rates associated with the time-weighted averaging periods modeled, as discussed in the BACT section of the project Preliminary Determination. Review of the refined NAAQS, and Class I & Class II Increment models used maximum potential short-term emission rates. Long-term modeling of sources with two years of actual emissions histories in the offsite inventory could have used maximum actual annual emissions, but conformance with long-term standards was readily demonstrated with the potential, short-term SO2 emission rates. Project significance modeling reviewed all operational loads presented (40 and 100% of capacity of the main boiler operating with the auxiliary boiler at 100% capacity). The maximum impacts were consistently predicted for the 100% load condition for the both the main and auxiliary boilers. The latter concentrations are reported on the attached tables addressing PSD significance levels and *de minimis* (significant) monitoring concentration thresholds.

3_ Receptor Locations: The screening and refined receptor grids provided by MACTEC were used in this analysis. The screening grid consisted of site fenceline receptors every 100 meters and an offsite Cartesian receptor grid with the following spacings: 100 meters to a downwind distance from the boiler stack of at least 2 km, and from there to about 13 km from the main boiler stack, 500 meter receptor spacing was used. The 24-hour SO_2 significant impact distance, initially determined on a 500m resolution receptor, was refined by re-running the model to a 1-km square receptor grid of 100m receptors centered on the highest initial concentration.

The refined receptor grid consisted of the screening grid confined to the maximum project significant impact distance, 5.42 km from the main boiler stack. The refined grid of the NAAQS model indicated maximum concentrations for the 3- and 24-hour periods were resolved on 500 m spaced receptors. Two additional 1-km square receptor grids of 100 m spacing were centered on those receptors, allowing refinement of the design concentrations to the nearest 100 m.

4_ **Terrain Elevations:** - Topography is generally rolling in the site vicinity with no terrain above the elevation of the main boiler stack tip (907 feet above mean sea level, AMSL) within 50 km. Terrain elevation data provided by MACTEC were processed using the AERMAP 09040 utility, with a NAD83 datum (to be consistent with the surveyed site plan datum), and were used in this evaluation. The input data to AERMAP included 90, 7.5 minute Digital Elevation Model (DEM) data files, and the east and north Universal Transverse Mercator (UTM, Zone 17) coordinates of the proposed model receptors (locations at which model concentrations are calculated). The proposed plant grade of 139.3 meters (457 feet) AMSL was used as the base elevation of all emission sources.

5_ **Building Downwash** - Building dimensions developed by MACTEC for use in building downwash calculations by AERMOD were verified using the latest version of the BPIPPRM program (Version 04274).

6_ **Class I Areas** – Seven PSD Class I areas exist within 300 km of the proposed facility. These are:

Class I Area	FLM	Distance (km) from Plant Washington
Great Smoky Mountains National Park, NC/TN	NPS	273
Cohutta Wilderness Area (WA), GA/TN	U.S.F.S.	261
Shining Rock WA, NC	U.S.F.S.	252
Joyce Kilmer/Slickrock WA, NC	U.S.F.S.	276
Cape Romain WMA, SC	U.S. F&WS	289
Wolf Island WMA, GA	U.S. F&WS	231
Okefenokee WMA, GA	U.S. F&WS	227

Project application materials, including modeling input and output files have been made available to each of these FLM agencies. These files include receptor locations for each Class I area, expressed in Lambert Conformal Coordinates (LCC) with receptor elevations in meters AMSL, as downloaded from the NPS receptor database. MACTEC contacted the "FLM permit coordinator" (presumably with the U.S. F&WS, since that agency manages the two Class I areas closest to Plant Washington) for guidance as to the assessments required of the project by that FLM agency. They were asked to perform visibility and acid deposition Air Quality Related Value (AQRV) assessments of the project, in accordance with the recommendations of the Federal Land Manager Air Quality Workgroup (FLAG) Phase I report (12/2000).

SIGNIFICANT IMPACT AREA ANALYSES

Class I: The maximum predicted NO_2, SO_2 and PM10 (used as a surrogate for PM2.5 assessments) concentrations at all Class I areas were below the proposed Class I area Increment significant impact levels (SILs) as shown in Section 7 of the permit application. The CALPUFF modeling system (CALPUFF, version

5.8, level 070623, POSTUTIL 1.56, level 070627, CALPOST 5.6394, level 070622) was used to assess all Class I area impacts. The facility has requested a 24-hour average emission limit in order to avoid conducting a cumulative Increment assessment at Wolf Island. The maximum predicted Increment concentrations are shown on Table II-1 of the attached Model Request Form.

Class II: A Class II area significant impact analysis was conducted (using the AERMOD model, version 07026) for NO_2, PM10, PM2.5 (using PM10 as a surrogate for PM2.5), SO_2, and CO, which are the criteria pollutants emitted in significant amounts from the proposed facility. Maximum impacts other than long-term SO_2 were consistently predicted with the maximum short-term emission rates of the 100% operating scenario. As indicated on Table II-2, the maximum predicted concentrations were below the SILs for CO, PM10 (& PM2.5), NO_2, and annual-averaged SO_2 (using the annual SO_2 emission limits). The predicted SO_2 concentrations exceeded the short-term SILs, yielding significant impact radii of 5.42 (24-hour) and 1.95 (3-hour) kilometers, respectively when evaluated using the maximum short-term emission rates for the Main and Auxiliary boilers. Thus, refined PSD Increment and NAAQS modeled evaluations, including the contributions of major sources off-site, were required for SO_2. None of the results above SILs occurred in complex terrain.

VOC emissions are also projected to be significant, but there is no modeled SIL for ozone. Since the project's VOC or NOx emissions are projected to exceed 100 tons-per-year (tpy), the facility was required to conduct an ozone impacts analysis.

PRECONSTRUCTION MONITORING EVALUATION

All pollutants in Table II-3 with projected emissions above the PSD significant emission rates (CO, NO_2, PM10, PM2.5, SO_2, and Fl) were evaluated to see if the facility should be required to conduct preconstruction monitoring. As shown in Table II-3, the projected maximum concentrations for each of these pollutants with emissions in excess of respective PSD emission rate thresholds are below their respective *de minimus* levels. This enables GA EPD to exempt all of these contaminants from preconstruction monitoring requirements.

CLASS I AREA AIR QUALITY RELATED VALUE (AQRV) ANALYSES

MACTEC conducted regional haze visibility and acid deposition analyses, using the maximum project emission rates, at all seven Class I areas located within 300 km of the project. The CALPUFF model system was used in these analyses.

Deposition: The maximum nitrogen deposition rate predicted for any of the seven Class I areas was predicted to be 0.0045 kg/ha/yr at the Shining Rock WA (in 2003). This maximum-modeled nitrogen deposition rate is below the Federal Land Manager (FLM) Deposition Analysis Threshold (DAT) level of 0.01 kg/ha/yr. As a result, the nitrogen deposition impacts at each of the seven Class I areas are considered acceptable.

The maximum sulfur deposition rate at any of the seven Class I areas was predicted occur at the Cohutta WA, and to be 0.0135 kg/ha/yr (in 2002). This maximum-modeled sulfur deposition rate is above the DAT level of 0.01 kg/ha/yr. At Cohutta, the DAT was also exceeded in 2003 (0.0117 kg/ha/yr). The sulfur DAT was predicted to be slightly exceeded at Cape Romain (2001 and 2002), the Great Smoky Mountain National Park (2003), the Joyce Kilmer/Slickrock WA (2003), and the Shining Rock WA (2003). These exceedances were less than or equal to the maximum sulfur deposition rate predicted at Cohutta during 2003. The averages of the three annual-modeled maximum rates of sulfur deposition at each Class I area are below the DAT level (except for Cohutta, 0.0112 kg/ha/yr; and Cape Romaine, 0.0101 kg/ha/yr). The maximum annual nitrogen and sulfur deposition rates predicted as a result of the project at each Class I area are presented on Table 7-8 of the application. An exceedance of the DAT thresholds may be deemed acceptable by the FLM, depending on the number of exceedances predicted to occur at individual Class I areas, and other factors. An exceedance of the DAT thresholds is not equivalent to a finding of adverse impact, but indicates additional analysis may be requested.

The U.S.F.S. FLM reviewed the Shining Rock WA Class I area modeling conducted for Plant Washington, on the basis that Shining Rock is the closest U.S.F.S.-managed area to Plant Washington. That review concluded the impacts of Plant Washington on Forest Service-managed Class I areas are acceptable and do not warrant further analysis.

During this review, it was observed that project short-term SO2 emission rates were used in assessing sulfur deposition. The use of the appropriate annual emission limits, which are less than 50% of the short-term limits, would inhibit the calculation of any excesses of the sulfur DAT.

Visibility. Visibility impacts due to regional haze are an AQRV of each of the seven Class I areas within 300 km of Plant Washington. The assessment of visibility impacts from the proposed facility was computed by determining the change in light extinction coefficient at each Class I area due to primary particulate matter emissions from the facility and secondary particulate products of atmospheric reactions during plume transport, such as sulfates and nitrates. The visibility impacts were calculated using CALPOST Method 2, at 95% relative humidity. The visibility impacts were computed as a percentage change in the 24-hour averaged light extinction coefficient (β_{ext}) above natural background light extinction. The 8th highest visibility impacts are indicated for each Class I area on Table 7-7. The largest 8th highest visibility impact of the project was predicted to occur at the Cape Romain WMA in 2002 (2.93%). MACTEC also presented a refined estimate of the visibility impacts at each Class I area using CALPOST Method 6 (see Table 7-6). The 8th highest maximum Method 6 visibility impact was 1.44% at Cape Romain in 2002. The regional haze acceptable impact level for screening (project-only) modeling is a 5% change in the β_{ext}. No Plant Washington project impacts were predicted to exceed this level of change.

PSD ANALYSIS

Class I Areas. No Class I SILs are predicted to be exceeded. For this reason, no further analysis of Class I Increment impacts was conducted.

Class II Areas. The minor source PSD baseline date for SO_2 in Washington County is December, 2000. Emissions of Washington County sources that began operation prior to that date were not included in the offsite PSD Increment inventory. Other PSD increment-consuming sources of nearby Georgia within 56 km of the project are included in the Class II PSD increment analysis for SO_2, and are tabulated in Appendix C of the application with changes noted in the accompanying Model Request Form tables. Sources were screened from the modeled inventory if they were farther from the facility than 56 km. Sources were also eliminated from the

Class II PSD increment analysis for SO_2 by conservative application of the 20-D screening method. No offsite sources are located within the project significant impact area. The modeled regional PSD Class II increment consumption results for SO_2 are summarized in Table III-2 for all increment-consuming sources. The maximum-modeled significance concentrations may be considered as the Increment consumed for those pollutants which did not exceed their respective SILs. The short-term SO_2 impacts include the project start-up scenario emissions.

NAAQS ANALYSIS

Similar to the PSD increment analysis, NAAQS modeling was conducted for all SO_2 point sources to a distance of about 50 km beyond the SO_2 SIA (56 km total). Sources were excluded using the 20-D rule except this rule was not applied to sources within 2 km of each other. The NAAQS source inventory, as modified for this modeling review, is available in the modeling files on compact disk.

NAAQS modeling results for SO_2 are summarized in Table IV. The short-term impacts include the project start-up scenario emissions. As shown, the maximum predicted SO_2 concentrations, including background concentrations, were predicted to comply with the NAAQS for SO_2.

OZONE IMPACTS ANALYSIS

MACTEC presents an analysis of Plant Washington's potential ozone impacts in section 5 of the application. The last three years of the 4th highest monitored 8-hour averaged ozone concentrations at each of the three ozone monitoring stations closest to the Plant Washington site are summarized in Table 5-1A. This table indicates that the latest three-year rolling average ozone design concentration is less than the 8-hour ozone standard at only the Columbia County monitor. Plant Washington elaborates that Columbia County is closer to Washington County in population, vehicle miles traveled, and NOx emissions density than the other two counties (Bibb and Richmond). Plant Washington extrapolates that Washington County is lower in each of these parameters, all of which contribute to ozone formation, than Columbia County.

Preconstruction monitoring for ozone can be waived in the event that representative ozone ambient air quality monitoring data for the area is available. Plant Washington has indicated that Washington County is conservatively represented by the monitored data collected by GA EPD in Columbia County. For this reason, it is recommended that preconstruction monitoring for ozone be waived for the Plant Washington project. The Plant Washington Generating Station is not anticipated to cause, or substantially contribute to, an excess of the 8-hour ozone standard in the region.

AIR TOXICS ANALYSIS

Maximum ground-level air toxic concentrations were assessed by MACTEC using the SCREEN3 model and maximum emission rates from the Main and Auxiliary boilers. Four air contaminants required refined modeled assessment using the ISCST3 model (version 02035) without downwash effects in accordance with the Georgia EPD *GUIDELINE FOR AMBIENT IMPACT ASSESSMENT OF TOXIC AIR POLLUTANT EMISSIONS*, 6/98 (Georgia Guideline). The maximum 1-hour modeled concentration from each model was multiplied by 1.32 and used for the 15-minute averaging period. Maximum-modeled concentrations for each air toxic pollutant and applicable averaging period are summarized and compared to their respective Acceptable Ambient Concentrations (AACs) the attached Table 6-2 from the application. The maximum ground-level concentration (MGLC) predicted for each contaminant over it's respective time-weighted averaging period was found to comply with the appropriate AAC.

MACTEC also assessed the potential synergistic effects in accordance with the Georgia Guideline. This guidance compares, for each of the three time-weighted averaging periods for which AACs are calculated, the sum of the ratios of each MGLC to it's AAC, regardless of whether each contaminant affects one or more organs in the same way. The cumulative impacts accounted for in this way were found to indicate total potential synergistic toxicities totaling 91%, 77%, and 22% for the time-weighted averaging periods of annual, 24-hour, and 15-minute periods, respectively. Since none of these totals exceed 100%, cumulative impacts are not considered to be of concern.

ADDITIONAL IMPACTS ANALYSIS

This section describes the additional impacts analysis that is required as a part of the PSD regulation. The additional impacts analysis assesses the potential impairment to visibility, soils and vegetation as a result of the operation of the source and associated commercial, industrial, and residential growth, and assesses the air quality impact as a result of such growth.

Growth. The growth analysis is a projection of the commercial, industrial, residential and other growth that may be projected to occur in the area as a result of the construction and operation of the proposed source. The anticipated increase in industrial, commercial, or residential growth in the area as a direct result of the proposed project will be negligible. Construction of the new power generation unit will require a temporary construction work force that will fluctuate from approximately 100 to an estimated 500 people for approximately 24 months. Many construction workers will be hired locally. Operation of the facility is expected to create between 100-150 permanent jobs. No significant amount of related industrial growth is expected to accompany the operation of the plant. Since no significant associated commercial or industrial growth is projected as a result of the proposed action, negligible growth-related air pollution impacts are expected.

Class II Area Visibility Analysis. An analysis of the conditions under which the project plume may be perceived as visible was not required of this project, since there are no state parks and/or historic sites, and airports and/or airstrips within the largest Class II significant impact area (within 5.4 km of the Main Boiler stack).

Soils and Vegetation.

The U.S. EPA has developed certain screening concentrations below which it can be reasonably assumed that the soils and vegetation in the vicinity of a proposed project will not experience any adverse effects due to air emissions associated with the project. These threshold concentrations are listed in Table V1 of the attached Model Request Form, and were compiled from EPA's *A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals* (EPA, 1980). Table VI presents a comparison of the proposed facility's worst-case impacts to these screening concentrations. Review of that table indicates the highest predicted impacts are all well below the screening concentrations. In addition, the facility has been modeled to demonstrate compliance with all applicable NAAQS, which are, in part, based on acceptable levels of environmental impact.

SUMMARY

The modeled air quality analysis reviewed and described above shows conformance of the project's air contaminant emissions with Class I and II PSD Increments and Class II NAAQS. The AQRVs of the closest Class I areas have been examined and found to show no cause for concern. The Air Toxics analysis shows conformance with the Georgia Air Toxics Guideline Acceptable Ambient Concentrations. The Additional Impacts Analysis indicates air quality impacts due to growth associated with the construction and operation of the project is expected to be minimal, as are the anticipated air quality impacts of the project on soils and vegetation. A Class II area visibility analysis was considered unnecessary due to the absence of state parks and/or historic sites, and airports and/or airstrips within the project's largest Class II significant impact area. The results of these conservative studies indicate there is no reason to deny the project the air permit for which it has applied on the basis of adverse air quality impacts.

Attachments:
Table 6-2 Air Toxic Emission Summary (from the Plant Washington Application).
Model Request Form tables of project impacts.
CAMx Photochemical Modeling Review: Plant Washington, Washington County

Table 6-2 Toxic Emission Summary

Pollutant	Main Boiler (lb/hr)	Main Boiler (g/s)	Auxiliary Boiler (lb/hr)	Auxiliary Boiler (g/s)	Main Boiler 1-Hr MGLC (mg/m^3)	Auxiliary Boiler 1-Hr MGLC (mg/m^3)	Total 1-Hr MGLC (mg/m^3)	Annual MGLC (mg/m^3)[2]	AAC Annual (mg/m^3)	% of allowable AAC[1]	24-Hr MGLC (mg/m^3)[1]	AAC 24-hour (mg/m^3)	% of allowable AAC[1]	15-Min MGLC (mg/m^3)	Short (15-min) Term Limit (mg/m^3)	% of allowable Short Term Limit
Organics																
Acenaphthene	2.49E-04	3.14E-05	3.62E-05	4.56E-06	2.19E-08	2.72E-08	4.91E-08	3.93E-09	-	-	1.96E-08	0.04	0.00005%	6.48E-08	-	-
Acenaphthylene	1.22E-04	1.54E-05	4.34E-07	5.47E-08	1.07E-08	3.26E-10	1.11E-08	8.85E-10	-	-	4.42E-09	0.12	0.000004%	1.46E-08	-	-
Acetaldehyde	2.78E-01	3.50E-02	1.97E-03	2.48E-04	2.45E-05	1.48E-06	2.59E-05	2.08E-06	4.55E-03	0.05%	1.04E-05	-	-	3.42E-05	4.50	0.0008%
Acetophenone	7.32E-03	9.22E-04		-	6.44E-07		6.44E-07	5.15E-08		-	2.58E-07	0.12	0.0002%	8.50E-07	-	-
Acrolein	1.42E-01	1.78E-02		-	1.24E-05		1.24E-05	9.96E-07	2.00E-05	4.98%	4.98E-06	-	-	1.64E-05	0.02	0.07%
Ammonia	51.07	6.43E+00		-	4.49E-03		4.49E-03	3.59E-04	1.00E-01	0.36%	1.80E-03	-	-	5.93E-03	2.44	0.2432%
Anthracene	1.02E-04	1.29E-05	2.09E-06	2.64E-07	9.01E-09	1.57E-09	1.06E-08	8.47E-10		-	4.23E-09	4.76E-04	0.0009%	1.40E-08	-	-
Benzene	6.34E-01	7.99E-02	3.67E-04	4.63E-05	5.58E-05	2.76E-07	5.61E-05	4.49E-06	4.55E-04	0.99%	2.24E-05	-	-	7.40E-05	0.80	0.009%
Benzo(a)anthracene	3.90E-05	4.92E-06	6.87E-06	8.67E-07	3.43E-09	5.17E-09	8.60E-09	6.88E-10	-	-	3.44E-09	4.76E-04	0.001%	1.14E-08	-	-
Benzo(a)pyrene	1.85E-05	2.34E-06		-	1.63E-09		1.63E-09	1.30E-10	-	-	6.52E-10	4.76E-04	0.0001%	2.15E-09	-	-
Benzo(b)fluoranthene	6.64E-05	8.37E-06		-	5.84E-09		5.84E-09	4.67E-10	-	-	2.34E-09	4.76E-04	0.0005%	7.71E-09	-	-
Benzo(e)pyrene	8.30E-06	1.05E-06		-	7.30E-10		7.30E-10	5.84E-11	-	-	2.92E-10	6.21E-04	0.00005%	9.64E-10	-	-
Benzo(g,h,i)perylene	2.10E-05	2.64E-06	3.87E-06	4.89E-07	1.85E-09	2.91E-09	4.76E-09	3.81E-10	-	-	1.90E-09	6.21E-04	0.0003%	6.28E-09	-	-
Benzo(g,h,i)pyrene	1.32E-05	1.66E-06		-	1.16E-09		1.16E-09	9.27E-11	-	-	4.64E-10	6.21E-04	0.0001%	1.53E-09	-	-
Benzo(b,k)fluoranthene	5.37E-05	6.76E-06	2.54E-06	3.20E-07	4.72E-09	1.91E-09	6.63E-09	5.30E-10	-	-	2.65E-09	4.76E-04	0.001%	8.75E-09	-	-
Benzo(k)fluoranthene	3.32E-05	4.18E-06		-	2.92E-09		2.92E-09	2.34E-10	-	-	1.17E-09	4.76E-04	0.0002%	3.85E-09	-	-
Benzyl chloride	3.42E-01	4.30E-02		-	3.00E-05		3.00E-05	2.40E-06	-	-	1.20E-05	1.19E-02	0.101%	3.97E-05	0.50	0.008%
Biphenyl	1.49E-03	1.88E-04		-	1.31E-07		1.31E-07	1.05E-08	-	-	5.26E-08	2.38E-03	0.002%	1.73E-07	-	-
bis(2-Ethylhexyl)phthalate	3.56E-02	4.49E-03		-	3.13E-06		3.13E-06	2.51E-07	-	-	1.25E-06	1.19E-02	0.01%	4.14E-06	1.00	0.0004%
Bromoform	5.48E-02	6.90E-03		-	4.82E-06		4.82E-06	3.85E-07	9.09E-03	0.004%	1.93E-06	-	-	6.36E-06	-	-
2-Butanone (MEK)	1.90E-01	2.40E-02		-	1.67E-05		1.67E-05	1.34E-06	5.00	0.00003%	6.70E-06	-	-	2.21E-05	88.47	0.00002%
Carbon tetrachloride	2.70E-02	3.40E-03		-	2.37E-06		2.37E-06	1.90E-07	6.67E-04	0.03%	9.49E-07	-	-	3.13E-06	15.73	0.00002%
Carbon disulfide	6.34E-02	7.99E-03		-	5.58E-06		5.58E-06	4.46E-07	0.70	0.0001%	2.23E-06	-	-	7.37E-06	9.33	0.0001%
Chlorobenzene	2.64E-02	3.33E-03		-	2.32E-06		2.32E-06	1.86E-07	-	-	9.29E-07	0.83	0.0001%	3.06E-06	-	-
Chloroform	2.88E-02	3.63E-03		-	2.53E-06		2.53E-06	2.03E-07	4.35E-04	0.05%	1.01E-06	-	-	3.34E-06	24.00	0.00001%
Chloromethane	2.59E-01	3.26E-02		-	2.28E-05		2.28E-05	1.82E-06	0.09	0.002%	9.10E-06	-		3.00E-05	41.40	0.0001%
2-Chloronaphthalene	3.32E-04	4.18E-05		-	2.92E-08		2.92E-08	2.34E-09	3.01E-03	0.0001%	1.17E-08	-	-	3.85E-08	7.86	0.0000005%
2-Chloroacetophenone	3.42E-03	4.30E-04		-	3.00E-07		3.00E-07	2.40E-08	3.00E-05	0.08%	1.20E-07	-	-	3.97E-07	-	-
Chrysene	4.88E-05	6.15E-06	4.08E-06	5.15E-07	4.29E-09	3.07E-09	7.36E-09	5.89E-10	-	-	2.94E-09	4.76E-04	0.001%	9.72E-09	-	-
Cumene	2.59E-03	3.26E-04		-	2.28E-07		2.28E-07	1.82E-08	0.40	0.000005%	9.10E-08	-	-	3.00E-07	-	-
Cyanide	1.22E+00	1.54E-01		-	1.07E-04		1.07E-04	8.58E-06		-	4.29E-05	1.19E-02	0.3606%	1.42E-04	-	-
Dibenzo(a,h)anthracene	1.55E-05	1.95E-06	2.86E-06	3.61E-07	1.36E-09	2.15E-09	3.52E-09	2.81E-10	-	-	1.41E-09	4.76E-04	0.0003%	4.64E-09	-	-
Di-nbutylphthalate	2.32E-02	2.93E-03		-	2.04E-06		2.04E-06	1.64E-07	-		8.18E-07	0.01	0.007%	2.70E-06	-	-
Dimethyl sulfate	2.34E-02	2.95E-03		-	2.06E-06		2.06E-06	1.65E-07	-	-	8.24E-07	1.19E-02	0.01%	2.72E-06	-	-
7,12-Dimethylbenz(a)anthracene	4.88E-06	6.15E-07		-	4.29E-10		4.29E-10	3.44E-11	-	-	1.72E-10	4.76E-04	0.00004%	5.67E-10	-	-
2,4-Dinitrotoluene	1.37E-04	1.72E-05		-	1.20E-08		1.20E-08	9.62E-10	-	-	4.81E-09	3.57E-03	0.0001%	1.59E-08	-	-
Ethylbenzene	4.59E-02	5.78E-03	1.09E-04	1.37E-05	4.03E-06	8.20E-08	4.12E-06	3.29E-07	1.00	0.00003%	1.65E-06	-	-	5.43E-06	54.27	0.00001%
Ethyl Chloride	2.05E-02	2.58E-03		-	1.80E-06		1.80E-06	1.44E-07	10.00	0.000001%	7.21E-07	-	-	2.38E-06	-	-
Ethylene dichloride	2.57E-02	3.24E-03		-	2.26E-06		2.26E-06	1.81E-07	3.85E-04	0.05%	9.05E-07	-		2.99E-06	40.48	0.00001%
Ethylene dibromide	5.86E-04	7.38E-05		-	5.15E-08		5.15E-08	4.12E-09	1.67E-06	0.25%	2.06E-08	-		6.80E-08	23.06	0.0000003%
Fluoranthene	3.46E-04	4.37E-05	8.30E-06	1.05E-06	3.05E-08	6.24E-09	3.67E-08	2.94E-09	-	-	1.47E-08	0.01	0.0002%	4.85E-08	-	-
Fluorene	4.44E-04	5.60E-05	7.66E-06	9.66E-07	3.91E-08	5.76E-09	4.48E-08	3.59E-09	-	-	1.79E-08	4.76E-04	0.0038%	5.92E-08	-	-
Formaldehyde	3.06E-01	3.86E-02	5.66E-02	7.13E-03	2.70E-05	4.25E-05	6.95E-05	5.56E-06	7.69E-04	0.72%	2.78E-05	-	-	9.17E-05	0.25	0.04%
Hexane	3.27E-02	4.12E-03		-	2.88E-06		2.88E-06	2.30E-07	0.70	0.00003%	1.15E-06	-	-	3.80E-06	-	
Hydrogen chloride	2.40E+01	3.03E+00		-	2.11E-03		2.11E-03	1.69E-04	2.00E-02	0.84%	8.45E-04	-	-	2.79E-03	0.70	0.40%
Indeno(1,2,3,c,d)pyrene	2.98E-05	3.75E-06	3.67E-06	4.63E-07	2.62E-09	2.76E-09	5.38E-09	4.30E-10	-	-	2.15E-09	4.76E-04	0.0005%	7.10E-09	-	-
Isophorone	2.83E-01	3.57E-02		-	2.49E-05		2.49E-05	1.99E-06	-	-	9.96E-06	0.33	0.003%	3.29E-05	2.83	0.001%
Methyl Bromide	7.81E-02	9.84E-03		-	6.87E-06		6.87E-06	5.49E-07	0.005	0.01%	2.75E-06	-		9.07E-06	8.00	0.0001%
Methyl hydrazine	8.30E-02	1.05E-02		-	7.30E-06		7.30E-06	5.84E-07	-	-	2.92E-06	4.52E-05	6.45%	9.63E-06	0.04	0.03%
MIBK	4.07E-02	5.12E-03		-	3.58E-06		3.58E-06	2.86E-07	3.00	0.00001%	1.43E-06	-	-	4.72E-06	30.72	0.00002%
MMA	9.76E-03	1.23E-03		-	8.58E-07		8.58E-07	6.87E-08	0.70	0.00001%	3.43E-07	-	-	1.13E-06	40.95	0.000003%
2-Methylnaphthalene	2.66E-04	3.35E-05	4.08E-06	5.15E-07	2.34E-08	3.07E-09	2.64E-08	2.11E-09	-	-	1.06E-08	0.01	0.0002%	3.49E-08	-	-
3-Methylchloranthrene	5.49E-07	6.92E-08		-	4.83E-11		4.83E-11	3.87E-12	-	-	1.93E-11	6.90E-03	0.0000003%	6.38E-11	-	-
MTBE	1.71E-02	2.15E-03		-	1.50E-06		1.50E-06	1.20E-07	3.00	0.000004%	6.01E-07	-	-	1.98E-06	-	-
Methylene chloride	1.42E-01	1.78E-02	7.74E-03	9.76E-04	1.24E-05	5.82E-06	1.83E-05	1.46E-06	2.13E-02	0.01%	7.31E-06	-	-	2.41E-05	43.42	0.0001%
Naphthalene	1.05E-02	1.32E-03	1.94E-03	2.44E-04	9.23E-07	1.46E-06	2.38E-06	1.90E-07	3.00E-03	0.01%	9.52E-07	-	-	3.14E-06	7.86	0.00004%
5-Methyl chrysene	1.07E-05	1.35E-06		-	9.44E-10		9.44E-10	7.55E-11	-	-	3.78E-10	4.76E-04	0.0001%	1.25E-09	-	-
OCDD	2.88E-08	3.63E-09		-	2.53E-12		2.53E-12	2.03E-13		-	1.01E-12	6.90E-02	0.000000001%	3.34E-12	-	-

Phenanthrene	1.32E-03	1.66E-04	1.80E-05	2.27E-06	1.16E-07	1.35E-08	1.29E-07	1.04E-08	-	-	5.18E-08	4.76E-04	0.01%	1.71E-07	-	-
Phenol	5.06E-02	6.38E-03	5.83E-03	7.35E-04	4.45E-06	4.38E-06	8.84E-06	7.07E-07	-	-	3.54E-06	4.52E-02	0.01%	1.17E-05	6.00	0.0002%
Propionaldehyde	1.85E-01	2.34E-02		-	1.63E-05		1.63E-05	1.30E-06	8.00E-03	0.02%	6.52E-06		-	2.15E-05	-	-
Pyrene	1.61E-04	2.03E-05	7.29E-06	9.19E-07	1.42E-08	5.48E-09	1.96E-08	1.57E-09	-	-	7.86E-09	4.76E-04	0.002%	2.59E-08	-	-
Styrene	2.57E-02	3.24E-03		-	2.26E-06		2.26E-06	1.81E-07	1.00	0.00002%	9.05E-07	-	-	2.99E-06	85.20	0.000004%
Sulfuric Acid (H_2SO_4) 1	3.32E+01	4.18E+00	1.44E-02	1.82E-03	2.92E-03	1.08E-05	2.93E-03	2.34E-04	-	-	1.17E-03	2.38E-03	49.243%	3.87E-03	0.30	1.2897%
Tetrachloroethylene	2.57E-02	3.24E-03	1.32E-04	1.66E-05	2.26E-06	9.92E-08	2.36E-06	1.89E-07	-	-	9.45E-07	1.61	0.0001%	3.12E-06	135.60	0.000002%
Toluene	1.17E-01	1.48E-02	1.06E-02	1.34E-03	1.03E-05	7.99E-06	1.83E-05	1.46E-06	5.00	0.00003%	7.32E-06	-	-	2.41E-05	113.00	0.00002%
1,1,1-Trichloroethane	2.84E-02	3.58E-03	1.82E-03	2.30E-04	2.50E-06	1.37E-06	3.87E-06	3.09E-07	-		1.55E-06	4.52	0.00003%	5.11E-06	246.00	0.000002%
1,1,2-Trichloroethane	3.90E-02	4.92E-03		-	3.43E-06		3.43E-06	2.75E-07	6.25E-03	0.004%	1.37E-06	-	-	4.53E-06	-	-
1,2,4-Trichlorobenzene	1.25E-02	1.58E-03		-	1.10E-06		1.10E-06	8.81E-08		-	4.40E-07	-	-	1.45E-06	3.70	0.00004%
Trichloroethylene	2.57E-02	3.24E-03		-	2.26E-06		2.26E-06	1.81E-07	-	-	9.05E-07	1.28	0.0001%	2.99E-06	107.50	0.000003%
Vinyl acetate	3.71E-03	4.67E-04	1.24E-03	1.56E-04	3.26E-07	9.29E-07	1.26E-06	1.00E-07	0.20	0.00005%	5.02E-07	-	-	1.66E-06	5.28	0.00003%
Xylene	3.86E-02	4.86E-03	3.26E-04	4.11E-05	3.39E-06	2.45E-07	3.64E-06	2.91E-07	0.10	0.00029%	1.46E-06	-	-	4.80E-06	65.10	0.00001%
m-Xylene	1.20E-02	1.52E-03		-	1.06E-06		1.06E-06	8.47E-08	0.10	0.00008%	4.23E-07		-	1.40E-06	65.10	0.000002%
o-Xylene	6.72E-03	8.47E-04		-	5.91E-07		5.91E-07	4.73E-08	0.10	0.00005%	2.37E-07		-	7.81E-07	65.10	0.000001%
p-Xylene	1.20E-02	1.52E-03		-	1.06E-06		1.06E-06	8.47E-08	0.10	0.00008%	4.23E-07		-	1.40E-06	65.10	0.000002%
P-cresol	7.89E-03	9.94E-04		-	6.94E-07		6.94E-07	5.55E-08		-	2.77E-07	0.05	0.0005%	9.16E-07		-
Pentachlorophenol	6.64E-05	8.37E-06		-	5.84E-09		5.84E-09	4.67E-10	-		2.34E-09	1.19E-03	0.0002%	7.71E-09		-
Hexachlorobenzene	6.64E-04	8.37E-05		-	5.84E-08		5.84E-08	4.67E-09	2.17E-05	0.02%	2.34E-08		-	7.71E-08		-
Methyl iodide	3.32E-03	4.18E-04		-	2.92E-07		2.92E-07	2.34E-08		-	1.17E-07	0.07	0.0002%	3.85E-07		-
1,3-Butadiene	3.08E-03	3.88E-04		-	2.71E-07		2.71E-07	2.17E-08	3.33E-05	0.07%	1.08E-07		-	3.58E-07	1.10	0.00003%
1,3-Dichloropropene	5.48E-03	6.91E-04		-	4.82E-07		4.82E-07	3.86E-08	2.50E-03	0.002%	1.93E-07		-	6.37E-07		-
1,4-Dichlorobenzene	8.76E-03	1.10E-03		-	7.71E-07		7.71E-07	6.16E-08	0.80	0.00001%	3.08E-07		-	1.02E-06		-
2,4,6-Trichlorophenol	6.64E-06	8.37E-07		-	5.84E-10		5.84E-10	4.68E-11	3.23E-03	0.000001%	2.34E-10		-	7.71E-10		-
2,4-Dinitrophenol	8.92E-05	1.12E-05		-	7.85E-09		7.85E-09	6.28E-10		-	3.14E-09	8.98E-04	0.0003%	1.04E-08		-
4-Nitrophenol	3.32E-05	4.19E-06		-	2.92E-09		2.92E-09	2.34E-10		-	1.17E-09	5.18E-03	0.00002%	3.86E-09		-
Allyl Chloride	6.66E-02	8.40E-03		-	5.86E-06		5.86E-06	4.69E-07	1.00E-03	0.05%	2.34E-06		-	7.74E-06	0.60	0.0013%
Calcium Cyanamide	2.81E-02	3.54E-03		-	2.47E-06		2.47E-06	1.98E-07	-		9.89E-07	1.19E-03	0.0831%	3.26E-06		-
Dibenzo[a,j]Acridine	4.25E-03	5.35E-04		-	3.74E-07		3.74E-07	2.99E-08		-	1.49E-07	0.03	0.0004%	4.93E-07		-
Dibenzofuran	4.75E-03	5.99E-04		-	4.18E-07		4.18E-07	3.34E-08		-	1.67E-07		-	5.52E-07		-
Diethyl Sulfate	1.94E-02	2.44E-03		-	1.70E-06		1.70E-06	1.36E-07		-	6.81E-07	0.04	0.002%	2.25E-06		-
Dimethyl Phthalate	8.00E-04	1.01E-04		-	7.04E-08		7.04E-08	5.63E-09		-	2.82E-08	0.01	0.0002%	9.29E-08		-
Polychlorinated Biphenyls	1.14E-04	1.44E-05		-	1.00E-08		1.00E-08	8.02E-10	1.00E-04	0.0008%	4.01E-09		-	1.32E-08		-
Propylene Dichloride	9.97E-03	1.26E-03		-	8.77E-07		8.77E-07	7.01E-08	4.00E-03	0.002%	3.51E-07		-	1.16E-06	50.80	0.000002%
Sodium Cyanide	6.71E-01	8.46E-02		-	5.90E-05		5.90E-05	4.72E-06	-		2.36E-05	0.012	0.1984%	7.79E-05	0.50	0.02%
Toluene-2,4-Diamine	1.14E-04	1.44E-05		-	1.00E-08		1.00E-08	8.04E-10		-	4.02E-09	5.52E-03	0.0001%	1.33E-08		-
Vinyl Chloride	5.92E-03	7.46E-04		-	5.21E-07		5.21E-07	4.17E-08	2.27E-04	0.02%	2.08E-07		-	6.88E-07	1.28	0.0001%
Dioxins (Total)	8.03E-08	1.01E-08	2.11E-09	2.66E-10	7.07E-12	1.59E-12	8.66E-12	6.92E-13	4.00E-08	0.0017%	3.46E-12		-	1.14E-11		-
Metals																
Antimony	1.46E-02	1.83E-03		-	1.28E-06		1.28E-06	1.02E-07	2.00E-04	0.05%	5.12E-07		-	1.69E-06	-	-
Arsenic	3.13E-01	3.94E-02	9.60E-04	1.21E-04	2.75E-05	7.22E-07	2.82E-05	1.00E-07	2.33E-07	970.64 % / 43.00%	1.13E-05	-	-	3.72E-05	2.00E-04	18.62%
Beryllium	2.85E-02	3.59E-03	7.20E-04	9.08E-05	2.50E-06	5.41E-07	3.04E-06	2.44E-07	4.17E-06	5.85%	1.22E-06	-	-	4.02E-06	5.00E-04	0.80%
Cadmium	5.35E-02	6.74E-03	7.20E-04	9.08E-05	4.71E-06	5.41E-07	5.25E-06	4.20E-07	5.56E-06	7.56%	2.10E-06	-	-	6.93E-06	3.00E-02	0.02%
Chromium (II,III)	2.02E-01	2.55E-02	7.20E-04	9.08E-05	1.78E-05	5.41E-07	1.83E-05	1.47E-06	-	-	7.33E-06	1.19E-03	0.62%	2.42E-05	-	-
Chromium (VI)	6.91E-02	8.70E-03		-	6.08E-06		6.08E-06	2.00E-08	8.33E-08	583.26 % / 24.00%	2.43E-06	-	-	8.02E-06	0.01	0.08%
Cobalt	4.88E-02	6.15E-03		-	4.29E-06		4.29E-06	3.43E-07	-	-	1.72E-06	2.38E-04	0.72%	5.67E-06	-	-
Copper	7.80E-03	9.83E-04	1.44E-03	1.82E-04	6.86E-07	1.08E-06	1.77E-06	1.42E-07	-	-	7.08E-07	2.38E-04	0.30%	2.33E-06	-	-
Lead	1.33E-01	1.67E-02	2.16E-03	2.72E-04	1.17E-05	1.62E-06	1.33E-05	1.06E-06	-	-	5.32E-06	1.19E-04	4.47%	1.76E-05	-	-
Mercury	1.39E-02	1.75E-03	7.20E-04	9.08E-05	1.22E-06	5.41E-07	1.77E-06	1.41E-07	3.00E-04	0.05%	7.06E-07	-	-	2.33E-06	0.01	0.02%
Magnesium	5.37E+00	6.76E-01		-	4.72E-04		4.72E-04	3.78E-05	-	-	1.89E-04	0.0357	0.53%	6.23E-04	-	-
Manganese	9.35E-01	1.18E-01	1.44E-03	1.82E-04	8.22E-05	1.08E-06	8.33E-05	2.90E-07	5.00E-05	13.33 % / 0.58%	3.33E-05	-	-	1.10E-04	0.50	0.02%
Nickel	1.64E-01	2.07E-02	7.20E-04	9.08E-05	1.45E-05	5.41E-07	1.50E-05	5.00E-08	4.17E-06	28.81 % / 1.20%	6.00E-06	-		1.98E-05	-	-
Phosphorus	2.61E-01	3.29E-02	2.68E-02	3.39E-03	2.30E-05	2.02E-05	4.32E-05	3.45E-06	-	-	1.73E-05	2.38E-04	7.25%	5.70E-05	-	-
Selenium	6.34E-01	7.99E-02	3.60E-03	4.54E-04	5.58E-05	2.71E-06	5.85E-05	4.68E-06	-	-	2.34E-05	4.76E-04	4.91%	7.72E-05	-	-
Zinc	5.20E-03	6.55E-04	9.60E-04	1.21E-04	4.57E-07	7.22E-07	1.18E-06	9.43E-08	-	-	4.72E-07	1.19E-02	3.96E-03 %	1.56E-06	1.00	0.0002%
Additional Evaluations																
Hydrogen Fluoride, as F	1.80E+00	2.27E-01	2.23E-03	2.82E-04	1.58E-04	1.68E-06	1.60E-04	1.28E-05	-	-	6.40E-05	5.95E-03	1.08%	2.11E-04	2.30E-01	0.09%
Cumulative Impact										90.88%			76.78%			21.77%

1. The model results in the highlighted cells are based on ISCST modeling and not the Screen3 results. The corresponding % of allowable ACC values for each of these concentrations shows the % of AAC when using the Screen3 model (1st) and % of AAC when using the ISCST model (2nd). See Table 6-3 for ISCST modeling results.

Appendix 8 – Modeling Request Form

REQUEST FOR MODELING ANALYSIS

I. ENGINEERING INPUT

Engineer Requesting: Purva Prabhu Date: 01/05/09

Emissions/Process Reviewed By: Purva Prabhu Date: 01/05/09

Desired Modeling Completion Date: ________

Project type(s): PSD Yes ; Toxics Yes ; Quarry ________ ; BART ________

Application No.: 17924 Permit Reference No.: ________

A. Source Information

- Facility Name: Plant Washington
- Location (City & County): City - Sandersville, County - Washington
- Criteria Pollutants emitted in significant amounts (tpy):

	Pollutant	Project		Pollutant	Plant-Wide
Project:	NO_X	1836	*	NO_X	1836
	SO_2	1896	*	SO_2	1896
	PM_{10}	678	*	PM_{10}	678
	CO	3642		CO	3642
	VOC	110		VOC	110
	Lead	0.58		Lead	0.58
	H_2SO_4	145	*	H_2SO_4	145

*Visibility-affecting pollutant

- Date emissions data verified? 01/05/09**

  ** [Table 5-3, CO 8-hr emission factor for coal fired boiler, 313.74 g/s and not 104.58

  Table 5-3, PM10 emission factor for auxiliary boiler, 0.726 g/s and not 0.42

  Please see attached sheets for tons/hour and lb/hr emission rates.]
- NAAQS and Increment have explicit pollutant-specific time-weighted averaging periods. If the project is to have short-term emission rates that differ from annual emission rates presented above (divided by the applicable time-weighting averaging period), please attach such information (in lbs/hr of pollutants with rates other than annual). Example: If maximum hourly rate not = to annual rate/8760 hrs-per-year X 2000 pounds-per-ton, then what is maximum hourly rate, etc.?
- Is data provided sufficient to accurately inventory the PSD Increment? Yes
- Attach plot plan of the facility that shows property lines, building locations and emission points, & receptor locations.
- **ATTACH MODELING CD OR FILES!**

A copy of the updated application and associated modeling files has been provided to modeling.

B. Background Information

- PSD baseline dates: SO_2 10/23/2000 PM_{10} 06/06/1978 NO_2 10/23/2000
- Modeling to be conducted for: PSD Increment Class I Yes, Class II Yes
  NAAQ Yes, Preconstruction monitoring Yes, BART Visibility ______
- If there are Class I areas within 300 km of the source, OR if Q/D > 4, where Q= tpy of visibility-affecting pollutants to be emitted by the project, and D= facility-to-Class I Area distance (km):

  distance to Cape Romain area(s) is 289 km.

  distance to Cohutta area(s) is 261 km.

  distance to Great Smokey Mtns area(s) is 273 km.

  distance to Joyce Kilmer area(s) is 276 km.

  distance to Shining Rock area(s) is 252 km

  distance to Wolf Island area(s) is 231 km

  distance to Okefenokee area(s) is 227 km
- Is modeling to include fugitive emissions (Yes/No)? Yes If yes, are fugitive emissions adequately characterized in report (Yes/No)? Yes
- If any actual stack height is less than its GEP stack height, attach BPIP model output table (provided by applicant).
- Are emission rates modeled allowable limits? Yes
- Periods of operation if other than 24 hours/day, 7 days/week:

  Source Code: ______ Hours per day ______ Days per week ______

  Auxiliary Boiler 876 Hours per year

  Mercury sorbent silo and SO_3 sorbent silo 6 Hours per day 7 Days per week

  Soda ash silo and hydrated lime silo 3 Hours per day 7 Days per Week

  Coal, limestone and ash handling operations will not operate 24 hours/day, 7 days/week. Requested information from the facility.
- Are complex terrain issues identified or considered in the report? Terrain was addressed using AERMOD
  If NOx and VOC emissions are to increase by more than 100 tpy, is an ozone ambient impacts analysis included in the application? Yes
- Are Class II visibility issues addressed? Yes
- Are additional impacts (soils, vegetation, & growth) addressed? Yes
- Remarks or additional information: ______

II. INITIAL {SIGNIFICANCE TEST} MODELING RESULTS (project emissions only!)

Date completed: 8/11/09; By: PSC

TABLE II-1: Project Impacts VS. Significance Level (All CLASS I AREAS) – Worst-case

Criteria Pollutant	Averaging Period	Significance Level (μg/m³)	Maximum* Project Concentration (μg/m³)	Receptor UTM Zone: 17 Meters E	Meters N	Model Met Data Period/Area [yymmddhh]/Area or Year/Area
SO_2	Annual	0.1	0.008	472657	3469628	2002/Wolf Island WMA
	24-Hour	0.2	0.1996	468694	3469639	03122524/Wolf Island WMA
	3-Hour	1.0	0.71	171939	3861622	02021424/Cohutta WA
PM_{10}	Annual	0.2	0.0025	625889	3639472	2002/Cape Romain WMA
	24-Hour	0.3	0.057	468694	3469639	03122524/Wolf Island WMA
NO_2	Annual	0.1	0.002	472657	3469628	2002/Wolf Island WMA

*Maximum concentration - = Each averaging period, all project emission sources operating at maximum capacity

- Model(s) used: CALPUFF 5.8 (level 070623), CALPOST 5.6394 (level 070622)

  Met. data: Year(s) 2001, 2002, & 2003 CALMET 5.8 (Level 070623) output files prepared by the U.S. Fish & Wildlife Service in July, 2007 at 4-km grid cell size, from VISTAS-sponsored Domain 4 Prognostic Meteorological Model MM4/5 output files at 12 or 36 km resolution

  Surface data from 206 surface stations, 306 preciptiation stations, and 6 over-water stations

  Upper air data from 13 upper air NWS stations

- Receptor information: 1 km-spaced gridded receptors as downloaded from the Nat'l Park Service database.
- Remarks of additional information: Plant Washington accepted a 24-hour SO_2 emission limit of 0.08 pounds SO_2/MMBtu in order to reduce its impacts to less than the 24-hr Class I SO_2 Significance level.

TABLE II-2: Project Impacts VS. Significance Level (CLASS II AREAS)

Criteria Pollutant	Averaging Period	Significance Level (μg/m³)	Maximum* Project Concentration (μg/m³)	Receptor UTM Zone: 17 Meters E	Meters N	Model Met Data Period [yymmddhh]	Significant Impact Distance (km)
SO_2	Annual	1	0.601	338763	3659340	1989	NS
	24-Hour	5	11.31	338468	3658817	87033124	**5.42**
	3-Hour	25	30.38	336637	3659011	91082715	1.95
PM_{10}	Annual	1	0.8613	336977	3660784	1989	NS
	24-Hour	5	4.951	337260	3660883	89032524	NS
NO_2	Annual	1	0.4578	338762	3659340	1989	NS
CO	8-Hour	500	60.01	336037	3659511	88060416	NS
	1-Hour	2000	127.63	338037	3661311	87073108	NS

*Maximum concentration = Each averaging period, all project emission sources operating at maximum capacity over the respective averaging period, except that the main boiler was also evaluated at 40% capacity. The results indicate 100% boiler capacity impacts.

- IF THE MAXIMUM PROJECT CONCENTRATION EXCEEDS THE SIGNIFICANCE LEVEL FOR ANY AVERAGING PERIOD, REFINED NAAQS / INCREMENT ANALYSIS IS REQUIRED FOR THAT POLLUTANT.
  Maximum Significant Impact Distances used to define pollutant-specific significant impact area indicated in Bold font.
  NS indicates no significant impact distance was identified.

Source: Plant Washington

TABLE II-3: Project Pollutant Monitoring *De Minimus* Impacts

Pollutant	Averaging Period	*De Minimus* Concentration	Project* Concentration	Receptor UTM Zone: 17		Model Met Data Period
		(μg/m³)	(μg/m³)	Meters E	Meters N	[yymmddhh] or year
CO	8-Hour	575	60.01	336037	3659511	88060416
NO_2	Annual	14	0.4578	338762	3659340	1989
PM_{10}	24-Hour	10	4.951	337260	3660883	89032524
SO_2	24-Hour	13	11.31	338468	3658817	87033124
Pb	3-Month	0.1	NS			
Fl	24-Hour	0.25	0.0200	338468	3658817	87033124
Total Reduced S	1-Hour	10	NS			
H_2S	1-Hour	0.2	NS			
Reduced S Compounds	1-Hour	10	NS			

*Highest concentration off property
NS: Not emitted by the project in excess of significant PSD emission rates.

- EXCLUSION FROM PRECONSTRUCTION MONITORING IF PROJECTED CONCENTRATION LESS THAN *DE MINIMUS*. (Yes/No) Yes, for all pollutants emitted in excess of respective PSD significant emission rates
- Model(s) used: AERMOD (07026), AERMET (06341), AERMAP (09040)

  Met. data: Year(s) 1987-1991

  Surface data from Lewis B. Wilson, aka Middle Georgia Regional, aka Macon Airport, GA NWS

  Upper air data from Centerville, Albama NWS station
- Receptor information: Receptors were located offsite on a 100-m spacing grid between the fenceline/patrolled property line and a downwind distance from the boiler stack of at least 2 km, and from there, at a spacing of 500 meters to about 13 km from the main boiler stack.
- Remarks of additional information: A 1-km square grid of 100-m spaced receptors was centered over the 500-meter receptor which initially indicated the maximum Significant Impact Distance (SID) for the 24-hour averaging period. The 24-hour SO_2 model was re-run with these receptors to refine the maximum SID to the nearest 100 meters.

MACTEC modeled NOx, EPD modeled NO_2 using the Ambient Ratio method (NO_2 = NOx X 0.75)

MACTEC modeled annual SO_2 impacts using short-term emission rates for the main and auxiliary boilers, EPD used the long-term emission limits from the BACT section of the application to assess annual SO_2 concentrations

III. FINAL MODELING RESULTS – PSD INCREMENT

TABLE III-1: Cumulative CLASS I AREA Increment Assessment (All Relevant Sources) was not required

Pollutant	Averaging Period	Allowable Increment	Maximum* Increments Consumed	Receptor UTM Zone:______		Model Met Data Period
		(μg/m³)	(μg/m³)	X (m)	Y (m)	[yymmddhh]
SO_2	Annual	2	NS			
	24-Hour	5	NS			
	3-Hour	25	NS			
PM_{10}	Annual	4	NS			
	24-Hour	8	NS			
NO_2	Annual	2.5	NS			

* Class I area concentrations:
Highest concentration: annual averaging periods
Highest, second-highest concentration: 24-hour and 3-hour averaging periods
NS: No significant concentration was predicted to occur from the project

- Models used: ______

  Met. data: Year(s) ______

  Surface data from ______

  Upper air data from ______

- Fugitive emissions included in model? ______

  - Remarks or additional information: Cumulative Increment modeling was not required as all pollutant impacts at each of the 7 Class I areas within 300 km of the project were below respective Class I Significance levels for each pollutant/time-averaging period.

TABLE III-2: CLASS II AREA PSD Increment Assessment, All Relevant Sources

Pollutant	Averaging Period	Allowable Increment ($\mu g/m^3$)	Maximum* Increments Consumed ($\mu g/m^3$)	Receptor UTM Zone: 17 X (m)	Y (m)	Model Met Data Period [yymmddhh]
SO_2	Annual	20	1.92	338517	3658904	1987
	24-Hour†	91	18.1 (10.3)	336537	3659211	88050124
	3-Hour†	512	58. (28.4)	336599	3660652	90050412
PM_{10}	Annual	17	NS			
	24-Hour	30	NS			
NO_2	Annual	25	NS			

*Off property concentrations:
Highest concentration: annual averaging periods
Highest, second highest concentration: 24-hour and 3-hour averaging periods
NS: No significant concentration predicted to occur from the project
†Reported concentrations include start-up emissions (concentrations at worst-case load, 100%, are in parentheses for perspective). The time and location of the highest 2nd high SO_2 3- and 24-hr concentrations shown are those including start-up emissions.

- Model(s) used: AERMOD (07026), AERMET (06341), AERMAP (09040)

Met. data: Year(s) 1987-1991

Surface data from Lewis B. Wilson, aka Middle Georgia Regional, aka Macon Airport, GA NWS

Upper air data from Centerville, Albama NWS station

- Fugitive emissions included in model? No SO_2 emissions are fugitive

- Remarks or additional information: During review of the Increment model,the following sources were added to the model (in addition to the Start-Up/Shut-Down, SUSD, scenario sources):

Kamin Spray Dryer #5 (KMINSD5)

BASF Toddville Spray Dryer #5 and three boilers (EHS23, EHS25, EHS26, & EHS28)

Burgess Pigments Calciner #7 (BPS06)

IV. FINAL MODELING RESULTS – NATIONAL AMBIENT AIR QUAILITY STANDARDS (NAAQS)

Source: Plant Washington

TABLE IV-1: Projected Impact – NAAQS

Pollutant	Averaging Period	All Source Impact	Total* Impact	NAAQS	Receptor UTM Zone: 17		Model Met Data Period
		(μg/m³)	(μg/m³)	(μg/m³)	X (m)	Y (m)	[yymmddhh]
SO_2	Annual	7.25	15.25	80	338864	3659512	1989
	24-Hour†	42.49	83.49	365	334400	3664500	89012024
	3-Hour†	118.3	305.3	1300	331600	3661700	89111806
PM_{10}	Annual	NS		50			
	24-Hour	NS		150			
NO_2	Annual	NS		100			
CO	8-Hour	NS		10,000			
	1-Hour	NS		40,000			
Pb	3-Month	NS		1.5			

*Total impact equals source impact, plus impact from offsite sources, plus background
†Reported concentrations include start-up emissions (concentrations at worst-case load, 100%, are in parentheses for perspective). The time and location of the highest 2nd high SO_2 3-, and 24-hr concentrations shown are those including start-up emissions. Design concentrations for 3- & 24-hr averages were refined to the nearest 100 meters.
NS: No significant concentration predicted to occur from the project

	Background Concentrations (μg/m³)			
Averaging Period	SO_2	PM_{10}	NO_2	CO
Annual	8	NS	NS	--
24-Hour	41	NS	--	--
8-Hour	--	--	--	NS
3-Hour	187	--	--	--
1-Hour	--	--	--	NS

- Origin(s) of other sources' emission data:

  Actual emissions ______ Allowable emissions √ AIRS/EI02 ______, has data been verified? Yes

  Sources added: 10 at Kamin, 2 at KT Clay 51/52 Source deleted: Burgess Pigment boiler (BPS07)

  Sources with modified emissions: 10 sources at BASF Toddville

- Have other sources been checked for GEP stack height? Yes

  Was actual ______ or GEP √ height used in the model?

- Model(s) used: See Table III-2
- Computer summary of contributing sources attached (Yes/No)? No. See Model Input/output files on CD
- Source of ambient concentrations GA EPD Network, Baldwin Co. Site, avg of data recorded in '03 and '06

*Off-property concentrations:
Highest concentration - annual averaging periods
Highest, second highest concentration – 24-hour - to - 1-hour averaging periods
Highest, 6th high concentration - 24-hour PM_{10} averaging period

V. CLASS II VISUAL PLUME MODEL RESULTS

Level I (VISCREEN) Analysis: **Not required due to absence of potentially sensitive receptors within the significant impact area. Only SO2 has a significant impact, and it is not input to the VISCREEN visual plume impacts model.**

Distance (D_{vis}) beyond which project emissions are predicted to cause no plume visible impacts under worst-case (F,1) conditions:________________km (limited to the maximum pollutant-specific (PM10, NO_x, or H_2SO_4 only) SIA or 50 km, whichever is less).

List of sensitive receptors between within D_{vis} in any direction from the facility (State Parks & Historic Sites, airports, etc.):

Sensitive Receptor	Closest Distance (km)	Azimuth from facility (°)	Pass Level I?

Level II (VISCREEN) Analysis:

Determination of Worst-case 1% Cumulative Frequency condition. Repeat as necessary for each sensitive receptor which did not screen out using Level I meteorological conditions:

Sensitive Receptor: ________________________________

Year of Met Data: ________ ________ ________ ________ ________

Met condition (ie., F,2): ________ ________ ________ ________ ________

Sensitive Receptors not passing Level II (VISCREEN) Analysis: ________________________________

____

____

Level III Analysis:

Sensitive Receptors not passing Level III (PLUVUE II) Analysis: ________________________________

____

Mitigating criteria: ____

____

VI. ADDITIONAL IMPACTS MODELING RESULTS – VEGETATION AND SOILS SCREENING

Source: Plant Washington

TABLE IV-1: Projected Impact – Project Significance Modeling

Pollutant	Averaging Period	Screening Threshold Concentrations of Potential Harm	Maximum Modeled Impact	(Calculated) Ambient Concentrations	Total Project Impacts for Comparison with Screening Threshold Concentrations
Units of Concentration:		μg/m³	μg/m³	μg/m³(/ factor)	μg/m³
NO_2	1-hour	NA	NA	58.3	NA
	4-hour	3,760	17.16	(46.1 / 0.79)	63.3
	8-hour	3,760	11.02	(40.8 / 0.70)	51.8
	1-month	564	2.07	(19.2 / 0.33*)	21.27
	Annual	94	0.4578	5.8	6.25
CO	1-hour	NA	127.63	1,814	NA
	1-week	1,800,000	127.63	(762 / 0.42*)	889
SO_2	1-hour	917	270	281	551
	3-hour	786	118.3	187	305.3
	Annual	18	7.25	8	15.25
PM	No Particulate assessment is prescribed in the guidance document				
Lead	3-month	Exempt (emission rate < significant)			
Fluorides	10-day	0.5	0.02§	NA	0.02
Beryllium	1-month	0.01	0.000109†	0.00015§	0.00026
Reduced sulfur compounds	4-hour	Exempt (emission rate < significant)			

* The 1-month and 1-week factors were extrapolated using the short-term equation of that guidance document.
NA Indicates not available
† Indicates a 1-month time averaged concentration.
§ Indicates a 24-hr averaged concentration.

Ambient background concentrations of NO_2 and CO with no apparent factor are actual 2007 monitored concentrations. Such background ambient concentrations were approximated from the maximum 1-hour NO_2 and CO monitored concentrations at a representative GA EPD monitoring site, using the time-weighing adjustment factors of *A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals*, EPA 450/2-81-078, 12/80. The NO_2 and CO impacts did not exceed applicable significance levels, so modeled impacts are those of the project only.

Modeled short-term concentrations resulting from project operation were modeled using the appropriate short-term emission rate. The worst-case design concentration modeled is tabulated for each time-averaging period.

The annual SO_2 concentration was modeled using the annual average emission rate, without start-up emissions. All SO_2 modeled impacts include emissions of the offsite source inventory, since project SO_2

impacts exceeded applicable Significant levels. The SO_2 ambient concentrations are averages of the appropriate design concentration values from 2003 & 2006 EPD-monitored data collected in Baldwin County.

Fluorides were modeled as 24-hour concentrations, since AERMOD does not have a 10-day output option. No ambient concentrations were available for fluorides, and no other major sources of fluorides are known in the area.

Beryllium was modeled as a 1-month concentration. The EPD monitoring network assessed a maximum state-wide concentration of beryllium by conducting 24-hr sampling once every 2 weeks. This 24-hour averaged maximum state-wide background concentration is 0.00015 $\mu g/m^3$. Adding these provides a conservative 1-month beryllium concentration approximation of 0.00026 $\mu g/m^3$.

The results of the soils and vegetation screening modeling of pollutants emitted in excess of PSD significant emission rates, but with impacts less than respective significance levels, indicated that worst-case project impacts are less than one percent of any proposed screening concentration threshold. Further assessment would apparently be unduly burdensome. Background ambient concentrations were approximated for perspective.

The SO_2 background ambient concentrations were collected in Baldwin County, near Georgia Power's coal-fired generating station, Plant Branch. Plant Branch is also in the modeled offsite inventory, and so is double-counted. This is an indication of the conservative nature of the SO_2 impacts assessed against the screening threshold concentrations of the guidance document cited above.