ASHDOWN MILL
BART ALTERNATIVE – TECHNICAL SUPPORT DOCUMENT

September 4, 2018

Introduction

With the continued decline in demand for printing and writing paper, the Ashdown Mill looks for opportunities to produce new products or move into new markets so it can remain competitive in dynamic and global markets. In order to maintain flexibility and competitiveness for the Mill, Domtar is slightly revising the BART Alternative. This revised Alternative is based on the January 4, 2018 telephone discussion with the Arkansas Department of Environmental Quality (ADEQ) and the United States Environmental Protection Agency-Region 6 (EPA) staffs. The approach meets the requirements of 40 C.F.R. § 51.308 while allowing the Mill the flexibility of a future voluntary retirement of No.1 Power Boiler based on the continuing reassessment of steam needs under the changing Mill configuration.

In summary, Domtar is proposing the following revised BART Alternative:

- Power Boiler No. 1 on natural gas only (as authorized in Domtar's air operating permit); and

- Power Boiler No. 2 at adjusted emission rates for SO_2 and NO_X (and the same emission rate for PM set in the FIP). Compared to the final BART FIP emission rates (*i.e.*, 345 lb/hr for NO_X and 91.5 lb/hr for SO_2), this scenario decreases NO_X emissions while allowing increased SO_2 emissions.

The specific emission rates associated with BART Alternative are summarized in Table 1 below.

Table 1. BART Alternative Scenario Emission Rates

Unit	Modeled Emission Rates		
	SO_2 (lb/hr)	**NO_X (lb/hr)**	**PM (lb/hr)**
Power Boiler No. 1 on natural gas only	0.5	191.10	5.2
Power Boiler No. 2 at adjusted emission rates for SO_2 and NO_X	435.0	293.0	81.6

Modeling of the BART Alternative scenario results in better predicted visibility improvement than the values presented in EPA's FIP across the four affected Class I areas: Caney Creek (CACR), Upper Buffalo (UPBU), Hercules Glades (HEGL), and Mingo (MING). Two CALPUFF-based modeling methodologies were utilized as summarized below. These methodologies were discussed with Mr. Michael Feldman, EPA-Region 6 Air Planning Section.[1] Method 1 follows the approach EPA used in the BART FIP where predicted impacts from

[1] Conference call between Mr. Michael Feldman, (EPA-Region 6, Air Planning Section), Mr. Jeremy Jewell (Trinity), and Ms. Christine Chambers (Trinity) on January 10, 2018.

separate models for each source and pollutant are combined together to arrive at an estimate of cumulative visibility improvement. Method 2 is a full-chemistry method that more accurately accounts for the chemical interaction of emissions through the combination of the sources into a single modeling file. Details on each method as well as the resulting visibility improvement are summarized below.

Background

EPA estimated visibility improvement for the BART FIP Controls by comparing the visibility impairment from a baseline scenario to the impairment for a control scenario. The modeling was conducted per source and per pollutant in separate modeling files, which does not account for the full chemical interaction of all emissions (*i.e.*, "Method 1"). Per discussion with EPA-Region 6, a combined assessment is an acceptable alternate method of calculating a cumulative visibility improvement for a control scenario at a site.[2] With this method ("Method 2"), all sources and pollutants are combined into a single modeling run per scenario per year. This method allows for interaction of the pollutants from the two boiler using the available chemical transformation mechanism of the CALPUFF model. Domtar completed the BART Alternative analysis using both methods to document that the proposed BART Alternative results in greater visibility improvement than EPA's BART FIP.

Conclusion

The proposed Domtar BART Alternative results in a greater visibility improvement than EPA's FIP utilizing either modeling methodology. As such, the BART Alternative results in greater visibility improvement than the EPA's FIP approach.

[2] *Ibid.*

TRINITY MODELING ASSESSMENT – BART FIP ALTERNATIVE
ASHDOWN MILL

CALPUFF BART FIP Alternative Assessment

Modeling of the BART Alternative results in better predicted visibility improvement than the improvement presented in EPA's FIP across the four affected Class I areas: Caney Creek (CACR), Upper Buffalo (UPBU), Hercules Glades (HEGL), and Mingo (MING). This CALPUFF modeling for the alternative BART assessment relies on key aspects of the original ADEQ and Central States Regional Air Planning Association (CENRAP) CALPUFF modeling protocol, along with a second modeling methodology to reflect full chemistry of the CALPUFF Modeling System as discussed with EPA-Region 6.[3] The following sections describe the modeling methodology, the selected emission rates and stack parameters, and the visibility improvement results at each of the Class I areas.

CALPUFF Modeling Methodology

The CALPUFF model is capable of modeling linear chemical transformation effects by using pseudo-first-order chemical reaction mechanisms for the conversion of SO_2 to sulfate and NO_X to nitrate using the available background ammonia concentrations included in the model. The preferential scavenging of ammonia is by sulfate; therefore, the total nitrate is estimated using the remaining available ammonia concentration. If the ratio of SO_2 to NO_X emissions in the model changes, this chemical interplay is affected.

EPA estimated visibility improvement for the BART FIP Controls by comparing the visibility impairment from a baseline scenario to the impairment for a control scenario. The modeling was conducted per source and per pollutant in separate modeling files, which does not account for the full chemical interaction of emissions. This approach was also utilized by Domtar to determine the visibility improvement from Domtar's BART Alternative and is outlined below in the *Method 1 – EPA's Assessment* section of this document.

Per discussion with EPA-Region 6, a combined assessment is an acceptable alternate method of calculating cumulative visibility effects, and therefore, visibility improvement for a multi-source control scenario at a site.[4] With this method, all sources and pollutants are combined into a single modeling run per scenario per year. This method allows for interaction of pollutants from both boilers using the available chemical transformation mechanism of the CALPUFF model. Domtar completed this assessment using CALPUFF as outlined below in the *Method 2 – Full Chemistry Assessment* section of this document.

[3] Conference call between Michael Feldman, (EPA-Region 6, Air Planning Section), Jeremy Jewell (Trinity), and Christine Chambers (Trinity) on January 10, 2018.

[4] *Ibid.*

Modeled Ashdown Mill Emissions

Table 2a and Table 2b provides a summary of the modeled emission rates.

- Baseline Emissions: Emissions for Power Boiler No. 1 and Power Boiler No. 2 are based on Table 43 of the April 8, 2015 Proposed FIP, 80 FR 18979.

- EPA FIP Proposed Controls: Emissions for Power Boiler No. 2 are based on the Final FIP, 81 FR 66339. No change from baseline for Power Boiler No. 1.

- Domtar BART Alternative: Emissions for Power Boiler No. 1 are based on natural gas only (*i.e.*, the current limits in Domtar's air operating permit), and emissions for Power Boiler No. 2 are at adjusted emission rates for SO_2 and NO_X. (The same emission rate for PM presented in the FIP.)

Table 2a. Baseline and EPA FIP Proposed Control Emission Rates

	Baseline			**EPA FIP Proposed Controls**		
Unit	**SO_2 (lb/hr)**	**NO_X (lb/hr)**	**PM (lb/hr)**	**SO_2 (lb/hr)**	**NO_X (lb/hr)**	**PM (lb/hr)**
Power Boiler No. 1	21.0	207.4	30.4	21.0	207.4	30.4
Power Boiler No. 2	788.2	526.8	81.6	91.5	345	81.6

Table 2b. Domtar BART Alternative Emission Rates

	Domtar BART Alternative		
	PB1 Natural Gas Only, PB2 Reduced NO_X/SO_2		
Unit	**SO_2 (lb/hr)**	**NO_X (lb/hr)**	**PM (lb/hr)**
Power Boiler No. 1	0.5	191.10	5.2
Power Boiler No. 2	435	293	81.6

Modeled Ashdown Mill Stack Parameters

Domtar's BART FIP Alternative assessment used actual stack parameters representative of each BART unit. Table 3 summarizes these parameters. These stack parameters are consistent with the FIP modeling.

Table 3. Modeled Stack Parameters

Unit	LCC East (km)	LCC North (km)	Base Elevation (m)	Stack Height (m)	Stack Diameter (m)	Exhaust Temperature (K)	Exhaust Velocity (m/s)
No. 1 Power Boiler - A	267.49713	-698.63952	99.58	66.14	2.1	342.04	11.06
No. 1 Power Boiler - B	267.49891	-698.63445	99.51	66.14	2.1	342.04	11.07
No. 2 Power Boiler	267.45242	-698.64643	99.95	71.63	3.66	324.82	11.92

Modeled Class I Areas

Table 4 below presents the Class I areas included in Domtar's BART Alternative Assessment, the responsible Federal Land Manager (FLM) and approximate distance between the Ashdown Mill and each area. Class I area receptor data from the National Park Service (NPS) Air Resources Division (ARD) is the same as that used in prior modeling analyses.

Table 4. Modeled Class I Areas

Class I Area	FLM	Approximate Distance from Ashdown Mill (km)
Caney Creek Wilderness (CACR)	Forest Service	85
Upper Buffalo Wilderness (UPBU)	Forest Service	250
Hercules Glades Wilderness (HEGL)	Forest Service	350
Mingo Wildlife Refuge (MING)	Fish and Wildlife Service	500

BART Alternate Modeling Steps and Modeling Results

Method 1 – EPA FIP Assessment Method

EPA estimated visibility improvement for the BART FIP Controls by comparing the visibility impairment from a baseline scenario to the impairment for a control scenario. The modeling was conducted per source and per pollutant in separate modeling files, which does not account for the full chemical interaction of emissions. For the purposes of direct comparison with the FIP, this approach was also utilized by Domtar to determine the visibility improvement from Domtar's BART Alternative.

EPA's proposed improvement due to the controls outlined in the FIP are predicted to result in a cumulative modeled improvement of **0.473** Δ**dv** (*see* Table 5 below). Domtar's proposed BART Alternative results in a cumulative modeled improvement of **0.549** Δ**dv** (*see* Table 6). Detailed steps on the calculation methodology are provided below.

Table 5. Method 1 - Cumulative Visibility Improvement Due to BART-FIP Controls

Description	Boiler	Pollutant	98th Percentile Visibility Impacts – Max. of Three Modeled Years (Δdv)			
			CACR	UPBU	HEGL	MING
FIP Baseline	1	Both	0.335	0.038	0.020	0.014
	2	Both	0.844	0.146	0.105	0.065
	Both	Both	1.179	0.184	0.125	0.079
FIP Controls	2	SO_2	0.524	0.082	0.046	0.035
	2	NO_X				
	2	Both	0.524	0.082	0.046	0.035
Calculated Improvement	2	SO_2	0.139	0.050	0.048	0.025
	2	NO_X	0.181	0.014	0.011	0.005
	2	Both	0.320	0.064	0.059	0.030
Cumulative Improvement	**Both**	**Both**	**0.473**			

Table 6. Method 1 - Cumulative Visibility Improvement Due to Proposed BART Alternative

Description	Boiler	Pollutant	98th Percentile Visibility Impacts – Max. of Three Modeled Years (Δdv)			
			CACR	UPBU	HEGL	MING
FIP Baseline	1	Both	0.335	0.038	0.020	0.014
	2	Both	0.844	0.146	0.105	0.065
	Both	Both	1.179	0.184	0.125	0.079
BART Alternative	1	Both	0.286	0.033	0.017	0.011
	2	Both	0.493	0.082	0.059	0.037
	Both	Both	0.779	0.115	0.076	0.048
Calculated Improvement	1	Both	0.049	0.005	0.003	0.003
	2	Both	0.351	0.064	0.046	0.028
	Both	Both	0.400	0.069	0.049	0.031
Cumulative Improvement	**Both**	**Both**	**0.549**			

EPA's estimated visibility effect from the FIP baseline as well as the calculated visibility improvement per Class I area from the FIP Controls is presented in Table 5. This data was extracted from the BART FIP. The cumulative visibility improvement from Domtar's proposed BART Alternative using Method 1, as outlined in Table 6, was calculated using the following steps:

Determine the maximum 98th percentile visibility impact per Class I area for the BART Alternative:

1. Run CALPUFF for Boiler No. 1 at emission rates currently listed in the operating permit with no limitation, extract the maximum 98th percentile of the 3-years modeled per Class I area (*see* the BART Alternative, Boiler 1 line item in Table 6 above).

2. Run CALPUFF for Boiler No. 2 with the emission rates listed in Table 1 and extract the maximum 98th percentile of the 3-years modeled per Class I area (*see* the BART Alternative, Boiler 2 line item in Table 6 above).

3. Sum BART Alternative maximum 98th percentile results for Boiler No. 1 and Boiler No. 2 to obtain the total 98th percentile effects (*see* the BART Alternative, Both line item in Table 6 above).

Determine the visibility improvement between the baseline and Domtar's BART Alternative per Class I area:

1. Determine the delta between the EPA predicted impacts using baseline conditions and the impacts resulting after Domtar's BART Alternative for Boiler No. 1 by subtracting the BART Alternative impacts from the baseline impacts for Boiler No. 1. (*See* the Calculated Improvement, Boiler No. 1 line item in Table 6 above).

2. Determine the delta between the EPA predicted impacts at the baseline and the impacts resulting after Domtar's BART Alternative for Boiler No. 2 by subtracting the BART Alternative impacts from the baseline impacts for Boiler No 2. (*See* the Calculated Improvement, Boiler No. 2 line item in Table 6 above).

3. Sum the delta from Boiler No. 1 and Boiler No. 2 (*see* the Calculated Improvement, Both line item in Table 6 above).

Determine the cumulative visibility improvement between the baseline and Domtar's BART Alternative:

1. Sum the improvement for each Class I area (*see* the Cumulative Improvement line item in Table 6 above).

Method 2 – Full Chemistry Assessment

With the Full Chemistry method, all sources and pollutants are combined into a single modeling run per year.

When combining sources and pollutants, EPA's proposed improvement due to the FIP controls is predicted to result in a cumulative modeled improvement of **0.516 Δdv**, as documented in Table 7 below; whereas, Domtar's BART Alternative results in a cumulative modeled improvement of **0.520 Δdv**, as documented in Table 8. Detailed steps on the calculation methodology are provided below.

Table 7. Method 2 - Cumulative Visibility Improvement Due to BART FIP Controls

Description	Boiler	Pollutant	98th Percentile Visibility Impacts – Max. of Three Modeled Years (Δdv)			
			CACR	UPBU	HEGL	MING
FIP Baseline	Both	Both	1.137	0.163	0.118	0.072
FIP Controls	Both	Both	0.776	0.103	0.057	0.038
Calculated Improvement	Both	Both	0.361	0.060	0.061	0.034
Cumulative Improvement	**Both**	**Both**	**0.516**			

Table 8. Method 2 - Cumulative Visibility Improvement Due to Proposed BART Alternative

Description	Boiler	Pollutant	98th Percentile Visibility Impacts – Max. of Three Modeled Years (Δdv)			
			CACR	UPBU	HEGL	MING
FIP Baseline	Both	Both	1.137	0.163	0.118	0.072
BART Alternative	Both	Both	0.753	0.104	0.069	0.044
Calculated Improvement	Both	Both	0.384	0.059	0.049	0.028
Cumulative Improvement	**Both**	**Both**	**0.520**			

The cumulative visibility improvement from Domtar's proposed BART Alternative using Method 2 was calculated following the below steps.

EPA's Proposed FIP Controls

Determine the maximum 98th percentile visibility impact per Class I area for the BART FIP Baseline: [5]

1. Run CALPUFF with Boiler No. 1 and Boiler No. 2 with the baseline emission rates for SO_2, NO_X, and PM_{10} listed in Table 1 and extract the maximum 98th percentile of the 3-years modeled per Class I area (*see* the FIP Baseline, Both Boilers, Both Pollutants, line item in Table 7 and Table 8 above).

Determine the maximum 98th percentile visibility impact per Class I area for the Proposed BART Controls:[6]

1. Run CALPUFF for Boiler No. 1 and Boiler No. 2 with the emission rates listed in Table 1 for the EPA FIP Proposed Controls and extract the maximum 98th percentile of the 3-years modeled per Class I area (*see* the FIP Controls, Both Boilers, Both Pollutants line item in Table 7 above).

Determine the visibility improvement between the FIP Baseline and EPA's Proposed Controls per Class I area:

1. Determine the delta between the estimated BART FIP impacts at the baseline and the estimated impacts resulting after EPA's Proposed Controls for Both Boilers by subtracting EPA's Proposed Control impacts from the baseline impacts for both boilers.

[5] Because Method 2 combines both boilers and all pollutants into a single modeling file, the FIP baseline scenario was run using the combined source and pollutant methodology. Because EPA modeled the baseline per boiler and summed the visibility impairment from each unit to calculate the FIP baseline visibility impairment, when the emissions from Boiler 1 and Boiler 2 are combined into one modeling file, the predicted baseline visibility impairment will be different than presented in the AR FIP due to the chemical interaction of the pollutants.

[6] Because Method 2 combines both boilers and all pollutants into a single modeling file, the FIP baseline scenario was run using the combined source and pollutant methodology. Because EPA modeled the baseline per boiler and summed the visibility impairment from each unit to calculate the FIP baseline visibility impairment, when the emissions from Boiler 1 and Boiler 2 are combined into one modeling file, the predicted baseline visibility impairment will be different than presented in the FIP due to the chemical interaction of the pollutants.

(*See* the Calculated Improvement, Both Boilers, Both Pollutant line item in Table 7 above).

Determine the cumulative visibility improvement between the Baseline and EPA's Proposed FIP Controls:

1. Sum the improvement for each Class I area (*see* the Cumulative Improvement line item in Table 7 above).

BART Alternative

Determine the maximum 98th percentile visibility impact per Class I area for Domtar's BART Alternative:

1. Run CALPUFF for Boiler No. 1 and Boiler No. 2 with the Domtar BART Alternative emission rates Operating Scenario A listed in Table 1 and extract the maximum 98th percentile of the 3-years modeled per Class I area (*see* the BART Alternative, Both Boilers, Both Pollutants line item in Table 8 above).

Determine the visibility improvement between the baseline and Domtar's BART Alternative per Class I area:

1. Determine the delta between the estimated BART FIP predicted impacts at the baseline and the impacts resulting after Domtar's BART Alternative for both boilers by subtracting the BART Alternative impacts from the baseline impacts from both boilers. (*See* the Calculated Improvement, Both Boilers, Both Pollutant line item in Table 8 above).

Determine the cumulative visibility improvement between the baseline and Domtar's BART Alternative for Operating Scenario A:

1. Sum the improvement for each Class I area (*see* the Cumulative Improvement line item in Table 8 above).