Advanced Materials for a Cleaner World
Hollingsworth & Vose

January 4, 2024

Julia DeGagné
Oregon Department of Environmental Quality
700 NE Multnomah Street, Suite 600
Portland, Oregon 97232

Re: Response to email dated December 14, 2023

Dear Julia:

Hollingsworth & Vose Fiber Company (H&V) received your email dated December 14, 2023 (the Email) relating to the following Cleaner Air Oregon (CAO) deliverables submitted to the Oregon Department of Environmental Quality (DEQ) on October 27, 2023: revised CAO emissions inventory (the Inventory), revised CAO modeling protocol (the Modeling Protocol), and the revised CAO risk assessment work plan (the Work Plan). H&V and Maul Foster & Alongi, Inc. (MFA) have prepared the following responses, due January 5, 2024. This response document is organized in the same manner as the information was requested in the Email. The Email comments are shown in bold followed by the response.

To address the requests of the DEQ in the Email, H&V and MFA have proposed revisions to previously submitted CAO submittals. If the proposed revisions are acceptable to the DEQ, MFA will prepare updated CAO materials to be submitted to the DEQ for approval.

1. **The CEMS data and analysis that was used in determining the modeled flow rates for the 400- and 600-series fans.**

Electronic copies of the Continuous Emissions Monitoring System (CEMS) data for the third quarter of 2019 through 2022 will be provided to the DEQ concurrently with this response letter. MFA reviewed CEMS flow rate data for two 400-series ceramic filtration units (CFUs) (CFU-108 and CFU-118) and one 600-series CFU (CFU-115). MFA calculated the minimum, maximum, and average flow rate for each quarter of available data and determined the overall minimum, maximum, and average flow rate for each CFU. For the 400-series CFUs, MFA compared both data sets and proposed a model flow rate slightly lower than the minimum flow rate from the two units. Likewise for the 600-series CFUs, MFA proposed a model flow rate slightly lower than the minimum flow rate flow rate measured at CFU-115. A summary of the CEMS flow rate data has been included as Attachment A.

2. **For the 200-series fans:**

    a. **The dates of the specific source tests used to determine the modeled flow rate.**

Because CFU-113 was not equipped with a CEMS, source test data was used to develop a representative model flow rate for the 200-series unit. The flow rate used for modeling is the

Hollingsworth & Vose Fiber Company
1115 S.E. Crystal Lake Drive, PO Box E, Corvallis, OR 97339-0598 USA
tel +1.541.738.5300
fax +1.541.753.0388
www.hollingsworth-vose.com

average flow rate (in awcfm) from MAO stack testing conducted on CFU-113 on September 18, 2018. This was the flow rate determined for the Oregon Methods 1 through 5. A copy of the MAO stack testing report has been included as Attachment B.

b. A fan curve or data from the manufacturer showing the range of operating flow rates.

The fan curve for the 200-series unit has been provided as Attachment C.

c. Is the flow rate of 6,263 cfm typical of the lowest rate during daily operations? If not, can you estimate how often the fan would operate below this rate?

H&V has reviewed 2023 flow rate data for CFU-113 and found that the normal daily flow rate is above the proposed flow rate. The flow rate data was recorded 18 times per hour (approximately every 3 minutes) and for the entire calendar year 2023 less than 0.2 percent of the flow measurements were below 6,263 cfm. Periods where flow was less than 6,263 cfm were brief (less than 30 minutes) suggesting these may have occurred during startup or shutdown of the CFU and were not the target flow rate for operation. They certainly did not represent the daily operating rate. Therefore, we believe that 6,263 cfm is a conservative representation of the lowest daily operating rate.

3. H&V's ACDP and the Protocol list different CFU routings for a few of the fiberizers. Can you confirm that Table 3-7 and Figure 2-3 in the [Modeling] Protocol is the accurate version?

Position	Routing in Protocol Table 3-7 and Figure 2-3	Routing in Permit EU Table (p.4)
L1R1 and L1R2	CFU 105	CFU 105 or CFU 102
L2R2	CFU 110 or CFU 112	CFU 110 only
L2R4 and L2R9	CFU 112 only	CFU 112 or CFU 102

The information provided in Table 3-7 and Figure 2-3 of the Modeling Protocol are correct. The information is consistent with that provided in the May 2023 Title V Air Permit application and H&V anticipates their new permit will reflect these corrections when it is issued.

4. Excel versions of the modeling protocol and emissions inventory tables.

H&V and MFA are proposing to amend the previously submitted TAC estimates and modeling methodology for the rotary fiberizer sources. If the DEQ accepts the proposed methodology,

MFA will prepare updated copies of the previously submitted CAO materials to the DEQ along with electronic copies of the revised emissions inventory and modeling protocol tables.

H&V and MFA are proposing to revise the production allocation at the rotary fiberizers to present “worst-case” production scenarios for the purposes of calculating risk. To determine the “worst-case” fiber production on a risk basis, MFA calculated the toxicity weighted emission rate for each rotary fiber type (Rotary Fine, Rotary Coarse, and Ultra Rotary Coarse). The toxicity weighted emission rate analysis is included as Attachment D.

In preparing the analysis, MFA used production rates for each fiber type to determine a toxic air contaminant (TAC) emission rate (see Equation 1).

Equation 1.

$$\text{TAC emission rate } \left(\frac{\text{g}}{s}\right) = \frac{\left(\text{production rate per position } \left[\frac{\text{lb}}{\text{hr}}\right]\right) \times \left(\text{TAC process emission factor } \left[\frac{\text{lb}}{\text{ton}}\right]\right) \times \left(453.592 \ \frac{\text{g}}{\text{lb}}\right)}{\left(2{,}000 \ \frac{\text{lb}}{\text{ton}}\right) \times \left(3{,}600 \ \frac{\text{s}}{\text{hr}}\right)}$$

The toxicity weighted emission rate was determined by dividing the emission rate for each fiber type by the appropriate risk-based concentration (RBC) for the TAC (see Equation 2).

Equation 2.

$$\text{TAC toxicity weighted emission rate } \left(\frac{\text{g/s}}{\text{ug/m}^3}\right) = \frac{\left(\text{TAC emission rate } \left[\frac{\text{g}}{\text{s}}\right]\right)}{\left(\text{RBC } \left[\frac{\text{ug}}{\text{m}^3}\right]\right)}$$

The total toxicity weighted emission rate for each risk category was determined by summing the TAC toxicity weighted emission rates (see Equation 3).

Equation 3.

$$\text{Total toxicity weighted emission rate} \left(\frac{\text{g/s}}{\text{ug/m}^3}\right) = \sum \left(\text{TAC toxicity weighted emission rate } \left[\frac{\text{g/s}}{\text{ug/m}^3}\right]\right)$$

Table 2 of Attachment D shows the total toxicity weighted emission rate for each fiber type and each risk category. The cells containing the highest toxicity weighted emission rate in each risk category have been highlighted. From this analysis, it was determined that Rotary Fine presents the fiber production with the highest potential risk for the following categories: Cancer Worker and Chronic Noncancer (all categories). Rotary Coarse presents the fiber production with the highest potential risk for the following categories: Cancer Residential, Cancer Child, and Acute Noncancer.

Based on this analysis, we propose to assess risk for two production scenarios: one with all rotary fiberizers assigned to production of Rotary Fine fiber and one with all rotary fiberizers assigned to production of Rotary Coarse fiber. As Ultra Rotary Coarse production did not have the highest toxicity weighted emission rate in any risk category it will be excluded from the proposed production scenarios. Table 1 below shows the assignment of fiberizer positions for the two scenarios.

Table 1. Fiberizer Position Assignment for Proposed Risk Scenarios

Fiber Type	Number of Production Positions Assigned	
	Scenario 1	Scenario 2
Rotary Fine	30	0
Rotary Coarse	0	30
Ultra Rotary Coarse	0	0
Flameblown	4	4

Neither of the proposed production scenarios reflect realistic production at the facility and cannot be achieved in practice. H&V is accepting these assumptions only to address any questions about the maximum risk posed by this facility under any scenario. Under Scenario 1, full production of rotary fine fiber would lead to drastic underutilization of the capacity of both the Line 1 and Line 2 Furnaces. In contrast, full production of rotary coarse fiber (Scenario 2) would require pull rates on the remelters at Lines 3 and 4 that cannot be met by the equipment nor could the Line 1 and Line 2 furnaces produce enough glass to supply all fiberizers at the rotary course production rate. While neither scenario could be achieved in practice, modeling risk at these theoretical extremes ensures that we do not underestimate risk from the facility. While we believe that this approach moots the remaining questions you posed, we have prepared answers to each in order to ensure a complete response.

5. **A narrative description and table that indicates what physical factors limit production for each fiberizer and fiber type, and how that relates to the Potential Fiber Types listed in Table 3-7 of the Modeling Protocol (for example, total fiber production limited by the capacity of the melter, URC limited by the capacity of the collection device, the remelter only able to product RF, etc.).**

As discussed under item 4, the proposed production scenarios do not take into account any physical limitations on the equipment for rotary fiber production. The proposed production scenarios maintain production of flameblown fiber at four positions as flameblown fiberizers cannot produce rotary fiber, and vice versa.

6. **Maximum daily and annual production rates for each fiberizer and potential fiber type based on any physical limitations. If production is allocated to fiber types or fiberizers for modeling based on a worst-case risk analysis, please provide the calculations used to demonstrate this.**

As discussed under item 4, H&V is proposing to amend previously submitted TAC estimates and modeling methodology for the rotary fiberizer sources. To determine the highest potential risk analysis, MFA estimated toxicity weighted emission rates for each rotary fiber type and risk category. The analysis determined that both Rotary Fine and Rotary Coarse present highest potential risk in different categories. As Ultra Rotary Coarse did not have the highest toxicity weighted emission rate in any risk category, no production of Ultra Rotary Coarse fiber will be included in the proposed risk assessments. The toxicity weighted emission rate analysis is

included as Attachment D. Table 2 below shows the daily and annual production rates for the proposed rotary fiber production.

Table 2. Maximum Rotary Fiberizer Production Rates

Rotary Fiber Type	Maximum Production Rate Per Position	
	Daily (lb/day)	Annual (tons/year)
Rotary Fine	1,426	260
Rotary Coarse	5,304	968

As discussed above, neither of the proposed scenarios reflect realistic production at the facility. Under Scenario 1, full production of rotary fine fiber would lead to drastic underutilization of the capacity of both the Line 1 and Line 2 Furnaces. In contrast, full production of rotary coarse fiber (Scenario 2) would require pull rates on the remelters at Lines 3 and 4 that cannot be met by the equipment.

7. **A list or table showing the modeling runs that will be submitted with the health risk assessment. Please note that modeling or risk analysis results for all modeling scenarios described as potentially possible in the modeling protocol should be addressed in the HRA submittal, including but not limited to:**
   a. **Annual and daily risk analysis results if L1R1, L1R2, L1R3, and L1R4 are treated as RC only**
   b. **Annual and daily risk analysis results if L1R1, L1R2, L1R3, and L1R4 are treated as RF only**
   c. **Annual and daily risk analysis results for the alternative RC/URC scenarios described in H&V's October 27, 2023 cover letter.**

As discussed under item 4, MFA is proposing to model two risk scenarios based on the results of the toxicity weighted emission rate analysis provided as Attachment D. As discussed in the Modeling Protocol and Risk Assessment Work Plan, MFA proposes to model using a unit emission rate. Therefore, MFA will be submitting a single modeling run for the two risk assessment scenarios. MFA will then use the modeled concentrations and dispersion factors to assess risk from the two production scenarios.

8. **Provide documentation of the maximum daily and annual capacity of the melter or any other documentation needed to confirm capacity limitations for glass fiber production.**

H&V has developed estimates of their production rates for each fiber type based on analysis of production capabilities with the incorporation of a variability factor for conservatism. These production rates were developed during the PSD permitting process and remain a conservative estimate of the H&V's production capabilities. We note that with the change in

risk scenarios being evaluated, we have assumed the maximum capacity of the fiberizing equipment without regard to melter capacity.

Please do not hesitate to contact me at (541) 738-5382 if you have any comments or require additional information.

Sincerely,

Anita Ragan
Environmental Health & Safety Manager

Attachments:
A. CEMS Flow Rate Data Summary Tables
B. September 2018 MAO Source Test Report (provided separately)
C. 200 Series Fan Curve
D. Rotary Fiber Toxicity Weighted Emission Rate Analysis

cc: Cindy Frost, H&V
Owen Rudloff, DEQ
J.R. Giska, DEQ
Mike Eisele, DEQ

ATTACHMENT A

CEMS Flow Rate Data Summary Tables

Table 1
CFU CEMS Flow Rate Data Summary
Hollingsworth & Vose Fiber Company—Corvallis, OR

CFU Grouping/Series	CFU	Flow Rate (ft^3/min)		
		Minimum	Maximum	Average
400	CFU-108	14,456	26,386	18,371
	CFU-118	14,163	26,406	19,100
	Proposed Model Flow Rate	**14,000**		
600	CFU-115	16,556	29,053	22,971
	Proposed Model Flow Rate	**16,500**		

Notes

CEMS = Continuous Emissions Monitoring System.

CFU = ceramic filtration device.

ft^3 = cubic feet.

min = minute.

Table 2
CFU-108 (Rotary Coarse) CEMS Flow Rate Data
Hollingsworth & Vose Fiber Company—Corvallis, OR

Year	Quarter No.	Flow Rate (ft^3/hr)		
		Minimum	Maximum	Average
2019	3	1,051,080	1,333,286	1,135,522
2019	4	1,003,240	1,353,629	1,110,601
2020	1	867,350	1,342,920	1,138,390
2020	2	1,018,487	1,351,824	1,143,858
2020	3	(1)		
2020	4	(1)		
2021	1	(1)		
2021	2	(1)		
2021	3	1,043,166	1,288,319	1,100,964
2021	4	1,000,349	1,380,090	1,091,632
2022	1	896,542	1,583,179	1,094,073
2022	2	875,423	1,397,890	1,090,504
2022	3	1,009,934	1,467,352	1,101,462
2022	4	967,154	1,479,680	1,065,017
Overall (ft^3/hr)		**867,350**	**1,583,179**	**1,102,288**
Overall [a] (ft^3/min)		**14,456**	**26,386**	**18,371**

Notes

CEMS = Continuous Emissions Monitoring System.

CFU = ceramic filtration device.

ft^3 = cubic feet.

hr = hour.

min = minute.

[a] Flow rate (ft^3/min) = (flow rate [ft^3/hr]) x (hr/60 min)

References

(1) All positions that exhaust to CFU-108 were down from June 23, 2020 through September 16,2021.

Table 3
CFU-115 (Flameblown) CEMS Flow Rate Data
Hollingsworth & Vose Fiber Company—Corvallis, OR

Year	Quarter No.	Flow Rate (ft^3/hr)		
		Minimum	Maximum	Average
2019	3	1,010,714	1,643,787	1,512,587
2019	4	1,029,378	1,580,231	1,418,157
2020	1	1,086,735	1,743,189	1,417,147
2020	2	1,031,431	1,539,201	1,432,517
2020	3	1,092,200	1,573,531	1,404,311
2020	4	1,152,309	1,507,863	1,383,454
2021	1	1,065,198	1,502,505	1,388,071
2021	2	1,048,475	1,670,230	1,352,905
2021	3	1,187,911	1,513,842	1,393,563
2021	4	1,207,977	1,465,703	1,363,257
2022	1	1,015,214	1,461,030	1,334,274
2022	2	1,023,705	1,475,381	1,343,640
2022	3	1,050,367	1,535,497	1,327,563
2022	4	993,376	1,409,085	1,268,478
Overall (ft^3/hr)		**993,376**	**1,743,189**	**1,378,270**
Overall [(a)] (ft^3/min)		**16,556**	**29,053**	**22,971**

Notes

CEMS = Continuous Emissions Monitoring System.

CFU = ceramic filtration device.

ft^3 = cubic feet.

hr = hour.

min = minute.

[(a)] Flow rate (ft^3/min) = (flow rate [ft^3/hr]) x (hr/60 min)

Table 4
CFU-118 (Rotary Fine) CEMS Flow Rate Data
Hollingsworth & Vose Fiber Company—Corvallis, OR

Year	Quarter No.	Flow Rate (ft^3/hr)		
		Minimum	Maximum	Average
2019	3	988,477	1,355,027	1,156,065
2019	4	914,475	1,584,335	1,205,404
2020	1	974,565	1,432,671	1,160,676
2020	2	973,194	1,441,628	1,172,690
2020	3	1,002,176	1,553,121	1,247,809
2020	4	905,634	1,359,128	1,153,895
2021	1	936,445	1,429,451	1,156,722
2021	2	901,184	1,449,596	1,191,790
2021	3	891,963	1,313,226	1,173,515
2021	4	947,975	1,312,969	1,133,683
2022	1	888,903	1,314,992	1,071,545
2022	2	977,604	1,380,148	1,079,066
2022	3	912,754	1,339,736	1,158,174
2022	4	849,752	1,257,448	980,419
Overall (ft^3/hr)		**849,752**	**1,584,335**	**1,146,003**
Overall [(a)] (ft^3/min)		**14,163**	**26,406**	**19,100**

Notes

CEMS = Continuous Emissions Monitoring System.

CFU = ceramic filtration device.

ft^3 = cubic feet.

hr = hour.

min = minute.

[(a)] Flow rate (ft^3/min) = (flow rate [ft^3/hr]) x (hr/60 min)

ATTACHMENT B

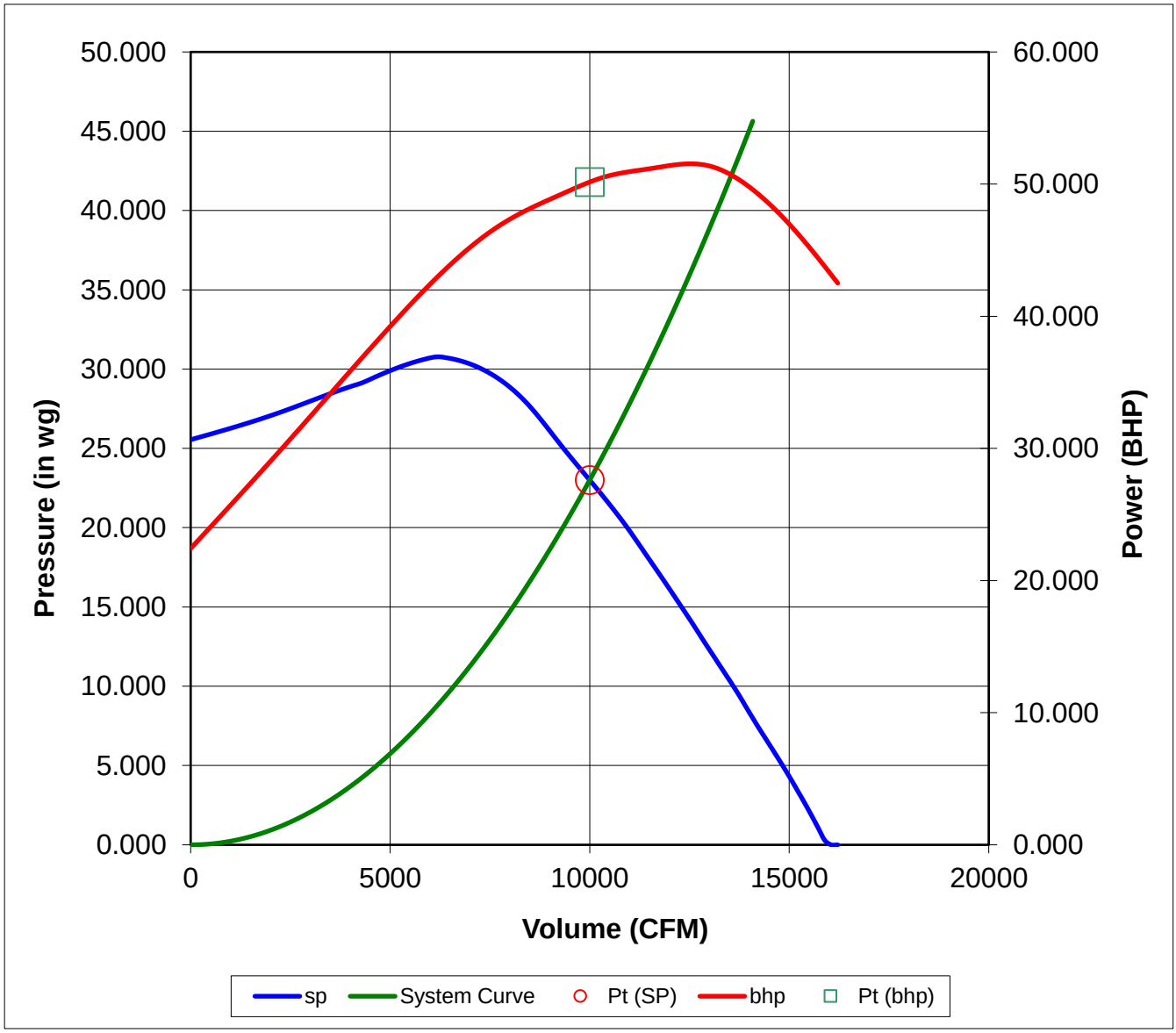
September 2018 MAO Source Test Report
(Provided Separately)

ATTACHMENT C

200 Series Fan Curve

Performance Curve

Date:	29-Jun-17	File:	2017-10400-001	**MCO**
Performance		Cust. No.:	45444	
Options:		Customer:	TRI MER CORP	
Inlet Box			PO Box 730	
107.0% Diameter Wheel		Product Line:	AF-Forty	
76.0% Width Wheel		Size:	245	
		Capacity:	Operating	
		Volume (CFM):	10,000	
		Press. (in wg):	23 (FSP)	
		Speed (RPM):	3550	
Temperature:	*200° F*	Power (BHP):	50.2	
Altitude:	*300 FT*	Density (lb/ft3):	0.0566	
		Max Safe Speed:	3550	



ATTACHMENT D

Rotary Fiber Toxicity Weighted Emission Rate Analysis

Table 1
Rotary Fiber Toxicity Weighted Emission Rate
Hollingsworth & Vose Fiber Company—Corvallis, OR

TAC	CAS/ODEQ Sequence Number	Regulatory Category (Yes/No)			RBC [2] (ug/m^3)						
					Cancer			Chronic Noncancer			Acute Noncancer
		TAC	HAP	RBC	Res	Child	Worker	Res	Child	Worker	
METALS											
Antimony	7440-36-0	Yes	Yes	Yes	--	--	--	0.30	1.30	1.30	1.00
Arsenic	7440-38-2	Yes	Yes	Yes	2.4E-05	1.3E-03	6.2E-04	1.7E-04	2.4E-03	2.4E-03	0.20
Barium	7440-39-3	Yes	No	No	--	--	--	--	--	--	--
Beryllium	7440-41-7	Yes	Yes	Yes	4.2E-04	0.011	5.0E-03	7.0E-03	0.031	0.031	0.020
Cadmium	7440-43-9	Yes	Yes	Yes	5.6E-04	0.014	6.7E-03	5.0E-03	0.037	0.037	0.030
Chromium (total)	7440-47-3	No	Yes	No	--	--	--	--	--	--	--
Chromium VI	18540-29-9	Yes	Yes	Yes	3.1E-05	5.2E-04	1.0E-03	0.083	0.88	0.88	0.30
Cobalt	7440-48-4	Yes	Yes	Yes	--	--	--	0.10	0.44	0.44	--
Copper	7440-50-8	Yes	No	Yes	--	--	--	--	--	--	100
Lead	7439-92-1	Yes	Yes	Yes	--	--	--	0.15	0.66	0.66	0.15
Manganese	7439-96-5	Yes	Yes	Yes	--	--	--	0.090	0.40	0.40	0.30
Mercury	7439-97-6	Yes	Yes	Yes	--	--	--	0.077	0.63	0.63	0.60
Nickel	7440-02-0	Yes	Yes	Yes	3.8E-03	0.10	0.046	0.014	0.062	0.062	0.20
Phosphorus	504	Yes	Yes	No	--	--	--	--	--	--	--
Selenium	7782-49-2	Yes	Yes	Yes	--	--	--	--	--	--	2.00
Zinc	7440-66-6	Yes	No	No	--	--	--	--	--	--	--
INORGANIC COMPOUNDS											
Carbon disulfide	75-15-0	Yes	Yes	Yes	--	--	--	800	3,500	3,500	6,200
Fluorides	239	Yes	No	Yes	--	--	--	2.30	20.0	20.0	240
Hydrogen fluoride	7664-39-3	Yes	Yes	Yes	--	--	--	2.10	19.0	19.0	16.0
Glasswool fibers	352	Yes	No	No	--	--	--	--	--	--	--
ORGANIC COMPOUNDS											
Acetone	67-64-1	Yes	No	Yes	--	--	--	31,000	140,000	140,000	62,000
Benzene	71-43-2	Yes	Yes	Yes	0.13	3.30	1.50	3.00	13.0	13.0	29.0
1,3-Butadiene	106-99-0	Yes	Yes	Yes	0.033	0.86	0.40	2.00	8.80	8.80	660
Cyclohexane	110-82-7	Yes	No	Yes	--	--	--	6,000	26,000	26,000	--
Ethyl benzene	100-41-4	Yes	Yes	Yes	0.40	10.0	4.80	260	1,100	1,100	22,000
Chloroethane	75-00-3	Yes	Yes	Yes	--	--	--	30,000	130,000	130,000	40,000
Formaldehyde	50-00-0	Yes	Yes	Yes	0.17	4.30	2.00	9.00	40.0	40.0	49.0
Hexane	110-54-3	Yes	Yes	Yes	--	--	--	700	3,100	3,100	--
Chloromethane	74-87-3	Yes	Yes	Yes	--	--	--	90.0	400	400	1,000
2-Butanone	78-93-3	Yes	No	Yes	--	--	--	5,000	22,000	22,000	5,000
Methyl isobutyl ketone	108-10-1	Yes	Yes	Yes	--	--	--	3,000	13,000	13,000	--
Toluene	108-88-3	Yes	Yes	Yes	--	--	--	5,000	22,000	22,000	7,500
m,p-Xylene	1330-20-7	Yes	Yes	Yes	--	--	--	220	970	970	8,700
o-Xylene	95-47-6	Yes	Yes	Yes	--	--	--	220	970	970	8,700
Total					**--**	**--**	**--**	**--**	**--**	**--**	**--**

Notes

g = gram.

HAP = hazardous air pollutant

hr = hour.

lb = pound.

m^3 = cubic meter.

RBC = risk based concentration.

Res = residential.

s = second.

TAC = toxic air contaminant.

ug = microgram.

[a] Emission rate (g/s) = (hourly production rate per-position [lb/hr])
x (process emission factor [lb/ton]) x (hr/3,600 s) x (ton/2,000 lb) x (453.592 g/lb)

Hourly production rate per-position—Rotary Fine (lb/hr) =	59.4	(3)
Hourly production rate per-position—Rotary Coarse (lb/hr) =	221	(3)
Hourly production rate per-position—Ultra Rotary Coarse (lb/hr) =	420	(3)

[b] Toxicity weighted emission rate (g/s/[ug/m^3]) = (emission rate [g/s]) / (RBC [ug/m^3])

References

[1] See Oregon Administrative Rule 340-245-8010 Table 2.

[2] See Table 3, "Emission Factor Summary for Toxic Air Contaminants" of approved Cleaner Air Oregon emissions inventory.

[3] Information provided by Hollingsworth & Vose Fiber Company for PSD permitting.

Table 1
Rotary Fiber Toxicity Weighted Emission Rate
Hollingsworth & Vose Fiber Company—Corvallis, OR

TAC	CAS/ODEQ Sequence Number	Regulatory Category (Yes/No)			Process Emission Factor [3] (lb/ton)			Emission Rate [a] (g/s)		
		TAC	HAP	RBC	Rotary Fine	Rotary Coarse	Ultra Rotary Coarse	Rotary Fine	Rotary Coarse	Ultra Rotary Coarse
METALS										
Antimony	7440-36-0	Yes	Yes	Yes	0	0	5.4E-05	--	--	1.4E-06
Arsenic	7440-38-2	Yes	Yes	Yes	0	0	0	--	--	--
Barium	7440-39-3	Yes	No	No	5.2E-05	3.3E-05	2.3E-05	1.9E-07	4.6E-07	6.0E-07
Beryllium	7440-41-7	Yes	Yes	Yes	0	0	0	--	--	--
Cadmium	7440-43-9	Yes	Yes	Yes	0	3.4E-05	2.1E-06	--	4.8E-07	5.6E-08
Chromium (total)	7440-47-3	No	Yes	No	1.8E-05	3.2E-05	1.3E-05	6.8E-08	4.5E-07	3.5E-07
Chromium VI	18540-29-9	Yes	Yes	Yes	1.8E-05	3.2E-05	1.3E-05	6.8E-08	4.5E-07	3.5E-07
Cobalt	7440-48-4	Yes	Yes	Yes	0	0	1.4E-06	--	--	3.7E-08
Copper	7440-50-8	Yes	No	Yes	4.4E-04	1.9E-04	1.8E-04	1.6E-06	2.6E-06	4.8E-06
Lead	7439-92-1	Yes	Yes	Yes	0	3.0E-04	0	--	4.2E-06	--
Manganese	7439-96-5	Yes	Yes	Yes	8.7E-05	2.9E-05	4.8E-05	3.3E-07	4.1E-07	1.3E-06
Mercury	7439-97-6	Yes	Yes	Yes	4.5E-06	1.9E-06	3.7E-06	1.7E-08	2.7E-08	9.7E-08
Nickel	7440-02-0	Yes	Yes	Yes	3.9E-05	7.3E-05	0	1.4E-07	1.0E-06	--
Phosphorus	504	Yes	Yes	No	7.3E-04	8.6E-04	6.5E-05	2.7E-06	1.2E-05	1.7E-06
Selenium	7782-49-2	Yes	Yes	Yes	0	0	0	--	--	--
Zinc	7440-66-6	Yes	No	No	1.1E-03	5.4E-04	3.4E-04	4.0E-06	7.5E-06	9.0E-06
INORGANIC COMPOUNDS										
Carbon disulfide	75-15-0	Yes	Yes	Yes	--	--	--	--	--	--
Fluorides	239	Yes	No	Yes	0	6.2E-03	2.5E-03	--	8.6E-05	6.5E-05
Hydrogen fluoride	7664-39-3	Yes	Yes	Yes	0.033	7.2E-04	2.3E-04	1.2E-04	1.0E-05	6.0E-06
Glasswool fibers	352	Yes	No	No	5.1E-03	1.8E-03	6.0E-04	1.9E-05	2.5E-05	1.6E-05
ORGANIC COMPOUNDS										
Acetone	67-64-1	Yes	No	Yes	0.050	0.012	0.019	1.9E-04	1.7E-04	5.1E-04
Benzene	71-43-2	Yes	Yes	Yes	9.9E-03	1.1E-03	4.2E-03	3.7E-05	1.5E-05	1.1E-04
1,3-Butadiene	106-99-0	Yes	Yes	Yes	--	--	2.2E-04	--	--	5.8E-06
Cyclohexane	110-82-7	Yes	No	Yes	--	--	--	--	--	--
Ethyl benzene	100-41-4	Yes	Yes	Yes	--	8.9E-04	4.6E-04	--	1.2E-05	1.2E-05
Chloroethane	75-00-3	Yes	Yes	Yes	--	--	--	--	--	--
Formaldehyde	50-00-0	Yes	Yes	Yes	0.78	0.065	0.026	2.9E-03	9.0E-04	6.7E-04
Hexane	110-54-3	Yes	Yes	Yes	0.049	2.0E-03	0.016	1.8E-04	2.8E-05	4.3E-04
Chloromethane	74-87-3	Yes	Yes	Yes	3.8E-03	--	--	1.4E-05	--	--
2-Butanone	78-93-3	Yes	No	Yes	1.9E-03	5.7E-04	7.8E-04	7.0E-06	7.9E-06	2.1E-05
Methyl isobutyl ketone	108-10-1	Yes	Yes	Yes	--	--	--	--	--	--
Toluene	108-88-3	Yes	Yes	Yes	0.023	5.1E-03	0.013	8.8E-05	7.2E-05	3.3E-04
m,p-Xylene	1330-20-7	Yes	Yes	Yes	--	2.1E-03	--	--	2.9E-05	--
o-Xylene	95-47-6	Yes	Yes	Yes	--	1.0E-03	--	--	1.4E-05	--
Total					**--**	**--**	**--**	**3.6E-03**	**1.4E-03**	**2.2E-03**

Notes

g = gram.

HAP = hazardous air pollutant

hr = hour.

lb = pound.

m^3 = cubic meter.

RBC = risk based concentration.

Res = residential.

s = second.

TAC = toxic air contaminant.

ug = microgram.

[a] Emission rate (g/s) = (hourly production rate per-position [lb/hr])
x (process emission factor [lb/ton]) x (hr/3,600 s) x (ton/2,000 lb) x (453.592 g/lb)

Hourly production rate per-position—Rotary Fine (lb/hr) =	59.4	(3)
Hourly production rate per-position—Rotary Coarse (lb/hr) =	221	(3)
Hourly production rate per-position—Ultra Rotary Coarse (lb/hr) =	420	(3)

[b] Toxicity weighted emission rate (g/s/[ug/m^3]) = (emission rate [g/s]) / (RBC [ug/m^3])

References

[1] See Oregon Administrative Rule 340-245-8010 Table 2.

[2] See Table 3, "Emission Factor Summary for Toxic Air Contaminants" of approved Cleaner Air Oregon emissions inventory.

[3] Information provided by Hollingsworth & Vose Fiber Company for PSD permitting.

Table 1
Rotary Fiber Toxicity Weighted Emission Rate
Hollingsworth & Vose Fiber Company—Corvallis, OR

TAC	CAS/ODEQ Sequence Number	Regulatory Category (Yes/No)			Toxicity Weighted Emission Rate [b] (g/s/[ug/m^3])						
					Rotary Fine						
					Cancer			Chronic Noncancer			Acute Noncancer
		TAC	HAP	RBC	Res	Child	Worker	Res	Child	Worker	
METALS											
Antimony	7440-36-0	Yes	Yes	Yes	--	--	--	--	--	--	--
Arsenic	7440-38-2	Yes	Yes	Yes	--	--	--	--	--	--	--
Barium	7440-39-3	Yes	No	No	--	--	--	--	--	--	--
Beryllium	7440-41-7	Yes	Yes	Yes	--	--	--	--	--	--	--
Cadmium	7440-43-9	Yes	Yes	Yes	--	--	--	--	--	--	--
Chromium (total)	7440-47-3	No	Yes	No	--	--	--	--	--	--	--
Chromium VI	18540-29-9	Yes	Yes	Yes	2.2E-03	1.3E-04	6.8E-05	8.2E-07	7.7E-08	7.7E-08	2.3E-07
Cobalt	7440-48-4	Yes	Yes	Yes	--	--	--	--	--	--	--
Copper	7440-50-8	Yes	No	Yes	--	--	--	--	--	--	1.6E-08
Lead	7439-92-1	Yes	Yes	Yes	--	--	--	--	--	--	--
Manganese	7439-96-5	Yes	Yes	Yes	--	--	--	3.6E-06	8.1E-07	8.1E-07	1.1E-06
Mercury	7439-97-6	Yes	Yes	Yes	--	--	--	2.2E-07	2.7E-08	2.7E-08	2.8E-08
Nickel	7440-02-0	Yes	Yes	Yes	3.8E-05	1.4E-06	3.1E-06	1.0E-05	2.3E-06	2.3E-06	7.2E-07
Phosphorus	504	Yes	Yes	No	--	--	--	--	--	--	--
Selenium	7782-49-2	Yes	Yes	Yes	--	--	--	--	--	--	--
Zinc	7440-66-6	Yes	No	No	--	--	--	--	--	--	--
INORGANIC COMPOUNDS											
Carbon disulfide	75-15-0	Yes	Yes	Yes	--	--	--	--	--	--	--
Fluorides	239	Yes	No	Yes	--	--	--	--	--	--	--
Hydrogen fluoride	7664-39-3	Yes	Yes	Yes	--	--	--	5.8E-05	6.5E-06	6.5E-06	7.7E-06
Glasswool fibers	352	Yes	No	No	--	--	--	--	--	--	--
ORGANIC COMPOUNDS											
Acetone	67-64-1	Yes	No	Yes	--	--	--	6.0E-09	1.3E-09	1.3E-09	3.0E-09
Benzene	71-43-2	Yes	Yes	Yes	2.8E-04	1.1E-05	2.5E-05	1.2E-05	2.8E-06	2.8E-06	1.3E-06
1,3-Butadiene	106-99-0	Yes	Yes	Yes	--	--	--	--	--	--	--
Cyclohexane	110-82-7	Yes	No	Yes	--	--	--	--	--	--	--
Ethyl benzene	100-41-4	Yes	Yes	Yes	--	--	--	--	--	--	--
Chloroethane	75-00-3	Yes	Yes	Yes	--	--	--	--	--	--	--
Formaldehyde	50-00-0	Yes	Yes	Yes	0.017	6.8E-04	1.5E-03	3.2E-04	7.3E-05	7.3E-05	6.0E-05
Hexane	110-54-3	Yes	Yes	Yes	--	--	--	2.6E-07	5.9E-08	5.9E-08	--
Chloromethane	74-87-3	Yes	Yes	Yes	--	--	--	1.6E-07	3.6E-08	3.6E-08	1.4E-08
2-Butanone	78-93-3	Yes	No	Yes	--	--	--	1.4E-09	3.2E-10	3.2E-10	1.4E-09
Methyl isobutyl ketone	108-10-1	Yes	Yes	Yes	--	--	--	--	--	--	--
Toluene	108-88-3	Yes	Yes	Yes	--	--	--	1.8E-08	4.0E-09	4.0E-09	1.2E-08
m,p-Xylene	1330-20-7	Yes	Yes	Yes	--	--	--	--	--	--	--
o-Xylene	95-47-6	Yes	Yes	Yes	--	--	--	--	--	--	--
Total					**0.020**	**8.2E-04**	**1.6E-03**	**4.1E-04**	**8.6E-05**	**8.6E-05**	**7.1E-05**

Notes

g = gram.

HAP = hazardous air pollutant

hr = hour.

lb = pound.

m^3 = cubic meter.

RBC = risk based concentration.

Res = residential.

s = second.

TAC = toxic air contaminant.

ug = microgram.

[a] Emission rate (g/s) = (hourly production rate per-position [lb/hr])
x (process emission factor [lb/ton]) x (hr/3,600 s) x (ton/2,000 lb) x (453.592 g/lb)

Hourly production rate per-position—Rotary Fine (lb/hr) =	59.4	(3)
Hourly production rate per-position—Rotary Coarse (lb/hr) =	221	(3)
Hourly production rate per-position—Ultra Rotary Coarse (lb/hr) =	420	(3)

[b] Toxicity weighted emission rate (g/s/[ug/m^3]) = (emission rate [g/s]) / (RBC [ug/m^3])

References

[1] See Oregon Administrative Rule 340-245-8010 Table 2.

[2] See Table 3, "Emission Factor Summary for Toxic Air Contaminants" of approved Cleaner Air Oregon emissions inventory.

[3] Information provided by Hollingsworth & Vose Fiber Company for PSD permitting.

Table 1
Rotary Fiber Toxicity Weighted Emission Rate
Hollingsworth & Vose Fiber Company—Corvallis, OR

TAC	CAS/ODEQ Sequence Number	Regulatory Category (Yes/No)			Toxicity Weighted Emission Rate [b] (g/s/[ug/m^3])						
					Rotary Coarse						
					Cancer			Chronic Noncancer			Acute Noncancer
		TAC	HAP	RBC	Res	Child	Worker	Res	Child	Worker	
METALS											
Antimony	7440-36-0	Yes	Yes	Yes	--	--	--	--	--	--	--
Arsenic	7440-38-2	Yes	Yes	Yes	--	--	--	--	--	--	--
Barium	7440-39-3	Yes	No	No	--	--	--	--	--	--	--
Beryllium	7440-41-7	Yes	Yes	Yes	--	--	--	--	--	--	--
Cadmium	7440-43-9	Yes	Yes	Yes	8.6E-04	3.4E-05	7.1E-05	9.6E-05	1.3E-05	1.3E-05	1.6E-05
Chromium (total)	7440-47-3	No	Yes	No	--	--	--	--	--	--	--
Chromium VI	18540-29-9	Yes	Yes	Yes	0.014	8.6E-04	4.5E-04	5.4E-06	5.1E-07	5.1E-07	1.5E-06
Cobalt	7440-48-4	Yes	Yes	Yes	--	--	--	--	--	--	--
Copper	7440-50-8	Yes	No	Yes	--	--	--	--	--	--	2.6E-08
Lead	7439-92-1	Yes	Yes	Yes	--	--	--	2.8E-05	6.4E-06	6.4E-06	2.8E-05
Manganese	7439-96-5	Yes	Yes	Yes	--	--	--	4.5E-06	1.0E-06	1.0E-06	1.4E-06
Mercury	7439-97-6	Yes	Yes	Yes	--	--	--	3.5E-07	4.2E-08	4.2E-08	4.4E-08
Nickel	7440-02-0	Yes	Yes	Yes	2.7E-04	1.0E-05	2.2E-05	7.2E-05	1.6E-05	1.6E-05	5.1E-06
Phosphorus	504	Yes	Yes	No	--	--	--	--	--	--	--
Selenium	7782-49-2	Yes	Yes	Yes	--	--	--	--	--	--	--
Zinc	7440-66-6	Yes	No	No	--	--	--	--	--	--	--
INORGANIC COMPOUNDS											
Carbon disulfide	75-15-0	Yes	Yes	Yes	--	--	--	--	--	--	--
Fluorides	239	Yes	No	Yes	--	--	--	3.7E-05	4.3E-06	4.3E-06	3.6E-07
Hydrogen fluoride	7664-39-3	Yes	Yes	Yes	--	--	--	4.8E-06	5.3E-07	5.3E-07	6.2E-07
Glasswool fibers	352	Yes	No	No	--	--	--	--	--	--	--
ORGANIC COMPOUNDS											
Acetone	67-64-1	Yes	No	Yes	--	--	--	5.6E-09	1.2E-09	1.2E-09	2.8E-09
Benzene	71-43-2	Yes	Yes	Yes	1.2E-04	4.6E-06	1.0E-05	5.1E-06	1.2E-06	1.2E-06	5.3E-07
1,3-Butadiene	106-99-0	Yes	Yes	Yes	--	--	--	--	--	--	--
Cyclohexane	110-82-7	Yes	No	Yes	--	--	--	--	--	--	--
Ethyl benzene	100-41-4	Yes	Yes	Yes	3.1E-05	1.2E-06	2.6E-06	4.7E-08	1.1E-08	1.1E-08	5.6E-10
Chloroethane	75-00-3	Yes	Yes	Yes	--	--	--	--	--	--	--
Formaldehyde	50-00-0	Yes	Yes	Yes	5.3E-03	2.1E-04	4.5E-04	1.0E-04	2.3E-05	2.3E-05	1.8E-05
Hexane	110-54-3	Yes	Yes	Yes	--	--	--	4.0E-08	9.0E-09	9.0E-09	--
Chloromethane	74-87-3	Yes	Yes	Yes	--	--	--	--	--	--	--
2-Butanone	78-93-3	Yes	No	Yes	--	--	--	1.6E-09	3.6E-10	3.6E-10	1.6E-09
Methyl isobutyl ketone	108-10-1	Yes	Yes	Yes	--	--	--	--	--	--	--
Toluene	108-88-3	Yes	Yes	Yes	--	--	--	1.4E-08	3.3E-09	3.3E-09	9.5E-09
m,p-Xylene	1330-20-7	Yes	Yes	Yes	--	--	--	1.3E-07	3.0E-08	3.0E-08	3.4E-09
o-Xylene	95-47-6	Yes	Yes	Yes	--	--	--	6.3E-08	1.4E-08	1.4E-08	1.6E-09
Total					**0.021**	**1.1E-03**	**1.0E-03**	**3.5E-04**	**6.6E-05**	**6.6E-05**	**7.2E-05**

Notes

g = gram.

HAP = hazardous air pollutant

hr = hour.

lb = pound.

m^3 = cubic meter.

RBC = risk based concentration.

Res = residential.

s = second.

TAC = toxic air contaminant.

ug = microgram.

[a] Emission rate (g/s) = (hourly production rate per-position [lb/hr])
x (process emission factor [lb/ton]) x (hr/3,600 s) x (ton/2,000 lb) x (453.592 g/lb)

Hourly production rate per-position—Rotary Fine (lb/hr) =	59.4	(3)
Hourly production rate per-position—Rotary Coarse (lb/hr) =	221	(3)
Hourly production rate per-position—Ultra Rotary Coarse (lb/hr) =	420	(3)

[b] Toxicity weighted emission rate (g/s/[ug/m^3]) = (emission rate [g/s]) / (RBC [ug/m^3])

References

[1] See Oregon Administrative Rule 340-245-8010 Table 2.

[2] See Table 3, "Emission Factor Summary for Toxic Air Contaminants" of approved Cleaner Air Oregon emissions inventory.

[3] Information provided by Hollingsworth & Vose Fiber Company for PSD permitting.

Table 1
Rotary Fiber Toxicity Weighted Emission Rate
Hollingsworth & Vose Fiber Company—Corvallis, OR

TAC	CAS/ODEQ Sequence Number	Regulatory Category (Yes/No)			Toxicity Weighted Emission Rate [b] (g/s/[ug/m^3])						
					Ultra Rotary Coarse						
					Cancer			Chronic Noncancer			Acute Noncancer
		TAC	HAP	RBC	Res	Child	Worker	Res	Child	Worker	
METALS											
Antimony	7440-36-0	Yes	Yes	Yes	--	--	--	4.8E-06	1.1E-06	1.1E-06	1.4E-06
Arsenic	7440-38-2	Yes	Yes	Yes	--	--	--	--	--	--	--
Barium	7440-39-3	Yes	No	No	--	--	--	--	--	--	--
Beryllium	7440-41-7	Yes	Yes	Yes	--	--	--	--	--	--	--
Cadmium	7440-43-9	Yes	Yes	Yes	1.0E-04	4.0E-06	8.4E-06	1.1E-05	1.5E-06	1.5E-06	1.9E-06
Chromium (total)	7440-47-3	No	Yes	No	--	--	--	--	--	--	--
Chromium VI	18540-29-9	Yes	Yes	Yes	0.011	6.8E-04	3.5E-04	4.3E-06	4.0E-07	4.0E-07	1.2E-06
Cobalt	7440-48-4	Yes	Yes	Yes	--	--	--	3.7E-07	8.4E-08	8.4E-08	--
Copper	7440-50-8	Yes	No	Yes	--	--	--	--	--	--	4.8E-08
Lead	7439-92-1	Yes	Yes	Yes	--	--	--	--	--	--	--
Manganese	7439-96-5	Yes	Yes	Yes	--	--	--	1.4E-05	3.2E-06	3.2E-06	4.2E-06
Mercury	7439-97-6	Yes	Yes	Yes	--	--	--	1.3E-06	1.5E-07	1.5E-07	1.6E-07
Nickel	7440-02-0	Yes	Yes	Yes	--	--	--	--	--	--	--
Phosphorus	504	Yes	Yes	No	--	--	--	--	--	--	--
Selenium	7782-49-2	Yes	Yes	Yes	--	--	--	--	--	--	--
Zinc	7440-66-6	Yes	No	No	--	--	--	--	--	--	--
INORGANIC COMPOUNDS											
Carbon disulfide	75-15-0	Yes	Yes	Yes	--	--	--	--	--	--	--
Fluorides	239	Yes	No	Yes	--	--	--	2.8E-05	3.3E-06	3.3E-06	2.7E-07
Hydrogen fluoride	7664-39-3	Yes	Yes	Yes	--	--	--	2.9E-06	3.2E-07	3.2E-07	3.8E-07
Glasswool fibers	352	Yes	No	No	--	--	--	--	--	--	--
ORGANIC COMPOUNDS											
Acetone	67-64-1	Yes	No	Yes	--	--	--	1.6E-08	3.6E-09	3.6E-09	8.2E-09
Benzene	71-43-2	Yes	Yes	Yes	8.6E-04	3.4E-05	7.5E-05	3.7E-05	8.6E-06	8.6E-06	3.9E-06
1,3-Butadiene	106-99-0	Yes	Yes	Yes	1.8E-04	6.8E-06	1.5E-05	2.9E-06	6.6E-07	6.6E-07	8.9E-09
Cyclohexane	110-82-7	Yes	No	Yes	--	--	--	--	--	--	--
Ethyl benzene	100-41-4	Yes	Yes	Yes	3.1E-05	1.2E-06	2.5E-06	4.7E-08	1.1E-08	1.1E-08	5.6E-10
Chloroethane	75-00-3	Yes	Yes	Yes	--	--	--	--	--	--	--
Formaldehyde	50-00-0	Yes	Yes	Yes	4.0E-03	1.6E-04	3.4E-04	7.5E-05	1.7E-05	1.7E-05	1.4E-05
Hexane	110-54-3	Yes	Yes	Yes	--	--	--	6.2E-07	1.4E-07	1.4E-07	--
Chloromethane	74-87-3	Yes	Yes	Yes	--	--	--	--	--	--	--
2-Butanone	78-93-3	Yes	No	Yes	--	--	--	4.1E-09	9.4E-10	9.4E-10	4.1E-09
Methyl isobutyl ketone	108-10-1	Yes	Yes	Yes	--	--	--	--	--	--	--
Toluene	108-88-3	Yes	Yes	Yes	--	--	--	6.7E-08	1.5E-08	1.5E-08	4.4E-08
m,p-Xylene	1330-20-7	Yes	Yes	Yes	--	--	--	--	--	--	--
o-Xylene	95-47-6	Yes	Yes	Yes	--	--	--	--	--	--	--
Total					**0.017**	**8.8E-04**	**7.9E-04**	**1.8E-04**	**3.6E-05**	**3.6E-05**	**2.7E-05**

Notes

g = gram.

HAP = hazardous air pollutant

hr = hour.

lb = pound.

m^3 = cubic meter.

RBC = risk based concentration.

Res = residential.

s = second.

TAC = toxic air contaminant.

ug = microgram.

[a] Emission rate (g/s) = (hourly production rate per-position [lb/hr])
x (process emission factor [lb/ton]) x (hr/3,600 s) x (ton/2,000 lb) x (453.592 g/lb)

Hourly production rate per-position—Rotary Fine (lb/hr) =	59.4	(3)
Hourly production rate per-position—Rotary Coarse (lb/hr) =	221	(3)
Hourly production rate per-position—Ultra Rotary Coarse (lb/hr) =	420	(3)

[b] Toxicity weighted emission rate (g/s/[ug/m^3]) = (emission rate [g/s]) / (RBC [ug/m^3])

References

[1] See Oregon Administrative Rule 340-245-8010 Table 2.

[2] See Table 3, "Emission Factor Summary for Toxic Air Contaminants" of approved Cleaner Air Oregon emissions inventory.

[3] Information provided by Hollingsworth & Vose Fiber Company for PSD permitting.

Table 2
Rotary Fiber Toxicity Weighted Emission Rate Summary
Hollingsworth & Vose Fiber Company—Corvallis, OR

Rotary Fiber Type	Total Toxicity Weighted Emission Rate [1] (g/s/[ug/m^3])						
	Cancer			Chronic Noncancer			Acute Noncancer
	Residential	Child	Worker	Residential	Child	Worker	
Rotary Fine	0.020	8.2E-04	**1.6E-03**	**4.1E-04**	**8.6E-05**	**8.6E-05**	7.1E-05
Rotary Coarse	**0.021**	**1.1E-03**	1.0E-03	3.5E-04	6.6E-05	6.6E-05	**7.2E-05**
Ultra Rotary Coarse	0.017	8.8E-04	7.9E-04	1.8E-04	3.6E-05	3.6E-05	2.7E-05

Notes

g = gram.

m^3 = cubic meter.

s = second.

ug = microgram.

References

[1] See Table 1, Rotary Fiber Toxicity Weighted Emission Rate.