ALLEGHENY COUNTY HEALTH DEPARTMENT
AIR QUALITY PROGRAM

June 28, 2016

SUBJECT: **Koppers Inc. – Clairton Tar Plant**
300 North State Street
Clairton, PA 15025
Allegheny County

Title V Operating Permit No. 0029

TO: Sandra L. Etzel
Chief Engineer

FROM: JoAnn Truchan
Air Quality Engineer

FACILITY DESCRIPTION:

Koppers Inc., Clairton Tar Plant is a tar refining facility that distills crude tar, petro tar, and decanted oil into various tar products, pitches, distillates, chemical oils, and creosotes. The recovery of the coal tar distillates is done by processing the tars through a series of flash and distillation columns, process heating units, centrifuges, and storage tanks. Liquid pitch can be extruded into solid pitch rods. Creosote is produced by blending products in Tanks #3, #4, and #36. Emissions from the creosote process are controlled by thermal oxidizer. Operations at the facility also include product loading, railcar depressurization, and a vapor/soil recovery unit.

The facility is a minor source of particulate matter (PM), particulate matter less than 10 µm in diameter (PM_{10}), particulate matter less than 2.5 µm in diameter ($PM_{2.5}$), oxides of nitrogen (NO_X), oxides of sulfur (SO_X), carbon monoxide (CO), and volatile organic compounds (VOCs) as defined in Article XXI, §2101.20. The facility is a major source of hazardous air pollutants (HAPs) as defined in Article XXI, §2101.20.

PERMIT APPLICATION COMPONENTS:

1. Title V Operating Permit application, dated September 1, 2010
2. Installation Permit #0029-I001, withdrawn/not issued (Fume Scrubber on Centrifuge and Pitch Loading)
3. Installation Permit #0029-I002, not issued via determination dated June 5, 2002 (Rod Pitch Process)
4. Installation Permit #0029-I003, issued August 21, 2003 (Creosote Blending)
5. Installation Permit #0029-I004, issued October 10, 2011 (Connections to RTO)
6. Installation Permit #0029-I005, issued January 17, 2012 (Tar Refining & Pitch Railcar Loading)
7. Installation Permit #91-I-0058-P, issued September 22, 2015 (Benzene Control)
8. RACT Plan Approval and Agreement #223, dated August 27, 1996
9. Stack test report, dated March 2, 2005 (Gas-blanketing gas destruction efficiency)
10. Stack test report, dated May 20, 2009 (Thermal oxidizer destruction efficiency)
11. Correspondence, dated September 19, 2010 (PTE calculations and insignificant sources)
12. Correspondence, dated September 17, 2010 (Process Heater Nomenclature)
13. Correspondence, dated November 15, 2010 (Miscellaneous information)
14. Correspondence, dated March 4, 2011 (information on pre-1995 permits)
15. Permits issued prior to 1996 (See Table 1 below)

Determinations

1. November 1, 2001: Change of service in Tank #34
   - RFD on 10/12/01
   - Exempted from permitting; tank is included in the equipment list.
2. February 1, 2007: Change of service in Tanks #7 and #9
   - RFD on 01/15/07; follow-up on 02/01/07
   - Exempted from permitting; tanks are included in the equipment list.
3. June 16, 2006: New material in Creosote Blend
   - No response found in files
   - Included in section V.D of the TVOP
4. February 18, 2011: Use of V-111 as a Decanter
   - RFD on 12/17/10
   - Exempted from permitting; Included in section V.A of the TVOP
5. January 13, 2015: Storage of Pavement Sealer Base in Tanks #5-#9

- RFD on 01/23/15
- Exempted from permitting; PSB added to Emission Unit Table

Older Permits

Table 1 contains a list of permits issued prior to 1996, and if applicable, any reasons the permit was not referenced in the Title V Operating Permit.

Table 1: Permits Issued Prior to 1996

Permit Number	Issue Date	Description	Reason for Exclusion from TVOP
703695-010-25703	12/14/1973	Tar Refining Process	Incorporated into the TVOP under Sections V.A, V.F, and V.G.
73-O-1154-P	12/14/1973	Tar Refining Process	
73-I-4033-P	03/21/1974	Vent Condenser on Tanks 1, 1A, M, and C	Tanks C & M are no longer in service. Due to changes in material, the vent condensers are no longer in operation.
73-I-4027-P	10/31/1974	Tar Refining Tanks 3-8, S, & T	Tanks S & T are no longer in service. Tanks #3 & #4 are in the TVOP under Section V.D. Tanks #5-#8 incorporated into TVOP under Section V.H. Due to changes in material, the vent condensers are no longer in operation. Tank #7 is part of the gas-blanketing system in the TVOP under Section V.A.
73-I-4028-P	10/31/1974	Tar Refining Tanks 10, 11, V-113	Tanks #10 & #11 are no longer in service. There is no longer a carbon absorber on V-113 as it is part of the gas-blanketing system in the TVOP under Section V.A.
73-I-4030-P	10/31/1974	Tar Refining Tanks V-100 & V-101	Tanks are no longer in service.
73-I-4031-P	10/31/1974	Tar Refining Tanks 12 & 13	Tanks are incorporated into TVOP under Section V.H. Due to changes in material, the vent condensers are no longer in operation.
73-I-4034-P	10/31/1974	No. 1 Tar Acid Tank	Process and tank are no longer in operation.
85-I-0045-P	02/01/1985	Alpha Methylstyrene Hydrogenation Unit	Process is no longer in operation
78-I-0089-P	--/--/--	Rod Pitch Process	Incorporated into the TVOP under Section V.B. Cyclones have been replaced with a more efficient baghouse.
87-I-0024-P	10/06/1987	Rod Pitch Process	
7035695-013-99900	07/13/1988	Rod Pitch Process	
89-I-0045-P	11/20/1989	Tank V-113	Incorporated into the TVOP under Sections V.A & V.H. Carbon absorber has been replaced by the gas-blanketing system.
89-I-0046-P	11/20/1989	Drain Tank	Tank V-300. Due to changes in material, carbon absorber is no longer in operation.
89-I-0047-P	11/20/1989	Day Tank	Tank V-112. Tank is no longer in service.
89-I-0048-P	11/20/1989	Tank V-100	Tanks are no longer in service.
89-I-0049-P	11/20/1989	Tank V-101	
91-I-0058-P	08/13/1991	Gas Blanketing System	Some tanks are no longer part of Koppers. The rest have been incorporated into the TVOP under Section V.A.
7035775-001-71700	09/15/1993	Rod Pitch Process	Incorporated into the TVOP under Section V.B. Cyclones have been replaced with a more efficient baghouse.
7035775-001-25704	03/07/1994	Tar Refining, Storage, & Loading	Incorporated into the TVOP under Section V.A. *(Note: This permit was never issued)*
95-I-0057-P	10/20/1995	Soil Vapor Extraction	Incorporated into the TVOP under Section VI.C.

EMISSION SOURCES:

Table 2: Emissions Sources

I.D.	Source Description	Control Device(s)	Maximum Capacity	Fuel/Raw Material	Stack I.D.[1]
P001	**Tar Refining Process** *(note 1)*				
	2 – Light Oil Decanters (V-110 and V-111)	direct-fired thermal oxidizer 4.5 MMBtu/hr; John Zink thermal oxidizer 12.34 MMBtu/hr (back-up)	65,700,000 gal/yr (total for P001)	light oil, water	S001, S003, or downriver
	R-6 Ejector (from 2-E-5 Ejector to 1-T-1 Column)			debenzolized tar, crude coal tar, petro tar, decanted oil	
	2-E-9 Ejector (from 2T4 Column to E13 Condenser, then V-113)			carbon black oil, petroleum distillate	
	2-E-16 Ejector (from 2D5 Column to E13 Condenser, then V-113)			carbon black oil, petroleum distillate *(note 2)*	
	2-E-5 Ejector (from 2T1 Column to R-6 Ejector)			debenzolized tar, petro tar, decanted oil	
P002	**Rod Pitch Process**				
	Dryer/Cooler	baghouse	12 ton/hr 60,480 tons/yr	liquid pitch	S002
	Solid Loading	none	12 ton/hr 60,480 tons/yr	solid pitch	--
P003	**Centrifuge Operation**				
	Tank V-20	none	31,536,000 gal/yr (total for P003)	debenzolized tar	--
	centrifuge	none		debenzolized tar	--
	dumpsters	none			--
	Tank V-18	none		debenzolized tar	--
P004	**Creosote Processing**				
	Tank #3	direct-fired thermal oxidizer 4.5 MMBtu/hr; John Zink thermal oxidizer 12.34 MMBtu/hr (back-up)	23,300,000 gal/yr (total for P004)	carbon black oil, naphthalene still residue, refined chemical oil, debenzolized tar, petroleum distillate	S007 (DFTO); S006 (JZTO)
	Tank #4				
	Tank #36				
Other Processes					
P005	Liquid Loading Operations - Barge	none	90,000 gal/hr	crude tar, petro tar, decanted oil, liquid pitch, refined chemical	--

I.D.	Source Description	Control Device(s)	Maximum Capacity	Fuel/Raw Material	Stack I.D.[1]
P005	Liquid Loading Operations – Truck & Railcar	DFTO; JZTO (see D001)	30,000 gal/hr	oil, carbon black oil, distillates, creosote, correction oils, petroleum pitch	S007; S006
P006	Cooling Tower	none	2,700 gal/min	cooling water	--
Process Heaters					
B001	Primary Heater 2F-1A (formerly 2-D-2)	none	16.0 MMBtu/hr	natural gas	S001
B002	TI Heater 2F-2A (formerly 2-D-5)	none	8.5 MMBtu/hr	natural gas	S001
B003	Spare Hot Oil Heater 1F-1C (formerly 1-T-2)	none	10.08 MMBtu/hr	natural gas	S001
B004	Hot Oil Heater 1F-2C (formerly 1-T-4)	none	4.5 MMBtu/hr	natural gas, gas blanketing gas	S001
B005	Prill Hot Oil Heater	none	4.5 MMBtu/hr	natural gas, gas blanketing gas	S003
B006	Secondary Heater 2F-1C (formerly 2-T-2)	none	6.2 MMBtu/hr	natural gas	S001
B007	2T3 Heater 2F-2B	none	6.0 MMBtu/hr	natural gas	S001
B008	2T4 Heater 2F-2C	none	6.0 MMBtu/hr	natural gas	S001
B009	2T1 Heater (2F-1B)	none	6.0 MMBtu/hr	natural gas	S001
B010	#1 Primary Flash Heater	none	18.9 MMBtu/hr	natural gas	S001
Storage Tanks					
D001	#7	direct-fired thermal oxidizer 4.5 MMBtu/hr; John Zink thermal oxidizer 12.34 MMBtu/hr (back-up)	1,000,000 gal.	crude tar	S007 (DFTO); S006 (JZTO)
D002	#5, #6, #8, #9 *(note 3)*		1,000, 000 gal. ea.	crude tar, petro tar, debenzolized tar, RCO, CBO, NSR, petro distillate, decanted oil, decanted oil distillate, creosotes, correction oil, pavement sealer base	
D003	M	none	100,000 gal.	debenzolized tar	--
D003	#12, #13	none	400,000 gal. ea.	debenzolized tar	--
D004	#34	DFTO; JZTO (see D001)	500,000 gal.	refined chemical oil, petro distillate (typical)	S007; S006
D005	#1, #1A, #2	none	1,000,000 gal. ea.	carbon black oil	--
D006	#35 *(note 4)*	none	600,000 gal.	distillate	--
D007	V-11, V-12, V-13	none	30,000 gal. ea.	pitch	--
D007	V-119 – V125, V-127	none	100,000 gal. ea.	pitch	--

I.D.	Source Description	Control Device(s)	Maximum Capacity	Fuel/Raw Material	Stack I.D.[1]
D008	#3, #4, #36 *(note 5)*	*(see process P004)*			
D009	#33	none	500,000 gal.	naphthalene still residue	--
D010	#32	none	60,000 gal.	correction oil	--
D011	V-113	natural gas blanketing	25,000 gal.	wastewater	--
D011	V-300	none	5,234 gal.	wastewater	--
D011	V-301	none	58,000 gal.	wastewater	--
D011	V-302	none	7,050 gal.	wastewater	--
D011	#11	none	500,000 gal.	wastewater	--
D012	V-110, V-111 *(see process P001)*	natural gas blanketing	80,000 gal. ea.	light oil	--
D013	#9	none	1,000,000 gal.	miscellaneous	--
D013	#31	none	60,000 gal.	miscellaneous	--
D013	V-16, V-17	none	5,000 gal. ea.	miscellaneous	--
D013	V-18, V-19	none	30,000 gal. ea.	miscellaneous	--
D013	V-112, V-112A	none	5,600 gal. ea.	miscellaneous	--
D013	V-126	none	100,000 gal.	miscellaneous	--
Sources of Minor Significance					
F001	Parking Lots & Roadways	none	n/a	n/a	--
G001	Railcar Depressurization	none	--	--	--
G002	Soil Vapor Extraction	none	--	--	--

1. Vapors from the tar refining process may be combined with coke-oven gas from the US Steel Clairton Works and sent downriver to the US Steel Irvin Works.
2. Vapors from the TI Column go directly to the 2-T-4 Column; vapors pulled from the 2-D-5 Column by the E-16 Ejector are condensed and make the carbon black oil that goes into the 2-T-4 Column.
3. Tanks #5-#9 are also considered crude tar storage (D001); Tanks #5 and #6 are used to store petro tar/decanted oil (D002) or debenzolized tar (D003).
4. Tank #35 is used to store distillate (D006) or correction oil (D010).
5. Tank #36 is used to process and/or store creosote.

STACKS:

Table 3: Stacks

Stack ID	Stack Height (ft)	Stack Diameter (ft)	Exhaust Rate (acfm)	Exhaust Temp. (ºF)	Lining/Outer Material
S001	105	6.75	57,000	1,200	carbon steel / none
S002	53	1.0	30,000	125	carbon steel / none
S003	40	2.0	3,000	1,200	steel / 5" castable
S006	50	6.0	6,600	1,400	carbon steel / carbon steel

METHOD OF DEMONSTRATING COMPLIANCE:

Methods of demonstrating compliance with the emission standards set in this permit are summarized in Table 4 below.

Table 4: Method(s) of Demonstrating Compliance

TVOP Section	Process	Method(s) of Demonstrating Compliance
V.A	Thermal Oxidizers	• Testing of the thermal oxidizer at least once every 5 years • Monitoring of thermal oxidizer temperature
V.B	Tar Refining Process	• Monthly monitoring of all equipment in benzene service for equipment leaks • Recordkeeping of production and operation • Testing of VOC DRE on gas-blanketing combustion at least annually (when combusting gas-blanketing gas)
V.C	Rod Pitch Process	• Monitoring of baghouse pressure drop • Recordkeeping of throughput and ours of operation
V.D	Centrifuge Operation	• Recordkeeping of production and operation • Analyses of materials
V.E	Creosote Blending Process	• Recordkeeping of production
V.F	Liquid Loading Operations	• Recordkeeping of production and loaded material properties • Analyses of materials
V.G	Process Heaters (natural gas only)	• Recordkeeping of fuel use
V.H	Process Heaters (gas blanketing gas)	• Testing of VOC DRE on gas-blanketing combustion at least annually (when combusting gas-blanketing gas) • Recordkeeping of fuel use
V.I	Storage Tanks	• Recordkeeping of material, material vapor pressure, and throughput
VI.A	Cooling Tower	• Monitoring of total dissolved solids content • Monitoring of water recirculation rate
VI.B	Vehicles and Roadways	• Recordkeeping of dust suppression activities • Recordkeeping of fuel use
VII.A	Tar Refining Process – Alternative Operating Scenario	• Monthly monitoring of all equipment in benzene service for equipment leaks • Recordkeeping of natural gas blanketing use

See operating permit No. 0029 for the specific conditions for determining compliance with the applicable requirements. Compliance with the short-term (lb/hr) limits must be maintained at all times, including startup and shutdown. Any emissions due to startup, shutdown, or malfunction are included in facility's total annual emissions.

REGULATORY APPLICABILITY:

1. **Article XX1 Requirements for Issuance:**
   See Permit Application No. 0029, Appendix F. The requirements of Article XXI, Parts B and C for the issuance of operating permits have been met for this facility. Article XXI, Part D, Part E & Part H will have the necessary sections addressed individually.

2. **Testing Requirements:**
   Testing is required on the thermal oxidizer at least once every five (5) years. Testing is also required annually on the 1F-2C Hot Oil Heater and Prill Hot Oil Heater while combusting gas blanketing gas to demonstrate compliance with RACT Order #223. The Department reserves the right to require additional testing if necessary in the future to assure compliance with the terms and conditions of this Title V Operating Permit.

3. **New Source Performance Standards (NSPS):**
No storage tanks meet the applicability requirements of 40 CFR Part 60, Subpart K – *Standards of Performance for Storage Vessels for Petroleum Liquids (1973-1978)* or 40 CFR Part 60, Subpart Ka – *Standards of Performance for Storage Vessels for Petroleum Liquids (1978-1984)*. The two tanks constructed in 1978 (V-112 and V-112A) both have capacities below the applicability threshold.

40 CFR Part 60, Subpart Kb – *Standards of Performance for Volatile Organic Liquid Storage Vessels (post-1984)* does not apply. The facility is considered a coke oven by-product recovery plant, and is exempt from this subpart under §60.110b(d)(1).

4. **NESHAP and MACT Standards:**
The facility is subject to 40 CFR Part 61, Subpart L – *National Emission Standard for Benzene Emissions from Coke By-Product Recovery Plants*.

The facility is subject to 40 CFR Part 61, Subpart V – *National Emission Standards for Equipment Leaks (Fugitive Emission Sources)*, as referenced by Subpart L.

The Creosote Blending Process is subject to 40 CFR Part 63, Subpart MMM – *National Emission Standards for Hazardous Air Pollutants for Pesticide Active Ingredient Production*. Some sections of Subpart L are more stringent than those in Subpart MMM, so those conditions have been streamlined, with the Subpart MMM conditions being subsumed by the Subpart L conditions.

- Section 61.139 of Subpart L requires that a minimum temperature be met at all times and that the temperature be continuously monitored. Section 63.1366 of Subpart MMM is for establishing averaging periods for temperature monitoring.
- Section 61.139(f) requires continuous monitoring while §63.1366(b) requires monitoring in 15-minute intervals.

The facility is not subject to 40 CFR Part 61, Subparts F, G, and H (the Hazardous Organic NESHAP). The facility is considered a coke oven by-product recovery plant, and is exempt from these subparts under §63.100(j)(5).

The facility is not subject to 40 CFR Part 61, Subpart J – *National Emission Standard for Equipment Leaks (Fugitive Emission Sources) of Benzene*. The facility is considered a coke oven by-product recovery plant, and is exempt from this subpart under §63.110(b).

The facility is not subject to 40 CFR Part 61, Subpart Y – *National Emission Standard for Benzene Emissions from Benzene Storage Vessels*. The facility is considered a coke oven by-product recovery plant, and is exempt from this subpart under §63.270(c).

The facility is not subject to 40 CFR Part 61, Subpart BB – *National Emission Standard for Benzene Emissions from Benzene Transfer Operations*. The facility is considered a coke oven by-product recovery plant, and is exempt from this subpart under §63.300(a).

The facility is not subject to 40 CFR Part 63, Subpart EEEE – *National Emission Standards for Hazardous Air Pollutants for Organic Liquid Distribution*. Only light oil is considered an organic liquid under this subpart. All light oil is pumped directly to another facility; no light oil is stored on-site or transferred into transport vehicles.

The facility is not subject to 40 CFR Part 63, Subpart FFFF – *National Emission Standards for Hazardous Air Pollutants for Miscellaneous Organic Chemical Production and Processes*. The SIC code for the facility is not among those listed for applicability to this subpart.

The process heaters are subject to 40 CFR Part 63, Subpart DDDDD – *National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters*. Only the work practice standards under §63.7500(a)(1) and Table 3 apply.

5. **Greenhouse Gas Reporting (40 CFR Part 98):**
Greenhouse gases (GHGs) from this facility come from the creosote process thermal oxidizer and the ten process heaters. Only three (3) of the six GHG categories apply: CO_2, N_2O (nitrous oxide), and CH_4 (methane). Based on the calculation methodology in 40 CFR Part 98, §98.33(a)(1), potential emissions of CO_2e are 42,742 tpy. This is less than the 100,000 tpy major source threshold, therefore the facility is not considered a major source of GHG emissions. Calculations of potential emissions are included in the Creosote Blending Process and Process Heaters sections below.

The requirements contained in the GHG reporting rule are not considered applicable requirements under the Title V regulations. Furthermore, after reviewing the actual natural gas use over the past ten (10) years (as reported in the Emissions Inventory), the highest actual CO_2e emissions was less than 15,000 metric tons in any given year, under the 25,000 metric ton applicability threshold for the reporting rule. Should the facility exceed 25,000 metric tons of CO_2e in any 12-month period, the facility would have to submit reports in accordance with 40 CFR Part 98.

EMISSION CALCULATIONS

Thermal Oxidizer Residence Time

The maximum capacity for the blower on the Direct-Fired Thermal Oxidizer is 2,100 acfm.
Combustion chamber volume = 170 ft^3
Residence time = 170 ft^3 ÷ 2,100 ft/min × 60 sec/min = 4.9 seconds

The maximum capacity for the blower on the John Zink Thermal Oxidizer is 3,000 acfm.
Combustion chamber volume = $(5.5\ ft)^2 \times \pi/4 \times 50\ ft = 1,188\ ft^3$
Residence time = 1,188 ft^3 ÷ 3,000 ft/min × 60 sec/min = 23.8 seconds

To demonstrate that each of the thermal oxidizers is capable of handling the additional capacity from the other thermal oxidizer, the current percent capacity was determined, followed by the percent capacity with the additional sources.

Table 5: Thermal Oxidizer Capacity

DFTO Design Flow Rate Capacity[(1)]		**JZTO Design Flow Rate Capacity[(1)]**	
	1,800 scfm		2,084 scfm
Sources Currently Permitted for Control		**Sources Currently Permitted for Control**	
Tank 7	109 scfm	Tanks 3 & 4[(4)]	235 scfm
Tank V-113[(2)]	13 scfm	Tank 34[(5)]	134 scfm
V-110 Decanter	38 scfm	Tank 36[(5)]	134 scfm
V-111 Decanter	38 scfm	Distillate Loading[(6)]	107 scfm
Pitch Railcar Loading	26 scfm	Total:	610 scfm
Total:	224 scfm		
Total Flow with Sources Currently Permitted for Control:	**224 scfm**	**Total Flow with Sources Currently Permitted for Control:**	**610 scfm**
12.44% of DFTO design used with current sources		29.27% of JZTO design used with current sources	
87.56% of DFTO design available		70.73% of JZTO design available	

New Sources Being Permitted for Control		**New Sources Being Permitted for Control**	
Tank 5, 6, 8, or 9(3)	14 scfm	Tank 7	109 scfm
Tank 5, 6, 8, or 9(3)	14 scfm	Tank V-113(2)	13 scfm
Tanks 3 & 4(4)	235 scfm	V-110 Decanter	38 scfm
Tank 34(5)	134 scfm	V-111 Decanter	38 scfm
Tank 36(5)	134 scfm	Pitch Railcar Loading	26 scfm
Distillate Loading(6)	107 scfm	Tank 5, 6, 8, or 9(3)	14 scfm
Total:	638 scfm	Tank 5, 6, 8, or 9(3)	14 scfm
		Total:	252 scfm
Total Flow with New Sources Being Permitted for Control:	**862 scfm**	**Total Flow with New Sources Being Permitted for Control:**	**862 scfm**
47.89% of DFTO design used with additional sources		41.36% of JZTO design used with additional sources	
52.11% of DFTO design available		58.64% of JZTO design available	

1. Design Flow Rate Capacity and Flow Rates from sources to DFTO came from *Oxidizer and Tank Ventilation System Design Basis* by Industrial Energy Engineering for Koppers, January 2010 and previous permit applications.
2. Process vent streams from Tar Refining Columns 1-T-1, 2-T-4, and 2-D-5 are routed into Tank V-113.
3. Two of Tanks 5, 6, 8, or 9 can be filled at a time.
4. Flow rate during 2009 stack test.
5. Pump rate to Tanks 34 and 36 (per tank): 1,000 gpm = 134 scfm
6. Distillate Loading: 45 min. to load 18,000 gal. into a railcar = 400 gpm, so use: 500 gpm
   20 min. to load 4,500 gal. into a truck = 225 gpm, so use: 300 gpm
   Total: 800 gpm = 107 scfm

DFTO Combustion

Emissions of from thermal oxidizer combustion were based on the following assumptions:

- PM, PM_{10}, and $PM_{2.5}$ emissions are based on the limits found in Article XXI, §2104.02.a.1.A.
- All PM was assumed to be PM_{10}; all PM_{10} was assumed to be $PM_{2.5}$.
- VOC emissions were based on the factor found in U.S. EPA AP-42 *Section 1.4: Natural Gas Combustion (7/98)*.
- CO emissions were based on the factor found in U.S. EPA AP-42 *Section 13.5: Industrial Flares (9/91)*.
- NO_X emissions were based on a factor established by manufacturer data for waste gas.
- SO_X (as SO_2) emissions were based on H_2S sampling from the compressor/chiller system during the December 2002 test.
- A 15% adjustment was added to all emissions calculated with AP-42 factors to account for operational variability.

Basis:

DFTO Rating:	4.5 MMBtu/hr (2.1 MMBtu/hr waste gas; 2.4 MMBtu/hr natural gas)
Natural gas rating:	1,050 Btu/scf
H2S concentration:	219 ppm
Chiller flow rate:	185 scfm
Molecular weights:	H_2S = 34 lb/lb·mol; SO_2 = 64 lb/lb·mol
NO_X emission factor:	0.15 lb/MMBtu
Hours of operation:	8,760 hours/year

Table 6a: DFTO Combustion – PM & VOC Emissions

Pollutant	AP-42 Factors	Thermal Oxidizer Combustion	
		4.5 MMBtu/hr	
	$lb/10^6$ scf	lb/hr	tpy
Particulate Matter	0.008[1]	0.036	0.158
PM_{10}	0.008[1]	0.036	0.158
$PM_{2.5}$	0.008[1]	0.036	0.158
VOC	5.5	0.027	0.119
CO_2e	--	550.0	2,656.7

1. Based on Article XXI, §2104.02.a.1.A (lb/MMBtu)

Table 6b: DFTO Combustion – NO_X & CO Emissions

Pollutant	Emission Factors		Natural Gas		Waste Gas		Total	
	natural gas	waste gas	2.4 MMBtu/hr		2.1 MMBtu/hr			
	$lb/10^6 scf$	lb/MMBtu	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
NO_X	100	0.15	0.229	1.001	0.315	1.380	0.544	2.381
CO	84	0.37	0.192	0.841	0.894	3.914	1.086	4.755

<u>DFTO Combustion SO_X Emissions</u>:
219 ppm ÷ 10^6 × 185 ft^3/min × 60 min/hr × 34 lb_{H2S}/lb·mol ÷ 385 ft^3/lb·mol = 0.215 lb/hr of H_2S

0.215 lb_{H2S}/hr × 64 lb_{SO2}/lb·mol_{SO2} ÷ 34 lb_{H2S}/lb·mol_{H2S} × lb·mol_{SO2}/lb·mol_{H2S} = **0.404 lb/hr SO_2**
= **1.770 tpy SO_2**

<u>Potential GHG mass and CO_2e Emissions</u>
Calculations of greenhouse gases (GHG) and CO_2-equivalent (CO_2e) emissions are based on the methodology found in 40 CFR Part 98, Subpart C, §98.33(a)(1), and factors found in Table C-1 and Table C-2 of that subpart.

Total rated heat input capacity of the thermal oxidizer = 4.5 MMBtu/hr × 8,760 hr/yr = 39,420 MMBtu/yr
Emission Factors: CO_2 = 53.02 kg/MMBtu
N_2O = 1×10^{-4} kg/MMBtu
CH_4 = 1×10^{-3} kg/MMBtu

CO_2: 39,420 MMBtu/yr × 53.02 kg/MMBtu ÷ 1,000 kg/metric ton = 2,090 metric tons/year
NO_2: 39,420 MMBtu/yr × 1×10^{-4} kg/MMBtu ÷ 1,000 kg/metric ton = 0.004 metric tons/year
CH_4: 39,420 MMBtu/yr × 1×10^{-3} kg/MMBtu ÷ 1,000 kg/metric ton = 0.039 metric tons/year

Global Warming Potential (GWP) Factors (from Part 98, Subpart A, Table A-1):
CO_2 = 1
N_2O = 298
CH_4 = 25

CO_2e = (2,090 × 1) + (0.004 × 298) + (0. 039 × 25) = 2,092 metric tons/year of CO_2e

<u>JZTO Combustion</u>
Emissions of SO_X and VOC from the John Zink Thermal Oxidizer combustion were based on factors found in U.S. EPA AP-42 *Section 1.4: Natural Gas Combustion (7/98).* NO_X and CO emissions limits are based on the John Zink performance guarantee for the thermal oxidizer. Particulate matter emissions limits are those found in Article XXI, §2104.02.a.1.A. A 15% adjustment was added to all emissions calculated with AP-42 factors to account for operational variability. All PM is assumed to be PM_{10}, and all PM_{10} is assumed to be $PM_{2.5}$.

The following assumptions were also used as a basis:

Natural gas rating: 1,050 Btu/scf
Hours of operation: 8,260 hours/year on natural gas

Table 7: John Zink Thermal Oxidizer Emissions

Pollutant	AP-42 Factors	Thermal Oxidizer Combustion 12.34 MMBtu/hr	
	$lb/10^6$ scf	lb/hr	tpy
Particulate Matter[1]	0.008	0.099	0.432
PM_{10}	0.008	0.099	0.432
$PM_{2.5}$	0.008	0.099	0.432
Nitrogen Oxides (NO_X)[2]	0.15	1.851	8.107
Sulfur Oxides (SO_X)	0.6	0.008	0.036
Carbon Monoxide (CO)[2]	0.20	2.468	10.810
VOC	5.5	0.074	0.326

1. Based on Article XXI, §2104.02.a.1.A (lb/MMBtu)
2. Based on John Zink performance guarantee (lb/MMBtu)

Potential GHG mass and CO_2e Emissions

Calculations of greenhouse gases (GHG) and CO_2-equivalent (CO_2e) emissions are based on the methodology found in 40 CFR Part 98, Subpart C, §98.33(a)(1), and factors found in Table C-1 and Table C-2 of that subpart.

Total rated heat input capacity of the thermal oxidizer = 12.34 MMBtu/hr × 8,760 hr/yr = 108,098 MMBtu/yr

Emission Factors: CO_2 = 53.02 kg/MMBtu
$N_2O = 1\times10^{-4}$ kg/MMBtu
$CH_4 = 1\times10^{-3}$ kg/MMBtu

CO_2: 108,098 MMBtu/yr × 53.02 kg/MMBtu ÷ 1,000 kg/metric ton = 5,731.377 metric tons/year
NO_2: 108,098 MMBtu/yr × 1×10^{-4} kg/MMBtu ÷ 1,000 kg/metric ton = 0.011 metric tons/year
CH_4: 108,098 MMBtu/yr × 1×10^{-3} kg/MMBtu ÷ 1,000 kg/metric ton = 0.108 metric tons/year

Global Warming Potential (GWP) Factors (from Part 98, Subpart A, Table A-1):

CO_2 = 1
N_2O = 298
CH_4 = 25

CO_2e = (5,731.377 × 1) + (0.011 × 298) + (0.108 × 25) = 5,737 metric tons/year of CO_2e

Creosote Blending Emissions

There are three options for the blending of creosote: P2 creosote, P1/P13 creosote, and a creosote petroleum solution. The maximum emissions represent the maximum for each component from the three options. Emissions were calculated using the following equation:

$E = V/RT \times \Sigma(P_i)(MW_i)$

Where:

E = Mass of Emissions
V = Volume of Gas Displaced
R = Ideal Gas Constant = 10.731 cf psi/lb·mol °R
P_i = Partial Pressure
MW_i = Molecular Weight

Thermal oxidizer destruction efficiency: 98%

Tar Refining Process

Emissions from the tar refining process are primarily from the 1-T-1, 2-T-4, and 2-D-5 columns, which vent directly to the natural gas-blanketed contaminated water tank V-113. The other tar refining columns (1-T-2, 2-T-1, 2-T-2, and TI columns) vent to either the 1-T-1, 2-T-4, or 2-D-5 columns.

Emissions from the 1-T-1, 2-T-4, and 2-D-5 columns were based on the method found in the U.S. EPA document Control of Volatile Organic Compound Emissions from Batch Processes – Alternative Control Techniques Information Document (Reference #A.94.102, 1994). The following equation was used:

$$S_e = MW_i \times (L_a/29) \times [P_{system} \div (P_{system} - P_i) - 1]$$

Where

S_e = VOC emissions (lb/hr)
MW_i = molecular weight of VOC (lb/lb·mol)
L_a = total air leakage rate in the system (lb/hr)
P_{system} = pressure of receiving vessel or ejector outlet conditions (mmHg)
P_i = vapor pressure of VOC at receiver temperature (mmHg)
29 = molecular weight of air (lb/lb·mol)

<u>1-T-1 Column</u>

The 1-T-1 Debenzolization column accepts emissions from the 2-T-1 and 1-T-2 columns. Emissions from the 1-T-1 column are then sent, through tank V-113, to the direct-fired thermal oxidizer (DFTO). Only one type of material is processed through this column, light oil from crude tar (petro tar and decanted oil are not used). The following were used as a basis:

Air Leak Rate, La = 230 lb/hr
System Pressure, P_{system} = 900 mmHg
Operating Hours = 8,760 hours/year
Compressor/Chiller Effiency = 98%

For the light oil VOC:

MW_i = 80.05 lb/lb·mol
P_i = 0.5299 psia = 27.394 mmHg
Calculated Se = 0.399 lb/hr

Table 8: 1-T-1 Column Emissions

Pollutant	**1-T-1 Column Case 1 – 100% Crude Tar (light oil)**		
	% in Vapor	**lb/hr**	**tpy**
Total VOC		0.399	1.746
Benzene	86.265	0.344	1.506
Ethylbenzene	0.174	0.001	0.003
Naphthalene	0.064	0.000	0.001
Phenol	0.002	0.000	0.000
Styrene	0.545	0.002	0.010
Toluene	10.666	0.043	0.186
m-Xylene	0.632	0.003	0.011
o-Xylene	0.199	0.001	0.003
p-Xylene	0.669	0.003	0.012
Total HAP		0.396	1.732
Total POM		0.000	0.001

<u>2-T-4 and 2-D-5 Columns</u>

The 2-T-4 and 2-D-5 columns accept emissions from the TI column and 2-T-2 column. Emissions are then sent, through tank V-113, to the DFTO. Three (3) types of material are processed: crude tar (carbon black oil (CBO) for 2-T-4 and coal tar pitch for 2-D-5), petro tar (petroleum distillate for 2-T-4 and petro pitch for 2-D-5), and decanted oil (decanted oil distillate for 2-T-4 and decanted oil pitch for 2-D-5). The following were used as a basis:

Table 9: 2-T-4 & 2-D-5 Column Input Data

	2-T-4 Column			**2-D-5 Column**		
Air Leak Rate, L_a	75	lb/hr		75	lb/hr	
System Pressure, P_{system}	835	mmHg		835	mmHg	
Operating Hours	8,760	hrs/yr		8,760	hrs/yr	
Compressor/Chiller Efficiency	98	%		98	%	
	MW_i	P_i	S_e	MW_i	P_i	S_e
	lb/lb·mol	mmHg	lb/hr	lb/lb·mol	mmHg	lb/hr
Case 1 – 100% Crude Tar	141.02	0.858	0.0075	146.79	12.786	0.1181
Case 2 – 100% Petro Tar	130.60	6.090	0.0496	131.97	80.979	0.7331
Case 3 – 100% Decanted Oil	178.20	1.623	0.0180	179.25	26.440	0.3032

The constituent $\%_{wt}$ in the vapor and estimated emissions for each case can be found in Appendix A. The worst-case emissions were from Case #2:

Table 10: 2-T-4 & 2-D-5 Column Emissions

Pollutant	**Combined Maximum Emissions 2-T-4 & 2-D-5 Columns**	
	lb/hr	**tpy**
Total VOC	0.783	3.428
Total HAP	0.484	2.122
Total POM	0.431	1.888

__Rod Pitch Process__
Emissions from the rod pitch process are produced from two separate operations: The Rod Pitch Dryer and the Solid Pitch Loading.

Per a determination letter dated June 5, 2002, emissions of particulate matter from the Rod Pitch Plant are limited to 9.28 tons/year.

__Rod Pitch Dryer__
Emissions factors from the Rod Pitch Dryer are based on a stack test of the baghouse conducted in July 1997. The following was used as a basis:

Production: 12 tons/hr
60,480 tons/yr
Baghouse capture eff.: 97.5%
Baghouse control eff.: 99.0%
July 1997 Stack Test Results
PM 0.540 lb/hr
PM_{10} 0.102 lb/hr
Throughput 8.000 tons/hr

All PM_{10} is assumed to be $PM_{2.5}$

Uncontrolled PM emission factor $= 0.540\ lb_{PM}/hr \div 8.0\ ton_{pitch}/hr \div (97.5/100) \div [1 - (99.0/100)]$
$= 6.923\ lb_{PM}/ton_{pitch}$

Uncontrolled PM_{10} emission factor $= 0.540\ lb_{PM10}/hr \div 8.0\ ton_{pitch}/hr \div (97.5/100) \div [1 - (99.0/100)]$
$= 1.308\ lb_{PM10}/ton_{pitch}$

Table 11: Rod Pitch Dryer Particulate Emissions

Pollutant	Uncontrolled Emission Factor	Hourly Emissions			
		Uncontrolled PTE	Stack PTE	Fugitive PTE	Total PTE
	lb_{PM}/ton_{pitch}	lb/hr	lb/hr	lb/hr	lb/hr
PM	6.923	83.077	0.810	2.077	**2.887**
PM_{10}	1.308	15.692	0.153	0.392	**0.545**
$PM_{2.5}$	1.308	15.692	0.153	0.392	**0.545**

Pollutant	Uncontrolled Emission Factor	Annual Emissions			
		Uncontrolled PTE	Stack PTE	Fugitive PTE	Total PTE
	lb_{PM}/ton_{pitch}	tpy	tpy	tpy	tpy
PM	6.923	209.354	2.041	5.234	**7.275**
PM_{10}	1.308	39.545	0.386	0.989	**1.374**
$PM_{2.5}$	1.308	39.545	0.386	0.989	**1.374**

HAP emissions from the Rod Pitch Dryer are based on the relative percentages of HAP (as a percent of total PM) from the three kinds of pitch produced: Coal Tar/Type A, Petro, or Decanted Oil Pitch.

Table 12: Rod Pitch Dryer HAP Emissions

Pollutant	Case 1 – Crude Tar Coal Tar/Type A Pitch			Case 2 – Petro Tar Petro Pitch			Case 3 – Decanted Oil Decanted Oil Pitch			Maximum Potential	
	$\%_w$ in pitch	Potential		$\%_w$ in pitch	Potential		$\%_w$ in pitch	Potential			
		lb/hr	tpy		lb/hr	tpy		lb/hr	tpy	lb/hr	tpy
PM		2.887	7.275		2.887	7.275		2.887	7.275	2.887	**7.275**
PM_{10}		0.545	1.374		0.545	1.374		0.545	1.374	0.545	**1.374**
$PM_{2.5}$		0.545	1.374		0.545	1.374		0.545	1.374	0.545	**1.374**
Dibenzofuran	0.13	0.004	0.009	0.00	0.000	0.000	0.00	0.000	0.000	0.004	**0.009**
Naphthalene	0.01	0.000	0.001	0.01	0.000	0.001	0.01	0.000	0.001	0.000	0.001
Acenaphthene	0.06	0.002	0.004	0.35	0.010	0.025	0.35	0.010	0.025	0.010	0.025
Anthracene	0.72	0.021	0.052	0.23	0.007	0.017	0.23	0.007	0.017	0.021	0.052
Benzo(a)-anthracene	1.02	0.029	0.074	0.17	0.005	0.012	0.17	0.005	0.012	0.029	0.074
Benzo(b)-fluoranthene	1.90	0.055	0.138	0.02	0.001	0.001	0.02	0.001	0.001	0.055	0.138
Benzo(k)-fluoranthene	0.65	0.019	0.047	0.01	0.000	0.001	0.01	0.000	0.001	0.019	0.047
Benzo(g,h,i)-perylene	1.15	0.033	0.084	0.00	0.000	0.000	0.00	0.000	0.000	0.033	0.084

Pollutant	Case 1 – Crude Tar Coal Tar/Type A Pitch			Case 2 – Petro Tar Petro Pitch			Case 3 – Decanted Oil Decanted Oil Pitch			Maximum Potential	
	$\%_w$ in pitch	Potential		$\%_w$ in pitch	Potential		$\%_w$ in pitch	Potential			
		lb/hr	tpy		lb/hr	tpy		lb/hr	tpy	lb/hr	tpy
Benzo(a)pyrene	1.53	0.044	0.111	0.09	0.003	0.007	0.09	0.003	0.007	0.044	0.111
Chrysene	1.15	0.033	0.084	0.26	0.008	0.019	0.26	0.008	0.019	0.033	0.084
Dibenzo(a,h)-anthracene	1.23	0.036	0.089	0.00	0.000	0.000	0.00	0.000	0.000	0.036	0.089
Fluoranthene	1.44	0.042	0.105	0.28	0.008	0.020	0.28	0.008	0.020	0.042	0.105
Fluorene	0.04	0.001	0.003	0.20	0.006	0.015	0.20	0.006	0.015	0.006	0.015
Indeno(1,2,3-cd)-pyrene	0.19	0.005	0.014	0.00	0.000	0.000	0.00	0.000	0.000	0.005	0.014
Phenanthrene	0.21	0.006	0.015	0.50	0.014	0.036	0.50	0.014	0.036	0.014	0.036
Pyrene	1.17	0.034	0.085	0.50	0.014	0.036	0.50	0.014	0.036	0.034	0.085
Total HAP		0.364	0.917		0.076	0.191		0.076	0.191	0.364	0.917
Total POM		0.364	0.917		0.076	0.191		0.076	0.191	0.364	**0.917**

Solid Pitch Loading

Emissions of particulate from the Solid Pitch Loading operation are based on factors found in U.S. EPA AP-42 *Section 13.2.4: Aggregate Handling and Storage Piles (11/06)* and the following equation:

$$E = k \times 0.0032 \times (U/5)^{1.3} \div (M/2)^{1.4}$$

Where:

E = emission factor (lb/ton)
k = particle size multiplier = 0.74 for PM
= 0.35 for PM_{10}
= 0.11 for $PM_{2.5}$
U = mean wind speed = 9 mph
M = moisture content = 2%

HAP emissions from Solid Pitch Loading are based on the relative percentages of HAP (as a percent of total PM) from the three kinds of pitch produced: Coal Tar/Type A, Petro, or Decanted Oil Pitch. A 15% adjustment factor was added to the calculated particulate values to account for operational variability from the AP-42 factors. The following assumptions were also used as a basis:

Pitch Loading = 225 tons/hr (based on 3 bins of 75 tons each unloaded to truck or rail an hour)
= 60,480 tons/yr

The calculated particulate emission factors are:

PM = 0.00508 lb_{PM}/ton_{pitch}
PM_{10} = 0.00240 lb_{PM10}/ton_{pitch}
$PM_{2.5}$ = 0.00076 $lb_{PM2.5}/ton_{pitch}$

Table 13: Solid Rod Pitch Loading Emissions

Pollutant	Case 1 – Crude Tar Coal Tar/Type A Pitch			Case 2 – Petro Tar Petro Pitch			Case 3 – Decanted Oil Decanted Oil Pitch			Maximum Potential	
	$\%_w$ in pitch	Potential		$\%_w$ in pitch	Potential		$\%_w$ in pitch	Potential			
		lb/hr	tpy		lb/hr	tpy		lb/hr	tpy	lb/hr	tpy
PM		1.316	0.177		1.316	0.177		1.316	0.177	1.316	0.177
PM_{10}		0.622	0.084		0.622	0.084		0.622	0.084	0.622	0.084
$PM_{2.5}$		0.196	0.026		0.196	0.026		0.196	0.026	0.196	0.026
Dibenzofuran	0.13	0.002	0.000	0.00	0.000	0.000	0.00	0.000	0.000	0.002	0.000

Pollutant	Case 1 – Crude Tar Coal Tar/Type A Pitch			Case 2 – Petro Tar Petro Pitch			Case 3 – Decanted Oil Decanted Oil Pitch			Maximum Potential	
	$\%_w$ in pitch	Potential		$\%_w$ in pitch	Potential		$\%_w$ in pitch	Potential			
		lb/hr	tpy		lb/hr	tpy		lb/hr	tpy	lb/hr	tpy
Naphthalene	0.01	0.000	0.000	0.01	0.000	0.000	0.01	0.000	0.000	0.000	0.000
Acenaphthene	0.06	0.001	0.000	0.35	0.005	0.001	0.35	0.005	0.001	0.005	0.001
Anthracene	0.72	0.009	0.001	0.23	0.003	0.000	0.23	0.003	0.000	0.009	0.001
Benzo(a)-anthracene	1.02	0.013	0.002	0.17	0.002	0.000	0.17	0.002	0.000	0.013	0.002
Benzo(b)-fluoranthene	1.90	0.025	0.003	0.02	0.000	0.000	0.02	0.000	0.000	0.025	0.003
Benzo(k)-fluoranthene	0.65	0.009	0.001	0.01	0.000	0.000	0.01	0.000	0.000	0.009	0.001
Benzo(g,h,i)-perylene	1.15	0.015	0.002	0.00	0.000	0.000	0.00	0.000	0.000	0.015	0.002
Benzo(a)pyrene	1.53	0.020	0.003	0.09	0.001	0.000	0.09	0.001	0.000	0.020	0.003
Chrysene	1.15	0.015	0.002	0.26	0.003	0.000	0.26	0.003	0.000	0.015	0.002
Dibenzo(a,h)-anthracene	1.23	0.016	0.002	0.00	0.000	0.000	0.00	0.000	0.000	0.016	0.002
Fluoranthene	1.44	0.019	0.003	0.28	0.004	0.000	0.28	0.004	0.000	0.019	0.003
Fluorene	0.04	0.001	0.000	0.20	0.003	0.000	0.20	0.003	0.000	0.003	0.000
Indeno(1,2,3-cd)-pyrene	0.19	0.002	0.000	0.00	0.000	0.000	0.00	0.000	0.000	0.002	0.000
Phenanthrene	0.21	0.003	0.000	0.50	0.007	0.001	0.50	0.007	0.001	0.007	0.001
Pyrene	1.17	0.015	0.002	0.50	0.007	0.001	0.50	0.007	0.001	0.015	0.002
Total HAP		0.166	0.022		0.034	0.005		0.034	0.005	0.166	0.022
Total POM		0.166	0.022		0.034	0.005		0.034	0.005	0.166	**0.022**

Centrifuge Operation

Emissions from the Centrifuge process are from two phases: dumpster loading and dumpster storage. Calculations of emissions are based on the following:

1. Centrifuge capacity = 60 gal/min = 3,600 gal/hr =31,536,000 gal/yr
2. Percent solids in the tar = 7%
   = 252 gal/hr = 2,207,520 gal/yr
3. Coal tar temperature = 180 °F (640 °R)
4. Dumpster capacity: Length = 4 ft = 121.9 cm
   Width = 3 ft = 91.4 cm
   Depth = 4 ft = 121.9 cm
   Capacity = 48 ft^3 = 359 gallons
5. Turnovers (assuming all solids are centrifuged to the dumpster) = 2,207,520 gal/yr ÷ 359 gal
   = 6,148 turnovers/year
6. Composition of materials in dumpster: 50$\%_v$ solid crude tar
   25$\%_v$ liquid crude tar
   25$\%_v$ air

Dumpster Loading

Calculated emissions from dumpster loading were based on emission factors derived from AP-42 *Section 5.2: Transportation and Marketing of Petroleum Liquids (6/08)*. A 15% adjustment was added to the calculated VOC emissions to account for operational variability from the AP-42 factors (HAP emissions estimates are based on a percentage of the total VOC). The following equation was used:

$$L_L = 12.46 \times SPM \div T$$

Where:

L_L = loading loss, lb/10^3 gallons of liquid loaded
S = saturation factor = 1.45 (from Table 5.2-1)
P = true vapor pressure of liquid loaded, psia = 0.2221 psia
M = molecular weight of vapors, lb/lb·mol = 91.78 lb/lb·mol
T = temperature of bulk liquid loaded, °R = 640 °R

L_L = 0.5753 $lb_{VOC}/10^3$ gal

VOC emissions = 0.5753 $lb_{VOC}/10^3$ gal × (252 ÷ 1,000) 10^3 gal/hr × (1 + 0.15) = **0.167 lb/hr VOC**
= 0.5753 $lb_{VOC}/10^3$ gal × (2,207,520 ÷ 1,000) 10^3 gal/hr × (1 + 0.15) = **0.635 tpy VOC**

Table 14: Centrifuge Loading Emissions

Pollutant	**Dumpster Loading Potential Emissions**		
	$\%_w$ in Vapor	**lb/hr**	**tpy**
Total VOC	100.000	0.167	0.635
Benzene	50.449	0.084	0.320
Biphenyl	0.149	0.000	0.001
m-Cresol	0.257	0.000	0.002
o-Cresol	0.211	0.000	0.001
p-Cresol	0.104	0.000	0.001
Dibenzofuran	0.087	0.000	0.001
Naphthalene	16.902	0.028	0.107
Phenol	0.512	0.001	0.003
Quinoline	0.380	0.001	0.002
Styrene	1.870	0.003	0.012
Toluene	12.694	0.021	0.081
m-Xylene	2.362	0.004	0.015
o-Xylene	1.961	0.003	0.012
p-Xylene	2.444	0.004	0.016
Acenaphthene	0.546	0.001	0.003
Total POM		0.031	0.117
Total HAP		0.152	0.579

Dumpster Storage

Calculated emissions from dumpster storage were based on the procedures contained in "Air Emission Models for Waste and Wastewater", EPA 453/R-94-080A, November 1994, *Chapter 9.3.4, Emission Model for Open Dumpster Storage*. The following additional assumptions were also used:

1. Average temperature assumed to be 77 °F (298 K)and average windspeed assumed to be 10 mph.
2. Diffusivity in air,D_a, was found in EPA's Water 8 program.
3. Initial volatile organic amound was calculated as follows:
   Density of crude tar = 10.08 lb/gal = 1.209 g/cm^3
   Amount of liquid crude tar in dumpster = 359 gallons × (25% ÷ 100) = 89.766 gallons
   = 89.766 gal × 10.08 lb/gal = 904.841 lbs
4. Effective diffusion coefficient, D_e, was calculated using the following equation:

$$D_e = D_a \times (e_a^{3.33} \div e_T^{2})$$

   Where:

e_a = air porosity of fixed waste = 0.25
e_T = total porosity of fixed waste = 0.05

5. Partition coefficient, K_{eq}, was calculated using the following equation:

$$K_{eq} = P \times MW \times e_a \div (R \times T \times L)$$

Where:
- P = vapor pressure of constituent, atm
- L = waste loading = 1.209 g/cm$_3$ × 25% = 0.302 g/cm$_3$
- MW = molecular weight of liquid crude tar = 218 g/g·mol
- e_a = air porosity of fixed waste = 0.25
- R = ideal gas constant = 82.05cm^3·atm/g·mol·K
- T = ambient temperature = 298 K

6. Volatilization constant, k_v, was calculated using the following equation:

$$k_v = K_{eq} \times D_e \div L^2$$

Where:
- K_{eq} = partition coefficient from #11 above
- D_e = effective diffusion coefficient from #10 above
- L = length of dumpster = 121.9 cm

7. $k_v t$ was calculated, assuming t equal to half a year, or 15,768,000 seconds.
8. $k_d t$ was calculated using the following equation:

$$k_d t = k_v t \times \pi^2 \div 4$$

9. Fraction lost to the air, F_a, was calculated using the following equation:

$$F_a = 0.72 \times (k_d t)^{½}$$

10. Maximum dumpster turnovers per year = 6,148.

Table 15: Centrifuge Constants & Calculated Factors

Pollutant	MW	P@77°F	D_a	Tar	Init. VO	D_e	K_{eq}	k_v	$k_v t$	$k_d t$	F_a
	g/g·mol	atm	cm²/s	%w	lbs	cm²/s					
Benzene	78.10	0.12347	0.088	0.30	2.71	0.00348	0.00091	2.13E-10	0.00337	0.00831	0.066
Biphenyl	154.20	0.00003	0.040	0.70	6.33	0.00158	0.00000	2.36E-14	0.00000	0.00000	0.001
m-Cresol	108.10	0.00021	0.074	0.20	1.81	0.00293	0.00000	3.05E-13	0.00000	0.00001	0.002
o-Cresol	108.10	0.00038	0.074	0.10	0.90	0.00293	0.00000	5.52E-13	0.00001	0.00002	0.003
p-Cresol	108.10	0.00014	0.074	0.10	0.90	0.00293	0.00000	2.04E-13	0.00000	0.00001	0.002
Dibenzofuran	168.20	0.00000	0.000	2.20	19.91	0.00000	0.00000	0.00E+00	0.00000	0.00000	0.000
Naphthalene	128.20	0.00034	0.059	11.70	105.87	0.00233	0.00000	3.94E-13	0.00001	0.00002	0.003
Phenol	94.10	0.00044	0.082	0.20	1.81	0.00324	0.00000	7.09E-13	0.00001	0.00003	0.004
Quinoline	129.20	0.00012	0.000	0.60	5.43	0.00000	0.00000	0.00E+00	0.00000	0.00000	0.000
Styrene	104.20	0.00783	0.071	0.10	0.90	0.00281	0.00006	1.09E-11	0.00017	0.00042	0.015
Toluene	92.40	0.03818	0.087	0.20	1.81	0.00344	0.00028	6.53E-11	0.00103	0.00254	0.036
m-Xylene	106.20	0.01067	0.070	0.10	0.90	0.00277	0.00008	1.47E-11	0.00023	0.00057	0.017
o-Xylene	106.20	0.00848	0.087	0.10	0.90	0.00344	0.00006	1.45E-11	0.00023	0.00056	0.017
p-Xylene	106.20	0.01125	0.077	0.10	0.90	0.00305	0.00008	1.70E-11	0.00027	0.00066	0.019
Acenaphthene	154.20	0.00003	0.071	3.00	27.15	0.00281	0.00000	4.18E-14	0.00000	0.00000	0.001

Sample Calculation for Benzene

Emissions = Initial VO × F_a × No. of Turnovers
= 2.71 lb/turnover × 0.066 × 6,148 turnovers/yr ÷ 2,000 lb/ton = **0.548 tpy of benzene**
= 0.125 lb/hr of benzene

Table 16: Centrifuge Dumpster Storage Emissions

Pollutant	Potential Emissions	
	lb/hr	tpy
Total VOC	0.455	**1.995**
Benzene	0.125	**0.548**
Biphenyl	0.003	**0.013**
m-Cresol	0.003	**0.014**
o-Cresol	0.002	**0.009**
p-Cresol	0.001	**0.006**
Dibenzofuran	0.000	**0.000**
Naphthalene	0.209	**0.918**
Phenol	0.005	**0.021**
Quinoline	0.000	**0.000**
Styrene	0.009	**0.041**
Toluene	0.046	**0.202**
m-Xylene	0.011	**0.048**
o-Xylene	0.011	**0.048**
p-Xylene	0.012	**0.052**
Acenaphthene	0.018	**0.077**
Total POM	0.455	**1.995**
Total HAP	0.230	**1.008**

<u>Creosote Blending Process</u>

There are three options for the blending of creosote: P2 creosote, P1/P13 creosote, and a creosote petroleum solution. The maximum emissions represent the maximum for each component from the three options. Emissions were calculated using the following equation:

$$E = V/RT \times \Sigma(P_i)(MW_i)$$

Where:

E = Mass of Emissions — P_i = Partial Pressure
V = Volume of Gas Displaced — MW_i = Molecular Weight
R = Ideal Gas Constant = 10.731 cf psi/lb·mol °R

Thermal oxidizer destruction efficiency: 98%

See Appendix B for the individual emissions estimates for each creosote option. The following table represents the maximum emissions limits:

Table 17: Creosote Blending Emissions

Constituent	Controlled Emissions		Constituent	Controlled Emissions	
	lb/hr	tpy		lb/hr	tpy
Total VOC	1.203	0.350	**Xylenes**	0.016	0.005
Benzene	0.008	0.003	**Acenaphthene**	0.010	0.003
Biphenyl	0.003	0.001	**Acenaphthylene**	0.001	0.000
m-Cresol	0.001	0.000	**Anthracene**	0.000	0.000
o-Cresol	0.005	0.001	**Fluroanthene**	0.001	0.000
p-Cresol	0.001	0.000	**Fluorene**	0.004	0.001
Dibenzofuran	0.002	0.001	**Phenanthrene**	0.001	0.000
Naphthalene	0.087	0.034	**Pyrene**	0.000	0.000
Phenol	0.003	0.001	**Total HAP**	0.116	0.045
Quinoline	0.006	0.002	**Total POM**	0.105	0.041

<u>Liquid Loading Operations (Non-Pitch)</u>

Liquid product is loaded to either barge, truck, or rail car. Barge loading emissions are not controlled. Pumping rates are:

Barge: 1,500 gal/min 90,000 gal/hr
Truck/Railcar: 500 gal/min 30,000 gal/hr

Calculated emissions from liquid loading operations were based on emission factors derived from AP-42 *Section 5.2: Transportation and Marketing of Petroleum Liquids (6/08)*. A 15% adjustment was added to the calculated VOC emissions to account for operational variability from the AP-42 factors (HAP emissions estimates are based on a percentage of the total VOC). The following equation was used:

$$L_L = 12.46 \times SPM \div T$$

Where:

L_L = loading loss, lb/10^3 gallons of liquid loaded
S = saturation factor = 0.50 (barge loading)
= 1.45 (truck/railcar loading)
P = true vapor pressure of liquid loaded, psia
M = molecular weight of vapors, lb/lb·mol
T = temperature of bulk liquid loaded, °R

DFTO destruction efficiency: 98%

Three cases were calculated, 100% Crude Tar, 100% Petro Tar, and 100% Distillate Oil. The constituent $\%_{wt}$ in the vapor, vapor pressure, and estimated loading loss factor for each case can be found in Appendix C. The throughputs and temperatures for each case are below:

Table 18: Liquid Loading Throughputs & Temperatures

Product		Quantity (gal/yr)	Temperature	
			(°F)	(°R)
Feed	Crude Tar	10,000,000	160	620
	Petro Tar	10,000,000	160	620
	Decanted Oil	10,000,000	160	620
	(maximum of the above)			
Feed	Debenzolized Tar	10,000,000	200	660
Overhead	Refined Chemical Oil	16,425,000	190	650
Distillate	Carbon Black Oil	22,995,000	165	625

Product		**Quantity (gal/yr)**	**Temperature**	
			(°F)	**(°R)**
	Petro Distillate	26,280,000	165	625
	Decanted Oil Distillate	26,280,000	165	625
	(maximum of the above)			
Creosotes	P2 Creosote	23,300,000	200	660
	P1/P13 Creosote	23,300,000	200	660
	CPS-P2/NCGO	23,300,000	200	660
	CPS-P2/Petro Distillate	23,300,000	200	660
	(maximum of the above)			
Purchased Correction Oil		7,000,000	200	660
Truck/Railcar Pump Rate		500 gal/min = 30,000 gal/hr		

Sample Calculation of VOC – Case #1, Crude Tar Loading
Basis:
Molecular Weight (M) = 90.42 lb/lb·mol
Vapor Pressure (P) = 0.1477 psia

L_{Lbarge} = 12.46 × 90.42 lb/lb·mol × 0.1477 psia × 0.50 ÷ 620 °R = 0.134 lb/10^3 gal
$L_{Ltruck/rail}$ = 12.46 × 90.42 lb/lb·mol × 0.1477 psia × 1.45 ÷ 620 °R = 0.389 lb/10^3 gal

Barge Emissions: 0.134 lb/10^3 gal × 90,000 gal/hr ÷ 1,000 × (1 + 0.15) = 13.889 lb/hr
0.134 lb/10^3 gal × 10,000,000 gal/yr ÷ 1,000 ÷ 2,000 lb/ton × (1 + 0.15) = 0.772 tpy

Truck/Railcar: 0.389 lb/10^3 gal × 30,000 gal/hr ÷ 1,000 × (1 + 0.15) × (1 - 0.98) = 0.269 lb/hr
0.389 lb/10^3 gal × 10,000,000 gal/yr ÷ 1,000 ÷ 2,000 lb/ton × (1 + 0.15) × (1 – 0.98) =
= 0.045 tpy

Maximum short-term emissions are from barge loading (13.869 lb/hr); maximum long-term emissions are from truck/railcar loading (2.237 tpy).

Sample Calculation of Benzene – Case #1, Crude Tar Barge Loading
Basis:
Vapor %w = 53.6%

Short-term: 13.889 lb/hr × (53.6 ÷ 100) = 7.444 lb/hr of benzene
Long-term: 0.772 tpy × (53.6 ÷ 100) = 0.414 tpy of benzene

Estimated potential-to-emit differs slightly from installation permit IP #0029-I004. This is due to using more updated values for constituent $\%_{wt}$ in the vapor and estimated vapor pressures, as well as a more accurate method of calculating short-term emissions that is more consistent with other loading calculations. Values for the weight percent and vapor pressures of each constituent can be found in Appendix C.1. Estimated emissions for each constituent for each case can be found in Appendix C.2 (for barge loading) and Appendix C.3 (for non-pitch tank and railcar loading).

Table 19: Liquid Loading (Non-Pitch) Emissions

POLLUTANT	Barge Loading		Truck & Railcar Loading	
	Hourly Emissions (lb/hr)	Total Yearly Emissions (tons/yr)*	Hourly Emissions (lb/hr)	Total Yearly Emissions (tons/yr)*
Volatile Organic Compounds (VOCs)	72.000	6.138	1.303	0.301
Hazardous Air Pollutants (HAPs)	54.403	4.813	0.967	0.226
Benzene	9.037	0.556	0.174	0.032
Naphthalene	28.383	2.484	0.532	0.137
Total POM	33.724	3.458	0.571	0.148

Pitch Loading

Calculated emissions from liquid pitch loading operations were based on emission factors derived from AP-42 *Section 5.2: Transportation and Marketing of Petroleum Liquids (6/08)*. A 15% adjustment was added to the calculated VOC emissions to account for operational variability from the AP-42 factors (HAP emissions estimates are based on a percentage of the total VOC). The following equation was used:

$$L_L = 12.46 \times SPM \div T$$

Where:

L_L = loading loss, lb/10^3 gallons of liquid loaded
S = saturation factor = 1.45
P = true vapor pressure of liquid loaded, psia
M = molecular weight of vapors, lb/lb·mol
T = temperature of bulk liquid loaded, °R

DFTO destruction efficiency: 98%

Four types of pitch were evaluated, Coal Tar Pitch, Type A Pitch, Liquid Petroleum Pitch, and Decanted Oil Pitch. The constituent $\%_{wt}$ in the vapor and estimated emissions for each case can be found in Appendix C. The following properties were used as a basis:

Table 20: Pitch Loading Input Data

Pitch Type	Molecular Weight	Vapor Pressure	Saturation Factor	Loading Loss (L_L)	Pump Rate	Annual Throughput	Temp.
	lb/lb·mol	psia		lb/10^3 gal	gal/hr	gal/yr	°F
Coal Tar	180.09	0.0281	1.45	0.103	30,000	42,705,000	425
Type A	172.32	0.0302		0.106			
Liquid Petroleum	158.81	0.0532		0.172			
Decanted Oil	158.81	0.0532		0.172			

Maximum controlled emissions from Pitch Loading are:

Table 21: Pitch Loading Emissions

Pollutant	lb/hr	tpy
Total VOC	0.119	0.085
Total HAP	0.119	0.085
Total POM	0.119	0.085

Process Heaters

All emissions from the process heaters, except for particulate matter were based on factors found in U.S. EPA AP-42 *Section 1.4: Natural Gas Combustion (7/98)*. Particulate matter emissions limits are those specified in Article XXI, §2104.02.d. The 2F-2A TI Heater had no specific limit in Article XXI, so the limit in §2104.02.a.1.A was used. Except where limited by Article XXI, all PM is assumed to be PM_{10}, and all PM_{10} is assumed to be $PM_{2.5}$.

Emissions of NO_X for the 2F-1A Primary, 2F-2A TI, and 2F-1C Secondary Heaters are based on performance graphs from the manufacturer. Readings from the graph were taken from the "On Ratio" line. Based on the manufacturer information, a correction factor of 1.20 was added to the reading for a medium-velocity combustor. A 10% adjustment factor was added to account for operational variability. The NOX ratings used for the 2F-1A Primary, 2F-2A TI, and 2F-1C Secondary Heaters, at 3% oxygen, are 66 ppm, 56 ppm, and 86 ppm, respectively.

The following assumptions were also used as a basis:

Natural gas rating:	1,050 Btu/scf
Hours of operation:	8,760 hours/year
NO_X MW:	45.2 lb/lb·mol (based on 5% NO and 95% NO_2)
F_d-Factor:	8,710 scf_{eg}/MMBtu
Exhaust Density:	385 scf/lb·mol
Hours of operation:	8,760 hours/year

<u>Sample NO_X Emissions (2F-1A Primary Heater):</u>

(66 ppm ÷ 10^6) × 8,710 scf/MMBtu × 16.0 MMBtu/hr ÷ 385 scf/lb·mol × 45.2 lb/lb·mol × [20.9/(20.9 – 3)] =

= **1.261 lb/hr NO_X from 2F-1A**

= 1.261 lb/hr × 8,760 hr/yr ÷ 2,000 lb/ton = **5.522 tpy NO_X from 2F-1A**

Table 22: Process Heater Emissions

Pollutant	Factor (note 1)	2F-1A Primary		2F-2A TI		1F-1C Spare Hot Oil		1F-2C Hot Oil		Prill Hot Oil	
		16.0 MMBtu/hr		8.5 MMBtu/hr		10.08 MMBtu/hr		4.5 MMBtu/hr		4.5 MMBtu/hr	
		lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
PM	0.008	0.128	**0.561**	0.068	**0.298**	0.050	**0.219**	0.010	**0.044**	0.020	**0.088**
PM_{10}	0.008	0.070	**0.307**	0.068	**0.298**	0.050	**0.219**	0.010	**0.044**	0.020	**0.088**
$PM_{2.5}$	0.008	0.070	**0.307**	0.068	**0.298**	0.050	**0.219**	0.010	**0.044**	0.020	**0.088**
NO_X	100	1.261	**5.522**	0.568	**2.489**	0.960	**4.205**	0.429	**1.877**	0.429	**1.877**
SO_X	0.6	0.009	**0.040**	0.005	**0.021**	0.006	**0.025**	0.003	**0.011**	0.003	**0.011**
CO	84	1.280	**5.606**	0.680	**2.978**	0.806	**3.532**	0.360	**1.577**	0.360	**1.577**
VOC	5.5	0.084	**0.367**	0.045	**0.195**	0.053	**0.231**	0.024	**0.103**	0.024	**0.103**

Pollutant	Factor (note 1)	2F-1C Secondary		2F-2B 2T3 Heater		2F-2C 2T4 Heater		2F-1B 2TI Heater		#1 Primary Flash	
		6.2 MMBtu/hr		6.0 MMBtu/hr		6.0 MMBtu/hr		6.0 MMBtu/hr		18.9 MMBtu/hr	
		lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
PM	--	0.050	**0.217**	0.040	**0.175**	0.030	**0.131**	0.020	**0.088**	0.070	**0.307**
PM_{10}	--	0.070	**0.307**	0.040	**0.175**	0.030	**0.131**	0.020	**0.088**	0.070	**0.307**
$PM_{2.5}$	--	0.070	**0.307**	0.040	**0.175**	0.030	**0.131**	0.020	**0.088**	0.070	**0.307**
NO_X	100	0.637	**2.788**	0.571	**2.503**	0.571	**2.503**	0.571	**2.503**	1.800	**7.884**
SO_X	0.6	0.004	**0.016**	0.003	**0.015**	0.003	**0.015**	0.003	**0.015**	0.011	**0.047**
CO	84	0.496	**2.172**	0.480	**2.102**	0.480	**2.102**	0.480	**2.102**	1.512	**60623**
VOC	5.5	0.032	**0.142**	0.031	**0.138**	0.031	**0.138**	0.031	**0.138**	0.099	**0.434**

1. For PM, PM_{10}, & $PM_{2.5}$, emission are from Article XXI, §2104.02.d. For the 2F-2A TI Heater, PM emissions are based on factors from Article XXI, §2104.02.a.1.A, (lb/MMBtu); for all other pollutants, emission factors are from AP-42, Section 1.4, (lb/10^6 scf).

Potential GHG mass and CO_2e Emissions

Calculations of greenhouse gases (GHG) and CO_2-equivalent (CO_2e) emissions are based on the methodology found in 40 CFR Part 98, Subpart C, §98.33(a)(1), and factors found in Table C-1 and Table C-2 of that subpart.

Total rated heat input capacity of the process heaters = 86.68 MMBtu/hr × 8,760 hr/yr = 759,317 MMBtu/yr

Emission Factors: CO_2 = 53.06 kg/MMBtu
N_2O = 1×10^{-4} kg/MMBtu
CH_4 = 1×10^{-3} kg/MMBtu

CO_2: 759,317 MMBtu/yr × 53.06 kg/MMBtu ÷ 1,000 kg/metric ton = 40,289 metric tons/year
NO_2: 759,317 MMBtu/yr × 1×10^{-4} kg/MMBtu ÷ 1,000 kg/metric ton = 0.076 metric tons/year
CH_4: 759,317 MMBtu/yr × 1×10^{-3} kg/MMBtu ÷ 1,000 kg/metric ton = 0.759 metric tons/year

Global Warming Potential (GWP) Factors (from Part 98, Subpart A, Table A-1):
CO_2 = 1
N_2O = 298
CH_4 = 25

CO_2e = (40,289 × 1) + (0.076 × 298) + (0.759 × 25) = 40,331 metric tons/year of CO_2e

Storage Tanks

Emissions from the tanks were estimated using the USEPA Tanks 4.0.9d program for each storage tank. Each tank was then grouped by category. Total throughput emissions used in the Tanks program represent the maximum based on plant production capacity, and not necessarily storage capacity. Tanks classified as "miscellaneous" (D013) do not store any VOC-containing materials.

Emissions from Tanks #34 and #36 were calculated separately under IP #0029-I004, emissions from the Tar Refining Tanks were calculated separately under IP #0029-I005, and emissions from the Tanks #5-#9 were calculated separately under IP #0029-I007. Those calculations are included below.

Table 23: Storage Tank Emissions

Category	Potential Emissions – tons/yr							
	Total VOC	Total HAP	Benzene	Naph-thalene	Xylenes	Acenaph-thene	Total POM	D/F
Crude Tar	0.219	0.201	0.117	0.032	0.014	0.001	0.035	0.000
Petro Tar, Decanted Oil	2.159	1.598	0.114	0.960	0.421	0.066	1.050	0.005
Debenzolized Tar	2.418	1.894	0.144	1.159	0.531	0.003	1.202	0.002
Refined Chemical Oil	0.131	0.085	0.002	0.061	0.008	0.000	0.062	0.000
Carbon Black Oil	0.170	0.161	0.000	0.103	0.000	0.031	0.161	0.003
Distillate	1.038	0.667	0.000	0.526	0.000	0.021	0.613	0.004
Pitch	8.486	8.434	0.000	0.539	0.000	4.022	8.434	0.488
Naphthalene Still Residue	1.219	0.645	0.000	0.322	0.000	0.121	0.645	0.022
Correction Oil	0.949	0.358	0.000	0.059	0.162	0.015	0.132	0.003
Wastewater	0.005	0.005	0.005	0.000	0.000	0.000	0.000	0.000
Light Oil	0.060	0.060	0.052	0.000	0.001	0.000	0.000	0.000

Tanks in the Tar Refining Process consist of the crude tar tank (Tank #7), decanters (V-110 & V-111), and the contaminated water tank (V-113). All four vessels vent to the DFTO. Annual emissions from the tanks were estimated using the USEPA Tanks 4.0.9d program for each tank. Hourly emissions were calculated using the following equation for vessel displacement:

$$E = V/RT \times \Sigma(P_i)(MW_i)$$

Where:

E = Mass of Emissions — P_i = Partial Pressure

V = Volume of Gas Displaced — MW_i = Molecular Weight

R = Ideal Gas Constant = 10.731 cf psi/lb·mol °R

DFTO destruction efficiency: 98%

The following were used as a basis:

Table 24: Tank Input Data

Tank ID	Material	Throughput	Material Temp.	Pump Rate	
		gal/yr	°F	gal/min	gal/hr
#7	crude tar	65,700,000	200	1,500	90,000
V-110	light oil	1,314,000	120	4.1	246
V-111	light oil	1,314,000	120	4.1	246
V-113	wastewater	25,000,000	70	300	18,000

The constituent $\%_{wt}$ in the vapor for each tank can be found in Appendix B. The controlled emissions from the tanks are as follows:

Table 25: Tar Refining Process Tank Emissions

Pollutant	Tank #7		V-110 & V-111 (combined)		V-113	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Total VOC	1.036	0.497	0.044	0.192	0.000	0.000
Total HAP	0.938	0.450	0.044	0.189	0.000	0.000
Benzene	0.491	0.236	0.037	0.160	0.000	0.000
Total POM	0.215	0.103	0.000	0.000	0.000	0.000

Emissions from Tank #34 were estimated using the USEPA Tanks 4.0.9d program and AP-42 *Section 7.1: Organic Liquid Storage Tanks (9/97)*. Refined Chemical Oil (RCO) storage produced the worst-case emissions estimate, so RCO was used for all calculations.

Basis:

Tank Diameter = 48.0 ft
Tank Height = 40.0 ft
Ave. Liquid Height = 20.0 ft
Net Throughput = 16,425,000 gallons/year
Temperature (T_{LA}) = 649.44 °R
Vapor Molecular Weight = 119.53 lb/ lb·mol (at T_{LA})
Vapor Pressure = 0.2501 psia (at T_{LA})

Table 26: Tank #34 Emissions

Pollutant	% Weight in Vapor	Controlled Emissions			
		Standing (lb/yr)	Working (lb/yr)	Total (lb/yr)	Total (tpy)
VOC	100.00	28.03	233.73	261.75	**0.131**
Benzene	1.68	0.47	3.93	4.40	**0.002**
Biphenyl	0.15	0.04	0.34	0.38	**0.000**
m-Cresol	0.22	0.06	0.50	0.57	**0.000**
o-Cresol	0.00	0.00	0.00	0.00	**0.000**
p-Cresol	0.18	0.05	0.41	0.46	**0.000**
Dibenzofuran	0.03	0.01	0.07	0.08	**0.000**
Ethylbenzene	1.41	0.40	3.31	3.70	**0.002**
Naphthalene	46.78	13.11	109.35	122.46	**0.061**
Phenol	0.27	0.08	0.63	0.71	**0.000**
Quinoline	0.37	0.10	0.88	0.98	**0.000**
Styrene	3.90	1.09	9.11	10.21	**0.005**
Toluene	3.22	0.90	7.52	8.43	**0.004**
m-Xylene	2.45	0.69	5.72	6.41	**0.003**
o-Xylene	1.02	0.29	2.38	2.67	**0.001**
p-Xylene	2.53	0.71	5.91	6.62	**0.003**
Acenaphthene	0.22	0.06	0.52	0.59	**0.000**
Acenaphthylene	0.11	0.03	0.26	0.29	**0.000**
Fluorene	0.05	0.01	0.11	0.12	**0.000**
Total HAP		18.11	150.97	169.08	**0.085**
Total POM		13.38	111.53	124.91	**0.062**

Emissions from the loading and storage of refined chemical oil (RCO) in Tank #36 are identical to those in Tank #34. RCO will only be stored in either Tank #34 or Tank #36 at any given time.

Tank #36 will also be used for creosote blending operations. Creosote will be mixed in Tank #36 with a side-mounted mixer rather than the heat exchanger/recirculation pump system currently used by Tanks #3 & #4. There are three options for the blending of creosote: P2 creosote, P1/P13 creosote, and a creosote petroleum solution. The maximum emissions come from the creosote petroleum solution (the sum emissions from P2 creosote, petroleum distillate, and purchased correction oil). See Appendix A for the individual emissions estimates from this creosote option.

Emissions were calculated using the following equation:

$$E = V/RT \times \Sigma(P_i)(MW_i)$$

Where:

E = Mass of Emissions — P_i = Partial Pressure
V = Volume of Gas Displaced — MW_i = Molecular Weight
R = Ideal Gas Constant = 10.731 cf psi/lb·mol °R

Thermal oxidizer destruction efficiency: 98%

Table 27: Tank #36 Emissions

Constituent	Controlled Emissions		Constituent	Controlled Emissions	
	lb/hr	tpy		lb/hr	tpy
Total VOC	1.203	0.350	**Xylenes**	0.016	0.005
Benzene	0.008	0.003	**Acenaphthene**	0.010	0.003
Biphenyl	0.003	0.001	**Acenaphthylene**	0.001	0.000
m-Cresol	0.001	0.000	**Anthracene**	0.000	0.000
o-Cresol	0.005	0.001	**Fluroanthene**	0.001	0.000
p-Cresol	0.001	0.000	**Fluorene**	0.004	0.001
Dibenzofuran	0.002	0.001	**Phenanthrene**	0.001	0.000
Naphthalene	0.087	0.034	**Pyrene**	0.000	0.000
Phenol	0.003	0.001	**Total HAP**	0.116	0.045
Quinoline	0.006	0.002	**Total POM**	0.105	0.041

Emissions from Tanks #5-#9 were based on the methodology found in U.S. EPA AP-42 Section 7.1: *Organic Liquid Storage Tanks (11/06)*. Three different cases were evaluated: Case #1 – 100% Crude Tar; Case #2 – 100% Petro Tar; Case #3 – 100% Decanted Oil. Each tank is capable of handling the entire throughput of each individual material. The following throughputs and temperatures were used:

Table 28: Tanks #5-#9 Throughputs

Material	Max. Throughput	Temperature	Case
Crude Tar	65,700,000 gal/yr	215 °F	1
Debenzolized Tar		215 °F	1
Petro Tar		215 °F	2
Decanted Oil		215 °F	3
Petroleum Distillate	26,280,000 gal/yr	215 °F	2
Decanted Oil Distillate		200 °F	3
Creosote[1]	23,300,000 gal/yr	215 °F	1,2,3
Carbon Black Oil	22,995,000 gal/yr	215 °F	1
Refined Chemical Oil	16,425,000 gal/yr	200 °F	1
Naphthalene Still Residue	7,000,000 gal/yr	215 °F	1,2,3
Purchased Correction Oil	7,000,000 gal/yr	215 °F	1,2,3
Wastewater	25,000,000 gal/yr	200 °F	1,2,3

1. Can be either P2 creosote, P2/needle coker gas oil creosote, or P2/petroleum distillate creosote.

For maximum emissions from each tank, the service (material; case) with the highest emissions for each individual constituent was used.

Table 29: Tanks #5-#9 Individual Tank Limits

Pollutant	Tank Emissions (tpy)
Volatile Organic Compounds (VOC)	0.669
Hazardous Air Pollutants (HAP)[1]	0.602
Benzene	0.302
Biphenyl	0.010
Naphthalene	0.373
Styrene	0.013
Toluene	0.080
Xylenes	0.055
Total POM	0.396

1. 'Total HAP' represents the emissions from the material (in Table 4) that gives off the maximum emissions and not the sum of the maximum emissions from each HAP constituent.

To determine the maximum total emissions from the five tanks, it was not feasible to just multiply the maximum individual emissions by five, as this would result in an artificially high number. Only one type of raw material other than crude tar (e.g. debenzolized tar, petro tar, decanted oil) can be processed at any given time. The same is true for distillates and creosotes. The maximum total emissions was determined by taking the five materials with the highest VOC emissions (which happen to be the same as those with the highest HAP emissions), and assume a worst-case situation where one tank is processing 100% of that material. The five materials with the highest emissions are:

Table 30a: Tanks #5-#9 Total Tank Emissions – VOC & HAP

Pollutant	VOC (tpy)	HAP (tpy)
Crude Tar	0.669	0.602
Debenzolized Tar	0.299	0.237
Refined Chemical Oil	0.188	0.122
Petro Distillate	0.085	0.054
Purchased Correction Oil	0.030	0.019
Total	**1.271**	**1.034**

Table 30b: Tanks #5-#9 Total Tank Emissions – Selected Individual HAPs

Pollutant	Crude Tar (tpy)	Debenz. Tar (tpy)	RCO (tpy)	Petro Dist. (tpy)	Purchased Corr. Oil (tpy)	Total (tpy)
Benzene	0.302	0.012	0.003	--	--	0.317
Biphenyl	0.002	0.001	0.001	0.001	0.001	0.006
Naphthalene	0.137	0.160	0.089	0.041	0.007	0.434
Styrene	0.013	--	0.007	--	--	0.020
Toluene	0.080	--	0.006	--	--	0.086
Xylenes	0.046	0.055	0.011	--	--	0.112
Total POM	0.008	0.008	0.016	0.006	0.006	0.044

Tanks #5- #9 are also permitted to store pavement sealer base (PSB), under an RFD exemption issued on January 23, 2015. The maximum per-tank emissions from PSB are 0.02 tpy of VOC and 0.02 tpy of HAP. It is not possible for all five tanks to process PSB at the same time.

SOURCES OF MINOR SIGNIFICANCE:

Cooling Tower

Emissions from the cooling tower were calculated using emission factors found in U.S. EPA AP-42 *Section 13.4: Wet Cooling Towers (1/95)*. A 15% adjustment was added to the calculated values to account for operational variability from the AP-42 factors. All PM is assumed to be PM_{10}, and all PM_{10} is assumed to be $PM_{2.5}$.

The following assumptions were used as a basis:

Recirculation Rate: 2,700 gal/min
Total Dissolved Solids: 1,500 ppm
Operating Hours: 8,760 hrs/yr
Emission Factor: 1.7 lb/10^3gal (from AP-42, Table 13.4-1 for induced draft)

1.7 lb/10^3gal ÷ 1,000 × 2,700 gal/min × 60 min/hr × (1,500 ppm ÷ 10^6) × (1 + 0.15) = 0.475 lb/hr PM
= **2.081 tpy PM**

Vehicles and Roadways

Vehicle & Equipment Engines

Estimates of emissions from vehicles and equipment were based on factors found in U.S. EPA AP-42 *Section 3.3: Gasoline and Diesel Industrial Engines (10/96)*. A 15% adjustment was added to the calculated values to account for operational variability from the AP-42 factors. All PM is assumed to be PM_{10}, and all PM_{10} is assumed to be $PM_{2.5}$. The following assumptions were used as a basis:

Diesel Usage = 18,000 gal/yr, locomotive (assumes 1,500 gal/month)
3,600 gal/yr, other equipment (assumes 300 gal/month)
21,600 gal/yr total
Heating Value of Diesel: 19,300 Btu/lb
Density of Diesel: 7.05 lb/gal

Gasoline Usage = 3,600 gal/yr (assumes 300 gal/month)
Heating Value of Gasoline: 20,300 Btu/lb
Density of Gasoline: 6.17 lb/gal

Table 31: Vehicle & Equipment Engine Emissions

Pollutant	Gasoline		Diesel		Potential Emissions		
	lb/MMBtu	lb/gal	lb/MMBtu	lb/gal	Gasoline tpy	Diesel tpy	Total tpy
PM	0.100	0.014	0.310	0.049	0.026	0.524	**0.550**
PM_{10}	0.100	0.014	0.310	0.049	0.026	0.524	**0.550**
$PM_{2.5}$	0.100	0.014	0.310	0.049	0.026	0.524	**0.550**
NO_X	1.630	0.235	4.410	0.690	0.423	7.453	**7.875**
SO_X	0.084	0.012	0.290	0.045	0.022	0.490	**0.512**
CO	0.990	0.143	0.950	0.149	0.257	1.605	**1.862**
VOC	2.100	0.302	0.350	0.055	0.544	0.591	**1.136**

<u>Roadways</u>

Estimates of emissions from paved and upaved roads were based on factors found in U.S. EPA AP-42 *Section 13.2.1: Paved Roads (11/06)* and *Section 13.2.2: Unpaved Roads (11/06)*, respectively. A 15% adjustment was added to the calculated values to account for operational variability from the AP-42 factors. The following assumptions were used as a basis:

Total VMT on Paved: 54,000 miles/yr (assumes 75% of total VMT)
Total VMT on Unpaved: 18,000 miles/yr (assumes 25% of total VMT)
Roadway control efficiency: 70% (based on dust control program)

For paved roadways, the following equation was used:

$$E = [k \times (sL/2)^{0.65} \times (W/3)^{1.5} - C] \times (1 - P/4N)$$

Where:
E = emission factor (lb/VMT)
k = particle size multiplier
sL = road surface silt loading
W = mean vehicle weight (tons)
C = emission factor for 1980's vehicle fleet exhaust, brake wear, and tire wear
P = number of days with at least 0.01" of precipitation during the averaging period
N = number of days in averaging period = 365 days

For unpaved roadways, the following equation was used:

$$E = k \times (s/12)^{a} \times (W/3)^{b} \times [(365 - P) \div 365]$$

Where:
E = emission factor (lb/VMT)
s = surface material silt content (%)
W = mean vehicle weight (tons)
P = number of days with at least 0.01" of precipitation
k, a, b = empirical constants

Table 32a: Paved Roadway Emissions

	Estimation Parameters					Emission Factor	Uncontrolled Emissions	Controlled Emissions
	k	sL	W	C	P	lb/VMT	tpy	tpy
PM	0.082	9.7	7.0	0.00047	150	0.731	22.711	**6.813**
PM_{10}	0.016	9.7	7.0	0.00047	150	0.142	4.421	**1.326**
$PM_{2.5}$	0.0024	9.7	7.0	0.00036	150	0.021	0.655	**0.197**

Table 32b: Unpaved Roadway Emissions

	Estimation Parameters						Emission Factor	Uncontrolled Emissions	Controlled Emissions
	k	a	b	s	W	P	lb/VMT	tpy	tpy
PM	4.9	0.7	0.45	6.0	7.0	150	2.601	26.925	**8.077**
PM_{10}	1.5	0.9	0.45	6.0	7.0	150	0.693	7.175	**2.153**
$PM_{2.5}$	0.15	0.9	0.45	6.0	7.0	150	0.069	0.718	**0.215**

Soil Vapor Recovery System

Basis:

- Uncontrolled VOC = 0.24 lb/hr (per IP #95-I-0057-P, issued 10/20/1995)
- Carbon Control = 99%

Controlled emissions = 0.24 lb/hr × (1 – 0.99) = 0.0024 lb/hr × 8,760 hrs/yr ÷ 2,000 lb/ton = **0.011 tpy of VOC**

Equipment Fugitives

Estimates of equipment fugitive emissions from were based on factors found in US EPA document *Protocol for Equipment Leak Emissions Estimates* (November 1995, EPA-453/R-95-017). The leak threshold value was assumed to be the highest value, 10,000 ppm.

Components Above Leak Threshold:	2%
Components Below Leak Threshold:	98% ("default zero")
Screening Value (SV):	10,000 ppm
Hours of Operation:	8,760 hours/year

Table 33: Equipment Leak Rates

		SOCMI Leak Rate			Default Zero Value (Table 2-11)
		(Table 2-9)			
		Leak Rate = (a) × $(SV)^b$ × 2.205 lb/kg			
Equipment Type[1]	Service	a	b	lb/hr	lb/hr
Pump Seals (P)	LL or HL	1.90×10^{-5}	0.824	8.27×10^{-2}	1.65×10^{-5}
Agitator Seals (Ag)	LL or HL	1.90×10^{-5}	0.824	8.27×10^{-2}	1.65×10^{-5}
Compressor Seals (C)	Gas	1.90×10^{-5}	0.824	8.27×10^{-2}	1.65×10^{-5}
Valves (V)	LL or HL	6.41×10^{-6}	0.797	2.18×10^{-2}	1.08×10^{-6}
	Gas	1.87×10^{-6}	0.873	1.28×10^{-2}	1.45×10^{-6}
PRV	Gas	1.90×10^{-5}	0.824	8.27×10^{-2}	1.65×10^{-5}
Flanges (FL)	Gas, LL or HL	3.05×10^{-6}	0.885	2.33×10^{-2}	1.34×10^{-6}

1. Open-ended lines have all been capped, therefore in accordance with EPA-453/R-95-017, this has a control reduction of 100%.

Three cases were calculated, 100% Crude Tar, 100% Petro Tar, and 100% Distillate Oil. Maximum emissions for VOC and for a majority of HAPs was from Case 1 – 100% Crude Tar. See Appendix B for the individual VOC emissions estimates and compositions for each option.

Sample Calculation of VOC – Case #1, Crude Tar, Valves in Heavy Liquid Service

Basis:

No. of Valves = 108 valves

Total Leak Rate = [108 valves × 2%/100 × 2.18×10^{-2} lb/hr/valve] + [108 valves × 98%/100 × 1.08×10^{-6} lb/hr/valve]
= 0.047 lb/hr = **0.207 tpy of VOC**

Table 34: Maximum Equipment Fugitive Emissions

Pollutant	Case 1 100% Crude Tar	Case 2 100% Petro Tar	Case 3 100% Decanted Oil	Maximum (tpy)
VOC	8.920	5.330	5.315	**8.920**
Benzene	0.313	0.000	0.000	**0.313**
Biphenyl	0.039	0.049	0.029	**0.049**
m-Cresol	0.005	0.008	0.000	**0.008**
o-Cresol	0.003	0.008	0.002	**0.008**
p-Cresol	0.004	0.007	0.000	**0.007**
Dibenzofuran	0.116	0.086	0.042	**0.116**
Ethylbenzene	0.005	0.000	0.000	**0.005**
Naphthalene	1.343	0.410	0.200	**1.343**
Phenol	0.011	0.005	0.006	**0.011**
Quinoline	0.039	0.034	0.019	**0.039**
Styrene	0.020	0.000	0.000	**0.020**
Toluene	0.074	0.000	0.000	**0.074**
m-Xylene	0.024	0.000	0.000	**0.024**
o-Xylene	0.021	0.007	0.007	**0.021**
p-Xylene	0.024	0.000	0.000	**0.024**
Acenaphthene	0.213	0.164	0.097	**0.213**
Acenaphthylene	0.050	0.060	0.014	**0.060**
Anthracene	0.165	0.071	0.036	**0.165**
Benzo(a)anthracene	0.094	0.041	0.014	**0.094**
Benzo(b)fluoranthene	0.056	0.005	0.004	**0.056**
Benzo(k)fluoranthene	0.030	0.002	0.001	**0.030**
Benzo(g,h,i)perylene	0.032	0.001	0.001	**0.032**
Benzo(a)pyrene	0.064	0.005	0.005	**0.064**
Chrysene	0.097	0.031	0.018	**0.097**
Dibenzo(a,h)anthracene	0.027	0.000	0.000	**0.027**
Fluoranthene	0.385	0.091	0.132	**0.385**
Fluorene	0.171	0.104	0.062	**0.171**
Indeno(1,2,3-cd)pyrene	0.022	0.001	0.001	**0.022**
Phenanthrene	0.593	0.265	0.150	**0.593**
Pyrene	0.274	0.124	0.124	**0.274**
TOTAL HAPS	4.313	1.578	0.963	**4.313**
TOTAL POM	3.809	1.544	0.948	**3.809**

<u>EMISSIONS SUMMARY:</u>

Table 35: Emissions Summary for Koppers Inc. – Clairton Tar Plant

Pollutant	Total (tpy*)
Particulate Matter	**29.086**
Particulate Matter <10 µm (PM_{10})	**17.509**
Particulate Matter <2.5 µm ($PM_{2.5}$)	**14.442**
Nitrogen Oxides (NO_X)	**44.186**
Sulfur Oxides (SO_X)	**0.742**
Carbon Monoxide (CO)	**35.048**
Volatile Organic Compounds (VOC)	**44.648**
Hazardous Air Pollutants (HAP)	**30.952**
Benzene	**3.713**
Ethylbenzene	**0.051**
Naphthalene	**10.258**
Phenol	**0.137**
Quinoline	**0.300**
Styrene	**0.220**
Toluene	**0.781**
Xylenes	**2.003**
Acenaphthene	**5.637**
Dibenzofuran	**0.876**
Total POM	**24.613**

* A year is defined as any consecutive 12-month period.

<u>RECOMMENDATION</u>:

All applicable Federal, State, and County regulations have been addressed in the permit application and the facility was found to be in compliance. The Title V Operating Permit for the Koppers Inc., Clairton Tar Plant facility should be approved with the emission limitations and terms & conditions in Permit No. 0029.

Appendix A.1: Tar Refining Tank Material Composition

Pollutant	Tank #7	V-110 & V-111	V-113
	% weight in vapor	% weight in vapor	% weight in vapor
Benzene	47.363	83.612	99.236
Biphenyl	0.186	0.000	0.000
m-Cresol	0.306	0.001	0.000
o-Cresol	0.248	0.001	0.000
p-Cresol	0.127	0.001	0.000
Cumene	0.000	0.000	0.000
Dibenzofuran	0.116	0.000	0.000
Ethylbenzene	0.000	0.235	0.000
Naphthalene	19.013	0.143	0.307
Phenol	0.605	0.004	0.458
Quinoline	0.440	0.000	0.000
Styrene	1.919	0.795	0.000
Toluene	12.299	11.949	0.000
m-Xylene	2.395	0.872	0.000
o-Xylene	2.001	0.283	0.000
p-Xylene	2.470	0.911	0.000
Acenaphthene	0.651	0.000	0.000
Acenaphthylene	0.000	0.000	0.000
Anthracene	0.023	0.000	0.000
Benzo(a)anthracene	0.000	0.000	0.000
Benzo(b)fluoranthene	0.000	0.000	0.000
Benzo(k)fluoranthene	0.000	0.000	0.000
Benzo(g,h,i)perylene	0.000	0.000	0.000
Benzo(a)pyrene	0.000	0.000	0.000
Chrysene	0.000	0.000	0.000
Dibenzo(a,h)anthracene	0.000	0.000	0.000
Fluoranthene	0.031	0.000	0.000
Fluorene	0.279	0.000	0.000
Indeno(1,2,3-cd)pyrene	0.000	0.000	0.000
Phenanthrene	0.050	0.000	0.000
Pyrene	0.001	0.000	0.000

Appendix A.2: 2-T-4 Column Emissions

Pollutant	2-T-4 Column								
	Case 1 – CBO			Case 2 – Petroleum Distillate			Case 3 – Decanted Oil Distillate		
	% in Vapor	lb/hr	tpy	% in Vapor	lb/hr	tpy	% in Vapor	lb/hr	tpy
Total VOC		**0.008**	**0.033**		**0.050**	**0.217**		**0.018**	**0.079**
Biphenyl	0.736	0.000	0.000	1.580	0.001	0.003	1.811	0.000	0.001
m-Cresol	0.000	0.000	0.000	1.843	0.001	0.004	0.000	0.000	0.000
o-Cresol	0.000	0.000	0.000	1.960	0.001	0.004	0.000	0.000	0.000
p-Cresol	0.000	0.000	0.000	1.576	0.001	0.003	0.000	0.000	0.000
Dibenzofuran	2.498	0.000	0.001	0.599	0.000	0.001	0.209	0.000	0.000
Naphthalene	54.083	0.004	0.018	47.890	0.024	0.104	3.776	0.001	0.003
Phenol	0.000	0.000	0.000	0.481	0.000	0.001	1.104	0.000	0.001
Quinoline	1.114	0.000	0.000	2.079	0.001	0.005	0.457	0.000	0.000
Acenaphthene	19.303	0.001	0.006	2.291	0.001	0.005	0.319	0.000	0.000
Acenaphthylene	0.000	0.000	0.000	2.238	0.001	0.005	0.879	0.000	0.001
Anthracene	0.841	0.000	0.000	0.042	0.000	0.000	0.020	0.000	0.000
Benzo(a)anthracene	0.006	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
Benzo(b)fluoranthene	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(k)fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(g,h,i)perylene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(a)pyrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Chrysene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dibenzo(a,h)-anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fluoranthene	2.916	0.000	0.001	0.041	0.000	0.000	0.345	0.000	0.000
Fluorene	8.390	0.001	0.003	0.664	0.000	0.001	0.190	0.000	0.000
Indeno(1,2,3-cd)-pyrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Phenanthrene	4.168	0.000	0.001	0.173	0.000	0.000	0.085	0.000	0.000
Pyrene	0.102	0.000	0.000	0.005	0.000	0.000	0.016	0.000	0.000
Total HAP		**0.007**	**0.031**		**0.031**	**0.138**		**0.002**	**0.007**
Total POM		0.007	0.031		0.029	0.125		0.001	0.006

Appendix A.2: 2-D-5 Column Emissions

Pollutant	2-D-5 Column								
	Case 1 – Coal Tar Pitch			Case 2 – Petro Pitch			Case 3 – Decanted Oil Pitch		
	% in Vapor	lb/hr	tpy	% in Vapor	lb/hr	tpy	% in Vapor	lb/hr	tpy
Total VOC		**0.118**	**0.517**		**0.733**	**3.211**		**0.303**	**1.328**
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biphenyl	0.930	0.001	0.005	2.308	0.017	0.074	2.172	0.007	0.029
m-Cresol	0.000	0.000	0.000	2.142	0.016	0.069	0.000	0.000	0.000
o-Cresol	0.000	0.000	0.000	2.131	0.016	0.068	0.000	0.000	0.000
p-Cresol	0.000	0.000	0.000	2.078	0.015	0.067	0.000	0.000	0.000
Dibenzofuran	4.234	0.005	0.022	1.173	0.009	0.038	0.336	0.001	0.004
Naphthalene	41.474	0.049	0.214	42.453	0.311	1.363	2.748	0.008	0.036
Phenol	0.000	0.000	0.000	0.541	0.004	0.017	1.019	0.003	0.014
Quinoline	0.979	0.001	0.005	2.112	0.015	0.068	0.381	0.001	0.005
Acenaphthene	19.488	0.023	0.101	2.673	0.020	0.086	0.306	0.001	0.004
Acenaphthylene	0.000	0.000	0.000	2.611	0.019	0.084	0.842	0.003	0.011
Anthracene	1.823	0.002	0.009	0.104	0.001	0.003	0.041	0.000	0.001
Benzo(a)anthracene	0.032	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000
Benzo(b)fluoranthene	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(k)fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(g,h,i)perylene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(a)pyrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Chrysene	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dibenzo(a,h)-anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fluoranthene	4.533	0.005	0.023	0.073	0.001	0.002	0.508	0.002	0.007
Fluorene	9.802	0.012	0.051	0.897	0.007	0.029	0.211	0.001	0.003
Indeno(1,2,3-cd)-pyrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Phenanthrene	9.542	0.011	0.049	0.459	0.003	0.015	0.184	0.001	0.002
Pyrene	0.395	0.000	0.002	0.021	0.000	0.001	0.060	0.000	0.001
Total HAP		**0.110**	**0.482**		**0.453**	**1.984**		**0.027**	**0.117**
Total POM		0.110	0.482		0.402	1.762		0.024	0.103

Appendix B: Creosote Blending Emissions

	Option 1					Option 2				
	P2 Creosote					P1/P13 Creosote				
	Quantity:		23,300,000		gal/yr	Quantity:		23,300,000		gal/yr
			3,114,765		cf/yr			3,114,765		cf/yr
			4,010		cf/hr			4,010		cf/hr
	Temperature:		685		°R	Temperature:		715		°R
	MWi	Pi	(Pi)(MWi)	E	E	MWi	Pi	(Pi)(MWi)	E	E
Constituent	lb/mol	psia	psia-lb/mol	lbs/hr	tons/yr	lb/mol	psia	psia-lb/mol	lbs/hr	tons/yr
VOC	131.79	7.74E-02	10.2038	0.111	0.043	124.77	8.47E-02	10.5701	0.110	0.043
Benzene	78.10	0.0000	0.0000	0.000	0.000	78.10	0.0096	0.7505	0.008	0.003
Biphenyl	154.20	0.0010	0.1518	0.002	0.001	154.20	0.0011	0.1765	0.002	0.001
m-Cresol	108.10	0.0000	0.0000	0.000	0.000	108.10	0.0009	0.0961	0.001	0.000
o-Cresol	108.10	0.0000	0.0000	0.000	0.000	108.10	0.0000	0.0000	0.000	0.000
p-Cresol	108.10	0.0000	0.0000	0.000	0.000	108.10	0.0008	0.0822	0.001	0.000
Dibenzofuran	168.20	0.0007	0.1150	0.001	0.000	168.20	0.0007	0.1244	0.001	0.001
Naphthalene	128.20	0.0436	5.5951	0.061	0.024	128.20	0.0620	7.9487	0.083	0.032
Phenol	94.10	0.0012	0.1133	0.001	0.000	94.10	0.0006	0.0565	0.001	0.000
Quinoline	129.20	0.0021	0.2757	0.003	0.001	129.20	0.0028	0.3608	0.004	0.001
o-Xylene	106.20	0.0000	0.0000	0.000	0.000	106.20	0.0000	0.0000	0.000	0.000
Acenaphthene	154.20	0.0048	0.7473	0.008	0.003	154.20	0.0053	0.8174	0.009	0.003
Acenaphthylene	152.20	0.0001	0.0164	0.000	0.000	152.20	0.0002	0.0232	0.000	0.000
Anthracene	178.20	0.0001	0.0144	0.000	0.000	178.20	0.0001	0.0174	0.000	0.000
Fluoranthene	202.30	0.0002	0.0413	0.000	0.000	202.30	0.0002	0.0416	0.000	0.000
Fluorene	166.20	0.0017	0.2792	0.003	0.001	166.20	0.0000	0.0000	0.000	0.000
Phenanthrene	178.20	0.0004	0.0703	0.001	0.000	178.20	0.0004	0.0730	0.001	0.000
Pyrene	202.30	0.0000	0.0021	0.000	0.000	202.30	0.0000	0.0015	0.000	0.000
Total HAP				0.081	0.031				0.110	0.043
Total POM				0.080	0.031				0.100	0.039

Appendix B: Creosote Blending Emissions (cont'd.)

	Option 3														
	P2 Creosote					Petroleum Distillate					Purchased Correction Oil				
	Quantity:		17,475,000		gal/yr	Quantity:		5,825,000		gal/yr	Quantity:		5,825,000		gal/yr
			2,336,074		cf/yr			778,691		cf/yr			778,691		cf/yr
			4,010		cf/hr			4,010		cf/hr			4,010		cf/hr
	Temperature:		685		°R	Temperature:		685		°R	Temperature:		685		°R
	MWi	Pi	(Pi)(MWi)	E	E	MWi	Pi	(Pi)(MWi)	E	E	MWi	Pi	(Pi)(MWi)	E	E
Constituent	lb/mol	psia	psia-lb/mol	lbs/hr	tons/yr	lb/mol	psia	psia-lb/mol	lbs/hr	tons/yr	lb/mol	psia	psia-lb/mol	lbs/hr	tons/yr
VOC	131.79	0.0774	10.2038	0.111	0.032	315.85	0.3170	100.0000	1.091	0.318	121.77	0.0696	8.4761	0.092	0.027
Benzene	78.10	0.0000	0.0000	0.000	0.000	78.10	0.0000	0.0000	0.000	0.000	78.10	0.0000	0.0000	0.000	0.000
Biphenyl	154.20	0.0010	0.1518	0.002	0.000	154.20	0.0006	0.0970	0.001	0.000	154.20	0.0006	0.0970	0.001	0.000
m-Cresol	108.10	0.0000	0.0000	0.000	0.000	108.10	0.0000	0.0000	0.000	0.000	108.10	0.0000	0.0000	0.000	0.000
o-Cresol	108.10	0.0000	0.0000	0.000	0.000	108.10	0.0039	0.4213	0.005	0.001	108.10	0.0039	0.4213	0.005	0.001
p-Cresol	108.10	0.0000	0.0000	0.000	0.000	108.10	0.0000	0.0000	0.000	0.000	108.10	0.0000	0.0000	0.000	0.000
Dibenzofuran	168.20	0.0007	0.1150	0.001	0.000	168.20	0.0001	0.0232	0.000	0.000	168.20	0.0001	0.0232	0.000	0.000
Naphthalene	128.20	0.0436	5.5951	0.061	0.018	128.20	0.0041	0.5246	0.006	0.002	128.20	0.0041	0.5246	0.006	0.002
Phenol	94.10	0.0012	0.1133	0.001	0.000	94.10	0.0016	0.1553	0.002	0.000	94.10	0.0016	0.1553	0.002	0.000
Quinoline	129.20	0.0021	0.2757	0.003	0.001	129.20	0.0018	0.2326	0.003	0.001	129.20	0.0018	0.2326	0.003	0.001
o-Xylene	106.20	0.0000	0.0000	0.000	0.000	106.20	0.0136	1.4417	0.016	0.005	106.20	0.0136	1.4417	0.016	0.005
Acenaphthene	154.20	0.0048	0.7473	0.008	0.002	154.20	0.0008	0.1311	0.001	0.000	154.20	0.0008	0.1311	0.001	0.000
Acenaphthylene	152.20	0.0001	0.0164	0.000	0.000	152.20	0.0004	0.0562	0.001	0.000	152.20	0.0004	0.0562	0.001	0.000
Anthracene	178.20	0.0001	0.0144	0.000	0.000	178.20	0.0000	0.0045	0.000	0.000	178.20	0.0000	0.0045	0.000	0.000
Fluoranthene	202.30	0.0002	0.0413	0.000	0.000	202.30	0.0000	0.0077	0.000	0.000	202.30	0.0000	0.0077	0.000	0.000
Fluorene	166.20	0.0017	0.2792	0.003	0.001	166.20	0.0004	0.0625	0.001	0.000	166.20	0.0004	0.0625	0.001	0.000
Phenanthrene	178.20	0.0004	0.0703	0.001	0.000	178.20	0.0002	0.0369	0.000	0.000	178.20	0.0002	0.0369	0.000	0.000
Pyrene	202.30	0.0000	0.0021	0.000	0.000	202.30	0.0000	0.0012	0.000	0.000	202.30	0.0000	0.0012	0.000	0.000
Total HAP				0.081	0.024				0.035	0.010				0.035	0.010
Total POM				0.080	0.023				0.013	0.004				0.013	0.004

The maximum total for Option #3 is the emissions from P2 Creosote plus either the emissions from Petroleum Distillate or from the Purchased Correction Oil, whichever is greater.

Appendix C.1: Liquid Loading Material Composition

Material Type	Molecular Weight	Vapor Pressure	Loading Loss (L_L) – Barge	Loading Loss (L_L) – Railcar
	lb/lb·mol	psia	lb/10^3 gal	lb/10^3 gal
Crude Tar	90.42	0.1477	0.134	0.389
Debenzolized Tar	118.11	0.1098	0.13	0.355
Refined Chemical Oil	119.54	0.2535	0.29	0.842
Carbon Black Oil	138.48	0.0032	0.004	0.013
Coal Tar Pitch	180.09	0.0281	0.036	0.103
Type A Pitch	172.32	0.0302	0.037	0.106
P2 Creosote	131.21	0.0417	0.052	0.150
P1/P13 Creosote	123.24	0.0468	0.054	0.158
CPS-P2/NCGO	131.55	0.0365	0.045	0.131
CPS-P2/Petro Distillate	131.77	0.0442	0.055	0.159
Petro Correction Oil (NCGO)	121.02	0.0391	0.045	0.130
Petro Tar	142.11	0.0037	0.005	0.015
Petro Distillate	129.83	0.0240	0.031	0.090
Liquid Petroleum Pitch	158.81	0.0532	0.059	0.172
Decanted Oil	190.00	0.0043	0.008	0.024
Decanted Oil Distillate	177.42	0.0056	0.010	0.029
Decanted Oil Pitch	158.81	0.0532	0.059	0.172

Appendix C.1: Liquid Loading Material Composition (cont'd.)
Percent (%) Weight in Vapor

	Crude Tar	Debenzolized Tar	Refined Chemical Oil	Carbon Black Oil	Coal Tar Pitch	Type A Pitch	P2 Creosote	P1/P13 Creosote	CPS-P2/NCGO	CPS-P2/Petro Distillate	Petro Correction Oil (NCGO)	Petro Tar	Petro Distillate	Liquid Petroleum Pitch	Decanted Oil Distillate	Decanted Oil Pitch
Benzene	53.6	4.4	1.7	0.0	0.0	0.0	0.0	8.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Biphenyl	0.1	0.1	0.1	0.6	0.0	0.0	1.3	1.5	1.4	1.4	1.0	6.1	1.2	0.0	1.6	0.0
m-Cresol	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	1.6	0.0	0.0	0.0
o-Cresol	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.6	0.0	1.8	0.0	0.0	0.0
p-Cresol	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0
Dibenzofuran	0.1	0.1	0.0	1.7	18.5	18.2	0.9	1.0	0.9	0.9	0.2	1.1	0.4	0.0	0.2	0.0
Ethylbenzene	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Naphthalene	14.8	52.2	46.8	60.7	0.0	11.2	55.7	75.0	53.8	56.4	6.0	26.5	50.7	7.4	4.6	7.4
Phenol	0.4	0.8	0.3	0.0	0.0	0.0	1.1	0.5	1.2	0.9	1.7	0.0	0.4	0.0	1.2	0.0
Quinoline	0.3	0.3	0.4	1.1	0.0	0.0	2.7	3.3	2.9	2.6	2.6	2.5	2.0	0.0	0.5	0.0
Styrene	1.8	0.0	3.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Toluene	13.0	0.0	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
m-Xylene	2.3	6.7	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
o-Xylene	1.9	5.6	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.6	0.0	0.0	0.0	0.0	0.0
p-Xylene	2.4	6.9	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Acenaphthene	0.4	0.1	0.2	18.3	14.6	11.9	7.0	7.2	6.8	5.8	1.4	13.9	2.0	55.3	0.3	55.3
Acenaphthylene	0.0	1.0	0.1	0.0	0.0	0.0	0.2	0.2	0.2	0.8	0.6	5.3	2.0	0.0	0.9	0.0
Anthracene	0.0	0.0	0.0	0.5	18.2	15.4	0.1	0.1	0.1	0.1	0.0	0.2	0.0	3.8	0.0	3.8
Benzo(a)anthracene	0.0	0.0	0.0	0.0	1.4	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
Benzo(b)fluoranthene	0.0	0.0	0.0	0.0	1.2	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Benzo(k)fluoranthene	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Benzo(g,h,i)perylene	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Benzo(a)pyrene	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chrysene	0.0	0.0	0.0	0.0	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fluoranthene	0.0	0.1	0.0	2.1	27.1	24.4	0.3	0.3	0.3	0.3	0.1	0.2	0.0	3.4	0.3	3.4
Fluorene	0.2	0.4	0.0	7.2	5.7	5.6	2.5	0.0	2.5	2.0	0.6	5.2	0.5	18.7	0.2	18.7
Indeno(1,2,3-cd)pyrene	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Phenanthrene	0.0	0.1	0.0	2.4	6.4	4.8	0.5	0.5	0.6	0.4	0.3	0.7	0.1	9.9	0.1	9.9

Appendix C.2: Liquid Loading Emissions – Barge

	Case #1 – 100% Crude Tar		Case #1 – 100% Petro Tar		Case #3 – 100% Decanted Oil		Maximum	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Total VOC	72.000	6.138	20.230	2.876	18.343	2.574	**72.000**	**6.138**
Benzene	9.037	0.556	0.493	0.064	0.493	0.064	**9.037**	**0.556**
Biphenyl	0.212	0.019	0.201	0.020	0.145	0.015	**0.212**	**0.020**
m-Cresol	0.142	0.014	0.101	0.014	0.048	0.006	**0.142**	**0.014**
o-Cresol	0.237	0.010	0.272	0.017	0.213	0.008	**0.272**	**0.017**
p-Cresol	0.104	0.011	0.082	0.011	0.040	0.005	**0.104**	**0.011**
Dibenzofuran	0.798	0.175	0.083	0.010	0.066	0.008	**0.798**	**0.175**
Ethylbenzene	0.424	0.039	0.000	0.000	0.000	0.000	**0.424**	**0.039**
Naphthalene	28.383	2.484	6.736	0.912	5.010	0.673	**28.383**	**2.484**
Phenol	0.390	0.027	0.149	0.012	0.147	0.012	**0.390**	**0.027**
Quinoline	0.512	0.045	0.384	0.039	0.310	0.029	**0.512**	**0.045**
Styrene	1.421	0.121	0.000	0.000	0.000	0.000	**1.421**	**0.121**
Toluene	2.776	0.189	0.000	0.000	0.000	0.000	**2.776**	**0.189**
m-Xylene	1.962	0.135	0.000	0.000	0.000	0.000	**1.962**	**0.135**
o-Xylene	2.185	0.118	0.858	0.033	0.858	0.033	**2.185**	**0.118**
p-Xylene	2.027	0.140	0.000	0.000	0.000	0.000	**2.027**	**0.140**
Acenaphthene	1.239	0.204	4.017	0.877	3.879	0.863	**4.017**	**0.877**
Acenaphthylene	0.245	0.018	0.166	0.018	0.082	0.008	**0.245**	**0.018**
Anthracene	0.688	0.161	0.244	0.057	0.242	0.056	**0.688**	**0.161**
Benzo(a)anthracene	0.051	0.012	0.009	0.002	0.009	0.002	**0.051**	**0.012**
Benzo(b)fluoranthene	0.046	0.011	0.001	0.000	0.001	0.000	**0.046**	**0.011**
Benzo(k)fluoranthene	0.002	0.000	0.000	0.000	0.000	0.000	**0.002**	**0.000**
Benzo(g,h,i)perylene	0.001	0.000	0.000	0.000	0.000	0.000	**0.001**	**0.000**
Benzo(a)pyrene	0.006	0.001	0.000	0.000	0.000	0.000	**0.006**	**0.001**
Chrysene	0.010	0.002	0.002	0.001	0.002	0.001	**0.010**	**0.002**
Dibenzo(a,h)anthracene	0.001	0.000	0.000	0.000	0.000	0.000	**0.001**	**0.000**
Fluoranthene	1.042	0.241	0.235	0.053	0.236	0.053	**1.042**	**0.241**
Fluorene	0.499	0.079	1.358	0.295	1.314	0.291	**1.358**	**0.295**
Phenanthrene	0.308	0.063	0.664	0.150	0.657	0.150	**0.664**	**0.150**
Pyrene	0.166	0.039	0.078	0.018	0.077	0.018	**0.166**	**0.039**
Total POM	33.724	3.458	14.010	2.429	11.864	2.146	**33.724**	**3.458**
Total HAP	54.403	4.813	15.935	2.577	13.633	2.272	**54.403**	**4.813**

Appendix C.3: Liquid Loading Emissions – Truck/Railcar

	Case #1 – 100% Crude Tar		Case #1 – 100% Petro Tar		Case #3 – 100% Decanted Oil		Maximum	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Total VOC	1.303	0.301	0.272	0.082	0.236	0.065	**1.303**	**0.301**
Benzene	0.174	0.032	0.010	0.004	0.010	0.004	**0.174**	**0.032**
Biphenyl	0.004	0.001	0.004	0.001	0.003	0.001	**0.004**	**0.001**
m-Cresol	0.003	0.001	0.002	0.001	0.001	0.000	**0.003**	**0.001**
o-Cresol	0.005	0.001	0.005	0.001	0.004	0.000	**0.005**	**0.001**
p-Cresol	0.002	0.001	0.002	0.001	0.001	0.000	**0.002**	**0.001**
Dibenzofuran	0.002	0.001	0.002	0.001	0.001	0.000	**0.002**	**0.001**
Ethylbenzene	0.008	0.002	0.000	0.000	0.000	0.000	**0.008**	**0.002**
Naphthalene	0.532	0.137	0.121	0.047	0.088	0.033	**0.532**	**0.137**
Phenol	0.007	0.002	0.003	0.001	0.003	0.001	**0.007**	**0.002**
Quinoline	0.010	0.003	0.007	0.002	0.006	0.002	**0.010**	**0.003**
Styrene	0.027	0.007	0.000	0.000	0.000	0.000	**0.027**	**0.007**
Toluene	0.054	0.011	0.000	0.000	0.000	0.000	**0.054**	**0.011**
m-Xylene	0.037	0.008	0.000	0.000	0.000	0.000	**0.037**	**0.008**
o-Xylene	0.041	0.007	0.017	0.002	0.017	0.002	**0.041**	**0.007**
p-Xylene	0.038	0.008	0.000	0.000	0.000	0.000	**0.038**	**0.008**
Acenaphthene	0.014	0.004	0.012	0.004	0.009	0.003	**0.014**	**0.004**
Acenaphthylene	0.005	0.001	0.003	0.001	0.002	0.000	**0.005**	**0.001**
Anthracene	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	**0.000**
Benzo(a)anthracene	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	**0.000**
Benzo(b)fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	**0.000**
Benzo(k)fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	**0.000**
Benzo(g,h,i)perylene	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	**0.000**
Benzo(a)pyrene	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	**0.000**
Chrysene	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	**0.000**
Dibenzo(a,h)anthracene	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	**0.000**
Fluoranthene	0.001	0.000	0.000	0.000	0.000	0.000	**0.001**	**0.000**
Fluorene	0.005	0.002	0.004	0.001	0.003	0.001	**0.005**	**0.002**
Phenanthrene	0.001	0.000	0.001	0.000	0.001	0.000	**0.001**	**0.000**
Pyrene	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	**0.000**
Total POM	0.571	0.148	0.152	0.056	0.110	0.040	**0.571**	**0.148**
Total HAP	0.967	0.226	0.189	0.065	0.145	0.047	**0.967**	**0.226**

Appendix C.4: Liquid Loading Emissions – Pitch

Pollutant	Coal Tar Pitch			Type A Pitch			Liquid Petroleum Pitch or Decanted Oil Pitch		
	$\%_{wt}$	lb/hr	tpy	$\%_{wt}$	lb/hr	tpy	$\%_{wt}$	lb/hr	tpy
Total VOC		0.071	0.051		0.073	0.052		0.119	0.085
Benzene	0.0	0.000	0.000	0.0	0.000	0.000	0.0	0.000	0.000
Biphenyl	0.0	0.000	0.000	0.0	0.000	0.000	0.0	0.000	0.000
m-Cresol	0.0	0.000	0.000	0.0	0.000	0.000	0.0	0.000	0.000
o-Cresol	0.0	0.000	0.000	0.0	0.000	0.000	0.0	0.000	0.000
p-Cresol	0.0	0.000	0.000	0.0	0.000	0.000	0.0	0.000	0.000
Cumene	0.0	0.000	0.000	0.0	0.000	0.000	0.0	0.000	0.000
Dibenzofuran	18.5	0.013	0.009	18.2	0.013	0.010	0.0	0.000	0.000
Ethylbenzene	0.0	0.000	0.000	0.0	0.000	0.000	0.0	0.000	0.000
Naphthalene	0.0	0.000	0.000	11.2	0.008	0.006	7.4	0.009	0.006
Phenol	0.0	0.000	0.000	0.0	0.000	0.000	0.0	0.000	0.000
Quinoline	0.0	0.000	0.000	0.0	0.000	0.000	0.0	0.000	0.000
Styrene	0.0	0.000	0.000	0.0	0.000	0.000	0.0	0.000	0.000
Toluene	0.0	0.000	0.000	0.0	0.000	0.000	0.0	0.000	0.000
m-Xylene	0.0	0.000	0.000	0.0	0.000	0.000	0.0	0.000	0.000
o-Xylene	0.0	0.000	0.000	0.0	0.000	0.000	0.0	0.000	0.000
p-Xylene	0.0	0.000	0.000	0.0	0.000	0.000	0.0	0.000	0.000
Acenaphthene	14.6	0.010	0.007	11.9	0.009	0.006	55.3	0.066	0.047
Acenaphthylene	0.0	0.000	0.000	0.0	0.000	0.000	0.0	0.000	0.000
Anthracene	18.2	0.013	0.009	15.4	0.011	0.008	3.8	0.005	0.003
Benzo(a)anthracene	1.4	0.001	0.001	1.2	0.001	0.001	0.1	0.000	0.000
Benzo(b)fluoranthene	1.2	0.001	0.001	1.1	0.001	0.001	0.0	0.000	0.000
Benzo(k)fluoranthene	0.0	0.000	0.000	0.0	0.000	0.000	0.0	0.000	0.000
Benzo(g,h,i)perylene	0.0	0.000	0.000	0.0	0.000	0.000	0.0	0.000	0.000
Benzo(a)pyrene	0.2	0.000	0.000	0.1	0.000	0.000	0.0	0.000	0.000
Chrysene	0.3	0.000	0.000	0.2	0.000	0.000	0.0	0.000	0.000
Dibenzo(a,h)anthracene	0.0	0.000	0.000	0.0	0.000	0.000	0.0	0.000	0.000
Fluoranthene	27.1	0.019	0.014	24.4	0.018	0.013	3.4	0.004	0.003
Fluorene	5.7	0.004	0.003	5.6	0.004	0.003	18.7	0.022	0.016
Indeno(1,2,3-cd)pyrene	0.0	0.000	0.000	0.0	0.000	0.000	0.0	0.000	0.000
Phenanthrene	6.4	0.005	0.003	4.8	0.004	0.003	9.9	0.012	0.008
Pyrene	4.5	0.003	0.002	4.2	0.003	0.002	1.2	0.001	0.001
Total HAP		0.070	0.050		0.072	0.051		0.119	0.085
Total POM		0.070	0.050		0.072	0.051		0.119	0.085

Appendix D.1: Equipment Leak Emissions – Option #1

Option #1 – 100% Crude Tar, VOC Emissions

		No. of Equipment Type						VOC Potential Emissions (tpy)						
Commodity	**Srvc.**	**P**	**Ag**	**C**	**V**	**PRV**	**FL**	**P**	**Ag**	**C**	**V**	**PRV**	**FL**	**TOTAL**
NON-REGULATED EQUIPMENT														
Crude Tar	HL	8	0	0	108	0	208	0.059	0.000	0.000	0.206	0.000	0.426	**0.691**
	G	0	0	0	5	0	11	0.000	0.000	0.000	0.006	0.000	0.023	**0.028**
Deben Tar	HL	6	0	0	271	0	658	0.044	0.000	0.000	0.518	0.000	1.346	**1.908**
	G	0	0	0	8	0	35	0.000	0.000	0.000	0.009	0.000	0.072	**0.081**
RCO	HL	4	0	0	147	0	357	0.029	0.000	0.000	0.281	0.000	0.731	**1.041**
	G	0	0	0	11	1	33	0.000	0.000	0.000	0.012	0.007	0.068	**0.087**
CBO	HL	5	0	0	248	1	554	0.037	0.000	0.000	0.474	0.000	1.134	**1.644**
	G	0	0	0	13	0	71	0.000	0.000	0.000	0.015	0.000	0.145	**0.160**
Coal Tar or Type A Pitch	HL	14	0	0	323	1	434	0.102	0.000	0.000	0.617	0.007	0.888	**1.615**
	G	0	0	0	0	0	11	0.000	0.000	0.000	0.000	0.000	0.023	**0.023**
NSR	HL	1	0	0	28	0	44	0.007	0.000	0.000	0.054	0.000	0.090	**0.151**
	G	0	0	0	4	0	9	0.000	0.000	0.000	0.005	0.000	0.018	**0.023**
Creosote	HL	2	0	0	53	0	83	0.015	0.000	0.000	0.101	0.000	0.170	**0.286**
	G	0	0	0	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**
Correction Oil	HL	1	0	0	22	0	35	0.007	0.000	0.000	0.042	0.000	0.072	**0.121**
	G	0	0	0	2	1	11	0.000	0.000	0.000	0.002	0.007	0.023	**0.032**
Sub-Total		41	0	0	1,243	4	2,554							**7.890**
REGULATED EQUIPMENT - SUBPART L AND PAI														
Light Oil	LL	1	0	0	39	1	68	0.007	0.000	0.000	0.075	0.007	0.139	**0.228**
	G	0	0	3	41	4	72	0.000	0.000	0.022	0.046	0.029	0.147	**0.245**
Crude Tar	HL	0	0	0	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**
	G	0	0	0	1	0	3	0.000	0.000	0.000	0.001	0.000	0.006	**0.007**
Creosote	HL	1	1	0	51	0	98	0.007	0.007	0.000	0.097	0.000	0.201	**0.313**
	G	0	0	1	20	7	76	0.000	0.000	0.007	0.023	0.051	0.156	**0.237**
Sub-Total	LL	2	1	4	152	12	317							**1.030**
TOTAL		43	1	4	1,395	16	2,871							**8.920**

Appendix D.1: Equipment Leak Emissions – Option #1 (cont'd.)

Option #1 – 100% Crude Tar, Composition

	Liquid Composition (as a % of total VOC_L)									Gas Composition (as a % of total VOC_G)								
	Crude Tar	Light Oil	Deben Tar	RCO	CBO	Pitch	NSR	Creo-sote	Corr. Oil	Crude Tar	Light Oil	Deben Tar	RCO	CBO	Pitch	NSR	Creo-sote	Corr. Oil
Benzene	0.30	36.29	0.01	0.02	0.00	0.00	0.00	0.00	0.00	47.36	83.61	5.91	1.67	0.00	0.00	0.00	0.00	0.00
Biphenyl	0.70	0.00	0.20	1.20	0.10	0.00	2.70	1.00	0.40	0.19	0.00	0.11	0.15	0.60	0.00	2.57	1.50	0.78
m-Cresol	0.20	0.10	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.31	0.00	0.00	0.22	0.00	0.00	0.00	0.00	0.00
o-Cresol	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.05
p-Cresol	0.10	0.10	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.00
Cumene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dibenzofuran	2.20	0.08	0.83	1.28	1.60	0.13	7.18	3.57	0.45	0.12	0.00	0.08	0.03	1.71	18.52	1.21	1.13	0.15
Ethylbenzene	0.00	0.80	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	1.41	0.00	0.00	0.00	0.00	0.00
Naphthalene	11.70	13.35	11.45	59.44	1.36	0.01	4.20	6.82	0.40	19.01	0.14	47.99	46.83	60.69	11.18	29.51	54.83	5.73
Phenol	0.20	0.28	0.10	0.19	0.00	0.00	0.00	0.07	0.06	0.60	0.00	0.70	0.27	0.00	0.00	0.00	1.20	1.46
Quinoline	0.60	0.06	0.16	1.07	0.06	0.00	1.91	0.72	0.38	0.44	0.00	0.29	0.38	1.15	0.00	5.76	2.98	2.33
Styrene	0.10	4.20	0.00	0.40	0.00	0.00	0.00	0.00	0.00	1.92	0.79	0.00	3.89	0.00	0.00	0.00	0.00	0.00
Toluene	0.20	15.30	0.00	0.10	0.00	0.00	0.00	0.00	0.00	12.30	11.95	0.00	3.21	0.00	0.00	0.00	0.00	0.00
m-Xylene	0.10	3.50	0.10	0.20	0.00	0.00	0.00	0.00	0.00	2.39	0.87	7.66	2.44	0.00	0.00	0.00	0.00	0.00
o-Xylene	0.10	1.40	0.10	0.10	0.00	0.00	0.00	0.00	0.10	2.00	0.28	6.31	1.02	0.00	0.00	0.00	0.00	20.98
p-Xylene	0.10	3.50	0.10	0.20	0.00	0.00	0.00	0.00	0.00	2.47	0.91	7.95	2.52	0.00	0.00	0.00	0.00	0.00
Acenaphthene	3.00	0.00	0.21	2.20	3.40	0.06	11.05	6.38	0.70	0.65	0.00	0.10	0.22	18.25	14.56	9.34	7.32	1.21
Acenaphthylene	0.00	0.17	1.69	1.10	0.00	0.00	1.91	0.18	0.30	0.00	0.00	0.84	0.11	0.00	0.00	1.61	0.26	0.52
Anthracene	3.70	0.00	1.25	0.05	4.35	0.72	2.84	3.60	0.70	0.02	0.00	0.01	0.00	0.49	18.22	0.05	0.14	0.03
Benzo(a)anthracene	1.60	0.00	1.05	0.00	2.08	1.02	0.00	1.83	0.51	0.00	0.00	0.00	0.00	0.00	1.37	0.00	0.00	0.00
Benzo(b)fluoranthene	0.50	0.00	0.60	0.00	0.40	1.90	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	1.25	0.00	0.00	0.00
Benzo(k)fluoranthene	0.30	0.00	0.44	0.00	0.50	0.65	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00
Benzo(g,h,i)perylene	0.00	0.00	0.68	0.00	0.00	1.15	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00
Benzo(a)pyrene	1.20	0.00	0.95	0.00	0.54	1.53	0.00	0.58	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00
Chrysene	1.40	0.00	1.02	0.00	2.20	1.15	0.00	1.97	1.30	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.00	0.00
Dibenzo(a,h)anthracene	0.50	0.00	0.15	0.00	0.00	1.23	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
Fluoranthene	3.90	0.00	3.29	0.01	12.47	1.44	2.42	8.57	1.00	0.03	0.00	0.05	0.00	2.11	27.07	0.06	0.41	0.05
Fluorene	2.80	0.00	1.30	1.00	3.10	0.04	8.60	5.00	0.70	0.28	0.00	0.28	0.05	7.25	5.73	3.16	2.74	0.52
Indeno(1,2,3-cd)pyrene	0.80	0.00	0.63	0.00	0.00	0.19	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phenanthrene	7.40	0.00	4.79	0.27	19.35	0.21	12.10	15.82	5.20	0.05	0.00	0.05	0.00	2.37	6.41	0.23	0.72	0.20
Pyrene	3.10	0.00	2.26	0.00	8.22	1.17	1.58	8.02	3.00	0.00	0.00	0.00	0.00	0.04	4.45	0.00	0.02	0.00

Appendix D.2: Equipment Leak Emissions – Option #2

Option #2 – 100% Petro Tar, VOC Emissions

		No. of Equipment Type						VOC Potential Emissions (tpy)						
Commodity	**Srvc.**	**P**	**Ag**	**C**	**V**	**PRV**	**FL**	**P**	**Ag**	**C**	**V**	**PRV**	**FL**	**TOTAL**
NON-REGULATED EQUIPMENT														
Petro Tar	HL	8	0	0	108	0	208	0.059	0.000	0.000	0.206	0.000	0.426	**0.691**
	G	0	0	0	5	0	11	0.000	0.000	0.000	0.006	0.000	0.023	**0.028**
Petroleum Distillate	HL	5	0	0	248	1	554	0.037	0.000	0.000	0.474	0.007	1.134	**1.652**
	G	0	0	0	13	0	71	0.000	0.000	0.000	0.015	0.000	0.145	**0.160**
Petroleum Pitch	HL	14	0	0	323	1	434	0.102	0.000	0.000	0.617	0.007	0.888	**1.615**
	G	0	0	0	0	0	11	0.000	0.000	0.000	0.000	0.000	0.023	**0.023**
NSR	HL	1	0	0	28	0	44	0.007	0.000	0.000	0.054	0.000	0.090	**0.151**
	G	0	0	0	4	0	9	0.000	0.000	0.000	0.005	0.000	0.018	**0.023**
Creosote	HL	2	0	0	53	0	83	0.015	0.000	0.000	0.101	0.000	0.170	**0.286**
	G	0	0	0	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**
Correction Oil	HL	1	0	0	22	0	35	0.007	0.000	0.000	0.042	0.000	0.072	**0.121**
	G	0	0	0	2	1	11	0.000	0.000	0.000	0.002	0.007	0.023	**0.032**
Sub-Total		31	0	0	806	3	1,471							**4.781**
REGULATED EQUIPMENT - SUBPART L AND PAI														
Creosote	HL	1	1	0	51	0	98	0.007	0.007	0.000	0.097	0.000	0.201	**0.313**
	G	0	0	1	20	7	76	0.000	0.000	0.007	0.023	0.051	0.156	**0.237**
Sub-Total		1	1	1	71	7	174							**0.549**
TOTAL		32	1	1	877	10	1,645							**5.330**

Appendix D.2: Equipment Leak Emissions – Option #2 (cont'd.)

Option #2 – 100% Petro Tar, Composition

	Liquid Composition (as a % of total VOC_L)						Gas Composition (as a % of total VOC_G)					
	Petro Tar	Petro Distillate	Pitch	NSR	Creosote	Corr. Oil	Petro Tar	Petro Distillate	Pitch	NSR	Creosote	Corr. Oil
Benzene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Biphenyl	1.10	1.40	0.00	2.70	1.00	0.40	6.09	1.22	0.00	2.57	1.50	0.78
m-Cresol	0.00	0.30	0.00	0.00	0.00	0.00	0.00	1.65	0.00	0.00	0.00	0.00
o-Cresol	0.00	0.20	0.00	0.00	0.00	0.20	0.00	1.83	0.00	0.00	0.00	4.05
p-Cresol	0.00	0.30	0.00	0.00	0.00	0.00	0.00	1.30	0.00	0.00	0.00	0.00
Cumene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dibenzofuran	1.10	2.50	0.00	7.18	3.57	0.45	1.06	0.39	0.00	1.21	1.13	0.15
Ethylbenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Naphthalene	0.63	7.85	0.01	4.20	6.82	0.40	26.45	50.65	7.40	29.51	54.83	5.73
Phenol	0.00	0.04	0.00	0.00	0.07	0.06	0.00	0.44	0.00	0.00	1.20	1.46
Quinoline	0.14	0.73	0.00	1.91	0.72	0.38	2.50	2.02	0.00	5.76	2.98	2.33
Styrene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Toluene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
m-Xylene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
o-Xylene	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	20.98
p-Xylene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Acenaphthene	2.80	2.63	0.35	11.05	6.38	0.70	13.92	2.04	55.30	9.34	7.32	1.21
Acenaphthylene	1.07	2.57	0.00	1.91	0.18	0.30	5.32	2.00	0.00	1.61	0.26	0.52
Anthracene	2.31	1.40	0.23	2.84	3.60	0.70	0.23	0.02	3.79	0.05	0.14	0.03
Benzo(a)anthracene	1.05	1.16	0.17	0.00	1.83	0.51	0.00	0.00	0.15	0.00	0.00	0.00
Benzo(b)fluoranthene	0.10	0.00	0.02	0.00	0.60	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Benzo(k)fluoranthene	0.13	0.00	0.01	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benzo(g,h,i)perylene	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benzo(a)pyrene	0.00	0.00	0.09	0.00	0.58	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Chrysene	0.60	0.57	0.26	0.00	1.97	1.30	0.00	0.00	0.04	0.00	0.00	0.00
Dibenzo(a,h)anthracene	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fluoranthene	1.43	1.14	0.28	2.42	8.57	1.00	0.22	0.03	3.43	0.06	0.41	0.05
Fluorene	2.40	1.60	0.20	8.60	5.00	0.70	5.15	0.54	18.65	3.16	2.74	0.52
Indeno(1,2,3-cd)pyrene	0.00	0.00	0.00	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phenanthrene	6.79	5.25	0.50	12.10	15.82	5.20	0.73	0.09	9.94	0.23	0.72	0.20
Pyrene	3.21	2.41	0.50	1.58	8.02	3.00	0.01	0.00	1.24	0.00	0.02	0.00

Appendix D.3: Equipment Leak Emissions – Option #3

Option #3 – 100% Decanted Oil, VOC Emissions

		No. of Equipment Type						VOC Potential Emissions (tpy)						
Commodity	**Srvc.**	**P**	**Ag**	**C**	**V**	**PRV**	**FL**	**P**	**Ag**	**C**	**V**	**PRV**	**FL**	**TOTAL**
NON-REGULATED EQUIPMENT														
Decanted Oil	HL	8	0	0	108	0	208	0.059	0.000	0.000	0.206	0.000	0.426	**0.691**
	G	0	0	0	5	0	11	0.000	0.000	0.000	0.006	0.000	0.023	**0.028**
Decanted Oil Distillate	HL	5	0	0	248	1	554	0.037	0.000	0.000	0.474	0.000	1.134	**1.644**
	G	0	0	0	13	0	71	0.000	0.000	0.000	0.015	0.000	0.145	**0.160**
Decanted Oil Pitch	HL	14	0	0	323	1	434	0.102	0.000	0.000	0.617	0.000	0.888	**1.608**
	G	0	0	0	0	0	11	0.000	0.000	0.000	0.000	0.000	0.023	**0.023**
NSR	HL	1	0	0	28	0	44	0.007	0.000	0.000	0.054	0.000	0.090	**0.151**
	G	0	0	0	4	0	9	0.000	0.000	0.000	0.005	0.000	0.018	**0.023**
Creosote	HL	2	0	0	53	0	83	0.015	0.000	0.000	0.101	0.000	0.170	**0.286**
	G	0	0	0	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**
Correction Oil	HL	1	0	0	22	0	35	0.007	0.000	0.000	0.042	0.000	0.072	**0.121**
	G	0	0	0	2	1	11	0.000	0.000	0.000	0.002	0.007	0.023	**0.032**
Sub-Total		31	0	0	806	3	1,471							**4.766**
REGULATED EQUIPMENT - SUBPART L AND PAI														
Creosote	HL	1	1	0	51	0	98	0.007	0.007	0.000	0.097	0.000	0.201	**0.313**
	G	0	0	1	20	7	76	0.000	0.000	0.007	0.023	0.051	0.156	**0.237**
Sub-Total		1	1	1	71	7	174							**0.549**
TOTAL		32	1	1	877	10	1,645							**5.315**

Appendix D.3: Equipment Leak Emissions – Option #3 (cont'd.)

Option #3 – 100% Decanted Oil, Composition

	Liquid Composition (as a % of total VOC_L)						Gas Composition (as a % of total VOC_G)					
	Decanted Oil	Decant.Oil Distillate	Decant.Oil Pitch	NSR	Creosote	Corr. Oil	Decanted Oil	Decant.Oil Distillate	Decant.Oil Pitch	NSR	Creosote	Corr. Oil
Benzene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Biphenyl	0.00	0.70	0.00	2.70	1.00	0.40	0.00	1.61	0.00	2.57	1.50	0.78
m-Cresol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
o-Cresol	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	4.05
p-Cresol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cumene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dibenzofuran	0.00	0.38	0.00	7.18	3.57	0.45	0.00	0.15	0.00	1.21	1.13	0.15
Ethylbenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Naphthalene	0.00	0.27	0.01	4.20	6.82	0.40	0.00	4.59	7.40	29.51	54.83	5.73
Phenol	0.00	0.04	0.00	0.00	0.07	0.06	0.00	1.16	0.00	0.00	1.20	1.46
Quinoline	0.00	0.07	0.00	1.91	0.72	0.38	0.00	0.51	0.00	5.76	2.98	2.33
Styrene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Toluene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
m-Xylene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
o-Xylene	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	20.98
p-Xylene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Acenaphthene	0.00	0.16	0.35	11.05	6.38	0.70	0.00	0.33	55.30	9.34	7.32	1.21
Acenaphthylene	0.00	0.44	0.00	1.91	0.18	0.30	0.00	0.90	0.00	1.61	0.26	0.52
Anthracene	0.00	0.29	0.23	2.84	3.60	0.70	0.00	0.01	3.79	0.05	0.14	0.03
Benzo(a)anthracene	0.00	0.00	0.17	0.00	1.83	0.51	0.00	0.00	0.15	0.00	0.00	0.00
Benzo(b)fluoranthene	0.00	0.00	0.02	0.00	0.60	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Benzo(k)fluoranthene	0.00	0.00	0.01	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benzo(g,h,i)perylene	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benzo(a)pyrene	0.00	0.00	0.09	0.00	0.58	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Chrysene	0.00	0.00	0.26	0.00	1.97	1.30	0.00	0.00	0.04	0.00	0.00	0.00
Dibenzo(a,h)anthracene	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fluoranthene	0.00	4.19	0.28	2.42	8.57	1.00	0.00	0.27	3.43	0.06	0.41	0.05
Fluorene	0.00	0.20	0.20	8.60	5.00	0.70	0.00	0.18	18.65	3.16	2.74	0.52
Indeno(1,2,3-cd)pyrene	0.00	0.00	0.00	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phenanthrene	0.00	1.12	0.50	12.10	15.82	5.20	0.00	0.05	9.94	0.23	0.72	0.20
Pyrene	0.00	3.72	0.50	1.58	8.02	3.00	0.00	0.01	1.24	0.00	0.02	0.00