



**KENTUCKY POLLUTANT
DISCHARGE ELIMINATION
SYSTEM**

FACT SHEET

KPDES No.: KY0041971

AI No.: 4054

Trimble County Generating Station
487 Corn Creek Road
Bedford, Trimble County, Kentucky

Date: October 8, 2021

Public Notice Information

Public Notice Start Date: August 31, 2021

Comment Due Date: September 30, 2021

General information concerning the public notice process may be obtained on the Division of Water's Public Notice Webpage at the following address:

<https://eec.ky.gov/Environmental-Protection/Water/Pages/Water-Public-Notices-and-Hearings.aspx>.

Public Notice Comments

Comments must be received by the Division of Water no later than 4:30 PM on the closing date of the comment period. Comments may be submitted by e-mail at: DOWPublicNotice@ky.gov or written comments may be submitted to the Division of Water at 300 Sower Blvd, Frankfort, Kentucky 40601.

Reference Documents

A copy of this proposed fact sheet, proposed permit, the application, other supporting material and the current status of the application may be obtained from the Department for Environmental Protection's Pending Approvals Search Webpage:

http://dep.gateway.ky.gov/eSearch/Search_Pending_Approvals.aspx?Program=Wastewater&NumDaysDoc=30.

Open Records

Copies of publicly-available documents supporting this fact sheet and proposed permit may also be obtained from the Department for Environmental Protection Central Office. Information regarding these materials may be obtained from the Open Records Coordinator at (502) 782-6849 or by e-mail at EEC.KORA@ky.gov.

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SECTION 1

FACILITY SYNOPSIS

1. FACILITY SYNOPSIS

1.1. Name and Address of Applicant

Louisville Gas & Electric Company
 P.O. Box 32010
 Louisville, Kentucky 40232

1.2. Facility Location

Trimble County Generating Station
 487 Corn Creek Road
 Bedford, Trimble County, Kentucky

1.3. Description of Applicant’s Operation

Generation of electric power is from two fossil-fired units with the following nominal generating capacity:

Unit 1- 525 MW (Began Operation 1990)

Unit 2 – 800 MW (Began Operation 2011)

and Units 5-10 – six, 170 MW natural gas fired simple-cycle combustion turbines

1.4. Wastewaters Collected and Treatment

The following table lists the flow, wastewater types collected, and treatment type for each outfall:

TABLE 1.			
Outfall No.	Average Flow	Wastewater Types Collected	Treatment Type
001	5.99	Stormwater Non-Domestic Process Water	Settling Neutralization Discharge to Surface Water
002	6.03	Noncontact Cooling Water	Discharge to Surface Water
003	0.023	Domestic Sanitary Wastewater	Chlorine Disinfection Activated Sludge Aerobic Digestion
004	0.003	Non-Domestic Process Water	Chemical Precipitation Neutralization
005	33.39	Plant Intake Water	Screening
006	1.35	Stormwater Non-Domestic Process Water	Settling Mixing Neutralization
007	0.93	Non-Domestic Process Water	Chemical Precipitation Mixing Neutralization
008	2.11	Stormwater Non-Domestic Process Water	Settling Mixing Neutralization
009	Not yet constructed	Stormwater Runoff	Discharged to Surface Water
010	Not yet constructed	Stormwater Runoff	Discharged to Surface Water
011	Not yet constructed	Stormwater Runoff	Discharged to Surface Water
012	Not yet constructed	Stormwater Runoff	Settling Discharged to Surface Water
013	Not yet constructed	Stormwater Runoff	Settling Discharged to Surface Water

The design flow of the facility is 18.0 MGD. The average annual flow is 12.02 MGD.

1.5. Permitting Action

This is a Modification of a major KPDES permit for an existing Steam Electric Generating Station [SIC Code 4911].

This permit modification is in response to the 2020 EPA's revisions to Steam Electric Effluent Limitation Guidelines. The modification modifies the technology-based requirements for FGD wastewater at Outfall 007.

The existing bottom ash handling systems for both Unit 1 and 2 are compliant with the Final ELG Rule and have no discharge of Bottom Ash Transport Water.

SECTION 2

RECEIVING/INTAKE WATERS

2. RECEIVING / INTAKE WATERS

2.1. Receiving Waters

All surface waters of the Commonwealth have been assigned stream use designations consisting of one or more of the following designations: Warmwater Aquatic Habitat (WAH), Primary Contact Recreation (PCR), Secondary Contact Recreation (SCR), Domestic Water Supply (DWS), Coldwater Aquatic Habitat (CAH) or Outstanding State Resource Water (OSRW)[401 KAR 10:026].

All surface waters of the Commonwealth are assigned one of the following antidegradation categories: Outstanding National Resource Water (ONRW), Exceptional Water (EW), Impaired Water (IW) or High Quality Water (HQ)[401 KAR 10:030].

Surface waters categorized as an IW are listed in Kentucky’s most recently approved Integrated Report to Congress on the Condition of Water Resources in Kentucky - Volume II. 303(d) List of Surface Waters.

The following table lists the stream use classifications associated with this permit.

TABLE 2.				
Receiving Water Name	Use Designation	Antidegradation Category	7Q10 Low Flow (cfs)	Harmonic Mean Flow (cfs)
¹ Ohio River	WAH PCR SCR DWS	IW	10,600	45,300
Corn Creek	WAH PCR SCR DWS	HQ	0.0	1.1
UT to UT to Corn Creek	WAH PCR SCR DWS	HQ	0.0	0.0
UT to Barebone Creek	WAH PCR SCR DWS	HQ	0.0	0.0

¹This segment of Ohio River (mile point 531.5 to 593.4) is listed as impaired in the 2014 303(d) List of Waters for Kentucky. Impaired uses are Fish Consumption (Partial Support). The pollutants of concern are Dioxin and Polychlorinated biphenyls (PCBs). The suspected sources are unknown. Facility in compliance with KPDES permit will not contribute to the impairment.

2.2. Intake Waters – Nearest Downstream Intake

TABLE 3.						
Intake Water Name	Public Water Supply Name	Latitude (N)	Longitude (W)	Miles Downstream	7Q10 Low Flow (cfs)	Harmonic Mean Flow (cfs)
Ohio River	Louisville Water Company	38°20'54"	85°38'14"	23	10,600	45,300

SECTION 3

OUTFALL 001

3. OUTFALL 001**3.1. Outfall Description**

The following table lists the outfall type, location, and description:

TABLE 4.				
Outfall Type	Latitude (N)	Longitude (W)	Receiving Water	Description of Outfall
External	38°34'49"	85°24'56"	Ohio River	Plant Fields – Roadways Stormwater Gas turbine evaporative cooler blowdown Gas turbine blade washings Gas turbine equipment floor drains Transformers stormwater drains

3.2. Reported Values

The following table summarizes the reported values for Outfall 001:

TABLE 5.							
Reported Parameters	Units	EFFLUENT					
		Loadings (lbs./day)		Concentrations			
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum
Flow	MGD	5.99	6.02	N/A	N/A	N/A	N/A
pH	SU	N/A	N/A	7.7	N/A	N/A	8.9
Total Suspended Solids	mg/l	N/A	N/A	N/A	8.0	8.25	N/A
Oil & Grease	mg/l	N/A	N/A	N/A	BDL	BDL	N/A
Hardness (as mg/l CaCO ₃)	mg/l	N/A	N/A	N/A	266.85	267.35	N/A
Total Recoverable Metals	mg/l	N/A	N/A	N/A	0.075	0.075	N/A

The abbreviation BDL means Below Detection Level

The above values are based off of 5-year DMR averages from 09/30/2012 to 06/30/2017.

3.3. Effluent Limitations and Monitoring Requirements

The following table summarizes the effluent limitations and monitoring requirements for Outfall 001:

TABLE 6.									
EFFLUENT LIMITATIONS								MONITORING REQUIREMENTS	
Effluent Characteristic	Units	Loadings (lbs./day)		Concentrations				Frequency	Sample Type
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum		
Flow	MGD	Report	Report	N/A	N/A	N/A	N/A	1/Quarter	Instantaneous
Total Suspended Solids	mg/l	N/A	N/A	N/A	30	60	N/A	1/Quarter	Grab
Oil & Grease	mg/l	N/A	N/A	N/A	10	15	N/A	1/Quarter	Grab
pH	SU	N/A	N/A	6.0	N/A	N/A	9.0	1/Quarter	Grab

3.4. Pertinent Factors

The effluent limitations for this outfall were developed in accordance with DOW’s General Procedures for Limitations Development located on DOW’s webpage at:

<http://dep.ky.gov/formslibrary/Documents/General%20Procedures%20for%20Limitations%20Development.pdf>

3.4.1. Technology-Based Effluent Limitations

Technology-based effluent limitations and standards, based on federally promulgated standards, a case-by-case basis, or a combination of the two, shall be included in all KPDES permits, where applicable.

3.4.1.1. Best Professional Judgement

Total Suspended Solids

The facility treats its stormwater for this parameter before discharge in a holding pond. Sedimentation is a commonly used treatment technology for the removal of total suspended solids that is both efficient and cost effective. Although several factors may influence the final concentration of total suspended solids in the discharge, it has been the experience of the Division that ponds that retain wastewater for 6 hours or more can achieve a total suspended solids concentration of 30 mg/l as a monthly average and 60 mg/l as a daily maximum.

Oil & Grease

The facility treats its stormwater for this parameter before discharge with an oil/water separator. Flotation or gravity separation of lighter petroleum based products from water is a common and cost effective method for the removal of oil & grease. It has been the experience of the Division that this treatment method can achieve an oil & grease concentration of 10 mg/l as a monthly average and 15 mg/l as a daily maximum.

3.4.2. Water Quality-Based Effluent Limitations

The following table lists those water-quality-based pollutants and/or pollutant characteristics of concern that DOW has determined exhibit reasonable potential and the basis of DOW’s determination. These determinations are consistent with the DOW’s reasonable potential analysis (RPA) procedures outlined in *Permitting Procedures For Determining “Reasonable Potential”* Kentucky Division of Water May 1, 2000.

TABLE 7.	
Pollutant or Pollutant Characteristic	Basis
Total Recoverable Metals	Total Recoverable Metals represents the summation of the analytical values of the following individual pollutants: Antimony, Arsenic, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Silver, Thallium and Zinc. An analysis of the DMR data indicates the concentrations of these pollutants did not demonstrate a reasonable potential as determined by DOW’s chemical specific RPA procedures. Therefore, DOW is removing the monitoring requirement for these parameters.

3.5. Limitation Calculations

3.5.1. Water Quality-Based Effluent Limitations

These calculations were preformed using a Microsoft EXCEL based workbook developed by DOW. The workbook is designed to compare effluent data to the applicable water quality standards while also

incorporating the characteristics of the receiving water and any regulatory ZID and/or MZ. The following table summarizes the results of these calculations for this outfall:

Effluent Characteristic	Units	Effluent Hardness	Stream Hardness	Mixing Zone Granted	Mixing Zone Mixed Hardness	ZID Granted	ZID Dilutions	ZID Mixed Hardness
Effluent Characteristic	Units	Reported Avg	Reported Max	Average Limitation	Maximum Limitation	Average Discharge %	Maximum Discharge %	Data Source
Hardness	mg/l	230	190	NO	N/A	NO	N/A	N/A
Antimony	µg/L	17.1	17.1	640	N/A	2.67	N/A	DMR
Arsenic	µg/L	31.25	31.25	150	340	20.83	9.19	DMR
Barium	µg/L	41	41	1144171.953	N/A	0.00	N/A	APP
Beryllium	µg/L	0	0	4576.687813	N/A	0.00	N/A	DMR
Cadmium	µg/L	0	0	0.501612665	4.974632136	0.00	0.00	DMR
Chloride	µg/L	62000	62000	600000	1200000	10.33	5.17	APP
Chromium	µg/L	0.1	0.1	114417.1953	N/A	0.00	N/A	DMR
Chromium (III)	µg/L	0.1	0.1	170.4747094	3566.667459	0.06	0.00	DMR
Chromium (VI)	µg/L	0.1	0.1	11	16	0.91	0.63	DMR
Copper	µg/L	1.95	1.95	19.00759753	30.68452098	10.26	6.35	DMR
Fluoride	µg/L	0	0	4576687.813	N/A	0.00	N/A	APP
Iron	µg/L	440	440	3500	4000	12.57	11.00	APP
Lead	µg/L	0	0	9.185948323	235.7271425	0.00	0.00	DMR
Mercury	µg/L	0	0	0.051	1.4	0.00	0.00	DMR
Nickel	µg/L	4.618	4.618	105.5320919	949.1957958	4.38	0.49	DMR
Nitrate (as N)	µg/L	350	350	11441719.53	N/A	0.00	N/A	APP
Phenol	µg/L	12	12	860000	N/A	0.00	N/A	APP
Selenium	µg/L	7.83	7.83	5	N/A	156.60	N/A	DMR
Silver	µg/L	0	0	N/A	15.85518239	N/A	0.00	DMR
Sulfate	µg/L	110000	110000	286042988.3	N/A	0.04	N/A	APP
Thallium	µg/L	0	0	0.47	N/A	0.00	N/A	DMR
Zinc	µg/L	14.1	14.1	242.6656569	242.6656569	5.81	5.81	DMR
Gross total alpha particle activity including radium-226 but excluding radon and uranium	pCi/L	15.1	15.1	73296.63606	N/A	0.02	N/A	APP
Combined radium-226 and radium-228	pCi/L	1.525	1.525	24432.21202	N/A	0.01	N/A	APP
Total gross beta particle activity	pCi/L	14	14	244322.1202	N/A	0.01	N/A	APP
Strontium-90	pCi/L	0	0	39091.53923	N/A	0.00	N/A	APP
Uranium	µg/L	10.9	10.9	146593.2721	N/A	0.01	N/A	APP
Ammonia (as N)	mg/l	0	0	2443.915046	N/A	0.00	N/A	APP
Nitrite-nitrogen Ohio River	mg/l	0.35	0.35	1	N/A	35.00	N/A	APP

3.5.2. Non-continuous discharge

The discharge from this outfall is not a continuous discharge, and is a controlled discharge that only discharges once a month for 8-hour time periods. Therefore, only the acute water quality standards apply to the discharge.

3.6. Justification of Requirements

Chapters 5 and 10 of Title 401 of the Kentucky Administrative Regulations (KARs), cited in the following, have been duly promulgated pursuant to the requirements of Chapter 224 of the Kentucky Revised Statutes.

At a minimum, all permits shall contain technology-based effluent limitations (TBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)]. When necessary to achieve water quality standards, all permits shall contain water quality-based effluent limitations (WQBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(d)]. Any WQBELs included in this permit are based upon the Kentucky Water Quality Standards (KYWQS) [401 KAR 10:031].

3.6.1. Flow

The monitoring requirements for this parameter are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(ii)] and requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48].

3.6.2. Total Suspended Solids and Oil & Grease

The limitations for these parameters are consistent with the requirements of 40 CFR 125.3(c)(2) as incorporated by reference in 401 KAR 5:080, Section 2(3). The limits are representative of the Division of Water's "Best Professional Judgment" (BPJ) determination of the "Best Conventional Pollutant Control Technology" (BCT) requirements for these pollutants.

3.6.3. pH

The limitations for this parameter are consistent Kentucky's Water Quality Standards [401 KAR 10:031, Section 4(1)(b) and Section 7].

3.6.4. Total Recoverable Metals and Hardness

Based on the last five years of DMR data the facility does not show reasonable potential for these parameters at this outfall. Therefore the decision to remove this parameter from the permit is based on the Division of Water's EPA approved "Permitting Procedures For Determining Reasonable Potential" and 40 CFR 122.44 (d). Since none of the remaining parameters are hardness dependent the monitoring requirements for hardness has also been removed.

SECTION 4

OUTFALL 002

4. OUTFALL 002**4.1. Outfall Description**

The following table lists the outfall type, location, and description:

TABLE 8.					
Outfall Number	Outfall Type	Latitude (N)	Longitude (W)	Receiving Water	Description of Outfall
002	External	38°34'36"	85°24'54"	Ohio River Via a Multi-Port Diffuser	Main plant outfall containing discharge from the following: Unit 1 and 2 Cooling Tower Blowdown Internal Outfalls 003, 006, 007, and 008
002A	Internal	38°34'36"	85°24'54"	Outfall 002	Unit 1 Cooling Tower Blowdown
002B	Internal	38°34'36"	85°24'54"	Outfall 002	Unit 2 Cooling Tower Blowdown

4.2. Reported Values

The following table summarizes the reported values for Outfall 002:

TABLE 9.							
Reported Parameters	Units	EFFLUENT					
		Loadings (lbs./day)		Concentrations			
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum
Flow	MGD	6.03	8.23	N/A	N/A	N/A	N/A
Temperature	°F	N/A	N/A	N/A	75.68	83.79	N/A
Free Available Chlorine	mg/l	N/A	N/A	N/A	NR	NR	N/A
Chlorination	Min/unit/day	N/A	N/A	N/A	NR	NR	N/A
Total Residual Chlorine	mg/l	N/A	N/A	N/A	NR	NR	N/A
Total Residual Oxidants	mg/l	N/A	N/A	N/A	BDL	BDL	N/A
Total Chromium	mg/l	N/A	N/A	N/A	0.0054	0.006	N/A
Total Zinc	mg/l	N/A	N/A	N/A	0.0498	0.05	N/A
Priority Pollutants	mg/l	N/A	N/A	N/A	NR	NR	N/A
Chloride	mg/l	N/A	N/A	N/A	174.76	174.76	N/A
Acute Toxicity	TU _a	N/A	N/A	N/A	N/A	N/A	2.00
Total Recoverable Iron	mg/l	N/A	N/A	N/A	2.22	2.22	N/A
Hardness (as mg/l CaCO ₃)	mg/l	N/A	N/A	N/A	814.51	814.51	N/A

TABLE 9.							
Reported Parameters	Units	EFFLUENT					
		Loadings (lbs./day)		Concentrations			
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum
pH	SU	N/A	N/A	7.7	N/A	N/A	8.7
The abbreviation BDL means below detection level							
The abbreviation NR means not required							

The above values are based off of 5-year DMR averages from 09/30/2012 to 07/31/2017.

4.3. Outfall 002

Tier 1 Effluent Limitations and Monitoring Requirements

The following table summarizes the effluent limitations and monitoring requirements for Outfall 002 prior the facility dewatering the gypsum storage pond (GSP) through internal outfall 006 to Outfall 002:

TABLE 10.									
EFFLUENT LIMITATIONS								MONITORING REQUIREMENTS	
Effluent Characteristic	Units	Loadings (lbs./day)		Concentrations				Frequency	Sample Type
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum		
Flow	MGD	Report	Report	N/A	N/A	N/A	N/A	Continuous	Calculated
Temperature	°F	N/A	N/A	N/A	Report	100	N/A	Continuous	Recorder
pH	SU	N/A	N/A	6.0	N/A	N/A	9.0	1/Week	Grab
Chloride	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Hardness (as mg/l CaCO ₃)	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Cadmium	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Copper	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Selenium	mg/l	N/A	N/A	N/A	0.051	Report	N/A	1/Quarter	Grab
Total Recoverable Selenium (Fish Tissue)	mg/kg dry weight	N/A	N/A	N/A	N/A	N/A	8.6	(¹)	(¹)
Acute WET ²	TU _A	N/A	N/A	N/A	N/A	N/A	1.00	1/Quarter	(³)

¹Should the monthly average concentration of Total Recoverable Selenium exceed 0.051 mg/l, see permit Section 5.12 for additional requirements.

TABLE 10.

EFFLUENT LIMITATIONS								MONITORING REQUIREMENTS	
Effluent Characteristic	Units	Loadings (lbs./day)		Concentrations				Frequency	Sample Type
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum		
² WET – Whole Effluent Toxicity									
³ Two (2) discrete grab samples shall be collected 12 hours apart									

Tier 2 Effluent Limitations and Monitoring Requirements

The following table summarizes the effluent limitations and monitoring requirements for Outfall 002 once the facility starts dewatering the gypsum storage pond (GSP) through internal outfall 006 to Outfall 002. The permittee shall notify the Division of Water, Surface Water Permits Branch at least 30 days prior to commencement of the process/knockout pond discharging directly to outfall 002 requesting to switch to the Tier2 limits.

TABLE 11.

EFFLUENT LIMITATIONS								MONITORING REQUIREMENTS	
Effluent Characteristic	Units	Loadings (lbs./day)		Concentrations				Frequency	Sample Type
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum		
Flow	MGD	Report	Report	N/A	N/A	N/A	N/A	Continuous	Calculated
Temperature	°F	N/A	N/A	N/A	Report	100	N/A	Continuous	Recorder
pH	SU	N/A	N/A	6.0	N/A	N/A	9.0	1/Week	Grab
Chloride	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Month	Grab
Total Recoverable Selenium	mg/l	N/A	N/A	N/A	0.051	Report	N/A	1/Month	Grab
Total Recoverable Selenium (Fish Tissue)	mg/kg dry weight	N/A	N/A	N/A	N/A	N/A	8.6	(²)	(²)
Hardness (as mg/l CaCO ₃)	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Month	Grab
Total Recoverable Antimony ¹	mg/l	N/A	N/A	N/A	1.93	Report	N/A	1/Month	Grab
Total Recoverable Arsenic ¹	mg/l	N/A	N/A	N/A	3.03	3.03	N/A	1/Month	Grab
Total Recoverable Beryllium ¹	mg/l	N/A	N/A	N/A	1.38	Report	N/A	1/Month	Grab
Total Recoverable Cadmium ¹	mg/l	N/A	N/A	N/A	0.04	0.04	N/A	1/Month	Grab
Total Recoverable Chromium ¹	mg/l	N/A	N/A	N/A	34.3	Report	N/A	1/Month	Grab
Total Recoverable Copper ¹	mg/l	N/A	N/A	N/A	0.25	0.25	N/A	1/Month	Grab

TABLE 11.

EFFLUENT LIMITATIONS								MONITORING REQUIREMENTS	
Effluent Characteristic	Units	Loadings (lbs./day)		Concentrations				Frequency	Sample Type
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum		
Total Recoverable Iron ¹	mg/l	N/A	N/A	N/A	35.1	35.1	N/A	1/Month	Grab
Total Recoverable Lead ¹	mg/l	N/A	N/A	N/A	0.84	1.88	N/A	1/Month	Grab
Total Recoverable Mercury ¹	mg/l	N/A	N/A	N/A	0.000046	0.0013	N/A	1/Month	Grab
Total Recoverable Nickel ¹	mg/l	N/A	N/A	N/A	7.87	7.87	N/A	1/Month	Grab
Total Recoverable Silver ¹	mg/l	N/A	N/A	N/A	Report	0.12	N/A	1/Month	Grab
Total Recoverable Thallium ¹	mg/l	N/A	N/A	N/A	0.083	Report	N/A	1/Month	Grab
Total Recoverable Zinc ¹	mg/l	N/A	N/A	N/A	2.106	2.106	N/A	1/Month	Grab
Acute WET ³	TU _A	N/A	N/A	N/A	N/A	N/A	1.00	1/Month	(⁴)

¹The Monthly Average and Daily Maximum concentrations for these pollutants are not effluent limitations, but water quality triggers that, if exceeded for two (2) consecutive months, require permittee action. See the Best Management Practices Plan Section - Additional BMP Conditions Subsection for additional requirements related to these triggers.

²Should the monthly average concentration of Total Recoverable Selenium exceed 0.051 mg/l, see permit Section 5.12 for additional requirements.

³WET – Whole Effluent Toxicity

⁴Two (2) discrete grab samples shall be collected 12 hours apart

Tier 3 Effluent Limitations and Monitoring Requirements

The following table summarizes the effluent limitations and monitoring requirements for once the dewatering of gypsum storage pond (GSP) through internal Outfall 006 through Outfall 002 has stopped. The permittee shall notify the Division of Water, Surface Water Permits Branch at least 30 days prior to commencement of the completion of gypsum storage pond dewatering requesting to switch to the Tier 3 limits.

TABLE 12.

EFFLUENT LIMITATIONS								MONITORING REQUIREMENTS	
Effluent Characteristic	Units	Loadings (lbs./day)		Concentrations				Frequency	Sample Type
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum		
Flow	MGD	Report	Report	N/A	N/A	N/A	N/A	Continuous	Calculated
Temperature	°F	N/A	N/A	N/A	Report	100	N/A	Continuous	Recorder
pH	SU	N/A	N/A	6.0	N/A	N/A	9.0	1/Week	Grab

TABLE 12.

EFFLUENT LIMITATIONS								MONITORING REQUIREMENTS	
Effluent Characteristic	Units	Loadings (lbs./day)		Concentrations				Frequency	Sample Type
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum		
Chloride	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Hardness (as mg/l CaCO ₃)	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Cadmium	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Copper	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Selenium	mg/l	N/A	N/A	N/A	0.051	Report	N/A	1/Quarter	Grab
Total Recoverable Selenium (Fish Tissue)	mg/kg dry weight	N/A	N/A	N/A	N/A	N/A	8.6	(¹)	(¹)
Acute WET ²	TU _A	N/A	N/A	N/A	N/A	N/A	1.00	1/Quarter	(³)

¹Should the monthly average concentration of Total Recoverable Selenium exceed 0.051 mg/l, see permit Section 5.12 for additional requirements.

²WET – Whole Effluent Toxicity

³Two (2) discrete grab samples shall be collected 12 hours apart

4.4. Outfall 002A and Outfall 002B

TABLE 13.

EFFLUENT LIMITATIONS								MONITORING REQUIREMENTS	
Effluent Characteristic	Units	Loadings (lbs./day)		Concentrations				Frequency	Sample Type
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum		
Flow	MGD	Report	Report	N/A	N/A	N/A	N/A	Continuous	Calculated
Free Available Chlorine ¹	mg/l	N/A	N/A	N/A	0.2	0.5	N/A	1/Occurrence ²	Multiple Grab ³
Total Residual Oxidants ^{1,4}	mg/l	N/A	N/A	N/A	Report	0.2	N/A	1/Occurrence ²	Multiple Grab ³
Oxidant Discharge Time ¹	Min/unit/day	N/A	N/A	N/A	N/A	120	N/A	1/Occurrence ²	Log
Total Chromium ¹	mg/l	N/A	N/A	N/A	0.2	0.2	N/A	1/Year	Grab
Total Zinc ¹	mg/l	N/A	N/A	N/A	1.0	1.0	N/A	1/Year	Grab
Priority Pollutants ^{1,5}	No Detectable Amount							1/Year	Calculated ⁶

¹Sampling of cooling tower blowdown must be taken at the nearest accessible point prior to discharge to or mixing with the receiving waters or wastestreams from other outfalls.

TABLE 13.

EFFLUENT LIMITATIONS								MONITORING REQUIREMENTS	
Effluent Characteristic	Units	Loadings (lbs./day)		Concentrations				Frequency	Sample Type
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum		
² The measurement frequency "Occurrence" means during periods of chlorination or oxidation addition to cooling water, but no more frequent than once per week.									
³ The sample type 'Multiple Grab' means grab samples collected at the approximate beginning of oxidant discharge and once every fifteen (15) minutes thereafter until the end of the oxidant discharge.									
⁴ The term Total Residual Oxidants (TRO) means the value obtained by using the amperometric titration or DPD methods for Total Residual Chlorine described in 40 CFR Part 136. In the event of addition of an oxidant other than Chlorine, the permittee shall receive prior approval from the DOW permitting staff before the initial use. TRO monitoring and limits only apply if the applicant chooses to utilize an oxidant other than Chlorine.									
⁵ Priority Pollutants are those contained in chemicals added for cooling tower maintenance and shall be monitored annually by grab sample or by engineering calculations. The results of the analyses/engineering calculations shall be totaled and reported as a single concentration on the DMR. The laboratory bench sheets/engineering or electronic equivalent calculations showing the results for each pollutant shall be attached to the DMR. The term priority pollutants means the 126 priority pollutants listed in 40 CFR Part 423 Appendix A except total chromium and total zinc.									
⁶ Compliance with the limitations, for the 126 priority pollutants, in paragraph (b)(10) of 40 CFR 423.15 may be determined by engineering calculations which demonstrate that the regulated pollutants are not detectable in the final discharge by the analytical methods in 40 CFR part 136.									
Neither free available chlorine nor total residual chlorine or oxidants may be discharged from any unit for more than two hours in any one day and not more than one unit in any plant may discharge free available chlorine or total residual chlorine or oxidants at any one time unless the utility can demonstrate to the DOW that the units in a particular location cannot operate at or below this level of chlorination or oxidant addition.									

4.5. Pertinent Factors

The effluent limitations for this outfall were developed in accordance with DOW’s General Procedures for Limitations Development located on DOW’s webpage at:

<http://dep.ky.gov/formslibrary/Documents/General%20Procedures%20for%20Limitations%20Development.pdf>

4.5.1. Dewatering of Gypsum Storage Pond

In order for the Gypsum Storage Pond to be closed, it must be decanted and dewatered through the intimal outfall 006 and discharged to the Ohio River via outfall 002. During dewatering, mechanical equipment may be required to remove interstitial water from the ash in the Ash Pond. While dewatering occurs the facility will be required to monitor for the metals listed in Table 11 and chlorides at a frequency of once per month. All discharges from Outfall 002 are sent to the discharge channel and mixed with cooling water and other facility flows prior to discharge to the Ohio River. Also, the Ohio River can provide further dilution of effluent if necessary and the facility has a high rate multi-port diffuser to allow for additional dilutions. For these reasons, monthly toxicity testing and monitoring of metals, with baseline water quality triggers during dewatering, will be required in place of metals limitations for the metals that currently due not show reasonable potential.

4.5.2. Technology-Based Effluent Limitations

Technology-based effluent limitations and standards, based on federally promulgated standards, a case-by-case basis, or a combination of the two, shall be included in all KPDES permits, where applicable.

4.5.2.1. Federal Effluent Limitations Guidelines

EPA has established a minimum level of technology that must be applied to certain industries. Due to the operations at this facility, all applicable sections of 40 CFR 423 shall be applied to this outfall. The following is a list of those requirements:

40 CFR 423.12(b) (1)

The pH of all discharges, except once through cooling water, shall be within the range of 6.0-9.0.

40 CFR 423.12(b) (2)

There shall be no discharge of polychlorinated biphenyl compounds such as those commonly used for transformer fluid.

40 CFR 423.12(b) (7)

The quantity of pollutants discharged in cooling tower blowdown shall not exceed the quantity determined by multiplying the flow of cooling tower blowdown sources times the concentration listed in the following table:

TABLE 14.		
BPT Effluent Requirements – Cooling Tower Blowdown		
Effluent Characteristic	Maximum for any one day	Maximum for monthly average
Free Available Chlorine	0.5 mg/l	0.2 mg/l

40 CFR 423.12(b) (8)

Neither free available chlorine nor total residual chlorine may be discharged from any unit for more than two hours in any one day and not more than one unit in any plant may discharge free available or total residual chlorine at any one time unless the utility can demonstrate to the Regional Administrator or sate,

if the state has NPDES permit issuing authority, that the units in a particular location cannot operate at or below this level of chlorination.

40 CFR 423.12(b) (12)

At the permitting authority’s discretion, the quantity of pollutant allowed to be discharged may be expressed as concentration limitations instead of the mass-based limitations specified in paragraphs (b)(3) through (b)(7), and (b)(11), of this section concentration limitations shall be those concentrations specified in this section.

In accordance with Sections 423.12 (b) (12) the permitting authority may allow the quantity of pollutant discharge to be expressed as a concentration limitation instead of a mass based limitation. The DOW has determined to apply the requirements of 40 CFR Part 423 in this manner.

40 CFR 423.13(a)

There shall be no discharge of polychlorinated biphenyl compounds such as those commonly used for transformer fluid.

40 CFR 423.13(d) (1)

The quantity of pollutants discharged in cooling tower blowdown shall not exceed the quantity determined by multiplying the flow of cooling tower blowdown time the concentration listed below:

TABLE 15.		
BAT Effluent Requirements – Cooling Tower Blowdown		
Effluent Characteristic	Maximum for any one day	Maximum for monthly average
Free Available Chlorine	0.5 mg/l	0.2 mg/l
The 126 priority pollutants (appendix A) contained in chemicals added for cooling tower maintenance, except:	(1)	(1)
Chromium, Total	0.2 mg/l	0.2 mg/l
Zinc, Total	1.0 mg/l	1.0 mg/l
¹ No detectable amount		

40 CFR 423.13(d) (2)

Neither free available chlorine nor total residual chlorine may be discharged from any unit for more than two hours in any one day and not more than one unit in any plant may discharge free available or total residual chlorine at any one time unless the utility can demonstrate to the Regional Administrator or state, if the state has NPDES permit issuing authority, that the units in a particular location cannot operate at or below this level of chlorination.

40 CFR 423.13(d) (3)

At the permitting authority’s discretion, instead of the monitoring in 40 CFR 122.11(b), compliance with the standards for the 126 priority pollutants in paragraph (d)(1) of this section may be determined by engineering calculations demonstrating that the regulated pollutants are not detectable in the final discharge by the analytical methods in 40 CFR part 136.

40 CFR 423.13(m)

At the permitting authority’s discretion, the quantity of pollutant allowed to be discharged may be expressed as concentration limitations instead of the mass-based limitations specified in paragraphs (b) through (l) of this section concentration limitations shall be those concentrations specified in this section.

In accordance with Sections 423.13 (m) the permitting authority may allow the quantity of pollutant discharge to be expressed as a concentration limitation instead of a mass based limitation. The DOW has determined to apply the requirements of 40 CFR Part 423 in this manner

40 CFR 423.15(a) (1)

Any new source as of November 19, 1982, subject to paragraph (a) of this section, must achieve the following new source performance standards, in addition to the limitations in 423.13 of this part, established on November 3, 2015. In the case of conflict, the more stringent requirements apply.

40 CFR 423.15(a) (1)

The pH of all discharges, except once through cooling water, shall be within the range of 6.0-9.0.

40 CFR 423.15(a) (2)

There shall be no discharge of polychlorinated biphenyl compounds such as those commonly used for transformer fluid.

40 CFR 423.15(a) (10)(i)

The quantity of pollutants discharged in cooling tower blowdown shall not exceed the quantity determined by multiplying the flow of cooling tower blowdown time the concentration listed below:

TABLE 16.		
NSPS Effluent Requirements – Cooling Tower Blowdown		
Effluent Characteristic	Maximum for any one day	Maximum for monthly average
Free Available Chlorine	0.5 mg/l	0.2 mg/l
The 126 priority pollutants (appendix A) contained in chemicals added for cooling tower maintenance, except:	(1)	(1)
Chromium, Total	0.2 mg/l	0.2 mg/l
Zinc, Total	1.0 mg/l	1.0 mg/l
¹ No detectable amount		

40 CFR 423.15(a)(10)(ii)

Neither free available chlorine nor total residual chlorine may be discharged from any unit for more than two hours in any one day and not more than one unit in any plant may discharge free available or total residual chlorine at any one time unless the utility can demonstrate to the Regional Administrator or state, if the state has NPDES permit issuing authority, that the units in a particular location cannot operate at or below this level of chlorination.

40 CFR 423.15(a)(10)(iii)

At the permitting authority’s discretion, instead of the monitoring in 40 CFR 122.11(b), compliance with the standards for the 126 priority pollutants in paragraph (a)(10)(i) of this section may be determined by engineering calculations demonstrating that the regulated pollutants are not detectable in the final discharge by the analytical methods in 40 CFR part 136.

40 CFR 423.15(a)(13)

At the permitting authority’s discretion, the quantity of pollutant allowed to be discharged may be expressed as concentration limitations instead of the mass-based limitations specified in paragraphs (a)(1) through (a)(13) of this section concentration limitations shall be those concentrations specified in this section.

In accordance with Sections 423.15 (a)(13) the permitting authority may allow the quantity of pollutant discharge to be expressed as a concentration limitation instead of a mass based limitation. The DOW has determined to apply the requirements of 40 CFR Part 423 in this manner

4.5.3. Best Professional Judgment “BPJ”

Time of Oxidants Discharge

The Division of Water will impose a limit of 120 minutes/day/unit of chlorination / oxidation discharge time. The limit is representative of the BAT requirements for the discharge of chlorine in cooling tower blowdown as specified in 40 CFR 423.13(d)(2) as incorporated in 401 KAR 5:065, Section 2(6). It is the “Best Professional Judgement” (BPJ) of the Division of Water that this requirement is also applicable to the addition of other oxidants as well as chlorine.

Total Residual Oxidants

The Division of Water will impose a daily maximum limit of 0.20 mg/l for this parameter. The limit is representative of the BAT requirements for total residual chlorine in once through cooling water as specified in 40 CFR 423.13(b)(1) as incorporated in 401 KAR 5:065, Section 2(6). It is the Division of Water’s Best Professional Judgment (BPJ) determination to limit oxidants discharged in cooling tower blowdown, when the permittee chooses to use an oxidant other than chlorine.

4.5.4. Water Quality-Based Effluent Limitations

The following table lists those water-quality-based pollutants and/or pollutant characteristics of concern that DOW has determined exhibit reasonable potential and the basis of DOW’s determination. These determinations are consistent with the DOW’s reasonable potential analysis (RPA) procedures outlined in *Permitting Procedures For Determining “Reasonable Potential”* Kentucky Division of Water May 1, 2000.

TABLE 17.	
Pollutant or Pollutant Characteristic	Basis
Whole Effluent Toxicity	The facility is rated as a “major discharger”. The facility’s discharge is a complex wastewater.
Chloride and Total Recoverable: Antimony, Arsenic, Beryllium, Chromium, Iron, Lead, Mercury, Nickel, Silver, Thallium, and Zinc	While the facility did not show reasonable potential to violate the State Water Quality Standards for these pollutants at this outfall, the facility is undergoing major changes during this permit cycle. The facility will be dewatering the gypsum storage pond through the existing internal outfall 006 to this outfall and will be adding three future internal outfalls (003, 007 and 008) to this outfall as well. Therefore, it is the Division of Waters Best Professional Judgement to continue monitoring for these parameters while the gypsum storage pond is being dewatered through this outfall.
Total Recoverable: Cadmium, Copper, and Selenium	A Mixing Zone has granted for these parameters. Because a Mixing Zone has been granted there is no reasonable potential for this parameter to violate the State Water Quality Standard. However, since the facility would show reasonable potential if not for the Mixing Zone it’s the Division of Waters Best Professional Judgement to continue monitoring for these parameters.
Temperature	Thermal pollution or heat loads are typically associated with industrial facilities where large volumes of cooling water are utilized. Therefore, DOW has determined that reasonable potential for this pollutant does exist.

4.5.5. Zone of Initial Dilution (ZID)

The Kentucky Water Quality Standards (KYWQS) allow the assignment of a ZID for acute aquatic life (Acute) WQBELs, for outfalls equipped with a submerged, high-rate multi-port diffuser structure [401 KAR

10:029, Section 4(3)]. Based upon the reasonable potential analysis the facility does not require mixing in order to meet an acute criterion at this time, therefore a ZID is not being assigned at this time.

4.5.6. Mixing Zone (MZ)

The Kentucky Water Quality Standards (KYWQS) allow the assignment of a MZ for chronic aquatic life (Chronic) and human health fish consumption (Fish) WQBELs and thermal discharges [401 KAR 10:029, Section 4]. The pollutants and/or the pollutant characteristics for which DOW has granted a MZ are listed as follows: Temperature, Total Recoverable Cadmium, Total Recoverable Copper, Total Recoverable Selenium, and Whole Effluent Toxicity.

4.6. Limitation Calculations

4.6.1. Comparison of TBELs to WQBELs

In order to determine if the calculated TBELs for a pollutant or pollutants are protective of water quality the TBELs must be directly compared to the calculated WQBELs for that pollutant or pollutants. Table 16 summarizes the applicable TBELs and WQBELs for this discharge.

TABLE 18.				
Pollutant	TBELs (mg/l)		WQBELs (mg/l)	
	Monthly Average	Daily Maximum	Monthly Average	Daily Maximum
Total Chromium	N/A	0.2	N/A	N/A
Hexavalent Chromium	N/A	N/A	0.158	0.158
Trivalent Chromium ¹	N/A	N/A	18.745	32.929
Total Recoverable Chromium	N/A	N/A	38142	N/A
Total Zinc	1.0	1.0	N/A	N/A
Total Recoverable Zinc ¹	N/A	N/A	2.235	2.235

¹The limitations are based on average hardness of 400 mg/l CaCO₃

Total Recoverable Zinc to Total Zinc

In regard to metals EPA uses the terms “total metal” and “total recoverable metal” synonymously to refer to metals solubilized by digestion with strong solutions of mineral acids, therefore total zinc and total recoverable zinc can be directly compared. In this case the TBEL is demonstrated to be protective of water quality criteria for total recoverable zinc. Therefore, no additional monitoring is required at this time.

Total Chromium, Total Recoverable Chromium, Hexavalent Chromium and Trivalent Chromium

In regard to metals EPA uses the terms “total metal” and “total recoverable metal” synonymously to refer to metals solubilized by digestion with strong solutions of mineral acids, therefore total chromium and total recoverable chromium can be directly compared. In this case the TBEL is demonstrated to be protective of water quality criteria for total recoverable chromium. Total chromium is a measure of all valent forms of chromium in an aqueous sample with the trivalent and hexavalent forms being the most dominate; thus a direct comparison cannot be made between total chromium TBELs and the hexavalent and trivalent WQBELs. However, for the purposes of conducting such a comparison DOW assumed the total chromium concentration was composed completely of one valence, i.e. the “worst case scenario”.

Following this approach DOW found that the total chromium TBEL would be protective of the trivalent chromium water quality criteria; however it would not be protective of the hexavalent chromium water quality criteria. Prior to imposing a hexavalent chromium WQBEL on the permit DOW, using application data for total chromium concentrations in the discharge, followed the same “worst case scenario”

approach in performing the hexavalent RPA. Based on these current discharge levels reasonable potential did not exist for hexavalent, therefore no additional monitoring is required at this time.

4.6.2. Water Quality-Based Effluent Limitations

These calculations were preformed using a Microsoft EXCEL based workbook developed by DOW. The workbook is designed to compare effluent data to the applicable water quality standards while also incorporating the characteristics of the receiving water and any regulatory ZID and/or MZ. The following table summarizes the results of these calculations for this outfall:

Effluent Characteristic	Units	Effluent Hardness	Stream Hardness	Mixing Zone Granted	Mixing Zone Mixed Hardness	ZID Granted	ZID Dilutions	ZID Mixed Hardness
Hardness	mg/l	400	190	YES	191.6447291	YES	9.9	211.2121212
Effluent Characteristic	Units	Reported Avg	Reported Max	Average Limitaion	Maximum Limitation	Average Discharge %	Maximum Discharge %	Data Source
Antimony	µg/L	1.2	1.2	2135.964444	N/A	0.06	N/A	APP
Arsenic	µg/L	0	0	3366	3366	0.00	0.00	APP
Barium	µg/L	10	10	381422.2222	N/A	0.00	N/A	APP
Beryllium	µg/L	3	3	1525.688889	N/A	0.20	N/A	APP
Cadmium	µg/L	1.9	1.9	45.16196382	45.16196382	4.21	4.21	APP
Chloride	µg/L	174764	174764	11880000	11880000	1.47	1.47	DMR
Chromium	µg/L	7.9	7.9	38142.22222	N/A	0.02	N/A	APP
Chromium (III)	µg/L	7.9	7.9	18745.40035	32929.67503	0.04	0.02	APP
Chromium (VI)	µg/L	7.9	7.9	158.4	158.4	4.99	4.99	APP
Copper	µg/L	43	43	280.339739	280.339739	15.34	15.34	APP
Cyanide, Free	µg/L	10	10	217.8	217.8	4.59	4.59	APP
Fluoride	µg/L	2400	2400	1525688.889	N/A	0.16	N/A	APP
Iron	µg/L	2221	2221	39600	39600	5.61	5.61	DMR
Lead	µg/L	6.2	6.2	929.7964949	2093.786195	0.67	0.30	APP
Mercury	µg/L	0.0206	0.0206	0.051	1.4	40.39	1.47	APP
Nickel	µg/L	50	50	8743.420961	8743.420961	0.57	0.57	APP
Nitrate (as N)	µg/L	2700	2700	3814222.222	N/A	0.07	N/A	APP
Phenol	µg/L	10	10	8009866.667	N/A	0.00	N/A	APP
Selenium	µg/L	13	13	638.403	N/A	2.04	N/A	APP
Silver	µg/L	0	0	N/A	135.5660558	N/A	0.00	APP
Sulfate	µg/L	370000	370000	95355555.56	N/A	0.39	N/A	APP
Thallium	µg/L	0.34	0.34	91.54133333	N/A	0.37	N/A	APP
Zinc	µg/L	85	85	2235.042513	2235.042513	3.80	3.80	APP
Gross total alpha particle activity including radium-226 but excluding radon and uranium	pCi/L	15.1	15.1	24401.5	N/A	0.06	N/A	APP
Combined radium-226 and radium-228	pCi/L	1.525	1.525	8133.833333	N/A	0.02	N/A	APP
Total gross beta particle activity	pCi/L	14	14	81338.33333	N/A	0.02	N/A	APP
Strontium-90	pCi/L	0	0	13014.13333	N/A	0.00	N/A	APP
Uranium	µg/L	10.9	10.9	48803	N/A	0.02	N/A	APP
Ammonia (as N)	mg/l	0.38	0.38	814.7057836	N/A	0.05	N/A	APP
Nitrite-nitrogen Ohio River	mg/l	2.7	2.7	127.6806	N/A	2.11	N/A	APP

See section 18 for the CORMIX Session Report and Prediction File.

4.6.3. WET Limit Calculation

In addition to chemical-specific criteria, 401 KAR 10:031 contains whole effluent toxicity (WET) criteria that necessitate the evaluation of complete effluents. The WET criterion is divided into two categories – acute and chronic. WET criteria are not measured in pollutant concentrations, but rather in toxicity units (TUs). The units TU represent the percentage of effluent that represents a toxic effect.

Pursuant to 401 KAR 10:029, Section 4(2) and 401 KAR 10:031, Section 4(j), the allowable instream concentration of toxic substances or whole effluent containing toxic substances shall not exceed a TU_C of 1.00, utilizing the IC25, at the edge of the assigned regulatory Mixing Zone and shall not exceed a TU_A of 1.00, utilizing the LC50, within the assigned mixing unless a Zone of Initial Dilution has been assigned. To determine the maximum TU_C that can be discharged to ensure a 1.00 TU_C is met at the edge of the assigned mixing zone, the following equation is used:

$$C_T = \frac{[C_D(Q_T + (MZF)(Q_U)) - C_U(MZF)(Q_U)]}{Q_T} = \frac{[1.00(27.86 + (0.333)(10600)) - 0(.333)(10600)]}{27.86} = 128$$

Where:

- C_T = the end of pipe effluent limit
- C_D = the pollutant water quality standard met at edge of mixing zone (1.00 TU)
- C_U = the pollutant background concentration, assumed to be 0 if no data available
- Q_T = the discharge flow (in cfs)
- Q_U = the receiving stream critical flow (7Q10 in cfs)
- MZF = mixing zone factor, not to exceed 0.333 for streams and rivers or not to exceed 0.1 for lakes

In order to translate between TU_A and TU_C , a relationship between TU_A and TU_C must be defined. This relationship is known as the acute to chronic ratio and is defined as the ratio of acute toxicity, expressed as an LC50, of an effluent to its chronic toxicity. It is used as a factor to estimate chronic toxicity from acute toxicity data. DOW has defined two ratios, one for bioaccumulative or persistent, and one for non-accumulative or non-persistent effluents.

For discharges containing:

- Bioaccumulative or persistent constituents, $1.00 TU_C = 0.01 TU_A$ (401 KAR 10:031, Section 4(1)(j)(2))
- Non-bioaccumulative or non-persistent constituents, $1.00 TU_C = 0.1TU_A$ (401 KAR 10:031, Section 4(1)(j)(1))

Since mercury, a bioaccumulative in accordance with 401 KAR 10:029, 4(1)(h)(2)(b), is in the discharge from this outfall the acute to chronic ratio is 0.01

Using the above calculated TU_C limit of 128 and the acute to chronic ratio of 0.01, results in a TU_A limit of 1.28. This result represents that 78% of the facilities effluent can't not produce an acute toxic effect. Therefore, there is enough mixing within the assigned mixing zone and TU_A can be used in place of TU_C , and 1.00 TU_A limit is placed on the permit.

4.7. Justification of Requirements

Chapters 5 and 10 of Title 401 of the Kentucky Administrative Regulations (KARs), cited in the following, have been duly promulgated pursuant to the requirements of Chapter 224 of the Kentucky Revised Statutes.

At a minimum, all permits shall contain technology-based effluent limitations (TBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)]. When necessary to achieve water quality standards, all permits shall contain water quality-based effluent limitations (WQBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(d)]. Any WQBELs included in this permit are based upon the Kentucky Water Quality Standards (KYWQS) [401 KAR 10:031].

4.7.1. Flow

The monitoring requirements for this parameter are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065,

Section 2(4) – 40 CFR 122.44(i)(1)(ii)] and requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48].

4.7.2. Temperature

The limitations for this parameter are consistent with Kentucky’s Water Quality Standards [401 KAR 10:031 Section 6 and 401 KAR 10:029 Section 4]. A mixing zone has been granted, in accordance with 401 KAR 10:029 Section 4, for this parameter.

4.7.3. Free Available Chlorine

The limits for this parameter is consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)(1) and 122.44(i)(1)], the criteria and standards for imposing TBELs [401 KAR 5:065, Section 2(6) – 40 CFR 122 Appendix A], and representative of the BPT, BAT, and NSPS requirements for cooling tower blowdown [40 CFR 423.12(b)(7)], [40 CFR 423.13(d)(1)], [40 CFR 423.15(a)(10)(i)].

4.7.4. Total Chromium, Total Zinc, and Priority Pollutants

The limits for these parameters are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)(1) and 122.44(i)(1)], the criteria and standards for imposing TBELs [401 KAR 5:065, Section 2(6) – 40 CFR 122 Appendix A], representative of the BAT and NSPS requirements for cooling tower blowdown [40 CFR 423.13(d)(1)] and [40 CFR 423.15(a)(10)], and consistent with Kentucky’s Water Quality Standards [401 KAR 10:031, Section 6].

4.7.5. Time of Oxidants Discharge

The limit for this parameter is consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)(1) and 122.44(i)(1)], the criteria and standards for imposing TBELs [401 KAR 5:065, Section 2(6) – 40 CFR 122 Appendix A], representative of the BAT and NSPS requirements for chlorine addition in [40 CFR 423.13(d)(1)(2)] and [40 CFR 423.15(a)(10)(ii)], and imposing Best Professional Judgement [401 KAR 5:080, Section 2(3) – 40 CFR 125.3].

4.7.6. Total Residual Oxidants

The limit for this parameter is consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)(1) and 122.44(i)(1)], the criteria and standards for imposing Best Professional Judgement [401 KAR 5:080, Section 2(3) – 40 CFR 125.3].

4.7.7. pH

The limit for this parameter is consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)(1) and 122.44(i)(1)], the criteria and standards for imposing TBELs [401 KAR 5:065, Section 2(6) – 40 CFR 122 Appendix A], representative of the BPT and NSPS requirements for pH [40 CFR 423.12 (b)(1)] and [40 CFR 423.15(a)(1)], and state water quality standards [401 KAR 10:031, Sections 4(1)(b) and 7].

4.7.8. Hardness and Total Recoverable: Antimony, Arsenic, Beryllium, Chromium, Iron, Lead, Mercury, Nickel, Silver, Thallium, and Zinc

The monitoring requirements for these pollutants are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065,

Section 2(4) – 40 CFR 122.44(i)(1)(i)] and requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48].

4.7.9. Total Recoverable: Cadmium and Copper

The monitoring requirements for these pollutants are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(i)] and requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48]. A mixing zone has been granted, in accordance with 401 KAR 10:029 Section 4, for this parameter.

4.7.10. Total Recoverable Selenium

A mixing zone has been granted for this pollutant that allows the chronic aquatic life criterion to be met at the edge of the mixing zone. The monthly average effluent limitation for this parameter is consistent with the requirements of 401 KAR 5:065, Section 2(4) [40 CFR 122.44(d)] and 401 KAR 10:031, Section 4. The monthly average concentration of 0.051 mg/l serves both as a trigger for the collection of adequate number of fish to conduct selenium residue in fish tissue testing and as a limitation in the event the permittee is unable to collect the required number of fish. These limitations are consistent with Kentucky's water quality standards for total recoverable selenium. The incorporation of Appendix A on the collection and handling requirements established in "Methods for Collection of Selenium Residue in Fish Tissue Used to Determine KPDES Permit Compliance" is consistent with the requirements of 401 KAR 5:070, Section 3[40 CFR 122.48(a)].

4.7.11. BMP Triggers

Permits shall include BMPs to control or abate the discharge of pollutants when numeric effluent limitations are infeasible and/or when the practices are reasonably necessary to achieve effluent limitations and standards to carry out the purposes and intent of the Clean Water Act (CWA). To determine the effectiveness of the BMPs during dewatering triggers have been established that if exceeded require the permittee to evaluate the currently employed BMPs and make necessary modifications.

4.7.12. Whole Effluent Toxicity

The limitations for this parameter are consistent with Kentucky's Water Quality Standards [401 KAR 10:031, Sections 4(1)(j)]. A mixing zone has been granted, in accordance with 401 KAR 10:029 Section 4, for this parameter.

SECTION 5

OUTFALL 003

5. OUTFALL 003

5.1. Outfall Description

The following table lists the outfall type, location, and description:

TABLE 19.				
Outfall Type	Latitude (N)	Longitude (W)	Receiving Water	Description of Outfall
Internal	38°35'11"	85°24'37"	BAP/Outfall 002	Domestic Sanitary Wastewater

5.2. Reported Values

In the previous permit, the package sewage treatment plant discharged to a combined bottom and fly ash treatment basin (BAP). The BAP operated as a no discharged system, therefore no monitoring or effluent limitations were proposed. Therefore, there are no reported values for this outfall at this time.

5.3. Effluent Limitations and Monitoring Requirements

Once the sewage treatment plant starts discharging to outfall 002, the following table summarizes the effluent limitations and monitoring requirements of Outfall 003.

TABLE 20.									
EFFLUENT LIMITATIONS								MONITORING REQUIREMENTS	
Effluent Characteristic	Units	Loadings (lbs./day)		Concentrations				Frequency	Sample Type
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Maximum Weekly Average	Maximum		
Flow	MGD	Report	Report	N/A	N/A	N/A	N/A	1/Month	Instantaneous
BOD ₅ ¹	mg/l	N/A	N/A	N/A	30	45	N/A	1/Month	Composite ²
Total Suspended Solids	mg/l	N/A	N/A	N/A	30	45	N/A	1/Month	Composite ²
Total Residual Chlorine	mg/l	N/A	N/A	0.2	N/A	N/A	N/A	1/Month	Grab

¹BOD₅ –Biochemical Oxygen Demand, 5-day

²A sample composed of four or more equal or flow-proportional aliquots collected over a period of no less than eight and no more than twenty-four hours and aggregated so that the aggregate sample reflects the average water quality of the effluent during the compositing or sample period

As long as the sewage treatment plant is discharged to the BAP that operates as no discharge system, NODI Code 9 “Conditional Monitoring-Not Required This Period” can be used for the monitoring requirements at this outfall.

5.4. Pertinent Factors

The effluent limitations for this outfall were developed in accordance with DOW’s General Procedures for Limitations Development located on DOW’s webpage at:

<http://dep.ky.gov/formslibrary/Documents/General%20Procedures%20for%20Limitations%20Development.pdf>

5.4.1. Technology-Based Effluent Limitations

Technology-based effluent limitations and standards, based on federally promulgated standards, a case-by-case basis, or a combination of the two, shall be included in all KPDES permits, where applicable.

5.4.2. Secondary Treatment Standards

Discharges of biochemically degradable wastes are subject to technology-based effluent limitations (TBELs) known as the Secondary Treatment Standards. Both state and federal regulations establish the requirements for secondary treatment. State regulations for secondary treatment only apply to non-POTWs [401 KAR 5:045].

TABLE 21.		
State Defined Secondary Treatment Standards		
Pollutant or Pollutant Characteristic	30-day average	7-day average
BOD ₅ (mg/l)	30	45
TSS (mg/l)	30	45

5.5. Justification of Requirements

Chapters 5 and 10 of Title 401 of the Kentucky Administrative Regulations (KARs), cited in the following, have been duly promulgated pursuant to the requirements of Chapter 224 of the Kentucky Revised Statutes.

At a minimum, all permits shall contain technology-based effluent limitations (TBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)]. When necessary to achieve water quality standards, all permits shall contain water quality-based effluent limitations (WQBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(d)]. Any WQBELs included in this permit are based upon the Kentucky Water Quality Standards (KYWQS) [401 KAR 10:031].

5.5.1. Internal Monitoring Point

The monitoring requirements for these parameters are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(iii)], and the requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48].

5.5.2. Flow

The monitoring requirements for this parameter are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(ii)] and requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48].

5.5.3. BOD₅

The limitations for this parameter are consistent with the secondary treatment standards for biochemically degradable wastes as defined in state regulations [401 KAR 5:045, Section 2].

5.5.4. Total Suspended Solids

The limitations for this parameter are consistent with the secondary treatment standards for biochemically degradable wastes as defined in state regulations [401 KAR 5:045, Section 2]. These effluent limitations are also consistent with Kentucky's Water Quality Standards [401 KAR 10:031, Section 4(1)(g)].

5.5.5. Total Residual Chlorine

The minimum requirement for this parameter is consistent with the requirements of 40 CFR 125.3(c)(2) as incorporated by 401 KAR 5:080, Section 2(3). The limit is the Division of Water's "Best Professional Judgment" (BPJ) determination of the minimum Total Residual Chlorine level required to insure adequate disinfection of the sanitary wastewater.

SECTION 6

OUTFALL 004

6. OUTFALL 004

6.1. Outfall Description

The following table lists the outfall type, location, and description:

TABLE 22.				
Outfall Type	Latitude (N)	Longitude (W)	Receiving Water	Description of Outfall
Internal	38°35'10"	85°24'47"	BAP/Outfall 008	Boiler Chemical Cleaning Waste Water

6.2. Reported Values

In the previous permit, the boiler chemical cleaning waste water plant discharged to a combined bottom and fly ash treatment basin (BAP). The BAP operated as a no discharged system, therefore no monitoring or effluent limitations were proposed. Therefore, there are no reported values for this outfall at this time.

6.3. Effluent Limitations and Monitoring Requirements

Once the boiler chemical cleaning waste water starts discharging to outfall 008, the following table summarizes the effluent limitations and monitoring requirements of Outfall 004.

TABLE 23.									
EFFLUENT LIMITATIONS								MONITORING REQUIREMENTS	
Effluent Characteristic	Units	Loadings (lbs./day)		Concentrations				Frequency	Sample Type
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum		
Flow	MGD	Report	Report	N/A	N/A	N/A	N/A	1/Batch ¹	Calculated
Total Recoverable Copper	mg/l	N/A	N/A	N/A	1.0	1.0	N/A	1/Batch ¹	Grab
Total Recoverable Iron	mg/l	N/A	N/A	N/A	1.0	1.0	N/A	1/Batch ¹	Grab

¹Monitoring shall be conducted once per metal cleaning operation.

As long as the boiler chemical cleaning waste water is discharged to the BAP that operates as no discharge system, NODI Code 9 "Conditional Monitoring-Not Required This Period" can be used for the monitoring requirements at this outfall.

6.4. Pertinent Factors

The effluent limitations for this outfall were developed in accordance with DOW’s General Procedures for Limitations Development located on DOW’s webpage at:

<http://dep.ky.gov/formslibrary/Documents/General%20Procedures%20for%20Limitations%20Development.pdf>

6.4.1. Jordan Memorandum

According to 40 CFR 423.11(c) the term chemical metal cleaning waste means any wastewater resulting from the cleaning of any metal process equipment with chemical compounds, including, but not limited to, boiler tube cleaning. According to 40 CFR 423.11(d) the term metal cleaning waste means any wastewater resulting from cleaning [with or without chemical compounds] any metal process equipment including, but not limited to, boiler tube cleaning, boiler fireside cleaning, and air preheater cleaning.

There are air heater wash waters and boiler fireside wash waters discharged to the BAP and in the future Outfall 008. These waters are not a result of cleaning with chemical compounds and they do not flow through Outfall 004. In the past these wastewaters were permitted to discharge directly to the ash pond without limitations or monitoring requirements. That permitting action was done pursuant to the Jordan Memorandum. The memorandum is from J. William Jordan, US EPA Permit Assistance and Evaluation Division, to Bruce P. Smith, US EPA Enforcement Division Region III, concerning interpretation of the metal cleaning wastes guidelines in the federal effluent limitation guidelines for steam electric power generating point sources. In the memorandum, Mr. Jordan explains that “All water washing operations are ‘low volume’ while any discharge from an operation involving chemical cleaning should be included in the metal cleaning category.” With that in mind, it makes sense that the limitations for chemical metal cleaning wastes do not apply to the air heater wash waters and boiler fireside wash waters at this facility.

It is the BPJ of the DOW to place low volume waste requirements on these wastewaters. The DOW has developed flow-weighted limitations at Outfall 008 to insure compliance with the federal effluent limitation guidelines for low volume wastes, chemical metal cleaning wastes, and other process wastewaters.

6.4.2. Technology-Based Effluent Limitations

Technology-based effluent limitations and standards, based on federally promulgated standards, a case-by-case basis, or a combination of the two, shall be included in all KPDES permits, where applicable.

6.4.2.1. Federal Effluent Limitations Guidelines

EPA has established a minimum level of technology that must be applied to certain industries. Due to the operations at this facility, all applicable sections of 40 CFR 423 shall be applied to this outfall. The following is a list of those requirements:

40 CFR 423.12(b)(5)

The quantity of pollutants discharged in metal cleaning wastes shall not exceed the quantity determined by multiplying the flow of metal cleaning wastes times the concentration listed in the following table:

TABLE 24.		
BPT Effluent Requirements – Metal Cleaning Wastes		
Effluent Characteristic	Maximum for any one day	Maximum for monthly average
TSS	100.0 mg/l	30.0 mg/l
Oil and Grease	20.0 mg/l	15.0 mg/l
Copper, Total	1.0 mg/l	1.0 mg/l

Iron, Total	1.0 mg/l	1.0 mg/l
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40 CFR 423.12(b) (12)

At the permitting authority’s discretion, the quantity of pollutant allowed to be discharged may be expressed as concentration limitations instead of the mass-based limitations specified in paragraphs (b)(3) through (b)(7), and (b)(11), of this section concentration limitations shall be those concentrations specified in this section.

In accordance with Sections 423.12 (b) (12) the permitting authority may allow the quantity of pollutant discharge to be expressed as a concentration limitation instead of a mass based limitation. The DOW has determined to apply the requirements of 40 CFR Part 423 in this manner.

40 CFR 423.13(e)

The quantity of pollutants discharged in chemical metal cleaning wastes shall not exceed the quantity determined by multiplying the flow of chemical metal cleaning wastes times the concentration listed in the following table:

TABLE 25.		
BAT Effluent Requirements – Chemical Metal Cleaning Wastes		
Effluent Characteristic	Maximum for any one day	Maximum for monthly average
Copper, Total	1.0 mg/l	1.0 mg/l
Iron, Total	1.0 mg/l	1.0 mg/l

40 CFR 423.13(m)

At the permitting authority’s discretion, the quantity of pollutant allowed to be discharged may be expressed as concentration limitations instead of the mass-based limitations specified in paragraphs (b) through (l) of this section concentration limitations shall be those concentrations specified in this section.

In accordance with Sections 423.13 (m) the permitting authority may allow the quantity of pollutant discharge to be expressed as a concentration limitation instead of a mass based limitation. The DOW has determined to apply the requirements of 40 CFR Part 423 in this manner

40 CFR 423.15(a) (4)

The quantity of pollutants discharged in chemical metal cleaning wastes shall not exceed the quantity determined by multiplying the flow of chemical metal cleaning wastes times the concentration listed in the following table:

TABLE 26.		
NSPS Effluent Requirements – Chemical Metal Cleaning Wastes		
Effluent Characteristic	Maximum for any one day	Maximum for monthly average
TSS	100.0 mg/l	30.0 mg/l
Oil and Grease	20.0 mg/l	15.0 mg/l
Copper, Total	1.0 mg/l	1.0 mg/l
Iron, Total	1.0 mg/l	1.0 mg/l

40 CFR 423.15(a)(13)

At the permitting authority’s discretion, the quantity of pollutant allowed to be discharged may be expressed as concentration limitations instead of the mass-based limitations specified in paragraphs (a)(1) through (a)(13) of this section concentration limitations shall be those concentrations specified in this section.

In accordance with Sections 423.15 (a)(13) the permitting authority may allow the quantity of pollutant discharge to be expressed as a concentration limitation instead of a mass based limitation. The DOW has determined to apply the requirements of 40 CFR Part 423 in this manner

6.4.3. Total Suspended Solids, and Oil and Grease

Since Outfall 004 effluent is directed to the no discharge BAP- bottom ash pond, and will be directed to the future Knock-Out/Process Waters Pond, the limitations for these pollutants has been applied at Outfall 008 after commingling with other waters. The DOW has developed flow-weighted limitations to insure compliance with the federal effluent limitation guidelines.

6.5. Justification of Requirements

Chapters 5 and 10 of Title 401 of the Kentucky Administrative Regulations (KARs), cited in the following, have been duly promulgated pursuant to the requirements of Chapter 224 of the Kentucky Revised Statutes.

At a minimum, all permits shall contain technology-based effluent limitations (TBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)]. When necessary to achieve water quality standards, all permits shall contain water quality-based effluent limitations (WQBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(d)]. Any WQBELs included in this permit are based upon the Kentucky Water Quality Standards (KYWQS) [401 KAR 10:031].

6.5.1. Internal Monitoring Point

The monitoring requirements for these parameters are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(iii)], and the requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48].

6.5.2. Flow

The monitoring requirements for this parameter are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(ii)] and requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48].

6.5.3. Total Copper and Total Iron

The limits for these parameters are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)(1) and 122.44(i)(1)], the criteria and standards for imposing TBELs [401 KAR 5:065, Section 2(6) – 40 CFR 122 Appendix A], representative of the BPT, BAT and NSPS requirements for metal cleaning wastes [40 CFR 423.12(b)(5)], [40 CFR 423.13(e)], and [40 CFR 423.15(a)(10)].

SECTION 7

OUTFALL 005

7. OUTFALL 005**7.1. Outfall Description**

The following table lists the outfall type, location, and description:

TABLE 27.				
Outfall Type	Latitude (N)	Longitude (W)	Receiving Water	Description of Outfall
External	38°35'16"	85°25'20"	Plant Intake from Ohio River	Raw Water Intake

7.2. Reported Values

The following table summarizes the reported values for Outfall 005:

TABLE 28.							
Reported Parameters	Units	EFFLUENT					
		Loadings (lbs./day)		Concentrations			
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum
Flow	MGD	30.74	40.21	N/A	N/A	N/A	N/A
Temperature	°F	N/A	N/A	N/A	59.46	65.54	N/A
Hardness	mg/l	N/A	N/A	N/A	154.04	154.04	N/A
pH	SU	N/A	N/A	7.05	N/A	N/A	8.76

The above values are based off of 5-year DMR averages from 09/30/2012 to 07/31/2017.

7.3. Effluent Limitations and Monitoring Requirements

The following table summarizes the effluent limitations and monitoring requirements for Outfall 005:

TABLE 29.									
EFFLUENT LIMITATIONS								MONITORING REQUIREMENTS	
Effluent Characteristic	Units	Loadings (lbs./day)		Concentrations				Frequency	Sample Type
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum		
Flow	MGD	Report	Report	N/A	N/A	N/A	N/A	Continuous	Recorder
Temperature	°F	N/A	N/A	N/A	Report	Report	N/A	Continuous	Recorder
Hardness (as mg/l CaCO ₃)	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Metals ¹	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab

TABLE 29.

EFFLUENT LIMITATIONS								MONITORING REQUIREMENTS	
Effluent Characteristic	Units	Loadings (lbs./day)		Concentrations				Frequency	Sample Type
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum		
¹ The term Total Recoverable Metals means those metals listed on Form C, Section V, Part C – Metals, Cyanide, and Phenols: Antimony, Arsenic, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Silver, Thallium, and Zinc.									

7.4. Pertinent Factors

The effluent limitations for this outfall were developed in accordance with DOW's General Procedures for Limitations Development located on DOW's webpage at:

<http://dep.ky.gov/formslibrary/Documents/General%20Procedures%20for%20Limitations%20Development.pdf>

7.5. Justification of Requirements

Chapters 5 and 10 of Title 401 of the Kentucky Administrative Regulations (KARs), cited in the following, have been duly promulgated pursuant to the requirements of Chapter 224 of the Kentucky Revised Statutes.

At a minimum, all permits shall contain technology-based effluent limitations (TBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)]. When necessary to achieve water quality standards, all permits shall contain water quality-based effluent limitations (WQBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(d)]. Any WQBELs included in this permit are based upon the Kentucky Water Quality Standards (KYWQS) [401 KAR 10:031].

7.5.1. Flow

The monitoring requirements for this parameter are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(ii)] and requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48].

7.5.2. Temperature, Total Recoverable Metals, and Hardness

The monitoring requirements for these parameters is consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(i)] and requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48].

7.5.3. pH

The removal of this parameter is consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(ii)] and requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48]. DOW has determined that effluent results for this parameter does not provide any additional insight into determining compliance with the effluent limitations at the final discharges.

SECTION 8

OUTFALL 006

8. OUTFALL 006

8.1. Outfall Description

The following table lists the outfall type, location, and description:

TABLE 30.				
Outfall Type	Latitude (N)	Longitude (W)	Receiving Water	Description of Outfall
Internal	38°35'11"	85°24'45"	Outfall 002	Tier 1: Unit 2 FGD-Gypsum Process Water, Coal-Limestone Piles Equipment Washdown, Water Treatment Building Sumps, Boiler Blowdown/Condensate Polishing/ Quench Wastewater, Coal-Limestone Piles Areas Precipitation Runoff, and GSP Pond Direct Precipitation
				Tier 2: Unit 2 FGD-Gypsum Process Water, Coal-Limestone Piles Equipment Washdown, Water Treatment Building Sumps, Boiler Blowdown/Condensate Polishing/ Quench Wastewater, Coal-Limestone Piles Areas Precipitation Runoff, GSP Pond Direct Precipitation, and CCRT-Handling Area CCR-Contact Precipitation Runoff

8.2. Reported Values

The following table summarizes the reported values for Outfall 006:

TABLE 31.							
Reported Parameters	Units	EFFLUENT					
		Loadings (lbs./day)		Concentrations			
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum
Flow	MGD	1.35	3.34	N/A	N/A	N/A	N/A
Total Recoverable Metals	mg/l	N/A	N/A	N/A	0.654	0.654	N/A
Total Suspended Solids	mg/l	N/A	N/A	N/A	7.66	13.12	N/A
Oil & Grease	mg/l	N/A	N/A	N/A	BDL	BDL	N/A
pH	SU	N/A	N/A	5.3	N/A	N/A	7.97

The abbreviation BDL means below detection level.

The above values are based off of 5-year DMR averages from 09/30/2012 to 07/31/2017.

8.3. Effluent Limitations and Monitoring Requirements

The following table summarizes the effluent limitations and monitoring requirements for Outfall 006:

TABLE 32.									
EFFLUENT LIMITATIONS								MONITORING REQUIREMENTS	
Effluent Characteristic	Units	Loadings (lbs./day)		Concentrations				Frequency	Sample Type
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum		
Flow	MGD	Report	Report	N/A	N/A	N/A	N/A	2/Month	Instantaneous
Total Suspended Solids	mg/l	N/A	N/A	N/A	30.0	91.8	N/A	2/Month	Grab
Oil and Grease	mg/l	N/A	N/A	N/A	14.0	18.8	N/A	2/Month	Grab

8.4. Pertinent Factors

The effluent limitations for this outfall were developed in accordance with DOW’s General Procedures for Limitations Development located on DOW’s webpage at:

<http://dep.ky.gov/formslibrary/Documents/General%20Procedures%20for%20Limitations%20Development.pdf>

8.4.1. Tiered Limits

The facility is in the process of closing out their BAP- bottom ash pond. In order to do this the facility must redirect flows that are currently discharging to the BAP to a new knock out pond and process pond. Therefore, tiered limits were proposed for the phase when the facilities knockout pond is constructed and discharging to internal outfall 006. At the request of the permittee, the most stringent of the calculated limits for TSS and Oil & Grease from section 8.5 will be placed on the permit to avoid the need to tier this outfall. The knockout pond will continue to discharge to outfall 006, until the process pond is complete, at which point it will start discharging through the process pond to internal outfall 008.

8.4.2. Legacy Wastewater

Once the facility starts having the Knockout and Process pond start discharging directly to outfall 002 via internal outfall 008 and not through the Gypsum Storage Pond (outfall 006) there will be no more sources contributing wastewater to this pond. The wastewater from the operations that were contributing to will still be in the impoundment unit it has been closed. Since the overall volumes of legacy wastewater will continue to decrease dramatically over time as the facility dewater the pond through outfall 002 unit the pond is ultimately closed, the Division will continue to apply the more stringent limitations for TSS and Oil & Grease to this outfall that applied when these operations were contributing to the outfall.

8.4.3. Technology-Based Effluent Limitations

Technology-based effluent limitations and standards, based on federally promulgated standards, a case-by-case basis, or a combination of the two, shall be included in all KPDES permits, where applicable.

8.4.3.1. Federal Effluent Limitations Guidelines

EPA has established a minimum level of technology that must be applied to certain industries. Due to the operations at this facility, all applicable sections of 40 CFR 423 shall be applied to this outfall. The following is a list of those requirements:

40 CFR 423.12(b) (3)

The quantity of pollutants discharged from low volume waste sources shall not exceed the quantity determined by multiplying the flow of low volume waste sources times the concentration listed in the following table:

TABLE 33.		
BPT Effluent Requirements – Low Volume Waste		
Effluent Characteristic	Maximum for any one day	Maximum for monthly average
TSS	100.0 mg/l	30.0 mg/l
Oil and Grease	20.0 mg/l	15.0 mg/l

40 CFR 423.12(b) (9)

Subject to the provisions of paragraph (b)(10) of this section, the following effluent limitations shall apply to the point source discharges of coal pile runoff:

TABLE 34.

BPT Effluent Requirements – Coal Pile Runoff		
Effluent Characteristic	Maximum for any one day	Maximum for monthly average
TSS	50 mg/l	-

40 CFR 423.12(b) (10)

Any untreated overflow from facilities designed, constructed, and operated to treat the volume of coal pile runoff which is associated with a 10 year, 24 hour rainfall event shall not be subject to the limitations in paragraph (b)(9) of this section

40 CFR 423.12(b) (11)

The quantity of pollutants discharged in FGD wastewater, flue gas mercury control wastewater, combustion residual leachate, or gasification wastewater shall not exceed the quantity determined by multiplying the flow of the applicable wastewater times the concentration listed in the following table:

TABLE 35.		
BPT Effluent Requirements – FGD wastewater		
Effluent Characteristic	Maximum for any one day	Maximum for monthly average
TSS	100.0 mg/l	30.0 mg/l
Oil and Grease	20.0 mg/l	15.0 mg/l

40 CFR 423.12(b) (12)

At the permitting authority’s discretion, the quantity of pollutant allowed to be discharged may be expressed as concentration limitations instead of the mass-based limitations specified in paragraphs (b)(3) through (b)(7), and (b)(11), of this section concentration limitations shall be those concentrations specified in this section.

In accordance with Sections 423.12 (b) (12) the permitting authority may allow the quantity of pollutant discharge to be expressed as a concentration limitation instead of a mass based limitation. The DOW has determined to apply the requirements of 40 CFR Part 423 in this manner.

40 CFR 423.12(b)(13)

In the event that waste streams from various sources are combined for treatment to be discharge, the quantity of each pollutant or pollutant property controlled in paragraphs (b)(1) through (b)(12) of this section attributable to each controlled waste source shall not exceed the specified limitations for that waste source.

40 CFR 423.13(g)(ii)

For FGD wastewater generated before the date determined by the permitting authority, as specified in paragraph (g)(1)(i), the quantity of pollutants discharged in FGD wastewater shall not exceed the quantity determined by multiplying the flow of FGD wastewater times the concertation listed for TSS in 423.12(b)(11).

40 CFR 423.13(m)

At the permitting authority’s discretion, the quantity of pollutant allowed to be discharged may be expressed as concentration limitations instead of the mass-based limitations specified in paragraphs (b) through (l) of this section concentration limitations shall be those concentrations specified in this section.

In accordance with Sections 423.13 (m) the permitting authority may allow the quantity of pollutant discharge to be expressed as a concentration limitation instead of a mass based limitation. The DOW has determined to apply the requirements of 40 CFR Part 423 in this manner

40 CFR 423.15(a)

Any new source as of November 19, 1982, subject to paragraph (a) of this section, must achieve the following new source performance standards, in addition to the limitations in 423.13 of this part, established on November 3, 2015. In the case of conflict, the more stringent requirements apply.

40 CFR 423.15(a) (2)

The quantity of pollutants discharged in low volume waste sources, FGD wastewater, flue gas mercury control wastewater, combustion residual leachate, and gasification wastewater shall not exceed the quantity determined by multiplying the flow of low volume waste sources times the concentration listed in the following table:

TABLE 36.		
BPT Effluent Requirements – Low volume wastes		
Effluent Characteristic	Maximum for any one day	Maximum for monthly average
TSS	100.0 mg/l	30.0 mg/l
Oil and Grease	20.0 mg/l	15.0 mg/l

40 CFR 423.15(a)(11)

Subject to the provisions of paragraph (a)(12) of this section, the quantity or quality of pollutants or pollutant parameters discharged in coal pile runoff shall not exceed the standards specified below:

TABLE 37.	
NSPS Effluent Requirements – Coal Pile Runoff	
Effluent Characteristic	NSPS for any time
TSS	Not to exceed 50 mg/l

40 CFR 423.15(a)(12)

Any untreated overflow from facilities designed, constructed, and operated to treat the coal pile runoff which results from a 10 year, 24 hour rainfall event shall not be subject to the standards in paragraph (a)(11) of this section.

40 CFR 423.15(a)(13)

At the permitting authority’s discretion, the quantity of pollutant allowed to be discharged may be expressed as concentration limitations instead of the mass-based limitations specified in paragraphs (a)(1) through (a)(13) of this section concentration limitations shall be those concentrations specified in this section.

In accordance with Sections 423.15 (a)(13) the permitting authority may allow the quantity of pollutant discharge to be expressed as a concentration limitation instead of a mass based limitation. The DOW has determined to apply the requirements of 40 CFR Part 423 in this manner

40 CFR 423.15(a)(14)

In the event that waste streams from various sources are combined for treatment or discharge, the quantity of each pollutant or pollutant property controlled in paragraphs (a)(1) through (13) of this section attributable to each wastes source shall not exceed the specified limitation for that waste source.

8.4.3.2. Best Professional Judgment (BPJ)

Coal Pile Runoff

In accordance with 401 KAR 5:080, Section 2(3) – 40 CFR 125.3 in the absence of promulgated technology based standards, the cabinet may develop appropriate technology based standards utilizing its ‘Best Professional Judgment’ (BPJ). The precious permit established the following BPJ limits for coal pile runoff.

TABLE 38.		
BPJ Effluent Requirements – Coal Pile Runoff		
Effluent Characteristic	Maximum for any one day	Maximum for monthly average
TSS	N/A	30.0 mg/l
Oil and Grease	5.0 mg/l	5.0 mg/l

These limits have not been changed for this permit renewal in accordance with anti-backsliding [40 CFR 122.44(l)].

Stormwater - Total Suspended Solids

The facility treats its storm water for this parameter before discharge in a holding pond. Sedimentation is a commonly used treatment technology for the removal of total suspended solids that is both efficient and cost effective. Although several factors may influence the final concentration of total suspended solids in the discharge, it has been the experience of the Division that ponds that retain wastewater for 6 hours or more can achieve a total suspended solids concentration of 30 mg/l as a monthly average and 60 mg/l as a daily maximum.

Stormwater -Oil & Grease

The facility does not treat its stormwater for this parameter before discharge. If treatment were to be necessary, an adequately sized oil /water separator with ample retention time would provide appropriate treatment. Flotation or gravity separation of lighter petroleum based products from water is a common and cost effective method for the removal of oil & grease. It has been the experience of the Division that this treatment method can achieve an oil & grease concentration of 10 mg/l as a monthly average and 15 mg/l as a daily maximum.

8.5. Limitation Calculations

8.5.1. Technology-Based Effluent Limitations

Tier 1

Outfall 006 Tier 1									
Source	Flow	TSS ELG		TSS Cal		O&G ELG		O&G Cal	
		AVG	MAX	AVG	MAX	AVG	MAX	AVG	MAX
Precipitation GSP-Gypsum Storage Pond	0.1131	30	60	3.393	6.786	10	15	1.131	1.6965
Unit 2 FGD Gypsum Sluice to GSP	0.8802	30	100	26.406	88.02	15	20	13.203	17.604
Coal Conveyor Equipment Washdowns	0.0167	30	100	0.501	1.67	15	20	0.2505	0.334
Limestone Prep Misc Eqpt Cooling & washdown	0.0009	30	100	0.027	0.09	15	20	0.0135	0.018
Precipitation Limestone Stor-Handing	0.0156	30	60	0.468	0.936	10	15	0.156	0.234
Precipitation Coal Pile & Maint Shop	0.0792	30	50	2.376	3.96	5	5	0.396	0.396
Precipitation Runoff Field & Helipad	0.0181	30	60	0.543	1.086	10	15	0.181	0.2715
Precipitation Runoff Pond Basin & Slopes	0.0151	30	60	0.453	0.906	10	15	0.151	0.2265
Unit 1 Boiler Drains & Blowoff Tank	0.0489	30	100	1.467	4.89	15	20	0.7335	0.978
Unit 2 Boiler Drain Sump	0.0322	30	100	0.966	3.22	15	20	0.483	0.644
Unit 2 Condensate Polishing Wastewaters	0.006	30	100	0.18	0.6	15	20	0.09	0.12
Water Treatment Bldg. Service Water Strainers Backwash	0.0653	30	100	1.959	6.53	15	20	0.9795	1.306
Clarifiers & Gravity Filters backwash	0.0058	30	100	0.174	0.58	15	20	0.087	0.116
Reverse Osmosis DM Pretreatment System Reject Stream	0.3524	30	100	10.572	35.24	15	20	5.286	7.048
Units 1&2 Demineralizer Regen Streams	0.0008	30	100	0.024	0.08	15	20	0.012	0.016
Total	1.6503			49.509	154.594			23.153	31.0085
			limit	30	93.6763			14.02957	18.78961

Tier 2

Outfall 006 Tier 2									
Source	Flow	TSS ELG		TSS Cal		O&G ELG		O&G Cal	
		AVG	MAX	AVG	MAX	AVG	MAX	AVG	MAX
Precipitation GSP-Gypsum Storage Pond	0.1131	30	60	3.393	6.786	10	15	1.131	1.6965
Unit 2 FGD Gypsum Sluice to GSP	0.8772	30	100	26.316	87.72	15	20	13.158	17.544
Reclaim HydroCyclone Overflow	0.0003	30	100	0.009	0.03	15	20	0.0045	0.006
Coal Conveyor Equipment Washdowns	0.0167	30	100	0.501	1.67	15	20	0.2505	0.334
Limestone Prep Misc Eqpt Cooling & washdown	0.0009	30	100	0.027	0.09	15	20	0.0135	0.018
Precipitation Limestone Stor-Handing	0.0156	30	60	0.468	0.936	10	15	0.156	0.234
Precipitation Coal Pile & Maint Shop	0.0792	30	50	2.376	3.96	10	15	0.792	1.188
Precipitation Runoff Field & Helipad	0.0181	30	60	0.543	1.086	10	15	0.181	0.2715
Precipitation Runoff Pond Basin & Slopes	0.0151	30	60	0.453	0.906	10	15	0.151	0.2265
Unit 1 Boiler Drains & Blowoff Tank	0.0489	30	100	1.467	4.89	15	20	0.7335	0.978
Unit 2 Boiler Drain Sump	0.0322	30	100	0.966	3.22	15	20	0.483	0.644
Unit 2 Condensate Polishing Wastewaters	0.006	30	100	0.18	0.6	15	20	0.09	0.12
Water Treatment Bldg. Service Water Strainers Backwash	0.0653	30	100	1.959	6.53	15	20	0.9795	1.306
Clarifiers & Gravity Filters backwash	0.0058	30	100	0.174	0.58	15	20	0.087	0.116
Reverse Osmosis DM Pretreatment System Reject Stream	0.3524	30	100	10.572	35.24	15	20	5.286	7.048
Units 1&2 Demineralizer Regen Streams	0.0008	30	100	0.024	0.08	15	20	0.012	0.016
Precipitation CCRT Handling, Base Haul Road, PWS-Bio Bldgs, U2-Cool Tower	0.0942	30	60	2.826	5.652	10	15	0.942	1.413
Total	1.7418			52.254	159.976			24.4505	33.1595
			Limit	30	91.84522			14.03749	19.03749

8.6. Justification of Requirements

Chapters 5 and 10 of Title 401 of the Kentucky Administrative Regulations (KARs), cited in the following, have been duly promulgated pursuant to the requirements of Chapter 224 of the Kentucky Revised Statutes.

At a minimum, all permits shall contain technology-based effluent limitations (TBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)]. When necessary to achieve water quality standards, all permits shall contain water quality-based effluent limitations (WQBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(d)]. Any WQBELs included in this permit are based upon the Kentucky Water Quality Standards (KYWQS) [401 KAR 10:031].

8.6.1. Internal Monitoring Point

The monitoring requirements for these parameters are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(iii)], and the requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48].

8.6.2. Flow

The monitoring requirements for this parameter are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(ii)] and requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48].

8.6.3. Total Suspended Solids

The limits for these parameters are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)(1) and 122.44(i)(1)], the criteria and standards for imposing TBELs [401 KAR 5:065, Section 2(6) – 40 CFR 122 Appendix A], representative of the BPT requirements for low volume waste [40 CFR 423.12(b)(3)], BPT requirements for coal pile runoff [40 CFR 423.12(b)(9)], BPT and BAT requirements for FGD Wastewater [40 CFR 423.12(b)(12)] and [40 CFR 423.13(g)(1)(ii)], NSPS requirements for low volume waste [40 CFR 423.15(a)(3)], NSPS requirements for coal pile runoff [40 CFR 423.15(a)(11)], and imposing Best Professional Judgement [401 KAR 5:080, Section 2(3) – 40 CFR 125.3].

8.6.4. Oil & Grease

The limits for these parameters are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)(1) and 122.44(i)(1)], the criteria and standards for imposing TBELs [401 KAR 5:065, Section 2(6) – 40 CFR 122 Appendix A], representative of the BPT requirements for low volume waste [40 CFR 423.12(b)(3)], BPT and BAT requirements for FGD Wastewater [40 CFR 423.12(b)(12)] and [40 CFR 423.13(g)(1)(ii)], NSPS requirements for low volume waste [40 CFR 423.15(a)(3)], and imposing Best Professional Judgement [401 KAR 5:080, Section 2(3) – 40 CFR 125.3].

8.6.5. Total Recoverable Metals

The removal of this parameter is consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(ii)] and requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48]. Since this outfall is an internal outfall and not discharging directly to the Ohio River State Water Quality Standards do not apply at this outfall.

SECTION 9

OUTFALL 007

9. OUTFALL 007

9.1. Outfall Description

The following table lists the outfall type, location, and description:

TABLE 39.				
Outfall Type	Latitude (N)	Longitude (W)	Receiving Water	Description of Outfall
Internal	38°35'11"	85°24'45"	Outfall 002	Treated FGD Wastewater

9.2. Effluent Limitations and Monitoring Requirements

The following table summarizes the effluent limitations and monitoring requirements for Outfall 007:

TABLE 40.									
EFFLUENT LIMITATIONS								MONITORING REQUIREMENTS	
Effluent Characteristic	Units	Loadings (lbs./day)		Concentrations				Frequency	Sample Type
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum		
Flow	MGD	Report	Report	N/A	N/A	N/A	N/A	2/Month	Instantaneous
Total Suspended Solids	mg/l	N/A	N/A	N/A	30.0	100.0	N/A	2/Month	Grab
Oil & Grease	mg/l	N/A	N/A	N/A	15.0	20.0	N/A	2/Month	Grab
Total Recoverable Arsenic ¹	µg/l	N/A	N/A	N/A	8	18	N/A	1/Month	Grab
Total Recoverable Mercury ¹	ng/l	N/A	N/A	N/A	34	103	N/A	1/Month	Grab
Total Recoverable Selenium ¹	µg/l	N/A	N/A	N/A	29	70	N/A	1/Month	Grab
Nitrate/nitrite as N ¹	mg/l	N/A	N/A	N/A	3	4	N/A	1/Month	Grab

¹These limits do not become effective till April 1st, 2024.

Until FGD treatment system is built and FGD starts discharging through this internal outfall NODI Code 9 "Conditional Monitoring-Not Required This Period" can be used for the monitoring requirements at this outfall.

9.3. Pertinent Factors

As the designated water pollution agency (KRS 244.16-060) for the Clean Water Act, the cabinet is required to obtain EPA approval for any changes to its state water quality standards (33 U.S.C. Section 303(c)). House Bill 386 (21 RS HB 386 enacted March 24, 2021) purports to require changes to state water quality standards (401 KAR Chapter 10). EEC believes that some of those changes would not be approvable. Unless and until 401 KAR Chapter 10 changes are promulgated and approved, the cabinet cannot issue a KPDES permit that includes limits based on HB 386. Additionally, calculating effluent limits as required by HB386 would violate DOW's MOA with EPA, since the MOA requires the cabinet to comply with the Clean Water Act (including 33 U.S.C. Section 303(c)) when calculating permit limits.

The effluent limitations for this outfall were developed in accordance with DOW's General Procedures for Limitations Development located on DOW's webpage at:

<http://dep.ky.gov/formslibrary/Documents/General%20Procedures%20for%20Limitations%20Development.pdf>

9.3.1. Technology-Based Effluent Limitations

Technology-based effluent limitations and standards, based on federally promulgated standards, a case-by-case basis, or a combination of the two, shall be included in all KPDES permits, where applicable.

9.3.1.1. FGD ELG Compliance Date

The Trimble County Generating Station existing FGDWW treatment system will be modified by constructing a new selenium / biological treatment system (ELG System) to post-treat the existing physical-chemical equipment flows. Included in the ELG System are outdoor bioreactors, sump and new building housing additional process equipment, electrical switchgear, control panels, laboratory and chemical storage tanks. The solids from the ELG System will be integrated into the existing FGDWW solids management flows. Treated effluent flow will continue to be directed to Outfall 002 and ultimately discharged via its high-rate multiport diffuser to the Ohio River.

40 CFR 423.13(g)(1)(i) require that the quantity of pollutants in FGD wastewater shall not exceed the quantity determined by 40 CFR 423.13(g)(1)(i). The permittee must meet this requirement by a date determined by the permitting authority. For FGD wastewater, the date has to be as soon as possible beginning October 13, 2021, but no later than December 31, 2025. The definition for the phrase "as soon as possible" can be found in 40 CFR 423.11(t). The permittee provided the Division of Water information to determine as soon as possible ELG compliance applicability dates.

LG&E awarded the Engineering, Procurement, and Construction agreement on March 15, 2021. Because the FGDWW treatment system activities are complex and highly integrated with existing plant systems. Following transfer of care, custody, and control of the system to LG&E, as well as plant troubleshooting-optimization efforts, LG&E requests an applicability date for the FGDWW system of April 1, 2024. For the FGDWW specific-activities, these phases and general expected durations include:

- Detailed engineering: beginning March 2021
- Procurement: beginning Q2 2021
- Construction – multi – discipline and multi – trades: beginning Q3 2021
- Mechanical startup, troubleshooting and testing; beginning Q2 2023
- Commercial Completion and performance test: beginning Q3 2023
- Plant testing and optimization: beginning Q4 2023

The DOW grants LG&E's requested compliance date. The discharge requirements for BAT FGD wastewater shall become effective on April 1, 2024.

9.3.1.2. Federal Effluent Limitations Guidelines

EPA has established a minimum level of technology that must be applied to certain industries. Due to the operations at this facility, all applicable sections of 40 CFR 423 shall be applied to this outfall. The following is a list of those requirements:

40 CFR 423.12(b) (11)

The quantity of pollutants discharged in FGD wastewater, flue gas mercury control wastewater, combustion residual leachate, or gasification wastewater shall not exceed the quantity determined by multiplying the flow of the applicable wastewater times the concentration listed in the following table:

TABLE 41.		
BPT Effluent Requirements – FGD wastewater		
Effluent Characteristic	Maximum for any one day	Maximum for monthly average
TSS	100.0 mg/l	30.0 mg/l
Oil and Grease	20.0 mg/l	15.0 mg/l

40 CFR 423.12(b) (12)

At the permitting authority’s discretion, the quantity of pollutant allowed to be discharged may be expressed as concentration limitations instead of the mass-based limitations specified in paragraphs (b)(3) through (b)(7), and (b)(11), of this section concentration limitations shall be those concentrations specified in this section.

In accordance with Sections 423.12 (b) (12) the permitting authority may allow the quantity of pollutant discharge to be expressed as a concentration limitation instead of a mass based limitation. The DOW has determined to apply the requirements of 40 CFR Part 423 in this manner.

40 CFR 423.13(g) (1)(i)

Except for those discharges to which paragraph (g)(2) or (g)(3) of this section applies, the quantity of pollutants in FGD wastewater shall not exceed the quantity determined by multiplying the flow of FGD wastewater times the concentration listed in the table 1 following this paragraph (g)(1)(i). Dischargers must meet the effluent limitations for FGD wastewater in this paragraph by a date determined by the permitting authority that is as soon as possible beginning October 13, 2021, but no later than December 31, 2025. These effluent limitations apply to the discharge of FGD wastewater generated on and after the date determined by the permitting authority for meeting the effluent limitations, as specified in this paragraph.

TABLE 42.		
BAT Effluent Requirements – FGD wastewater		
Effluent Characteristic	Maximum for any one day	Maximum for monthly average
Arsenic, total	18 µg/l	8 µg/l
Mercury, total	103 ng/l	34 ng/l
Selenium, total	70 µg/l	29 µg/l
Nitrate/nitrite as N	4 mg/l	3 mg/l

40 CFR 423.13(g) (1)(ii)

For FGD wastewater generated before the date determined by the permitting authority, as specified in paragraph (g)(1)(i), the quantity of pollutants discharged in FGD wastewater shall not exceed the quantity determined by multiplying the flow of FGD wastewater times the concentration listed for TSS in 423.12(b)(11).

40 CFR 423.13(m)

At the permitting authority’s discretion, the quantity of pollutant allowed to be discharged may be expressed as concentration limitations instead of the mass-based limitations specified in paragraphs (b) through (l) of this section concentration limitations shall be those concentrations specified in this section.

In accordance with Sections 423.13 (m) the permitting authority may allow the quantity of pollutant discharge to be expressed as a concentration limitation instead of a mass based limitation. The DOW has determined to apply the requirements of 40 CFR Part 423 in this manner

40 CFR 423.15(a)

Any new source as of November 19, 1982, subject to paragraph (a) of this section, must achieve the following new source performance standards, in addition to the limitations in 423.13 of this part, established on November 3, 2015. In the case of conflict, the more stringent requirements apply.

40 CFR 423.15(a) (2)

The quantity of pollutants discharged in low volume waste sources, FGD wastewater, flue gas mercury control wastewater, combustion residual leachate, and gasification wastewater shall not exceed the quantity determined by multiplying the flow of low volume waste sources times the concentration listed in the following table:

TABLE 43.		
BPT Effluent Requirements – Low volume wastes		
Effluent Characteristic	Maximum for any one day	Maximum for monthly average
TSS	100.0 mg/l	30.0 mg/l
Oil and Grease	20.0 mg/l	15.0 mg/l

40 CFR 423.15(a)(13)

At the permitting authority’s discretion, the quantity of pollutant allowed to be discharged may be expressed as concentration limitations instead of the mass-based limitations specified in paragraphs (a)(1) through (a)(13) of this section concentration limitations shall be those concentrations specified in this section.

In accordance with Sections 423.15 (a)(13) the permitting authority may allow the quantity of pollutant discharge to be expressed as a concentration limitation instead of a mass based limitation. The DOW has determined to apply the requirements of 40 CFR Part 423 in this manner

9.4. Justification of Requirements

Chapters 5 and 10 of Title 401 of the Kentucky Administrative Regulations (KARs), cited in the following, have been duly promulgated pursuant to the requirements of Chapter 224 of the Kentucky Revised Statutes.

At a minimum, all permits shall contain technology-based effluent limitations (TBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)]. When necessary to achieve water quality standards, all permits shall contain water quality-based effluent limitations (WQBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(d)]. Any WQBELs included in this permit are based upon the Kentucky Water Quality Standards (KYWQS) [401 KAR 10:031].

9.4.1. Internal Monitoring Point

The monitoring requirements for these parameters are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(iii)], and the requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48].

9.4.2. Flow

The monitoring requirements for this parameter are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(ii)] and requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48].

9.4.3. Total Arsenic, Total Mercury, Total Selenium, and Nitrate/nitrite

The limits for these parameters are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)(1) and 122.44(i)(1)], the criteria and standards for imposing TBELs [401 KAR 5:065, Section 2(6) – 40 CFR 122 Appendix A], and representative of the BAT and NSPS requirements for FGD wastewater [40 CFR 423.13(g)(1)(i)] and [40 CFR 423.15(a)].

9.4.4. Total Suspended Solids and Oil & Grease

The limits for these parameters are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)(1) and 122.44(i)(1)], the criteria and standards for imposing TBELs [401 KAR 5:065, Section 2(6) – 40 CFR 122 Appendix A], and representative of the BPT and NSPS requirements for FGD wastewater [40 CFR 423.12(11)] and [40 CFR 423.15(a)(3)].

SECTION 10

OUTFALL 008

10. OUTFALL 008

10.1. Outfall Description

The following table lists the outfall type, location, and description:

TABLE 44.				
Outfall Type	Latitude (N)	Longitude (W)	Receiving Water	Description of Outfall
Internal	38°34'57"	85°24'42"	Outfall 002	Coal-Limestone Piles Equipment Washdown, Water Treatment Building Sumps, Boiler Blowdown/Condensate Polishing/Quench Wastewaters, Coal-Limestone Piles Area Precipitation Runoff, CCRT-Handling Area CCR-Contact Precipitation Runoff, Unit 1 Plant Sumps (including unit 1 air heater washes, unit 1 bottom ash loading area drains-sumps, unit 1 boiler turbine building, aux boiler washdowns and floor drains), Unit 2 Plant Sumps (including unit 2 air heater washes, fly ash loading area washdown, unit 1 pyrites/MR sluice dewater pit drains, unit 2 bottom ash loading area drains-sumps, unit 2 boiler-turbine building washdowns and floor drains, and fly ash marketing silo washdown/precipitation runoff sumps), Internal Outfall 004, and landfill leachate.

10.2. Effluent Limitations and Monitoring Requirements

The following table summarizes the effluent limitations and monitoring requirements for Outfall 008:

TABLE 45.									
EFFLUENT LIMITATIONS								MONITORING REQUIREMENTS	
Effluent Characteristic	Units	Loadings (lbs./day)		Concentrations				Frequency	Sample Type
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum		
Flow	MGD	Report	Report	N/A	N/A	N/A	N/A	2/Month	Instantaneous
Total Suspended Solids	mg/l	N/A	N/A	N/A	30.0	95.4	N/A	2/Month	Grab
Oil & Grease	mg/l	N/A	N/A	N/A	14.3	19.1	N/A	2/Month	Grab

10.3. Pertinent Factors

The effluent limitations for this outfall were developed in accordance with DOW’s General Procedures for Limitations Development located on DOW’s webpage at:

<http://dep.ky.gov/formslibrary/Documents/General%20Procedures%20for%20Limitations%20Development.pdf>

10.3.1. Technology-Based Effluent Limitations

Technology-based effluent limitations and standards, based on federally promulgated standards, a case-by-case basis, or a combination of the two, shall be included in all KPDES permits, where applicable.

10.3.1.1. Federal Effluent Limitations Guidelines

EPA has established a minimum level of technology that must be applied to certain industries. Due to the operations at this facility, all applicable sections of 40 CFR 423 shall be applied to this outfall. The following is a list of those requirements:

40 CFR 423.12(b) (3)

The quantity of pollutants discharged from low volume waste sources shall not exceed the quantity determined by multiplying the flow of low volume waste sources times the concentration listed in the following table:

TABLE 46.		
BPT Effluent Requirements – Low Volume Waste		
Effluent Characteristic	Maximum for any one day	Maximum for monthly average
TSS	100.0 mg/l	30.0 mg/l
Oil and Grease	20.0 mg/l	15.0 mg/l

40 CFR 423.12(b) (9)

Subject to the provisions of paragraph (b)(10) of this section, the following effluent limitations shall apply to the point source discharges of coal pile runoff:

TABLE 47.		
BPT Effluent Requirements – Coal Pile Runoff		
Effluent Characteristic	Maximum for any one day	Maximum for monthly average
TSS	50 mg/l	-

40 CFR 423.12(b) (10)

Any untreated overflow from facilities designed, constructed, and operated to treat the volume of coal pile runoff which is associated with a 10 year, 24 hour rainfall event shall not be subject to the limitations in paragraph (b)(9) of this section

40 CFR 423.12(b) (11)

The quantity of pollutants discharged in FGD wastewater, flue gas mercury control wastewater, combustion residual leachate, or gasification wastewater shall not exceed the quantity determined by multiplying the flow of the applicable wastewater times the concentration listed in the following table:

TABLE 48.		
BPT Effluent Requirements – combustion residual leachate		
Effluent Characteristic	Maximum for any one day	Maximum for monthly average
TSS	100.0 mg/l	30.0 mg/l
Oil and Grease	20.0 mg/l	15.0 mg/l

40 CFR 423.12(b) (12)

At the permitting authority’s discretion, the quantity of pollutant allowed to be discharged may be expressed as concentration limitations instead of the mass-based limitations specified in paragraphs (b)(3) through (b)(7), and (b)(11), of this section concentration limitations shall be those concentrations specified in this section.

In accordance with Sections 423.12 (b) (12) the permitting authority may allow the quantity of pollutant discharge to be expressed as a concentration limitation instead of a mass based limitation. The DOW has determined to apply the requirements of 40 CFR Part 423 in this manner.

40 CFR 423.12(b)(13)

In the event that waste streams from various sources are combined for treatment to be discharge, the quantity of each pollutant or pollutant property controlled in paragraphs (b)(1) through (b)(12) of this section attributable to each controlled waste source shall not exceed the specified limitations for that waste source.

40 CFR 423.13(l)

The quantity of pollutants discharged in combustion residual leachate shall not exceed the quantity determined by multiplying the flow of combustion residual leachate times the concertation for TSS listed in 423.12(b)(11).

40 CFR 423.13(m)

At the permitting authority’s discretion, the quantity of pollutant allowed to be discharged may be expressed as concentration limitations instead of the mass-based limitations specified in paragraphs (b) through (l) of this section concentration limitations shall be those concentrations specified in this section.

In accordance with Sections 423.13 (m) the permitting authority may allow the quantity of pollutant discharge to be expressed as a concentration limitation instead of a mass based limitation. The DOW has determined to apply the requirements of 40 CFR Part 423 in this manner

40 CFR 423.15(a)

Any new source as of November 19, 1982, subject to paragraph (a) of this section, must achieve the following new source performance standards, in addition to the limitations in 423.13 of this part, established on November 3, 2015. In the case of conflict, the more stringent requirements apply.

40 CFR 423.15(a) (3)

The quantity of pollutants discharged in low volume waste sources, FGD wastewater, flue gas mercury control wastewater, combustion residual leachate, and gasification wastewater shall not exceed the quantity determined by multiplying the flow of low volume waste sources times the concentration listed in the following table:

TABLE 49.		
NSPS Effluent Requirements – Low volume wastes		
Effluent Characteristic	Maximum for any one day	Maximum for monthly average
TSS	100.0 mg/l	30.0 mg/l
Oil and Grease	20.0 mg/l	15.0 mg/l

40 CFR 423.15(a)(11)

Subject to the provisions of paragraph (a)(12) of this section, the quantity or quality of pollutants or pollutant parameters discharged in coal pile runoff shall not exceed the standards specified below:

TABLE 50.	
NSPS Effluent Requirements – Coal Pile Runoff	
Effluent Characteristic	NSPS for any time
TSS	Not to exceed 50 mg/l

40 CFR 423.15(a)(12)

Any untreated overflow from facilities designed, constructed, and operated to treat the coal pile runoff which results from a 10 year, 24 hour rainfall event shall not be subject to the standards in paragraph (a)(11) of this section.

40 CFR 423.15(a)(13)

At the permitting authority’s discretion, the quantity of pollutant allowed to be discharged may be expressed as concentration limitations instead of the mass-based limitations specified in paragraphs (a)(1) through (a)(13) of this section concentration limitations shall be those concentrations specified in this section.

In accordance with Sections 423.15 (a)(13) the permitting authority may allow the quantity of pollutant discharge to be expressed as a concentration limitation instead of a mass based limitation. The DOW has determined to apply the requirements of 40 CFR Part 423 in this manner

40 CFR 423.15(a)(14)

In the event that waste streams from various sources are combined for treatment or discharge, the quantity of each pollutant or pollutant property controlled in paragraphs (a)(1) through (13) of this section attributable to each wastes source shall not exceed the specified limitation for that waste source.

10.3.1.2. Best Professional Judgment (BPJ)

Coal Pile Runoff

In accordance with 401 KAR 5:080, Section 2(3) – 40 CFR 125.3 in the absence of promulgated technology based standards, the cabinet may develop appropriate technology based standards utilizing its ‘Best Professional Judgment’ (BPJ). The precious permit established the following BPJ limits for coal pile runoff.

TABLE 51.		
BPJ Effluent Requirements – Coal Pile Runoff		
Effluent Characteristic	Maximum for any one day	Maximum for monthly average
TSS	N/A	30.0 mg/l
Oil and Grease	5.0 mg/l	5.0 mg/l

These limits have not been changed for this permit renewal in accordance with anti-backsliding [40 CFR 122.44(l)].

Stormwater - Total Suspended Solids

The facility treats its storm water for this parameter before discharge in a holding pond. Sedimentation is a commonly used treatment technology for the removal of total suspended solids that is both efficient and cost effective. Although several factors may influence the final concentration of total suspended solids in the discharge, it has been the experience of the Division that ponds that retain wastewater for 6 hours or more can achieve a total suspended solids concentration of 30 mg/l as a monthly average and 60 mg/l as a daily maximum.

Stormwater -Oil & Grease

The facility does not treat its stormwater for this parameter before discharge. If treatment were to be necessary, an adequately sized oil /water separator with ample retention time would provide appropriate treatment. Flotation or gravity separation of lighter petroleum based products from water is a common and cost effective method for the removal of oil & grease. It has been the experience of the Division that this treatment method can achieve an oil & grease concentration of 10 mg/l as a monthly average and 15 mg/l as a daily maximum.

10.4. Limitation Calculations

10.4.1. Technology-Based Effluent Limitations

Outfall 008									
Source	Flow	TSS ELG		TSS Cal		O&G ELG		O&G Cal	
		AVG	MAX	AVG	MAX	AVG	MAX	AVG	MAX
Precipitation CCRT Handling, Base Haul Road, PWS-Bio Bldgs, U2-cooling tower	0.0942	30	60	2.826	5.652	10	15	0.942	1.413
Landfil Leachate	0.2018	30	100	6.054	20.18	15	20	3.027	4.036
Coal Conveyor Equipment Washdowns	0.0167	30	100	0.501	1.67	15	20	0.2505	0.334
Limestone Prep Misc. Eqpt Cooling &	0.0009	30	100	0.027	0.09	15	20	0.0135	0.018
Precipitation Coal Pile & Maint. Shop	0.0792	30	50	2.376	3.96	5	5	0.396	0.396
Precipitation Limestone Stor-Handling	0.0156	30	60	0.468	0.936	10	15	0.156	0.234
Water Treatment Bldg. Service Water Strainers Backwash	0.0653	30	100	1.959	6.53	15	20	0.9795	1.306
Clarifiers & Gravity Filters Backwash	0.0058	30	100	0.174	0.58	15	20	0.087	0.116
Reverse Osmosis-DM pretreatment System Reject Stream	0.3524	30	100	10.572	35.24	15	20	5.286	7.048
Units 1&2 Demineralizer Regen	0.0008	30	100	0.024	0.08	15	20	0.012	0.016
Precipitation Knockout Pond Basin, Roads, Helipad	0.0181	30	60	0.543	1.086	10	15	0.181	0.2715
Precipitation Process Pond Basin & Unit 1 Boiler Drains & Blowoff Tank	0.0151	30	60	0.453	0.906	10	15	0.151	0.2265
Unit 1 Boiler Drains & Blowoff Tank	0.0489	30	100	1.467	4.89	15	20	0.7335	0.978
Unit 2 Boiler Drain Sump	0.0322	30	100	0.966	3.22	15	20	0.483	0.644
Unit 2 Condensate Polishing	0.006	30	100	0.18	0.6	15	20	0.09	0.12
Fly Ash Marketing Truck Loading Area	0.0064	30	100	0.192	0.64	15	20	0.096	0.128
Unit 2 Air Heater Washes	0.0418	30	100	1.254	4.18	15	20	0.627	0.836
U2 SSC - Bottom Ash Submerged Conveyor, Overflows & Dewatering Pit	0.3839	30	100	11.517	38.39	15	20	5.7585	7.678
U2 Bottom Ash Loading Area Drains-	0.0199	30	100	0.597	1.99	15	20	0.2985	0.398
U2 Boiler Turbine Bldg Washdowns & Floor Drains	0.0406	30	100	1.218	4.06	15	20	0.609	0.812
Unit 2 Turbine Room Sump	0.043	30	100	1.29	4.3	15	20	0.645	0.86
Unit 1 Air Heater Washes	0.0418	30	100	1.254	4.18	15	20	0.627	0.836
Unit 1 Turbine Room Sump	0.0638	30	100	1.914	6.38	15	20	0.957	1.276
Unit 1 Boiler Room Sump	0.2088	30	100	6.264	20.88	15	20	3.132	4.176
Unit 1 bottom ash loading area drains-	0.006	30	100	0.18	0.6	15	20	0.09	0.12
U1 SSC - Bottom Ash Submerged Conveyor, Overflows & Dewatering Pit	0.3021	30	100	9.063	30.21	15	20	4.5315	6.042
Units 1-2 Boiler Chemical Clean Wastewaters	0.0033	30	100	0.099	0.33	15	20	0.0495	0.066
Total	2.1144			63.432	201.76			30.209	40.385
			Limit	30	95.42187			14.28727	19.09998

10.5. Justification of Requirements

Chapters 5 and 10 of Title 401 of the Kentucky Administrative Regulations (KARs), cited in the following, have been duly promulgated pursuant to the requirements of Chapter 224 of the Kentucky Revised Statutes.

At a minimum, all permits shall contain technology-based effluent limitations (TBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)]. When necessary to achieve water quality standards, all permits shall contain water quality-based effluent limitations (WQBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(d)]. Any WQBELs included in this permit are based upon the Kentucky Water Quality Standards (KYWQS) [401 KAR 10:031].

10.5.1. Internal Monitoring Point

The monitoring requirements for these parameters are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(iii)], and the requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48].

10.5.2. Flow

The monitoring requirements for this parameter are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(ii)] and requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48].

10.5.3. Total Suspended Solids

The limits for these parameters are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)(1) and 122.44(i)(1)], the criteria and standards for imposing TBELs [401 KAR 5:065, Section 2(6) – 40 CFR 122 Appendix A], representative of the BPT requirements for low volume waste [40 CFR 423.12(b)(3)], BPT requirements for metal cleaning waste [40 CFR 423.12(b)(5)], BPT requirements for coal pile runoff [40 CFR 423.12(b)(9)], NSPS requirements for low volume waste [40 CFR 423.15(a)(3)], NSPS requirements for chemical metal cleaning wastes [40 CFR 423.15(a)(4)], NSPS requirements for coal pile runoff [40 CFR 423.15(a)(11)], and imposing Best Professional Judgement [401 KAR 5:080, Section 2(3) – 40 CFR 125.3].

10.5.4. Oil & Grease

The limits for these parameters are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)(1) and 122.44(i)(1)], the criteria and standards for imposing TBELs [401 KAR 5:065, Section 2(6) – 40 CFR 122 Appendix A], representative of the BPT requirements for low volume waste [40 CFR 423.12(b)(3)], BPT requirements for metal cleaning waste [40 CFR 423.12(b)(5)], NSPS requirements for low volume waste [40 CFR 423.15(a)(3)], NSPS requirements for chemical metal cleaning wastes [40 CFR 423.15(a)(4)], and imposing Best Professional Judgement [401 KAR 5:080, Section 2(3) – 40 CFR 125.3].

SECTION 11

OUTFALL 009

11. OUTFALL 009

11.1. Outfall Description

The following table lists the outfall type, location, and description:

TABLE 52.				
Outfall Type	Latitude (N)	Longitude (W)	Receiving Water	Description of Outfall
External	38°35'60"	85°25'06"	UT to Corn Creek	Stormwater runoff from closed/capped BAP-bottom ash pond

11.2. Effluent Limitations and Monitoring Requirements

The following table summarizes the effluent limitations and monitoring requirements for Outfall 009:

TABLE 53.									
EFFLUENT LIMITATIONS								MONITORING REQUIREMENTS	
Effluent Characteristic	Units	Loadings (lbs./day)		Concentrations				Frequency	Sample Type
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum		
Flow	MGD	Report	Report	N/A	N/A	N/A	N/A	1/Quarter	Instantaneous
Total Suspended Solids	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
pH	SU	N/A	N/A	Report	N/A	N/A	Report	1/Quarter	Grab
Hardness (as mg/l CaCO ₃)	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Arsenic	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Cadmium	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Chromium	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Copper	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Lead	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Mercury	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Nickel	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Silver	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Zinc	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab

Until this outfall is constructed and stormwater for the closed/capped portions of the BAP-bottom ash pond start discharging through this outfall NODI Code 9 "Conditional Monitoring-Not Required This Period" can be used for the monitoring requirements at this outfall.

11.3. Pertinent Factors

The effluent limitations for this outfall were developed in accordance with DOW’s General Procedures for Limitations Development located on DOW’s webpage at:

<http://dep.ky.gov/formslibrary/Documents/General%20Procedures%20for%20Limitations%20Development.pdf>

11.3.1. Water Quality-Based Effluent Limitations

The following table lists those water-quality-based pollutants and/or pollutant characteristics of concern that DOW has determined exhibit reasonable potential and the basis of DOW’s determination. These determinations are consistent with the DOW’s reasonable potential analysis (RPA) procedures outlined in *Permitting Procedures For Determining “Reasonable Potential”* Kentucky Division of Water May 1, 2000.

TABLE 54.	
Pollutant or Pollutant Characteristic	Basis
Total Suspended solids, Hardness, pH and Total Recoverable: Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Silver, and Zinc	Once construction to close the BAP-bottom ash pond commences stormwater runoff from the closed/capped BAP will discharge through this outfall. To insure there is no issues with the stormwater from the closed/capped portions of the BAP it is the Divisions best professional judgement to monitor for these pollutants. Monitoring will allow us to know the concentrations within the effluent. In the future DOW will analyze the results for the potential to exceed water quality criteria.

11.4. Justification of Requirements

Chapters 5 and 10 of Title 401 of the Kentucky Administrative Regulations (KARs), cited in the following, have been duly promulgated pursuant to the requirements of Chapter 224 of the Kentucky Revised Statutes.

At a minimum, all permits shall contain technology-based effluent limitations (TBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)]. When necessary to achieve water quality standards, all permits shall contain water quality-based effluent limitations (WQBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(d)]. Any WQBELs included in this permit are based upon the Kentucky Water Quality Standards (KYWQS) [401 KAR 10:031].

11.4.1. Flow

The monitoring requirements for this parameter are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(ii)] and requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48].

11.4.2. Total Suspended Solids, Hardness, pH, and Total Recoverable: Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Silver, and Zinc

The monitoring requirements for these pollutants are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(i)] and requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48].

SECTION 12

OUTFALL 010

12. OUTFALL 010**12.1. Outfall Description**

The following table lists the outfall type, location, and description:

TABLE 55.				
Outfall Type	Latitude (N)	Longitude (W)	Receiving Water	Description of Outfall
External	38°36'07"	85°25'20"	Corn Creek	Stormwater runoff from closed/capped GSP-gypsum storage pond-northeast areas

12.2. Effluent Limitations and Monitoring Requirements

The following table summarizes the effluent limitations and monitoring requirements for Outfall 010:

TABLE 56.									
EFFLUENT LIMITATIONS								MONITORING REQUIREMENTS	
Effluent Characteristic	Units	Loadings (lbs./day)		Concentrations				Frequency	Sample Type
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum		
Flow	MGD	Report	Report	N/A	N/A	N/A	N/A	1/Quarter	Instantaneous
Total Suspended Solids	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
pH	SU	N/A	N/A	Report	N/A	N/A	Report	1/Quarter	Grab
Hardness (as mg/l CaCO ₃)	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Arsenic	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Cadmium	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Chromium	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Copper	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Lead	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Mercury	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Nickel	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Silver	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Zinc	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Until this outfall is constructed and stormwater for the closed/capped portions of the GSP-gypsum storage pond start discharging through this outfall NODI Code 9 "Conditional Monitoring-Not Required This Period" can be used for the monitoring requirements at this outfall.									

12.3. Pertinent Factors

The effluent limitations for this outfall were developed in accordance with DOW’s General Procedures for Limitations Development located on DOW’s webpage at:

<http://dep.ky.gov/formslibrary/Documents/General%20Procedures%20for%20Limitations%20Development.pdf>

12.3.1. Water Quality-Based Effluent Limitations

The following table lists those water-quality-based pollutants and/or pollutant characteristics of concern that DOW has determined exhibit reasonable potential and the basis of DOW’s determination. These determinations are consistent with the DOW’s reasonable potential analysis (RPA) procedures outlined in *Permitting Procedures For Determining “Reasonable Potential”* Kentucky Division of Water May 1, 2000.

TABLE 57.	
Pollutant or Pollutant Characteristic	Basis
Total Suspended Solids, Hardness, pH and Total Recoverable: Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Silver, and Zinc	Once construction to close the GSP-gypsum storage pond commences stormwater runoff from the closed/capped GSP northeast areas will discharge through this outfall. To insure there is no issues with the stormwater from the closed/capped portions of the GSP it is the Divisions best professional judgement to monitor for these pollutants. Monitoring will allow us to know the concentrations within the effluent. In the future DOW will analyze the results for the potential to exceed water quality criteria.

12.4. Justification of Requirements

Chapters 5 and 10 of Title 401 of the Kentucky Administrative Regulations (KARs), cited in the following, have been duly promulgated pursuant to the requirements of Chapter 224 of the Kentucky Revised Statutes.

At a minimum, all permits shall contain technology-based effluent limitations (TBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)]. When necessary to achieve water quality standards, all permits shall contain water quality-based effluent limitations (WQBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(d)]. Any WQBELs included in this permit are based upon the Kentucky Water Quality Standards (KYWQS) [401 KAR 10:031].

12.4.1. Flow

The monitoring requirements for this parameter are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(ii)] and requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48].

12.4.2. Total Suspended Solids, Hardness, pH, and Total Recoverable: Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Silver, and Zinc

The monitoring requirements for these pollutants are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(i)] and requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48].

SECTION 13

OUTFALL 011

13. OUTFALL 011**13.1. Outfall Description**

The following table lists the outfall type, location, and description:

TABLE 58.				
Outfall Type	Latitude (N)	Longitude (W)	Receiving Water	Description of Outfall
External	38°36'02"	85°25'32"	Corn Creek	Stormwater runoff from closed/capped GSP-gypsum storage pond-northwest areas

13.2. Effluent Limitations and Monitoring Requirements

The following table summarizes the effluent limitations and monitoring requirements for Outfall 011:

TABLE 59.									
EFFLUENT LIMITATIONS								MONITORING REQUIREMENTS	
Effluent Characteristic	Units	Loadings (lbs./day)		Concentrations				Frequency	Sample Type
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum		
Flow	MGD	Report	Report	N/A	N/A	N/A	N/A	1/Quarter	Instantaneous
Total Suspended Solids	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
pH	SU	N/A	N/A	Report	N/A	N/A	Report	1/Quarter	Grab
Hardness (as mg/l CaCO ₃)	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Arsenic	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Cadmium	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Chromium	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Copper	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Lead	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Mercury	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Nickel	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Silver	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Zinc	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab

Until this outfall is constructed and stormwater for the closed/capped portions of the GSP-gypsum storage pond start discharging through this outfall NODI Code 9 "Conditional Monitoring-Not Required This Period" can be used for the monitoring requirements at this outfall.

13.3. Pertinent Factors

The effluent limitations for this outfall were developed in accordance with DOW’s General Procedures for Limitations Development located on DOW’s webpage at:

<http://dep.ky.gov/formslibrary/Documents/General%20Procedures%20for%20Limitations%20Development.pdf>

13.3.1. Water Quality-Based Effluent Limitations

The following table lists those water-quality-based pollutants and/or pollutant characteristics of concern that DOW has determined exhibit reasonable potential and the basis of DOW’s determination. These determinations are consistent with the DOW’s reasonable potential analysis (RPA) procedures outlined in *Permitting Procedures For Determining “Reasonable Potential”* Kentucky Division of Water May 1, 2000.

TABLE 60.	
Pollutant or Pollutant Characteristic	Basis
Total Suspended solids, Hardness, pH and Total Recoverable: Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Silver, and Zinc	Once construction to close the GSP-gypsum storage pond commences stormwater runoff from the closed/capped GSP northwest areas will discharge through this outfall. To insure there is no issues with the stormwater from the closed/capped portions of the GSP it is the Divisions best professional judgement to monitor for these pollutants. Monitoring will allow us to know the concentrations within the effluent. In the future DOW will analyze the results for the potential to exceed water quality criteria.

13.4. Justification of Requirements

Chapters 5 and 10 of Title 401 of the Kentucky Administrative Regulations (KARs), cited in the following, have been duly promulgated pursuant to the requirements of Chapter 224 of the Kentucky Revised Statutes.

At a minimum, all permits shall contain technology-based effluent limitations (TBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)]. When necessary to achieve water quality standards, all permits shall contain water quality-based effluent limitations (WQBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(d)]. Any WQBELs included in this permit are based upon the Kentucky Water Quality Standards (KYWQS) [401 KAR 10:031].

13.4.1. Flow

The monitoring requirements for this parameter are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(ii)] and requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48].

13.4.2. Total Suspended Solids, Hardness, pH, and Total Recoverable: Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Silver, and Zinc

The monitoring requirements for these pollutants are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(i)] and requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48].

SECTION 14

OUTFALL 012

14. OUTFALL 012

14.1. Outfall Description

The following table lists the outfall type, location, and description:

TABLE 61.				
Outfall Type	Latitude (N)	Longitude (W)	Receiving Water	Description of Outfall
External	38°36'03"	85°24'31"	UT to UT to Corn Creek	Landfill Stormwater Runoff

14.2. Effluent Limitations and Monitoring Requirements

The following table summarizes the effluent limitations and monitoring requirements for Outfall 012:

TABLE 62.									
EFFLUENT LIMITATIONS								MONITORING REQUIREMENTS	
Effluent Characteristic	Units	Loadings (lbs./day)		Concentrations				Frequency	Sample Type
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum		
Flow	MGD	Report	Report	N/A	N/A	N/A	N/A	1/Quarter	Instantaneous
Total Suspended Solids	mg/l	N/A	N/A	N/A	Report	100	N/A	1/Quarter	Grab
pH	SU	N/A	N/A	6.0	N/A	N/A	9.0	1/Quarter	Grab
Hardness (as mg/l CaCO ₃)	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Arsenic	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Cadmium	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Chromium	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Copper	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Iron	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Lead	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Mercury	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Nickel	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Silver	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
Total Recoverable Zinc	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab

Until this outfall is constructed and stormwater runoff from the landfill starts discharging through this outfall NODI Code 9 "Conditional Monitoring-Not Required This Period" can be used for the monitoring requirements for this outfall.

14.3. Pertinent Factors

The effluent limitations for this outfall were developed in accordance with DOW’s General Procedures for Limitations Development located on DOW’s webpage at:

<http://dep.ky.gov/formslibrary/Documents/General%20Procedures%20for%20Limitations%20Development.pdf>

14.3.1. Technology-Based Effluent Limitations

Technology-based effluent limitations and standards, based on federally promulgated standards, a case-by-case basis, or a combination of the two, shall be included in all KPDES permits, where applicable.

14.3.1.1. Best Professional Judgment (BPJ)

Landfill – Stormwater Runoff

This facility utilizes a sedimentation basin in its operation which provides for the settling of suspended solids. Sedimentation is a commonly used treatment technology for the removal of total suspended solids from non-contaminated stormwater runoff associated with landfill operations. Sedimentation is both efficient and cost effective. Although several factors may influence the final concentration of total suspended solids in the discharge, it has been the experience of the Division that ponds that retain landfill-related stormwater for six hours or more can achieve a total suspended solids concentration of 100 mg/l as a daily maximum.

14.3.2. Water Quality-Based Effluent Limitations

The following table lists those water-quality-based pollutants and/or pollutant characteristics of concern that DOW has determined exhibit reasonable potential and the basis of DOW’s determination. These determinations are consistent with the DOW’s reasonable potential analysis (RPA) procedures outlined in *Permitting Procedures For Determining “Reasonable Potential”* Kentucky Division of Water May 1, 2000.

TABLE 63.	
Pollutant or Pollutant Characteristic	Basis
Total Recoverable: Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Mercury, Nickel, Silver, and Zinc	Since this is a new constructed outfall for a new land fill to insure there is no issues with the stormwater from this new outfall it is the Divisions best professional judgement to monitor for these pollutants. Monitoring will allow us to know the concentrations within the effluent. In the future DOW will analyze the results for the potential to exceed water quality criteria.

14.4. Justification of Requirements

Chapters 5 and 10 of Title 401 of the Kentucky Administrative Regulations (KARs), cited in the following, have been duly promulgated pursuant to the requirements of Chapter 224 of the Kentucky Revised Statutes.

At a minimum, all permits shall contain technology-based effluent limitations (TBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)]. When necessary to achieve water quality standards, all permits shall contain water quality-based effluent limitations (WQBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(d)]. Any WQBELs included in this permit are based upon the Kentucky Water Quality Standards (KYWQS) [401 KAR 10:031].

14.4.1. Flow

The monitoring requirements for this parameter are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065,

Section 2(4) – 40 CFR 122.44(i)(1)(ii)] and requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48].

14.4.2. Hardness and Total Recoverable: Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Mercury, Nickel, Silver, and Zinc

The monitoring requirements for these pollutants are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(i)] and requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48].

14.4.3. Total Suspended Solids

The limitations for this parameter are consistent with the requirements of 40 CFR 125.3(c)(2) as incorporated by reference in 401 KAR 5:080, Section 2(3). The limits are representative of the Division of Water’s “Best Professional Judgment” (BPJ) determination of the “Best Conventional Pollutant Control Technology” (BCT) requirements for these pollutants.

14.4.4. pH

The limitations for this parameter are consistent Kentucky’s Water Quality Standards [401 KAR 10:031, Section 4(1)(b) and Section 7].

SECTION 15

OUTFALL 013

15. OUTFALL 013

15.1. Outfall Description

The following table lists the outfall type, location, and description:

TABLE 64.				
Outfall Type	Latitude (N)	Longitude (W)	Receiving Water	Description of Outfall
External	38°35'36"	85°24'36"	UT to Barebone Creek	Stormwater Runoff for Haul Road

15.2. Effluent Limitations and Monitoring Requirements

The stormwater runoff from the areas served by Outfall 013 shall be managed using appropriate Best Management Practices (BMPs) to prevent the discharge of pollutants from those areas.

15.3. Pertinent Factors

The effluent limitations for this outfall were developed in accordance with DOW's General Procedures for Limitations Development located on DOW's webpage at:

<http://dep.ky.gov/formslibrary/Documents/General%20Procedures%20for%20Limitations%20Development.pdf>

15.4. Justification of Requirements

Chapters 5 and 10 of Title 401 of the Kentucky Administrative Regulations (KARs), cited in the following, have been duly promulgated pursuant to the requirements of Chapter 224 of the Kentucky Revised Statutes.

At a minimum, all permits shall contain technology-based effluent limitations (TBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)]. When necessary to achieve water quality standards, all permits shall contain water quality-based effluent limitations (WQBELs) [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(d)]. Any WQBELs included in this permit are based upon the Kentucky Water Quality Standards (KYWQS) [401 KAR 10:031].

15.4.1. Best Management Practices (BMPs)

The use of BMPs for the control of drainage from the non-industrial portions of the facility are consistent with the KPDES permit program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(k)].

SECTION 16

OTHER CONDITIONS

16. OTHER CONDITIONS

16.1. Schedule of Compliance

The permittee is required to comply with all effluent limitations by the effective date of the permit unless a compliance schedule is included with the permit.

16.2. Antidegradation

The conditions of Kentucky's Antidegradation Policy have been satisfied [401 KAR 10:029, Section 1]. The facility discharges to waters categorized as "Impaired Waters" pursuant to 33 U.S.C. 1315(b). Therefore pursuant to 401 KAR 10:030, Section 1(4), further review is not required.

The conditions of Kentucky's Antidegradation Policy have been satisfied [401 KAR 10:029, Section 1]. This permitting action is a reissuance of a KPDES permit that does not authorize an expanded discharge.

16.3. Standard Conditions

The conditions listed in the Standard Conditions Section of the permit are consistent with the conditions applicable to all permits [401 KAR 5:065, Section 2(1) – 40 CFR 122.41].

16.4. Sufficiently Sensitive Analytical Methods

Analytical methods utilized to demonstrate compliance with the effluent limitations established in this permit shall be sufficiently sensitive to detect pollutant levels at or below the required effluent limit [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)].

16.5. Certified Laboratory

All environmental analysis to be performed by a certified laboratory is consistent with the certified wastewater laboratory requirements [401 KAR 5:320, Section 3].

16.6. BMP Plan

Permits are to include BMPs to control or abate the discharge of pollutants when: 1) authorized under section 304(e) of the CWA for the control of toxic pollutants and hazardous substances from ancillary industrial activities; 2) authorized under Section 402(p) of the CWA for the control of storm water discharges; 3) numeric effluent limitations are infeasible; or 4) the practices are reasonably necessary to achieve effluent limitations and standards or to carry out the purposes and intent of the CWA [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(k)]

16.7. Certified Operators

Wastewater treatment plants and wastewater collection systems that accept wastewaters containing domestic sewage are to be operated by a certified operator [401 KAR 5:010].

16.8. Ohio River Outfall Signage

Kentucky is a member of the Ohio River Valley Water Sanitation Compact (ORSANCO) [KRS 224.18-760]. Article I of the Compact pledges faithful cooperation between the signatory states. Article IV authorizes the Commission to adopt, prescribe and promulgate rules, regulations and standards for administering and enforcing the Compact. The ORSANCO pollution control standards for discharges to the Ohio River require that holders of an individual NPDES permit post and maintain a permanent marker having specific dimensions at each Ohio River outfall. The permittee shall comply with the permanent marker requirements of ORSANCO's Pollution Control Standards.

16.9. Cooling Water Additives, FIFRA, and Mollusk Control

The discharge of any product registered under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) in cooling water which ultimately may be released to the waters of the Commonwealth is

prohibited, except Herbicides, unless specifically identified and authorized by the KPDES permit. In the event the permittee needs to use a biocide or chemical not previously reported for mollusk control or other purpose, the permittee shall submit sufficient information, a minimum of thirty (30) days prior to the commencement of use of said biocides or chemicals to the Division of Water for review and establishment of appropriate control parameters.

16.10. 316(b) Cooling Water Intake Structure

The permittee shall use this permitting cycle to gather the application materials required within 40 CFR 122.21(r) necessary to establish impingement mortality and entrainment BTA requirements as applicable under 40 CFR 125.94(c) and (d). This information shall be included with the next KPDES permit renewal application for this facility, unless an alternate schedule for the submission of the information required is granted.

16.11. Polychlorinated Biphenyls

Pursuant to the requirements of 40 CFR Part 423.12(b) (2), there shall be no discharge, from any point source, of Polychlorinated Biphenyl compounds such as those commonly used in transformer fluids. The permittee shall implement this requirement as a specific section of the BMP plan developed for this section.

16.12. Selective Catalytic Reduction Devices or Systems (SCRs) and Selective Non-Catalytic Reduction Devices or Systems (SNCR)

In response to Clean Air Act amendments and recent EPA rules, the installation of these devices for NOx reduction may become necessary. Associated with the installation and operation of these units, an “ammonia slip” may occur resulting in the discharge of ammonia to the ash pond. The impact of such an occurrence on the performance of the ash pond and any eventual impact on the environment is not known. Therefore, should it become necessary to install these devices, the permittee shall develop and implement an Ammonia Monitoring Plan. The plan shall be submitted to the DOW within ninety (90) days of the determination that these devices will be installed, and shall include at a minimum influent and effluent monitoring of each unit on a monthly bases with submission of the data as a quarterly report. If such a plan already exists, then the plan should be appropriately modified during each installation of additional SCR or SNCR devices or systems.

16.13. ORSANCO’s Mercury Variance

The permittee requested a variance from ORSANCO’s mercury standard of 0.000012 mg/l for effluent from this site which discharges to the Ohio River. Mercury is a pollutant believed to be present in FGD wastewaters. The permittee is installing a new treatment system for FGD wastewaters in order to achieve compliance with new federal effluent limitation guidelines. The treatment system utilizes new treatments never before used by the power industry. Effluent from Outfall 002 will be partially comprised of treated FGD wastewaters, and the permittee believes the effluent will be able to meet Kentucky’s water quality criteria for mercury once the new treatment system is operational. The permittee is doubtful the effluent will consistently meet ORSANCO’s mercury standard. Given these circumstances, the DOW granted the variance ORSANCO’s mercury standard and will apply Kentucky’s water quality criteria for mercury for discharges to the Ohio River.

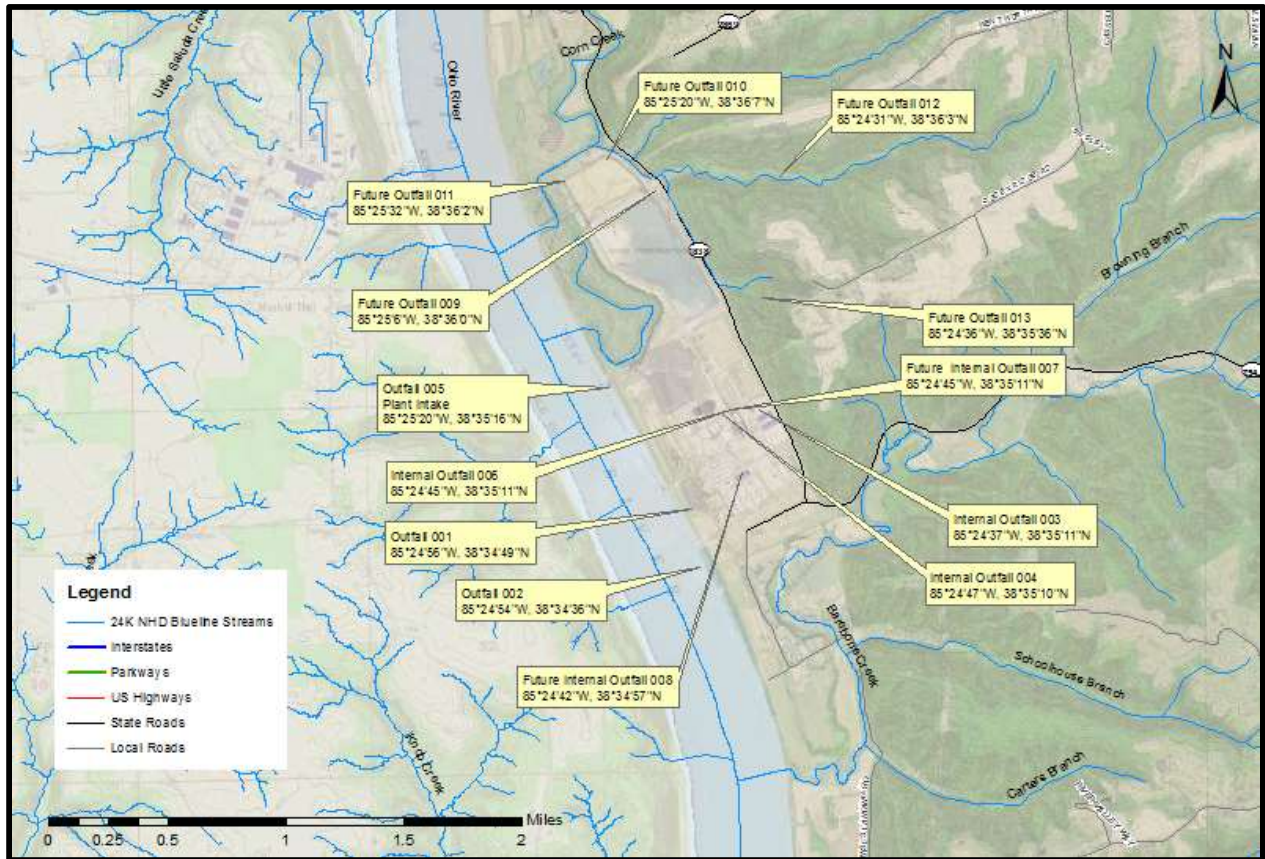
16.14. Unpermitted Combustion Residual Leachate

Pursuant to 40 CFR 423.11(r), the term combustion residual leachate (“leachate”) means “leachate from landfills or surface impoundments containing combustion residuals. Leachate is composed of liquid, including any suspended or dissolved constituents in the liquid, that has percolated through waste or other materials emplaced in a landfill, or that passes through the surface impoundment’s containment structure (e.g., bottom, dikes, berms). Combustion residual leachate includes seepage and/or leakage

from a combustion residual landfill or impoundment unit. Combustion residual leachate includes wastewater from landfills and surface impoundments located on non-adjoining property when under the operational control of the permitted facility.”

This permit authorizes the discharge of leachate from outfall 008. For newly discovered leachate seeps from a CCR surface impoundment or a CCR landfill, as defined at 40 CFR 257.53, to the surface that discharge or have a potential to discharge to a water of the commonwealth other than through outfall 008, the permittee shall develop and implement a plan to address such surface seeps. The plan shall be included as part of the on-site BMP Plan and shall address, at a minimum, (1) scheduled inspections for identifying surface leachate seeps, (2) maintenance of CCR landfills and/or impoundments to minimize the potential for surface leachate seeps, and (3) corrective measures that will be implemented upon the discovery of a surface leachate seep that is not being controlled by a permitted outfall authorized for discharge of leachate. The permittee shall notify the DOW Surface Water Permits Branch and the appropriate DOW Field Office of planned corrective measures for any identified surface seeps of leachate as soon as feasible after discovery of such a leachate seep, but no later than ten (10) days after the discovery. Such corrective measures may include: (1) plans to reduce or eliminate the leachate seep to the surface; (2) actions to route the surface leachate seep (via a conveyance designed to contain the flow or eliminate the possibility of infiltration) to an outfall permitted to discharge leachate; and (3) combinations of actions to eliminate or, if elimination is not feasible, reduce and control a surface leachate seep and ensure any discharge to a receiving stream is authorized by the permit. Please note that this does not exempt the permittee from 24-hour reporting Section 2.12 of the permit.

16.14. Location Map



SECTION 17

CORMIX Report

17. CORMIX REPORT**17.1. Session Report**

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CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
CORMIX MIXING ZONE EXPERT SYSTEM
CORMIX Version 10.0GTD
HYDRO2:Version-10.0.0.0 July,2016
SITE NAME/LABEL:
DESIGN CASE: LG&E Trimble Co
FILE NAME: C:\Users\Andrew.Parrish\Desktop\Cormix\Trimble Co\LG&E Trimble Co.prd
Using subsystem CORMIX2: Multiport Diffuser Discharges
Start of session: 09/21/2017--11:03:51
*****
SUMMARY OF INPUT DATA:
-----
AMBIENT PARAMETERS:
Cross-section = bounded
Width BS = 624.84 m
Channel regularity ICHREG = 1
Ambient flowrate QA = 300.16 m^3/s
Average depth HA = 3.47 m
Depth at discharge HD = 2.44 m
Ambient velocity UA = 0.1384 m/s
Darcy-Weisbach friction factor F = 0.0324
Calculated from Manning's n = 0.025
Wind velocity UW = 2 m/s
Stratification Type STRCND = U
Surface temperature = 20 degC
Bottom temperature = 20 degC
Calculated FRESH-WATER DENSITY values:
Surface density RHOAS = 998.2051 kg/m^3
Bottom density RHOAB = 998.2051 kg/m^3
-----
DISCHARGE PARAMETERS: Submerged Multiport Diffuser Discharge
Diffuser type DITYPE = unidirectional perpendicular
Diffuser length LD = 12.19 m
Nearest bank = left
Diffuser endpoints YB1 = 23.5 m; YB2 = 35.25 m
Number of openings NOPE = 3
Number of Risers NRISER = 3
Ports/Nozzles per Riser NPPERR = 1
Spacing between risers/openings SPAC = 6.10 m
Port/Nozzle diameter D0 = 0.3557 m
with contraction ratio = 1
Equivalent slot width B0 = 0.0245 m
Total area of openings TAO = 0.2981 m^2
Discharge velocity U0 = 2.65 m/s
Total discharge flowrate Q0 = 0.788627 m^3/s
Discharge port height H0 = 0.18 m
Nozzle arrangement BETYPE = unidirectional without fanning
Diffuser alignment angle GAMMA = 74.5 deg
Vertical discharge angle THETA = 15 deg
Actual Vertical discharge angle THEAC = 15 deg
Horizontal discharge angle SIGMA = 0 deg
Relative orientation angle BETA = 74.5 deg
Discharge temperature (freshwater) = 28 degC
Corresponding density RHO0 = 996.2338 kg/m^3
Density difference DRHO = 1.9713 kg/m^3
Buoyant acceleration GP0 = 0.0194 m/s^2
Discharge concentration C0 = 2 TUa
Surface heat exchange coeff. KS = 0 m/s
Coefficient of decay KD = 0 /s
-----
FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
Discharge (volume flux) q0 = 0.064684 m^2/s
Momentum flux m0 = 0.171114 m^3/s^2
Buoyancy flux j0 = 0.001253 m^3/s^3
-----
DISCHARGE/ENVIRONMENT LENGTH SCALES:
LQ = 0.02 m Lm = 8.93 m LM = 14.69 m
lm' = 99999 m Lb' = 99999 m La = 99999 m
(These refer to the actual discharge/environment length scales.)
-----
NON-DIMENSIONAL PARAMETERS:
Slot Froude number FR0 = 121.56
Port/nozzle Froude number FRD0 = 31.87
Velocity ratio R = 19.11
-----
MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
Toxic discharge = yes
CMC concentration CMC = 1 TUa
CCC concentration CCC = 0.01 TUa
Water quality standard specified = given by CCC value
Regulatory mixing zone = yes
Regulatory mixing zone specification = width
Regulatory mixing zone value = 206.20 m (m^2 if area)
Region of interest = 6249 m
*****
HYDRODYNAMIC CLASSIFICATION:
*-----*
| FLOW CLASS = MU2 |
*-----*
This flow configuration applies to a layer corresponding to the full water
depth at the discharge site.
Applicable layer depth = water depth = 2.44 m

```

Limiting Dilution $S = (QA/Q0) + 1.0 = 381.6$

MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

X-Y-Z Coordinate system:
Origin is located at the BOTTOM below the port/diffuser center:
29.38 m from the left bank/shore.
Number of display steps NSTEP = 500 per module.

NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing. It has no regulatory
implication. However, this information may be useful for the discharge
designer because the mixing in the NFR is usually sensitive to the
discharge design conditions.
Pollutant concentration at NFR edge $c = 0.1484$ TUa
Dilution at edge of NFR $s = 13.5$
NFR Location: $x = 74.17$ m
(centerline coordinates) $y = 0$ m
 $z = 2.44$ m
NFR plume dimensions: half-width (bh) = 24.21 m
thickness (bv) = 0.81 m
Cumulative travel time: 1331.9756 sec.

Buoyancy assessment:
The effluent density is less than the surrounding ambient water
density at the discharge level.
Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards
the surface.

Near-field instability behavior:
The diffuser flow will experience instabilities with full vertical mixing
in the near-field.
There may be benthic impact of high pollutant concentrations.

FAR-FIELD MIXING SUMMARY:
Plume is vertically fully mixed WITHIN NEAR-FIELD (or a fraction thereof),
but RE-STRATIFIES LATER.
Plume becomes vertically fully mixed again at 0 m downstream.

PLUME BANK CONTACT SUMMARY:
Plume in bounded section contacts one bank only at 74.17 m downstream.
***** TOXIC DILUTION ZONE SUMMARY *****
Recall: The TDZ corresponds to the three (3) criteria issued in the USEPA
Technical Support Document (TSD) for Water Quality-based Toxics Control,
1991 (EPA/505/2-90-001).
Criterion maximum concentration (CMC) = 1 TUa
Corresponding dilution = 2
The CMC was encountered at the following plume position:
Plume location: $x = 0.09$ m
(centerline coordinates) $y = 0$ m
 $z = 0.19$ m
Plume dimension: half-width (bh) = 6.01 m
thickness (bv) = 0.04 m
Computed distance from port opening to CMC location = 0.09 m.
CRITERION 1: This location is within 50 times the discharge length scale of
 $Lq = 0.32$ m.
++++ The discharge length scale TEST for the TDZ has been SATISFIED. +++++
Computed horizontal distance from port opening to CMC location = 0.09 m.
CRITERION 2: This location is within 5 times the ambient water depth of
 $HD = 2.44$ m.
+++++ The ambient depth TEST for the TDZ has been SATISFIED. +++++
Computed distance from port opening to CMC location = 0.09 m.
CRITERION 3: This location is within one tenth the distance of the extent
of the Regulatory Mixing Zone of 1080.69 m in any
spatial direction from the port opening.
++++ The Regulatory Mixing Zone TEST for the TDZ has been SATISFIED. +++++
The diffuser discharge velocity is equal to 2.65 m/s.
This is below the value of 3.0 m/s recommended in the TSD.
*** All three CMC criteria for the TDZ are SATISFIED for this discharge. ***
***** REGULATORY MIXING ZONE SUMMARY *****
The plume conditions at the boundary of the specified RMZ are as follows:
Pollutant concentration $c = 0.032618$ TUa
Corresponding dilution $s = 61.3$
Plume location: $x = 1080.29$ m
(centerline coordinates) $y = 29.38$ m
 $z = 2.44$ m
Plume dimensions: half-width (bh) = 206.20 m
thickness (bv) = 1.69 m
Cumulative travel time: 8580.6797 sec.
Note:
Plume concentration c and dilution s values are reported based on prediction
file values - assuming linear interpolation between predicted points just
before and just after the RMZ boundary has been detected.
Please ensure a small step size is used in the prediction file to account
for this linear interpolation. Step size can be controlled by increasing
(reduces the prediction step size) or decreasing (increases the prediction
step size) the - Output Steps per Module - in CORMIX input.
At this position, the plume is CONTACTING the LEFT bank.
However, the CCC for the toxic pollutant was not encountered within the
predicted plume region.
***** FINAL DESIGN ADVICE AND COMMENTS *****
CORMIX2 uses the TWO-DIMENSIONAL SLOT DIFFUSER CONCEPT to represent
the actual three-dimensional diffuser geometry. Thus, it approximates
the details of the merging process of the individual jets from each
port/nozzle.
In the present design, the spacing between adjacent ports/nozzles
(or riser assemblies) is of the order of, or less than, the local
water depth so that the slot diffuser approximation holds well.
Nevertheless, if this is a final design, the user is advised to use a

END OF MOD201: DIFFUSER DISCHARGE MODULE

 BEGIN MOD271: ACCELERATION ZONE OF UNIDIRECTIONAL CO-FLOWING DIFFUSER
 In this laterally contracting zone the diffuser plume becomes VERTICALLY FULLY MIXED over the entire layer depth (HS = 2.44m).
 Full mixing is achieved after a plume distance of about five layer depths from the diffuser.
 Profile definitions:
 BV = layer depth (vertically mixed)
 BH = top-hat half-width, in horizontal plane normal to trajectory
 S = hydrodynamic average (bulk) dilution
 C = average (bulk) concentration (includes reaction effects, if any)
 TT = Cumulative travel time

X	Y	Z	S	C	BV	BH	TT
0.00	0.00	0.18	1.0	0.200E+01	0.02	6.10	.00000E+00
0.01	0.00	0.18	1.4	0.145E+01	0.02	6.08	.59378E-02
0.02	0.00	0.18	1.5	0.130E+01	0.02	6.07	.13128E-01
0.04	0.00	0.18	1.7	0.121E+01	0.03	6.06	.21114E-01
0.05	0.00	0.18	1.8	0.114E+01	0.03	6.05	.29735E-01
0.06	0.00	0.19	1.8	0.108E+01	0.03	6.03	.38897E-01
0.07	0.00	0.19	1.9	0.104E+01	0.03	6.02	.48536E-01
0.09	0.00	0.19	2.0	0.100E+01	0.04	6.01	.58606E-01

** CMC HAS BEEN FOUND **

The pollutant concentration in the plume falls below CMC value of 0.100E+01 in the current prediction interval.

This is the extent of the TOXIC DILUTION ZONE.

0.10	0.00	0.19	2.1	0.967E+00	0.04	6.00	.69072E-01
0.11	0.00	0.19	2.1	0.937E+00	0.04	5.99	.79905E-01
0.12	0.00	0.19	2.2	0.911E+00	0.05	5.98	.91081E-01
0.13	0.00	0.19	2.3	0.888E+00	0.05	5.96	.10258E+00
0.15	0.00	0.19	2.3	0.866E+00	0.06	5.95	.11438E+00
0.16	0.00	0.19	2.4	0.847E+00	0.06	5.94	.12648E+00
0.17	0.00	0.19	2.4	0.829E+00	0.07	5.93	.13885E+00
0.18	0.00	0.20	2.5	0.812E+00	0.07	5.92	.15149E+00
0.20	0.00	0.20	2.5	0.796E+00	0.08	5.91	.16438E+00
0.21	0.00	0.20	2.6	0.782E+00	0.08	5.90	.17752E+00
0.22	0.00	0.20	2.6	0.768E+00	0.09	5.88	.19090E+00
0.23	0.00	0.20	2.6	0.756E+00	0.09	5.87	.20451E+00
0.24	0.00	0.20	2.7	0.744E+00	0.10	5.86	.21833E+00
0.26	0.00	0.20	2.7	0.732E+00	0.10	5.85	.23238E+00
0.27	0.00	0.20	2.8	0.721E+00	0.11	5.84	.24663E+00
0.28	0.00	0.20	2.8	0.711E+00	0.11	5.83	.26108E+00
0.29	0.00	0.20	2.9	0.701E+00	0.12	5.82	.27573E+00
0.30	0.00	0.21	2.9	0.692E+00	0.12	5.81	.29058E+00
0.32	0.00	0.21	2.9	0.683E+00	0.13	5.80	.30561E+00
0.33	0.00	0.21	3.0	0.675E+00	0.13	5.79	.32083E+00
0.34	0.00	0.21	3.0	0.667E+00	0.14	5.78	.33623E+00
0.35	0.00	0.21	3.0	0.659E+00	0.14	5.77	.35180E+00
0.37	0.00	0.21	3.1	0.652E+00	0.15	5.76	.36754E+00
0.38	0.00	0.21	3.1	0.644E+00	0.15	5.75	.38345E+00
0.39	0.00	0.21	3.1	0.637E+00	0.16	5.74	.39953E+00
0.40	0.00	0.21	3.2	0.631E+00	0.16	5.73	.41577E+00
0.41	0.00	0.22	3.2	0.624E+00	0.17	5.71	.43216E+00
0.43	0.00	0.22	3.2	0.618E+00	0.17	5.70	.44871E+00
0.44	0.00	0.22	3.3	0.612E+00	0.18	5.69	.46542E+00
0.45	0.00	0.22	3.3	0.606E+00	0.18	5.68	.48227E+00
0.46	0.00	0.22	3.3	0.601E+00	0.19	5.67	.49927E+00
0.48	0.00	0.22	3.4	0.595E+00	0.19	5.67	.51642E+00
0.49	0.00	0.22	3.4	0.590E+00	0.20	5.66	.53371E+00
0.50	0.00	0.22	3.4	0.585E+00	0.20	5.65	.55114E+00
0.51	0.00	0.22	3.4	0.580E+00	0.20	5.64	.56871E+00
0.52	0.00	0.22	3.5	0.575E+00	0.21	5.63	.58641E+00
0.54	0.00	0.23	3.5	0.570E+00	0.21	5.62	.60425E+00
0.55	0.00	0.23	3.5	0.566E+00	0.22	5.61	.62222E+00
0.56	0.00	0.23	3.6	0.561E+00	0.22	5.60	.64031E+00
0.57	0.00	0.23	3.6	0.557E+00	0.23	5.59	.65854E+00
0.59	0.00	0.23	3.6	0.553E+00	0.23	5.58	.67690E+00
0.60	0.00	0.23	3.6	0.549E+00	0.24	5.57	.69538E+00
0.61	0.00	0.23	3.7	0.545E+00	0.24	5.56	.71398E+00
0.62	0.00	0.23	3.7	0.541E+00	0.25	5.55	.73270E+00
0.63	0.00	0.23	3.7	0.537E+00	0.25	5.54	.75155E+00
0.65	0.00	0.24	3.8	0.533E+00	0.26	5.53	.77051E+00
0.66	0.00	0.24	3.8	0.530E+00	0.26	5.52	.78959E+00
0.67	0.00	0.24	3.8	0.526E+00	0.27	5.52	.80878E+00
0.68	0.00	0.24	3.8	0.522E+00	0.27	5.51	.82809E+00
0.69	0.00	0.24	3.9	0.519E+00	0.28	5.50	.84751E+00
0.71	0.00	0.24	3.9	0.516E+00	0.28	5.49	.86705E+00
0.72	0.00	0.24	3.9	0.512E+00	0.29	5.48	.88669E+00
0.73	0.00	0.24	3.9	0.509E+00	0.29	5.47	.90644E+00
0.74	0.00	0.24	4.0	0.506E+00	0.30	5.46	.92630E+00
0.76	0.00	0.24	4.0	0.503E+00	0.30	5.45	.94627E+00
0.77	0.00	0.25	4.0	0.500E+00	0.31	5.45	.96634E+00
0.78	0.00	0.25	4.0	0.497E+00	0.31	5.44	.98652E+00
0.79	0.00	0.25	4.0	0.494E+00	0.32	5.43	.10068E+01
0.80	0.00	0.25	4.1	0.491E+00	0.32	5.42	.10272E+01
0.82	0.00	0.25	4.1	0.489E+00	0.33	5.41	.10477E+01
0.83	0.00	0.25	4.1	0.486E+00	0.33	5.40	.10683E+01
0.84	0.00	0.25	4.1	0.483E+00	0.34	5.39	.10889E+01
0.85	0.00	0.25	4.2	0.481E+00	0.34	5.39	.11097E+01
0.87	0.00	0.25	4.2	0.478E+00	0.35	5.38	.11306E+01
0.88	0.00	0.25	4.2	0.475E+00	0.35	5.37	.11516E+01
0.89	0.00	0.26	4.2	0.473E+00	0.36	5.36	.11726E+01
0.90	0.00	0.26	4.3	0.471E+00	0.36	5.35	.11938E+01
0.91	0.00	0.26	4.3	0.468E+00	0.37	5.35	.12151E+01
0.93	0.00	0.26	4.3	0.466E+00	0.37	5.34	.12364E+01
0.94	0.00	0.26	4.3	0.463E+00	0.38	5.33	.12579E+01
0.95	0.00	0.26	4.3	0.461E+00	0.38	5.32	.12794E+01
0.96	0.00	0.26	4.4	0.459E+00	0.39	5.31	.13010E+01

0.98	0.00	0.26	4.4	0.457E+00	0.39	5.31	.13227E+01
0.99	0.00	0.26	4.4	0.454E+00	0.40	5.30	.13445E+01
1.00	0.00	0.27	4.4	0.452E+00	0.40	5.29	.13664E+01
1.01	0.00	0.27	4.4	0.450E+00	0.41	5.28	.13884E+01
1.02	0.00	0.27	4.5	0.448E+00	0.41	5.28	.14105E+01
1.04	0.00	0.27	4.5	0.446E+00	0.41	5.27	.14326E+01
1.05	0.00	0.27	4.5	0.444E+00	0.42	5.26	.14549E+01
1.06	0.00	0.27	4.5	0.442E+00	0.42	5.25	.14772E+01
1.07	0.00	0.27	4.5	0.440E+00	0.43	5.25	.14996E+01
1.09	0.00	0.27	4.6	0.438E+00	0.43	5.24	.15221E+01
1.10	0.00	0.27	4.6	0.436E+00	0.44	5.23	.15447E+01
1.11	0.00	0.27	4.6	0.434E+00	0.44	5.22	.15673E+01
1.12	0.00	0.28	4.6	0.432E+00	0.45	5.22	.15900E+01
1.13	0.00	0.28	4.6	0.431E+00	0.45	5.21	.16129E+01
1.15	0.00	0.28	4.7	0.429E+00	0.46	5.20	.16358E+01
1.16	0.00	0.28	4.7	0.427E+00	0.46	5.19	.16587E+01
1.17	0.00	0.28	4.7	0.425E+00	0.47	5.19	.16818E+01
1.18	0.00	0.28	4.7	0.424E+00	0.47	5.18	.17049E+01
1.19	0.00	0.28	4.7	0.422E+00	0.48	5.17	.17281E+01
1.21	0.00	0.28	4.8	0.420E+00	0.48	5.17	.17514E+01
1.22	0.00	0.28	4.8	0.419E+00	0.49	5.16	.17748E+01
1.23	0.00	0.28	4.8	0.417E+00	0.49	5.15	.17982E+01
1.24	0.00	0.29	4.8	0.415E+00	0.50	5.15	.18217E+01
1.26	0.00	0.29	4.8	0.414E+00	0.50	5.14	.18453E+01
1.27	0.00	0.29	4.9	0.412E+00	0.51	5.13	.18690E+01
1.28	0.00	0.29	4.9	0.410E+00	0.51	5.12	.18927E+01
1.29	0.00	0.29	4.9	0.409E+00	0.52	5.12	.19165E+01
1.30	0.00	0.29	4.9	0.407E+00	0.52	5.11	.19404E+01
1.32	0.00	0.29	4.9	0.406E+00	0.53	5.10	.19644E+01
1.33	0.00	0.29	4.9	0.404E+00	0.53	5.10	.19884E+01
1.34	0.00	0.29	5.0	0.403E+00	0.54	5.09	.20125E+01
1.35	0.00	0.30	5.0	0.402E+00	0.54	5.08	.20367E+01
1.37	0.00	0.30	5.0	0.400E+00	0.55	5.08	.20609E+01
1.38	0.00	0.30	5.0	0.399E+00	0.55	5.07	.20853E+01
1.39	0.00	0.30	5.0	0.397E+00	0.56	5.06	.21096E+01
1.40	0.00	0.30	5.1	0.396E+00	0.56	5.06	.21341E+01
1.41	0.00	0.30	5.1	0.394E+00	0.57	5.05	.21586E+01
1.43	0.00	0.30	5.1	0.393E+00	0.57	5.05	.21832E+01
1.44	0.00	0.30	5.1	0.392E+00	0.58	5.04	.22079E+01
1.45	0.00	0.30	5.1	0.390E+00	0.58	5.03	.22326E+01
1.46	0.00	0.30	5.1	0.389E+00	0.59	5.03	.22574E+01
1.48	0.00	0.31	5.2	0.388E+00	0.59	5.02	.22822E+01
1.49	0.00	0.31	5.2	0.387E+00	0.60	5.01	.23072E+01
1.50	0.00	0.31	5.2	0.385E+00	0.60	5.01	.23322E+01
1.51	0.00	0.31	5.2	0.384E+00	0.61	5.00	.23572E+01
1.52	0.00	0.31	5.2	0.383E+00	0.61	5.00	.23824E+01
1.54	0.00	0.31	5.2	0.382E+00	0.61	4.99	.24075E+01
1.55	0.00	0.31	5.3	0.380E+00	0.62	4.98	.24328E+01
1.56	0.00	0.31	5.3	0.379E+00	0.62	4.98	.24581E+01
1.57	0.00	0.31	5.3	0.378E+00	0.63	4.97	.24835E+01
1.58	0.00	0.32	5.3	0.377E+00	0.63	4.97	.25089E+01
1.60	0.00	0.32	5.3	0.376E+00	0.64	4.96	.25345E+01
1.61	0.00	0.32	5.3	0.374E+00	0.64	4.95	.25600E+01
1.62	0.00	0.32	5.4	0.373E+00	0.65	4.95	.25857E+01
1.63	0.00	0.32	5.4	0.372E+00	0.65	4.94	.26114E+01
1.65	0.00	0.32	5.4	0.371E+00	0.66	4.94	.26371E+01
1.66	0.00	0.32	5.4	0.370E+00	0.66	4.93	.26629E+01
1.67	0.00	0.32	5.4	0.369E+00	0.67	4.92	.26888E+01
1.68	0.00	0.32	5.4	0.368E+00	0.67	4.92	.27148E+01
1.69	0.00	0.32	5.5	0.367E+00	0.68	4.91	.27408E+01
1.71	0.00	0.33	5.5	0.366E+00	0.68	4.91	.27668E+01
1.72	0.00	0.33	5.5	0.364E+00	0.69	4.90	.27929E+01
1.73	0.00	0.33	5.5	0.363E+00	0.69	4.90	.28191E+01
1.74	0.00	0.33	5.5	0.362E+00	0.70	4.89	.28454E+01
1.76	0.00	0.33	5.5	0.361E+00	0.70	4.88	.28717E+01
1.77	0.00	0.33	5.6	0.360E+00	0.71	4.88	.28980E+01
1.78	0.00	0.33	5.6	0.359E+00	0.71	4.87	.29244E+01
1.79	0.00	0.33	5.6	0.358E+00	0.72	4.87	.29509E+01
1.80	0.00	0.33	5.6	0.357E+00	0.72	4.86	.29775E+01
1.82	0.00	0.33	5.6	0.356E+00	0.73	4.86	.30040E+01
1.83	0.00	0.34	5.6	0.355E+00	0.73	4.85	.30307E+01
1.84	0.00	0.34	5.6	0.354E+00	0.74	4.85	.30574E+01
1.85	0.00	0.34	5.7	0.353E+00	0.74	4.84	.30842E+01
1.87	0.00	0.34	5.7	0.352E+00	0.75	4.83	.31110E+01
1.88	0.00	0.34	5.7	0.352E+00	0.75	4.83	.31378E+01
1.89	0.00	0.34	5.7	0.351E+00	0.76	4.82	.31648E+01
1.90	0.00	0.34	5.7	0.350E+00	0.76	4.82	.31918E+01
1.91	0.00	0.34	5.7	0.349E+00	0.77	4.81	.32188E+01
1.93	0.00	0.34	5.7	0.348E+00	0.77	4.81	.32459E+01
1.94	0.00	0.35	5.8	0.347E+00	0.78	4.80	.32730E+01
1.95	0.00	0.35	5.8	0.346E+00	0.78	4.80	.33002E+01
1.96	0.00	0.35	5.8	0.345E+00	0.79	4.79	.33275E+01
1.98	0.00	0.35	5.8	0.344E+00	0.79	4.79	.33548E+01
1.99	0.00	0.35	5.8	0.343E+00	0.80	4.78	.33822E+01
2.00	0.00	0.35	5.8	0.343E+00	0.80	4.78	.34096E+01
2.01	0.00	0.35	5.9	0.342E+00	0.81	4.77	.34371E+01
2.02	0.00	0.35	5.9	0.341E+00	0.81	4.77	.34646E+01
2.04	0.00	0.35	5.9	0.340E+00	0.81	4.76	.34922E+01
2.05	0.00	0.35	5.9	0.339E+00	0.82	4.76	.35198E+01
2.06	0.00	0.36	5.9	0.338E+00	0.82	4.75	.35475E+01
2.07	0.00	0.36	5.9	0.337E+00	0.83	4.75	.35752E+01
2.08	0.00	0.36	5.9	0.337E+00	0.83	4.74	.36030E+01
2.10	0.00	0.36	6.0	0.336E+00	0.84	4.74	.36308E+01
2.11	0.00	0.36	6.0	0.335E+00	0.84	4.73	.36587E+01
2.12	0.00	0.36	6.0	0.334E+00	0.85	4.73	.36867E+01
2.13	0.00	0.36	6.0	0.333E+00	0.85	4.72	.37147E+01
2.15	0.00	0.36	6.0	0.333E+00	0.86	4.72	.37427E+01
2.16	0.00	0.36	6.0	0.332E+00	0.86	4.71	.37708E+01
2.17	0.00	0.36	6.0	0.331E+00	0.87	4.71	.37989E+01

2.18	0.00	0.37	6.1	0.330E+00	0.87	4.70	.38271E+01
2.19	0.00	0.37	6.1	0.329E+00	0.88	4.70	.38554E+01
2.21	0.00	0.37	6.1	0.329E+00	0.88	4.69	.38837E+01
2.22	0.00	0.37	6.1	0.328E+00	0.89	4.69	.39120E+01
2.23	0.00	0.37	6.1	0.327E+00	0.89	4.68	.39404E+01
2.24	0.00	0.37	6.1	0.326E+00	0.90	4.68	.39688E+01
2.26	0.00	0.37	6.1	0.326E+00	0.90	4.67	.39973E+01
2.27	0.00	0.37	6.2	0.325E+00	0.91	4.67	.40259E+01
2.28	0.00	0.37	6.2	0.324E+00	0.91	4.67	.40544E+01
2.29	0.00	0.38	6.2	0.324E+00	0.92	4.66	.40831E+01
2.30	0.00	0.38	6.2	0.323E+00	0.92	4.66	.41118E+01
2.32	0.00	0.38	6.2	0.322E+00	0.93	4.65	.41405E+01
2.33	0.00	0.38	6.2	0.321E+00	0.93	4.65	.41693E+01
2.34	0.00	0.38	6.2	0.321E+00	0.94	4.64	.41981E+01
2.35	0.00	0.38	6.2	0.320E+00	0.94	4.64	.42270E+01
2.37	0.00	0.38	6.3	0.319E+00	0.95	4.63	.42559E+01
2.38	0.00	0.38	6.3	0.319E+00	0.95	4.63	.42849E+01
2.39	0.00	0.38	6.3	0.318E+00	0.96	4.63	.43139E+01
2.40	0.00	0.38	6.3	0.317E+00	0.96	4.62	.43429E+01
2.41	0.00	0.39	6.3	0.317E+00	0.97	4.62	.43720E+01
2.43	0.00	0.39	6.3	0.316E+00	0.97	4.61	.44012E+01
2.44	0.00	0.39	6.3	0.315E+00	0.98	4.61	.44304E+01
2.45	0.00	0.39	6.4	0.315E+00	0.98	4.60	.44596E+01
2.46	0.00	0.39	6.4	0.314E+00	0.99	4.60	.44889E+01
2.47	0.00	0.39	6.4	0.313E+00	0.99	4.59	.45182E+01
2.49	0.00	0.39	6.4	0.313E+00	1.00	4.59	.45476E+01
2.50	0.00	0.39	6.4	0.312E+00	1.00	4.59	.45771E+01
2.51	0.00	0.39	6.4	0.311E+00	1.01	4.58	.46065E+01
2.52	0.00	0.40	6.4	0.311E+00	1.01	4.58	.46360E+01
2.54	0.00	0.40	6.4	0.310E+00	1.02	4.57	.46656E+01
2.55	0.00	0.40	6.5	0.309E+00	1.02	4.57	.46952E+01
2.56	0.00	0.40	6.5	0.309E+00	1.02	4.57	.47248E+01
2.57	0.00	0.40	6.5	0.308E+00	1.03	4.56	.47545E+01
2.58	0.00	0.40	6.5	0.308E+00	1.03	4.56	.47843E+01
2.60	0.00	0.40	6.5	0.307E+00	1.04	4.55	.48141E+01
2.61	0.00	0.40	6.5	0.306E+00	1.04	4.55	.48439E+01
2.62	0.00	0.40	6.5	0.306E+00	1.05	4.54	.48737E+01
2.63	0.00	0.40	6.6	0.305E+00	1.05	4.54	.49037E+01
2.65	0.00	0.41	6.6	0.305E+00	1.06	4.54	.49336E+01
2.66	0.00	0.41	6.6	0.304E+00	1.06	4.53	.49636E+01
2.67	0.00	0.41	6.6	0.303E+00	1.07	4.53	.49936E+01
2.68	0.00	0.41	6.6	0.303E+00	1.07	4.52	.50237E+01
2.69	0.00	0.41	6.6	0.302E+00	1.08	4.52	.50538E+01
2.71	0.00	0.41	6.6	0.302E+00	1.08	4.52	.50840E+01
2.72	0.00	0.41	6.6	0.301E+00	1.09	4.51	.51142E+01
2.73	0.00	0.41	6.7	0.300E+00	1.09	4.51	.51445E+01
2.74	0.00	0.41	6.7	0.300E+00	1.10	4.50	.51748E+01
2.76	0.00	0.41	6.7	0.299E+00	1.10	4.50	.52051E+01
2.77	0.00	0.42	6.7	0.299E+00	1.11	4.50	.52355E+01
2.78	0.00	0.42	6.7	0.298E+00	1.11	4.49	.52659E+01
2.79	0.00	0.42	6.7	0.298E+00	1.12	4.49	.52964E+01
2.80	0.00	0.42	6.7	0.297E+00	1.12	4.49	.53269E+01
2.82	0.00	0.42	6.7	0.297E+00	1.13	4.48	.53574E+01
2.83	0.00	0.42	6.8	0.296E+00	1.13	4.48	.53880E+01
2.84	0.00	0.42	6.8	0.295E+00	1.14	4.47	.54186E+01
2.85	0.00	0.42	6.8	0.295E+00	1.14	4.47	.54493E+01
2.87	0.00	0.42	6.8	0.294E+00	1.15	4.47	.54800E+01
2.88	0.00	0.43	6.8	0.294E+00	1.15	4.46	.55107E+01
2.89	0.00	0.43	6.8	0.293E+00	1.16	4.46	.55415E+01
2.90	0.00	0.43	6.8	0.293E+00	1.16	4.46	.55723E+01
2.91	0.00	0.43	6.8	0.292E+00	1.17	4.45	.56032E+01
2.93	0.00	0.43	6.9	0.292E+00	1.17	4.45	.56341E+01
2.94	0.00	0.43	6.9	0.291E+00	1.18	4.45	.56651E+01
2.95	0.00	0.43	6.9	0.291E+00	1.18	4.44	.56960E+01
2.96	0.00	0.43	6.9	0.290E+00	1.19	4.44	.57271E+01
2.97	0.00	0.43	6.9	0.290E+00	1.19	4.43	.57581E+01
2.99	0.00	0.43	6.9	0.289E+00	1.20	4.43	.57892E+01
3.00	0.00	0.44	6.9	0.289E+00	1.20	4.43	.58204E+01
3.01	0.00	0.44	6.9	0.288E+00	1.21	4.42	.58516E+01
3.02	0.00	0.44	7.0	0.288E+00	1.21	4.42	.58828E+01
3.04	0.00	0.44	7.0	0.287E+00	1.22	4.42	.59140E+01
3.05	0.00	0.44	7.0	0.287E+00	1.22	4.41	.59453E+01
3.06	0.00	0.44	7.0	0.286E+00	1.22	4.41	.59767E+01
3.07	0.00	0.44	7.0	0.286E+00	1.23	4.41	.60080E+01
3.08	0.00	0.44	7.0	0.285E+00	1.23	4.40	.60395E+01
3.10	0.00	0.44	7.0	0.285E+00	1.24	4.40	.60709E+01
3.11	0.00	0.45	7.0	0.284E+00	1.24	4.40	.61024E+01
3.12	0.00	0.45	7.0	0.284E+00	1.25	4.39	.61339E+01
3.13	0.00	0.45	7.1	0.283E+00	1.25	4.39	.61655E+01
3.15	0.00	0.45	7.1	0.283E+00	1.26	4.39	.61971E+01
3.16	0.00	0.45	7.1	0.282E+00	1.26	4.38	.62287E+01
3.17	0.00	0.45	7.1	0.282E+00	1.27	4.38	.62604E+01
3.18	0.00	0.45	7.1	0.281E+00	1.27	4.38	.62921E+01
3.19	0.00	0.45	7.1	0.281E+00	1.28	4.37	.63239E+01
3.21	0.00	0.45	7.1	0.281E+00	1.28	4.37	.63557E+01
3.22	0.00	0.45	7.1	0.280E+00	1.29	4.37	.63875E+01
3.23	0.00	0.46	7.2	0.280E+00	1.29	4.36	.64193E+01
3.24	0.00	0.46	7.2	0.279E+00	1.30	4.36	.64512E+01
3.26	0.00	0.46	7.2	0.279E+00	1.30	4.36	.64832E+01
3.27	0.00	0.46	7.2	0.278E+00	1.31	4.35	.65152E+01
3.28	0.00	0.46	7.2	0.278E+00	1.31	4.35	.65472E+01
3.29	0.00	0.46	7.2	0.277E+00	1.32	4.35	.65792E+01
3.30	0.00	0.46	7.2	0.277E+00	1.32	4.35	.66113E+01
3.32	0.00	0.46	7.2	0.277E+00	1.33	4.34	.66434E+01
3.33	0.00	0.46	7.2	0.276E+00	1.33	4.34	.66756E+01
3.34	0.00	0.46	7.3	0.276E+00	1.34	4.34	.67077E+01
3.35	0.00	0.47	7.3	0.275E+00	1.34	4.33	.67400E+01
3.36	0.00	0.47	7.3	0.275E+00	1.35	4.33	.67722E+01
3.38	0.00	0.47	7.3	0.274E+00	1.35	4.33	.68045E+01

3.39	0.00	0.47	7.3	0.274E+00	1.36	4.32	.68369E+01
3.40	0.00	0.47	7.3	0.274E+00	1.36	4.32	.68692E+01
3.41	0.00	0.47	7.3	0.273E+00	1.37	4.32	.69016E+01
3.43	0.00	0.47	7.3	0.273E+00	1.37	4.32	.69341E+01
3.44	0.00	0.47	7.3	0.272E+00	1.38	4.31	.69665E+01
3.45	0.00	0.47	7.4	0.272E+00	1.38	4.31	.69990E+01
3.46	0.00	0.48	7.4	0.271E+00	1.39	4.31	.70316E+01
3.47	0.00	0.48	7.4	0.271E+00	1.39	4.30	.70642E+01
3.49	0.00	0.48	7.4	0.271E+00	1.40	4.30	.70968E+01
3.50	0.00	0.48	7.4	0.270E+00	1.40	4.30	.71294E+01
3.51	0.00	0.48	7.4	0.270E+00	1.41	4.30	.71621E+01
3.52	0.00	0.48	7.4	0.269E+00	1.41	4.29	.71948E+01
3.54	0.00	0.48	7.4	0.269E+00	1.42	4.29	.72276E+01
3.55	0.00	0.48	7.4	0.269E+00	1.42	4.29	.72604E+01
3.56	0.00	0.48	7.5	0.268E+00	1.42	4.28	.72932E+01
3.57	0.00	0.48	7.5	0.268E+00	1.43	4.28	.73260E+01
3.58	0.00	0.49	7.5	0.267E+00	1.43	4.28	.73589E+01
3.60	0.00	0.49	7.5	0.267E+00	1.44	4.28	.73918E+01
3.61	0.00	0.49	7.5	0.267E+00	1.44	4.27	.74248E+01
3.62	0.00	0.49	7.5	0.266E+00	1.45	4.27	.74578E+01
3.63	0.00	0.49	7.5	0.266E+00	1.45	4.27	.74908E+01
3.65	0.00	0.49	7.5	0.265E+00	1.46	4.27	.75238E+01
3.66	0.00	0.49	7.5	0.265E+00	1.46	4.26	.75569E+01
3.67	0.00	0.49	7.6	0.265E+00	1.47	4.26	.75901E+01
3.68	0.00	0.49	7.6	0.264E+00	1.47	4.26	.76232E+01
3.69	0.00	0.49	7.6	0.264E+00	1.48	4.26	.76564E+01
3.71	0.00	0.50	7.6	0.264E+00	1.48	4.25	.76896E+01
3.72	0.00	0.50	7.6	0.263E+00	1.49	4.25	.77229E+01
3.73	0.00	0.50	7.6	0.263E+00	1.49	4.25	.77562E+01
3.74	0.00	0.50	7.6	0.262E+00	1.50	4.25	.77895E+01
3.76	0.00	0.50	7.6	0.262E+00	1.50	4.24	.78228E+01
3.77	0.00	0.50	7.6	0.262E+00	1.51	4.24	.78562E+01
3.78	0.00	0.50	7.7	0.261E+00	1.51	4.24	.78896E+01
3.79	0.00	0.50	7.7	0.261E+00	1.52	4.24	.79231E+01
3.80	0.00	0.50	7.7	0.261E+00	1.52	4.23	.79566E+01
3.82	0.00	0.51	7.7	0.260E+00	1.53	4.23	.79901E+01
3.83	0.00	0.51	7.7	0.260E+00	1.53	4.23	.80236E+01
3.84	0.00	0.51	7.7	0.260E+00	1.54	4.23	.80572E+01
3.85	0.00	0.51	7.7	0.259E+00	1.54	4.22	.80908E+01
3.86	0.00	0.51	7.7	0.259E+00	1.55	4.22	.81244E+01
3.88	0.00	0.51	7.7	0.258E+00	1.55	4.22	.81581E+01
3.89	0.00	0.51	7.7	0.258E+00	1.56	4.22	.81918E+01
3.90	0.00	0.51	7.8	0.258E+00	1.56	4.21	.82256E+01
3.91	0.00	0.51	7.8	0.257E+00	1.57	4.21	.82593E+01
3.93	0.00	0.51	7.8	0.257E+00	1.57	4.21	.82931E+01
3.94	0.00	0.52	7.8	0.257E+00	1.58	4.21	.83270E+01
3.95	0.00	0.52	7.8	0.256E+00	1.58	4.21	.83608E+01
3.96	0.00	0.52	7.8	0.256E+00	1.59	4.20	.83947E+01
3.97	0.00	0.52	7.8	0.256E+00	1.59	4.20	.84286E+01
3.99	0.00	0.52	7.8	0.255E+00	1.60	4.20	.84626E+01
4.00	0.00	0.52	7.8	0.255E+00	1.60	4.20	.84966E+01
4.01	0.00	0.52	7.9	0.255E+00	1.61	4.20	.85306E+01
4.02	0.00	0.52	7.9	0.254E+00	1.61	4.19	.85646E+01
4.04	0.00	0.52	7.9	0.254E+00	1.62	4.19	.85987E+01
4.05	0.00	0.53	7.9	0.254E+00	1.62	4.19	.86328E+01
4.06	0.00	0.53	7.9	0.253E+00	1.63	4.19	.86670E+01
4.07	0.00	0.53	7.9	0.253E+00	1.63	4.18	.87011E+01
4.08	0.00	0.53	7.9	0.253E+00	1.63	4.18	.87353E+01
4.10	0.00	0.53	7.9	0.252E+00	1.64	4.18	.87696E+01
4.11	0.00	0.53	7.9	0.252E+00	1.64	4.18	.88038E+01
4.12	0.00	0.53	7.9	0.252E+00	1.65	4.18	.88381E+01
4.13	0.00	0.53	8.0	0.251E+00	1.65	4.17	.88724E+01
4.15	0.00	0.53	8.0	0.251E+00	1.66	4.17	.89068E+01
4.16	0.00	0.53	8.0	0.251E+00	1.66	4.17	.89412E+01
4.17	0.00	0.54	8.0	0.250E+00	1.67	4.17	.89756E+01
4.18	0.00	0.54	8.0	0.250E+00	1.67	4.17	.90100E+01
4.19	0.00	0.54	8.0	0.250E+00	1.68	4.17	.90445E+01
4.21	0.00	0.54	8.0	0.249E+00	1.68	4.16	.90790E+01
4.22	0.00	0.54	8.0	0.249E+00	1.69	4.16	.91135E+01
4.23	0.00	0.54	8.0	0.249E+00	1.69	4.16	.91481E+01
4.24	0.00	0.54	8.0	0.248E+00	1.70	4.16	.91827E+01
4.26	0.00	0.54	8.1	0.248E+00	1.70	4.16	.92173E+01
4.27	0.00	0.54	8.1	0.248E+00	1.71	4.15	.92520E+01
4.28	0.00	0.54	8.1	0.248E+00	1.71	4.15	.92866E+01
4.29	0.00	0.55	8.1	0.247E+00	1.72	4.15	.93213E+01
4.30	0.00	0.55	8.1	0.247E+00	1.72	4.15	.93561E+01
4.32	0.00	0.55	8.1	0.247E+00	1.73	4.15	.93908E+01
4.33	0.00	0.55	8.1	0.246E+00	1.73	4.15	.94256E+01
4.34	0.00	0.55	8.1	0.246E+00	1.74	4.14	.94605E+01
4.35	0.00	0.55	8.1	0.246E+00	1.74	4.14	.94953E+01
4.36	0.00	0.55	8.1	0.245E+00	1.75	4.14	.95302E+01
4.38	0.00	0.55	8.2	0.245E+00	1.75	4.14	.95651E+01
4.39	0.00	0.55	8.2	0.245E+00	1.76	4.14	.96000E+01
4.40	0.00	0.56	8.2	0.245E+00	1.76	4.14	.96350E+01
4.41	0.00	0.56	8.2	0.244E+00	1.77	4.13	.96700E+01
4.43	0.00	0.56	8.2	0.244E+00	1.77	4.13	.97050E+01
4.44	0.00	0.56	8.2	0.244E+00	1.78	4.13	.97401E+01
4.45	0.00	0.56	8.2	0.243E+00	1.78	4.13	.97752E+01
4.46	0.00	0.56	8.2	0.243E+00	1.79	4.13	.98103E+01
4.47	0.00	0.56	8.2	0.243E+00	1.79	4.13	.98454E+01
4.49	0.00	0.56	8.2	0.242E+00	1.80	4.13	.98806E+01
4.50	0.00	0.56	8.3	0.242E+00	1.80	4.12	.99158E+01
4.51	0.00	0.56	8.3	0.242E+00	1.81	4.12	.99510E+01
4.52	0.00	0.57	8.3	0.242E+00	1.81	4.12	.99862E+01
4.54	0.00	0.57	8.3	0.241E+00	1.82	4.12	.10022E+02
4.55	0.00	0.57	8.3	0.241E+00	1.82	4.12	.10057E+02
4.56	0.00	0.57	8.3	0.241E+00	1.83	4.12	.10092E+02
4.57	0.00	0.57	8.3	0.240E+00	1.83	4.12	.10128E+02
4.58	0.00	0.57	8.3	0.240E+00	1.83	4.11	.10163E+02

4.60	0.00	0.57	8.3	0.240E+00	1.84	4.11	.10198E+02
4.61	0.00	0.57	8.3	0.240E+00	1.84	4.11	.10234E+02
4.62	0.00	0.57	8.4	0.239E+00	1.85	4.11	.10269E+02
4.63	0.00	0.57	8.4	0.239E+00	1.85	4.11	.10305E+02
4.65	0.00	0.58	8.4	0.239E+00	1.86	4.11	.10340E+02
4.66	0.00	0.58	8.4	0.238E+00	1.86	4.11	.10376E+02
4.67	0.00	0.58	8.4	0.238E+00	1.87	4.11	.10411E+02
4.68	0.00	0.58	8.4	0.238E+00	1.87	4.10	.10447E+02
4.69	0.00	0.58	8.4	0.238E+00	1.88	4.10	.10483E+02
4.71	0.00	0.58	8.4	0.237E+00	1.88	4.10	.10518E+02
4.72	0.00	0.58	8.4	0.237E+00	1.89	4.10	.10554E+02
4.73	0.00	0.58	8.4	0.237E+00	1.89	4.10	.10590E+02
4.74	0.00	0.58	8.5	0.237E+00	1.90	4.10	.10625E+02
4.75	0.00	0.59	8.5	0.236E+00	1.90	4.10	.10661E+02
4.77	0.00	0.59	8.5	0.236E+00	1.91	4.10	.10697E+02
4.78	0.00	0.59	8.5	0.236E+00	1.91	4.09	.10733E+02
4.79	0.00	0.59	8.5	0.236E+00	1.92	4.09	.10769E+02
4.80	0.00	0.59	8.5	0.235E+00	1.92	4.09	.10805E+02
4.82	0.00	0.59	8.5	0.235E+00	1.93	4.09	.10840E+02
4.83	0.00	0.59	8.5	0.235E+00	1.93	4.09	.10876E+02
4.84	0.00	0.59	8.5	0.234E+00	1.94	4.09	.10912E+02
4.85	0.00	0.59	8.5	0.234E+00	1.94	4.09	.10948E+02
4.86	0.00	0.59	8.5	0.234E+00	1.95	4.09	.10984E+02
4.88	0.00	0.60	8.6	0.234E+00	1.95	4.09	.11020E+02
4.89	0.00	0.60	8.6	0.233E+00	1.96	4.09	.11056E+02
4.90	0.00	0.60	8.6	0.233E+00	1.96	4.08	.11093E+02
4.91	0.00	0.60	8.6	0.233E+00	1.97	4.08	.11129E+02
4.93	0.00	0.60	8.6	0.233E+00	1.97	4.08	.11165E+02
4.94	0.00	0.60	8.6	0.232E+00	1.98	4.08	.11201E+02
4.95	0.00	0.60	8.6	0.232E+00	1.98	4.08	.11237E+02
4.96	0.00	0.60	8.6	0.232E+00	1.99	4.08	.11273E+02
4.97	0.00	0.60	8.6	0.232E+00	1.99	4.08	.11310E+02
4.99	0.00	0.61	8.6	0.231E+00	2.00	4.08	.11346E+02
5.00	0.00	0.61	8.7	0.231E+00	2.00	4.08	.11382E+02
5.01	0.00	0.61	8.7	0.231E+00	2.01	4.08	.11419E+02
5.02	0.00	0.61	8.7	0.231E+00	2.01	4.08	.11455E+02
5.04	0.00	0.61	8.7	0.230E+00	2.02	4.07	.11491E+02
5.05	0.00	0.61	8.7	0.230E+00	2.02	4.07	.11528E+02
5.06	0.00	0.61	8.7	0.230E+00	2.03	4.07	.11564E+02
5.07	0.00	0.61	8.7	0.230E+00	2.03	4.07	.11601E+02
5.08	0.00	0.61	8.7	0.229E+00	2.03	4.07	.11637E+02
5.10	0.00	0.61	8.7	0.229E+00	2.04	4.07	.11673E+02
5.11	0.00	0.62	8.7	0.229E+00	2.04	4.07	.11710E+02
5.12	0.00	0.62	8.7	0.229E+00	2.05	4.07	.11747E+02
5.13	0.00	0.62	8.8	0.228E+00	2.05	4.07	.11783E+02
5.15	0.00	0.62	8.8	0.228E+00	2.06	4.07	.11820E+02
5.16	0.00	0.62	8.8	0.228E+00	2.06	4.07	.11856E+02
5.17	0.00	0.62	8.8	0.228E+00	2.07	4.07	.11893E+02
5.18	0.00	0.62	8.8	0.228E+00	2.07	4.07	.11930E+02
5.19	0.00	0.62	8.8	0.227E+00	2.08	4.06	.11966E+02
5.21	0.00	0.62	8.8	0.227E+00	2.08	4.06	.12003E+02
5.22	0.00	0.62	8.8	0.227E+00	2.09	4.06	.12040E+02
5.23	0.00	0.63	8.8	0.227E+00	2.09	4.06	.12077E+02
5.24	0.00	0.63	8.8	0.226E+00	2.10	4.06	.12113E+02
5.25	0.00	0.63	8.8	0.226E+00	2.10	4.06	.12150E+02
5.27	0.00	0.63	8.9	0.226E+00	2.11	4.06	.12187E+02
5.28	0.00	0.63	8.9	0.226E+00	2.11	4.06	.12224E+02
5.29	0.00	0.63	8.9	0.225E+00	2.12	4.06	.12261E+02
5.30	0.00	0.63	8.9	0.225E+00	2.12	4.06	.12298E+02
5.32	0.00	0.63	8.9	0.225E+00	2.13	4.06	.12335E+02
5.33	0.00	0.63	8.9	0.225E+00	2.13	4.06	.12372E+02
5.34	0.00	0.64	8.9	0.225E+00	2.14	4.06	.12409E+02
5.35	0.00	0.64	8.9	0.224E+00	2.14	4.06	.12446E+02
5.36	0.00	0.64	8.9	0.224E+00	2.15	4.06	.12483E+02
5.38	0.00	0.64	8.9	0.224E+00	2.15	4.06	.12520E+02
5.39	0.00	0.64	8.9	0.224E+00	2.16	4.06	.12557E+02
5.40	0.00	0.64	9.0	0.223E+00	2.16	4.05	.12594E+02
5.41	0.00	0.64	9.0	0.223E+00	2.17	4.05	.12631E+02
5.43	0.00	0.64	9.0	0.223E+00	2.17	4.05	.12668E+02
5.44	0.00	0.64	9.0	0.223E+00	2.18	4.05	.12706E+02
5.45	0.00	0.64	9.0	0.222E+00	2.18	4.05	.12743E+02
5.46	0.00	0.65	9.0	0.222E+00	2.19	4.05	.12780E+02
5.47	0.00	0.65	9.0	0.222E+00	2.19	4.05	.12817E+02
5.49	0.00	0.65	9.0	0.222E+00	2.20	4.05	.12855E+02
5.50	0.00	0.65	9.0	0.222E+00	2.20	4.05	.12892E+02
5.51	0.00	0.65	9.0	0.221E+00	2.21	4.05	.12929E+02
5.52	0.00	0.65	9.0	0.221E+00	2.21	4.05	.12967E+02
5.54	0.00	0.65	9.1	0.221E+00	2.22	4.05	.13004E+02
5.55	0.00	0.65	9.1	0.221E+00	2.22	4.05	.13041E+02
5.56	0.00	0.65	9.1	0.221E+00	2.23	4.05	.13079E+02
5.57	0.00	0.65	9.1	0.220E+00	2.23	4.05	.13116E+02
5.58	0.00	0.66	9.1	0.220E+00	2.24	4.05	.13154E+02
5.60	0.00	0.66	9.1	0.220E+00	2.24	4.05	.13191E+02
5.61	0.00	0.66	9.1	0.220E+00	2.24	4.05	.13229E+02
5.62	0.00	0.66	9.1	0.219E+00	2.25	4.05	.13266E+02
5.63	0.00	0.66	9.1	0.219E+00	2.25	4.05	.13304E+02
5.64	0.00	0.66	9.1	0.219E+00	2.26	4.05	.13341E+02
5.66	0.00	0.66	9.1	0.219E+00	2.26	4.05	.13379E+02
5.67	0.00	0.66	9.1	0.219E+00	2.27	4.05	.13417E+02
5.68	0.00	0.66	9.2	0.218E+00	2.27	4.04	.13454E+02
5.69	0.00	0.67	9.2	0.218E+00	2.28	4.04	.13492E+02
5.71	0.00	0.67	9.2	0.218E+00	2.28	4.04	.13530E+02
5.72	0.00	0.67	9.2	0.218E+00	2.29	4.04	.13567E+02
5.73	0.00	0.67	9.2	0.218E+00	2.29	4.04	.13605E+02
5.74	0.00	0.67	9.2	0.217E+00	2.30	4.04	.13643E+02
5.75	0.00	0.67	9.2	0.217E+00	2.30	4.04	.13681E+02
5.77	0.00	0.67	9.2	0.217E+00	2.31	4.04	.13718E+02
5.78	0.00	0.67	9.2	0.217E+00	2.31	4.04	.13756E+02
5.79	0.00	0.67	9.2	0.217E+00	2.32	4.04	.13794E+02

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5.80 0.00 0.67 9.2 0.216E+00 2.32 4.04 .13832E+02
5.82 0.00 0.68 9.3 0.216E+00 2.33 4.04 .13870E+02
5.83 0.00 0.68 9.3 0.216E+00 2.33 4.04 .13908E+02
5.84 0.00 0.68 9.3 0.216E+00 2.34 4.04 .13946E+02
5.85 0.00 0.68 9.3 0.216E+00 2.34 4.04 .13984E+02
5.86 0.00 0.68 9.3 0.215E+00 2.35 4.04 .14022E+02
5.88 0.00 0.68 9.3 0.215E+00 2.35 4.04 .14060E+02
5.89 0.00 0.68 9.3 0.215E+00 2.36 4.04 .14098E+02
5.90 0.00 0.68 9.3 0.215E+00 2.36 4.04 .14136E+02
5.91 0.00 0.68 9.3 0.215E+00 2.37 4.04 .14174E+02
5.93 0.00 0.69 9.3 0.214E+00 2.37 4.04 .14212E+02
5.94 0.00 0.69 9.3 0.214E+00 2.38 4.04 .14250E+02
5.95 0.00 0.69 9.3 0.214E+00 2.38 4.04 .14288E+02
5.96 0.00 0.69 9.4 0.214E+00 2.39 4.04 .14327E+02
5.97 0.00 0.69 9.4 0.214E+00 2.39 4.04 .14365E+02
5.99 0.00 0.69 9.4 0.213E+00 2.40 4.04 .14403E+02
6.00 0.00 0.69 9.4 0.213E+00 2.40 4.04 .14441E+02
6.01 0.00 0.69 9.4 0.213E+00 2.41 4.04 .14480E+02
6.02 0.00 0.69 9.4 0.213E+00 2.41 4.04 .14518E+02
6.04 0.00 0.69 9.4 0.213E+00 2.42 4.04 .14556E+02
6.05 0.00 0.70 9.4 0.212E+00 2.42 4.04 .14594E+02
6.06 0.00 0.70 9.4 0.212E+00 2.43 4.04 .14633E+02
6.07 0.00 0.70 9.4 0.212E+00 2.43 4.04 .14671E+02
6.08 0.00 0.70 9.4 0.212E+00 2.44 4.04 .14710E+02
6.10 0.00 0.70 9.4 0.212E+00 2.44 4.04 .14748E+02
Cumulative travel time = 14.7481 sec ( 0.00 hrs)

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Plume centerline may exhibit slight discontinuities in transition to subsequent far-field module.

END OF MOD271: ACCELERATION ZONE OF UNIDIRECTIONAL CO-FLOWING DIFFUSER

 BEGIN MOD251: DIFFUSER PLUME IN CO-FLOW

Phase 1: Vertically mixed, Phase 2: Re-stratified

Phase 1: The diffuser plume is VERTICALLY FULLY MIXED over the entire layer depth.

This flow region is INSIGNIFICANT in spatial extent and will be by-passed.

 Phase 2: The flow has RESTRATIFIED at the beginning of this zone.

Profile definitions:

BV = top-hat thickness, measured vertically
 BH = Gaussian 1/e (37%) half-width in horizontal plane normal to trajectory
 ZU = upper plume boundary (Z-coordinate)
 ZL = lower plume boundary (Z-coordinate)
 S = hydrodynamic centerline dilution
 C = centerline concentration (includes reaction effects, if any)
 TT = Cumulative travel time

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X Y Z S C BV BH TT
6.10 0.00 2.44 9.4 0.212E+00 2.44 4.56 .14748E+02
6.23 0.00 2.44 9.5 0.211E+00 2.33 4.77 .16898E+02
6.37 0.00 2.44 9.5 0.211E+00 2.27 4.90 .19051E+02
6.50 0.00 2.44 9.5 0.211E+00 2.23 5.01 .21206E+02
6.64 0.00 2.44 9.5 0.211E+00 2.19 5.11 .23363E+02
6.78 0.00 2.44 9.5 0.211E+00 2.15 5.21 .25522E+02
6.91 0.00 2.44 9.5 0.210E+00 2.12 5.29 .27683E+02
7.05 0.00 2.44 9.5 0.210E+00 2.09 5.38 .29847E+02
7.19 0.00 2.44 9.5 0.210E+00 2.06 5.46 .32013E+02
7.32 0.00 2.44 9.5 0.210E+00 2.04 5.53 .34181E+02
7.46 0.00 2.44 9.5 0.209E+00 2.02 5.61 .36351E+02
7.59 0.00 2.44 9.6 0.209E+00 1.99 5.68 .38524E+02
7.73 0.00 2.44 9.6 0.209E+00 1.97 5.75 .40699E+02
7.87 0.00 2.44 9.6 0.209E+00 1.95 5.82 .42875E+02
8.00 0.00 2.44 9.6 0.209E+00 1.93 5.89 .45055E+02
8.14 0.00 2.44 9.6 0.208E+00 1.91 5.95 .47236E+02
8.27 0.00 2.44 9.6 0.208E+00 1.90 6.02 .49419E+02
8.41 0.00 2.44 9.6 0.208E+00 1.88 6.08 .51605E+02
8.55 0.00 2.44 9.6 0.208E+00 1.86 6.14 .53793E+02
8.68 0.00 2.44 9.6 0.208E+00 1.85 6.20 .55983E+02
8.82 0.00 2.44 9.6 0.207E+00 1.83 6.26 .58175E+02
8.95 0.00 2.44 9.7 0.207E+00 1.82 6.32 .60369E+02
9.09 0.00 2.44 9.7 0.207E+00 1.81 6.38 .62566E+02
9.23 0.00 2.44 9.7 0.207E+00 1.79 6.44 .64765E+02
9.36 0.00 2.44 9.7 0.207E+00 1.78 6.50 .66966E+02
9.50 0.00 2.44 9.7 0.206E+00 1.77 6.56 .69169E+02
9.64 0.00 2.44 9.7 0.206E+00 1.75 6.61 .71374E+02
9.77 0.00 2.44 9.7 0.206E+00 1.74 6.67 .73581E+02
9.91 0.00 2.44 9.7 0.206E+00 1.73 6.72 .75791E+02
10.04 0.00 2.44 9.7 0.206E+00 1.72 6.78 .78003E+02
10.18 0.00 2.44 9.7 0.205E+00 1.71 6.83 .80217E+02
10.32 0.00 2.44 9.7 0.205E+00 1.70 6.89 .82433E+02
10.45 0.00 2.44 9.8 0.205E+00 1.69 6.94 .84651E+02
10.59 0.00 2.44 9.8 0.205E+00 1.68 6.99 .86871E+02
10.72 0.00 2.44 9.8 0.205E+00 1.67 7.05 .89094E+02
10.86 0.00 2.44 9.8 0.204E+00 1.66 7.10 .91319E+02
11.00 0.00 2.44 9.8 0.204E+00 1.65 7.15 .93545E+02
11.13 0.00 2.44 9.8 0.204E+00 1.64 7.20 .95774E+02
11.27 0.00 2.44 9.8 0.204E+00 1.63 7.25 .98005E+02
11.41 0.00 2.44 9.8 0.204E+00 1.62 7.31 .10024E+03
11.54 0.00 2.44 9.8 0.203E+00 1.61 7.36 .10247E+03
11.68 0.00 2.44 9.8 0.203E+00 1.60 7.41 .10471E+03
11.81 0.00 2.44 9.9 0.203E+00 1.60 7.46 .10695E+03
11.95 0.00 2.44 9.9 0.203E+00 1.59 7.51 .10919E+03
12.09 0.00 2.44 9.9 0.203E+00 1.58 7.55 .11144E+03
12.22 0.00 2.44 9.9 0.202E+00 1.57 7.60 .11368E+03
12.36 0.00 2.44 9.9 0.202E+00 1.56 7.65 .11593E+03
12.49 0.00 2.44 9.9 0.202E+00 1.56 7.70 .11818E+03
12.63 0.00 2.44 9.9 0.202E+00 1.55 7.75 .12043E+03
12.77 0.00 2.44 9.9 0.202E+00 1.54 7.80 .12269E+03
12.90 0.00 2.44 9.9 0.201E+00 1.53 7.85 .12495E+03
13.04 0.00 2.44 9.9 0.201E+00 1.53 7.89 .12720E+03

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13.18	0.00	2.44	9.9	0.201E+00	1.52	7.94	.12946E+03
13.31	0.00	2.44	10.0	0.201E+00	1.51	7.99	.13173E+03
13.45	0.00	2.44	10.0	0.201E+00	1.51	8.03	.13399E+03
13.58	0.00	2.44	10.0	0.201E+00	1.50	8.08	.13626E+03
13.72	0.00	2.44	10.0	0.200E+00	1.50	8.13	.13853E+03
13.86	0.00	2.44	10.0	0.200E+00	1.49	8.17	.14080E+03
13.99	0.00	2.44	10.0	0.200E+00	1.48	8.22	.14307E+03
14.13	0.00	2.44	10.0	0.200E+00	1.48	8.27	.14535E+03
14.26	0.00	2.44	10.0	0.200E+00	1.47	8.31	.14763E+03
14.40	0.00	2.44	10.0	0.199E+00	1.46	8.36	.14991E+03
14.54	0.00	2.44	10.0	0.199E+00	1.46	8.40	.15219E+03
14.67	0.00	2.44	10.0	0.199E+00	1.45	8.45	.15447E+03
14.81	0.00	2.44	10.1	0.199E+00	1.45	8.49	.15676E+03
14.94	0.00	2.44	10.1	0.199E+00	1.44	8.54	.15905E+03
15.08	0.00	2.44	10.1	0.199E+00	1.44	8.58	.16134E+03
15.22	0.00	2.44	10.1	0.198E+00	1.43	8.63	.16363E+03
15.35	0.00	2.44	10.1	0.198E+00	1.43	8.67	.16593E+03
15.49	0.00	2.44	10.1	0.198E+00	1.42	8.72	.16822E+03
15.63	0.00	2.44	10.1	0.198E+00	1.42	8.76	.17052E+03
15.76	0.00	2.44	10.1	0.198E+00	1.41	8.81	.17282E+03
15.90	0.00	2.44	10.1	0.197E+00	1.41	8.85	.17512E+03
16.03	0.00	2.44	10.1	0.197E+00	1.40	8.89	.17743E+03
16.17	0.00	2.44	10.1	0.197E+00	1.40	8.94	.17974E+03
16.31	0.00	2.44	10.2	0.197E+00	1.39	8.98	.18205E+03
16.44	0.00	2.44	10.2	0.197E+00	1.39	9.03	.18436E+03
16.58	0.00	2.44	10.2	0.197E+00	1.38	9.07	.18667E+03
16.71	0.00	2.44	10.2	0.196E+00	1.38	9.11	.18898E+03
16.85	0.00	2.44	10.2	0.196E+00	1.37	9.16	.19130E+03
16.99	0.00	2.44	10.2	0.196E+00	1.37	9.20	.19362E+03
17.12	0.00	2.44	10.2	0.196E+00	1.36	9.24	.19594E+03
17.26	0.00	2.44	10.2	0.196E+00	1.36	9.28	.19827E+03
17.40	0.00	2.44	10.2	0.196E+00	1.36	9.33	.20059E+03
17.53	0.00	2.44	10.2	0.195E+00	1.35	9.37	.20292E+03
17.67	0.00	2.44	10.2	0.195E+00	1.35	9.41	.20525E+03
17.80	0.00	2.44	10.3	0.195E+00	1.34	9.45	.20758E+03
17.94	0.00	2.44	10.3	0.195E+00	1.34	9.50	.20991E+03
18.08	0.00	2.44	10.3	0.195E+00	1.33	9.54	.21225E+03
18.21	0.00	2.44	10.3	0.194E+00	1.33	9.58	.21459E+03
18.35	0.00	2.44	10.3	0.194E+00	1.33	9.62	.21693E+03
18.48	0.00	2.44	10.3	0.194E+00	1.32	9.66	.21927E+03
18.62	0.00	2.44	10.3	0.194E+00	1.32	9.71	.22161E+03
18.76	0.00	2.44	10.3	0.194E+00	1.32	9.75	.22396E+03
18.89	0.00	2.44	10.3	0.194E+00	1.31	9.79	.22631E+03
19.03	0.00	2.44	10.3	0.193E+00	1.31	9.83	.22866E+03
19.17	0.00	2.44	10.3	0.193E+00	1.30	9.87	.23101E+03
19.30	0.00	2.44	10.4	0.193E+00	1.30	9.91	.23336E+03
19.44	0.00	2.44	10.4	0.193E+00	1.30	9.96	.23572E+03
19.57	0.00	2.44	10.4	0.193E+00	1.29	10.00	.23808E+03
19.71	0.00	2.44	10.4	0.193E+00	1.29	10.04	.24044E+03
19.85	0.00	2.44	10.4	0.192E+00	1.29	10.08	.24280E+03
19.98	0.00	2.44	10.4	0.192E+00	1.28	10.12	.24517E+03
20.12	0.00	2.44	10.4	0.192E+00	1.28	10.16	.24753E+03
20.25	0.00	2.44	10.4	0.192E+00	1.28	10.20	.24990E+03
20.39	0.00	2.44	10.4	0.192E+00	1.27	10.24	.25227E+03
20.53	0.00	2.44	10.4	0.192E+00	1.27	10.28	.25464E+03
20.66	0.00	2.44	10.4	0.191E+00	1.27	10.32	.25702E+03
20.80	0.00	2.44	10.5	0.191E+00	1.26	10.36	.25939E+03
20.94	0.00	2.44	10.5	0.191E+00	1.26	10.40	.26177E+03
21.07	0.00	2.44	10.5	0.191E+00	1.26	10.44	.26415E+03
21.21	0.00	2.44	10.5	0.191E+00	1.25	10.49	.26653E+03
21.34	0.00	2.44	10.5	0.191E+00	1.25	10.53	.26892E+03
21.48	0.00	2.44	10.5	0.191E+00	1.25	10.57	.27131E+03
21.62	0.00	2.44	10.5	0.190E+00	1.24	10.61	.27369E+03
21.75	0.00	2.44	10.5	0.190E+00	1.24	10.65	.27608E+03
21.89	0.00	2.44	10.5	0.190E+00	1.24	10.69	.27848E+03
22.02	0.00	2.44	10.5	0.190E+00	1.24	10.73	.28087E+03
22.16	0.00	2.44	10.5	0.190E+00	1.23	10.77	.28327E+03
22.30	0.00	2.44	10.5	0.190E+00	1.23	10.81	.28567E+03
22.43	0.00	2.44	10.6	0.189E+00	1.23	10.84	.28807E+03
22.57	0.00	2.44	10.6	0.189E+00	1.22	10.88	.29047E+03
22.70	0.00	2.44	10.6	0.189E+00	1.22	10.92	.29287E+03
22.84	0.00	2.44	10.6	0.189E+00	1.22	10.96	.29528E+03
22.98	0.00	2.44	10.6	0.189E+00	1.22	11.00	.29769E+03
23.11	0.00	2.44	10.6	0.189E+00	1.21	11.04	.30010E+03
23.25	0.00	2.44	10.6	0.188E+00	1.21	11.08	.30251E+03
23.39	0.00	2.44	10.6	0.188E+00	1.21	11.12	.30492E+03
23.52	0.00	2.44	10.6	0.188E+00	1.20	11.16	.30734E+03
23.66	0.00	2.44	10.6	0.188E+00	1.20	11.20	.30976E+03
23.79	0.00	2.44	10.6	0.188E+00	1.20	11.24	.31218E+03
23.93	0.00	2.44	10.7	0.188E+00	1.20	11.28	.31460E+03
24.07	0.00	2.44	10.7	0.188E+00	1.19	11.32	.31703E+03
24.20	0.00	2.44	10.7	0.187E+00	1.19	11.36	.31945E+03
24.34	0.00	2.44	10.7	0.187E+00	1.19	11.39	.32188E+03
24.47	0.00	2.44	10.7	0.187E+00	1.19	11.43	.32431E+03
24.61	0.00	2.44	10.7	0.187E+00	1.18	11.47	.32674E+03
24.75	0.00	2.44	10.7	0.187E+00	1.18	11.51	.32918E+03
24.88	0.00	2.44	10.7	0.187E+00	1.18	11.55	.33161E+03
25.02	0.00	2.44	10.7	0.187E+00	1.18	11.59	.33405E+03
25.16	0.00	2.44	10.7	0.186E+00	1.17	11.63	.33649E+03
25.29	0.00	2.44	10.7	0.186E+00	1.17	11.67	.33893E+03
25.43	0.00	2.44	10.7	0.186E+00	1.17	11.70	.34138E+03
25.56	0.00	2.44	10.8	0.186E+00	1.17	11.74	.34382E+03
25.70	0.00	2.44	10.8	0.186E+00	1.17	11.78	.34627E+03
25.84	0.00	2.44	10.8	0.186E+00	1.16	11.82	.34872E+03
25.97	0.00	2.44	10.8	0.185E+00	1.16	11.86	.35117E+03
26.11	0.00	2.44	10.8	0.185E+00	1.16	11.90	.35362E+03
26.24	0.00	2.44	10.8	0.185E+00	1.16	11.94	.35608E+03
26.38	0.00	2.44	10.8	0.185E+00	1.15	11.97	.35854E+03
26.52	0.00	2.44	10.8	0.185E+00	1.15	12.01	.36100E+03

