



**KENTUCKY POLLUTANT  
DISCHARGE ELIMINATION  
SYSTEM**

**FACT SHEET**

**KPDES No.:** KY0003221

**AI No.:** 2122

Mill Creek Generating Station  
14660 Dixie Highway  
Louisville, Jefferson County, Kentucky

**Date:** October 8, 2021

**Public Notice Information**

Public Notice Start Date: August 30, 2021

Comment Due Date: September 29, 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](mailto: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](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](mailto: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 Co  
 PO Box 32010  
 Louisville, KY 40232

**1.2. Facility Location**

Mill Creek Generating Station  
 14660 Dixie Highway  
 Louisville, Jefferson County, Kentucky

**1.3. Description of Applicant’s Operation**

The facility is a coal fired steam electric power generation and transmission facility. The facility has four units; each unit is listed below with the corresponding nameplate generating capacity.

Unit 1 – 355 MW

Unit 2 – 355 MW

Unit 3 – 463 MW

Unit 4 – 544 MW

**1.4. Wastewaters Collected and Treatment**

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

<b>TABLE 1.</b>			
<b>Outfall No.</b>	<b>Average Flow (MGD)</b>	<b>Wastewater Types Collected</b>	<b>Treatment Type</b>
001	218.272	Non-contact cooling water, process wastewaters, and stormwater	Discharge to Surface Water
002	19.547	Process wastewaters, and stormwater	Settling and Neutralization of all flows. Chemical Precipitation of Outfall 006 effluent and Dead Storage Pond waters.
003	4.3427	Non-process wastewaters	None
004	3.5282	Non-process wastewaters	Discharge to Surface Water
005	3.232	Non-process wastewaters	Discharge to Surface Water
006	None	Process wastewaters	Chemical precipitation, neutralization
007	Intermittent	Stormwater runoff	Discharge to Surface Water
009	245.443	Plant intake water	Screening
010	Intermittent	Stormwater runoff	Discharge to Surface Water
011	Intermittent	Stormwater runoff	Discharge to Surface Water

TABLE 1.			
Outfall No.	Average Flow (MGD)	Wastewater Types Collected	Treatment Type
012	0.0415	Process wastewaters, non-process wastewaters, and stormwater runoff	Settling, Chemical Precipitation, Neutralization. Stormwater is treated by settling only.
013	None	Stormwater runoff	Discharge to Surface Water
014	Intermittent	Stormwater runoff	Discharge to Surface Water
015	Intermittent	Stormwater runoff	Discharge to Surface Water
016	Intermittent	Stormwater runoff	Discharge to Surface Water
017	Intermittent	Stormwater runoff	Discharge to Surface Water
018	Intermittent	Stormwater runoff	Discharge to Surface Water
019	Intermittent	Stormwater runoff	Discharge to Surface Water
020	Intermittent	Stormwater runoff	Discharge to Surface Water
021	Intermittent	Stormwater runoff	Discharge to Surface Water
022	Intermittent	Stormwater runoff	Discharge to Surface Water
023	6.7602	Process wastewaters, non-process wastewaters, and stormwater runoff	Discharge to Surface Water
024	Estimated 1.6027	Process wastewaters	Chemical Precipitation, Mixing, Neutralization
025	9.0449	Process wastewaters, non-process wastewaters, and stormwater runoff	Settling, Chemical precipitation, Neutralization, Discharge to Surface Water. Stormwater is treated by settling only.

The design flow of the facility, for flows other than stormwater, is 241.0743 MGD. The average annual flow, including stormwater, is 244.6207 MGD.

**1.5. Permitting Action**

This is a major modification of a major KPDES permit for an existing fossil-fueled fired steam electric power generation and transmission facility [SIC Code 4911, NAICS Code 221112].

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 024. The bottom ash handling system was converted to a dry management system previously; so, the current system is compliant with the Final ELG Rule and has no discharge of Bottom Ash Transport Water.

This modification is also for a proposed new Outfall 025 that will discharge through a high-rate multiport diffuser to the Ohio River. Outfall 002 and Outfall 003 will be redirected from Outfall 001 to this new outfall. Outfall 001 has been updated to reflect the redirection of these flows from this Outfall.



The facility has completed their ash pond dewatering. Therefore past and dewatering conditions have been removed from outfalls 001, 002, and 002A. Additionally, the facility has completed construction of their diffuser at outfall 023 and the redirection Outfall 012 to Outfall 023. The monitoring conditions at outfall 012 and 023 have been updated to reflect this change. Note the limits at these Outfalls have not changed, but just the conditional monitoring requirements that no longer apply have been removed.

# **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.

<b>TABLE 2.</b>				
<b>Receiving Water Name</b>	<b>Use Designation</b>	<b>Antidegradation Category</b>	<b>7Q10 Low Flow (cfs)</b>	<b>Harmonic Mean Flow (cfs)</b>
Ohio River	WAH PCR SCR DWS	IW	11,000	49,000
Mill Creek	WAH PCR SCR DWS	IW	0	0
Unnamed Tributary of Pond Creek	WAH PCR SCR DWS	HQ	0	0
<p>This segment of Ohio River (mile point 612.4 to 674.8) is listed as impaired in the 2014 303(d) List of Waters for Kentucky. Impaired uses are Fish Consumption (Partial Support), Primary Contact (Not Supported), and Warm Water (Partial Support). The pollutants of concern are Dioxin, E. coli, Iron and Polychlorinated biphenyls (PCBs). The suspected sources are unknown.</p> <p>This segment of Mill Creek (mile point 0 to 9.9) is listed as impaired in the 2014 303(d) List of Waters for Kentucky. Impaired uses are Primary Contact (Not Supported), and Warm Water (Not Supported). The pollutants of concern are Fecal Coliform, nutrients, organic enrichment, and sedimentation. The suspected sources are illegal dumps, municipal and industrial point source discharges, and urban runoff.</p>				

**2.2. Intake Waters – Nearest Downstream Intake**

<b>TABLE 3.</b>						
<b>Intake Water Name</b>	<b>Public Water Supply Name</b>	<b>Latitude (N)</b>	<b>Longitude (W)</b>	<b>Miles Downstream</b>	<b>7Q10 Low Flow (cfs)</b>	<b>Harmonic Mean Flow (cfs)</b>
Ohio River	Evansville, IN	37°57'27.5"	87°34'27.8"	164	12900	60,900

# **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	38.05139°	85.91278°	Ohio River	Combination of Unit 1 once-through/condenser cooling water, Process Water Pond Discharge (Outfall 002), Unit 2 cooling tower blowdown (Outfall 003), and stormwater runoff from Area 1.

**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	218.272	240.048	N/A	N/A	N/A	N/A
Temperature	°C	N/A	N/A	N/A	28.6	34.9	N/A
Free Available Chlorine	mg/l	N/A	N/A	N/A	*	*	N/A
Total Residual Chlorine	mg/l	N/A	N/A	N/A	*	*	N/A
Total Residual Oxidants	mg/l	N/A	N/A	N/A	0.08	0.09	N/A
Time of Oxidant Addition	minutes/unit/day	N/A	N/A	N/A	N/A	57	N/A
pH	SU	N/A	N/A	7.7	N/A	N/A	8.0

\* Discharge Monitoring Results (DMR) indicate there were no periods of chlorination, therefore testing was not required.

The above values are based off of 5-year DMR averages from 02/28/2012 to 02/28/2017.

**3.3. Effluent Limitations and Monitoring Requirements**

The following table summarizes the effluent limitations and monitoring requirements for Outfall 001 which will take effect once Ash Pond dewatering operations ceased. These requirements will remain until Outfalls 002 and 003 discharge has been redirected to the new Outfall 025:

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/Day	Calculated
Temperature	° F	N/A	N/A	N/A	Report	110	N/A	1/Day	Log
Free Available Chlorine	mg/l	N/A	N/A	N/A	0.2	0.5	N/A	Per Occurrence <sup>1</sup>	Multiple Grab <sup>2</sup>
Total Residual Chlorine	mg/l	N/A	N/A	N/A	0.011	0.019	N/A	Per Occurrence <sup>1</sup>	Multiple Grab <sup>2</sup>
Total Residual Oxidants	mg/l	N/A	N/A	N/A	Report	0.20	N/A	Per Occurrence <sup>1</sup>	Multiple Grab <sup>2</sup>
Time of Oxidant Addition	minutes/unit/day	N/A	N/A	N/A	N/A	120	N/A	Per Occurrence <sup>1</sup>	Log
pH	SU	N/A	N/A	6.0	N/A	N/A	9.0	1/Week	Grab
Chronic WET <sup>3</sup>	TU <sub>c</sub>	N/A	N/A	N/A	N/A	N/A	11.84	1/Quarter	( <sup>4</sup> )
Total Recoverable Iron <sup>5</sup>	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Month	Grab
Total Recoverable Mercury <sup>5</sup>	mg/l	N/A	N/A	N/A	0.000051	0.0014	N/A	1/Month	Grab
Total Recoverable Selenium <sup>5</sup>	mg/l	N/A	N/A	N/A	0.056	Report	N/A	1/Month	Grab
Total Recoverable Selenium <sup>5</sup> (Fish Tissue)	mg/kg dry weight	N/A	N/A	N/A	N/A	N/A	8.6	( <sup>6</sup> )	( <sup>6</sup> )
<sup>1</sup> Per Occurrence means during periods of chlorination or oxidant addition, but no more frequent than once per week.									
<sup>2</sup> Multiple grab means grab samples collected at the approximate beginning of oxidant discharge and once every fifteen (15) minutes thereafter until the end of oxidant discharge.									
<sup>3</sup> WET – Whole Effluent Toxicity									
<sup>4</sup> Three (3) 24-hour composite samples with one each collected every other day for a period of five (5) days, i.e. days 1, 3, & 5.									
<sup>5</sup> Limitations and Monitoring requirements for these pollutants only apply when Unit 1 once-through cooling waters are not discharged through Outfall 001.									
<sup>6</sup> Should the monthly average concentration of Total Recoverable Selenium exceed 56 µg/l, see Section 5.4.5 for additional requirements.									
Not more than one unit may discharge free available or total residual chlorine at any one time.									
The term Total Residual Oxidants means the value obtained using the amperometric titration or DPD methods for Total Residual Chlorine described in 40 CFR Part 136. In the event the permittee needs to use an oxidant other than chlorine, the permittee shall request approval prior to the initial use of the oxidant from the Division of Water.									

The following table summarizes the effluent limitations and monitoring requirements for Outfall 001 which will take effect once Outfalls 002 and 003 discharge has been redirected to the new Outfall 025

TABLE 7.									
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/Day	Calculated
Temperature	° F	N/A	N/A	N/A	Report	110	N/A	1/Day	Log
Free Available Chlorine	mg/l	N/A	N/A	N/A	0.2	0.5	N/A	Per Occurrence <sup>1</sup>	Multiple Grab <sup>2</sup>
Total Residual Chlorine	mg/l	N/A	N/A	N/A	0.011	0.019	N/A	Per Occurrence <sup>1</sup>	Multiple Grab <sup>2</sup>
Total Residual Oxidants	mg/l	N/A	N/A	N/A	Report	0.20	N/A	Per Occurrence <sup>1</sup>	Multiple Grab <sup>2</sup>
Time of Oxidant Addition	minutes/unit/day	N/A	N/A	N/A	N/A	120	N/A	Per Occurrence <sup>1</sup>	Log
pH	SU	N/A	N/A	6.0	N/A	N/A	9.0	1/Week	Grab
<sup>1</sup> Per Occurrence means during periods of chlorination or oxidant addition, but no more frequent than once per week.									
<sup>2</sup> Multiple grab means grab samples collected at the approximate beginning of oxidant discharge and once every fifteen (15) minutes thereafter until the end of oxidant discharge.									
Not more than one unit may discharge free available or total residual chlorine at any one time.									
The term Total Residual Oxidants means the value obtained using the amperometric titration or DPD methods for Total Residual Chlorine described in 40 CFR Part 136. In the event the permittee needs to use an oxidant other than chlorine, the permittee shall request approval prior to the initial use of the oxidant from the Division of Water.									

### 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:

<https://eec.ky.gov/Environmental-Protection/Forms%20Library/General%20Procedures%20for%20Limitations%20Development.pdf>

#### 3.4.1. Facility Changes

This facility will continue to operate as a coal fired steam electric power generation and transmission facility. The facility will undergo major changes in response to the recently updated federal regulations concerning Coal Combustion Residuals (CCR) and Effluent Limitation Guidelines (ELG). New treatment equipment, redirection of flows, impoundment construction and other activities continue to significantly change this site.

The ash pond, was dewatered, regraded and closed through internal Outfall 002 and ultimately discharged through Outfall 001. During ash pond closure work, flows which were previously sent to the Ash Pond were redirected to a temporary pond. Lastly, a permanent process settling pond was created to provide settling, neutralization, and treatment for plant sumps, coal and limestone pile runoff, and FGD liquids.

Segregation of FGD wastewaters and construction of a treatment system for those wastewaters will require major changes at the facility. The permittee plans to have FGD wastewaters segregated and the treatment plant ready by January 1, 2025.

#### 3.4.2. Ash Pond Waters

The facilities ash pond has been dewatered and no longer has any ash sluice waters discharged.

#### 3.4.3. Mercury

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 for Outfall 001 effluent.

#### 3.4.4. Unit 1 Offline

There will be times when Unit 1 is offline. Sometimes the cooling water pumps will continue to run even though Unit 1 is offline, and Outfall 001 will receive the large flow associated with those pumps. Most of the time Unit 1 is offline the cooling water pumps will not run, and Outfall 001 will have a smaller flow dominated by Outfall 002 effluent. Total recoverable iron, total recoverable mercury, and total recoverable selenium as well as selenium fish tissue sampling are added to Outfall 001 for these reasons. These specific pollutants are present in Outfall 002 effluent at quantities which have the reasonable potential to exceed Kentucky's water quality criteria. The limitations and monitoring requirements for these specific pollutants are to be monitored when Unit 1 is offline and Outfall 001 is not receiving the cooling water flow.



**3.4.5. 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. In accordance with Section 423.12(b)(12) the permitting authority may allow the quantity of pollutant discharged to be expressed as a concentration limitation instead of a mass based limitation. The DOW has determined to apply the requirements of 40 CFR 423 in this manner. This facility is subject to the following subparts in 40 CFR 423:

40 CFR 423.12(b)(6) The quantity of pollutants discharged in once through cooling water shall not exceed the quantity determined by multiplying the flow of once through cooling water sources times the concentration listed in the following table:

Pollutant or pollutant property	BPT effluent limitations	
	Maximum concentration (mg/l)	Average concentration (mg/l)
Free available chlorine	0.5	0.2

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 State, if the State has NPDES permit issuing authority, that the units in a particular location cannot operate at or below this level or 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 a concentration limitation 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.

40 CFR 423.13(b)(1) For any plant with a total rated electric generating capacity of 25 or more megawatts, the quantity of pollutants discharged in once through cooling water from each discharge point shall not exceed the quantity determined by multiplying the flow of once through cooling water from each discharge point times the concentration listed in the following table:

Pollutant or pollutant property	BAT Effluent Limitations
	Maximum concentration (mg/l)
Total residual chlorine	0.20

40 CFR 423.13(b)(2) Total residual chlorine may not be discharged from any single generating unit for more than two hours per day unless the discharger demonstrates to the permitting authority that discharge for more than two hours is required for macroinvertebrate control. Simultaneous multi-unit chlorination is permitted.

**3.4.6. 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.

<b>TABLE 8.</b>	
<b>Pollutant or Pollutant Characteristic</b>	<b>Basis</b>
Temperature	The discharge concentration of this pollutant exceeds 90% of the calculated WQBELs for this pollutant. A mixing zone is granted, and monitoring and a limitation will be required for this pollutant.
Whole Effluent Toxicity	Facility is rated as a major, and this outfall discharges a complex waste stream. A mixing zone is granted for this pollutant and a limitation will be required.
Total Residual Chlorine	The BPJ establishes a limit for Total Residual Oxidants in cooling tower blowdown are less stringent than Kentucky Water Quality Standard for total residual chlorine. Therefore, the total residual chlorine WQ limits shall apply during periods of chlorination addition to the cooling water.

**3.4.7. 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: Whole Effluent Toxicity and temperature.

**3.4.8. Water Quality-Based Effluent Limitations**

These calculations were performed 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	200	146	NO	N/A	NO	N/A	N/A
Effluent Characteristic	Units	Reported Avg	Reported Max	Average Limitation	Maximum Limitation	Average Discharge %	Maximum Discharge %	Data Source
Antimony	µg/L	0	0	219.4022284	N/A	0.00	N/A	APP
Arsenic	µg/L	0	0	150	340	0.00	0.00	APP
Barium	µg/L	55	55	39178.96936	N/A	0.14	N/A	APP
Beryllium	µg/L	0	0	156.7158774	N/A	0.00	N/A	APP
Cadmium	µg/L	0	0	0.452269669	4.31574272	0.00	0.00	APP
Chloride	µg/L	47000	47000	600000	1156000	7.83	4.07	APP
Chromium	µg/L	0	0	3917.896936	N/A	0.00	N/A	APP
Copper	µg/L	6.2	6.2	16.86789633	26.89861028	36.76	23.05	APP
Cyanide, Free	µg/L	0	0	5.2	22	0.00	0.00	APP
Fluoride	µg/L	0	0	156715.8774	N/A	0.00	N/A	APP
Iron	µg/L	430	430	1000	3600	43.00	11.94	APP
Lead	µg/L	0	0	7.688748355	197.306431	0.00	0.00	APP
Mercury	µg/L	0.00811	0.00811	0.051	1.4	15.90	0.58	APP
Nickel	µg/L	0	0	93.76357854	843.3453079	0.00	0.00	APP
Phenol	µg/L	0	0	822758.3565	N/A	0.00	N/A	APP
Selenium	µg/L	0	0	5	N/A	0.00	N/A	APP
Silver	µg/L	0	0	N/A	12.46725828	N/A	0.00	APP
Sulfate	µg/L	100000	100000	9794742.34	N/A	1.02	N/A	APP
Thallium	µg/L	0	0	0.47	N/A	0.00	N/A	APP
Zinc	µg/L	25.7	0	215.5653916	215.5653916	0.00	0.00	APP
Gross total alpha particle activity including radium-226 but excluding radon and uranium	pCi/L	0	0	2718.60376	N/A	0.00	N/A	APP
Combined radium-226 and radium-228	pCi/L	0.551	0.551	906.2012535	N/A	0.06	N/A	APP
Total gross beta particle activity	pCi/L	4.68	4.68	9062.012535	N/A	0.05	N/A	APP
Strontium-90	pCi/L	0	0	1449.922006	N/A	0.00	N/A	APP
Uranium	µg/L	0.95	0.95	5437.207521	N/A	0.02	N/A	APP
Total Residual Chlorine	µg/L	0	0	11	19	0.00	0.00	APP
Ammonia (as N)	mg/l	0.166	0.54	30.11243293	N/A	0.55	N/A	APP
Temperature	°F	83.498	94.838	0	89	93.82	106.56	DMR

The reported values shown above reflect values entered into Form C. In accordance with the DOW's reasonable potential analysis procedures, the reported values from Form C were compared to the laboratory's certificate of analysis and any values with J or U qualifiers were made equal to zero. A J meant the value was estimated, while a U mean the analyte was analyzed for but not detected above the critical level.

### 3.4.9. WET Criteria Calculation

The DOW imposes whole effluent toxicity (WET) testing on the following types of dischargers: (1) industrial dischargers rated as a major using EPA's major rating system; (2) industrial dischargers with complex wastestreams; (3) POTWs with a design capacity equal to or greater than 1.0 MGD; and (4) POTWs having an approved Pretreatment Program. 401 KAR 10:031 contains WET criteria. The WET criteria 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<sub>c</sub> of 1.00, utilizing the IC25, at the edge of the assigned regulatory Mixing Zone and shall not exceed a TU<sub>A</sub> 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:

$$C_T = \frac{[C_D(Q_T + (MZF)(Q_U)) - C_U(MZF)(Q_U)]}{Q_T} = \frac{[1.00(337.88 + (0.333)(11000)) - 0(0.333)(11000)]}{337.88} = 11.84 TU_C$$

Where:

- $C_T$  = the end of pipe effluent limit
- $C_D$  = the pollutant water quality standard met at edge of mixing zone (1.00  $TU_C$ )
- $C_U$  = 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. The DOW has defined two factors, both are given below.

When effluent contains bioaccumulative or persistent toxic substances, 1.00  $TU_C$  = 0.01  $TU_A$  (401 KAR 10:031 Section 4(1)(j)(2)).

When effluent does not contain bioaccumulative or persistent toxic substances, 1.00  $TU_C$  = 0.1  $TU_A$  (401 KAR 10:031 Section 4(1)(j)(1)).

Mercury, a bioaccumulative chemical of concern in accordance with 401 KAR 10:029, Section 4(1)(h)(2)(b), is detected in the discharge from this outfall therefore the appropriate acute to chronic ratio is 0.01. Using the above calculated  $TU_C$  limit of 11.84 and the acute to chronic ratio of 0.01, results in a  $TU_A$  limit of 0.1184. This result represents that 845% of the effluent cannot produce an acutely toxic effect. Any number above 100% does not make sense therefore  $TU_A$  cannot be used in place of  $TU_C$ , and 11.84  $TU_C$  limit is placed in the permit.

### 3.5. 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].

#### 3.5.1. 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].

### **3.5.2. 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].

### **3.5.3. Free Available Chlorine**

The limitations for this pollutant are consistent with Kentucky's Water Quality Standards and Federal Effluent Limitation Guidelines [401 KAR 5:065, Section 2(6)]. The limit is representative of the Best Practicable Control Technology Currently Available (BPT) requirements for the discharge of this pollutant in once-through cooling water [40 CFR 423.12(b)(6)].

### **3.5.4. Total Residual Chlorine**

The limitations for this pollutant are consistent with Federal Effluent Limitation Guidelines [401 KAR 5:065, Section 2(6)]. The limit is representative of the Best Available Technology Economically Achievable (BAT) requirements for the discharge of this pollutant in once-through cooling water [40 CFR 423.13(b)(1)]. The limitations for this parameter are consistent with Kentucky's Water Quality Standards [401 KAR 10:031, Sections 4(1)(k)].

### **3.5.5. Total Residual Oxidants**

The limitation for this pollutant is representative of the BAT requirements for the addition of chlorine in once-through cooling water [401 KAR 5:065, Section 2(6) and 40 CFR 423.13(b)(1)]. It is the best professional judgement (BPJ) of the Division of Water (DOW) that this requirement is also applicable to the addition of other oxidants [401 KAR 5:080 Section 2(3)].

### **3.5.6. Time of Oxidant Addition**

The limitation for this parameter is representative of the BPT and BAT requirements for chlorine in once-through cooling water [401 KAR 5:065, Section 2(6) and 40 CFR 423.12(b)(8) and 423.13(b)(2)]. It is the BPJ of the DOW that this requirement is also applicable to the addition of other oxidants [401 KAR 5:080 Section 2(3)].

### **3.5.7. pH**

The limitations for this parameter are consistent Kentucky's Water Quality Standards [401 KAR 10:031, Section 4(1)(b) and Section 7] and Federal Effluent Limitation Guidelines [401 KAR 5:065, Section 2(6) – 40 CFR 122 Appendix A]. The limits are representative of the BPT requirements for this parameter in all discharges except once through cooling water [40 CFR 423.12(b)(1)].

### **3.5.8. Total Recoverable: Iron, Mercury, and Selenium**

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].

### **3.5.9. Hardness**

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

### **3.5.10. Whole Effluent Toxicity**

The limitations for this parameter are consistent with Kentucky's Water Quality Standards [401 KAR 10:031, Sections 4(1)(j) and 401 KAR 10:029 Section 4].

# **SECTION 4**

## **OUTFALL 002**

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

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

TABLE 9.				
Outfall Type	Latitude (N)	Longitude (W)	Receiving Water	Description of Outfall
Internal	38.05778°	85.91083°	Outfall 001	Process Waters Pond discharge. Process Waters Pond will contain process wastewaters (low volume waste sources, metal cleaning wastes, coal pile runoff, and FGD process waters) and stormwater. Also, the FGD process waters will receive treatment prior to mixing with the other flows in the pond.

**4.2. Reported Values**

The following table summarizes the reported values for Outfall 002:

TABLE 10.							
Reported Parameters	Units	EFFLUENT					
		Loadings (lbs./day)		Concentrations			
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum
Flow	MGD	19.547	20.634	N/A	N/A	N/A	N/A
Total Suspended Solids	mg/l	N/A	N/A	N/A	20	23	N/A
Oil & Grease	mg/l	N/A	N/A	N/A	BDL	BDL	N/A
Hardness (as mg/l CaCO <sub>3</sub> )	mg/l	N/A	N/A	N/A	990	1080	N/A
Total Recoverable Metals	mg/l	N/A	N/A	N/A	0.18	0.18	N/A
Acute Toxicity	TU <sub>A</sub>	N/A	N/A	N/A	N/A	<1	N/A
pH	SU	N/A	N/A	7.8	N/A	N/A	8.0

The above values are based off of 5-year DMR averages from 02/28/12 to 02/28/17.

**4.3. Effluent Limitations and Monitoring Requirements**

The following table summarizes the effluent limitations and monitoring requirements for Outfall 002 which took effect once Ash Pond dewatering activities ceased:



**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	1/Day	Instantaneous
Total Suspended Solids	mg/l	N/A	N/A	N/A	30.0	97.9	N/A	2/Month	Grab
Oil & Grease	mg/l	N/A	N/A	N/A	14.5	19.3	N/A	2/Month	Grab
There shall be no discharge of pollutants in fly ash transport water generated on and after October 31, 2019.									
There shall be no discharge of pollutants in bottom ash transport water generated on and after November 1, 2020.									

#### 4.4. 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:

<https://eec.ky.gov/Environmental-Protection/Forms%20Library/General%20Procedures%20for%20Limitations%20Development.pdf>

##### 4.4.1. Facility Changes

This facility will continue to operate as a coal fired steam electric power generation and transmission facility. The facility will undergo major changes in response to the recently updated federal regulations concerning Coal Combustion Residuals (CCR) and Effluent Limitation Guidelines (ELG). New treatment equipment, redirection of flows, cessation of ash sluicing flows, impoundment construction and other activities will significantly change this site.

The facility is in the process of removing, modifying, or constructing seven ponds. One of these ponds is the ash pond, which was dewatered, regraded and closed. The ash pond was dewatered through internal Outfall 002 and ultimately discharged through Outfall 001. During ash pond closure work, flows which were previously sent to the Ash Pond was redirected to a temporary pond. Lastly, a permanent process settling pond was created to provide settling, neutralization, and treatment for plant sumps, coal and limestone pile runoff, and FGD liquids.

Segregation of FGD wastewaters and construction of a treatment system for those wastewaters will require major changes at the facility. The permittee plans to have FGD wastewaters segregated and the treatment plant ready by January 1, 2025.

##### 4.4.2. Ash Pond Waters

The facilities ash pond has been dewatered and no longer has any ash sluice waters discharged.

##### 4.4.3. 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 Ash Pond. These waters are not a result of cleaning with chemical compounds and they do not flow through Outfall 006. 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, boiler fireside wash waters, and any other non-chemical metal cleaning wastewaters 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 002 to insure compliance with the federal effluent

limitation guidelines for low volume wastes, chemical metal cleaning wastes, and other process wastewaters.

**4.4.4. 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. Certain technology-based effluent limitations and compliance deadlines included in this permit are based upon effluent limitation Guidelines (“ELGs”) that are under reconsideration by the United States Environmental Protection Agency (“EPA”). 82 Fed. Reg. 43494 (September 18, 2017).

**4.4.4.1. 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. In accordance with Section 423.12(b)(12) the permitting authority may allow the quantity of pollutant discharged to be expressed as a concentration limitation instead of a mass based limitation. The DOW has determined to apply the requirements of 40 CFR 423 in this manner. This facility is subject to the following subparts in 40 CFR 423:

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:

Pollutant or pollutant property	BPT effluent limitations	
	Maximum for any 1 day (mg/l)	Average of daily values for 30 consecutive days shall not exceed (mg/l)
TSS	100.0	30.0
Oil and grease	20.0	15.0

40 CFR 423.12(b)(4) The quantity of pollutants discharged in fly ash and bottom ash transport water shall not exceed the quantity determined by multiplying the flow of fly ash and bottom ash transport water times the concentration listed in the following table:

Pollutant or pollutant property	BPT effluent limitations	
	Maximum for any 1 day (mg/l)	Average of daily values for 30 consecutive days shall not exceed (mg/l)
TSS	100.0	30.0
Oil and grease	20.0	15.0

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:

Pollutant or pollutant property	BPT effluent limitations	
	Maximum for any 1 day (mg/l)	Average of daily values for 30 consecutive days shall not exceed (mg/l)
TSS	100.0	30.0
Oil and grease	20.0	15.0
Copper, total	1.0	1.0
Iron, total	1.0	1.0

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:

Pollutant or pollutant property	BPT effluent limitations
	Maximum concentration for any time (mg/l)
TSS	50

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:

Pollutant or pollutant property	BPT Effluent limitations	
	Maximum for any 1 day (mg/l)	Average of daily values for 30 consecutive days shall not exceed (mg/l)
TSS	100.0	30.0
Oil and grease	20.0	15.0

40 CFR 423.13(g)(1)(i) *FGD wastewater*. 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 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.

Pollutant or pollutant property	BAT Effluent limitations	
	Maximum for any 1 day	Average of daily values for 30 consecutive days shall not exceed
Arsenic, total (ug/L)	18	8
Mercury, total (ng/L)	103	34
Selenium, total (ug/L)	70	29
Nitrate/nitrite as N (mg/L)	4	3

(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(h)(1)(i) *Fly ash transport water*. Except for those discharges to which paragraph (h)(2) of this section applies, or when the fly ash transport water is used in the FGD scrubber, there shall be no discharge of pollutants in fly ash transport water. Dischargers must meet the discharge limitation in this paragraph by a date determined by the permitting authority that is as soon as possible beginning November 1, 2018, but no later than December 31, 2023. This limitation applies to the discharge of fly ash transport water generated on and after the date determined by the permitting authority for meeting the discharge limitation, as specified in this paragraph. Whenever fly ash transport water is used in any other plant process or is sent to a treatment system at the plant (except when it is used in the FGD scrubber), the resulting effluent must comply with the discharge limitation in this paragraph. When the fly ash transport water is used in the FGD scrubber, the quantity of pollutants in fly ash transport water shall not exceed the quantity determined by multiplying the flow of fly ash transport water times the concentration listed in the table in paragraph (g)(1)(i) of this section.

40 CFR 423.13(k)(1)(i) *Bottom ash transport water*. Except for those discharges to which paragraph (k)(2) of this section applies, or when the bottom ash transport water is used in the FGD scrubber, there shall be no discharge of pollutants in bottom ash transport water. Dischargers must meet the discharge limitation 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. This limitation applies to the discharge

of bottom ash transport water generated on and after the date determined by the permitting authority for meeting the discharge limitation, as specified in this paragraph. Whenever bottom ash transport water is used in any other plant process or is sent to a treatment system at the plant (except when it is used in the FGD scrubber), the resulting effluent must comply with the discharge limitation in this paragraph. When the bottom ash transport water is used in the FGD scrubber, the quantity of pollutants in bottom ash transport water shall not exceed the quantity determined by multiplying the flow of bottom ash transport water times the concentration listed in the table in paragraph (g)(1)(i) of this section.

**4.4.4.2. BPJ**

It is the BPJ of the DOW to apply the following Total Suspended Solids (TSS) limitations to the uncontaminated rainfall contributing to this effluent: 30 mg/l and 50 mg/l as monthly average and daily maximum limitations respectively. It is the BPJ of the DOW to not allow the uncontaminated rainfall to contribute oil and grease to this effluent. It is the BPJ of the DOW to place a 5 mg/l limitation on oil and grease in the contaminated rainfall runoff contributing to this effluent. The DOW has developed flow-weighted limitations for TSS, and oil and grease at Outfall 002 to insure compliance with the federal effluent limitation guidelines for low volume wastes, chemical metal cleaning wastes, and other process wastewaters.

**4.5. Limitation Calculations**

**4.5.1. Technology-Based Effluent Limitations**

The DOW has developed flow-weighted limitations for Outfall 002 effluent to insure compliance with the federal effluent limitation guidelines for the various types of waters comingled in the Process Waters Pond.

The Ash Pond was replaced with the Process Waters Pond which has a surface area of 10 acres. Therefore, 10 acres is used in the flow calculations for runoff resulting from direct rainfall.

Average annual rainfall data for 2016 was found on the Kentucky Mesonet website. Rainfall data from Oldham County was used as Jefferson County information was not available.

<http://www.kymesonet.org/summaries.html>

The conversion factor is a result of the factors needed to convert acres to square feet, inches per year to feet per day, and cubic feet per day to million gallons per day.

The following calculations produce the TSS, and oil and grease limitations.

Flow Calculations					
Source	Coefficient of Runoff	Surface Area (acres)	Average Annual Rainfall (inches/year)	Average Conversion Factor	Average Flow (MGD)
<b>Process Pond (Uncontaminated Runoff)</b>					
Basin Direct Surface Discharge	1	10	46.1	0.0000744	0.034298

Limitations Calculations					
Source	Flow (MGD)	Total Suspended Solids			
		Concentration (mg/l)		Contribution	
		Average	Maximum	Average	Maximum
Process Pond (Uncontaminated Runoff)	0.0342984	30	50	1.028952	1.71492
Coal Pile Settling Basin (Dust Control, Equipment washdowns, stormwater from areas 2.d, 2.e)	0.1089	30	50	3.267	5.445
Landfill stormwater and leachate	0.0746	30	100	2.238	7.46
FGD Process Waters (FGD PWS Treatment System Waters)	1.6027	30	100	48.081	160.27
stormwater from areas 2.a and 2.c	0.0621016	30	50	1.863048	3.10508
Boiler Chemical Metal Cleaning Wastewaters (006)	0.0326	30	100	0.978	3.26
Units 1-4:					
Bottom & Fly Ash Sluice Waters	0	30	100	0	0
Pyrites Sluice Waters	0.4369	30	100	13.107	43.69
Air Heater Wash Waters	0.1046	30	100	3.138	10.46
Sumps	2.3554	30	100	70.662	235.54
Total	4.8121			144.363	470.945
			<b>Limits</b>	30.0	97.9

Limitations Calculations					
Source	Flow (MGD)	Oil & Grease			
		Concentration (mg/l)		Contribution	
		Average	Maximum	Average	Maximum
Process Pond (Uncontaminated Runoff)	0.0342984	0	0	0	0
Coal Pile Settling Basin (Dust Control, Equipment washdowns, stormwater from areas 2.d, 2.e, and 2.f)	0.1089	5	5	0.5445	0.5445
Landfill stormwater and leachate	0.0746	15	20	1.119	1.492
FGD Process Waters (FGD PWS Treatment System Waters)	1.6027	15	20	24.0405	32.054
stormwater from areas 2.a and 2.c	0.0621016	5	5	0.310508	0.310508
Boiler Chemical Metal Cleaning Wastewaters (006)	0.0326	15	20	0.489	0.652
Units 1-4:					
Bottom & Fly Ash Sluice Waters	0	15	20	0	0
Pyrites Sluice Waters	0.4369	15	20	6.5535	8.738
Air Heater Wash Waters	0.1046	15	20	1.569	2.092
Sumps	2.3554	15	20	35.331	47.108
Total	4.8121			69.957008	92.99101
			<b>Limits</b>	14.5	19.3

#### 4.6. 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].

##### 4.6.1. 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].

##### 4.6.2. Total Suspended Solids, and Oil and Grease

The limitations for these pollutants are consistent with Kentucky's Water Quality Standards and Federal Effluent Limitation Guidelines [401 KAR 5:065, Section 2(6) – 40 CFR 122 Appendix A]. The limits are representative of the BPT and BAT requirements for discharges of these pollutants in low volume waste sources waters [40 CFR 423.12(b)(3)], fly ash and bottom ash transport waters [40 CFR 423.12(b)(4) and 40 CFR 423.13(h)(1) and k(1)], metal cleaning wastes [40 CFR 423.12(b)(5)], coal pile runoff [40 CFR 423.12(b)(9)], combustion residual leachate [40 CFR 423.12(b)(11) and 40 CFR 423.13(l)] and FGD wastewaters [40 CFR 423.12(b)(11) and 40 CFR 423.13(g)(1)(ii)].



# **SECTION 5**

## **OUTFALL 002A**

**5. OUTFALL 002A****5.1. Outfall Description**

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

TABLE 12.				
Outfall Type	Latitude (N)	Longitude (W)	Receiving Water	Description of Outfall
External	38.05778°	85.91083°	Ohio River	Process Waters Pond discharge. Process Waters Pond will contain process wastewaters (low volume waste sources, metal cleaning wastes, coal pile runoff, and FGD process waters) and stormwater. Also, the FGD process waters will receive treatment prior to mixing with the other flows in the pond.

**5.2. Reported Values**

The following table summarizes the reported values for Outfall 002:

TABLE 13.							
Reported Parameters	Units	EFFLUENT					
		Loadings (lbs./day)		Concentrations			
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum
Flow	MGD	19.547	20.634	N/A	N/A	N/A	N/A
Total Suspended Solids	mg/l	N/A	N/A	N/A	20	23	N/A
Oil & Grease	mg/l	N/A	N/A	N/A	BDL	BDL	N/A
Hardness (as mg/l CaCO <sub>3</sub> )	mg/l	N/A	N/A	N/A	990	1080	N/A
Total Recoverable Metals	mg/l	N/A	N/A	N/A	0.18	0.18	N/A
Acute Toxicity	TU <sub>A</sub>	N/A	N/A	N/A	N/A	<1	N/A
pH	SU	N/A	N/A	7.8	N/A	N/A	8.0

The above values are based off of 5-year DMR averages from 02/28/12 to 02/28/17.

**5.3. Effluent Limitations and Monitoring Requirements**

The following table summarizes the effluent limitations and monitoring requirements for Outfall 002A which took effect once Ash Pond dewatering activities ceased:

TABLE 14.

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/Day	Instantaneous
Total Suspended Solids	mg/l	N/A	N/A	N/A	30.0	97.9	N/A	2/Month	Grab
Oil & Grease	mg/l	N/A	N/A	N/A	14.5	19.3	N/A	2/Month	Grab
pH	SU	N/A	N/A	6.0	N/A	N/A	9.0	2/Month	Grab
Total Recoverable Iron	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Month	Grab
Total Recoverable Mercury	mg/l	N/A	N/A	N/A	0.000051	0.0014	N/A	1/Month	Grab
Total Recoverable Selenium	mg/l	N/A	N/A	N/A	0.056	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	( <sup>1</sup> )	( <sup>1</sup> )
Acute WET <sup>2</sup>	TU <sub>A</sub>	N/A	N/A	N/A	N/A	N/A	1.00	1/Quarter	( <sup>3</sup> )

<sup>1</sup>Should the monthly average concentration of Total Recoverable Selenium exceed 56 µg/l, see Section 5.4.5 for additional requirements.

<sup>2</sup>WET – Whole Effluent Toxicity

<sup>3</sup>Two (2) discrete grab samples.

There shall be no discharge of pollutants in fly ash transport water generated on and after October 31, 2019.

There shall be no discharge of pollutants in bottom ash transport water generated on and after November 1, 2020.

#### 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:

<https://eec.ky.gov/Environmental-Protection/Forms%20Library/General%20Procedures%20for%20Limitations%20Development.pdf>

##### 5.4.1. Consent Decree

The permittee and Sierra Club entered into a consent decree, Civil Action No. 3:14-CV-391-H, December 14, 2016. One of the conditions in the decree is that Outfall 002 can only make direct discharges to the Ohio River under certain circumstances. Those circumstances are:

1. Emergency situations which include, but are not limited to, circumstances in which LG&E deem it necessary in operating the station to make direct discharges from Outfall 002 in order to prevent overtopping of the impoundments for the Main Ash Pond, to ensure the structural integrity of the impoundments for the pond, or to prevent or mitigate the loss of or damage to life, health, property, or essential public services.
2. Planned direct discharges in order to conduct maintenance, repairs, or inspection of either or both discharge pipes from Outfall 002 to Outfall 001.

##### 5.4.2. Facility Changes

This facility will continue to operate as a coal fired steam electric power generation and transmission facility. The facility will undergo major changes in response to the recently updated federal regulations concerning Coal Combustion Residuals (CCR) and Effluent Limitation Guidelines (ELG). New treatment equipment, redirection of flows, cessation of ash sluicing flows, impoundment construction and other activities will significantly change this site.

The facility is in the process of removing, modifying, or constructing seven ponds. One of these ponds is the ash pond, which was dewatered, regraded and closed. The ash pond was dewatered through internal Outfall 002 and ultimately discharged through Outfall 001. During ash pond closure work, flows which were previously sent to the Ash Pond was redirected to a temporary pond. Lastly, a permanent process settling pond was created to provide settling, neutralization, and treatment for plant sumps, coal and limestone pile runoff, and FGD liquids.

Segregation of FGD wastewaters and construction of a treatment system for those wastewaters will require major changes at the facility. The permittee plans to have FGD wastewaters segregated and the treatment plant ready by January 1, 2025.

##### 5.4.3. Ash Pond Waters

The facilities ash pond has been dewatered and no longer has any ash sluice waters discharged.

##### 5.4.4. Mercury

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 for Outfall 002A effluent.

**5.4.5. 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 56 µg/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)].

**5.4.6. 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. Certain technology-based effluent limitations and compliance deadlines included in this permit are based upon effluent limitation Guidelines (“ELGs”) that are under reconsideration by the United States Environmental Protection Agency (“EPA”). 82 Fed. Reg. 43494 (September 18, 2017).

**5.4.6.1. 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. In accordance with Section 423.12(b)(12) the permitting authority may allow the quantity of pollutant discharged to be expressed as a concentration limitation instead of a mass based limitation. The DOW has determined to apply the requirements of 40 CFR 423 in this manner. This facility is subject to the following subparts in 40 CFR 423:

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:

Pollutant or pollutant property	BPT effluent limitations	
	Maximum for any 1 day (mg/l)	Average of daily values for 30 consecutive days shall not exceed (mg/l)
TSS	100.0	30.0
Oil and grease	20.0	15.0

40 CFR 423.12(b)(4) The quantity of pollutants discharged in fly ash and bottom ash transport water shall not exceed the quantity determined by multiplying the flow of fly ash and bottom ash transport water times the concentration listed in the following table:

Pollutant or pollutant property	BPT effluent limitations	
	Maximum for any 1 day (mg/l)	Average of daily values for 30 consecutive days shall not exceed (mg/l)
TSS	100.0	30.0
Oil and grease	20.0	15.0

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:

Pollutant or pollutant property	BPT effluent limitations	
	Maximum for any 1 day (mg/l)	Average of daily values for 30 consecutive days shall not exceed (mg/l)
TSS	100.0	30.0
Oil and grease	20.0	15.0
Copper, total	1.0	1.0
Iron, total	1.0	1.0

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:

Pollutant or pollutant property	BPT effluent limitations
	Maximum concentration for any time (mg/l)
TSS	50

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:

Pollutant or pollutant property	BPT Effluent limitations
---------------------------------	--------------------------

	Maximum for any 1 day (mg/l)	Average of daily values for 30 consecutive days shall not exceed (mg/l)
TSS	100.0	30.0
Oil and grease	20.0	15.0

40 CFR 423.13(g)(1)(i) *FGD wastewater*. 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 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.

Pollutant or pollutant property	BAT Effluent limitations	
	Maximum for any 1 day	Average of daily values for 30 consecutive days shall not exceed
Arsenic, total (ug/L)	18	8
Mercury, total (ng/L)	103	34
Selenium, total (ug/L)	70	29
Nitrate/nitrite as N (mg/L)	4	3

(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(h)(1)(i) *Fly ash transport water*. Except for those discharges to which paragraph (h)(2) of this section applies, or when the fly ash transport water is used in the FGD scrubber, there shall be no discharge of pollutants in fly ash transport water. Dischargers must meet the discharge limitation in this paragraph by a date determined by the permitting authority that is as soon as possible beginning November 1, 2018, but no later than December 31, 2023. This limitation applies to the discharge of fly ash transport water generated on and after the date determined by the permitting authority for meeting the

discharge limitation, as specified in this paragraph. Whenever fly ash transport water is used in any other plant process or is sent to a treatment system at the plant (except when it is used in the FGD scrubber), the resulting effluent must comply with the discharge limitation in this paragraph. When the fly ash transport water is used in the FGD scrubber, the quantity of pollutants in fly ash transport water shall not exceed the quantity determined by multiplying the flow of fly ash transport water times the concentration listed in the table in paragraph (g)(1)(i) of this section.

40 CFR 423.13(k)(1)(i) *Bottom ash transport water*. Except for those discharges to which paragraph (k)(2) of this section applies, or when the bottom ash transport water is used in the FGD scrubber, there shall be no discharge of pollutants in bottom ash transport water. Dischargers must meet the discharge limitation 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. This limitation applies to the discharge of bottom ash transport water generated on and after the date determined by the permitting authority for meeting the discharge limitation, as specified in this paragraph. Whenever bottom ash transport water is used in any other plant process or is sent to a treatment system at the plant (except when it is used in the FGD scrubber), the resulting effluent must comply with the discharge limitation in this paragraph. When the bottom ash transport water is used in the FGD scrubber, the quantity of pollutants in bottom ash transport water shall not exceed the quantity determined by multiplying the flow of bottom ash transport water times the concentration listed in the table in paragraph (g)(1)(i) of this section.

**5.4.6.2. BPJ**

It is the BPJ of the DOW to apply the following Total Suspended Solids (TSS) limitations to the uncontaminated rainfall contributing to this effluent: 30 mg/l and 50 mg/l as monthly average and daily maximum limitations respectively. It is the BPJ of the DOW to not allow the uncontaminated rainfall to contribute oil and grease to this effluent. It is the BPJ of the DOW to place a 5 mg/l limitation on oil and grease in the contaminated rainfall runoff contributing to this effluent. The DOW has developed flow-weighted limitations for TSS, and oil and grease at Outfall 002 to insure compliance with the federal effluent limitation guidelines for low volume wastes, chemical metal cleaning wastes, and other process wastewaters.

**5.4.7. 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.

<b>TABLE 15.</b>	
<b>Pollutant or Pollutant Characteristic</b>	<b>Basis</b>
Whole Effluent Toxicity	Facility is rated as a major, and this outfall discharges a complex waste stream. A mixing zone is granted for this pollutant.
Total Recoverable Iron	The discharge concentration of this pollutant exceeds 70% of the calculated water quality-based effluent limitations (WQBELs) for this pollutant.
Total Recoverable Mercury	The discharge concentration of this pollutant exceeds 90% of the calculated WQBELs for this pollutant.
Total Recoverable Selenium	The discharge concentration of this pollutant exceeds 90% of the calculated WQBEL for this pollutant. A mixing zone is granted for this pollutant and a trigger will be applied.



**5.4.8. 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: Total Recoverable Selenium and Whole Effluent Toxicity.

**5.5. Limitation Calculations**

**5.5.1. Technology-Based Effluent Limitations**

The DOW has developed flow-weighted limitations for Outfall 002 effluent to insure compliance with the federal effluent limitation guidelines for the various types of waters comingled in the Process Waters Pond.

The Ash Pond was replaced with the Process Waters Pond which has a surface area of 10 acres. Therefore, 10 acres is used in the flow calculations for runoff resulting from direct rainfall.

Average annual rainfall data for 2016 was found on the Kentucky Mesonet website. Rainfall data from Oldham County was used as Jefferson County information was not available.

<http://www.kymesonet.org/summaries.html>

The conversion factor is a result of the factors needed to convert acres to square feet, inches per year to feet per day, and cubic feet per day to million gallons per day.

The following calculations produce the TSS, and oil and grease limitations.

Flow Calculations					
Source	Coefficient of Runoff	Surface Area (acres)	Average Annual Rainfall (inches/year)	Average Conversion Factor	Average Flow (MGD)
<b>Process Pond (Uncontaminated Runoff)</b>					
Basin Direct Surface Discharge	1	10	46.1	0.0000744	0.034298

Limitations Calculations					
Source	Flow (MGD)	Total Suspended Solids			
		Concentration (mg/l)		Contribution	
		Average	Maximum	Average	Maximum
Process Pond (Uncontaminated Runoff)	0.0342984	30	50	1.028952	1.71492
Coal Pile Settling Basin (Dust Control, Equipment washdowns, stormwater from areas 2.d, 2.e)	0.1089	30	50	3.267	5.445
Landfill stormwater and leachate	0.0746	30	100	2.238	7.46
FGD Process Waters (FGD PWS Treatment System Waters)	1.6027	30	100	48.081	160.27
stormwater from areas 2.a and 2.c	0.0621016	30	50	1.863048	3.10508
Boiler Chemical Metal Cleaning Wastewaters (006)	0.0326	30	100	0.978	3.26
Units 1-4:					
Bottom & Fly Ash Sluice Waters	0	30	100	0	0
Pyrites Sluice Waters	0.4369	30	100	13.107	43.69
Air Heater Wash Waters	0.1046	30	100	3.138	10.46
Sumps	2.3554	30	100	70.662	235.54
Total	4.8121			144.363	470.945
			<b>Limits</b>	30.0	97.9

Limitations Calculations					
Source	Flow (MGD)	Oil & Grease			
		Concentration (mg/l)		Contribution	
		Average	Maximum	Average	Maximum
Process Pond (Uncontaminated Runoff)	0.0342984	0	0	0	0
Coal Pile Settling Basin (Dust Control, Equipment washdowns, stormwater from areas 2.d, 2.e, and 2.f)	0.1089	5	5	0.5445	0.5445
Landfill stormwater and leachate	0.0746	15	20	1.119	1.492
FGD Process Waters (FGD PWS Treatment System Waters)	1.6027	15	20	24.0405	32.054
stormwater from areas 2.a and 2.c	0.0621016	5	5	0.310508	0.310508
Boiler Chemical Metal Cleaning Wastewaters (006)	0.0326	15	20	0.489	0.652
Units 1-4:					
Bottom & Fly Ash Sluice Waters	0	15	20	0	0
Pyrites Sluice Waters	0.4369	15	20	6.5535	8.738
Air Heater Wash Waters	0.1046	15	20	1.569	2.092
Sumps	2.3554	15	20	35.331	47.108
Total	4.8121			69.957008	92.99101
			<b>Limits</b>	14.5	19.3

### 5.5.2. Water Quality-Based Effluent Limitations

These calculations were performed 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	146	YES	148.5430196	NO	N/A	N/A
Effluent Characteristic	Units	Reported Avg	Reported Max	Average Limitation	Maximum Limitation	Average Discharge %	Maximum Discharge %	Data Source
Antimony	µg/L	0	0	2393.027227	N/A	0.00	N/A	APP
Arsenic	µg/L	8.9	8.9	340	340	2.62	2.62	APP
Barium	µg/L	86	86	427326.2905	N/A	0.02	N/A	APP
Beryllium	µg/L	0	0	1709.305162	N/A	0.00	N/A	APP
Cadmium	µg/L	0	0	8.731374985	8.731374985	0.00	0.00	APP
Chloride	µg/L	110000	110000	1200000	1200000	9.17	9.17	APP
Chromium	µg/L	0	0	42732.62905	N/A	0.00	N/A	APP
Copper	µg/L	9.6	9.6	51.68449826	51.68449826	18.57	18.57	APP
Cyanide, Free	µg/L	0	0	22	22	0.00	0.00	APP
Fluoride	µg/L	1800	1800	1709305.162	N/A	0.11	N/A	APP
Iron	µg/L	800	800	4000	4000	20.00	20.00	APP
Lead	µg/L	0	0	476.8177624	476.8177624	0.00	0.00	APP
Mercury	µg/L	0.0787	0.0787	0.051	1.4	154.31	5.62	APP
Nickel	µg/L	31	31	1515.921838	1515.921838	2.04	2.04	APP
Phenol	µg/L	0	0	8973852.1	N/A	0.00	N/A	APP
Selenium	µg/L	17	17	499.4063028	N/A	3.40	N/A	APP
Silver	µg/L	0	0	N/A	41.07168773	N/A	0.00	APP
Sulfate	µg/L	460000	460000	106831572.6	N/A	0.43	N/A	APP
Hydrogen Sulfide, Undissociated	µg/L	0	0	199.7625211	N/A	0.00	N/A	APP
Thallium	µg/L	0	0	102.5583097	N/A	0.00	N/A	APP
Zinc	µg/L	24	24	387.8303147	387.8303147	6.19	6.19	APP
Gross total alpha particle activity including radium-226 but excluding radon and uranium	pCi/L	8.85	8.85	30204.8501	N/A	0.03	N/A	APP
Combined radium-226 and radium-228	pCi/L	0	0	10068.28337	N/A	0.00	N/A	APP
Total gross beta particle activity	pCi/L	11	11	100682.8337	N/A	0.01	N/A	APP
Strontium-90	pCi/L	0	0	16109.25339	N/A	0.00	N/A	APP
Uranium	µg/L	12.3	12.3	60409.70021	N/A	0.02	N/A	APP
Total Residual Chlorine	µg/L	20	20	19	19	105.26	105.26	APP
Temperature	°F	61.7	61.7	0	110	56.09	56.09	APP

### 5.6. 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].

#### **5.6.1. 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].

#### **5.6.2. Total Suspended Solids, and Oil and Grease**

The limitations for these pollutants are consistent with Kentucky's Water Quality Standards and Federal Effluent Limitation Guidelines [401 KAR 5:065, Section 2(6) – 40 CFR 122 Appendix A]. The limits are representative of the BPT and BAT requirements for discharges of these pollutants in low volume waste sources [40 CFR 423.12(b)(3)], fly ash and bottom ash transport waters [40 CFR 423.12(b)(4) and 40 CFR 423.13(h)(1) and k(1)], metal cleaning wastes [40 CFR 423.12(b)(5)], coal pile runoff [40 CFR 423.12(b)(9)], combustion residual leachate [40 CFR 423.12(b)(11) and 40 CFR 423.13(l)] and FGD wastewaters [40 CFR 423.12(b)(11) and 40 CFR 423.13(g)(1)(ii)].

#### **5.6.3. pH**

The limitations for this parameter are consistent Kentucky's Water Quality Standards [401 KAR 10:031, Section 4(1)(b) and Section 7] and Federal Effluent Limitation Guidelines [401 KAR 5:065, Section 2(6) – 40 CFR 122 Appendix A]. The limits are representative of the BPT requirements for this parameter in all discharges except once through cooling water [40 CFR 423.12(b)(1)].

#### **5.6.4. Total Recoverable Iron**

The monitoring requirements for this pollutant 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].

#### **5.6.5. Total Recoverable Mercury**

The limitations for this pollutant are consistent with Kentucky's Water Quality Standards [401 KAR 10:031, Section 6].

#### **5.6.6. Total Recoverable Selenium**

The limitations for this pollutant are consistent with Kentucky's Water Quality Standards [401 KAR 10:031, Section 6 and 401 KAR 10:029 Section 4].

#### **5.6.7. Whole Effluent Toxicity**

The limitations for this parameter are consistent with Kentucky's Water Quality Standards [401 KAR 10:031, Sections 4(1)(j) and 401 KAR 10:029 Section 4].

# **SECTION 6**

## **OUTFALL 003**

**6. OUTFALL 003**

**6.1. Outfall Description**

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

TABLE 16.				
Outfall Type	Latitude (N)	Longitude (W)	Receiving Water	Description of Outfall
Internal	38.05556°	85.91139°	Outfall 001 / Outfall 025	Unit 2 cooling tower blowdown

**6.2. Reported Values**

The following table summarizes the reported values for Outfall 003:

TABLE 17.							
Reported Parameters	Units	EFFLUENT					
		Loadings (lbs./day)		Concentrations			
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum
Flow	MGD	4.3427	4.5958	N/A	N/A	N/A	N/A
Free Available Chlorine	mg/l	N/A	N/A	N/A	*	*	N/A
Total Residual Chlorine	mg/l	N/A	N/A	N/A	*	*	N/A
Total Residual Oxidants	mg/l	N/A	N/A	N/A	0	0	N/A
Time of Oxidant Addition	minutes/unit/day	N/A	N/A	N/A	N/A	0	N/A
Total Recoverable Chromium	mg/l	N/A	N/A	N/A	0.001	0.002	N/A
Total Recoverable Zinc	mg/l	N/A	N/A	N/A	0.012	0.017	N/A
Priority Pollutants	mg/l	N/A	N/A	N/A	**	**	N/A

\* DMRs indicate there were no periods of chlorination, therefor testing was not required.

\*\* DMRs indicate there were no chemicals added that would trigger the conditional testing.

The above values are based off of 5-year DMR averages from 02/28/12 to 02/28/17.

**6.3. Effluent Limitations and Monitoring Requirements**

The following table summarizes the effluent limitations and monitoring requirements for Outfall 003:

TABLE 18.									
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/Month	Calculated
Free Available Chlorine	mg/l	N/A	N/A	N/A	0.2	0.5	N/A	Per Occurrence <sup>1</sup>	Multiple Grab <sup>2</sup>
Total Residual Chlorine	mg/l	N/A	N/A	N/A	Report	0.2	N/A	Per Occurrence <sup>1</sup>	Multiple Grab <sup>2</sup>
Total Residual Oxidants <sup>3</sup>	mg/l	N/A	N/A	N/A	Report	0.2	N/A	Per Occurrence <sup>1</sup>	Multiple Grab <sup>2</sup>
Time of Oxidant Addition	minutes/unit/day	N/A	N/A	N/A	N/A	120	N/A	Per Occurrence <sup>1</sup>	Log
Total Recoverable Chromium	mg/l	N/A	N/A	N/A	0.2	0.2	N/A	1/Year	Grab
Total Zinc	mg/l	N/A	N/A	N/A	1.0	1.0	N/A	1/Year	Grab
Priority Pollutants <sup>4</sup>	mg/l	N/A	N/A	N/A	N/A	NDA <sup>5</sup>	N/A	1/Year	Calculated
<sup>1</sup> Per Occurrence means during periods of chlorination or oxidant addition, but no more frequent than once per week.									
<sup>2</sup> Multiple grab means grab samples collected at the approximate beginning of oxidant discharge and once every fifteen (15) minutes thereafter until the end of oxidant discharge.									
<sup>3</sup> The term Total Residual Oxidants means the value obtained using the amperometric titration or DPD methods for Total Residual Chlorine described in 40 CFR Part 136. In the event the permittee needs to use an oxidant other than chlorine, the permittee shall request approval prior to the initial use of the oxidant from the Division of Water.									
<sup>4</sup> Priority pollutants shall be monitored once per year by grab sample or by engineering calculations. The results of the analyses/engineering calculations shall show the results for each pollutant and be attached to the DMR. The term priority pollutant means the pollutants (40 CFR 423 Appendix A) which are contained in chemicals added for cooling tower maintenance, except Total Recoverable Chromium and Total Recoverable Zinc.									
<sup>5</sup> The abbreviation NDA means No Detectable Amount.									
Not more than one unit may discharge free available or total residual chlorine at any one time.									

**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:

<https://eec.ky.gov/Environmental-Protection/Forms%20Library/General%20Procedures%20for%20Limitations%20Development.pdf>

**6.4.1. Facility Changes**

Outfall 003 effluent was directed to the Ash Pond in the past. Outfall 003 effluent will now be directed to Outfall 001.

**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. Applicable subparts are shown below:

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:

Pollutant or pollutant property	BPT effluent limitations	
	Maximum concentration (mg/l)	Average concentration (mg/l)
Free available chlorine	0.5	0.2

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

40 CFR 423.13(b)(1) For any plant with a total rated electric generating capacity of 25 or more megawatts, the quantity of pollutants discharged in once through cooling water from each discharge point shall not exceed the quantity determined by multiplying the flow of once through cooling water from each discharge point times the concentration listed in the following table:

Pollutant or pollutant property	BAT Effluent Limitations
	Maximum concentration (mg/l)
Total residual chlorine	0.20



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 times the concentration listed below:

Pollutant or pollutant property	BAT effluent limitations	
	Maximum concentration (mg/l)	Average concentration (mg/l)
Free available chlorine	0.5	0.2
Pollutant or pollutant property	Maximum for any 1 day –(mg/l)	Average of daily values for 30 consecutive days shall not exceed = (mg/l)
The 126 priority pollutants (Appendix A) contained in chemicals added for cooling tower maintenance, except:	( <sup>1</sup> )	( <sup>1</sup> )
Chromium, total	0.2	0.2
Zinc, total	1.0	1.0

<sup>1</sup>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.

**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. Flow**

The monitoring requirements for this parameter are consistent with monitoring requirements for internal waste streams [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(iii)].

#### **6.5.2. Free Available Chlorine**

The limitations for this pollutant are consistent with Kentucky's Water Quality Standards and Federal Effluent Limitation Guidelines [401 KAR 5:065, Section 2(6)]. The limit is representative of the BPT requirements for the discharge of this pollutant in cooling tower blowdown [40 CFR 423.12(b)(7)].

#### **6.5.3. Total Residual Chlorine**

The limitations for this pollutant are consistent with Kentucky's Water Quality Standards [401 KAR 5:065, Section 2(6) and 401 KAR 5:080, Section 2(3)]. These limits are representative of the DOW's BPJ determination of BAT requirements for the discharge of this pollutant in cooling tower blowdown. The DOW based this determination on the requirement for once-through cooling water discharges specified in 40 CFR 423.13(b)(1).

#### **6.5.4. Total Residual Oxidants**

The limitation for this pollutant is consistent with Kentucky's Water Quality Standards [401 KAR 5:080, Section 2(3)]. These limits are representative of the DOW's BPJ determination of BAT requirements for the discharge of these pollutants in cooling tower blowdown. The DOW based this determination on the requirement for once-through cooling water discharges specified in 40 CFR 423.13(b)(1). It is the BPJ of the DOW that this requirement is also applicable to the addition of these pollutants in cooling tower blowdown.

#### **6.5.5. Time of Oxidant Addition**

The limitation for this parameter is consistent with Kentucky's Water Quality Standards [401 KAR 5:065, Section 2(6) and 401 KAR 5:080, Section 2(3)]. The limit is representative of the BPT and BAT requirements for chlorine in cooling tower blowdown [401 KAR 5:065, Section 2(6) and 40 CFR 423.12(b)(8) and 423.13(d)(2)]. It is the BPJ of the DOW that this requirement is also applicable to the addition of other oxidants.

#### **6.5.6. Total Recoverable Chromium, Total Recoverable Zinc, and Priority Pollutants**

The limitations for these pollutants are representative of the BAT requirements for cooling water blowdown [401 KAR 5:065, Section 2(6) and 40 CFR 423.13(d)(1)].

# SECTION 7

## OUTFALL 004

**7. OUTFALL 004**

**7.1. 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	38.04944°	85.91306°	Outfall 023	Unit 3 cooling tower blowdown

**7.2. Reported Values**

The following table summarizes the reported values for Outfall 004:

TABLE 20.							
Reported Parameters	Units	EFFLUENT					
		Loadings (lbs./day)		Concentrations			
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum
Flow	MGD	3.5285	8.2362	N/A	N/A	N/A	N/A
Temperature	°C	N/A	N/A	N/A	28	31.2	N/A
pH	SU	N/A	N/A	8.4	N/A	N/A	8.7
Free Available Chlorine	mg/l	N/A	N/A	N/A	*	*	N/A
Total Residual Chlorine	mg/l	N/A	N/A	N/A	*	*	N/A
Total Residual Oxidants	mg/l	N/A	N/A	N/A	0	0	N/A
Time of Oxidant Addition	minutes/unit/day	N/A	N/A	N/A	N/A	0	N/A
Total Recoverable Chromium	mg/l	N/A	N/A	N/A	0.001	0.001	N/A
Total Recoverable Zinc	mg/l	N/A	N/A	N/A	0.026	0.027	N/A
Priority Pollutants	mg/l	N/A	N/A	N/A	**	**	N/A

\* DMRs indicate there were no periods of chlorination, therefor testing was not required.

\*\* DMRs indicate there were no chemicals added that would trigger the conditional testing.

The above values are based off of 5-year DMR averages from 02/28/12 to 02/28/17.

**7.3. Effluent Limitations and Monitoring Requirements**

The following table summarizes the effluent limitations and monitoring requirements for Outfall 004:

TABLE 21.									
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/Week	Calculated
Priority Pollutants <sup>1</sup>	mg/l	N/A	N/A	N/A	N/A	NDA <sup>2</sup>	N/A	1/Year	Calculated
Free Available Chlorine	mg/l	N/A	N/A	N/A	0.2	0.5	N/A	Per Occurrence <sup>3</sup>	Multiple Grab <sup>4</sup>
Total Residual Chlorine	mg/l	N/A	N/A	N/A	Report	0.20	N/A	Per Occurrence <sup>3</sup>	Multiple Grab <sup>4</sup>
Total Residual Oxidants	mg/l	N/A	N/A	N/A	Report	0.20	N/A	Per Occurrence <sup>3</sup>	Multiple Grab <sup>4</sup>
Time of Oxidant Addition	minutes/unit/day	N/A	N/A	N/A	N/A	120	N/A	Per Occurrence <sup>3</sup>	Log
<sup>1</sup> Priority pollutants shall be monitored once per year by grab sample or by engineering calculations. The results of the analyses/engineering calculations shall show the results for each pollutant and be attached to the DMR. The term priority pollutant means the pollutants (40 CFR 423 Appendix A) which are contained in chemicals added for cooling tower maintenance, except Total Recoverable Chromium and Total Recoverable Zinc.									
<sup>2</sup> The abbreviation NDA means No Detectable Amount.									
<sup>3</sup> Per Occurrence means during periods of chlorination or oxidant addition, but no more frequent than once per week.									
<sup>4</sup> Multiple grab means grab samples collected at the approximate beginning of oxidant discharge and once every fifteen (15) minutes thereafter until the end of oxidant discharge.									
The term Total Residual Oxidants means the value obtained using the amperometric titration or DPD methods for Total Residual Chlorine described in 40 CFR Part 136. In the event the permittee needs to use an oxidant other than chlorine, the permittee shall request approval prior to the initial use of the oxidant from the Division of Water.									
Not more than one unit may discharge free available or total residual chlorine at any one time.									

**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:

<https://eec.ky.gov/Environmental-Protection/Forms%20Library/General%20Procedures%20for%20Limitations%20Development.pdf>

**7.4.1. Facility Changes**

Outfall 004 and Outfall 005 are now internal monitoring points. Monitoring to show compliance with the technology based effluent limitations for the priority pollutants, free available chlorine, total residual chlorine, total residual oxidants, and time of oxidant addition will occur at internal points Outfall 004 and Outfall 005. Water quality based effluent limitations are not applied at internal monitoring points, they are applied at external Outfall 023.

**7.4.2. 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.

**7.4.2.1. 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. Applicable subparts are shown below:

40 CFR 423.12(b)(1) (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)(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:

Pollutant or pollutant property	BPT effluent limitations	
	Maximum concentration (mg/l)	Average concentration (mg/l)
Free available chlorine	0.5	0.2

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

40 CFR 423.13(b)(1) For any plant with a total rated electric generating capacity of 25 or more megawatts, the quantity of pollutants discharged in once through cooling water from each discharge point shall not exceed the quantity determined by multiplying the flow of once through cooling water from each discharge point times the concentration listed in the following table:

Pollutant or pollutant property	BAT Effluent Limitations
---------------------------------	--------------------------

	Maximum concentration (mg/l)
Total residual chlorine	0.20

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 times the concentration listed below:

Pollutant or pollutant property	BAT effluent limitations	
	Maximum concentration (mg/l)	Average concentration (mg/l)
Free available chlorine	0.5	0.2
Pollutant or pollutant property	Maximum for any 1 day –(mg/l)	Average of daily values for 30 consecutive days shall not exceed = (mg/l)
The 126 priority pollutants (Appendix A) contained in chemicals added for cooling tower maintenance, except:	(1)	(1)
Chromium, total	0.2	0.2
Zinc, total	1.0	1.0

<sup>1</sup>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.

### 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 (iii)] and requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48].

#### **7.5.2. Priority Pollutants**

The limitations for these pollutants are representative of the BAT requirements for cooling tower blowdown [401 KAR 5:065, Section 2(6) and 40 CFR 423.13(d)(1)].

#### **7.5.3. Free Available Chlorine**

The limitations for this pollutant are consistent with Kentucky's Water Quality Standards and Federal Effluent Limitation Guidelines [401 KAR 5:065, Section 2(6)]. The limit is representative of the BPT requirements for the discharge of this pollutant in cooling tower blowdown [40 CFR 423.12(b)(7)].

#### **7.5.4. Total Residual Chlorine**

The limitation for this pollutant is consistent with Kentucky's Water Quality Standards [401 KAR 5:080, Section 2(3)]. These limits are representative of the DOW's BPJ determination of BAT requirements for the discharge of these pollutants in cooling tower blowdown. The DOW based this determination on the requirement for once-through cooling water discharges specified in 40 CFR 423.13(b)(1). It is the BPJ of the DOW that this requirement is also applicable to cooling tower blowdown.

#### **7.5.5. Total Residual Oxidants**

The limitation for this pollutant is consistent with Kentucky's Water Quality Standards [401 KAR 5:080, Section 2(3)]. These limits are representative of the DOW's BPJ determination of BAT requirements for the discharge of these pollutants in cooling tower blowdown. The DOW based this determination on the requirement for once-through cooling water discharges specified in 40 CFR 423.13(b)(1). It is the BPJ of the DOW that this requirement is also applicable to the addition of these pollutants in cooling tower blowdown.

#### **7.5.6. Time of Oxidant Addition**

The limitation for this parameter is consistent with Kentucky's Water Quality Standards [401 KAR 5:065, Section 2(6) and 401 KAR 5:080, Section 2(3)]. The limit is representative of the BPT and BAT requirements for chlorine in cooling tower blowdown [401 KAR 5:065, Section 2(6) and 40 CFR 423.12(b)(8) and 423.13(d)(2)]. It is the BPJ of the DOW that this requirement is also applicable to the addition of other oxidants.



# **SECTION 8**

## **OUTFALL 005**

**8. OUTFALL 005**

**8.1. 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	38.04944°	85.91306°	Outfall 023	Unit 4 cooling tower blowdown

**8.2. Reported Values**

The following table summarizes the reported values for Outfall 005:

TABLE 23.							
Reported Parameters	Units	EFFLUENT					
		Loadings (lbs./day)		Concentrations			
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum
Flow	MGD	3.232	5.0165	N/A	N/A	N/A	N/A
Temperature	°C	N/A	N/A	N/A	28.8	32.0	N/A
pH	SU	N/A	N/A	8.4	N/A	N/A	8.7
Free Available Chlorine	mg/l	N/A	N/A	N/A	*	*	N/A
Total Residual Chlorine	mg/l	N/A	N/A	N/A	*	*	N/A
Total Residual Oxidants	mg/l	N/A	N/A	N/A	0	0	N/A
Time of Oxidant Addition	minutes/unit/day	N/A	N/A	N/A	N/A	0	N/A
Total Recoverable Chromium	mg/l	N/A	N/A	N/A	.001	.005	N/A
Total Recoverable Zinc	mg/l	N/A	N/A	N/A	0.018	0.019	N/A
Priority Pollutants	mg/l	N/A	N/A	N/A	**	**	N/A

\* DMRs indicate there were no periods of chlorination, therefor testing was not required.

\*\* DMRs indicate there were no chemicals added that would trigger the conditional testing.

The above values are based off of 5-year DMR averages from 02/28/12 to 02/28/17.

**8.3. Effluent Limitations and Monitoring Requirements**

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

TABLE 24.									
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/Week	Calculated
Priority Pollutants <sup>1</sup>	mg/l	N/A	N/A	N/A	N/A	NDA <sup>2</sup>	N/A	1/Year	Calculated
Free Available Chlorine	mg/l	N/A	N/A	N/A	0.2	0.5	N/A	Per Occurrence <sup>3</sup>	Multiple Grab <sup>4</sup>
Total Residual Chlorine	mg/l	N/A	N/A	N/A	Report	0.20	N/A	Per Occurrence <sup>3</sup>	Multiple Grab <sup>4</sup>
Total Residual Oxidants	mg/l	N/A	N/A	N/A	Report	0.20	N/A	Per Occurrence <sup>3</sup>	Multiple Grab <sup>4</sup>
Time of Oxidant Addition	minutes/unit/day	N/A	N/A	N/A	N/A	120	N/A	Per Occurrence <sup>3</sup>	Log
<sup>1</sup> Priority pollutants shall be monitored once per year by grab sample or by engineering calculations. The results of the analyses/engineering calculations shall show the results for each pollutant and be attached to the DMR. The term priority pollutant means the pollutants (40 CFR 423 Appendix A) which are contained in chemicals added for cooling tower maintenance, except Total Recoverable Chromium and Total Recoverable Zinc.									
<sup>2</sup> The abbreviation NDA means No Detectable Amount.									
<sup>3</sup> Per Occurrence means during periods of chlorination or oxidant addition, but no more frequent than once per week.									
<sup>4</sup> Multiple grab means grab samples collected at the approximate beginning of oxidant discharge and once every fifteen (15) minutes thereafter until the end of oxidant discharge.									
The term Total Residual Oxidants means the value obtained using the amperometric titration or DPD methods for Total Residual Chlorine described in 40 CFR Part 136. In the event the permittee needs to use an oxidant other than chlorine, the permittee shall request approval prior to the initial use of the oxidant from the Division of Water.									
Not more than one unit may discharge free available or total residual chlorine at any one time.									

**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:

<https://eec.ky.gov/Environmental-Protection/Forms%20Library/General%20Procedures%20for%20Limitations%20Development.pdf>

**8.4.1. Facility Changes**

Outfall 004 and Outfall 005 are now internal monitoring points. Monitoring to show compliance with the technology based effluent limitations for the priority pollutants, free available chlorine, total residual chlorine, total residual oxidants, and time of oxidant addition will occur at internal points Outfall 004 and Outfall 005. Water quality based effluent limitations are not applied at internal monitoring points, they are applied at external Outfall 023.

**8.4.2. 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.

**8.4.2.1. 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. Applicable subparts are shown below:

40 CFR 423.12(b)(1) (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)(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:

Pollutant or pollutant property	BPT effluent limitations	
	Maximum concentration (mg/l)	Average concentration (mg/l)
Free available chlorine	0.5	0.2

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

40 CFR 423.13(b)(1) For any plant with a total rated electric generating capacity of 25 or more megawatts, the quantity of pollutants discharged in once through cooling water from each discharge point shall not exceed the quantity determined by multiplying the flow of once through cooling water from each discharge point times the concentration listed in the following table:

Pollutant or pollutant property	BAT Effluent Limitations
---------------------------------	--------------------------

	Maximum concentration (mg/l)
Total residual chlorine	0.20

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 times the concentration listed below:

Pollutant or pollutant property	BAT effluent limitations	
	Maximum concentration (mg/l)	Average concentration (mg/l)
Free available chlorine	0.5	0.2
Pollutant or pollutant property	Maximum for any 1 day –(mg/l)	Average of daily values for 30 consecutive days shall not exceed = (mg/l)
The 126 priority pollutants (Appendix A) contained in chemicals added for cooling tower maintenance, except:	(1)	(1)
Chromium, total	0.2	0.2
Zinc, total	1.0	1.0

<sup>1</sup>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.

**8.5. 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].

#### **8.5.1. 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 (iii)] and requirements for recording and reporting of monitoring results [401 KAR 5:070, Section 3 – 40 CFR 122.48].

#### **8.5.2. Priority Pollutants**

The limitations for these pollutants are representative of the BAT requirements for cooling tower blowdown [401 KAR 5:065, Section 2(6) and 40 CFR 423.13(d)(1)].

#### **8.5.3. Free Available Chlorine**

The limitations for this pollutant are consistent with Kentucky's Water Quality Standards and Federal Effluent Limitation Guidelines [401 KAR 5:065, Section 2(6)]. The limit is representative of the BPT and BAT requirements for the discharge of this pollutant in cooling tower blowdown [40 CFR 423.12(b)(7) and 40 CFR 423.13(d)(1)].

#### **8.5.4. Total Residual Chlorine**

The limitation for this pollutant is consistent with Kentucky's Water Quality Standards [401 KAR 5:080, Section 2(3)]. These limits are representative of the DOW's BPJ determination of BAT requirements for the discharge of these pollutants in cooling tower blowdown. The DOW based this determination on the requirement for once-through cooling water discharges specified in 40 CFR 423.13(b)(1). It is the BPJ of the DOW that this requirement is also applicable to cooling tower blowdown.

#### **8.5.5. Total Residual Oxidants**

The limitation for this pollutant is consistent with Kentucky's Water Quality Standards [401 KAR 5:080, Section 2(3)]. These limits are representative of the DOW's BPJ determination of BAT requirements for the discharge of these pollutants in cooling tower blowdown. The DOW based this determination on the requirement for once-through cooling water discharges specified in 40 CFR 423.13(b)(1). It is the BPJ of the DOW that this requirement is also applicable to the addition of these pollutants in cooling tower blowdown.

#### **8.5.6. Time of Oxidant Addition**

The limitation for this parameter is consistent with Kentucky's Water Quality Standards [401 KAR 5:065, Section 2(6) and 401 KAR 5:080, Section 2(3)]. The limit is representative of the BPT and BAT requirements for chlorine in cooling tower blowdown [401 KAR 5:065, Section 2(6) and 40 CFR 423.12(b)(8) and 423.13(d)(2)]. It is the BPJ of the DOW that this requirement is also applicable to the addition of other oxidants.

# **SECTION 9**

## **OUTFALL 006**

**9. OUTFALL 006**

**9.1. Outfall Description**

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

TABLE 25.				
Outfall Type	Latitude (N)	Longitude (W)	Receiving Water	Description of Outfall
Internal	38.05639°	85.90972°	Outfall 002	Boiler chemical metal cleaning wastes

**9.2. Reported Values**

The following table summarizes the reported values for Outfall 006:

TABLE 26.							
Reported Parameters	Units	EFFLUENT					
		Loadings (lbs./day)		Concentrations			
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum
DMRs indicate no discharges from this outfall.							

The above values are based off of 5-year DMR averages from 02/28/12 to 02/28/17.

**9.3. Effluent Limitations and Monitoring Requirements**

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

TABLE 27.								MONITORING REQUIREMENTS	
EFFLUENT LIMITATIONS								Frequency	Sample Type
Effluent Characteristic	Units	Loadings (lbs./day)		Concentrations					
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum		
Flow	MGD	Report	Report	N/A	N/A	N/A	N/A	1/Batch <sup>1</sup>	Calculated
Total Copper	mg/l	N/A	N/A	N/A	1.0	1.0	N/A	1/Batch <sup>1</sup>	Grab
Total Iron	mg/l	N/A	N/A	N/A	1.0	1.0	N/A	1/Batch <sup>1</sup>	Grab
pH	SU	N/A	N/A	6.0	N/A	N/A	9.0	1/Batch <sup>1</sup>	Grab

<sup>1</sup>Monitoring shall be conducted once per metal cleaning operation.



**9.4. 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:

<https://eec.ky.gov/Environmental-Protection/Forms%20Library/General%20Procedures%20for%20Limitations%20Development.pdf>

**9.4.1. Jordan Memorandum**

There are air heater wash waters and boiler fireside wash waters discharged to the Ash Pond. These waters are not a result of cleaning with chemical compounds and they do not flow through Outfall 006. The DOW has developed flow-weighted limitations at Outfall 002 to insure compliance with the federal effluent limitation guidelines for low volume wastes, chemical metal cleaning wastes, and other process wastewaters. See section 0 for more details.

**9.4.2. Total Suspended Solids, and Oil and Grease**

The Ash Pond treats many waste streams. Since Outfall 006 effluent is directed to the Ash Pond, and will be directed to the future Process Waters Pond, the limitations for these pollutants has been applied at Outfall 002 after commingling with other waters. The DOW has developed flow-weighted limitations to insure compliance with the federal effluent limitation guidelines.

**9.4.3. 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.

**9.4.3.1. 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 applicable subparts are below:

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)(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:

Pollutant or pollutant property	BPT effluent limitations	
	Maximum for any 1 day (mg/l)	Average of daily values for 30 consecutive days shall not exceed (mg/l)
TSS	100.0	30.0
Oil and grease	20.0	15.0
Copper, total	1.0	1.0

Iron, total	1.0	1.0
-------------	-----	-----

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:

Pollutant or pollutant property	BAT effluent limitations	
	Maximum for any 1 day (mg/l)	Average of daily values for 30 consecutive days shall not exceed –(mg/l)
Copper, total	1.0	1.0
Iron, total	1.0	1.0

**9.5. 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].

**9.5.1. Flow**

The monitoring requirements for this parameter are consistent with monitoring requirements for internal waste streams [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(iii)].

**9.5.2. Total Copper, and Total Iron**

The limitations for these pollutants are representative of the BPT and BAT requirements for these pollutants in metal cleaning waste waters [401 KAR 5:065, Section 2(6) and 40 CFR 423.12(b)(5) and 423.13(e)].

**9.5.3. pH**

The limitations for this parameter are consistent with Federal Effluent Limitation Guidelines [401 KAR 5:065, Section 2(6) – 40 CFR 122 Appendix A]. The limits are representative of the BPT requirements for this parameter in all discharges except once through cooling water [40 CFR 423.12(b)(1)].

# **SECTION 10**

**OUTFALLS 007, 010, 011, 014, 016, 017, 018, 019,  
020, 021, 022**

**10. OUTFALLS 007, 010, 011, 014, 016, 017, 018, 019, 020, 021, 022****10.1. Outfall Descriptions**

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

TABLE 28.					
Outfall #	Outfall Type	Latitude (N)	Longitude (W)	Receiving Water	Description of Outfall
007	External	38.05306°	85.90500°	Ohio River	Stormwater runoff from Area 7L (below powerhouse west side)
010	External	38.06278°	85.90500°	Mill Creek	Stormwater runoff from Area 10B (North entrance and maintenance areas)
011	External	38.04583°	85.90028°	Unnamed Tributary to Pond Creek	Stormwater runoff from Areas 11C, R (East entrance, parking, and future landfill). No leachate will discharge through this outfall.
014	External	38.05389°	85.91222°	Ohio River	Stormwater runoff from Area 14 (Switchyard-Powerhouse northwest side)
016	External	38.04972°	85.90444°	Ohio River	Stormwater runoff from Area 16 (Closed Landfill B)
017	External	38.06194°	85.91083°	Ohio River	Stormwater runoff from Area 17 (Ash Pond west external slopes)
018	External	38.05944°	85.91111°	Ohio River	Stormwater runoff from Area 18 (Ash Pond southwest external slopes)
019	External	38.05583°	85.91167°	Ohio River	Stormwater runoff from Area 19 (Riverbank slopes west of Unit 2 cooling tower)
020	External	38.04944°	85.91250°	Ohio River	Stormwater runoff from Area 20 (Riverbank slopes west of Unit 4 cooling tower)
021	External	38.04778°	85.91278°	Ohio River	Stormwater runoff from Area 21 (Riverbank slopes west of Unit 3 cooling tower)
022	External	38.04639°	85.91278°	Ohio River	Stormwater runoff from Area 22 (Yard area southwest of Unit 3 cooling tower)

**10.2. Reported Values**

The previous permit did not require reporting of monitoring results for these outfalls. Best Management Practices (BMP) were used to control or abate any discharge of pollutants from these outfalls.

**10.3. Effluent Limitations and Monitoring Requirements**

The following table summarizes the effluent limitations and monitoring requirements for Outfalls 007, 010, 011, 014, 016, 017, 018, 019, 020, 021, 022:

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		
Due to the absence of any industrial processes, equipment or storage areas being located within the areas served by these outfalls, the DOW has determined that implementation of BMPs would be the most effective approach for controlling pollutants from these areas. The BMP Plan shall specifically mention controls and practices used to control or abate the discharge of pollutants in stormwater discharges from these outfalls.									

#### **10.4. 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:

<https://eec.ky.gov/Environmental-Protection/Forms%20Library/General%20Procedures%20for%20Limitations%20Development.pdf>

#### **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. Best Management Practices**

The requirement to address the stormwater discharges from these outfalls within the BMP Plan is consistent with the KPDES program requirements for establishing effluent limitations, standards, and permit conditions [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(k)].

# **SECTION 11**

## **OUTFALL 009**

**11. OUTFALL 009**

**11.1. 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	38.05306°	85.90500°	N/A	Plant Intake Water

**11.2. Reported Values**

The following table summarizes the reported values for Outfall 009:

TABLE 31.							
Reported Parameters	Units	EFFLUENT					
		Loadings (lbs./day)		Concentrations			
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum
Flow	MGD	245.443	260.242	N/A	N/A	N/A	N/A
Temperature	° C	N/A	N/A	N/A	17.9	20.1	N/A
Total Suspended Solids	mg/l	N/A	N/A	N/A	85	161	N/A
Hardness (as CaCO3)	mg/l	N/A	N/A	N/A	171	190	N/A
pH	SU	N/A	N/A	7.5	N/A	N/A	7.9
Total Recoverable Metals	mg/l	N/A	N/A	N/A	0.086	0.086	N/A

The above values are based off of 5-year DMR averages from 02/28/2012 to 02/28/2017.



**11.3. Effluent Limitations and Monitoring Requirements**

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

<b>TABLE 32.</b>									
<b>EFFLUENT LIMITATIONS</b>								<b>MONITORING REQUIREMENTS</b>	
<b>Effluent Characteristic</b>	<b>Units</b>	<b>Loadings (lbs./day)</b>		<b>Concentrations</b>				<b>Frequency</b>	<b>Sample Type</b>
		<b>Monthly Average</b>	<b>Daily Maximum</b>	<b>Minimum</b>	<b>Monthly Average</b>	<b>Daily Maximum</b>	<b>Maximum</b>		
Flow	MGD	Report	Report	N/A	N/A	N/A	N/A	1/Week	Instantaneous
Temperature	° F	N/A	N/A	N/A	Report	Report	N/A	1/Week	Grab
Total Recoverable Metals	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Quarter	Grab
The effluent characteristic Total Recoverable Metals means Total Recoverable: Antimony, Arsenic, Beryllium, Cadmium, Chromium, Copper, Iron, Lead, Mercury, Nickel, Selenium, Silver, Thallium, and Zinc.									

**11.4. 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:

<https://eec.ky.gov/Environmental-Protection/Forms%20Library/General%20Procedures%20for%20Limitations%20Development.pdf>

**11.4.1. 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.

<b>TABLE 33.</b>	
<b>Pollutant or Pollutant Characteristic</b>	<b>Basis</b>
Flow and Temperature	Intake water is used for many applications at this plant, including cooling water. Mixing zone calculations for temperature require an upstream value, and this value can be easily found and tracked by recording the temperature of the intake water. 40 CFR 122.44(i)(1)(iii) allows NPDES permits to include requirements for measurements of pollutants in internal waste streams and intake water.

**11.5. 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].

**11.5.1. Flow, and Temperature**

The monitoring requirements for these parameters are consistent with monitoring requirements for internal waste streams [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(iii)].

# **SECTION 12**

## **OUTFALL 012**

**12. OUTFALL 012****12.1. Outfall Description**

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

TABLE 34.				
Outfall Type	Latitude (N)	Longitude (W)	Receiving Water	Description of Outfall
Internal	38.04778°	85.91250°	Outfall 023	Discharges combined flows of stormwater from Areas 12 a through f, FGD/Gypsum Dewatering Filtrate and U- Flow Flush process waters, and non-process wastewaters: Clearwell Surplus Cooling/Service waters, Equipment-truck loadout miscellaneous washdown, Unit 3 and/or Unit 4 cooling tower blowdown. Outfall 012 is an internal monitoring point and effluent is conveyed to Outfall 023.

**12.2. Reported Values**

The following table summarizes the reported values for Outfall 012:

TABLE 35.							
Reported Parameters	Units	EFFLUENT					
		Loadings (lbs./day)		Concentrations			
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum
Flow	MGD	0.0415	0.0651	N/A	N/A	N/A	N/A
Total Suspended Solids	mg/l	N/A	N/A	N/A	18	23	N/A
Oil & Grease	mg/l	N/A	N/A	N/A	ND	ND	N/A
Hardness (as CaCO <sub>3</sub> )	mg/l	N/A	N/A	N/A	2113	2113	N/A
Sulfate	mg/l	N/A	N/A	N/A	1109	1111	N/A
Chlorides	mg/l	N/A	N/A	N/A	694	694	N/A
pH	mg/l	N/A	N/A	8.0	N/A	N/A	8.1

The above values are based off of 5-year DMR averages from 02/28/12 to 02/28/17.

**12.3. Effluent Limitations and Monitoring Requirements**

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

TABLE 36.									
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/Month	Instantaneous
Total Suspended Solids	mg/l	N/A	N/A	N/A	30.0	67.3	N/A	1/Month	Grab
Oil & Grease	mg/l	N/A	N/A	N/A	9.1	12.3	N/A	1/Month	Grab

**12.4. 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:

<https://eec.ky.gov/Environmental-Protection/Forms%20Library/General%20Procedures%20for%20Limitations%20Development.pdf>

**12.4.1. Future Operations**

FGD/Gypsum Dewatering Filtrate and U- Flow Flush process waters will be sent to the FGD Process Water Treatment System. Outfall 012 discharges combined flows of stormwater from Areas 12 a through f, and non-process wastewaters: Clearwell Surplus Cooling/Service waters, Equipment- truck loadout miscellaneous washdown.

Outfall 012 is an internal monitoring point and will not discharge directly to the Ohio River. Effluent from Outfall 012 will combine with effluent from Outfalls 004 and 005 to become Outfall 023 effluent.

**12.4.2. Cooling Tower Blowdown**

Under existing operations, cooling tower blowdown from Units 3 and 4 can be used in either the ash sluicing process or the pyrites sluicing process. Blowdown that is not used in those processes is piped to the Clearwell Settling Pond where it is mixed with treated river water prior to use in the FGD process and gypsum solidification process. The Clearwell Settling Pond overflow pipe discharges to the GPP Runoff Settling Pond where the overflow mixes with other waste streams prior to discharging through Outfall 012. The permittee shall include in the BMP Plan for this station a description of controls and practices used to minimize the release of oxidants into the Clearwell Settling Pond during bromination of the cooling tower waters. The minimization of oxidants released into the Clearwell Settling Pond should then ensure negligible or no oxidants present in Outfall 012 effluent. Cooling tower blowdown from Units 3 and 4 which is sent to the Clearwell Settling Pond should be similar in nature to the Units 3 and 4 blowdown discharged through Outfalls 004 and 005. Technology based limitations and monitoring are applied at Outfall 004 and 005. For all these reasons, internal monitoring was not applied to the blowdown which discharges to the Clearwell Settling Pond.

**12.4.3. 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.

**12.4.3.1. 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:

Pollutant or pollutant property	BPT effluent limitations	
	Maximum for any 1 day (mg/l)	Average of daily values for 30 consecutive days shall not exceed (mg/l)

TSS	100.0	30.0
Oil and grease	20.0	15.0

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:

Pollutant or pollutant property	BPT Effluent limitations	
	Maximum for any 1 day (mg/l)	Average of daily values for 30 consecutive days shall not exceed (mg/l)
TSS	100.0	30.0
Oil and grease	20.0	15.0

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).

**12.4.3.2. BPJ**

It is the BPJ of the DOW to apply 30 mg/l and 60 mg/l, as monthly average and daily maximum limitations respectively, TSS limitations to the Clearwell Pond effluent. The facility treats the Clearwell Pond effluent for TSS before discharge to the GPP Runoff Pond. Sedimentation is a commonly used treatment technology for the removal of TSS that is both efficient and cost effective. Although several factors may influence the final concentration of TSS in the Clearwell Pond discharge, it has been the experience of the Division that facilities which treat for TSS can achieve a concentration of 30 mg/l as a monthly average and 60 mg/l as a daily maximum.

It is the BPJ of the DOW to place a 5 mg/l limitation on oil and grease in the Clearwell Pond effluent. Clearwell Pond effluent is made up of treated river intake water and cooling tower blowdown, and neither of these flows should contain a significant amount of oil and grease.

Stormwater flows receive settling in the GPP Runoff Pond. Sedimentation is a commonly used treatment technology for the removal of TSS that is both efficient and cost effective. Although several factors may influence the concentration of TSS in stormwater, it has been the experience of the Division that facilities which treat for TSS can achieve a concentration of 30 mg/l as a monthly average and 60 mg/l as a daily maximum.

The facility does not treat the stormwater flowing into the GPP Runoff Pond for oil and grease. 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 these treatment methods can achieve oil & grease concentrations of 10 mg/l as a monthly average and 15 mg/l as a daily maximum.

The DOW has developed flow-weighted limitations for TSS, and oil and grease at Outfall 012 to insure compliance with the federal effluent limitation guidelines for low volume wastes, chemical metal cleaning wastes, and other process wastewaters.

**12.5. Limitation Calculations**

**12.5.1. Technology-Based Effluent Limitations**

Past average and maximum limitations for TSS were 30 mg/l and 50 mg/l respectively. Past average and maximum limitations for Oil and Grease were 10 mg/l and 15 mg/l respectively. The limitations for TSS and Oil and Grease are revised based on a reassessment of the types of flows which combine to form Outfall 012 effluent and the applicable federal effluent guidelines. The DOW has developed flow-weighted limitations to insure compliance with the federal effluent guidelines. The average flows used in the calculations below are from the water balance diagram for existing operations, which was provided in KPDES application. The average flow for each source is multiplied by the applicable limitation (in concentrations) to obtain the contribution of that pollutant by each source. The total contribution is divided by the total flow to obtain the final effluent limitation.

Limitations Calculations					
Source	Flow (MGD)	Total Suspended Solids			
		Concentration (mg/l)		Contribution	
	Average	Average	Maximum	Average	Maximum
clearwell settling pond	0.0462	30	60	1.386	2.772
stormwater from areas 12.a through f	0.0599	30	60	1.797	3.594
FGD/ gypsum dewatering filtrate and hydroclones underflow flush process waters	0.015	30	100	0.45	1.5
low volume wastes (equipment-truck loadout misc. washdown)	0.0085	30	100	0.255	0.85
<b>Total</b>	<b>0.1296</b>			<b>3.888</b>	<b>8.716</b>
			<b>Limits</b>	<b>30.0</b>	<b>67.3</b>



Limitations Calculations					
Source	Flow (MGD)	Oil & Grease			
		Concentration (mg/l)		Contribution	
	Average	Average	Maximum	Average	Maximum
clearwell settling pond	0.0462	5	5	0.231	0.231
stormwater from areas 12.a through f	0.0599	10	15	0.599	0.8985
FGD/ gypsum dewatering filtrate and hydroclones underflow flush process waters	0.015	15	20	0.225	0.3
low volume wastes (equipment-truck loadout misc. washdown)	0.0085	15	20	0.1275	0.17
Total	0.1296			1.1825	1.5995
			<b>Limits</b>	<b>9.1</b>	<b>12.3</b>

## **12.6. 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].

### **12.6.1. 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].

### **12.6.2. Total Suspended Solids, and Oil & Grease**

The limitations for these pollutants are consistent with Kentucky's Water Quality Standards [401 KAR 5:080, Section 2(3)]. These limits are representative of the DOW's BPJ determination of BPT and BAT requirements for the discharge of these pollutants in this combined flow of stormwater, process, and non-process wastewaters. The DOW based this determination on the requirement for low volume wastes specified in 40 CFR 423.12(b)(3) and FGD wastewater in 40 CFR 423.12(b)(11) and 423.13(g)(1)(ii).

# **SECTION 13**

## **OUTFALL 013**

**13. OUTFALL 013**

**13.1. Outfall Description**

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

TABLE 37.				
Outfall Type	Latitude (N)	Longitude (W)	Receiving Water	Description of Outfall
External	38.04194°	85.91250°	Ohio River	Stormwater runoff from Area 13 (Landfill A- stabilized FGD sludge/off-spec gypsum)

**13.2. Reported Values**

The following table summarizes the reported values for Outfall 013:

TABLE 38.							
Reported Parameters	Units	EFFLUENT					
		Loadings (lbs./day)		Concentrations			
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum
The Landfill Runoff Settling Pond discharges through Outfall 013. The pond has not discharged in the last 5 years.							

**13.3. Effluent Limitations and Monitoring Requirements**

The following table summarizes the effluent limitations and monitoring requirements for Outfall 013:

TABLE 39.									
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

### 13.4. 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:

<https://eec.ky.gov/Environmental-Protection/Forms%20Library/General%20Procedures%20for%20Limitations%20Development.pdf>

#### 13.4.1. Landfill Leachate

The Landfill A Runoff Pond #1 discharges through Outfall 013 to the Ohio River. Landfill A does not have a leachate collection system pipe to pond #1. In the future, Landfill A will expand northward and that portion of the landfill will have a leachate collection system. That system will drain to Pond #2 which will drain to the future process waters pond.

#### 13.4.2. Technology-Based Effluent Limitations

##### 13.4.2.1. Total Suspended Solids

The facility treats Outfall 013 effluent for this parameter before discharge. Sedimentation is a commonly used treatment technology for the removal of TSS that is both efficient and cost effective. Although several factors may influence the final concentration of TSS in the discharge, it has been the experience of the Division that facilities which treat for TSS can achieve a concentration of 30 mg/l as a monthly average and 60 mg/l as a daily maximum.

##### 13.4.2.2. Oil & Grease

The facility does not treat Outfall 013 effluent 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 these treatment methods can achieve oil & grease concentrations of 10 mg/l as a monthly average and 15 mg/l as a daily maximum.

### 13.5. Limitation Calculations

#### 13.5.1. Water Quality-Based Effluent Limitations

These calculations were performed 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	146	NO	N/A	NO	N/A	N/A
Effluent Characteristic	Units	Reported Avg	Reported Max	Average Limitation	Maximum Limitation	Average Discharge %	Maximum Discharge %	Data Source
Antimony	µg/L	1.3	1.3	640	N/A	0.20	N/A	APP
Arsenic	µg/L	31	31	150	340	20.67	9.12	APP
Barium	µg/L	77	77	124566022.4	N/A	0.00	N/A	APP
Beryllium	µg/L	0	0	498264.0897	N/A	0.00	N/A	APP
Cadmium	µg/L	0	0	0.755841246	8.731374985	0.00	0.00	APP
Chloride	µg/L	60000	60000	600000	1200000	10.00	5.00	APP
Chromium	µg/L	1.9	1.9	12456602.24	N/A	0.00	N/A	APP
Copper	µg/L	0.61	0.61	30.49938305	51.68449826	2.00	1.18	APP
Cyanide, Free	µg/L	0	0	5.2	22	0.00	0.00	APP
Fluoride	µg/L	0	0	498264089.7	N/A	0.00	N/A	APP
Iron	µg/L	1500	1500	1000	4000	150.00	37.50	APP
Lead	µg/L	0.31	0.31	18.58090366	476.8177624	1.67	0.07	APP
Mercury	µg/L	0.0258	0.0258	0.051	1.4	50.59	1.84	APP
Nickel	µg/L	3.9	3.9	168.5409938	1515.921838	2.31	0.26	APP
Phenol	µg/L	21	21	860000	N/A	0.00	N/A	APP
Selenium	µg/L	4.2	4.2	5	N/A	84.00	N/A	APP
Silver	µg/L	0	0	N/A	41.07168773	N/A	0.00	APP
Sulfate	µg/L	680000	680000	31141505605	N/A	0.00	N/A	APP
Thallium	µg/L	0	0	0.47	N/A	0.00	N/A	APP
Zinc	µg/L	9.7	9.7	387.8303147	387.8303147	2.50	2.50	APP
Gross total alpha particle activity including radium-226 but excluding radon and uranium	pCi/L	0	0	8820956.704	N/A	0.00	N/A	APP
Combined radium-226 and radium-228	pCi/L	0.527	0.527	2940318.901	N/A	0.00	N/A	APP
Total gross beta particle activity	pCi/L	76.3	76.3	29403189.01	N/A	0.00	N/A	APP
Strontium-90	pCi/L	0	0	4704510.242	N/A	0.00	N/A	APP
Uranium	µg/L	0.146	0.146	17641913.41	N/A	0.00	N/A	APP
Total Residual Chlorine	µg/L	0	0	11	19	0.00	0.00	APP
Ammonia (as N)	mg/l	0.36	0.36	144785.4946	N/A	0.00	N/A	APP
Temperature	°F	59.54	59.54	0	89	66.90	66.90	APP

Water was dipped out of the pond and analyzed for the pollutants shown in the table above. The dipped water contained a concentration which exceeds 90% of the calculated chronic WQBEL for iron and 70% of the calculated chronic WQBEL for selenium. The U.S. E.P.A. Industrial Stormwater Monitoring and Sampling Guide (EPA 832-B-09-003) warns that samples from stagnant or slowly moving water inside a pond will not yield a representative sample. The pollutants in the sample may not be adequately mixed. Also, the pond has not discharged in the past 5 years, and it would take a large rain event for this pond to discharge. The DOW believes that chronic limits for iron and selenium should not be applied to this precipitation dependent discharge. Precipitation dependent discharges occur intermittently so chronic exposure of biota to pollutants in the effluent is unlikely.

### 13.6. 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].

### **13.6.1. 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].

### **13.6.2. Total Suspended Solids, and Oil and Grease**

The limitations for these pollutants are consistent with Kentucky's Water Quality Standards [401 KAR 5:080, Section 2(3) – 40 CFR 125.3]. These limits are representative of the DOW's BPJ determination of BPT and BCT requirements for the discharge of these pollutants in stormwater.

### **13.6.3. pH**

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

# **SECTION 14**

## **OUTFALL 015**



**14. OUTFALL 015**

**14.1. Outfall Description**

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

TABLE 40.				
Outfall Type	Latitude (N)	Longitude (W)	Receiving Water	Description of Outfall
External	38.06472°	85.91028°	Ohio River	Stormwater runoff from Area 15 and stormwater runoff from northwestern 0.7 acres of closed-capped Ash Pond areas.

**14.2. Reported Values**

The following table summarizes the reported values for Outfall 015:

TABLE 41.							
Reported Parameters	Units	EFFLUENT					
		Loadings (lbs./day)		Concentrations			
		Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum

The previous permit did not require reporting of monitoring results for this outfall. Stormwater from Area 15 was addressed by best management practices.

**14.3. Effluent Limitations and Monitoring Requirements**

The following table summarizes the effluent limitations and monitoring requirements for Outfall 015:

TABLE 42.									
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
Hardness (as mg/l CaCO <sub>3</sub> )	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
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

**14.4. 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:

<https://eec.ky.gov/Environmental-Protection/Forms%20Library/General%20Procedures%20for%20Limitations%20Development.pdf>

**14.4.1. Facility Changes**

The permittee is in the process of removing the ash pond, which will be dewatered, regraded and closed. The ash pond will be dewatered through internal Outfall 002 and ultimately discharged through Outfall 001. Once the ash pond is closed and capped, stormwater runoff from the northern 33.5 acres will flow to Outfall 015. The requirements set forth in Table 50 apply once Outfall 015 receives flow from the closed and capped ash pond, until that happens the flows from Area 15 shall continue to be addressed solely by best management practices.

**14.4.2. 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.

<b>TABLE 43.</b>	
<b>Pollutant or Pollutant Characteristic</b>	<b>Basis</b>
Flow, Total Suspended Solids, Hardness, pH, and Total Recoverable: Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Silver, Zinc	Upcoming construction activities and redirection of stormwater flows to this outfall may increase the potential for these pollutants to be present in the discharge. For these reasons monitoring will be required for these parameters and 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.

**14.5. 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].

**14.5.1. 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].

**14.5.2. Total Suspended Solids, Hardness, pH, Total Recoverable: Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Silver, 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 15**

## **OUTFALL 023**

**15.    OUTFALL 023**

**15.1.   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
External	38.04750°	85.91361°	Ohio River	Outfall 012 effluent combines with the effluent from Outfalls 004 and Outfall 005. Outfall 012 discharges the combined flows of stormwater from Areas 12 a through f, FGD/Gypsum Dewatering Filtrate and U- Flow Flush process waters, and non-process wastewaters: Clearwell Surplus Cooling/Service waters, Equipment- truck loadout miscellaneous washdown, Unit 3 and/or Unit 4 cooling tower blowdown.

**15.2.   Reported Values**

There are no reported values for this outfall. This is a new outfall created so that the combined flow of Unit 3 and Unit 4 cooling tower blowdowns and Outfall 012 effluent can be monitored prior to discharge to the Ohio River.

**15.3. Effluent Limitations and Monitoring Requirements**

The following table summarizes the effluent limitations and monitoring requirements for Outfall 023:

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	1/Week	Calculated
Temperature	°F	N/A	N/A	N/A	Report	115	N/A	1/Week	Grab
pH	SU	N/A	N/A	6.0	N/A	N/A	9.0	1/Week	Grab
Total Recoverable Iron	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Month	Grab
Total Recoverable Copper	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Month	Grab
Hardness (as mg/l CaCO <sub>3</sub> )	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Month	Grab
Total Recoverable Chromium	mg/l	N/A	N/A	N/A	0.2	0.2	N/A	1/Year	Grab
Total Recoverable Zinc	mg/l	N/A	N/A	N/A	1.0	1.0	N/A	1/Year	Grab
Total Residual Chlorine	mg/l	N/A	N/A	N/A	Report	Report	N/A	1/Year	Grab
Total Recoverable Mercury	mg/l	N/A	N/A	N/A	0.000051	0.0014	N/A	1/Month	Grab
Total Recoverable Selenium	mg/l	N/A	N/A	N/A	24.0	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	( <sup>1</sup> )	( <sup>1</sup> )
Acute Toxicity <sup>2</sup>	TU <sub>A</sub>	N/A	N/A	N/A	N/A	8.00	N/A	1/Quarter	( <sup>3</sup> )

<sup>1</sup>Should the monthly average concentration of Total Recoverable Selenium exceed 24.0 mg/l, see Section **Error! Reference source not found.** for additional requirements.

<sup>2</sup>WET – Whole Effluent Toxicity

<sup>3</sup>Two (2) discrete grab samples shall be collected 12 hours apart.

#### 15.4. 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:

<https://eec.ky.gov/Environmental-Protection/Forms%20Library/General%20Procedures%20for%20Limitations%20Development.pdf>

##### 15.4.1. Facility Changes

Outfall 004, Outfall 005, and Outfall 012 are now internal monitoring points. Monitoring to show compliance with the technology based effluent limitations for the priority pollutants, free available chlorine, total residual chlorine, total residual oxidants, and time of oxidant addition occur at internal points Outfall 004 and Outfall 005. Water quality based effluent limitations are not applied at internal monitoring points, they are applied at external Outfall 023.

##### 15.4.2. Diffuser

The permittee submitted to the DOW a report which contained the proposed design for a multi-port diffuser and the results of the mixing zone analysis completed with the Cornell Mixing Zone Model (CORMIX). Submission of the report fulfilled the first milestone in the schedule of compliance for meeting the total recoverable copper limitations at Outfall 023. Submission of the report also fulfilled the requirement for the first quarterly progress report.

The diffuser will be utilized at the new Outfall 023 located near the existing Outfalls 004, 005 and 012. The effluent of Outfall 023 will be the combined flows of Outfalls 004, 005 and 012. Barge traffic is common in the vicinity of the new Outfall 023. The diffuser will be located on the river bottom with ports 2 feet above the bottom and it should not interfere with barge traffic or be damaged by barges. The diffuser will have five ports, each with a 12 inch diameter, directed 45 degrees toward the west bank of the Ohio River.

The intent of the diffuser design is to improve mixing of the discharge with the Ohio River and provide a minimum ten-fold (10:1) dilution of effluent concentrations at the edge of the Zone of Initial Dilution (ZID). The CORMIX model results indicate that a dilution of 27.3:1 can be achieved at the edge of the ZID at maximum discharge flows and low river conditions. The river velocity for the schematized river cross-section and the  $Q_{7,10}$  flow of 11,000 cfs was 0.39 ft/s. The diffuser port exit velocity was 7.9 ft/s at maximum discharge flow, 4.1 ft/s at average discharge flow, and 2.1 ft/s at minimum discharge flow. The discharge velocity from the diffuser ports will be greater than the river velocity even at minimum discharge conditions, under the conditions modeled. The model also predicts that the centerline temperature of the thermal plume decreases to below the 89 °F criteria within the mixing zone under bounding, worst-case conditions. The DOW reviewed the report, modeled the diffuser using CORMIX, and concluded the diffuser design is acceptable thus a ZID will be granted. Mixing Zone and ZID calculations can be found in Sections 15.4.6 and 15.4.7 of the Fact Sheet. The CORMIX prediction and session reports can be found in Section 19 of the Fact Sheet.



**15.4.3. 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.

**15.4.3.1. 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. Applicable subparts are shown below:

40 CFR 423.12(b)(1) (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)(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:

Pollutant or pollutant property	BPT effluent limitations	
	Maximum concentration (mg/l)	Average concentration (mg/l)
Free available chlorine	0.5	0.2

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

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 times the concentration listed below:

Pollutant or pollutant property	BAT effluent limitations	
	Maximum concentration (mg/l)	Average concentration (mg/l)
Free available chlorine	0.5	0.2
Pollutant or pollutant property	Maximum for any 1 day –(mg/l)	Average of daily values for 30 consecutive days shall not exceed = (mg/l)

The 126 priority pollutants (Appendix A) contained in chemicals added for cooling tower maintenance, except:	( <sup>1</sup> )	( <sup>1</sup> )
Chromium, total	0.2	0.2
Zinc, total	1.0	1.0

<sup>1</sup>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.

#### 15.4.4. Total Recoverable Zinc, and Total Zinc

In regard to metals, US EPA uses the terms “total metal” and “total recoverable metals” 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.

#### 15.4.5. 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.

Pollutant or Pollutant Characteristic	Basis
Temperature	The discharge concentration of this pollutant exceeds 90% of the calculated WQBELs for this pollutant. A mixing zone and ZID are granted, and monitoring and a limitation will be required for this pollutant.
Total Recoverable Iron	The discharge concentration of this pollutant exceeds 70% of the calculated WQBELs for this pollutant. Monitoring is required for this pollutant.
Total Recoverable Copper	The discharge concentration of total recoverable copper will no longer exceed 90% of the calculated WQBELs for this pollutant once the diffuser is used. A mixing zone and ZID are granted, and monitoring is required for this pollutant in place of limitations.
Total Chromium	The discharge concentration did not exceed 70% of the calculated WQBELs for this pollutant. However, chromium is subject to the technology-based effluent standards for this industrial category. In accordance with Kentucky's EPA-approved RPA procedures, if a promulgated technology-based effluent standard exists, then the discharge has reasonable potential, and therefore effluent limitations and monitoring requirements shall be applied for those effluent characteristics addressed by the most stringent standard. DOW has determined that reasonable potential for this pollutant does exist and requirements for this pollutant are addressed by technology-based standards and water quality based standards, of which the former is more stringent.

Total Zinc	In accordance with Kentucky's EPA-approved RPA procedures, if a promulgated technology-based effluent standard exists, then the discharge has reasonable potential, and therefore effluent limitations and monitoring requirements shall be applied for those effluent characteristics addressed by the most stringent standard. DOW has determined that reasonable potential for this pollutant does exist and requirements for this pollutant are addressed by technology-based standards and water quality based standards, of which the former is more stringent. A mixing zone and ZID are granted for this pollutant.
Total Residual Chlorine	The discharge concentration of total residual chlorine will no longer exceed 90% of the WQBELs for this pollutant once the diffuser is used. A mixing zone and ZID are granted, and monitoring is required for this pollutant in place of limitations.
Whole Effluent Toxicity	The facility is a major, and the wastewater is a complex waste stream. A mixing zone and ZID are granted for this parameter.

Note that Outfall 004 and Outfall 005 effluent combine and discharge through Outfall 023. Outfall 005 effluent was not sampled for the application. Outfall 004 data was submitted as representative data for Outfall 005 effluent. Both Unit 3 and Unit 4 cooling towers are operated similarly and Unit 3 cooling tower blowdown should have similar composition to Unit 4 cooling tower blowdown. Outfall 004 data was used to determine which water-quality based effluent limitations should be applied at Outfall 023.

**15.4.6. Mixing Zone (MZ)**

The Kentucky Water Quality Standards 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 and ZID are listed as follows:

TABLE 47.				
Pollutant or Pollutant Characteristic	Mixing Zone Factor (MZF)	Linear Distance (ft)	Surface Area (sq. ft)	Volume (cfs)
Whole Effluent Toxicity	0.222	364	208095	2444
Total Recoverable Copper	0.119	195	59682	1309
Temperature	0.0188	31	1484	206
Total Recoverable Zinc	0.0076	12	241	83
Total Residual Chlorine	0.1299	213	71116	1429

**15.4.7. 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)]. The pollutants and/or pollutant characteristics for which DOW has granted a ZID are listed as follows:

TABLE 48.		
Pollutant or Pollutant Characteristic	Dilutions	Linear Distance to ZID Edge (ft)
Whole Effluent Toxicity	26.65	34.7
Total Recoverable Copper	27.3	44.3
Temperature	7.7	2
Total Recoverable Zinc	5.5	0.9
Total Residual Chlorine	27.3	44.3

## **15.5. Limitation Calculations**

### **15.5.1. Water Quality-Based Effluent Limitations**

These calculations were performed 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:

Hardness Dependent Metals Calculations	Units	Effluent Hardness	Stream Hardness	Mixing Zone Granted	MZF	Mixing Zone Mixed Hardness	ZID Granted	ZID Dilutions	Acute Mixed Hardness
Copper	mg/l	270	146	YES	0.119128	147	YES	27.3	150.54212
Effluent Characteristic	Units	Reported Avg	Reported Max	Average Limitation	Maximum Limitation	Average Discharge %	Maximum Discharge %	MZF	Data Source
Antimony	µg/L	0	0	640	N/A	0.00	N/A	0	APP
Arsenic	µg/L	0	0	150	340	0.00	0.00	0	APP
Barium	µg/L	82	82	417670	N/A	0.02	N/A	0	APP
Beryllium	µg/L	0	0	1670.68	N/A	0.00	N/A	0	APP
Cadmium	µg/L	0	0	0.564887	5.85535	0.00	0.00	0	APP
Chloride	µg/L	68000	68000	600000	1200000	11.33	5.67	0	APP
Chromium	µg/L	1	1	41767	N/A	0.00	N/A	0	DMR
Copper	µg/L	120	120	561.8902	561.8902	21.36	21.36	0.119128	APP
Cyanide, Free	µg/L	0	0	5.2	22	0.00	0.00	0	APP
Fluoride	µg/L	0	0	1670680	N/A	0.00	N/A	0	APP
Iron	µg/L	800	800	1000	4000	80.00	20.00	0	APP
Lead	µg/L	0	0	11.26602	289.1053	0.00	0.00	0	APP
Mercury	µg/L	0	0	0.051	1.4	0.00	0.00	0	APP
Nickel	µg/L	12	12	120.8639	1087.096	9.93	1.10	0	APP
Phenol	µg/L	0	0	300	300	0.00	0.00	0	APP
Selenium	µg/L	0	0	596.5745	N/A	0.00	N/A	0.333	APP
Silver	µg/L	0	0	N/A	20.89032	N/A	0.00	0	APP
Sulfate	µg/L	130000	130000	1.04E+08	N/A	0.12	N/A	0	APP
Thallium	µg/L	0	0	0.47	N/A	0.00	N/A	0	APP
Zinc	µg/L	26	27	1025.596	1025.596	2.54	2.63	0	DMR
Gross total alpha particle activity including radium-226 but excluding radon and uranium	pCi/L	0	0	29521.05	N/A	0.00	N/A	0	APP
Combined radium-226 and radium-228	pCi/L	0.698	0.698	9840.35	N/A	0.01	N/A	0	APP
Total gross beta particle activity	pCi/L	6.97	6.97	98403.5	N/A	0.01	N/A	0	APP
Tritium	pCi/L			39361400	N/A	0.00	N/A	0	
Strontium-90	pCi/L	0	0	15744.56	N/A	0.00	N/A	0	APP
Uranium	µg/L	1.02	1.02	59042.1	N/A	0.00	N/A	0	APP
Toxicity	TUa			AcuteWET	7.995	%Effluent	12.51	0.222207	
Total Residual Chlorine	µg/L	40	40	518.7	518.7	7.71	7.71	0.129903	APP
Ammonia (as N)	mg/l	0	0	485.666	N/A	0.00	N/A	0	APP
Nitrite-nitrogen Ohio River	mg/l			1	N/A	0.00	N/A	0	
Temperature	°F	82.4	88.16	0	115	71.65217	76.66087	0.018763	DMR

## **15.6. 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].

### **15.6.1. 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].

### **15.6.2. Temperature**

The limitation for this parameter are consistent with Kentucky's Water Quality Standards [401 KAR 10:031 Section 6 and 401 KAR 10:029 Section 4].

### **15.6.3. pH**

The limitations for this parameter are consistent Kentucky's Water Quality Standards [401 KAR 10:031, Section 4(1)(b) and Section 7] and Federal Effluent Limitation Guidelines [401 KAR 5:065, Section 2(6) – 40 CFR 122 Appendix A]. The limits are representative of the BPT requirements for this parameter in all discharges except once through cooling water [40 CFR 423.12(b)(1)].

### **15.6.4. Total Recoverable Iron**

The monitoring requirements for this pollutant 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].

### **15.6.5. Total Recoverable Copper**

The monitoring requirements for this pollutant are consistent with Kentucky's Water Quality Standards [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(i)], 401 KAR 10:029 Section 4].

### **15.6.6. Hardness**

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

### **15.6.7. Total Recoverable Chromium**

The limitations for these pollutants are representative of the BAT requirements for cooling tower blowdown [401 KAR 5:065, Section 2(6) and 40 CFR 423.13(d)(1)] and are consistent with Kentucky's Water Quality Standards [401 KAR 10:031 Section 6].

**15.6.8. Total Recoverable Zinc**

The limitations for these pollutants are representative of the BAT requirements for cooling tower blowdown [401 KAR 5:065, Section 2(6) and 40 CFR 423.13(d)(1)] and are consistent with Kentucky's Water Quality Standards [401 KAR 10:029 Section 4, and 401 KAR 10:031 Section 6].

**15.6.9. Total Residual Chlorine**

The monitoring requirements for this pollutant are consistent with Kentucky's Water Quality Standards [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(i)], 401 KAR 10:029 Section 4].

**15.6.10. Whole Effluent Toxicity**

The limitation for this parameter is consistent with Kentucky's Water Quality Standards [401 KAR 10:031, Sections 4(1)(j) and 401 KAR 10:029 Section 4].

# **SECTION 16**

## **OUTFALL 024**



**16. OUTFALL 024****16.1. Outfall Description**

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

TABLE 49.				
Outfall Type	Latitude (N)	Longitude (W)	Receiving Water	Description of Outfall
Internal	38.04778°	85.90917°	Process Waters Pond (Outfall 002)	New internal outfall for discharges from the new FGD Process Water Treatment System

**16.2. Reported Values**

This is a new outfall with no past reported values.

**16.3. Effluent Limitations and Monitoring Requirements**

The following table summarizes the effluent limitations and monitoring requirements for Outfall 024 beginning January 1, 2025:

TABLE 50.									
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/Month	Calculated
Total Recoverable Arsenic	µg/l	N/A	N/A	N/A	8	18	N/A	1/Month	Grab
Total Recoverable Mercury	ng/l	N/A	N/A	N/A	34	103	N/A	1/Month	Grab
Total Recoverable Selenium	µg/l	N/A	N/A	N/A	29	70	N/A	1/Month	Grab
Nitrate/nitrite as N	mg/l	N/A	N/A	N/A	3	4	N/A	1/Month	Grab

#### 16.4. 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:

<https://eec.ky.gov/Environmental-Protection/Forms%20Library/General%20Procedures%20for%20Limitations%20Development.pdf>

##### 16.4.1. FGD ELG Compliance Date

The Mill Creek 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. For the FGDWW project, discreet steps of the engineering-procurement-installation contract include multiple overlapping phases which are not specifically sequential but highly interdependent so that delays of any step likely lead to delays of completing the entire project. The FGDWW system treated effluent will be discharged through monitored Outfall 024 and be directed to the process pond. Treated effluent flow will continue to be directed to the plant process ponds to Outfall 002. These treated FGDWW flows and most plant process flows are currently combined with once-thru cooling return flows through Outfall 001. In conjunction with this project, LGE-Mill Creek plans to construct a high-rate multiport diffuser (proposed new Outfall 025) for the combined discharges of FGDWW and most process flow to the Ohio River; the diffuser construction completion and in-service date is projected to occur by the end of 2021.

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 January 1, 2025. For the FGDWW specific-activities, these phases and general expected durations include:

- Detailed engineering: beginning May 2021
- Procurement: beginning Q3 2021
- Construction – multi – discipline and multi – trades: beginning Q4 2021
- Mechanical startup, troubleshooting and testing; beginning Q1 2024
- Commercial Completion and performance test: beginning Q2 2023
- Plant testing and optimization: beginning Q3-Q4 2023

The DOW grants LG&E's requested compliance date. The discharge requirements for BAT FGD wastewater shall become effective on January 1, 2025.

##### 16.4.2. Total Suspended Solids, and Oil & Grease

The Ash Pond, and the future Process Waters Pond, treats many waste streams. Since Outfall 024 effluent will be directed to the future Process Waters Pond, the limitations for these pollutants will be applied at

Outfall 002 after commingling with other waters. The Division of Water will develop flow-weighted limitations to ensure compliance with the federal effluent limitation guidelines.

**16.4.3. Technology-Based Effluent Limitations**

**16.4.3.1. 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)(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:

Pollutant or pollutant property	BPT Effluent limitations	
	Maximum for any 1 day (mg/l)	Average of daily values for 30 consecutive days shall not exceed (mg/l)
TSS	100.0	30.0
Oil and grease	20.0	15.0

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.

Pollutant or pollutant property	BAT Effluent limitations	
	Maximum for any 1 day	Average of daily values for 30 consecutive days shall not exceed
Arsenic, total (ug/L)	18	8
Mercury, total (ng/L)	103	34

Selenium, total (ug/L)	70	29
Nitrate/nitrite as N (mg/L)	4	3

(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).

**16.5. 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 TBELs [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(a)]. When necessary to achieve water quality standards, all permits shall contain WQBELs [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(d)]. WQBELs included in this permit are based upon the KYWQS [401 KAR 10:031].

**16.5.1. Flow**

The monitoring requirements for this parameter are consistent with monitoring requirements for internal waste streams [401 KAR 5:065, Section 2(4) – 40 CFR 122.44(i)(1)(iii)].

**16.5.2. Total Arsenic, Total Mercury, Total Selenium, Nitrate/Nitrite (as N)**

The limitations for these pollutants are representative of the BAT requirements for these pollutants in FGD wastewater [401 KAR 5:065, Section 2(6) and 40 CFR 423.13(g)(1)(i)].

# **SECTION 17**

## **OUTFALL 025**

**17. OUTFALL 025**

**17.1. Outfall Description**

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

TABLE 51.				
Outfall Type	Latitude (N)	Longitude (W)	Receiving Water	Description of Outfall
External	38.05515°	85.91321°	Ohio River	Process Waters Pond Discharge (Outfall 002) Unit 2 Cooling Tower Blowdown (Outfall 003) Stormwater Runoff (Non -Contaminated)

**17.2. Reported Values**

This is a new outfall with no past reported values.

**17.3. Effluent Limitations and Monitoring Requirements**

The following table summarizes the effluent limitations and monitoring requirements for Outfall 025:

TABLE 52.									
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	Calculated
Temperature	°F	N/A	N/A	N/A	Report	110	N/A	2/Month	Grab
pH	SU	N/A	N/A	6.0	N/A	N/A	9.0	2/Month	Grab
Hardness (as mg/l CaCO <sub>3</sub> )	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	0.315	0.315	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 Mercury	mg/l	N/A	N/A	N/A	0.000051	0.0014	N/A	1/Quarter	Grab
Total Recoverable Selenium	mg/l	N/A	N/A	N/A	0.628	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	( <sup>1</sup> )	( <sup>1</sup> )
Acute Toxicity <sup>2</sup>	TU <sub>A</sub>	N/A	N/A	N/A	N/A	8.61	N/A	1/Quarter <sup>4</sup>	( <sup>3</sup> )

<sup>1</sup>Should the monthly average concentration of Total Recoverable Selenium exceed 0.628 mg/l, see Section 5.13 of the permit for additional requirements.

**TABLE 52.**

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

**17.4. 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: <https://eec.ky.gov/Environmental-Protection/Forms%20Library/General%20Procedures%20for%20Limitations%20Development.pdf>

**17.4.1. Water Quality-Based Effluent Limitations**

The following table lists those pollutants and/or pollutant characteristics of concern that DOW has determined exhibit reasonable potential to cause or contribute to an excursion of a water quality-based criterion, 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. This table may also include pollutants for which DOW has found the existence of reasonable potential to be indeterminate or for which DOW needs additional study.

<b>TABLE 53.</b>	
<b>Pollutant or Pollutant Characteristic</b>	<b>Basis</b>
Whole Effluent Toxicity	The facility is rated as a “major discharger”. The facility’s discharge is a complex wastewater.
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.
Total Recoverable Iron Total Recoverable Mercury Total Recoverable Selenium	These pollutant were limited at outfall 001 when Unit 1 once-through cooling waters were not discharged through Outfall 001. Since the discharge concentration from the new Outfall 025 are unknown, it is the Divisions best professional judgement to continue to limit these pollutants at Outfall 025 once flows are redirected from Outfall 001. These requirements will be reevaluated with the next permit renewal.
Total Recoverable Copper	The copper concentration from Outfall 003 is expected to be above the WQS without the added dilution from the once through cooling water. The concentration of copper in the combined flow to Outfall 005 is expected to be lower than that in Outfall 003, due to Outfall contributions. However, since the actual concentration of copper to Outfall 025 is unknown it is the Divisions best professional judgement to apply limits this pollutant. These requirements will be reevaluated with the next permit renewal.

**17.4.2. 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:



Pollutant or Pollutant Characteristic	Mixing Zone Factor (MZF)	Linear Distance (ft)	Surface Area (sq. ft)	Volume (cfs)
Whole Effluent Toxicity	0.23	393.3	121489	2530
Temperature	0.011	18.81	278	121
Total Recoverable Copper	0.12	205	33071	1320
Total Recoverable Selenium	0.333	569	254666	3663

### 17.4.3. 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)]. The pollutants and/or pollutant characteristics for which DOW has granted a ZID are listed as follows:

Pollutant or Pollutant Characteristic	Dilutions	Linear Distance to ZID Edge (ft)
Whole Effluent Toxicity	28.7	36.9
Total Recoverable Copper	28.7	36.9

### 17.5. Limitation Calculations

#### 17.5.1. Calculations for Water Quality-Based Effluent Limitations

These calculations were performed 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:

Hardness Dependent Metals Calculations	Units	Effluent Hardness	Stream Hardness	Mixing Zone Granted	MZF	Mixing Zone Mixed Hardness	ZID Granted	ZID Dilution	Acute Mixed Hardness
Copper	mg/l	272	100	YES	0.14508259	101	YES	28.7	105.99303

Effluent Characteristic	Units	Reported Avg	Reported Max	Average Limitation	Maximum Limitation	Average Discharge %	Maximum Discharge %	MZF	Data Source
Antimony	µg/L	0	0	640	N/A	0.00	N/A	0	DMR
Arsenic	µg/L	1.5	1.5	150	340	1.00	0.44	0	DMR
Beryllium	µg/L	0	0	1758.4	N/A	0.00	N/A	0	DMR
Cadmium	µg/L	0	0	1.755490506	5.060775046	0.00	0.00	0	DMR
Chromium	µg/L	3.2	3.2	43960	N/A	0.01	N/A	0	DMR
Copper	µg/L	12.7	12.7	315.3616816	315.3616816	4.03	4.03	0.1450826	DMR
Iron	µg/L	1636	1636	3500	4000	46.74	40.90	0	DMR
Lead	µg/L	1.3	1.3	11.37236205	291.8342577	11.43	0.45	0	DMR
Mercury	µg/L	0.0003	0.0003	0.051	1.4	0.59	0.02	0	DMR
Nickel	µg/L	5.3	5.3	121.6208657	1093.90435	4.36	0.48	0	DMR
Selenium	µg/L	0.8	0.8	627.71	N/A	0.13	N/A	0.333	DMR
Silver	µg/L	0	0	N/A	21.15718479	N/A	0.00	0	DMR
Thallium	µg/L	0	0	0.47	N/A	0.00	N/A	0	DMR
Zinc	µg/L	20.1	20.1	279.7219547	279.7219547	7.19	7.19	0	DMR
Temperature	°F	82.3	91.6	0	110	74.82	83.27	0.0112299	DMR

Effluent Characteristic	Reported Units	Reported Avg	Reported Max	Toxicity Type	Toxicity Units	Maximum Limitation	%Effluent	MZF	Data Source
Toxicity	None			AcuteWET	TUa	8.61	11.61	0.2275401	

Reported values are based on outfall 001 DMR data.

## **17.6. 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].

### **17.6.1. 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 5:050, Section 4 – 40 CFR 122.48].

### **17.6.2. Temperature**

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

### **17.6.3. 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 requirements for pH [40 CFR 423.12 (b)(1)], and state water quality standards [401 KAR 10:031, Sections 4(1)(b) and 7].

### **17.6.4. Total Recoverable Mercury**

The limitations for these parameters are consistent with Kentucky's Water Quality Standards [401 KAR 10:031, Section 6].

### **17.6.5. 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 0.386 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 5:050, Section 4 [40 CFR 122.48(a)].

### **17.6.6. Total Recoverable Copper**

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

**17.6.7. Total Recoverable Iron**

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)(i)] and requirements for recording and reporting of monitoring results [401 KAR 5:050, Section 4 – 40 CFR 122.48].

**17.6.8. 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 and zone of initial dilution has been granted, in accordance with 401 KAR 10:029 Section 4, for this parameter.

# **SECTION 18**

## **OTHER CONDITIONS**

## **18. OTHER CONDITIONS**

### **18.1. 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.

### **18.2. Antidegradation**

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. Discharges to impaired waters do not require an SDAA.

### **18.3. 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].

### **18.4. 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)].

### **18.5. 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].

### **18.6. 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)]

### **18.7. 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.

### **18.8. 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 required information is granted.

### **18.9. Polychlorinated Biphenyls**

There shall be no discharge of polychlorinated biphenyl compounds such as those commonly used in transformer fluids from any point source. The permittee shall include in the BMP Plan for this station the controls and practices used to meet this requirement. [40 CFR 423.12(b)(2) and 40 CFR 423.13(a)]

### **18.10. 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 DOW for review and establishment of appropriate control parameters.

### **18.11. 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. The reduction of emissions is accomplished by a chemical reaction which uses ammonia. SCR catalysts gradually deactivate during normal system operations, which can result in incomplete chemical reactions and emissions of unreacted ammonia. 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.

### **18.12. 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-adjointing property when under the operational control of the permitted facility.”

This permit authorizes the discharge of leachate from Outfalls 001 and 002A. 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 Outfalls 001 or 002A, 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.

18.13. Location Map

## LG&E Mill Creek Generating Station KY0003221



This data is distributed by the Commonwealth of Kentucky,  
 Division of Geographic Information (DGI), located in Frankfort KY

The data are available at <http://kygeonet.ky.gov>



# **SECTION 19**

## **CORMIX**

**19. CORMIX FILES**

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                CORMIX MIXING ZONE EXPERT SYSTEM
                CORMIX Version 11.0GTD
                HYDRO2:Version-11.0.0.0  April, 2018
SITE NAME/LABEL:      Mill Creek Station
DESIGN CASE:         Mill Creek Outfall 023 Diffuser
FILE NAME:          C:\Users\Cassie Campbell\Desktop\mill creek diffuser report.prd
Using subsystem CORMIX2:  Multiport Diffuser Discharges
Start of session:    02/26/2019--10:15:06
*****
```

SUMMARY OF INPUT DATA:

```
-----
AMBIENT PARAMETERS:
Cross-section          = bounded
Width                 BS   = 457.20 m
Channel regularity    ICHREG = 1
Ambient flowrate      QA   = 311.49 m^3/s
Average depth         HA   = 5.70 m
Depth at discharge    HD   = 5.70 m
Ambient velocity      UA   = 0.1195 m/s
Darcy-Weisbach friction factor F = 0.0176
  Calculated from Manning's n = 0.02
Wind velocity         UW   = 4.00 m/s
Stratification Type   STRCND = U
Surface temperature   = 29.5 degC
Bottom temperature    = 29.5 degC
Calculated FRESH-WATER DENSITY values:
Surface density       RHOAS = 995.7971 kg/m^3
Bottom density        RHOAB = 995.7971 kg/m^3
-----
DISCHARGE PARAMETERS:
Submerged Multiport Diffuser Discharge
Diffuser type         DITYPE = unidirectional perpendicular
Diffuser length       LD   = 24.38 m
Nearest bank         = left
Diffuser endpoints    YB1 = 97.54 m;   YB2 = 121.92 m
Number of openings    NOPEN = 5
Number of Risers      NRISER = 5
Ports/Nozzles per Riser NPPERR = 1
Spacing between risers/openings SPAC = 6.10 m
Port/Nozzle diameter  D0   = 0.3048 m
  with contraction ratio = 1
Equivalent slot width B0   = 0.011969 m
Total area of openings TA0 = 0.3648 m^2
Discharge velocity    U0   = 2.40 m/s
Total discharge flowrate Q0 = 0.876253 m^3/s
Discharge port height H0   = 0.61 m
Nozzle arrangement    BETYPE = unidirectional without fanning
Diffuser alignment angle GAMMA = 90 deg
Vertical discharge angle THETA = 0 deg
Actual Vertical discharge angle THEAC = 0 deg
Horizontal discharge angle SIGMA = 315 deg
Relative orientation angle BETA = 45 deg
Discharge temperature (freshwater) = 43.33 degC
Corresponding density RHO0 = 990.8954 kg/m^3
Density difference     DRHO = 4.9017 kg/m^3
```

Buoyant acceleration	GP0	= 0.0483 m/s <sup>2</sup>
Discharge concentration	C0	= 100 %
Surface heat exchange coeff.	KS	= 0 m/s
Coefficient of decay	KD	= 0 /s

FLUX VARIABLES PER UNIT DIFFUSER LENGTH:

Discharge (volume flux)	q0	= 0.035936 m <sup>2</sup> /s
Momentum flux		
(based on slot width B0)	m0 =U0 <sup>2</sup> *B0	= 0.069048 m <sup>3</sup> /s <sup>2</sup>
(based on volume flux q0)	m0 =U0*q0	= 0.086311 m <sup>3</sup> /s <sup>2</sup>
Buoyancy flux		
(based on slot width B0)	j0 =U0*GP0*B0	= 0.001388 m <sup>3</sup> /s <sup>3</sup>
(based on volume flux q0)	j0 =q0*GP0	= 0.001735 m <sup>3</sup> /s <sup>3</sup>

DISCHARGE/ENVIRONMENT LENGTH SCALES:

LQ = 0.01 m	Lm = 6.05 m	LM = 5.54 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	= 99.92
Port/nozzle Froude number	FRD0	= 19.80
Velocity ratio	R	= 20.10

MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:

Toxic discharge		= yes
CMC concentration	CMC	= 10 %
CCC concentration	CCC	= 5 %
Water quality standard specified		= given by CCC value
Regulatory mixing zone		= yes
Regulatory mixing zone specification		= distance
Regulatory mixing zone value		= 166.42 m (m <sup>2</sup> if area)
Region of interest		= 5000 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 = 5.70 m

Limiting Dilution S = (QA/Q0)+ 1.0 = 356.5

\*\*\*\*\*

MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

X-Y-Z Coordinate system:

Origin is located at the BOTTOM below the port/diffuser center:

109.73 m from the left bank/shore.

Number of display steps NSTEP = 300 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  $c = 3.8131 \%$

Dilution at edge of NFR  $s = 26.2$

NFR Location:  $x = 8.62 \text{ m}$

(centerline coordinates)  $y = -8.62 \text{ m}$

$z = 5.70 \text{ m}$

NFR plume dimensions: half-width (bh) = 9.55 m

thickness (bv) = 5.70 m

Cumulative travel time: 57.7686 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 becomes vertically fully mixed WITHIN NEAR-FIELD at 0 m downstream, but RE-STRATIFIES LATER and is not mixed in the far-field.

Plume becomes laterally fully mixed at 1607.96 m downstream.

PLUME BANK CONTACT SUMMARY:

Plume in bounded section contacts nearest bank at 340.85 m downstream.

Plume contacts second bank at 1607.96 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) = 10 %

Corresponding dilution = 10

The CMC was encountered at the following plume position:

Plume location:  $x = 1.10 \text{ m}$

(centerline coordinates)  $y = -1.10 \text{ m}$

$z = 0.73 \text{ m}$

Plume dimension: half-width (bh) = 11.35 m

thickness (bv) = 0.73 m

Computed distance from port opening to CMC location = 1.56 m.

CRITERION 1: This location is within 50 times the discharge length scale of  $Lq = 0.27 \text{ m}$ .

+++++ The discharge length scale TEST for the TDZ has been SATISFIED. +++++

Computed horizontal distance from port opening to CMC location = 1.55 m.

CRITERION 2: This location is within 5 times the ambient water depth of  $HD = 5.70 \text{ m}$ .

+++++ The ambient depth TEST for the TDZ has been SATISFIED. +++++

Computed distance from port opening to CMC location = 1.56 m.  
 CRITERION 3: This location is within one tenth the distance of the extent  
 of the Regulatory Mixing Zone of 166.72 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 2.40 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 = 2.593544 %
Corresponding dilution	s = 38.6

Plume location:	x = 166.42 m
(centerline coordinates)	y = -8.62 m
	z = 5.70 m

Plume dimensions:	half-width (bh) = 75.19 m
	thickness (bv) = 1.88 m

Cumulative travel time: 1374.9446 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.  
 Furthermore, the CCC for the toxic pollutant has indeed been met  
 within the RMZ. In particular:

The CCC was encountered at the following plume position:

The CCC for the toxic pollutant was encountered at the following  
 plume position:

CCC	= 5 %
Corresponding dilution	= 20
Plume location:	x = 4.89 m
(centerline coordinates)	y = -4.89 m
	z = 1.15 m

Computed horizontal distance from port opening to CCC location = 6.94

Plume dimensions:	half-width (bh) = 9.90 m
	thickness (bv) = 3.24 m





C = centerline concentration (includes reaction effects, if any)  
Uc = Local centerline excess velocity (above ambient)  
TT = Cumulative travel time

X	Y	Z	S	C	BV	BH	Uc	TT
0.00	0.00	0.61	1.0	0.100E+03	0.01	12.19	2.317	.000000E+00

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 = 5.70m).  
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	0.61	1.0	0.100E+03	0.01	12.19	.000000E+00
0.03	-0.03	0.61	2.5	0.407E+02	0.02	12.17	.37038E-01
0.06	-0.06	0.62	3.1	0.327E+02	0.04	12.14	.89866E-01
0.09	-0.09	0.62	3.5	0.284E+02	0.06	12.11	.15215E+00
0.11	-0.11	0.62	3.9	0.256E+02	0.08	12.09	.22168E+00
0.14	-0.14	0.63	4.3	0.235E+02	0.10	12.06	.29720E+00
0.17	-0.17	0.63	4.6	0.219E+02	0.11	12.04	.37786E+00
0.20	-0.20	0.63	4.9	0.206E+02	0.13	12.01	.46306E+00
0.23	-0.23	0.64	5.1	0.195E+02	0.15	11.99	.55233E+00
0.26	-0.26	0.64	5.4	0.186E+02	0.17	11.96	.64531E+00
0.29	-0.29	0.64	5.6	0.178E+02	0.19	11.94	.74169E+00
0.32	-0.32	0.64	5.8	0.172E+02	0.21	11.92	.84122E+00
0.34	-0.34	0.65	6.0	0.165E+02	0.23	11.89	.94369E+00
0.37	-0.37	0.65	6.3	0.160E+02	0.25	11.87	.10489E+01
0.40	-0.40	0.65	6.4	0.155E+02	0.27	11.85	.11567E+01
0.43	-0.43	0.66	6.6	0.151E+02	0.29	11.82	.12670E+01
0.46	-0.46	0.66	6.8	0.147E+02	0.30	11.80	.13795E+01
0.49	-0.49	0.66	7.0	0.143E+02	0.32	11.78	.14943E+01
0.52	-0.52	0.67	7.2	0.139E+02	0.34	11.76	.16112E+01
0.55	-0.55	0.67	7.3	0.136E+02	0.36	11.73	.17301E+01
0.57	-0.57	0.67	7.5	0.133E+02	0.38	11.71	.18509E+01
0.60	-0.60	0.68	7.7	0.130E+02	0.40	11.69	.19735E+01
0.63	-0.63	0.68	7.8	0.128E+02	0.42	11.67	.20980E+01
0.66	-0.66	0.68	8.0	0.125E+02	0.44	11.65	.22241E+01
0.69	-0.69	0.69	8.1	0.123E+02	0.46	11.63	.23519E+01
0.72	-0.72	0.69	8.3	0.121E+02	0.48	11.61	.24813E+01
0.75	-0.75	0.69	8.4	0.119E+02	0.49	11.59	.26122E+01
0.78	-0.78	0.70	8.6	0.117E+02	0.51	11.57	.27446E+01
0.80	-0.80	0.70	8.7	0.115E+02	0.53	11.55	.28784E+01
0.83	-0.83	0.70	8.8	0.113E+02	0.55	11.53	.30137E+01
0.86	-0.86	0.71	9.0	0.111E+02	0.57	11.51	.31502E+01
0.89	-0.89	0.71	9.1	0.110E+02	0.59	11.49	.32882E+01
0.92	-0.92	0.71	9.2	0.108E+02	0.61	11.47	.34274E+01
0.95	-0.95	0.72	9.4	0.107E+02	0.63	11.45	.35678E+01
0.98	-0.98	0.72	9.5	0.105E+02	0.65	11.43	.37095E+01



1.01	-1.01	0.72	9.6	0.104E+02	0.67	11.41	.38523E+01
1.03	-1.03	0.72	9.7	0.103E+02	0.68	11.39	.39963E+01
1.06	-1.06	0.73	9.9	0.101E+02	0.70	11.37	.41414E+01
1.09	-1.09	0.73	10.0	0.100E+02	0.72	11.35	.42876E+01

\*\* CMC HAS BEEN FOUND \*\*

The pollutant concentration in the plume falls below CMC value of 0.100E+02 in the current prediction interval.

This is the extent of the TOXIC DILUTION ZONE.

1.12	-1.12	0.73	10.1	0.991E+01	0.74	11.34	.44349E+01
1.15	-1.15	0.74	10.2	0.979E+01	0.76	11.32	.45833E+01
1.18	-1.18	0.74	10.3	0.968E+01	0.78	11.30	.47326E+01
1.21	-1.21	0.74	10.4	0.958E+01	0.80	11.28	.48830E+01
1.24	-1.24	0.75	10.6	0.948E+01	0.82	11.27	.50343E+01
1.26	-1.26	0.75	10.7	0.938E+01	0.84	11.25	.51866E+01
1.29	-1.29	0.75	10.8	0.929E+01	0.86	11.23	.53399E+01
1.32	-1.32	0.76	10.9	0.919E+01	0.87	11.21	.54941E+01
1.35	-1.35	0.76	11.0	0.910E+01	0.89	11.20	.56491E+01
1.38	-1.38	0.76	11.1	0.902E+01	0.91	11.18	.58051E+01
1.41	-1.41	0.77	11.2	0.893E+01	0.93	11.16	.59619E+01
1.44	-1.44	0.77	11.3	0.885E+01	0.95	11.15	.61196E+01
1.47	-1.47	0.77	11.4	0.877E+01	0.97	11.13	.62781E+01
1.49	-1.49	0.78	11.5	0.869E+01	0.99	11.12	.64375E+01
1.52	-1.52	0.78	11.6	0.862E+01	1.01	11.10	.65976E+01
1.55	-1.55	0.78	11.7	0.855E+01	1.03	11.08	.67586E+01
1.58	-1.58	0.79	11.8	0.847E+01	1.05	11.07	.69203E+01
1.61	-1.61	0.79	11.9	0.840E+01	1.06	11.05	.70828E+01
1.64	-1.64	0.79	12.0	0.834E+01	1.08	11.04	.72460E+01
1.67	-1.67	0.79	12.1	0.827E+01	1.10	11.02	.74100E+01
1.70	-1.70	0.80	12.2	0.821E+01	1.12	11.01	.75747E+01
1.72	-1.72	0.80	12.3	0.814E+01	1.14	10.99	.77401E+01

1.75	-1.75	0.80	12.4	0.808E+01	1.16	10.98	.79063E+01
1.78	-1.78	0.81	12.5	0.802E+01	1.18	10.96	.80731E+01
1.81	-1.81	0.81	12.6	0.796E+01	1.20	10.95	.82406E+01
1.84	-1.84	0.81	12.7	0.790E+01	1.22	10.93	.84088E+01
1.87	-1.87	0.82	12.7	0.785E+01	1.24	10.92	.85776E+01
1.90	-1.90	0.82	12.8	0.779E+01	1.25	10.90	.87471E+01
1.93	-1.93	0.82	12.9	0.774E+01	1.27	10.89	.89173E+01
1.95	-1.95	0.83	13.0	0.769E+01	1.29	10.88	.90881E+01
1.98	-1.98	0.83	13.1	0.763E+01	1.31	10.86	.92595E+01
2.01	-2.01	0.83	13.2	0.758E+01	1.33	10.85	.94315E+01
2.04	-2.04	0.84	13.3	0.753E+01	1.35	10.84	.96042E+01
2.07	-2.07	0.84	13.4	0.749E+01	1.37	10.82	.97774E+01
2.10	-2.10	0.84	13.4	0.744E+01	1.39	10.81	.99512E+01
2.13	-2.13	0.85	13.5	0.739E+01	1.41	10.79	.10126E+02
2.16	-2.16	0.85	13.6	0.735E+01	1.43	10.78	.10301E+02
2.18	-2.18	0.85	13.7	0.730E+01	1.44	10.77	.10476E+02
2.21	-2.21	0.86	13.8	0.726E+01	1.46	10.76	.10652E+02
2.24	-2.24	0.86	13.9	0.721E+01	1.48	10.74	.10829E+02
2.27	-2.27	0.86	13.9	0.717E+01	1.50	10.73	.11006E+02
2.30	-2.30	0.87	14.0	0.713E+01	1.52	10.72	.11184E+02

2.33	-2.33	0.87	14.1	0.709E+01	1.54	10.70	.11362E+02
2.36	-2.36	0.87	14.2	0.705E+01	1.56	10.69	.11541E+02
2.39	-2.39	0.87	14.3	0.701E+01	1.58	10.68	.11721E+02
2.41	-2.41	0.88	14.3	0.697E+01	1.60	10.67	.11900E+02
2.44	-2.44	0.88	14.4	0.693E+01	1.62	10.66	.12081E+02
2.47	-2.47	0.88	14.5	0.689E+01	1.63	10.64	.12262E+02
2.50	-2.50	0.89	14.6	0.686E+01	1.65	10.63	.12443E+02
2.53	-2.53	0.89	14.7	0.682E+01	1.67	10.62	.12625E+02
2.56	-2.56	0.89	14.7	0.678E+01	1.69	10.61	.12807E+02
2.59	-2.59	0.90	14.8	0.675E+01	1.71	10.60	.12990E+02
2.62	-2.62	0.90	14.9	0.671E+01	1.73	10.58	.13173E+02
2.64	-2.64	0.90	15.0	0.668E+01	1.75	10.57	.13357E+02
2.67	-2.67	0.91	15.0	0.665E+01	1.77	10.56	.13541E+02
2.70	-2.70	0.91	15.1	0.661E+01	1.79	10.55	.13726E+02
2.73	-2.73	0.91	15.2	0.658E+01	1.81	10.54	.13911E+02
2.76	-2.76	0.92	15.3	0.655E+01	1.82	10.53	.14097E+02
2.79	-2.79	0.92	15.3	0.652E+01	1.84	10.52	.14283E+02
2.82	-2.82	0.92	15.4	0.649E+01	1.86	10.51	.14470E+02
2.84	-2.84	0.93	15.5	0.646E+01	1.88	10.50	.14656E+02
2.87	-2.87	0.93	15.6	0.643E+01	1.90	10.48	.14844E+02
2.90	-2.90	0.93	15.6	0.640E+01	1.92	10.47	.15032E+02
2.93	-2.93	0.94	15.7	0.637E+01	1.94	10.46	.15220E+02
2.96	-2.96	0.94	15.8	0.634E+01	1.96	10.45	.15408E+02
2.99	-2.99	0.94	15.9	0.631E+01	1.98	10.44	.15598E+02
3.02	-3.02	0.95	15.9	0.628E+01	2.00	10.43	.15787E+02
3.05	-3.05	0.95	16.0	0.625E+01	2.01	10.42	.15977E+02
3.07	-3.07	0.95	16.1	0.622E+01	2.03	10.41	.16167E+02
3.10	-3.10	0.95	16.1	0.620E+01	2.05	10.40	.16358E+02
3.13	-3.13	0.96	16.2	0.617E+01	2.07	10.39	.16549E+02
3.16	-3.16	0.96	16.3	0.614E+01	2.09	10.38	.16740E+02
3.19	-3.19	0.96	16.3	0.612E+01	2.11	10.37	.16932E+02
3.22	-3.22	0.97	16.4	0.609E+01	2.13	10.36	.17124E+02
3.25	-3.25	0.97	16.5	0.607E+01	2.15	10.35	.17317E+02
3.28	-3.28	0.97	16.6	0.604E+01	2.17	10.34	.17510E+02
3.30	-3.30	0.98	16.6	0.602E+01	2.19	10.33	.17703E+02
3.33	-3.33	0.98	16.7	0.599E+01	2.21	10.32	.17897E+02
3.36	-3.36	0.98	16.8	0.597E+01	2.22	10.31	.18091E+02
3.39	-3.39	0.99	16.8	0.595E+01	2.24	10.30	.18286E+02
3.42	-3.42	0.99	16.9	0.592E+01	2.26	10.29	.18480E+02
3.45	-3.45	0.99	17.0	0.590E+01	2.28	10.28	.18676E+02
3.48	-3.48	1.00	17.0	0.588E+01	2.30	10.28	.18871E+02
3.51	-3.51	1.00	17.1	0.585E+01	2.32	10.27	.19067E+02
3.53	-3.53	1.00	17.2	0.583E+01	2.34	10.26	.19263E+02
3.56	-3.56	1.01	17.2	0.581E+01	2.36	10.25	.19460E+02
3.59	-3.59	1.01	17.3	0.579E+01	2.38	10.24	.19657E+02
3.62	-3.62	1.01	17.3	0.576E+01	2.40	10.23	.19854E+02
3.65	-3.65	1.02	17.4	0.574E+01	2.41	10.22	.20052E+02
3.68	-3.68	1.02	17.5	0.572E+01	2.43	10.21	.20250E+02
3.71	-3.71	1.02	17.5	0.570E+01	2.45	10.20	.20448E+02

3.74	-3.74	1.02	17.6	0.568E+01	2.47	10.20	.20646E+02
3.76	-3.76	1.03	17.7	0.566E+01	2.49	10.19	.20845E+02
3.79	-3.79	1.03	17.7	0.564E+01	2.51	10.18	.21045E+02
3.82	-3.82	1.03	17.8	0.562E+01	2.53	10.17	.21244E+02
3.85	-3.85	1.04	17.9	0.560E+01	2.55	10.16	.21444E+02
3.88	-3.88	1.04	17.9	0.558E+01	2.57	10.15	.21644E+02
3.91	-3.91	1.04	18.0	0.556E+01	2.59	10.14	.21845E+02
3.94	-3.94	1.05	18.0	0.554E+01	2.60	10.14	.22045E+02
3.97	-3.97	1.05	18.1	0.552E+01	2.62	10.13	.22247E+02
3.99	-3.99	1.05	18.2	0.550E+01	2.64	10.12	.22448E+02
4.02	-4.02	1.06	18.2	0.548E+01	2.66	10.11	.22650E+02
4.05	-4.05	1.06	18.3	0.547E+01	2.68	10.10	.22852E+02
4.08	-4.08	1.06	18.4	0.545E+01	2.70	10.10	.23054E+02
4.11	-4.11	1.07	18.4	0.543E+01	2.72	10.09	.23257E+02
4.14	-4.14	1.07	18.5	0.541E+01	2.74	10.08	.23460E+02
4.17	-4.17	1.07	18.5	0.539E+01	2.76	10.07	.23663E+02
4.20	-4.20	1.08	18.6	0.538E+01	2.78	10.07	.23866E+02
4.22	-4.22	1.08	18.7	0.536E+01	2.79	10.06	.24070E+02
4.25	-4.25	1.08	18.7	0.534E+01	2.81	10.05	.24274E+02
4.28	-4.28	1.09	18.8	0.533E+01	2.83	10.04	.24479E+02
4.31	-4.31	1.09	18.8	0.531E+01	2.85	10.04	.24683E+02
4.34	-4.34	1.09	18.9	0.529E+01	2.87	10.03	.24888E+02
4.37	-4.37	1.10	19.0	0.528E+01	2.89	10.02	.25093E+02
4.40	-4.40	1.10	19.0	0.526E+01	2.91	10.01	.25299E+02
4.43	-4.43	1.10	19.1	0.524E+01	2.93	10.01	.25505E+02
4.45	-4.45	1.10	19.1	0.523E+01	2.95	10.00	.25711E+02
4.48	-4.48	1.11	19.2	0.521E+01	2.97	9.99	.25917E+02
4.51	-4.51	1.11	19.2	0.520E+01	2.98	9.99	.26123E+02
4.54	-4.54	1.11	19.3	0.518E+01	3.00	9.98	.26330E+02
4.57	-4.57	1.12	19.4	0.516E+01	3.02	9.97	.26537E+02
4.60	-4.60	1.12	19.4	0.515E+01	3.04	9.97	.26745E+02
4.63	-4.63	1.12	19.5	0.513E+01	3.06	9.96	.26952E+02
4.66	-4.66	1.13	19.5	0.512E+01	3.08	9.95	.27160E+02
4.68	-4.68	1.13	19.6	0.510E+01	3.10	9.95	.27368E+02
4.71	-4.71	1.13	19.7	0.509E+01	3.12	9.94	.27577E+02
4.74	-4.74	1.14	19.7	0.507E+01	3.14	9.93	.27785E+02
4.77	-4.77	1.14	19.8	0.506E+01	3.16	9.93	.27994E+02
4.80	-4.80	1.14	19.8	0.505E+01	3.17	9.92	.28203E+02
4.83	-4.83	1.15	19.9	0.503E+01	3.19	9.91	.28413E+02
4.86	-4.86	1.15	19.9	0.502E+01	3.21	9.91	.28622E+02
4.89	-4.89	1.15	20.0	0.500E+01	3.23	9.90	.28832E+02

\*\* WATER QUALITY STANDARD OR CCC HAS BEEN FOUND \*\*

The pollutant concentration in the plume falls below water quality standard or CCC value of 0.500E+01 in the current prediction interval.

This is the spatial extent of concentrations exceeding the water quality standard or CCC value.

4.91	-4.91	1.16	20.0	0.499E+01	3.25	9.90	.29042E+02
4.94	-4.94	1.16	20.1	0.498E+01	3.27	9.89	.29253E+02
4.97	-4.97	1.16	20.2	0.496E+01	3.29	9.88	.29463E+02
5.00	-5.00	1.17	20.2	0.495E+01	3.31	9.88	.29674E+02
5.03	-5.03	1.17	20.3	0.493E+01	3.33	9.87	.29885E+02
5.06	-5.06	1.17	20.3	0.492E+01	3.35	9.87	.30096E+02
5.09	-5.09	1.18	20.4	0.491E+01	3.36	9.86	.30308E+02
5.12	-5.12	1.18	20.4	0.489E+01	3.38	9.85	.30520E+02
5.14	-5.14	1.18	20.5	0.488E+01	3.40	9.85	.30732E+02
5.17	-5.17	1.18	20.5	0.487E+01	3.42	9.84	.30944E+02
5.20	-5.20	1.19	20.6	0.486E+01	3.44	9.84	.31156E+02
5.23	-5.23	1.19	20.6	0.484E+01	3.46	9.83	.31369E+02
5.26	-5.26	1.19	20.7	0.483E+01	3.48	9.83	.31582E+02
5.29	-5.29	1.20	20.8	0.482E+01	3.50	9.82	.31795E+02
5.32	-5.32	1.20	20.8	0.481E+01	3.52	9.82	.32009E+02
5.35	-5.35	1.20	20.9	0.479E+01	3.54	9.81	.32222E+02
5.37	-5.37	1.21	20.9	0.478E+01	3.55	9.81	.32436E+02
5.40	-5.40	1.21	21.0	0.477E+01	3.57	9.80	.32650E+02
5.43	-5.43	1.21	21.0	0.476E+01	3.59	9.80	.32864E+02
5.46	-5.46	1.22	21.1	0.474E+01	3.61	9.79	.33079E+02
5.49	-5.49	1.22	21.1	0.473E+01	3.63	9.79	.33293E+02
5.52	-5.52	1.22	21.2	0.472E+01	3.65	9.78	.33508E+02
5.55	-5.55	1.23	21.2	0.471E+01	3.67	9.78	.33723E+02
5.57	-5.57	1.23	21.3	0.470E+01	3.69	9.77	.33939E+02
5.60	-5.60	1.23	21.3	0.469E+01	3.71	9.77	.34154E+02
5.63	-5.63	1.24	21.4	0.468E+01	3.73	9.76	.34370E+02
5.66	-5.66	1.24	21.4	0.466E+01	3.74	9.76	.34586E+02
5.69	-5.69	1.24	21.5	0.465E+01	3.76	9.75	.34802E+02
5.72	-5.72	1.25	21.5	0.464E+01	3.78	9.75	.35019E+02
5.75	-5.75	1.25	21.6	0.463E+01	3.80	9.74	.35235E+02
5.78	-5.78	1.25	21.6	0.462E+01	3.82	9.74	.35452E+02
5.80	-5.80	1.26	21.7	0.461E+01	3.84	9.74	.35669E+02
5.83	-5.83	1.26	21.8	0.460E+01	3.86	9.73	.35886E+02
5.86	-5.86	1.26	21.8	0.459E+01	3.88	9.73	.36103E+02
5.89	-5.89	1.26	21.9	0.458E+01	3.90	9.72	.36321E+02
5.92	-5.92	1.27	21.9	0.457E+01	3.92	9.72	.36539E+02
5.95	-5.95	1.27	22.0	0.456E+01	3.93	9.72	.36757E+02
5.98	-5.98	1.27	22.0	0.454E+01	3.95	9.71	.36975E+02
6.01	-6.01	1.28	22.1	0.453E+01	3.97	9.71	.37193E+02
6.03	-6.03	1.28	22.1	0.452E+01	3.99	9.70	.37412E+02
6.06	-6.06	1.28	22.2	0.451E+01	4.01	9.70	.37631E+02
6.09	-6.09	1.29	22.2	0.450E+01	4.03	9.70	.37850E+02
6.12	-6.12	1.29	22.3	0.449E+01	4.05	9.69	.38069E+02
6.15	-6.15	1.29	22.3	0.448E+01	4.07	9.69	.38288E+02
6.18	-6.18	1.30	22.4	0.447E+01	4.09	9.69	.38508E+02
6.21	-6.21	1.30	22.4	0.446E+01	4.11	9.68	.38727E+02
6.24	-6.24	1.30	22.5	0.445E+01	4.13	9.68	.38947E+02

6.26	-6.26	1.31	22.5	0.444E+01	4.14	9.68	.39167E+02
6.29	-6.29	1.31	22.6	0.443E+01	4.16	9.67	.39388E+02
6.32	-6.32	1.31	22.6	0.442E+01	4.18	9.67	.39608E+02
6.35	-6.35	1.32	22.7	0.441E+01	4.20	9.67	.39829E+02
6.38	-6.38	1.32	22.7	0.441E+01	4.22	9.66	.40049E+02
6.41	-6.41	1.32	22.7	0.440E+01	4.24	9.66	.40270E+02
6.44	-6.44	1.33	22.8	0.439E+01	4.26	9.66	.40492E+02
6.47	-6.47	1.33	22.8	0.438E+01	4.28	9.65	.40713E+02
6.49	-6.49	1.33	22.9	0.437E+01	4.30	9.65	.40935E+02
6.52	-6.52	1.33	22.9	0.436E+01	4.32	9.65	.41156E+02
6.55	-6.55	1.34	23.0	0.435E+01	4.33	9.65	.41378E+02
6.58	-6.58	1.34	23.0	0.434E+01	4.35	9.64	.41600E+02
6.61	-6.61	1.34	23.1	0.433E+01	4.37	9.64	.41822E+02
6.64	-6.64	1.35	23.1	0.432E+01	4.39	9.64	.42045E+02
6.67	-6.67	1.35	23.2	0.431E+01	4.41	9.64	.42267E+02
6.70	-6.70	1.35	23.2	0.430E+01	4.43	9.63	.42490E+02
6.72	-6.72	1.36	23.3	0.430E+01	4.45	9.63	.42713E+02
6.75	-6.75	1.36	23.3	0.429E+01	4.47	9.63	.42936E+02

6.78	-6.78	1.36	23.4	0.428E+01	4.49	9.63	.43159E+02
6.81	-6.81	1.37	23.4	0.427E+01	4.51	9.62	.43383E+02
6.84	-6.84	1.37	23.5	0.426E+01	4.52	9.62	.43606E+02
6.87	-6.87	1.37	23.5	0.425E+01	4.54	9.62	.43830E+02
6.90	-6.90	1.38	23.6	0.424E+01	4.56	9.62	.44054E+02
6.93	-6.93	1.38	23.6	0.424E+01	4.58	9.61	.44278E+02
6.95	-6.95	1.38	23.7	0.423E+01	4.60	9.61	.44503E+02
6.98	-6.98	1.39	23.7	0.422E+01	4.62	9.61	.44727E+02
7.01	-7.01	1.39	23.7	0.421E+01	4.64	9.61	.44952E+02
7.04	-7.04	1.39	23.8	0.420E+01	4.66	9.61	.45176E+02
7.07	-7.07	1.40	23.8	0.419E+01	4.68	9.60	.45401E+02
7.10	-7.10	1.40	23.9	0.419E+01	4.70	9.60	.45626E+02
7.13	-7.13	1.40	23.9	0.418E+01	4.71	9.60	.45852E+02
7.16	-7.16	1.41	24.0	0.417E+01	4.73	9.60	.46077E+02
7.18	-7.18	1.41	24.0	0.416E+01	4.75	9.60	.46303E+02
7.21	-7.21	1.41	24.1	0.415E+01	4.77	9.60	.46528E+02
7.24	-7.24	1.41	24.1	0.415E+01	4.79	9.59	.46754E+02
7.27	-7.27	1.42	24.2	0.414E+01	4.81	9.59	.46980E+02
7.30	-7.30	1.42	24.2	0.413E+01	4.83	9.59	.47206E+02
7.33	-7.33	1.42	24.3	0.412E+01	4.85	9.59	.47433E+02
7.36	-7.36	1.43	24.3	0.411E+01	4.87	9.59	.47659E+02
7.39	-7.39	1.43	24.3	0.411E+01	4.89	9.59	.47886E+02
7.41	-7.41	1.43	24.4	0.410E+01	4.90	9.59	.48113E+02
7.44	-7.44	1.44	24.4	0.409E+01	4.92	9.58	.48340E+02
7.47	-7.47	1.44	24.5	0.408E+01	4.94	9.58	.48567E+02
7.50	-7.50	1.44	24.5	0.408E+01	4.96	9.58	.48794E+02
7.53	-7.53	1.45	24.6	0.407E+01	4.98	9.58	.49021E+02
7.56	-7.56	1.45	24.6	0.406E+01	5.00	9.58	.49249E+02
7.59	-7.59	1.45	24.7	0.405E+01	5.02	9.58	.49477E+02

7.62	-7.62	1.46	24.7	0.405E+01	5.04	9.58	.49705E+02
7.64	-7.64	1.46	24.8	0.404E+01	5.06	9.58	.49933E+02
7.67	-7.67	1.46	24.8	0.403E+01	5.08	9.57	.50161E+02
7.70	-7.70	1.47	24.8	0.403E+01	5.09	9.57	.50389E+02
7.73	-7.73	1.47	24.9	0.402E+01	5.11	9.57	.50617E+02
7.76	-7.76	1.47	24.9	0.401E+01	5.13	9.57	.50846E+02
7.79	-7.79	1.48	25.0	0.400E+01	5.15	9.57	.51075E+02
7.82	-7.82	1.48	25.0	0.400E+01	5.17	9.57	.51304E+02
7.85	-7.85	1.48	25.1	0.399E+01	5.19	9.57	.51533E+02
7.87	-7.87	1.49	25.1	0.398E+01	5.21	9.57	.51762E+02
7.90	-7.90	1.49	25.2	0.398E+01	5.23	9.57	.51991E+02
7.93	-7.93	1.49	25.2	0.397E+01	5.25	9.57	.52221E+02
7.96	-7.96	1.49	25.2	0.396E+01	5.27	9.57	.52450E+02
7.99	-7.99	1.50	25.3	0.396E+01	5.28	9.56	.52680E+02
8.02	-8.02	1.50	25.3	0.395E+01	5.30	9.56	.52910E+02
8.05	-8.05	1.50	25.4	0.394E+01	5.32	9.56	.53140E+02
8.08	-8.08	1.51	25.4	0.393E+01	5.34	9.56	.53370E+02
8.10	-8.10	1.51	25.5	0.393E+01	5.36	9.56	.53600E+02
8.13	-8.13	1.51	25.5	0.392E+01	5.38	9.56	.53831E+02
8.16	-8.16	1.52	25.5	0.391E+01	5.40	9.56	.54061E+02
8.19	-8.19	1.52	25.6	0.391E+01	5.42	9.56	.54292E+02
8.22	-8.22	1.52	25.6	0.390E+01	5.44	9.56	.54523E+02
8.25	-8.25	1.53	25.7	0.390E+01	5.46	9.56	.54754E+02
8.28	-8.28	1.53	25.7	0.389E+01	5.47	9.56	.54985E+02
8.30	-8.30	1.53	25.8	0.388E+01	5.49	9.56	.55216E+02
8.33	-8.33	1.54	25.8	0.388E+01	5.51	9.56	.55448E+02
8.36	-8.36	1.54	25.8	0.387E+01	5.53	9.56	.55679E+02
8.39	-8.39	1.54	25.9	0.386E+01	5.55	9.56	.55911E+02
8.42	-8.42	1.55	25.9	0.386E+01	5.57	9.56	.56142E+02
8.45	-8.45	1.55	26.0	0.385E+01	5.59	9.56	.56374E+02
8.48	-8.48	1.55	26.0	0.384E+01	5.61	9.56	.56606E+02
8.51	-8.51	1.56	26.1	0.384E+01	5.63	9.55	.56839E+02
8.53	-8.53	1.56	26.1	0.383E+01	5.65	9.55	.57071E+02
8.56	-8.56	1.56	26.1	0.383E+01	5.66	9.55	.57303E+02
8.59	-8.59	1.56	26.2	0.382E+01	5.68	9.55	.57536E+02
8.62	-8.62	1.57	26.2	0.381E+01	5.70	9.55	.57769E+02

Cumulative travel time = 57.7687 sec ( 0.02 hrs)

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

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

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BEGIN MOD251: DIFFUSER PLUME IN CO-FLOW

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

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

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

END OF MOD251: DIFFUSER PLUME IN CO-FLOW

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\*\* End of NEAR-FIELD REGION (NFR) \*\*

The initial plume WIDTH values in the next far-field module will be CORRECTED by a factor 1.76 to conserve the mass flux in the far-field! The correction factor is quite large because of the small ambient velocity relative to the strong mixing characteristics of the discharge! This indicates localized RECIRCULATION REGIONS and INTERNAL HYDRAULIC JUMPS.

Width predictions show discontinuities. Dilution values should be acceptable.

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BEGIN MOD241: BUOYANT AMBIENT SPREADING

Profile definitions:

- BV = top-hat thickness, measured vertically
- BH = top-hat half-width, measured horizontally in y-direction
- ZU = upper plume boundary (Z-coordinate)
- ZL = lower plume boundary (Z-coordinate)
- S = hydrodynamic average (bulk) dilution
- C = average (bulk) concentration (includes reaction effects, if any)
- TT = Cumulative travel time

Plume Stage 1 (not bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL	TT
8.62	-8.62	5.70	26.2	0.381E+01	5.70	16.82	5.70	0.00	.57769E+02
9.73	-8.62	5.70	26.5	0.378E+01	5.54	17.48	5.70	0.16	.67012E+02
10.84	-8.62	5.70	26.7	0.374E+01	5.39	18.13	5.70	0.31	.76256E+02
11.94	-8.62	5.70	27.0	0.371E+01	5.25	18.77	5.70	0.45	.85500E+02
13.05	-8.62	5.70	27.2	0.368E+01	5.12	19.40	5.70	0.58	.94744E+02
14.16	-8.62	5.70	27.4	0.365E+01	5.01	20.01	5.70	0.70	.10399E+03

This prediction file is cutoff at the Zone of Initial Dilution restriction, 44.3 feet or 13.505 meters. 13.505 meters is the distance equal to 50 times the square root of the cross-sectional area of a discharge port. The full prediction file can be seen in the diffuser design report submitted by the permittee as required by the compliance schedule for Outfall 023.