Arkansas Department of Energy and Environment - Division of Environmental Quality
Water Quality Management Plan Summary

Date: February 9, 2023 Prepared by: Kai Imamura Reviewed by: Shane Byrum

☐ New Permit ☒ Renewal Permit ☐ Amended Permit

Permit No.: AR0042846 **Facility Name:** Ash Grove Cement – Foreman Plant

Type of Discharge: Process water pond (treated sanitary wastewater; stormwater runoff from the former coal processing area and coal washout pond; wash-down water from the plant process area, raw material storage area, and salvage storage area; truck washout water; Cement Kiln Dust landfill leachate and runoff; and non-contact cooling water)

Effluent Flow: 6.45 MGD (Outfall 003)[1] **County:** Little River

Outfall Coordinates: Latitude: 33° 41' 15.3" N; Longitude: 94° 25' 28.7" W

Receiving Stream: an unnamed tributary, thence to French Creek, thence to Walnut Bayou, thence to the Red River

Assessment Unit: AR_11140106_ 004[2] **Planning Segment:** 1B **7Q10:** 0 cfs

Ecoregion: Gulf Coastal (Typical) **Watershed Size at Outfall (mi^2):** 1

Current 208 Plan Monthly Average Effluent Limits in mg/L (BOD_5/TSS[3]/DO[4]):

May – October: 10/50/2
November – April: 10/50/5

Proposed 208 Plan Monthly Average Effluent Limits:

No changes from current effluent limits shown above.

TMDL Limits (if any): None

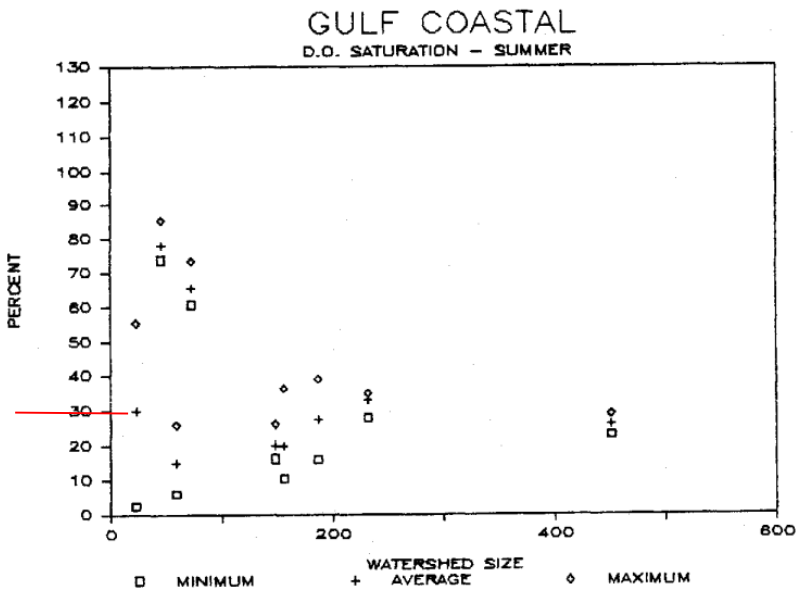
Justification (Sag = Minimum Modeled Value ≠ Difference in Value):

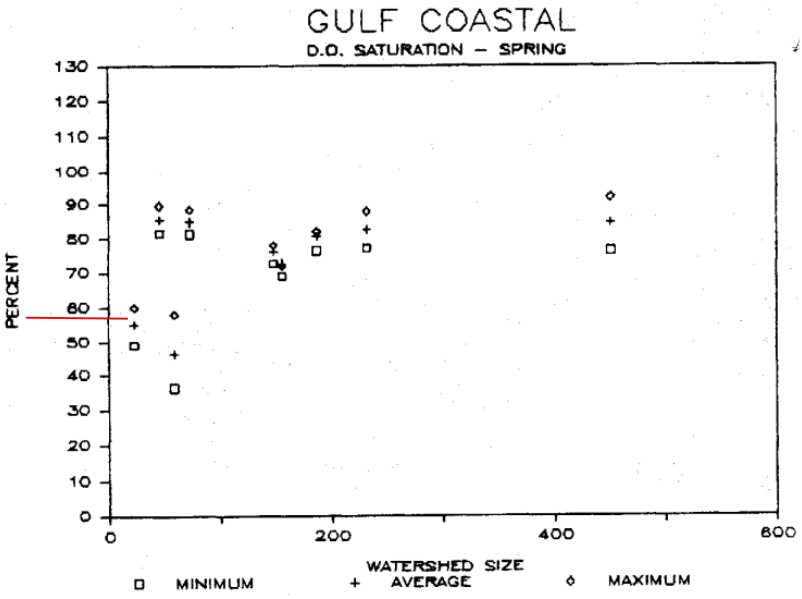
Reach No.	Length (miles)	DO_C (mg/L)	Sag_C (mg/L)	Distance to Sag_C (miles)	DO_P (mg/l)	Sag_P (mg/L)	Distance to Sag_P (miles)
1	1.0	2.0	2.0	0.0	5.0	5.0	0.0

Values in above table are from modeling analysis dated February 9, 2023.

Remarks: This is for the reissuance of the discharge permit for this existing facility. The 208 Plan is being updated to revise the Outfall 003 flow from 3.36 MGD to 6.45 MGD. The 2017 modeling analysis was updated on February 9, 2023 to reflect this flow rate increase. Based on the updated model, the current limits meet water quality standards for DO.

[1] Effluent flow based on DMRs September 2020 – August 2022
[2] Reach number listed is closest downstream 3-digit reach which is assigned to Walnut Bayou.
[3] TSS limit is a daily maximum.
[4] DO limit is an instantaneous minimum.


GULF COASTAL
D.O. SATURATION – SUMMER
PERCENT
130
120
110
100
90
80
70
60
50
40
30
20
10
0
0
200
400
600
WATERSHED SIZE
MINIMUM
AVERAGE
MAXIMUM


GULF COASTAL
D.O. SATURATION – SPRING
PERCENT
130
120
110
100
90
80
70
60
50
40
30
20
10
0
0
200
400
600
WATERSHED SIZE
MINIMUM
AVERAGE
MAXIMUM

Sediment Oxygen Demand (SOD) for Various Temperatures and Ecoregion [5]

Rocky Substrate[4]						Applicable Ecoregions[6]
TSS[1]	SOD_{20}	SOD_{22}	SOD_{29}	SOD_{30}	SOD_{31}	Ozark Highlands
15[2]	0.3	0.34	0.51	0.54	0.57	Boston Mountains
20[2]	0.5	0.56	0.84	0.90	0.95	Ouachita Mountains
30[2]	1.0	1.12	1.69	1.79	1.90	
45[3]	1.4	1.57	2.37	2.51	2.66	
90[3]	1.8	2.02	3.04	3.22	3.42	
Mixed Substrate						Arkansas River Valley
TSS[1]	SOD_{20}	SOD_{22}	SOD_{29}	SOD_{30}	SOD_{31}	Gulf Coastal Plain
15[2]	0.4	0.45	0.68	0.72	0.76	
20[2]	0.7	0.79	1.18	1.25	1.33	
30[2]	1.3	1.46	2.20	2.33	2.47	
45[3]	1.6	1.80	2.70	2.87	3.04	
90[3]	1.9	2.13	3.21	3.40	3.61	
Sandy Substrate[4]						Arkansas River Valley
TSS[1]	SOD_{20}	SOD_{22}	SOD_{30}	SOD_{31}	SOD_{32}	Gulf Coastal Plain
15[2]	0.5	0.56	0.90	0.95	1.01	Delta
20[2]	0.8	0.90	1.43	1.52	1.61	
30[2]	1.5	1.69	2.69	2.85	3.0	
45[3]	1.8	2.02	3.22	3.42	3.62	
90[3]	2.0	2.25	3.58	3.80	4.02	

[1] Projected TSS instream after mixing.

[2] TSS values are from MOA with EPA found in the CPP. SOD values for rocky substrate are the lower end of range given in the MOA. SOD values for sandy substrate are the upper end of range given in the MOA.

[3] These TSS concentrations are outside of the range given in the MOA, so the corresponding SOD values are estimated.

[4] SOD values given in this table are the lower and upper ends of the recommended range. SOD values between the upper and lower values are acceptable based on nature of substrate.

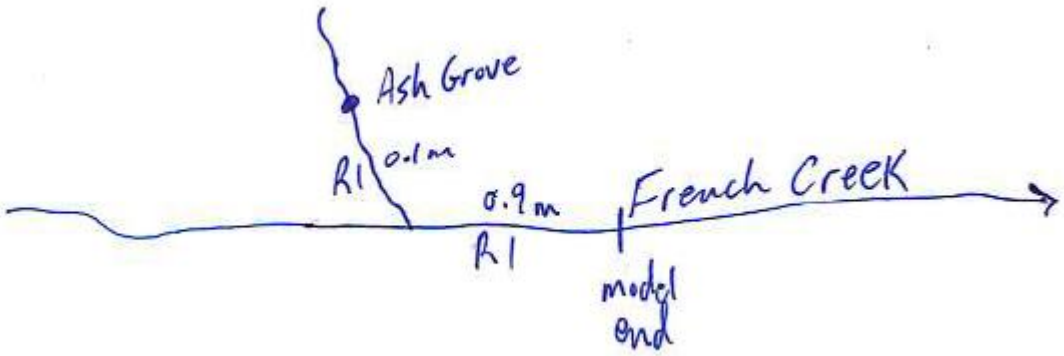
[5] Deviations from these rates may take place in situations of high instream dilution, which significantly reduces the impact of the benthal (sediment) deposits on oxygen consumption. In these situations, justification on a case by case basis will be provided in the documentation submitted to EPA.

[6] Applicable ecoregions are based on the general characteristics of waterbodies within each ecoregion (Rocky, Gravel, or Mixed). A different substrate type may be used based on site specific observations of the particular stream in question.

MODEL INPUT DATA

Upstream River Parameters	Critical Season (May-Oct.)	Primary Season (Nov.-Apr.)
Flow (cfs)	0.0	0.0
Temp. (°C)	30.0 (WQS)	22.0 (WQS)
Dissolved Oxygen (mg/L)	2.26 (30% saturation)	5.05 (58% saturation)
5-Day BOD ($CBOD_5$) (mg/L)	1.0	1.0
Ult. CBOD/$CBOD_5$ (unitless)	2.3	2.3
Ammonia (mg/L)	0.1	0.1
Upstream River Mile (miles)	1.0	1.0

Model Diagram:



Discharger 1	Critical Season (May-Oct.)	Primary Season (Nov.-Apr.)
Flow (MGD)	6.45 (DMRs September 2020 – August 2022)	6.45 (DMRs September 2020 – August 2022)
Temperature (°C)	30.0 (WQS)	22.0 (WQS)
Dissolved Oxygen (mg/L)	2.0 (permit)	5.0 (permit)
5-Day BOD_5 (mg/L)	10 (permit)	10 (permit)
Ult. CBOD/$CBOD_5$ (unitless)	2.3 (default)	2.3 (default)
Ammonia (mg/L)	0.0 (Non-detect, Form 2C)	0.0 (Non-detect, Form 2C)

Quick Calculator **Stream Hydraulics for Critical and Primary Seasons**

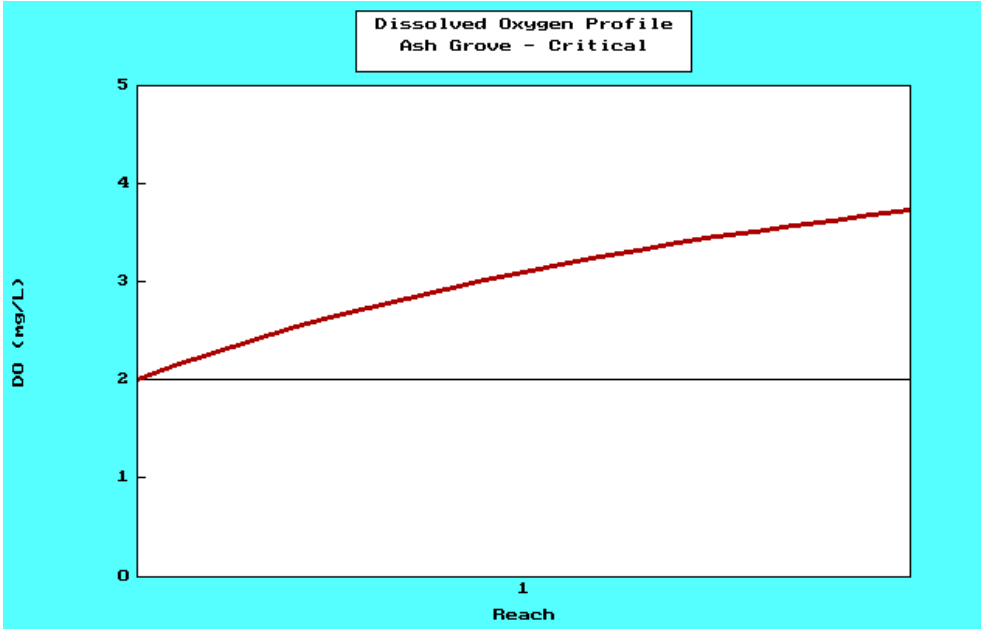
0	Headwater in CFS			0.088886	0.5	0.492814	0.4	22.828827	0.1
					FPS		Feet		Feet
6.45	Discharger 1 in MGD		Reach 1 Velocity		0.281	Depth	1.237	Width	28.734

Reach 1	Critical Season	Primary Season	Justification
Length (miles)	1.0	1.0	To Model End
Velocity (fps)	0.281	0.281	Spreadsheet
Average Depth (ft)	1.237	1.237	Spreadsheet
Temperature (°C)	30.0	22.0	Rule 2 WQS (Gulf Coastal ecoregion)
K_d (1/day)	0.4	0.4	EPA MOA
K_n (1/day)	0.4	0.4	EPA MOA
SOD (g/m^2/day)	2.33 (K20=1.3)	1.46 (K20=1.3)	EPA MOA TSS limit of 50 mg/l daily max*
K_a (1/day)	5.0	5.0	O'Conner-Dobbins formula

*TSS limit of 50 mg/l daily maximum is equivalent to approximately 33 mg/l monthly average based on the standard 1.5 multiplier used in permits. SOD rate used in model corresponds to a monthly average TSS of 30 mg/l from table shown on page 3 of this report. This SOD rate used is considered conservative since the TSS from this discharge is mostly inorganic suspended solids. Inorganic suspended solids do not have as much impact on the instream dissolved oxygen compared to organic suspended solids in domestic wastewater.

CRITICAL SEASON (42846_C.SMP)

10/50/2 simulation (BOD5/TSS/DO)



Ash Grove - Critical	TABULAR MODEL OUTPUT		
River Mile	DO (mg/L)	BOD (mg/L)	NH3 (mg/L)
1 1.00	2.00	23.00	0.00
2 0.95	2.14	22.84	0.00
3 0.90	2.27	22.69	0.00
4 0.85	2.40	22.53	0.00
5 0.80	2.52	22.38	0.00
6 0.75	2.63	22.22	0.00
7 0.70	2.73	22.07	0.00
8 0.65	2.83	21.92	0.00
9 0.60	2.92	21.77	0.00
10 0.55	3.01	21.62	0.00
11 0.50	3.10	21.47	0.00
12 0.45	3.17	21.32	0.00
13 0.40	3.25	21.18	0.00
14 0.35	3.32	21.03	0.00
15 0.30	3.39	20.89	0.00
16 0.25	3.45	20.74	0.00
17 0.20	3.51	20.60	0.00
18 0.15	3.57	20.46	0.00
19 0.10	3.62	20.32	0.00
20 0.05	3.67	20.18	0.00
21 -0.00	3.72	20.04	0.00

Ash Grove - Critical	Run information screen	
Name of receiving stream		Un.Trib.French Crk.
Number of discharges	(max = 10)	1
Number of reaches	(max = 10)	1
Reaeration type	(O, T, M)	O'Connor-Dobbins
Run title for screen display		Ash Grove - Critical
Graphics printer type	(HP, FX, LQ, None)	None
Printed graph resolution	(Low, Med, High)	None

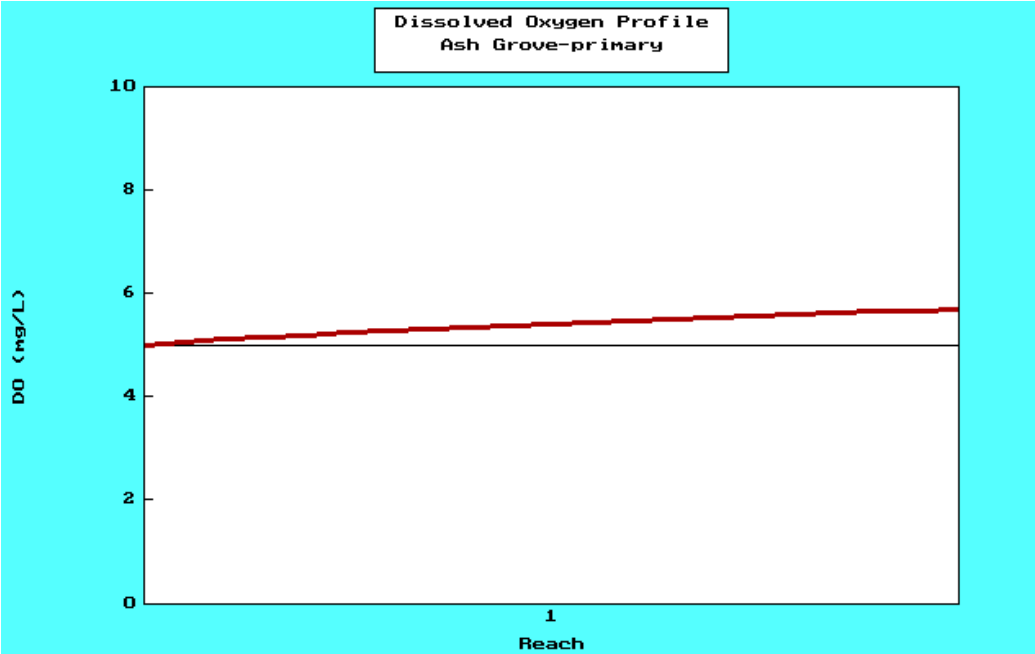
Ash Grove - Critical	Upstream River Parameters		Comments
Flow	(cfs)	0.00	7Q10
Temperature	(°C)	30.00	Rule 2
Dissolved Oxygen	(mg/l)	-0.00	
5-Day BOD	(mg/l)	1.00	default
Ult. CBOD / 5-Day BOD		2.30	EPA Guidance
pH	(su)	7.00	default
Ammonia	(mg/l)	0.10	default
Alkalinity	(mg/l)	-0.00	
Upstream river mile		1.00	model length

Ash Grove - Critical	Parameters for Discharge 1		Comments
Flow	(MGD)	6.45	DMRs 2020-2022
Temperature	(°C)	30.00	Reg. 2 Std.
Dissolved Oxygen	(mg/l)	2.00	Permit
5-Day BOD	(mg/l)	10.00	Permit
Ult. CBOD / 5-Day BOD		2.30	default
pH	(su)	7.00	default
Ammonia	(mg/l)	0.00	ND in Form 2C
Alkalinity	(mg/l)	-0.00	
Beginning of Reach Number		1	
Name of Discharger		Ash Grove 003	

Ash Grove - Critical	Parameters for Reach 1		Comments
Length	(mile)	1.00	To Model End
Velocity	(fps)	0.28	Spreadsheet
Slope	(ft/mile)	-0.00	
Average Depth	(ft)	1.24	Spreadsheet
Temperature	(°C)	30.00	Calculated
BOD Removal Rate	(1/day)	0.40	EPA MDA
NH3 Decay Rate	(1/day)	0.40	EPA MDA
Sediment Oxygen Demand	(g/m^2/day)	2.33	k20=1.3
Photosynthesis/respiration	(mg/L/day)	-0.00	

PRIMARY SEASON (42846_P.SMP)

10/50/5 simulation (BOD5/TSS/DO)



Ash Grove-primary	TABULAR MODEL OUTPUT		
River Mile	DO (mg/L)	BOD (mg/L)	NH3 (mg/L)
1 1.00	5.00	23.00	0.00
2 0.95	5.05	22.89	0.00
3 0.90	5.10	22.78	0.00
4 0.85	5.14	22.67	0.00
5 0.80	5.19	22.57	0.00
6 0.75	5.23	22.46	0.00
7 0.70	5.27	22.35	0.00
8 0.65	5.31	22.25	0.00
9 0.60	5.34	22.14	0.00
10 0.55	5.38	22.03	0.00
11 0.50	5.41	21.93	0.00
12 0.45	5.44	21.82	0.00
13 0.40	5.47	21.72	0.00
14 0.35	5.50	21.62	0.00
15 0.30	5.53	21.51	0.00
16 0.25	5.56	21.41	0.00
17 0.20	5.58	21.31	0.00
18 0.15	5.61	21.21	0.00
19 0.10	5.63	21.11	0.00
20 0.05	5.66	21.01	0.00
21 -0.00	5.68	20.91	0.00

Ash Grove-primary	Run information screen	
Name of receiving stream		Un.Trib.French Crk.
Number of discharges	(max = 10)	1
Number of reaches	(max = 10)	1
Reaeration type	(O, T, M)	O'Connor-Dobbins
Run title for screen display		Ash Grove-primary
Graphics printer type	(HP, FX, LQ, None)	None
Printed graph resolution	(Low, Med, High)	None

Ash Grove-primary	Upstream River Parameters		Comments
Flow	(cfs)	0.00	7Q10
Temperature	(°C)	22.00	Rule 2
Dissolved Oxygen	(mg/l)	5.05	58%sat ERstudy
5-Day BOD	(mg/l)	1.00	default
Ult. CBOD / 5-Day BOD		2.30	default
pH	(su)	7.00	default
Ammonia	(mg/l)	0.10	default
Alkalinity	(mg/l)	-0.00	
Upstream river mile		1.00	

Ash Grove-primary	Parameters for Discharge 1		Comments
Flow	(MGD)	6.45	DMRs 2020-2022
Temperature	(°C)	22.00	Reg. 2 Std.
Dissolved Oxygen	(mg/l)	5.00	Permit
5-Day BOD	(mg/l)	10.00	Permit
Ult. CBOD / 5-Day BOD		2.30	default
pH	(su)	7.00	default
Ammonia	(mg/l)	0.00	ND in app
Alkalinity	(mg/l)	-0.00	
Beginning of Reach Number		1	
Name of Discharger		Ash Grove 003	

Ash Grove-primary	Parameters for Reach 1		Comments
Length	(mile)	1.00	To Model End
Velocity	(fps)	0.28	Spreadsheet
Slope	(ft/mile)	-0.00	
Average Depth	(ft)	1.24	Spreadsheet
Temperature	(°C)	22.00	Calculated
BOD Removal Rate	(1/day)	0.40	Draft EPA MOA
NH3 Decay Rate	(1/day)	0.40	Draft EPA MOA
Sediment Oxygen Demand	(g/m^2/day)	1.46	k20=1.3
Photosynthesis/respiration	(mg/L/day)	-0.00	