



# MORRISON SHIPLEY

January 15, 2020

Mr. Myrl Lawrence  
ADEQ Enforcement Analyst  
Office of Water Quality  
Division of Environmental Quality  
Arkansas Department of Energy and Environment  
5301 Northshore Drive  
North Little Rock, AR 72118-5317

**RE: NPDES Permit Number ARR012466**  
**AFIN: 17-00059**  
**Alma, Arkansas**

Dear Mr. Lawrence:

The Final Report for the Corrective Action Plan for the referenced permit is enclosed. The Corrective Actions have successfully addressed the BOD<sub>5</sub> and TSS issues at the treatment facility.

With this letter, on behalf of the City of Alma, I am requesting closure of the CAP and the CAO associated with this project.

Sincerely,  
**Morrison-Shipley Engineers, Inc.**

Mark Gross, Ph.D., P.E.  
Senior Project Manager

Attachment

**FINAL REPORT**

Alma, Arkansas Wastewater Treatment Facility

Corrective Action Plan

NPDES Permit No. AR0021466

AFIN 17-00059

January 2020

Prepared for:

City of Alma, Arkansas

Prepared by:

Morrison Shipley Engineers, Inc.

5704 Euper Lane

Fort Smith, AR 72903

479-452-1933

[www.morrisonshipley.com](http://www.morrisonshipley.com)





## EXECUTIVE SUMMARY

Alma entered into a finalized Consent Administrative Order in January 2017 as a result of BOD<sub>5</sub> and TSS exceedances of the NPDES permit. A Corrective Action Plan (CAP) was developed and approved by the Division of Environmental Quality in 2017 and modified in 2018.

The following Corrective Actions were proposed:

- Repair and restore aeration in lagoon one
- Install ultrasonic equipment to disrupt and destroy algae
- Install baffles and booms in lagoons two and three
- Install floating covers in lagoons two and three
- Install aerators in lagoon three

The following Corrective Actions Implemented:

- Repair and restore aeration in lagoon one
- Install baffles and booms in lagoons two and three
- Install floating covers in lagoons two and three
- Install aerators in lagoon three

Prior to implementing corrective actions under the CAP, Alma was adding EarthTec® supplement and alum for algae control, but the additions had lost effectiveness over time. With the concurrence of DEQ Staff, EarthTec® and alum addition was discontinued.

The selected alternative was to repair and reinstate aeration in lagoon one, install baffles and booms in lagoons two and three, install floating covers in lagoons two and three, and install aerators in lagoon three.

The wastewater treatment facility has not exceeded BOD<sub>5</sub> or TSS permit limits since the aeration in lagoon one was restored in 2018.

The Corrective Actions have successfully addressed the BOD<sub>5</sub> and TSS concerns and the treatment facility is in compliance with the NPDES permit.

Introduction

The Alma, Arkansas wastewater treatment facility located at 2500 Orrick Road southeast of the City of Alma is permitted under the NPDES permit system as Permit Number AR0021466, AFIN 17-00059. The system treats municipal wastewater from the City of Alma, Arkansas and from the Town of Dyer, Arkansas.

The treatment system consists of a mechanical screen (comminutor) and Parshall flume in the headworks. Lagoon one is 1 (one) completely mixed cell followed by two partially mixed cells. Lagoon two is 2 (two) facultative cells. Cell one is used as a partial-mix cell with supplemental aeration as needed. Lagoon three consists of facultative sections with one aerated (partial-mix) cell. Lagoon four is used as a holding lagoon for equalization as needed.

The facility is permitted for the following parameters and limits:

Effluent Characteristics	Discharge Limitations		
	Mass, lb./day	Concentration, mg/L or as noted	
		Monthly Avg.	7-Day Avg.
Flow	N/A	Report, MGD	Report, MGD
Overflows	Monthly Total SSOs (occurrences/month)		
Overflow Volume	Monthly Total Volume of SSOs (gallons/month)		
Biochemical Oxygen Demand (BOD <sub>5</sub> )	437.9	30.0	45.0
Total Suspended Solids (TSS)	437.9	30.0	45.0
Dissolved Oxygen (D.O.)	N/A	2.0 (Inst. Min.)	
Fecal Coliform Bacteria (FCB)		Colonies/100 mL	
May - September	N/A	200	400
October - April	N/A	1000	2000
Total Residual Chlorine (TRC)	N/A	0.4 (Inst. Max.)	
Total Recoverable Arsenic	N/A	Report	Report
Total Phosphorus (TP)	N/A	Report	Report
Nitrate + Nitrite Nitrogen (NO <sub>3</sub> + NO <sub>2</sub> - N)	N/A	Report	Report
pH	N/A	<u>Minimum</u> 6.0 s.u.	<u>Maximum</u> 9.0 s.u.
Acute WET Testing			
<b>Pimephales promelas (Acute)</b> Pass/Fail Lethality (48-Hr NOEC) TEM6C Survival (48-Hr NOEC)		Report (Pass/Fail)	

Coeff. Of Variation Pass/Fail Retest 1 Pass/Fail Retest 2 Pass/Fail Retest 3		Report % Report % Report Pass/Fail Report Pass/Fail Report Pass/Fail		
<b>Daphnia pulex (Acute)</b> Pass/Fail Lethality (48-Hr NOEC) TEM3D Survival (48-Hr NOEC) Coeff. Of Variation Pass/Fail Retest 1 Pass/Fail Retest 2 Pass/Fail Retest 3		Report (Pass/Fail)  Report % Report % Report Pass/Fail Report Pass/Fail Report Pass/Fail		

The City entered a Consent Administrative Order in January 2018 as a result of BOD<sub>5</sub> and TSS permit exceedances. The CAO was amended in January of 2019.

The Corrective Action Plan (CAP) for the City of Alma was developed in 2017. The corrective actions have been implemented within the schedule proposed and amended in March 2018 and November 2018.

## PROGRESSION AND COMPLETION OF PROPOSED CORRECTIVE ACTIONS

### *Aeration Equipment Repair*

The aeration diffusers were repaired and replaced in lagoon one as a first step to improve the treatment system performance. Appendix A includes photographs of the functioning aeration system in lagoon one.

### *Ultrasonic Algae Destruction*

Initially, algae were characterized and quantified to determine if the algae in the Alma wastewater treatment facility are candidates for ultrasonic destruction. The laboratory classifying the algae determined that they are.

Investigation into ultrasonic destruction of algae showed that there are no successful projects in the United States where ultrasonic algae destruction worked to the satisfaction of the facility owner at a wastewater treatment lagoon. One of the wastewater operators who had tried ultrasonic destruction warned not to “waste the money” on ultrasonic equipment in a wastewater lagoon.

The proposal to install ultrasonic algae destruction was abandoned and other alternatives were explored.

### *Floating Covers*

Using floating covers to block sunlight and prevent algae growth in lagoon three and part of lagoon two was investigated, and success was found at wastewater treatment facilities in the United States.

#### **-Recycled material**

Initially, floating covers were fabricated from recycled material – PVC billboard sheets. The sheets were heat welded, encapsulating closed-cell foam for flotation. Grommets were installed in the edges. Photos of the recycled material covers are shown in Appendix B. Unfortunately, high winds destroyed the covers, and insufficient time remained to continue the process of researching and developing covers robust enough to withstand the environmental factors at the wastewater treatment facility.

#### **- Commercially fabricated cover**

Commercially available floating tiles, Advanced Water Treatment Technologies, Inc. (AWTTI) HexProtect® Aqua floating covers were ordered. The covers are made of hexagonal “pucks” approximately 8 inches across and 2 inches deep, ballasted with water. The tiles are deployed by simply dumping them into the lagoon and allowing them to float into position, closing the gaps between the tiles. Photos of the HexProtect® cover are shown in Appendix D along with photos of personnel deploying the tiles.

AWTTI opened a manufacturing facility in Texas, reducing shipping cost, and making the floating tiles affordable.

As of January 14, 2020, 9 (nine) truckloads of floating tiles remain to be delivered. Alma has purchased the tiles and is committed to deploying the remainder of the tiles as they arrive and as weather allows.

#### *Baffles and Booms*

The HexProtect® floating tiles can drift and migrate around the water surface, resulting in unplanned open areas exposed to sunlight. The sunlight can cause the algae to grow. Baffles were placed in lagoon three to improve liquid flow patterns and to prevent the HexProtect® tiles from migrating. The baffles were custom fabricated to reach to the bottom of the lagoon. The openings at the ends of the baffles were protected by booms that were built with shallow curtains under the water surface and floating 6-inch “logs” on the water surface. The baffles and booms have successfully contained the tiles in the areas where the coverage was planned. Appendix C includes photos of the baffles and booms installed in Lagoon 3 before the floating tiles were installed.

A Construction Permit was required for installing baffles, booms and aerators in the treatment system. The Construction Permit is included as Appendix E of this report.

#### *Aerators in Lagoon Three*

With aeration restored in lagoon one, the treatment system performance improved. The system was modeled using the effluent data from lagoon two as the influent to lagoon three to determine the aeration requirements for lagoon three. The model, with the strongest influent concentration since the aeration was restored to lagoon one, showed that two 7.5 horsepower aerators in lagoon three are sufficient to maintain BOD<sub>5</sub> within permit limits. A request to modify the construction permit was approved by the DEQ Staff and the approval letter is included as Appendix F. The two aerators, each 7.5 horsepower, have been installed in lagoon three in an open cell. Appendix G is a photograph of the aerators in lagoon three.

## CONCLUSION

The Proposed Corrective Actions have successfully kept the Alma wastewater treatment system in compliance with the BOD<sub>5</sub> and TSS permit limits.

The following corrective actions have been fully implemented:

- Restoration of aeration in lagoon one
- Installation of baffles and booms in lagoons two and three
- Installation of aerators in the open cell of lagoon three
- Installation of all but 9 truckloads of HexProtect® floating cover in lagoons two and three

Alma has purchased the HexProtect® tiles and will install the remainder as they arrive on site, subject to weather conditions





**APPENDIX A**  
**Aeration in Lagoon 1 Photos**





Aerators in Lagoon 1  
Looking east



Aeration in Lagoon 1  
Looking Southeast



**APPENDIX B**  
**Recycled Material Cover Photos**





Heat Welding Covers



Grommets in Edges of Covers





Covers Deployed over Lagoon 2  
Looking South

**APPENDIX C**  
**Baffles and Booms for Lagoon 3**





Baffles and Booms in Lagoon 3  
Looking West

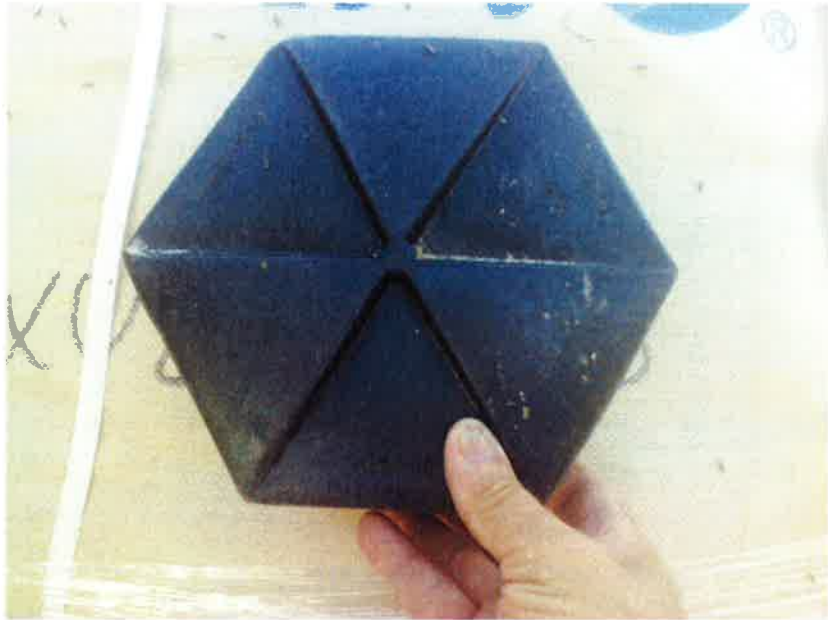


Baffles and Booms in Lagoon 3  
A second view looking west



**APPENDIX D**  
**HexProtect® Floating Cover Photos**





HexProtect® Tile



Installing Tiles  
Looking north along the west bank of Lagoon 3





Installing HexProtect Tiles



Tiles on Lagoons  
Looking north at Lagoon 3



Tiles in Lagoon 3  
Looking west at Lagoon 3



**APPENDIX E**  
**Construction Permit**



# ADEQ

ARKANSAS  
Department of Environmental Quality

APR 28 2019

CERTIFIED MAIL RETURN RECEIPT REQUESTED: 9489 0090 0027 6060 6594 37

The Honorable Keith Greene  
Mayor, City of Alma  
811 Fayetteville Avenue  
Alma, AR 72921

RE: NPDES Permit Number AR0021466C, AFIN 17-00059

Dear Mayor Greene:

This Certificate of Service constitutes notice of the Department's final permit decision and a copy of the final permit is enclosed.

All persons submitting written comments during the thirty (30) day public comment period, and all other persons entitled to do so, may request an adjudicatory hearing and Commission review on whether the decision of the Director should be reversed or modified. Such a request shall be in the form and manner required by Regulation 8.603, including filing a written Request for Hearing with the APC&E Commission Secretary at 101 E. Capitol Ave., Suite 205, Little Rock, Arkansas 72201 within thirty (30) calendar days of the date of issuance of this final permit decision as provided in Reg. 8.211(B)(1). If you have any questions about filing the request, please call the Commission at 501-682-7890.

I, Amy Deardoff, hereby certify that a copy of this permit has been mailed by first class mail to Mayor Keith Greene at 811 Fayetteville Avenue in Alma, AR 72921.



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Amy Deardoff  
Administrative Specialist, Office of Water Quality

STATE CONSTRUCTION PERMIT

Permit Number: AR0021466C

Permittee:

City of Alma  
811 Fayetteville Avenue  
Alma, AR 72921

Consulting Engineer:

Morrison Shipley  
2407 SE Cottonwood Street Suite 1  
Bentonville, AR 72712

This permit allows the permittee listed above to modify the wastewater treatment system in accordance with the permit application and plans and specifications which were received on January 2, 2019, under authority of the Arkansas Water and Air Pollution Control Act (Arkansas Code Annotated §8-4-101 et seq. and Arkansas Code Annotated §8-4-201 et seq.) and the following terms and conditions.

1. The treatment system shall be modified in accordance with the final plans and specifications as submitted to the Arkansas Department of Environmental Quality (ADEQ). In case any statement or representation in the aforementioned documents is found to be incorrect, this approval may be revoked.
2. There shall be no deviation from the permitted plans and specifications unless the revisions have been submitted for review and written approval is received.
3. Within thirty (30) days of completion of construction, a Professional Engineer (PE) registered in Arkansas shall submit written certification to the Department (Permits Branch of the Office of Water Quality) that the facility has been modified in accordance with the approved plans and specifications. The responsible official for the permittee must also sign the certification. Certification forms are located at the following web link:


<https://www.adeg.state.ar.us/water/permits/npdes/individual/pdfs/state-construction-permit-completion-of-construction.pdf>

4. This permit is issued in reliance upon the statements and representations made in the application and the plans and specifications. Issuance of this State Construction Permit does not guarantee satisfactory performance of the treatment system. The permittee shall ensure that water quality standards are not violated. Any modifications to the treatment facility necessary to meet water quality standards are the responsibility of the permittee and would require a modification to this State Construction Permit.
5. A State Construction Permit for modification of an existing wastewater treatment facility does not constitute an NPDES permit. Issuance of a State Construction Permit for modification of a treatment system in no way guarantees or assumes that an application for an NPDES permit to operate the system will be approved or an NPDES permit will be issued.
6. Reserved.
7. A complete "Operations and Maintenance (O&M) Manual" of the wastewater treatment system shall be updated by the engineering consultant for the operator's use before the plant is in operation.

8. If a construction site will disturb equal to or greater than one (1) acre and less than five (5) acres, the permittee shall comply with the requirements in Reg. 6.203 for Stormwater discharge associated with a small construction site, as defined in APC&EC Regulation No. 6. If the construction site will disturb five (5) acres or more, the permittee shall comply with the terms of the Stormwater Construction General Permit Number ARR150000 prior to the start of construction. BMPs must be implemented regardless of the size.
9. This facility is located as follows: Latitude: 35° 27' 38.5" N; Longitude: 94° 11' 8.4" W; Exit 13 off I-40, south on Hwy 71 to Hwy 64. East 2.45 miles on Hwy 64 to Orrick Rd. South 1.9 miles on Orrick Rd to 2500 Orrick Rd (south of Redhill Rd) in Crawford County, Arkansas.
10. The receiving waters for this facility are the Arkansas River in Segment 3H of the Arkansas River Basin. The outfall is located at the following coordinates: Outfall 001: Latitude: 35° 26' 43.2" N; Longitude: 94° 09' 33.6" W.
11. Floating baffles and tiles will be added to Lagoon 2. Baffle curtains, floating baffles, and aerators will be added to Lagoon 3. The modified treatment system will consist of a bar screen, Parshall flume, Lagoon 1 (one complete mix cell followed by two partially mixed cells), Lagoon 2 (two facultative cells with partial mix aeration used as necessary), Lagoon 3 (1 cell completely covered with tiles with no aeration and 2 cells each partially covered with tiles and partial mix aeration), chlorine disinfection, and dechlorination. Lagoon 4 is used for holding/equalization purposes. The current treatment consists of a bar screen, Parshall flume, Lagoon 1 (1 complete mix cell followed by two partial mixed cells), Lagoon 2 (2 facultative cells with partial mix aeration as necessary), Lagoon 3 (facultative), chlorine disinfection, and dechlorination. Lagoon 4 is used for holding/equalization purposes. The design flow of 1.75 MGD will not be changing as a result of these construction activities.
12. Failure to begin construction within one (1) year of the effective date may result in termination of this permit if a request for an extension is not submitted to the Department in a timely manner.
13. The permittee must submit notification of the start of construction within fifteen (15) days after construction has begun.
14. The permitted activities may not commence until approval from the Arkansas Department of Health has been received.

Effective Date: May 1, 2019

  
Caleb J. Osborne  
Associate Director, Office of Water Quality  
Arkansas Department of Environmental Quality

  
Issue Date



## FINAL STATEMENT OF BASIS

For State Construction Permit Number AR0021466C.

The issuing office is:

Arkansas Department of Environmental Quality  
5301 Northshore Drive  
North Little Rock, Arkansas 72118

The applicant is:

City of Alma  
811 Fayetteville Avenue  
Alma, AR 72921

### 1. BASIS FOR PERMIT AND CONDITIONS

This permit is your authority to modify the wastewater treatment system in accordance with the permit application and plans and specifications which were received on January 2, 2019. The issuance of this permit and conditions are based on the Arkansas Water and Air Pollution Control Act (Arkansas Code Annotated §8-4-101 et seq. and Arkansas Code Annotated §8-4-201 et seq.), Arkansas Pollution Control and Ecology Commission (APC&EC) Regulation No. 6.202, NPDES Discharge permit AR0021466, and 40 CFR 122.26.

Specific permit conditions and their sources are listed as follows:

Conditions 1, 2, 3, 4, 5, 7, 9, 10, 12, and 13 are self-explanatory. Condition 8 is based on 40 CFR Part 122.26. Condition 11 is based on submitted application and Plans and Specifications. Condition 14 is based on Reg. 6.202(A).

### 2. PUBLIC NOTICE

The public notice of the draft permit was published for public comment on March 8, 2019. The last day of the comment period was thirty (30) days after the publication date. No public comments were received on the draft permit.

### 3. PERMIT FEE

In accordance with Reg. No. 9.402(A), the fee for issuance of the state construction permit is \$500.

### 4. SOURCES

1. Application Form 1 and Plans and Specifications dated January 2, 2019.
2. APC&EC Reg. 6, Reg. 8, and Reg. 9.
3. A.C.A. §8-4-217(b)(1)(C).
4. 40 CFR 122.26.

**5. CONTACT PERSON**

The ADEQ contact person for submitting written comments, requesting information, or obtaining copies of the application, permit, and the Statement of Basis is:

Loretta Carstens, P.E.  
NPDES Branch, Office of Water Quality  
Arkansas Department of Environmental Quality  
5301 Northshore Drive  
North Little Rock, Arkansas 72118-5317  
(501) 682-0612

**APPENDIX F**  
**Approval of Modified Construction Permit**



**A R K A N S A S**  
Department of Environmental Quality

JAN 07 2020



Mark Gross, P.E.  
Senior Project Manager  
Morrison-Shipley Engineers, Inc.  
5704 Euper Lane, Suite 200  
Fort Smith, AR 72903

RE: State Construction Permit No. AR0021466C, AFIN 17-00059  
City of Alma

Dear Mr. Gross:

The Office of Water Quality (OWQ) has reviewed your November 20, 2019, request to not install aerators in the last cell of the third lagoon as well as the updated basis of design submitted December 4, 2019. Based on the review of the updated basis of design, it is the OWQ's understanding that aeration to Lagoon 1 has been restored and actual data has been used in calculating the aeration needs for Lagoon 2 and Lagoon 3. The updated calculations demonstrate that the effluent limits can be met without aeration in the last cell of Lagoon 3.

Based on the OWQ's understanding outlined in the preceding paragraph, the OWQ will not require that the aerators in the last cell of Lagoon 3 be installed at this time. You will need to reference this letter when the Certification of Completion of Construction Form is submitted.

If you have any questions, please contact Loretta Carstens, P.E., of the NPDES Permits Section at [loretta.carstens@adeq.state.ar.us](mailto:loretta.carstens@adeq.state.ar.us) or at (501) 682-0612.

Sincerely,

Bryan Leamons, P.E.  
Senior Operations Manager

BL:lc

cc: Richard Healey, Enforcement Branch Manager  
Jason Bolenbaugh, Compliance Branch Manager  
Mark Yardley, Direct of Public Works – City of Alma ([mark@cityofalma.org](mailto:mark@cityofalma.org))

**APPENDIX G**  
**Aerators in Lagoon 3 Partial-Mix Cell**



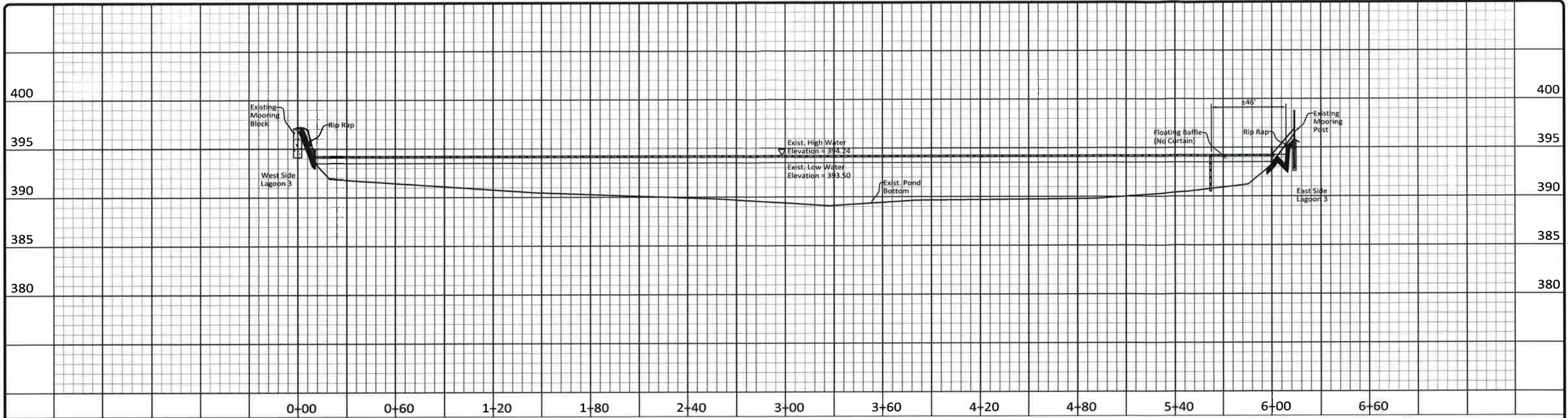
Aerators in Lagoon 3  
Looking west at Lagoon 3

**APPENDIX H**  
**Record Drawings of Final Treatment System Plan**



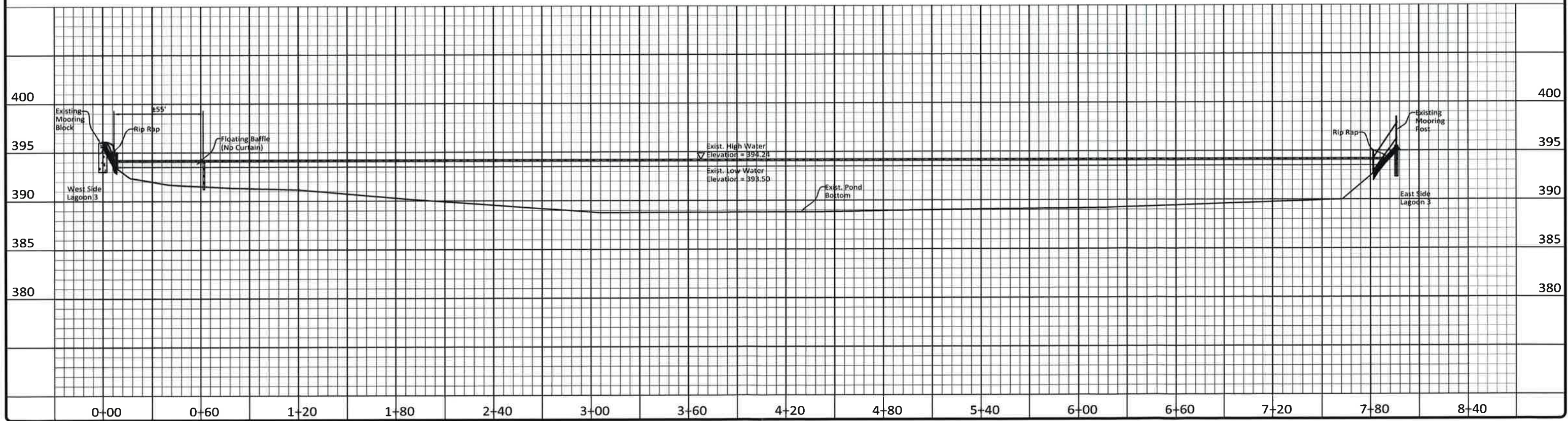






BAFFLE CURTAIN #1

BAFFLE CURTAIN #2



Drawing Name: M:\2020\AAR-62\AAR-62-PROFILES.dwg User: jmaguire Date: 01/14/2020 11:58:00 AM

Revision	By	Date

**MORRISON SHIPLEY**

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Drawn By	DRC
Approved By	MAG
Date	01.14.2020
Project No.	AAR-62

Vertical Scale	1"=5'
Horizontal Scale	1"=30'
Plotting Scale	1"=30'
Drawing Name	PROFILES POND

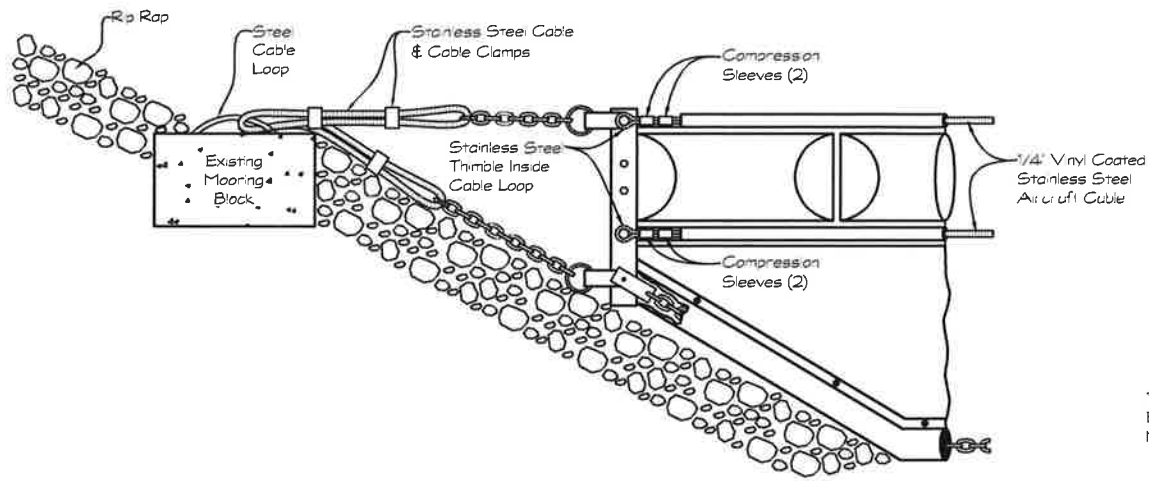
**WWTP**  
LAGOONS 2 AND 3  
IMPROVEMENTS

Alma, Crawford County, Arkansas

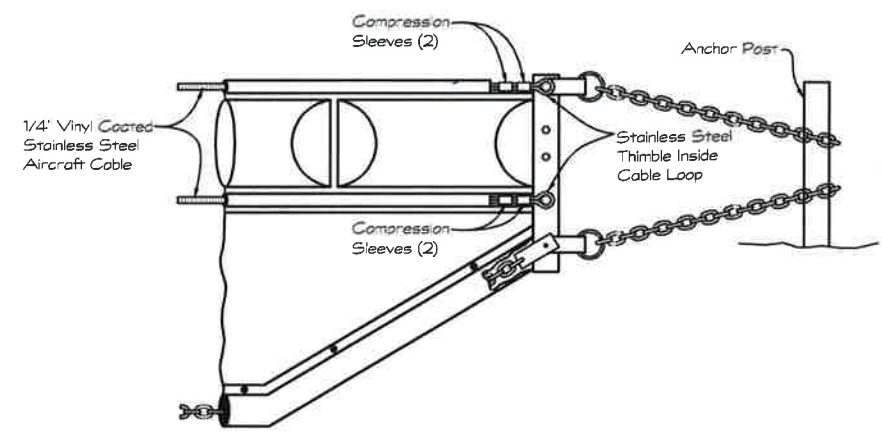
LAGOON 3 BAFFLE CURTAIN  
PROFILES

Record Drawing - 01.14.2020

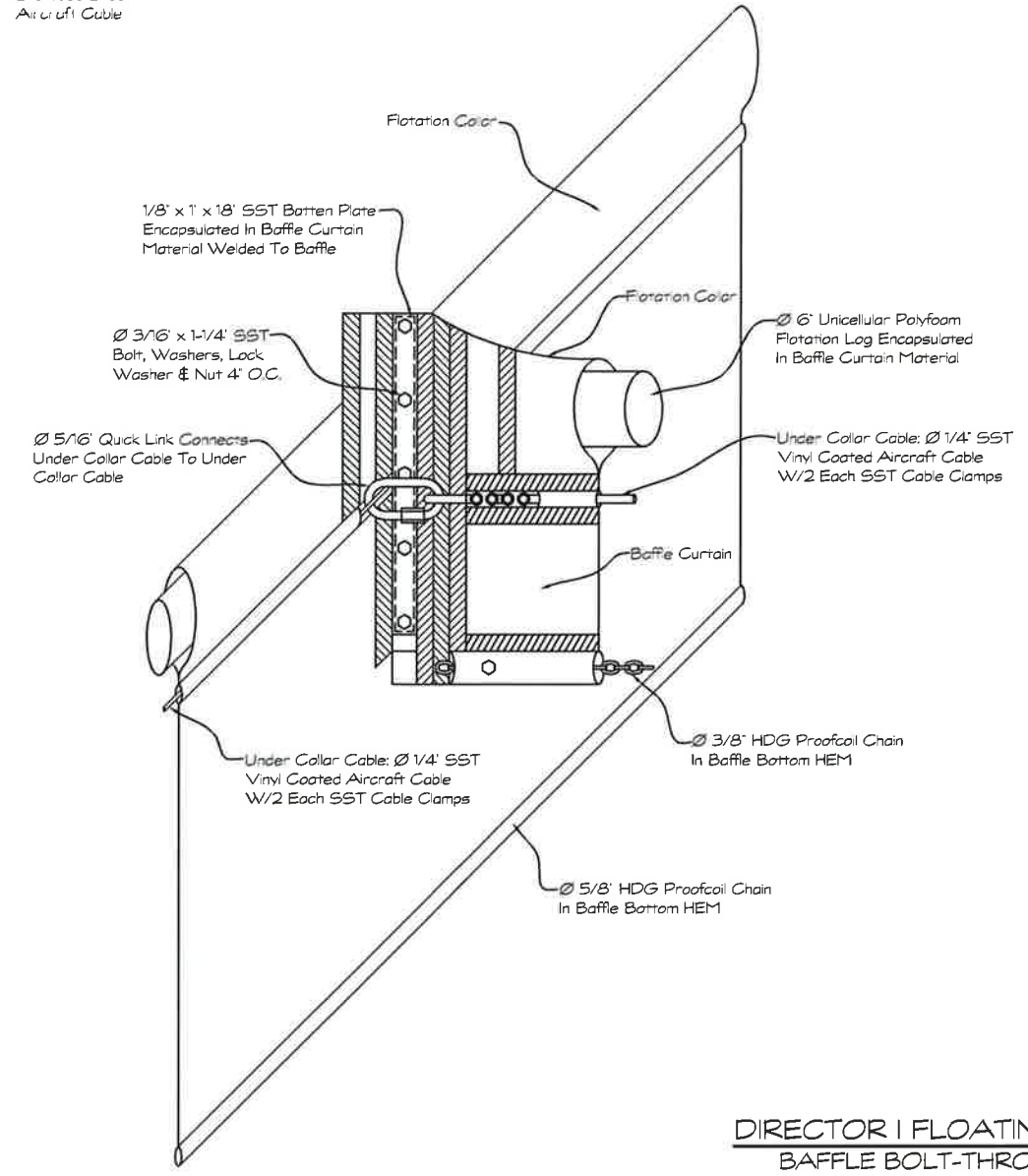
Sheet No.  
**3**  
of  
**4**



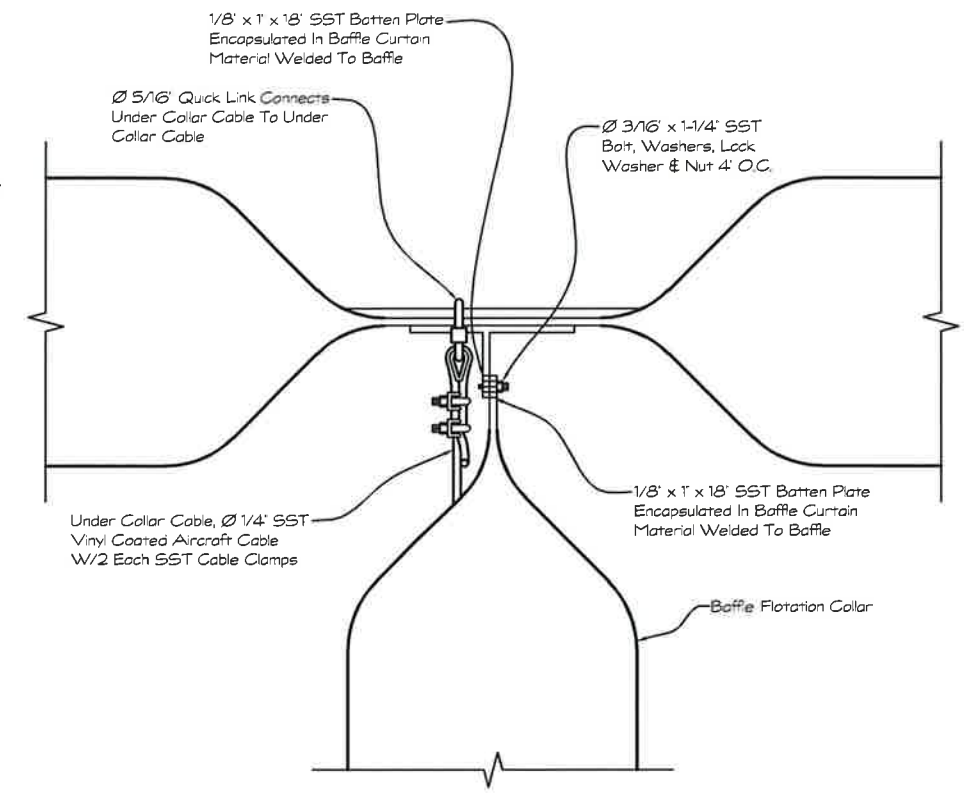
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FOR EXISTING MOORING BLOCKS**  
No Scale



**DIVERSION BAFFLE CURTAIN ANCHOR DETAIL  
FOR EXISTING MOORING POSTS**  
No Scale



**DIRECTOR I FLOATING BAFFLE  
BAFFLE BOLT-THROUGH TEE**  
No Scale



Drawing Name: M:\0524\PROJ\AAR-62\DWG\AAR-62-01000-01.dwg Plot Date: 01/14/2020 11:37:59 AM Plotter: HP DesignJet 5000 Series

Revision	By	Date

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Drawn By	DRC
Approved By	MAG
Date	01.14.2020
Project No.	AAR-62
Vertical Scale	-
Horizontal Scale	1"=100'
Plotting Scale	1
Drawing Name	LAGOON 3 IMP.

**WWTP**  
**LAGOONS 2 AND 3**  
**IMPROVEMENTS**

Alma, Crawford County, Arkansas

**DETAILS**

Record Drawing - 01.14.2020

Sheet No. **4**  
of **4**