PINE BLUFF ARSENAL
OUTFALL 01C
CORRECTIVE ACTION PLAN
FOR TOTAL RECOVERABLE MERCURY

Quarterly Progress Report

Prepared By:

PINE BLUFF ARSENAL
PINE BLUFF, ARKANSAS

May 27, 2025

1.0 Introduction

Pine Bluff Arsenal (PBA) submitted a Corrective Action Plan (CAP) for total recoverable mercury at Outfall 01C to the Arkansas Energy and Environment, Division of Environmental Quality, Office of Water Quality (DEQ) on June 15, 2018. The CAP dated June 15, 2018 was prepared in response to a letter received from DEQ on March 21, 2018. The CAP was subsequently revised and submitted to DEQ during March 2019 (PBA, 2019) and requires the preparation of quarterly progress reports which are scheduled to be completed by the 30th of February, May, August, and November.

The Consent Administrative Order (CAO) LIS 19-029 was transmitted to PBA in the April 11, 2019 letter to Doug McKim, PBA from Bailey Taylor, Office of Water, DEQ stated a final anticipated compliance date of January 31, 2022. As stated in the CAO (in paragraph 8 under Order and Agreement), "DEQ may grant an extension of this Order, provided that the Respondent requests such an extension in writing and provided that the delay or anticipated delay has been caused by circumstances beyond the control of and without the fault of Respondent. The time for performance may be extended for a reasonable period but, in no event longer than the period of delay resulting from such circumstances. The burden of proving that any delay is caused by circumstances beyond the control of and without fault of Respondent and the length of delay attributable to such circumstances shall rest with the Respondent."

PBA's request for an extension was submitted to DEQ on December 6, 2021. DEQ reviewed PBA's request and extended the final compliance date to December 31, 2024 as contained in Amendment 1 of CAO LIS 19-029-001 dated April 26, 2022. Note, on December 10th, 2024, PBA submitted a request to DEQ for an extension of the final compliance date from December 31st, 2024 to January 31st, 2028; PBA is currently awaiting a response from DEQ and follow-up Amendment of CAO LIS 19-029-001.

PBA continues to work on the corrective action to achieve compliance with the mercury permit limit as described in the CAP. This quarterly report provides a summary of the progress made on these efforts since the previous quarterly progress report dated February 2025.

2.0 Corrective Actions to Achieve Compliance with the Mercury Permit Limit at Outfall 01C

The CAP describes the following three-phased approach designed to meet the total recovery mercury permit limit at Outfall 01C.

1. Improvement of the operational performance and hydraulic retention time of the Runoff Control Impoundment (RCI) to optimize the settling of silt and clay sized particles in the water column that may be associated with mercury.
2. If a source(s) of mercury within the RCI watershed is identified, evaluate best management practices that could be implemented to reduce mercury transport in storm water.
3. Development of a site-specific bioaccumulation factor (BAF) to be used to determine a site-specific mercury water quality criterion.

A brief description of each approach, the schedule as presented in the CAP, and a summary of the progress made during the past quarter are given below.

2.1 Approach 1: Optimization of Settling of Solids in the Runoff Control Impoundment

The goal of this approach is to assess potential RCI operational improvements and best management practices to increase the hydraulic retention time of the RCI and improve the settling of silt and clay sized particles. The following activities and associated completion dates are summarized as follows:

- Assessment of total mercury concentration, suspended sediment concentration, turbidity and particle size distribution of the suspended sediment in samples collected from the RCI
  - Completed: June 2018
- Perform a detailed bathymetric survey to evaluate the hydraulic retention time of the RCI in conjunction with the settling velocities of suspended sediment
  - Completed: December 2018
- Update the RCI operational assessment to address potential operational improvements to increase the hydraulic retention time and improve settling of silt and clay sized particles. This assessment included analysis of the particle size distributions in sediment and surface water as well as the results of the bathymetric survey.
  - Completed: February 20, 2020

2.1.1 Summary of Progress on Approach 1 since the February 2025 Quarterly Status Report

Approach 1 has been completed. The RCI Operational Assessment document (PBA 2020) was attached to the February 27, 2020 quarterly progress report.

Since completion of the RCI operational assessment (PBA, 2020), PBA's environmental staff continually work to improve the hydraulic retention time of the RCI and to improve the settling time of silt and clay sized particles. As limited by precipitation events within the RCI watershed, PBA staff maintain the RCI pool elevation at 223.5 feet (sluice gate #1) when possible, to allow the largest amount of storage volume within the RCI between storm events. Once the storm event has passed and the RCI pool elevation has stabilized, PBA staff attempt to allow five or more days before each subsequent sluice gate is opened. After sufficient time has passed, PBA continues the practice of slowly reducing the water level in the RCI starting with the highest sluice gate to maximize the hydraulic retention time and the settling of the silt and clay sized particles. As discussed in the RCI operational assessment (PBA, 2020), the operation of the RCI is greatly affected by back-to-back storm events which reduce the hydraulic capacity of the RCI and decrease the hydraulic retention time.

As discussed in Volume 4 (PBA, 2024a), a mercury variance was proposed by PBA for the Phillips Creek watershed that provides a temporary criterion (variance criterion) that is composed of:

- a fish tissue criterion of 1.12 milligrams per kilogram (mg/kg) wet weight (ww) total mercury, and
- a corresponding translated water concentration of 228 ng/L (or parts per trillion), total recoverable mercury (PBA, 2024a).

Based on DEQ comments received by PBA on October 17, 2024 and that were discussed during an October 31, 2024 conference call with DEQ, PBA, and PBA contractor staff from Great Lakes Environmental Center, Inc. (GLEC), DEQ requested recalculation of the temporary mercury variance by increasing the fish tissue ingestion rate from 17.5 grams per day to 22 grams per day (USEPA, 2015). In addition, consistent with the USEPA (2015) guidance, body weight was increased from 70 kilograms to 80 kilograms. By incorporating these two changes, the proposed mercury fish tissue criterion decreased from 1.12 mg/kg ww to 0.855 mg/kg ww and the corresponding translated water concentration decreased from 228 ng/L to 174 ng/L total recoverable mercury.

Note that the concentrations of mercury measured at Outfall 01C (see Figure 1) are significantly less than the translated mercury concentration of 174 ng/L that is proposed by PBA to be incorporated in the Phillips Creek watershed mercury variance. Since 2021, PBA's efforts to increase the RCI hydraulic retention time are reflected in the overall lower mercury concentrations that are measured at Outfall 01C and that are summarized on Figure 1.

2.2 Approach 2: Evaluate Best Management Practices (BMP) to Reduce Mercury Transport in Storm Water

Contingent on implementation of any BMPs to control mercury transport to the RCI is the identification of the source(s) of mercury within the RCI watershed that are mobilized during rain events. To date, the source(s) of mercury to the RCI has not been identified conclusively.

To attempt to identify the source(s) of mercury within the 545-acre drainage area that discharges to the RCI, PBA completed a series of surface water and soil/sediment sampling events from April 2018 through October 2021, and these data were presented in prior quarterly status reports and in Volume 3 of the proposed Phillips Creek watershed mercury variance (PBA, 2024b). As discussed in the CAP (PBA, 2019), previous quarterly progress reports, and summarized in Volume 3 of the proposed Phillips Creek watershed mercury variance (PBA, 2024b), although mercury has been detected in multiple locations both within (and outside) the RCI drainage area, a specific source area has not been located. If the source(s) of mercury can be located within the RCI watershed, then the following best management practices (BMPs) could be implemented:

1. If needed, repair key drainage system physical issues (i.e., incidental diversions, bank/channel erosion, etc.) to reduce erosion.
2. If needed, revegetate/restore the land surface that contains inadequate cover to reduce erosion.
3. If areas of mercury transport are identified that cannot be addressed using BMPs 1 or 2, then storm water treatment BMPs may be evaluated in those areas and could include berms, infiltration swales, small detention areas (created with ditch checks, or in small tributaries, etc.), etc.

2.2.1 Summary of Progress on Approach 2 since the February 2025 Quarterly Progress Report

Table 1 provides a summary of the sampling activity for mercury conducted under Approach 2 in conjunction with CAP since 2018. Note, the data for all the sampling events presented in Table 1 are summarized in the applicable Quarterly Progress Report and in Volume 3 of the proposed Phillips Creek watershed mercury variance (PBA, 2024b). The most recent low level mercury sampling event for Phillips Creek at sample locations PC-1 to PC-5 and Eastwood Bayou EB-2 to EB-5 was completed the week of October 20, 2024.

2.3 Approach 3: Development of a Site-Specific Bioaccumulation Factor (BAF) to be used to determine a Site-Specific Mercury Water Quality Criterion

A site-specific BAF was developed as part of the process to derive a site-specific water quality criterion for mercury in Phillips Creek. If approved, the site-specific criterion could be used to modify the Outfall 01C permit limit for total mercury. A plan for the BAF study was submitted to DEQ (PBA, 2018) on April 3, 2018. A summary of the activities completed during the BAF study is as follows:

- Unfiltered and filtered total mercury and methylmercury along with total suspended solids were measured in water samples collected from four sites in Phillips Creek.
    - Schedule: April 2018 through November 2018

    - Receipt of laboratory data for November sampling event: January 2019
- Collection and laboratory testing of fish tissue samples at the same four sites in Phillips Creek
    - Schedule: August and November 2018
    - Receipt of laboratory data for the November sampling event: January 2019
- Submitted data analysis and report containing the results of the BAF study and proposed site-specific water quality criterion for mercury to DEQ for their review and approval
    - Completed: March 15, 2019
- DEQ's adoption of a tissue-based mercury criterion is required after which the site-specific BAF will be used to translate the tissue-based criterion to a water-based criterion. PBA prepared a justification for modifying the recommended USEPA tissue-based criterion and this justification was included in the BAF study report.
    - Completed: March 15, 2019; revised May 17, 2021 (PBA, 2021)

2.3.1 Summary of Progress on Approach 3 since the February 2025 Quarterly Status Report

Sampling and analysis of surface water grab samples was completed at five sites in Phillips Creek and four sites in Eastwood Bayou in October 2024. The surface water samples were measured for total recoverable mercury (see Table 2 for data and Figure 2 for sampling locations). The Phillips Creek and Eastwood Bayou surface water samples were collected by PBA's contractor (Great Lakes Environmental Center, Inc.) during the annual ecological trend monitoring event. Laboratory services were provided by Eurofins (formerly American Interplex). A surface water sample was not collected at sample location PC-6 as this site location was dry within 200 meters of the sample point. The laboratory data for the October 21st and 22nd, 2024 sampling event are summarized in Table 2. The next Phillips Creek sampling event is scheduled for October 2025.

3.0 Summary of Completed and Upcoming Work

DEQ conducted an in-person meeting and site visit on October 21, 2024. The DEQ site inspection was conducted to facilitate DEQ's review of PBA's draft mercury variance for the Phillips Creek watershed (PBA, 2024a) and to discuss their comments to the proposed mercury variance dated October 17, 2024. Based on DEQ's comments, the proposed highest attainable condition (HAC) in the Phillps Creek watershed for the mercury variance, expressed on the basis of fish tissue mercury concentration, was revised to 0.855 mg/kg wet weight, with a translated water value of 0.174 µg/L (174 ng/L). Both values have been periodically exceeded in the Phillips Creek watershed, downstream and upstream of the RCI discharge from Outfall 01C to Phillips Creek. As discussed in Volume 4 of the proposed mercury variance for the Phillips Creek watershed (PBA, 2024a), the water and fish tissue variance criteria are anticipated to be protective of downstream waters, in this case, the Arkansas River downstream of the confluence with Phillips Creek.

On February 21, 2025, in a letter addressed to Mr. Joe Martin, Interim Deputy Associate Director, Office of Water Quality, DEQ, from Mr. Joseph Hurt, Chief, Environmental Compliance Division, PBA, PBA provided written response to DEQ's October 17, 2024 comments to the proposed Phillips Creek mercury variance (PBA, 2024c). PBA's February 21, 2025 responses to comments were reviewed by DEQ, and on April 28, 2025, PBA received notification that comments 1-6 and 8-14 were adequately addressed (DEQ, 2025). With respect to comment #7, DEQ noted "…*that it may become necessary during the variance reevaluations of the highest attainable condition to investigate sources of mercury, including but not limited to mercury in water from atmospheric deposition*." PBA's acknowledgement of comment #7 is noted.

The proposed mercury variance document (Volume 4) will be revised and re-submitted to DEQ June 2025, who is in turn expected to submit the final proposed mercury variance to USEPA Region 6 for their preliminary review. Upon adoption of the temporary mercury variance criterion PBA anticipates that the revised water quality-based permit limit for Outfall 01C will be derived based on the water concentration portion (0.174 µg/L) of the temporary variance criterion and PBA will continue to monitor mercury at Outfall 01C as required under NPDES Permit No. AR0001678.

4.0 References

PBA. 2018. Study Plan for a Mercury Bioaccumulation in Phillips Creek, Pine Bluff Arsenal. Document submitted to DEQ on April 3, 2018.

PBA. 2019. Revised Corrective Action Plan Total Recoverable Mercury, Outfall 01C, NPDES Permit Number AR0001678, Pine Bluff Arsenal. Document dated June 15, 2018; revised March 2019.

PBA. 2020. Assessment of the Runoff Control Impoundment Hydraulic Retention Time and Suspended Sediment Trapping Efficiency. Pine Bluff Arsenal, Pine Bluff, Arkansas. Document dated February 20, 2020.

PBA. 2021. Proposed Site-specific Mercury Water Quality Criterion for Phillips Creek, Pine Bluff Arsenal, Pine Bluff, Arkansas. Document dated: March 15, 2019; revised May 17, 2021.

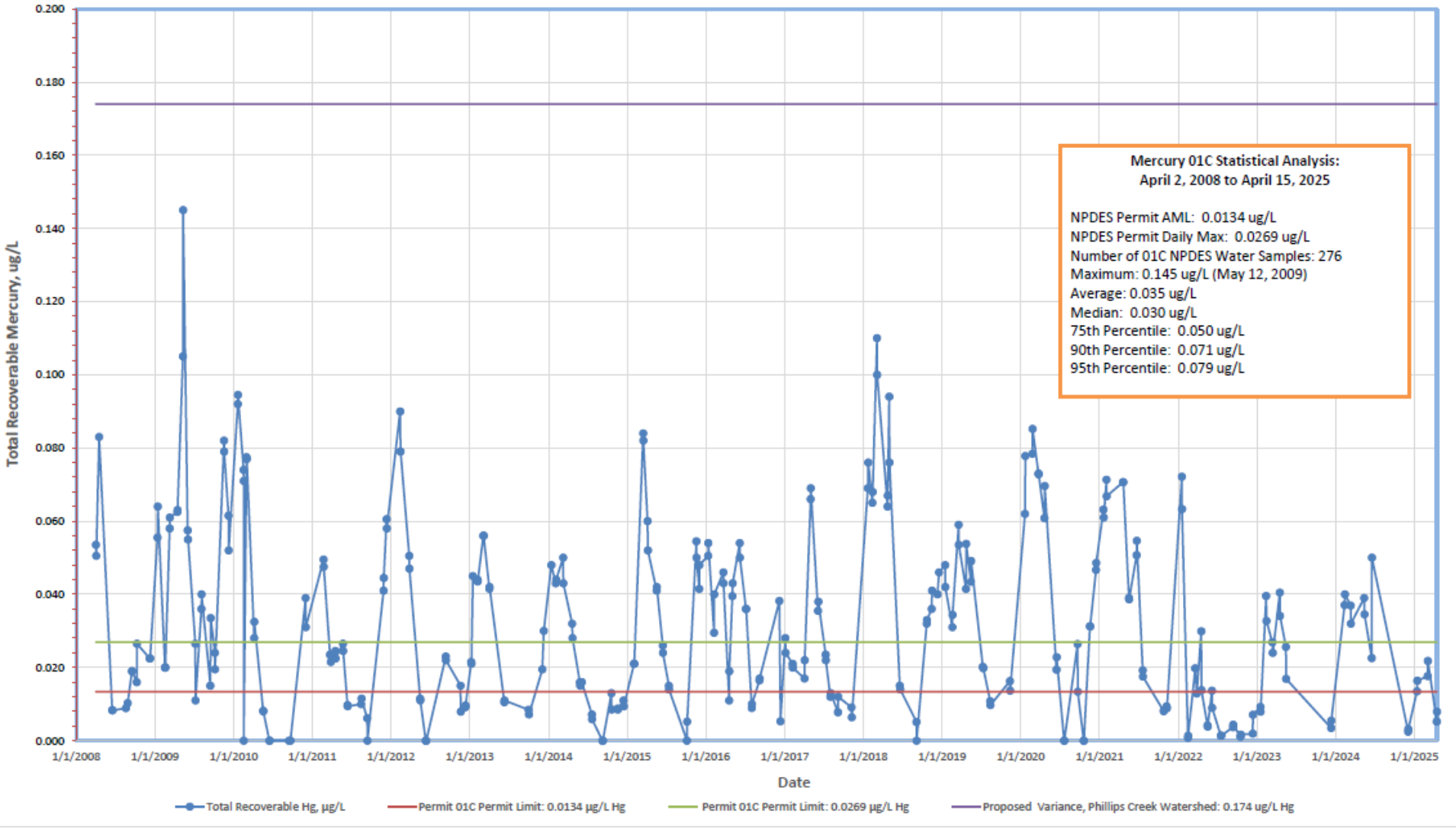
PBA. 2024a. Volume 4, Proposed Mercury Variance for the Phillips Creek Watershed Pine Bluff Arsenal, Pine Bluff, Arkansas. Pine Bluff Arsenal, Pine Bluff, Arkansas. Document dated May 23, 2024.

PBA. 2024b. Volume 3, Distribution of Mercury in the Phillips Creek and Eastwood Bayou Watersheds 2018-2023, Pine Bluff Arsenal, Pine Bluff, Arkansas. Document dated: June 11, 2024.

PBA. 2024c. Response to October 17, 2024 DEQ Comments on Volume 4, Proposed Mercury Variance for the Phillips Creek Watershed Pine Bluff Arsenal, Pine Bluff, Arkansas. Pine Bluff Arsenal, Pine Bluff, Arkansas. Document originally submitted to PBA by GLEC on December 18, 2024, followed subsequently by submittal by PBA to DEQ on February 21, 2025.

USEPA. 2015. Human Health Ambient Water Quality Criteria: 2015 Update. USEPA, Office of Water, Washington DC. Document number: EPA 820-F-15-001. Dated: June 2015.

Figure 1. NPDES Permit 01C, Total Recoverable Mercury, ug/L
April 2, 2008 to April 15, 2025



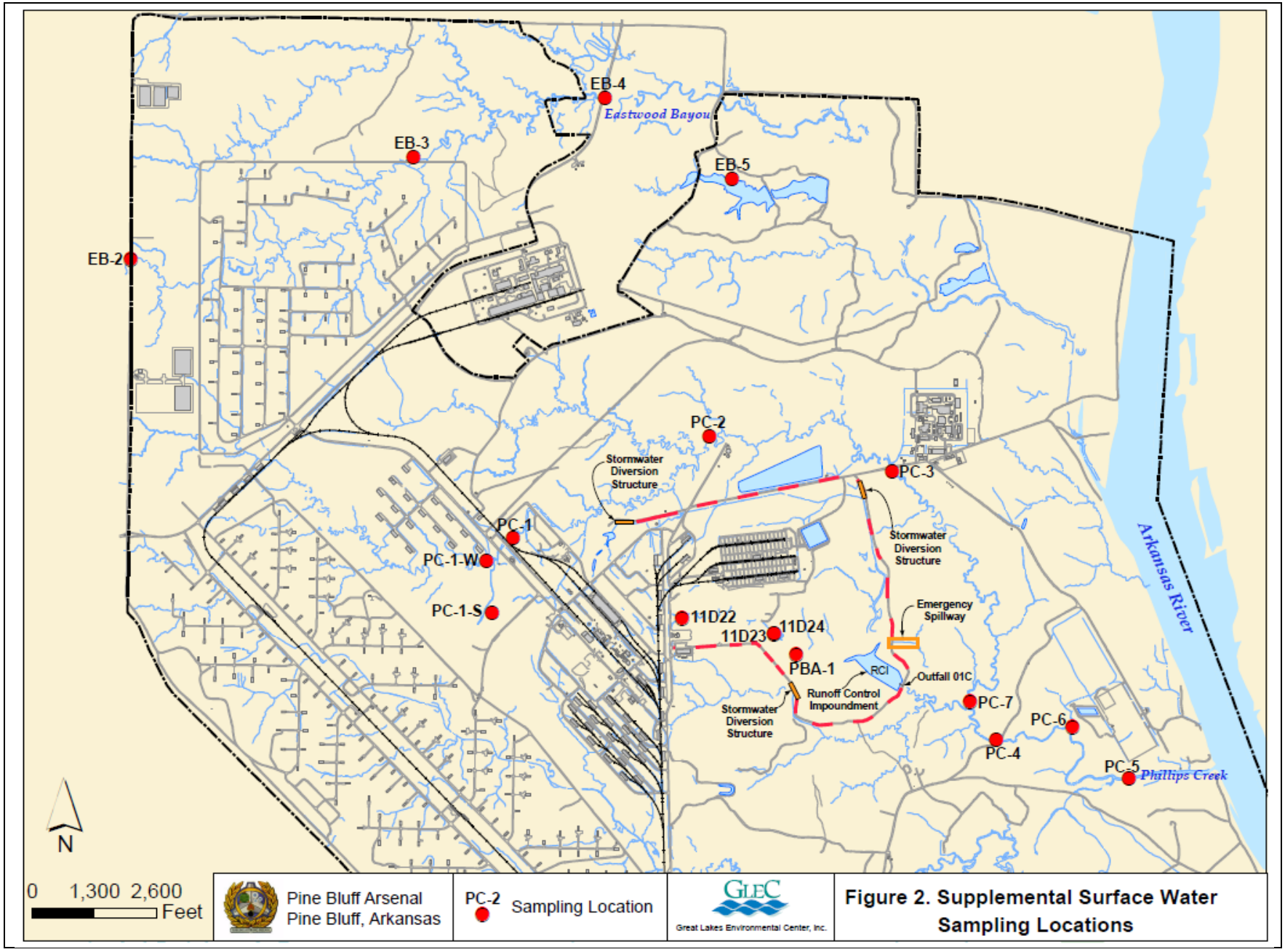

EB-4
Eastwood Bayou
EB-3
EB-5
EB-2
PC-2
Stormwater Diversion Structure
PC-3
PC-1
PC-1-W
PC-1-S
Stormwater Diversion Structure
Arkansas River
11D22
11D23
11D24
Emergency Spillway
PBA-1
RCI
Outfall 01C
Runoff Control Impoundment
Stormwater Diversion Structure
PC-7
PC-6
PC-4
PC-5
Phillips Creek
N
0 1,300 2,600 Feet
Pine Bluff Arsenal
Pine Bluff, Arkansas
PC-2 Sampling Location
GLEC
Great Lakes Environmental Center, Inc.
Figure 2. Supplemental Surface Water Sampling Locations

Table 1. Summary of Sampling Events for Sourcing Mercury in the RCI Watershed from April 2018 through October 2024.

Date	Sample Location	Media	Sample Type
4/17/2018	PC4, PC5, PC6, PC7	Surface water	Grab samples
5/10/2018	PC4, PC5, PC6, PC7	Surface water	Grab samples
9/6/2018	11D-4, 11D-10, 11D-8, 11D-14, 11D-1, 11D-12 11D-13, PC-3, PBA-3, RCI, PBA-1	Surface water	Grab samples
11/12/2018	11D-1, 11D-2 trib, 11D-12, 11D-13, 11D-15, 11D-18, 11D-19, 11D-20, 11D-21, PC3, PBA1, PBA3, RCI	Surface water	Grab samples
4/4-5/2018	11D-1, 11D-16, 11D-17, PBA-1	Surface water	Time series using ISCO automatic sampler
10/16/2019	SOIL 1, SOIL 2, SOIL 3, 11D-1, 19SED -1, 19SED-2, 19SED-3, 19SED-4, 19SED-5, 19SED-6, 19SED-7, 19SED-8	Soil and sediment	Grab samples
10/30/2019	SOIL 2A, SOIL B, SOIL, 2C-1, SOIL 2C-2, SOIL 4, SOIL 5, SOIL 6, SOIL 7, SOIL 3A, SOIL 3B	Soil	Grab samples
12/18/2019	SOIL-7a, SOIL-7b, SOIL-8a, SOIL-8b, SOIL-8c, SOIL-9a, SOIL-9b, SOIL-9c, SOIL-10a, SOIL-10b, SOIL-10c, 19SED-9, 19SED-10, 19SED-11, 19SED-12	Soil and sediment	Grab samples
2/10/2020	11D-22, 11D-24, PBA-1	Surface water	Time series using ISCO automatic sampler
3/9-10/2020	11D-22, 11D-24, PBA-1	Surface water	Time series using ISCO automatic sampler
3/12-13/2020	11D-23	Surface water	Time series using ISCO automatic sampler
3/15/2021	PBA-1, 11D-22, 11D-24, PC-3	Surface water	Time series using ISCO automatic sampler
3/18/2021	11D-23	Surface water	Time series using ISCO automatic sampler
4/29/2021	PC-1S	Surface water	Time series using ISCO automatic sampler
5/2/2021	PC-1W	Surface water	Time series using ISCO automatic sampler
2/26/2021	EB-2, EB-4	Surface water	Time series using ISCO automatic sampler

Date	Sample Location	Media	Sample Type
10/27/2021	EB-2, EB-4	Surface water	Time series using ISCO automatic sampler
9/15/2021	RCI NW, RCI SW, RCI NE, RCI SE	Sediment	Grab samples
9/15/2021	PC-1, PC-2, PC-3, PC-4, PC-5, PC-6	Surface water	Grab samples
11/1-2/2022	PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, EB-2, EB-4	Surface water	Grab samples
10/17/2023	PC-1, PC-2, PC-3, PC-4, PC-5, PC-6, EB-2, EB-3, EB-4, EB-5	Surface water	Grab samples
10/21-22/24	PC-1, PC-2, PC-3, PC-4, PC-5, EB-2, EB-3, EB-4, EB-5	Surface water	Grab samples

Table 2. Total Recoverable Mercury Measured in Water Samples Collected in Phillips Creek (PC) and Eastwood Bayou (EB) on October 21-22, 2024.

Sample ID	Date Collected	Total Recoverable Hg, ng/L (ppt)
PC-1	10-21-24	2.6
PC-2	10-21-24	1.5
PC-3	10-21-24	15
PC-4	10-21-24	530
PC-5-1	10-21-24	8.4
PC-5-2	10-21-24	7.7
PC-5 Field Blank	10-21-24	<0.49
EB-2	10-22-24	0.66
EB-2 Field Blank	10-22-24	<0.49
EB-3	10-22-24	<0.49
EB-4	10-22-24	<0.49
EB-5	10-22-24	<0.49

Notes: Duplicate samples collected at PC-5 are denoted as -1 and -2.

Schedule of Deliverables and Regulatory Approvals.

Description	Status	Completion Date
CAO Extension	DEQ extended the final compliance date in Amendment 1 of CAO LIS 19-129-001, dated April 26, 2022.	December 31, 2024.
Approach 1. Improvement of the operational performance and hydraulic retention time of the RCI to optimize the settling of silt and clay sized particles in the water column that may be associated with mercury.	Complete.	February 20, 2020.
Approach 2. If a source of mercury within the RCI watershed is identified, evaluate best management practices (BMPs) that could be implemented to reduce mercury transport in storm water to the RCI.	A summary of soil, sediment, and surface water testing in the Phillips Creek watershed from 2018-2023 is contained in Volume 3 of the proposed mercury variance (PBA, 2024b). Annual surface water sampling events are scheduled within the Phillips Creek watershed.	As the source of mercury impacts is further defined within the RCI watershed at the completion of the remaining surface water sampling events, the Corrective Action Plan will be revised to include a summary of the proposed BMP(s) and implementation schedule.
Approach 3. Development of a site-specific bioaccumulation factor (BAF) as the evidence to support a WQ standard temporary variance, to propose a site-specific mercury water quality criterion for Phillips Creek.	Report submitted to DEQ on March 15, 2019. DEQ provided comments to this report on July 15th, 2020. PBA prepared responses to DEQ's comments in a letter dated August 14, 2020.	Report submitted to DEQ March 15, 2019. DEQ provided comments to this report on July 15, 2020 and PBA responded to the DEQ comments on August 14, 2020. PBA received DEQ concurrence with the August 14, 2020 response on October 7, 2020.
EPA Approval of Rule 2 Triennial Review (specifically Rule 2.309)	Currently in Triennial Review process.	Completion date dependent upon EPA approval of Rule 2.309
DEQ and USEPA Technical Review of Variance: Preliminary DEQ and USEPA Region 6 review to proceed with temporary mercury variance for the Phillips Creek Watershed.	Technical submission to support the variance was submitted to DEQ May 23, 2024. DEQ comments were received October 17, 2024. Following revisions based on DEQ comments, PBA will submit a revised technical submission to DEQ before being forwarded to USEPA Region 6 during the fall of 2024.	The completion date is dependent upon the amount of time for DEQ approval of the revised mercury variance document review and approval of the proposed variance by USEPA.
3rd Party Rule Making	This process can take up to a year.	Approximately one year from DEQ approval to proceed with a variance of the WQ standard for Hg.
USEPA Regulatory Approval. Following completion of 3rd party rule-making, USEPA approval of the water quality standard temporary variance for Hg in Phillips Creek.	USEPA Region 6 must notify the State within 60 days that revisions are approved or notify the State within 90 days of disapproval (40 CFR 130.21)	To be determined.
DEQ NPDES Permit Modification. Following USEPA approval of the variance site-specific water quality criterion for mercury, DEQ modification of the NPDES permit AR0001678	PBA anticipates discussion with OWQ Permits Section prior to USEPA approval to implement a variance into the permit.	After approval of variance by USEPA Region 6.
Quarterly Progress Reports.	Quarterly progress reports will be prepared until USEPA approval is complete.	Quarterly progress reports will be submitted to DEQ by the 30th of May, August, November, and February