

**TASK ORDER No. 40**  
**Approach Development for the Second Dose Alum Application on Lotus Lake**  
**Pursuant to Agreement for Engineering Services**  
**Riley Purgatory Bluff Creek Watershed District and BARR Engineering Company.**  
**September 8, 2022**

This Task Order is issued pursuant to Section 1 of the above-cited engineering services agreement between the Riley Purgatory Bluff Creek Watershed District (District) and BARR Engineering Company (Engineer) and incorporated as a part thereof.

1. Description of Services: In 2017, The RPBCWD collected sediment cores from Lotus Lake to determine sediment P release rates and the potential need for an alum treatment. Based on these results, an alum treatment was completed in the Fall of 2018 apply one half of the prescribed dose. While total phosphorus and Secchi depth improved in the lake, algal blooms continued to occur. To further investigate the role of internal P loading in these algal blooms and to determine the effectiveness of the first alum dose, sediment cores were again collected from the lake including sediment P release rates in the shallower areas of the lake. The results suggest that these shallow areas may be contributing significant P loads to the lake and need to be addressed. The results also demonstrated significant reductions of P release in the deep areas where the alum treatment was the focus. Based on these results, the next alum treatment on Lotus Lake should consider treatment of the shallower areas along with the second alum dose in the deep areas. A revised plan needs to be developed for the next alum application on Lotus Lake which is scheduled for 2023. The revised plan should:
  - a. Determine alum doses and costs for the shallow areas of the lake
  - b. Consider changes to original application areas to complete the alum treatments in the deep areas while moving some alum to the shallow areas
  - c. Consider the potential limitations and benefits of alum treatments in shallow areas
  - d. Develop scenarios for the 2023 Lotus Lake alum application that consider costs and anticipated effectiveness.
  
2. Scope of Services: To develop an alum application plan for Lotus Lake in 2023, Barr staff will complete the following scope of work.

**Task 1. Review, compile, and analyze current water quality and sediment data for Lotus Lake.**

Barr staff will compile available water quality data and sediment data to enhance the understanding of current water quality conditions and update the assessment of the

alum treatment. Barr staff will summarize water quality and sediment data to determine factors affecting the alum treatment and whether a new course is required.

**Task 2. Develop alum application scenarios for Lotus Lake aimed at minimizing sediment P loading and improving water quality.**

Scenarios will be developed for the next alum treatment to determine the best approach with available resources. Some scenarios (up to 5) may include:

- a. Alum treatment in shallow and deep areas without cost considerations
- b. Alum treatment in shallow and deep keeping costs within current budgets
  - a. Alum may be moved from the deep areas to shallow areas
- c. Adjustments to the dose based on coring results

**Task 3. Present at a District workshop on alum treatments and the alum dosing scenarios for Lotus Lake.**

Once the scenarios are developed, Barr staff will present the results to the District Board including a discussion on the use of alum in deep and shallow lakes with recreational boating. The presentation will cover how alum works, common misconceptions about alum and how it works, case studies of alum used in shallow waterbodies similar to Lotus Lake, and considerations for the next alum treatment. The discussion will summarize the alum dosing scenarios considered, suggest a preferred approach for controlling internal P-loading for Lotus Lake, discuss District planned watershed activities, and an overall approach for long term water quality management in the lake.

**Task 4. Develop a Technical Memorandum summarizing the results of the assessment.**

A technical memorandum summarizing the results and recommendations will be developed and delivered to the District.

3. Deliverables:

The following deliverables will be provided as a result of completing this task order:

- a. A presentation to the District Board including a discussion of the use of alum on shallow lakes and Lotus Lake
- b. A technical memorandum describing the current conditions in Lotus Lake and a recommended approach for future alum treatments.

4. Assumptions:

Several assumptions were made in preparing the scope of work for this agreement.

Assumptions are as follows:

- a. District will be responsible for providing analytical data in a digital format (i.e., spreadsheet) (Pace and UW-Stout data)
- b. The District will provide all available and applicable GIS and CAD files to Barr in electronic format.
- c. The assessment will rely on information and data readily available and provided by the District.
- d. Deliverables will only be provided in electronic format.

5. Budget:

Services under this Task Order will be compensated for in accordance with the engineering services agreement and will not exceed \$9,680 without written authorization by the Administrator. The following table provides a breakdown of the anticipated cost for major tasks associated with scope of services describe above.

Task	Task Description	Anticipated Budget	Anticipated Completion Date
1	Compile and analyze data	\$1,765	October 2022
2	Alum application scenarios	\$3,030	October 2022
3	District workshop	\$2,185	January 2023
4	Technical memorandum	\$2,700	January 2023
<b>Task Order 37; Sediment Analysis Services Total</b>		<b>\$9,680</b>	

6. Schedule and Assumptions Upon Which Schedule is Based

- a) The Board workshop will occur in January 2023. If the workshop schedule does not allow for this meeting, it will be scheduled at a later date.

IN WITNESS WHEREOF, intending to be legally bound, the parties hereto execute and deliver this Agreement.

CONSULTANT

RILEY PURGATORY BLUFF CREEK  
WATERSHED DISTRICT

By \_\_\_\_\_

By \_\_\_\_\_

Its \_\_\_\_\_

Its \_\_\_\_\_

Date:

Date:

*APPROVED AS TO FORM & EXECUTION*

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