

**MEMORANDUM**  
**Comfort Lake-Forest Lake Watershed District**

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**To:** Board of Managers **Date:** February 16, 2017  
**From:** Mike Kinney  
**Subject:** Shields Lake Stormwater Harvest and Irrigation Reuse System and Alum Treatment Scope of Work – Phases 1-4 & 9

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**Background/Discussion**

The Shields Lake Stormwater Harvest and Irrigation Reuse System and Alum Treatment project is a multi-phase project that includes partnering with the Forest Hills Golf Course to complete. Staff has a meeting and presentation scheduled with the Forest Hills Golf Course Board and Staff on the evening February 16<sup>th</sup> to go over the proposed project.

Like other past projects, there are several elements of the project moving in parallel so as to meet the timeline requirements needed to commence the first phase of the project at the earliest window available. In short, we are focusing on starting construction of the stormwater harvest pond in October 2017 with additional elements of the irrigation reuse system to follow. We could then look to complete the alum treatment in 2018.

Given the short window for the needed field investigation work, design, permitting, etc., staff is recommending approval of the attached scope of work for Phases 1-4 & 9 contingent on the execution of the grant agreement with BWSR. This will then allow EOR to start the work needed to meet this timeline without waiting for the next board meeting.

**Recommended Action**

Manager \_\_\_\_\_ moves to authorize the administrator, on advice of counsel, to enter into an agreement with EOR for services outline in the attached memo dated February 16, 2017 regarding Phases 1-4 & 9 of the Shields Lake Stormwater Harvest and Irrigation Reuse System and Alum Treatment in an amount not to exceed \$71,800.

**Attached:** EOR Scope of Work Memo dated February 16, 2017

**Date** | February 16, 2017

**To** | Board of Managers

**Contact info** | CLFLWD

**cc** | Mike Kinney

**Contact info** | CLFLWD

**From** | Greg Graske, PE

**Contact info** | EOR

Meghan Funke, PhD

**Regarding** | Shields Lake Stormwater Harvest and Irrigation Reuse System and Alum Treatment Project

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## Introduction

In 2016, the Comfort Lake Forest Lake Watershed District (CLFLWD) was awarded a Clean Water Fund grant from BWSR to implement the Shields Lake Stormwater Harvest and Irrigation Reuse System and Alum Treatment project. The total project cost was estimated at \$1,030,000 of which the total grant amount is \$824,000 and the required match is \$206,000. The stormwater harvesting and irrigation reuse system will impound water from 294 acres of agricultural and golf course lands (or 35% of the Shields Lake watershed area) draining to a constructed 1.2-acre pond, which will be connected to the existing golf course irrigation system by a 1,300 foot pipe and pump system. Following implementation of the reuse system, which will reduce watershed loads to Shields Lake, alum will be applied to the lake sediments to reduce internal phosphorus loading and flip the shallow lake from a turbid water state to a clear water state.

## Targeting and Pollutant Removal Goals

For Shields Lake to achieve an in-lake phosphorus concentration goal of 60 µg/L, the total phosphorus load needs to be reduced by 912 lb/yr from both watershed sources (35% of the total load) and in-lake sediment sources (65% of the total load). Forest Lake, located downstream of Shields Lake, is currently meeting the water quality standard, but phosphorus reductions are needed to protect this important regional recreational lake.

Flow and water quality monitoring of 16 tributaries to Forest Lake was initiated in March of 2016 as part of the Forest Lake Clean Water Partnership Diagnostic Study. Preliminary load calculations from the first three months of this monitoring identified Shields Lake as the largest single source of flow (35% of the total monitored flow) and phosphorus load (25% of the total monitored load) to Forest Lake. In 2015 the District funded a separate diagnostic study to monitor flow and phosphorus at 5 sites on 4 tributaries to Shields Lake. One tributary site drains 294 acres of agricultural and golf course lands (or 35% of the Shields Lake watershed area) and contributes 61 percent (234 lb/yr) of the total monitored phosphorus load to Shields Lake with a flow-weighted mean concentration of 450 µg/L – well above the ecoregion background target of 100 µg/L.

The stormwater harvest and irrigation reuse system is predicted to supply up to 26 million gallons of water per year for irrigation and reduce 77 pounds of phosphorus per year discharging to Shields Lake (including the dissolved fraction). Currently the golf course withdraws approximately 12 to 30 million

gallons of water each year from a deep, regionally significant aquifer. In addition, several downstream stormwater ponds on the same tributary are undersized and overtaxed. By reducing flows, those ponds will operate more efficiently with increased treatment capacity, further reducing phosphorus loads to Shields Lake.

The in-lake alum treatment is expected to achieve the rest of the phosphorus reductions needed for Shields Lake to meet its in-lake phosphorus goal. The predicted load reduction to Forest Lake from Shields Lake attaining an in-lake phosphorus concentration of 60 µg/L is 250 lb/yr (or 21%) reduction in total phosphorus loads to the middle basin of Forest Lake. Improving the water quality of Forest Lake Middle will also improve the water quality of the next downstream basin, Forest Lake West.

### **Work Plan for Feasibility Phase**

The following work plan details the feasibility activities proposed to implement the Shields Lake Stormwater Harvest and Irrigation Reuse System and Alum Treatment Project. This work plan includes only the engineering costs associated with the feasibility components of the overall BWSR grant work plan. Final Permitting, Final Design, Specifications, Bidding and Construction Management are not included in this work plan.

#### **Phase 1: Project Agreements**

EOR will provide support for District staff and legal counsel who will work to finalize a formal agreement with the Forest Hills Golf Course for construction access, maintenance access, and O&M responsibilities for the stormwater harvest and irrigation reuse system. Forest Hills Golf Course was involved with the submittal of the grant application and provided a letter of support indicating their intent to enter into a formal agreement with the CLFLWD for this project. Currently the project is anticipated to be completed entirely on golf course property. If the feasibility assessment under Phase 3 determines that easements through private property would provide significant overall cost savings, then additional agreements and easements would be required. CLFLWD staff would work closely with the BWSR grant administrator to revise the work plan, if needed.

**Estimated hours and Cost:** 6 hours - \$1,000

**Timeline:** February 2017 – April 2017

**Deliverables:** Forest Hills Golf Course Agreement

**Assumptions:** The bulk of this effort has or will be completed prior to grant execution. Easement drawings and legal descriptions are not included in this cost.

#### **Phase 2: Field Data Collection**

EOR will collect field data necessary to determine the feasibility and specific design of the stormwater harvest and irrigation reuse system. Data collection includes, but is not limited to, a field meeting with golf course representatives, soil borings and geotechnical report, wetland delineation, existing irrigation system design and capacity, and surveying with utility locate. The geotechnical analysis will include determination of the type of material to be excavated in the pond and the depth to water table, structural support recommendations for the outlet structure for the pond and the intake for the reuse system pipe, and evaluation of the soil characteristics along the pipe alignment for assessment of open cut versus directional drilling options. Existing utility information within the project area will be requested from the

City of Forest Lake, the golf course and known private utilities. EOR will complete a wetland delineation for all wetlands within the project area, finalize a delineation report based on site observations and monitoring data, and bring the delineation through the approval process with the local WCA LGU (City of Forest Lake) and USACOE.

**Estimated hours and Cost:** 116 hours - \$28,300 (approximately \$13,000 of this is in the form of reimbursable expenses includes soil borings, geotechnical report, and surveying expenses)

**Timeline:** April 2017 – June 2017

**Deliverables:** Base CADD drawings for existing conditions, Soil boring logs and geotechnical report, Approved Wetland Delineation

### **Phase 3: Feasibility Assessment**

As part of the feasibility assessment, EOR will consider pond sizing and outlet structure design, pipe alignment options, and pipe system design (gravity versus pump) options that will meet the Golf Course irrigation demands and the water and phosphorus reduction goals for Shields Lake. This task includes watershed modeling refinement, multi-year reuse calculator scenario testing, water quality benefit calculations, concept CADD plans, and preliminary cost estimates. As part of the modeling exercise EOR will assess upstream and downstream water levels and flows. Water levels and flows have been a concern in the downstream neighborhood. The modeling will evaluate different pond and outlet configurations in an attempt to reduce flows and water levels downstream. The modeling will also be used to ensure that there is no increase in flood elevations on the adjacent private properties while maximizing the amount of water that can be stored for reuse. Multiple pipe alignments, outlet structures and pond configurations will be considered as part of the feasibility assessment. EOR will also assess the ability to reuse excavated materials on adjacent golf course property in order to save on hauling costs.

**Estimated hours and Cost:** 262 hours - \$31,900

**Timeline:** February 2017 – June 2017

**Deliverables:** Design recommendations for pipe alignment, size and configuration, modeling results including multi-year assessment of flows and volumes, pond sizing and outlet design recommendations, concept CADD drawings, preliminary cost estimates

### **Phase 4: Permitting Needs Assessment**

EOR and District staff will reach out to potential permitting agencies to discuss the project activities, goals and permitting requirements. Agencies may include (but not be limited to) MPCA (NPDES and SWPPP), City of Forest Lake, MDNR (Appropriations), Washington County, BWSR, MDA, and USACOE. This will include preliminary scoping and discussions with agencies of mitigation strategies for potential wetland impacts. An EAW is currently not expected to be required for this project.

**Estimated hours and Cost:** 40 hours - \$5,800

**Timeline:** May 2017 – July 2017

**Deliverables:** Summary of permitting requirements and input from permitting agencies

**Assumptions:** This task is for initial meetings with permitting agencies and assessment of permitting needs only. Additional work will be needed for drafting of all of the required permits

**Phase 9: Alum Dosing**

Paleolimnological sediment core data, previously collected by the St. Croix Watershed Research Station on behalf of CLFLWD, will be reviewed and analyzed by EOR to develop an appropriate dosing plan for Shields Lake in 2017. It is anticipated that a dosing plan will be developed in 2017, concurrent with the design of the reuse system. The alum treatment will likely be split into two treatments, with the first half applied in 2018, and the second half applied in 2019. The alum will likely be applied in the fall, following aquatic plant senescence, but the exact timing of the treatments is yet to be determined.

**Estimated hours and Cost:** 35 hours - \$4,800

**Timeline:** March 2017 – September 2017

**Deliverables:** Alum dose specifications

**Assumptions:** This task is for development of Alum dose specifications only. Additional work will be needed for permitting, bidding, project oversight.

**Summary**

The total estimated cost for the feasibility phase of the Shields Lake Stormwater Harvest and Irrigation Reuse System and Alum Treatment Project Work Plan is \$71,800. The Board should consider authorization of Phases 1-4 & 9 contingent on final approvals of the BWSR grant. The phases outlined in this memo include only the feasibility portions of the phases from the overall work plan presented to BWSR. Remaining Phases may occur following Board ordering the project per 103B.251. A work plan for the remaining phases will be presented at that time.