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MEMO

TO: Nine Mile Creek Watershed District Board of Managers

FROM: Randy Anhorn

DATE: June 11, 2019

RE: Draft Lake Cornelia and Lake Edina User Attainability Analysis studies

Background/Discussion

Staff has been working on updating the Lake Cornelia and Lake Edina User Attainability Analysis (UAA) studies. A draft report has recently been completed. Staff will present findings, recommendations and next steps at the June 19, 2019 regular Board meeting.

Request

While the draft report identifies a few management practices to improve the lakes' water quality, staff is interested in undertaking an in-lake alum treatment on Lake Cornelia yet his fall. In order to do so, we would need to a complete a feasibility study on the alum treatment (to identify application rates, estimated cost, etc....) for the board to accept. For this reason, after discussion on the draft report and findings, we would like the managers to direct staff bring the final report (with suggested edits) **AND** an alum treatment feasibility study to the managers to take action on at the July board meeting. Attached is a scope of work for the feasibility study.

Memorandum

To: Randy Anhorn, Nine Mile Creek Watershed District
From: Janna Kieffer
Subject: Lake Cornelia Alum Treatment Feasibility Study Scope of Work
Date: June 12, 2019
c: Keith Pilgrim, Barr Engineering Co.

The Nine Mile Creek Watershed District (NMCWD) recently completed a Use Attainability Analysis (UAA) for Lake Cornelia (updated from 2010) and Lake Edina (first version) to assess the water quality and prescribe management activities to improve lake water quality. One of the recommendations of the study is to conduct an alum treatment of Lake Cornelia (North and South Basins) to bind (or immobilize) the phosphorus in lake bottom sediments and prevent release of the phosphorus into the water column. This management activity will improve summer water quality conditions in Lake Cornelia (North and South) and Lake Edina.

The NMCWD is tentatively planning, upon Board approval, to conduct the alum treatment in the fall of 2019. The UAA report includes analysis of the anticipated effectiveness of an alum treatment in improving water quality and a planning-level cost estimate. The feasibility study will summarize the results of the UAA as it pertains to the need for and anticipated effectiveness of the alum treatment, as well as provide additional consideration and discussion of other alternatives to reduce internal phosphorus loading. The feasibility study will also include a more in-depth review of site access, identification of permitting requirements, and an updated cost estimate based on data from sediment cores collected from North and South Lake Cornelia in early-June.

Scope of Work

The primary tasks to be completed and/or summarized as part of the feasibility study are discussed below.

1. Sediment core collection and phosphorus fractionation (*already underway as part of 2019 targeted monitoring*)

Sediment cores were collected from North and South Cornelia in June 2019. These samples will be analyzed through a process called phosphorus fractionation to better understand the potential rate of phosphorus release from lake bottom sediments. For this task, we will fractionate the sediment core samples to extract and accurately identify/target the forms of phosphorus that are contributing to internal loading, and subsequently determine the implications for control. Iron-bound phosphorus, organic phosphorus, aluminum-bound phosphorus, and calcium-bound phosphorus will be extracted and analyzed separately. Iron-bound and loosely-sorbed phosphorus are the forms of phosphorus that can most readily contribute to internal loading of phosphorus within a water body. Anoxic conditions (i.e. low

oxygen levels) at the sediment interface will convert iron in the sediment to a soluble form, releasing phosphorus that was previously bound to insoluble iron. Organic phosphorus can also contribute to internal loading of biologically available phosphorus. Under normal conditions, aluminum-bound and calcium-bound phosphorus in the sediment do not contribute to internal loading of biologically available phosphorus.

2. Development of Alum Dosing and Preliminary Alum Application Plan

Results of the sediment core analysis will be used to calculate the optimal alum dose for each part of each lake to reduce internal phosphorus loading. Based on the amount of mobile phosphorus (the pool that contributes to internal loading) in the sediment, an alum dose will be calculated that will reduce internal loading to the desired goal. Another factor that will be considered in calculating the alum dose is the amount of labile (easily broken down) organic phosphorus in the sediment. This form of phosphorus is not immediately available for use by algae but will break down over time and increase the mobile phosphorus pool in the sediment. The addition of this phosphorus pool into the dosing calculation will ensure that an alum dose is added to each lake that will effectively control internal phosphorus loading for an extended period of time.

3. Permitting and Site Access

There is no public access to Lake Cornelia. As part of the feasibility study, we will work with the City of Edina to identify potential staging areas and routes to provide equipment access, identify site access restoration requirements, and identify/evaluate the need for permissions to access the lake via private lands.

The feasibility study will also include a summary of project permitting requirements.

4. Preparation of Updated Engineer's Estimate of Probable Costs

An updated engineer's estimate of probable cost to conduct the alum treatment will be completed following the alum dosing and development of the preliminary application plan. This information will include the total alum quantity to be applied, the total acreage to be treated and estimates for the quantity and price of the bid items.

5. Technical Memo

The results of the tasks described above will be summarized in a technical memorandum and submitted to NMCWD staff, the NMCWD Board, and the City of Edina for review and comment. The technical memo will include a summary of the results of the UAA as it pertains to the need for and anticipated effectiveness of the alum treatment, as well as provide additional discussion of other alternatives to reduce internal phosphorus loading. This memorandum will include a map that indicates the recommended alum dosing rates that should be applied to the various areas of each lake.

Estimated Cost and Schedule

The following table summarizes the estimated costs associated with each task described in the scope of work.

Task	Description of Task	Amount
1	Sediment core collection and phosphorus fractionation (<i>underway as part of 2019 targeted monitoring</i>)	\$5,000
2	Development of alum dosing and preliminary alum application plan	\$4,000
3	Permitting and Site Access	\$2,000
4	Preparation of Updated Engineer's Estimate of Probable Costs	\$1,000
5	Technical memo	\$3,000
Total Estimated Cost (excluding Task 1)		\$ 10,000

Assuming authorization to proceed at the June 19, 2019 NMCWD regular board meeting, we propose to complete the work and provide a draft of the technical memo by July 17, 2019.