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February 28, 2023

Mr. Kevin Gagne
Deputy Director
Lewiston Public Works Department
103 Adams Avenue, Lewiston, ME 04240

Dear Mr. Gagne:

Water Resource Services (WRS) is pleased to offer services relating to the management of raw water quality in or entering Lake Auburn for the City of Lewiston. The fundamental issue facing the City with respect to Lake Auburn is ongoing and increasing inputs from the watershed. Without complete control of the watershed and its land uses, the threat of undesirable inputs grows with population and the long-term health of the lake and water supply is at risk. Various efforts are underway to manage the watershed, but from past experience there is already enough development and agriculture to cause at least occasional water quality problems in the lake. These include low oxygen over a variable area of the bottom and portion of the water column, generation of elevated concentrations of algae, and increased turbidity. With limited treatment options, maintaining a high quality of raw water is imperative. From our discussion of current issues and projected needs, the following scope of services is suggested.

1. Review existing in-lake data that include oxygen, phosphorus concentration, algae, water clarity, and conductivity for trends over time and consider the influence of past in-lake management actions (e.g., aluminum treatment), precipitation pattern, and temperature. This would include in-lake and tributary data, with estimation of flow for tributaries allowing quantification of inputs from each. The intent is to quantify changes over time, establish relative magnitude of sources, and look for drivers that might be subject to control.
2. Evaluate the overall phosphorus load to Lake Auburn through available data and the Lake Loading and Response Model (LLRM). We understand that FBE has created a version of this model for their work examining the influence of possible ordinances, and we can limit cost if that model is made available. We need to know the range of projected loads for key inputs, which would include major tributary drainage areas, direct drainage, any permitted discharges, atmospheric inputs, groundwater load, wildlife inputs, and internal load. This loading analysis is needed to compare results from possible management scenarios.
3. Evaluate any part of the watershed believed to generate a significant portion of the total phosphorus load to Lake Auburn for sources and potential for source control and pollutant trapping. FBE has provided an assessment of the likely result of proposed ordinances, but we are not aware of any evaluation of actual sources on a parcel by parcel basis or consideration of the potential for load reduction by a suite of watershed management techniques. Comparison of the potential load reduction from existing and projected future watershed loading scenarios to the target threshold will reveal whether or not the target phosphorus load is achievable through watershed management.

4. Evaluate options for water quality control at or near significant input points to Lake Auburn. There are multiple "end of pipe" methods for improving water quality, including various detention, filtration, wetland, and chemical treatments, any of which could be applicable. Of primary interest here is the potential to establish a phosphorus inactivation dosing station on one or more tributaries or major storm water drainage systems. Addition of aluminum could greatly reduce available phosphorus entering the lake, would also impact suspended solids (and associated turbidity), and could be focused on storms or specific times of the year as warranted to achieve the desired load. We know that in-lake aluminum addition can provide temporary control of phosphorus availability and internal loading, but focusing on input points could be more effective and less expensive.

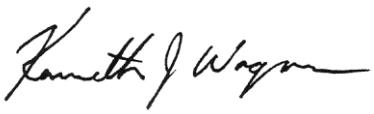
This process is analogous to figuring out how to best repair a leaky boat. We know that leaks (in this case mostly inputs from the watershed) are causing the boat to take on water (phosphorus, algae, turbidity in the lake). We know how to bail out the boat (algaecides and phosphorus inactivation that have been used, oxygenation and dredging which have not been applied) to keep it afloat, but recognize that ultimately the leaks have to be patched. Just how we go about reducing those leaks is subject to practical limitations and cost, and understanding the options, related benefits and constraints, and associated costs, will inform sound decisions.

The cost of this effort is largely dependent on data availability and labor to work with those data, evaluate the watershed, review modeling, and set up comparisons of existing vs potential future scenarios for management. Working with Ecological Instincts, we can provide these services. My best estimate of related costs is as follows:

Task #	Description	Cost ($)
1	Data review	7200
2	P load from LLRM	3700
3	Watershed evaluation	21500
4	Inflow treatment options	7500
5	Meetings and reports	7200
	Total	47100

Contact me with questions or to discuss moving forward.

Sincerely yours,



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