Report to: Markham Subcommittee Meeting Date: June 26, 2024

SUBJECT: Swan Lake- 2023 Water Quality Status and Updates
PREPARED BY: Robert Muir, Environmental Services, Ext. 2357
Zahra Parhizgari, Environnemental Services, Ext. 2867

RECOMMENDATION:

1. THAT the report entitled "Swan Lake- 2023 Water Quality Status and Updates" be received;
2. AND THAT Staff continue to implement the Long-term Management Plan for Swan Lake approved by Council in December 2021, including advancement of submerged aquatic vegetation, research into chloride treatment, and flow diversion evaluation (previously in Phases 2 and 3 of the Plan);
3. AND THAT Staff report back annually on water quality results and evaluation of adapted Core and Complementary measures for consideration in Phase 2 of the Plan through the Markham Sub-Committee with the participation of the Friends of Swan Lake Park;
4. AND THAT the next review of the Plan will be in 2025 (after the completion of Phase 1 and other measures as listed under item 2) with consideration for a workshop in 2026;
5. AND THAT Staff be authorized and directed to do all things necessary to give effect to this resolution.

PURPOSE:

The purpose of this report is to present:

- 2023 water quality results and implemented measures;
- Scope of work for 2024; and
- Report on the community meeting held on March 25, 2024

BACKGROUND:

On November 16, 2021, Staff provided a report and presentation to the Markham Subcommittee titled Swan Lake Water Quality Management Plan, outlining the history of Swan Lake management activities up to that point and a Long-Term Management Plan for Swan Lake Water Quality (the Plan) for the next 25 years. The Plan was developed based on a scientific evaluation of issues and opportunities for lake management and an assessment of several lake management measures designed with input from stakeholders (see here for Meeting Minutes).

The Swan Lake Long-Term Management Plan follows an adaptive management approach, through which management activities would be adjusted to maximize benefits and minimize

impacts. The Council endorsed this phased approach on December 14, 2021 (see here for General Committee Meeting Minutes and Council Meeting Minutes).

As per resolutions 7, 8, and 9 of the December 14, 2021 meeting, Staff have met the Friends of Swan Lake Park and the Markham Subcommittee annually to report on the water quality results and evaluation of the adapted measures (see here for Markham Subcommittee Report and Presentation in 2022 and 2023).

The following Discussion presents the 2023 water quality results and a description of the scope of work for the 2024 activities.

At the 2023 Sub-Committee meeting, the sub-committee requested that Staff hold a public meeting to communicate the Swan Lake water quality improvement program to City residents. This meeting was held on March 25, 2024, a summary of which is also provided in this report.

DISCUSSION:

2023 Water Quality Results and Implemented Measures

The Phase 1 Core Measures completed in 2023 include:

- Annual monitoring
- Enhanced geese management
- Fish management

Staff collected water quality data through the Swan Lake monitoring program from January to December 2023. These data provide insight into long-term trends in water quality and help determine the need for and impact of chemical treatment of Swan Lake (see Attachment A for the 2023 Annual Report).

Contractors completed geese management by chasing ("hazing") geese, oiling eggs, and managing nests. The hazing frequency was modified in 2021 to focus on the migration seasons. The increased hazing frequency (starting in mid-August) effectively reduced the number of geese present at different times of the day to about 50% of the geese numbers in 2020. As part of the enhance program, resident geese were relocated away from the Lake.

A fish inventory and removal campaign were completed to remove bottom-dwelling fish, which could interfere with the chemical treatment efficacy. Only three fish species were caught in the Lake through this intensive effort: Common Carp (non-native), Brown Bullhead, and Fathead Minnow.

The management activities in 2023 focused on the significant nutrient loadings identified in the Long-Term Plan (i.e., fish management to reduce internal loads from the lake bottom and geese management to reduce external loads).

In addition, some Phase 2 and 3 Complementary and Alternative Measures were brought forward in 2023, including:

- Planting of submerged aquatic vegetation
- Research into chloride removal technologies
- Feasibility of flow diversion

After reviewing the 2022 water quality results by the City's limnologist consultant, it was determined that the introduction of submerged aquatic vegetation (macrophytes) should be advanced to Phase 1 so that beneficial plant communities can compete with and help mitigate algae (phytoplankton) growth. Macrophytes will increase water clarity, which in turn, enhances their own growing conditions. The TRCA was hired in 2023 and planted wild celery in four fenced areas on the north side of the Lake.

Discussion with York University continued to enhance the methodology for a pilot project using biochar for the removal of chloride from water. York University is in the process of acquiring additional research funding and contract review in preparation for this project.

In 2023, a consultant was hired to conduct a technical analysis of stormwater flow diversion scenarios for the catchment area contributing to the Lake. The consultant has completed a background review and collected additional field data to adequately characterize the stormwater system in the catchment area and is currently developing a hydrologic and hydraulic model.

2024 Scope of Work

a. Phase 1 Core Measures

In 2024, the planned Phase 1 Core measures will continue, including water quality monitoring, geese management, and fish management. The scope of geese management was expanded in 2022 to further reduce the number of resident and migratory geese.

The Long-Term Plan includes provisions for a chemical treatment program every three to five years as the measure that will have the most immediate and tangible effect on water quality in the Lake. A chemical treatment using PAC was completed in 2021. The second chemical treatment is currently being planned for May-June of 2024.

b. Introducing Submerged Plants

Planting more submerged aquatic vegetation will continue in 2024 to increase water clarity. The 2024 chemical treatment will help improve clarity, providing an excellent opportunity for the plants to establish and propagate.

c. Chloride Removal using Biochar

Contract negotiation is underway with York University to develop biochar adsorption techniques to remove chloride from Swan Lake. In 2024, the researchers will characterize Swan Lake water and conduct lab-scale units to test the biochar's efficiency in this process.

d. Flow Diversion Study

The flow diversion study will be completed in 2024 and will provide information on any feasible scenario for flow diversion, and potential impacts and mitigation measures for any capacity-related impacts projected in the study area. The result of this analysis will be used to determine the potential benefits of each scenario on chloride concentration in the Lake.

This analysis will be of a technical nature and depending on the outcome and other considerations (e.g., system ownership), a Municipal Class Environmental Assessment-type study may be required to engage all stakeholders and identify a preferred alternative.

Community Meeting

During the May 11, 2023, Markham Subcommittee meeting, the sub-committee requested that a public information meeting be held to explain the Swan Lake Water Quality Improvement program to interested residents.

This meeting was held on March 25, 2024, at the Markham Museum to:

- Provide details of the water quality improvement program;
- Provide details of the park's improvement program;
- Share achievements of the program since it started;
- Inform the public about upcoming activities in 2024;
- Discuss ways to get involved in improving water quality and habitat health;
- Provided updates on the Shoreline Restoration project and its continuing role supporting water quality improvement as a first priority;
- Answer any questions the public may have.

The meeting witnessed an impressive turnout with over 120 community members in attendance. A Power Point presentation was delivered, effectively communicating the program details and its positive results. The active participation and expressed appreciation from the community for the work completed by Environmental Services and Operations Staff was truly heartening and appreciated. The presentation and display boards can be found in Attachment B.

FINANCIAL CONSIDERATIONS:

No financial impact.

HUMAN RESOURCES CONSIDERATIONS:

Not applicable.

ALIGNMENT WITH STRATEGIC PRIORITIES:

This report aligns with the areas of strategic focus as follows:

- Safe, Sustainable, & Complete Community: the proposed strategy will support the enhancement of the natural environment and built form through sustainable integrated planning, infrastructure management and services.
- Stewardship of Money & Resources: the strategy proposed will provide a reasonable cost-effective level of service.

BUSINESS UNITS CONSULTED AND AFFECTED:

Not applicable.

RECOMMENDED BY:

Eddy Wu,
Director, Environmental Services

Morgan Jones,
Commissioner, Community Services

ATTACHMENTS:

Attachment A - 2023 Annual Water Quality Report

Attachment B- Community Meeting Presentation and Display Boards

Attachment A- 2023 Annual Water Quality Report

Attachment B- Community Meeting Presentation and Display Boards