General Committee Meeting Agenda

Meeting No. 15 | September 6, 2022 | 9:30AM | Live streamed

Members of the public have the option to attend either remotely via Zoom or in-person in the Council Chamber at the Civic Centre.

Members of the public can participate by:

1. VIEWING THE ONLINE LIVESTREAM:

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2. EMAILING A WRITTEN SUBMISSION:

Members of the public may submit written deputations by email to clerkspublic@markham.ca.
Written submissions must be received by 5:00 PM the day before the meeting.
If the deadline for written submission has passed, you may:
Email your written submission directly to Members of Council; or
Make a deputation at the meeting by completing and submitting an online *Request to Speak Form*
If the deadline for written submission has passed **and** Council has finished debate on the item at the meeting, you may email your written submission directly to Members of Council.

3. REQUEST TO SPEAK / DEPUTATION:

Members of the public who wish to make a live deputation, please register prior to the start of the meeting by:
Completing an online ***Request to Speak Form***, or,
E-mail clerkspublic@markham.ca providing full name, contact information and item they wish to speak, or,
If you do not have access to email, contact the Clerk's office at **905-479-7760** on the day ofthe meeting.
*If Council or Committee has finished debate at the meeting on the item, you may email your written submission directly to Members of Council.

The list of ***Members of Council is available online at this link.***
Alternate formats for this document are available upon request.
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Note: As per Section 7.1(h) of the Council Procedural By-Law,
Council will take a ten minute recess after two hours have passed since the last break.

General Committee Agenda

Meeting Number: 15

September 6, 2022, 9:30 AM - 1:00 PM

Live streamed

Pages

1. CALL TO ORDER

INDIGENOUS LAND ACKNOWLEDGEMENT

We begin today by acknowledging the traditional territories of Indigenous peoples and their commitment to stewardship of the land. We acknowledge the communities in circle. The North, West, South and Eastern directions, and Haudenosaunee, Huron-Wendat, Anishnabeg, Seneca, Chippewa, and the current treaty holders Mississaugas of the Credit peoples. We share the responsibility with the caretakers of this land to ensure the dish is never empty and to restore relationships that are based on peace, friendship, and trust. We are committed to reconciliation, partnership and enhanced understanding.

2. DISCLOSURE OF PECUNIARY INTEREST

3. APPROVAL OF PREVIOUS MINUTES

3.1. MINUTES OF THE JUNE 20, 2022 GENERAL COMMITTEE (16.0) — 7

1. That the minutes of the June 20, 2022 General Committee meeting be confirmed.

4. DEPUTATIONS

5. COMMUNICATIONS

5.1. YORK REGION COMMUNICATIONS (13.4) — 19

Note: Questions regarding Regional correspondence should be directed to Chris Raynor, Regional Clerk.

1. That the communication dated June 14, 2022 from York Region regarding 2022 Development Charges Bylaw Notice of Passage be received for information purposes.

6. PETITIONS

7. CONSENT REPORTS - FINANCE & ADMINISTRATIVE ISSUES

7.1. MINUTES OF THE MAY 30, 2022 MARKHAM PUBLIC LIBRARY BOARD MEETING (16.0) 20

1. That the minutes of the May 30, 2022 Markham Public Library Board meeting be received for information purposes.

7.2. MINUTES OF THE APRIL 20, 2022 AND MAY 18, 2022 ANIMAL CARE COMMITTEE (16.0) 27

1. That the minutes of the April 20, 2022 and May 18, 2022 Animal Care Committee meeting be received for information purposes.

7.3. MINUTES OF THE MARCH 7, 2022 GERMAN MILLS MEADOW AND NATURAL HABITAT COMMITTEE MEETING (16.0) 42

1. That the minutes of the March 7, 2022 German Mills Meadow and Natural Habitat Committee meeting be received for information purposes.

7.4. MINUTES OF THE FEBRUARY 9, MARCH 23, APRIL 13 & MAY 18, 2022 UNIONVILLE BUSINESS IMPROVEMENT AREA MEETING (16.0) 47

1. That the minutes of the February 9, March 23, April 13 and May 18, 2022 Unionville Business Improvement Area Board meeting be received for information purposes.

7.5. 2023 CAPITAL BUDGET PRE-APPROVAL (7.5) 63

J. Pak, ext. 2514

1. That the report dated September 6, 2022 entitled, “2023 Capital Budget Pre-Approval” be received; and,
2. That Council approve the 2023 Capital Budget pre-approvals, which total $48,879,300 as outlined in Appendices 1 and 2; and,
3. That Staff be authorized and directed to do all things necessary to give effect to this resolution.

7.6. STAFF AWARDED CONTRACTS FOR JUNE, JULY AND AUGUST 2022 (7.12) 198

A. Moore, ext. 4711

1. That the report entitled “Staff Awarded Contracts for the Months of June, July, August 2022” be received; and,
2. That Staff be authorized and directed to do all things necessary to give

effect to this resolution.

8. CONSENT REPORTS - COMMUNITY SERVICES ISSUES

8.1. 026-T-18 ROAD REHABILITATION PROGRAM - RESTORATION OF CONCRETE CURB AND SIDEWALK CONTRACT EXTENSION (5.10) 213

S. Dollmaier, ext. 2748 / M. Lee, ext. 2239

1. That the report entitled “026-T-18 Road Rehabilitation Program – Restoration of Concrete Curb and Sidewalk Contract Extension” be received; and,
2. That the contract for Restoration of Concrete Curb and Sidewalk be extended for one (1) additional year (from January 1 – December 31, 2023) to De Ferrari Construction Limited in the estimated value of $2,402,562.58 inclusive of HST and subject to Consumer Price Index (CPI) All-items Canada from December 2021 to December 2022; and,
3. That the award be funded from the capital accounts for the annual Asphalt program subject to Council approval of the 2023 capital budget; and,
4. That the tendering process be waived in accordance with Purchasing By-Law 2017-8, Part II, Section 11. Non-Competitive Procurement, items 11.1 (c) and (g), which state:
    a. When the extension of an existing Contract would prove more cost-effective or beneficial; and
    b. Where it is in the City’s best interest not to solicit a competitive bid; and,
5. That the 2022 contract shortfall in the estimated amount of $203,472.68 inclusive of HST be funded from Life Cycle Replacement and Reserve Fund; and further,
6. That Staff be authorized and directed to do all things necessary to give effect to this resolution.

8.2. EXTENSION AND ALIGNMENT OF RECYCLING DEPOT SERVICE CONTRACTS (5.1) 217

C. Marsales, ext. 3560

1. That the report entitled “Extension and Alignment of Recycling Depot Service Contracts” be received; and,
2. That the tendering process be waived in accordance with the City’s Purchasing By-law # 2017-8, Part II, Section 11.1(c), Non Competitive Procurement which states, “when the extension of an existing Contract would prove more cost-effective or beneficial”; and,
3. That the recycling depot service contracts be extended with The Recycle People Corporation for three (3) years from January 1,

2023 to December 31, 2025 in the annual amount of $349,874.70 (Incl. of HST) relating specifically to the three (3) separate contracts below;

- $ 103,226.24 – Recycling Collection and Marketing (201-Q-17)
- $ 33,518.00 – Styrofoam Densifier (048-S-20)
- $ 213,130.46 – Recycling Depot Staffing (019-S-19)
- $ 349,874.70 – Total Amount for 2023

4. That the 2023 Operating Budget be adjusted by $32,389.75 ($349,874.70 - $317,484.95 = $32,389.75) as outlined in Financial Considerations, subject to Council approval of the 2023 Operating Budget; and,
5. That the award amounts in 2024 and 2025 be adjusted for price based upon the Consumer Price Index for All-Items Ontario (May to May) and Council approval of the 2024 and 2025 Operating Budgets; and,
6. That the Chief Administrative Officer be authorized to extend all three contracts for an additional fourth (4th) year in 2026, at the same terms and conditions by mutual agreement between the City and the contractor, should the blue box program transition process be delayed; and further,
7. That Staff be authorized and directed to do all things necessary to give effect to this resolution.

9. PRESENTATION - COMMUNITY SERVICES ISSUES

9.1. 011-T-22 WINTER ROAD MAINTENANCE CONTRACT UPDATE (5.10) 221

A. Lam, ext. 4857 / S. Dollmaier, ext. 2748

1. That presentation entitled "Tender 011-T-22 Winter Road Maintenance Services" be received; and,
2. That Council adopts plowing all local roads at 7.5cm and Senior Windrow to be completed in four (4) hours, be awarded for twelve (12) winter seasons (November 16, 2024 – April 15, 2036) in the estimated annual amount of $7,802,885.98 (inclusive of HST); and,
3. That the estimated budget shortfall of $1,665,086 be phased in over a 3-year period commencing in 2023 and be included as part of the 2023-2025 operating budgets, subject to Council approval of the 2023-2025 operating budgets.

10. REGULAR REPORTS - FINANCE & ADMINISTRATIVE ISSUES

10.1. MINUTES OF THE MAY 11, 2022 MARKHAM SUB-COMMITTEE SWAN LAKE MEETING (16.0) 238

Note: Committee has the option to endorse, amend, refer to staff or receive for information the following recommendation from the May 11, 2022 Markham

Sub-Committee meeting:

That the General Committee consider the following motion passed at the May 11, 2022, Markham Sub-Committee meeting:

1. That the staff report and presentation on the "Swan Lake- 2021 Water Quality Status and Updates" be received; and,
2. That the FOSLP (Friends of Swan Lake Park) presentation "Action Plan For Restoration of Swan Lake and Swan Lake Park" and York University presentation on the research it is proposing on the use charcoal filter system to remove nutrients and chloride be received and referred to staff; and further,
3. That staff report back on the feasibility, and implications of designating Swan Lake a natural heritage asset, as part of the Official Plan update.

11. MOTIONS

12. NOTICES OF MOTION

13. NEW/OTHER BUSINESS

__As per Section 2 of the Council Procedural By-Law, "New/Other Business__ would generally apply to an item that is to be added to the __Agenda__ due to an urgent statutory time requirement, or an emergency, or time sensitivity".

14. ANNOUNCEMENTS

15. CONFIDENTIAL ITEMS

That, in accordance with Section 239 (2) of the Municipal Act, General Committee resolve into ta confidential session to discuss the following matters:

15.1. FINANCE & ADMINISTRATIVE ISSUES

15.1.1. GENERAL COMMITTEE CONFIDENTIAL MINUTES- JUNE 20, 2022 (16.0) [Section 239 (2)(a)(c)]

15.1.2. THE SECURITY OF THE PROPERTY OF THE CITY OR LOCAL BOARD; 2023 CAPITAL BUDGET PRE-APPROVAL (7.13) [239 (2)(a)]

16. ADJOURNMENT

Information Page

General Committee Members: All Members of Council

General Committee
Chair: Regional Councillor Jack Heath
Vice Chair: Councillor Khalid Usman

Finance & Administrative Issues
Chair: Regional Councillor Jack Heath
Vice Chair: Councillor Khalid Usman

Community Services Issues
Chair: Councillor Karen Rea
Vice Chair: Councillor Isa Lee

Environment & Sustainability Issues
Chair: Regional Councillor Joe Li
Vice Chair: Councillor Reid McAlpine

Land, Building & Parks Construction Issues
Chair: Councillor Keith Irish
Vice Chair: Councillor Andrew Keyes

General Committee meetings are audio and video streamed live at the City of Markham's website.

Alternate formats are available upon request.

Consent Items: All matters listed under the consent agenda are considered to be routine and are recommended for approval by the department. They may be enacted on one motion, or any item may be discussed if a member so requests.

Note: The times listed on this agenda are approximate and may vary; Council may, at its discretion, alter the order of the agenda items.

Note: As per the Council Procedural By-Law, Section 7.1 (h) General Committee will take a 10 minute recess after two hours have passed since the last break.

General Committee is scheduled to recess for lunch from approximately 12:00 PM to 1:00 PM.

MARKHAM

Electronic General Committee Meeting Minutes

Meeting Number: 14
June 20, 2022, 9:30 AM - 3:00 PM
Live streamed

Roll Call	Mayor Frank Scarpitti Deputy Mayor Don Hamilton Regional Councillor Jack Heath Regional Councillor Joe Li Regional Councillor Jim Jones Councillor Keith Irish Councillor Alan Ho	Councillor Reid McAlpine Councillor Karen Rea Councillor Andrew Keyes Councillor Amanda Collucci Councillor Khalid Usman Councillor Isa Lee
Staff	Andy Taylor, Chief Administrative Officer Trinela Cane, Commissioner, Corporate Services Claudia Storto, City Solicitor and Director of Human Resources Joel Lustig, Treasurer Bryan Frois, Chief of Staff Kimberley Kitteringham, City Clerk Mary Creighton, Director, Recreation Services Frank Clarizio, Director, Engineering Biju Karumanchery, Director, Planning & Urban Design Graham Seaman, Director, Sustainability & Asset Management	Alex Moore, Manager of Purchasing & Accounts Payable Morgan Jones, Commissioner, Community Services Rob Cole, Acting Chief Information Officer Eddy Wu, Acting Director, Environmental Services Hristina Giantsopoulos, Election/Council & Committee Coordinator John Wong, Technology Support Specialist II Sumon Acharjee, Chief Information Officer Rajeeth Arulanantham, Assistant to Council/Committee Jennifer Evans, Legislative Coordinator

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1. CALL TO ORDER

INDIGENOUS LAND ACKNOWLEDGEMENT

We begin today by acknowledging the traditional territories of Indigenous peoples and their commitment to stewardship of the land. We acknowledge the communities in circle. The North, West, South and Eastern directions, and Haudenosaunee, Huron-Wendat, Anishnabeg, Seneca, Chippewa, and the current treaty holders Mississaugas of the Credit peoples. We share the responsibility with the caretakers of this land to ensure the dish is never empty and to restore relationships that are based on peace, friendship, and trust. We are committed to reconciliation, partnership and enhanced understanding.

Under the authority of the *COVID-19 Economic Recovery Act*, *2020* (Bill 197) and the City of Markham's *Council Procedural By-law 2017-5*, this meeting was conducted in a hybrid format where members of General Committee, staff, and Members of the public participated both in-person and remotely.

General Committee convened at 9:35 AM with Regional Councillor Jack Heath presiding as Chair.

2. DISCLOSURE OF PECUNIARY INTEREST

There were none disclosed.

3. APPROVAL OF PREVIOUS MINUTES

3.1 MINUTES OF THE JUNE 7, 2022 AND JUNE 8, 2022 GENERAL COMMITTEE MEETING (16.0)

Moved by Deputy Mayor Don Hamilton
Seconded by Councillor Alan Ho

1. That the minutes of the June 7, 2022 and June 8, 2022 General Committee Meeting be confirmed.

Carried

4. DEPUTATIONS

There were deputations in relation to item 8.1. Please refer to the item for details.

5. COMMUNICATIONS

5.1 YORK REGION COMMUNICATIONS (13.4)

Moved by Councillor Khalid Usman
Seconded by Deputy Mayor Don Hamilton

1. That the following communications dated 2022 from York Region be received for information purposes:

1. 2022 Development Charges By-Law and Background Study
2. 2019 to 2023 Strategic Plan Year 3 (2021) Progress Report and 2023 to 2027 Strategic Plan Development
3. Affordable Housing in York Region - 2021 Measuring and Monitoring
4. Update on Sustainable Development Incentive Programs
5. Toronto Global Membership and Foreign Direct Investment Realignment
6. Long-Term Care Transformation Second Draft National Standard
7. Community Safety and Well-Being Plan for York Region
8. Regional Greening Strategy Refinement and 2021 Achievements
9. 2022 Water and Wastewater Master Plan Update
10. South York Greenway Cycling and Pedestrian Corridor Route Alignment and Project Advancement
11. Draft Regional Official Plan Consultation Update and Statutory Public Meeting

Carried

6. PETITIONS

There were no petitions.

7. CONSENT REPORTS - FINANCE & ADMINISTRATIVE ISSUES

7.1 MINUTES OF THE MAY 9, 2022 RACE RELATIONS COMMITTEE MEETING (16.0)

Moved by Councillor Khalid Usman
Seconded by Councillor Isa Lee

1. That the minutes of the May 9, 2022 Race Relations Committee meeting be received for information purposes.

Carried

7.2 MINUTES OF THE MAY 12, 2022 MARKHAM TRAIN STATION COMMUNITY CENTRE BOARD MEETING (16.0)

Moved by Councillor Khalid Usman
Seconded by Councillor Isa Lee

1. That the minutes of the May 12, 2022 Markham Train Station Community Centre Board meeting be received for information purposes.

Carried

7.3 009-T-22 YONGE & GRANDVIEW PARK - CONSTRUCTION (8.2)

Moved by Councillor Khalid Usman
Seconded by Councillor Isa Lee

1. That the report entitled “009-T-22 Yonge & Grandview Park - Construction” be received; and,
2. That staff be authorized to award a contract to Quality Property Services, the lowest priced bidder, in the total amount of $590,483.80 inclusive of HST; and,
3. That a contingency in the amount of $47,238.70 (8%) inclusive of HST established to cover any additional project costs be approved, and that authorization be granted to approve expenditures of this contingency amount up to the specified limit in accordance with the Expenditure Control Policy; and,
4. That the Urban Design Capital Administration Fee in the amount of $57,395.03 be approved; and,
5. That the award, contingency and capital administration amounts in the total amount of $695,117.53 ($590,483.80 + $47,238.70 + $57,395.03) be funded from capital project 21023 Yonge & Grandview Park – Construction, GL account 081-5350-21023-005, which has an available budget of $645,106.00; and,
6. That the shortfall of $50,011.53 ($645,106.00 - $695,117.53) be funded from the City-wide Soft Development Charges in the amount of $45,010.38 (90%) and the Parks Cash-in-Lieu in the amount of $5,001.15 (10%); and further,
7. That Staff be authorized and directed to do all things necessary to give effect to this resolution.

Carried

7.4 002-R-22 MARKHAM VILLAGE FLOOD CONTROL IMPLEMENTATION - PHASE 1 DESIGN STORM/ SANITARY SEWERS AND CAST IRON WATERMAIN UPGRADES (5.6)

Moved by Councillor Khalid Usman
Seconded by Councillor Isa Lee

1. That the report entitled "002-R-22 Consulting Engineering Services for Markham Village Flood Control Implementation - Phase 1 Storm/ Sanitary Sewers and Cast Iron Watermain Upgrades" be received; and,
2. That the detailed design work under contract 002-R-22 Consulting Engineering Services for Markham Village Flood Control Implementation - Phase 1 Storm/ Sanitary Sewers and Cast Iron Watermain Upgrades (inclusive of Phases 1A, 1B, and 1C) be awarded to the highest ranked, second lowest priced Bidder, R.V. Anderson Associates Limited, in the amount of $1,204,735.62, inclusive of HST; and,
3. That a 20% contingency in the amount of $240,947.12, inclusive of HST, be established to cover any additional construction costs and that authorization to approve expenditures of this contingency amount up to the specified limit be in accordance with the Expenditure Control Policy; and,
4. That the Consulting Engineering Services for detailed design award in the amount of $1,445,682.75 ($1,204,735.62 + $240,947.12) be funded from the capital project 058-6150-22193-005 "Markham Village Flood Control Implementation Phase 1 - Design"; and,
5. That the remaining budget of $569,217.25 in capital project 058-6150-22193-005 "Markham Village Flood Control Implementation Phase 1 - Design" will not be required from the Stormwater Fee Reserve; and,
6. That the contract administration services (inclusive of 10% contingency) be awarded to R.V. Anderson Associates Limited for:Phase 1A in the amount of $586,094.66 ($532,813.32 + $53,281.33),Phase 1B in the amount of $621,153.01 ($564,684.56+ $56,468.46), and,Phase 1C in the amount of $660,382.10 ($660,347.37 + $60,034.74), be requested as part of the 2024, 2025, and 2026 Capital budget process, subject to Council approval; and,
7. That the future Purchase Order for contract administration of Phases 1A, 1B, and 1C be updated to reflect the actual construction time required based on the final design; and further,

8. That Staff be authorized and directed to do all things necessary to give effect to this resolution.

Carried

7.5 STAFF AWARDED CONTRACTS FOR MAY 2022 (7.12)

There were inquiries in relation to the following contracts:

- 034-R-22 Markham Innovation Exchange (MIX)- Developing Model Guidance Consultant;
- 045-R-22 Landscape Architectural Consulting Services, Rougeside Promenade Park;
- 076-T-22 New Infill Residential Service Connections at Various Locations; and,
- 078-S-22 Purchase of Multi-Function Devices and Single Purpose Printers and maintenance and Support Services (Click Charges) through the Ontario Provincial Government via OPS VOR arrangement - Workplace Print and Services.

Moved by Deputy Mayor Don Hamilton
Seconded by Councillor Reid McAlpine

1. That the report entitled "Staff Awarded Contracts for the Month of May 2022" be received; and,
2. That Staff be authorized and directed to do all things necessary to give effect to this resolution

Carried

7.6 207-T-21 FAIRTREE CRICKET PITCH LIGHTING PURCHASE AND INSTALLATION (7.9)

Moved by Councillor Khalid Usman
Seconded by Councillor Isa Lee

1. That the report entitled "Tender 207-T-21 Fairtree Cricket Pitch Lighting Installation" be received; and,

2. That the contract for Tender 207-T-21 Fairtree Cricket Pitch Lighting Installation be awarded to the lowest priced bidder, Nadelec Contracting Inc. in the amount of $386,118.14, inclusive of HST; and,
3. That a 10% contingency in the amount of $38,611.81 inclusive of HST, be established to cover any additional construction costs and that authorization to approve expending of the contingency amount up to the specified limit be in accordance with the Expenditure Control Policy; and,
4. That the estimated costs of $424,729.96 ($386,118.14 + $38,611.81) be funded from accounts as listed in the Financial Considerations section with budget available of $227,915.00; and,
5. That the budget shortfall in the amount of $196,814.96 ($424,729.96 - $227,915.00) be funded from the Development Charges - City-Wide Soft Reserve in the amount of $177,133.46 (90%) and Non-DC Growth in the amount of $19,681.50 (10%); and further,
6. That Staff be authorized and directed to do all things necessary to give effect to this resolution.

Carried

8. PRESENTATIONS - FINANCE & ADMINISTRATIVE ISSUES

8.1 IMPLEMENTATION OF DIGITAL BRIDGE OVERPASS BANNER SIGNS IN MARKHAM (7.0)

Trinela Cane, Commissioner, Corporate Services, addressed the Committee and presented the, Implementation of Digital Bridge Overpass Banner Signs in Markham, which provided an overview of the new digital board locations for commercial advertising and City messaging opportunities.

The following deputations were heard in relation to the presentation:

Nancy Coldham, expressed opposition to the implementation of the overpass banners and noted concerns with safety guidelines and driver distraction.

Valerie Burke, expressed opposition to the implementation of the overpass banners and cited that they are unattractive, unnecessary, and environmentally unsustainable.

James G Lafromboise, expressed opposition to the implementation of the overpass banners citing concerns with safety, and the potential impact on the environment and wildlife.

Evelin Ellison, expressed opposition to the implementation of the overpass banners.

There was discussion on the following:

- Safety specifications of the banners in relation to light pollution and structure;
- The anticipated revenue that will be generated with the implementation of the banners;
- That there be consideration to reduce the number of lumens on the boards to reduce the amount of light generated;
- The amount of hydro consumption and who is responsible for energy usage;
- The ability to provide emergency communication on the signs;
- Concerns with the overpass banner location on Bayview Avenue and a suggestion to identify alternate locations;
- A suggestion to lower or turn off lights at night when there is less traffic volume;
- That there be consideration to provide more stationary messaging and that the timing of when messages change;

The Committee requested that staff provide information in relation to illumination standards, safety statistics around overpass banners, and potential alternate locations.

Moved by Deputy Mayor Don Hamilton
Seconded by Councillor Reid McAlpine

That item 8.1 be moved forward on the agenda.

Carried

Moved by Mayor Frank Scarpitti
Seconded by Councillor Andrew Keyes

1. That the Report entitled “Implementation of Digital Bridge Overpass Banner Signs in Markham” be received; and,

2. **That the recommendation be approved in principle and that staff return to a Committee meeting /Council meeting on July 14 with responses to the inquiries made;**

3. That Staff be authorized to complete negotiations and finalize a Digital Sign Agreement with RCC Media Inc. for the installation and maintenance of Digital Overpass Banner Signs on CN railway bridges in Markham, to the satisfaction of the Commissioner of Corporate Services and the City Solicitor; and,

4. That the Mayor and City Clerk be authorized to sign the agreement with RCC Media Inc., and any amendment thereto approved by the Commissioner of Corporate Services and the City Solicitor; and,

5. That Staff report back within 2 years of the signing of the agreement with RCC Media Inc. with a status report; and,

6. **That the deputations from Nancy Coldham, Valerie Burke, James Deframboise and Evelin Ellison be received; and further,**

7. That Staff be authorized and directed to do all things necessary to give effect to this resolution.

Carried

9. PRESENTATIONS - COMMUNITY ISSUES

9.1 LIFESAVING SOCIETY COMMENDATION NOMINIATIONS (12.2.6)

Mary Creighton, Director of Recreation, addressed the Committee and introduced the Lifesaving Society Commendation Nominations and acknowledged the following staff members for their quick action and judgement in having performed a successful rescue in an aquatic or non-aquatic emergency:

- Clare Meadway, Community Program Supervisor (Aquatics);
- Victor So, Lifeguard;
- Thineash John, Lifeguard;
- James Bird, Lifeguard;
- Carmen Wong, Leadership Conductor;
- May Tam, Leadership Conductor;

- Jennifer Thompson, Shift Supervisor.

The Committee thanked these staff members for their courage and congratulated them on their nominations.

Moved by Mayor Frank Scarpitti
Seconded by Regional Councillor Joe Li

1. That the following award recipients be acknowledged for their contributions to this achievement:
    - Clare Meadway, Community Program Supervisor (Aquatics)
    - Victor So, Lifeguard
    - Thineash John, Lifeguard
    - James Bird, Lifeguard
    - Carmen Wong, Leadership Conductor
    - May Tam, Leadership Conductor
    - Jennifer Thompson, Shift Supervisor

Carried

10. MOTIONS

There were none.

11. NOTICES OF MOTION

There were none.

12. NEW/OTHER BUSINESS

There was no new or other business.

13. ANNOUNCEMENTS

There were no announcements.

14. CONFIDENTIAL ITEMS

Moved by Deputy Mayor Don Hamilton
Seconded by Councillor Khalid Usman

That, in accordance with Section 239 (2) of the Municipal Act, General Committee resolve into confidential session to discuss the following matters:

Carried

14.1 FINANCE AND ADMINISTRATIVE ISSUES

14.1.1 GENERAL COMMITTEE CONFIDENTIAL MINUTES - JUNE 7, 2022 & JUNE 8, 2022 (16.0) [Section 239 (2)(a)(b)(c)(e)]

The General Committee confidential minutes dated June 7, 2022 and June 8, 2022 were confirmed.

14.1.2 APPROVAL OF RESTRICTED AND CONFIDENTIAL GENERAL COMMITTEE MINUTES - APRIL 26, 2021 (16.0) [Section 239 (2)(b)(d)]

The General Committee restricted and confidential minutes dated April 26, 2021 were confirmed.

14.1.3 SECURITY OF THE PROPERTY OF THE MUNICIPALITY OR LOCAL BOARD (UPDATE ON SECURITY ACTIVITY OF CITY ASSET); (12.0) [Section 239 (2)(a)]

The Committee consented to receive the information provided.

14.2 LAND, BUILDING & PARKS CONSTRUCTION ISSUES

14.2.1 PROPOSED OR PENDING ACQUISITION OF LAND BY CITY OR LOCAL BOARD; (WARD 8); (8.6) [Section 239 (2)(c)]

The Committee consented to place this item on the June 28, 2022 Confidential Council Meeting Agenda for consideration.

14.2.2 PROPOSED DISPOSITION OF REAL PROPERTY OF THE CITY OR LOCAL BOARD (WARD 1); (8.1) [Section 239 (2)(a)]

The Committee consented to place this item on the June 28, 2022 Confidential Council Meeting Agenda for consideration.

14.2.3 PROPOSED OR PENDING ACQUISITION OF LAND BY CITY OR LOCAL BOARD (WARD 8); (8.6)[Section 239 (2)(c)]

The Committee consented to place this item on the June 28, 2022 Confidential Council Meeting Agenda for consideration.

14.2.4 A PROPOSED OR PENDING ACQUISITION OF DISPOSITION OF LAND BY THE CITY OR LOCAL BOARD - RELOCATION OF KOCH-WIDEMAN HOUSE OT MARKHAM HERITAGE ESTATES (WARD 6); (8.6)[Section 239 (2)(c)]

The Committee consented to place this item on the June 28, 2022 Confidential Council Meeting Agenda for consideration.

15. ADJOURNMENT

Moved by Regional Councillor Jim Jones
Seconded by Councillor Isa Lee

That the General Committee meeting adjourn at 2:13 PM.

Carried

PUBLIC NOTICE

Passage of The Regional Municipality of York Development Charges Bylaw

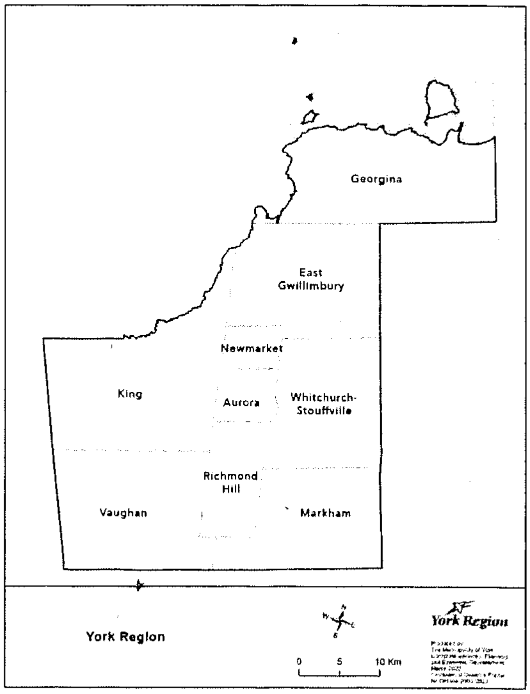
Thursday, June 2, 2022

On Thursday May 26, 2022, York Regional Council passed *Development Charges Bylaw No. 2022-31*, which will come into effect on Friday, June 17, 2022.

Development charges are fees collected on new residential and non-residential development and are the primary source of funding for growth-related infrastructure. The purpose of *Development Charges Bylaw No. 2022-31* is to help fund growth-related capital costs for hard services (water, wastewater and roads) and general services (Yonge North Subway Extension, Toronto-York Spadina Subway Extension, transit, police, waste diversion, public health, public works, ambulance services, housing services, court services, long-term care/seniors services and growth studies).

Development Charges Bylaw No. 2022-31 will apply to all lands in The Regional Municipality of York, with the exception of those wastewater services in the Village of Nobleton, currently recovered under Bylaw No. 2021-34. The map illustrates the location to which *Development Charges Bylaw No. 2022-31* applies.

The new development charges rates, under *Development Charges Bylaw No. 2022-31*, will apply to residential and non-residential development and are as set out in the table below.



Residential (per unit)	2022 Development Charges Rates
Single and Semi-Detached	$77,758
Multiple Unit Dwelling	$64,697
Apartments >=700 square feet	$50,206
Apartments < 700 square feet	$32,654
Non-Residential (per square foot of Gross Floor Area)	
Retail	$60.61
Industrial/Office/Institutional	$24.41
Hotel	$10.91

A copy of *Development Charges Bylaw No. 2022-31* is available online at york.ca/development charges

Alternatively, a copy can be made available for delivery by contacting the Regional Clerk at: 1-877-464-9675, extension 71320, or by email at regionalclerk@york.ca

Any person or organization may appeal this bylaw to the Ontario Land Tribunal (OLT) under Section 14 of the *Development Charges Act, 1997* by filing with the Regional Clerk a notice of appeal setting out their objection to the bylaw and the reasons supporting the objection. The last day for appealing *Development Charges Bylaw No. 2022-31* is 40 days after the passage of the bylaw, at 4:30 p.m. on Tuesday, July 5, 2022.

Christopher Raynor, Regional Clerk
17250 Yonge Street, Newmarket, ON, L3Y 6Z1

York Region

AGENDA 2.1

MARKHAM PUBLIC LIBRARY BOARD

Regular Meeting

Minutes of Regular Meeting held on Monday, May 30, 2022 7:07 p.m., Virtual Meeting

Present from Board:	Mr. Raymond Chan, Vice-Chair/Acting Chair Mr. Edward Choi Councillor Keith Irish Councillor Andrew Keyes Mrs. Pearl Mantell Mrs. Lillian Tolensky Mr. David Whetham Mr. Jay Xie
Present from Staff:	Mrs. Catherine Biss, CEO & Secretary-Treasurer Ms. Andrea Cecchetto, Director, Service Excellence Mrs. Diane Macklin, Director, Community Engagement Ms. Michelle Sawh, Director, Administration & Operational Support Ms. Deborah Walker, Director, Library Strategy & Planning Mrs. Hilary Murphy, Manager, Planning & Reporting Ms. Polly Chan, Financial Analyst Ms. Megan Garza, Senior Manager, Organizational Transformation Mrs. Anthea Bailie, Manager, Collections & Technical Services Mr. Patrick Pan, Manager, Facilities & Workplace Safety Mrs. Susan Price, Board Secretary
Regrets:	Ms. Margaret McGrory, Chair Deputy Mayor Don Hamilton Mr. Ben Hendriks Ms. Iqra Awan
Guests:	Ms. Christina Gao, Manager, KPMG, Ms. Maria Khoushnood, Partner, Audit KPMG

1.0 Call to Order/Approval of Agenda

Mr. Raymond Chan, Vice-Chair/Acting Chair called the meeting to order at 7:07 p.m.

Moved by Mrs. Lillian Tolensky
Seconded by Councillor Keith Irish

Resolved that the agenda be approved.

Carried.

As Ms. McGrory was unable to join the remote meeting due to technical difficulties, Mr. Chan assumed the Role of Chair and called the meeting to order.

1.1 Declaration of Conflict of Pecuniary Interest

None.

AGENDA 2.1

1.2 **Delegation**

None.

1.3 **Chair's Remarks:**

CHAIR'S INDIGENOUS LAND ACKNOWLEDGMENT

We begin today by acknowledging the traditional territories of Indigenous Peoples and their commitment to stewardship of the land. We acknowledge the communities in circle. The North, West, South and Eastern directions, the Haudenosaunee, Huron-Wendat, Anishnabeg, Seneca, Chippewa and the current treaty holders Mississaugas of the Credit peoples. We share the responsibility with the caretakers of this land to ensure the dish is never empty and to restore relationships that are based on peace, friendship and trust. We are committed to reconciliation, partnership and enhanced understanding.

Mr. Chan asked Directors to introduce any staff members present.

The Vice-Chair reminded the Board that votes would need to be counted and to keep their hands raised until staff are able to do so.

Reminder to Board members to send Policy questions/clarifications to the Board Secretary by June 15 in preparation for the June Board Education Q&A, a reminder e-mail will be sent with the link to the latest version of the policies.

1.4 **Board CEO-Linkage BCL-2e Policy; Performance Review:**

On behalf of the Chair the Vice-Chair advised the Board that the process for the Chief Executive Officer Performance Review for the year 2021 (ending February 28, 2022) was undertaken and completed.

The signed documents will be filed along with the CEO's response, per procedure.

Additionally, there will be a copy stored in a secured file on the server.

PLEASE NOTE THAT AGENDA 5.1 WAS MOVED AHEAD IN ORDER TO ACCOMMODATE OUR GUESTS.

5.1 **Financial Statements of the Markham Public Library Board:**

Staff introduced and welcomed Ms. Christina Gao, Manager, KPMG, Ms. Maria Khoushnood, Partner, Audit, KPMG who conducted the Markham Public Library Board annual audit.

Ms. Khoushnood stated that she would give a high level review and all that remained to complete the audit was approval from the Board. It was a clean audit, there were no issues noted, no audit misstatements and no control deficiencies. Ms. Koushnood asked if there were any questions, there were none. She also expressed appreciation on the efficiencies of MPL Management staff.

Staff thanked the auditors for attending.

Moved by Mrs. Pearl Mantell
Seconded by Mr. Jay Xie

Resolved that the report entitled "Financial Statements of the Markham Public Library Board, December 31, 2021" be received; and,

That the Board approve the Financial Statements of the Markham Public Library Board December 31, 2021; and,

That the Board Chair be authorized to sign the approved 2021 Financial Statements on behalf of the Board; and,

That the Board authorize Staff to issue the final audited Financial Statements for the fiscal year ended December 31, 2021;

AND that Staff be authorized and directed to do all things necessary to give effect to this resolution.

Carried.

2.0 Approval of Minutes:

2.1 Library Board Minutes April 25, 2022

Moved by Mrs. Lillian Tolensky
Seconded by Councillor Andrew Keyes

Resolved that the minutes of the April 25, 2022 Library Board Meeting be confirmed.

Carried.

2.2 Consent Agenda:

Moved by Councillor Andrew Keyes
Seconded by Mr. Jay Xie

Resolved that the Consent Agenda comprising Agenda items 2.2 to 2.4.1 and the same are hereby approved as written and the CEO of the Library is hereby authorized and directed to take such action that may be necessary to give effect to the recommendations as therein contained:

2.3 Declaration of Due Diligence by the CEO

2.4 Communication and Correspondence:

2.4.1 thestar.com: Markham Public Library's Cornell branch reopens April 29 with in-person services
https://www.thestar.com/local-markham/news/2022/04/28/markham-public-library-s-cornell-branch-reopens-april-29-with-in-person-services.html

Carried.

AGENDA 2.1

3.0 **CEO's Highlights:**

The Chair asked the CEO to comment on the Highlights. Mrs. Biss briefly mentioned the following items, before turning to staff for their presentations.

- Retirement of Markham's Commissioner of Community Services
- 2022 Development Charges Background Study and Community Benefits Charges

The staff presentation reviewed the information contained in the Board package with a focus that included:

- Alignment with Markham's Strategic priorities
- Density Bonusing (Transition from s37 to Community Benefits Charges) -allowing for an increase in height or density of a proposed development if there would be a provision for other facilities such as a library eg. Perth/Dupont Library at 299 Campbell Ave.
- Markville Secondary Plan Study-Workshop with Parks, Recreation and Library Staff

There was lots of discussion, questions and clarifications.

Moved by Councillor Andrew Keyes
Seconded by Mrs. Pearl Mantell

Resolved that the report entitled "CEO's Highlights May 2022" be received.

Carried.

3.1 **Markham Centre Update, May 2022**

Staff presented and gave a comprehensive review of the report contained in the Board package and pointed out many examples of multi-use spaces and urban library design in other cities. The goal is to develop a vision for a Downtown library with a focus on Arts and Culture that would provide opportunities and encourage the formation of an arts and cultural infrastructure and would attract creative talent to Downtown.

Moved by Mrs. Lillian Tolensky
Seconded by Mr. Edward Choi

Resolved that the report entitled "Markham Centre Update, May 2022" be received.

Carried.

4.0 **Annual Monthly Policy Review**
(To be undertaken at the January meeting)

5.0 **Internal Monitoring Reports:**
(Compliance list of internal monitoring reports and discussion led by members)

5.1 Please see at the beginning of the meeting

5.2 **Executive Limitation: EL-2d Financial Condition**
(Assigned to Mrs. Pearl Mantell)

Mrs. Mantell advised that she had reviewed the report and found it to be compliant and complete. She had contacted Board members by e-mail and received no questions or concerns and there were none from the floor.

The report confirmed that the CEO and MPL's practices relative to MPL's Financial Condition comply with the requirements of EL-2d policy.

Moved by Mrs. Pearl Mantell
Seconded by Mr. Edward Choi

Resolved that the Report entitled "Internal Monitoring Report-Executive Limitation El-2d, Financial Condition" be received.

Carried.

6.0 **Ends**

7.0 **Governance:**

7.1 **Update from OLS-Margaret McGrory**

None this month.

8.0 **Ownership Linkage:**

8.1 **Input from Board Members**

There were no reports from Board members attending library related events at this time.

9.0 **Board Advocacy:**
9.1 **June-August 2022 Library Programs**

Staff advised the Board that now that things were getting back to a more 'normal" routine, they were working towards reporting programs on a quarterly basis.

Moved by Mrs. Pearl Mantell
Seconded by Councillor Andrew Keyes

Resolved that the report "June-August 2022 Library Programs" be received.

Carried.

10.0 **Education**
10.1 **The Fine-Free Movement in Libraries**

Staff explained that the MPL Fine-free Pilot launched in April 2021 for children and teens. 300+ Canadian Libraries have implemented fine-free policies, including TPL. The goal of the movement is to improve **Access, Equity, and Service** for patrons. Studies show that fines are a barrier to access and will prevent some clients from using the library. It should be noted that fine-free applies to late fees not the loss of materials. If customers are not intimidated by mounting late fees they will be more inclined to return outstanding materials.

There was some discussion about customer accountability with this policy and loss of revenues. It was also suggested that more information on the parameters of the policy be readily available in branches.

Staff noted that studies have shown there has not been a negative impact from the fine-free movement in libraries. There may be an initial loss of revenue, however revenue from fines has been in a steady state of decline for some years. Any loss in revenue would be partially offset by the costs and resources required to collect the fines.

Staff recommended that the Fine-Free Report on the success of the Pilot for MPL be deferred to March 2023 when more realistic (post-pandemic) numbers would be available.

Moved by Mrs. Lillian Tolensky
Seconded by Mrs. Pearl Mantell

Resolved that the Board receives the Board Education Presentation entitled "The Fine-Free Movement in Libraries"

Carried.

11.0 **Incidental Information (none)**

12.0 **New Business:**
12.1 **Presentation on "The Canadian Library" Project**

The CEO made the presentation as a follow up to a request made at the April 25, 2022 regular Board Meeting. At that meeting, the Board passed the following motion: **"Staff to investigate finding possible funding sources to purchase fabric for the Canadian Library project"**

Mrs. Biss explained that the Canadian Library Project is a settler initiative to bring awareness and commemorate *Murdered and Missing Indigenous Women and Girls (MMIWG*). The initiative has projects underway in Ontario, Alberta and B.C.

Staff investigated the option of providing funding to the Canadian Library for Indigenous cloth, but after consultation with City advisors and review of our own policies, the library determined that funding another organization in this way was not possible.

However, staff determined that they could support the project in the following ways:

With a MOU in place….

- The library will continue to provide discarded hardcover books to the Canadian Library
- We will provide joint programs that include a representative of the organization to explain the initiative and the practices in place to ensure respectful process and increase awareness around MMIWG
- That for these Library programs, the Canadian Library will be compensated for any specific materials related to the program including fabric, and the Library will be responsible for any speaker fees for these joint programs.

In addition the Library will continue to explore other opportunities to bring in speakers who can speak to their experiences as an Indigenous person so that the community has the information they need to better understand Indigenous peoples, the history of Canada's treatment of Indigenous peoples and the calls to action of Truth and Reconciliation.

Moved by Mr. Jay Xie
Seconded by Mr. David Whetham

Resolved that the presentation on "The Canadian Library" project be received.

Carried.

13.0 **Board Evaluation:**
13.1 **Questionnaire: Performance of Individual Board Members**

The Vice-Chair asked Board Members to complete the questionnaire and e-mail to the Board Secretary.

14.0 **In Camera Agenda (none)**

15.0 **Adjournment:**

Moved by Mr. Edward Choi and seconded by Mrs. Lillian Tolensky that the meeting be adjourned at 8:36 p.m.

Electronic Animal Care Committee
MINUTES
April 20, 2022
ZOOM
5:30 PM – 7:30 PM

Members Present	Regrets
Areez Remtulla, Interim Chair Valerie Burke, Vice Chair Aviva Harari Bernice Royce Cathy McKnight Dr. Esther Attard Filandro Fernandes Janet Andrews June Ziola	Christy Lehman, Animal Care Supervisor

Staff
John Britto, Committee Secretary (PT)

Item	Discussion	Action
1. Call to Order	The Animal Care Committee convened at 5:32 PM with Areez Remtulla in the Chair.	
2. Approval of the March 16, 2022, Animal Care Committee Meeting Minutes	**Moved by Janet Andrews** **Seconded by Bernice Royce** **That the minutes of the March 16, 2022, Animal Care Committee meeting be approved, with a minor editorial change.** **Carried**	
3. Update regarding recruitment of new members	Areez agreed to follow up with Laura Gold in Clerks and will inform the committee members of any updates.	**Areez to follow-up with Laura re update on the recruitment of new members.**

4. Business Arising from the Minutes	Committee reviewed the list of action items and updated the Action Item Table (please see last page of the minute's document for details). - <u>Online Pet Licensing Renewal Form</u> June Ziola advised that one of the online pages relating to charitable receipts has not been revised. Areez suggested that this matter be kept as outstanding on the action item list. Valerie and Areez thanked June for her work in this matter. - <u>Review of Outstanding Action Items</u> Members reviewed and updated the outstanding action items list. - <u>Committee positions election & Annual Plan</u>: Areez advised that Valerie indicated that she would like to continue as Vice Chair till the end of 2022. He further advised that Cathy may seek election for Vice Chair in 2023 once she feels comfortable with having more experience on the committee. Valerie advised that she welcomes Cathy's assistance with work involving the Vice Chair position, which would potentially help in her taking over as the Vice Chair in 2023. Cathy agreed with this suggestion. Areez advised that he has not been successful in seeking interest from any committee member to serve as Events Coordinator. He suggested that if one or two members committed to take on the responsibility to serve as Events Coordinator for one event, that way the work could be spread out among all the members, rather than one member take on the responsibility of all the events during the year. Fil advised that, considering he has joined the committee very recently, he is willing to assist another more experienced member with this work.	

	Valerie was of the opinion that coordinating of events requires at least two lead members, however, considering that this year with only the Unionville, Markham Music Festival and Christmas parades planned, this may not be the case this year.	
	Cathy advised that the Unionville BIA is planning a one-day event on Saturday, June 4. She further advised that Sara Sterling, Executive Director of the Unionville BIA is very keen to have this event, however in a different format as compared to previous years. Cathy volunteered to take the lead for this event and will follow-up with Sara to find out details about the event.	**Cathy to follow-up with Sara Sterling, Unionville BIA for details of the Unionville Festival event.**
	Bernice Royce advised that volunteers need to work rotating shifts at any event to make the work involved totally manageable.	
	Janet advised that the tent and the banner are currently with Denielle. She agreed to confirm this from Denielle. Janet further advised that the member/s doing the event's morning shift will need to pick up all the other events materials from her house.	
	Areez advised that since he has some of the materials, he is willing to pick up the other materials from Janet's and Denielle's houses.	**Areez to pick up event materials from Denielle's and Janet's houses.**
	Janet suggested that a decision needs to be made whether members would like to sell stuff at the events. She suggested that at least the dog and cat toys should be sold at events which would amount to a small source of revenue, and she has a lot of these items available.	
	Responding to June's concern, Areez advised that he has a lot of experience of setting up tents and that he will make sure the tent is set up early on the day of the event.	**Areez to set up tent on the day of the event**
	Bernice and Valerie agreed that only the dog and cat toys should be sold at events. Valerie also suggested that the donation box should be used at the events.	

	Aviva volunteered to help at the Unionville Festival event, and also to bring along her dog which would be a good source of crowd attraction. Cathy also agreed to bring along her dog for the event. She mentioned that adoption services were available at one of the past festivals but was not sure if it was the CAEC or the OSPCA and enquired if such a service could be had at the Unionville event. Bernice was not in favour of having cats at any events as they can get easily stressed out. Instead, she suggested having a corkboard displaying pictures and relevant information of cats that are available for adoption. Cats will need to be taken to the event site in crates, and this is something that cats dislike, which is also a cause for them to get stressed out. Janet advised that the only time animals were taken to an event in the past was at the Stiver Mill Farmers Market event, when the OSPCA brought dogs, not cats. She agreed with Bernice. Cats are terrified of being in the open. They would need an enclosure big enough to accommodate a litter box, whereas dogs only need to be on a leash. Janet advised that in the past Denielle spent hours printing pictures of cats, dogs, guinea pigs, etc. that were available for adoption at the OSPCA and the CAEC and displayed these pictures on a corkboard, which got a lot of interest from visitors at the various events. Areez agreed that putting up pictures of adoptable animals at events would definitely incentivize people to adopt. Considering that the committee has not participated in events since the pandemic struck two years ago, Valerie suggested that a sub-committee be constituted to work out the logistics related to potential events for the year.	

		Areez, Aviva, Bernice, Valerie, Cathy, June and Phil agreed to serve on the sub-committee for the 2022 Unionville BIA event. Janet agreed to assist but will not be able to attend the event due to ongoing medical reasons. Aviva offered her backyard as a meeting place for the sub-committee, if members were comfortable meeting in person, rather than virtually. Areez agreed to coordinate a time and date for the sub-committee to meet for this purpose. Areez also agreed to email the members the dates of the other events planned for 2022 so members can consider which event they would like to volunteer their services and time for. Janet advised that it may be too late to get booth space for the Markham Village Music Festival scheduled to be held June 17-18, 2022. Cathy advised that she has contacts with the organizers of this event and agreed to reach out to them for details of the event. Janet advised that the committee has paid for booth space in the Farmers Market area through the owner of The Cat's Meow Café. She further advised that the City of Markham's booth area is very close to Hwy 7 that does not attract visitors to the event.	**Areez to email time and date for the sub-committee meeting to discuss logistics for the Unionville BIA event.**
		Cathy advised that she will be away the weekend of June 18, so can't coordinate the Markham Village Music Festival event, but agreed to reach out to the Committee Chair to find out if it is still possible for the ACC to participate in the event. Janet advised that it would be good to get booth space, as in the past, in the Farmers Market area. The committee agreed with Cathy's suggestion to first confirm if space is available to participate in the event, before discussing anything related to the event.	**Cathy to follow up with the Markham Music Festival event organizers**

	June agreed to coordinate, and Phil and Areez agreed to assist, if the committee is able to participate in the Markham Village Music Festival event. With respect to the Christmas parades, which will be held later in the year, Areez agreed to email details to the members for their review and consideration. Valerie advised that she does not have any update with respect to the motion requesting General Committee to ask staff to update bird-friendly buildings to CSA standards. She advised that the City is in the process of looking at retrofitting the buildings but they haven't worked on coming back with any information on updating the standards. - <u>Present annual plan</u> Areez emailed members a copy of the Annual Plan for their review in advance of the meeting. Janet thanked Cathy for the amazing work she did in editing the draft plan. She suggested consistency throughout the draft Annual Plan, specifically in the use of the words 'Plan' and 'Action Plan', suggesting the use of 'Action Plan'. The committee agreed with this suggestion. Cathy suggested reviewing the document from the grammatical standpoint prior to finalizing it. The committee discussed the issue of monitoring euthanasia rates. Considering that we are in the month of April, the committee agreed that the Plan is a bit ambitious for 2022, and it was agreed to combine some items and move some to 2023. Considering the extent of time that would be needed to discuss and finalize the draft Annual Plan, the committee agreed to refer the plan to the sub-committee for a review prior to providing it for final consideration by the entire Animal Care Committee.	**Areez to email details of Christmas parades.**

	Janet and Cathy volunteered to work on the draft plan prior to the sub-committee review.	
5. Animal Services Program Update	- <u>Coyote Response and Coexistence Strategy Virtual Information Meeting – March 23</u> This matter was deferred to the May 18 meeting. - <u>Cat Adoption & Education Centre</u> This matter was deferred to the May 18 meeting. - <u>Shades of Hope Wildlife Centre</u> This matter was deferred to the May 18 meeting.	
6. Communications	None	
7. Events	- Areez agreed to email the committee members details of the various potential events scheduled for the year.	**Areez to email members potential 2022 events**
8. New Business	- <u>Elections correspondence</u> **Moved by Valerie Burke** **Seconded by Janet Andrews** **That the election correspondence from the Clerks Office circulated along with the agenda materials was received by the Animal Care Committee.** **Carried** - <u>Election of Vice Chair</u> Janet Andrews nominated Valerie Burke as Vice Chair of the Animal Care Committee. The Chair asked for further nominations from the members. As no further nominations were received, Areez Remtulla, Interim Chair declared nominations closed. **Valerie Burke was acclaimed Vice Chair of the Animal Care Committee.** - <u>Incident at German Mills Meadow</u> Aviva Harari advised of an unfortunate incident she witnessed at the German Mills	

	Meadow the weekend of April 16-17, when a group of individuals and a couple who were playing with a dog that was off leash. She also witnessed two older women walking there who were chased by the off-leash dog. Aviva informed that she called the City's Animal Services and is still waiting for a call back – the incident happened on Sunday. She further advised of her concerns with the lack of response, and also the very limited signage, no snow fencing around the bird nesting houses or the path in the Meadow, etc. Dr. Esther Attard suggested that such incidents should be brought to the attention of Christy Lehman, Animal Services Supervisor by email. Valerie thanked Aviva for doing the right thing by contacting Animal Services but agreed with Dr. Esther Attard about emailing Christy. Aviva advised that she would email Christy about the incident and also send her the video she took of the dog chasing the two elderly women. After discussion on the matter, the Committee adopted the following motion: **Moved by Aviva Harari** **Seconded by Dr. Esther Attard** **That Animal Services Officers monitor the German Mills Meadow area during the bird nesting season, erect additional signage relaying the importance of avoiding the bird house areas, and that the city consider undertaking a communications program to educate Markham residents on the ongoing avian flu outbreak.** **Carried**	
9. Date of the Next Meeting	The next Animal Care Committee meeting will be held on May 18, 2022, at 5:30 PM.	
10. Adjournment	The Animal Care Committee adjourned at 7:20 PM.	

Action Item	Meeting Date	Person Responsible	Status
Conduct a breakeven analysis to determine the ideal price of the cookbook	December 16, 2020	June Ziola	On hold awaiting in person meetings
Committee Elections	January 19, 2022	Areez Remtulla to send descriptions of elected roles to Committee members who, in turn, are asked to advise if they would be interested in serving.	Elections to be deferred to April 20, 2022, meeting.
Follow up on the status of a committee motion requesting General Committee to ask staff to update bird-friendly buildings to CSA standards	January 19, 2022	Valerie Burke	In process
Indigenous Teaching	February 16, 2022	Christy to contact the Diversity Specialist for a presentation at a future ACC meeting.	In process
Road Trip to Shades of Hope	February 16, 2022	Areez to email members to contact Christy if they are interested in a road trip to the SOH	In process
2023 Proclamation Request dates	March 16, 2022	T B D	To be considered at the November 2022 meeting
Coyote Public Meeting email	March 16, 2022	Areez to forward email from Christy to the members	Completed.
Scroll presentation to Denielle Duncan	March 16, 2022	Areez to email Clerks	Laura Gold confirmed that the scroll will be sent to Denielle
Recruitment of new members	April 20, 2022	Areez to email Laura re update on the recruitment of new members.	In progress.
Unionville Festival event	April 20, 2022	Cathy McKnight to follow-up with Sara Sterling, Unionville BIA for details of the	Date confirmed. No cost. Details to be received. In progress.

Action Item	Meeting Date	Person Responsible	Status
		2022 Unionville Festival event. Areez to email time and date for the sub-committee to discuss logistics for the event	
Events materials	April 20, 2022	Areez to pick up events materials from Denielle's and Janet's houses.	Janet will follow-up with Denielle and Cathy.
Markham Village Music Festival (June 17-28, 2022)	April 20, 2022	Cathy to follow up with the Markham Music Festival event organizers for details of the event	Janet booked and paid for space. Completed
Christmas parades event	April 20, 2022	Areez to email details of Christmas parades to the members for their review and consideration.	In progress

Electronic Animal Care Committee
MINUTES
May 18, 2022
ZOOM
5:30 PM – 7:30 PM

Members Present	**Regrets**
Areez Remtulla, Chair Valerie Burke, Vice Chair Aviva Harari Cathy McKnight Dr. Esther Attard Filandro Fernandes Janet Andrews June Ziola	Bernice Royce

Staff

John Britto, Committee Secretary (PT)
Christy Lehman, Animal Care Supervisor

Item	Discussion	Action
1. Call to Order	The Animal Care Committee convened at 5:35 PM with Areez Remtulla in the Chair.	
2. Approval of the April 20, 2022, Animal Care Committee Meeting Minutes	**Moved by Janet Andrews** **Seconded by Dr. Esther Attard** **That the minutes of the April 20, 2022, Animal Care Committee meeting be approved, with minor editorial revisions.** **Carried**	
3. Update regarding recruitment of new members	Christy advised that interviews for new members are scheduled to be held in June. Five new members are likely to join the Animal Care Committee as soon as Council approves their appointments.	

4. Business Arising from the Minutes	- <u>Final review of Annual Plan</u> The Committee reviewed the draft Annual Plan that was previously circulated by Areez for review/comments, and after a few revisions the following motion was adopted: **Moved by Janet Andrews** **Seconded by Filandro Fernandes** **That the 2022 Animal Care Committee Annual Report be approved.** **Carried** - <u>Follow-up on issue – German Mills Meadow</u> Following up on the unfortunate incident witnessed by Aviva on the weekend of April 16-17, 2022, at the German Mills Meadow, Christy suggested that an email be sent to David Plant, Manager of Parks Operations and the Chair of the German Mills Community Centre Board advising them of the incident. Aviva agreed to draft the email for Areez to send. - <u>Review of Outstanding Action Items</u> The Committee reviewed the list of action items and updated the Action Item Table (please see last page of the minutes document for details).	**Aviva to draft email for Areez to send to David Plant and the Chair of the German Mills Meadow and Natural Habitat Liaison Committee**
5. Animal Services Program Update	- <u>Cat Adoption & Education Centre</u> Christy shared with the Committee her presentation that she will be making to the May 24, 2022, General Committee meeting. Christy encouraged the Committee members to either attend the General Committee meeting or email their support for this item. - <u>Shades of Hope Wildlife Centre</u> No update.	
6. Communications	None	
7. Events	- Areez agreed to follow-up with Cathy to email Committee members details of the	**Areez to follow-up with Cathy to**

	Unionville Festival event and also seeking volunteers for the event.	**email members seeking volunteers for the Unionville Festival event.**
8. New Business	- <u>No response to a wildlife related issue</u> Janet advised of the wildlife related issue that was still awaiting response from the City's Animal Services. Christy suggested that Janet send her an email about the incident. - <u>Election of Chair</u> Janet Andrews nominated Areez Remtulla as Chair of the Animal Care Committee. Valerie Burke seconded the nomination. The Committee Secretary asked for further nominations from the members. As no further nominations were received, the Committee Secretary declared nominations closed. **Areez Remtulla was acclaimed Chair of the Animal Care Committee.**	**Janet to email Christy about the wildlife related issue still awaiting a response from Animal Services**
9. Date of the Next Meeting	The next Animal Care Committee meeting will be held on June 15, 2022, at 5:30 PM.	
10. Adjournment	The Animal Care Committee adjourned at 7:40 PM.	

ACTION ITEMS

Action Item	Meeting Date	Person Responsible	Status
Conduct a breakeven analysis to determine the ideal price of the cookbook	December 16, 2020	June Ziola	On hold awaiting in person meetings
Follow up on the status of a committee motion requesting General Committee to ask staff to update bird-friendly buildings to CSA standards	January 19, 2022	Valerie Burke	In process
Indigenous Teaching	February 16, 2022	Christy to contact the Diversity Specialist for a presentation at a future ACC meeting.	In process
Road Trip to Shades of Hope	February 16, 2022	Areez to email members to contact Christy if they are interested in a road trip to the SOH	In process
2023 Proclamation Request dates	March 16, 2022	T B D	To be considered at the November 2022 meeting
Unionville Festival event	April 20, 2022	Cathy McKnight to follow-up with Sara Sterling, Unionville BIA for details of the 2022 Unionville Festival event. Areez to email time and date for the sub-committee to discuss logistics for the event	Date confirmed. No cost. Details to be received. In progress.
Events materials	April 20, 2022	Cathy to pick up events materials from Denielle's and Janet's houses.	Janet will follow-up with Denielle and Cathy.
Markham Village Music Festival (June 17-28, 2022)	April 20, 2022	Cathy to follow up with the Markham Music Festival event organizers for details of the event	Janet booked and paid for space. Completed

Action Item	Meeting Date	Person Responsible	Status
Christmas parades event	April 20, 2022	Areez to email details of Christmas parades to the members for their review and consideration.	In progress
Follow-up regarding incident at German Mills Meadow – weekend of April 16-17	May 18, 2022	Aviva to draft email for Areez to send to David Plant and the Chair of the German Mills Meadow and Natural Habitat Liaison Committee.	
Unionville Festival event	May 18, 2022	Areez to follow-up with Cathy to email members seeking volunteers for the Unionville Festival event	
Wildlife related issue still awaiting response from Animal Services	May 18, 2022	Janet to email Christy about the matter.	

German Mills Meadow & Natural Habitat Liaison Committee

Date: March 7, 2022
Time: 5:00pm – 7:00pm
Location: Zoom
Chair: Councillor Keith Irish

Members: Councillor Keith Irish (Chair), Regional Councillor Jack Heath, Ted Kelly, Edith Kangas, Kimberly Seymour,

Staff: Alice Lam, Rick Cefaratti, Clement Messere, Lauren Patton, Tomas Cihula, Nory Takata, and Negar Mahmoudi

Guests: Tomas Chihula, Kevin Hicks, Linda Lattner

Regrets: Bernard Sze, Gail Lavery, Yang Jingli

Scribe: Bindi Patel & Laura Gold

ITEM	DISCUSSION	ACTION
1. Call to order	The German Mills Meadow & Natural Habitat Committee convened at 5:05pm with Councillor Keith Irish in the Chair.	
2. Bahai Redevelopment Proposal	Rick Cefaratti, Senior Planner, provided an update on the "Bahai Centre Building Proposal", advising that the Bahai Group is proposing an extension to their original proposal, the concept plan that was shared with staff was displayed to the Committee. Mr. Cefaratti advised that the Bahai Centre has not submitted a formal application at this time, and that the concept plan may have changed since presented to staff. The concept plan displayed to staff included a daycare, lodging, and worship building. Staff have some concern in regards to the proposed place of worship building, as it is being proposed in the greenway system where development is typically not permitted. Councillor Irish advised that he had met with the external planners and architect associated with the project, and did walkabout of the site. Councillor Irish advised that the Bahai Centre was being very cautious of the natural environment and that they want move the heritage house to address some flooding issues. Councillor Irish explained that the Bahai Centre is planning on submitting a development application for this project sometime this year. The Committee expressed the following concerns in regards to the concept plan:	

	• Expressed concern regarding the impact the project will have on the greenway system, as lot 3 is too close to where deer cross to access the woods. • Expressed concern that they wanted to extend a City of Markham road into the meadow; • Noted that there are plans for the Adventure Valley lands to return to a natural Site; • Expressed concern that lot 1 is on a significant slope, and suggested that an alternate location would ensure a more secure structure Clement Messere, Manager of Development, Central District, explained that environmental assessment will need to be conducted if a formal development application is submitted for this project, which would look at both trees on the site and surrounding the site.	
3. Approval of Minutes	Moved by Kimberly Seymour Seconded by Ted Kelly That the minutes from October 7, 2021 German Mills Meadow & Natural Habitat Liaison Committee be approved as presented. **Carried**	
4. Gas & Environmental Monitoring of German Mills	Negar Mahmoudi, Supervisor Utility & Right-of-Way, provided the following update: <u>2021 Gas Monitoring Results</u> • There were acceptable levels of below the limit along the northern & western border, and inside the blow house; • The levels were below the limit inside the Bayview Glen Country Club buildings, and some exceedance was detected outside f the buildings but consistent with historical results. <u>2021 Environmental Monitoring Results</u> • The surface water or soil vapors were below the limit • Some impacted groundwater has been found extends to south beneath the Bayview Glen Country Club and Baha'i property, but the amount is decreasing and the long term trend is stable. <u>2021 Equipment Maintenance Completed</u> • All required equipment maintenance was completed.	

	<u>November Fan Closure:</u> • Noted that there was 5 days when the fan was turned off due to water drainage issues, and the sound investigation. • Residents were under the impression that it was dangerous for the fan to be shut down so there were questions around adjusted operation hours. • Staff advised that if the fan is turned off the methane would start increasing, noting 5 days is not long enough to test this. <u>Access Road Pavement:</u> • The access road needs to be good condition so that meadow can be accessed by Fire and Emergency Services, and for safety and monitoring purposes. . • There were some concerns that the access road was not plowed after a large snowstorm to allow for Fire and Emergency Services to access the meadow. • Alice Lam, Director of Operations will be following up with Markham Fire to see what their minimum plowing requirements are fire the access road. <u>Noise Assessment:</u> • Several noise complaints were received in relation to the blower house motor; • The investigation is not yet complete, but a preliminary solution was adding a silencer. <u>Blower House Concerns</u>: • The detected odor could be related to collected gas from waste which is unavoidable, or it may be from diesel detected during a bi-annual maintenance of the diesel generator. <u>Blower House Concerns - Operating Hours:</u> • It was not recommended to reduce the operating hours as the methane concentration at the boundaries will exceed the acceptable limits. Additionally, there is risk of migration of landfill gas to adjacent residents (requires frequent monitoring), and it reduces the blower motor lifecycle. The historic data shows that in 2017 and 2020 that when the gas collection system was not efficiently working (prior to upgrade) or the blower motor was not operating during construction, the methane concentration was exceeded the limit. These results justifies the requirement that the gas collection system and blower motor shall work 24/7.	**Alice Lam** – connect with Markham Fire to determine their access requirements **Alice Lam** – look into sourcing a silencer and contact the external consultants to get a better completion timeline

	• When there is construction and the blower is off for long periods of time, there is additional monitoring to ensure the levels are within an acceptable range. Blower House Concerns – shut down and decommission: • The decommissioning criterion where discussed and it was explained and clarified that the historic data and site condition does not meet the required criteria to allow the City to shut down the blower motor and gas collection system.	
5. Meadow Maintenance	Fencing Proposal: • The updated footprint for the fencing is substantially smaller than originally proposed due the budget restraints. • Fence will be 4 feet in height made from 14-gauge welded wire 2" x 4" mesh, mounted on a T-bar. • There is some flexibility with respect to where the fence will be located, as long as it's within budget. There was a suggestion to have the fence along the length of the road, and create some arms on the sides Snow Clearing of Trails: • Pathway repairs and completion is scheduled for this spring. • A mow strip of 1.5m will be maintained. • There will be no mowing until beginning of August for nesting birds and then 1 pass per month until the end of season. • All maintenance practices will be documented and shared with Operations team for continuity purposes. Wood Chips: • Had previously begun to apply apply to wood chips on the upper loop, this work will resume once weather and staff are available Removal of Barbed Wire Fencing: • The barbed wire on the City property has now been removed. There is still barbed wire remaining on the Bahai property, which has been referred to Bylaws for removal. • Nory Takata, Parks Planner will connect with the Area Supervisor for removal of the remaining barbed wire that extends behind John Street. Bylaw Signage:	**Nory Takata** – Can discuss with the area supervisor for removal

	• Current signage is not effective at deterring people from taking items from the meadow. • Alice Lam, Director of Operations & Nory Takata, Park Planner will coordinate to create more effective signage.	**Alice Lam & Nory Takata –** look into a more effective signage & locations
6. New Business	Off-leash Concerns: • Animal Care Officers may be required to monitor the area more frequently to reduce the amount of waste	
7. Next Meeting Date	The next German Mills Meadow & Natural Habitat Liaison Committee meeting will be held on a date to be determined in September.	
8. Adjournment	German Mills Meadow & Natural Habitat Liaison Committee adjourned at 7:09pm	

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MEETING MINUTES
Annual General Meeting: Unionville BIA
Date: Wednesday, February 9th, 2022 at 7pm
Via Zoom

Attendees:
Board: Chair Niina Felushko, Vice Chair Natasha Usher, Treasurer/Secretary Shibani Sahney, Deputy Mayor Don Hamilton, Councillor Reid McAlpine, Kash Mahmood, Debbie Smrz, Sylvia Morris, Sarah Iles

Members: Lindsay McLelland, Ray Smylie, Kimberly Wake, Susannah Huang, Natasza Tyler, Kevin Lee, Marc Agnew, Jeff Day, George LeDonne, Alison Zou

Guests: Mayor Frank Scarpitti, Wes Rowe, Mike Gannon, Rob Kadlovski

Staff: Sara Sterling, Executive Director; Michael Butler, My Main Street Business Advisor

1. **Call to order**

Good evening everyone, my name is Niina Felushko I am the Chair of the Unionville Business Improvement Area, and I would like to call this Annual General Meeting to order. It is 7:04pm.

2. **Chair's Welcome**

Mayor Scarpitti, Deputy Mayor Hamilton, Councillor McAlpine, UBIA Board and members, and guests, welcome to the 2022 UBIA Annual General Meeting. We are so pleased you could all join us tonight as we review our past year and look ahead to 2022.

I would like to take a moment to recognize the Directors of the UBIA Board, shown here on the slide. Two of our Directors have recently stepped down, Roger Kanda and Natasha Usher, we thank them for their many years of service and dedication to Main Street Unionville. They will certainly be missed.

3. **Approval of agenda**

I would first like to ask for approval of our agenda. The agenda has been sent out to members and guests, and is here on the screen for your viewing as well.

Motion by: Deputy Mayor Don Hamilton
Seconded by: Debbie Smrz
All were in favour

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4. **Approval of 2021 AGM Minutes**

I would next like to ask for approval of the 2021 minutes, sent out by email as well.

Motion by: Sylvia Morris
Seconded by: Sarah Iles
All were in favour

5. **Chair's Remarks: Year in Review**

(Chair Niina Felushko) What a year of ups and downs! We thought 2021 would be better than 2020, but sadly we encountered more COVID lockdowns and restrictions than the year before.

We were once again unable to hold traditional events such as Thursday Night at the Bandstand and the Unionville Festival, although we did manage to launch a new Unionville Market. Having the Market at the Stiver Mill instead of the Bandstand where we wanted it proved a bit of a challenge with getting the number of visitors we wanted, but it was a good experience to give it a try.

I am sure many of you noticed our abundance of beautiful flowers and the return of live music on the street this Summer. Paired with the extended restaurant patios and warm summer nights, our summer did provide a bit of a respite from COVID and its restrictions. However, once numbers continued to rise back up again in the Fall and Winter, we had to cancel our Christmas parade but were able to highlight the street with our many light displays, which drew much attention on social media and in other media outlets.

Above all, our main goal this year was to keep you informed and educated about the pandemic, which government programs were available and how to apply for them, and which regulations we needed to follow, when. We were responsive to your questions and reach-outs for assistance, and will continue to be as responsive in 2022.

We want to thank those who responded to our recent survey, many of you asked for more marketing spend on the street in general, which we will be doing, as well as content creation help with your social media marketing. We will be announcing a program soon to help everyone with that as well.

We are truly looking ahead to a positive 2022 as we work on the design and plans with the City for our Street Revitalization, and ensure all of our members get the support they need to really get ahead and into a recovery period.

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6. Executive Director Report

(**Executive Director Sara Sterling**) As Niina stated, we had a challenging year for sure. Fortunately all signs lead to lifting of further COVID restrictions and we are planning for an eventful year on Main Street ahead.

Niina talked about some of the accomplishments for the street this year. One of our most significant gains was a recent one that will stretch into 2022 – the "My Main Street" grant we were awarded from the Economic Development Council of Ontario to go towards the salary of a new Main Street Business Advisor.

This new program and Advisor will accomplish a set-out curriculum built by the EDCO to help "bring back Main Streets" across Ontario. Fortunately it also aligns very well with the previous RFP we issued, meaning we are now spending government money to come to the same results.

The first step will be for the Advisor to conduct market research, supported by the government, to help us understand who is coming to the street and why, and what they are looking for in the future. The second step is to provide business advice such as marketing, accounting and business development. The third piece, that you may be most interested in, is awarding 10 x $10,000 government grants for both existing businesses and entrepreneurs. More on these grants will be forthcoming mid-year and the Advisor will be assisting businesses in applying for them.

We are thrilled to announce we have hired our Main Street Advisor and he is on the call with us tonight, Michael Butler. Michael has lived in Unionville for almost 20 years and frequents many of our businesses on a regular basis. He has numerous years of experience in Business Development and brings a friendly positive attitude to the role.

Michael, please say hello to everyone. Michael Butler: Thank you Sara, and I am happy to be here with everyone tonight and look forward to working with you all over the next year.

Also, as many of you are aware, the City will soon be making a decision on the future design of Main Street and its Streetscape Revitalization. I expect the Mayor will speak about this shortly, but we did want to ensure everyone knows that we will be working hard to keep you informed and educated about when construction will commence – which we do not think will be until late this year – and how we can all get through it together. It will be great to have an awesome new street with so many new functions and amenities!

Lastly, we are hoping to host the Unionville Festival again this year, assuming we stay in a recovery mode. This will be the first year the UBIA has taken over the hosting of the event from

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the previous volunteer committee, who did an amazing job for 50 years. We are working with the City and YRP to ensure a safe, COVID friendly event.

With the Festival we also hope to bring more music, concerts and other events back to the street. Here's looking ahead to a great 2022!

7. Mayor Presentation and Q&A

(Chair Niina Felushko) We are honoured tonight to have Mayor Frank Scarpitti with us to talk about the future of Unionville, and answer a couple of your questions afterwards. The Mayor has always been a great advocate for Main Street Unionville and we appreciate his time and dedication. Over to you, Mr. Mayor.

Notes from Mayor Scarpitti's presentation:
Mayor Scarpitti thanked Niina for the invitation and everyone on the Board for their contributions, as well as Sara Sterling for her work, and Wes Rowe for his help with Remembrance Day last year.

They Mayor spoke about Streetscape Revitalization, and shared with everyone the Options that were on the table, in the staff recommendation going to DSC on February 22nd. He showed many slides with images and options, and talked about lighting, traffic calming and better traffic flow as well as more pedestrian uses. The Mayor publicly stated he would support Option #4 at a cost of $10.2 million as Main Street Unionville was a tourist hub and needed the upgrade desperately in order to maintain tourism.

The Mayor also mentioned a new Public Art initiative that will be on Main Street Unionville, but that it is just in the development stages so no details are available just yet.

Executive Director Sara Sterling: Thank you Mr. Mayor for your presentation, we appreciate your time. We do have some questions that have been submitted by our members for you.

1. The businesses on the street are very much looking forward to having the street revitalized and getting the update it needs so desperately. The decision on spending funds is coming up on February 22nd, can you give us an update on where you think the decision might go, and do you recognize the importance of ensuring Markham's number one tourism destination receives the attention it deserves?
    - This question was essentially answered during the Mayor's speech when he committed to supporting the $10.2 million Option.
2. The past two years have obviously been a struggle for everyone, especially small businesses. One of the things that hurt us the most is the inability to host events during the Summer when others nearby like Aurora and Newmarket had more flexible

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rules. Can the City commit to being more flexible this Summer if the Provincial restrictions allow?

- The Mayor said if Covid Recovery continues on the path it is now, that the City will be permitting larger events going forward. The City is starting to look at how it will plan Canada Day, which likely means the Unionville Festival would be allowed.

Other questions for the Mayor:

1. Sylvia Morris asked what the timing and stages would be for construction? The Mayor responded that it will be most of 2023 and into 2024, but depends heavily on what the construction and design teams find when they start digging. There will be consultations with stakeholders to help decided if the road needs to be closed and if so when, and for how long.
2. Rob Kadlovski asked the Mayor if Watford Group had made an application to the City yet for their development? They Mayor responded that no they had not received an application. Sylvia commented she had spoken with Harshal Dave who committed to sending in the application soon.

The Mayor was thanked by all for his attendance and presentation.

7. **2021 Financials**

Chair Niina Felushko presented the 2021 financials. We are again in a surplus situation due to lack of spending during Covid.

Motion to accept 2021 financials: Sarah Iles
Seconded by: Sylvia Morris
All were in favour

6. **Proposed Annual Budget**

Chair Niina Felushko presented the 2022 Budget. She highlighted the additional revenue including the My Main Street Program grant for $57,500, as well as City and CCT grants. We are hoping to be able to spend more funds on events this year, as well as a push on Marketing and a new Business Support Program that will help our businesses with various projects.

Motion to approve proposed budget: Debbie Smrz
Seconded by: Shibani Sahney
All were in favour

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7. Election of Directors

Chair Niina Felushko: The Unionville BIA Board is comprised of 7 to 11 Board members, including two from City Council. At this time we have 9 Board members. These leaves space for the addition of 2 new Board members should there be interest among members to join. A member is defined as someone who owns property or a business on Main Street Unionville.

We have received one notice of interest from Kimberly Wake, a business owner of Chez Co., a new real estate and design firm located at 161 Main Street. She has submitted her intention and a biography to the Board and the Board supports her nomination.

Are there any other nominations from the floor? No there were not.

If not, we need a nominator and seconder for Kimberly.

Nominator: Niina Felushko
Seconder: Shibani Sahney
All in favour

8. Next meeting

The next meeting of the Unionville BIA Board will be Wednesday February 16th at 930am on Zoom. If you are not on the Board but interested in attending please contact Sara for the Zoom link.

9. Adjournment

If there are no other items I will make a motion to adjourn.

Motion to adjourn: Niina Felushko
Seconded: Deputy Mayor Don Hamilton
All were in favour

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Unionville BIA Board Meeting
Date: Wednesday March 16, 2022
Via ZOOM

Board Members in Attendance:
Deputy Mayor Don Hamilton, Niina Felushko, Shibani Sahney, Debbie Smrz, Kimberly Wake, Kash Mahmood, Sarah Iles, Sylvia Morris

Regrets: Tony Lamanna, Reid McAlpine

Guests: Natasza Tyzler, Jeff Day

Executive Director: Sara Sterling, Michael Butler

Call to order: By Chair Niina Felushko at 9:30am

Approval of Agenda
Motion to approve by Don Hamilton
Seconded by Debbie Smrz
All were in favour

Approval of Meeting Minutes, February 2022
Motion to approve by Debbie Smrz
Seconded by Niina Felushko
All were in favour

Approval and update of Financials
We do not have the financials from the City – they will be reviewed at the next meeting.

City Updates
Reid did not attend, Don did not have any updates to share at this time.

ED Report by Sara Sterling
Festival: Planning for the Festival is well underway. We have almost all the booths booked, plenty of volunteers and entertainers booked as well. Sponsorship has been amazing with $46,500 total. Sara will have a full schedule ready by May to share.

My Main Street: Michael gave a quick update on the businesses he's been meeting with and training he's been attending. His market research is coming together well.

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Commercial Façade: A reminder to everyone that the City is accepting applications for Commercial Façade Grant until April 1st. Sara has shared the info with the street 3 times.

Member Social: We will be hosting a "member social" at the Arms on Wed April 13th at 5pm. It's a chance for the businesses to network and connect with each other. We are hoping to have one of these each quarter.

Office move: We are working on the lease with the City for McKay House and expect to have the keys for April 1st. Don suggested any remaining items from the old office could be donated to Union Villa.

Real Estate updates
Calabria Bakery is hoping to open in May. They are still fixing the structural issues at 177 Main Street, Sylvia has a couple people interested.

New items:
Do we want to continue meetings on Zoom or move back to in person? Everyone agreed Zoom is easier to fit the meeting into their days, so we will keep it online and see each other on the street and at our Socials. Sara will send out next 3 month meeting invites and Zoom links.

Sylvia reported a break in at 177 Main Street and asked if cameras on the street is a good idea. It was decided no for various reasons – large cost, who would monitor, etc. Niina did suggest that maybe we offer a subsidy to businesses who want to buy cameras for their own store.

Motion to adjourn: Niina Felushko
Seconded: Sarah Iles
All were in favour

Meeting adjourned at 10:18am

Next Meeting: Wednesday, April 13th at 930am

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Unionville BIA Board Meeting
Date: Wednesday April 13, 2022
Via ZOOM

Board Members in Attendance:
Deputy Mayor Don Hamilton, Niina Felushko, Shibani Sahney, Kash Mahmood, Sylvia Morris, Reid McAlpine, Tony Lamanna

Regrets: Debbie Smrz, Kimberly Wake

Guests: Natasza Tyzler, Rob Kadlovski (10:32am)

Staff: Sara Sterling, Michael Butler

Call to order: By Chair Niina Felushko at 9:37am

Approval of Agenda
Motion to approve by Don Hamilton
Seconded by Shibani Sahney
All were in favour

Approval of Meeting Minutes, February 2022
Motion to approve by Sylvia Morris
Seconded by Reid McAlpine
All were in favour

Approval and update of Financials
Niina reviewed both February and March financials as we did not have them previously to review. She noted that the Digital Main Street GL code is actually for My Main Street costs, meaning Michael's salary. Reid suggested we ensure it is as clear as possible for when it goes to Council next week.

Approval of February Financials
Motion to approve by Reid McAlpine
Seconded by Shibani Sahney
All were in favour

Approval of March Financials
Motion to approve by Sylvia Morris
Seconded by Reid McAlpine
All were in favour

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City Updates
Tony asked Reid about the Streetscape Revitalization as he is concerned about the timing of construction. While his concern is noted, we do have to recognize that this is a massive project and it is highly likely that construction will have to happen throughout all seasons of the year. Reid mentioned the City is planning a Communications Plan to manage and that both the City and BIA will do everything possible to ensure we keep our businesses as viable as possible. Sylvia asked if the construction would be done in pieces, but we do not have any of that information yet.

ED Report by Sara Sterling
Festival: Planning for the Festival is well underway. All booths are booked as well as most entertainment. Road closure and YRP is pretty much good to go.

My Main Street: Michael gave a quick update on the businesses he's been meeting with and training he's been attending. He will be helping out with the Festival a bit, and will start to communicate with more businesses this coming month.

Commercial Façade: Five businesses on the street applied for the program. We do not know who qualified.

Member Social: It was decided to cancel the Social as only 11 people RSVP'ed, 8 of them being Board members. There is also some concern about COVID spread right now.

Office move: We have the keys and will be slowly moving in over the next couple of months.

Social Media videos: We are going to produce social media videos for whomever wants one on the street. We have a quote from a great videographer, it will cost us approx. $450 per business. This money will come out of our budgeted $30,000 "Business Support Program". We are aiming to do this in May.

FedDev Grant: The Federal Govt has announced $8 milion dollars in funding for tourist areas like ours. We have been encouraged to apply through CCT and will do so shortly. We will likely get $100,000 to be used towards Market and Events from now until Dec 31, 2022.

Real Estate updates
Sylvia: Therese is now thinking of selling her building at 177 Main St, she has not leased it yet. 141 Main Street sold to a group of doctors. Grand Havana Cigars has left, a new spa is coming in. No update on 147A Main St.

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New items:
The City has asked the UBIA for an opinion on Thursday Night at the Bandstand. While the Board in general wants to support the event as it is a great tradition, there are concerns about the logistics of it all with road closures and safety with potential thousands of people. Sara will discuss further with the City as it is really their call. Indications from them is that Bill Dawson is asking the City to manage and pay for all the road closures, which is not fair as it is not a City event. If Bill does do the event the UBIA would support with a sponsorship, but the UBIA does not have the resources to support in any other way.

In Camera: Niina has called an in-camera session. See separate notes.

Motion to adjourn: Niina Felushko
Seconded: Sylvia Morris
All were in favour

Meeting adjourned at 11:07am

Next Meeting: Wednesday, May 18th,2022

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Unionville BIA Board Meeting
Date: Wednesday May 18, 2022
Via ZOOM

Board Members in Attendance:
Deputy Mayor Don Hamilton, Councillor Reid McAlpine, Niina Felushko, Shibani Sahney, , Kimberly Wake, Judi McIntyre, Michael Butler, Rob, Tony Lamanna
Regrets:

Guests: Natasza Tyzler, Wes Row

Executive Director: Niina Felushko (On Behalf of Sarah Sterling)

Call to order: By Chair Niina Felushko at 9:40am

Approval of Agenda
Motion to approve by Niina 9:40am
Seconded by ______
All were in favour

Approval of Meeting Minutes, April 2022
Sarah is off on Medical Leave - Judi McIntyre has stepped in to assist.
Motion to approve by Niina
Seconded by Tony Lamanna/Reid McAlpine
All were in favour

Approval and update of Financials

Request to table the April Financials as Revenues were not matching and would like to take a closer review. Vendor payments were not showing. Footnotes removed for April.
Approved 2022 financials
New grant for $100,000 submitted by Sarah before her leave was turned down as we are not eligible. Spoke to CCT who reverted back to partnership program $8,000 or $6000 instead of $100,000. (Some reasons were that we have our own bank account/ non-profit).
We will receive $6,000 for Unionville festival oppose to the $40,000 requested. Therefore Just under $60,000 for Festival. Within Budget.

Grant submissions to Destination Markham have been submitted
Mercedes Benz appriwched to sponsor- A sponsorship deck has been created to assist with summer programming.

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Christmas $20,000 beautification. Quote came in at $23,000. Spent $15,000 on odds/ends (visualize it, banners, gazebo, etc).
Destination Markham Business support program - $0 spent but beginning soon.

Retail Action Strategy - A bit behind - Finalize my Mainstream

Questions:
Deputy Mayor Hamilton Addresses missing out on sizeable amount of Money suggests approaching the city to re-organize ourselves so that we don't run into this again in the future.
Councillor Reid McAlpine suggests speaking to our solicitor and also addresses how this may impact member tax levies.
Niina spoke to someone at the city who asked about 'keyshore'
Rob expressed concern about misinformation around the qualification criteria and will put a call through to find out more.
Councillor Reid McAlpine brought up that perhaps speaking to Paul Chang to advocate for us in Ottawa around the rules or to structure things differently in the future.

Open Streets -May 24th
Development Services Agreed to same program in the past and it makes it much simpler.
Jakes Patio Expansion is done.
Chatbar patio has been approved to expand out into street not into courtyard beside it.
City Staff are working out the placement of the Flower Barrels.
Walk of Public Art - Next week - Wednesday 21st of May at 8am.
Today is the Walk for festival with city folks.
It was brought up by Tony Lamanna that there has been Street Racing by Motor Bikes on the street and this should be addressed with YRP. Reid McAlpine will notify Super Intendant Wilson to have patrol alerted.

City Updates
Streetscape and Revitalization
Meetings are Underway, all commissioners were present including Sr. Management therefore its a priority.
Planning, Timing and communication are what they are addressing at this point.
Three meetings are scheduled for next month with UBIA and liaison committee.
Community open house scheduled for June.
Deputy Mayor Don Hamilton remains steadfast in the opinion that one option may be to Close street for a shorter period of time or close one lane at a time, this extends timeline. Both options to be explored thoroughly for the best outcome of the vendors and end results.
Tony Lamanna and Reid discuss "Defined tendering" and the criteria surrounding selecting the best contractors for the job.

HISTORIC MAIN STREET
UNIONVILLE
SETTLED IN 1794

Design, integration of public art & finish selections to be discussed with UBIA and public input. Slides to come.
Its estimated they are at the 30% design phase, then will address further at the 60% design phase and then 100%.

My Main Street: Michael Butler has been active in the My Mainstreet 12 Business Accelerator programs. They have gone through the digital mainsheet and 15 min/walk/research. \My Mainstreet Launch has more to do over the coming months but Michael plans to have a summary for the next meeting. There will also be an upcoming webinar for members - post festival in mid June.

ED Report by Judi McIntyre
Festival: Shaping up terrific. Everything seems to be in place. All road closure communication is complete and the walk today will ensure everything is addressed in advance. Niina opened discussion around the inclusivity for the neighbourhood and how we can make the festival or future events more inclusive. Such as sign language interpreters, etc. The water truck was a challenge and was eliminated from the plans. However for future events it was agreed that Eco-Footprint was important and it should be explored how it can be included more for future events. As an example a “permanent” water bottle filling station was proposed for the street design during revitalization. Mayor cannot be present for the event but will send Jim Jones in his place. Music is booked for Friday and Sunday before festival.

Bandstand: MOU on Bandstand. Tuesday after long weekend through to the fall city provides signage at their expense. Additional Support from Bi-Laws. There will be regular meetings and Holding a permit will be shown. Criteria put in place to avoid busters. MOU Agreements in place. Everything will be underway as of next week.

UBIA Office space: The office is in the process of moving over to the new location. Niina Makes a motion to take over the second room at the Mackai office paying $600 and add $400-$500 which is less than $1500 that was being paid at the previous office. Price per square foot was something that was agreed to be looked at when negotiating the price. Tony Lamann advocates and approves Niinas motion. Reid McAlpine seconds the motion. He also suggests to Partner with the City as they are looking to take an office on the Main Street level and proposes sharing during construction period.

Shibani Sahney brought forward a motion: 2022 Partnership with Mac for Music on the Street. 13 Week program for $15,000. Requested funds from Destination Markham. Reid McAlpine seconds the motion and everybody is in favour.

HISTORIC MAIN STREET
UNIONVILLE
SETTLED IN 1794

New Items: Judi McIntyre mentions that Historical Tours with George Duncan may come back. 15 businesses on the street will be getting Grants to do videos for their businesses on the street with Maria, Trevor and Jason. There was discussion around the bringing back outdoor movies as an event 3-4 times during the summer. More to report on this for the next meeting. Part of Destination Markham.

Members Social: How to engage other members on the street should be addressed. Reid Mc Alpine suggests Keeping this off the list for now.

Commercial Facade Grant: #208 work is underway for Historical Improvement under the "Heritage Facade Improvement Grant". There are several contains surrounding this. Bi-Law officers have started to walk the street to bring issues to light and ensure they fit heritage criteria. Talks around reimbursement of improvements is required.

Ladies Night in the Fall: The first ladies night was well received and similar timing should be considered for the next one. Late September or Early October.

Halloween: Nothing for Halloween as covid restricted this. Discussion around if a Ghost tour could be a fun idea.

Christmas Parade: It was agreed that keeping it to an Evening parade was the best and set us apart from the rest of the parades. This also allowed for an all day event to promote winter wonderland theme throughout the day and hopefully drive traffic to all businesses. All were in agreement on this. Rob brought up the Christmas light proposal for the street, reaching out to Noma to have them sponsor to light up the street with beautiful lights as an attraction during Christmas.

Real Estate updates:
No update on #147
#141 - Three Doctors purchased it.
Chat bar sold - ownership changed but it will remain the same.
City in process of paving the back half of the parking and reached out to owners to get their portions done swell.
Painting and Paving planned for this summer.
Old Starks is under renovation to remediate but still not much more of an update.

Marc Agnew (209 Mainstreet owner) enters into the Meeting at 11:00am. Mentions he plans to paint his building but it is on the to do list.

Reid McAlpine discusses Paid Parking being a Revenue source and what it might look like fir the future. The city is proceeding with Parking proposals for Unionville. Do we have sufficient parking and the beautification of that parking so that it doesn't take away from the West side of the street.

Motion to adjourn: Niina Felushko
Seconded: Tony Lamanna
All were in favour

Meeting adjourned at 11:13am

Next Meeting: Wednesday, June 16th at 9:30am

MARKHAM

Report to: General Committee | Meeting Date: September 6, 2022

SUBJECT: 2023 Capital Budget Pre-Approval
PREPARED BY: Jay Pak, Acting Senior Manager, Financial Planning

RECOMMENDATION:

1. That the report dated September 6, 2022 entitled, “2023 Capital Budget Pre-Approval” be received; and

2. That Council approve the 2023 Capital Budget pre-approvals, which total $48,879,300 as outlined in Appendices 1 and 2; and

3. That Staff be authorized and directed to do all things necessary to give effect to this resolution.

PURPOSE:
To obtain Council approval of the City of Markham’s 2023 Capital Budget pre-approval.

BACKGROUND:
With the municipal election on Monday, October 24, 2022, the 2023 Capital Budget will likely be approved in February/March 2023. Prior to budget approval, some capital projects are required to be initiated in order to prevent delays in design or construction, meet operational/program requirements and allow early commencement of the procurement process to potentially achieve competitive pricing. Pre-approval of the 2023 capital projects mentioned in this report will achieve this goal.

OPTIONS/ DISCUSSION:
There are 49 projects requested to be pre-approved in this report, and the corresponding request forms are attached for reference (Appendix 2). Projects being requested for pre-approval and the rationale for requiring pre-approval in 2022 by department are as follows:

- **Recreation Services ($2.0M)**
  - Angus Glen CC Pool Repair- Construction
  - Centennial CC Poor Repair - Construction
  - PanAm Centre Pool Filter Refurbishment
  - Recreation Arena Refrigeration Gasket Replacement

Rationale for pre-approval: All pre-approval projects within Recreation require the procurement process to begin in Q3 or Q4, 2022. Based on the facility and program timelines, the requested projects are intended to commence work prior to March 2023, so that the City can mitigate any potential impact to residents and user groups.

- **Operations – Roads ($9.3M)**
    - Asphalt Resurfacing
    - Boulevard Repairs
    - Bridge Structure Preventative Maintenance - Roads
    - Emergency Repairs
    - Localized Repairs - Curb & Sidewalk
    - Localized Repairs - Parking Lots
    - Parking Lots- Rehabilitation

Rationale for pre-approval: All projects listed above are annual completion projects associated with asphalt and concrete rehabilitation and maintenance contracts that either need to commence in January 2023 or go to the market by Q1 2023. Subsequently, significant work is required to prepare the tender prior to going to the market in early 2023 for spring construction commencement.

- **Operations – Parks ($3.9M)**
    - AODA Playground Refurbishments - Year 1 of 4
    - Boulevard/Park Trees Replacement
    - Court Resurfacing/Reconstruction - Markham Tennis Club
    - Court Resurfacing/Reconstruction/Maintenance
    - Fence (Tennis Courts)
    - Markham Trees for Tomorrow
    - Pathways Resurfacing
    - Playstructure Replacement
    - Sportsfield Maintenance & Reconstruction

*Rationale for pre-approval***:** All projects listed above require pre-approval in 2022 due to weather conditions permitting either the survey, verification, planting or consulting work to be done prior to awarding the main contract. Several of the projects are to go out to the market starting in January of 2023 which also necessitates significant work to prepare the tender for spring construction and planting season.

- **Operations - Fleet ($2.6M)**
    - Corporate Fleet Replacement - Non-Fire - Pre Approval
    - Corporate Fleet Replacement – Waterworks
    - New Fleet - Parks - Pre Approval
    - New Fleet – Roads
    - Upfit of Fleet Services Mobile Van

*Rationale for pre-approval***:** The Fleet projects listed above require pre-approval mainly due to escalating market conditions whereby staff are seeking to secure inventory and pricing in Q4 2022 in the face of escalating costs and supply chain delivery issues. As the contracts begin in the spring of 2023, any delays in the delivery of the vehicles would significantly risk timely delivery of the vehicles required to maintain 2023 service levels.

- **Operations - Utility Inspection & Survey ($0.1M)**

- German Mills Meadow Environmental Monitoring Program

*Rationale for pre-approval***:** Year 1of this project is renewed in late 2022 for January 2023 start. Waiting until 2023 to commence the project will jeopardize the City's obligation to meet legislated requirements.

- **Environmental Services - Infrastructure ($15.5M)**
  - Bridges and Culverts - Condition Inspection
  - Storm and Sanitary Sewer CCTV Inspection
  - Structures Program-Full-time Staff
  - West Thornhill Flood Control Implementation Phase 4B Construction

*Rationale for pre-approval***:** The majority of projects listed above are require pre-approval as the Purchase Orders for the projects are set to expire by the end of 2022. In order to continue the service levels into January 2023, the POs need to be renewed by Q4 2022. The West Thornhill Flood Control Implementation Phase 4B requires pre-approval in order to be properly prepared for the tender process in Q1 of 2023. Each phase is critical in order to be ready for construction in Q2 of 2023.

- **Environmental Services - Stormwater ($0.3M)**
  - SWM Ponds - Condition Inspection
  - Water Quality Improvements
  - Water Quality Monitoring at Swan Lake
  - West Thornhill Flood Control - Phase 4C & 4D Additional Design

Rationale for pre-approval: The majority of projects listed above require pre-approval in order to commence in time for a January 2023 start date and as such, are dependent on weather conditions prior for work to be completed prior to the tender process. The West Thornhill Flood Control – Phase 4C & 4D additional design project aligns with the Yonge subway line project. As the completion of the design project will require 6-9 months, a consultant is needed in 2022 to ensure that construction can commence on schedule in 2024.

- **Environmental Services - Waterworks ($12.3M)**
  - Asset Management Analyst - Full Time Staff
  - Cathodic Protection of Ductile Iron Watermains
  - CI Watermain Replacement – Construction
  - SCADA Instrumentation and Replacement
  - Water Meters - Replacement Program

*Rationale for pre-approval***:** The Asset Management Analyst position is a continuation from 2022 with a contract expiry of December 2022. This project requires pre-approval in 2022 in order to ensure that the position is continuously funded into 2023. The majority of the remaining projects listed above require pre-approval in order to commence the tendering process in Q4 of 2022 so that 2023 targets can be met. The SCADA Instrumentation and Replacement project requires pre-approval due to long lead times from recent supply shortages experienced in the market.

- **IT Services ($1.3M)**
    - ITS - TXM Solution Replacement (Consulting)
    - IT Lifecycle Asset Replacement
    - ITS - Leap Cloud (formerly Feb Server)
    - ITS - Microsoft 365
    - ITS - Oracle DB Licensing

*Rationale for pre-approval***:** The projects listed above require pre-approval in 2022 to expedite software and licensing updates across the IT infrastructure to maintain system security and resilience.

- **Finance ($0.2M)**
    - Water Billing Transition Project - Phase 2 of 3

Rationale for pre-approval: The project above relates to the Alectra water billing system replacement and requires pre-approval in 2022 as it is phase 2 of a 3 phase project, and the consultant is imperative in ensuring that Phase 3 commences on target.

- **Sustainability & Asset Management ($0.8M)**
    - Roofing Replacement Projects

*Rationale for pre-approval***:** The project above requires pre-approval in 2022 due to extensive lead times required as a result of supply chain issues experienced in the market.

- **Theatre ($0.6M)**
    - Theatre-Dressing Room Renovations
    - Theatre-Fire Curtain Replacement

Rationale for pre-approval: The projects above require pre-approval in 2022 mainly due to extensive lead times required as a result of supply chain issues experienced in the market.

- **Building Services ($0.1M)**
    - Building Standards Guide Builder

Rationale for pre-approval: To ensure the software and guides are active and available for customers before the spring rush for permits. If not in place for spring 2023, the full benefit of this software will not be experienced until 2024.

The major sources of funding for the 2023 Capital Budget pre-approval include:

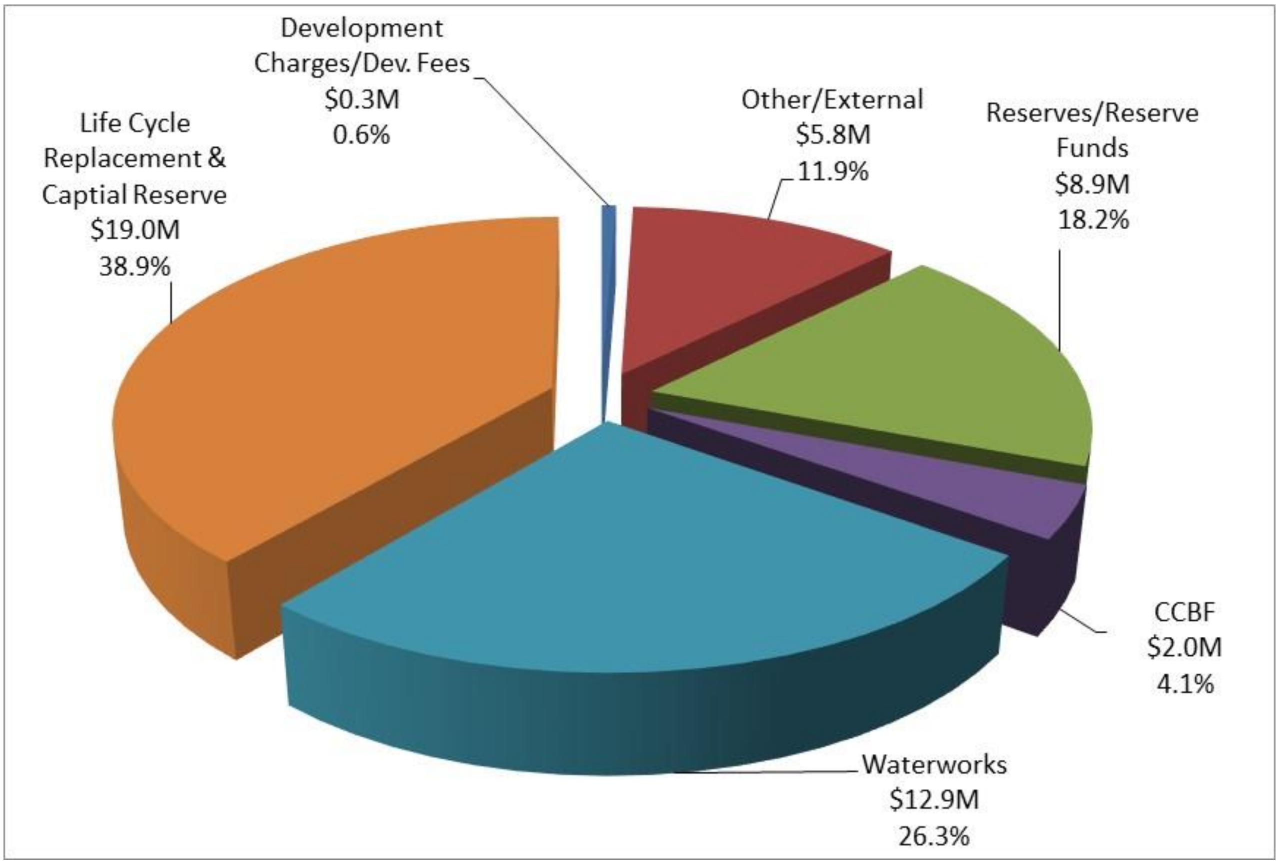
- $19.0M (38.9%) from Life Cycle Replacement and Capital Reserve Fund for the maintenance of parks, roads/bridges, as well as community centre pools;

- $12.9M (26.3%) from Waterworks Reserve to support Waterworks maintenance;
- $7.2M (14.6%) from Stormwater Reserve Fund and $2.0M (4.1%) from Canada Community Building Fund (CCBF) totalling $9.2M for flood control program
- $5.8M (11.9%) from federal Disaster Mitigation and Adaptation Fund (DMAF) grant to support the flood control program;
- $1.7M (3.6%) from Facility Ramp and Trees for Tomorrow Reserve Funds mainly for AODA playground compliance and Trees for Tomorrow; and
- $0.3M (0.6%) from Development Charges and Development Fees.

Further details on sources of funding are illustrated on Table 1.

Table 1: 2023 Capital Budget Pre-approval Funding Sources

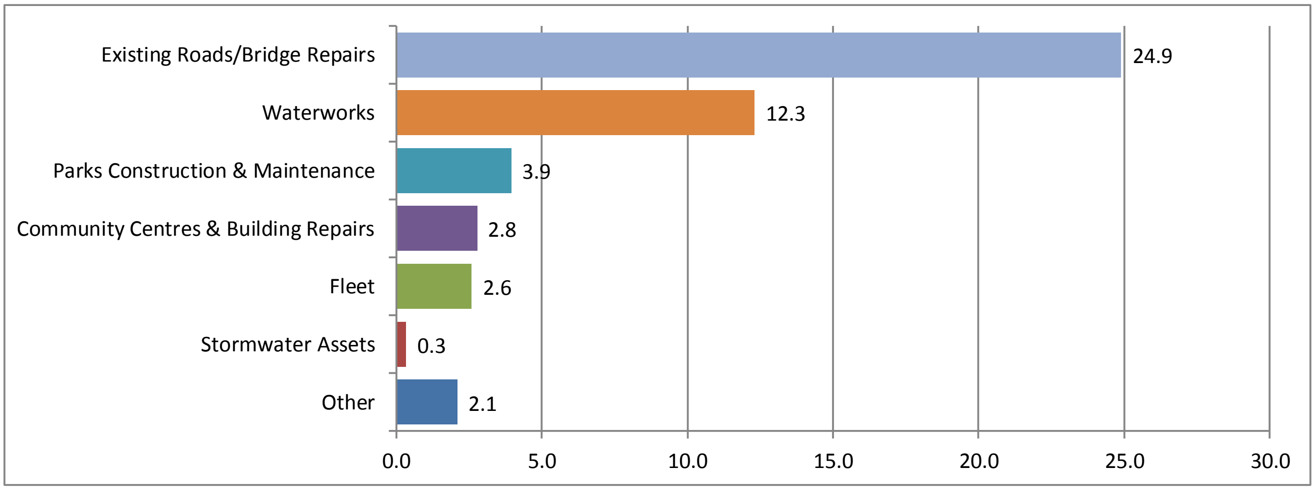
Total $48.9M



2023 Capital Budget pre-approval expenditures by category are summarized on Table 2.

Table 2: 2023 Capital Budget Pre-approval Expenditures by Category (In $Millions)

Total $48.9M



FINANCIAL CONSIDERATIONS
The 2023 Capital Budget pre-approval includes $48,879,300 of capital projects which are funded from multiple funding sources as outlined in Appendix 1.

2023 Capital Budget pre-approval will not impact any major directions from the new Council after the municipal election on October 24, 2022.

HUMAN RESOURCES CONSIDERATIONS
Not applicable.

ALIGNMENT WITH STRATEGIC PRIORITIES:
The 2023 Capital Budget pre-approval of $48,879,300 includes capital projects that align with the City of Markham's strategic priorities developed by Council.

BUSINESS UNITS CONSULTED AND AFFECTED:
All business units have been consulted during the 2023 Capital Budget pre-approval submission and review process.

RECOMMENDED BY:

Joel Lustig, Treasurer

Trinela Cane, Commissioner,
Corporate Services

ATTACHMENTS:

Appendix 1 – 2023 Capital and Other Programs Budget: Summary of Pre-Approval Projects

Appendix 2 – 2023 Capital and Other Programs Budget: Project Request Forms

CITY OF MARKHAM
2023 CAPITAL and OTHER PROGRAMS PRE-APPROVAL BUDGET
by Department

Project Description	Total	Operating Non-Life Cycle	Operating Life Cycle	DC - Reserve	DC - Developer	Other	Description of Other Funding
Community Services							
Recreation Services							
23001 Angus Glen C.C. Pool Repair - Construction	719,600		719,600				
23002 Centennial C.C. Pool Repair - Construction	981,700		981,700				
23003 Markham Pan Am Centre Pool Filter Refurbishment	237,600		237,600				
23004 Recreation Arena Refrigeration Gasket Replacement	35,600		35,600				
TOTAL Recreation Services	**1,974,500**	-	**1,974,500**	-	-	-	
Operations - Roads							
23005 Asphalt Resurfacing	7,883,200		7,883,200				
23006 Boulevard Repairs	88,000		88,000				
23007 Bridge Structure Preventative Maintenance - Roads	27,400		27,400				
23008 Emergency Repairs	162,200		162,200				
23009 Localized Repairs - Curb & Sidewalk	929,700		929,700				
23010 Localized Repairs - Parking Lots	157,000		157,000				
23011 Parking Lots- Rehabilitation	45,800		45,800				
TOTAL Operations - Roads	**9,293,300**	-	**9,293,300**	-	-	-	
Operations - Parks							
23012 AODA Playground Refurbishments - Year 1 of 4	1,049,900					1,049,900	Ramp up Reserve
23013 Boulevard/Park Trees Replacement	942,300		942,300				
23051 Court Resurfacing/Reconstruction - Markham Tennis Club	236,900		78,968			157,932	Tennis Clubs
23014 Court Resurfacing/Reconstruction/Maintenance	491,000		383,444			107,556	Tennis Clubs
23015 Fence (Tennis Courts)	86,800		86,800				
23016 Markham Trees for Tomorrow	125,300					125,300	Trees for Tomorrow Reserve
23017 Pathways Resurfacing	151,300		151,300				
23018 Playstructure Replacement	705,100		451,100			254,000	Ramp up Reserve
23019 Sportsfield Maintenance & Reconstruction	148,800		148,800				
TOTAL Operations - Parks	**3,937,400**	-	**2,242,712**	-	-	**1,694,688**	
Operations - Fleet							
23020 Corporate Fleet Replacement - Non-Fire - Pre Approval	2,407,000		2,407,000				(1) see note below
23021 Corporate Fleet Replacement - Waterworks	108,000					108,000	Waterworks Reserve
23022 New Fleet - Parks - Pre Approval	11,200			11,200			(2) see note below
23023 New Fleet - Roads	32,600			32,600			

CITY OF MARKHAM
2023 CAPITAL and OTHER PROGRAMS PRE-APPROVAL BUDGET
by Department

Project Description	Total	Operating Non-Life Cycle	Operating Life Cycle	DC - Reserve	DC - Developer	Other	Description of Other Funding
23024 Upfit of Fleet Services Mobile Van	30,500			30,500			
TOTAL Operations - Fleet	**2,589,300**	**-**	**2,407,000**	**74,300**	**-**	**108,000**	
Operations - Utility Inspection & Survey							
23025 German Mills Meadow Environmental Monitoring Program -	82,800		82,800				(3) see note below
TOTAL Operations - Utility Inspection & Survey	**82,800**	**-**	**82,800**	**-**	**-**	**-**	
Environmental Services - Infrastructure							
23026 Bridges and Culverts - Condition Inspection	81,600		81,600				
23027 Storm and Sanitary Sewer CCTV Inspection	756,600		262,600			494,000	Waterworks Reserve
23028 Structures Program-Full-time Staff	149,200		149,200				
23029 West Thornhill Flood Control Implementation Ph 4B Constr.	14,522,500					14,522,500	SMW Rsrv, DMAF Grant, CCBF
TOTAL Environmental Services - Infrastructure	**15,509,900**	**-**	**493,400**	**-**	**-**	**15,016,500**	
Environmental Services - Stormwater							
23030 SWM Ponds - Condition Inspection	28,100		28,100				
23031 Water Quality Improvements	77,300		77,300				
23032 Water Quality Monitoring at Swan Lake	30,900		30,900				
23033 West Thornhill Flood Control - Ph 4C & 4D Addl. Design	203,500					203,500	Stormwater Reserve
TOTAL Environmental Services - Stormwater	**339,800**	**-**	**136,300**	**-**	**-**	**203,500**	
Environmental Services - Waterworks							
23034 Asset Management Analyst - Full Time Staff	110,700					110,700	Waterworks Reserve
23035 Cathodic Protection of Ductile Iron Watermains	995,100					995,100	Waterworks Reserve
23036 CI Watermain Replacement - Construction	9,811,400					9,811,400	Waterworks Reserve
23037 SCADA Instrumentation and Replacement	312,000		312,000				
23038 Water Meters - Replacement Program	1,067,600					1,067,600	Waterworks Reserve
TOTAL Environmental Services - Waterworks	**12,296,800**	**-**	**312,000**	**-**	**-**	**11,984,800**	
TOTAL Community Services	**46,023,800**	**-**	**16,942,012**	**74,300**	**-**	**29,007,488**	
Corporate Services							
IT Services							
23039 ITS - TXM Solution Replacement (Consultancy)	101,800					101,800	Ramp up Reserve
23040 IT Lifecycle Asset Replacement	488,400		390,720			97,680	(4) see note below
23042 ITS - Leap Cloud (Feb Server)	149,600					149,600	Development Fee, Building Fee, WW

CITY OF MARKHAM
2023 CAPITAL and OTHER PROGRAMS PRE-APPROVAL BUDGET
by Department

Project Description	Total	Operating Non-Life Cycle	Operating Life Cycle	DC - Reserve	DC - Developer	Other	Description of Other Funding
23043 ITS - Microsoft 365	407,000		325,600			81,400	Development Fee, Building Fee, WW
23044 ITS - Oracle DB Licensing	107,400					107,400	Development Fee, Building Fee, WW
TOTAL Asset Management	**1,254,200**	-	**716,320**	-	-	**537,880**	
Finance							
23045 Water Billing Transition Project - Phase 2 of 3	203,500					203,500	Waterworks Reserve
TOTAL Finance	**203,500**	-	-	-	-	**203,500**	
Sustainability & Asset Management							
23046 Roofing Replacement Projects	767,000		767,000				
TOTAL Sustainability & Asset Management	**767,000**	-	**767,000**	-	-	-	
TOTAL Corporate Services	**2,224,700**	-	**1,483,320**	-	-	**741,380**	
Development Services							
Theatre							
23047 Theatre-Dressing Room Renovations	447,700		447,700				
23048 Theatre-Fire Curtain Replacement	111,900		111,900				
TOTAL Theatre	**559,600**	-	**559,600**	-	-	-	
Building Services							
23050 Building Standards Guide Builder	71,200					71,200	Building Standards Reserve Fund
TOTAL Building Services	**71,200**	-	-	-	-	**71,200**	
TOTAL Development Services	**630,800**	-	**559,600**	-	-	**71,200**	
TOTAL Pre-Approval Requests	**48,879,300**	-	**18,984,932**	**74,300**	-	**29,820,068**	

Notes:

(1) The overall project budget is $3,918,900, pre-approval request is $2,407,000 due to long lead time for delivery of vehicles

(2) The overall project budget is $238,100, pre-approval request is $11,200 due to requirement for upcoming winter maintenance

(3) The overall project budget is $357,500, pre-approval request is $82,800 due to contract extension with current vendor commencing January 1, 2023

(4) The overall project budget is $7.1M, preliminary and subject to change. Pre-approval request is $488,400 due to long lead time for delivery

2023 PROJECT FUNDING REQUEST FORM

Number: 23001

Project Cost: **$719,600**

Project Name: **Angus Glen C.C. Pool Repair - Construction**

Repair/Replace

Commission: Community Services

Department: Recreation Services

Project Mgr: Kerry Wakefield / Colby Brygidyr

Ward(s): CW ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☑ 6 ☐ 7 ☐ 8 ☐

Useful Life: 50 Pre Approval: ☑

Category: Major

Cost Validation: Third party estimate

Requirement Validation: Condition assessment

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

This project is to repair the main pool tank at Angus Glen C.C. During the COVID-19 pandemic, the pool was closed and drained and extensive time without water caused the concrete walls, waterproof membrane, and grout to dry and shrink more than it typically would during a normal shutdown for maintenance. The drier conditions of the materials followed by a quick fill with cold water as per industry standard resulted in cracking of the concrete shell. This resulted in water leaking through the concrete tank in a number of areas around the tank, predominantly in the deep end where the water filled first. Phase 1 is underway, where a consultant (Aquatic Design & Engineering) has been retained to investigate the extent of the issue. This project is to request funding for the second phase of the project.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	2023	Future Phases
Cost/Quote:	600,000	0
Internal Charges:	48,000	0
External Consulting:	0	0
Contingency %: 10	60,000	0
Sub Total:	708,000	0
HST Impact:	11,616	0
Total Project Cost:	**719,600**	**0**

NOTES

The main tank pool is original and was constructed in 2006. The purpose of the concrete tank is to hold and maintain water in a safe manner within the pool environment. Due to the leaks experienced while reopening the Angus Glen pool, a condition assessment of the main pool tank was completed. Further investigation and preliminary findings indicate that extensive repair is warranted.

SOURCE(S) OF FUNDING ($)

Funding Type	Budget	Components				TOTAL	Future Phases
Operating Funded Life Cycle	719,600	719,600	0	0	0	719,600	0
TOTAL FUNDING	**719,600**					**719,600**	**0**

OPERATING BUDGET IMPACT	Personnel	Non Personnel	Revenues	Expenditures/(Revenues)
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	Year	Amount	Amount in Study

Life Cycle

Amount in Study:	821,400
Amount Incl HST	719,600
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: **23002**

Project Cost: **$981,700**

Project Name: **Centennial C.C. Pool Repair - Construction**

Repair/Replace

Commission: Community Services

Department: Recreation Services

Project Mgr: Janice Carroll / Colby Brygidyr

Ward(s): CW ☐ 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Useful Life: 50 Pre Approval: ☑

Category: Major

Cost Validation: Third party estimate

Requirement Validation: Condition assessment

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

This project is to repair and replace the tiles and waterproofing of the main pool tank at Centennial C.C. During the COVID-19 pandemic, the pool was closed and drained and extensive time without water caused the concrete walls, waterproof membrane and grout to dry and shrink more than it typically would during a normal shutdown for maintenance. The same conditions also caused the underwater light casing and seals to crack. The drier conditions of the materials followed by a quick fill with cold water as per industry standard resulted in cracking of the concrete shell. This resulted in water leaking through the concrete tank in a number of areas around the tank, predominantly in the deep end where the water filled first. This project is to request funding for second phases of work. The first phase is underway, where a consultant is conducting tests and make repair recommendations. The second phase is to repair according to the consultant recommendations.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	810,000	0
Internal Charges:	75,000	0
External Consulting:	0	0
Contingency %: 10	81,000	0
Sub Total:	966,000	0
HST Impact:	15,682	0
Total Project Cost:	**981,700**	**0**

NOTES

The tiles on the main tank pool are original and constructed in 1968. Due to the leaks experienced, a condition assessment indicates that replacement was warranted. A consultant has been retained to investigate the extent of the repair and a contractor will be retained to complete the necessary repair to the main pool tank. The pool tank is at the end of its lifecycle and will require replacement within the next few years.

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Construction (Components)				**TOTAL**	**Future Phases**
Operating Funded Life Cycle	981,700	981,700	0	0	0	981,700	0
TOTAL FUNDING	**981,700**					**981,700**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	Year	Amount	Amount in Study

Life Cycle

Amount in Study:	2,154,400
Amount Incl HST	981,700
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: **23003**

Project Cost: **$237,600**

Project Name: **Markham Pan Am Centre Pool Filter Refurbishment**

Repair/Replace

Commission: Community Services

Department: Recreation Services

Project Mgr: Edward Migue

Useful Life: 5 Pre Approval: ☑

Category: Minor

Cost Validation: External peer review

Requirement Validation: Condition assessment

ITS Involved Project: Is ITS Consulted? ☐

Ward(s): CW ☐ 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

This project is to refurbish the components within the two (2) pool filtration tanks at Markham Pan Am Centre. The components being replaced for the pool filtration tanks are utilized to remove insoluble matter from the swimming pool to ensure for clear, safe and hygienic water to all participants. The work will consist of parts and labour required to open the pool filters.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	200,000	0
Internal Charges:	0	0
External Consulting:	12,300	0
Contingency %: 10	21,230	0
Sub Total:	233,530	0
HST Impact:	4,110	0
Total Project Cost:	**237,600**	**0**

NOTES

The existing pool filtration tanks were installed in 2014. A condition asessment conducted by a third party consultant indicates that multiple parts within the filtration tank require replacement. The project consists of replacing multiple filter elements (septums, o-rings, gaskets, etc.) and labour to ensure that the filtration system meets its life cycle. Annually, Pan Am hosts 42 swim meets and events. Water quality issues have been mitigated with short term solutions, but these will not be sustainable.

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components				**TOTAL**	**Future Phases**
Operating Funded Life Cycle	237,600	237,600	0	0	0	237,600	0
TOTAL FUNDING	**237,600**					**237,600**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	Year	Amount	Amount in Study

Life Cycle

Amount in Study:	1,766,400
Amount Incl HST	237,600
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23004

Project Cost: **$35,600**

Project Name: **Recreation Arena Refrigeration Gasket Replacement**

Repair/Replace

Commission: Community Services

Useful Life: 10 Pre Approval: ☑

Department: Recreation Services

Project Mgr: Mike Hasted

Category: Minor

Ward(s): CW ☐ 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Cost Validation: Third party estimate

Requirement Validation: Condition assessment

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

This project is to replace the gaskets within the plate and frame heat exchanger at Centennial C.C. The heat exchanger is a critical piece of refrigeration equipment. Its performance directly affects efficiency and safety. The manufacturer of the heat exchanger recommends replacement of the gasket every 7-10 years based on condition assessment. Constant exposure to ammonia speeds the aging process of the rubber gaskets and thus can compromise sealing efficiency.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	35,000	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	35,000	0
HST Impact:	616	0
Total Project Cost:	**35,600**	**0**

NOTES

The existing plate and frame heat exchanger was last installed in 2009 at Centennial C.C. The gaskets are original. Based on condition assessment, replacement is warranted. Constant exposure of the gaskets to ammonia speeds the natural aging process of the rubber gaskets and thus can compromise sealing efficiencies. The amount requested is consistent with recent quote.

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components				**TOTAL**	**Future Phases**
Operating Funded Life Cycle	35,600	0	0	0	0	0	0
TOTAL FUNDING	**35,600**					**0**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	Year	Amount	Amount in Study

Life Cycle

Amount in Study:	2,154,400
Amount Incl HST	35,600
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23005

Project Cost: **$7,883,200**

Project Name: **Asphalt Resurfacing**

Repair/Replace

Commission: Community Services

Department: Operations - Roads

Project Mgr: Zoyeb Vahora

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Useful Life: 20 Pre Approval: ☑

Category: Minor

Cost Validation: Recent awards

Requirement Validation: Condition assessment

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Asphalt resurfacing of roads throughout the City utilizing a pavement management program to select rehabilitation candidates. The overall goal is to maintain an acceptable pavement condition index and user satisfaction by implementing cost effective strategies designed to extend pavement life and reduce overall maintenance costs of the road network. Other work includes interlock, material testing, route and seal, steel, and AC index. Various strategies are utilized on a site specific basis to reach program goals.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	7,746,869	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	7,746,869	0
HST Impact:	136,345	0
Total Project Cost:	**7,883,200**	**0**

NOTES

Asphalt Resurfacing of approximatley 19.5 km of two and four lane roads. 5.4 km of two and four lane roads of pavement preservation. There is no substantial backlog in this program. The 2021 pavement laser condition survey, conducted biannually, identifies 75.7% of the road network as good or better (long term target 80%). AC Index component is $176K and will be adjusted at the time of award, dependent on the current price of crude oil.

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components				**TOTAL**	**Future Phases**
	0	0	0	0	0	0	0
Operating Funded Life Cycle	7,883,200	0	0	0	0	0	0
TOTAL FUNDING	**7,883,200**					**0**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	**Year**	**Amount**	**Amount in Study**

Life Cycle

Amount in Study:	7,679,700
Amount Incl HST	7,883,200
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

Request amount is higher than life cycle due to increased cost of crude oil impacting the components of the asphalt mix. The additional request amount of $200K is an estimate and is subject to change.

Project	Asphalt Resurfacing
2023 Capital Request	$7,883,200
Funding Source	Life Cycle Reserve
Description of Program	Asphalt resurfacing of roads throughout the City utilizing a pavement management program to select rehabilitation candidates. The overall goal is to maintain an acceptable pavement condition index and user satisfaction by implementing cost effective strategies designed to extend pavement life and reduce overall maintenance and reconstruction costs of the road network.
Project Rationale	Condition assessment is conducted bi-annually to determine specific locations. This is followed by a detailed visual inspection by Operations staff which verifies the laser condition assessment. Identified in the Life Cycle Reserve Study.
Legislative Requirement	O. Reg. 239/02: Minimum Maintenance Standards for Municipal Highways outlines patrol and maintenance requirement related to roadway infrastructure inclusive of asphalt pavement and sidewalk.
History	n/a
Future Phases	This funding is requested each year.
Total Project Cost	n/a
Related Projects	
Related Maps	
Alignment to the Strategic Plan	Properly paved and well maintained roads help reduce accidents and promotes safe movement of traffic reducing traveling time. Contracts within this program call for reharvesting and recycling of construction materials. Strategies include warm mix designs which lowers emissions and utilizes recycled aggregate.

2023 PROJECT FUNDING REQUEST FORM

MARKHAM

Number: 23006

Project Cost: **$88,000**

Project Name: **Boulevard Repairs**

Repair/Replace

Commission: Community Services

Useful Life: 10 Pre Approval: ☑

Department: Operations - Roads

Category: Annual

Project Mgr: Taylor Thomson

Cost Validation: Recent awards

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Requirement Validation: Condition assessment

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

The purpose of this project is to maintain boulevard areas in good condition to minimize hazards for pedestrians. Repairs to boulevards throughout the City are for interlock brick pavers only (does not include concrete, curb or asphalt).

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	2023	Future Phases
Cost/Quote:	86,485	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	86,485	0
HST Impact:	1,522	0
Total Project Cost:	**88,000**	**0**

NOTES

Some of the larger repairs include Main Street Markham, Kenilworth Gate and Abberly, 438 Raymerville, Calvert Park, and Colborne St. Installation cost is $36/m2. The budget allows for 2402 SqM to be repaired. This is an annual program. There is no substantial backlog within this program and the boulevards are in a state of good repair. 3 year avg is $51K.
Unit cost is consistent with recent award plus inflation.

SOURCE(S) OF FUNDING ($)

Funding Type	Budget	Components				TOTAL	Future Phases
Operating Funded Life Cycle	88,000	0	0	0	0	0	0
TOTAL FUNDING	**88,000**					**0**	**0**

OPERATING BUDGET IMPACT	Personnel	Non Personnel	Revenues	Expenditures/(Revenues)
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	Year	Amount	Amount in Study

Life Cycle

Amount in Study:	88,000
Amount Incl HST	88,000
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23007

Project Cost: **$27,400**

Project Name: **Bridge Structure Preventative Maintenance - Roads**

Repair/Replace

Commission: Community Services

Department: Operations - Roads

Project Mgr: Taylor Thomson

Ward(s): CW ☑ 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐

Useful Life: 30 Pre Approval: ☑

Category: Annual

Cost Validation: Recent awards

Requirement Validation: Condition assessment

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Annual preventative maintenance of the 27 City owned bridge/culvert structures on an as required basis. Work to be carried out on an as required basis which includes fill and grade bridge approaches, route and seal cracks on bridge decks, concrete sealer application, concrete patches on approach.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	26,900	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	26,900	0
HST Impact:	473	0
Total Project Cost:	**27,400**	**0**

NOTES

Locations to be determined upon condition assessment. There is no substantial backlog and Bridge structures are in a state of good repair. Operations is responsible for preventative maintenance on bridges/culverts such as minor grading, patching, sealing of bridge approaches and bridge decks, while Environmental Services is responsible for its inspection/rehabilitation and replacement. Amount requested is consistent with the 2022 Life Cycle Reserve Study update.

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components				**TOTAL**	**Future Phases**
Operating Funded Life Cycle	27,400	0	0	0	0	0	0
TOTAL FUNDING	**27,400**					**0**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	**Year**	**Amount**	**Amount in Study**

Life Cycle

Amount in Study:

Amount Incl HST

Year in the study

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

Life Cycle resides in Envirnomental Services ($54,800) and is split 50:50 between Roads and Parks.

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23008

Project Cost: **$162,200**

Project Name: **Emergency Repairs**

Repair/Replace

Commission: Community Services

Useful Life: 20 Pre Approval: ☑

Department: Operations - Roads

Category: Annual

Project Mgr: Dennis King/ Anthony Leocata

Cost Validation: Recent awards

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Requirement Validation: Visual inspection

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Emergency repairs to guiderails, guide cable, storm sewers, entrance features, outfalls, inlets, and cross connections as required. These repairs could be necessary due to motor vehicle accidents, winter maintenance, and damage from storm water or pipe/road failures.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	159,365	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	159,365	0
HST Impact:	2,805	0
Total Project Cost:	**162,200**	**0**

NOTES

Examples of work done in previous years; Storm Sewer Repairs - 20 Heritage, 12 Vanwood, Silver Aspen, Main Street Markham, and Main Street Unionville- 3yr avg $149K. This is an annual program.

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components				**TOTAL**	**Future Phases**
Operating Funded Life Cycle	162,200	0	0	0	0	0	0
TOTAL FUNDING	**162,200**					**0**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	**Year**	**Amount**	**Amount in Study**

Life Cycle

Amount in Study:	162,200
Amount Incl HST	162,200
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23009

Project Cost: **$929,700**

Project Name: **Localized Repairs - Curb & Sidewalk**

Repair/Replace

Commission: Community Services

Department: Operations - Roads

Project Mgr: Taylor Thomson

Useful Life: 20 Pre Approval: ☑

Category: Minor

Cost Validation: Recent awards

Requirement Validation: Condition assessment

ITS Involved Project: Is ITS Consulted? ☐

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Maintenance repairs to sidewalks, curbs, and catch basins throughout the City as identified by staff. Ensure that deficient sections are repaired to minimize trip and fall incidents and reduce associated liability to the City. The purpose of the concrete curb is to channel storm water into the storm sewer system.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	913,620	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	913,620	0
HST Impact:	16,080	0
Total Project Cost:	**929,700**	**0**

NOTES

Specific locations to be determined upon completion of condition audit in 2022. 3 year avg is $844K. Amount requested is higher due to growth and more deficiencies identified, consistent with the amount in the 2022 Life Cycle Reserve Study Update.

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components				**TOTAL**	**Future Phases**
Operating Funded Life Cycle	929,700	0	0	0	0	0	0
TOTAL FUNDING	**929,700**					**0**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	Year	Amount	Amount in Study

Life Cycle

Amount in Study:	929,700
Amount Incl HST	929,700
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

Project	Localized Repairs – Curb and Sidewalk
2023 Capital Request	$929,700
Funding Source	Life Cycle Reserve
Description of Program	Maintenance repairs to sidewalks, curbs, multi-use paths (MUP) and catch basins throughout the City as identified by staff through road patrol. Ensure that deficient sections are repaired to minimize trip and fall incidents, ponding/drainage issues, and reduce associated liability to the City. The purpose of conducting repairs to our concrete curbs are to removed damaged sections (hit by vehicles) and to ensure the channelization of storm water into the storm sewer system.
Project Rationale	Addresses minor repair locations of curb, sidewalk, MUP failures in order to reduce the City's liability, protect against claims of negligence and extend the Life Cycle. Identified in the Life Cycle Reserve Study.
Legislative Requirement	O. Reg. 239/02: Minimum Maintenance Standards for Municipal Highways outlines patrol and maintenance requirement related to roadway infrastructure inclusive of asphalt pavement and sidewalk.
History	n/a
Future Phases	This funding is requested each year.
Total Project Cost	n/a
Related Projects	Localized Repairs Concrete/Asphalt, Asphalt Resurfacing
Related Maps	n/a
Alignment to the Strategic Plan	Program ensures roads and boulevards are made safe for all cyclists, pedestrians and vehicular traffic. Program removes hazards, deficiencies, and reduces risk to the City by replacing with new concrete. This program promotes safety, reduces liability and encourages walkability within the community.

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: **23010**

Project Cost: **$157,000**

Project Name: **Localized Repairs - Parking Lots**

Repair/Replace

Commission: Community Services

Useful Life: 8 Pre Approval: ☑

Department: Operations - Roads

Project Mgr: Taylor Thomson

Category: Minor

Cost Validation: Recent awards

Requirement Validation: Condition assessment

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Ongoing maintenance and repairs of municipal parking lots throughout the City. Includes repairs to concrete and asphalt infrastructure, maintenance holes and catchbasin adjustments and asphalt resurfacing.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	154,285	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	154,285	0
HST Impact:	2,715	0
Total Project Cost:	**157,000**	**0**

NOTES

2023 locations: Markham Village Arena (2,050 m2) and Main Street Markham Fire Station 97 (1,439 m2) . This is an annual program. There is no substantial backlog in this program. 3 year avg is $157K.

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components				**TOTAL**	**Future Phases**
Operating Funded Life Cycle	157,000	0	0	0	0	0	0
TOTAL FUNDING	**157,000**					**0**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	**Year**	**Amount**	**Amount in Study**

Life Cycle

Amount in Study:	126,400
Amount Incl HST	157,000
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

Amount requested increased to align with the 3 yr average to allow for more area to be done at he Markham Village Arena which will push out the total rehab of the parking lot in Life Cycle by 5-10 years.

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23011

Project Cost: **$45,800**

Project Name: **Parking Lots- Rehabilitation**

Repair/Replace

Commission: Community Services

Department: Operations - Roads

Project Mgr: Zoyeb Vahora

Useful Life: 20 Pre Approval: ☑

Category: Minor

Cost Validation: Recent awards

Requirement Validation: Condition assessment

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Complete rehabilitation of selected municipal parking lots throughout the City. Includes removal and replacement of concrete, interlock and asphalt infrastructure, as well as maintenance holes and catch basin adjustments.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	44,990	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	44,990	0
HST Impact:	792	0
Total Project Cost:	**45,800**	**0**

NOTES

Rehabilitation of Fire Station 91 (1,345 m2). There is no backlog in the program. The parking lots are in a state of good repair. Unit cost is consistent with recent award plus inflation.

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components				**TOTAL**	**Future Phases**
Operating Funded Life Cycle	45,800	0	0	0	0	0	0
TOTAL FUNDING	**45,800**					**0**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	**Year**	**Amount**	**Amount in Study**

Life Cycle

Amount in Study:	81,600
Amount Incl HST	45,800
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

185 Main Street ($21K) and 22 Washington ($15K) deferred based on condition assessment.

2023 PROJECT FUNDING REQUEST FORM

MARKHAM

Number: 23012

Project Cost: **$1,049,900**

Project Name: **AODA Playground Refurbishments - Year 1 of 4**

Repair/Replace

Commission: Community Services

Department: Operations - Parks

Project Mgr: Dean McDermid

Useful Life: 0 Pre Approval: ☑

Category: Minor

Cost Validation: Recent awards

Requirement Validation: Condition assessment

ITS Involved Project: Is ITS Consulted? ☐

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Replacement of safety surfacing along with associated elements to make playgrounds fully accessible and AODA compliant. This 4 year project will address playgrounds currently with sand safety surfacing installed from 2015 and later and will run in parallel to the yearly capital life cycle replacement project for Playstructures & Rubberized Surface Replacement. There are 17 locations in the first year where the play surface will be upgraded to Engineered Wood Fiber (EWF) to be compliant with AODA standards.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	2023	Future Phases
Cost/Quote:	984,947	2,750,039
Internal Charges:	0	0
External Consulting:	46,791	0
Contingency %: 0	0	0
Sub Total:	1,031,738	2,750,039
HST Impact:	18,159	48,401
Total Project Cost:	**1,049,900**	**2,798,400**

NOTES

This is a Citywide 4 year program with locations selected based on current accessibility by ward. There is currently a backlog of playgrounds which require refurbishment to be fully AODA complaint by 2025. This project requires removal of sand surfacing and replacement with EWF, in addition to installing drainage, curbs, entrance ramps, and paved pathways to access the playground. Funding source is Ramp Up Reserve, as approved by Council.

SOURCE(S) OF FUNDING ($)

Funding Type	Budget	Components				TOTAL	Future Phases
Ramp Up	1,049,900	0	0	0	0	0	2,798,400
TOTAL FUNDING	**1,049,900**					**0**	**2,798,400**

OPERATING BUDGET IMPACT	Personnel	Non Personnel	Revenues	Expenditures/(Revenues)
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	Year	Amount	Amount in Study

Life Cycle

Amount in Study:

Amount Incl HST

Year in the study

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

Project	AODA Playbround Refurbishments
2023 Capital Request	$1,049,900
Funding Source	Life Cycle Reserve
Description of Program	Replacement of safety surfacing along with associated elements to make playgrounds fully accessible and AODA compliant. This 4 year project will address playgrounds with sand safety surfacing from 2015 forward and will run in parallel to the yearly capital lifecycle replacement project for Playstructures & Rubberized Surface Replacement. There are 17 locations in the first year with a total of 19 playstructures being refurbished in the first year.
Project Rationale	Playground safety surfacing is required to meet AODA guidelines to meet the CSA guidelines (Z614-07 Children's Play spaces and Equipment).
Legislative Requirement	City playground safety surfacing is required to be CSA – Canadian Standards Association CAN/CSA-Z614-07 certified at the time of installation and throughout the useful life. Monthly inspections by certified playground inspectors combined with a yearly third party inspector ensure complaince
History	This project is reflective of AODA requirements for compliant playground surfacing by the end of 2025. Play structures are identified for inspection after 17 years of service with the total number of structures yearly being reflective of growth which occurred 17
Future Phases	$2,798,400
Total Project Cost	$3,848,300
Related Projects	n/a
Related Maps	n/a
Alignment to the Strategic Plan	The City provides safe use of outdoor recreation facilities for families which aligns with the guidelines established in the Integrated Leisure Master Plan.

Park Name	Park Address	Ward	Area	Surfacing	Pit size	Curb Type	Curb Length	Class	Built	Replaced	Fences	Drainage	Sod	Curbs	Pathways	EWF	Ramps	Remove Sand	Park Total
Springdale Park	45 Norwich Drive	4	3	Granite Sand	433	Grass	102m	Sr.		2016	$6,000	$2,500	$4,000	$18,360	$900	$15,155	$3,500	$5,196	$55,611
John Baird Woods	145 Mingay Drive	4	3	Granite Sand	520	Curb	179m	Jr./Sr.	2017		$6,000	$2,500	$4,000			$18,200	$3,500	$6,240	$40,440
Alma Walker Park	31 Wooten Way North	4	4	Granite Sand	544.41	Grass	89m	Jr./Sr.		2018	$6,000	$2,500	$2,000	$16,020		$19,043.50	$3,500	$6,492.92	$55,556
Armstrong Park	25 Major Button's Drive	4	4	Granite Sand	308.19	Grass	141m	Jr./Sr.		2018	$6,000	$2,500	$2,000	$25,380	$42,000	$10,787	$3,500	$3,698.28	$95,865
Robinson Park	46 Robinson Street	4	3	Granite Sand	487	Grass	135m	Jr./Sr.		2018	$6,000	$2,500	$2,000	$24,300	$7,500	$17,045	$3,500	$5,844	$68,689
Stargell Park	17 Stargell Cresent	4	3	Granite Sand	310	Grass	71m	Jr./Sr.		2018	$6,000	$2,500	$2,000	$12,780	$1,500	$10,580	$3,500	$3,720	$42,580
Amber Glen Park	9 Empire Street	4	4	Granite Sand	221.53	Grass	79m	Sr.		2019	$6,000	$2,500	$2,000	$14,220	$1,500	$7,753.55	$3,500	$2,658.36	$40,132
Morgan Park (North Pool)	11 Parkway Avenue	4	4	Granite Sand	395.84	Grass	77m	Jr./Sr.		2019	$6,000	$2,500	$2,000	$13,860		$13,854.40	$3,500	$4,750	$46,464
Morgan Park (South)	11 Parkway Avenue	4	4	Granite Sand	601.44	Wood	97m	Jr./Sr.		2019	$6,000	$2,500	$4,000	$17,460	$10,500	$21,050.40	$3,500	$7,217	$72,228
Reesor Park	73 Wooten Way North	4	4	Granite Sand	385.74	Grass	83m	Sr.		2020	$6,000	$2,500	$2,000	$14,940	$13,500.90	$13,500.90	$3,500	$4,620	$60,562
											Fences	Drainage	Sod	Curbs	Pathways	EWF	Ramps	Remove Sand	
Leitchcroft Park	381 South Park Road	8	1	Granite Sand	421.1	Curb	120m	Jr./Sr.		2017	$6,000	$2,500	$4,000			$14,738.50	$3,500	$5,053.20	$35,792
Risebrough Park	97 Risebrough Circuit	8	2	Granite Sand	309.3	Wood	70m	Sr.		2017	$6,000	$2,500	$4,000	$12,600	$1,800	$10,825.50	$3,500	$4,911.60	$46,137
Wilclay Park (East)	54 Hillcroft Drive	8	2	Granite Sand	94.85	75% Stone, 25% Curb	124m	Jr.	2017		$6,000		$4,000			$3,319.75	$3,500	$1,138.20	$17,958
Armadale Park	2401 Denison Street	8	2	Granite Sand	439.5	50% Wood, 50% Asphalt	125m	Sr.		2018	$6,000	$2,500	$3,000	$22,500		$15,382.50	$3,500	$5,274	$58,157
Randall Park (North)	70 Randall Avenue	8	2	Granite Sand	231.8	60% Curb, 40% Grass	101m	Jr.		2018	$6,000	$2,500	$4,000	$18,180	$2,100	$8,113	$7,000	$2,781.60	$50,675
Randall Park(South)	70 Randall Avenue	8	2	Granite Sand	93	Grass	80m	Sr.		2018	$6,000	$2,500	$2,000	$14,400	$4,800	$3,255	$3,500	$1,116	$37,571
Highgate Park	37 Highgate Drive	8	2	Granite Sand	390	Wood	78m	Sr.		2019	$6,000	$2,500	$4,000	$14,040		$13,650	$3,500	$4,680	$48,370
Middleton Park	49 Risebrough Circuit	8	2	Granite Sand	188	Grass	49m	Sr.		2019	$6,000	$2,500	$2,000	$8,820	$4,800	$6,580	$3,500	$2,256	$36,456
Van Horne Pond	71 Pond Drive	8	1	Granite Sand	225	Curb	57m	Sr.		2019	$6,000	$2,500	$4,000			$7,875	$3,500	$2,700	$26,575

Funded by Ramp-Up - New project in 2023
For Pre-approval 100%

New Project Year 1 of 4	**$935,817**
External Consulting	**$46,791**
Contingency - 5%	**$49,130**
Total Pre-Tax	**$1,031,738**
HST Impact	**$18,159**
Total Project Cost	**$1,049,897**

Total Project (4 year) - inc. Contingency, External Consulting, HST Impact	**$3,848,337**

Market conditions uncertain;
Potential revision on cost

2023	**Year 1**	**$1,049,897**
	Year 2	**$1,096,822**
	Year 3	**$1,029,821**
	Year 4	**$671,797**
		$3,848,337

2023 PROJECT FUNDING REQUEST FORM

Number: 23013

Project Cost: **$942,300**

Project Name: **Boulevard/Park Trees Replacement**

Repair/Replace

Commission: Community Services

Department: Operations - Parks

Project Mgr: Josh Van Kemp

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Useful Life: 50 Pre Approval: ☑

Category: Annual

Cost Validation: Recent awards

Requirement Validation: Condition assessment

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Boulevard/Park replacement tree planting is an annual program which enables the City to replace approximately 1150 dead, diseased or damaged trees. Cost per tree is approximately $595 to plant with 2 year warranty and $110 to grind the stump in preparation for planting. This funding will be requested each year to address tree loss through damage, accidents and normal mortality.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	2023	Future Phases
Cost/Quote:	810,750	0
Internal Charges:	117,263	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	928,013	0
HST Impact:	14,269	0
Total Project Cost:	**942,300**	**0**

NOTES

This is an annual program and funds will be requested each year. A 3-year review (2019-2021) of blvd/park trees removed an avg of 1,150 trees per year, therefore the number of stumps removed & trees planted will be increased to maintain a minimum 1:1 ratio of replacement to support the Council approved canopy coverage goal of 30%. 5 inspections are required for site, stump and tree planting condition/warranty inspections each year. 3 dedicated seasonal staff will be required each year to ensure accurate planning & quality control. Current 2022 cost of a seasonal parks labourer is approx. $39K for a 150 day contract.

SOURCE(S) OF FUNDING ($)

Funding Type	Budget	Components				TOTAL	Future Phases
Operating Funded Life Cycle	942,300	0	0	0	0	0	0
TOTAL FUNDING	**942,300**					**0**	**0**

OPERATING BUDGET IMPACT	Personnel	Non Personnel	Revenues	Expenditures/(Revenues)
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	Year	Amount	Amount in Study

Life Cycle

Amount in Study:	385,400
Amount Incl HST	942,300
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

Life cycle is based on 700 trees at rate of $424 to plant and $106 to grind the stump.

Project	Boulevard/Park Tree Replacement
2023 Capital Request	$942,300
Funding Source	Life Cycle Reserve
Description of Program	Boulevard/Park replacement tree planting is an annual program to replace dead, diseased or damaged trees with mortality averaging 1150 trees. Cost per tree is approximately $595 to plant with 2 year warranty and $110 to grind the stump in preparation for planting. This funding will be requested yearly to address the previous year tree loss and add replacement canopy working to our goal of 30%.
Project Rationale	Boulevard/Park replacement tree planting is an annual program which enables the City to replace approximately 1150 dead, diseased or damaged trees. A 3-year review (2019-2021) of blvd/park trees removed an average of 1,150 trees per year, therefore the number of stumps removed & trees planted will be increased to maintain a minimum 1:1 ratio of replacement to support the Council approved canopy coverage goal of 30%. 5 inspections are required for site, stump and tree planting condition/warranty inspections each year.
Legislative Requirement	n/a
History	n/a
Future Phases	This funding is requested each year.
Total Project Cost	$942,300
Related Projects	n/a
Related Maps	n/a
Alignment to the Strategic Plan	Safe & Sustainable Community

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23051

Project Cost: **$236,900**

Project Name: **Court Resurfacing/Reconstruction - Markham Tennis Club**

Repair/Replace

Commission: Community Services

Department: Operations - Parks

Project Mgr: Dean McDermid

Useful Life: 7

Pre Approval: ☑

Category: Minor

Cost Validation: Recent awards

Requirement Validation: Condition assessment

ITS Involved Project: Is ITS Consulted? ☐

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Rebuilding and resurfacing of all Markham Tennis Club courts based on condition assessment.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	232,776	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	232,776	0
HST Impact:	4,097	0
Total Project Cost:	**236,900**	**0**

NOTES

The total cost of resurfacing and rebuilding the 6 courts at Markham Tennis Club (Reesor Park) will be shared equally between Markham Tennis Club, The City of Markham and Premier Racquet Club. Markham Tennis Club court replacement and resurfacing will proceed subject to satisfactory club and private company finance review and agreement of both parties to undertake repayment. This is an asset based program and is subject to condition assessment.

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components				**TOTAL**	**Future Phases**
Operating Funded Life Cycle	78,968	0	0	0	0	0	0
Other External	157,932	0	0	0	0	0	0
TOTAL FUNDING	**236,900**					**0**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	**Year**	**Amount**	**Amount in Study**

Life Cycle

Amount in Study:	379,700
Amount Incl HST	79,000
Year in the study	

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

The resurfacing of three courts at Markham Tennis Club have been accelerated from 2024 to 2023 while the other three courts have been changed from resurfacing to rebuilding to address new drainage issues. The other tennis courts scheduled for resurfacing/reconstruction are inlcuded as part of a separate project request.

MARKHAM TENNIC CLUB - REBUILDING/ RESURFACING

Inventory Description	Facility	Rebuild or Resurface	2023 Inflated - Pre-Tax Markham Share	Club Share Pre-Tax	Premium Racquet Markham Share	Total Project Cost Pre-Tax	Total Project Cost Inc. HST Impact	Comment
Court Surfacing - Tennis/ Basketball	Reesor - Tennis #1 (North) - Rebuild	Rebuild	22,222	22,222	22,222	66,666	67,839	**Revised from Resurface to Rebuild pending condition assessment**; Cost provided by contractors - $200k pre-tax for the 3 courts; Pending club consultation and financials
Court Surfacing - Tennis/ Basketball	Reesor - Tennis #2 (North) - Rebuild	Rebuild	22,222	22,222	22,222	66,666	67,839	**Revised from Resurface to Rebuild pending condition assessment**; Cost provided by contractors - $200k pre-tax for the 3 courts; Pending club consultation and financials
Court Surfacing - Tennis/ Basketball	Reesor - Tennis #3 (North) - Rebuild	Rebuild	22,222	22,222	22,222	66,666	67,839	**Revised from Resurface to Rebuild pending condition assessment**; Cost provided by contractors - $200k pre-tax for the 3 courts; Pending club consultation and financials
Court Surfacing - Tennis/ Basketball	Reesor - Tennis #4 (South) - Resurface	Resurface	3,642	3,642	3,642	10,926	11,118	Revised cost provided by contractor; Accelerate from 2024- per discussion with SAM
Court Surfacing - Tennis/ Basketball	Reesor - Tennis #5 (South) - Resurface	Resurface	3,642	3,642	3,642	10,926	11,118	Revised cost provided by contractor; Accelerate from 2024- per discussion with SAM
Court Surfacing - Tennis/ Basketball	Reesor - Tennis #6 (South) - Resurface	Resurface	3,642	3,642	3,642	10,926	11,118	Revised cost provided by contractor; Accelerate from 2024- per discussion with SAM
	TOTAL		77,592	77,592	77,592	232,776	236,873	
	TOTAL PROJECT COST (ROUNDED OFF)						**236,900**	

Summary:

Funding (Inc. HST Impact)	Details	Tennis Courts
Lifecycle	Resurface - 3 South Courts	11,118
External - Club	Resurface - 3 South Courts	11,118
External - Premium Racquet	Resurface - 3 South Courts	11,118
Lifecycle	Rebuild - 3 North Courts	67,839
External - Club	Rebuild - 3 North Courts	67,839
External - Premium Racquet	Rebuild - 3 North Courts	67,839
		236,873
	TOTAL PROJECT COST (ROUNDED OFF)	**236,900**

Cost	**232,776**
HST Impact	4,097
Total Project Cost Inc. HST Impact	236,873
TOTAL PROJECT COST (ROUNDED OFF)	**236,900**

	Tennis Courts
Rebuild	203,518
Resurface	33,355
Total	236,873
TOTAL PROJECT COST (ROUNDED OFF)	**236,900**

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23014

Project Cost: **$491,000**

Project Name: **Court Resurfacing/Reconstruction/Maintenance**

Repair/Replace

Commission: Community Services

Department: Operations - Parks

Project Mgr: Dean McDermid

Useful Life: 7 Pre Approval: ☑

Category: Annual

Cost Validation: Recent awards

Requirement Validation: Condition assessment

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Repair and resurfacing of basketball, public and club tennis courts based on condition assessment.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	482,514	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	482,514	0
HST Impact:	8,492	0
Total Project Cost:	**491,000**	**0**

NOTES

The City contributes to the annual maintenance of the clay courts at Unionville Tennis Club to a maximum of $3k per court (total of $9k per year for 3 clay courts). The total cost of resurfacing/rebuilding courts at tennis clubs is shared 50:50 between the tennis club and the City. Tennis club court replacement/rehabilitation will proceed subject to satisfactory club finance review and agreement of the club to undertake repayment. This is an asset based program and is subject to condition assessment

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components: Tennis Court	Basketball Court	Clay		**TOTAL**	**Future Phases**
Operating Funded Life Cycle	383,444	311,144	63,300	9,000	0	383,444	0
Other External	107,556	107,556	0	0	0	107,556	0
TOTAL FUNDING	**491,000**					**491,000**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	**Year**	**Amount**	**Amount in Study**

Life Cycle

Amount in Study:	379,700
Amount Incl HST	383,400
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

Denison Park basketball court - additional $9K required for 2 poles, backboards and nets. Legacy Park basketball court - additional $23K due to rebuild instead of scheduled resurface based on condition assessment. 3 courts at Reesor accelerated from 2024 to 2023 (resurface). 3 courts from Reesor changed from resurfacing to rebuild. The resurfacing of three courts at Markham Tennis Club have been accelerated from 2024 to 2023 while the other three courts have been changed from resurfacing to rebuilding to address new drainage issues and are included as part of a separate project request.

2023 COURT REBUILDING/RESURFACING

Inventory Description	Facility	Rebuild or Resurface	2023 Inflated - Pre-Tax Markham Share	Club Share Pre-Tax	Total Project Cost Pre-Tax	Total Project Cost Inc. HST Impact	Comment
Court Surfacing - Tennis/ Basketball	Ada Mackenzie - Tennis #1 - Resurface	Resurface	17,615		17,615	17,925	
Court Surfacing - Tennis/ Basketball	Ada Mackenzie - Tennis #2 - Resurface	Resurface	17,615		17,615	17,925	
Court Surfacing - Tennis/ Basketball	Box Grove - Tennis #1 - Resurface	Resurface	8,808	8,808	17,616	17,926	Pending club consultation and financials
Court Surfacing - Tennis/ Basketball	Box Grove - Tennis #2 - Resurface	Resurface	8,808	8,808	17,616	17,926	Pending club consultation and financials
Court Surfacing - Tennis/ Basketball	Carlton Park - Tennis #1 - Resurface	Resurface	8,808	8,808	17,616	17,926	Pending club consultation and financials
Court Surfacing - Tennis/ Basketball	Carlton Park - Tennis #2 - Resurface	Resurface	8,808	8,808	17,616	17,926	Pending club consultation and financials
Court Surfacing - Tennis/ Basketball	Carlton Park - Tennis #3 - Resurface	Resurface	8,808	8,808	17,616	17,926	Pending club consultation and financials
Court Surfacing - Tennis/ Basketball	Carlton Park - Tennis #4 - Resurface	Resurface	8,808	8,808	17,616	17,926	Pending club consultation and financials
Court Surfacing - Tennis/ Basketball	Carlton Park - Tennis #5 (Clay)		3,000		3,000	3,000	Not subject to HST
Court Surfacing - Tennis/ Basketball	Carlton Park - Tennis #6 (Clay)		3,000		3,000	3,000	Not subject to HST
Court Surfacing - Tennis/ Basketball	Carlton Park - Tennis #7 (Clay)		3,000		3,000	3,000	Not subject to HST
Court Surfacing - Tennis/ Basketball	Denison Park - Basketball #1 (full) - Resurface	Resurface	14,713		14,713	14,972	$9k added - for two poles,backboards and nets.
Court Surfacing - Tennis/ Basketball	Frisby - Tennis #1 - Resurface	Resurface	17,615		17,615	17,925	
Court Surfacing - Tennis/ Basketball	Frisby - Tennis #2 - Resurface	Resurface	17,615		17,615	17,925	
Court Surfacing - Tennis/ Basketball	Legacy Park - Basketball #1 (full) - Rebuild	Rebuild	32,017		32,017	32,580	Updated cost - Requires rebuild instead of resurface as scheduled in
Court Surfacing - Tennis/ Basketball	Milliken Mills Park - Basketball #1(full) S - Resurface	Resurface	12,854		12,854	13,080	
Court Surfacing - Tennis/ Basketball	Pomona Valley - Tennis #1 - Resurface	Resurface	8,808	8,808	17,616	17,926	Pending club consultation and financials
Court Surfacing - Tennis/ Basketball	Pomona Valley - Tennis #2 - Resurface	Resurface	8,808	8,808	17,616	17,926	Pending club consultation and financials
Court Surfacing - Tennis/ Basketball	Pomona Valley - Tennis #3 - Resurface	Resurface	8,808	8,808	17,616	17,926	Pending club consultation and financials
Court Surfacing - Tennis/ Basketball	Pomona Valley - Tennis #4 - Resurface	Resurface	8,808	8,808	17,616	17,926	Pending club consultation and financials
Court Surfacing - Tennis/ Basketball	Pomona Valley - Tennis #5 - Resurface	Resurface	8,808	8,808	17,616	17,926	Pending club consultation and financials
Court Surfacing - Tennis/ Basketball	Pomona Valley - Tennis #6 - Resurface	Resurface	8,808	8,808	17,616	17,926	Pending club consultation and financials

Inventory Description	Facility	Rebuild or Resurface	2023 Inflated - Pre-Tax Markham Share	Club Share Pre-Tax	Total Project Cost Pre-Tax	Total Project Cost Inc. HST Impact	Comment
Court Surfacing - Tennis/ Basketball	Robinson - Tennis #1 - Rebuild	Rebuild	47,192		47,192	48,023	
Court Surfacing - Tennis/ Basketball	Robinson - Tennis #2 - Rebuild	Rebuild	47,192		47,192	48,023	
Court Surfacing - Tennis/ Basketball	Sablewood - Basketball #1 (half) - Resurface	Resurface	2,618		2,618	2,665	
Court Surfacing - Tennis/ Basketball	South Unionville Park Tennis - West #1 - Resurface	Resurface	17,615		17,615	17,925	
Court Surfacing - Tennis/ Basketball	South Unionville ParkTennis - West #2 - Resurface	Resurface	17,615		17,615	17,925	
	TOTAL		376,974	105,696	482,670	491,006	
	TOTAL PROJECT COST (ROUNDED OFF)					**491,000**	

Summary:

Funding (Inc. HST Impact)	Details	Tennis Courts	Basketball Court	Clay Court	Total
Lifecyle	Resurface - Denison, Milliken & Sablewood		30,717		30,717
Lifecyle	Rebuild - Legacy		32,580		32,580
Lifecyle	Clay Court - Unionville TC			9,000	9,000
Lifecyle	Resurface - TC-Boxgove, Pomona, Unionville	107,556			107,556
External - Club	Resurface - TC-Boxgove, Pomona, Unionville	107,556			107,556
Lifecyle	Resurface/ Rebuild - Public Courts - Aida MacKenzie, Frisby,Robinson and South Unionville Park West	203,596			203,596
		418,708	**63,297**	**9,000**	**491,005**
	TOTAL PROJECT COST (ROUNDED OFF)				**491,000**

Cost	**482,514**
HST Impact	8,492
Total Project Cost Inc. HST Impact	491,006
TOTAL PROJECT COST (ROUNDED OFF)	**491,000**

	Tennis Courts	Basketball Court	Total
Rebuild	96,045	32,580	128,625
Resurface	322,664	30,717	353,381
Clay Court Maintenance	9,000		9,000
Total	427,709	63,297	491,006
TOTAL PROJECT COST (ROUNDED OFF)	**427,700**	**63,300**	**491,000**

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23015

Project Cost: **$86,800**

Project Name: **Fence (Tennis Courts)**

Repair/Replace

Commission: Community Services

Department: Operations - Parks

Project Mgr: Dean McDermid

Ward(s): CW ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☑ 6 ☐ 7 ☐ 8 ☐

Useful Life: 35 Pre Approval: ☑

Category: Annual

Cost Validation: Internal peer review

Requirement Validation: Condition assessment

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Replacement of perimeter fencing of tennis courts helps to protect the playing surfaces from non-court uses while maintaining the limits of play and allowing securement of the courts when not available for users.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	85,334	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	85,334	0
HST Impact:	1,502	0
Total Project Cost:	**86,800**	**0**

NOTES

This is an asset based program and is subject to condition assessment. The 2023 locations are Simonston Park – (German Mills Tennis Club) and Robinson Park. Unit costs are based on original cost of construction plus inflation. There is no substantial backlog and the fences are in a state of good repair

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components				**TOTAL**	**Future Phases**
Operating Funded Life Cycle	86,800	0	0	0	0	0	0
TOTAL FUNDING	**86,800**					**0**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	**Year**	**Amount**	**Amount in Study**

Life Cycle

Amount in Study:	164,600
Amount Incl HST	86,800
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23016

Project Cost: **$125,300**

Project Name: **Markham Trees for Tomorrow**

New Asset/Expansion

Commission: Community Services

Department: Operations - Parks

Project Mgr: Matt Busato

Useful Life: 50 Pre Approval: ☑

Category: Annual

Cost Validation: Internal peer review

Requirement Validation: Condition assessment

ITS Involved Project: Is ITS Consulted? ☐

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Initiated in 2007, the program focuses on supporting canopy core initiatives through the engagement of community and corporate volunteers and Non-Government Organizations. The program scope is developed annually based on changing priorities that focus on education to promote and maintain the health and longevity of our urban forest. To date, over 400,000 trees have been planted citywide since the program's inception. This is an annual program and funds will be requested each year.

BUILDING MARKHAM'S FUTURE TOGETHER: Exceptional Services by Exceptional People

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	84,700	0
Internal Charges:	39,088	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	123,788	0
HST Impact:	1,491	0
Total Project Cost:	**125,300**	**0**

NOTES

Program focus is City tree planting projects that incorporate community engagement and partnership opportunities. 2023 Goals- 1. Tree planting to support to the City’s 30% tree canopy goal 2. Continue NGO partnerships such as 10,000 Trees, Tree Canada, Friends of the Rouge and other corporate community engagement projects to promote education and stewardship opportunities. Internal Chargeback for 1 – 150 Day Staff. Funding source is Trees for Tomorrow Reserve. The balance in the Trees For Tomorrow reserve as of May 31, 2022 is $669,768.

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components				**TOTAL**	**Future Phases**
Other Internal	125,300	0	0	0	0	0	0
TOTAL FUNDING	**125,300**					**0**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	**Year**	**Amount**	**Amount in Study**

Life Cycle

Amount in Study:

Amount Incl HST

Year in the study

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: **23017**

Project Cost: **$151,300**

Project Name: **Pathways Resurfacing**

Repair/Replace

Commission: Community Services

Department: Operations - Parks

Project Mgr: Dean McDermid

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Useful Life: 15 Pre Approval: ☑

Category: Minor

Cost Validation: Recent awards

Requirement Validation: Condition assessment

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Paving and repairs of aggregate pathways at various parks and locations. These locations are prone to wear and tear and washouts following heavy rain and flooding. Paving will help to alleviate this problem. Limestone pathways require additional material to be added and compacted. Locations will be assessed and determined based on condition assessment in spring. Staff will investigate environmental options for future considerations.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	2023	Future Phases
Cost/Quote:	148,681	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	148,681	0
HST Impact:	2,617	0
Total Project Cost:	**151,300**	**0**

NOTES

This is an annual program and funds will be requested each year. Locations are subject to condition assessment to be done in spring 2023. Condition assessments are done in early spring when total quantities and materiality of repairs is determined. Asphalt park pathways are assessed for trip edges greater than 2.0cm as outlined in Prov Leg O.Reg. 239/02 for minimum maintenance standards. There is no substantial backlog and the pathways are in a state of good repair. 3yr avg is $128K.

SOURCE(S) OF FUNDING ($)

Funding Type	Budget	Components				TOTAL	Future Phases
Operating Funded Life Cycle	151,300	0	0	0	0	0	0
TOTAL FUNDING	**151,300**					**0**	**0**

OPERATING BUDGET IMPACT	Personnel	Non Personnel	Revenues	Expenditures/(Revenues)
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	Year	Amount	Amount in Study

Life Cycle

Amount in Study:	151,300
Amount Incl HST	151,300
Year in the study	

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: **23018**

Project Cost: **$705,100**

Project Name: **Playstructure Replacement**

Repair/Replace

Commission: Community Services

Department: Operations - Parks

Project Mgr: Dave Plant

Useful Life: 17 Pre Approval: ☑

Category: Minor

Cost Validation: Recent awards

Requirement Validation: Condition assessment

ITS Involved Project: Is ITS Consulted? ☐

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Replacement of playground equipment, and safety surfacing as required, to maintain the current standards (CSA – Canadian Standards Association CAN/CSA-Z614-07. Children's Playspaces and Equipment) and AODA compliance. There are 7 structures to be completed in 2023, which require the removal of the sand surfacing and installation of Engineered Wood Fiber (EWF).

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	692,951	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	692,951	0
HST Impact:	12,196	0
Total Project Cost:	**705,100**	**0**

NOTES

This is an asset based program with all locations subject to condition assessment. Funding changes yearly based on life cycle replacement of specific play structures. There is no backlog of play structure equipment upon completion of the 2023 project and the assets are in a state of good repair. There is a backlog of AODA compliant playground safety surfacing which requires removal and replacement with AODA compliant surfacing (EWF) by 2025 which will be addressed yearly with equipment replacements and a 4 year project starting in 2023.

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components				**TOTAL**	**Future Phases**
Operating Funded Life Cycle	451,100	0	0	0	0	0	0
Ramp Up	254,000	0	0	0	0	0	0
TOTAL FUNDING	**705,100**					**0**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	**Year**	**Amount**	**Amount in Study**

Life Cycle

Amount in Study:	499,100
Amount Incl HST	451,100
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

Locations scheduled for 2023 replacement in Lifecycle that will be deferred based on condition assessment: Colty Corners (1-Senior), Cornell Rouge Woods (1-Junior, 1 - Senior), E.B.F. Robinson Park (1-Senior), Frederick Peterson Park (1-Junior) and South Unionville Park (1-Senior).
Locations accelerated from 2024 to 2023 based on condition assessment: Lloyd Robertson Park (1-Senior), Mintleaf Park (2-Senior) - 1-senior and 1-junior and Peace Park (1-Senior).

Project	Play structure & Rubberized Surface Replacement
2023 Capital Request	$705,100
Funding Source	Life Cycle Reserve
Description of Program	Replacement of playground equipment, and safety surfacing as required, to maintain the current standards (CSA – Canadian Standards Association CAN/CSA-Z614-07. Children's Play spaces and Equipment) and AODA compliance. There are 9 structures to be completed in 2022, 2 of them with rubberized surfacing and 13 which require the removal of the sand surfacing and installation of Engineered Wood Fiber (EWF).
Project Rationale	These structures require replacement prior to any failures occurring, based on condition assessment to meet the CSA guidelines (Z614-07 Children's Play spaces and Equipment).
Legislative Requirement	City play structures are required to be CSA – Canadian Standards Association CAN/CSA-Z614-07 certified at the time of installation and throughout their useful life. Monthly inspections by certified playground inspectors combined with a yearly third party safety audit ensures compliance.
History	This project is reflective of play structures identified in the parks lifecycle and supported by condition assessment. Play structures are identified for inspection after 17 years of service with the total number of structures yearly being reflective of growth which occurred 17 years previously.
Future Phases	This funding is requested each year based on lifecycle.
Total Project Cost	n/a
Related Projects	Play Structure Rubberized Surface Replacement
Related Maps	n/a
Alignment to the Strategic Plan	The City provides safe use of outdoor recreation facilities for families which aligns with the guidelines established in the Integrated Leisure Master Plan.

2023 Playground Structure and Safety Surface

Inventory Description	Facility	2023 Inflated - Pre-Tax	Pre-Approval Amount	Comment
Playground Structure	Butternut Parkette	17,730	17,730	
Playground Structure	Hughson (1-Combined)	47,281	47,281	
Playground Structure	Joseph Ellerby (1-Senior, 1-Junior)	94,561	94,561	
Playground Structure	Ross Brown Park (1-Senior)	59,101	59,101	
Playground Structure	Lloyd Robertson Park (1-Senior)	59,124	59,124	Accelerated from 2024 to 2023 due to condition assessment
Playground Structure	Mintleaf Park (2-Senior) - s/b 1-senior and 1-junior	100,510	100,510	Accelerated from 2024 to 2023 due to condition assessment
Playground Structure	Peace Park (1-Senior)	65,036	65,036	Accelerated from 2024 to 2023 due to condition assessment
Playground Structure	AODA - Engineered Wood Fiber	249,608	249,608	
	Total	**692,951**	**692,951**	
	Total Pre - Tax	**692,951**	**692,951**	
	HST Impact	**12,196**	**12,196**	
	Total Inc. HST Impact	**705,147**	**705,147**	
	Total Project Cost (Rounded Off)	**705,100**	**705,100**	

Locations scheduled for 2023 replacement in Lifecycle that will be deferred based on condition assessment

Colty Corners (1- Senior)

Cornell Rouge Woods (1-Junior, 1 - Senior)

E.B.F. Robinson Park (1-Senior)

Frederick Peterson Park (1-Junior)

South Unionville Park (1-Senior)

Funding	Including Tax Impact
Lifecycle (7 - Playground Structures)	451,146
Ramp-Up - AODA - Engineered Wood Fiber	254,001
Total Inc. HST Impact	**705,147**
Total Project Cost (Rounded Off)	**705,100**

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23019

Project Cost: **$148,800**

Project Name: **Sportsfield Maintenance & Reconstruction**

Repair/Replace

Commission: Community Services

Useful Life: 5 Pre Approval: ☑

Department: Operations - Parks

Category: Annual

Project Mgr: James Bingham

Cost Validation: Internal peer review

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Requirement Validation: Condition assessment

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Life cycle program includes top dressing, grass seed, sod, fertilizer, and irrigation upgrades as per contracts. Funds within this project may be reallocated to sportsfield maintenance materials and services that require immediate attention unforeseen at time of submission such as sodding of damaged fields. Locations to be determined each spring and again at the end of playing season based on inspection.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	2023	Future Phases
Cost/Quote:	146,247	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	146,247	0
HST Impact:	2,574	0
Total Project Cost:	**148,800**	**0**

NOTES

This is an annual program and funds will be requested each year. There are 212 sportsfields existing in various parks and schools which consist of baseball diamonds, rugby, soccer, cricket and football fields. The lack of weeds on City fields is due largely to promoting healthy turf through sound cultural practices tailored to each field based on requirements. This is an annual program and funding will be requested each year. There is no substantial backlog within this program and assets are in a state of good repair. Project cost is based on existing contracts. 3 year avg is $127K.

SOURCE(S) OF FUNDING ($)

Funding Type	Budget	Components				TOTAL	Future Phases
Operating Funded Life Cycle	148,800	0	0	0	0	0	0
TOTAL FUNDING	**148,800**					**0**	**0**

OPERATING BUDGET IMPACT	Personnel	Non Personnel	Revenues	Expenditures/(Revenues)
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	Year	Amount	Amount in Study

Life Cycle

Amount in Study:	148,800
Amount Incl HST	148,800
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23020

Project Cost: **$2,407,000**

Project Name: **Corporate Fleet Replacement - Non-Fire - Pre Approval**

Repair/Replace

Commission: Community Services

Department: Operations - Fleet

Project Mgr: Tanya Lewinberg/Tony Greco

Useful Life: 5   Pre Approval: ☑

Category: Major

Cost Validation: Internal peer review

Requirement Validation: Condition assessment

ITS Involved Project: Is ITS Consulted? ☐

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

2023 Annual Fleet Replacement Program based on the Council adopted Corporate Fleet Policy Guidelines. Life cycle costing targets optimal replacement intervals (ORI) which identifies the most cost effective time period for replacement. All vehicles and equipment contained in this program have reached or surpassed the ORI. User Departments were consulted with respect to the units in this program. Total units -20 units out of a total of 52 units.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	2,365,368	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	2,365,368	0
HST Impact:	41,630	0
Total Project Cost:	**2,407,000**	**0**

NOTES

Useful life varies - 4 to 12 years based on units types. Cost Validation- Most recent purchase of similar unit type; Requirement validation - Condition assessment, vehicle reliability & down time, & operating costs. Units specified in this program will be purchased with the most recent technology available at time of purchase providing maximized fuel economy with minimal emissions.

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Licensed (19)	Non Licensed (1)			**TOTAL**	**Future Phases**
Operating Funded Life Cycle	2,407,000	2,235,900	171,100	0	0	2,407,000	0
TOTAL FUNDING	**2,407,000**					**2,407,000**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	**Year**	**Amount**	**Amount in Study**

Life Cycle

Amount in Study:	3,267,200
Amount Incl HST	2,407,000
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

20 units for pre approval (out of total of 52 units) including 3 licenced units accelerated from 2024 due to condition assessment.

Project	Corporate Fleet Replacement – Non Fire
2023 Capital Request	$2,407,000
Funding Source	Life Cycle Reserve
Description of Program	2023 Annual Fleet Replacement Program based on the Council adopted Corporate Fleet Policy Guidelines. Life cycle costing targets optimal replacement intervals (ORI) which identifies the most cost effective time period for replacement. All vehicles and equipment contained in this program have reached or surpassed the ORI. User Departments are consulted with respect to the units in this program. Total units - 20 units
Project Rationale	2023 Annual Fleet Replacement Program based on the Council adopted Corporate Fleet Policy Guidelines. To maintain current service levels for all users department
Legislative Requirement	n/a
History	
Future Phases	This funding is requested each year.
Total Project Cost	n/a
Related Projects	
Related Maps	n/a
Alignment to the Strategic Plar	Providing reliable fleet units allowing effective municipal services to local residents and businesses. Promoting the continued use of new technology along with alternate energy solutions that reduce fuel consumption and improved fleet efficiencies with reductions in overall fleet emissions.

2023 Corporate Fleet Replacement - Non-Fire (FOR PRE-APPROVAL)

Asset ID	Inventory Description	Mileage (Km)	Usage (Hours)	Facility	Category	Model Year	2023 Inflated Cost	Adjustment	2023 Updated Cost	Comments
1038	COMPACT PICK UP	95,722		ASSET MAN-Licensed	Licensed	2013	39,797		39,797	Deferred from 2021 to 2023; conversion to crew cab
1174	FULL SIZE WINDOW VAN	85,023		OPERATIONS-Licensed	Licensed	2012	56,631		56,631	Cost based on 185-T-20 Plus 10k - toolbox and inverter, plus inflation; Deferred from 2020 to 2023; Plus 10k - toolbox and inverter
1236	19,500 GVW FLATBED WITH 9' ARCTIC PLOW	95,272		OPERATIONS-Licensed	Licensed	2015	123,285		123,285	Price $101,366 adjusted to align 047-T-22 - base price $115,814, plus Markhamizing plus inflation
1253	FULL SIZE REG CAB PICK UP 4X4	154,946		OPERATIONS-Licensed	Licensed	2016		44,014	44,014	Accelerate from 2024 to 2023
1272	SINGLE AXLE ALLSEASON DUMP/PLOW/WING	78,311	4,545	OPERATIONS-Licensed	Licensed	2013	289,705		289,705	
1273	SINGLE AXLE ALLSEASON DUMP/PLOW/WING	82,598	5,056	OPERATIONS-Licensed	Licensed	2013	289,705		289,705	
1274	SINGLE AXLE ALLSEASON DUMP/PLOW/WING	80,941	4,966	OPERATIONS-Licensed	Licensed	2013	298,692		298,692	2017 add Pavement Edger implement
1422	ARTICULATED SIDEWALK TRACTOR 4X4		3,617	SIDEWALK-Non Licensed	Non Licensed	2013	168,171		168,171	
3238	FORESTRY BUCKET TRUCK	86,428	7,100	OPERATIONS / PARKS-Licensed	Licensed	2013	237,677		237,677	
3239	FORESTRY BUCKET TRUCK	88,103	7,061	OPERATIONS / PARKS-Licensed	Licensed	2013	237,677		237,677	
3326	FULL SIZE PICK UP 4X4	107,335		OPERATIONS / PARKS-Licensed	Licensed	2013	45,311		45,311	Deferred from 2021 to 2023
3342	19,500 GVW FLATBED WITH 9' ARCTIC PLOW	69,787		OPERATIONS-Licensed	Licensed	2016		123,285	123,285	Accelerate from 2024 to 2023 Price $101,366 adjusted to align 047-T-22 - base price $115,814, plus Markhamizing plus inflation
3355	COMPACT EXTENDED CAB PICK UP	68,896		OPERATIONS-Licensed	Licensed	2013	39,797		39,797	Deferred from 2021 to 2023; conversion to crew cab
3360	FULL SIZE SHORT BOX PICK UP 4X4	218,062		OPERATIONS-Licensed	Licensed	2013	65,327		65,327	
3377	FULL SIZE 2500 CREW CAB PICK UP 4X2 W/ 8' Box	125,789		OPERATIONS-Licensed	Licensed	2015	49,336		49,336	
6086	COMPACT CAR	66,668		ENFOR LIC-Licensed	Licensed	2014	58,444		58,444	Deferred from 2022 to 2023; conversion to PHEV hybrid - Bylaw vehicle
6096	COMPACT CAR	76,266		CLERK-1-Licensed	Licensed	2011	58,444		58,444	Deferred from 2019 to 2023; conversion to PHEV hybrid - Bylaw vehicle
6097	COMPACT CAR	80,732		CLERK-1-Licensed	Licensed	2011	58,444		58,444	Deferred from 2019 to 2023; conversion to PHEV hybrid - Bylaw vehicle
7037	COMPACT CREW CAB PICK UP	77,383		WASTE-Licensed	Licensed	2011	38,650		38,650	Deferred from 2019 to 2023; conversion to crew cab
7035	FULL SIZE 1500 REG CAB PICK UP 4X2		124,889	WASTE-1-Licensed	Licensed	2016		42,976	42,976	Accelerate from 2024 to 2023
						Total Pre-Tax	**2,155,093**	**210,275**	**2,365,368**	
						HST impact	**37,930**		**41,630**	
						Total Project Cost	**2,193,023**		**2,406,998**	
						Rounded Off Project Cost	**2,193,000**		**2,407,000**	

ORIGINAL PROJECT COST

No. of Units	Category	Pre-Tax	HST Impact	Project Cost
16	Licensed	1,986,922	34,970	**2,021,892**
1	Non Licensed	168,171	2,960	**171,131**
		2,155,093	**37,930**	**2,193,023**
17			**Rounded Off - Project Cost**	**2,193,000**

UPDATED PROJECT COST

No. of Units	Category	Pre-Tax	HST Impact	Project Cost
19	Licensed	2,197,197	38,671	**2,235,868**
1	Non Licensed	168,171	2,960	**171,131**
		2,365,368	**41,630**	**2,406,998**
20			**Rounded Off - Project Cost**	**2,407,000**

2023 PROJECT FUNDING REQUEST FORM

Number: 23021

Project Cost: **$108,000**

Project Name: **Corporate Fleet Replacement - Waterworks**

Repair/Replace

Commission: Community Services

Department: Operations - Fleet

Project Mgr: Tanya Lewinberg/Edgar Tovilla

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Useful Life: 8 Pre Approval: ☑

Category: Major

Cost Validation: Recent awards

Requirement Validation: Other(specify in Notes)

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Part of the Annual Fleet Replacement Program based on the Council adopted Corporate Fleet policy guidelines. Life Cycle costing targets Optimal Replacement Intervals (ORI) which identifies the most cost effective time period for replacement. All vehicles and equipment (2 units) contained in this program have reached or surpassed the ORI. This is funded by Waterworks reserve.

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PROJECT COSTS ($)	2023	Future Phases
Cost/Quote:	106,160	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	106,160	0
HST Impact:	1,868	0
Total Project Cost:	**108,000**	**0**

NOTES

2 units - Requirement Validation - meeting the approved replacement criteria, pending condition assessment. All units in this request will be purchased with the most recent technology available at time of purchase providing maximum fuel economy with minimal emissions.

SOURCE(S) OF FUNDING ($)

Funding Type	Budget	Components: Licensed (2)	Non Fleet			TOTAL	Future Phases
Waterworks	108,000	105,900	2,100	0	0	108,000	0
TOTAL FUNDING	**108,000**					**108,000**	**0**

OPERATING BUDGET IMPACT	Personnel	Non Personnel	Revenues	Expenditures/(Revenues)
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	Year	Amount	Amount in Study

Life Cycle

Amount in Study:

Amount Incl HST

Year in the study

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

2023 Waterworks Fleet Replacement

Asset ID	Inventory Description	Mileage (Km)	Usage (Hours)	Facility	Model Year	2023 Inflated Pre-Tax	Adjustment	2023 Updated Cost	Comments
2174	FULL SIZE CARGO VAN	54,196		WATER- Licensed	2014	43,052		43,052	Deferred from 2022 to 2023; Price aligned with 2188
2174	Specification Change			WATER- Licensed		8,967		8,967	Specification change to F250
2181	COMPACT VAN	56,604		WATER- Licensed	2014	48,032	(48,032)	-	Based on PD22036; Deferred from 2022 to 2024;
2182	COMPACT VAN	52,842		WATER- Licensed	2014	48,032	(48,032)	-	Based on PD22036; Deferred from 2022 to 2024;
2188	FULL SIZE CARGO VAN	57,057		WATER- Licensed	2016		43,052	43,052	Accelerate from 2024 to 2023
2188	Specification Change			WATER- Licensed			8,967	8,967	Specification change to F250
2245	PORTABLE DIESEL GENERATOR 35 KV		125	WATER- Non Licensed (Tools & Equip)	2008	63,464	(63,464)	-	Deferred from 2021 to 2024; Cost based on quote from Sommers Generators Systems
2246	FORKLIFT PROPANE POWERED		738	WATER- Non Licensed (Tools & Equip)	2010	35,587	(35,587)	-	Deferred from 2022 to 2024; PD 17120
	Waterworks Non Fleet < $5,000 or Misc			WATER - Waterworks Non Fleet < $5,000 or Misc		2,122		2,122	
						249,256	**(143,096)**	**106,160**	
					Total Pre-Tax	**249,256**		**106,160**	
					HST impact	**4,387**		**1,868**	
					Total Project Cost	**253,642**		**108,027**	
					Rounded Off Project Cost	**253,600**		**108,000**	

ORIGINAL PROJECT COST

No. of Units	Category	Pre-Tax	HST Impact	Project Cost
3	Licensed	148,083	2,606	**150,689**
2	Non Licensed (Tools & Equipment)	99,051	1,743	**100,794**
	Waterworks Non Fleet < $5,000 or Misc	2,122	37	**2,159**
		249,256	**4,387**	**253,643**
5			**Rounded Off - Project Cost**	**253,600**

UPDATED PROJECT COST

No. of Units	Category	Pre-Tax	HST Impact	Project Cost
2	Licensed	104,038	1,831	**105,869**
0	Non Licensed (Tools & Equipment)		-	-
	Waterworks Non Fleet < $5,000 or Misc	2,122	37	**2,159**
		106,160	**1,868**	**108,028**
2			**Rounded Off - Project Cost**	**108,000**

2023 PROJECT FUNDING REQUEST FORM

Number: 23022

Project Cost: **$11,200**

Project Name: **New Fleet - Parks - Pre Approval**

New Asset/Expansion

Commission: Community Services

Department: Operations - Fleet

Project Mgr: Tanya Lewinberg/David Plant

Useful Life: 8 Pre Approval: ☑

Category: Annual

Cost Validation: Internal peer review

Requirement Validation: Condition assessment

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Supply & delivery of (1) Hydraulic Snow Blower with Skid Steer.

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PROJECT COSTS ($)	2023	Future Phases
Cost/Quote:	11,006	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	11,006	0
HST Impact:	194	0
Total Project Cost:	**11,200**	**0**

NOTES

Hydraulic snow blower with Skid Steer - For monolithic sidewalk clearing.

SOURCE(S) OF FUNDING ($)

Funding Type	Budget	Components				TOTAL	Future Phases
DCA	11,200	0	0	0	0	0	0
TOTAL FUNDING	**11,200**					**0**	**0**

OPERATING BUDGET IMPACT	Personnel	Non Personnel	Revenues	Expenditures/(Revenues)
	$0	$1,629	$0	$1,629

DCA/LIFE CYCLE DETAILS

DCA Name	Year	Amount	Amount in Study

Life Cycle

Amount in Study:

Amount Incl HST

Year in the study

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23023

Project Cost: **$32,600**

Project Name: **New Fleet - Roads**

New Asset/Expansion

Commission: Community Services

Department: Operations - Fleet

Project Mgr: Tony Greco/Steven Dollmaier

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Useful Life: 20 Pre Approval: ☑

Category: Annual

Cost Validation: Third party estimate

Requirement Validation: Other(specify in Notes)

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Purchase of one (1) new Slip In Water Tank for "Pro-Line" Body

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PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	32,000	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	32,000	0
HST Impact:	563	0
Total Project Cost:	**32,600**	**0**

NOTES

In the winter, bridges get dirty from the sand, salt and anti-icing chemicals that are spread on roads. Salt eats away at steel, which makes up much of a bridge's structure. Spring cleaning prolongs the life of our bridges and enhance the annual bridge maintenance program. The tank will also be used for Direct Liquid Applications during the winter months to prevent snow and ice from bonding to the pavement. This will help the City staff address hot spots, areas of concern and legislation changes to the MMS within the City as currently we have to give the contractor 24 hours' notice to be deployed. This will allow staff to address within the 24hours.

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components				**TOTAL**	**Future Phases**
DCA	32,600	0	0	0	0	0	0
TOTAL FUNDING	**32,600**					**0**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	**Year**	**Amount**	**Amount in Study**

Life Cycle

Amount in Study:

Amount Incl HST

Year in the study

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

2023 PROJECT FUNDING REQUEST FORM

Number: 23024

Project Cost: **$30,500**

Project Name: **Upfit of Fleet Services Mobile Van**

New Asset/Expansion

Commission: Community Services

Department: Operations - Fleet

Project Mgr: Tony Greco

Useful Life: 16   Pre Approval: ☑

Category: Annual

Cost Validation: Third party estimate

Requirement Validation: Condition assessment

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Based on operational requirements, Fleet is making the request to upfit the Fleet mobile service van unit 5121 with the following:
1.) Mobile power unit equipped with air compressor, welding unit and vehicle booster
2.) Anti-slip heavy duty flooring
3.) Shelving unit to store various supplies
4.) Rear cargo door tool holder
5.) LED track lighting front to back in cargo area
6.) Front and rear LED emergency lights for roadside safety

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	2023	Future Phases
Cost/Quote:	30,000	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	30,000	0
HST Impact:	528	0
Total Project Cost:	**30,500**	**0**

NOTES

Fleet currently has a full size high roof cargo van used as a mobile service vehicle to repair vehicles/equipment and breakdowns in the field and at various City facilities including Civic Centre, 8100 Warden Ave. and Markham East yard. Having a fully equipped mobile service vehicle will aid in repairing units in the field reducing the need for towing, minimizing return trips to Fleet and increasing our current service levels to the various City departments.

SOURCE(S) OF FUNDING ($)

Funding Type	Budget	Components				TOTAL	Future Phases
DCA	30,500	0	0	0	0	0	0
TOTAL FUNDING	**30,500**					**0**	**0**

OPERATING BUDGET IMPACT	Personnel	Non Personnel	Revenues	Expenditures/(Revenues)
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	**Year**	**Amount**	**Amount in Study**

Life Cycle

Amount in Study:

Amount Incl HST

Year in the study

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23025

Project Cost: **$82,800**

Studies/Pilot Programs

Project Name: **German Mills Meadow Environmental Monitoring Program**

Commission: Community Services

Department: Operations - Utility Inspection & Survey

Project Mgr: Negar Mahmoudi

Ward(s): CW ☐ 1 ☑ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Useful Life: 0 Pre Approval: ☑

Category: Major

Cost Validation: Recent awards

Requirement Validation: Legislative compliance

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Hire a consultant for the management of the German Mills Meadow and Natural Habitat. Work includes condition assessment, monitoring systems to ensure that appropriate protection is provided to abutting properties and German Mills Creek. This request is to hire a consultant to monitor for 1 year to ensure methane gas concentrations are below MOE (Ministry of Environment) compliance levels and German Mills Creek is not adversely affected by the leachate.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	2023	Future Phases
Cost/Quote:	0	0
Internal Charges:	0	0
External Consulting:	81,368	0
Contingency %: 0	0	0
Sub Total:	81,368	0
HST Impact:	1,432	0
Total Project Cost:	**82,800**	**0**

NOTES

This request is for year 1 of a 3 year program.

SOURCE(S) OF FUNDING ($)

Funding Type	Budget	Components				TOTAL	Future Phases
Operating Funded Life Cycle	82,800	0	0	0	0	0	0
TOTAL FUNDING	**82,800**					**0**	**0**

OPERATING BUDGET IMPACT	Personnel	Non Personnel	Revenues	Expenditures/(Revenues)
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	Year	Amount	Amount in Study

Life Cycle

Amount in Study:	357,600
Amount Incl HST	82,800
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

Request is for one year monitoring.

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23026

Project Cost: **$81,600**

Project Name: **Bridges and Culverts - Condition Inspection**

Studies/Pilot Programs

Commission: Community Services

Department: ES - Infrastructure

Project Mgr: Hossein Sharif

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Useful Life: 0 Pre Approval: ☑

Category: Minor

Cost Validation: Recent awards

Requirement Validation: Legislative compliance

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Hire a consultant to inspect vehicular bridges (14), pedestrian bridges (44), culverts (74) and boardwalks (9) as mandated by Public Transportation and Highway Act - Regulation 104/97 to ensure public safety. A total of 141 structures will be inspected out of 365. This program ensures inspections take place within the regulated timelines.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	0	0
Internal Charges:	0	0
External Consulting:	80,200	0
Contingency %: 0	0	0
Sub Total:	80,200	0
HST Impact:	1,412	0
Total Project Cost:	**81,600**	**0**

NOTES

This is an annual program. There is no backlog and structures are in a state of good repair.
Operations is responsible for preventative maintenance on bridges/culverts such as minor grading, patching, sealing of approaches and decks, and siltation removal from culverts, while Env. Services is responsible for its inspection, rehabilitation and replacement.
Unit cost is consistent with recent award plus inflation. Amount requested is consistent with 2022 Life Cycle Reserve Study Update.

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components				**TOTAL**	**Future Phases**
Operating Funded Life Cycle	81,600	0	0	0	0	0	0
TOTAL FUNDING	**81,600**					**0**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	**Year**	**Amount**	**Amount in Study**

Life Cycle

Amount in Study:	81,600
Amount Incl HST	81,600
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

2023 PROJECT FUNDING REQUEST FORM

MARKHAM

Number: 23027

Project Cost: **$756,600**

Project Name: **Storm and Sanitary Sewer CCTV Inspection**

Studies/Pilot Programs

Commission: Community Services

Useful Life: 0 Pre Approval: ☑

Department: ES - Infrastructure

Category: Major

Project Mgr: Philip Zhang

Cost Validation: Recent awards

Ward(s): CW ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☑ 5 ☑ 6 ☐ 7 ☑ 8 ☑

Requirement Validation: Condition assessment

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Program to determine the condition of the storm and sanitary sewers using closed circuit television (CCTV) inspection. Pipe rehabilitation/ replacement programs will be developed based on the condition inspection results. 2023 Program includes:
a) 107 km storm sewers out of total 940 km (Life Cycle funded); b) 106 km sanitary sewers out of total 931 km (Waterworks funded).
Map is attached.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	2023	Future Phases
Cost/Quote:	676,400	3,333,000
Internal Charges:	0	0
External Consulting:	67,100	0
Contingency %: 0	0	0
Sub Total:	743,500	3,333,000
HST Impact:	13,086	58,661
Total Project Cost:	**756,600**	**3,391,700**

NOTES

This is an annual program (10 year cycle) - Phase 5 of 10. Program will be re-evaluated at the end of the 10 year cycle. External consultant is retained to identify deficiencies on CCTV inspection. Unit cost is consistent with recent award.

SOURCE(S) OF FUNDING ($)

Funding Type	Budget	Components: Contractor	Consultant			TOTAL	Future Phases
Operating Funded Life Cycle	262,600	238,900	23,700	0	0	262,600	1,219,700
Waterworks	494,000	449,400	44,600	0	0	494,000	2,172,000
TOTAL FUNDING	**756,600**					**756,600**	**3,391,700**

OPERATING BUDGET IMPACT	Personnel	Non Personnel	Revenues	Expenditures/(Revenues)
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	Year	Amount	Amount in Study

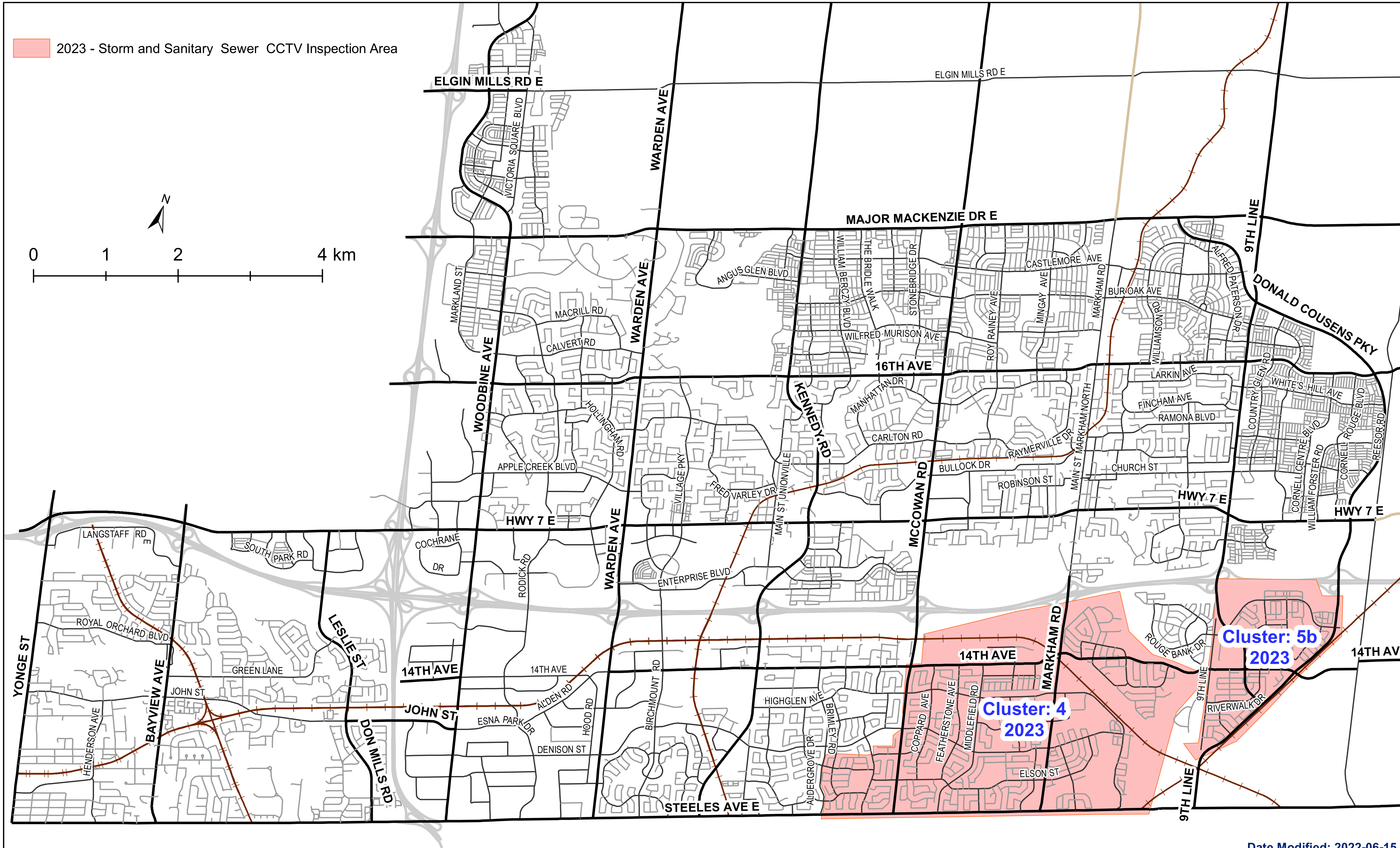
Life Cycle

Amount in Study:	262,600
Amount Incl HST	262,600
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

Total Cost: $756,600
$494,000 (65%) is funded through Sanitary Lifecycle (Water Rate)
$262,600 (35%) is funded through Storm Lifecycle

MARKHAM STORM AND SANITARY SEWER CCTV INSPECTION



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Program Name: Storm and Sanitary CCTV Inspection

Department: Environmental Services

Phase #	Inspection year	Project #	Past	2023	Future	Total	Comments
Phase 1	2019	#19225 / #19248/ 760-510-5300	$524,003			$524,003	52 km storm; 52 km sanitary; 1,400 laterals
Phase 2	2020	#20237	$1,585,200			$1,585,200	90 km storm; 91 km sanitary; 6,946 laterals
Phase 3	2021	*#21149*	*$652,800*			$652,800	80 km storm; 94 km sanitary
Phase 4	2022	*#22186*	*$625,800*			$625,800	82.3 km storm; 80.8 km sanitary
Phase 5	2023	***#23xxx (This request)***		***$756,600***		$756,600	107 km storm; 106 km sanitary
Phase 6 to Phase 10	2024 - 2028				$3,391,700	$3,391,700	
Total Cost			**$3,387,803**	**$756,600**	**$3,391,700**	**$7,536,103**	

Description of Program

Program to determine the condition of the storm and sanitary sewers using closed circuit television (CCTV) inspection

What was completed in the past

4 phases have been completed or in progress (out of 10 phases): $3.39M

Current ask

CCTV inspection of 107 km storm sewers (out of 940 km) and 106 km sanitary sewers (out of 931 km) - $756,600

Future Phases

Phases 6 to 10 between 2024 - 2028: $3.39M

Related 2023 Project(s)

Sanitary Sewer Rehabilitation (#23xxx): $846,600

Map Attached

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23028

Project Cost: **$149,200**

Project Name: **Structures Program-Full-time Staff**

Studies/Pilot Programs

Commission: Community Services

Useful Life: 0 Pre Approval: ☑

Department: ES - Infrastructure

Project Mgr: Paul Ahn

Category: Annual

Cost Validation: Other(specify in Notes)

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Requirement Validation: Other(specify in Notes)

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

This funds one Senior Project Engineer (existing Permanent Full-Time staff) position.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	0	0
Internal Charges:	149,200	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	149,200	0
HST Impact:	0	0
Total Project Cost:	**149,200**	**0**

NOTES

This is an annual program. The annual structures (bridges and culverts) program includes detailed visual inspection, condition survey/design, and cost effective maintenance program. The results are used to identify the structures that require rehabilitation. Rehabilitation of structures improves the overall condition and increases the service life. The amount requested is consistent with the 2022 Life Cycle Reserve Study Update.
Requirement validation: This position is critical to support structures rehabilitation projects for the City-owned structures.

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components				**TOTAL**	**Future Phases**
Operating Funded Life Cycle	149,200	0	0	0	0	0	0
TOTAL FUNDING	**149,200**					**0**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	**Year**	**Amount**	**Amount in Study**

Life Cycle

Amount in Study:	149,200
Amount Incl HST	149,200
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: **23029**

Project Cost: **$14,522,500**

Project Name: **West Thornhill Flood Control Implementation Ph 4B Constr.**

Repair/Replace

Commission: Community Services

Department: ES - Infrastructure

Project Mgr: Paul Ahn

Useful Life: 100 Pre Approval: ☑

Category: Major

Cost Validation: Recent awards

Requirement Validation: Other(specify in Notes)

Ward(s): CW ☐ 1 ☑ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

To continue with the flood remediation program in the West Thornhill area based on Class EA study recommendations. This budget request is for upgrading the storm sewer pipes in Phase 4B area (Romfield Circuit area). See attached location map. Program is as follows:

- Est. West Thornhill program cost is $110M (as of April 2019)
- Previous budget approved (up to 2022) represents 76% of West Thornhill Program cost.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	13,244,013	12,140,700
Internal Charges:	612,199	0
External Consulting:	425,678	0
Contingency %: 0	0	0
Sub Total:	14,281,890	12,140,700
HST Impact:	240,587	213,676
Total Project Cost:	**14,522,500**	**12,354,400**

NOTES

Requirement: Council direction to upgrade the storm sewer system in West Thornhill to 100 year level protection.
Funding Source: Stormwater Reserve. External consulting includes contract administration. The City will receive 40% of the eligible cost through DMAF Grant. Net cost to the City will be 60%.
Future phases are 4C & 4D - (Royal Orchard - between Yonge St. and Bay Thorn Dr, Wild Cherry Ln, Apple Orchard Path, Silver Aspen Dr, Normark Dr and Donalbain Cr).

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components: CA	Construction	Int charge		**TOTAL**	**Future Phases**
Gas Tax	2,000,000	0	2,000,000	0	0	2,000,000	0
Infrastructure Grant	5,564,111	173,268	5,390,843	0	0	5,564,111	0
Reserve Fund	6,958,389	259,902	6,086,288	612,199	0	6,958,389	12,354,400
TOTAL FUNDING	**14,522,500**					**14,522,500**	**12,354,400**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	Year	Amount	Amount in Study

Life Cycle

Amount in Study:

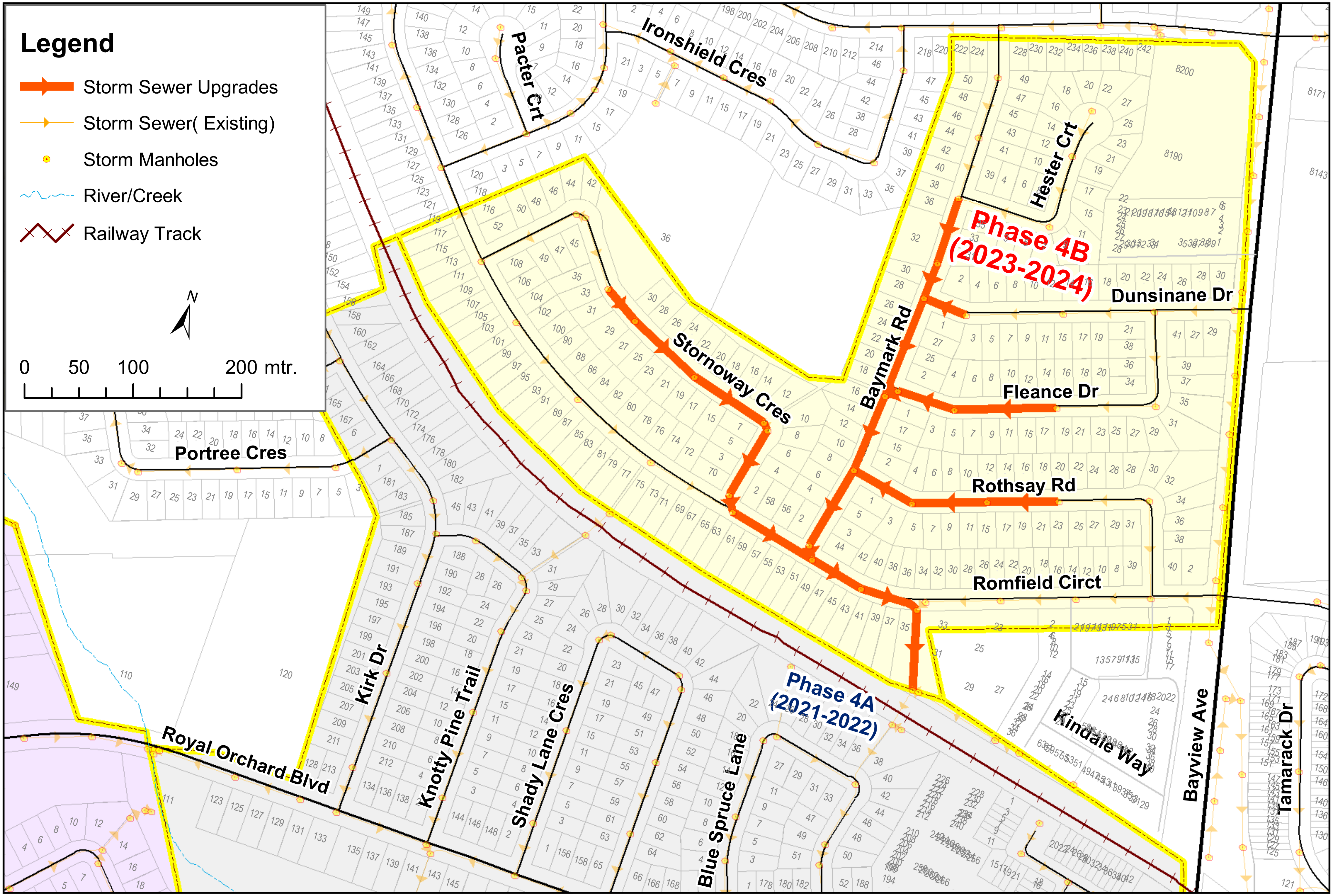
Amount Incl HST

Year in the study

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

West Thornhill Flood Control Implementation – Phase 4B Construction



Date: 2022-06-15

Program Name: West Thornhill Flood Control Implementation

Department: Environmental Services

Component	Project #	Past	2023	Future	Total
Phase 1 (East of Bayview, North of Steeles, SW of CN tracks)	#8530, #9330, #14271, #15014	$19,310,616			$19,310,616
Phase 2 (West of Bayview, East of Yonge, N of Steeles, S of CN Tracks)	#16210, #17201, #18279, #19232	$26,051,767			$26,051,767
Phase 3 (West of Bayview, East of Yonge, S of John, N of CN tracks)	#16211, #20252 #21164, **#22190** **(This Request)**	$26,348,353			$26,348,353
staff recovery					
Contingency for Ph 3					
Phase 4 (Royal Orchard/ Romfield - West of Bayview, East of Yonge)	#18280 #21165 **#23xxx**	$12,412,539	**$14,522,500**	$12,354,226	$39,289,265
Total Cost		**$84,123,275**	**$14,522,500**	**$12,354,226**	**$111,000,000**

Description of Program

To upgrade the storm sewer system in West Thornhill to 100 year level protection

What was completed in the past

11 phases have been completed or in progress (out of 14 phases) since 2013 - 2022: $84.1M

Current ask

Phase 4B Construction (#23xxx): $14,522,500

Future Phases

Phases 4C, 4D Construction 2024 - 2026 - $12.4M

Related 2022 Project(s)

CI watermain Replacement - West Thornhill Phase 3C Construction (#22204): $3,102,500

Map Attached

PROGRAM STATUS

Phases	Project Status
1A (Doncrest Dr and Daffodil Ave)	Total completion in Aug 2017
1B (Laureleaf Rd, Poinsetta Dr, Multiflora Pl)	Total completion in Aug 2018
1C (Canadiana Dr)	Total completion in Dec 2018
2A (Grandview Ave, Brightbay Cr, Courtham Ave, Rayneswood Cr, Pineval Dr, Elspeth Pl)	Total completion in Dec 2018
2B (Grandview Park, Henderson Ave and Proctor Ave)	Total completion in Dec 2019
2C (Grandview Ave/ Woodward Ave/ Highland Park Blvd - between Jewll St and Yonge St, Meadow Ave, Willowdale Blvd, Dudley Ave, Jewell St)	Total completion in Nov 2021
2D (Grandview Ave/ Woodward Ave/Highland Park Blvd - between Henderson Ave and Jewell St.; Dalmeny Rd, Delcair Cr, Henderson Ave between Grandview Ave and Dalmeny Rd)	Total completion in Nov 2021
3A (Morgan Ave - between Henderson ad Yonge; Clark Ave - between Hendwerson and Johnson)	Under warranty until Aug 2023
3B (Johnson St, Vanwood Rd, St. Andreas Crt, Ida St, Dove Ln, Wiarton Crt)	Under warranty until Nov 2023
4A (Royal Orchard - between Doral Gate to Pomona Creek, Kirk Dr, Knotty Pine Trail, Blus Spruce Ln, Doral Gate, Augusta Crt)	Project commenced in May 2021; Anticipated Substantial completion in Nov 2022
3C (Clark Ave and Glen Cameron Rd, Lilian Ave, Mira Road, Pheasant Valley Crt)	Project commenced in May 2022;
4B (This Request) (Romfield Cir Area)	Design 90% completed; Construction in 2023 - 2024
4C & 4D (Royal Orchard - between Yonge St. and Bay Thorn Dr, Wild Cherry Ln, Apple Orchard Path, Silver Aspen Dr, Normark Dr, Donalbain Cr)	Design 90% completed; Construction in 2024 - 2026

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23030

Project Cost: **$28,100**

Studies/Pilot Programs

Project Name: **SWM Ponds - Condition Inspection**

Commission: Community Services

Department: ES - Stormwater

Project Mgr: Rob Muir

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Useful Life: 0

Pre Approval: ☑

Category: Major

Cost Validation: Recent awards

Requirement Validation: Condition assessment

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Condition assessment of inlet/outlet control structures and measurement of sediment level on selected stormwater management (SWM) ponds in order to update the SWM Pond database, and to develop an effective pond SWM maintenance program.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	2023	Future Phases
Cost/Quote:	0	0
Internal Charges:	0	0
External Consulting:	27,600	0
Contingency %: 0	0	0
Sub Total:	27,600	0
HST Impact:	534	0
Total Project Cost:	**28,100**	**0**

NOTES

This program runs every other year. Prior to request for funding for sediment cleaning, SWM ponds will be inspected and surveyed to determine maintenance requirements and priority rankings.

Approximately 15 ponds will be surveyed out of total 70 wet ponds. Operations is responsible for minor above ground maintenance on SWM ponds while Environmental Services is responsible for all other aspects including inspection, sediment cleaning, rehabilitation and flood control strategies. There is no backlog.

SOURCE(S) OF FUNDING ($)

Funding Type	Budget	Components				TOTAL	Future Phases
Operating Funded Life Cycle	28,100	0	0	0	0	0	0
TOTAL FUNDING	**28,100**					**0**	**0**

OPERATING BUDGET IMPACT	Personnel	Non Personnel	Revenues	Expenditures/(Revenues)
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	Year	Amount	Amount in Study

Life Cycle

Amount in Study:	28,100
Amount Incl HST	28,100
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23031

Project Cost: **$77,300**

Project Name: **Water Quality Improvements**

Studies/Pilot Programs

Commission: Community Services

Department: ES - Stormwater

Project Mgr: Zahra Parhizgari

Useful Life: 0 Pre Approval: ☑

Category: Major

Cost Validation: Internal peer review

Requirement Validation: Other(specify in Notes)

ITS Involved Project: Is ITS Consulted? ☐

Ward(s): CW ☐ 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☑ 6 ☐ 7 ☐ 8 ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

This project is to carry out the geese control program at Swan Lake (Ward 5) and Toogood Pond (Ward 3). This program is intended to manage recurring water quality complaints and to reduce nutrient loading into Swan Lake and Toogood Pond.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	76,000	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	76,000	0
HST Impact:	1,338	0
Total Project Cost:	**77,300**	**0**

NOTES

This is an annual program to carry out geese control at Swan Lake and Toogood Pond.
Program has been enhanced on geese management, fish removal as per Markham Sub Committee report dated Nov 16, 2021 which was approved by the Council.
Requirement Validation: To protect the water quality.

SOURCE(S) OF FUNDING ($)

Funding Type	Budget	Components				TOTAL	Future Phases
Operating Funded Life Cycle	77,300	0	0	0	0	0	0
TOTAL FUNDING	**77,300**					**0**	**0**

OPERATING BUDGET IMPACT	Personnel	Non Personnel	Revenues	Expenditures/(Revenues)
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	Year	Amount	Amount in Study

Life Cycle

Amount in Study:	77,300
Amount Incl HST	77,300
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23032

Project Cost: **$30,900**

Studies/Pilot Programs

Project Name: **Water Quality Monitoring at Swan Lake**

Commission: Community Services

Department: ES - Stormwater

Project Mgr: Zahra Parhizgari

Ward(s): CW ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☑ 6 ☐ 7 ☐ 8 ☐

Useful Life: 0 Pre Approval: ☑

Category: Major

Cost Validation: Recent awards

Requirement Validation: Other(specify in Notes)

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

This request is to continue with the water quality sampling and analysis at Swan Lake.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	0	0
Internal Charges:	0	0
External Consulting:	30,400	0
Contingency %: 0	0	0
Sub Total:	30,400	0
HST Impact:	535	0
Total Project Cost:	**30,900**	**0**

NOTES

Requirement: In June 2020, Council approved continuation of monitoring at Swan Lake.
Unit cost is consistent with recent budget plus inflation. Amount requested is consistent with 2022 Life Cycle Reserve Study Update.

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components				**TOTAL**	**Future Phases**
Operating Funded Life Cycle	30,900	0	0	0	0	0	0
TOTAL FUNDING	**30,900**					**0**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	**Year**	**Amount**	**Amount in Study**

Life Cycle

Amount in Study:	30,900
Amount Incl HST	30,900
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23033

Project Cost: **$203,500**

Project Name: **West Thornhill Flood Control - Ph 4C & 4D Addl. Design**

Repair/Replace

Commission: Community Services

Department: ES - Stormwater

Project Mgr: Timothy Ng

Ward(s): CW ☐ 1 ☑ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Useful Life: 100 Pre Approval: ☑

Category: Major

Cost Validation: Internal peer review

Requirement Validation: Other(specify in Notes)

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

This budget request is for additional detailed design work required for Phase 4C & 4D. Map is attached.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	0	0
Internal Charges:	0	0
External Consulting:	200,000	0
Contingency %: 0	0	0
Sub Total:	200,000	0
HST Impact:	3,520	0
Total Project Cost:	**203,500**	**0**

NOTES

Additional design is required for Phase 4C & 4D due to following:

- To accommodate new developments around Yonge Street and Royal Orchard subway station areas, revisions to original sanitary sewer alignment, and increase in capacity is required
- Excess soil management O. Reg. 406/19 has been implemented in 2022 that dictates additional testing of soils and tracking
- Storm sewer outfall redesign and diversion are required to accommodate adjacent property owners (Ladies Golf Club Toronto) and revise the original EA alignment

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components				**TOTAL**	**Future Phases**
Reserve Fund	203,500	0	0	0	0	0	0
TOTAL FUNDING	**203,500**					**0**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	**Year**	**Amount**	**Amount in Study**

Life Cycle

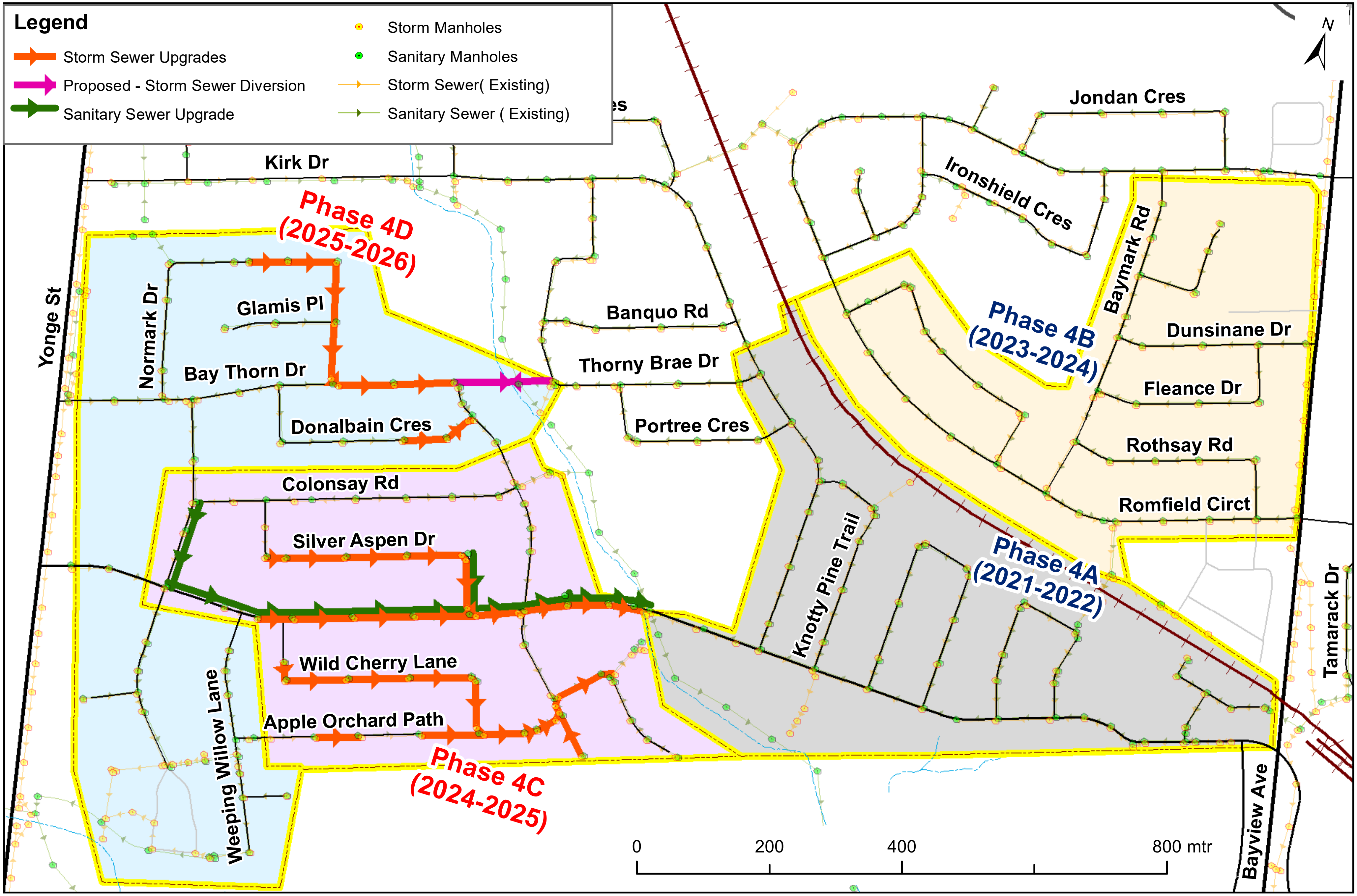
Amount in Study:

Amount Incl HST

Year in the study

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

West Thornhill Flood Control – Phases 4C & 4D Additional Design



Q:\Environmental Services\CAPITAL RIGHT OF WAY\Department Share\00_GIS_Capital Planning\02_Capital Projects\2023_Capital Projects\MXD\West ThornhillPh 4C & 4D Additional Design.mxd

Date: 2022-06-16

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23034

Project Cost: $110,700

Project Name: **Asset Management Analyst - Full Time Staff**

Studies/Pilot Programs

Commission: Community Services

Useful Life: 0 Pre Approval: ☑

Department: ES - Waterworks

Project Mgr: Shipra Singh

Category: Annual

Cost Validation: Other(specify in Notes)

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Requirement Validation: Other(specify in Notes)

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

This funds one permanent full time staff position.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	0	0
Internal Charges:	110,700	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	110,700	0
HST Impact:	0	0
Total Project Cost:	**110,700**	**0**

NOTES

This position will assist the IMS/ Capital Planning Manager to effectively manage data and capital planning for all ES assets with a value of $7.6B (78% of City assets value) and enhance the service level.

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components				**TOTAL**	**Future Phases**
Waterworks	110,700	0	0	0	0	0	0
TOTAL FUNDING	**110,700**					**0**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	**Year**	**Amount**	**Amount in Study**

Life Cycle

Amount in Study:	110,700
Amount Incl HST	110,700
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23035

Project Cost: **$995,100**

Project Name: **Cathodic Protection of Ductile Iron Watermains**

Repair/Replace

Commission: Community Services

Department: ES - Waterworks

Project Mgr: Richard Kit

Ward(s): CW ☐ 1 ☑ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☑

Useful Life: 20 Pre Approval: ☑

Category: Minor

Cost Validation: Recent awards

Requirement Validation: Other(specify in Notes)

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Program to install corrosion protection material (anodes) to ductile iron (DI) watermains to reduce/ prevent corrosion. Renewal of corrosion protection is necessary to replace the depleted anodes (18-20 years old) and test stations. Map attached.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	977,900	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	977,900	0
HST Impact:	17,211	0
Total Project Cost:	**995,100**	**0**

NOTES

This is an annual program. Program commenced in 1993 with an avg. of 120 watermain breaks/year which has reduced to an avg. of 19 breaks/ year in last five years. Second cycle of ductile and cast iron watermains corrosion protection commenced in 2014.
This request is to install anodes for approx. 20 km length of DI watermain (Refer to attached map). Unit cost is consistent with recent award plus inflation.

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components				**TOTAL**	**Future Phases**
Waterworks	995,100	0	0	0	0	0	0
TOTAL FUNDING	**995,100**					**0**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

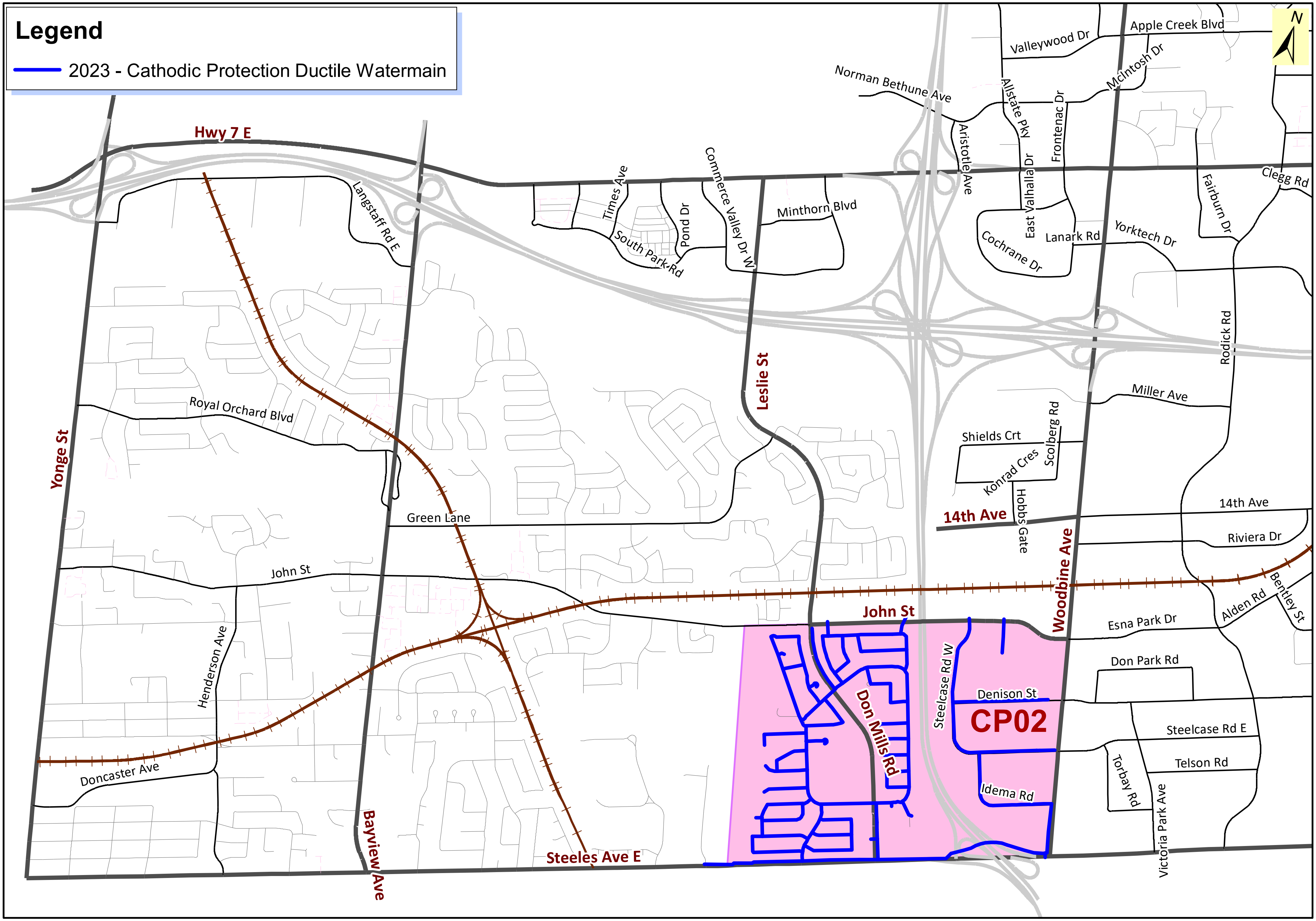
DCA Name	**Year**	**Amount**	**Amount in Study**

Life Cycle

Amount in Study:	995,100
Amount Incl HST	995,100
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

Cathodic Protection of Ductile Iron Watermain



Program Name: Cathodic Protection of Iron Watermains						
Department: Environmental Services						
Year	**Project #**	**Past**	**2023**	**Future**	**Total**	**Remarks**
2019	#19241	$427,800			$427,800	10.4 km Cast Iron
2020	#20255	$378,900			$378,900	11 km Cast Iron
2021	#21167	$493,100			$493,100	15 km Ductile Iron
2022	#22201	$444,000			$444,000	12 km Ductile Iron
2023	**#23xxx**		**$995,100**		$995,100	20 km Ductile Iron
2024 Onwards				varies	varies	
Total		$1,743,800	$995,100			
Description of Program						
Program to install corrosion protection material (anodes) to ductile iron (DI) and Cast Iron (CI) watermains to reduce/ prevent corrosion. This is an annual program.						
What was completed in the past						
See above table						
Current ask						
$995,100						
Future Phases						
Varies						
Related 2023 Project(s)						
N/A						
Map	Attached					

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23036

Project Cost: **$9,811,400**

Project Name: **CI Watermain Replacement - Construction**

Repair/Replace

Commission: Community Services

Useful Life: 0 Pre Approval: ☑

Department: ES - Waterworks

Category: Major

Project Mgr: Jawaid Khan

Cost Validation: Recent awards

Ward(s): CW ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☑ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Requirement Validation: Other(specify in Notes)

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Replacement of approx. 3.5 km cast iron (CI) watermain in Drakefield Rd/ Banfield Ave./ Princess St/ Dublin St Area (refer to attached map).

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	9,193,800	65,194,870
Internal Charges:	149,200	0
External Consulting:	301,300	0
Contingency %: 0	0	0
Sub Total:	9,644,300	65,194,870
HST Impact:	167,114	1,147,430
Total Project Cost:	**9,811,400**	**66,342,300**

NOTES

This is an annual program (Phase 5b of 15; ending in 2032). Total CI Watermain: 54.1 km. As part of the CI watermain replacement program, 92% of aged CI watermain will be replaced with PVC and 8% will be rehabilitated with CIPP liner. This request is for construction of 3.5km cast iron watermain.
Design was requested through 2022 capital budget request.

SOURCE(S) OF FUNDING ($)

Funding Type	Budget	Components: CA	Construction	Internal staff		TOTAL	Future Phases
Waterworks	9,811,400	306,600	9,355,600	149,200	0	9,811,400	66,342,300
TOTAL FUNDING	**9,811,400**					**9,811,400**	**66,342,300**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	**Year**	**Amount**	**Amount in Study**

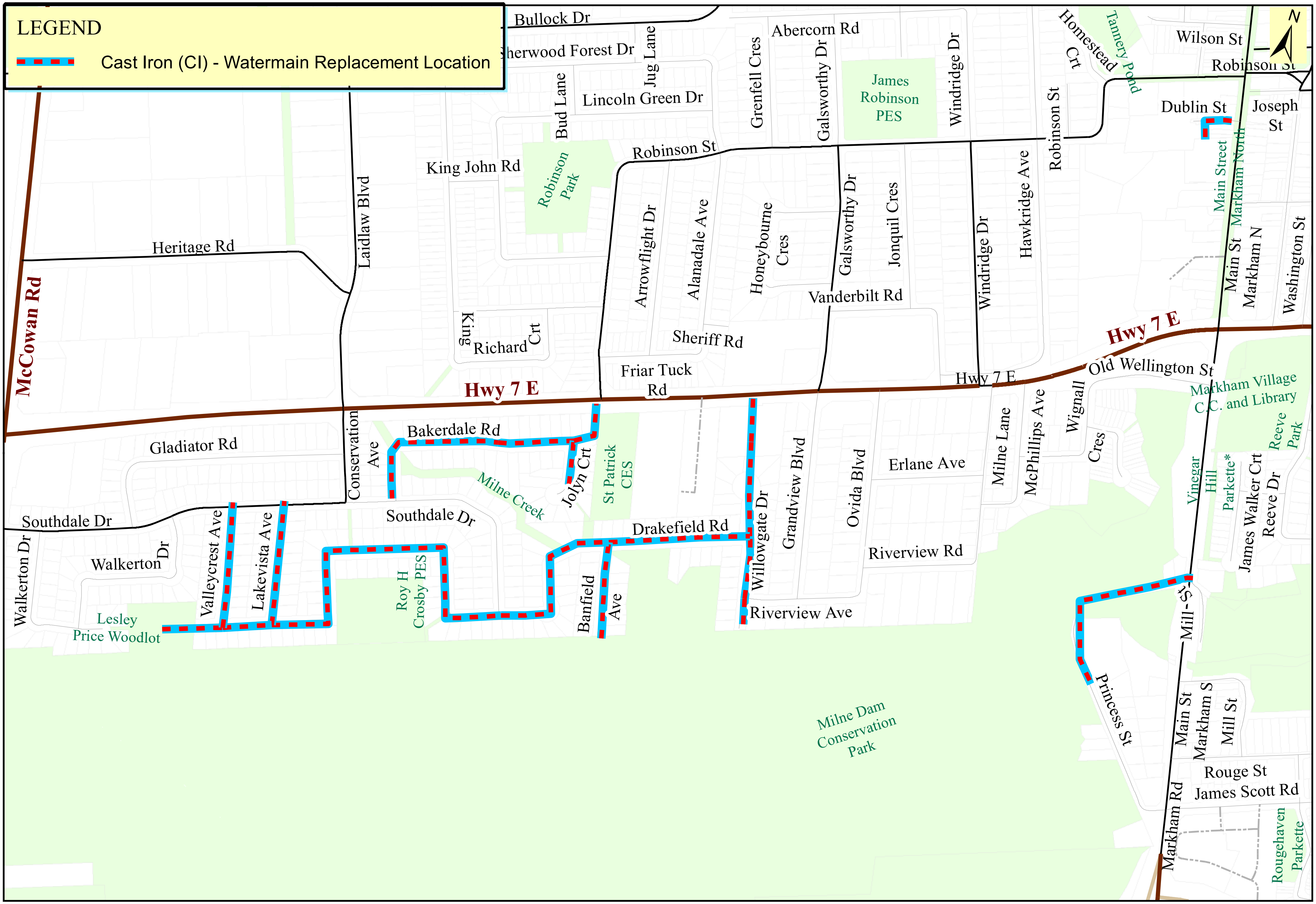
Life Cycle

Amount in Study:	9,688,200
Amount Incl HST	9,811,400
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

Cost has been increased based on the current tender rates.

Cast Iron (CI) Watermain Replacement - Construction



Program Name: CI Watermain Rehabilitation / Replacement

Department: Environmental Services

Component	Project #	Past	2023	Future	Total
Phase 1 (West Thornhill Ph 2D; McCowan Rd & Heritage St.; Old English Lane & Limcombe Dr Area)	#19245, #19243	$13,624,200			$13,624,200
Phase 2 (West Thornhill Ph 3A; Laureleaf Area / Milmar Crt Area)	#19242, #20257, #20258	$12,034,200			$12,034,200
Phase 3a (John St & 14th Ave end Section (Re-Lining))	#20256, #21168	$7,060,400			$7,060,400
Phase 3b (West Thornhill Area - Phase 3B)	#21170	$4,036,300			$4,036,300
Phase 4a (Gladiotor Rd / Bakerdale / Southdale / Bakerdale Area)	#21169, #22202	$5,746,300			$5,746,300
Phase 4b (West Thornhill Area - Phase 3C)	#22204	$3,412,700			$3,412,700
Phase 5a - Design (Drakefield Rd/ Banfield Ave./ Princess St. / Dublin St. Area)	#22203	$297,200			$297,200
Phase 5b - Construction (Drakefield Rd/ Banfield Ave./ Princess St. / Dublin St. Area)	**#23xxx (This request)**		$9,811,400		$9,811,400
Phase 6 to Phase 15	N/A			$66,342,300	$66,342,300
Total		**$46,211,300**	**$9,811,400**	**$66,342,300**	**$122,365,000**

Description of Program

To replace aged cast iron watermain (current age: 58 years; service life: 60 years) with PVC watermain (service life: 90 years)

What was completed in the past

4 phases (Phase 1, 2, 3 & 4) have been completed (out of 15 phases) since 2019 - $45.9M

Phase 5a (design) completed - $0.3M

Total (2019-2022): $46.2M

Current ask

Phase 5b - Construction (Drakefield Rd/ Banfield Ave./ Princess St. / Dublin St. Area) (#23XXX): $9,811,400

Future phases

Phase 6 to Phase 15 (2024- 2032) - $66.3M

Related 2023 project(s)

None

Map Attached

PROGRAM STATUS

Phases	Project Status
Phase 1	Completed in 2019
Phase 2a (Design) (Laureleaf Area / Milmar Crt & Alden Rd)	Completed in 2019
Phase 2a (Construction) (Laureleaf Area / Milmar Crt & Alden Rd)	Completed in 2020
Phase 2b (West Thornhill Area - Phase 3A: Morgan Ave - between Henderson ad Yonge; Clark Ave - between Hendwerson and Johnson)	Completed in 2020
Phase 3a (Design) (John St & 14th Ave end Section (Re-Lining))	Completed in 2020
Phase 3a (Construction) (John St & 14th Ave end Section (Re-Lining))	Completed in 2021
Phase 3b (Construction) (West Thornhill Area - Phase 3B: Johnson St, Vanwood Rd, St. Andreas Crt, Ida St, Dove Ln, Wiarton Crt)	Completed in 2021
Phase 4a (Design) (Gladiotor Rd / Bakerdale / Southdale / Bakerdale Area)	Completed in 2021
Phase 4a (Construction) (Gladiotor Rd / Bakerdale / Southdale / Bakerdale Area)	2022
Phase 4b (Construction) (West Thornhill Area - Phase 3C (Glen Cameron Rd, Lilian Ave, Mira Road, Pheasant Valley Crt)	2022
Phase 5a - Design (Drakefield Rd/ Banfield Ave./ Princess St. / Dublin St. Area))	2022
Phase 5b - Construction (This Request) (Drakefield Rd. / Banfield Ave./ Princess St. / Dublin St. Area)	**2023**
Phase 6 to Phase 15 (various streets)	2024 - 2032

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23037

Project Cost: **$312,000**

Project Name: **SCADA Instrumentation and Replacement**

Repair/Replace

Commission: Community Services

Useful Life: 0 Pre Approval: ☑

Department: ES - Waterworks

Project Mgr: Edgar Tovilla

Category: Major

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Cost Validation: Third party estimate

Requirement Validation: Legislative compliance

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Added/replacement of instrumentation equipment for all 5 sanitary pumping stations, and increased the cost of SCADA programming and AM Integration study.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	2023	Future Phases
Cost/Quote:	306,604	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	306,604	0
HST Impact:	5,396	0
Total Project Cost:	**312,000**	**0**

NOTES

Plan to apply priorities 1 to 3 from the SUMMA Engineering report (June 2022). These priorities include: centralized SCADA system upgrade to latest version of software,new reporting software configuration (no license required),investigation of backup alarming and remote terminal units communication reliability,remote SCADA system upgrade to latest software,remote SCADA system upgrade hardware for the 5 stations,field devices comms. hardware (generator, monitor, relays, VFD), and upgrade of HMI screens, historian & Win 911 modifications.

SOURCE(S) OF FUNDING ($)

Funding Type	Budget	Components				TOTAL	Future Phases
Operating Funded Life Cycle	312,000	0	0	0	0	0	0
TOTAL FUNDING	**312,000**					**0**	**0**

OPERATING BUDGET IMPACT	Personnel	Non Personnel	Revenues	Expenditures/(Revenues)
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	Year	Amount	Amount in Study

Life Cycle

Amount in Study:	317,500
Amount Incl HST	312,000
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23038

Project Cost: **$1,067,600**

Project Name: **Water Meters - Replacement Program**

Repair/Replace

Commission: Community Services

Useful Life: 20 Pre Approval: ☑

Department: ES - Waterworks

Category: Minor

Project Mgr: Vikas Thakur

Cost Validation: Recent awards

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Requirement Validation: Other(specify in Notes)

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Replacement of Residential, Multi Residential and Industrial/ Commercial/ Institutional (ICI) water meters that have reached the end of their service life.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	1,049,100	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	1,049,100	0
HST Impact:	18,464	0
Total Project Cost:	**1,067,600**	**0**

NOTES

This is an annual program. Total inventory: 83,614. This request is to replace approx. 3,927 water meters (3,800 residential, 22 multi residential and 105 ICI) and perform random testing of approx. 5% of meters for accuracy per AWWA C700 (Recommendation #1 for Improvement on Metering Practices, 2015 by Region of York). There is no substantial backlog and water meters are in a state of good repair. Unit cost is consistent with recent award plus inflation.

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components				**TOTAL**	**Future Phases**
Waterworks	1,067,600	0	0	0	0	0	0
TOTAL FUNDING	**1,067,600**					**0**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	**Year**	**Amount**	**Amount in Study**

Life Cycle

Amount in Study:	1,067,600
Amount Incl HST	1,067,600
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

Program Name: Water Meters - Replacement Program

Department: Environmental Services

Year	Project #	Past	2023	Future	Total
2019	#19253	$802,500			$802,500
2020	#20266	$996,700			$996,700
2021	#21175	$1,013,200			$1,013,200
2022	#22209	$936,400			$936,400
2023	**#23xxx**		**$1,067,600**		$1,067,500
2024 Onwards				varies	varies
Total		$3,748,800	$1,067,600		

Type of Water Meter	Total Inventory (as of Jan 2022)	2023 Program	
Residential	80,897	3,800	4.7%
Multi Residential	588	22	3.7%
Industrial/ Commercial/ Institutional (ICI)	2,129	105	4.9%
Total	**83,614**	**3,927**	**4.7%**

Description of Program

Replacement of Residential, Multi-Residential and Industrial/Commercial/Institutional (ICI) water meters that have reached the end of their service life (20 years)

What was completed in the past

See above table

Current ask

Water Meters - Replacement Program (#23xxx): $1,067,*600*

Future Phases

Varies

Related 2023 Project(s)

N/A

Map N/A

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23039

Project Cost: **$101,800**

Project Name: **ITS - TXM Solution Replacement (Consultancy)**

Studies/Pilot Programs

Commission: Corporate Services

Department: ITS

Project Mgr: Ned Sirry

Useful Life: 0   Pre Approval: ☑

Category: Minor

Cost Validation: Third party estimate

Requirement Validation: Other(specify in Notes)

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

ITS Involved Project: Is ITS Consulted? ☑

DETAILED DESCRIPTION (SCOPE OF PROJECT):

As a result of Mississauga’s notification of the Property Tax Billing System (TXM) not being supported post a future TBD date, we will need to find a new solution. As we are also in the midst of looking for a new water billing solution as well, there may be an opportunity to look at bundling the systems together. In order to determine the next steps and identify future capital requirements, consultant capital is need to review and help determine solution direction.

BUILDING MARKHAM'S FUTURE TOGETHER: Stewardship of Money & Resources

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	0	0
Internal Charges:	0	0
External Consulting:	100,000	0
Contingency %: 0	0	0
Sub Total:	100,000	0
HST Impact:	1,760	0
Total Project Cost:	**101,800**	**0**

NOTES

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components				**TOTAL**	**Future Phases**
Ramp Up	101,800	0	0	0	0	0	
TOTAL FUNDING	**101,800**					**0**	

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	**Year**	**Amount**	**Amount in Study**

Life Cycle

Amount in Study:

Amount Incl HST

Year in the study

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23040

Project Cost: **$488,400**

Project Name: **IT Lifecycle Asset Replacement**

Repair/Replace

Commission: Corporate Services

Useful Life: 0 Pre Approval: ☑

Department: ITS

Project Mgr: Sugun Rao

Category: Major

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Cost Validation: Third party estimate

Requirement Validation: Condition assessment

ITS Involved Project: Is ITS Consulted? ☑

DETAILED DESCRIPTION (SCOPE OF PROJECT):

The request is to seek pre-approval of IT Lifecycle hardware and software assets that are 8 to 10 year old and have started to fail causing unexpected service interruptions.

BUILDING MARKHAM'S FUTURE TOGETHER: Exceptional Services by Exceptional People

PROJECT COSTS ($)	2023	Future Phases
Cost/Quote:	480,000	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	480,000	0
HST Impact:	8,448	0
Total Project Cost:	**488,400**	**0**

NOTES

The pre-approval request includes replacement of the following assets:
1. Tier 1 Firewall (Primary Data Centre),
2. Computing device - For newly elected council members, Forestry department and adhoc new requests,
3. Audio Visual equipment for Council Chambers

The $92k Non-Personnel operating budget is for the ongoing firewall subscription licenses that provide additional cyber security features. Operating budget impact is expected to start in 2023.

SOURCE(S) OF FUNDING ($)

Funding Type	Budget	Components				TOTAL	Future Phases
Building Fees	29,304	0	0	0	0	0	0
Development Fees	39,072	0	0	0	0	0	0
Operating Funded Life Cycle	390,720	0	0	0	0	0	0
Waterworks	29,304	0	0	0	0	0	0
TOTAL FUNDING	**488,400**					**0**	**0**

OPERATING BUDGET IMPACT	Personnel	Non Personnel	Revenues	Expenditures/(Revenues)
	$0	$92,000	$0	$92,000

DCA/LIFE CYCLE DETAILS

DCA Name	Year	Amount	Amount in Study

Life Cycle

Amount in Study:	5,198,000
Amount Incl HST	390,700
Year in the study	

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

Staff has validated that the proceeding 2023 capital submission has sufficient life cycle funding.

DETAILS FOR CAPITAL PROJECT IT LIFECYCLE ASSET REPLACEMENT

Item	Quantity	Total Costs	Source of Funding: Life Cycle	Water Works	Building	Engineering	Planning
2023 IT Lifecycle Asset Replacement							
1 **Tier 1 Firewall Replacement**		$250,000	$200,000	$15,000	$15,000	$10,000	$10,000
Replacement of aging Tier one Firewall. (8+ year old), The replacement solution will include enhanced security features such as threat prevention, Sandblast for Zero-Day protection.							
2 **Council Chamber - Audio Processor Replacement**	1	$130,000	$104,000	$7,800	$7,800	$5,200	$5,200
Replacement of 10 years old Digital Audio processor and touch screen control panel in Council Chamber. The components of this asset has failed three times witnin a month causing service interruption during council meeting.							
3 **Computing device replacement**		$100,000	$80,000	$6,000	$6,000	$4,000	$4,000
Life Cycle repalcement of computing device for new council members, Forestry and other adhoc requests							
Total		**$480,000**	**$384,000**	**$28,800**	**$28,800**	**$19,200**	**$19,200**
HST Impact	1.76%	$8,448	$6,758	$507	$507	$338	$338
Total with HST Impact		**$488,448**	**$390,758**	**$29,307**	**$29,307**	**$19,538**	**$19,538**

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23042

Project Cost: **$149,600**

Project Name: **ITS - Leap Cloud (Feb Server)**

Repair/Replace

Commission: Corporate Services

Useful Life: 2 Pre Approval: ☑

Department: ITS

Project Mgr: Rob Cole

Category: Minor

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Cost Validation: Third party estimate

Requirement Validation: Condition assessment

ITS Involved Project: Is ITS Consulted? ☑

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Our current portal forms are maintained in what is called LEAP (formerly FEB server). Capital costs include cost of upgrading current Leap forms to Leap version 9 and migrating forms from the current Compugen environment to a new environment on the Amazon Web Services Cloud.
This includes migrating approximately 85 existing Portal forms.

BUILDING MARKHAM'S FUTURE TOGETHER: Exceptional Services by Exceptional People

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	147,000	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	147,000	0
HST Impact:	2,587	0
Total Project Cost:	**149,600**	**0**

NOTES

There is $52.5k operating budget for Leap hosting in GL account 400-400-5361. The $70k Non-Personnel Cost is incremental operating cost and is expected to start in 2024.

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components				**TOTAL**	**Future Phases**
Building Fees	8,976	0	0	0	0	0	0
Development Fees	11,968	0	0	0	0	0	0
Ramp Up	119,680	0	0	0	0	0	0
Waterworks	8,976	0	0	0	0	0	0
TOTAL FUNDING	**149,600**					**0**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$70,000	$0	$70,000

DCA/LIFE CYCLE DETAILS

DCA **Name**	**Year**	**Amount**	**Amount in Study**

Life Cycle

Amount in Study:	
Amount Incl HST	
Year in the study	

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23043

Project Cost: **$407,000**

Project Name: **ITS - Microsoft 365**

New Asset/Expansion

Commission: Corporate Services

Useful Life: 8 Pre Approval: ☑

Department: ITS

Category: Minor

Project Mgr: Sugun Rao

Cost Validation: Third party estimate

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Requirement Validation: Other(specify in Notes)

ITS Involved Project: Is ITS Consulted? ☑

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Microsoft 365 (M365) has become the standard tool in our industry for efficient utilization of the office suite of tools (ie. Word, Excel, PowerPoint.) as well as for email, document collaboration, messaging. The tool is cloud based allowing for the freeing up of onsite server capacity. In addition, it provides the opportunity to further introduce Power BI, a business intelligence tool for mining data and being able to present and use this data to make critical decisions.

BUILDING MARKHAM'S FUTURE TOGETHER: Exceptional Services by Exceptional People

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	100,000	0
Internal Charges:	0	0
External Consulting:	300,000	0
Contingency %: 0	0	0
Sub Total:	400,000	0
HST Impact:	7,040	0
Total Project Cost:	**407,000**	**0**

NOTES

High level estimate of $300k for consultancy and implementation services received from Microsoft based on our current environment, inclusive of a new tool to collect usage stats. Capital includes Year 1 licensing cost of $100K. Incremental annual operating budget impact of $100k is expected to start in 2024.
This project and solution will require an additional 0.5 FTE for ongoing support. The 1 FTE Personnel Costs shown below is a combined submission of the 0.5 FTE needed for this project and 0.5 FTE needed for the Cyber Security Enhancement project. The Personnel Cost impact is expected to start in 2023.

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components				**TOTAL**	**Future Phases**
Building Fees	24,420	0	0	0	0	0	0
Development Fees	32,560	0	0	0	0	0	0
Operating Funded Life Cycle	325,600	0	0	0	0	0	0
Waterworks	24,420	0	0	0	0	0	0
TOTAL FUNDING	**407,000**					**0**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$124,625	$100,000	$0	$224,625

DCA/LIFE CYCLE DETAILS

DCA Name	Year	Amount	Amount in Study

Life Cycle

Amount in Study:	2,442,100
Amount Incl HST	325,600
Year in the study	

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

Staff has validated that the proceeding 2023 capital submission has sufficient life cycle funding.

2023 PROJECT FUNDING REQUEST FORM

Number: 23044

Project Cost: **$107,400**

Project Name: **ITS - Oracle DB Licensing**

New Asset/Expansion

Commission: Corporate Services

Department: ITS

Useful Life: 0 Pre Approval: ☑

Project Mgr: Matt Miller

Category: Minor

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Cost Validation: Third party estimate

Requirement Validation: Other(specify in Notes)

ITS Involved Project: Is ITS Consulted? ☑

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Increase the Oracle Enterprise Edition License pool with 3 additional core licenses. These additions will allow us to expand our Oracle Database storage and processing power. This will allow us to futureproof for any additional Enterprise applications as needed. This is needed for license compliance. Hardware has already been ordered and is about to be commissioned.
CAPEX
Oracle Database Enterprise Edition License = 3 @ $28,821 = $86,463
Software Update License & Support = 3 @ $6,341 = $19,023
Total = $105,486

Operating
Software Update License & Support = 3 @ $6,341 = $19,023
Total: $19,023

BUILDING MARKHAM'S FUTURE TOGETHER: Exceptional Services by Exceptional People

PROJECT COSTS ($)	2023	Future Phases
Cost/Quote:	105,500	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	105,500	0
HST Impact:	1,857	0
Total Project Cost:	**107,400**	**0**

NOTES

The Non-Personnel budget impact is expected to start in 2024.

SOURCE(S) OF FUNDING ($)

Funding Type	Budget	Components				TOTAL	Future Phases
Building Fees	6,444	0	0	0	0	0	0
Development Fees	8,592	0	0	0	0	0	0
Ramp Up	85,920	0	0	0	0	0	0
Waterworks	6,444	0	0	0	0	0	0
TOTAL FUNDING	**107,400**					**0**	**0**

OPERATING BUDGET IMPACT	Personnel	Non Personnel	Revenues	Expenditures/(Revenues)
	$0	$19,100	$0	$19,100

DCA/LIFE CYCLE DETAILS

DCA Name	**Year**	**Amount**	**Amount in Study**

Life Cycle

Amount in Study:

Amount Incl HST

Year in the study

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23045

Project Cost: **$203,500**

Project Name: **Water Billing Transition Project - Phase 2 of 3**

Studies/Pilot Programs

Commission: Corporate Services

Department: Finance

Project Mgr: Shane Manson

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Useful Life: 0 Pre Approval: ☑

Category: Minor

Cost Validation: Third party estimate

Requirement Validation: Other(specify in Notes)

ITS Involved Project: Is ITS Consulted? ☑

DETAILED DESCRIPTION (SCOPE OF PROJECT):

The City's water billing is currently outsourced to Alectra Utilities until the end of 2024. Phase 1 was Discovery Phase to clearly articulate the current state and desired objectives for the water billing solution, which includes documenting requirements and provide options on the best process to to move forward. This is expected to be completed by the end of September 2022. Phase 2 requires a consultant to support and guide in the procurement, evaluation, selection and vendor negotiations of the option selected (in-house, out-sourced, or hybrid), which should be decided by the end of 2022. Phase 3 will be the implementation of the option chosen.

BUILDING MARKHAM'S FUTURE TOGETHER: Stewardship of Money & Resources

PROJECT COSTS ($)	2023	Future Phases
Cost/Quote:	0	0
Internal Charges:	0	0
External Consulting:	200,000	0
Contingency %: 0	0	0
Sub Total:	200,000	0
HST Impact:	3,520	0
Total Project Cost:	**203,500**	**0**

NOTES

Pre-approval required of $200K to ensure funding is intact to acquire consultant to continue to move forward with Phase 2. A separate budget will be submitted for software, systems, etc once the option has been determined and approved by Senior Management.

SOURCE(S) OF FUNDING ($)

Funding Type	Budget	Components: Consultant				TOTAL	Future Phases
Waterworks	203,500	203,500	0	0	0	203,500	0
TOTAL FUNDING	**203,500**					**203,500**	**0**

OPERATING BUDGET IMPACT	Personnel	Non Personnel	Revenues	Expenditures/(Revenues)
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	Year	Amount	Amount in Study

Life Cycle

Amount in Study:

Amount Incl HST

Year in the study

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: **23046**

Project Cost: **$767,000**

Project Name: **Roofing Replacement Projects**

Repair/Replace

Commission: Corporate Services

Useful Life: 20 Pre Approval: ☑

Department: Sustainability and Asset Management

Category: Major

Project Mgr: Michael Ryan

Cost Validation: Internal peer review

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Requirement Validation: Condition assessment

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

This project includes roofing and accessories replacement works at various locations throughout the City to ensure a state of good repair and in alignment to the Asset Management Plan/Policy. Roofs for replacement in the budget year will be determined in the previous year, upon completion of annual condition assessment. Funding request is based on historical budgets, life cycle database and trending. Condition assessment completed 2021, over a year ago, and as a result may be subject to change.

BUILDING MARKHAM'S FUTURE TOGETHER: Exceptional Services by Exceptional People

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	753,734	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	753,734	0
HST Impact:	13,266	0
Total Project Cost:	**767,000**	**0**

NOTES

$42,800 - Cedar Grove Community Centre - Chimney (1960) & Shingles (2003)
$724,200 - Thornhill Community Centre - Fitness Centre Flat Roof (2005)

Amount is consistent with the 2022 Life Cycle Reserve Study update.

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Cedar Grove Community Centre	Thornhill Community Centre			**TOTAL**	**Future Phases**
Operating Funded Life Cycle	767,000	42,800	724,200	0	0	767,000	0
TOTAL FUNDING	**767,000**					**767,000**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	**Year**	**Amount**	**Amount in Study**

Life Cycle

Amount in Study:	938,100
Amount Incl HST	767,000
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

2023 Budget Request Back-up Pictures

Thornhill Community Centre – Roofing (18 years olds)

	
Photo 1: Numerous Blisters (elevated areas) in a high traffic area. Previous patch repairs (lighter coloured membrane areas).	**Photo 2**: Close up of blister on Roofs at the same area as Photo 1. Significantly more blisters than what would be seen on a roof such as this.
	
Photo 3: Degranulation (darker areas) of the membrane which is indicative of the age. Will accelerate UV deterioration of the membrane. Previous patch repairs (lighter coloured membrane patch).	**Photo 4**: Blister at the roof perimeter. Note with increase in temperature blisters become larger this increases the thermal expansion/contraction of the membrane. This will increases wear on the membrane (e.g. degranulation, cracking).

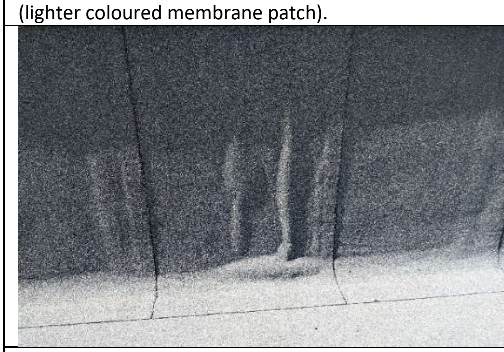
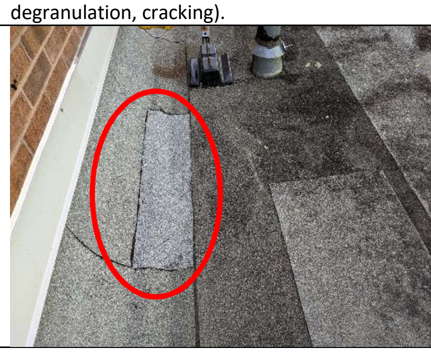

	

Photo 5: Blisters at the walls, widespread at walls.	**Photo 6**: Previous patch repairs.

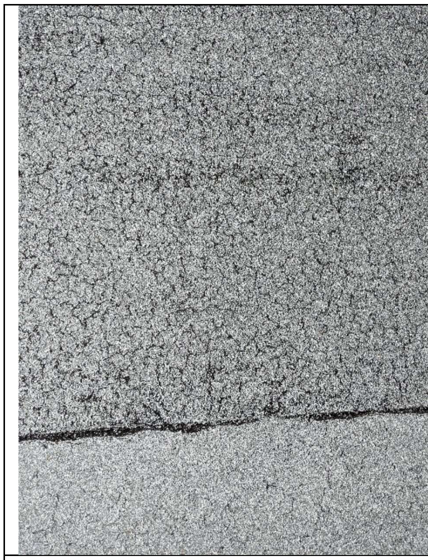


Photo 7: Alligatoring (cracking) of roofing membrane.	Photo 8: Roofing membrane degranulation. Granules protect roof from UV degradation.

Cedar Grove Community Centre – Roof Replacement (19 years old)

Photo 1: Roof shingles are curling at west elevation. Sign of UV degradation.

Photo 2: Degranulation and curling of shingles at roof.

Photo 3: Widespread curling of the roofing shingles. Roof has failed.

Photo 4: Shingle curling at the east elevation.

Photo 5: Leaking at building interior, significant leak event to cause this “bubbling” of the tile.

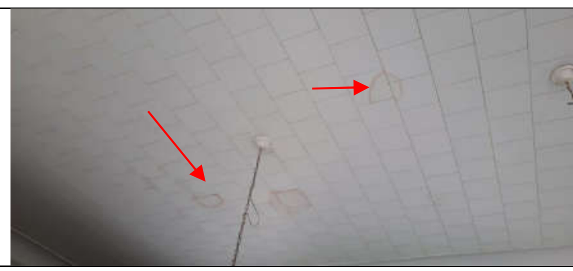


Photo 6: Water staining at the building interior.

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23047

Project Cost: $447,700

Project Name: **Theatre-Dressing Room Renovations**

Repair/Replace

Commission: Development Services

Department: Theatre

Project Mgr: Andrew Rosenfarb

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Useful Life: 15 Pre Approval: ☑

Category: Major

Cost Validation: Third party estimate

Requirement Validation: Condition assessment

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Originally requested, approved by council, tendered and awarded in 2020-Project # 20008, this project was deferred because the facility was closed. Project includes a redesign and renovation of 6 separate dressing rooms including replacement of flooring, counters, shower stalls, tiles, plumbing fixtures, toilets, partitions, sinks/faucets, mirrors, chairs, costume racks, lighting, electrical and painting.

BUILDING MARKHAM'S FUTURE TOGETHER: Exceptional Services by Exceptional People

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	360,000	0
Internal Charges:	0	0
External Consulting:	40,000	0
Contingency %: 10	40,000	0
Sub Total:	440,000	0
HST Impact:	7,744	0
Total Project Cost:	**447,700**	**0**

NOTES

Last refurbished over 15 years ago (2007), the venue's dressing rooms are in disrepair and several components have visible damage. Dressing rooms are used by both our professional artists from around the world and members of our community. For some, these rooms are one of the only few impressions they get of the Theatre and City of Markham. The theatre is requesting to renovate these spaces to better serve our clients and community. Amount is consistent with the 2023 Life Cycle Reserve Study update.

SOURCE(S) OF FUNDING ($)

Funding Type	Budget	Design & Consultant	Construction	Contigency	HST Impact	TOTAL	Future Phases
Operating Funded Life Cycle	447,700	40,000	360,000	40,000	7,700	447,700	0
TOTAL FUNDING	**447,700**					**447,700**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	**Year**	**Amount**	**Amount in Study**

Life Cycle

Amount in Study:	1,333,700
Amount Incl HST	447,700
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: **23048**

Project Cost: **$111,900**

Project Name: **Theatre-Fire Curtain Replacement**

Repair/Replace

Commission: Development Services

Useful Life: 25 Pre Approval: ☑

Department: Theatre

Category: Minor

Project Mgr: Andrew Rosenfarb

Cost Validation: Third party estimate

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Requirement Validation: Condition assessment

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Original to the building (1985), the fire curtain separates the stage from the audience in the event of a fire. The fire curtain was not completely replaced after it's usefule life as the condition assesment determined that minor repairs were sufficient. Recently, the fire curtain was inspected by staff and a theatrical rigging company, it's been advised that this curtain along with it's components is due for complete replacement. This project will also replace the manual winch system which controls the movement of this fire separation barrier with an automated one.

BUILDING MARKHAM'S FUTURE TOGETHER: Safe & Sustainable Community

PROJECT COSTS ($)	2023	Future Phases
Cost/Quote:	100,000	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 10	10,000	0
Sub Total:	110,000	0
HST Impact:	1,936	0
Total Project Cost:	**111,900**	**0**

NOTES

The hardware, bolts and chains that secure the equipment overhead are due for replacement. The industry standard useful life for this asset is 25 years, the current life of the curtain (37 years) is well past it's replacement time.

SOURCE(S) OF FUNDING ($)

Funding Type	Budget	Supply/Install	HST			TOTAL	Future Phases
Operating Funded Life Cycle	111,900	110,000	1,900	0	0	111,900	0
TOTAL FUNDING	**111,900**					**111,900**	**0**

OPERATING BUDGET IMPACT	Personnel	Non Personnel	Revenues	Expenditures/(Revenues)
	$0	$0	$0	$0

DCA/LIFE CYCLE DETAILS

DCA Name	Year	Amount	Amount in Study

Life Cycle

Amount in Study:	1,333,700
Amount Incl HST	111,900
Year in the study	2023

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

2023 PROJECT FUNDING REQUEST FORM

Number: 23050

Project Cost: **$71,200**

Project Name: **Building Standards Guide Builder**

New Asset/Expansion

Commission: Development Services

Department: Building Services

Project Mgr: Stephanie Di Perna

Ward(s): CW ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐

Useful Life: 0 Pre Approval: ☑

Category: Minor

Cost Validation: Third party estimate

Requirement Validation: Legislative compliance

ITS Involved Project: Is ITS Consulted? ☐

DETAILED DESCRIPTION (SCOPE OF PROJECT):

Specialized guide builder software to assist building management staff in creating specific and comprehensive user guides with ease and without dedicated staff or ITS support. Currently applicants are spending upwards to 10 business days trying to figure out what is required for the different application types. There is software that will assist in building guides to assist applicants along the way with built in checklist so that the application filed the first time is correct and can be circulated for building code and zoning review.

BUILDING MARKHAM'S FUTURE TOGETHER: Stewardship of Money & Resources

PROJECT COSTS ($)	**2023**	**Future Phases**
Cost/Quote:	70,000	0
Internal Charges:	0	0
External Consulting:	0	0
Contingency %: 0	0	0
Sub Total:	70,000	0
HST Impact:	1,232	0
Total Project Cost:	**71,200**	**0**

NOTES

Cloud based software and future cloud based fees will be incurred ($34,000/yr). Software name is Camino Permit Guide Solution.

SOURCE(S) OF FUNDING ($)

Funding Type	**Budget**	Components				**TOTAL**	**Future Phases**
Building Fees	71,200	0	0	0	0	0	0
TOTAL FUNDING	**71,200**					**0**	**0**

OPERATING BUDGET IMPACT	**Personnel**	**Non Personnel**	**Revenues**	**Expenditures/(Revenues)**
	$0	$34,000	$0	$34,000

DCA/LIFE CYCLE DETAILS

DCA Name	**Year**	**Amount**	**Amount in Study**

Life Cycle

Amount in Study:

Amount Incl HST

Year in the study

DCA and/or Life Cycle: Explain if there is a change in the year and/or cost:

MARKHAM

Report to: General Committee Meeting Date: September 6, 2022

SUBJECT: Staff Awarded Contracts for the Months of June, July & August 2022
PREPARED BY: Alex Moore, Ext, 4711

RECOMMENDATION:

1. THAT the report entitled "Staff Awarded Contracts for the Months of June, July, August 2022" be received; and
2. That Staff be authorized and directed to do all things necessary to give effect to this resolution.

PURPOSE:
Pursuant to Part III section 15 of the Procurement Bylaw (No. 2017-8), passed by Council on March 21, 2017, a report shall be submitted to Council on a monthly basis to advise of awarded contracts greater than $50,000.

Key Points:

- All purchases were in compliance with Procurement Bylaw 2017-8
- 39 contract awards totaling $ 12,403,724.75 were approved during June, July & August 2022

BACKGROUND:
On a monthly basis, Procurement advises Council of all contracts awarded by the Chief Administrative Officer, Commissioners, or Directors with a total cost exceeding $50,000.

In order to streamline the reporting process, Procurement has revised the monthly report to provide information pertinent to the contract award. The Procurement Bylaw delegates authority to staff to award contracts if the contract award meets specific criteria. The following chart outlines the award limits under the Procurement Bylaw:

Dollar threshold	Within Criteria	Outside Criteria*
$50,000 or greater, but less than $100,000	Director	Commissioner
$100,000 or greater, but less than $350,000	Commissioner	CAO
$350,000 or greater	CAO	Council

* If one (1) of the below noted criteria is not met then the contract award is identified as outside criteria and the approval authority is changed to either the Commissioner, CAO or Council.

- The Contract Award is to the lowest priced or highest ranked (as applicable), compliant Bidder
- The expenses relating to the goods/services being procured are included in the budget (Operating/Capital)
- The Contract Award is within the approved budget
- The term of the Contract is for a maximum of four (4) years
- There is no litigation between the Successful Bidder and the City at the time of Contract Award

- There is no disqualified Bidder (which disqualified Bidder is also the lowest priced or highest ranked Bidder (as applicable) pursuant to the Quotation process) at the time of Contract Award

The following table provides a synopsis of the procurement activities during June, July & August 2022.

Procurement Activity	Number of Awards	Total Award Value June, July & August 2022
Request for Tender (T)	15	$10,083,556.96
Request for Quotation (Q)	10	$ 790,452.90
Request for Proposal (R)	4	$ 485,979.87
Non-Competitive Procurement (S)	10	$ 1,043,735.02
Total Procurement Activity	**39**	**$12,403,724.75**

The following table provides a synopsis of the procurement award amounts by Commission during June, July & August 2022.

Procurement by Commission	Number of Awards	Total Award Value June, July & August 2022
Development Services	10	$6,214,677.93
Corporate Services	12	$3,155,177.72
Community Services	17	$3,033,869.10
Chief Administrative Office	0	n/a
Total Procurement Activity	**39**	**$12,403,724.75**

Request for Tender (T) – is a method of procurement that is used when the exact specifications for the deliverables are known, there are two or more sources of supply and the vendors are only required to submit pricing information. Requests for Tenders are awarded to the low bidder unless reference checks or past performance warrants rationale for not awarding the contract.

Request for Quotation (Q) – is a method of procurement similar to a request for tender except the procurement is of a low dollar value (less than $100,000) and may be issued to a limited number of bidders who are invited to submit bids. Requests for Quotations are awarded to the low bidder unless reference checks or past performance warrants rationale for not awarding the contract.

Request for Proposal (R) – is a method of procurement that is used where the deliverables are not clearly specified and it is anticipated that proponents may propose a variety of alternatives to fulfill the requirements. The evaluation of proposals includes both technical (70%) and financial (30%) evaluation and the award is made to the highest scoring proponent.

Non-Competitive Procurement (S) – is a method of procurement whereby the Treasurer and/or the Senior Manager, Procurement may, in consultation with the applicable Director negotiate a contract for the supply of goods and services without a competitive process. These awards are generally required under circumstances where: there is only one source of supply; extension of existing contract would be beneficial to the City; specialized equipment or vehicles are being acquired; or it is deemed to be in the City's best interest to not to solicit a competitive bid.

1 Development Services Commission

Contract # 087-T-22
Sidewalk Construction and Illumination Program
Term: All work must be completed by May 2023

Department	Engineering
No. of Bids	9
Vendor	Vaughan Paving Ltd.
Budget	$1,948,097.00
Award Amount	$1,640,533.27
Variance	$307,563.73

The award is for the construction of six (6) new sidewalks and three (3) streetlights. From the remaining budget of $307,563.73, $120,000.00 will be retained for utility relocation/adjustments, tree replacement/plantings, post streetlight level measurement, construction support, permits and a sidewalk feasibility study as budgeted for in the project. The remaining budget of $187,563.73 ($307,563.73 - $120,000.00) will be returned to the original funding source.

2

Contract # 174-Q-22
Consulting Services for the Development of a High Frequency Rail (HFR) Station in the City of Markham
Term: A final draft report will be provided by August 26, 2022.

Department	Engineering
No. of Bids	2
Vendor	Steer Davies Gleave
Budget	$130,000.00
Award Amount	$87,395.56
Variance	$42,604.44

The City and York Region are interested in leveraging the future presence of the HFR line through Markham for its economic development and growth potential and opportunities to enhance the HFR line. Under this joint study the consultant will complete the following objectives:

- Prepare a strategic business case for an additional station in Markham on the proposed Toronto to Quebec HFR line and a draft submission for the City of Markham to submit to the HFR Joint Project Office (JPO) based on the strategic business case.

The remaining budget will be returned to the original funding source.

3

Contract # 119-R-22
Markham Economic Development and Culture Strategy
Term: All work must be completed by February 28, 2023.

Department	Economic Growth
No. of Bids	2
Vendor	Deloitte LLP
Budget	$253,100.00
Award Amount	$242,087.04
Variance	$11,012.96

Consulting services to develop Markham's latest five-year economic development and culture strategy. The remaining budget of $11,012.96 will be returned back to its original funding source.

4

Contract # 010-T-22
Victoria Square Boulevard Culvert Construction and Creek Restoration
Term: Work to be completed by December 2022.

Department	Engineering
No. of Bids	9
Vendor	Graham Bros. Construction Limited
Budget	$2,273,584.80
Award Amount	$2,053,082.86
Variance	$220,501.94

The contract is for the reconstruction of a structural concrete culvert on Victoria Square Boulevard located between Vine Cliff Boulevard and Stony Hill Avenue.
Of the remaining budget in the amount of $220,502.14, staff will retain $154,336.80 in the account for construction administration and inspections services and the remaining budget of $66,165.35 will be returned to the original funding source.

5

Contract # 175-T-22
Markham Centre Multi-Use Trail Construction from Birchmount Road to Sheridan Pond
Term: Work to be completed by November 2022.

Department	Engineering
No. of Bids	10
Vendor	Pine Valley Corporation
Budget	$818,700.00
Award Amount	$476,880.97
Variance	$341,819.03

The contract is for the construction of phase II of the Markham Centre multi-use trail from Birchmount Road to the Sheridan Pond. The remaining budget will be returned to the original funding source.

6

Contract # 202-S-22
Consulting Engineering Services for Contract Administration and Inspection of Culvert Construction on Victoria Square Boulevard

Term: Work to be completed by December 2022

Department	Engineering
No. of Bids	Non-Competitive
Vendor	Ainley Group
Budget	$154,336.80
Award Amount	$154,336.80
Variance	$0.00

7

Contract # 170-T-22

New Infill Residential Service Connections at twenty eight (28) Locations

Term: Work to be completed by October 2022.

Department	Engineering
No. of Bids	4
Vendor(s)	Nelli Construction, MAAD Excavation, Utility Force
Budget	$833,577.17
Award Amount	$833,577.17
Variance	$0.00

Service connections are fully paid by homeowners.

8

Contract # 161-T-22

Construction of Intersection Cross-Ride Treatments at the Intersections Located along the Markham Road Multi-Use Pathway

Term: Work to be completed by September 2022.

Department	Engineering
No. of Bids	5
Vendor	Aqua Tech Solutions
Budget	$295,792.00
Award Amount	$346,928.34
Variance	($51,136.34)

The contract is for the construction of cross-ride facilities on the existing multi-use pathway where it intersects multiple streets and public accesses from north of 16th Avenue to south of Major Mackenzie Drive. The scope of work includes civil/concrete works, pavement markings and signage.

The project will be partially funded by the Region under the Pedestrian and Cycling Municipal Partnership Program (PCMPP) in the amount of $73,392. The cost of award is up fronted by the City until the reimbursement is received. The budget shortfall in the amount of $51,136.34 will be funded from the Engineering Capital Contingency ($33,238.62) and Non-DC Growth Contingency (17,897.72).

9

Contract # 044-R-22

Consulting Engineering Services for Environmental Policy and Procedures for Conveyance of Land to the City Pursuant to the Planning Act Update

Term: Work to be completed by December 2023.

Department	Engineering
No. of Bids	4
Vendor	Watermark Environmental
Budget	$95,200.00
Award Amount	$65,199.58
Variance	$30,000.42

The contract is to update the City's Environmental Policy and Procedures for the Conveyance of Land to ensure that it reflects and incorporates all applicable provincial legislation that have been updated, amended, or introduced since 2017.

The remaining budget will be returned to the original funding source.

10

Contract # 169-S-22

Forest Restoration Planting Projects (Fall 2022)

Term: Work to be completed by November 2022.

Department	Planning & Urban Design
No. of Bids	Non-Competitive
Vendor	Toronto and Region Conservation Authority
Budget	$879,561.31
Award Amount	$314,656.34
Variance	$564,904.97

Of the City's recommended award amount of $314,656.34, the grant funding of $93,523.13 will be used to reimburse the City of 29.7% of the total contract value. Of the remaining balance in the amount $564,904.97, staff estimate $50,000 will be required for fall planting projects and the estimated remaining balance of $514,904.97 will be transferred to account # 031-2220094 at year end.

#11 Corporate Services Commission

Contract # 030-S-22

Municipal Elections 2022, for Optical Scan Vote Tabulators & Professional Services

Term: Work to be completed by December 2022, unless a recount is required.

Department	Legislative Services
No. of Bids	Non-Competitive
Vendor	Election Systems & Software
Budget	$687,333.12
Award Amount	$83,817.68
Variance	$603,515.44

The remaining budget in the amount of $603,515.44 will be used for other election items such as technology, professional services, event support staff (i.e., poll workers, public outreach) for the 2022 Municipal Election.

#12

Contract # 056-Q-22

Emergency Generator Replacement at Fire Station #91

Term: Work to be completed by November 2022.

Department	S&AM
No. of Bids	2
Vendor	RPM Industrial Inc.
Budget	$55,000.00
Award Amount	$49,965.43
Variance	$5,034.57

The contract is for the replacement of an emergency standby generator at Fire Station 91.
The remaining budget of $5,034.57 will be retained in the project for other related works.

#13

Contract # 063-T-22
Truck Shelter Replacement at 4415 14th Ave
Term: Work will be completed by October 2022.

Department	S&AM
No. of Bids	5
Vendor	Laycon Construction Services Inc.
Budget	$118,950.00
Award Amount	$127,120.11
Variance	($8,170.11)

The contract is for the replacement of the truck shelter at Central Park Shop.

The shortfall of $8,170.11 was mainly related to the supply issues for lumber and other materials. The shortfall will be funded from the available budget of $8,500.00 in the same Project 22081.

#14

Contract # 079-S-22
Municipal Election 2022, for Voting Place Technology Rentals & Professional Services
Term: Work will be completed by October 24, 2022.

Department	Legislative Services
No. of Bids	Non-Competitive
Vendor	MCR Rental Solutions
Budget	$478,871.51
Award Amount	$88,639.16
Variance	$390,232.35

The contract is for voting place technology rentals (laptops, IPads, Tables, IPad stands, scanners, printers) and professional services (onsite staff) for the 2022 Municipal Election.
The remaining budget in the amount of $390,232.35 will be used for other election items such as event communications, contract staff, and temporary support staff (e.g., poll workers) for the 2022 Municipal Election. Staff are confident the remaining budget of $390,232.35 is sufficient barring any unforeseen circumstances surrounding COVID-19, etc.

#15

Contract # 126-T-22
Roof Replacement at 160 Dudley Avenue
Term: Work will be completed by September 2022.

Department	S&AM
No. of Bids	7
Vendor	E-D Roofing Ltd.
Budget	$600,000.00
Award Amount	$596,092.78
Variance	$3,907.22

The contract is for the replacement of all roofs excluding the proposed Fire Station roof at 160 Dudley Avenue.
The remaining budget of $3,907.22 will be returned to the original funding source.

#16

Contract # 180-S-22

Consulting Services Network Detection and Response Solution

Term: 48 Months (4 years) - commencing July 2022 to June 2026.

Department	ITS
No. of Bids	Non-Competitive
Vendor	Confidential
Budget	$263,000.00
Award Amount	$50,273.51
Variance	$212,726.49

The remaining balance of $212,726.49 will remain in the account to fund other ITS Programs.

#17

Contract # 125-T-22

Thornlea Pool Restoration

Term: Work will be completed by October 2022.

Department	S&AM
No. of Bids	6
Vendor	Canada Construction
Budget	$1,718,200.00
Award Amount	$1,860,320.35
Variance	($142,120.35)

The contract for the restoration of Thornlea Pool includes various mechanical, roof, concrete, pool, leak, masonry and replacement of a dectron dehumidification unit. The shortfall of $142,120.35 was mainly related to the material and labour cost increases. The shortfall will be funded from the available budget of $214,348.31 in the same Project 21208.

#18

Contract # 095-R-22

Consulting Services, Security, Vulnerability Assessment and Penetration Testing - Electronic Municipal Voting System

Term: Work will be completed by August 2022

Department	ITS
No. of Bids	2
Vendor	MNP LLP
Budget	$55,968.00
Award Amount	$54,288.96
Variance	$1,679.04

The contract is to review and ensure that all necessary security precautions have been undertaken to ensure the election is completed in a fair and equitable way, without possibility of tampering with the election process. The remaining budget of $1,679.04 will be retained in the account for other election items.

#19

Contract # 153-S-22

Supply and Installation of Bird Safe Film at 8100 Warden and Milliken Mills Community Centre

Term: All work must be completed by September 30, 2022.

Department	S&AM
No. of Bids	Non-competitive
Vendor	Convenience Group Inc.
Budget	$99,557.76
Award Amount	$98,279.81
Variance	$1,277.95

The remaining budget of $1,277.95 will be returned to the original funding source.

#20

Contract # 184-Q-22

Markham Civic Centre Heating and Cooling Pump and Motor Replacement

Term: Work will be completed by October 2022

Department	S&AM
No. of Bids	6
Vendor	Hart Pump Service
Budget	$62,000.00
Award Amount	$61,612.83
Variance	$387.17

The contract is for the replacement of six (6) water pumps and one (1) glycol pump at the Markham Civic Centre. The remaining budget of $387.17 will be returned back to its original funding source.

#21

Contract # 181-S-22

Consulting Services, Vulnerability Management System (VMS)

Term: 5 Years - commencing August 2022 to July 2027.

Department	ITS
No. of Bids	Non-competitive
Vendor	Confidential
Budget	$29,078.94
Award Amount	$29,078.94
Variance	$0.00

#22

Contract # 166-Q-22

Parking Lot Light Pole Replacement at Markham Village Community Centre Parking Lot

Term: Work to be completed by October 2022.

Department	S&AM
No. of Bids	8
Vendor	Hastings Utilities
Budget	$43,093.66
Award Amount	$55,688.16
Variance	($12,594.50)

The contract for the supply and replacement of existing light fixtures, pole mounted luminaires, and electrical panels and all associated accessories. The budget shortfall in the amount of $12,594.50 will be funded from the Non-DC Capital Contingency account.

#23 Community Services Commission

Contract # 050-T-22

Material Testing & Geotechnical Investigation – Pavement Analysis for Future Resurfacing Programs

Term: The term of the contract is for one (1) term starting from the date of award to December 31, 2022 with an option to renew for three (3) additional, separate one (1) year periods.

Department	Operations
No. of Bids	13
Vendor	Saffa Engineering Inc.
Budget	$60,000.00
Award Amount	$60,000.00
Variance	$0.00

#24

Contract # 115-Q-22

Armadale Community Centre Washroom and Changeroom Refurbishment

Term: Work to be completed by August 2023.

Department	Recreation Services
No. of Bids	6
Vendor	Icon Restoration Services Inc.
Budget	$54,800.00
Award Amount	$129,468.27
Variance	($74,668.27)

The contract is the renovation of the washrooms and change rooms at the Armadale Community Centre. The work includes replacing the existing 6 washroom partitions, 2 countertops, and approximately 4300 square feet of wall and floor tiles. The budget shortfall in the amount of $74,668.27 will be funded from the Non-DC Capital Contingency account.

The shortfall can be attributed to 1. Original cost estimate based off a 3rd party quote from October 2019 – Over 2 years ago. 2. Original cost estimate included material cost only, and did not include demolition, supply and installation of tiles (this represents $55,000 of the shortfall). 3. Increased material and labour costs on the countertops and partitions portion of the work make up the remaining reason for the shortfall.

#25

Contract # 120-Q-22

Milliken Mills Washroom and Change room Refurbishment

Term: Work to be completed by August 2022.

Department	Recreation Services
No. of Bids	7
Vendor	Icon Restoration Services Inc.
Budget	$109,433.00
Award Amount	$87,276.58
Variance	$22,156.42

The contract is to replace various washroom and change room amenities at the Milliken Mills Community Centre arena lobby, dressing rooms, and main lobby washrooms.

The remaining balance of $22,156.42 will be returned back to its original funding source.

#26

Contract # 127-Q-22

City Owned Fence Repair and Replacement

Term: Work to be completed by December 2022.

Department	Operations
No. of Bids	8
Vendor	Bramalea Fence
Budget	$50,900.00
Award Amount	$80,761.32
Variance	($29,861.32)

The contract is for the removal and replacement of City-owned fences at the following locations:

- 55 Pillar Rock Crescent (repair) (+ / - 11 lm)
- 332 John Street, along rail corridor (+ / - 17 lm);
- R.J. Clatworthy Arena, behind arena along rail corridor (+ / - 99 lm);
- 555 Miller Avenue, Markham Operations Yard (+ / - 438 lm).

The budget shortfall in the amount of $29,861.32 will be funded from Non-DC Capital Contingency account. The budget shortfall can be attributed to an increase in costs relating to increases in steel (60% increase), shipping cost increases of material and labour increases.

#27

Contract # 141-Q-22

Consulting Engineering Services for Suspended Watermain Rehabilitation

Term: Work to be completed by July 2022.

Department	Environmental Services
No. of Bids	2
Vendor	R.V. Anderson Associates Limited
Budget	$703,900.00
Award Amount	$65,331.44
Variance	$638,568.56

The contract is for engineering services to complete rehabilitation design for suspended watermains. The remaining balance of $638,569.56 ($703,900 - $65,331.44) is required for the rehabilitation works.

#28

Contract # 142-Q-22

Court Resurfacing

Term: Work to be completed by November 2022.

Department	Operations
No. of Bids	2
Vendor	Premium Court
Budget	$45,900.00
Award Amount	$61,054.96
Variance	($15,154.96)

The contract is to resurface the following basketball courts: 1. Berczy Park South, 2. Highgate Park, 3. Cornell Community Centre, 4. Johnsview Park, 5. Elson Park, 6. John Canning Park. The budget shortfall of $15,154.96 will be funded from Non-DC Capital Contingency account. The basketball court cost under this report are 11.11 % higher than previous costs. The shortfall is due to the increased costs in labour and fuel.

#29

Contract # 066-R-22

Consulting Engineering Services for Sediment Removal at Two Stormwater Management Ponds

Term: Phase 1 – Detailed Design for pond #44 & #96 to be completed by December 31, 2022.

Phase 2 – Contract Administration / Inspection pond #44 & #96 to be completed by August 31, 2023.

Department	Environmental Services
No. of Bids	6
Vendor	Resilient Consulting
Budget	$148,400.00
Award Amount	$124,404.29
Variance	$23,995.71

The remaining budget $23,995.71 will be retained in the project to address additional fees associated with excess soils management O. Reg.406/19 that has recently been enforced (in effect 2023), any unused funds at the end of the project will be returned to the original funding source.

#30

Contract # 065-T-22

Erosion Restoration at Tributary to Germans Mills Creek

Term: Work to be completed by November 2022.

Department	Environmental Services
No. of Bids	5
Vendor	Dynex Construction Inc
Budget	$451,386.00
Award Amount	$443,013.58
Variance	$8,372.42

The contract is to undertake stream restoration/stabilization works at one (1) erosion site within the tributary to German Mills Creek. The remaining budget of $8,372.42 will be retained in the project to address other unplanned erosion sites.

#31

Contract # 159-T-22

Steel Beam Guide Rail Installation, Repair & Upgrades

Term: Work to be completed by December 2022.

Department	Operations
No. of Bids	3
Vendor	Peninsula Construction
Budget	$209,200.00
Award Amount	$243,607.33
Variance	($34,407.33)

The contract is for steel beam guide rail inclusive of end treatment installation, repairs and upgrades to meet the latest Ontario Provincial Standards Specifications. The budget shortfall of $34,407.33 will be funded from the Non DC Capital Contingency account.

The shortfall is due to increased costs related to fuel, labour and materials/supplies (i.e. steel).

#32

Contract # 111-T-22
Splash Pad Replacements at Beaupre and Millennium Parks
Term: Work to be completed by December 2022.

Department	Operations
No. of Bids	3
Vendor	Mopal Construction
Budget	$584,009.00
Award Amount	$533,581.27
Variance	$50,427.73

The contract is for the splash pad replacements at Beaupre and Millennium Parks.

The remaining budget in the amount of $50,427.73 will be returned to the original funding source in project #22152.

#33

Contract # 189-S-22
Supply, Deliver and Install Musical Instruments at Various Parks
Term: Work to be completed by September 2022.

Department	Operations
No. of Bids	Non-competitive
Vendor	ABC Recreation Ltd
Budget	$78,400.00
Award Amount	$73,370.36
Variance	$5,029.64

The contract is for the supply, delivery and installation of standalone outdoor musical play instruments at Bishop's Gate, Centennial and Milliken Mills Parks.

The remaining budget in the amount of $5,029.64 will be utilized for other growth related park improvements.

#34

Contract # 058-T-22
Shade Structure Provision at Various Parks (Fairtree Cricket Ground, Windy Hill and Reeve Park)
Term: Wok to be completed by September 2022.

Department	Operations
No. of Bids	3
Vendor	Mopal Construction
Budget	$471,600.00
Award Amount	$407,603.12
Variance	$63,996.88

The contract is for Supply and Installation of three (3) shade structures in three (3) City of Markham Parks (Fairtree Cricket Ground, Windy Hill and Reeve Parks).

Of the remaining budget in the amount of $63,996.88, staff require $15,000 for geotechnical testing ($5,000 per park) and the remaining balance of $48,996.88 will be returned to the original funding source.

#35

Contract # 144-T-22

Centennial Community Centre Mechanical Replacement

Term: Work to be completed by December 2022.

Department	Recreation Services
No. of Bids	5
Vendor	Active Mechanical
Budget	$110,561.00
Award Amount	$103,907.14
Variance	$6,653.86

The contract is to replace, one (1) main pool heat exchanger, one (1) wading pool heat exchanger, two (2) sump pumps and four (4) exhaust fans.

The remaining balance of $6,653.86 will be returned back to its original funding source.

#36

Contract # 117-Q-22

Lighting Replacement at Cornell Community Centre Parking Garage & Fitness Centre

Term: Work to be completed by November 2022.

Department	Recreation Services
No. of Bids	9
Vendor	Energy Network Services Inc.
Budget	$68,294.00
Award Amount	$111,898.35
Variance	($43,604.35)

The contract is to replace the existing fluorescent lighting with more energy efficient lighting (LEDs) in the parking garage and fitness area within Cornell Community Centre.

The budget shortfall in the amount of $43,604.35 will be funded from the Non-DC Capital Contingency account. The shortfall can be attributed to the increased costs of material, labour, freight and delivery.

#37

Contract # 118-T-22

Angus Glen Community Centre Exterior Walkway Refurbishment

Term: Work to be completed by September 2022.

Department	Recreation Services
No. of Bids	6
Vendor	Laycon Construction Services
Budget	$120,413.00
Award Amount	$180,581.87
Variance	($60,168.87)

The contract to replace exterior pedestrian paving at the Angus Glen Community Centre with concrete.

The budget shortfall in the amount of $60,168.87 will be funded from the Canada Community Building Fund (CCBF). The shortfall can be attributed to the increased costs of material, labour, and the increased demand and shortage of cement

#38

Contract # 165-T-22

Rehabilitation of Streetlighting System (2022)

Term: Work to be completed by March 2023.

Department	Environmental Services
No. of Bids	5
Vendor	Hastings Utilities Contracting Ltd.
Budget	$331,200.00
Award Amount	$303,846.91
Variance	$27,353.09

The contract is for the rehabilitation of the existing street lighting system (straightening of 11 poles, replacement of 20 existing poles, and rehabilitation of 24 poles) and the installation of new streetlights (29 new LED streetlights on a combination of 22 new streetlight poles, 2 existing hydro poles, and 5 new walkway poles. Additionally, 9 existing streetlights luminaires will upgraded to higher wattages).

An additional $18,000 is required under #22191to retain a consultant to secure 3rd party attachment permits for attachment of streetlight luminaires on existing Alectra owned hydro poles and for obtaining TRCA permit. The remaining balance of $362.65 ($18,362.65 - $18,000.00) from #22191, $4,629.04 from #22192 and $4,361.39 from #21151will be returned to the original funding source.

#39

Contract # 191-S-22

Supply and Application of Liquid Brine

Term: 4 years – effective November 1, 2022 to April 15, 2023.

Department	Operations
No. of Bids	Non-competitive
Vendor	Miller Paving Limited
Budget	$24,162.31
Award Amount	$24,162.31
Variance	$0.00

The contract is for the supply and application of liquid brine.

RECOMMENDED BY:

Joel Lustig,
Treasurer

Graham Seaman
Acting Commissioner, Corporate Services

MARKHAM

Report to: General Committee Meeting Date: September 6, 2022

SUBJECT: 026-T-18 Road Rehabilitation Program - Restoration of Concrete Curb and Sidewalk Contract Extension and Funding of 2022 Contract Shortfall

PREPARED BY: Steven Dollmaier, Sr. Mgr. Roads & Survey, Ext 2748
Melita Lee, Senior Buyer, Ext. 2239

RECOMMENDATION:

1) That the report entitled "026-T-18 Road Rehabilitation Program – Restoration of Concrete Curb and Sidewalk Contract Extension" be received; and,

2) That the contract for Restoration of Concrete Curb and Sidewalk be extended for one (1) additional year (from January 1 – December 31, 2023) to De Ferrari Construction Limited in the estimated value of $2,402,562.58 inclusive of HST and subject to Consumer Price Index (CPI) All-items Canada from December 2021 to December 2022; and,

3) That the award be funded from the capital accounts for the annual Asphalt program subject to Council approval of the 2023 capital budget; and,

4) That the tendering process be waived in accordance with Purchasing By-Law 2017-8, Part II, Section 11. Non-Competitive Procurement, items 11.1 (c) and (g), which state:
   (c) When the extension of an existing Contract would prove more cost-effective or beneficial; and
   (g) Where it is in the City's best interest not to solicit a competitive bid; and,

5) That the 2022 contract shortfall in the estimated amount of $203,472.68 inclusive of HST be funded from Life Cycle Replacement and Reserve Fund; and further,

6) That Staff be authorized and directed to do all things necessary to give effect to this resolution.

PURPOSE:
To obtain Council approval for the following:

1. Extend contract 026-T-18 for the restoration of concrete curb and sidewalk for one (1) additional year (January 1 to December 31, 2023) at the same 2022 itemized pricing subject to a CPI escalation (All-items Canada from December to December).
2. Attain additional incremental funding in the amount of $203,472.68 for the anticipated shortfall in 2022 and be funded from the Life Cycle Replacement and Reserve Fund.

BACKGROUND:

This contract involves the restoration of concrete curb and sidewalks as part of the overall road rehabilitation program. Prior to the road pavement being rehabilitated, deficient and end of life curbs and sidewalks must first be replaced.

In 2018, the City awarded the contract through a competitive procurement process for restoration of concrete curb and sidewalk to De Ferrari Construction Limited (De Ferrari) for a one (1) year period (from date of award to December 31, 2018) with an option to renew for an additional four (4) years (2019 – 2022). The pricing for the first three years of the contract were fixed (2018-2020), with the remaining two (2) years (2021-2022) subject to CPI with escalation not to exceed a 3% yearly increase. The contract is set to expire on December 31, 2022.

OPTIONS/ DISCUSSION:

Contract Extension

Due to the ongoing Covid-19 pandemic, Staff have been proactively reviewing expiring contracts to determine the best options moving forward and to mitigate any potential cost increase. Staff anticipate that issuing a new tender will potentially result in pricing of at least 15-20% greater than current rates and follows similar trends as seen across multiple contracts with the industry in 2022. The anticipated increase is due to increases in baseline material costs (specifically aggregate materials used in the production of concrete products), direct and indirect fuel costs associated with transportation of aggregates to concrete plants and concrete delivery from the plant to site, and labour cost increase.

By negotiating this extension, the City is able to secure an extension for contract 026-T-18 at the same 2022 itemized pricing subject to a CPI adjustment. The adjustment will be based on the percentage change in the posted All-items CPI (Consumer Price Index) for Canada for the previous twelve (12) month period (December 2021 – December 2022). The extension of the current contract with De Ferrari will negate any additional potential price increases, ensure the continuity and provision for concrete curb and sidewalk restoration services to the City, and continue to provide safety to the public.

Staff recommend that the existing contract be extended for one (1) year while staff continue to monitor market conditions and challenges associated with Covid-19 for such services.

Additional incremental funding - 2022
The 2022 contract was set to increase by 3%, however due to increased costs related to fuel, concrete, mobilization of equipment, repairs and maintenance of equipment, the 2022 contract costs have increased by 13% or $203,472.68. Staff looked at the option of reducing or deferring some work in 2022, however, since this contract is part of the overall road rehabilitation program, this option is not feasible, as it would adversely affect the City's ability to maintain road quality standards.

Due to such increases, an additional incremental funding in the amount of $203,472.68 is required to complete the City's 2022 asphalt rehabilitation program.

OPERATING BUDGET AND LIFE CYCLE IMPACT
There is no incremental impact to the operating budget. Staff will monitor current prices and makes adjustments to the 2023 Life Cycle Reserve Study as necessary for the asphalt program.

HUMAN RESOURCES CONSIDERATIONS
Not applicable.

ALIGNMENT WITH STRATEGIC PRIORITIES:
Not applicable.

BUSINESS UNITS CONSULTED AND AFFECTED:
Procurement and Financial Services Departments have been consulted in the preparation of this report.

ENVIRONMENTAL CONSIDERATIONS:
A number of strategies within the Road Rehabilitation Program are environmentally friendly. The use of recycled crushed concrete is allowed for as an aggregate sub-base thereby reducing the use of new natural aggregate resources and eliminating associated extraction and production costs. The contract also stipulates having all excavated granular material disposed offsite at an approved materials recycling facility to ensure such materials can be reused, extending the material lifecycle.

RECOMMENDED BY:

Alice Lam, Acting Commissioner
Community Services

ATTACHMENTS:
Not applicable.

MARKHAM

Report to: General Committee Meeting Date: September 06, 2022

SUBJECT: Extension and Alignment of Recycling Depot Service Contracts

PREPARED BY: Claudia Marsales, Senior Manager, Waste and Environmental Management

RECOMMENDATION:

1. THAT the report entitled "Extension and Alignment of Recycling Depot Service Contracts" be received;

2. THAT the tendering process be waived in accordance with the City's Purchasing By-law # 2017-8, Part II, Section 11.1(c), Non Competitive Procurement which states, "when the extension of an existing Contract would prove more cost-effective or beneficial";

3. THAT the recycling depot service contracts be extended with The Recycle People Corporation for three (3) years from January 1, 2023 to December 31, 2025 in the annual amount of $349,874.70 (Incl. of HST) relating specifically to the three (3) separate contracts below;

   - $ 103,226.24 – Recycling Collection and Marketing (201-Q-17)
   - $ 33,518.00 – Styrofoam Densifier (048-S-20)
   - $ 213,130.46 – Recycling Depot Staffing (019-S-19)

   $ 349,874.70 – Total Amount for 2023

4. THAT the 2023 Operating Budget be adjusted by $32,389.75 ($349,874.70 - $317,484.95 = $32,389.75) as outlined in Financial Considerations, subject to Council approval of the 2023 Operating Budget;

5. THAT the award amounts in 2024 and 2025 be adjusted for price based upon the Consumer Price Index for All-Items Ontario (May to May) and Council approval of the 2024 and 2025 Operating Budgets;

6. THAT the Chief Administrative Officer be authorized to extend all three contracts for an additional fourth (4th) year in 2026, at the same terms and conditions by mutual agreement between the City and the contractor, should the blue box program transition process be delayed;

7. AND THAT Staff be authorized and directed to do all things necessary to give effect to this resolution.

PURPOSE:
To obtain Council approval to extend the recycling depot service contracts with The Recycle People Corporation *("the Recycle People")* for three (3) years from January 1, 2023 to December 31, 2025.

The extensions will align the future expiration of all three contracts with the City's mandated blue box program transition date of December 31, 2025, as required by the Ministry of the Environment, Conservation and Parks.

BACKGROUND:

The Recycle People is a local waste management company that currently provides multiple services to the City in support of its recycling depots and styrofoam recycling program. The contractor has provided excellent service to the City since 2010, and has managed the safe operation of all four recycling depots throughout the COVID-19 pandemic. The Recycle People currently hold three separate contracts with the City as detailed below:

201-Q-17: Recycling Collection and Marketing, for the hauling and marketing of styrofoam, plastic film, ink/toner cartridges and batteries from the City's four recycling and depots and two additional facilities (Civic Centre and 555 Miller Avenue) based on a scheduled and an 'as-needed' basis.

048-S-20: Styrofoam Densifier, for the processing of styrofoam collected from the City's recycling depots and facilities.

019-S-19: Recycling Depot Staffing, for the provision/supervision of attendants to operate the City's recycling depots.

In 2022, the Province finalized Regulation 391/21, which makes the producers of blue box materials fully accountable and financially responsible for their products and packaging once they reach their end of life. The regulation also outlines the process for transitioning responsibility of the provincial blue box program from municipalities to the producers, and provides a scheduled transition date for every Ontario municipality. As per the Ministry's schedule, the City is required to transition on December 31, 2025.

OPTIONS/ DISCUSSION:

The contracts listed above support and provide key services to the operation of the City's four recycling depots and its styrofoam recycling program. The City has benefited from having a local provider willing to fill service gaps and perform small/medium-sized contracts at fair rates for services that are not attractive to larger waste management companies. Limited market interest in these services was confirmed after the City issued bids in 2013 (219-Q-13) and 2017 (201-Q-17) for the Recycling Collection and Marketing contract and received only one bid from the Recycle People.

The City's blue box program is scheduled to transition on December 31, 2025. It is expected that transition will impact both operations and funding for the recycling depots as well as the styrofoam recycling program. In order to ensure continued and uninterrupted operation of these key services until transition, Staff from Environmental Services and Procurement approached the Recycle People to gauge the contractor's interest in extending all three contracts to align their expiration with the City's scheduled blue box transition date.

Staff entered into negotiations seeking favourable terms for combining and extending the three separate service contracts. The Recycle People agreed to extend all three contracts until December 31, 2025 with annual price adjustments tied to the Consumer Price Index, as well as an additional 4% increase for the first year of the Recycling Depot Staffing contract (019-S-19). The additional 4% is required to ensure the contractor is able to attract and retain staff. The recycling depots present challenging working conditions, including weather exposure, working alone at night, and indirect access to washroom facilities. As such, the Recycle People currently need to pay at least 10% above minimum wage in order to remain competitive in a labour market that provides for opportunity to work in less challenging conditions.

Staff considered combining all three of the recycling depot service contracts and releasing a bid to the market in an attempt to attract interested vendors, however instead opted to negotiate extensions in an effort to avoid the economic conditions listed below, which may affect market pricing:

- Rising fuel costs
- Competitive labour market
- Vehicle manufacturing delays
- Increased insurance rates
- Proximity to blue box program transition

Extending the contracts under the negotiated terms allows the City to avoid these unfavourable market conditions, which could specifically impact pricing on the recycling depot service contracts, as they are primarily truck, fuel and labour-based.

FINANCIAL CONSIDERATIONS:

2023 Operating Budget Impact

Account Name	Account #	Budget Available for this Award	Cost of Award	Budget Shortfall
MKDRP Recycling Service	770-470-5912	$27,576.55	$29,727.52	($2,150.97)
UVDRP Recycling Service	770-471-5912	$24,676.70	$26,601.48	($1,924.78)
MMDRP Recycling Service	770-472-5912	$9,309.82	$10,035.99	($726.17)
THDRP Recycling Service	770-473-5912	$24,676.70	$26,601.48	($1,924.78)
RECYC Recycling Service	770-772-5912	$3,965.59	$4,274.91	($309.32)
CIVC S/A – Gar. Collection	750-751-5350	$5,551.82	$5,984.86	($433.04)
DENSIFIER – Cont. Services	770-474-5399	$31,092.77	$33,518.00	($2,425.23)
MKDRP Contracted Service	770-470-5399	$94,123.00	$105,229.51	($11,106.51)
UVDRP Contracted Service	770-471-5399	$43,824.00	$48,995.76	($5,171.76)
MMDRP Contracted Service	770-472-5399	$7,796.00	$8,715.93	($919.93)
THDRP Contracted Service	770-473-5399	$44,892.00	$50,189.26	($5,297.26)
Totals:		**$317,484.95**	**$349,874.70**	**($32,389.75)**

The 2023 Operating Budget for Waste & Environmental Management will be adjusted in the amount of $32,389.75 to reflect the 2023 award amount, subject to Council approval of the 2023 Operating Budget.

There is no incremental impact to the Life Cycle Replacement and Reserve Fund.

CONCLUSION:
The non-competitive procurement and alignment of all three recycling depot service contracts is cost-effective and beneficial for the City as it provides for stable pricing and service continuity with an experienced vendor while the City transitions responsibility of its blue box program.

HUMAN RESOURCES CONSIDERATIONS
Not Applicable

ALIGNMENT WITH STRATEGIC PRIORITIES:
This award supports GreenMarkham goals, meets Council approved service levels and provides the City with certainty ahead of blue box program transition.

BUSINESS UNITS CONSULTED AND AFFECTED:
Financial Services Department has been consulted in the preparation of this report.

RECOMMENDED BY:

Eddy Wu
Director, Environmental Services

Alice Lam
Acting Commissioner, Community Services

Tender 011-T-22 Winter Road Maintenance Services

September 6, 2022

Purpose

Subsequent to the July 11, 2022 Development Services Committee meeting on Winter Road Maintenance Services Award, Council Resolution #8.3.2.7, more detail on Part A

- Winter Road Services Utilizing Single and Tandem Axle Windrow Units, Options 1-7, including the tax rate increase
- A modified Option 5, which includes increasing the local roads service level with no sidewalks to 5cm and senior windrow removal within the current 8 hour window

Recommendation

- That presentation entitled "Tender 011-T-22 Winter Road Maintenance Services" be received; and,
- That Council adopts plowing all local roads at 7.5cm and Senior Windrow to be completed in four (4) hours, be awarded for twelve (12) winter seasons (November 16, 2024 – April 15, 2036) in the estimated annual amount of $7,802,885.98 (inclusive of HST); and
- That the estimated budget shortfall of $1,665,086 be phased in over a 3-year period commencing in 2023 and be included as part of the 2023-2025 operating budgets, subject to Council approval of the 2023-2025 operating budgets;

Assumptions

Plowing Local Roads	7.5 cm	5 cm	Primary
Average Winter Events (days)	5	8	44
Average Salt Usage (t)	23,687	26,178	34,114
Single Axle/Tandem Axle Hours	300	480	660
Senior Windrow Equipment	30	60	46
Citywide Windrow Equipment	46	46	46
Windrow Hours	250	125	80
Loader Hours	80	128	192
Load and Haul - Citywide	3	4	6
Driveways - Senior	7,500	7,500	7,500
Driveways - Citywide	82,000	82,000	82,000

Source:

- Environment Canada Weather (based on five (5) year average)
- City of Markham Winter Tracker (based on five (5) year average)
- Environment Canada Salt Reports (based on five (5) year average)

Load & Haul:
Source – Recent tender with Richmond Hill

Description	**Est. Hours**	**Unit Price Per Hour**	**Extended Price**	**Price Per km**
Crew and Equipment for removing snow and hauling to designated snow dump (RH 1080 km of roads)	185	$ 2,291.60	$ 423,946.31	$ 392.54
Crew and Equipment for removing snow and hauling to designated snow dump (Markham 2250 km of Roads)	385	$ 2,291.60	$ 883,215.00	$ 392.54

Overall Cost

Option	Description	Total Cost	Status Quo	Incremental Impact Above Status Quo	Tax Impact - comparing to 2022 WM budget
1	Status Quo (Plowing at 7.5cm + 8 hours Senior Windrow)	$ 7,397,779.42	$ 7,397,779.42	$0	0.95%
3	**Plowing at 7.5cm + 4 hours Senior Windrow**	**$ 7,802,885.98**	**$ 7,397,779.42**	**$405,107**	**1.19%**
4	Plowing at 7.5cm + 8 hours Citywide Windrow	$ 10,514,539.45	$ 7,397,779.42	$3,116,760	2.79%
5	Plowing at 5cm + 8 hours Senior Windrow	$ 10,588,512.77	$ 7,397,779.42	$3,190,733	2.83%
6	Plowing at 5cm + 4 hours Senior Windrow	$ 11,062,307.33	$ 7,397,779.42	$3,664,528	3.11%
7	Plowing at 5cm + 8 hours Citywide Windrow	$ 14,638,248.44	$ 7,397,779.42	$7,240,469	5.22%
Councillor Irish	Everything Primary + 8 hours Senior Windrow	$ 14,372,641.10	$ 7,397,779.42	$6,974,861	5.07%
Councillor Irish	Everything Primary + 4 hours Senior Windrow	$ 14,879,063.99	$ 7,397,779.42	$7,481,284	5.36%
Councillor Irish	Everything Primary + 8 hours Citywide Windrow	$ 20,196,198.62	$ 7,397,779.42	$12,798,418	8.50%
Councillor McAlpine	Plowing at 5cm (inc no SW) & Plowing at 7.5cm (with SW) + 8 hour Sr Windrow	$ 9,619,280.12	$ 7,397,779.42	$2,221,500	2.26%

Opt 1 - Status Quo (Plowing at 7.5cm + 8 hours Senior Windrow)

- Plowing
  - $3,956,835.84
- Windrows
  - $863,026.56
- Loaders (Back Lanes & Cul-de-sac)
  - $2,577,917.02

Total Cost = $7,397,779.42

❖ *There is <u>no extra cost or salt</u> added to this option*

Opt 3 - Plowing at 7.5cm + 4 hours Senior Windrow (Recommended)

- Plowing
  - $3,956,835.84
- Windrows
  - $1,268,133.12
- Loaders (Back Lanes & Cul-de-sac)
  - $2,577,917.02

Total Cost = $7,802,885.98

❖ *There is <u>no extra cost or salt</u> added to this option*

Opt 4 - Plowing at 7.5cm + 8 hours Citywide Windrow

- Plowing
  - $3,956,835.84
- Windrows
  - $3,979,786.59
- Loaders (Back Lanes & Cul-de-sac)
  - $2,577,917.02

Total Cost = $10,514,539.45

❖ *There is <u>no extra cost or salt</u> added to this option*

Opt 5 - Plowing at 5cm + 8 hours Senior Windrow

- Plowing
  - $5,485,617.02
- Windrows
  - $1,206,466.56
- Salt
  - $213,365.35
- Loaders (Back Lanes & Cul-de-sac)
  - $3,683,063.83

Total Cost = $10,588,512.77

Opt 6 - Plowing at 5cm + 4 hours Senior Windrow

- Plowing
  - $5,485,617.02
- Windrows
  - $1,680,261.12
- Salt
  - $213,365.35
- Loaders (Back Lanes & Cul-de-sac)
  - $3,683,063.83

Total Cost = $11,062,307.33

Opt 7 - Plowing at 5cm + 8 hours Citywide Windrow

- Plowing
  - $5,485,617.02
- Windrows
  - $5,256,202.23
- Salt
  - $213,365.35
- Loaders (Back Lanes & Cul-de-sac)
  - $3,683,063.83

Total Cost = $14,638,248.44

Councillor McAlpine - Plowing at 5cm (include no Sidewalk) & Plowing at 7.5cm (with Sidewalk) + 8 hour Senior Windrow

- Plowing
  - $5,258,122.37
- Windrows
  - $1,135,438.08
- Salt
  - $99,229.25
- Loaders (Back Lanes & Cul-de-sac)
  - $3,130,490.42

Total Cost = $9,619,280.12

Councillor Irish - Everything Primary + 8 hours Senior Windrow

- Plowing
  - $6,243,932.54
- Windrows
  - $1,723,342.23
- Salt
  - $1,248,773.41
- Loaders (Back Lanes & Cul-de-sac)
  - $5,156,592.92

Total Cost = $14,372,641.10

Councillor Irish - Everything Primary + 4 hours Senior Windrow

- Plowing
  - $6,243,932.54
- Windrows
  - $2,229,765.12
- Salt
  - $1,248,773.41
- Loaders (Back Lanes & Cul-de-sac)
  - $5,156,592.92

Total Cost = $14,879,063.99

Councillor Irish - Everything Primary + 8 hours Citywide Windrow

- Plowing
  - $6,243,932.54
- Windrows
  - $7,546,899.75
- Salt
  - $1,248,773.41
- Loaders (Back Lanes & Cul-de-sac)
  - $5,156,592.92

Total Cost = $20,196,198.62

Recommendation

- That Council adopts plowing all local roads at 7.5cm and Senior Windrow to be completed in four (4) hours, be awarded for twelve (12) winter seasons (November 16, 2024 – April 15, 2036) in the estimated annual amount of $7,802,885.98 (inclusive of HST)

Any Questions?

Markham Sub-Committee Meeting Minutes

May 11, 2022, 10:00 AM - 12:00 PM
Electronic Meeting

Sub-Committee Members	Regional Councillor Jack Heath, Chair Councillor Karen Rea Councillor Andrew Keyes Councillor Amanda Collucci Mayor Frank Scarpitti (Ex-Officio) Deputy Mayor Don Hamilton (Ex-Officio) Regional Councillor Jim Jones (Ex-Officio)
Regrets	Councillor Keith Irish (Ex-Officio)
Guests and Staff	Councillor Khalid Usman Eddy Wu, Director of Environmental Services Rob Muir, Manager, Stormwater Zahra Parhizgari, Environmental Engineer Morgan Jones, Commissioner of Community Services Alice Lam, Director of Operations Arvin Prasad, Commissioner of Development Services Eddy Wu, Director of Environmental Services Kumar Prathapan, Senior Manager, Infrastructure Sito Saran, Manager, Environmental

1. CALL TO ORDER

The Markham Sub-committee convened at 10:05 AM with Regional Councillor Jack Heath in the Chair 10:05 PM.

2. DISCLOSURE OF PECUNIARY INTEREST

There was no disclosures of pecuniary interest.

3. SWAN LAKE REPORT AND PRESENTATION

3.1 ANNUAL WATER QUALITY REPORT (STAFF)

Rob Muir, Manager, Stormwater, provided a presentation on the Annual Water Quality Report for Sawn Lake.

The Committee was satisfied with initial results of the 2021 Annual Water Quality Report, and was curious about the long term expectations of the program. The Committee also discussed the difference between PAC and Phoslock, and noted that is still seeing a lot of geese in the water.

Staff advised that they are obtaining the expected results from the use of PAC to improve the water quality in Swan Lake, and will continue monitoring water quality to evaluate the treatment performance. Staff further advised that they would adjust the program over time based on the outcome of PAC's performance.

Staff noted that they started using PAC due to challenges in importing Phoslock from Australia, noting that both chemicals remove phosphate from the water, but perform this action differently.

Staff advised that they are conducting enhanced hazing, and other measures to continue to address the geese issue at Swan Lake, noting that it will be more challenging to tackle the geese population during migration season.

The representative from York University, suggested using passive water treatment systems to filter out/adsorb the nutrients and chloride.

3.6 RESEARCH PROPOSAL FROM YORK UNIVERSITY ON USE OF CHARCOAL FILTER SYSTEM TO REMOVE NUTRIENTS AND CHLORIDE (FOSLP)

Satinder K. Brar, Professor in Environmental Engineering, provided a presentation on the on the research they propose on the use of charcoal filter system to remove nutrients and chloride from lakes.

The Committee advised that it would be interested in going on walk with the York University team to highlight some of the issues specific to Swan Lake.

Staff noted that they have not had the opportunity to review the materials provided by the York University in detail, but are interested to know how this method will be applied in whole-lake systems. York U advised that this approach has not been applied in lakes, rather for wastewater treatment systems after secondary treatment to polish the partially-treated wastewater.

3.2 HIGH LEVEL LAKE WATER FLOW ANALYSIS (STAFF)

Rob Muir, Manager, Stormwater, presented the lake water flow and chloride analysis.

The Committee discussed the importance of maintenance, burying the storm ponds to address algae concerns, controlling chloride in this area, and the main sources of chlorides.

With respect to controlling algae in ponds, staff advised that Swan Lake is different from stormwater ponds that are designed to capture contaminants to prevent them from discharging into downstream rivers. Staff advised that algae in stormwater ponds indicates those treatment facilities are operating as intended.

Staff advised that the main source of chlorides in this area is the salt applied for winter maintenance, and the best approach to reduce chloride load is source control.

The York University specialist suggested intensely treating the water during times of greatest contamination, and using a filter to stop some of the contamination from entering the lake.

Alice Lam, Director of Operations, advised that the City of Markham has a Salt Management Plan and uses less salt for winter maintenance relative to other municipalities. The Committee noted that the majority of the area is maintained privately.

3.3 REVIEW OF LONGER-TERM ACTIONS TO MAINTAIN RESTORATION (STAFF)

Rob Muir, Manager, Stormwater, presented the staff Review of Longer-Term Actions to Maintain Restoration, including FOSLP’s proposed Holistic Approach to Realizing Community Goals.

The Committee noted that making structural changes to the stormwater management system in the Swan Lake area, including modification of original infrastructure can be very costly. It also noted that some of the amenities proposed for the Swan Lake Park are being planned for the Rouge National Park nearby, where they are more appropriate.

The Committee suggested that Swan Lake could be considered for a natural heritage designation and asked that staff report back on the feasibility and implications of declaring Swan Lake a natural heritage asset or ‘Eco Park’ through the Official Plan process. Staff noted that the OP has criteria for designating an area as natural heritage, and that the Environmental Services can comment on the water resources aspects.

3.4, 3.5, 3.6 PRESENTATION, ECO PARK QUESTIONNAIRE, NATURAL HERITAGE NETWORK REPORT, ACTION PLAN TO END SWAN LAKE'S STORMWATER ROLE (ANALYSIS OF STORMWATER FLOWS SHOWING REROUTING OPTIONS), AND RESEARCH PROPOSALS (FOSLP)

Fred Peters, Friends of Swan Lake Park, presented the Action Plan For Restoration of Swan Lake and Swan Lake Park including FOSLP's request for natural heritage designation for Swan Lake Park and FOSLP's Eco Park Questionnaire, FOSLP's request to end the stormwater management role for Swan Lake (i.e., Analysis of Stormwater Flows Showing Rerouting Options (FOSLP)), and FOSLP's request for support for research initiatives including chloride removal (i.e., per item 3.6 above), oxygen enhancement (i.e., per Fleming College's Development of a Scope of Work for Research into Water Quality on Swan Lake), and survey of lower level aquatic life.

He acknowledged that the analysis provided on rerouting stormwater flow has been done without technical tools, but he was comfortable that the ponds have the capacity to handle more flows, and the changes will not increase flooding risk downstream.

The Committee noted that historical designs could be very costly to change and it is best to focus on managing salt usage at this time. However, it noted that the City would likely need to continue its stormwater management responsibilities with respect to the lake.

Moved by Councillor Andre Keyes
Seconded by Regional Councillor Jim Jones

1. THAT the staff report and presentation on the "Swan Lake- 2021 Water Quality Status and Updates" be received; and,
2. That the FOSLP presentation "Action Plan For Restoration of Swan Lake and Swan Lake Park" and York University presentation on the research it is proposing on the use charcoal filter system to remove nutrients and chloride be received and referred to staff; and further,
3. That Markham Sub-Committee request that staff report back on the feasibility, and implications of designating Swan Lake a natural heritage asset, as part of the Official Plan update.

Carried

3. ADJOURNMENT

Moved by Councillor Andrew Keyes
Seconded by Councillor Amanda Collucci

That the Markham Sub-Committee adjourned at 12:07 PM.

Carried

Swan Lake

Annual Meeting with Markham Subcommittee

May 11, 2022

Environmental Services
Authors: Robert Muir, Manager, Stormwater
Zahra Parhizgari, Environmental Engineer, Stormwater

Agenda

- Background
- 2021 Water Quality Results and
  Evaluation of Implemented Core Measures
- High Level Water Flow and Chloride Analysis
- Review of FOSLP's Holistic Approach to
  Realizing Community Goals
- Recommendations

Background

BUILDING MARKHAM'S FUTURE TOGETHER
2020 – 2023 Strategic Plan

MARKHAM

2021 Council Resolutions

MINUTES AND NOTES OF THE NOVEMBER 16, 2021 MARKHAM SUB-COMMITEE (16.0)

1. That the minutes and notes of the November 16, 2021 Markham Sub-Committee meeting be received for information purposes; and,
2. That the report entitled "Swan Lake Water Quality Management Plan" be received; and,
3. That Staff implement the Plan presented as Option 1 including proposed Core and new Complementary measures beginning in 2023; and,
4. That an additional $2.35M over 25 years be reflected in the 2022 Lifecycle Reserve Update; and,
5. That an additional $10K be added to the 2022 Budget for geese relocation, and fish management at Swan Lake; and,
6. That staff be given discretion to advance three low-cost programs (<$90k) into Phase 1 (initial 5 years), including:
    i) Research into chloride solutions
    ii) planting submerged plants
    iii) incorporation of the fish management plan and fish stocking
7. That Staff report back annually on water quality results and evaluation of adapted Core and Complementary measures for consideration in Phase 2 of the strategy through the Markham Sub Committee with the participation of the Friends of Swan Lake Park in today's presentation and other concerns, including high level lake water flow analysis; and,
8. That staff report back to the Markham Sub Committee within the next 6 months (before the end of June) to discuss suggestions in Friends of Swan Lake Park in today's presentation and other concerns that have arisen; and further,
9. That staff be directed to consider longer-term actions to achieve and maintain restoration; and further,
10. That Staff be authorized and directed to do all things necessary to give effect to this resolution.

Option 1 - Expanded Core & Complementary Measures

and Evaluate the need for Alternative Measures

Core

Complementary

Alternative

Activity	Phase 1 Core Measures (Years 1-5)	Phase 2 Core+ Complementary Measures (Years 6-10)	Phase 3 Core+ Alternative Measures (Years 11-25)
Water quality monitoring and annual reporting to Subcommittee	✓	✓	✓
Geese management and explore enhanced methods	✓	✓	✓
Remove benthic-dwelling fish	✓	✓	✓
Maintenance of stormwater management facilities (by developers then City)	✓	✓	✓
Community Engagement	✓	✓	✓
Chemical treatment (adjusted frequency at the end of each Phase)	✓	✓	✓
Shoreline planting / Improvements	✓		
Chemical oxygenation pilot project (by research institute)	✓		
Fish management plan and fish stocking (by MNDMNRF)	✓	✓	
Planting of submerged plants	✓	✓	
New technologies for chloride treatment	✓	✓	
Investigate contribution from groundwater and dumping areas if required			✓
Evaluate/design structural modifications such as lake water recirculation and stormwater redirection, if required			✓
Evaluate implemented measures and report back	✓	✓	✓

Need TBD (Cost Excluded)

Core Measures Implemented in 2021

Activity	Phase 1 Core Measures (Years 1-5)
Water quality monitoring and annual reporting to Subcommittee	☑
Geese management *and explore enhanced methods*	☑
Remove benthic-dwelling fish	☑
Maintenance of stormwater management facilities (by developers then City)	☑
Community Engagement	☑
Chemical treatment	☑
Shoreline planting / Improvements	☑ underway
Chemical oxygenation pilot project (by research institute)	pending more data collection (planned for 2024/2025)
Fish management plan and fish stocking (by MNDMNRF)	
Planting of submerged plants	
New technologies for chloride treatment	

Enhanced hazing (fall)
Geese relocation (73)
Nest and egg removal (13 nests and 52 eggs)
Reduced the number to half

Fish inventory (Common Carp, Brown Bullhead, and Fathead Minnow)
Removal of bottom dwelling fish (to avoid disturbance of sediment)

Clearing of the blocked inlet to the East Pond to prevent untreated runoff from being discharged to the Lake (completed by developer)

13 tonnes of Poly Aluminum Chloride (PAC) were applied to the Lake in a controlled manner over several days

BUILDING MARKHAM'S FUTURE TOGETHER
2020 – 2023 Strategic Plan

MARKHAM

2021 Water Quality Results and Evaluation of Implemented Core Measures

BUILDING MARKHAM'S FUTURE TOGETHER
2020 – 2023 Strategic Plan

MARKHAM

Water Quality Monitoring

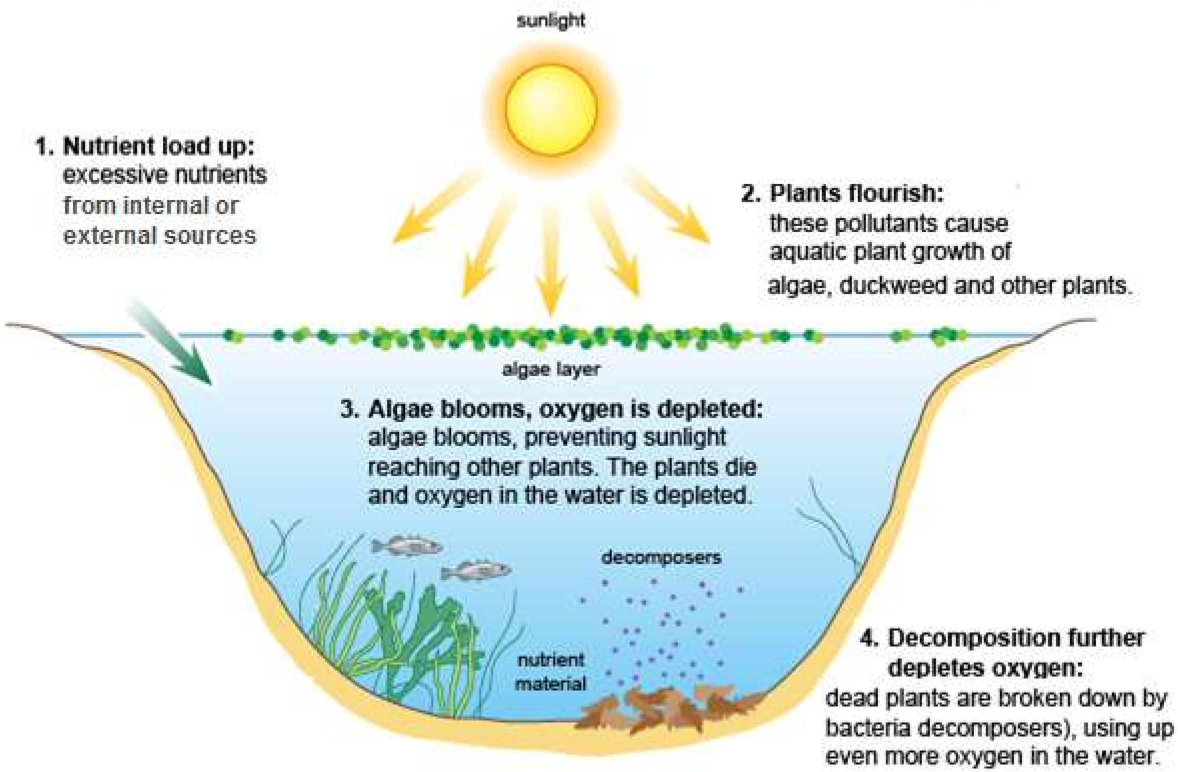
- ○ Dissolved oxygen, clarity,
- ○ Dissolved organic carbon, color
- ○ Nutrients (phosphorus and nitrogen)
- ○ Phytoplankton
- • Chloride
- • Water level
- • Geese count

BUILDING MARKHAM'S FUTURE TOGETHER
2020 – 2023 Strategic Plan

MARKHAM

Water Quality Processes

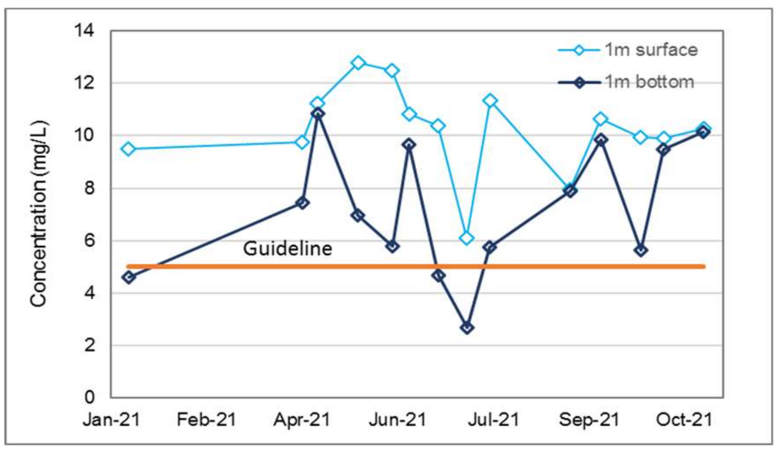
- Excessive amount of phosphorus and nitrogen results in algae growth
- As the algae die and decompose, the process consumes dissolved oxygen (DO)
- Die-off and decomposition of submerged plants also contributes to low DO

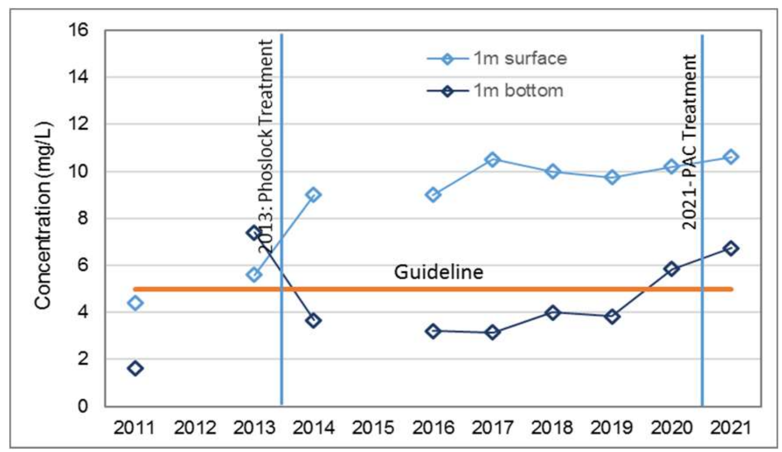


Eutrophic Classifications (based on DO, phosphorus, clarity):
Oligotrophic: pristine
Mesotrophic: clear with some submerged plants
Eutrophic: somewhat unclear, lots of planktonic plant growth
Hypereutrophic: unclear, with frequent algal blooms

Water Quality Results- Dissolved Oxygen

- Minimum required DO for the protection of warm water fish is 4-5 mg/L
- In 2021:
  - Surface concentration >5mg/L all year
  - Bottom concentration >5mg/L after treatment
- Increased compared to pre-treatment years



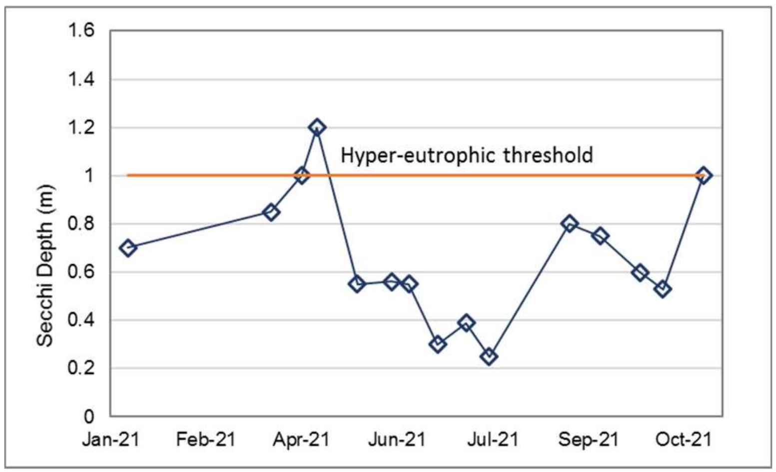


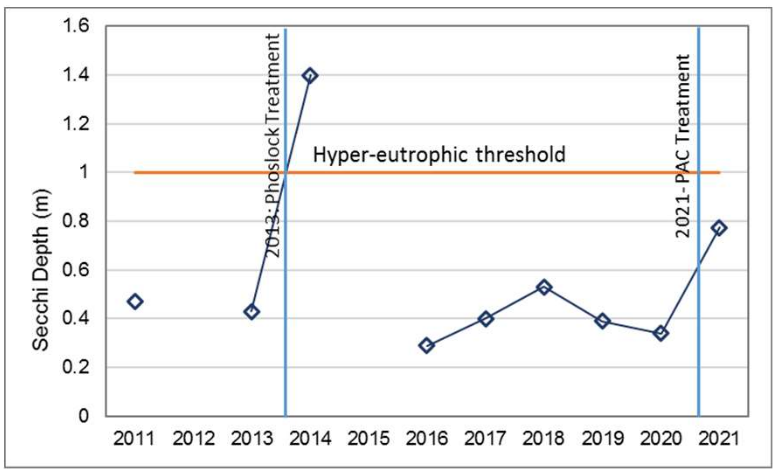
BUILDING MARKHAM'S FUTURE TOGETHER
2020 – 2023 Strategic Plan

MARKHAM

Water Quality Results- Clarity

- Below 1 m represents hyper-eutrophic, but 1m a good target for shallow lakes due to low depth and sediment impact
- In 2021:
  - Increased to >1m after treatment
- Increased compared to pre-treatment years





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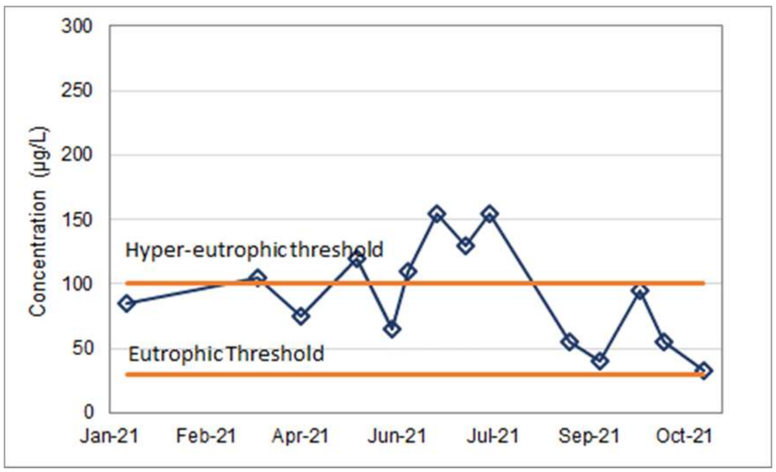
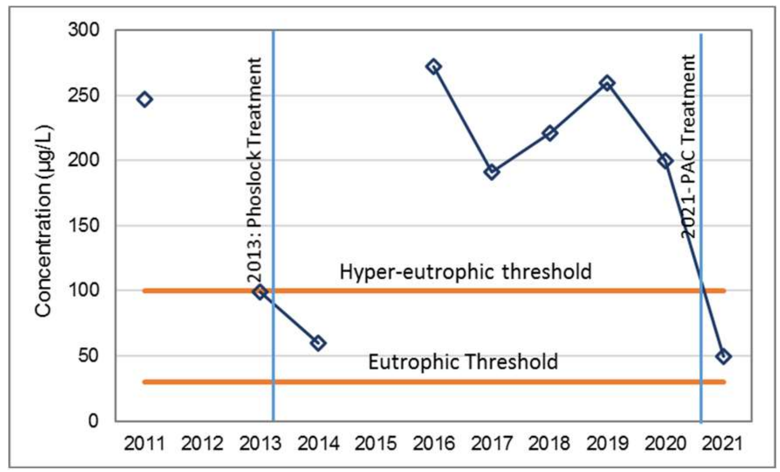
Water Quality Results- Total Phosphorus

- Above 100 µg/L represent hyper-eutrophic conditions
- Above 30 µg/L eutrophic
- In 2021:
  - Average after treatment: 50 µg/L
- Decreased compared to pre-treatment years





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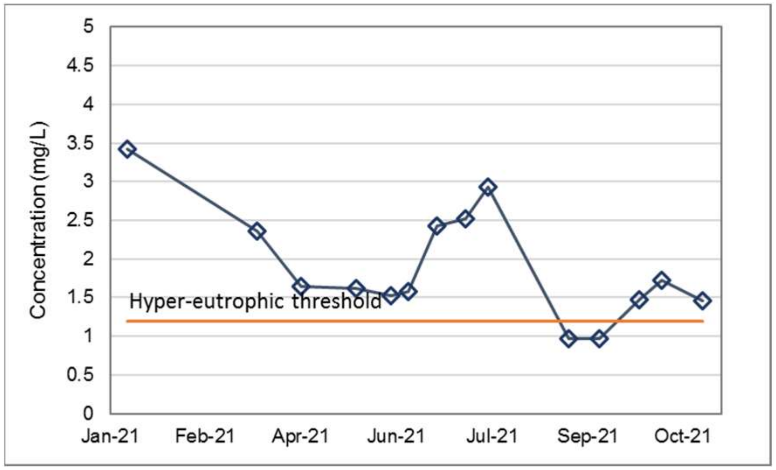
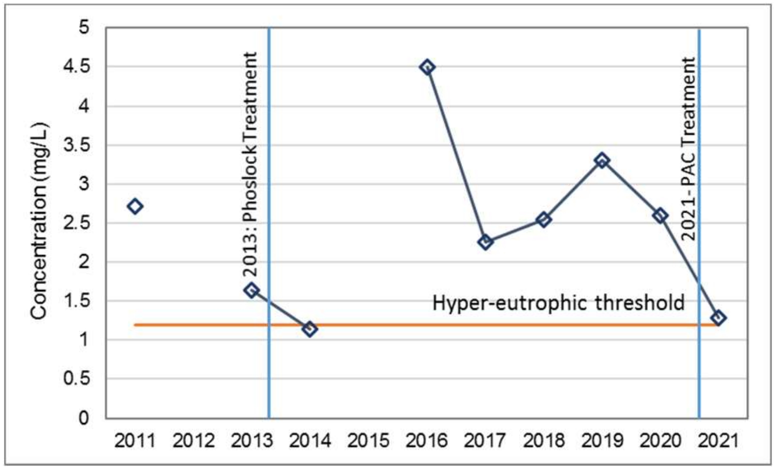
Water Quality Results- Total Nitrogen

- Above 1.2 mg/L represents hyper-eutrophic conditions
- In 2021:
  - Dropped to 1 mg/L after treatment
  - Dominant forms not bioavailable
- Decreased compared to pre-treatment years





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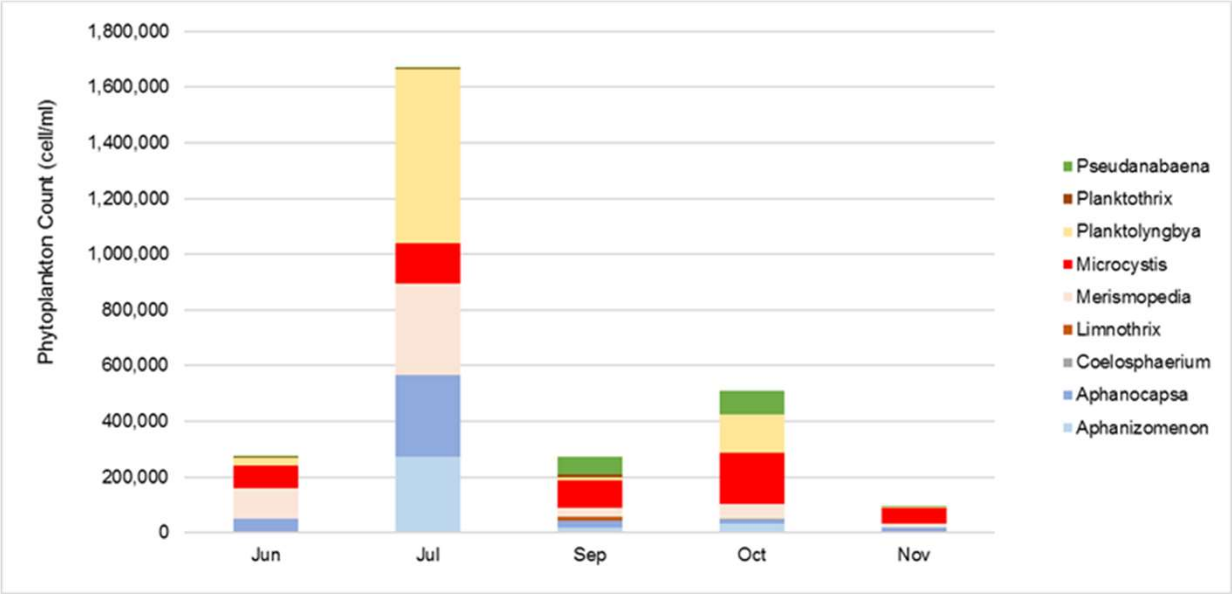
Water Quality Results- Phytoplankton

- Phytoplankton (cell count and cyanobacteria) was measured before and after treatment.
- Cell numbers decreased immediately after the treatment.
- Microcystis (toxin producing algae) also decreased after treatment, but increased about 5 weeks later, potentially due to the high load of nutrients from the blocked inlet to the East Pond.



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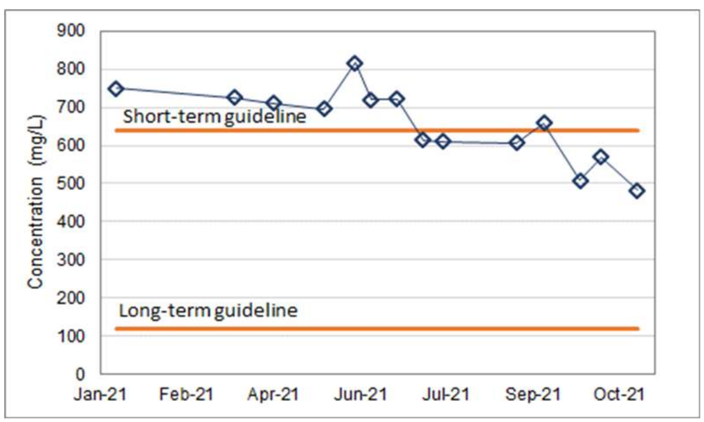
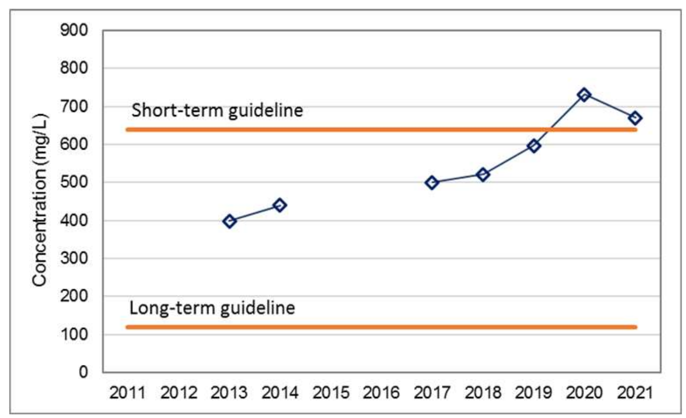
Water Quality Results- Chloride

- Chloride concentration increasing in urban lakes as a result of de-icer application
- Chloride does not biodegrade, readily precipitate, volatilize, or bioaccumulate
- Chloride guidelines include a long-term guideline (chronic exposure) of 120 mg/L and a short-term guideline (sudden spike) of 640 mg/L
- Chloride concentrations have been increasing in Swan Lake





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Aquatic Habitat

- Supports minnows (present in 1000's)
- Larger fish also observed

Photos courtesy of Mark Henschel

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Summary- Water Quality

- Management activities in 2021 focused on the significant nutrient loadings:
  - PAC treatment was used to reduce internal loads
  - Geese management was used to reduce external loads
- These activates were effective at improving water quality:
  - reduce phosphorus concentrations
  - Improved water clarity
  - Increased dissolved oxygen levels
  - reduction of cyanobacteria

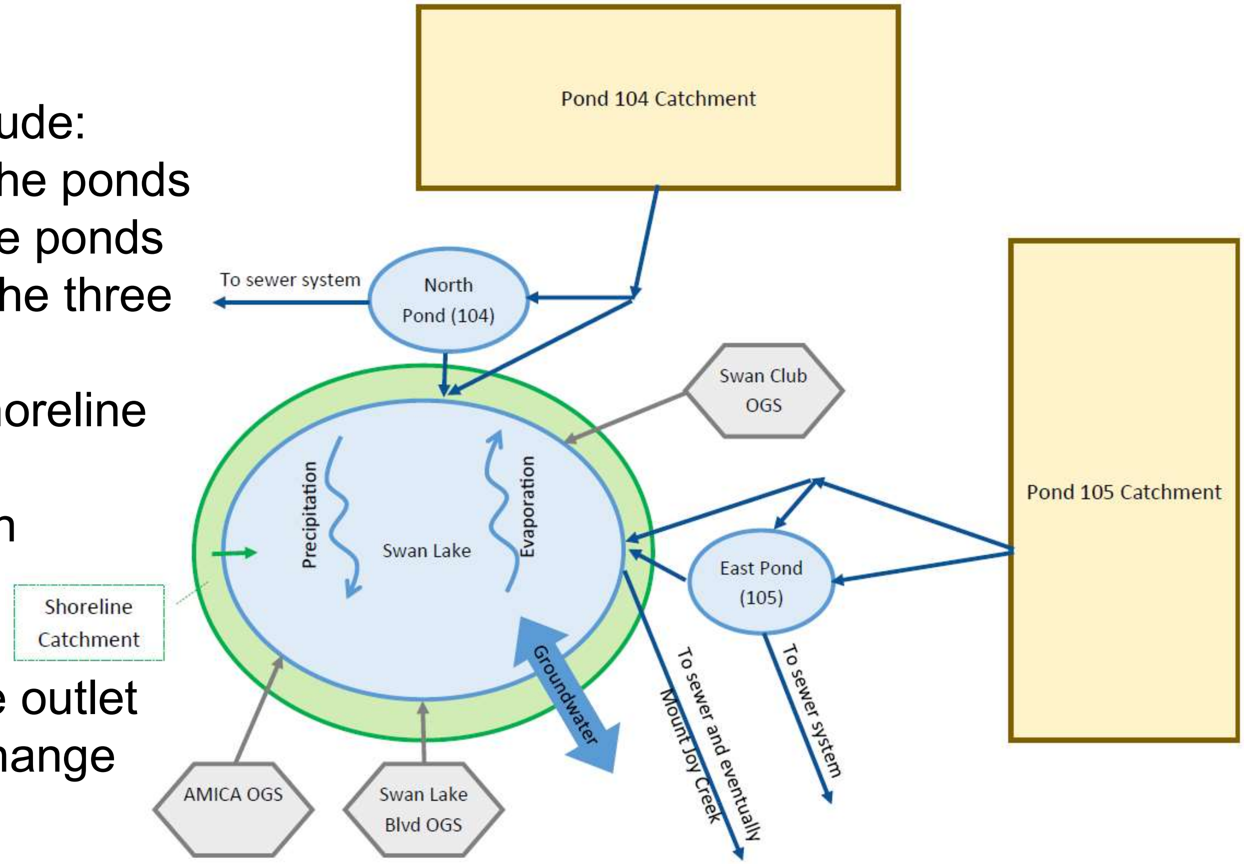
Swan Lake, August 2021

- Monitoring in 2022 (first complete post-treatment year) will provide more conclusive information about the efficacy of PAC treatment and clearing of the blocked inlet.

High Level Water Flow and Chloride Analysis

Conceptual Model

- Flows to the Lake include:
  - flows bypassing the ponds
  - overflows from the ponds
  - discharges from the three OGS
  - runoff from the shoreline area
  - direct precipitation
- Outflows include:
  - evaporation
  - flow through Lake outlet
  - groundwater exchange



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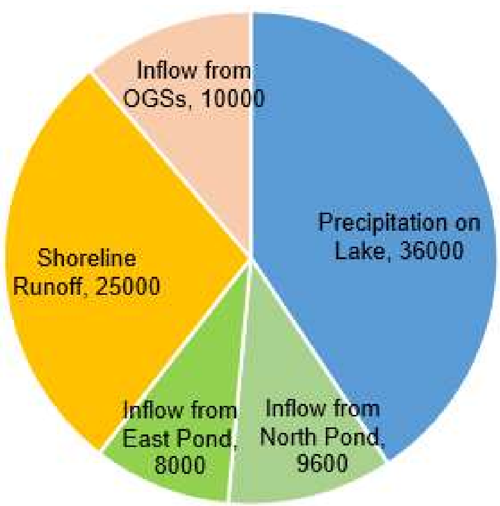
Modelling Approach

- Reviewed drainage plans and delineated catchments
- Reviewed stormwater controls
- Compiled precipitation data and calculated evaporation
- Developed a continuous model for 2009-2021
- Estimated runoff from each catchment and through each pathway
- Used water level data to estimate outflow
- Collected salt usage data (with help from FOSLP)
- Collected runoff samples for chloride analysis
- Estimated chloride contribution from each source

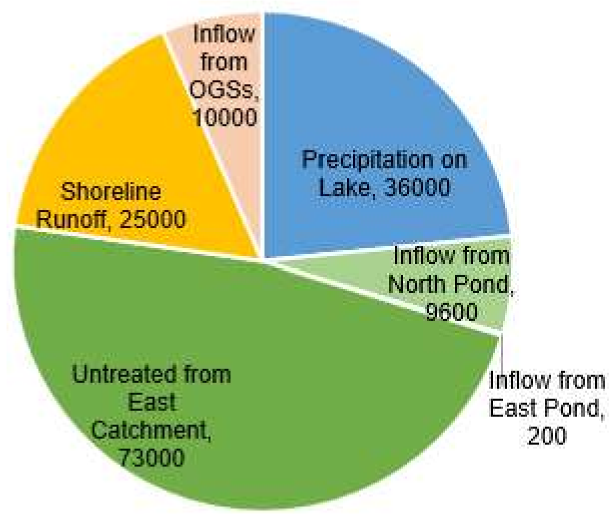
Water Flow Result

- Most of the runoff from the developed catchment is treated in two ponds, and the treated runoff is discharged to the storm sewer system
- During the period when the northern inlet to the Ease Pond was blocked (~2018-2021), a significant amount of untreated runoff discharged to the Lake.

Annual inflows (m^3, as designed)



Annual inflows (m^3, blocked inlet)



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Chloride Monitoring

- Data availability:
  - Limited in-Lake data before 2017
  - Concentration at Dock and Bridge measured since 2017 from April to Nov
  - No runoff data until 2021
  - No snow melt data until 2022
- Additional data collection in 2021/2022:
  - Runoff data (inlet to ponds and to the Lake from ponds/OGSs/shoreline)
  - Concentration at Lake outlet (maybe more representative of the overall condition than the Dock)

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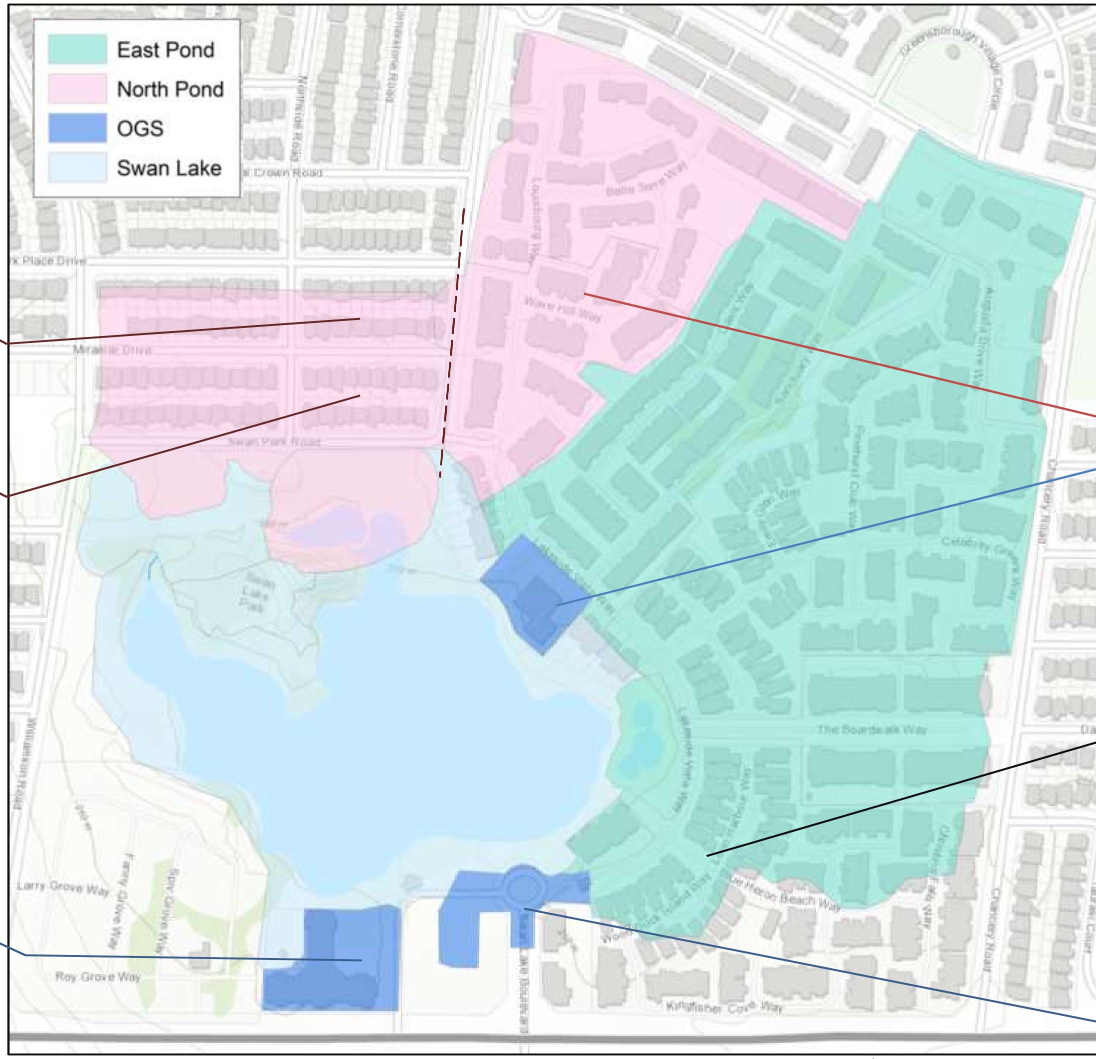
Winter Maintenance and Salt Usage



City:
1 km roads
2200 kg salt/yr

Residents:
driveways/
walkways

Swan Lake Village Corporation:
14 km road
~ 30 tonnes/yr
&
driveways/
walkways/parking
70 tonnes/yr

AMICA
Corporation

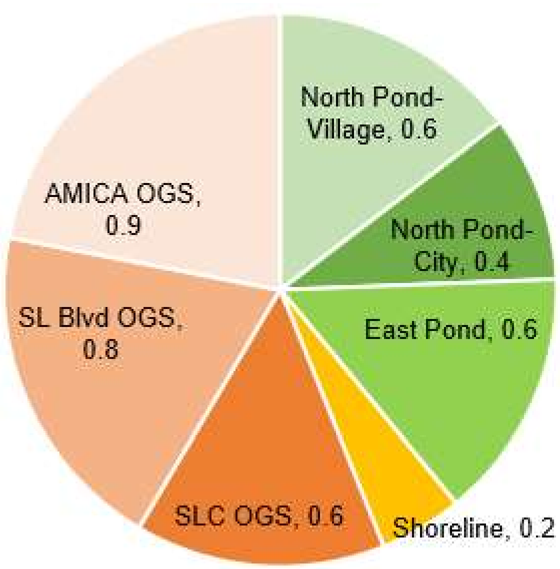
City
130 m roads
900 kg salt/yr

*salt usage from driveways/parkways on the north and AMICA property was estimated.

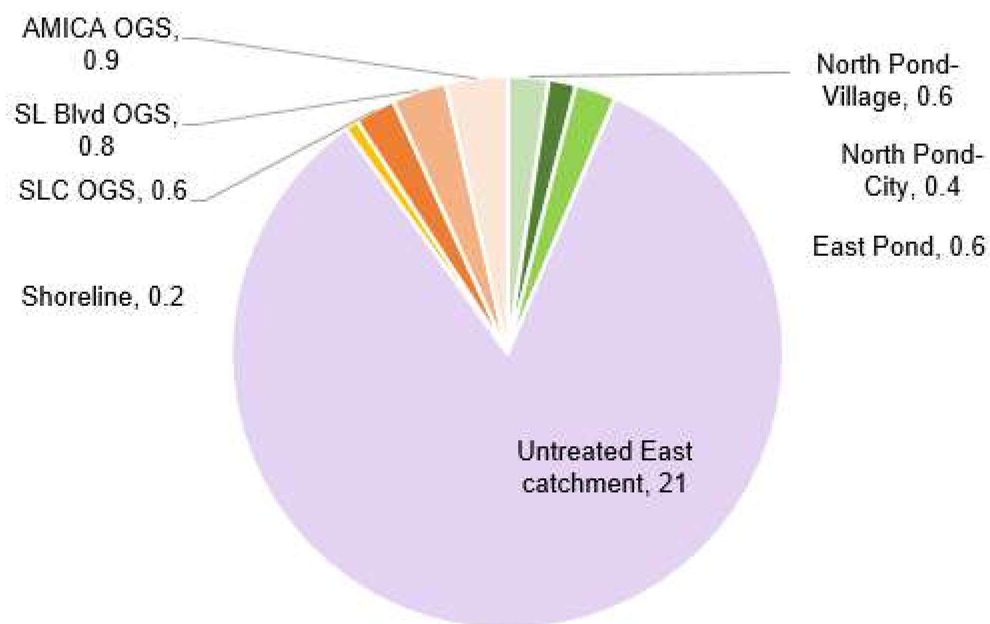
Chloride Budget

- A preliminary chloride budget was developed using available data on chloride concentration and salt usage.

Chloride Input (ton/yr, design drainage)



Chloride Input (ton/yr, blocked inlet)



*the park pathways are not salted; shoreline contribution likely from road runoff

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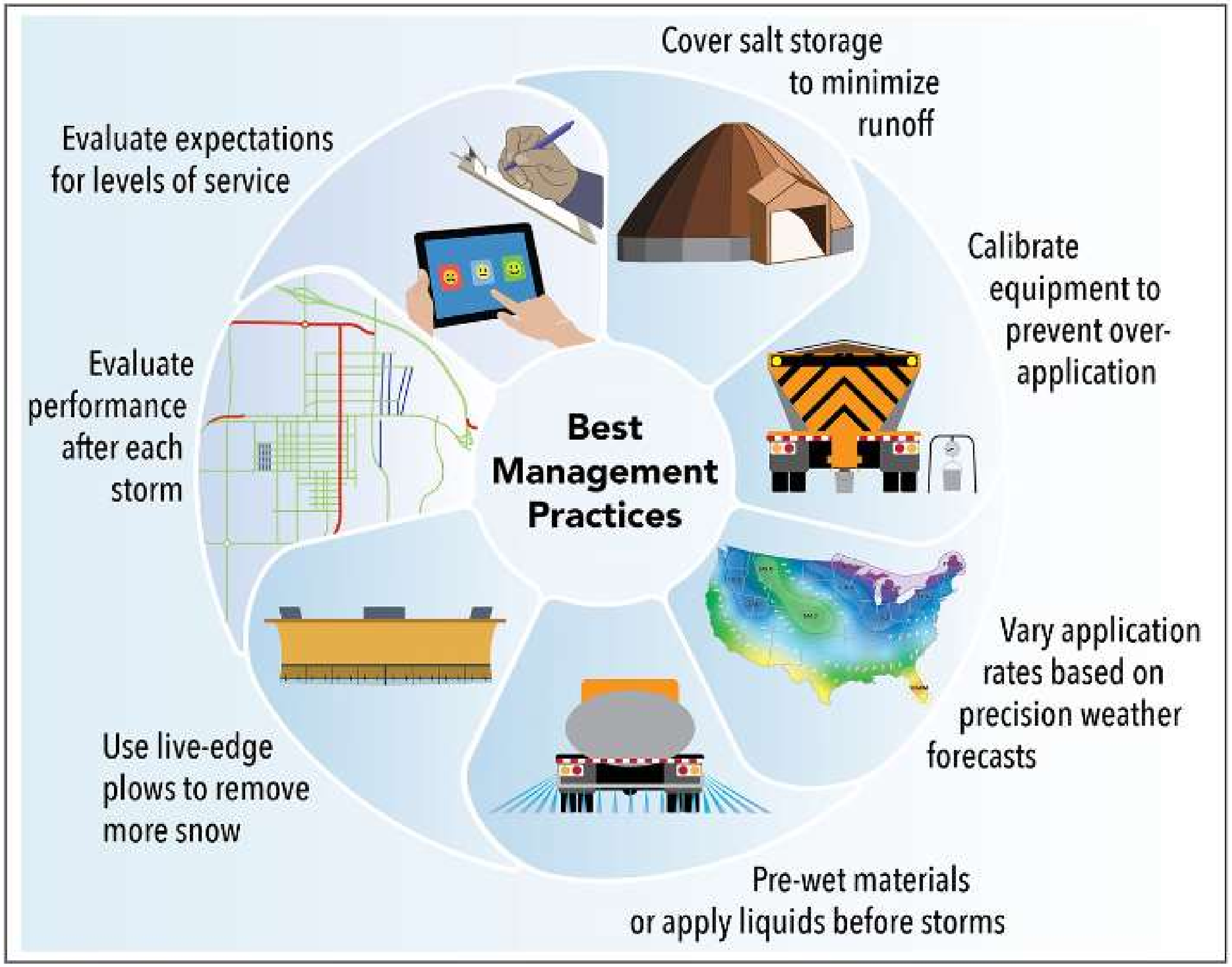
Summary- Water Flow and Chloride

- Highest contribution of chloride from untreated runoff (stopped in 2021) followed by Swan Lake Blvd (initial).
- More data to be collected to confirm findings re contributions, impact of cleared inlet, overall concentration in the Lake
- Other short-term measures:
  - Managing the de-icing material application rate and type (e.g., sand and salt mix or other material instead of rock salt)
  - Calibration of salting equipment and monitoring of salt application rates on different surfaces
  - Confirm contribution of each source, develop targets and educational material promoting winter maintenance BMPs
- Next level (if required):
  - Redirecting chloride-laden snowmelt/ runoff and it away from the Lake (i.e., structural modifications, requires detailed study)

Best Management Practices to Curb the Salinization of Freshwater Ecosystems



Source: https://esajournals.onlinelibrary.wiley.com/doi/epdf/10.1002/fee.2433

Review of Friends of Swan Lake Park "Holistic Approach to Realizing Community Goals"

FOSLP Survey and Interpretation

FOSLP Survey	City's Evaluation
367 residents of the Greensborough area participated in survey completed by FOSLP in February 2021. FOSLP's evaluation states that 'Area residents clearly support a long-term plan that involves investment in sustainable solutions and restoration of the aquatic and land-based habitat'	• The Definition of Community Vision was Premature: conducted before the improvements in 2021 and those planned through the long-term water quality management plan. • Survey population not representative of the City or Ward 5 (Greensborough community, 73% retired). • Costs associated with 'restoration' (i.e. mesotrophic state) not reflected accurately in the survey (shown as \$1.5 - \$2M over 20 years, vs \$12-20M estimated by the City). • Therefore, the definition of 'restoration' as a survey outcome is not valid. • The survey feedback suggested that 86% of respondents use Swan Lake Park primarily for walking. • The community survey identifies a low percentage of all residents having an interest in contact activities such as swimming (12%) and canoeing and kayaking (39%). The percentages are slightly higher in the 'non-retired' population. • More than half of all respondents were interested in more viewing opportunities, while only 13% looked for fishing opportunities.

Vision for Swan Lake Water Quality

FOSLP Proposal	Constraints	City's Goal Statement	City's Plan to Achieve the Goal Statement
Residents Support Environmental 'Restoration' (defined as mesotrophic state) Meets community engagement objectives for lake and park – healthy aquatic and terrestrial habitat • Supports lower-level aquatic life .. • Should reduce dependency on future chemical treatments • Environmental restoration a critical community objective	Mesotrophic Target is not Supported: - According to the City's limnologist, the best achievable outcome of aggressive management for Swan Lake is expected to be borderline meso-eutrophic with respect to phosphorus concentration and hyper-eutrophic for transparency (low due to sediment disturbance in shallow lakes). - Proposed Mesotrophic restoration is not supported	To improve the overall health of Swan Lake, which will provide opportunities for no-contact activities for the enjoyment of the community	• Water quality and shoreline improvement will support a healthier aquatic and terrestrial environment. • Due to the nature of the Lake, chemical treatment will be required in the short term (frequency and dosage adjusted at the end of each Phase).

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Swan Lake Environment and Beneficial Uses

FOSLP Proposal	Constraints	Current Opportunities	Future Opportunities
Restoring the 'Original Community Role' by Supporting Contact Level Activities/ Restoration • When safe, lift current restrictions • Lake not accessible due to health risks • Fishing temporarily banned • Traditional fountain removed • Original recreational plans restricted (canoeing, kayaking, ice hockey etc.)	• Contact level activities will require conformance with E-Coli guidelines and the involvement of Public Health, which are not deemed feasible for Swan Lake.	• The Lake supports a large community of small algae-eating fish (10000 fathead minnow in 2021).	• Once the water quality improves, fish stocking and submerged plants will be introduced. • At that point, the City will revisit the fishing ban advisory (no consumption) and re-installation of the fountain.

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Swan Lake Park Improvement and Uses

FOSLP Proposal	Constraints	Current Opportunities	Future Opportunities
"Natural Spaces Wildlife Places " Park • Destination to help with mental well being • Area for relaxation, exercise, bird watching • Support wildlife education (aquatic and terrestrial) • Children's playground, low impact recreation	• Swan Lake Park is classified as a Community Park. Any park use is subject to provincial gathering limits and permits. • Large portion not developable for proposed active uses. • Park environment improvements consider local conditions not equivalent to other park sites (e.g., Toogood site accommodates cold water fishery, Provincially-significant wetland, Greenbelt designation)	• Trail upgrades in 2021 provide for a safer walking experience • The Park is currently well-used for low impact recreation by all age groups. • Opportunities for wildlife observations (including bird watching) are currently abundant.	• A Park Refresh project is underway to restore the shoreline focusing on removal of invasive species. The second year of the park refresh program is on schedule to be completed in 2022.

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Manipulating Flows and Lake Level

FOSLP Proposal	Constraints	Current Plan	Future Opportunities
Potential to Reduce Stormwater Flows into Markham Village Flood Control Area ; Towards a self-sustaining Swan Lake: • Raise lake level to retain local runoff within the lake • Redirect stormwater from lake to reduce road salt • Retain flood control features of current system • Needs to be validated by technical assessment	The current stormwater management system provides flood protection in the catchment area, and any change may increase flood risk upstream or downstream.	Source control has been determined as the primary means of chloride control in Phase 1.	• Structural change may be considered if other Core and Complementary measures do not achieve the set targets. • An example would be redirecting snowmelt runoff from the Lake. • During Markham Village Project 2 Area design, the role of the Lake and any change in flow patterns can be modelled.

Holistic Approach and Stewardship

FOSLP Proposal	Policy Framework and Improvement Plan	Integration and Stakeholder Engagement
Integrate Markham's Foundation Eco Policies into a Holistic "Eco Park" Strategy for Restoration of Swan Lake 1) Adopt "holistic" Eco Park approach that recognizes improved Community Engagement and Restoration of Swan Lake and Swan Lake Park … 2) Define a process for addressing the missing environmental elements 3) Implement a Stewardship Plan: centralized "holistic" standard that integrates all departmental elements – stormwater management environmental services, park management, park development backed by a long-term undertaking to maintain the standards	• Environmental improvements consider local environmental setting/sensitivities outside OP's Natural Heritage Network. • The 2021 long-term water quality-adaptive approach for setting and achieving targets for the Lake environment for the next 25 years • Improvement of the aquatic habitat • Pond maintenance • Invasive species through shoreline rehabilitation work. • Terrestrial environment: Friends of Rouge Watershed planted 1,000 native wildflowers at Swan Lake Park. • Popular passive recreational uses are supported through trail upgrades • Non-contact uses will expand with quality improvements.	• City departments work closely to maintain and improve the Lake and the Park environment according to the mandate given by the City Council. • Staff will continue to monitor the conditions and consult with the community and stakeholders to adapt the plan accordingly.

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Summary- FOSLP Proposal

Evaluation of FOSLP's Proposal	City's Approach
• Community survey by FOSLP was conducted prior to implementation of ongoing commitments. • Survey represented the Greensborough community and did not include all Ward 5 residents (73% retired). • Survey proposed unattainable water quality conditions and uses. Survey underestimated costs of implementation of 'Restoration' activities. • The survey feedback suggested that 86% of respondents use Swan Lake Park primarily for walking, which is meeting community needs now. • About 40% were interested in canoeing and kayaking, but only 12-13% were looking for fishing or swimming opportunities. • Some of the activities proposed under Vision (e.g., Artists in Park, Cultural Events, and Environmental Camps) are not consistent with the community designation for the Park – amenities / land not available for proposed active park uses.	**Current and Future Opportunities:** ✓ Passive uses of the Park ✓ Improving the health of aquatic and terrestrial habitat ✓ Lake and Park environments are being improved. ✓ A goal for water quality improvement has been defined and community/stakeholder engagement is ongoing. ✓ A long-term water quality improvement plan is approved to support environmental improvements and recreational opportunities, complemented by support of passive recreational uses. **Proposals not supported** : × Mesotrophic target is not supported based on the City's limnologist evaluation. × Manipulating flows and water level are not pursued in Phase 1of the water quality plan. × Reclassification of Swan Lake Park from Community Park to change the intended use.

Recommendations

Recommendations

1. THAT the report entitled "Swan Lake- 2021 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;

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 strategy through the Markham Sub-Committee with the participation of the Friends of Swan Lake Park;

4. AND THAT Staff be authorized and directed to do all things necessary to give effect to this resolution.

Questions?

Report to: Markham Subcommittee Meeting Date: May 11, 2022

SUBJECT: Swan Lake- 2021 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- 2021 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;
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 strategy through the Markham Sub-Committee with the participation of the Friends of Swan Lake Park;
4. 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:

- The 2021 water quality results and evaluation of Core measures implemented in 2021;
- A high-level water flow analysis and chloride budget; and
- A review of the Friends of Swan Lake Park (FOSLP) proposals made under a 'Holistic Approach to Realizing Community Goals'.

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 for the next 25 years.

With help from our consultant, Staff developed this Plan 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. The stakeholder input included propositions made in FOSLP reports and presentations, "A Holistic Approach to Realizing Community Goals" (November 3, 2021) and "Towards Realizing Community Goals for Water Quality" (November 16, 2021), among others.

Link to the November 16 Subcommittee Report and Swan Lake Long-Term Management

Link to November 16 Subcommittee Meeting Minutes

The Swan Lake Long-Term Management Plan followed an adaptive management approach, through which management activities would be adjusted to maximize benefits and minimize impacts. The Plan's phased approach includes the following components:

- Phase 1: Core Measures for the first five years:
- Phase 2: Adapted Core Measures and Complementary Measures for years six to ten:
- Phase 3: Adapted Core Measures with or without Alternative Measures past year ten

On December 7 and 14, 2021, further deputations were brought by FOSLP to the General Committee and the Council, and the following resolutions were passed:

1. That the minutes and notes of the November 16, 2021 Markham Sub-Committee meeting be received for information purposes; and,
2. That the report entitled "Swan Lake Water Quality Management Plan" be received; and,
3. That Staff implement the Plan presented as Option 1 including proposed Core and new Complementary measures beginning in 2023; and,
4. That an additional $2.35M over 25 years be reflected in the 2022 Lifecycle Reserve Update; and,
5. That an additional $10K be added to the 2022 Budget for geese relocation, and fish management at Swan Lake; and,
6. That staff be given discretion to advance three low-cost programs (<$90k) into Phase 1 (initial 5 years), including:
   i) Research into chloride solutions
   ii) Planting submerged plants
   iii) Incorporation of the fish management plan and fish stocking
7. That Staff report back annually on water quality results and evaluation of adapted Core and Complementary measures for consideration in Phase 2 of the strategy through the Markham Sub Committee with the participation of the Friends of Swan Lake Park in today's presentation and other concerns, including high level lake water flow analysis; and,
8. That staff report back to the Markham Sub Committee within the next 6 months (before the end of June) to discuss suggestions in Friends of Swan Lake Park in today's presentation and other concerns that have arisen; and further,
9. That staff be directed to consider longer-term actions to achieve and maintain restoration; and further,
10. That Staff be authorized and directed to do all things necessary to give effect to this resolution.

Link to December 7, General Committee Meeting Minutes

Link December 14 to Council Meeting Minutes

The following Discussion presents 2021 Water Quality Results and High Level Water Flow Analysis to address resolution 7 above. The Discussion also evaluates suggestions by FOSLP and longer–term actions to achieve restoration, specifically the FOSLP “Holistic Approach to Realizing Community Goals”, to address resolutions 8 and 9.

DISCUSSION:

2021 Water Quality Results and Evaluation of Implemented Core Measures

The Phase 1 Core Measures completed in 2021 include:

- Annual monitoring
- Enhanced geese management
- Fish management
- Chemical treatment
- Pond maintenance

Staff collected water quality data through the Swan Lake monitoring program from January to November 2021. 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).

Contractors completed Geese management by chasing geese with border collies, oiling eggs and managing nests, and by relocation of geese in the spring. Hazing frequency was modified from previous years to focus on the migration seasons. The increased hazing frequency (starting on September 1) effectively reduced the number of geese present at different times of the day to about 50% of the geese numbers in 2020.

A fish inventory and removal campaign was 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. Of these, only Fathead Minnow was found in abundant numbers and this main fish species was left in Swan Lake.

In August 2021, chemical treatment was completed during which 13 tonnes of Poly Aluminum Chloride (PAC) were applied to the Lake in a controlled manner over several days.

The management activities in 2021 focused on the significant nutrient loadings identified in the Long-Term Plan (i.e., PAC treatment to reduce internal loads from the lake bottom and geese management to reduce external loads). These activities effectively improved water quality in the Lake and represent a positive step toward improving the aquatic habitat and meeting the long-term water quality goals.

Based on the measured Secchi desk transparency and nutrient concentrations in 2021, Swan Lake is classified at a low-eutrophic condition post-treatment. Monitoring in 2022 (the first complete post-treatment year) will provide more conclusive information about the efficacy of PAC treatment and other implemented Core measures.

In December 2021, at the City’s request, Daniels Group cleared the northern inlet to the East Pond. This inlet was blocked for a few years, releasing untreated runoff to the Lake.

High Level Water Flow Analysis and Chloride Budget

In 2019, the City developed a PCSWMM model (which is an advanced modeling software for stormwater systems) to estimate the volume of water flowing through different catchments, in the pipes and overland to various stormwater controls and eventually to the Lake. The model has been refined since it was first developed to reflect the site conditions more accurately.

The intended use of the PCSWMM model was to develop a high-level estimate of the various catchment contributions to the total runoff into Swan Lake. The model has not been calibrated with flow monitoring data, as this information was not available for the simulation period. Thus, the runoff output from the current model represents a high-level simulated runoff estimate, which is adequate for approximating concentration inputs to the Lake. This model is not intended to analyze the impact of flow diversion on peak flows downstream or upstream of the Lake.

The model was run continuously for the period since 2009, and monthly results were used in the analysis of nutrient loads (in the Long-Term Plan). It is also being used to estimate chloride loads from different catchment areas (see Attachment B).

Chloride concentrations have been increasing in urban lakes due to de-icer application for winter maintenance of roads and walkways. Chloride does not biodegrade, readily precipitate, volatilize, or bioaccumulate. It does not adsorb readily onto mineral surfaces, and therefore when introduced, concentrations remain high in surface water.

In Swan Lake, average chloride concentrations have increased over the years to values above applicable guidelines for the protection of aquatic life. In response, the City has started collecting runoff samples and salt usage data (from the City's Road department and the Swan Lake Village/AMICA management). These data are used to quantify chloride loads and determine the relative contribution of each catchment area to identify the most efficient strategy for reducing chloride loading to the Lake.

The analysis found that chloride loading from the untreated runoff from the East Pond catchment (caused by a blocked inlet) was the main contributor to the Lake concentrations. The blocked inlet was cleared in December 2021, and it is expected that chloride concentrations in the Lake will gradually decrease through the replacement of Lake water with cleaner runoff.

Based on concentrations measured in front of the outfall to the Lake, Swan Lake Blvd. may have a high chloride contribution. This load may also contribute to locally-high readings at the Dock sampling station relative to the overall Lake conditions (allowing the Lake to support a large community of minnows). These theories will need to be confirmed with more samples, as well as the monitoring of salt application rates on the boulevard.

Consistent with the recommendations of the Swan Lake Long-Term Management Plan, it is recommended to collect more data (chloride concentrations, salt usage data, fish population) and explore measures to reduce chloride load before investing in costly investigations of structural changes required to adjust the existing water flow patterns, e.g., through diversions.

Review of FOSLP Holistic Approach

On November 3, 2021, the Friends of Swan Lake Park provided a presentation to the City entitled "A Holistic Approach to Realizing Community Goals". This presentation was later expanded and presented to the Markham Subcommittee on November 16, 2021, titled "Towards Realizing Community Goals for Water Quality". The presentation includes suggested longer-term actions to achieve and maintain restoration of the park and lake, including expanded uses.

Staff responded to FOSLP regarding these presentations in a memo on March 3, 2022 (See Attachment C). As noted in the March 2022 memo, many of the suggested ideas and measures proposed in the FOSLP presentations are being advanced under the City's approved and ongoing activities, including:

- Passive uses of the Park
- Improving the health of the aquatic and terrestrial habitat
- Improving Lake and Park environments
- Definition of a goal for water quality improvement
- Community/stakeholder engagement
- A long-term water quality improvement plan to support environmental improvements and recreational opportunities

Some ideas and measures in the FOSLP proposal are not supported by staff, including:

- Mesotrophic target
- Manipulating flows and water level

The ideas in the FOSLP proposal have been put forward to achieve goals defined based on a community survey conducted by FOLSP in February 2021. However, this definition of a community vision was considered by Staff to be premature and had several limitations, as the community survey:

- did not represent all Ward 5 residents, nor all demographics;
- was conducted prior to the implementation of ongoing commitments;
- proposed unattainable water quality conditions such as a 'mesotrophic' condition that is not supported based on the City's limnologist evaluation;
- underestimated the costs of implementation of 'Restoration' activities.

With respect to activities in the Park, the survey suggested that most respondents use Swan Lake Park primarily for walking which is meeting community needs today. Some of the activities proposed (e.g., Artists in Park, Cultural Events, and Environmental Camps) will require amenities not available in the Park (e.g., parking spaces, washrooms) and are inconsistent with uses within designated Community Parks and available development space for active uses. Other ideas, such as assessing habitat and identifying actions for "other wildlife" are more appropriate within the City's designated Natural Heritage Network (excludes Swan Lake Park).

Based on this review of the FOSLP proposal, and given that suggested ideas and measures with technical merit are currently being advanced, it is recommended that Staff continue to implement the Long-term Management Plan for Swan Lake approved by Council in December 2021 and report back annually on water quality results, including the evaluation of adapted Core and Complementary measures for consideration in Phase 2 of the strategy through the Markham Sub-Committee with the participation of the Friends of Swan Lake Park.

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- 2021 Water Quality Report

Attachment B- High Level Water Flow Analysis

Attachment C- Markham Review of FOSLP Holistic Approach

ATTACHMENT A- 2021 WATER QUALITY REPORT

ATTACHMENT B- HIGH LEVEL WATER FLOW ANALYSIS

ATTACHMENT C- MARKHAM REVIEW OF FOSLP HOLISTIC APPROACH

Swan Lake Water Quality Monitoring 2021 Annual Report

March 2022

Project Number: 21163

MARKHAM

Environmental Services

Prepared By:

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Manager, Stormwater

Executive Summary

Background

Swan Lake is situated in the City of Markham at the intersection of Sixteenth Avenue and Williamson Road. Swan Lake has an approximate area of 5.5 ha and a maximum water depth of 4.5 m. A gravel pit in the 1960s and 1970s, Swan Lake is currently a community feature with multiple trails and urban development surrounding it.

Several issues were discovered with Swan Lake in 2010, including high phosphorus levels and significant algal blooms during the summer months, which led to low oxygen levels and degraded fish habitats. A Phoslock treatment was administered in 2013 to reduce the phosphorus levels and algal blooms in Swan Lake.

In 2019, the City of Markham conducted a study to define a water quality management strategy for Swan Lake. The strategy which was finalized in July 2020 recommended a chemical treatment in 2021.

In August 2021, 13 tonnes of Poly Aluminum Chloride (PAC) were applied to the Lake in a controlled manner over several days.

A long-term Management Plan was received by the Markham Sub Committee in November 2021 and approved by the Council in December 2021, including provisions for chemical treatment every three years.

Water quality monitoring of Swan Lake has been conducted almost annually since the first treatment in 2013 in order to track water quality and the continued effectiveness of the treatment. The collected data presented in this report is part of the ongoing monitoring program that will allow for continuous assessment of the water quality in Swan Lake and will be used to implement and adapt the long-term management plan for Swan Lake.

This report discusses observations at the three monitored stations throughout 2021. A separate report evaluates the impact of the 2021 chemical treatment on water quality in Swan Lake.

Results

Water quality is regularly monitored at two shoreline sites; the Dock, and the Bridge. Water quality is monitored bi-weekly throughout the summer (May-September) and monthly in the spring (April) and fall (October-November). Samples and measurements are taken at 0.5 m increments for the depth of the lake. A level logger is used to record the water level in the Lake.

Additional testing completed in 2021 included:

- Pre-treatment (January and March) and post-treatment (September to November) monitoring at the deepest part of the Lake (Central station)
- Monitoring of different treatment zones during treatment (August)

The following paragraphs provide the monitoring results for the 2021 monitoring period, as well as annual summaries of available data from 2011 to 2021. The respective figures include plots of measured dissolved oxygen (DO), water clarity, phosphorus concentration, chloride concentration, geese count, and algae.

Phosphorus concentration and water clarity were compared to the eutrophication thresholds, and/or the interim targets developed for Swan Lake through the 2019 water quality improvement study. For DO and chloride, Federal and/or Provincial water quality Guidelines or Objectives are shown for perspective. It should be noted that Swan Lake is not a natural waterbody, and there is no requirement for it to comply with these limits. Where technically and economically feasible, the City will aim to meet these limits to protect and enhance the aquatic environment.

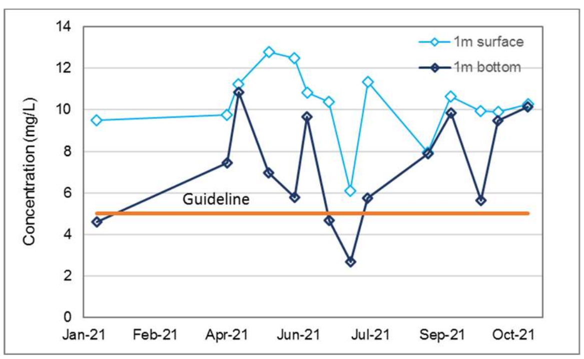
Dissolved Oxygen (DO), Temperature and pH

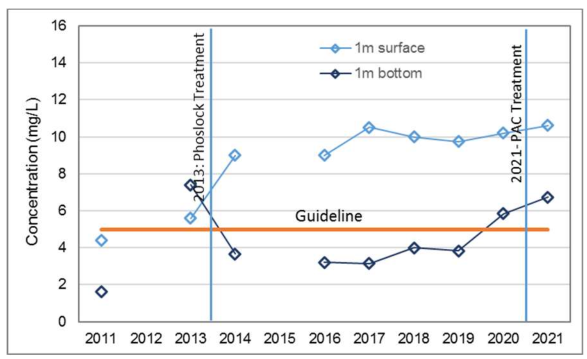
The minimum dissolved oxygen concentration required for the protection of warm water fish is 5 mg/L for water temperatures up to 20 °C and 4 mg/L for temperatures above 20 °C. DO concentrations for the 1m from the surface, and 1m from the bottom layers are shown below. Measured surface concentrations were above the DO guideline throughout 2021. DO concentration at 2 m increased significantly in August, but remained low at 2.5 m.

During the summer, the Lake was stratified with occasional mixing (resulting in similar surface and deep water concentrations). In the fall, the layers were mixed and similar concentrations were observed over depth.

When stratified, bottom concentrations were below the DO guideline thresholds. Lower concentrations could have lethal or sub-lethal (physiological and behavioral) effects on fish. However, some fish can acclimate to lower oxygen levels and survive concentrations between 1 and 3 mg/L, and oxygen levels nearer to the surface remained above the minimum guideline.

Figure ES-2: 2021 Monitoring Results and 2011-2021 Annual Results- Dissolved Oxygen





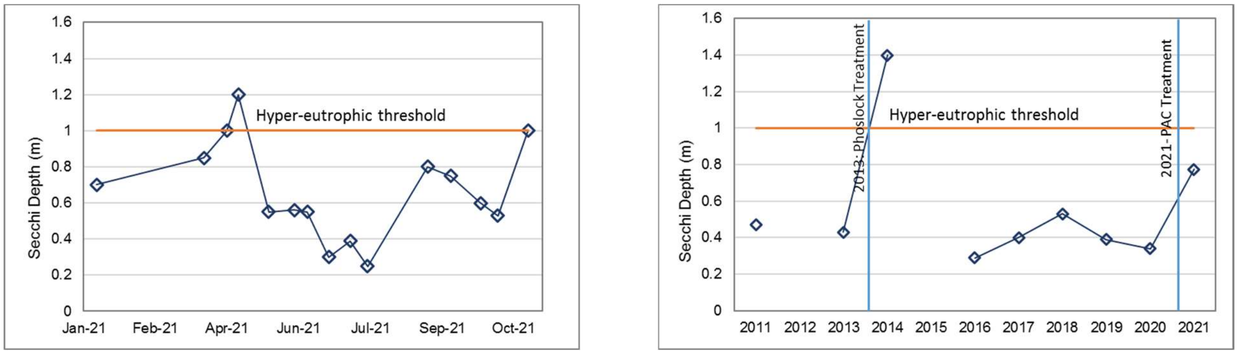
Note 1: DO concentrations are shown at 1 m from the surface and 1 m from bottom.
Note 2: Histotical data are shown for the average growing period.

pH measured at the lab ranged from 7.9 to 8.5 before the chemical treatment and 7.4 to 8.2 following the treatment.

Water Clarity (Secchi Depth)

Secchi depth represents water clarity, which declines when algae level increases. In the trophic state classification scheme, growing period average water clarity of under 1 m is the threshold for a hyper-eutrophic condition. In 2021, water clarity was under 0.5 m at the beginning of June, but increased to up to 1.2 m in August following chemical treatment..

Figure ES-3: 2021 Monitoring Results and 2011-2021 Annual Results- Secchi Depth

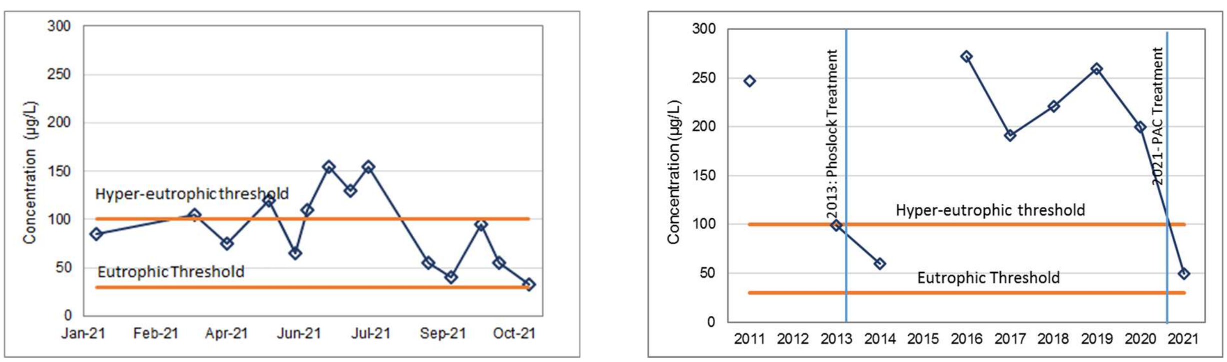


Phosphorus and Nitrogen Concentrations

Phosphorus concentration is the most important indicator of trophic state in Swan Lake. It is an indication of how prone the Lake is to algae growth.

Phosphorus concentrations above 100 µg/L represent a hyper-eutrophic condition, which entails high nutrient concentrations leading to high algae concentrations. Total phosphorus concentration in the top 1 m depth averaged at above 100 µg/L before the chemical treatment (March-July). The concentrations over the growing season (June-July) averaged about 140 µg/L (above the 100 µg/L threshold for a hyper-eutrophic condition) before dropping to about 50 µg/L after treatment.

Figure ES-1: 2021 Monitoring Results and 2011-2021 Annual Results- Total Phosphorus



Note 1: The 2021 values are averages of samples collected at 0.5 and 1.5 m from surface (1.5 m values are missing for mid-May to m0d-July).
Note 2: Annual concentrations are summaries of the growing period.
Note 3: The interim target shown is based on the water quality improvement strategy report (July 2020), and applies to the average over two consecutive years.

Total nitrogen concentrations over the growing season averaged about 2.39 mg/L before the chemical treatment to about 1.0 mg/L after treatment (below the 1.2 mg/L threshold for a hyper-eutrophic condition). In 2021, ammonia and nitrate concentrations (the forms available for uptake by biota) were generally very low, and nitrogen was mainly present as organic matter.

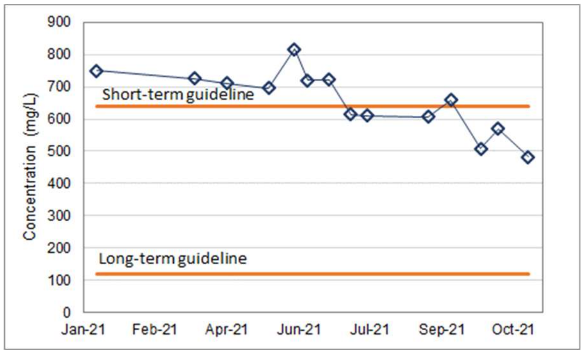
Chloride Concentration

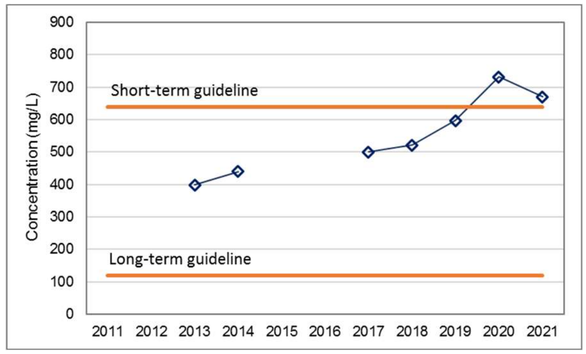
Chloride concentration has been increasing in urban lakes as a result of de-icer application for winter maintenance of roads and walkways. Chloride does not biodegrade, readily precipitate, volatilize, or bioaccumulate. It does not adsorb readily onto mineral surfaces and therefore when introduced, concentrations remain high in surface water.

Chloride guidelines developed for generic environmental data include a long-term guideline (120 mg/L) and a short-term guideline (640 mg/L). The long-term guideline has been developed to protect all organisms (present in Canadian aquatic systems) against negative effects during chronic indefinite exposure. The short-term guideline aims to protect most species against lethality during a sudden hike in chloride concentration for an acute short period (24-96 hrs). These guidelines may be over-protective for areas with an elevated concentration of chloride and associated adapted ecological community. For such circumstances, it has been suggested that site-specific (higher) targets be derived considering local conditions such as water chemistry, background concentrations, and aquatic community structure.

Chloride concentrations have been increasing in Swan Lake over the past few years, and the long-term management plan for the Lake discusses practical approaches to manage this increase.

Figure ES-4: 2021 Monitoring Results and 2011-2021 Annual Results- Chloride





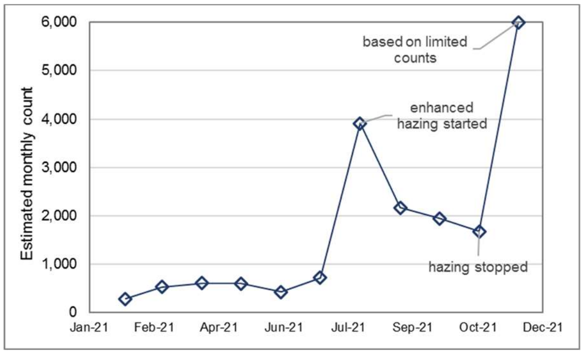
Geese Count

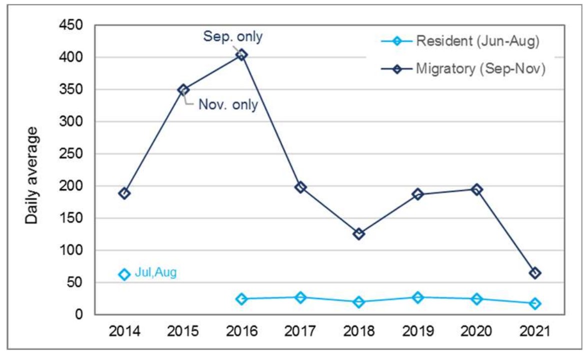
Geese are the primary external source of nutrients in the Lake. Therefore, active geese management is completed annually. The geese control program started in 2014, focusing on resident geese. The program extended to the management of migratory geese in 2016.

The 2021 program included an expanded hazing program starting in September, nest management and geese relocation, the installation of nine strobe lights on the Lake and adjacent stormwater ponds, and a volunteer-based geese count program.

In 2021, there was a significant decrease in the count of migratory geese as a result of increased hazing efforts. The strobe lights did not have any noticeable impact on the counts. The volunteer geese count effort resulted in the collection of a significant amount of data, which helps provide more certainty in the results, and was used to better time hazing efforts.

Figure ES-5: 2021 Monitoring Results and 2011-2021 Annual Results- Geese Count





Note 1: 2021 data are the sum of counts in each month, compensated for days with no count.
Note 2: Annual data are daily averages of counts over June-August and September to November, representing resident and migratory geese, respectively.

Algal Blooms and Cyanobacteria

In 2021, surface scums were observed along the shoreline around the Dock, as well as in the northern bay at the Bridge site.

Samples were collected before and after chemical treatment in 2021 and sent to the laboratory for phytoplankton and cyanobacteria. Test results are discussed in a report on chemical treatment evaluation.

Several algal blooms with potentially toxic cyanobacteria were observed in years before 2011; however, testing completed before 2011 and following treatment (2013-2016) did not detect any Microcystin in the water. In 2016, a bloom was tested and resulted in a Microcystin concentration of 73 µg/L. Extended blooms were observed at several sites in 2018; however, cell density was at half of WHO's threshold for significantly increased human health risk. These results suggest that in most years, toxin-producing cyanobacteria are not the dominant form of phytoplankton present in Swan Lake.

Summary and Recommendations

Based on the measured Secchi desk transparency and nutrient concentrations, Swan Lake was classified as low eutrophic in the post-treatment period in 2021.

In 2019, the City initiated a study to define a water quality management strategy for Swan Lake. The strategy was finalized in July 2020. The strategy which was finalized in July 2020 recommended a chemical treatment in 2021. In August 2021, 13 tonnes of Poly Aluminum Chloride (PAC) were applied to the Lake in a controlled manner over several days. A long-term Management Plan was received by Markham Sub Committee in November 2021 and approved by the Council in December 2021, including provisions for chemical treatment every three years, and enhanced geese management.

The 2022 monitoring program will follow the recommendation of the long-term water quality management report and will include the annual monitoring program, as well as enhanced monitoring to determine the effectiveness of the proposed chemical application.

Overall, the management activities in 2021 that focused on the significant nutrient loadings identified in the water quality management plan (i.e., PAC treatment to reduce internal loads and geese management to reduce external loads), was effective at improving water quality in the lake as shown in reduce phosphorus concentrations and improved water clarity and dissolved oxygen levels. These improvements represent a positive step towards improving aquatic habitat in the lake and meeting the long-term water quality goals.

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Appendices

Tables

Figures

1. Introduction

Swan Lake is situated in the City of Markham at the intersection of Sixteenth Avenue and Williamson Road, as shown below in Figure 1. Swan Lake has an approximate area of 5.5 ha and a maximum water depth of 4.5 m (from the deepest point to the Lake edges). Formerly a gravel pit in the 1960s and 1970s, Swan Lake is currently a community feature with multiple trails and urban development surrounding it.

Several issues were discovered with Swan Lake in 2010, including high phosphorus levels and significant algal blooms during the summer months, which led to low oxygen levels and degraded fish habitats. A Phoslock treatment was administered in 2013 to reduce the phosphorus levels and algal blooms in Swan Lake.

In 2019, the City of Markham conducted a study to define a water quality management strategy for Swan Lake. The strategy which was finalized in July 2020 recommended chemical treatment starting in 2021. In August 2021, 13 tonnes of Poly Aluminum Chloride (PAC) were applied to the Lake in a controlled manner over several days.

A long-term Management Plan was received by Markham Sub Committee in November 2021 and approved by the Council in December 2021, including provisions for chemical treatment every three years.

Water quality monitoring of Swan Lake has been conducted annually since treatment in 2013 in order to track water quality and the continued effectiveness of the Phoslock. The 2021 monitoring results presented in this report are part of the ongoing monitoring program that will allow for continuous assessment of the water quality in Swan Lake and will help establish a long-term plan for the treatment of Swan Lake.

Figure 1: Swan Lake Location and Monitoring Stations

2. Water Quality

2.1 Monitoring Program

2.1.1 Locations

Water quality was monitored at two shoreline sites, the Dock, and the Bridge, and at the deepest part of the Lake, the Central station, as shown in Figure 1. The water depth at the dock is approximately 2.5-3 meters, which allows it to represent Swan Lake as a whole. The water depth at the bridge is about 0.5 meters deep, and it is used to represent the conditions of the shallow bays around Swan Lake. Field testing and sampling for laboratory analysis were completed at both sites to ensure the water conditions at Swan Lake were properly represented.

During the bi-weekly monitoring, samples and measurements were taken at 0.5 m increments for the depth of the lake. The dock site was the deeper of the two sites, allowing for sampling and monitoring from 0.5 – 2.5 m, whereas the bridge site was shallow and sampling was typically only achievable under the surface, slightly above the bottom of the Lake to avoid sediment contamination.

The horizontal sampler was damaged in mid-May and until a replacement was obtained in mid-July, surface water samples were collected using a bucket at both sites.

When water level dropped to around 2 m, samples were not collected from the 2.5 m depth at the Dock station.

2.1.2 Duration and Frequency

In 2021, water quality was monitored bi-weekly throughout the summer (May-September) and monthly in the spring (April) and fall (October-November).

Additional testing completed in 2021 included:

- Pre-treatment (January and March) and post-treatment (September to November) monitoring at the deepest part of the Lake
- Monitoring of different treatment zones during treatment (August)

A total of 24 sampling events were completed.

2.1.3 Parameters and Methodology

Vertical water quality profiling, water transparency readings (Secchi depth), and photographic documentation were performed during each site visit.

Field testing was done utilizing an YSI ProODO meter to determine the temperature and dissolved oxygen (DO) at each sampling interval over the vertical profile of the lake. To ensure accurate readings, the meter and probe were stored in a proper carrying bag and regularly calibrated as instructed in the handheld quick-start guide.

Water transparency was measured as part of the field testing at both the dock and bridge monitoring sites. Transparency was measured using a Secchi disk by lowering it into the water while rotating the handle until the black and white pattern of the Secchi disk was no longer visible. The water depth read from the Secchi disk was then recorded as the transparency (i.e., water clarity) depth.

Water samples for laboratory testing were taken using a horizontal water sampler at different depths. Parameters analyzed at various stations and times included:

- Nutrients including total and ortho phosphorus, ammonia, nitrate, Total Kjeldahl Nitrogen (TKN)
- Chloride, color, Dissolved Organic Carbon (DOC), pH
- Alkalinity, aluminum, calcium, iron, magnesium, sulphate
- Chlorophyll a

Observations of Swan Lake were noted, and photographs were taken during each monitoring/inspection site visit. Photographs provide a way to record the condition of vegetation and algae around Swan Lake. Completed inspection forms can be found in Appendix A. All photographs from the 2021 monitoring period are provided in Appendix B.

2.1.4 Targets and Thresholds

The 2019 water quality improvement study proposed a set of interim targets for Swan Lake to be used as triggers for management actions if the triggers are tripped in two consecutive years. Numerical values were defined for total phosphorus (100 µg/L) and Secchi depth (0.45 m).

Generic thresholds for hyper-eutrophic conditions in the lakes are provided in Table 1.

Table 1: Eutrophic State Classification

Parameter	Eutrophic Condition	Hyper-eutrophic Condition
Secchi Depth (m)	1-2.1	<1
Total Phosphorus (µg/L)	31-100	100
Total Nitrogen (mg/L)	0.65-1.20	>1.20

For DO and chloride, Federal and/or Provincial water quality Guidelines[1] or Objectives[2] were considered for perspective. It should be noted that Swan Lake is not a natural waterbody, and there is no requirement for it to comply with these limits. Where technically and economically feasible, the City will aim to meet these limits to protect and enhance the aquatic environment.

The minimum dissolved oxygen concentration required for the protection of warm water fish is 5 mg/L for water temperatures up to 20 °C and 4 mg/L for temperatures above 20 °C. Lower concentrations could have lethal or sub-lethal (physiological and behavioral) effects on fish. However, some fish can acclimate to lower oxygen levels and survive concentrations between 1 and 3 mg/L.

Chloride guidelines developed based on generic environmental data include a long-term guideline (120 mg/L) and a short-term guideline (640 mg/L). The long-term guideline has been developed to protect all organisms (present in Canadian aquatic systems) against negative effects during indefinite exposure. The short-term guideline will protect most species against lethality during a sudden hike in chloride concentration for a short period (24-96 hrs). These guidelines may be over-protective for areas with an elevated concentration of chloride and associated adapted ecological community. For such circumstances, it has been suggested that site-specific (higher) targets be derived considering local conditions such as water chemistry, background concentrations, and aquatic community structure.

Total and dissolve aluminum were monitored this year to determine any impact of PAC application on aluminum concentration in Lake water.

For Cyanotoxins, the Health Canada guideline for recreational activities is 20 µg/L[3].

[1] Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Aquatic Life (http://ceqg-rcqe.ccme.ca/en/index.html)
[2] Ontario Provincial Water Quality Objectives or PWQO (https://www.ontario.ca/page/water-management-policies-guidelines-provincial-water-quality-objectives#section-13)
[3] Health Canada, 2012. Guidelines for Canadian Recreational Water Quality, Third Edition. Water, Air and Climate Change Bureau, Healthy Environments and Consumer Safety Branch, Ottawa, Ontario.

2.2 2021 Water Quality Results

The following sections discuss observations at the three monitored stations (Dock, Bridge, and Central) throughout 2021. A separate report evaluates the impact of the 2021 chemical treatment on water quality in Swan Lake.

2.2.1 Dissolved Oxygen and Temperature

Table 2 provides the measured DO profile over the 2021 monitoring period.

At the Dock station, surface concentrations were above 5 mg/L throughout 2021. Below 2 m depth, the DO was under 2 m/L in most of the sampling events from late May through July, indicating anoxic conditions. DO concentration at 2 m increase significantly in August, but remained low at 2.5 m. All but one measurements at the Bridge indicated a DO concentration of above 2 mg/L, with most being above or close to 4 mg/L.

Table 3 provides the measured temperature profile in 2021, indicating warm water throughout the depth in the summer months.

Profiles of temperature and dissolved oxygen (see Figure 2) indicate that Swan Lake is thermally stratified during May and July despite its shallow depth. The separation of water layers is evident during the summer months as DO decreases very drastically as water depth increases.

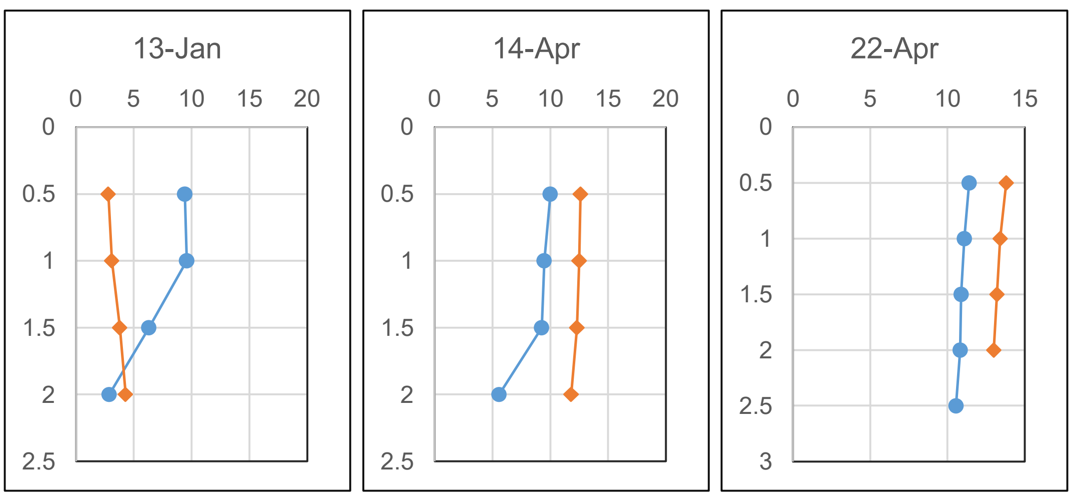
Table 2: Measured DO Profile (mg/L)

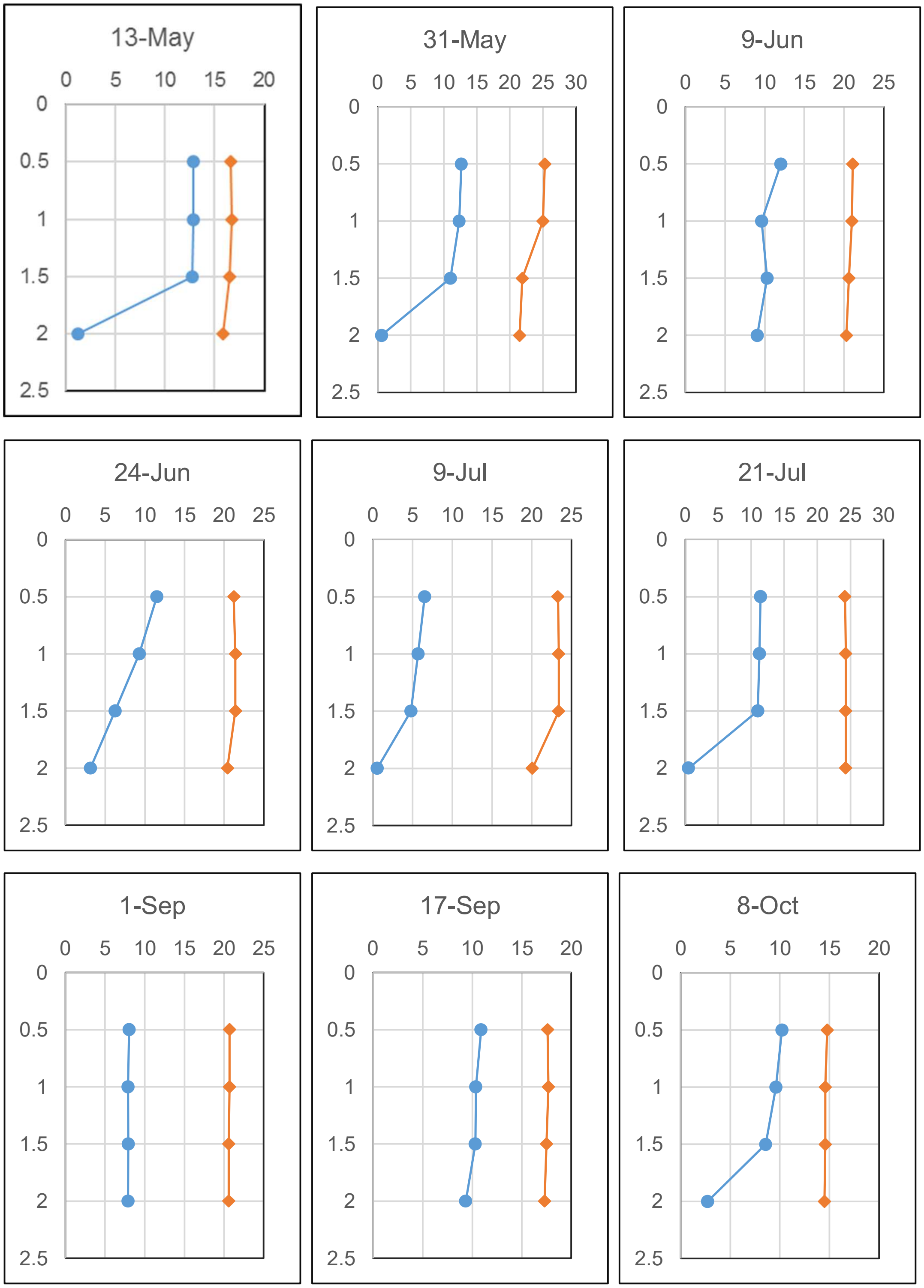
	Bridge	Dock				Central			
	Depth (m)	Depth (m)				Depth (m)			
Date	0.5	0.5	1	1.5	2	0.5	1.5	2.5	3
1/13/2021	-	9.4	9.6	6.3	2.9	-	-	-	-
3/29/2021	-	-	-	-	-	11.0	11.4	11.0	-
4/14/2021	8.5	10.0	9.5	9.3	5.6	-	-	-	-
4/22/2021	-	11.4	11.1	10.9	10.8	-	-	-	-
5/13/2021	9.8	12.8	12.8	12.7	1.3	-	-	-	-
5/31/2021	7.6	12.6	12.3	11.0	0.6	-	-	-	-
6/9/2021	1.8	12.0	9.6	10.3	9.0	-	-	-	-
6/24/2021	3.7	11.5	9.3	6.2	3.1	-	-	-	-
7/9/2021	2.3	6.5	5.7	4.8	0.6	-	-	-	-
7/21/2021	5.3	11.4	11.3	11.0	0.5	-	-	-	-
8/23/2021	-	-	-	-	-	6.3	7.3	1.9	1.0
9/1/2021	3.1	8.0	7.9	7.9	7.9	-	-	-	-
9/7/2021	-	-	-	-	-	10.4	9.2	1.3	-
9/17/2021	5.0	10.9	10.4	10.3	9.4	-	-	-	-
9/29/2021	-	-	-	-	-	7.8	8.3	7.5	-
10/8/2021	3.7	10.2	9.6	8.6	2.7	-	-	-	-
10/14/2021	-	-	-	-	-	10.8	9.2	0.1	-
10/20/2021	5.9	10.0	9.8	9.7	9.3	-	-	-	-
10/28/2021	-	-	-	-	-	10.3	9.8	4.2	-
11/10/2021	8.3	10.3	10.2	10.1	10.2	-	-	-	-

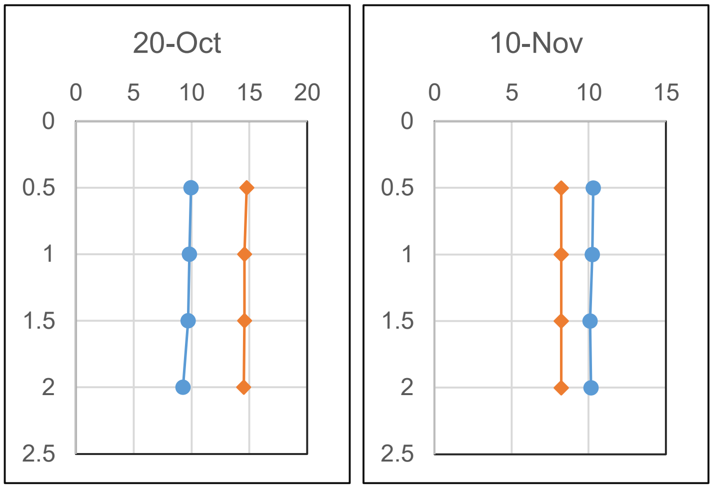
Table 3: Measured Temperature Profile (°C)

Date	Bridge	Dock				Central			
	Depth (m)	Depth (m)				Depth (m)			
	0.5	0.5	1	1.5	2	0.5	1.5	2.5	3
1/13/2021	-	2.8	3.1	3.8	4.3	-	-	-	-
3/29/2021	-	-	-	-	-	8.2	8.3	8.0	-
4/14/2021	14.0	12.6	12.5	12.3	11.8	-	-	-	-
4/22/2021	-	9.1	9.1	9.1	9.1	-	-	-	-
5/13/2021	13.2	13.8	13.4	13.2	13.0	-	-	-	-
5/31/2021	15.2	16.6	16.7	16.5	15.8	-	-	-	-
6/9/2021	24.5	25.3	25.0	21.9	21.5	-	-	-	-
6/24/2021	19.8	21.1	21.0	20.6	20.3	-	-	-	-
7/9/2021	20.0	21.2	21.4	21.4	20.4	-	-	-	-
7/21/2021	22.5	23.3	23.4	23.4	20.1	-	-	-	-
8/23/2021	-	-	-	-	-	27.7	-	22.3	23.4
9/1/2021	21.9	24.2	24.3	24.3	24.3	-	-	-	-
9/7/2021	-	-	-	-	-	22.0	21.4	21.1	-
9/17/2021	19.6	20.7	20.7	20.6	20.6	-	-	-	-
9/29/2021	-	-	-	-	-	18.3	18.2	17.2	-
10/8/2021	17.2	17.6	17.7	17.5	17.3	-	-	-	-
10/14/2021	-	-	-	-	-	19.2	18.7	17.3	-
10/20/2021	13.6	14.8	14.6	14.6	14.5	-	-	-	-
10/28/2021	-	-	-	-	-	10.8	10.8	11.2	-
11/10/2021	8.2	8.2	8.2	8.2	8.2	-	-	-	-

Figure 2: Temperature (orange) and DO (blue) Profile at the Dock Station

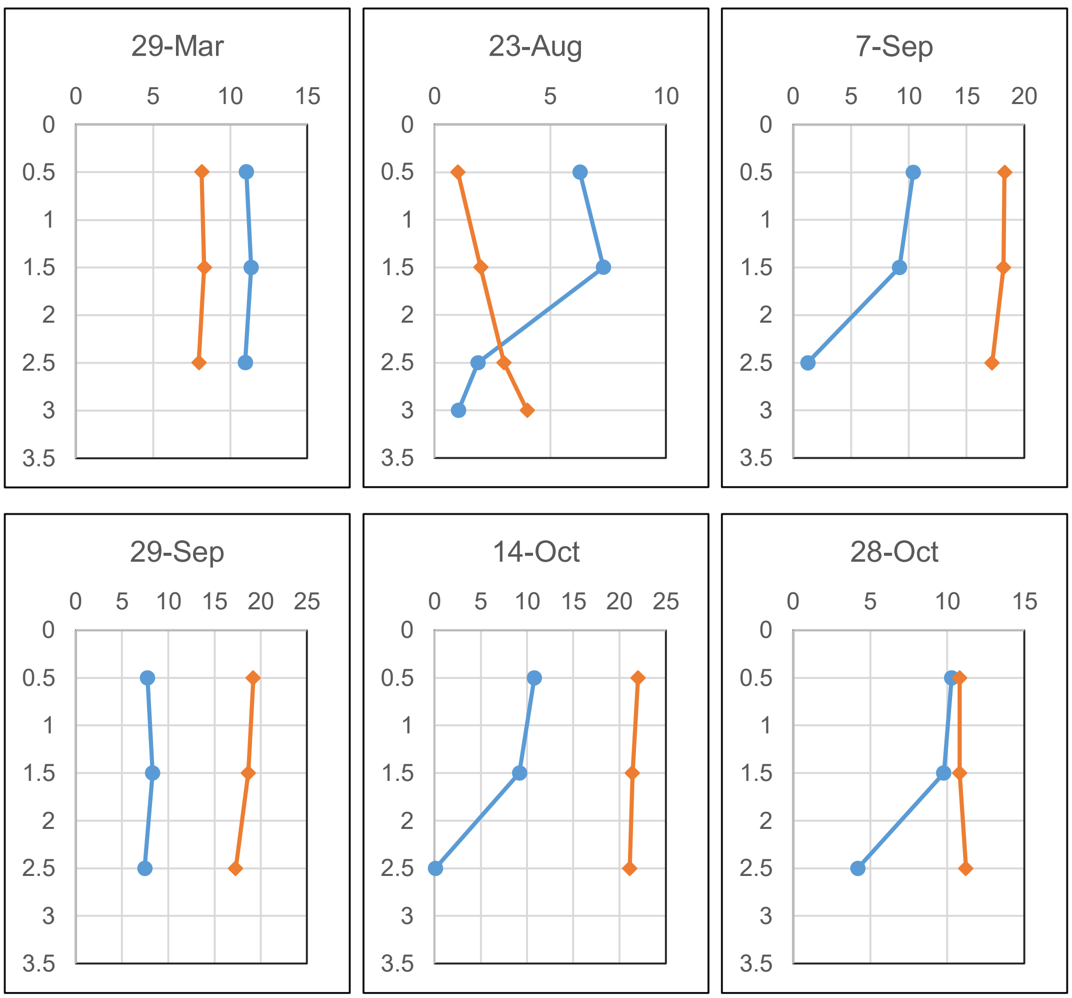



13-May
0 5 10 15 20
0 0.5 1 1.5 2 2.5
31-May
0 5 10 15 20 25 30
0 0.5 1 1.5 2 2.5
9-Jun
0 5 10 15 20 25
0 0.5 1 1.5 2 2.5
24-Jun
0 5 10 15 20 25
0 0.5 1 1.5 2 2.5
9-Jul
0 5 10 15 20 25
0 0.5 1 1.5 2 2.5
21-Jul
0 5 10 15 20 25 30
0 0.5 1 1.5 2 2.5
1-Sep
0 5 10 15 20 25
0 0.5 1 1.5 2 2.5
17-Sep
0 5 10 15 20
0 0.5 1 1.5 2 2.5
8-Oct
0 5 10 15 20
0 0.5 1 1.5 2 2.5



Note: The vertical axis shows depth (m), while the horizontal axis represents both Temperature (°C) and DO (mg/L).

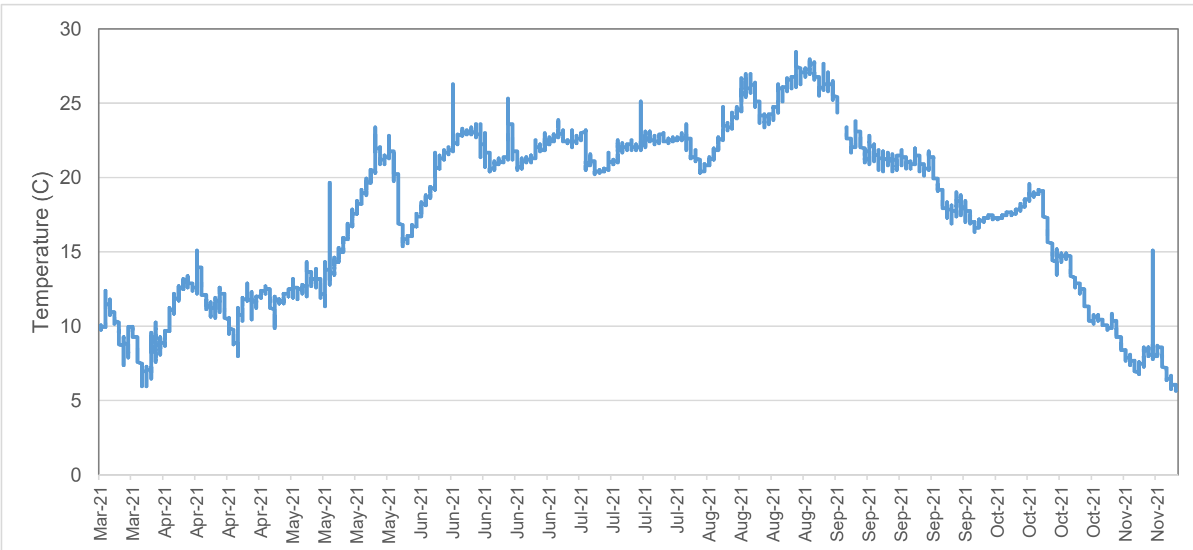
Figure 3: Temperature (orange) and DO (blue) Profile at the Cental Station



Note: The vertical axis shows depth (m), while the horizontal axis represents both Temperature (°C) and DO (mg/L).

Water temperature was also recorded by the level/temperature logger installed at the Dock station. The probe was located at 1 m from the Lake bed. Figure 4 provides recorded temperature at 15-min intervals. Water temperature was lower in 2021 relative to 2020.

Figure 4: Temperature Recorded by the Level/Temperature Logger at the Dock Station (1m from bottom)



2.2.2 Water Transparency

Table 4 summarizes the results of the water transparency readings. Transparency at the Dock station was under 0.5 m at the beginning of June but increase to up to 1.2 m in August following chemical treatment.

Table 4: 2021 Secchi Depth Results (m)

Date	Dock	Bridge	Central
13-Jan	0.7		
29-Mar	0.85		0.5
14-Apr	1	0.62	
22-Apr	1.2		
13-May	0.55	0.54	
31-May	0.56	0.51	
9-Jun	0.55	0.41	
24-Jun	0.3	0.4	
9-Jul	0.39	0.26	
21-Jul	0.25	0.26	
23-Aug			1.2
1-Sep	0.8	0.55	
7-Sep			0.7
17-Sep	0.75	0.64	
29-Sep			0.7
8-Oct	0.6	0.4	
14-Oct			0.75
20-Oct	0.53	0.53	
28-Oct			0.8
10-Nov	1	0.52	

2.2.3 pH

On-site measurements of pH in 2019 and 2020 were very high and therefore were investigated through lab analysis for pH in 2021. pH measured at the lab ranged from 7.9 to 8.5 before the chemical treatment and 7.4 to 8.2 following the treatment.

2.2.4 Nutrients Concentrations

Samples collected during each visit were transported to Caduceon Environmental Laboratories and tested for Total Phosphorus, Phosphate, Total Kjeldahl Nitrogen, Nitrate, and Ammonia.

The results can be found in Figure 5 for the Dock site and Figure 6 for the Bridge site. The Certificate of Analysis from Caduceon Environmental Laboratories in Appendix C.

Nutrient concentrations are shown for the depths sampled.

Total phosphorus concentration in the top 1 m depth averaged at above 100 µg/L before the chemical treatment (March-July). The concentrations over the growing season (June-July) averaged about 140 µg/L (above the 100 µg/L threshold for a hyper-eutrophic condition) before dropping to about 50 µg/L after treatment.

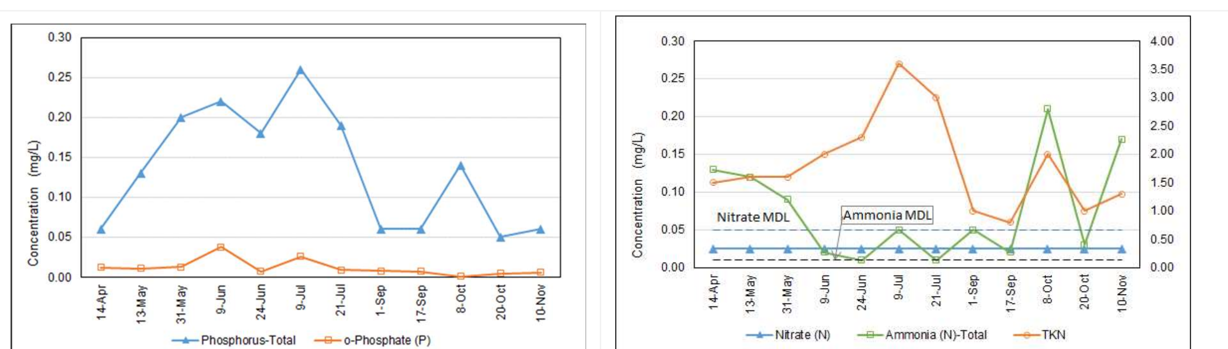
Nitrogen concentration was analyzed in terms of Total Kjeldahl Nitrogen (TKN), Ammonia (NH_3) and Nitrate (NO_3). Total nitrogen concentrations over the growing season averaged about 2.39 mg/L before the chemical treatment to about 1.0 mg/L after treatment (below the 1.2 mg/L threshold for a hyper-eutrophic condition). Before and after concentrations at the Bridge site were 2.77 mg/L and 0.96 mg/L, respectively.

Ammonia and nitrate are the forms that are directly bioavailable, with ammonia being the most usable form for algae. In 2021, Ammonia and Nitrate concentrations were generally close to or below Method Detection Limit (MDL), and nitrogen was mainly present as organic compounds (i.e., TKN less Ammonia) with the exception of spring samples.

Figure 5: Measured Nutrients Concentrations in 2021 - Dock Site

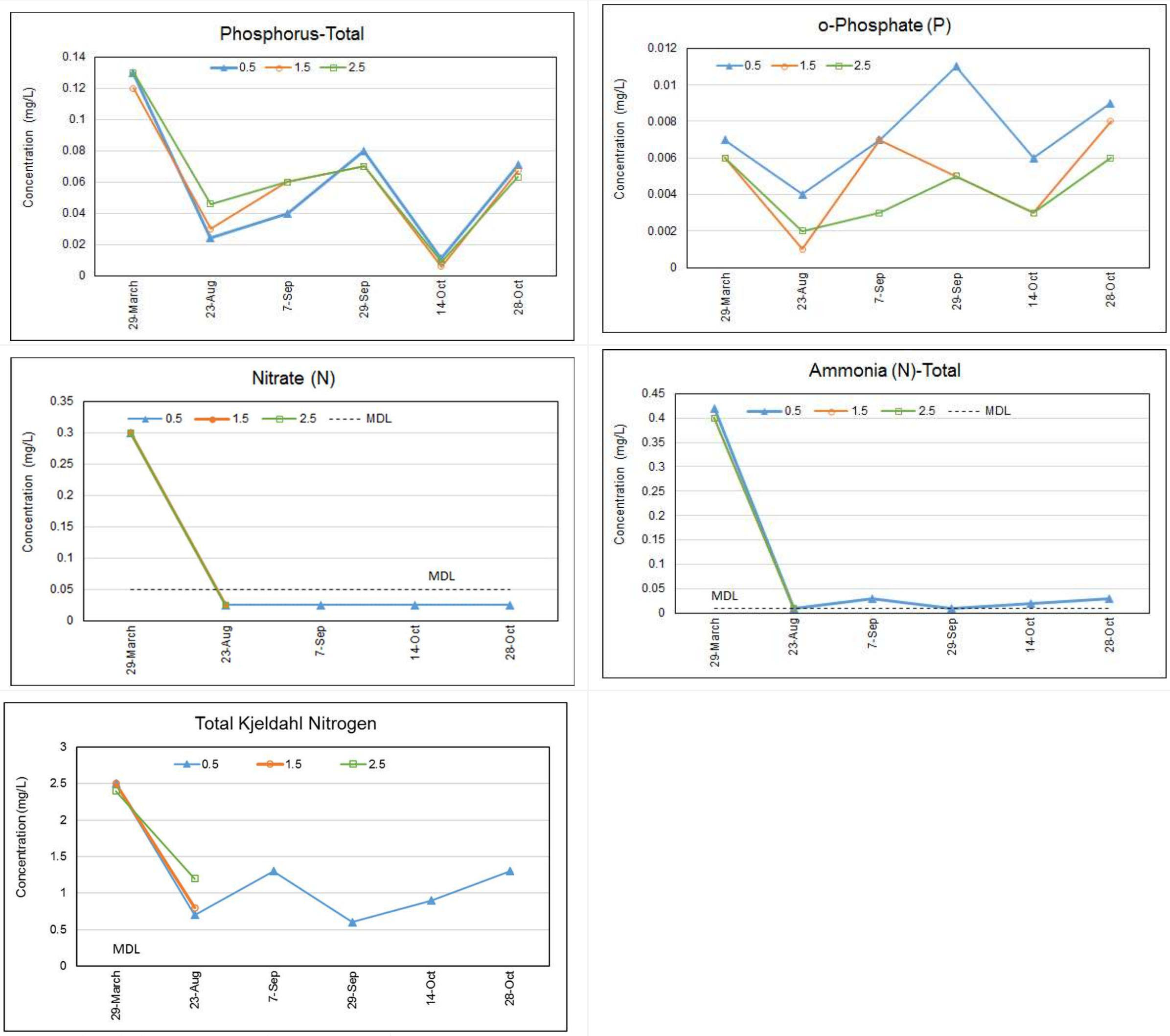
Note: Values below MDL are shown as MDL/2

Figure 6: Measured Nutrients Concentrations in 2021 - Bridge Site



Note: Values below MDL are shown as MDL/2.
TKN is shown on the secondary (right) axis.

Figure 7: Measured Nutrients Concentrations in 2021 - Central Site



Note: Values below MDL are shown as MDL/2

2.2.5 Chloride and DOC Concentrations and Color

Samples collected during each visit were also analyzed for Chloride, Dissolved Organic Carbon (DOC), and Colour. The results are summarized in Table 5.

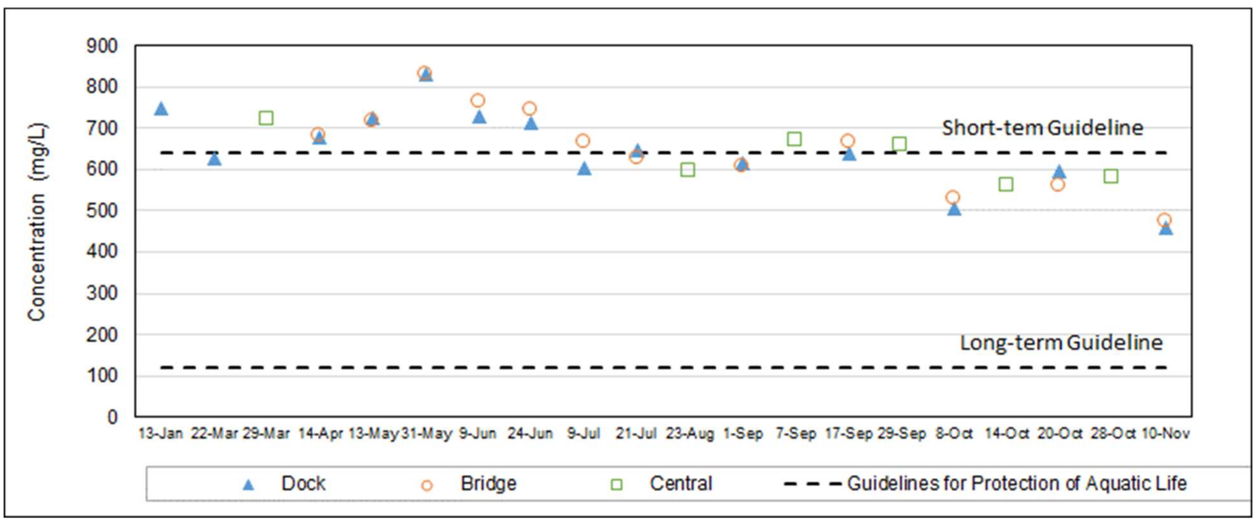
Water quality testing results indicated that all samples taken at all sites contained high chloride levels in Swan Lake until the end of June (>640 mg/L). Samples collected in July and later on contained lower chloride concentrations with an average of 590 mg/L. Chloride levels tend to rise in the spring as runoff containing de-icing agents are discharged to the Lake. Once introduced to a waterbody, chloride does not biodegrade, readily precipitate, volatilize, or bioaccumulate. It does not adsorb readily onto mineral surfaces, and therefore when introduced, concentrations remain high in surface water.

Chloride guidelines developed based on generic environmental data include a long-term guideline (120 mg/L) and a short-term guideline (640 mg/L). These guidelines may be over-protective for areas with an elevated concentration of chloride and associated adapted ecological community. For such circumstances, it has been suggested that site-specific (higher) targets be derived considering local conditions such as water chemistry, background concentrations, and aquatic community structure.

Table 5: Measured DOC, Color and Chloride

Date	Dock			Bridge			Central		
	Cl	Colour	DOC	Cl	Colour	DOC	Cl	Colour	DOC
13-Jan	749	10	5.9	-	-	-	-	-	-
22-Mar	725	11	2.2	-	-	-	-	-	-
29-Mar	-	-	-	-	-	-	684	12	2.4
14-Apr	711	14	3.8	681	15	3.8	-	-	-
13-May	696	11	1.6	715	11	1.5	-	-	-
31-May	817	10	1.5	831	15	1.7	-	-	-
9-Jun	720	12	1.7	764	21	1.9	-	-	-
24-Jun	721	12	2.9	744	14	1.6	-	-	-
9-Jul	614	15	1.6	666	17	1.6	-	-	-
21-Jul	611	14	1.3	627	16	1.2	-	-	-
23-Aug	-	-	-	-	-	-	594	3	0.5
1-Sep	607	3	0.8	607	4	0.7	-	-	-
7-Sep	-	-	-	-	-	-	671	3	0.8
17-Sep	659	3	1.3	666	3	0.9	-	-	-
29-Sep	-	-	-	-	-	-	657	4	0.8
8-Oct	508	5	0.9	529	5	1.0	-	-	-
14-Oct	-	-	-	-	-	-	560	3	1.0
20-Oct	569	3	1.8	561	8	2.1	-	-	-
28-Oct	-	-	-	-	-	-	579	3	1.7
10-Nov	483	4	1.2	475	6	1.3	-	-	-

Figure 8: Chloride Concentrations in 2021



2.2.6 Algae Growth and Toxicity

Algae blooms, which have been a problem in Swan Lake in previous years, reoccurred during the 2021 monitoring period. During the summer, surface scum was found at both the Dock and Bridge sampling sites. The surface scum found at the Bridge site was generally worse upon visual inspection, likely due to the stagnant conditions in the bay.

Samples were collected before and after chemical treatment and sent to the laboratory for phytoplankton and cyanobacteria. Test results are discussed in the report on chemical treatment evaluation.

Signs warning the public against water contact for humans and pets remained in place throughout 2021 (see **Error! Reference source not found.**).

2.2.7 Summary of Monitoring Results in 2021

Profiles of temperature and dissolved oxygen indicated that Swan Lake was mostly thermally stratified during the summer.

DO concentrations measured in the 1 m surface water were above the DO guideline for the protection of aquatic life. When stratified, bottom concentrations were lower than the DO guideline. DO concentration at 2 m increased significantly in August, but remained low at 2.5 m.

Transparency at the Dock station was under 0.5 m at the beginning of June but increase to up to 1.2 m in August following chemical treatment.

pH measured at the lab ranged from 7.9 to 8.5 before the chemical treatment and 7.4 to 8.2 following the treatment. Total phosphorus concentration in the top 1 m depth averaged at above 100 µg/L before the chemical treatment (March-July). The concentrations over the growing season (June-July) averaged about 140 µg/L (above the 100 µg/L threshold for a hyper-eutrophic condition) before dropping to about 50 µg/L after treatment.

Total nitrogen concentrations over the growing season averaged about 2.39 mg/L before the chemical treatment to about 1.0 mg/L after treatment (below the 1.2 mg/L threshold for a hyper-eutrophic condition). Chloride concentrations were very high (close to 640 mg/L), but slightly lower than 2020.

Throughout the 2021 monitoring period, surface scum was found at both the Dock and Bridge sampling sites. Samples were collected before and after chemical treatment and sent to the laboratory for phytoplankton and cyanobacteria. Test results are discussed in the report on chemical treatment evaluation.

2.3 Water Quality Trends

Water quality monitoring of Swan Lake has been conducted annually since treatment in 2013 to track water quality and the continued effectiveness of implemented mitigation measures.

The following paragraphs and Figure 9 provide a summary of water quality trends for the period of monitoring.

Dissolved Oxygen (DO)

Historical records of DO and temperature profile show that Swan Lake thermally stratifies during the summer despite its shallow depth. Anoxic conditions have been observed at depths below 2 m, to a depth as high as 1 to 1.5 m (in 2016). The majority of surface concentrations have been above 5 mg/L since 2014.

Water Clarity (Secchi Depth)

In Swan Lake, Secchi depth has typically been quite low throughout the summer, but it increases in November, reflecting the end of the growing period for phytoplankton. The average annual values shown in Figure 9 are all below 1 m, except in 2014 and 2021 following chemical treatment.

Total Phosphorus (TP)

Average growing period (May - October) TP concentrations indicate hyper-eutrophic conditions in all monitored years except for the post-treatment years, 2013 and 2014 as well as 2021.

Nitrogen Compounds

Total nitrogen concentration over the growing period has always been above the 1.2 mg/L threshold for a hyper-eutrophic condition, except in the post-treatment year, 2014 and in 2021. Nitrogen is, however, not believed to be the limiting nutrient for eutrophication in Swan Lake (i.e., the nutrient that elicits the largest response in algae growth).

Inorganic nitrogen-compounds (NO_2, NO_3, and NH_3) have often been below detection limits, indicating relatively low levels of bioavailable nitrogen concentrations. In 2021, ammonia and nitrate concentrations were generally very low, and nitrogen was mainly present as organic matter.

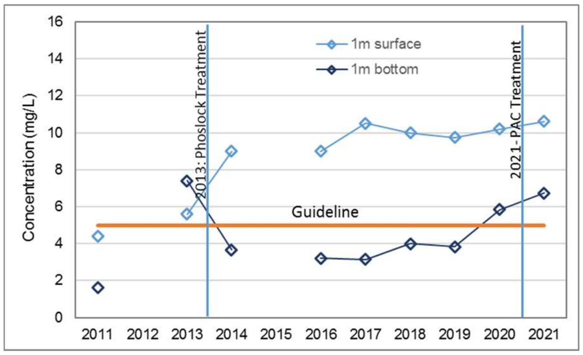
Chloride

Chloride concentration has been increasing in urban lakes due to de-icer application for winter maintenance of roads and walkways. Chloride does not biodegrade, readily precipitate, volatilize, or bioaccumulate. It does not adsorb readily onto mineral surfaces, and therefore when introduced, concentrations remain high in surface water.

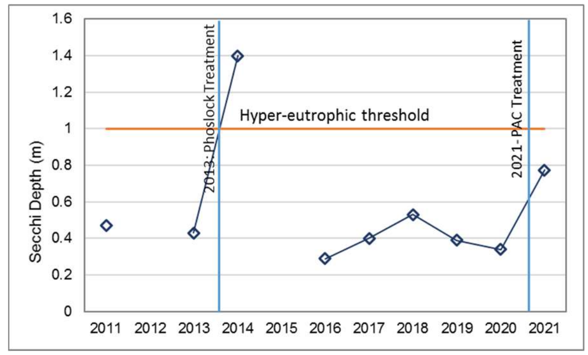
Chloride concentrations have been increasing in Swan Lake over the past few years with slight drop in 2021. The long-term management plan for the Lake suggests that the main mechanism for lowering chloride levels would be source control. Emerging technologies and flow redirection may be considered in future.

Figure 9: Historical Water Quality Results (Growing-Season Averages)

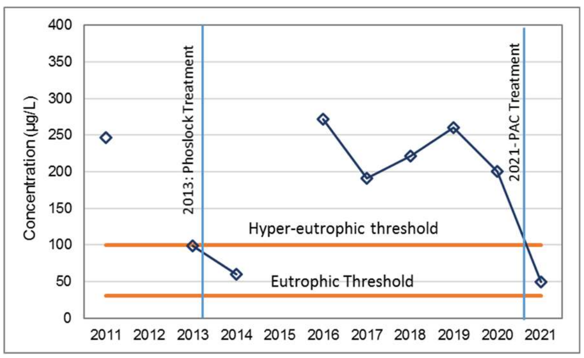
DO



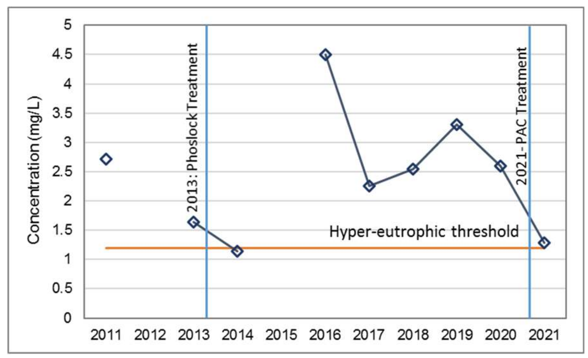
Secchi Depth



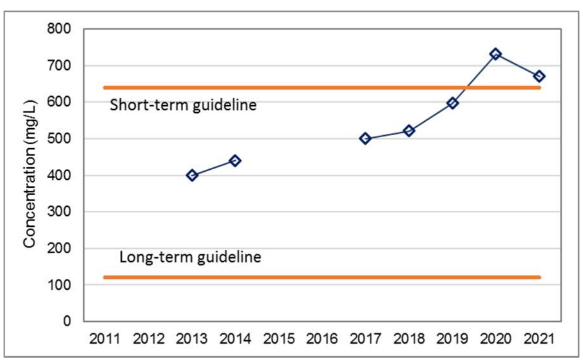
Total Phosphorus



Total Nitrogen



Chloride



Algae Blooms and Cyanobacteria

Table 6 provides a summary of the observed algae blooms in the Lake over the years. It also shows any tests conducted to measure toxins (mainly in terms of microcystin concentration) in the Lake water.

Table 6: Records of Algae Blooms and Toxicity

Year/Period	Algae Blooms Observation	Toxicity Test Result
Before 2011	Several blooms of cyanobacteria were observed	Microcystin concentration under detection limit
2013-2016	No apparent cyanobacteria proliferation and blooms; no resident concern related to the Lake's water quality	Microcystin concentration under detection limit
2016	A bloom was detected at one location	Microcystin concentration of 73 µg/L in one sample tested (recreational guideline is 20 µg/L)
2017	No bloom was observed	-
2018	Extended blooms were observed at several sites	Not tested for toxicity; cell density was at half of WHO's threshold for significantly increased risk for human health
2019	Extended blooms were observed at several sites	Microcystin toxicity was measured with test strips; all samples were below 10 µg/L
2020	Blooms were observed at several sites	Microcystin toxicity was measured with test strips; all samples were below 10 µg/L
2021	Blooms were observed at several sites	(see memo on treatment performance)

3. Water Level Monitoring

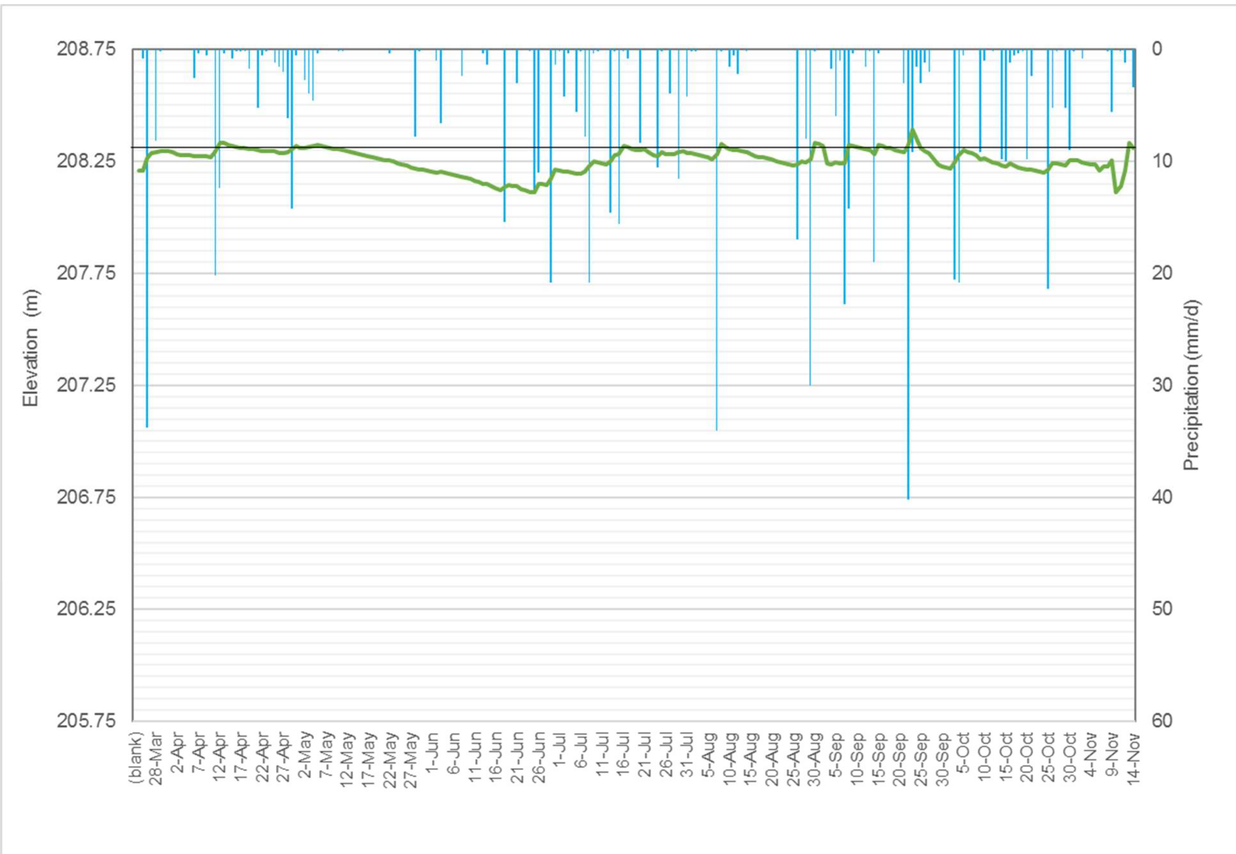
Water level and temperature were monitored using HOBOware U20 Water logger mounted at the Dock. The data logger records the pressure and temperature of the water every 15 minutes. The measured pressure is compensated using a baro-logger to calculate water depth.

The deepest site in the Lake is at 204.8 m. The sensor is located 1 m above the lakebed (at 205.75). The calculated water level changed from 208.11 m (2.36 m depth) in June to 208.39 (2.64 m depth) in September.

The maximum water level recorded in 2017, 2018 and 2020 were 208.48,208.35 and 208.25 m, respectively. The 2019 water level data were incomplete.

Rain data from the nearby rain gauge located at the Markham Museum are shown in Figure 10.

Figure 10: Lake Elevation Records and Precipitation in 2021



4. Geese Management

4.1 Geese Management Approach

Geese reduction at Swan Lake is necessary due to the nutrient load they contribute to the Lake.

In 2021, the geese management program was completed by two external contractors.

Border Control Bird Dogs, an external consultant, was hired to chase (i.e., ‘haze’) terrestrial geese by border collies (including the Toogood Pond where they also performed egg oiling). Program activity frequency was modified from previous years to focus on the migration seasons. The frequent geese chasing would encourage the geese to relocate to a quieter place and reduce the number of resident geese at Swan Lake.

The Toronto Region Conservation Authority (TRCA) was hired to relocate resident geese from Swan Lake and to remove the nests and eggs from the area. In total, 73 Canada Geese were rounded up from Swan Lake on June 18th 2021. Four adult Canada geese and four goslings were left at Swan Lake. In addition, a total 13 nets containing 52 eggs were managed at Swan Lake during April to June.

The strobe lights purchased in 2020 at the request of Friends of Swan Lake Park were also installed on the Lake and the two adjacent stormwater management ponds. Strobe lights work by using a solar-powered LED light that flashes every two seconds and is intended to disrupt the geese’s sleep patterns and discourage them from staying on the Lake.

4.2 Geese Count

In 2021, the geese count was completed by the consultant, City staff, and volunteers from the community.

Border Control Bird Dogs recorded the number of geese observed during each visit. Staff counted the number of geese every two to four weeks, coinciding with the water quality sampling site visits.

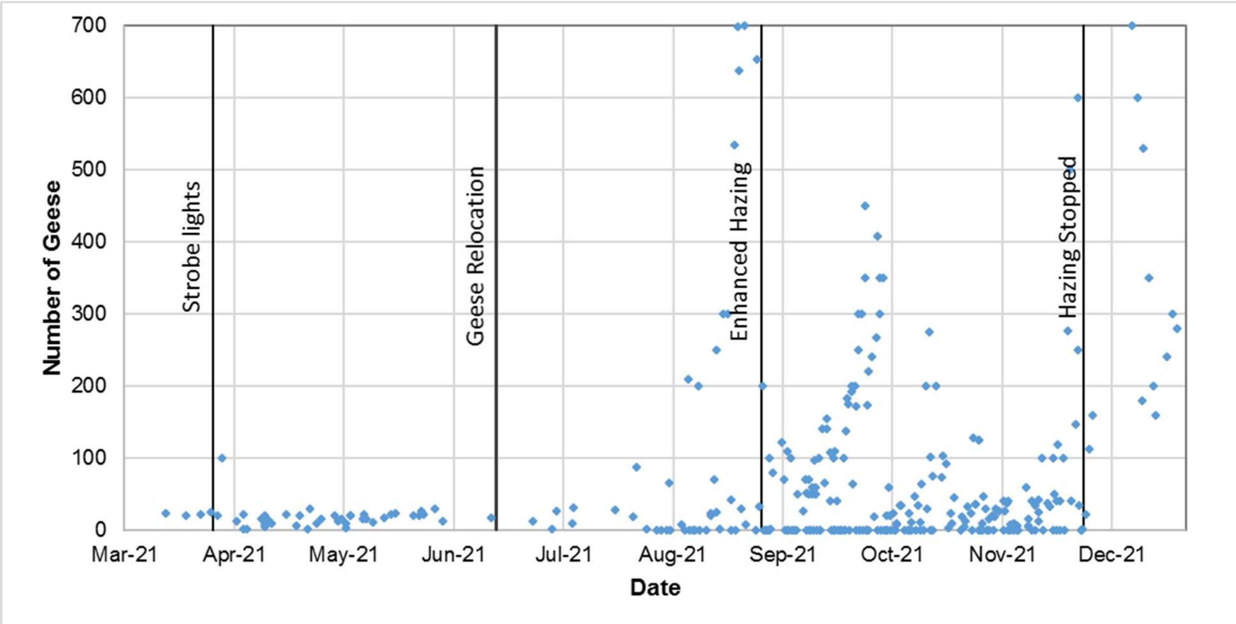
Friends of Swan Lake organized a geese count campaign and provided a spreadsheet of the counts to the City. Staff also developed a geese count App using ArcGIS Survey123, which a number of residents used to record geese count and note other wildlife observations.

4.3 Results

Figure 11 illustrates the number of geese counted at Swan Lake throughout the 2021 monitoring period.

In this figure, a significant increase in geese during the fall months is evident, which occurs when they migrate south; however, the increased hazing frequency (starting on September first) was very effective in reducing the number of geese present at different times of the day. Following the enhanced hazing, daily numbers dropped to below 500, and remained much lower than previous years. Any impact that strobe lights might have had on the geese count is not readily evident from the data.

Figure 11: 2021 Geese Count Results

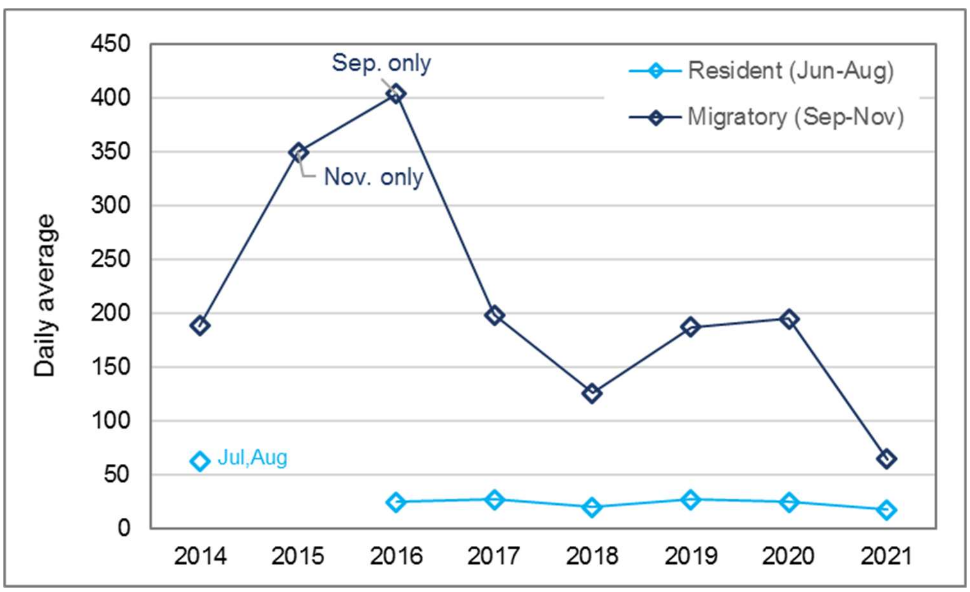


4.4 Historical Trends

Active geese management has been completed annually since 2014. The geese control focusing on resident geese at the beginning and extended to the management of migratory geese in 2016.

Daily Averages of counts are shown for each year in Figure 12. Data are summarized for June to August, and September to November, representing resident and migratory geese, respectively. Despite a general increase in geese population in Southern Ontario, the numbers at Swan Lake have been controlled over the past years.

Figure 12: Historical Geese Counts



5. Summary and Conclusions

Through the Swan Lake monitoring program, data were collected from January to November 2021. The collected data provide insight into long-term trends in water quality and will also help determine the need for and impact of chemical treatment of Swan Lake.

Dissolved oxygen, temperature, and water transparency were measured at two stations through bi-weekly site visits and at the Central station pre and post-treatment. Profiles of temperature and dissolved oxygen indicated that Swan Lake was thermally stratified during the summer despite its shallow depth. The minimum dissolved oxygen concentration required for the protection of warm water fish is 5 mg/L, which was met in the surface water but not the deep water pre-treatment.

pH measured at the lab ranged from 7.9 to 8.5 before the chemical treatment and 7.4 to 8.2 following the treatment.

Transparency at the Dock station was under 0.5 m at the beginning of June, but increased to up to 1.2 m in August following chemical treatment.

Water samples were analyzed for nutrients (phosphorus and nitrogen compounds). Total phosphorus concentration in the top 1 m depth averaged at above 100 µg/L before the chemical treatment (March-July). The concentrations over the growing season (June-July) averaged about 140 µg/L (above the 100 µg/L threshold for a hyper-eutrophic condition) before dropping to about 50 µg/L after treatment.

Total nitrogen concentrations over the growing season averaged about 2.39 mg/L before the chemical treatment to about 1.0 mg/L after treatment (below the 1.2 mg/L threshold for a hyper-eutrophic condition).

Chloride concentrations were frequently high (upwards of 640 mg/L) in 2021), but slightly lower than 2020. Chloride concentration exceeded the long-term (120 mg/L) and short-term (640 mg/L) guidelines for the protection of aquatic life.

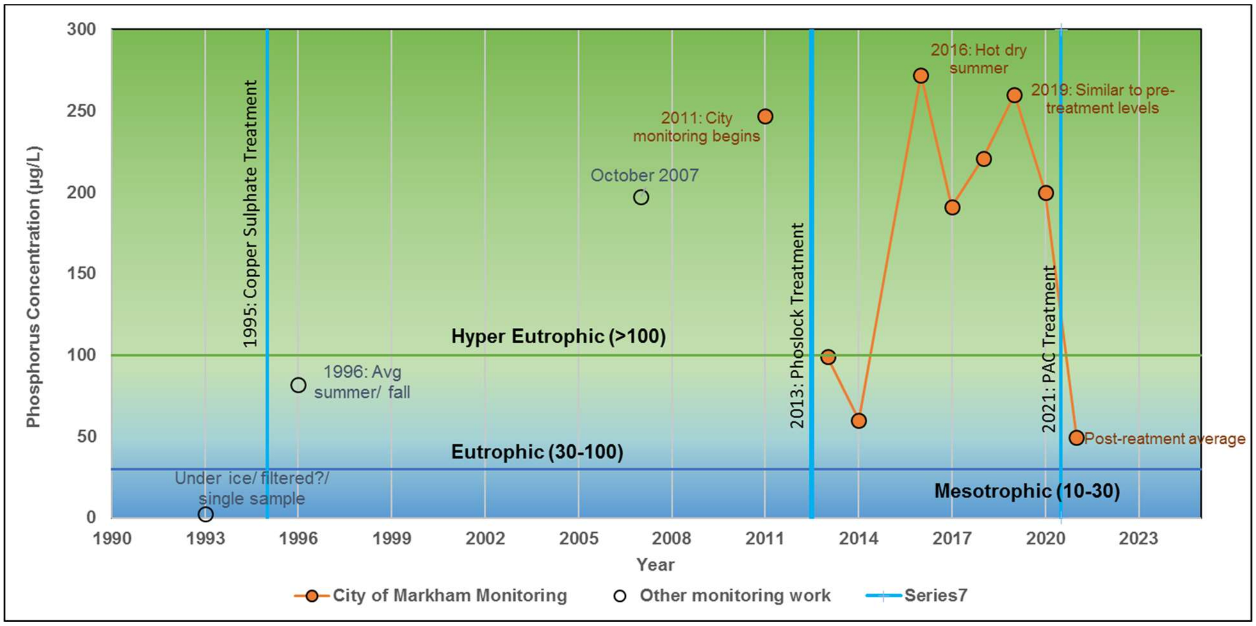
Throughout the 2021 monitoring period, surface scum was found at both the Dock and Bridge sampling sites. Samples were collected before and after chemical treatment and sent to the laboratory for phytoplankton and cyanobacteria. Test results are discussed in the report on chemical treatment evaluationA level logger was used to record the water level in the Lake. The water level at the logger location changed from 208.11 m (2.36 m depth) in June to 208.39 (2.64 m depth) in September.

In 2021, geese management was completed by chasing terrestrial geese by border collies and egg oiling, as well as nest management and geese relocation in the spring. Program frequency was modified from previous years to focus on the migration seasons. Nine strobe lights were also installed on the Lake and the two stormwater management ponds. The increased hazing frequency (starting on September 1st) was very effective in reducing the number of geese present at different times of the day to about 50% of numbers in 2020. Any impact that strobe lights might have had on the geese count is not readily evident.

Based on the measured Secchi desk transparency and nutrient concentrations in 2021, Swan Lake is classified at a low-eutrophic condition post-treatment. Figure 13 provides a summary of phosphorus concentrations for all the years with available data.

Overall, the management activities in 2021 that focused on the significant nutrient loadings identified in the water quality management plan (i.e., PAC treatment to reduce internal loads and geese management to reduce external loads), was effective at improving water quality in the lake as shown in reduce phosphorus concentrations and improved water clarity and dissolved oxygen levels. These improvements represent a positive step towards improving aquatic habitat in the lake and meeting the long-term water quality goals.

Figure 13: Trophic State Classification for Swan Lake based on Phosphorus Concentration



Appendix A : Swan Lake Water Quality Inspection Forms

Appendix B : Photographic Documentation

Appendix C : Certificate of Analysis

M E M O R A N D U M

To: File
Prepared by: Zahra Parhizgari, Senior Environmental Engineer,
Roshanak Maleki, Senior Environmental Engineer
Date: April 2022

Re: Swan Lake Water Quality Management- Water Flow and Chloride Analysis

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Introduction

This memorandum was prepared to describe the water balance model developed in support of the Long-Term Management Plan for Swan Lake, updated with additional considerations to support a water flow analysis. It also analyzes existing information on chloride concentration in the Lake, sources of chloride, and potential mitigation measures to be considered.

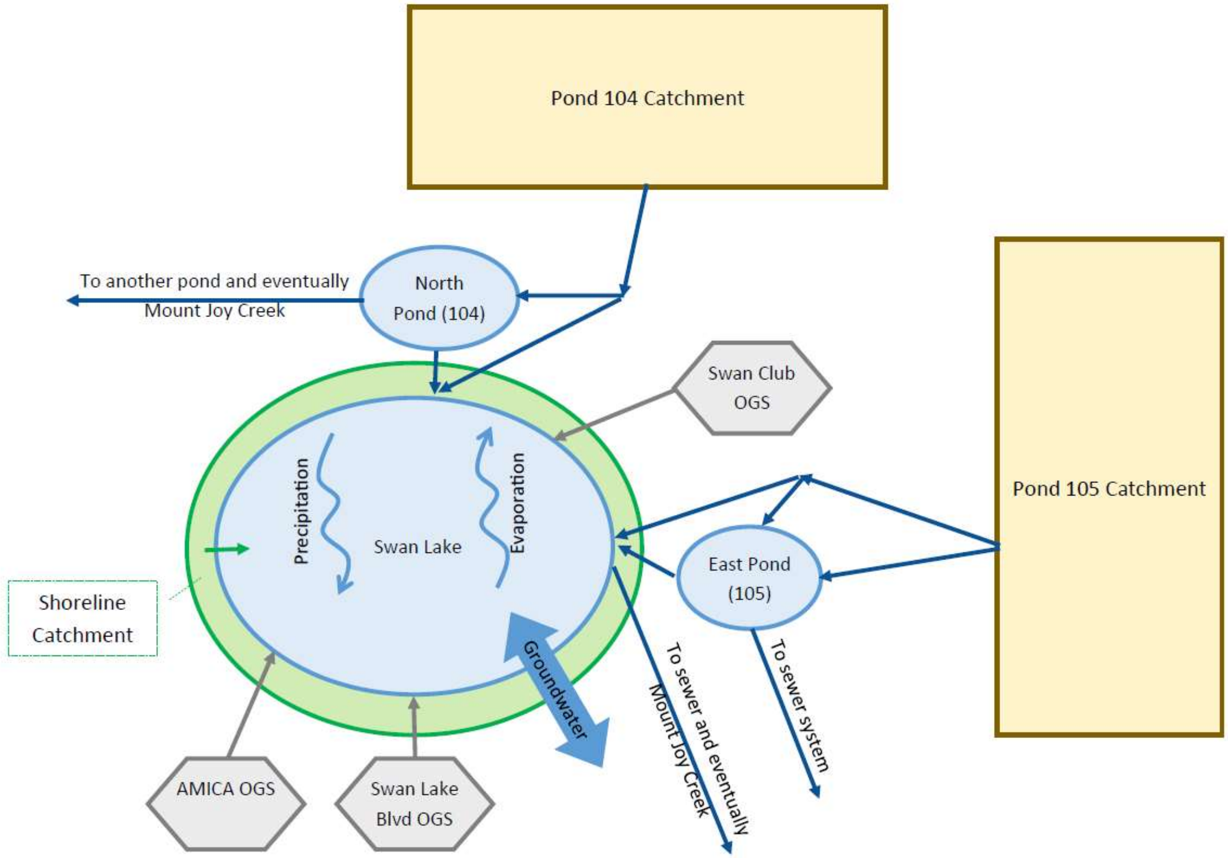
Water Flow Analysis

A conceptual model of flows in and out of Swan Lake is shown in Figure 1. Various components of this model and the data and methods used to quantify them are described below.

The majority of the runoff from the developed catchment area is treated in two stormwater management ponds, and the treated runoff is discharged to the storm sewer system. The remaining flows bypassing the ponds, overflows from the ponds, discharges from the three Oil and Grit Separators (OGS) as well as runoff from the shoreline area are discharged to the Lake.

The following sections describe the design information and modeling methodology used to estimate the runoff quantity produced in each catchment area and the fraction discharged to the Lake.

Figure 1: Swan Lake Conceptual Site Model



Drainage Plan

The Environmental Master Drainage Plan for the Swan Lake Community (Cosburn Ltd. et al., 1995) analyzed the site outlet capacities, major/minor drainage systems, and quantity and quality control requirements. The study area of this Master Plan included catchments draining to Swan Lake and areas to the west, east, and north which would drain to a storm sewer inlet on 16th Ave. and from the west drainage area to the Exhibition Creek (aka Mount Joy Creek).

Recent LiDAR data and as-built information on the existing storm sewer network were used to delineate the catchments being conveyed to the Lake and adjacent stormwater pond facilities. As per the catchment delineation performed, the drainage area to the Lake is about 37.0 ha. Of this area, two (2) stormwater management ponds serve about 81% (29.6 ha) of the Lake's catchment area. Three OGS's treat the runoff from 5% of the catchment (1.8 ha). Runoff from the remainder of the area (about 5.6 ha) is comprised of overland flow from the immediate shoreline and was considered uncontrolled in the model.

Stormwater Controls

As per the 1995 Master Plan, two wet extended detention ponds (#104- North Pond and #105-East Pond) were proposed to accommodate the proposed site layout and required grading and provide quality control. These ponds were designed to attenuate the stormwater runoff generated by a 2-hr duration, 25 mm runoff. Each pond would have a sediment forebay at each storm sewer inlet (to concentrate larger sediment particles) and a shallow area with emergent aquatic planting at the pond outfall (to provide natural habitat and nutrient uptake). The North and East Ponds would have one and two inlets, respectively. A flow splitter immediately upstream of each pond outfall would direct the 25 mm storm runoff to the pond. Weirs within the flow splitters would direct the storm flows and the pond volume to the Lake for flood control attenuation.

The North Pond (ID #104) was constructed as an extended detention wet pond in 2001 to collect up to 25 mm storm event runoff from an area of 12.95 ha (including the pond block) conveyed to the Pond by a 1050 mm diameter concrete storm sewer. The Pond has a permanent storage volume of 1558 m^3 at an elevation of 208.3 m, and a total extended detention storage volume of 810 m^3 at an elevation of 208.8 m. It has an inlet structure, a 28 m long sediment forebay, an access road, and a maintenance road. The outlet structure includes a reversed sloped pipe to a manhole with a 100 mm diameter orifice plate, which releases controlled discharge from the North Pond to the storm sewer on Williamson Road via a 200 mm diameter storm sewer. A diversion structure is located upstream of the North Pond in a 2400 mm diameter manhole, which includes an overflow weir that conveys flow to Swan Lake at a spill elevation of 208.8 m. An emergency spillway is also located on the west side of the Pond, which discharges to Swan Lake at a spill elevation of 209.0 m.

The East Pond (ID #105) was constructed as an extended detention wet pond in 1996 to service a total drainage area of 18.49 ha (including the pond block). The East Pond has a permanent storage of 2051 m^3 at an elevation of 208.3 m and an active storage volume of 1096 m^3 at an elevation of 208.8 m with a minimum detention time of 24 hrs. The Pond outflow is controlled by a submerged perforated pipe and a precast twin catchbasin. The twin catchbasin allows for additional outflow once the active storage depth exceeds an elevation of 208.45 m. The pond release rate is controlled by a 66 mm diameter orifice plate located at the outlet. The south and north inlet structures divert flows to Swan Lake once the water surface elevation in the extended detention pond exceeds 208.7 m. An emergency spillway is also located on the west side of the Pond, which discharges to Swan Lake at a spill elevation of 209.25 m.

Both the East Pond and North Pond are currently privately owned and operated, but will ultimately be assumed by the City of Markham for long-term ownership and operation.

In addition to the two stormwater management ponds, there are three OGS units in the catchment, treating runoff from the Swan Club in Swan Lake Village and referred to as "Swan Club" thereafter (100 Lakeside Vista Way), AMICA development (6360 16th Ave.), and Swan Lake Blvd.

Lake Operation

As per the 1995 Master Plan, the water captured by Swan Lake would either be infiltrated or evaporated. A restricted outfall was also recommended for the Lake discharging to the 16th Ave. storm sewer to maintain a constant water level and positive drainage of the Lake.

Once the Swan Lake water level exceeds an elevation of 208.3 m, excess storage is released through the foundation drain collection (FDC) system. A 165 mm orifice plate located at the outlet side of the Lake headwall adjacent to the East Pond controls the outflow from Swan Lake to the FDC system. The Lake release rate was limited to 100 L/s to accommodate the downstream drainage constraint at the 16th Ave. storm sewer (2-year peak flow of 1.166 m^3/s).

Precipitation and Evaporation

Meteorological parameters are the most frequently measured and affect several components of the water balance analysis.

Precipitation data in 5-min intervals are available from the Markham Museum meteorological station, complemented with data from the Mount Joy Community Center station. Daily minimum, average, and maximum temperature are available from the Buttonville Airport station.

Evapotranspiration (ET) rates are not measured in any station close to the study area and were therefore calculated using climate data from the nearest stations. Based on data availability and the required resolution, ET was estimated using the Priestley-Taylor model (Priestley & Taylor, 1972).

Hydrologic Modelling

The PCSWMM model was used for estimating various flows. The model traces the water flow from rainfall through different catchments in the pipes and overland to various stormwater controls and eventually to the Lake.

Both ponds were initially designed with permanent pools for water quality control and extended detention volumes for the 25-mm event. Therefore, a 25 mm storm event was simulated in the PCSWMM model to confirm that the existing SWM ponds are performing relatively close to the intended design. It should be noted that a different modelling approach was used for the purposes of this water balance analysis compared to the approach used in the original pond designs, which would lead to slight differences in results. However, the results from the PCSWMM simulation of the 25 mm storm event confirmed that both of the existing SWM ponds are functioning as designed in the model, as expected.

Surface runoff from all outfalls was modelled for the 2009 to 2021 period using the PCSWMM model. Both minor and major systems were modelled over a continuous period using a 5-min time step.

The intended use of the PCSWMM model was to develop a high-level estimate of the various catchment contributions to the total runoff into Swan Lake. By developing this high-level estimate, the relative proportion of runoff from each catchment can be assessed for:

- Total runoff controlled by existing SWM pond facilities;
- Total runoff being treated by existing OGS units; and
- Total uncontrolled runoff.

In recent years, sediment accumulation in front of the northern inlet to the East Pond blocked the flow from the upstream catchment, causing it to be directed to the Lake instead. The exact date of this blockage is not known, and therefore, an estimate was made using available water quality information (see later sections). This scenario was also modeled using PSCWMM to demonstrate the impact of pipe blockage. In the PCSWMM model, the 450 mm dia. pipe was removed, and it was assumed that all flow from the upstream catchment area is discharged to the Lake.

Groundwater Exchange

Available reports, including the 1995 Environmental Master Plan, various geotechnical reports prepared in support of development applications in the area, as well as reports on the methane gas ventilation system, were reviewed to develop an estimate of groundwater exchange between the Lake and the surrounding area. Based on these reports, groundwater flow in and out of the Lake was estimated to range between 10 and 300 m^3/day; however, there is not enough spatial and temporal resolution to use these values in the water balance analysis.

Outflow

Since there is no measurement of outflow, collected water level data were used to estimate outflow by assuming that discharge starts when the water level reaches an elevation of 208.3 m, i.e., the invert of the overflow weir.

In 2017, a water level logger was installed next to the dock on the southern shore of the Lake. The logger, which was moved to the front of the dock in 2020, has been recording the water level continuously during the ice-free periods.

The 2017-2021 data were extrapolated to the previous years by correlating water level with rainfall and evapotranspiration, and outflows were estimated accordingly for all years of modelling.

Water Balance Results

A summary of the annual water balance results for both the design conditions (unblocked inlet) and the blocked inlet is provided in Table 1and Table 2, respectively.

In these tables, the balance of all estimated components is shown as ‘Balance’, which could be attributed to groundwater or other uncertainties in the model assumptions.

Table 1: Average Water Balance for Design Conditions (m3/mon) for the Period of 2009-2021

Month	Direct Precipitation	Evaporation	North Pond	East Pond	Shoreline Runoff	OGSs	Outflow	Balance
Jan	2028	-388	955	681	1775	626	0	-3844
Feb	1979	-761	120	51	1267	498	0	-1366
Mar	2351	-2715	342	320	1647	627	0	-448
Apr	3881	-4605	1123	686	3046	1138	0	-1763
May	3310	-7329	584	493	2095	855	-4418	2112
Jun	4266	-8448	1393	1175	2581	997	-1616	-1875
Jul	3446	-8904	1162	1354	2254	989	-304	-1534
Aug	3513	-7059	1090	1348	2026	877	-840	-2313
Sep	3153	-4192	1175	1045	2044	839	-1677	-3124
Oct	3724	-1778	651	538	2393	966	0	-8327
Nov	2448	-723	540	284	2193	772	0	-6085
Dec	2291	-312	484	257	1948	698	0	-3297

Table 2: Average Water Balance for Blocked Inlet (m3/mon) for the Period of 2009-2021

Month	Direct Precipitation	Evaporation	North Pond	East Pond	Untreated from East Pond Catchment	Shoreline Runoff	OGSs	Outflow	Balance
Jan	2028	-386	955	0	4636	1775	626	0	-7801
Feb	1979	-752	120	0	3848	1267	498	0	-5172
Mar	2351	-2691	342	7	4340	1647	627	0	-4500
Apr	3881	-4575	1123	0	8376	3046	1138	0	-9483
May	3310	-7309	584	0	6458	2095	855	-4418	-3874
Jun	4266	-8427	1393	5	8073	2581	997	-1616	-8800
Jul	3446	-8912	1162	110	6534	2254	989	-304	-6817
Aug	3513	-7078	1090	42	6346	2026	877	-840	-7334
Sep	3153	-4233	1175	33	5883	2044	839	-1677	-7953
Oct	3724	-1805	651	0	7412	2393	966	0	-15176
Nov	2448	-734	540	5	5960	2193	772	0	-11755
Dec	2291	-313	484	0	5289	1948	698	0	-8327

Chloride Analysis

Background

Chloride concentration has been increasing in urban lakes due to de-icer application for winter maintenance of roads and walkways. Chloride does not biodegrade, readily precipitate, volatilize, or bioaccumulate. It does not adsorb readily onto mineral surfaces, and therefore when introduced, concentrations remain high in surface water.

Chloride guidelines developed for generic environmental data include a long-term guideline (120 mg/L) and a short-term guideline (640 mg/L). The long-term guideline has been developed to protect all organisms (present in Canadian aquatic systems) against negative effects during indefinite exposure. The short-term guideline aims to protect most species against lethality during a sudden hike in chloride concentration for a short period (24-96 hrs). These guidelines may be over-protective for areas with an elevated concentration of chloride and associated adapted ecological communities. For such circumstances, it has been suggested that site-specific (higher) targets be derived considering local conditions such as water chemistry, background concentrations, and aquatic community structure.

Chloride Concentration

Water quality is regularly monitored at two shoreline sites, the Dock (S1) and the Bridge (S2). The water depth at the dock is approximately 2.5-3 meters, representing deeper sections of Swan Lake, and this station has historically been used to represent the 'whole lake'. The water depth at the bridge is about 0.5 meters deep, and it is used to represent the conditions of the shallow bays around Swan Lake.

In the earlier years of monitoring, sampling was completed at the deepest point in the Lake (Main or Central station, S3). Samples were also not analyzed for chloride regularly, but conductivity was measured frequently. Conductivity has been found to be linearly related to chloride concentration in roadway runoff; however, there is higher variability in pond outlets due to the presence of other ions (MNDOT, 2017). Nonetheless, samples with both chloride and conductivity measurements were reviewed, and a weak correlation was found between the two constituents. In the absence of any chloride data for earlier years, this correlation was used to estimate chloride concentrations in the Lake. Table 3 summarizes chloride and conductivity results available for Swan Lake.

Table 3: Dates with both Chloride and Conductivity Measurements

Date	Location	Station	Chloride (mg/L)	Conductivity (µs/cm)
7/2/2013	Main	S305	399	1189
10/28/2021	Main	S305	579	1081
1/13/2022	East Pond	EP-IN	13200	27700
1/13/2022	OGS	SLB-OGS	3160	9660
3/6/2022	East Pond	EP-IN	380	1500
3/6/2022	North Pond	NP-IN	410	1600
3/16/2022	East Pond	EP-IN	3700	12000
3/16/2022	North Pond	NP-IN	3100	10000

Monthly averages for the three Lake stations (Dock, Bridge, Central, or S1/S2/S3) averaged over all depths (when available) are provided in Table 4.

Water quality testing results indicated that all samples taken at the Dock monitoring site contained high chloride levels in Swan Lake throughout the monitoring period (>640 mg/L).

Values have generally increased year over year. Monthly values have been highest in April-July and lower in Aug-Nov. Few data points are available for Jan-Mar as the Lake is frozen during this period. A possible explanation could be that chloride concentrations in the runoff are highest during snowmelt (March-April). Lake concentrations remain high through the spring and part of the summer until the Lake water is diluted with precipitation and unsalted runoff.

Table 4: Monthly Average Concentration of Chloride (mg/L) in the Lake

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Annual Average
2011								568	529	388		492
2012			294									294
2013		199			424		436	404	348	311	220	341
2014	318			462	432	481	472	401	300	320	239	383
2017				732	638	502	429	417	409	438	398	477
2018				457	585	558	590	615	393	392	345	511
2019				581	544		585	656	575	608	570	596
2020				711	717	717	762	749	742	753	717	737
2021	749		700	784	762	733	624	968	613	515	480	679

Note: Estimated based on conductivity for 2011-2014, when few measurements of chloride are available.
Each average represents about four data points, except for 2011 and 2021 when more chloride samples were collected.

In 2022, water samples were collected from various inlets to the Lake and analyzed for chloride. These data, along with scattered data from previous years, are shown in Table 5. Based on this limited dataset, chloride concentration in the spring runoff from the pond catchments is about 1000 mg/L (average of pond inlet measurements). This concentration would not usually end up in the Lake, except through the East Pond bypass during the period that the northern inlet was blocked. At other times, the bypass would carry 'cleaner' water (after the first flush), with concentrations around 200 mg/L. Flows from the ponds to the Lake have an average concentration of 350 mg/L (average of pond and outlet concentrations).

In 2022, samples were collected from the Swan Lake Blvd. (SLB) and AMICA OGS at the outfall to the Lake. The outfalls were not flowing during some sampling events, in which case, samples were collected from the pool of water present. There was no flow/ visible water at the outfall from the Swan Club (SLC) OGS, and therefore, no sample was collected at this location. The runoff collected from SLB OGS contained about 2000 mg/L of chloride, while AMICA OGS had a concentration of about 500 mg/L.

Samples were also collected from the shoreline runoff, which resulted in very low chloride concentrations (about 25 mg/L).

Table 5: Chloride Concentrations in Inflow and Outflow from Ponds and OGSs

	East Pond				**North Pond**				**OGSs**	
	Pond Inflow		Inflows to Lake		Pond Inflow			Inflow to Lake	Inflows to Lake	
Date	Pond Inlet	Pond	From south	Bypass	Inlet	Road	Pond	Bypass	AMICA -OGS	SLB-OGS
3/20/2012 *	577	572	-	-	673	-	56	-	-	-
3/26/2021	957	343	-	-	98.5	-	199	-	-	-
4/11/2021	-	-	673	131	79	-	-	-	-	-
1/13/2022	13200**	-	-	-	-	-	-	-	-	3160
2/15/2022	2340	-	-	-	2120	326	-	-	360	836
3/6/2022	380	410	-	-	410	-	180	-	610	1200
3/16/2022	3700	-	-	-	3100	-	-	-	470	4800
3/24/2022	1200	-	-	150	1100	-	-	-	240	1900
4/6/2022	2800	-	-	350	-	-	-	-	1100	-

* Data were used cautiously since the exact location of samples and sampling conditions are not known.
** Standing water, not used in calculations.

Sources of Chloride

Salt usage data were obtained from the City's Road department and the Swan Lake Village Corporation.

Winter maintenance of 1 km of the catchment roads and sidewalks is completed by the City of Markham. The City prescribes and tracks the quantity of salt distributed to the City roadways based on current and future forecast models and temperatures to determine the required action and material usages in compliance with the desired service level of service and O.Reg 239/02 requirements.

The City has used an average of 3,100 kg of salt per year over the past two years (R. O'Hara, personal communication, June 18, 2021). Swan Lake Blvd (130 m of primary roads) received 972.4 Kg of salt, while local roads north of Swan Lake (880 m) received 2129 kg of salt. About 40 salting events were completed for primary roads and 10 for local roads.

The remaining roads and parking areas, as well as private walkways and driveways are serviced privately.

As per the Village Amenities Committee (VAC) (M. Petit personal communication, February 2, 2022), the Village Corporation employs "a qualified, reputable cleaning and maintenance service employing Smart About Salt principles to plow/shovel and their insurance recommends the deicing methods of rock salt, applied as necessary to maintain their insurance and mitigate potential claim". The amount of rock salt applied is about 88-110 tonnes per winter season, of which 30% is applied to the 14 km of single-lane kilometers of roadways plus parking areas, and 70% is applied to unit walkways and driveways and mail locations.

Information on salt usage in the AMICA property (0.75 ha) serviced by an OGS is not available.

The amount of salt used in residential driveways north of Swan Park Road is not known.

Chloride Transport

Chloride in salting materials is readily dissolved in water and transported overland by runoff or infiltrated into soils, contaminating groundwater and surface water. A fraction of chloride in applied road salt is retained by soil and is not observed in surface runoff.

As a result, salt loading to surface water occurs primarily in winter and spring during melt conditions but continues through the summer and fall via the discharge of impacted groundwater, dry deposition of dust to the lake surface, non-point source runoff washing dry salt from land surfaces. Salt accumulated in the ponds could also be discharged into the Lake through the flushing of stormwater ponds.

Areal Load

Chloride loads can be determined from the mass of chloride in the Lake using chloride concentration and the Lake outflow data, and assuming steady-state conditions, as follows:

$L_{Cl} = [Cl] * qs * Ao$

where,

[Cl] is average chloride concentration in the Lake,
qs is the areal water load out of the Lake as Q/Ao,
Q is the mean outflow from the Lake, and
Ao is the lake surface area

As shown in Table 6, areal loads of water and chloride have increased significantly in 2018, with the annual chloride load being about twice that of previous years. This may originate from two factors, higher water load, and higher chloride concentrations. The higher water load could be due to more severe storms routed from the stormwater ponds to the Lake (the impact of blockage is not considered in this model). Higher chloride concentrations (measured in Lake) may represent when the inlet blockage occurred, resulting in higher loads. Hence, we assumed that 2018 was the year the inlet blockage occurred.

Table 6: Areal Water and Chloride Load

Year	Precipitation on Lake	Evaporation from Lake	Inflow from Pond 104	Inflow from Pond105	Shoreline Runoff	Inflow from OGSs	Outflow	Balance	Chloride in Lake (mg/L)	Lake surface (m^2)	Areal water load (m/yr)	Cl Load (t/yr)
2009	40,071	-44,215	11,384	8,168	28,748	10,490	-10,347	-38,993	378*	49940	0.99	18.6
2010	33,063	-46,919	11,966	10,768	20,967	8,373	-14,467	-23,025	378*	50018	0.75	14.2
2011	25,591	-45,891	1,036	1,116	14,066	5,875	-5,115	-67	492	47821	0.11	2.6
2012	37,419	-48,912	12,223	10,990	28,470	11,219	-9,410	-38,023	294	47757	0.99	13.9
2013	36,623	-45,556	4,634	5,225	23,897	9,363	-8,885	-21,890	341	50247	0.61	10.5
2014	36,383	-43,824	9,702	9,682	20,872	8,998	-16,467	-27,197	383	49108	0.89	16.7
2015	32,785	-47,079	12,673	10,101	21,419	8,877	-11,167	-28,918	430*	48240	0.83	17.2
2016	27,946	-48,862	1,015	1,193	14,894	6,824	-3,851	-552	430*	47076	0.09	1.9
2017	36,055	-50,139	6,207	5,214	25,090	11,112	-7,321	-26,031	477	47326	0.70	15.9
2018	44,455	-47,777	13,594	11,690	33,308	12,843	-7,246	-58,712	511	48068	1.37	33.7
2019	45,331	-46,164	17,274	11,229	39,824	13,221	-10,701	-66,757	596	48382	1.60	46.2
2020	38,016	-50,620	12,249	9,025	30,088	10,479	-4,360	-41,492	737	46940	0.98	33.8
2021	39,328	-47,851	11,088	12,621	26,864	10,811	-5,779	-42,586	679	47596	1.02	32.8

Notes:
Flow components are in m^3/yr
* Chloride concentration assumed as the average of adjacent years.

Source Contributions to Chloride Levels in the Lake

In order to identify the most efficient strategy for reducing chloride loading to the Lake, a high-level estimate was made of the contribution of different sources. Two independent methods were used for this estimate, and adjustments were made to achieve similar results between the two methods.

The first method uses available runoff concentrations and modelled flows to estimate chloride input to the Lake. Model assumptions include:

- Runoff produced from December to April contains a specified concentration of chloride. No chloride concentration was assigned to other months.
- Runoff concentrations were adjusted up to ±50% to achieve similar results to the second method.
- Runoff volumes (from Table 1 and Table 2) were divided into catchments with different salting arrangements based on catchment areas.
- The northern inlet to the East Pond has been blocked since 2018.

The second method uses salt usage data and application time, as well as assumptions related to salt retention. Model assumptions include:

- Salting operation occurred from December to April, distributed based on the number of snow events in each month (snowfall information from Toronto Buttonville station).
- Salt usage data were used to estimate the amount of salt applied in each catchment annually and the amount of chloride in runoff from the area (see Table 7).

- The fraction of runoff from each area discharged to the Lake (after passing through stormwater controls, if applicable) was estimated from the PCSWMM model. The fraction was about 10% for the North Pond catchment and 3% for the East Pond (70% when the inlet was blocked).
- Lower salt usage (up to 50%) was considered for years before 2016 to achieve similar results to the first method.

Table 7: Salt Usage Assumptions

Area	Maintained by	Road Length (m)	Walkway/ Driveway/ Parking **(ha)	Road Salt (kg/yr)	Walkway/ Parking Salt (kg/yr)	Salt used (ton/yr)	Cl Content ⋆ (kg/yr)	Retention in soil (assumed)	Cl in runoff (kg/yr)
East Pond	Village	10460*	8.835	22414*	51302 *	74	44230	0.2	35384
North Pond	Village	3540*	2.99	7586*	17362 *	25	14969	0.2	11975
SLC OGS	Village	0	0.23	0	1336 *	1.3	801	0	801
North Pond	City- local road	880	0	2129	11672 ***	13.8	8280	0.2	6624
SL Blvd	City- primary road	130	0	972.4	0	1.0	583	0	583
AMICA OGS	AMICA	0	0.375	0	2178 +	2.2	1307	0	1307

Notes:
* 14 km (and associated salt usage) divided based on catchment area fractions (75% and 25%)
** Assumed 50% of the surface area
*** Assumed the same application rate as in the Village by local resident
+ Assumed the same application rate as SLC OGS
⋆ 60% of rock salt is chloride

Estimated contributions are provided in Table 8and Table 9 for the two methods.

Given the many assumptions made for these estimates, the results should be used with caution. Nonetheless, both methods show a significant increase in chloride loading from the untreated runoff from the East Pond catchment. The blocked inlet causing this load was cleared in 2021, and therefore, this load will not be present in the future.

Swan Lake Blvd. may have a high chloride contribution based on measured concentrations in front of the outfall to the Lake.

Measured concentrations for AMICA outfall are not very high; however, the salt application rate should be confirmed.

No measurement was completed for the Swan Club OGS due to lack of flow.

Table 8: Chloride Contribution Estimated using Runoff Concentrations (ton/yr)

Year	Pond 104-Village	Pond 104-City	Pond105	Untreated Pond105 catchment	Shoreline	SLC OGS	SL Blvd OGS	AMICA OGS
Concentration (mg/L)	250	250	250	200 (600*)	25	600	1000	600**
2009	1.13	0.76	0.42	0.60	0.32	0.75	1.46	1.22
2010	0.26	0.18	0.07	0.10	0.17	0.40	0.79	0.65
2011	0.00	0.00	0.00	0.00	0.13	0.30	0.59	0.50
2012	0.02	0.01	0.00	0.01	0.12	0.30	0.59	0.50
2013	0.24	0.16	0.09	0.12	0.18	0.49	0.97	0.81
2014	0.03	0.02	0.03	0.04	0.12	0.33	0.65	0.54
2015	0.49	0.33	0.21	0.31	0.13	0.34	0.67	0.56
2016	0.06	0.04	0.03	0.05	0.17	0.49	0.97	0.80
2017	0.25	0.17	0.10	0.14	0.27	0.72	1.41	1.17
2018	0.24	0.16	0.00	19.14	0.29	0.70	1.37	1.15
2019	1.21	0.82	0.00	28.20	0.47	0.93	1.82	1.52
2020	1.55	1.04	0.00	28.43	0.50	0.99	1.93	1.61
2021	0.39	0.26	0.02	13.81	0.27	0.59	1.16	0.97
Average	0.45	0.30	0.08	0.15 (22.4*)	0.24	0.57	1.11	0.92

Notes:
* Concentration/ contribution of untreated runoff for the normal operation after the first flush (2009-2017) and including the first flush (2018-2021)
** Assumed the same as SLC OGS

Table 9: Chloride Contribution Estimated using Salt Usage Data (ton/yr)

Year	Pond 104-Village	Pond 104-City	Pond105	Untreated Pond105 catchment	Shoreline	SLC OGS	SL Blvd OGS	AMICA OGS
Salt Usage* (ton/yr)	24.9	13.8	73.7		0.5 ***	1.3	1.0	2.2
2009	0.56	0.62	0.25	0.61	0.15	0.39	0.57	0.64
2010	0.52	0.58	0.23	0.57	0.14	0.37	0.53	0.60
2011	0.56	0.62	0.25	0.61	0.15	0.39	0.57	0.64
2012	0.56	0.62	0.25	0.61	0.15	0.39	0.57	0.64
2013	0.54	0.60	0.24	0.58	0.14	0.38	0.55	0.61
2014	0.50	0.55	0.22	0.54	0.13	0.35	0.51	0.57
2015	0.55	0.61	0.24	0.60	0.14	0.39	0.56	0.63
2016	1.03	0.57	0.45	1.11	0.13	0.72	0.52	1.17
2017	1.05	0.58	0.46	1.14	0.14	0.74	0.54	1.20
2018	0.86	0.48	0.05	17.11	0.11	0.60	0.44	0.98
2019	1.00	0.55	0.06	19.81	0.13	0.70	0.51	1.14
2020	0.99	0.55	0.06	19.67	0.13	0.69	0.51	1.13
2021	1.09	0.60	0.07	21.62	0.14	0.76	0.56	1.24
Average	0.75	0.58	0.22	0.71 (19.6)**	0.14	0.53	0.53	0.86

Notes:
* Lower application rates before 2016
** Contribution of untreated runoff for the normal operation after the first flush (2009-2017) and including the first flush (2018-2021).
*** Not salted; however, runoff from adjacent areas contribute to slight loads from the shoreline.

Chloride Management and Mitigation Strategy

Field monitoring and data analysis were employed to estimate source contributions and chloride transport through the catchment.

Chloride loading from the untreated runoff from the East Pond catchment was found to be the main contributor to loads. The blocked inlet causing this load was cleared in 2021, and it is expected that chloride concentrations will gradually decrease now that this source is not present.

Other measures that could be considered if chloride concentration is found to affect the Lake's health may include:

- Managing the de-icing material application rate and type (e.g., sand and salt mix or other material instead of rock salt) to achieve an optimum value that addresses safety concerns as well as chloride load.
- Calibration of salting equipment and monitoring of salt application rates on different surfaces.
- Capturing chloride-laden snowmelt/ runoff and redirecting it away from the Lake.

Assumptions and Limitations

Swan Lake PCSWMM Model

As the PCSWMM model results provide a high-level estimate of these runoff contributions, it should also be noted that there are several limitations and assumptions of the PCSWMM model:

- The model has not been calibrated with flow monitoring data, as this information was not available for the simulation period. Thus, the runoff output from the current model represents a high-level simulated runoff estimate, which is adequate for approximating concentration inputs to the Lake.
- The PCSWMM model does not account for groundwater inputs, as this information was not available for the simulation period. However, from qualitative field observations, it has been observed that groundwater inputs may have some influence on water level fluctuations in Swan Lake.
- The PCSWMM model does not account for the influence of snowpack and snowmelt, as this information was not available for the simulation period. Snowpack and snowmelt can affect the timing of runoff and peak flows into the Lake during the winter months.

Water Balance Analysis

Assumptions and limitations that apply to the overall water balance analysis include:

- Balancing inflows with outflows is not feasible with existing information (due to insufficient groundwater data and limitations of the PCSWMM model).
- Water level data are available since 2017 for the ice-free period. These data were extrapolated to previous years and the under-ice period to estimate outflow. The correlation of water level with rainfall and temperature will need to be validated as more water level data are collected.
- Parts of the Swan Lake catchment have been developed in recent years; however, it was assumed that the catchment characteristics did not change pre and post-development and current conditions were used in the analysis. The impact of new stormwater controls was taken into account by attributing the catchment area of the OGS unit on 6360 16th Ave. to the unit after it was installed in 2018 (i.e., uncontrolled runoff from this catchment until 2018).

Chloride Analysis

Assumptions and limitations that apply to the chloride analysis include:

- Based on an areal load analysis, it was estimated that the northern inlet to the East Pond had been blocked since 2018.
- Missing chloride concentrations in the Lake were assumed as the average of adjacent years.
- Salt usage data for the AMICA property was assumed similar to the Swan Club.
- Salt usage date in the residential area north of Swan Lake was assumed similar to those in the Village.
- Several parameters in the equations used to estimate salt usage and chloride transport were assumed.

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Ministry of Environment, Conservation and Parks (MECP, formerly MOE). 2001. Amended Certificate of Approval (CofA, now ECA) No. 7027-53LRES.

Minnesota Department of Transportation (MNDOT). 2017. Study of De-icing Salt Accumulation and Transport Through a Watershed. Report 2017-50.

Pers Comm. (2021, June 18). Email from Robert O’Hara to Zahra Parhizgari.

Pers Comm. (2022, February 22). Email from Mark Petit to Robert Muir.

MEMORANDUM

TO: Friends of Swan Lake Park (c/o Fred Peters)

FROM: Eddy Wu, Director, Environmental Services
Alice Lam, Director, Operations

PREPARED BY Robert Muir, Manager, Stormwater
Zahra Parhizgari, Environmental Engineer
David Plant, Sr. Manager - Parks, Horticulture and Forestry

CC: Morgan Jones, Director, Community Services
Councillor Andrew Keyes

DATE: March 3, 2022

SUBJECT: Review of Friends of Swan Lake "Holistic Approach to Realizing Community Goals"

PURPOSE:

Review of the proposals made by the Friends of Swan Lake Park (FOSLP) on community goals and measures to achieve them.

BACKGROUND:

On November 3, 2021, the Friends of Swan Lake Park provided a presentation to the City entitled "A Holistic Approach to Realizing Community Goals". This presentation was later expanded and presented to the Markham Subcommittee on November 16, 2021, entitled as "Towards Realizing Community Goals for Water Quality".

Specific propositions made in these presentations related to water quality improvement have been considered in Swan Lake's long-term water quality management plan. This plan was presented to the General Committee on December 7, 2021, and was endorsed by the Council on December 14, 2021.

This memo reviews ideas and measures put forward in the November 3, 2021 presentation, specifically targeted at achieving the goals that FOSLP defined for Swan Lake and the Park through a survey conducted in February 2021 (by FOSLP). Those ideas and measures are identified as the "FOSLP Proposal".

FOSLP PROPOSAL REVIEW:

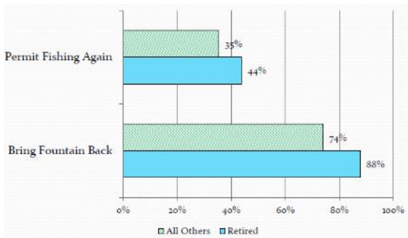
The following table provides our evaluation of the FOSLP Proposal and describes the City's current approach to advancing related topics and that aligns with previous Council resolutions (e.g., December 14, 2021) and the mandate given to staff.

FOSLP Proposal	Proposal Evaluation and Approved Approach
Slide 4- Potential to Reduce Stormwater Flows into Markham Village Flood Control Area ; Towards a self-sustaining Swan Lake: • Raise lake level to retain local runoff within the lake • Redirect stormwater from lake to reduce road salt • Retain flood control features of current system • Needs to be validated by technical assessment 	**Manipulating Flows and Water Level are not Pursued in Phase 1:** • The current stormwater management system provides flood protection in the Swan Lake catchment area, and any change may increase flood risk upstream or downstream. • Source control has been determined as the primary means of chloride control in Phase 1. • Structural change to the stormwater management system and lake operations may be considered if other Core and Complementary measures do not achieve the set targets. • When the Markham Village Project 2 Area design advances, the role of the Lake and any change in flow patterns can be modelled and confirmed.

<table>
<tr><th>FOSLP Proposal</th><th>Proposal Evaluation and Approved Approach</th></tr>
<tr><td>
Slides 5/6/7- Need to Strengthen Community Engagement

“Natural Spaces Wildlife Places” Park

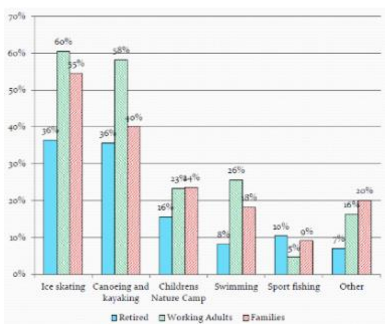
Destination to help with mental well being
Area for relaxation, exercise, bird watching
Support wildlife education (aquatic and terrestrial)
Children’s playground, low impact recreation



When safe, lift current restrictions

Lake not accessible due to health risks
Fishing temporarily banned
Traditional fountain removed

Original recreational plans restricted (canoeing, kayaking, ice hockey etc.)
Park Improvement Survey, March 2021 (367 respondents)



Short term: making the water safe
Reversing the cyanobacteria restrictions

Restoring the Original Community Role by Supporting Contact Level Activities
</td><td>
Passive uses of the Park are Supported:

The Park is currently well-used for low impact recreation by all age groups, consistent with Community Park designation.
Natural Spaces Wildlife Places signage is posted where applicable and does not reflect the type of park but rather marks an area
Opportunities for wildlife observations (including bird watching) are currently abundant and will be enhanced through proposed shoreline improvement work.
As water quality improves, the City will revisit the fishing ban advisory (no consumption) and re-installation of the fountain.

Contact Activities are not Supported:

Contact level activities will require conformance with E-Coli guidelines and the involvement of Public Health, which are not deemed feasible for Swan Lake.
Some of the activities proposed (e.g., children campground) will require amenities not available in the Park (e.g., parking spaces, washrooms).
The community survey identifies a low percentage of the key group represented by the survey (i.e., Retired) having an interest in contact activities such as swimming.
Proposed activities do not align with usable space and park has limitations on developable land for active uses.

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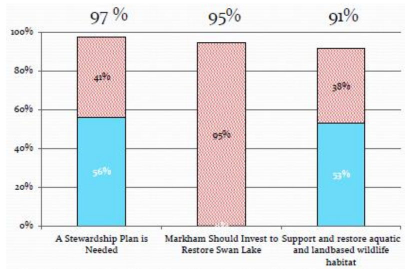
FOSLP Proposal	**Proposal Evaluation and Approved Approach**
Slides 8/9/10- Why Restoration Is Important?/ Residents Support Environmental Restoration  1. Meets community engagement objectives for lake and park – healthy aquatic and terrestrial habitat 2. Healthy aquatic environment healthy terrestrial environment healthy greenspace benefits all of Markham 3. Supports lower-level aquatic life that can consume algae and improved oxygen levels that reduce phosphorus drawn from the sediments  • Should reduce dependency on future chemical treatments • Environmental restoration a critical community objective • Sustained through a Stewardship Plan	**Improving the Health of Aquatic and Terrestrial Habitat is Supported:** • The Lake already supports a large community of small algae-eating fish (10000 fathead minnow identified as per the inventory completed by the TRCA in 2021). • Water quality and shoreline improvement will support a healthier aquatic and terrestrial environment. • Once the water quality improves, fish stocking and submerged plants will be introduced. • Due to the nature of the Lake, chemical treatment will be required in the short term. In the proposed adaptive management approach, frequency and dosage are adjusted at the end of each Phase. **Mesotrophic Target is not Supported:** • According to the City’s limnologist, the best achievable outcome of aggressive management for Swan Lake is expected to be borderline meso-eutrophic with respect to phosphorus concentration and hyper-eutrophic for transparency (low due to sediment disturbance in shallow lakes). **Eutrophic Classifications (based on DO, phosphorus, clarity)** • Oligotrophic: pristine • Mesotrophic: clear with some submerged plants • Eutrophic: somewhat unclear, lots of planktonic plant growth • Hypereutrophic: unclear, with frequent algal blooms

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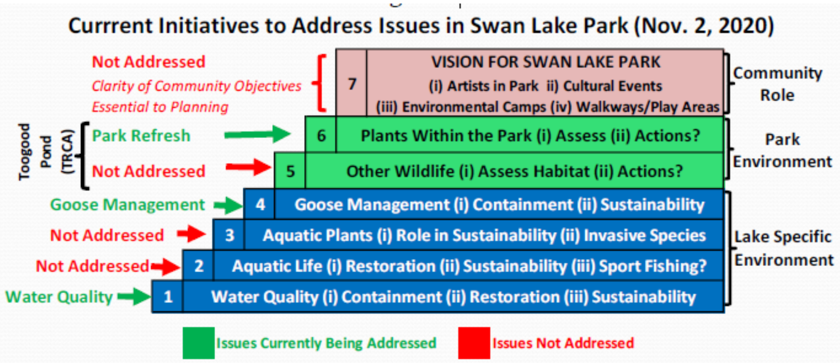
Slide 12- Define Goals – Address Missing Elements

Council's June 2020 mandate addresses several critical areas

- Several elements require development of goals and remediation plans
  - The Community objectives for engagement, restoration of aquatic and terrestrial habitat need to be integrated



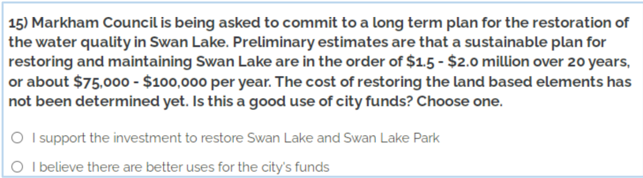
Note: January 27, 2022 slides presented to Environment Advisory Committee indicate that #2 and #3 above have been addressed.

Lake and Park Environments are Being Improved:

- Water quality and shoreline improvement will already support a healthier aquatic and terrestrial environment.
- Submerged plants and fish stocking will provide further advance improvement.
- As water quality improves, staff will revisit the fishing ban advisory (no consumption).
- Fish stocking recommendation will dictate 'sport fishing' potential considering suitable species.
- Park Environment improvements consider local conditions and may not be equivalent to other park sites (e.g., Toogood site accommodates cold water fishery, Provincially-significant wetland, Greenbelt designation).

The Definition of Community Vision in February 2021 was Premature:

- The FOSLP survey was conducted before the improvements implemented in 2021 and those planned through the long-term water quality management plan.
- Costs associated with 'restoration' were not reflected accurately in the survey (see Q.15 below).
- The survey provides insight from the sample population; however, the population is not representative of the City or Ward 5 (Greensborough community, 73% retired).
- Some of the activities proposed under Vision (e.g., Artists in Park, Cultural Events, and Environmental Camps) will require amenities not available in the Park (e.g., parking spaces, washrooms).



15) Markham Council is being asked to commit to a long term plan for the restoration of the water quality in Swan Lake. Preliminary estimates are that a sustainable plan for restoring and maintaining Swan Lake are in the order of $1.5 - $2.0 million over 20 years, or about $75,000 - $100,000 per year. The cost of restoring the land based elements has not been determined yet. Is this a good use of city funds? Choose one.

○ I support the investment to restore Swan Lake and Swan Lake Park

○ I believe there are better uses for the city's funds

MARKHAM

<table>
<tr><th>FOSLP Proposal</th><th>Proposal Evaluation and Approved Approach</th></tr>
<tr><td>
Slides 15/16/17/18- Integrate Markham's Foundation Eco Policies into a Holistic "Eco Park" Strategy for Restoration of Swan Lake

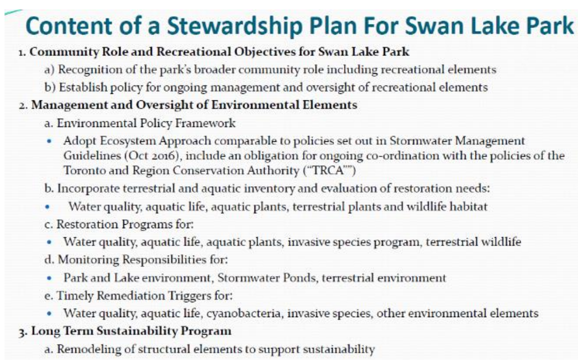
Recommendations:

1) Adopt "holistic" Eco Park approach that recognizes improved Community Engagement and Restoration of Swan Lake and Swan Lake Park as a critical community need. Integrate and build upon existing Markham policies

2) Define a process for addressing the missing environmental elements

3) Implement a Stewardship Plan

- Swan Lake is a regulatory orphan, does not fall under any existing regulatory framework (TRCA, other Markham Environmental guidelines)
- The 1993 Environmental Management Study for Swan Lake, set out the ongoing policy framework for the City of Markham in its role as Steward of Swan Lake Park but not the management responsibilities. No longer used as a policy framework.
- Need for a centralized "holistic" standard that integrates all departmental elements – stormwater management environmental services, park management, park development backed by a long-term undertaking to maintain the standards.



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Community Goals and Role:

- The Vision defined through FOSLP's survey in Feb 2021 was premature (See the previous page).
- The City's Goal is "To improve the overall health of Swan Lake, which will provide opportunities for no-contact activities for the enjoyment of the community" (water quality plan).
- The community and stakeholders will be involved in the management plan updates and review of progress.
- The shoreline restoration plan is being developed in consultation with the community. Note plan scope is not to add shore amenities.

Policy Framework and Improvement Plan:

- The 2021 long-term water quality plan for Swan Lake defines a management framework for the Lake. It contains an adaptive approach for setting & achieving targets for the Lake environment for next 25 years.
- Provisions for the improvement of the aquatic habitat are provided.
- Pond maintenance will be conducted following the assumption process.
- Invasive species will be dealt with through shoreline rehabilitation work.
- The terrestrial environment is being enhanced. In 2021, the City partnered with Friends of Rouge Watershed to plant over 1,000 native wildflowers at Swan Lake Park.
- Popular passive recreational uses identified in FOSLP survey are supported through trail upgrades. Non-contact uses will expand with quality improvements.
- Environmental improvements consider local environmental setting/ sensitivities. Per 2014 Official Plan, park is not part of Natural Heritage System (park categorized as "Other Greenway System Lands").

Integration and Stewardship Plan:

- City departments work closely to maintain and improve the Lake and the Park environment according to the mandate given by the City Council.
- Staff have developed a long-term management plan for the Lake and will continue to monitor the conditions and consult with the community and stakeholders to adapt the plan accordingly.
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CLOSURE:

The FOSLP Proposal evaluation indicates that many ideas and measures are being advanced under the City's approved and ongoing activities. As summarized above:

- Passive uses of the Park are supported.
- Improving the health of aquatic and terrestrial habitat is supported.
- Lake and Park environments are being improved.
- A goal for water quality improvement has been defined and community/stakeholder engagement is ongoing.
- A long-term water quality improvement plan is approved to support environmental improvements and recreational opportunities, complemented by support of passive recreational uses.

Some ideas and measures in the FOSLP Proposal are not supported:

- Manipulating flows and water level are not pursued in Phase 1of the water quality plan.
- Mesotrophic target is not supported based on the City's limnologist evaluation.

Lastly, as indicated above, the definition of community vision in February 2021, the basis for the Holistic Approach being proposed was premature and had several limitations:

- Community survey by FOSLP was conducted prior to implementation of ongoing commitments.
- Survey proposed unattainable water quality conditions and uses.
- Survey underestimated costs of implementation of 'Restoration' activities.
- Survey represented the Greensborough community and did not include all Ward 5 residents. The feedback suggested that 73% of respondents were retired which represents Swan Lake Village and Amica well but not the entire ward.
- The survey feedback suggested that 86% of respondents (315 out of 367) use Swan Lake Park primarily for walking which is meeting community needs now.
- Some of the activities proposed under Vision (e.g., Artists in Park, Cultural Events, and Environmental Camps) will require amenities not available in the Park (e.g., parking spaces, washrooms) and are inconsistent with uses within designated Community Parks and available development space for active uses. Assessing habitat and identifying actions for "other wildlife" are more appropriate within the City's designated Natural Heritage Network (excludes Swan Lake Park).

The City has no current plans to reclassify Swan Lake Park or change the intended use. While we appreciate the feedback from FOSLP through their community survey, the results do not support a change from the current use of Swan Lake Park.

Action Plan For Restoration of Swan Lake and Swan Lake Park

Fred Peters
Markham Subcommittee

May 11, 2022

Objectives: Request Support For Three Things

1. Natural Heritage Designation For Swan Lake Park
2. Initiate Action Plan to End Stormwater Role for Swan Lake
3. Support Three Research Initiatives
   a) Chloride Removal (York University)
   b) Oxygen Enhancement (Fleming College)
   c) Survey of Lower Level Aquatic Life – Benchmark (TRCA?)

Submissions

1) Eco Park Questionnaire (Milne/Toogood/Swan Lake)
2) Natural Heritage Network Designation
3) Action Plan to End Stormwater Role
4) Research Proposal York U (Nutrient & Chloride removal)
5) Research Proposal Fleming College (Oxygen enhancement)

Agenda

- **Research Programs**
  - York University
  - Fleming College
- Eco Park Strategy
  - Natural Heritage Designation
- Ending Stormwater Role

BUILDING MARKHAM'S FUTURE TOGETHER
2020 – 2023 Strategic Plan

MARKHAM

Option 1 - Expanded Core & Complementary Measures
and Evaluate the need for Alternative Measures

	Activity	Phase 1 Core Measures (Years 1-5)	Phase 2 Core+ Complementary Measures (Years 6-10)	Phase 3 Core+ Alternative Measures (Years 11-25)
Core	Water quality monitoring and annual reporting to Subcommittee	✓	✓	✓
Core	Geese management and explore enhanced methods	✓	✓	✓
Core	Remove benthic-dwelling fish	✓	✓	✓
Core	Maintenance of stormwater management facilities (by developers then City)	✓	✓	✓
Core	Community Engagement	✓	✓	✓
Core	Chemical treatment (adjusted frequency at the end of each Phase)	✓	✓	✓
Complementary	Shoreline planting / Improvements	✓		
Complementary	Chemical oxygenation pilot project (by research institute)	✓		
Complementary	Fish management plan and fish stocking (by MNDMNRF)	✓	✓	
Complementary	Planting of submerged plants	✓	✓	
Complementary	New technologies for chloride treatment	✓	✓	
Alternative	Investigate contribution from groundwater and dumping areas if required			✓
Alternative	Evaluate/design structural modifications such as lake water recirculation and stormwater redirection, if required			✓
Alternative	**Evaluate implemented measures and report back**	✓	✓	✓

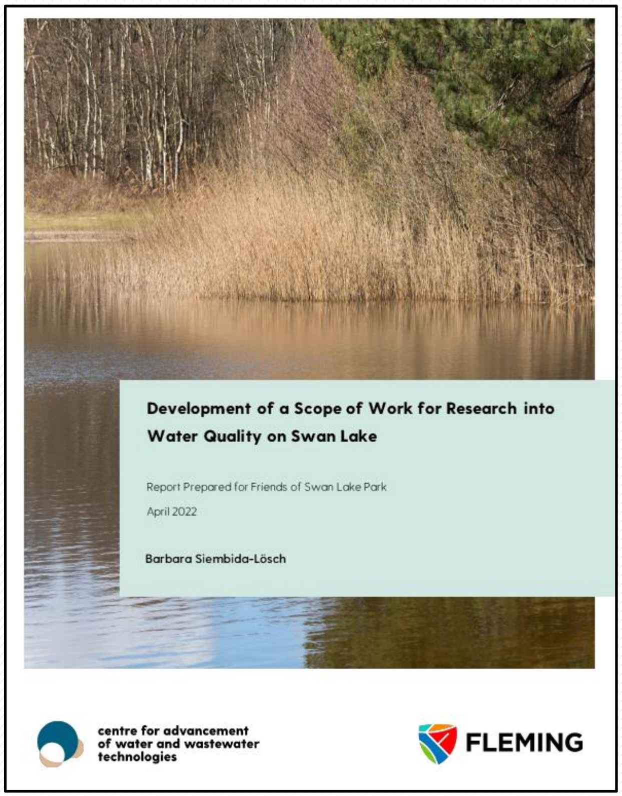
Phase 1: L-T Budget $90k

Don't wait 10 years
End Stormwater Role

Need TBD (Cost Excluded)

Research By Fleming College & York University

Use of Chemicals To Improve Oxygen Levels


Development of a Scope of Work for Research into Water Quality on Swan Lake

Report Prepared for Friends of Swan Lake Park

April 2022

Barbara Siembida-Lösch

centre for advancement of water and wastewater technologies

FLEMING

Cost $37k

Use of Charcoal Filters To Remove Nutrients & Chloride


YORK U

Research Into Removal of Nutrients and Chlorides from Swan Lake

Rama Pulicharla Ph.D.

Post Doctoral Researcher

Dr. Satinder K Brar

Professor

May 2, 2022

Cost $43k

Agenda

- Research Programs
  - York University
  - Fleming College
- **Eco Park Strategy**
  - Natural Heritage Designation
- Ending Stormwater Role

Substantive & Critical Processes Underway Since 2020

Swan Lake

1) Enhanced Goose Management Program launched
   - Fall hazing doubled, strobe lights added
   - Relocation program June 2021
2) TRCA fish inventory started, removal of bottom feeders
3) Sediment testing in Oct 2020
4) Aluminum Chloride compound applied in July 2021
5) Core long term plan approved by Council Dec 2021
6) TRCA shoreline redesign
   - May 2022 Conceptual Outline

Swan Lake Park

1) Park "Refresh" Program approved
   - Pollinator plantings
   - Invasive species program
2) Pathways repaired in 2021
   - Amica extension completes pathway around lake
   - Public parking added
   - New, safer sidewalks around traffic circle

Our Original Vision For Restoration

Many interconnected elements in a healthy ecosystem

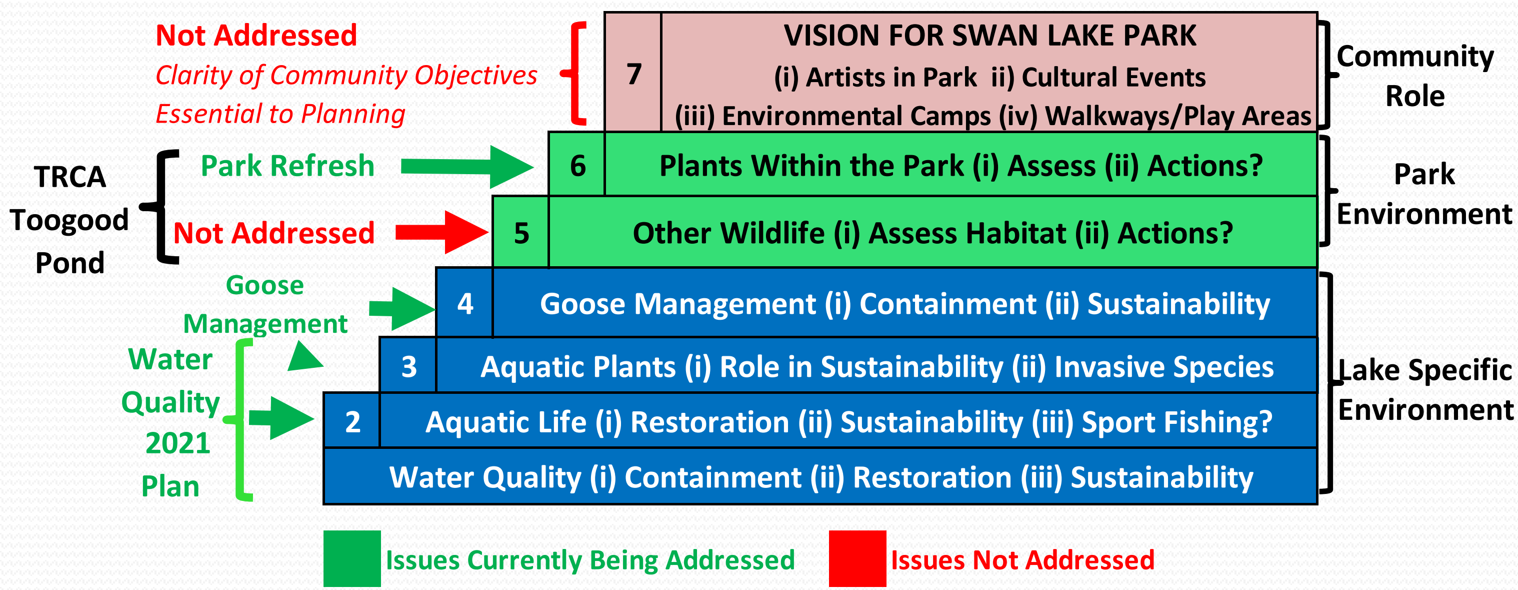
Interconnected Elements within Swan Lake Park

Define Goals – Address Missing Elements

Council's June 2020 mandate addresses several critical areas

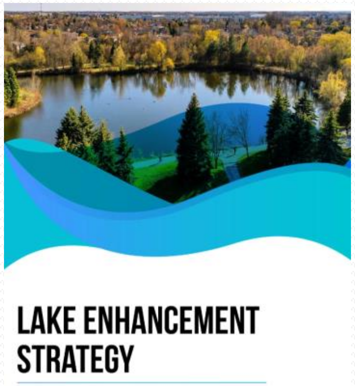
- Several elements require development of goals and remediation plans
- The Community objectives for engagement, restoration of aquatic and terrestrial habitat need to be integrated ("holistic approach")
- Swan Lake is unique - No regulatory framework ("regulatory orphan")

Current Initiatives to Address Issues in Swan Lake Park (Dec 14, 2021)



An Example of Community Driven Targets

Brampton's Eco Park Strategy



Eco Park Principles

1. Maximize ecological value
2. Provide opportunities for social services
3. Make nature visible
4. Design with nature
5. Integrate with surrounding community
6. Support innovation
7. Reflect local identity

Lake Enhancement Goals (14 Lakes)

A. **Natural Heritage**: Improve lake habitat and water quality

B. **Parks**: Connect people with lake

C. **Recreation**: Expand sustainable water-related programming

D. **Communications and Engagement**: Engage community and park users and build awareness of Brampton lakes.

Average cost $2.5 - $5 m
(Swan Lake $1.8 – $3.4)

Markham – similar concepts

Markham – No similar program, seen to discourage interaction

Integrate Markham's Foundation Eco Policies into a Holistic "Eco Park" and "Lake Enhancement" Strategy for Restoration

Community Goals

- Markham's Vision for Parks, Eco Spaces
- Markham's Environmental Objectives
- Greensborough Community Perspective (Survey)

Integrate Markham's Existing Policy Framework

- Park Management
- Eco System Approach/ Adopt TRCA framework
- Stormwater/Flood Control Framework
- **Add new policy on role of major water bodies**

Swan Lake and Swan Lake Park

- Define specific community vision/objectives/goals
- Define specific environmental vision/objectives/goals
- "Natural Spaces" vision, Define Park Improvement Plan
- Define Swan Lake Restoration Plan
- Develop action, monitoring and remediation plans

Stewardship Plan

Eco Park and Lake Enhancement Questionnaire

Would your park benefit if Markham adopted a program similar to Brampton's Eco Park Strategy and Lake Enhancement Program?

	Eco Park Strategy	Lake Enhancement Strategy
Yes	MP SL	MP TP SL
Don't Know	TP	
No		

Do you agree that the water body in your park reflects well on Markham's attention to:

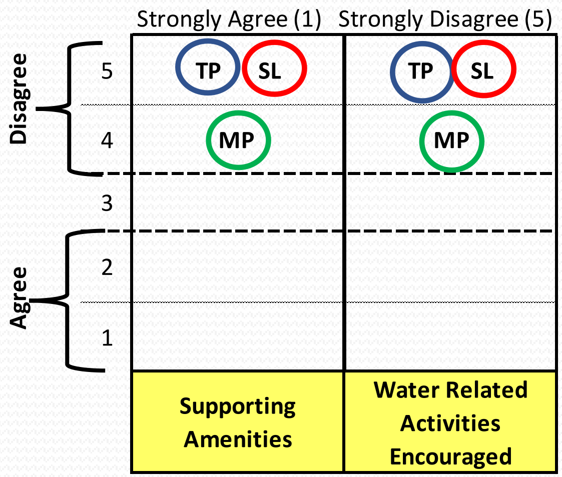
Strongly Agree (1) Strongly Disagree (5)

		Local Ecosystem	Habitat for a Variety of Species	Aquatic Environment
Disagree	5	SL	SL	SL
Disagree	4	TP	TP	TP
	3	MP	MP	MP
Agree	2			
Agree	1			

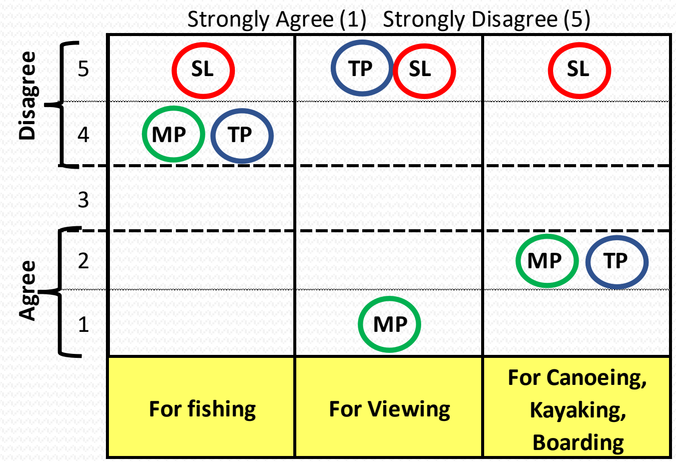
Park		Major Water Body	Respondent's Association
MP	Milne Dam Conservation Park	Rouge River, Milne Reservoir	Milne Dam Conservation Park Ratepayers Assoc.
TP	Toogood Pond Park	Toogood Pond, Bercyz Creek, Little Rouge Creek	Normandale Community Residents Association
SL	Swan Lake Park	Swan Lake	Friends of Swan Lake Park

Need for Lake Enhancement Strategy

Do you agree that the amenities in the park encourage and support interaction with the water body and that water related activities are encouraged.



There are sufficient access points to the major water body



Why would you like to see water quality improved?		
TG SL	MP SL	MP TP SL
For general environmental reasons	To improve aquatic life	So that it is safer for human interaction

Permitted and Desired Water Interaction Activities				
Desired	SL	TP SL	MP TP SL	
Currently Permitted	MP TP	MP		
	Fishing	Canoeing, Kayaking, Boarding	Skating	Swimming

Staff Reaction:

Dismissive of Community Survey (Mar 2020)

- **"Premature"** – before improvements
  - Intent was to garner community views to determine goals for the projects. Why would you do it afterward? Was not a report card!
- **Community "Vision"** – Perspective was role of integrated Mt Joy/Weaver/Swan Lake, in context of Mt. Joy redevelopment
- **357 respondents not representative** of Ward 5 or Markham, biased by high component of retired residents
- **Restoration costs** cited as $2 mm, not $12 - $20m currently estimated, therefore community "restoration" support dismissed

Response: If staff has better information:

a) That suggests community at large does not support restoration

b) That endorses the current "no contact" policy

PLEASE SHARE!

Staff: Three Proposals Not Supported

1. **Mesotrophic Target ("Restoration")**

   Response: Strengthen water quality program

   a) addressing oxygen levels and excessive chloride

2. **Manipulating flows and water levels in Phase 1**

   - **(now Phase 3 - years 10+)**

   Response: Don't delay critical components of solution

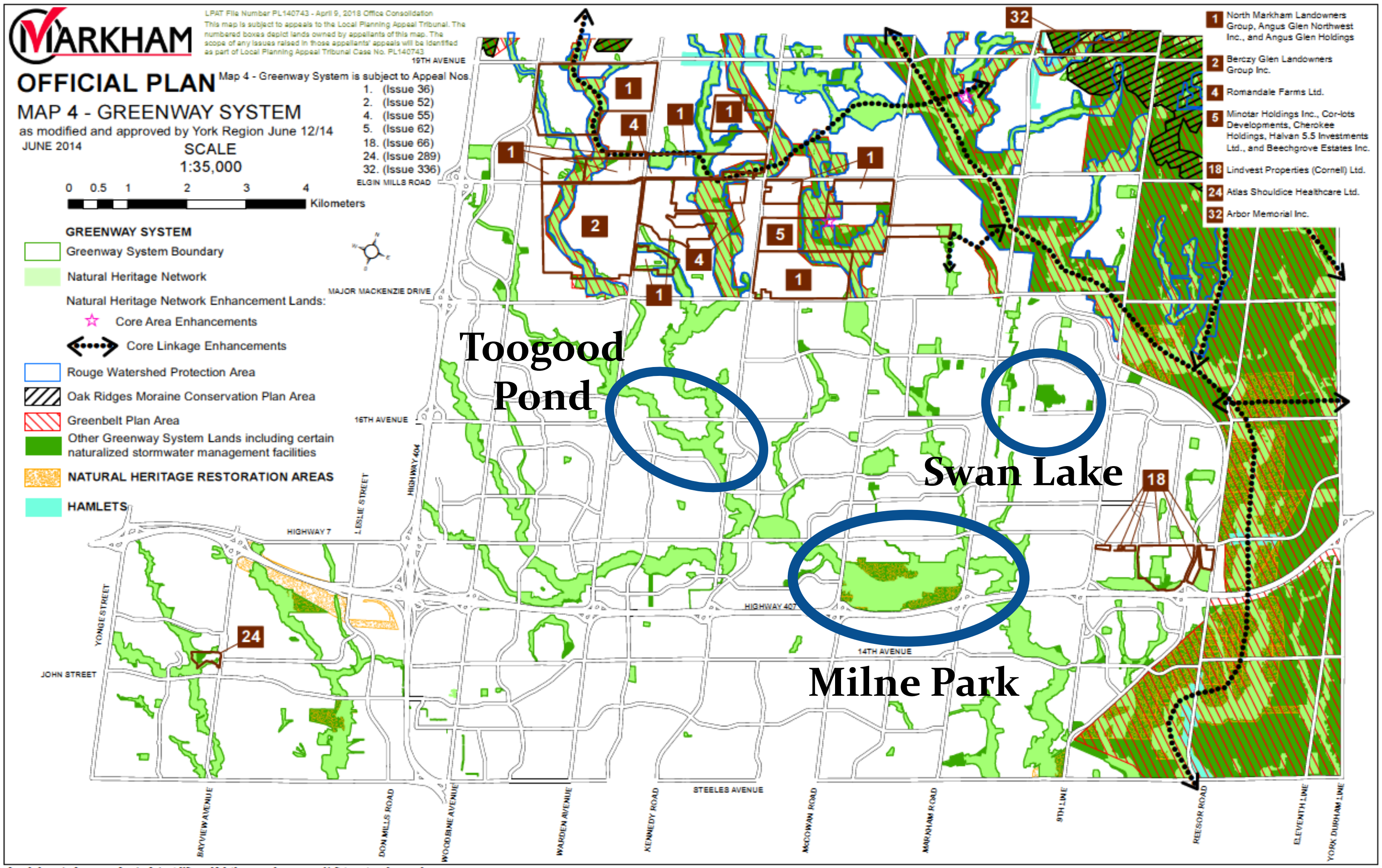
   a) End stormwater role

   b) Consider Flow via North Channel

3. **Reclassification of Swan Lake Park from Community Park to change its intended use**

   Response: Seek designation as Natural Heritage Network, remain Community Park

Markham Greenway System



Markham's Greenway System

Six Environmentally Sensitive Categories

1) Greenbelt Plan Lands

2) Oak Ridges Moraine

3) Rouge Watershed Protection

4) **Natural Heritage Network Lands**

5) Natural Heritage Network Enhancement Lands

6) **Other Greenway Lands** including certain stormwater management facilities

- Swan Lake Park: Community Park within "Other Greenway Lands"
- **Natural Heritage Network Lands**
  - Milne Reservoir, Toogood Pond ("man-made" entities)
  - Ongoing environmental monitoring
  - "Natural Heritage Inventory and Assessment" underway

	Size of Park	Size of Water Body	Bird Species	Established
Milne Dam Conservation Park	123 ha	Largest	161	1825
Swan Lake Park	45 ha	5.4 ha	155	1850
Toogood Pond Park	33 ha	Slightly smaller than Swan Lake	122	1840

May 2021

Natural Heritage Inventory and Assessment Study

- Phase 1 detailed report on the land inventory and plant, bird and aquatic life within Heritage system
  - like analysis requested per TRCA analysis of Toogood Pond
- Phase 2 detailed management study to provide wildlife and biodiversity strategy for Heritage areas
- Phase 2 (starting 2022) baseline for next Official Plan

Need for a Stewardship Plan

1) Swan Lake is a regulatory orphan, does not fall under any existing regulatory framework (TRCA, Markham Environmental guidelines)
2) The 1993 Environmental Management Study for Swan Lake, set out the ongoing policy framework for the City of Markham in its role as Steward of Swan Lake Park but not the management responsibilities. No longer used as a policy framework.
3) Need for a centralized "holistic" standard that integrates all departmental elements

Natural Heritage Network Designation would provide baseline for stewardship plan

Goal: Natural Heritage Network Status

- Comparable environmental status to Milne Park and Toogood Pond
- End "regulatory orphan" status
- Inclusion in current Natural Heritage assessment of land-based environmental elements
- Case for inclusion:
  1. Significant "Groundwater Recharge Area" for Aquifer
  2. An "Ecologically Significant Area"
     - # species, migratory path
  3. A "Heritage Site" (established 1850's)

Agenda

- Research Programs
  - York University
  - Fleming College
- Eco Park Strategy
  - Natural Heritage Designation
- **Ending Stormwater Role**

BUILDING MARKHAM'S FUTURE TOGETHER
2020 – 2023 Strategic Plan

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Option 1 - Expanded Core & Complementary Measures
and Evaluate the need for Alternative Measures

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Core	Geese management and explore enhanced methods	✓	✓	✓
Core	Remove benthic-dwelling fish	✓	✓	✓
Core	Maintenance of stormwater management facilities (by developers then City)	✓	✓	✓
Core	Community Engagement	✓	✓	✓
Core	Chemical treatment (adjusted frequency at the end of each Phase)	✓	✓	✓
Complementary	Shoreline planting / Improvements	✓		
Complementary	Chemical oxygenation pilot project (by research institute)	✓		
Complementary	Fish management plan and fish stocking (by MNDMNRF)	✓	✓	
Complementary	Planting of submerged plants	✓	✓	
Complementary	New technologies for chloride treatment	✓	✓	
Alternative	Investigate contribution from groundwater and dumping areas if required			✓
Alternative	Evaluate/design structural modifications such as lake water recirculation and stormwater redirection, if required			✓
	Evaluate implemented measures and report back	✓	✓	✓

Need TBD (Cost Excluded)

Phase 1:
Fleming College
York, TRCA

Don't wait 10 years
End Stormwater Role

Meeting Community and Restoration Goals

Two Challenges: 1) Attaining Improved Level 2) Staying There

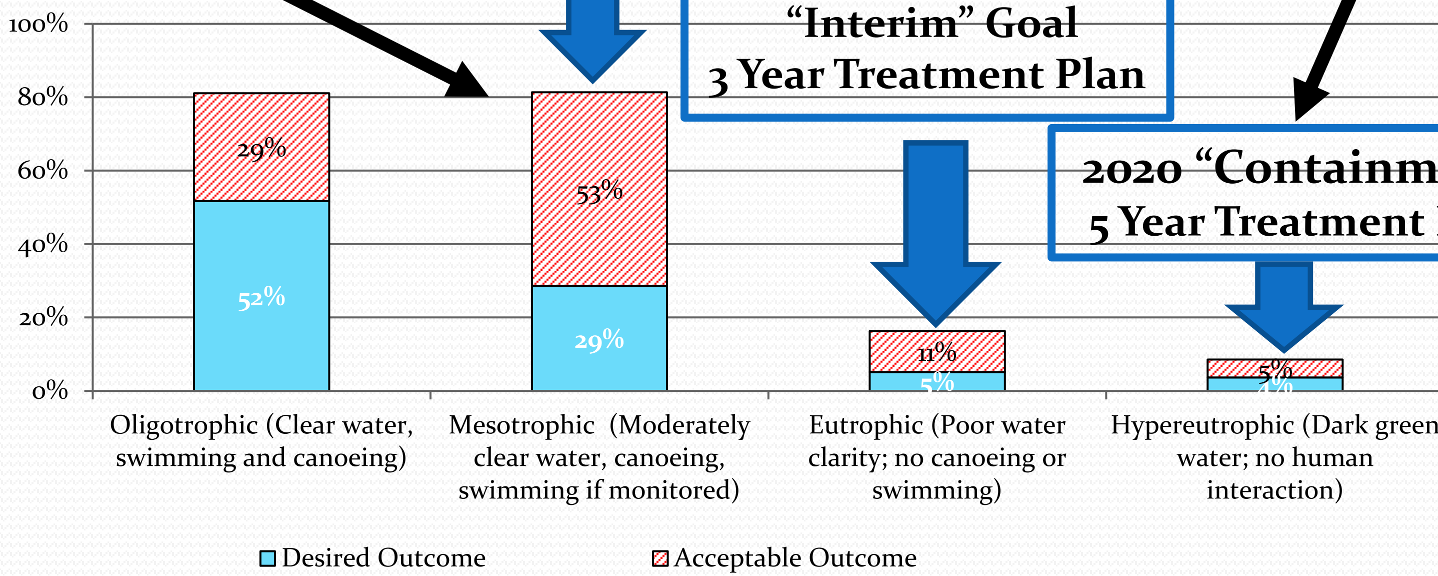
- More stable
- Natural balance
- Less Intervention
- Healthier aquatic environment
- Human interaction

"Restoration and Engagement"
Long Term Goals

- Unstable States
- Periodic Intervention
- Limited aquatic support
- No human interaction

2021 "Stabilization"
No Contact
"Interim" Goal
3 Year Treatment Plan

2020 "Containment"
5 Year Treatment Plan



Markham Long Term Water Quality Plan (Dec 2021)

FOSLP Goal: More Comprehensive Water Quality Plan

- Three core issues acknowledged – current plan focuses only on one
- Restoration Goal (Mesotrophic) – address all three issues

	Issue #1 Excessive Nutrients (Phosphorus, Nitrogen)	Issue #2 Low Oxygen Levels	Issue #3 Excessive Chloride (Road Salt)
Primary Source	**Canada Geese**	**Dying Algae Stagnant Pond (No inflows)**	**Six Stormwater Connections**
CHALLENGE #1	**Reduce New Sources**	**Increase Sources**	**Reduce New Sources**
Markham Goals	50% Reduction	No Goals	No Goals
Markham Plan	Nest disruption, hazing, relocation, shoreline redesign	Research into chemical treatment	Encourage less use of road salt
FOSLP Proposal	**Support (Geese count etc.)**	**Research/Recycle/ Aeration**	**5 -Step Action Plan Reroute/Reduce/Maintain**
CHALLENGE #2	**Remove from Lake**	**Increase Level**	**Remove from Lake**
Markham Goals	50%+ Reduction	No Goals	30% - 40% Reduction (?)
Markham Plan	Chemical treatments (initially 3 yrs, possibly 5 yrs)	Gradual improvement with less algae Adding aquatic plants 5+ years	"No feasible solution" No actions plans Research Phase 1
FOSLP Proposal	**3-year cycle for 10 years**	**Fleming College Research 2022**	**York U Research 2022**

Dumping Salt Into Swan Lake

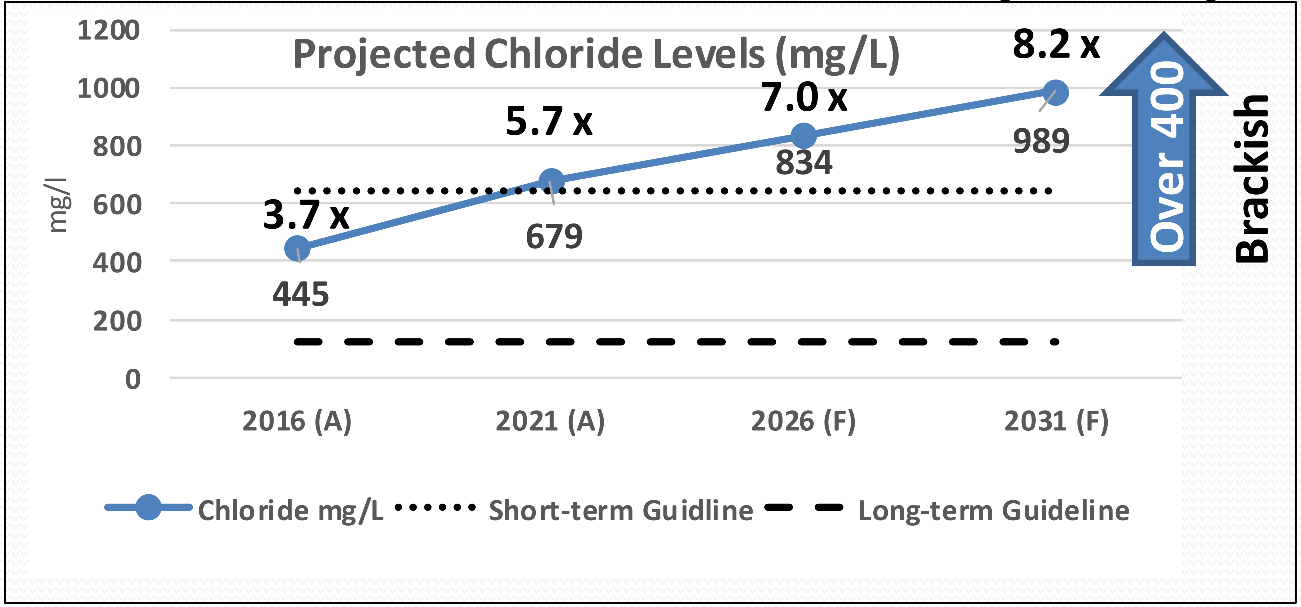
2.3 tonnes of chloride have been added to Swan Lake every year for the past 13 years through the stormwater system

- Equivalent to 3.8 tonnes of road salt each year (60% chloride)
- Ongoing for over 20 yrs.
- Will continue until the stormwater role is ended

There are now 50 tonnes of chloride in Swan Lake

Chloride Increasing Annually

- Average increase 2.3 tonnes per year (before blockage)
- Currently 5.7x Federal guidelines
- Forecast to be 7.0x in 5 years, 8.2x in 10 years if no action
- Continues to undermine aquatic support
- Problem well defined, no reason to delay for 10 years



Very Poor Aquatic Environment: Plants & Fish

- “Brackish” water due to chloride - no longer “fresh water” body
- Many species of fish and plants cannot survive, no impact on algae

Historical Reports	2021 Fish Inventory
• Fathead Minnows	• Fathead Minnows (>10,000)
• Carp	• Common Carp (7 euthanized)
	• Brown Bullhead (209 relocated)
• Pumpkinseed Sunfish	• nil
• Catfish	• nil
• Goldfish	• nil
• Largemouth Bass	• nil

Study of Fathead Minnows

- South Dakota Pond
- Similar size to Swan Lake
- Population over 100,000
- Adults die within 60 days of spawning

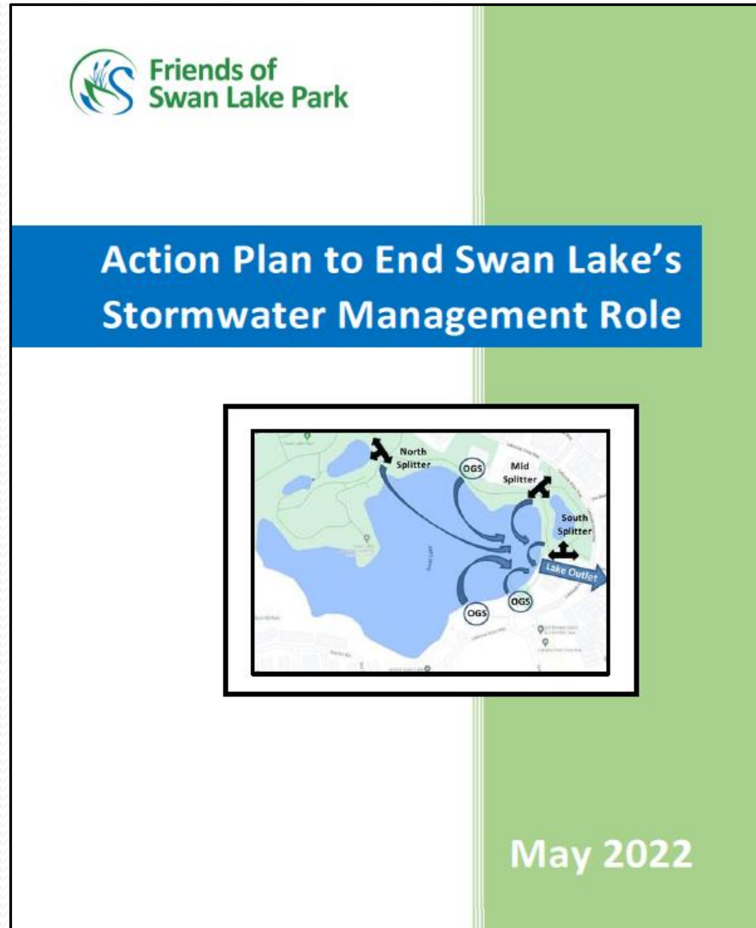
- **Remaining Fathead Minnows at risk due to Chloride**
  - Included in Federal Chloride Guidelines Study – at risk at levels over 698 mg/l
  - Swan Lake already exceeds this level and likely to increase

Recommendation: TRCA inventory of lower-level aquatic fish & plant life: zooplankton, snails etc. to assess ability to support recovery

5-Step Action Plan to End Stormwater Role

1) Redirect OGS Flows
2) Reduce Flows Bypassing Pond
3) Effective maintenance
4) Reduce local salt use
5) Expedite research into ways to remove salt

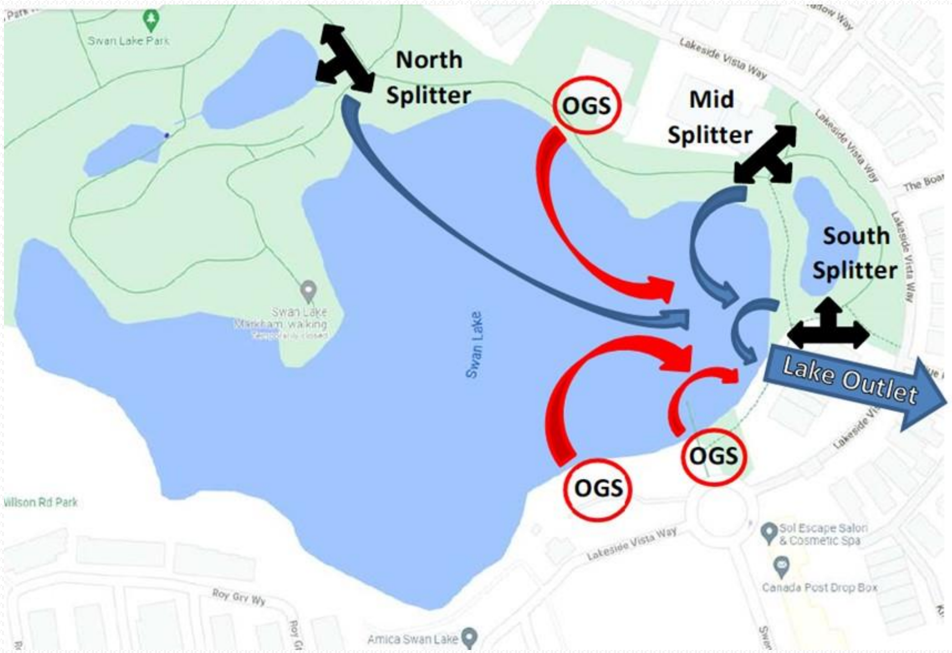
- Utilize existing flood risk management infrastructure
- Potential to reduce road salt entering lake by 70% -80%?



Swan Lake's Stormwater Role

Six Active Sources of Road Salt

- Six Sources: 3 OGS Units, 3 Pond Bypass Sources



Stormwater Source	Basis for Estimate: Water Samples	Basis for Estimate: Usage Data
Three OGS Units	71%	53%
Two Stormwater Ponds	23%	43%
Shoreline	7%	4%
Total	100%	100%

Community Origin	Basis for Estimate: Water Samples	Basis for Estimate: Usage Data
Markham	38%	31%
Swan Lake Village	30%	42%
Amica	25%	24%
Shoreline	7%	4%
Total	100%	100%

- OGS sources can be eliminated;
- Pond bypass reduced (estimate 50% - 66%)

Two Steps to Ending Stormwater Role

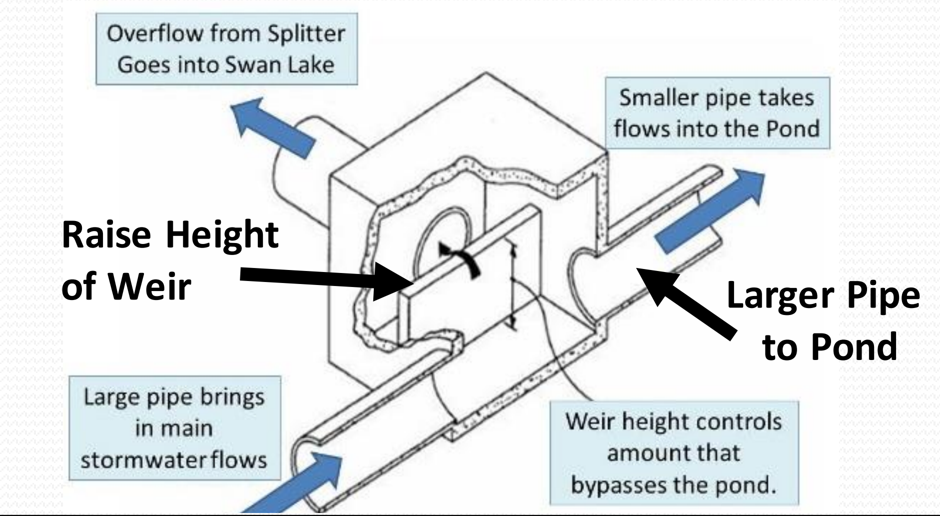
Reroute OGS Flows

- Reroute all three OGS
- Salt inflows eliminated 100%
- Chloride reduced 50% - 70%

Redesign Splitters

- Raise splitters, increase pipe sizes
- Potential flow reduction 50% - 66%
- Chloride reduction 10% - 20%

Options For Rerouting Swan Lake OGS Flows



Relatively low-cost changes
Ponds believed to have capacity

Impact: Reduce Chloride Over 80%

If all OGS flows are rerouted **and** pond bypass reduced by:

- 50% then chloride inflows from regulated sources can be reduced from 75% - 82%
- 66%, then reductions of 82% - 86% possible

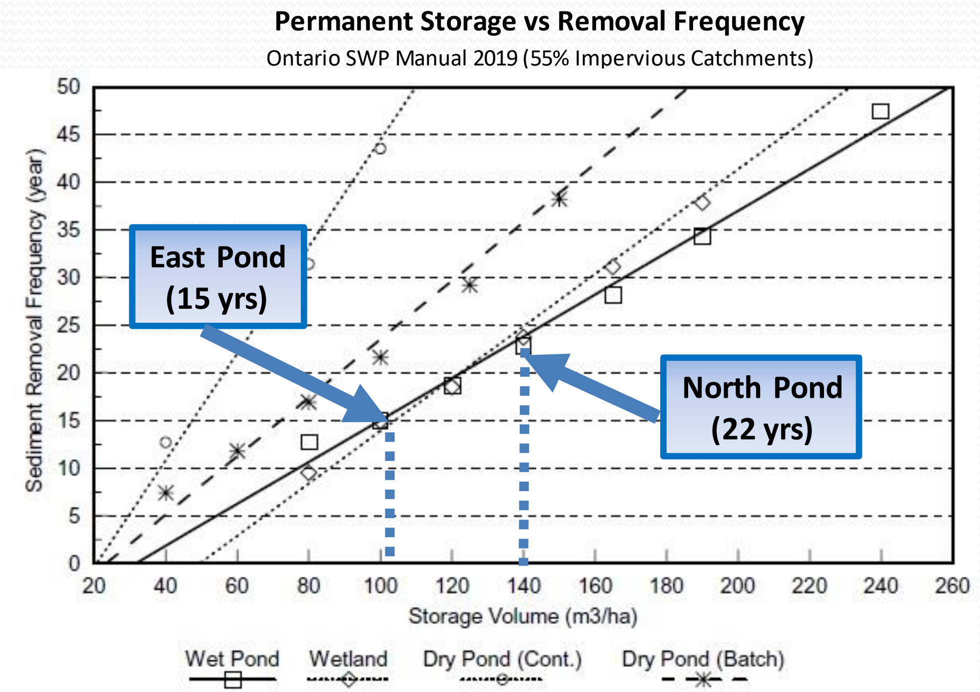
	Basis for Estimate					
	Water Samples			Usage Data		
Stormwater Source	**Qty**	**Reduction**	**Qty**	**Qty**	**Reduction**	**Qty**
Three OGS Units	33.7	100%	0.0	25.0	100%	0.0
Two Stormwater Ponds	10.8	50%	5.4	20.2	50%	10.1
Shoreline	3.1	0%	3.1	1.8	0%	1.8
Total	47.6		8.5	47.0		11.9
% of original Flows			18%			25%
Reduction			82%			75%

With 66% reduction of pond bypass		
Reduction	86%	82%

Man-made problem needing man-made solution

Importance of Maintenance

- 3–4 year blockage in Mid-Splitter responsible for 10%+ of chloride in Swan Lake
- General guidelines on pond cleaning requirements tied to area served and pond designed capacity



East Pond

- Constructed 1996
- Operational 26 years
- Some cleanup in 2010 after construction?

North Pond

- Constructed 2001
- Operational 21 years

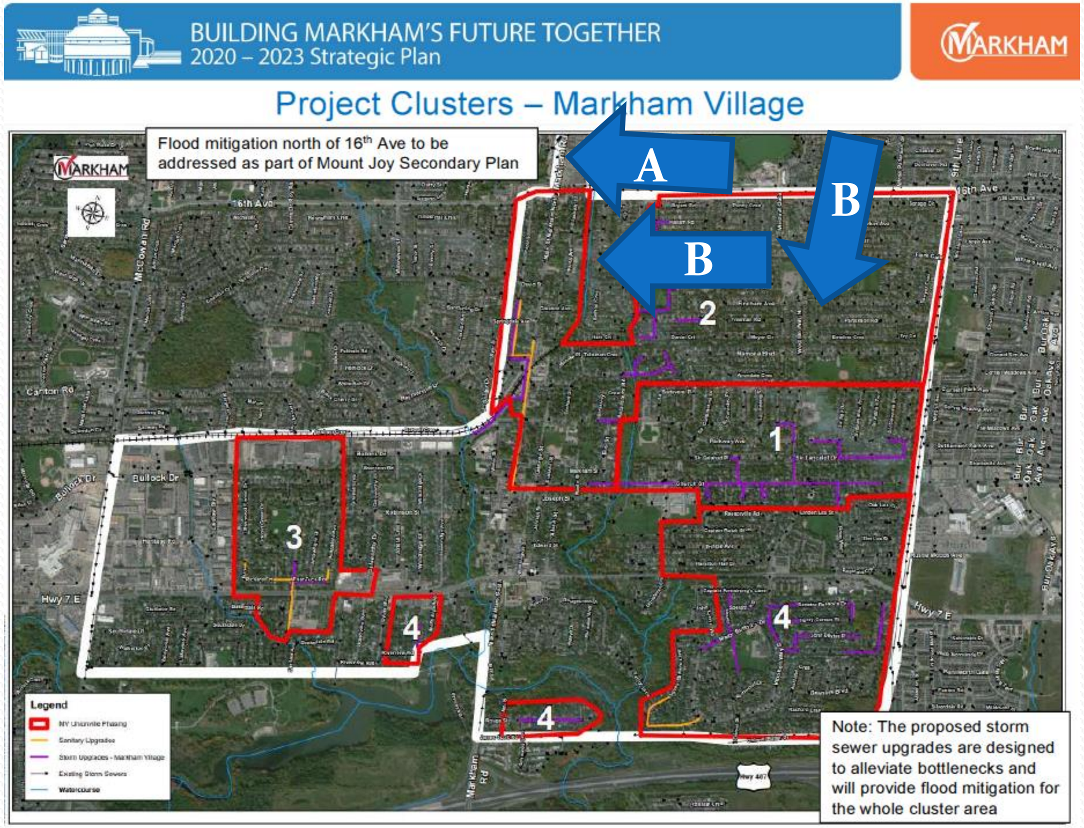
Downstream Areas Impacted

- **Lake Outflow System – to SLV then south of 16th Ave**
  - Lake outflows reduced or eliminated
  - Additional flows from Amica and Traffic Circle of similar volume to traditional lake flows. Some differences in timing
- **East Pond Outflow – to SLV then to south of 16th Ave**
  - Increase depends on success of raising splitters (50%)
  - Staff estimated bypass is 3% of total flows – only 2% more
- **North Pond Outflow – to Williamson Road, reduces 16th Ave**
  - Increase depends on success of raising splitters
  - Staff estimates bypass flows at 10% of total flows – so 5%+

NOTE: Projected increases are of "**total flows**".

The "**rate of flow** (l/**sec**)" which is a significant factor for flood control remains unchanged – it is regulated by current structure.

Flood Control Program Markham Village (June 2021)



A) West to Mt Joy

34% total pond flows

Reducing bypass flows

- By 50% adds 10%
- By 66% adds 14%

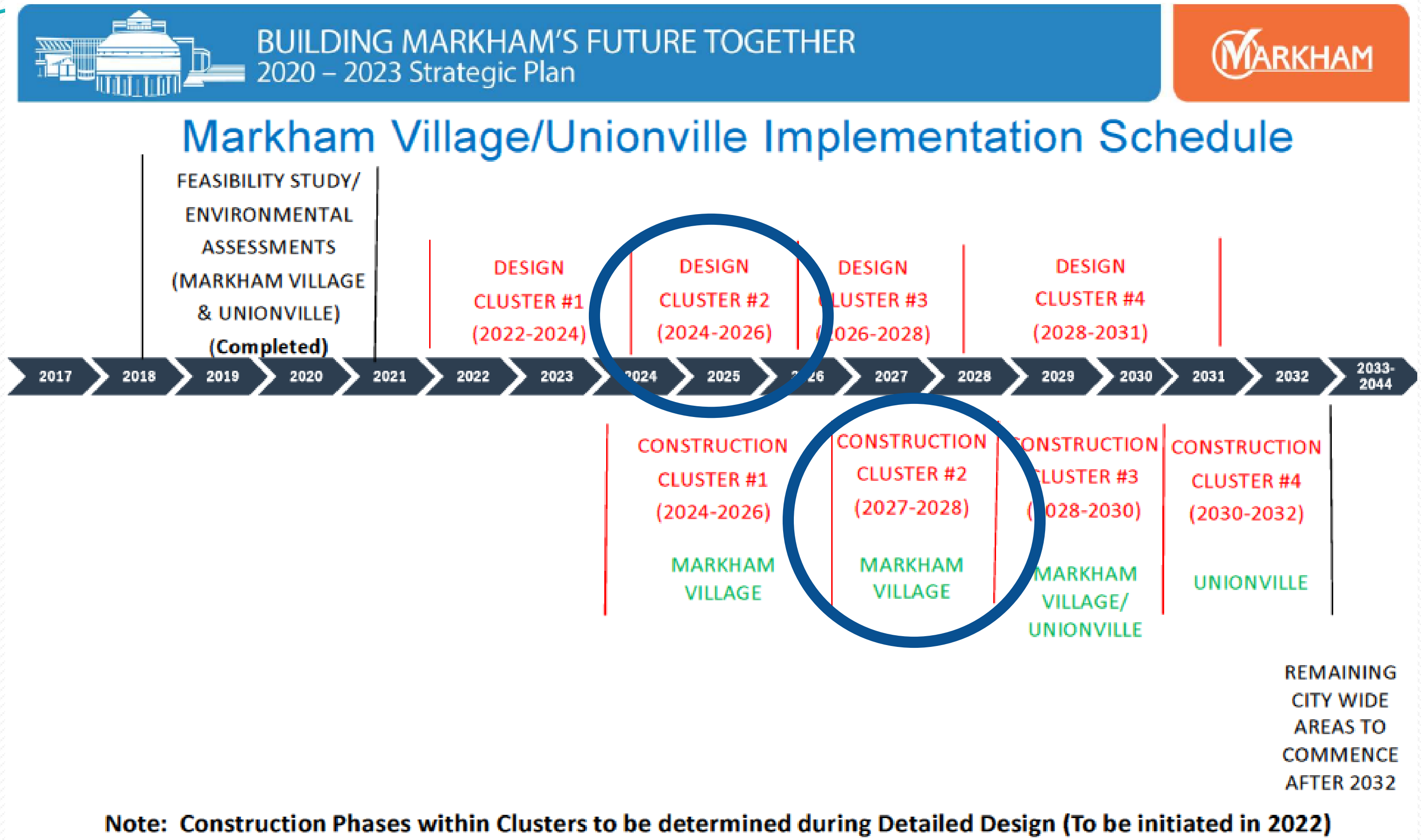
B) South to Area #2

66% total pond flows

Reducing bypass flows

- By 50% adds 4%
- By 66% adds 6%

Need to assess if increased volumes are significant



Project Cluster #2 (Markham Village) - Ramona Blvd., Daniel Court/ Fincham Improvements

- Sewer Upgrades

Critical To End Stormwater Role: Two Options

OPTION #1:

Proceed with changes within current infrastructure

a) Current Pond Review
- To determine if cleaning is necessary
- Add technical assessment to estimate ability to reduce flows within current pond design
  - North Pond ability to handle Swan Club OGS flows

b) Technical design of Amica & Traffic Circle OGS routes.
- Assess lake outlet ability to handle flows

c) Determine if impact on downstream system material

Ending Stormwater Role: Two Options

OPTION #2: Concern about downstream then:

Link changes to two major projects on horizon

1. **Markham Flood Protection Project – Phase 2** (2025)
   - Staff suggestion
2. **Pond Assumption** – 3-5 years or longer
   - Review underway to assess if cleaning needed
   - Planning for handover to city(?)
   - Timing uncertain

Still require program to remove build-up in the lake

- **Delays add to challenge of removing chloride**
- **Undermines aquatic support**

Other Research Resources

- **Pond Evaluation by Developer**
  - Redesign of Splitters - % reduction in by pass flows
  - North Pond ability to handle Swan Club OGS Flows
- **Engineering Students (York?)**
  - Pond Evaluation as above
  - Rerouting of OGS flows – design layout/sizing
- **Water Environmental Association of Ontario**
  - Student Design Competition
  - Recommend by FOSLP in 2020 and endorsed by Freshwater Research

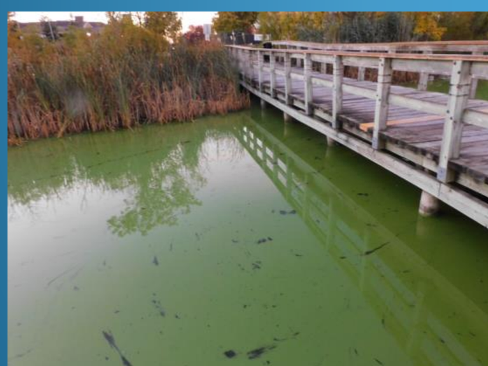
We Request You Initiate:

1. Natural Heritage Designation For Swan Lake Park
2. An Action Plan to End Stormwater Role for Swan Lake
3. Three Research Projects
   a) Chloride Removal (York University)
   b) Oxygen Enhancement (Fleming College)
   c) Survey of Lower Level Aquatic Life – Benchmark (TRCA?)

Friends of Swan Lake Park

Focused on Restoring Swan Lake and Swan Lake Park

From this



Back to This

Thank You!

Friends of Swan Lake Park

Eco Park Questionnaire

March 2022

In February 2022, Friends of Swan Lake sent out a questionnaire to ratepayer groups within Markham, soliciting their views on the conditions within parks in their areas designated as having natural settings and adjacent to a major water body. The questionnaire was based on the founding principles cited in the City of Brampton's recently adopted Eco Park Strategy and Lake Enhancement Program.

The following report summarizes the responses from three area associations.

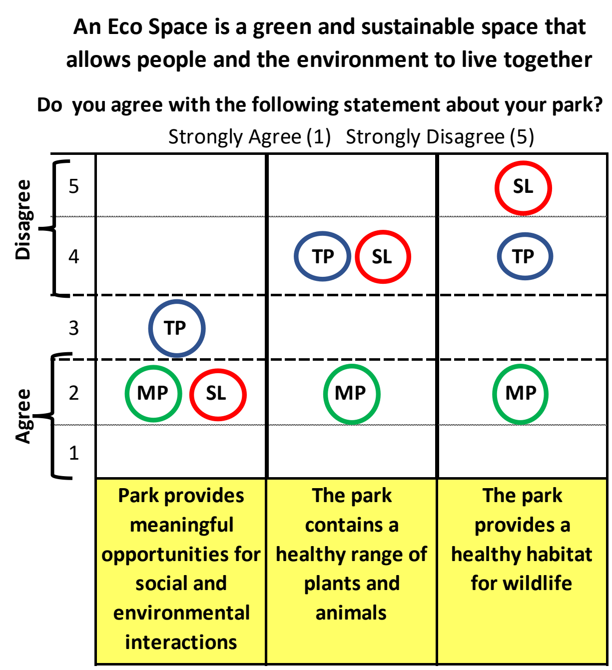
Park		Major Water Body	Respondent's Association
MP	Milne Dam Conservation Park	Rouge River, Milne Reservoir	Milne Dam Conservation Park Ratepayers Assoc.
TP	Toogood Pond Park	Toogood Pond, Bercyz Creek, Little Rouge Creek	Normandale Community Residents Association
SL	Swan Lake Park	Swan Lake	Friends of Swan Lake Park

Observations on the Natural Spaces Component

All three parks contain areas designated by Markham as "Natural Spaces, Wildlife Places".

Toogood Pond was viewed as being primarily a natural setting while Milne Park and Swan Lake Park were described as "mostly natural setting, with some recreational facilities". It was reported that Toogood Pond and Swan Lake Park provide a good balance between natural spaces and human interaction while it was indicated that Milne Park would benefit from more natural spaces away from the houses and trails, free from human interaction.

The adjacent chart summarizes the views expressed related to the natural environmental setting within each park.



Milne Park and Swan Lake Park were reported to provide meaningful opportunities for social and environmental interactions.

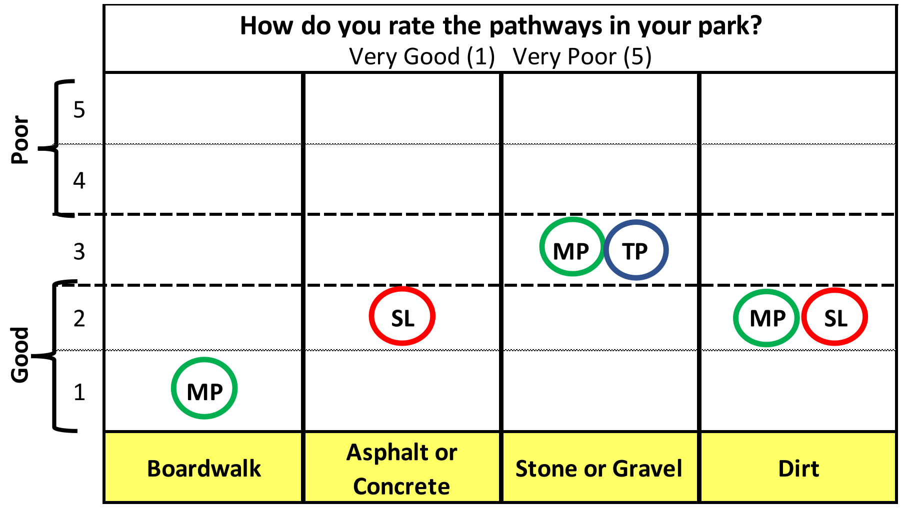
Toogood Pond and Swan Lake Park were viewed as not containing a healthy range of plants and animals nor a healthy habitat for wildlife. All three parks were viewed as containing invasive plant species. Several species were noted in Swan Lake Park while Hogwood was thought to be present at Toogood Pond. Markham's Phase 1 Natural Heritage Inventory and Assessment Report (May 2021) reported several types of invasive plants within Milne Park as well.

Use of Land Based Elements

All respondents indicated that cycling was permitted on the pathways within the park but also noted that the pathways were too narrow to adequately support both pedestrians and cyclists.

Overall, the condition of the pathways was rated "good".

At Milne Park and Swan Lake Park some of the pathways were deemed not accessible to visitors with walking mobility issues due to the nature of the terrain whereas at Toogood Pond some pathways were considered not accessible due to maintenance.



Observations on the Water Quality

Respondents were asked how they would describe the water quality within the major water body.

How would you desrcibe the water quality in your major water body?	
Clear water; wide range of plants and fish	
Moderately clear water; good range of plants and fish	
Poor water clarity; limited range of plants and fish	MP TP
Water dark green; only a few plants and fish	SL

Milne Reservoir and Toogood Pond were described as having "Poor water clarity, limited range of plants and fish". This description aligns with the scientific classification of "Eutrophic".

Currently Swan Lake is described as having "water dark green, only a few plants and fish" which aligns with "Hypereutrophic", the poorest classification.

Markham recently approved a long-term water quality improvement program for Swan Lake that, if successful, would increase the water quality to Eutrophic level, the same level observed for Milne Reservoir and Toogood Pond.

The respondents were asked if the local water body reflects well on Markham's attention to environmental factors.

None of the respondents felt that the current water quality reflected well on Markham's attention to the local ecosystem, the habitat for a variety of species nor on the care for the aquatic environment.

All respondents indicated they would like to see water quality improved so that it is safer for human interaction.

Two of the three respondents indicated improved water quality was also expected to improve aquatic life within the water body but also provide general environmental benefits.

Do you agree that the water body in your park reflects well on Markham's attention to:

Strongly Agree (1) Strongly Disagree (5)

		Local Ecosystem	Habitat for a Variety of Species	Aquatic Environment
Disagree	5	SL	SL	SL
	4	TP	TP	TP
	3	MP	MP	MP
Agree	2			
	1			

Why would you like to see water quality improved?

For general environmental reasons	To improve aquatic life	So that it is safer for human interaction
TG SL	MP SL	MP TP SL

Engagement with the Major Water Body

The respondents were asked to outline their understanding of the currently permitted water-based activities in their park and to indicate what additional activities they would like to see supported by Markham. None of the respondents were advocating for swimming.

All respondents indicated that they either have or would like to see interaction with the major water body to include summer water engagement activities such as fishing, canoeing, kayaking, and boarding and ice skating in the winter.

Permitted and Desired Water Interaction Activities

	Fishing	Canoeing, Kayaking, Boarding	Skating	Swimming
Desired	SL	TP SL	MP TP SL	
Currently Permitted	MP TP	MP		

All respondents indicated there was the need for greater access within the park for fishing. Respondents noted the need for improved viewing at Toogood Pond and at Swan Lake and for improved access to Swan Lake for canoeing and kayaking.

All agree that water related activities are not encouraged and indicated that more could be done within the park to encourage and support interaction with the water body.

There are sufficient access points to the major water body

Strongly Agree (1) Strongly Disagree (5)

		For fishing	For Viewing	For Canoeing, Kayaking, Boarding
Disagree	5	SL	TP SL	SL
	4	MP TP		
	3			
Agree	2			MP TP
	1		MP	

Do you agree that the amenities in the park encourage and support interaction with the water body and that water related activities are encouraged.

Strongly Agree (1) Strongly Disagree (5)

		Supporting Amenities	Water Related Activities Encouraged
Disagree	5	TP SL	TP SL
	4	MP	MP
	3		
Agree	2		
	1		

Concluding Comments

All respondents agreed that their park would benefit if Markham were to adopt a program like Brampton's Lake Enhancement Program that is focused on encouraging and supporting water-based activities.

Respondents for Milne Park and Swan Lake believe that their park would also benefit if Markham were to adopt an Eco Park Strategy like Brampton's.

Would your park benefit if Markham adopted a program similar to Brampton's Eco Park Strategy and Lake Enhancement Program?

	Eco Park Strategy	Lake Enhancement Strategy
Yes	MP SL	MP TP SL
Don't Know	TP	
No		

Respondents provided the following additional comments:

- Conflicts on trails between pedestrians and cyclists. Busy trails. Would be great to have separation.
- I strongly support your initiatives around Swan Lake. Markham has tremendous assets that are poorly managed by the city, in fact, the city is discouraging winter skating on the ponds. New developments are being approved with virtually no parks or recreational facilities which make preserving and enhancing the existing assets even more important. We should support local politicians that support parks, recreation, and green initiatives.

Summary

Respondents indicated overall satisfaction with the mix of environmental and social interaction supported within their park but indicated more could be done to improve the terrestrial habitat and in making pathways safer for pedestrians and cyclists.

The respondents indicated overall dissatisfaction with the water quality and the limited range of water-based activities currently supported and encouraged within the park. Respondents were also of the view that more should be done to improve water quality and human engagement with the water body.

Friends of Swan Lake Park

Designating Swan Lake Park as a Significant Component of Markham's Natural Heritage Network Lands

May 2022

Designating Swan Lake Park as part of Markham's Natural Heritage Network

Swan Lake is a regulatory orphan. It is not considered part of the Rouge River watershed nor a stormwater pond, so it has been managed as a unique feature without any formal environmental standard. [1]

Markham's Greenway System and Natural Heritage Network

In the 2014 Official Plan, Markham has designated many ecologically sensitive areas as part of its Greenway System. Areas within the Greenway System are areas "that will preserve significant ecological value" and that "provide opportunities to improve biodiversity and connectivity of natural features and ecological function". Areas within the Greenway system are protected from future development. Appendix A provides a map of Markham's Greenway System at the time of the 2014 Official Plan.

The Greenway system is comprised of six categories of environmentally protected areas: 1) Greenbelt Plan lands; 2) Oak Ridges Moraine Conservation Plan area lands; 3) Rouge Watershed Protection area; 4) Natural Heritage Network Lands; 5) Natural Heritage Network Enhancement Lands; and 6) Other Greenway Lands including certain naturalized stormwater management facilities.

Swan Lake Park is already recognized as an ecologically important area. Though Swan Lake is not a stormwater pond, Swan Lake Park is designated as a "Community Park" within the "Other Greenway Lands including certain naturalized stormwater management facilities", a category used primarily for areas containing large stormwater ponds and areas which do not receive the same environmental review and focus as do Natural Heritage Network Lands.

In preparation for the next official plan, Markham has initiated a review of its Natural Heritage Network Lands. We believe Swan Lake Park should be recategorized and treated as a significant component of Markham's Natural Heritage Network Lands comparable to Milne Park and Toogood Pond and be included in the current environmental review.

Elements of a Natural Heritage Network

Ontario has provided guidelines on the components of a Natural Heritage Network. The primary requirement is for an area to be ecologically sensitive. It is not necessary for a component of a Natural Heritage Network to contain a river, stream, or major water body. For example, Regional Forests and other significant woodland areas are included. In May 2021, Markham Council suggested staff give consideration to including hydro fields as natural heritage resources.

Many of the areas within Markham's designated Natural Heritage Network are integral components of the Oak Ridges Moraine or the Rouge River Watershed. Swan Lake is not directly connected to the Rouge River watershed, but it does contain a major water body. Swan Lake Park satisfies many of the criteria in the Ontario guidelines that are to be considered in designating an area a component of a Natural Heritage Network, making Swan Lake Park an excellent candidate for inclusion in Markham's Natural Heritage Network.

[1] Cover artwork by Paul Cassidy

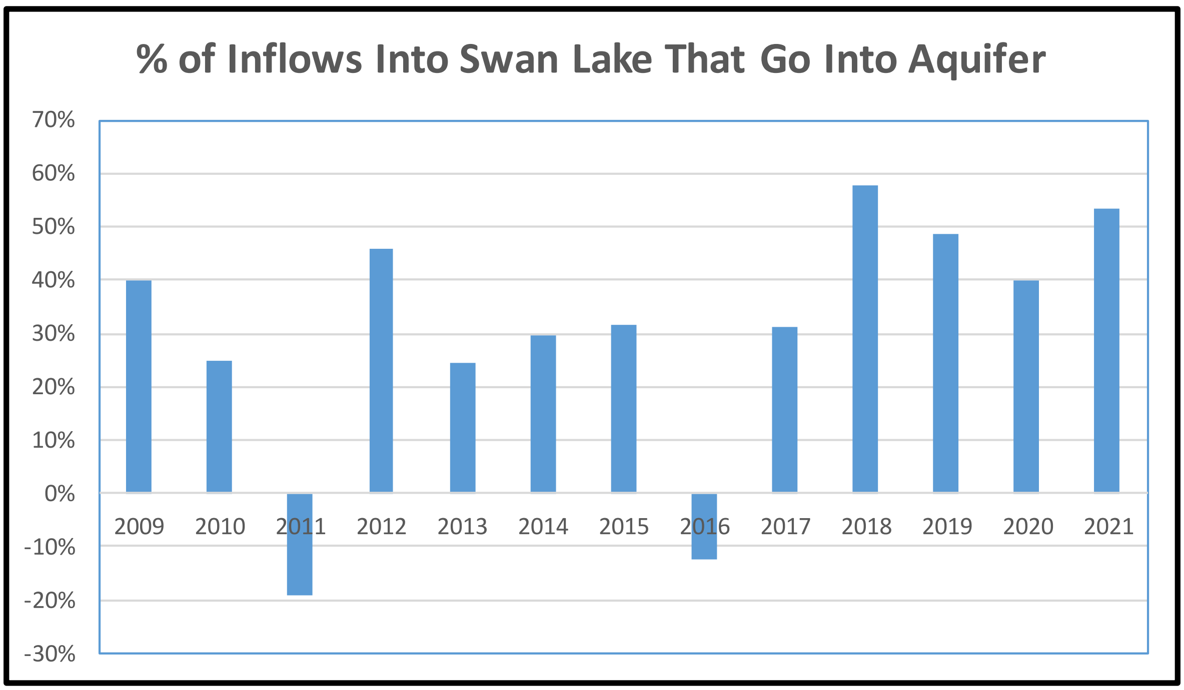
1) Swan Lake – A Significant Local Groundwater Recharge Area

At 5.4 hectares, Swan Lake is the second largest of three major water bodies in Markham and Swan Lake Park is the second largest of the three parks that surround the water bodies.

	Size of Park	Size of Water Body
Milne Dam Conservation Park	123 hectares	Largest
Swan Lake Park	45 hectares	5.4 hectares
Toogood Pond Park	33 hectares	Water area estimated to be slightly smaller than Swan Lake

Within Natural Heritage systems, major water bodies are considered significant natural sources for recharging the aquifer. A recent flow analysis by Markham staff confirms Swan Lake's role as a source for naturally recharging the aquifer. Over the 13-year period 2009 – 2021, it is estimated that 35% of all water flowing into Swan Lake enters the aquifer. In some years, the contribution to the aquifer has exceeded 50%.

Groundwater flow in and out of the lake is estimated to range between 10 and 300 m^3/day.



The Official Plan defines a "significant local groundwater recharge area" as an area that sustains aquifer water levels, groundwater flow patterns, aquatic habitat, and key hydrologic features.

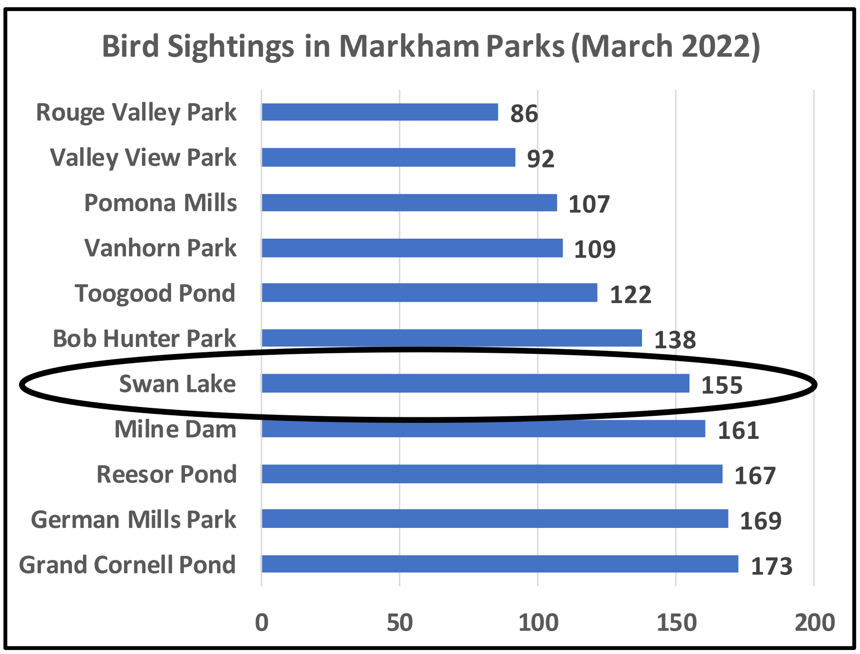
Swan Lake should be designated as a "significant local groundwater recharge area" within Markham's Natural Heritage Network.

2) Swan Lake Park – An Ecologically Significant Area

Over 10% of Swan Lake Park's 45 hectares constitutes woodland and naturalized areas contributing to the canopy of the Greensborough area and supporting a wide range of bird and terrestrial wildlife. Pollinator plants were recently added to a small meadow area within the park.

Swan Lake Park is well known by local birding enthusiasts for its diverse range of species.

In addition, local photographers have documented over 12 different mammals, 4 different species of turtles and 34 different species of insects as listed in Appendix B.



Ebird.org is a site supported by Cornell University to support research into bird species. Of 11 Markham Parks listed on the ebird.org website, Swan Lake Park is reported to host 155 different species – the fifth largest of the Markham parks.

There are only a few more sightings in the much larger Milne Park (161) and 122 sightings at Toogood Pond.

One important aspect in selecting areas as part of the Natural Heritage Network is their role in supporting wildlife migratory routes. Swan Lake's role in the migratory pathway for Canada Geese and Mallards is well documented but it also provides an important resting area for many other migratory birds – over 40 of the 153 species listed in Appendix B have been identified as migratory species.

The well documented biodiversity within Swan Lake Park needs protection and nurturing.

3) Swan Lake - An Important Component of Markham's Heritage

All of Markham's three major water bodies, Milne Reservoir, Toogood Pond, and Swan Lake are man-made structures – none are natural entities. A former gravel quarry, Swan Lake has a comparable legacy to the other two major water bodies recognized by Markham.

Markham Village was founded around 1825. Milne Reservoir's history can be traced to the first mill starting around that period near the site of the present dam. Toogood Pond's start has been traced back to a grist mill started in 1840's while the quarry in what is now Swan Lake can be traced backed to the 1850's when gravel was extracted to support the building of area railroads.

Swan Lake, in its various forms, has been an instrumental component of the heritage of Markham Village.

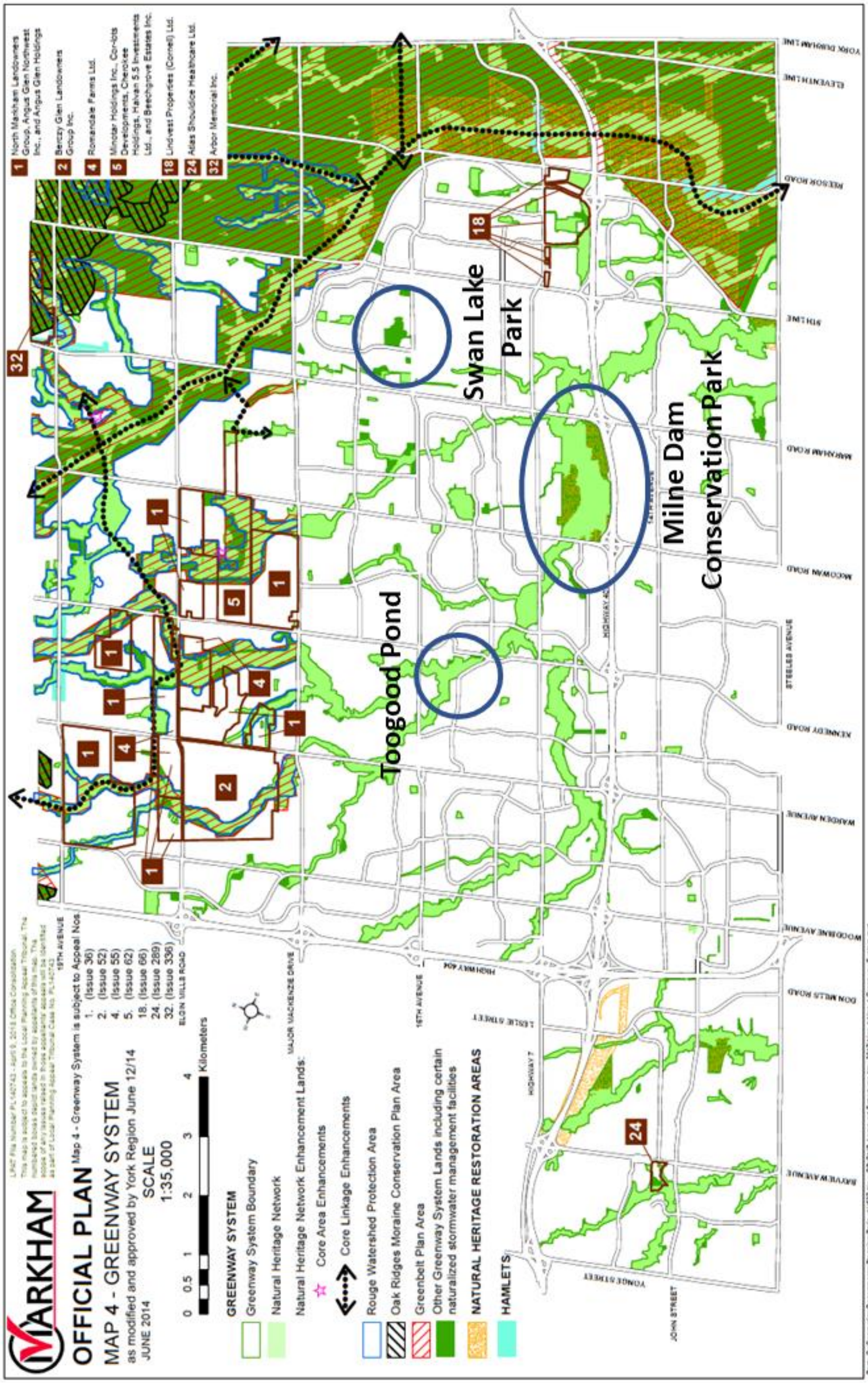
Conclusion

Markham has already determined that Swan Lake is a major local groundwater recharge area while Swan Lake Park is well documented as one of the leading wildlife habitats in Markham.

Swan Lake Park is a significant ecological area within Markham, and it should be provided the same environmental stewardship as Milne Park and Toogood Pond by being designated as a critical component in Markham's Natural Heritage Network.

Under sections 3.1.2.11 and 3.1.2.12 of Markham's 2014 Official Plan, Markham Council has the authority to refine the boundaries of the Natural Heritage Network Lands pending an environmental review. We recommend that Markham undertake an assessment on the feasibility of designating Swan Lake Park as part of Markham's Natural Heritage Network and, if approved, that Swan Lake Park be included in Phase 2 of the Natural Heritage Management Study.

Appendix A: Markham's Greenway System



Appendix B: Wildlife in Swan Lake Park

Swan Lake Park is home to a rich diversity of wildlife.

The Friends of Swan Lake Park is asking Markham to undertake an environmental assessment of the aquatic and terrestrial habitats in Swan Lake and Swan Lake Park with a view to determining whether Swan Lake Parks should be designated as a significant component of Markham's Natural Heritage Network.





Photos courtesy of Don and Cindy Fowler and Maureen Peters

Friends of Swan Lake Park

Swan Lake Park Bird Sightings Recorded on ebird.org March 14, 2021

1 Alder Flycatcher
2 American Black Duck
3 American Coot
4 American Crow
5 American Golden-Plover
6 American Goldfinch
7 American Pipit
8 American Redstart
9 American Robin
10 American Tree Sparrow
11 Baltimore Oriole
12 Bank Swallow
13 Barn Swallow
14 Bay-breasted Warbler
15 Bay-breasted/Blackpoll Warbler
16 Belted Kingfisher
17 Black-and-white Warbler
18 blackbird sp.
19 Blackburnian Warbler
20 Black-capped Chickadee
21 Black-crowned Night-Heron
22 Blackpoll Warbler
23 Black-throated Blue Warbler
24 Black-throated Green Warbler
25 Blue Jay
26 Blue-gray Gnatcatcher
27 Blue-headed Vireo
28 Blue-winged Teal
29 Blue-winged Warbler
30 Brown Creeper
31 Brown Thrasher
32 Brown-headed Cowbird
33 Bufflehead
34 Cackling Goose
35 Canada Goose
36 Canada Warbler
37 Cape May Warbler
38 Caspian Tern
39 Catharus sp.
40 Cedar Waxwing
41 Chestnut-sided Warbler
42 Chimney Swift
43 Chipping Sparrow
44 Clay-colored Sparrow
45 Cliff Swallow
46 Common Grackle
47 Common Loon
48 Common Merganser
49 Common Raven
50 Common Tern
51 Common Yellowthroat
52 Cooper's Hawk
53 Dark-eyed Junco
54 Domestic goose sp. (Domestic type)
55 Double-crested Cormorant
56 Downy Woodpecker
57 Downy/Hairy Woodpecker
58 Eastern Kingbird
59 Eastern Phoebe
60 Eastern Whip-poor-will
61 Eastern Wood-Pewee
62 Empidonax sp.
63 European Starling
64 Field Sparrow
65 flycatcher sp. (Tyrannidae sp.)
66 Fox Sparrow
67 Gadwall
68 Golden-crowned Kinglet
69 Golden-winged Warbler
70 goose sp.
71 Gray Catbird
72 Gray-cheeked Thrush
73 Great Blue Heron
74 Great Crested Flycatcher
75 Greater Scaup
76 Greater White-fronted Goose
77 Greater Yellowlegs
78 Greater/Lesser Yellowlegs
79 Green Heron
80 gull sp.

Swan Lake Park Bird Sightings Recorded on ebird.org March 14, 2021

81 Hairy Woodpecker
82 Hermit Thrush
83 Herring Gull
84 Hooded Merganser
85 Horned Grebe
86 Horned Lark
87 House Finch
88 House Sparrow
89 House Wren
90 Indigo Bunting
91 Killdeer
92 Least Flycatcher
93 Magnolia Warbler
94 Mallard
95 Mallard/American Black Duck
96 Merlin
97 Mourning Dove
98 Mourning Warbler
99 Nashville Warbler
100 Northern Cardinal
101 Northern Flicker
102 Northern Parula
103 Northern Rough-winged Swallow
104 Northern Waterthrush
105 Orange-crowned Warbler
106 Osprey
107 Palm Warbler
108 peep sp.
109 Philadelphia Vireo
110 Pied-billed Grebe
111 Pine Warbler
112 Prairie Warbler
113 Red-bellied Woodpecker
114 Red-breasted Merganser
115 Red-breasted Nuthatch
116 Red-eyed Vireo
117 Redhead
118 Red-tailed Hawk
119 Ring-billed Gull
120 Ring-necked Duck
120 Rock Pigeon
121 Rose-breasted Grosbeak
122 Ruby-crowned Kinglet
123 Ruby-throated Hummingbird
124 Ruddy Duck
125 Scarlet Tanager
126 Sharp-shinned/Cooper's Hawk
127 Snow Goose
128 Solitary Sandpiper
129 Song Sparrow
130 Spotted Sandpiper
131 Swainson's Thrush
132 swallow sp.
133 Swamp Sparrow
134 Tennessee Warbler
135 tern sp.
136 Tree Swallow
137 Trumpeter Swan
138 Turkey Vulture
139 Veery
140 Virginia Rail
141 warbler sp. (Parulidae sp.)
142 Warbling Vireo
143 White-breasted Nuthatch
144 White-crowned Sparrow
145 White-throated Sparrow
146 Willow Flycatcher
147 Wilson's Snipe
148 Wilson's Warbler
149 Wood Duck
150 Yellow Warbler
151 Yellow-bellied Flycatcher
152 Yellow-bellied Sapsucker
153 Yellow-rumped Warbler

Terrestrial Wildlife and Insects in Swan Lake Park

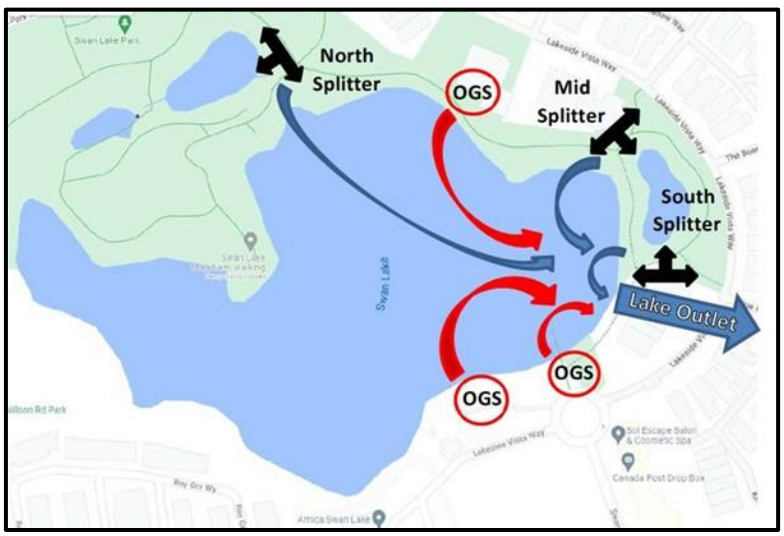
The following summary of terrestrial wildlife and insects in Swan Lake Park was compiled by Don Fowler based on photographs and sightings of Don and Cindy Fowler, members of The Friends of Swan Lake Park.

	Common Name	Scientific Name	Photographed
Mammals			
1	Beaver		
2	Black Squirrel		2019
3	Coyote		
4	Eastern Chipmunk	Tamius striatus	2007-2019
5	Eastern Cottontail Rabbit		2007-2019
6	Grey Squirrel		2019
7	Mink		
8	Muskrat		
9	Racoon	Procyon lotor	2007-2019
10	Red Fox		2014-2019
11	Red Squirrel		2019
12	Skunk (very young)		2019
Turtles			
1	Eastern Midland Painted Turtle		2007-2019
2	Large unidentified turtle		2019
3	Red-eared Slider		2012-2019
4	Snapping Turtle		2007-2019

	Common Name	Scientific Name	Photographed
INSECTS			
1	Bald Faced Hornet		2017-2019
2	Black Blowfly		2018
3	Black Saddlebags Dragonfly		2019
4	Black-tipped Darner Dragonfly	Aeshna Tuberculifera	2017
5	Bumble Bee		2007-2019
6	Cabbage White Butterfly		2018
7	Canada Darner Dragonfly		2019
8	Carolina Grasshopper	Dissosteira Carolina	2019
9	Carpenter Bee		2014-2019
10	Common Whitetail Dragonfly		2017-2019
11	Eastern Amber Dragonfly		2019
12	Eastern Black Swallowtail Butterfly		2019
13	Familiar Bluet Damselfly		2018-2019
14	German Yellow Jacket Wasp	Vespula Germanica	2017
15	Great Black Wasp		2019
16	Green Blowfly		2018-2019
17	Honey Bee		2016-2019
18	Japanese Beetle		2017-2019
19	Large White Butterfly		2019
20	Monarch Butterfly		2007-2019
21	Mustard White Butterfly		2016-2018
22	Narrow-headed Marsh Fly	Helophilus fasciatus	2017
23	Orange Sulfur Butterfly		2018
24	Painted Lady Butterfly		2017-2019
25	Pecks Skipper Butterfly		2017-2019
26	Question Mark Butterfly		2018-2019
27	Red Admiral Butterfly		2017-2019
28	Red-legged Grasshopper		2019
29	Slender Spreadwing Damselfly		2019
30	Viceroy Butterfly		2017-2019
31	Western Conifer Seed bug	Leptoglossus Occidentalis	2019
32	Widow Skimmer Dragonfly		2019
33	Yellow-legged Mud-dauber	Sceliphron Caementarium	2019
34	Western Tiger Swallowtail Butterfly		2018 - SL Village

Friends of Swan Lake Park

Action Plan to End Swan Lake's Stormwater Management Role



May 2022

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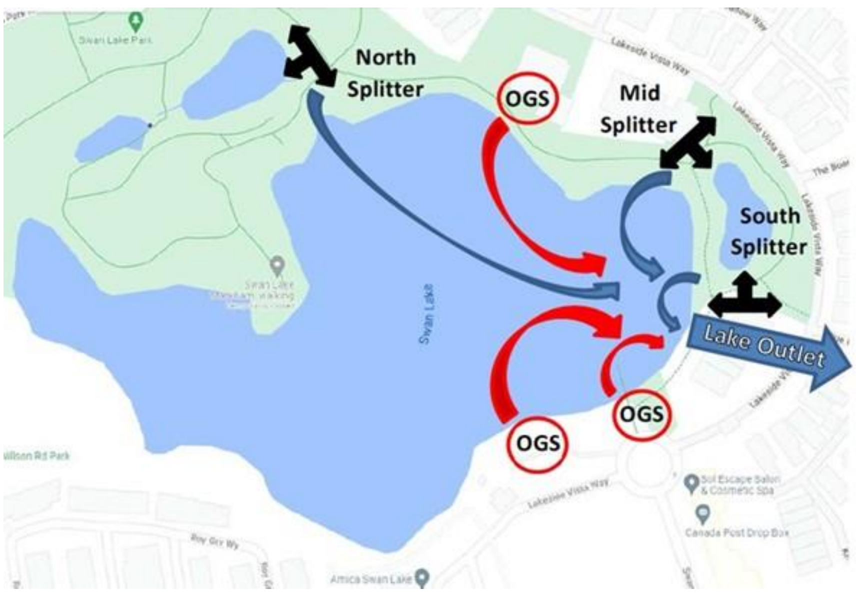
EXECUTIVE SUMMARY: ACTION PLAN TO END SWAN LAKE'S STORMWATER ROLE

Swan Lake Park's role as a "Natural Spaces/Wildlife Places" community park is undermined by several early design decisions that established Swan Lake as an active element in the local stormwater management regime. In essence, Swan Lake is the "third" stormwater pond in Swan Lake Park, and we believe this role is not necessary and should be minimized.

Water quality in Swan Lake is deteriorating each year. Initiatives are underway to minimize and manage phosphorus and nitrogen levels. The focus of this report is to identify ways to reduce the build-up of chloride from road salt that is undermining the aquatic environment.

Swan Lake can no longer be described as a freshwater lake. Due to the chloride, the water is classified as "brackish" and the condition is only going to get worse since there are no obvious ways to remove the chloride and there are no substantive programs in place to reduce the annual build-up of chloride.

Recycling Stormwater Through Swan Lake



Currently, annual stormwater flows, and road salt are unnecessarily being recycled through Swan Lake from six areas.

Enhanced salt management practices must be encouraged but the challenge of addressing excessive chloride levels in Swan Lake lies primarily in minimizing Swan Lake's role in the local stormwater management regime and establishing a rigorous maintenance routine.

Five-Step Action Program

Given that use of road salt can only be minimized, not discontinued, we recommend Markham adopt a five-step program as soon as possible to reduce the continuing inflow of road salt into Swan Lake:

Action #1: Reroute the three oil/grit separator flows into the main stormwater sewer system.

Action #2: Minimize the stormwater flows bypassing the ponds and entering Swan Lake by redesigning the pond infrastructure.

Action #3: Implement an effective pond monitoring and maintenance program to ensure future stormwater flows are not unnecessarily contaminating Swan Lake.

Action #4: Initiate an educational and awareness program in the local community to minimize use of road salt.

Action #5: Expedite research into approaches for removing chloride already in Swan Lake.

Our analysis identifies three core benefits arising from these proposed changes to the local infrastructure:

1) Swan Lake would become a self-contained entity retaining more of the clean local runoff and precipitation. Contaminated stormwater from the local communities would substantially remain in the stormwater system. Simply increasing the blend of fresh water within the lake should help enhance water quality and the aquatic environment.
2) Any additional flows directed downstream would be rerouted through the more tightly controlled pond management system rather than the lake outlet system, further minimizing downstream flooding risk.
3) Annual chloride contributions would be reduced over 80%. Minimizing the increase in chloride levels will provide an improved aquatic environment for zooplankton and small fish that are a natural means of controlling algae growth, reduce the risk of chloride contamination of the downstream aquifer and reduce future costs of expensive chemical treatments.

Ending Stormwater Role and Reducing the Sources of Chloride

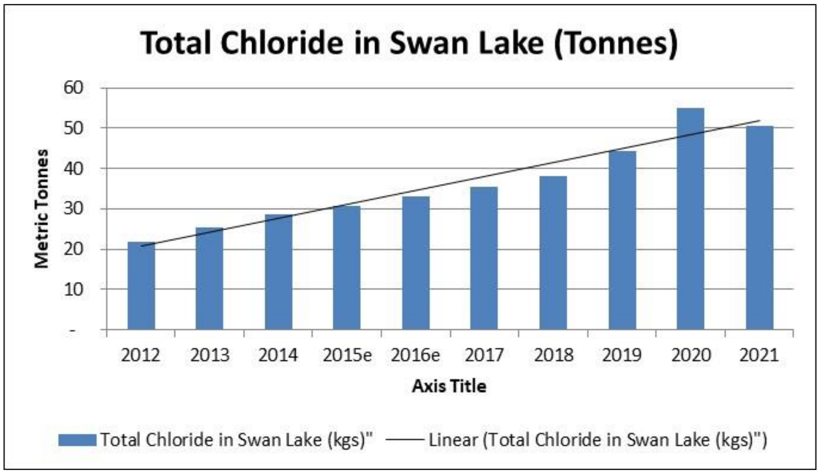
The following sections identify approaches that could end or significantly reduce Swan Lake's role as a stormwater pond.

1. All the OGS flows could be rerouted away from the lake reducing chloride inflows by 53% - 71%. The Amica and traffic circle flows could be redirected to the existing lake outlet system and the Swan Club OGS to the North Pond.
2. A technical assessment is required to quantify the reduction; however, the following analysis concludes that a significant portion of the flows currently bypassing the two ponds could be redirected into the ponds by raising the splitters and by increasing the size of the pipes going into the pond system. A 50% reduction in pond bypass flows would reduce chloride inflows from 11% - 21% while a 66% reduction in bypass flows would reduce chloride inflows by 15% - 28%.

EXCESSIVE CHLORIDE: THE PROBLEM

Swan Lake contains an excessive amount of chloride that Markham[14] and Freshwater Research[6] attribute to winter de-icing operations.

Chloride does not break down and will accumulate within the lake over time, impairing the health of aquatic plants and many forms of aquatic species. The excessive chloride (from road salt) is sufficient to kill small fish and eliminate zooplankton in the water, natural elements that consume algae.

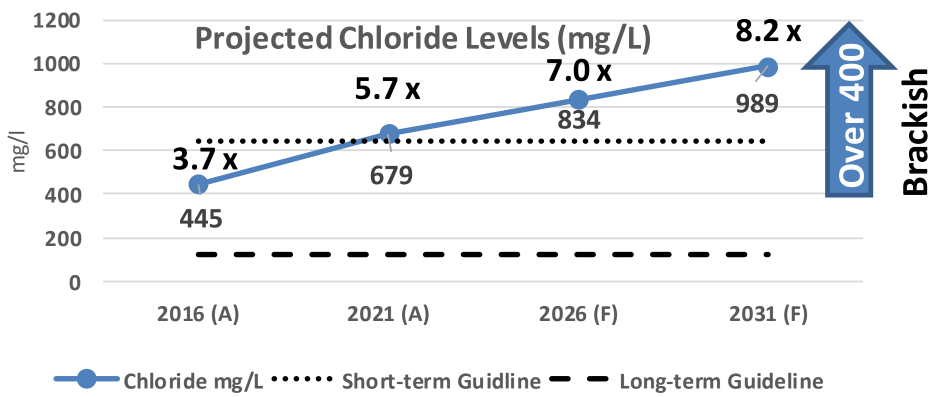


The adjacent chart illustrates the rapid increase in chloride levels in Swan Lake over the past few years. The annual increase prior to 2018 is estimated at 2.3 metric tonnes per year.

Markham concludes that the rapid rise in 2019 is not attributable to changes in normal winter salt management practices in the area but rather due to poor maintenance of the pond infrastructure.

The Mid-Splitter which serves the largest catchment area, was clogged for an estimated 3 years. The excess attributable to poor maintenance is estimated at 11% of the current chloride content in Swan Lake.

In 2021, the seasonal average for chloride in Swan Lake was 5.7 times higher than the Federal long-term guidelines[1] of 640 mg/l and well above the short-term (30 day) guideline of 120 mg/l. Individual recordings have been as high as 793 mg/l.



The Mid-Splitter system was cleared in 2021. If we revert to the traditional increase of 2.3 tonnes per year, the amount of chloride in the lake is projected to increase to 7.0x the long-term guidelines within 5 years and to 8.2x the guidelines in 10 years.

Other factors such as the amount of precipitation and volume of flows leaving the lake may result in diluting the build-up of chloride as projected, but those factors were present prior to 2018 so they may already be reflected in the average build-up of 2.3 tonnes per year.

Reduction in chloride levels, restoration of a healthy zooplankton community and a robust stock of small algae eating fish could provide a meaningful natural contribution to the control of algal growth and cyanobacteria in Swan Lake.

The decline in the fish population in Swan Lake is well documented. The only substantive species identified in the 2021 fish inventory by the TRCA were Fathead Minnows. However, the 10,000 estimated for Swan Lake appears low compared to comparable sized water bodies. In a study of Fathead Minnows in a South Dakoda pond comparable in size to Swan Lake, the study reported a population of over 100,000.

Historical Reports	2021 Fish Inventory
• Fathead Minnows	• Fathead Minnows (>10,000)
• Carp	• Common Carp (7 euthanized)
	• Brown Bullhead (209 relocated)
• Pumpkinseed Sunfish	• nil
• Catfish	• nil
• Goldfish	• nil
• Largemouth Bass	• nil

Fathead Minnows were included in the analysis setting the Federal chloride guidelines. Fathead Minnows were shown to have a high tolerance for short-term peaks in chloride levels but were at risk after 33 days with chloride levels of 598 mg/l. Chloride levels in Swan Lake. Not consistently exceed a safe level for Fathead Minnows.

Markham staff have stated that the existence of the Fatheaded Minnow illustrates the health of Swan Lake. The Federal guidelines would suggest they are in fact a species at risk.

Zooplankton is a beneficial element in freshwater because it consumes phytoplankton (microscopic algae and microbes).

A healthy zooplankton colony would be an important contributor to controlling algal growth in Swan Lake, but the high level of chloride is undermining the existence of zooplankton in Swan Lake.

As a first step in its Fish Management program, Markham should initiate an assessment of zooplankton and invertebrates to determine the current state of health of the lower-level aquatic life that sustain fish and consume algae. This assessment would also serve as a benchmark for determining success of future efforts to restore the aquatic health of the lake.

Research studies suggest that high chloride levels can lead to lower oxygen levels by diminishing aquatic plant life. There is little visible water-based plant life in Swan Lake. Controlling oxygen levels and chloride levels provides more natural biomanipulation options for the management of water quality in Swan Lake.

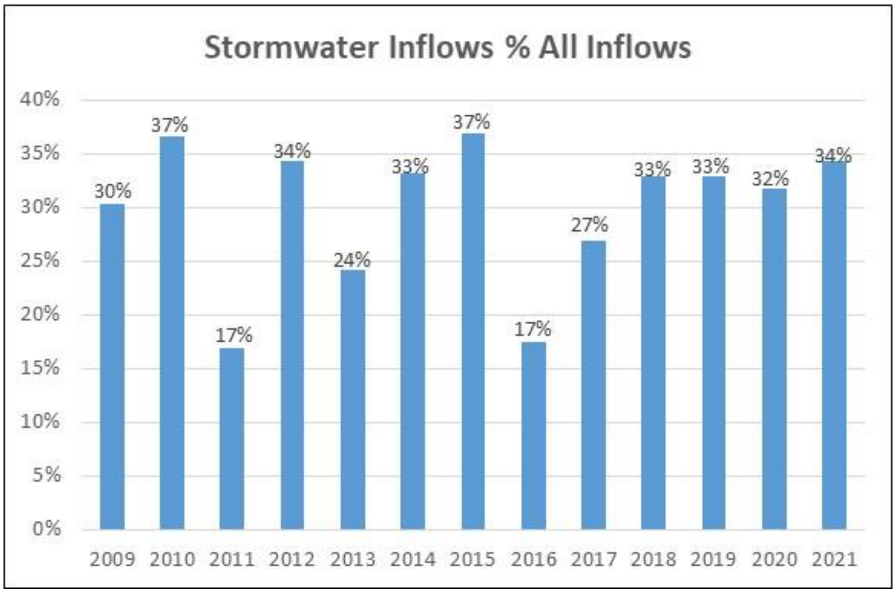
A small amount of chloride may enter Swan Lake via the aquifer but that is not likely a major concern. The greater concern should be that Swan Lake, with its very high concentrations, is likely a source adding chloride to the downstream aquifer. Stormwater ponds are designed to minimize leakage into the aquifer.

Swan Lake has no similar leakage prevention capabilities, so a continued buildup of chloride is endangering water quality in the downstream aquifer.

Sources of Excessive Chloride

In April 2022, Markham staff completed a high-level review of the inflows and outflows in Swan Lake for the 13-year period, 2009 - 2021.

The primary natural sources of water for Swan Lake, accounting for 69% of all inflows were identified as direct precipitation and runoff from the adjacent parklands. The remaining 31% was attributed to stormwater sources.



Stormwater Inflows 2009-2021

	Year	Dec-Mar
North Pond	35%	34%
East Pond	30%	23%
OGS Total	36%	43%
Amica OGS	15%	19%
Traffic Circle OGS	11%	13%
Swan Club OGS	9%	11%

Over the 13-year period, 35% of all stormwater flows were attributed to the North Pond, 30% to the East Pond and 36% to the three OGS units. During the winter months when the road salt is applied the OGS units accounted for 43% of all flows with 32% attributed to the Amica and Traffic Circle units.

Markham staff recently completed an analysis to determine the sources of road salt entering Swan Lake. There is very little data available, so they developed estimates using two different methods. One method was based on a few water samples taken in the March/April of 2021 and 2022 that provided data on the amount entering from the OGS units and the amount of salt bypassing the ponds. The second approach was based on annual volumes of salt used by Markham and Swan Lake Village applied to the drainage areas served by the ponds and OGS units.

The estimate based on water samples attributes the three OGS units as being responsible for 71% of the road salt entering the lake with the amounts bypassing the ponds accounting for 23%. The estimates based on total annual usage attributes 53% to the OGS units and 43% to the ponds. In either case, the three OGS units are seen as the primary problem.

	Basis for Estimate	
Stormwater Source	**Water Samples**	**Usage Data**
Three OGS Units	71%	53%
Two Stormwater Ponds	23%	43%
Shoreline	7%	4%
Total	100%	100%

	Basis for Estimate	
Community Origin	**Water Samples**	**Usage Data**
Markham	38%	31%
Swan Lake Village	30%	42%
Amica	25%	24%
Shoreline	7%	4%
Total	100%	100%

The analysis also attributed Markham being responsible for 31% - 38% of the road salt, Swan Lake Village for 30% - 42% and Amica for 24% - 25% of the chloride.

Markham's analysis concluded that, other than the blockage of the Mid-Splitter, the pond infrastructure was performing to the original design specifications. The primary analysis was based on properly functioning pond infrastructure as designed but also attempted to estimate the impact of the blocked Mid-Splitter.

	Basis for Estimate	
Total Inflows	**Water Samples**	**Usage Data**
Regulated Flows	34%	36%
Blockage (100%)	66%	64%
Regulated Flows	51%	53%
Blockage (50%%)	49%	47%

The analysis estimated that the blockage accounted for 64% - 66% of the chloride entering Swan Lake over the 3-year period. If you adjust to assume the blockage was only 50% (not 100% as assumed in the analysis) then the blockage still attributes 47% - 49% of the chloride entering during that period,

Over the period 2018 – 2021 the amount of chloride increased 12.5 tonnes. The expected increase over 3 years would be 6.9 tonnes suggesting that the excess of 5.6 tonnes (45%) is attributable to the blockage or 11% of the current 51 tonnes in the lake.

Reducing the Sources of Chloride

The following sections identify approaches that could end or significantly reduce Swan Lake's role as a stormwater pond.

1. All the OGS flows could be rerouted away from the lake. The Amica and traffic circle flows could be redirected to the existing lake outlet system and the Swan Club OGS unit could be redirected to the North Pond.
2. A technical assessment is required to quantify the reduction; however, the following analysis concludes that a significant portion of the flows currently bypassing the two ponds could be redirected into the ponds by raising the splitters and by increasing the size of the pipes going into the pond system.

The following table illustrates that if 100% of the OGS flows are directed away from the lake and the amounts bypassing the ponds are reduced by 50% then chloride entering Swan Lake can be reduced by 75% - 82%.

	Basis for Estimate					
	Water Samples			Usage Data		
Stormwater Source	**Qty**	**Reduction**	**Qty**	**Qty**	**Reduction**	**Qty**
Three OGS Units	33.7	100%	0.0	25.0	100%	0.0
Two Stormwater Ponds	10.8	50%	5.4	20.2	50%	10.1
Shoreline	3.1	0%	3.1	1.8	0%	1.8
Total	47.6		8.5	47.0		11.9
% of original Flows			18%			25%
Reduction			82%			75%

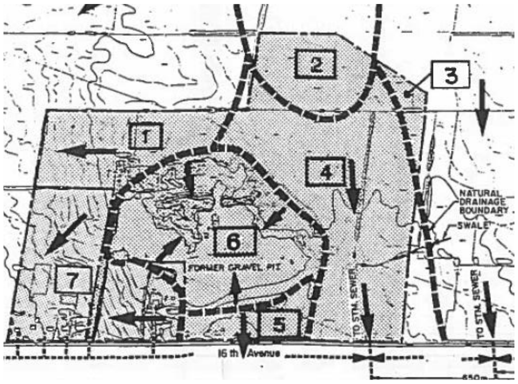
With 66% reduction of pond bypass		
Reduction	86%	82%

If the redesign of the splitters were able to reduce the amounts bypassing the ponds by 66%, overall chloride flows would be reduced 82% - 86%.

ACTION #1: REROUTING SWAN LAKE OGS FLOWS

Original Drainage Design (1995)

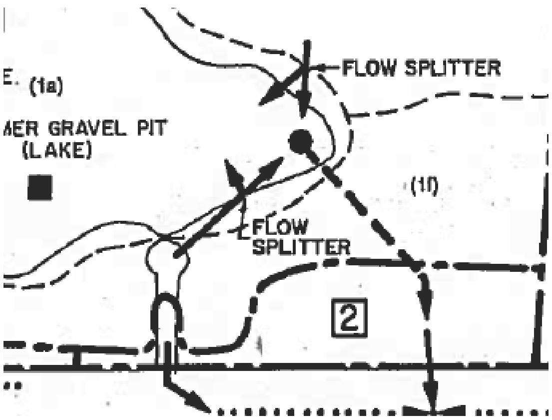
This analysis entails revisiting the original design decisions made regarding the use of OGS units.



Natural Area Drainage: Cosburn Figure 5

The original master drainage design[2] for the area noted that the land immediately north of 16th Avenue (area 5), which included the Amica property and most of the traffic circle, all drained naturally southwards towards 16th Avenue or west towards Mount Joy Creek (Exhibition Creek as it was then known). Consequently, stormwater from the southern end of Swan Lake Village and the new townhomes east of Williamson Road at 16th Avenue were directed to stormwater systems along 16th Avenue.

Outflows from the East Pond and Swan Lake also go the stormwater system on 16th Avenue.



Original Drainage Plan for Traffic Circle
Cosburn Figure 6

As indicted in the adjacent diagram, the report indicated that the traffic circle would be directed to the stormwater pond. However, contrary to these original recommendations, the Amica properties and the traffic circle area on Swan Lake Boulevard were permitted to drain directly into Swan Lake via oil/grit separators. Consequently, these two areas unnecessarily directly contribute chloride and other contaminants not removed from the oil/grit separators into the lake.

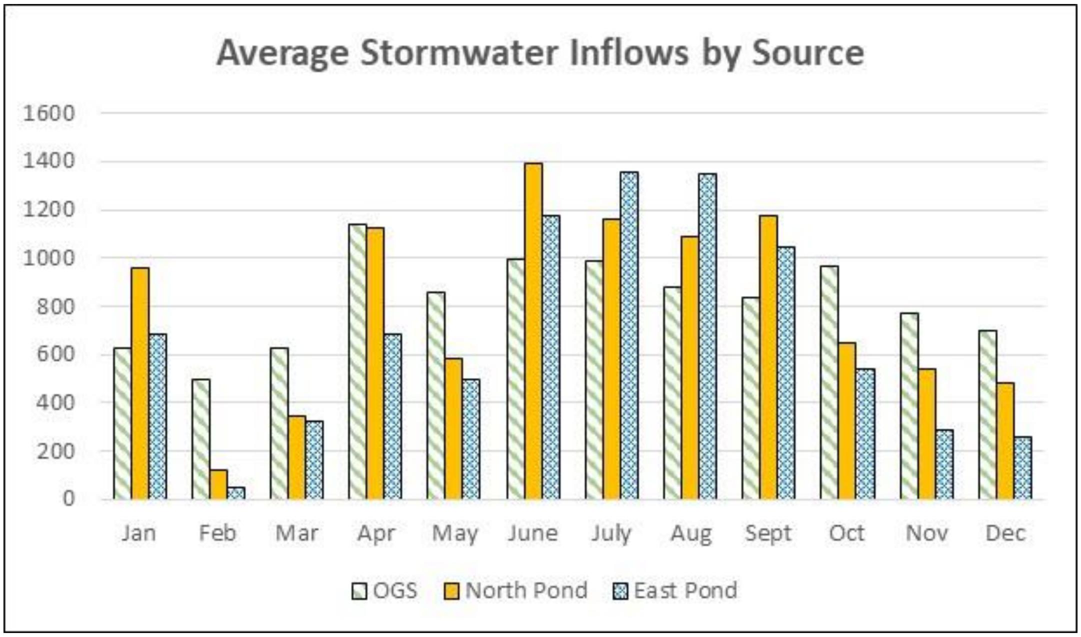
It is not clear why these areas were not routed to the East Stormwater Pond or to the lake outlet. Our analysis in Appendix D concludes that the pond has the capacity to handle these additional volumes. Our analysis involved revisiting the original design decisions, trying to identify any impediments. We concluded that there are feasible route alternatives.

The three OGS units serve approximately 1.75 ha. with the Amica and Traffic Circle Units serving approximately 74% of the area.

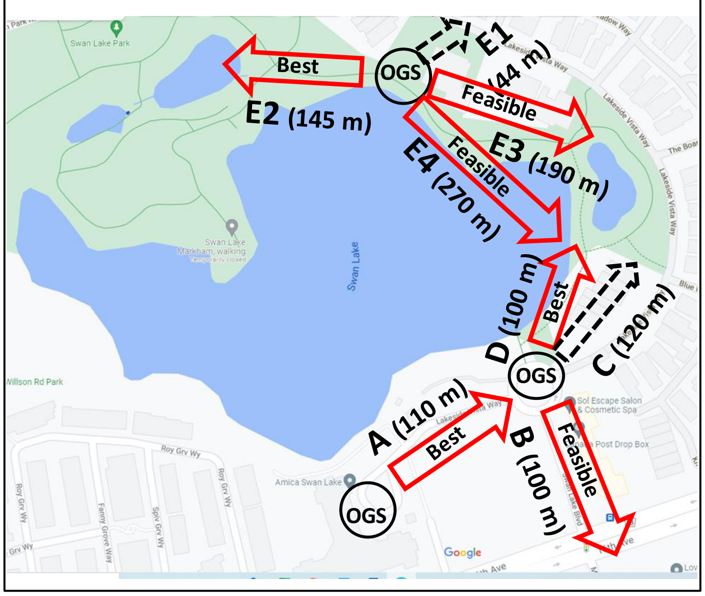
Markham's water budget model provided estimates for the total OGS areas. In our analysis, the volumes were attributed to each area based on the relative size of the areas served.

OGS Units		
	Area (ha)	**%**
Amica	0.75	43%
Traffic Circle	0.54	31%
Swan Club	0.46	26%
Total Area	1.75	100%
Amica & TC	1.29	74%

The following table illustrates that the total OGS flows are of comparable scale to the amounts estimated to be bypassing the East Pond and North Pond. All flows are higher during the summer months.



Options For Rerouting Swan Lake OGS Flows



A) Redirecting flows from the Amica property to the traffic circle
B) Redirecting the combined Amica and current traffic circle volumes south to 16th Avenue
C) Redirecting the combined flows from Amica and the traffic circle to the East Pond
D) Redirecting the combined flows from Amica and the traffic circle to the lake outlet
E) Redirecting the flows from the Swan Club OGS either to the Swan Lake Village Collector System (E1), the North Pond (E2), the East Pond (E3) or to the lake outlet (E4).

Conclusions: Several Feasible Options Identified

Our analysis notes whether the proposed route falls within the scope of the existing flood protection system or whether it would involve bypassing these protective devices. Any route that would bypass existing flood protection devices would require a detailed technical assessment of any potential downstream risks. Such assessment is beyond the scope of this analysis.

Summary of Options for Rerouting OGS Flows					
Rerouting Options	**Distance (m)**	**Feasible**	**Within Flood Protection**	**System Technical Assessment**	**Jurisdiction**
A: Amica to Traffic Circle	**110**	**Yes**	**No**	**Depends on route**	**Amica/Developer/ Markham**
B: Traffic Circle to 16th Avenue	100	Possible	No	Yes	Markham/York Region
C: Traffic Circle to East Pond Outlets					
C3 To SLV Collector	170	Possible	No	Yes	Markham/ SLV
D: Traffic Circle to Lake Outlets					
D1 To Lake Head Outlet	**80**	**Best**	**Yes**	**No**	**Markham/ Developer**
D2 To MH10B	**90**	**Best**	**Yes**	**No**	**Markham/ Developer**
D3 To SLV Collector	130	Possible	No	Yes	Markham/ Developer/SLV
E: Rerouting Swan Club OGS Flows					
E1(b) Swan Club OGS to SLV FDC System	44	Possible	No	Yes	Markham/SLV
E2 Swan Club OGS to North Pond Splitter	**145**	**Best**	**Yes**	**Pond Only**	**Markham/ Developer**
E3 Swan Club OGS to East Pond Mid-Splitter	190	Possible	Yes	No	Markham/Developer/SLV
E4 Swan Club OGS to Lake Outlet	270	Possible	Yes	No	Markham

I) Amica and Traffic Circle OGS Flows

a) It appears feasible to connect the Amica OGS flows to the traffic circle (Route A)

b) The best option for rerouting the combined Amica and traffic circle OGS flows is to direct the flows to the existing lake outlet either at the lake outlet headwall or at MH10B (Routes D1 or D2). These routes have the lowest risk of back flows and remain within the existing flood control mechanism and thus should reduce the need for a full-scale technical analysis of downstream systems.

c) It appears feasible to direct the combined flows directly south along Swan Lake Boulevard to the 16th Avenue system (Route B). This would require a detailed technical assessment of the downstream impact of these additional volumes flowing eastward along 16th Avenue.

d) It may be possible to use Route C2 to reroute the flows to the pond outlet system (MH4B) however backflow risk may be a significant factor, so it is not considered one of the better options.

e) There appear to be two possible routes for connecting the combined flows to the Swan Lake Village collector system as a route to the 16th Avenue system (Routes C3 and D3). These routes would bypass existing flood control mechanisms so the flow may need to be managed by use of additional orifice plates and/or possible reduction of the lake outflow volumes. A detailed technical analysis of the impact of additional flows, if any, on the Swan Lake Village Collector System would be required.

II) Swan Club OGS

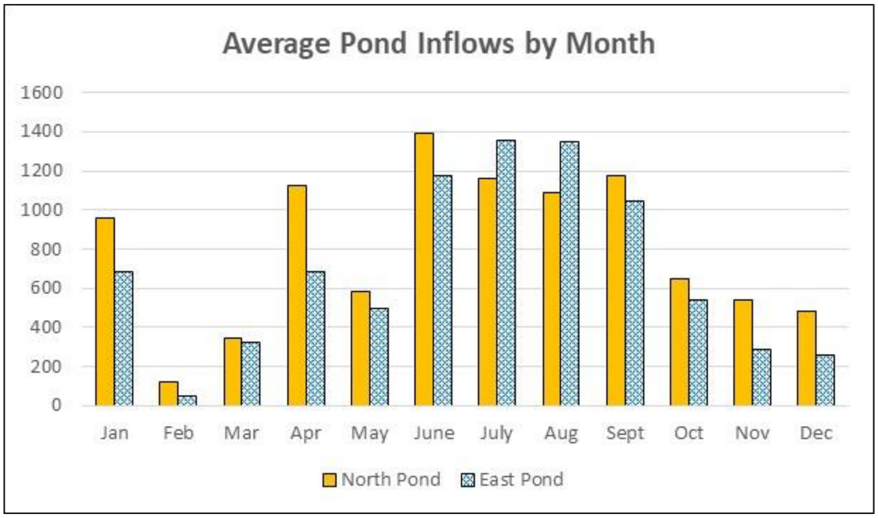
a) The best option is routing the OGS flows from the Swan Club to the North Pond (E2).

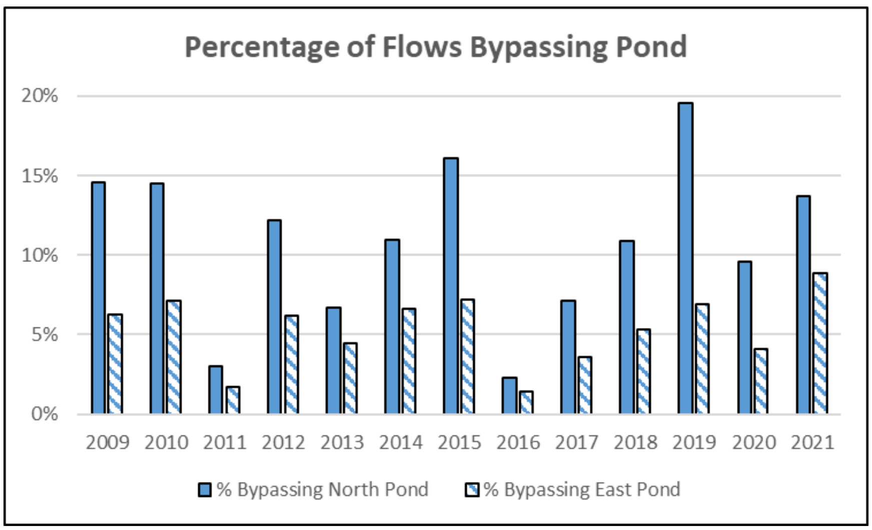
b) Another feasible option for the Swan Club OGS is to route the flows 270 m along the lakeside pathway to the lake outflow system at the lakehead or at MH10B (E4) and join with the flows from the traffic circle (Route D1 or D2).

If flows from the OGS units are redirected to the lake outlet system, there should be less outflow from the lake, therefore consideration should be given to lessening backflow risk by reducing the outflows from the lake by reducing the size of the orifice plate at the lake outlet headwall .

ACTION #2: REDUCING FLOWS BYPASSING THE PONDS

The two stormwater ponds contribute 65% of all stormwater entering Swan Lake and account for approximately 23%-43% of the chloride volumes added to the lake each year.





The North Pond is responsible for 35% of the total stormwater volume over the 13-year period while 30% is attributed to the East Pond. The balance of 35% is attributed to the three OGS units. The peak inflows from the ponds into the lake are in the May though August period.

Over the 13-year period 2009 – 2021, estimates based on the recent water budget analysis indicate that from 2% - 20% of the annual flows entering the North Pond stormwater system are bypassing the pond and going into Swan Lake. The average over the 13-year period is 10.9%.

Similarly, it is estimated that from 1% - 9% of the annual flows entering the East Pond stormwater system are bypassing the pond with the average volume entering the lake estimated at 5.3% of the total flow.

The two stormwater ponds in Swan Lake Park have underutilized capacity. The analysis detailed in Appendix D provides a high-level assessment of the ability to reduce the amount of stormwater that bypasses these ponds by directing more stormwater into the ponds.

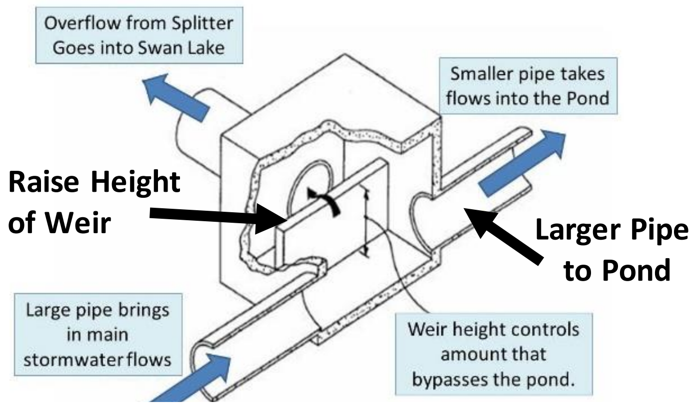
The capacity of the East Pond is 129% of the required capacity to serve its drainage area. Raising the splitters by 0.2 m will increase the pond capacity to 181% of the required capacity.

Raising the splitter in the North Pond by 0.1 m will increase pond capacity to 209% from the current 175% of required capacity.

Pond Capacity as % of Required	As Built	By Raising Splitters
East Pond (#105)	129%	181%
North Pond (#104)	175%	209%

Two approaches were considered to reduce the flows bypassing the ponds:

1) Raising the height of the weir within each flow splitter which has the dual effect of redirecting more water while increasing the pond capacity, and
2) increasing the size of the pipes that carry water from the splitter into the pond



The rate of flow through a pipe depends on the size of the pipe but it is also impacted by the height of the water and the speed of the flow. A hydraulic analysis would incorporate all the factors and would be required to determine the impact of raising the height of the weir and changing the size of the pipe on the increase in flow through the pipe. In this analysis we are only able to comment on the relative size of the pipe area as a benchmark for the potential impact of changing pipe sizes.

Raising the splitter in the South Splitter will have the impact of utilizing an additional 18% of the existing pipe capacity but will have no impact on either the Mid-Splitter or the North Splitter because the existing 450 mm pipe is already below the height of the splitter.
A hydraulic analysis would be required to determine the appropriate size of pipe and the potential impact on flows through the pipe.

Percentage Increase in Pipe Area Under The Weir			
Splitter	**South**	**Mid**	**North**
Existing 450 mm pipes			
Raising Splitter	18%	0%	0%
Enlarged 600 mm pipes			
Existing Splitter	44%	42%	51%
Raised Splitter	103%	78%	76%

To illustrate the potential impact of increasing the size of the pipe from the splitter to the pond, we compared the portion of the current 450 mm pipe below the weir height to the portion of a 600 mm pipe that would be below the weir.

With the existing splitter height, a 600 mm pipe would increase the pipe area below the weir by 44% in the South Splitter, 42% in the Mid-Splitter and 51% in the North Splitter. Raising the splitters increases the utilized pipe area by 103%, 78% and 76% respectively.

There should be little downstream risk associated with the proposed changes. First, all pond outflows are regulated using orifice plates to constrain outflow into the downstream systems. The East Pond outflows are regulated by a 66 mm orifice plate while the North Pond flows are regulated by a 100 mm plate. The operation of the orifice plates will need to be assessed with the higher maximum water levels and adjusted if necessary. The second factor is that these flows currently add to the lake volumes flowing downstream. In essence additional flows into the pond will be substantially offset by a reduction in outflows from the lake into the downstream system where they would pass through a more tightly regulated facility.

A technical analysis is required to quantify the potential reductions to flows bypassing the ponds if the proposed design changes were implements.

If the proposed adjustments to the pond dynamics were to redirect the first 500 m^3 of stormwater into the pond each winter month, then the road salt laden flows bypassing the North Pond would be reduced by 35% and the East Pond flows by 44%.

If the adjustments were able to reduce the initial flows by 1,000 m^3 per month during the winter, then the reduction in road salt laden flows could be reduced by 54% and 61%.

Reduction in Monthly Stormwater Flows	First 500 cu m	First 1000 cu m
North Pond		
Full Year	30%	49%
Winter Months	35%	54%
East Pond		
Full Year	32%	52%
Winter Months	44%	61%

The splitters provide an important local flood protection role and for that reason it will not be possible to stop all the stormwater flows from bypassing the ponds, but it appears that the flows could be significantly reduced and have a correspondingly important impact on reducing one of the primary sources of road salt entering the lake.

A technical assessment of the ponds ability to managed increased flows within Markham's design criteria would be required but this analysis illustrates that with relative minor changes there is the potential to significantly reduce the amount of road salt laden stormwater that is bypassing the ponds and going into Swan Lake.

ACTION #3: RIGOROUS POND MAINTENANCE PROGRAM

Maintenance of the Pond and Lake Inlets

The inlets into the ponds require routine maintenance. The Mid-Splitter was clogged for about three years before being cleared in December 2021. It is estimated that this blockage accounts for approximately 11% of the chloride in Swan Lake.

The following photos show the before and after images of the East Pond inlet pipe from the Mid-Splitter.

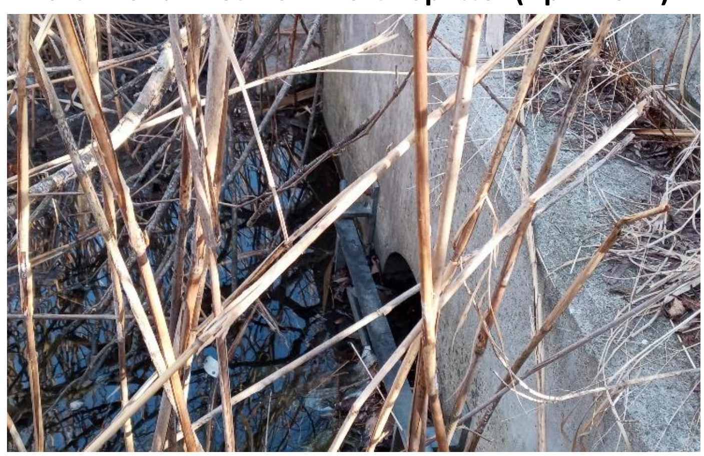
East Pond Mid-Splitter Before Cleaning (Dec 2021)

East Pond Mid-Splitter After Cleaning (April 2022)

The other inlet pipes do not appear to be clogged but the there is a build-up of reeds and mud at the pond entrance.

East Pond –Inlet from South Splitter (April 2022)

North Pond Inlet from North Splitter (April 2022)



Pond Cleaning

Typically ponds such as these are cleaned for the first time immediately before being turned over to the municipality. This is often 10 years after being built.

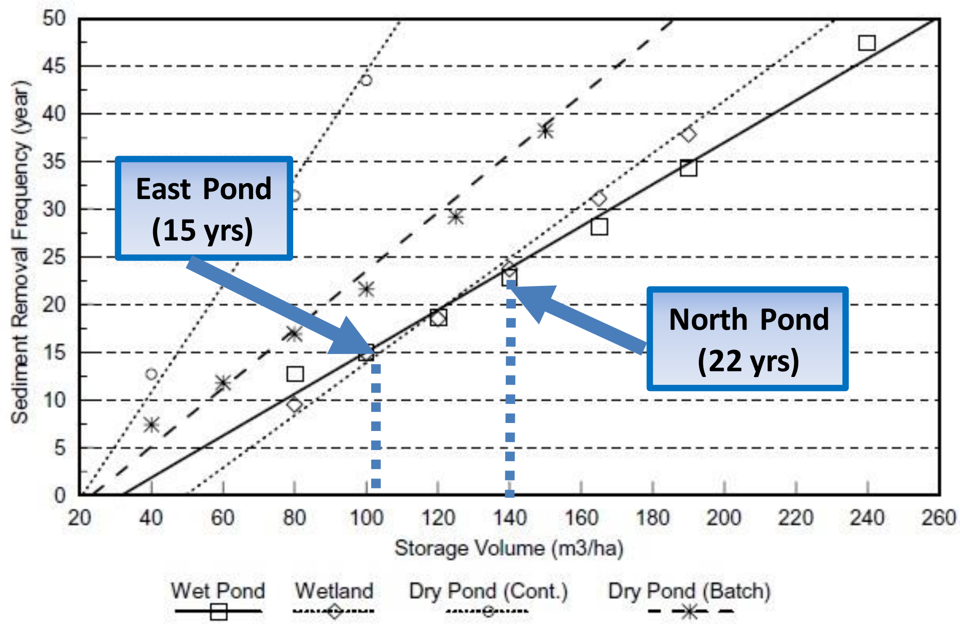
These ponds remain under the control of the developer. The East Pond was built in 1996 and has been operational for 26 years. The North Pond was built in 2001 and operational for 21 years. Ontario's guidelines[11] call for regular monitoring and maintenance of all the elements of a stormwater pond system.

The ponds require cleaning periodically based on the relationship between the size of the area served and the pond design capacity. The oil/grit separators are recommended to be cleaned every year and the overall design assumes that all outlets and inlets remain clear and fully functional.

Other than the cleaning of the Mid-Splitter in December 2021, which was cleared only after the Friends of Swan Lake brought the problem to the attention of city staff, there is little evidence of active monitoring and maintenance of the Swan Lake pond infrastructure.

Permanent Storage vs Removal Frequency

Ontario SWP Manual 2019 (55% Impervious Catchments)



The guidelines suggest that the East Pond should be cleaned approximately every 15 years and the North Pond every 22 years. There may have been some cleaning activity performed at the East Pond around 2010 when the last phase of construction was completed in Swan Lake Village.

The Ministry of the Environment typically imposes requirements to monitor the ponds to ensure they are performing as designed when they issue their Certificate of Approval. In the case of these ponds, we have been unable to determine if any monitoring program for the ponds was required by the MOE or if any has been done.

ACTION # 4: IMPROVEMENTS IN SALT MANAGEMENT PRACTICES

The annual winter use of road salt in the adjacent areas is the primary source of chloride that has accumulated in the lake. A fundamental objective should be to encourage minimal use of road salt in the area. Prudent management of road salt in the local communities must be encouraged however it remains a fact that road salt is the primary tool for winter safety management and its use will continue.

Improvement in management practices needs to be encouraged. Two initiatives should be considered:

a) Review of Salt Management Protocols

Markham is responsible for the management of about 15% of the areas draining into the Swan Lake stormwater systems. The remainder is under the control of private owners.

- We believe Markham manages its salt applications under a 2005 policy guideline[10]. If so, then this should be reviewed to see if there have been material advancements that could be adopted.
- Private owners should be encouraged to adopt environmentally safe protocols.
- Markham and private owners should be encouraged to hire only contractors that have completed the training program and are certified under the "Smart About Salt" program. Information on the program is available at http://smartaboutsalt.com/.

b) Consider Use of Brine

Brine introduces the concept of "anti-icing" by placing a layer of brine on the surface area before the storm to prevent freezing. Traditional road salt practices involve "de-icing" – using salt to remove ice after it has formed.

The benefit of adopting brine as part of the salt management regime was illustrated by a recent pilot project at Ryerson University that resulted in a 25% reduction in the use of salt and a modest reduction in costs.

The November 2021 long-term water quality plan for Swan Lake, did not include any specific programs to address the build-up of chloride in Swan Lake. The report has suggested that local communities be encouraged to reduce the use of road salt to help mitigate the amount entering the lake. The primary neighbouring communities are senior retirement communities that are conscious of the environmental issue but also empathize the need for road salt as a safety measure for their residents. Swan Lake Village has confirmed that its contractor is certified under the Smart About Salt program.

Improvement in salt management practices is important however it alone will not have a material impact on the ongoing build-up of chloride in Swan Lake.

ACTION #5: RESEARCH INTO REMOVING CHLORIDE

The challenges in addressing the restoration challenges in Swan Lake are complex and a diversity of skills and views is required. The following summary outlines a variety of resources that may be able to contribute to key elements of a long-term sustainable plan for Swan Lake.

In the November 2021 Swan Lake Long-Term Management Plan[13] Markham has recognized the need for research into the removal of chloride already in the lake and for means to improve oxygen levels.

York University Research into Removal of Phosphorus, Nitrogen and Chloride

The Swan Lake long-term plan calls for research into means for removal of chloride starting in 5 years. Since the intrinsic chloride problem is known and expected to get progressively worse and research programs take 2-3 years, a more expedient timeframe is required. To that end, the Friends of Swan Lake Park have solicited a proposal by researchers at York University to initiate a study of using charcoal-based products to remove phosphorus, nitrogen, and chloride from Swan Lake. The proposal is provided in Appendix E. We encourage Markham to commit to a timelier research effort and support this and other research efforts to improve and restore water quality in Swan Lake.

Fleming College Research into Improving Oxygen Levels

The Swan Lake long-term plan calls for research into the potential for the use of Calcium Peroxide as a means for improving oxygen levels in Swan Lake during the initial 5 years. This concept arose from a 2020 report by Fleming College sponsored by the Friends of Swan Lake Park. The Friends of Swan Lake Park have solicited a proposal by researchers at the Centre for Water and Wastewater Technologies at Fleming College on the potential for use of calcium peroxide for improving oxygen levels in Swan Lake. The proposal is provided in Appendix F.

Technical Assessment of Rerouting OGS Flows and Reducing Flows Bypassing the Ponds

The engineering issues raised related to rerouting OGS flows and in raising the splitters and potentially resizing the pond inlet pipes could be assessed in several ways:

a) The developer responsible for the two stormwater ponds could include a review of the design of the pond splitters in the context of their technical assessment of whether the ponds require cleaning.
b) City staff could provide a technical review of the proposal to reroute the Amica and Traffic Circle OGS flows to the lake outlet and the Swan Club OGS flows to the North Pond and determine whether further technical downstream assessment is required since these changes fall within the current flood protection mechanisms.
c) Engineering students could be engaged to undertake an assessment of the above issues.

Water Environment Association of Ontario Student Design Competition

In its June 2020 report, the Friends of Swan Lake Park recommended that the challenge of establishing a comprehensive restoration plan for Swan Lake and Swan Lake Park be submitted as a topic for the annual student design competition sponsored by WEAO. This recommendation was endorsed by Freshwater Research in its July 2020 report.

IMPACT OF PROPOSED CHANGES ON DOWNSTREAM SYSTEMS

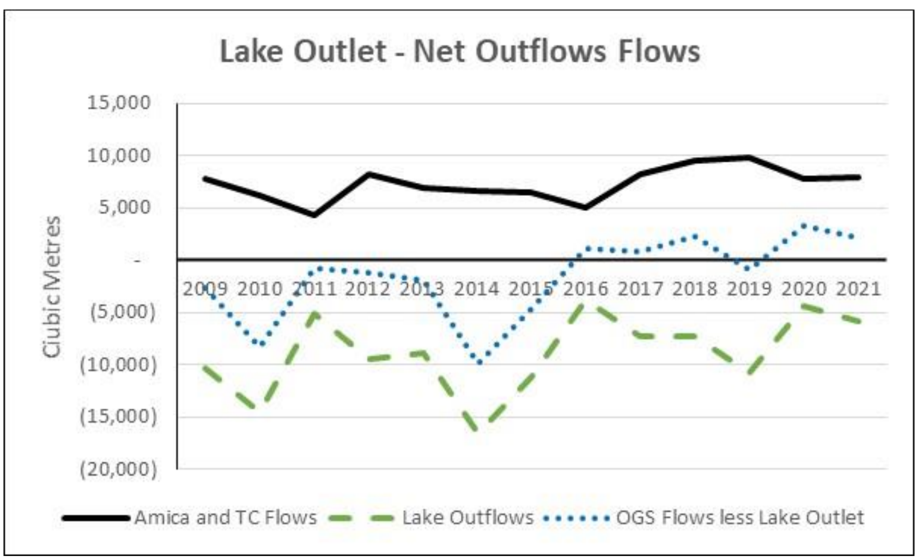
Once fully implemented the program for rerouting stormwater inflows away from Swan Lake will impact the three primary stormwater outlets:

a) The lake outlet would be used primarily to serve the Amica and Traffic Circle flows with minimal flows expected from the lake.
b) The flows from the East Pond into the Swan Lake Village Collector System and ultimately the 16th Avenue southern system will increase up to 3%-5% depending on the success in reducing the flows bypassing the East Pond.
c) The flows from the North Pond going into the Williamson Road system and ultimately the 16th Avenue westward system will increase by the additional volume of the Swan Club OGS unit and up to 5% - 8% depending on the success of reducing amounts bypassing the ponds.

The following section summarizes the estimated impact on total annual flows. For flood control purposes, the rate of flow in litres/sec is a significant factor. By managing these flows through the existing flood protection mechanisms there should be no change in the rate of flow and therefore nominal impact on flood control risk. A technical confirmation would be required.

a) Impact on Lake Outlet Flows

The current outflows from the lake can be largely attributed to the stormwater inflows. If these inflows are eliminated, the lake will level out at a natural balance determined by the amount of precipitation, the amount of evaporation and the forces of the aquifer.



This chart illustrates that over the 11-year period 2009 – 2021, the OGS flows from Amica, and the traffic circle have generally been smaller than the lake outflows.

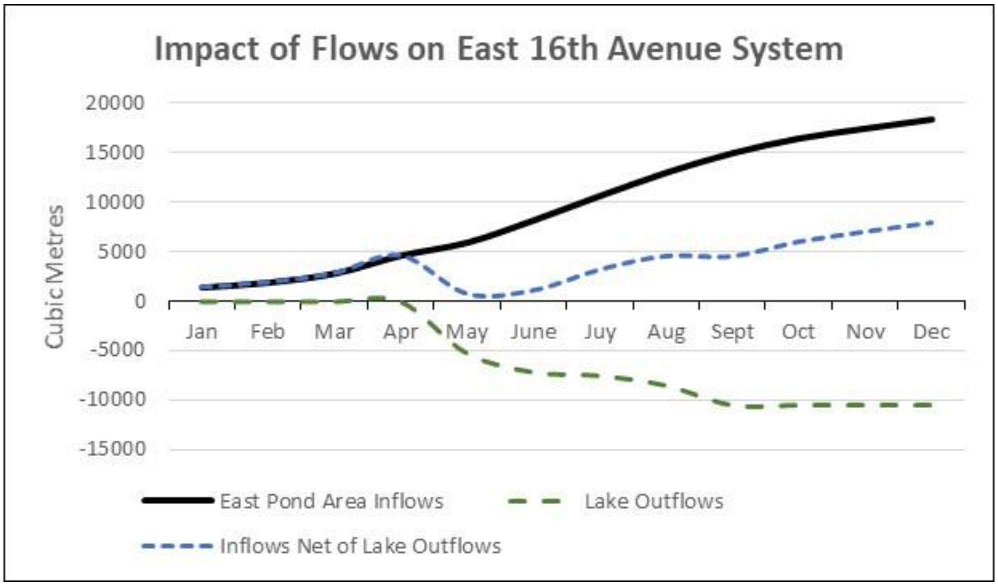
By rerouting the Amica and Traffic Circle OGS flows to the lake outlet there should be a lower volume of water passing through the lake outlet system.

Historical observation, before the construction of the stormwater connections, record the lake level as ranging from 208.2 – 208.5 and averaging 208.35, slightly above the current regulated level of 208.3. It is expected outflows from the lake as a stand-alone entity will be virtually eliminated or infrequent. The amount the lake can absorb before there are direct outflows from the lake will be influenced by natural sources and by the success in reducing the flows bypassing the ponds.

b) Impact on the East Pond Outlet

It is estimated that on average 5.3% of the flows entering the East Pond system bypass the pond and enter Swan Lake. Raising the splitters and increasing the pipe sizes has the potential to reduce flows going into the lake during all but the summer months.

The additional flows retained in the pond will leave through a tightly regulated system that greatly restricts outflows so the downstream risk should be minimal.

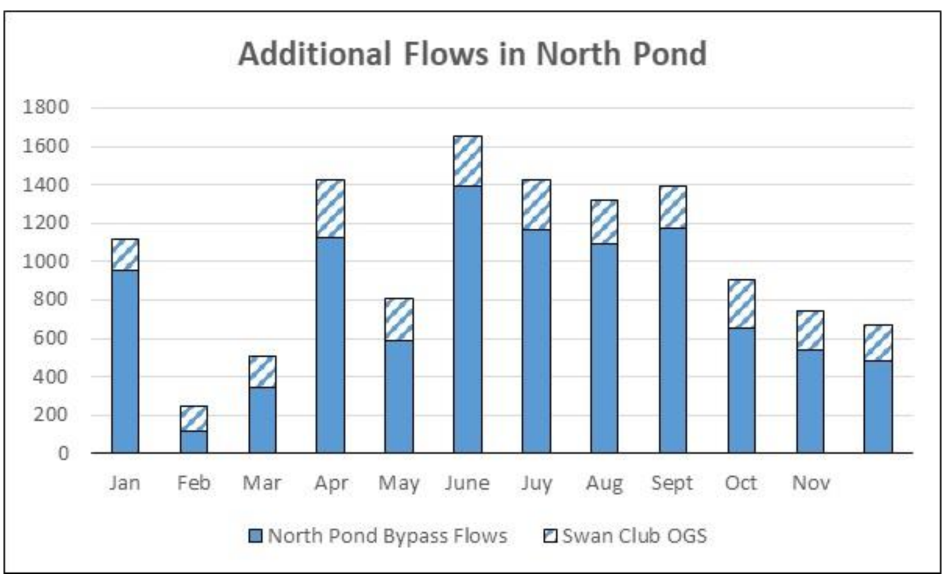


The adjacent chart illustrates the combined impact on the Eastern 16th Avenue system on the combined OGS flows from the Lake Outlet System and the additional flows from the East Pond.

The estimated net inflows indicates that the cumulative impact will build towards the second half of the year.

c) Impact on Williamson Road System

The North Pond and the Williamson Road system will be impacted in two ways: a) relatively small volume flows from the Swan Club OGS system, and 2) retained flows, estimated at potentially up to 5% - 8% of current pond flows.



The adjacent chart illustrates the average additional flows expected to be directed into the North Pond assuming that no flows bypass the pond and go into Swan Lake.

These flows, currently directed into Swan Lake and ultimately the 16th Avenue system, would be rerouted into the Williamson Road system.

References:

1) Canadian Water Quality Guidelines for Protection of Aquatic Life, Canadian Council of Minsters of the Environment, 2011

2) Environmental Master Drainage Plan, Cosburn Patterson Wardman Limited, Revised Sept. 1995

3) Swan Lake Water Budget and Levels, Letter to Town of Markham from Barenco, Sept. 19, 2000

4) Swan Lake – North Pond, Stormwater Management Brief, Earth Tech Canada Inc., Revised July 31, 2000

5) Swan Lake Village Townhouses, Stormwater Management Brief, Earth Tech Canada, Revised September 2005

6) Swan Lake Water Quality Management, Freshwater Research, July 17, 2020

7) Hydrological Modeling (City of Markham), Appendix C, Swan Lake Water Quality Management, Freshwater Research July 17, 2020

8) Swan Lake Monitoring Program 2020 Annual Report, Markham Environmental Services, March 2021

9) Markham Stormwater Management Guidelines, City of Markham, October 2016

10) Salt Management Plan, City of Markham, March 16, 2005

11) Stormwater Management Planning and Design Manual, Ministry of Environment, Ontario, Mar 2003

12) Storm Water Management Facility Sediment Maintenance Guide, Greenland International Consulting Inc. August 1999

13) Swan Lake Long-Term Management Plan, City of Markham, November 2021

14) Swan Lake Water Quality Management – Water Flow and Chloride Analysis, Markham, April 2022

15) Various technical drawings made available by City of Markham and Swan Lake Village
    a) East Pond, Drawing 10, Cosburn Patterson Wardman, Town File 3057, Project 87464, Jan. 1996
    b) East Pond, Drawing 101, Cosburn Patterson Wardman, Project 87464, September 1995
    c) East Pond, Drawing 301, Cosburn Patterson Wardman, Project 87464, As recorded, Aug. 2002
    d) East Pond, Drawing 501, Cosburn Patterson Wardman, Project 87464, August 1995
    e) East Pond, Drawing 502, Cosburn Patterson Wardman, Project 87464, August 1995
    f) Traffic Circle OGS and Lake Outlet, Drawing 504, Cosburn Patterson Wardman, Project 87464, August 1995
    g) North Pond, Drawing A1-99647, Earth Tech, Project 99647, April 2000
    h) Amica 6380, Drawing R-1, Cosburn Patterson Wardman, Project 87464D, August 1999
    i) Swan Lake Village, Drawing S1, Cosburn Patterson Mather, Project 87464, August 1995
    j) Swan Lake Village, Drawing G1, Earth Tech, Project 76814, February 2005
    k) The Swan Club, Drawing A1-00727-G1, Earth Tech, Project 00727, April 2000

Appendix A: Limitations of the Analysis

In assessing the feasibility of the routes, or the dynamics of flow splitters we used some very basic tools that were sufficient to outline reasons why certain options could be dismissed but not technically sufficient to confirm that they would work.

In reviewing the feasibility of rerouting the OGS flows, the initial focus was whether there was sufficient slope for potential pipes within the existing infrastructure to support the proposed route.

Consideration was also given as to whether there were any known physical impediments such as other buried utility services (electrical, water, other sewer systems). In most cases, the engineering drawings used in this analysis did not identify other adjacent utility services so additional work would be required to confirm if there are any physical impediments to be considered.

In our analysis of the impact of raising the height of the weirs within each splitter or on changing pipe sizes within the splitters, our analysis was limited to only comparing the actual change in capacity (area) of the pipe. While we can illustrate the ability to increase the weirs or the percentage increase in the size of the pipe, the rate of flow through a pipe is also impacted by the height of the water column, water pressure and the speed of the flow. A hydraulic analysis would incorporate all the relevant factors and would be required to determine the impact of a change in weir height and pipe capacity on the change in the volume flowing through the pipe. We can estimate the potential impact of only one factor.

One of the challenges that impacts the range of options is the low-lying nature of the area surrounding the lake. For example, most of the adjacent land and existing infrastructure is a matter of centimeters above or below the lake and pond levels. Anytime a connection is below the lake or pond level, the risk of "backflow" was considered i.e.: the risk that at high levels, water could flow from the lake or pond back into the collector system – a reversal of the intended design. Almost all options considered "feasible" will need to be reviewed to consider whether backflow is a potential problem.

Stormwater systems are designed primarily to remove stormwater from the specified drainage areas but to do so in a way that also mitigates local and downstream flooding risk.

Our analysis notes whether the proposed route falls within the scope of the existing flood protection system or whether it would involve bypassing these protective devices. Any route that would bypass existing flood protection devices would require a detailed technical assessment of any potential downstream risks. Such assessment is beyond the scope of this analysis.

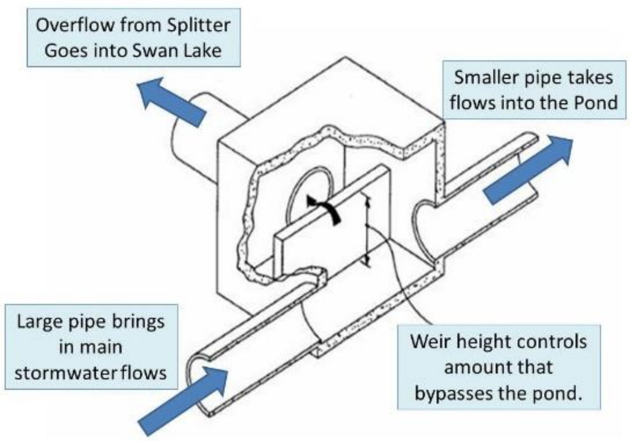
For the purposes of this analysis, we have ignored jurisdictional issues and focused solely on the physical designs of the systems. Different elements in the stormwater system are under the control and responsibility of different organizations. Most solutions would require co-operation between two or more organizations to proceed. In our summary table in Appendix C, we indicate the parties we believe would need to be involved if the option were to proceed.

Appendix B: Flood Protection Measures

Stormwater systems are designed primarily to remove stormwater from a specific drainage area but to do so in a way that also mitigates both local and downstream flooding risk. The primary stormwater system around Swan Lake was designed to direct rainfalls of up to 25 ml to the ponds. In the event of more intense rainfalls, the design of the system employs two techniques to help manage the risk of local and downstream flooding:

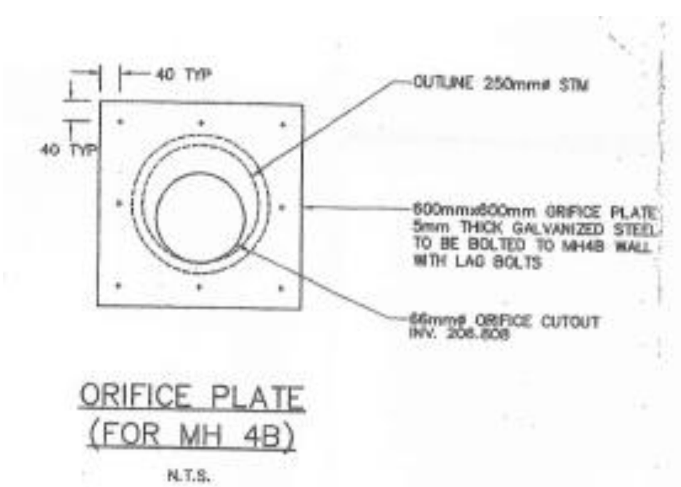
1) the use of "splitters" at the stormwater ponds enables heavy volumes and spring run-offs to bypass the pond system and go into Swan Lake, and
2) the use of "orifice plates" to reduce flows from one part of the system to another. For example, the outflow pipe from the lake is 375 mm in diameter but a 165 mm orifice plate installed over the lakehead outlet reduces the volume of water that can enter this outlet pipe from the lake. A similar arrangement is in place to regulate the outflows from both ponds.

Flood Protection Role of Splitters



The splitters installed at each pond contribute to flood risk management in two ways: 1) Under normal rainfall conditions, the splitters direct stormwater runoff directly to the pond but during large rain events some of the runoff is directed into Swan Lake. 2) As the ponds approach the limit of their storage capacity, the splitters serve to direct overflow from the ponds into the lake.

Flood Protection Role of Orifice Plates



Orifice plates are used to reduce average flows leaving an area and to reduce surges in the outflow.

An orifice plate consists of a large medal plate that is placed over a large pipe. The orifice plate contains a hole cut-out smaller than the pipe. This illustration shows the orifice plate at the East Pond outlet.

The plate covers a 250 mm pipe. The cut-out is 66 mm restricting the amount of water that can leave the East Pond to the capacity that can flow through the 66 mm opening.

The folowing table sumarizes the location and relative size of the orifice plates installed within the Swan Lake stormwater system.

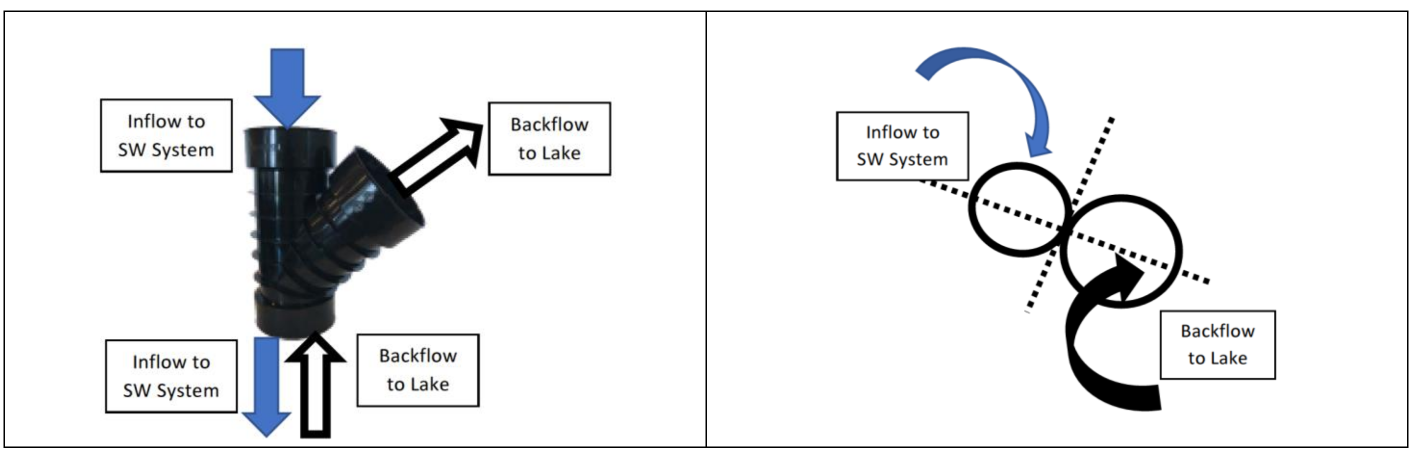
	Size of Pipe			Relative Size of Orifice Plate		
Location		Diameter (mm)	Area (m2)	Diameter (mm)	Area (m2)	% of Pipe
Lakehead wall	Lakehead	375	0.1104	165	0.0214	19%
East Pond Outlet (#105)	MH4B	250	0.0491	66	0.0034	7%
North Pond Outlet (#104)	MHB	200	0.0314	100	0.0079	25%
SLV Connection to 16th	West	450	0.1590	190	0.0284	18%
Avenue	East	375	0.1104	160	0.0201	18%

OGS Units and Backflow Risk

As noted earlier, the OGS units and related infrastructure are just marginally above or below the lake surface. Anytime a connection is below the lake or pond level, the risk of "backflow" was considered i.e.: the risk that at high levels, water could flow from the lake or pond back into the collector system – a reversal of the intended design.

Connected Infrastructure: Distance Above Lake/Ponds					
Pond Splitters		Above	OGS Units		Above
South Splitter (East Pond)	208.391	0.091	Amica	208.21	-0.090
Mid-Splitter (East Pond)	208.340	0.040	Traffic Circle	208.25	-0.050
North Splitter (North Pond)	208.310	0.010	Swan Club	208.94	0.640
Swan Lake and both ponds are regulated at 208.3 m					

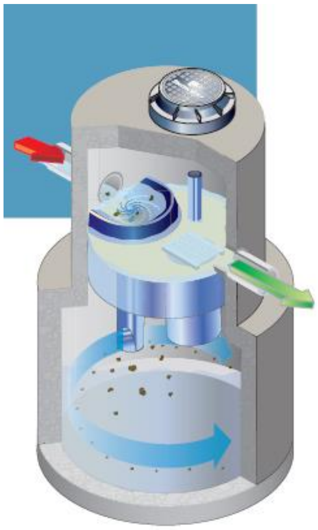
If appropriate, the design of any changes should consider installing an element to control and reduce backflow risk near each OGS unit. One option may be to install "Y" shaped pipes to redirect any backflow to the lake.



In this example, the pipe would be slightly rotated so that the portion carrying backflows to the lake would be lower than the outflows. The outflows would head downstream through the smaller portion on the higher side of the pipe. In the event of any backflow, it would be directed back through the lower portion and into the lake.

Appendix C: Rerouting Oil/Grit Separator Flows from Swan Lake

The following analysis provides a high-level assessment of the feasibility of rerouting the stormwater flows from the three oil/grit separator units away from Swan Lake and into the stormwater system.



Oil/grit separators ("OGS") are designed to remove oils and heavy particles to minimize the pollutants. The polluted water enters the container and falls to the bottom. The heavy material remains in the container and the somewhat cleaner water then rises and flows out and into Swan Lake.

These units have no ability to remove road salt and other pollutants that are soluble and absorbed by stormwater runoff. The units installed at Swan Lake are all manufactured by Imbrium and are units in their Stormceptor product line.

These units are not designed to retain the runoff. As noted in the table below most of the storage capacity is devoted to retaining sediment. The manufacturer notes the importance of monitoring the buildup of sediment each year and removing the sediment once it exceeds 15% of capacity.

Oil/grit separators are installed in the parking lot at Amica, adjacent to the dock area in the traffic circle on Swan Lake Boulevard and in the parking lot of the Swan Club in Swan Lake Village.

					Sediment Capacity	
Location	Elevation of Outlet to Lake	Size of Area Supported	Product	Total Storage Volume (m^3)	Maximum (m^3)	% of Storage
Traffic Circle on Swan Lake Blvd	208.25	0.54 ha	STC 2000	6.2	5.9	82%
Amica property	208.21	0.75 ha	STC 1500	7.3	6.2	85%
Swan Club Parking Lot	208.94	0.46 ha	STC 300	1.8	1.5	95%

In reviewing the feasibility of rerouting the OGS flows, the initial focus was whether there was sufficient slope for potential pipes within the existing infrastructure to support the proposed route. Two slope rates were used – a minimum rate of slope of 0.20% or 0.30% (a decline of 0.20 m or 0.30 m per 100 metres of distance). Steeper slopes (greater than 0.30%) are helpful in moving sediment through the system. Slope rates within the existing pipe infrastructure are generally between 0.14% and 0.51%.

I) Route A - Redirecting Amica Flows to the Traffic Circle

It is approximately 110 metres along the Amica driveway from the current OGS unit at Amica to the centre of the traffic circle.

Amica 6360 - Retirement Block Servicing Plan (Cosburn Patterson, Project 87464D, Drawing R-1)			
OGS (STC1500)		**Lake Headwall**	
Pipe (mm)	**Elevation (M)**		
W 375	Inv = 208.26		
S 450	Inv = 208.24		
N 450	Inv = 208.21 ➡	S 450	Inv = 208.20

Amica to Traffic Circle		
Distance (m)	110	110
Minimum slope	0.30%	0.20%
Slope (m)	0.33	0.22
Elevation Amica OGS	208.21	208.21
Entry Traffic Circle	207.88	207.99
Minimum allowance	0.02	0.02
Exit Elevation	**207.86**	**207.97**

The current 450 mm outflow pipe to the lake in the Amica OGS is at an elevation of 208.21 m above sea level. Allowing for a potential pipe slope of between 0.20% and 0.30% over the 110-metre distance indicates that the entry into the traffic circle would be at an elevation of between 207.88 and 207.99 m.

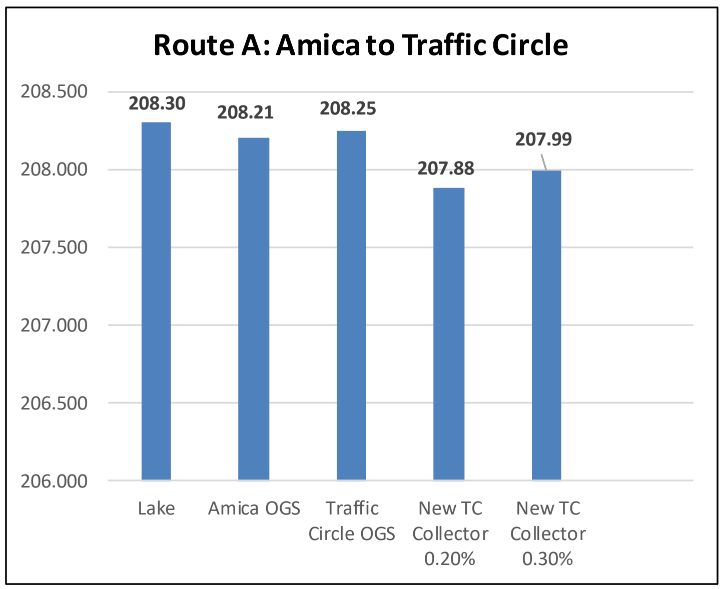
After allowing for a minimum drop of 0.02 m for the outflow pipe, the outflow pipe from the traffic circle would be between an elevation of 207.86 to 207.97 m.

There are no known obstacles along the proposed route along Amica's driveway, but an analysis of other utility features would be required.

Three Traffic Circle Collector Options

Three locations were considered for consolidating the Amica and the traffic circle flows within the traffic circle - using one of two existing manholes at the traffic circle or creation of a new manhole. We conclude that the best solution would be to install a new manhole as the collection point.

As highlighted in the adjacent chart, the new pipes would enter the traffic circle below the existing OGS unit in the traffic circle.



Traffic Circle (Source: Cosborn Patterson Town File 3057 Project 87464 Drawing 10 - Jan 1996)							
STM MH3		**STM MH2**		**STM MH1 (OGS-STC2000)**		**Lake Headwall**	
Pipe (mm)	**Elevation (M)**	**Pipe (mm)**	**Elevation (M)**	**Pipe (mm)**	**Elevation (M)**		
W 375	Inv = 208.44						
E 375	Inv = 208.47	E 375	Inv = 208.33				
		N 450	Inv = 208.28	S 450	Inv = 208.26		
				N 450	Inv = 208.25	S 450	Inv = 208.20
		Connections		**Connections**		**Connections**	
		From MH3 to MH2		**From MH2 to MH1**		**From MH1 to Lake**	
		Size	375 Conc	Size	450 Conc	Size	450 Conc
		Distance	21.5 m	Distance	14.0 m	Distance	10.0 m
		Slope	0.51%	Slope	0.14%	Slope	0.40%

First option: STM MH1 (Drawing 10) contains the current OGS unit. It has a 450 mm inflow pipe from STM MH2 entering at an elevation of 208.26 and a 450 mm outflow pipe to the lake at an elevation of 208.25. The proposed new inflow pipe from Amica (207.88 – 207.99) would be below the existing inflow from STM MH2 inflow so the OGS unit would need to be removed and replaced with a new manhole.

Second option: Alternatively, the new connection from Amica could be directed to STM MH2 in the traffic circle. A 375 mm inflow pipe from STM MH3 enters at an elevation of 208.33. The proposed line from Amica would enter below this connection. Pipe between MH1 and MH2 would need to be removed and replaced. Accordingly, this option is not as good as the first.

Third Option: Rather than rework an existing manhole it appears preferable to use a new manhole unit that would provide for inflow pipes from STM MH2 (at 208.26 m) and from Amica (between 207.88 and 207.99).

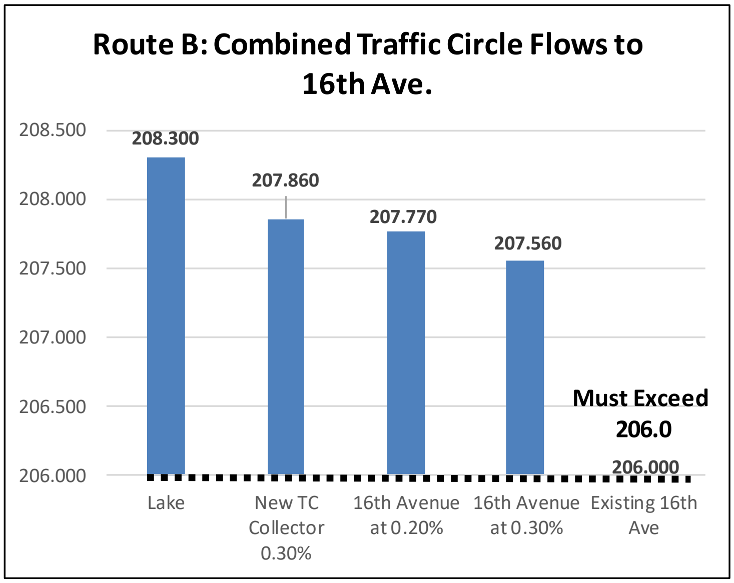
In either case, if we provide for an outflow allowance of 0.02 m below the lowest inflow pipe from Amica, the outflow pipe from the traffic circle collector unit would be at an elevation of between 207.86 and 207.97.

It is beyond the scope of this analysis, but the system design may require different pipe sizes and slopes for carrying the consolidate Amica and traffic circle flows depending on whether it is connecting to either 16th Avenue, the East Pond or to the lake outlet system.

II) Route B - Direct Connection to 16th Avenue and the SLV Collector System

Combined Flows Traffic Circle to 16th Ave.		
Distance (m)	100	100
Minimum slope	0.30%	0.20%
Slope (m)	0.30	0.20
Departure Elevation from Traffic Circle (New Collector))	207.86	207.97
Inflows to 16th Ave	**207.56**	**207.77**

The distance from the traffic circle to 16th Avenue and Swan Lake Boulevard is approximately 100 m. With a minimum pipe slope of between 0.20% - 0.30% it would indicate that the inflow pipe from the traffic circle would enter the 16th Avenue system at an elevation of between 207.56 and 207.77 m.



The outflow from MH6 at 16th Avenue is at 206.0 m which is well below the proposed entry pipe from the traffic circle. Therefore, there is sufficient slope to support the proposed connection.

There are several utility services (electrical, water, sanitary sewers) connections along Swan Lake Boulevard so a clear route for a stormwater pipe would need to be defined along Swan Lake Boulevard.

This route bypasses any existing flood protection infrastructure so surge suppression devices such as an orifice plate may be warranted.

It should be noted that the Route B connection on 16th Avenue flows back into the southern end of Swan Lake Village before connecting to MH14 and then the external system on 16th Avenue. Consideration would have to be given to the ability of the Swan Lake Village Collector system to handle the additional average volumes

Conclusion

The preliminary analysis suggests that Route B is a viable option depending on the ability of the southern portion of the Swan Lake Village Collector system to handle the volumes. A detailed technical analysis of the downstream impact would be required to validate the viability of this route. The addition of surge suppression devices needs to be considered.

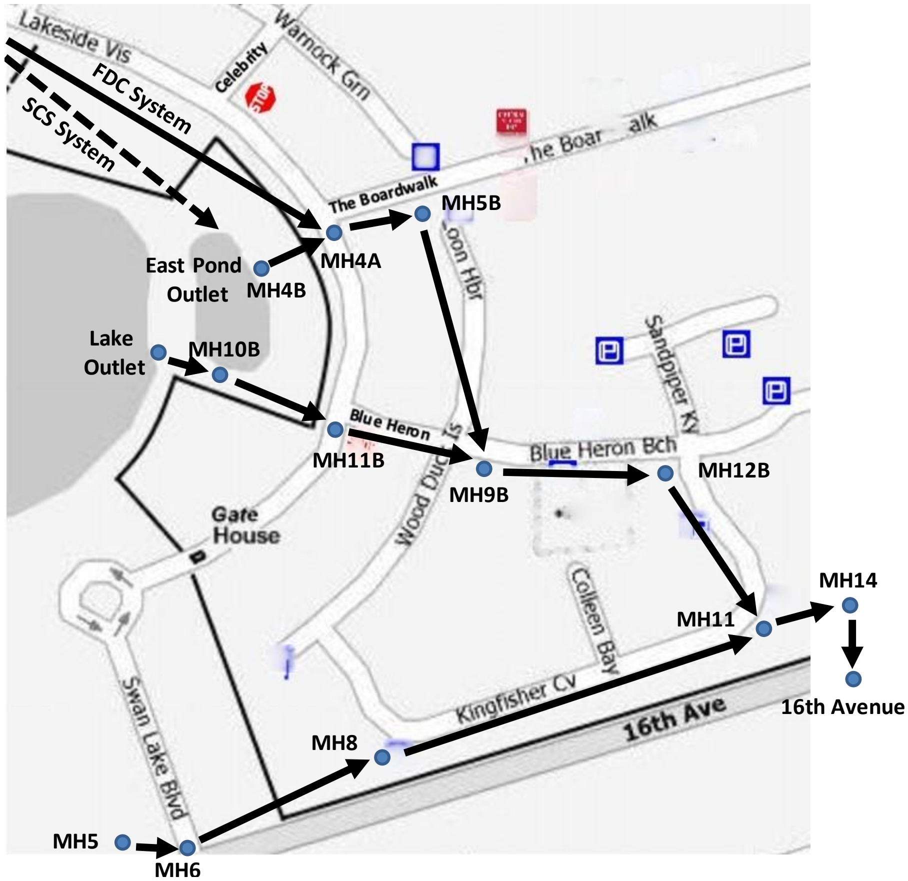
III) Utilizing Existing Pond and Lake Infrastructure

The ideal option would be to direct the OGS flows into the existing infrastructure with the built-in flood protections. At present the OGS flows go into the lake and contribute to the volume of water that leaves the lake, passing through a collector system within Swan Lake Village then into the 16th Avenue system about 150 m east of Swan Lake Boulevard. In essence, the bulk of the OGS flows are already leaving through this collector system so finding a direct route for the OGS flows should minimize any downstream impact. Directing OGS flows directly to either the pond or lake outlets could be offset by reduced lake outflows.

Two routes were considered within the managed system: Route C) directing OGS flows to the pond outlet system, either via the existing service manholes or directly into the pond; Route D) directing OGS flows to the lake outlet system via the existing manholes or into the lake level outlet.

Other options considered were to connect directly with the Swan Lake Village Collector System near the East Pond, bypassing the pond management infrastructure.

Swan Lake Village Collector System



Once the flows leave either the pond or the lake, they flow into a system that is a combination of stormwater and a Foundation Collection System which means there is the risk of basement flooding in this area if the flows are not controlled properly.

So, the first area of local flooding risk is within the southern end of Swan Lake Village. The downstream risk, if any, begins after flows leave Swan Lake Village at MH14 near 16th Avenue.

Flows from the street, Amica and the retail plaza flow eastward from Swan Lake Blvd and 16th Avenue into the southern end of Swan Lake Village before connecting to MH14 and then the external system on 16th Avenue.

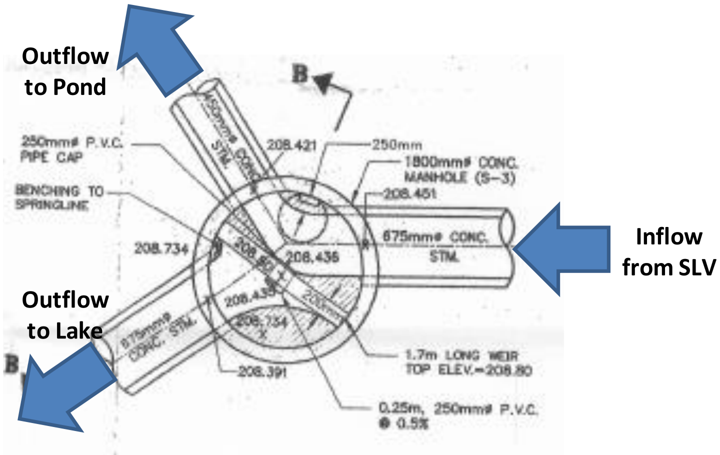
Route C: Directing Traffic Circle Flows to the East Pond

Three possibilities were considered: C1) Connecting to the existing splitter structures or to the pond surface directly, C2) connecting into the regulated portion of the pond outflow system and C3) bypassing the regulated pond outflow by connecting directly to the Swan Lake Village collector system and then on to 16th Avenue.

Combined Flows Traffic Circle to East Pond		
Distance (m)	90	90
Minimum slope	0.30%	0.20%
Slope (m)	0.27	0.18
Traffic Circle (New Collector)	207.86	207.97
Inflow to pond	**207.59**	**207.79**

The distance from the traffic circle to the pond is approximately 90 m. A minimum slope of between 0.20% and 0.30% would indicate that the inflow pipe carrying combined flows from the traffic circle would enter at an elevation of between 207.59 and 207.79 m.

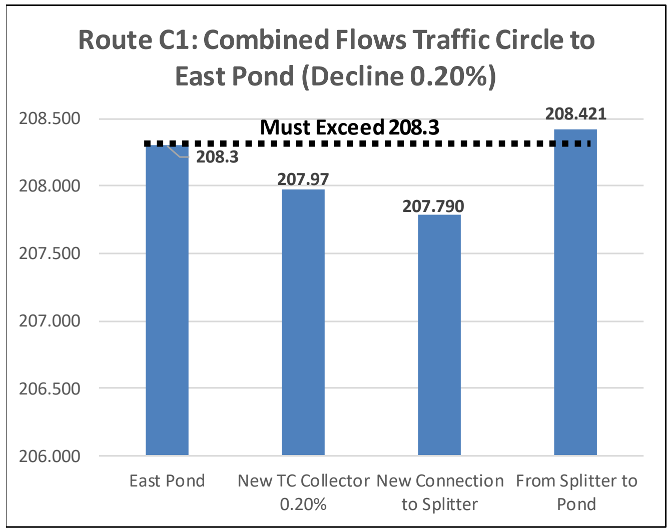
Route C1 - Connecting to the Splitter System or Directly to Pond



MH27 (Drawing 501)[13d] contains the South Splitter unit. The main inflow pipe (675 mm) from Swan Lake Village enters at an elevation of 208.451 and a 450 mm outflow pipe to the pond leaves at an elevation of 208.421.

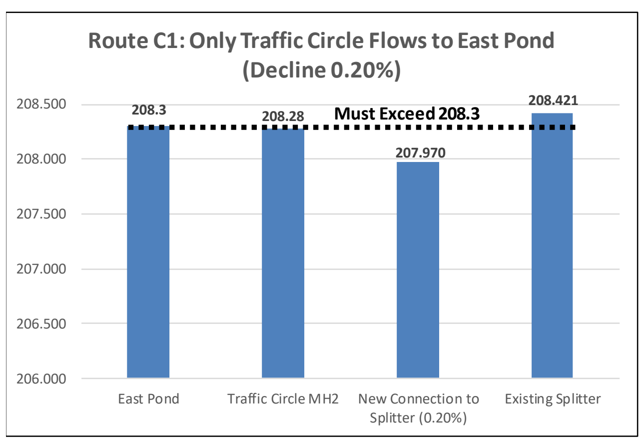
The 675 mm pipe that takes overflow water from the splitter to the lake is at an elevation of 208.391 m.

At the lower slope of 0.20%, the combined flows from the traffic circle would enter at 207.79 m so the proposed new inflow pipe from the traffic circle would be below the existing pond outflow pipe within the splitter manhole (208.421). Using the splitter would not be an option since the new pipe would be lower than the existing. Similarly, bypassing the splitter and going directly to the pond is not an option since the pond level is designed to be maintained at 208.3 m which is above the traffic circle elevation so there is the risk of backflow if connected directly to the pond.



The analysis considered whether the backflow risk would still be a factor even if only the flows from the traffic circle were considered.

The adjacent chart illustrates that the infrastructure in the traffic circle (MH2) is at an elevation of 208.28 m, slightly below the regulated level in the East Pond (208.3 m) and below the main inflow pipe from the splitter to the East Pond (208.421).



So even if only the flows from the traffic circle were included, the connection at 207.97 would still be below the splitter connection and a connection to the splitter or pond would not be feasible due to the risk of backflow.

Conclusion

Any connection to the South Splitter or the pond would not work.

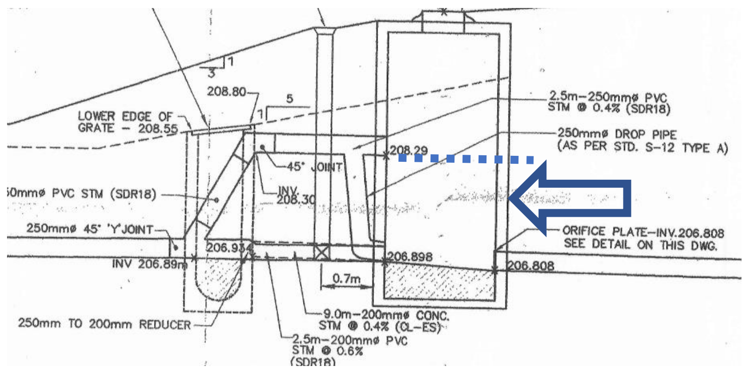
Route C2 - Via Regulated East Pond Outlet

Traffic Circle to East Pond Outlet (MH4B)		
Distance (m)	170	170
Minimum slope	0.30%	0.20%
Slope (m)	0.51	0.34
Traffic Circle (New	207.86	207.97
Inflow to Pond Outlet/SVL	**207.35**	**207.63**

East Pond Outlet - Drawing 501					
Pond Drain		MH4B		MH4A (SLV Collector)	
Pipe (mm)	Elevation (M)	Pipe (mm)	Elevation (M)	Pipe (mm)	Elevation (M)
250	206.83	250	206.898		
		Outflow 250	206.808		
		Orifice 66	206.808	250	206.688
				Lake Outflow	206.125
				Outflow to SLV	206.038

Connections		Connections	
Pond Drain to MH4B		**From MH4B to MH4A**	
Size	250 Conc	Size	250 Conc
Distance	14 m	Distance	12 m
Slope	0.40%	Slope	1.00%
		Note: MH4A is SLV Collector	

The pond depth is regulated at a normal depth of 208.3 m through a structure contained within MH4B (Drawing 501) located near Lakeside Vista and The Boardwalk.



While the primary pipes are 250 mm in diameter, the outflow to the Swan Lake Village Collector System (MH4A) is regulated by a 66 mm orifice plate within MH4B.

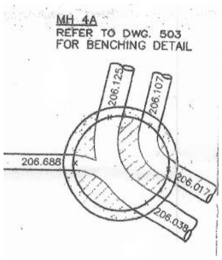
The outflows pass through the orifice plate at an elevation of 206.808 which would be below the intake level from the traffic circle (207.35 - 207.63). However, once the pond exceeds the regulated depth of 208.3 m, due to the outflow restrictions of the orifice plate, the chamber within MH4B could fill above the level of the inlet pipe from the traffic circle and there would be significant risk of backflow making this option not feasible.

Conclusion

Routing the combined flows to the Pond Outlet at MH4B could work if the design included a means to eliminate or reduce the "back flow risk" from MH4B to the traffic circle.

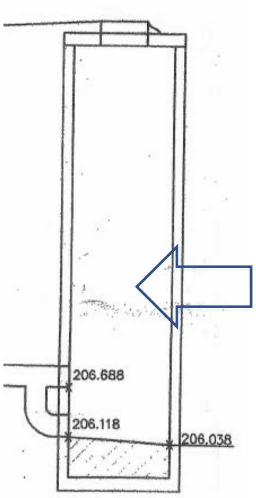
Route C3 – Connecting to Swan Lake Village System - Bypassing East Pond Regulated Flows

The third option considered would be to bypass the regulated pond system and connect directly to the collector system within Swan Lake Village which outflows to 16th Avenue. After passing through the restrictions of the 66 mm orifice plate, pond outflows go from MH4B go into MH4A (Drawing 501) and are combined with other flows from the Foundation Collector System within Swan Lake Village (SLV). (Note: the parallel pipe shown in the diagram below is believed to be the sanitary system pipe.)



It may be feasible to direct OGS flows directly into the SLV collector system (MH4A) which is approximately an additional distance of 12 m (total of 182 m from the traffic circle). Investigation would be required to ensure there are not buried obstacles.

The OGS inflows could be regulated, like the pond outflows, by use of an orifice plate before entering MH4A or before leaving the traffic circle.



There would be little risk of backflows from the 16th Swan Lake Village collector system. Consideration should be given to reducing lake outflows to offset the OGS flows.

If installation of a back flow mechanism at the traffic circle is not feasible but extra storage is required, perhaps oversized pipes could be used from the traffic circle to MH4A to provide additional storage.

Conclusion

This option is comparable to Route D3, the lake outlet connection to the Swan Lake Collector System, but involves an additional distance of approximately 50 m. Both options are comparable to Route B in that they bypass the existing pond infrastructure and provide a connection to the 16th Avenue system via the Swan Lake Village Collector System.

This option would require an in-depth technical review of the impact on the collector system within Swan Lake Village and a review to determine if there are any infrastructure obstacles blocking the route.

Route D: Directing Traffic Circle Flows to the Lake Outlet System

Route D involves using the exiting lake outlet infrastructure. At present all lake flows pass though a system with some basic surge protection. Indirectly the OGS flows use this system since the OGS flows go into the lake. When the lake is at its regulated height, by displacement other water is pushed out of the lake while when the lake is below its regulated height the flows adds to the build up within the lake.

Three options were considered: D1: connecting at the lake level outlet at the headwall, D2: connecting at manhole MH10B or D3: at the connecting point with the Swan Lake Village Collector system (MH11B)

Lake Outlet (Drawings 101 and 502)					
Lake Head		MH10B (near splitter)		MH11B (SLV Collector)	
Pipe (mm)	Elevation (M)	Pipe (mm)	Elevation (M)	Pipe (mm)	Elevation (M)
Lake Level	208.30				
375	207.00				
Orifice 165	207.00	375	206.88 *		
		375	206.808	375	206.125
		Connections		Connections	
		Lakehead to MH10B		From MH10B to MH11B	
		Size	375 Conc	Size	375 Conc
		Distance	21 m	Distance	40 m
		Slope	0.57%	Slope	0.40%

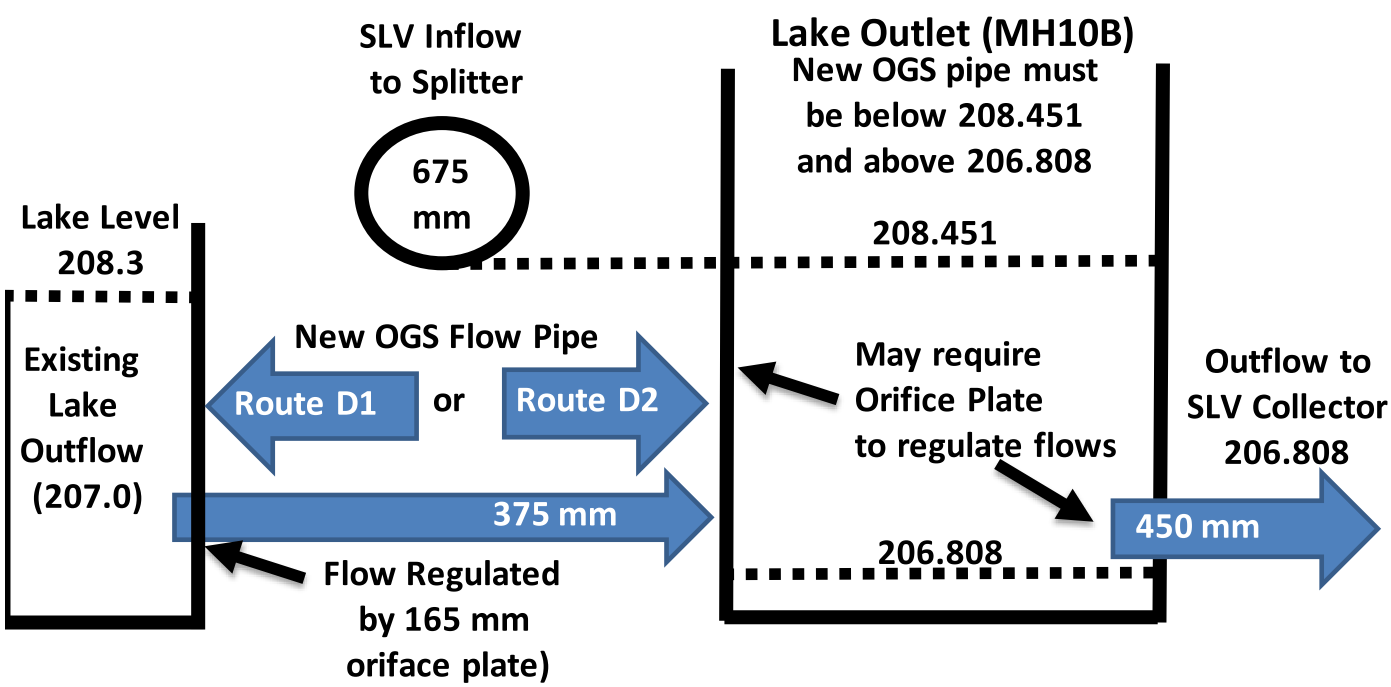
* Estimate. Not all elevation details for MH10B were available

Route D1 – Connecting the Lake Level Headwall

The lake level is currently regulated by the lower end of a service grate at 208.3 m. on the southeast shoreline of the lake. Route D1 considered directing OGS outflows to the lake level outlet.

As the diagram below illustrates, the Lake Outlet System is significantly below the pond infrastructure so pipes can pass beneath the pond infrastructure.

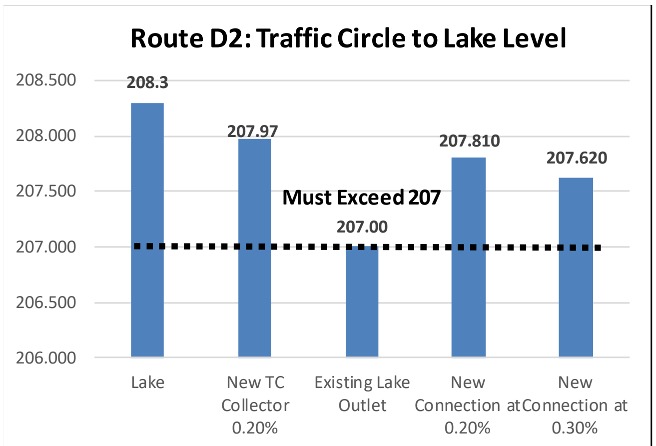
Connecting to the Swan Lake Outlet System



Combined Flows Traffic Circle to Lake Level Outlet (Headwall/Drawing 504)		
Distance (m)	80	80
Minimum slope	0.30%	0.20%
Slope (m)	0.24	0.16
Departure Elevation from	207.86	207.97
Inflow to lake	**207.62**	**207.81**

The distance from the traffic circle directly to the lake level outlet is approximately 80 m. indicating that an inflow pipe from the traffic circle would enter at 207.62 and 207.81 m.

The outflow pipe is near the base of the chamber at an elevation of 207.0 m[13g] indicating that direct inflows from the traffic circle would be feasible.



The outlet pipe is 375 mm however the flows through the outlet are regulated by a 165 mm orifice plate. There could be a risk of back flow when the lake level exceeds 208.3 m. Once the chamber collecting the lake outflow exceeds the entry pipe from the traffic circle there is the risk of back flow.

Conclusion

Directly connecting to the lake outlet headwall may work but there would need to be a design element to control back flow. Any solution would need to pass below the existing inflow and outflow pipes connected to the South Splitter.

Route D2 – Connecting to MH10B

Combined Flows Traffic Circle to Lake Outlet (MH10B/Drawing 301)		
Distance (m)	90	90
Minimum slope	0.30%	0.20%
Slope (m)	0.27	0.18
Traffic Circle (New Collector)	207.86	207.97
Inflow to lake MH10B	**207.59**	**207.79**

The outflows from the lake pass through MH10B (Drawing 301). The distance from the traffic circle to the service manhole MH10B is approximately 90 m. The inflow pipe from the traffic circle would enter at an elevation between 207.59 - 207.79 m.

This is above the inflow pipe from the lake which is estimated to be 206.88 m and above the outflow pipe (206.808) that carries the flow to 16th Avenue.

The outflow from MH10B is through a 375 mm pipe. There does not appear to be an orifice plate within MH10B to regulate the outflow from this unit. If additional flows are directed into this unit, it may be desirable to add an orifice plate to restrict outflows into the 16th Avenue collector system.

Consideration should be given to reducing the outflows from the lake by reducing the size of the orifice plate at the lakehead outlet. If flows from the OGS units are redirected to the outlet system, then there should be less outflow from the lake.

Conclusion
Direct flows to MH10B appears feasible and to offer a low level of backflow risk. A build up of flows in MH10B may back up into the traffic circle system so the back flow risk requires further analysis. This may require consideration of reviewing pipe storage capacity in any line coming from the traffic circle, possibly by oversizing the pipe.

Route D3 – Connecting to the Swan Lake Village Collector System

It may be feasible to connect to the Swan Lake Collector system at MH11B if it was determined to be preferable to D1 or D2. This manhole is closer to the traffic circle compared to the pond outlet connection at MH4A (Route C3) but connects to a different portion of the system leading to 16th Avenue. We were not able to determine whether there was another orifice plate at the connection with the Swan Lake Village System. Both D3 and C3 are not within the existing flood control mechanisms and would likely require a technical analysis of the impact, if any, on the Swan Lake Village Collector System.

Conclusion: Lake Outlet System: Most Viable Options
It appears that the Lake Outlet system provides the most viable options for rerouting the OGS flows from Swan Lake. Both the lakehead outlet (D1) and the MH10B collector (D2) are within the existing flood control mechanisms. Assuming the backflow risk can be managed, a connection to either the lakehead (D1) or the MH10B connector (D2) provide viable options.

IV) Route E - Redirect Swan Club OGS Flows to the Pond or the Lake Outlet

Four routes were considered: E1: Directing OGS flows to the existing stormwater collector systems within Swan Lake Village; E2) directing OGS flows to the North Pond; E3) directing OGS flows to the East Pond; or E4) directing OGS flows to the lake outlet via the existing service manholes or into the lake outlet.

The OGS unit at the Swan Club in Swan Lake Village sits in the lower portion of the parking lot well below the adjacent street, Lakeside Vista.

At 208.94 m, which is 0.64 m above the lake level, the Swan Club OGS unit is at the highest elevation relative to the lake of all three OGS units which provides more flexibility compared to the other OGS units.

Swan Club OGS Drawing A1-00727-01				
OGS (STC300)			**Lake Headwall**	
Pipe (mm)	**Elevation (M)**			
W 250	Inv = 208.94	➡	E 250	Inv = 208.50
			Connections **From OGS to Lake**	
			Size	250 PVC
			Distance	14.5 m
			Slope	3.00%

Route E1: Connecting to the Existing Swan Lake Village Collector Systems

Within Swan Lake Village there are two collector systems that run parallel along Lakeside Vista: 1) the Stormwater Collector System (SCS) that takes water to the Mid-Splitter and then the East Pond, and (2) The Swan Lake Village Foundation Drain Collector (FDC) system that takes flows directly to 16th Avenue bypassing the East Pond. The FDC system is a 250 mm pipe that is approximately 2.0 m lower than the SCS system.

A 44 m extension from the OGS unit to Lakeside Vista would enter at an elevation of between 208.81 and 208.85.

Swan Club to Lakeside Vista (Drawing A1-000727-01)		
Distance (m)	44	44
Minimum slope	0.30%	0.20%
Slope (m)	0.132	0.088
Elevation Swan Club OGS	208.94	208.94
Entry Lakeside Vista	**208.81**	**208.85**

The elevation of the SCS along Lakeside Vista was shown as 208.77 m at MH1 while the adjacent FDC at MH1B was given as 206.75 m.

Based on an estimated distance of 80 m from the Swan Club to MH1, we estimated the elevation of the SCS system near the Swan Club to be approximately 209.17 while the FDC system is at an elevation of 207.15 m, 2.02 m lower.

This estimate suggests that the better route of taking the flows to the East Pond is not feasible because the connection from the OGS unit would enter below the SCS system.

SWM/FDC Collector System on Lakeside Vista (Drawing A1-000727-01)		
	SCS(MH1)	**FDC (MH1B)**
Size of pipe	525 mm	250 mm
Swan Club to MH1/MH1B	80	80
Elevation MH1/MH1B	208.77	206.75
Slope	0.50%	0.50%
Slope (m)	0.40	0.40
Elevation at Swan Club	209.17	207.15
OGS extension	**Below SWM Not Feasible**	**Above FDC Feasible**
Extension from OGS between 208.81 - 208.85		

However, a connection to the FDC system may be feasible. The FDC System is not designed for taking hard surface runoff like the parking lot. A technical analysis would be required to determine whether there was any material flooding risk introduced into the FDC System if the Swan Club OGS flows were added. Consideration would have to be given to use of surge protection devices such as orifice plates.

An additional consideration is that the FDC System carries cleaner water that can bypass the stormwater pond. It may be necessary to maintain the OGS unit at the Swan Club to remove some of the sediments before the OGS flows enter the FDC system.

Conclusion

A direct connection of the Swan Club OGS unit to the Swan Lake Village Foundation Drain Collector System may be feasible but a technical assessment would be required. A connection to the Swan Lake Village Stormwater Collector that takes flows to the East Pond is not feasible.

Route E2: Directing Swan Club OGS Flows to the North Pond System

The distance from the Swan Club OGS unit to the splitter at the North Pond is approximately 145 m. A pipe would enter the area between 208.51 and 208.65. This is above the splitter outlet to the pond (208.33) and the regulated pond level of 208.3 m therefore a connection would be feasible from a gravity perspective. An appropriate route and size for such a pipe would need to be determined.

Swan Club to North Pond		
Distance (m)	145	145
Minimum slope	0.30%	0.20%
Slope (m)	0.44	0.29
Elevation Swan Club OGS	208.94	208.94
Entry North Pond	**208.51**	**208.65**

North Pond Splitter	
Source (Earth Tech Project 99647 Drawing A1-99647-D2 Apr 2000)	
Pipe	**Elevation**
Inflow 1050	Inv = 208.391
Pond Outflow 450	Inv = 208.33
Lake Outflow 1050	Inv = 208.31

Conclusion

A connection from the Swan Club OGS unit to the North Pond system is feasible.

Route E3: Directing Swan Club OGS Flows to the East Pond System

The distance along the lakeside pathway from the Swan Club OGS unit to the splitter on the north side of the East Pond (Mid-Splitter) is approximately 190 m. A pipe would enter the area at 207.37 and 207.56. It is estimated that a pipe using a lower slope of 0.20% would enter above the elevation of the connections in the splitter connection to the pond which we estimate to be 208.34 and above the regulated pond level of 208.3 m so it may be a feasible option.

Swan Club to East Pond - Mid-Splitter		
Distance (m)	190	190
Minimum slope	0.30%	0.20%
Slope (m)	0.57	0.38
Elevation Swan Club OGS	208.94	208.94
Entry East Pond/Lake	**208.37**	**208.56**

Detailed drawings were not available for the East Pond Mid-Splitter, so elevation numbers are based on estimates calculated based on the known elevation at the lakehead and the distance.

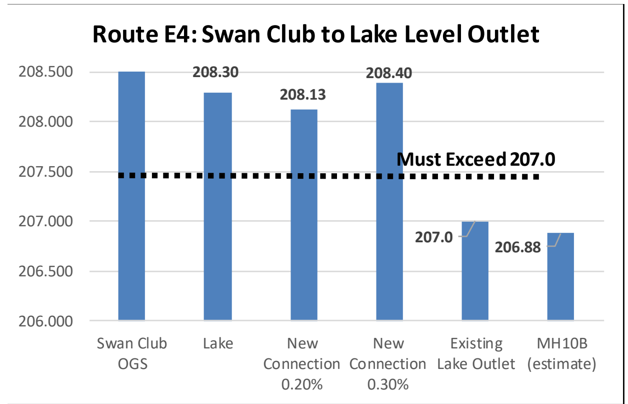
East Pond Mid-Splitter	
(Source: Drawing 87464 - S1)	
Pipe (mm)	**Elevation (M)**
Inflow Box 2.4 x 1.2	Inv = 208.451 (e)
Pond Outflow 450	Inv = 208.34 (e)
Lake Outflow Box 2.4 x 1.2	Inv = 208.391 (e)
Lake Headwall	208.3
Distance splitter to headwall	10.0 m

Conclusion

A connection from the Swan Club OGS unit to the East Pond Mid-Splitter or directly to the pond is feasible using a lower sloped pipe but this is a much longer route than to the North Pond.

Route E4: Directing Swan Club OGS Flows to the Lake Outlet System

Swan Club to Lakeside Outlet		
Distance (m)	270	270
Minimum slope	0.30%	0.20%
Slope (m)	0.81	0.54
Elevation Swan Club OGS	208.94	208.94
Entry East Pond/Lake	**208.13**	**208.40**



A 270 m connection from the Swan Club OGS to the lakeside headwall would be above the current outlets for the lake outflows. may be possible to direct the flows to the lakehead unit or to MH10B as per Route D1 and D2 and blend with combined flows from the traffic circle provided the pipe could pass under the pipe connecting the Mid-Splitter to the lake headwall. It

Conclusion:

Route D4 may be feasible for directing the Swan Club OGS flows to the lake outlet system, but this is a much longer route compared to the alternatives (E2 and E3).

Summary of Options for Rerouting OGS Flows						
Rerouting Options	**Distance (m)**	**Feasible**	**Comments/Conditions**	**Within Flood Protection**	**System Technical Assessment**	**Jurisdiction**
A: Amica to Traffic Circle	**110**	**Yes**	**Need to manage backflow risk**	**No**	**Depends on route**	**Amica/Developer/ Markham**
B: Traffic Circle to 16th Avenue	100	Possible	If 16th Ave. system can support volumes	No	Yes	Markham/York Region
C: Traffic Circle to East Pond Outlets						
C1 To South Splitter or East Pond	90	No	Not feasible due to backflow risk	Yes	No	Markham/ Developer
C2 To East Pond Outlet (Regulated)	170	No	Not feasible due to backflow risk	Yes	No	Markham/Developer/SLV
C3 To SLV Collector	170	Possible	If SLV collector system can support volumes	No	Yes	Markham/ SLV
D: Traffic Circle to Lake Outlets						
D1 To Lake Head Outlet	**80**	**Best**	**Need to manage backflow risk**	**Yes**	**No**	**Markham/ Developer**
D2 To MH10B	**90**	**Best**	**Need to manage backflow risk**	**Yes**	**No**	**Markham/ Developer**
D3 To SLV Collector	130	Possible	If SLV collector system can support volumes	No	Yes	Markham/ Developer/SLV
E: Rerouting Swan Club OGS Flows						
E1(a) Swan Club OGS to SLV SCS Collector	44	No	Not feasible due to elevation	No	Yes	Markham/SLV
E1(b) Swan Club OGS to SLV FDC System	44	Possible	Need to manage surge risk	No	Yes	Markham/SLV
E2 Swan Club OGS to North Pond Splitter	**145**	**Best**	**Need to manage backflow risk**	**Yes**	**Pond Only**	**Markham/ Developer**
E3 Swan Club OGS to East Pond Mid-Splitter	190	Possible	Need to manage backflow risk	Yes	No	Markham/Developer/SLV
E4 Swan Club OGS to Lake Outlet	270	Possible	Need to manage backflow risk	Yes	No	Markham

Appendix D: The Case for Reducing Stormwater Flows Bypassing the Ponds

In assessing the ability to reduce the amount of stormwater bypassing the two stormwater ponds three factors were considered: 1) Raising the splitters 2) Increasing the size of pipes flowing from the splitter to the pond and 3) the ability of the ponds to manage additional volumes.

In our analysis of the impact of raising the height of the weirs within each splitter or on changing pipe sizes within the splitters, our analysis was limited to only comparing the actual change in capacity (area) of the pipe. While we can illustrate the ability to increase the weirs or the percentage increase in the size of the pipe, the rate of flow through a pipe is also impacted by the height of the water column, water pressure and the speed of the flow. A hydraulic analysis would incorporate all the relevant factors and would be required to determine the impact of a change in weir height and pipe capacity on the change in volume flowing through the pipe.

A) Storm Management Role of the Splitters

Basic Design requirement

24 hr	20 mm

3-hour Design Storm Measures

5 Year	42 mm
100 Year	80 mm

The ponds have been built to exceed Markham's requirements[9] for the area served by the ponds. The criteria set out in the design of the two stormwater ponds at Swan Lake include that they must be able to clear a 25 mm rain event in 24 hrs, slightly above the minimum requirement of 20 mm over 24 hr. The ponds must also be able to handle extreme weather events. Markham sets out two measures for extreme weather events: i) the ability to handle a 5-year rain event of 42 mm over 3 hours and ii) the ability to handle a 100-year rain event defined as 80 mm over 3 hours.

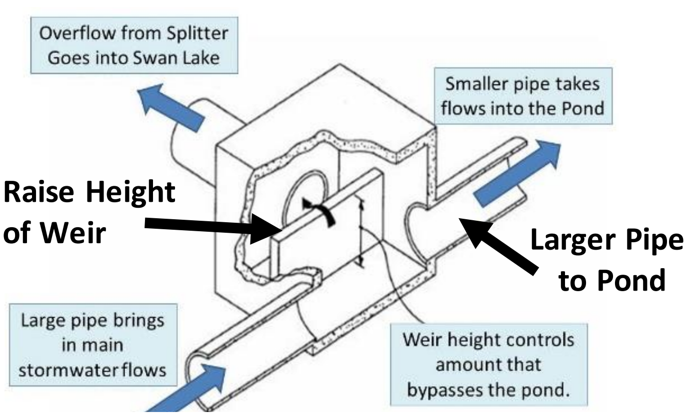
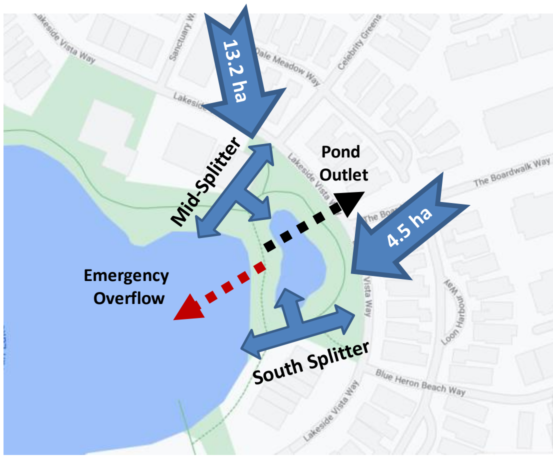


Illustration of a typical Splitter Design

The splitters installed at each pond contribute in two ways: 1) Under normal rainfall conditions, the splitters direct stormwater runoff directly to the pond but during large rain events some of the runoff is directed into Swan Lake. 2) As the ponds approach the limit of their storage capacity, the splitters serve to direct overflow from the ponds into the lake.

Any changes would have to ensure that the local flood protection role is maintained.

B) Reducing Flows from the East Pond (#105) into Swan Lake



The East Stormwater Pond serves 18.4 hectares (ha) of which 13.2 ha is in the central area of Swan Lake Village and flows through the Mid-Splitter and 4.5 ha enters through the South Splitter. The pond and adjacent parkland account for another 0.7 ha.

Once the inlet chamber within the splitter is at capacity, the excess storm water will go over the weir and flow directly into Swan Lake, bypassing the pond.

i) Raising the Splitter

The amount of water bypassing the splitters can be reduced by increasing the height of the weir within each splitter. There is a difference of 0.45 metres between the current height of the weir and the maximum level that the East Pond can support. The weir within the East Pond splitters is at an elevation of 208.8 m. Increasing the weir height by 0.2 metres (7.87 inches) will add 40% to the pond's active storage capability.

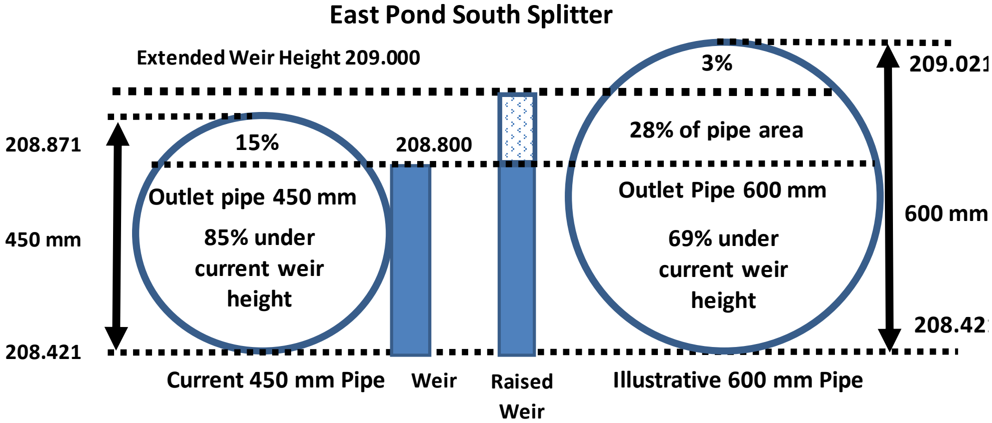
ii) Increasing Pipe Capacity

Increasing the size of the pipe taking water from the splitter into the pond may also reduce the flows bypassing the pond. To illustrate the impact of increasing the pipe sizes we compared a 600 mm pipe to the current 450 mm pipe in relationship to the height of the weir. A hydraulic analysis would be required to determine the appropriate size of pipe and the impact, if any, on the flow through the pipe.

The East Pond is served by two splitters, the South Splitter, and the Mid-Splitter.

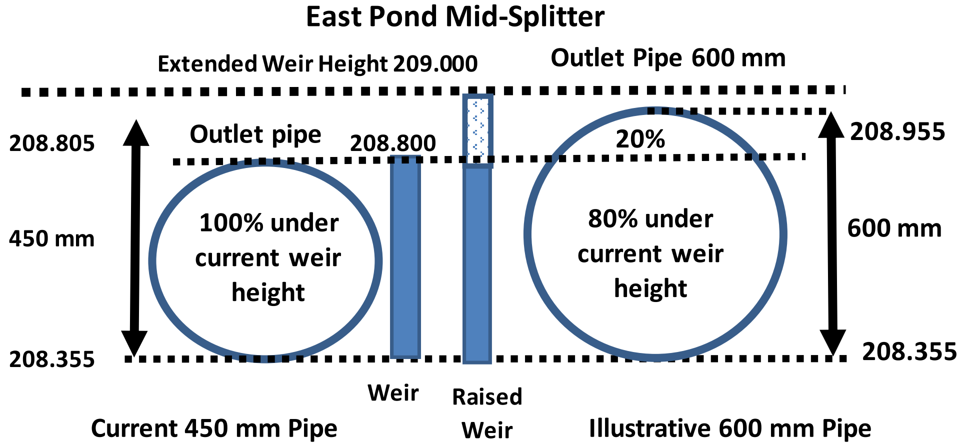
In the South Splitter, the main sewers bringing stormwater into the East Pond are 675 mm in diameter while the pipe that carries flows from the splitter into the pond is only 450 mm in diameter and therefore only 85% of the pipe area is below the top of the weir.

East Pond South Splitter



If the weir were raised 0.2 m, then the entire pipe would be utilized, and the total flow through the pipe may be increased. If a 600 mm pipe were installed, then 69% of the pipe area would be below the current weir height. If the weir were raised only 3% of the larger pipe would be above the weir.

In the Mid-Splitter, the main sewers bringing stormwater into the East Pond area are box culverts, so the fluid dynamics involved will be different from the those of the South and North Splitters. The main collector structures are 1.8 m x 0.9 m however in the splitter area the culvert is 2.4 m x 0.9 m representing a large chamber area.



The pipe that carries flows from the Mid-Splitter into the pond is only 450 mm. A detailed technical drawing of the Mid-Splitter was not available however we were able to estimate elevations based on the information provided in Drawing S1[15b].

At present, the outlet pipe in the Mid-Splitter is essentially at the same height as the weir. Increasing the weir height may have little impact on the utilization of the existing 450 mm pipe other than some possible increased flow due to increased hydraulic pressure.

Enlarging the outlet to a 600 mm pipe would increase the active pipe capacity without changing the weir height. If the weir height were increased the 600 mm pipe would be fully utilized. A hydraulic analysis would be required to determine the impact on the total flow.

iii) East Pond Capacity

The East Pond was built with an active storage capacity of 1,096 m^3 that is 129% of the required capacity[5]. Increasing the splitter level increases the active capacity by 438 m^3 to 1,534 m^3 or 181% of the required capacity.

	Required	As Built	% Of Required	With Proposed Increase	Percent Of Required
Active Storage	848 m^3	1,096 m^3	129%	1,534 m^3	181%

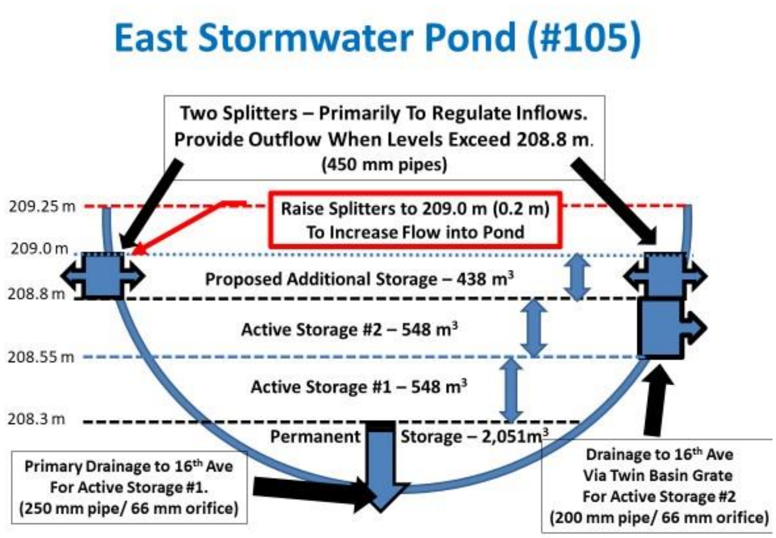
There are two outlets in the East Pond that join up with the Swan Lake Village Collector System that passes through the south end of Swan Lake Village before connecting to the stormwater sewer system on 16th Avenue.

The lower outlet in the middle of the pond controls the normal water level at an elevation of 208.3 metres (m) and regulates the permanent storage volumes in the pond. This lower outlet removes any build up to 208.55 m at which point the second outlet (grates on the east shoreline) direct additional volumes to 16th Avenue through a 200 mm pipe. Pond outflows through either route are restricted by a 66 mm orifice plate at the outlet before entering the Swan Lake Village Collector System.

Under normal rainfall circumstances the two splitters route water into the ponds but they have another role. The splitters also serve as the third tier of outlets when the pond level exceeds 208.8 m, the top of the dividing barrier in the splitters (the "weir"). Under these conditions water can leave the pond and flow into Swan Lake via the splitters. It may be required to also increase the height of the regulating structure for the pond if the height of the weirs is increased.

Under extreme conditions, if the pond were to rise an additional 0.45 metres to 209.25 m, there is an emergency overflow area that will take pond water to the lake over the pathway adjacent to the lake.

It is proposed to use some of this underutilized capacity to increase pond retention volumes by increasing the height of the barriers in the splitters.



The adjacent chart illustrates the active storage elements and the proposed extension of the storage realized by raising the level of the splitters by 0.2 metres.

Calculations for determining the capacity of stormwater ponds are complex. Preliminary estimates suggest that if the weirs were raised by 0.2 metres, the East Pond would support and clear the additional volumes.

The performance of the pond should not be materially impacted by raising the splitters, but less rainfall will bypass the ponds during major rain events and therefore less road salt will be redirected to the lake.

A) Reducing Flows from the North Pond (#104) into Swan Lake

The North Stormwater Pond serves 11.2 hectares (ha) which includes 6.0 ha in the western portion of Swan Lake Village, 4.0 ha consisting of homes north of Swan Park Road, the northern boundary of Swan Lake Park and another 1.2 ha which includes the pond and surrounding parkland.

i) Raising the Splitter

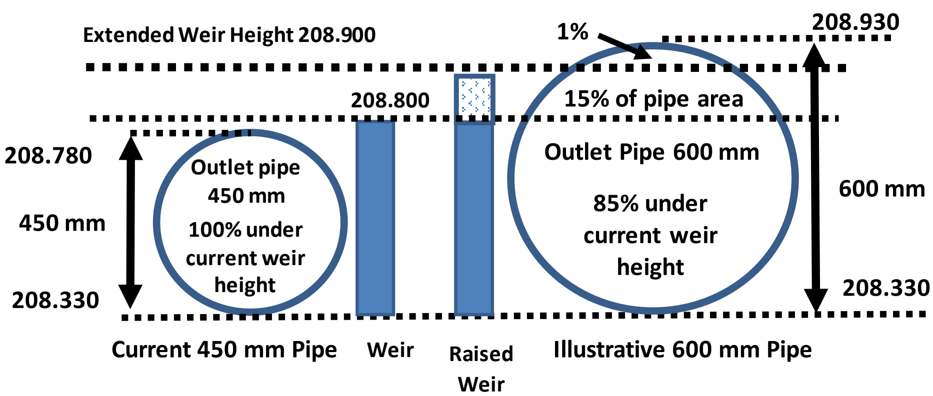
The amount of water bypassing the North Splitter can be reduced by increasing the height of the weir within the splitter. There is a difference of 0.2 metres between the current height of the weir and the maximum level that the North Pond can support. The weir within the North Pond splitters is at an elevation of 208.8 m. Increasing the weir height by 0.1 metres will add 20% to the pond's active storage capability.

ii) Increasing Pipe Capacity

The main pipe bringing stormwater into the North Pond is 1050 mm in diameter while the pipe that carries flows from the splitter into the pond is only 450 mm in diameter. The height of the weir within the splitter serving the North Pond is already above the top of the 450 mm outlet pipe.

Other than the possible benefit of increased hydraulic pressure, increasing the weir height is expected to have a nominal impact on the utilization of the existing 450 mm pipe.

North Pond North Splitter



If a 600 mm pipe were installed, 85% of the pipe area would be below the current weir height and substantially all the pipe area would be below the increased weir height of 208.9 m.

A hydraulic analysis would be required to determine the impact on the total flow and the appropriate size of pipe.

iii) North Pond Capacity

Unlike the East Pond which has two outlets supporting the active storage capacity, the North Pond has only one outlet in the middle of the pond to clear the active storage volumes. This outlet maintains the pond at an elevation of 208.3 metres (m) and regulates the permanent storage volumes in the pond.

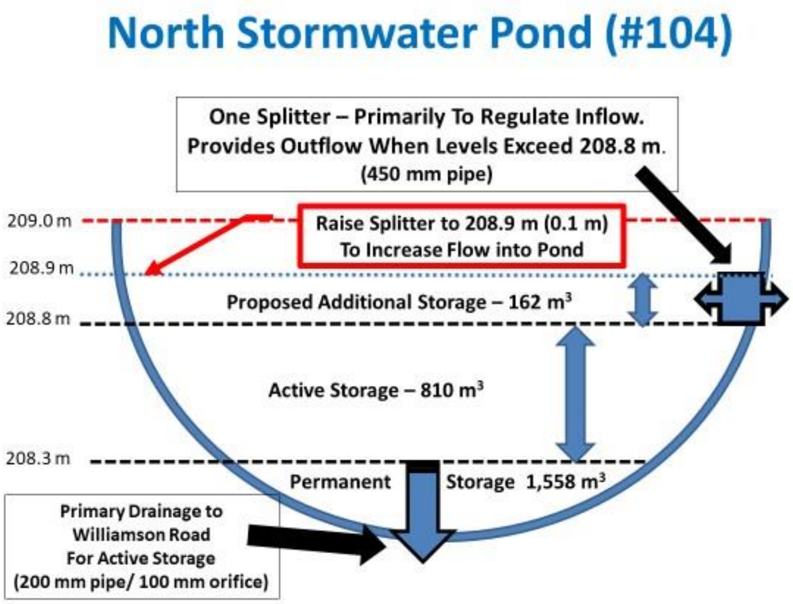
Under normal rainfall circumstances the splitter will route water into the pond but its second role is to serve as the second-tier outlet when the pond level exceeds 208.8 m, the top of the dividing barrier in the splitter (the "weir"). Under these flood level conditions water can leave the pond and flow into Swan Lake via the splitter.

Under extreme conditions, if the pond were to rise an additional 0.2 metres to 209.0 m, there is an emergency overflow area that will take pond water to the lake through the North Channel.

It is proposed to use 50% of this underutilized capacity to increase pond retention volumes by increasing the height of the barrier within the splitter by 0.1 metres.

The North Pond has an active storage capacity of 810 m^3 that is 175% of the required capacity[3]. Increasing the splitter level 0.1 m increases the active capacity by 162 m^3 to 972 m^3 or 209% of the required capacity.

	Required	As Built	% Of Required	With Proposed Increase	Percent of Required
Active Storage	464 m^3	810 m^3	175%	972 m^3	209%



The adjacent chart illustrates the active storage elements and the proposed extension of the storage by raising the level of the splitters by 0.1 metres.

Calculations for determining the capacity of stormwater ponds are complex. Preliminary estimates that suggest that if the weir were raised by 0.1 metres, the North Pond would support and clear the additional volumes.

The performance of the North Pond should not be materially impacted by raising the splitter and increasing the pipe capacity, but less rainfall will bypass the ponds during major rain events and therefore less road salt will be redirected to the lake.

Outbound flows from the North Pond go into a stormwater system on Williamson Road and then ultimately into a westbound system along 16th Avenue.

One unique feature of the North Pond system is that water that bypasses the pond and goes into Swan Lake contributes to the flows that leave Swan Lake and go into the eastbound system on 16th Avenue. Keeping more water in the North Pond system ultimately contributes more water to the westbound 16th Avenue system and less to the eastbound 16th Avenue system.

A detailed technical analysis would be required to determine the balance between the additional volumes that could be redirected into the North Pond and the storage capacity of the pond.

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Research Into Removal of Nutrients and Chlorides from Swan Lake

Rama Pulicharla Ph.D.

Post Doctoral Researcher

Dr. Satinder K Brar
Professor

May 2, 2022

Removal of Nutrients (N and P) and Chlorides from Swan Lake Water

1. Introduction:

Nitrogen (N) and phosphorus (P) are essential elements for many important life processes such as protein and DNA synthesis, primary production, cellular growth, and reproduction for both plants and animals that make up the aquatic food web[1,2]. Both elements are critical nutrients for crop productivity and are largely responsible for ensuring adequate food, fiber, and shelter for the growing human population[3]. To meet the demands of the current population excessive use of nutrients are in use to grow food leading to nutrient surpluses and mismanagement of nutrients in developed countries and developing countries, respectively[4,5]. Surface water receives water from municipal sewage treatment plants, runoff from fertilized lawns and cropland, failing septic systems, runoff from animal manure storage areas, and industrial wastewater. Hence, excessive usage of these nutrients has resulted in losses of nutrients from land (urban and agricultural runoff) to water bodies[6]. A modest increase in P and N can cause undesirable events including accelerated plant growth, algae bloom (eutrophication), low dissolved oxygen, and the death of certain fish, invertebrates, and other aquatic animals[7].

Apart from these nutrients, Chlorides are very common water pollutants, especially in Canada[8]. The Canadian industries produced 10 million metric tonnes of salt in 2021 and nearly three-quarters of this total is rock salt used primarily for highway de-icing[9], [10]. Surface runoff of this salt serves as the primary anthropogenic source of chloride to the receiving water bodies apart from industrial chemicals and fertilizer from agriculture such as sodium chloride, and potassium chloride, respectively. Like N and P, Chloride is an essential element for maintaining proper osmotic pressure, water balance, and acid-base balance in aquatic and terrestrial ecosystems[11]. Increased chloride concentrations can induce a variety of environmental effects such as acidification of streams, effect on mortality and reproduction of aquatic plants and animals, inhibit the process of denitrification, the microbial process, that's critical for removing nitrate and maintaining water quality[12].

Over the past decades, significant progress has been made towards our understanding of the dynamics of anthropogenic inputs of N, P, and Cl^- and the development of various removal techniques from the receiving water bodies[13,13–15]. Furthermore, the recognition of enormous amounts of N, P, and Cl^- inputs by humans has driven much research into the scope for better management of these nutrients. In this project, we are proposing the adsorption technology using biochar produced from Char technologies to remove all three nutrients from Swan Lake water. Based on the characteristics of the lake water, biochar adsorption technology will be developed and tested on a lab-scale to understand the critical parameters to achieve optimal efficiency.

2. Objectives:

The global objective of this project is to "Development of biochar adsorption techniques to remove nutrients from Swan Lake and its scale-up. The specific objectives are:

Objective 1. Adsorption removal of nutrients (N, P, and Cl^-) from Swan Lake water

- 1.1 Characterization of Swan Lake water
- 1.2 Biochar utilization for the removal of nitrogen, phosphorus, and chloride nutrients

Objective 2. lab-scale units to test the biochar efficiency on the removal of selected nutrients

3. Methodology:

Objective 1. Removal of nutrients (N, P, and Cl^-) from Swan Lake water

3.1 Characterization of Swan Lake water: Nearly, one-month Swan Lake samples (twice a week) will be collected to monitor the existing concentration of selected nutrients in the surface water. Apart from the N, P, and Cl^-, other physical and chemical characterization of water samples such as total dissolved solids, pH, dissolved oxygen, total suspended solids, chemical oxygen demand, conductivity, and heavy metals will be measured as per standard methods[16].

3.2 Biochar utilization for the removal of nutrients

Biochar is produced by the CHAR Biocarbon Inc. organization from wood residues and will be used in this project. The biochar will be received from CHAR as a complimentary for this project. The received biochar sample will be ground and sieved to obtain uniform biochar microparticles 1-100 µm with an increased surface area. The treated biochar samples will be dried at 60 °C overnight and used for the adsorption removal of nutrients. Further, characterization (size analysis, porosity, pore distribution, ash, and moisture content) of processed biochar will be carried out as per ASTM methods described in the studies of Brar's group[17].

3.2.1 Adsorption capacity of biochar for Nutrients: The processed biochar will be subjected to adsorption studies of selected Nutrients in the collected lake samples. To find the adsorption efficiency, two types of tests will be carried out: (1) The optimization of the biochar weight at a constant concentration of each nutrient (10 mg; this will be determined based on the objective 1) individually and in combination; (2) Optimization of concentrations of nutrients 5-100 mg for a constant weight of biochar obtained from test 1. Once the optimization of biochar weight and its efficiency was determined, collected lake samples will be used to test the removal efficiency of biochar in real samples. All the experiments will be conducted at constant pH (surface water pH) and agitation speed (150 rpm) for 24h in an incubator shaker at 25 ± 1 °C and in triplicates. After incubation, the mixture of biochar and nutrient suspensions will be centrifuged, and the clear supernatant will be used for estimating the concentration of the un-adsorbed nutrient by the methods used in objective 1[18].

Objective 2. Lab-scale unit to test the biochar efficiency

Bench-scale testing will be performed as rapid small-scale column tests (RSSCTs) to validate the performance of biochar. This approach is critically important before going for the pilot- and full-scale surface water treatment, to evaluate how real water conditions (e.g., dissolved organic carbon, pH), and water constituents (e.g., organic matrix, residual chlorine for drinking water) impact the overall nutrients removal[16]. **Lab-scale filter:** The optimized biochar weight obtained from *objective 2.2* will be further used to develop a lab-scale filter, a rapid small-scale column test (RSSCTs). RSSCT setup: Column experiments will be conducted using a glass column (1 cm inner diameter, 20 cm long) packed with biochar (2 g and 5 g) and sealed with glass pearls/glass wool and glass beads to hold the biochar frameworks in place. This type of packing will give compactness to the adsorbent (i.e. MBEFs). Dr. Brar's group has already conducted biochar-packed column tests to study the removal of trace contaminants[19]. The collected lake samples spiked with selected nutrients, 10 mg (each N, P, and Cl^-) will be pumped through the column using a peristaltic pump. Various nutrient concentrations (1 – 10 mg/g) at a different flow rate (1- 5-mL/min) for all nutrients will be tested for 24 h and the collected samples will be analyzed for residual nutrients as per *Objective 1*. Performance indicators: For the lab-scale filter, indicators such as the loading behavior of biochar will be expressed in terms of the normalized concentration C_0/C_t (where C_0 and C_t are the inlet and outlet (at time t) of nutrient concentrations, respectively) for a given mass of biochar (bed height). Other performance indicators such as equilibrium uptake of the column, the total amount of nutrient adsorbed, and removal percent of nutrients will be determined as per our previous studies. Column regeneration: Chemical regeneration methods will be adopted from the literature. Briefly, the used biochar will be equilibrated in a mechanical shaker for 1 h with sodium chloride and HCl for biochar recovery.

4. Project budget:

Timeline: We suggest using a Gantt chart to provide a timeline showing which task will be done when to achieve each objective

Research goals	**July – August 2022**	**September-October 2022**	**November-December 2022**
Project initial meeting at York University	York University		
1. Removal of nutrients (N, P, and Cl-)			
1.1 Characterization of Swan Lake water			
1.2 Biochar utilization for the removal of nutrients			
2. Lab-scale units to test the biochar efficiency			

Expenditure:

Expenditure type	**July-August 2022**	**September-October 2022**	**November - December 2022**	**Total**
Salaries and Wages				
Research Associate	2,500	3,000	4,000	**9,500**
Student	500	1,500	1,500	**3,500**
Project Management and corodination	250	500	500	**1,250**
Professional service expenditure (Lab analysis)	2,500	3,500	3,500	**9,500**
Field service (sampling and travel)	750	1,000	1,000	**2,750**
Subtotal of Salaries and benefits	6,500	9,500	10,500	**26,500**
Material and supplies expenditure				
Lab consumables and supply	3,000	3,000	3,500	**9,500**
Subtotal of Material and supplies expenditure	3,000	3,000	3,500	**9,500**
University overhead (20% of total)				
Overhead (20%)	1,900	2,500	2,800	**7,200**
Total Budjget	11,400	15,000	16,800	**43,200**

Deliverables:

Objective 1: Optimization of biochar weight as per Swan Lake characteristics to remove the selected nutrients
Objective 2: Verifying the efficiency of the lab-scale biochar-based filter for the removal of the nutrients

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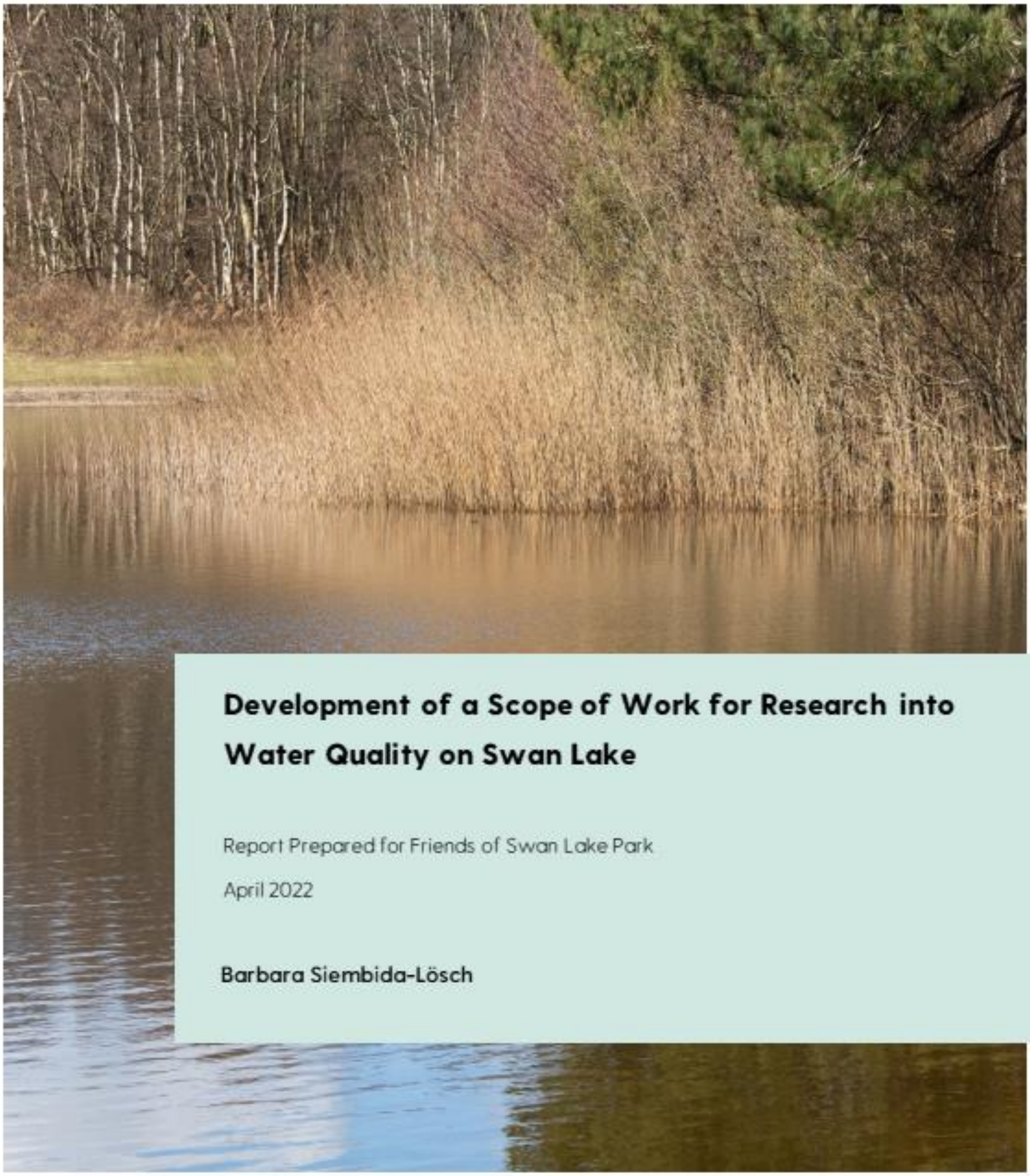
Prof. Satinder K Brar

Dr. Brar has an H-index of 65 and is a nationally and internationally recognized researcher with exceptional expertise in the two converging fields of value-addition of wastes and removal of emerging contaminants. Her research has transcended frontiers and is now adapted all around the world. For example, her research on biopesticides and biofertilizers using wastewaters is now applied in Vietnam, Morocco, Ivory Coast, Thailand, Mexico, and India. In fact, she is frequently invited to give talks in different international forums and conferences, about the wide-ranging subject of applied biotechnology. For example, she was invited by German, Mexican, Indian and Chinese Academy of Sciences to share her experiences on solid waste value-addition and the fate of emerging contaminants. She has been counted amongst the most outstanding and innovative world-class researchers whose accomplishments have made a major impact in her field. She has been invited by different grant agencies worldwide (including France, Switzerland, Spain, Germany, Poland, Austria, Malaysia, Australia, US, Taiwan, Hong Kong, India, among others) as a reviewer and expert in panels that talk volumes about her exceptional research prowess and expertise.

Rama Pulicharla, Dr.

Experienced analytical chemist with a demonstrated history of working in analytical laboratories and developing validated methods for pharmaceuticals and other organic compounds. Water treatment scientist with a strong background in water treatment methods, contaminant fate and transport, site remediation, data collection and management. Skilled in chemistry, Good Laboratory Practice (GLP), chromatographic techniques, mass spectrometry, elemental analysis, development & validation of analytical methods. Strong Pharmacy and Chemistry professional background.

Appendix F: Fleming College Research into use of Calcium Peroxide to Improve Oxygen Levels



Development of a Scope of Work for Research into Water Quality on Swan Lake

Report Prepared for Friends of Swan Lake Park

April 2022

Barbara Siembida-Lösch

centre for advancement of water and wastewater technologies

FLEMING

Development of a Scope of Work for Research into Water Quality on Swan Lake

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Contents

1.0 Introduction

1.1 Background

Swan Lake, a man-made lake located in Markham, Ontario, has long suffered the effects of eutrophication, an over enrichment of minerals and nutrients. A surplus of external nutrient inputs has resulted in the continued accumulation of nutrients stored within the lake from year to year. The overall nutrient load, accompanied with warm weather conditions, has allowed for continued oxygen depletion (anoxia) and prolonged cyanobacteria blooms throughout Swan Lake, perpetuating the eutrophication issue even further.

Currently, phosphorus levels in Swan Lake are managed in two ways: using Phoslock®, a patented phosphorus locking technology, and/or using Polyaluminium Chloride (PAC), an inorganic coagulant. While these chemicals address the phosphorus concerns, they do not necessarily address the anoxia issues within Swan Lake. Anoxic conditions remain a concern for the health of Swan Lake and in the long-term care and sustainability of the flora and fauna in the area.

1.2 Purpose

The Friends of Swan Lake Park (FSLP) is a not-for-profit organization located in Markham, Ontario. Working with the City of Markham, the FSLP have spent several years providing input and feedback into important environmental concerns related to the quality and treatment of Swan Lake and its surrounding environment. Of particular interest is addressing oxygen levels within Swan Lake through possible treatment options. The focus of this report is to address this challenge, and to detail a scope of work outlining the use of calcium peroxide as a treatment option to improve oxygen levels within Swan Lake.

2.0 Research on Use of Oxygen Release Compounds

2.1 Calcium/Magnesium Peroxide

The biological mineralization of organic matter in lake sediments consumes large quantities of oxygen. This consumption can lead to more serious issues, including anoxic conditions. A lack of oxygen in the lake environment can result in the release of excess nitrogen and phosphorus from sediment into the overlying water. These excess nutrients, in turn, allow for excessive plant and algae growth, inevitably leading to deterioration of water quality (Lu et al., 2017; Li et al., 2020). Therefore, the improvement of dissolved oxygen (DO) levels is significant in the restoration and sustainability of surface water bodies.

The common approaches to controlling eutrophic water include:

1) physical methods (e.g., environmental water diversion/hydraulic control, artificial aeration, sediment dredging);

2) chemical methods (e.g., flocculation/precipitation, chemical alga-killing, adding Fe/Al salt or Phoslock®); and

3) biological methods (e.g., ecological floating islands, constructed wetlands).

Although these approaches can occasionally alleviate eutrophication, they are often characterized by high costs and low efficiency. In addition, some (e.g. biological methods) are susceptible to environmental factors while others (e.g. aluminium salts) can be toxic to aquatic organisms (Wang et al., 2019).

An alternative technique for the oxygenation of the water column and sediments is chemical oxidation. This technique can be performed using oxygen release compounds (ORCs) such as calcium peroxide (CaO_2) and/or magnesium peroxide (MgO_2). This alternative method avoids the limitation of mechanical aeration in the affected area and inefficient oxygen diffusion (Lu et al., 2017; Xu et al., 2018; Wang et al., 2019, Li et al., 2020). CaO_2 is an oxygen release compound, comprising a high-energy peroxide covalent bond, which can easily liberate oxygen when it is in contact with hydrous media (Song et al., 2020).

Various studies have proven that the addition of CaO_2 to surface water and sediments, slowly releases oxygen in water, leading to an increase in the DO levels, suppression of anaerobic conditions, control of water blooming, and aerobic biodegradation of accumulated organic contaminants in the sediments (Lu et al., 2017).

In a study by Huang et al. (2017) the addition of 20 g CaO_2 to 37.5 L water containing municipal river sediments increased the DO (1 mg/L) of surface water for eight weeks (Huang et al., 2017). Nykänen et al. (2012) observed more prominent effects of increasing the DO levels of sediments for 14 weeks in laboratory tests (75 g CaO_2/m^2 sediment surface) and 40 weeks in field tests (50 g CaO_2/m^2

sediment surface) when using granulated CaO_2. In addition to the increased DO levels of sediments, Nykänen's study also showed accelerated aerobic microbial activity following CaO_2 amendment. The organic matter contents in the pond sediment decreased from 18% to 4% while the control test showed no changes.

Other studies have shown that adding CaO_2 into sediment could restrain phosphorus release from sediment for over 10 weeks, controlling water blooming (Huang et al., 2011). In the aerobic conditions, phosphorus concentrated in the sediment creates insoluble metal-phosphate complexes and can't be released to the water column. Cho and Lee (2002) investigated the effect of CaO_2 on the growth and proliferation of a water-blooming cyanobacterium and observed that the phosphate concentration quickly decreased when CaO_2 was added. Most of the soluble phosphate was removed within 1 hour, and an accumulation of precipitated residue was observed as a result of the reaction with CaO_2. Therefore, it could be concluded that the addition of CaO_2 promotes phosphorus transfer into the sediment from the total water system (Lu et al., 2017).

In practical applications, it is crucial to modify CaO_2, permitting the slow, continuous release of oxygen. Application of CaO_2 in compressed forms such as granules, briquettes, or as composites with other materials for surface water and sediments restoration can meet that requirement. These coarser CaO_2 products sink more easily to the sediment, where oxygen is required. Mixing of water is avoided to prevent the movement of nutrients to the surface and the growth of algae and aquatic plants (Lu et al., 2017).

In addition, using other materials to embed CaO_2 powder to achieve more controllable release rates have been studied. The composite of CaO_2 and stearic acid was found to have a longer oxygen-releasing period, a milder effect on pH, and reduced 79.6% total phosphorus (TP) in 35 days compared to CaO_2 powder during experiments with urban river sediments (Li et al., 2014). Zhou et al. (2019) mixed calcium peroxide material with water purification sludge and cement, suggesting that modified calcium material can release oxygen continuously and slowly, effectively reducing the dissolved inorganic phosphorus concentration of the overlying water and pore water.

The aforementioned research demonstrates that use of CaO_2 may have promising treatment effects on the increase of DO and should be considered for use in Swan Lake. The following scope of work outlines how to introduce and assess its treatment capability.

3.0 Proposed Scope of Work

The following scope is all encompassing, meaning it contains the full suite of recommended parameters and analytes to be tested for maximum results. This scope is a draft and open to feedback and input from stakeholders and researchers working on Swan Lake. In an attempt to keep costs low, two treatment totes have been included, however it may be beneficial to include a third treatment tote to evaluate a range of CaO_2 concentrations and their effect (high vs low).

3.1 Laboratory Scale Testing

Sample collection and characterization

Sediment samples from Swan Lake would be collected with a columnar sampler from the top 40 cm layer. Overlying water would be collected in plastic buckets at the same time, at a depth of approximately 3.5 - 4 m (depending on sampling site). Sampling would occur during summer months (July – August) when anoxia conditions are the most severe within the lake. The collected samples would then be transported to the CAWT laboratory immediately after sampling. To maintain sample integrity all samples would be kept cool during transportation, avoiding light exposure and disturbance.

Temperature, pH, conductivity, dissolved oxygen (DO), and oxidation reduction potential (ORP) in the overlying water would be analyzed immediately following sample collection and while on site. Prior to commencing experiments, sediment and water samples would first need to be characterized. The following parameters are recommended, and would be analyzed in the CAWT's ISO 17025:2017 accredited laboratory:

- Sediment: ammonia, nitrate, nitrite, total Kjeldahl nitrogen (TKN-N), total phosphorus (TP), total solids (TS), volatile solids (VS), total organic carbon (TOC), moisture, total and dissolved iron (Fe), Aluminum (Al), Magnesium (Mg), and Calcium (Ca), dissolved Chloride (Cl), ORP, pH, alkalinity, adenosine triphosphate (ATP), DO
- Overlying water: ammonia, nitrate, nitrite, TKN-N, TP, soluble reactive phosphorus (SRP, also called orthophosphate), total suspended solids (TSS), TOC, total and dissolved iron (Fe), Aluminum (Al), Magnesium (Mg), and Calcium (Ca), dissolved Chloride (Cl), ORP, pH, alkalinity, DO, colour, turbidity, and conductivity

Experimental set-up

Following the collection and characterization of sediment and overlying water samples, experiments would be carried out under the following operating conditions:

- Equipment: 2 totes (1 treatment tote and 1 control)

- Sampling location and timelines: sediment and overlying water samples would be collected from Swan Lake during summer (July-August)
- Sample volume: 1000 L of lake sediment and 1000 L of the sediment overlying water
- Oxidant: granulated CaO_2
- Doses: suggest either 100 g CaO_2/m^2 or 1000 g CaO_2/m^2 (estimated amount of CaO_2 is 1.5 kg)
- Sample analysis of the overlying water: ammonia, nitrate, nitrite, total Kjeldahl nitrogen (TKN-N), total phosphorus (TP), SRP, total suspended solids (TSS), TOC, total and dissolved Fe, Al, Mg, Ca, dissolved Cl, ORP, pH, alkalinity, DO, turbidity, temperature and conductivity
- Sample analysis of the sediment: TKN-N, TP, total solids (TS), volatile solids (VS), total organic carbon (TOC), Fe, Al, Mg, Ca, Cl, ORP, pH, adenosine triphosphate (ATP), DO, temperature

The analytical methods to be used are outlined in Table 1 (over).

Table 1. A summary of the analytical methods used at the CAWT for the analysis of the sediment and overlying water parameters.

Analyte	Test Method	Accredited*	Reference Method	Unit	CAWT Reporting Limit
pH	M531	Yes	SM 4500-H+B	n/a	n/a
conductivity	M531	Yes	SM 2510B,	µs/cm	4
turbidity	M562	Yes	SM 2130B,	NTU	0.2
alkalinity	M531	Yes	SM 2320 B	mg/L	5.0
ORP	M555	No	SM 2850	mV	n/a
DO	M554	No	SM 4500-O H	mg/L	n/a
Ammonia	M546	Yes	In-house	mg/L	0.020
Nitrate	M532	Yes	EPA 353.2	mg/L	0.020
Nitrite	M532	Yes	EPA 353.2	mg/L	0.006
TKN	M533	Yes	EPA 351.2	mg/L	0.29
TP	M534	Yes	SM 4500-P E	mg/L	0.01
SRP	M534	Yes	SM 4500-P-E	mg/L	0.003
TS	M561	No	EPA 180.1	mg/L	3
TVS	M561	No	EPA 180.1	mg/L	3
TSS	M545	Yes	SM 2540D	mg/L	3
ATP	M575	No	LUMINULTRA MICROBIAL; MONITORING (QGA-25/QGA-100)	pg ATP/mL	n/a
TOC	M547	Yes	SM 5310 B	m/L	1.0
Cations/anions	M549	Yes	ASTM D6919-09, SM 4110 B	mg/L	

* *ISO/IEC 17025:2017*

Test plan

The following experiments would be carried out to identify the effect the addition of calcium peroxide will have on DO and phosphorus levels in sediment and overlying water.

<u>Step 1:</u> Two reactors (totes) named A and B would be operated as follows: Reactor A would act as a blank (control) test and would be filled with sediment and water collected from Swan Lake without any oxidizing agent. Reactor B would be filled with the Swan Lake sediment and overlying water and a granular grade of calcium peroxide (CaO_2) spread evenly over the sediment surface (concentration to be determined).

<u>Step 2:</u> All reactors would be sealed and kept in an environmental chamber in the dark at 20 °C for 4-6 weeks.

<u>Step 3:</u> Sediment samples would be collected from the reactors twice a week using a sample corer. The overlying water samples would twice a week be collected half way between the sediment and water surface. Samples would be analyzed for parameters outlined in *Experimental set-up*.

Statistical analysis and data interpretation

The experimental data would be statistically analyzed, calculated, and plotted using Excel software. The average value, standard deviation, and variance of the data would be analyzed. The mean would be tested using t-test methods with a significance level of $p < 0.05$.

3.2 Bench-Scale Testing - Bioavailable Phosphorus Assay (Optional)

Phosphorus bioavailability in lake sediment is an important factor to consider with regards to Swan Lake's potentially worsening trophic status. Internal phosphorus release from sediment could become a predominant long-term source of phosphorus to the water once the external phosphorus load is controlled. The total and/or dissolved phosphorus concentration may not be adequate to assess the phosphorus release risk associated with its presence in natural waters. Before an environmentally-sound and long-term phosphorus management strategy for Swan Lake can be developed, it is important to understand what forms of phosphorus occur in sediments, the dynamics of cycling between forms of differing bioavailability (i.e., available for uptake by plants and aquatic biota), and the processes controlling sediment phosphorus removal. Sediment samples collected from various locations along the lake would be subjected to varying anoxic conditions, changes in pH, and perhaps temperature, to identify the factors that influence the release of phosphorus, which is either particulate-bound or dissolved in the overlying water.

Using this information, we can assess how to best manage phosphorus to minimize environmental impacts.

Therefore, it is important to investigate the potential release of bioavailable phosphorus from the lake's sediment. This can be done in a bench-scale study (anaerobic chamber/glove box) by simulating anoxic conditions in the collected sediment samples. The study would determine and assess the environmental factors influencing phosphorus mobilization from sediments (e.g. pH, temperature, redox). Additionally, while analyzing the sediment composition the levels of bioavailable phosphorus fractions that are released from sediments under various environmental conditions could be determined. The CAWT has an algal bioassay in place to determine and monitor the bioavailable fractions of phosphorus in water and sediments. It would be of great value to monitor this parameter over several seasons to evaluate changes.

The CAWT has the capability to perform this testing should there be interest in pursuing this work in future.

4.0 Proposed Timeline and Budget

Anticipated Start Date: June 13, 2022

Anticipated End Date: September 16, 2022

Duration: 14 weeks

Phase	Project Start-up	Sample characterization	Calcium Peroxide Experiments	Decommission & Summary	Total
Duration (weeks)	2	2	6	4	14
Anticipated Start Date	13-Jun-22	27-Jun-22	11-Jul-22	22-Aug-22	13-Jun-22
Anticipated End Date	24-Jun-22	08-Jul-22	19-Aug-22	16-Sep-22	16-Sep-22
Salary & Benefits					
Project Management & Coordination	$ 415	$ 83	$ 332	$ 415	$ 1,245
Research Scientist	$ 663	$ 332	$ 1,326	$ 1,326	$ 3,647
Lab Analysis & Quality Assurance		$ 732	$ 9,407		$ 10,139
Operations & Field	$ 787	$ 525	$ 2,098	$ 263	$ 3,673
Student	$ 255	$ 255	$ 1,020	$ 255	$ 1,785
SUBTOTAL Salaries & Benefits	**$ 2,120**	**$ 1,927**	**$ 14,183**	**$ 2,259**	**$ 20,489**
Non Capital					
Lab Consumables & supplies		$ 237	$ 3,983		$ 4,220
Operational Supplies		$ 15	$ 660		$ 675
Travel & Shipping		$ 1,130	$ 3,323		$ 4,453
SUBTOTAL Non Capital	**$ -**	**$ 1,382**	**$ 7,966**	**$ -**	**$ 9,348**
Overhead, Admin & Contingency					
Overhead (20%)	$ 424	$ 662	$ 4,430	$ 452	$ 5,968
Contingency (5%)	$ 106	$ 166	$ 1,108	$ 113	$ 1,493
SUBTOTAL Non Capital	**$ 530**	**$ 828**	**$ 5,538**	**$ 565**	**$ 7,461**
Total Budget	**$ 2,650**	**$ 4,137**	**$ 27,687**	**$ 2,824**	**$ 37,298**

**Budget is an estimate based on maximum number of parameters analyzed; it can be reduced and optimized at request.*

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About the CAWT

Fleming College's Centre for Advancement of Water and Wastewater Technologies (formerly the Centre for Alternative Wastewater Treatment) is a research centre located at the college's Lindsay, Ontario, Canada campus. When its doors opened in 2004, the CAWT was primarily focused on researching treatment wetland systems and phytoremediation technologies for cold climates.

No longer focusing on just alternative technologies, in the last decade the CAWT has gained an international reputation for engaging in innovative water and wastewater applied research and offering technology development services to the private sector, governments, non-governmental agencies, and to universities.

Designed for customizable operations and project implementation, the CAWT is a unique centre with advanced infrastructure and on-site facilities.

The CAWT is ISO/IEC 17025 certified by the Canadian Association for Laboratory Accreditation (CALA), participates in the CALA Proficiency Testing Program, and has passed the VerifiGlobal Peer Assessment (ISO/IEC 17020:2012 Conformity Assessment in the scope of ISO 14034:2016 Environmental Management – ETV).

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Research Into Removal of Nutrients and Chlorides from Swan Lake

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Removal of Nutrients (N and P) and Chlorides from Swan Lake Water

1. Introduction:

Nitrogen (N) and phosphorus (P) are essential elements for many important life processes such as protein and DNA synthesis, primary production, cellular growth, and reproduction for both plants and animals that make up the aquatic food web[1,2]. Both elements are critical nutrients for crop productivity and are largely responsible for ensuring adequate food, fiber, and shelter for the growing human population[3]. To meet the demands of the current population excessive use of nutrients are in use to grow food leading to nutrient surpluses and mismanagement of nutrients in developed countries and developing countries, respectively[4,5]. Surface water receives water from municipal sewage treatment plants, runoff from fertilized lawns and cropland, failing septic systems, runoff from animal manure storage areas, and industrial wastewater. Hence, excessive usage of these nutrients has resulted in losses of nutrients from land (urban and agricultural runoff) to water bodies[6]. A modest increase in P and N can cause undesirable events including accelerated plant growth, algae bloom (eutrophication), low dissolved oxygen, and the death of certain fish, invertebrates, and other aquatic animals[7].

Apart from these nutrients, Chlorides are very common water pollutants, especially in Canada[8]. The Canadian industries produced 10 million metric tonnes of salt in 2021 and nearly three-quarters of this total is rock salt used primarily for highway de-icing[9], [10]. Surface runoff of this salt serves as the primary anthropogenic source of chloride to the receiving water bodies apart from industrial chemicals and fertilizer from agriculture such as sodium chloride, and potassium chloride, respectively. Like N and P, Chloride is an essential element for maintaining proper osmotic pressure, water balance, and acid-base balance in aquatic and terrestrial ecosystems[11]. Increased chloride concentrations can induce a variety of environmental effects such as acidification of streams, effect on mortality and reproduction of aquatic plants and animals, inhibit the process of denitrification, the microbial process, that's critical for removing nitrate and maintaining water quality[12].

Over the past decades, significant progress has been made towards our understanding of the dynamics of anthropogenic inputs of N, P, and Cl^- and the development of various removal techniques from the receiving water bodies[13,13–15]. Furthermore, the recognition of enormous amounts of N, P, and Cl^- inputs by humans has driven much research into the scope for better management of these nutrients. In this project, we are proposing the adsorption technology using biochar produced from Char technologies to remove all three nutrients from Swan Lake water. Based on the characteristics of the lake water, biochar adsorption technology will be developed and tested on a lab-scale to understand the critical parameters to achieve optimal efficiency.

2. Objectives:

The global objective of this project is to "Development of biochar adsorption techniques to remove nutrients from Swan Lake and its scale-up. The specific objectives are:

Objective 1. Adsorption removal of nutrients (N, P, and Cl^-) from Swan Lake water

- 1.1 Characterization of Swan Lake water
- 1.2 Biochar utilization for the removal of nitrogen, phosphorus, and chloride nutrients

Objective 2. lab-scale units to test the biochar efficiency on the removal of selected nutrients

3. Methodology:

Objective 1. Removal of nutrients (N, P, and Cl^-) from Swan Lake water

3.1 Characterization of Swan Lake water: Nearly, one-month Swan Lake samples (twice a week) will be collected to monitor the existing concentration of selected nutrients in the surface water. Apart from the N, P, and $Cl^{-,}$ other physical and chemical characterization of water samples such as total dissolved solids, pH, dissolved oxygen, total suspended solids, chemical oxygen demand, conductivity, and heavy metals will be measured as per standard methods[16].

3.2 Biochar utilization for the removal of nutrients

Biochar is produced by the CHAR Biocarbon Inc. organization from wood residues and will be used in this project. The biochar will be received from CHAR as a complimentary for this project. The received biochar sample will be ground and sieved to obtain uniform biochar microparticles 1-100 μm with an increased surface area. The treated biochar samples will be dried at 60 °C overnight and used for the adsorption removal of nutrients. Further, characterization (size analysis, porosity, pore distribution, ash, and moisture content) of processed biochar will be carried out as per ASTM methods described in the studies of Brar's group[17].

3.2.1 Adsorption capacity of biochar for Nutrients: The processed biochar will be subjected to adsorption studies of selected Nutrients in the collected lake samples. To find the adsorption efficiency, two types of tests will be carried out: (1) The optimization of the biochar weight at a constant concentration of each nutrient (10 mg; this will be determined based on the objective 1) individually and in combination; (2) Optimization of concentrations of nutrients 5-100 mg for a constant weight of biochar obtained from test 1. Once the optimization of biochar weight and its efficiency was determined, collected lake samples will be used to test the removal efficiency of biochar in real samples. All the experiments will be conducted at constant pH (surface water pH) and agitation speed (150 rpm) for 24h in an incubator shaker at 25 ± 1 °C and in triplicates. After incubation, the mixture of biochar and nutrient suspensions will be centrifuged, and the clear supernatant will be used for estimating the concentration of the un-adsorbed nutrient by the methods used in objective 1[18].

Objective 2. Lab-scale unit to test the biochar efficiency

Bench-scale testing will be performed as rapid small-scale column tests (RSSCTs) to validate the performance of biochar. This approach is critically important before going for the pilot- and full-scale surface water treatment, to evaluate how real water conditions (e.g., dissolved organic carbon, pH), and water constituents (e.g., organic matrix, residual chlorine for drinking water) impact the overall nutrients removal[16].

Lab-scale filter: The optimized biochar weight obtained from *objective 2.2* will be further used to develop a lab-scale filter, a rapid small-scale column test (RSSCTs). RSSCT setup: Column experiments will be conducted using a glass column (1 cm inner diameter, 20 cm long) packed with biochar (2 g and 5 g) and sealed with glass pearls/glass wool and glass beads to hold the biochar frameworks in place. This type of packing will give compactness to the adsorbent (i.e. MBEFs). Dr. Brar's group has already conducted biochar-packed column tests to study the removal of trace contaminants[19]. The collected lake samples spiked with selected nutrients, 10 mg (each N, P, and Cl^-) will be pumped through the column using a peristaltic pump. Various nutrient concentrations (1 – 10 mg/g) at a different flow rate (1- 5-mL/min) for all nutrients will be tested for 24 h and the collected samples will be analyzed for residual nutrients as per *Objective 1*.

Performance indicators: For the lab-scale filter, indicators such as the loading behavior of biochar will be expressed in terms of the normalized concentration C_0/C_t (where C_0 and C_t are the inlet and outlet (at time t) of nutrient concentrations, respectively) for a given mass of biochar (bed height). Other performance indicators such as equilibrium uptake of the column, the total amount of nutrient adsorbed, and removal percent of nutrients will be determined as per our previous studies.
Column regeneration: Chemical regeneration methods will be adopted from the literature. Briefly, the used biochar will be equilibrated in a mechanical shaker for 1 h with sodium chloride and HCl for biochar recovery.

4. Project budget:

Timeline: We suggest using a Gantt chart to provide a timeline showing which task will be done when to achieve each objective

Research goals	**July – August 2022**	**September-October 2022**	**November-December 2022**
Project initial meeting at York University	York University		
1. Removal of nutrients (N, P, and Cl-)			
1.1 Characterization of Swan Lake water			
1.2 Biochar utilization for the removal of nutrients			
2. Lab-scale units to test the biochar efficiency			

Expenditure:

Expenditure type	July-August 2022	September-October 2022	November - December 2022	Total
Salaries and Wages				
Research Associate	2,500	3,000	4,000	**9,500**
Student	500	1,500	1,500	**3,500**
Project Management and corodination	250	500	500	**1,250**
Professional service expenditure (Lab analysis)	2,500	3,500	3,500	**9,500**
Field service (sampling and travel)	750	1,000	1,000	**2,750**
Subtotal of Salaries and benefits	6,500	9,500	10,500	**26,500**
Material and supplies expenditure				
Lab consumables and supply	3,000	3,000	3,500	**9,500**
Subtotal of Material and supplies expenditure	3,000	3,000	3,500	**9,500**
University overhead (20% of total)				
Overhead (20%)	1,900	2,500	2,800	**7,200**
Total Budjget	11,400	15,000	16,800	**43,200**

Deliverables:

Objective 1: Optimization of biochar weight as per Swan Lake characteristics to remove the selected nutrients
Objective 2: Verifying the efficiency of the lab-scale biochar-based filter for the removal of the nutrients

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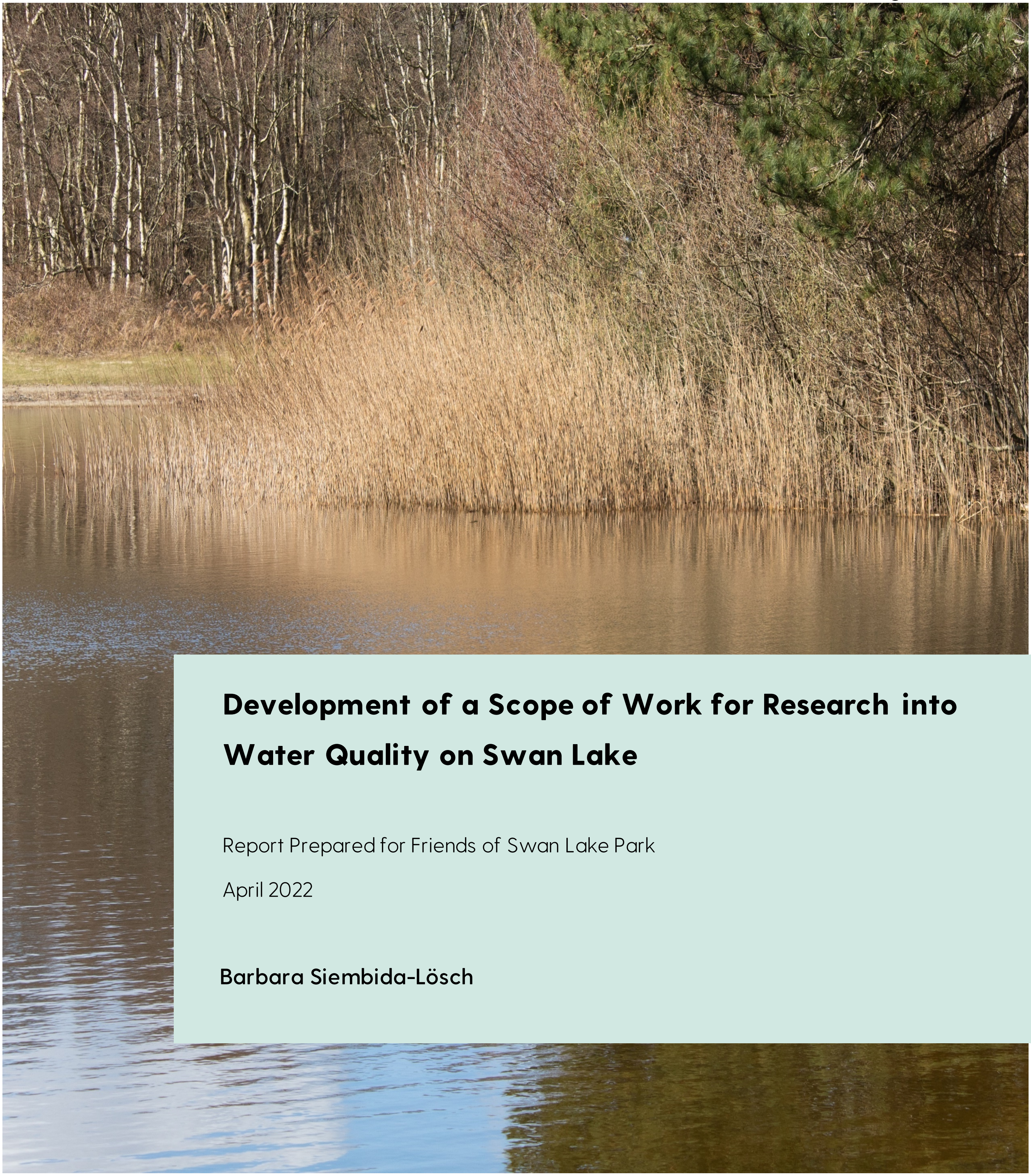
Prof. Satinder K Brar

Dr. Brar has an H-index of 65 and is a nationally and internationally recognized researcher with exceptional expertise in the two converging fields of value-addition of wastes and removal of emerging contaminants. Her research has transcended frontiers and is now adapted all around the world. For example, her research on biopesticides and biofertilizers using wastewaters is now applied in Vietnam, Morocco, Ivory Coast, Thailand, Mexico, and India. In fact, she is frequently invited to give talks in different international forums and conferences, about the wide-ranging subject of applied biotechnology. For example, she was invited by German, Mexican, Indian and Chinese Academy of Sciences to share her experiences on solid waste value-addition and the fate of emerging contaminants. She has been counted amongst the most outstanding and innovative world-class researchers whose accomplishments have made a major impact in her field. She has been invited by different grant agencies worldwide (including France, Switzerland, Spain, Germany, Poland, Austria, Malaysia, Australia, US, Taiwan, Hong Kong, India, among others) as a reviewer and expert in panels that talk volumes about her exceptional research prowess and expertise.

Rama Pulicharla, Dr.

Experienced analytical chemist with a demonstrated history of working in analytical laboratories and developing validated methods for pharmaceuticals and other organic compounds. Water treatment scientist with a strong background in water treatment methods, contaminant fate and transport, site remediation, data collection and management. Skilled in chemistry, Good Laboratory Practice (GLP), chromatographic techniques, mass spectrometry, elemental analysis, development & validation of analytical methods. Strong Pharmacy and Chemistry professional background.



Development of a Scope of Work for Research into Water Quality on Swan Lake

Report Prepared for Friends of Swan Lake Park

April 2022

Barbara Siembida-Lösch

centre for advancement of water and wastewater technologies

FLEMING

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1.0 Introduction

1.1 Background

Swan Lake, a man-made lake located in Markham, Ontario, has long suffered the effects of eutrophication, an over enrichment of minerals and nutrients. A surplus of external nutrient inputs has resulted in the continued accumulation of nutrients stored within the lake from year to year. The overall nutrient load, accompanied with warm weather conditions, has allowed for continued oxygen depletion (anoxia) and prolonged cyanobacteria blooms throughout Swan Lake, perpetuating the eutrophication issue even further.

Currently, phosphorus levels in Swan Lake are managed in two ways: using Phoslock®, a patented phosphorus locking technology, and/or using Polyaluminium Chloride (PAC), an inorganic coagulant. While these chemicals address the phosphorus concerns, they do not necessarily address the anoxia issues within Swan Lake. Anoxic conditions remain a concern for the health of Swan Lake and in the long-term care and sustainability of the flora and fauna in the area.

1.2 Purpose

The Friends of Swan Lake Park (FSLP) is a not-for-profit organization located in Markham, Ontario. Working with the City of Markham, the FSLP have spent several years providing input and feedback into important environmental concerns related to the quality and treatment of Swan Lake and its surrounding environment. Of particular interest is addressing oxygen levels within Swan Lake through possible treatment options. The focus of this report is to address this challenge, and to detail a scope of work outlining the use of calcium peroxide as a treatment option to improve oxygen levels within Swan Lake.

2.0 Research on Use of Oxygen Release Compounds

2.1 Calcium/Magnesium Peroxide

The biological mineralization of organic matter in lake sediments consumes large quantities of oxygen. This consumption can lead to more serious issues, including anoxic conditions. A lack of oxygen in the lake environment can result in the release of excess nitrogen and phosphorus from sediment into the overlying water. These excess nutrients, in turn, allow for excessive plant and algae growth, inevitably leading to deterioration of water quality (Lu et al., 2017; Li et al., 2020). Therefore, the improvement of dissolved oxygen (DO) levels is significant in the restoration and sustainability of surface water bodies.

The common approaches to controlling eutrophic water include:

1) physical methods (e.g., environmental water diversion/hydraulic control, artificial aeration, sediment dredging);

2) chemical methods (e.g., flocculation/precipitation, chemical alga-killing, adding Fe/Al salt or Phoslock®); and

3) biological methods (e.g., ecological floating islands, constructed wetlands).

Although these approaches can occasionally alleviate eutrophication, they are often characterized by high costs and low efficiency. In addition, some (e.g. biological methods) are susceptible to environmental factors while others (e.g. aluminium salts) can be toxic to aquatic organisms (Wang et al., 2019).

An alternative technique for the oxygenation of the water column and sediments is chemical oxidation. This technique can be performed using oxygen release compounds (ORCs) such as calcium peroxide (CaO_2) and/or magnesium peroxide (MgO_2). This alternative method avoids the limitation of mechanical aeration in the affected area and inefficient oxygen diffusion (Lu et al., 2017; Xu et al., 2018; Wang et al., 2019, Li et al., 2020). CaO_2 is an oxygen release compound, comprising a high-energy peroxide covalent bond, which can easily liberate oxygen when it is in contact with hydrous media (Song et al., 2020).

Various studies have proven that the addition of CaO_2 to surface water and sediments, slowly releases oxygen in water, leading to an increase in the DO levels, suppression of anaerobic conditions, control of water blooming, and aerobic biodegradation of accumulated organic contaminants in the sediments (Lu et al., 2017).

In a study by Huang et al. (2017) the addition of 20 g CaO_2 to 37.5 L water containing municipal river sediments increased the DO (1 mg/L) of surface water for eight weeks (Huang et al., 2017). Nykänen et al. (2012) observed more prominent effects of increasing the DO levels of sediments for 14 weeks in laboratory tests (75 g CaO_2/m^2 sediment surface) and 40 weeks in field tests (50 g CaO_2/m^2

sediment surface) when using granulated CaO_2. In addition to the increased DO levels of sediments, Nykänen's study also showed accelerated aerobic microbial activity following CaO_2 amendment. The organic matter contents in the pond sediment decreased from 18% to 4% while the control test showed no changes.

Other studies have shown that adding CaO_2 into sediment could restrain phosphorus release from sediment for over 10 weeks, controlling water blooming (Huang et al., 2011). In the aerobic conditions, phosphorus concentrated in the sediment creates insoluble metal-phosphate complexes and can't be released to the water column. Cho and Lee (2002) investigated the effect of CaO_2 on the growth and proliferation of a water-blooming cyanobacterium and observed that the phosphate concentration quickly decreased when CaO_2 was added. Most of the soluble phosphate was removed within 1 hour, and an accumulation of precipitated residue was observed as a result of the reaction with CaO_2. Therefore, it could be concluded that the addition of CaO_2 promotes phosphorus transfer into the sediment from the total water system (Lu et al., 2017).

In practical applications, it is crucial to modify CaO_2, permitting the slow, continuous release of oxygen. Application of CaO_2 in compressed forms such as granules, briquettes, or as composites with other materials for surface water and sediments restoration can meet that requirement. These coarser CaO_2 products sink more easily to the sediment, where oxygen is required. Mixing of water is avoided to prevent the movement of nutrients to the surface and the growth of algae and aquatic plants (Lu et al., 2017).

In addition, using other materials to embed CaO_2 powder to achieve more controllable release rates have been studied. The composite of CaO_2 and stearic acid was found to have a longer oxygen-releasing period, a milder effect on pH, and reduced 79.6% total phosphorus (TP) in 35 days compared to CaO_2 powder during experiments with urban river sediments (Li et al., 2014). Zhou et al. (2019) mixed calcium peroxide material with water purification sludge and cement, suggesting that modified calcium material can release oxygen continuously and slowly, effectively reducing the dissolved inorganic phosphorus concentration of the overlying water and pore water.

The aforementioned research demonstrates that use of CaO_2 may have promising treatment effects on the increase of DO and should be considered for use in Swan Lake. The following scope of work outlines how to introduce and assess its treatment capability.

3.0 Proposed Scope of Work

The following scope is all encompassing, meaning it contains the full suite of recommended parameters and analytes to be tested for maximum results. This scope is a draft and open to feedback and input from stakeholders and researchers working on Swan Lake. In an attempt to keep costs low, two treatment totes have been included, however it may be beneficial to include a third treatment tote to evaluate a range of CaO_2 concentrations and their effect (high vs low).

3.1 Laboratory Scale Testing

Sample collection and characterization

Sediment samples from Swan Lake would be collected with a columnar sampler from the top 40 cm layer. Overlying water would be collected in plastic buckets at the same time, at a depth of approximately 3.5 - 4 m (depending on sampling site). Sampling would occur during summer months (July – August) when anoxia conditions are the most severe within the lake. The collected samples would then be transported to the CAWT laboratory immediately after sampling. To maintain sample integrity all samples would be kept cool during transportation, avoiding light exposure and disturbance.

Temperature, pH, conductivity, dissolved oxygen (DO), and oxidation reduction potential (ORP) in the overlying water would be analyzed immediately following sample collection and while on site. Prior to commencing experiments, sediment and water samples would first need to be characterized. The following parameters are recommended, and would be analyzed in the CAWT's ISO 17025:2017 accredited laboratory:

- Sediment: ammonia, nitrate, nitrite, total Kjeldahl nitrogen (TKN-N), total phosphorus (TP), total solids (TS), volatile solids (VS), total organic carbon (TOC), moisture, total and dissolved iron (Fe), Aluminum (Al), Magnesium (Mg), and Calcium (Ca), dissolved Chloride (Cl), ORP, pH, alkalinity, adenosine triphosphate (ATP), DO
- Overlying water: ammonia, nitrate, nitrite, TKN-N, TP, soluble reactive phosphorus (SRP, also called orthophosphate), total suspended solids (TSS), TOC, total and dissolved iron (Fe), Aluminum (Al), Magnesium (Mg), and Calcium (Ca), dissolved Chloride (Cl), ORP, pH, alkalinity, DO, colour, turbidity, and conductivity

Experimental set-up

Following the collection and characterization of sediment and overlying water samples, experiments would be carried out under the following operating conditions:

- Equipment: 2 totes (1 treatment tote and 1 control)

- Sampling location and timelines: sediment and overlying water samples would be collected from Swan Lake during summer (July-August)
- Sample volume: 1000 L of lake sediment and 1000 L of the sediment overlying water
- Oxidant: granulated CaO_2
- Doses: suggest either 100 g CaO_2/m^2 or 1000 g CaO_2/m^2 (estimated amount of CaO_2 is 1.5 kg)
- Sample analysis of the overlying water: ammonia, nitrate, nitrite, total Kjeldahl nitrogen (TKN-N), total phosphorus (TP), SRP, total suspended solids (TSS), TOC, total and dissolved Fe, Al, Mg, Ca, dissolved Cl, ORP, pH, alkalinity, DO, turbidity, temperature and conductivity
- Sample analysis of the sediment: TKN-N, TP, total solids (TS), volatile solids (VS), total organic carbon (TOC), Fe, Al, Mg, Ca, Cl, ORP, pH, adenosine triphosphate (ATP), DO, temperature

The analytical methods to be used are outlined in Table 1 (over).

Table 1. A summary of the analytical methods used at the CAWT for the analysis of the sediment and overlying water parameters.

Analyte	Test Method	Accredited*	Reference Method	Unit	CAWT Reporting Limit
pH	M531	Yes	SM 4500-H+B	n/a	n/a
conductivity	M531	Yes	SM 2510B,	µs/cm	4
turbidity	M562	Yes	SM 2130B,	NTU	0.2
alkalinity	M531	Yes	SM 2320 B	mg/L	5.0
ORP	M555	No	SM 2850	mV	n/a
DO	M554	No	SM 4500-O H	mg/L	n/a
Ammonia	M546	Yes	In-house	mg/L	0.020
Nitrate	M532	Yes	EPA 353.2	mg/L	0.020
Nitrite	M532	Yes	EPA 353.2	mg/L	0.006
TKN	M533	Yes	EPA 351.2	mg/L	0.29
TP	M534	Yes	SM 4500-P E	mg/L	0.01
SRP	M534	Yes	SM 4500-P-E	mg/L	0.003
TS	M561	No	EPA 180.1	mg/L	3
TVS	M561	No	EPA 180.1	mg/L	3
TSS	M545	Yes	SM 2540D	mg/L	3
ATP	M575	No	LUMINULTRA MICROBIAL; MONITORING (QGA-25/QGA-100)	pg ATP/mL	n/a
TOC	M547	Yes	SM 5310 B	m/L	1.0
Cations/anions	M549	Yes	ASTM D6919-09, SM 4110 B	mg/L	

* *ISO/IEC 17025:2017*

Test plan

The following experiments would be carried out to identify the effect the addition of calcium peroxide will have on DO and phosphorus levels in sediment and overlying water.

<u>Step 1:</u> Two reactors (totes) named A and B would be operated as follows: Reactor A would act as a blank (control) test and would be filled with sediment and water collected from Swan Lake without any oxidizing agent. Reactor B would be filled with the Swan Lake sediment and overlying water and a granular grade of calcium peroxide (CaO_2) spread evenly over the sediment surface (concentration to be determined).

<u>Step 2</u>: All reactors would be sealed and kept in an environmental chamber in the dark at 20°C for 4-6 weeks.

<u>Step 3:</u> Sediment samples would be collected from the reactors twice a week using a sample corer. The overlying water samples would twice a week be collected half way between the sediment and water surface. Samples would be analyzed for parameters outlined in *Experimental set-up*.

Statistical analysis and data interpretation

The experimental data would be statistically analyzed, calculated, and plotted using Excel software. The average value, standard deviation, and variance of the data would be analyzed. The mean would be tested using t-test methods with a significance level of $p < 0.05$.

3.2 Bench-Scale Testing - Bioavailable Phosphorus Assay (Optional)

Phosphorus bioavailability in lake sediment is an important factor to consider with regards to Swan Lake's potentially worsening trophic status. Internal phosphorus release from sediment could become a predominant long-term source of phosphorus to the water once the external phosphorus load is controlled. The total and/or dissolved phosphorus concentration may not be adequate to assess the phosphorus release risk associated with its presence in natural waters. Before an environmentally-sound and long-term phosphorus management strategy for Swan Lake can be developed, it is important to understand what forms of phosphorus occur in sediments, the dynamics of cycling between forms of differing bioavailability (i.e., available for uptake by plants and aquatic biota), and the processes controlling sediment phosphorus removal. Sediment samples collected from various locations along the lake would be subjected to varying anoxic conditions, changes in pH, and perhaps temperature, to identify the factors that influence the release of phosphorus, which is either particulate-bound or dissolved in the overlying water.

Using this information, we can assess how to best manage phosphorus to minimize environmental impacts.

Therefore, it is important to investigate the potential release of bioavailable phosphorus from the lake's sediment. This can be done in a bench-scale study (anaerobic chamber/glove box) by simulating anoxic conditions in the collected sediment samples. The study would determine and assess the environmental factors influencing phosphorus mobilization from sediments (e.g. pH, temperature, redox). Additionally, while analyzing the sediment composition the levels of bioavailable phosphorus fractions that are released from sediments under various environmental conditions could be determined. The CAWT has an algal bioassay in place to determine and monitor the bioavailable fractions of phosphorus in water and sediments. It would be of great value to monitor this parameter over several seasons to evaluate changes.

The CAWT has the capability to perform this testing should there be interest in pursuing this work in future.

4.0 Proposed Timeline and Budget

Anticipated Start Date: June 13, 2022

Anticipated End Date: September 16, 2022

Duration: 14 weeks

Phase	Project Start-up	Sample characterization	Calcium Peroxide Experiments	Decommission & Summary	Total
Duration (weeks)	2	2	6	4	14
Anticipated Start Date	13-Jun-22	27-Jun-22	11-Jul-22	22-Aug-22	13-Jun-22
Anticipated End Date	24-Jun-22	08-Jul-22	19-Aug-22	16-Sep-22	16-Sep-22
Salary & Benefits					
Project Management & Coordination	$ 415	$ 83	$ 332	$ 415	$ 1,245
Research Scientist	$ 663	$ 332	$ 1,326	$ 1,326	$ 3,647
Lab Analysis & Quality Assurance		$ 732	$ 9,407		$ 10,139
Operations & Field	$ 787	$ 525	$ 2,098	$ 263	$ 3,673
Student	$ 255	$ 255	$ 1,020	$ 255	$ 1,785
SUBTOTAL Salaries & Benefits	**$ 2,120**	**$ 1,927**	**$ 14,183**	**$ 2,259**	**$ 20,489**
Non Capital					
Lab Consumables & supplies		$ 237	$ 3,983		$ 4,220
Operational Supplies		$ 15	$ 660		$ 675
Travel & Shipping		$ 1,130	$ 3,323		$ 4,453
SUBTOTAL Non Capital	**$ -**	**$ 1,382**	**$ 7,966**	**$ -**	**$ 9,348**
Overhead, Admin & Contingency					
Overhead (20%)	$ 424	$ 662	$ 4,430	$ 452	$ 5,968
Contingency (5%)	$ 106	$ 166	$ 1,108	$ 113	$ 1,493
SUBTOTAL Non Capital	**$ 530**	**$ 828**	**$ 5,538**	**$ 565**	**$ 7,461**
Total Budget	**$ 2,650**	**$ 4,137**	**$ 27,687**	**$ 2,824**	**$ 37,298**

**Budget is an estimate based on maximum number of parameters analyzed; it can be reduced and optimized at request.*

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About the CAWT

Fleming College's Centre for Advancement of Water and Wastewater Technologies (formerly the Centre for Alternative Wastewater Treatment) is a research centre located at the college's Lindsay, Ontario, Canada campus. When its doors opened in 2004, the CAWT was primarily focused on researching treatment wetland systems and phytoremediation technologies for cold climates.

No longer focusing on just alternative technologies, in the last decade the CAWT has gained an international reputation for engaging in innovative water and wastewater applied research and offering technology development services to the private sector, governments, non-governmental agencies, and to universities.

Designed for customizable operations and project implementation, the CAWT is a unique centre with advanced infrastructure and on-site facilities.

The CAWT is ISO/IEC 17025 certified by the Canadian Association for Laboratory Accreditation (CALA), participates in the CALA Proficiency Testing Program, and has passed the VerifiGlobal Peer Assessment (ISO/IEC 17020:2012 Conformity Assessment in the scope of ISO 14034:2016 Environmental Management – ETV).

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