Board of Directors - Notice of Meeting

April 18, 2024 Time: 10:00 am

SCRCA Administration Office/Remote*
205 Millpond Cres., Strathroy

Tentative Agenda

1. Land Acknowledgement
2. Chair's Remarks
3. Adoption of Agenda
4. Declaration of Pecuniary Interests
5. Minutes
   5.1 Minutes of the February 29, 2024 Board Meeting Pg. 7-18
6. Presentations
   6.1 Stu Seabrook, Riggs Engineering - Floodplain Mapping
7. Reports
   7.1 GM's Report Pg. 19-20
   7.2 Conservation Ontario Report *(Verbal)*
   7.3 Risk Management Program Pg. 21-23
   7.4 Campground Wastewater Management Update Pg. 24-25
   7.5 Dam Decommissioning Studies Pg. 26-310
   7.6 Highland Glen Reserve Pg. 311-312
   7.7 Auditor's RFQ Pg. 313
   7.8 Purchasing Policy Pg. 314
   7.9 Re-designation of Officers Pg. 315-316
   7.10 Legislative Changes Pg. 317-334
   7.11 Stewardship Permitting Fees Pg. 335
8. Consent Items
   8.1 Acceptance of Information Items
      (a) Business Arising Pg. 336
      (b) Current Watershed Conditions Pg. 337-338
      (c) Shoreline Projects Update Pg. 339-340
      (d) Floodplain Mapping Project Update Pg. 341-342
      (e) Community Emergency Preparedness Grant Pg. 343-344
      (f) Regulations Activity Summary Pg. 345-349
      (g) Planning Activity Summary Pg. 350-352
      (h) Revenue and Expenditures Pg. 353
      (i) Disbursements Pg. 354
      (j) General Levy Update Pg. 355
      (k) St. Clair River AOC Pg. 356-358
      (l) Communications Update Pg. 359-362
      (m) Education Update Pg. 363-364
9. Director Correspondence
   9.1 Correspondence from Don Crowe Re Darcy McKeough Dam Pg. 365
   9.2 Correspondence from Deborah Boyse Re Proposed Landfill (2) Pg. 366-367
10. In Camera Session to Discuss Personnel Matters
11. New Business
12. Adjournment

NOTE: *The Thames-Sydenham and Region Source Protection Authority Meeting will take place immediately following. Please remain on Zoom (if applicable) after adjournment of this meeting.*

**Please be advised that electronic participation is dependent upon the use of compatible equipment and consistent internet connection, which is outside of the control of SCRCA staff members. Meeting locations and available technology may hinder full participation of those joining remotely; therefore, it is strongly recommended that you attend meetings in person, where possible. Every effort will be made to accommodate those who cannot.*

April 18, 2024

Disclaimer: Board members, staff, guests and members of the public are advised that the SCRCA Special Meeting and Authority Board meetings are being video/audio recorded, and will be live streamed and posted to the Authority's Youtube channel along with the official written minutes. As such, comments and opinions expressed may be published and any comments expressed by individual Board members, guests and the general public are their own, and do not represent the opinions or comments of the Full Authority and/or the SCRCA Board of Directors. The recorded video of the Full Authority meeting is not considered the official record of that meeting. The official record of the Authority meeting shall consist solely of the Minutes approved by the Board of Directors.

Board of Directors Proposed Resolutions

(Roll call)

1. Land Acknowledgment

2. Chair's Remarks

3. It is requested that each Director declare a conflict of interest at the appropriate time, on any item within this agenda in that a Director may have pecuniary interest.

4. **Moved by:** **Seconded by:**
That the Board of Directors adopts the agenda for the meeting as presented.

5. Minutes

5.1 **Moved by:** **Seconded by:**
That the minutes of the Board of Directors meeting, held February 29, 2024, be approved as distributed.

6. Presentations

6.1 **Moved by:** **Seconded by:**
That the Board of Directors acknowledge the presentation from Stu Seabrook of Riggs Engineering on floodplain mapping.

7. Reports

7.1 **Moved by:** **Seconded by:**
That the Board of Directors acknowledges the General Manager's report, dated April 11, 2024.

7.2 **Moved by:** **Seconded by:**
That the Board of Directors receive for information the verbal report concerning the April 15, 2024 Conservation Ontario Annual General Meeting.

7.3 **Moved by:** **Seconded by:**
That the Board of Directors acknowledge the report dated March 21, 2024 on the Authority's Risk Management Program and approve the recommended updates to the SCRCA Risk Management and Land Classification Guideline as outlined in this report.

7.4 **Moved by:** **Seconded by:**
That the Board of Directors acknowledge and receive for information the report dated March 21, 2024 on Campground Wastewater Management.

7.5 **Moved by:** **Seconded by:**
That the Board of Directors acknowledges the report, dated March 21, 2024 on the completed dam decommissioning studies for the Head St. dam and Coldstream dam, and further, direct staff to distribute the appropriate reports to the St. Clair Region Conservation Foundation and Municipalities of Strathroy-Caradoc and Middlesex-Centre.

7.6 **Moved by:** **Seconded by:**
That the Board of Directors acknowledges the report, dated March 19, 2024 on the Highland Glen Conservation Area Reserve and further, directs staff to use the remaining Highland Glen Reserve funding to complete identified risk mitigation measures by prioritizing projects that provide the greatest risk reduction with the available funds.

7.7 **Moved by:** **Seconded by:**
That the Board of Directors acknowledges the report, dated March 25, 2024 regarding the requests for proposals for audit services for the Authority and the Foundation, and further, appoints MNP Chartered Professional Accountants LLP as their auditors, effective June 1, 2024.

7.8 **Moved by:** **Seconded by:**
That the Board of Directors acknowledges the report, dated March 26, 2024 regarding the proposed amendment of purchasing limits and authorizations in the SCRCA Purchasing Policy, and further, approves the recommended changes within the report.

7.9 **Moved by:** **Seconded by:**
That in accordance with Section 30.1 of the Conservation Authorities Act, the following staff be reappointed as Enforcement Officers under the Prohibited Activities, Exemptions and Permits regulation, Ontario

Regulation 41/24 and the Provincial Offences Act: M. Deisley, J. Vlasman, M. Weber; and That in accordance with Section 30.1 of the Conservation Authorities Act, the following staff be reappointed as Enforcement Officers under the Rules of Conduct in Conservation Areas O. Reg. 688/21 and the Provincial Offences Act: G. Wilcox, L. Derks, K. Smith.

7.10 **Moved by:** **Seconded by:**
That this staff report providing details of recent legislative and regulatory changes (Conservation Authorities Act and Ontario Regulation 41/24) be received for information. And further that the Board support the timelines for implementation of policy, guidelines and procedural documents and the transition procedures and guidelines.

7.11 **Moved by:** **Seconded by:**
That the Board of Directors acknowledge the report, dated March 28, 2024 regarding stewardship permitting fees, and further, direct staff to reduce the required permit fee to $200, only to be applied to stewardship projects, to cover staff time reviewing and permitting under Ontario Regulation 41/24.

8. Informational Items

8.1 **Moved by:** **Seconded by:**
That the Board of Directors approves the consent agenda and receives the accompanying items 7.1 (a) through 7.1 (m) as information.

9. Correspondence

9.1 **Moved by:** **Seconded by:**
That the Board of Directors acknowledges the correspondence, received February 24, 2024 from Mr. Don Crowe regarding the operation of the Darcy McKeough Dam and concerns for Otter Creek.

9.2 **Moved by:** **Seconded by:**
That the Board of Directors acknowledges the correspondence, received on March 11, 2024 and March 21, 2024 from Ms. Deborah Boyse regarding the proposed landfill in Dresden, ON.

10. In-Camera

10.1 **Moved by:** **Seconded by:**
That the Board of Directors move in-camera at ____ a.m./p.m. to discuss____________with only the Board Coordinator, General Manager and Manager of Conservation Areas to remain present.

10.2 **Moved by:** **Seconded by:**
That the Board of Directors rise and report at ____ a.m./p.m. and return to regular business.

11. New Business

12. Adjournment

12.1 **Moved by:** **Seconded by:**
That the meeting be adjourned.

(This meeting is followed immediately by the Thames-Sydenham and Region Source Protection Authority Meeting)

Board of Directors Meeting Minutes

Date: February 22, 2024 Time: 10:00 a.m.
Dawn-Euphemia Community Centre
6213 Mill Street, Florence, ON

Directors Present: Al Broad, Pat Brown, Chair; Terry Burrell, Sue Cates, Greg Grimes, Aaron Hall, Emery Huszka, Rhonda Jubenville, Brad Loosley, Betty Ann MacKinnon, Don McCabe, Don McCallum, Mary Lynne McCallum, Steve Miller, Kristen Rodrigues, Lorie Scott, Vice Chair; Jerry Westgate

Directors Remote: John Brennan, Adam Kilner

Directors Regrets: Anne Marie Gillis, Frank Kennes

Staff Present: Donna Blue, Manager of Communications; Steve Clark, Risk Management Official/Inspector; Melissa Deisley, Director of Planning and Regulations; Nicole Drumm, Watershed Biologist; Chris Durand, Manager of IT/GIS; Emily Febrey, Communication and Education Technician; Ashley Fletcher, Administrative Assistant/Board Coordinator; Kate Jamieson, Payroll/Accounting Clerk; Melissa Levi, Conservation Education Coordinator; Chunning Li, Director of Corporate Services; Tim Payne, Manager of Forestry; Ken Phillips, General Manager; Girish Sankar, Director of Water Resources; Steve Shaw, Manager of Conservation Services; Kelli Smith, Conservation Lands Specialist; Sarah Snetsinger, Watershed Biologist; Myra Spiller, Conservation Education/Community Partnership Technician; Shane White, Maintenance Foreman – McKeough Dam; Greg Wilcox, Manager of Lands

Guests Present: Jeff Agar, Mayor of the Township of St. Clair; Steve Arnold; Gary Atkison, Mayor of Plympton-Wyoming; Lindsay Buchanan, Rural Lambton Stewardship Network; Donna Clermont, Town of Dawn-Euphemia; Jason Cole, Lambton County; Paul Dalton, Township of Dawn-Euphemia; Grace Dekker, Centre Ipperwash Community Association; Joe Faas, St. Clair Region Conservation Foundation; Dr. Catherine Febria, Healthy Headwaters, University of Windsor; Dave Ferguson, Mayor of Brooke-Alvinston; Michelle Ferri, Centre Ipperwash Community Association; Maureen Harvey, Centre Ipperwash Community Association; Jill Jackson, Hillside School; Jeffrey Lallean, Healthy Headwaters; Brad Langstaff, Township of St. Clair; Kevin Marriott, Warden of Lambton County; Dave Marsh, Municipality of Lambton Shores; Sandra Marshall, Centre Ipperwash Community Association; Andrew Meyer, Lambton County; Netty McEwen, Township of Plympton-Wyoming; Anne McGugan; Don McGugan; Ray Mile, MNP Chartered Professional Accountants LLP; Nicole Monague, Hillside School; Ross O'Hara, 2024 Director; Kathryn Shailer; Sarika Sharma, Healthy Headwaters; Bonnie Stevenson, The Beacon of St. Clair Township; Carla Trepanier, Town of Dawn-Euphemia; Anita

Turner, Centre Ipperwash Community Association; Thiranya Weerakoon, Healthy Headwaters; Julie Welker, Upper Thames River Conservation Authority.

1. **Land Acknowledgement**

A land acknowledgment was read by General Manager, Ken Phillips which recognized the St. Clair Region Conservation Authority watershed as part of the traditional territories of the Anishinaabeg, Haudenosaunee, Lūnaapéewak and Chonnonton Nations, who have a sacred responsibility to preserve the land and water of southwestern Ontario. Also acknowledged are the Treaties that allow the SCRCA to work alongside the First Nation Communities of Kettle and Stony Point, Aamjiwnaang and Bkejwanong to ensure we share the responsibility of preserving the land and water.

2. **Call to Order and Chair's Remarks**

The meeting was called to order by the Chair, Pat Brown, who on behalf of the directors and staff of the Conservation Authority, welcomed everyone to the annual meeting and went on to highlight some of the Conservation Authority's achievements this past year.

2023 Highlights:

- The Conservation Education program continued to be a popular choice among teachers and students alike, with almost 22,000 students engaged throughout the year. The team continued to offer virtual and schoolyard programs, allowing them to reach schools unable to visit our Education Centre in Petrolia due to bussing costs and availability.
- In collaboration with St. Clair Township and the City of Sarnia, shoreline protection work continued along Lake Huron and the St. Clair River to help reduce erosion that can threaten important municipal infrastructure. This on-going work will also help prepare shoreline communities for more intense wind and wave action, expected as a result of climate change.
- The Planning and Regulations team continued to support safe and resilient development throughout the watershed by issuing over 200 permits and providing comments on over 200 *Planning Act* applications.
- 2023 also marked the release of the 10,000th turtle hatchling by the Biology team since 2016, when the Captive Hatch and Release turtle program began. This program aims to lend a helping hand to our local turtle species by collecting and incubating eggs from nests at risk of predation, development, and human activities.
  - Biologists also monitored local waterways for fish and freshwater mussel species as part of their work to fill knowledge gaps related to species at risk distributions and populations which is essential to prioritizing research activities and implementing rehabilitation and protection measures.
- Through the Healthy Watersheds and tree planting programs, the SCRCA continued to provide both technical and financial support to local landowners interested in implementing projects on their properties – over 70,000 trees were

planted, and 41 stewardship projects were implemented throughout the watershed.
- In support of the commitment to continuously improve visitor experience and accessibility at our Conservation Areas, the SCRCA was able to secure several grants to upgrade trails and other amenities to allow everyone to enjoy and connect with the outdoors.

And lastly, the SCRCA continued to meet the legislative requirements prescribed under new regulations issued through the *Conservation Authorities Act*.

3. Introduction of Guests

The Chair thanked our Board of Directors and staff for their hard work and dedication to the Authority and acknowledged the partners, whose support and collaborations help realize our vision of a healthy and sustainable natural environment in the St. Clair Region.

Special guests were introduced and the following collaborators and partners in attendance were recognized:
- Kettle and Stony Point Hillside School
- Lambton County
- Council members and staff from several of our member municipalities
- St. Clair Region Conservation Foundation
- The University of Windsor
- Rural Lambton Stewardship Network
- Upper Thames River Conservation Authority
- Plains Midstream Canada

The Honourable Marilyn Gladu, Member of Parliament for Sarnia-Lambton, who was unable to attend the meeting; as well as his Worship Al Broad, Mayor of the Township of Dawn-Euphemia and his Worship Lambton County Warden and Mayor of the Township of Enniskillen, Kevin Marriott brought greetings and expressed appreciation of the collaborative efforts of the SCRCA on various initiatives and projects.

4. Declaration of Pecuniary Interests

Director Emery Huszka declared a pecuniary interest pertaining to budgetary items, as per the terms of his appointment as agricultural representative through the Ministry of Northern Development, Mines, Natural Resources and Forestry.

5. Approval of the Agenda

BD-24-01
Grimes – Huszka
"That the agenda for the Annual General Meeting be adopted."
CARRIED

6. **Minutes**

6.1 Minutes of the December 7, 2023 Board of Directors Meeting

BD-24-02
Miller – Loosley
"That the minutes of the Board of Directors meeting held December 7, 2023, be approved as distributed."

CARRIED

6.2 Minutes of the February 8, 2024 Executive Committee Meeting

BD-24-03
Burrell – MacKinnon
"That the minutes of the Executive Committee meeting held February 8, 2024, be approved as distributed."

CARRIED

7. **Conservation Ontario Report**

Verbal Update:

General Manager, Ken Phillips provided a verbal update on the new regulation, released Friday, February 16th surrounding flood hazard work and planning and regulations, providing Ministerial powers to overrule Authority and Board decisions on the issue of permits, as well as new protocols for environmental assessments. Conservation Ontario will be providing further updates regarding a response.

BD-24-04
Loosley – Scott
"That the Board of Directors receive for information, a verbal report on the Conservation Ontario Council meeting, held remotely on December 11, 2023."

CARRIED

8. **Presentation of the 2023 Audited Statements**

BD-24-05
Burrell – Miller
"That the St. Clair Region Conservation Authority accepts the recommendation of the Executive Committee and report from the Authority's auditors, MNP Chartered Professional Accountants LLP, and further approves the 2023 Audited Financial Statements."

CARRIED

9. **Conservation Awards**

Vice Chair Lorie Scott presented the following Conservation Awards:

Kettle and Stony Point First Nation Hillside School

- For the past four school years, Hillside School has partnered with St. Clair Conservation's Education Team to provide students with hands-on, outdoor, land-based, learning opportunities.
- Hillside School offers a Land-Based Education program to ensure students understand their roles, responsibilities, and relationship toward the natural world.
- The success of this program is dependent on all the staff at the school – the Ojibwee teachers, classroom teachers, classroom support staff, and administration.
- Working together with St. Clair Conservation, each classroom visits a nearby forest for 'bushwalks' once every three weeks.
- During each bushwalk the students experience holistic lessons on various subjects.
- Lessons contain a blend of western-science, Ojibwee language, and traditional knowledge.
- Students at Hillside School, the next generation, benefit immensely from this on-the-land learning.
- Exceptional Educators, like the staff at Hillside School, contribute to an increase in knowledge and connection to the natural world.
- The Authority is grateful for the knowledge and education we also received from the teachers and students at Hillside School and for their warm welcome into their school community.

  On behalf of the Kettle and Stony Point First Nation Hillside School, Nicole Monague expressed thanks for the award and for the collaborative relationship with the SCRCA.

Centre Ipperwash Community Association

- Members of the Centre Ipperwash Community Association embody their vision for projects, which states "By coming together to share, work, and play, the quality of life within our community can be improved."
- Many members, including a former Conservation Award recipient, Sandra Marshal (who is here today), head out to Ipperwash Beach almost daily to walk to shoreline.
- While out on their walks, enjoying Ipperwash Beach, members are geared up with gloves, buckets, and pickers to collect garbage they come across to ensure that the beach remains both aesthetically and environmentally clean.
- St. Clair Conservation partners with the Association to host the annual Ipperwash Beach Cleanup which happens the Saturday after Labour Day.

- Many members participate year after year and because of their daily garbage pickup, our September cleanup event is always much easier than expected, considering the busy summer crowds that visit the beach every summer.
- We want to thank the Centre Ipperwash Community Association for their commitment to community and long-standing commitment to ensure Ipperwash Beach remains an inviting and clean shoreline.

Representing the Centre Ipperwash Community Association, Sandra Marshall spoke regarding the initiatives and achievements of the group gave thanks for the award.

BD-24-06
Rodrigues – Cates
"That the Board of Directors congratulates the 2024 Conservation Award Winners and thanks them for their contributions to conservation."

CARRIED

10. Service Awards

The following service awards were presented:

Five Years of Service

- John Brennan, Director
- Pat Brown, Director and Chair
- Frank Kennes, Director
- Don McCallum, Director
- Lorie Scott, Director
- Brad Loosley, Director

Ten Years of Service

- Melissa Deisley, Director of Planning and Regulations

15 Years of Service

- Steve Clark, Risk Management Official/Inspector

20 Years of Service

- Shane White, Maintenance Foreman, McKeough Floodway

25 Years of Service

- Chris Durand, Manager of IT/GIS

35 Years of Service

- Steve Shaw, Manager of Conservation Services

BD-24-07
Burrell – MacKinnon
"That the Board of Directors acknowledges the service awards presented to the directors and staff and further that they be thanked for their years of dedicated service."

CARRIED

A short recess was called following the conclusion of 2023 business. The meeting resumed at 11:02 a.m. to conduct 2024 business. Ross O'Hara, 2024 Director representing the Town of Petrolia was welcomed to the Board.

11. Code of Conduct

BD-24-08
McCallum, Mary Lynne – Burrell
"That the Board of Directors acknowledges and complies with the St. Clair Region Conservation Authority's Code of Conduct and Administrative By-laws."

CARRIED

12. Election of Officers

BD-24-09
Scott – Huszka
"That Ken Phillips be appointed chair for the election of the 2024 Chair and Vice Chair."

CARRIED

BD-24-10
Miller – Westgate
"That Tim Payne and Donna Blue be appointed scrutineers in the event of an election."

CARRIED

The positions of Chair and Vice Chair were declared vacant and nominations were called for the office of Chairperson for 2024.

Steve Miller nominated Pat Brown for the position of Chair.

Pat Brown confirmed his willingness to stand for the position of Chair.

Pat Brown was declared Chair of the St. Clair Region Conservation Authority for 2024, by acclamation, and addressed the Board of Directors.

Emery Huszka nominated Lorie Scott for the position of Vice Chair.

Lorie Scott confirmed her willingness to stand for the position of Vice Chair.

Lorie Scott was declared Vice Chair of the St. Clair Region Conservation Authority for 2024, by acclamation, and addressed the Board of Directors.

BD-24-11
Burrell - Grimes
"That nominations for the position of Chair and Vice Chair be closed."
CARRIED

13. Nominating Committee Report

Nominating Committee Chair, Betty Ann MacKinnon declared vacancies on the Executive and Low Water Response Committees due to the election of Chair and Vice Chair. Nominations were requested from the floor to complete memberships.

Kristen Rodrigues volunteered to serve on the Executive Committee.

Greg Grimes volunteered to serve on the Low Water Response Committee.

BD-24-12
Miller - Scott
"That the St. Clair Region Conservation Authority adopts the 2023 Nominating Committee's Report, as amended, fulfilling the SCRCA committee needs in 2024."
CARRIED

BD-24-13
Burrell – Cates
"That the 2024 Executive Committee for the St. Clair Region Conservation Authority be: Pat Brown, Chair; Lorie Scott, Vice Chair; Al Broad, Terry Burrell, Rhonda Jubenville, Frank Kennes, Betty Ann MacKinnon, Steve Miller and Kristen Rodrigues."
CARRIED

14. Authorization to Borrow

BD-24-14
Burrell – O'Hara
"That the Authority Chair or the Vice-Chair and the General Manager/Secretary-Treasurer or Director of Finance be authorized to borrow from the Libro Credit Union, Strathroy for the general operations and capital program of the Authority, a sum not to exceed $1,810,000 to be repaid from grants received from the Province of Ontario, Government of Canada, levies assessed to the member municipalities and general revenue."

CARRIED

15. 2024 Appointments

BD-24-15
Kilner – Brennan
"That the Authority's 2024 representative to Conservation Ontario will be the Authority Chair, the Vice-Chair will be the first alternate and the General Manager be the second alternate."

CARRIED

16. Presentation

BD-24-16
McCabe - Rodrigues
"That the Board of Directors receive for information the presentation provided by Dr. Catherine Febria, Canada Research Chair, Assistant Professor and Director of the Healthy Headwaters Lab at the Great Lakes Institute for Environmental Research (GLIER) at the University of Windsor on the relationship and collaboration with the SCRCA Biology department."

CARRIED

17. Staff Reports

17.1 General Manager's Report

BD-24-17
Burrell – Miller
"That the Board of Directors acknowledges the General Manager's report dated February 12, 2024."

CARRIED

17.2 Land Acquisition Policy

BD-24-18
Brennan – McCallum, Mary Lynne
"That the board of directors approves the SCRCA Land Acquisition and Disposition Policy as identified through the recent changes to the Mandatory Programs and Services regulation under the *Conservation Authorities Act*."

CARRIED

17.3 Land Inventory

BD-24-19
Grimes – Burrell
"That the board of directors acknowledges the report highlighting the development of a Land Inventory as required through the recent changes to the Mandatory Programs and Services regulation under the *Conservation Authorities Act*."

CARRIED

17.4 Draft Conservation Lands Strategy

BD-24-20
Scott – Burrell
"That the board of directors acknowledges the draft Conservation Lands Strategy developed as part of the recent changes to the Mandatory Programs and Services regulation under the Conservation Authorities Act. Furthermore, the board of directors directs staff to proceed with the public consultation and Indigenous engagement sessions as the next step in the process of finalizing the Conservation Areas Strategy."

CARRIED

18. Consent Agenda

Item 18.1 (k) on SCRCA 2024 Special Events was pulled from the consent agenda for discussion.

BD-24-21
Huszka – Burrell
"That the Board of Directors approves the consent agenda and endorses the recommendations accompanying Items 18.1 a - 18.1 j."

CARRIED

Director Emery Huszka highlighted the upcoming Sydenham River Canoe & Kayak Race on Sunday, April 28, 2024 and encouraged staff, guests and fellow directors to participate.

Director Don McCabe reminded attendees of the upcoming A.W. Campbell Maple Syrup Festival held at the A.W. Campbell Conservation Area on Saturday, March 16 – Sunday, March 17, 2024 occurring in conjunction with the annual pancake breakfast, hosted by the Alvinston Firefighters at the Brooke-Alvinston-Inwood Community Centre. All are encouraged to attend both events.

BD-24-22
Grimes – Westgate
“That the Board of Directors approves and endorses the recommendations accompanying Item 18.1 k.”

CARRIED

19. Correspondence

19.1 Ministry of Natural Resources and Forestry Letter re Approval of Extension

BD-24-23
Cates – Burell
“That the Board of Directors acknowledge the correspondence from the Ministry of Natural Resources and Forestry, dated December 13, 2023, granting the St. Clair Region Conservation Authority an extension to March 31, 2024 in order to meet the transition requirements under Ontario Regulation 687/21: Transition Plans and Agreements under the CAA (O. Reg 687/21).”

CARRIED

19.2 Ministry of Natural Resources and Forestry Letter re Direction on Planning Fees

BD-24-24
Miller – Scott
“That the Board of Directors acknowledge the correspondence from the Ministry of Natural Resources and Forestry, dated December 13, 2023, extending the Minister’s direction for Conservation Authorities regarding fee changes associated with planning, development and permitting fees to December 31, 2024.”
CARRIED

The Board of Directors voted to take a one hour recess. The meeting reconvened at 1:00 p.m.

The following directors, present earlier within the meeting, were absent at this time: John Brennan, Terry Burrell, Aaron Hall, Adam Kilner.

BD-24-25
Broad – Miller
"That the Board of Directors approve a one hour recess with intent to reconvene at 1:00 p.m."

CARRIED

20. In-Camera

BD-24-26
Scott – MacKinnon
"That the Board of Directors move in-camera at 1:03 p.m. to discuss legal matters with only the General Manager, Board Coordinator, and Manager of Conservation Lands remaining present."

CARRIED

BD-24-27
O'Hara – McCallum
"That the Board of Directors rise and report at 1:06 p.m. and return to regular business."

CARRIED

21. Adjournment

BD-24-25
Huszka – Cates
"That the meeting be adjourned."

CARRIED

Pat Brown	**Ken Phillips**
Chair	**General Manager**

St. Clair Conservation

Meeting Date:	April 18, 2024	**Item 7.1**
Report Date:	April 11, 2024	
Submitted by:	Ken Phillips	

Subject: General Manager's Report

Recommendation:

That the Board of Directors receive for information the General Managers Report dated April 11, 2024.

Operations

- The General Manager attended Conservation Ontario (CO) sessions on changes to the Conservation Authorities Act on February 13th and 26th as well as March 25th via Zoom. Discussion centred around adapting to the changes mandated by the Province around designation of officers under the revised Act, changes to drainage review under the Act, and the need to revise appeal mechanisms offered by the CA in the event of a permit being denied. A detailed report concerning permit denials will be coming at the June 27 Board of Directors meeting.
- On March 16th, the General Manager attended a session hosted by CO that involved information pertaining to the role of the Ontario Ombudsman. The session centered around a recent investigation of a conservation authority with regard to meeting practices and procedures. Of central concern were the protocols around in camera sessions, when they are to be used and how the public is to be notified and record keeping of such events. The SCRCA is in compliance with the expectations of the Ombudsman's office in the aforementioned areas.
- The General Manager attended a management committee meeting of the Thames-Sydenham Source Water Protection Region on March 15th. The meeting focused on a reduction in funding for each of the partners, as a result of direction from the Province. While source protection funding has been guaranteed for a longer period of time, it has not been adjusted for inflation, which results in a shortfall. The current budget is being reviewed for areas that can be reduced to meet Provincial expectations.

Community/Partnership Outreach

- The General Manager attended the Green Breakfast hosted by the Sarnia Lambton Chamber of Commerce on February 27th. Mike Moroney, Project Coordinator for the St. Clair River Area of Concern, provided an overview of the efforts to improve the conditions of the St. Clair River. The next breakfast is slated for April 23 with Jessica Van Zwol, SCRCA's Healthy Watershed Specialist doing a presentation on urban stewardship practices.

- On March 4th, the General Manager provided a presentation for the Alvinston Optimist Club regarding SCRCA programs and the role of the St. Clair Conservation Foundation. The audience was very complimentary toward the environmental education program and the impact it has had on the community.
- The General Manager volunteered for hot chocolate duty at the annual Maple Syrup program on the weekend of March 16-17th. The event was well attended and well received. Further information is provided in the agenda package.
- On April 3rd, the General Manager was a panelist on the McMaster University Environmental Forum session on careers in conservation. The discussion centred around the career opportunities that exist with conservation authorities, what a regular workday looks like, and why each panelist chose the career they did.

Federal/Provincial/Municipal Meetings

- On February 27th, the General Manager provided a session for Warwick Township on flood mitigation measures property that owners can take to minimize flood damage to their homes and property. An overview of SCRCA flood forecasting and warning was provided as well as suggestions for property owners to use on their own property to help reduce the impact of flood events. The session is available on Warwick Township's YouTube channel.
- On March 12th, the General Manager, along with the Chair and Board member Sue Cates hosted Minister of Senior Affairs and Accessibility Raymond Cho at Coldstream Conservation Area. The Minster and his staff were given a tour of the new trail surfacing, accessible picnic tables and benches that were provided by a grant from the Ministry. Minister Cho was pleased with the results of the grant and enjoyed his time at Coldstream.
- The General Manager attended Plympton-Wyoming Council on March 27th to provide an overview of the SCRCA budgeting process and financial challenges. Questions centered on how the SCRCA budget is created, pressures impacting future budget increases and what measures the SCRCA will take to reduce budget increases.

Meeting Date: April 18, 2024 **Item 7.3**
Report Date: March 21, 2024
Submitted by: Greg Wilcox

Subject: Risk Management Update

Recommendation:

That the Board of Directors acknowledge this report dated March 21, 2024 on the Authority's Risk Management Program and approve the recommended updates to the SCRCA Risk Management and Land Classification Guideline, as outlined in this report.

Background:

In April of 2022, SCRCA implemented a Risk Management and Land Classification Guideline. As part of the Risk Management Program, a staff committee meets at least once annually to review the program. On February 14, 2024, the committee met to review the program for 2023.

New in 2023:

- In addition to Conservation Areas and Lambton County lands, property inspections have been developed and implemented for the Mckeough Dam and floodway, McKeough upstream lands, forest tracts, and Foundation lands (using Citywide Software)
- Change in permitted seasonal campsite structures at Authority operated campgrounds to better align with OBC regulation
- Seasonal campsite construction and alteration request form developed and implemented
- Updated seasonal camping agreement and new "Schedule A" developed to improve the legal agreement between SCRCA and seasonal campers
- Two Conservation Area staff appointed as Section 29 Provincial Offences Officers
- Draft Conservation Area strategy developed to guide future land management decisions and future property management plans

Risk Assessments:

In 2023, risk assessments were completed for Education programming, A.W. Campbell CA, L.C. Henderson CA, Warwick CA, and Greenhill Gardens (Foundation).

Common Hazards Identified included:

- Insufficient railings on bridges
- Poison ivy along trail edges
- Need for additional signage
- Drowning risk (deep water, skating, high flows during flooding)

- Dog bite risk
- Poor lighting at portable washrooms and parking lots
- Risks associated with multi-use roads, multi-use trails
- Need for pool safety covers
- Lack of a formal lease/operational agreement for the McKeough Outlet Park, SCRCA remains responsible for maintenance and liability

No hazards deemed “high risk” were identified.

Staff are investigating potential mitigation measures and implementing as budgets permit. Priority is given to higher risk hazards.

In 2024, additional risk assessments will be completed for McKeough Dam, floodway, upstream lands, forest tracts, and Foundation properties.

2023 Property Inspections:

Through the use of the Citywide Maintenance Manager program, staff completed 185 property inspections. Forty-seven work orders were completed that were the direct result of an inspection. An additional ninety-one work orders were completed that were not directly connected to an inspection. Common work orders addressed issues related to signage, trails, boardwalks, trees, playgrounds, roads/parking lots, and benches/picnic tables.

Coldstream Soccer Field:

Since resuming operation of Coldstream Conservation Area in 2022, the soccer field has only had 1 user each season (approximately 10 games annually). The women’s soccer team that was renting the field has decided to rent elsewhere for 2024 due to the field condition. The field is not level and staff have concerns regarding its continued use. The field will not be rented for soccer in 2024.

Flooding at Conservation Areas:

Staff have concerns regarding the use of conservation areas during flooding events. Conservation Area facilities including trails, parking lots, and picnic areas are often located within the flood plain. When these areas flood, there is an increased risk to visitor safety. During recent flooding events, staff have observed continued use of conservation areas during flooding, including winter flooding with cold, fast-moving water. New gates or barricades are necessary to identify closed conservation areas or closed areas within conservation areas during flooding.

Risk Management and Land Classification Guideline Recommended Updates:

1. The SCRCA Risk Management and Land Classification Guideline identifies the frequency of inspections of SCRCA properties. The inspection program is expanding to include programs that operate on Authority lands. In 2024, the Education department will begin

conducting inspections related to their programming, however, the Guideline does not specify frequency of inspection.

Proposed Update:

Education program inspections will be completed **"monthly from September to June"**

2. To comply with changes to the Conservation Authorities Act, SCRCA is required to complete a Conservation Area Strategy by the end of 2024. Guidance from Conservation Ontario has provided a recommended land classification system for the Strategy. The draft strategy follows the land classification system recommended by Conservation Ontario to provide consistency with other Authorities. The land classification system varies from what exists in our Risk Management and Land Classification Guideline.

Proposed Update:

The classification system used in the Risk Management and Land Classification Guideline are more appropriate for implementation of the Authority's risk management program. For clarity, it is recommended that the following statement be added to the Guideline:
"The SCRCA's Conservation Lands Strategy includes land classifications that vary slightly from this Guideline. For the purposes of Risk Management, the classifications in this Guideline will be used."

Meeting Date: April 18, 2024 **Item 7.4**
Report Date: March 21, 2024
Submitted by: Greg Wilcox

Subject: Campground Wastewater Management Update

Recommendation:

That the Board of Directors acknowledge this report on Campground Wastewater Management, dated March 21, 2024.

Background:

SCRCA operates three campgrounds within our Conservation Areas (A.W. Campbell, L.C. Henderson, and Warwick). All SCRCA campgrounds have conventional septic systems consisting of septic tanks which outlet to leaching beds. Some leaching beds are raised beds and include a pumping system. Septic systems receive wastewater from washroom buildings and/or from dumping stations. Staff offer pump out services, where a 250 gallon tank is pulled around the park, wastewater is pumped directly from trailer holding tanks and transported to dumping stations. Additionally, some seasonal campers opt to drain their own wastewater into portable waste tanks and wheel it to the dump station. Transient campers haul their trailer to the dumping station for depositing wastewater.

Due to the anticipated daily flow rates at each campground exceeding 10,000 L/day, SCRCA systems are classified as Large Subsurface Sewage Disposal Systems (LSSDS) per the Design Guidelines for Sewage Works (DGSW). As such, approval is required from the MECP for installation of a proposed system.

SCRCA is currently working with SBM Ltd. (consultant) to design a new septic system for A.W. Campbell Conservation Area (AWC) that meets MECP design guidelines and acquire an Environmental Compliance Approval for the site.

Challenge:

During the design process at AWC, there was a considerable discrepancy between the design flows for the dump station septic system and current actual use. Staff have identified that the current practice for managing grey water (water from sinks/showers) on seasonal campsites is to outlet that water directly to the ground (generally into a perforated tile or grey water pit). Only black water (water from toilets) is being pumped from trailer holding tanks and taken to the dump station for treatment by our septic system.

Through initial staff research and discussion with SBM Ltd., this practice of discharging grey water directly to the ground may no longer be permitted. SBM is investigating solutions and staff plan to meet with MECP to discuss as soon as possible. If this practice is not permitted moving forward, this will impact the design of the AW Campbell septic, as well as require changes to waste management at both LC Henderson and Warwick.

There may be an immediate impact in how our campgrounds manage grey water. Staff are working with SBM to determine the best short and long-term solutions to this issue.

Financial Impact:

Financial impacts are unknown at this time. There will be immediate impacts to operational budgets to manage this additional volume of water if current practices can’t continue. There will be future capital impacts as all three campgrounds may require upgraded wastewater management infrastructure to manage grey water.

Meeting Date: April 18, 2024 **Item 7.5**
Report Date: March 21, 2024
Submitted by: Greg Wilcox

Subject: Dam Decommissioning Studies

Recommendation:

That the Board of Directors acknowledges this report, dated March 21, 2024 on the completed dam decommissioning studies for the Head St. dam and Coldstream dam, and further, direct staff to distribute the appropriate reports to the St. Clair Region Conservation Foundation and Municipalities of Strathroy-Caradoc and Middlesex-Centre.

Background:

With funding support from the WECI program, St. Clair Region Conservation Foundation, Strathroy-Caradoc, and Middlesex-Centre, dam decommissioning studies have been completed for both the Head St. dam in Strathroy and the Coldstream dam.

Studies were completed in late 2023. The reports are attached for review. Additionally, staff have created summary reports for each that highlight key findings (attached).

Scope of Reports:

- Background
- Ecological Impacts
- Existing Conditions and Sediment Analysis
- Flood and Erosion Analysis
- Methods of Dam Removal
- Sediment Management Strategies
- Preliminary Costing of Each Removal Option
- Site Restoration Options

ENGINEERING
CONSULTANTS LTD

Potential Removal of the Coldstream Dam

St. Clair Region Conservation Authority

21-118

January, 2024

Prepared By:

GSS Engineering Consultants Ltd.

Unit 230 - 945 3rd Avenue East

Owen Sound, ON N4K 2K8

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1 INTRODUCTION

The St. Clair Region Conservation Authority (SCRCA) is evaluating possible removal of the Coldstream and Head Street dams. These dams are located on the East Sydenham River near Strathroy, Ontario.

Removal of the dams are anticipated to improve environmental conditions in the East Sydenham River, provide new recreational opportunities and eliminate long term costs for dam maintenance and replacement.

The Coldstream dam is located in Coldstream, Ontario. The dam is located approximately 12 km northeast of Strathroy. This dam is constructed of vertical sheet piling with large armour stone placed on the downstream side of the dam as well as additional armour stone on the upstream side of the dam. The sheet pile dam section is approximately 45 m long with an additional earthen berm portion which is also approximately 40 m long. The earthen berm section is located at the south end of the sheet pile dam portion.

The Coldstream dam is approximately 3.35 m (11') high. The dam was built in approximately 1968. The dam was originally constructed to support recreational activity (swimming, boating, fishing, etc.). However, use of the head pond (reservoir) has declined over the years in part due to accumulated sediment depth and a decline in water quality.

This report summarizes various studies and analysis completed to support possible removal of the Coldstream dam in the future. A similar report has been prepared for the Head Street dam in Strathroy.

This report includes the following appendices relating to possible removal of the Coldstream dam:

Appendix A contains a dam condition report for the Coldstream dam as completed by True Engineering (June, 2022).

Appendix B provides a separate study completed by GEO Morphix consultants to estimate channel formation features through the head pond area of the dam if the dam was removed, including estimates of the sediment volumes that could be mobilized by dam removal.

Appendix C provides sediment quality data based on samples collected in April 2022 by SCRCA. Six samples were collected and analysed for heavy metals and nutrients and two separate samples were collected for particle size analysis.

2 DAM REMOVAL IN ONTARIO

Many dams in Ontario were constructed over a century ago during early days of industrial development. The dams were constructed to generate electricity for local, early hydro systems and to harness water power for grist mills, sawmills and wood manufacturing industries.

Many of the earliest dams were constructed of wood and in many cases these early dams were destroyed by flood events. In some cases, there dams were rebuilt using concrete often mixed with stone and wood in the core of the dam. Some of the early concrete dams are still intact but many have significantly deteriorated. The structural condition of these dams will continue to deteriorate with time and remain vulnerable to failure during major flood events.

In some case, these legacy, industrial dams remain owned by private interests. However, it is also common that ownership of legacy dams has transferred over the years to the local municipality or to the local conservation authority. The Ministry of Natural Resources and Forestry also owns a relatively large number of dams in Ontario.

Additional dams were built during the 1950's to the 1970's but rarely to harness river power for industrial purposes. Many of these more recent dams were built to provide recreational opportunities and many private dams constructed during this era were on smaller streams to provide small lake and pond features for rural residents. Larger dams were also constructed during this era for flood and ice control and in some cases to provide dilution water to better assimilate treated wastewater plant effluents from downstream communities during periods of low stream flow.

In some cases, the owners of these dams have pursued decommissioning (removal) of these dams to eliminate the liabilities of dam ownership and long-term operation and maintenance costs. The construction cost of new dams for strictly recreational or aesthetic purposes is typically very high compared to funds available from stretched public sector capital budgets, especially in an era where other municipal or provincial owned infrastructure is aging out and requires expensive replacement or upgrading.

In addition, major power dams were built over the decades to provide hydroelectricity. Many or most of these hydro dams are owned and operated by Ontario Power Generation (OPG). Dams can also serve navigation. The Trent Severn waterway is one very good example where dams (i.e. locks) allow watercraft and larger vessels to navigate river systems from one water body to another at different elevations.

While dams can provide important benefits to the residents of Ontario, dams can also impact river ecology by blocking the migration of fish, increase water temperatures during hot summer weather and interfere with normal and healthy sediment transport. In many cases the head ponds behind dams slowly fill with river sediment carried downstream from upstream sources.

The Ministry of Natural Resources (MNRF) is the lead agency for dam safety in Ontario. Large dams have the capacity to cause extreme damage to downstream communities if they fail especially during major flood events. The Lakes and Rivers Improvement Act (LRIA) in Ontario is the principal legislation in Ontario governing the design, operation, maintenance and decommissioning of dams.

The following sections describe the reasons for dam removal, the new recreational and environmental site opportunities that can be provided by dam removal, the challenges that face the owner of a dam who is considering dam removal and permitting requirements in Ontario for dam removal.

2.1 Reasons for Dam Removal

Like other infrastructure, dams age over time and have a finite life span. Some other forms of infrastructure, such as renewable energy installations, may include decommissioning plans that provide financial guarantees to ensure the removal (or replacement) of the infrastructure at the end of their life span.

Most dams and in particular older dams in Ontario likely have no long term decommissioning plan and even more unlikely to have financial securities in place to ensure the long term decommissioning of the dam.

Dam owners therefore at some point need to consider when and how an aging dam should be removed. Dam decommissioning (removal) should be considered in the following circumstances:

i) The dam is aged, structurally unsafe and unstable and considered to be at risk of failure.

ii) Catastrophic failure of the dam could result in damage or destruction of downstream infrastructure including housing and buildings and potentially result in the loss of life.

iii) The dam no longer serves its original, intended purpose.

iv) The dam is unsafe particularly if serious injury or death (i.e. drownings) have previously occurred at the dam.

v) The dam is undersized in terms of its ability to safely convey major flood events.

vi) The dam owner wants to eliminate the liability of dam ownership and eliminate the costs of dam operation and maintenance.

vii) The dam has environmental issues including impacts to fish passage, excessive heating of cold or cool water streams and interruption of normal sediment transport.

viii) Sediment accumulation results in reduced swimming and boating opportunities. Sediment accumulation also linked with declining water quality and algae growth in the head pond.

ix) Removal of the dam would eliminate the dam head pond and provide an opportunity to restore the original stream habitat.

x) The dam owner recognizes the dam has a finite life span and dam removal at the present time is likely less costly than dam removal in the future.

xi) The dam also incorporates a bridge component, and the bridge needs to be replaced due to structurally deficiencies, limited traffic capacity or high costs for repair and maintenance.

xii) The dam head pond is accumulating sediment from upstream sources and the dam owner recognizes that removal of dam now reduces the amount of sediment that needs to be dealt with in the future.

2.2 Recreational and Environmental Site Opportunities.

Dams owned by municipalities and conservation authorities are usually on lands with public access and established passive recreational activities. The dam property may feature developed and maintained picnic and camping areas, beach and swimming areas, parking areas and washrooms etc.

As well, the public lands surrounding dams and associated reservoirs may include natural areas bisected by walking trails. As such, public lands around dam locations may feature a mix of wild areas for management of fish and wildlife and areas more managed for park visitors and recreational use.

Most dams owned by municipalities and conservation authorities have been in place for many decades. Many of the dams are aged (50 years old or more) or very aged (80 years old of more). While these older dams have likely received maintenance over the years, likely the dam height and area of the reservoir (head pond) is largely unchanged since the early days of construction.

As such, removal of a dam, and the resulting loss of the head pond, will have a major impact on the appearance of the dam site. In our opinion, it is often difficult for the public to visualize what the property will look like once the dam is removed. Due to the marked change in the appearance of the site once a dam is removed and given this change in appearance may be difficult to visualize, members of the public may be uncomfortable with a dam removal proposal.

Long time users of the recreational opportunities provided by the head pond area may be reluctant to have the dam removed, especially if boating or swimming opportunities are lost as a result of dam removal. However, the majority of dam reservoirs slowly fill with sediment and silty or muck sediments can impair water quality and bottom conditions that negatively effect swimming enjoyment. Head ponds filling with sediment also impair boating on such head ponds.

It is therefore possible that over many years the use and enjoyment of using dam head ponds for swimming and boating has declined due to sediment accumulation and possibly worsening of water quality conditions. Conservation authority budgets are also likely limited in providing lifeguards etc. for swimming areas.

While some established recreational activities will be lost or reduced due to dam removal, other features can become available after dam removal is completed. These additional features can include the following:

i) Site aesthetics and view. Many old dams are not considered attractive. Concrete can be rough, unfinished and spalling and worst case the concrete components are broken, failing, unstable and potentially dangerous to persons around the actual dam. Metal components can be rusty and earthen berms may be eroded, stony and unsightly. Graffiti may be present on concrete surfaces.

Removal of the dam eliminates the normally unpleasant aesthetic view of an aging dam structure. Removal of the dam also frees up new landscape areas that were previously blocked from view. For instance, a dam normally obscures the downstream view of the river when viewed from above unless one is standing on the dam.

ii) New river use opportunities. Depending on the size of the river, removal of the dam can restore and enhance kayak and canoeing on moving river water as opposed to lake waters. Likely, water quality conditions will improve after dam removal which can enhance the kayaking or canoeing experience.

iii) More land area. The former head pond area can, over time, be converted to new green space. This additional land area can be used for a variety of purposes including an expanded trail system, open manicured area for passive sports and dog walking or expanded natural revegetation areas with or without supplemental planting of new shrubs and trees.

iv) Additional natural features. The former head pond area can be repurposed to provide enhanced wildlife habitat. Depending on location, sediment type and local preferences, the new land area can be converted to natural grasslands, new shrub and forest cover, isolated and/or seasonal wetlands and pond habitat. These habitat choices can be selected to promote pollinators, grassland bird and animal species, mixed forest bird and animal species and wetland fish and wildlife species.

v) New stream habitat. The new river habitat replacing the former impounded area may support new cold or cool water fishing opportunities for brook, brown or rainbow trout.

2.3 Dam Removal Challenges

Dam removal in Ontario can be challenging process when financing, environmental and permitting (regulatory) factors are considered. As well, dams can be very important to the history of the community so that dam removal can become a political issue at the local level.

The following challenges may be encountered when the dam owner contemplates removal of a dam:

i) A Class Environmental Assessment (Class EA) will likely be required for dams owned by municipalities or conservation authorities.

ii) Dam removal may be opposed by the local community resulting in the proposed dam removal becoming a political issue.

iii) Removal of the dam would result in the loss of still water recreational opportunities such as boating, swimming, fishing etc.

iv) The overall cost of dam removal (approvals and capital cost) may be much higher than initially estimated and beyond the financial capacity of the dam owner.

v) The dam may provide flood control benefits to the downstream water course and removal of the dam could increase flood risk to downstream areas.

vi) The dam may store large volumes of sediment within the head pond that has accumulated over many years. Dealing with such sediment on a proactive basis can be difficult and expensive.

vii) In addition to applying to MNRF for approval to remove the dam under LRIA, as well as completing an initial Class EA, additional permitting by other agencies will likely be required. Collectively, obtaining all permits and completing the Class EA can be a very long, complex and expensive process.

viii) In some cases, the dam has been identified by MNRF or Fisheries and Oceans Canada, or other groups, as a dam that should stay to prevent upstream migration of predatory or invasive aquatic species, especially if aquatic species at risk have been identified upstream of the dam.

ix) Conversely, if there are species at risk that inhabit the river downstream of the dam, there could be concerns that an increase in short term or long term sediment loadings from the dam removal could impact such downstream aquatic species.

2.4 Permitting Requirements for Dam Removal

As per previous sections, there are a large number of permitting and regulatory requirements that often need to occur before a dam is removed in Ontario. The following sections summarize permitting and planning requirements.

Class Environmental Assessment (Class EA). Currently, a Schedule B Class EA needs to be completed to decommission a dam in Ontario if the dam is owned by a municipality or conservation authority. If privately owned, the dam may have to complete a similar public consultation process before permits are issued by MNRF in particular.

A municipal Class EA is a public consultation process required under the *Environmental Assessment Act*. Consultation with various stakeholder groups is required including various provincial and federal ministries as well as consultation with Indigenous communities.

Lakes and Rivers Improvement Act. The LRIA approval process under MNRF requires the proponent to determine the need for the proposed dam removal. This normally involves completion of an Environmental Screening Table which reviews a wide range of natural environment, land use, social, cultural, economic and Indigenous community considerations for both positive and negative effects of dam removal. Documentation of successful consultation with Indigenous communities is normally required for MNRF to issue an approval under LRIA.

As well, while not specifically listed as a requirement for dam removal, MNRF typically requires the proponent identify the Hazard Potential Classification (HPC) of the dam which classifies the dam as being low, moderate, high or very high hazard. The hazard classification is based on incremental losses to life, property, the environment and cultural - built heritage features that could result from the uncontrolled release of the reservoir (head pond) due to dam failure.

Once the HPC is completed, the Inflow Design Flood (IDF) is estimated. The IDF is based on the return frequency of flood flows appropriate for the HPC. For instance, dams deemed to have a low hazard classification have a lower IDF (25 year to 100 return flood flow) compared to dams having a high hazard classification which would have a higher IDF (1000 year to Probable Maximum Flood (PMF) flow).

The LRIA application also identifies where the proposed project is a full dam removal or a partial dam removal. In the case of a partial dam removal, the proponent is required to complete a dam stability analysis to confirm that the remaining portion of the dam is structural stable under normal flow and flood flow conditions as well as considering ice and earthquake effects.

As part of the LRIA application, construction drawings are submitted that include the proposed, step wise methodology to be employed by the contractor to remove the dam.

Fisheries Act. The Fisheries Act is administered by Fisheries and Oceans Canada and was updated in 2019.

The updated Act restores the previous requirement to prohibit the harmful alteration, disruption or destruction of fish habitat (HADD) and to prevent the death of fish by means other than fishing. The updated Act also promotes restoration of degraded fish habitat and rebuilding of fish stocks.

For a dam removal project, the proponent would normally submit a Request for Review which acts an approval application under the Fisheries Act. The Request for Review includes submission of reports, drawings and other documents prepared by the proponent which identifies the features of the work plan intended to prevent HADD and to prevent the release of deleterious substances.

The Act also provides the means to allow the proponent to apply for an authorization under the Act. The authorization, if granted, would approve the harmful alteration, disruption or destruction of fish habitat in particular circumstances. In some cases, the proponent of a dam removal project may conclude that some impact to fish habitat is unavoidable and may consider applying for an authorization at the time of the Request for Review application.

On Site Excess Soil Management O.Reg. 406/19. This relatively new regulation under the Environmental Protection Act was passed in 2019 and came fully into effect on January 1, 2023. This regulation governs the sampling, transport and reuse or disposal of excess soil in Ontario where soil is proposed to be transported from one site to another.

At this time, it is understood this regulation applies to the handling of sediment in dam reservoirs (head ponds). If sediment is proposed to be collected and transported away from the dam site, the regulation outlines testing and analytical requirements for sediment samples.

Subject to considerations that include the volume of excess soil to be removed, the past use and location of the site of origin, and certain specified exemptions, filing a notice in the provincial Registry may be required prior to removal of excess soil from the project site. Filing a notice requires the preparation of certain documents, including an assessment of past uses, sampling and analysis plan, soil characterization report, and excess soil destination report.

The number of sediment samples requiring analysis is based on the proposed volume of sediment proposed for relocation. A historic site review of the dam site is used to guide the range of parameters to be tested for. The planning of the testing program and the collection of sediment samples for laboratory analysis is to be completed by a Qualified Person as defined by Ontario Regulation 153/04.

Depending on results of laboratory analysis, the sediment may be reused elsewhere. Registration of the re-use site(s) may be required. If a notice of project is filed on the Registry, then transportation of excess soil (including reservoir sediment) is to be described in an excess soil destination report developed by the Qualified Person and a tracking system for each load must be implemented.

Canadian Navigable Water Act. The Canadian Navigable Waters Act is administered by Transport Canada. An application to Transport Canada for an Approval under the Act may be required in those cases where the removal of the dam could impact navigation during the work or after the dam is removed.

Evidence of successful consultation with Indigenous communities is normally required as part of the application process.

Conservation Authorities Act (RSO 1990 as amended). An application for a permit to remove a dam would normally be required when the proponent proposes to remove a dam within an area covered by a Conservation Authority. The purpose of the application and subsequent permit approval (if granted with or without conditions) is to help ensure the preservation of life and property due to the risk of flooding, erosion and other natural hazards.

3 EAST SYDENHAM RIVER WATERSHED CHARACTERISTICS AND HYDROLOGY

Tables 1, 2 and **3** overleaf respectively provide general watershed characteristics, estimates of low river flows during the dry summer period and estimates of return flood flows. The following section provides a summary of watershed characteristics upstream of the Coldstream dam and low flows and flood flows at the dam location.

3.1 Watershed Characteristics

The East Sydenham River in Coldstream has an upstream drainage area of approximately 61.6 square kilometers. The watershed extends northeast from Coldstream to near Southgate and Ilderton. Overall, the watershed has a modest gradient of approximately 0.26 % on average in the Coldstream area (from MNRF OWIT). See **Table 1** for details.

The watershed is well described in previous reports. Parrish Geomorphic previously prepared the report entitled "Sydenham River - Fluvial Geomorphology Assessment (December, 2000)". This report covers the entire Sydenham River watershed but describes the East Sydenham River as follows:

- While much of the Sydenham watershed features primarily silt and clay soils, the East Sydenham River is influenced significantly by the Caradoc Sand Plain.
- In addition, the East Sydenham River crosses glaciofluvial and recent fluvial deposits consisting of silt, sand and gravel.
- River substrate is typically a mix of bedrock, clay, silt, sand or gravel. Combined with low channel gradient, "this mixture of substrate has created unique stream habitats".
- The overall watershed (including the East Sydenham) has relatively poor drainage due to low stream gradients and overall low relief. Such low relief has resulted historically in flooding.
- Land use is largely agricultural and minimal forest cover remains. The Parrish report indicates the original forest cover was cleared in the 1800's, though riparian forest cover remains or has re-established along the East Sydenham River.

The report also discussed sedimentation, erosion and changes in peak flows over time. Overall, the East Sydenham River drainage basin is prone to erosion. Relatively low gradients result in poor mobilization of fine sediments (silt, sand and clay) in the river channel. Accumulation of silt and sandy sediment in the Coldstream dam head pond is further discussed in this report.

3.2 Low Flow River Conditions

Daily flows from the Federal Stream flow gauge 02GG005 were analyzed for years 2002 to 2022 and prorated for the drainage area upstream of Coldstream. This gauge is located approximately 400 m downstream of the Head Street dam in Strathroy.

Table 2 provides estimated, average summer monthly flows at the Coldstream dam based on prorated data from the above Federal Stream flow gauge. Average, monthly summer flows (July, August and September) range from approximately 0.08 cubic meters per second (m^3/s) to 1.7 m^3/s. Overall, average monthly flows during the dry summer period are approximately 0.28 m^3/s.

Table 1

Watershed Characteristics of

East Sydenham River at Coldstream, Ontario

(From OWIT)

Drainage Area	61.6 km²
Length of Main Channel	20.8 km
Maximum Channel Elevation	296.96 m
Minimum Channel Elevation	242.61 m
Overall Channel Slope	± 0.26%
Local Channel Slope Near Dam Site (From MNR Make A Map)	± 0.43%

Table 2

Summary of Low Flow Information (m^3/s)

*Estimate of Average Monthly Flows – Sydenham River at Coldstream

Environment Canada Gauge 02GG005

Year	July	August	September	Average
2002	0.126	0.081	0.082	0.096
2003	0.150	0.096	0.128	0.125
2004	0.257	0.223	0.155	0.212
2005	0.162	0.144	0.184	0.163
2006	0.639	0.364	0.270	0.425
2007	0.143	0.174	0.129	0.149
2008	0.201	0.190	0.297	0.230
2009	0.281	0.197	0.177	0.218
2010	0.236	0.139	0.125	0.167

Year	July	August	September	Average
2011	0.249	0.260	0.307	0.272
2012	0.177	0.156	0.153	0.162
2013	0.335	0.200	1.725	0.753
2014	0.323	0.179	0.743	0.415
2015	0.382	0.191	0.165	0.246
2016	0.203	0.536	0.196	0.312
2017	0.220	0.176	0.176	0.191
2018	0.375	0.436	0.239	0.350
2019	0.265	0.404	0.245	0.305
2020	0.183	0.379	0.262	0.274
2021	0.338	0.224	1.336	0.632

Year	July	August	September	Average
2022	0.159	0.174	0.153	0.162
Average	**0.257**	**0.234**	**0.345**	**0.279**

*Average monthly flows of the Sydenham River at Coldstream are estimated by prorating the average monthly flows of the downstream gauge (02GG005) by the difference in upstream drainage area (drainage area upstream of gauge is 2.8 times that of Coldstream)

Table 3

Summary of Return Flood Flows for East Sydenham River at Coldstream

Prorated from East Sydenham River at Strathroy

June 2023 21-118

*East Sydenham River at Coldstream	
Return Period	**Flood Flow**
Mean Annual Flow	0.7 m^3/s
2 year	19 m^3/s
5 year	24 m^3/s
10 year	29 m^3/s
20 year	33 m^3/s
50 year	39 m^3/s
100 year	45 m^3/s

*Flood flows of the East Sydenham River at Coldstream are estimated by prorating B.M. Ross and Associates' flood flow estimates of the East Sydenham River at Strathroy by the difference in upstream drainage area (drainage area upstream of Strathroy is 2.8 times that of Coldstream)

3.3 Return Flood Flows

Table 3 summarizes return peak flood flows for the Coldstream dam. Flood flows range from 19 m^3/s for the 2-year flood flow to 45 m^3/s for the 100-year flood flow. These return flood flows are based on previously estimated flood flows for the East Sydenham River in Strathroy (as estimated by BM Ross Consultants). The Strathroy flood flows were then prorated based on the upstream drainage area for the Coldstream dam location.

4 DESCRIPTION OF COLDSTREAM DAM AND CURRENT HEAD POND CONDITIONS

The Coldstream dam was constructed in approximately 1968. The dam is located adjacent to Ilderton Road, a short distance downstream of Coldstream Road. The Coldstream Conservation Area is located along the northwest side of the dam and head pond.

As noted previously, the dam is approximately 3.35 m high (normal upstream water level compared to normal downstream water level). The dam consists of vertical steel sheet piles driven into the riverbed below, forming a continuous retaining wall. The piles are made of heavy gauge ARCH-Type individual metal sheets locked together at the joints during installation. Original drawings for the dam show the sheets are driven into the soil below for a similar depth as the height of the sheets above the downstream water level.

The downstream side of the sheet piling is protected by large armour stone (ranging in size from 16 inches to 24 inches in diameter) on a slope of approximately 3:1 horizontal to vertical. The armour stone provides protection to the soil material below the sheet pile wall from erosion. The sheet pile portion of the dam is approximately 45 m wide. The adjacent earthen berm portion of the dam (south of sheet pile dam portion) is approximately 40 m long.

Photo 1: Coldstream dam constructed of vertical sheet piling and downstream armour stone.

The Coldstream dam does not contain any spillways or stop logs. As such, there is no way to easily adjust water levels in the dam head pond.

Photo 2: Large sloping armour stone placement on downstream side of sheet pile dam. Sydenham River downstream of dam visible in background.

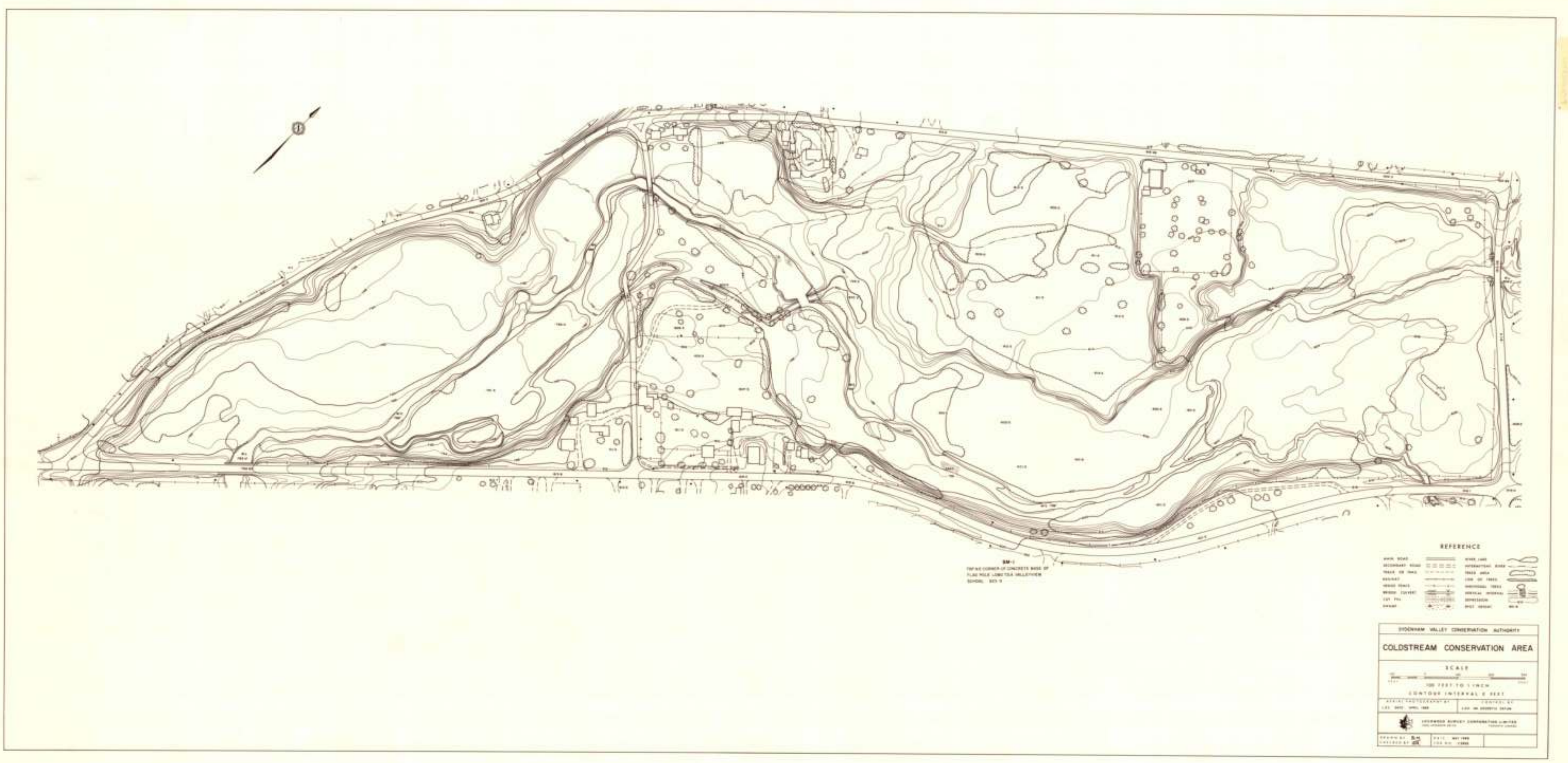
The dam is also equipped with a low flow bypass valve. The condition of the bypass valve is not known but is not believed to be operatable (personal communication with SCRCA).

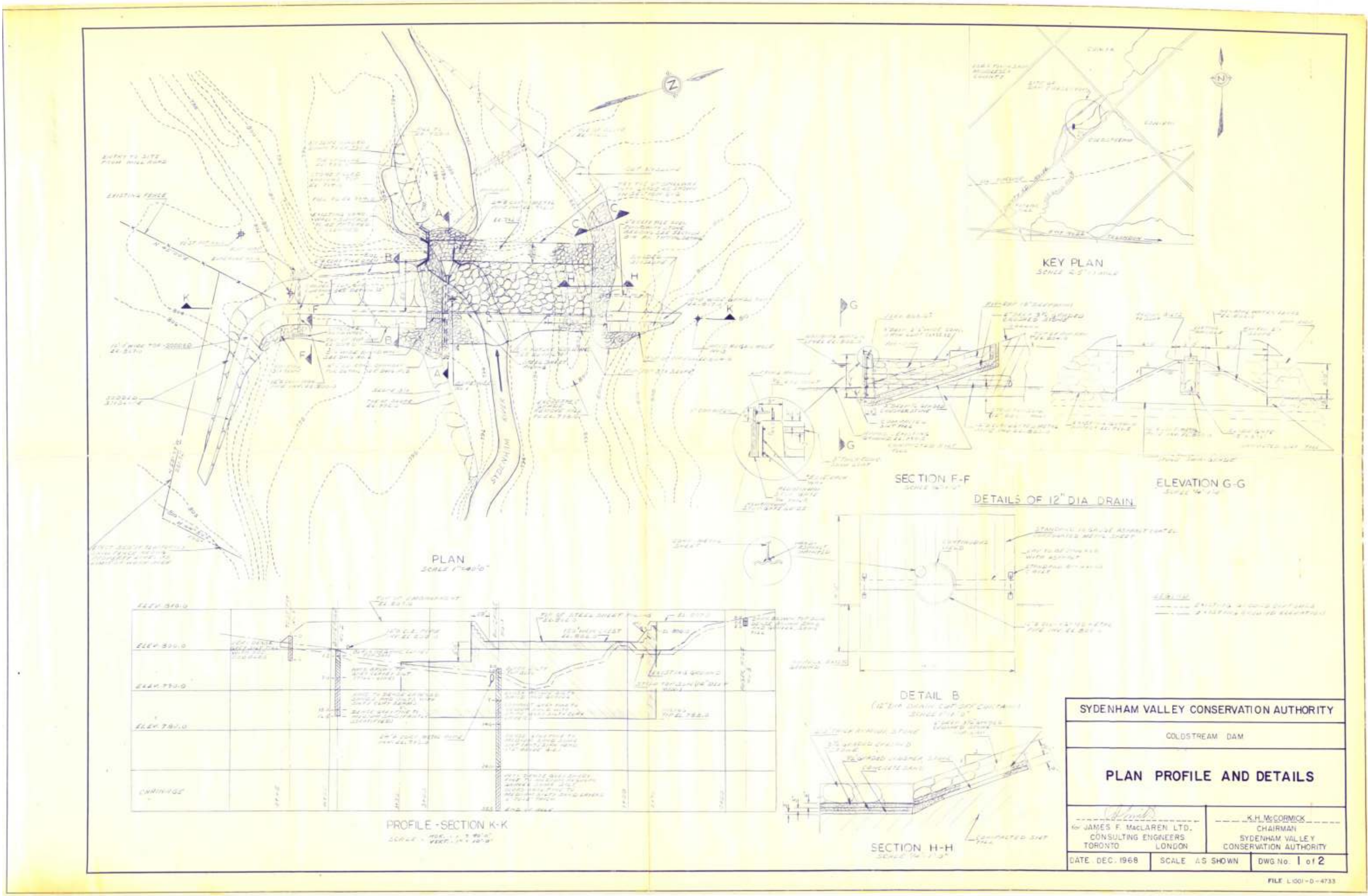
Original **dam design drawings (three)** are provided overleaf. Drawings available include plan views and cross section views of the dam. A dam site plan is also available that shows the original contours in the head pond area as well as the original stream location and gradient in the head pond area. The site plan drawings also indicate a significant amount of native fill was removed from the head pond area before the dam was constructed, likely to increase the depth of the head pond to promote recreational activities.

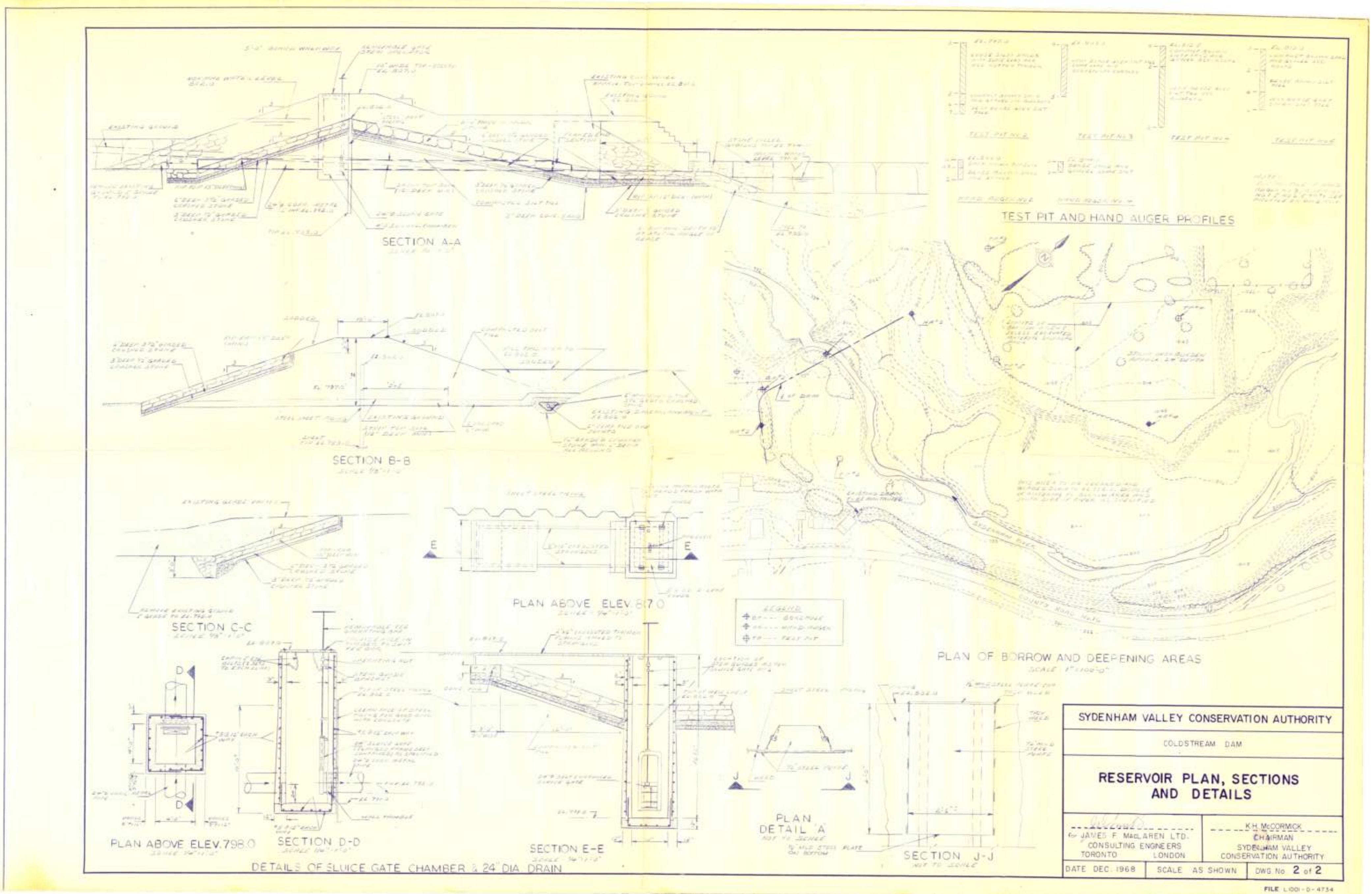
Appendix A includes a dam condition report prepared by True Engineering (June, 2022). This report concludes the Coldstream dam appears to be in overall good condition.

Given that the dam was built in 1968, the dam is now about 55 years old. As above, engineering assessments have deemed the dam to be in good condition. As such, the total life expectancy of the dam could be estimated as 75 to 100 years. Therefore, the remaining life expectancy would be approximately 20 to 45 years.

However, while in good condition at present, the dam at some point will likely deteriorate and need to be removed.


REFERENCE
SYDENHAM VALLEY CONSERVATION AUTHORITY
COLDSTREAM CONSERVATION AREA
SCALE


KEY PLAN
PLAN
SECTION F-F
ELEVATION G-G
DETAILS OF 12" DIA. DRAIN
DETAIL B
PROFILE - SECTION K-K
SECTION H-H
SYDENHAM RIVER
SYDENHAM VALLEY CONSERVATION AUTHORITY
COLDSTREAM DAM
PLAN PROFILE AND DETAILS
for JAMES F. MacLAREN LTD.
CONSULTING ENGINEERS
TORONTO LONDON
K.H. McCORMICK
CHAIRMAN
SYDENHAM VALLEY
CONSERVATION AUTHORITY
DATE DEC. 1968
SCALE AS SHOWN
DWG No. 1 of 2
FILE L-1001-D-4733


SECTION A-A
TEST PIT AND HAND AUGER PROFILES
SECTION B-B
SECTION C-C
PLAN ABOVE ELEV. 817.0
LEGEND
PLAN OF BORROW AND DEEPENING AREAS
PLAN ABOVE ELEV. 798.0
SECTION D-D
SECTION E-E
PLAN
DETAIL 'A'
SECTION J-J
DETAILS OF SLUICE GATE CHAMBER & 24" DIA. DRAIN
SYDENHAM VALLEY CONSERVATION AUTHORITY
COLDSTREAM DAM
RESERVOIR PLAN, SECTIONS AND DETAILS
for JAMES F. MacLAREN LTD.
CONSULTING ENGINEERS
TORONTO LONDON
K.H. McCORMICK
CHAIRMAN
SYDENHAM VALLEY
CONSERVATION AUTHORITY
DATE DEC. 1968
SCALE AS SHOWN
DWG. No. 2 of 2
FILE L001-D-4734

While reasonable life expectancy remains for the Coldstream Dam, it is beyond the scope of this report to assess capacity of the dam for very large flood events in the future. Climate change may affect precipitation patterns and may increase the frequency and magnitude of major rain events that could result in flood flows exceeding the capacity of the dam.

The current area of the head pond is approximately 4.5 ha (11.2 acres). The overall depth of the head pond is relatively shallow with a maximum depth of approximately 1.37 m (4.5’) (water depth above accumulated sediment levels). Historically, much of the head pond would have been deeper, but the head pond has accumulated large volumes of sediment since being constructed. Accumulation of sediment is assumed to be ongoing and downstream areas of the head pond toward the Coldstream dam are assumed to still be filling with sediment (i.e. sediment depths will continue to get deeper over time near the dam).

The following sections describe in further detail sediment conditions in the head pond.

4.1 Head Pond Sediment Depth

Figures 1, 2 and **3** detail sediment conditions in the Coldstream dam head pond.

Figure 1 shows the depth of water to top of sediment and also depth of water to hard bottom for each point and also provides the calculated depth of sediment (depth of sediment is equal to total depth of water to hard bottom minus depth of water to top of sediment.).

As per **Figure 1**, depth of water over the sediment ranges from 0.76 m (30”) to 1.37 m (4.5’) with a typical depth of water over sediment being about 1.1 m depth. Overall, water depths increase only slightly in the downstream portion of the head pond (toward the Coldstream dam) indicating that the head pond in this area is still slowly filling with sediment. **Figure 1** also shows locations of cross sections.

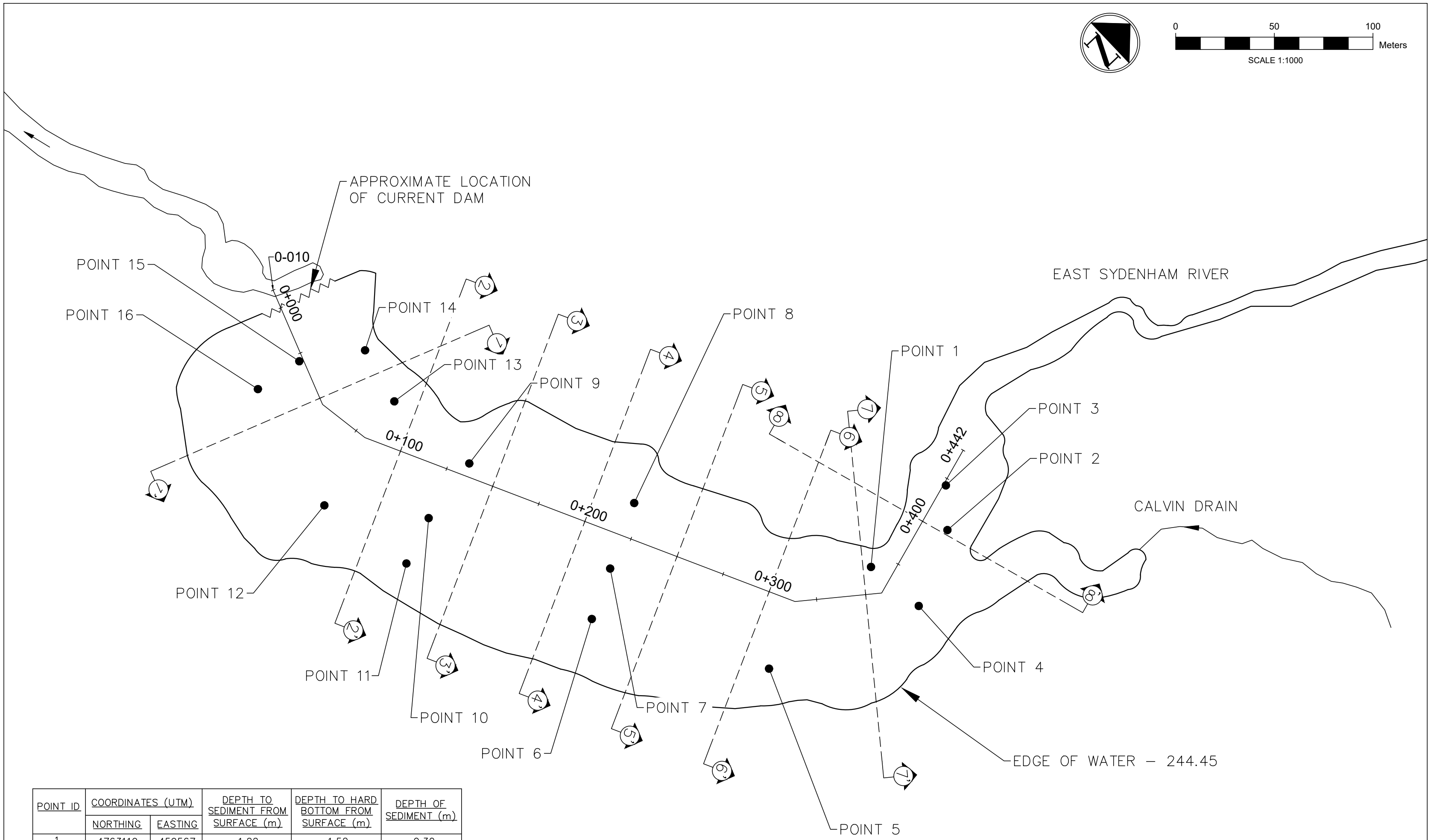
Figure 2 provides cross-sectional information of the sediment depth at various sections of the head pond. While water depth over the sediment layer increases slowly toward the Coldstream dam, the top of sediment is generally flat across the width of the head pond.

Figure 3 uses color to illustrate total sediment depth (depth of sediment from top of sediment to hard bottom). As per **Figure 3**, the depth of sediment around the edges of the head pond is typically less than 0.5 m but increases to over 2 m depth in certain portions of the head pond. However, sediment depths of 0.5 m to 1.5 m cover much of the head pond area.

4.2 Head Pond Sediment Volume

As per **Figure 1**, the total estimated volume of sediment in the head pond at this time is estimated to be over 22,500 cubic meters.

As discussed in later sections, this volume of sediment is significant. Sediment management is therefore a significant consideration if a decision was made to remove the Coldstream dam in the future.



POINT ID	COORDINATES (UTM)		DEPTH TO SEDIMENT FROM SURFACE (m)	DEPTH TO HARD BOTTOM FROM SURFACE (m)	DEPTH OF SEDIMENT (m)
	NORTHING	EASTING			
1	4763119	459567	1.22	1.52	0.30
2	4763160	459580	0.76	0.91	0.15
3	4763175	459563	0.76	1.22	0.46
4	4763123	459598	0.91	1.22	0.30
5	4763046	459569	0.91	1.52	0.61
6	4762998	459489	0.76	2.13	1.37
7	4763022	459477	1.22	1.98	0.76
8	4763054	459461	1.07	1.37	0.30
9	4763007	459389	0.91	2.29	1.37
10	4762973	459395	1.07	2.44	1.37
11	4762949	459404	1.07	1.83	0.76
12	4762939	459354	1.07	1.83	0.76
13	4763001	459340	1.07	2.13	1.07
14	4763008	459311	1.07	1.22	0.15
15	4762980	459292	1.37	3.05	1.68
16	4762955	459288	1.22	2.13	0.91

AREA OF RESERVOIR = ± 45,000 m²
AREA OF SEDIMENT = ± 44,000 m²
VOLUME OF SEDIMENT = ± 22,500 m³

KEY PLAN

LEGEND

— 244.00m — SEDIMENT SURFACE CONTOURS (0.25m)
– – – – STATION CROSS SECTIONS
——— EDGE OF WATER (244.45m)

CAUTION: THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS, PROPERTY LINES AND OTHER UNDERGROUND AND OVERGROUND UTILITIES ARE STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES, PROPERTY LINES & STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES, PROPERTY LINES & STRUCTURES, AND SHOULD ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

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GSS ENGINEERING CONSULTANTS LTD
Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7
Telephone: (519) 372-4828

Title:

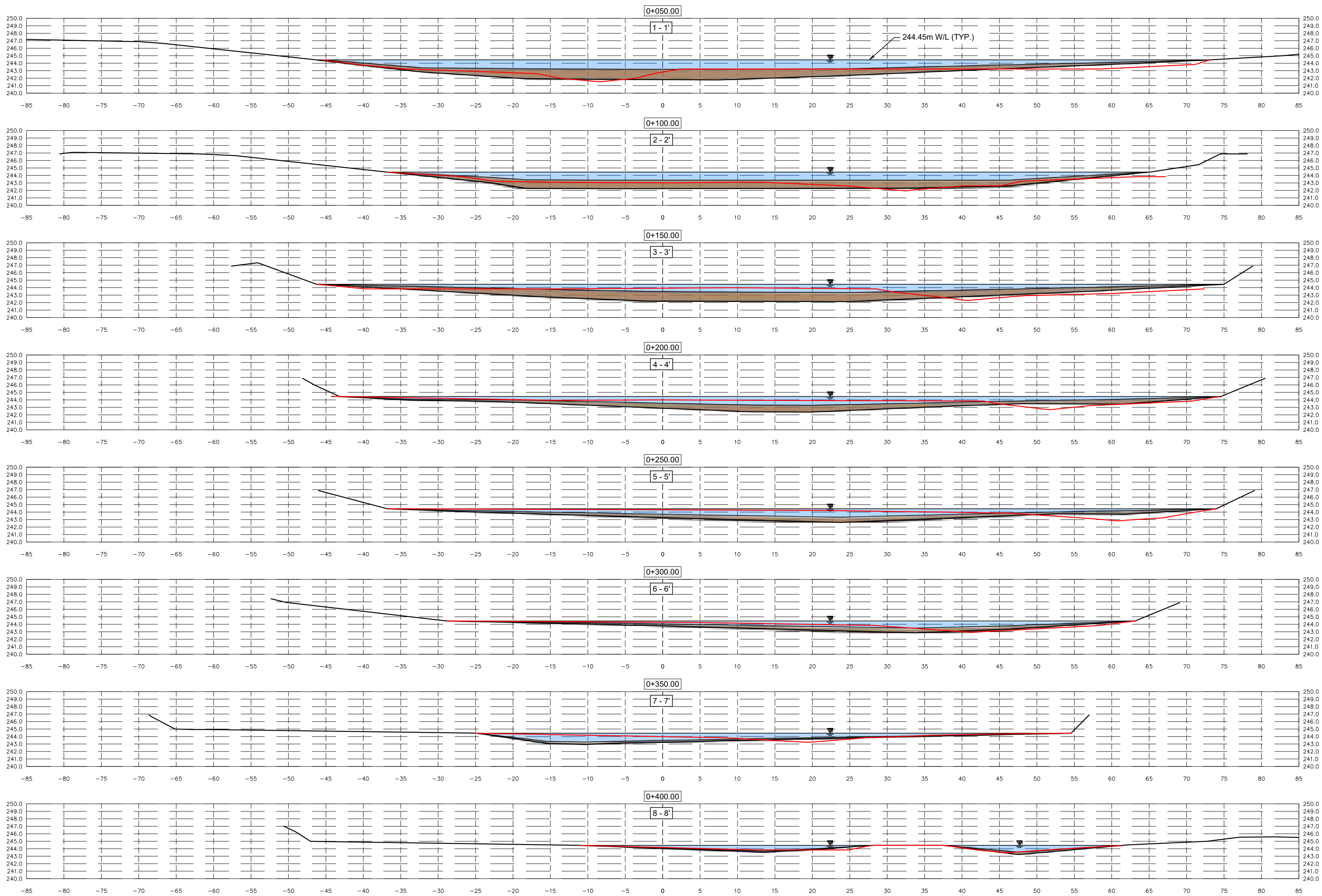
EXISTING SITE PLAN
AND SEDIMENT ELEVATIONS
COLDSTREAM RESERVOIR

Client: ST. CLAIR REGION CONSERVATION AUTHORITY

Design:	SNM	Scale:	1:1000
Drawn:	SNM	Approved:	Design Engineer
Checked:	JTG		
Date:	MAR. 2022		

Drawing No. 21118C–FIGURE 1

COLDSTREAM RESERVOIR CROSS-SECTION VIEWS
VERT / HORZ 1:250 SCALE



NOTE: ALL CROSS-SECTIONS ARE LOOKING UPSTREAM AT THE COLDSTREAM RESERVOIR

KEY PLAN

LEGEND

- WATER SURFACE (244.45m)
- TOP OF SEDIMENT / SURFACE
- TOP OF HARD BOTTOM
- 1968 SURFACE (PRE DAM CONSTRUCTION)
- WATER
- SEDIMENT

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ENGINEERING CONSULTANTS LTD
Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7
Telephone: (519) 372-4828

Title:
CROSS-SECTIONS
SEDIMENT LAYERS
COLDSTREAM RESERVOIR

Client: ST. CLAIR REGION CONSERVATION AUTHORITY

Design:	SNM	Scale:	VERT/HORZ 1:250
Drawn:	SNM	Approved:	Design Engineer
Checked:	JTG		
Date:	MAR. 2022		

Drawing No. 21118C-FIGURE 2

KEY PLAN

LEGEND

FLOW DIRECTION

EDGE OF WATER

CAUTION: THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS, PROPERTY LINES AND OTHER UNDERGROUND AND OVERGROUND UTILITIES ARE STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES, PROPERTY LINES & STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES, PROPERTY LINES & STRUCTURES, AND SHOULD ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

DD/MM/YY	DESCRIPTION

REVISION / ISSUE

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GSS ENGINEERING CONSULTANTS LTD
Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7
Telephone: (519) 372-4828

Title:
SEDIMENT DEPTH ANALYSIS
PLAN VIEW
OF COLDSTREAM RESERVOUR
COLDSTREAM DAM

Client: ST. CLAIR REGION CONSERVATION AUTHORITY

Design:	JTG	Scale:	1:1000
Drawn:	JTB	Approved:	Design Engineer
Checked:	JTG		
Date:	JULY 2022		

Drawing No. 21118C–FIGURE 3

4.3 Estimated Original River Channel Location and Form

The original dam and site plan drawings provided in this section show the original stream channel location. In general, the stream channel appears to have run along the southeast side of the pond near Ilderton Road.

If the dam was removed, there is some possibility that the new channel would form again in the original, historic channel with similar depth, cross-sectional shape and meander pattern as historically existed. However, the original excavation of fill from the head pond area, coupled with the large volume of sediment in the head pond, could result in a new channel location or the new channel having a different form (i.e. different channel depth, cross-sectional shape and meander pattern) than the original, historic channel.

To better estimate what channel form might develop in the head pond area if the Coldstream dam was removed, GEO Morphix fluvial geomorphologists were retained by GSS Engineering to evaluate a future stream formation in the head pond. The results of the GEO Morphix analysis are provided in **Appendix B.**

4.4 GEO Morphix Evaluation Summary

The GEO Morphix study (January 2023) in **Appendix B** provides the following conclusions and observations.

The study concludes that the new channel that forms in the head pond area (after dam removal) could form significant meander belts. The estimated meander belt width (MBW) that could form is quite significant and ranges from about 55 m to 80 m. Key conclusions are:

i) The above meander belt width approaches the widest part of the current head pond.

ii) The channel width and depth that could form over time through the sediment deposition area is estimated to have a width of 7.4 m and a depth of 0.74 m. However, this depth is from final water level to final channel bottom and does not include the height of riverbanks (i.e. remaining sediment) above the final water level at normal river flow rates.

iii) The volume of sediment that would be released from the head pond is estimated to be approximately 7,000 cubic meters if the sediment was allowed to be naturally released from the head pond. This estimate is 31% of the total estimated volume of sediment currently in the head pond (see Section 4.2).

iv) Overall, the GEO Morphix study concludes that removal of the sediment from the head pond in advance of dam removal is not likely practical.

4.5 Head Pond Sediment Contaminant Analysis

Appendix C provides results of contaminant analysis completed by ALS Laboratories of London, Ontario for sediment samples collected in the head pond during April, 2022. Samples were analyzed for metals and nutrients. Sediment samples were collected from six locations.

The **Technical Memorandum** provided at the end of this section provides greater detail of the sediment sampling, testing, and results. **Figure 4** (see the Tech. Memo) shows the location of the sampling locations. As per **Figure 4**, samples CS1 and CS4 were collected in the upper end of the head pond, samples CS2 and CS5 were collected in the middle part of the head pond, and samples CS3 and CS6 were collected in the downstream portion of the head pond. **Table 4** (of the Tech. Memo) provides all analytical results for all samples.

Results of analysis are summarized as follows:

i) There were no exceedances of metals for any samples other than for Manganese (samples CS4 and CS6) which had levels above the low effect level but below the severe effect level as published by MECP for sediment quality in Ontario (1993);

ii) All metal results were lower than sediment standards set by MECP for soil, ground water and sediment quality (2011);

iii) Phosphorus levels in sediment samples CS2, CS3 and CS6 were the only nutrient exceeding the above MECP levels or standards. Levels of phosphorus in these three samples exceeded the low effect level set by the 1993 MECP sediment quality standard for phosphorus (600 ug/g) but levels in these samples were well below the severe effect level for phosphorus (2,000 ug/g).

iv) Cyanide testing levels were set higher for sample CS2 due to high moisture content to a level above the 2011 MECP standard for sediment. As such, it cannot be confirmed if cyanide levels in CS2 were below the MECP standard. However, the other five sediment samples were also tested at the normal minimum detection level and results for all five samples were below the MECP cyanide quality standard.

Overall, sediment quality in the Coldstream dam head pond appears to be free of contaminants other than elevated levels of phosphorus in three of six samples and elevated levels of manganese in two of the six samples.

It should be noted that there are new regulations in Ontario that govern the movement of excess fill and earth material (*Excess Soil Regulation O. Reg. 406/19*). If there was serious consideration of excavating or dredging sediment from the dam head pond, then additional samples of sediment may have to be collected and analyzed for a wider range of parameters to meet the requirements of the above Regulation. Potentially, the same additional samples, and additional analysis of additional parameters, would be required if approvals were obtained to allow sediment in the head pond to naturally be carried downstream following dam removal.

4.6 Head Pond Sediment Characteristics

Appendix C also provides results of particle size analysis completed for two sediment samples collected in the head pond during April, 2022, being sediment samples CSPSA1 and CSPSA2.

Sample CSPSA1 was collected at the CS4 location and therefore represents sediment in the upstream portion of the head pond. Sample CSPSA2 was collected at the CS6 location and therefore represents sediment in the downstream portion of the head pond.

Based on particle size analysis, the upstream sample CSPSA1 consisted primarily of gravel (33%), medium sand (36%) and coarse sand (22%) with lesser amounts of fine sand and trace amounts of silt and clay.

The downstream sample CSPSA2 consisted of mainly fine sand and silt (45% and 23% respectively) with 37% medium sand.

In general, these results are consistent with soil and geologic conditions within the watershed upstream of the Coldstream dam, as discussed in earlier sections of this report.

4.7 Head Pond Sedimentation Accumulation Rate

Previously, a report entitled *Strathroy Reservoir Management Study* (2003) was prepared by Greck and Associates Limited (Greck) which described the Head Street dam and head pond in Strathroy. This report was wide ranging and discussed sediment accumulation, water quality issues, fish passage, effects on species at risk and invasive species, recreational uses, flood control and protection, erosion control and reservoir ecology. The study proposed measures to address and manage the reservoir impacts.

In Section 4.2 of the Study (Sediment Accumulation and Quality), Greck used historical water depths in the Head Street dam head pond to estimate the rate of sediment accumulation. Overall, Greck estimated that approximately 800 m^3/year of sediment were being deposited in the head pond. Review of the report in 2023 by GSS Engineering Consultants Ltd; combined with other data resulted in GSS Engineering concluding the rate of sediment accumulation could actually be higher at 1,300 m^3/year. GSS Engineering also noted the depth of water over the accumulated sediment in the Head Street head pond was 0.7 m.

The Coldstream dam is located on the same river (East Sydenham River) as is the Head Street dam. As such, sedimentation rates are believed to be at least comparable for the Coldstream dam as they are for the Head Street dam.

As noted, the current water depth over the accumulated sediment in the Head Street head pond is only 0.7 m, while the average depth of water over the sediment in the Coldstream head pond is 1.1 m (see Section 4.1 of this report).

Therefore, it would appear the Coldstream head pond is still accumulating sediment. The area of watershed upstream of Coldstream is approximately 61.6 square kilometers (see **Table 1**). The total watershed upstream of the Head Street dam is approximately 172.6 square kilometers which includes the watershed of the Coldstream dam.

Assuming all sediment washing into Coldstream stays in the Coldstream head pond, the contributing watershed area to the Head Street dam, downstream of Coldstream, is 111 square kilometers. If the lower sedimentation rate for the Head Street dam of 800 is m^3/year is assumed, the sedimentation rate per square kilometer of watershed area is 7.2 m^3/year per square kilometer.

Based on the watershed area upstream of the Coldstream dam being 61.6 square kilometers, and a sediment inflow rate of 7.2 m^3/year per square kilometer, the total sediment inflow to the Coldstream dam is approximately 444 m^3/year.

The estimated area of the Coldstream dam head pond is 4.5 ha (45,0000 square meters) as per Section 4 of this report. Based on the above, estimated sediment inflow rate of 444 m^3/year, the head pond is filling at approximately 10 mm (1 cm) per year. As such, over the next 50 years, the remaining water depth, above the sediment, would reduce by approximately 0.5 m (20 inches) to a depth of approximately 0.6 m.

TECHNICAL MEMORANDUM

Coldstream Sediment Analysis

November 7, 2022 21-118

In April, 2022, sediment samples were collected by staff of SCRCA from the Coldstream headpond in the small settlement area of Coldstream. Six sediment samples were collected and analysed from the six locations shown approximately on Figure 4 overleaf.

The sediment samples were analysed for a wide variety of metals and nutrients by ALS Laboratories of London. A copy of the lab results from ALS dated May 11, 2022 are provided in this section. A total of 36 metals and nutrients were analyzed for. See also Table 4.

As per Table 4, manganese levels in sediment samples CS4 and CS6 were the only metal exceeding MECP levels or standards. Levels of manganese in these two samples exceeded the low effect level set by the 1993 MECP sediment quality standard for manganese (460 ug/g) but levels in these samples were well below the severe effect level for manganese (1,100 ug/g).

Phosphorus levels in sediment samples CS2, CS3 and CS6 were the only nutrient MECP levels or standards. Levels of phosphorus in these three samples exceeded the low effect level set by the 1993 MECP sediment quality standard for phosphorus (600 ug/g) but levels in these samples were well below the severe effect level for phosphorus (2,000 ug/g).

The detection limit of cyanide was increased from 0.050 ug/g to 0.123 ug/g for sample CS2, due to high sample moisture content. This is higher than the 2011 MECP sediment quality standard for cyanide (0.1 ug/g). Therefore, sample CS2 was not sufficiently measured for a safe level of cyanide. However, this sample contains less then 0.123 ug/g of cyanide and since all five other samples have less then 0.050 ug/g of cyanide, it is assumed that sample CS2 does not exceed the 2011 MECP standard.

Overall, sediment quality in the Coldstream dam head pond appears to be free of contaminants other than elevated levels Manganese in two of six samples and Phosphorus in three of six samples.

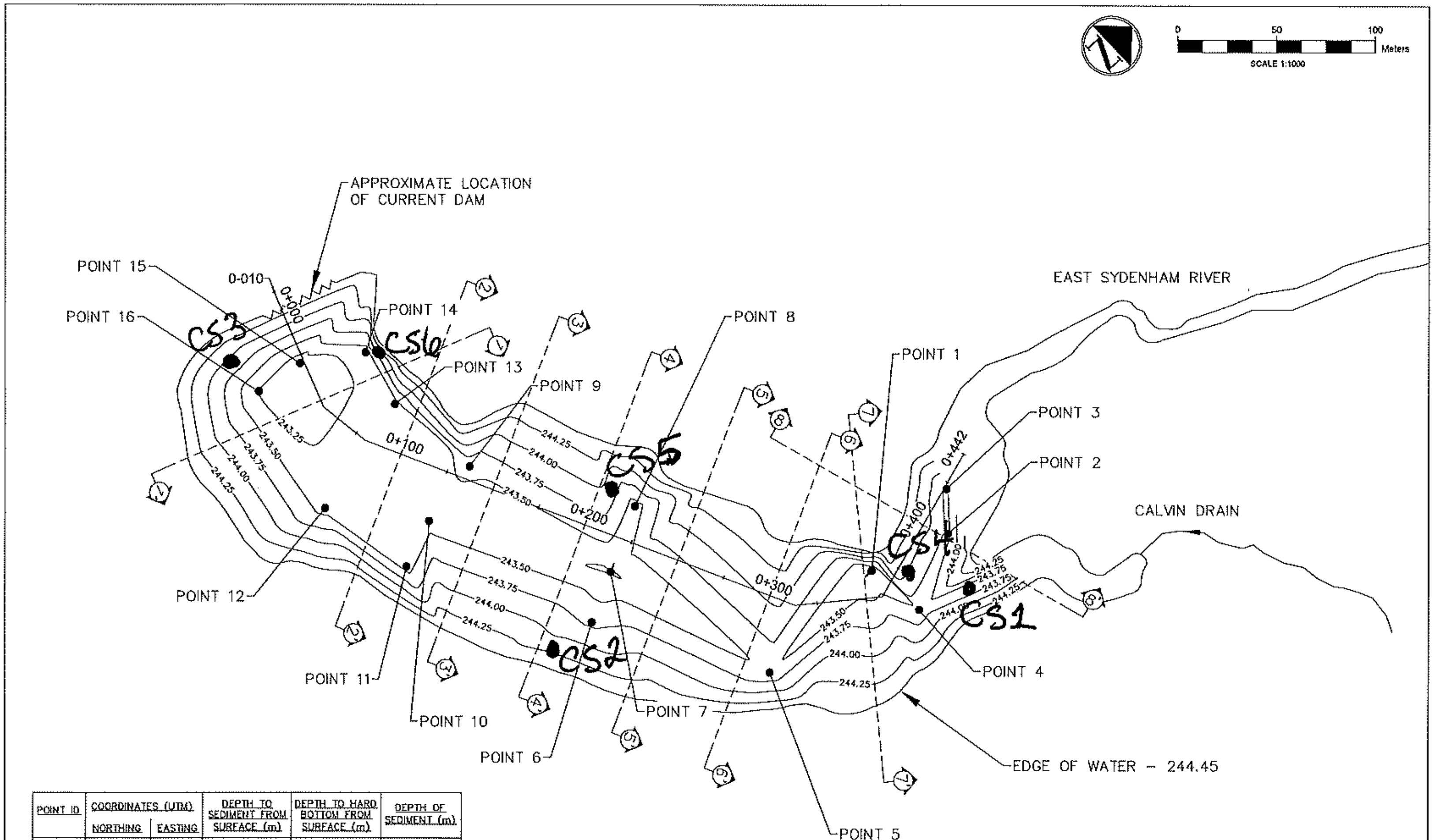
Sediment samples were also submitted for particle size analysis. Sample CSPSA1 was collected at the CS4 location. Sample CSPSA2 was collected at the CS6 location. As per the results, the upstream sample (CSPSA1) consisted of mostly gravel (33%), medium sand (36%) and coarse sand (22%) and the downstream sample (CSPSA2) contained more fine sand and silt (45% and 23% respectively) with 37% medium sand.

Prepared by

GSS ENGINEERING CONSULTANTS LTD.

Jacob Bartley, E.I.T

Unit 104D • 1010 9th Avenue West • Owen Sound • ON • N4K 5R7 • 519.372.4828



POINT ID	COORDINATES (UTM)		DEPTH TO SEDIMENT FROM SURFACE (m)	DEPTH TO HARD BOTTOM FROM SURFACE (m)	DEPTH OF SEDIMENT (m)
	NORTHING	EASTING			
1	4763119	459567	1.22	1.52	0.30
2	4763160	459580	0.76	0.91	0.15
3	4763175	459563	0.76	1.22	0.46
4	4763123	459598	0.91	1.22	0.30
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8	4763054	459461	1.07	1.37	0.30
9	4763007	459389	0.91	2.29	1.37
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11	4762949	459404	1.07	1.83	0.76
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14	4763008	459311	1.07	1.22	0.15
15	4762980	459292	1.37	3.05	1.68
16	4762955	459288	1.22	2.13	0.91

AREA OF RESERVOIR = ± 45,000 m^2
AREA OF SEDIMENT = ± 44,000 m^2
VOLUME OF SEDIMENT = ± 22,500 m^3

Figure 4
Sediment Sampling Locations in April, 2022

KEY PLAN

LEGEND

— 244.00m — SEDIMENT SURFACE CONTOURS (0.25m)
STATION CROSS SECTIONS
EDGE OF WATER (244.45m)

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DD/MM/YY | DESCRIPTION
REVISION / ISSUE

Seal not valid unless signed and dated

ENGINEERING

Title:
EXISTING SITE PLAN
AND SEDIMENT ELEVATIONS
COLDSTREAM RESERVOIR

Client: ST. CLAIR REGION CONSERVATION AUTHORITY

Design:	JTG	Scale:	1:1000
Drawn:	SNM	Approved:	Design Engineer
Checked:	JTG		
Date:	MAR. 2022		

Drawing No. 2111BC-03

ENGINEERING CONSULTANTS LTD

TABLE 4

Summary of Sediment Quality Data for Metals and Other Inorganic Parameters
Potential Removal of the Coldstream Dam

November 4, 2022 — 21-118

Sample Identification		CS1	CS2	CS3	CS4	CS5	CS6	MECP (1993) Sediment Quality [1]		MECP (2011) Table 1 [2]
Date Collected		14-Apr-22	14-Apr-22	14-Apr-22	14-Apr-22	14-Apr-22	14-Apr-22			
Lab Sample ID		L2699441-1	L2699441-2	L2699441-3	L2699441-4	L2699441-5	L2699441-6	LEL	SEL	Background
Parameter	Units									
Cyanide, Free	µg/g	<0.050	<0.123	<0.050	<0.050	<0.050	<0.050	-	-	0.1
Aluminum (Al)	µg/g	3260	8740	10900	8150	5290	12100	-	-	-
Antimony (Sb)	µg/g	<0.10	<0.10	<0.20	0.20	<0.20	<0.20	-	-	NV
Arsenic (As)	µg/g	1.89	2.37	3.02	4.50	2.81	3.22	6	33	6
Barium (Ba)	µg/g	17.1	56.4	75.1	41.3	33.2	78.3	-	-	NV
Beryllium (Be)	µg/g	0.16	0.36	0.42	0.31	0.24	0.47	-	-	NV
Bismuth (Bi)	µg/g	<0.20	<0.20	<0.40	<0.20	<0.40	<0.40	-	-	-
Boron (B)	µg/g	<5.0	7.8	10.0	7.2	<10	12.0	-	-	NV
Cadmium (Cd)	µg/g	0.089	0.255	0.280	0.166	0.140	0.304	0.6	10	0.6
Calcium (Ca)	µg/g	200000	114000	174000	143000	172000	183000	-	-	-
Chromium (Cr)	µg/g	9.68	14.50	18.30	14.8	11.4	19.5	26	110	26
Cobalt (Co)	µg/g	2.43	4.85	5.96	5.01	3.07	6.42	-	-	50
Copper (Cu)	µg/g	4.23	11.50	14.30	13.40	6.60	15.60	16	110	16
Iron (Fe)	µg/g	8330	12200	14600	14100	9120	15800	20000	40000	-
Lead (Pb)	µg/g	4.03	6.72	8.10	13.00	4.20	8.80	31	250	31
Lithium (Li)	µg/g	4.3	9.6	10.9	8.7	6.3	13.9	-	-	-
Magnesium (Mg)	µg/g	15200	14200	17700	20600	19200	18700	-	-	-
Manganese (Mn)	µg/g	266	338	418	**<u>492</u>**	313	**<u>495</u>**	460	1100	-
Mercury (Hg)	µg/g	0.0146	0.0248	0.0280	0.0331	0.0110	0.0320	0.2	2	0.2
Molybdenum (Mo)	µg/g	0.27	0.27	0.25	0.55	<0.20	0.29	-	-	NV
Nickel (Ni)	µg/g	6.09	11.60	14.40	11.80	7.8	15.70	16	75	16
Phosphorus (P)	µg/g	339	**<u>834</u>**	**<u>850</u>**	587	590	**<u>900</u>**	600	2000	-
Potassium (K)	µg/g	400	1,110	1,700	1,040	790	1,790	-	-	-
Selenium (Se)	µg/g	<0.20	0.70	0.76	0.28	<0.40	0.69	-	-	NV
Silver (Ag)	µg/g	<0.10	<0.10	<0.20	<0.10	<0.20	<0.20	-	-	0.5
Sodium (Na)	µg/g	159	287	230	206	190	230	-	-	NV
Strontium (Sr)	µg/g	121.0	87.3	139.0	101.0	131.0	149.0	-	-	-
Sulfur (S)	µg/g	<1000	1,200	<2000	<1000	<2000	<2000	-	-	-
Thallium (Tl)	µg/g	<0.050	0.074	0.10	0.062	<0.10	0.120	-	-	NV
Tin (Sn)	µg/g	<2.0	<2.0	<4.0	8.5	<4.0	<4.0	-	-	-
Titanium (Ti)	µg/g	120	130	207	211	208	232	-	-	-
Tungsten (W)	µg/g	<0.50	<0.50	<1.0	<0.50	<1.0	<1.0	-	-	-
Uranium (U)	µg/g	0.754	0.715	0.720	0.735	0.650	0.720	-	-	NV
Vanadium (V)	µg/g	13.40	17.60	23.1	22.2	15.6	25.4	-	-	NV
Zinc (Zn)	µg/g	21.2	47.2	57.0	41.3	30.4	66.1	120	820	120
Zirconium (Zr)	µg/g	<1.0	1.4	<2.0	<1.0	<2.0	<2.0	-	-	-

Notes:
1. Lowest Effect Level (LEL) and Severe Effect Level (SEL) from the 1993 MECP "Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario".
2. Table 1 Background Site Condition Standards for Sediment from the 2011 MECP "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act".
3. Results higher than corresonding guideline or standard are shown in **BOLD** and <u>underlined</u>.
4. "NV" indicates no value derived. "-" indicates no applicable standard or not analysed.

5 ECOLOGICAL IMPACTS AND BENEFITS OF THE COLDSTREAM DAM

The International Union for Conservation of Nature has designated the Sydenham River as one of thirteen freshwater Key Biodiversity Areas in Canada. This is due to the diversity of freshwater species supported by the Sydenham River. The Sydenham River is home to 34 mussel species and 80 fish species as well as many other semi-aquatic species such as turtles, snakes, amphibians, and dragonflies. Some of these species are designated as Species at Risk and are found nowhere else in Canada or remain in only a few locations globally.

As noted in the 2018 Sydenham River Recovery Strategy (Strategy) there are a number of threats to aquatic Species at Risk that inhabit the Sydenham River. Specifically, dams are identified in the Strategy as negatively impacting aquatic habitat by causing thermal warming, impacting normal sediment transport processes and sediment deposition, and posing a barrier to fish migration and mussel distribution. The identified impacts and benefits of the Coldstream dam are discussed in the following sections:

5.1 Sedimentation and Sediment Distribution

Sediment loading and turbidity are some of the major factors affecting aquatic species in the Sydenham River. Increases in sediment loads over time can be attributed to land use practices such as agricultural activity, lack of riparian areas and erosion.

Benefits of Dam Removal:

The Coldstream dam interrupts natural sediment transport which degrades aquatic habitat for Species at Risk downstream of the Coldstream dam. If the dam was removed, natural sediment transport would be restored which would benefit downstream populations of fish, mussels and turtles which rely on these sand and gravel substrates for various life stages.

Possible Negative Impacts of Dam Removal:

Although natural sediment transport and loading is a benefit to the aquatic habitats downstream, the dam currently decreases the rate of downstream siltation. Silt, unlike sand and gravel, can negatively impact species downstream by increasing turbidity and making it difficult for species to fulfill their life cycle requirement. Silt can also smother and suffocate sedentary species like mussels or fish eggs. With the amount of silt that has accumulated behind the Coldstream dam, additional study is recommended to determine silt transport rates and the affected downstream area if the decision is made to remove the dam and allow sediment to naturally migrate downstream.

5.2 Water Temperatures

Water temperature plays an important role in aquatic ecosystems and can directly impact the species composition of an area.

Water temperature loggers were placed upstream of the Coldstream dam head pond and downstream of the dam during the summers of 2016, 2017 and 2018.

During these summers, the water temperature significantly increased from upstream to downstream of the dam. The following **Table 5** summarizes the average upstream and downstream water temperatures for the years 2016, 2017 and 2018. The following averages are for temperatures at 4 pm each day when normally stream temperatures reach their daily maximum before cooling off to varying degrees overnight.

Table 5

Summer Water Temperatures Upstream and Downstream of the Coldstream Dam for 2016, 2017 and 2018

Year	Average Upstream Water Temperature at 4:00 pm.	Average Downstream Water Temperature at 4:00 pm.	Increase in Average Water Temperature due to Coldstream Dam at 4:00 p.m.
2016	20.96 C	22.91C	1.95 C
2017	19.24 C	22.31 C	3.07 C
2018	20.19 C	23.56 C	3.37 C
Average	**20.13 C**	**22.93 C**	**2.80 C**

As per **Table 5** above, the average increase in water temperature due to the dam head pond was 2.80 C. This is a significant increase in summer water temperatures that could limit cold and cool water fish species downstream of the dam. The warming effect of impoundments such as the Coldstream Dam are also anticipated to increase due to warmer summer air temperatures resulting from climate change.

5.3 Water Quality

Increase in summer water temperatures and excess nutrients can have a negative effect on the aquatic ecosystem, including change in species composition, increase in algal blooms and depleted oxygen levels.

The Coldstream dam is situated within the East Sydenham River Headwaters sub-watershed. The geology in this sub-watershed includes sand and gravel areas which contribute groundwater, which encourages cool/cold-water fish communities. As per Section 5.2, the Coldstream dam causes some warming of the Sydenham River during the summer months.

As such, the dam is likely causing warming of the river water downstream of the dam as well as warmer temperatures in the head pond. As sediment accumulates behind the dam the reservoir has become shallower, leading to quicker warming of water and likely contributes to algal blooms during the open water period. Excess nutrient loading from upstream sources, including agriculture, may also contribute to algae blooms.

The following photos (**Photo 3** and **Photo 4**) depict unusually heavy algae blooms in the Coldstream dam head pond in May, 2022.

Photo 3: Algal bloom in the Coldstream dam head pond in May 2022. View to the southwest to the dam area from the Coldstream Conservation Area on the northwest shore. (SCRCA photo.)

Photo 4: Algal bloom in the Coldstream dam head pond in May, 2022. View to the east toward Ilderton Road from the Coldstream Conservation Area on the northwest shore. (SCRCA photo.)

5.4 Fish Passage

The Sydenham River is home to eighty (80) fish species, ten (10) of which are listed as Species at Risk. Barriers and modifications to natural stream flows can impact fish movement through the ecosystem to fulfill life cycle requirements.

Benefits of Dam Removal:

The Coldstream dam limits the ability of fish to move freely through the East Sydenham River and access a wide variety of fish habitat types. Removal of the dam would restore fish passage upstream.

Possible Negative Impacts of Dam Removal:

Invasive species like Round Goby (Neogobius melanostomus) are currently unable to move upstream of the Coldstream dam. If Round Goby were to first move upstream past the Head Street dam in Strathroy, removal of the Coldstream dam would allow Round Goby access to much of the entire watershed. Records show the current distribution is just below the Head Street dam. Round Goby, like many other invasive species, is prolific at reproducing and will outcompete native fish like Darters for food and other habitat resources.

The presence of Round Goby has shifted the feeding ecology of benthic species in the Sydenham River, as well as species with direct diet overlap such as the Eastern Sand Darter (Firth et al, 2021). As native species decline and natural hosts of mussel larvae (glochidia) are removed, the glochidia must attach to the next best option, being Round Goby. This results in the glochidia being unable to mature into juveniles and therefore do not survive.

A study by Tremblay et al in 2016 states "*N. melanostomus are likely acting as a sink for glochidia, whereby they prevent glochidia from reaching their intended hosts. This has negative implications for unionid species that exhibit high rates of infection and poor/no metamorphosis on N. melanostomus".* Without the Coldstream dam in place, Round Goby and other invasive species could move more freely upstream through the East Sydenham River which could impact native species in this area.

5.5 Mussel Distribution

As previously mentioned, the Sydenham River is home to 34 freshwater mussel species in the family Uniondae and is identified as the most mussel diverse watershed in Canada. These organisms are long lived filter feeders that strain out oxygen, food, and nutrients and also remove pollutants and suspended particles. Mussels are also sedentary or slow-moving organisms that often rely on host fishes to carry their larva (glochidia) upstream. Mussels rely on clear water to attract a host fish using their lures and releasing their larva into the water column.

Benefits of Dam Removal:

The existing Coldstream dam may hinder mussel distribution as host species (fish) are unable to move freely upstream due to the barrier created by the dam. Removal of the dam would allow for further movement of the mussels as the larva (glochidia) would be carried further by the host fish.

As previously noted, the dam impedes the natural transport of sand and gravel through the river system. This may result in less suitable downstream habitat and degraded mussel beds.

Possible Negative Impacts of Dam Removal:

As previously noted, the dam holds back silt and sand sediment. If the silt was allowed to wash downstream, the silt may negatively affect mussel habitat and limit essential life cycle processes such as reproduction, respiration and feeding.

6 GENERAL ANALYSIS OF SEDIMENT REMOVAL FROM THE COLDSTREAM DAM HEAD POND.

The following section evaluates generally possible options to remove the Coldstream dam in terms of managing the large volume of sediment in the head pond. As per previous sections, there is significant sediment build up in the head pond consisting of fine sand as well as silt and clay.

Section 4.4 summarizes the major findings of the January, 2023 GEO Morphix review of potential effect on channel formation and possible sediment release following removal of the Coldstream dam.

As per Section 4.4, GEO Morphix estimates a significant volume of sediment would be released from the head pond if the dam was removed.

However, the GEO Morphix review did not estimate the rate of transport of the released sediment through the downstream river channel. As such, if removal of the dam was seriously considered, additional evaluation of sediment management options would be recommended.

Section 7 discusses options for sediment management that would accompany dam removal. Two of the options include removal of sediment from the head pond before the dam is removed.

These two options are i) dredging of the head pond sediment with the full water level present in the head pond or ii) excavation of sediment from the head pond “in the dry” after a temporary channel (or temporary pipeline) is first constructed around the head pond.

With the above two options, the amount of sediment released downstream would be significantly less than if the river flow was allowed to naturally carve a new channel through the head pond sediment once the dam was removed.

If the river was allowed to carry the sediment downstream then two additional options are available being i) the dam is removed in stages (i.e. over three years) and the sediment is allowed to be carried downstream over an extended time frame or ii) the dam is removed entirely at one time and the sediment is allowed to be carried downstream in a relatively short period (i.e. over one year).

As sediment is released from the reservoir a portion would be deposited along the riverbed and edges of the East Sydenham River. Finer sediment particles will likely travel further and faster downstream then heavier sediment particles. The heavier sediment particles are likely to deposit in deeper portions of the riverbed and on the inside of river bends, where water velocities are reduced. The pool below the dam and the river reach a short distance below the dam would likely receive heavy sediment loadings. Finer sediment particles would likely be transported many kilometres downstream during high flows in the East Sydenham River.

These particles will likely continue to move downstream over time and eventually deposit in the Head Street dam head pond in Strathroy unless the Head Street dam had already been removed.

If the dam removal option selected allows sediment to wash freely downstream, additional study is recommended to estimate sediment transport rates and the area(s) along the East Sydenham River that will be most affected by the sediment transport.

However, without additional study, the following general conclusions are provided at this time:

i) As per later sections of this report, it does not appear practical to dredge or excavate the sediment from the head pond before the dam is removed. A similar conclusion was reached by GEO Morphix in their January, 2023 evaluation of channel formation in the head pond sediment.

ii) Slow release of head pond sediment over say three years (by step wise removal of the dam over three years) would likely pose lesser risks to the downstream channel condition than if the dam was completely removed in one work season.

Based on the above, it is recommended that further modelling of sediment transport downstream of the dam site be carried out if a decision was made in principle to remove the dam without first removing significant volumes of sediment from the head pond.

7 METHODS OF DAM REMOVAL AND SEDIMENT MANAGEMENT STRATEGIES

This section discusses various options to remove the Coldstream dam if a decision was made to remove the dam in the future. As per previous sections, there is a significant amount of sediment in the dam head pond. Management of sediment is therefore a major consideration when alternatives for dam removal are evaluated.

7.1 Dam Removal Methodologies

Dams can be removed using several methods as follows:

i) Full removal of the dam during one summer work period.

ii) Gradual removal of the dam over two or more seasons where stop logs (if existing) are removed in the first year followed by full removal of the dam in the second year or full removal of the dam over a number of subsequent years.

iii) Partial removal of a dam whereby enough of a dam is removed to achieve environmental goals (i.e. restore fish passage and reduce summertime heating of stream water temperatures) but retain some of the dam to retain sediment storage capacity or to provide some other social or economic benefit that would accrue by retaining some level of ponding behind the remaining portion of the dam.

iv) Potentially leave dam in place and construct new stream bypass channel around the entire headpond.

With the above general options, there are the following sediment management options:

i) Option 1 - Prior to dam removal, remove the sediment from the head pond by use of a hydraulic dredge. This requires a floating dredge system that pumps a large volume of sediment mixed with water to a receiving basin that would allow the sediment fraction to settle and the clear “decant” water to return to the river

ii) Option 2 - As part of the dam removal process, construct a large bypass channel or pipeline around the head pond and dam and discharge the river flow below the dam site. Once the stream bypass is established, mechanically remove head pond sediment “in the dry” using large excavation equipment and dump trucks etc.

iii) Option 3 - Remove complete dam in one season, or remove the dam in stages over several years, and allow river flow to transport the sediment in the head pond downstream naturally.

iv) Option 4 – Leave sediment and dam in place if new stream bypass channel constructed around entire head pond.

Table 6 provides a summary of seven dam removal options including sediment management strategies for each option. This includes Option 6 which is construction of a new bypass channel around dam and head pond and Option 7 which is “do nothing” (leave dam in place as is).

For all options proposing dam removal (Options 1, 2, 3, 4 and 5), the dam removal component of the overall project is of moderate complexity as the dam height (3.35 m) is of moderate height and the volume of fill and rock armour stone beside the sheet pile dam is relatively large.

However, access to the south end of the sheet pile section of the dam is good for large equipment and access to the north end of the dam is also relatively good. These factors would allow the dam to be removed relatively easily, compared to the sediment management options for each option which would be more complex.

As per **Table 6**, removal of the dam would also have social and environmental advantages and disadvantages. While removal of the head pond would negate some recreational opportunities, swimming is currently very restricted in the head pond due to high bacteria levels and the occurrence of heavy algae growth in some years. Significant sediment accumulation in the head pond over the years has also reduced the recreational benefits of the dam.

Generally, there would likely be an overall environmental benefit to removing the dam by restoring fish passage, restoring natural sediment transport and reducing summer water temperatures. Option 6 (new stream channel constructed around dam head pond) also achieves most of these benefits.

Sediment management would be a major challenge for most options, and as noted on **Table 6**, pre-consultation with regulatory agencies regarding options for sediment management is recommended.

Sediment management costs could be very large if sediment removal is to be completed using a hydraulic dredge or is excavated mechanically. Such large costs include the costs for construction of a very large settling pond (lagoon) for the dredging option or a temporary bypass channel or pipeline system for the option to remove sediment from the head pond “in the dry”.

Preliminary cost estimates for the seven different dam removal options (including the “do nothing” option) are provided in **Table 7.**

As per **Table 7**, costs to remove just the dam (not including sediment management costs) are estimated to be $500,000 to $1,600,000 depending on which option is considered. Option 5 (partial removal of the sheet pile dam) has the lowest estimated cost, with the highest cost being Option 3 where the dam is removed in steps over several years with water remaining in the head pond at declining levels as the dam is removed.

Much higher costs are assigned to active sediment management for Options 1 and 2. With these Options, sediment is removed by dredging or mechanical excavation before the dam is removed. Such active sediment management costs are estimated to cost at least $1,800,000 in addition to the actual dam removal costs. As discussed in the next sections, these active sediment management costs would likely have significant technical challenges and potentially high social impacts.

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TABLE 6
Sediment Management and Dam Removal Options
Potential Removal of the Coldstream Dam

Sediment Management and Dam Removal Options	Economic Considerations	Technical Obstacles	Social Impacts	Environmental Impacts	Regulatory Concerns
Option 1: **Dredging of sediment with water in head pond followed by complete dam removal.**	• Very expensive sediment management option as very large volume of sediment/ water mixture will be produced. • Dam removal will be relatively inexpensive.	• Onsite sediment dewatering required. Very large settling pond likely required. • Ultimate sediment disposal requirements could be difficult. • Equipment mobilization, operation and demobilization required.	• Large area required for sediment dewatering in current park area. Major impact to park users.	• Aquatic species (fish, turtles, etc.) in the head pond may be entrained in the dredged sediment. • Fish migration provided. • Thermal impacts to water temperature from head pond are eliminated.	• Regulations regarding sediment disposal on off-site lands are now quite stringent.
Option 2: **Temporary bypass of river around dam. Excavate sediment "in the dry" and complete dam removal.**	• Expensive sediment management option. • Temporary bypass pipe or channel around head pond will be expensive to construct. • Least expensive dam removal option.	• Construction of bypass pipe or new channel around the reservoir could be very difficult to design and locate. • Ultimate sediment disposal requirements could be difficult. • Excavating wet sediment with equipment within pond footprint likely difficult.	• Bypass pipe or channel could be a safety hazard until dam and sediments are removed. • Large area of deep, soft sediment could be a danger to pedestrians.	• As head pond level lowers, aquatic species may become trapped in the drying up reservoir. • Fish migration provided. • Thermal impacts to water temperature from head pond are eliminated.	• Regulations regarding sediment disposal on off-site lands are now quite stringent.
Option 3: **Remove dam in phases over ± 3 years. Allows slow release of sediment over 3 years.**	• More expensive dam removal option than Option 4. • No significant cost for sediment management.	• Maintaining structural integrity of dam is required over ± 3 year process. • The long timeline to remove dam may be difficult contractually.	• Current reservoir area could be a safety hazard for multiple years due to large areas of deep, soft sediment.	• Sediment is released downstream at a relatively high rate. • Sydenham River downstream of dam will become turbid following each step of dam removal due to entrained sediment. • Fish migration provided. • Thermal impacts to water temperature from head pond are eliminated.	• LIRA (MNRF) permitting may be complicated due to partial removal of dam in steps. • Regulators may not allow the periodic release of large volumes of sediment.
Option 4: **One time removal of complete dam. Allow one time release of sediment.**	• Relatively inexpensive dam removal option. • No significant cost for sediment management.	• Water velocity management required to allow head pond to drain slowly.	• Current reservoir area could be a safety hazard for one or two years due to large areas of deep, soft sediment.	• Very large amount of sediment will be transported downstream in a relatively short timeframe. • Sydenham River downstream of dam will become turbid due to entrained sediment. • Fish migration provided. • Thermal impacts to water temperature from head pond are eliminated.	• Regulators may not allow the sudden release of large volumes of sediment.
Option 5: **Partial dam removal. Construct "rocky ramp" step pool system to provide fish passage.**	• Least expensive dam removal option. • No significant cost for sediment management.	• Water velocity management required to allow head pond to drain slowly.	• Current reservoir area could be a safety hazard for one or two years due to large areas of deep, soft sediment.	• Fish migration provided. • Thermal impacts to water temperature from head pond are largely eliminated. • Sediment is partially released downstream at a relatively high rate. • Sydenham River downstream of dam will become turbid following partial dam removal due to entrained sediment.	• Regulators may not allow the sudden release of sediment.

Sediment Management and Dam Removal Options	Economic Considerations	Technical Obstacles	Social Impacts	Environmental Impacts	Regulatory Concerns
<u>Option 6:</u> **Construct permanent new, natural stream channel around dam headpond. Leave dam, head pond and sediment in place as is.**	• Cost to build permanent bypass stream channel quite high. • Avoids cost of dam removal and cost of removing sediment.	• Geotechnical investigations required to confirm remaining land between water in head pond and new channel will be structurally stable and hydraulically stable. • Bridges (pedestrian and/or vehicle bridges) to cross over new stream channel may be required to access north end of dam.	• This Option maintains a lake environment at the site and provides a new, natural stream channel area for viewing, nature enjoyment and passive recreational use. • As the dam deteriorates it will eventually become safety hazard.	• Fish migration provided. • Thermal impacts to water temperature from head pond are largely eliminated as flow through head pond is significantly reduced. • Sediment release from the head pond is avoided.	• This option requires a large volume of earth fill to be removed to construct new, natural stream channel. Need to follow Excess Fill regulations for disposal of fill elsewhere. • As the dam's structural integrity degrades over time, regulators may be concerned with public safety and dam failure.
<u>Option 7:</u> **Do nothing.**	• No immediate cost. • Potential for increased maintenance costs as the dam deteriorates.	• Dam may need to be structurally reinforced in the future.	• As the dam deteriorates it will eventually become safety hazard.	• The dam obstructs fish migration. • The dam deprives aquatic species (including SAR) downstream of dam of required sediment. • The head pond continues to warm up water temperatures during the summer.	• As the dam's structural integrity degrades over time, regulators may be concerned with public safety and dam failure.

TABLE 7
Sediment Management and Dam Removal Options - Preliminary Cost Estimate
Potential Removal of the Coldstream Dam

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Sediment Management and Dam Removal Options	Capital Cost Estimate for Dam Removal	Capital Cost Estimate for Sediment Removal	Total Capital Cost Estimate	Comments
Option 1: **Dredging of sediment with water in head pond followed by complete dam removal.**	$1,100,000 to $1,300,000	>$2,000,000 Need to construct very large sediment/dewatering lagoon on north side of head pond.	>$3,100,000 to $3,300,000	Cost to design, approve and construct large sediment/dewatering pond difficult to estimate. Would also be final restoration costs of dewatering pond once sediment dries. Major impact on conservation authority site project.
Option 2: **Temporary bypass of river around dam. Excavate sediment "in the dry" and complete dam removal.**	$700,000 to $900,000	>$1,800,000 Cost to build large bypass channel or large bypass pipe around north side of head pond would be extremely high.	>$2,500,00 to $2,700,000	Technically difficult. The bypass channel/pipeline likely would need to be quite large to accommodate a reasonably large flow, i.e. ± 5 m^3/s. Deep excavation likely required through higher lands on northern side of pond. Removal of excavated sediment from "dry pad" likely difficult due to wet, soft soil conditions.
Option 3: **Remove dam in phases over ± 3 years. Allows slow release of sediment over 3 years.**	$1,600,000	Essentially zero cost for active sediment management as sediment would slowly wash downstream. Assume $300,000 for bioengineering stabilization of emerging stream banks.	$1,900,000	Second lowest overall cost. Agreement from all review agencies (DFO, MECP, MNRF and SCRCA) required in advance to allow downstream sediment release from head pond.
Option 4: **One time removal of complete dam. Allow one time release of sediment.**	$1,100,000 to $1,300,000	Essentially zero cost for active sediment management as sediment would wash downstream. Assume $300,000 for bioengineering stabilization of emerging stream banks.	$1,400,000 to $1,600,000	Lowest overall cost. Agreement from all review agencies (DFO, MECP, MNRF and SCRCA) required in advance to allow downstream sediment release from head pond.
Option 5: **Partial dam removal. Construct "rocky ramp" step pool system to provide fish passage.**	$500,000 for partial dam removal in one year.	Essentially zero cost for active sediment management as sediment would wash downstream. Assume $300,000 for bioengineering stabilization of emerging stream banks.	$800,000	Lowest overall cost. Provides fish passage and minimizes downstream sediment migration.
Option 6: **Construct permanent new, natural stream channel around dam headpond. Leave dam and sediment in place as is.**	New channel would be approximately 350 m long and designed for major flood flows of approximately 100 cubic meters per second. The cost of the new channel is estimated to be $1,800,000 to $2,100,000.	No cost. Sediment remains in place.	Cost for new permanent, stream channel estimated to be $1,800,000 to $2,100,000.	Cost similar to Options 3 and 4 but more than Option 5. Long term, dam removal and sediment management may still be required.
Option 7: **Do nothing.**	Theoretically zero cost. However, ultimately, dam will reach end of service life and will need to be repaired, rebuilt or removed.	No cost.	Theoretically zero.	Volume of sediment in head pond will continue to increase over time. With inflation and extra sediment, future costs for dam removal will increase compared to current costs.

Note: Capital costs do not include consultation, engineering or permitting costs.

A summary of the seven options is provided as follows:

7.1.1 Option 1 – Dredging of Sediment from the Head Pond Before the Dam Is Removed.

This option assumes a floating barge would be used to pump a large volume of water and sediment mixture from the head pond in advance of dam removal.

The additional volume of water mixed with the sediment could be very large. For instance, the total volume of sediment above the Coldstream dam is estimated to be 22,500 cubic meters. Even if only half of the sediment was removed by dredging (11,000 cubic meters) there could be easily twice that amount of water entrained with the true sediment (i.e. 2 cubic meters of water per cubic meter of sediment). If so, the total volume of water/sediment removed would be approximately 33,000 cubic meters. A large settling pond would be required to allow the sediment particles to settle out of the water. If there was enough settling time, the water exiting the pond should be clear enough to run back into the river downstream of the dam.

If the floating dredge system featured a 12 inch diameter discharge pipe, and the velocity of the pumped flow was 1.2 m/s (to maintain entrained sediment in suspension) the pump discharge rate would be 70 liters per second (approx. 250 cubic meters per hour.). For a ten hour workday, the total discharge would be 2,500 cubic meters. If one third of the total volume was sediment, then there would be approximately 850 cubic meters of sediment removed per day.

To remove the above 11,000 cubic meters of sediment, the process would require close to 13 days of pumping. This represents about two to three weeks of pumping and if this rate of productivity could be sustained, then a sediment removal target of 11,000 cubic meters could be achieved in one summer season.

However, the volume of a temporary sediment settling pond would be quite large. If a 2 m deep lagoon was assumed, and that sediment storage of only 1 m depth was assumed, then a settling pond (lagoon) with an area of at least 11,000 square meters would be required for a target volume of just half of the total sediment volume.

A pond of therefore approximately 1 ha would be required with total water depth of 2 m (in addition to say 0.6 m freeboard above the water surface) meaning that a large lagoon with a volume of 20,000 to 25,000 cubic meters would be required with a depth of 2.6 m. If the settling pond was rectangular in shape with the length 3 times the width, the overall dimensions would be about 65 m wide by 200 m long. Overall, a lagoon of this size would take up a considerable portion of the Conservation Authority property on the north side of the head pond. There would also be costs and analytical costs associated with transporting the fill generated by construction of the settling pond offsite.

The capital cost of a settling pond of this size would likely exceed $500,000 at a nominal construction cost of $20 per cubic meter. The outlet would also have to be designed to allow an outflow rate of 70 liters per second of settled, clear overflow water. The inlet design would have to feature energy dissipation to avoid eroding the inlet area. The overall site would likely have to be fenced off to prevent the public from entering the settling pond area. Once all costs are considered, the cost to construct the lagoon would likely exceed $1 M. In addition, the actual costs of the dredging equipment and manpower etc. would be in addition and is estimated to be between $500,000 to $1,000,000.

The actual dam removal cost would be relatively high ($1.1 M to $1.3 M) as the dam would be removed with the head pond full of water.

The other consideration is the quality (clarity) of water being discharged from the downstream end of the lagoon. Assuming the clear water surface volume of the lagoon is 11,000 cubic meters, and with an inflow rate of 70 l/s, the settling time in the pond would be approximately 2 days. Depending on settling rates associated with various particle sizes, 2 days of settling time may not be enough to ensure relatively clear water leaving the settling pond.

Assuming the lagoon was built and used over the course of one summer, decommissioning costs of the lagoon would need to be considered, including drying out the sediment which could be problematic depending on weather conditions and design details of the lagoon (i.e. bottom level of lagoon relative to final water level in the head pond area). Such decommissioning costs, including possible trucking away of the sediment after drying, could be very high. A general alternative would be regrading the lagoon and storing the sediment permanently on site.

As per **Table 7**, the preliminary capital cost of Option 1 (excluding engineering, planning and permitting costs) is estimated to be $3.1 M to $3.3 M. These costs assume the sediment stays on site.

In addition is the environmental concerns associated with a dredging system pumping a sediment/water slurry from the head pond. The head pond contains fish and other aquatic animals and, normally, Department of Fisheries and Oceans requirements dictate fine screening of bypass pumping system to avoid entrainment of even very small fish and other aquatic life in the pumping system. The large flow volume capacity, and heavy solids contents, of a pumped dredging system would suggest fine screening is impractical due to frequent plugging of a screening system.

7.1.2 Option 2 – Construct a Bypass Channel (or Pipeline) Around Dam Head Pond and Then Mechanically Remove Some or All of the Sediment “In the Dry”.

This option assumes that first a temporary bypass channel is built around the dam head pond. In the case of the Coldstream dam, it is assumed that this channel (or bypass pipeline) would be constructed around the north west side of the head pond on Conservation Authority lands.

The total length of channel or bypass pipeline would need to be approximately 350 m long. The channel or pipeline would start upstream of the head pond and require a coffer dam system to direct the water into the bypass system.

The capacity of the new bypass channel (or pipeline) would need to be substantial. General guidance provided by MNRF for other dam removal projects suggests the capacity of the temporary bypass channel should be adequate for a 2 year return summer flood flow. In the case of the Coldstream dam, the average summer flow is only 0.28 cubic meters per second. Conversely, the 2-year return flood flow (for all seasons) is much larger (19 cubic meters per second). Overall, a summer flood flow capacity of perhaps 2 to 5 cubic meters per second would be required to provide a balance between the risk of flow capacity exceedance of the channel (or pipeline) versus costs to build an even larger capacity bypass channel or pipeline.

If a channel was constructed for say 5 cubic meters per second, and assuming a slow flow velocity of 1.0 m/s, a channel 5 m wide by 1 m deep (plus freeboard) would be required. If freeboard height of 0.5 m was assumed, a rectangular channel with a cross section of 1.5 m deep by approximately 14 m wide at the top (giving 3:1 stable side slopes) would be required.

The nominal excavation volume of this channel would be approximately 14.25 cubic meters per meter of channel. However, the lands on the north west side of the pond rise rapidly from the water surface by 2 to 3 m, and total excavation to construct an open channel would likely be in the range of 30 to 40 cubic meters per meter. Total volume would be approximately 13,000 cubic meters for a channel length of 350 m. Based on $30 per cubic meter for excavation, the nominal cost would be $390,000 plus the added cost for removal of this soil, at least temporarily, from the site.

As a second option, a buried bypass pipeline could be installed. However, the pipeline(s) would also need to have a capacity of 5 cubic meters per second. Normally, a pipeline would consist of one (or two) large diameter pipes. Water velocity would have to be quite low (i.e. 0.6 m/s) to avoid excessive friction losses in the pipe to prevent the water level entering the pipeline from backing up and overflowing the upstream end of the pipeline during high stream flow events.

If a two pipe system was employed (2.5 cubic meters per second per pipeline), the diameter of each pipe would be approximately 1.8 m in diameter (6’ diameter) to convey the flow at low velocity.

Overall, a bypass pipe system would likely exceed material and installation costs of $2,500 per meter. The actual cost could be much more recognizing that essentially all of the pipeline would need to be built below the current water level in the head pond. Even if the pipeline was well set off from the north edge of the head pond, the groundwater level would likely be at the same level as the head pond surface level. This same groundwater level challenge would also apply to the bypass channel sub-option first described. Given a 350-meter-long pipeline, the cost for the pipeline alone would be approximately $875,000. Constructing the outlet with erosion protection, and a major coffer dam system at the inlet, would likely result in overall costs of approximately $1,300,000.

With this option, sediment would be excavated “in the dry” from the head pond. In reality, to excavate in the dry, there would need to be zero water flow entering the head pond through the upstream coffer dam. This is likely unrealistic as the working depth in the head pond would be below the water level upstream of the head pond. As well, there would be ground water seepage and surface runoff entering the pond. All combined, the sediment would be wet and loose and access into the pond area for excavation and hauling away of sediment (i.e. track excavators and dump trucks) could be very difficult without equipment sinking into the soft and wet material.

Disposal of the sediment would be assumedly off site. Assuming half of the sediment was removed from the site (11,000 cubic meters) then this sediment would be subject to new excess fill regulations that would require extensive testing of the sediment for contaminants and careful tracking of the disposal site for the material among other requirements of the relatively new *On-Site and Excess Soil Management Regulation (Ont. Reg 406/19).* Likely, costs for excavation, loading of trucks and off loading of the sediment at another location would likely be at least $40 per cubic meter and thus sediment disposal costs would likely exceed $500,000 with testing and other costs.

As per **Table 7**, the preliminary capital cost of Option 2 (excluding engineering, planning and permitting costs) is estimated to be $2.0 M to $2.2 M. It is also difficult to assess the practicality of removing wet sediment from the head pond and transporting to an acceptable disposal site.

7.1.3 Option 3– Remove Dam Over Several Years. Remove Approximately 1/3 of the Dam Each Year for Three Years. Allow Sediment to Be Washed Downstream Over Several Years As Dam Is Removed

As per Options 1 and 2, removal of sediment before the dam is removed may not be feasible or cost effective due to the large volume of sediment in the head pond and difficulty in constructing a large settling pond for dredging or a bypass pipeline or channel.

As such, with Option 3, it is assumed that government agency approvals would be received in advance that allows the sediment to naturally transport downstream from the head pond over time. Option 3 assumes the dam will be removed in stages over three years. This should spread the release of sediment over three years and therefore minimize concerns with sediment transport downstream of the dam.

With Option 3, it is assumed that say the top 1.2 m of the dam would be removed in year 1. In practise this could mean an initial series of notches is cut in the sheet piling wall to drop the water level in the head pond by 1.2 m over the course of say two weeks. Subsequently, the balance of the sheet pile above the new water level could be removed along with removal of the armour stone above the new level.

Given the average water depth now is approximately 1.1 m above the accumulated sediment, some sediment would be mobilized during the first year removal.

The next year, an additional 0.8 to 1.2 m of sheet pile height could be removed along with the armour stone above the new water level. This second lowering would increase substantially the volume of sediment released over time.

In the third year, the balance of the dam would be removed. More sediment would be released over time, and it could take several seasons for the new stream channel to fully develop. While a substantial volume of sediment would be washed downstream in the three years, there would likely still be a significant volume of sediment that would remain in the head pond that would likely revegetate with grass and shrubs naturally.

As noted, a stable channel through the sediment therefore may take several years to fully develop. As per the GEO Morphix report, channel meander may be significant and total volumes of sediment released from the head pond over time could be very large. However, removal of the dam over several years would result in a relatively gradual release of sediment over several years. This should minimize any negative impacts of sediment transport downstream of the dam.

In practise, it may be difficult to remove a dam slowly over several years. In most cases, an experienced construction company with heavy equipment is hired to remove the dam. Mobilization of equipment, preparation of the site for construction, providing equipment access etc. and other economic factors usually favours completion of a dam removal project in a relatively short, one season period with no major interruptions. As well, if grant funding is available, the terms of the grant funding may require the complete project be done in one season. As well, part removal of the dam each year over several years can lead to complications with obtaining permits from regulators. Part removal of the dam may require the proponent (the dam owner) to prove the partially removed dam remains safe to the public and structurally stable until the full dam is removed.

The main benefit of a slow dam removal process is, theoretically, that sediment management can be improved and major loss of stored sediment from the head pond to the downstream watercourse can be avoided.

As per **Table 7** the preliminary capital cost of Option 3 (excluding engineering, planning and permitting costs) is estimated to be $1,900,000. The cost for dam removal is higher as the complete dam is removed partially every year and the contractor (or contractors) have to remobilize etc. to the project site over a three year period.

7.1.4 Option 4 – Remove Entire Dam in One Year. Allow Sediment to Be Washed Downstream Over One Year After Dam Is Removed.

This option is the same as Option 3 except the dam is completely removed over one year.

With this case, the full water drop (3.35 m) will occur relatively quickly, and water levels would stay low and consistent for larger flood flows as well as smaller flows as the full width of the existing dam (45 m wide) would be available to convey large flood flows.

More sediment would migrate downstream in the first year though total sediment transported downstream would be essentially the same for Option 3 and Option 5 though sediment discharge would be more spread out over time than with Option 5.

As per **Table 7**, the preliminary capital cost of Option 4 (excluding engineering, planning and permitting costs) is estimated to be $1,400,000 to $1,600,000. Costs for this Option is relatively low as there is no significant active sediment management costs and the dam is fully removed in a single year construction contract.

7.1.5 Option 5 – Remove Portion of Dam in One Year. Provide Step Pool System Downstream of Remaining Dam to Provide Fish Passage Through Lowered Dam Crest. Allow Relatively Small Portion of Sediment to Be Washed Downstream.

This Option is part removal of the dam only. With this option, the top portion of the dam is removed and a smaller flow way through the central portion of the remaining sheet pile wall is also removed.

The intent is to allow a new channel to carve through the upper sediment layer but provide a grade control level, and central flow through location in the remaining dam, to control upstream channel formation and minimize downstream sediment migration.

Figure 5A provides a cross section view of the existing dam on top and a second view below showing one possible option for partial dam removal. As per the drawing, it proposed that the top 0.9 m of the dam be first removed which would drain a significant amount of water from the head pond but leave a water level that is still slightly above the top of sediment in the head pond.

The second step would be removal of additional sheet pile to provide a spillway through the remaining sheet pile wall. See **Figure 5B**. The spillway is 0.8 m deep by 8.8 m wide with additional end slopes at 3:1 slope. In addition, a 0.5 m deep by 2 m wide low flow channel would be cut through the sheet pile wall below the main spillway for a low flow channel.

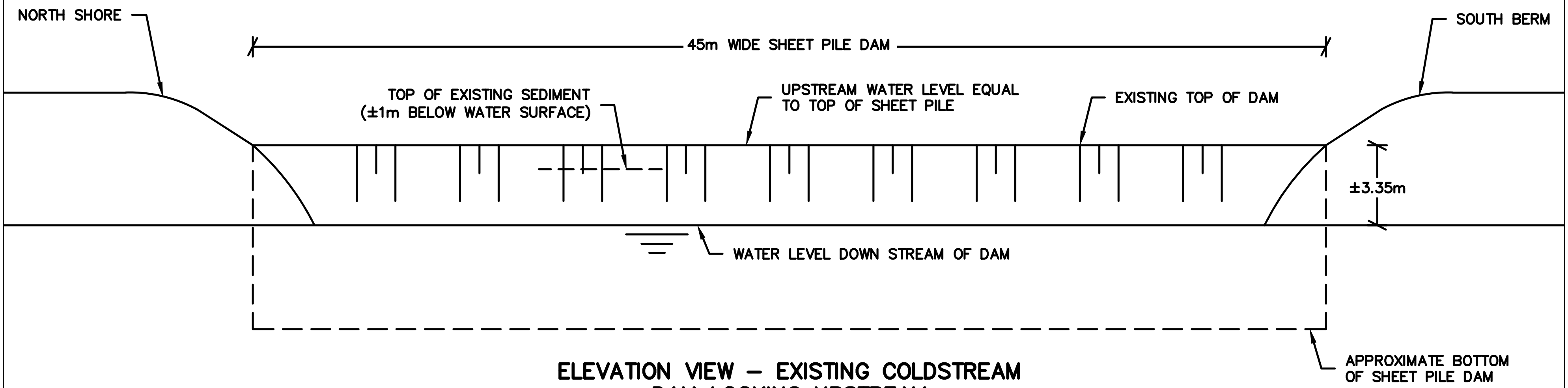
Based on the spillway geometry, the cross section area of sediment upstream of the flow way (including low flow channel) is approximately 6 square meters. If this area of new channel formed upstream for the entire length of the head pond (approximately 500 m), then approximately 3,000 cubic meters of sediment would move downstream. If 50% more sediment was lost due to channel meanders forming upstream, then total sediment lost would be approximately 4,500 cubic meters. This compares to an estimated volume of 22,500 cubic meters of sediment in the head pond.

The cross section of the spillway, as above, is approximately 6 square meters. The estimated 2 year return flood flow is 19 m^3/s. At a nominal velocity of 3 m/s, the spillway has a capacity of approximately the 2 year return flood flow. This flow will be sufficient to carve a stable channel through the sediment upstream but leave a significant flood plain area on each side of the channel. Under very large flows (i.e. 50 and 100 year flood flows), the water level would rise and flow over the entire top of the remaining dam.

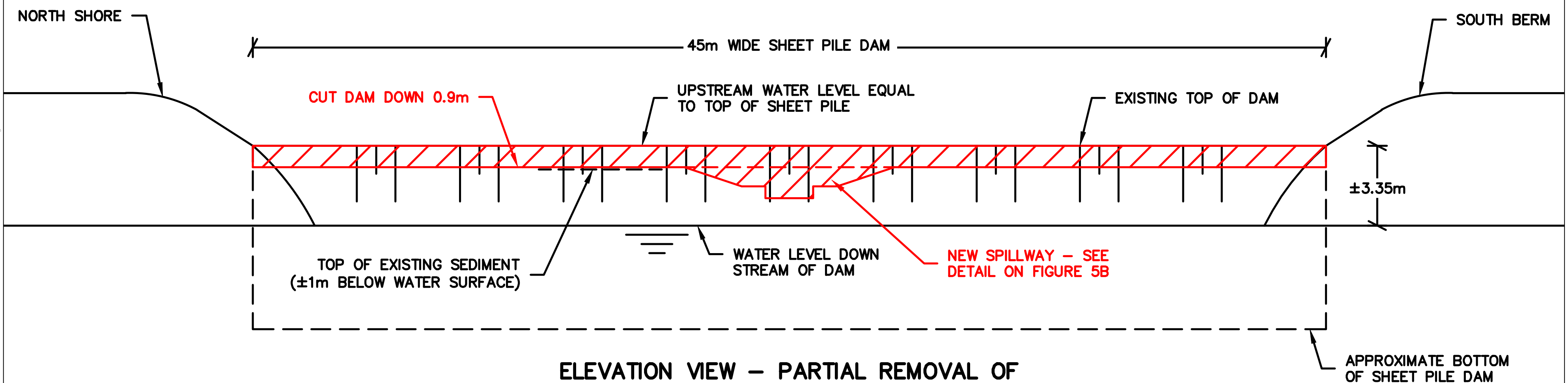
The cross section of the low flow portion of the spillway is 2 m wide by 0.5 m (1 square meter) which should convey 2 m^3/s at a nominal flow velocity of 2 m/s. This exceeds the average, annual stream flow of 0.7 m^3/s by approximately 3 times. As such, normally, all stream flow would pass through the low flow portion of the spill way.

Downstream of the low flow spill way, the large armour stone on site would be repurposed to form a series of 200 mm (8") high step pools to provide a rocky ramp style fishway from the river below up to the low flow spillway. The sheet pile dam now has armour stone for approximately 11 m downstream of the dam to the river below. This would allow for 5 step pools with a nominal length of 2 m each (and a drop of 8" from pool to pool) to be constructed over the 11 m. This should allow migration of fish up through the remaining dam for even weak swimming fish.

Figure 5C shows a similar step pool constructed on Armstrong Creek in Markdale, Ontario. The step pool system was part of a dam removal project on this stream. In this case, the dam on Armstrong Creek was an earthen berm dam and the intent was to remove most of the dam but leave the dam base intact to retain most of the pond sediment. The step pool allows the dam base to remain but also to restore fish passage up Armstrong Creek.



ELEVATION VIEW – EXISTING COLDSTREAM DAM LOOKING UPSTREAM



ELEVATION VIEW – PARTIAL REMOVAL OF COLDSTREAM DAM LOOKING UPSTREAM

0 10 20

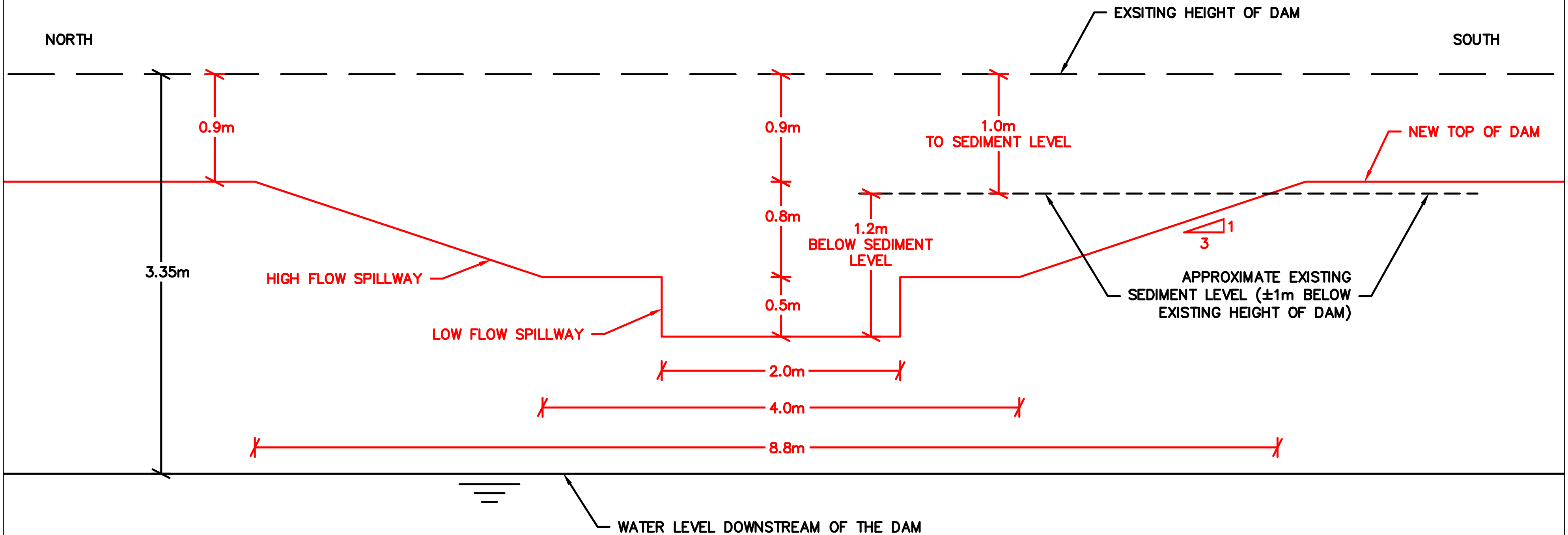
Meters

SCALE 1:250

PARTIAL REMOVAL OF THE COLDSTREAM DAM

GSS ENGINEERING CONSULTANTS LTD

Design:	JTG
Drawn:	JTB
APPROVED:	JTG
Date:	JULY 2023
Scale:	1:250
FILE No.	21-118
FIG. No.	5A



ELEVATION VIEW – DETAIL OF NEW SPILLWAY

SCALE 1:50

PARTIAL REMOVAL OF THE COLDSTREAM DAM NEW SPILLWAY DETAIL

GSS ENGINEERING CONSULTANTS LTD

Design:	JTG
Drawn:	JTB
APPROVED:	JTG
Date:	JULY 2023
Scale:	1:50
FILE No.	21-118
FIG. No.	5B

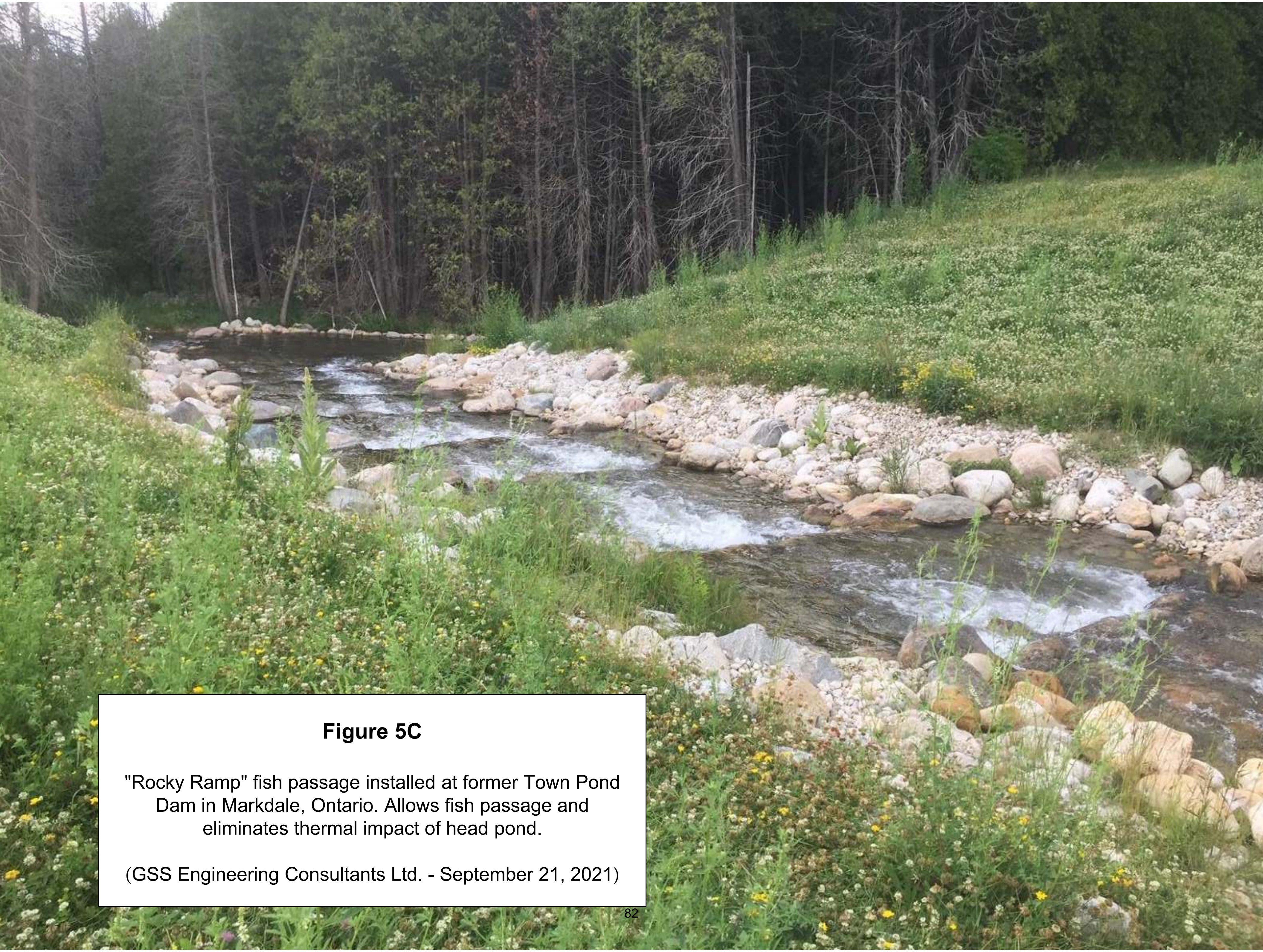


Figure 5C

"Rocky Ramp" fish passage installed at former Town Pond Dam in Markdale, Ontario. Allows fish passage and eliminates thermal impact of head pond.

(GSS Engineering Consultants Ltd. - September 21, 2021)

As per **Table 7**, the preliminary capital cost of Option 5 (excluding engineering, planning and permitting costs) is estimated to be $800,000. As per **Table 7**, the capital cost of the partial dam removal option is estimated to be $500,000 (relatively low cost) as much of the sheet pile steel remains in place. Also, approximately 60% of the armour stone could remain on site. The existing armour stone would also be used to construct the rocky ramp step pool system. The total cost estimate is $800,000 which includes $300,000 for bioengineering stabilization of emerging stream banks.

Part removal of the dam, in conjunction with the rocky ramp step pool system, provides significant cost savings, provides effective fish passage and minimizes downstream sediment transport.

7.1.6 Option 6 – Construct Permanent Bypass Channel Around Head Pond. Leave Dam and Head Pond Sediment As Is.

This Option builds in some part on Option 2 (temporary bypass channel around the head pond) but in this case the channel is permanent.

Figure 6A provides a plan view of the new natural stream channel running through the conservation area on the northwest side of the existing head pond. Overall, the new channel would be approximately 350 m long and would route the main branch of the Sydenham River around the head pond. However, the smaller unnamed tributary entering the top of the head pond from the northeast (labelled Unnamed Tributary A) would continue to flow into the head pond as per current conditions with this conceptual design. See end of this section for **Figure 6A** (and for **Figure 6B**).

However, the majority of sediment coming into the head pond would be eliminated as well as nutrients, etc. that contribute to periodic algae blooms in the head pond. This approach would also restore free fish passage up the Sydenham River and allow the majority of sediment in the river system to be transported downstream naturally. Leaving the dam and sediment in place avoids the upfront cost of full or partial dam removal and retains a local lake type water feature.

The new channel would be constructed to include fish habitat features and be hydraulically designed so it conveys summer low flows as well as safely conveying peak flood flows and by rights should be designed to safely convey the regional flood flow which is normally two times or more of the 100 year flood flow.

As per **Table 3,** the 100-year flood flow is estimated to be 45 cubic meters per second (m^3/s). Therefore, for preliminary design purposes, the regional flood flow is estimated as 100 m^3/s. Assuming a water depth under flood conditions of 1.5 m deep and a flow velocity of 3 m/s, the width of the new channel flood plain would have to be approximately 20 m wide given the side slopes of the new channel are included in the conveyance cross section.

This relatively flat, broad floodplain would normally be dry and would support natural vegetation. Within the flood plain, a smaller, low flow channel would be constructed to carry approximately the 2- year return flood flow (19 m^3/s – see **Table 3**) at bank full conditions. Assuming a 2.5 m/s velocity at bank full conditions, the low flow channel would be approximately 7.5 m wide by 1 m deep. This channel would be constructed of imported, natural large stone and gravel to replicate as close as possible a natural stream channel and include riffles and pools and meandering similar to existing conditions upstream and downstream of the dam location. For costing, 1,000 tonnes of 12” to 16” diameter natural stone and 2” to 3” diameter river stone is assumed.

Figure 6B provides cross section views though the head pond and new channel area at the 25% and 75% points down the new channel. As per **Figure 6B**, the elevation of land where the channel is built is approximately 3.5 m above the existing water level in the head pond at the upstream end of the head pond but is about 2.5 m above the head pond near the dam.

As the new channel has to be lower than the pond level at the upstream end, the upstream excavation depth is approximately 4.5 m deep. As the new channel progresses downstream, it needs to get progressively deeper until it is at the same level of the river downstream of the dam. As such, the depth of excavation of the channel at the downstream end is approximately 7.0 m below the existing ground level.

Given the depth of the channel excavation (4.5 m to 7.0 m deep) and the approximate 20 m width of the flood plain, (before side slopes are considered), the volume of fill requiring excavation and disposal elsewhere would be approximately 56,000 cubic meters. This is a very large volume compared to the amount of sediment (approximately 22,500 cubic metes) contained within the head pond.

The success of the project relies on the remaining native earth material between the pond and the new stream channel being structurally and hydraulically stable to prevent seepage of water though this material from the higher water level in the head pond into the new, lower stream channel. As well, the fill removed from the new channel would be subject to relatively new provincial Excess Fill regulations that require extensive contaminant testing of fill being transported offsite and a reporting schedule for the off site disposal location(s) of the fill. In addition, some bridge passage from the conservation authority lands to the northwest of the new channel to the berm area between the head pond and new channel may be required to access the north end of the existing dam for maintenance.

As per **Table 7**, the estimated cost of Option 6 is $1,800,000 to $2,100,000. This value includes excavation and then disposal of the excess fill elsewhere. The estimate cost also includes significant volumes of new natural stone to build a series of low level step pools as well as topsoiling, seeding and planting of native trees and shrubs along the side slopes of the new channel. While this option avoids any cost of dam removal, or removal of the sediment in the dam head pond, the dam may need to be removed at some point in the future. Future dam removal would require dealing with the sediment at that time.

There are also property constraints at the downstream end of the new channel where it would connect to the existing river below the dam. A private property extends into this area from the north and leaves little room to create the new channel and continue pedestrian pathways in this area.

Finally, it may be preferable to have some water overflow into the head pond from the Sydenham River during flood events to shed some of the flood flow out of the new natural channel. However, this would require detailed hydraulic analysis to determine if some shedding of peak flood flow is feasible.

7.1.7 Option 7 – Do Nothing. Leave Dam and Sediment As Is.

With this option, no action would be taken with the dam or sediment. Costs (economic and social) would be minimal. However, this option ignores the fact the dam likely has a finite service life and ultimately the dam could fail, become unsafe or the environmental effects of the dam could become significant.

Costs will also rise with time as more stringent environmental regulations might evolve with time. As well, the total sediment storage capacity of the dam does not appear to have occurred as yet. In other words, the reservoir still appears to be filling with sediment. As per this report, the dam was constructed approximately 55 years ago in 1968. It is therefore possible that the total sediment volume stored in the head pond in the future could be 50% to 100% more than currently exists in the head pond.

As such, costs for dam removal and sediment management will likely increase with time due to greater sediment volumes and additional regulatory requirements before inflationary effects are considered.

7.2 Summary of Options and Costs

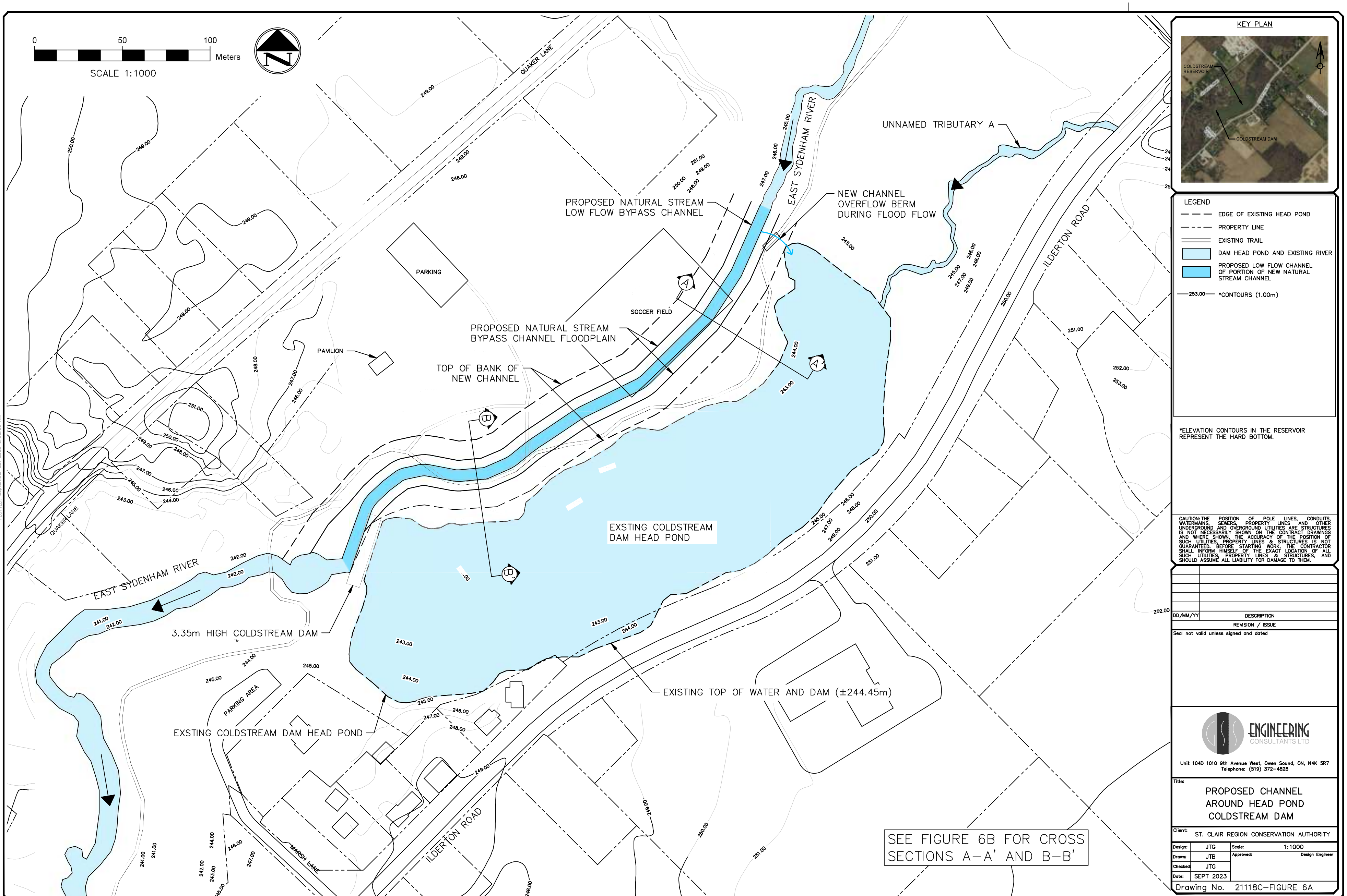
As per the above analysis, there appears to be very significant cost and technical challenges to complete Option 1 or Option 2. Both of these options would deal proactively with the sediments to prevent sediment in the head pond from being naturally transported downstream. However, the technical and environmental challenges, and the capital and engineering costs of Option 1 and 2, would appear beyond the reach of the project.

As such, the recommendation of this report is that Option 1 and Option 2 are not considered feasible at this time and that Option 3, 4, 5 and 6 be considered further for removal or modification of the Coldstream dam.

7.3 Potential Removal of Coldstream Dam Next-Steps

The flow chart overleaf provides a general outline of the next steps for the potential removal of the Coldstream dam. The flow chart includes numerous steps including selection of the preferred dam removal and sediment management method, consultation with review agencies, recommended additional studies, engineering of the dam removal drawings and specifications, tendering the project, removal of the dam, and finishing with the rehabilitation of the former head pond area.

Emphasize is placed on effective communication with review agencies. If the dam is to be removed, it is very important that all appropriate review agencies (MNRF, MECP, DFO, Indigenous groups) are consulted in advance to determine the preferred method to remove the dam and to manage the sediment. If passive sediment management is the preferred option, it is important that all review agencies are aware of the affects this will have on the East Sydenham River (increased turbidity and siltation downstream of the dam).



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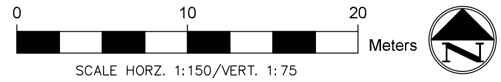
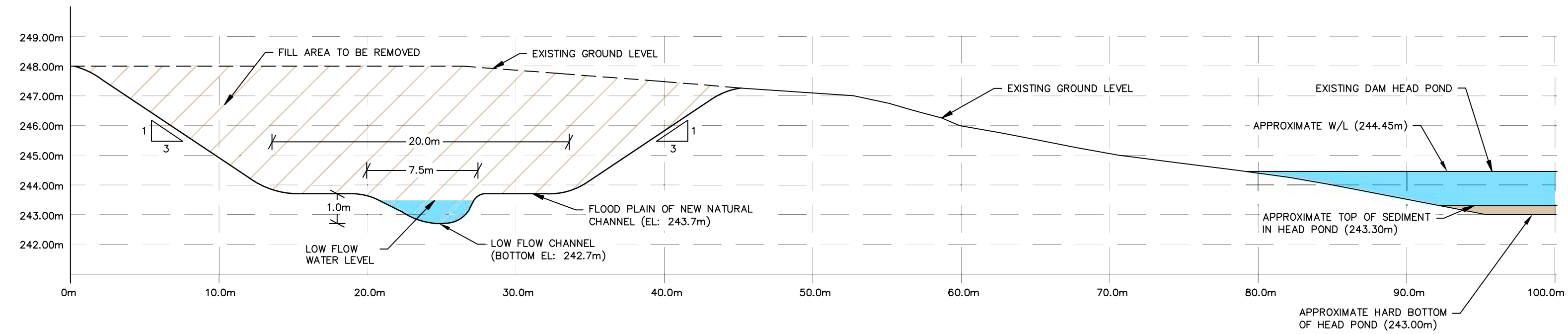
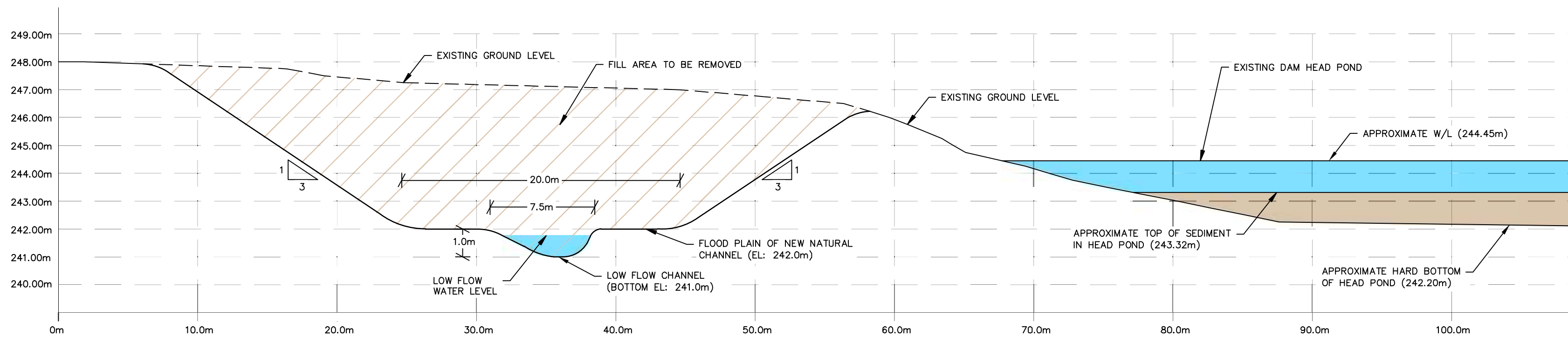




CROSS SECTION A–A' – UPSTREAM SECTION

SCALE HORZ. 1:150/VERT. 1:75



CROSS SECTION B–B' – DOWNSTREAM SECTION

SCALE HORZ. 1:150/VERT. 1:75

LEGEND

- DAM HEAD POND
- SEDIMENT
- EXISTING GROUND
- PROPOSED CHANNEL

*AREAS FOR POTENTIAL EROSION CONTROL ARE BASED ON THE ASSUMED FINAL CHANNEL PATH. THE ACTUAL AREAS REQUIRING EROSION CONTROL SHOULD BE SELECTED BASED ON THE ACTUAL FINAL CHANNEL PATH.

**ELEVATION CONTOURS IN THE RESERVOIR REPRESENT THE HARD BOTTOM AND ASSUME THE ACCUMULATED SEDIMENT IS REMOVED.

CAUTION: THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS, PROPERTY LINES AND OTHER UNDERGROUND AND OVERGROUND UTILITIES ARE STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES, PROPERTY LINES & STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES, PROPERTY LINES & STRUCTURES, AND SHOULD ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

DD/MM/YY	DESCRIPTION

REVISION / ISSUE

Seal not valid unless signed and dated

GSS ENGINEERING CONSULTANTS LTD

Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7
Telephone: (519) 372–4828

Title:

PROPOSED CHANNEL
AROUND HEAD POND
COLDSTREAM DAM

Client: ST. CLAIR REGION CONSERVATION AUTHORITY

Design:	JTG	Scale:	HORZ. 1:150/VERT. 1:75
Drawn:	JTB	Approved:	Design Engineer
Checked:	JTG		
Date:	SEPT 2023		

Drawing No. 21118C–FIGURE 6B

PLOTTED: September 25, 2023 9:31:22 AM

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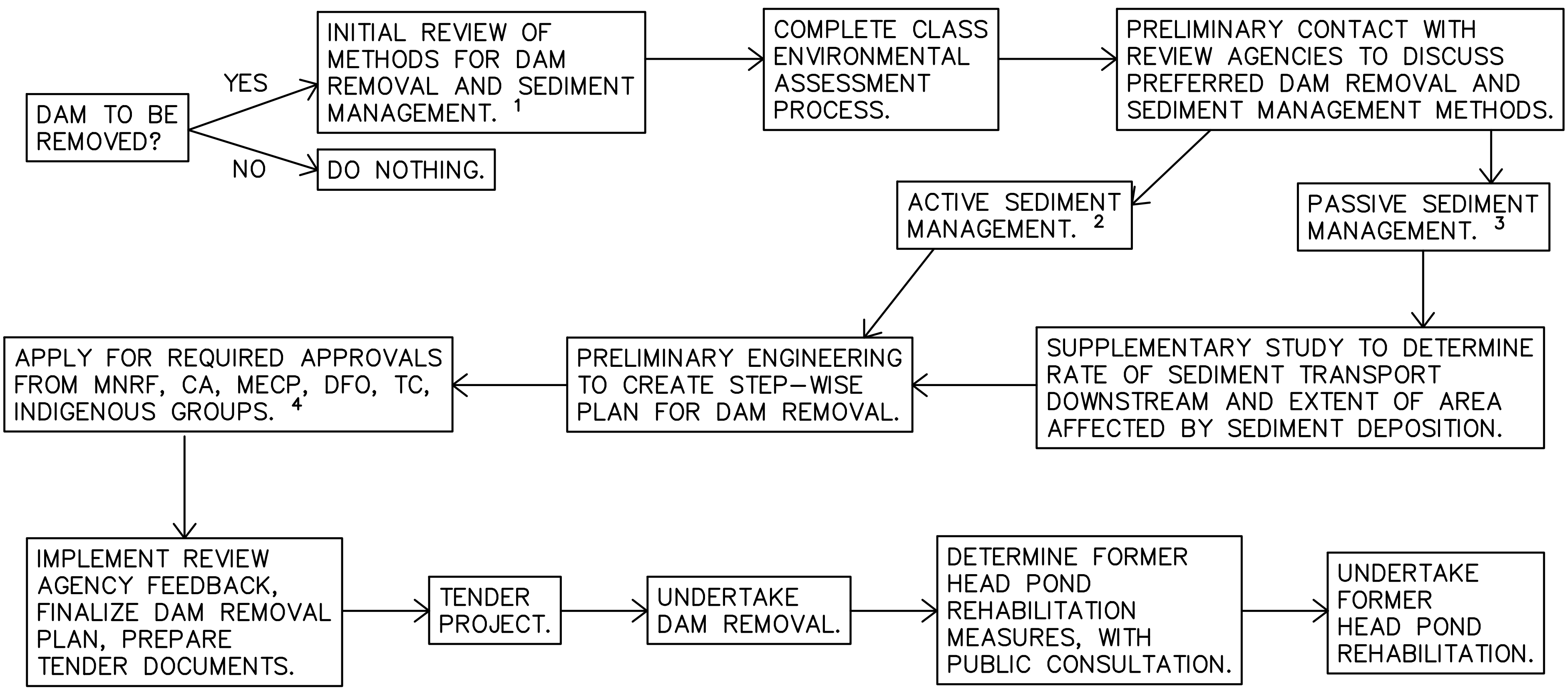
POTENTIAL DECOMMISSIONING OF COLDSTREAM DAM
PROJECT FLOW CHART



1. PUBLIC CONSULTATION COULD BE CONSIDERED FOR DETERMINING THE PREFERRED METHOD FOR DAM REMOVAL AND SEDIMENT MANAGEMENT.

2. ACTIVE SEDIMENT MANAGEMENT INCLUDES DREDGING OR EXCAVATING ACCUMULATED SEDIMENT PRIOR TO DAM REMOVAL.

3. PASSIVE SEDIMENT MANAGEMENT CONSISTS OF ALLOWING THE SEDIMENT TO BE TRANSPORTED DOWN STREAM NATURALLY BY THE RIVER.

4. IF PASSIVE SEDIMENT MANAGEMENT IS SELECTED IT IS IMPERATIVE THAT ALL REVIEW AGENCIES ARE FULLY AWARE OF THE EFFECTS.

8 HEAD POND RESTORATION OPTIONS

The Coldstream Dam head pond has an area of approximately 4.5 ha. This large area thus represents an opportunity for a range of rehabilitation options if the dam is removed at some point.

As described in Section 2, removal of a dam can provide new habitat for a large variety of fish and wildlife species and new passive recreational opportunities.

In general, the former head pond area can be allowed to revegetate naturally over time with the new stream channel being allowed to form naturally. Or a variety of new, natural and manmade features could be developed. A list of possible features is as follows:

i) New wildlife habitat. The former head pond area can be restored in a number of ways for new grassland areas. The remaining sediment will contain a seedbank supporting growth of a variety of native plant species once seed germination occurs. Importation of topsoil may be required in some areas.

ii) Alternatively, the former head pond area can be supplemented with new native wildflower and grass lands seed mixes to provide tallgrass grassland and pollinator growth similar to what was originally common to the area. This may require importing some topsoil and/or clean fill material to shape the ground surface and enhance growing conditions.

Photo 5: Meadow seeded with pollinator plants.

Photo 6: Tall grass prairie in southwestern Ontario.

iii) In addition to grassland areas, part or all of the head pond area can be planted with native trees and shrubs to provide forest and edge habitat in addition to grass land habitat.

Photo 7: Tree planting project with popular trees over four year span.

iv) Shallow pool or pond features can be provided by excavating and shaping the remaining sediment. These water features (ponds) could be constructed deep enough to support fish year-round, and therefore provide public fishing opportunities. The water features can also be created as shallow wetland areas or shaped and located so they provide seasonal (ephemeral) wetland conditions.

Photo 8: Wetland pond system with adjacent pollinator areas as well as maintained grass areas.

v) Water features would not typically be directly connected to the new stream channel but could refill from local runoff, by intersecting the local groundwater table or by filling during high water (flood) conditions.

vi) It would be expected that pond or wetland areas would attract a wide variety of insects, birds and animals. Wildlife viewing platforms (or viewing towers) could be provided to support birdwatching etc.

vii) Trails and sitting areas within the head pond area to promote physical activity and located along the edges of wetlands and ponds to better view birds and other wildlife.

viii) The trail network could also feature adjoining parking areas, picnic areas, off leash dog parks or other recreational amenities including canoe and kayak access points.

ix) The final stream channel can be enhanced to provide erosion control and improved fish habitat conditions. Fish habitat can be enhanced with step pools, spawning gravels, vortex weirs and woody overhead cover. Stream fishing opportunities can also be provided.

The following sections outlines preliminary, recommended restoration options for the Coldstream head pond area once the dam is removed.

8.1 Overview of Head Pond Restoration Options.

In discussion with the SCRCA, a limited range of relatively low-cost restoration options (capital and maintenance costs) have been considered as part of this report.

Figures 7, 8, 9 and **10** overleaf are provided as conceptual restoration options for the dam head pond area if the dam was removed. These options feature a variety of passive recreational use opportunities, have minimal maintenance costs and provide a variety of natural wildlife habitats. The rehabilitation options are not included in the cost estimates for dam removal or sediment management discussed in Section 7 of this report.

All of the rehabilitation options show areas where erosion control along the new stream channel may be required. These areas include the shoreline at the dam site and along the south shoreline as this is the estimated path of the final river channel through the head pond area. If the final river path is different then that depicted on the restoration drawings, the areas requiring erosion control should be altered accordingly. The GEO Morphix study (January, 2023) in **Appendix B** describes potential erosion control methods.

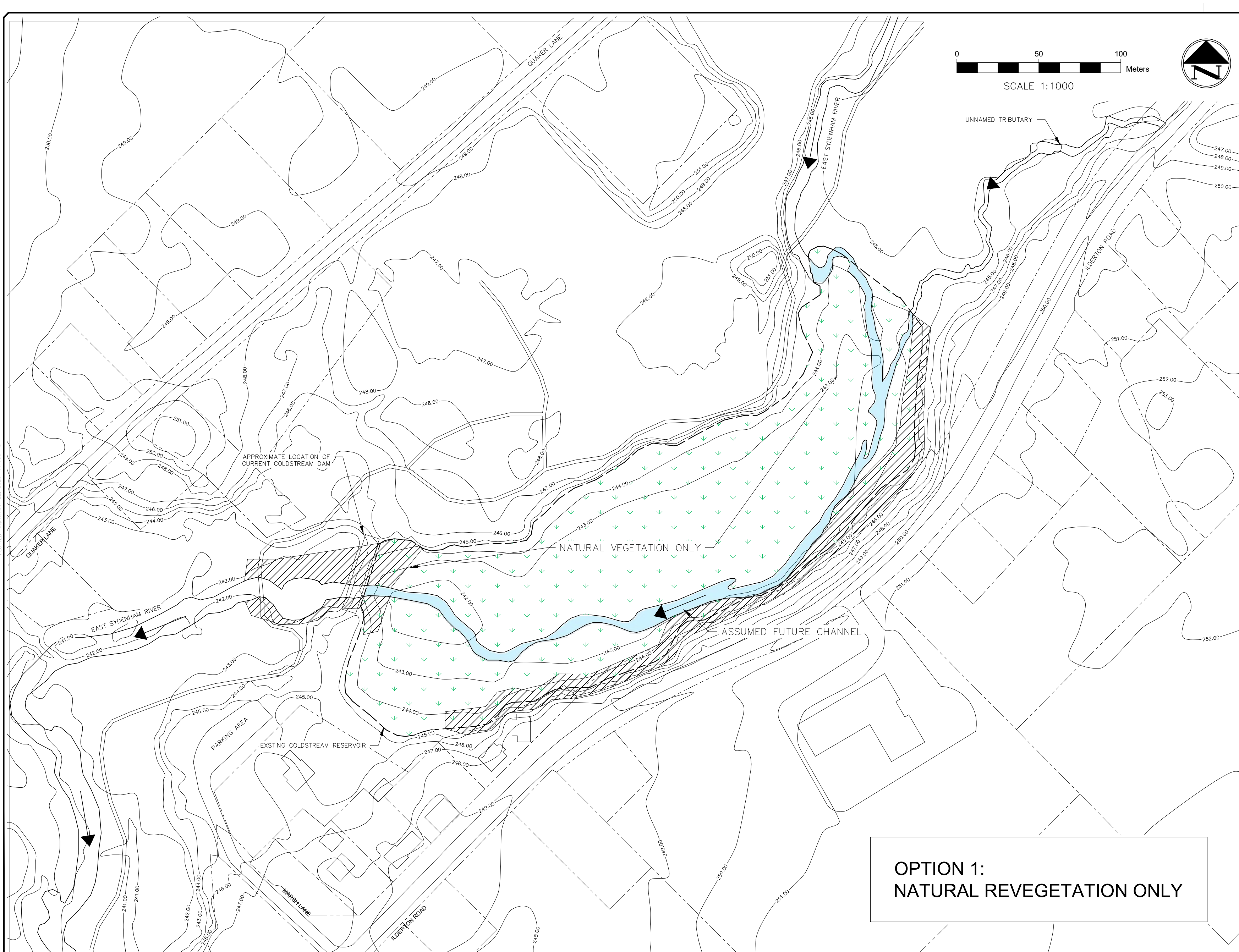
As noted in Section 7 of this report, it is likely unrealistic for a dam removal strategy to be implemented that proactively removes the accumulated sediment in the Coldstream dam reservoir. Therefore, it is assumed that if the dam is removed the accumulated sediment will be left to be naturally transported downstream over time. As the river meanders through the empty reservoir in search of its final channel path, much of the sediment may be transported and this will alter the topography of the former reservoir area. As such it is recommended that any major head pond rehabilitation efforts take place only after the river has found it’s final path and the topography is relatively constant. This may take 5-10 years.

Alternatively, Section 7 describes Option 6 which includes a permanent, natural bypass channel around the dam and head pond. This option would avoid release of sediment from the head pond. The following rehabilitation options for the head pond area would not apply to Option 6 as the head pond would remain “as is” with Option 6.

Until the river has created a final path, the large plain of drying sediment and meandering river may be quite soft and dangerous for human use. Therefore, it is recommended that human use of the former head pond is discouraged until rehabilitation is fully completed.

8.1.1 Head Pond Restoration Option 1 – Natural Grassland and River Edge Wetlands.

This Option is the most basic and allows natural revegetation of the drained head pond area. The head pond sediment and underlying substrate likely contains an extensive, natural “seed bank” of natural grassland and wetland plants that would grow naturally once the head pond water was removed. The wetlands would develop along the stream edges and other areas having wet or moist soil conditions.



KEY PLAN

LEGEND

- EDGE OF EXISTING HEAD POND
- PROPERTY LINE
- EXISTING TRAIL
- ASSUMED FUTURE CHANNEL IN THE EXISTING HEAD POND
- PROPOSED NATURALLY RE-VEGETATED AREA
- PROPOSED PLANTED TREES AT HIGHER ELEVATIONS
- PROPOSED PLANTED WET TOLERANT SHRUBS AT LOWER ELEVATIONS
- PROPOSED TRAIL
- PROPOSED WATER FEATURE (POND/WETLAND)
- OVERFLOW CULVERT FROM WATER FEATURE TO RIVER
- *AREA FOR POTENTIAL EROSION CONTROL
- 253.00 **CONTOURS (1.00m)

*AREAS FOR POTENTIAL EROSION CONTROL ARE BASED ON THE ASSUMED FINAL CHANNEL PATH. THE ACTUAL AREAS REQUIRING EROSION CONTROL SHOULD BE SELECTED BASED ON THE ACTUAL FINAL CHANNEL PATH.

**ELEVATION CONTOURS IN THE RESERVOIR REPRESENT THE HARD BOTTOM AND ASSUME THE ACCUMULATED SEDIMENT IS REMOVED.

CAUTION: THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS, PROPERTY LINES AND OTHER UNDERGROUND AND OVERGROUND UTILITIES ARE STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES, PROPERTY LINES & STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES, PROPERTY LINES & STRUCTURES, AND SHOULD ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

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	REVISION / ISSUE

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GSS ENGINEERING CONSULTANTS LTD

Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7
Telephone: (519) 372-4828

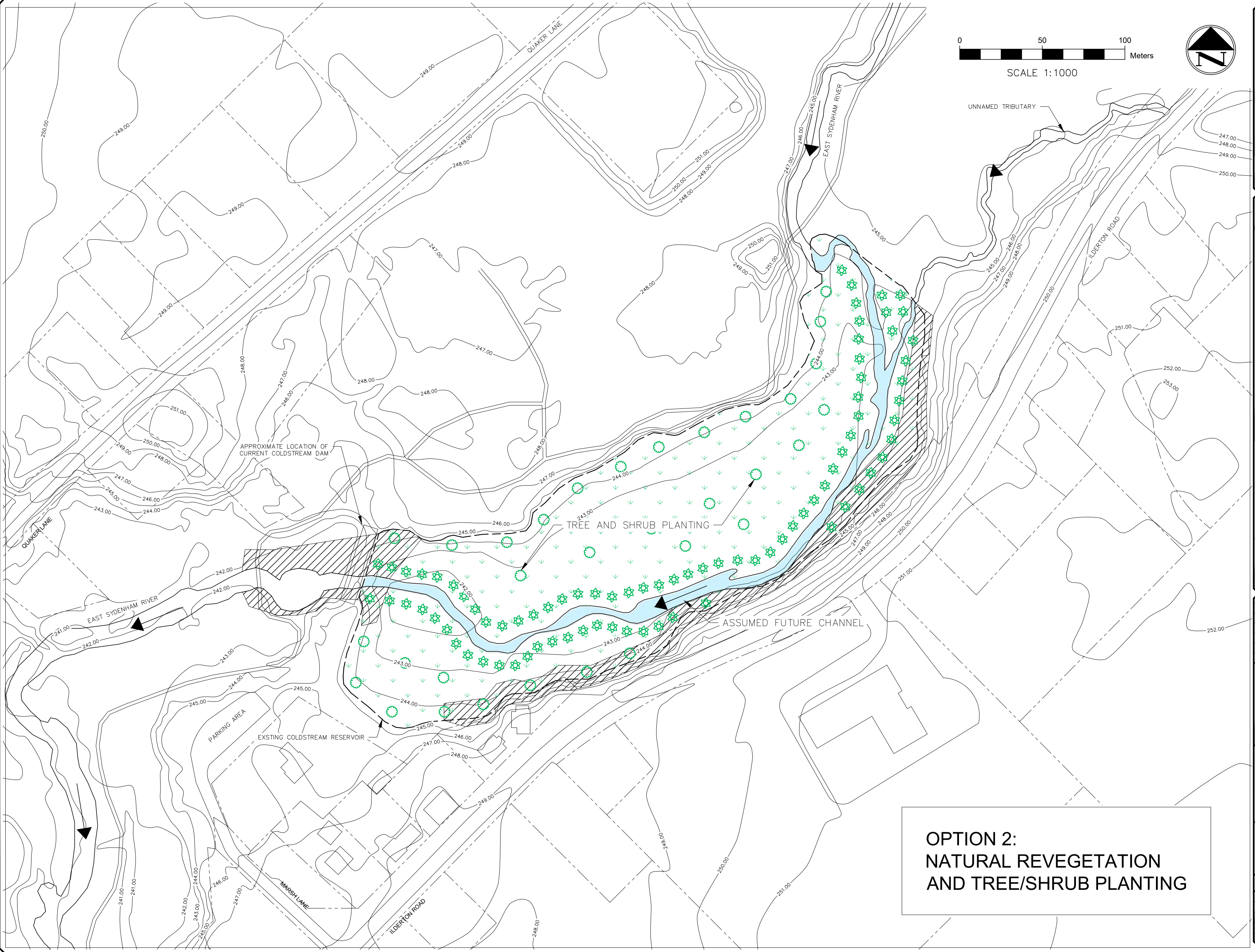
Title:
OPTION 1
HEAD POND RESTORATION
COLDSTREAM DAM

Client: ST. CLAIR REGION CONSERVATION AUTHORITY

Design:	JTG	Scale:	1:1000
Drawn:	JTB	Approved:	Design Engineer
Checked:	JTG		
Date:	JUNE 2023		

Drawing No. 21118C-FIGURE 7

\\GSS_Common\GSS Common\GSS Common\2021\21-118 Head Street and Coldstream Dam Decommissioning\Drawings\Coldstream\21118C.dwg Sep 22, 2023 - 4:17pm



OPTION 2:
NATURAL REVEGETATION AND TREE/SHRUB PLANTING

KEY PLAN

LEGEND

- EDGE OF EXISTING HEAD POND
- PROPERTY LINE
- EXISTING TRAIL
- ASSUMED FUTURE CHANNEL IN THE EXISTING HEAD POND
- PROPOSED NATURALLY RE-VEGETATED AREA
- PROPOSED PLANTED TREES AT HIGHER ELEVATIONS
- PROPOSED PLANTED WET TOLERANT SHRUBS AT LOWER ELEVATIONS
- PROPOSED TRAIL
- PROPOSED WATER FEATURE (POND/WETLAND)
- OVERFLOW CULVERT FROM WATER FEATURE TO RIVER
- *AREA FOR POTENTIAL EROSION CONTROL
- 253.00 **CONTOURS (1.00m)

*AREAS FOR POTENTIAL EROSION CONTROL ARE BASED ON THE ASSUMED FINAL CHANNEL PATH. THE ACTUAL AREAS REQUIRING EROSION CONTROL SHOULD BE SELECTED BASED ON THE ACTUAL FINAL CHANNEL PATH.

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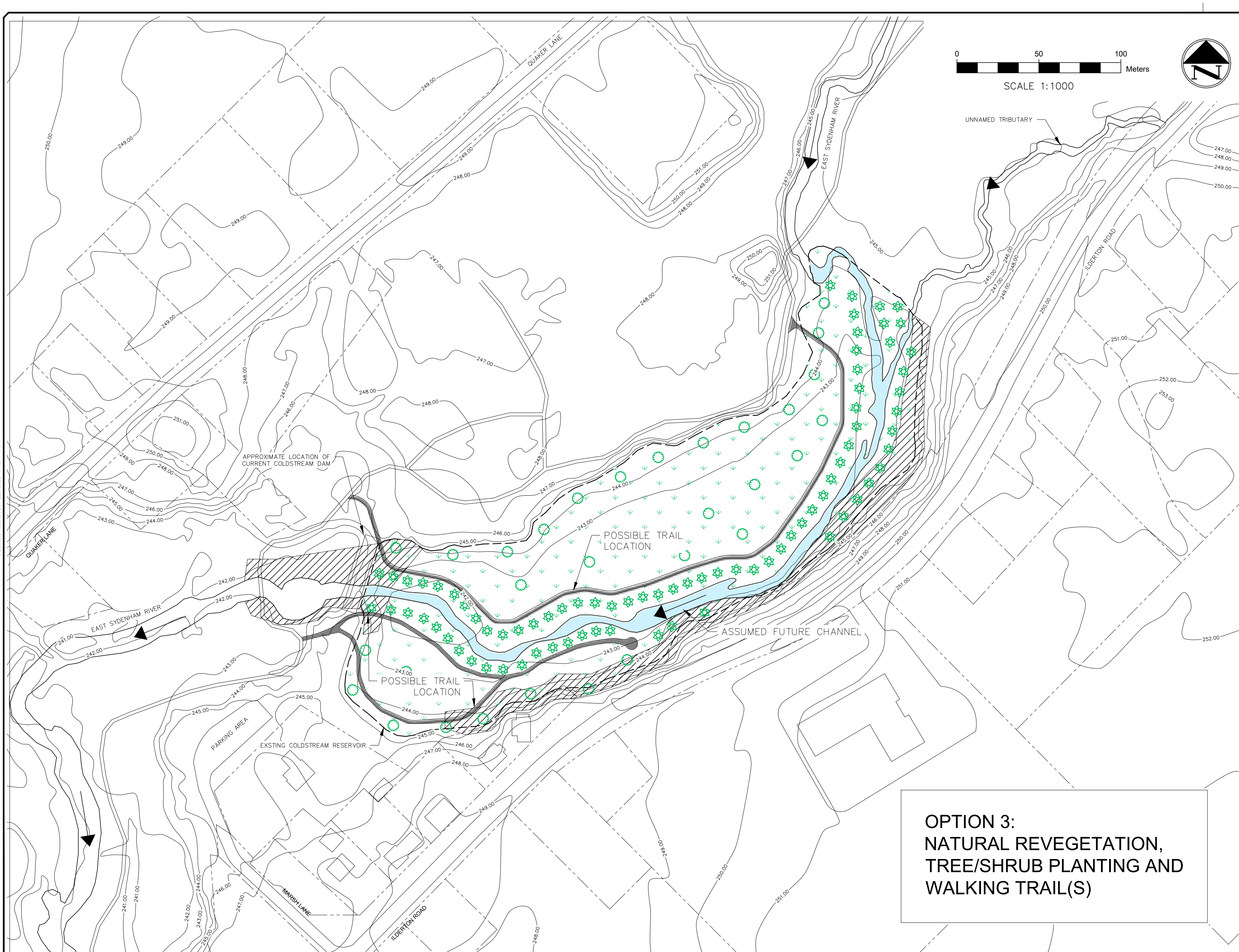
GSS ENGINEERING CONSULTANTS LTD
Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7
Telephone: (519) 372-4828

Title: OPTION 2 HEAD POND RESTORATION COLDSTREAM DAM

Client: ST. CLAIR REGION CONSERVATION AUTHORITY

Design:	JTG	Scale:	1:1000
Drawn:	JTB	Approved:	Design Engineer
Checked:	JTG		
Date:	JUNE 2023		

Drawing No. 21118C-FIGURE 8



OPTION 3: NATURAL REVEGETATION, TREE/SHRUB PLANTING AND WALKING TRAIL(S)

KEY PLAN

LEGEND

- EDGE OF EXISTING HEAD POND
- PROPERTY LINE
- EXISTING TRAIL
- ASSUMED FUTURE CHANNEL IN THE EXISTING HEAD POND
- PROPOSED NATURALLY RE-VEGETATED AREA
- PROPOSED PLANTED TREES AT HIGHER ELEVATIONS
- PROPOSED PLANTED WET TOLERANT SHRUBS AT LOWER ELEVATIONS
- PROPOSED TRAIL
- PROPOSED WATER FEATURE (POND/WETLAND)
- OVERFLOW CULVERT FROM WATER FEATURE TO RIVER
- *AREA FOR POTENTIAL EROSION CONTROL
- 253.00 **CONTOURS (1.00m)

*AREAS FOR POTENTIAL EROSION CONTROL ARE BASED ON THE ASSUMED FINAL CHANNEL PATH. THE ACTUAL AREAS REQUIRING EROSION CONTROL SHOULD BE SELECTED BASED ON THE ACTUAL FINAL CHANNEL PATH.

**ELEVATION CONTOURS IN THE RESERVOIR REPRESENT THE HARD BOTTOM AND ASSUME THE ACCUMULATED SEDIMENT IS REMOVED.

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GSS ENGINEERING CONSULTANTS LTD
Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7
Telephone: (519) 372-4828

Title: OPTION 3
HEAD POND RESTORATION
COLDSTREAM DAM

Client: ST. CLAIR REGION CONSERVATION AUTHORITY

Design:	JTG	Scale:	1:1000
Drawn:	JTB	Approved:	Design Engineer
Checked:	JTG		
Date:	JUNE 2023		
Drawing No.	21118C-FIGURE 9		

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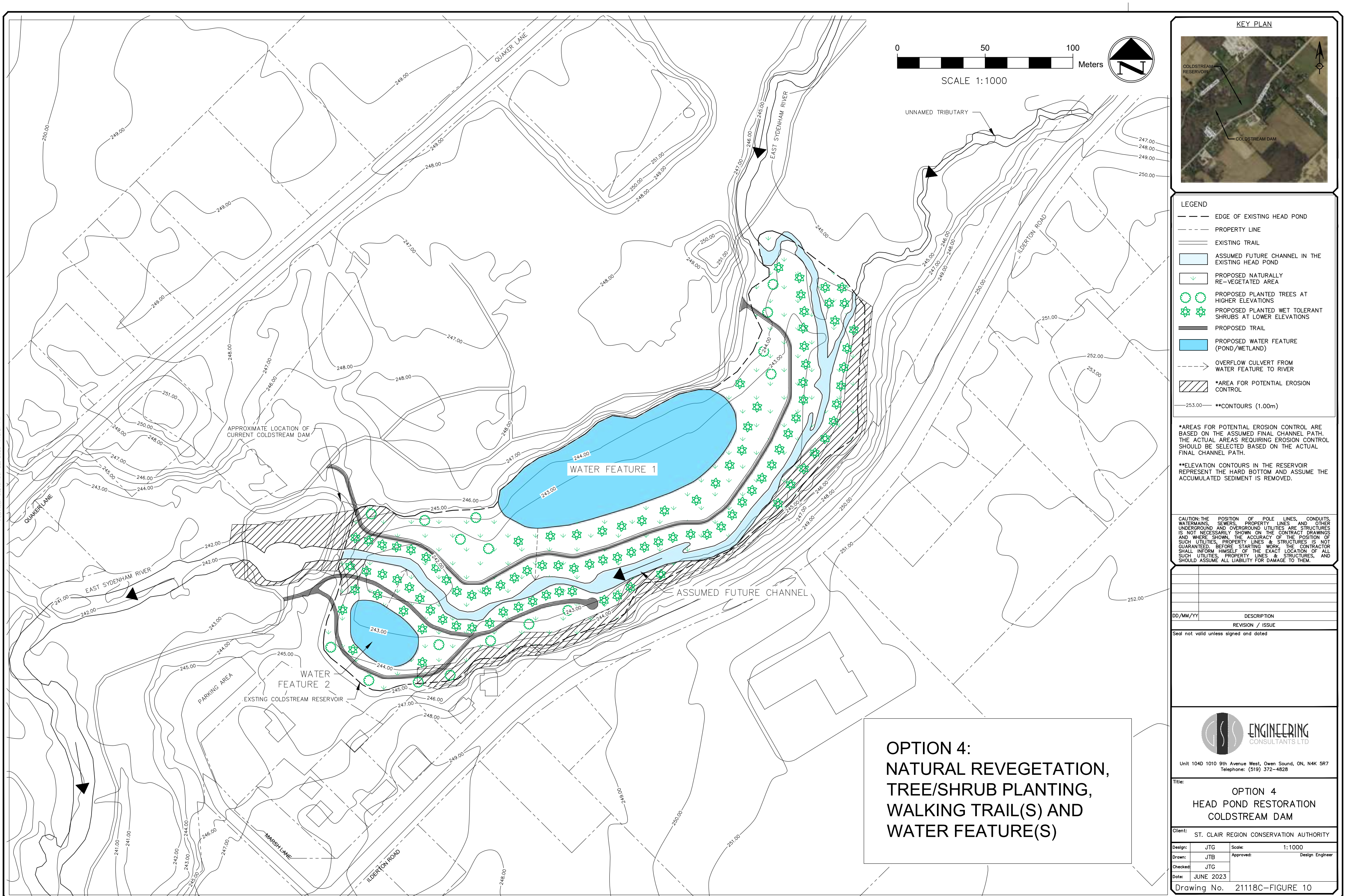
KEY PLAN
COLDSTREAM RESERVOIR
COLDSTREAM DAM
LEGEND
EDGE OF EXISTING HEAD POND
PROPERTY LINE
EXISTING TRAIL
ASSUMED FUTURE CHANNEL IN THE EXISTING HEAD POND
PROPOSED NATURALLY RE-VEGETATED AREA
PROPOSED PLANTED TREES AT HIGHER ELEVATIONS
PROPOSED PLANTED WET TOLERANT SHRUBS AT LOWER ELEVATIONS
PROPOSED TRAIL
PROPOSED WATER FEATURE (POND/WETLAND)
OVERFLOW CULVERT FROM WATER FEATURE TO RIVER
*AREA FOR POTENTIAL EROSION CONTROL
**CONTOURS (1.00m)
*AREAS FOR POTENTIAL EROSION CONTROL ARE BASED ON THE ASSUMED FINAL CHANNEL PATH. THE ACTUAL AREAS REQUIRING EROSION CONTROL SHOULD BE SELECTED BASED ON THE ACTUAL FINAL CHANNEL PATH.
**ELEVATION CONTOURS IN THE RESERVOIR REPRESENT THE HARD BOTTOM AND ASSUME THE ACCUMULATED SEDIMENT IS REMOVED.
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DESCRIPTION
REVISION / ISSUE
Seal not valid unless signed and dated
GSS ENGINEERING CONSULTANTS LTD
Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7
Telephone: (519) 372-4828
Title:
OPTION 4
HEAD POND RESTORATION
COLDSTREAM DAM
Client:
ST. CLAIR REGION CONSERVATION AUTHORITY
Design: JTG
Drawn: JTB
Checked: JTG
Date: JUNE 2023
Scale: 1:1000
Approved:
Design Engineer
Drawing No. 21118C-FIGURE 10
0
50
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SCALE 1:1000
N
UNNAMED TRIBUTARY
EAST SYDENHAM RIVER
QUAKER LANE
ILDERTON ROAD
MARSH LANE
PARKING AREA
APPROXIMATE LOCATION OF CURRENT COLDSTREAM DAM
WATER FEATURE 1
WATER FEATURE 2
EXSTING COLDSTREAM RESERVOIR
ASSUMED FUTURE CHANNEL
OPTION 4:
NATURAL REVEGETATION,
TREE/SHRUB PLANTING,
WALKING TRAIL(S) AND
WATER FEATURE(S)

In addition to the natural seed bank, this Option could include supplemental seeding with an initial “cover crop” to stabilize exposed soils as quickly as possible. The cover crop could also be combined with additional seeding with native, tallgrass prairie plants and wetland plant species.

This option would take several years to fully develop but would likely feature extensive plant growth in the second summer after the dam and head pond were removed. Such a grassland/wetland plant environment would provide good quality habitat within several years for a wide variety of bird, mammal and amphibian species as well as a wide variety of insect and pollinator species.

This Option does not include any trails or other features to specifically provide outdoor recreational opportunities, but the overall area would remain available for passive public use.

8.1.2 Head Pond Restoration Option 2 – Trees, Shrubs, Natural Grasslands and River Edge Wetlands.

Option 2 is the same as Option 1 but includes planting of native trees and shrubs in addition to establishing an extensive area of native plant and wetland plant growth. A more diverse range of wildlife habitats would be created over time that could expand the diversity of bird, animal and insect species.

8.1.3 Head Pond Restoration Option 3 – Modest Pedestrian Trail System Included with Trees, Shrubs, Natural Grasslands and River Edge Wetlands.

Option 3 includes all features included in Options 1 and 2 but introduces a walking trail component.

The walking trail component would be modest in scope and be designed to encourage passive, non-motorized use of the area with recreational use confined primarily to the walking trail corridors. To minimize maintenance requirements, additional amenities such as picnic shelters, additional parking areas, washrooms etc. are not proposed with Option 3.

Most of the area would continue to provide diverse, good quality wildlife habitat.

8.1.4 Head Pond Restoration Option 4 – Pond and Wetland Features as Well as Modest Pedestrian Trail System with Trees, Shrubs, Natural Grasslands and River Edge Wetlands.

This Option would include all the features of Options 1, 2 and 3 but would introduce several wetland or pond features separate from the actual stream channel. It would be anticipated that these water features would be shallow, excavated areas where the water levels are similar or the same as the water level in the adjacent stream channel.

Portions of the wetland or pond features would be located close to the trail edges to provide more wildlife viewing opportunities. The wetland and pond features would provide additional habitat features for a wide variety of shorebird and waterfowl species as well as other bird, mammal, amphibian and reptile species including turtles.

9 NATURAL (ECOLOGICAL) IMPACTS AND BENEFITS OF DAM REMOVAL

Overall, the Sydenham River supports a wide diversity of fish and mussel species. At least 82 species of fish and 24 species of mussels have been identified. Many of these fish and mussel species are rare elsewhere. Six species of fish and eleven species of mussels occurring in the watershed have been classified as being endangered, threatened or of special concern.

Numerous publications have described the rich diversity of fish and mussel species in the watershed including the many species considered at risk.

9.1 Impacts of Existing Coldstream Dam on SAR Species

One of these publications is *Action Plan for the Sydenham River in Canada: An Ecosystem Approach* as published by the Fisheries and Oceans Canada in 2018.

This report describes the North and East Sydenham River drainage basins in some detail including gradient, geology and land use. The report notes that much of the original forest and wetland habitat areas within the watershed have been lost. This report describes the East Sydenham River, which includes the Coldstream dam, as follows:

"*The East Sydenham River has a relatively diverse substrate and associated habitat with well defined riffles and pools, which create exceptional habitat for native freshwater mussels (including seven species listed under SARA as Endangered*)."

The report also describes, in general, threats to aquatic species at risk. These risks include negative land use practises, thermal impacts due to loss of stream side riparian zones and the thermal impacts of dams, suspended solids from drainage and overland runoff, nutrient enrichment from point and nonpoint sources, toxic contaminants associated with herbicides and pesticides and impacts of exotic aquatic species.

Dams are described in the report as impacting aquatic habitat by causing thermal warming and impacting normal sediment transport processes. While not noted specifically, dams are also barriers to fish migration. All three of these impacts would be associated with the Coldstream dam as per the following:

- The dam acts as an upstream migration barrier for almost all fish species.
- The temperature of the river increases due to the dam head pond in the summer.
- The dam stores a large volume of silt and sand sediments and impacts the natural transport of sediment in the river.

The report notes "Loadings of suspended solids as causing turbidity and siltation is presumed to be the primary limiting factor for most aquatic species at risk in the Sydenham River watershed." Therefore, removal of the dam could be cause for increased sediment loadings on the river downstream of the Coldstream dam.

9.2 Potential Benefits of Dam Removal on SAR Species

The DFO report also notes dams as being a general cause of two different Specific Threats being sedimentation upstream and erosion downstream. Both of these Specific Threats are considered High in terms of Level of Concern.

Removal of the Coldstream dam (or construction of the permanent, natural bypass channel) should benefit aquatic habitat downstream of the dam by restoring the natural supply of sediment to fish and mussel species downstream of the dam. As well, removal of the dam would reduce the thermal impact of the dam head pond and provide resilience to increased stream warming over time associated with climate change. As well, removal of the dam would eliminate a barrier to fish migration.

9.3 Potential Negative Ecological Impacts of Dam Removal

As per previous sections, removal of the dam may cause significant discharge of sediment stored in the dam head pond in a relatively short span of time depending on the option selected to remove the dam. Such sediment loading on the river downstream of the dam could be cause of negative impacts on fish and mussel habitat if the increased sediment loadings were excessive. The release of this sediment can negatively affect mussel species by limiting essential life cycle processes such as reproduction, respiration and feeding.

If it is decided that the dam is to be removed and sediment is to be managed passively, additional study is recommended to determine the rate of sediment transport and the affected downstream area.

Removal of the dam may also allow exotic fish species (including round goby) to gain access to the river upstream of the dam.

9.4 Impacts/Benefits of Dam Removal on Reptile, Amphibian and Bird Species Composition

Previous sections of the report describe habitat types that would be created in the dam head pond area if the dam was removed. While the diversity of habitat types varies with the selected head pond restoration option, the existing head pond area would convert, for all options, to a natural grassland habitat with wetland fringes along the edge of the river.

If trees and shrubs were also planted in the restored area, along with the creation of new ponds and/or wetlands, overall habitat diversity would increase and would support a wide range of plant and animal species including good habitat for birds, insects, mammals etc. as well as reptiles and amphibians.

10 SUMMARY AND DISCUSSION

This report examines options, impacts and costs to potentially remove the Coldstream dam. This report is summarized as follows:

10.1 Estimated Costs for Dam Removal and Head Pond Rehabilitation Options

The capital costs of dam removal vary significantly and depend largely on whether the sediment is removed from the dam head pond or if the sediment is allowed to naturally wash downstream.

Overall, removal of the sediment from the head pond appears to be very costly, difficult from a technical perspective, will likely have significant social impacts and is also risky in terms of whether sediment removal can be done successfully. The GEO Morphix report included in **Appendix B** concludes generally that sediment removal from the head pond is likely impractical.

Capital cost estimates range from $2,500,000 to $3,300,000 for Options 1 and 2 where sediment is removed from the head pond prior to dam removal. These cost estimates are very preliminary, however, and could increase significantly based on further detailed investigation. Costs could also be significantly impacted by new provincial regulations governing excess soil and fill management especially if the sediment was disposed off of site.

Conversely, the cost of dam removal, if the sediment was allowed to wash downstream (over one or multiple years), would be significantly less and estimated to range in cost from $800,000 to $1,900,000.

The cost of Option 6 (create a new permanent bypass channel) is estimated to be $1,800,000 to $2,100,000.

10.2 Summary of Ecological Impacts/Benefits of Dam Removal

Overall, removal of the dam (or construction of a permanent, natural bypass channel) should have a net benefit to river ecology. Dam removal should improve aquatic habitat for aquatic species at risk by restoring natural sediment transport and supply downstream of the dam, by reducing the thermal impact to the river caused by the dam head pond and by restoring full fish passage.

The dam removal options that include allowing the sediment to naturally wash down the river, if considered, should be carefully discussed in advance with regulatory authorities including the Department of Fisheries and Oceans, and the provincial MNRF and MECP.

It is likely critical that all of these agencies, and perhaps others, come to agreement early in the planning process as to the preferred means to deal with the large volume of sediment stored in the dam head pond.

It is recommended that further sediment transport assessment be completed if a preliminary decision was made to remove the dam and the preferred option was to allow the stored sediment in the head pond to wash naturally down the river.

Prepared by:

Jeff Graham, P. Eng., President,
GSS Engineering Consultants Ltd.

Jacob Bartley, EIT
GSS Engineering Consultants Ltd.

APPENDIX A

June, 2022 Dam Inspection Report by True Engineering

DRAFT

Inspection Report of Water Control Structures

Submitted to St. Clair Region Conservation Authority

June 17, 2022
Project No. 2461-021

TRUE

ENGINEERING ■ PLANNING ■ URBAN DESIGN ■ LAND SURVEYING

PO Box 21 | Ilderton ON | N0M 2A0 | www.true.ca | tel 519 518 7157

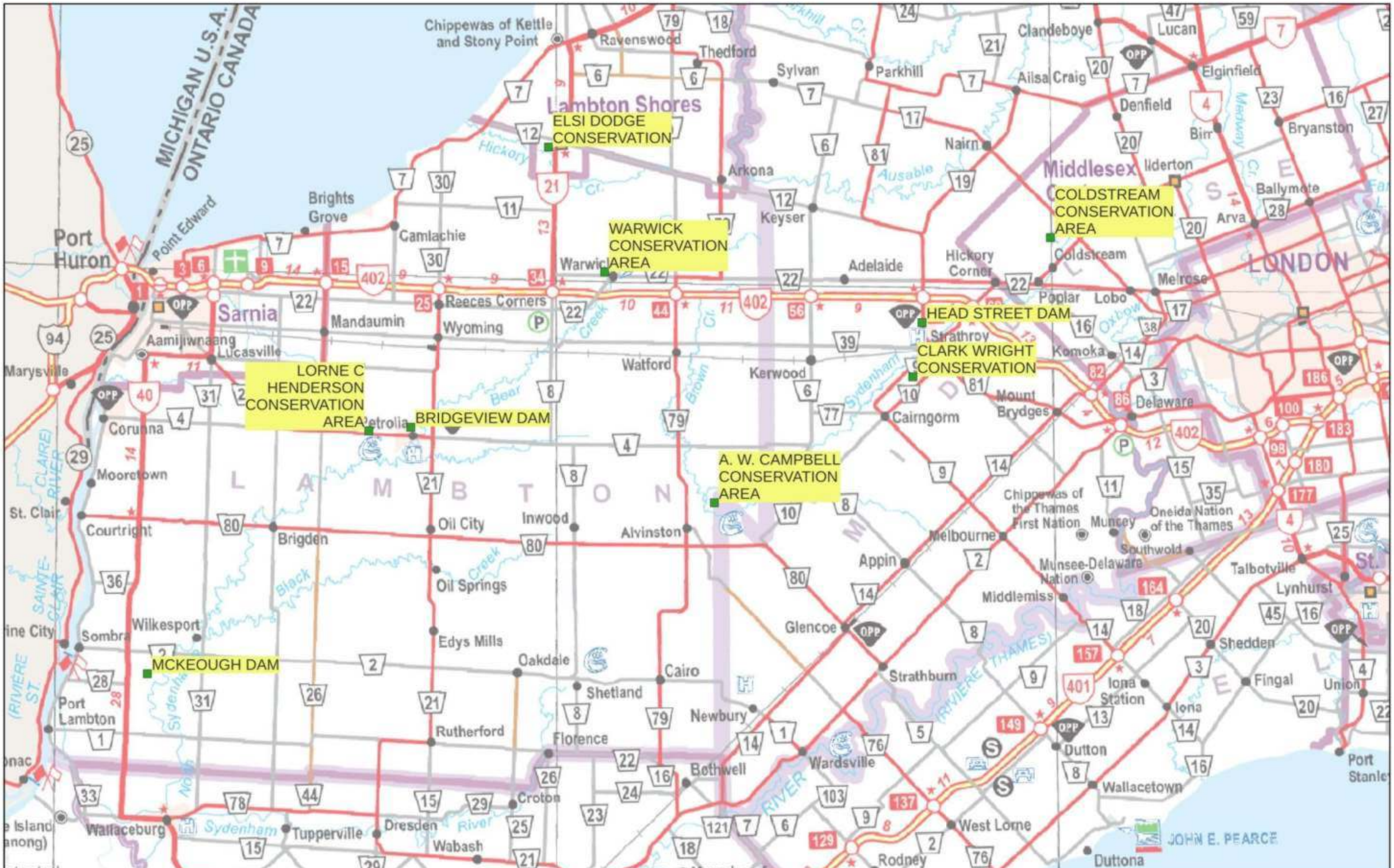
1.0 Introduction

St. Clair Region Conservation Authority (SCRCA) owns and operates water control structures at nine sites within its administrative area. The nine sites are listed below (also shown in Figure 1). Majority of the water control structures were constructed between 1960's and 1980's for the purposes of providing impoundments for recreational use. The McKeough Dam and Floodway is the only major water control structure that was constructed specifically for the purposes of flood control. The listing of water control structures that are subject to inspections in this work are:

1. Coldstream Conservation Area, Coldstream, ON
   a) Coldstream Dam
2. Head Street, Strathroy, ON
   a) Head Street Dam
3. Clark Wright Conservation Area, Strathroy, ON
   a) Clark Wright Dam
4. W. Darcy McKeogh Dam and Floodway, Sombra, ON
   a) Darcy McKeough Dam (embankment and control structure)
   b) Floodway channel (6 km)
   c) Drop structure (adjacent to St. Clair River)
5. A.W. Campbell Conservation Area, Alvinston, ON
   a) Morrough Lake Dam
   b) Campbell House Dam
6. Bridgeview Park (Petrolia)
   a) Bridgeview Dam
7. Lorne C. Henderson Conservation Area, Petrolia, ON
   a) Weir 1
   b) Weir 2
   c) Weir 3
   d) Pond Dam
8. Warwick Conservation Area, Warwick, ON
   a) Warwick Dam
9. Esli Dodge Conservation Area, Forest, ON
   a) Esli Dodge Dam

This report presents the summary findings of routine inspections carried out by TRUE Consulting staff at the above water control structures. Inspections in this work are limited to general site recognizance of civil works looking at overland drainage, erosion, shoreline protection, grading, general conditions of water control structures, embankments, seepage, etc. Structural inspections were not included in the present scope of work.

Inspections were carried out by a qualified hydrotechnical engineer with a license to practice engineering in the Province of Ontario.



LOCATION PLAN

INSPECTIONS OF SCRCA WATER CONTROL STRUCTURES

DRAWN BY: PP	
SCALE: 1:450,000	
FIG. NO: 1	REV.: 0
PROJECT NO. 2461-021	
DATE: MAR 2022	

1.1 Note on Site Visits/Inspections

Due to project reporting timelines some of the initial site visits and inspections were completed during late winter of 2022. Weather constraints (snow and ice cover, frozen lakes/rivers, ice at the shoreline) prevented a complete inspection at all features at the sites. In some instances snow and ice cover occupied an area that required inspecting, and thus prevented completion of all aspects of the inspections. Winter site visits were carried out in late February 2022 at Coldstream Dam, Head Street Dam, and Clark Wright Dam, from which only partial inspections could be completed. Snow and ice covered portions of the structures which hindered the inspection work. For example, snow and ice covered much of the shoreline and spillways in some locations, thus preventing the inspector from observing actual site conditions (such as erosion of shoreline, slope stability and characteristics of the embankments, etc).

Collection of aerial photographs by a drone-copter pilot at the McKeough Dam and Floodway were carried out in December of 2021.

Follow up site visits were completed at the end of May of 2022 to complete the remaining detailed visual inspections for the sites question. Observations made from follow up inspections have been appended to the original photographic log and are presented as Appendices to this document.

1.2 Scope of Work

A site visit by our staff are to be carried out on each of the nine sites included in this project. The intent of the inspections is to complete a condition survey of existing structures at each site and obtain an accurate visual record of conditions as it existed at the time of the inspections. The inspections are to include a check of gate valve/stop log operations for sites that have them (if available/possible), along with the conditions observed at upstream and downstream embankments and shoreline, spillways, river bed, control structures, etc. The inspections focus on identifying major deficiencies at the site of each water control structure.

Each component of each structure is to be photographed, tagged with a brief description, and assembled into a detailed photo log. The photo log is intended to be used as a template for future inspections, and could be used for the evaluation (or progression) of the rate of deterioration at each structure. The summary of inspections thus document all major material defects, and performance that will ultimately require future maintenance and/or repairs.

In accordance with provincial regulations, dam owners are responsible for the safe operation and maintenance of their dams. Part of the safe operation of the dams includes the responsibility to implement appropriate public safety measures to address potential exposure to hazards created at each site. Many of the sites in this project are located at Conservation Areas where public has access to the grounds.

A limited scope public safety assessment is to be completed. A prioritized list of recommendations in implementing public safety measures (such as installation of fences, signage, etc) is to be developed.

Structural inspections are not included in the scope of work for this project.

A preliminary review of the existing operating rules of the McKeough Dam has been included in this work. This review includes identification of elevation thresholds upon which overbank flooding starts at Wallaceburg, with the production of inundation extents from several water levels. Pluvial flooding (which occurs as ponding from heavy rainfall and/or snowfall) is not included, as all focus is to be on riverine flooding that could be controlled by the McKeough Dam. A review of available time series data (water levels, flows, and wind speed/directions) has also been included to identify if the said data could be used to support future updates to the existing operating rules.

1.3 Nomenclature

This report adopts the naming convention that assumes the observer stands in the middle of the river and looks downstream. For example, references are made to left and right embankments, wingwalls, banks, shoreline, or other structures or dam components, which relate to what a person sees by standing in the middle of the river and looking downstream. Such a convention adopts flow direction as a basis upon which structures/components are referenced in the report.

1.4 Repair Priority Levels

Identification of deficiencies and recommendations for future repairs/studies in this report are provided according to the following list of priorities:

- Priority S (safety related, requires immediate attention),
- Priority 1 (will require action within 1 to 2 years),
- Priority 2 (will require action within 2 to 5 years),
- Priority 3 (will require action within 5 to 10 years),

Recommendations for corrective action at each site/structure shall be provided according to the above priority level. Priority S (safety related) is one that requires immediate attention, as there is immediate risk to staff and/or public. Other priority levels are assigned to components according to their level of deterioration and/or overall function.

1.5 Background Review

Previous inspections of SCRCA water control structures include the following:

- 1995 general inspections of all SCRCA water control structures by Paragon Engineering Limited,
- 1997 inspections of the McKeough Floodway by Stanley Consulting Group (general and structural inspections of the Floodway only),
- 2005 general inspections of all SCRCA water control structures by Stantec, and
- 2011 general of all SCRCA water control structures by Stantec, and structural inspected by VDP Engineering Ltd.

SCRCA has provided to TRUE Consulting the 2011 Inspection Report of its water control structures (Stantec, 2011) for use in this project. The 2011 Inspection Report documents general conditions at the nine sites listed above, along with results of a limited scope structural inspection. A description was provided for each site, following with observations of conditions that existed at the time of the inspections. A set of recommendations for maintenance and repairs is provided for each dam site.

The photographic log portion of the 2011 Inspection Report was not provided to TRUE Consulting. Therefore, comparison between 2011 and 2022 conditions could only be made on the basis of photographs included in the main body of the 2011 Inspection Report.

Majority of the issues noted in the 2011 Inspection Report are related to vegetation management (trees and brush growing through the structures, and/or debris accumulation at the spillways). Conditions of vertical inlet drop structures (also refereed to as morning glory spillways) were noted in the 2011 inspections, as were areas where bank or slope erosion were identified. Significant damage to the Weir 2 structure at the Lorne C. Henderson Conservation Area was noted, with seepage and erosion at the upstream and downstream embankments were identified. Shallow surface slumping was identified on several section of the side slopes of the McKeough Floodway, and recommended to be monitored.

Major maintenance works implemented since the 2011 inspection have been included at the site of the McKeough Floodway only. The maintenance implemented included culvert replacement of drains that outlet into the floodway channel, repairs along the side slopes of the Floodway, and some overland drainage works.

Maintenance works at other sites were limited to brush and vegetation removal, and clearing debris at spillways and intake structures.

Existing drawings of the water control structures subject to inspections were not available for review. All comments offered in this report are based on visual evidence present during the inspection, and professional judgment of the report's author.

2.0 Description of Water Control Structures

This section provides a brief description of the water control structures that are subject of the inspections.

2.1 Coldstream Conservation Area

Coldstream Dam is located on the upper reaches of the Sydenham River within the hamlet of Coldstream and in the Municipality of Middlesex Centre. The dam consists of a 40 m +/- long steel sheet pile wall installed across the main channel, with riprap placed adjacent to the sheet piling on its downstream side. The entire sheet pile and riprap structure forms the main spillway at the Coldstream Dam. The dam structure is responsible for creating a headpond that is approximately 400 m long and 100 m wide.

The sheet piling at the dam site is keyed into the right bank. For this reason, the Coldstream Dam does not have a traditional right embankment.

The steel sheet piling is likewise keyed into the existing left bank, into an area with significant amount of fill that originally placed adjacent to the left bank. This area is referred as the left embankment. The crest of the left embankment is in the order of 20 m +/- wide.

Existing erosion protection is evident on the right downstream bank only.

There is a low flow valve control structure on the left upstream embankment, but is not operational.

Approximately 75 m downstream of Coldstream Dam is an existing pedestrian footbridge, which is used by the area residents to access the recreational trail system within the Coldstream Conservation Area.

Conditions observed at the Coldstream Dam are presented in the next section of the report, and are accompanied by a detailed photographic log in Appendix A.

2.2 Head Street Dam (Strathroy)

Head Street Dam is located on the Sydenham River in Strathroy, Ontario, about 60 m downstream of the Head Street bridge. The dam consists of approximately a 45 m long sheet piling installed across the main channel of the river, with riprap placed on a wedge adjacent to the sheet piling on its downstream side. The sheet piling is keyed into the banks on both sides. As a result of the keying in of the piling, there are no embankments at the dam site. Downstream shoreline on both left and right banks are protected with existing riprap erosion protection.

The dam includes an existing reinforced concrete control structure, with a concrete bridge accessible from the left bank. The control structure has one bay of removable stop logs that can control the water levels in the upstream headpond. Downstream of the control structure are reinforced concrete wingwalls with a small concrete channel that extends through the riprap spillway.

3.0 Inspection Findings and Recommendations

Observations from site inspections completed are documented in the text below, along with a detailed photographic log for each site. Attached appendices present photographic logs that document in detail observed conditions at the time of the inspections. The photographic logs provided are intended to be used as a baseline reference for future inspection and monitoring efforts to be carried out by SCRCA staff.

Site visits and inspections at Coldstream, Head Street and Clark Wright Dams were carried out in late February of 2022 when portions of the structures were covered with snow/ice. Follow-up site visits and inspections were completed in late May of 2022 at these sites.

Observations and inspections at the McKeough Dam and Floodway are made based on drone-copter aerial imagery collected in early December of 2021 and the site visit from May of 2022.

3.1 Coldstream Conservation Area

3.1.1 Observations

Refer to Appendix A – Coldstream Dam for a detailed photographic log and inspector's notes.

There are no signage warning users of the Conservation Area of the hazards associated at the dam site. An existing trail traverses the top of the left downstream bank that poses fall risk to some.

The left upstream embankment appears in good condition. The shoreline is noted as heavily vegetated at the waterline. Settlement of embankment crest, cracks or other signs of instability were not observed. The left upstream shoreline of the reservoir is likewise vegetated, with mature trees and/or brush growing close to the waterline. Some amount of shoreline protection visible at the left upstream embankment, and only at the waterline. Heavy vegetation cover exists along the left upstream bank.

The right upstream shoreline at Coldstream Dam is the reservoir bank is also heavily vegetated with trees/brush. There is some existing riprap on the right upstream bank but not to sufficient quantity to offer shoreline protection. Shoreline erosion was not observed at this location.

The main control structure at the dam site includes a 40 m +/- long steel sheet pile wall that spans the reservoir and main channel. On the downstream face of the sheet piling a wedge of riprap has been placed which forms the dam's main spillway. The spillway riprap adjacent on the right bank has previously washed out, and has an approximately 0.9 m lower crest than the remaining portion of the spillway. Similar conditions were noted in the 2011 Inspection Report, leading conclusion that the downstream riprap spillway erosion has occurred in the past, and is likely still ongoing. As a result of the noted erosion larger portion of the flow over the dam is concentrated through the narrow section near the right bank, which can lead to more future erosion of the downstream riprap spillway. Given the ongoing spillway erosion, monitoring for bed scour in the river channel downstream of the riprap spillway is recommended for the future.

Two large trees were observed to be growing through the side slopes of the downstream riprap spillway. Trees growing through the riprap spillway can eventually destabilize the riprap/sheet pile dam structure, and place the entire dam at risk. Note that in this type of construction, the sheet piling relies on the its downstream wedge of riprap to resist the forcing from upstream loading (water levels during floods, ice, silt, etc). Near the right bank brush vegetation was observed growing through the downstream spillway riprap as well.

Some amount of debris accumulation has been observed on the reservoir side of the sheet piling. It is anticipated that more debris accumulation typically occurs after the spring freshet.

The remaining downstream spillway riprap is in generally good condition. The individual stones are free of major deterioration or cracks. No major erosion of the downstream spillway riprap was observed.

There exists a control shaft structure near the left bank at the dam site, running parallel to the sheet piling. A timber walkway connects the control shaft structure to the left bank and shoreline. The top of control shaft structure has no accessible components (no hatches, or valves), leading to a conclusion that the low flow valve (typically used to lower the headpond in case of maintenance) is not functional. Outlet of the control shaft structure on the downstream side was not able to be identified.

The right downstream bank at the Coldstream Dam site is protected with large riprap stone, with the protection wrapping along the existing trail leading to the pedestrian bridge. There is significant amount of brush, shrub and even mature trees growing through the riprap bank. Some of the trees are leading towards the toe of slope, and are an indicative sign of bank instability. The individual riprap stones in this location are in good condition, however. Such growth through the riprap structure is not appropriate, and will increase its rate of deterioration, ultimately leading to higher maintenance costs.

The left downstream bank is located at the interface between the embankment slope and the riprap spillway. The area is heavily vegetated with brush. The shoreline at the left downstream bank is showing signs of bank instability, with trees growing sideways through the embankment slope (which will eventually collapse, and further destabilize the slope). Along the left downstream slope a mass concrete abutment of the former mill house is visible, and has a vertical face in excess of 2 m. As public has access to this area, the old abutment presents a vertical fall hazard, and thus requires installation of a handrail according to Ontario Building Code standards (MNR, 2011). The 2011 Inspection Report has also flagged this vertical fall hazard, and recommended installation of a handrail.

The trail that leads to the pedestrian bridge crossing downstream of the dam has shifted from erosion, with the bridge approach wooden sheeting heaving upwards. This poses a hazard to the pedestrians using the Coldstream Conservation Area. Further, the right shoreline in the vicinity of the right bridge abutment has significantly eroded. The shoreline downstream of the right abutment is presently showing signs of recent erosion and undermining via exposed tree roots. The erosion at this location has extended around the entire right footing, to the point that the entire footing is simply resting vertically on top of the eroded bank. There is no passive support to the footing from the surrounding soil, as all of it has eroded. Future erosion will continue, causing the shoreline around the abutment to further erode, and thus leading to a possible collapse of the pedestrian bridge. Erosion at this site is flagged as a public safety concern, and thus requires immediate corrective action.

3.1.2 Recommendations

Recommendations for follow-up action at the Coldstream Dam are as follows:

Priority S (safety related, require immediate attention)

- Install shoreline erosion protection works around the right abutment of the pedestrian bridge downstream of the dam.

Priority 1 (1 to 2 years)

- Install safety signs in the Conservation Area (on both sides of the river) indicating dangers associated to public access in close proximity of a dam.
- Remove brush and tree vegetation from: i) the left embankment (upstream and downstream), ii) the right downstream shoreline, and iii) the riprap spillway.
- Remove debris that accumulates on the upstream side of the reservoir along the sheet piling.

Priority 2 (2 to 5 years)

- Install hand railing at all location of vertical fall hazards that meet MNR (2011) standards (at the old mill house abutment, and at the valve control structure).
- Restore riprap slope protection along the left downstream bank, and re-grade bank as appropriate.
- Replace washed out rock from the downstream riprap spillway to match the crest of the sheet piling. Re-grade transition riprap spillway to match existing conditions.
- Conduct a topographic survey (or otherwise) probe the channel downstream of the riprap spillway for indications of possible channel bed scour.

Priority 3 (5 to 10 years)

- Restore functionality of the valve control structure to allow de-watering of the headpond during low flow conditions for maintenance operations.
- Complete routine inspections of the water control structure, establish a detailed photographic log, and compare deterioration against 2022 inspections.

3.2 Head Street Dam (Strathroy)

3.2.1 Observations

Refer to Appendix B – Head Street Dam for a detailed photographic log and inspector's notes.

5.0 General Recommendations

The following offers a set of general recommendations to assist SCRCA in operating and maintaining its water control structures.

1. Several safety related issues have been flagged by the inspections, including: i) erosion of the soil adjacent to the right abutment of the pedestrian bridge at Coldstream Dam, ii) access platform at Morrough Lake Dam that is loose, iii) deteriorated structural steel at Warwick Dam bridge, and iv) unsafe path over the emergency spillway at Esli Dodge Dam. These safety related issues should be addressed immediately.

2. There are no public safety related signage at any of the sites inspected. As public has access to ground at and around the water control structures, signs should be posted warning users of hazards around deep and/or fast moving waters.

3. Many of the sites inspected are between 40 and 60 years old, and are approaching the limit to their useful service life. As many of the structures have vertical inlet drop structures that are damaged, leaning, and otherwise deteriorating. Capital planning needs to take place on developing a priority schedule to repair and/or restore the structures to appropriate engineering standards.

4. Heavy brush vegetation is present along the engineering structures at majority of the water control structures owned by SCRCA. Allowing vegetation to establish increases the rate of deterioration of the structures, and will thus lessen their remaining useful life.

5. Similar to above, inspection at several sites have noted that mature trees are growing through the engineering structures, and should be removed.

6. At most sites heavy grass/brush/trees prevented detailed visual inspections as some features were not visible. After heavy vegetation and trees are removed, follow up inspections should be completed.

7. Two methodologies for updating the operating rules of the McKeough Dam are offered (one based on numerical model simulation and one based on revising elevation thresholds). Each have their own advantages and disadvantages, and it will ultimately be up to SCRCA to decide which approach to adopt in the future.

References

Stantec (2011). 2011 Inspection Report, St. Clair Region Conservation Authority Water Control Structures, Report prepared by Stantec, London, Ontario, February, 2012.

MNR (2011). Public Safety Around Dams, Best Management Practices. Ontario's Ministry of Natural Resources, August 2011.

APPENDIX B

GEO Morphix Report for Stream Channel Analysis in Head Pond

(January, 2023)

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January 12, 2023

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Attention: Jacob Bartley
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Re: Geomorphological Technical Review, Removal of Coldstream Road Dam and Head Street Dam
East Sydenham River
Strathroy, Ontario
GEO Morphix Project No. PN22087

The Coldstream Road Dam and Head Street Dam located along the East Sydenham River in Coldstream and in the Town of Strathroy, Ontario, respectively, are proposed for possible removal. The St. Clair Region Conservation Authority (SCRCA) has requested that a geomorphological study be completed to evaluate the potential extent and alignments of the channel planform that will form following the dam removals within the upstream ponded area. An understanding of the extent of the future hazard posed by the watercourse and potential release of accumulated sediments is also required prior to deactivating the dams.

GEO Morphix Ltd. (GEO Morphix) was retained by the project engineer GSS Engineering Consultants Ltd. (GSS) to provide geomorphological input and guidance in support of the possible dam removals. To address these requirements, the following activities were completed:

- Review of East Sydenham River topographic surveys and sediment depth data to identify preferred channel pathways in the event of a dam removal
- Identify bankfull geometries and associated planimetric properties for the theoretical channel that will form within the ponded areas upstream of the dams
- Define a meander belt width for the theoretical channels
- Provide mapping of the expected planform and erosion hazard lines
- Outline in-channel bioengineering approaches to mitigate lateral and vertical erosion (e.g., channel widening and downcutting)
- Estimate quantities of potential sediment release based on geometric relationships

We provide this memo which summarizes the above-noted activities and provides geomorphological recommendations with respect to implementation.

Background Information

The Coldstream Road Dam is situated east of Strathroy along an upper reach of the East Sydenham River. The Coldstream Dam is bounded by Ilderton Road and residential dwellings to the south, Coldstream Road to the east, and Coldstream Conservation Area to the North. Based on our review of available watershed studies, the Coldstream Road Dam was built sometime between 1969 and 1972.

The Head Street Dam is situated within the Town of Strathroy. The Head Street Dam is bounded by Front Street and residential dwellings to the south, Head Street to the west, and Strathroy

Conservation Area to the north. Based on our review of available watershed studies, the Head Street Dam was built around 1973.

Sediment depth findings and topographical surveys were provided by GSS (drawings dated 2022).

Both dams form a significant barrier to fish, reducing the opportunity for upstream migration. They also produce languid flow conditions, due to backwatering effects, which in turn promotes poor water quality conditions (e.g., increased water temperature, sedimentation, and possibly algal growth).

Bankfull Channel Analyses

Removal of the dams will lower upstream water levels, thereby concentrating flow along the thalweg (e.g., deepest part of the channel/reservoir in cross sectional view). Along this path, a channel will develop naturally as the reservoir drains. The potential form of the channel is discussed below.

Channel Geometry

The geometries of the theoretical channel were informed based on a desktop assessment of a surrogate channel reach characterized by a predominantly unaltered or natural form. Bankfull channel width was measured remotely upstream and downstream from the dams using recent orthoimagery. Bankfull depth was estimated by applying known stream geometric relationships (Rosgen, 1994). With consideration to the existing channel conditions and increased potential for downcutting following dam removal (e.g., due to the relatively fine/erodible sediment composition in the reservoirs), a width to depth ratio of 10 was selected. For large rivers, width to depth ratios can be significantly higher (e.g., >12), but given the channel would be newly activated, we assumed relatively augmented rates of channel downcutting, which lowers the overall ratio.

At the Coldstream Street Dam location, the channel bankfull width and corresponding estimated depth were 7.4 m and 0.74 m. At the Head Street Dam location, the channel bankfull width and corresponding estimated depth were 16.1 and 1.61 m.

Channel Alignment

The alignment the theoretical channel will adopt was assessed through two approaches. The first examined the existing channel topography including existing sediment deposits, as surveyed by GSS. The low point or thalweg in each surveyed transect of the channel was mapped to delineate the theoretical channel central tendency (i.e., dominant or trending channel flowpath).

The second approach assumes the erosion/removal of the sediment deposits, as they consist of relatively loose and erodible materials, to identify the potential historical alignment of the channel. With this caveat applied, the thalweg is again extracted from the available surveys and mapped to form the theoretical historical channel central tendency.

Meander Belt Assessment

Most watercourses in southern Ontario have a natural tendency to develop and maintain a meandering planform, provided there are no spatial constraints. A meander belt width assessment estimates the lateral extent that a meandering channel could occupy and may potentially occupy in the future. The assessment is therefore useful for informing the potential hazard to proposed activities in the vicinity of the above-noted theoretical channels as well as the need for supporting erosion mitigation measures.

When defining the meander belt width for a creek system, the Ministry of Natural Resources and Forestry (MNRF, 2002) treats unconfined and confined systems differently. Unconfined systems are those with poorly defined valleys or slopes well-outside where the channel could realistically migrate. Confined systems are those where the watercourse is contained within a defined valley, where valley wall contact is possible.

Both the Coldstream Road Dam and Head Street Dam are likely unconfined systems. As such, the meander belt width is likely beyond the maximum extent of potential meander migration and areas of potential future valley wall contact. Where infrastructure is also present, these locations may need future infrastructure/erosion protection.

In unconfined systems, the limit of the erosion hazard and migration potential can be delineated based on empirical meander belt width models. For this study, we have selected and applied three desktop-based models to compute a range of meander belt widths. These models are scientifically defensible and have been verified in past studies as suitable for use in Southern Ontario. At this time, no method is preferred as each provides a range of potential migration extents based on different properties (i.e. watershed scale, flow, slope and bankfull geometry). The models are summarized below and their results provided are in **Table 1**.

TRCA (2004) Empirical Model

$$B_w = -14.827 + 8.319\ln(\rho g Q S * DA)$$ **[Eq. 1]**

where B_w is the meander belt width, ρ is the density of water, g is acceleration due to gravity, Q is the 2-year return period event discharge, S is the channel gradient, and DA is the drainage area.

For this study, the 2-year return period event discharges and drainage areas were estimated using a modified version of the Ontario Flow Assessment Tool which generates watersheds based on publicly available regional topography (e.g., LiDAR), and calculates watershed characteristics using empirical relations.

Modified Williams (1986) Empirical Approach

$$B_w = 4.3{W_b}^{1.12} + W_b$$ **[Eq. 2]**

Ward et al. (2002) Empirical Approach

$$B_w = 6{W_b}^{1.12}$$ **[Eq. 3]**

where B_w is the meander belt width, and W_b is the bankfull width, as estimated from aerial orthoimagery along an unaltered section of reach (see *Bankfull Channel* section above).

Table 1. Modelled Meander Belt Widths

Reach	Recommended Meander Belt Width (m)		
	TRCA (2004)	Modified Williams – Width (1986) *	Ward Width *
Coldstream Road	73	57	78
Head Street	82	136	187

**Includes a 20% Factor of Safety*

The meander belt widths in **Table 1** are applied equidistant along the channel central tendency (see Section *Bankfull Channel Analyses* for details related to central tendency estimation). Typically, the belt widths are based on a review of the existing meander pattern. However, in this case, the historical meandering planform could not be identified due to the presence of the dam and reservoir.

For the purpose of this analysis, two approximate central tendencies were delineated to project the calculated meander belt widths. The two central tendencies were delineated using different contour datasets provided by GSS; the current thalweg central tendency was delineated using the sediment surface contour dataset, and the historical thalweg central tendency was delineated using the hard bottom contour dataset. An overview of the meander belt widths associated with the theoretical channel at both locations is provided in **Appendix A**. From a review of topography, the assumed edge of reservoir is correlated with a defined break in slope, or the presumed "top of bank". This term is used loosely as the extent of the head is associated with the break in slope. As displayed in **Appendix A**, solid meander belt width lines indicate where the erosion hazard falls within the top of bank, whereas dotted meander belt width lines indicated where the erosion hazard extends beyond the top of bank. Note that the entire area delineated by the meander belt does not reflect an active erosion hazard. The delineated extents identify the potential migration limits the channel may attain in the future. In areas of concern, erosion mitigation treatments (e.g., bank bioengineering) may be installed to combat channel adjustment.

Potential Sediment Release

Dam structures create backwatering conditions, which slows upstream in-channel flow velocity, and promotes sediment settling/deposition. Therefore, a primary concern associated with dam removals is the corresponding abrupt release of these sediments downstream. Common related short-term impacts include increased water turbidity, sediment accumulation at downstream locations, as well as water quality impacts resulting from the sudden release of water (e.g., water temperature change).

Sediment release is a product of the available sediment as well as the method and phasing of the dam removal. One approach to estimate the amount of sediment mobilized is to calculate sediment entrainment as a function of the theoretical channel geometry (see *Bankfull Channel* section for details), plus contingency to account for potential activation of sediments beyond the bankfull channel limits. Assuming the release is limited to the channel size can result in a significant underestimate of the release, as most of the collected material within the reservoir extents will be fine and thus highly susceptible to entrainment in the post-condition. A more practical approach is to assume a worst-case scenario which better accounts for the volume of loose materials that extend beyond the theoretical bankfull channel limits and would represent a maximum probable release.

To gauge the release, a number of assumptions were made regarding channel geometry and the extent of active sediment. First, the channel width of the newly formed bankfull channel would be similar to channel widths found beyond the impact of the dam. Second, the channel depth could be approximated from the bankfull width applying industry known natural channel width-to-depth ratios (Rosgen, 1994). In this case, we assumed a width-to-depth ratio of 10 (see *Bankfull Channel* section for details), which resulted in a channel depth of 0.74 m and 1.61 m for the Coldstream Road Dam and Head Street Dam, respectively. The assumed depths fall within the depth of available sediments.

Additionally, we have assumed that the active erosion area is limited to three times the theoretical bankfull channel width, or 22 m for the Coldstream Road Dam channel and 48 m for the Head Street Dam channel. This was considered to be a reasonable estimate, if the work were combined with appropriate phasing of the dewatering and dam removal.

Finally, the erosion area was assumed to extend the entire length of the thalweg (central tendency), which measured 433 m at the Coldstream Road Dam location and 619 m at the Head Street dam location.

Table 2. Potential Sediment Release Estimates

Parameters	Coldstream Road	Head Street
Active Bankfull Width (*3) (m)	22	48
Average Bankfull Channel Depth (Bankfull Width/10) (m)	0.74	1.61
Thalweg Length (m)	433	619
Estimated Volume of Sediment (m^3)	7,049	47,836

Importantly, the release could be larger than what is indicated in **Table 2** if appropriate phasing and sediment management is not applied. With respect to phasing, removal of the dam structures should be timed to avoid high in-channel flow conditions and to promote soil stabilization through revegetation during favourable growing periods. Non-vegetated surfaces may also be mechanically stabilized with erosion control blankets for temporary protection as vegetation establishes. Dam structure removal and reservoir drawdown should occur in a gradual, staged manner to reduce erosivity of the associated flow release and to permit enhanced vegetation establishment during the interim period between drawdown events. Abrupt removal (e.g., over daily or weekly intervals) will subject relatively exposed, sensitive sediments to more turbulent flow conditions. Therefore, large reservoir drawdown is typically recommended to occur over the course of 1 or more years.

Strategic use and placement of erosion and sediment controls, such as silt fencing and cofferdams, can also help mitigate erosive forces and sediment transfer by forming temporary barriers and promoting backwatering/depositional conditions. In addition, a qualified environmental monitor or geomorphologist should conduct regular inspections to rapidly address potential erosion issues as they arise. Finally, longer-term erosion mitigation strategies, such as bioengineering, may be implemented for enhanced bed and bank protection (see below Section for details).

Selective removal of built-up sediments in the reservoir in advance of the dam removal can also help reduce the extent of release. However, this is not considered a practical or cost-effective approach due to the scale of the reservoirs and degree of existing sediment accumulation.

Channel Restoration Recommendations

The newly formed channels will be allowed to evolve over time, thereby forming naturally occurring habitat. However, the newly formed channel will be relatively susceptible to erosion as it will take years for vegetation to establish deep rooting systems to help hold the bank materials intact. As such, more robust erosion mitigation treatments may be required along the channel bed or bank in problematic areas and/or to address erosion concerns. There are multiple design alternatives depending on the degree of stability required. Several examples are described below.

Channel Bank Bioengineering

A vegetative rock buttress treatment is a popular and relatively robust bank treatment option for large river systems. It may be configured with hydraulically-sized stone, to offer the requisite stability to withstand severe flow conditions, and may be revegetated with a high density of live plantings to enhance terrestrial cover and provide shading benefits to the watercourse.

The vegetated rock buttress consists of multiple rows of large subrounded to subangular boulders with live plantings installed in the gaps that occur between adjacent stones. As the plantings establish, feature stability is further enhanced through root generation. The stones are hydraulically-sized to withstand entrainment during a range of flood events. Larger stones sourced from the mix are to be positioned along the toe of the treatment, where in-channel shear is greatest. Relatively smaller stones may be used to construct the upper rows of treatment.

Alternatively, relatively “soft”, more heavily vegetated bioengineering solutions are also available where the erosion risk is relatively reduced. Soft treatments generally consist of stone-based toe protection, overlaid with vegetated treatments such as fascines, soil lifts, and/or simple live staking. These treatments rely on vegetation establishment and live woody elements to hold the bank intact. Successful, relatively easy-to-implement examples include brush mattressing, vegetated layering, and root wad bank protection. The treatments are further supported with biodegradable erosion control blanket to provide short-term erosion control while the plantings establish. Although slightly less robust than the vegetated rock buttress, soft treatments provide optimal benefit to aquatic wildlife through provision of a combination of stone and woody features.

Example photographs of constructed channel bioengineering techniques are included in **Figure 1**.

Channel Bed Grade Control

Removal of the dams will result in a gradual lowering of the channel bed as the channel adjusts to re-establish a stable invert at the dam location. Channel bed grade controls may be installed at strategic locations to provide stability while maintaining seamless flow connectivity between the upstream naturalized channel and downstream receiving channel.

Channel bed grade controls consist of stone-based weirs which extend laterally across the channel. Weir stones are hydraulically-sized (oversized) for long-term stability. Upstream of each weir, the degradational tendency of the bed in an alluvial stream is mitigated, although this effect decreases progressively farther upstream. To construct a weir, stones should be arranged with an arc shape with the apex of the arc pointing in the upstream direction. This not only helps to increase the stability of the weir by strengthening the contact between stones due the flow direction but also to locally concentrate flows towards the centre of the channel and promote pool development and maintenance. Weir spacing should be such that the backwater of a weir extends to the next upstream weir or existing stable riffle, under low flow conditions. In addition to combating channel degradation, the weirs provide a degree of morphological variability to the channel bed. This benefits aquatic wildlife through provision of spatially diverse flows, enhanced flow aeration, and refuge opportunity within the relatively languid pools that form between weirs.

Example photographs of constructed channel bed grade controls and bank bioengineering techniques are included in **Figure 1**. **Figure 1A** displays a weir grade control supported by brush mattressing along the channel banks. The toe of the brush mattress treatment is reinforced with stone, for stability, while the upper banks gradually revegetate. In **Figure 1B**, the left bank is reinforced with a vegetative rock buttress to combat lateral migration. In addition, the bed is reinforced with hydraulically-sized stone weirs to combat downcutting while maintaining flow connectivity (and fish passage) through the restored reach. This represents a more robust design alternative applicable in areas where the erosion potential is high.

Figure 1: A) Typical vortex rock weir B) Typical vegetated rock buttress

Implementation of a combination of the channel bed and bank treatments is likely appropriate at the dam removal locations to manage erosion in proximity to important assets or infrastructure.

Summary

GEO Morphix has reviewed the available data to estimate the channel configuration, meander belt, and potential release of sediment associated with the removal of both the Coldstream Road Dam and Head Street Dam in Strathroy, Ontario.

Empirical modelling was applied to delineate the meander belt widths at each location. The recommended meander belt width for the Coldstream Dam, ranged from 57 m to 78 m. The corresponding estimated sediment load was 7,049 m^3. The recommended meander belt width for the Head Street Dam ranged from 82 m to 187 m, with a potential sediment load of approximately 47,836 m^3.

We recommend that the water levels of both dams be lowered systematically through strategic dewatering and sediment stabilization. Sediment releases could be substantially larger if dewatering and stabilization is not undertaken during dam removal. These estimates assume no downcutting below the approximated bankfull depth, which could result in a much larger volumes of sediment being released.

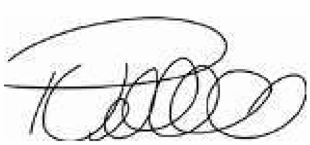
Bank bioengineering is recommended to mitigate future lateral migration, and in areas where the channel meanders near infrastructure. In addition, channel bed controls may be installed at the dam locations to provide vertical channel stability, as required. Although, implementation of the noted mitigation treatment is not an immediate concern and may be coordinated following identification of problematic areas during post-removal monitoring.

It is important to note that short-term transfer of sediments from the reservoirs is expected as the previously trapped sediments are uncovered and mobilized. Removal of the dam will also impact long-term sediment transfer, although transport rates are expected to align with natural pre-dam conditions.

Finally, the sediment surveys provide volumetric estimates, but were not detailed enough to identify the historical planform of the channel with accuracy. Completion of detailed sediment surveys is recommended to support the development of future dam removal plans. Detailed surveys can be performed in open water using side-scan sonar to identify remnant areas of excavation and historical channel morphology.

We trust this memo meets your requirements. Should you have any other questions or concerns, please contact the undersigned.

Respectfully submitted,



Paul Villard Ph.D., P.Geo., CAN-CISEC, EP, CERP
Director, Principal Geomorphologist

References

Ministry of Natural Resources and Forestry (MNRF). 2002. Technical Guide – River and Stream Systems: Erosion Hazard Limit.

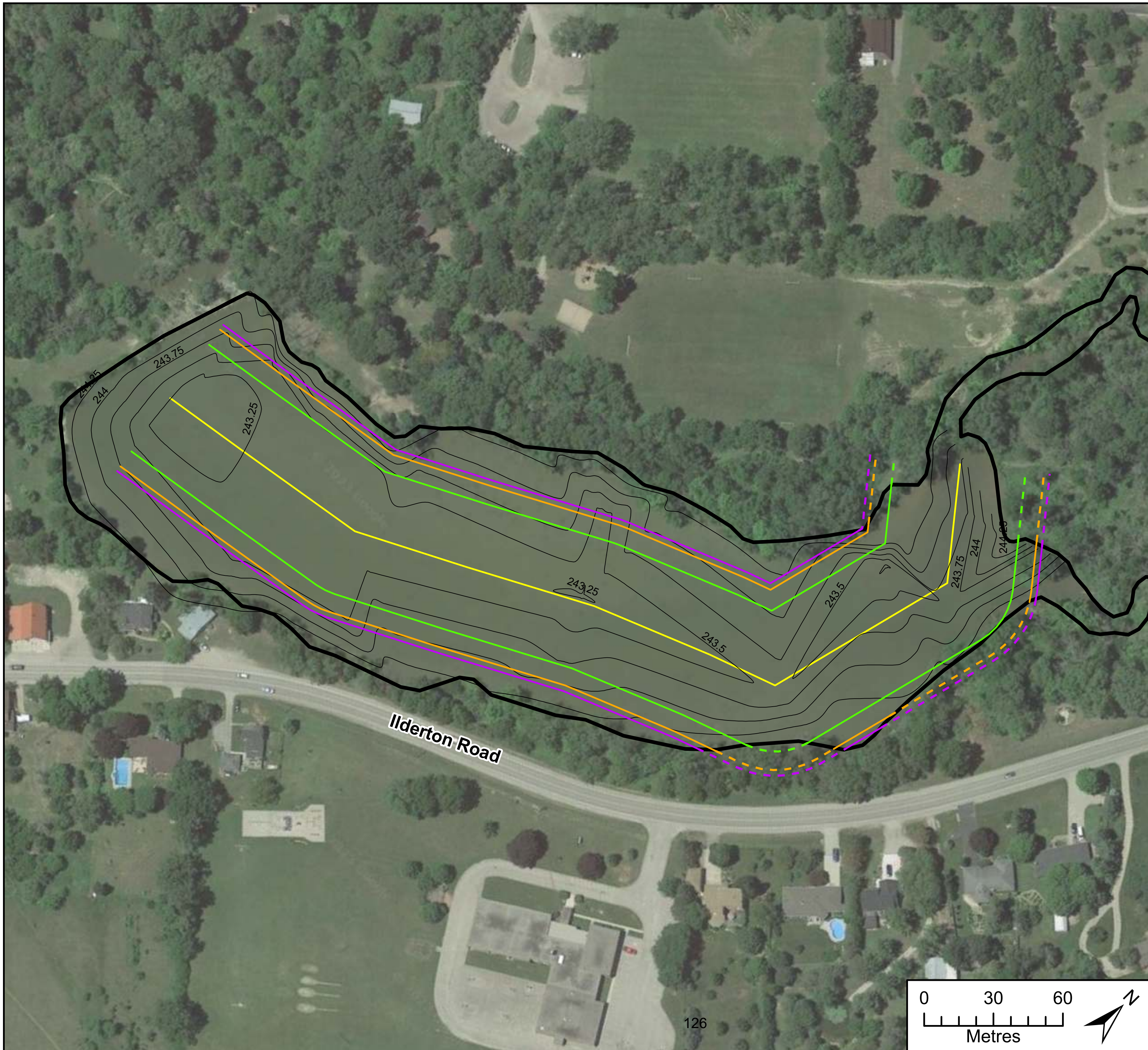
Rosgen, D.L. 1994. A classification of natural rivers. Catena, v. 22, pp. 169-199

Toronto and Region Conservation Authority (TRCA). 2004. Belt Width Delineation Procedures.

Ward, A. D. Mecklenberg, J. Mathews, and D. Farver. 2002. Sizing Stream Setbacks to Help Maintain Stream Stability. Paper Number: 022239. 2002 ASAE Annual International Meeting. Chicago, IL, USA. July 28-July 31, 2002

Williams, G.P. 1986. River meanders and channel size. Journal of Hydrology, 88 (1-2): 147-164.

Appendix A
Erosion Hazard Map



GEO | MORPHIX™

Preliminary MBW

Based on Current Thalweg

Coldstream Reservoir

Strathroy, Ontario

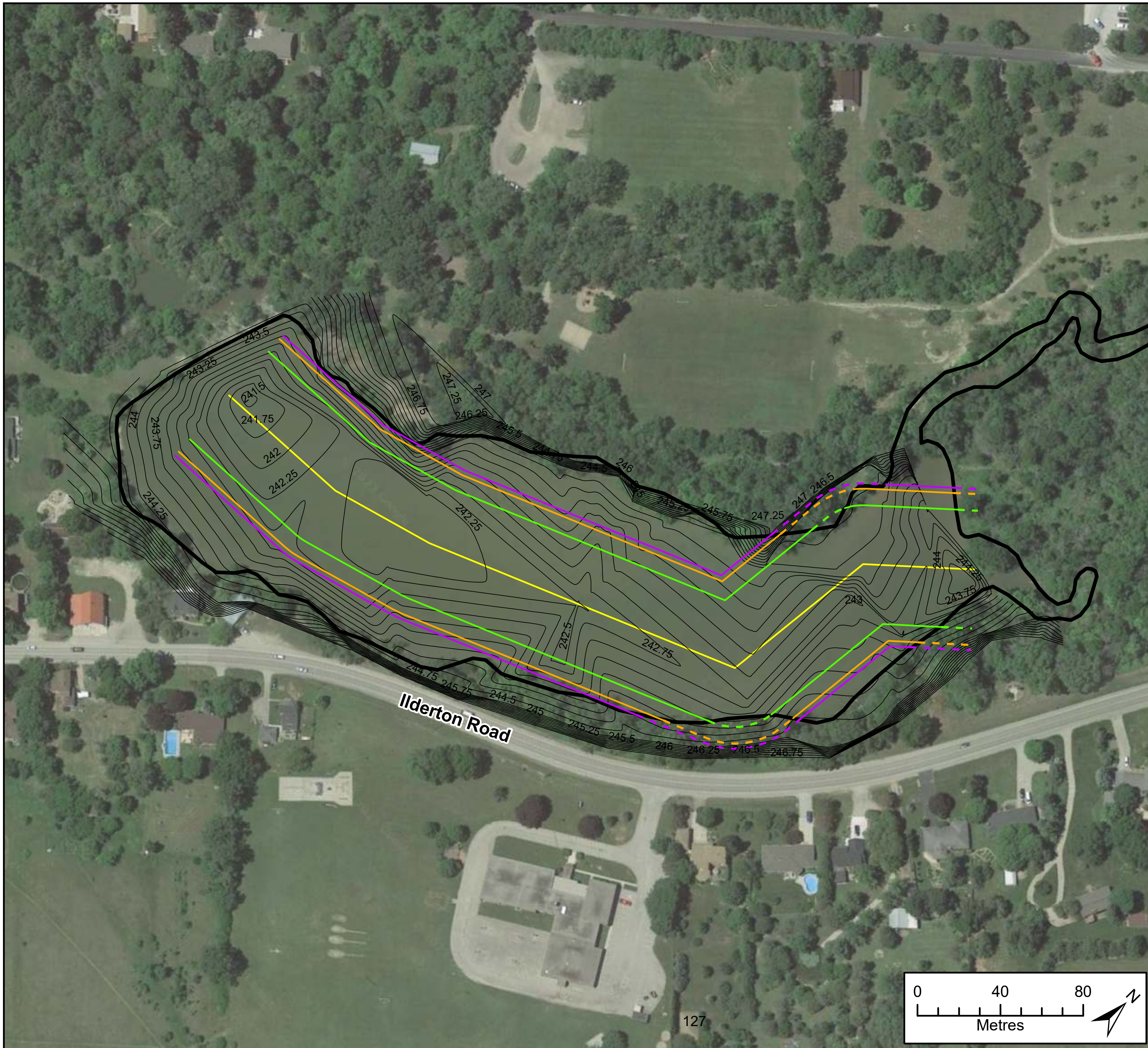
Legend

- Approximate Reservoir Boundary
- Sediment Bed Contours
- Approximate Current Central Tendancy (derived from thalweg of sediment) including removal of more recently deposited sediments
- TRCA (73 m)
- Modified Williams Width (20% Factor of Safety) (57 m)
- Ward Width (20% Factor of Safety) (78 m)
- Williams (outside of top of bank)
- TRCA (outside of top of bank)
- Ward (outside of top of bank)

Corresponding dashed lines represent outside of approximate top of bank

We have reviewed the cross-sections, and the boundary of the reservoir generally appear to correspond with the top of bank

Imagery: Google Earth, 2018. MBW: GEO Morphix Ltd., 2022. Approximate Reservoir Boundary: GSS Engineering, 2022. Print Date: January 2023. PN22087. Drawn By: M.O., P.V.



GEO | MORPHIX™

Preliminary MBW

Based on Historical Thalweg

Coldstream Reservoir

Strathroy, Ontario

Legend

- Approximate Reservoir Boundary
- Hard Bottom Contours
- Approximate Historical Central Tendancy
- TRCA (73 m)
- Modified Williams Width (20% Factor of Safety) (57 m)
- Ward Width (20% Factor of Safety) (78 m)
- Williams (outside of top of bank)
- TRCA (outside of top of bank)
- Ward (outside of top of bank)

Corresponding dashed lines represent outside of approximate top of bank

We have reviewed the cross-sections, and the boundary of the reservoir generally appear to correspond with the top of bank

Imagery: Google Earth, 2018. MBW: GEO Morphix Ltd., 2022. Approximate Reservoir Boundary: GSS Engineering, 2022. Print Date: January 2023. PN22087. Drawn By: M.O., P.V.

GEO | MORPHIX™

Preliminary MBW

Based on Current Thalweg

Head Street Reservoir

Strathroy, Ontario

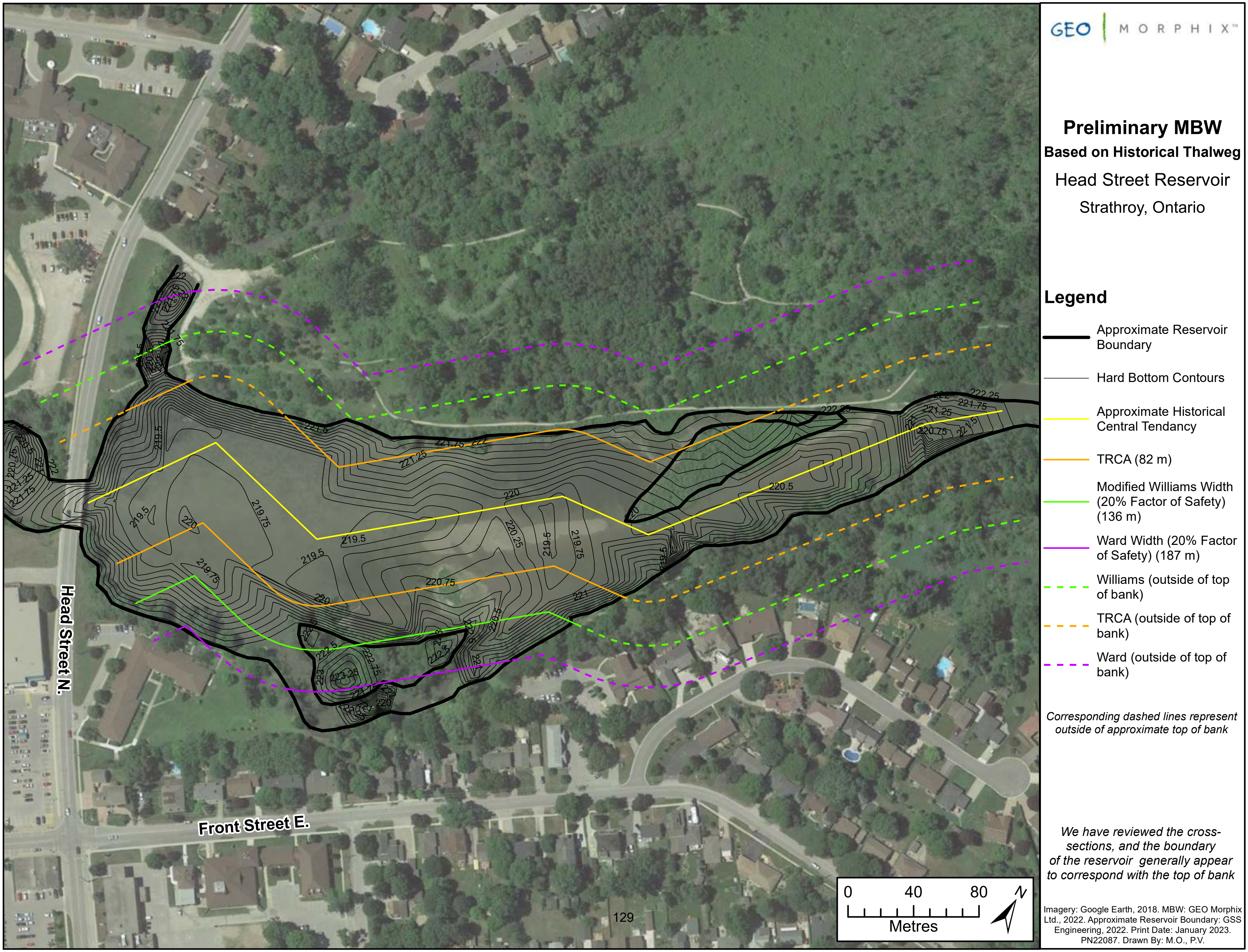
Legend

- Approximate Reservoir Boundary
- Sediment Bed Contours
- Approximate Current Central Tendancy (derived from thalweg of sediment) including removal of more recently deposited sediments
- TRCA (82 m)
- Modified Williams Width (20% Factor of Safety) (136 m)
- Ward Width (20% Factor of Safety) (187 m)
- Williams (outside of top of bank)
- TRCA (outside of top of bank)
- Ward (outside of top of bank)

Corresponding dashed lines represent outside of approximate top of bank

We have reviewed the cross-sections, and the boundary of the reservoir generally appear to correspond with the top of bank

Imagery: Google Earth, 2018. MBW: GEO Morphix Ltd., 2022. Approximate Reservoir Boundary: GSS Engineering, 2022. Print Date: January 2023. PN22087. Drawn By: M.O., P.V.


Head Street N.
Front Street E.
GEO MORPHIX™
Preliminary MBW
Based on Historical Thalweg
Head Street Reservoir
Strathroy, Ontario
Legend
Approximate Reservoir Boundary
Hard Bottom Contours
Approximate Historical Central Tendancy
TRCA (82 m)
Modified Williams Width (20% Factor of Safety) (136 m)
Ward Width (20% Factor of Safety) (187 m)
Williams (outside of top of bank)
TRCA (outside of top of bank)
Ward (outside of top of bank)
Corresponding dashed lines represent outside of approximate top of bank
We have reviewed the cross-sections, and the boundary of the reservoir generally appear to correspond with the top of bank
0 40 80
Metres
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Imagery: Google Earth, 2018. MBW: GEO Morphix Ltd., 2022. Approximate Reservoir Boundary: GSS Engineering, 2022. Print Date: January 2023. PN22087. Drawn By: M.O., P.V.

APPENDIX C

Contaminant and Particle Size Analysis of Sediment Samples

ST. CLAIR REGION CONS. AUTH.
ATTN: Greg Wilcox
205 MILL POND CRESCENT
STRATHROY ON N7G 3P9

Date Received: 14-APR-22
Report Date: 11-MAY-22 13:32 (MT)
Version: FINAL

Client Phone: 519-245-3710

Certificate of Analysis

Lab Work Order #: L2699441

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers:
Legal Site Desc:

Costas Farassoglou
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2699441-1	L2699441-2	L2699441-3	L2699441-4	L2699441-5
	Description	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampled Date	14-APR-22	14-APR-22	14-APR-22	14-APR-22	14-APR-22
	Sampled Time					
	Client ID	CS1	CS2	CS3	CS4	CS5
Grouping	**Analyte**					
SOIL						
Physical Tests	Grain Size Curve					
	% Moisture (%)	23.1	59.4	53.0	20.1	30.8
	pH (pH units)	7.43	6.74	6.86	7.43	7.04
Particle Size	Gravel (4.75mm - 3in.) (%)					
	Medium Sand (0.425mm - 2.0mm) (%)					
	Coarse Sand (2.0mm - 4.75mm) (%)					
	Fine Sand (0.075mm - 0.425mm) (%)					
	Silt (0.002mm - 0.075mm) (%)					
	Silt (0.005mm - 0.075mm) (%)					
	Clay (<0.002mm) (%)					
	Clay (<0.005mm) (%)					
Cyanides	Cyanide, Free (ug/g)	<0.050	<0.123 DLHM	<0.050	<0.050	<0.050
Metals	Aluminum (Al) (ug/g)	3260	8740	10900 DLM	8150	5290 DLM
	Antimony (Sb) (ug/g)	<0.10	<0.10	<0.20 DLM	0.20	<0.20 DLM
	Arsenic (As) (ug/g)	1.89	2.37	3.02 DLM	4.50	2.81 DLM
	Barium (Ba) (ug/g)	17.1	56.4	75.1 DLM	41.3	33.2 DLM
	Beryllium (Be) (ug/g)	0.16	0.36	0.42 DLM	0.31	0.24 DLM
	Bismuth (Bi) (ug/g)	<0.20	<0.20	<0.40 DLM	<0.20	<0.40 DLM
	Boron (B) (ug/g)	<5.0	7.8	10 DLM	7.2	<10 DLM
	Cadmium (Cd) (ug/g)	0.089	0.255	0.280 DLM	0.166	0.140 DLM
	Calcium (Ca) (ug/g)	200000	114000	174000 DLM	143000	172000 DLM
	Chromium (Cr) (ug/g)	9.68	14.5	18.3 DLM	14.8	11.4 DLM
	Cobalt (Co) (ug/g)	2.43	4.85	5.96 DLM	5.01	3.07 DLM
	Copper (Cu) (ug/g)	4.23	11.5	14.3 DLM	13.4	6.6 DLM
	Iron (Fe) (ug/g)	8330	12200	14600 DLM	14100	9120 DLM
	Lead (Pb) (ug/g)	4.03	6.72	8.1 DLM	13.0	4.2 DLM
	Lithium (Li) (ug/g)	4.3	9.6	10.9 DLM	8.7	6.3 DLM
	Magnesium (Mg) (ug/g)	15200	14200	17700 DLM	20600	19200 DLM
	Manganese (Mn) (ug/g)	266	338	418 DLM	492	313 DLM
	Mercury (Hg) (ug/g)	0.0146	0.0248	0.028 DLM	0.0331	0.011 DLM
	Molybdenum (Mo) (ug/g)	0.27	0.27	0.25 DLM	0.55	<0.20 DLM
	Nickel (Ni) (ug/g)	6.09	11.6	14.4 DLM	11.8	7.8 DLM
	Phosphorus (P) (ug/g)	339	834	850 DLM	587	590 DLM
	Potassium (K) (ug/g)	400	1110	1700 DLM	1040	790 DLM
	Selenium (Se) (ug/g)	<0.20	0.70	0.76 DLM	0.28	<0.40 DLM
	Silver (Ag) (ug/g)	<0.10	<0.10	<0.20 DLM	<0.10	<0.20 DLM

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L2699441-6	L2699441-7	L2699441-8		
	Sample ID	L2699441-6	L2699441-7	L2699441-8		
	Description	SOIL	SOIL	SOIL		
	Sampled Date	14-APR-22	14-APR-22	14-APR-22		
	Sampled Time					
	Client ID	CS6	CS PSA1	CS PSA 2		
Grouping	**Analyte**					
SOIL						
Physical Tests	Grain Size Curve		SEE ATTACHED	SEE ATTACHED		
	% Moisture (%)	38.1				
	pH (pH units)	6.84				
Particle Size	Gravel (4.75mm - 3in.) (%)		33.3	<1.0		
	Medium Sand (0.425mm - 2.0mm) (%)		35.8	36.9		
	Coarse Sand (2.0mm - 4.75mm) (%)		21.8	2.7		
	Fine Sand (0.075mm - 0.425mm) (%)		6.6	44.8		
	Silt (0.002mm - 0.075mm) (%)		<1.0	12.1		
	Silt (0.005mm - 0.075mm) (%)		<1.0	11.1		
	Clay (<0.002mm) (%)		1.8	3.3		
	Clay (<0.005mm) (%)		1.8	4.3		
Cyanides	Cyanide, Free (ug/g)	<0.050				
Metals	Aluminum (Al) (ug/g)	12100 DLM				
	Antimony (Sb) (ug/g)	<0.20 DLM				
	Arsenic (As) (ug/g)	3.22 DLM				
	Barium (Ba) (ug/g)	78.3 DLM				
	Beryllium (Be) (ug/g)	0.47 DLM				
	Bismuth (Bi) (ug/g)	<0.40 DLM				
	Boron (B) (ug/g)	12 DLM				
	Cadmium (Cd) (ug/g)	0.304 DLM				
	Calcium (Ca) (ug/g)	183000 DLM				
	Chromium (Cr) (ug/g)	19.5 DLM				
	Cobalt (Co) (ug/g)	6.42 DLM				
	Copper (Cu) (ug/g)	15.6 DLM				
	Iron (Fe) (ug/g)	15800 DLM				
	Lead (Pb) (ug/g)	8.8 DLM				
	Lithium (Li) (ug/g)	13.9 DLM				
	Magnesium (Mg) (ug/g)	18700 DLM				
	Manganese (Mn) (ug/g)	495 DLM				
	Mercury (Hg) (ug/g)	0.032 DLM				
	Molybdenum (Mo) (ug/g)	0.29 DLM				
	Nickel (Ni) (ug/g)	15.7 DLM				
	Phosphorus (P) (ug/g)	900 DLM				
	Potassium (K) (ug/g)	1790 DLM				
	Selenium (Se) (ug/g)	0.69 DLM				
	Silver (Ag) (ug/g)	<0.20 DLM				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2699441-1	L2699441-2	L2699441-3	L2699441-4	L2699441-5
	Description	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampled Date	14-APR-22	14-APR-22	14-APR-22	14-APR-22	14-APR-22
	Sampled Time					
	Client ID	CS1	CS2	CS3	CS4	CS5
Grouping	**Analyte**					
SOIL						
Metals	Sodium (Na) (ug/g)	159	287	230 DLM	206	190 DLM
	Strontium (Sr) (ug/g)	121	87.3	139 DLM	101	131 DLM
	Sulfur (S) (ug/g)	<1000	1200	<2000 DLM	<1000	<2000 DLM
	Thallium (Tl) (ug/g)	<0.050	0.074	0.10 DLM	0.062	<0.10 DLM
	Tin (Sn) (ug/g)	<2.0	<2.0	<4.0 DLM	8.5	<4.0 DLM
	Titanium (Ti) (ug/g)	120	130	207 DLM	211	208 DLM
	Tungsten (W) (ug/g)	<0.50	<0.50	<1.0 DLM	<0.50	<1.0 DLM
	Uranium (U) (ug/g)	0.754	0.715	0.72 DLM	0.735	0.65 DLM
	Vanadium (V) (ug/g)	13.4	17.6	23.1 DLM	22.2	15.6 DLM
	Zinc (Zn) (ug/g)	21.2	47.2	57.0 DLM	41.3	30.4 DLM
	Zirconium (Zr) (ug/g)	<1.0	1.4	<2.0 DLM	<1.0	<2.0 DLM

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2699441-6 SOIL 14-APR-22 CS6	L2699441-7 SOIL 14-APR-22 CS PSA1	L2699441-8 SOIL 14-APR-22 CS PSA 2		
Grouping	**Analyte**					
SOIL						
Metals	Sodium (Na) (ug/g)	DLM 230				
	Strontium (Sr) (ug/g)	DLM 149				
	Sulfur (S) (ug/g)	DLM <2000				
	Thallium (Tl) (ug/g)	DLM 0.12				
	Tin (Sn) (ug/g)	DLM <4.0				
	Titanium (Ti) (ug/g)	DLM 232				
	Tungsten (W) (ug/g)	DLM <1.0				
	Uranium (U) (ug/g)	DLM 0.72				
	Vanadium (V) (ug/g)	DLM 25.4				
	Zinc (Zn) (ug/g)	DLM 66.1				
	Zirconium (Zr) (ug/g)	DLM <2.0				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Item 7.5
Attachment 2

2023

POTENTIAL REMOVAL OF THE COLDSTREAM DAM IN COLDSTREAM, ONTARIO

PROJECT SUMMARY

ST. CLAIR REGION CONSERVATION AUTHORITY | 205 Mill pond Crescent, Strathroy, ON N7G 3P9

Background

The Coldstream Dam is located approximately 12 km northeast of Strathroy in Coldstream, Ontario in the headwaters of the east Sydenham River. Originally constructed in 1968, the structure is approximately 3.35m high and consists of a 45m long retaining wall of vertical sheet piles made of heavy gauge ARCH-Type individual sheets locked together at joint during installation. Large armor stone was placed on the downstream side of the dam ranging in size from 16-24 inches in diameter and placed on a slope of 3:1 horizontal to vertical. An earthen berm approximately 40m long is located at the southern end of the sheet pile dam. The dam does not contain any spillways or stop logs so there is no way to adjust the water levels in the reservoir. The dam is equipped with a low flow bypass valve however, the condition of the valve is believed to be non-operatable. The original purpose of the dam and reservoir was to support recreational opportunities like swimming, boating, and fishing.

Figure 1 Right: Coldstream dam 1986, Left: Coldstream reservoir used for swimming and boating in the 1970's

Since the installation of the dam and creation of the reservoir sedimentation has occurred increasing the depth of sediment in the reservoir. Additionally, the water quality has declined. This has resulted in a negative impact on recreational activities and wildlife habitat.

Dams in general can negatively impact river ecosystems by creating barriers to fish passage, impeding mussel distribution, altering thermal regimes, altering sediment transport, and degrading water quality (temperature, oxygen levels, algal growth, and bacteria levels). Local concerns have been raised about the water quality in the reservoir, specifically the algal blooms that occur.

Figure 2 2022 Algal bloom in reservoir at Coldstream

With this change in function of the reservoir, and new information regarding the impacts of dams on freshwater systems, the St. Clair Region Conservation Authority (SCRCA) is interested in the feasibility of removing the dam and restoring the reservoir to a more natural river system. The SCRCA has hired GSS Engineering Consultants Ltd. to review the current conditions of the dam and reservoir and investigate the potential removal of the dam. This report summarizes the information obtained from the report titled Potential Removal of the Coldstream Dam in Coldstream, Ontario.

Ecological impacts

The International Union for Conservation of Nature has designated the Sydenham River as one of thirteen freshwater Key Biodiversity Areas in Canada. This is due to the diversity of freshwater species supported by the Sydenham River. The Sydenham River is home to 34 mussel species and 80 fish species as well as many other semi-aquatic species such as turtles, snakes, amphibians, and dragonflies. Some of these species are designated as Species at Risk and are found nowhere else in Canada or remain in only a few locations globally.

As noted in the 2018 Sydenham River Recovery Strategy (Strategy) there are several threats to aquatic Species at Risk that inhabit the Sydenham River. Specifically, dams are identified in the Strategy as negatively impacting aquatic habitat by:

- Causing thermal warming – based on surveys conducted by SCRCA staff over three years, temperature loggers recorded water temperature at the upstream and downstream end of the reservoir and noted on average the water temperature downstream of the reservoir was 2.8°C warmer in the summer months than upstream of the reservoir.

- Decreasing water quality – due to the low flows and shallow water within the reservoir algal blooms have increased. Algal blooms impact water quality by depleting oxygen levels and can create an unpleasant odor and safety concerns on top of being aesthetically unappealing.
- Altering sediment transport processes and sediment deposition - the Coldstream dam prevents sediments such as sand and gravel from moving downstream, this sediment is necessary for some wildlife and their various life stages.
- barrier to fish migration and mussel distribution – the Coldstream dam limits the ability of fish to move freely through the Sydenham River and access a wide variety of habitat types. Additionally, by limiting the ability of fish to move the distribution of mussels are also impacted as many mussels rely on fish hosts to move their young upstream.

Removal of the Coldstream dam would eliminate an identified threat to aquatic species at risk and their habitat and life stages. However, removal of the dam can also negatively impact aquatic species and their habitats if the sediment, specifically the silt, in the reservoir is not managed effectively. Silt, unlike sand and gravel, can negatively impact species downstream by increasing turbidity and making it difficult for species to fulfill their life cycle requirements. Silt can also smother and suffocate sedentary species like mussels or fish eggs. With the amount of silt that has accumulated behind the Coldstream Dam, additional study is recommended to determine silt transport rates and the affected downstream area if the decision is made to remove the dam and allow sediment to naturally migrate downstream.

Overall, removal of the dam should have a net benefit to river ecology. Dam removal should improve habitat for aquatic species at risk by restoring natural sediment transport and supply downstream of the dam, by reducing the thermal impact to the river caused by the dam reservoir and by restoring fish passage. The dam removal options that include allowing the sediment to naturally wash down the river, if considered, should be carefully discussed in advance with regulatory authorities including the Department of Fisheries and Oceans, and the provincial MNRF and MECP. It is critical that these agencies, and perhaps others, come to agreement early in the planning process as to the preferred means to deal with the large volume of sediment stored in the reservoir.

Existing Conditions and Sediment Analysis

Based on the GSS report and subsequent dam condition report prepared by True Engineering in June 2022, the Coldstream dam appears to be in good condition overall. The total life expectancy is estimated at 75-100 years, with the remaining life expectancy estimated at 20-45 years. The reservoir is approximately 4.5 ha in size. The overall depth is relatively shallow with a maximum depth of approximately 1.37m. Historically the reservoir would have been deeper but large volumes of sediment have accumulated and are still accumulating since the time of construction. Sediment depths will continue to increase over time closer to the dam.

Surveys completed by GSS Engineering Consultants summarized the various water depths over the sediment ranged from 0.76m to 1.37m with a typical depth of water over sediment being 1.1m. Reservoir depths were greater toward the Coldstream dam confirming that this area is still slowly accumulating sediment. The sediment depth ranged from less than 0.5m around the edges of the reservoir to over 2m depth in certain areas, more typically, sediment depths of 0.5m to 1.5m cover much of the reservoir.

The volume of sediment in the reservoir currently is estimated to be over 22,500 cubic meters. Based on the watershed area upstream of Coldstream dam it is estimated 444 m^3/year is the total sediment infill rate to the Coldstream dam reservoir. Using the estimated sediment infill rate the reservoir is filling at approximately 10mm (1cm) per year. If this accumulation rate continues, it is projected that over the next 50 years the remaining water depth, above the sediment, would reduce by approximately 0.5m to a depth of approximately 0.6m.

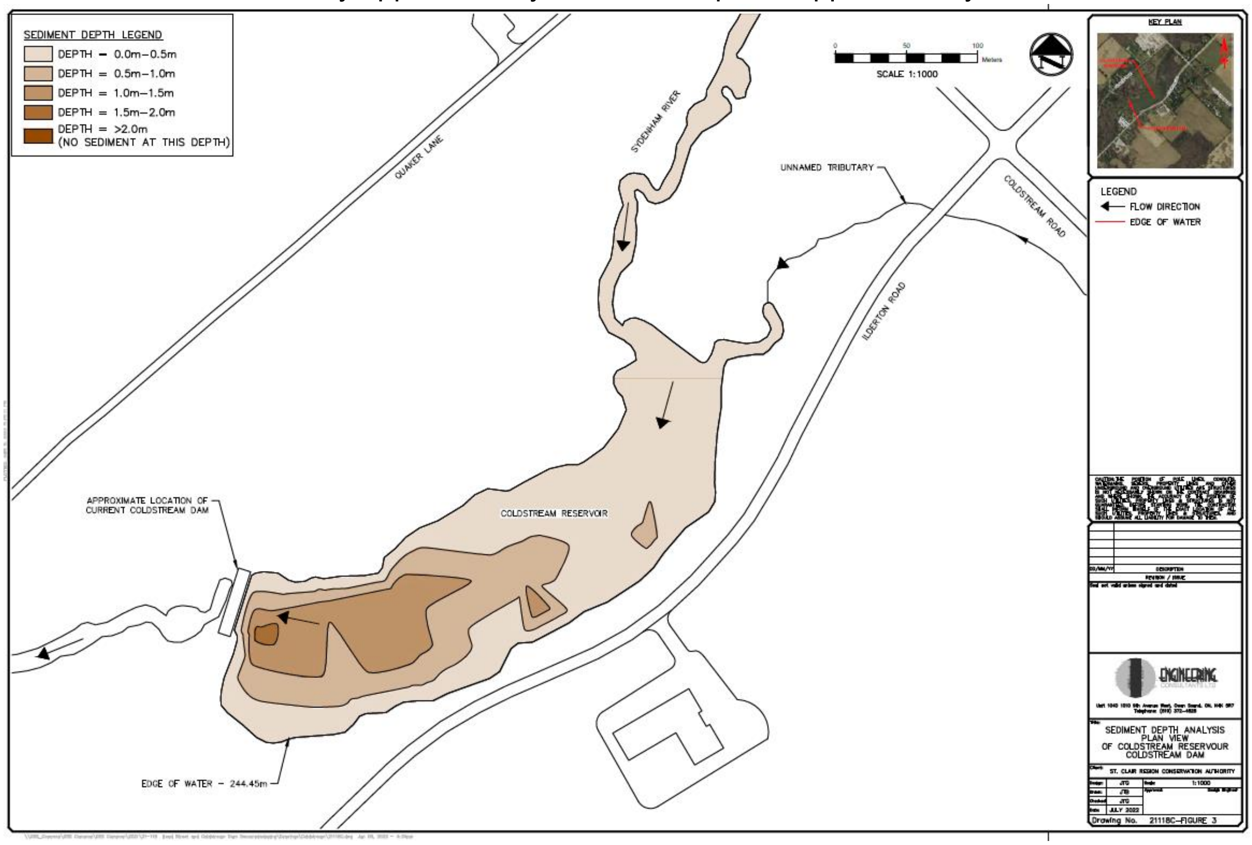


Figure 3 Sediment Depth Analysis for the Coldstream Reservoir

Sediment samples were also collected for analysis to determine if any contaminants are present in the system. Results of the analysis indicate that the sediment quality in the Coldstream reservoir is free of contaminants other than a few locations where elevated levels of phosphorus and manganese were detected. Although these levels were elevated, they were still below the sediment quality standard for phosphorus and manganese set by the Ministry of Environment Conservation and Parks.

A study prepared by GEO Morphix in January 2023 reviewed the potential effects of sediment release and channel formation following the removal of the dam. This study concludes that the new channel that forms in the reservoir (after dam removal) could form significant meander belts with widths ranging from 55m to 80m. These widths approach the widest part of the reservoir. The channel width and depth that could form through the sediment deposition area is estimated to have a width of 7.4 m and a depth of 0.74 m. However, this depth is from final water level to final channel bottom and does not include the height of riverbanks (i.e. remaining sediment) above the final water level at normal river flow rates.

Based on the current sediment conditions in the reservoir it is estimated that an approximate volume of 7,000 cubic meters of sediment would be released from the reservoir if the entirety of the dam were removed. This is 31% of the total estimated volume of sediment currently in the reservoir. It is not known the rate of transport of the released sediment and further evaluation of sediment management options would be required.
It is noted that new regulations in Ontario govern the movement of excess fill and earth material (*Excess Soil Regulation O. Reg. 406/19*). Therefore, if excavation or dredging sediment from the reservoir is proposed additional samples of sediment may be required for analysis of a wider range of parameters to meet the requirements of the regulation.

Based on current conditions, and without further studies, the following conclusions have been presented by GSS Engineers Consultants for sediment management:

1. As per the GSS Engineering and Geo Morphix reports it does not appear practical to dredge or excavate the sediment from the reservoir before the dam is removed.
2. Slow release of the sediment in the reservoir by a stepped removal of the dam over three years would pose less risks to the downstream channel condition than if the dam was completely removed in one season.

Flood and Erosion Analysis

The GSS report looked at what impacts the dam removal would have on flooding and sediment transport.

The flood flows of the East Sydenham River at Coldstream have been estimated by prorating B.M. Ross and Associates' flood flow estimates of the East Sydenham River at Strathroy by the difference in upstream drainage area for the Coldstream dam location. The drainage area upstream of Strathroy is 2.8 times that of Coldstream. Based on this, the flood flows range from 19 m^3/s for the 2-year flood flow to 45 m^3/s for the 100-year flood flow for the Coldstream dam location.

Methods of Dam Removal and Sediment Management Strategies

If a decision is made to remove the Coldstream dam, there are several methods for removing a dam to consider, they are as follows:

1. Full removal of the dam for one summer work period.
2. Gradual removal of the dam over two or more seasons where stop logs are removed in the first year followed by full removal of the dam in the second year or full removal of the dam over several subsequent years.
3. Partial removal of the dam where enough of a dam is removed to achieve environmental goals (i.e. restore fish passage and reduce summertime heating of stream water temperatures) but retain some of the dam to retain sediment storage capacity or to provide some other social or economic benefit by retaining some level of ponding behind the remaining portion of the dam.

4. Construct a permanent bypass channel around the head pond, leaving the dam and head pond sediment as is.

To manage the sediment within the reservoir the following options have been presented by GSS Engineering Consultants:

1. Prior to dam removal, remove the sediment from the reservoir by use of a hydraulic dredge. This requires a floating dredge system that pumps a large volume of sediment mixed with water to a receiving basin that would allow the sediment fraction to settle and the clear “decant” water to return to the river.
2. As part of the dam removal process, construct a large bypass channel or pipeline around the reservoir and dam and discharge the river flow below the dam site. Once the stream bypass is established, mechanically remove reservoir sediment “in the dry” using large excavation equipment and dump trucks etc.
3. Remove dam in stages and allow vegetation to establish and stabilize soils. River flow will transport some sediment in the reservoir downstream naturally.
4. Remove dam in one season and allow flow to transport the sediment in the reservoir downstream naturally.

Table 6 provides a summary of seven general dam removal options including sediment management strategies for each option. This includes the option to “do nothing” (leave dam in place).
For all options proposing dam removal (Options 1, 2, 3, 4, and 5), the dam removal component of the overall project is of moderate complexity as the dam height (3.35 m) is of moderate height and the volume of fill and rock armor stone beside the sheet pile dam is relatively high. Capital costs to remove the dam only (i.e. without sediment management costs) are estimated to range from $500,000 to $1,600,000.

Table 7 provides an overall preliminary cost estimate for the seven different dam removal options. Option 5, partial removal of the sheet pile dam, is estimated to be the lowest cost of dam removal with the highest cost being Option 3 where the dam is removed in steps over several years with water remaining in the reservoir while the dam is removed.

Much higher costs are assigned to active sediment management for Options 1 and 2 where the sediment is removed first by dredging or mechanical excavation before the dam is removed. Such active sediment management costs are estimated to cost at least $1,800,000 in addition to dam removal costs. As discussed in the next sections these active sediment management costs are also seen to have extreme technical challenges and potentially high social impacts.

ENGINEERING CONSULTANTS LTD

December 12, 2023

TABLE 6
Sediment Management and Dam Removal Options
Potential Removal of the Coldstream Dam

21-118

Sediment Management and Dam Removal Options	Economic Considerations	Technical Obstacles	Social Impacts	Environmental Impacts	Regulatory Concerns
<u>**Option 1:**</u> **Dredging of sediment with water in head pond followed by complete dam removal.**	• Very expensive sediment management option as very large volume of sediment/ water mixture will be produced. • Dam removal will be relatively inexpensive.	• Onsite sediment dewatering required. Very large settling pond likely required. • Ultimate sediment disposal requirements could be difficult. • Equipment mobilization, operation and demobilization required.	• Large area required for sediment dewatering in current park area. Major impact to park users.	• Aquatic species (fish, turtles, etc.) in the head pond may be entrained in the dredged sediment. • Fish migration provided. • Thermal impacts to water temperature from head pond are eliminated.	• Regulations regarding sediment disposal on off-site lands are now quite stringent.
<u>**Option 2:**</u> **Temporary bypass of river around dam. Excavate sediment "in the dry" and complete dam removal.**	• Expensive sediment management option. • Temporary bypass pipe or channel around head pond will be expensive to construct. • Least expensive dam removal option.	• Construction of bypass pipe or new channel around the reservoir could be very difficult to design and locate. • Ultimate sediment disposal requirements could be difficult. • Excavating wet sediment with equipment within pond footprint likely difficult.	• Bypass pipe or channel could be a safety hazard until dam and sediments are removed. • Large area of deep, soft sediment could be a danger to pedestrians.	• As head pond level lowers, aquatic species may become trapped in the drying up reservoir. • Fish migration provided. • Thermal impacts to water temperature from head pond are eliminated.	• Regulations regarding sediment disposal on off-site lands are now quite stringent.
<u>**Option 3:**</u> **Remove dam in phases over ± 3 years. Allows slow release of sediment over 3 years.**	• More expensive dam removal option than Option 4. • No significant cost for sediment management.	• Maintaining structural integrity of dam is required over ± 3 year process. • The long timeline to remove dam may be difficult contractually.	• Current reservoir area could be a safety hazard for multiple years due to large areas of deep, soft sediment.	• Sediment is released downstream at a relatively high rate. • Sydenham River downstream of dam will become turbid following each step of dam removal due to entrained sediment. • Fish migration provided. • Thermal impacts to water temperature from head pond are eliminated.	• LIRA (MNRF) permitting may be complicated due to partial removal of dam in steps. • Regulators may not allow the periodic release of large volumes of sediment.
<u>**Option 4:**</u> **One time removal of complete dam. Allow one time release of sediment.**	• Relatively inexpensive dam removal option. • No significant cost for sediment management.	• Water velocity management required to allow head pond to drain slowly.	• Current reservoir area could be a safety hazard for one or two years due to large areas of deep, soft sediment.	• Very large amount of sediment will be transported downstream in a relatively short timeframe. • Sydenham River downstream of dam will become turbid due to entrained sediment. • Fish migration provided. • Thermal impacts to water temperature from head pond are eliminated.	• Regulators may not allow the sudden release of large volumes of sediment.

Sediment Management and Dam Removal Options	Economic Considerations	Technical Obstacles	Social Impacts	Environmental Impacts	Regulatory Concerns
<u>Option 5:</u> **Partial dam removal. Construct "rocky ramp" step pool system to provide fish passage.**	• Least expensive dam removal option. • No significant cost for sediment management.	• Water velocity management required to allow head pond to drain slowly.	• Current reservoir area could be a safety hazard for one or two years due to large areas of deep, soft sediment.	• Fish migration provided. • Thermal impacts to water temperature from head pond are largely eliminated. • Sediment is partially released downstream at a relatively high rate. • Sydenham River downstream of dam will become turbid following partial dam removal due to entrained sediment.	• Regulators may not allow the sudden release of sediment.
<u>Option 6:</u> **Construct permanent new, natural stream channel around dam headpond. Leave dam, head pond and sediment in place as is.**	• Cost to build permanent bypass stream channel quite high. • Avoids cost of dam removal and cost of removing sediment.	• Geotechnical investigations required to confirm remaining land between water in head pond and new channel will be structurally stable and hydraulically stable. • Bridges (pedestrian and/or vehicle bridges) to cross over new stream channel may be required to access north end of dam.	• This Option maintains a lake environment at the site and provides a new, natural stream channel area for viewing, nature enjoyment and passive recreational use. • As the dam deteriorates it will eventually become safety hazard.	• Fish migration provided. • Thermal impacts to water temperature from head pond are largely eliminated as flow through head pond is significantly reduced. • Sediment release from the head pond is avoided.	• This option requires a large volume of earth fill to be removed to construct new, natural stream channel. Need to follow Excess Fill regulations for disposal of fill elsewhere. • As the dam's structural integrity degrades over time, regulators may be concerned with public safety and dam failure.
<u>Option 7:</u> **Do nothing.**	• No immediate cost. • Potential for increased maintenance costs as the dam deteriorates.	• Dam may need to be structurally reinforced in the future.	• As the dam deteriorates it will eventually become safety hazard.	• The dam obstructs fish migration. • The dam deprives aquatic species (including SAR) downstream of dam of required sediment. • The head pond continues to warm up water temperatures during the summer.	• As the dam's structural integrity degrades over time, regulators may be concerned with public safety and dam failure.

December 12, 2023 — 21-118

TABLE 7
Sediment Management and Dam Removal Options - Preliminary Cost Estimate
Potential Removal of the Coldstream Dam

Sediment Management and Dam Removal Options	Capital Cost Estimate for Dam Removal	Capital Cost Estimate for Sediment Removal	Total Capital Cost Estimate	Comments
Option 1: **Dredging of sediment with water in head pond followed by complete dam removal.**	$1,100,000 to $1,300,000	>$2,000,000 Need to construct very large sediment/dewatering lagoon on north side of head pond.	>$3,100,000 to $3,300,000	Cost to design, approve and construct large sediment/dewatering pond difficult to estimate. Would also be final restoration costs of dewatering pond once sediment dries. Major impact on conservation authority site project.
Option 2: **Temporary bypass of river around dam. Excavate sediment "in the dry" and complete dam removal.**	$700,000 to $900,000	>$1,800,000 Cost to build large bypass channel or large bypass pipe around north side of head pond would be extremely high.	>$2,500,00 to $2,700,000	Technically difficult. The bypass channel/pipeline likely would need to be quite large to accommodate a reasonably large flow, i.e. ± 5 m^3/s. Deep excavation likely required through higher lands on northern side of pond. Removal of excavated sediment from "dry pad" likely difficult due to wet, soft soil conditions.
Option 3: **Remove dam in phases over ± 3 years. Allows slow release of sediment over 3 years.**	$1,600,000	Essentially zero cost for active sediment management as sediment would slowly wash downstream. Assume $300,000 for bioengineering stabilization of emerging stream banks.	$1,900,000	Second lowest overall cost. Agreement from all review agencies (DFO, MECP, MNRF and SCRCA) required in advance to allow downstream sediment release from head pond.
Option 4: **One time removal of complete dam. Allow one time release of sediment.**	$1,100,000 to $1,300,000	Essentially zero cost for active sediment management as sediment would wash downstream. Assume $300,000 for bioengineering stabilization of emerging stream banks.	$1,400,000 to $1,600,000	Lowest overall cost. Agreement from all review agencies (DFO, MECP, MNRF and SCRCA) required in advance to allow downstream sediment release from head pond.
Option 5: **Partial dam removal. Construct "rocky ramp" step pool system to provide fish passage.**	$500,000 for partial dam removal in one year.	Essentially zero cost for active sediment management as sediment would wash downstream. Assume $300,000 for bioengineering stabilization of emerging stream banks.	$800,000	Lowest overall cost. Provides fish passage and minimizes downstream sediment migration.
Option 6: **Construct permanent new, natural stream channel around dam headpond. Leave dam and sediment in place as is.**	New channel would be approximately 350 m long and designed for major flood flows of approximately 100 cubic meters per second. The cost of the new channel is estimated to be $1,800,000 to $2,100,000.	No cost. Sediment remains in place.	Cost for new permanent, stream channel estimated to be $1,800,000 to $2,100,000.	Cost similar to Options 3 and 4 but more than Option 5. Long term, dam removal and sediment management may still be required.
Option 7: **Do nothing.**	Theoretically zero cost. However, ultimately, dam will reach end of service life and will need to be repaired, rebuilt or removed.	No cost.	Theoretically zero.	Volume of sediment in head pond will continue to increase over time. With inflation and extra sediment, future costs for dam removal will increase compared to current costs.

Note: Capital costs do not include consultation, engineering or permitting costs.

Summary of Options and Costs

As per the options and estimated costs presented in Table 6 and Table 7, there appears to be very significant costs and technical challenges to complete Option 1 or Option 2 with preliminary cost estimates ranging from $2.5 M to $3.3 M. Both options would deal proactively with the sediments to prevent sediment in the reservoir from being naturally transported downstream. However, the technical and environmental challenges, and the capital and engineering costs of Option 1 and 2, would appear beyond the reach of the project. As such, the recommendation of GSS Engineering Consultants Ltd is that Option 1 and Option 2 are not considered feasible at this time and that Option 3, 4, 5, and 6 be considered further for removal of the Coldstream dam.

It is likely unrealistic for a dam removal strategy to be implemented that proactively removes the accumulated sediment in the Coldstream reservoir. Therefore, it is assumed that if the dam is removed the accumulated sediment will be left to be naturally transported downstream over time. As the river meanders through the empty reservoir in search of its final channel path, much of the sediment will be transported and this will alter the topography of the former reservoir area. As such it is recommended that any major rehabilitation efforts in the reservoir take place only after the river has found it's final path and the topography is relatively constant. This may take 5-10 years.

Alternatively, one option includes a permanent, natural bypass channel around the dam and reservoir. This option would avoid release of sediment from the head pond and therefore the following rehabilitation options would not apply for this option as the reservoir would remain "as is".

Until the river has created a final path, the large plain of drying sediment and meandering river may be dangerous for human use. It is recommended that human use of the former reservoir be discouraged until rehabilitation is fully completed.

Potential Removal of Coldstream Dam Next-Steps

Figure 3 provides a general outline of the next steps for the potential removal of the Coldstream Dam in the form of a flow chart. The flow chart follows the steps including selection of preferred removal and sediment management method, consultation with review agencies, recommended additional studies, engineering of dam removal, tendering the project, removal of the dam, and finishing with the rehabilitation of the former reservoir. Emphasis is placed on communication with review agencies. If the dam is to be removed, it is very important that all appropriate review agencies (MNRF, MECP, DFO, Indigenous groups) are consulted to determine the preferred dam removal and sediment management option. If passive sediment management is the preferred option, it is important that all review agencies are aware of the effects this will have on the East Sydenham River (increased turbidity and siltation downstream of the dam).

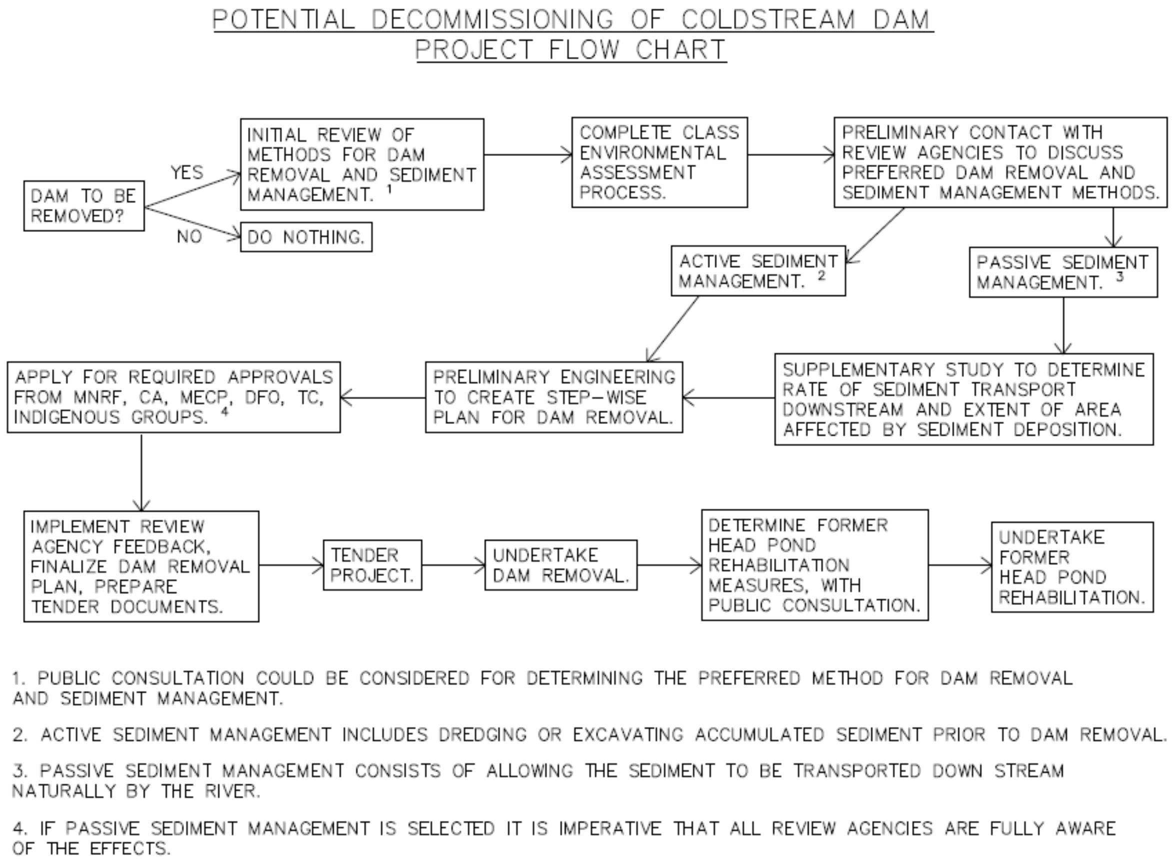
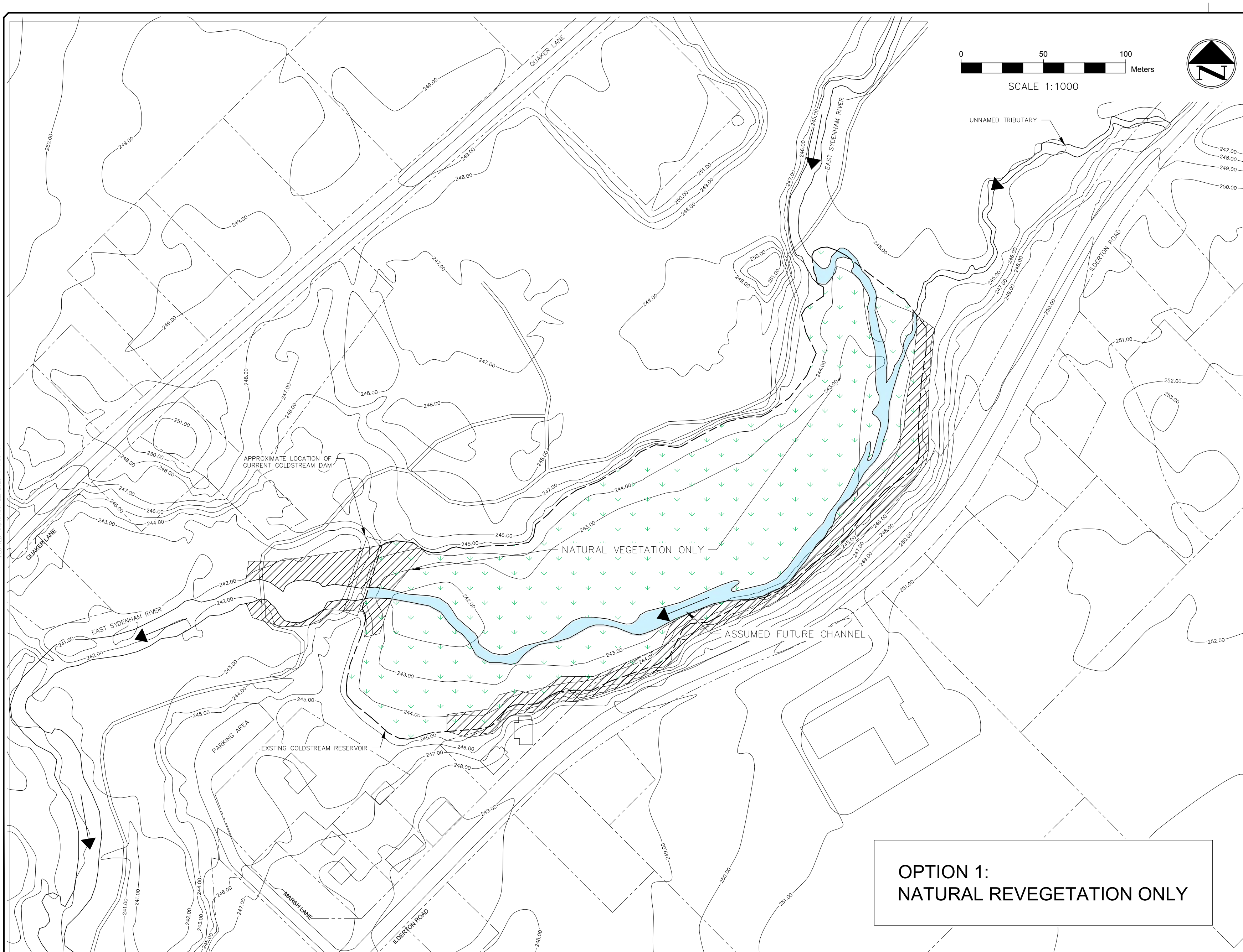


Figure 3 Next Steps for Potential Decommissioning of Coldstream Dam Project

Restoration of the Reservoir

The Coldstream dam reservoir has an area of approximately 4.5ha. This large area provides an opportunity for a range of rehabilitation options if ever the dam is considered for removal. Options have been presented by GSS Engineering Consultants, based on feedback from the SCRCA and relatively low costs for construction and maintenance. The following figures provide a visual concept for restoration of this area following dam removal and include options for creating passive recreation and improving natural wildlife habitats.

All the rehabilitation options highlight areas in which erosion control may be required. These areas include the shores of the dam and along the south shoreline as this is the estimated path of the river through the reservoir. If the final river path is different then that identified on the restoration drawings, the areas requiring erosion control should be altered accordingly.



OPTION 1:
NATURAL REVEGETATION ONLY

KEY PLAN

LEGEND

- EDGE OF EXISTING HEAD POND
- PROPERTY LINE
- EXISTING TRAIL
- ASSUMED FUTURE CHANNEL IN THE EXISTING HEAD POND
- PROPOSED NATURALLY RE-VEGETATED AREA
- PROPOSED PLANTED TREES AT HIGHER ELEVATIONS
- PROPOSED PLANTED WET TOLERANT SHRUBS AT LOWER ELEVATIONS
- PROPOSED TRAIL
- PROPOSED WATER FEATURE (POND/WETLAND)
- OVERFLOW CULVERT FROM WATER FEATURE TO RIVER
- *AREA FOR POTENTIAL EROSION CONTROL
- 253.00 **CONTOURS (1.00m)

*AREAS FOR POTENTIAL EROSION CONTROL ARE BASED ON THE ASSUMED FINAL CHANNEL PATH. THE ACTUAL AREAS REQUIRING EROSION CONTROL SHOULD BE SELECTED BASED ON THE ACTUAL FINAL CHANNEL PATH.

**ELEVATION CONTOURS IN THE RESERVOIR REPRESENT THE HARD BOTTOM AND ASSUME THE ACCUMULATED SEDIMENT IS REMOVED.

CAUTION: THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS, PROPERTY LINES AND OTHER UNDERGROUND AND OVERGROUND UTILITIES ARE STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES, PROPERTY LINES & STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES, PROPERTY LINES & STRUCTURES, AND SHOULD ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

DD/MM/YY	DESCRIPTION
	REVISION / ISSUE

Seal not valid unless signed and dated

GSS ENGINEERING CONSULTANTS LTD
Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7
Telephone: (519) 372-4828

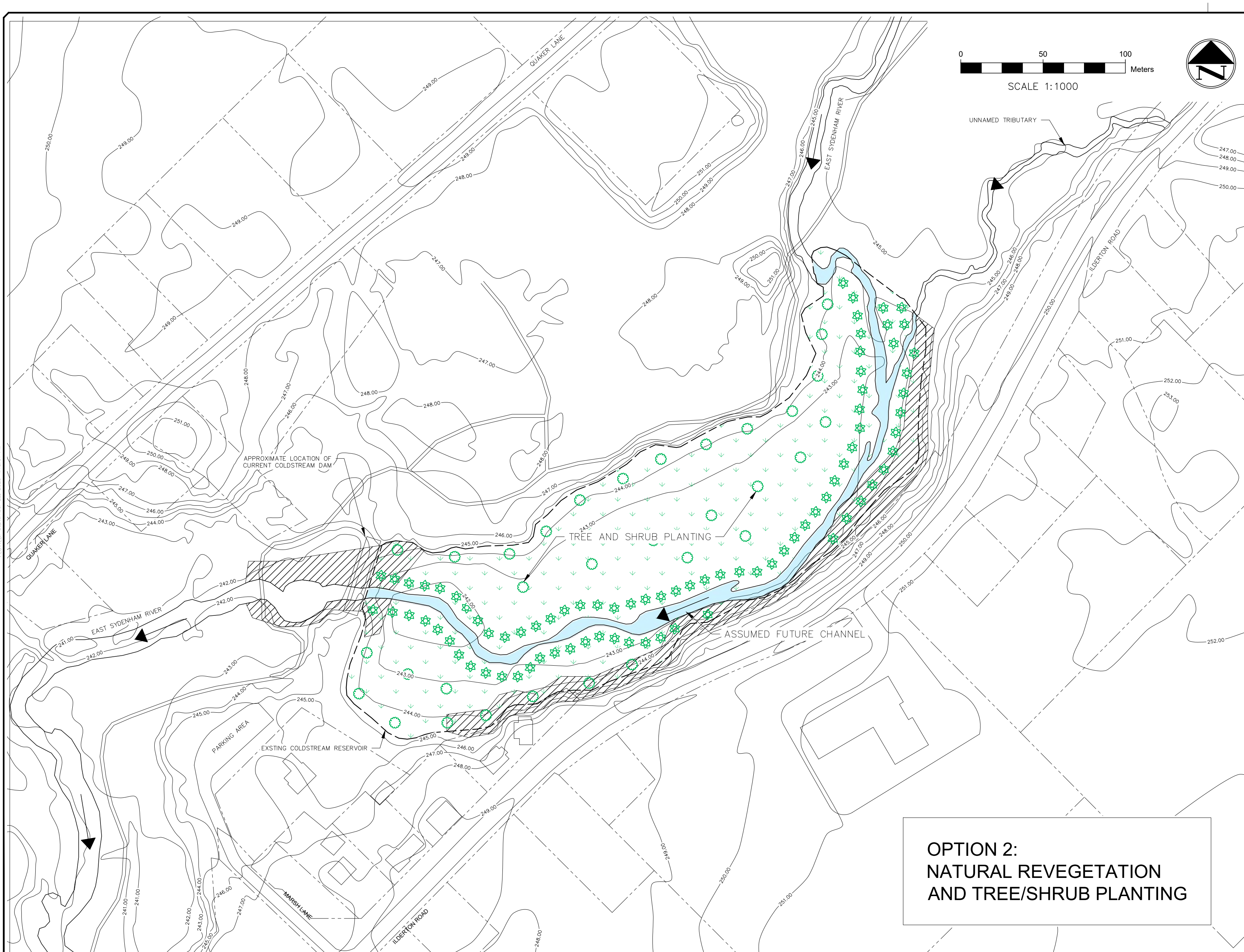
Title:
OPTION 1
HEAD POND RESTORATION
COLDSTREAM DAM

Client: ST. CLAIR REGION CONSERVATION AUTHORITY

Design:	JTG	Scale:	1:1000
Drawn:	JTB	Approved:	Design Engineer
Checked:	JTG		
Date:	JUNE 2023		

Drawing No. 21118C–FIGURE 7

\\GSS_Common\GSS Common\GSS Common\2021\21-118 Head Street and Coldstream Dam Decommissioning\Drawings\Coldstream\21118C.dwg Sep 22, 2023 - 4:17pm



KEY PLAN

LEGEND

- EDGE OF EXISTING HEAD POND
- PROPERTY LINE
- EXISTING TRAIL
- ASSUMED FUTURE CHANNEL IN THE EXISTING HEAD POND
- PROPOSED NATURALLY RE-VEGETATED AREA
- PROPOSED PLANTED TREES AT HIGHER ELEVATIONS
- PROPOSED PLANTED WET TOLERANT SHRUBS AT LOWER ELEVATIONS
- PROPOSED TRAIL
- PROPOSED WATER FEATURE (POND/WETLAND)
- OVERFLOW CULVERT FROM WATER FEATURE TO RIVER
- *AREA FOR POTENTIAL EROSION CONTROL
- 253.00 **CONTOURS (1.00m)

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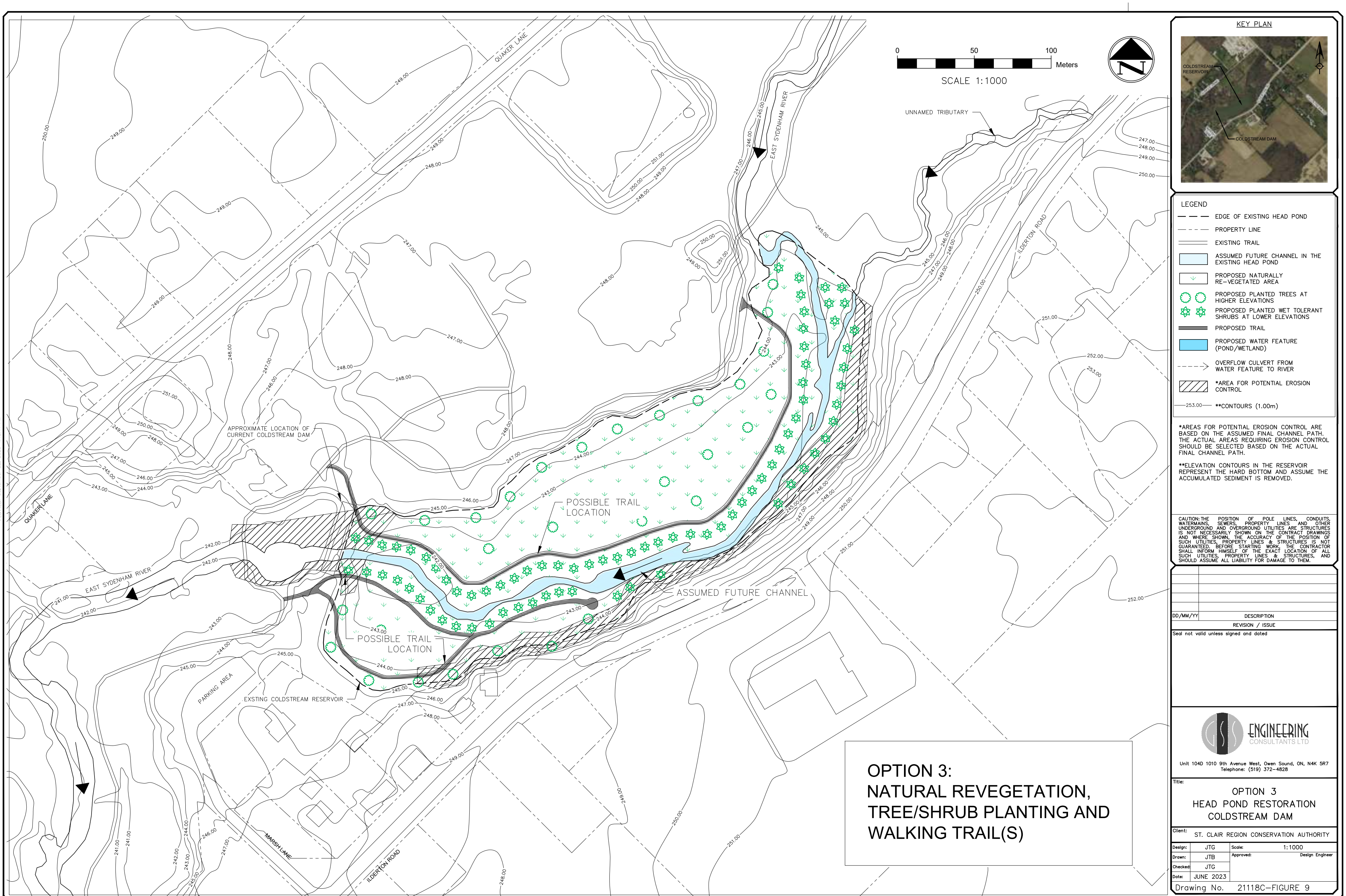
Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7
Telephone: (519) 372-4828

Title:
OPTION 2
HEAD POND RESTORATION
COLDSTREAM DAM

Client: ST. CLAIR REGION CONSERVATION AUTHORITY

Design:	JTG	Scale:	1:1000
Drawn:	JTB	Approved:	Design Engineer
Checked:	JTG		
Date:	JUNE 2023		

Drawing No. 21118C-FIGURE 8



KEY PLAN
COLDSTREAM RESERVOIR
COLDSTREAM DAM
SCALE 1:1000
0
50
100
Meters
LEGEND
EDGE OF EXISTING HEAD POND
PROPERTY LINE
EXISTING TRAIL
ASSUMED FUTURE CHANNEL IN THE EXISTING HEAD POND
PROPOSED NATURALLY RE-VEGETATED AREA
PROPOSED PLANTED TREES AT HIGHER ELEVATIONS
PROPOSED PLANTED WET TOLERANT SHRUBS AT LOWER ELEVATIONS
PROPOSED TRAIL
PROPOSED WATER FEATURE (POND/WETLAND)
OVERFLOW CULVERT FROM WATER FEATURE TO RIVER
*AREA FOR POTENTIAL EROSION CONTROL
**CONTOURS (1.00m)
*AREAS FOR POTENTIAL EROSION CONTROL ARE BASED ON THE ASSUMED FINAL CHANNEL PATH. THE ACTUAL AREAS REQUIRING EROSION CONTROL SHOULD BE SELECTED BASED ON THE ACTUAL FINAL CHANNEL PATH.
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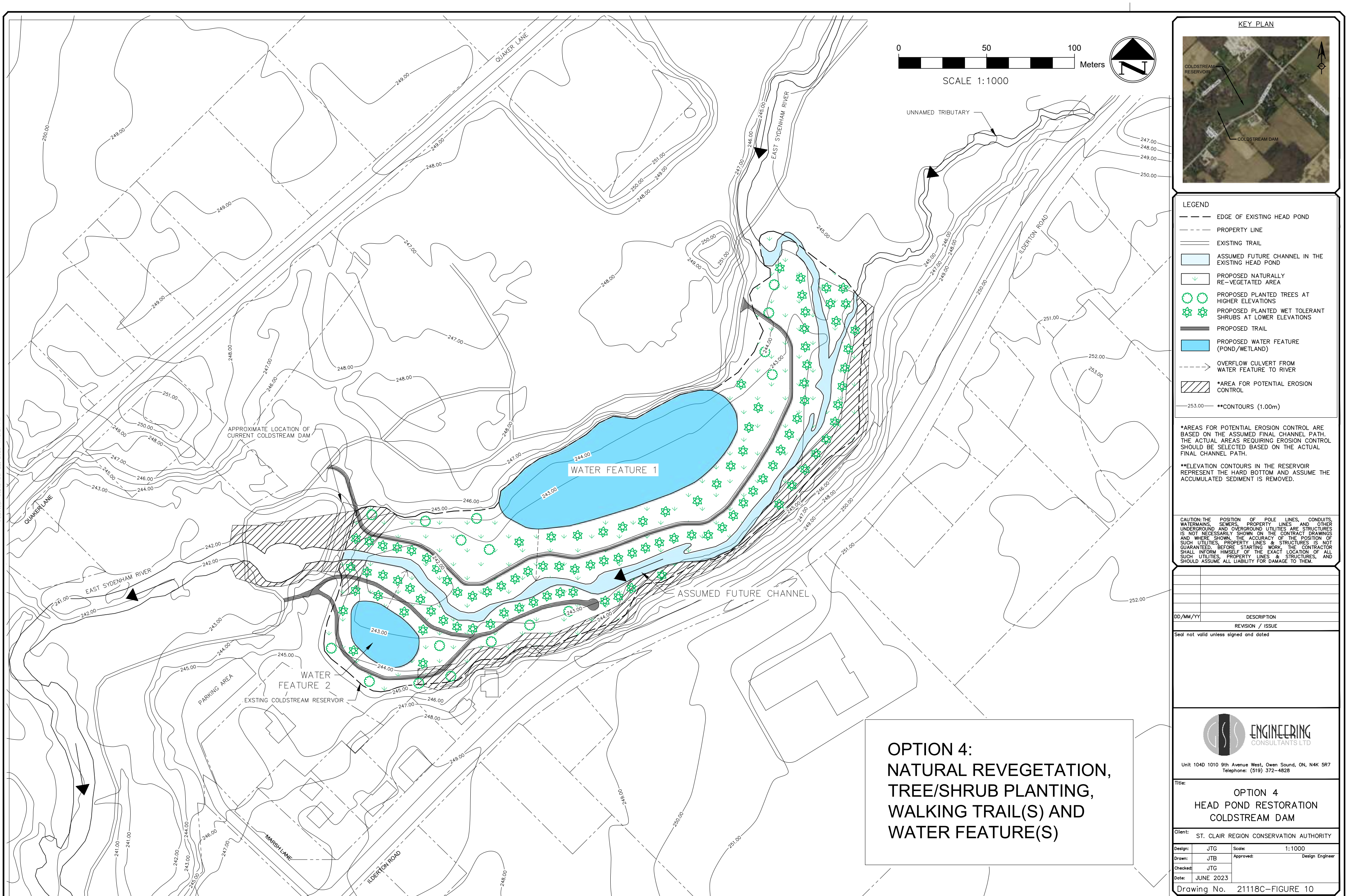
QUAKER LANE
EAST SYDENHAM RIVER
UNNAMED TRIBUTARY
ILDERTON ROAD
MARSH LANE
PARKING AREA
APPROXIMATE LOCATION OF CURRENT COLDSTREAM DAM
EXSTING COLDSTREAM RESERVOIR
POSSIBLE TRAIL LOCATION
POSSIBLE TRAIL LOCATION
ASSUMED FUTURE CHANNEL
OPTION 3:
NATURAL REVEGETATION,
TREE/SHRUB PLANTING AND
WALKING TRAIL(S)
DD/MM/YY
DESCRIPTION
REVISION / ISSUE
Seal not valid unless signed and dated
GSS ENGINEERING CONSULTANTS LTD
Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7
Telephone: (519) 372-4828
Title:
OPTION 3
HEAD POND RESTORATION
COLDSTREAM DAM
Client:
ST. CLAIR REGION CONSERVATION AUTHORITY
Design: JTG
Drawn: JTB
Checked: JTG
Date: JUNE 2023
Scale: 1:1000
Approved:
Design Engineer
Drawing No. 21118C-FIGURE 9


OPTION 4:
NATURAL REVEGETATION, TREE/SHRUB PLANTING, WALKING TRAIL(S) AND WATER FEATURE(S)
0 50 100 Meters
SCALE 1:1000
KEY PLAN
COLDSTREAM RESERVOIR
COLDSTREAM DAM
LEGEND
EDGE OF EXISTING HEAD POND
PROPERTY LINE
EXISTING TRAIL
ASSUMED FUTURE CHANNEL IN THE EXISTING HEAD POND
PROPOSED NATURALLY RE-VEGETATED AREA
PROPOSED PLANTED TREES AT HIGHER ELEVATIONS
PROPOSED PLANTED WET TOLERANT SHRUBS AT LOWER ELEVATIONS
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Telephone: (519) 372-4828
Title:
OPTION 4
HEAD POND RESTORATION
COLDSTREAM DAM
Client: ST. CLAIR REGION CONSERVATION AUTHORITY
Design: JTG
Drawn: JTB
Checked: JTG
Date: JUNE 2023
Scale: 1:1000
Approved:
Design Engineer
Drawing No. 21118C-FIGURE 10
QUAKER LANE
EAST SYDENHAM RIVER
UNNAMED TRIBUTARY
ILDERTON ROAD
APPROXIMATE LOCATION OF CURRENT COLDSTREAM DAM
WATER FEATURE 1
WATER FEATURE 2
EXSTING COLDSTREAM RESERVOIR
ASSUMED FUTURE CHANNEL
PARKING AREA
MARSH LANE

Additional potential restoration features include:

Wildlife habitat in the form of grasslands or pollinator meadows can be created to promote diversity.

Reforestation of the area with native plantings of trees and shrubs can be an effective way to restore the property.

Water features such as shallow wetland areas or ephemeral pools for amphibians and deeper ponds to support fish communities can be located adjacent to the new channel location and enhance habitat in this area; these types of features would be constructed offline and would not be directly linked to the new channel.

Viewing platforms or towers can be installed at various location for wildlife observations.

Trails complete with sitting areas may be created or enhancements made to the existing trail system to promote physical activity and highlight the restoration features of the property.

Additional recreational amenities such as picnic areas and water access points for canoes/kayaks that are linked to the new trail system may be integrated into the property.

To improve fish habitat conditions, a variety of in channel features may be considered to enhance the restoration including step pools, spawning/gravel beds, vortex weirs and woody overhead cover.

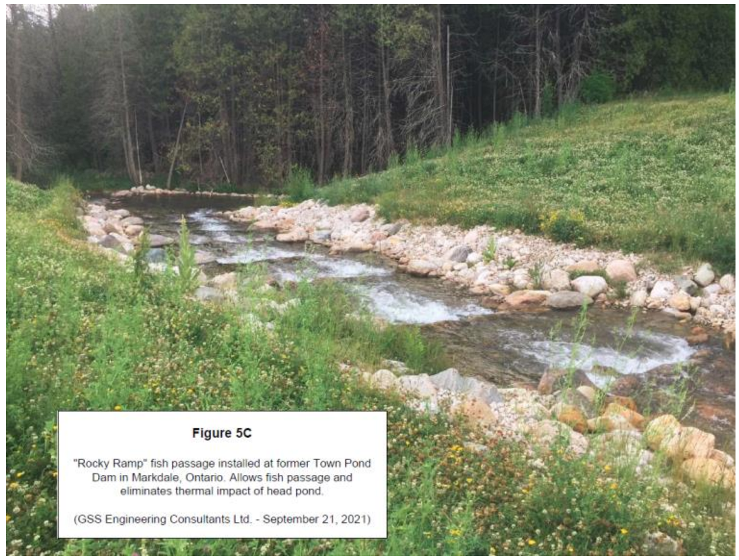

Figure 5C

"Rocky Ramp" fish passage installed at former Town Pond Dam in Markdale, Ontario. Allows fish passage and eliminates thermal impact of head pond.

(GSS Engineering Consultants Ltd. - September 21, 2021)

ENGINEERING
CONSULTANTS LTD

Potential Removal of the Head Street Dam in Strathroy, Ontario

St. Clair Region Conservation Authority

21-118

January, 2024

Prepared By:

GSS Engineering Consultants Ltd.

Unit 230, 945 - 3rd Avenue East

Owen Sound, ON

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TABLE OF CONTENTS

1 INTRODUCTION

The St. Clair Region Conservation Authority (SCRCA) is evaluating possible removal of the Head Street and Coldstream dams. These dams are located on the East Sydenham River near London, Ontario.

The Head Street dam is located in Strathroy, Ontario. The dam is located approximately 70 m southwest (downstream) of the Head Street bridge in Strathroy. This dam is constructed of vertical sheet piling with large armour stone placed on the downstream side of the dam.

The height of the Head Street dam is approximately 1.4 m. The dam features a reinforced concrete spillway with stop logs for level control of the upstream head pond. The Head Street dam was built in approximately 1972. The dam was originally constructed to support recreational activity (swimming, boating, fishing, etc.) and to create a wildlife habitat for various species. However, as the head pond has accumulated sediment the water depth has decreased, negatively impacting the head ponds utility for recreation or to support wildlife habitats.

The Coldstream Dam is located further upstream on the East Sydenham River near the small settlement area of Coldstream. Construction of the Coldstream Dam is similar to the Head Street dam with vertical sheet piling and large armour stone on the downstream side of the dam. Additional armour stone is provided on the upstream side. The Coldstream Dam does not feature a spillway but does have valving and piping near the south end of the dam that theoretically could be used to drain the head pond.

The height of the Coldstream dam is approximately 4 m. The Coldstream dam was built in approximately 1969.

This Report summarizes various studies and analysis completed to support possible removal of the Head Street dam in the future. A similar report has been prepared for the Coldstream dam.

This report includes the following appendices relating to possible removal of the Head Street dam:

Appendix A contains a dam condition report for the Head Street dam as completed by True Engineering (June, 2022).

Appendix B provides a separate study completed by GEO Morphix consultants to estimate channel formation features through the head pond area of the dam if the dam was removed, including estimates of the sediment volumes that could be mobilized by dam removal.

Appendix C provides sediment quality data based on samples collected in April 2022 by SCRCA. Six samples were collected and analysed for heavy metals and nutrients and two separate samples were collected for particle size analysis.

Appendix D provides a hydraulic study of the Head Street bridge just upstream of the dam and downstream of the dam. This study was completed to estimate river water levels and water velocities under the Head Street bridge assuming the dam was removed.

2 DAM REMOVAL IN ONTARIO

Many dams in Ontario were constructed over a century ago during early days of industrial development. The dams were constructed to generate electricity for local, early hydro systems and to harness water power for grist mills, sawmills and wood manufacturing industries.

Many of the earliest dams were constructed of wood and in many cases these early dams were destroyed by flood events. In some cases, there dams were rebuilt using concrete often mixed with stone and wood in the core of the dam. Some of the early concrete dams are still intact but many have significantly deteriorated. The structural condition of these dams will continue to deteriorate with time and remain vulnerable to failure during major flood events.

In some case, these legacy, industrial dams remain owned by private interests. However, it is also common that ownership of legacy dams has transferred over the years to the local municipality or to the local conservation authority. The Ministry of Natural Resources and Forestry also owns a relatively large number of dams in Ontario.

Additional dams were built during the 1950’s to the 1970’s but rarely to harness river power for industrial purposes. Many of these more recent dams were built to provide recreational opportunities and many private dams constructed during this era were on smaller streams to provide small lake and pond features for rural residents. Larger dams were also constructed during this era for flood and ice control and in some cases to provide dilution water to better assimilate treated wastewater plant effluents from downstream communities during periods of low stream flow.

In some cases, the owners of these dams have pursued decommissioning (removal) of these dams to eliminate the liabilities of dam ownership and long-term operation and maintenance costs. The construction cost of new dams for strictly recreational or aesthetic purposes is typically very high compared to funds available from stretched public sector capital budgets, especially in an era where other municipal or provincial owned infrastructure is aging out and requires expensive replacement or upgrading.

In addition, major power dams were built over the decades to provide hydroelectricity. Many or most of these hydro dams are owned and operated by Ontario Power Generation (OPG). Dams can also serve navigation. The Trent Severn waterway is one very good example where dams (i.e. locks) allow watercraft and larger vessels to navigate river systems from one water body to another at different elevations.

While dams can provide important benefits to the residents of Ontario, dams can also impact river ecology by blocking the migration of fish, increase water temperatures during hot summer weather and interfere with normal and healthy sediment transport. In many cases the head ponds behind dams slowly fill with river sediment carried downstream from upstream sources.

The Ministry of Natural Resources (MNRF) is the lead agency for dam safety in Ontario. Large dams have the capacity to cause extreme damage to downstream communities if they fail especially during major flood events. The Lakes and Rivers Improvement Act (LRIA) in Ontario is the principal legislation in Ontario governing the design, operation, maintenance and decommissioning of dams.

The following sections describe the reasons for dam removal, the new recreational and environmental site opportunities that can be provided by dam removal, the challenges that face the owner of a dam who is considering dam removal and permitting requirements in Ontario for dam removal.

2.1 Reasons for Dam Removal

Like other infrastructure, dams age over time and have a finite life span. Some other forms of infrastructure, such as renewable energy installations, may include decommissioning plans that provide financial guarantees to ensure the removal (or replacement) of the infrastructure at the end of their life span.

Most dams and in particular older dams in Ontario likely have no long term decommissioning plan and even more unlikely to have financial securities in place to ensure the long term decommissioning of the dam.

Dam owners therefore at some point need to consider when and how an aging dam should be removed. Dam decommissioning (removal) should be considered in the following circumstances:

i) The dam is aged, structurally unsafe and unstable and considered to be at risk of failure.

ii) Catastrophic failure of the dam could result in damage or destruction of downstream infrastructure including housing and buildings and potentially result in the loss of life.

iii) The dam no longer serves its original, intended purpose.

iv) The dam is unsafe particularly if serious injury or death (i.e. drownings) have previously occurred at the dam.

v) The dam is undersized in terms of its ability to safely convey major flood events.

vi) The dam owner wants to eliminate the liability of dam ownership and eliminate the costs of dam operation and maintenance.

vii) The dam has environmental issues including impacts to fish passage, excessive heating of cold or cool water streams and interruption of normal sediment transport.

viii) Sediment accumulation results in reduced swimming and boating opportunities. Sediment accumulation also linked with declining water quality and algae growth in the head pond.

ix) Removal of the dam would eliminate the dam head pond and provide an opportunity to restore the original stream habitat.

x) The dam owner recognizes the dam has a finite life span and dam removal at the present time is likely less costly than dam removal in the future.

xi) The dam also incorporates a bridge component, and the bridge needs to be replaced due to structurally deficiencies, limited traffic capacity or high costs for repair and maintenance.

xii) The dam head pond is accumulating sediment from upstream sources and the dam owner recognizes that removal of dam now reduces the amount of sediment that needs to be dealt with in the future.

2.2 Recreational and Environmental Site Opportunities.

Dams owned by municipalities and conservation authorities are usually on lands with public access and established passive recreational activities. The dam property may feature developed and maintained picnic and camping areas, beach and swimming areas, parking areas and washrooms etc.

As well, the public lands surrounding dams and associated reservoirs may include natural areas bisected by walking trails. As such, public lands around dam locations may feature a mix of wild areas for management of fish and wildlife and areas more managed for park visitors and recreational use.

Most dams owned by municipalities and conservation authorities have been in place for many decades. Many of the dams are aged (50 years old or more) or very aged (80 years old of more). While these older dams have likely received maintenance over the years, likely the dam height and area of the reservoir (head pond) is largely unchanged since the early days of construction.

As such, removal of a dam, and the resulting loss of the head pond, will have a major impact on the appearance of the dam site. In our opinion, it is often difficult for the public to visualize what the property will look like once the dam is removed. Due to the marked change in the appearance of the site once a dam is removed and given this change in appearance may be difficult to visualize, members of the public may be uncomfortable with a dam removal proposal.

Long time users of the recreational opportunities provided by the head pond area may be reluctant to have the dam removed, especially if boating or swimming opportunities are lost as a result of dam removal. However, the majority of dam reservoirs slowly fill with sediment and silty or muck sediments can impair water quality and bottom conditions that negatively effect swimming enjoyment. Head ponds filling with sediment also impair boating on such head ponds.

It is therefore possible that over many years the use and enjoyment of using dam head ponds for swimming and boating has declined due to sediment accumulation and possibly worsening of water quality conditions. Conservation authority budgets are also likely limited in providing lifeguards etc. for swimming areas.

While some established recreational activities will be lost or reduced due to dam removal, other features can become available after dam removal is completed. These additional features can include the following:

i) Site aesthetics and view. Many old dams are not considered attractive. Concrete can be rough, unfinished and spalling and worst case the concrete components are broken, failing, unstable and potentially dangerous to persons around the actual dam. Metal components can be rusty and earthen berms may be eroded, stony and unsightly. Graffiti may be present on concrete surfaces.

Removal of the dam eliminates the normally unpleasant aesthetic view of an aging dam structure. Removal of the dam also frees up new landscape areas that were previously blocked from view. For instance, a dam normally obscures the downstream view of the river when viewed from above unless one is standing on the dam.

ii) New river use opportunities. Depending on the size of the river, removal of the dam can restore and enhance kayak and canoeing on moving river water as opposed to lake waters. Likely, water quality conditions will improve after dam removal which can enhance the kayaking or canoeing experience.

iii) More land area. The former head pond area can, over time, be converted to new green space. This additional land area can be used for a variety of purposes including an expanded trail system, open manicured area for passive sports and dog walking or expanded natural revegetation areas with or without supplemental planting of new shrubs and trees.

iv) Additional natural features. The former head pond area can be repurposed to provide enhanced wildlife habitat. Depending on location, sediment type and local preferences, the new land area can be converted to natural grasslands, new shrub and forest cover, isolated and/or seasonal wetlands and pond habitat. These habitat choices can be selected to promote pollinators, grassland bird and animal species, mixed forest bird and animal species and wetland fish and wildlife species.

v) New stream habitat. The new river habitat replacing the former impounded area may support new cold or cool water fishing opportunities for brook, brown or rainbow trout.

2.3 Dam Removal Challenges

Dam removal in Ontario can be challenging process when financing, environmental and permitting (regulatory) factors are considered. As well, dams can be very important to the history of the community so that dam removal can become a political issue at the local level.

The following challenges may be encountered when the dam owner contemplates removal of a dam:

i) A Class Environmental Assessment (Class EA) will likely be required for dams owned by municipalities or conservation authorities.

ii) Dam removal may be opposed by the local community resulting in the proposed dam removal becoming a political issue.

iii) Removal of the dam would result in the loss of still water recreational opportunities such as boating, swimming, fishing etc.

iv) The overall cost of dam removal (approvals and capital cost) may be much higher than initially estimated and beyond the financial capacity of the dam owner.

v) The dam may provide flood control benefits to the downstream water course and removal of the dam could increase flood risk to downstream areas.

vi) The dam may store large volumes of sediment within the head pond that has accumulated over many years. Dealing with such sediment on a proactive basis can be difficult and expensive.

vii) In addition to applying to MNRF for approval to remove the dam under LRIA, as well as completing an initial Class EA, additional permitting by other agencies will likely be required. Collectively, obtaining all permits and completing the Class EA can be a very long, complex and expensive process.

viii) In some cases, the dam has been identified by MNRF or Fisheries and Oceans Canada, or other groups, as a dam that should stay to prevent upstream migration of predatory or invasive aquatic species, especially if aquatic species at risk have been identified upstream of the dam.

ix) Conversely, if there are species at risk that inhabit the river downstream of the dam, there could be concerns that an increase in short term or long term sediment loadings from the dam removal could impact such downstream aquatic species.

2.4 Permitting Requirements for Dam Removal

As per previous sections, there are a large number of permitting and regulatory requirements that often need to occur before a dam is removed in Ontario. The following sections summarize permitting and planning requirements.

Class Environmental Assessment (Class EA). Currently, a Schedule B Class EA needs to be completed to decommission a dam in Ontario if the dam is owned by a municipality or conservation authority. If privately owned, the dam may have to complete a similar public consultation process before permits are issued by MNRF in particular.

A municipal Class EA is a public consultation process required under the *Environmental Assessment Act*. Consultation with various stakeholder groups is required including various provincial and federal ministries as well as consultation with Indigenous communities.

Lakes and Rivers Improvement Act. The LRIA approval process under MNRF requires the proponent to determine the need for the proposed dam removal. This normally involves completion of an Environmental Screening Table which reviews a wide range of natural environment, land use, social, cultural, economic and Indigenous community considerations for both positive and negative effects of dam removal. Documentation of successful consultation with Indigenous communities is normally required for MNRF to issue an approval under LRIA.

As well, while not specifically listed as a requirement for dam removal, MNRF typically requires the proponent identify the Hazard Potential Classification (HPC) of the dam which classifies the dam as being low, moderate, high or very high hazard. The hazard classification is based on incremental losses to life, property, the environment and cultural - built heritage features that could result from the uncontrolled release of the reservoir (head pond) due to dam failure.

Once the HPC is completed, the Inflow Design Flood (IDF) is estimated. The IDF is based on the return frequency of flood flows appropriate for the HPC. For instance, dams deemed to have a low hazard classification have a lower IDF (25 year to 100 return flood flow) compared to dams having a high hazard classification which would have a higher IDF (1000 year to Probable Maximum Flood (PMF) flow).

The LRIA application also identifies where the proposed project is a full dam removal or a partial dam removal. In the case of a partial dam removal, the proponent is required to complete a dam stability analysis to confirm that the remaining portion of the dam is structural stable under normal flow and flood flow conditions as well as considering ice and earthquake effects.

As part of the LRIA application, construction drawings are submitted that include the proposed, step wise methodology to be employed by the contractor to remove the dam.

Fisheries Act. The Fisheries Act is administered by Fisheries and Oceans Canada and was updated in 2019.

The updated Act restores the previous requirement to prohibit the harmful alteration, disruption or destruction of fish habitat (HADD) and to prevent the death of fish by means other than fishing. The updated Act also promotes restoration of degraded fish habitat and rebuilding of fish stocks.

For a dam removal project, the proponent would normally submit a Request for Review which acts an approval application under the Fisheries Act. The Request for Review includes submission of reports, drawings and other documents prepared by the proponent which identifies the features of the work plan intended to prevent HADD and to prevent the release of deleterious substances.

The Act also provides the means to allow the proponent to apply for an authorization under the Act. The authorization, if granted, would approve the harmful alteration, disruption or destruction of fish habitat in particular circumstances. In some cases, the proponent of a dam removal project may conclude that some impact to fish habitat is unavoidable and may consider applying for an authorization at the time of the Request for Review application.

On Site Excess Soil Management O.Reg. 406/19. This relatively new regulation under the Environmental Protection Act was passed in 2019 and came fully into effect on January 1, 2023. This regulation governs the sampling, transport and reuse or disposal of excess soil in Ontario where soil is proposed to be transported from one site to another.

At this time, it is understood this regulation applies to the handling of sediment in dam reservoirs (head ponds). If sediment is proposed to be collected and transported away from the dam site, the regulation outlines testing and analytical requirements for sediment samples.

Subject to considerations that include the volume of excess soil to be removed, the past use and location of the site of origin, and certain specified exemptions, filing a notice in the provincial Registry may be required prior to removal of excess soil from the project site. Filing a notice requires the preparation of certain documents, including an assessment of past uses, sampling and analysis plan, soil characterization report, and excess soil destination report.

The number of sediment samples requiring analysis is based on the proposed volume of sediment proposed for relocation. A historic site review of the dam site is used to guide the range of parameters to be tested for. The planning of the testing program and the collection of sediment samples for laboratory analysis is to be completed by a Qualified Person as defined by Ontario Regulation 153/04.

Depending on results of laboratory analysis, the sediment may be reused elsewhere. Registration of the re-use site(s) may be required. If a notice of project is filed on the Registry, then transportation of excess soil (including reservoir sediment) is to be described in an excess soil destination report developed by the Qualified Person and a tracking system for each load must be implemented.

Canadian Navigable Water Act. The Canadian Navigable Waters Act is administered by Transport Canada. An application to Transport Canada for an Approval under the Act may be required in those cases where the removal of the dam could impact navigation during the work or after the dam is removed.

Evidence of successful consultation with Indigenous communities is normally required as part of the application process.

Conservation Authorities Act (RSO 1990 as amended). An application for a permit to remove a dam would normally be required when the proponent proposes to remove a dam within an area covered by a Conservation Authority. The purpose of the application and subsequent permit approval (if granted with or without conditions) is to help ensure the preservation of life and property due to the risk of flooding, erosion and other natural hazards.

3 RIVER WATERSHED CHARACTERISTICS AND HYDROLOGY AND EXISTING RIVER CONDITIONS

Tables 1, 2 and **3** overleaf respectively provide general watershed characteristics, estimates of low river flows during the dry summer period and estimates of return flood flows. The following section provides a summary of watershed characteristics upstream of the Head Street dam and low flows and flood flows at the dam location.

3.1 Watershed Characteristics

The East Sydenham River in Strathroy has an upstream drainage area of approximately 173 square kilometers. The watershed extends northeast from Strathroy to near Southgate and Ilderton. Overall, the watershed is relatively low gradient (0.18% on average upstream of Strathroy) but is flatter in the Strathroy area with a local gradient of approximately 0.10% (from MNRF OWIT).

The watershed is well described in previous reports. Parrish Geomorphic previously prepared the report entitled "Sydenham River - Fluvial Geomorphology Assessment (December, 2000)". This report covers the entire Sydenham River watershed but describes the East Sydenham River as follows:

- While much of the Sydenham watershed features primarily silt and clay soils, the East Sydenham River is influenced significantly by the Caradoc Sand Plain.
- In addition, the East Sydenham River crosses glaciofluvial and recent fluvial deposits consisting of silt, sand and gravel.
- River substrate is typically a mix of bedrock, clay, silt, sand or gravel. Combined with low channel gradient, "this mixture of substrate has created unique stream habitats".
- The overall watershed (including the East Sydenham) has relatively poor drainage due to low stream gradients and overall low relief. Such low relief has resulted historically in flooding.
- Land use is largely agricultural and minimal forest cover remains. The Parrish report indicates the original forest cover was cleared in the 1800's, though riparian forest cover remains or has re-established along the East Sydenham River.

The report also discussed sedimentation and erosion and changes in peak flows over time. Overall, the East Sydenham River drainage basin is prone to erosion. Relatively low gradients result in poor mobilization of fine sediments (silt, sand and clay) in the river channel. Accumulation of fine sediment in the Head Street dam head pond is further discussed in this report.

3.2 Low Flow River Conditions

Daily flows from the Federal Stream flow gauge 02GG005 were analyzed for years 2002 to 2022. This gauge is located approximately 400 m downstream of the Head Street dam in Strathroy.

Table 2 provides average monthly flows at the station. Average summer monthly flows (July, August and September) range from approximately 0.23 cubic meters per second (m^3/s) to 4.83 m^3/s. Overall, average monthly flows during the dry summer period are approximately 0.78 m^3/s.

Table 1

Watershed Characteristics of

East Sydenham River at Strathroy, Ontario

(From OFAT II)

July 2022 21-118

Drainage Area	172.6 km^2
Length of Main Channel	42.0 km
Maximum Channel Elevation	296.96 m
Minimum Channel Elevation	220.67 m
Overall Channel Slope	± 0.18%
Local Channel Slope Near Dam Site (From MNR Make A Map)	± 0.10%

Table 2

Summary of Low Flow Information (m^3/s)

Average Monthly Flows – Sydenham River at Strathroy

Environment Canada Gauge 02GG005

Year	July	August	September	Average
2002	0.352	0.227	0.230	0.270
2003	0.420	0.269	0.358	0.349
2004	0.720	0.625	0.435	0.593
2005	0.453	0.403	0.514	0.457
2006	1.79	1.02	0.756	1.19
2007	0.401	0.486	0.362	0.416
2008	0.564	0.532	0.832	0.643
2009	0.788	0.552	0.495	0.612
2010	0.660	0.390	0.349	0.466

Year	July	August	September	Average
2011	0.696	0.729	0.859	0.761
2012	0.496	0.436	0.429	0.454
2013	0.937	0.560	4.83	2.11
2014	0.903	0.501	2.08	1.16
2015	1.07	0.535	0.463	0.689
2016	0.569	1.50	0.548	0.872
2017	0.615	0.494	0.494	0.534
2018	1.05	1.22	0.669	0.980
2019	0.741	1.13	0.687	0.853
2020	0.511	1.06	0.733	0.768
2021	0.945	0.627	3.74	1.77

Year	July	August	September	Average
2022	0.445	0.486	0.427	0.453
Average	**0.720**	**0.656**	**0.966**	**0.781**

Table 3

Summary of Return Flood Flows and Flood Flow Elevations by HEC RAS

East Sydenham River at Strathroy

July 2022 21-118

Return Period	**Flood Flow**	**Water Level Elevation ***	**Water Depth ***
Mean Annual Flow	2 m^3/s	220.9 m	0.4 m
2 year	54 m^3/s	222.9 m	2.4 m
5 year	68 m^3/s	223.2 m	2.7 m
10 year	80 m^3/s	223.3 m	2.8 m
20 year	93 m^3/s	223.5 m	3.0 m
50 year	110 m^3/s	223.6 m	3.1 m
100 year	125 m^3/s	223.8 m	3.3 m

* At point 43 m downstream of Head Street dam. Elevation of bottom of river at this location is ± 220.5 m.

NOTE: Flood flows provided by SCRCA and based on estimate of flood flows provided by B.M. Ross and Associates.

3.3 Return Flood Flows

Table 3 summarizes return peak flood flows for the Head Street Dam. Flood flows range from 54 m^3/s for the 2-year flood flow to 125 m^3/s for the 100-year flood flow (as estimated by BM Ross consultants).

Water depths for various flood flows are also provided in **Table 3**. As per **Table 3**, based on a river bottom elevation downstream of the Head Street dam of +/- 220.5 m asl, the water depth of the river ranges from 2.4 m depth with the 2-year flood to 3.3 m for the 100-year flood. A discussion of river flood flows and corresponding water levels is provided further in this report.

4 DESCRIPTION OF HEAD STREET DAM AND CURRENT HEAD POND CONDITIONS

The Head Street Dam in Strathroy was constructed in approximately 1972. The dam is located approximately 70 m downstream of the Head Street bridge.

The dam is approximately 1.4 m high (normal upstream water level compared to normal downstream water level). The dam consists of vertical steel sheet piles drove into the riverbed below, forming a continuous retaining wall. The piles are made of heavy gauge ARCH-Type individual metal sheets locked together at the joints during installation. These types of sheets are usually used in so called ‘shallow construction’ meaning that the sheet piles are not driven to a significant depth into the riverbed, and therefore do not form a fixed vertical cantilever. The downstream side of the sheet piling is protected by large armour stone (ranging in size from 16 inches to 24 inches in diameter) on a slope of approximately 7:1 horizontal to vertical. The rip rap provides protection to the soil in front of the wall from scoring and erosive effect of the water flow over the wall. The dam is approximately 45 m wide.

Photo 1: Head Street Dam vertical sheet piling and downstream armour stone.

The south end of the dam also features a concrete spillway equipped with stop logs that allow water levels in the head pond to be adjusted. However, all stop logs are normally kept in the spillway such that water levels are equal with the top of the adjacent sheet piles. The spillway opening is protected by removable metal grating. The spillway is accessed via a flat plate concrete bridge. The bridge and the platform on top of the spillway are protected by an aluminum guard.

Photo 2: View of the Head Street Dam concrete spillway.

The dam is also equipped with a low flow bypass valve. The condition of the bypass valve is not known but is not believed to be operatable (personal communication with SCRCA).

Various drawings that illustrate the dam are overleaf, though a complete set of drawings for the dam is not available. Drawings available include a cross-section view of the spillway and a number of older drawings of the Head Street bridge and road drawings, one of which was completed prior to dam construction. The Head Street bridge was built before the dam was constructed. The effect of potential dam removal on the Head Street bridge is discussed further in this report.

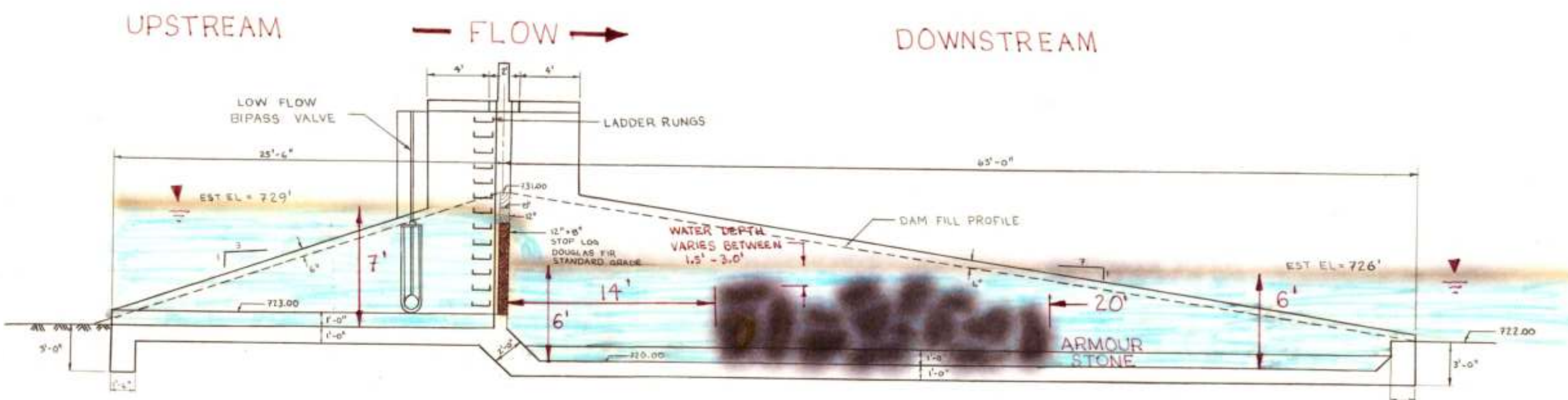
Drawing 21118H-H1 following the overleaf drawings is an air photo of the dam area which is believed to have been taken in 1972 shortly before the dam was constructed. The water surface area at that time through the current head pond area is featured in blue. For comparison, a red line shows the current, larger limits of the head pond and the dam location.

Appendix A includes a dam condition report prepared by True Engineering (June, 2022). This report concludes the Head Street dam appears to be in overall good condition.

Given that the dam was built in approximately 1972, the dam is now about 52 years old. As above, engineering assessments have deemed the dam to be in good condition. As such, the total life expectancy of the dam could be estimated as 75 to 100 years. Therefore, the remaining life expectancy would be approximately 23 to 48 years.

However, while in good condition at present, the dam at some point will likely deteriorate and need to be removed.

LONGITUDINAL SECTION THROUGH CONCRETE SPILLWAY



NOTES:

1. DRAWING BASED ON ORIGINAL CONSTRUCTION PLANS PREPARED BY NISBET LETHAM LTD. CONSULTING ENGINEERS, SARNIA, ONT. DATED 24 APRIL 1972.

2. SPILLWAY MODIFIED BY ADDITION OF ARMOUR STONE

3. WATER LEVEL AND DEPTH MEASUREMENTS AS TAKEN BY AUTHORITY STAFF ON 20 JULY 1984

NO.	DATE	DESCRIPTION	BY

REVISIONS

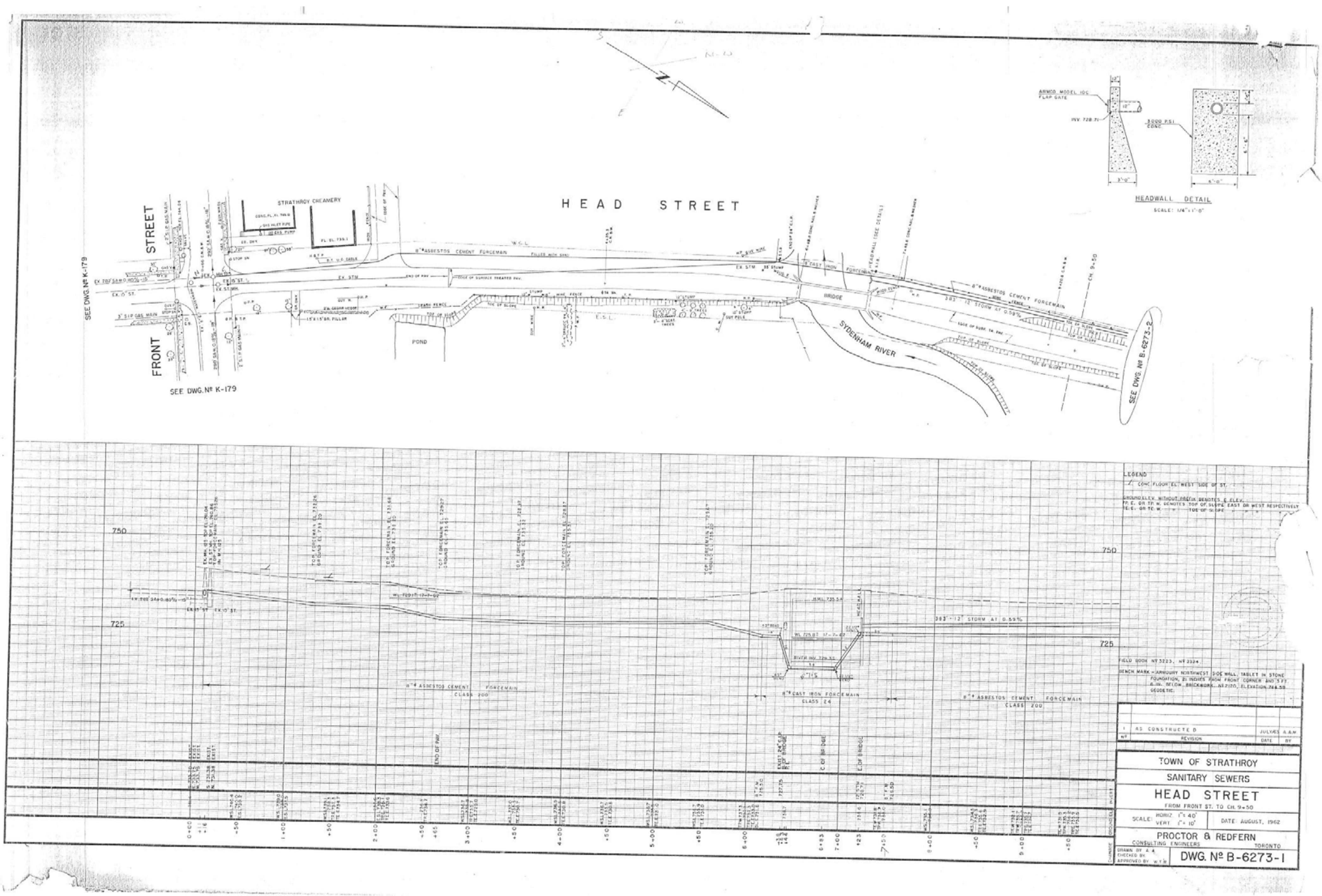
ST. CLAIR REGION CONSERVATION AUTHORITY

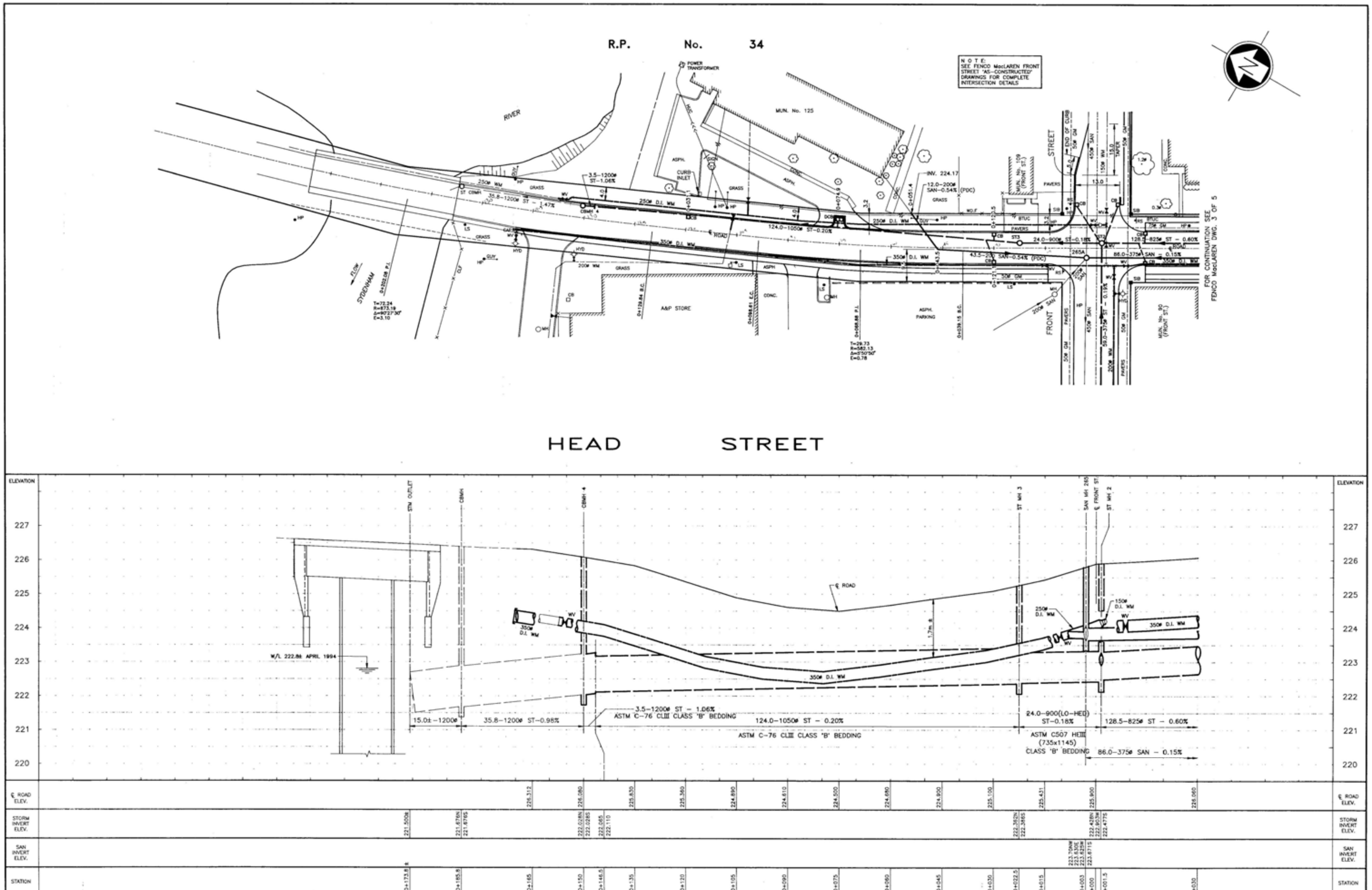
PROJECT: STRATHROY DAM

DRWG. TITLE: CONCRETE SPILLWAY

DRWN. V.I. COATSWORTH	CHKD.
DATE SEPTEMBER 21, 1984	APPD.
SCALE 1" = 4'	DRWG. NO.

BRUNING 40-105 6/80


HEAD STREET
STRATHROY CREAMERY
FRONT STREET
SEE DWG. Nº K-179
SEE DWG. Nº K-179
SEE DWG. Nº B-6273-2
SYDENHAM RIVER
BRIDGE
POND
8" ASBESTOS CEMENT FORCEMAIN
HEADWALL DETAIL
SCALE: 1/4" = 1'-0"
ARMCO MODEL 10C FLAP GATE
3000 P.S.I. CONC.
LEGEND
FIELD BOOK Nº 3223, Nº 2324
8"Ø ASBESTOS CEMENT FORCEMAIN CLASS 200
8"Ø CAST IRON FORCEMAIN CLASS 24
8"Ø ASBESTOS CEMENT FORCEMAIN CLASS 200
383' - 12" STORM AT 0.59%
750
725
AS CONSTRUCTED
REVISION
DATE
BY
TOWN OF STRATHROY
SANITARY SEWERS
HEAD STREET
FROM FRONT ST. TO CH. 9+50
SCALE: HORIZ. 1" = 40'
VERT. 1" = 10'
DATE: AUGUST, 1962
PROCTOR & REDFERN
CONSULTING ENGINEERS
TORONTO
DWG. Nº B-6273-1



1	94.11.15	AS-CONSTRUCTED				
0	94.05.25	ISSUE FOR TENDER				
REV.	DATE	ISSUE RECORD	REV.	DATE	REVISION	APP'VD.

SEAL: DRAWING ISSUED FOR CONSTRUCTION STAMPED W.D. WISHART, P.ENG. 94/05/25

CLIENT: TOWN OF STRATHROY

PROJECT: HEAD STREET RECONSTRUCTION

DRAWN BY:	R.A. TURGEON
CHECKED BY:	T.A. COPELAND
DESIGNED BY:	A.J. SLABON
LEAD ENGINEER:	T.A. COPELAND
PROJ. MANAGER:	W.D. WISHART

TITLE: HEAD STREET — CIVIL

STORM AND SANITARY SEWERS

(FROM BRIDGE NORTH OF FRONT STREET TO FRONT STREET)

Fenco MacLaren SNC·LAVALIN

SCALE: 1:500 H, 1:50 V

DATE: JULY 1994

F.M.I. DRAWING NUMBER: 4 OF 5

REV.: 1

KEY PLAN

GENERAL NOTES

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE SERVICING STANDARDS FOR THE STRATHROY PUBLIC UTILITIES COMMISSION, AND TOWN OF STRATHROY (LATEST REVISION).
2. AT LEAST 48 HOURS PRIOR TO COMMENCING CONSTRUCTION ON ANY EXISTING ROAD ALLOWANCE MAINTAINED BY THE TOWN OF STRATHROY, THE CONTRACTOR MUST INFORM LLOYD STARLING, TOWN OF STRATHROY, WORKS SUPERINTENDENT AND OBTAIN ALL REQUIRED APPROVALS AND PERMITS.
3. THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS, AND OTHER UNDERGROUND AND ABOVEGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS. POSITION OF SUCH UTILITIES AND STRUCTURES SHOWN IS NOT GUARANTEED. PRIOR TO COMMENCEMENT OF CONSTRUCTION, THE CONTRACTOR SHALL:
   a) OBTAIN FIELD LOCATES OF ALL EXISTING UNDERGROUND UTILITIES WITHIN THE LIMITS OF THE CONSTRUCTION SITE.
   b) VERIFY ALL OUTLET INFORMATION, BENCHMARKS, ELEVATIONS, AND DIMENSIONS AND REPORT ANY DISCREPANCIES IMMEDIATELY TO THE ENGINEER.
4. ALL UTILITY CROSSINGS OR POTENTIAL DISRUPTION OF NORMAL SERVICE MUST BE CO-ORDINATED WITH THE UTILITY COMPANY TWO WEEKS PRIOR TO COMMENCEMENT OF CONSTRUCTION. THE CONTRACTOR IS TO MEET ALL THE REQUIREMENTS OF THE OWNERS OF THE UTILITIES ON THIS PLAN.
5. CONTRACTOR TO EXCAVATE AND EXPOSE EXISTING WATERMAINS PRIOR TO CONSTRUCTION IN ORDER TO CONFIRM EXISTING ELEVATION AND ALIGNMENT. CONTRACTOR TO REPAIR DAMAGE TO EXISTING WATERMAIN ON EAST SIDE OF BRIDGE UNDER THIS CONTRACT.
6. CONTRACTOR TO REMOVE EXISTING ASPHALT/CONCRETE SIDEWALKS THROUGH CONSTRUCTION AREA AND REPLACE WITH NEW CONCRETE SIDEWALK FOLLOWING WATERMAIN INSTALLATION. NEW SIDEWALK TO EXTEND TO EXISTING CONCRETE SIDEWALKS EACH END. EXISTING CURB AND GUTTER TO BE PROTECTED AND MAINTAINED THROUGHOUT EXCEPT IN AREA OF EXCAVATION FOR CONNECTION OF SOUTH WATERMAIN.
7. PRIOR TO COMMENCING ANY WORK ON THE INSTALLATION OF ANY SERVICES, AN APPROVED SET OF PLANS AND SERVICING STANDARDS FOR THE TOWN OF STRATHROY MUST BE AVAILABLE ON THE JOB AND REMAIN THERE WHILE WORK IS BEING DONE.
8. THE SETTING OF LINES AND GRADES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
10. ALL EXISTING SURFACES AND UTILITIES DAMAGED OR DISTURBED SHALL BE REPAIRED OR REPLACED TO THE SATISFACTION OF THE GOVERNING BODY AT THE SOLE EXPENSE OF THE CONTRACTOR. ANY SUPPORT OF EXISTING UTILITIES SHALL BE COMPLETED AT THE EXPENSE OF THE CONTRACTOR.
11. RESTORATION OF DISTURBED ASPHALT ROAD SURFACE SHALL CONSIST OF 600 MM OF SELECTIVELY EXCAVATED NATIVE FINE SAND OR IMPORTED SELECT SUB-GRADE MATERIAL COMPACTED TO 98% SPMDD, 150 MM OF GRANULAR 'A' COMPACTED TO 100% SPMDD, 60mm OF HL8 AND 40mm OF HL3 ASPHALT. THE CONTRACTOR SHALL NEATLY SAWCUT THE ASPHALT OUTSIDE THE LIMITS OF THE EXCAVATION PRIOR TO CONSTRUCTION.
12. EXISTING TOPOGRAPHICAL DETAIL AND SITE SERVICE INFORMATION WAS PROVIDED BY CALLON DIETZ INCORPORATED FROM SITE SURVEY CONDUCTED IN AUGUST 1994.
13. EXISTING SERVICING INFORMATION WAS TAKEN FROM "AS CONSTRUCTED" DRAWINGS OBTAINED FROM THE TOWN OF STRATHROY.

BENCHMARK ELEV. 227.268
TOP OF SPINDLE OF HYDRANT ON WEST SIDE OF HEAD ST. 50m SOUTH OF KITTRIDGE AVE.

PRINTED
DEC 18 1995
UMA ENGINEERING LTD.

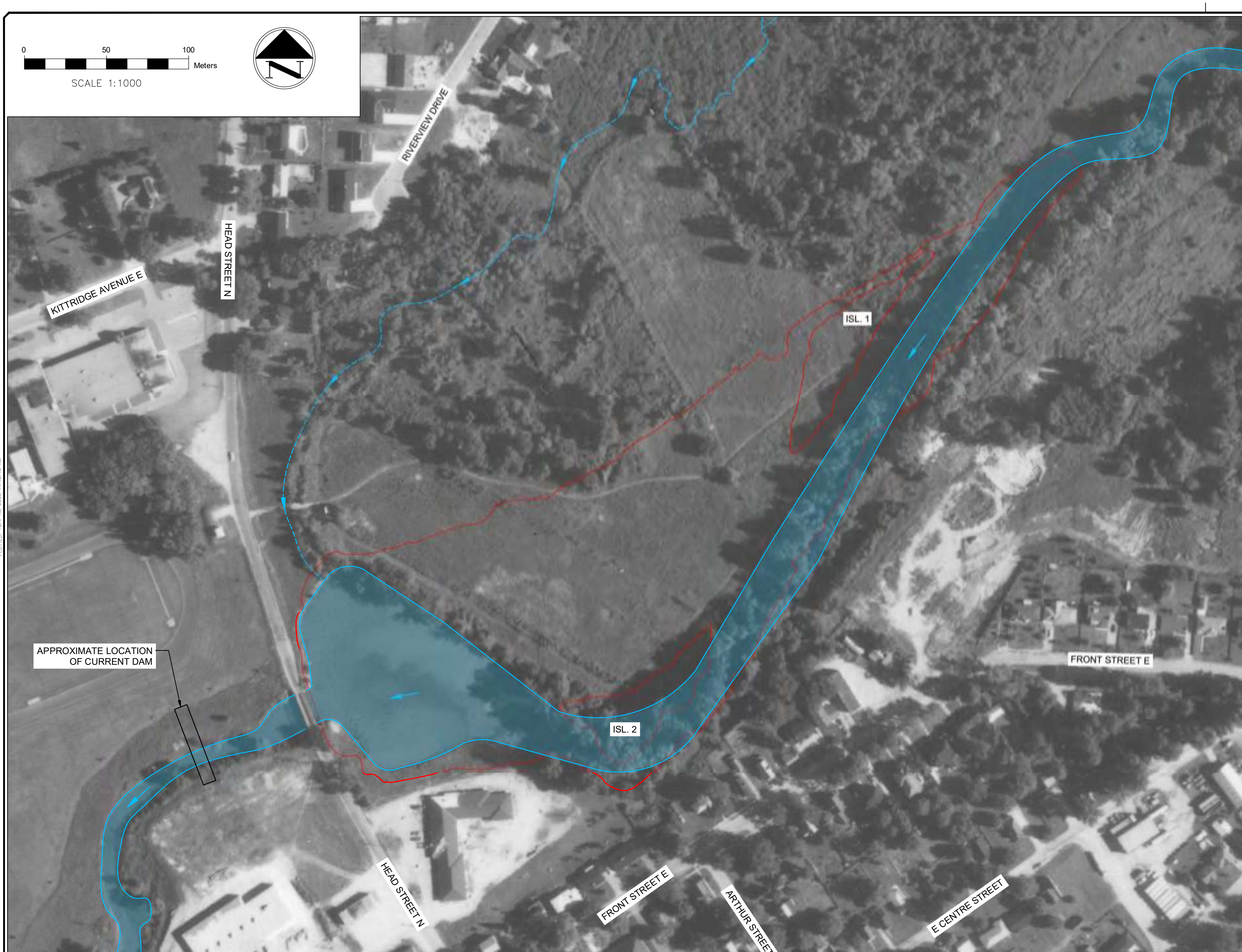
UMA Engineering Ltd.
Engineers & Planners

Strathroy P.U.C.
137 Frank Street
Strathroy, Ontario
N7G 2R8
Tel: (519) 245-2010
Fax: (519) 245-5384

HEAD STREET

350mm WATERMAIN
FROM STA 0+625 TO STA. 0+743.6

PROJECT No. 9346-002
SHEET No. 1



KEY PLAN

LEGEND

ISL. ISLAND

EDGE OF WATER 2019 SURVEY (222.35m)

APPROX. EXTENTS OF WATER 1972 AIR PHOTO

APPROX. TRIBUTARY STREAM 1972 AIR PHOTO

FLOW DIRECTION

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ENGINEERING CONSULTANTS LTD

Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7
Telephone: (519) 372-4828

Title:

1972 AIR PHOTO & 2019 EDGE OF WATER HEAD STREET DAM

Client: ST. CLAIR REGION CONSERVATION AUTHORITY

Design:	JTG	Scale:	1:1000
Drawn:	JTB	Approved:	Design Engineer
Checked:	JTG		
Date:	JULY 2022		

Drawing No. 21118H-H1

PLOTTED: April 18, 2023 11:42:48 AM

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While reasonable life expectancy remains for the Head Street dam, it is beyond the scope of this report to assess capacity of the dam for very large flood events in the future. Climate change may affect precipitation patterns and may increase the frequency and magnitude of major rain events that could result in flood flows exceeding the capacity of the dam.

The current area of the head pond is approximately 6.2 ha (15.3 acres). The overall depth of the head pond is relatively shallow with a maximum depth of approximately 1.2 m (4') (water depth above accumulated sediment levels). Historically, much of the head pond would have been deeper, but the head pond has accumulated large volumes of sediment since being constructed. Accumulation of sediment is assumed to be ongoing and downstream areas of the head pond toward the Head Street bridge are assumed to still be filling with sediment (i.e. water depths will continue to get shallower over time near the bridge).

The following sections describe in further detail sediment conditions in the head pond.

4.1 Head Pond Sediment Depth

Figures 1, 2, 3 and **4** detail sediment conditions in the Head Street dam head pond.

In previous years, SCRCA staff surveyed depth of water over the sediment by wading the head pond in the summer and measuring water depth from the surface to the top of sediment.

For this study, it was agreed that the survey be done again, though in the newest survey, a long steel rod would be used to also measure from the water surface to hard bottom. The hard bottom is assumed to be the original riverbank or original bottom of river elevation.

The resurvey was completed by SCRCA staff in May, 2022 once river flows normalized following spring runoff. **Figure 1** summarizes the data at each measurement point and also shows the location of each measurement point on a map of the head pond.

Figure 1 shows the depth of water to top of sediment and also depth of water to hard bottom for each point and also provides the calculated depth of sediment (depth of sediment is equal to total depth of water to hard bottom minus depth of water to top of sediment.).

As per **Figure 1**, depth of water over the sediment ranges from 0.15 m (6") to 1.2 m (4') with a typical depth of water over sediment being 0.5 to 0.9 m depth. Overall, water depths increase in the lower third of the head pond (toward the Head Street dam) indicating that the head pond is still slowly filling with sediment.

Figure 2 and **Figure 3** provide cross-sectional information of the sediment depth at various sections of the head pond. While water depth over the sediment layer increases slowly toward the Head Street bridge, the top of sediment is generally flat across the width of the head pond.

Figure 4 uses color to illustrate total sediment depth (depth of sediment from top of sediment to hard bottom). As per **Figure 4**, the depth of sediment around the edges of the head pond is typically less than 0.5 m but increases to over 2 m depth in certain portions of the head pond. However, sediment depths of 1.5 m or more cover much of the head pond area.

0 100 200 Meters

SCALE 1:1500

SEDIMENT AND HARD BOTTOM DEPTH PROBING DATA, AS COLLECTED BY THE SCRCA IN MAY OF 2022

POINT ID	COORDINATES (UTM)		DEPTH TO SEDIMENT FROM SURFACE (m)	DEPTH TO HARD BOTTOM FROM SURFACE (m)	DEPTH OF SEDIMENT (m)
	NORTHING	EASTING			
1	4757048	449669	0.66	2.21	1.55
2	4757053	449660	1.12	2.11	0.99
3	4756995	449630	0.56	2.08	1.52
4	4757004	449619	0.48	2.18	1.70
5	4756962	449582	0.41	1.73	1.32
6	4756949	449595	0.74	2.06	1.32
7	4756923	449559	0.61	2.44	1.83
8	4756912	449568	0.71	2.95	2.24
9	4756875	449543	0.64	2.16	1.52
10	4756894	449525	0.43	2.26	1.83
11	4756909	449511	0.18	2.24	2.06
12	4756925	449495	0.76	2.08	1.32
13	4756914	449474	0.64	1.35	0.71
14	4756896	449488	0.43	2.97	2.54
15	4756874	449505	0.36	2.90	2.54
16	4756847	449517	0.36	2.51	2.16
17	4756818	449505	0.38	2.34	1.96
18	4756840	449490	0.18	1.42	1.24
19	4756853	449479	0.15	1.73	1.57
20	4756883	449459	0.25	2.21	1.96
21	4756898	449451	0.71	1.45	0.74
22	4756887	449422	0.69	1.73	1.04
23	4756848	449426	0.51	3.02	2.51
24	4756833	449435	0.30	2.31	2.01
25	4756815	449442	0.36	1.65	1.30
26	4756789	449450	0.48	2.21	1.73
27	4756780	449397	0.51	3.12	2.62
28	4756806	449385	0.71	2.82	2.11
29	4756832	449366	0.61	2.67	2.06
30	4756854	449355	0.81	2.64	1.83
31	4756846	449321	0.81	2.69	1.88
32	4756817	449325	0.76	2.64	1.88
33	4756771	449333	0.97	2.41	1.45
34	4756752	449336	0.94	2.72	1.78
35	4756755	449305	1.12	2.57	1.45
36	4756779	449297	0.91	2.31	1.40
37	4756810	449290	0.89	2.49	1.60
38	4756834	449283	0.71	2.90	2.19
39	4756772	449185	0.79	2.06	1.27
40	4756759	449193	0.89	2.69	1.80
41	4756783	449497	0.61	2.39	1.78
42	4756739	449459	0.91	2.79	1.88
43	4756892	449228	0.51	1.70	1.19
44	4756857	449236	0.58	2.54	1.96
*45	4756734	449292	0.91	2.13	1.22
*46	4756748	449288	0.91	2.44	1.52
*47	4756769	449282	0.91	2.90	1.98
*48	4756797	449275	0.91	2.74	1.83
*49	4756833	449259	1.22	3.05	1.83
*50	4756749	449267	1.22	2.13	0.91
*51	4756768	449258	1.22	2.44	1.22
*52	4756787	449251	1.22	2.13	0.91

AREA OF RESERVOIR = ± 62,644 m^2

VOLUME OF SEDIMENT = ± 66,680 m^3

*POINTS ACQUIRED DURING FEBRUARY 2022 PROBING THROUGH ICE, AS OPPOSED TO POINTS ACQUIRED DURING MAY 2022 PROBING

KEY PLAN

LEGEND

- EXISTING PEDESTRIAN TRAIL
- ISL. — ISLAND
- SCRCA — ST. CLAIR REGION CONSERVATION AUTHORITY
- EDGE OF WATER (222.35m)
- POINT 1 — POINT OF SEDIMENT AND HARD BOTTOM PROBING
- FLOW DIRECTION

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GSS ENGINEERING CONSULTANTS LTD

Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7
Telephone: (519) 372-4828

Title:

EXISTING SEDIMENT DEPTH DATA
STRATHROY RESERVOIR
HEAD STREET DAM

Client: ST. CLAIR REGION CONSERVATION AUTHORITY

Design:	JTG	Scale:	1:1500
Drawn:	JTB	Approved:	Design Engineer
Checked:	JTG		
Date:	JULY 2022		

Drawing No. 21118H-FIGURE 1

PLOTTED: April 18, 2023 11:20:42 AM

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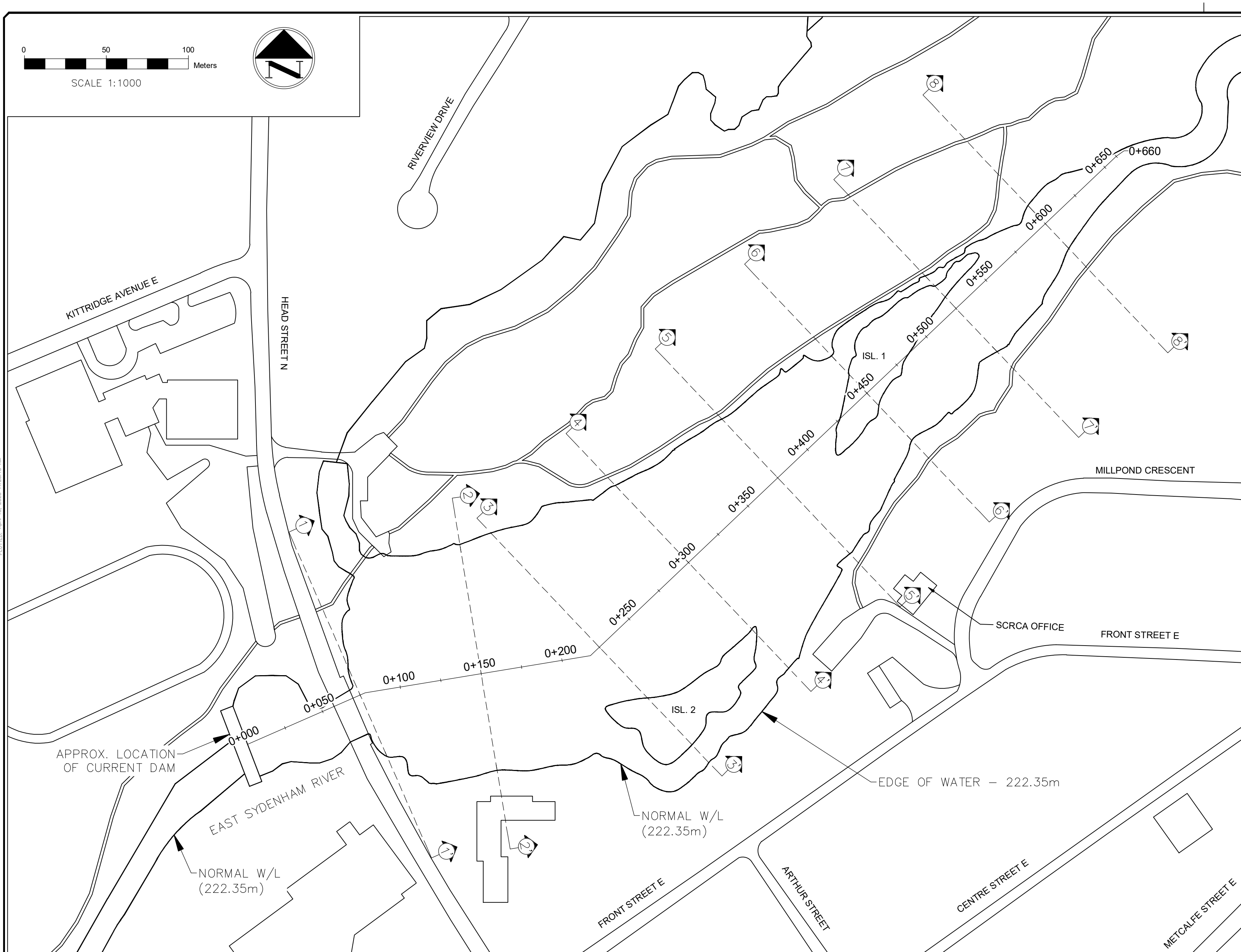

KEY PLAN

LEGEND

(double line)	EXISTING PEDESTRIAN TRAIL
ISL.	ISLAND
SCRCA	ST. CLAIR REGION CONSERVATION AUTHORITY
(single line)	EDGE OF WATER (222.35m)

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GSS ENGINEERING CONSULTANTS LTD
Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7
Telephone: (519) 372-4828

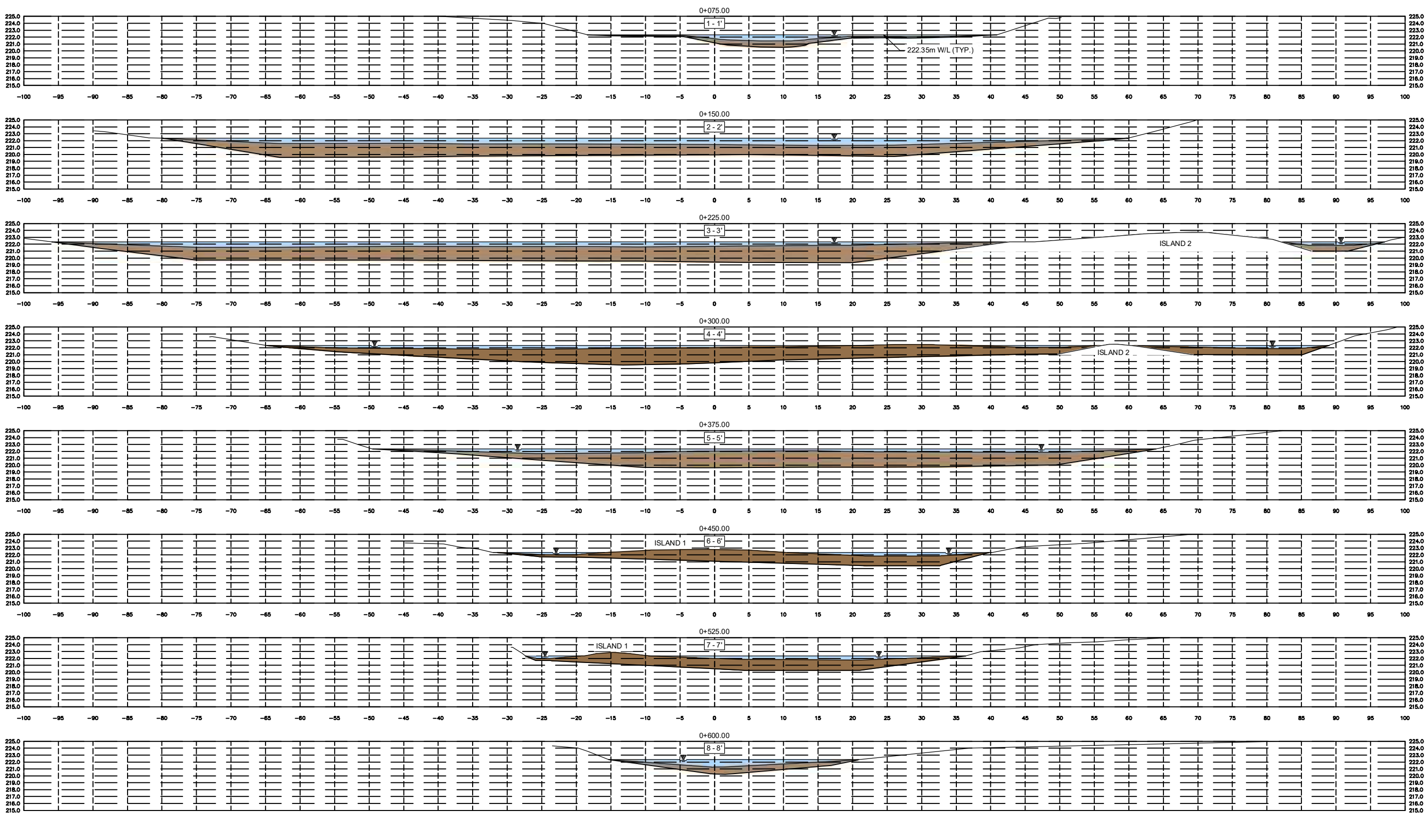
Title:
CROSS SECTIONS LAYOUT
PLAN VIEW
OF STRATHROY RESERVOIR
HEAD STREET DAM

Client: ST. CLAIR REGION CONSERVATION AUTHORITY

Design:	JTG	Scale:	1:1000
Drawn:	JTB	Approved:	Design Engineer
Checked:	JTG		
Date:	JULY 2022		

Drawing No. 21118H–FIGURE 2

STRATHROY RESERVOIR CROSS-SECTION VIEWS
VERT / HORZ 1:250 SCALE



NOTE: ALL CROSS-SECTIONS ARE LOOKING UPSTREAM AT THE STRATHROY RESERVOIR

KEY PLAN

LEGEND

▼	WATER SURFACE (222.35m)
—	TOP OF RESERVOIR SEDIMENT / SURFACE
—	TOP OF HARD BOTTOM
(blue)	WATER
(brown)	SEDIMENT

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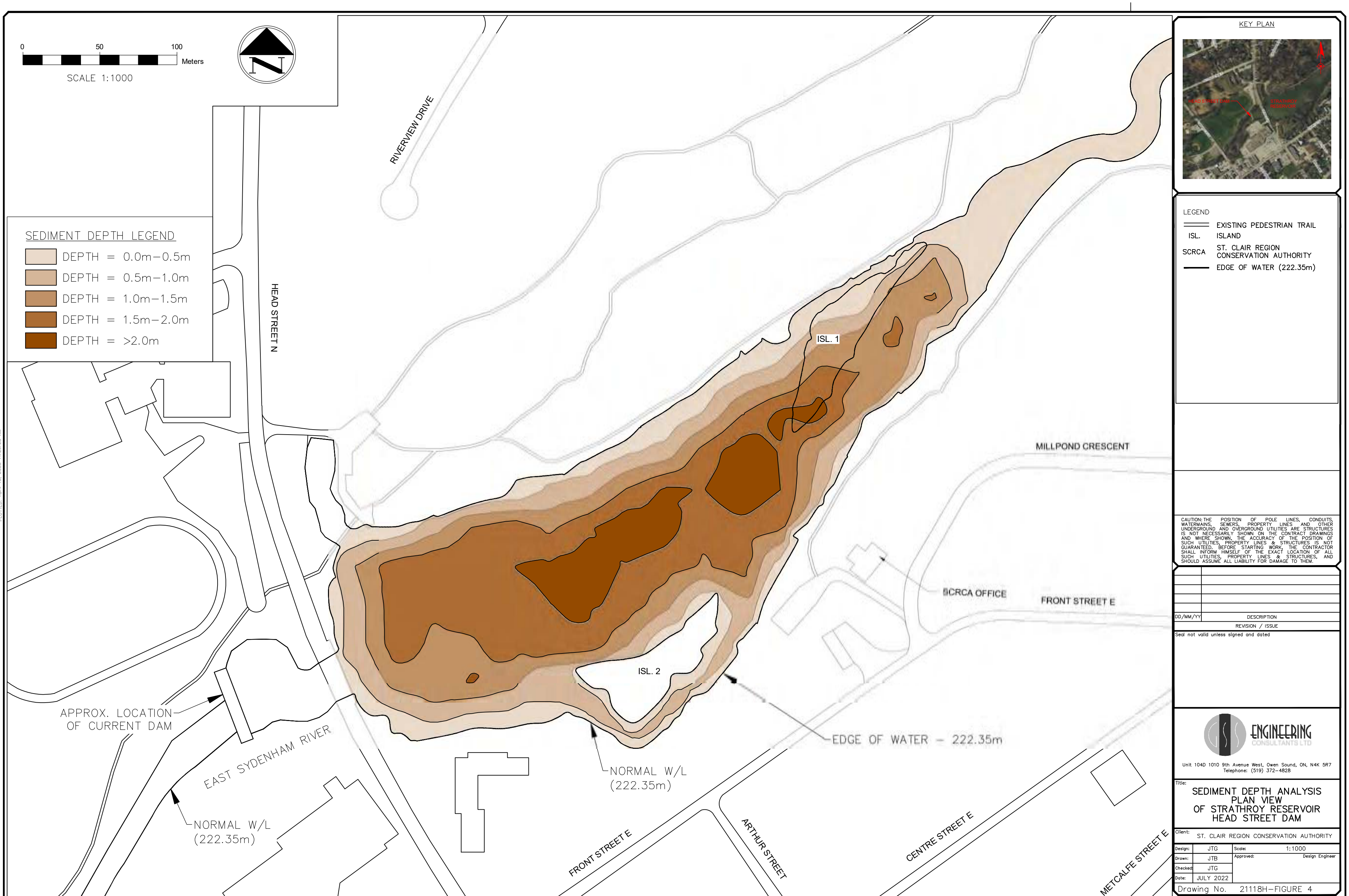
Telephone: (519) 372-4828

Title:
CROSS SECTIONS
SEDIMENT LAYERS
STRATHROY RESERVOIR
HEAD STREET DAM

Client: ST. CLAIR REGION CONSERVATION AUTHORITY

Design:	JTG	Scale:	1:250
Drawn:	JTB	Approved:	Design Engineer
Checked:	JTG		
Date:	JULY 2022		

Drawing No. 21118H–FIGURE 3



0
50
100
Meters
SCALE 1:1000
N
SEDIMENT DEPTH LEGEND
DEPTH = 0.0m–0.5m
DEPTH = 0.5m–1.0m
DEPTH = 1.0m–1.5m
DEPTH = 1.5m–2.0m
DEPTH = >2.0m
RIVERVIEW DRIVE
HEAD STREET N
ISL. 1
ISL. 2
MILLPOND CRESCENT
SCRCA OFFICE
FRONT STREET E
APPROX. LOCATION OF CURRENT DAM
EAST SYDENHAM RIVER
NORMAL W/L (222.35m)
NORMAL W/L (222.35m)
EDGE OF WATER – 222.35m
FRONT STREET E
ARTHUR STREET
CENTRE STREET E
METCALFE STREET E
KEY PLAN
LEGEND
EXISTING PEDESTRIAN TRAIL
ISL. ISLAND
SCRCA ST. CLAIR REGION CONSERVATION AUTHORITY
EDGE OF WATER (222.35m)
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DESCRIPTION
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ENGINEERING CONSULTANTS LTD
Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7
Telephone: (519) 372-4828
Title:
SEDIMENT DEPTH ANALYSIS PLAN VIEW OF STRATHROY RESERVOIR HEAD STREET DAM
Client: ST. CLAIR REGION CONSERVATION AUTHORITY
Design: JTG
Drawn: JTB
Checked: JTG
Date: JULY 2022
Scale: 1:1000
Approved:
Design Engineer
Drawing No. 21118H–FIGURE 4

As discussed in later sections, this volume of sediment is very significant. Sediment management would therefore likely be the most significant consideration if a decision was made to remove the Head Street dam in the future.

4.3 Estimated Original River Channel Location and Form

As noted, Drawing 21118H-H1 shows what is believed to be the historic river channel upstream of the existing dam. In general, the historic channel runs along the southeast edge of the existing head pond.

If the dam was removed, there is some possibility that the new channel would form again in the original, historic channel with similar depth, cross-sectional shape and meander pattern. However, the large volume of sediment in the head pond could result in a new channel location or the new channel having a different form (i.e. different channel depth, cross-sectional shape and meander pattern) than the historic channel.

To better estimate what channel form might develop in the head pond area if the Head Street Dam was removed, GEO Morphix fluvial geomorphologists were retained by GSS Engineering to evaluate a future stream channel through the head pond. The results of the GEO Morphix analysis are provided in **Appendix B.**

4.4 GEO Morphix Evaluation Summary

The GEO Morphix study (January, 2023) in **Appendix B** provides the following conclusions and observations:

The study concludes that the new channel that forms in the head pond area (after dam removal) could form significant meander belts. The estimated meander belt width that could form is quite significant and ranges from about 80 m to 190 m. Key conclusions are:

i) The above meander belt width approaches or exceeds the widest part of the current head pond.

ii) The channel width and depth that could form over time through the sediment deposition area is estimated to have a width of 16 m and a depth of 1.61 m. However, this depth is from final water level to final channel bottom and does not include the height of riverbanks (i.e. remaining sediment) above the final water level at normal river flow rates.

iii) The volume of sediment that would be released from the head pond is estimated to be approximately 48,000 cubic meters if the sediment was allowed to be naturally released from the head pond. This estimate is 73% of the total estimated volume of sediment currently in the head pond (see Section 3.2).

iv) Overall, the GEO Morphix study concludes that removal of the sediment from the head pond in advance of dam removal is not likely practical.

4.5 Head Pond Sediment Contaminant Analysis

Appendix C provides results of contaminant analysis completed by ALS Laboratories of London, Ontario for sediment samples collected in the head pond during April, 2022. Samples were analyzed for metals and nutrients. Sediment samples were collected from six locations.

The Technical Memorandum overleaf provides greater detail of the sediment sampling, testing, and results. **Figure 5** (following the Tech. Memo.) shows the location of the sampling locations. As per **Figure 5**, samples S1, S2 and S4 were collected in the upstream half of the head pond, and samples S3, S5 and S6 were collected in the downstream half of the head pond. **Table 4** (following **Figure 5**) provides all analysis results.

Results of analysis are summarized as follows:

i) There were no exceedances of metals for any samples above the low effect level or the severe effect level as published by MECP for sediment quality in Ontario (1993);

ii) All metal results were lower than sediment standards set by MECP for soil, ground water and sediment quality (2011);

iii) Phosphorus levels in sediment samples S4, S5 and S6 were the only nutrient exceeding the above MECP levels or standards. Levels of phosphorus in these three samples exceeded the low effect level set by the 1993 MECP sediment quality standard for phosphorus (600 ug/g) but levels in these samples were well below the severe effect level for phosphorus (2,000 ug/g).

Overall, sediment quality in the Head Street dam head pond appears to be free of contaminants other than elevated levels of phosphorus in three of six samples.

It should be noted that there are new regulations in Ontario that govern the movement of excess fill and earth material (*Excess Soil Regulation O. Reg. 406/19*). If there was serious consideration of excavating or dredging sediment from the dam head pond, then additional samples of sediment would likely have to be collected and analyzed for a wider range of parameters to meet the requirements of the above Regulation. Potentially, the same additional samples, and additional analysis of additional parameters, would be required if approvals were obtained to allow sediment in the head pond to naturally be carried downstream following dam removal.

4.6 Head Pond Sediment Characteristics

Appendix C also provides results of particle size analysis completed for two sediment samples collected in the head pond during April, 2022, being sediment samples SPSA1 and SPSA2.
Sample SPSA1 was collected at the S4 location and therefore represents sediment in the upstream half of the head pond. Sample SPSA2 was collected at the S6 location and therefore represents sediment in the downstream half of the head pond.

ENGINEERING
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TECHNICAL MEMORANDOM

Head Street Sediment Analysis

July 12, 2022 21-118

In April, 2022, sediment samples were collected by staff of SCRCA from the Head Street headpond in Strathroy. Six sediment samples were collected and analysed from the six locations shown approximately on Figure 5 overleaf.

The sediment samples were analysed for a wide variety of metals and nutrients by ALS Laboratories of London. A copy of the lab results from ALS dated May 6, 2022 are provided in this section. A total of 36 metals and nutrients were analyzed for. See also Table 4.

As per Table 4, there were no exceedances of metals for any samples above the low effect level or the severe effect level as published by MECP for sediment quality in Ontario (1993). All metal results were lower than sediment standards set by MECP for soil, ground water and sediment quality (2011);

Phosphorus levels in sediment samples S4, S5 and S6 were the only nutrient exceeding the above MECP levels or standards. Levels of phosphorus in these three samples exceeded the low effect level set by the 1993 MECP sediment quality standard for phosphorus (600 ug/g) but levels in these samples were well below the severe effect level for phosphorus (2,000 ug/g).

Overall, sediment quality in the Head Street dam head pond appears to be free of contaminants other than elevated levels of phosphorus in three of six samples.

If sediment was to be removed (or released) from the dam headpond, a significant number of additional samples of sediment would likely have to be collected for additional analysis and for additional parameters, to meet requirements of *Ontario's Excess Soil Regulation (O.Reg. 406/19)*.

Sediment samples were also submitted for particle size analysis. Sample SPSA1 was collected at the S4 location. Sample SPSA2 was collected at the S6 location. As per the results, the upstream sample (SPSA1) was more sandy (consisting of 91% fine sand) and the downstream sample (SPSA2) contained more silt and clay (43% and 26% respectively) with 31% fine sand.

Prepared by

GSS ENGINEERING CONSULTANTS LTD.

Jeff Graham, P.Eng.
President

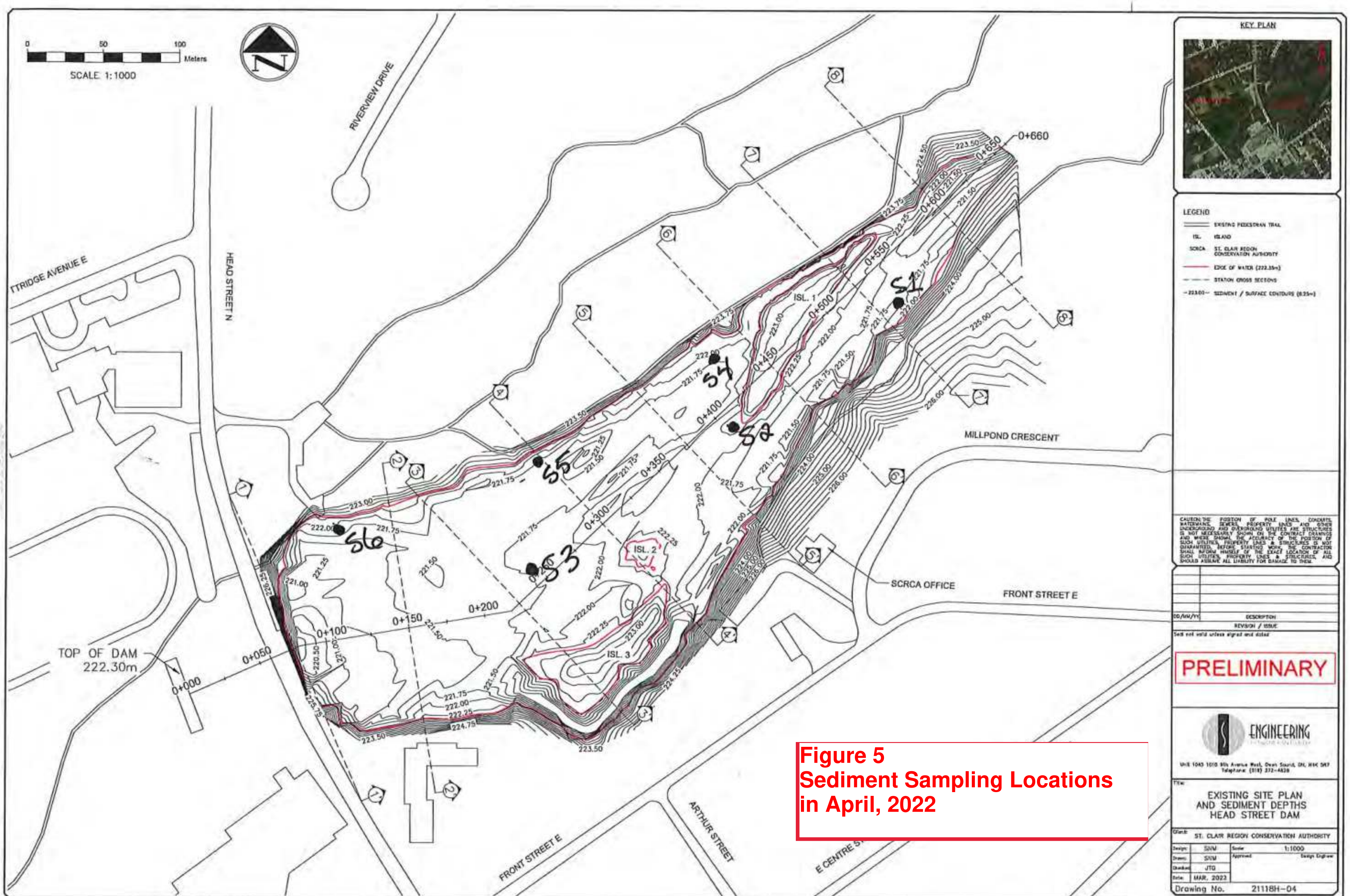

Figure 5
Sediment Sampling Locations in April, 2022

July 14, 2022 | 21-118

TABLE 4

Summary of Sediment Quality Data for Metals and Other Inorganic Parameters
Potential Removal of the Head Street Dam

Sample Identification		S1	S2	S3	S4	S5	S6	MECP (1993)		MECP (2011)
Date Collected		22-Apr-2022	22-Apr-2022	22-Apr-2022	22-Apr-2022	22-Apr-2022	22-Apr-2022	Sediment Quality [1]		Table 1 [2] Background
Lab Sample ID		L2700779-1	L2700779-2	L2700779-3	L2700779-4	L2700779-5	L2700779-6	LEL	SEL	
Parameter	Units									
Cyanide, Free	µg/g	<0.50 [5]	<0.050	0.053	<0.1	<0.1	<0.1	-	-	0.1
Aluminum (Al)	µg/g	2280	1790	4340	7300	10100	7490	-	-	-
Antimony (Sb)	µg/g	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	NV
Arsenic (As)	µg/g	1.42	1.14	1.78	2.63	3.87	2.33	6	33	6
Barium (Ba)	µg/g	12.9	8.3	27.8	65.7	75.1	57.8	-	-	NV
Beryllium (Be)	µg/g	<0.10	<0.10	0.17	0.28	0.42	0.30	-	-	NV
Bismuth (Bi)	µg/g	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	-	-	-
Boron (B)	µg/g	<5.0	<5.0	<5.0	6.6	9.1	6.0	-	-	NV
Cadmium (Cd)	µg/g	0.051	0.034	0.104	0.187	0.232	0.156	0.6	10	0.6
Calcium (Ca)	µg/g	71600	67000	56200	88800	71000	67900	-	-	-
Chromium (Cr)	µg/g	4.64	2.89	6.88	11.0	15.6	12.1	26	110	26
Cobalt (Co)	µg/g	1.53	1.12	2.27	3.57	4.94	3.73	-	-	50
Copper (Cu)	µg/g	2.20	1.45	4.74	7.49	10.90	8.00	16	110	16
Iron (Fe)	µg/g	4740	3110	6560	9880	14000	11200	20000	40000	-
Lead (Pb)	µg/g	1.90	1.58	3.33	5.01	7.08	5.05	31	250	31
Lithium (Li)	µg/g	2.5	<2.0	4.3	7.1	10.3	8.9	-	-	-
Magnesium (Mg)	µg/g	15000	12700	9290	9240	10800	9750	-	-	-
Manganese (Mn)	µg/g	174	154	156	256	319	220	460	1100	-
Mercury (Hg)	µg/g	<0.0050	<0.0050	0.0126	0.0201	0.0281	0.0199	0.2	2	0.2
Molybdenum (Mo)	µg/g	0.11	<0.10	0.17	0.18	0.31	0.19	-	-	NV
Nickel (Ni)	µg/g	3.04	2.24	4.69	7.56	10.7	8.58	16	75	16
Phosphorus (P)	µg/g	305	228	526	**<u>719</u>**	**<u>935</u>**	**<u>740</u>**	600	2000	-
Potassium (K)	µg/g	330	280	630	1,080	1,470	1,060	-	-	-
Selenium (Se)	µg/g	<0.20	<0.20	<0.20	0.28	0.38	0.26	-	-	NV
Silver (Ag)	µg/g	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	0.5
Sodium (Na)	µg/g	104	98	119	155	180	156	-	-	NV
Strontium (Sr)	µg/g	80.8	75.0	64.1	97.3	80.1	66.7	-	-	-
Sulfur (S)	µg/g	<1000	<1000	<1000	1000	1300	<1000	-	-	-
Thallium (Tl)	µg/g	<0.050	<0.050	<0.050	0.083	0.091	0.070	-	-	NV
Tin (Sn)	µg/g	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	-	-
Titanium (Ti)	µg/g	152	92.8	190	194	252	148	-	-	-
Tungsten (W)	µg/g	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	-	-	-
Uranium (U)	µg/g	0.266	0.215	0.304	0.394	0.467	0.326	-	-	NV
Vanadium (V)	µg/g	7.96	4.79	10.8	15.0	22.0	16.9	-	-	NV
Zinc (Zn)	µg/g	14.7	11.6	25.0	37.0	52.9	39.8	120	820	120
Zirconium (Zr)	µg/g	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-	-

Notes:
1. Lowest Effect Level (LEL) and Severe Effect Level (SEL) from the 1993 MECP "Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario".
2. Table 1 Background Site Condition Standards for Sediment from the 2011 MECP "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act".
3. Results higher than corresonding guideline or standard are shown in **BOLD** and <u>underlined</u>.
4. "NV" indicates no value derived. "-" indicates no applicable standard or not analysed.
5. Method Detection Limit was raised by 10x (0.050 ug/g to 0.50 ug/g) due to matrix interference (chemical interference).

Based on particle size analysis, the upstream sample SPSA1 consisted primarily of fine sand (91%) and some medium sand (5.4%) with the balance of the sample being silt and clay.

The downstream sample SPSA2 consisted of mainly silt (43%) and clay (26%) with the balance of the sample being fine sand (31%).

In general, these results are consistent with soil and geologic conditions within the watershed upstream of the Head Street dam, as discussed in earlier sections of this report.

4.7 Head Pond Sedimentation Accumulation Rate

The *Strathroy Reservoir Management Study* prepared by Greck and Associates Limited, herein after referred to as Greck, in 2003 discusses many impacts that result from the reservoir behind the Head Street Dam. The impacts include sediment accumulation, water quality, fish passage, effects on species at risk and invasive species, recreational uses, flood control and protection, erosion control, and reservoir ecology. The study proceeds to propose measures to address and manage the reservoir impacts.

In *Section 4.2 Sediment Accumulation and Quality* of the *Strathroy Reservoir Management Study* report, Greck uses historical water depths in the Head Street reservoir to estimate the rate of sediment accumulation.

The Head Street Dam and therefore the reservoir behind the dam was constructed in 1972. Greck states that the reservoir had an average water depth of 1.5 m over an area of 5 ha when constructed. By 1989 Greck states that the average water level in the reservoir had reduced to 1.2 m. Therefore, an average of 0.3 m of sediment had accumulated over the 5-ha area (15,000 m^3) in 18 years. Greck concluded that the sediment accumulation rate in the Head Street reservoir is approximately 800 m^3/year (15,000 m^3 ÷ 18 years).

Based on the reservoir survey conducted by the SCRCA in February and May of 2022, the current average water depth (to the top of sediment) in the Head Street reservoir is approximately 0.7 m. Following Greck's logic to estimate the sediment accumulation rate, an average of 0.5 m of sediment has accumulated over the 5-ha area (25,000 m^3), since 1989 (over 32 years). Greck also indicates that 2,000 m^3 of sediment was dredged from the upstream end of the reservoir in 1989. However, this sediment has since reaccumulated in this area. The total sediment accumulation over the last 32 years, therefore, is estimated to be up to 27,000 m3, or a sediment accumulation rate of approximately 800 m3/year. This estimate compares favorably with Greck's earlier estimate.

However, as previously stated we estimate the area of the reservoir to be approximately 6.2-ha, as opposed to 5-ha. Further, as expressed in Section 3.1, during the SCRCA's 2022 reservoir survey the sediment was probed to measure the depth from water level to original hard bottom and subsequently determine the depth of accumulated sediment at each survey point. From this survey it was determined that a total of approximately 66,000 m^3 of sediment has accumulated in the reservoir over the last 50 years (since the construction of the reservoir in 1972). Therefore, the sediment accumulation rate would be approximately 1,300 m^3/year.

This result is not indicative of an increased sediment accumulation rate since Greck completed their estimate. Rather the reservoir area and average water depth when the reservoir was constructed may have been underestimated in Greck’s evaluation, as these properties should remain largely constant over time.

Therefore, the true sediment accumulation rate in the Head Street Reservoir is likely somewhere between the low estimate of 800 m^3/year and the higher rate of 1,300 m^3/year. We conclude the approximate rate of sedimentation is 1,100 m^3/year.

With a sediment accumulation rate of 1,100 m^3/year, approximately 0.02 m of average water depth will be lost over the 6.2-ha reservoir each year. If the dam remains unaltered and the sediment accumulation is not managed, based on a current average water depth of 0.7 m, theoretically in 35 years (by the year 2058) the reservoir would be completely full of sediment.

However, as there will always be some active water depth over the sediment, and faster velocities near the dam will scour sediment from the bottom, the effective full storage of sediment will likely occur before 2058.

5 ECOLOGICAL IMPACTS AND BENEFITS OF THE HEAD STREET DAM

The International Union for Conservation of Nature has designated the Sydenham River as one (1) of thirteen (13) freshwater Key Biodiversity Areas in Canada. This is due to the diversity of freshwater species supported by the Sydenham River. The Sydenham River is home to 34 mussel species and 80 fish species as well as many other semi-aquatic species such as turtles, snakes, amphibians and dragonflies. Some of these species are designated as Species at Risk and are found nowhere else in Canada or remain in only a few locations globally. These Key Biodiversity Areas are contributing significantly to the global persistence of biodiversity.

As noted in the 2018 Sydenham River Recovery Strategy there are a number of threats to the aquatic Species at Risk identified within the Sydenham River. Specifically, dams are identified within the report as impacting aquatic habitat by causing thermal warming, impacting normal sediment transport processes and sediment deposition, and posing a barrier to fish migration or passage and mussel distribution. The identified impacts and benefits of the Head Street dam are discussed in the following sections.

5.1 Sedimentation and Sediment Distribution

Sediment loading and turbidity are some of the major factors affecting aquatic species in the Sydenham River. Increases in sediment loads over time can be attributed to various processes including land use such as agriculture, lack of riparian areas and erosion.

Benefits of Dam Removal:

The Head Street dam interrupts natural sediment transport and loadings which degrades aquatic habitats for Species at Risk downstream of the Head Street dam. If the dam was not in place, sediments such as sand and gravel that are held back by the dam would transport downstream and benefit fish, mussel and turtle habitat which rely on these substrates for various life stages.

Possible Negative Impacts of Dam Removal:

Although natural sediment transport and loading is a benefit to the habitats downstream, the dam currently decreases the rate of downstream siltation. Silt, unlike sand and gravel, can negatively impact species downstream by increasing turbidity and making it difficult for species to fulfill their life cycle requirement. Silt can also smother and suffocate sedentary species like mussels or fish eggs. With the amount of silt that has accumulated behind the Head Street dam, additional study is recommended to determine silt transport rates and the affected downstream area if the decision is made to remove the dam and allow sediment to naturally migrate downstream.

5.2 Water Temperatures

Water temperature plays an important role in aquatic ecosystems and can directly impact the species composition of an area.

The SCRCA placed temperature loggers at a location upstream and downstream of the Head Street Dam to determine whether there were any impacts to the water temperature. Loggers were places for three consecutive years (2017-2019).

During these summers, the water temperature significantly increased from upstream to downstream of the dam. The following **Table 5** summarizes the average upstream and downstream water temperatures for the years 2017, 2018 and 2019. The following averages are for temperatures at 4 pm each day when normally stream temperatures reach their daily maximum before cooling off to varying degrees overnight.

Table 5

Summer Water Temperatures Upstream and Downstream of the Head Street Dam for 2017, 2018 and 2019

Year	Average Upstream Water Temperature at 4:00 pm.	Average Downstream Water Temperature at 4:00 pm.	Increase in Average Water Temperature due to Head Street Dam at 4:00 p.m.
2017	17.90	20.23	2.33
2018	19.37	21.75	2.38
2019	18.06	21.05	2.99
Average	**18.44**	**21.01**	**2.57**

As per **Table 5** above, the average increase in water temperature due to the dam head pond was 2.57 C. This is a significant increase in summer water temperatures that could limit cold and cool water fish species downstream of the dam. The warming effect of impoundments such as the Head Street Dam are also anticipated to increase due to warmer summer air temperatures resulting from climate change.

5.3 Water Quality

Increase in water temperature and excess nutrients can have negative effects on the aquatic ecosystem including change in species composition, increase in algal blooms and depleted oxygen levels.

The Head Street Dam is situated within the East Sydenham River Headwaters sub-watershed. The substrate in this sub-watershed is sandy and gravelly with a high influence from groundwater, which lends to cool/cold-water fish communities. As per Section 5.2, the dam is causing a warming of the river water downstream of the dam and within the head pond.

As sediment accumulates behind the dam, the reservoir has become shallower, leading to quicker warming of water and likely contributes to algal blooms in the dry summer months. The following photos (Photo 3 and Photo 4) depict typical algal blooms in the Head Street dam reservoir.

Photo 3: Algal bloom in the Head Street Dam reservoir, downstream of the Head Street Bridge along the south shore.

Photo 4: Algal bloom in the Head Street Dam reservoir, upstream of the Head Street Bridge.

The reservoir behind the dam attracts a large population of Canadian Geese. The geese make nests on the exposed sediment mud flats in the upstream portion of the reservoir and along the shore of the reservoir as well as wade in the reservoir waters. Excrement from the large population of geese likely degrades the water and land quality in and around the reservoir. Goose excrement contains high levels of bacterial and avian parasites which can be harmful to the health of humans and wildlife. Canadian Geese are often territorial and aggressive which diminishes the recreational viability of the reservoir.

Photo 5 below shows the large population of Geese that occupy the reservoir.

Photo 5: Canada Geese in the reservoir upstream of the Head Street Dam.

5.4 Fish Passage

The Sydenham River is home to eighty (80) fish species, ten (10) of which are listed as Species at Risk. Barriers and modifications to natural stream flows can impact fish movement through the ecosystem to fulfill life cycle requirements.

Benefits of Dam Removal:

The Head Street dam limits the ability of fish to move freely through the East Sydenham River and access a wide variety of fish habitat types.

Possible Negative Impacts of Dam Removal:

Invasive Species like Round Goby (Neogobius melanostomus) appear unable to move upstream past the Head Street Dam. Records show the current distribution is just below the Head Street Dam. Round Goby, like many other Invasive species, is prolific at reproducing and will outcompete native fishes like Darters for food and other habitat resources.

The presence of Round Goby has shifted the feeding ecology of benthic species in the Sydenham River, as well as species with direct diet overlap such as the Eastern Sand Darter (Firth et al, 2021). As the native species decline and natural hosts of mussel larvae (glochidia) are removed, the glochidia must attach to the next best option, being Round Goby. This results in the glochidia being unable to mature into juveniles and therefore do not survive.

A study by Tremblay et al in 2016 states "*N. melanostomus are likely acting as a sink for glochidia, whereby they prevent glochidia from reaching their intended hosts. This has negative implications for unionid species that exhibit high rates of infection and poor/no metamorphosis on N. melanostomus".* Without the Head Street Dam in place, the Round Goby and other Invasive Species could move upstream through the East Sydenham River which could impact native species in this area.

5.5 Mussel Distribution

As previously mentioned, the Sydenham River is home to 34 freshwater mussel species in the family Uniondae and identified as the most mussel diverse watershed in Canada. These organisms are long lived filter feeders that siphon the water and strain out oxygen, food, and nutrients, and remove pollutants and suspended particles. Mussels are also sedentary or slow-moving organisms often relying on host fishes to carry their larva (glochidia) upstream. Mussels rely heavily on clear water to attract a host fish using their lures and releasing their larva into the water column.

Benefits of Dam Removal:

The Head Street dam may be hindering mussel distribution as host species (fish) are unable to move freely upstream due to the barrier created by the dam. Removal of the dam would allow for further movement of the mussels as the larva (glochidia) would be carried further by the host fish.

As previously noted, the dam impedes the natural transport of key substrates like sand and gravel through the river system. This may result in less suitable downstream habitats and degraded mussel beds.

Possible Negative Impacts of Dam Removal:

As previously noted, the dam holds back a large volume of silt. If this silt were allowed to wash downstream this may negatively affect mussel habitat and limit essential life cycle processes such as reproduction, respiration and feeding.

6 FLOOD, EROSION AND SEDIMENTATION ANALYSIS OF DAM REMOVAL

The flood plain along much of the river, especially in the Strathroy area, is relatively wide and thus the inundated area along the river during major flood events is also relatively wide.

The following sections evaluate the impacts of flooding in the Strathroy area if the dam was removed. As well, an estimate of channel formation that would occur through the existing head pond area of the Head Street dam is provided, if the dam was removed in the future. As per previous sections, there is significant sediment build up in the head pond consisting of fine sand as well as silt and clay.

6.1 Impact of Dam Removal on 100-Year Flood Flow Limits

Appendix D provides details of the HEC RAS model developed by GSS Engineering for the East Sydenham River in Strathroy upstream and downstream of the Head Street dam. This model uses return flood flow estimates for the 100-year flood event down to the 2-year flood event. The model also takes into account overall river slope, flood plain elevation data for the flood plain adjacent to the river and backwater effects from the Head Street bridge and the Head Street dam.

The model was used primarily to estimate the limits of flooding that would occur for a 100-year flood flow event of 125 m^3/s. In particular, the model was developed to estimate the area of flood inundation with current conditions (dam in place) and after removal. The area of the river modelled started approximately 1.2 km downstream of the dam and extends approximately 4.7 km upstream of the dam for a total modelled distance of approximately 5.9 km.

As per **Appendix D**, the modelling shows no difference between the 100-year inundated flood area before and after dam removal for the river downstream of the dam. Upstream of the dam, modelling shows the inundated flood area is slightly less after the dam is removed. **Figure 21118H-02** in **Appendix D** depicts the flood inundation boundary for the pre-dam removal (in red) and for the post dam removal (in blue). In areas upstream and downstream of the dam that only depict a blue line (post dam removal), the blue line is overlapping the red line. Indicating the flood inundation boundary for pre and post dam removal are the same in this area, and therefore the dam has no affect on flooding in this area.

Under 100-year flood conditions, the downstream water level reaches an elevation of approximately 223.26 m which is appreciably higher than the top of the existing dam (222.35 m), such that the dam becomes submerged during major flood events.

Overall, the results are consistent with the fact that the river valley in the Strathroy area has low gradient, and a wide shallow flood plain and that the dam height is relatively low (i.e. 1.4 m) compared to the increase in water depth that would occur during a major flood event. During the 100-year flood event, the flow width becomes quite wide and water velocities remain relatively low due to the low gradient river channel.

The model results provided in **Appendix D** therefore predict there would be no significant changes in flooding conditions for the 100-year flood event if the dam was removed.

However, this conclusion does not consider the effect of sediment release from the head pond on the downstream channel if the dam was removed, and a significant volume of the sediment in the head pond was washed downstream over time following removal of the dam.

6.2 Potential Impacts/Benefits of Changes in Sediment Movement/Deposition Following Dam Removal

Section 4.4 summarizes the major findings of the January, 2023 GEO Morphix review of channel formation and possible sediment release accompanying the removal of the Head Street dam.

As per Section 4.4, GEO Morphix estimates a significant volume of sediment could be released from the head pond if the dam was removed.

However, the GEO Morphix review did not estimate the rate of transport of the released sediment through the downstream river channel. As such, if removal of the dam was seriously considered, the following additional study would be recommended.

Section 8 discusses options for dam removal. Two of the options include removal of sediment from the head pond <u>before</u> the dam is removed.

These two options are i) dredging of the head pond sediment with full water level present in the head pond or ii) excavation of sediment from the head pond “in the dry” after a temporary channel (or temporary pipeline) is first constructed around the head pond.

With the above two options, the amount of sediment released downstream would be significantly less than if the river was allowed to naturally carve a new channel through the head pond sediment once the dam was removed.

If the river was allowed to carry the sediment downstream than two additional options are available being i) the dam is removed in stages (i.e. over three years) and the sediment is allowed to be carried downstream over an extended time frame or ii) the dam is removed entirely at one time and the sediment is allowed to be carried downstream in a relatively short period (i.e. over one year).

As sediment is released from the reservoir a portion would be deposited along the bed and edges of the East Sydenham River. Finer sediment particles will travel further downstream then heavier sediment particles. The heavier sediment particles are likely to be deposited in deeper portions of the river bed and on the outside of river bends, where water velocities are reduced. The pool below the dam and the river reach a short distance below the dam would likely receive heavy sediment loadings. Finer sediment particles are likely to be transported many kilometres downstream and are likely to remobilize during high flows in the East Sydenham River. These particles will likely continue to move downstream over time and may eventually deposit in Lake St. Clair. If a dam removal option selected allows sediment to wash freely downstream, additional study is recommended to determine sediment transport rates and the area(s) along the East Sydenham River that will be most affected by the sediment transport.

However, without additional study, the following general conclusions are provided at this time:

i) As per later sections of this report, it does not appear practical to dredge or excavate the sediment from the head pond before the dam is removed. A similar conclusion was presented by GEO Morphix in their January, 2023 evaluation of channel formation in the head pond sediment.

ii) Slow release of head pond sediment over say three years (by step wise removal of the dam over say three years) would likely pose lesser risks to the downstream channel condition than if the dam was completely removed in one work season.

Based on the above, it is recommended that further modelling of sediment transport downstream of the dam site be carried out if a decision was made in principle to remove the dam without significant sediment being first removed from the dam head pond.

7 IMPACT OF DAM REMOVAL ON HEAD STREET BRIDGE

As per Section 6.1, **Appendix D** provides a HEC RAS model of flood flow elevations upstream and downstream of the Head Street dam. This model is also used to estimate flood velocities under the Head Street bridge if the dam was removed in the future. River velocities under the Head Street bridge could be a concern if higher velocities caused erosion of the riverbed along the bridge abutments and around the central support piers.

The following summarizes the river velocities provided in **Appendix D**.

7.1 Description of Existing Head Street Bridge

It is understood the existing Head Street bridge was constructed at some point in the 1960's. In comparison, the Head Street dam was constructed in approximately 1972. Therefore, the bridge is older than the dam and theoretically the bridge designers took into account flood flow conditions and accompanying river flow velocities that existed prior to dam construction.

Overall, the open area under the bridge is approximately 35 m wide. Vertical concrete abutments are located at each end of the bridge. The bridge deck is supported by concrete beams running longitudinally with the bridge. At the approximate one third point each way are two concrete support piers that run parallel with river flow. A schematic cross-sectional view of the bridge looking from upstream to downstream is provided in **Figure 1** of **Appendix D**.

For **Figure 1**, it is assumed that the river bottom under the bridge would have an elevation of approximately 220.7 m, or slightly higher than the estimated elevation of the river bottom just downstream of the existing dam. This compares to the top elevation of the existing dam (estimated as 222.35 m) such that the stable river bottom under the bridge would be 1.65 m below the top of the existing dam.

Despite efforts by the SCRCA and GSS Engineering, no engineering drawings for the bridge could be located. As such, the elevation, the size and the depth of the footings under the north and south bridge abutments, and under the central piers, are not known. The analysis provided in this report therefore relies on estimates of water velocity that would occur under the bridge based on the above estimated river bottom elevation and other factors built into the HEC RAS model as discussed in Section 4 and as per **Appendix D**.

The analysis completed by GSS Engineering is based on estimated water velocities that would occur under the bridge during high flood flows, moderate flood flows and normal low flows if the Head Street dam was removed in the future.

7.2 Assessment of Dam Removal on Head Street Bridge

As per **Appendix D,** hydraulic analysis of water velocities under the Head Street bridge were completed for the 100-year flood event, the 2-year flood event and the mean annual stream flow. Results of these analysis are provided as follows.

7.2.1 Impact of Dam Removal on Bridge During Major Flood Conditions

The major flood flow evaluated was the 100-year return flood flow of 125 m^3/s. As per **Figure 1** in **Appendix C** of **Appendix D**, the river velocities under the bridge for this flow rate are estimated to be a maximum of 2.11 m/s in the center of the channel with an overall, average water velocity of 1.62 m/s. These velocities are relatively slow and are not felt to be high enough to result in scour (erosion) along the bridge abutments or around the center piers.

However, as a precaution, it is recommended that stone (12” to 16” diameter) be added to the bottom of the river under the bridge and along the river abutments if the dam was removed to guard against any scour. It should be noted that the HEC RAS modelling shows only a slight reduction in flood inundation water levels upstream of the dam if the dam was removed. As such, water velocities under the bridge, before and after dam removal, should be very similar for the 100-year flood flow. As such, the addition of stone under the bridge is proposed only as a precautionary measure. As well, as noted, the bridge was built before the dam was constructed so the original bridge designers likely took into account flood flow velocities that occurred prior to dam construction.

As per **Appendix C** of **Appendix D** (see specifically **Figure 2**), the above velocities were checked by taking the flow of 125 m^3/s and dividing it by the estimated, post dam removal cross-sectional area of the river channel under the bridge. As per **Figure 2**, the cross-sectional area is estimated to be 75.33 square meters. This area is based on the opening width under the bridge times the estimated water depth of 2.5 m at the 100-year flood flow. Dividing the flow rate of 125 m^3/s by the area of 75.33 square meters yields a velocity of approximately 1.66 m/s, which is similar to the average velocity of 1.62 m/s predicted by the HEC RAS analysis.

7.2.2 Impact of Dam Removal on Bridge During Moderate and Low Flood Conditions

Appendix C of **Appendix D** also provides estimates of river velocities for the 2-year flood flow of 53.6 m^3/s following removal of the dam. As per **Appendix C** of **Appendix D** (see **Figure 3**) the estimated, maximum velocities are 1.13 m/s or less. These are considerably lower velocities than predicted for the 100-year flood flow after the dam is removed.

The 2-year flood flow of 53.6 m^3/s was used in the analysis because it is generally understood the 2-year return flood flow normally represents the bank full capacity of a natural channel, and that the 2-year flood flow is normally associated with the stream flow that forms a natural stream channel in terms of channel width, meander pattern and depth.

Appendix C of **Appendix D** also provides the estimated flow velocity for the Mean Annual Flow of 2 m^3/s. The HEC RAS model predicts the river velocity under the bridge would be minimal under these conditions (0.34 m/s).

7.2.3 Conclusions – Stability of Head Street Bridge if Head Street Dam Removed

As per previous sections, the water velocities under the bridge, even at 100-year flood flows, are relatively low and unlikely to cause any scour of the river bottom, or along the edge of the bridge abutments or around the center support piers. As noted, the HEC RAS model also predicts the water levels under the bridge for the 100-year flood flow, after the dam is removed, will be very similar to current water levels with the existing dam in place. Similar water levels mean the cross-sectional flow area will be unchanged, meaning the average water velocity for the 100-year flood flow would be largely unchanged for before and after dam removal conditions.

Nonetheless, it is recommended that a layer of 12” to 16” diameter stone be placed on the bottom under the bridge and up the edges to the 100-year flood high water mark to the protect bridge bottom area from scour.

8 METHODS OF DAM REMOVAL AND SEDIMENT MANAGEMENT STRATEGIES

This section discusses various options to remove the Head Street dam if a decision was made to remove the dam in the future. As per previous sections, there is a significant amount of sediment in the dam head pond. Management of sediment is therefore a major consideration when alternatives for dam removal are evaluated.

8.1 Dam Removal Methodologies

Dams can be removed using several methods as follows:

i) Full removal of the dam during one summer work period.

ii) Gradual removal of the dam over two or more seasons where stop logs are removed in the first year followed by full removal of the dam in the second year or full removal of the dam over a number of subsequent years.

iii) Partial removal of a dam whereby enough of a dam is removed to achieve environmental goals (i.e. restore fish passage and reduce summer time heating of stream water temperatures) but retain some of the dam to retain sediment storage capacity or to provide some other social or economic benefit that would accrue by retaining some level of ponding behind the remaining portion of the dam (Note – for this study, only full removal of the dam is included in the dam removal options).

With the above general options, here are the following sediment management options:

i) Prior to dam removal, remove the sediment from the head pond by use of a hydraulic dredge. This requires a floating dredge system that pumps a large volume of sediment mixed with water to a receiving basin that would allow the sediment fraction to settle and the clear "decant" water to return to the river.

ii) As part of the dam removal process, construct a large bypass channel or pipeline around the head pond and dam and discharge the river flow below the dam site. Once the stream bypass is established, mechanically remove head pond sediment "in the dry" using large excavation equipment and dump trucks etc.

iii) Remove dam all or in stages and allow river flow to transport the sediment in the head pond downstream naturally.

Table 6 overleaf provides a summary of five general dam removal options including sediment management strategies for each option. This includes the Option 5 which is "do nothing" (leave dam in place).

For all options proposing dam removal (Options 1, 2, 3 and 4), the dam removal component of the overall project appears to be relatively straight forward as the dam structure is relatively low

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TABLE 6
Sediment Management and Dam Removal Options
Potential Removal of the Head Street Dam

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Sediment Management and Dam Removal Options	Economic Considerations	Technical Obstacles	Social Impacts	Environmental Impacts	Regulatory Concerns
Option 1: **Dredging of sediment with water in head pond followed by complete dam removal.**	• Very expensive sediment management option as very large volume of sediment/ water mixture will be produced. • Dam removal will be relatively inexpensive.	• Onsite sediment dewatering required. Very large settling pond likely required. • Ultimate sediment disposal requirements could be difficult. • Equipment mobilization, operation and demobilization required.	• Large area required for sediment dewatering in current park area. Major impact to park users.	• Aquatic species (fish, turtles, etc.) in the head pond may be entrained in the dredged sediment.	• Regulations regarding sediment disposal on off-site lands are now quite stringent.
Option 2: **Temporary bypass of river around dam. Excavate sediment "in the dry" and complete dam removal.**	• Expensive sediment management option. • Temporary bypass pipe or channel around head pond will be expensive to construct. • Least expensive dam removal option.	• Construction of bypass pipe or new channel around the reservoir could be very difficult to design and locate. • Ultimate sediment disposal requirements could be difficult. • Excavating wet sediment with equipment within pond footprint likely difficult.	• Bypass pipe or channel could be a safety hazard until dam and sediments are removed. • Large area of deep, soft sediment could be a danger to pedestrians.	• As head pond level lowers, aquatic species may become trapped in the drying up reservoir.	• Regulations regarding sediment disposal on off-site lands are now quite stringent.
Option 3: **Remove dam in phases over ± 3 years. Allows slow release of sediment over 3 years.**	• More expensive dam removal option than Option 4. • No significant cost for sediment management.	• Maintaining structural integrity of dam is required over ± 3 year process. • The long timeline to remove dam may be difficult contractually.	• Current reservoir area could be a safety hazard for multiple years due to large areas of deep, soft sediment.	• Sediment is released downstream at a relatively high rate. • Sydenham River downstream of dam will become turbid following each step of dam removal due to entrained sediment.	• LIRA (MNRF) permitting may be complicated due to partial removal of dam in steps. • Regulators may not allow the periodic release of large volumes of sediment.
Option 4: **One time removal of complete dam. Allow one time release of sediment.**	• Relatively inexpensive dam removal option. • No significant cost for sediment management.	• Water velocity management required to allow head pond to drain slowly.	• Current reservoir area could be a safety hazard for one or two years due to large areas of deep, soft sediment.	• Very large amount of sediment will be transported downstream in a relatively short timeframe. • Sydenham River downstream of dam will become turbid due to entrained sediment.	• Regulators may not allow the sudden release of large volumes of sediment.
Option 5: **Do nothing.**	• No immediate cost. • Potential for increased maintenance costs as the dam deteriorates.	• Dam may need to be structurally reinforced in the future.	• As the dam deteriorates it will eventually become safety hazard.	• The dam obstructs fish migration. • The dam deprives aquatic species (including SAR) downstream of dam of required sediment.	• As the dam's structural integrity degrades over time, regulators may be concerned with public safety and dam failure.

and easily accessible from the north side. Capital costs to remove the dam only (i.e. without sediment management costs) are estimated to range from $300,000 to $800,000.

However, sediment management costs could be very large if sediment removal is to be completed using a hydraulic dredge or is excavated mechanically. Such large costs include the costs for construction of a very large settling pond (lagoon) for the dredging option or a bypass channel or pipeline system for the option to remove sediment from the head pond "in the dry".

Overall preliminary cost estimates for the five different dam removal options (including the "do nothing" option) are provided in **Table 7** overleaf.

As per **Table 7**, costs to remove just the dam (not including sediment management costs) are estimated to be $300,000 to $800,000 depending on which Option is considered. Option 2, where the head pond upstream of the dam is first drained, is estimated to be the lowest cost of dam removal with the highest cost being Option 3 where the dam is removed in steps over several years with water remaining in the head pond while the dam is removed.

Much higher costs are assigned to active sediment management for Options 1 and 2 where the sediment is removed first by dredging or mechanical excavation before the dam is removed. Such active sediment management costs are estimated to cost at least $5,000,000 to $9,000,000 in addition to dam removal costs. As discussed in the next sections these active sediment management costs are also seen to have extreme technical challenges and potentially high social impacts.

A summary of the five options is provided as follows:

8.1.1 Option 1 – Dredging of Sediment From the Head Pond Before the Dam Is Removed.

This option assumes a floating barge would be used to pump a large volume of water and sediment mixture from the head pond in advance of dam removal.

The additional volume of water mixed with the sediment could be very large. For instance, the total volume of sediment above the Head Street dam is estimated to be 66,000 cubic meters. Even if only half of the sediment was removed by dredging (33,000 cubic meters) there could be easily twice that amount of water entrained with the true sediment (i.e. 2 cubic meters of water per cubic meter of sediment). If so, the total volume of water/sediment removed would be 100,000 cubic meters. A large settling pond would be required to allow the sediment particles to settle out of the water. If there was enough settling time, the water exiting the pond should be clear enough to run back into the river downstream of the dam.

If the floating dredge system featured a 12 inch diameter discharge pipe, and the velocity of the pumped flow was 1.2 m/s (to maintain entrained sediment in suspension) the pump discharge rate would be 70 liters per second (approx. 250 cubic meters per hour.). For a ten hour work day, the total discharge would be 2,500 cubic meters. If one third of the total volume was sediment, then there would be approximately 850 cubic meters of sediment removed per day.

To remove the above 33,000 cubic meters of sediment, the process would require close to 40 days of pumping. This represents about two months of pumping and if this rate of productivity

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TABLE 7
Sediment Management and Dam Removal Options - Preliminary Cost Estimate
Potential Removal of the Head Street Dam

Sediment Management and Dam Removal Options	Capital Cost Estimate for Dam Removal	Capital Cost Estimate for Sediment Removal	Total Capital Cost Estimate	Comments
Option 1: **Dredging of sediment with water in head pond followed by complete dam removal.**	$500,000 to $700,000	> $5,000,000 Need to construct very large sediment/dewatering lagoon on north side of head pond.	> $5,500,000 to $5,700,000	Cost to design, approve and construct very large sediment/dewatering pond very difficult to estimate. Would also be final restoration costs of dewatering pond once sediment dries.
Option 2: **Temporary bypass of river around dam. Excavate sediment "in the dry" and complete dam removal.**	$300,000 to $500,000	> $9,000,000 Cost to build large bypass channel or large bypass pipe around north side of head pond - and pass water under Head Street - would be extremely high.	> $9,300,000 to $9,500,000	Technically very difficult. The bypass channel/pipeline likely would need to be very large to accommodate a reasonably large flow, i.e. potentially the 2-year flood flow rate of 54 m^3/s. Creating new bridge/culvert, etc. under Head Street for new channel or pipeline would be extremely difficult and expensive.
Option 3: **Remove dam in phases over ± 3 years. Allows slow release of sediment over 3 years.**	$800,000	Essentially zero cost for active sediment management as sediment would slowly wash downstream. Assume $300,000 for bioengineering stabilization of emerging stream banks.	$1,100,000	Second lowest overall cost. Agreement from all review agencies (DFO, MECP, MNRF and SCRCA) required in advance to allow downstream sediment release from head pond.
Option 4: **One time removal of complete dam. Allow one time release of sediment.**	$500,000 to $700,000	Essentially zero cost for active sediment management as sediment would wash downstream. Assume $300,000 for bioengineering stabilization of emerging stream banks.	$800,000 to $1,000,000	Lowest overall cost. Agreement from all review agencies (DFO, MECP, MNRF and SCRCA) required in advance to allow downstream sediment release from head pond.
Option 5: **Do nothing.**	Theoretically zero cost. However, ultimately, dam will reach end of service life and need to be repaired, rebuilt or removed.	No cost.	Theoretically zero.	Volume of sediment in head pond will continue to increase over time. With inflation and extra sediment, future costs for dam removal will increase compared to current costs.

Note: Capital costs do not include consultation, engineering or permitting costs.

could be sustained, then a sediment removal target of 33,000 cubic meters could be achieved in one summer season.

However, the volume of a temporary sediment settling lagoon would be quite large. If a 2 m deep lagoon was assumed, and that sediment storage of only 1 m depth was assumed, then a settling pond (lagoon) with an area of at least 33,000 square meters would be required for a target volume of just half of the total sediment volume.

A pond of therefore approximately 3.3 ha would be required with total water depth of 2 m (in addition to say 0.6 m freeboard above the water surface) meaning that a large lagoon with a volume of 70,000 to 90,000 cubic meters would be required with a depth of 2.6 m. If the settling pond was rectangular in shape with the length 3 times the width, the overall dimensions would be 100 m wide by 330 m long. Overall, a lagoon of this size would consume much of the public lands owned by the SCRCA on the north side of the head pond.

The capital cost of settling pond of this size would likely exceed $2,000,000 at a nominal construction cost of $20 per cubic meter. The outlet would also have to be designed to allow an outflow rate of 70 liters per second of settled, clear overflow water. The inlet design would have to feature energy dissipation to avoid eroding the inlet area. The overall site would likely have to be fenced off to prevent the public from entering the settling pond area. Once all costs are considered, the cost to construct the lagoon would likely exceed $3,000,000. In addition, the actual costs of the dredging equipment and manpower etc. would be in addition and is estimated to be between $1,000,000 and $2,000,000.

The other consideration is the quality (clarity) of water being discharged from the downstream end of the lagoon. Assuming the clear water surface volume of the lagoon is 33,000 cubic meters, and with an inflow rate of 70 l/s, the settling time in the pond would be approximately 5 days. Theoretically, with 5 days of the settling time, the water should be relatively clear when leaving the settling pond.

Assuming the lagoon was built and used over the course of one summer, decommissioning costs of the lagoon would need to be considered, including drying out the sediment which could be problematic depending on weather conditions and design details of the lagoon (i.e. bottom level of lagoon relative to final water level in the head pond area). Such decommissioning costs, including possible trucking away of the sediment after drying, could be very high. A general alternative would be regrading the lagoon and storing the sediment permanently on site. However, all the land that is owned by the SCRCA north of the river is in the flood plane of the East Sydenham River. Therefore, the sediment cannot be retained on site.

As per **Table 7**, the preliminary capital cost of Option 1 (excluding engineering, planning and permitting costs) is estimated to be $5,500,000 to $5,700,000 including the actual dam removal costs. These costs assume the sediment stays on site.

In addition there is the environmental concerns associated with a dredging system pumping a sediment/water slurry from the head pond. The head pond contains fish and other aquatic animals and, normally, Department of Fisheries and Oceans requirements dictate fine screening of bypass pumping system to avoid entrainment of even very small fish and other aquatic life in the pumping system. The large flow volume capacity, and heavy solids contents, of a pumped dredging system would suggest fine screening is impractical due to frequent plugging of a screening system.

8.1.2 Option 2 – Construct a Bypass Channel (or Pipeline) Around Dam Head Pond and then Mechanically Remove Some or All Of the Sediment "In The Dry".

This option assumes that first a temporary bypass channel is built around the dam head pond. In the case of the Head Street dam, it is assumed that this channel (or bypass pipeline) would be constructed around the north side of the head pond. The total length of channel or bypass pipeline would need to be approximately 600 to 700 m long (overall length of dam head pond) and theoretically would need to be tunnelled under Head Street on the north of the Head Street bridge and continue downstream approximately 100 m to discharge below the Head Street dam.

The bypass channel or bypass pipe could stop short of Head Street and discharge into the "side stream" coming in from the north just upstream of Head Street. However, if this was done, and the dam subsequently removed, the open water upstream of Head Street would need to be separated by a coffer dam stretching the entire width of the head pond (approximately 130 m) to separate the portion of the head pond upstream of the bypass channel. This concept is further discussed below.

The capacity of the new bypass channel (or pipeline) would need to be substantial. General guidance provided by MNRF for other dam removal projects suggests the capacity of the temporary bypass channel should be adequate for a 2 year return summer flood flow. In the case of the Head Street dam, the average summer flow is only 0.46 cubic meters per second. Conversely, the 2-year return flood flow (for all seasons) is much larger (54 cubic meters per second). Overall, a summer flood flow capacity of perhaps 5 to 10 cubic meters per second would be required to provide a balance between the risk of flow capacity exceedance of the channel (or pipeline) versus costs to build an even larger capacity bypass channel or pipeline.

If a channel was constructed for say 10 cubic meters per second, and assuming a slow flow velocity of 1.0 m/s, a channel 10 m wide by 1 m deep (plus freeboard) would be required. If freeboard height of 0.5 m was assumed, a rectangular channel with a cross section of 1.5 m deep by approximately 19 m wide (giving 3:1 stable side slopes) would be required.

The excavation volume of this channel would be approximately 22 cubic meters per meter of channel. Total volume would be approximately 14,300 cubic meters for a channel length of 650 m. Based on $30 per cubic meter for excavation, the nominal cost would be about $400,000. However, there are significantly more technical challenges that would impact this approach as discussed further below.

As a second option, a buried bypass pipeline could be installed. However, the pipeline(s) would also need to have a capacity of 10 cubic meters per second. Normally, a pipeline would consist of one (or two) large diameter pipes. Water velocity would have to be quite low (i.e. 0.6 m/s) to avoid excessive friction losses in the pipe to prevent the water level entering the pipeline from backing up and overflowing the upstream end of the pipeline during high stream flow events.

If a two pipe system was employed (5 cubic meters per second per pipeline), the pipe diameter would be approximately 2.4 m to 3 m in diameter (8 to 10' diameter) to convey the flow at low velocity. However, the total elevation drop from upstream to downstream is only 1.4 m (the height of the existing dam) and as such more smaller pipes would be required (i.e. four 1.8 m diameter pipes) or potentially the downstream end of the larger pipes would need to exit below the water level downstream of the dam.

Overall, a bypass pipe system would likely exceed material and installation costs of $3,000 per meter. The actual cost could be much more recognizing that essentially all of the pipeline would need to be built below the current water level in the head pond. Even if the pipeline was well set off from the north edge of the head pond, the groundwater level would likely be at the same level as the head pond surface level. This same groundwater level challenge would also apply to the bypass channel sub-option first described.

Overall, given very challenging conditions for a channel or a pipeline (i.e. construction below the groundwater water table and likely need for temporary channel or pipeline to flow under Head Street), it would appear this Option is not feasible even before the feasibility of excavating sediment “in the dry” from the head pond was considered.

With this option, sediment would be excavated “in the dry” from the head pond. In reality, to excavate in the dry, there would need to be zero water flow entering the head pond through the upstream coffer dam. This is likely unrealistic as the working depth in the head pond would be below the water level upstream of the head pond. As well, there would be ground water seepage and surface runoff entering the pond. All combined, the sediment would be wet and loose and access into the pond area for excavation and hauling away of sediment (i.e. track excavators and dump trucks) would be almost impossible without the equipment sinking into the soft material or getting stuck.

Disposal of the sediment would be assumedly off site. One issue would be the volume of sediment that needs to be excavated. Assuming half of the sediment was removed from the site (33,000 cubic meters) then this sediment would be subject to new excess fill regulations that would require extensive testing of the sediment for contaminants and careful tracking of the disposal site for the material among other requirements of the relatively new *On-Site and Excess Soil Management Regulation (Ont. Reg 406/19).*

As per **Table 7**, the preliminary capital cost of Option 2 (excluding engineering, planning and permitting costs) is estimated to be $9,300,000 to $9,500,000 including costs for removal of the dam. This estimate includes costs to convey water under Head Street (through a pipeline or culvert), but it is very difficult to estimate what total capital costs would be for this Option. These costs do not include costs of trucking the sediment off site. It is also difficult to assess the practicality of removing wet sediment from the head pond and transporting to an acceptable disposal site.

8.1.3 Option 3– Remove Dam Over Several Years. Remove Stop Logs In Year 1 and Remove Remainder of Dam In Subsequent Years. Allow Sediment to Be Washed Downstream Over Several Years as Dam Is Removed.

As per Options 1 and 2, removal of sediment before the dam is removed may not be feasible or cost effective due to the large volume of sediment in the head pond.

As such, with Option 3, it is assumed that government agency approvals would be received in advance that allows the sediment to naturally transport downstream from the head pond over time. Option 3 assumes the dam will be removed in stages over several years. By removing the dam over several years, the release of sediment is spread over several years and should minimize concerns with sediment transport downstream of the dam.

With Option 3, it is assumed that the stop logs would be removed in year 1. The stop logs would likely be removed by hand over say two weeks, which would cause the water level in the head pond to lower until the upstream water level matches the downstream water level (would drain head pond by about 1.4 m depth).

As noted, the current water depth in the head pond is about 1.4 m higher than the water level below the dam. As well, upstream of the dam, the water depth to top of sediment is typically less than 1.4 m (typical range is 0.4 m to 1 m water depth over top of sediment).

As such, as the stop logs are removed, and the water level in the head pond lowers, a new channel will form by downcutting through the sediment for most of the head pond length. As the stream down cuts through the sediment, the sediments will begin to mobilize downstream. Likely, a new channel 0.5 m to 1.0 m deep would form through the head pond sediment after all the stop logs were removed.

However, a final, stable channel through the head pond sediment will not likely form after the stop logs are removed from the spillway. The spillway is relatively small with a width of only 2.4 m (8’). Even with the spillway flowing full with all the stop logs removed, our analysis would indicate the spillway would convey only 5 to 6 m^3/s before water levels upstream of the spillway would rise to the top of the sheet pile dam and then overflow the entire width of the dam, as the dam functions now.

Conventional understanding of natural stream channel formation is that the stable, natural channel is formed by a flow rate approximately equal to the 2-year return flood flow. In the case of Head Street, the 2-year flood flow is estimated to be approximately 54 m^3/s, or much more than the spillway will convey.

As such, if the stop logs were simply removed, a relatively shallow channel would develop through the sediment upstream. This channel would not cut down through the full depth of sediment and the initial channel would not likely be stable or fully formed.

For a true channel to form, most, if not all, of the dam would have to be removed, with the sheet piles, armour stone and full spillway (including spillway base) removed at least 1.5 m below the water surface level downstream of the dam. This would provide the cross-sectional area of river channel required to easily convey at least the 2-year return flood flow of 54 m^3/s.

This Option 3 assumes the stop logs are removed in year 1 with step wise removal of additional dam cross section in subsequent years. This option theoretically allows vegetation to start colonizing exposed areas of sediment after year 1 which would provide initial stabilization of the some of the sediment. However, additional sediment would be conveyed out of the head pond in subsequent years as more and more of the dam is removed.

A stable channel through the sediment therefore may take several years to fully develop. As per the GEO Morphix report, channel meander may be significant and total volumes of sediment released from the head pond over time could be very large. However, removal of the dam over several years would result in a relatively gradual release of sediment over several years. This should minimize any negative impacts of sediment transport downstream of the dam.

However, this Option results in the head pond being low in the summer and then temporarily refilling during higher flow events. Water levels in the head pond therefore would overall be variable between year 1 and years 2 and 3 and pose aesthetic challenges to the dam removal process.

In practise, it may be difficult to remove a dam slowly over several years. In most cases, an experienced construction company with heavy equipment is hired to remove the dam. Mobilization of equipment, preparation of the site for construction, providing equipment access etc. and other economic factors usually favours completion of a dam removal project in a relatively short, one season period with no major interruptions. As well, if grant funding is available, the terms of the grant funding may require the complete project be done in one season.

As well, part removal of the dam each year over several years can lead to complications with obtaining permits from regulators. Part removal of the dam may require the proponent (the dam owner) to prove the partially removed dam remains safe to the public and structurally stable until the full dam is removed.

The main benefit of a slow dam removal process is, theoretically, that sediment management can be improved and major loss of stored sediment from the head pond to the downstream watercourse can be avoided.

As per **Table 7**, the preliminary capital cost of Option 3 (excluding engineering, planning and permitting costs) is estimated to be $1,100,000. Costs for this Option are relatively low as there is no significant active sediment management costs. However, some additional capital costs are estimated as actual dam removal costs are higher as the dam removal contract is extended over a number of years.

8.1.4 Option 4 – Remove Entire Dam In One Year. Allow Sediment to Be Washed Downstream Over One Year After Dam Is Removed.

This option is the same as Option 3 except the dam is completely removed over one year.

With this case, the full water drop (1.4 m) will occur relatively quickly and water levels would stay low and consistent for larger flood flows as well as smaller flows.

More sediment would migrate downstream in the first year though total sediment transported downstream would be essentially the same with Option 3 and 4 though more spread out over time with Option 3. However, sediment transport downstream of the dam site could be more of a concern with Option 4 than with Option 3.

As per **Table 7**, the preliminary capital cost of Option 4 (excluding engineering, planning and permitting costs) is estimated to be $800,000 to $1,000,000. Costs for this Option is relatively low as there is no significant active sediment management costs and the dam is fully removed in a single year construction contract.

8.1.5 Option 5 – Do Nothing. Leave Dam and Sediment As Is.

With this option, no action would be taken with the dam or sediment. Costs (economic and social) would be minimal. However, this option ignores the fact the dam likely has a finite service life and ultimately the dam could fail, become unsafe or the environmental effects of the dam could become significant.

Costs will also rise with time as further, more stringent environmental regulations might evolve with time. As well, the total sediment storage capacity of the dam does not appear to have occurred as yet. In other words, the reservoir still appears to be filling with sediment. As per this report, the dam was constructed approximately 50 years ago in 1972. It is therefore possible that in another 50 years, the total sediment stored in the head pond will be perhaps 50% to 100% more than currently stored in the head pond.

As such, costs for dam removal and sediment management will likely increase with time due to greater sediment volumes before inflationary effects are considered.

8.2 Summary of Options and Costs

As per the above analysis, there appears to be very significant cost and technical challenges to complete Option 1 or Option 2. Both of these options would deal proactively with the sediments to prevent sediment in the head pond from being naturally transported downstream. However, the technical and environmental challenges, and the capital and engineering costs of Option 1 and 2, would appear beyond the reach of the project.

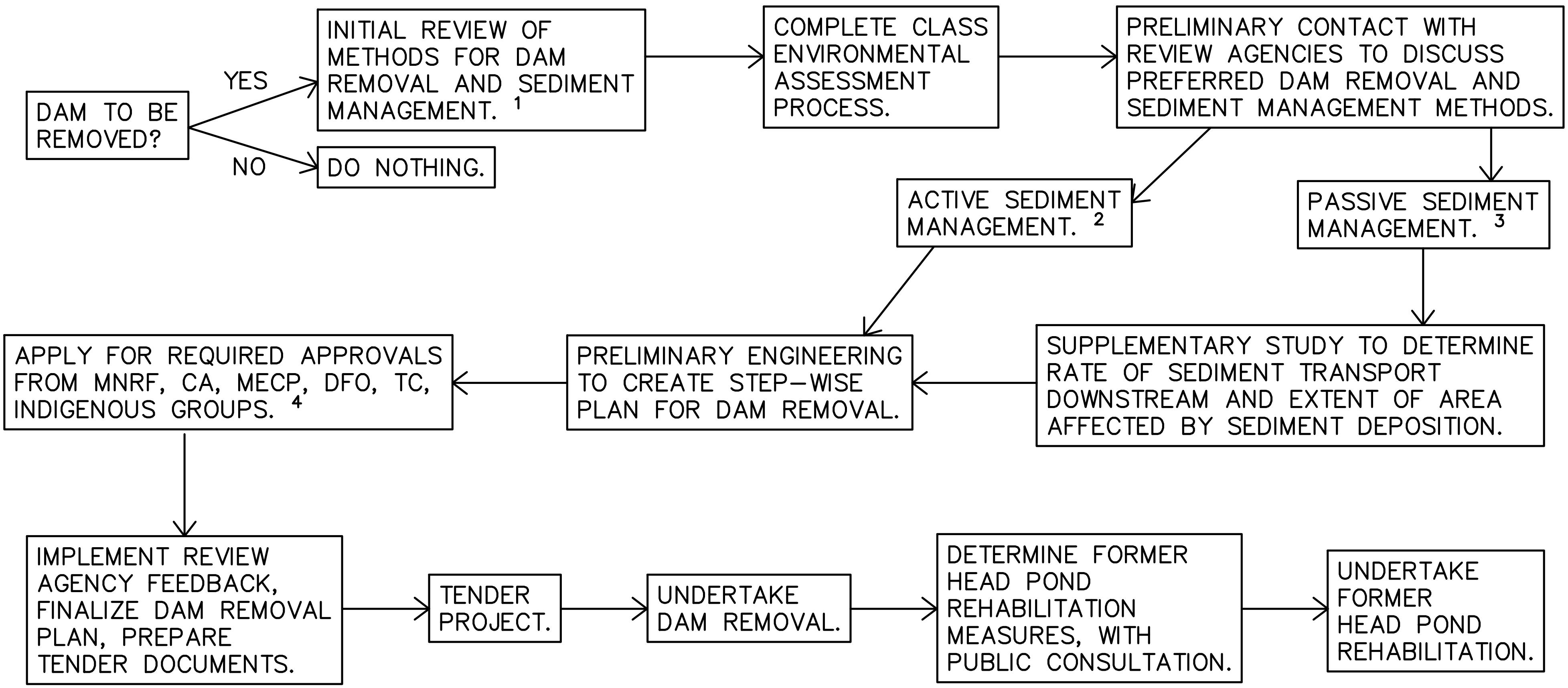
As such, the recommendation of this report is that Option 1 and Option 2 are not considered feasible at this time and that Option 3 and 4 be considered further for removal of the Head Street dam.

8.3 Potential Removal of Head Street Dam Next Steps

The flow chart overleaf provides a general outline of the next steps for the potential removal of the Head Street dam. The flow chart follows the steps including selection of preferred removal and sediment management method, consultation with review agencies, recommended additional study, engineering of dam removal, tendering the project, removal of the dam, and finishing with the rehabilitation of the former head pond.

Emphasis is placed on communication with review agencies. If the dam is to be removed, it is very important that all appropriate review agencies (MNRF, MECP, DFO, Indigenous groups) are consulted regarding the preferred dam removal and sediment management option. If passive sediment management is the preferred option, it is important that all review agencies are aware of the affects this will have on the East Sydenham River (increased turbidity and siltation downstream of the dam).

POTENTIAL DECOMMISSIONING OF HEAD STREET DAM PROJECT FLOW CHART



1. PUBLIC CONSULTATION COULD BE CONSIDERED FOR DETERMINING THE PREFERRED METHOD FOR DAM REMOVAL AND SEDIMENT MANAGEMENT.

2. ACTIVE SEDIMENT MANAGEMENT INCLUDES DREDGING OR EXCAVATING ACCUMULATED SEDIMENT PRIOR TO DAM REMOVAL.

3. PASSIVE SEDIMENT MANAGEMENT CONSISTS OF ALLOWING THE SEDIMENT TO BE TRANSPORTED DOWN STREAM NATURALLY BY THE RIVER.

4. IF PASSIVE SEDIMENT MANAGEMENT IS SELECTED IT IS IMPERATIVE THAT ALL REVIEW AGENCIES ARE FULLY AWARE OF THE EFFECTS.

9 HEAD POND RESTORATION OPTIONS

The Head Street dam head pond has an area of approximately 6.2 ha. This large area thus represents an opportunity for a range of rehabilitation options if the dam is removed at some point.

As described in Section 2, removal of a dam can provide new habitat for a large variety of fish and wildlife species and new passive recreational opportunities.

In general, the former head pond area can be allowed to revegetate naturally over time with the new stream channel being allowed to form naturally. Or a variety of new, natural and manmade features could be developed. A list of possible features is as follows:

i) New wildlife habitat. The former head pond area can be restored in a number of ways for new grassland areas. The remaining sediment will contain a seedbank supporting growth of a variety of native plant species once seed germination occurs. Importation of topsoil may be required in some areas.

ii) Alternatively, the former head pond area can be supplemented with new native wildflower and grass lands seed mixes to provide tallgrass grassland and pollinator growth similar to what was originally common to the area. This may require importing some topsoil and/or clean fill material to shape the ground surface and enhance growing conditions.

Photo 6: Meadow seeded with pollinator plants.

Photo 7: Tall grass prairie in southwestern Ontario.

iii) In addition to grassland areas, part or all of the head pond area can be planted with native trees and shrubs to provide forest and edge habitat in addition to grass land habitat.

Photo 8: Tree planting project with popular trees over four year span.

iv) Shallow pool or pond features can be provided by excavating and shaping the remaining sediment. These water features (ponds) could be constructed deep enough to support fish year-round, and therefore provide public fishing opportunities. The water features can also be created as shallow wetland areas or shaped and located so they provide seasonal (ephemeral) wetland conditions.

Photo 9: Wetland pond system with adjacent pollinator areas as well as maintained grass areas.

v) Water features would not typically be directly connected to the new stream channel but could refill from local runoff, by intersecting the local groundwater table or by filling during high water (flood) conditions.

vi) It would be expected that pond or wetland areas would attract a wide variety of insects, birds and animals. Wildlife viewing platforms (or viewing towers) could be provided to support birdwatching etc.

vii) Trails and sitting areas within the head pond area to promote physical activity and located along the edges of wetlands and ponds to better view birds and other wildlife.

viii) The trail network could also feature adjoining parking areas, picnic areas, off leash dog parks or other recreational amenities including canoe and kayak access points.

ix) The final stream channel can be enhanced to provide erosion control and improved fish habitat conditions. Fish habitat can be enhanced with step pools, spawning gravels, vortex weirs and woody overhead cover. Stream fishing opportunities can also be provided.

The following sections outlines preliminary, recommended restoration options for the Head Street head pond area once the dam is removed.

9.1 Overview of Head Pond Restoration Options.

In discussion with the SCRCA, a limited range of relatively low-cost restoration options (capital and maintenance costs) have been considered as part of this report.

Figures 6, 7, 8 and **9** overleaf are provided as conceptual restoration options for the dam head pond area if the dam was removed. These options feature a variety of passive recreational use opportunities, have minimal maintenance costs and provide a variety of natural wildlife habitats. The rehabilitation options are not included in the cost estimates for dam removal or sediment management discussed in Section 8 of this report.

All of the rehabilitation options depict areas in which erosion control may be required. These areas include the shores of the dam, under the Head Street Bridge, and along the south shoreline as this is the estimated path of the river through the head pond. If the final river path is different then that depicted on the restoration drawings, the areas requiring erosion control should be altered accordingly. The GEO Morphix study (January, 2023) in **Appendix B** describes potential erosion control methods.

As noted in Section 8 of this report, it is likely unrealistic for a dam removal strategy to be implemented that proactively removes the accumulated sediment in the Head Street reservoir. Therefore, it is assumed that if the dam is removed the accumulated sediment will be left to be naturally transported downstream over time. As the river meanders through the empty reservoir in search of its final channel path, much of the sediment will be transported and this will alter the topography of the former reservoir area. As such it is recommended that any major head pond rehabilitation efforts take place only after the river has found it’s final path and the topography is relatively constant. This may take 5-10 years.

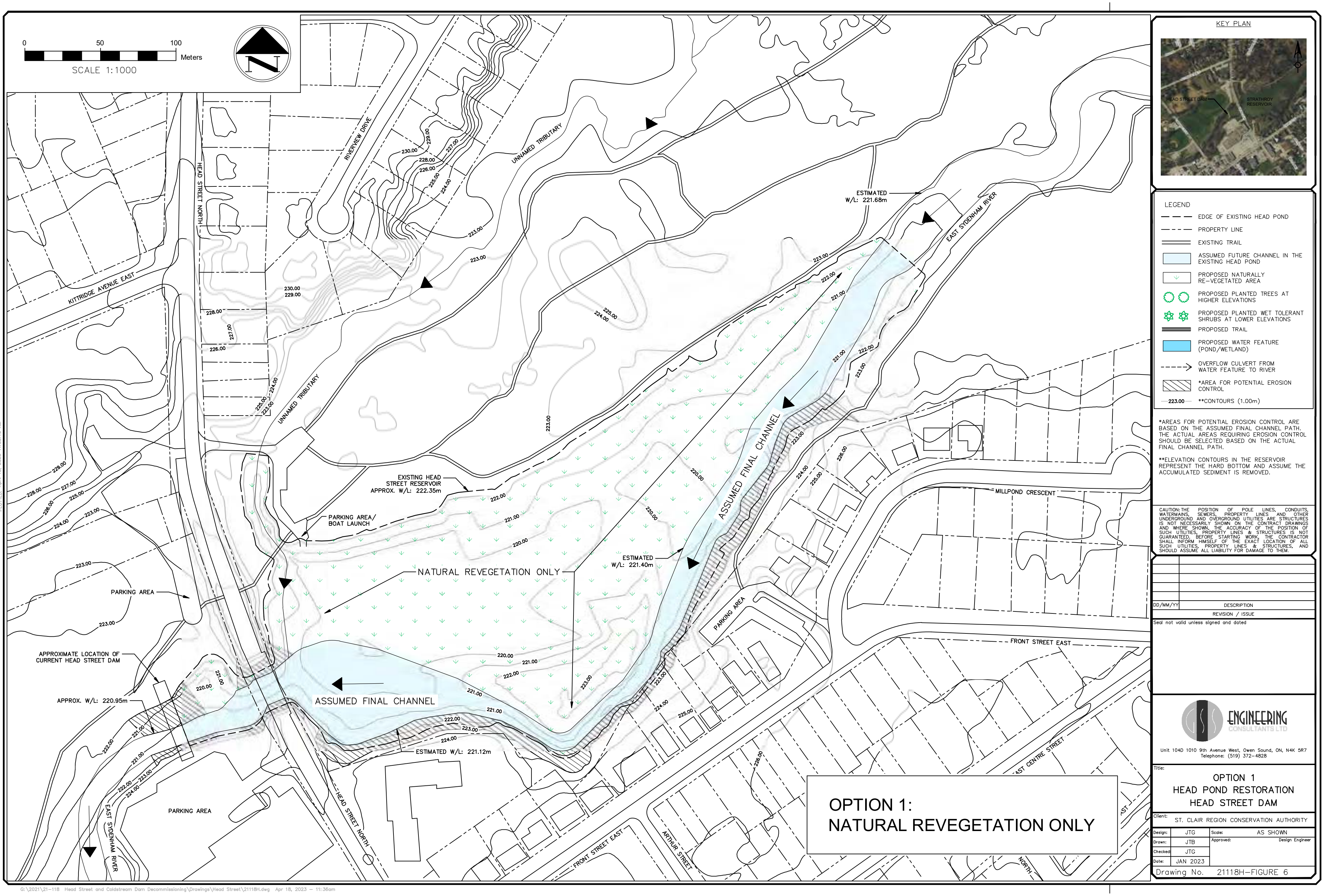
Until the river has created a final path, the large plain of drying sediment and meandering river may be dangerous for human use. Therefore, it is recommended that human use of the former head pond is discouraged until rehabilitation is completed.

9.1.1 Head Pond Restoration Option 1 – Natural Grassland and River Edge Wetlands.

This Option is the most basic and allows natural revegetation of the drained head pond area. The head pond sediment and underlying substrate likely contains an extensive, natural “seed bank” of natural grassland and wetland plants that would grow naturally once the head pond was removed. The wetlands would develop along the stream edges and other areas having wet or moist soil conditions.

In addition to the natural seed bank, this Option could include supplemental seeding with an initial “cover crop” to stabilize exposed soils as quickly possible. The cover crop could also be combined with additional seeding with native grassland plants and wetland plant species.

This option would take several years to fully develop but would likely feature extensive plant growth in the second summer after the dam and head pond were removed. Such a grassland/wetland plant environment would provide good quality habitat within several years for a wide variety of bird, mammal and amphibian species as well as a wide variety of insect and pollinator species.



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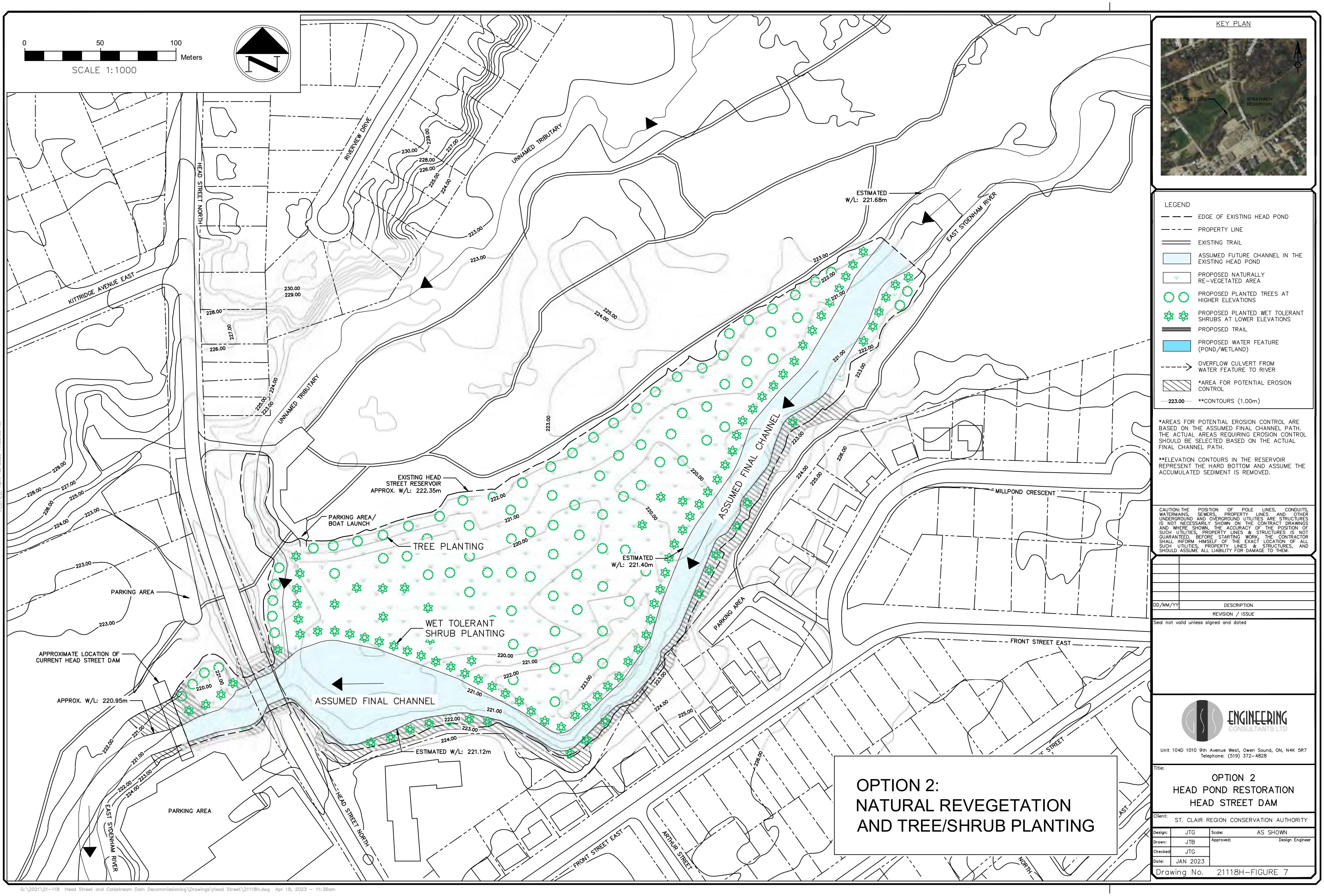
KEY PLAN
HEAD STREET DAM
STRATHROY RESERVOIR
LEGEND
EDGE OF EXISTING HEAD POND
PROPERTY LINE
EXISTING TRAIL
ASSUMED FUTURE CHANNEL IN THE EXISTING HEAD POND
PROPOSED NATURALLY RE-VEGETATED AREA
PROPOSED PLANTED TREES AT HIGHER ELEVATIONS
PROPOSED PLANTED WET TOLERANT SHRUBS AT LOWER ELEVATIONS
PROPOSED TRAIL
PROPOSED WATER FEATURE (POND/WETLAND)
OVERFLOW CULVERT FROM WATER FEATURE TO RIVER
*AREA FOR POTENTIAL EROSION CONTROL
223.00 **CONTOURS (1.00m)
*AREAS FOR POTENTIAL EROSION CONTROL ARE BASED ON THE ASSUMED FINAL CHANNEL PATH. THE ACTUAL AREAS REQUIRING EROSION CONTROL SHOULD BE SELECTED BASED ON THE ACTUAL FINAL CHANNEL PATH.
**ELEVATION CONTOURS IN THE RESERVOIR REPRESENT THE HARD BOTTOM AND ASSUME THE ACCUMULATED SEDIMENT IS REMOVED.
CAUTION: THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS, PROPERTY LINES AND OTHER UNDERGROUND AND OVERGROUND UTILITIES ARE STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES, PROPERTY LINES & STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES, PROPERTY LINES & STRUCTURES, AND SHOULD ASSUME ALL LIABILITY FOR DAMAGE TO THEM.
DD/MM/YY
DESCRIPTION
REVISION / ISSUE
Seal not valid unless signed and dated
ENGINEERING CONSULTANTS LTD
Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7
Telephone: (519) 372-4828
Title:
OPTION 1
HEAD POND RESTORATION
HEAD STREET DAM
Client:
ST. CLAIR REGION CONSERVATION AUTHORITY
Design: JTG
Scale: AS SHOWN
Drawn: JTB
Approved: Design Engineer
Checked: JTG
Date: JAN 2023
Drawing No. 21118H–FIGURE 6
OPTION 1:
NATURAL REVEGETATION ONLY
HEAD STREET NORTH
RIVERVIEW DRIVE
UNNAMED TRIBUTARY
KITTRIDGE AVENUE EAST
EAST SYDENHAM RIVER
ESTIMATED W/L: 221.68m
MILLPOND CRESCENT
FRONT STREET EAST
EXISTING HEAD STREET RESERVOIR APPROX. W/L: 222.35m
PARKING AREA/ BOAT LAUNCH
NATURAL REVEGETATION ONLY
ESTIMATED W/L: 221.40m
ASSUMED FINAL CHANNEL
PARKING AREA
APPROXIMATE LOCATION OF CURRENT HEAD STREET DAM
APPROX. W/L: 220.95m
ESTIMATED W/L: 221.12m
ARTHUR STREET
EAST CENTRE STREET
NORTH
G:\2021\21-118 Head Street and Coldstream Dam Decommissioning\Drawings\Head Street\21118H.dwg Apr 18, 2023 – 11:36am



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Meters
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KEY PLAN
HEAD STREET DAM
STRATHROY RESERVOIR
LEGEND
EDGE OF EXISTING HEAD POND
PROPERTY LINE
EXISTING TRAIL
ASSUMED FUTURE CHANNEL IN THE EXISTING HEAD POND
PROPOSED NATURALLY RE-VEGETATED AREA
PROPOSED PLANTED TREES AT HIGHER ELEVATIONS
PROPOSED PLANTED WET TOLERANT SHRUBS AT LOWER ELEVATIONS
PROPOSED TRAIL
PROPOSED WATER FEATURE (POND/WETLAND)
OVERFLOW CULVERT FROM WATER FEATURE TO RIVER
*AREA FOR POTENTIAL EROSION CONTROL
223.00 **CONTOURS (1.00m)
*AREAS FOR POTENTIAL EROSION CONTROL ARE BASED ON THE ASSUMED FINAL CHANNEL PATH. THE ACTUAL AREAS REQUIRING EROSION CONTROL SHOULD BE SELECTED BASED ON THE ACTUAL FINAL CHANNEL PATH.
**ELEVATION CONTOURS IN THE RESERVOIR REPRESENT THE HARD BOTTOM AND ASSUME THE ACCUMULATED SEDIMENT IS REMOVED.
CAUTION: THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS, PROPERTY LINES AND OTHER UNDERGROUND AND OVERGROUND UTILITIES ARE STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES, PROPERTY LINES & STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES, PROPERTY LINES & STRUCTURES, AND SHOULD ASSUME ALL LIABILITY FOR DAMAGE TO THEM.
DD/MM/YY DESCRIPTION
REVISION / ISSUE
Seal not valid unless signed and dated
ENGINEERING CONSULTANTS LTD
Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7
Telephone: (519) 372-4828
Title:
OPTION 2
HEAD POND RESTORATION
HEAD STREET DAM
Client:
ST. CLAIR REGION CONSERVATION AUTHORITY
Design: JTG
Drawn: JTB
Checked: JTG
Date: JAN 2023
Scale: AS SHOWN
Approved: Design Engineer
Drawing No. 21118H-FIGURE 7
OPTION 2:
NATURAL REVEGETATION
AND TREE/SHRUB PLANTING
RIVERVIEW DRIVE
UNNAMED TRIBUTARY
HEAD STREET NORTH
KITTRIDGE AVENUE EAST
EAST SYDENHAM RIVER
MILLPOND CRESCENT
FRONT STREET EAST
ARTHUR STREET
ESTIMATED W/L: 221.68m
EXISTING HEAD STREET RESERVOIR APPROX. W/L: 222.35m
PARKING AREA/ BOAT LAUNCH
TREE PLANTING
WET TOLERANT SHRUB PLANTING
ESTIMATED W/L: 221.40m
ASSUMED FINAL CHANNEL
PARKING AREA
APPROXIMATE LOCATION OF CURRENT HEAD STREET DAM
APPROX. W/L: 220.95m
ESTIMATED W/L: 221.12m
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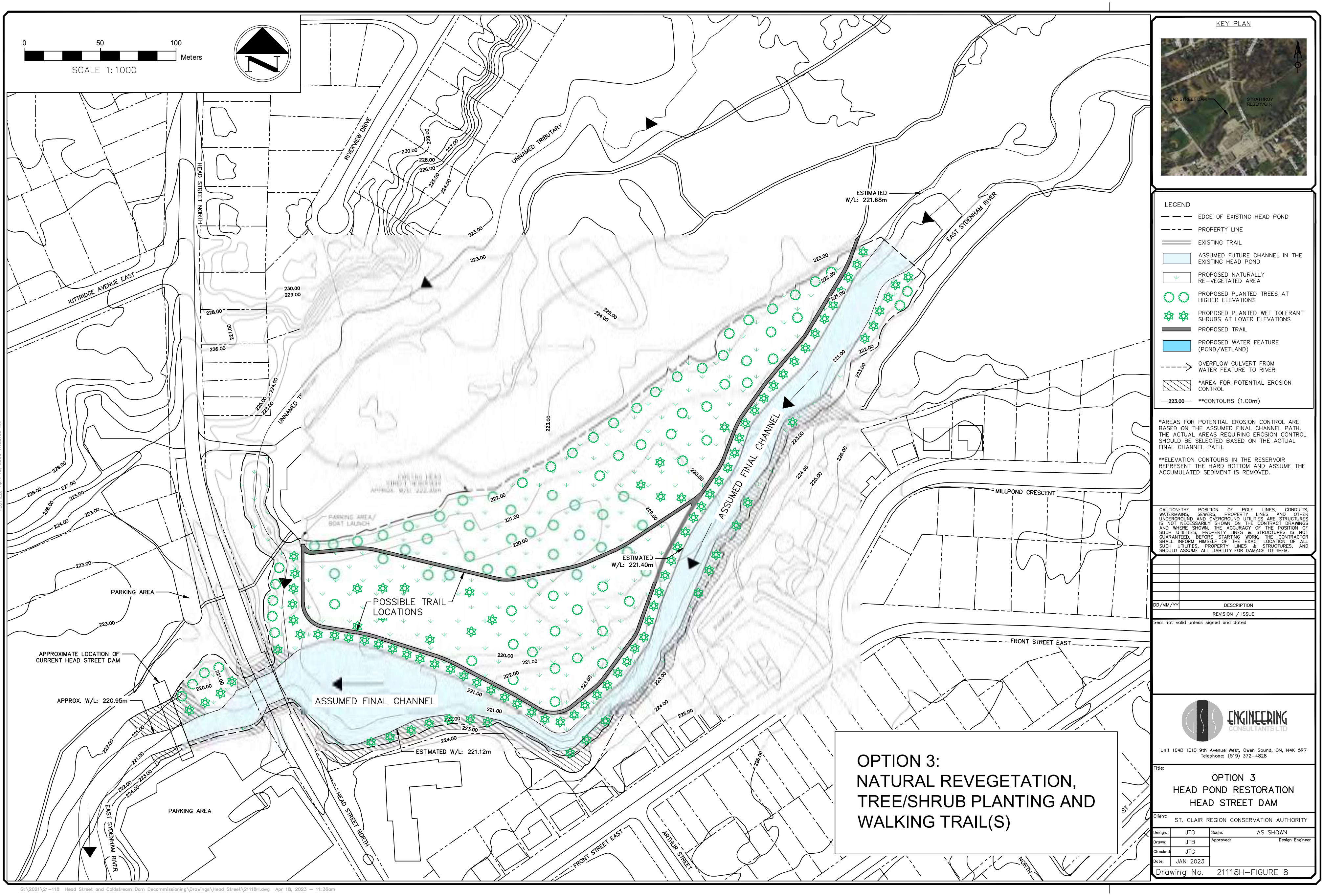

0
50
100
Meters
SCALE 1:1000
N
KEY PLAN
HEAD STREET DAM
STRATHROY RESERVOIR
LEGEND
EDGE OF EXISTING HEAD POND
PROPERTY LINE
EXISTING TRAIL
ASSUMED FUTURE CHANNEL IN THE EXISTING HEAD POND
PROPOSED NATURALLY RE-VEGETATED AREA
PROPOSED PLANTED TREES AT HIGHER ELEVATIONS
PROPOSED PLANTED WET TOLERANT SHRUBS AT LOWER ELEVATIONS
PROPOSED TRAIL
PROPOSED WATER FEATURE (POND/WETLAND)
OVERFLOW CULVERT FROM WATER FEATURE TO RIVER
*AREA FOR POTENTIAL EROSION CONTROL
223.00 **CONTOURS (1.00m)
*AREAS FOR POTENTIAL EROSION CONTROL ARE BASED ON THE ASSUMED FINAL CHANNEL PATH. THE ACTUAL AREAS REQUIRING EROSION CONTROL SHOULD BE SELECTED BASED ON THE ACTUAL FINAL CHANNEL PATH.
**ELEVATION CONTOURS IN THE RESERVOIR REPRESENT THE HARD BOTTOM AND ASSUME THE ACCUMULATED SEDIMENT IS REMOVED.
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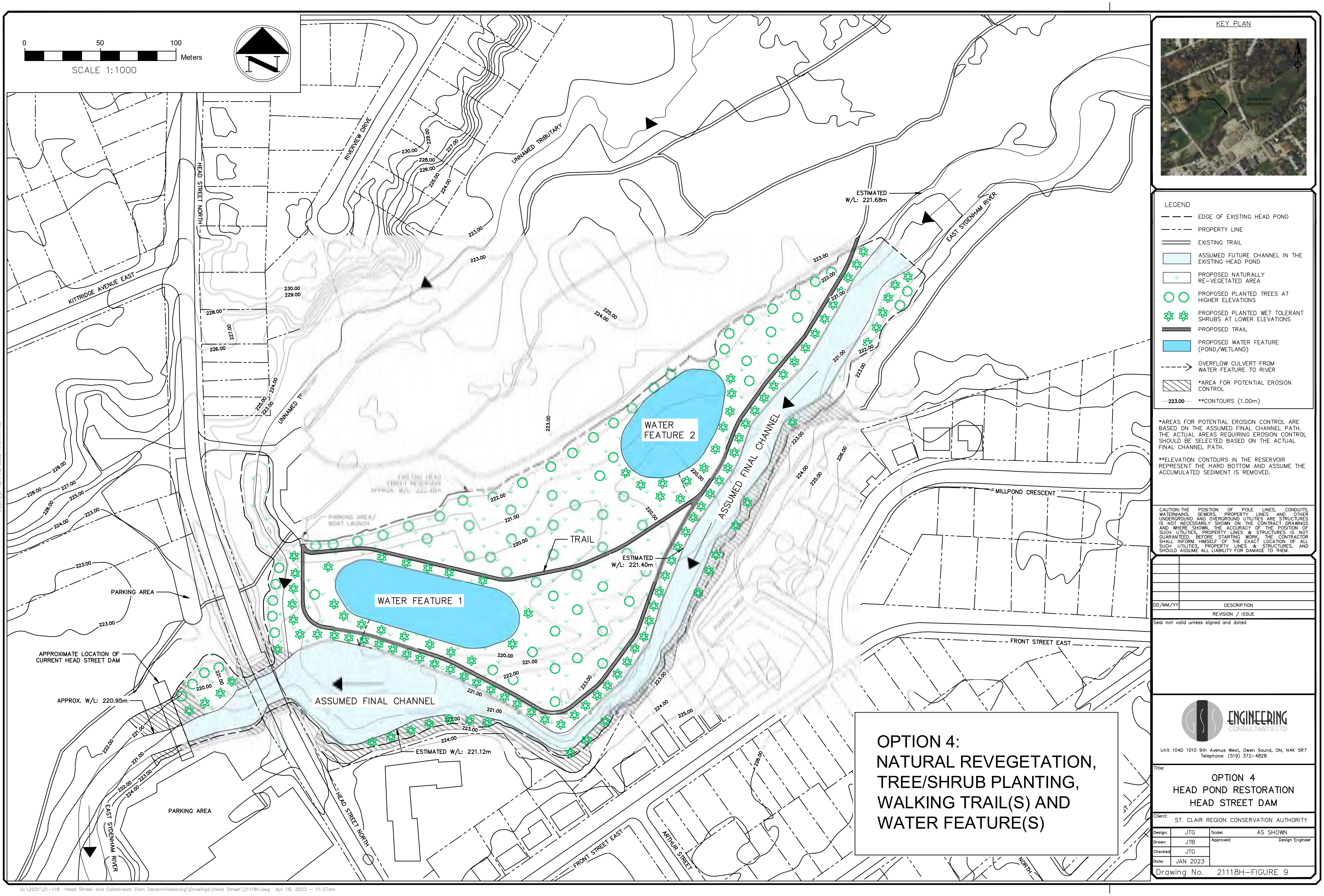
DD/MM/YY
DESCRIPTION
REVISION / ISSUE
Seal not valid unless signed and dated
ENGINEERING
Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7
Telephone: (519) 372-4828
Title:
OPTION 3
HEAD POND RESTORATION
HEAD STREET DAM
Client:
ST. CLAIR REGION CONSERVATION AUTHORITY
Design: JTG
Drawn: JTB
Checked: JTG
Date: JAN 2023
Scale: AS SHOWN
Approved:
Design Engineer
Drawing No. 21118H-FIGURE 8
OPTION 3:
NATURAL REVEGETATION,
TREE/SHRUB PLANTING AND
WALKING TRAIL(S)
KITTRIDGE AVENUE EAST
HEAD STREET NORTH
RIVERVIEW DRIVE
UNNAMED TRIBUTARY
EAST SYDENHAM RIVER
ESTIMATED W/L: 221.68m
ESTIMATED W/L: 221.40m
ESTIMATED W/L: 221.12m
APPROX. W/L: 220.95m
ASSUMED FINAL CHANNEL
POSSIBLE TRAIL LOCATIONS
PARKING AREA
APPROXIMATE LOCATION OF CURRENT HEAD STREET DAM
MILLPOND CRESCENT
FRONT STREET EAST
ARTHUR STREET



SCALE 1:1000
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KEY PLAN
HEAD STREET DAM
STRATHROY RESERVOIR
LEGEND
EDGE OF EXISTING HEAD POND
PROPERTY LINE
EXISTING TRAIL
ASSUMED FUTURE CHANNEL IN THE EXISTING HEAD POND
PROPOSED NATURALLY RE-VEGETATED AREA
PROPOSED PLANTED TREES AT HIGHER ELEVATIONS
PROPOSED PLANTED WET TOLERANT SHRUBS AT LOWER ELEVATIONS
PROPOSED TRAIL
PROPOSED WATER FEATURE (POND/WETLAND)
OVERFLOW CULVERT FROM WATER FEATURE TO RIVER
*AREA FOR POTENTIAL EROSION CONTROL
**CONTOURS (1.00m)
*AREAS FOR POTENTIAL EROSION CONTROL ARE BASED ON THE ASSUMED FINAL CHANNEL PATH. THE ACTUAL AREAS REQUIRING EROSION CONTROL SHOULD BE SELECTED BASED ON THE ACTUAL FINAL CHANNEL PATH.
**ELEVATION CONTOURS IN THE RESERVOIR REPRESENT THE HARD BOTTOM AND ASSUME THE ACCUMULATED SEDIMENT IS REMOVED.
CAUTION: THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS, PROPERTY LINES AND OTHER UNDERGROUND AND OVERGROUND UTILITIES ARE STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES, PROPERTY LINES & STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES, PROPERTY LINES & STRUCTURES, AND SHOULD ASSUME ALL LIABILITY FOR DAMAGE TO THEM.
DD/MM/YY
DESCRIPTION
REVISION / ISSUE
Seal not valid unless signed and dated
ENGINEERING CONSULTANTS LTD
Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7 Telephone: (519) 372-4828
Title:
OPTION 4
HEAD POND RESTORATION
HEAD STREET DAM
Client: ST. CLAIR REGION CONSERVATION AUTHORITY
Design: JTG
Drawn: JTB
Checked: JTG
Date: JAN 2023
Scale: AS SHOWN
Approved: Design Engineer
Drawing No. 21118H-FIGURE 9
OPTION 4:
NATURAL REVEGETATION, TREE/SHRUB PLANTING, WALKING TRAIL(S) AND WATER FEATURE(S)
WATER FEATURE 1
WATER FEATURE 2
TRAIL
ASSUMED FINAL CHANNEL
ESTIMATED W/L: 221.68m
ESTIMATED W/L: 221.40m
ESTIMATED W/L: 221.12m
APPROX. W/L: 220.95m
APPROXIMATE LOCATION OF CURRENT HEAD STREET DAM
PARKING AREA
HEAD STREET NORTH
KITTRIDGE AVENUE EAST
RIVERVIEW DRIVE
UNNAMED TRIBUTARY
EAST SYDENHAM RIVER
MILLPOND CRESCENT
FRONT STREET EAST
ARTHUR STREET
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This Option does not include any trails or other features to specifically provide outdoor recreational opportunities, but the overall area would remain available for passive public use.

9.1.2 Head Pond Restoration Option 2 – Trees, Shrubs, Natural Grasslands and River Edge Wetlands.

Option 2 is the same as Option 1 but includes planting of native trees and shrubs in addition to establishing an extensive area of native plant and wetland plant growth. A more diverse range of wildlife habitats would be created over time that could expand the diversity of bird, animal and insect species.

9.1.3 Head Pond Restoration Option 3 – Modest Pedestrian Trail System Included with Trees, Shrubs, Natural Grasslands and River Edge Wetlands.

Option 3 includes all features included in Options 1 and 2 but introduces a walking trail component.

The walking trail component would be modest in scope and be designed to encourage passive, non-motorized use of the area with recreational use confined primarily to the walking trail corridors. To minimize maintenance requirements, addition amenities such as picnic shelters, additional parking areas, washrooms etc. are not proposed with Option 3.

Most of the area would continue to provide diverse, good quality wildlife habitats.

9.1.4 Head Pond Restoration Option 4 – Pond and Wetland Features as Well as Modest Pedestrian Trail System with Trees, Shrubs, Natural Grasslands and River Edge Wetlands.

This Option would include all the features of Options 1, 2 and 3 but would introduce several wetland or pond features separate from the actual stream channel. It would be anticipated that these water features would be shallow, excavated areas where the water levels are similar or the same as the water level in the adjacent stream channel.

Portions of the wetland or pond features would be located close to the trail edges to provide more wildlife viewing opportunities. The wetland and pond features would provide additional habitat features for a wide variety of shorebird and waterfowl species as well as other bird, mammal, amphibian and reptile species including turtles.

10 NATURAL (ECOLOGICAL) IMPACTS AND BENEFITS OF DAM REMOVAL

Overall, the Sydenham River supports a wide diversity of fish and mussel species. At least 82 species of fish and 24 species of mussels have been identified. Many of these fish and mussel species are rare elsewhere. Six species of fish and eleven species of mussels occurring in the watershed have been classified as being endangered, threatened or of special concern.

Numerous publications have described the rich diversity of fish and mussel species in the watershed including the many species considered at risk.

10.1 Impacts of Existing Head Street Dam on SAR Species

One of these publications is *Action Plan for the Sydenham River in Canada: An Ecosystem Approach* as published by the Fisheries and Oceans Canada in 2018.

This report describes the North and East Sydenham River drainage basins in some detail including gradient, geology and land use. The report notes that much of the original forest and wetland habitat areas within the watershed have been lost. This report describes the East Sydenham River, which includes the Head Street dam in Strathroy, as follows:

"*The East Sydenham River has a relatively diverse substrate and associated habitat with well defined riffles and pools, which create exceptional habitat for native freshwater mussels (including seven species listed under SARA as Endangered*)."

The report also describes, in general, threats to aquatic species at risk. These risks include negative land use practises, thermal impacts due to loss of stream side riparian zones and the thermal impacts of dams, suspended solids from drainage and overland runoff, nutrient enrichment from point and non point sources, toxic contaminants associated with herbicides and pesticides and impacts of exotic aquatic species.

Dams are described in the report as impacting aquatic habitat by causing thermal warming and impacting normal sediment transport processes. While not noted specifically, dams are also barriers to fish migration. All three of these impacts would be associated with the Head Street dam as per the following:

- The dam acts as an upstream migration barrier to almost all fish species.
- The temperature of the river increases due to the dam head pond in the summer (personal communication with SCRCA staff).
- The dam stores a large volume of silt and sand sediments and impacts the natural transport of sediment in the river.

The report notes "Loadings of suspended solids as causing turbidity and siltation is presumed to be the primary limiting factor for most aquatic species at risk in the Sydenham River watershed." Therefore, removal of the dam could be cause for increased sediment loadings on the river downstream of the Head Street dam.

10.2 Potential Benefits of Dam Removal on SAR Species

The DFO report also notes dams as being a general cause of two different Specific Threats being sedimentation upstream and erosion downstream. Both of these Specific Threats are considered High in terms of Level of Concern.

Removal of the Head Street dam should benefit aquatic habitat downstream of the dam by restoring normal sediment transport and supply of sediment to fish and mussel species downstream of the dam location. As well, removal of the dam should reduce the thermal impact of the dam head pond and provide resilience to increased stream warming over time associated with climate change. As well, removal of the dam would eliminate at minimum a partial barrier to fish migration.

10.3 Potential Negative Ecological Impacts of Dam Removal

As per previous sections, removal of the dam may cause significant discharge of sediment stored in the dam head pond in relatively short span of time depending on the option selected to remove the dam. Such sediment loading on the river downstream of the dam could be cause of negative impacts on fish and mussel habitat if the increased sediment loadings were excessive. The release of sediment can negatively affect mussel species by limiting essential life cycle processes such as reproduction, respiration and feeding.

Removal of the dam may also allow exotic fish species (including round goby) to gain access to the river upstream of the dam.

10.4 Impacts/Benefits of Dam Removal on Reptile, Amphibian and Bird Species Composition

Previous sections of the report describe habitat types that would be created in the dam head pond area if the dam was removed. While the diversity of habitat types varies with the head pond restoration option selected, the existing head pond area would convert, for all options, to a natural grassland habitat with wetland fringes along the edge of the river.

If trees and shrubs were also planted in the restored area, along with the creation of new ponds and/or wetlands, overall habitat diversity would increase and would support a wide range of plant and animal species including good habitat for birds, insects, mammals etc. as well as reptiles and amphibians.

11 SUMMARY AND DISCUSSION

This report examines options, impacts and costs to potentially remove the Head Street dam in Strathroy. This report is summarized as follows:

11.1 Estimated Costs for Dam Removal and Head Pond Rehabilitation Options

The capital costs of dam removal vary significantly and depend largely on whether the sediment is removed from the dam head pond or if the sediment is allowed to naturally wash downstream.

Overall, removal of the sediment from the head pond appears to be very costly, difficult from a technical perspective, will likely have significant social impacts and is also risky in terms of whether sediment removal can be done successfully. The GEO Morphix report included in **Appendix B** concludes generally that sediment removal from the head pond is likely impractical.

Capital cost estimates range from $5,500,000 M to $9,500,000 M for Options 1 and 2 where sediment is removed from the head pond prior to dam removal. These cost estimates are very preliminary, however, and could increase significantly based on further detailed investigation. Costs could also be significantly impacted by new provincial regulations governing excess soil and fill management, especially if the sediment was disposed off of site.

Conversely, the cost of dam removal, if the sediment was allowed to wash downstream (over one or multiple years), would be significantly less and estimated to range from $800,000 to $1,100,000.

11.2 Summary of Ecological Impacts/Benefits of Dam Removal

Overall, removal of the dam should have a net benefit to river ecology. Dam removal should improve aquatic habitat for aquatic species at risk by restoring natural sediment transport and supply downstream of the dam, by reducing the thermal impact to the river caused by the dam head pond and by restoring full fish passage.

The dam removal options that include allowing the sediment to naturally wash down the river, if considered, should be carefully discussed in advance with regulatory authorities including the Department of Fisheries and Oceans, and the provincial MNRF and MECP.

It is likely critical that all of these agencies, and perhaps others, come to agreement early in the planning process as to the preferred means to deal with the large volume of sediment stored in the dam head pond.

11.3 Summary of Flooding, Channel Erosion and Sedimentation Impacts from Dam Removal

HEC RAS modelling of the East Sydenham River shows no measurable impact on river flooding conditions upstream and downstream of the Head Street dam when existing dam conditions are compared to post dam removal conditions.

However, it is recommended that further sediment transport assessment be completed if a preliminary decision was made to remove the dam and the preferred option was to allow the stored sediment in the head pond to wash naturally down the river.

11.4 Summary of Potential Impacts to Head Street Bridge from Dam Removal

The HEC RAS modelling of the river under the Head Street bridge indicates water velocities under the bridge, if the dam was removed, will be relatively slow under a wide range of moderate to high flood flow events.

As such, there appears to be minimal risk to the bridge if the dam is removed. Supplementary large rip rap along the river bottom adjacent to the bridge piers is recommended, however, as a precautionary measure to protect the bridge piers.

Prepared by;

Jeff Graham, P. Eng., President,
GSS Engineering Consultants Ltd.

Jacob Barley, EIT
GSS Engineering Consultants Ltd.

APPENDIX A

June, 2022 Dam Inspection Report
by True Engineering

DRAFT

Inspection Report of Water Control Structures

Submitted to St. Clair Region Conservation Authority

June 17, 2022
Project No. 2461-021

ENGINEERING ■ PLANNING ■ URBAN DESIGN ■ LAND SURVEYING

PO Box 21 | Ilderton ON | N0M 2A0 | www.true.ca | tel 519 518 7157

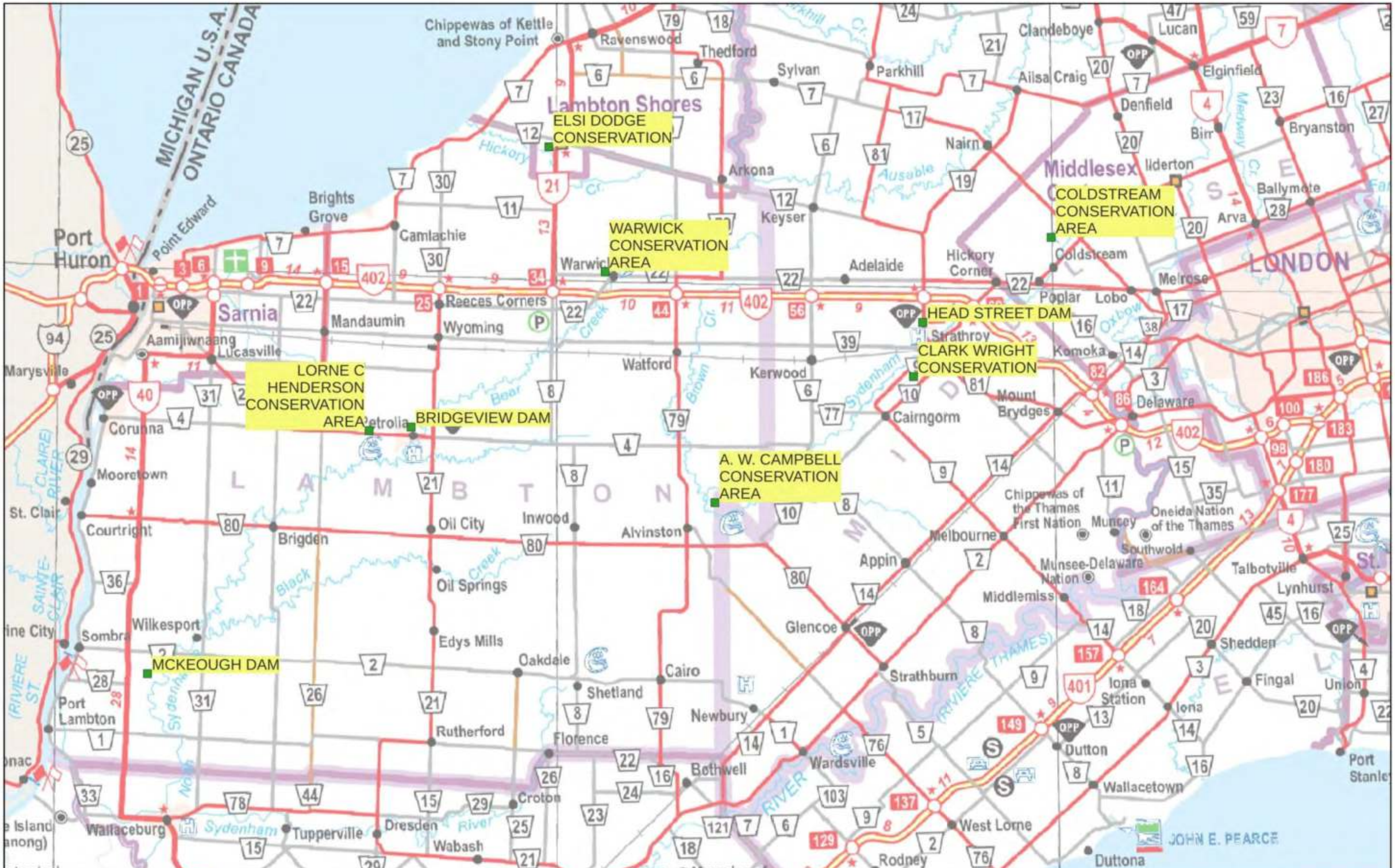
1.0 Introduction

St. Clair Region Conservation Authority (SCRCA) owns and operates water control structures at nine sites within its administrative area. The nine sites are listed below (also shown in Figure 1). Majority of the water control structures were constructed between 1960's and 1980's for the purposes of providing impoundments for recreational use. The McKeough Dam and Floodway is the only major water control structure that was constructed specifically for the purposes of flood control. The listing of water control structures that are subject to inspections in this work are:

1. Coldstream Conservation Area, Coldstream, ON
   a) Coldstream Dam
2. Head Street, Strathroy, ON
   a) Head Street Dam
3. Clark Wright Conservation Area, Strathroy, ON
   a) Clark Wright Dam
4. W. Darcy McKeogh Dam and Floodway, Sombra, ON
   a) Darcy McKeough Dam (embankment and control structure)
   b) Floodway channel (6 km)
   c) Drop structure (adjacent to St. Clair River)
5. A.W. Campbell Conservation Area, Alvinston, ON
   a) Morrough Lake Dam
   b) Campbell House Dam
6. Bridgeview Park (Petrolia)
   a) Bridgeview Dam
7. Lorne C. Henderson Conservation Area, Petrolia, ON
   a) Weir 1
   b) Weir 2
   c) Weir 3
   d) Pond Dam
8. Warwick Conservation Area, Warwick, ON
   a) Warwick Dam
9. Esli Dodge Conservation Area, Forest, ON
   a) Esli Dodge Dam

This report presents the summary findings of routine inspections carried out by TRUE Consulting staff at the above water control structures. Inspections in this work are limited to general site recognizance of civil works looking at overland drainage, erosion, shoreline protection, grading, general conditions of water control structures, embankments, seepage, etc. Structural inspections were not included in the present scope of work.

Inspections were carried out by a qualified hydrotechnical engineer with a license to practice engineering in the Province of Ontario.



LOCATION PLAN

INSPECTIONS OF SCRCA WATER CONTROL STRUCTURES

TRUE

PROJECT NO. 2461-021

DATE: MAR 2022

DRAWN BY: PP

SCALE: 1:450,000

FIG. NO:	REV.:
1	0

1.1 Note on Site Visits/Inspections

Due to project reporting timelines some of the initial site visits and inspections were completed during late winter of 2022. Weather constraints (snow and ice cover, frozen lakes/rivers, ice at the shoreline) prevented a complete inspection at all features at the sites. In some instances snow and ice cover occupied an area that required inspecting, and thus prevented completion of all aspects of the inspections. Winter site visits were carried out in late February 2022 at Coldstream Dam, Head Street Dam, and Clark Wright Dam, from which only partial inspections could be completed. Snow and ice covered portions of the structures which hindered the inspection work. For example, snow and ice covered much of the shoreline and spillways in some locations, thus preventing the inspector from observing actual site conditions (such as erosion of shoreline, slope stability and characteristics of the embankments, etc).

Collection of aerial photographs by a drone-copter pilot at the McKeough Dam and Floodway were carried out in December of 2021.

Follow up site visits were completed at the end of May of 2022 to complete the remaining detailed visual inspections for the sites question. Observations made from follow up inspections have been appended to the original photographic log and are presented as Appendices to this document.

1.2 Scope of Work

A site visit by our staff are to be carried out on each of the nine sites included in this project. The intent of the inspections is to complete a condition survey of existing structures at each site and obtain an accurate visual record of conditions as it existed at the time of the inspections. The inspections are to include a check of gate valve/stop log operations for sites that have them (if available/possible), along with the conditions observed at upstream and downstream embankments and shoreline, spillways, river bed, control structures, etc. The inspections focus on identifying major deficiencies at the site of each water control structure.

Each component of each structure is to be photographed, tagged with a brief description, and assembled into a detailed photo log. The photo log is intended to be used as a template for future inspections, and could be used for the evaluation (or progression) of the rate of deterioration at each structure. The summary of inspections thus document all major material defects, and performance that will ultimately require future maintenance and/or repairs.

In accordance with provincial regulations, dam owners are responsible for the safe operation and maintenance of their dams. Part of the safe operation of the dams includes the responsibility to implement appropriate public safety measures to address potential exposure to hazards created at each site. Many of the sites in this project are located at Conservation Areas where public has access to the grounds.

A limited scope public safety assessment is to be completed. A prioritized list of recommendations in implementing public safety measures (such as installation of fences, signage, etc) is to be developed.

Structural inspections are not included in the scope of work for this project.

A preliminary review of the existing operating rules of the McKeough Dam has been included in this work. This review includes identification of elevation thresholds upon which overbank flooding starts at Wallaceburg, with the production of inundation extents from several water levels. Pluvial flooding (which occurs as ponding from heavy rainfall and/or snowfall) is not included, as all focus is to be on riverine flooding that could be controlled by the McKeough Dam. A review of available time series data (water levels, flows, and wind speed/directions) has also been included to identify if the said data could be used to support future updates to the existing operating rules.

1.3 Nomenclature

This report adopts the naming convention that assumes the observer stands in the middle of the river and looks downstream. For example, references are made to left and right embankments, wingwalls, banks, shoreline, or other structures or dam components, which relate to what a person sees by standing in the middle of the river and looking downstream. Such a convention adopts flow direction as a basis upon which structures/components are referenced in the report.

1.4 Repair Priority Levels

Identification of deficiencies and recommendations for future repairs/studies in this report are provided according to the following list of priorities:

- Priority S (safety related, requires immediate attention),
- Priority 1 (will require action within 1 to 2 years),
- Priority 2 (will require action within 2 to 5 years),
- Priority 3 (will require action within 5 to 10 years),

Recommendations for corrective action at each site/structure shall be provided according to the above priority level. Priority S (safety related) is one that requires immediate attention, as there is immediate risk to staff and/or public. Other priority levels are assigned to components according to their level of deterioration and/or overall function.

1.5 Background Review

Previous inspections of SCRCA water control structures include the following:

- 1995 general inspections of all SCRCA water control structures by Paragon Engineering Limited,
- 1997 inspections of the McKeough Floodway by Stanley Consulting Group (general and structural inspections of the Floodway only),
- 2005 general inspections of all SCRCA water control structures by Stantec, and
- 2011 general of all SCRCA water control structures by Stantec, and structural inspected by VDP Engineering Ltd.

SCRCA has provided to TRUE Consulting the 2011 Inspection Report of its water control structures (Stantec, 2011) for use in this project. The 2011 Inspection Report documents general conditions at the nine sites listed above, along with results of a limited scope structural inspection. A description was provided for each site, following with observations of conditions that existed at the time of the inspections. A set of recommendations for maintenance and repairs is provided for each dam site.

The photographic log portion of the 2011 Inspection Report was not provided to TRUE Consulting. Therefore, comparison between 2011 and 2022 conditions could only be made on the basis of photographs included in the main body of the 2011 Inspection Report.

Majority of the issues noted in the 2011 Inspection Report are related to vegetation management (trees and brush growing through the structures, and/or debris accumulation at the spillways). Conditions of vertical inlet drop structures (also refereed to as morning glory spillways) were noted in the 2011 inspections, as were areas where bank or slope erosion were identified. Significant damage to the Weir 2 structure at the Lorne C. Henderson Conservation Area was noted, with seepage and erosion at the upstream and downstream embankments were identified. Shallow surface slumping was identified on several section of the side slopes of the McKeough Floodway, and recommended to be monitored.

Major maintenance works implemented since the 2011 inspection have been included at the site of the McKeough Floodway only. The maintenance implemented included culvert replacement of drains that outlet into the floodway channel, repairs along the side slopes of the Floodway, and some overland drainage works.

Maintenance works at other sites were limited to brush and vegetation removal, and clearing debris at spillways and intake structures.

Existing drawings of the water control structures subject to inspections were not available for review. All comments offered in this report are based on visual evidence present during the inspection, and professional judgment of the report's author.

2.0 Description of Water Control Structures

This section provides a brief description of the water control structures that are subject of the inspections.

2.1 Coldstream Conservation Area

Coldstream Dam is located on the upper reaches of the Sydenham River within the hamlet of Coldstream and in the Municipality of Middlesex Centre. The dam consists of a 40 m +/- long steel sheet pile wall installed across the main channel, with riprap placed adjacent to the sheet piling on its downstream side. The entire sheet pile and riprap structure forms the main spillway at the Coldstream Dam. The dam structure is responsible for creating a headpond that is approximately 400 m long and 100 m wide.

The sheet piling at the dam site is keyed into the right bank. For this reason, the Coldstream Dam does not have a traditional right embankment.

The steel sheet piling is likewise keyed into the existing left bank, into an area with significant amount of fill that originally placed adjacent to the left bank. This area is referred as the left embankment. The crest of the left embankment is in the order of 20 m +/- wide.

Existing erosion protection is evident on the right downstream bank only.

There is a low flow valve control structure on the left upstream embankment, but is not operational.

Approximately 75 m downstream of Coldstream Dam is an existing pedestrian footbridge, which is used by the area residents to access the recreational trail system within the Coldstream Conservation Area.

Conditions observed at the Coldstream Dam are presented in the next section of the report, and are accompanied by a detailed photographic log in Appendix A.

2.2 Head Street Dam (Strathroy)

Head Street Dam is located on the Sydenham River in Strathroy, Ontario, about 60 m downstream of the Head Street bridge. The dam consists of approximately a 45 m long sheet piling installed across the main channel of the river, with riprap placed on a wedge adjacent to the sheet piling on its downstream side. The sheet piling is keyed into the banks on both sides. As a result of the keying in of the piling, there are no embankments at the dam site. Downstream shoreline on both left and right banks are protected with existing riprap erosion protection.

The dam includes an existing reinforced concrete control structure, with a concrete bridge accessible from the left bank. The control structure has one bay of removable stop logs that can control the water levels in the upstream headpond. Downstream of the control structure are reinforced concrete wingwalls with a small concrete channel that extends through the riprap spillway.

An existing stormwater outfall is located some 30 m downstream of the sheet piling on the right bank. Land on the right bank is the Strathroy Rotary Memorial Trail and Park, with the path traversing close to the dam itself. The left bank at the dam site is an existing parking lot of the Kenwick Mall complex, and is entirely fenced off.

The headpond at the Head Street Dam is approximately 800 m long, and 140 m wide (at its widest point). There is a park with a recreational trail along the entire length of the headpond on the right bank upstream of Head Street. The left bank of the headpond is an existing residential area, although there is an existing path that runs along the water's edge.

Conditions observed at the Head Street Dam are presented in the next section, and are accompanied by a detailed photographic log in Appendix B.

2.3 Clark Wright Conservation Area

Clark Wright Dam is located on a small tributary of the Sydenham River, and is located southwest of Strathroy. The Conservation Area is located on Walker's Drive, between Sutherland Road and Glen Oak Road. The dam is a very small water control structure (in the order of 1.2 m wide and 1 m high). The structure consists of two reinforced concrete wingwalls (on left and right banks), with seepage cuttoff walls running perpendicular to (and built into) each wingwall. The wingwalls have metal gains that allow for installation of flashboards that allow the water level in the headpond to rise. Based on the information provided by SCRCA, flashboards are not typically used or installed at the Clark Wright Dam site.

There is no erosion protection at the dam site.

The dam creates a very small impoundment that measures about 100 m long and about 35 m wide (at its widest point). There is an existing recreational trail at the Conservation Area around the property, with a small wooden beam bridge crossing the creek downstream of the dam.

2.4 McKeough Dam and Floodway

The W. Darcy McKeough Dam and Floodway (constructed between 1978-1983) is the largest flood control structure owned by the SCRCA. The dam is located on the North Sydenham River, about 7 km east of the hamlet of Sombra. The dam's main function is to hold back water from the North Sydenham River and reduce flows prior to reaching the downstream community of Wallaceburg. Note that the McKeough Dam can only hold back water for streams draining north of Wallaceburg. The dam can not address flooding from Sydenham River proper (arriving from the east) or from backwater from Lake St. Clair.

The purpose of the McKeough Dam is to divert flood waters from the North Sydenham River westward to the St. Clair River and thus bypassing the town of Wallaceburg in the process. The dam consists of a 600 m +/- long earth fill embankment and a concrete control structure that houses two vertical lift gates. The height of the dam is approximately 7 m. The gates at the control structure (5.5 m high and 7.3 m wide) are shoreline in the vicinity of the right bridge abutment has significantly eroded. The shoreline downstream of the right abutment is presently showing signs of recent erosion and undermining via exposed tree roots. The erosion at this location has extended around the entire right footing, to the point that the entire footing is simply resting vertically on top of the eroded bank. There is no passive support to the footing from the surrounding soil, as all of it has eroded. Future erosion will continue, causing the shoreline around the abutment to further erode, and thus leading to a possible collapse of the pedestrian bridge. Erosion at this site is flagged as a public safety concern, and thus requires immediate corrective action.

3.1.2 Recommendations

Recommendations for follow-up action at the Coldstream Dam are as follows:

Priority S (safety related, require immediate attention)

- Install shoreline erosion protection works around the right abutment of the pedestrian bridge downstream of the dam.

Priority 1 (1 to 2 years)

- Install safety signs in the Conservation Area (on both sides of the river) indicating dangers associated to public access in close proximity of a dam.
- Remove brush and tree vegetation from: i) the left embankment (upstream and downstream), ii) the right downstream shoreline, and iii) the riprap spillway.
- Remove debris that accumulates on the upstream side of the reservoir along the sheet piling.

Priority 2 (2 to 5 years)

- Install hand railing at all location of vertical fall hazards that meet MNR (2011) standards (at the old mill house abutment, and at the valve control structure).
- Restore riprap slope protection along the left downstream bank, and re-grade bank as appropriate.
- Replace washed out rock from the downstream riprap spillway to match the crest of the sheet piling. Re-grade transition riprap spillway to match existing conditions.
- Conduct a topographic survey (or otherwise) probe the channel downstream of the riprap spillway for indications of possible channel bed scour.

Priority 3 (5 to 10 years)

- Restore functionality of the valve control structure to allow de-watering of the headpond during low flow conditions for maintenance operations.
- Complete routine inspections of the water control structure, establish a detailed photographic log, and compare deterioration against 2022 inspections.

3.2 Head Street Dam (Strathroy)

3.2.1 Observations

Refer to Appendix B – Head Street Dam for a detailed photographic log and inspector's notes.

There are no signage at the Rotary Memorial Trail and Park warning users of the hazards associated with close proximity to the dam site and/or fast flowing water.

The left upstream shoreline at the Head Street Dam is covered with dense vegetation and mature trees. Similarly, the right upstream shoreline consists of several mature trees, and dense brush. Substantial erosion protection works were not observed on either the left or right upstream shoreline, but neither were signs of ongoing erosion.

The Head Street Dam consists of 45 m +/- length of sheet piling installed across the main channel of Sydenham River, with a wedge of riprap placed on the downstream face of the piling. The downstream riprap acts as a main spillway. The spillway riprap was observed to be in good condition, with no signs of erosion of the rock. The spillway riprap was observed to be flush with the top of the steel sheet piling. The sheet piling was noted as straight and vertical, with no signs of leaning or tilting. A large tree is seen growing immediately upstream of the sheet piling, on the right bank.

The left downstream bank at the Head Street Dam was noted as protected with large diameter riprap, with no noticeable signs of erosion or undermining. A large tree is seen growing through the left downstream bank, and currently does not pose a thread to bank stability. The right downstream bank was likewise observed to have riprap shoreline protection, although covered with heavy brush and shrub vegetation. The riprap at the right downstream bank consists of large diameter rock (similar in size to the downstream spillway rock). Some of the rock from the right downstream bank has been dislodged from the bank, and rests on the river bed. The right downstream bank still has some remaining rock as lining, but large gaps are present through which vegetation has established.

An existing control structure exists near the left bank at the Head Street Dam site. A reinforced concrete access bridge connects the control structure to the left bank. The entire left bank is fenced off, with no public access to the control structure from the public. The reinforced concrete access bridge appears in good condition. The access bridge is supported via two vertical concrete piles installed through the spillway riprap. There was no evidence of erosion around the base of the vertical concrete piles.

The control structure has a single stop log bay with a concrete outlet channel on the downstream side. Downstream of the control structure are two concrete wingwalls that also appear in good condition. The deck at the control structure likewise appears in good condition, and is covered with a metal grate. Stop log lifter was not observed at the dam site. A handrail is present along the access bridge and around the perimeter of the deck of the control structure.

It is not known if the stop log bay is currently functional, of what is the status of the stop log lifter.

Public has no access to the left bank, access bridge, or the deck of the control structure, as the entire area is fenced off.

3.2.2 Recommendations

Recommendations for follow-up action at the Head Street Dam are as follows:

Priority S (safety related, require immediate attention)

- None.

Priority 1 (1 to 2 years)

- Install safety signs along the trail adjacent to the dam at the Rotary Memorial Park indicating dangers associated to public access in close proximity of a dam.
- Remove brush and tree vegetation from: i) left and right downstream shoreline, ii) riprap spillway.
- Continue to remove debris that accumulates on the upstream side of the reservoir along the sheet piling.

Priority 2 (2 to 5 years)

- Conduct a topographic survey (or otherwise) probe the channel downstream of the riprap spillway for indications of possible channel bed scour.
- Continue to monitor vegetation growth through the riprap spillway structure, and periodically remove, as necessary.
- Undertake maintenance operations and restore riprap shoreline protection at the right downstream bank.

Priority 3 (5 to 10 years)

- Complete routine inspections of the water control structure, establish a detailed photographic log, and compare deterioration against 2022 inspections.

3.3 Clark Wright Conservation Area

3.3.1 Observations

Refer to Appendix C – Clark Wright Dam for a detailed photographic log and inspector's notes.

Clark Wright Dam consists of two reinforced concrete wingwalls (with a built in seepage cutoff wall) installed on a tributary of the Sydenham River, southwest of Strathroy. The concrete of the wingwalls appear in good conditions, with no visible signs of distress. There exist gain slots for the placement of flashboards, which could raise the water level in the headpond. At the time of the inspections there were no flashboards at the structure. It is our understanding that flashboards are no longer used, and the area has been left to naturalize.

Small amount of loss of fill was noticed on the upstream left and right wingwalls (on the headpond side). If left untreated, it could ultimately threaten the overall stability of the structure. Fill should be restored in this location to prevent future problems.

Bed scour was noticed between the sill and the downstream wingwalls. A photograph from the 2011 Inspection Report shows that river bed downstream of the gains is flush with the existing sill. Observation in 2022 at the same location have revealed that bed erosion in the order of 1 m has taken place since 2011. This bed erosion should be addressed.

5.0 General Recommendations

The following offers a set of general recommendations to assist SCRCA in operating and maintaining its water control structures.

1. Several safety related issues have been flagged by the inspections, including: i) erosion of the soil adjacent to the right abutment of the pedestrian bridge at Coldstream Dam, ii) access platform at Morrough Lake Dam that is loose, iii) deteriorated structural steel at Warwick Dam bridge, and iv) unsafe path over the emergency spillway at Esli Dodge Dam. These safety related issues should be addressed immediately.

2. There are no public safety related signage at any of the sites inspected. As public has access to ground at and around the water control structures, signs should be posted warning users of hazards around deep and/or fast moving waters.

3. Many of the sites inspected are between 40 and 60 years old, and are approaching the limit to their useful service life. As many of the structures have vertical inlet drop structures that are damaged, leaning, and otherwise deteriorating. Capital planning needs to take place on developing a priority schedule to repair and/or restore the structures to appropriate engineering standards.

4. Heavy brush vegetation is present along the engineering structures at majority of the water control structures owned by SCRCA. Allowing vegetation to establish increases the rate of deterioration of the structures, and will thus lessen their remaining useful life.

5. Similar to above, inspection at several sites have noted that mature trees are growing through the engineering structures, and should be removed.

6. At most sites heavy grass/brush/trees prevented detailed visual inspections as some features were not visible. After heavy vegetation and trees are removed, follow up inspections should be completed.

7. Two methodologies for updating the operating rules of the McKeough Dam are offered (one based on numerical model simulation and one based on revising elevation thresholds). Each have their own advantages and disadvantages, and it will ultimately be up to SCRCA to decide which approach to adopt in the future.

References

Stantec (2011). 2011 Inspection Report, St. Clair Region Conservation Authority Water Control Structures, Report prepared by Stantec, London, Ontario, February, 2012.

MNR (2011). Public Safety Around Dams, Best Management Practices. Ontario's Ministry of Natural Resources, August 2011.

APPENDIX B

GEO Morphix Report for Stream Channel Analysis in Head Pond

(January, 2023)

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Attention: Jacob Bartley
B.Eng., E.I.T

Re: Geomorphological Technical Review, Removal of Coldstream Road Dam and Head Street Dam
East Sydenham River
Strathroy, Ontario
GEO Morphix Project No. PN22087

The Coldstream Road Dam and Head Street Dam located along the East Sydenham River in Coldstream and in the Town of Strathroy, Ontario, respectively, are proposed for possible removal. The St. Clair Region Conservation Authority (SCRCA) has requested that a geomorphological study be completed to evaluate the potential extent and alignments of the channel planform that will form following the dam removals within the upstream ponded area. An understanding of the extent of the future hazard posed by the watercourse and potential release of accumulated sediments is also required prior to deactivating the dams.

GEO Morphix Ltd. (GEO Morphix) was retained by the project engineer GSS Engineering Consultants Ltd. (GSS) to provide geomorphological input and guidance in support of the possible dam removals. To address these requirements, the following activities were completed:

- Review of East Sydenham River topographic surveys and sediment depth data to identify preferred channel pathways in the event of a dam removal
- Identify bankfull geometries and associated planimetric properties for the theoretical channel that will form within the ponded areas upstream of the dams
- Define a meander belt width for the theoretical channels
- Provide mapping of the expected planform and erosion hazard lines
- Outline in-channel bioengineering approaches to mitigate lateral and vertical erosion (e.g., channel widening and downcutting)
- Estimate quantities of potential sediment release based on geometric relationships

We provide this memo which summarizes the above-noted activities and provides geomorphological recommendations with respect to implementation.

Background Information

The Coldstream Road Dam is situated east of Strathroy along an upper reach of the East Sydenham River. The Coldstream Dam is bounded by Ilderton Road and residential dwellings to the south, Coldstream Road to the east, and Coldstream Conservation Area to the North. Based on our review of available watershed studies, the Coldstream Road Dam was built sometime between 1969 and 1972.

The Head Street Dam is situated within the Town of Strathroy. The Head Street Dam is bounded by Front Street and residential dwellings to the south, Head Street to the west, and Strathroy

Conservation Area to the north. Based on our review of available watershed studies, the Head Street Dam was built around 1973.

Sediment depth findings and topographical surveys were provided by GSS (drawings dated 2022).

Both dams form a significant barrier to fish, reducing the opportunity for upstream migration. They also produce languid flow conditions, due to backwatering effects, which in turn promotes poor water quality conditions (e.g., increased water temperature, sedimentation, and possibly algal growth).

Bankfull Channel Analyses

Removal of the dams will lower upstream water levels, thereby concentrating flow along the thalweg (e.g., deepest part of the channel/reservoir in cross sectional view). Along this path, a channel will develop naturally as the reservoir drains. The potential form of the channel is discussed below.

Channel Geometry

The geometries of the theoretical channel were informed based on a desktop assessment of a surrogate channel reach characterized by a predominantly unaltered or natural form. Bankfull channel width was measured remotely upstream and downstream from the dams using recent orthoimagery. Bankfull depth was estimated by applying known stream geometric relationships (Rosgen, 1994). With consideration to the existing channel conditions and increased potential for downcutting following dam removal (e.g., due to the relatively fine/erodible sediment composition in the reservoirs), a width to depth ratio of 10 was selected. For large rivers, width to depth ratios can be significantly higher (e.g., >12), but given the channel would be newly activated, we assumed relatively augmented rates of channel downcutting, which lowers the overall ratio.

At the Coldstream Street Dam location, the channel bankfull width and corresponding estimated depth were 7.4 m and 0.74 m. At the Head Street Dam location, the channel bankfull width and corresponding estimated depth were 16.1 and 1.61 m.

Channel Alignment

The alignment the theoretical channel will adopt was assessed through two approaches. The first examined the existing channel topography including existing sediment deposits, as surveyed by GSS. The low point or thalweg in each surveyed transect of the channel was mapped to delineate the theoretical channel central tendency (i.e., dominant or trending channel flowpath).

The second approach assumes the erosion/removal of the sediment deposits, as they consist of relatively loose and erodible materials, to identify the potential historical alignment of the channel. With this caveat applied, the thalweg is again extracted from the available surveys and mapped to form the theoretical historical channel central tendency.

Meander Belt Assessment

Most watercourses in southern Ontario have a natural tendency to develop and maintain a meandering planform, provided there are no spatial constraints. A meander belt width assessment estimates the lateral extent that a meandering channel could occupy and may potentially occupy in the future. The assessment is therefore useful for informing the potential hazard to proposed activities in the vicinity of the above-noted theoretical channels as well as the need for supporting erosion mitigation measures.

When defining the meander belt width for a creek system, the Ministry of Natural Resources and Forestry (MNRF, 2002) treats unconfined and confined systems differently. Unconfined systems are those with poorly defined valleys or slopes well-outside where the channel could realistically migrate. Confined systems are those where the watercourse is contained within a defined valley, where valley wall contact is possible.

Both the Coldstream Road Dam and Head Street Dam are likely unconfined systems. As such, the meander belt width is likely beyond the maximum extent of potential meander migration and areas of potential future valley wall contact. Where infrastructure is also present, these locations may need future infrastructure/erosion protection.

In unconfined systems, the limit of the erosion hazard and migration potential can be delineated based on empirical meander belt width models. For this study, we have selected and applied three desktop-based models to compute a range of meander belt widths. These models are scientifically defensible and have been verified in past studies as suitable for use in Southern Ontario. At this time, no method is preferred as each provides a range of potential migration extents based on different properties (i.e. watershed scale, flow, slope and bankfull geometry). The models are summarized below and their results provided are in **Table 1**.

TRCA (2004) Empirical Model

$$B_w = -14.827 + 8.319\ln(\rho g Q S * DA) \quad \textbf{[Eq. 1]}$$

where B_w is the meander belt width, ρ is the density of water, g is acceleration due to gravity, Q is the 2-year return period event discharge, S is the channel gradient, and DA is the drainage area.

For this study, the 2-year return period event discharges and drainage areas were estimated using a modified version of the Ontario Flow Assessment Tool which generates watersheds based on publicly available regional topography (e.g., LiDAR), and calculates watershed characteristics using empirical relations.

Modified Williams (1986) Empirical Approach

$$B_w = 4.3{W_b}^{1.12} + W_b \quad \textbf{[Eq. 2]}$$

Ward et al. (2002) Empirical Approach

$$B_w = 6{W_b}^{1.12} \quad \textbf{[Eq. 3]}$$

where B_w is the meander belt width, and W_b is the bankfull width, as estimated from aerial orthoimagery along an unaltered section of reach (see *Bankfull Channel* section above).

Table 1. Modelled Meander Belt Widths

Reach	Recommended Meander Belt Width (m)		
	TRCA (2004)	Modified Williams – Width (1986) *	Ward Width *
Coldstream Road	73	57	78
Head Street	82	136	187

**Includes a 20% Factor of Safety*

The meander belt widths in **Table 1** are applied equidistant along the channel central tendency (see Section *Bankfull Channel Analyses* for details related to central tendency estimation). Typically, the belt widths are based on a review of the existing meander pattern. However, in this case, the historical meandering planform could not be identified due to the presence of the dam and reservoir.

For the purpose of this analysis, two approximate central tendencies were delineated to project the calculated meander belt widths. The two central tendencies were delineated using different contour datasets provided by GSS; the current thalweg central tendency was delineated using the sediment surface contour dataset, and the historical thalweg central tendency was delineated using the hard bottom contour dataset. An overview of the meander belt widths associated with the theoretical channel at both locations is provided in **Appendix A**. From a review of topography, the assumed edge of reservoir is correlated with a defined break in slope, or the presumed "top of bank". This term is used loosely as the extent of the head is associated with the break in slope. As displayed in **Appendix A**, solid meander belt width lines indicate where the erosion hazard falls within the top of bank, whereas dotted meander belt width lines indicated where the erosion hazard extends beyond the top of bank. Note that the entire area delineated by the meander belt does not reflect an active erosion hazard. The delineated extents identify the potential migration limits the channel may attain in the future. In areas of concern, erosion mitigation treatments (e.g., bank bioengineering) may be installed to combat channel adjustment.

Potential Sediment Release

Dam structures create backwatering conditions, which slows upstream in-channel flow velocity, and promotes sediment settling/deposition. Therefore, a primary concern associated with dam removals is the corresponding abrupt release of these sediments downstream. Common related short-term impacts include increased water turbidity, sediment accumulation at downstream locations, as well as water quality impacts resulting from the sudden release of water (e.g., water temperature change).

Sediment release is a product of the available sediment as well as the method and phasing of the dam removal. One approach to estimate the amount of sediment mobilized is to calculate sediment entrainment as a function of the theoretical channel geometry (see *Bankfull Channel* section for details), plus contingency to account for potential activation of sediments beyond the bankfull channel limits. Assuming the release is limited to the channel size can result in a significant underestimate of the release, as most of the collected material within the reservoir extents will be fine and thus highly susceptible to entrainment in the post-condition. A more practical approach is to assume a worst-case scenario which better accounts for the volume of loose materials that extend beyond the theoretical bankfull channel limits and would represent a maximum probable release.

To gauge the release, a number of assumptions were made regarding channel geometry and the extent of active sediment. First, the channel width of the newly formed bankfull channel would be similar to channel widths found beyond the impact of the dam. Second, the channel depth could be approximated from the bankfull width applying industry known natural channel width-to-depth ratios (Rosgen, 1994). In this case, we assumed a width-to-depth ratio of 10 (see *Bankfull Channel* section for details), which resulted in a channel depth of 0.74 m and 1.61 m for the Coldstream Road Dam and Head Street Dam, respectively. The assumed depths fall within the depth of available sediments.

Additionally, we have assumed that the active erosion area is limited to three times the theoretical bankfull channel width, or 22 m for the Coldstream Road Dam channel and 48 m for the Head Street Dam channel. This was considered to be a reasonable estimate, if the work were combined with appropriate phasing of the dewatering and dam removal.

Finally, the erosion area was assumed to extend the entire length of the thalweg (central tendency), which measured 433 m at the Coldstream Road Dam location and 619 m at the Head Street dam location.

Table 2. Potential Sediment Release Estimates

Parameters	Coldstream Road	Head Street
Active Bankfull Width (*3) (m)	22	48
Average Bankfull Channel Depth (Bankfull Width/10) (m)	0.74	1.61
Thalweg Length (m)	433	619
Estimated Volume of Sediment (m^3)	7,049	47,836

Importantly, the release could be larger than what is indicated in **Table 2** if appropriate phasing and sediment management is not applied. With respect to phasing, removal of the dam structures should be timed to avoid high in-channel flow conditions and to promote soil stabilization through revegetation during favourable growing periods. Non-vegetated surfaces may also be mechanically stabilized with erosion control blankets for temporary protection as vegetation establishes. Dam structure removal and reservoir drawdown should occur in a gradual, staged manner to reduce erosivity of the associated flow release and to permit enhanced vegetation establishment during the interim period between drawdown events. Abrupt removal (e.g., over daily or weekly intervals) will subject relatively exposed, sensitive sediments to more turbulent flow conditions. Therefore, large reservoir drawdown is typically recommended to occur over the course of 1 or more years.

Strategic use and placement of erosion and sediment controls, such as silt fencing and cofferdams, can also help mitigate erosive forces and sediment transfer by forming temporary barriers and promoting backwatering/depositional conditions. In addition, a qualified environmental monitor or geomorphologist should conduct regular inspections to rapidly address potential erosion issues as they arise. Finally, longer-term erosion mitigation strategies, such as bioengineering, may be implemented for enhanced bed and bank protection (see below Section for details).

Selective removal of built-up sediments in the reservoir in advance of the dam removal can also help reduce the extent of release. However, this is not considered a practical or cost-effective approach due to the scale of the reservoirs and degree of existing sediment accumulation.

Channel Restoration Recommendations

The newly formed channels will be allowed to evolve over time, thereby forming naturally occurring habitat. However, the newly formed channel will be relatively susceptible to erosion as it will take years for vegetation to establish deep rooting systems to help hold the bank materials intact. As such, more robust erosion mitigation treatments may be required along the channel bed or bank in problematic areas and/or to address erosion concerns. There are multiple design alternatives depending on the degree of stability required. Several examples are described below.

Channel Bank Bioengineering

A vegetative rock buttress treatment is a popular and relatively robust bank treatment option for large river systems. It may be configured with hydraulically-sized stone, to offer the requisite stability to withstand severe flow conditions, and may be revegetated with a high density of live plantings to enhance terrestrial cover and provide shading benefits to the watercourse.

The vegetated rock buttress consists of multiple rows of large subrounded to subangular boulders with live plantings installed in the gaps that occur between adjacent stones. As the plantings establish, feature stability is further enhanced through root generation. The stones are hydraulically-sized to withstand entrainment during a range of flood events. Larger stones sourced from the mix are to be positioned along the toe of the treatment, where in-channel shear is greatest. Relatively smaller stones may be used to construct the upper rows of treatment.

Alternatively, relatively "soft", more heavily vegetated bioengineering solutions are also available where the erosion risk is relatively reduced. Soft treatments generally consist of stone-based toe protection, overlaid with vegetated treatments such as fascines, soil lifts, and/or simple live staking. These treatments rely on vegetation establishment and live woody elements to hold the bank intact. Successful, relatively easy-to-implement examples include brush mattressing, vegetated layering, and root wad bank protection. The treatments are further supported with biodegradable erosion control blanket to provide short-term erosion control while the plantings establish. Although slightly less robust than the vegetated rock buttress, soft treatments provide optimal benefit to aquatic wildlife through provision of a combination of stone and woody features.

Example photographs of constructed channel bioengineering techniques are included in **Figure 1**.

Channel Bed Grade Control

Removal of the dams will result in a gradual lowering of the channel bed as the channel adjusts to re-establish a stable invert at the dam location. Channel bed grade controls may be installed at strategic locations to provide stability while maintaining seamless flow connectivity between the upstream naturalized channel and downstream receiving channel.

Channel bed grade controls consist of stone-based weirs which extend laterally across the channel. Weir stones are hydraulically-sized (oversized) for long-term stability. Upstream of each weir, the degradational tendency of the bed in an alluvial stream is mitigated, although this effect decreases progressively farther upstream. To construct a weir, stones should be arranged with an arc shape with the apex of the arc pointing in the upstream direction. This not only helps to increase the stability of the weir by strengthening the contact between stones due the flow direction but also to locally concentrate flows towards the centre of the channel and promote pool development and maintenance. Weir spacing should be such that the backwater of a weir extends to the next upstream weir or existing stable riffle, under low flow conditions. In addition to combating channel degradation, the weirs provide a degree of morphological variability to the channel bed. This benefits aquatic wildlife through provision of spatially diverse flows, enhanced flow aeration, and refuge opportunity within the relatively languid pools that form between weirs.

Example photographs of constructed channel bed grade controls and bank bioengineering techniques are included in **Figure 1**. **Figure 1A** displays a weir grade control supported by brush mattressing along the channel banks. The toe of the brush mattress treatment is reinforced with stone, for stability, while the upper banks gradually revegetate. In **Figure 1B**, the left bank is reinforced with a vegetative rock buttress to combat lateral migration. In addition, the bed is reinforced with hydraulically-sized stone weirs to combat downcutting while maintaining flow connectivity (and fish passage) through the restored reach. This represents a more robust design alternative applicable in areas where the erosion potential is high.

Figure 1: A) Typical vortex rock weir B) Typical vegetated rock buttress

Implementation of a combination of the channel bed and bank treatments is likely appropriate at the dam removal locations to manage erosion in proximity to important assets or infrastructure.

Summary

GEO Morphix has reviewed the available data to estimate the channel configuration, meander belt, and potential release of sediment associated with the removal of both the Coldstream Road Dam and Head Street Dam in Strathroy, Ontario.

Empirical modelling was applied to delineate the meander belt widths at each location. The recommended meander belt width for the Coldstream Dam, ranged from 57 m to 78 m. The corresponding estimated sediment load was 7,049 m^3. The recommended meander belt width for the Head Street Dam ranged from 82 m to 187 m, with a potential sediment load of approximately 47,836 m^3.

We recommend that the water levels of both dams be lowered systematically through strategic dewatering and sediment stabilization. Sediment releases could be substantially larger if dewatering and stabilization is not undertaken during dam removal. These estimates assume no downcutting below the approximated bankfull depth, which could result in a much larger volumes of sediment being released.

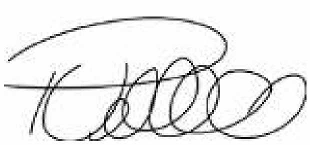
Bank bioengineering is recommended to mitigate future lateral migration, and in areas where the channel meanders near infrastructure. In addition, channel bed controls may be installed at the dam locations to provide vertical channel stability, as required. Although, implementation of the noted mitigation treatment is not an immediate concern and may be coordinated following identification of problematic areas during post-removal monitoring.

It is important to note that short-term transfer of sediments from the reservoirs is expected as the previously trapped sediments are uncovered and mobilized. Removal of the dam will also impact long-term sediment transfer, although transport rates are expected to align with natural pre-dam conditions.

Finally, the sediment surveys provide volumetric estimates, but were not detailed enough to identify the historical planform of the channel with accuracy. Completion of detailed sediment surveys is recommended to support the development of future dam removal plans. Detailed surveys can be performed in open water using side-scan sonar to identify remnant areas of excavation and historical channel morphology.

We trust this memo meets your requirements. Should you have any other questions or concerns, please contact the undersigned.

Respectfully submitted,



Paul Villard Ph.D., P.Geo., CAN-CISEC, EP, CERP
Director, Principal Geomorphologist

References

Ministry of Natural Resources and Forestry (MNRF). 2002. Technical Guide – River and Stream Systems: Erosion Hazard Limit.

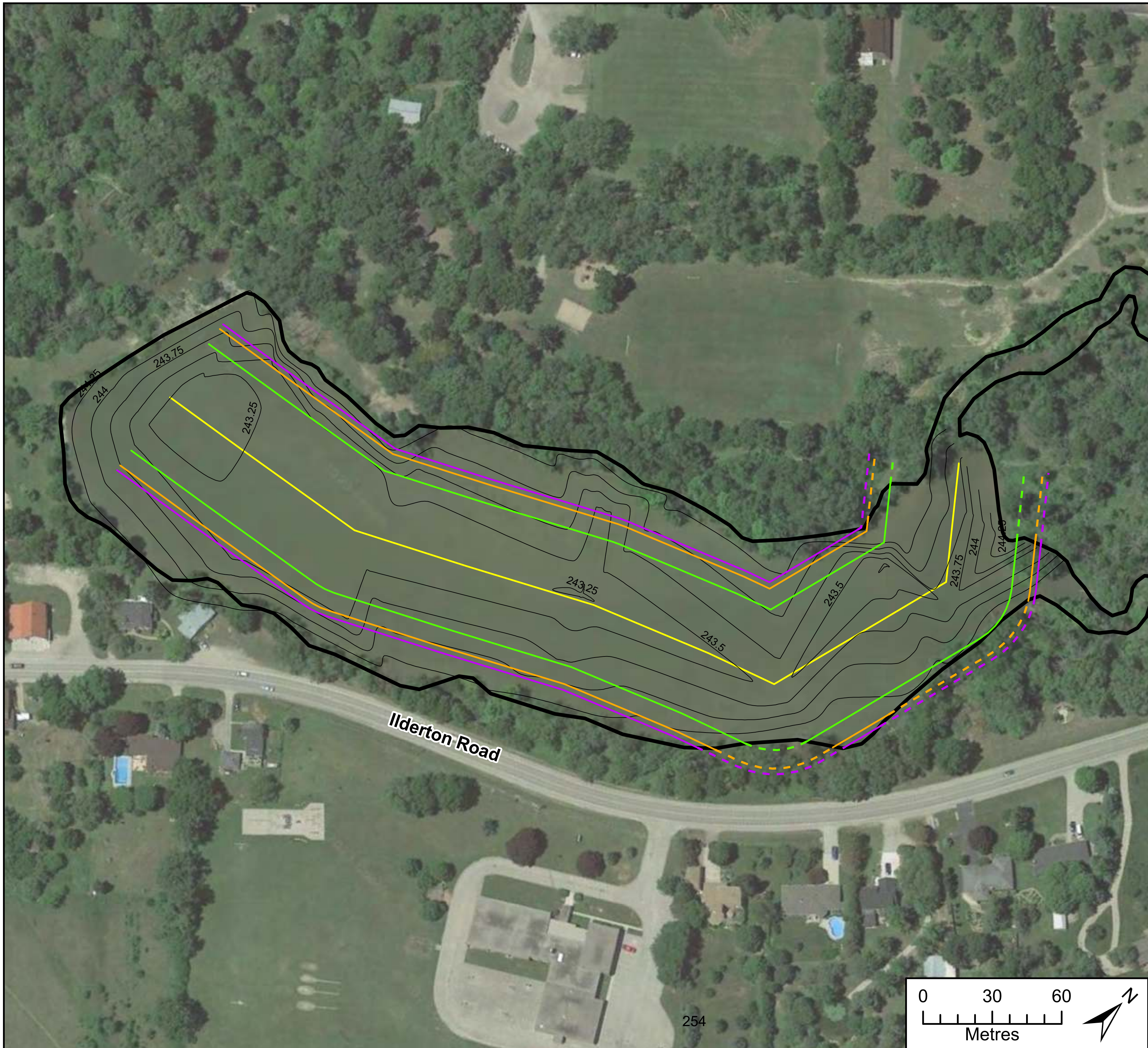
Rosgen, D.L. 1994. A classification of natural rivers. Catena, v. 22, pp. 169-199

Toronto and Region Conservation Authority (TRCA). 2004. Belt Width Delineation Procedures.

Ward, A. D. Mecklenberg, J. Mathews, and D. Farver. 2002. Sizing Stream Setbacks to Help Maintain Stream Stability. Paper Number: 022239. 2002 ASAE Annual International Meeting. Chicago, IL, USA. July 28-July 31, 2002

Williams, G.P. 1986. River meanders and channel size. Journal of Hydrology, 88 (1-2): 147-164.

Appendix A
Erosion Hazard Map



Preliminary MBW

Based on Current Thalweg

Coldstream Reservoir

Strathroy, Ontario

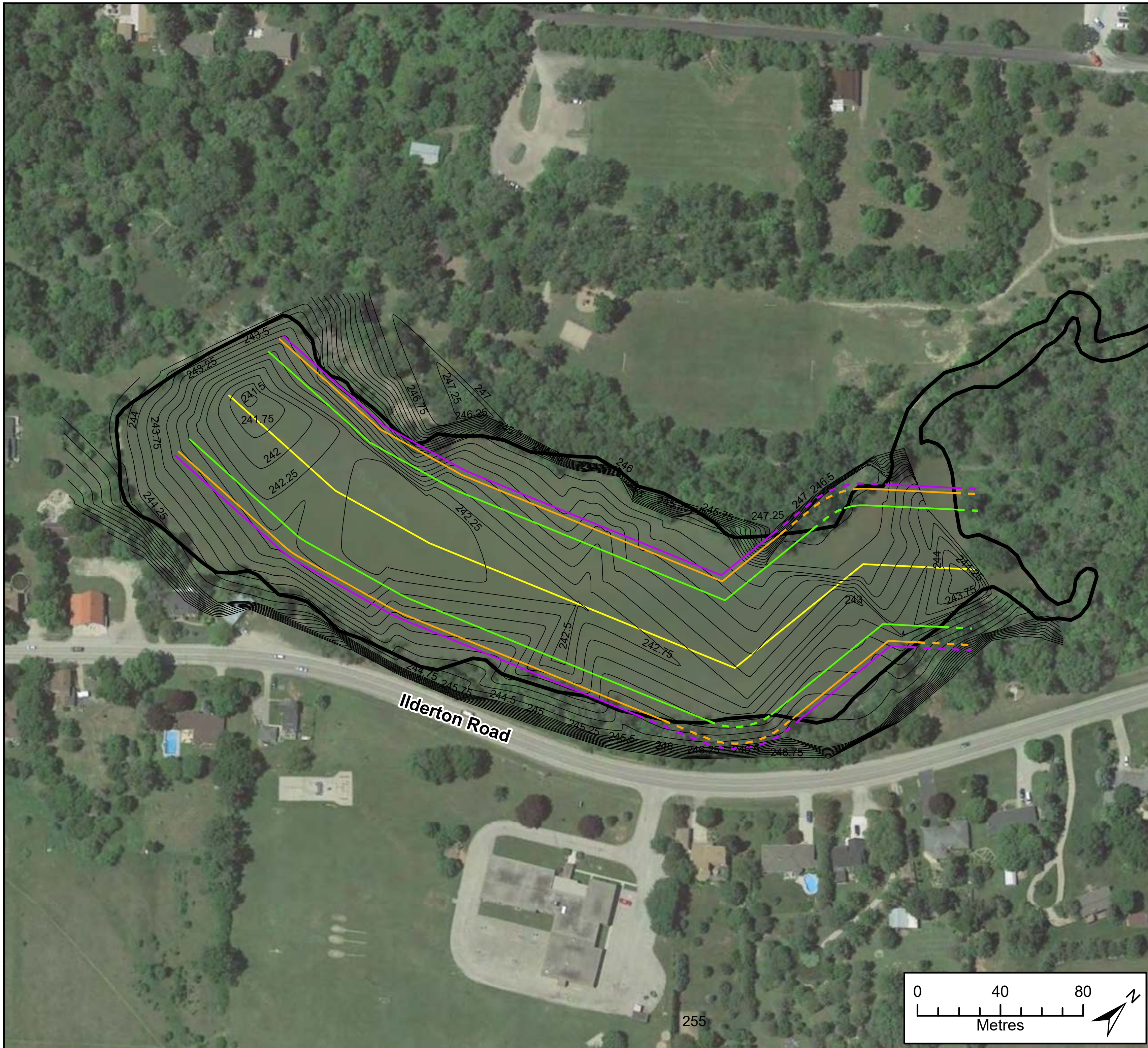
Legend

- Approximate Reservoir Boundary
- Sediment Bed Contours
- Approximate Current Central Tendancy (derived from thalweg of sediment) including removal of more recently deposited sediments
- TRCA (73 m)
- Modified Williams Width (20% Factor of Safety) (57 m)
- Ward Width (20% Factor of Safety) (78 m)
- Williams (outside of top of bank)
- TRCA (outside of top of bank)
- Ward (outside of top of bank)

Corresponding dashed lines represent outside of approximate top of bank

We have reviewed the cross-sections, and the boundary of the reservoir generally appear to correspond with the top of bank

Imagery: Google Earth, 2018. MBW: GEO Morphix Ltd., 2022. Approximate Reservoir Boundary: GSS Engineering, 2022. Print Date: January 2023. PN22087. Drawn By: M.O., P.V.



GEO | MORPHIX™

Preliminary MBW

Based on Historical Thalweg

Coldstream Reservoir

Strathroy, Ontario

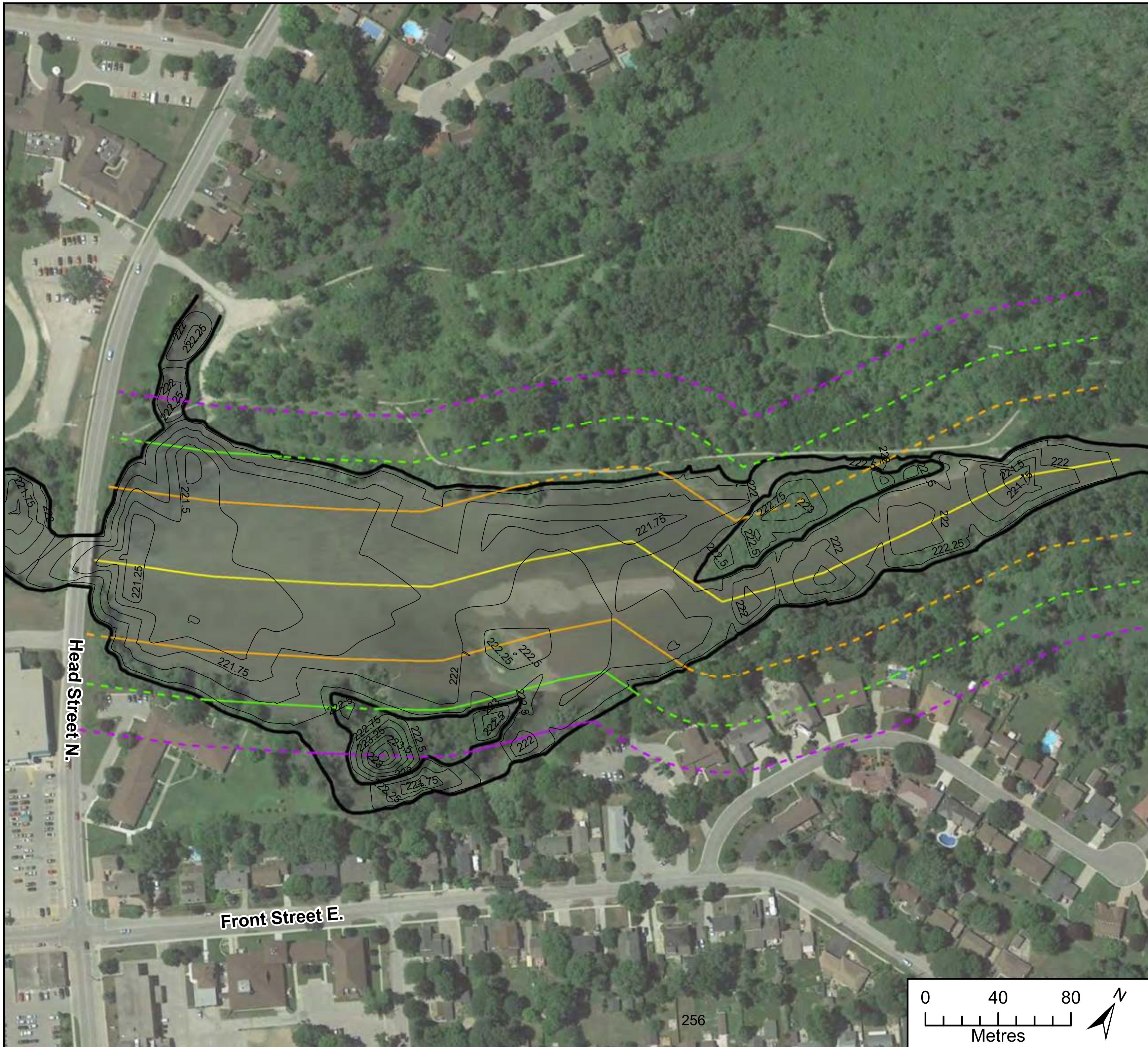
Legend

- Approximate Reservoir Boundary
- Hard Bottom Contours
- Approximate Historical Central Tendancy
- TRCA (73 m)
- Modified Williams Width (20% Factor of Safety) (57 m)
- Ward Width (20% Factor of Safety) (78 m)
- Williams (outside of top of bank)
- TRCA (outside of top of bank)
- Ward (outside of top of bank)

Corresponding dashed lines represent outside of approximate top of bank

We have reviewed the cross-sections, and the boundary of the reservoir generally appear to correspond with the top of bank

Imagery: Google Earth, 2018. MBW: GEO Morphix Ltd., 2022. Approximate Reservoir Boundary: GSS Engineering, 2022. Print Date: January 2023. PN22087. Drawn By: M.O., P.V.



GEO MORPHIX™

Preliminary MBW

Based on Current Thalweg

Head Street Reservoir

Strathroy, Ontario

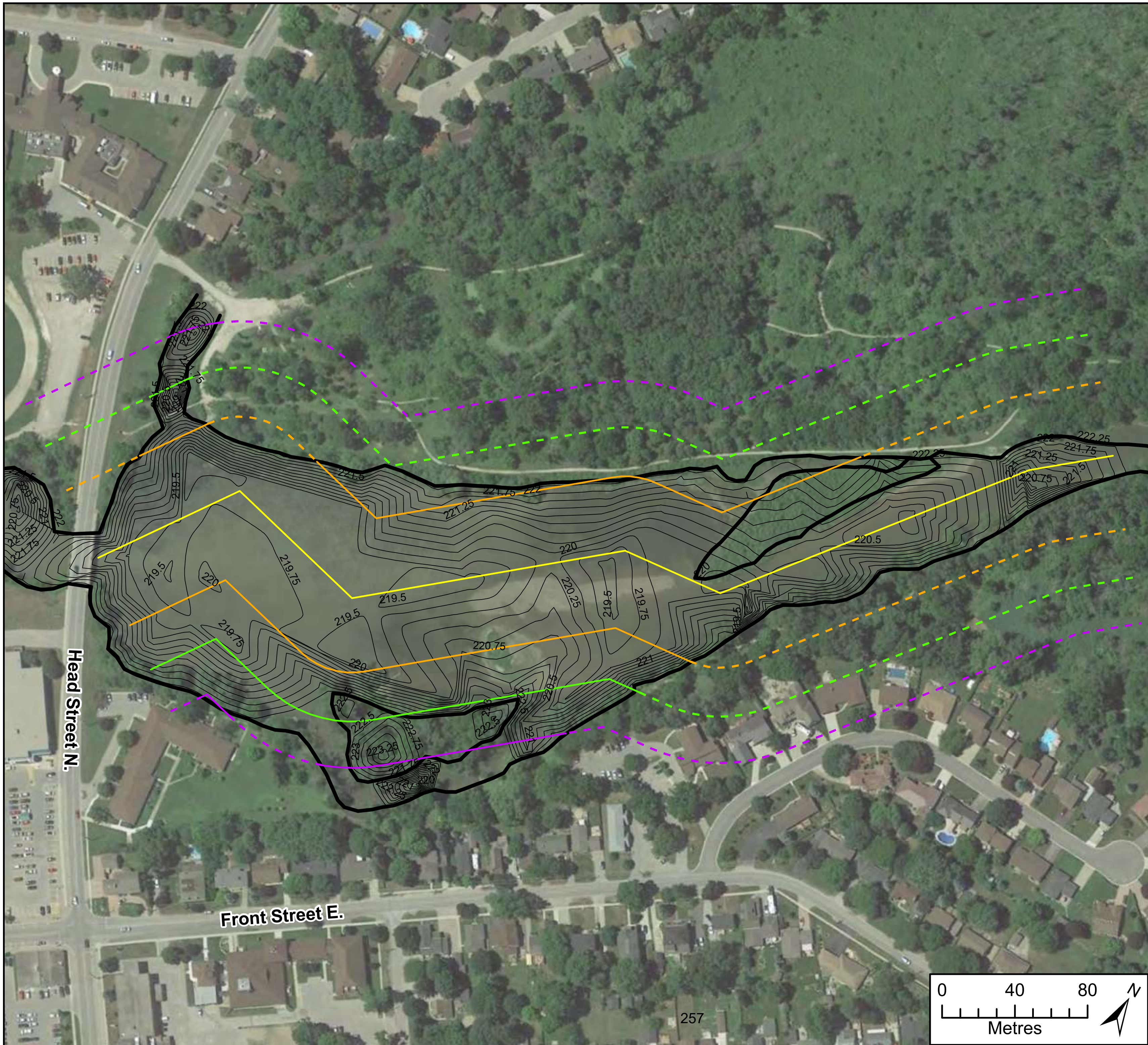
Legend

- Approximate Reservoir Boundary
- Sediment Bed Contours
- Approximate Current Central Tendancy (derived from thalweg of sediment) including removal of more recently deposited sediments
- TRCA (82 m)
- Modified Williams Width (20% Factor of Safety) (136 m)
- Ward Width (20% Factor of Safety) (187 m)
- Williams (outside of top of bank)
- TRCA (outside of top of bank)
- Ward (outside of top of bank)

Corresponding dashed lines represent outside of approximate top of bank

We have reviewed the cross-sections, and the boundary of the reservoir generally appear to correspond with the top of bank

Imagery: Google Earth, 2018. MBW: GEO Morphix Ltd., 2022. Approximate Reservoir Boundary: GSS Engineering, 2022. Print Date: January 2023. PN22087. Drawn By: M.O., P.V.



GEO MORPHIX™

Preliminary MBW

Based on Historical Thalweg

Head Street Reservoir

Strathroy, Ontario

Legend

- Approximate Reservoir Boundary
- Hard Bottom Contours
- Approximate Historical Central Tendancy
- TRCA (82 m)
- Modified Williams Width (20% Factor of Safety) (136 m)
- Ward Width (20% Factor of Safety) (187 m)
- Williams (outside of top of bank)
- TRCA (outside of top of bank)
- Ward (outside of top of bank)

Corresponding dashed lines represent outside of approximate top of bank

We have reviewed the cross-sections, and the boundary of the reservoir generally appear to correspond with the top of bank

Imagery: Google Earth, 2018. MBW: GEO Morphix Ltd., 2022. Approximate Reservoir Boundary: GSS Engineering, 2022. Print Date: January 2023. PN22087. Drawn By: M.O., P.V.

APPENDIX C

Contaminant and Particle Size Analysis of Sediment Samples

ST. CLAIR REGION CONS. AUTH.
ATTN: Greg Wilcox
205 MILL POND CRESCENT
STRATHROY ON N7G 3P9

Date Received: 22-APR-22
Report Date: 06-MAY-22 15:27 (MT)
Version: FINAL

Client Phone: 519-245-3710

Certificate of Analysis

Lab Work Order #: L2700779

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers:
Legal Site Desc:

Costas Farassoglou
Account Manager

ADDRESS: 309 Exeter Road Unit #29, London, ON N6L 1C1 Canada | Phone: +1 519 652 6044 | Fax: +1 519 652 0671
ALS CANADA LTD Part of the ALS Group An ALS Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L2700779-1	L2700779-2	L2700779-3	L2700779-4	L2700779-5
	Sample ID	L2700779-1	L2700779-2	L2700779-3	L2700779-4	L2700779-5
	Description	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampled Date	22-APR-22	22-APR-22	22-APR-22	22-APR-22	22-APR-22
	Sampled Time	13:00	13:10	13:15	13:30	13:40
	Client ID	S1	S2	S3	S4	S5
Grouping	**Analyte**					
SOIL						
Physical Tests	Grain Size Curve					
	% Moisture (%)	29.5	26.7	48.8	60.7	57.5
	pH (pH units)	7.36	6.83	7.00	6.85	6.81
Particle Size	Gravel (4.75mm - 3in.) (%)					
	Medium Sand (0.425mm - 2.0mm) (%)					
	Coarse Sand (2.0mm - 4.75mm) (%)					
	Fine Sand (0.075mm - 0.425mm) (%)					
	Silt (0.002mm - 0.075mm) (%)					
	Silt (0.005mm - 0.075mm) (%)					
	Clay (<0.002mm) (%)					
	Clay (<0.005mm) (%)					
Cyanides	Cyanide, Free (ug/g)	<0.50 DLM	<0.050	0.053	<0.1 DLHM	<0.1 DLHM
Metals	Aluminum (Al) (ug/g)	2280	1790	4340	7300	10100
	Antimony (Sb) (ug/g)	<0.10	<0.10	<0.10	<0.10	<0.10
	Arsenic (As) (ug/g)	1.42	1.14	1.78	2.63	3.87
	Barium (Ba) (ug/g)	12.9	8.28	27.8	65.7	75.1
	Beryllium (Be) (ug/g)	<0.10	<0.10	0.17	0.28	0.42
	Bismuth (Bi) (ug/g)	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B) (ug/g)	<5.0	<5.0	<5.0	6.6	9.1
	Cadmium (Cd) (ug/g)	0.051	0.034	0.104	0.187	0.232
	Calcium (Ca) (ug/g)	71600	67000	56200	88800	71000
	Chromium (Cr) (ug/g)	4.64	2.89	6.88	11.0	15.6
	Cobalt (Co) (ug/g)	1.53	1.12	2.27	3.57	4.94
	Copper (Cu) (ug/g)	2.20	1.45	4.74	7.49	10.9
	Iron (Fe) (ug/g)	4740	3110	6560	9880	14000
	Lead (Pb) (ug/g)	1.90	1.58	3.33	5.01	7.08
	Lithium (Li) (ug/g)	2.5	<2.0	4.3	7.1	10.3
	Magnesium (Mg) (ug/g)	15000	12700	9290	9240	10800
	Manganese (Mn) (ug/g)	174	154	156	256	319
	Mercury (Hg) (ug/g)	<0.0050	<0.0050	0.0126	0.0201	0.0281
	Molybdenum (Mo) (ug/g)	0.11	<0.10	0.17	0.18	0.31
	Nickel (Ni) (ug/g)	3.04	2.24	4.69	7.56	10.7
	Phosphorus (P) (ug/g)	305	228	526	719	935
	Potassium (K) (ug/g)	330	280	630	1080	1470
	Selenium (Se) (ug/g)	<0.20	<0.20	<0.20	0.28	0.38
	Silver (Ag) (ug/g)	<0.10	<0.10	<0.10	<0.10	<0.10

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2700779-6	L2700779-7	L2700779-8		
	Description	SOIL	SOIL	SOIL		
	Sampled Date	22-APR-22	22-APR-22	22-APR-22		
	Sampled Time	13:45	13:10	13:45		
	Client ID	S6	SPSA1	SPSA2		
Grouping	**Analyte**					
SOIL						
Physical Tests	Grain Size Curve		SEE ATTACHED	SEE ATTACHED		
	% Moisture (%)	59.7				
	pH (pH units)	6.75				
Particle Size	Gravel (4.75mm - 3in.) (%)		<1.0	<1.0		
	Medium Sand (0.425mm - 2.0mm) (%)		5.4	<1.0		
	Coarse Sand (2.0mm - 4.75mm) (%)		<1.0	<1.0		
	Fine Sand (0.075mm - 0.425mm) (%)		90.6	30.7		
	Silt (0.002mm - 0.075mm) (%)		2.2	52.2		
	Silt (0.005mm - 0.075mm) (%)		2.1	43.1		
	Clay (<0.002mm) (%)		1.8	17.0		
	Clay (<0.005mm) (%)		1.9	26.1		
Cyanides	Cyanide, Free (ug/g)	<0.1 DLHM				
Metals	Aluminum (Al) (ug/g)	7490				
	Antimony (Sb) (ug/g)	<0.10				
	Arsenic (As) (ug/g)	2.33				
	Barium (Ba) (ug/g)	57.8				
	Beryllium (Be) (ug/g)	0.30				
	Bismuth (Bi) (ug/g)	<0.20				
	Boron (B) (ug/g)	6.0				
	Cadmium (Cd) (ug/g)	0.156				
	Calcium (Ca) (ug/g)	67900				
	Chromium (Cr) (ug/g)	12.1				
	Cobalt (Co) (ug/g)	3.73				
	Copper (Cu) (ug/g)	8.00				
	Iron (Fe) (ug/g)	11200				
	Lead (Pb) (ug/g)	5.05				
	Lithium (Li) (ug/g)	8.9				
	Magnesium (Mg) (ug/g)	9750				
	Manganese (Mn) (ug/g)	220				
	Mercury (Hg) (ug/g)	0.0199				
	Molybdenum (Mo) (ug/g)	0.19				
	Nickel (Ni) (ug/g)	8.58				
	Phosphorus (P) (ug/g)	740				
	Potassium (K) (ug/g)	1060				
	Selenium (Se) (ug/g)	0.26				
	Silver (Ag) (ug/g)	<0.10				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2700779-1	L2700779-2	L2700779-3	L2700779-4	L2700779-5
	Description	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampled Date	22-APR-22	22-APR-22	22-APR-22	22-APR-22	22-APR-22
	Sampled Time	13:00	13:10	13:15	13:30	13:40
	Client ID	S1	S2	S3	S4	S5
Grouping	**Analyte**					
SOIL						
Metals	Sodium (Na) (ug/g)	104	98	119	155	180
	Strontium (Sr) (ug/g)	80.8	75.0	64.1	97.3	80.1
	Sulfur (S) (ug/g)	<1000	<1000	<1000	1000	1300
	Thallium (Tl) (ug/g)	<0.050	<0.050	<0.050	0.083	0.091
	Tin (Sn) (ug/g)	<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti) (ug/g)	152	92.8	190	194	252
	Tungsten (W) (ug/g)	<0.50	<0.50	<0.50	<0.50	<0.50
	Uranium (U) (ug/g)	0.266	0.215	0.304	0.394	0.467
	Vanadium (V) (ug/g)	7.96	4.79	10.8	15.0	22.0
	Zinc (Zn) (ug/g)	14.7	11.6	25.0	37.0	52.9
	Zirconium (Zr) (ug/g)	<1.0	<1.0	<1.0	<1.0	<1.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2700779-6	L2700779-7	L2700779-8		
	Description	SOIL	SOIL	SOIL		
	Sampled Date	22-APR-22	22-APR-22	22-APR-22		
	Sampled Time	13:45	13:10	13:45		
	Client ID	S6	SPSA1	SPSA2		
Grouping	**Analyte**					
SOIL						
Metals	Sodium (Na) (ug/g)	156				
	Strontium (Sr) (ug/g)	66.7				
	Sulfur (S) (ug/g)	<1000				
	Thallium (Tl) (ug/g)	0.070				
	Tin (Sn) (ug/g)	<2.0				
	Titanium (Ti) (ug/g)	148				
	Tungsten (W) (ug/g)	<0.50				
	Uranium (U) (ug/g)	0.326				
	Vanadium (V) (ug/g)	16.9				
	Zinc (Zn) (ug/g)	39.8				
	Zirconium (Zr) (ug/g)	<1.0				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

APPENDIX D

HEC-RAS Analysis for Head Street Bridge

in Strathroy, Ontario

Flood Mapping & Velocity Analysis

Potential Removal of the Head Street Dam

St. Clair Region Conservation Authority

21-118

July, 2022

Prepared By:

GSS Engineering Consultants Ltd.

Unit 104D, 1010 – 9th Ave, W.

Owen Sound, ON

N4K 5R7

519-372-4828

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<u>APPENDICES</u>

1 INTRODUCTION

GSS Engineering Consultants Ltd. (GSS Engineering) was retained by the St. Clair Region Conservation Authority (SCRCA) to evaluate the potential removal of the Head Street Dam in Strathroy, Ontario. The dam is located on the East Sydenham River.

A hydraulic model of the Sydenham River through Strathroy was created using HEC-RAS to evaluate possible impacts to flood conditions in Strathroy if the dam was removed. As well, modelling was used to estimate velocities under the Head Street bridge, if the dam was removed.

2 METHODOLOGY

The hydraulic analysis was completed using HEC-RAS version 6.1. Existing hydraulic models were not available for the site. Therefore, GSS Engineering Consultants Ltd. (GSS) developed a hydraulic model of the Sydenham River in Strathroy.

The *"Ontario Digital Terrain Model (Lidar-Derived)"* provided by the Ontario Ministry of Natural Resources and Forestry was used to generate the base terrain in the HEC-RAS model. However, the Lidar-Derived model does not contain any data of the river bathymetry. Therefore, the river channel depth below the normal water surface was estimated. The estimated river bathymetry was calibrated using water level elevation vs. flow rate data, as provided by the Government of Canada for the Sydenham River at Strathroy flow gauge (gauge number = 02GG005). The modelled river bathymetry was estimated so the water level rise predicted by the model aligned the real-world data of water level rise in the Sydenham River during various flow events.

A total of 16 stream cross-sections were established to complete the modelling. See Figure 1 in **Appendix A** (Key Plan) for the locations of 8 key cross-sections. The remaining 8 cross-sections (not depicted on Figure 1 in **Appendix A**) were created to provide greater detail to modelled river channel but were not created to illustrate model results. The cross-sections on Figure 1 in **Appendix A** begin approximately 900 m west (downstream) of the Head Street Dam and extend approximately 950 m east (upstream) of the dam.

The Head Street Bridge is located approximately 70 m east (upstream) of the Head Street Dam. The bridge was modelled with the dimensions as shown in Figure 1 overleaf. All bridge dimensions were provided by the SCRCA.

The SCRCA provided return flood flows (100-yr, 50-yr, 20-yr, 10-yr, 5-yr, 2-yr) for the Sydenham River at Strathroy as prepared by B.M. Ross and Associates Limited in 1997. Further, the OFAT (Ontario Flow Assessment Tool) was used to estimate the mean annual flow (MAF) in the Sydenham River at Strathroy.

The return flood flows used in the hydraulic model are summarized in Table 1 below.

Table 1: Flood Flow Rates Used for HEC-RAS Model

Storm	100-yr	50-yr	20-yr	10-yr	5-yr	2-yr	MAF
Flow (m^3/s)	125.3	110.3	93.2	80.3	68.0	53.6	2.2

The HEC-RAS cross-sections presented in Appendix A show the anticipated water level elevations for these flow rates.

The flow was modelled as steady-state for the rates outlined in Table 1 above.

3 MODELLING RESULTS

3.1 Flood Inundation Area Surrounding the Head Street Dam

Since the area surrounding the Sydenham River through Strathroy is largely urban, it is important to determine the effect, if any, on local flooding if the Head Street dam was removed.

The flood inundation area was determined for pre-dam removal and post-dam removal conditions for the 100 year return flood flow. The flood inundation boundary was delineated based on the modelled HEC-RAS water surface elevations and the HEC-RAS terrain as provided by *"Ontario Digital Terrain Model (Lidar-Derived)"*.

The flood inundation limits for both pre and post dam removal can be seen on Figure 1 in **Appendix B**, for the portion of the Sydenham River +/- 1.2 km downstream of the dam to the upper limit of the existing head pond (approximately 900 m upstream of the dam).

As shown on Figure 1, the model predicts that removal of the Head Street Dam does not have any significant effect on the flood inundation in Strathroy for the 100-year return flood event. With the dam removed, there is slightly less flooding upstream of the dam location. There are no changes in flooding downstream of the dam.

Figure 2 in **Appendix B** is the same but includes an additional 3.8 km of river upstream of the existing dam head pond. Figure 2 indicates there is no change in flood inundation, for before and after dam removal, for the river upstream of the existing head pond.

3.2 Water Velocity Through the Head Street Bridge

The Head Street Bridge is located 70 m upstream of the Head Street Dam. It is therefore important to consider what effect dam removal would have on the bridge.

With the dam removed, it is possible that water velocities would increase under the Head Street Bridge. Water velocity through the Head Street Bridge, with the dam removed, was evaluated using HEC-RAS, for the 100-year storm event stream flow (125.3 m^3/s), and for smaller return flood flows, to determine if water velocities stay reasonably low with the dam removed.

Figure 1 in **Appendix C** shows predicted water velocities through the Head Street Bridge with the dam removed for the 100 year flood flow. As expected, the highest water velocities occur at the middle of the river channel. HEC-RAS predicts water velocities at the middle of the river reach a maximum velocity of 2.11 m/s, with an average water velocity of 1.62 m/s, for the 100-year flood flow event.

The continuity equation was also used to check the HEC-RAS predicted velocities. The continuity equation approach for estimating water velocity through the Head Street Bridge is shown on Figure 2 of **Appendix C**. The continuity equation (flow rate divided by the cross-sectional area of the flow path) predicts an average water velocity of 1.66 m/s through the Head Street Bridge for the 100-year storm event stream flow. Therefore, the velocity estimates provided by the HEC-RAS model appear to be accurate.

Figure 3 in **Appendix C** provides the same HEC RAS analysis for the 2 year return flood flow estimate of 53.6 m^3/s. As per Figure 3, the maximum river center water velocity is only 1.13 m/s with the dam removed. Similarly, Figure 4 shows the HEC RAS analysis for the mean annual flow of 2.2 m^3/s. Maximum velocities are very low (i.e. 0.34 m/s).

Overall, velocities under the Head Street bridge are not expected to increase significantly under large flood events as HEC RAS modelling indicates water levels for the 100 year flood flow are the same for before and after dam removal upstream and downstream of the Head Street bridge. Nonetheless, with the 100 year flood flow, maximum water velocities will remain relatively low (2.11 m/s). These velocities are not expected to cause any scour of concern around the bridge abutments or around the center support piers. However, placement of a layer of natural stone (12” to 16” diameter) around the support piers and along the abutments would be recommended as a precaution.

It should be noted that Head Street bridge was built before the Head Street dam was constructed. As such, the bridge designers at that time likely took into account scour velocities associated with large flood flows that existed prior to dam construction.

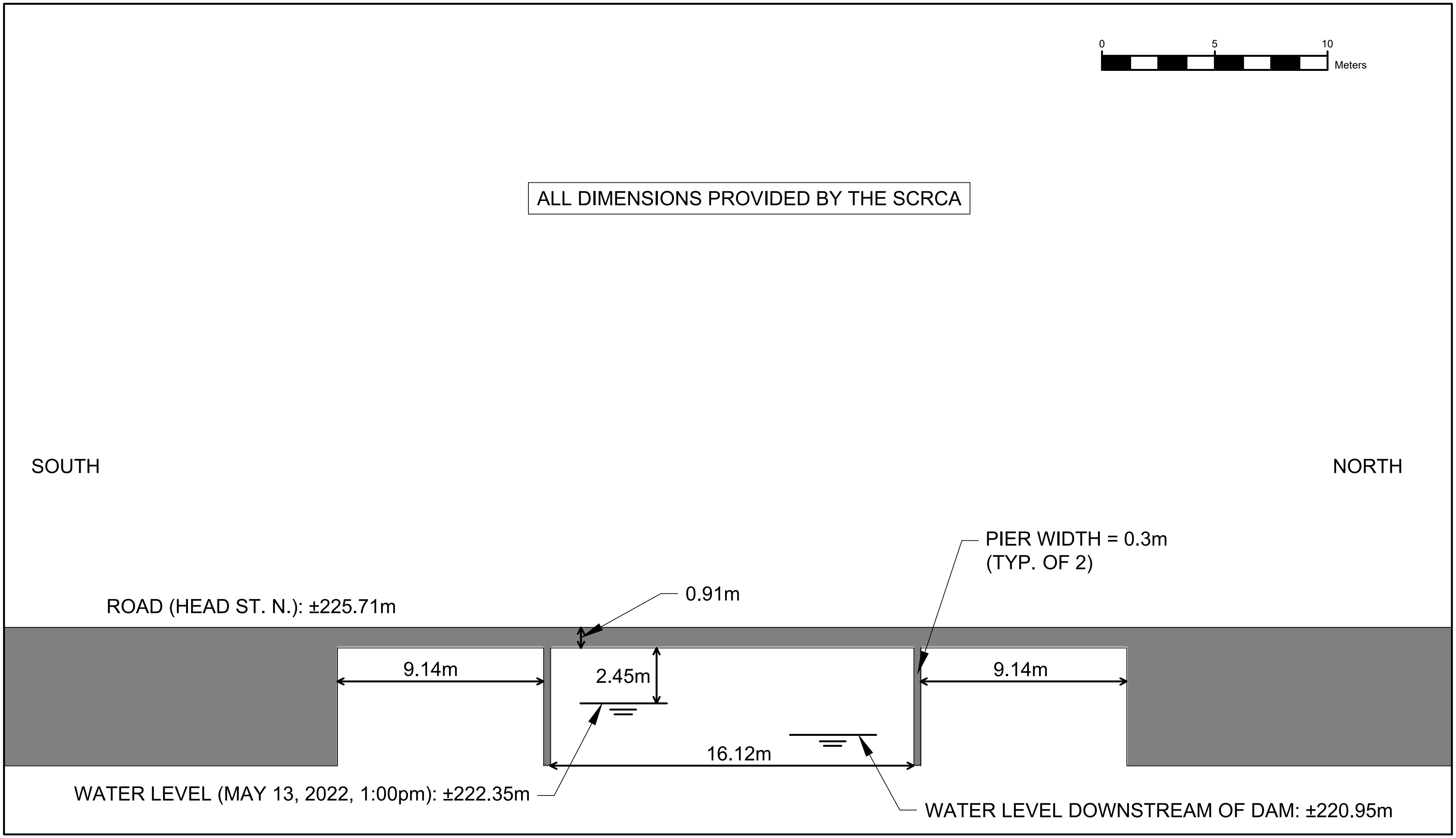
Respectfully submitted,

GSS ENGINEERING CONSULTANTS LTD.

Jacob Bartley, E.I.T

Jeff Graham, P. Eng., President,

JB/JG



HEAD STREET BRIDGE DIMENSIONS
CROSS-SECTION VIEW
HEAD STREET DAM DECOMISSIONING

ENGINEERING
CONSULTANTS LTD

Design:	JTG
Drawn:	JTB
APPROVED:	JTG
Date:	JULY 2022
Scale:	AS SHOWN
FILE No.	21118
FIG. No.	FIGURE 1

APPENDIX A

HEC-RAS Cross-Sections

KEY PLAN

LEGEND

ISL.	ISLAND
SCRCA	ST. CLAIR REGION CONSERVATION AUTHORITY
←	FLOW DIRECTION
—	EDGE OF WATER (NORMAL WATER LEVEL)

CAUTION: THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS, PROPERTY LINES AND OTHER UNDERGROUND AND OVERGROUND UTILITIES ARE STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES, PROPERTY LINES & STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES, PROPERTY LINES & STRUCTURES, AND SHOULD ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

DD/MM/YY	DESCRIPTION
REVISION / ISSUE	

Seal not valid unless signed and dated

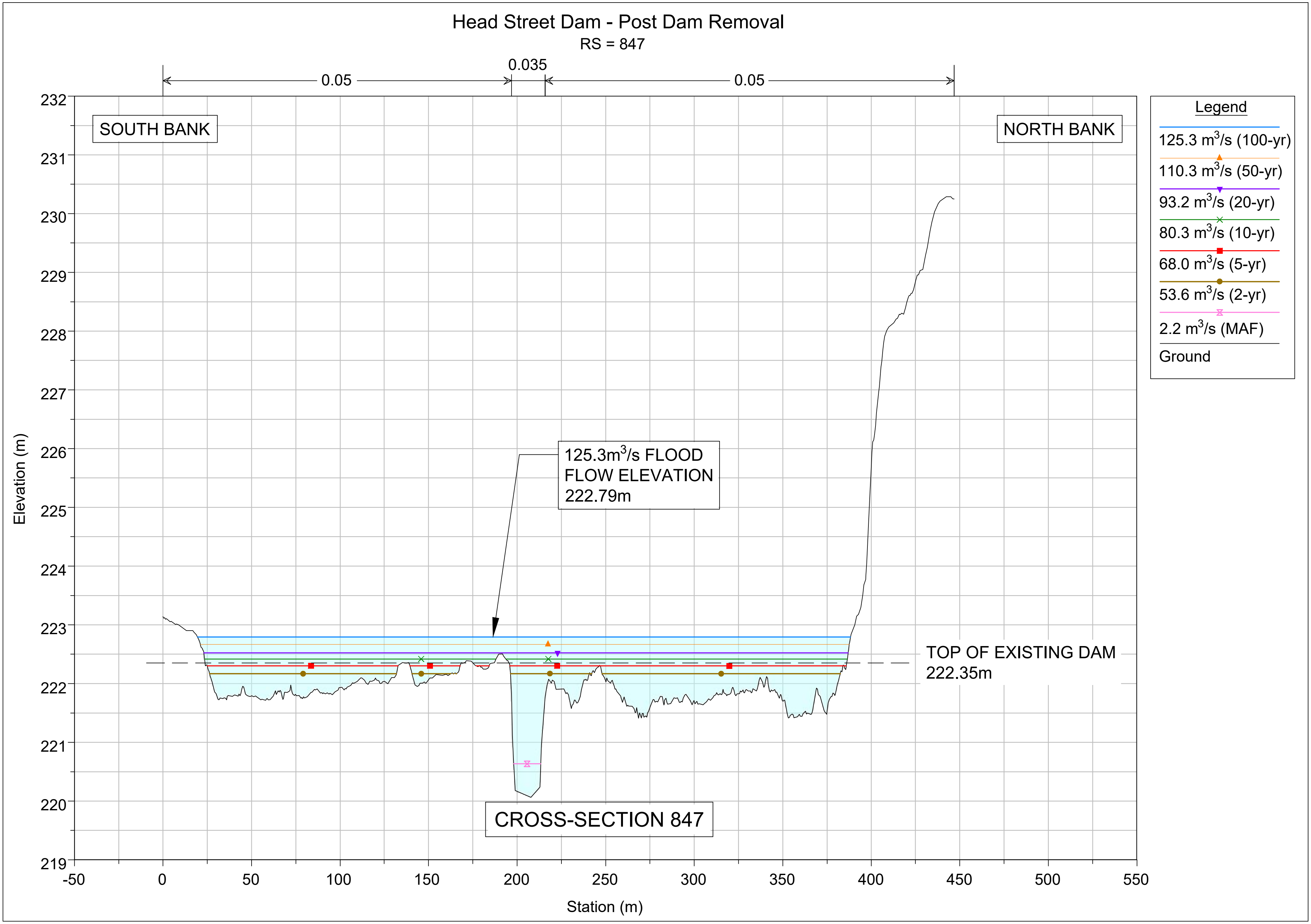
GSS ENGINEERING CONSULTANTS LTD
Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7
Telephone: (519) 372–4828

Title:
HEC–RAS CROSS–SECTIONS KEY PLAN THE EAST SYDENHAM RIVER HEAD STREET DAM

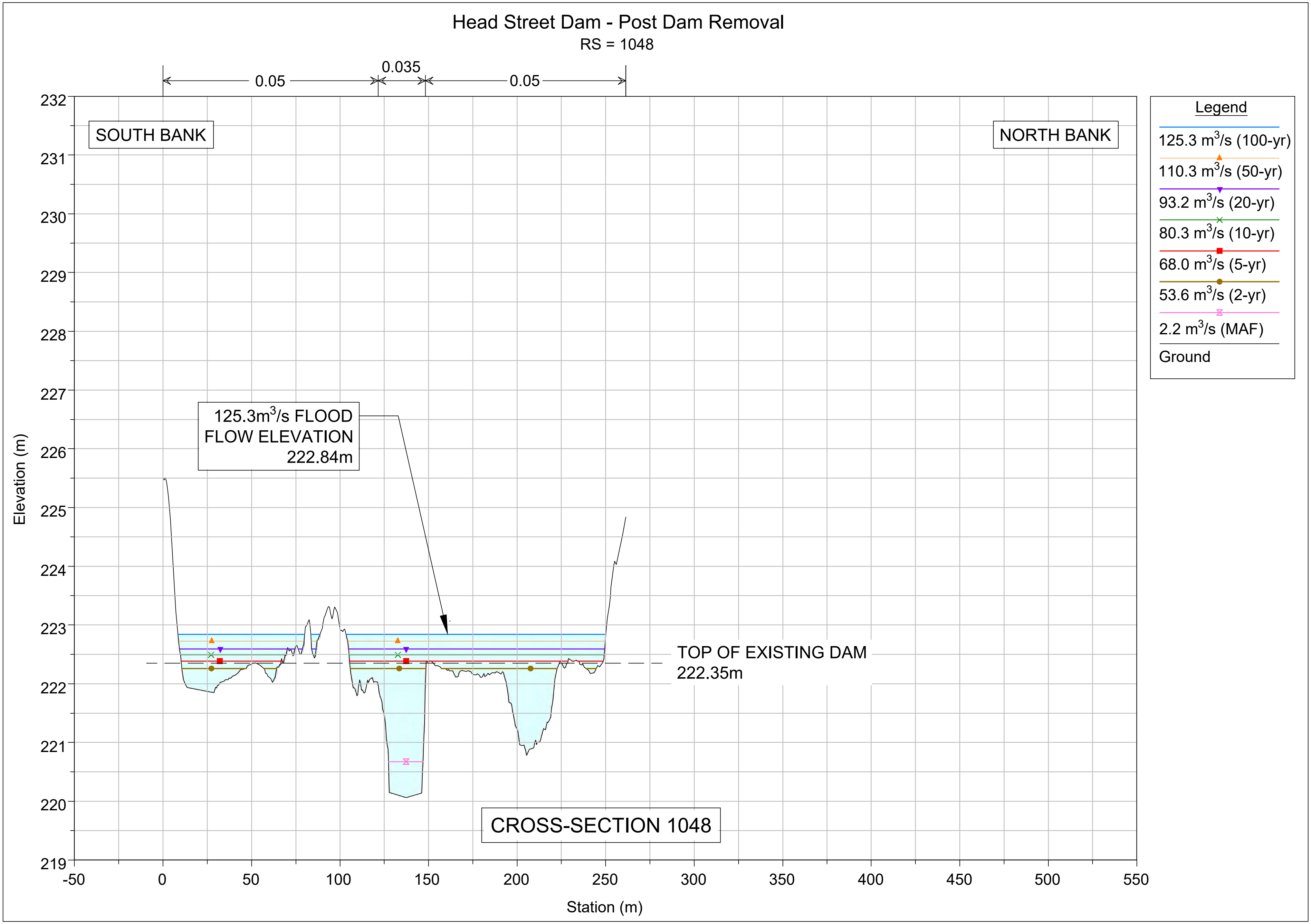
Client: ST. CLAIR REGION CONSERVATION AUTHORITY

Design:	JTG	Scale:	AS SHOWN
Drawn:	JTB	Approved:	Design Engineer
Checked:	JTG		
Date:	JULY 2022		

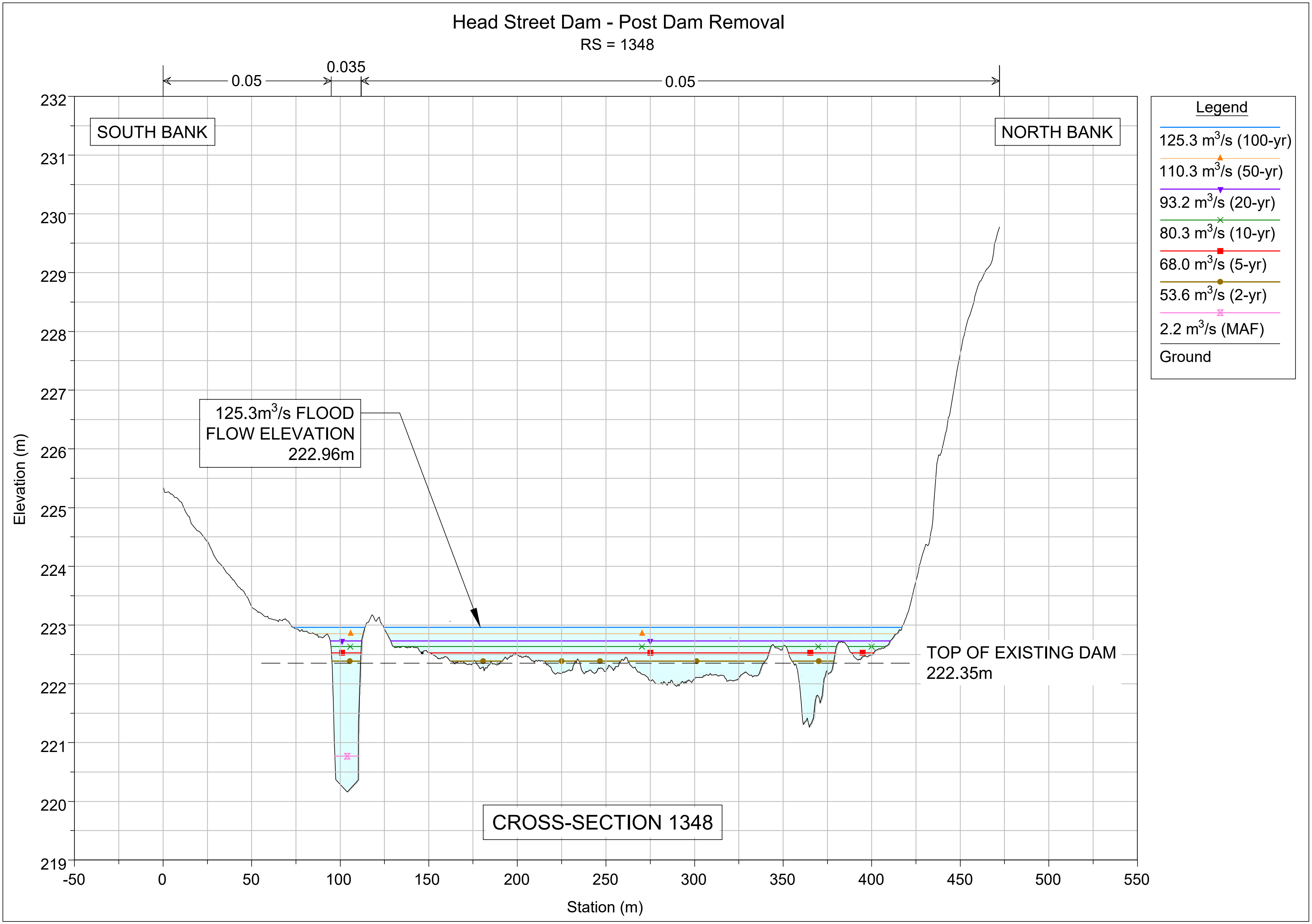
Drawing No. 21118H–D1



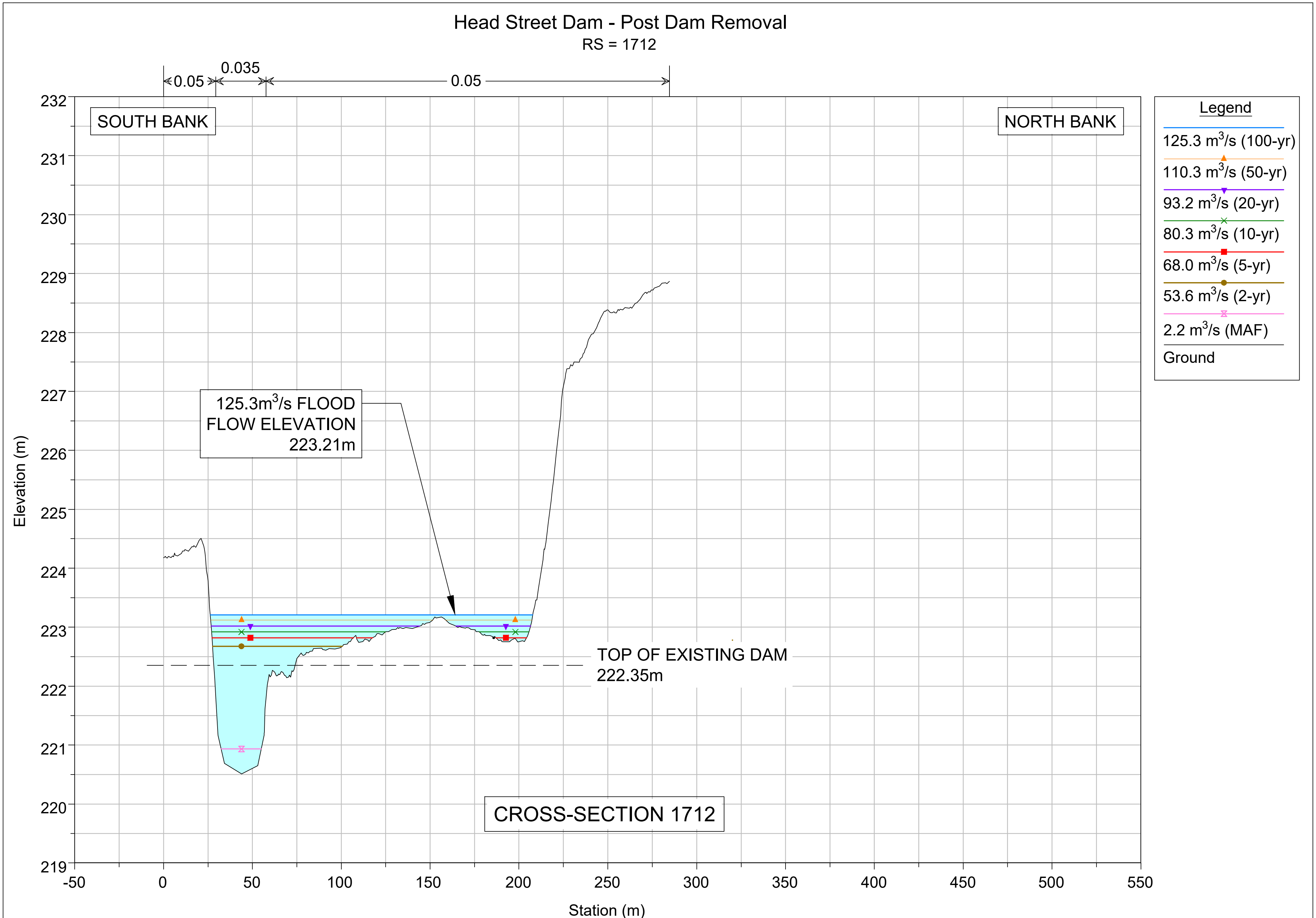
Head Street Dam - Post Dam Removal
RS = 847
0.05
0.035
0.05
SOUTH BANK
NORTH BANK
Legend
125.3 m³/s (100-yr)
110.3 m³/s (50-yr)
93.2 m³/s (20-yr)
80.3 m³/s (10-yr)
68.0 m³/s (5-yr)
53.6 m³/s (2-yr)
2.2 m³/s (MAF)
Ground
125.3m³/s FLOOD FLOW ELEVATION 222.79m
TOP OF EXISTING DAM 222.35m
CROSS-SECTION 847
Elevation (m)
Station (m)
232
231
230
229
228
227
226
225
224
223
222
221
220
219
-50
0
50
100
150
200
250
300
350
400
450
500
550

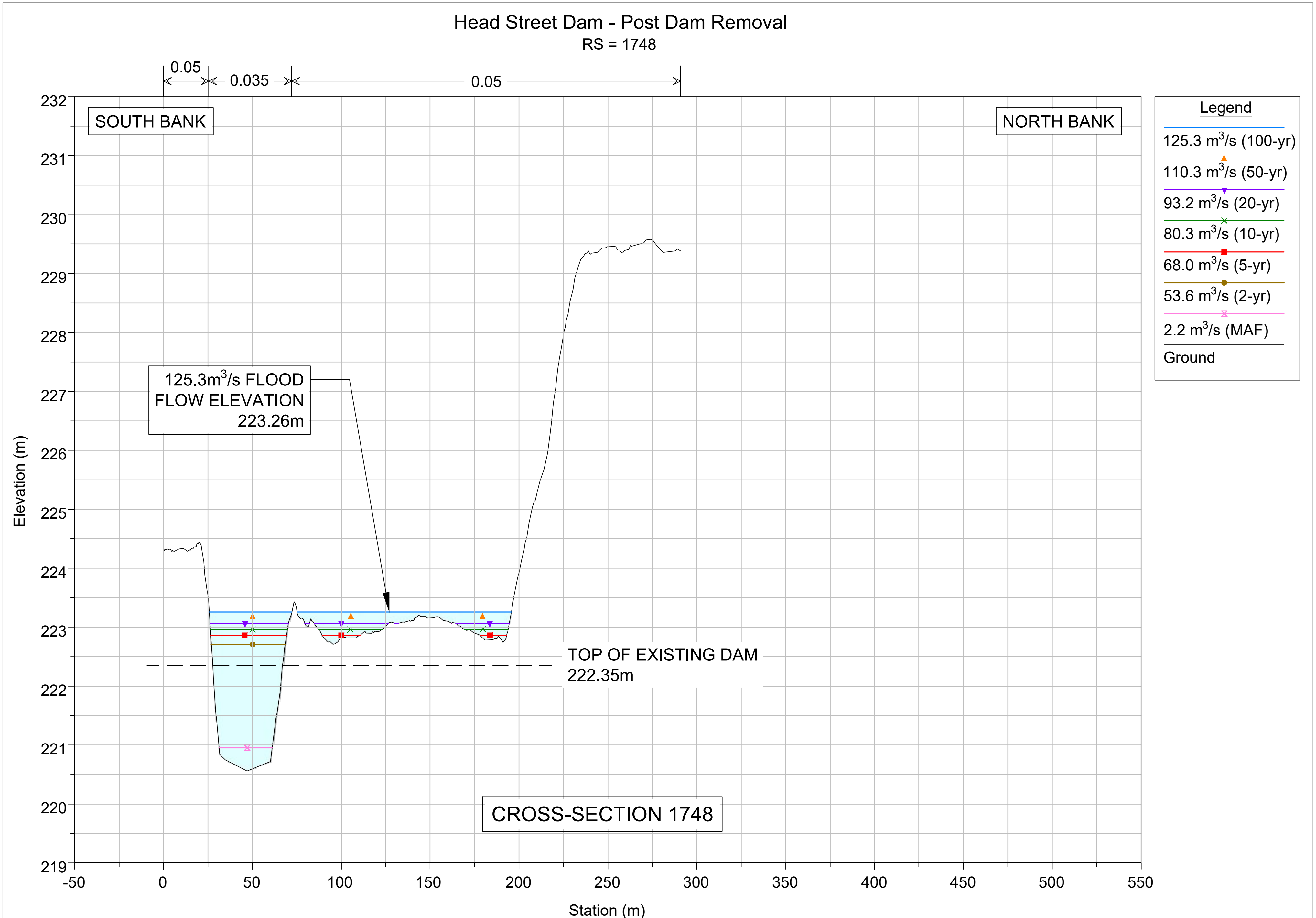


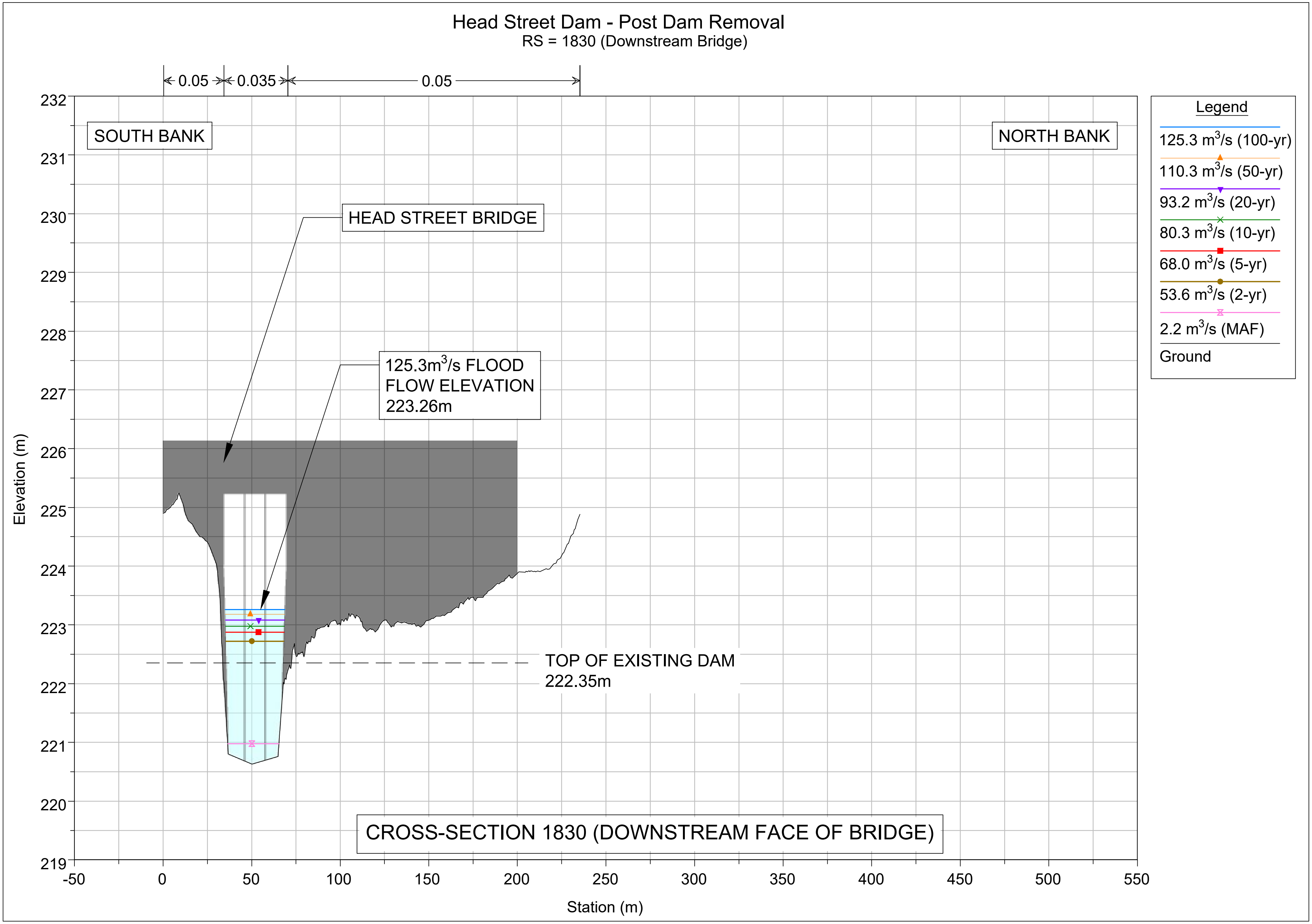
Head Street Dam - Post Dam Removal
RS = 1048
0.05
0.035
0.05
SOUTH BANK
NORTH BANK
Legend
125.3 m3/s (100-yr)
110.3 m3/s (50-yr)
93.2 m3/s (20-yr)
80.3 m3/s (10-yr)
68.0 m3/s (5-yr)
53.6 m3/s (2-yr)
2.2 m3/s (MAF)
Ground
125.3m3/s FLOOD
FLOW ELEVATION
222.84m
TOP OF EXISTING DAM
222.35m
CROSS-SECTION 1048
Elevation (m)
Station (m)
232
231
230
229
228
227
226
225
224
223
222
221
220
219
-50
0
50
100
150
200
250
300
350
400
450
500
550



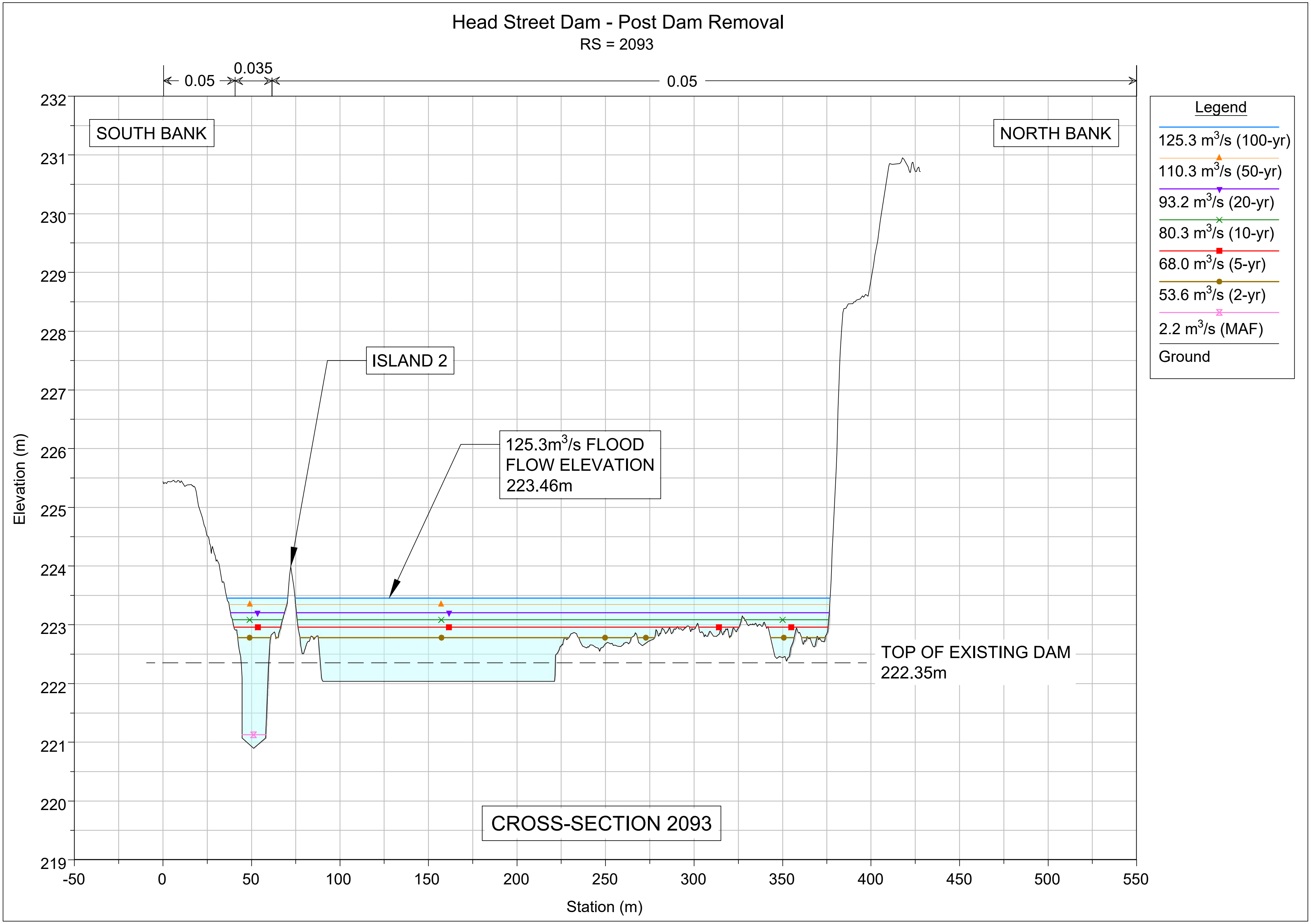
Head Street Dam - Post Dam Removal
RS = 1348
0.05
0.035
0.05
SOUTH BANK
NORTH BANK
125.3m³/s FLOOD FLOW ELEVATION 222.96m
TOP OF EXISTING DAM 222.35m
CROSS-SECTION 1348
Legend
125.3 m³/s (100-yr)
110.3 m³/s (50-yr)
93.2 m³/s (20-yr)
80.3 m³/s (10-yr)
68.0 m³/s (5-yr)
53.6 m³/s (2-yr)
2.2 m³/s (MAF)
Ground
Elevation (m)
Station (m)
232
231
230
229
228
227
226
225
224
223
222
221
220
219
-50
0
50
100
150
200
250
300
350
400
450
500
550


Head Street Dam - Post Dam Removal
RS = 1712
0.05
0.035
0.05
SOUTH BANK
NORTH BANK
125.3m³/s FLOOD FLOW ELEVATION 223.21m
TOP OF EXISTING DAM 222.35m
CROSS-SECTION 1712
Legend
125.3 m³/s (100-yr)
110.3 m³/s (50-yr)
93.2 m³/s (20-yr)
80.3 m³/s (10-yr)
68.0 m³/s (5-yr)
53.6 m³/s (2-yr)
2.2 m³/s (MAF)
Ground
Elevation (m)
Station (m)

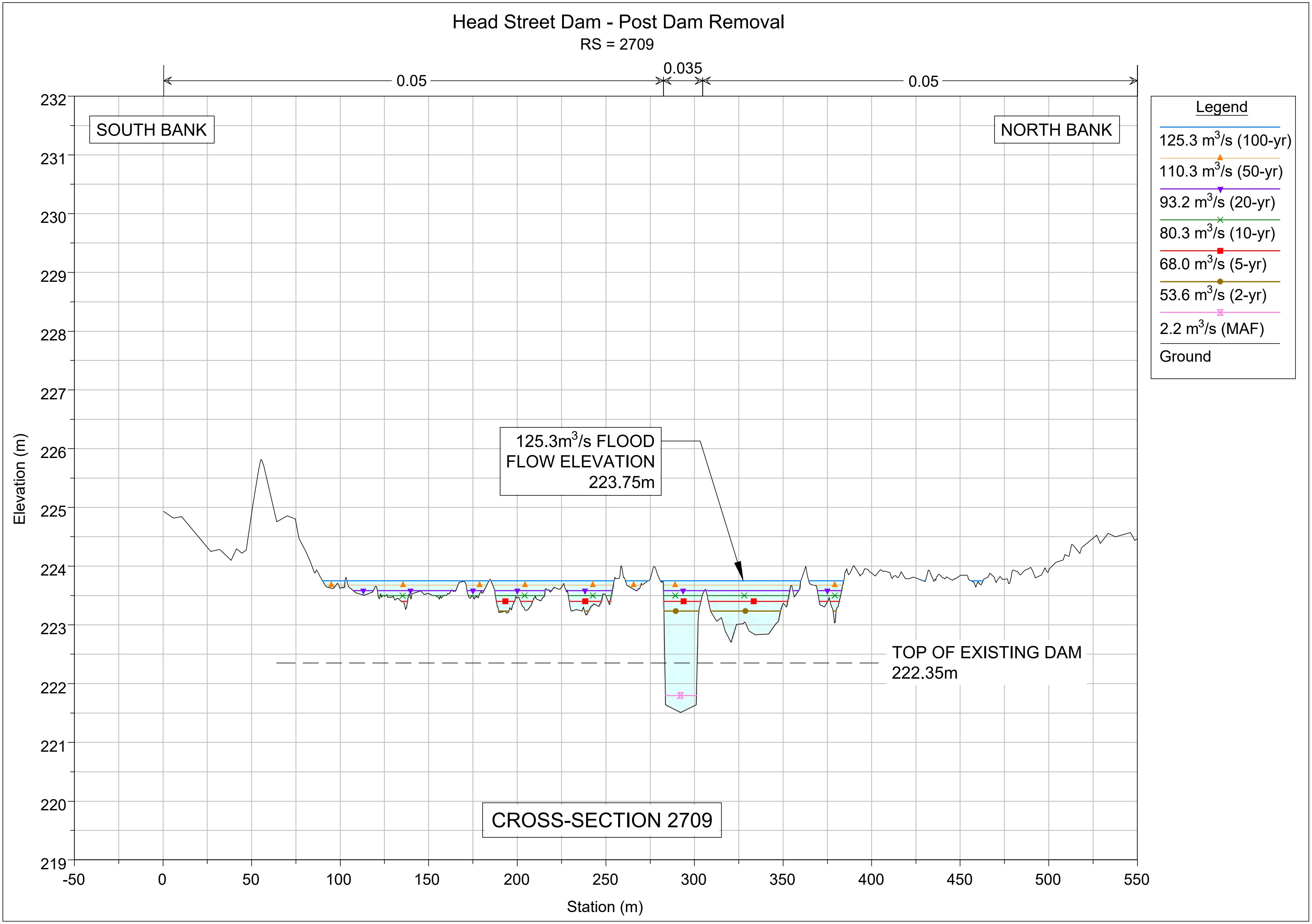

Head Street Dam - Post Dam Removal
RS = 1748
0.05
0.035
0.05
SOUTH BANK
NORTH BANK
125.3m3/s FLOOD FLOW ELEVATION 223.26m
TOP OF EXISTING DAM 222.35m
CROSS-SECTION 1748
Legend
125.3 m3/s (100-yr)
110.3 m3/s (50-yr)
93.2 m3/s (20-yr)
80.3 m3/s (10-yr)
68.0 m3/s (5-yr)
53.6 m3/s (2-yr)
2.2 m3/s (MAF)
Ground
Elevation (m)
Station (m)



Head Street Dam - Post Dam Removal
RS = 1830 (Downstream Bridge)
0.05
0.035
0.05
SOUTH BANK
NORTH BANK
HEAD STREET BRIDGE
125.3m^3/s FLOOD FLOW ELEVATION 223.26m
TOP OF EXISTING DAM 222.35m
CROSS-SECTION 1830 (DOWNSTREAM FACE OF BRIDGE)
Legend
125.3 m^3/s (100-yr)
110.3 m^3/s (50-yr)
93.2 m^3/s (20-yr)
80.3 m^3/s (10-yr)
68.0 m^3/s (5-yr)
53.6 m^3/s (2-yr)
2.2 m^3/s (MAF)
Ground
Elevation (m)
Station (m)
232
231
230
229
228
227
226
225
224
223
222
221
220
219
-50
0
50
100
150
200
250
300
350
400
450
500
550



Head Street Dam - Post Dam Removal
RS = 2093
0.05
0.035
0.05
SOUTH BANK
NORTH BANK
ISLAND 2
125.3m³/s FLOOD FLOW ELEVATION 223.46m
TOP OF EXISTING DAM 222.35m
CROSS-SECTION 2093
Legend
125.3 m³/s (100-yr)
110.3 m³/s (50-yr)
93.2 m³/s (20-yr)
80.3 m³/s (10-yr)
68.0 m³/s (5-yr)
53.6 m³/s (2-yr)
2.2 m³/s (MAF)
Ground
Elevation (m)
Station (m)
232
231
230
229
228
227
226
225
224
223
222
221
220
219
-50
0
50
100
150
200
250
300
350
400
450
500
550



Head Street Dam - Post Dam Removal
RS = 2709
0.05
0.035
0.05
SOUTH BANK
NORTH BANK
Legend
125.3 m3/s (100-yr)
110.3 m3/s (50-yr)
93.2 m3/s (20-yr)
80.3 m3/s (10-yr)
68.0 m3/s (5-yr)
53.6 m3/s (2-yr)
2.2 m3/s (MAF)
Ground
125.3m3/s FLOOD FLOW ELEVATION 223.75m
TOP OF EXISTING DAM 222.35m
CROSS-SECTION 2709
Elevation (m)
Station (m)

APPENDIX B

Flood Inundation of the Area Surrounding the Head Street Dam

KEY PLAN

LEGEND

ISL.	ISLAND
SCRCA	ST. CLAIR REGION CONSERVATION AUTHORITY
←	FLOW DIRECTION
(black line)	EDGE OF WATER (NORMAL WATER LEVEL)
(blue hatch)	100-YEAR FLOOD INUNDATION AREA (POST DAM REMOVAL)
(red line)	100-YEAR FLOOD INUNDATION BOUNDARY (PRE-DAM REMOVAL)

CAUTION: THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS, PROPERTY LINES AND OTHER UNDERGROUND AND OVERGROUND UTILITIES ARE STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES, PROPERTY LINES & STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES, PROPERTY LINES & STRUCTURES, AND SHOULD ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

DD/MM/YY	DESCRIPTION
REVISION / ISSUE	

Seal not valid unless signed and dated

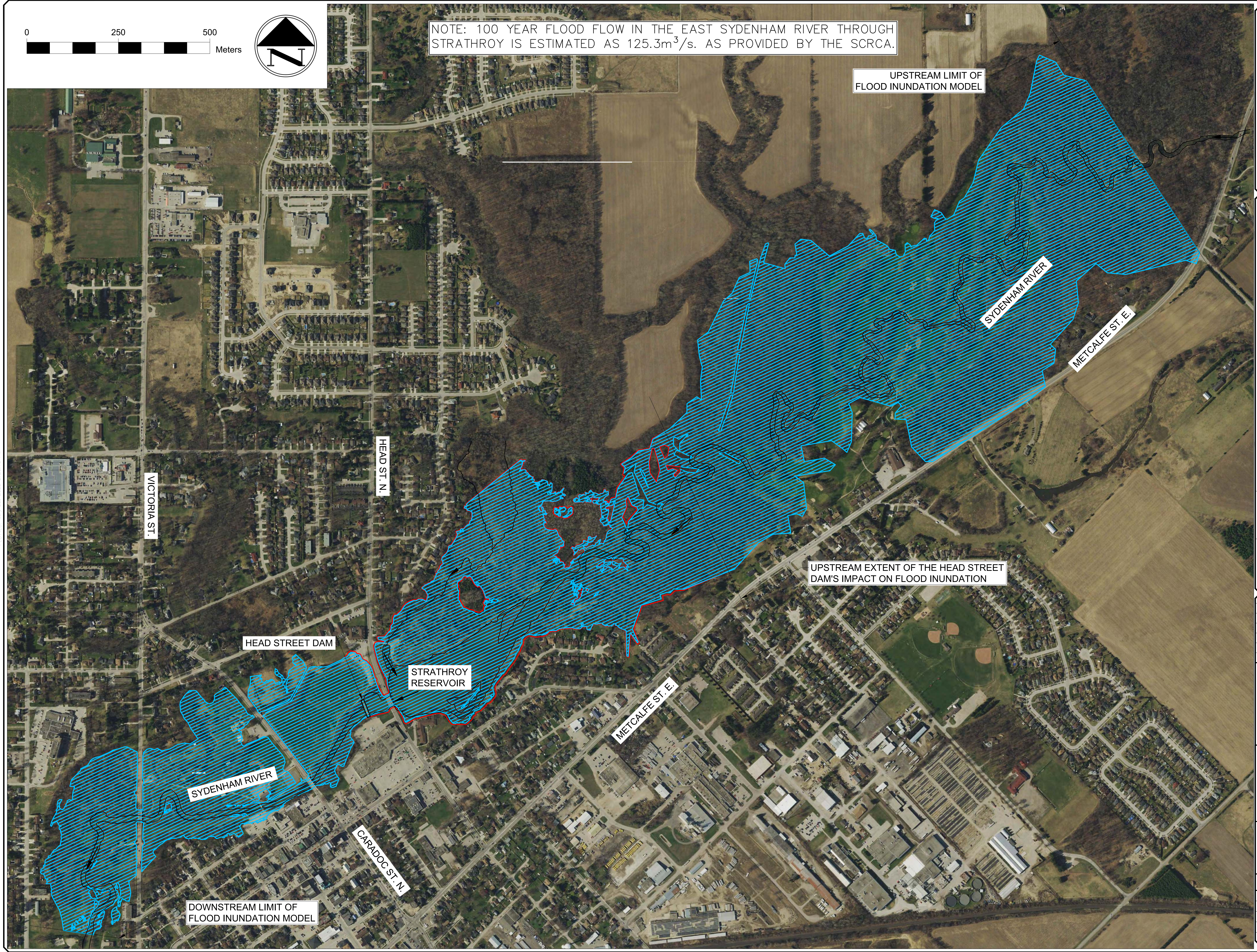
GSS ENGINEERING CONSULTANTS LTD
Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7
Telephone: (519) 372-4828

Title:
100-YEAR FLOOD INUNDATION OF THE EAST SYDENHAM RIVER THROUGH STRATHROY HEAD STREET DAM

Client: ST. CLAIR REGION CONSERVATION AUTHORITY

Design:	JTG	Scale:	AS SHOWN
Drawn:	JTB	Approved:	Design Engineer
Checked:	JTG		
Date:	JULY 2022		

Drawing No. 21118H-01



KEY PLAN

LEGEND

- FLOW DIRECTION
- EDGE OF WATER (NORMAL WATER LEVEL)
- 100–YEAR FLOOD INUNDATION AREA (POST DAM REMOVAL)
- 100–YEAR FLOOD INUNDATION BOUNDARY (PRE–DAM REMOVAL)

CAUTION: THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS, PROPERTY LINES AND OTHER UNDERGROUND AND OVERGROUND UTILITIES ARE STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES, PROPERTY LINES & STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES, PROPERTY LINES & STRUCTURES, AND SHOULD ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

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Design:	JTG	Scale:	AS SHOWN
Drawn:	JTB	Approved:	Design Engineer
Checked:	JTG		
Date:	JULY 2022		

Drawing No. 21118H–02

APPENDIX C

Water Velocity Through the Head Street Bridge

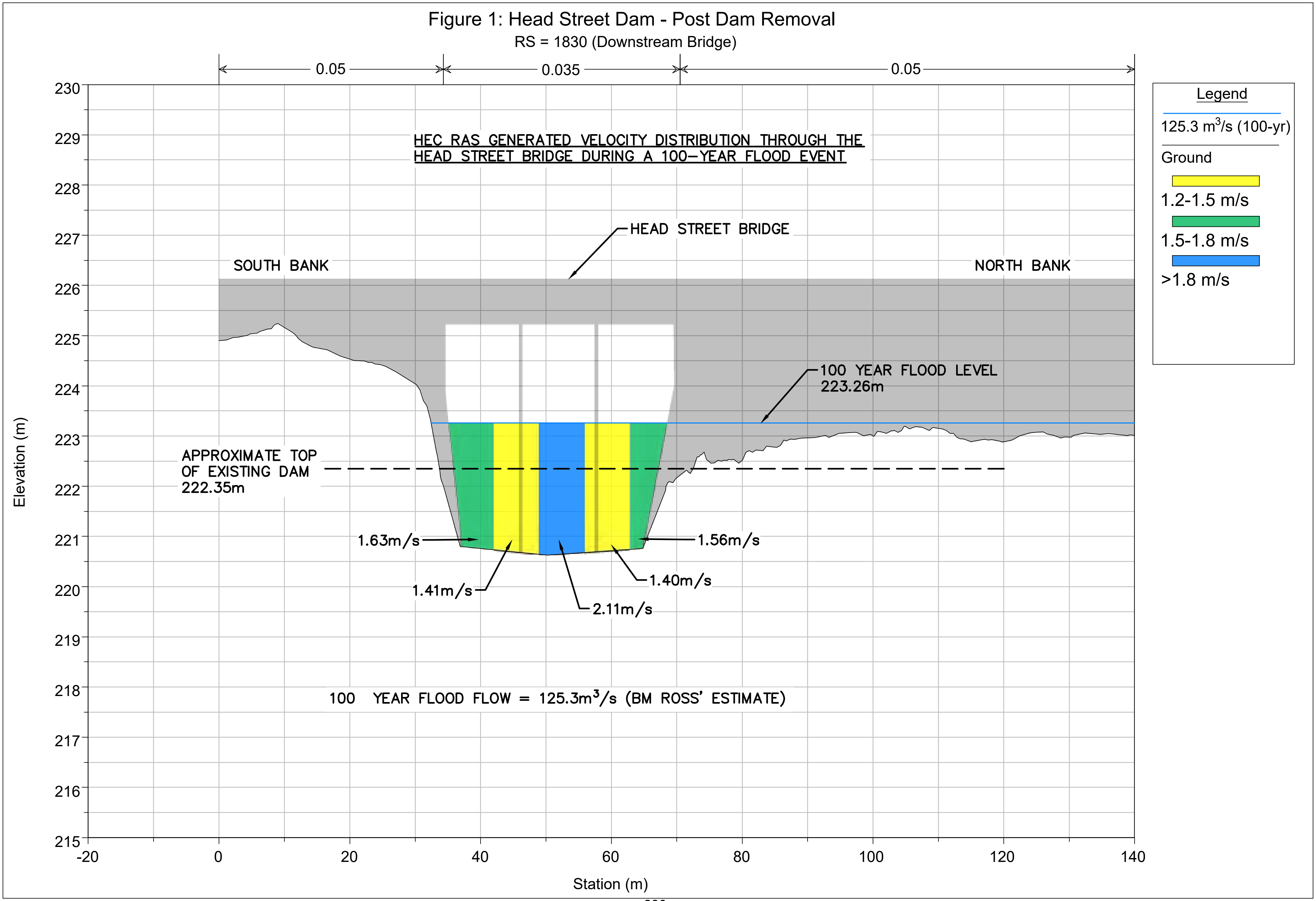


Figure 1: Head Street Dam - Post Dam Removal
RS = 1830 (Downstream Bridge)
0.05
0.035
0.05
HEC RAS GENERATED VELOCITY DISTRIBUTION THROUGH THE HEAD STREET BRIDGE DURING A 100–YEAR FLOOD EVENT
HEAD STREET BRIDGE
SOUTH BANK
NORTH BANK
100 YEAR FLOOD LEVEL 223.26m
APPROXIMATE TOP OF EXISTING DAM 222.35m
1.63m/s
1.41m/s
2.11m/s
1.40m/s
1.56m/s
100 YEAR FLOOD FLOW = 125.3m³/s (BM ROSS' ESTIMATE)
Legend
125.3 m³/s (100-yr)
Ground
1.2-1.5 m/s
1.5-1.8 m/s
>1.8 m/s
Elevation (m)
Station (m)

Figure 2: Head Street Dam - Post Dam Removal
RS = 1830 (Downstream Bridge)

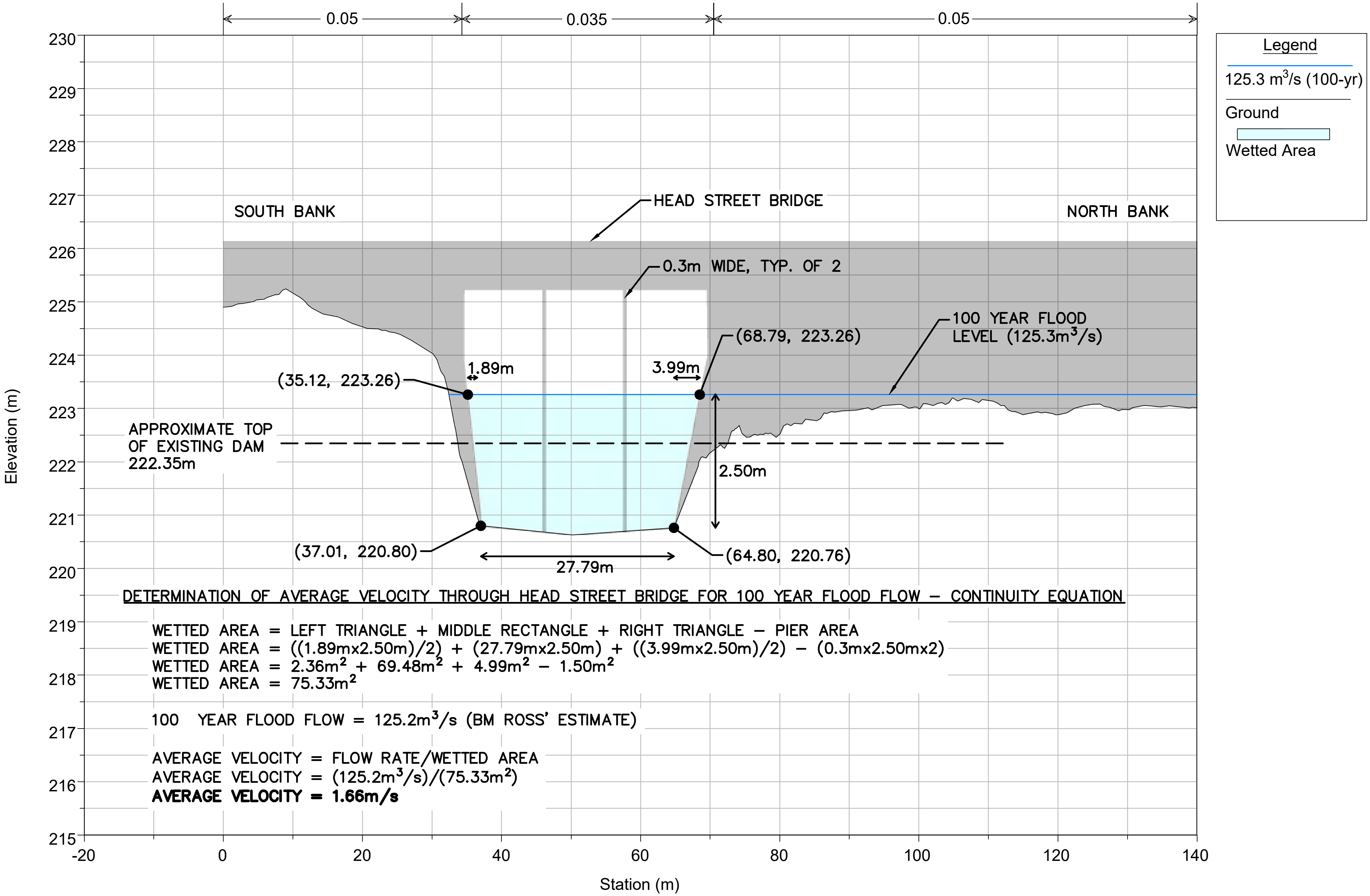


Figure 3: Head Street Dam - Post Dam Removal

RS = 1830 (Downstream Bridge)

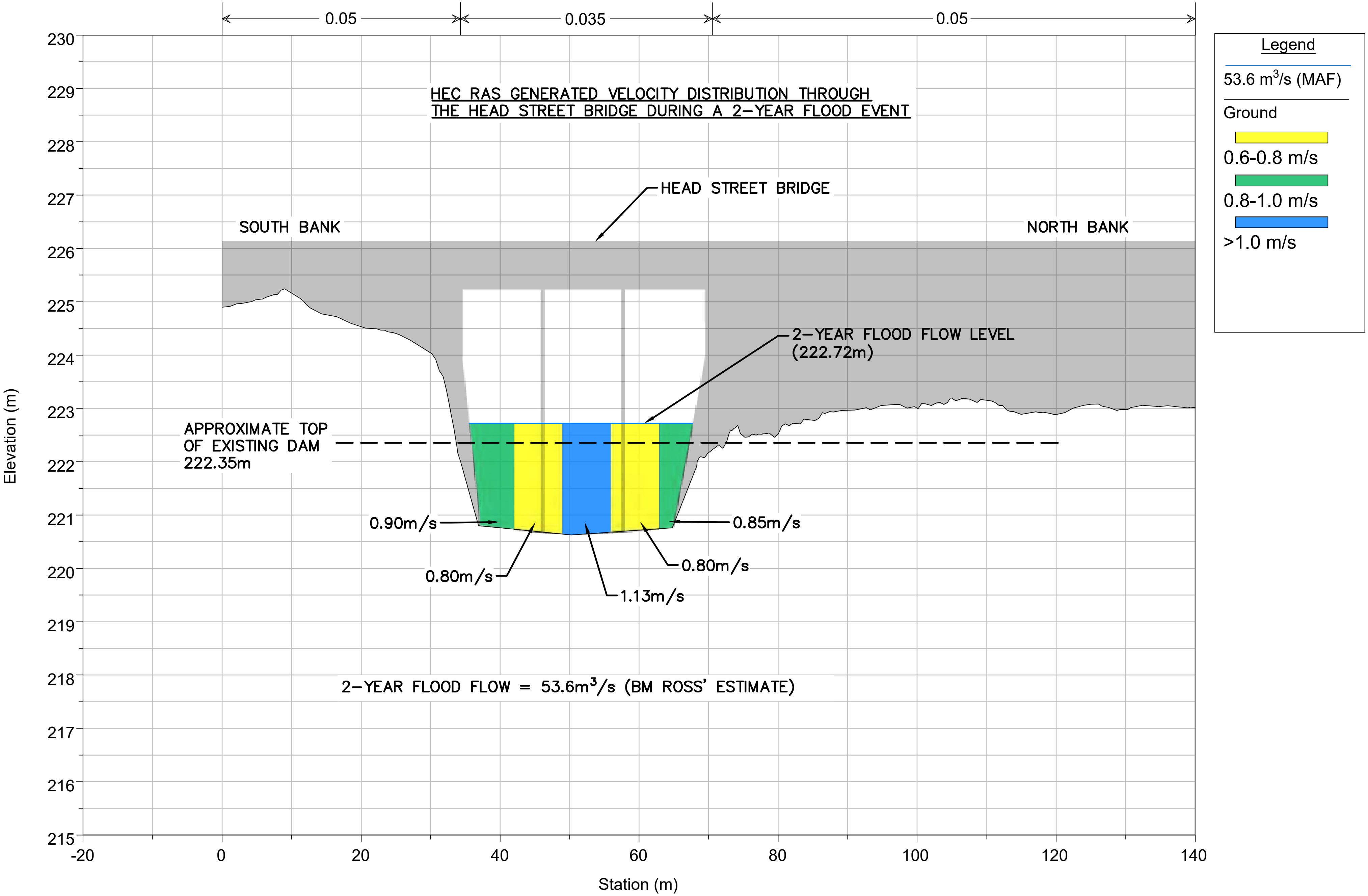
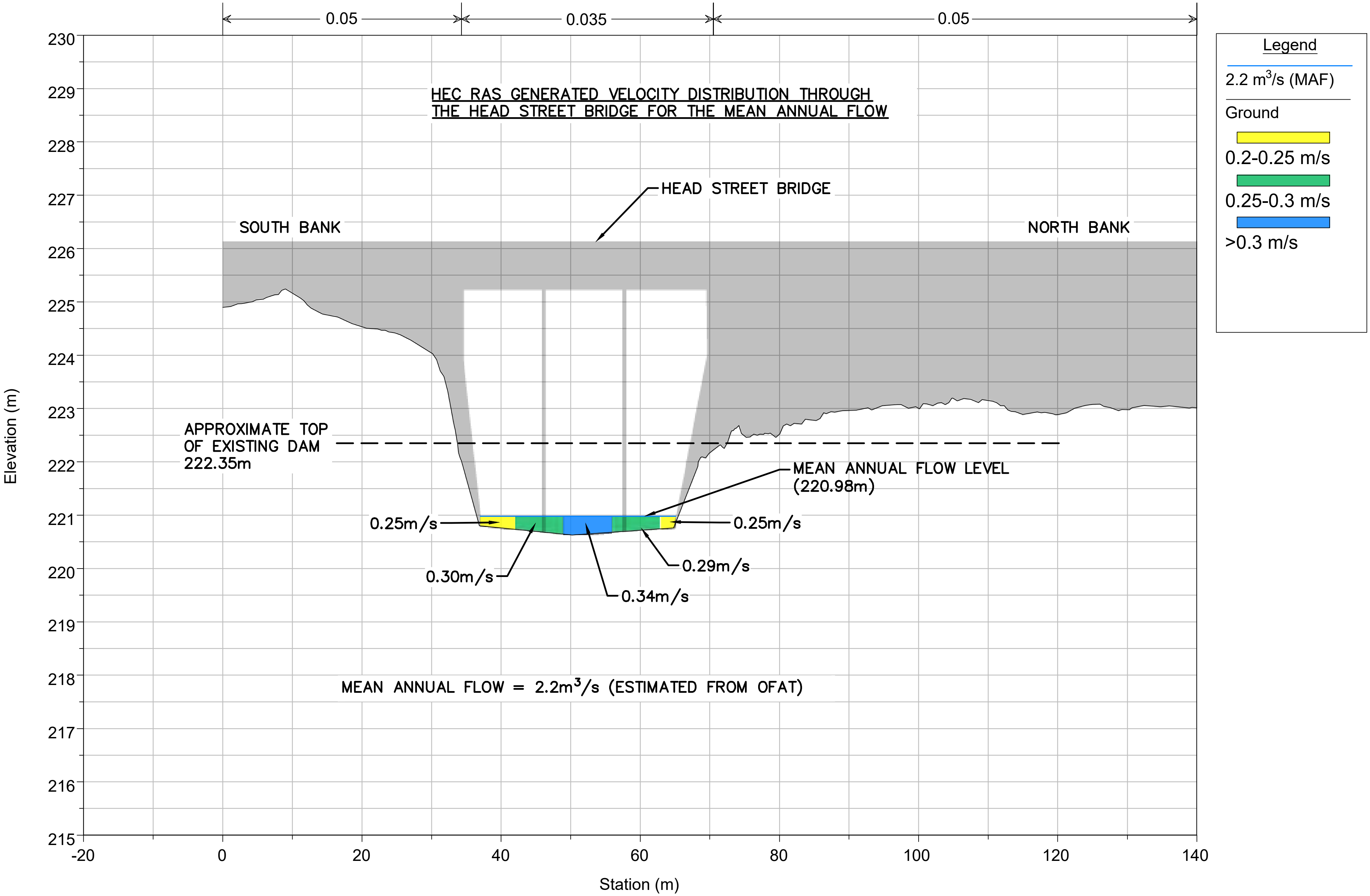


Figure 4: Head Street Dam - Post Dam Removal

RS = 1830 (Downstream Bridge)



2023

POTENTIAL REMOVAL OF THE HEAD STREET DAM IN STRATHROY, ONTARIO

PROJECT SUMMARY

ST. CLAIR REGION CONSERVATION AUTHORITY | 205 Mill pond Crescent, Strathroy, ON N7G 3P9

Background

The Head Street Dam is located approximately 70m southwest (downstream) of the Head Street bridge in Strathroy, Ontario on the east branch of the Sydenham River. Originally constructed in the 1970s, the structure is approximately 1.4m high and consists of a 45m long retaining wall of vertical sheet piles imbedded in the riverbed with large armor stone placed on the downstream side of the dam for added stability. The south end features a concrete spillway equipped with eight stop logs that allow water levels in the head pond (reservoir) to be adjusted. The purpose of the reservoir was to provide flood attenuation and recreational opportunities.

Figure 1 Head Street Dam after construction in the 1970s

Since the installation of the dam and creation of the reservoir large volumes of sediment have accumulated causing the pond to become shallower over time. This has resulted in a negative impact on recreational activities and wildlife habitat. Dams in general can further negatively impact river ecosystems by creating barriers to fish passage, impeding mussel distribution, altering thermal regimes, altering sediment transport, and degrading water quality (temperature, oxygen levels, algal growth, and bacteria levels). Local concerns have been raised about the water quality in the reservoir, specifically the algal blooms that occur.

With this change in function of the reservoir, and new information regarding the impacts of dams on freshwater systems, the St. Clair Region Conservation Authority (SCRCA) is interested in the feasibility of removing the dam and restoring the reservoir to a more natural river system. In 2003, the SCRCA hired Greck and Associates to complete an Environmental Assessment and determine viable options to deal with the accumulation of sediment. Some of the options from this report included do nothing, remove the dam partially, remove the dam with or without an offline pond or wetland feature and dam removal without dredging. In the end the decision at the time was to do nothing. More recently, the SCRCA has hired GSS Engineers Consultants Ltd. to review the current conditions of the dam and reservoir and investigate the potential removal of the dam. This report summarizes the information obtained from the report titled Potential Removal of the Head Street Dam in Strathroy, Ontario.

Ecological impacts

The International Union for Conservation of Nature has designated the Sydenham River as one
of thirteen freshwater Key Biodiversity Areas in Canada. This is due to the diversity of freshwater species supported by the Sydenham River. The Sydenham River is home to 34 mussel species and 80 fish species as well as many other semi-aquatic species such as turtles, snakes, amphibians and dragonflies. Some of these species are designated as Species at Risk and are found nowhere else in Canada or remain in only a few locations globally.

As noted in the 2018 Sydenham River Recovery Strategy (Strategy) there are a number of threats to aquatic Species at Risk that inhabit the Sydenham River. Specifically, dams are identified in the Strategy as negatively impacting aquatic habitat by:

- Causing thermal warming – based on surveys conducted by SCRCA staff over three years, temperature loggers recorded water temperature at the upstream and downstream end of the reservoir and noted on average the water temperature downstream of the reservoir was 2.6°C warmer in the summer months than upstream of the reservoir.
- Decreasing water quality – due to the low flows and shallow water within the reservoir algal blooms have increased. Algal blooms impact water quality by depleting oxygen levels and can create an unpleasant odor and safety concerns on top of being aesthetically unappealing.
- Altering sediment transport processes and sediment deposition - the head street dam prevents sediments such as sand and gravel from moving downstream, this sediment is necessary for some wildlife and their various life stages.
- Barrier to fish migration and mussel distribution – the head street dam limits the ability of fish to move freely through the Sydenham River and access a wide variety of habitat types. Additionally, by limiting the ability of fish to move the distribution of mussels are also impacted as many mussels rely on fish hosts to move their young upstream.

Removal of the Head Street dam would eliminate an identified threat to aquatic species at risk and their habitat and life stages. However, removal of the dam can also negatively impact aquatic species and their habitats if the sediment, specifically the silt, in the reservoir is not managed effectively. Silt, unlike sand and gravel, can negatively impact species downstream by increasing turbidity and making it difficult for species to fulfill their life cycle requirement. Silt can also smother and suffocate sedentary species like mussels or fish eggs. With the amount of silt that has accumulated behind the Head Street Dam, additional study is recommended to determine silt transport rates and the affected downstream area if the decision is made to remove the dam and allow sediment to naturally migrate downstream.

Overall, removal of the dam should have a net benefit to river ecology. Dam removal should improve aquatic habitat for aquatic species at risk by restoring natural sediment transport and supply downstream of the dam, by reducing the thermal impact to the river caused by the dam reservoir and by restoring full fish passage. The dam removal options that include allowing the sediment to naturally wash down the river, if considered, should be carefully discussed in advance with regulatory authorities including the Department of Fisheries and Oceans, and the provincial MNRF and MECP. It is likely critical that all these agencies, and perhaps others, come to agreement early in the planning process as to the preferred means to deal with the large volume of sediment stored in the reservoir.

Existing Conditions and Sediment Analysis

Based on the GSS report, the Head Street dam appears to be in good condition overall. The reservoir is approximately 6.2 ha in size and relatively shallow with a maximum depth of approximately 1.2m. In 1989 a portion of the reservoir was dredged to remove some of the accumulated sediment in order to improve recreational opportunities. Since this time, sediment has further accumulated, and it is predicted that water depths will become shallower especially near the bridge.

Surveys completed in the spring of 2022 summarized the various water depths over the sediment ranged from 0.15m to 1.2m with a typical depth of water over sediment being 0.5-0.9m. Depths were greater toward the Head Street dam confirming that this area is still slowly accumulating sediment. The sediment depth ranged from less than 0.5m around the edges of the pond to over 2m depth in certain areas, more typically, sediment depths of 1.5m or more cover much of the reservoir.

The current volume of sediment in the reservoir, is estimated to be over 66,000 cubic meters, which leads to an estimated sediment accumulation rate between 800m^3/year to 1,300m^3/year based on the current average water depth of 0.7m. If this accumulation rate continues, it is projected that the reservoir could be completely full of sediment by

2058.

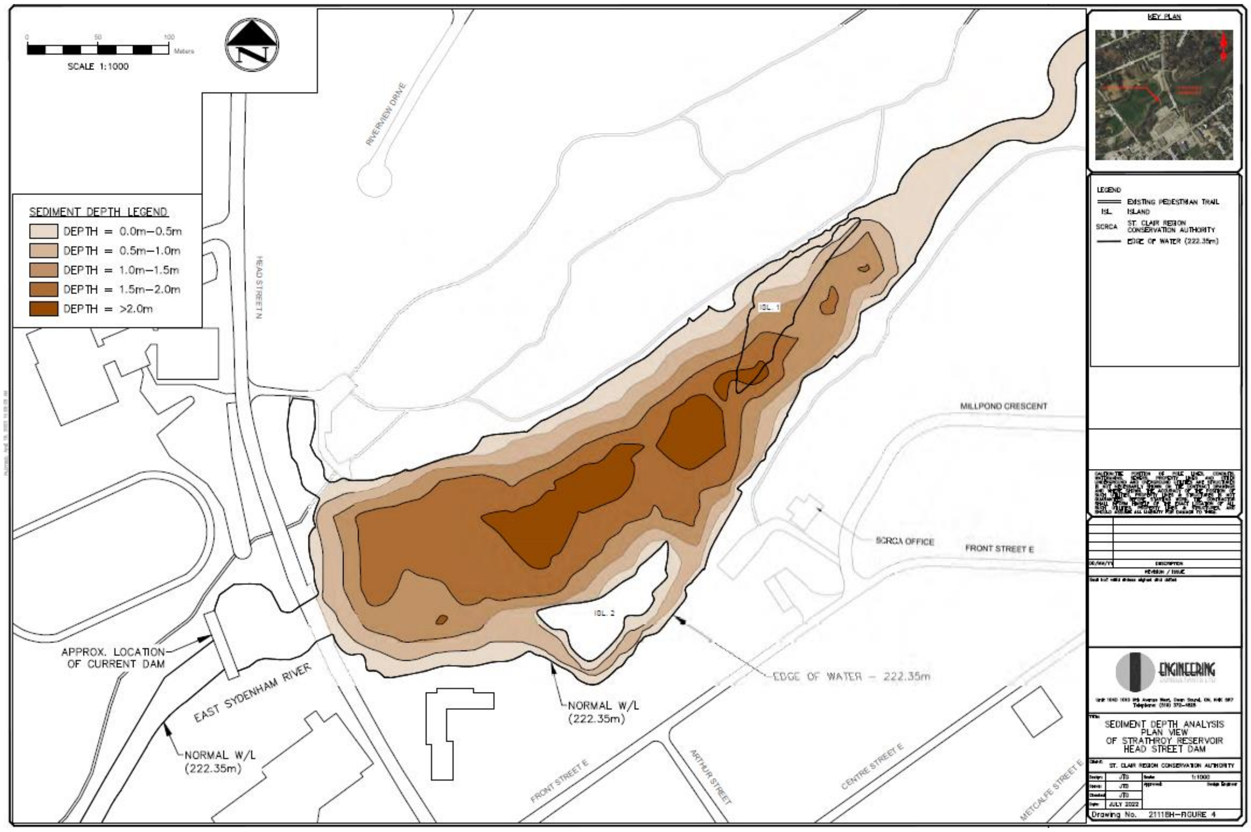


Figure 2 Sediment Depth Analysis for the Strathroy Reservoir

Sediment samples were also collected for analysis to determine if any contaminants are present in the system. Results of the analysis indicate that the sediment quality in the Head Street dam reservoir is free of contaminants other than a few locations where elevated levels of phosphorus were detected. Although these levels were elevated, they were still below the sediment quality standard for phosphorus set by the Ministry of Environment Conservation and Parks.

A study prepared by GEO Morphix in January 2023 reviewed the potential effects of sediment release and channel formation following the removal of the dam. This study concludes that the new channel that forms in the reservoir (after dam removal) could form significant meander belts with widths ranging from 80m to 190m. These widths approach or exceed the current width of the reservoir. The channel width and depth that could form through the sediment deposition area is estimated to have a width of 16 m and a depth of 1.61 m. However, this depth is from final water level to final channel bottom and does not include the height of riverbanks (i.e. remaining sediment) above the final water level at normal river flow rates.

Based on the current sediment conditions in the reservoir it is estimated that an approximate volume of 48,000 cubic meters of sediment would be released from the reservoir if the entirety of the dam were removed. This is 73% of the total estimated volume of sediment currently in the reservoir. It is not known the rate of transport of the

released sediment and further evaluation of sediment management options would be required.
It is noted that new regulations in Ontario govern the movement of excess fill and earth material (*Excess Soil Regulation O. Reg. 406/19*). Therefore, if excavation or dredging sediment from the reservoir is proposed additional samples of sediment may be required for analysis of a wider range of parameters to meet the requirements of the regulation.

Based on current conditions, and without further studies, the following conclusions have been presented by GSS Engineers Consultants for sediment management:

1. As per the GSS Engineering and Geo Morphix reports it does not appear practical to dredge or excavate the sediment from the reservoir before the dam is removed.
2. Slow release of reservoir sediment over three years (by stepped removal of the dam
   over three years) would likely pose less risks to the downstream channel condition than if the dam was completely removed in one work season.
3. Further modelling is recommended of sediment transport downstream of the dam site if a decision was made in principle to remove the dam without significant sediment being first removed from the reservoir.

Flood and Erosion Analysis

The floodplain of the Sydenham River specifically in the Strathroy area is relatively wide. The GSS report looked at what impacts the dam removal would have on flooding and sediment transport.

Using a HEC RAS model developed by GSS Engineering a 5.9km stretch of the East Sydenham River, upstream and downstream of the Head Street dam, was used to estimate return flood flows calculated for the 100-year flood event down to the 2-year flood event. The model also estimates the area which will become flooded under current conditions (dam in place) and after dam removal.

The modelling shows no difference between the 100-year inundated flood area before and after dam removal for the river downstream of the dam. Upstream of the dam, modelling shows the inundated flood area is slightly less after the dam is removed. Figure 3 below depicts the flood boundary for the pre-dam removal (in red) and for the post dam removal (in blue). In areas upstream and downstream of the dam that only depict a blue line (post dam removal), the blue line is overlapping the red line. This Indicates the flood boundary for pre and post dam removal are the same in this area, and therefore the dam has no affect on flooding. The model results predict there would be no significant change in flooding conditions for the 100-year flood event if the dam was removed. The modelling however, does not take into account the effects of sediment release from the reservoir downstream if the dam were removed.

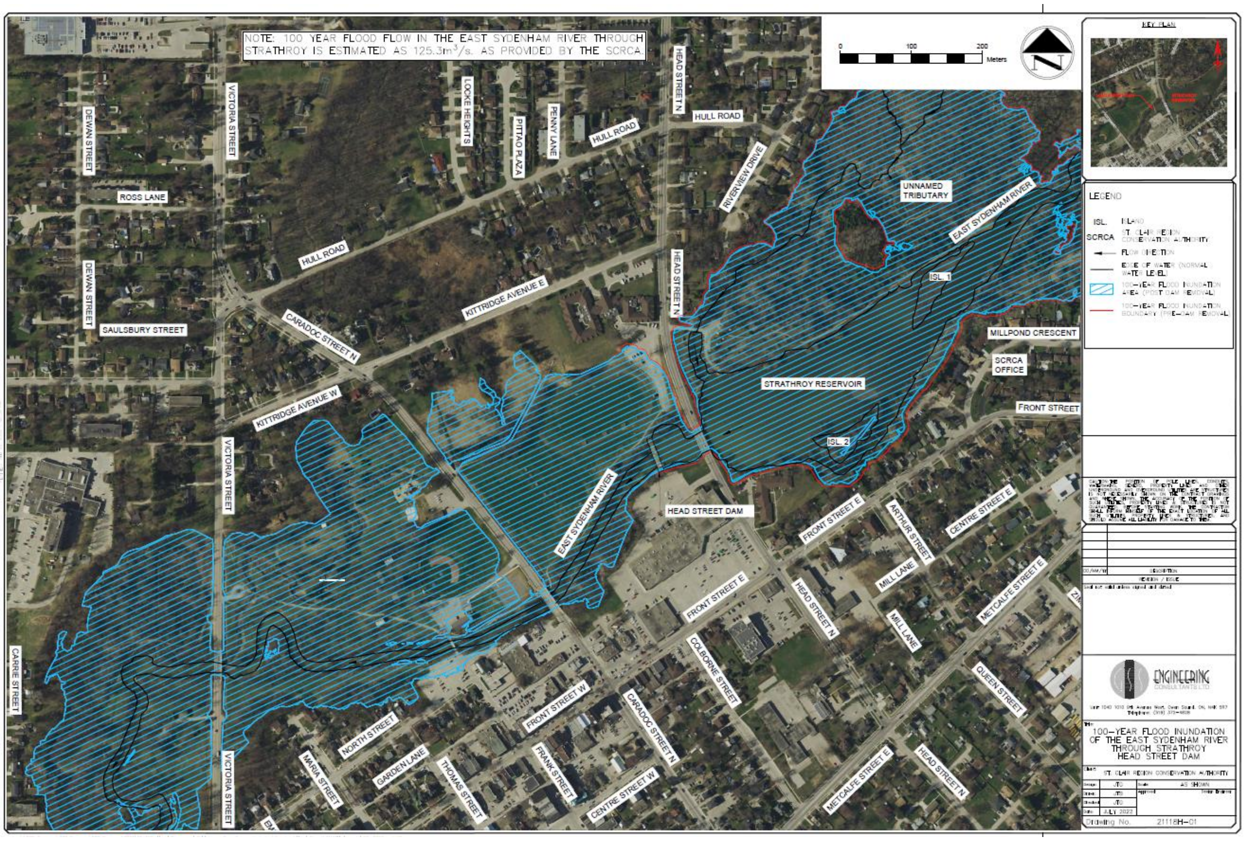


Figure 3 100-year Flood Inundation of the East Sydenham River through Strathroy

Stability of the Head Street Bridge if the Head Street Dam is Removed

A major concern brought forward from the potential removal of the Head Street dam is the impact that the higher velocities from a river system may have on the Head Street bridge. The concern being that these higher velocities may cause erosion of the riverbed along the bridge abutments and around the central support piers. Upon investigation the Head Street bridge was constructed at some point in the 1960's. This timeframe is prior to the installation of the dam. It is assumed the bridge design accounted for the flood flow conditions and accompanying river flow velocities that existed prior to the dam construction. Using the HEC RAS model previously mentioned, which was used to model flood flow elevations upstream and downstream of the Head Street dam, the modelling was also used to estimate flood velocities under the Head Street bridge if the dam was removed in the future.

Hydraulic analysis of water velocities under the Head Street bridge were completed for the 100-year flood event, the 2-year flood event and the mean annual stream flow. Through this analysis it was determined that the water velocities under the bridge, even at 100-year flood flows, are relatively low (average 1.62m/s) and unlikely to cause any scour of the river bottom, along the edge of the bridge abutments, or around the center

support piers. The HEC RAS model also predicts the water levels under the bridge after the dam is removed and during the 100-year flood flow will be like current water levels with the dam in place. Similar water levels indicates that the cross-sectional flow will be unchanged and the average water velocity for the 100-year flood flow will be unchanged for pre and post dam removal conditions.
As a precaution, it is recommended that a layer of 12” to 16” diameter stone be placed on the river bottom under the bridge and up the banks to the 100-year flood high water mark to further protect the bridge and riverbed from scour.

Methods of Dam Removal and Sediment Management Strategies

If a decision is made to remove the Head Street dam, there are several methods for removing a dam to consider, they are as follows:

1. Full removal of the dam in one summer work period.
2. Gradual removal of the dam over two or more seasons where stop logs are removed in the first year followed by full removal of the dam in the second year or full removal of the dam over several subsequent years.
3. Partial removal of the dam where enough of a dam is removed to achieve environmental goals (i.e. restore fish passage and reduce summertime heating of stream water temperatures) but retain some of the dam to retain sediment storage capacity or to provide some other social or economic benefit by retaining some level of ponding behind the remaining portion of the dam

For this study, only full removal of the dam is considered in the removal options presented by GSS Engineering Consultants.

To manage the sediment within the reservoir the following options have been presented by GSS Engineering Consultants:

1. Prior to dam removal, remove the sediment from the reservoir by use of a hydraulic dredge. This requires a floating dredge system that pumps a large volume of sediment mixed with water to a receiving basin that would allow the sediment fraction to settle and the clear “decant” water to return to the river.
2. As part of the dam removal process, construct a large bypass channel or pipeline around the reservoir and dam and discharge the river flow below the dam site. Once the stream bypass is established, mechanically remove reservoir sediment “in the dry” using large excavation equipment and dump trucks etc.
3. Remove dam all or in stages and allow river flow to transport the sediment in the reservoir downstream naturally.

Table 5 provides a summary of five general dam removal options including sediment management strategies for each option. This includes the option to “do nothing” (leave dam in place).

For all options proposing dam removal (Options 1, 2, 3 and 4), the dam removal component of the overall project appears to be relatively straight forward as the dam structure is relatively low and easily accessible from the north side. Capital costs to remove the dam only (i.e. without sediment management costs) are estimated to range from $300,000 to $800,000.

Table 6 provides an overall preliminary cost estimate for the five different dam removal options. Option 2, where the reservoir upstream of the dam is first drained, is estimated to be the lowest cost of dam removal with the highest cost being Option 3 where the dam is removed in steps over several years with water remaining in the reservoir while the dam is removed.

Much higher costs are assigned to active sediment management for Options 1 and 2 where the sediment is removed first by dredging or mechanical excavation before the dam is removed. Such active sediment management costs are estimated to cost at least $4,000,000 to $6,000,000 in addition to dam removal costs. As discussed in the next sections these active sediment management costs are also seen to have extreme technical challenges and potentially high social impacts.

GSS ENGINEERING CONSULTANTS LTD

TABLE 6
Sediment Management and Dam Removal Options
Potential Removal of the Head Street Dam

January 15, 2023 21-118

Sediment Management and Dam Removal Options	Economic Considerations	Technical Obstacles	Social Impacts	Environmental Impacts	Regulatory Concerns
Option 1: **Dredging of sediment with water in head pond followed by complete dam removal.**	• Very expensive sediment management option as very large volume of sediment/ water mixture will be produced. • Dam removal will be relatively inexpensive.	• Onsite sediment dewatering required. Very large settling pond likely required. • Ultimate sediment disposal requirements could be difficult. • Equipment mobilization, operation and demobilization required.	• Large area required for sediment dewatering in current park area. Major impact to park users.	• Aquatic species (fish, turtles, etc.) in the head pond may be entrained in the dredged sediment.	• Regulations regarding sediment disposal on off-site lands are now quite stringent.
Option 2: **Temporary bypass of river around dam. Excavate sediment "in the dry" and complete dam removal.**	• Expensive sediment management option. • Temporary bypass pipe or channel around head pond will be expensive to construct. • Least expensive dam removal option.	• Construction of bypass pipe or new channel around the reservoir could be very difficult to design and locate. • Ultimate sediment disposal requirements could be difficult. • Excavating wet sediment with equipment within pond footprint likely difficult.	• Bypass pipe or channel could be a safety hazard until dam and sediments are removed. • Large area of deep, soft sediment could be a danger to pedestrians.	• As head pond level lowers, aquatic species may become trapped in the drying up reservoir.	• Regulations regarding sediment disposal on off-site lands are now quite stringent.
Option 3: **Remove dam in phases over ± 3 years. Allows slow release of sediment over 3 years.**	• More expensive dam removal option than Option 4. • No significant cost for sediment management.	• Maintaining structural integrity of dam is required over ± 3 year process. • The long timeline to remove dam may be difficult contractually.	• Current reservoir area could be a safety hazard for multiple years due to large areas of deep, soft sediment.	• Sediment is released downstream at a relatively high rate. • Sydenham River downstream of dam will become turbid following each step of dam removal due to entrained sediment.	• LIRA (MNRF) permitting may be complicated due to partial removal of dam in steps. • Regulators may not allow the periodic release of large volumes of sediment.
Option 4: **One time removal of complete dam. Allow one time release of sediment.**	• Relatively inexpensive dam removal option. • No significant cost for sediment management.	• Water velocity management required to allow head pond to drain slowly.	• Current reservoir area could be a safety hazard for one or two years due to large areas of deep, soft sediment.	• Very large amount of sediment will be transported downstream in a relatively short timeframe. • Sydenham River downstream of dam will become turbid due to entrained sediment.	• Regulators may not allow the sudden release of large volumes of sediment.
Option 5: **Do nothing.**	• No immediate cost. • Potential for increased maintenance costs as the dam deteriorates.	• Dam may need to be structurally reinforced in the future.	• As the dam deteriorates it will eventually become safety hazard.	• The dam obstructs fish migration. • The dam deprives aquatic species (including SAR) downstream of dam of required sediment.	• As the dam's structural integrity degrades over time, regulators may be concerned with public safety and dam failure.

January 19, 2023 21-118

TABLE 7
Sediment Management and Dam Removal Options - Preliminary Cost Estimate
Potential Removal of the Head Street Dam

Sediment Management and Dam Removal Options	Capital Cost Estimate for Dam Removal	Capital Cost Estimate for Sediment Removal	Total Capital Cost Estimate	Comments
Option 1: **Dredging of sediment with water in head pond followed by complete dam removal.**	$500,000 to $700,000	> $5,000,000 Need to construct very large sediment/dewatering lagoon on north side of head pond.	> $5,500,000 to $5,700,000	Cost to design, approve and construct very large sediment/dewatering pond very difficult to estimate. Would also be final restoration costs of dewatering pond once sediment dries.
Option 2: **Temporary bypass of river around dam. Excavate sediment "in the dry" and complete dam removal.**	$300,000 to $500,000	> $9,000,000 Cost to build large bypass channel or large bypass pipe around north side of head pond - and pass water under Head Street - would be extremely high.	> $9,300,000 to $9,500,000	Technically very difficult. The bypass channel/pipeline likely would need to be very large to accommodate a reasonably large flow, i.e. potentially the 2-year flood flow rate of 54 m^3/s. Creating new bridge/culvert, etc. under Head Street for new channel or pipeline would be extremely difficult and expensive.
Option 3: **Remove dam in phases over ± 3 years. Allows slow release of sediment over 3 years.**	$800,000	Essentially zero cost for active sediment management as sediment would slowly wash downstream. Assume $300,000 for bioengineering stabilization of emerging stream banks.	$1,100,000	Second lowest overall cost. Agreement from all review agencies (DFO, MECP, MNRF and SCRCA) required in advance to allow downstream sediment release from head pond.
Option 4: **One time removal of complete dam. Allow one time release of sediment.**	$500,000 to $700,000	Essentially zero cost for active sediment management as sediment would wash downstream. Assume $300,000 for bioengineering stabilization of emerging stream banks.	$800,000 to $1,000,000	Lowest overall cost. Agreement from all review agencies (DFO, MECP, MNRF and SCRCA) required in advance to allow downstream sediment release from head pond.
Option 5: **Do nothing.**	Theoretically zero cost. However, ultimately, dam will reach end of service life and need to be repaired, rebuilt or removed.	No cost.	Theoretically zero.	Volume of sediment in head pond will continue to increase over time. With inflation and extra sediment, future costs for dam removal will increase compared to current costs.

Note: Capital costs do not include consultation, engineering or permitting costs.

Summary of Options and Costs

As per the options and estimated costs presented in Table 6 and Table 7, there appears to be very significant cost and technical challenges to complete Option 1 or Option 2. Both options would deal proactively with the sediments to prevent sediment in the reservoir from being naturally transported downstream. However, the technical and environmental challenges, and the capital and engineering costs of Option 1 and 2, would appear beyond the reach of the project. As such, the recommendation of GSS Engineering Consultants Ltd is that Option 1 and Option 2 are not considered feasible at this time and that Option 3 and 4 be considered further for removal of the Head Street dam.

Potential Removal of Head Street Dam Next-Steps

The Figure 4 provides a general outline of the next steps for the potential removal of the Head Street Dam in the form of a flow chart. The flow chart follows the steps including selection of preferred removal and sediment management method, consultation with review agencies, recommended additional studies, engineering of dam removal, tendering the project, removal of the dam, and finishing with the rehabilitation of the former reservoir. Emphasis is placed on communication with review agencies. If the dam is to be removed, it is very important that all appropriate review agencies (MNRF, MECP, DFO, Indigenous groups) are consulted to determine the preferred dam removal and sediment management option. If passive sediment management is the preferred option, it is important that all review agencies are aware of the effects this will have on the East Sydenham River (increased turbidity and siltation downstream of the dam).

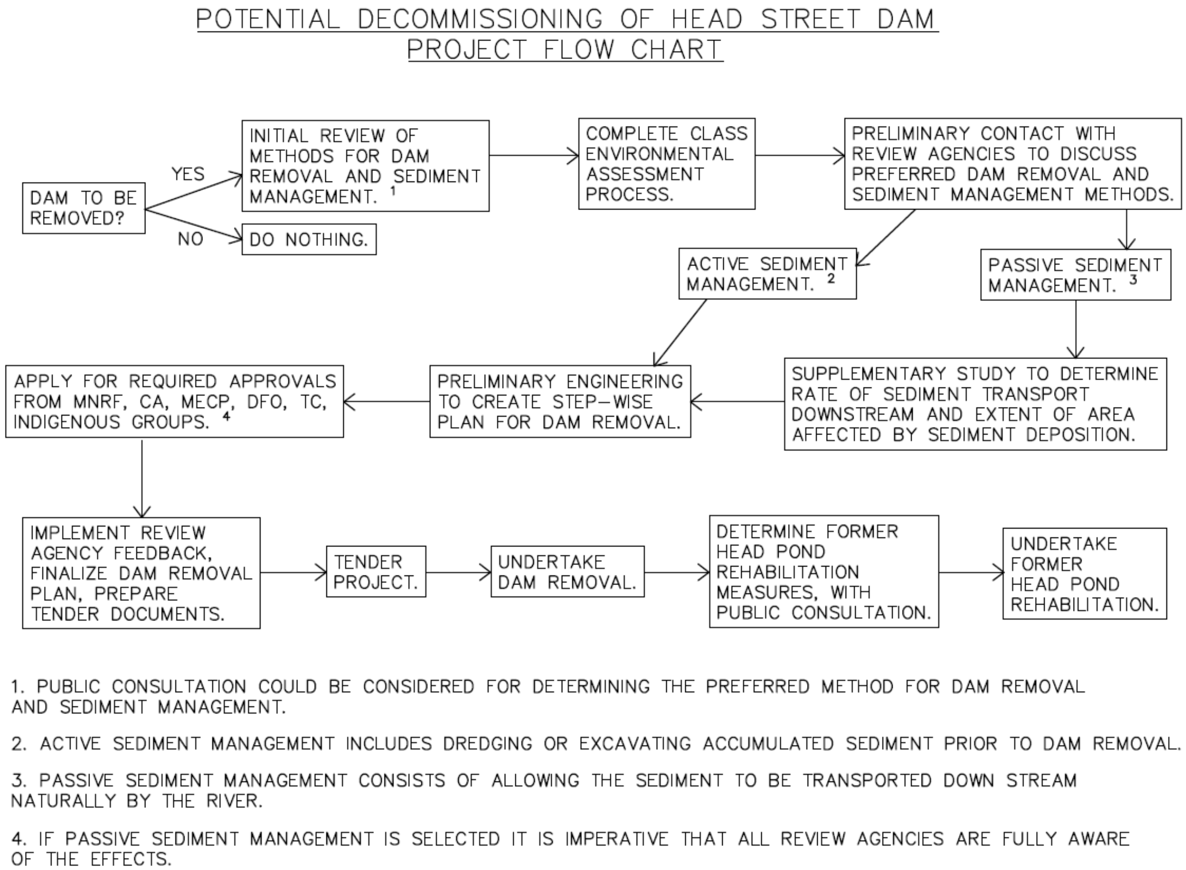


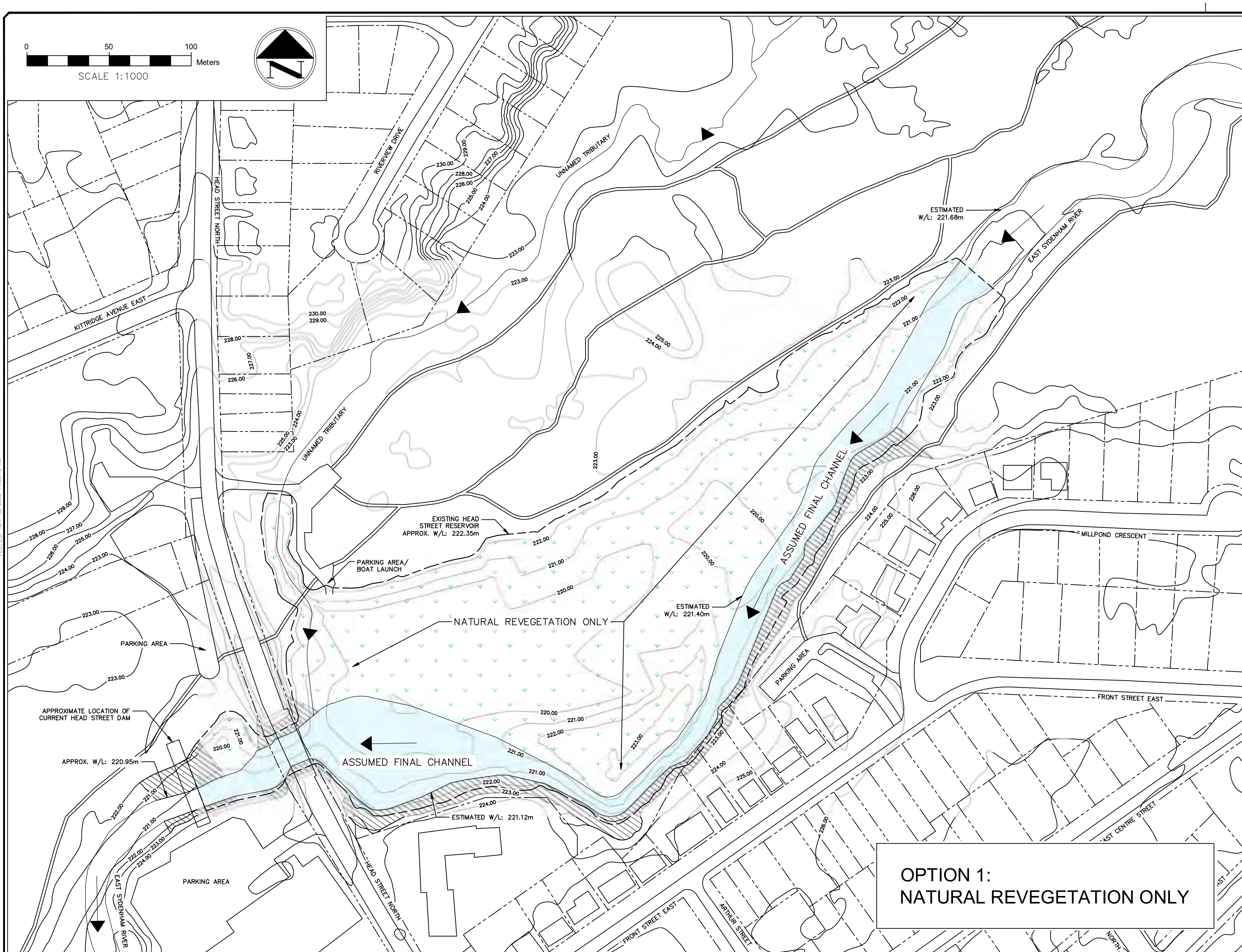
Figure 4 Next Steps for Potential Decommissioning of Head Street Dam Project

Restoration of the Reservoir

The Head Street dam reservoir has an area of approximately 6.2ha. This large area provides an opportunity for a range of rehabilitation options if ever the dam is considered for removal. Four options have been presented by GSS Engineering Consultants, based on feedback from the SCRCA and relatively low costs for construction and maintenance. The following figures provide a conceptual option for restoration of this area if the dam was removed and include options for creating passive recreational use and improving natural wildlife habitats all while incurring minimal maintenance costs.

All the rehabilitation options depict areas in which erosion control may be required. These areas include the shores of the dam, under the Head Street Bridge, and along the south shoreline as this is the estimated path of the river through the reservoir. If the final river path is different then that depicted on the restoration drawings, the areas requiring erosion control should be altered accordingly.

It is likely unrealistic for a dam removal strategy to be implemented that proactively removes the accumulated sediment in the Head Street reservoir. Therefore, it is assumed that if the dam is removed the accumulated sediment will be left to be naturally transported downstream over time. As the river meanders through the empty reservoir in search of its final channel path, much of the sediment will be transported and this will alter the topography of the former reservoir area. As such it is recommended that any major rehabilitation efforts in the reservoir take place only after the river has found it's final path and the topography is relatively constant. This may take 5-10 years. Until the river has created a final path, the large plain of drying sediment and meandering river may be dangerous for human use. Therefore, it is recommended that human use of the former reservoir is discouraged until rehabilitation is fully completed.



OPTION 1:
NATURAL REVEGETATION ONLY

KEY PLAN

LEGEND

- EDGE OF EXISTING HEAD POND
- PROPERTY LINE
- EXISTING TRAIL
- ASSUMED FUTURE CHANNEL IN THE EXISTING HEAD POND
- PROPOSED NATURALLY RE-VEGETATED AREA
- PROPOSED PLANTED TREES AT HIGHER ELEVATIONS
- PROPOSED PLANTED WET TOLERANT SHRUBS AT LOWER ELEVATIONS
- PROPOSED TRAIL
- PROPOSED WATER FEATURE (POND/WETLAND)
- OVERFLOW CULVERT FROM WATER FEATURE TO RIVER
- *AREA FOR POTENTIAL EROSION CONTROL
- 223.00 **CONTOURS (1.00m)

*AREAS FOR POTENTIAL EROSION CONTROL ARE BASED ON THE ASSUMED FINAL CHANNEL PATH. THE ACTUAL AREAS REQUIRING EROSION CONTROL SHOULD BE SELECTED BASED ON THE ACTUAL FINAL CHANNEL PATH.

**ELEVATION CONTOURS IN THE RESERVOIR REPRESENT THE HARD BOTTOM AND ASSUME THE ACCUMULATED SEDIMENT IS REMOVED.

CAUTION: THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS, PROPERTY LINES AND OTHER UNDERGROUND AND OVERGROUND UTILITIES ARE STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES, PROPERTY LINES & STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES, PROPERTY LINES & STRUCTURES, AND SHOULD ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

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	REVISION / ISSUE

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GSS ENGINEERING CONSULTANTS LTD

Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7
Telephone: (519) 372-4828

Title:
OPTION 1
HEAD POND RESTORATION
HEAD STREET DAM

Client: ST. CLAIR REGION CONSERVATION AUTHORITY

Design:	JTG	Scale:	AS SHOWN
Drawn:	JTB	Approved:	Design Engineer
Checked:	JTG		
Date:	JAN 2023		
Drawing No.	21118H–FIGURE 6		

PLOTTED: April 18, 2023 11:36:10 AM

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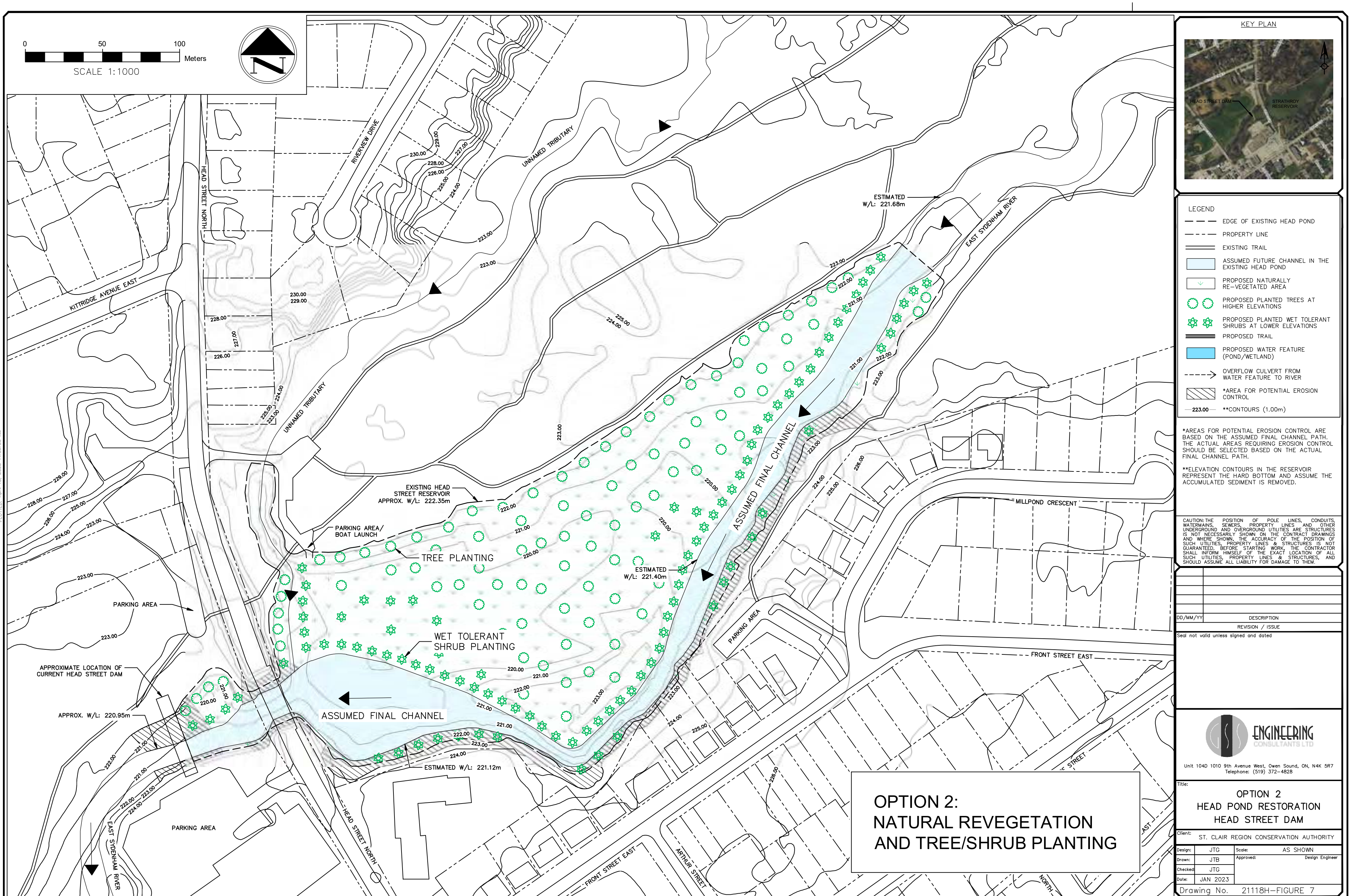

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KEY PLAN
HEAD STREET DAM
STRATHROY RESERVOIR
LEGEND
EDGE OF EXISTING HEAD POND
PROPERTY LINE
EXISTING TRAIL
ASSUMED FUTURE CHANNEL IN THE EXISTING HEAD POND
PROPOSED NATURALLY RE-VEGETATED AREA
PROPOSED PLANTED TREES AT HIGHER ELEVATIONS
PROPOSED PLANTED WET TOLERANT SHRUBS AT LOWER ELEVATIONS
PROPOSED TRAIL
PROPOSED WATER FEATURE (POND/WETLAND)
OVERFLOW CULVERT FROM WATER FEATURE TO RIVER
*AREA FOR POTENTIAL EROSION CONTROL
223.00 **CONTOURS (1.00m)
*AREAS FOR POTENTIAL EROSION CONTROL ARE BASED ON THE ASSUMED FINAL CHANNEL PATH. THE ACTUAL AREAS REQUIRING EROSION CONTROL SHOULD BE SELECTED BASED ON THE ACTUAL FINAL CHANNEL PATH.
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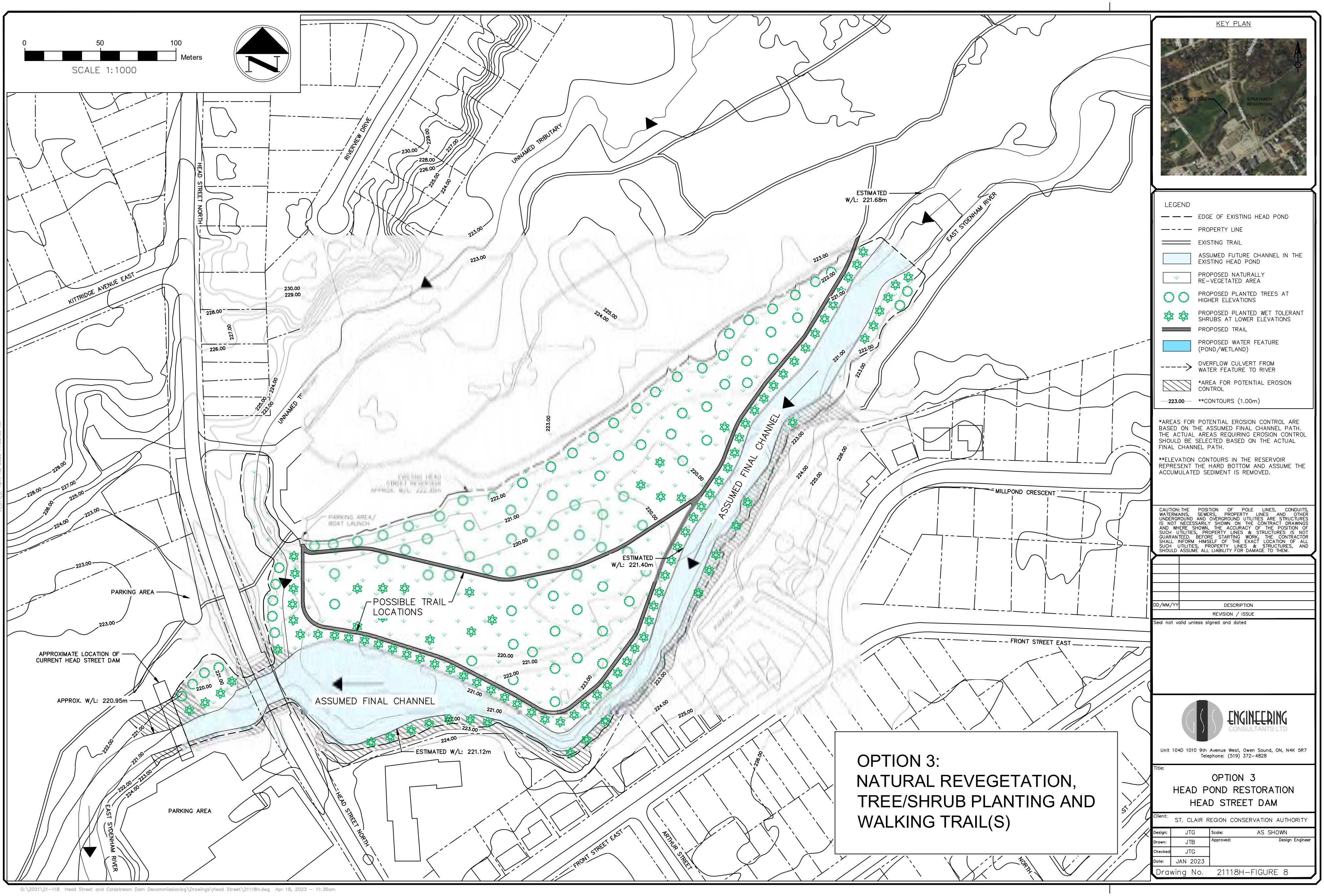
ENGINEERING CONSULTANTS LTD
Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7
Telephone: (519) 372-4828
Title:
OPTION 2
HEAD POND RESTORATION
HEAD STREET DAM
Client: ST. CLAIR REGION CONSERVATION AUTHORITY
Design: JTG
Drawn: JTB
Checked: JTG
Date: JAN 2023
Scale: AS SHOWN
Approved: Design Engineer
Drawing No. 21118H-FIGURE 7
OPTION 2:
NATURAL REVEGETATION
AND TREE/SHRUB PLANTING
RIVERVIEW DRIVE
UNNAMED TRIBUTARY
HEAD STREET NORTH
KITTRIDGE AVENUE EAST
EAST SYDENHAM RIVER
MILLPOND CRESCENT
FRONT STREET EAST
ARTHUR STREET
ESTIMATED W/L: 221.68m
EXISTING HEAD STREET RESERVOIR APPROX. W/L: 222.35m
PARKING AREA/ BOAT LAUNCH
TREE PLANTING
WET TOLERANT SHRUB PLANTING
ASSUMED FINAL CHANNEL
ESTIMATED W/L: 221.40m
ESTIMATED W/L: 221.12m
PARKING AREA
APPROXIMATE LOCATION OF CURRENT HEAD STREET DAM
APPROX. W/L: 220.95m



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KEY PLAN
HEAD STREET DAM
STRATHROY RESERVOIR
LEGEND
EDGE OF EXISTING HEAD POND
PROPERTY LINE
EXISTING TRAIL
ASSUMED FUTURE CHANNEL IN THE EXISTING HEAD POND
PROPOSED NATURALLY RE-VEGETATED AREA
PROPOSED PLANTED TREES AT HIGHER ELEVATIONS
PROPOSED PLANTED WET TOLERANT SHRUBS AT LOWER ELEVATIONS
PROPOSED TRAIL
PROPOSED WATER FEATURE (POND/WETLAND)
OVERFLOW CULVERT FROM WATER FEATURE TO RIVER
*AREA FOR POTENTIAL EROSION CONTROL
223.00 **CONTOURS (1.00m)
*AREAS FOR POTENTIAL EROSION CONTROL ARE BASED ON THE ASSUMED FINAL CHANNEL PATH. THE ACTUAL AREAS REQUIRING EROSION CONTROL SHOULD BE SELECTED BASED ON THE ACTUAL FINAL CHANNEL PATH.
**ELEVATION CONTOURS IN THE RESERVOIR REPRESENT THE HARD BOTTOM AND ASSUME THE ACCUMULATED SEDIMENT IS REMOVED.
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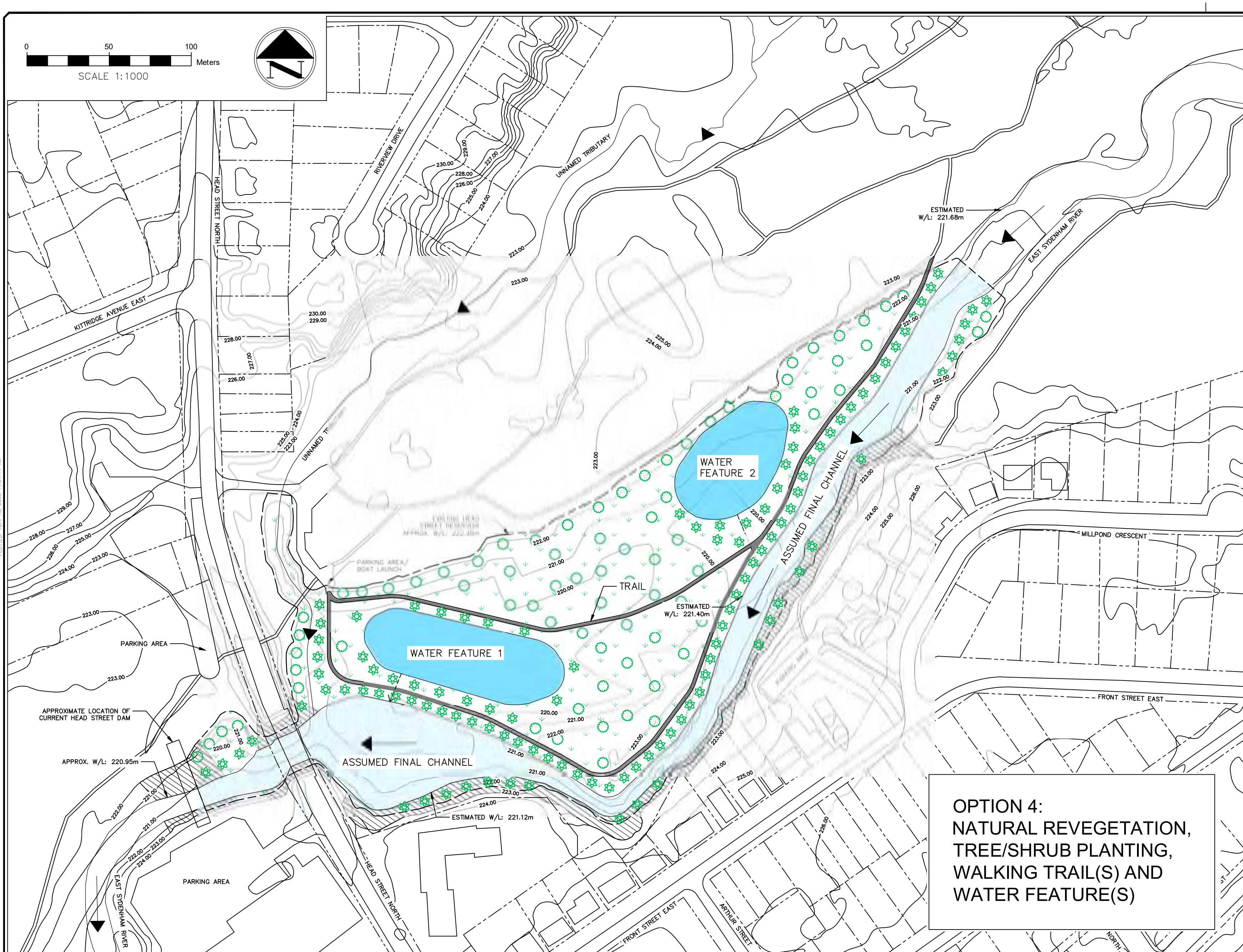
ENGINEERING
CONSULTANTS LTD
Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7
Telephone: (519) 372-4828
Title:
OPTION 3
HEAD POND RESTORATION
HEAD STREET DAM
Client: ST. CLAIR REGION CONSERVATION AUTHORITY
Design: JTG
Drawn: JTB
Checked: JTG
Date: JAN 2023
Scale: AS SHOWN
Approved: Design Engineer
Drawing No. 21118H-FIGURE 8
OPTION 3:
NATURAL REVEGETATION,
TREE/SHRUB PLANTING AND
WALKING TRAIL(S)
RIVERVIEW DRIVE
UNNAMED TRIBUTARY
KITTRIDGE AVENUE EAST
HEAD STREET NORTH
EAST SYDENHAM RIVER
MILLPOND CRESCENT
FRONT STREET EAST
ARTHUR STREET
ESTIMATED W/L: 221.68m
ESTIMATED W/L: 221.40m
ESTIMATED W/L: 221.12m
APPROX. W/L: 220.95m
APPROXIMATE LOCATION OF CURRENT HEAD STREET DAM
PARKING AREA
POSSIBLE TRAIL LOCATIONS
ASSUMED FINAL CHANNEL
ASSUMED FINAL CHANNEL



KEY PLAN

LEGEND

- EDGE OF EXISTING HEAD POND
- PROPERTY LINE
- EXISTING TRAIL
- ASSUMED FUTURE CHANNEL IN THE EXISTING HEAD POND
- PROPOSED NATURALLY RE-VEGETATED AREA
- PROPOSED PLANTED TREES AT HIGHER ELEVATIONS
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GSS ENGINEERING CONSULTANTS LTD

Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7
Telephone: (519) 372-4828

Title:
OPTION 4
HEAD POND RESTORATION
HEAD STREET DAM

Client: ST. CLAIR REGION CONSERVATION AUTHORITY

Design:	JTG	Scale:	AS SHOWN
Drawn:	JTB	Approved:	Design Engineer
Checked:	JTG		
Date:	JAN 2023		
Drawing No.	21118H–FIGURE 9		

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Additional potential restoration features include:

Wildlife habitat in the form of grasslands or pollinator meadows can be created to promote diversity.

Reforestation of the area with native plantings of trees and shrubs can be an effective way to restore the property.

Water features such as shallow wetland areas or ephemeral pools for amphibians and deeper ponds to support fish communities can be located adjacent to the new channel location and enhance habitat in this area; these types of features would be constructed offline and would not be directly linked to the new channel.

Viewing platforms or towers can be installed at various location for wildlife observations.

Trails complete with sitting areas may be created or enhancements made to the existing trail system to promote physical activity and highlight the restoration features of the property.

Additional recreational amenities such as picnic areas and water access points for canoes/kayaks that are linked to the new trail system may be integrated into the property.

To improve fish habitat conditions, a variety of in channel features may be considered to enhance the restoration including step pools, spawning/gravel beds, vortex weirs and woody overhead cover.

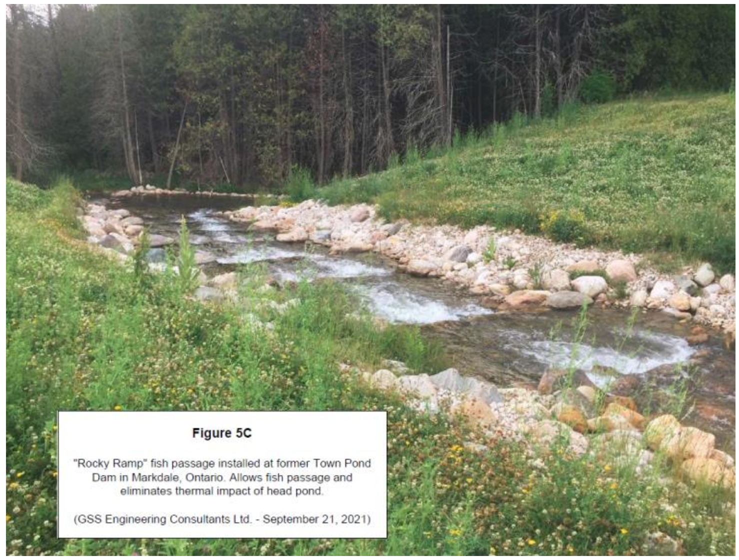

Figure 5C

"Rocky Ramp" fish passage installed at former Town Pond Dam in Markdale, Ontario. Allows fish passage and eliminates thermal impact of head pond.

(GSS Engineering Consultants Ltd. - September 21, 2021)

Meeting Date: April 18, 2024 **Item 7.6**

Report Date: March 19, 2024

Submitted by: Greg Wilcox

Subject: Highland Glen Conservation Area Reserve Funds

Recommendation:

That the Board of Directors acknowledges this report, dated March 19, 2024 on the Highland Glen Conservation Area Reserve, and further, direct staff to use the remaining Highland Glen Reserve funding to complete identified risk mitigation measures by prioritizing projects that provide the greatest risk reduction with the available funds.

Background:

Ownership of the Highland Glen Conservation Area was transferred to the Town of Plympton-Wyoming in December of 2023. Currently, SCRCA has a reserve fund of $16,196 for Highland Glen CA. Reserve funds were accumulated prior to 2023. During this time, SCRCA classified the property as a Regional CA. Regional Conservation Areas were financially supported by all Municipal partners through general levy.

Recommendations:

Through the Authority's risk management program, several risks have been identified on Authority lands. Staff recommend that the remaining Highland Glen reserve, which was funded through general levy, be used to support the following identified mitigation measures. Due to limited funding, not all of the following measures will be completed in 2024.

1. Installation of five post & chain barricades at parking and trail entrances to enable closure of properties/trails during flood events. Staff have identified publicly accessible areas that are prone to flooding/high flows. Being able to respond quickly to close these areas will reduce the risk to members of the public.
   Estimated Cost: $2100

2. Acquisition of 10 temporary barricades for closing trails during flooding and during trail maintenance.
   Estimated Cost: $1200

3. Installation of railings on two small bridges located at Strathroy CA. Fabricate and weld posts to the bridge I-beams and install wood handrails and balusters. Replace old plywood decking that is delaminating and creating a trip hazard. Adding railings to existing bridges was identified by our insurer.
   Estimated Cost: $7500 (for two bridges)

4. New I-beam bridge with railings at Strathroy CA. The existing I-beams are undersized creating significant bounce on the bridge. The existing bridge has no railings.
   Estimated Cost: $10,500

5. Fabricate and install 3 guardrails on concrete bridge abutments at Coldstream CA. The existing concrete abutment walls have approximately a 3-5 foot drop to the river with no guardrail.
   Estimated Cost: $7600

6. Installation of 4 solar powered post lights at portable washroom locations within A.W. Campbell Conservation Area. There is no existing lighting at these locations, risk assessment has identified this is a potential trip hazard for visitors.
   Estimated Cost: $5000

7. New I-beam bridge with railings at AW Campbell CA on south trail loop. Existing bridge was removed in March 2024. The bridge was aging, in poor condition, and struck/damaged by a tree in the 2023 summer windstorm.
   Estimated Cost: $ Unknown at this time

8. Upgrade campground pool winter tarps to safety covers.
   Cost Estimate: $5000

9. Numerous signage improvements were identified throughout all Conservation Areas. Common signs requirements include “Dog on Leash”, “Multi-use Roads/Trails”, “Deep Water”, and improved trail mapping.
   Cost Estimate: $8000

10. Acquiring a second AED for Warwick Conservation Area. An AED is currently located on the east side of the CA (East of Warwick Village Rd). Many campsites are located west of Warwick Village Rd. and if an AED were required the time to bring the AED from its current location would be impractical.
    Cost Estimate: $1800

Financial Impact:

The $16,196 would be combined with available budget, grants and donations to achieve as many improvements as possible. Staff will prioritize mitigations based on maximizing risk reduction with the available funds.

St. Clair Conservation

Meeting Date: April 18, 2024 **Item 7.7**
Report Date: March 25, 2024
Submitted by: Chunning Li

Subject: Audit Services for 2024 - 2028

Recommendation:

That the Board of Directors accepts the provided quote and appoints MNP Chartered Professional Accountants as the auditor for 2024 – 2028.

Background:

Every 5 years the St. Clair Region Conservation Authority sends out Request For Quotes (RFQ) for the year end auditing services. SCRCA sent the RFQ on February 7, 2024 to 4 accounting firms within the watershed with a response date of March 15, 2024. We received 1 quote back from MNP as outlined below:

St. Clair Region Conservation Authority					
	2024	2025	2026	2027	2028
Professional Fee	$20,000	$21,100	$22,200	$23,400	$24,600
Admin Fee	$1,000	$1,055	$1,110	$1,170	$1,230
Total Invoice Excl. HST	$21,000	$22,155	$23,310	$24,570	$25,830

This is a large increase compared to the current audit fees, the main reasons for which are:

1. Due to the amount and complexity of accounts and the new auditing standards, the annual professional fee time incurred has been significantly higher than MNP had initially estimated when it proposed on the 2019 to 2023 period. It has incurred substantially low recovery rates in the previous 5-year audits, and it increases the proposed fees to be more consistent with other Non-Profit-Organization (NPO) clients.

2. High inflation rates from 2022 onwards have had a significant impact on its business, just like all other businesses, and it has to increase professional fee rates in order to keep up with rising payroll and operating costs internally.

Staff reviewed last RFQ for 2019 to 2023 year-ends and analyzed the proposed fees, and negotiated with MNP to get a special discount compared with its regular discount to NPO clients. This special discount saves us $22,000 in 5 years and is reflected in the above proposed fees. Staff recommends accepting MNP quote.

St. Clair Conservation

Meeting Date: April 18, 2024 **Item 7.8**
Report Date: March 26, 2024
Submitted by: Chunning Li

Subject: Amendment of Purchasing Policy

Recommendation:

That the Board approves the amendment of the purchasing limits and authorization in Purchasing Policy as recommended in this report.

Background:

Current purchasing policy was originally established in 2015 and most purchasing limits and authorization haven't been updated since then. The inflation and market conditions have changed significantly, especially after the 2019 COVID-19 pandemic, and current thresholds are impeding day to day business operations.

Staff have analyzed our operation needs and reviewed purchasing policies from other Conservation Authorities who have updated their policies in the past 3 years and are willing to share. Based on this review and the operation and control objectives of the policy, staff recommends the following amendments, outlined in Table 1.

Table 1: Proposed amendments to the Purchasing Policy		
Purchasing limits		
Current	**Proposed**	**Other change**
$1,500 - $2,500	$1,500 - $5,000	change "3 verbal or written quotes should be secured" to "3 verbal or written quotes should be secured, where feasible"
$2,500 - $25,000	$5,000 - $25,000	No change. Minimum 3 written quotation should be obtained
Purchasing authorization		
Current	**Proposed**	**Position**
$1,500 and under	$4,500 and under	Department Managers
$3,500 and under	$6,500 and under	Department Directors
$5,000 and under	$8,000 and under	Director of Corporate Services

St. Clair Conservation

Meeting Date: April 18, 2024 **Item 7.9**
Report Date: March 25, 2024
Submitted by: Ken Phillips, General Manager

Subject: Designation of Provincial Offences Officers

Recommendation:

That in accordance with Section 30.1 of the Conservation Authorities Act, the following staff be reappointed as Enforcement Officers under the Prohibited Activities, Exemptions and Permits regulation, Ontario Regulation 41/24 and the Provincial Offences Act: M. Deisley, J. Vlasman, M. Weber; and
That in accordance with Section 30.1 of the Conservation Authorities Act, the following staff be reappointed as Enforcement Officers under the Rules of Conduct in Conservation Areas O. Reg. 688/21 and the Provincial Offences Act: G. Wilcox, L. Derks, K. Smith.

Background:

On April 1, 2024, Part VII of the Conservation Authorities Act (Enforcement and Offences) was proclaimed, resulting in a need to re-appoint all existing Conservation Authority Provincial Offences Officers and any new officers consistent with the updated legislation. Traditionally, the appointment of enforcement officers was designated to Section 28 Permit Regulations and/or Section 29 Conservation Lands Regulations. The upcoming changes to the Conservation Authorities Act require that officers be appointed under Section 30.1 as opposed to Section 28 and 29, This is an administrative change to be in compliance with the Conservation Authorities Act and its regulations that will take effect on April 1, 2024.

Current staff that undertook the Provincial Offences Training, were appointed by the St. Clair Region Conservation Authority's Board of Directors under our prior Section 28 and Section 29 Regulations. There are currently six staff members working for SCRCA that have active status under the Provincial Offences Act designation.

The table below outlines SCRCA staff who meet the requirements and hold a designation as Provincial Offences Officers who will require re-appointment under the updated legislation.

Badge Number	Last Name	First Name	Date of Training	Board Endorsement	Status	Section
#150	Deisley	Melissa	October 2014	November 13, 2014	Active	28
#151	Vlasman	Jeff	October 2021	November 4, 2021	Active	28
#152	Weber	Meagan	October 2021	November 4, 2021	Active	28

#155	Wilcox	Greg	February 2023	March 10, 2023	Active	29
#156	Derks	Lucas	February 2023	March 10, 2023	Active	29
#153	Smith	Kelli	April 2019	June 27, 2019	Active	28, 29

Conservation Ontario provided Conservation Authorities with a guidance document outlining the elements within the Officer Re-appointment protocol. The following criteria shall be satisfied when re-appointing an employee as an “officer” for enforcing Section 28 and/or Section 29 of the Conservation Authorities Act*:*

1. The officer shall provide proof of a clean criminal background check, Vulnerable Sector check (immediately prior to their appointment)
2. The officer shall be adequately trained in the legislation they are to enforce (i.e. Conservation Authorities Act, Provincial Offences Act, Trespass to Property Act)

When the qualifying criteria are satisfied, the officer shall be re-appointed as a Provincial Offences Officer by the Board to enforce section 28 and/or section 29 of the Conservation Authorities Act for the jurisdiction in which the officer has received the appointment.

The Conservation Authority and Provincial Offences Officer shall each maintain a file of appointments, including proof that the qualifying criteria (referenced above) have been satisfied, to confirm that staff are properly empowered to enforce the legislation, respective to their appointment. The file should be updated regularly to include all relevant training.

St. Clair Conservation

Meeting Date: April 18, 2024 **Item 7.10**
Report Date: March 25, 2024
Submitted by: Ken Phillips, General Manager
Melissa Deisley, Director of Planning & Regulations

Subject: Legislative & Regulatory Changes Affecting Conservation Authorities

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Recommendation:

That this staff report providing details of recent legislative and regulatory changes (Conservation Authorities Act and Ontario Regulation 41/24) be received for information, and further that the Board support the timelines for implementation of policy, guidelines and procedural documents and the transition procedures and guidelines.

Background:

On February 16, 2024, a new Ministers Regulation (Ontario Regulation 41/24 'Prohibited Activities, Exemptions and Permits') under the Conservation Authorities Act approved by the Province, was filed by the government. This Regulation will revoke the current 36 individual Conservation Authority Regulations and consolidate them into a single province wide regulation. The St. Clair Region Conservation Authority's existing Ontario Regulation 171/06 "Development, Interference with Wetlands and Alterations to Shorelines and Watercourses" will no longer be applicable, effective April 1, 2024, when Ontario Regulation 41/24 comes into effect. The enactment of this Regulation will also coincide with the proclamation of associated sections of the *Conservation Authorities Act.*

The administration of O. Reg. 41/24 is a Mandatory Program and Service of the Conservation Authority as per Section 21.1.1 of the *Conservation Authorities Act* and O. Reg. 686/21: Mandatory Programs and Services. Under Section 8 of O. Reg. 686/21, Conservation Authorities shall provide programs and services to ensure that the Authority carries out its duties, functions and responsibilities to administer and enforce the provisions of Parts VI and VII of the Act and any Regulations made under those parts.

This draft of new legislation and regulation related to the *Conservation Authorities Act* is unprecedented since the original passage of the Act in 1946 and follows a series of 4 bills introduced in the Legislative Assembly of Ontario over the past 7 years that have amended the *Conservation Authorities Act* and changed the regulation-making powers of the provincial government, amongst other things, in relation to the Conservation Authorities:

- Bill 139, *Building Better Communities and Conserving Watersheds Act, 2017,* received Royal Assent on December 12, 2017;
- Bill 108, *More Homes, More Choice Act,* 2019, received Royal Assent on June 6, 2019;
- Bill 229, *Protect, Support and Recover from COVID-19 Act (Budget Measures), 2020,* received Royal Assent on December 8, 2020; and finally,

- Bill 23, *More Homes Built Faster Act,* 2022, received Royal Assent on November 28, 2022;

The Authority will continue to require applications for a permit to undertake development, interference and/or alteration activities within areas as designated under the Conservation Authorities Act and Ontario Regulation 41/24.

Legislative Changes

As a result of the new Regulation and updated Act, there are several amendments that must be made to existing Authority policies, procedures and documents. Some of the primary changes in the new legislation are summarized below.

<u>Conservation Authorities Act Updates:</u>

- **Regulatory Tests -** A change in the tests used by CAs in consideration of permit issuance, remove "Conservation of Land" and "pollution" and add "unstable soils and bedrock"
  *Note: existing tests including the control of "flooding", "erosion", and "dynamic beaches" are maintained
- **Exemptions –** Enabling the exemption of certain low-risk development activities as established in the regulation
- **Minister Orders –** Requiring CAs to issue permits for:
  - Projects subject to Community Infrastructure and Housing Accelerator orders and allowing the Minister to review and amend any conditions
- **Enhanced Minister Orders –** Enhancing the Minister's powers with regards to permits issued where a zoning order has been made by:
  - Extending the existing regulation authority of the Minister to prescribe conditions on a permit to also enable the Minister to limit what conditions may be included;
  - Specify that where the Minister has made a regulation allowing development to begin prior to an ecological compensation agreement, the development may not continue if the agreement has not been reached within the time period outlined in the regulation
- **Permit Appeal Process –** Additional review/appeal processes for permit fees and decisions to the Minister and/or the Ontario Land Tribunal (OLT):
  - Regarding a permit fee (OLT);
  - Regarding a CA decision (Minister review (subject to regulation) and/or OLT); or
  - Failure to make a decision within 90 days (OLT).
- **Enhanced Minister Powers –** Allowing the Minister to direct a CA to:
  - Not issue a permit, and enabling the Minister to issue a permit in place of that CA (with or without conditions); and
  - Not issue a permit for a specified period of time
- **CA Enforcement Powers –** including changes to:
  - Ability for Officers to enter properties.
  - Ability to issue stop work orders; and
  - Enhanced penalties for fines and imprisonment.

Regulatory Changes with the Implementation of Ontario Regulation 41/24:

- **Definitions –** New definition for 'watercourse' – from "***an identifiable depression in the ground*** *in which a flow of water regularly or continuously occurs"* to "***a defined channel, having a bed and banks, or sides,*** *in which a flow of water regularly or continuously occurs".*
  *this appears to be similar to an old definition, pre-2006.
- **Prohibited activities and areas where a CA permit is required:**
  - Removal of 120 metre 'other areas' (or 'regulated area') from PSWs and implementation of a consistent 30 metre regulated areas around all wetlands.
  - Allowance (or 'regulated area') from wave uprush or other water-related hazards for shorelines changes from 15 metres to an 'appropriate allowance'
- **Regulatory Mapping –** enhanced provisions, requiring a CA to:
  - Make regulation mapping publicly available;
  - Annually review and update maps; and
  - Requirements for notification to the public and stakeholders for any significant changes
- **Exemptions from a permit for certain low-risk activities –** new exceptions for low-risk activities (Attachment 1).
- **Process for applying for CA permit –** new requirements for:
  - Pre-submission consultations; and
  - Enhanced application requirements
- **Service requirements for a CA in reviewing permit applications –** new customer service standards for CAs directly in the legislation including:
  - Deeming an application complete (or incomplete) within 21 days of receiving an application and associated fee; and
  - Limiting the ability for a CA to ask for additional studies, technical information or plans once an application has been deemed complete (unless applicant agrees);
  - Requirements for the Authority to make a decision on a permit, once deemed complete, within 90 days. *Note: this is an increase in most scenarios from the current timelines we adhere to through our Customer Service Strategy.
- **Request for Review –** new provisions allowing applicants to request the CA review if:
  - Notice for deeming application complete (or incomplete) has not been received;
  - The applicant disagrees with the decision an application is incomplete; or
  - The applicant disagrees the request for information, studies or plans is reasonable.
- **Policy and procedures documents for permits –** new requirement for CAs to develop policy and procedures documents that include:
  - Details of pre-consultation processes and complete application requirements;
  - Procedures of the permit review process;
  - Standard timelines for a CA to make a decision for a permit once it's deemed complete; and
  - A process for the periodic review of policies and procedures.

Enactment of Ontario Regulation 41/24 amending Ontario Regulation 171/06

- The addition of Section 8.1 (1) (Standards and Requirements Part VI) requires Authorities to prepare and publish annual reports outlining performance statistics for permits, including timelines.

While the SCRCA has already implemented procedures associated with many of these best practices, such as reporting on timelines bi-monthly, and annually, exemptions, and mapping, the updated legislation will require that the Authority amends and updates our current policies, procedures and guidelines to be consistent with the Act and Regulation.

Due to the significant scope of work required to implement all the required changes, staff are proposing a phased approach to updating/creating documents as outlined in Attachment 2. Staff will continue to coordinate with Conservation Ontario and other Authorities to create and update existing policies, procedures and guidelines, the implementation of O. Reg. 41/24 will occur as of April 1, 2024.

To assist in providing clarity, a letter was sent to Municipal building & planning departments (Attachment 3) outlining the changes to the legislative and regulatory framework and provide our transition plan. Additionally, a virtual session with the relevant departments for all member municipalities will be arranged.

Attachments 4 and 5 outline the transition procedures as provided by Conservation Ontario to be adopted by the SCRCA until our existing procedural manuals and guidelines can be created and/or updated.

Relevance to Conservation Authority Policy

Current policies, procedures and guidelines will need to be updated to be applicable under the new legislative and regulatory framework.

A transition plan as well as a detailed plan for updates with timeframes has been provided in the attachments.

Impact on Conservation Authority Finances

It is expected that there will be an impact to the program budget due to the loss of revenue associated with the exemptions and reduction in regulated area around wetlands. Based on a review of files issued in the last two years, it appears there would be a loss of approximately 50 permits annually, as well as a loss of approximately 130 DART SCRs. The SCRCA has already streamlined many of our approvals, such as fences, patios and decks outside the shoreline hazard and flood hazard, through the issuance of site clearances, however, it is anticipated that landowners and municipalities will still want clearances for works that are now exempt. This will require staff time with no current cost recovery through our fees.

The additional workload associated with the required changes will be accommodated within the existing 2024 budget. There is no funding by the province to facilitate these changes.

Attachments:
Attachment 1: Exemptions as outlined in Ontario Regulation 41/24
Attachment 2: Transition Checklist
Attachment 3: Letter to Municipalities
Attachment 4: Interim Policies and Guidelines for the Administration and Implementation of O. Reg 41/24
Attachment 5: Transition Procedures & Guidelines

Attachment 1: Exemptions as outlined in O. Reg 41/24

Excerpt from O. Reg. 41/24: Prohibited Activities, Exemptions and Permits as of March 28, 2024

Note: Applicants are encouraged to confirm exceptions with the CA prior to carrying out the work.

5. Paragraph 2 of subsection 28 (1) of the Act does not apply to,

(a) the construction, reconstruction, erection or placement of,

i. a seasonal or floating dock that,

A. is **10 square metres or less**,

B. does not require permanent support structures, and

C. can be removed in the event of flooding,

ii. a rail, chain-link or panelled fence with **a minimum of 75 millimetres of width between panels, that is not within a wetland or watercourse,**

iii. agricultural in-field erosion control structures that are **not within a wetland or watercourse** and that do **not have any outlet of water directed or connected to a watercourse, wetland or river or stream valley**,

iv. a non-habitable accessory building or structure that,

A. is incidental or subordinate to the principal building or structure,

B. is **15 square metres or less**, and

C. is not within a wetland or watercourse, or

v. an **unenclosed** detached deck or patio that is **15 square metres or less, is not placed within a watercourse or wetland** and does not utilize any method of cantilevering;

(b) the installation of new tile drains that are **not within a wetland or watercourse**, **within 30 metres of a wetland or within 15 metres of a watercourse, and that have an outlet of water that is not directed or connected to a watercourse, wetland or river or stream valley**, or the maintenance or repair of existing tile drains;

(c) the installation, maintenance or repair of a pond for watering livestock that is **not connected to or within a watercourse or wetland, within 15 metres of a wetland or a watercourse**, and where no excavated material is deposited within an area where subsection 28 (1) of the Act applies;

(d) the maintenance or repair of a driveway or private lane that is **outside of a wetland** or the maintenance or repair of a public road, provided that the driveway or road is **not extended or widened and the elevation, bedding materials and existing culverts are not altered;**

(e) the maintenance or repair of municipal drains as described in, and conducted in accordance with the mitigation requirements set out in the Drainage Act and the Conservation Authorities Act Protocol, approved by the Minister and available on a government of Ontario website, as it may be amended from time to time; and

(f) the reconstruction of a non-habitable garage with **no basement, if the reconstruction does not exceed the existing footprint of the garage and does not allow for a change in the potential use** of the garage to create a habitable space.

Attachment 2: Transition Checklist

✓	Priority Actions	CA Actions	Timeframe for completions
	Communications strategy & implementation	• Prepare communications for municipal partners, stakeholders, and the public. • Arrange a Municipal meeting to review roles and responsibilities with Planning, building and by-law departments. • Update references & information on our website	Notification to Municipalities completed – March 15 Meeting with Municipal Planning, Building & By-law Departments – April SCRCA website updates with notices and information for the public – ongoing as changes and updates are implemented
	Interim Policies & Guidelines for the Administration & Implementation of **O. Reg. 41/24.**	• Interim policy is required until a policy and procedures document regarding permits (as now required under O. Reg. 41/24) can be completed and consulted on.	**A proposed interim Policy is attached for consideration and approval by the Board of Directors.** A detailed policy and procedures document regarding permits will be drafted and consulted on by the end of 2024.

	Transitional Procedures & Guidelines	• Policy required for transitioning from O. Reg. 171/06 to O. Reg. 41/24 to ensure permits and new applications are subjected to the appropriate procedures and guidelines, depending on their date of submission	**Proposed Transition Policy attached for consideration and approval by SCRCA Board of Directors**
	Consider (re)delegating Authority powers	• To accommodate efficient timelines for permit review / issuance, administration reviews, permit cancellations, holding of hearings, etc. (legal counsel may be required). • Update guideline documents as applicable.	Consideration of delegations – in progress
	Re-appointment of officers	• Appointment of officers under a new class designation will be required.	**See Board Report Item 7.6**
	Regulatory mapping updates	• SCRCA mapping requires updating to reflect new regulation limits. • The distance CAs regulate around all wetlands is 30 meters,	**In process – updates to reduce the regulated area around PSW's to be completed by April 1, 2024 and notification provided to Municipalities.**

		resulting in a reduction to the 120 metre regulated area around Provincially Significant Wetlands (PSW) • The definition of a watercourse was updated	SCRCA will apply the new definition of watercourse through the normal screening process and site investigation, where applicable, at the time of a permit application.
	Administrative updates	• **Update regulatory and legislative references on permit application form, administrative by-law and other documents (e.g. hearing guidelines), maps, website, etc.**	**In progress – permit application form and other internal documents have been updated.** Updates to other documents, maps, and the website will be ongoing throughout 2024.

Attachment 3: Letter to Municipalities

Date: March 11, 2024

To: Township of Brooke-Alvinston, Township of Dawn-Euphemia, Township of Enniskillen, Village of Oil Springs, Town of Petrolia, Town of Plympton-Wyoming, Village of Point Edward, City of Sarnia, St. Clair Township, Township of Warwick-Watford, Township of Adelaide-Metcalfe, Village of Newbury, Municipality of Strathroy-Caradoc and Lambton County

Re: Legislative and Regulatory Changes Affecting Conservation Authority Development Permitting
(Effective April 1, 2024)

On February 16, 2024, a new Minister's regulation (Ontario Regulation 41/24: Prohibited Activities, Exemptions and Permits) under the *Conservation Authorities Act* was approved by the Province. This regulation will replace individual regulations held by each Conservation Authority. Moving forward, O. Reg. 41/24 will be used by all Conservation Authorities (CA). The regulation's effective date is April 1, 2024. The enactment of O. Reg. 41/24 will also coincide with the proclamation of associated sections within the *Conservation Authorities Act.*

While O. Reg. 41/24 represents a single regulation for all CAs, much of the CA regulatory process remains the same. The administration of O. Reg. 41/24 is a Mandatory Program and Service of the Conservation Authorities as per Section 21.1.1 of the *Conservation Authorities Act* and as stipulated in O. Reg. 686/21: Mandatory Programs and Services. Under section 8 of O. Reg. 686/21, Conservation Authorities shall provide programs and services to ensure that the Authority carries out its duties, functions and responsibilities to administer and enforce the provisions of Parts VI and VII of the Act and any regulations made under those Parts.

CAs will continue to require applications for a permit to undertake otherwise prohibited development or alteration activities in regulated areas as defined under the *Conservation Authorities Act* and in O. Reg. 41/24.

For those applications submitted prior to the enactment of O. Reg. 41/24, the current permitting process will be followed. New permit applications submitted on or after April 1, 2024 will follow the processes outlined in the updated Section 28 of the *Conservation Authorities Act* and O. Reg. 41/24. Conservation Authorities will be working closely with member municipalities to coordinate communication and update policies and procedures to ensure a smooth transition to April 1, 2024.

Key Changes

While much of the CA regulatory process remains the same, key changes of interest for our municipal partners include:

- The definition of a "watercourse" has been amended from "***an identifiable depression in the ground*** *in which a flow of water regularly or continuously occurs*" to "***a defined channel, having a bed and banks or sides****, in which a flow of water regularly or continuously occurs*".
- The regulated area around wetlands ("other areas") will be consistent at 30 m, including around provincially significant wetlands. It was previously 120m.
- Exceptions for certain low-risk activities (see Attachment One for further details).

These changes will require CAs to review and update their associated policies and procedures, and regulatory mapping (as appropriate) to reflect the new regulatory requirements. Municipalities are advised that CA regulatory mapping which has been shared for screening purposes will require updates, and in the interim, CA staff may need to undertake site visits to confirm regulated features and areas.

In addition, section 5 of O. Reg. 41/24 provides a list of activities or works where a CA permit is no longer required, where works are carried out in accordance with the regulation. Applicants are encouraged to confirm exceptions with the CA prior to carrying out the work. CAs will work to provide implementation support materials to municipalities and the public.

Of note to member municipalities is that section 5e) states that a permit is not required for the maintenance or repair of municipal drains if the works are conducted in accordance with mitigation requirements set out in the Drainage Act and Section 28 Regulations Team (DART) protocol. However, member municipalities/drainage superintendents are reminded to continue to notify their local conservation authority of proposed drainage works. This will provide an opportunity for conservation authority staff to identify between works that follow the DART protocol and are exempt, and those works that will still require a conservation authority permit. It is also a reminder that OMAFRA still requires conservation authority input on drains.

Plan Review Services

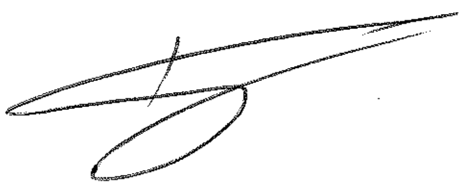
There are no changes to CA planning services at this time. Conservation Authorities **continue to provide mandatory, or Category 1 programs or services related to reviewing and commenting on applications and other matters (e.g., planning document updates) under the *Planning Act*, and for proposals under Acts** referred to in Section 6 (2) of Ontario Regulation 686/21: Mandatory Programs and Services. Municipalities must continue to circulate planning applications and other matters, including technical reports to CAs so that we may review and comment on natural hazards and wetland matters per Ontario Regulation 686/21. Comments provided will reflect a watershed-based approach to the provision of mandatory programs and services.

We look forward to continuing our strong working relationship and providing you with exemplary services. We will continue to be in contact as we work to transition to this new legislative and regulatory framework.

In order to streamline communication, where multiple CAs share jurisdiction in one municipality, the CA with the largest jurisdiction in that municipality is taking the lead in communication and is sending this letter on behalf of all CAs. Individual CAs will be updating their respective boards on the new regulation changes and passing motions on interim and transitional policies at board meetings in the coming weeks.

Further communication with links to interim and transitional policies will follow. In the meantime, if you or your staff have any questions or concerns regarding the new regulation, please contact the undersigned or individual CA staff. If required, CAs are happy to coordinate information sessions for your staff and councils.

Sincerely,



Ken Phillips
General Manager/Secretary Treasurer

<u>Attachment 4: Interim Policies and Guidelines for the Administration and Implementation of O. Reg. 41/24</u>

Effective Date:

April 1, 2024

Summary

On April 1, 2024, Ontario Regulation 41/24 (Prohibited Activities, Exemptions and Permits) and Part VI of the *Conservation Authorities Act* came into effect. This regulation replaces the St. Clair Region Conservation Authority previous regulation – Ontario Regulation 171/06: "Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses".

The proclamation of the new legislative and regulatory framework necessitates updates to existing Conservation Authority policies and procedures, including SCRCA's Board Approved Shoreline Policy (2011), and SCRCA's Board Approved Wetland Policy (2016).

Interim Policy Guidance

As of April 1, 2024, the St. Clair Region Conservation Authority will review and make decisions on applications for permits in accordance with Part VI of the *Conservation Authorities Act* and Ontario Regulation 41/24. Amendments to the SCRCA's current Board Approved policies and creation of a new policy document will be forthcoming to reflect this new framework. Per section 12 of O. Reg. 41/24, the SCRCA will consult with stakeholders and the public during the review and update process as the authority considers advisable. Where discrepancies exist between the text of the legislation or regulation and the information provided within the Board Approved policies and these Interim Policy Guidelines, the text of the legislation and regulation will prevail.

Key variances from the processes in the existing legislation and guidelines include, but are not limited to:

1) Assessing permit applications made under Section 28.1 of the *Conservation Authorities* Act to determine if the proposed works will affect the control of flooding, erosion, dynamic beaches, and **unstable soil or bedrock**.
2) Assessing applications to determine whether the proposed activity would create conditions or circumstances that, in the event of a natural hazard, might jeopardize the **health or safety of persons** or result in the **damage or destruction of property.**
3) Attaching conditions to a permit only if the conditions (1) assist in preventing or mitigating any effects on the control of flooding, erosion, dynamic beaches or unstable soil or bedrock or (2) assist in preventing or mitigating any effects on human health or safety or any damage or destruction of property in the event of a natural hazard.

4) Reducing the regulated area surrounding provincially significant wetlands or wetlands from 120 m to 30 m. The other areas in which development activities are prohibited are within 30 m of all wetlands in the SCRCA's area of jurisdiction.

5) Exceptions from CA permits for specific activities outlined in section 5 of O. Reg. 41/24, when carried out in accordance with the regulation.

6) Updated complete application requirements (as outlined in section 7 of O. Reg. 41/24), including requirements for landowner authorization and payment of applicable fee.

7) A new process for applicants to request an administrative review of an application (circumstances outlined in section 8 of O. Reg. 41/24).

8) Updated definition of *watercourse* to a "defined channel, having a bed and banks or sides, in which a flow of water regularly or continuously occurs".

9) New requirement (as outlined in subsection 7(2) O. Reg. 41/24) to notify the applicant of whether an application is complete within 21 days and provide the applicant notice of a decision within 90 days following confirmation of a complete application (as outlined in 28.1(22) of the *Conservation Authorities Act).*

10) A new process for pre-submission consultation (circumstances outlined in section 6 of O. Reg. 41/24).

11) Enforcement procedures, appeals and hearing processes described in Parts VI and VII of the *Conservation Authorities Act*.

Attachment 5: Transitional Procedures & Guidelines

February 2024

Background

The existing Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation provided each CA with the power to regulate development and activities in or adjacent to river or stream valleys, shorelines of the Great Lakes-St. Lawrence River system and inland lakes, watercourses, hazardous lands (e.g., unstable soil, bedrock, and slopes), wetlands and other areas around wetlands. Development taking place on these lands may require permission from the CA to confirm that the control of flooding, erosion, dynamic beaches, pollution or the conservation of land are not affected.

On February 16, 2024 the Prohibited Activities, Exemptions and Permits under *Conservation Authorities Act* Regulation (Ontario Regulation 41/24) was approved by the Province under subsection 28(1) of the *Conservation Authorities Act*. The administration of O. Reg. 41/24 is a Mandatory Program and Service of the Conservation Authorities as per Section 21.1.1 of the *Conservation Authorities Act* and as stipulated in O. Reg. 686/21: Mandatory Programs and Services. Under section 8 of O. Reg. 686/21, Conservation Authorities shall provide programs and services to ensure that the Authority carries out its duties, functions and responsibilities to administer and enforce the provisions of Parts VI and VII of the Act and any regulations made under those Parts.

The transitional policies and procedures are important in the implementation of the new regulations which will become effective as of April 1, 2024.

Purpose

The purpose of this document is to guide Authority staff through the transition from the current individual Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulations to the implementation of the new O. Reg. 41/24: Prohibited Activities, Exemptions and Permits Regulation.

PERMIT APPLICATIONS

Applications Submitted Before April 1, 2024

Applications for permission to develop in a regulated area or interfere with a wetland or watercourse received prior to April 1, 2024, will be subject to the provisions of the applicable Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation in effect at the time the application was received.

If the subject application for the proposed works is not within an area or an activity regulated under the new regulation (O. Reg. 41/24), then the applicant will be advised in writing that a permit is not required for the proposed works.

Applications Submitted After April 1, 2024

All applications received on or after April 1, 2024, will be subject to the provisions of O. Reg. 41/24.

Extension of Permissions Issued under the Current Regulation

Permits issued prior to April 1, 2024, and have expiry dates beyond April 1, 2024 will remain valid for the duration identified on the permission. Inspections and conditions enforced under the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation will continue until the permission expires.

A request for extension of a permit issued before April 1, 2024, that is received prior to April 1, 2024, will be considered in accordance with the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation.

A request for extension of a permit issued before April 1, 2024, that is received after April 1, 2024, will be considered in accordance with O. Reg. 41/24. An applicant requesting an extension will be notified in writing that an extension is not required if the permit is for a development activity or interference/alteration not within a regulated area established under O. Reg. 41/24 or is otherwise subject to an exception under the same.

Requests for an extension of the existing permit must be received by the Authority prior to the date of expiry shown on the permission.

REVIEW OF PLANNING APPLICATIONS

Planning Applications Submitted Before April 1, 2024

All plan review will be conducted in accordance with the O. Reg. 686/21: Mandatory Programs and Services, O. Reg. 596/22: Prescribed Acts – Subsections 21.1.1 (1.1) and 21.1.2 (1.1) of the Act, as well as based on the provisions of the current Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation. Plan input activities will note that O. Reg. 41/24 will be in effect April 1, 2024.

Planning Applications Submitted After April 1, 2024

All plan input and review will be conducted in accordance with the O. Reg. 686/21: Mandatory Programs and Services, O. Reg. 596/22: Prescribed Acts – Subsections 21.1.1 (1.1) and 21.1.2 (1.1) of the Act, as well as based on the provisions of O. Reg. 21/24: Prohibited Activities, Exemptions and Permits Regulation.

VIOLATION NOTICES AND LEGAL ACTIONS COMMENCED BEFORE APRIL 1, 2024

Violation Notices issued prior to April 1, 2024, will be addressed, and remedied by CA Provincial Offences Officers in accordance with the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation.

Violation Notices issued prior to April 1, 2024, for works in an area or activity no longer regulated under the new O. Reg. 41/24, upon satisfactory resolution of the matter, the proponent will be issued a letter advising that the works occurring in violation of the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation have remedied/ rectified and the violation notice is revoked.

Violation notices issued and prosecutions commenced on or after April 1, 2024, will confirm with Parts VI and VII of the Act and O. Reg. 41/24.

Legal actions that commenced prior to April 1, 2024, may proceed where appropriate under consultation with legal counsel.

Other Agency Approvals

Issuance of a permit does not relieve the applicant from the responsibility of acquiring approval from other agencies or relieve the applicant from compliance with any conditions that other agencies may impose on the work.

St. Clair Conservation

Meeting Date: April 18, 2024 **Item 7.11**
Report Date: March 28, 2024
Submitted by: Melissa Deisley, Director of Planning & Regulations

Subject: Stewardship Permitting Fees

Recommendation:

That the Board of Directors direct staff to reduce the required permit fee to $200, only to be applied to stewardship projects, to cover staff time reviewing and permitting under Ontario Regulation 41/24.

Background:

There are various agencies who provide funding and/or leadership on stewardship projects across the watershed, including SCRCA, Ducks Unlimited, Rural Lambton Stewardship Network (RLSN), ALUS, and adjacent Conservation Authorities. Stewardship projects include wetland creations and maintenance or upgrades to existing wetlands, tree planting, erosion control berms for in-field erosion, and drain erosion control and rehabilitation work.

Historically, SCRCA has not charged a permit fee for SCRCA led projects, or RLSN led projects. However, other organizations, or individual landowners were being required to pay the permit fee. Formal permits have been provided for these works to all organizations except SCRCA led projects. Depending on the proposed works, the application fee can range from Routine Permit ($270) to Minor Permit A ($525) plus the Processing Fee ($155).

SCRCA Staff are proposing to reduce the required permit fee to $200 for stewardship projects only, and apply this fee to all organizations listed above, including SCRCA led projects to ensure consistency. The $200 is to cover staff time to review and provide a permit for the proposed project under Ontario Regulation 41/24. Staff are recommending that this fee be lowered from the current fee schedule, as we acknowledge that these projects work towards benefiting the environment, meeting SCRCA's Conservation goals, and helping landowners implement Best Management Practices and stewardship projects on their property. By keeping the fee low and applying this consistently across all organizations, this allows staff to carry out their mandatory review under the Conservation Authorities Act, while not deterring landowners to complete this valuable work across the watershed.

Meeting Date: April 18, 2024 **Item 8.1 (a)**
Report Date: February 9, 2024
Submitted by: Ashley Fletcher, Board Coordinator

Subject: Business Arising

Regarding BD-21-29
Report on reserves deferred until Asset Management Plan in place
Directors request a report on the benchmark data from the 2017 Conservation Authorities Statistical Survey and comparative analysis of Conservation Authority annual statements, of which have reserves, focusing on the SCRCA's position of fiscal health.

St. Clair Conservation

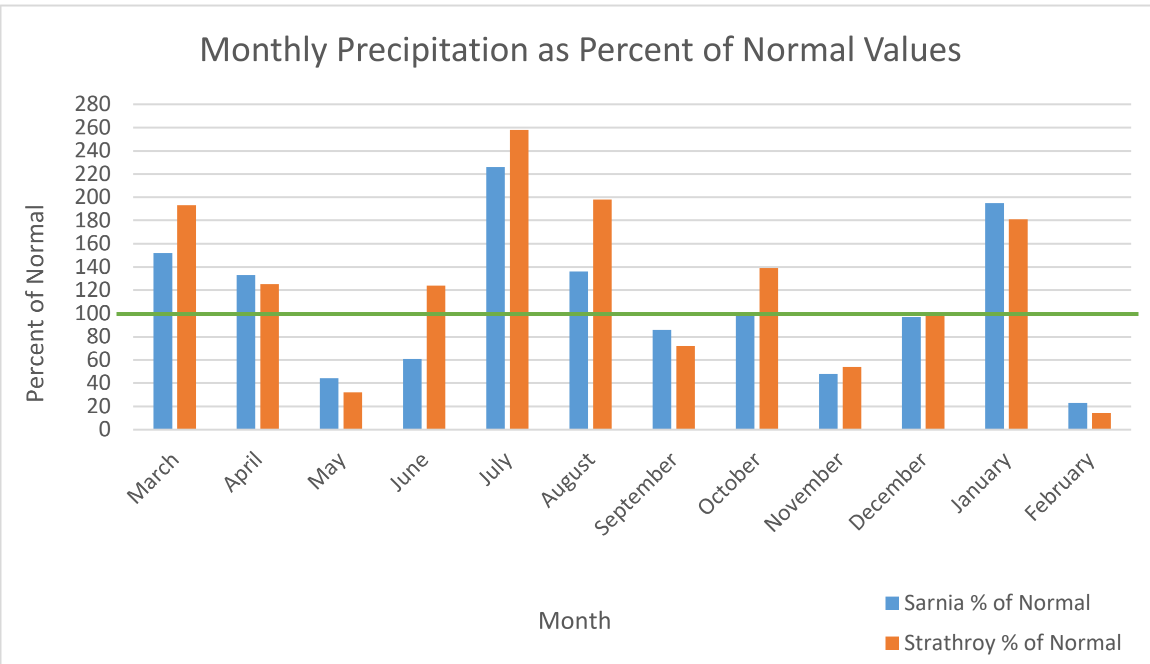
Meeting Date: April 18, 2024 **Item 8.1 (b)**
Report Date: March 27, 2024
Submitted by: Nicholas Hagerty, Girish Sankar

Subject: Watershed Conditions and Water Levels

Report Highlight

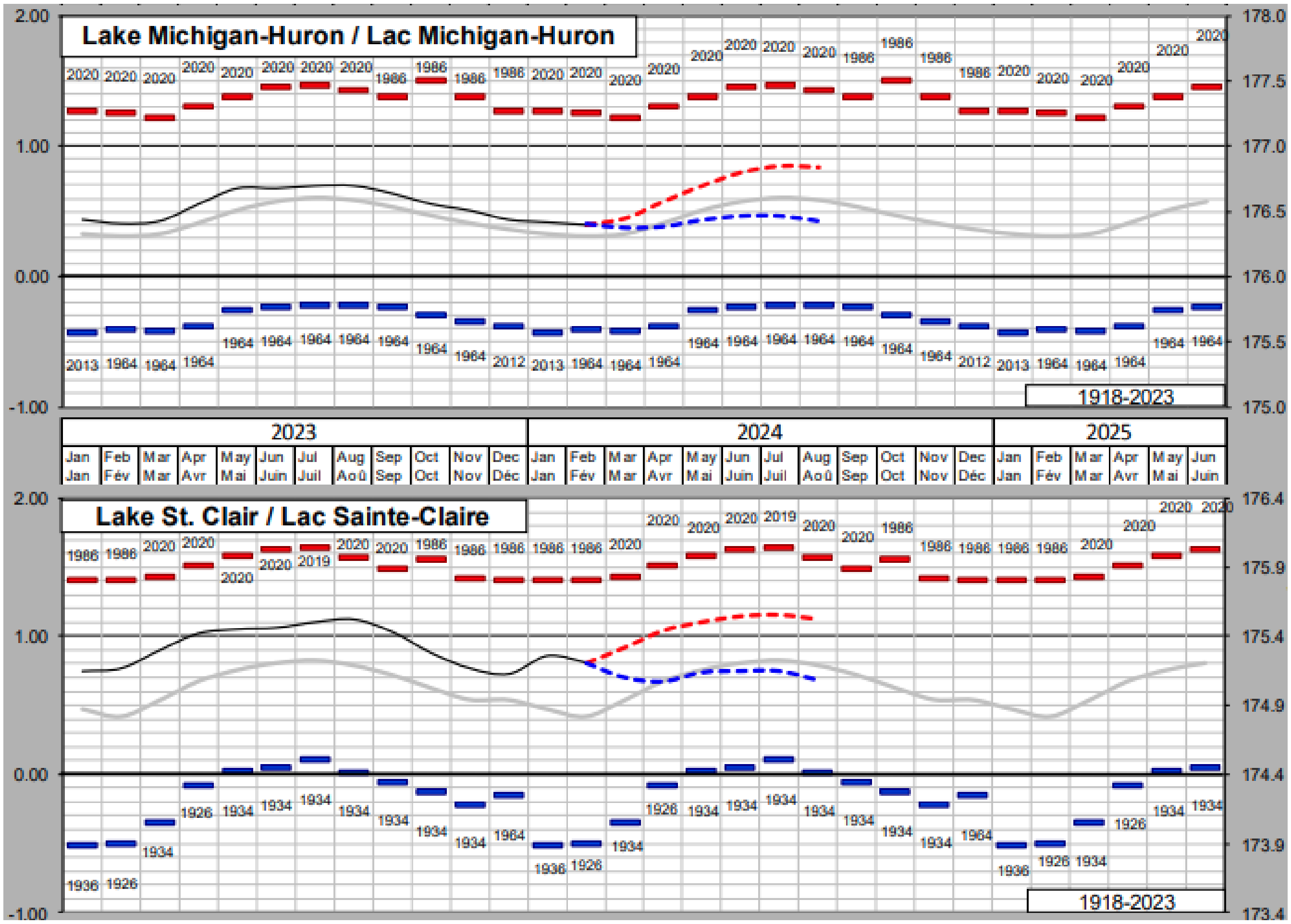
- The current flood threat is low to moderate due to lower water levels
- Low soil saturation levels across the watershed

Precipitation



- This past winter Sarnia and Strathroy experienced varying precipitation amounts; December was near normal amounts whereas January saw far greater amounts of precipitation leading to an early freshet event at the end of January
- The entirety of the Great Lakes basin experienced low precipitation in the month of February

Lake Levels



- Lake Michigan-Huron and St. Clair declined about 1 to 2 inches
- According to the Great Lakes water levels 6-month forecast, Lake Michigan-Huron and St. Clair are expected to be near their February monthly mean level in March
- Expectation for drier than normal conditions in the coming months

Flood Threat

- The flood threat is currently low to moderate
- Lower water levels in the Great Lakes have enabled greater storage capacity in Wallaceburg
- Spring rain events have the potential to cause minor, nuisance flooding into natural floodplain areas; conditions for major flooding do not exist at the time of this report

St. Clair Conservation

Meeting Date: April 18, 2024 **Item 8.1 (c)**
Report Date: March 26, 2024
Submitted by: Girish Sankar

Subject: 2023- 2024 Shoreline Projects

Recommendation:

That the Board of Directors acknowledges this report dated March 26, 2024, on the progress of shoreline projects across the watershed.

1) **Penhuron Drive to Kenwick Street shoreline restoration:**
    - Construction work started in December 2023 and the project progress has been on schedule and budget.
    - Project signage has been installed on site.
    - Additional funding was received through the WECI program – Total funds received - $916,000 for this shoreline project

Construction Progress - Penhuron Drive to Kenwick Street Shoreline

2) Seager Park shoreline restoration:

- Constriction contract has been being awarded to Vanbree Bulldozing and Contracting for $903,297.14 + HST
- Engineering services is offered by Shoreplan Engineering Ltd
- Project is funded by DMAF, WECI and St. Clair Township
- Construction work has been delayed due to stringent permitting requirements from DFO and MNRF
- SCRCA and Shoreplan Engineering continue to liaise with the permitting agencies.

Seager Park – On site construction access preparation

Meeting Date:	February 22, 2024	**Item**	**8.1 (d)**
Report Date:	February 2, 2024		
Submitted by:	Girish Sankar		

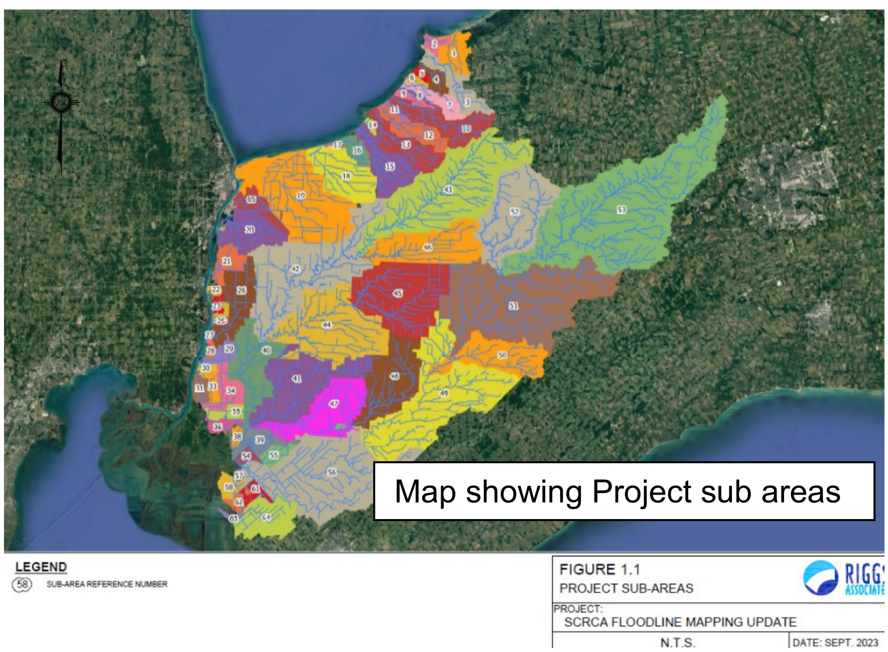
Subject:	Floodplain Mapping Project

Recommendation:

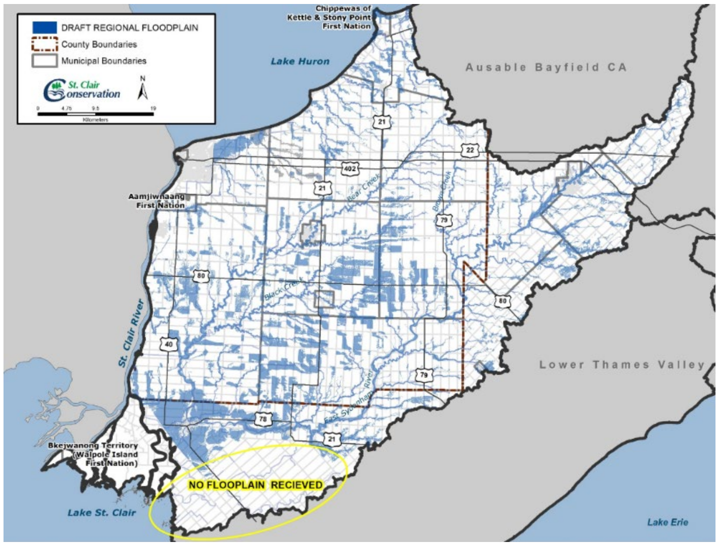
That the Board of Directors acknowledges the report dated March 26, 2024 on the update to the floodplain mapping project.

Background:

- Hydrologic and Hydraulic Modelling has been completed and flood lines have been developed by Riggs Engineering



- This floodplain mapping includes the 100 year and regional flood lines for the SCRCA watershed
- Riggs Engineering has completed QA/QC work on the development of the flood lines
- Staff continue to review the draft flood lines
- The Floodplain delineation in the lower reaches of the watershed and headwaters of streams still needs to be addressed.



Next Steps:

- SCRCA is in the process of scheduling training and outreach session with the Municipalities
- This session will be led by Riggs Engineering and is expected to be delivered in May/June 2024.

St. Clair Conservation

Meeting Date: April 18, 2024 **Item 8.1 (e)**
Report Date: March 27, 2024
Submitted by: Nicholas Hagerty, Girish Sankar

Subject: Community Emergency Preparedness Grant

Recommendation:

That the Board of Directors acknowledges the report dated March 26, 2024 on the Community Emergency Preparedness Grant

Background:

In light of recent high intensity storms and an increasingly unpredictable climate, SCRCA has explored ways at improving our Flood Forecasting and Warning program. Currently, SCRCA has 12 stream gauges across the watershed that provide watershed conditions, but there is always room for more data.

In October, 2023 the Ontario government opened funding for the Community Emergency Preparedness Grant (CEPG) to help communities and organizations purchase critical supplies, equipment and deliver training and services to improve local emergency preparation and response.

SCRCA was successful in receiving **$25,500** worth of funding through this grant. Funds will be allocated towards expanding the existing network and is looking to add 5 to 10 water level sensors across the watershed.

Aspen10 Internet of Things (IoT) Edge Device

These state-of-the-art sensors are an all-in-one unit and are smaller than the conventional doghouse stream gauges. They have built in solar panels, and batteries and will be able to communicate to a cloud service either through GOES Satellite or cellular communication. Because of the size of the sensors they can be placed in locations that wouldn't have been able to have a traditional doghouse stream gauge.

The location of the sensors will be located at bridges that have experienced road closures in the past and at other areas of key interest across the watershed. Municipalities will be involved and approval will be sought out to determine the appropriate placement of sensors.

The Advanced Warning Equipment (AWARE) Flood System by AWARE Monitoring Systems.

The additional sensors will be used in conjunction with our current stream gauges to improve early warning communication to our municipalities during flood conditions. This will enable municipalities to deploy their staff to ensure roads are closed.

The sensors will upload data through a cloud platform and will be shared with the public and municipalities. Part of the project will be going towards re-commissioning the Tupperville gauge with upgraded equipment and installing a new stream gauge along Otter Creek on Kimball Road at Peers Wetland.

Completion of this project is required by August 30, 2024.

Staff Report

Meeting Date: April 18, 2024 **Item 8.1 (f)**
Report Date: March 27, 2024
Submitted by: Melissa Deisley, Jeff Vlasman, Meagan Weber

Subject: Regulations Activity Summary

A summary of staff activity related to the Conservation Authority's *Development, Interference of Wetlands, and Alterations to Shorelines and Watercourses Regulation* (Ontario Regulation 171/06 under Ontario Regulation 97/04) is presented below. This report covers the period from February 1, 2024 to Februrary 29, 2024

Regulations Permits Issued

Application #	Location	Municipality	Proposal	Submitted	Issued	Days
R#2023-0812	1707 Marthaville Rd, Dawn	Dawn-Euphemia	lower pipeline	Feb-14	Feb-14	1
R#2023-0813	1533 Robinson Rd, Dawn	Dawn-Euphemia	lower pipeline	Feb-13	Feb-13	1
R#2024-0040	3911 Churchill Ln (closest address)	Enniskillen	water crossing for fibre in RoW	Jan-31	Feb-02	2
R#2024-0041	north of 3576 Petrolia Ln (closest address)	Enniskillen	multiple water crossings for fibre in RoW	Feb-01	Feb-02	1
R#2024-0046	4605 Centre St (closest address)	Enniskillen	water crossing for fibre in RoW	Jan-12	Feb-05	24
R#2023-0373	11066 Lamont Dr (nearest address), Komoka	Middlesex Centre	like-for-like culvert replacement	Jan-30	Feb-28	29
R#2023-0326	4270 Bluepoint Dr, Plympton	Plympton-Wyoming	build a shorewall & erosion control	Jan-31	Feb-02	2
R#2024-0038	3868 Confederation Ln (closest address)	Plympton-Wyoming	water crossing for fibre in RoW	Feb-01	Feb-02	1
R#2024-0042	west of 5544 Confederation Ln (closest address)	Plympton-Wyoming	multiple water crossings for fibre in RoW	Feb-01	Feb-02	1

R#2024-0047	4590 Douglas Ln (closest address)	Plympton-Wyoming	multiple water crossings for fibre in RoW	Jan-12	Feb-08	27
R#2024-0048	east of 4532 Douglas Ln (closest address)	Plympton-Wyoming	water crossing for fibre in RoW	Jan-12	Feb-09	28
R#2024-0049	6795 Hillsboro Rd (closest address)	Plympton-Wyoming	water crossing for fibre in RoW	Jan-12	Feb-09	28
R#2024-0050	northeast of 5007 Wright Ln (closest address)	Plympton-Wyoming	water crossing for fibre in RoW	Jan-12	Feb-09	28
R#2024-0051	6869 Blue Heron Rd (closest address)	Plympton-Wyoming	multiple water crossings for fibre in RoW	Jan-11	Feb-09	29
R#2024-0062	4084 Egremont Rd (closest address)	Plympton-Wyoming	water crossing for fibre in RoW	Jan-31	Feb-05	5
R#2024-0063	4531 Egremont Rd (closest address)	Plympton-Wyoming	water crossing for fibre in RoW	Jan-31	Feb-05	5
R#2024-0064	southeast of 3368 Hyslop Ln (closest address)	Plympton-Wyoming	water crossing for fibre in RoW	Jan-31	Feb-06	6
R#2024-0065	6174 Oil Heritage Rd (closest address)	Plympton-Wyoming	water crossing for fibre in RoW	Jan-31	Feb-06	6
R#2024-0066	5817 London Ln (closest address)	Plympton-Wyoming	multiple water crossings for fibre in RoW	Feb-07	Feb-07	1
R#2024-0067	4758 Confederation Ln (closest address)	Plympton-Wyoming	multiple water crossings for fibre in RoW	Feb-07	Feb-07	1
R#2024-0080	1220 Fort Street	Point Edward	2024 dredging	Jan-25	Feb-01	7
R#2024-0127	2849 Old Lakeshore Road	Sarnia	build a new dwelling	Feb-12	Feb-27	15

Total Permits Issued: 22 **Average Number of Days to Issue for this Period: 11.27**

Regulations Inquiries

FileReference	Municipality	Location
R#2024-0151	Adelaide-Metcalfe	24809 Melbourne Road
R#2024-0119	Brooke-Alvinston	8083 Petrolia Line, Brooke-Alvinston
R#2023-0429	Chatham-Kent	759 Wellington St, Dresden

R#2023-0677	Chatham-Kent	29451 Sharrow Rd, Thamesville
R#2024-0016	Chatham-Kent	9 Second Street
R#2024-0084	Chatham-Kent	615 Gillard Street
R#2024-0113	Chatham-Kent	Throughout Chatham-Kent
R#2024-0123	Chatham-Kent	325 Nelson Street
R#2024-0152	Chatham-Kent	8666 Oldfield Line
R#2024-0156	Chatham-Kent	6650 Angler Line
R#2024-0147	Dawn-Euphemia	577 George Street
R#2022-0592	Enniskillen	3115 Rokeby Line, Enniskillen
R#2023-0762	Enniskillen	4277 South Plank Rd, Oil Springs
R#2024-0157	Enniskillen	4634 Fairweather Road
R#2022-0446	Lambton Shores	9507 Ipperwash Rd
R#2022-0737	Lambton Shores	6602 Lakeshore Road, Lambton Shores
R#2024-0090	Lambton Shores	9599 Mary Street
R#2024-0108	Lambton Shores	9639 Ipperwash Road
R#2024-0134	Lambton Shores	6817 East Parkway Drive
R#2024-0085	Middlesex Centre	22821 Denfield Road
R#2020-0709	Plympton-Wyoming	3548 Queen Street
R#2023-0650	Plympton-Wyoming	5038 Egremont Rd, Camlachie
R#2023-0780	Plympton-Wyoming	4420 Lakeshore Rd, Plympton-Wyoming
R#2024-0110	Plympton-Wyoming	5610 Aberander Line
R#2024-0171	Plympton-Wyoming	3923 Delmage Ave
R#2023-0710	Sarnia	2849 Old Lakeshore Rd, Bright's Grove
R#2024-0075	Sarnia	northwest of 1857 Michigan Line
R#2024-0076	Sarnia	1080 Bramer Lane
R#2024-0126	Sarnia	260 Christina Street S
R#2024-0143	Sarnia	733 Lakeshore Road
R#2022-0777	St. Clair	4170 Telfer Road, Corunna
R#2024-0045	St. Clair	south of 598 Polymoore Drive
R#2024-0141	St. Clair	south of 2756 Smith Line
R#2024-0103	Strathroy-Caradoc	342 Pannell Lane (closest address)
R#2024-0145	Strathroy-Caradoc	214 Millpond Crescent
R#2024-0159	Strathroy-Caradoc	18 Pearson Ave, Strathroy

R#2024-0161	Strathroy-Caradoc	523 Riverview Dr, Strathroy
R#2024-0162	Strathroy-Caradoc	27 Pearson Ave

Total Regulations Inquiries: 38

Regulations - DART Completed Files

File Reference	Municipality	Drain / Watercourse
R#2024-0055	Adelaide-Metcalfe	Richardson Earley Drain
R#2024-0114	Adelaide-Metcalfe	Lyons Drainage Works
R#2024-0172	Adelaide-Metcalfe	Inch Drain
R#2023-0664	Brooke-Alvinston	Annette Drain
R#2023-0833	Enniskillen	Hodges Drain
R#2024-0129	Enniskillen	4th Con Johnson Creek Drain
R#2024-0100	Lambton Shores	Ross Drain
R#2024-0139	Middlesex Centre	Fisher-Watt Drain 2023
R#2024-0120	Plympton-Wyoming	Highland Creek Drain
R#2024-0131	Plympton-Wyoming	Errol Road Drain
R#2024-0144	Plympton-Wyoming	Bannister Drain
R#2024-0146	Plympton-Wyoming	Paul Drain
R#2024-0149	Plympton-Wyoming	30 Creek Drain
R#2024-0169	Plympton-Wyoming	Shea Ferguson Drain
R#2024-0138	Sarnia	Hiawatha Drain
R#2020-0771	Warwick	Kilmer Drain
R#2024-0140	Warwick	Sisson Drain

Total DART Permits Issued: 17

Regulations Permits - Drains

File Reference	Municipality	Drain / Watercourse
R#2022-0550	Adelaide-Metcalfe	Beattie Award Drain
R#2023-0515	Brooke-Alvinston	Wilcox Drain
R#2024-0097	Brooke-Alvinston	Carpenter Drain
R#2023-0669	Dawn-Euphemia	25 Sideroad Drain and Reid Drain
R#2024-0102	Plympton-Wyoming	Berry Drain
R#2024-0111	Plympton-Wyoming	Bannister Drain
R#2022-0094	Strathroy-Caradoc	Baran Drain

R#2024-0130	Strathroy-Caradoc	Henderson Drain 1968

Total Regulations Inquiries Regarding Drains: 8

Staff Report

Meeting Date: April 18, 2024 **Item 8.1 (g)**
Report Date: March 27, 2024
Submitted by: Melissa Deisley, Shelby Campbell, Kelsey Oatman

Subject: Planning Activity Summary

A summary of staff activity related to Municipal Plan Input and Review is presented below. This report covers the period from February 1, 2024 to February 29, 2024

Municipal Plan Input and Review

File Reference	Location	Municipality	Municipal File
PL#2023-0019	2668 Katesville Drive	Adelaide-Metcalfe	Z05-2024 B02-2023
PL#2024-0009	6504 Scotchmere Drive	Adelaide-Metcalfe	
PL#2024-0010	2719 Napperton Dr	Adelaide-Metcalfe	Z02-2024 B01-2024
PL#2023-0097	668 Isaac Street	Chatham-Kent	
PL#2024-0004	Lot 11, Con 3 Gore, Water Street	Chatham-Kent	
PL#2024-0002	520 Dawn Mills Road	Dawn-Euphemia	
PL#2023-0114	3760 Courtright Line	Enniskillen	B-01-2024
PL#2024-0014	4348 LaSalle Line	Enniskillen	
PL#2024-0017	2710 Plowing Match Road	Enniskillen	
PL#2020-0041	south of 9602 West Ipperwash Road	Lambton Shores	OPA02-2024 Z04-2024 B-04-2024 - B-08-2024
PL#2019-008	Timberwalk Trail	Middlesex Centre	ZBA 03 2019 39T-MC1901 A21-2023, A-22-2023, A-02-2024
PL#2018-100	4051 Discovery Line	Petrolia	38T-21007
PL#2020-0001	3368 London Line	Plympton-Wyoming	OPA 51 ZBA 5 of 2024 B-01/24
PL#2020-0075	4386 Confederation Line	Plympton-Wyoming	OPA 53 ZBA 4 of 2024 B-03/24 A-03/24
PL#2021-0070	4921 Edith Lane	Plympton-Wyoming	A-12/21, A-07/24

PL#2022-0110	5706 Lakeshore Road, also off of Hillsboro Road	Plympton-Wyoming	B-05/24; B-06/24 A-04/24
PL#2022-0155	Hillsboro Road & Townsend Line	Plympton-Wyoming	OPA55 ZBA3-2023
PL#2023-0027	Fleming Road and Creekside Drive	Plympton-Wyoming	B-05/23, B-06/23 A-26/23
PL#2023-0079	3156 Douglas Street	Plympton-Wyoming	A-22/23
PL#2024-0008	4270 Bluepoint Drive	Plympton-Wyoming	A-06/24
PL#2024-0015	4434 Fisher Line	Plympton-Wyoming	B-02/24 A-02/24
PL#2022-0117	1407 London Line	Sarnia	
PL#2023-0054	1489 Churchill Rd (Plank Rd)	Sarnia	
PL#2024-0016	east of 1569 Wellington Street	Sarnia	
PL#2024-0018	706 Beach Lane	Sarnia	
PL#2024-0006	4460 Olde Drive	Southwest Middlesex	
PL#2023-0020	Indian Rd & St. Clair Parkway	St. Clair	
PL#2024-0011	4370 St. Clair Parkway	St. Clair	A-42-23
PL#2024-0012	475 Lyndoch Street	St. Clair	A-44-23
PL#2024-0013	3871 St. Clair Parkway	St. Clair	A-46-23
PL#2018-106	589 Victoria Street	Strathroy-Caradoc	B2-2024
PL#2018-056	390 Second Street, Pt Lt 25, Con 3	Strathroy-Caradoc	ZBA17-2022 39T-SC2401
PL#2021-0016	Lot 7 Carrie Street	Strathroy-Caradoc	
PL#2023-0061	8532 Glendon Drive, Mount Brydges	Strathroy-Caradoc	
PL#2023-0081	6919 Calvert Drive	Strathroy-Caradoc	ZBA20-2023 SPA2-2024
PL#2021-0041	7757 Confederation Line	Warwick	
PL#2021-0069	308 St. Clair Street	Warwick	Z-05-23
PL#2024-0019	6310 Quaker Road	Warwick	

Total Plan Review Items: 38

Environmental Assessments

File Reference	Location	Municipality
EA#2024-0002	255 Albert Street	Strathroy-Caradoc

Total Environmental Assessments: 1

Legal Inquiries

File Reference	Location	Municipality
LL#2024-0002	1540 Venetian Blvd	Point Edward

Total Legal Inquiries: 1

Prepared By: Chunning Li
March 25, 2024
DRAFT

ST CLAIR REGION CONSERVATION AUTHORITY
Statement of Revenue and Expenditure
As at Feb 29, 2024

	Actual To Date			Annual Budget Prorated		Variance from Budget	
	Revenue	Expenditures	Surplus(Deficit)	Revenue	Expenditures	Revenue	Expenditures
Flood Control & Erosion Control	$534,430	$43,146	$491,283	$88,786	$88,786	$445,644	($45,639)
Capital Projects/WECI	$2,925,949	$1,526,178	$1,399,771	$707,500	$707,500	$2,218,449	$818,678
Conservation Area's Capital Development	$0	$0	$0	$43,167	$43,167	($43,167)	($43,167)
IT Capital	$4,565	$0	$4,565	$4,565	$3,333	$0	($3,333)
Equipment	$7,234	$73,808	($66,574)	$43,102	$44,333	($35,868)	$29,474
Planning & Regulations	$746,007	$122,031	$623,976	$166,191	$166,191	$579,816	($44,160)
Technical Studies	$670,069	$75,465	$594,604	$105,878	$105,878	$564,191	($30,413)
Recreation	$134,348	$139,808	($5,459)	$287,832	$287,832	($153,483)	($148,024)
Property Management	$13,230	$58,313	($45,083)	$52,047	$52,047	($38,817)	$6,266
Education	$37,932	$33,959	$3,973	$36,060	$36,060	$1,872	($2,101)
Communication	$119,499	$23,933	$95,567	$19,581	$19,581	$99,918	$4,352
Source Water Protection	$183,520	$20,081	$163,439	$80,376	$80,376	$103,144	($60,295)
Conservation Services/Healthy Watersheds	$809,939	$54,074	$755,865	$84,463	$84,463	$725,476	($30,389)
Administration/AOC Management	$1,152,984	$135,238	$1,017,746	$152,302	$152,302	$1,000,682	($17,064)
	$7,339,706	**$2,306,032**	**$5,033,674**	**$1,871,848**	**$1,871,848**	**$5,467,857**	**$434,184**
	-	-	-				

Notes:

1. Municipal matching, non-matching,and Recreation levies have been invoiced and are recorded in the actual revenue reported above. See General Levy Report for amounts outstanding.
2. The significant variances from budget to actual is reflective of the nature/timing and uniqueness of the particular projects. The variances will reduce and disappear as the year progresses.
3. Budget for the year is divided by 12 and multiplied by the number of months in the reporting period, this does not reflect the seasonality of the nature/ timing of projects

Item 8.1 (i)
Kate Jamieson
February 29, 2024

ST. CLAIR REGION CONSERVATION AUTHORITY

Cheques issued January-February 2024

CHQ. #	DATE	VENDOR	DESCRIPTION	AMOUNT
123523	1/2/2024	Acorn Tree Service	Tree removal - Coldstream, Warwick, Peers	13,899.00
123524	1/2/2024	Barco Products Canada	Benches & picnic tables	11,579.03
123526	1/2/2024	FIREFIELD LANDSCAPE SUPPLY	Strathroy office landscaping	7,186.80
123530	1/2/2024	RIGGS ENGINEERING LTD.	NDMP floodplain mapping	217,711.45
123534	1/2/2024	STRATHROY WELDING AND REPAIRS	Coldstream & Clark Wright maintenance	8,023.00
123548	1/10/2024	Murray Mills Excavating & Trucking (Sarnia) Ltd.	Repairs to Point Edward Casino walkway	9,605.00
123556	1/12/2024	LARRY MACDONALD CHEV OLDS	2023 Chevrolet Colorado x2	81,945.82
123559	1/24/2024	Alternative Land Use Services (ALUS) Middlesex Inc.	Contribution to Morgan-Earley wetland project	5,000.00
123567	1/24/2024	SHOREPLAN ENGINEERING LTD.	Seagar Park shoreline & Old Lakeshore Road	27,530.52
123569	1/24/2024	Van Bree Drainage And Bulldozing	Penhuron to Kenwick shoreline improvements	230,232.34
123581	2/8/2024	GSS Engineering Consultants Ltd.	Head St & Coldstream Dam decommission	27,841.87
123583	2/8/2024	Invasive Phragmites Control Centre	Invasive phragmites management - Bates & McLean	49,403.60
123594	2/20/2024	The Drafting Clinic Canada Limited	Large scanner	8,610.60
123596	2/20/2024	HRDownloads Inc	HR Professional & advice access	16,526.25
123604	2/20/2024	Van Bree Drainage And Bulldozing	Penhuron to Kenwick shoreline improvements	736,073.82
123605	2/20/2024	VanTam Fencing	McKeough Dam driveway fencing	28,074.85
123612	2/28/2024	Lambton Area Water Supply System	Shoreline protection grant	180,000.00
123617	2/28/2024	Van Gorp Constuction Inc	Warwick utility shed renovation	11,235.09
123619	2/28/2024	Van Bree Drainage And Bulldozing	Penhuron to Kenwick shoreline improvements	421,644.46
		TOTAL CHEQUE DISBURSEMENTS -		**$ 2,092,123.50**

Internet banking payments for January-February 2024

TRANS #	DATE	VENDOR	DESCRIPTION	AMOUNT
10487	1/31/2024	RECEIVER GENERAL	Payroll source deductions	22,949.44
10488	1/31/2024	WORKPLACE SAFETY & INS. BOARD	WSIB	5,848.27
10496	1/31/2024	Libro Credit Union - Visa	Employee expenses	10,652.72
10500	1/31/2024	OMERS	Employee pension	37,238.90
10504	1/31/2024	RECEIVER GENERAL	Payroll source deductions	59,421.48
10506	1/31/2024	RWAM Insurance Administrators Inc	Employee group benefits	16,287.32
10509	1/31/2024	Township of St. Clair - Property Taxes	Property taxes	20,207.08
10511	1/31/2024	WORKPLACE SAFETY & INS. BOARD	WSIB	5,753.95
10522	2/29/2024	Libro Credit Union - Visa	Employee expenses	8,231.59
10523	2/29/2024	MNP LLP	Year-end audit fees	8,602.12
10525	2/29/2024	Municipality of Chatham-Kent - Property Taxes	Property taxes	7,376.14
10529	2/29/2024	OMERS	Employee pension	57,309.94
10530	2/29/2024	ONTARIO MINISTER OF FINANCE	Employer Health Tax	6,157.80
10533	2/29/2024	RECEIVER GENERAL	Payroll source deductions	92,290.99
10535	2/29/2024	RWAM Insurance Administrators Inc	Employee group benefits	16,840.77
10540	2/29/2024	WORKPLACE SAFETY & INS. BOARD	WSIB	8,852.53
		TOTAL INTERNET BANKING DISBURSEMENTS -		**$ 384,021.04**

Visa purchases:	Olivec Canada - portable fencing for AWC	$	4,379.32	
	Kingbridge Conference King City	$	668.96	
	MTO TSD SO Strathroy	$	1,182.25	
	Key Contact London - Sydenham River	$	981.83	
	Vyond	$	869.92	
	Owl Labs - Meeting Owl	$	1,897.27	
	Bluehost - hosting account renewal	$	516.16	
	Amazon - Clinometer	$	560.89	
	Badder Bus - Maple Syrup Festival	$	683.65	
	Badder Bus - Maple Syrup Festival	$	683.65	
	PAYROLL RUNS			
	Payroll No. 1	$	63,948.95	
	Payroll No. 2	$	67,370.44	
	Payroll No. 3	$	66,028.08	
	Payroll No. 4	$	66,098.70	
	Payroll No. 5	$	82,748.90	
	TOTAL PAYROLL RUNS -	**$**	**346,195.07**	
	TOTAL DISBURSEMENTS -			**$2,822,339.61**

Item 8.1 (j)
Kate Jamieson
February 29, 2024

2024 GENERAL LEVY SUMMARY

MUNICIPALITY	GROSS LEVY	PAID TO DATE	OUTSTANDING
Sarnia	$ 593,817.96	$ 148,454.49	$ 445,363.47
Chatham-Kent	$ 210,141.49	$ -	$ 210,141.49
Brooke-Alvinston Twp.	$ 28,215.78	$ 28,215.78	$ -
Dawn Euphemia Twp.	$ 42,224.94	$ 42,224.94	$ -
Enniskillen Twp.	$ 30,928.50	$ -	$ 30,928.50
Lambton Shores M.	$ 81,969.10	$ 81,969.10	$ -
Oil Springs V	$ 3,242.06	$ 3,242.06	$ -
Petrolia T	$ 41,928.24	$ 41,928.24	$ -
Plympton-Wyoming T	$ 92,091.51	$ -	$ 92,091.51
Point Edward V	$ 34,184.04	$ 34,184.04	$ -
St. Clair Twp.	$ 179,264.40	$ 179,264.40	$ -
Warwick Twp.	$ 36,573.01	$ -	$ 36,573.01
Adelaide Metcalfe Twp.	$ 31,456.75	$ -	$ 31,456.75
Middlesex Centre Twp.	$ 37,781.90	$ 37,781.90	$ -
Newbury V	$ 2,545.80	$ 2,545.80	$ -
Southwest Middlesex M.	$ 18,857.98	$ 18,857.98	$ -
Strathroy-Caradoc M.	$ 146,121.55	$ 146,121.55	$ -
TOTAL	**$ 1,611,345.01**	**$ 764,790.28**	**$ 846,554.73**

Meeting Date:	April 18, 2024	**Item**	**8.1 (k)**
Report Date:	March 27, 2024		
Submitted by:	Mike Moroney and Donna Blue		
Subject:	St. Clair River Area of Concern Update		

Recommendation:

That the Board accept this update on the status of efforts to address the remaining Beneficial Use Impairments (BUIs) in the St. Clair River Area of Concern.

Background:

Degradation of Fish and Wildlife Populations – BUI #3
The draft status assessment report for this BUI was completed in October 2023 and the findings were presented to the Canadian Remedial Action Plan Implementation Committee (CRIC) by Environment and Climate Change Canada (ECCC) on November 7, 2023. The CRIC accepted the report findings and recommended that the engagement process commence to have this BUI redesignated to "not impaired". The engagement commenced with a presentation to Aamjiwnaang First Nation Environment Committee on February 20, 2024, and a presentation at the Walpole Island First Nation Heritage Centre Open House on March 19, 2024.

Restrictions on Drinking Water Consumption or Taste and Odour Problems – BUI #9
Staff are awaiting confirmation from ECCC and MECP (Ministry of the Environment, Conservation and Parks) that this BUI has been redesignated to not impaired based on the recommendation in the status assessment report and feedback received during the redesignation engagement process.

Loss of Fish and Wildlife Habitat – BUI #14
The CRIC Habitat Subcommittee team continues with their work on reviewing and providing input on the draft status assessment report for the Loss of Fish and Wildlife Habitat, and the draft Aquatic Habitat Management Plan. With seven delisting criteria to be considered as part of the assessment, the report has required compiling information on efforts over the past 30 years to restore and protect fish and wildlife habitat in the St. Clair River Area of Concern. The draft report includes a recommendation that this BUI be redesignated to not impaired.

Recent and Scheduled Meetings

Canadian RAP Implementation Committee (CRIC)
- May 11, 2023
- November 7, 2023
- Next meeting scheduled for April 25, 2024

Friends of the St. Clair River (FOSCR)

- June 21, 2023
- July 27, 2023
- December 14, 2023 (Annual General Meeting)
- March 7, 2024
- Next meeting scheduled for April 24, 2024

Binational Public Advisory Council (BPAC)

- April 19, 2023
- August 2, 2023
- October 26, 2023
- January 31, 2024
- Next meeting scheduled for May 2, 2024

Outreach and Engagement

Newsletter
Friends of the St. Clair River and the RAP Office continue to partner on the production of St. Clair River News, a free monthly e-newsletter: March Newsletter

Educational Signs
The Friends of the St. Clair River completed their project that involved the creation of educational signs for posting along the St. Clair River at various locations, covering 5 topics. The signs were delivered to the Village of Point Edward, the City of Sarnia, and St. Clair Township and are expected to be installed in spring 2024.

Sarnia-Lambton Chamber of Commerce
Presentation provided by the RAP Coordinator on February 27, 2024, to provide an update on progress in addressing St. Clair River Beneficial Use Impairments.

Walpole Island First Nation Heritage Centre Open House
The event, held on March 19, 2024, was well attended by the community. Several presentations were made, including one by the RAP Coordinator on the status of progress in addressing the St. Clair River BUIs. Several display booths were also set-up by various organizations, including a booth for the St. Clair River RAP program.

International Association for Great Lakes Research 2024 Conference
The RAP Coordinator has been invited to make a presentation on May 24, 2024, on the status of addressing BUIs in the St. Clair River. This event, held in Windsor and hosted by the University of Windsor, is scheduled for May 20-24, 2024.

Management of Contaminated Sediment
The Ontario Ministry of the Environment, Conservation, and Parks (MECP), with assistance from Environment and Climate Change Canada (ECCC), are taking the lead on outreach activities associated with the implementation phase of this project. Dow has confirmed that it

will be leading the implementation work and covering the associated costs. Work is anticipated to be able to occur in the later part of summer 2024, subject to the required approvals being in place.

Strategic Objectives(s):

To ensure that our rivers, lakes and streams are properly safeguarded, managed and restored.

Financial Impact:

Funding for the RAP Coordinator position is provided by the Ministry of the Environment, Conservation and Parks (MECP) and Environment and Climate Change Canada (ECCC). The agreement with MECP for the period 2022-2024 concluded on February 28, 2024, with a final report submitted to MECP as stipulated in the agreement. Subsequently, funding was successfully secured for the 2024-2025 and 2025-2026 periods under their Great Lakes Program.

Similarly, the funding agreement with ECCC for the period 2023-2024 came to an end on March 31, 2024, accompanied by the submission of a final report to ECCC as required. Additionally, an application has been submitted for funding under the federal Great Lakes Freshwater Ecosystem Initiative Program for the 2024-2025 and 2025-2026 time frame. The SCRCA is currently awaiting confirmation of funding approval.

The RAP Coordinator continues to hold monthly meetings with ECCC and MECP, providing regular updates on the status of the project work.

Meeting Date: April 18, 2024 **Item 8.1 (I)**
Report Date: March 26, 2024
Submitted by: Donna Blue

Subject: Communications Update

Recommendation:

That this report be received as information.

2024 Maple Syrup Festival

Close to 1,000 people visited the A.W. Campbell Conservation Area for the 2024 Maple Syrup Festival on March 16th and 17th. Held in partnership with the Brooke-Alvinston Firefighters Association annual pancake breakfast, visitors were treated to demonstrations of historical maple syrup production, wagon rides, maple taffy, and hot chocolate.

The 2024 event also featured local vendors and environmental groups along with a shuttle to and from the Conservation Area thanks to generous sponsorships by Bluewater Power and the Alvinston and District Optimist Club.

Mooretown based Bear Creek Stables once again provided wagon rides during the 2024 Maple Syrup Festival.

Local vendors at the festival included the Sydenham Field Naturalists, St. Clair Region Conservation Authority Biology Team, Oh Me Nerves Photography, Bird Friendly Sarnia, Ontario Federation of Anglers and Hunters, Dairy Distillery, and Black Gold Brewery

Myra Spiller, Conservation Education/Community Partnership Technician demonstrates historical maple syrup production.

Maple taffy was once again offered to visitors during the 2024 event.

Sydenham River Canoe and Kayak Race

Staff are looking forward to welcoming paddlers from all over southern Ontario for the 2024 edition of the Sydenham River Canoe and Kayak Race scheduled for Sunday, April 28, 2024. Co-sponsored by the St. Clair Region Conservation Foundation and Authority, the race serves as a fundraiser for the SCRCA's Conservation Education program.

The race features 11 different race classes and three different race lengths. The race begins on Mosside Road, just west of County Road 79, north of Cairo and ends at Shetland Conservation Area. While the 2023 race was cancelled due to weather, the 2022 event saw over $5,000 raised by the 70 paddlers who participated.

New for 2024, is a proposed "rain date" tentatively scheduled for the following Sunday (May 5th). Once confirmation from staff, partners, and vendors is received more intent promotion of the "rain date" will occur.

For more information on the race visit https://www.scrca.on.ca/events/sydenham-river-canoe-and-kayak-race-3/.

Paddlers participating in the Pro C2 Men and Pro C2 Mixed race classes get ready at the starting line during the 2022 Sydenham River Canoe and Kayak Race

Media and Social Media Analytics:

In order to continually improve upon our activities related to local media outlets and social media, communications staff will be reviewing analytics to help assess our communications efforts.

The following statistics cover the timeframe from January 1st to February 29th, 2024:

Media Relations

Activity	2024 (January – February)	2023 (January – February)
Media Releases	2	1
News Article Mentions	137	77

Social Media

Facebook

Activity	Total	2024 (January – February)	2023 (January – February)
Post Reach*	--	19,599	17,070
Page Visits	--	1,202	582
New Likes/Followers	2,592	37	23
Posts	--	25	25

***Post Reach** – The number of people who saw any content from your Page or about your Page, including posts, stories, ads, social information from people who interact with your Page, etc.

X (Formerly Twitter)

Activity	Total	2024 (January – February)	2023 (January – February)
Tweets	--	29	33
Retweets	--	26	43
New Followers	949	0	16
Engagements*	--	255	369

* **Engagements** = clicks, retweets, replies, follows, and likes

Strategic Objectives(s):

Goal 4 - Provide recreation and education opportunities for the public to enjoy and learn from our natural environment.

St. Clair Conservation

Meeting Date:	April 18, 2024	**Item**	**8.1 (m)**
Report Date:	March 26, 2024		
Submitted by:	Melissa Levi and Myra Spiller		

Subject: Conservation Education Report – April Education Program Summary

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Recommendation:

That this report be received as information.

Spring Outdoor Education Programs:

Maple Syrup Program: Approximately 600 students visited the A.W. Campbell Conservation Area to participate in the Sweet Maple Syrup field trip this year. Field trips were held between March 19th and 28th, 2024.

Field Trips: The St. Clair Conservation Education team is currently booking Spring Field Trips. To date approximately 2,200 students are expected to visit from over 20 different watershed schools. There are still spaces left; teachers continue to inquire about bookings daily.

Nature in your Neighbourhood: The Education Team is currently booking Spring Schoolyard programming. To date approximately 300 students from 3 watershed schools will participate. With some spaces remaining, it is anticipated that additional schools will participate in May and June 2024.

Sponsored Education Program Updates:

Plains Midstream Canada – Spring Water Awareness Schoolyard Program: Plains Midstream Canada continues to fund this program, which teaches students to stay safe in the springtime by keeping away from the edge of the water. The program is fully booked for 2024; approximately 1,250 students are expected to participate this April.

First Nations Program Engagement:

Land-Based Education Project at Kettle and Stony Point First Nation: Education staff continue to partner in the development of the school's Land-Based Education Program. Programming will run weekly until March 2024. Education Staff are hopeful to acquire additional funding to ensure this valuable partnership can continue.

Land-Based Education Project at Aamjiwnaang First Nation: Education staff have been invited to participate in a NEW partnership with Aamjiwnaang Kinoomaage Gamig, which is an Elementary school located within this First Nation community. Beginning in April 2024, Education staff will visit the school monthly to lead Outdoor programming in a nearby forest for students in Kindergarten through to Grade 4. This partnership will be funded through the existing EcoAction grant.

Committee Involvement:

Lambton County Trails Committee: Education Staff continues to be active on this committee, assisting to communicate Conservation Area projects and Special Events to the larger Lambton County community.

Rekindle the Sparks Planning Committee: Education Staff continue to provide support to this committee. Planning for the 2024 conference will commence in February.

Arbour Week Committee: The Education Team continues to be a part of the Arbor Week Committee.

Strategic Objectives(s):

Goal 4 – Provide recreation and education opportunities for the public to enjoy and learn from our natural environment.

RECEIVED

FEB 2 6 2024

St. Clair Regional Conservation Authority

205 Millpond Crescent

Strathroy, Ontario

N7G 3P9

RE: Darcy McKeough Dam operational concerns re Otter Creek

Attention all board of directors

February 1, 2024

Dear SCRCA Board members,

Since inception of this diversion dam project, farms south of the project have endured periodic flooding damage as a consequence of its operation including to our home farm, barns and dwelling.

As we experience increasingly more severe weather events, we are concerned about potential greater damage. While we acknowledge the success of the project to minimize damages to urban Wallaceburg, some of that cost has always been at our expense. As the project reaches the end of its designed lifespan, we wish to be on record that any re-design, upgrade or significant refurbishment ought to now include measures to also protect our interests. The premise for the project, while well meaning, in fact intentionally ignored hardships it placed on our farm and that of our neighbours for the "greater good". Harming us was ignored because it helped others.

For your future consideration, technology available in 2024 is vastly superior to that of the 1984 period during completion of construction, particularly as it pertains to water monitoring and perhaps a better ability to adjust flow to Otter Creek in real time. We know that a more attentive operational procedure while more complex would in fact minimize damages done to our properties by slowing water flow to allow more orderly volume exit.

There may indeed now also be engineering designs to address our concerns which were not considered or acted upon in 1984. SCRCA ought to now quantify the acres affected during the dam's operational history and move to reconcile with those of us who've been harmed by implementing future improvements.

Regardless of the Act, our damages have been real, and in some cases entirely preventable with operational modifications. In 2024 we are now aware of the fertilizer runoff effect on the Great Lakes, yet the dam operation continues to leach our farms with its overflow, leaving compaction and debris, lost fertility, lost rotational crop opportunities (like winter wheat which can never survive flooding), and lost use of previously existing infrastructure due to flood threat. We encourage the SCRCA to work with the Ontario, and Federal Government to acknowledge our hardship, and seek available solutions for this morally unjust historical oversight.

Thank you.

Don Crowe Don Crowe

[redacted]

cc: others

RECEIVED
MAR 11 2024

March 6/24

Attention

I am writing this letter in hopes of attracting assistance from any ministry office that may be able to help us.

Have you heard of us?

We are a small town in southwest Ontario, called Dresden. We have one stop light in town. We are the final destination in the famed Underground Railroad and the site of Uncle Tom's Cabin.

There is a company by the name of York1 who is forcing their way in, to destroy our peaceful community, by making a large dumpsite about 1km north of our town. This is a direct threat to our community - our kids - our water - the wildlife - our roads - our property values and our environment. We do not want this - our town is cohesive in our resistance.

We have worked our whole lives to own our little home on the north side of Dresden - raised our family, now have a granddaughter.. How dare York1 force their way in - without a care for the impact this has on every level of our entire area.

Would you or could you use your influence in any way to benefit our cause.

Thanking you for your consideration.

Sincerely
Deborah Boyse
Deborah Boyse.

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MAR 2 1 2023

Attention March 14/24

I would implore some one at your office to please look into YORK I and it's proposed invasion upon the town of Dresden, Ontario.

This is NOT the location to support a dumpsite.

- Molly's Creek and its ecosystem as a direct conduit into rivers and lakes.
- Roads → additional and heavy → steady truck traffic conflicting with school busses and our seasonal farm traffic during tomato harvest.
- Air quality and noise pollution and a visual ugliness → inflicted on our town.
- Wildlife → inclusive of eagles/owls/turtles/fish and snakes who depend on and inhabit this area.
- Our property values will suffer → who wants to live in proximity to this?
- Our environment will decline → our kids do not deserve to grow up with this in our backyard.
- Our community is important and we need our ministries and elected officials to stand and act on our behalf to stop York I.

As a resident of Dresden I cannot stress enough the urgence of this action required on your part.

We will remember who helps us → when we need it.

Please - Please stand with Dresden → Stop York I.

Signed
Deborah Boyce.