2024 Business Case

Water Quality Program

The intent of this business case is to underscore the vital importance of continued funding for the Water Quality Program managed by Saugeen Valley Conservation Authority (SVCA). This program ensures the health of our watershed by promoting environmental sustainability, public health, and local economic stability.

Issued Date: June 29, 2023

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Water Quality Program

1. Executive Summary

Saugeen Valley Conservation Authority (SVCA) is one of the 36 conservation authorities in Ontario dedicated to protecting, restoring, and managing our natural resources.

The Saugeen watershed encompasses 4,675 km^2 in the counties of Bruce, Dufferin, Grey, Huron, and Wellington. SVCA's jurisdiction includes the Saugeen, Penetangore, Teeswater, and Pine Rivers, as well as the adjoining Lake Huron shoreline.

SVCA's Water Quality Program monitors, analyzes, and safeguards the health of our watershed. The key benefits of this program include environmental preservation, public health protection, economic sustainability, recreational opportunities enhancement, and education and awareness campaigns.

1.1 Recommended Solution

To sustain and build on these key benefits, it is vital to ensure the continuation of municipal funding through cost apportioning agreements as permitted under the *Conservation Authorities Act.* This funding structure not only secures the necessary resources to maintain the program's operational excellence but also demonstrates the municipalities' commitment to environmental conservation. By maintaining this funding, we can ensure the Water Quality Program continues to provide critical services, enhancing the health and wellbeing of our communities and the environment.

2. Introduction

2.1 Purpose of the Business Case

To demonstrate the value of SVCA's Water Quality Program and advocate for continued municipal funding.

This business case outlines the value, scope, and long-term benefits of the Water Quality Program managed by SVCA. Continued funding through municipal cost-apportioning agreements, as a Category 3 program and service, is requested to maintain this critical program.

The Water Quality Program plays an instrumental role in preserving our watershed's environmental health. This program allows SVCA to monitor and assess the quality of water and aquatic habitats within the Saugeen watershed. This program contributes significantly to our shared commitment towards sustainable natural resource management. The data collected through this program empowers our communities to implement effective strategies to protect our water resources against pollution, degradation, and understand the influences of climate change.

The significant funding invested through past municipal levy has allowed SVCA to sustain this fundamental program. These resources have been invaluable in supporting the broad-ranging work carried out by SVCA, from 2001 through today.

It is important to note that the ripple effects of this program extend beyond environmental considerations. The Water Quality Program underpins the intrinsic value of our natural heritage. The continuation of this program, therefore, is not just a matter of ecological preservation but is an investment in the resilience and prosperity of our communities.

In the ensuing document, we will delve into the specifics of our Water Quality Program, including its current accomplishments, its future potential, and its overall impact on the Saugeen watershed. Furthermore, we will present a clear case for why its continued funding is essential. We look forward to your active engagement with this crucial matter, confident that with your understanding and support, we can secure the long-term future of this key program and, by extension, the continued well-being of our watershed and its communities.

2.2 Scope and Limitations

The business case covers the importance, scope, and impact of the program, focusing on the Saugeen watershed. It does not consider alternate funding models or program redesign.

3. Current Situation

The SVCA's Water Quality Program is functioning well, but continued funding from municipalities is at risk due to the new arrangement as mandated by the province for mandatory and non-mandatory programs and services.

3.1 Background Relationship with Municipalities

Conservation authorities and the municipalities we serve share a mutual commitment to environmental conservation and sustainable community development. Conservation authorities provide vital services that support and enhance the quality of life within municipalities. These range from watershed management and water quality monitoring to flood monitoring and warning, regulation of development, habitat preservation, and conservation of sensitive lands.

In turn, municipalities provide vital support to conservation authorities, primarily in the form of funding and policy endorsement. Together, we work towards safeguarding natural resources, ensuring public health and safety, and fostering sustainable growth. This intricate relationship ensures that environmental priorities are balanced with socio-economic needs, leading to well-rounded, sustainable development that benefits current and future generations.

Thus, the relationship between conservation authorities and municipalities is not merely functional but is a critical partnership towards achieving our shared sustainability goals.

3.2 Background Information Regarding Category 3 Programs and Services

In 2021, *Conservation Authorities Act* amendments required conservation authorities to complete an inventory of programs and services by February 2022. The inventory has categorized our programs and services as follows:

Category 1: those prescribed as mandatory by the province;

Category 2: those delivered on behalf of a municipality; and

Category 3: those that further conservation, restoration, development, and management of natural resources.

Effective January 1, 2024, the continuation of Category 3 programs and services will necessitate the formalization of cost apportioning agreements between SVCA and each member municipality. This requirement ensures that municipal funding continues to support the effective delivery and implementation of our programs and services.

SVCA proposes that member municipalities commit to a five-year agreement. Provisions for conflict resolution, amendments, and early termination will be embedded within the agreement structure.

This agreement timeline ensures the seamless operation of our programs and services, while simultaneously allowing room for annual adaptations within the sanctioned budget or during review periods. Given that program implementation spans multiple years, a multiple year agreement offers necessary lead time for adjustments. Instances include securing lab services, ordering equipment, calibration solutions, and inventory. Similarly, watershed monitoring and reporting necessitate a multiple year engagement for efficiency and cost-effectiveness.

The agreement will also establish a cost distribution mechanism among the municipalities. SVCA suggests adhering to the existing levy apportionment calculation mandated by the Province of Ontario, known as the modified current value assessment method. This method is already in use for the remaining municipal levy apportionment for Category 1 mandatory programs and services, hence its adoption ensures consistency.

3.3 Program History

Saugeen Valley Conservation Authority historically started collecting water quality data in select locations as far back as the 1960's, partnering with the Ontario Ministry of the Environment. Surface water sampling in our watershed continued until provincial government funding was cut in 1996.

SVCA's Water Quality Program was revitalized in 2001 following the Walkerton Water Crisis of May 2000. The Walkerton Water Crisis stands as a stark reminder of the critical importance of enhanced water quality monitoring. In the small Ontario town of Walkerton, contamination of the town's water supply with *E. coli* bacteria led to a tragic public health crisis that caused the deaths of seven people and left more than two thousand residents ill. This calamity, one of the worst of its kind in Canadian history, occurred due to a combination of factors including faulty infrastructure, inadequate water treatment, and a lack of regulatory oversight.

In response to the crisis, the Ontario government instituted sweeping changes to water management policies, ushering in an era of heightened vigilance and commitment to protecting water quality.

SVCA's Water Quality Program was reestablished as a direct result of the lessons learned from Walkerton. This program, fueled by a sense of urgency and purpose, was tasked with the critical mandate to monitor, protect, and enhance the water quality in our jurisdiction, with the dual aims of ensuring public health and preventing a recurrence of such a devastating event.

3.4 Program Background

SVCA conducts regular surface and groundwater sampling at various sites across our watershed. We collect *in situ* general chemistry, complete lab analysis for indicator parameters, monitor groundwater chemistry levels, and review results in consideration of applicable legislation and guidelines. We also undertake biomonitoring of benthic macroinvertebrates, which serve as key indicators of long-term trends in water quality and ecosystem health.

Provincial Water Quality Monitoring Network – Category 1 Program

This provincial water quality monitoring network was established over 50 years ago with collaboration between government and environmental agencies and local conservation authorities.

Under this program, SVCA staff collect surface water samples at 14 sites monthly during ice-free periods (April to November). These sites were selected based on our ability to measure water quality as it travels from a tributary to a larger basin, to monitor wastewater discharges, and to provide representative water quality conditions across our watershed. Samples are analyzed in a laboratory by the Ministry of Environment, Conservation and Parks (MECP), for parameters such as nitrates, metals, phosphorus, and chloride, among others.

Surface Water Quality Monitoring – Category 3 Program

Our team completes monthly surface water sampling at 15 sites within SVCA's jurisdiction, during ice free periods. These sites were selected with support from the MECP to fill important data gaps within the provincial monitoring program given the size of SVCA's watershed. These samples undergo analysis by trusted private laboratories and are tested for parameters consistent with the provincial program. Testing for *E. coli* at all provincial and SVCA sites is also completed under this program.

Water quality monitoring is essential to identify man-made sources or activities that affect the suitability of surface water for drinking water source protection, conservation of aquatic life, and recreational opportunities. This data is used in the management of aquatic ecosystems, to determine where actions may be needed, and to evaluate the efficacy of policy actions. Long-term data collection and trending is key to determine if water quality is improving or deteriorating over time.

Our water quality data allows SVCA to establish baseline conditions; establish and characterize long-term trends for various water quality indicator parameters; monitor compliance with Provincial Water Quality Objectives; provide information to municipalities and other regulatory agencies to support development (*i.e.*, nutrient inputs and loading, stormwater discharge, sewage facility discharges, and infrastructure removals, such as dams and weirs); and to determine the effectiveness of watershed programs.

Provincial Groundwater Monitoring Network – Category 1 Program

SVCA staff monitor 23 different aquifers situated across 13 different locations within the watershed. These include ten deep wells delving into bedrock aquifers and thirteen wells analyzing shallow, overburden aquifers located in the sediment layer above the bedrock. Water

levels and water temperature in these wells are recorded on an hourly basis, and annual water quality samples are generally collected each Fall. Any instances of surpassing Ontario Drinking Water Quality Standards (ODWQS) are promptly reported to the respective municipalities and the local Health Unit. This consistent monitoring of changes in groundwater levels and quality assists SVCA in making informed decisions related to resource management. Moreover, rain gauges have been integrated into numerous well sites to provide a better understanding of the correlation between rainfall and groundwater levels, and water use and taking, supporting the groundwater component of our Low Water Response Program.

Ontario Benthos Biomonitoring Program – Category 3 Program

Each year, we collect benthic macroinvertebrates—organisms such as bottom-dwelling insects, crustaceans, worms, and mollusks—from rivers and streams across the watershed. These creatures serve as excellent indicators of water quality. The presence, absence, or relative abundance of various species provides invaluable insights into water quality and the extent and sources of habitat degradation based on their tolerance to pollution. Biomonitoring and surface water quality sampling go together; biomonitoring identifies that there is a problem with the health of an aquatic system, and surface water sampling can help identify what that problem is and how it can be mitigated. Abundance and the type of organism found in a watercourse can also serve as an excellent proxy for the health of other aquatic organisms, such as fish populations. This data is critical for support of recreational activities, such as fishing, kayaking, and swimming, as well as economic development through tourism.

Watershed Report Cards – Category 3 Program

Watershed Report Cards are developed every five (5) years using guidelines from Conservation Ontario. All conservation authorities across Ontario develop the Report Cards to ensure consistent reporting across the province and to provide watershed residents with a high-level summary of the state of our watershed resources, as well as to identify potential stressors, such as rapid urbanization, changing land uses, and climate change. There are four key indicators that are used in the preparation of the Watershed Report Card: groundwater quality, surface water quality, forest coverage, and wetland coverage.

The Watershed Report Card is an excellent tool for conservation authorities to inform watershed residents about the health of their watershed in an easy-to-understand format. The format simplifies the extensive amounts of research and technical data.

Healthy Lake Huron Initiative – Category 3 Program

Since 2011, SVCA, along with similar organizations, has been actively engaged in a collaborative effort to safeguard and enhance the water quality of Lake Huron, focusing on areas that demand immediate remedial action. Part of SVCA's contribution involves the monthly collection of baseline and storm-event (runoff) samples from the South Pine River located in the Township of Huron-Kinloss. This water chemistry data, in conjunction with meteorological data, is fed into a computer-based model. This predictive tool enhances our understanding of how sediment and pollutants, such as nutrients, migrate from land into waterbodies.

Drinking Water Source Protection – Category 1 Program

The Water Quality Program is integral to SVCA's contribution towards the Drinking Water Source Protection Program, a mandated program under the *Clean Water Act, 2006.* Its primary objective is to safeguard the quality and quantity of current and future sources of municipal drinking water, thus ensuring the long-term availability of clean, safe drinking water for our communities.

In the Saugeen – Grey Sauble – North Bruce Peninsula Source Protection Region, Saugeen Conservation collaborates with Grey Sauble Conservation Authority and the Municipality of Northern Bruce Peninsula to protect 38 municipal residential drinking water systems. The data collected through our Water Quality Program provides the baseline for the Drinking Water Source Protection Plan's Assessment Report which is the technical foundation of the Source Protection Plan.

The Source Protection Plan determines the areas that are vulnerable or at risk of contamination and outlines a set of policies to address any identified threats. The Plan also provides specific timelines for policy implementation and necessitates ongoing monitoring of policy. This approach involves managing and mitigating risks through the effective use of existing legislation and regulations.

3.5 The Value of Data

The Water Quality Program's ability to continually provide updated, accurate data is crucial for proactive and informed decision-making within the Conservation Authority as well as to support economic development. The true value of data lies in its continuity and accumulation over time. With over twenty years of managing this program, the data collected can be used to establish long-term trends in watershed health, and therefore lend itself to detecting anomalies, predict outcomes, and make informed decisions.

The process of data collection is an ongoing narrative, where each data point connects to another, forming a continuous story of our watershed's health. Interruptions to this process can have profound implications. If we were to cease collecting data now, the existing wealth of information would lose much of its potency. Without continuity, discerning long-term trends or detecting subtle but significant changes becomes virtually impossible, thus undermining the informative value of the data we've gathered. Therefore, it is essential to maintain our data collection efforts to protect the integral value of the two-decade-long narrative we have built and enable us to proactively protect our watershed.

The need to continue data collection becomes particularly pressing considering climate change, an urgent global challenge that necessitates informed, proactive, and adaptive responses. As weather patterns become more unpredictable and extreme events more frequent, our understanding of how these changes impact our water quality is of paramount importance. Our data collection efforts allow us to track changes, identify emerging trends, and forecast potential challenges, informing our responses, and aiding in the development of strategies to mitigate the impacts of climate change. Without a continuous record, it will be nearly

impossible to determine if environmental impacts are local (*i.e*., point source pollution) or a result of changing background conditions (i.e., climate change).

At SVCA, we are keenly aware of the power of data as a tool for change and are in the process of making our water quality data publicly accessible and AODA (*Accessibility for Ontarians with Disabilities Act*) compliant via Microsoft Power-bi. This initiative aims to democratize data access, allowing any student, researcher, public authority, or government to utilize this valuable resource. By making this data widely available, we enable a multitude of stakeholders to engage in meaningful scientific investigations, supporting planning and development, enhancing our collective understanding of climate change impacts, and contributing to the creation of strategies that protect our environment and keep our communities safe. We are also in the process of preparing an annual water quality report to summarize, in depth, the current state of our watershed and how it might impact our communities.

3.6 Risks and Issues with the Current State

Loss of municipal funding would lead to discontinuation of this critical programs, posing significant ecological and economic impacts.

The prospect of losing funding for the Water Quality Program at SVCA carries with it more than just the discontinuation of a service; it represents the potential loss of a significant investment made by our municipalities over the years. A minimum amount of 2.9 million dollars has been directed towards this program, building its capacity, honing its methods, and accumulating a wealth of valuable data.

This investment should not be perceived as a sunk cost, but rather as a strategic commitment towards the long-term health and sustainability of our shared environment and communities. If funding were to be discontinued, so too would be the inherent value of the program and its accumulated data. It would be akin to abruptly abandoning a critical infrastructure project mid-way, thereby diminishing the returns on the investment made thus far.

Conservation authorities such as Saugeen Valley Conservation Authority (SVCA) are at the forefront of environmental conservation, utilizing the most efficient and scientifically backed methods to gather water quality data. Our extensive network, experienced team, and deep local knowledge ensure data collection is accurate, relevant, and cost-effective. It is important to note that outsourcing these data collection activities would invariably lead to significantly increased expenses, as there are no other local non-profit agencies equipped with the expertise and resources to carry out this critical task.

Furthermore, no alternative sources of this precise, area-specific information exist. If water quality monitoring ceases, or there is a gap in the data record, it will be difficult, if not impossible, to determine if temporal changes and trends in the data are due to pollution or site-specific sources, or if the changes can be attributed to watershed-wide factors such as climate change or natural variability.

Continuation of this SVCA program ensures a complete, reliable record. Therefore, the Water Quality Program implemented by SVCA is not only economically sound, but it also delivers

invaluable insights that could not be readily obtained otherwise, reinforcing the necessity of our work and the essential need for its continued funding.

Therefore, it is of utmost importance that we recognize and appreciate the true value of the Water Quality Program, understanding it not as a recurring cost, but as an ongoing investment in our region's environmental health, economic vitality, and overall resilience.

A commitment to sustained funding is critical to ensure that we continue to extract the maximum potential value from this significant investment for the benefit of our communities and the environment.

Please see Appendix B – Water Quality Program Investment.

4. Business Needs and Requirements

4.1 Objectives and Outcomes

Secure continued funding, maintain water quality, ensure public health, and promote sustainable local economic development.

The objectives and outcomes of our Water Quality Program are clear and interconnected, underpinning our collective vision of a sustainable Authority. At the forefront of these objectives is securing continued funding. This is a critical prerequisite to maintain the program's ongoing effectiveness and its ability to deliver tangible outcomes. By maintaining the Water Quality Program, we safeguard the ecological health of our watershed, preserving biodiversity and ensuring the longevity of our natural resources. Inextricably linked to this is our commitment to ensuring public health. By preserving water quality, we protect our communities from waterborne diseases, promote development and ensure a safe and healthy environment for our residents.

Lastly, our program aims to promote sustainable local economic development. Through our actions, we protect and enhance the region's natural assets, such as clean water and diverse ecosystems, which support various economic activities, from agriculture to tourism. In doing so, we ensure the long-term economic vitality of our region, providing a foundation for growth that balances environmental sustainability with socio-economic progress. Each of these objectives, while distinct, feeds into and reinforces the others, creating a holistic approach to our regional efforts.

4.2 Key Deliverables

Continued delivery of Category 3 programs, including surface water quality monitoring (i.e., sample collection, analysis, and reporting), biomonitoring, and public awareness campaigns such as watershed report cards.

4.3 Critical Success Factors

Success of the Water Quality Program is dependent upon sustained municipal funding, effective program execution by Saugeen Conservation and stakeholder support.

4.4 Recommended Solution

Continued funding of the Water Quality Program through 5-year cost apportioning agreements.

4.5 How This Meets Business Needs and Requirements

Municipal funding has historically supported the program and would meet current and anticipated future needs.

4.6 Alternative Solutions Considered and Why They Were Not Chosen

While enthusiastic, engagement with grassroots organizations proves to be unreliable due to the changing nature of their membership, varying degrees of experience and education, administrative issues (such as insurance) and their ability to access land (particularly private).

Research has been conducted to explore alternative funding avenues. However, other funding streams, while potentially supplementary, do not possess the capacity to replace the substantial monetary commitment provided by municipal funding, without threatening the continuity and effectiveness of the Water Quality Program. Funding from municipalities can be supported by additional sources but cannot be sustained by them.

5. Benefits and Risks

5.1 Tangible and Intangible Benefits

In the realm of tangible benefits, the scientific outputs of the Water Quality Program offer invaluable insight into our watershed's health, providing the data necessary to detect and predict environmental changes, prioritize conservation efforts, support sustainable development, and guide critical decision-making processes. Clean water, biodiversity preservation, healthier communities, sustainable local economies, and educational opportunities are tied to this program.

As for intangible benefits, the Water Quality Program bolsters public trust and community well-being, cultivates an ethos of environmental stewardship, and fortifies the social contract between municipalities and their residents by ensuring the safeguarding of our natural resources for present and future generations.

5.2 Costs and Risks Involved

Funding disruption could jeopardize the program's continuance and its associated benefits.

The Water Quality Program is funded though shared cost apportionment among 15 municipalities, demonstrating an impressive model of cooperative environmental stewardship. This shared cost approach not only makes the financial burden more manageable for each municipality but also promotes the health of our shared watershed, which naturally transcends municipal boundaries. By investing in this program, these municipalities are embracing a profound sense of community and collective responsibility, safeguarding our shared environment for the greater good, and fostering a stronger, more resilient region for everyone. This is a clear example of a commitment to the principles of 'being a good neighbour', and to

the understanding that protecting our natural resources is a responsibility that extends beyond borders.

Additionally, it's critical to understand that the shared funding model also implies a shared business risk; if even one municipality opts out of the program, the Water Quality Program is compromised, threatening the continuity of this invaluable environmental initiative for the entire region.

5.3 Risk Mitigation Strategies

Risk mitigation forms an essential part of our strategy to secure the continuity of the Water Quality Program.

One approach is advocacy for continued funding; SVCA is committed to maintaining a strong, ongoing advocacy campaign aimed at securing sustained funding for the program. This involves clearly communicating the program's benefits and significance to member municipalities, and other stakeholders.

The other approach is active stakeholder engagement; engagement with all stakeholders is another critical risk mitigation strategy. We believe in fostering an environment of transparency, collaboration and open dialogue with municipalities, community members, and other partners about all work and services offered through SVCA.

6. Implementation Plan

6.1 Timeline

At the May 20, 2023 Meeting, the SVCA Board of Directors gave staff the direction to develop a business case to accompany the draft cost-apportioning Agreement that has been prepared to negotiate with municipalities. The Directors requested that staff engage with senior administrative municipal staff on the draft Agreement prior to returning to their next meeting on July 20, 2023 with a proposed Agreement to take to municipal Councils requesting a resolution to continue with Category 3 Programs and Services.

Following the July 20, 2023 meeting, SVCA staff will pursue reaching out to Councils with an Agreement and the business cases to support program continuation. Agreements must be in place with municipalities by January 1, 2024 for the continuation of Category 3 programs and services.

6.2 Stakeholders and Their Roles and Responsibilities

Saugeen Valley Conservation Authority (SVCA)

SVCA bears the primary responsibility for executing the Water Quality Program. This includes planning, monitoring, data collection, analysis, and reporting. Additionally, SVCA will continue to seek out additional revenue streams, such as environmental grants and partnerships, to supplement the funding received through municipalities.

Municipal Governments

Municipal governments play a critical role in providing funding through the municipal levy (Category 1 programs) and cost apportioning agreements (Category 3 programs) which is essential for the continuation and effectiveness of SVCA's Water Quality Program. Municipal commitment to this funding model illustrates recognition of the program's importance and value to communities and constituents. Furthermore, municipal governments can also contribute by promoting the program's objectives within their jurisdictions and supporting initiatives that align with the conservation of water quality and overall watershed health.

6.3 Potential Barriers to Implementation

Watersheds transect municipal boundaries, requiring inter-jurisdictional cooperation and agreement.

7. Financial Analysis

7.1 Cost of Proposed Solution

Fees supporting the Water Quality Program that have not been allocated to Category 1 Programs and Services would be apportioned to municipalities using the modified current value assessment method as these are watershed-wide programs that benefit all municipalities and residents.
Please see Appendix C – Cost Apportionment of Water Quality Program.

7.2 Return on Investment Analysis

Benefits of a healthy watershed significantly outweigh the investment; there is a high return on investment in terms of environmental, health, and economic benefits.

Analysis

The Return on Investment (ROI) analysis for the Water Quality Program at Saugeen Valley Conservation Authority strongly supports its ongoing funding. When considering ROI, it is vital to acknowledge the multidimensional nature of the returns generated by the program. These returns are not merely financial but extend to substantial environmental, health, and economic benefits.

Environmental returns manifest in the preservation of our local watershed's health, ensuring a robust and resilient ecosystem for future generations. Health benefits are realized through the prevention of waterborne diseases, enhancing the wellbeing of our community, and indirectly contributing to savings in healthcare costs. Economic returns are generated via sustainable local development and activities dependent on a clean and reliable water source, such as agriculture and tourism.

However, a crucial factor influencing this ROI is the ongoing nature of the program. The program's capacity to continuously collect and analyze data is integral to its value. The longitudinal data it generates enables the detection of trends and anomalies, informing proactive management strategies and contributing to the program's preventative capabilities.

Thus, to realize and maximize this ROI, the continuity of the program, underpinned by sustained funding, is vital. Any disruption could impair our ability to capitalize fully on these valuable returns, emphasizing the necessity for consistent investment in the Water Quality Program.

8. Critical Assumptions and Dependencies

8.1 List of Assumptions Made in the Business Case

One of the crucial assumptions of this business case is that municipal funding will continue through cost apportioning agreements. Funding apportionment would increase annually as it would with the levy. This funding provides the primary resource enabling the program to maintain and enhance its operations.

8.2 Key Dependencies for Successful Execution

The successful execution of the Water Quality Program heavily relies on the continued support and funding from our member municipalities. Their understanding of the program's value and their commitment to upholding it are essential to our mission.

Success also depends on effective execution by SVCA, as it is SVCA's responsibility to effectively implement the program, from consistent monitoring and data collection to timely reporting and public education, is a crucial dependency. The team's expertise, dedication, and effective management are fundamental to delivering the program's objectives and outcomes.

9. Conclusion

The Water Quality Program, managed by SVCA, offers substantial benefits to the Saugeen watershed, a region encompassing five counties. The program plays a pivotal role in preserving water quality, promoting public health, and fostering local economic sustainability. Its educational initiatives also increase community awareness about water conservation, strengthening public involvement in watershed health.

Thus, continued funding through municipalities remains vital. This funding model enables the program to maintain its valuable work, contributing significantly to the well-being of the watershed and the municipalities within its bounds.

Appendix A: 2022 Watershed Report Card

Saugeen Conservation has prepared this report card as a summary of the 2017-2021 state of water quality, forests, and wetlands in our watershed. These report cards are released every five years together with Conservation Ontario.

A watershed describes an area, and the waterways that flow through it and towards a major outlet such as a lake. Everything in a watershed is connected and actions upstream can affect conditions downstream.

We measure certain features in our watershed to learn about their current condition, as well as trends. This information helps us plan for the future.

Groundwater

Groundwater is flowing water that is found below the ground, that is often stored in aquifers. Groundwater is monitored at 23 sites in our watershed through the Provincial Groundwater Monitoring Network (PGMN). Groundwater quality for this report was graded on chloride and nitrogen (nitrate + nitrite) levels.

Chloride and nitrogen can exist naturally, however natural levels in water are generally minimal. Increased levels in our waterways can be related to:

- the use of road salts (chloride only)
- septic systems
- fertilizers and manure
- industrial discharge
- erosion

What's different in this report card?

Previous watershed report cards only used five years of data to come up with their findings. This report card uses a minimum of ten years of data, or more if it was available for a better view of long-term trends.

Our Findings:

Chloride levels at all tested sites received a grade of A (excellent).

Nitrogen levels at most (86%) of the sites received a grade of A (excellent).

Two sites received nitrogen grades of B (good) and one site received a D (poor).

Different nitrogen grades from these sites could be caused by using more data from a longer period of time. The three sites that did not receive an A grade are in locations where we might expect to see higher levels of nitrogen, based on their environments.

The map is a visual representation of our findings.

Note:

- These findings are not to be considered indicators of drinking water quality.
- Groundwater quality results being reported are specific to the site location and do not apply to the watershed as a whole.
- No biological levels (ie. *E.coli*) were considered.

Surface Water Quality

Surface water is monitored at 31 sites along major streams and rivers in our watershed. This monitoring happens through the Provincial Water Quality Monitoring Network (PWQMN) and through Saugeen Conservation's own network. Sampling occurs monthly from April to November each year. Surface water quality for this report was graded on phosphorus, Escherichia coli (*E.coli*), and benthic macroinvertebrates.

Phosphorus is an essential nutrient for all living organisms, however it can have harmful effects on aquatic life at high levels. Phosphorus levels can be natural, and increase with human influence.

E.coli is a type of bacteria commonly found in the intestines of warm blooded animals. *E. coli* is often used as an indicator of contamination from human and animal waste. *E.coli* levels may increase after heavy rainfalls and snowmelt.

Benthic macroinvertebrates refer to small aquatic bugs that live on the bottom of streams, rivers, and lakes; they can tell us about long term water quality because they are sensitive to their environments. Certain types of bugs can only thrive in good water, as they have a low tolerance to pollution.

What's different in this report card?

Previous watershed report cards only used the downstream monitoring sites. This report card used data from all surface water sites in our watershed. Using more data allows us to have more confidence in our findings.

Our Findings:

- Overall grades range from A (Excellent) to C (Fair), with mostly (60%) B (Good) grades.
- Most overall grades have not changed from the 2018 report card, however the Beatty Saugeen River, Lake Fringe and Upper Main Saugeen River areas have improved.
- Phosphorus grades fell in the South Saugeen River and Lower Main Saugeen River. Remaining grades stayed the same.
- E.coli grades remained mostly unchanged across the watershed, with improvement for the Penetangore River area.
- Benthic macroinvertebrate grades generally improved.

The map is a visual representation of our findings.

Note:

Streams and rivers are constantly changing, and water quality results represent only a snapshot in time.

Forest Conditions

Forests provide important habitat for wildlife and plants. Forests also give us cleaner air and water, economic benefits, and recreational areas for people to enjoy.

Forest conditions in the 2022 report card were graded on the percentage of forest cover, forest interior and riparian cover, which is the area between land and a river or stream.

Forests in our watershed have changed since early settlement, with agriculture and housing development driving the demand for forest clearing. The growing presence of invasive plant and animal species can also overwhelm forests.

Geographic Information Systems (GIS) tools were used to determine forest grades.

Our Findings:

- Grades range from A (excellent) to D (poor), with mostly B (good) and C (fair).

The map is a visual representation of our findings.

Note:

- Forests grow slowly, but the benefits begin as soon as trees are planted. Changes in forest cover will be noticed in five years or more.
- In 2022, Saugeen Conservation planted 28,000 trees and more than that number again were sold directly to landowners for independent planting.

Wetland Conditions

Wetlands play a very important role in our watershed. They help lessen the impact of floods and droughts, protect our shorelines, absorb pollutants, improve water quality, and provide habitats for many species. Protecting our wetlands is critical to the well being of people and our planet.

Wetlands were graded on the percentage of wetland cover. Geographic Information Systems (GIS) tools were used to inform wetland grades.

Our Findings:

- Grades range from A (excellent) to D (poor) with mostly excellent grades.
- Only 17.5% of the Saugeen watershed is covered by wetlands.

The map is a visual representation of our findings.

What can you do to support the health of our watershed?

- Support your local conservation authority through donation
- Volunteer with local environmental organizations
- Advocate for the environment through delegations to municipal council, and engaging your elected officials
- If your municipality has an environmental committee of council, consider joining
- Ask your local government to support environmental initiatives
- If you have a septic system, inspect and pump it every three to five years
- Decommission unused or damaged wells
- Dispose of household chemicals at hazardous waste depots
- Plant native species and educate yourself on invasives in your area

Consider how we are all connected.

Appendix B: Investment in Water Quality Program Table

Year	Water Quality Budget	Today's dollars
2001	9,000	14,393
2002	173,000	271,932
2003	124,580	190,276
2004	108,927	163,652
2005	81,263	119,226
2006	81,470	116,684
2007	93,470	130,992
2008	97,519	134,379
2009	98,747	135,593
2010	97,118	130,942
2011	96,626	126,146
2012	99,898	127,856
2013	99,831	127,250
2014	102,203	127,672
2015	106,601	132,111
2016	104,208	127,031
2017	114,246	137,025
2018	109,797	128,824
2019	98,302	113,047
2020	100,890	116,280
2021	99,400	110,807
2022	109,650	114,481
Totals	**2,206,746**	**2,896,600**

This appendix presents an Investment in Water Quality Program Table by Member Municipalities, providing a financial overview of the program. The numbers detailed within this table are derived from audited financial statements, focusing on budgeted amounts as these represent the financial commitments that our Board of Directors have allocated to the program over the years. It is important to note that the actual expenses incurred have closely aligned with the budgeted projections, reflecting the accuracy of our planning process.

To account for the effect of inflation over the years and to present a more accurate representation of the monetary value today, the Bank of Canada's inflation calculator was utilized to adjust the historical values.

Following these adjustments, the total investment that SVCA has made to the Water Quality Program since 2001 stands at approximately $2.9 million dollars, illustrating our long-standing commitment to maintaining and enhancing the quality of our water resources.

Please note that the figures presented in the table exclusively reflect the financial contributions made by our Member Municipalities towards the Water Quality Program. They do not account for additional funding sourced from the Ministry of Environment, Conservation and Parks, grant

procurement initiatives, or other strategic partnerships. These external funding streams, although not included in these totals, have been instrumental in supplementing the resources provided by our Member Municipalities, thereby enhancing the overall financial support for the program.

Appendix C: Cost Apportionment of Water Quality Program by Municipality

Municipality	Amount
Arran-Elderslie	$2,986
Brockton	$10,280
Chatsworth	$3,565
Grey Highlands	$5,166
Hanover	$7,789
Howick	$321
Huron-Kinloss	$6,597
Kincardine	$20,823
Minto	$3,235
Morris-Turnberry	$228
Saugeen Shores	$25,046
South Bruce	$5,765
Southgate	$8,124
Wellington North	$4,693
West Grey	$14,432
Totals	**$119,050**

Appendix D: Water Quality Annual Report Preview – DRAFT

Excerpt from DRAFT 2022 Water Quality Report

This document is a draft only and is not intended for distribution. Data review and analysis is still on-going.

1. Introduction

The Saugeen Watershed is divided into ten sub-watersheds, each having its own natural and man-made features (see Figure XX).

Saugeen Valley Conservation Authority (SVCA) closely monitors the quality of water in the area. SVCA works with the Ministry of the Environment, Conservation and Parks (MECP) as part of the Provincial Water Quality Monitoring Network (PWQMN) to check water at 14 sites. PWQMN is essential for collecting information on the water's chemicals and physical properties.

Given the size of the watershed, 14 sites were not enough to collect all the needed information. In 2012, SVCA started an additional program to monitor 15 additional sites. Moreover, two more sites are part of an initiative called Healthy Lake Huron. Now, there are 31 sites in total where the water is monitored. This helps us gather the data needed to understand the health of the watershed.

SVCA collects benthic macroinvertebrates at 20 sites. This helps us understand the overall health of the watershed. These creatures serve as excellent indicators of water quality. The presence, absence, or relative abundance of various species provides invaluable insights into water quality.

As more people live in the area and farming activities increase, along with changes in weather patterns, it's increasingly important to keep an eye on water quality conditions. This is necessary because these changes can put pressure on the water environment. The monitoring programs help SVCA systematically collect important information, which is crucial for understanding and maintaining the quality of water both now and in the future.

2.0 Methods

2.1 Field Sampling

2.1.1 Surface Water

Surface water samples are collected using in-stream "grab" techniques throughout the year, typically in the first week of every month, during ice free periods (April to November). These samples are collected in accordance with PWQMN sample protocols. Additionally, *in situ* measurements of water temperature, pH, specific conductivity, turbidity, oxidative redox potential, and dissolved oxygen are collected at the time of sample collection. Sampling was conducted independent of precipitation events, however, precipitation data from the day of and two days prior to sampling were considered during data analysis.

Appendix D: This document is a draft only and is not intended for distribution. Data review and analysis is still on-going.

In 2022, surface water samples were collected at 31 sites within SVCA's watershed: 14 sites under the PWQMN program, 15 sites under SVCA's internal monitoring program, and 2 sites under the Healthy Lake Huron stewardship initiative.

All samples collected under the PWQMN and Healthy Lake Huron programs were analyzed at the MECP laboratory, while SVCA samples were sent externally to SGS laboratories.

Sample collection in 2020 was variable due to laboratory shutdowns associated with the COVID-19 pandemic. SVCA sampling was not completed at this time, PWQMN sampling was only available during the months of January, October, and November 2020.

2.1.2 Benthic Macroinvertebrates

Benthic macroinvertebrates were collected at 20 sites throughout the Saugeen watershed using the Ontario Benthic Biomonitoring Network (OBBN) stream sampling protocol. Samples are collected bi-annually in May using a typical "kick-and-sweep" method with a D-net. As per OBBN protocol, three replicate samples are collected to cover different sections of the watercourse, encompassing two riffles and one pool, per sample site. The kick-and-sweep collection method is undertaken across each riffle and pool section to ensure a minimum of 100-animal count is obtained. Samples are then sieved and placed into plastic containers,

preserved with 95% ethanol. Large debris is discarded after confirming no loss of macroinvertebrates. Finally, samples are transported and stored in a cool environment until sorting is completed.

2.2 Laboratory Analysis

2.2.1 Surface Water

All surface water samples are analyzed using a standard set of water quality parameters, as noted in Appendix X. Metals are also sampled at select sites under the PWQMN program.

The Lower Main Saugeen River at Burgoyne (Q4) is also sampled monthly, from April to November, for parameters associated with pesticide monitoring. The pesticide monitoring program is in partnership with the Ontario Ministry of Agriculture, Food, and Rural Affairs (OMAFRA) and the MECP. This separate program is focused on Southern Ontario where there is heavy agricultural use. The program aims to characterize pesticide levels in the water and note trends with time. A report on these trends was published in 2022 for all sites across Southern Ontario.[1]

For this report, six parameters were selected for discussion. These parameters are total phosphorus, nitrogen (nitrate-nitrite), chloride, total suspended solids, *E. coli*, and benthic macroinvertebrates (Table 1). The results for each parameter were compared to Provincial Water Quality Objectives (PWQO) or Canadian Water Quality Guidelines (CWQG) (Table 1).

PWQO were developed to protect all forms of aquatic life and all parts of their lifecycle. Additionally, PWQO can be used to protect recreational users by reviewing public health considerations (OMOEE 1994).

Where possible, the PWQO were used as they relate more specifically to surface water parameters. CWQG is typically associated with drinking water standards.

Total suspended solids and chloride are not identified in the PWQO and therefore they were reviewed against the CWQG.

Table 1. Provincial Water Quality Objectives (PWQO) & Canadian Water Quality Guidelines (CWQG).

Parameter (Unit)	***Water Quality Objectives/Guidelines (Unit)***	***PWQO or CWQG***	
Total Phosphorus (mg/L)	0.03 mg/L	PWQO	
Nitrogen; nitrite-nitrate (mg/L)	10 mg/L	PWQO	
Total Suspended Solids (TSS) (mg/L)	30 mg/L	CWQG	

[1] Raby, M., Lissemore, L., Kaltenecker, G., Beaton, D., & Prosser, R. S. (2022). Characterizing the exposure of streams in southern Ontario to agricultural pesticides. Chemosphere, 294, 133769.

Parameter (Unit)	*Water Quality Objectives/Guidelines (Unit)*	*PWQO or CWQG*	
Escherichia coli (*E. coli*) CFU/100mL)	(100 CFU/100mL)	PWQO	
Chloride (mg/L)	120 mg/L	CWQG	

2.2.2 Benthic Macroinvertebrates

Identification of benthic macroinvertebrates requires specific skills and certification under the Ontario Benthos Biomonitoring Network. SVCA certified staff can complete the analysis for benthic macroinvertebrates in-house.

Collected samples are rinsed and sieved through 500 um mesh to remove fine particulates. Large debris is removed and discarded, ensuring no loss of specimens. Each sample is then stirred, and a sub-sample is collected. Specimens are picked out of the sub-sample and reviewed under a microscope for identification. In accordance with OBBN protocol, specimens are identified to the Group 27 taxonomic level. Specimens are 'picked' from the sample until a total of 100 specimens have been analyzed.

Due time constraints, 2020 and 2021 samples were analyzed by the University of Windsor.

2.3 Parameters

2.3.1 Total Phosphorus

Phosphorus is a crucial nutrient for the growth of aquatic plants and algae. Phosphorus is a key factor in the overall health and productivity of freshwater ecosystems.

Phosphorus levels can occur naturally through soil and rock erosion. Phosphorus can also be impacted by human inputs such as fertilizers, manure, development, and industrial waste. High phosphorus levels are typically associated with storm events and high turbidity.

High phosphorus levels can lead to excess plant and algae growth, which reduces the oxygen needed for other aquatic species to survive.

The Provincial Water Quality Objective for phosphorus in streams is 0.03 mg/L (Table X).

2.3.2 Nitrogen: nitrate-nitrite

Like phosphorus, nitrogen is an important nutrient for aquatic plants and algae growth. However, high levels of nitrogen can be harmful to aquatic organisms. Nitrogen can reduce dissolved oxygen in the water, which organisms rely on to survive.

Nitrogen can occur naturally, however, it can also be present due to human-made sources, such as fertilizers, manure, failing septic systems, and industrial waste. Fertilizers and agricultural runoff are often the most significant source of high nitrogen levels in a watercourse.

Nitrogen in water is a combination of nitrite (NO_2-) and nitrate (NO_3-).

The Provincial Water Quality Objective for nitrogen is 10 mg/L (Table X).

2.3.3 Chloride

Chloride in watercourses often comes from winter maintenance activities which use salt. Once on roads, chlorides are easily washing into nearby ditches and make their way into larger rivers and lakes. Chlorides do not adhere to other minerals and therefore levels are often high in shallow waterbodies. Chlorides can be toxic to aquatic organisms.

The Canadian Water Quality Guidelines for chloride is 120 mg/L (Table X).

2.3.4 Total Suspended Solids (TSS)

Total suspended solids are a measure of the number of suspended particles in the water; it is often related to turbidity (i.e., cloudiness). Turbidity can exist naturally through erosion and watercourse flow or be impacted by human-made sources such as stormwater runoff and increased erosion from development or agriculture. If total suspended solids are high, sunlight may not reach the lower depths of a watercourse, making it difficult for plants and algae to grow.

Additionally, organics and metals often adhere to suspended solids, making them available for aquatic organisms to consume.

Canadian Water Quality Guidelines notes the maximum increase of TSS should be no more than 30 mg/L from background levels.

2.3.5 E. coli

Escherichia coli (*E. coli*) are a group of bacteria often found in the digestive systems of warm-blooded animals. They are commonly used to indicate the presence of fecal contamination as they are not naturally found in aquatic ecosystems (i.e., plants or in soils). These bacteria can cause stomach illness and potentially more serious health problems if consumed.

Provincial Water Quality Objectives suggest that water is safe for swimming when levels are less than 100 colony-forming units (CFU) / 100mL.

Since *E. coli* cannot survive long on their own, monthly surface water samples need to be reviewed alongside other parameters.

2.3.6 Benthic Macroinvertebrates

The term benthic macroinvertebrates refer to watercourse bottom-dwelling organisms such as insects, crustaceans, worms, and mollusks. These creatures serve as excellent indicators of water quality because of their tolerance to pollution. The presence and abundance of different species helps us understand water quality and overall watershed health.

Benthic macroinvertebrates can also serve as an excellent indicator for the health of other aquatic organisms, such as fish populations.

Appendix D: This document is a draft only and is not intended for distribution. Data review and analysis is still on-going.

3.0 South Saugeen River

The South Saugeen River sub-watershed covers has a drainage area of 798 km^2. This sub-watershed is through primarily agricultural land and includes watercourses such as Carrick, Meux, Bell's, and Fairbanks Creeks. The South Saugeen River ultimately flows into the Main Saugeen River, south of Hanover.

There are three samples sites within this sub-watershed (Figure X). These sites are a combination of PWQMN (Q10, and Q14) and SVCA's internal monitoring program (S13).

Precipitation data used for analysis was collected from SVCA's Mount Forest stream gauge station. Precipitation data for 2019 was not included.

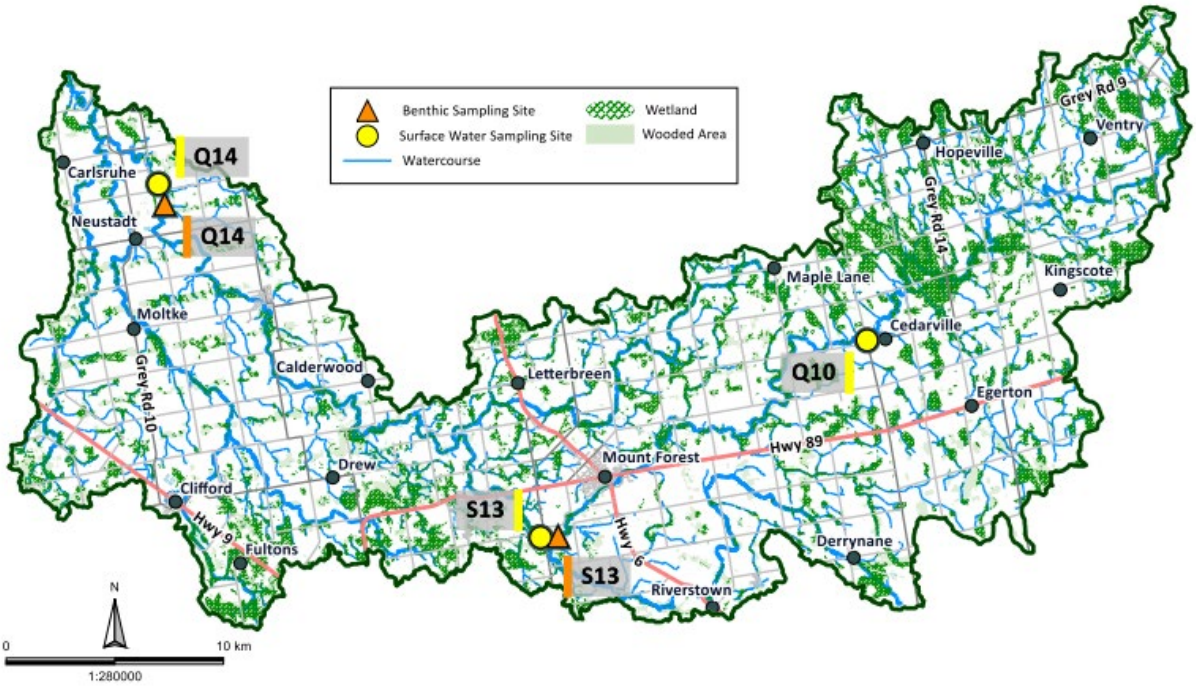

Figure 1: South Saugeen sub watershed map of surface water monitoring sites.

3.1 Results

3.1.1 Surface Water – 2022 Results

In 2022, most parameters within this sub-watershed were below water quality objectives, except for phosphorus (Figure X) and *E. coli* (Figure X). Phosphorus and *E. coli* showed most change during the summer months and exceeded water quality objectives 25% of the time.

There were no exceedances for nitrogen, chloride, and total suspended solids in 2022.

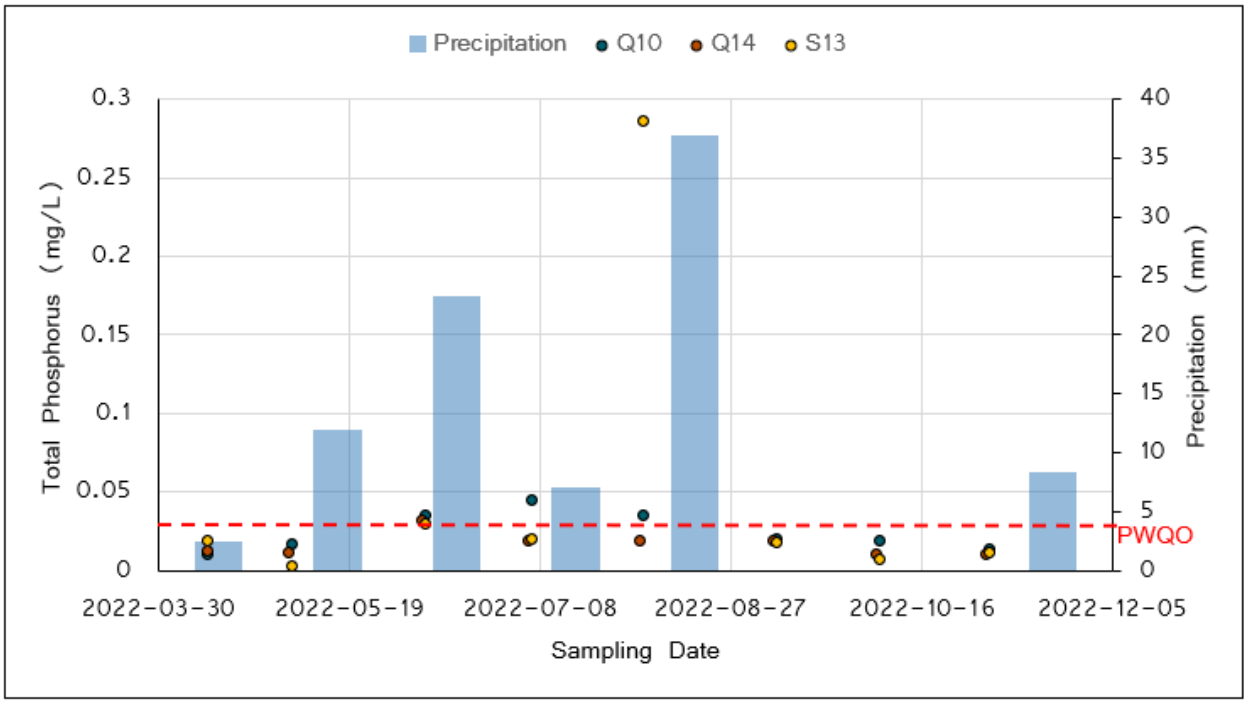

Figure 2: Total phosphorus (mg/L) concentrations for sampling locations within the South Saugeen River sub-watershed in 2022. PWQO= 0.03 mg/L.

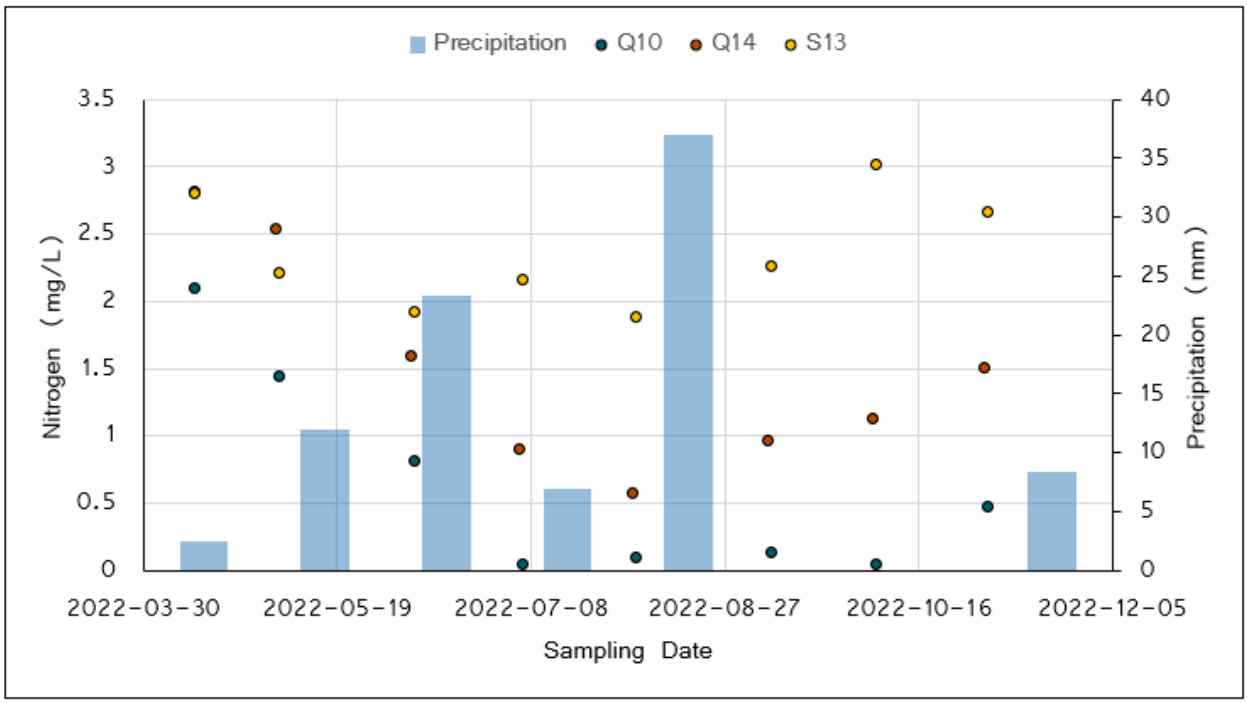

Figure 3: Nitrogen: nitrite- nitrate (mg/L) concentrations for sampling locations within the South Saugeen River sub-watershed in 2022. PWQO= 10 mg/L.

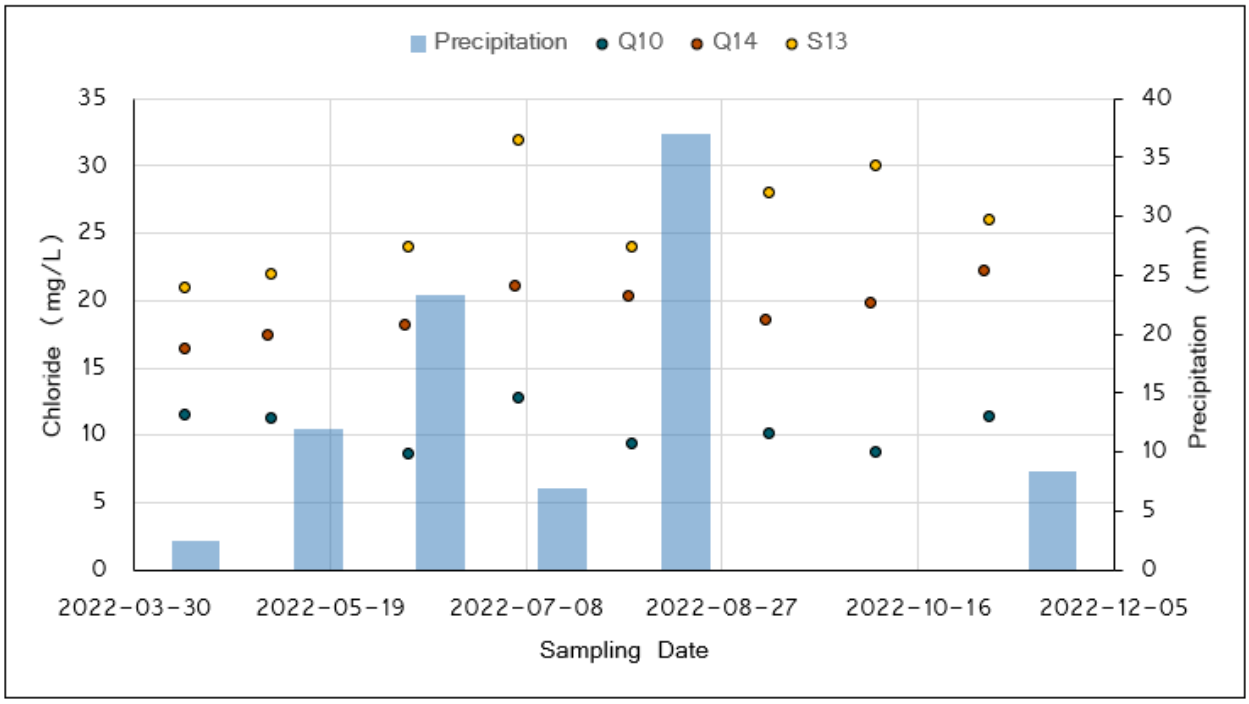

Figure 4: Chloride concentrations (mg/L) for all sampling locations within the South Saugeen River sub-watershed in 2022. CWQG= 120 mg/L.

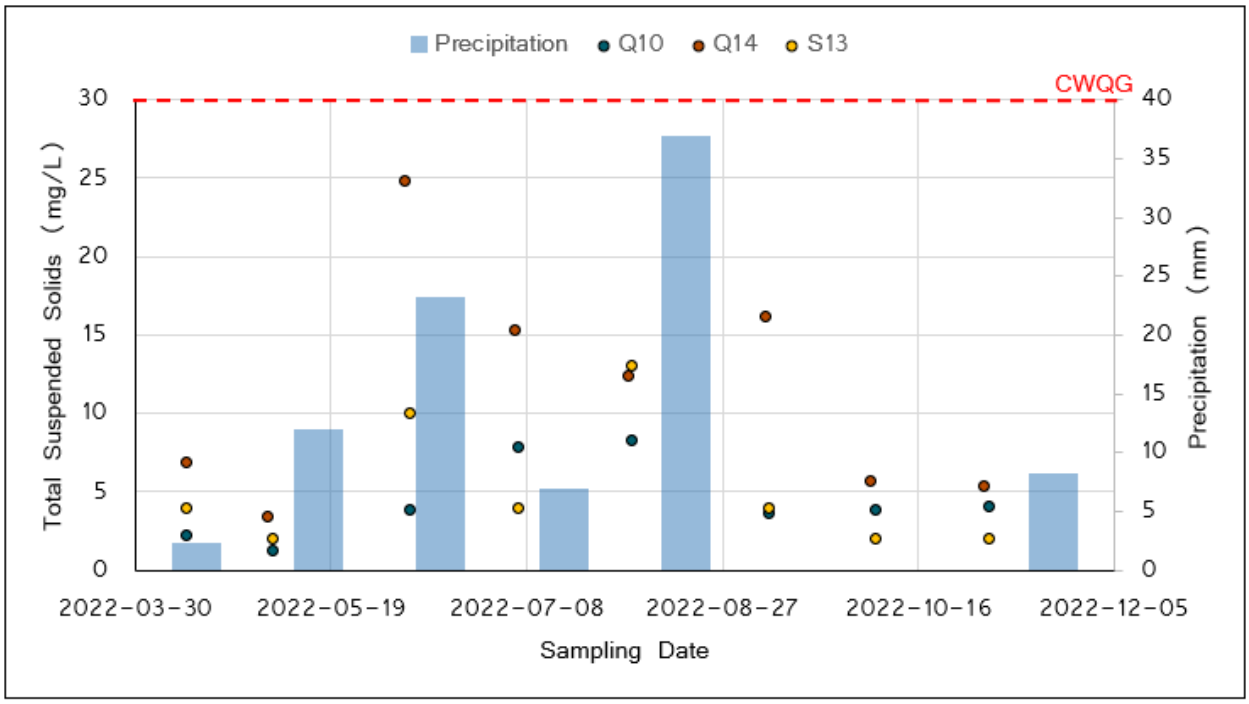

Figure 5: Total suspended solids concentrations (mg/L) for sampling locations within the South Saugeen River sub-watershed in 2022. CWQG = 30 mg/L.

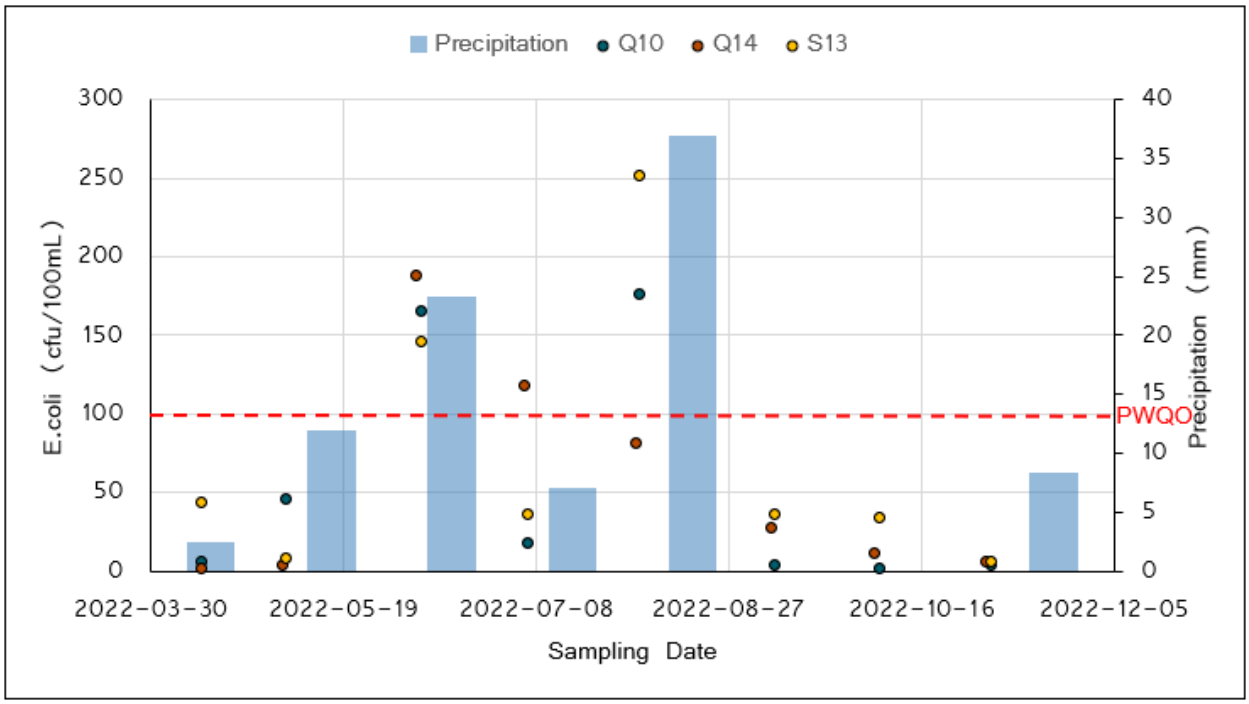

Figure 6: E. coli concentrations for sampling locations within the South Saugeen River sub-watershed in 2022. PWQO= 100 cfu/100mL

3.1.2 Surface Water - Long-term Results

Long-term findings within the South Saugeen River sub-watershed are similar to 2022 findings. Most parameters are generally well below water quality objectives, except for *E. coli* with 22% of sample results above. Phosphorus and total suspended solids also recorded a few exceedances (phosphorus – 5% and total suspended solids – 3% of samples)

There were no nitrogen or chloride exceedances between 2002 and 2022.

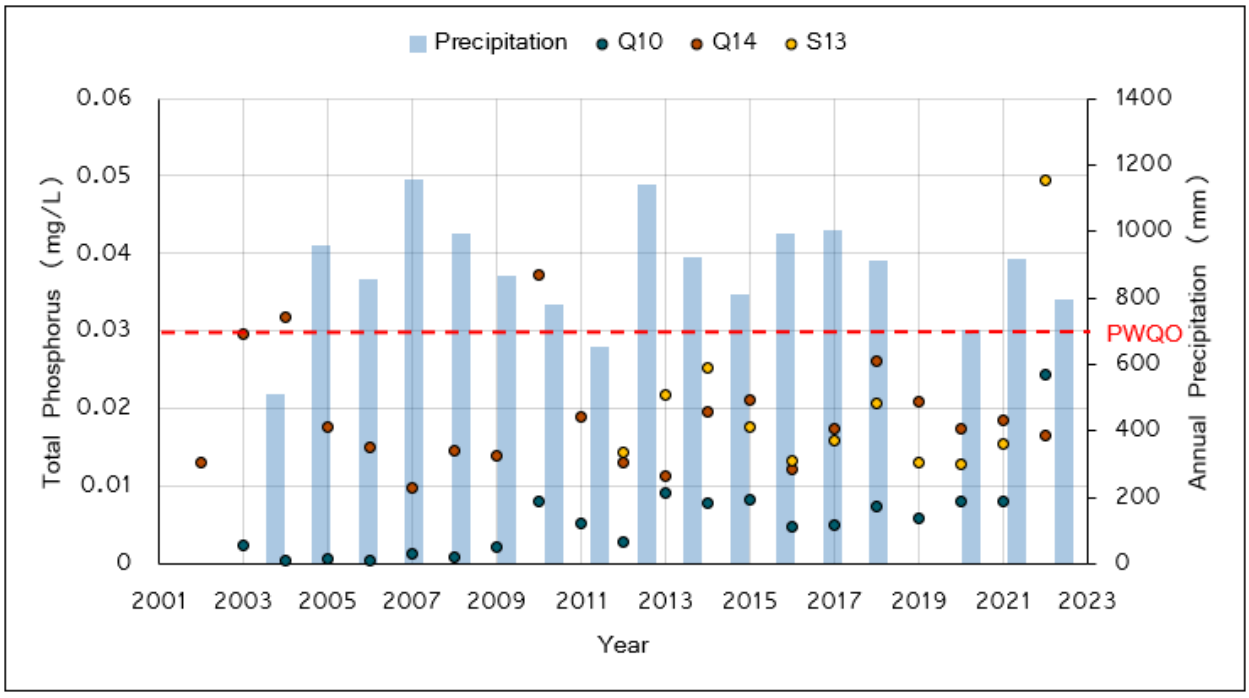

Figure 7:. Annual average phosphorus concentrations (mg/L) for sampling locations within the South Saugeen River sub- watershed from 2002 to 2022. SVCA internal sampling program began at S13 in 2012, no prior data available. PWQO= 0.03 mg/L.

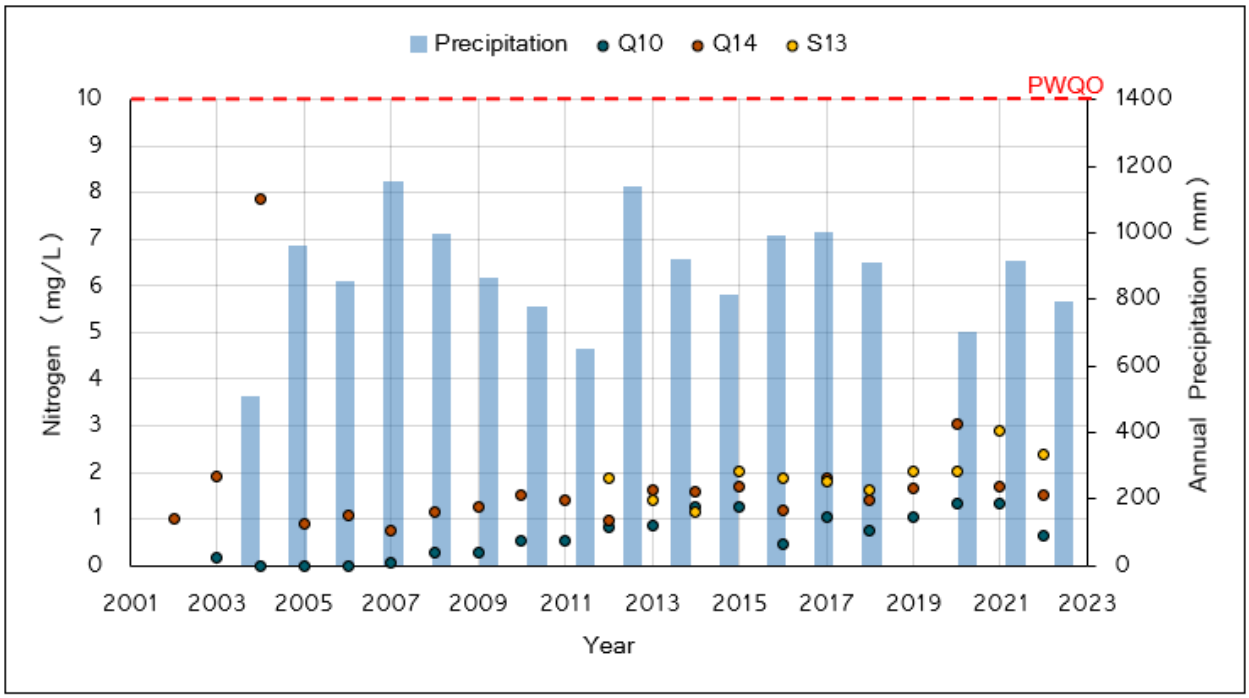

Figure 8: Annual average nitrogen: nitrate-nitrite concentrations (mg/L) for sampling locations within the South Saugeen River sub-watershed from 2002 to 2022. SVCA internal sampling program began at S13 in 2012, no prior data available. PWQO= 10 mg/L.

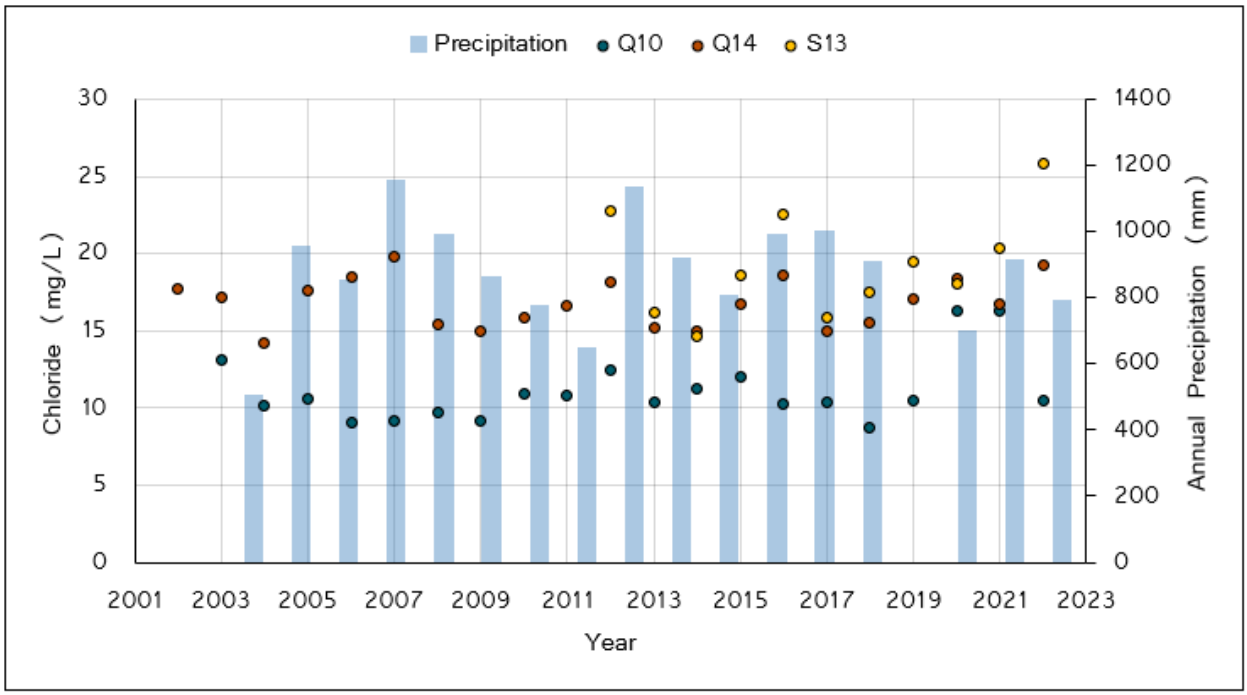

Figure 9: Annual average chloride concentrations (mg/L) for sampling locations within the South Saugeen River sub-watershed from 2002 to 2022. SVCA internal sampling program began at S13 in 2012, no prior data available. CWQG = 120 mg/L.

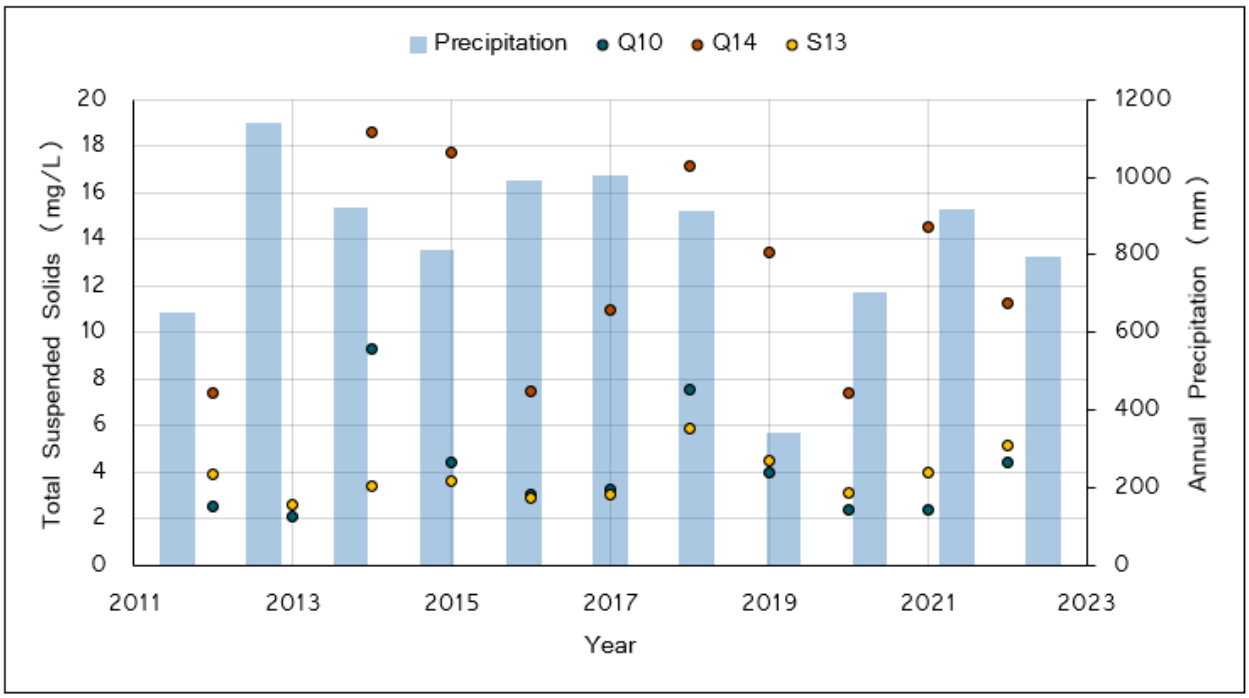

Figure 10: Total suspended solids concentrations (mg/L) for sampling locations within the South Saugeen River sub-watershed from 2002 to 2022. Analysis of TSS began in 2012, no prior data available. CWQG= 30 mg/L.

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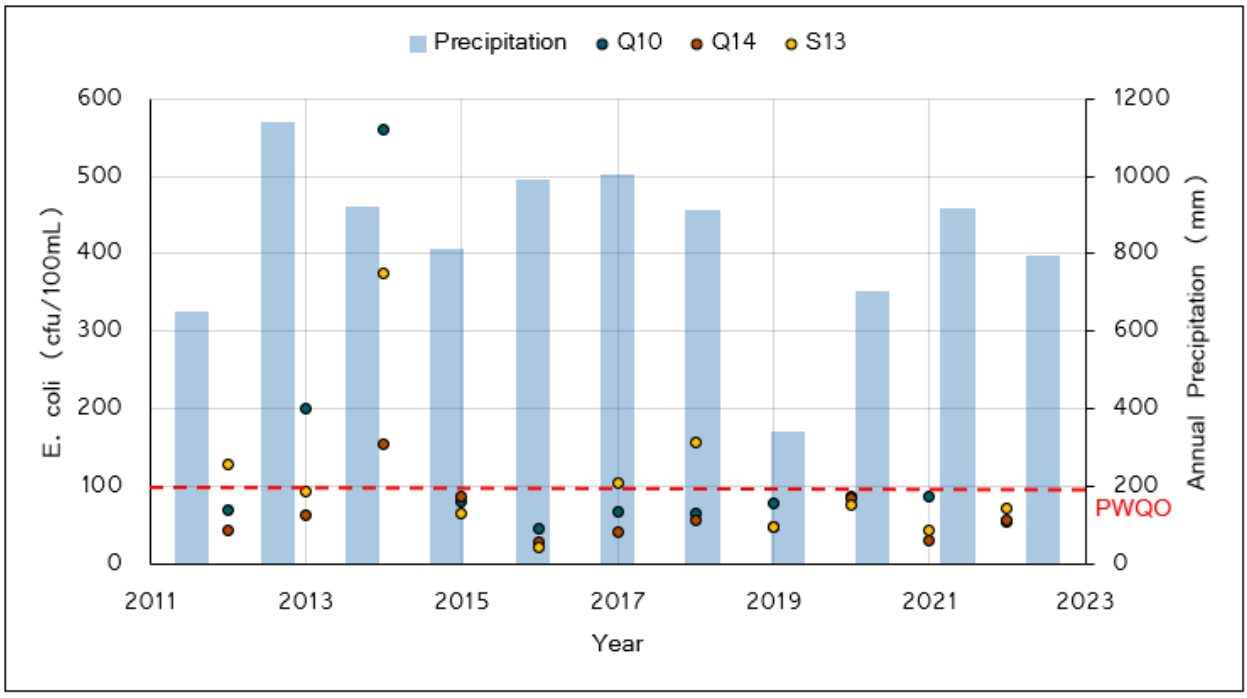

Figure 11:. Annual average E. coli concentrations for all three sampling locations within the South Saugeen River sub-watershed from 2002 to 2022. No data prior to 2012 available. PWQO = 100 cfu/100mL.

Sample of historical data for one SVCA station:

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Date (yyyy-mm-dd)	Time (24h)	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (uS/cm) (Field)	pH (Field)	Escherichia coli (CFU/100mL)	Total Suspended Solids (mg/L)	pH	Alkalinity, Total (mg/L)	Conductivity (uS/cm)	Nitrogen-Kjeldahl (N) (mg/L)	Chloride (mg/L)	Sulphate (mg/L)	Nitrite (mg/L)	Nitrate (mg/L)	Nitrogen, Nitrate-Nitrite (mg/L)	Phosphorus (mg/L)
[redacted]	10:00:00	11.53	9.61	458	8.25	10	4	8.32	257	503	0.5	3	15	0.05	1.38	1.38	0.018
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[redacted]	11:30:00	15.27	12.02	547	8.22	10	2	8.38	258	524	0.5	0.1	29	0.05	1.32	1.32	0.032
[redacted]	12:30:00	15.35	9.62	528	8.28	42	2	8.49	246	519	0.5	0.4	27	0.05	1.21	1.21	0.026
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[redacted]	13:00:00	16.45	8.32	551	8.21	24	2	8.37	238	548	0.8	0.3	31	0.05	1.05	1.05	0.029
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[redacted]	12:30:00	11.34	10.58	476	8.31	10	4	8.32	285	475	0.5	0.7	15	0.05	1.31	1.31	0.019
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[redacted]	13:57:00	8.3	11.54	453.1		28	4	8.26	253	428	0.5	8	12	0.05	1.18	1.18	0.025
[redacted]	14:00:00	15.2	9.45	514	8.35	58	5	8.44	283	508	0.5	3	15	0.05	1.35	1.35	0.018
[redacted]	14:00:00	17.6	9.1	548	8.42	148	5	8.5	264	452	0.5	10	17	0.05	1.14	1.14	0.022
[redacted]	13:40:00	17.3	9.68	523	4.81	26	3	8.51	228	448	0.5	3	3	0.05	0.68	0.68	0.007
[redacted]	14:15:00	12.3	9.28	538	8.34	18	2	8.43	273	523	0.5	10	28	0.05	1.32	1.32	0.065
[redacted]	13:55:00	14.2	9.87	548	8.34	32	2	8.41	271	534	0.5	10	28	0.05	1.2	1.2	0.024
[redacted]	15:43:00	9.8	12.72	558	8.28	24	2	8.44	265	545	0.5	11	21	0.05	1.62	1.62	0.083
[redacted]						2	2	8.51	246	502	0.5	3	15	0.05	1.54	1.54	0.019
[redacted]	14:10:00	7.8	12.37	485	8.26	2	2	8.39	248	465	0.5	3	13	0.05	1.37	1.37	0.019
[redacted]	12:05:00	12	9.86	487	8.28	248	18	8.43	247	493	0.5	8	13	0.05	0.33	0.33	0.052
[redacted]	11:45:00	28.2	9.87	58.5	8.61	72	5	8.42	258	478	0.5	8	28	0.05	1.31	1.31	0.051
[redacted]	14:20:00	21.5	8.64	507		48	4	8.38	228	458	0.5	3	27	0.05	1.03	1.12	0.033
[redacted]	14:05:00	28.6	8.53	529		24	4	8.45	258	524	0.5	3	29	0.04	1.11	1.15	0.038
[redacted]	14:51:00	8.6	10.25	555													
[redacted]	12:50:00	4.8	13.01	443.3	8.43	2	4	8.15	229	458	0.5	3	13	0.05	1.11	1.11	0.083
[redacted]	14:35:00	15.1	10.52	484	8.64	22	4	8.45	246	479	0.7	3	14	0.05	0.35	0.35	0.015
[redacted]	14:22:00	16.6	9.73	516	8.65	51	6	8.51	264	517	0.5	3	15	0.05	1.22	1.22	0.016
[redacted]	11:11:00	20	8.58	521	8.46	62	5	8.27	241	515	1	10	24	0.05	1.18	1.21	0.044
[redacted]	13:13:00	13.1	8.4	516	8.53	44	3	8.54	245	517	0.5	3	23	0.1	1.1	1.2	0.035
[redacted]	12:17:00	14.6	9.88	537	8.22	56	2	8.27	261	517	0.5	10	30	0.05	1.12	1.17	0.054
[redacted]	11:14:00	8.6	10.54	546	8.24	4	2	8.33	255	533	0.5	12	28	0.05	1.05	1.05	0.018
[redacted]	12:53:00	2.6	13.31	623	8.38	32	3	8.33	254	542	0.5	11	30	0.05	1.51	1.51	0.017
[redacted]	10:32:00	4.2	13.14	543	8.52	4	2	8.54	218	424	0.5	8	8	0.05	2.12	2.12	0.005
[redacted]	13:46:00	14.2	10.61	443	8.43	8	2	8.47	233	502	0.5	10	17	0.05	1.13	1.13	0.033
[redacted]	12:11:00					178	6	8.45	242	505	1	10	22	0.05	1.18	1.18	0.045
[redacted]	10:34:00	13.3	9.11	518	8.54	58	2	8.42	246	508	0.5	10	23	0.05	0.31	0.31	0.015
[redacted]	11:15:00	15.6	10.34	515	8.62	48	4	8.5	258	503	0.5	10	31	0.05	0.31	0.31	0.026
[redacted]	12:45:00	/	/	/	/	28	2	8.45	256	517	0.8	3	27	0.05	0.84	0.84	0.012
[redacted]	11:25:00	5.6	11.31	533	8.75	10	3	8.5	265	536	0.5	11	23	0.05	1.01	1.01	0.01
[redacted]	01:21:00	2.2	13.63	535	8.47	34	5	8.46	264	548	0.5	13	24	0.05	1.25	1.25	0.018
[redacted]	12:54:00	7	11.36	547		2	3	8.42	243	513	0.5	10	18	0.05	1.6	1.6	0.014
[redacted]	11:03:00	8.1	11.12	501		32	4	8.3	244	501	0.6	10	13	0.05	1.11	1.11	0.022
[redacted]	12:52:00	15.7	9.68	525	/												
[redacted]	11:43:00	21.5	9.81	524	8.34	86	5	8.48	246	513	0.5	13	31	0.05	1.13	1.13	0.034
[redacted]	12:07:00	16.8	9.92	546	8.36												
[redacted]	11:43:00	15.3	9.38	512	8.33												
[redacted]	12:08:00	13.8	9.51	525	8.35	112	4	8.47	258	515	0.5	14	13	0.05	1	1	0.03
[redacted]	12:08:00	5.1	11.85	546	8.58	38	3	8.44	288	521	0.5	13	18	0.05	1.38	1.38	0.019
[redacted]	14:52:00	8.1	11.82	516	8.47	2	5	8.33	266	523	0.5	14	18	0.05	1.51	1.51	0.011
[redacted]	12:38:00	8.7	11.38	537	8.43	4	4	8.35	274	538	0.5	12	28	0.05	1.64	1.64	0.012
[redacted]	12:51:00	13.5	8.33	442	7.37	1200	85	8.28	242	458	0.5	11	15	0.05	1	1	0.025
[redacted]	12:28:00	15	8.36	525	7.36	148	6	8.38	251	538	0.5	13	27	0.05	1.43	1.43	0.048
[redacted]	11:38:00	15.8	8.86	529	8.03	52	2	8.44	258	553	0.5	13	32	0.05	1.22	1.22	0.052
[redacted]	12:36:00	14.7	9.84	538	8.07	38	2	8.35	251	562	0.5	13	33	0.05	1.4	1.46	0.052
[redacted]	12:23:00	7.7	11.15	552	8.08	18	6	8.33	258	566	0.5	13	34	0.05	1.45	1.45	0.049
[redacted]	12:17:00	7.2	11.55	566	8.11	8	2	8.35	262	567	0.5	14	32	0.05	1.38	1.38	0.038
[redacted]																	[redacted]