DRINKING WATER SOURCE PROTECTION
Our Actions Matter

CTC Source Protection Region

CTC Source Protection Committee Meeting (#3/23)

Meeting Details

Date: Wednesday, December 6, 2023 1:00 – 4:00 p.m.

Chair: Nathan Hyde

Location: Hybrid meeting[1] (Microsoft TEAMS and in-person); Credit Valley Conservation Administration Office, Boardroom; 1255 Old Derry Road, Mississauga, ON

Agenda

Agenda Item	Page Number

1. **Call to Order and Roll Call**
2. **Review of Agenda**
3. **Disclosure of Conflict of Interest**
4. **Minutes of Previous Meetings**
5. **Chair's Remarks**
6. **Updates**
   - 6.1. Update from the Ministry of Environment, Conservation and Parks (TBC)
   - 6.2. Update from Conservation Ontario Source Water Protection Manager (Leslie Rich)
   - 6.3. Update from Source Protection Authority Liaison (Quentin Hanchard, CAO of Credit Valley Conservation)

[1] CTC Source Protection Committee meetings are video recorded for the purpose of minute taking.

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7. Committee Business		
7.1.	Reports to Committee	
	a. Review of the CTC Source Protection Region statistical trend analysis study results	3
	b. Review of the CTC Source Protection Plan Nutrient Policies	186
	c. ERO postings on proposed streamlining of environmental permissions	278
	d. CTC Program Update	292
7.2.	Other Business	
8. Correspondence		
8.1.	Email advising of resolution from Halton Region Council. October 27, 2023. To CTC Source Protection Chair from Graham Milne, Regional Clerk, Regional Municipality of Halton	353
8.2.	Letter advising of approval of an extension of Section 58 Risk Management Plans policy implementation timelines, CTC Source Protection Plan. November 21, 2023. To CTC Program Manager from Jennifer McKay, Manager, Source Protection Section, Conservation and Source Protection Branch, Ministry of the Environment, Conservation and Parks.	360
8.3.	Letter advising of resignation of Chair of Quinte Area Source Protection Committee. Received November 21, 2023. To Minister of Environment, Conservation and Parks from Max Christie, Chair, Quinte Area Source Protection Committee.	362
9. Next Meeting		
February 21, 2024 1–4 p.m. (hybrid: @ CVC head office & TEAMS)		
10. Adjourn		

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CTC Source Protection Region

TO: **Chair and Members of the Source Protection Committee Meeting #3/23, Dec 06, 2023**

FROM: **Behnam Doulatyari, Program Manager, CTC Source Protection Region**

RE: **Review of the CTC Source Protection Region (SPR) statistical trend analysis study results**

KEY ISSUES

Task 12, 13, and 14 under the s. 36 workplan identifies the need to review current drinking water *Issues* in the CTC SPR based on the latest water quality monitoring data and statistical trend analysis research results.

RECOMMENDATION

THAT the CTC Source Protection Committee receive the staff report Review of the CTC SPR statistical trend analysis study results and attachment for information.

AND FURTHER THAT the CTC Source Protection Committee endorse data requirements and sampling schedules presented in the recommendations section of this staff report for effective utilization of the updated statistical method, as outlined in the *CTC SPR Water Quality Assessment Technical Report* (**Attachment 1**).

Background

A drinking water *Issue* as defined by the Technical Rules under the Clean Water Act, 2006 includes:

The presence of a parameter in water at a surface water intake or in a well, including a monitoring location related to a drinking water system to which clause 15(2)(e) of the Act applies, if the parameter is listed in Schedule 1, 2 or 3 of the Ontario Drinking Water Quality Standards or Table 4 of the Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines and,

a. *The parameter is present at a concentration that may result in the deterioration of the quality of the water for use as a source of drinking water, or*

b. *There is a trend of increasing concentrations of the parameter at the surface water intake, well or monitoring location and a continuation of that trend would result in the deterioration of the quality of the water for use as a source of drinking water.*

The source water is/ may still be safe to drink, however because the concentration of a specific parameter(s) is elevated and/ or increasing, the *Clean Water Act, 2006* compels the SPC to determine the cause and create policies to manage or prohibit the *Issue*. An *Issue* can be chemical or pathogenic and always originates from a threat activity occurring in or near a vulnerable area. Every elevated parameter in the raw water is not necessarily considered an *Issue* when they are known to be naturally occurring and/ or can be removed or treated by the water treatment plant.

In the CTC SPR, a total of five Issue Contributing Areas (ICAs) associated with Wellhead Protection Areas were delineated in the Credit Valley Source Protection Area (CVSPA). Three ICAs were delineated in the Town Orangeville, one in Georgetown, and one in Acton.

In the Town of Orangeville, there is a Sodium *Issue* at Orangeville Wells 6, 9A, and 9B. There is a Chloride *Issue* at Orangeville Wells 6, 9A, 9B, 10, and 11. Within the Town of Orangeville, the application and storage of road salt as well as snow storage have been determined as the main activities responsible for the Sodium and Chloride *Issues.* The *Issue* designation was evaluated in the foundation report *Issues Determination, Town of Orangeville Wells* (CTC, 2013a).

Within Georgetown, there is a Chloride *Issue* at Cedarvale Wells 1A, 4, and 4A. The application and storage of road salt was determined as the main activity responsible for the Chloride *Issue*. In Acton, a Nitrate *Issue* exists at Davidson Well 1. The likely activities that are responsible for the Nitrate *Issue* include the application of commercial fertilizer, agricultural source material, and septic systems. The *Issue* designation in Georgetown and Acton was evaluated in the foundation report *Issues Determination, Halton Region Wells* (CTC, 2013b).

Historically, water quality parameter data collected from municipal production wells was analyzed to determine if a specific parameter exceeded the applicable Ontario Drinking Water Quality Standard (ODWQS) or if statistical projections using linear regression showed the potential for concentrations to increase above the applicable ODWQS threshold within a thirty-year period. The thirty-year period was chosen as this was generally the planning horizon at the time under the Growth Plan for the Greater Golden Horseshoe, which applied to most of the municipalities in the CTC SPR. When determining whether a specific water quality parameter should be classified as an *Issue*, consideration was also given to the frequency with which the half concentration of the ODWQS threshold was met or exceeded.

Task 12, 13, and 14 under the s. 36 workplan identifies the need to review current drinking water *Issues* in the CTC SPR based on the latest water quality monitoring data and statistical trend analysis methods. Furthermore, the CTC SPC reiterated their concern around water quality *Issues* at municipal production wells and the need for further investigation. Accordingly, a multi phase investigation was initiated which includes the following:

(i) Phase 1: Review and update the statistical trend analysis method employed for identifying drinking water *Issues*, establish water quality data management standards, and sampling frequency recommendations, presented in the *CTC SPR Water Quality Assessment Technical Report* (**Attachment 1**).

(ii) Phase 2: Review and update *Issue* identification methods and develop a delisting criterion.

(iii) Phase 3: Review existing drinking water *Issues* and conduct a hydrogeological assessment as to the likely cause of the observed statistical trend based on all available data.

(iv) Phase 4: Develop an automated water quality reporting tool in collaboration with ORMGP platform.

Analysis

Water quality statistical trend analysis methods and accompanying trend plots are tools used to identify deteriorating source water quality conditions before they become an *Issue.* They are also used to improve our understanding of the impact of existing Drinking Water Source Protection Plan policy's ability to protect the quality of source water.

The objectives of the CTC SPR statistical trend analysis study and corresponding *CTC SPR Water Quality Assessment Technical Report* (**Attachment 1**) were to:

- Evaluate available statistical trend analysis methods that can by used to identify *Issues.*
- Based on the comparison of different statistical trend analysis methods, recommend a preferred approach.
- Use the preferred approach to analyze municipal production and monitoring well raw water quality data in the CTC Source Protection Region to identify any existing or potential *Issues.*

The outcome of the CTC SPR statistical trend analysis study is to demonstrate a standardized and repeatable statistical method that can be applied by municipalities in future annual progress reports. As such, the *CTC SPR Water Quality Assessment Technical Report* (**Attachment 1**) describes a defendable approach that will facilitate municipal decision making to identify or remove a drinking water quality *Issue*.

In the study, three statistical tests were compared:

1. Linear Regression (LME),
2. Seasonal Mann Kendall (SMK), and
3. General Additive Model (GAM; annual and seasonal).

Table 1 lists different statistical assumptions and capabilities, and which of them must be met by each of the three statistical tests. These are compared to characteristics of groundwater monitoring data to highlight which of the assumptions are likely to be violated when applied.

Based on the comparison of the three tests, both linear regressions and seasonal Mann Kendall violate many statistical assumptions when used to analyse groundwater data.

Table 1. Assumptions of three statistical tests, compared to characteristics of groundwater monitoring data.

Assumption	Linear Regression	Seasonal Mann Kendall	General Additive Model	Groundwater Monitoring Data
Normal Distribution	yes	no	no	no
Monotonic	yes	yes	no	no
Missing values	yes	yes	yes	yes
Temporal autocorrelation	no	maybe	yes	yes
Can include covariates	no*	no**	yes	yes
Detects seasonal patterns	no	yes***	yes	yes

* Covariates can be addressed by analyzing residuals or upgrading to a multiple linear regression.
** Can be dealt with by pre-whitening the data before conducting the test
***Any monotonic trends present in all seasons must be in the same direction (up or down), otherwise, the SMK test will be misleading.

Of the three statistical tests reviewed, the General Additive Models (GAMs) was the only method that can deal with groundwater data without the fear of violating assumptions. GAMs are an extension of simple regressions. They use a sliding window approach where trends are estimated in each individual window, and then stitched together for an overall trend. The result is a trend that may appear linear, or show periods of increase, decrease and/or stability over the duration of the monitoring period. A detailed analysis of all three statistical methods is provided in Section 2 - Methodology of the *CTC SPR Water Quality Assessment Technical Report* (**Attachment 1**).

Linear regression and GAM tests were run on all the municipal production wells in the CTC SPR using the full data record available for sodium, chloride, and nitrate parameters. In addition to the statistical tests, the parameter estimates from the tests were used to plot trends in these parameter concentrations as a visual aid and evaluate the likelihood of exceeding the applicable Ontario Drinking Water Quality Standards during the observed period (i.e., up to 2022), and into the future (i.e., 2040). Detailed statistical test results and trend plots for each municipal production well are provided in Section 3 - Results and Discussion of the *CTC SPR Water Quality Assessment Technical Report* (**Attachment 1**).

Municipal feedback

Municipalities were informed that a review of current drinking water *Issues* in the CTC SPR based on the latest water quality monitoring data and statistical trend analysis methods would be undertaken as a component of the s. 36 workplan. A preliminary review of water quality trend results based on three statistical analytic methods for municipal production wells with *Issues* in the CTC SPR was performed and presented to municipalities with existing ICAs, Halton Region and Town of Orangeville, in February 2023. The results of this review were discussed at the CTC

Implementation Working Group on February 27, 2023. The preferred (i.e., GAM) statistical trend analysis method was shared with the CTC Implementation Working Group and discussed at the meeting on September 26, 2023. Municipalities were receptive and open to implementing the GAM method when analysing municipal production and monitoring well groundwater data. Specifically, to determine if statistical projections showed the potential for parameter concentrations in groundwater data to increase above the applicable ODWQS threshold within a given timeframe.

Next Steps

Considering the findings presented in the *CTC SPR Water Quality Assessment Technical Report* (**Attachment 1**), a series of recommendations are presented. These recommendations are not intended to serve as a comprehensive list of all recommended actions. Rather, they are to be used as a starting point for discussion. The recommendations may be refined through discussions with CTC SPR technical staff and through consultation with municipal partners. The recommendations will be implemented through the multi phase investigation as outlined in the Background section of this staff report.

The multi phase investigation will be undertaking following the workplan presented in **Table 2**.

Table 2. CTC SPR Water Quality Assessment Technical Report multi phase investigation workplan

Phase	Task	Description	Timeline
Phase 2	Review and update I*ssue* identification methods and develop a delisting criterion.	CTC SPR technical staff to review water quality trend analysis results and accompanying plots and revise drinking water *Issue* identification methods. CTC SPR technical staff and partner municipalities to work collaboratively to develop drinking water *Issue* delisting criterion.	Q1 2024
Phase 3	Examine current drinking water issues and conduct a hydrogeological assessment to determine the cause of the observed trend using all available data.	CTC SPR technical staff to lead the task with support from municipal partners. Municipal partners to share supporting material data with CTC SPR technical staff. Supporting material includes municipal monitoring wells water quality data, municipal production well pumping rate data, groundwater level data from municipal production and monitoring wells, land use change mapping or data, and available road salt application rates.	Q1/Q2 2024

Phase	Task	Description	Timeline
Phase 4	Develop an automated water quality reporting tool in collaboration with the Oak Ridges Moraine Groundwater Program (ORMGP).	CTC SPR technical staff and ORMGP staff to develop an automated water quality reporting tool and Issue identification tool through the ORMGP platform.	TBD

Recommendations (as presented in the *CTC SPR Water Quality Assessment Technical Report)*

1) CTC Source Protection Region will adopt the GAM statistical method for analysing municipal production and monitoring well raw water quality data, to identify any existing or potential *Issues,* and to inform the Annual Progress Reporting process*.* Municipalities in CTC are requested to use this trend analysis method when producing trend plots and projections of water quality data.
2) To effectively utilize the GAM method, specific data requirements must be met. These include:
    a. Quality controlled data – ensure that data are quality controlled and that all outliers are evaluated to ensure they are correct and should be retained in the analysis.
    b. Detection limits – provide the detection limits that each laboratory has reported so this can be used to process the censored data.
    c. Exact concentrations – To apply the above approach for censored data, exact concentrations provided by the labs are necessary.
3) CTC Source Protection Authority's recommend that municipalities update their sampling schedule of raw groundwater from municipal production wells to at least **four times per year** (i.e., one sample per season) for sodium, chloride, nitrate, and nitrite parameters, if not already doing so.
4) CTC Source Protection Authority's recommend that municipalities consider updating their sampling schedule of municipal monitoring wells to at least **four times per year** (i.e., one sample per season) for sodium, chloride, and nitrate and nitrite parameters, if not already doing so.
5) CTC Source Protection Authority's recommend that municipal production wells with an increasing parameter trend, and where the parameter concentration is above the half MAC for any of the three parameters: sodium, chloride, and/ or nitrate and nitrite, increase their sampling frequency to **monthly** for the parameter(s) that have an increasing trend, if not already doing so. For reference, policy SAL-9(b) in the Approved Source Protection Plan CTC Source Protection Region (2022) directs the municipality to undertake monthly sampling of sodium and chloride parameters in raw water at affected wells within an Issue Contributing Area for Sodium or Chloride.

6) Municipalities to upload all their municipal production and monitoring well levels and water quality parameter data by February 1st of each year to the Oak Ridges Moraine Groundwater Program (ORMGP) database, following the ORMGP file importing process.

References

CTC Source Protection Committee. (2022). Approved Source Protection Plan: CTC Source Protection Region. March 2022. Version 5.

CTC Source Protection Region. (2013a). Issue Determination, Town of Orangeville Wells. September 2013. Toronto, ON: Toronto and Region Conservation.

CTC Source Protection Region. (2013b). Issue Determination, Halton Region Wells. April 2013. Toronto, ON: Toronto and Region Conservation.

Report prepared by:
Hailey Ashworth, Specialist, Hydrogeology, Credit Valley Conservation
T: 905-670-1615, ext. 309
Email: hailey.ashworth@cvc.ca
Date: October 26, 2023

Attachments (1)
Attachment 1: CTC SPR Water Quality Assessment Technical Report

DRINKING WATER SOURCE PROTECTION
Our Actions Matter

CTC Source Protection Region

CTC Source Protection Region Water Quality Assessment Technical Report

Prepared by: Credit Valley Source Protection Authority

October 25, 2023

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Appendices

Appendix A: Wells excluded from the trend analysis.

Appendix B: Wells excluded from the monthly analysis.

Appendix C: Trend and guideline comparisons for all wells

Appendix D: Overview of trend results by regional municipality and parameter

Appendix E: Oak Ridges Moraine Groundwater Program (ORMGP) file importing process

Tables

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1 Introduction

1.1 Background

Drinking water quality in Ontario is regulated by the provincial government through laws, regulations, and system-specific legal instruments (permits and licenses). Following the tragedy in Walkerton, Ontario in May 2000, a public inquiry led by Justice Dennis O'Connor made 121 recommendations to ensure clean and safe municipal drinking water in Ontario. This included the establishment of new laws and regulations, including the *Safe Drinking Water Act, 2002* and the *Clean Water Act, 2006*.

Under the *Safe Drinking Water Act, 2002* (SDWA), all municipal residential drinking water system owners in Ontario must operate their system(s) under a valid Municipal Drinking Water License. To comply with Ontario Regulation 170/03 under the SDWA, annually, each drinking water system owner must prepare a Water Quality Report that provides information on the quality of water supplied and a Summary Report covering the operation and overall performance of the drinking water system(s). The Water Quality Report and the Summary Report are made available to the public each year to ensure transparency.

In compliance with the SDWA, the quality of drinking water must be monitored to ensure it meets provincial standards. Regular sampling and testing of raw, treated, and distributed drinking water is performed for several organic, inorganic, physical and radiological parameters. Organic parameter testing is conducted for E. coli, fecal Coliform bacteria, total Coliform bacteria, and Heterotrophic Plate Count. Inorganic parameter testing includes a full suite to capture the general chemistry characteristics of the water used as a source for municipal water systems. From a drinking water source perspective, emphasis is placed on three parameters — sodium (Na), chloride (Cl) and nitrate (NO3) — since they are commonly sampled, are typical indications of surface activity, and are mobile in the groundwater flow system.

For large municipal residential drinking water systems, raw water microbiological samples are taken at least once every week before any treatment is applied to the water. Each sample is tested for E. coli and total coliforms. Sampling frequency for raw water inorganic (chemical) and organic parameters is performed at least once every twelve months from a raw water supply that is surface water based, and at least once every thirty-six months from a raw water supply that is groundwater based. Each sample is tested for every parameter set out in Schedule 23 and 24 of the SDWA. If a test result for any parameter exceeds half of the standard prescribed for the parameter in Schedule 2 of the Ontario Drinking Water Quality Standards (ODWQS), the frequency of sampling and testing for that parameter shall be increased so that at least one water sample is taken and tested every three months for four consecutive periods (surface water) or two consecutive periods (groundwater). Sampling and testing are performed by trained and qualified operators. The provincial government requires that all drinking water testing laboratories be accredited by the Standards Council of Canada.

On an annual basis, drinking water systems in Ontario undergo an inspection program to confirm compliance with provincial drinking water legislation. Through these inspections, the provincial government ensures that each drinking water system meets sampling, testing and disinfection requirements, treatment standards, and terms and conditions as stated in Ontario Regulations 170/03, 169/03 and 128/04 under the SDWA. These inspections also include checks of control measures in place to maintain protection of sources of drinking water under the *Ontario Water Resources Acts, 1990* and the *Clean Water Act, 2006* (CWA).

The CWA and its associated regulations aim to protect existing and future sources of drinking water before it enters the municipal drinking water treatment system. The CWA established a locally driven, science-based, multi-stakeholder process to protect municipal drinking water sources and designated private drinking water sources. This process is meant to promote the shared responsibility of all stakeholders to protect local sources of drinking water from threats to both water quantity and quality.

The CWA is not designed to protect all of Ontario's water resources. The CWA has a narrower focus, which is sources of water that have been designated by a municipality as being a current or future source of residential municipal drinking water. The *Ontario Water Resources Act, 1990* and the *Environmental Protection Act, 1990*, along with other provincial and federal laws remain the primary legislation for protecting the quality and quantity of Ontario's water resources.

With the CWA and its first regulations coming into force in 2006, Source Protection Regions (SPR) and the nineteen corresponding Source Protection Committees (SPC) were established. The CTC Source Protection Region (**Figure 1**) contains 25 large and small watersheds and spans from the Oak Ridges Moraine in the north to Lake Ontario in the south. The region contains portions of the Niagara Escarpment, Oak Ridges Moraine, Greenbelt, Lake Ontario, and the most densely populated region of Canada. The CTC Source Protection Region includes:

- 25 local municipalities and eight single tier, regional or county municipalities;
- 63 active municipal supply wells; and
- 16 municipal surface water intakes on Lake Ontario.

The region is complex and diverse in terms of geology, physiology, population, and development pressures. There are many, often conflicting water uses including drinking water supply, recreation, irrigation, agriculture, commercial and industrial uses, as well as ecosystem needs. This diverse setting represents a significant challenge because of the variability of available information upon which to base the technical work, the differing stresses on water resources related to development pressure and population growth, and the differences in the nature, density, and locations of threats to the quality and quantity of water resources.

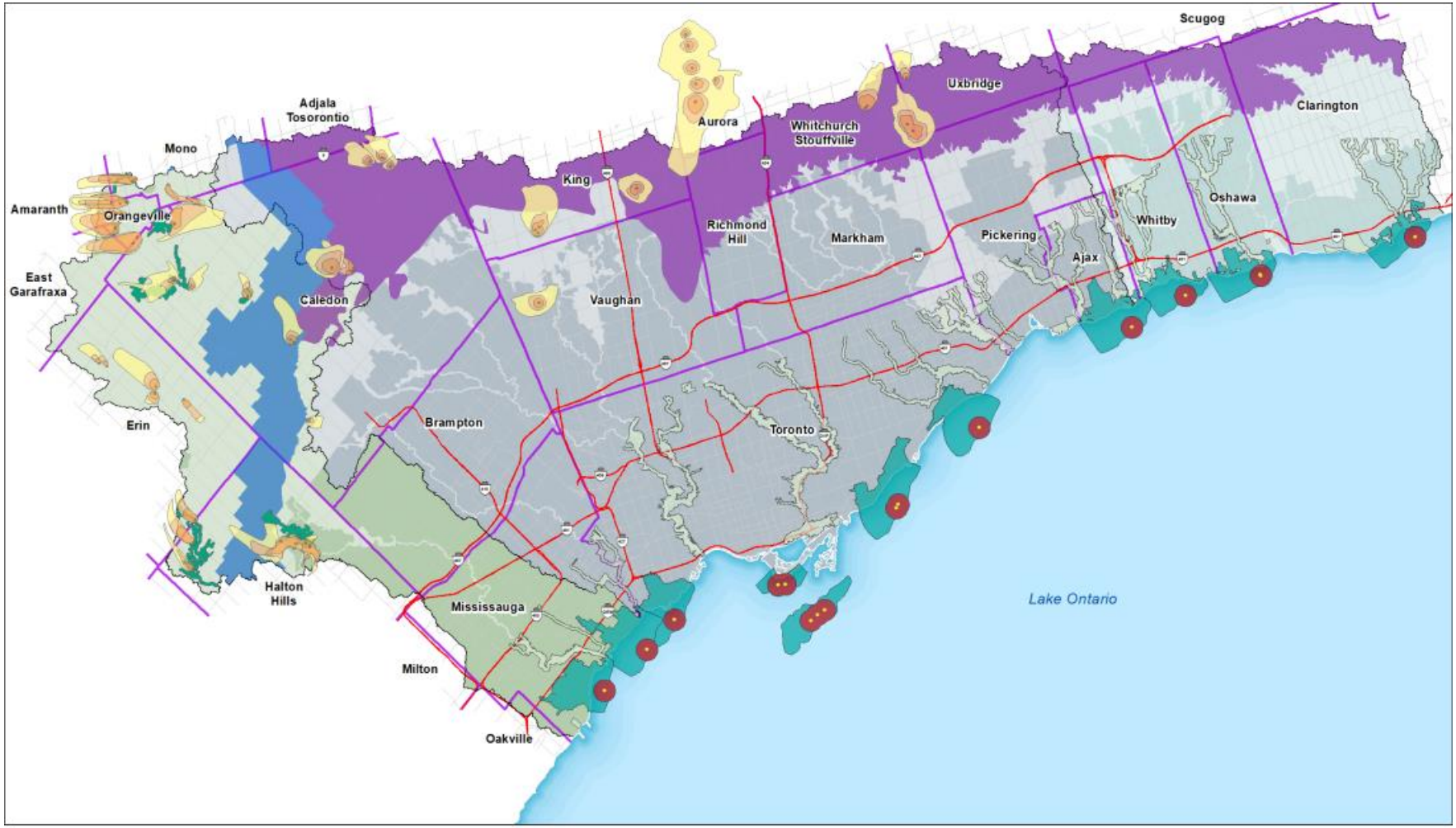

Figure 1. Map of the CTC Source Protection Region.

1.2 Drinking water vulnerability analysis and threats evaluation

In 2015, the CTC Source Protection Region submitted its first Source Protection Plan (SPP) under the CWA. The CTC SPP is supported by three Assessment Reports, one for each Source Protection Area (Credit Valley, Toronto and Region, and Central Lake Ontario).

Assessment Reports are technical documents that provide scientific information which is used to develop SPPs. Assessment Reports and SPPs are "living documents", which are amended as new information becomes available, or as necessary to reflect changes to a municipal drinking water system(s).

A component of each Assessment Report as prescribed under the Technical Rules of the CWA is performing a drinking water vulnerability analysis and threats evaluation of sources of drinking water. This typically involves three steps:

1) **Identify and map vulnerable areas**. There are four types of vulnerable areas: Wellhead Protection Areas (WHPAs), Intake Protection Zones (IPZs), Highly Vulnerable Aquifers (HVAs), and Significant Groundwater Recharge Areas (SGRAs). These areas can be vulnerable based on water quantity or water quality considerations, or both. The natural vulnerability of HVAs, WHPAs, and IPZs are assessed and scored high, medium, or low using approved provincial methodologies. Vulnerability scoring is required in the determination of risk to the sources when assessing the different land-uses and activities that exist on the landscape.
2) **Identify threats.** Under the CWA, a prescribed threat is defined as "an activity or condition that adversely affects or has the potential to adversely affect the quality or quantity of any water that is or may be used as a source of drinking water and includes an activity or condition that is prescribed by source protection regulation as a drinking water threat." The CWA focuses on protecting municipal supplies of drinking water. Other legislation, such as the *Ontario Water Resources Act, 1990*; Ontario Reg. 903: Water Wells; and Ontario Reg. 387/04: Permit to Take Water (PTTW), addresses threats to private drinking systems. There are twenty-two different types (i.e., activities) of prescribed threats to drinking water quality and quantity. Specific threats to water quality fall under two categories – chemicals and pathogens.
3) **Calculate threat levels.** There are many potential threats to drinking water, but the level of risk they pose depends on the nature of the threat and its relative location to a municipal drinking water system. Risk is determined using the vulnerability score and hazard scores assigned to the different activities and their associated chemicals and pathogens. Within WHPAs, IPZs and HVAs, vulnerability analyses and scoring determine which anthropogenic activities constitute significant, moderate, or low threats to the drinking water source in question.

Under Part XI (Drinking Water Threats: Water Quality) of the Technical Rules, the SPC must describe the circumstances associated with various activities or conditions under which the presence of a specified chemical or pathogen could threaten the water quality of a drinking water source now or in the future.

1.3 Issues approach in the identification of significant threats to drinking water

A drinking water *Issue* as defined by the Technical Rules under the CWA includes:

The presence of a parameter in water at a surface water intake or in a well, including a monitoring location related to a drinking water system to which clause 15(2)(e) of the Act applies, if the parameter is listed in Schedule 1, 2 or 3 of the Ontario Drinking Water Quality Standards or Table 4 of the Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines and,

a. *The parameter is present at a concentration that may result in the deterioration of the quality of the water for use as a source of drinking water, or*
b. *There is a trend of increasing concentrations of the parameter at the surface water intake, well or monitoring location and a continuation of that trend would result in the deterioration of the quality of the water for use as a source of drinking water.*

The source water is/ may still be safe to drink, however because the concentration of a specific parameter(s) is elevated and/ or increasing, the CWA compels the SPC to determine the cause and create policies to manage or prohibit the *Issue*. An *Issue* can be chemical or pathogenic and always originates from a threat activity occurring in or near a vulnerable area. Every elevated parameter in the raw water is not necessarily considered an *Issue*.

The Technical Rules require that the following information be compiled to identify an *Issue*:

- Parameter or pathogen of concern.
- Affected wells, intakes, or monitoring wells.
- Map of the area within which prescribed or local threats could contribute to the *Issue* - the Issue Contributing Area (ICA). The ICA should be mapped as a polygon within the vulnerable area.
- List of activities, conditions from past activities, and natural conditions that are associated with the parameter or pathogen.
- Circumstances under which the parameter or pathogen is considered.

The Technical Rules state that any activity or condition that can contribute to an *Issue* is a significant drinking water threat within the ICA. If the *Issue* is in a surface water source, all activities, or conditions (linked to past activities) that could cause the parameter to be released into the surface water are considered threats. If the *Issue* is within a groundwater source, all activities, or conditions (linked to past activities) that could cause the parameter to be released

into the groundwater are considered threats. Any natural conditions contributing to an *Issue* must be documented, but these conditions do not become threats. Documentation is required for the activities or conditions that are considered threats, including their location. Where documentation is not clear or complete, but the data indicates that there may be an *Issue*, data and information gaps are noted with the recommendation that they be addressed and incorporated in a future update of the applicable Assessment Report.

1.3.1 Issue Contributing Areas

Assessment Reports define Issue Contributing Areas (ICAs) based on data collected from municipal wells, where increasing levels of a parameter(s) could exceed the Ontario Drinking Water Quality Standards (ODWQS). Elevated parameters are not considered an *Issue* when they are known to be naturally occurring and do not present a problem for the water treatment plant operator. For *Issues* caused by anthropogenic activities, the Assessment Report must delineate the area contributing to an *Issue* (i.e., ICA) or include a plan to delineate the ICA. Once a drinking water *Issue* is identified, then any activities or conditions that may be causing that *Issue* needs to be identified. *Issues* are generally identified by Municipal Drinking Water Operations staff through the routine collection and analysis of drinking water system and raw water monitoring results.

The first step is to identify an ICA in the vicinity of the location at which the *Issue* has been observed. The ICA may be different than the vulnerable area (i.e., WHPA or IPZ). In the second step, specific drinking water threats that could reasonably be expected to contribute to the *Issue* are identified. All such threats are automatically classified as significant. Within a WHPA or an IPZ, the vulnerability score coupled with the circumstance will determine the level of threat, however, in an ICA, threats may be identified as significant regardless of the vulnerability score if it is determined to be contributing to the increasing parameter trend.

1.4 Issues identified in the CTC Source Protection Region

In the CTC SPR, a total of five ICAs associated with WHPAs were delineated in the Credit Valley Source Protection Area (CVSPA). Three ICAs were delineated in the Town Orangeville, one in Georgetown, and one in Acton.

1.4.1 Dufferin County – Town of Orangeville

The Town of Orangeville (Town) has a municipal supply comprised of twelve wells. The WHPA delineation and vulnerability assessment processes around these wells are described in the *Approved Assessment Report: Credit Valley Source Protection Area* (CTC SPC, 2019).
A total of 2,728 significant threats have been identified on 2,495 parcels in the vulnerable areas of the Town's wellheads. Two hundred twenty-seven of these threats are related to water quantity, while the rest are related to water quality. Seventy-eight of the water quality threats originate on lands within Peel Region, two hundred and five originate in the Township of East

Garafraxa and twelve originate in the Township of Amaranth. These significant threats have been linked mainly to sodium and chloride *Issues* from the storage of snow, and the handling, storage, and application of road salts.

In June 2013, the SPC requested that an evaluation be undertaken utilizing updated criteria which resulted in the development of the report *Issues Determination, Town of Orangeville Wells* (CTC, 2013a). It was subjected to review by the Town of Orangeville and approved by the SPC in October 2013. The report involved the review of parameter trends to assess how their concentrations have varied over time, and whether statistical projection showed the potential for concentrations to increase above the applicable Ontario Drinking Water Quality Standard (ODWQS) threshold within a thirty-year period. This time horizon was proposed by staff, as this is generally the planning horizon under the Growth Plan for the Greater Golden Horseshoe, which applies to most municipalities in the CVSPA. In determination of an *Issue*, consideration was also given to the frequency with which the half concentration of the ODWQS (1/2 maximum allowable concentration (MAC)) threshold was met or exceeded. Based on this assessment, the following issues were identified:

- Sodium *Issue* – Wells 6, 9A, and 9B.
- Chloride *Issue* – Wells 6, 9A, 9B, 10, and 11.

ICAs for the Town of Orangeville's Wells are shown in **Figure 2**. The ICAs were delineated based on the linkages between the *Issues* noted and the history of land usage and development in the area.

- The WHPAs for Wells 2A, 5/5A, and 9A/9B are overlapping and mapped as a single WHPA. The ICA for Sodium and Chloride for Well 9A/B is interpreted as being the extent of this WHPA.
- The WHPA defined for Wells 6 and 11 is regarded as the ICA for Chloride at these wells and Sodium at Well 6.
- The WHPA for Well 10 is regarded as the ICA for Chloride. Well 10 is identified as a GUDI well (groundwater under the direct influence of surface water), and runoff within the WHPA-E may also be contributing to the occurrence of the Chloride *Issue*. As such, the WHPA-E is included in the ICA.

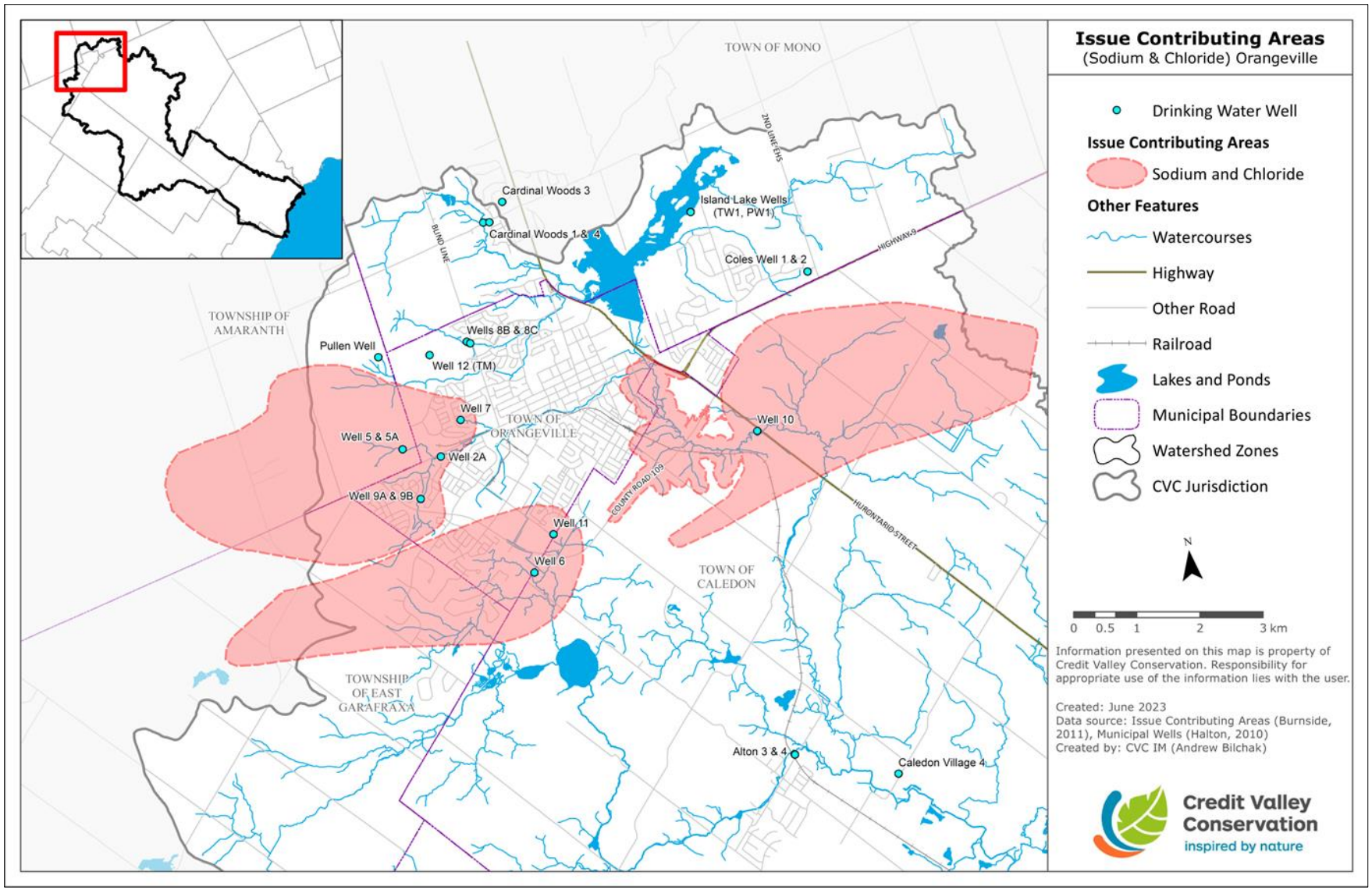

Figure 2. Issue Contributing Areas (Sodium and/ or Chloride) in the Town of Orangeville.

1.4.1.1. Sodium and Chloride *Issues*

Sodium and Chloride *Issues* are thought to be linked to both point sources and non-point sources. Point sources include water softener backwash discharged to septic systems, while non-point sources are impacts from road salt application. Any activity that utilizes or has the potential to generate sodium or chloride in an ICA would automatically be considered a significant drinking water threat, if included as a circumstance listed in the Provincial Tables of Circumstances or if added as a local threat. The activities that are thought to contribute to the Sodium and Chloride *Issues* are as follows:

- Storage of road salt.
- Application of road salt.
- Storage of snow
- Septic systems; and
- Sewage and Stormwater Management Systems.

The application and storage of road salts as well as snow storage have been determined as the main activities responsible for the increasing Sodium and Chloride trends in the Town's wells. The focus of policies and implementation efforts has been on these sources. Treatment processes that can remove sodium and chloride from water include reverse osmosis, distillation, and deionization – which are all expensive to undertake, energy intensive and result in further waste to be handled. The only current practical way to minimize the impacts from road salt on the environment is to reduce the amount being used, without compromising the safety of the public during winter conditions.

1.4.2 Halton Region – Town of Halton Hills

In the CVSPA, Halton Region provides municipal water supply through twelve wells in the Town of Halton Hills through the Georgetown and Acton drinking water systems. The WHPA delineation and vulnerability assessment processes around these wells are described in the *Approved Assessment Report: Credit Valley Source Protection Area* (CTC SPC, 2019).
In the development of the *Approved Assessment Report: Credit Valley Source Protection Area* (CTC SPC, 2019), water quality data and information were accessed through *Ontario Regulation 170/03* Water Quality Reports (2003 and 2009), and through historic raw water quality records provided by Halton Region. The data was reviewed to assess whether any parameter(s) are impacting or have the potential to impact the quality of the groundwater-based drinking water sources in Georgetown and Acton. The parameter trends were studied to assess how their concentrations have varied over time, and whether statistical projections show the potential for concentrations to increase above the ODWQS thresholds within a thirty-year period. In determination of an *Issue*, consideration was also given to the frequency with which the half concentration of the ODWQS (1/2 maximum allowable concentration (MAC)) threshold was met or exceeded. Based on this assessment, the following I*ssues* were identified:

- Nitrate *Issue* – Davidson Well 1

- Chloride *Issue* – Cedarvale Wells 1A, 4, and 4A

1.4.2.1. Nitrate *Issues*

The ICA for Nitrate is shown in **Figure 3** and the ICA for Chloride is shown in **Figure 4**. The ICA for Nitrate was delineated to include the WHPAs A, B and E for Davidson Well 1. Since Davidson Well 2 has the same WHPA boundary, the WHPA for Davidson Well 2 is also included in the ICA. Any activity that utilizes or has the potential to generate Nitrate in the ICA would automatically be considered a significant drinking water threat, if included as a circumstance listed in the Provincial Tables of Circumstances, or if added as a local threat. The CTC SPC has developed policies in the CTC SPP to mitigate against such activities.

The historical data for the Davidson Wellfield (Well 1 and 2) has shown a great deal of variability in nitrate concentrations since 1985. A statistical analyses study (CTC, 2013b) concluded that for Well 1, the ODWQS threshold for Nitrate of 10 mg/L could be met as early as 2049. The Nitrate concentration in Well 2 is not expected to meet or exceed the threshold until 2083.

The data for both wells exhibited repeated spikes over the ODWQS 1/2 maximum allowable concentration (i.e., 5 mg/L) throughout the 1985 to 2009 period. Additional data and study are underway to determine whether these spikes are a result of pumping volume changes, seasonal or climatic variations, land-use changes, increased commercial fertilizer applications, or a combination of all four. Since the future land is predicted to remain predominantly rural/ agricultural with expected ongoing nutrient applications, Davidson Well 1 was assigned as having a Nitrate *Issue*.

For the period from 1985 to 2013 raw groundwater samples were generally collected from the Davidson Wellfield (Well 1 and 2) on a quarterly frequency. The frequency increased to weekly from 2013 to present to support a more detailed review of seasonal fluctuations and identification of annual maximum and minimum concentrations. To assess the overall trends in Nitrate concentrations at the Davidson Wellfield and to estimate when Nitrate concentrations may potentially exceed the ODWQS of 10 mg/L, linear trend analysis using mean annual concentrations were completed for the following datasets: 1985 – 2009; 2010 – 2017; and 1985 – 2017. Based on linear trend analyses, trend lines were projected to estimate the year when the ODWQS threshold may be exceeded. A linear trend analysis was also completed using the maximum annual Nitrate concentrations (from years with at least four values) for the period 1987 – 2017. The results are summarized in **Table 1**.

Table 1. Summary of projected exceedances of ODWQS (10 mg/L) for Nitrate.

Review Period	Projected Exceedance of ODWQS for Nitrate – Davidson Well 1	Projected Exceedance of ODWQS for Nitrate – Davidson Well 2
Mean Values		
1985 - 2009	2061	2072
2010 - 2017	2334	2436
1985 - 2017	2153	2209
Maximum Values		
1985 - 2013	2049	2083
1985 - 2017	2103	2101

The sources of Nitrate are thought to be due to the application of nitrogen-rich fertilizers on agricultural fields for crop production, tilling of residual crop matter into the soil, and septic system leachate. Given the cyclical nature of the Nitrate concentrations observed, the statistical analyses study (CTC, 2013b) suggested that the trends may be influenced by seasonal variation in agricultural practices at locations close to the wells, and in areas where a direct hydrological connection exists between the ground surface and the producing aquifer.

In 2017, Halton Region's Risk Management Official initiated the development of Risk Management Plans (RMPs) within the Nitrate ICA. In addition, Halton Region, Town of Halton Hills, and the County of Wellington staff continue to engage with residents located in the ICA to complete septic system inspections.

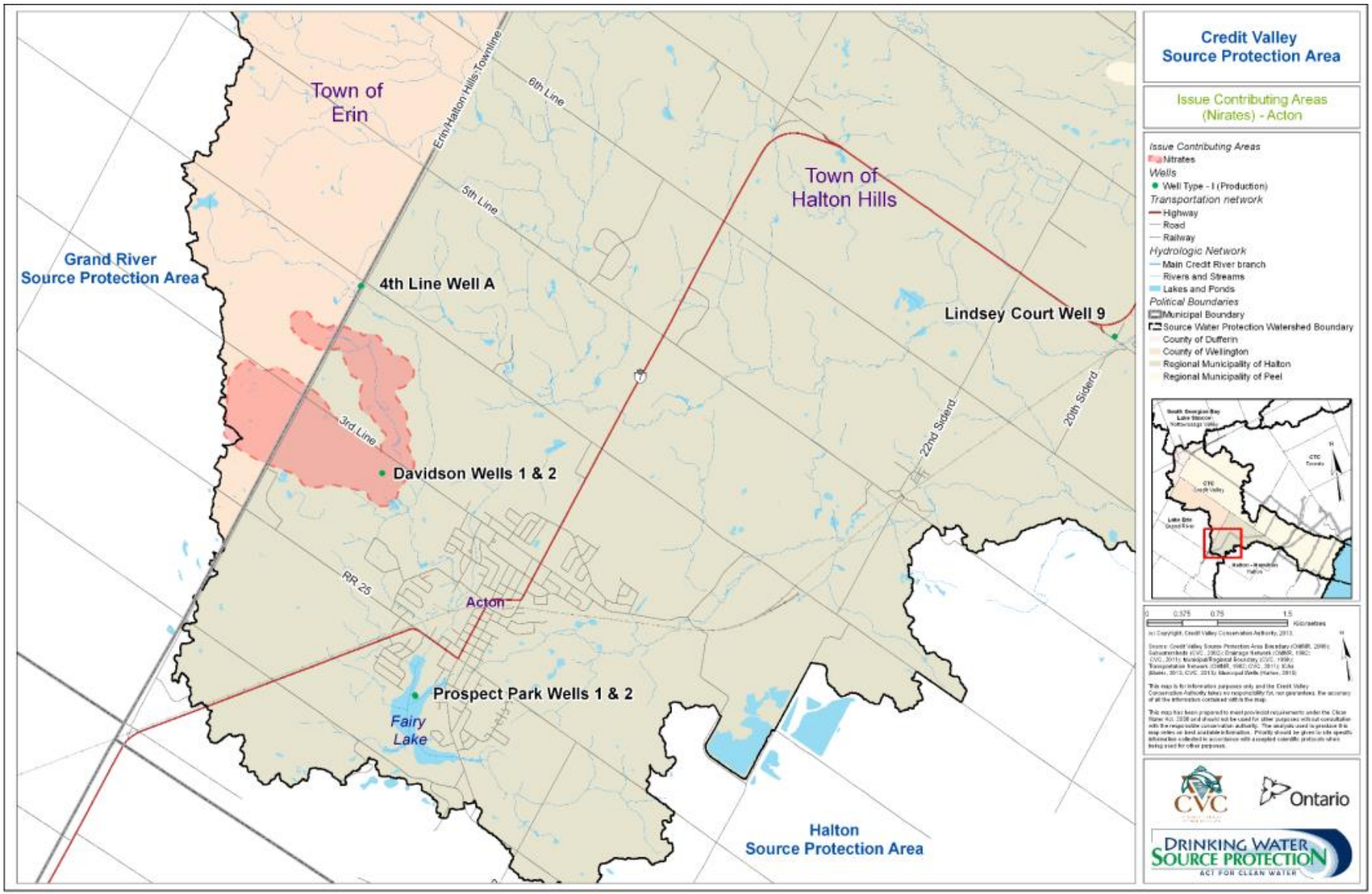

Figure 3. Issue Contributing Area (Nitrate) in Acton.

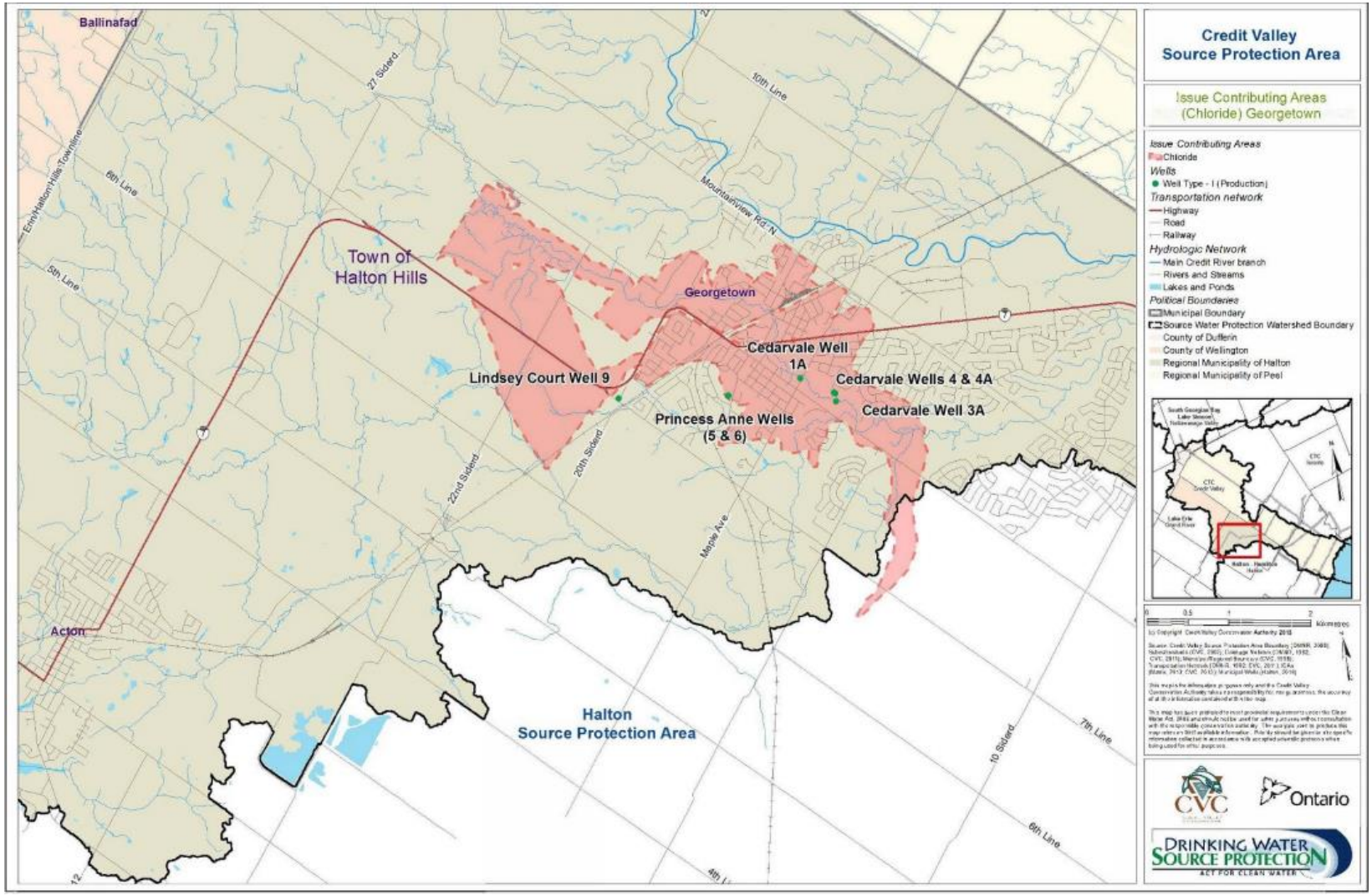

Figure 4. Issue Contributing Area (Chloride) in Georgetown.

1.4.2.2. Chloride *Issues*

The Chloride ICA in Georgetown includes the entire WHPAs A to E for Cedarvale Wells 1A, 4, and 4A. Genivar (2013) completed an assessment of the local sources of Chloride on behalf of Halton Region in 2013. This study indicated that approximately 99% of the road salt applied within the vicinity of the Cedarvale Wellfield is estimated to come from winter maintenance activities on public roads and private property. Genivar (2013) estimated that approximately 85% of the total road salt application is on private properties (i.e., parking lots) including commercial, industrial, institutional, and multi-unit residential properties.

Water quality threats from personal residential application of road salt are being managed through ongoing education and outreach activities. Numerous properties have been identified as requiring Risk Management Plans to manage non-residential road salt usage. Halton Region's Risk Management Official has begun the process of managing these threats through the establishment of Risk Management Plans.

Average Chloride concentrations in the raw water for each of Georgetown's wells between the period 1986 and 2009, apart from Lindsay Court Well 9, have exhibited increases. The initial *Issue* evaluation was completed using Chloride concentration data from 1986 to 2009. CTC staff reviewed the Chloride concentration data in 2013 (CTC, 2013b) to further assess Chloride trends. CTC staff determined that mean Chloride concentrations could exceed the ODWQS AO (250 mg/L) as early as 2028 at Cedarvale Well 4A and 2042 at Cedarvale Well 1A. An analysis of Chloride concentrations for Cevarvale Well 4 was not reported at this time.

Between the period 1986 to 2013, raw groundwater samples were generally collected from Cedarvale Wells 1A, 4 and 4A on a quarterly frequency. The frequency was increased to monthly from 2013 to present. The increase in sampling frequency was performed to support a more detailed review of seasonal fluctuations and identification of annual maximum and minimum concentrations.

To assess the overall trends in Chloride concentrations at Cedarvale Wells 1A, 4, and 4A, and to estimate when Chloride concentrations may potentially exceed the ODWQS AO, linear trend analyses using mean annual concentrations were completed for the following datasets: 1986 - 2009 and 1986 - 2017. In addition, a linear trend analysis was completed for the maximum observed Chloride concentrations for the 1986-2017 dataset. Based on the linear trend analyses, trend lines were projected to estimate the year when the ODWQS AO may potentially be exceeded. The results are summarized in **Table 2** and generally indicate that when more recent data are considered, the number of years until mean Chloride concentrations are estimated to potentially exceed the ODWQS AO increases. Only Chloride concentrations at Well 4A are projected to exceed the ODWQS AO in less than 30 years. The review of projected trend lines based on analysis of maximum observed values suggests that periodic exceedances of the ODWQS AO may potentially occur at all three wells in less than 30 years.

Table 2. Summary of projected exceedances of ODWQS AO for Chloride.

Review Period	Projected Exceedance of ODWQS AO for Chloride – Cedarvale Well 1A	Projected Exceedance of ODWQS AO for Chloride – Cedarvale Well 4	Projected Exceedance of ODWQS AO for Chloride – Cedarvale Well 4A
Mean Values			
1986 - 2009	2037	2031	2026
1986 - 2017	2055	2051	2035
Maximum Values			
1986 - 2017	2044	2038	2021

1.5 Study objectives

Task 12, 13, and 14 under the s. 36 workplan identifies the need to review current drinking water *Issues* in the CTC SPR based on the latest water quality monitoring data and statistical trend analysis methods. Furthermore, the CTC SPC reiterated their concern around water quality *Issues* at municipal production wells and the need for further investigation. This is partly due to the general importance of this topic in safeguarding the quality of municipal source water, and partly from the need to review *Issue* identification and delisting criteria in reference to statistical water quality trend plots.

Water quality trend analysis and accompanying plots are tools used to identify deteriorating source water quality conditions before they become an *Issue.* They can also be used to both isolate what may be contributing to the identified *Issue*, as well as improve our understanding of the impact of existing Drinking Water Source Protection Plan policy's ability to protect the quality of source water.

The objectives of this study are to:

- Evaluate available statistical trend analysis methods that can by used to identify drinking water *Issues.*
- Based on the comparison of different statistical trend analysis methods, recommend a preferred approach.
- Use the preferred approach to analyze municipal production well raw water quality data in the CTC Source Protection Region to identify any existing or potential *Issues.*

Through this exercise, existing water quality *Issues* will be evaluated using the preferred statistical trend analysis method to determine if increasing levels of a parameter(s) could exceed the applicable Ontario Drinking Water Quality Standards (ODWQS) by 2040.

The outcome of this study is to demonstrate a standardized and repeatable statistical method that can be applied by municipalities in future annual progress reports. These annual progress reports outline progress made on implementing policies within the CTC Source Protection Plan. As such, this study will describe a defendable approach that will facilitate municipal decision making to identify or remove a drinking water *Issue*.

2 Methodology

Historically, water quality parameter data collected from municipal wells were analyzed to determine if a specific parameter:

1. Exceeded the applicable ODWQS,
2. Statistical projections using linear regression showed the potential for concentrations to increase above the applicable ODWQS threshold within a thirty-year period, or
3. The frequency with which the half concentration of the ODWQS threshold was met or exceeded was high.

If any of these three conditions were met, an *Issue* may have been identified.

There are many analytic techniques available to assess water quality trends, model, or project future concentrations, and test the influence of different factors in the observed trends. These different approaches vary in their assumptions, flexibility, and ability to meet analytic objectives. In this study three statistical tests commonly used to describe trends over time in environmental data are compared. This comparison will be used to demonstrate what analytic approach should be used in the future to meet the needs of municipal partners and objectives related to source water protection and water quality trend analysis.

2.1 Overview of different trend tests

Each statistical test has different assumptions about the dataset, which should be considered when making decisions about which approach to apply. It is important to understand these assumptions because they can limit the effectiveness of some of the tests to detect true patterns and trends.

Before the different tests are discussed, an overview of groundwater monitoring data is provided. This will inform what statistical assumptions may be violated when using different tests. Specifically, groundwater chemistry data often have the following characteristics:

- **Non- normal** - many low or high values, all values above zero;
- **Unequal variance** – many sources of variation that result in heterogenous variance;
- **Non-linear relationships** - non-monotonic relationships to time are common with values increasing and decreasing over the monitoring period;
- **Spatial and temporal dependence** – sampling points in monitoring programs are never independent of one another.
- **Missing values** – long-term monitoring data sets often have missing values whether it is due to equipment failure, logistic constraints, or other unforeseen events;

- **Changes to lab processing or field sampling methods –** lab processing techniques have improved over time with advancements in technology. Samples may be taken to different labs through time over the monitoring;
- **Censored data** – values that are below the detection limits of the lab sampling techniques.

Many of the characteristics of groundwater chemistry data directly relate to important assumptions in statistical tests. Often data are non-normal and skewed to one end of the distribution with many low or high values. Also, as values are non-negative, a gamma distribution might be more appropriate than a gaussian distribution. Because there are many sources of variation in the data, or covariates that can influence parameter concentrations, we see unequal variance, or non- monotonic patterns in the data. This includes seasonal or diurnal cycles with periods of increase or decrease over the monitoring period. Finally, monitoring data are never inherently independent. In any monitoring program the same wells are visited year after year. This means that monitoring programs violate both temporal and spatial independence. These data are serially auto-correlated, and as such methods that can apply an autoregressive moving average (ARMA) approach should be considered. All these characteristics must be reviewed carefully before applying any analytic approach.

In addition to aspects that touch on assumptions of statistical tests, there are other complications with the data that influence what methods we use. For example, missing values are common, which some methods are not able to handle. As technologies improve, labs use different methods on their samples. This can result in biases or extra noise in the data that could influence the trend results. And often labs provide concentrations that are censored or identified as non-detects. This means that the provided values are below a detection limit defined by the processing technique used by the lab. Trend approaches need quantitative data, so something needs to be done with these censored data to be useful. Simply replacing the non-detections with the detection limit however is not recommended (Helsel & Hirsch, 1992).

As will be demonstrated, groundwater data violate many of the statistical assumptions of the two most used tests. This emphasizes the importance of carefully reviewing the methods available to find the most appropriate and robust approaches.

The sections below provide an overview of the three statistical approaches compared, as well as their statistical assumptions:

1. Linear Regression (LME);
2. Seasonal Mann Kendall (SMK); and
3. Generalized Additive Mixed Model (GAMM; annual and monthly).

For a quick overview of how groundwater data match the statistical assumptions and capabilities of the individual tests, refer to **Table 3**.

2.1.1 Linear Regression

A linear regression is a simple, parametric technique used by many agencies, and familiar to even the most junior data analysts. Parametric tests are generally considered to be more powerful at detecting significant trends, even with small sample sizes. Historic trends and future conditions are forecasted by fitting a straight line through available data points using the least squares approach. This estimates the relationship between x and y, which in our case describes how parameter concentrations change over time (**Figure 5**). Statistical outputs of a linear regression include a slope (i.e., rate of change), intercept, test statistic (i.e., t-value) and p-value (i.e., probability of no effect; Quinn & Keough, 2002).

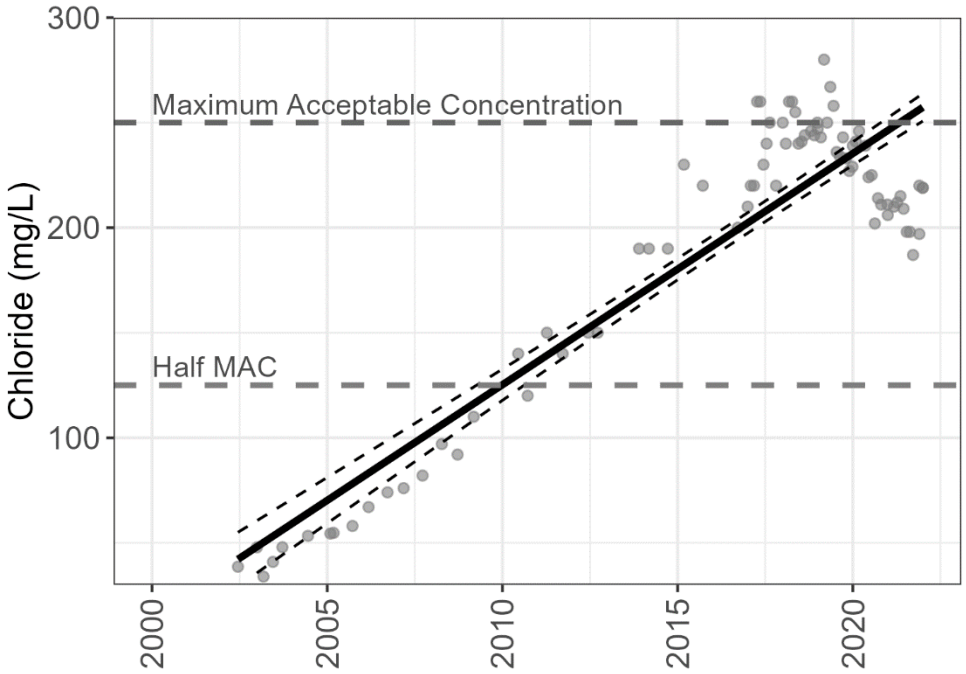

Figure 5. Example of a simple linear regression, with trend line and 95% confidence intervals. The data points and trend line are plotted against the ODWQS (Maximum Acceptable Concentration; higher dashed grey line) to determine if concentrations exceed guidelines throughout the monitoring period.

Of all the tests, linear regressions have the most stringent statistical assumptions. For trend results to be reliable, data must have a:

- Normal distribution,
- Equal variance,
- Temporal independence,
- Spatial independence,
- Linear relationship between time and year.

Although linear regressions are familiar and available in many programs, groundwater data often violate many of the listed statistical assumptions. Some of these violations can be addressed by

transforming the data, however, this approach may not even be enough. Therefore, linear regressions on groundwater data potentially yield unreliable results.

2.1.2 Seasonal Mann-Kendall

Over the years agencies have looked for other methods to analyze trends in monitoring data, due to the very restrictive nature of linear regressions listed above. The Seasonal Mann Kendall (SMK), a non-parametric test, has gained popularity since the 80s, as an alternative that has more flexibility and better addresses some of the challenges of environmental data (Helsel & Hirsch, 2020). Non-parametric tests such as the SMK provide higher power to detect statistical trends when data are non-normal, or in the presence of outliers and/or data gaps. In the SMK, the data are split into groups such as season or month to describe trends that are likely to be different from one another. In this approach, a Mann Kendall test is run on each individual season or month, and then these results are combined (**Figure 6**). No comparisons are made across the pre-defined groups (i.e., season or month), rather data from January are compared to January, et cetera. Statistical outputs of an SMK include slopes (i.e., sens-slope), intercepts, test statistics (i.e., tau) and p-values (i.e., probability of no effect) for each season, and then an overall significance (i.e., Z) and slope for the full monitoring period (Donald et al., 2011). Notably, if the sample size is large (#seasons * years ≥ 25), the power to detect a trend approximates a parametric analysis (Meals et al., 2011).

This test does not have strict assumptions regarding normality, equal variances, or linearity. However, it does have three assumptions to consider (Meals et al., 2011):

- A value can always be declared as less than, greater than, or equal to another value;
- Data are independent; and
- The distribution of the data remains constant.

Although it cannot be run in excel, there are many programs such as R that have packages available to run these statistics. Of interest, SMK can only use one value per season or month (i.e., the grouping factor). If sampling occurs more frequently, the values must be pre-processed before they are used in the analysis (Helsel & Hirsch, 2020). This can include the calculation of a median.

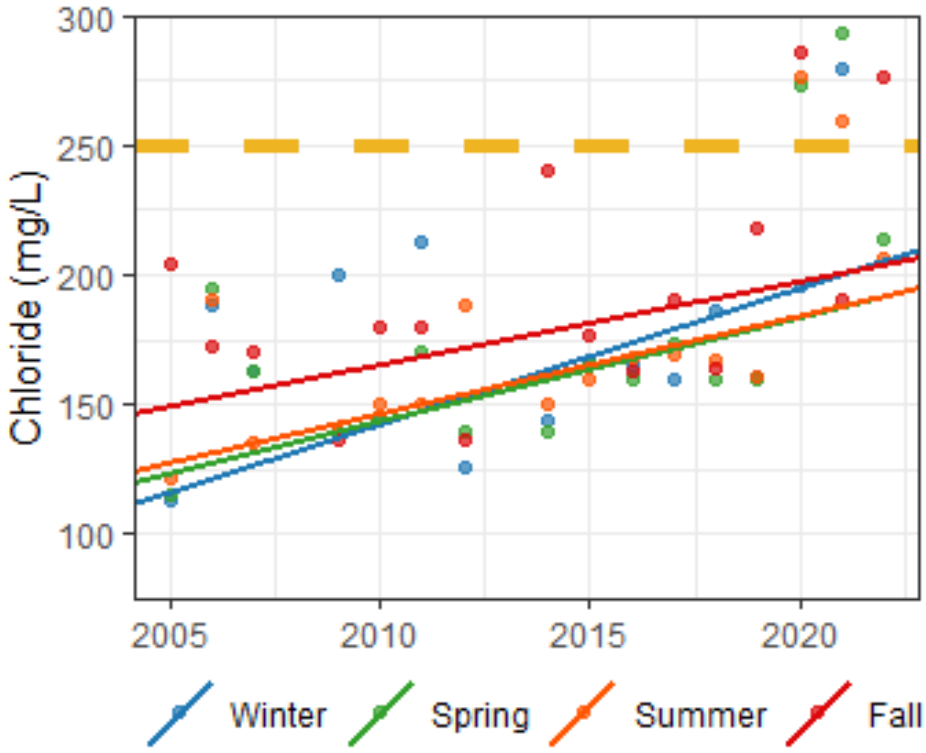

Figure 6. Example of a Seasonal Mann Kendall, with trend lines computed for each season. The data points and trend lines are plotted against the ODQWS (dotted orange line) to determine if concentrations exceed guidelines throughout the monitoring period.

While the SMK is more suitable for groundwater data, it still does not meet all statistical assumptions. For example, a SMK only detects monotonic trends, so any identified trend will increase or decrease over the entire monitoring period. This eliminates the ability to detect a period of increase followed by a period of decrease. Those experienced with groundwater data understand trends can vary in direction. This is especially true over long monitoring periods, when a management intervention is applied, or when an important covariate is highly variable (e.g., temperature, precipitation, water levels).

Of note, although season-specific trends can be detected, this can only be done with confidence if all the trend lines are moving in the same direction. All must be increasing, decreasing or stable. The rate of change (i.e., slope) can be different, but all trends must be in the same direction (Meals et al., 2011). Assumptions such as these are a concern considering that some parameter concentrations, such as chlorides and nitrates, respond to sizeable differences in seasonal inputs across the seasons (e.g., increasing trends of nitrates in summer may be followed by decreasing trends in fall or winter).

One major limitation of the SMK is that it cannot include additional covariates, such as precipitation, soil substrate, or lab technique. This limits the ability to control for variability in the data due to factors that are not of primary interest (e.g., soil substrate or lab technique), or test the relative influence that different factors have on the response variable (e.g., consumptive

demand, application of BMP). This test can therefore be used to describe a general simple trend but cannot provide insight on any potential drivers that influence the observed outcome.

The SMK is not the best approach for analyzing groundwater monitoring data or evaluating the effectiveness of policies on improving municipal groundwater quality.

2.1.3 Generalized Additive Mixed Model (GAMM)

Generalized additive models are an extension of simple regressions, where the distribution is not defined. This means that the relationship between the predictor and independent variable can be gaussian, but it can also be used or other types of data (i.e., count, presence-absence), with the appropriate model specifications. They use smoothing functions to identify patterns in the data, without being constrained by a straight line. This is typically done with a spline, that separates the data into groups (or windows) by knots, and then a trend is fit to that group of data. The trends from these smaller groups are then stitched together and smoothed for an overall trend (**Figure 7**).

It is important to note that GAMMs have both fixed and random components. The fixed factors are those that are of primary interest in the analysis, and in this case, would be time. The random part of the model is where parameters that are not of primary interest but add variability to the data are specified. This can include covariates, such as sampling lab, or station number, if multiple stations are included in one model.

As mentioned, monitoring data should usually be analyzed using an approach that identifies and takes into consideration an auto-correlation. In the GAMM, this is specified as a random factor, with an auto-regressive moving average (ARIMA). This means that estimates in each grouping window are derived by applying an ARIMA. The auto-regressive process dictates whether the current (or future) value is based on the immediately preceding values (windows), or whether additional data influence the current (or future) trends. The moving average component uses past forecast errors in a regression-like model, by creating a series of averages from different subsets of the full data set to smooth out the influence of outliers. When combined, this approach uses the most recent data and errors to influence the trend lines and future projections more heavily, than considering the data from the whole monitoring record equally. This approach is not monotonic, so it results in a trend that may appear linear, or show periods of increase, decrease and/or stability over the duration of the monitoring period (**Figure 8**).

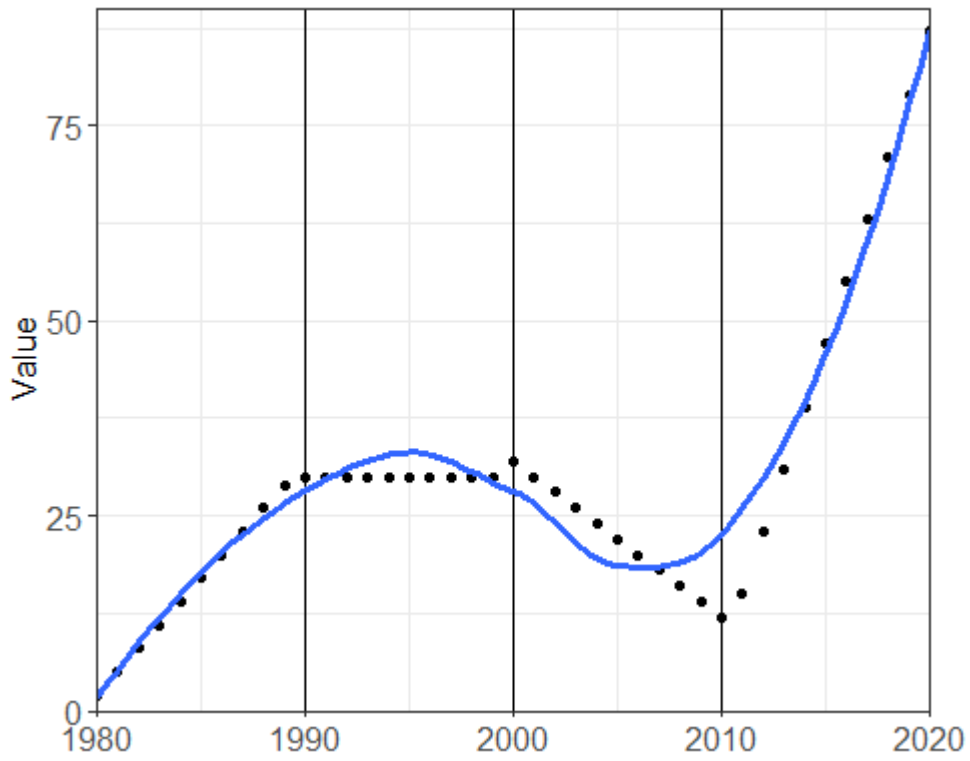

Figure 7. Example of how a trend line is developed in a generalized additive model by stitching together trend lines from individual windows.

These models are particularly useful for data sets with non-normal error distributions (i.e., proportions, counts, or when they do not have negative values) and when data points are not independent. This makes the GAMM a good approach for environmental monitoring data. In addition, these models are non-parametric, so data do not need to be normalized. This ensures that the relationship between the predictor and independent factor are not modified in the transformation process. These models are also able to include covariates and predictors, to help explain the observed trends, so we can isolate drivers behind an observed *Issue*, and better develop a management response to improve conditions.

Notably, GAMMs can identify patterns in the data that are more difficult to detect with other techniques. This is because the models are non-monotonic and can pick up on periods of increase and decrease within a year, and across years. Being able to isolate trends in months or seasons improves the effectiveness of mitigation recommendations.

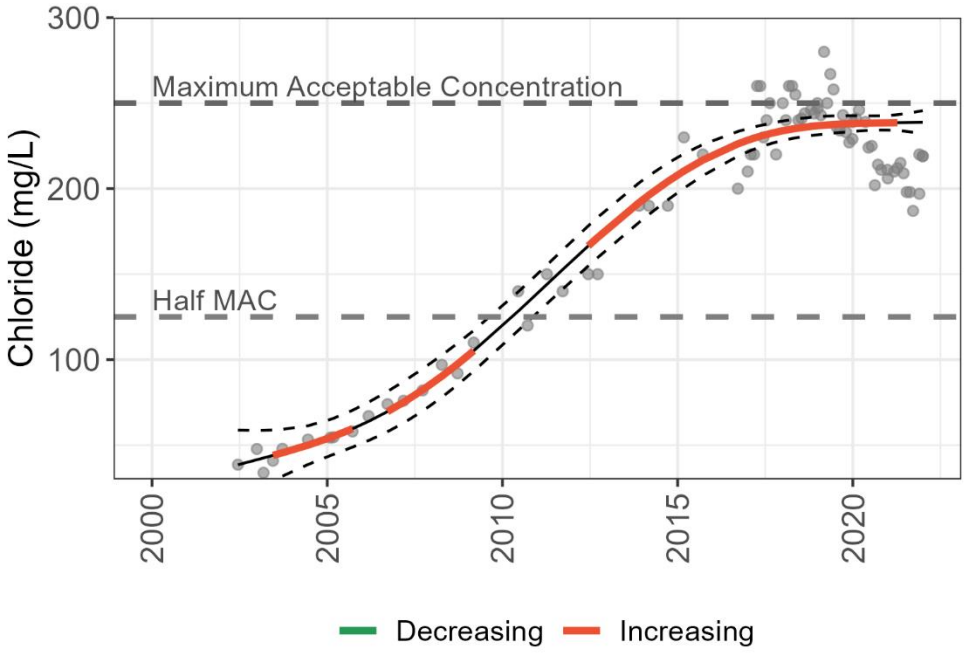

Figure 8. Example of a generalized additive model, with trend line and 95% confidence intervals. The data points and trend line are plotted against the ODWQS (Maximum Acceptable Concentration; higher dashed grey line) to determine if concentrations exceed guidelines throughout the monitoring period.

In a GAMM, the size of the groups or windows can be adjusted based on the analytic needs, the length of the monitoring period, and characteristics of the dataset. This is done by changing the number of knots (k). The default is set to 10 (k=10) for the models, which specifies that the full dataset will be partitioned into 9 equally sized windows (i.e., window # = k-1). This means that for a well that has 20 years of available data, that each of the windows covers a period of approximately 2.2 years. This may be fine for describing trends based on observed data but may be a problem for forecasting and predictions. When using a GAMM to forecast future trends, the most recent data (i.e., last window) has the strongest influence on the predictions. Although the projections do include data and errors from the whole monitoring record, if the windows contain only 2.2 years of data, then the future trends will be most heavily influenced by what has happened in those last few years. To address this issue, the models can be adjusted in two ways:

1. change the ‘k’ value from the default value to specify how large the windows are, and/or
2. change the auto-regressive (AR) value to specify which data are heavily weighted in the trend analysis or projections.

2.2 Comparison of statistical tests and preferred approach

Based on the comparison of the three tests, both linear regressions and SMK violate many statistical assumptions when used to analyze groundwater data. The recommended approach

therefore is to use GAMMs to analyze annual trends, monthly patterns, and future projections. Although not covered in this report, GAMMs are also the most effective method to include covariates, and therefore isolate potential drivers or change- either negative, or positive.

Table 3. Assumptions of three statistical tests, compared to characteristics of groundwater monitoring data. Cells shaded orange indicate that a statistical assumption is likely to be violated when applied to groundwater monitoring data. Cells shaded green indicate that a test is able to meet an assumption all of the time. Cells shaded yellow indicate that the assumption may be met some of the time.

Assumption	Linear Regression	Seasonal Mann Kendall	General Additive Model	Groundwater Monitoring Data
Normal Distribution	yes	no	no	no
Monotonic	yes	yes	no	no
Missing values	yes	yes	yes	yes
Temporal autocorrelation	no	no	yes	yes
Can include covariates	no*	no**	yes	yes
Detects seasonal patterns	no	yes***	yes	yes

* Covariates can be addressed by analyzing residuals, or upgrading to a multiple linear regression.

** Can be dealt with by pre-whitening the data before conducting the test.

***Any monotonic trends present in all seasons must be in the same direction (up or down), otherwise, the SMK test will be misleading.

2.2.1 Methods to identify ***Issues***

To identify *Issues*, the following statistical methods are recommended:

1. **Do concentrations exceed the half-Maximum Allowable Concentration (MAC)?**
    - Current period of record: Calculate the median parameter concentrations based on the last year of data and determine if it exceeds or is below the half-MAC. If it does exceed the half-MAC, this can be considered a potential *Issue*, and continued monitoring is required to evaluate the trend.
    - Future (2040): Determine if the projected trend line crosses the half-MAC. If it does exceed the half-MAC, this can be considered a potential *Issue*, and continued monitoring is required to evaluate the trend.
2. **Do concentrations exceed the ODWQS?**
    - Current period of record: Calculate the median parameter concentrations based on the last year of data and determine if it exceeds or is below the ODWQS.
    - Future (2040): Determine if the projected trend line crosses the ODWQS.

3. **Is there an increasing trend in concentrations?**
    - Current period of record: Use GAMM to determine if there is a statistically increasing trend for the monitoring data.
    - Future: Use GAMM projection trends to determine if the trend line increases between current and future period.

2.2.2 Using GAMMs to identify projected guideline exceedances

Because GAMMs are less familiar than the other tests, a hybrid approach has been developed that considers the results from both the linear regression and GAMM (**Figure 9**). Specifically, the certainty of exceeding a guideline is described as follows:

- when forecasts from both statistical tests show an exceedance, an *Issue* is considered ***highly likely***.
- when only one test shows an exceedance, an *Issue* is ***somewhat likely***.
- if neither trend lines exceeds, or shows a decreasing trend, an *Issue* is ***not likely***.

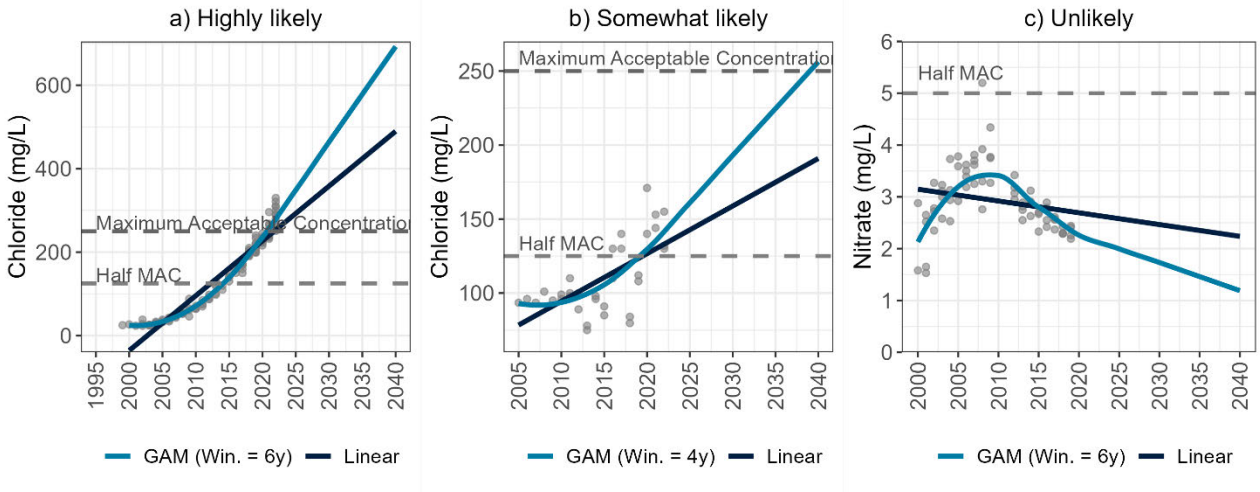

Figure 9. Example of how information from the linear regression and GAMM can by used to identify guideline exceedances and trends. Where both statistical tests show a guideline exceedance, this is considered a) highly likely, where only one test shows an exceedance, this is considered b) somewhat likely, and where no tests shows an exceedance, this is considered c) unlikely.

Importantly, the projection period should not exceed the length of the data record used to estimate a statistical trend or baseline period (e.g., if a 20-year monitoring period is available, the projections should not extend more than 20 years into the future). However, the SWP policies are interested in projecting concentrations to 2040. Unfortunately, the data record is not long enough for some wells to project to 2040 with confidence. Although these projections are provided, they are assigned a confidence score, similar to those used by the Intergovernmental Panel on Climate Change (IPCC; Budescuet al. 2011). Where the existing data record is shorter

than how far into the future the projections are made, it is assigned a '***low confidence***'. When the existing data record is as long or exceeds how far into the future the projections are made, this is assigned a '***moderate confidence***'.

2.3 Application of preferred approach

2.3.1 Data

Groundwater chemistry data were received for sixty-six municipal production wells across six regional municipalities (**Error! Reference source not found.**). Monitoring duration was highly variable, ranging from a low of one year and up to thirty-eight years. For each well, groundwater samples were collected multiple times during each monitoring year, ranging from one to fifty-four times in any given year.

Table 4. Summary of data sets provided by each regional municipality, including number of wells and years of data collection. Ranges indicate minimum and maximum years of data provided for each parameter and regional municipality.

	Dufferin	Durham	Halton	Peel	Wellington	York
Number of Wells	20	2	13	15	4	12
Parameters & Years of Data Collection						
Nitrates[a]	5 - 21	18	6 - 33	1 - 21	16 - 20	3 - 33
Sodium	5 - 24	18	6 - 32	1 - 19	2 - 20	3 - 35
Chloride	5 - 24	18	6 - 33	1 - 19	19 - 20	5 - 35

[a]Nitrates were measured as nitrites + nitrates.

Of note, the ability to detect trends improves with a longer period of record—a minimum of five to 10 years of monthly data are preferred (Meals et al., 2011). Gaps should also not exceed one third of the data record (Helsel & Hirsch, 2020). Analyzed data should be collected by consistent methods, and with few long gaps. Wells with a shorter monitoring record or data gaps were analyzed for this report, however, these results should always be interpreted with caution.

To be included in the analyses the data had to meet the following conditions:

- Include more than two discrete values (i.e., could not be all 0 with one different value);

- Contain a minimum of at least four years of uninterrupted monitoring data. If a 2-year gap in monitoring was present, the monitoring period post gap had to be a minimum of four years; and
- Contain no unreliable values such as extreme outliers that were likely due to data entry, lab, sampling, or other human errors.

Two thousand and forty-five data records (fifteen per cent) did not meet the necessary conditions to be used in the trend analysis. The data records did not meet the requirements for two main reasons: 1) large data gaps, or 2) samples all had the same concentrations and were therefore below the detection limit (see below). Because of these data exclusions, 20 well/parameter combinations were not included in the final trend analysis (**Table 5**, **Appendix A**).

To run the monthly GAMM, a minimum of ten months of data per year were required across the monitoring period. Three municipalities (Durham, Wellington and York) lacked the data to analyze monthly trends at any well, and only Halton had sufficient data to analyze monthly trends for all three parameters (**Table 5**, **Appendix B**).

One additional detail regarding the data included in the trend analyses and projections is of special note. Raw chemistry results below the detection limit posted by a laboratory are identified as 'Non-Detects' or 'Censored Data'. These values should not be replaced with known detection limits or arbitrary numerical values (i.e., zeroes or half the detection limit) because this can lead to inaccurate trend results and bias the estimates of trend slopes (Helsel & Hirsch, 2020). To address this issue, Robust Regression on Order Statistics (i.e., Robust ROS; Helsel, 2005) should be used to adjust the censored data. Robust ROS uses the observed distribution of the detected values to calculate a regression and probability plot that predicts the value of the censored values. Robust ROS consistently performs well in simulation studies, especially with small datasets and where the error distribution is unknown. This approach is also able to deal with multiple detection limits. All statistical trend tests should be applied to a dataset consisting of the detected (i.e., value > detection limit) and Robust ROS estimated values for the censored observations. This is an approach that is recommended by Helsel & Hirsch (2020) and has been in regular practice by the United States Environmental Protection Agency for over 20 years. Acton was the only municipality to identify values below the detection limit, using a '<' symbol, for approximately three per cent of their samples. They did not however provide the detection limits themselves, so it was not possible to apply the preferred statistical approach, to data provided by Acton, or any other municipality. Instead, for any values identified as non-detects and listed as < *x*, we used *x* as the value in the trend analysis.

Table 5. Number of wells, by municipality and parameter that had sufficient data records for the trend and seasonal analyses. For details on which wells were excluded and why, refer to Appendix A and Appendix B.

Parameter	Municipality	Wells Suitable for Trend Analysis (#)	Wells Suitable for Monthly Analysis (#)
Nitrate	Dufferin	15 (75%)	0
Nitrate	Durham	2 (100%)	0
Nitrate	Halton	13 (100%)	2 (15%)
Nitrate	Peel	6 (40%)	2 (13%)
Nitrate	Wellington	2 (100%)	0
Nitrate	York	11 (92%)	0
Chloride	Dufferin	20 (100%)	11 (55%)
Chloride	Durham	2 (100%)	0
Chloride	Halton	13 (100%)	4 (31%)
Chloride	Peel	13 (87%)	0
Chloride	Wellington	4 (100%)	0
Chloride	York	12 (100%)	0
Sodium	Dufferin	20 (100%)	11 (55%)
Sodium	Durham	2 (100%)	0
Sodium	Halton	13 (100%)	4 (31%)
Sodium	Peel	14 (93%)	0
Sodium	Wellington	3 (75%)	0
Sodium	York	11 (92%)	0

2.3.2 Annual trends and projections

The purpose of any trend analysis is to identify and quantify trends in a parameter of interest, after controlling for the many potential sources of variability in a dataset. This will show whether conditions are improving or deteriorating. Besides identifying how conditions are changing over time, some approaches can be used to identify if the parameter of interest is responding to the implementation of management measures or conservation actions. Below is a summary of the trend analysis completed on municipal groundwater quality data, using the preferred analytic approach.

Once the data were cleaned, statistical tests were used to analyze groundwater chemistry trends, and evaluate the likelihood of exceeding Ontario Drinking Water Standards during the observed period (i.e., up to 2023) and into the future (i.e., 2040).

As mentioned, to be included in the trend analysis, a well needed to have at least four years of monitoring data. Tests were run on individual wells using the full continuous data record available, unless there were large monitoring gaps present. If gaps exceeded two years in duration, only the data after the gap were analyzed.

The trend analysis in a GAMMM is formulated as follows:

GAMM.Model <- gamm(Parameter Concentration ~ s(Time, bs=”cc”, k = 5), correlation = corARMA(form = ~ 1|Year, p = 1))

In the trend analysis, all eligible data samples were included, with the ‘Time’ factor specifying the year-month combination. This means that each sample was included individually, rather than being combined in a ‘Year’ factor that would be the mean value of all samples from a given year. The bs="cc" specifies a penalized cyclic cubic regression spline, which forces the trend lines from the end of one year to match up with the trend line in the following year. Using this specification ensures that there is continuity in the overall time trend, with no large jumps from one year to the next.

The size of the windows, defined by k= number of knots, was adjusted from the default value of 10, to a value of five for most wells. For wells with less than eight years’ of data, k was changed to three. This was done to ensure each of the windows included no less than two years of data, with windows ranging from two to ten years across the wells. Based on a sensitivity analysis that compared different k values, a k of five yielded the most stable results, while ensuring projections were not based on a period that was too short or based on short-term patterns in the data.

The ‘correlation’ in the random effects indicates that the samples are serially auto correlated, because they were collected at the same well, year after year. This correlation was modelled as an ARMA, as discussed earlier. The auto-regressive value (AR) for this exercise was kept at one. In

the future, both the k and AR values should be tested for individual wells to optimize the models and ensure they reflect specific well conditions.

Slopes and p-values were calculated for all tests to determine the significance of the trend for the analyzed record period. Because GAMMs can detect non-monotonic trends (periods of increase and/or decrease over the monitoring period), periods of significant change were identified by calculating confidence intervals of the modelled trend and determining whether they include zero. Periods in time where the confidence interval does not include zero, are identified as periods of significant change.

Projections used a slightly different GAMM formulation, with the trend line extended to 2040 using the 'predict' function, as follows:

GAMM.Model <- gamm(Parameter Concentration ~ s(Year, bs="cc", k = 5), correlation = corARMA(form = ~ 1|Year, p = 1))

The 'Time' factor from the trend analysis was replaced with the factor 'Year'. Because the projected trend lines are based on the slope from the last few data points, seasonal specific trends (e.g., seasonal decreases in nitrate concentrations in the winter, or seasonal increases of chlorides in the winter) can have a disproportionately large influence. Therefore, by using the mean annual values for predictions, the projections are based on overall annual trends, rather than seasonal trends that can skew the results. It is important to note that testing the significance of projected trends is not possible. Therefore, all reports on projected trends are simply a description of the direction of the trend line.

Analyses were conducted and figures produced in R 4.1.1 (R Core Team, 2021), with the use of packages cowplot, EnvStats, lattice, mgcv, MASS, tidyverse. Significance level was set at p = 0.10 across all tests.

2.3.3 Figures to assist in interpreting annual and seasonal trends

Besides the statistical tests, the parameter estimates from the tests were used to plot trends in groundwater chemistry as a visual aid. Three figures were produced for each of the wells (**Figure 10**):

1. The first figure plots the annual trend over the monitoring period, using a GAMM, with periods of increase bolded in red and periods of decrease bolded in green (**Figure 10a**).
2. The second figure compares monthly concentrations of the parameter of interest across two years- the first and last year of the monitoring period with a full data record (**Figure 10b**). More specifically, this figure shows:
    - the monthly/seasonal variation in parameter concentrations (i.e., seasonal/cyclical patterns of highs and lows, which seasons have the highest and lowest concentrations, whether cyclical patterns have changed over the monitoring period);

- in which months the concentrations have changed- the further apart the lines are, the larger the magnitude of change (i.e., overlapping lines mean little to no change, partially overlapping lines mean small to moderate changes, and non-overlapping lines mean large changes in concentrations); and
- range of chloride/nitrate concentrations over the year, and how these may have changed over the monitoring period.

3. The third figure shows projections to 2040, based on the linear regression and GAMM (**Figure 10c**).

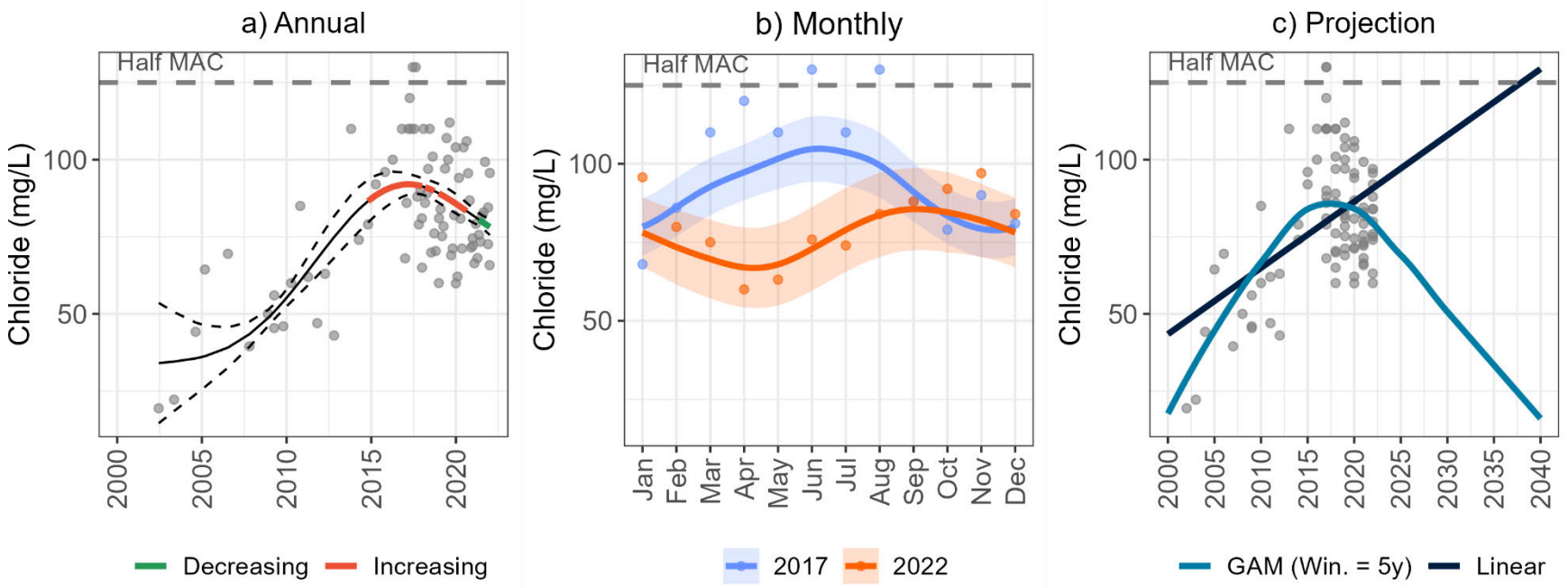

Figure 10. Examples of trend figures derived from GAMM showing a) annual non-monotonic trends where periods of increase are bolded in red and periods of decrease are bolded in green, b) monthly variation in groundwater chemistry concentrations in the first and last year of the monitoring period, and c) projections of parameter concentrations to 2040 based on a linear regression and GAMM. All data points and trend lines are compared to the Maximum Acceptable Concentration (MAC) and the half MAC.

2.3.4 Forecasting and Ontario Drinking Water Quality Standard (ODWQS) exceedances

Groundwater chemistry is evaluated based on the Ontario Drinking Water Quality Standards Guidelines (ODWQS; MOE, 2006). ODWQS has defined an aesthetic objective for chloride of 250 mg/L, sodium of 200 mg/L and a maximum acceptable concentration for nitrite + nitrate (i.e., nitrate) of 10 mg/L. Regarding municipal drinking water wells, the Local Medical Officer of Health is notified when sodium concentrations exceed 20 mg/L so that information may be communicated to local physicians for use with patients on sodium reduced diets.

The focus on chloride, sodium, and nitrate is to identify and differentiate natural versus anthropogenic impacts on groundwater quality. An increasing trend over time in these parameters shows an anthropogenic impact. In addition, these three parameters have been identified as existing drinking water *Issues* in the CTC SPR.

Parameter concentrations in each of the wells were compared to the applicable ODWQS objectives, to determine if concentrations exceed the objectives in both 2022 and 2040. For the most recent year of data, this was done by simply reporting whether the median concentration values for that year exceeds the objectives. By extending the trend lines into the future using slope estimates from each of the models, we also predict whether parameter concentrations are likely to exceed the objectives in 2040 (i.e., do the trend lines meet or cross the objective threshold). As discussed in Section 2.2.1, we classified the risk of exceeding objective threshold concentrations as “highly likely” if both the GAMM and linear regression trend lines met the exceedance threshold, as “somewhat likely” if one of the two trend lines met the exceedance threshold, and as “unlikely” if neither of the trend lines met the exceedance threshold.

3 Results & Discussion

Statistical tests and trend analysis using the GAMM method were completed on chloride, sodium, and nitrate data from sixty-six municipal production wells across six regional municipalities in the CTC SPR (**Appendix C**). An overview of the status and trend results for the municipal production wells with current drinking water *Issues*, and municipal production wells with potential drinking water *Issues* has been presented below. For status and trend results for all the municipal production wells in the CTC SPR refer to **Appendix D**. In all the figures, the term Maximum Acceptable Concentration (MAC) and ODWQS refer to the same threshold and are interchangeable.

A component of the multi phase investigation associated with this study will be to review existing drinking water *Issues* and conduct a hydrogeological assessment to identify the likely cause of the observed statistical trend based on all available data. This task will be performed during Phase 3 (refer to **Next Steps**).

3.1 Nitrate

Status and trend results for the municipal production wells in the CTC SPR with a Nitrate *Issue* or potential Nitrate *Issue* are presented in **Table 6**. Presently, only one well in the CTC SPR is designated with a Nitrate *Issue* - Davidson 1. Davidson 1 displays a decreasing trend in Nitrate concentrations over the monitoring period (**Figure 11**). The most recent (current) Nitrate concentration is below the ODWQS threshold of 10 mg/L. The GAMM projection predicted an exceedance of the ODWQS threshold to be unlikely by 2040, with a projected 2040 concentration of 3.24 mg/L.

There are three wells that were flagged as having a potential Nitrate *Issue* – Orangeville Well 2A (**Figure 12**), Orangeville Well 5 (**Figure 13**), and Orangeville Well 5A (**Figure 14**). Each of the three wells showed an increasing trend in Nitrate concentrations over the monitoring period. For Orangeville Well 5A, the GAMM projection predicted an exceedance of the ODWQS threshold to be somewhat likely by 2040, with a predicted concentration of 11.9 mg/L. Orangeville Well 2A and 5 were unlikely to exceed the ODWQS threshold by 2040.

Elevated groundwater nitrate concentrations indicate that nitrate from surface sources is infiltrating into the source aquifer. The most vulnerable settings within the watershed occur where unconfined sand and gravel aquifers occur near the ground surface, or where the overburden material overlying fractured bedrock aquifers is thin or absent. Each of these wells with elevated nitrates are in or along the edge of areas mapped as having high aquifer vulnerability (CTC SPC, 2019). The vulnerability of an aquifer increases as the relative amount of protection provided by the overlying geological materials decreases.

Non-point sources of nitrate are often linked to the application of nitrogen-rich natural and artificial fertilizers on agricultural fields for crop production and tilling of residual crop matter

into the soil. Point sources are usually associated with faulty septic systems, livestock operations, and bio-solids management from municipal wastewater treatment plants.

The sources of nitrate at Davidson 1 are thought to be because of the application of nitrogen-rich fertilizers on agricultural fields for crop production and tilling of residual crop matter into the soil. The elevated nitrate concentrations at Orangeville Wells 2A, 5, and 5A require further investigation as to the likely source.

Table 6. Summary of municipal production wells with existing or potential Nitrate *Issues*. The row in **bold font** is a municipal production well with an existing Nitrate *Issue*. For the current period, concentrations are based on median observed values, and trends are based on GAMM results. For 2040 projections, concentrations and trend directions are based on GAMMs, and likelihood of exceedance is based on comparison of GAMM and linear regression.

		Current				2040 Projections			
Municipality	Well	Concentration (mg/L)	Comparison to ODWQS	Trend Direction[a]	Magnitude of Change (mg/L)	Concentration (mg/L)	Likelihood of exceeding ODWQS	Trend Direction	Magnitude of Change (mg/L)
Dufferin	Well 2A	3.88	Below	↑*	2.03	5.51	Unlikely	↑	1.63
Dufferin	Well 5	4.85	Below	↑*	0.01	6.75	Unlikely	↑	1.9
Dufferin	Well 5A	6.36	Below	↑*	1.56	11.9	Somewhat likely	↑	5.54
Halton	**Davidson 1**	**2.52**	**Below**	**↓***	**0.73**	**3.24**	**Unlikely**	**↓**	**0.72**

[a] arrows with '*' denote a statistically significant trend (increase or decrease)

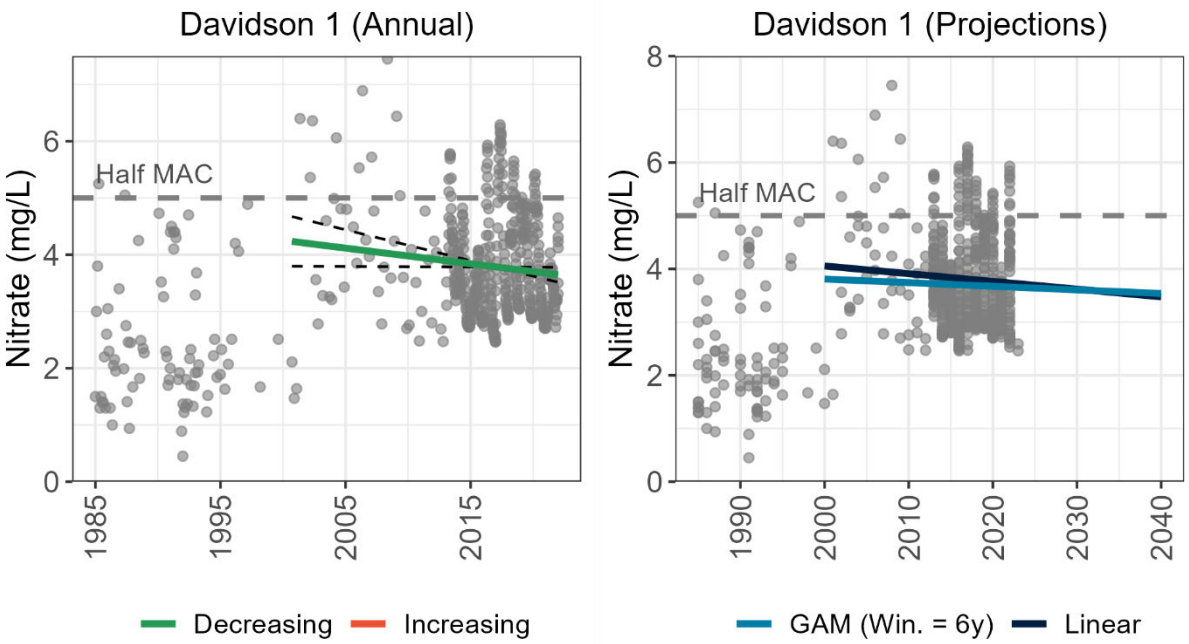

Figure 11. Nitrate concentration at Davidson 1 is currently below the half-Maximum Acceptable Concentration (MAC) of 5 mg/L and is showing a significantly decreasing trend. Nitrate concentration is unlikely to exceed the half-MAC of 5 mg/L by 2040.

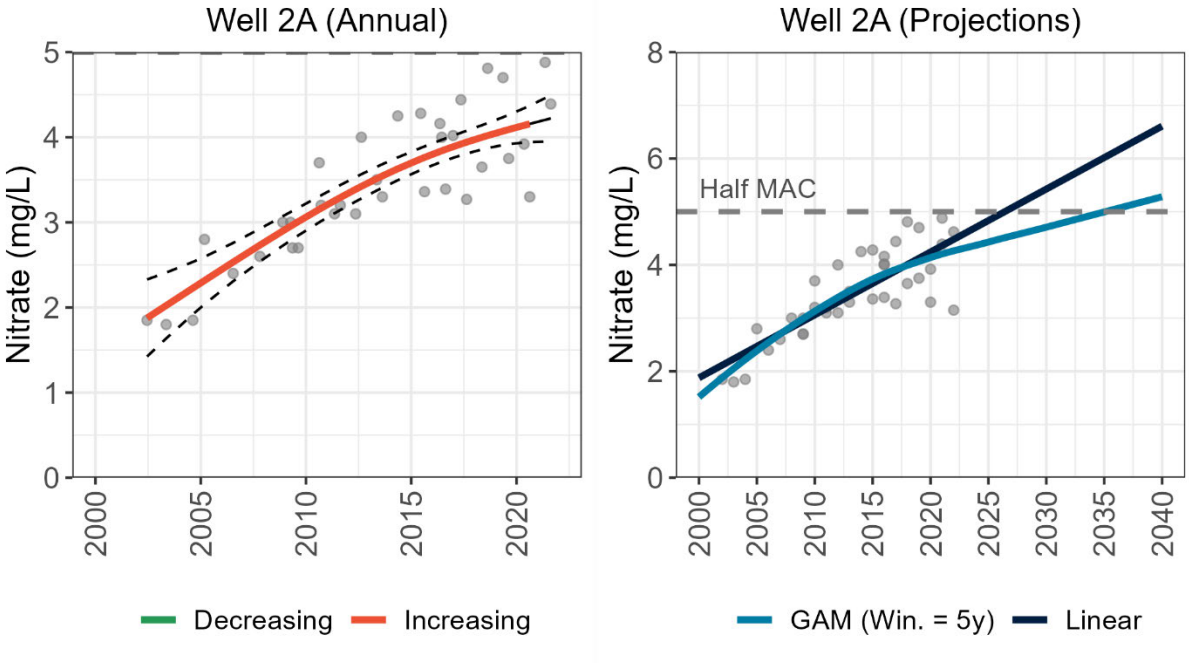

Figure 12. Nitrate concentration at Orangeville Well 2A is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significantly increasing trend. Nitrate concentration is highly likely to exceed the half-MAC of 5 mg/L and unlikely to exceed the MAC by 2040.

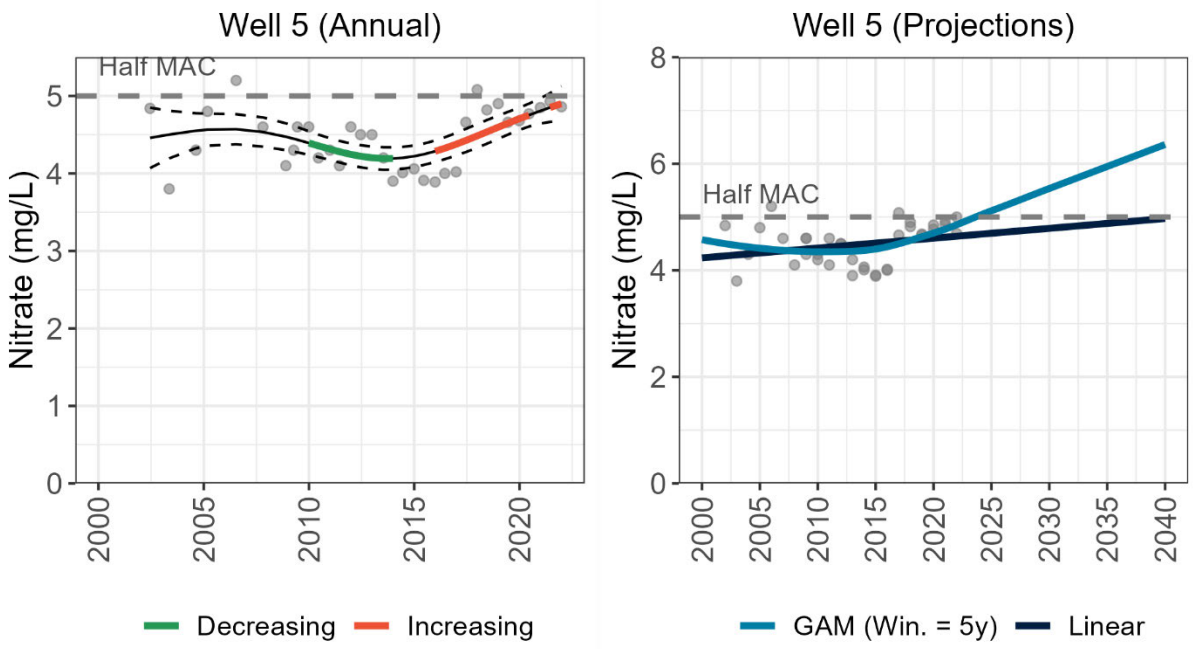

Figure 13. Nitrate concentration at Orangeville Well 5 are currently approaching the half-Maximum Acceptable Limit (MAC) of 5 mg/L and showing a significantly increasing trend. Nitrate concentration is highly likely to exceed the half-MAC of 5 mg/L, but unlikely to exceed the MAC by 2040.

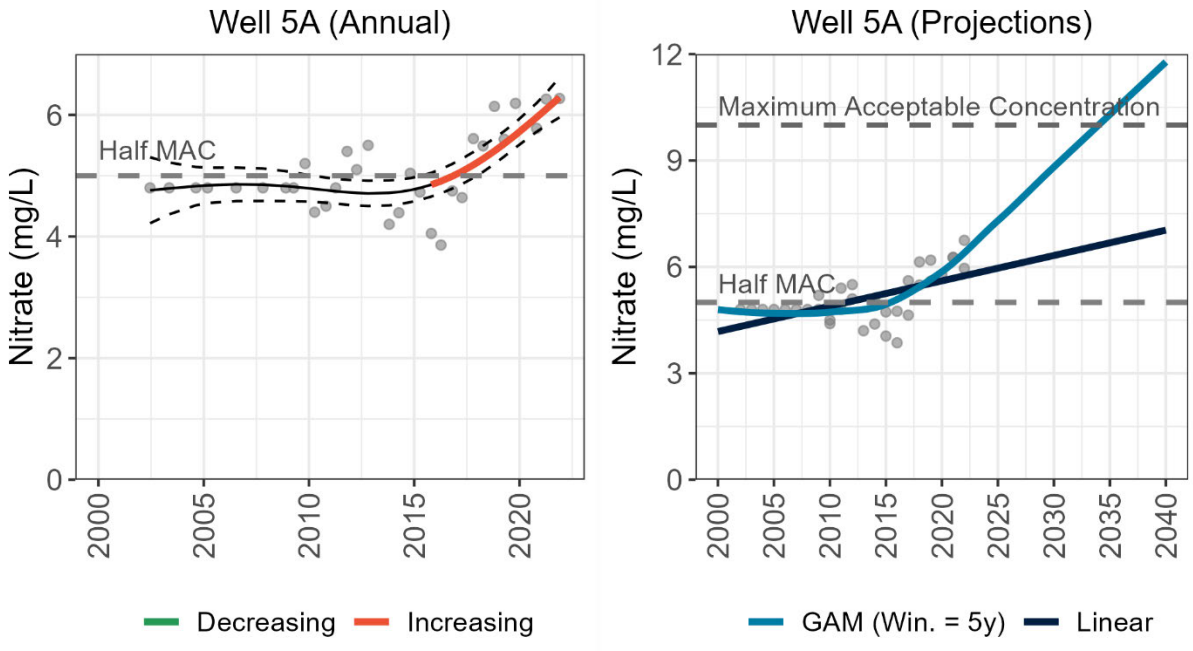

Figure 14. Nitrate concentration at Orangeville Well 5A is currently above the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significantly increasing trend since 2016. Nitrate concentration is highly likely to exceed the half-MAC of 5 mg/L and somewhat likely to exceed the MAC of 10 mg/L by 2040.

3.2 Chloride

Status and trend results for the municipal production wells in the CTC SPR with a Chloride *Issue* or a potential Chloride *Issue* are presented in **Table 7**. Presently, five wells in Dufferin County – Orangeville Wells 6, 9A, 9B, 10, and 11; and three wells in Halton Region – Cedarvale 1A, 4, and 4A have a Chloride *Issue*.

Each of the wells with a Chloride *Issue* showed an increasing trend in Chloride concentrations over the monitoring period. The most recent (current) Chloride concentrations at Orangeville Wells 6 (**Figure 20**), 9A (**Figure 21**), 9B (**Figure 22**), and 11 (**Figure 24**) are above the ODWQS threshold of 250 mg/L. At the remaining wells, the most recent (current) Chloride concentrations are below the ODWQS threshold.

For Orangeville Wells 9A, 9B, 10 (**Figure 23**) and 11, the GAMM projection predicted an exceedance of the ODWQS threshold to be highly likely by 2040, with predicted concentrations of 252 mg/L, 250 mg/L, 706 mg/L, and 697 mg/L, respectively. For Orangeville Well 6, the GAMM projection predicted an exceedance of the ODWQS threshold as somewhat likely by 2040, with a predicted concentration of 220 mg/L.

For Cedarvale 4A (**Figure 19**), the GAMM projection predicted an increasing trend, with an exceedance of the threshold to be highly likely by 2040, with a predicted concentration of 379 mg/L. For Cedarvale 1A (**Figure 16**) and 4 (**Figure 18**), the GAMM projection predicted an increasing trend, with an exceedance of the threshold to be somewhat likely by 2040, with predicted concentrations of 328 mg/L and 343 mg/L, respectively.

There are three wells that were flagged as having a potential Chloride *Issue* – Cedarvale 3/3A (**Figure 17**), Prospect Park 1 (**Figure 15**), and Stouffville PW 3 (**Figure 25**). Each of the three wells showed an increasing trend in Chloride concentrations over the monitoring period. The GAMM method created a projection trend line that was increasing for each of these wells. For Cedarvale 3/3A, the GAMM projection predicted an exceedance of the ODWQS threshold to be unlikely by 2040, with a predicted concentration of 222 mg/L. Prospect Park 1 and Stouffville PW 3 were somewhat likely to exceed the ODWQS threshold by 2040, with predicted concentrations of 315 mg/L and 398 mg/L, respectively.

Chlorides are typically a good indicator of urban development. Chloride salts are commonly used in winter as de-icing agents (sodium chloride) and in the summer for dust suppression (calcium or magnesium chloride). Chloride concentrations are generally elevated in more urbanized areas or areas with a high density of road networks. Most of the road salt used is in the form of sodium chloride, so high levels of chloride usually also imply elevated levels of sodium. Wells that do not exhibit increasing chloride concentrations are typically situated in rural or natural areas, remote from impervious surfaces.

Typically, groundwater with increasing chloride trends is located within or along the edge of areas mapped as having high aquifer vulnerability. The most vulnerable settings within the watershed occur where unconfined sand and gravel aquifers occur near the ground surface, or where the overburden material overlying fractured bedrock aquifers is thin or absent. For

example, in the Credit Valley Source Protection Area, in many areas the overburden overlying the Amabel Formation (a regionally extensive aquifer) is thin making the aquifer susceptible to surficial sources of contamination.

The elevated chloride levels in the wells listed in **Table 7** may indicate that the well capture zone intersects chloride plumes originating from surface sources such as winter de-icing activities (i.e., road salt application). An important control factor on chloride concentrations in unconfined aquifers is the permeability of the overburden material and depth. In general, if the overburden material consists of highly permeable sand and gravel, and the aquifer depth is shallow, the well is more likely to be under the direct influence of surface water and more susceptible to contamination from surface sources.

Table 7. Summary of municipal groundwater wells with existing or potential Chloride *Issues*. The rows in **bold font** are municipal production wells with an existing Chloride *Issue*. For the current period, concentrations are based on median observed values, and trends are based on GAMM results. For 2040 projections, concentrations and trend directions are based on GAMMs, and likelihood of exceedance is based on comparison of GAMM and linear regression.

		Current				2040 Projections			
Municipality	Well	Concentration (mg/L)	Comparison to ODWQS	Trend Direction[a]	Magnitude of Change (mg/L)	Concentration (mg/L)	Likelihood of exceeding ODWQS	Trend Direction	Magnitude of Change (mg/L)
Dufferin	**Well 10**	**223**	**Below**	**↑***	**129**	**706**	**Highly likely**	**↑**	**483**
Dufferin	**Well 11**	**291**	**Above**	**↑***	**266**	**697**	**Highly likely**	**↑**	**406**
Dufferin	**Well 6**	**266**	**Above**	**↑***	**223**	**220**	**Somewhat likely**	**↓**	**-46**
Dufferin	**Well 9A**	**316**	**Above**	**↑***	**249**	**252**	**Highly likely**	**↓**	**-64**
Dufferin	**Well 9B**	**319**	**Above**	**↑***	**228**	**250**	**Highly likely**	**↓**	**-93**
Halton	**Cedarvale 1/1A**	**173**	**Below**	**↑***	**67**	**328**	**Somewhat likely**	**↑**	**155**
Halton	Cedarvale 3/3A	174	Below	↑*	59.5	222	Unlikely	↑	48
Halton	**Cedarvale 4**	**213**	**Below**	**↑***	**52.5**	**343**	**Somewhat likely**	**↑**	**130**
Halton	**Cedarvale 4A**	**224**	**Below**	**↑***	**108**	**379**	**Highly likely**	**↑**	**155**
Halton	Prospect Park 1	124	Below	↑*	87	315	Somewhat likely	↑	191
York	Stouffville PW 3	222	Below	↑*	165	398	Somewhat likely	↑	176

[a] arrows with '*' denote a statistically significant trend (increase or decrease)

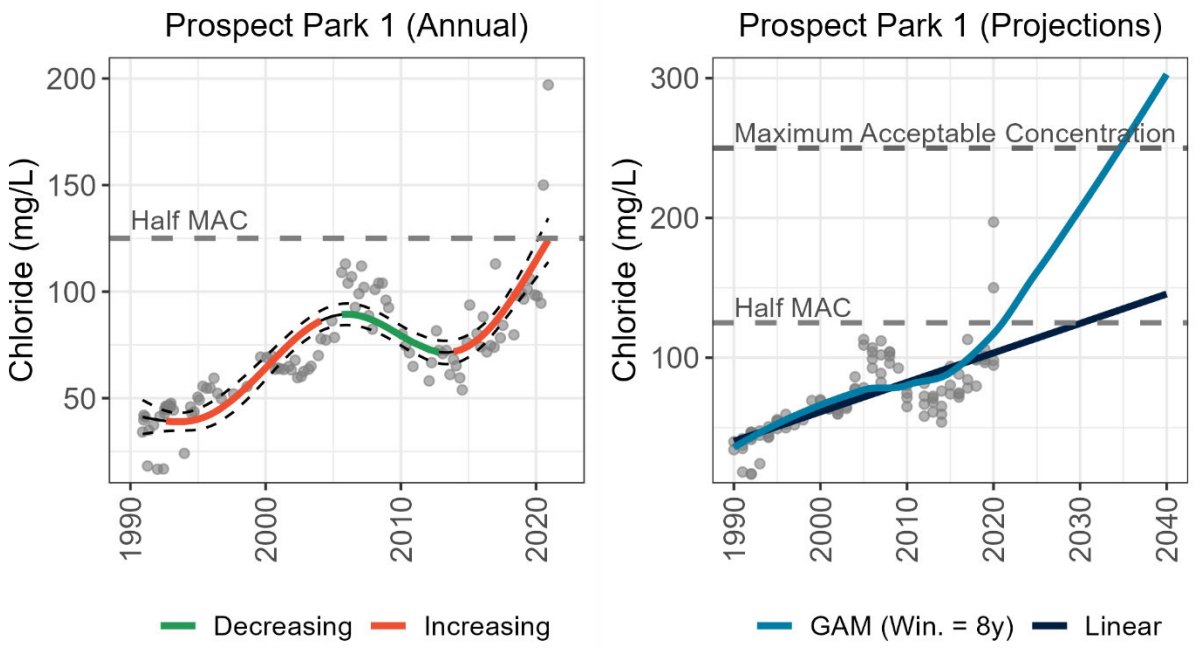

Figure 15. Chloride concentration at Prospect Park 1 Well is currently at the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significantly increasing trend as of 2013. Chloride concentration is highly likely to exceed the half-MAC and somewhat likely to exceed the MAC of 250 mg/L by 2040.

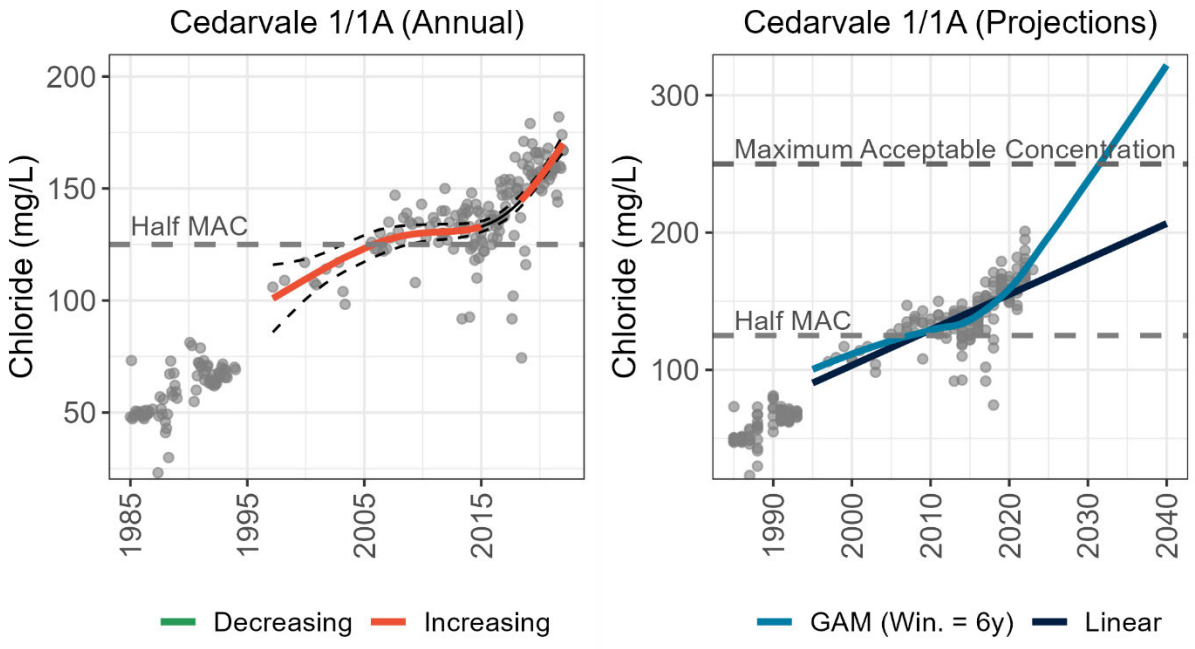

Figure 16. Chloride concentration at Cedarvale 1/1A Well is currently above the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significantly increasing trend. Chloride concentration is somewhat likely to exceed the MAC of 250 mg/L by 2040.

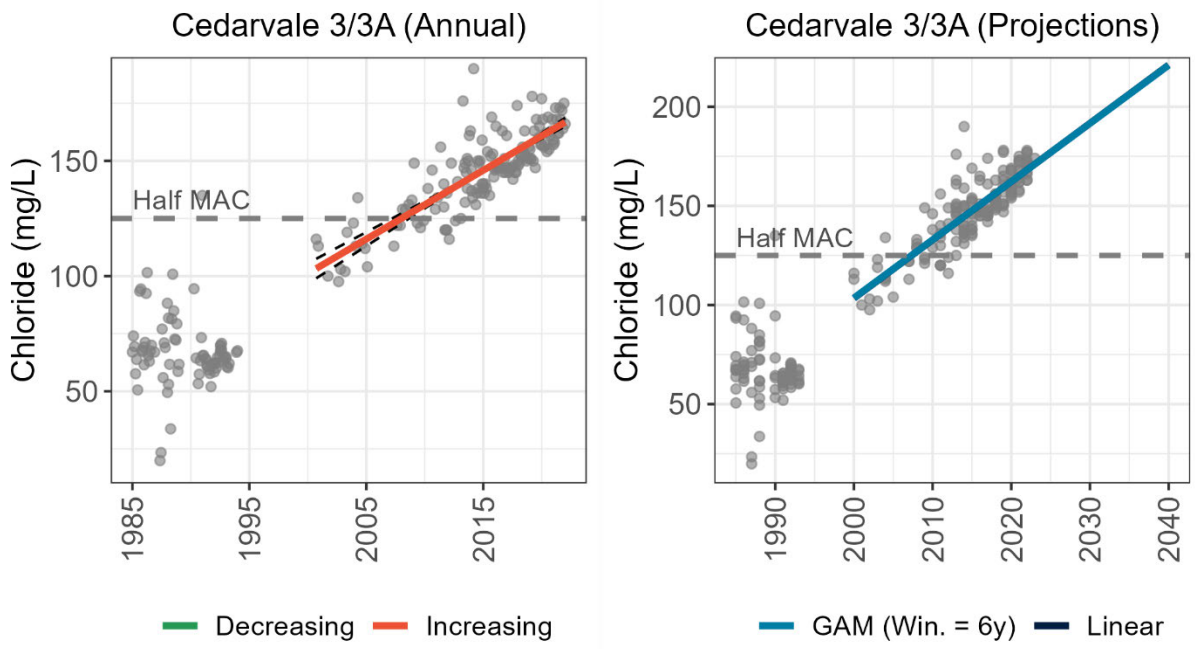

Figure 17. Chloride concentration at Cedarvale 3/3A Well is currently above the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significantly increasing trend. Chloride concentration is unlikely to exceed the MAC of 250 mg/L by 2040.

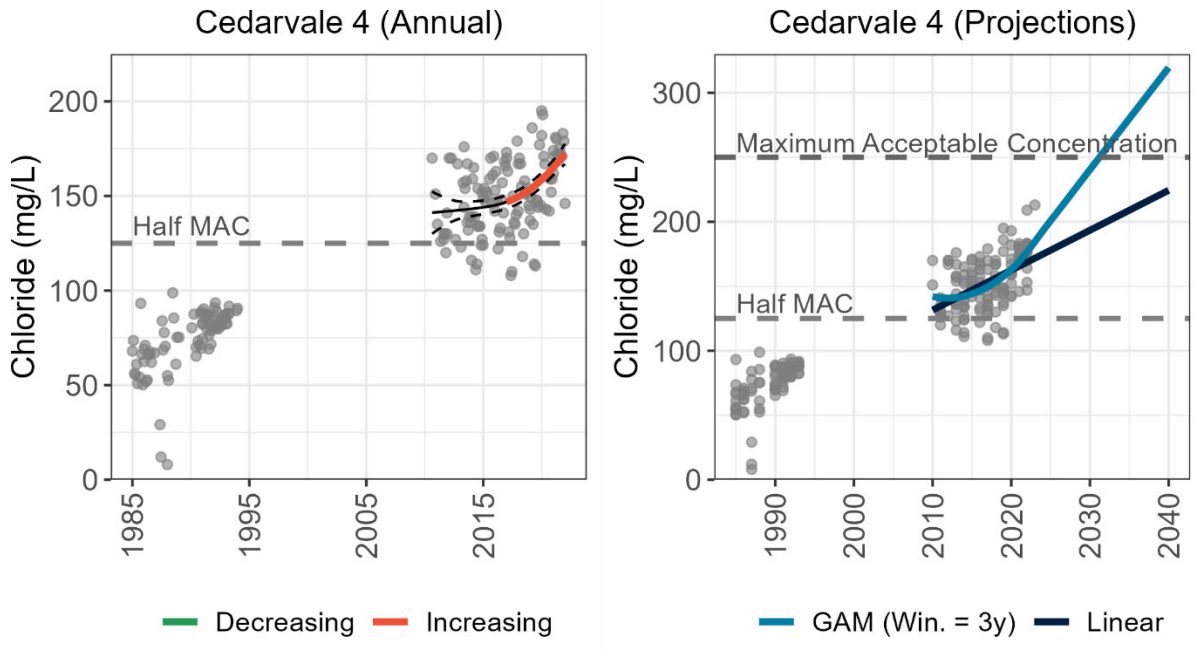

Figure 18. Chloride concentration at Cedarvale 4 Well is currently above the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significantly increasing trend. Chloride concentration is somewhat likely to exceed the MAC of 250 mg/L by 2040.

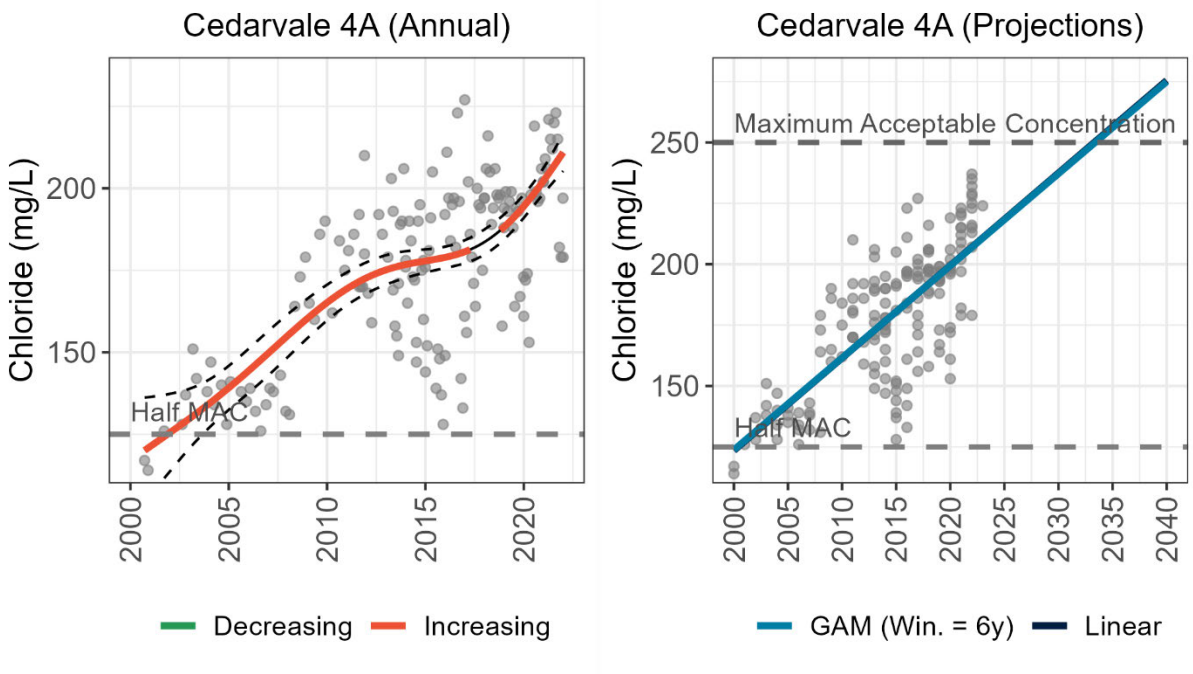

Figure 19. Chloride concentration at Cedarvale 4A Well is currently above the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significantly increasing trend. Chloride concentration is highly likely to exceed the MAC of 250 mg/L by 2040.

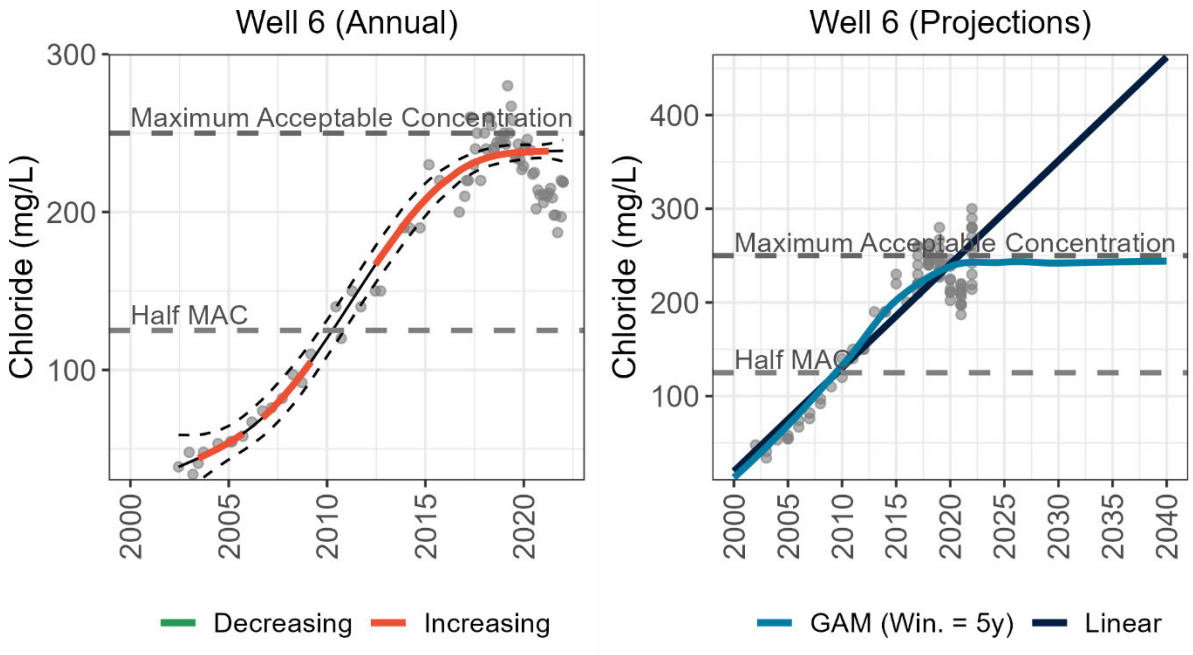

Figure 20. Chloride concentration at Orangeville Well 6 is currently above the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significantly increasing trend. Chloride concentration is highly likely to exceed the MAC of 250 mg/L by 2040.

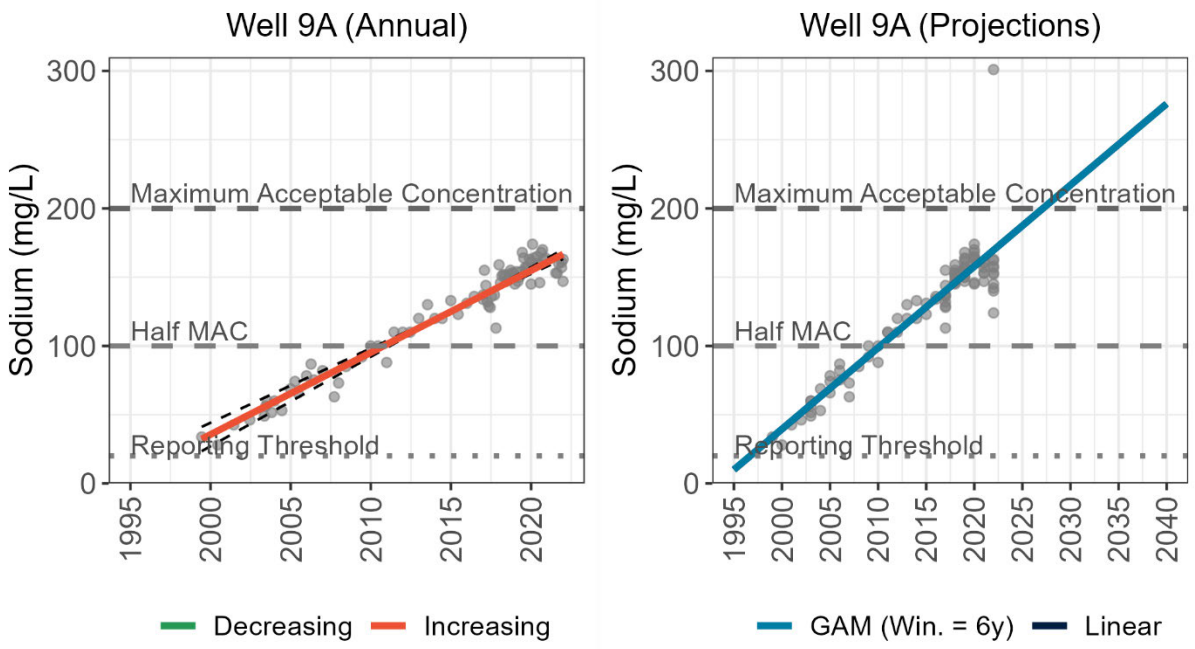

Figure 21. Chloride concentration at Orangeville Well 9A is currently above the Maximum Acceptable Limit (MAC) of 250 mg/L and is showing a significantly increasing trend. Chloride concentration is highly likely to remain above the MAC by 2040.

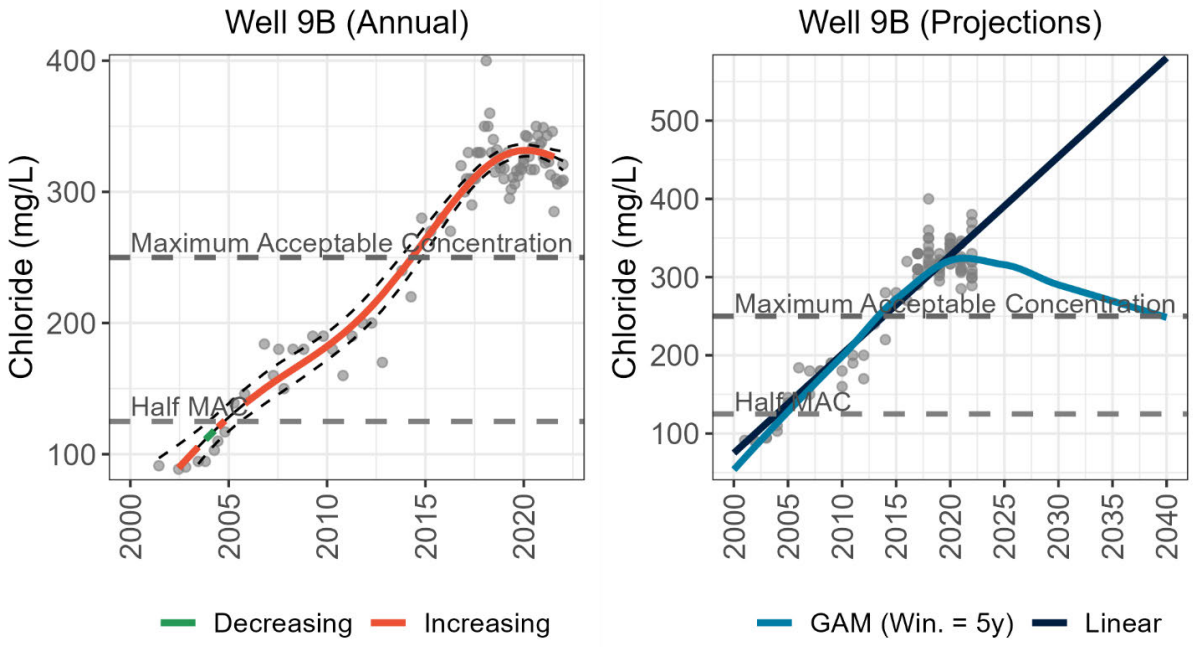

Figure 22. Chloride concentration at Orangeville Well 9B is currently above the Maximum Acceptable Limit (MAC) of 250 mg/L and is showing a significantly increasing trend. Chloride concentration is highly likely to remain above the MAC by 2040.

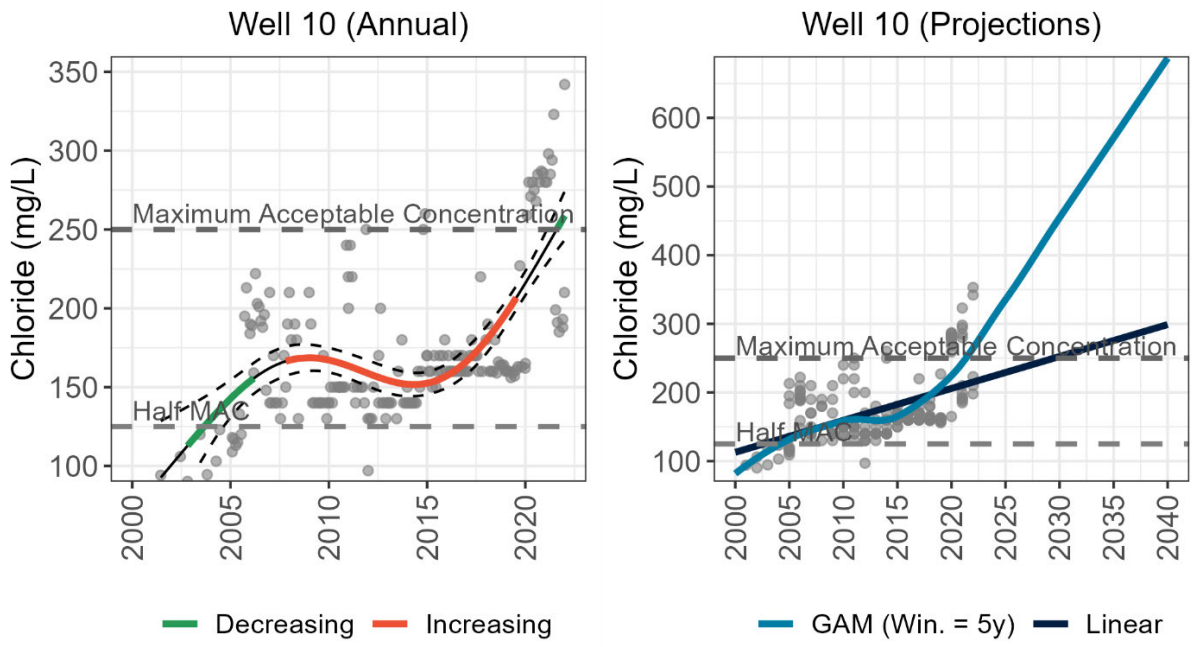

Figure 23. Chloride concentration at Orangeville Well 10 is above the Maximum Acceptable Limit (MAC) of 250 mg/L and has shown a statistically significant increase for most of the monitoring period. Chloride concentration is highly likely to remain above the MAC by 2040.

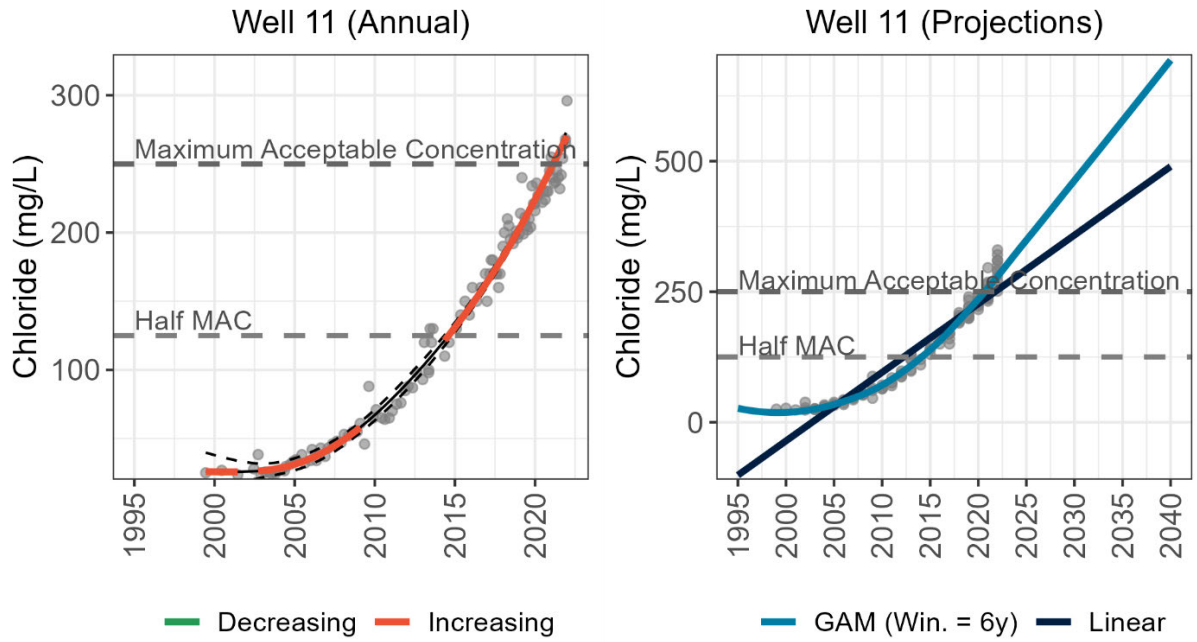

Figure 24. Chloride concentration at Orangeville Well 11 is above the Maximum Acceptable Limit (MAC) of 250 mg/L and is showing a significantly increasing trend. Chloride concentration is highly likely to remain above the MAC by 2040.

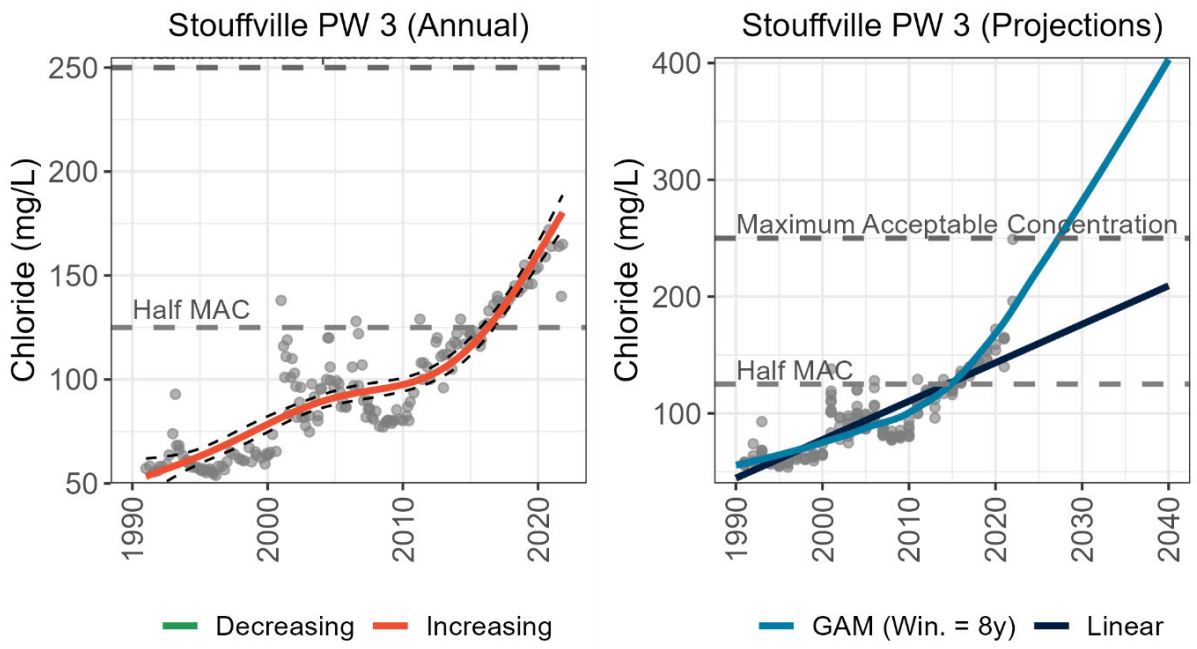

Figure 25. Chloride concentration at Stouffville PW 3 is above the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significantly increasing trend. Chloride concentration is somewhat likely to exceed the MAC of 250 mg/L by 2040.

3.3 Sodium

Status and trend results for the municipal production wells in the CTC SPR with a Sodium *Issue* or a potential Sodium *Issue* are presented in **Table 8**. Presently, three wells in Dufferin County – Orangeville Wells 6, 9A, and 9B have a Sodium *Issue*.

Each of the wells with a Sodium *Issue* showed an increasing trend in Sodium concentrations over the monitoring period. The most recent (current) Sodium concentrations at Orangeville Wells 6 (**Figure 26**), 9A (**Figure 27**), and 9B (**Figure 28**) are below the ODWQS threshold of 200 mg/L.

For Orangeville Well 9A, the GAMM projection predicted an increasing trend, with an exceedance of the ODWQS threshold as highly likely by 2040, with a predicted concentration of 276 mg/L. For Orangeville Wells 6 and 9B, the GAMM projection predicted an exceedance of the ODWQS threshold to be somewhat likely by 2040, with predicted concentrations of 109 mg/L and 169 mg/L, respectively.

There is a single well that was flagged as having a potential Sodium *Issue* – Orangeville Well 11 (**Figure 29**). This well showed an increasing trend in Sodium concentrations over the monitoring period. The GAMM method created a projection trend line that was increasing, with a predicted exceedance of the ODWQS threshold to be somewhat likely by 2040.

Increasing sodium concentrations in the source aquifer are likely attributed to increasing de-icing application rates during the winter months and/or leachate from septic systems using water softeners. Sodium and chloride tend to follow the same trends, where contamination of groundwater and surface water by sodium and chloride is a common occurrence in growing urban and existing urbanized areas. For example, when intensified residential land use and high-density road networks are present within the capture zone of wells, there is a direct correlation to increasing trends of sodium and chloride.

Table 8. Summary of municipal groundwater wells with existing or potential Sodium *Issues*. The rows in **bold font** are municipal production wells with an existing Sodium *Issue*. For the current period, concentrations are based on median observed values, and trends are based on GAMM results. For 2040 projections, concentrations and trend directions are based on GAMMs, and likelihood of exceedance is based on comparison of GAMM and linear regression.

		Current				2040 Projections			
Municipality	Well	Concentration (mg/L)	Comparison to ODWQS	Trend Direction[a]	Magnitude of Change (mg/L)	Concentration (mg/L)	Likelihood of exceeding ODWQS	Trend Direction	Magnitude of Change (mg/L)
Dufferin	Well 11	83.2	Below	↑*	72.3	269	Somewhat likely	↑	186
Dufferin	**Well 6**	**110**	**Below**	**↑***	**96.7**	**109**	**Somewhat likely**	**↓**	**-1**
Dufferin	**Well 9A**	**153**	**Below**	**↑***	**119**	**276**	**Highly likely**	**↑**	**123**
Dufferin	**Well 9B**	**155**	**Below**	**↑***	**110**	**169**	**Somewhat likely**	**↑**	**14**

[a] arrows with '*' denote a statistically significant trend (increase or decrease)

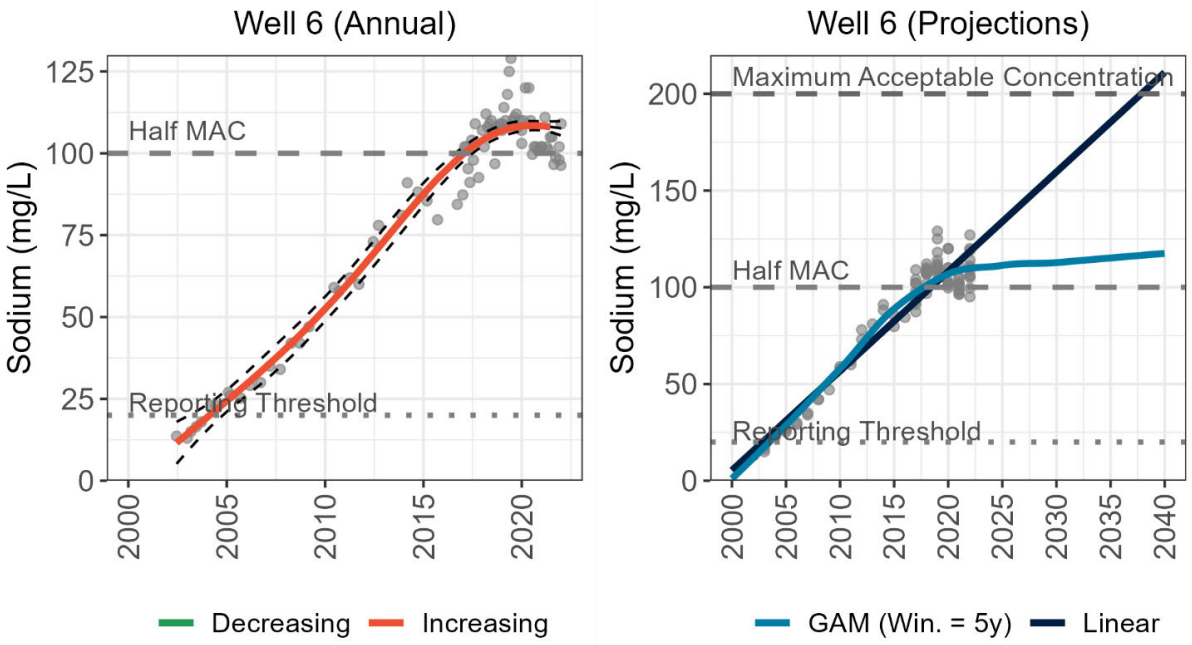

Figure 26. Sodium concentration at Orangeville Well 6 is increasing significantly and has exceeded the half-Maximum Acceptable Concentration (MAC) of 100 mg/L. Sodium concentration is somewhat likely to exceed the MAC of 200 mg/L by 2040.

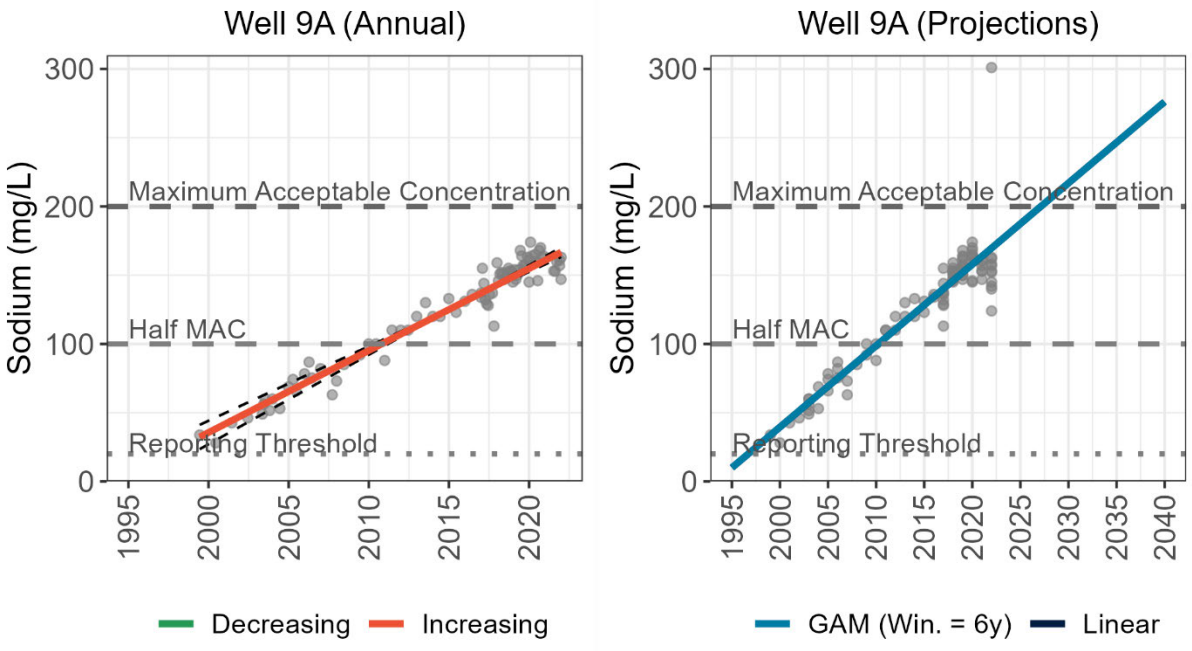

Figure 27. Sodium concentration at Orangeville Well 9A is increasing significantly and has exceeded the half-Maximum Acceptable Concentration (MAC) of 100 mg/L. Sodium concentration is highly likely to exceed the MAC of 200 mg/L by 2040.

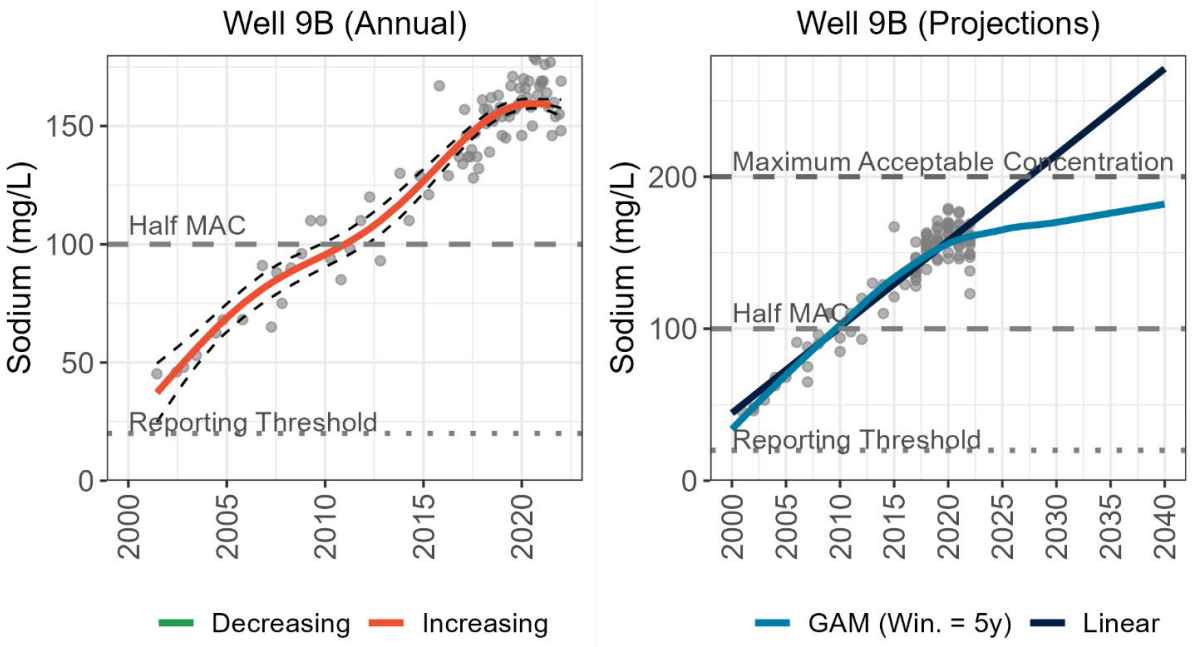

Figure 28. Sodium concentration at Orangeville Well 9B is increasing significantly and has exceeded the half-Maximum Acceptable Concentration (MAC) of 100 mg/L. Sodium concentration is somewhat likely to exceed the MAC of 200 mg/L by 2040.

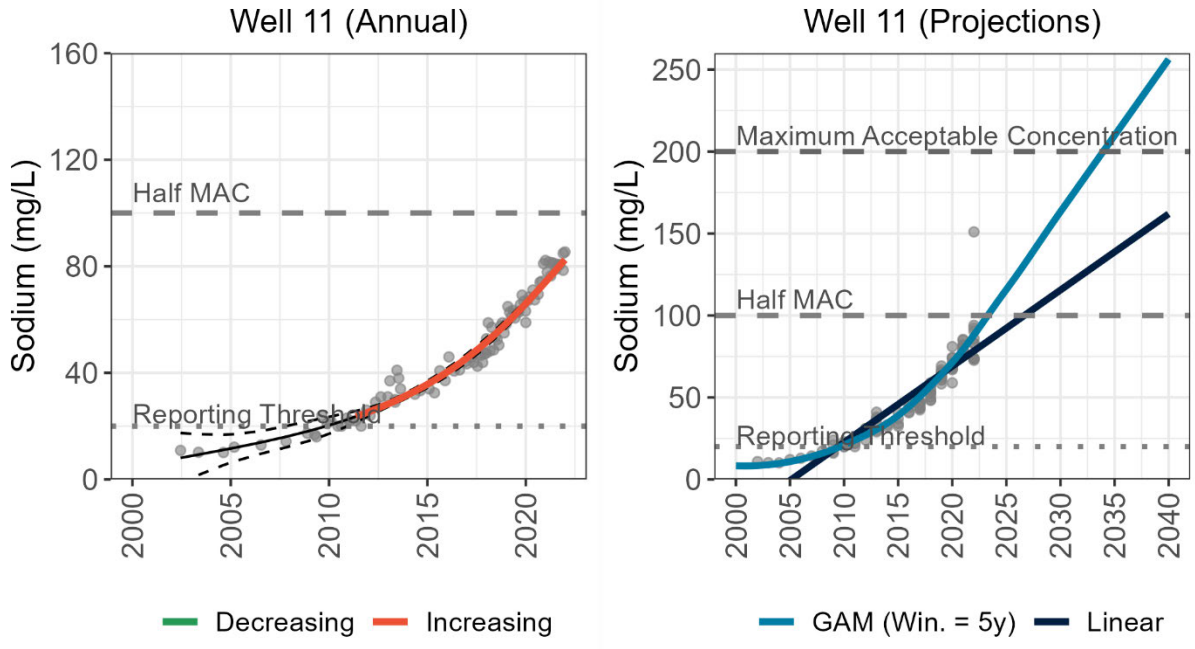

Figure 29. Sodium concentration at Orangeville Well 11 is increasing significantly and has exceeded the Reporting Threshold of 20 mg/L, though it has not yet exceeded the half-Maximum Acceptable Concentration (MAC) of 100 mg/L. Sodium concentration is somewhat likely to exceed the MAC of 200 mg/L by 2040.

4 Recommendations

Considering the findings presented in this report, a series of recommendations are presented. These recommendations are not intended to serve as a comprehensive list of all recommended actions. Rather, they are to be used as a starting point for discussion. The recommendations may be refined through discussions with CTC SPR technical staff and through consultation with municipal partners. The recommendations will be implemented through the multi-phase investigations outlined in the **Next Steps** section of this report.

1) CTC Source Protection Region will adopt the GAMM statistical method for analysing municipal production and monitoring well raw water quality data, to identify any existing or potential *Issues,* and to inform the Annual Progress Reporting process. Municipalities in CTC are requested to use this trend analysis method when producing trend plots and projections of water quality data.
2) To effectively utilize the GAMM method, specific data requirements must be met. These include:
    a. Quality controlled data – ensure that data are quality controlled and that all outliers are evaluated to ensure they are correct and should be retained in the analysis.
    b. Detection limits – provide the detection limits that each laboratory has reported so this can be used to process the censored data.
    c. Exact concentrations – to apply the above approach for censored data, exact concentrations provided by the laboratory are necessary.
3) CTC Source Protection Authority's recommend that municipalities update their sampling schedule of raw groundwater from municipal production wells to at least **four times per year** (i.e., one sample per season) for sodium, chloride, nitrate, and nitrite parameters, if not already doing so.
4) CTC Source Protection Authority's recommend that municipalities consider updating their sampling schedule of municipal monitoring wells to at least **four times per year** (i.e., one sample per season) for sodium, chloride, and nitrate and nitrite parameters, if not already doing so.
5) CTC Source Protection Authority's recommend that municipal production wells with an increasing parameter trend, and where the parameter concentration is above the half-MAC for any of the three parameters: sodium, chloride, and/ or nitrate and nitrite, increase their sampling frequency to **monthly** for the parameter(s) that have an increasing trend, if not already doing so. For reference, policy SAL-9(b) in the Approved Source Protection Plan CTC Source Protection Region (2022) directs the municipality to undertake monthly sampling of sodium and chloride parameters in raw water at affected wells within an Issue Contributing Area for Sodium or Chloride.
6) Municipalities to upload all their municipal production and monitoring well levels and water quality parameter data by February 1st of each year to the Oak Ridges Moraine Groundwater Program (ORMGP) database, following the ORMGP file importing process. The file importing process and instructions are provided in **Appendix E**.

5 Next Steps

Task 12, 13, and 14 under the s. 36 workplan identifies the need to review current drinking water *Issues* in the CTC SPR based on the latest water quality monitoring data and statistical trend analysis methods. Furthermore, the CTC SPC reiterated their concern about water quality *Issues* at municipal production wells and the need for further investigation. Accordingly, a multi phase investigation was initiated which includes the following:

(i) Phase 1: Review and update the statistical trend analysis method employed for identifying drinking water *Issues*, establish water quality data management standards, and sampling frequency recommendations (this study).

(ii) Phase 2: Review and update *Issue* identification methods and develop a delisting criterion.

(iii) Phase 3: Review existing drinking water *Issues* and conduct a hydrogeological assessment as to the likely cause of the observed statistical trend based on all available data.

(iv) Phase 4: Develop an automated water quality reporting tool in collaboration with ORMGP platform.

The multi phase investigation will be undertaken following the workplan presented in **Table 9**.

Table 9. Multi phase investigation workplan

Phase	Task	Description	Timeline
Phase 2	Review and update I*ssue* identification methods and develop a delisting criterion.	CTC SPR technical staff to review water quality trend analysis results and accompanying plots and revise drinking water *Issue* identification methods. CTC SPR technical staff and partner municipalities to work collaboratively to develop drinking water *Issue* delisting criterion.	Q1 2024
Phase 3	Examine current drinking water issues and conduct a hydrogeological assessment to determine the cause of the observed trend using all available data.	CTC SPR technical staff to lead the task with support from municipal partners. Municipal partners to share supporting material data with CTC SPR technical staff. Supporting material includes municipal monitoring wells water quality data, municipal production well pumping rate data, groundwater level data from municipal production and monitoring wells, land use change mapping or data, and available road salt application rates. For the wells with *Issues*, municipalities determine what factors are influencing the concentrations and which should	Q1/Q2 2024

Phase	Task	Description	Timeline
		be included in future analyses (i.e., lab name and sampling technique, covariates).	
Phase 4	Develop an automated water quality reporting tool in collaboration with the Oak Ridges Moraine Groundwater Program (ORMGP).	CTC SPR technical staff and ORMGP staff to develop an automated water quality reporting tool and *Issue* identification tool through the ORMGP platform.	TBD

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Appendices

Appendix A: Wells excluded from the trend analysis.

Table A-1. List of wells and parameters that were excluded from trend analysis.

Parameter	Municipality	Well Name	Reason for Exclusion
Nitrate	Dufferin	Coles 1	All values identical
Nitrate	Dufferin	Coles 2	All values but one identical
Nitrate	Dufferin	Island Lake PW 3	All values but one identical
Nitrate	Dufferin	Well 10	All values identical
Nitrate	Dufferin	Well 11	All values but one identical
Nitrate	Peel	Caledon East PW 4	All values but one identical (post data gap)
Nitrate	Peel	Caledon East PW 4A	All values identical
Nitrate	Peel	Caledon East PW 6	Insufficient data (only one year of data)
Nitrate	Peel	Caledon Village 4	All values but one identical (post data gap)
Nitrate	Peel	Cheltenham 1	All values but one identical
Nitrate	Peel	Inglewood 4	Insufficient data (only three years of data); All values identical
Nitrate	Peel	Palgrave PW 2	All values but one identical
Nitrate	Peel	Palgrave PW 3	All values but one identical
Nitrate	Peel	Palgrave PW 4	All values but one identical
Nitrate	York	Kleinburg PW 4	Insufficient data (only three years of data post data gap)
Chloride	Peel	Caledon East PW 6	Insufficient data (only one year of data)
Chloride	Peel	Inglewood 4	Insufficient data (only three years of data)
Sodium	Peel	Caledon East PW 6	Insufficient data (only one year of data)
Sodium	Wellington	Hillsburgh Heights H2	Insufficient data (only one year of data post data gap)
Sodium	York	Kleinburg PW 4	Insufficient data (only three years of data post data gap)

Appendix B: Wells excluded from the monthly analysis.

Table B-1. List of wells excluded from monthly trend analysis for nitrates.

Municipality	Well Name	Maximum # of Months Sampled	Reason for Exclusion
Dufferin	Cardinal Woods MW 1	2	Never sampled at least 10 months in a year.
Dufferin	Cardinal Woods MW 3	3	Never sampled at least 10 months in a year.
Dufferin	Cardinal Woods MW 4	3	Never sampled at least 10 months in a year.
Dufferin	Island Lake PW 1	3	Never sampled at least 10 months in a year.
Dufferin	Island Lake PW 2	2	Never sampled at least 10 months in a year.
Dufferin	Well 12	3	Never sampled at least 10 months in a year.
Dufferin	Well 2A	4	Never sampled at least 10 months in a year.
Dufferin	Well 5	3	Never sampled at least 10 months in a year.
Dufferin	Well 5A	2	Never sampled at least 10 months in a year.
Dufferin	Well 6	2	Never sampled at least 10 months in a year.
Dufferin	Well 7	4	Never sampled at least 10 months in a year.
Dufferin	Well 8B	2	Never sampled at least 10 months in a year.
Dufferin	Well 8C	3	Never sampled at least 10 months in a year.
Dufferin	Well 9A	3	Never sampled at least 10 months in a year.
Dufferin	Well 9B	2	Never sampled at least 10 months in a year.
Durham	Uxville MW 1	12	Has not been sampled at least 10 months in a year since 2013
Durham	Uxville MW 2	12	Has not been sampled at least 10 months in a year since 2013
Halton	4th Line A	12	Has not been sampled at least 10 months in a year since 1991
Halton	4th Line B	4	Never sampled at least 10 months in a year.
Halton	Cedarvale 1/1A	11	Has only been sampled at least 10 months in a year before a large data gap.
Halton	Cedarvale 3/3A	11	Has only been sampled at least 10 months in a year before a large data gap.
Halton	Cedarvale 4	5	Never sampled at least 10 months in a year.
Halton	Cedarvale 4A	10	Has only been sampled at least 10 months in a year before a large data gap.
Halton	Lindsay Court 9	5	Never sampled at least 10 months in a year.
Halton	Princess Anne 5	11	Has only been sampled at least 10 months in a year before a large data gap.

Municipality	Well Name	Maximum # of Months Sampled	Reason for Exclusion
Halton	Princess Anne 6	4	Never sampled at least 10 months in a year.
Halton	Prospect Park 1	5	Never sampled at least 10 months in a year.
Halton	Prospect Park 2	4	Never sampled at least 10 months in a year.
Peel	Caledon Village 3	7	Never sampled at least 10 months in a year.
Peel	Caledon Village 3B	1	Never sampled at least 10 months in a year.
Peel	Cheltenham 2	1	Never sampled at least 10 months in a year.
Peel	Inglewood 3	1	Never sampled at least 10 months in a year.
Wellington	Hillsburgh Heights H2	1	Never sampled at least 10 months in a year.
Wellington	Well E7	1	Never sampled at least 10 months in a year.
York	King City PW 3	4	Never sampled at least 10 months in a year.
York	King City PW 4	4	Never sampled at least 10 months in a year.
York	Kleinburg PW 3	4	Never sampled at least 10 months in a year.
York	Nobleton PW 2	4	Never sampled at least 10 months in a year.
York	Nobleton PW 3	5	Never sampled at least 10 months in a year.
York	Nobleton PW 5	1	Never sampled at least 10 months in a year.
York	Stouffville PW 1	4	Never sampled at least 10 months in a year.
York	Stouffville PW 2	4	Never sampled at least 10 months in a year.
York	Stouffville PW 3	7	Never sampled at least 10 months in a year.
York	Stouffville PW 5	11	Has not been sampled at least 10 months in a year since 1989
York	Stouffville PW 6	11	Has not been sampled at least 10 months in a year since 1989

Table B- 2. List of wells excluded from monthly trend analysis for chloride.

Municipality	Well Name	Maximum # of Months Sampled	Reason for Exclusion
Dufferin	Cardinal Woods MW 1	2	Never sampled at least 10 months in a year.
Dufferin	Cardinal Woods MW 3	3	Never sampled at least 10 months in a year.
Dufferin	Cardinal Woods MW 4	3	Never sampled at least 10 months in a year.
Dufferin	Coles 1	3	Never sampled at least 10 months in a year.
Dufferin	Coles 2	3	Never sampled at least 10 months in a year.
Dufferin	Island Lake PW 1	3	Never sampled at least 10 months in a year.
Dufferin	Island Lake PW 2	2	Never sampled at least 10 months in a year.
Dufferin	Island Lake PW 3	3	Never sampled at least 10 months in a year.
Dufferin	Well 2A	6	Never sampled at least 10 months in a year.
Durham	Uxville MW 1	12	Has not been sampled at least 10 months in a year since 2013
Durham	Uxville MW 2	12	Has not been sampled at least 10 months in a year since 2013
Halton	4th Line A	11	Has not been sampled at least 10 months in a year since 1991
Halton	4th Line B	4	Never sampled at least 10 months in a year.
Halton	Davidson 1	11	Has only been sampled at least 10 months in a year before a large data gap.
Halton	Davidson 2	11	Has only been sampled at least 10 months in a year before a large data gap.
Halton	Lindsay Court 9	5	Never sampled at least 10 months in a year.
Halton	Princess Anne 5	12	Has only been sampled at least 10 months in a year before a large data gap.
Halton	Princess Anne 6	4	Never sampled at least 10 months in a year.
Halton	Prospect Park 1	9	Never sampled at least 10 months in a year.
Halton	Prospect Park 2	4	Never sampled at least 10 months in a year.
Peel	Alton 3	9	Never sampled at least 10 months in a year.
Peel	Caledon East PW 3	6	Never sampled at least 10 months in a year.
Peel	Caledon East PW 4	3	Never sampled at least 10 months in a year.
Peel	Caledon East PW 4A	1	Never sampled at least 10 months in a year.
Peel	Caledon Village 3	6	Never sampled at least 10 months in a year.

Municipality	Well Name	Maximum # of Months Sampled	Reason for Exclusion
Peel	Caledon Village 3B	1	Never sampled at least 10 months in a year.
Peel	Caledon Village 4	6	Never sampled at least 10 months in a year.
Peel	Cheltenham 1	2	Never sampled at least 10 months in a year.
Peel	Cheltenham 2	3	Never sampled at least 10 months in a year.
Peel	Inglewood 3	6	Never sampled at least 10 months in a year.
Peel	Palgrave PW 2	1	Never sampled at least 10 months in a year.
Peel	Palgrave PW 3	1	Never sampled at least 10 months in a year.
Peel	Palgrave PW 4	2	Never sampled at least 10 months in a year.
Wellington	Glendevon H3	1	Never sampled at least 10 months in a year.
Wellington	Hillsburgh Heights H2	1	Never sampled at least 10 months in a year.
Wellington	Well E7	1	Never sampled at least 10 months in a year.
Wellington	Well E8	1	Never sampled at least 10 months in a year.
York	King City PW 3	4	Never sampled at least 10 months in a year.
York	King City PW 4	4	Never sampled at least 10 months in a year.
York	Kleinburg PW 3	4	Never sampled at least 10 months in a year.
York	Kleinburg PW 4	4	Never sampled at least 10 months in a year.
York	Nobleton PW 2	4	Never sampled at least 10 months in a year.
York	Nobleton PW 3	5	Never sampled at least 10 months in a year.
York	Nobleton PW 5	1	Never sampled at least 10 months in a year.
York	Stouffville PW 1	5	Never sampled at least 10 months in a year.
York	Stouffville PW 2	5	Never sampled at least 10 months in a year.
York	Stouffville PW 3	9	Never sampled at least 10 months in a year.
York	Stouffville PW 5	11	Has not been sampled at least 10 months in a year since 1989
York	Stouffville PW 6	11	Has not been sampled at least 10 months in a year since 1989

Table B-3. List of wells excluded from monthly trend analysis for sodium.

Municipality	Well Name	Maximum # of Months Sampled	Reason for Exclusion
Dufferin	Cardinal Woods MW 1	2	Never sampled at least 10 months in a year.
Dufferin	Cardinal Woods MW 3	3	Never sampled at least 10 months in a year.
Dufferin	Cardinal Woods MW 4	3	Never sampled at least 10 months in a year.
Dufferin	Coles 1	3	Never sampled at least 10 months in a year.
Dufferin	Coles 2	3	Never sampled at least 10 months in a year.
Dufferin	Island Lake PW 1	3	Never sampled at least 10 months in a year.
Dufferin	Island Lake PW 2	2	Never sampled at least 10 months in a year.
Dufferin	Island Lake PW 3	3	Never sampled at least 10 months in a year.
Dufferin	Well 2A	6	Never sampled at least 10 months in a year.
Durham	Uxville MW 1	12	Has not been sampled at least 10 months in a year since 2013
Durham	Uxville MW 2	12	Has not been sampled at least 10 months in a year since 2013
Halton	4th Line A	11	Has not been sampled at least 10 months in a year since 1991
Halton	4th Line B	4	Never sampled at least 10 months in a year.
Halton	Davidson 1	11	Has only been sampled at least 10 months in a year before a large data gap.
Halton	Davidson 2	11	Has only been sampled at least 10 months in a year before a large data gap.
Halton	Lindsay Court 9	5	Never sampled at least 10 months in a year.
Halton	Princess Anne 5	11	Has only been sampled at least 10 months in a year before a large data gap.
Halton	Princess Anne 6	4	Never sampled at least 10 months in a year.
Halton	Prospect Park 1	9	Never sampled at least 10 months in a year.
Halton	Prospect Park 2	4	Never sampled at least 10 months in a year.
Peel	Alton 3	7	Never sampled at least 10 months in a year.
Peel	Caledon East PW 3	6	Never sampled at least 10 months in a year.
Peel	Caledon East PW 4	3	Never sampled at least 10 months in a year.
Peel	Caledon East PW 4A	2	Never sampled at least 10 months in a year.
Peel	Caledon Village 3	6	Never sampled at least 10 months in a year.

Municipality	Well Name	Maximum # of Months Sampled	Reason for Exclusion
Peel	Caledon Village 3B	2	Never sampled at least 10 months in a year.
Peel	Caledon Village 4	6	Never sampled at least 10 months in a year.
Peel	Cheltenham 1	3	Never sampled at least 10 months in a year.
Peel	Cheltenham 2	3	Never sampled at least 10 months in a year.
Peel	Inglewood 3	6	Never sampled at least 10 months in a year.
Peel	Inglewood 4	2	Never sampled at least 10 months in a year.
Peel	Palgrave PW 2	2	Never sampled at least 10 months in a year.
Peel	Palgrave PW 3	2	Never sampled at least 10 months in a year.
Peel	Palgrave PW 4	2	Never sampled at least 10 months in a year.
Wellington	Glendevon H3	1	Never sampled at least 10 months in a year.
Wellington	Well E7	1	Never sampled at least 10 months in a year.
Wellington	Well E8	1	Never sampled at least 10 months in a year.
York	King City PW 3	4	Never sampled at least 10 months in a year.
York	King City PW 4	4	Never sampled at least 10 months in a year.
York	Kleinburg PW 3	4	Never sampled at least 10 months in a year.
York	Nobleton PW 2	4	Never sampled at least 10 months in a year.
York	Nobleton PW 3	5	Never sampled at least 10 months in a year.
York	Nobleton PW 5	1	Never sampled at least 10 months in a year.
York	Stouffville PW 1	5	Never sampled at least 10 months in a year.
York	Stouffville PW 2	5	Never sampled at least 10 months in a year.
York	Stouffville PW 3	9	Never sampled at least 10 months in a year.
York	Stouffville PW 5	11	Has not been sampled at least 10 months in a year since 1989
York	Stouffville PW 6	11	Has not been sampled at least 10 months in a year since 1989

Appendix C: Trend and guideline comparisons for all wells

Table C-1. Nitrate trends and guidelines comparisons.

Regional Municipality	# Wells Increasing	# Wells Decreasing	# Wells Stable	# Wells Exceeding Half-MAC	# Wells Exceed MAC
Dufferin	8	0	7	1	0
Durham	1	0	1	0	0
Halton	2	2	9	0	0
Peel	2	2	2	0	0
Wellington	1	0	1	0	0
York	8	1	2	0	0

Table C-2. Chloride trends and guidelines comparisons.

Regional Municipality	# Wells Increasing	# Wells Decreasing	# Wells Stable	# Wells Exceeding Half-MAC	# Wells Exceed MAC
Dufferin	13	1	6	6	4
Durham	0	0	2	0	0
Halton	9	0	4	4	0
Peel	10	0	3	1	0
Wellington	4	0	0	0	0
York	7	1	4	1	0

Table C-3. Sodium trends and guidelines comparisons.

Regional Municipality	# Wells Increasing	# Wells Decreasing	# Wells Stable	# Wells Exceeding Half-MAC	# Wells Exceed MAC
Dufferin	14	1	5	3	0
Durham	1	0	1	0	0
Halton	11	0	2	0	0
Peel	8	1	5	1	0
Wellington	0	0	3	0	0
York	6	2	3	1	0

Table C-4. Summary of municipal production wells Nitrate trend analysis results. For the current period, concentrations are based on median observed values, and trends are based on GAMM results. For 2040 projections, concentrations and trend directions are based on GAMMs, and likelihood of exceedance is based on comparison of GAMM and linear regression. "NA" indicates wells that were excluded from analysis. Significant results are denoted by an up or down directional arrow (↑ or ↓).

		Current				2040 Projections			
Municipality	Well	Concentration (mg/L)	Comparison to ODWQS	Trend Direction	Magnitude of Change (mg/L)	Concentration (mg/L)	Likelihood of exceeding ODWQS	Trend Direction	Magnitude of Change (mg/L)
Dufferin	Cardinal Woods MW 1	0.565	Below	↑	0.065	0.834	Unlikely	↑	0.269
Dufferin	Cardinal Woods MW 3	2.61	Below	↑	1.21	6.32	Unlikely	↑	3.71
Dufferin	Cardinal Woods MW 4	1.04	Below	↔	0.14	1.86	Unlikely	↑	0.82
Dufferin	Coles 1	0	Below	NA	NA	NA	NA	NA	NA
Dufferin	Coles 2	0	Below	NA	NA	NA	NA	NA	NA
Dufferin	Island Lake PW 1	0.009	Below	↔	0.009	0.0916	Unlikely	↑	0.0826
Dufferin	Island Lake PW 2	0.0065	Below	↔	0.0065	0.006	Unlikely	↓	-0.0005
Dufferin	Island Lake PW 3	0.002	Below	NA	NA	NA	NA	NA	NA
Dufferin	Well 10	0	Below	NA	NA	NA	NA	NA	NA
Dufferin	Well 11	0	Below	NA	NA	NA	NA	NA	NA
Dufferin	Well 12	0.73	Below	↑	0.53	0.761	Unlikely	↑	0.031
Dufferin	Well 2A	3.88	Below	↑	2.03	5.51	Unlikely	↑	1.63
Dufferin	Well 5	4.85	Below	↑	0.01	6.75	Unlikely	↑	1.9
Dufferin	Well 5A	6.36	Below	↑	1.56	11.9	Somewhat likely	↑	5.54

Municipality	Well	Current				2040 Projections			
		Concentration (mg/L)	Comparison to ODWQS	Trend Direction	Magnitude of Change (mg/L)	Concentration (mg/L)	Likelihood of exceeding ODWQS	Trend Direction	Magnitude of Change (mg/L)
Dufferin	Well 6	0.0555	Below	↑	0.0555	0.0971	Unlikely	↑	0.0416
Dufferin	Well 7	0	Below	↔	0	0.00106	Unlikely	↑	0.00106
Dufferin	Well 8B	0.498	Below	↑	0.198	1.31	Unlikely	↑	0.812
Dufferin	Well 8C	0.568	Below	↑	0.418	0.746	Unlikely	↑	0.178
Dufferin	Well 9A	3.26	Below	↔	1.06	0	Unlikely	↓	-3.26
Dufferin	Well 9B	3.74	Below	↔	1.39	0.631	Unlikely	↓	-3.11
Durham	Uxville MW 1	1.03	Below	↑	0.425	0.687	Unlikely	↓	-0.343
Durham	Uxville MW 2	0.69	Below	↔	0.23	0.431	Unlikely	↓	-0.259
Halton	4th Line A	2.31	Below	↑	0.71	0	Unlikely	↓	-2.31
Halton	4th Line B	3.06	Below	↔	0.71	4.21	Unlikely	↑	1.15
Halton	Cedarvale 1/1A	0.94	Below	↔	0.255	0.3	Unlikely	↓	-0.64
Halton	Cedarvale 3/3A	1.92	Below	↔	-0.045	1.92	Unlikely	↔	0
Halton	Cedarvale 4	0.68	Below	↔	0.21	0.468	Unlikely	↓	-0.212
Halton	Cedarvale 4A	0.63	Below	↔	-0.04	0.247	Unlikely	↓	-0.383
Halton	Davidson 1	2.52	Below	↑	0.73	3.24	Unlikely	↑	0.72
Halton	Davidson 2	2.33	Below	↑	0.32	2.77	Unlikely	↑	0.44
Halton	Lindsay Court 9	1.64	Below	↔	-0.08	2.07	Unlikely	↑	0.43
Halton	Princess Anne 5	2.38	Below	↓	-2.27	2.81	Unlikely	↑	0.43
Halton	Princess Anne 6	2.34	Below	↑	0.11	1.14	Unlikely	↓	-1.2

Municipality	Well	Current				2040 Projections			
		Concentration (mg/L)	Comparison to ODWQS	Trend Direction	Magnitude of Change (mg/L)	Concentration (mg/L)	Likelihood of exceeding ODWQS	Trend Direction	Magnitude of Change (mg/L)
Halton	Prospect Park 1	0.01	Below	↓	-0.19	0	Unlikely	↓	-0.01
Halton	Prospect Park 2	0.105	Below	↔	0.08	0	Unlikely	↓	-0.105
Peel	Alton 3	2.34	Below	↑	0.76	0	Unlikely	↓	-2.34
Peel	Caledon East PW 3	2.9	Below	↓	-3.03	0	Unlikely	↓	-2.9
Peel	Caledon East PW 4	0.1	Below	NA	NA	NA	NA	NA	NA
Peel	Caledon East PW 4A	0.1	Below	NA	NA	NA	NA	NA	NA
Peel	Caledon East PW 6	0.1	Below	NA	NA	NA	NA	NA	NA
Peel	Caledon Village 3	2.8	Below	↑	0.435	25.5	Somewhat likely	↑	22.7
Peel	Caledon Village 3B	0.13	Below	↓	-0.08	0	Unlikely	↓	-0.13
Peel	Caledon Village 4	0.1	Below	NA	NA	NA	NA	NA	NA
Peel	Cheltenham 1	0.1	Below	NA	NA	NA	NA	NA	NA
Peel	Cheltenham 2	0.1	Below	↑	0.05	0.186	Unlikely	↑	0.086
Peel	Inglewood 3	0.1	Below	↔	0.05	0.0438	Unlikely	↓	-0.0562
Peel	Inglewood 4	0.1	Below	NA	NA	NA	NA	NA	NA

Municipality	Well	Current				2040 Projections			
		Concentration (mg/L)	Comparison to ODWQS	Trend Direction	Magnitude of Change (mg/L)	Concentration (mg/L)	Likelihood of exceeding ODWQS	Trend Direction	Magnitude of Change (mg/L)
Peel	Palgrave PW 2	0.1	Below	NA	NA	NA	NA	NA	NA
Peel	Palgrave PW 3	0.1	Below	NA	NA	NA	NA	NA	NA
Peel	Palgrave PW 4	0.1	Below	NA	NA	NA	NA	NA	NA
Wellington	Hillsburgh Heights H2	1.18	Below	↑	0.305	1.69	Unlikely	↑	0.51
Wellington	Well E7	0.1	Below	↔	-0.025	0	Unlikely	↓	-0.1
York	King City PW 3	1	Below	↑	0.99	3.97	Unlikely	↑	2.97
York	King City PW 4	0.5	Below	↑	0.49	4.99	Unlikely	↑	4.49
York	Kleinburg PW 3	1	Below	↑	0.95	4.62	Unlikely	↑	3.62
York	Kleinburg PW 4	1	Below	NA	NA	NA	NA	NA	NA
York	Nobleton PW 2	1	Below	↑	0.95	3.79	Unlikely	↑	2.79
York	Nobleton PW 3	1	Below	↑	0.95	2.94	Unlikely	↑	1.94
York	Nobleton PW 5	1	Below	↑	0.992	0.184	Unlikely	↓	-0.816
York	Stouffville PW 1	0.5	Below	↑	0.45	1.77	Unlikely	↑	1.27

Municipality	Well	Current				2040 Projections			
		Concentration (mg/L)	Comparison to ODWQS	Trend Direction	Magnitude of Change (mg/L)	Concentration (mg/L)	Likelihood of exceeding ODWQS	Trend Direction	Magnitude of Change (mg/L)
York	Stouffville PW 2	0.5	Below	↑	0.45	1.84	Unlikely	↑	1.34
York	Stouffville PW 3	2.5	Below	↑	2.15	9.88	Unlikely	↑	7.38
York	Stouffville PW 5	2.52	Below	↑	0.48	5.88	Unlikely	↑	3.36
York	Stouffville PW 6	1.9	Below	↔	-0.44	4.18	Unlikely	↑	2.28

Table C-5. Summary of municipal production wells Chloride trend analysis results. For the current period, concentrations are based on median observed values, and trends are based on GAMM results. For 2040 projections, concentrations and trend directions are based on GAMMs, and likelihood of exceedance is based on comparison of GAMM and linear regression. "NA" indicates wells that were excluded from analysis. Significant results are denoted by an up or down directional arrow (↑ or ↓).

		Current				2040 Projections			
Municipality	Well	Concentration (mg/L)	Comparison to ODWQS	Trend Direction	Magnitude of Change (mg/L)	Concentration (mg/L)	Likelihood of exceeding ODWQS	Trend Direction	Magnitude of Change (mg/L)
Dufferin	Cardinal Woods MW 1	72.5	Below	↑	5.5	87.5	Unlikely	↑	15
Dufferin	Cardinal Woods MW 3	132	Below	↑	38.5	263	Somewhat likely	↑	131
Dufferin	Cardinal Woods MW 4	98.4	Below	↓	-21.6	158	Unlikely	↑	59.6
Dufferin	Coles 1	2.96	Below	↔	1.96	8.22	Unlikely	↑	5.26
Dufferin	Coles 2	1.9	Below	↔	0.9	4.11	Unlikely	↑	2.21
Dufferin	Island Lake PW 1	21.8	Below	↔	6.8	29.2	Unlikely	↑	7.4
Dufferin	Island Lake PW 2	22	Below	↔	-5	24	Unlikely	↑	2
Dufferin	Island Lake PW 3	13.8	Below	↑	2.1	24.3	Unlikely	↑	10.5
Dufferin	Well 10	223	Below	↑	129	706	Highly likely	↑	483
Dufferin	Well 11	291	Above	↑	266	697	Highly likely	↑	406
Dufferin	Well 12	21.4	Below	↑	9.4	16.9	Unlikely	↓	-4.5
Dufferin	Well 2A	81.1	Below	↑	53.3	105	Unlikely	↑	23.9
Dufferin	Well 5	108	Below	↑	44.2	148	Unlikely	↑	40
Dufferin	Well 5A	82	Below	↔	62.6	0	Unlikely	↓	-82

Municipality	Well	Current				2040 Projections			
		Concentration (mg/L)	Comparison to ODWQS	Trend Direction	Magnitude of Change (mg/L)	Concentration (mg/L)	Likelihood of exceeding ODWQS	Trend Direction	Magnitude of Change (mg/L)
Dufferin	Well 6	266	Above	↔	223	220	Somewhat likely	↓	-46
Dufferin	Well 7	28.8	Below	↑	19.9	34.9	Unlikely	↑	6.1
Dufferin	Well 8B	29.8	Below	↔	7.6	61.1	Unlikely	↑	31.3
Dufferin	Well 8C	24.5	Below	↑	11.7	45	Unlikely	↑	20.5
Dufferin	Well 9A	316	Above	↑	249	252	Highly likely	↓	-64
Dufferin	Well 9B	319	Above	↑	228	226	Somewhat likely	↓	-93
Durham	Uxville MW 1	3.88	Below	↔	1.1	5.73	Unlikely	↑	1.85
Durham	Uxville MW 2	3.69	Below	↔	1.09	5.28	Unlikely	↑	1.59
Halton	4th Line A	13.7	Below	↔	5.1	12.4	Unlikely	↓	-1.3
Halton	4th Line B	18.4	Below	↔	5.1	23	Unlikely	↑	4.6
Halton	Cedarvale 1/1A	173	Below	↑	67	328	Somewhat likely	↑	155
Halton	Cedarvale 3/3A	174	Below	↑	59.5	222	Unlikely	↑	48
Halton	Cedarvale 4	213	Below	↑	52.5	343	Somewhat likely	↑	130
Halton	Cedarvale 4A	224	Below	↑	108	379	Highly likely	↑	155
Halton	Davidson 1	48	Below	↑	20	78.1	Unlikely	↑	30.1
Halton	Davidson 2	40	Below	↑	15.5	66	Unlikely	↑	26
Halton	Lindsay Court 9	58.5	Below	↑	13.9	93.1	Unlikely	↑	34.6
Halton	Princess Anne 5	99.4	Below	↑	30.4	73.8	Unlikely	↓	-25.6

Municipality	Well	Current				2040 Projections			
		Concentration (mg/L)	Comparison to ODWQS	Trend Direction	Magnitude of Change (mg/L)	Concentration (mg/L)	Likelihood of exceeding ODWQS	Trend Direction	Magnitude of Change (mg/L)
Halton	Princess Anne 6	94.9	Below	↑	16.6	68.2	Unlikely	↓	-26.7
Halton	Prospect Park 1	124	Below	↑	87	315	Somewhat likely	↑	191
Halton	Prospect Park 2	88.4	Below	↑	15.2	177	Unlikely	↑	88.6
Peel	Alton 3	115	Below	↔	39.5	118	Unlikely	↑	3
Peel	Caledon East PW 3	180	Below	↔	27	215	Unlikely	↑	35
Peel	Caledon East PW 4	37	Below	↑	33.2	75.7	Unlikely	↑	38.7
Peel	Caledon East PW 4A	21	Below	↑	4	16.3	Unlikely	↓	-4.7
Peel	Caledon East PW 6	12	Below	NA	NA	NA	NA	NA	NA
Peel	Caledon Village 3	109	Below	↑	41.8	498	Somewhat likely	↑	389
Peel	Caledon Village 3B	63	Below	↔	-2	40.6	Unlikely	↓	-22.4
Peel	Caledon Village 4	27	Below	↑	16.3	41.9	Unlikely	↑	14.9
Peel	Cheltenham 1	86	Below	↑	35.1	61.3	Unlikely	↓	-24.7
Peel	Cheltenham 2	63	Below	↑	15.4	73.4	Unlikely	↑	10.4
Peel	Inglewood 3	25	Below	↑	4	33.9	Unlikely	↑	8.9

Municipality	Well	Current				2040 Projections			
		Concentration (mg/L)	Comparison to ODWQS	Trend Direction	Magnitude of Change (mg/L)	Concentration (mg/L)	Likelihood of exceeding ODWQS	Trend Direction	Magnitude of Change (mg/L)
Peel	Inglewood 4	37	Below	NA	NA	NA	NA	NA	NA
Peel	Palgrave PW 2	11	Below	↑	6.93	21.3	Unlikely	↑	10.3
Peel	Palgrave PW 3	19	Below	↑	12.8	56.6	Unlikely	↑	37.6
Peel	Palgrave PW 4	13	Below	↑	7.5	17	Unlikely	↑	4
Wellington	Glendevon H3	2.4	Below	↑	1.4	4.32	Unlikely	↑	1.92
Wellington	Hillsburgh Heights H2	21.3	Below	↑	7.3	29.7	Unlikely	↑	8.4
Wellington	Well E7	7.3	Below	↑	2.5	7.75	Unlikely	↑	0.45
Wellington	Well E8	6.2	Below	↑	3.8	22.3	Unlikely	↑	16.1
York	King City PW 3	1.25	Below	↔	0.433	6.12	Unlikely	↑	4.87
York	King City PW 4	1.18	Below	↔	0.363	1.9	Unlikely	↑	0.72
York	Kleinburg PW 3	25.9	Below	↑	6.59	41.7	Unlikely	↑	15.8
York	Kleinburg PW 4	27.6	Below	↑	3.1	40	Unlikely	↑	12.4
York	Nobleton PW 2	11.7	Below	↑	8.84	17.6	Unlikely	↑	5.9
York	Nobleton PW 3	31	Below	↔	20.6	8.28	Unlikely	↓	-22.7

Municipality	Well	Current				2040 Projections			
		Concentration (mg/L)	Comparison to ODWQS	Trend Direction	Magnitude of Change (mg/L)	Concentration (mg/L)	Likelihood of exceeding ODWQS	Trend Direction	Magnitude of Change (mg/L)
York	Nobleton PW 5	10.9	Below	↓	-13	18.5	Unlikely	↑	7.6
York	Stouffville PW 1	1.51	Below	↑	0.125	1.12	Unlikely	↓	-0.39
York	Stouffville PW 2	3.06	Below	↔	0.965	1.97	Unlikely	↓	-1.09
York	Stouffville PW 3	222	Below	↑	165	398	Somewhat likely	↑	176
York	Stouffville PW 5	84.3	Below	↑	65.1	106	Unlikely	↑	21.7
York	Stouffville PW 6	44.4	Below	↑	38	57.4	Unlikely	↑	13

Table C-6. Summary of municipal production wells Sodium trend analysis results. For the current period, concentrations are based on median observed values, and trends are based on GAMM results. For 2040 projections, concentrations and trend directions are based on GAMMs, and likelihood of exceedance is based on comparison of GAMM and linear regression. "NA" indicates wells that were excluded from analysis. Significant results are denoted by an up or down directional arrow (↑ or ↓).

		Current				2040 Projections			
Municipality	Well	Concentration (mg/L)	Comparison to ODWQS	Trend Direction	Magnitude of Change (mg/L)	Concentration (mg/L)	Likelihood of exceeding ODWQS	Trend Direction	Magnitude of Change (mg/L)
Dufferin	Cardinal Woods MW 1	35.2	Below	↑	6.2	46.9	Unlikely	↑	11.7
Dufferin	Cardinal Woods MW 3	74.5	Below	↑	28	185	Unlikely	↑	110
Dufferin	Cardinal Woods MW 4	45.3	Below	↓	-9.7	51.2	Unlikely	↑	5.9
Dufferin	Coles 1	11	Below	↑	5	14.5	Unlikely	↑	3.5
Dufferin	Coles 2	5.91	Below	↑	1.91	9.68	Unlikely	↑	3.77
Dufferin	Island Lake PW 1	12	Below	↓	-8	0	Unlikely	↓	-12
Dufferin	Island Lake PW 2	13.8	Below	↔	-15.2	0	Unlikely	↓	-13.8
Dufferin	Island Lake PW 3	19	Below	↔	-4.5	0	Unlikely	↓	-19
Dufferin	Well 10	79.5	Below	↑	29.1	203	Somewhat likely	↑	124
Dufferin	Well 11	83.2	Below	↑	72.3	269	Somewhat likely	↑	186

Municipality	Well	Current				2040 Projections			
		Concentration (mg/L)	Comparison to ODWQS	Trend Direction	Magnitude of Change (mg/L)	Concentration (mg/L)	Likelihood of exceeding ODWQS	Trend Direction	Magnitude of Change (mg/L)
Dufferin	Well 12	12.4	Below	↑	3.6	19.4	Unlikely	↑	7
Dufferin	Well 2A	34.8	Below	↑	21.6	50.1	Unlikely	↑	15.3
Dufferin	Well 5	54.4	Below	↑	21.8	78.6	Unlikely	↑	24.2
Dufferin	Well 5A	37.3	Below	↔	27.3	19	Unlikely	↓	-18.3
Dufferin	Well 6	110	Below	↑	96.7	109	Somewhat likely	↓	-1
Dufferin	Well 7	8.55	Below	↑	4.22	13.2	Unlikely	↑	4.65
Dufferin	Well 8B	7.64	Below	↔	-2.46	15.2	Unlikely	↑	7.56
Dufferin	Well 8C	6.57	Below	↑	0.92	14.2	Unlikely	↑	7.63
Dufferin	Well 9A	153	Below	↑	119	276	Highly likely	↑	123
Dufferin	Well 9B	155	Below	↑	110	169	Somewhat likely	↑	14
Durham	Uxville MW 1	2.7	Below	↔	0.35	2.23	Unlikely	↓	-0.47
Durham	Uxville MW 2	2.59	Below	↔	0.29	3.1	Unlikely	↑	0.51
Halton	4th Line A	5.95	Below	↔	1.65	4.98	Unlikely	↓	-0.97
Halton	4th Line B	7.15	Below	↔	1.23	5.24	Unlikely	↓	-1.91
Halton	Cedarvale 1/1A	75.4	Below	↑	16.1	115	Unlikely	↑	39.6
Halton	Cedarvale 3/3A	77.2	Below	↑	17.9	119	Unlikely	↑	41.8
Halton	Cedarvale 4	84.6	Below	↑	13.5	137	Unlikely	↑	52.4
Halton	Cedarvale 4A	99.2	Below	↑	48.1	138	Unlikely	↑	38.8

Municipality	Well	Current				2040 Projections			
		Concentration (mg/L)	Comparison to ODWQS	Trend Direction	Magnitude of Change (mg/L)	Concentration (mg/L)	Likelihood of exceeding ODWQS	Trend Direction	Magnitude of Change (mg/L)
Halton	Davidson 1	22	Below	↑	8.6	35.1	Unlikely	↑	13.1
Halton	Davidson 2	19.2	Below	↑	9.35	29.6	Unlikely	↑	10.4
Halton	Lindsay Court 9	30.8	Below	↑	11.3	25	Unlikely	↓	-5.8
Halton	Princess Anne 5	50.9	Below	↔	14.5	31	Unlikely	↓	-19.9
Halton	Princess Anne 6	49.4	Below	↑	16.1	38.7	Unlikely	↓	-10.7
Halton	Prospect Park 1	60.7	Below	↑	48.7	162	Unlikely	↑	101
Halton	Prospect Park 2	43	Below	↑	9.85	88.7	Unlikely	↑	45.7
Peel	Alton 3	68	Below	↔	30	85.6	Unlikely	↑	17.6
Peel	Caledon East PW 3	104	Below	↔	26.4	172	Unlikely	↑	68
Peel	Caledon East PW 4	18	Below	↑	13.3	26	Unlikely	↑	8
Peel	Caledon East PW 4A	7.2	Below	↔	-0.4	23.8	Unlikely	↑	16.6
Peel	Caledon East PW 6	21	Below	NA	NA	NA	NA	NA	NA
Peel	Caledon Village 3	38	Below	↑	1.4	69.6	Unlikely	↑	31.6
Peel	Caledon Village 3B	36.5	Below	↔	-1	49.4	Unlikely	↑	12.9

Municipality	Well	Current				2040 Projections			
		Concentration (mg/L)	Comparison to ODWQS	Trend Direction	Magnitude of Change (mg/L)	Concentration (mg/L)	Likelihood of exceeding ODWQS	Trend Direction	Magnitude of Change (mg/L)
Peel	Caledon Village 4	10.5	Below	↑	2.9	10.8	Unlikely	↑	0.3
Peel	Cheltenham 1	32.5	Below	↔	9.7	39.6	Unlikely	↑	7.1
Peel	Cheltenham 2	20.5	Below	↑	6.1	28	Unlikely	↑	7.5
Peel	Inglewood 3	14	Below	↓	-1.2	21.4	Unlikely	↑	7.4
Peel	Inglewood 4	23	Below	↓	-1	24.5	Unlikely	↑	1.5
Peel	Palgrave PW 2	5.7	Below	↑	1.17	8.94	Unlikely	↑	3.24
Peel	Palgrave PW 3	5.4	Below	↑	1.51	8.13	Unlikely	↑	2.73
Peel	Palgrave PW 4	5.6	Below	↑	5.59	0	Unlikely	↓	-5.6
Wellington	Glendevon H3	11	Below	↔	1.4	8.74	Unlikely	↓	-2.26
Wellington	Hillsburgh Heights H2	1	Below	NA	NA	NA	NA	NA	NA
Wellington	Well E7	6.1	Below	↔	0.16	3.61	Unlikely	↓	-2.49
Wellington	Well E8	5.2	Below	↔	0.6	6.58	Unlikely	↑	1.38
York	King City PW 3	8.01	Below	↔	1.11	8.26	Unlikely	↑	0.25
York	King City PW 4	8.19	Below	↑	1.68	12.9	Unlikely	↑	4.71
York	Kleinburg PW 3	16.4	Below	↓	-5.2	17.8	Unlikely	↑	1.4

Municipality	Well	Current				2040 Projections			
		Concentration (mg/L)	Comparison to ODWQS	Trend Direction	Magnitude of Change (mg/L)	Concentration (mg/L)	Likelihood of exceeding ODWQS	Trend Direction	Magnitude of Change (mg/L)
York	Kleinburg PW 4	21.9	Below	NA	NA	NA	NA	NA	NA
York	Nobleton PW 2	14.5	Below	↔	5.9	16.6	Unlikely	↑	2.1
York	Nobleton PW 3	13.8	Below	↔	3.7	15.1	Unlikely	↑	1.3
York	Nobleton PW 5	15.5	Below	↓	-1.8	8.71	Unlikely	↓	-6.79
York	Stouffville PW 1	16.2	Below	↑	0.008	15.4	Unlikely	↓	-0.8
York	Stouffville PW 2	18.3	Below	↑	1.99	21.4	Unlikely	↑	3.1
York	Stouffville PW 3	103	Below	↑	79.8	154	Unlikely	↑	51
York	Stouffville PW 5	38	Below	↑	31.5	58.5	Unlikely	↑	20.5
York	Stouffville PW 6	16.3	Below	↑	13.3	26.5	Unlikely	↑	10.2

Appendix D: Overview of trend results by regional municipality and parameter

Nitrate

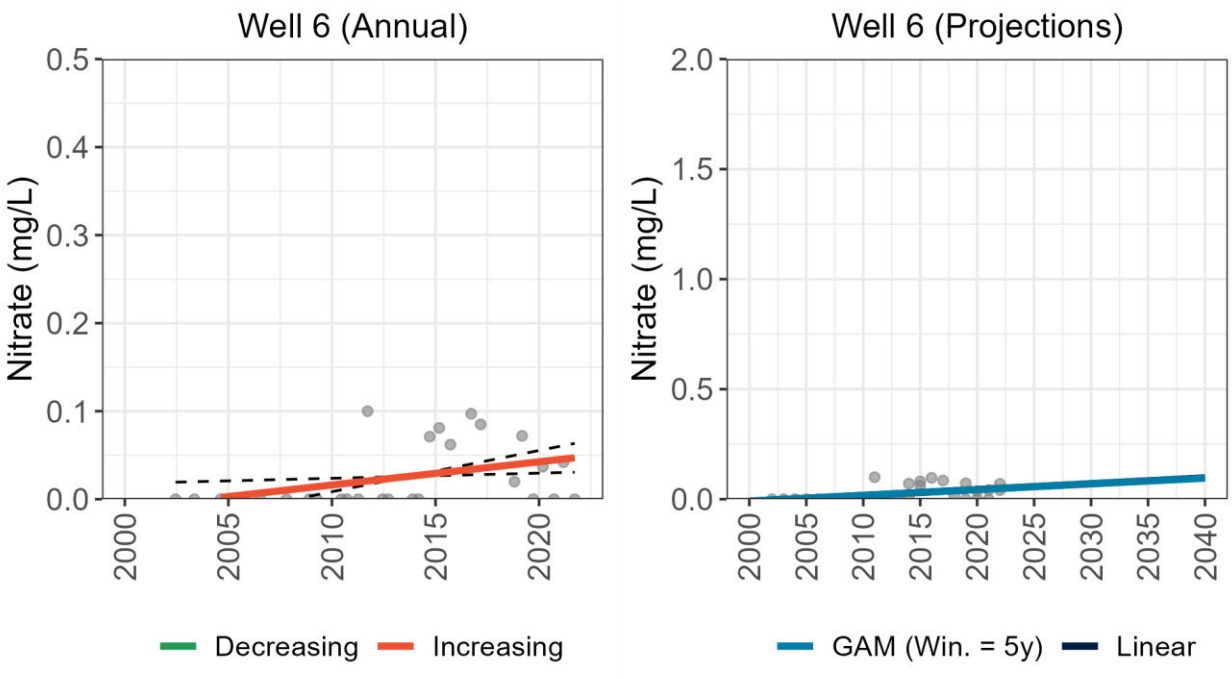


Figure D-1. Nitrate concentration at Orangeville Well 6 is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant positive trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

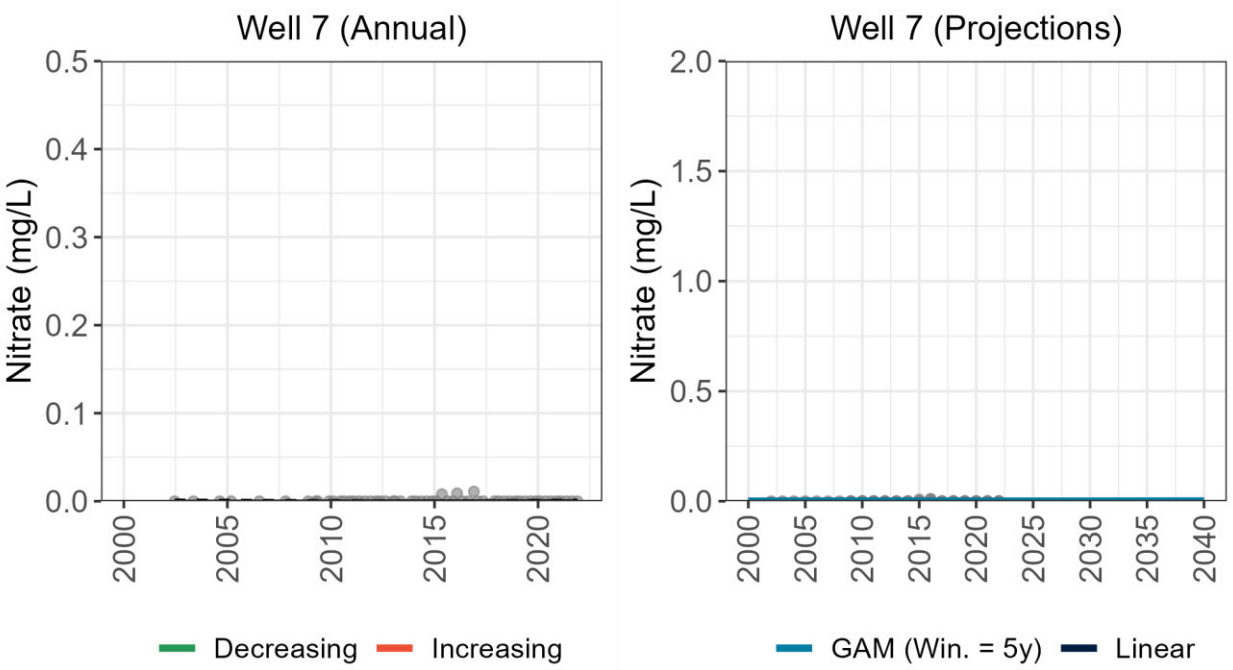


Figure D-2. Nitrate concentration at Orangeville Well 7 is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing no significant trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

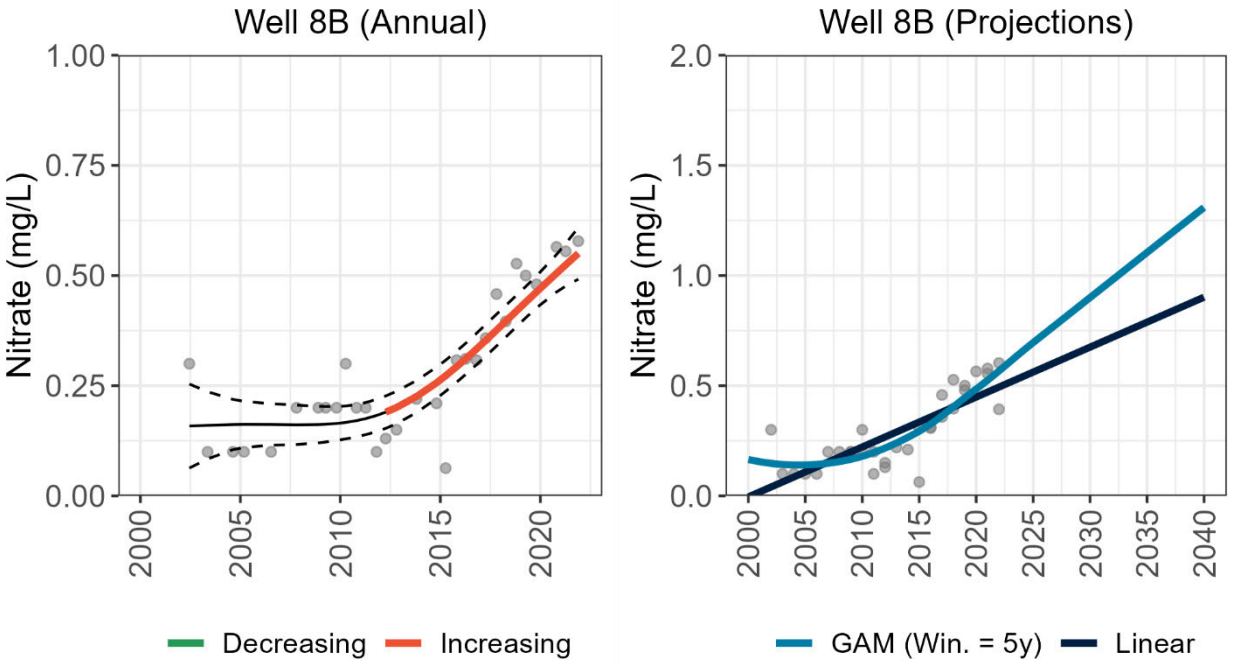


Figure D-3. Nitrate concentration at Orangeville Well 8B is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant positive trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

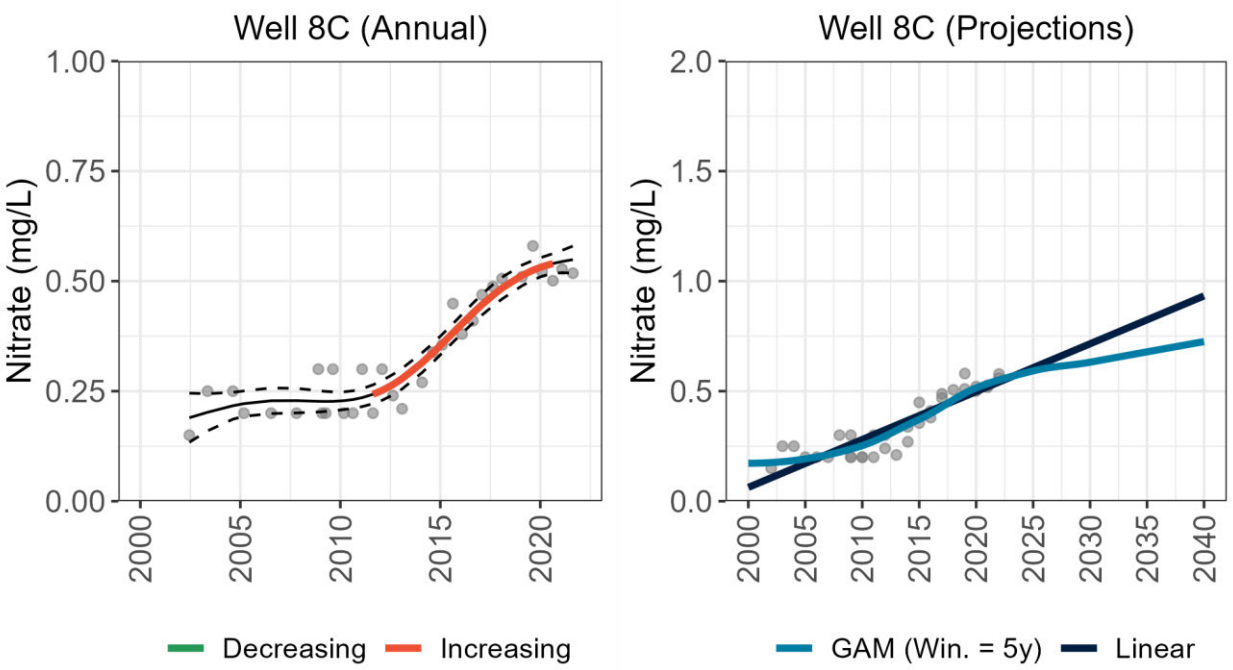


Figure D-4. Nitrate concentration at Orangeville Well 8C is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing no significant trend as of 2021. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

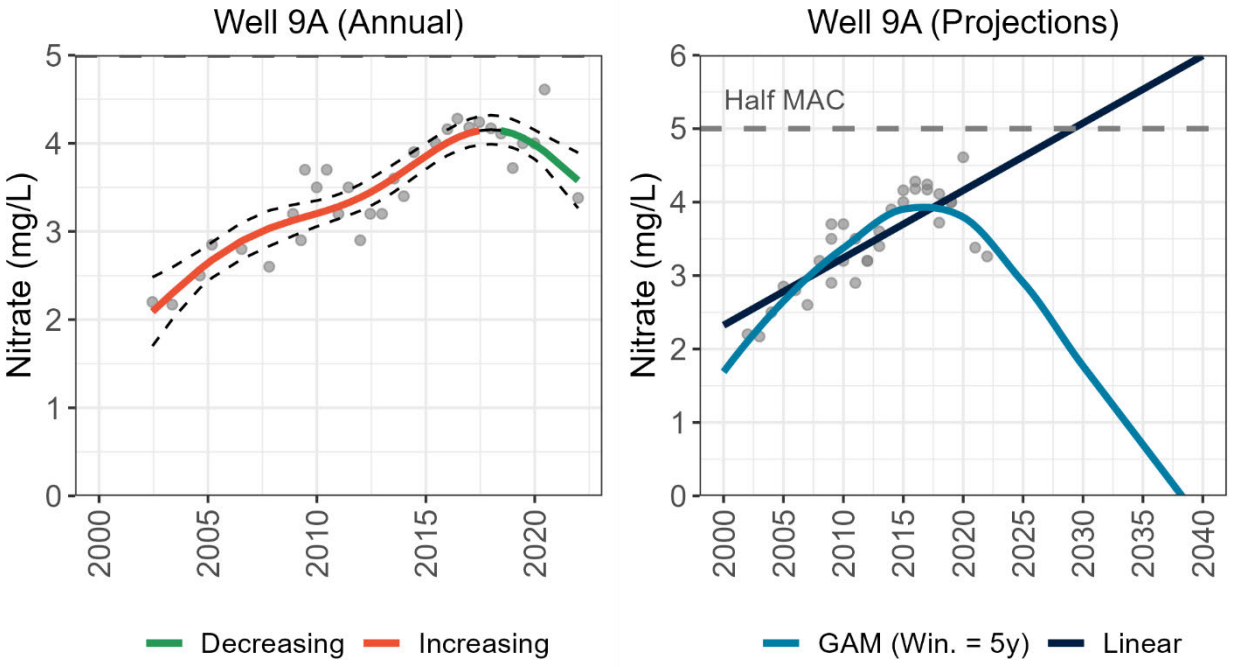


Figure D-5. Nitrate concentration at Orangeville Well 9A is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant negative trend. Nitrate concentration is somewhat likely to exceed the half-MAC by 2040.

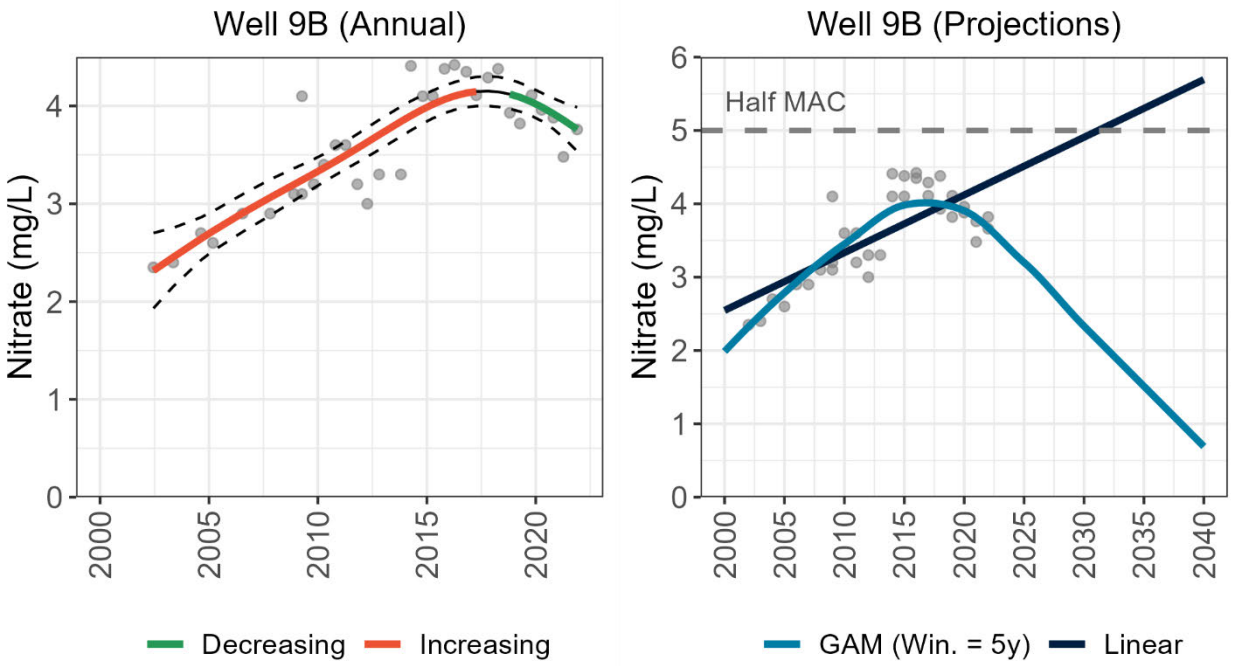


Figure D-6. Nitrate concentration at Orangeville Well 9B is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant negative trend. Nitrate concentration is somewhat likely to exceed the half-MAC by 2040.

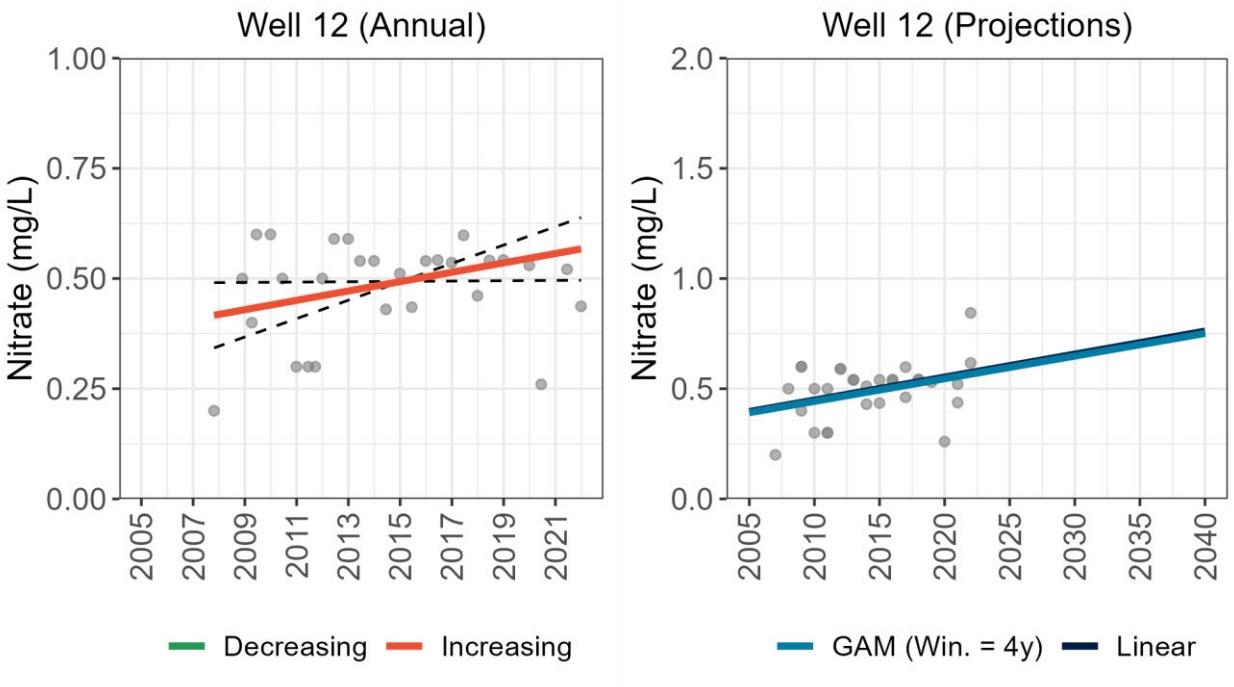


Figure D-7. Nitrate concentration at Orangeville Well 12 is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant positive trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

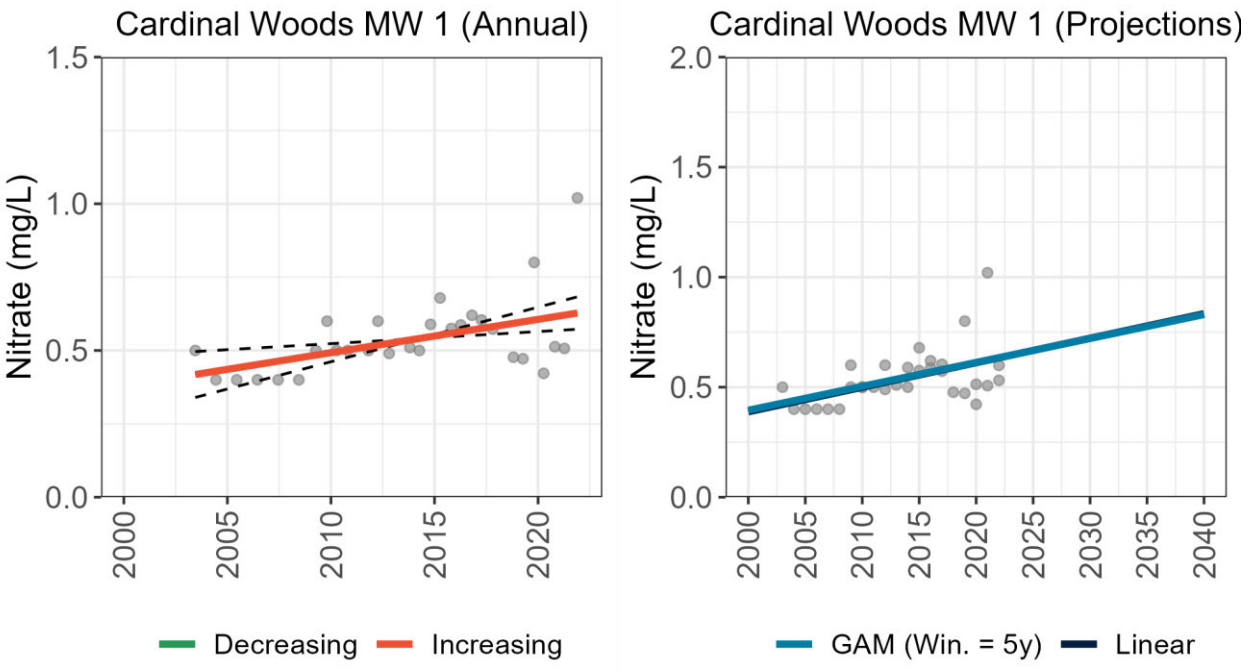


Figure D-8. Nitrate concentration at Cardinal Woods MW 1 is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant positive trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

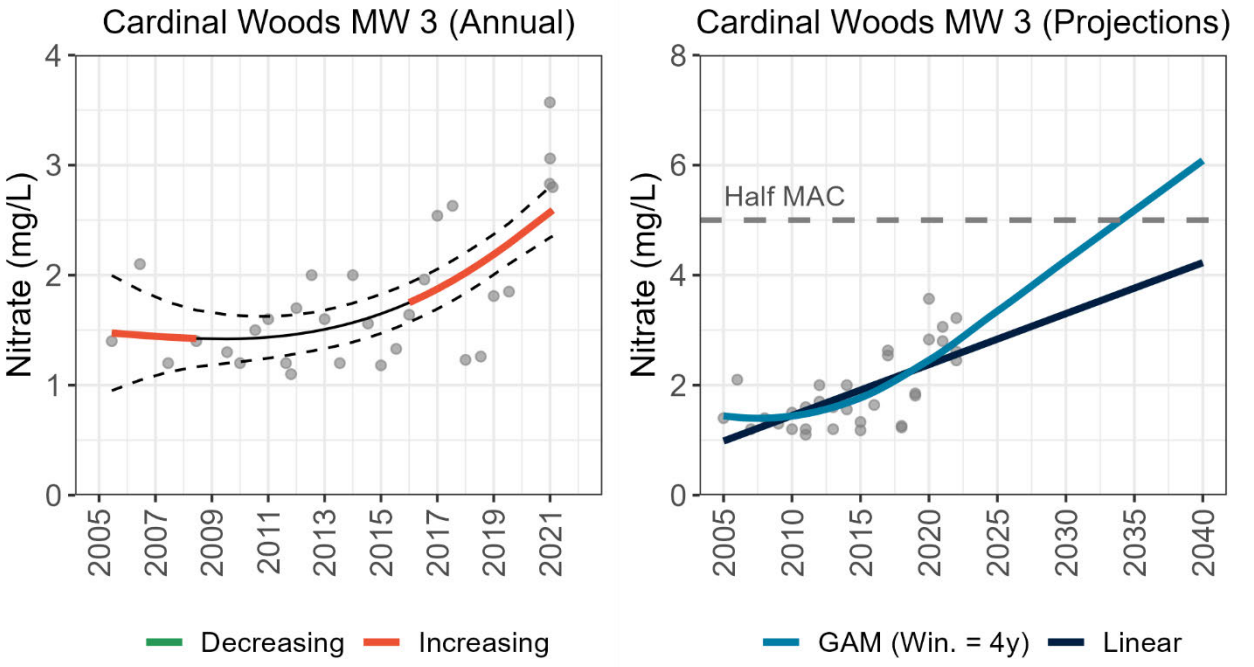


Figure D-9. Nitrate concentration at Cardinal Woods MW 3 is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant positive trend. Nitrate concentration is somewhat likely to exceed the half-MAC by 2040.

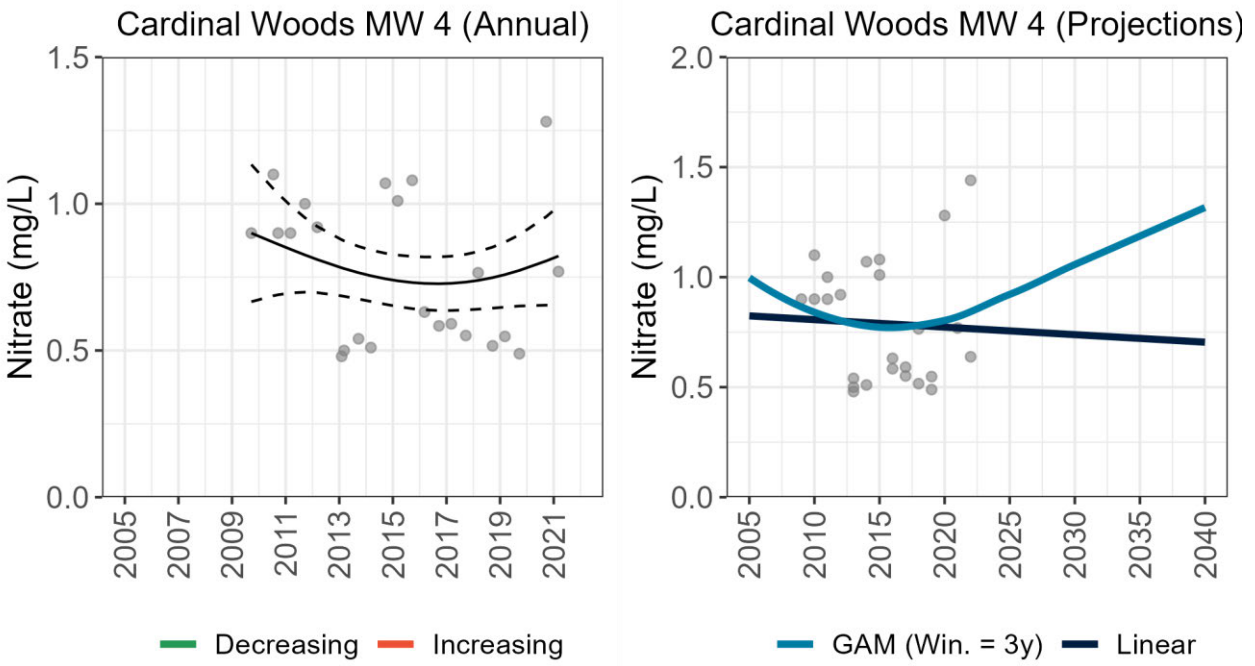


Figure D-10. Nitrate concentration at Cardinal Woods MW 4 is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing no significant trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

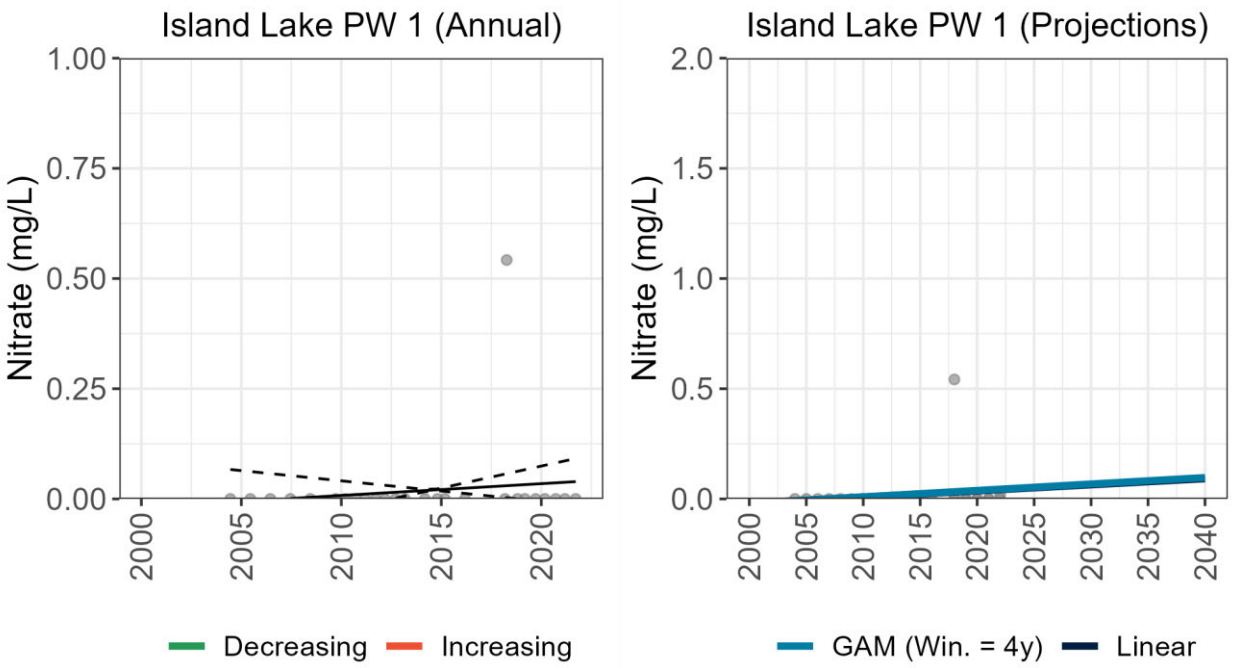


Figure D-11. Nitrate concentration at Island Lake PW 1 is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing no significant trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

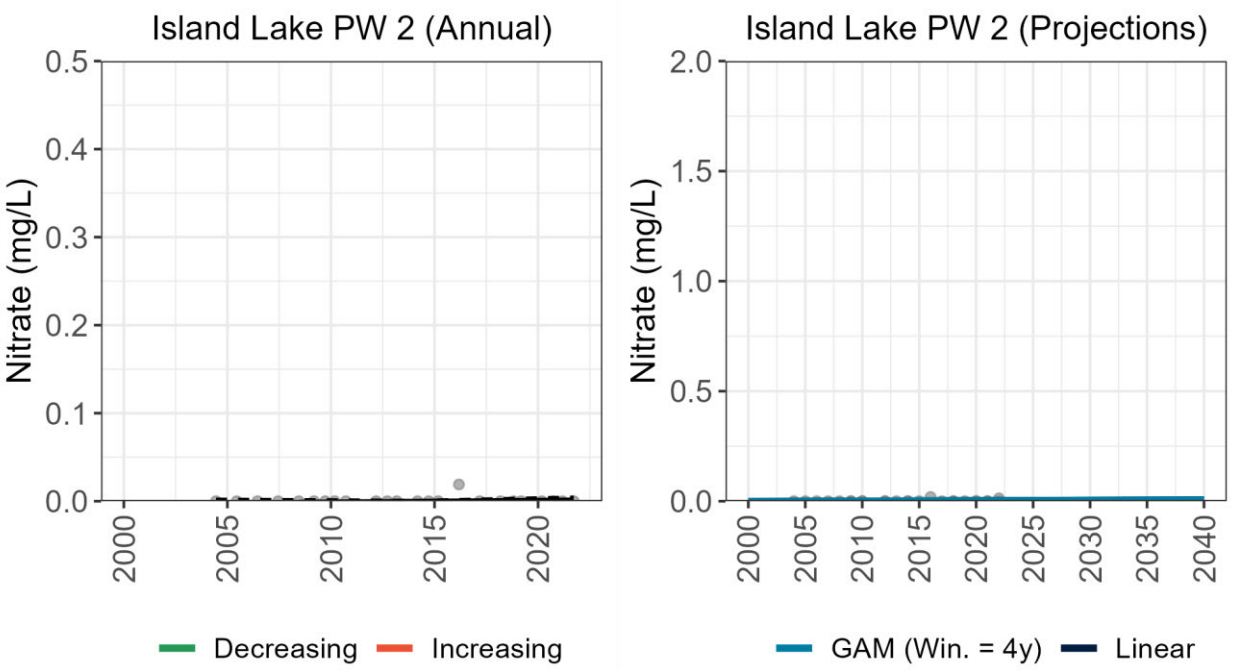


Figure D-12. Nitrate concentration at Island Lake PW 2 is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing no significant trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

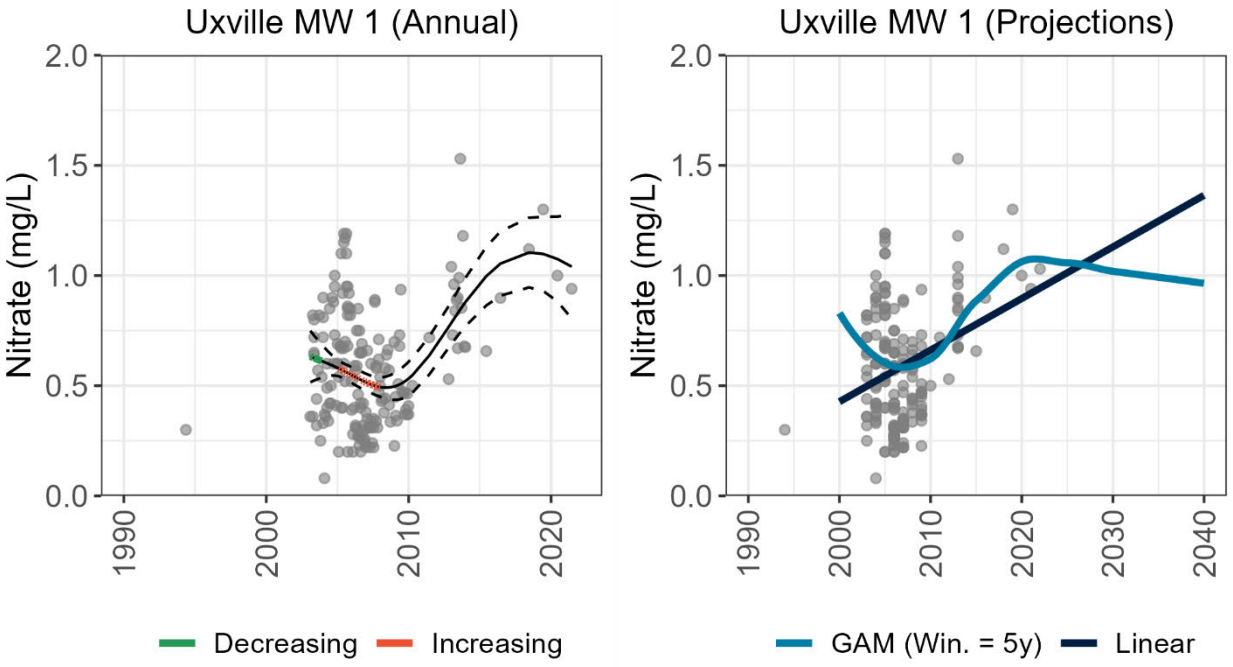


Figure D-13. Nitrate concentration at Uxville MW 1 Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing no significant trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

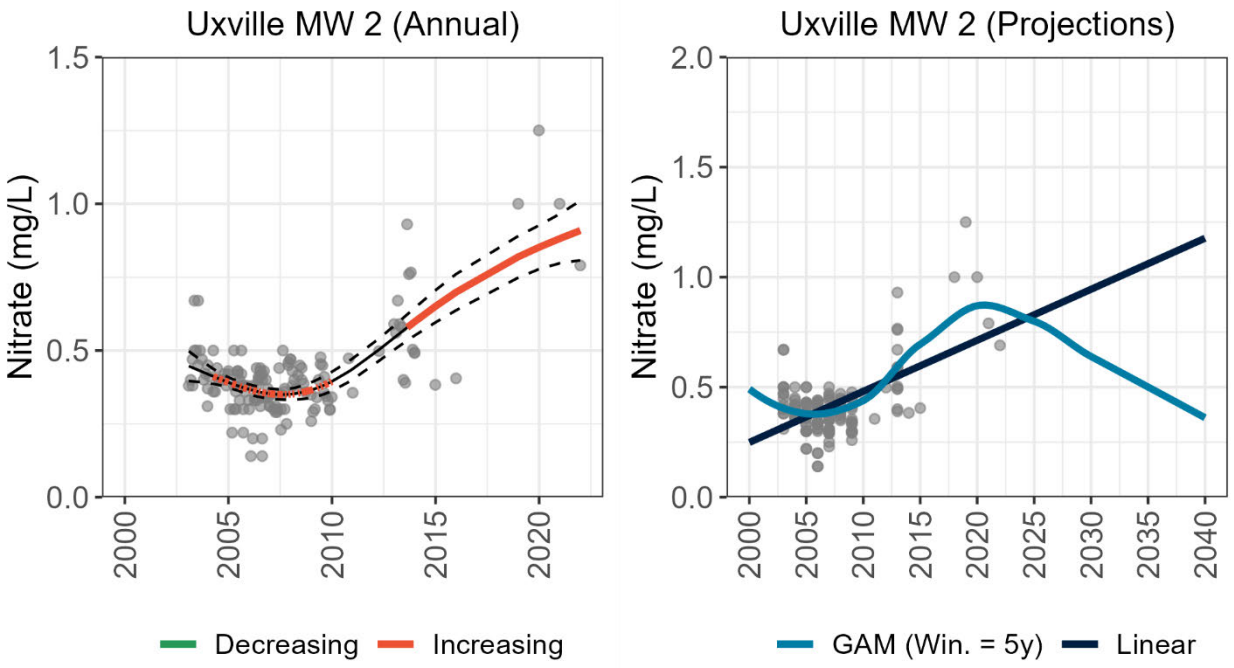


Figure D-14. Nitrate concentration at Uxville MW 2 Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant positive trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

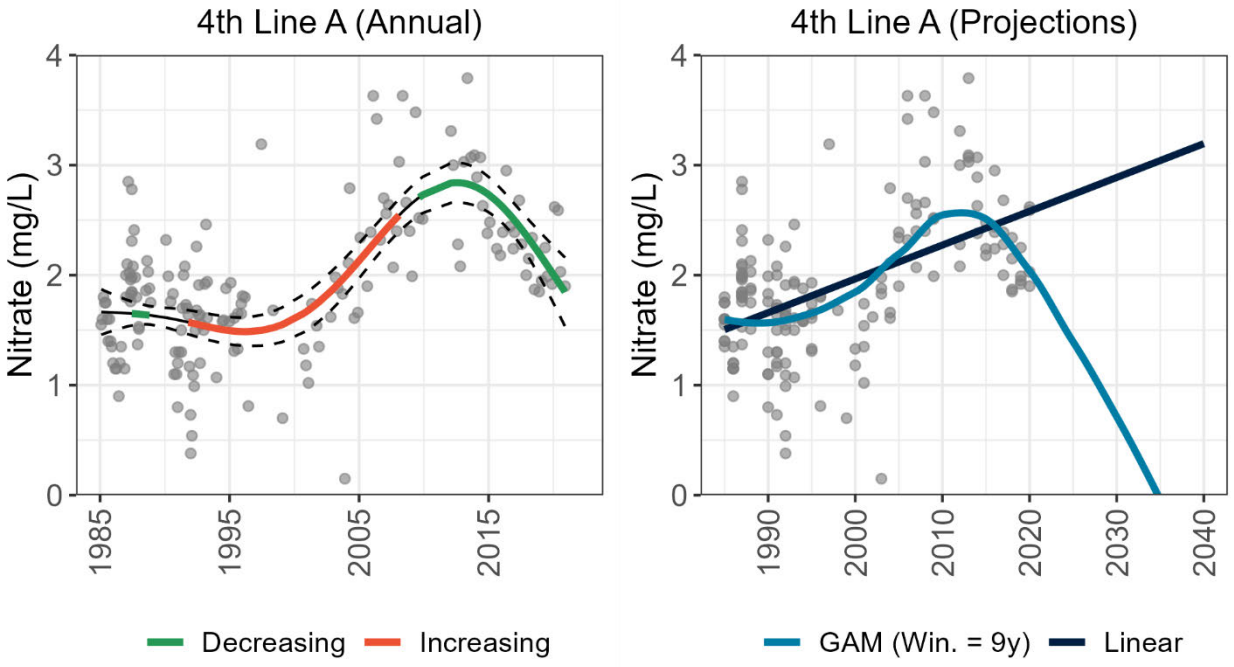


Figure D-15. Nitrate concentration at 4th Line A Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a negative trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

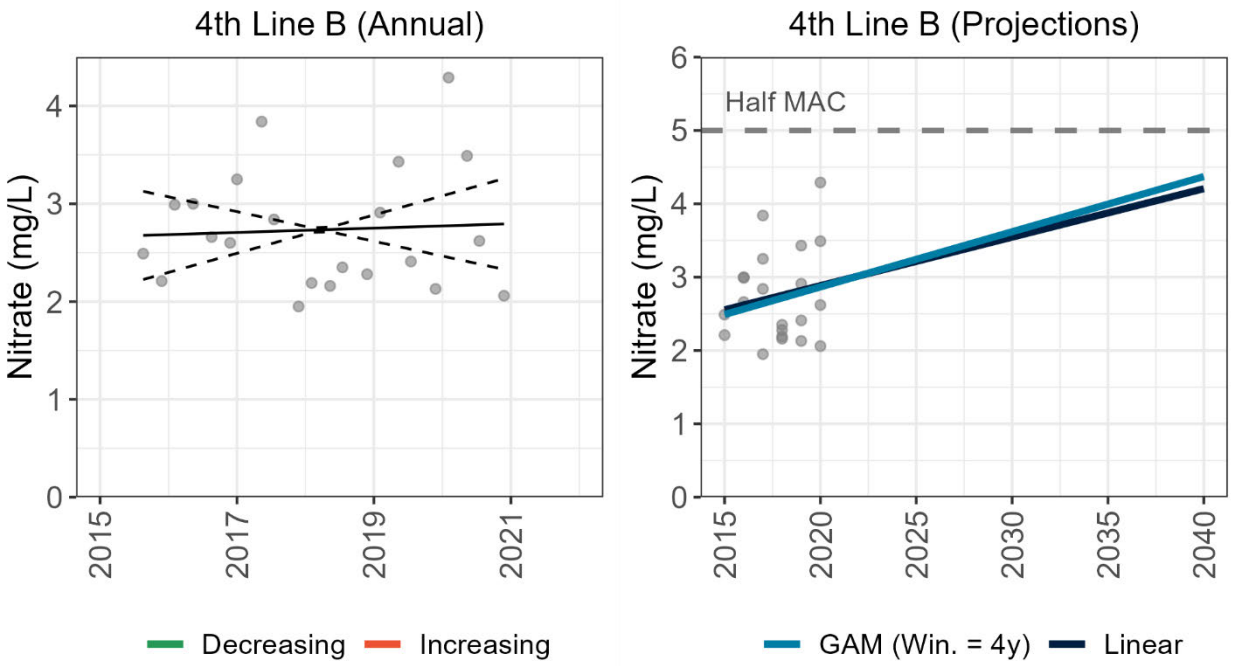


Figure D-16. Nitrate concentration at 4th Line B Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing no significant trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

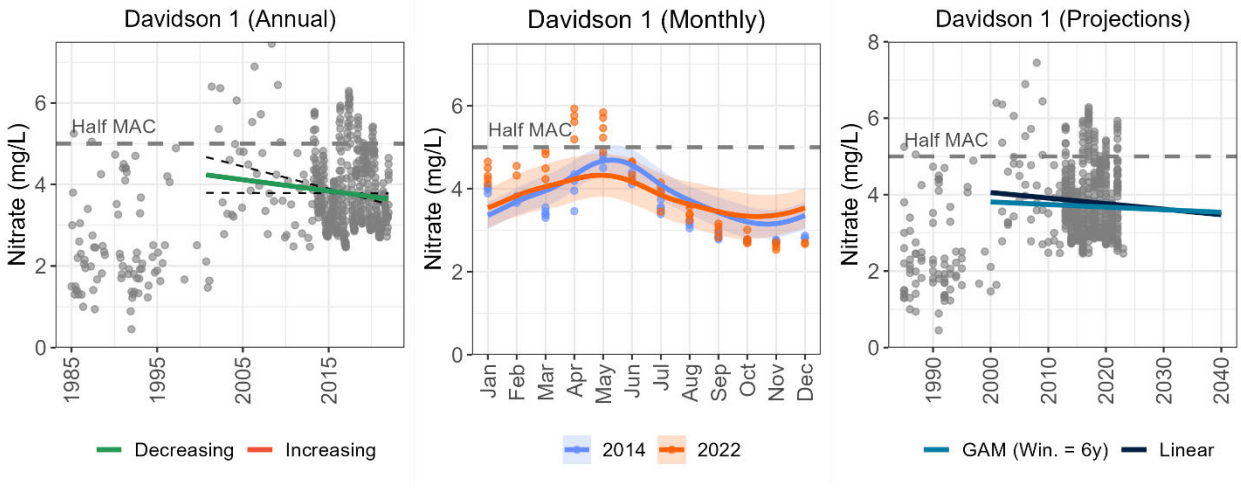


Figure D-17. Nitrate concentration at Davidson 1 Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant negative trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

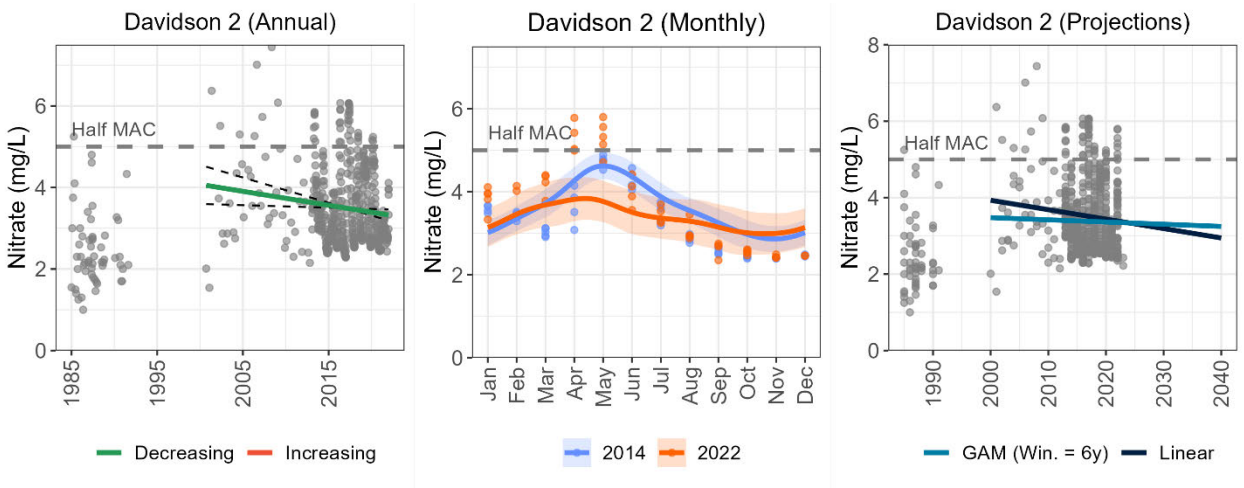


Figure D-18. Nitrate concentration at Davidson 2 Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant negative trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

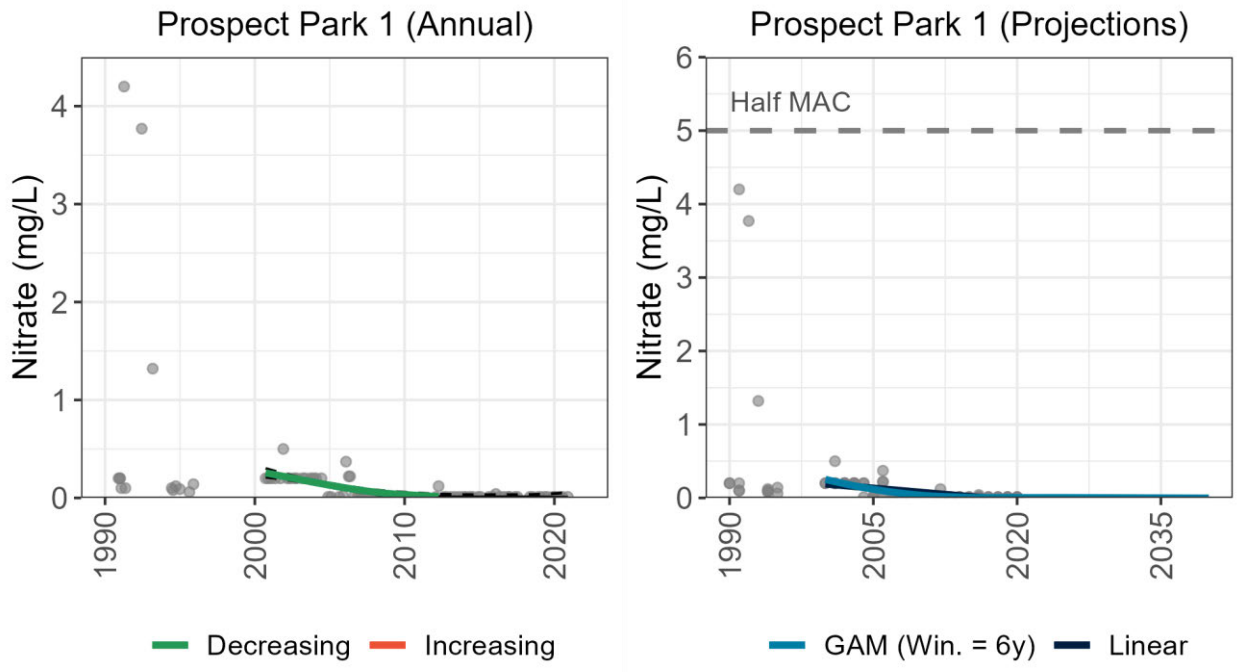


Figure D-19. Nitrate concentration at Prospect Park 1 Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant negative trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

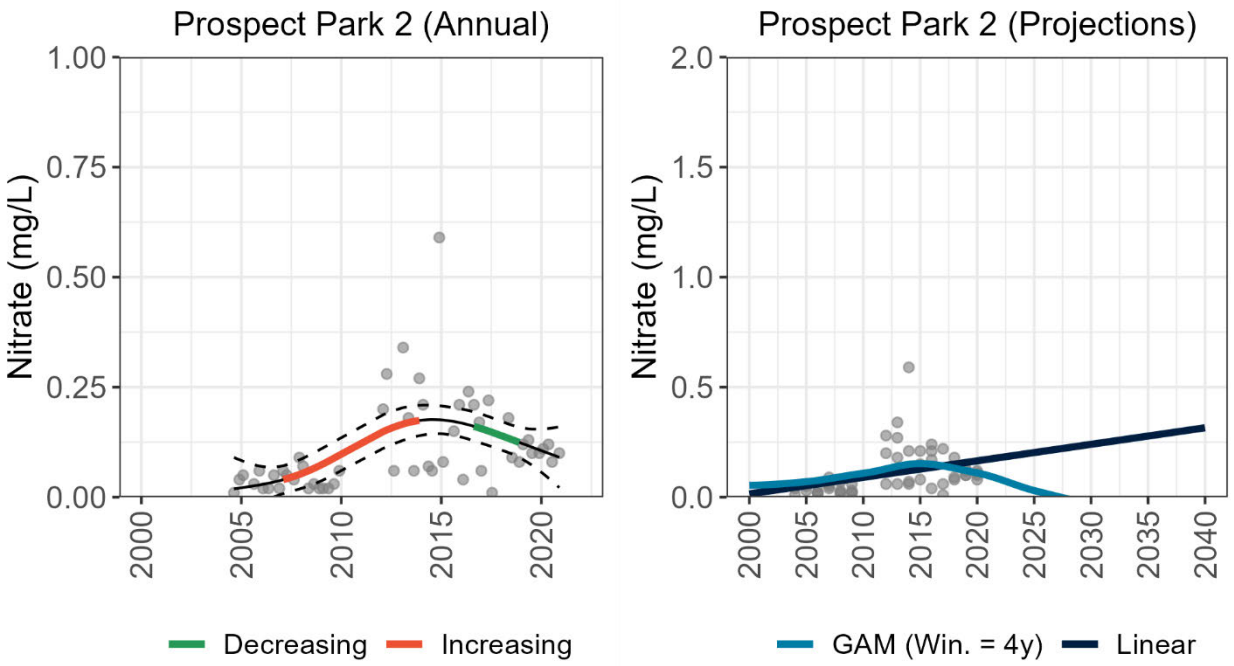


Figure D-20. Nitrate concentration at Prospect Park 2 Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing no significant trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

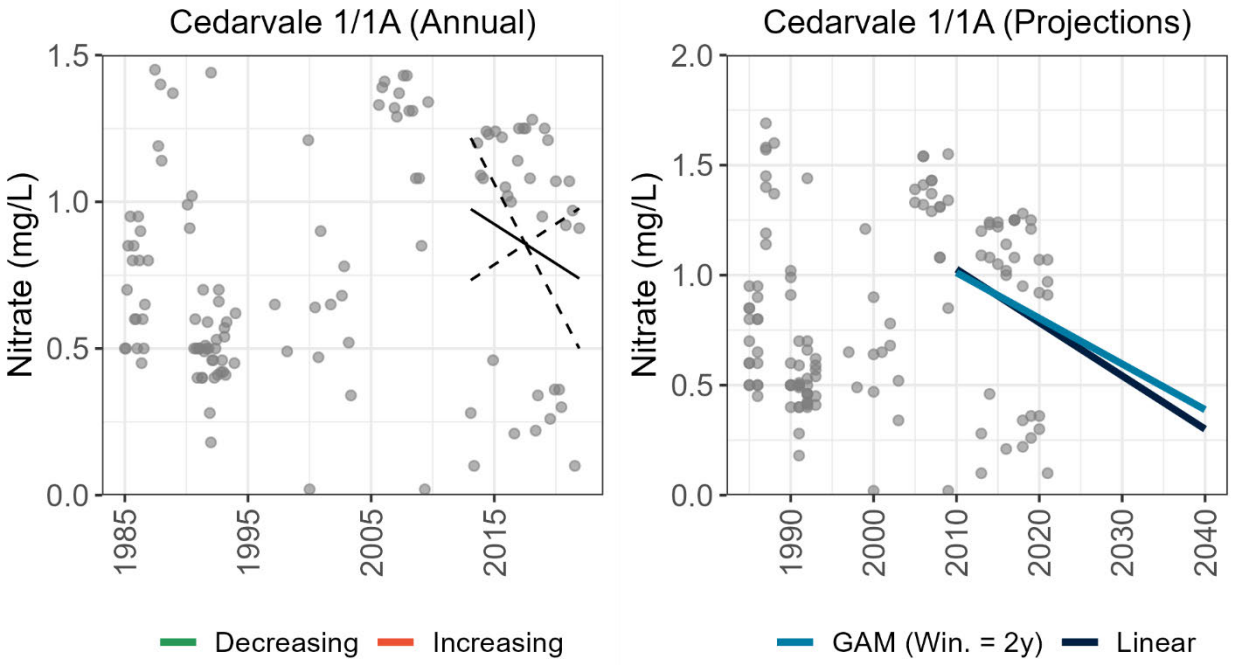


Figure D-21. Nitrate concentration at Cedarvale 1/1A Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing no significant trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

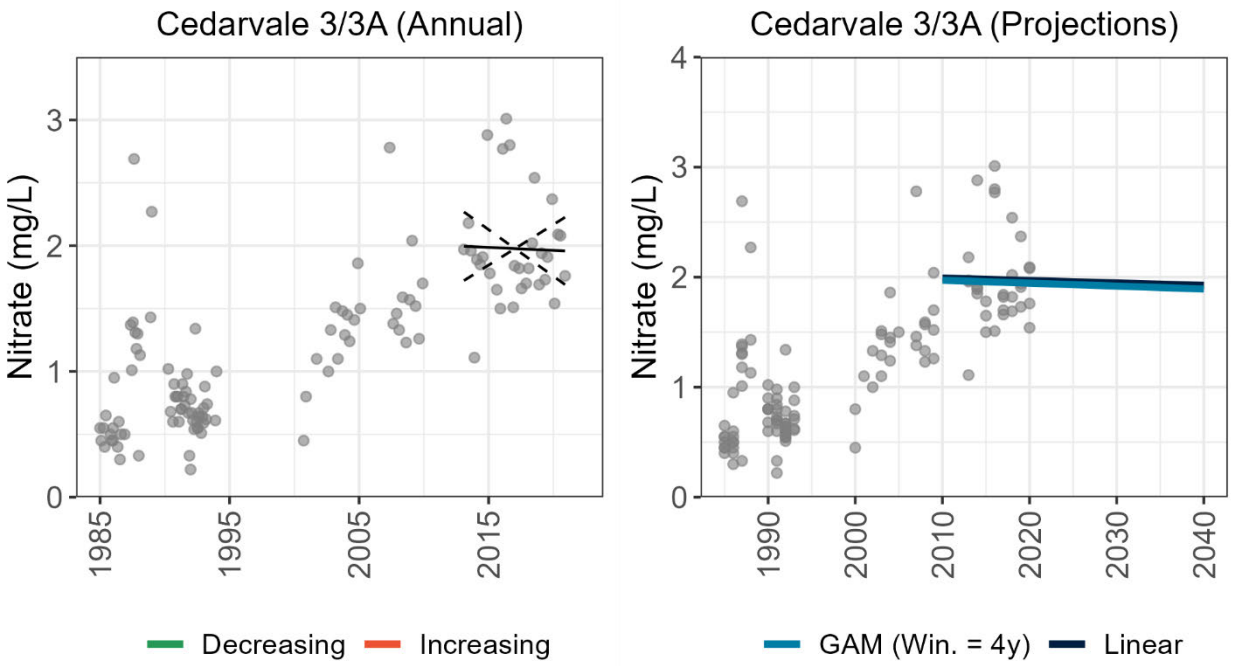


Figure D-22. Nitrate concentration at Cedarvale 3/3A Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing no significant trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

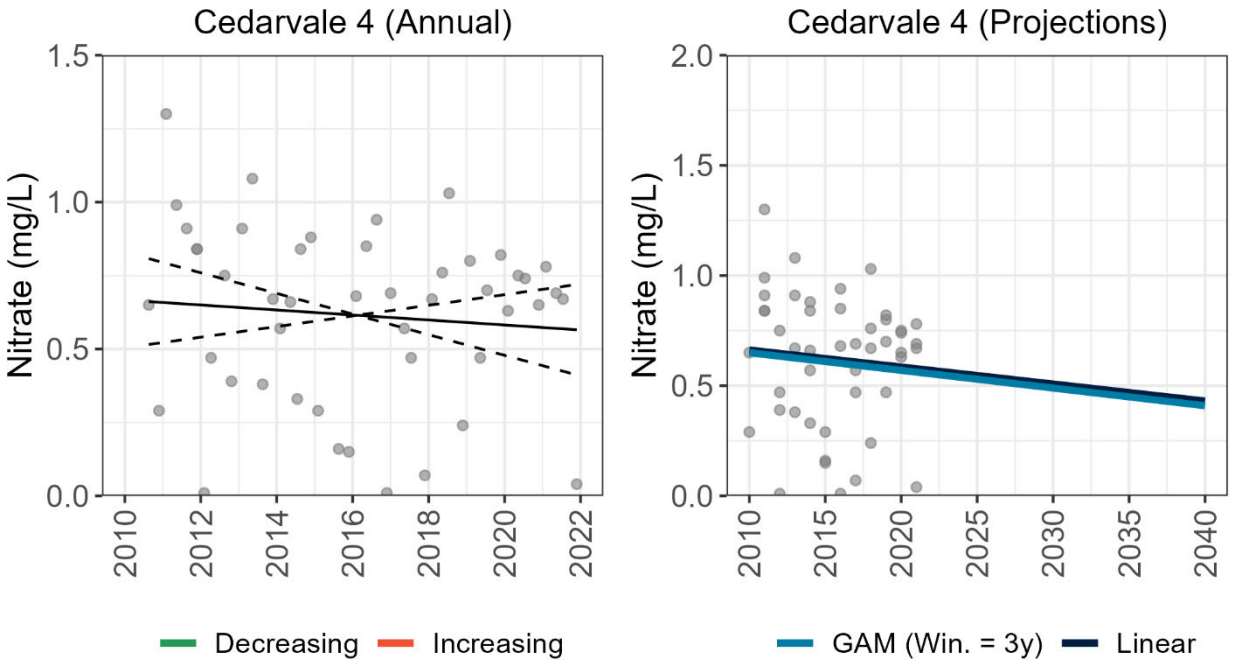


Figure D-23. Nitrate concentration at Cedarvale 4 Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing no significant trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

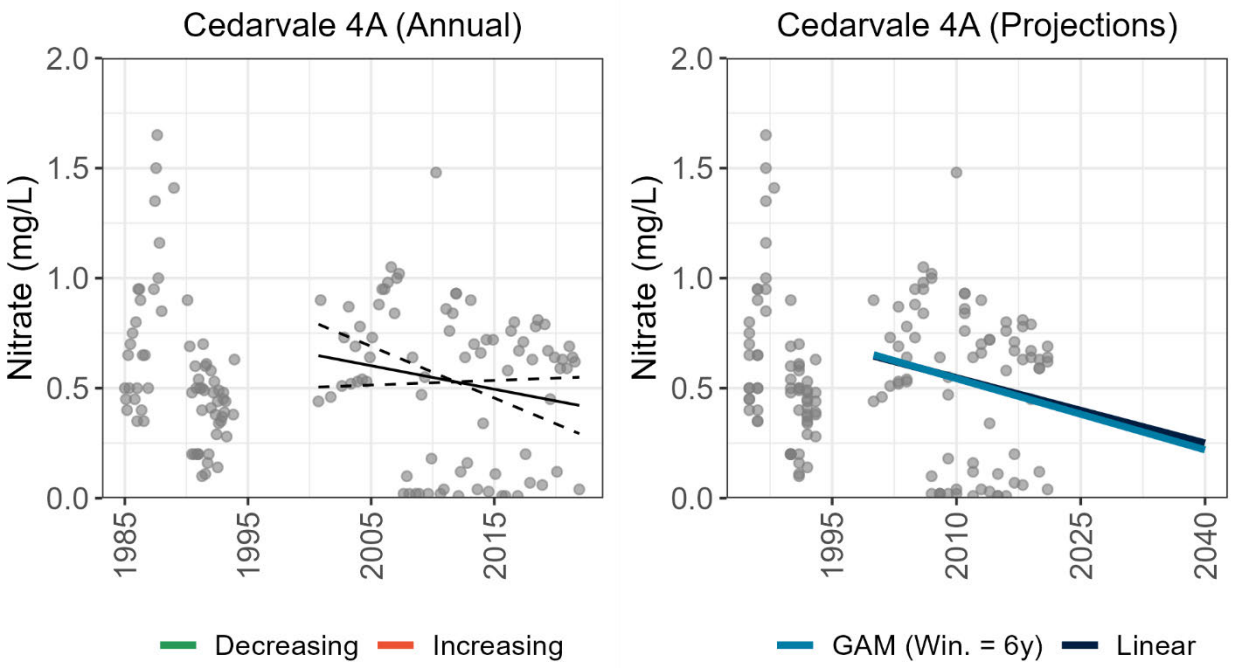


Figure D-24. Nitrate concentration at Cedarvale 4A Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing no significant trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

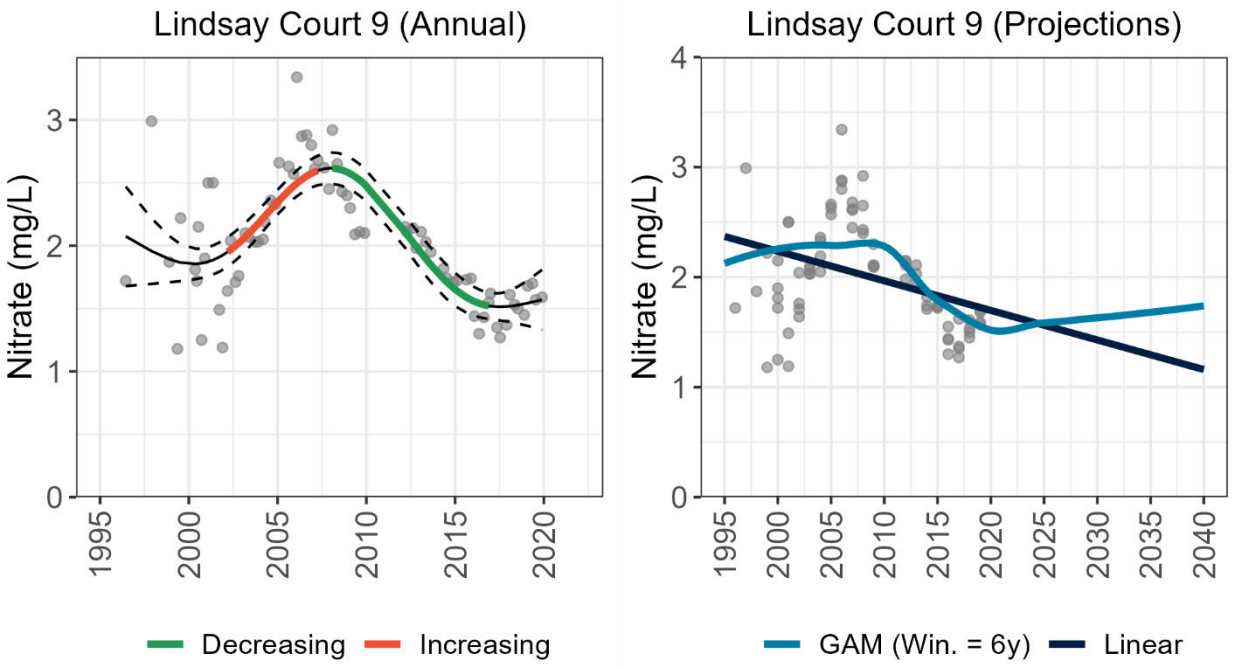


Figure D-25. Nitrate concentration at Lindsay Court 9 Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing no significant trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

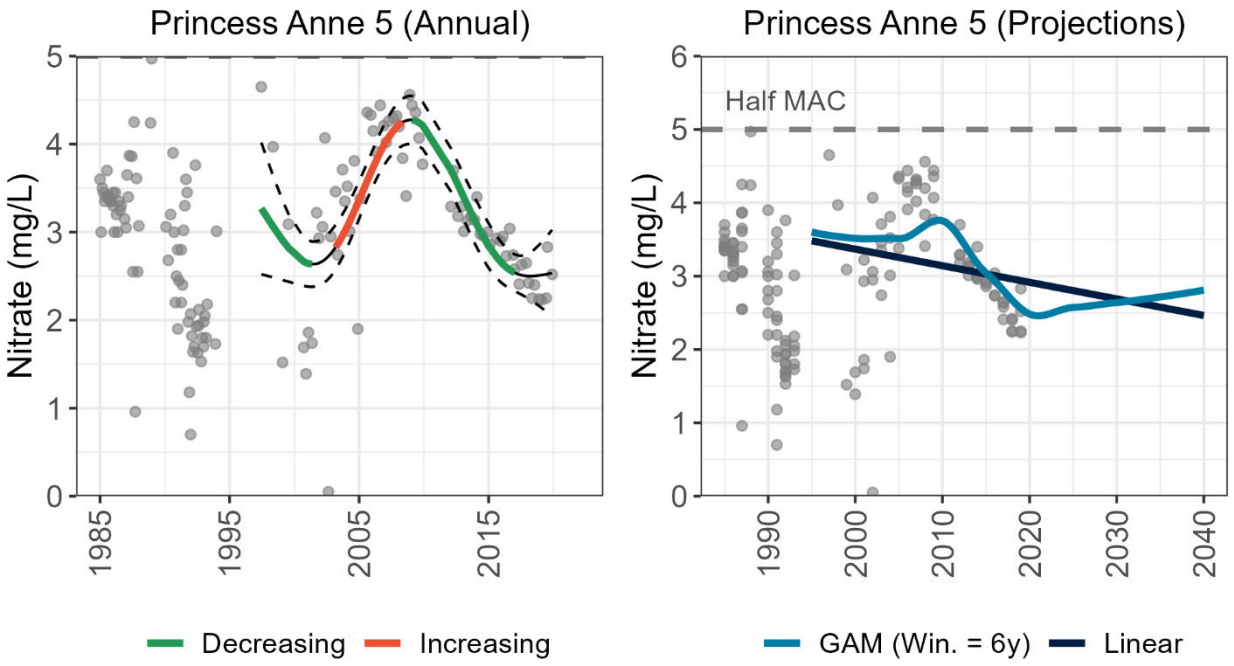


Figure D-26. Nitrate concentration at Princess Anne 5 Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing no significant trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

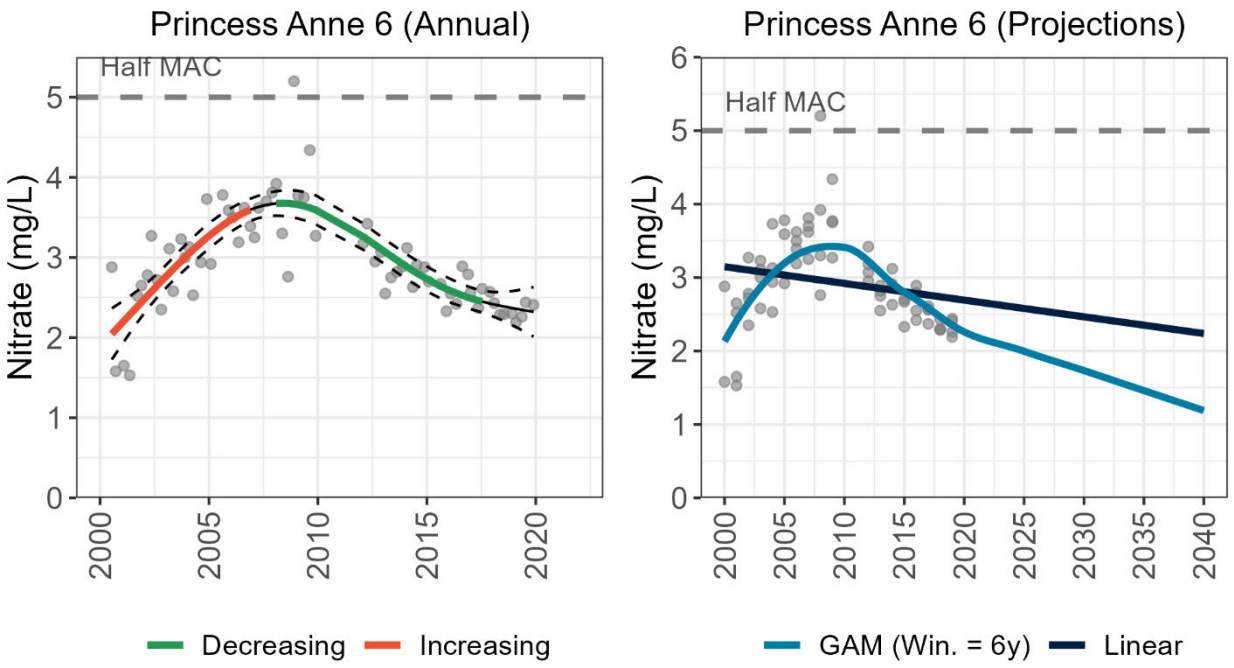


Figure D-27. Nitrate concentration at Princess Anne 6 Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing no significant trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

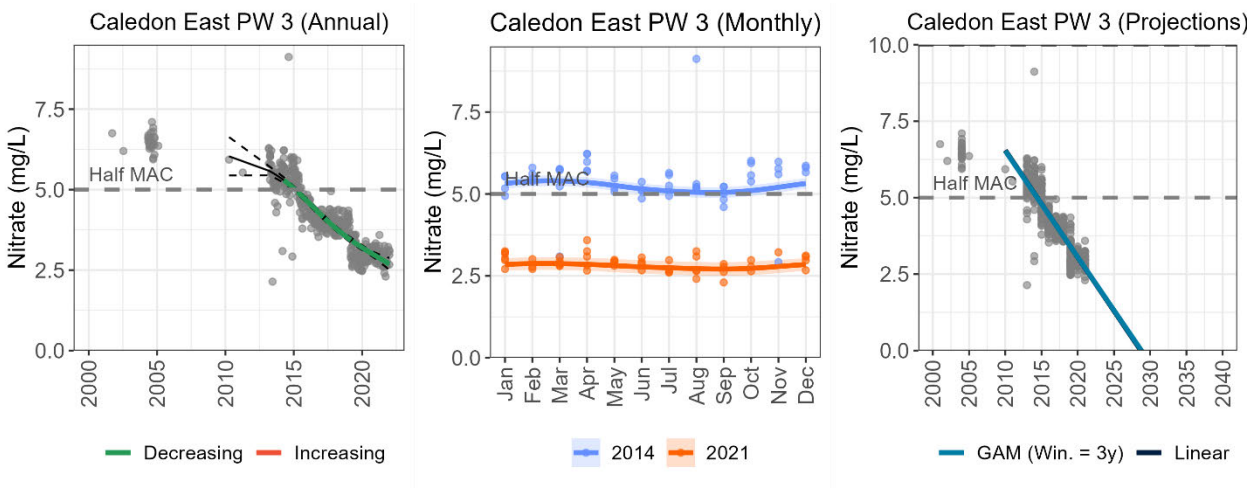


Figure D-28. Nitrate concentration at Caledon East PW 3 is currently above the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant negative trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

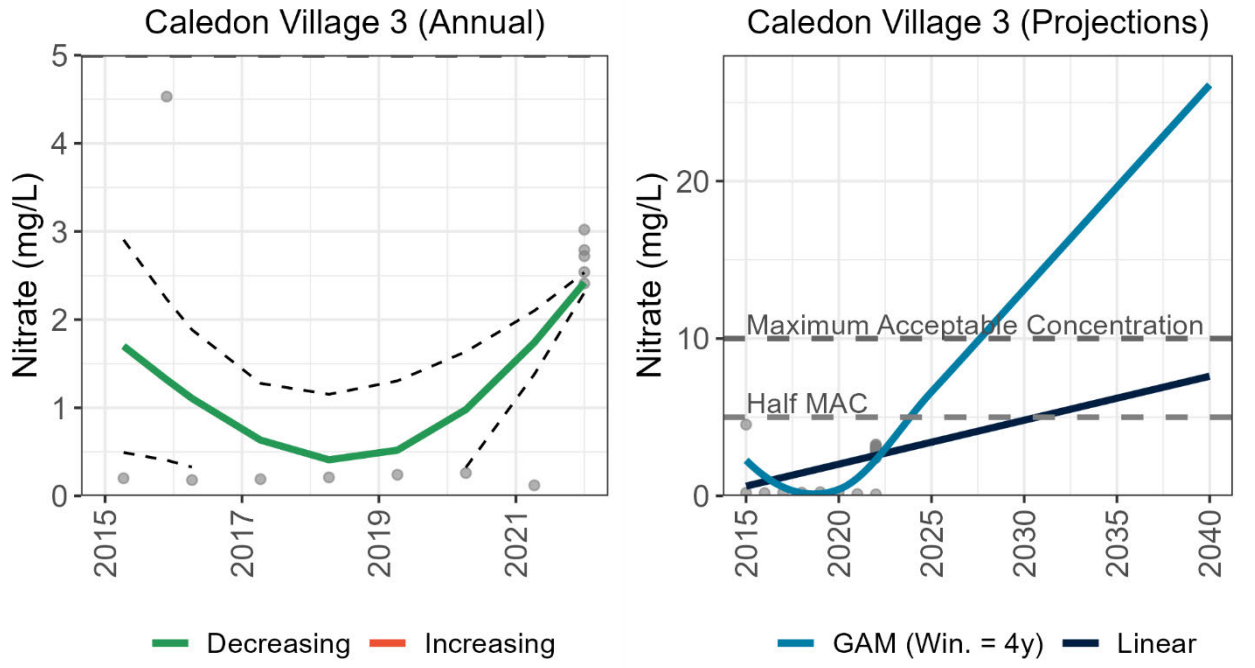


Figure D-29. Nitrate concentration at Caledon Village 3 Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant negative trend. Nitrate concentration is highly likely to exceed the half-MAC and somewhat likely to exceed the MAC of 10 mg/L by 2040.

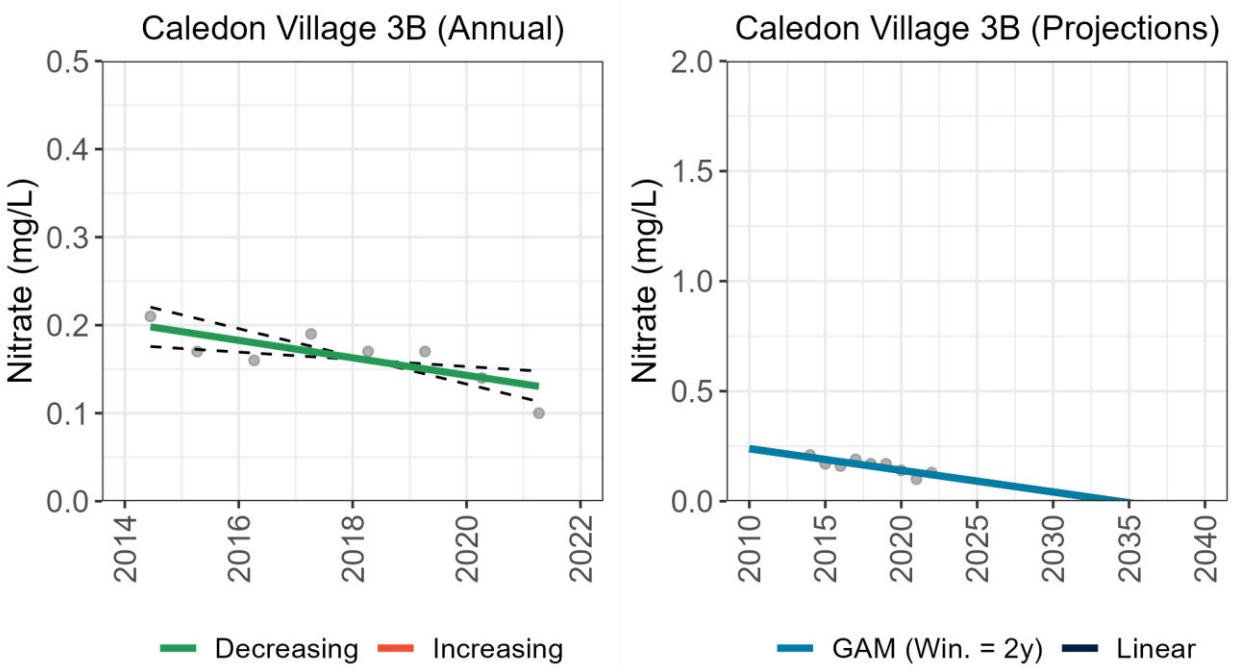


Figure D-30. Nitrate concentration at Caledon Village 3B Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant negative trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

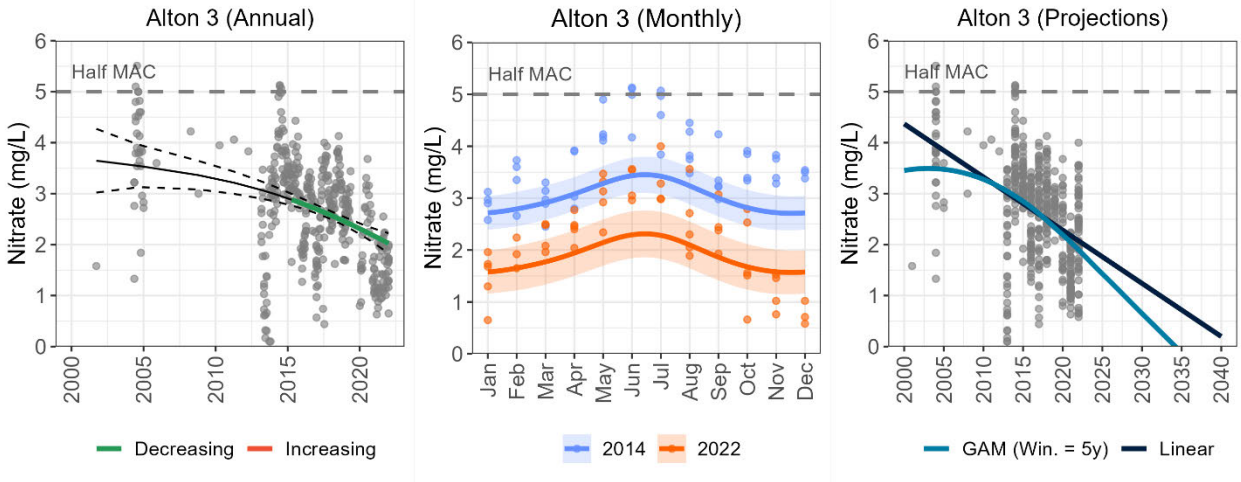


Figure D-31. Nitrate concentration at Alton 3 Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant negative trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

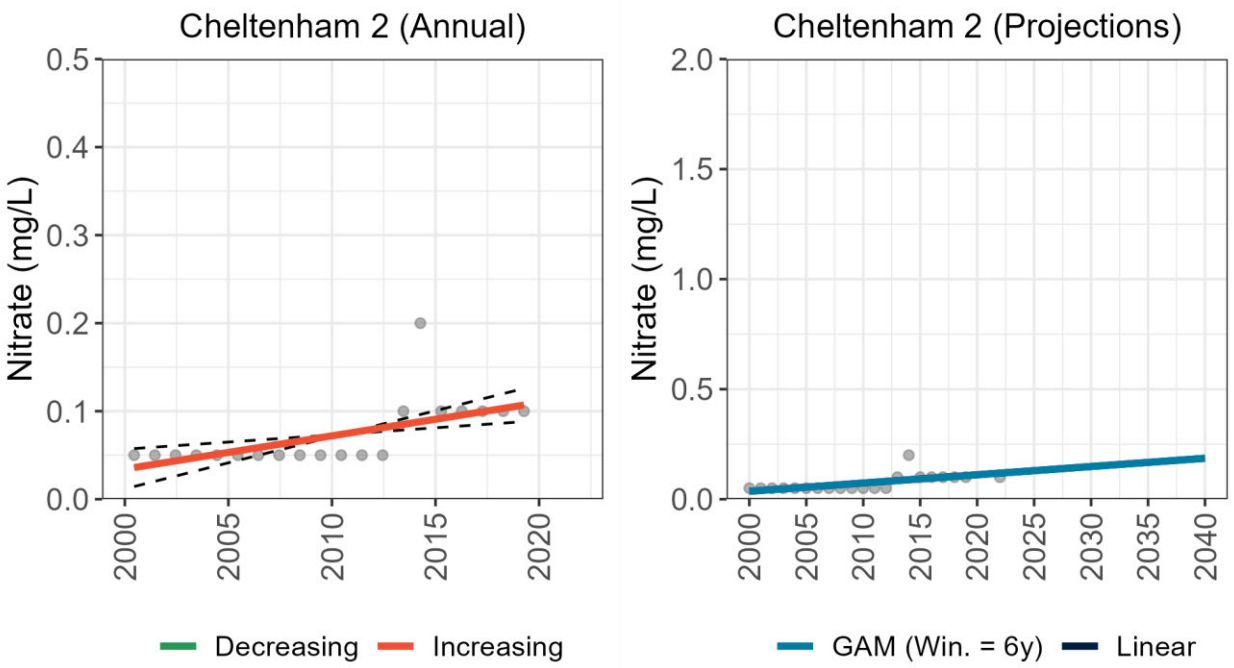


Figure D-32. Nitrate concentration at Cheltenham 2 Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant positive trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

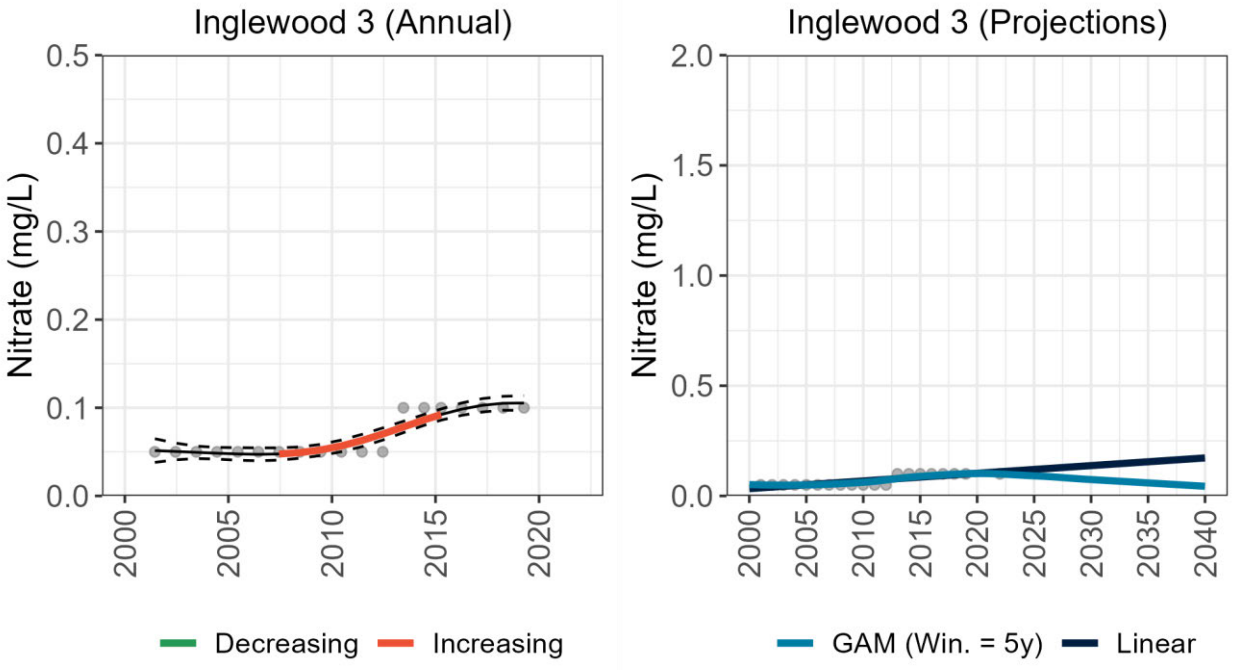


Figure D-33. Nitrate concentration at Inglewood 3 Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing no significant trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

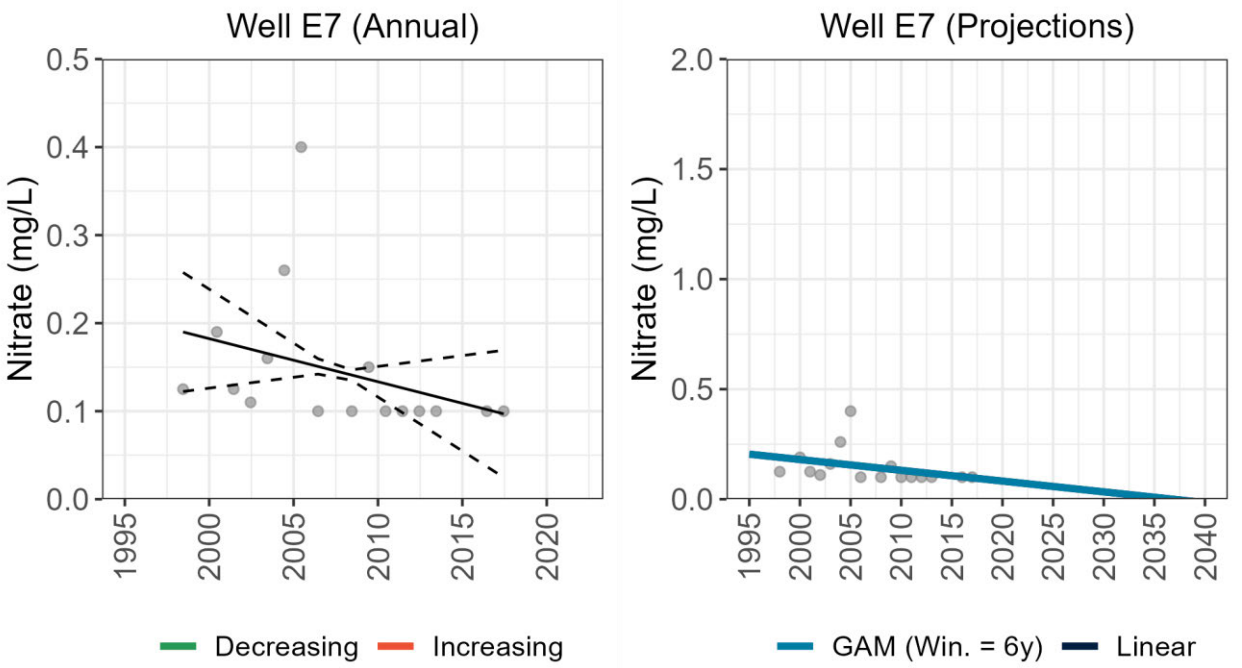


Figure D-34. Nitrate concentration at Erin Well E7 is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing no significant trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

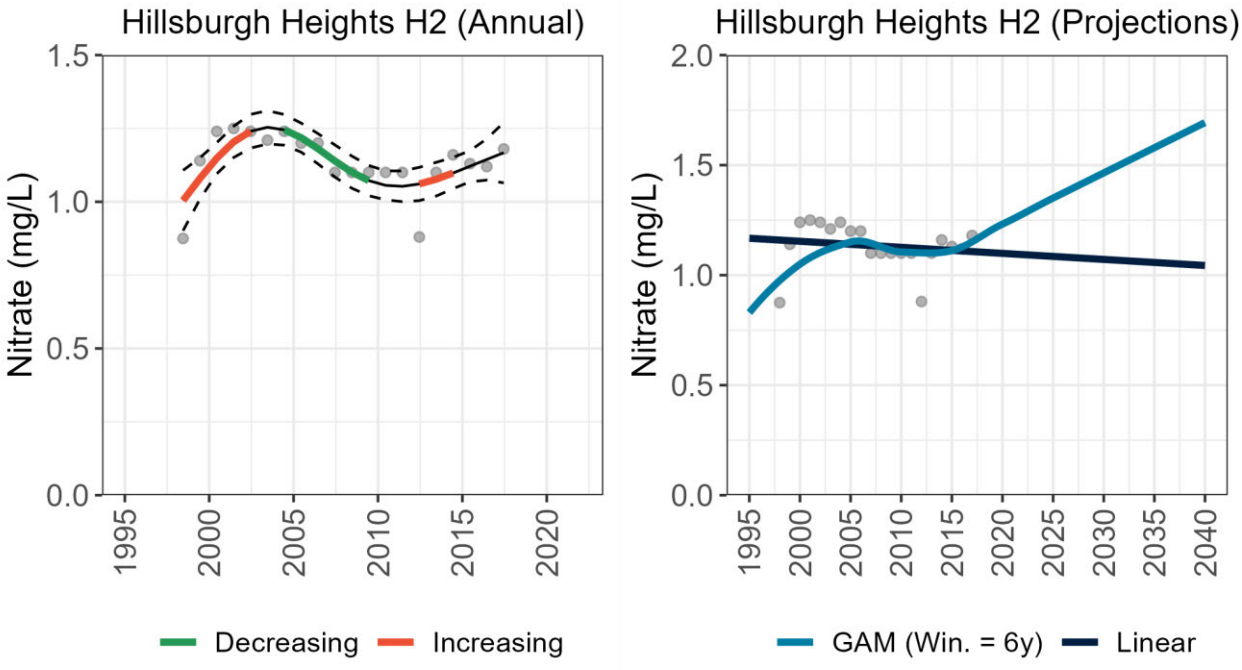


Figure D-35. Nitrate concentration at Hillsburgh Heights H2 Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing no significant trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

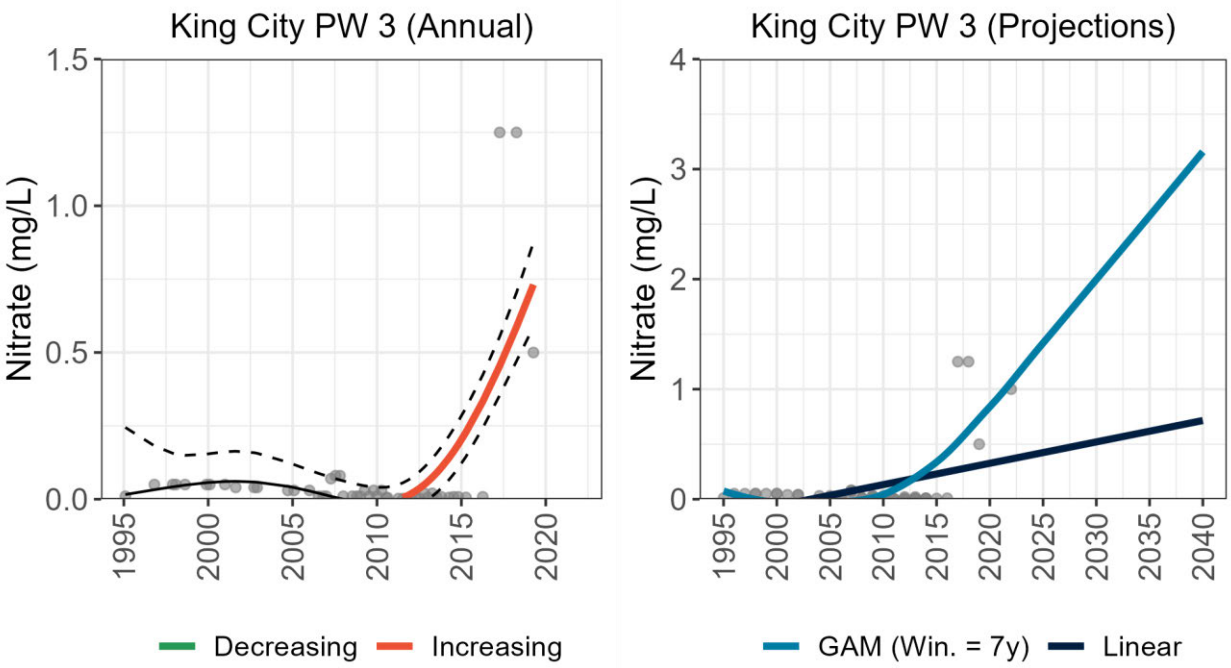


Figure D-36. Nitrate concentration at King City PW 3 is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant positive trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

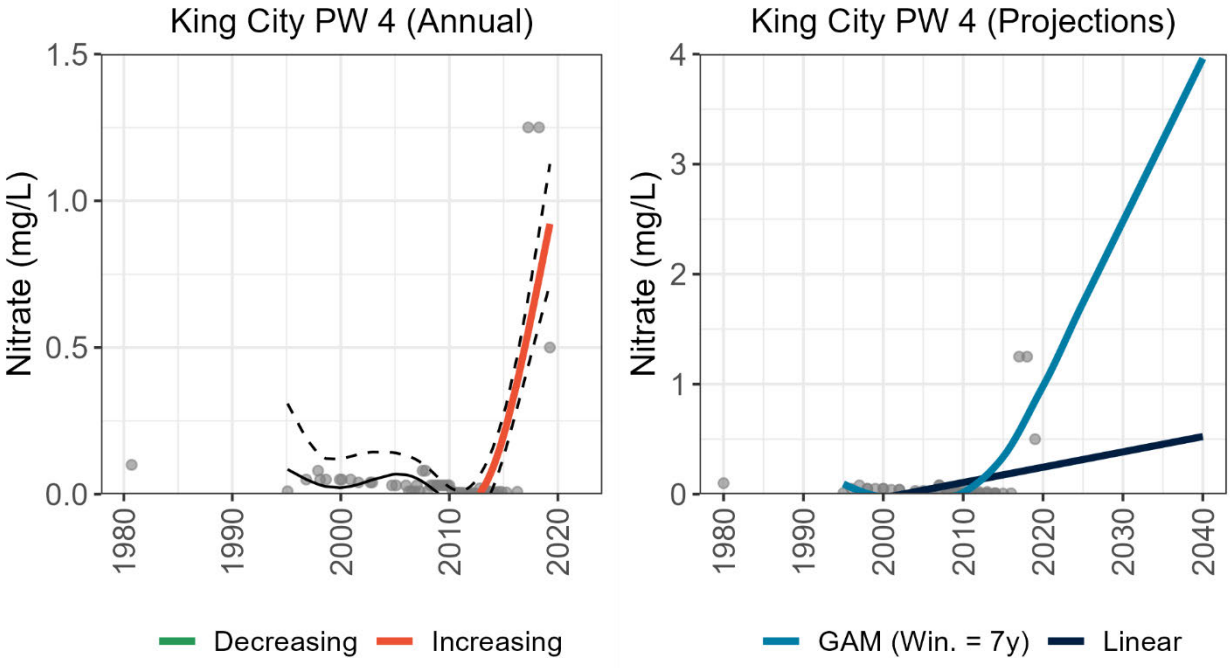


Figure D-37. Nitrate concentration at King City PW 4 is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant positive trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

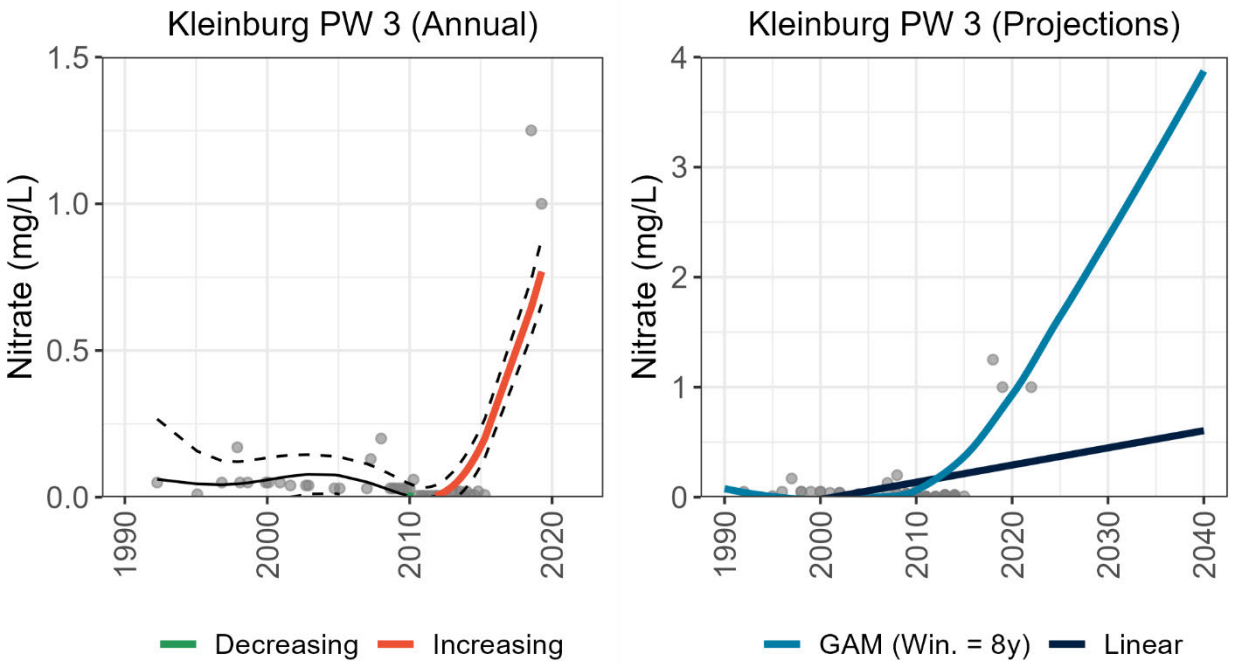


Figure D-38. Nitrate concentration at Kleinburg PW 3 is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant positive trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

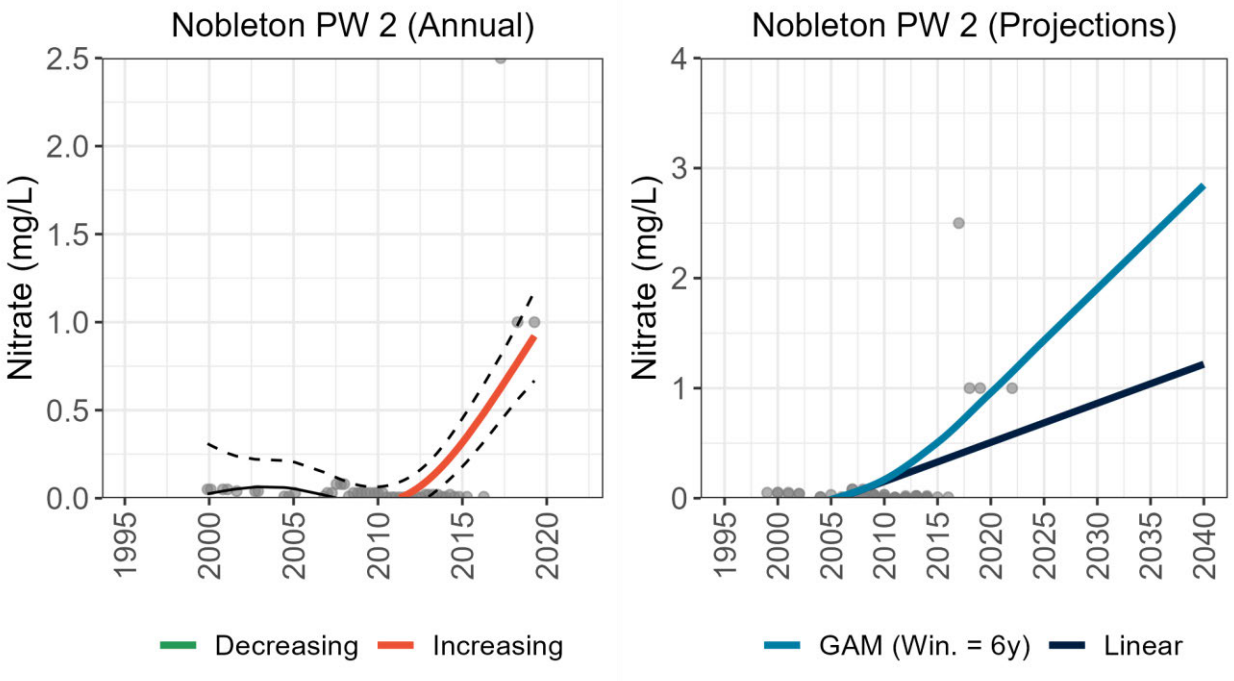


Figure D-39. Nitrate concentration at Nobleton PW 2 is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant positive trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

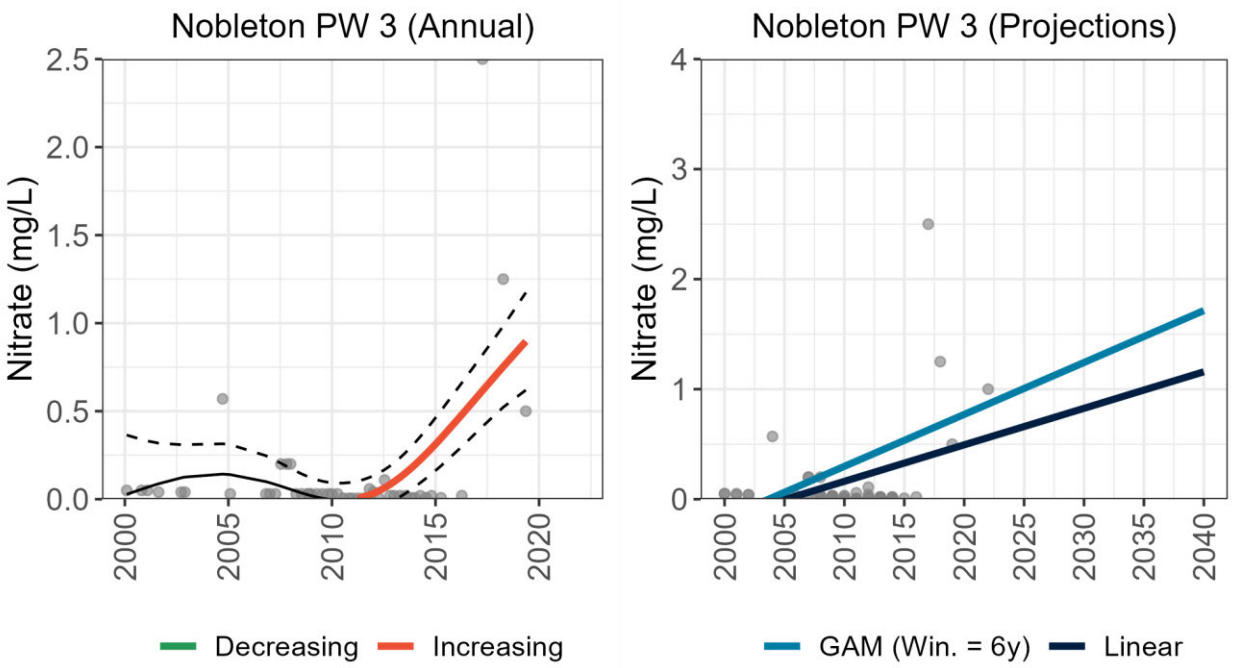


Figure D-40. Nitrate concentration at Nobleton PW 2 is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant positive trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

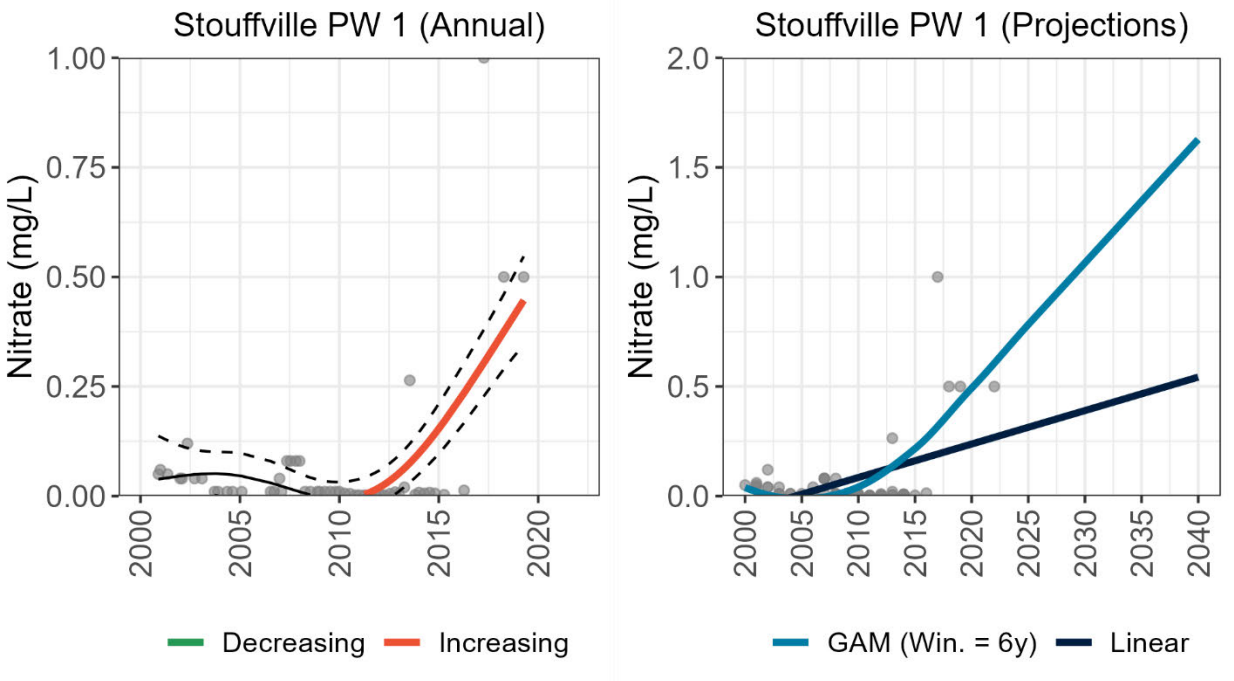


Figure D-41. Nitrate concentration at Stouffville PW 1 Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant positive trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

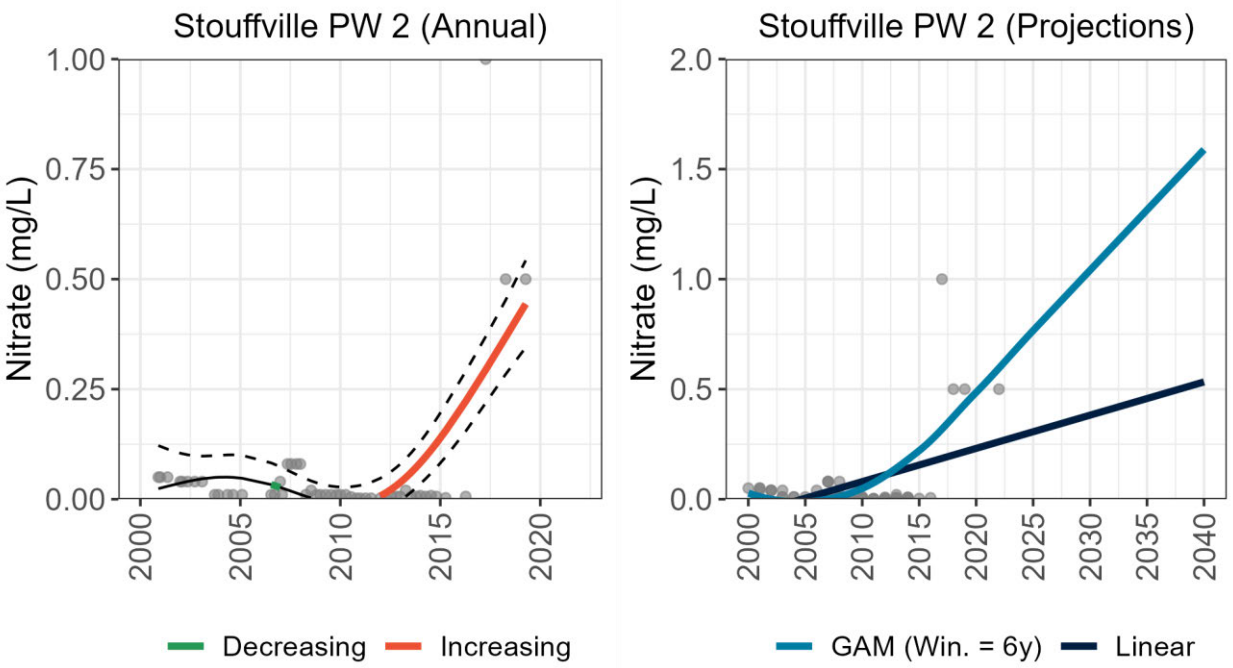


Figure D-42. Nitrate concentration at Stouffville PW 2 Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant positive trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

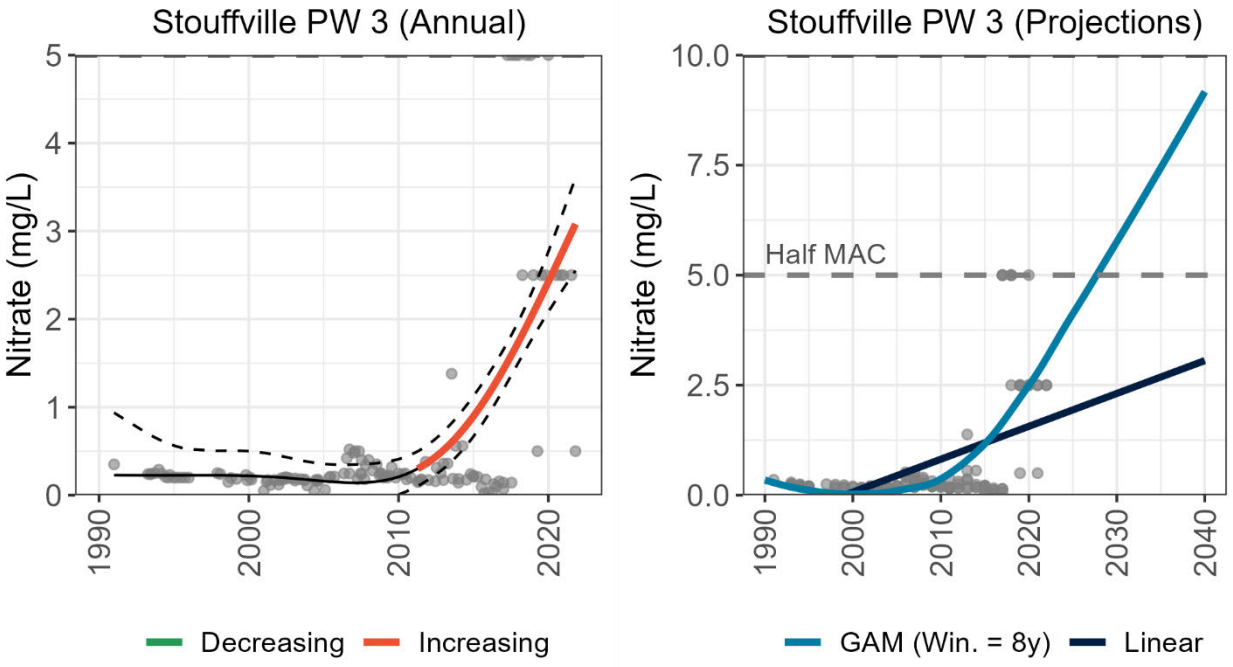


Figure D-43. Nitrate concentration at Stouffville PW 3 Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant positive trend. Nitrate concentration is somewhat likely to exceed the half-MAC by 2040.

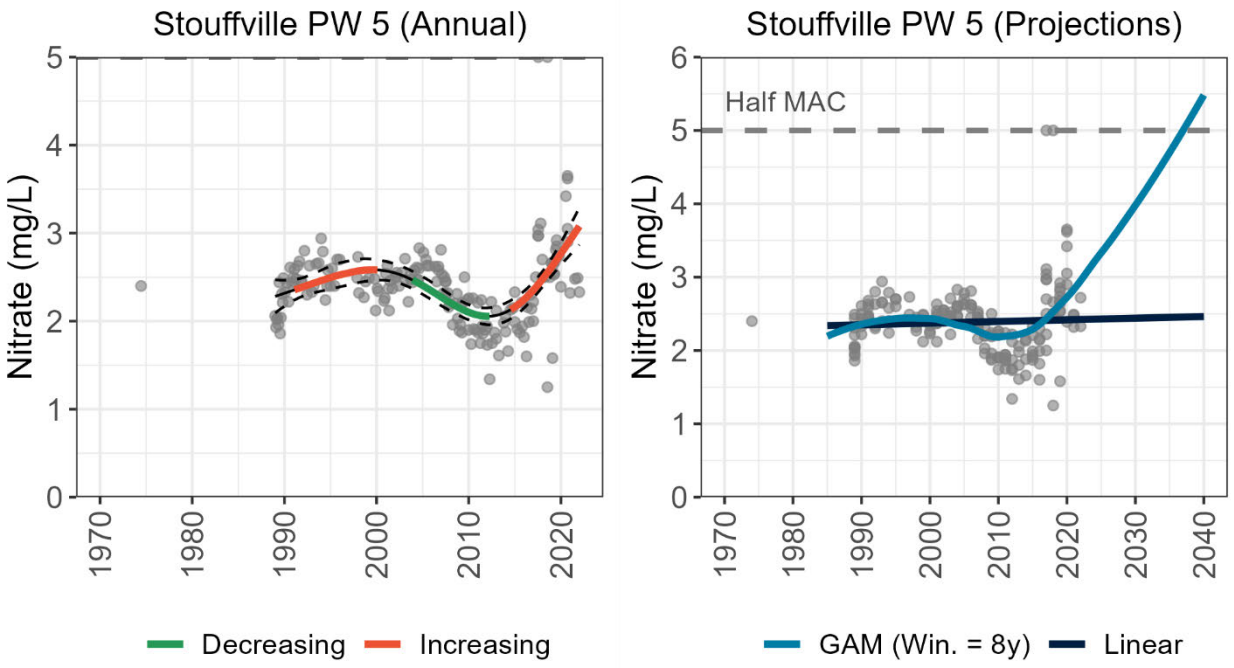


Figure D-44. Nitrate concentration at Stouffville PW 5 Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant positive trend. Nitrate concentration is somewhat likely to exceed the half-MAC by 2040.

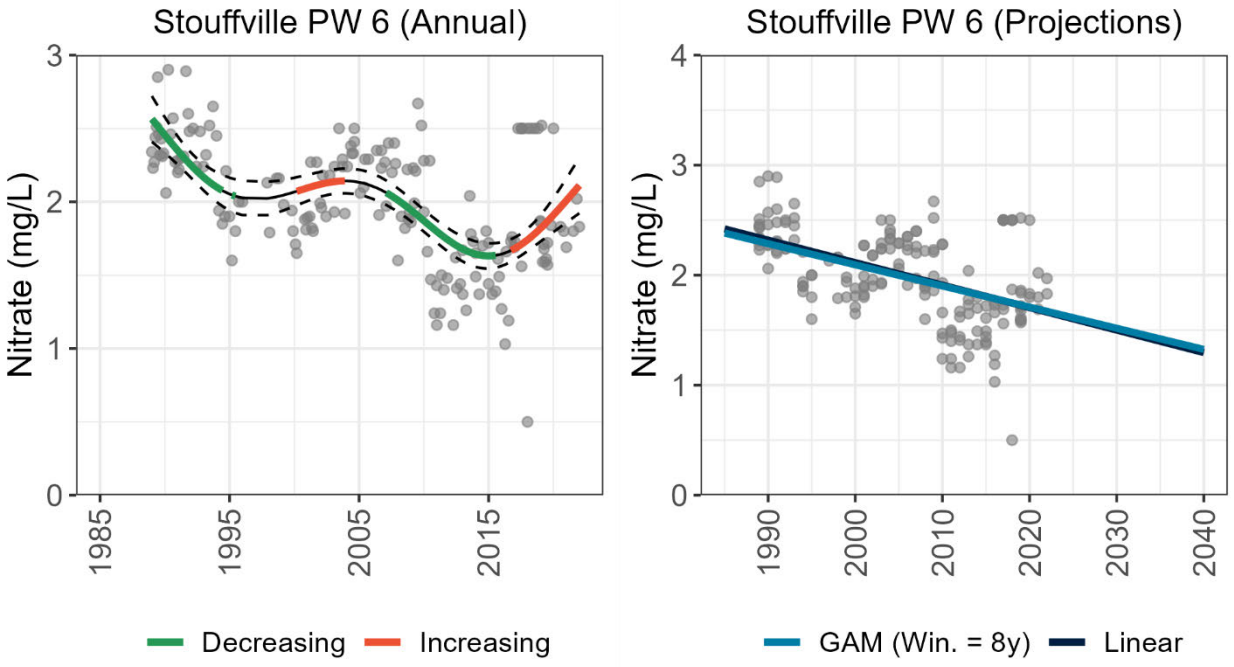


Figure D-45. Nitrate concentration at Stouffville PW 6 Well is currently below the half-Maximum Acceptable Limit (MAC) of 5 mg/L and is showing a significant positive trend. Nitrate concentration is unlikely to exceed the half-MAC by 2040.

Chloride

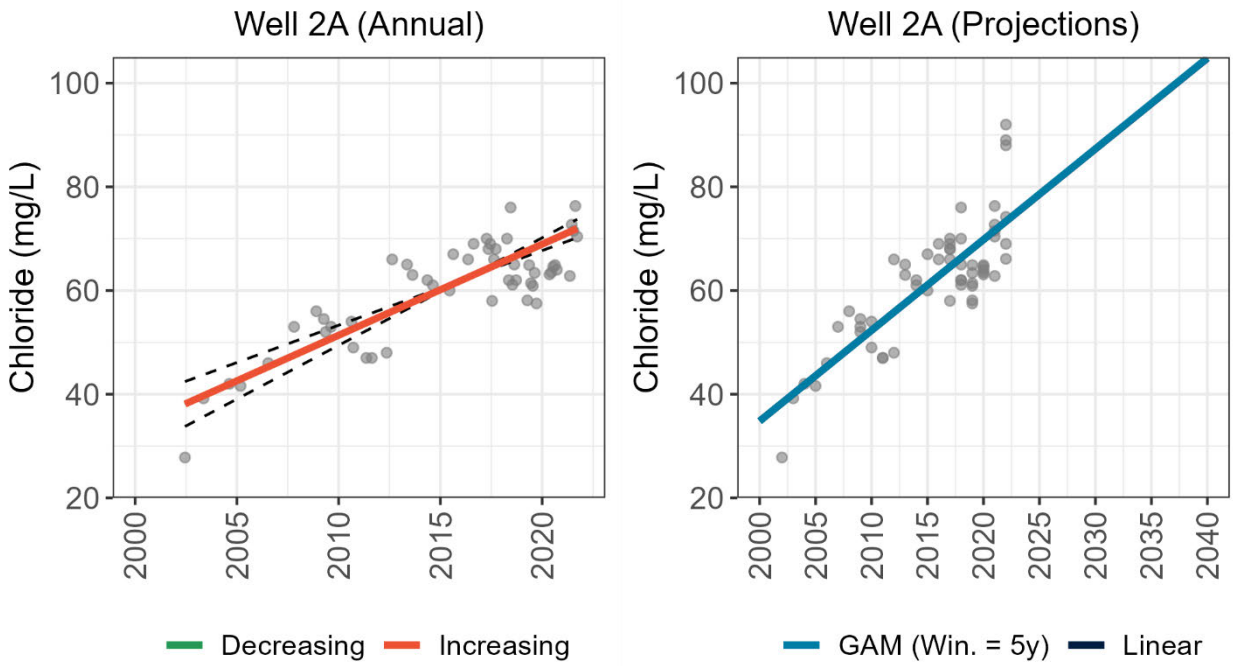


Figure D-46. Chloride concentration at Orangeville Well 2A is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

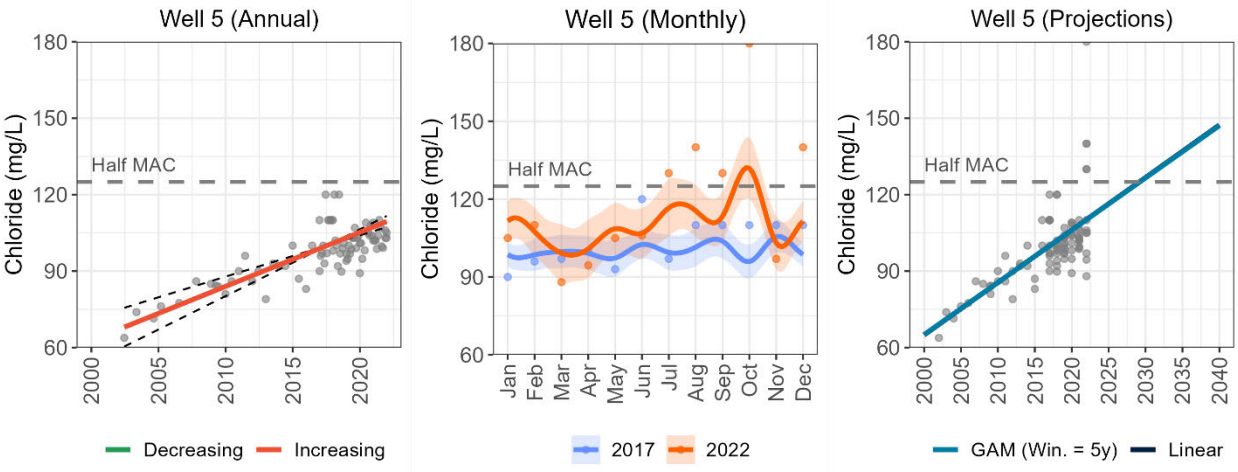


Figure D-47. Chloride concentration at Orangeville Well 5 is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is highly likely to exceed the half-MAC by 2040.

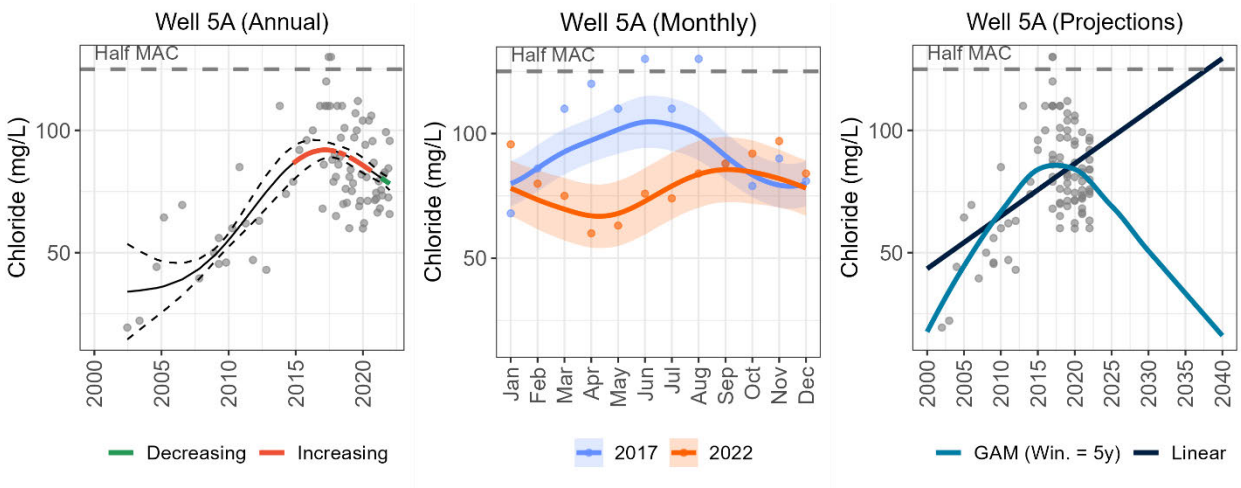


Figure D-48. Chloride concentration at Orangeville Well 5A is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant negative trend as of 2021. Chloride concentration is somewhat likely to exceed the half-MAC by 2040.

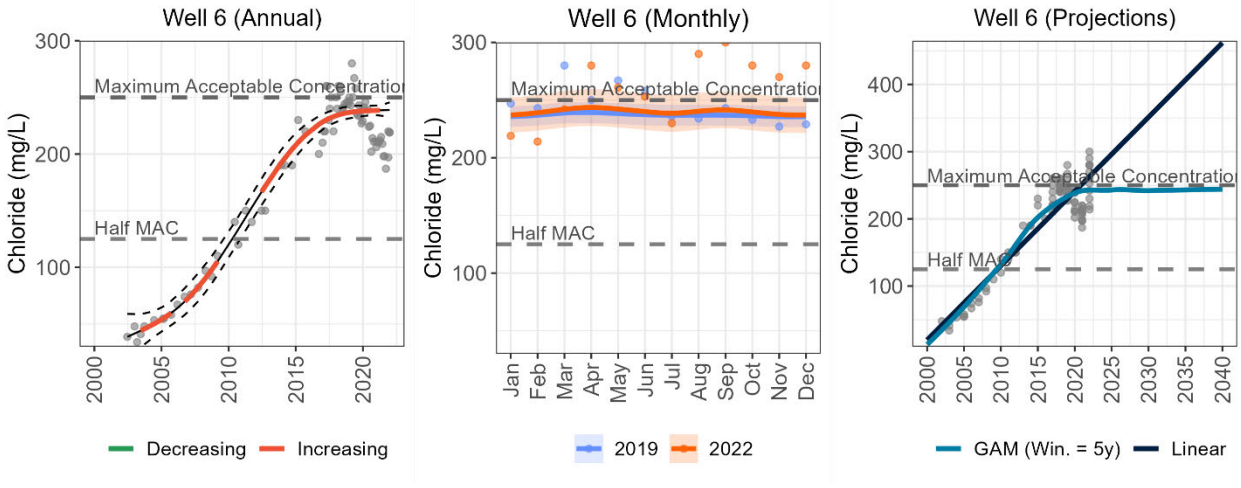


Figure D-49. Chloride concentration at Orangeville Well 6 is currently near the Maximum Acceptable Limit (MAC) of 250 mg/L and is showing a significant positive trend. Chloride concentration is highly likely to exceed the MAC by 2040.

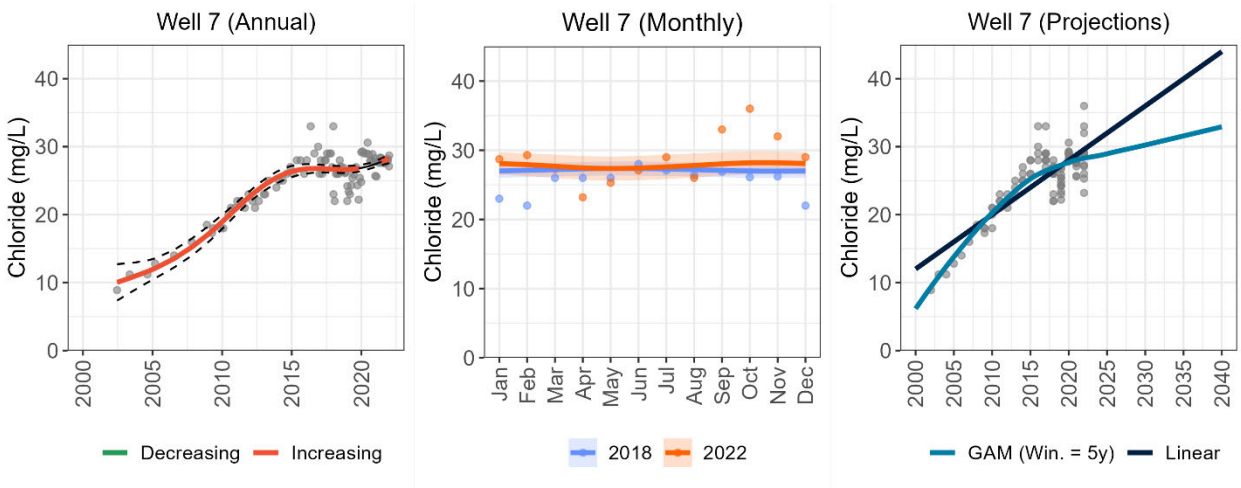


Figure D-50. Chloride concentration at Orangeville Well 7 is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

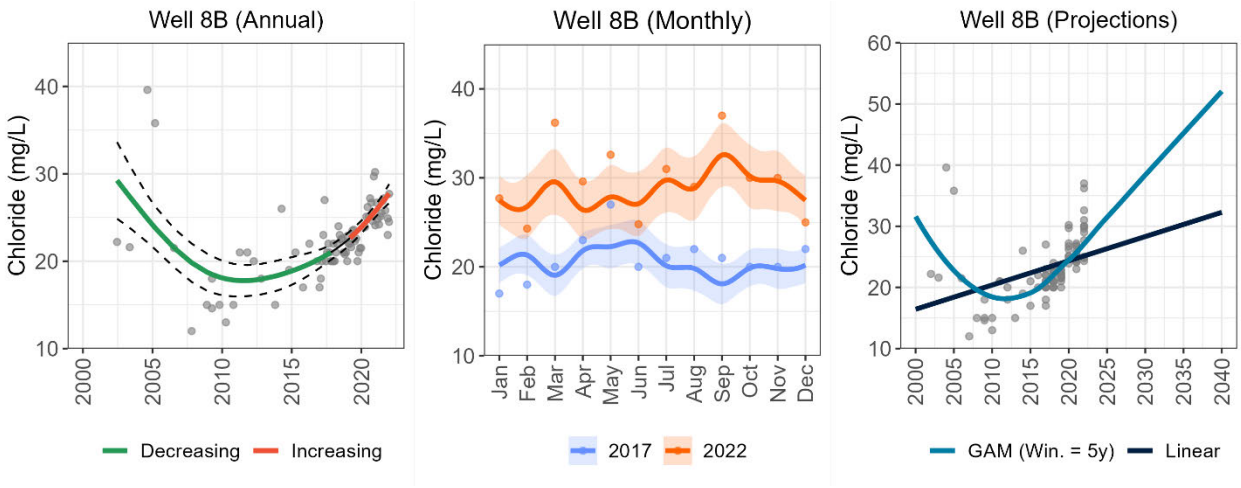


Figure D-51. Chloride concentration at Orangeville Well 8B is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

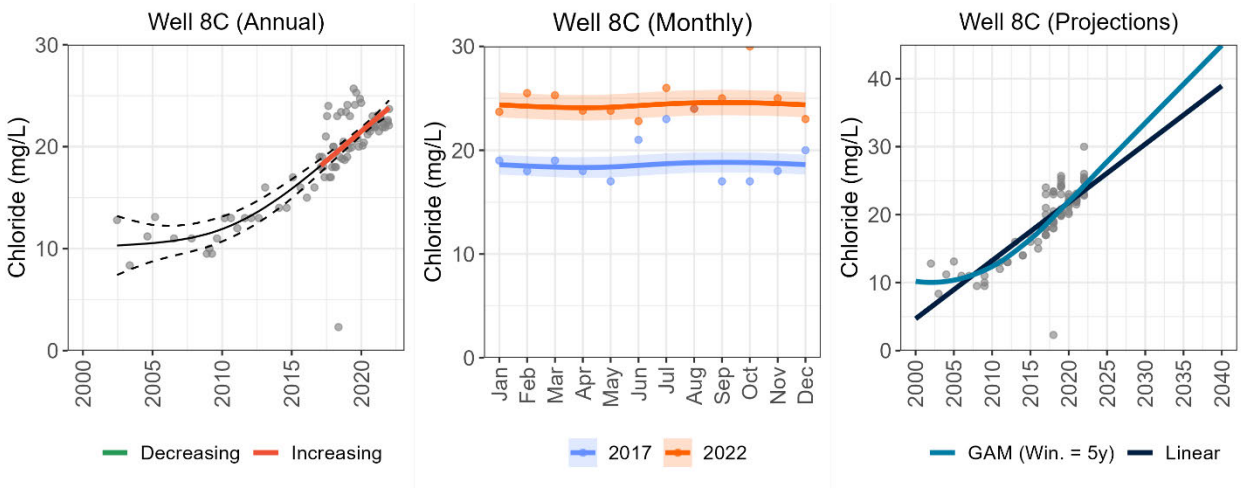


Figure D-52. Chloride concentration at Orangeville Well 8C is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

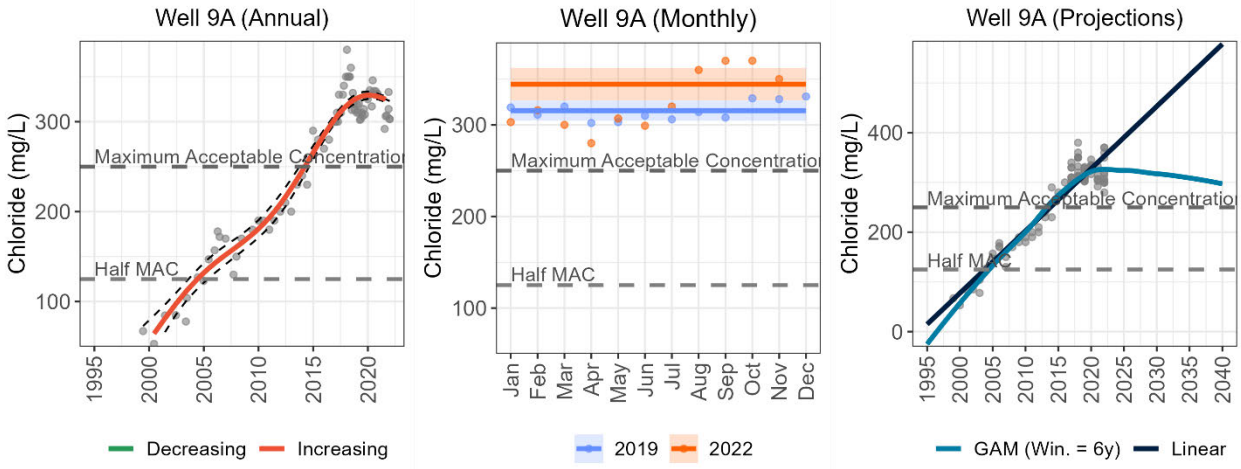


Figure D-53. Chloride concentration at Orangeville Well 9A is currently above the Maximum Acceptable Limit (MAC) of 250 mg/L and is showing a significant positive trend. Chloride concentration is highly likely to exceed the MAC by 2040.

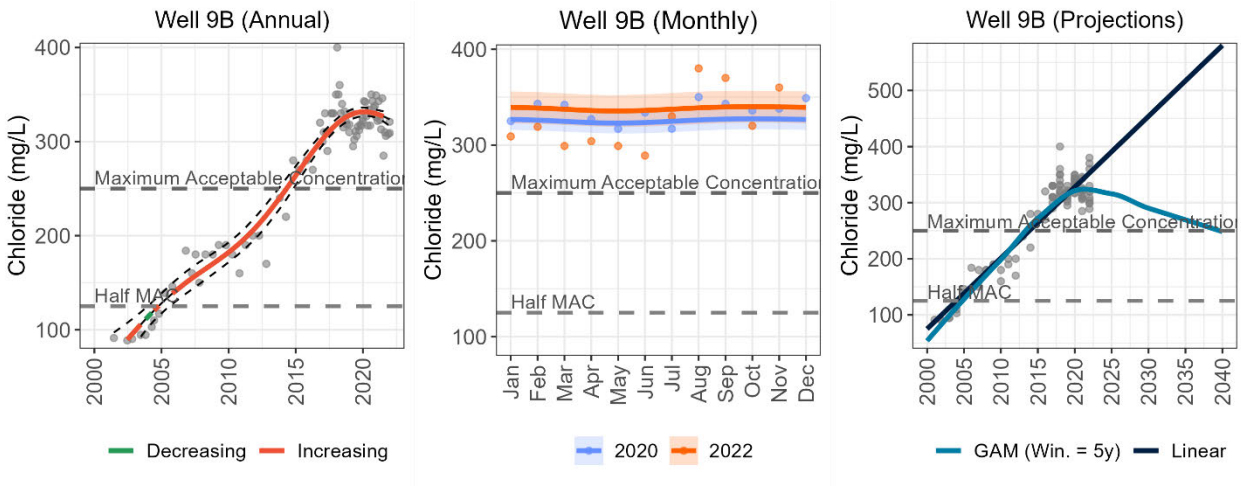


Figure D-54. Chloride concentration at Orangeville Well 9B is currently above the Maximum Acceptable Limit (MAC) of 250 mg/L and is showing a significant positive trend. Chloride concentration is highly likely to exceed the MAC by 2040.

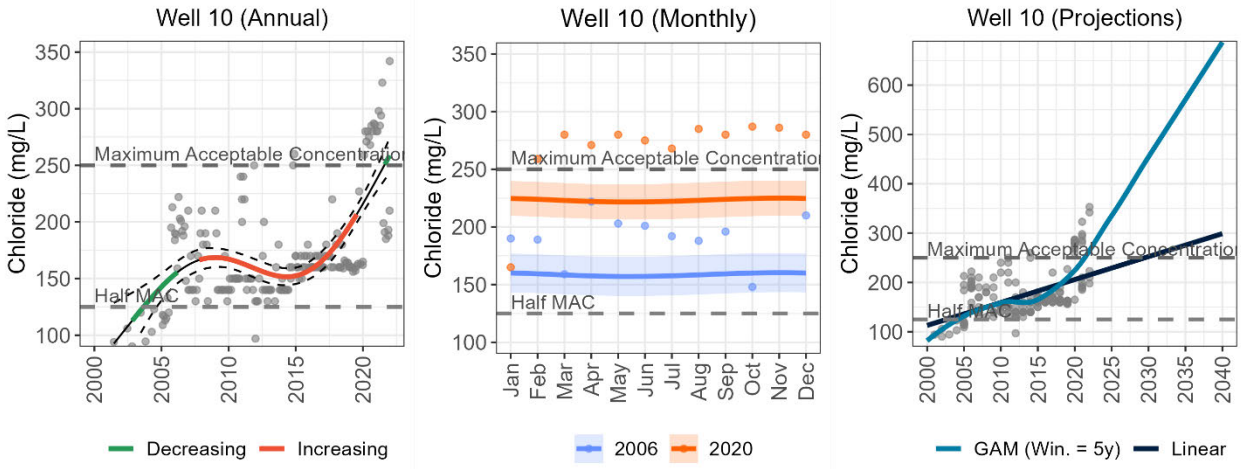


Figure D-55. Chloride concentration at Orangeville Well 10 is currently above the Maximum Acceptable Limit (MAC) of 250 mg/L and is showing a significant negative trend as of 2021. Chloride concentration is highly likely to exceed the MAC by 2040.

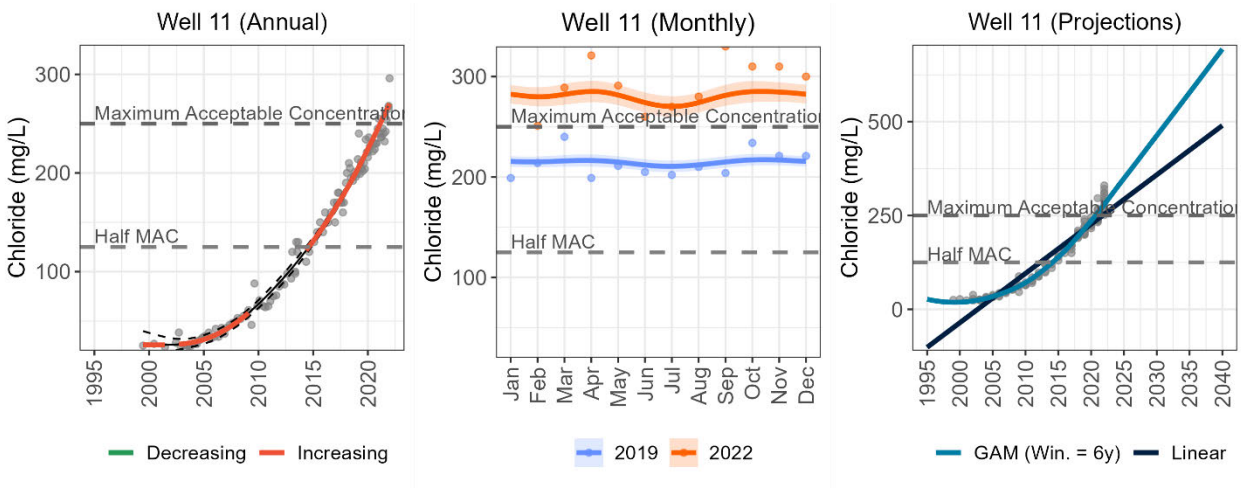


Figure D-56. Chloride concentration at Orangeville Well 11 is currently above the Maximum Acceptable Limit (MAC) of 250 mg/L and is showing a significant positive trend. Chloride concentration is highly likely to exceed the MAC by 2040.

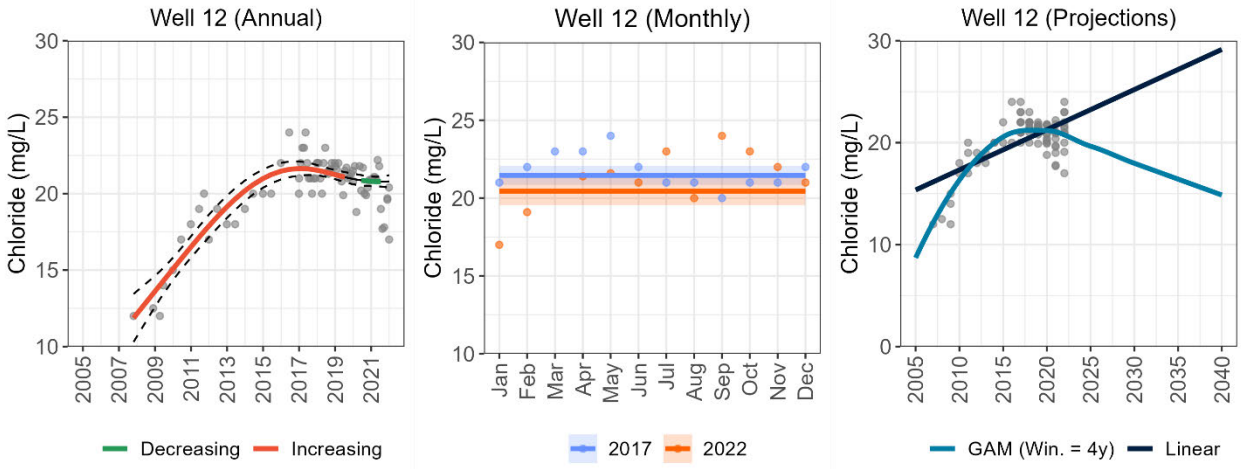


Figure D-57. Chloride concentration at Orangeville Well 12 is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant negative trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

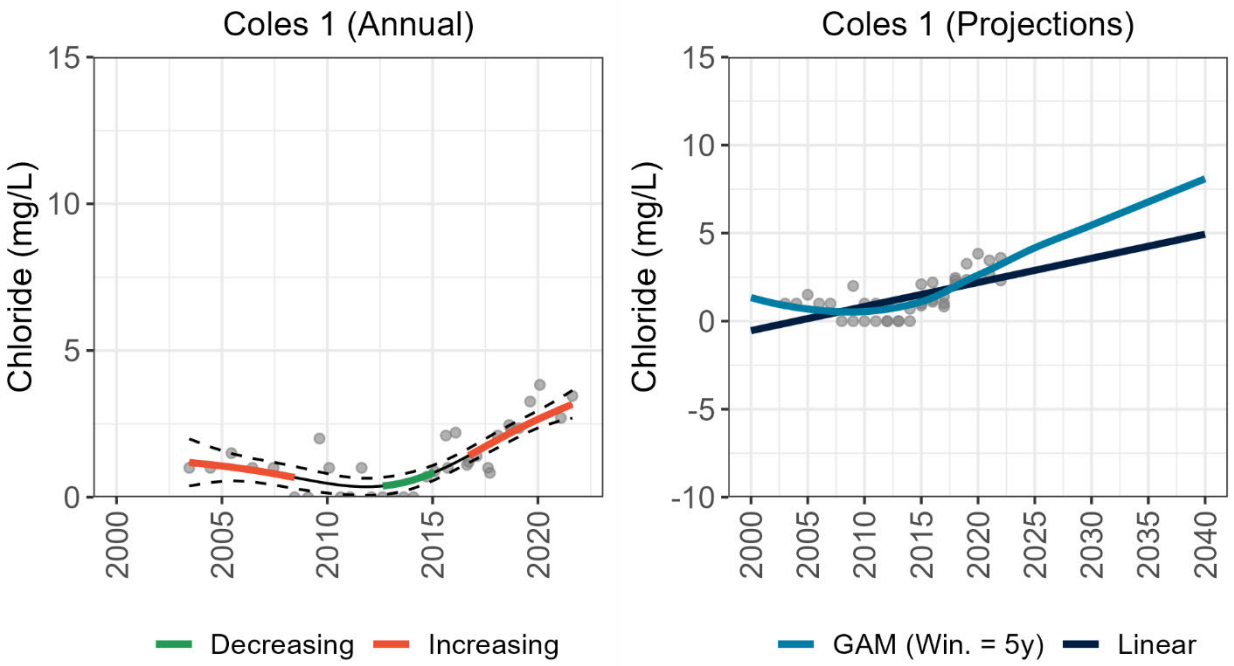


Figure D-58. Chloride concentration at Coles 1 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

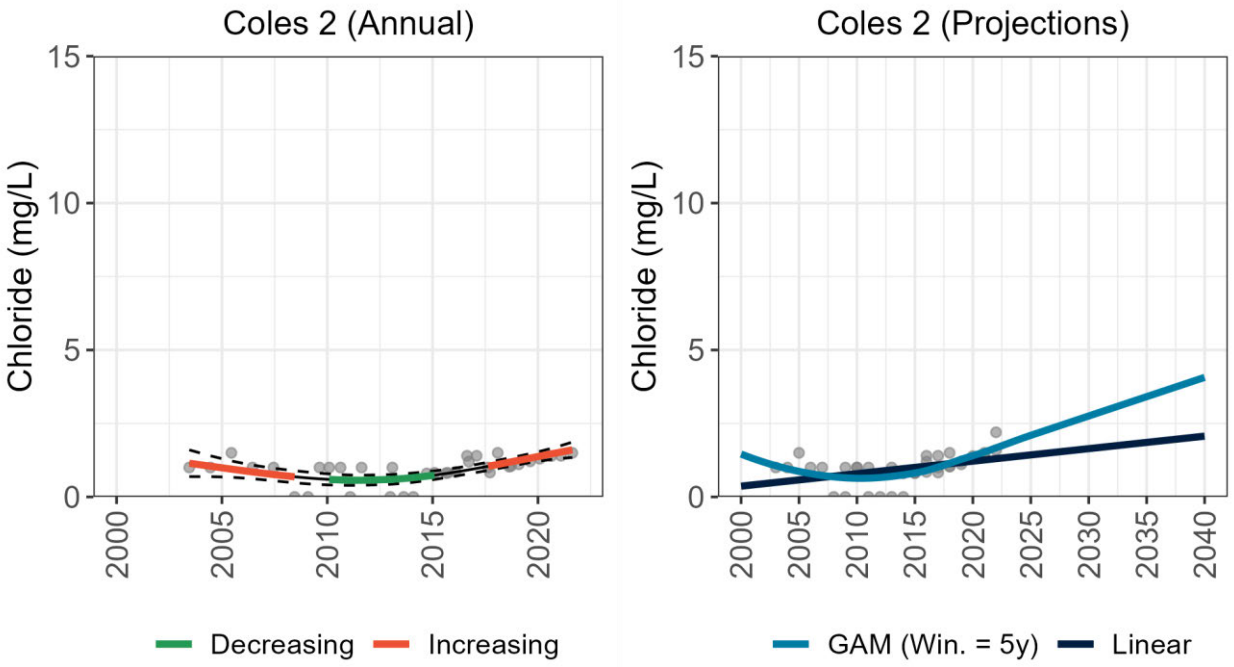


Figure D-59. Chloride concentration at Coles 2 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

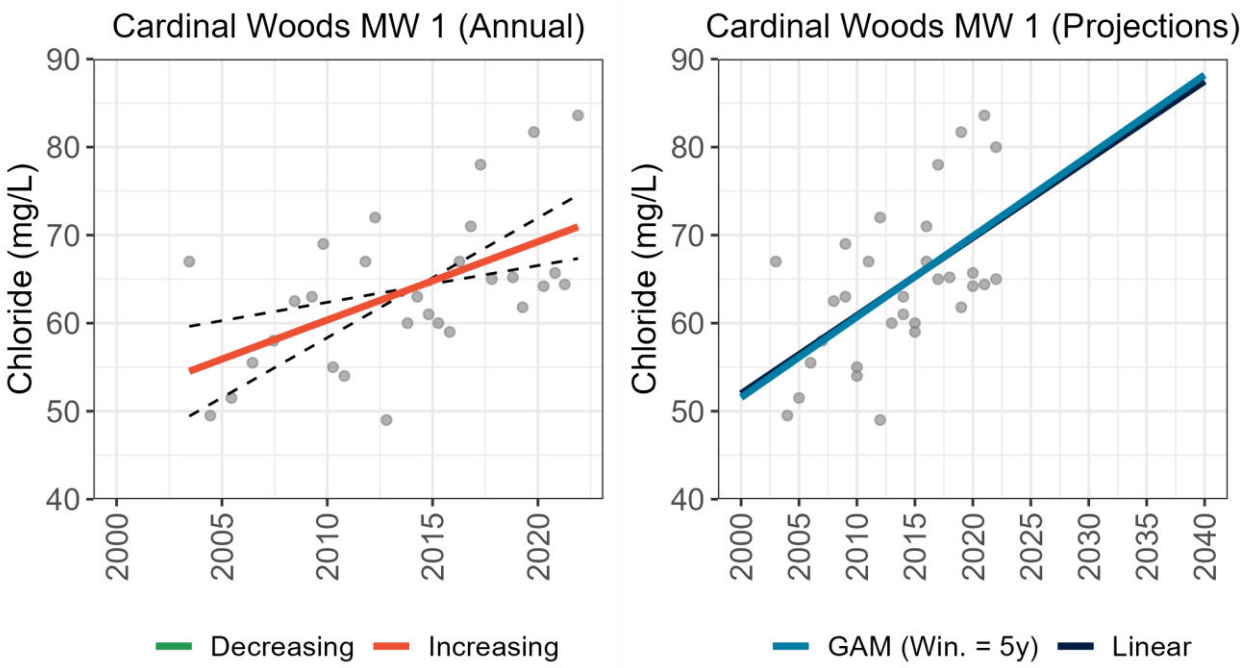


Figure D-60. Chloride concentration at Cardinal Woods MW 1 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

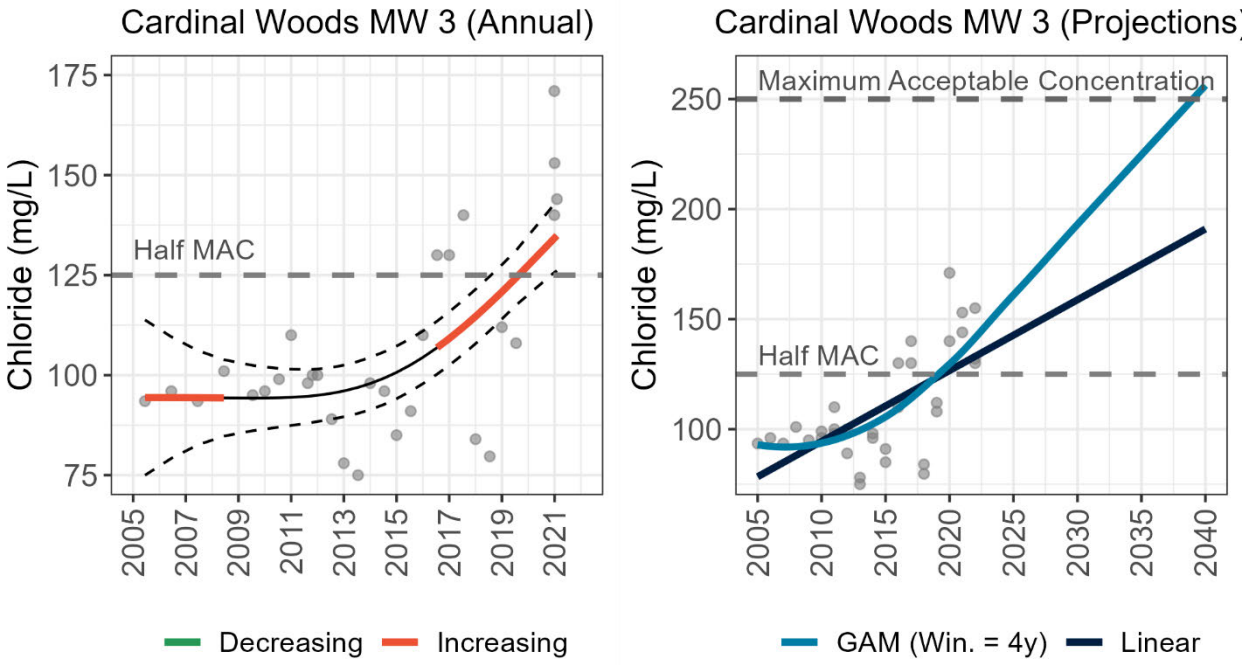


Figure D-61. Chloride concentration at Cardinal Woods MW 3 Well is currently above the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is somewhat likely to exceed the MAC of 250 mg/L by 2040.

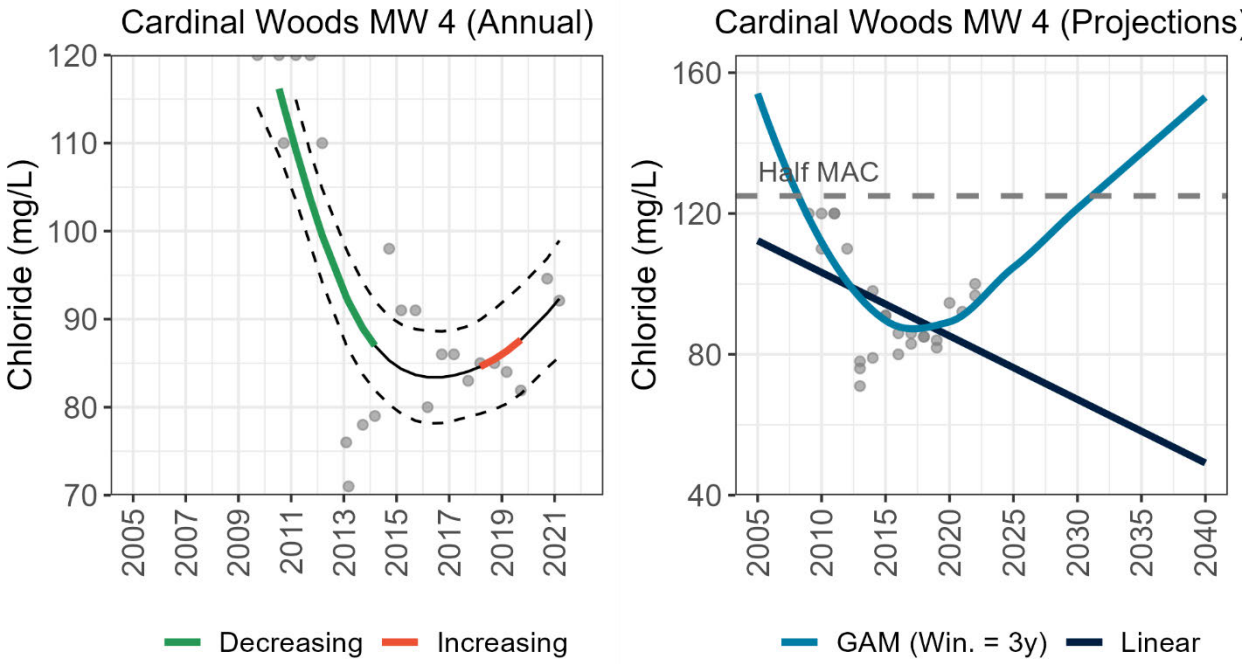


Figure D-62. Chloride concentration at Cardinal Woods MW 4 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing no significant trend. Chloride concentration is somewhat likely to exceed the half-MAC by 2040.

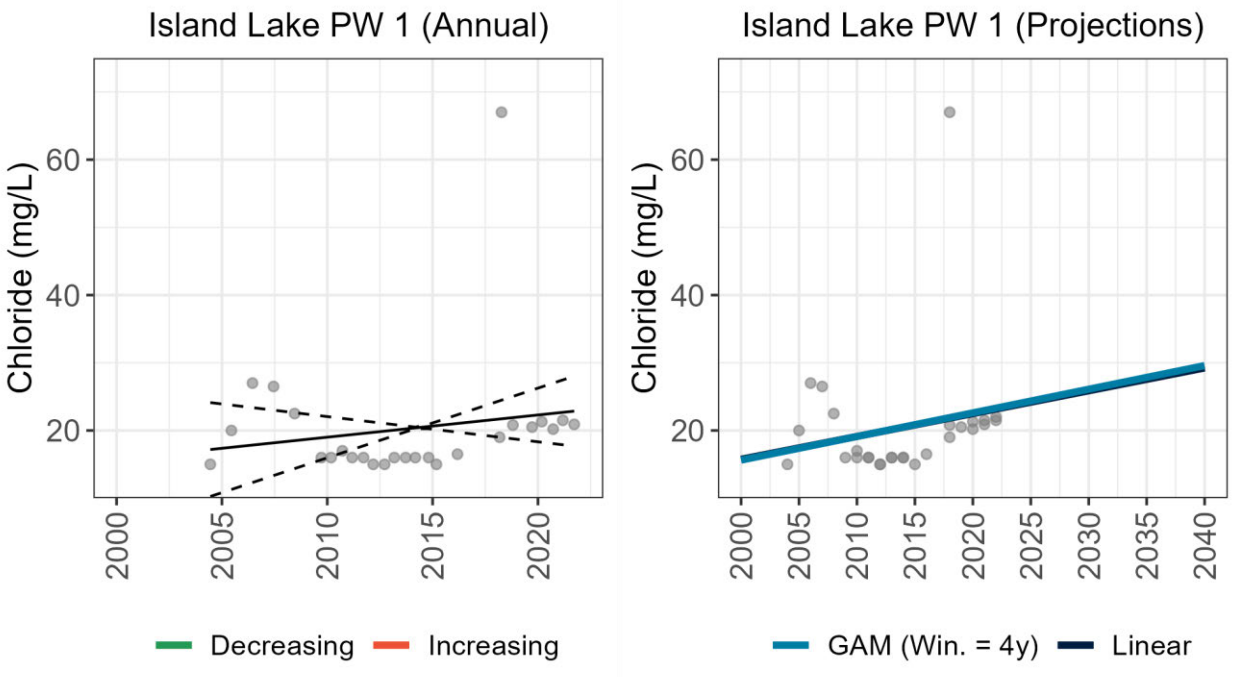


Figure D-63. Chloride concentration at Island Lake PW 1 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing no significant trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

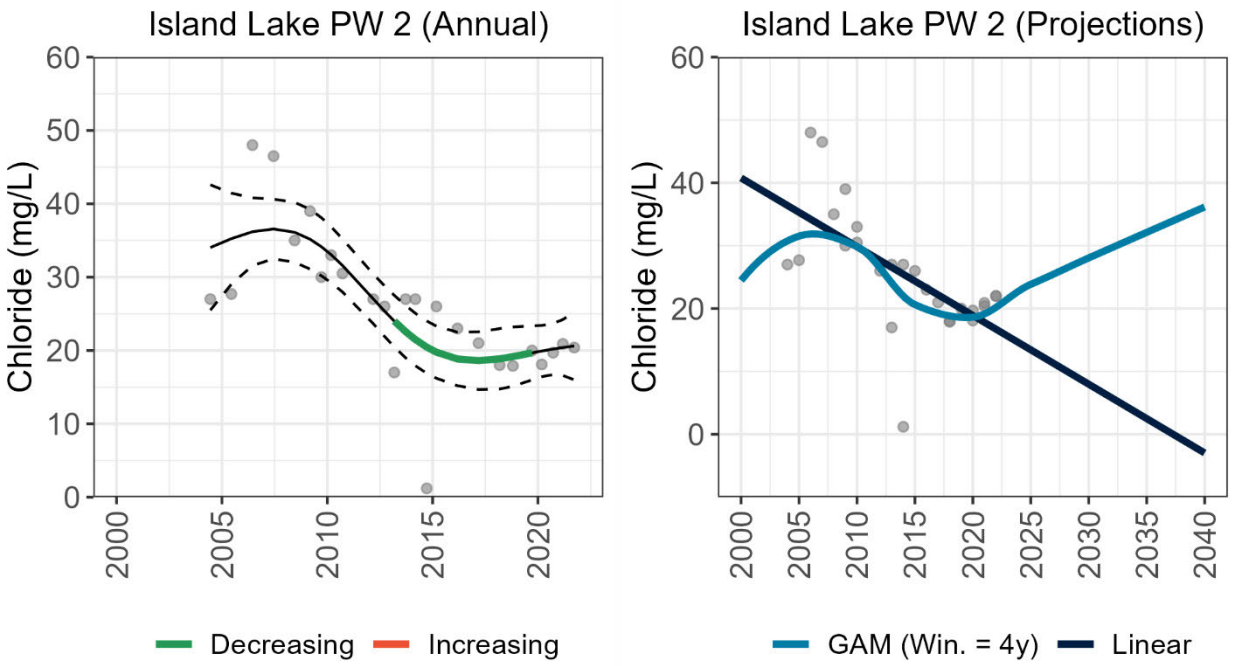


Figure D-64. Chloride concentration at Island Lake PW 2 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing no significant trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

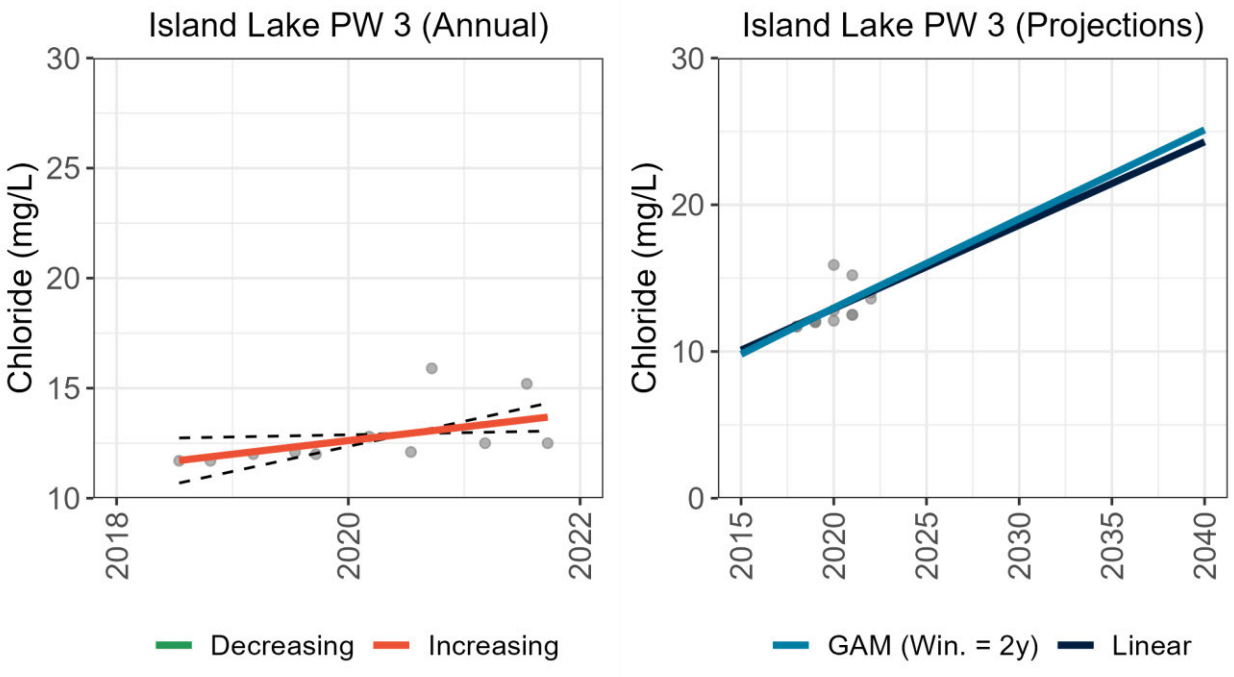


Figure D-65. Chloride concentration at Island Lake PW 3 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

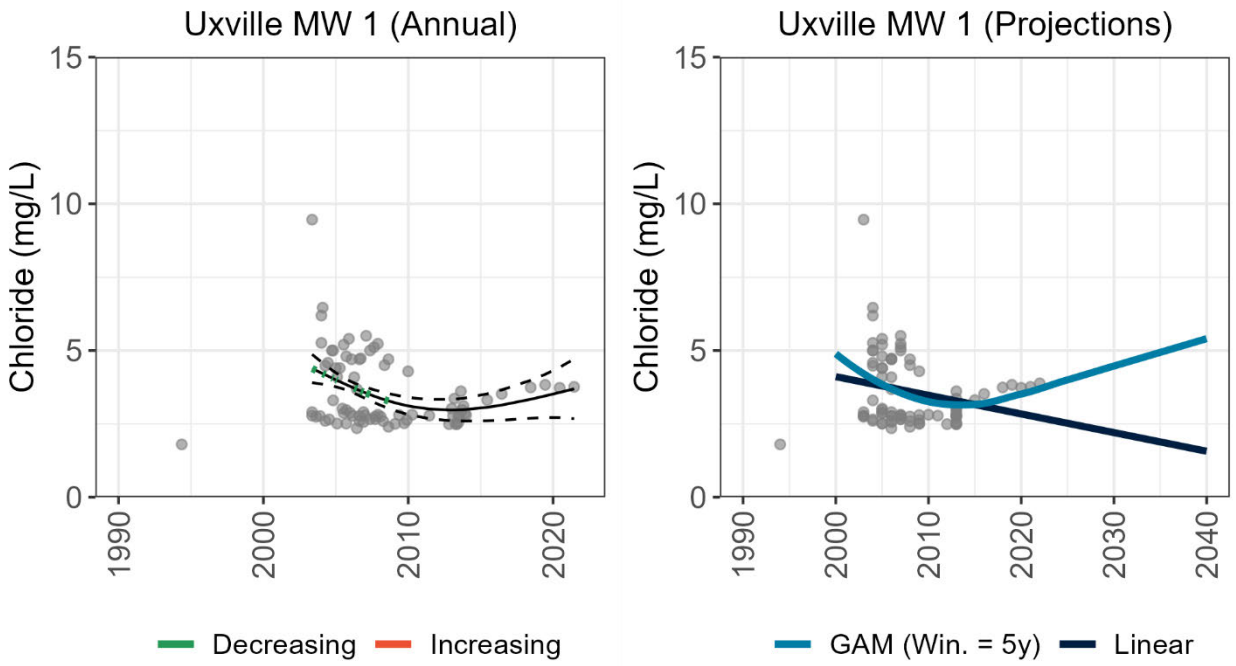


Figure D-66. Chloride concentration at Uxville MW 1 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing no significant trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

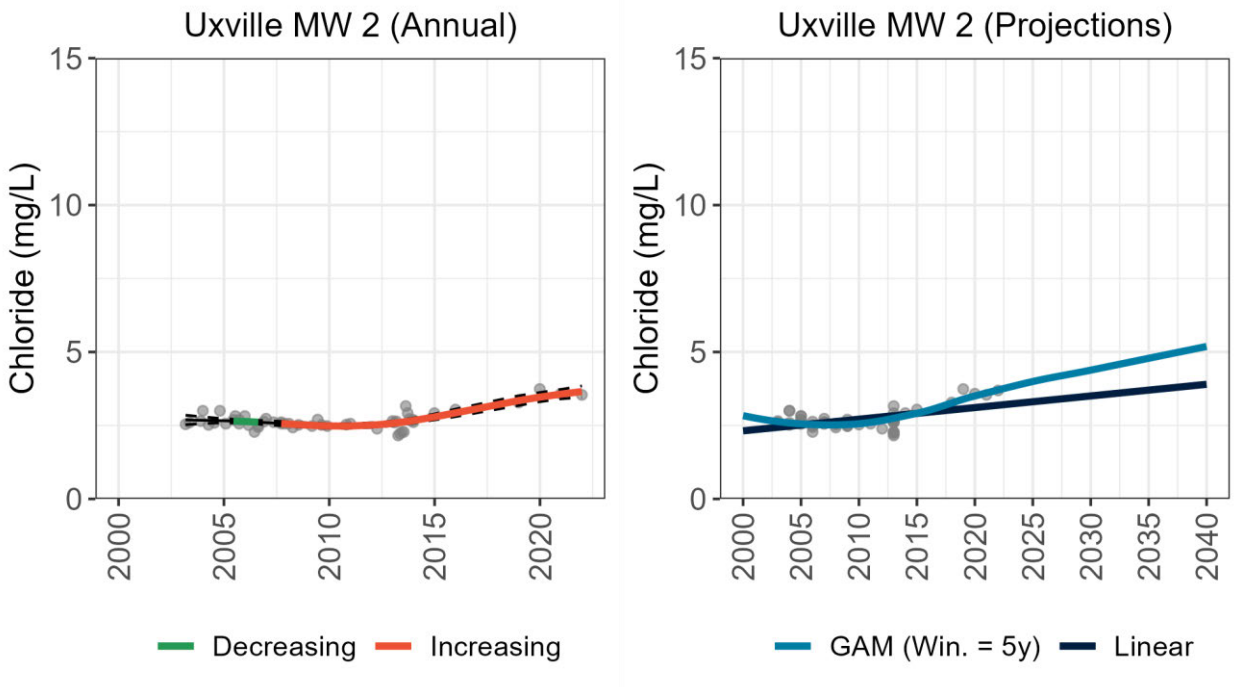


Figure D-67. Chloride concentration at Uxville MW 2 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

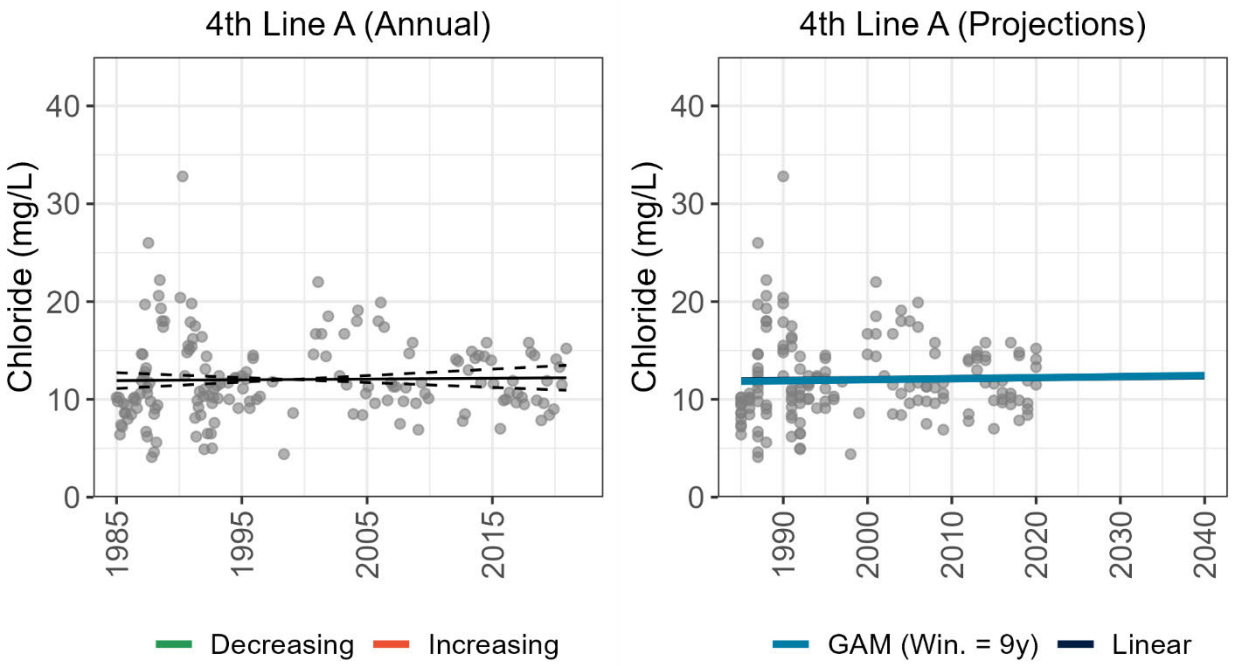


Figure D-68. Chloride concentration at 4th Line A Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing no significant trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

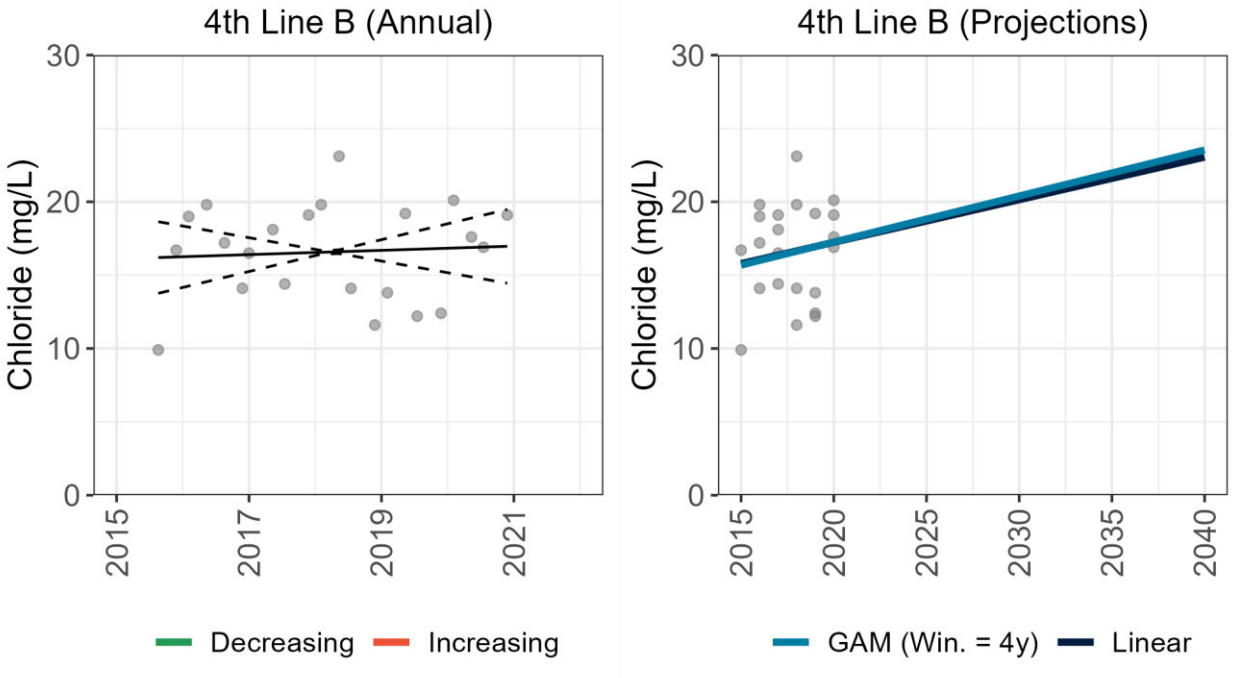


Figure D-69. Chloride concentration at 4th Line B Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing no significant trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

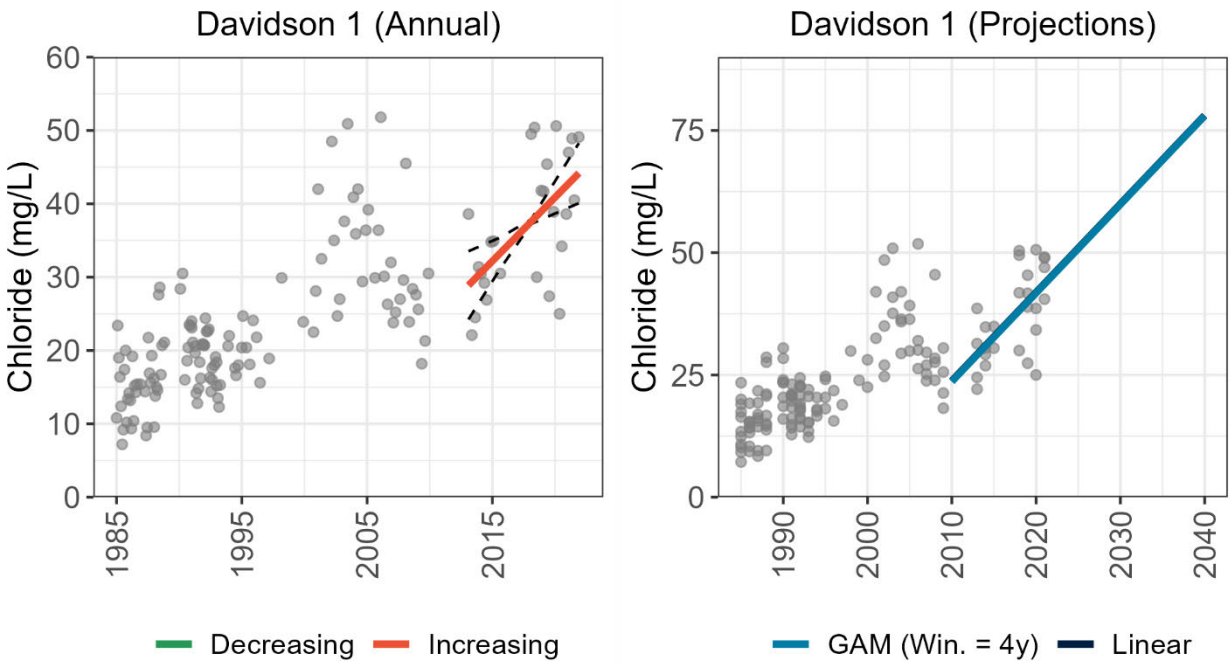


Figure D-70. Chloride concentration at Davidson 1 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

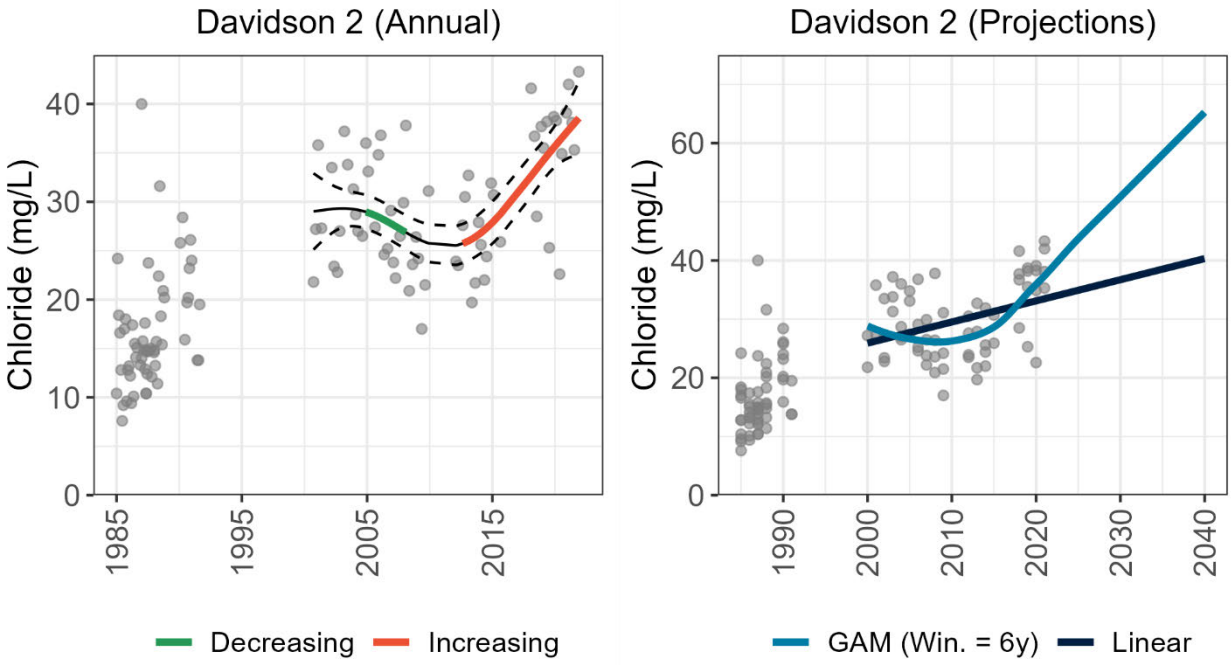


Figure D-71. Chloride concentration at Davidson 2 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

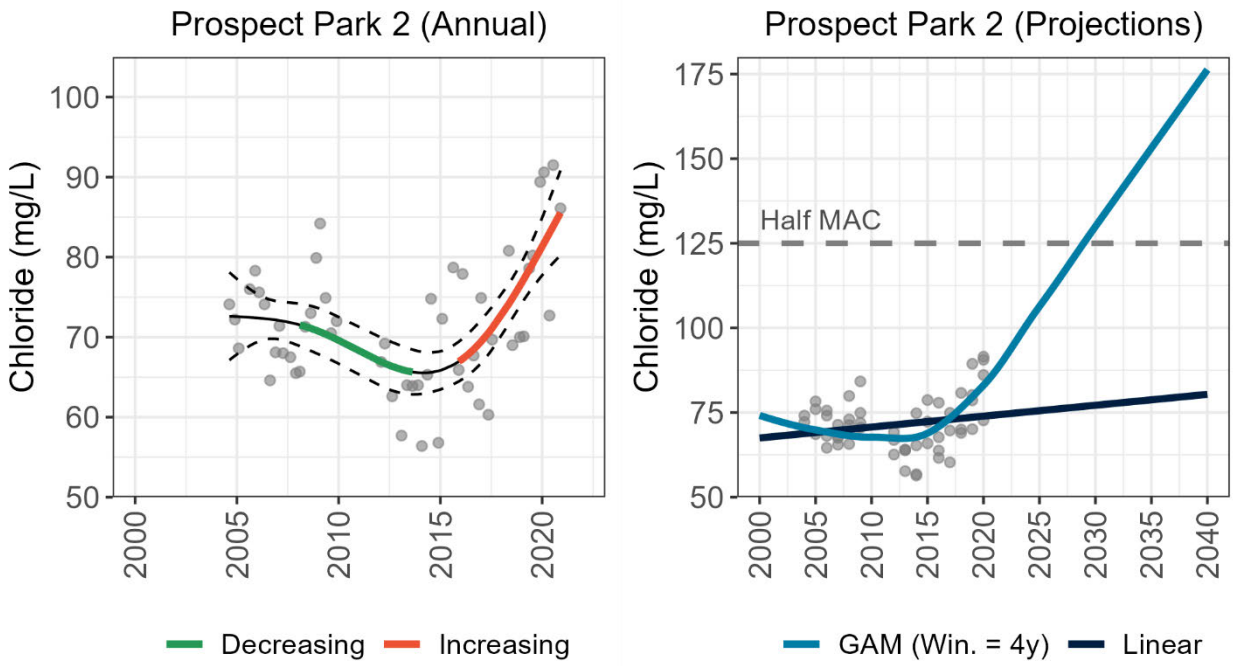


Figure D-72. Chloride concentration at Prospect Park 2 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is somewhat likely to exceed the half-MAC by 2040.

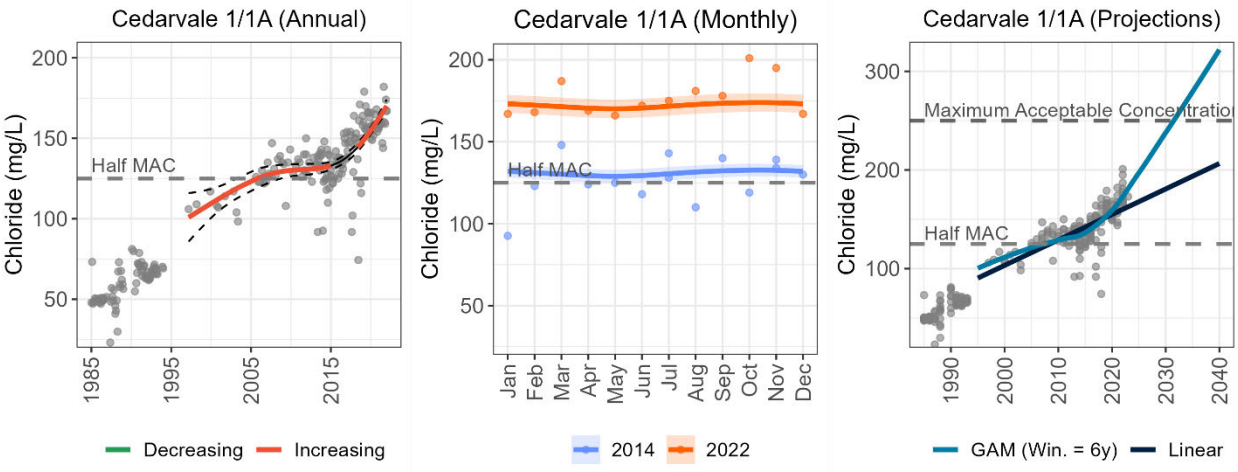


Figure D-73. Chloride concentration at Cedarvale 1/1A Well is currently above the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is somewhat likely to exceed the MAC of 250 mg/L by 2040.

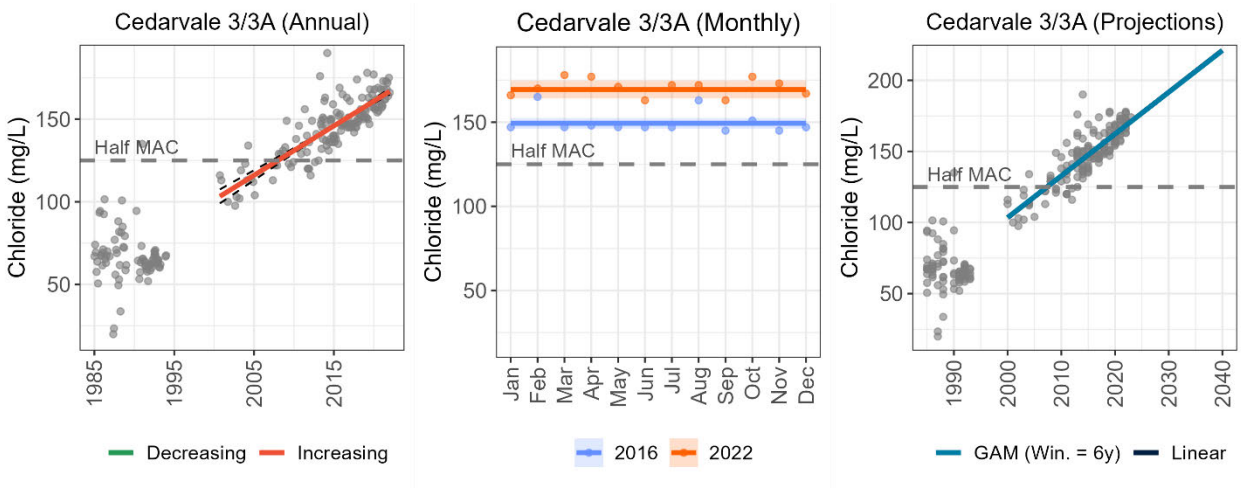


Figure D-74. Chloride concentration at Cedarvale 3/3A Well is currently above the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is highly likely to exceed the MAC of 250 mg/L by 2040.

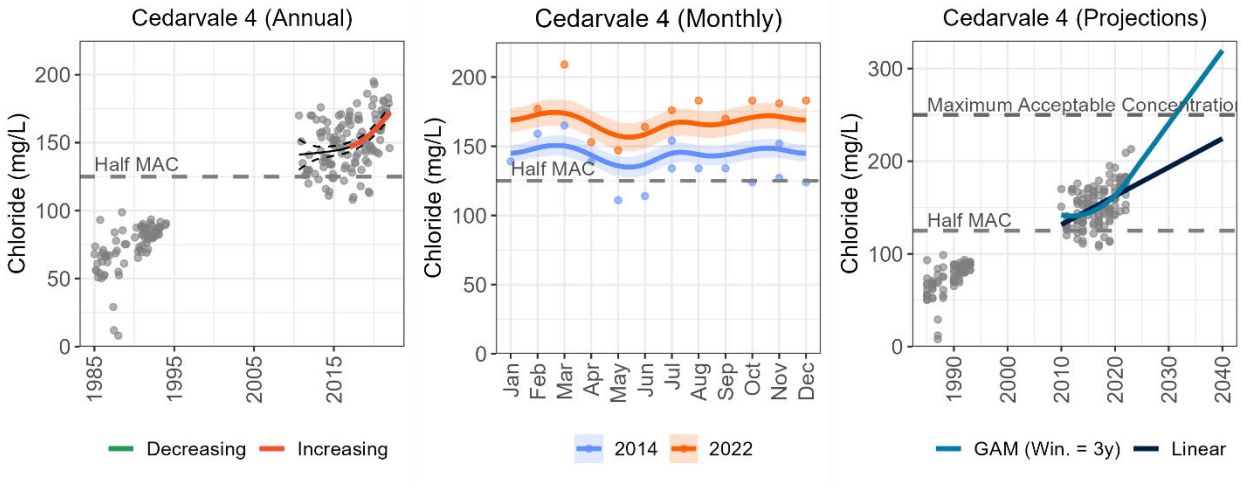


Figure D-75. Chloride concentration at Cedarvale 4 Well is currently above the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is somewhat likely to exceed the MAC of 250 mg/L by 2040.

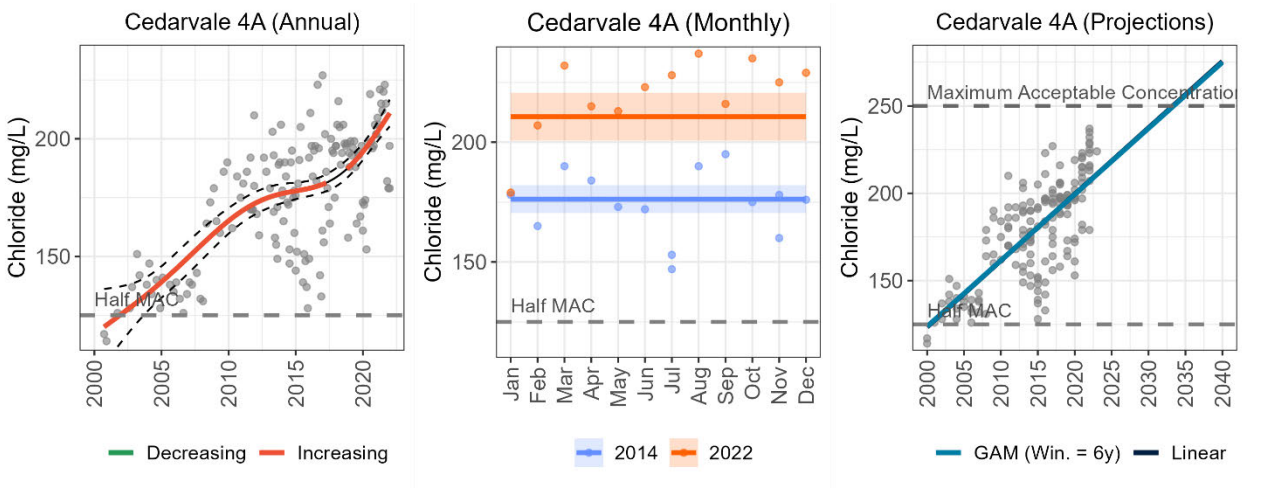


Figure D-76. Chloride concentration at Cedarvale 4A Well is currently above the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is highly likely to exceed the MAC of 250 mg/L by 2040.

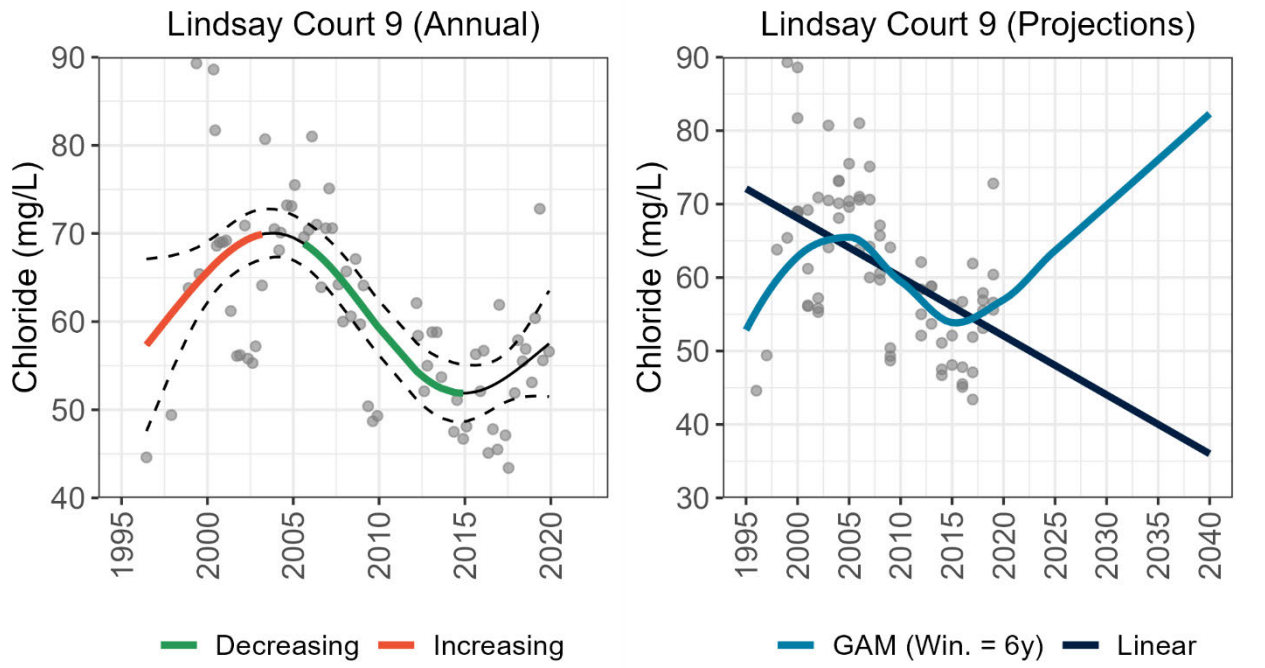


Figure D-77. Chloride concentration at Lindsay Court 9 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing no significant trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

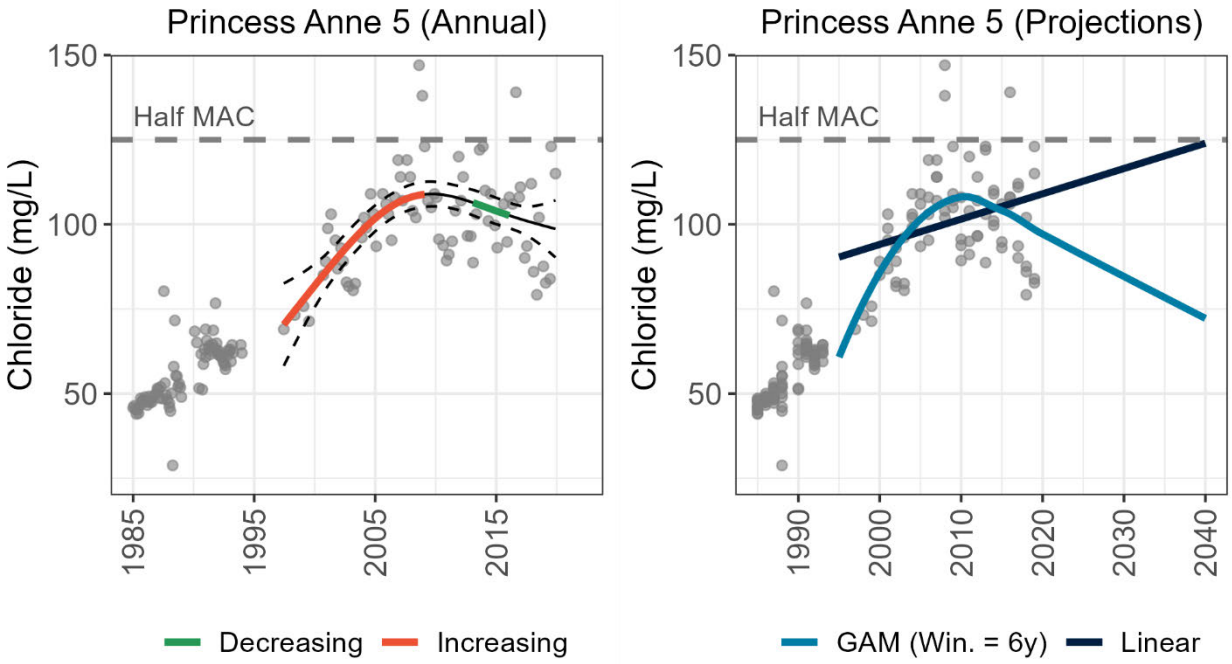


Figure D-78. Chloride concentration at Princess Anne 5 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing no significant trend. Chloride concentration is somewhat likely to exceed the half-MAC by 2040.

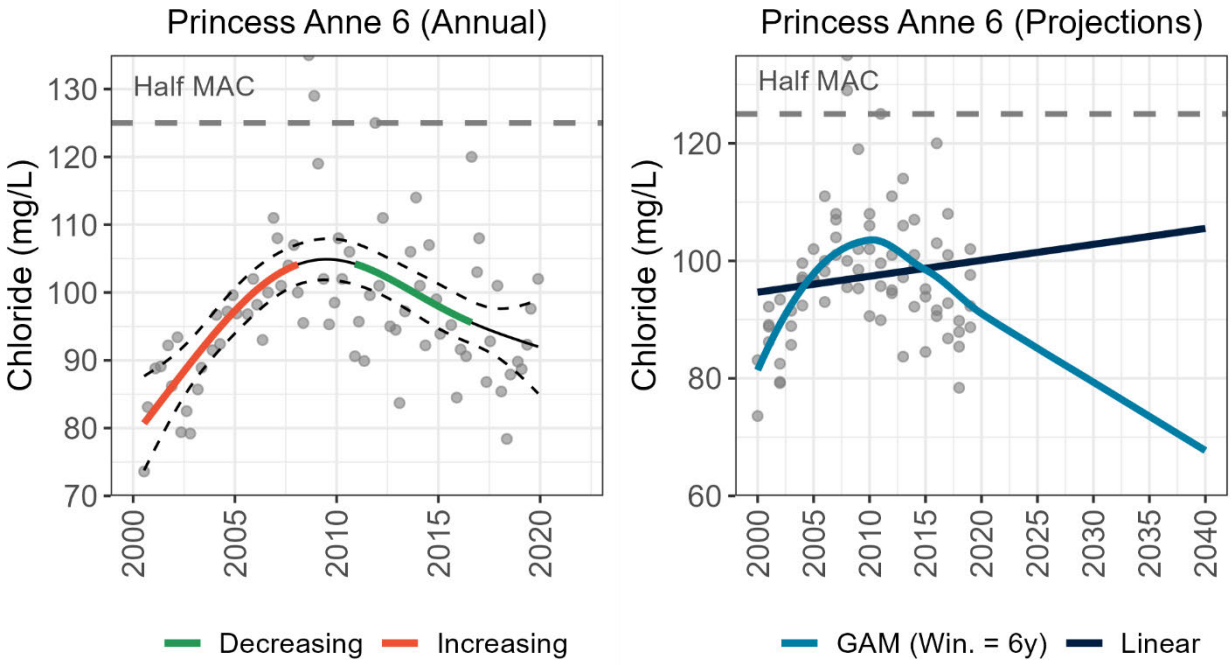


Figure D-79. Chloride concentration at Princess Anne 6 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing no significant trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

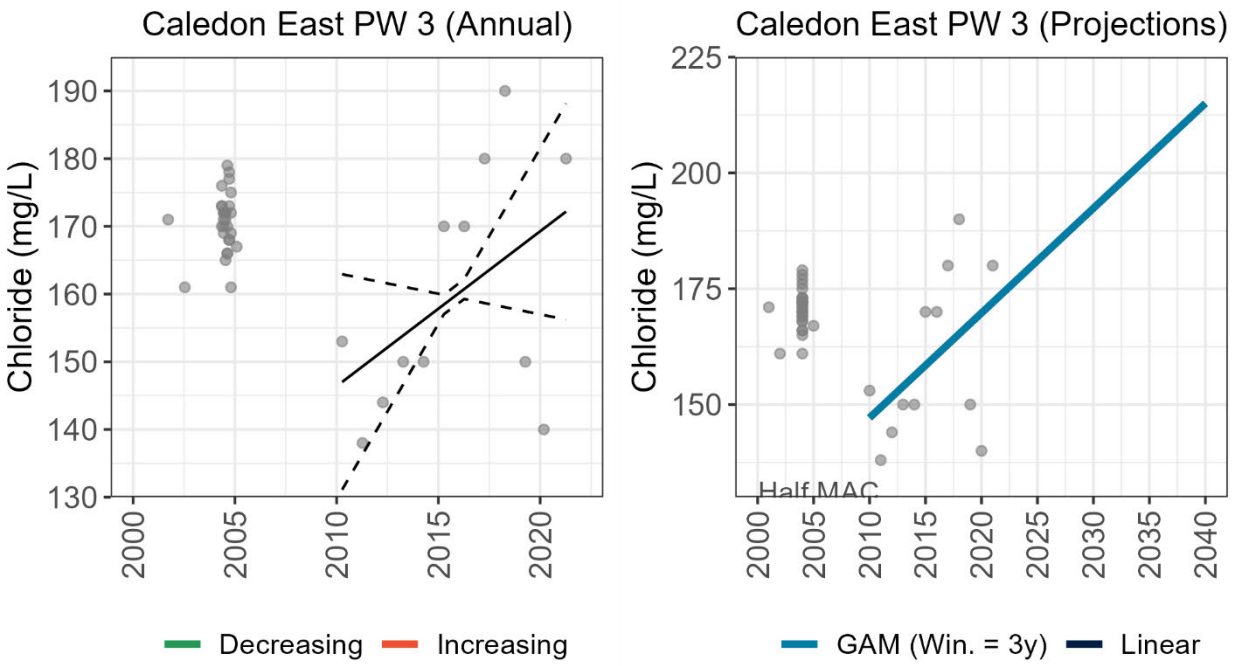


Figure D-80. Chloride concentration at Caledon East PW 3 Well is currently above the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing no significant trend. Chloride concentration is unlikely to exceed the MAC of 250 mg/L by 2040.

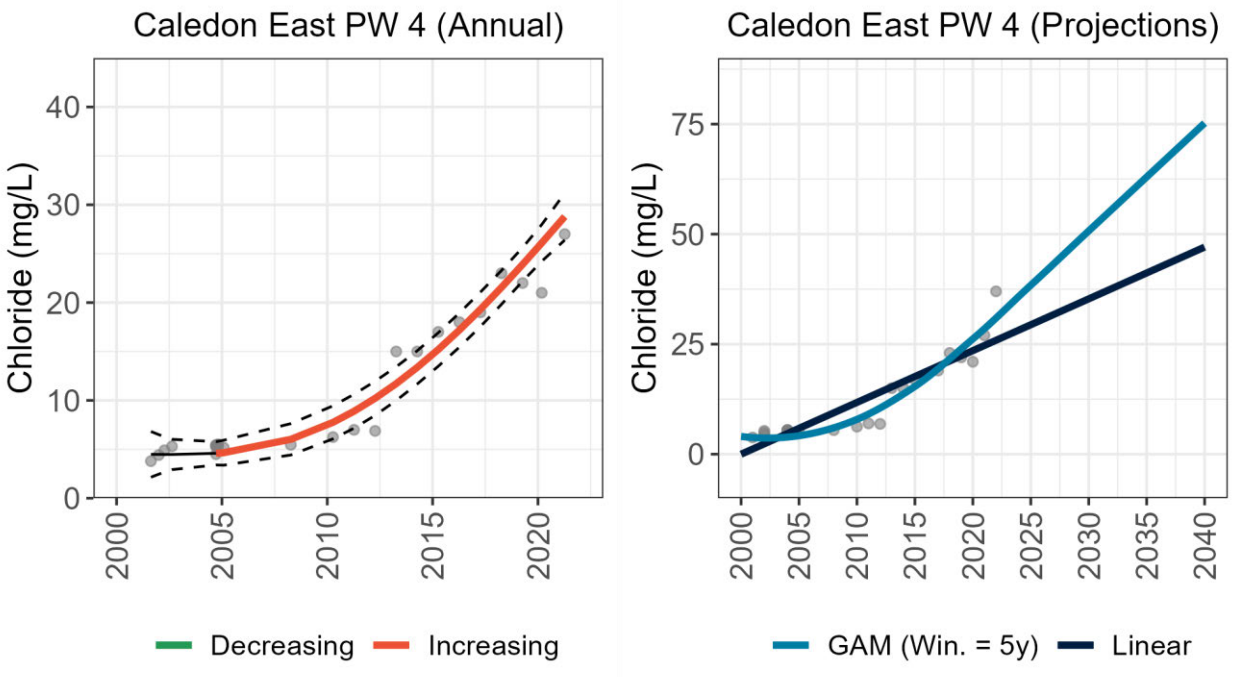


Figure D-81. Chloride concentration at Caledon East PW 4 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

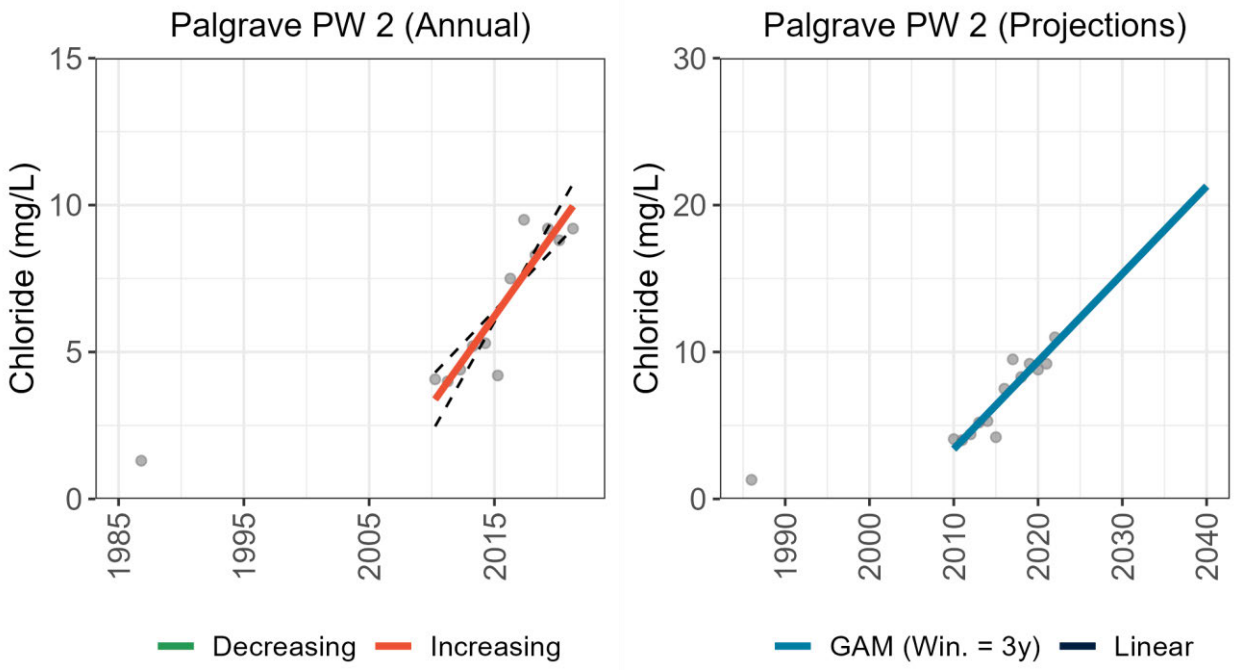


Figure D-82. Chloride concentration at Palgrave PW 2 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

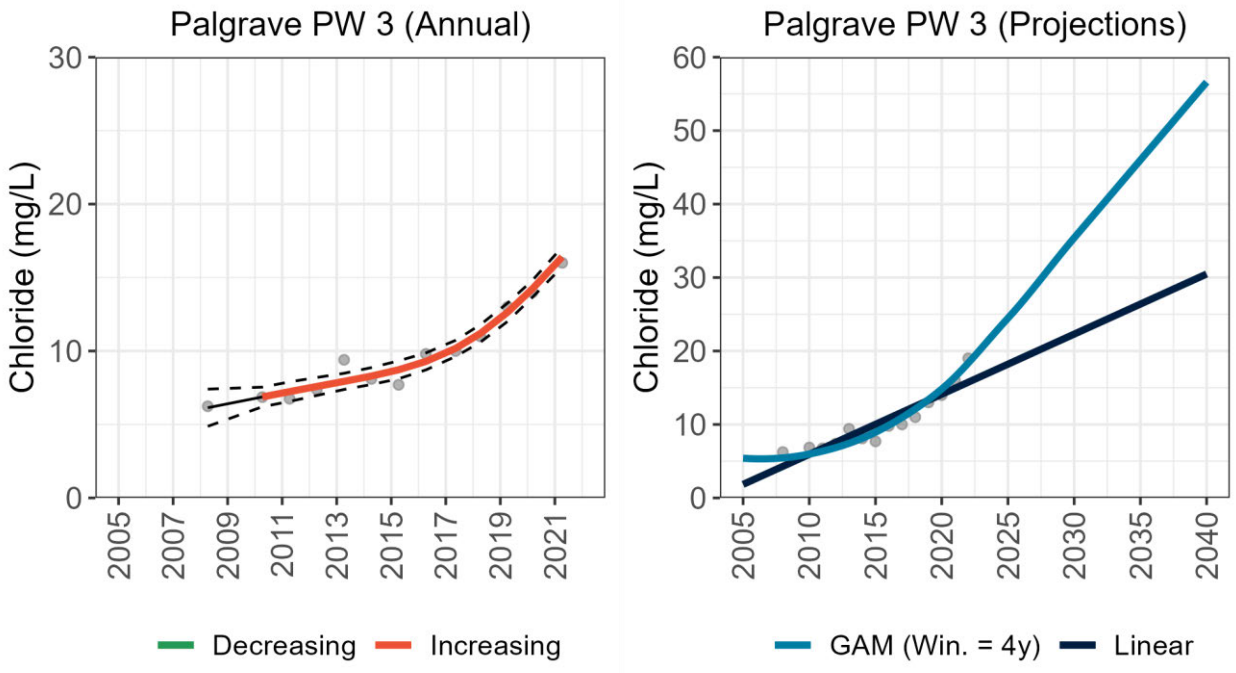


Figure D-83. Chloride concentration at Palgrave PW 3 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

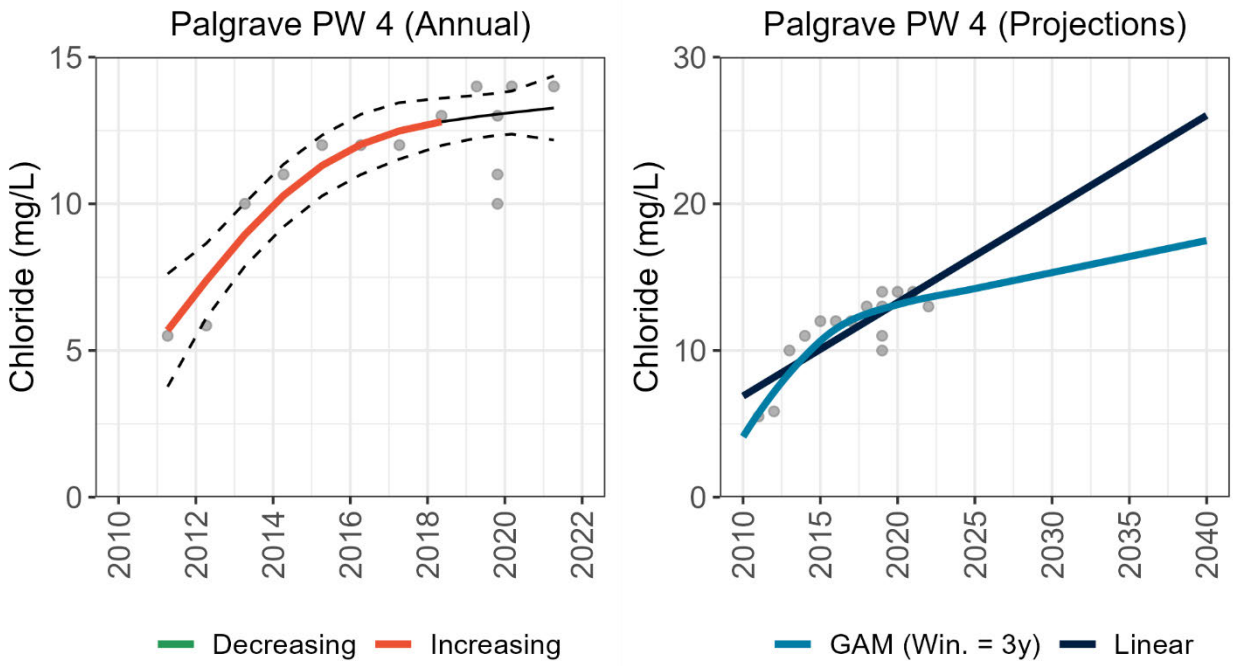


Figure D-84. Chloride concentration at Palgrave PW 4 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

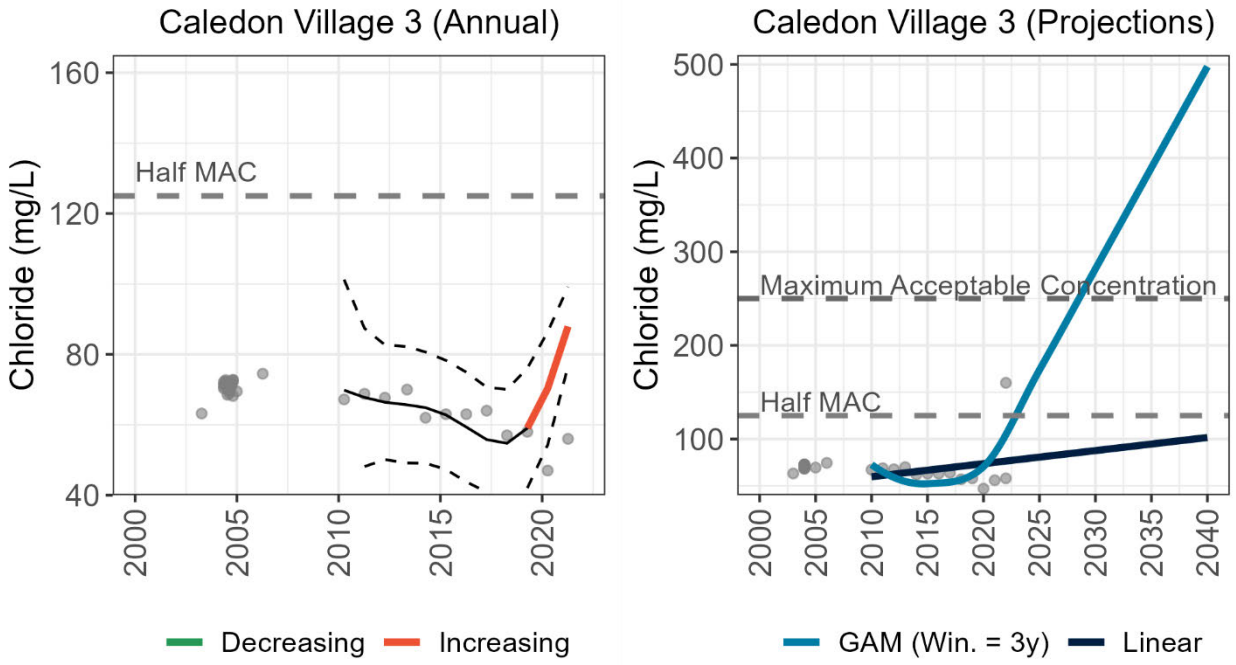


Figure D-85. Chloride concentration at Caledon Village 3 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is somewhat likely to exceed the MAC of 250 mg/L by 2040.

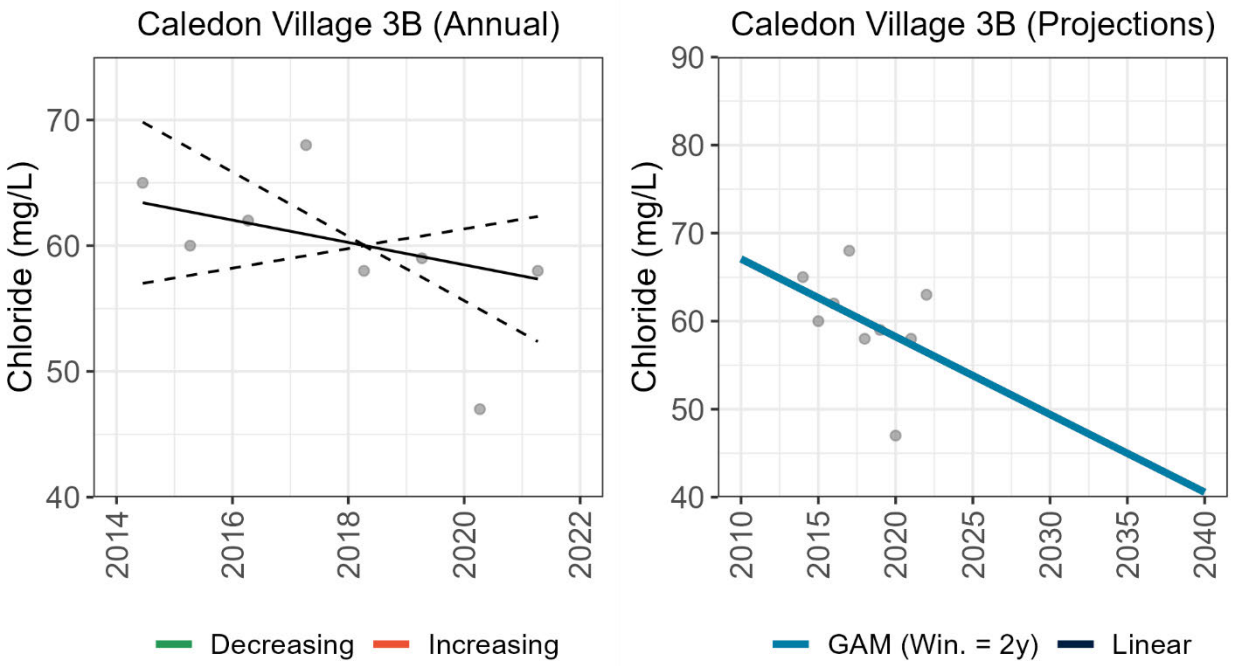


Figure D-86. Chloride concentration at Caledon Village 3B Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing no significant trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

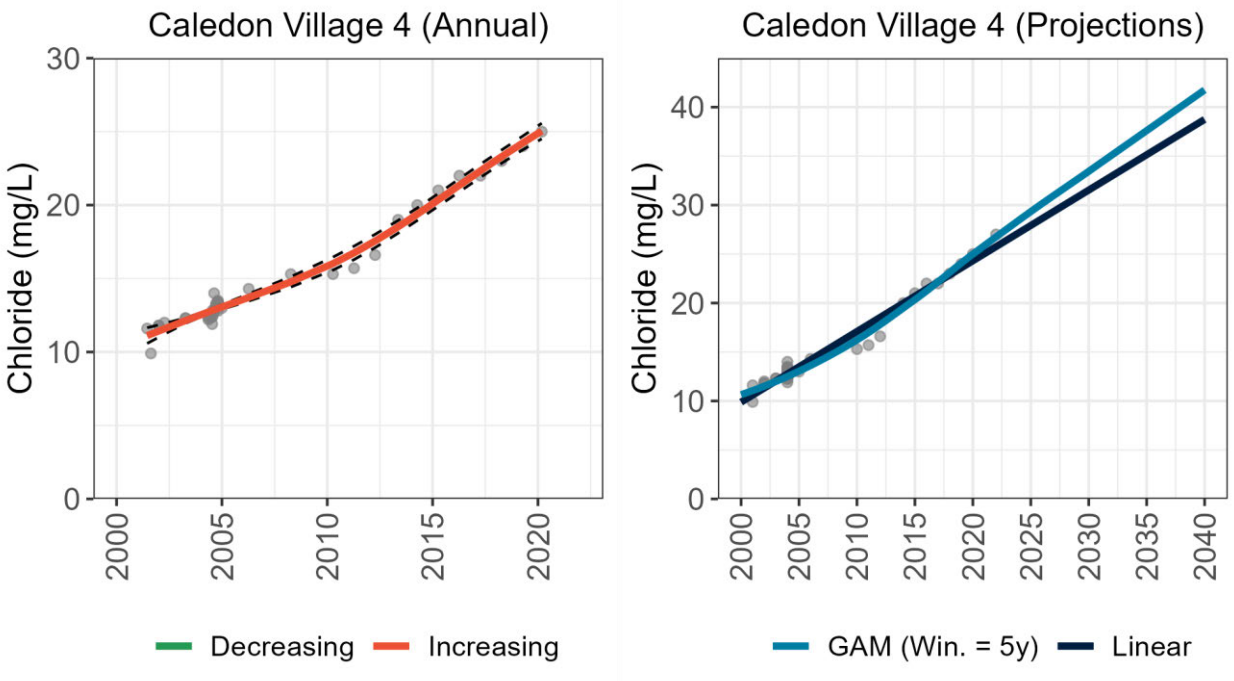


Figure D-87. Chloride concentration at Caledon Village 4 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

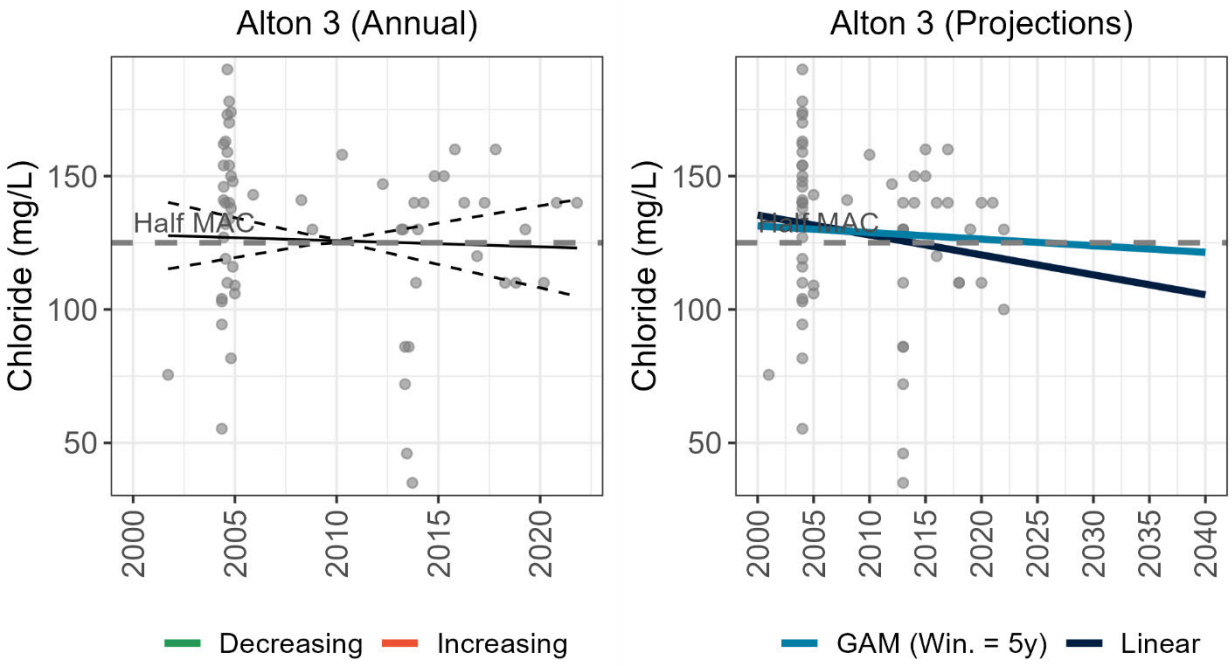


Figure D-88. Chloride concentration at Alton 3 Well is currently at the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing no significant trend. Chloride concentration is somewhat likely to exceed the half-MAC by 2040.

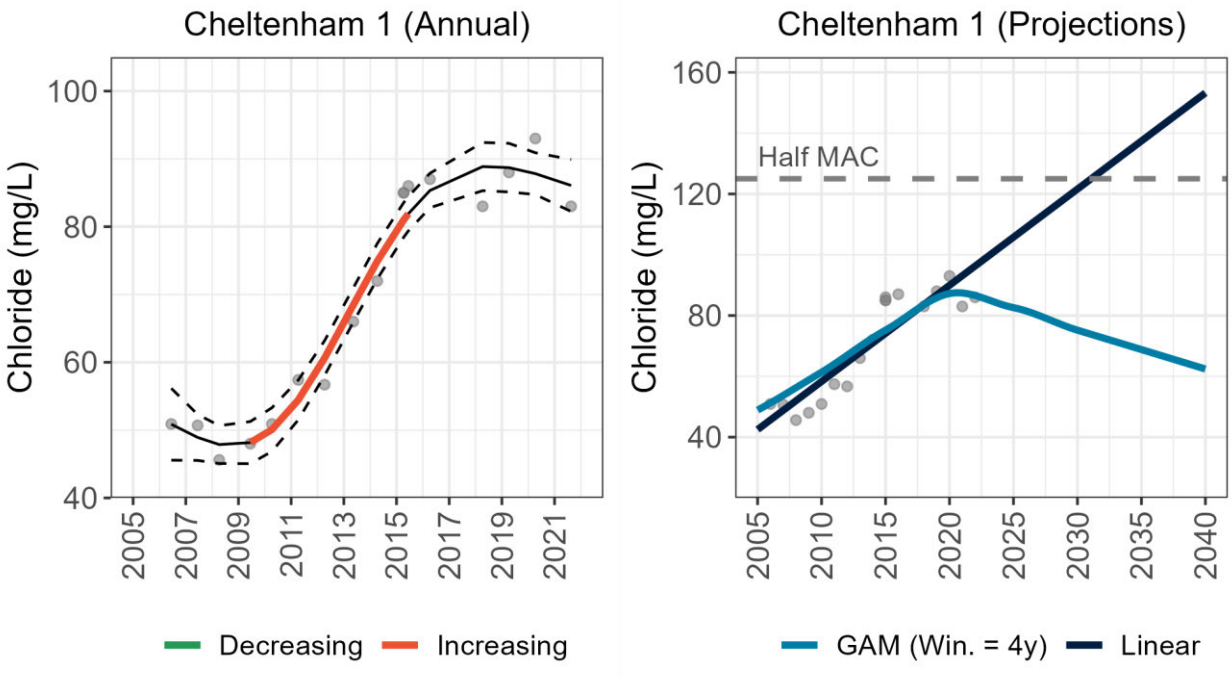


Figure D-89. Chloride concentration at Cheltenham 1 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing no significant trend. Chloride concentration is somewhat likely to exceed the half-MAC by 2040.

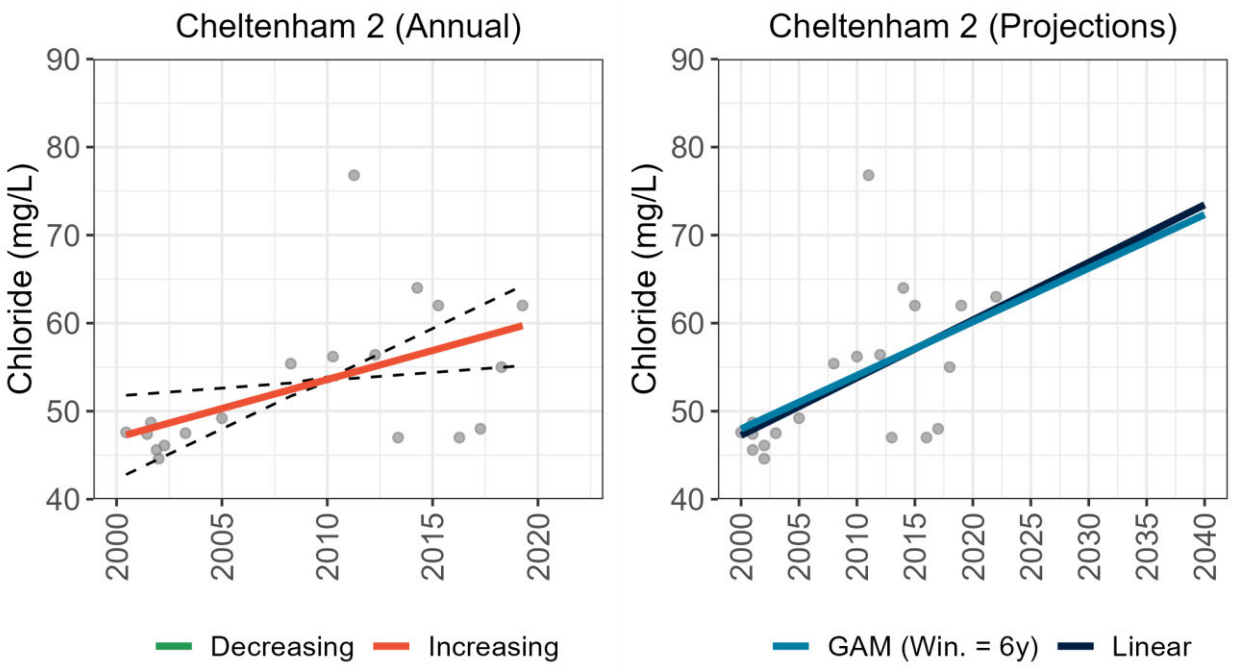


Figure D-90. Chloride concentration at Cheltenham 2 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

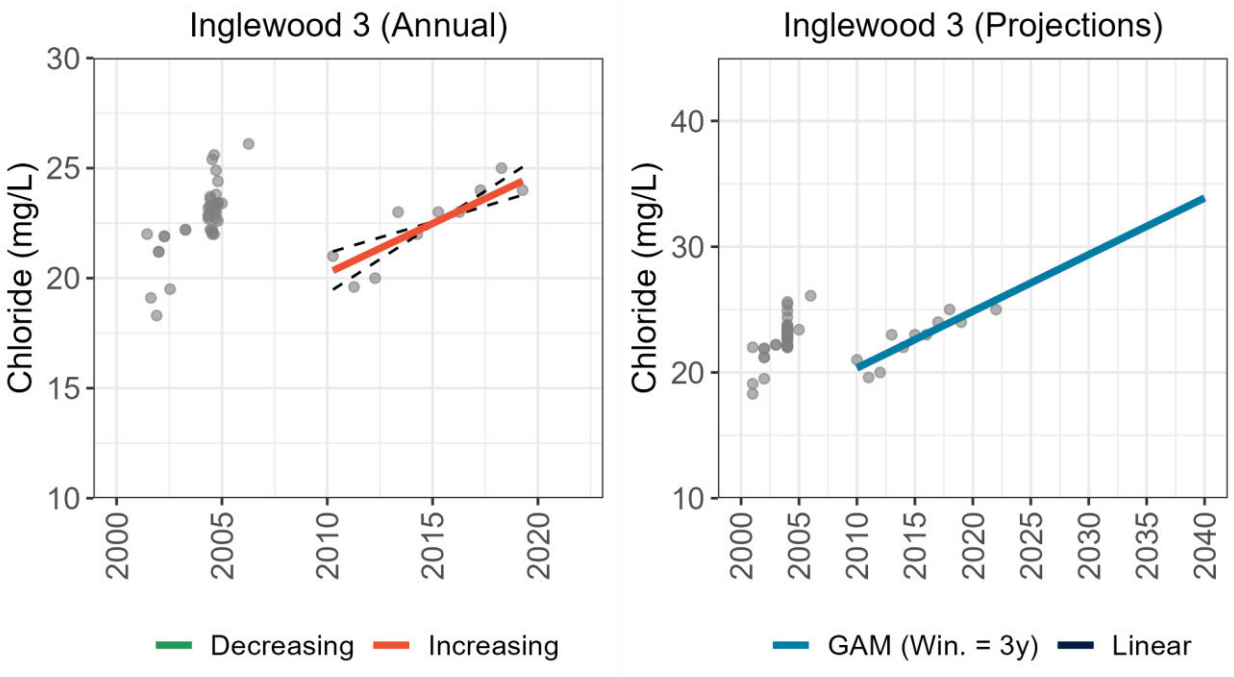


Figure D-91. Chloride concentration at Inglewood 3 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

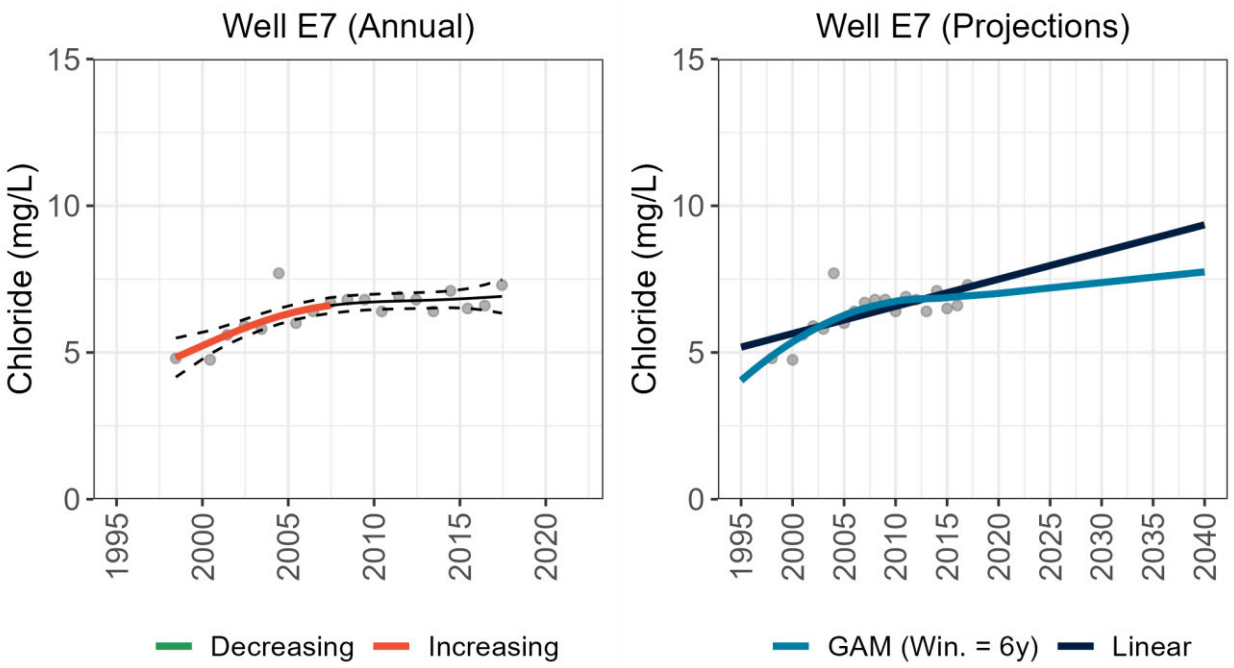


Figure D-92. Chloride concentration at Erin Well E7 is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing no significant trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

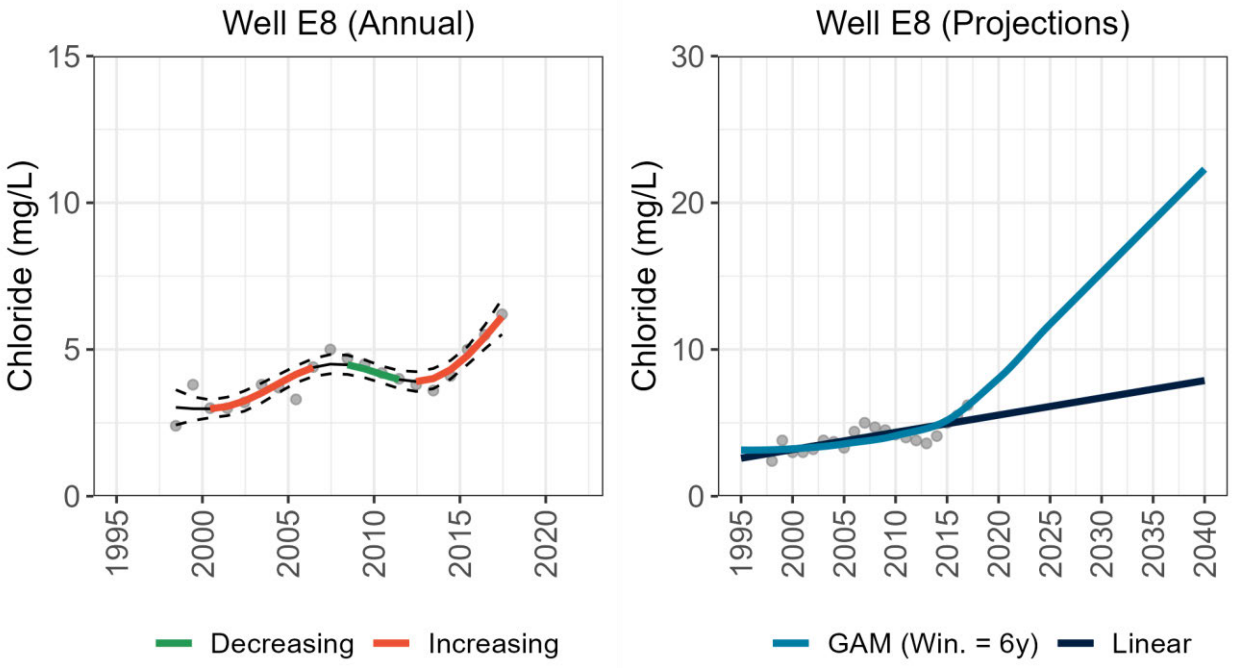


Figure D-93. Chloride concentration at Erin Well E8 is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

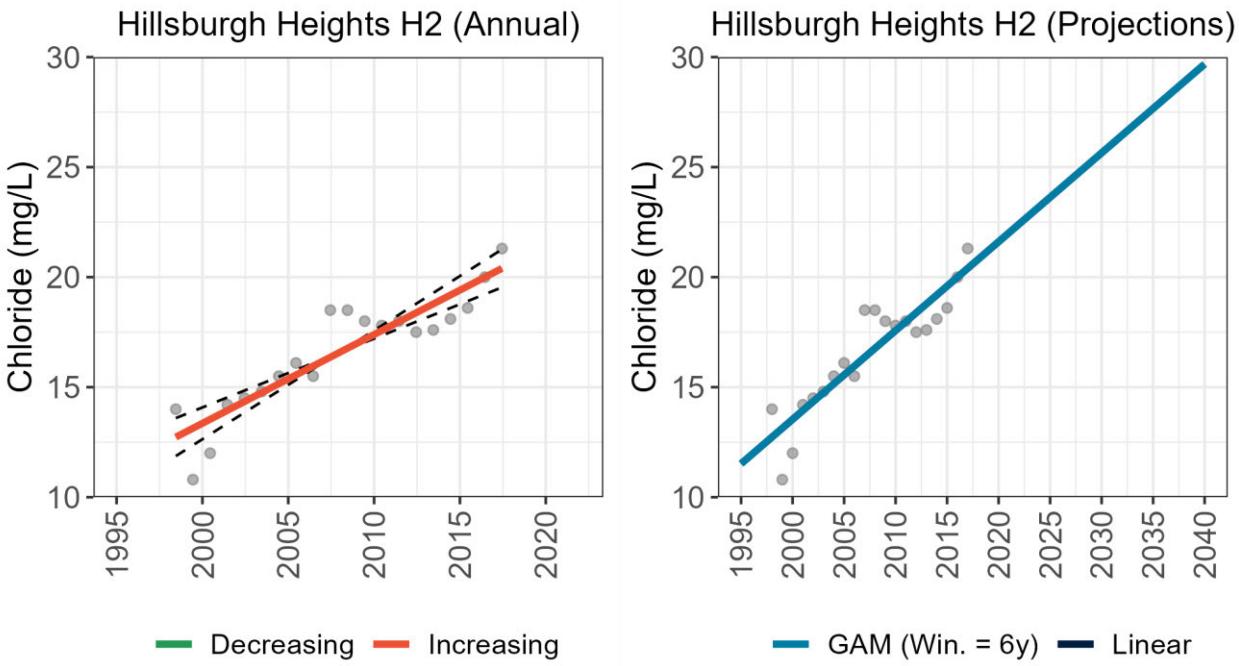


Figure D-94. Chloride concentration at Hillsburgh Heights H2 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

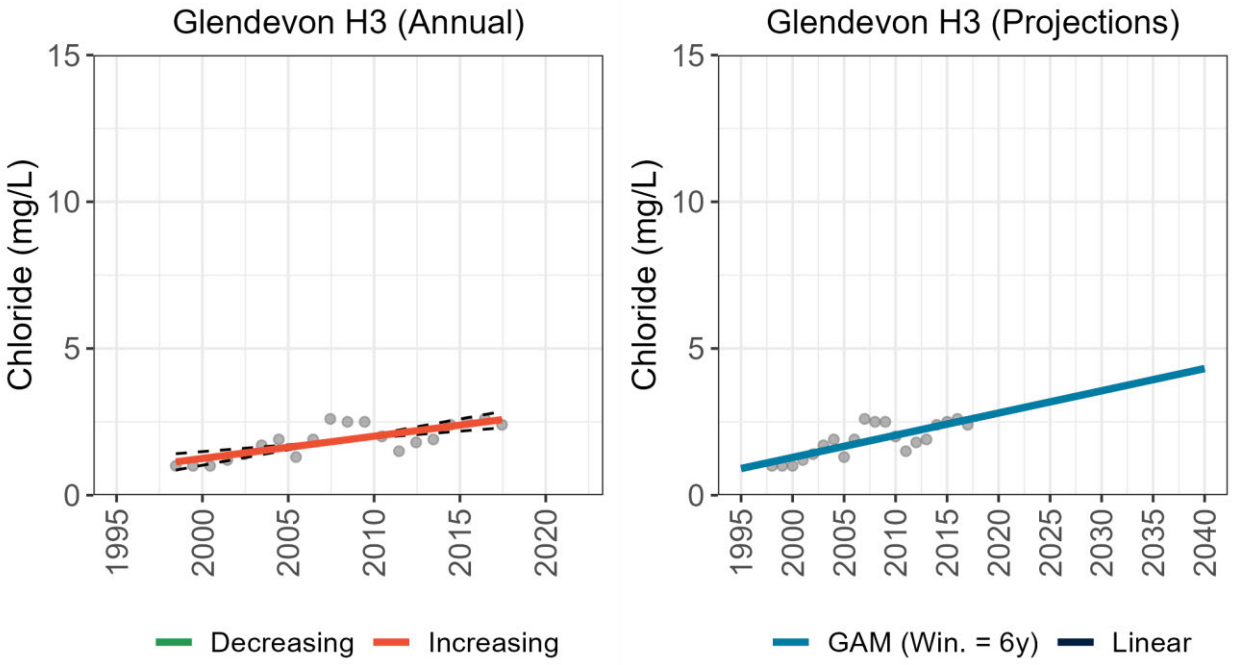


Figure D-95. Chloride concentration at Glendevon H3 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

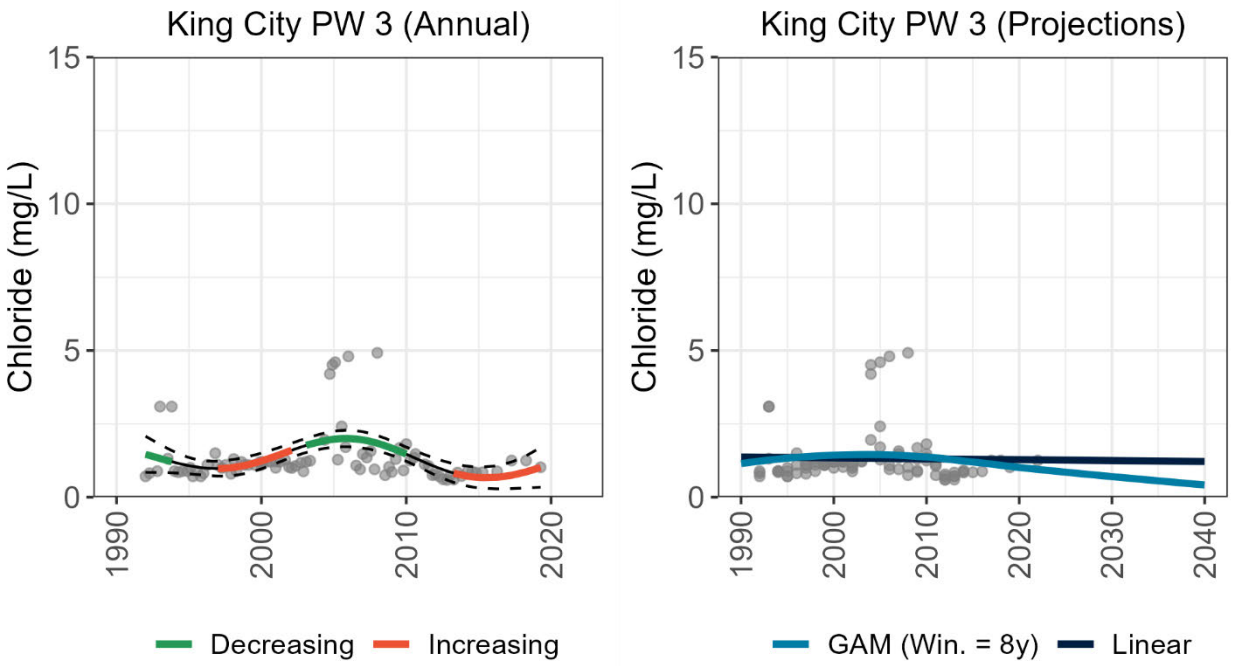


Figure D-96. Chloride concentration at King City PW 3 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

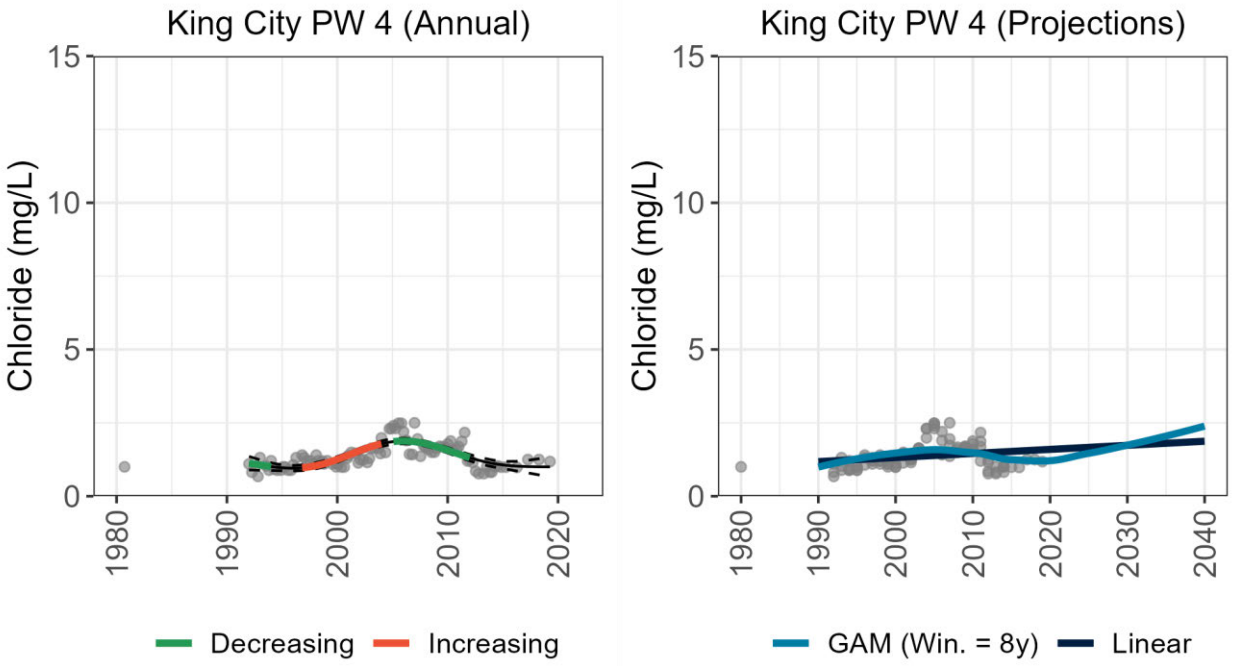


Figure D-97. Chloride concentration at King City PW 4 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing no significant trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

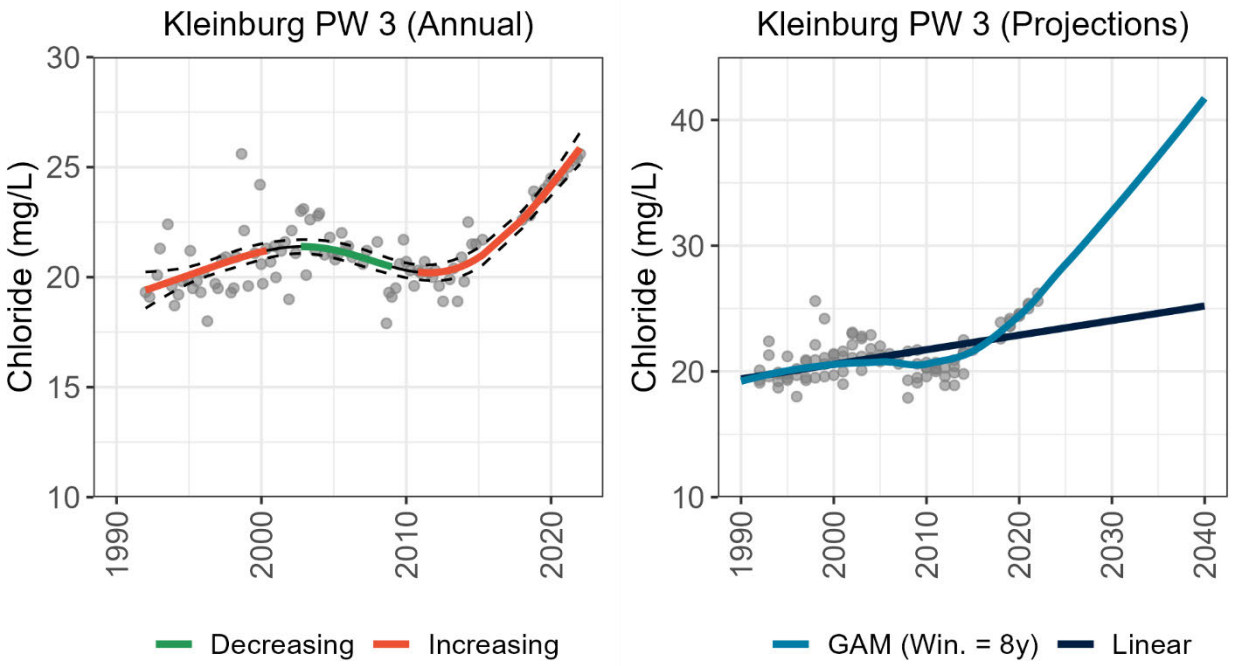


Figure D-98. Chloride concentration at Kleinburg PW 3 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

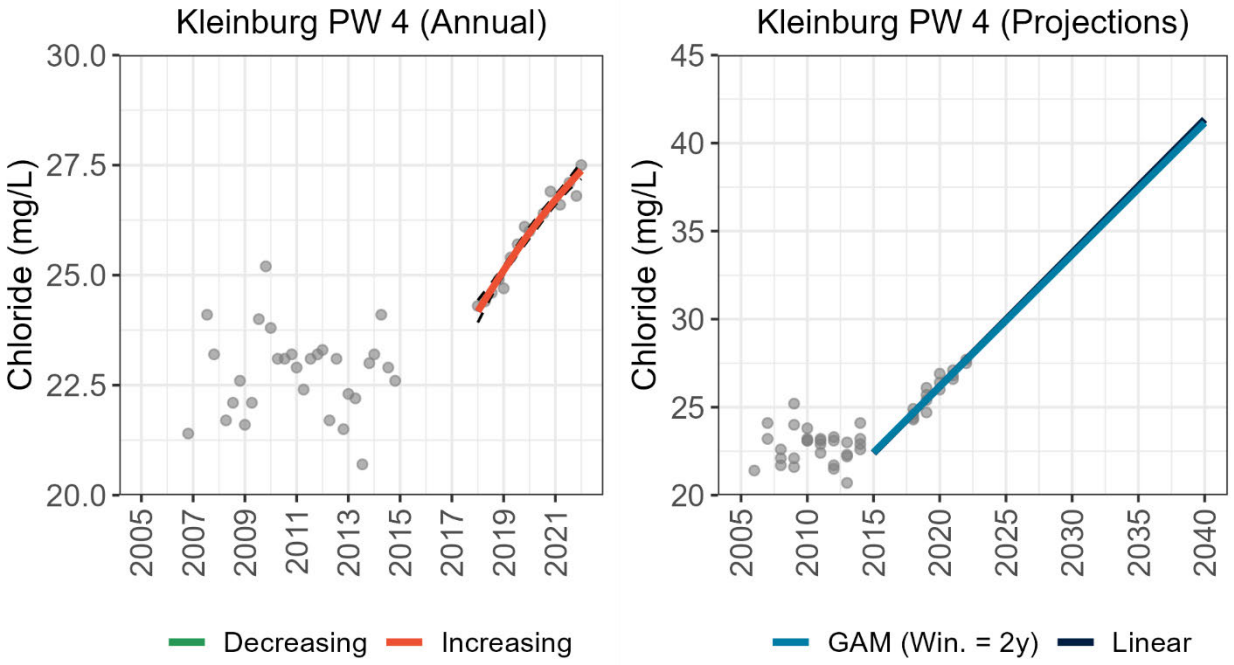


Figure D-99. Chloride concentration at Kleinburg PW 4 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

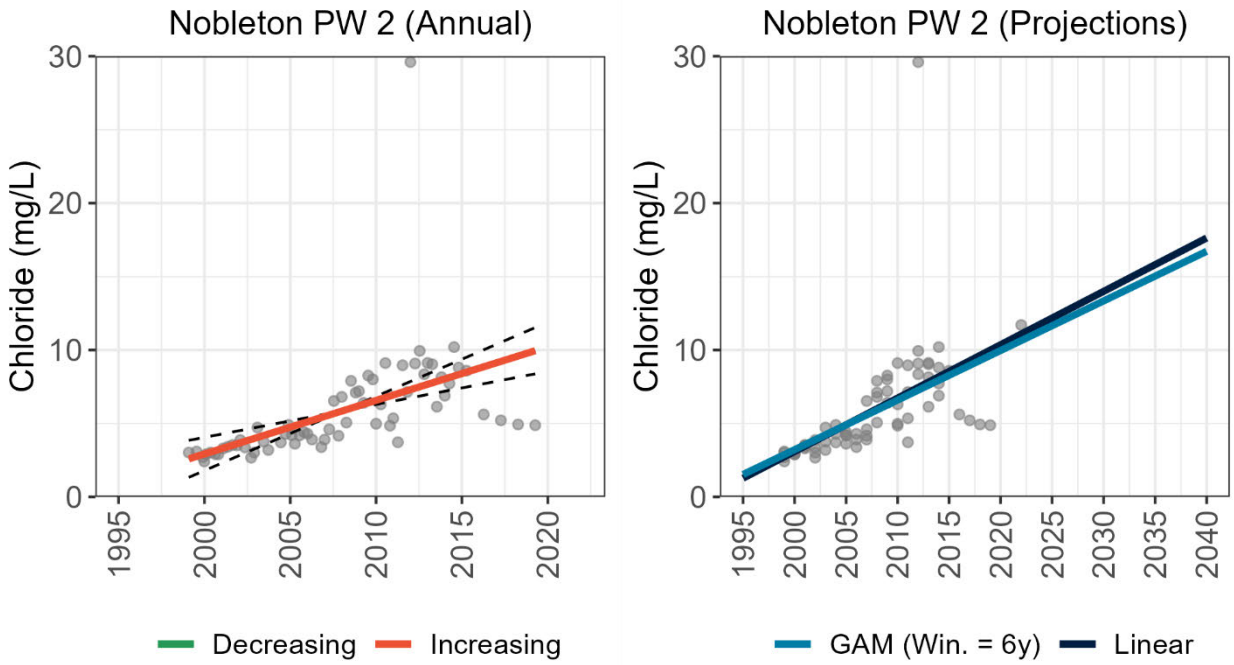


Figure D-100. Chloride concentration at Nobleton PW 2 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

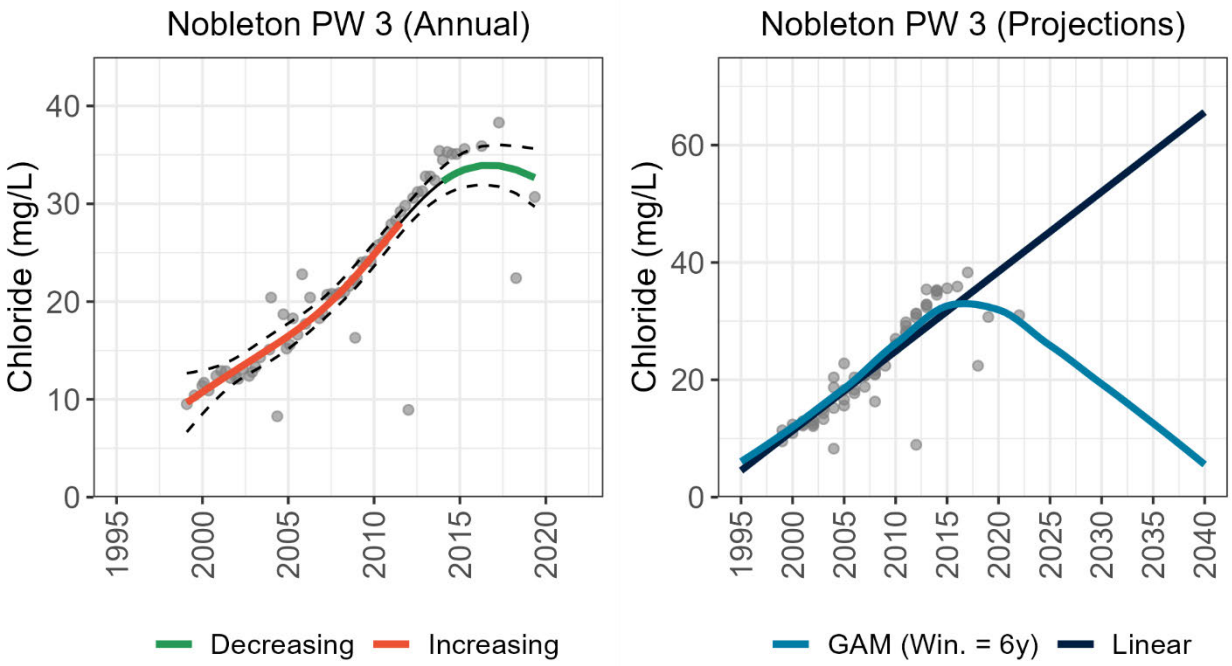


Figure D-101. Chloride concentration at Nobleton PW 3 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant negative trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

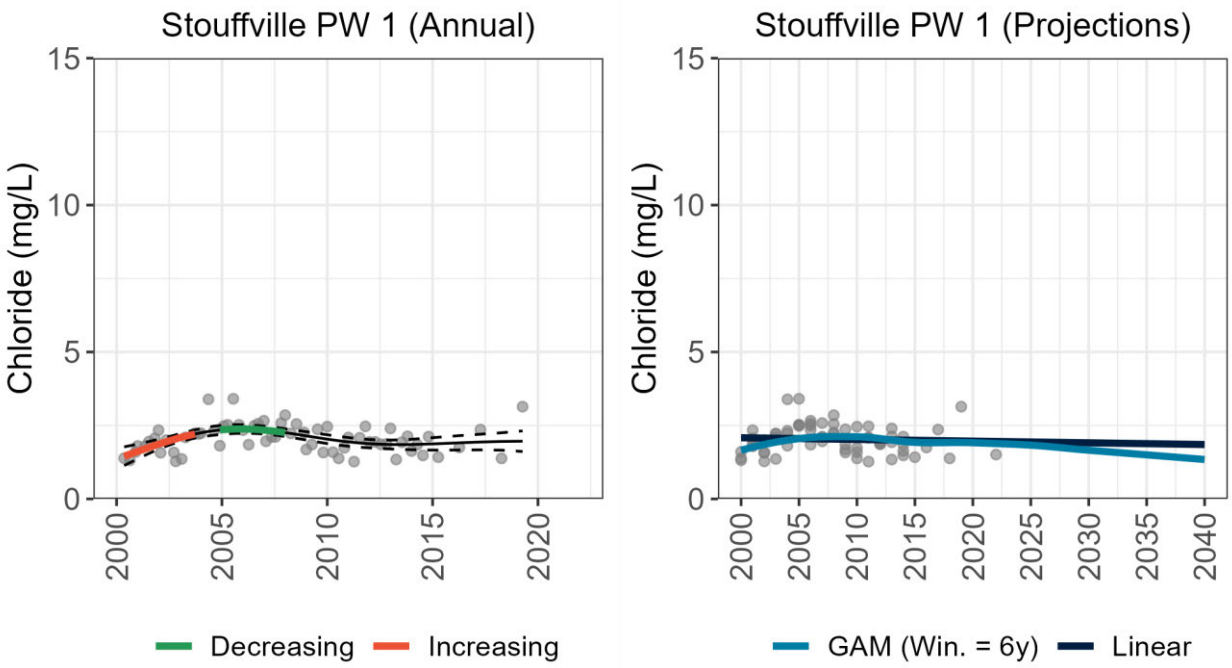


Figure D-102. Chloride concentration at Stouffville PW 1 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing no significant trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

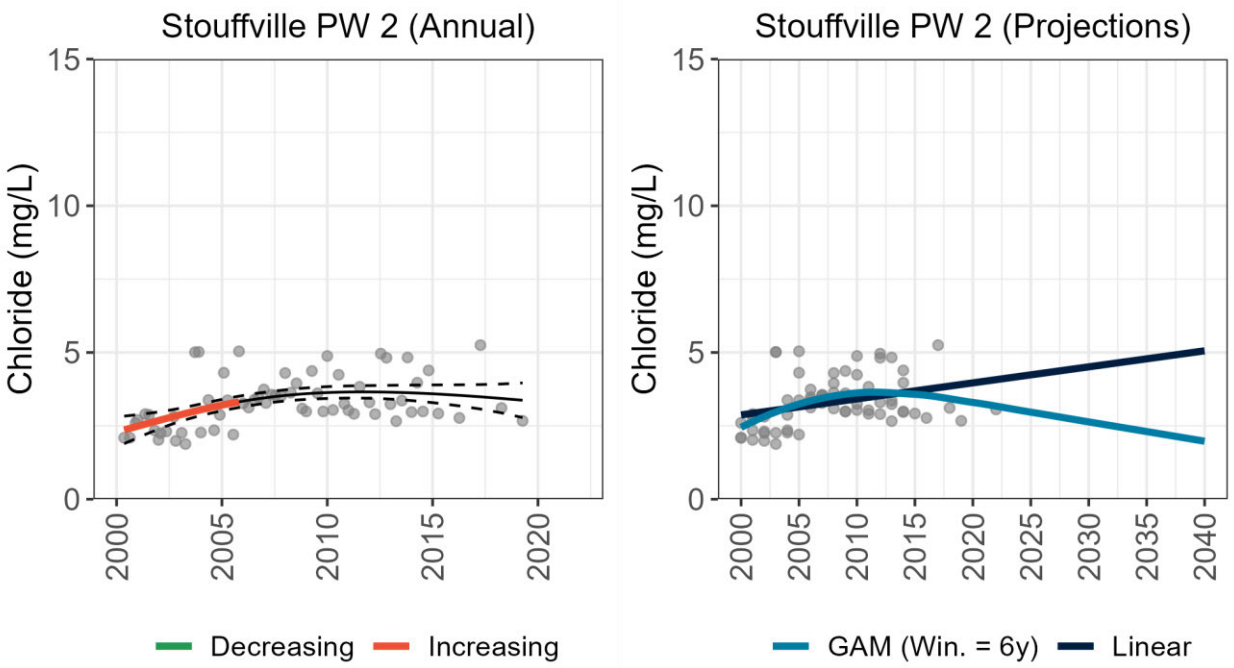


Figure D-103. Chloride concentration at Stouffville PW 2 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing no significant trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

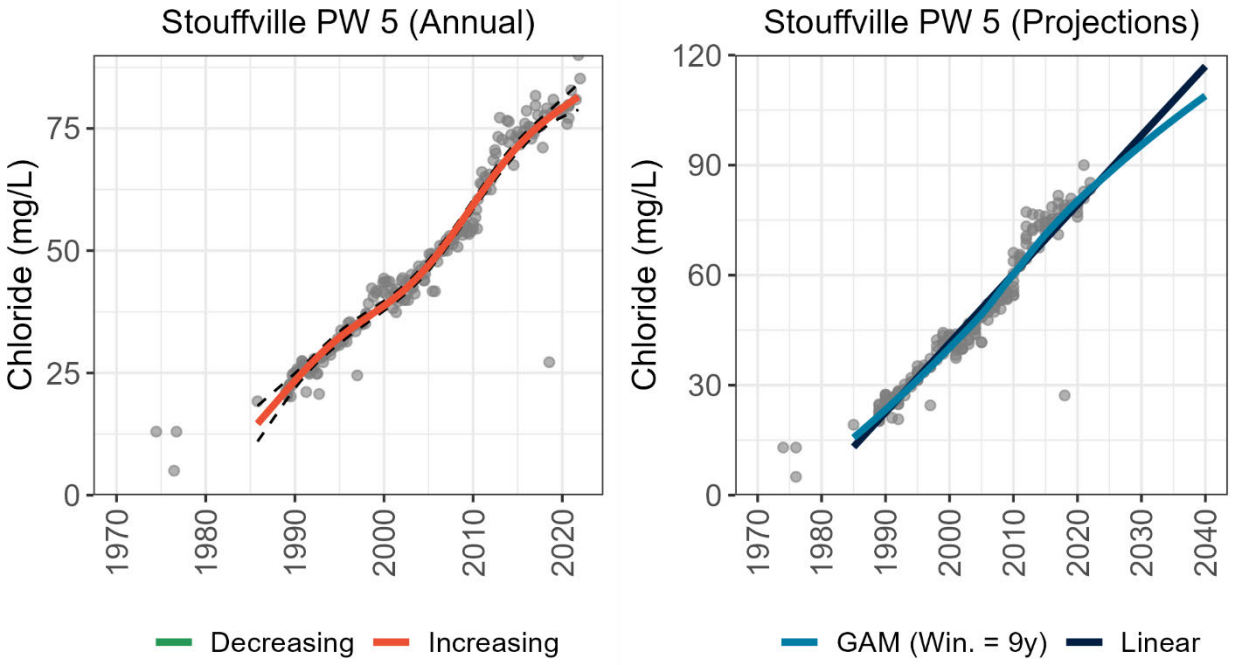


Figure D-104. Chloride concentration at Stouffville PW 5 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

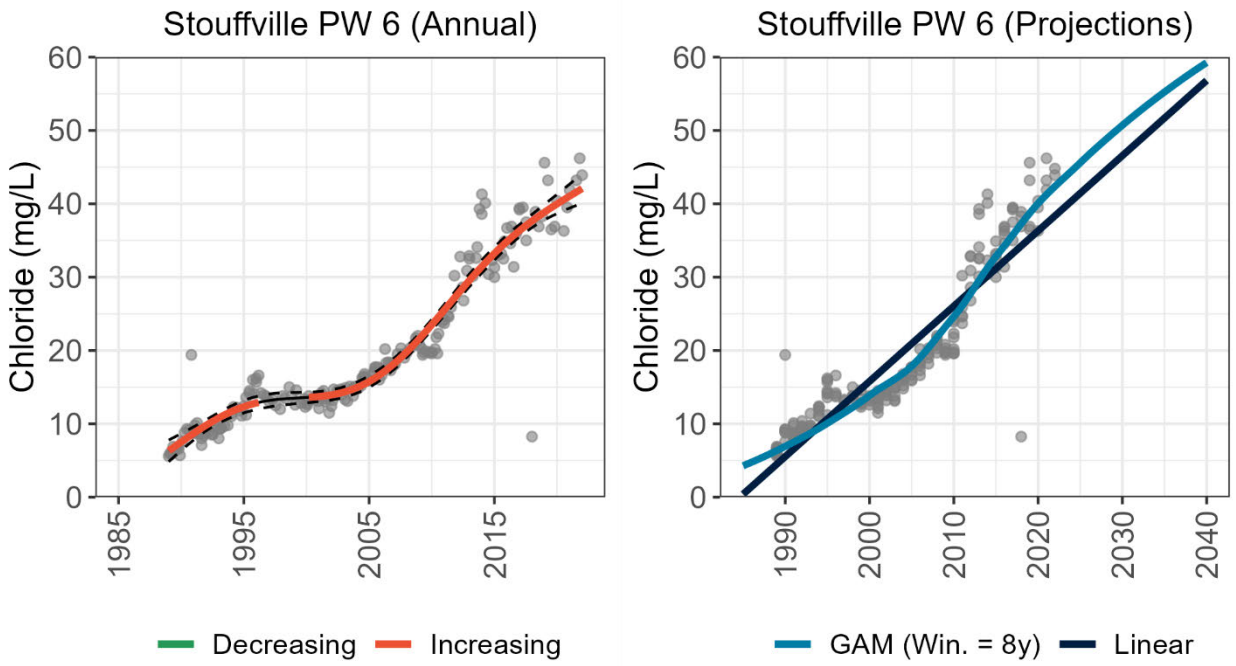


Figure D-105. Chloride concentration at Stouffville PW 6 Well is currently below the half-Maximum Acceptable Limit (MAC) of 125 mg/L and is showing a significant positive trend. Chloride concentration is unlikely to exceed the half-MAC by 2040.

Sodium

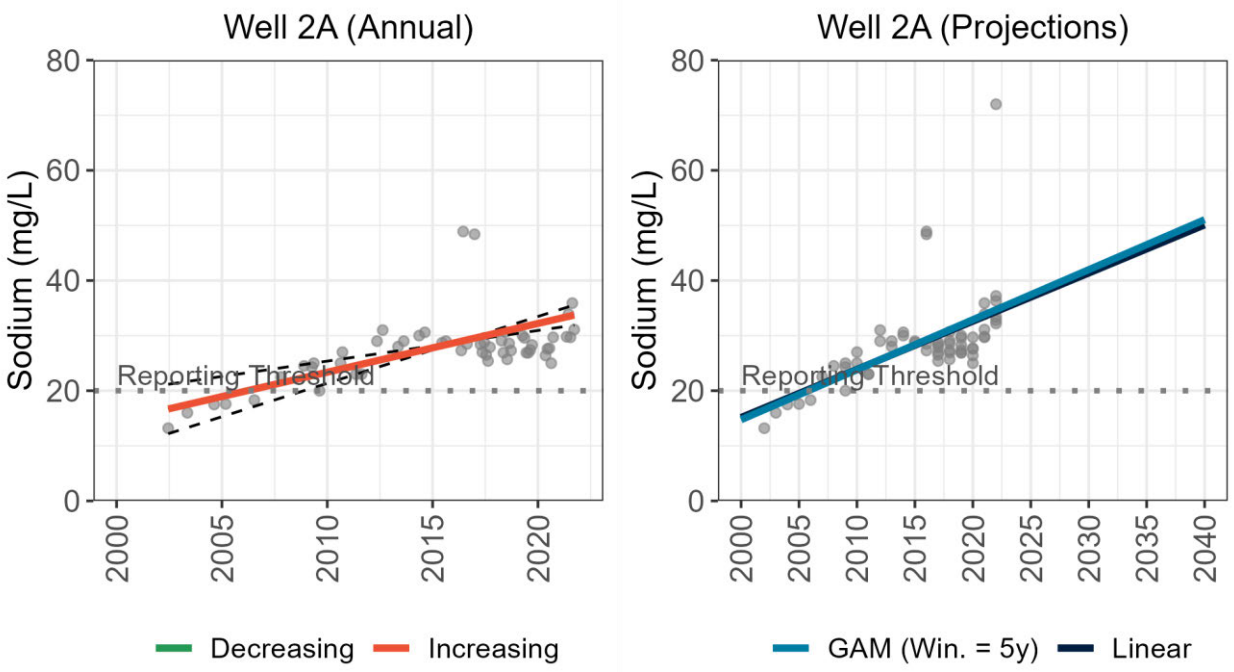


Figure D-106. Sodium concentration at Orangeville Well 2A is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing a significant positive trend and is unlikely to exceed the half-MAC by 2040.

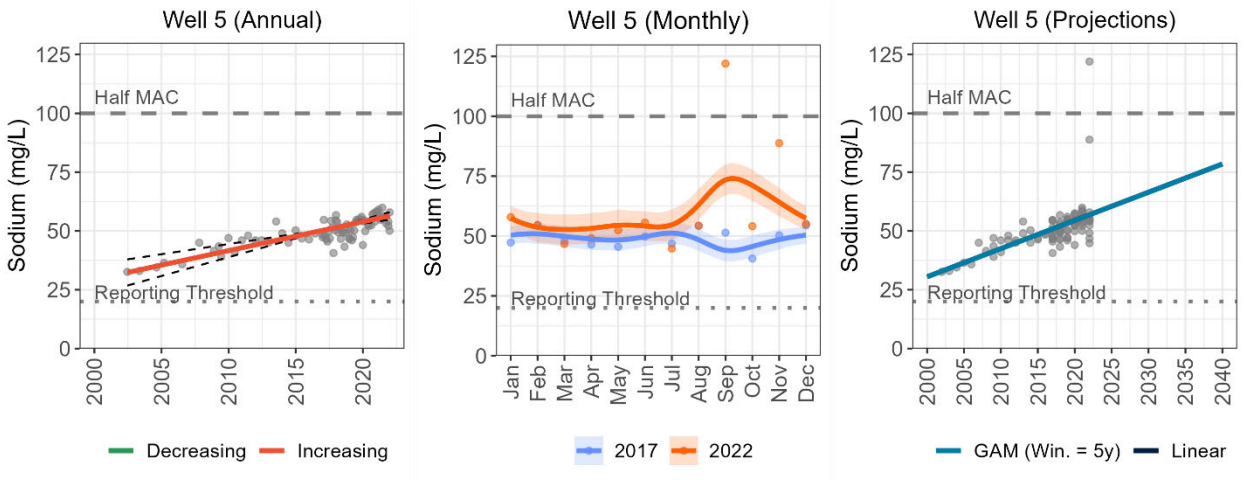


Figure D-107. Sodium concentration at Orangeville Well 5 is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing a significant positive trend and is unlikely to exceed the half-MAC by 2040.

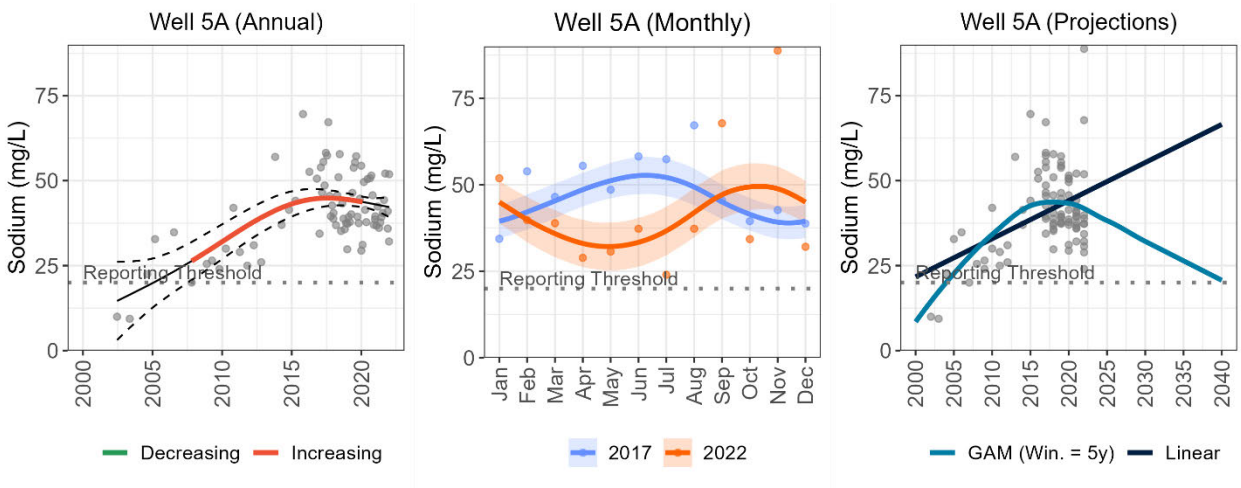


Figure D-108. Sodium concentration at Orangeville Well 5A is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing no significant trend and is unlikely to exceed the half-MAC by 2040.

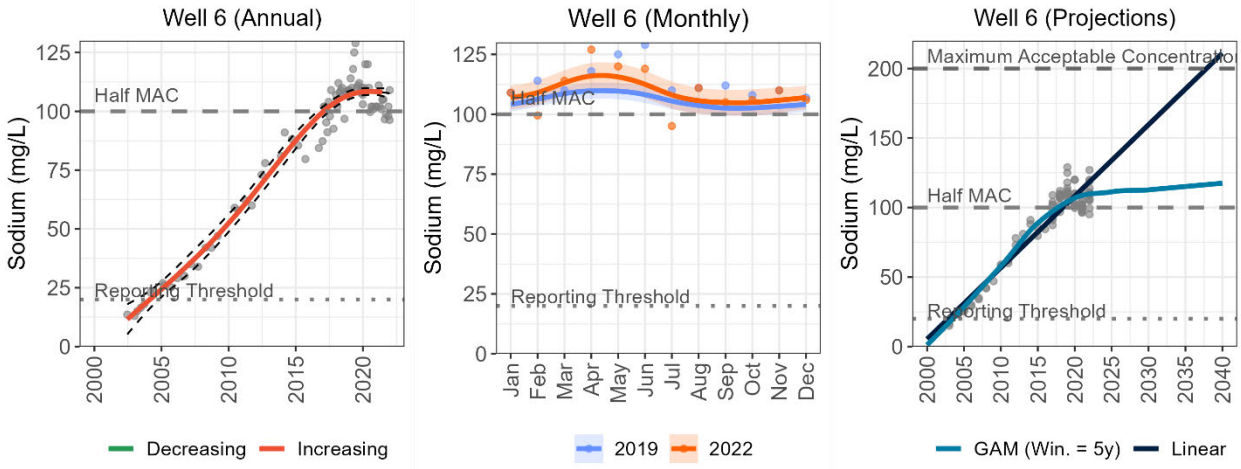


Figure D-109. Sodium concentration at Orangeville Well 6 is currently above the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing a significant positive trend and is somewhat likely to exceed the MAC of 200 mg/L by 2040.

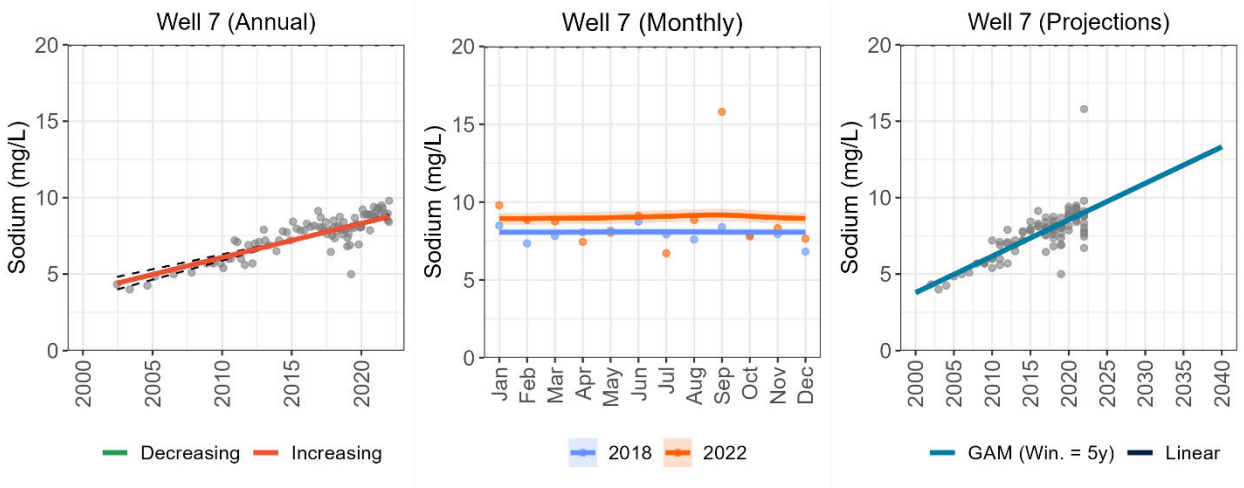


Figure D-110. Sodium concentration at Orangeville Well 7 is currently below the Reporting Trigger of 20 mg/L and is showing a significant positive trend. Sodium concentration is unlikely to exceed the Reporting Trigger by 2040.

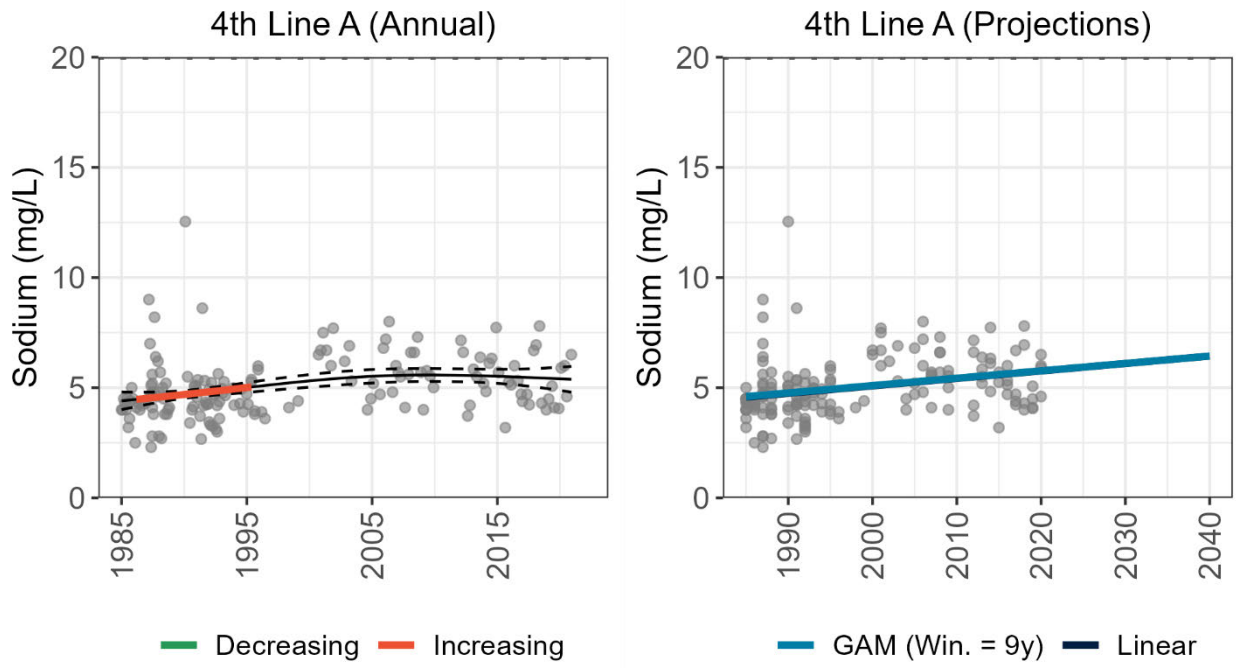


Figure D-111. Sodium concentration at 4th Line A Well is currently below the Reporting Trigger of 20 mg/L and is showing no significant trend. Sodium concentration is unlikely to exceed the Reporting Trigger by 2040.

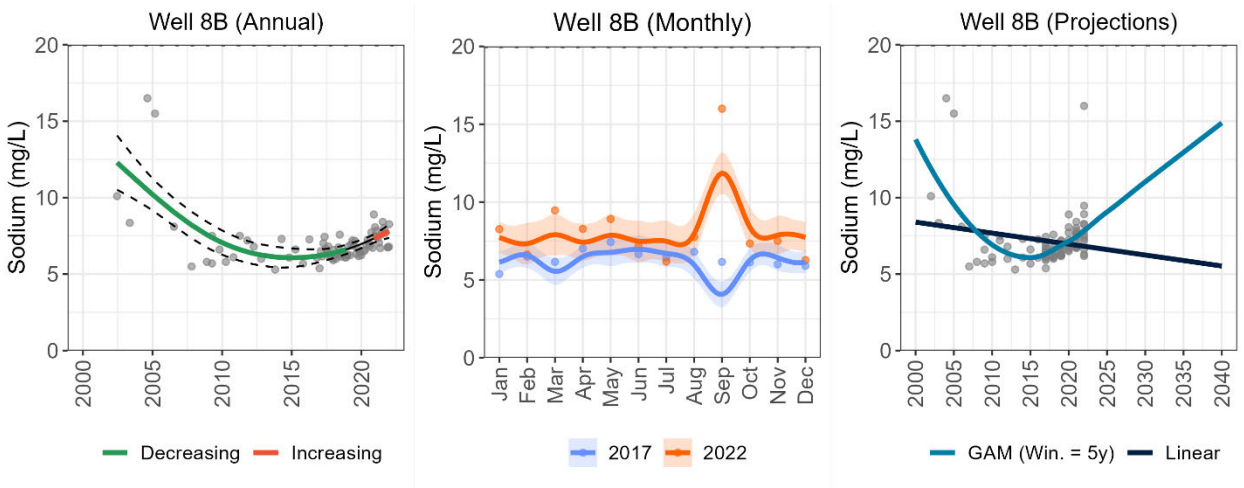


Figure D-112. Sodium concentration at Orangeville Well 8B is currently below the Reporting Trigger of 20 mg/L and is showing a significant positive trend. Sodium concentration is unlikely to exceed the Reporting Trigger by 2040.

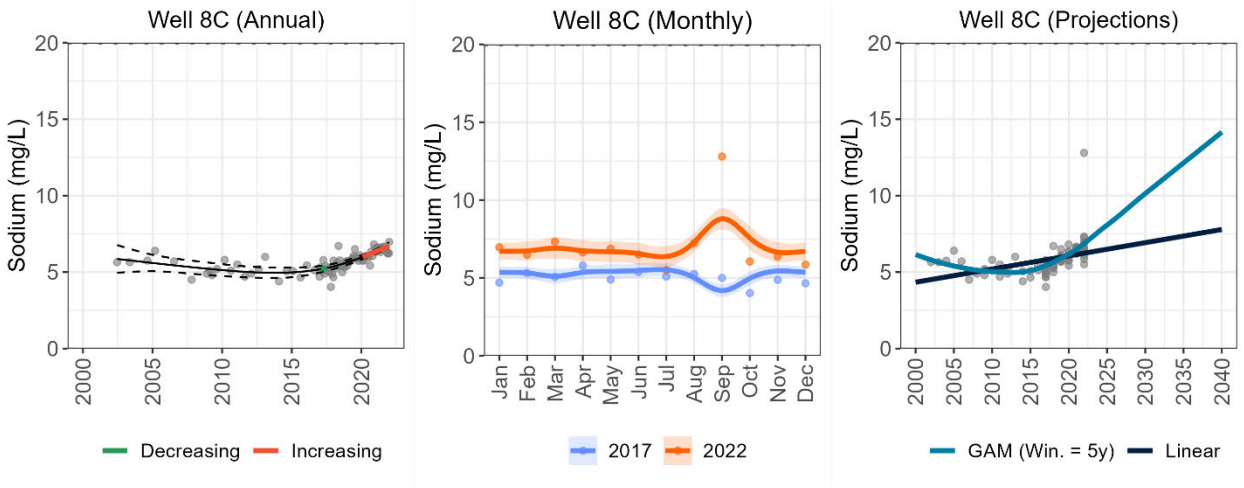


Figure D-113. Sodium concentration at Orangeville Well 8C is currently below the Reporting Trigger of 20 mg/L and is showing a significant positive trend. Sodium concentration is unlikely to exceed the Reporting Trigger by 2040.

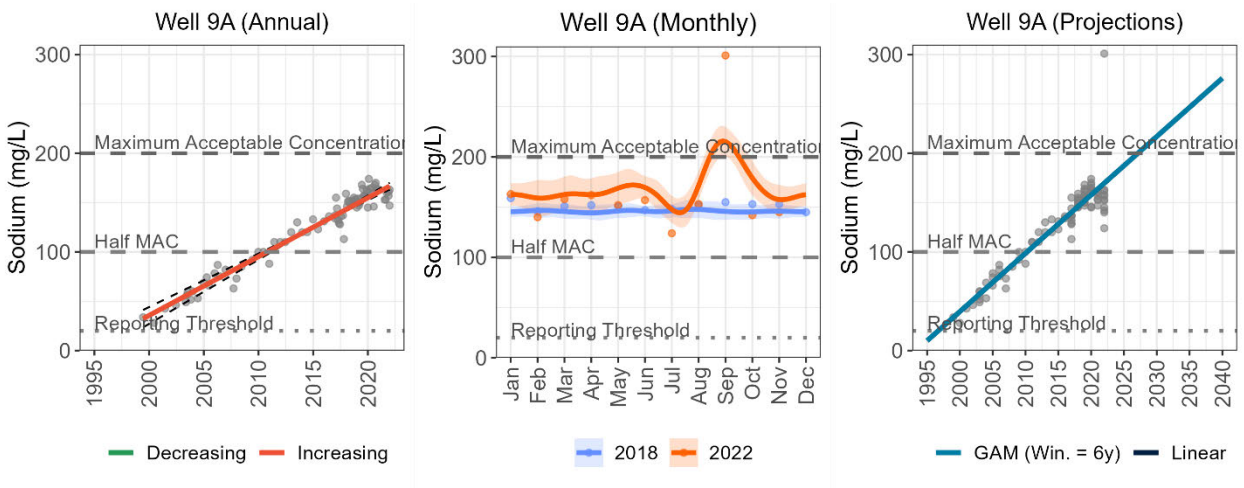


Figure D-114. Sodium concentration at Orangeville Well 9A is currently above both the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing a significant positive trend and is highly likely to exceed the MAC of 200 mg/L by 2040.

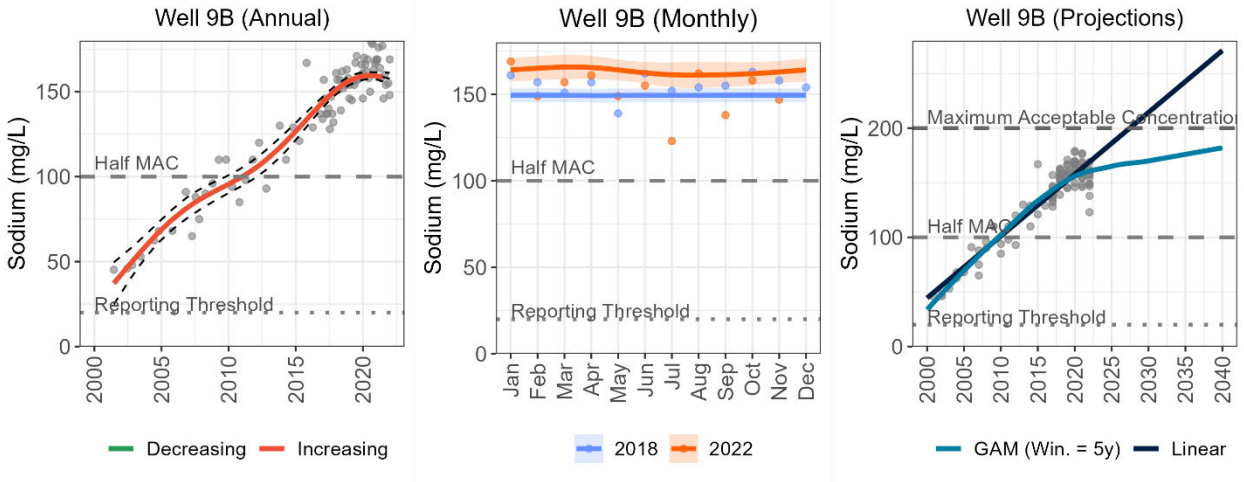


Figure D-115. Sodium concentration at Orangeville Well 9B is currently above the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing a significant positive trend and is somewhat likely to exceed the MAC of 200 mg/L by 2040.

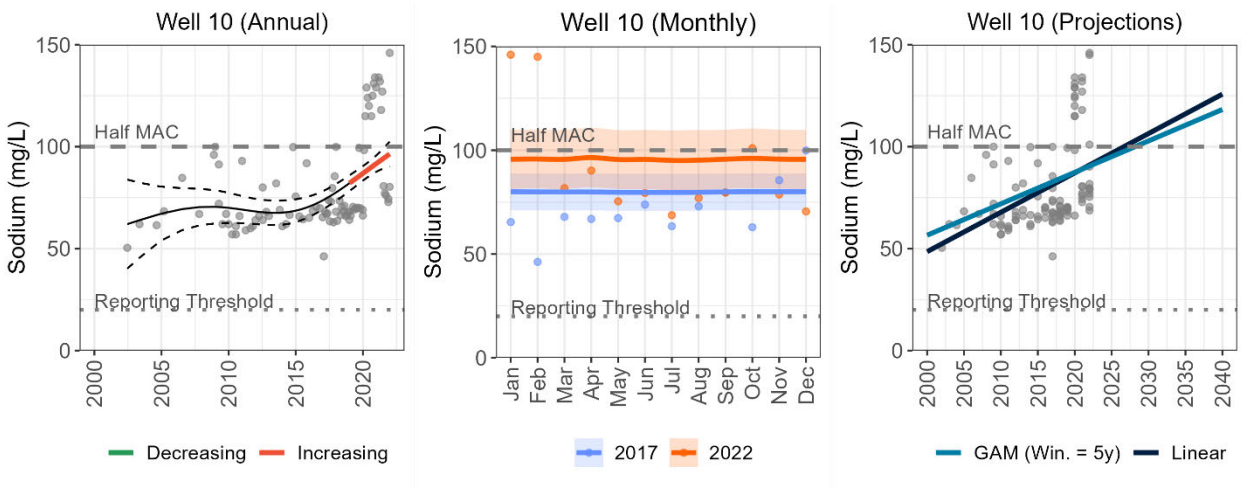


Figure D-116. Sodium concentration at Orangeville Well 10 is currently above the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing a significant positive trend and is unlikely to exceed the MAC of 200 mg/L by 2040.

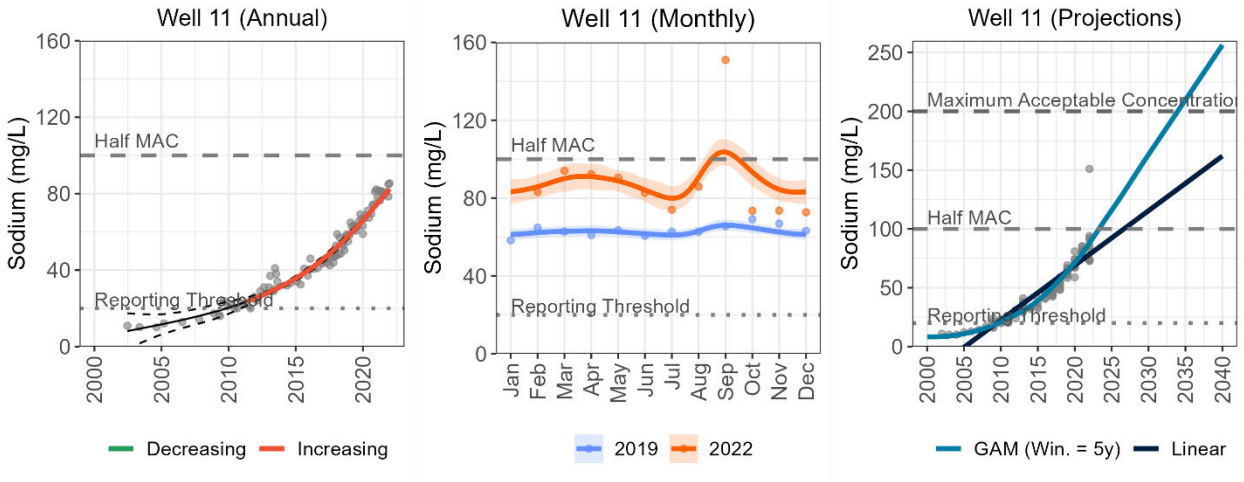


Figure D-117. Sodium concentration at Orangeville Well 11 is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing a significant positive trend and is highly likely to exceed the half-MAC and somewhat likely to exceed the MAC of 200 mg/L by 2040.

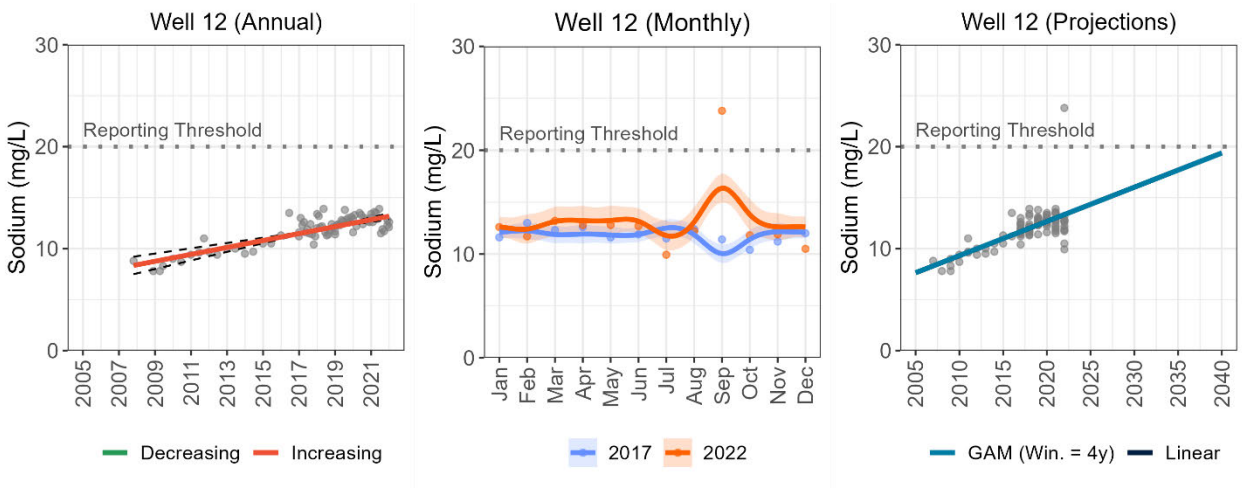


Figure D-118. Sodium concentration at Orangeville Well 12 is currently below the Reporting Trigger of 20 mg/L and is showing a significant positive trend. Sodium concentration is unlikely to exceed the Reporting Trigger by 2040.

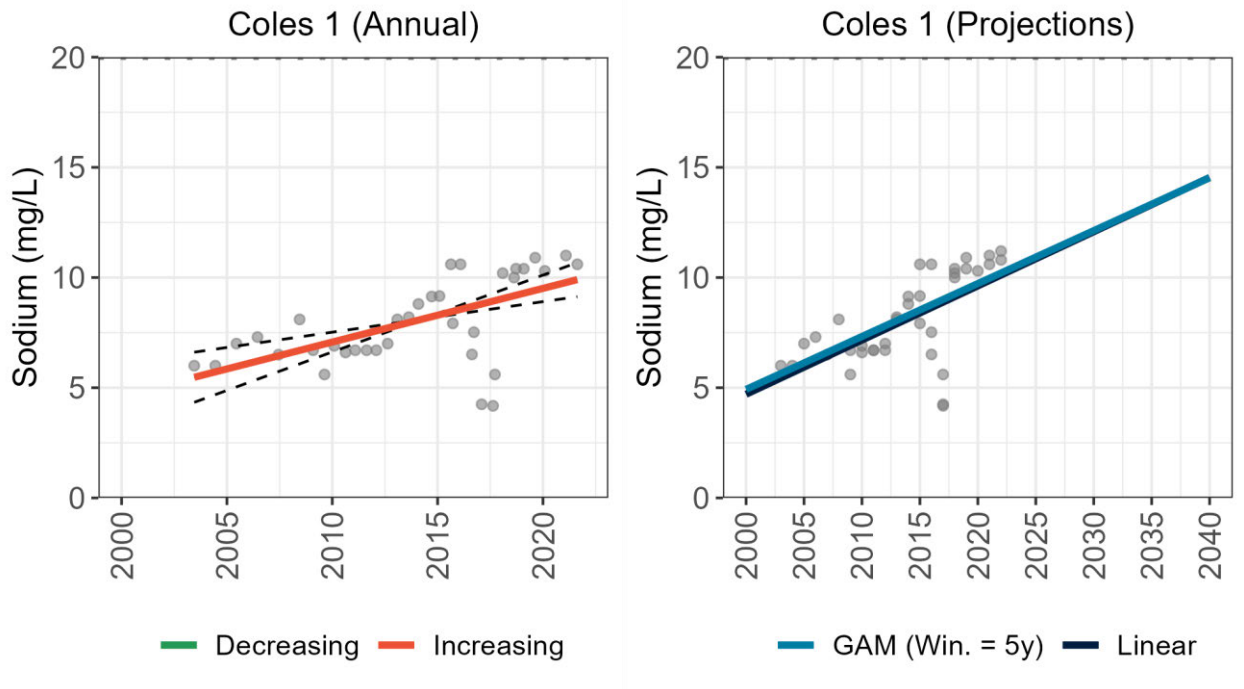


Figure D-119. Sodium concentration at Coles 1 Well is currently below the Reporting Trigger of 20 mg/L and is showing a significant positive trend. Sodium concentration is unlikely to exceed the Reporting Trigger by 2040.

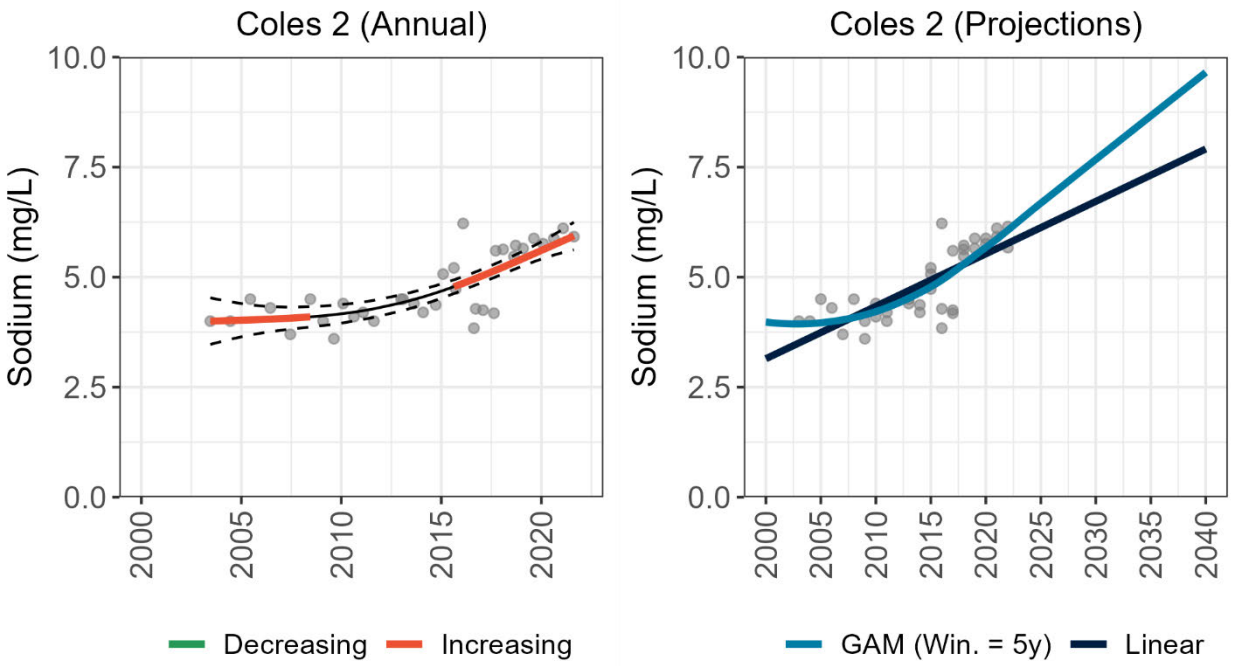


Figure D-120. Sodium concentration at Coles 2 Well is currently below the Reporting Trigger of 20 mg/L and is showing a significant positive trend. Sodium concentration is unlikely to exceed the Reporting Trigger by 2040.

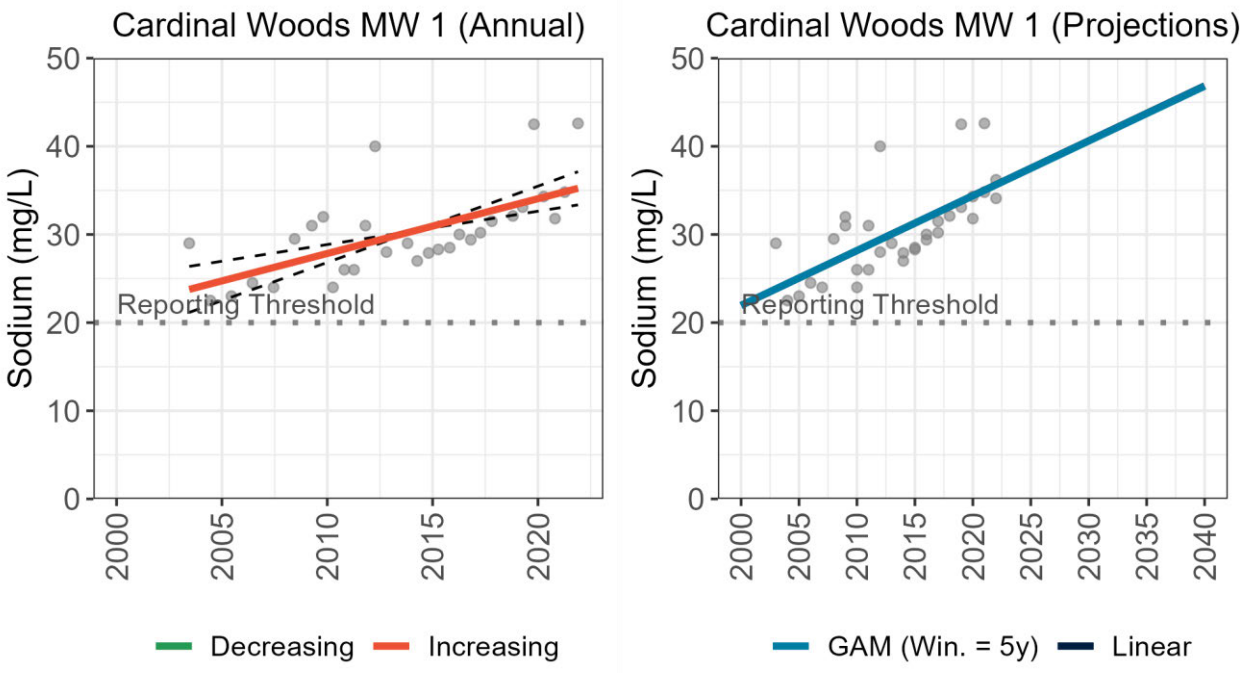


Figure D-121. Sodium concentration at Cardinal Woods MW 1 Well is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing a significant positive trend and is unlikely to exceed the half-MAC by 2040.

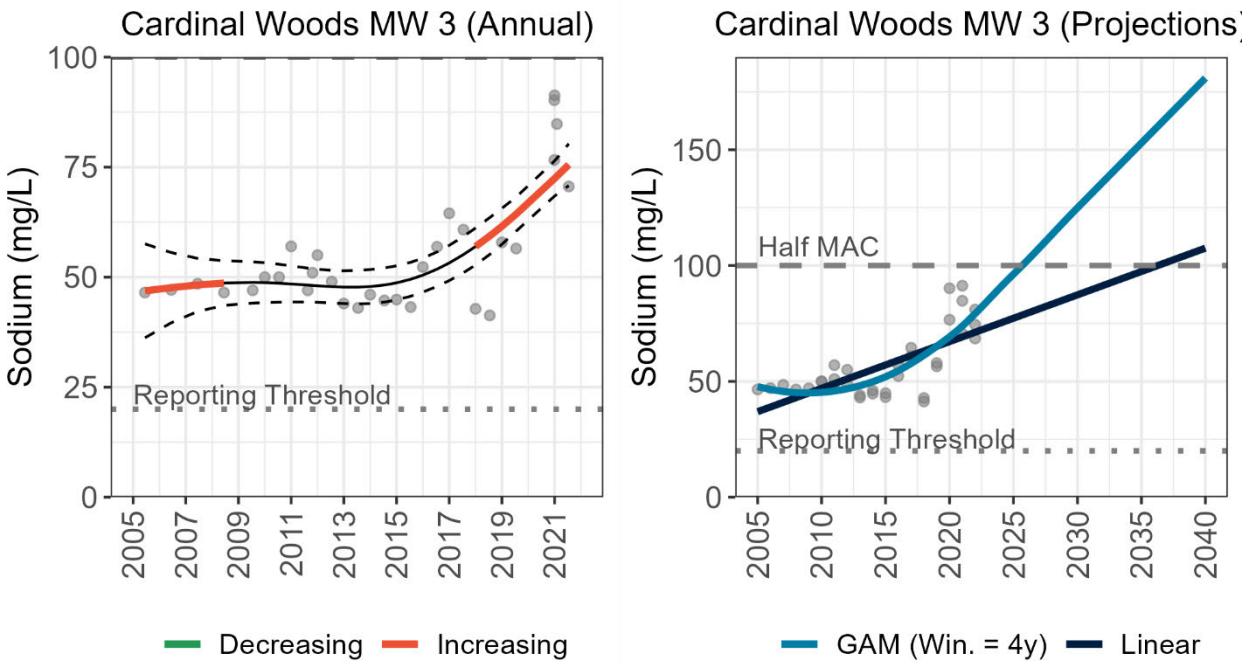


Figure D-122. Sodium concentration at Cardinal Woods MW 3 Well is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing a significant positive trend and is highly likely to exceed the half-MAC by 2040.

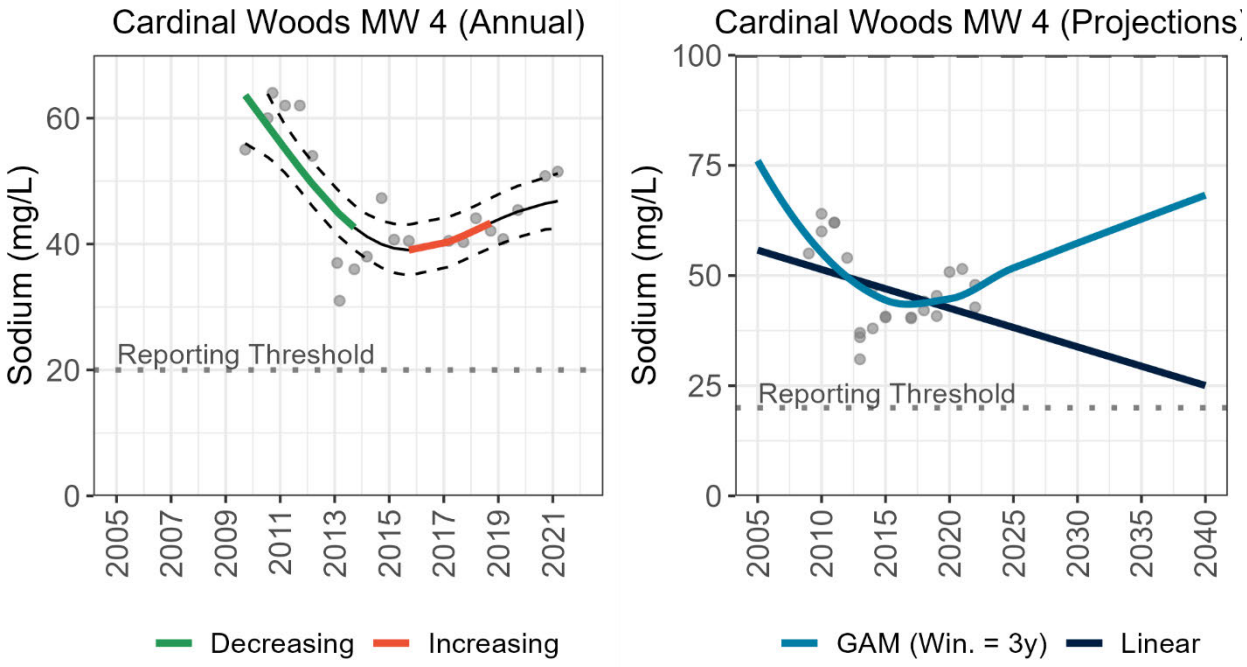


Figure D-123. Sodium concentration at Cardinal Woods MW 4 Well is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing no significant trend and is unlikely to exceed the half-MAC by 2040.

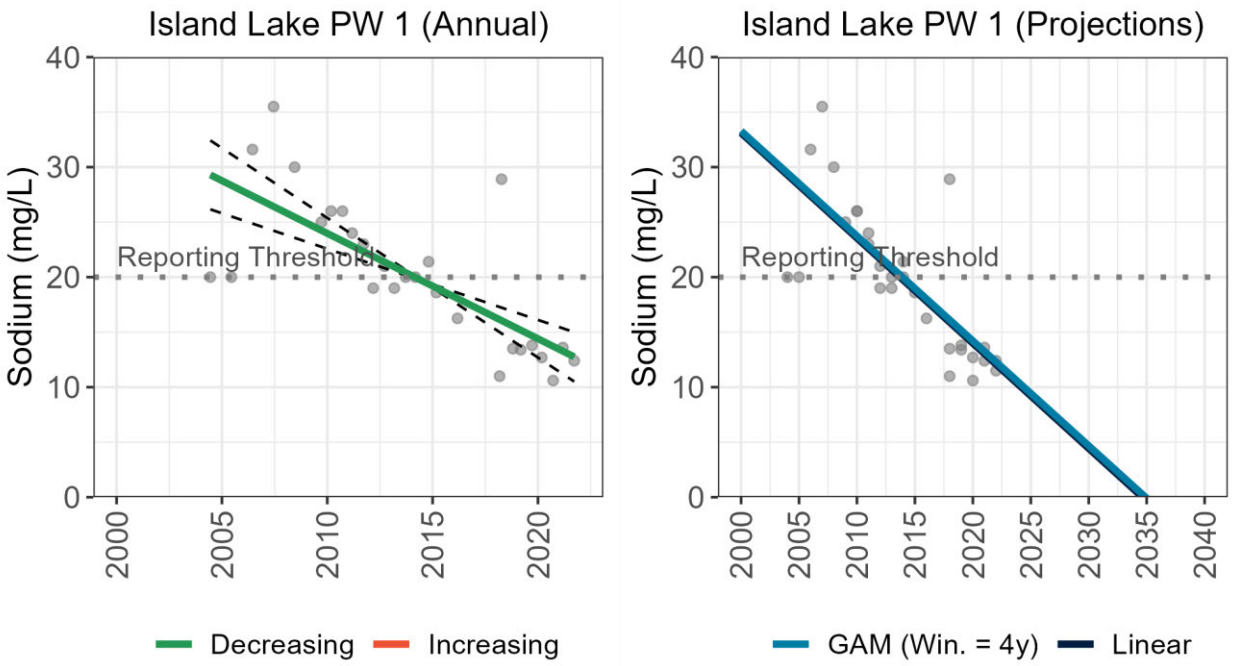


Figure D-124. Sodium concentration at Island Lake PW 1 Well is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing a significant negative trend and is unlikely to exceed the Reporting Threshold by 2040.

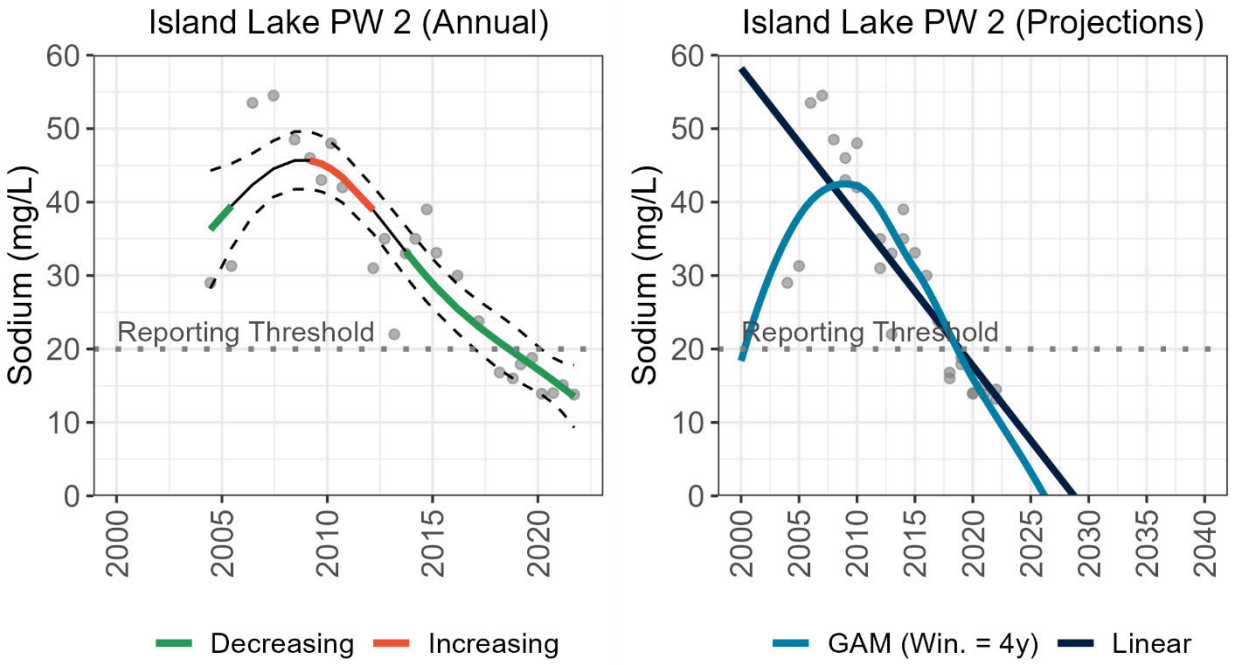


Figure D-125. Sodium concentration at Island Lake PW 2 1 Well is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing a significant negative trend and is unlikely to exceed the Reporting Threshold by 2040.

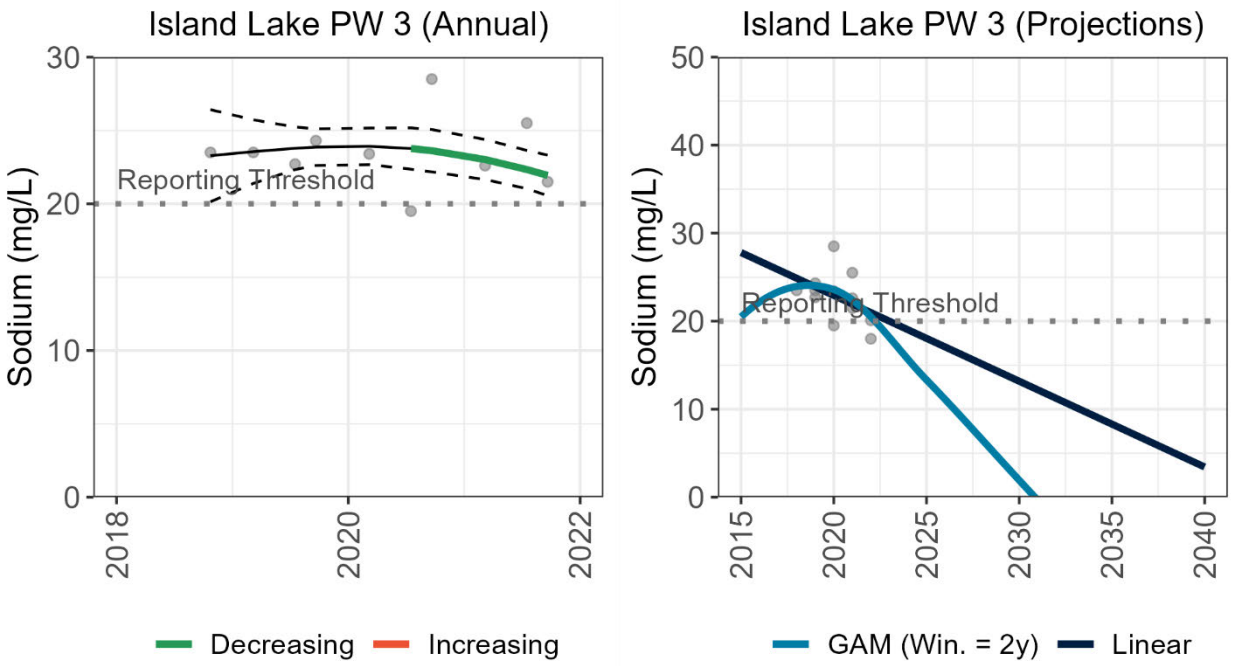


Figure D-126. Sodium concentration at Island Lake PW 3 Well is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing a significant negative trend and is unlikely to exceed the Reporting Threshold by 2040.

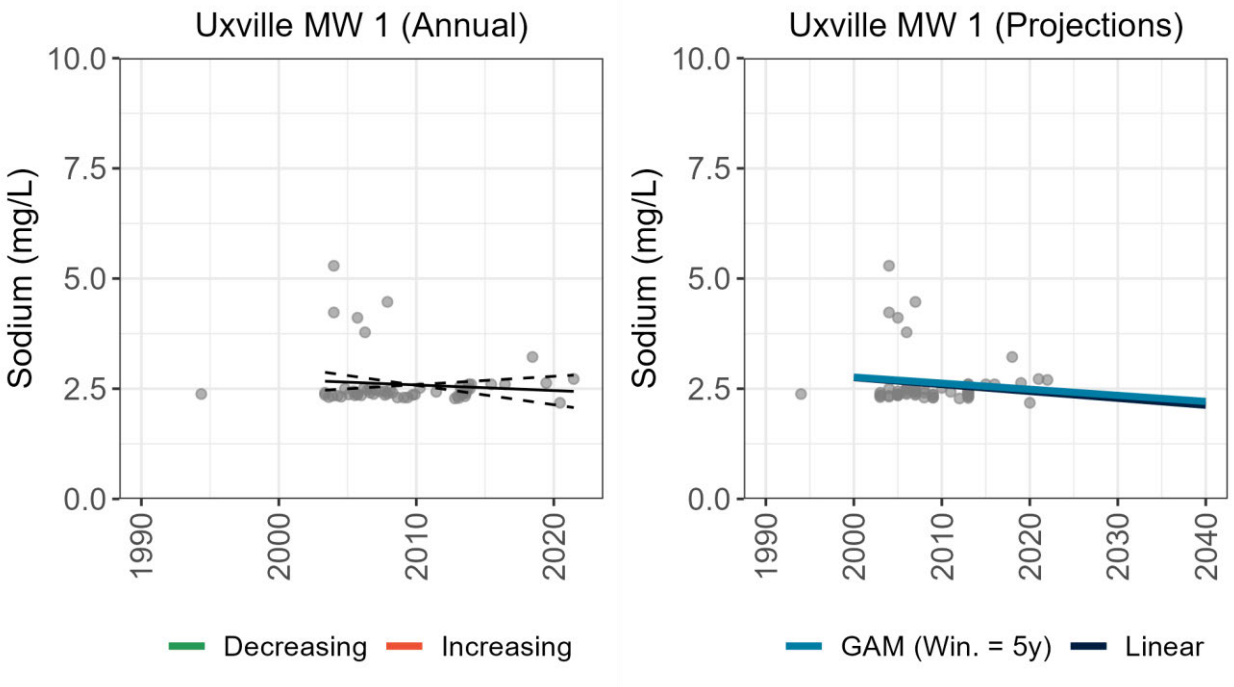


Figure D-127. Sodium concentration at Uxville MW 1 Well is currently below the Reporting Trigger of 20 mg/L and is showing no significant trend. Sodium concentration is highly likely to exceed the Reporting Trigger by 2040.

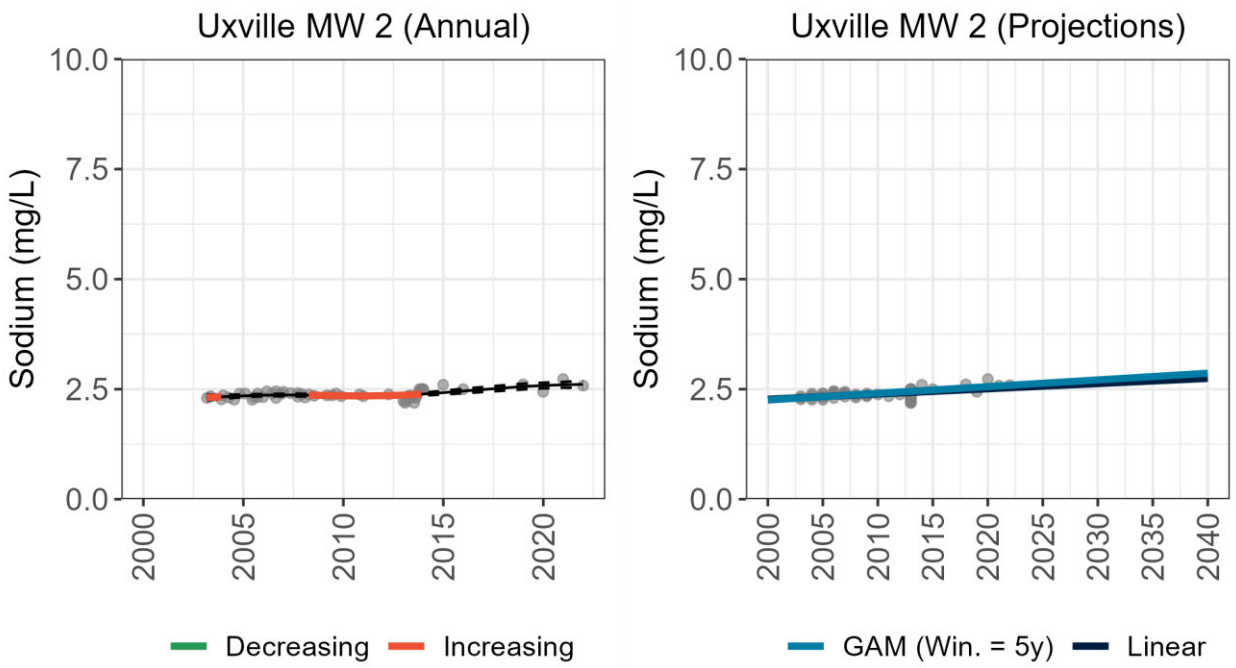


Figure D-128. Sodium concentration at Uxville MW 2 Well is currently below the Reporting Trigger of 20 mg/L and is showing a significant positive trend. Sodium concentration is unlikely to exceed the Reporting Trigger by 2040.

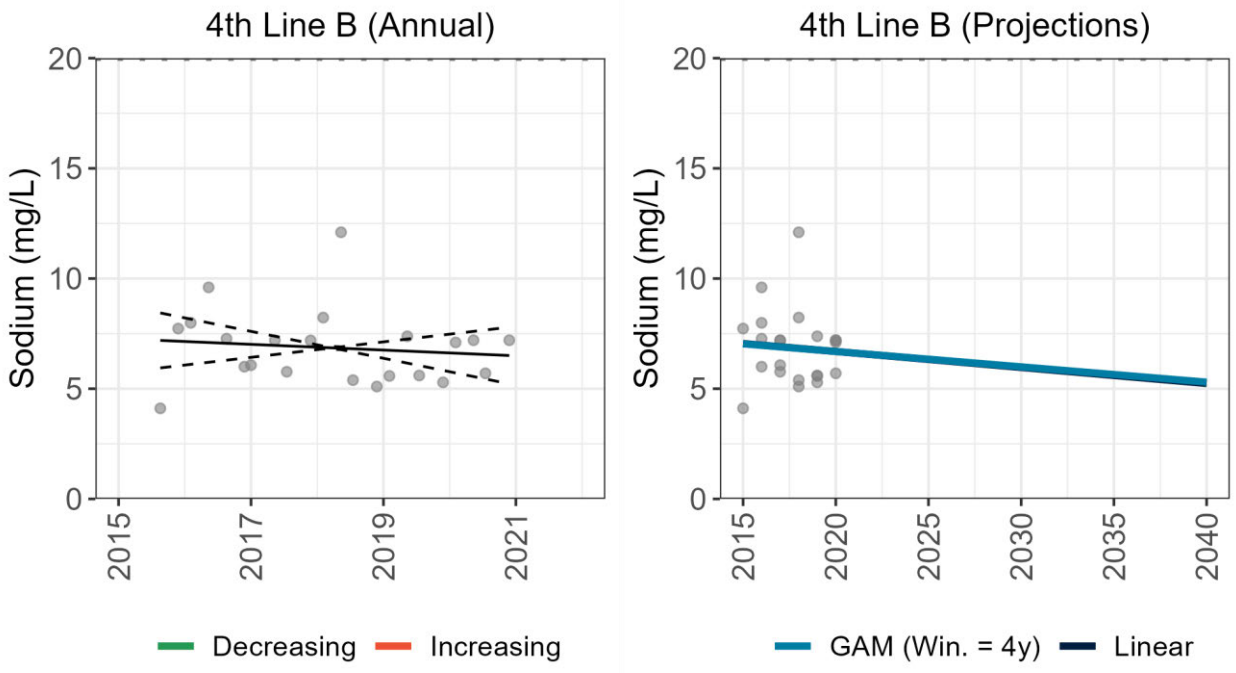


Figure D-129. Sodium concentration at 4th Line B Well is currently below the Reporting Trigger of 20 mg/L and is showing no significant trend. Sodium concentration is unlikely to exceed the Reporting Trigger by 2040.

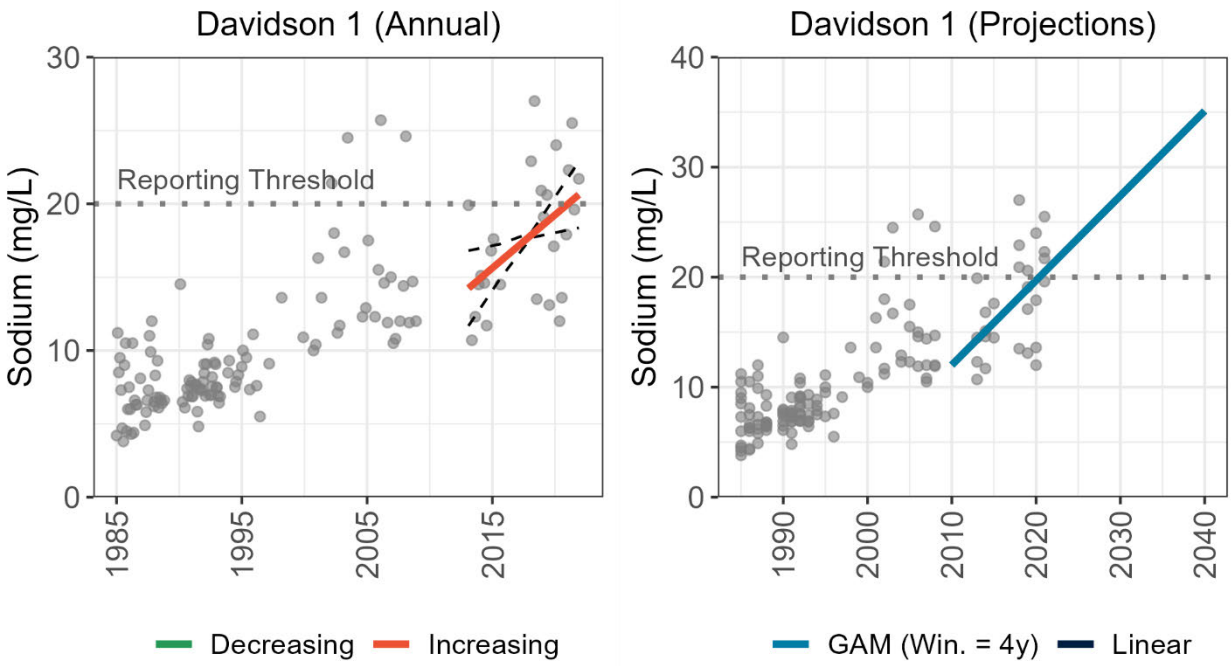


Figure D-130. Sodium concentration at Davidson 1 Well is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L and is showing a significant positive trend. Sodium concentration is unlikely to exceed the half-MAC by 2040.

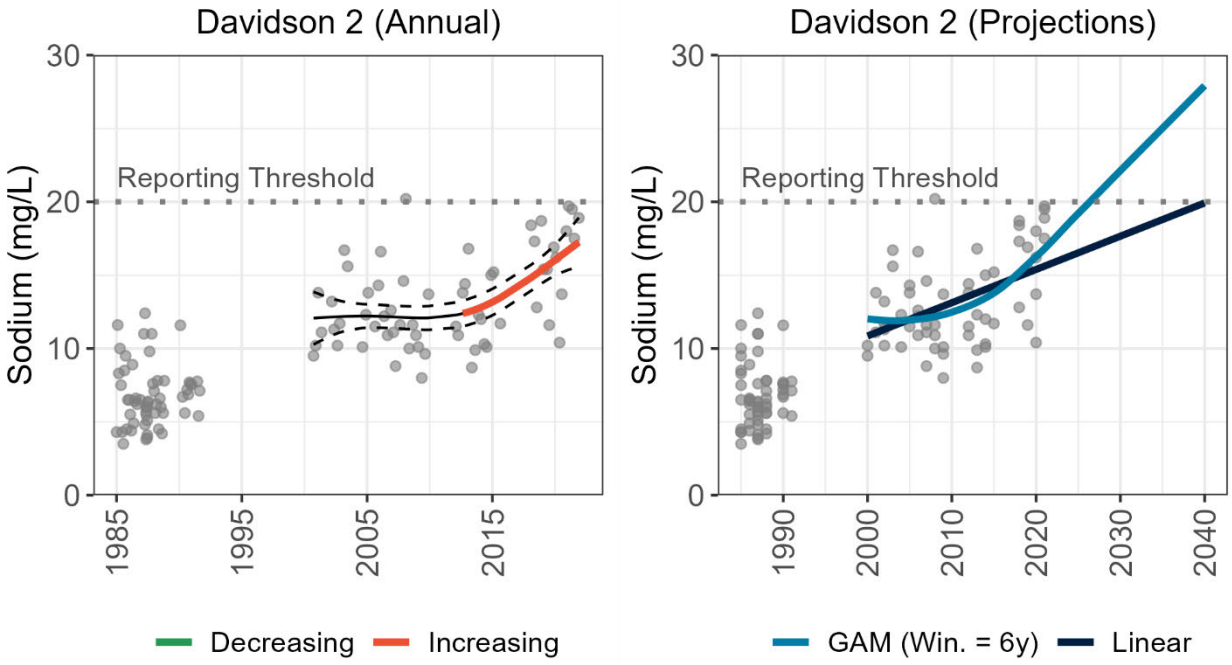


Figure D-131. Sodium concentration at Davidson 2 Well is currently below the Reporting Trigger of 20 mg/L and is showing a significant positive trend. Sodium concentration is highly likely to exceed the Reporting Trigger by 2040.

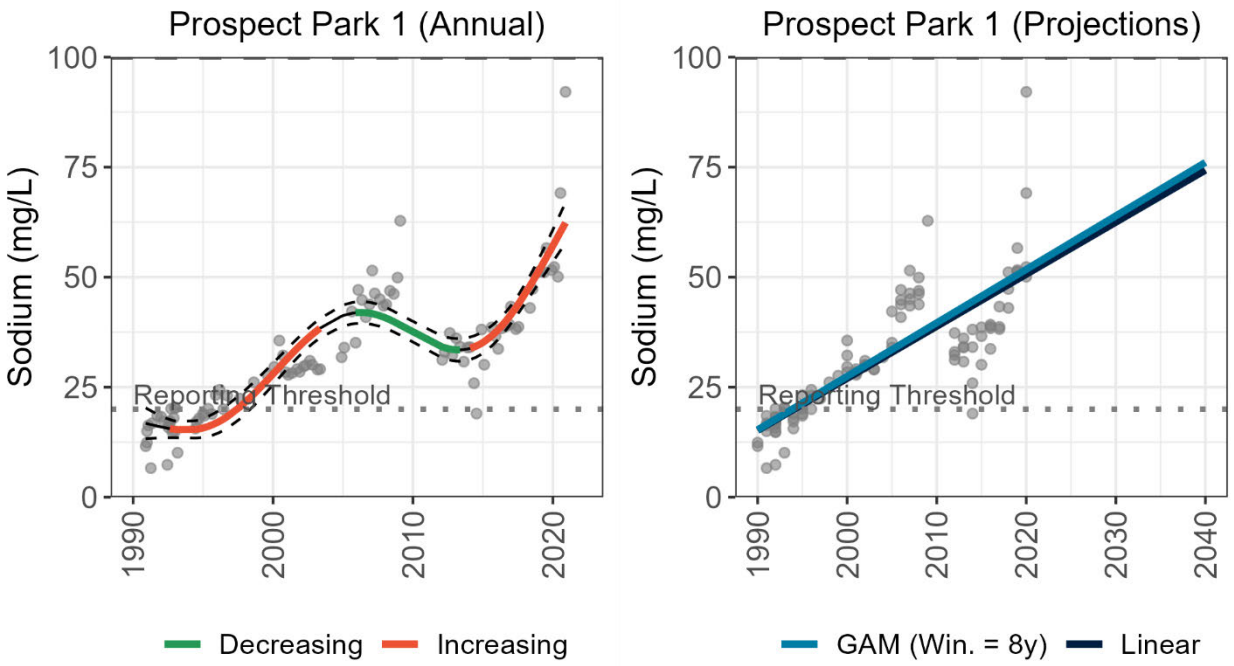


Figure D-132. Sodium concentration at Prospect Park 1 Well is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L and is showing a significant positive trend. Sodium concentration is unlikely to exceed the half-MAC by 2040.

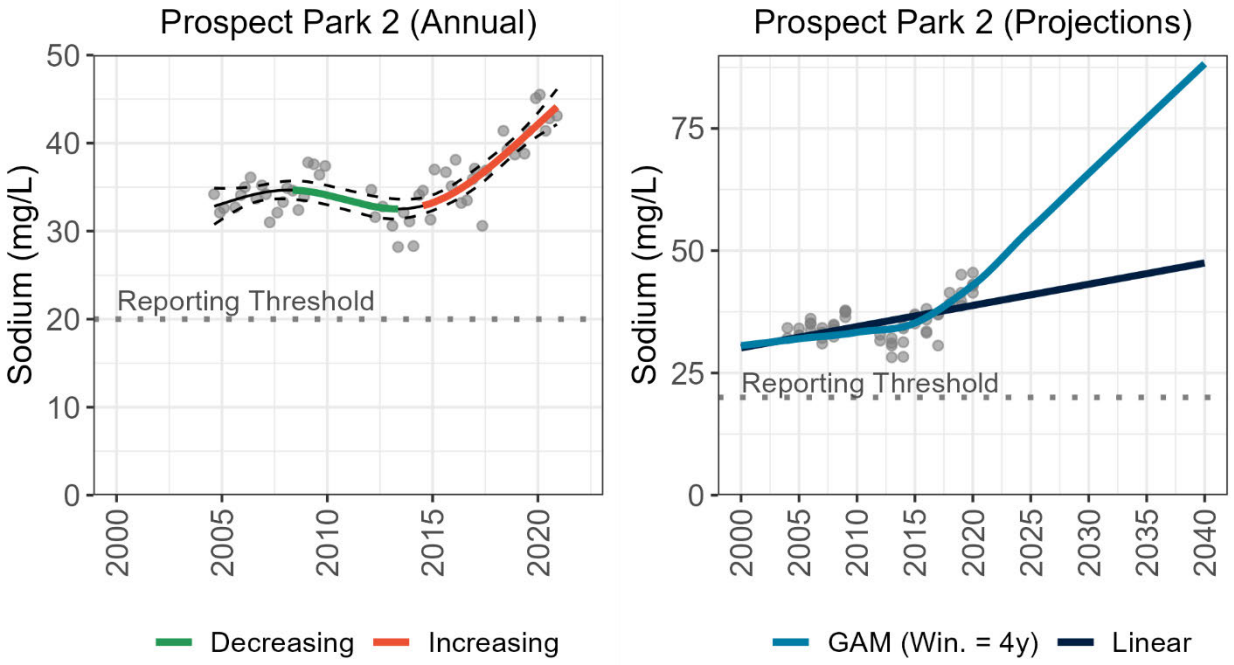


Figure D-133. Sodium concentration at Prospect Park 2 1 Well is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing a significant positive trend and is unlikely to exceed the half-MAC by 2040.

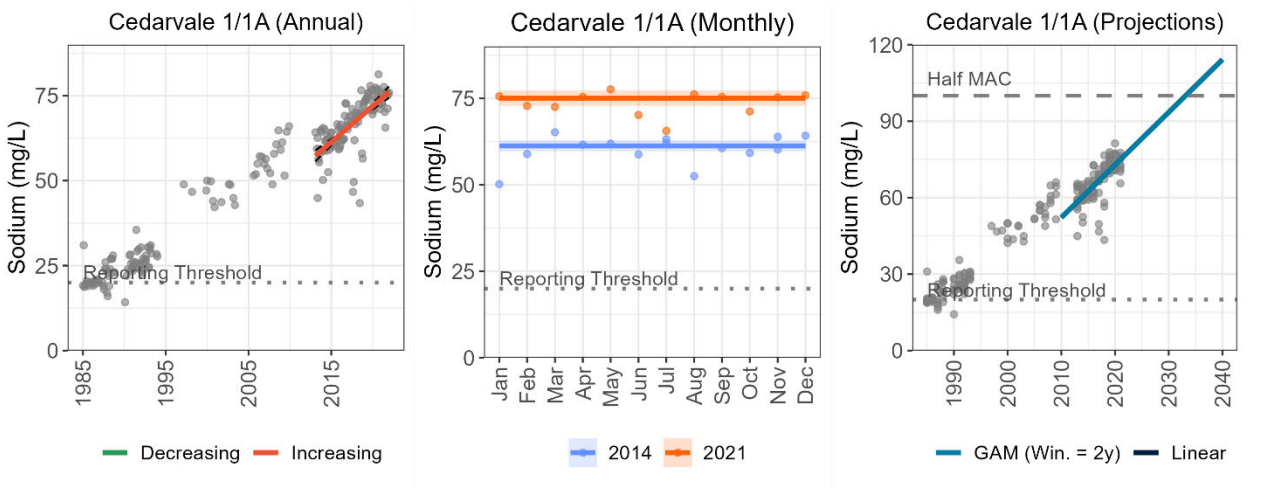


Figure D-134. Sodium concentration at Cedarvale 1/1A Well is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing a significant positive trend and is highly likely to exceed the half-MAC by 2040.

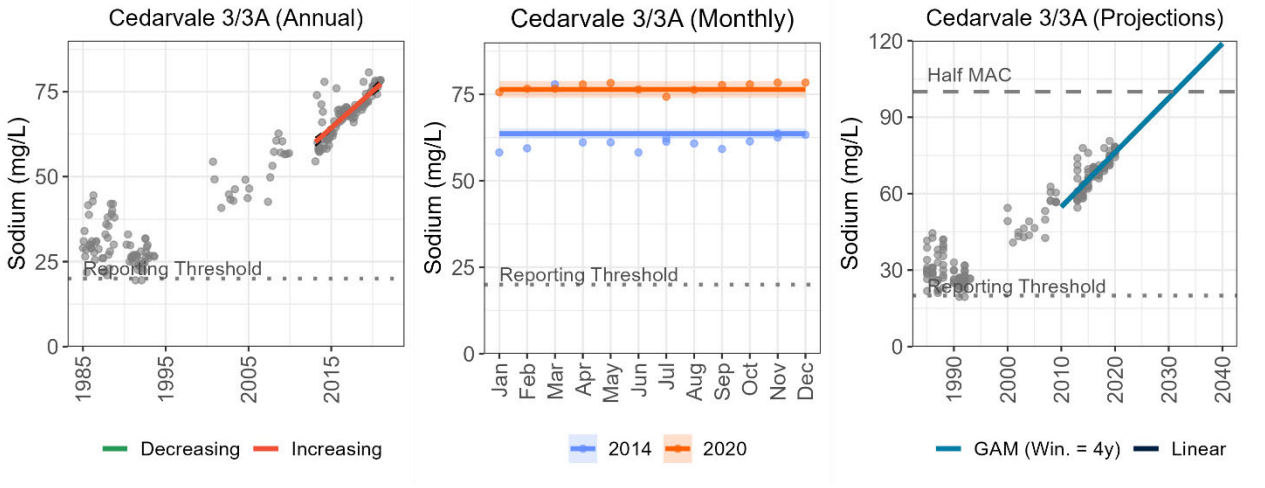


Figure D-135. Sodium concentration at Cedarvale 3/3A Well is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing a significant positive trend and is highly likely to exceed the half-MAC by 2040.

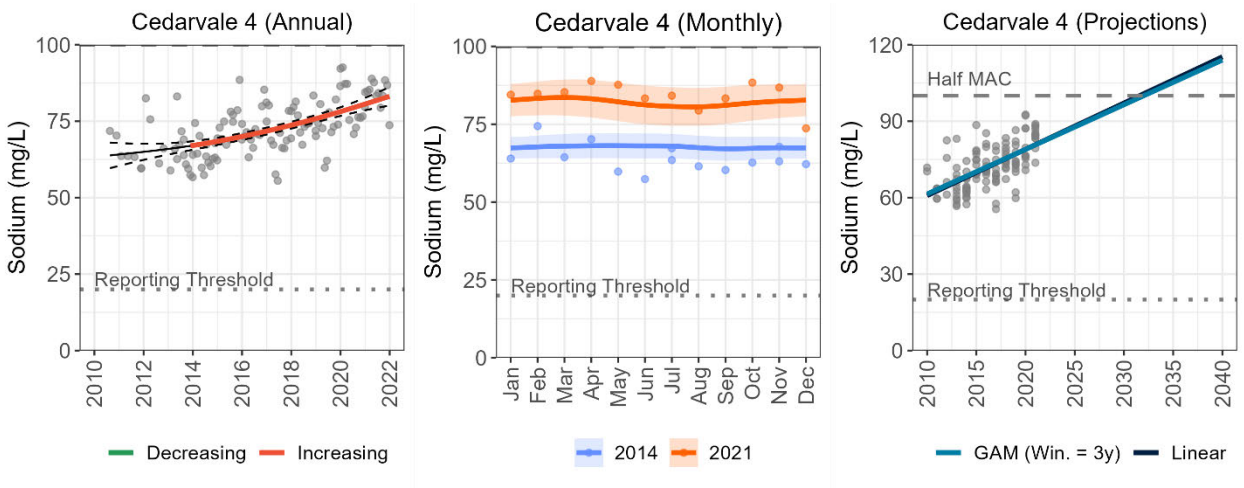


Figure D-136. Sodium concentration at Cedarvale 4 Well is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing a significant positive trend and is highly likely to exceed the half-MAC by 2040.

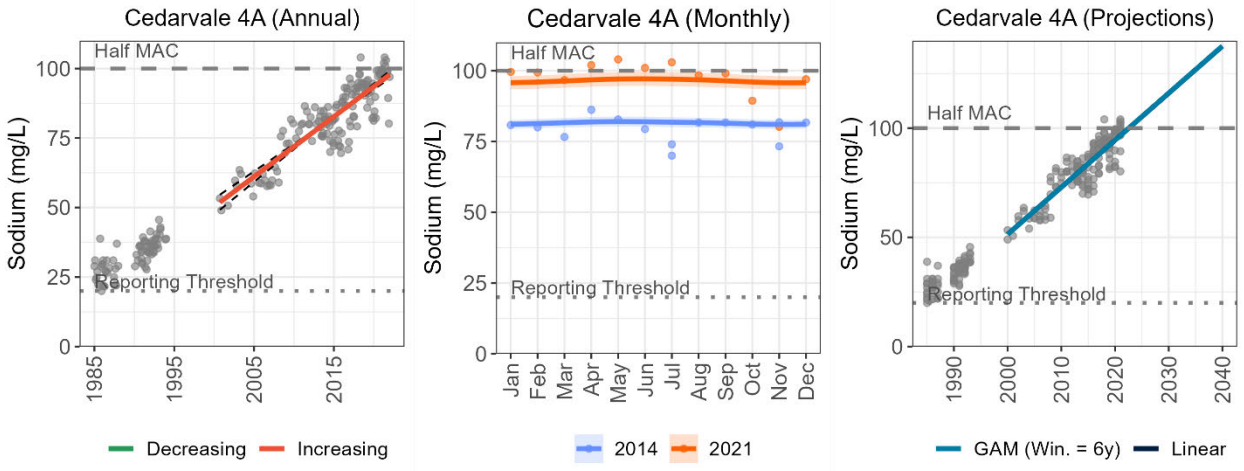


Figure D-137. Sodium concentration at Cedarvale 4A Well is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing a significant positive trend and is highly likely to exceed the half-MAC by 2040.

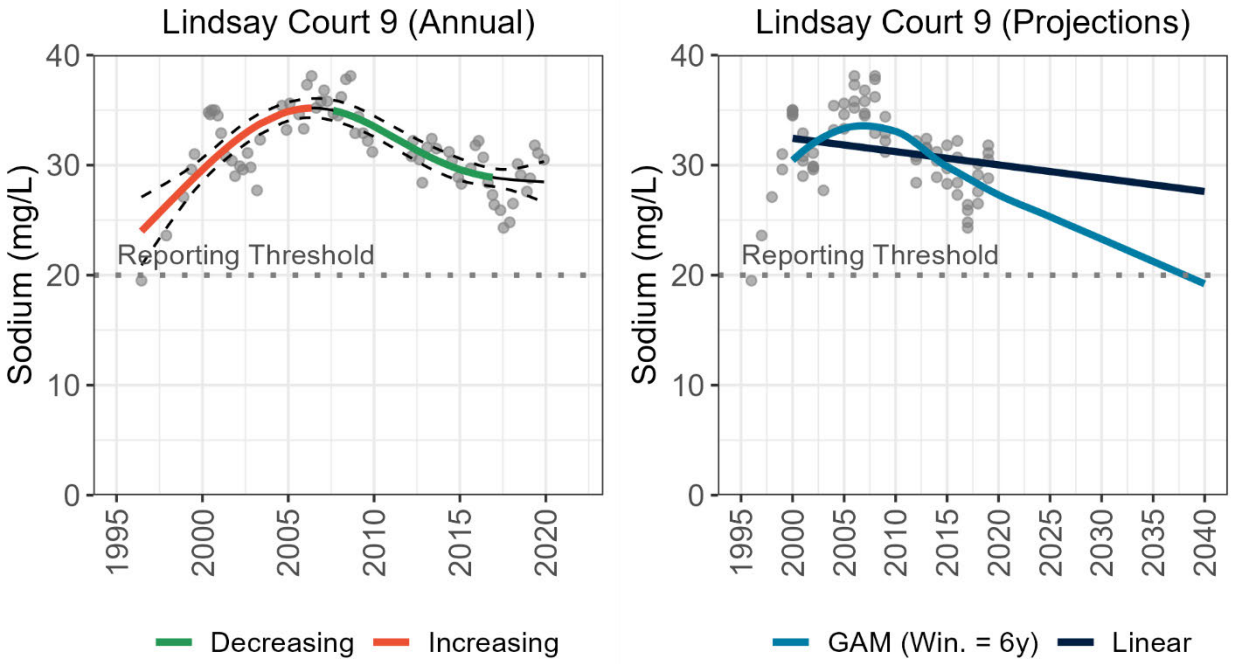


Figure D-138. Sodium concentration at Lindsay Court 9 Well is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing a significant negative trend and is unlikely to exceed the half-MAC by 2040.

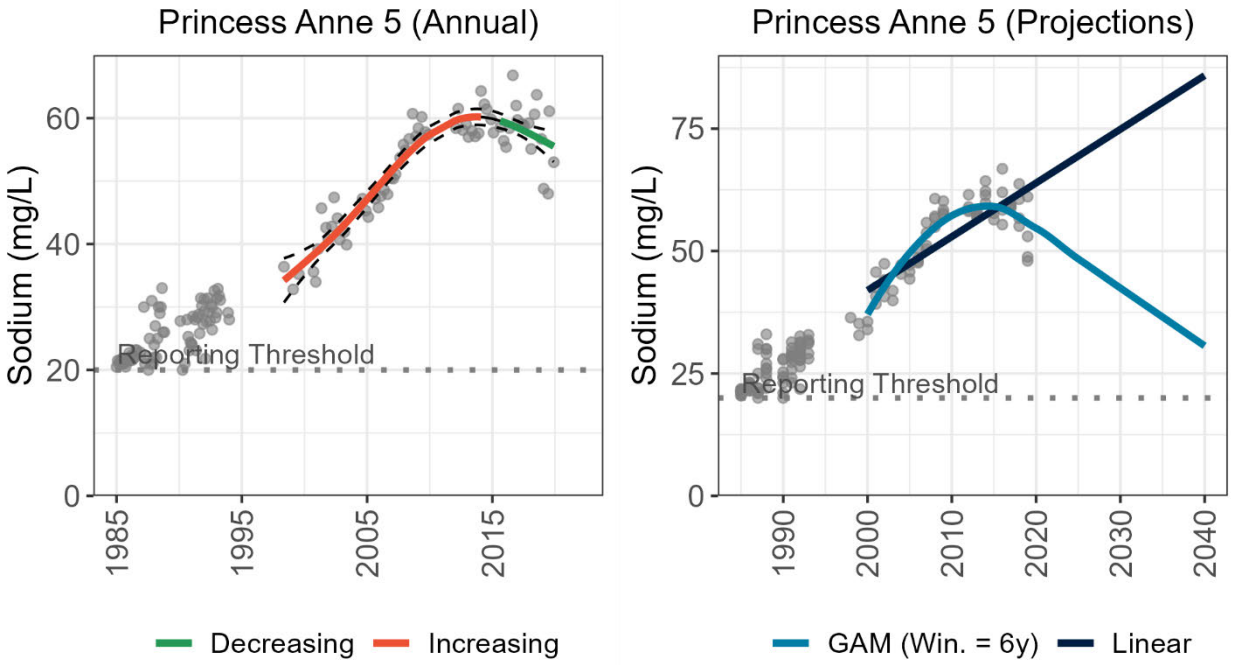


Figure D-139. Sodium concentration at Princes Anne 5 Well is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing a significant negative trend and is unlikely to exceed the half-MAC by 2040.

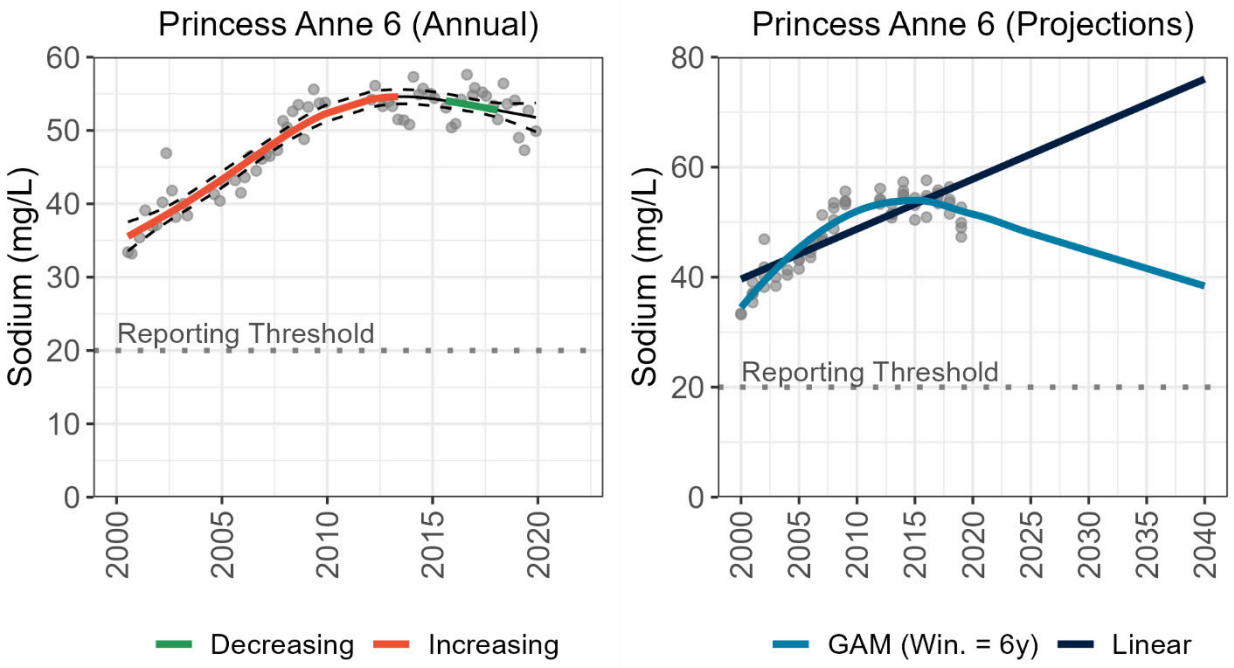


Figure D-140. Sodium concentration at Princes Anne 6 Well is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing no significant trend and is unlikely to exceed the half-MAC by 2040.

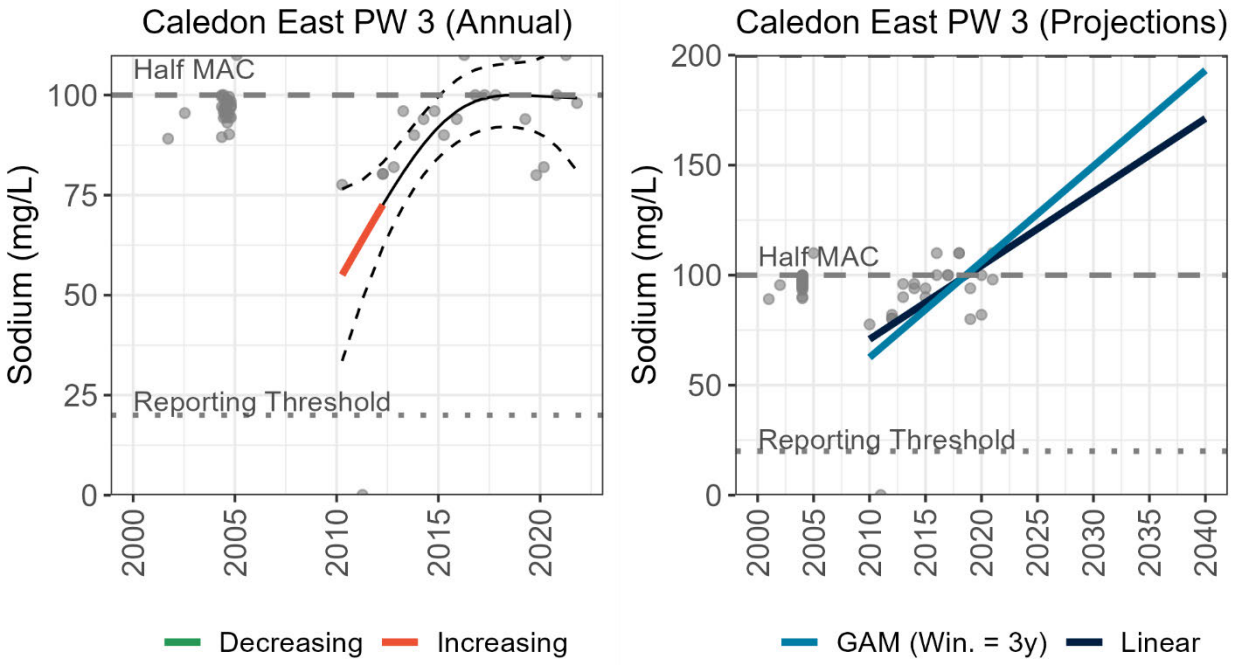


Figure D-141. Sodium concentration at Caledon East PW 3 Well is currently above the half-Maximum Acceptable Limit (MAC) of 100 mg/L and is showing no significant trend. Sodium concentration is unlikely to exceed the MAC of 200 mg/L by 2040.

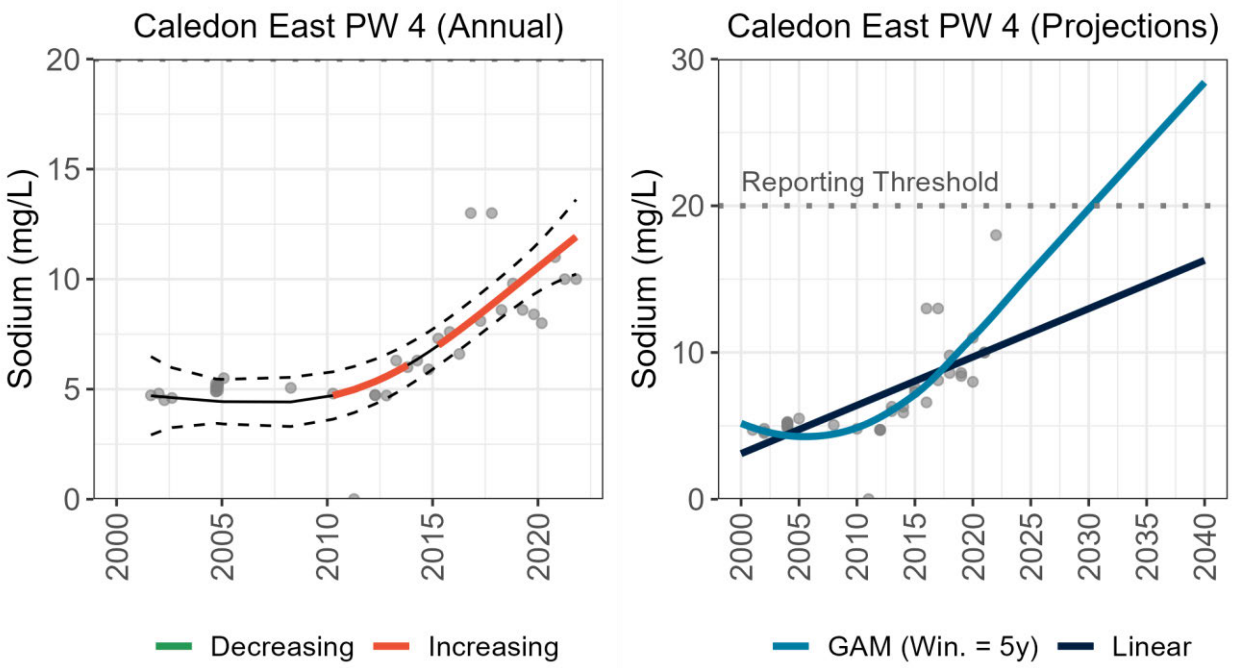


Figure D-142. Sodium concentration at Caledon East PW 4 Well is currently below the Reporting Trigger of 20 mg/L and is showing a significant positive trend. Sodium concentration is somewhat likely to exceed the Reporting Trigger by 2040.

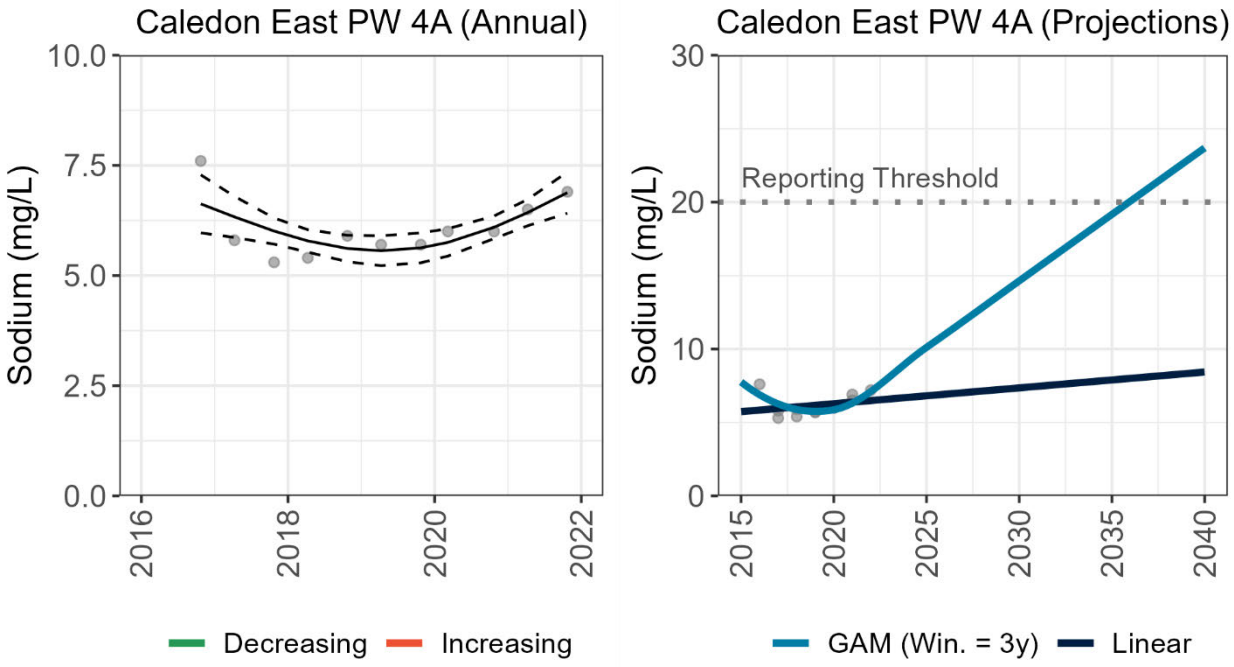


Figure D-143. Sodium concentration at Caledon East PW 4A Well is currently below the Reporting Trigger of 20 mg/L and is showing a significant positive trend. Sodium concentration is somewhat likely to exceed the Reporting Trigger by 2040.

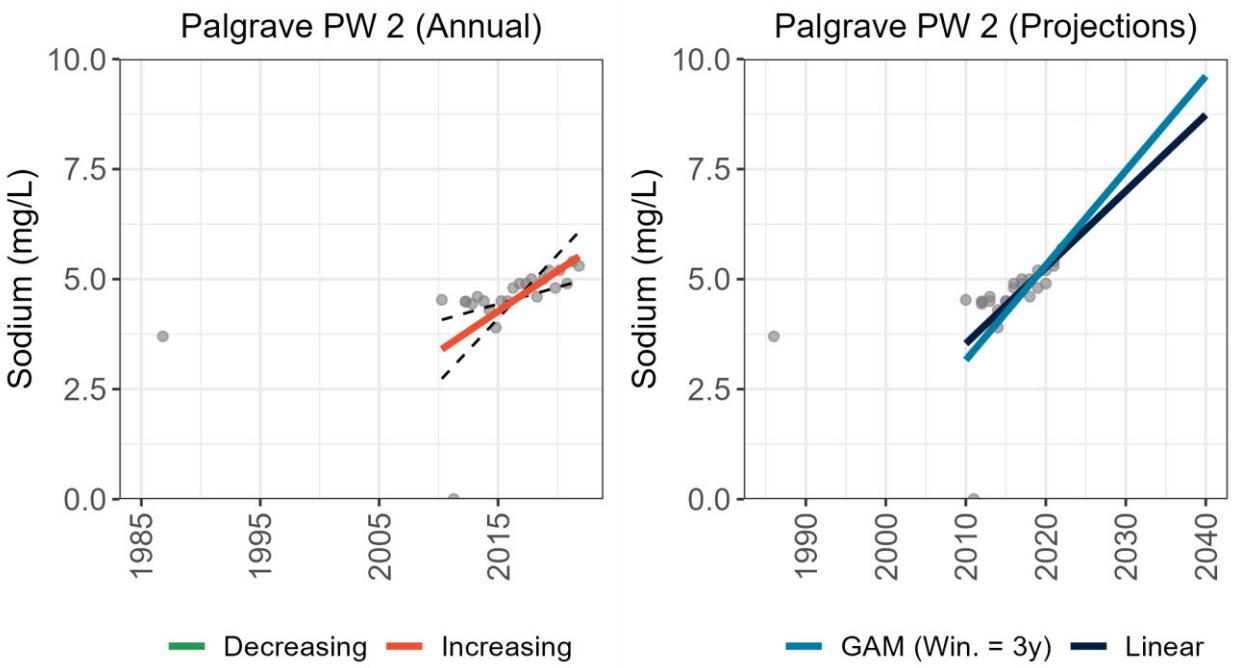


Figure D-144. Sodium concentration at Palgrave PW 2 is currently below the Reporting Trigger of 20 mg/L and is showing a significant positive trend. Sodium concentration is unlikely to exceed the Reporting Trigger by 2040.

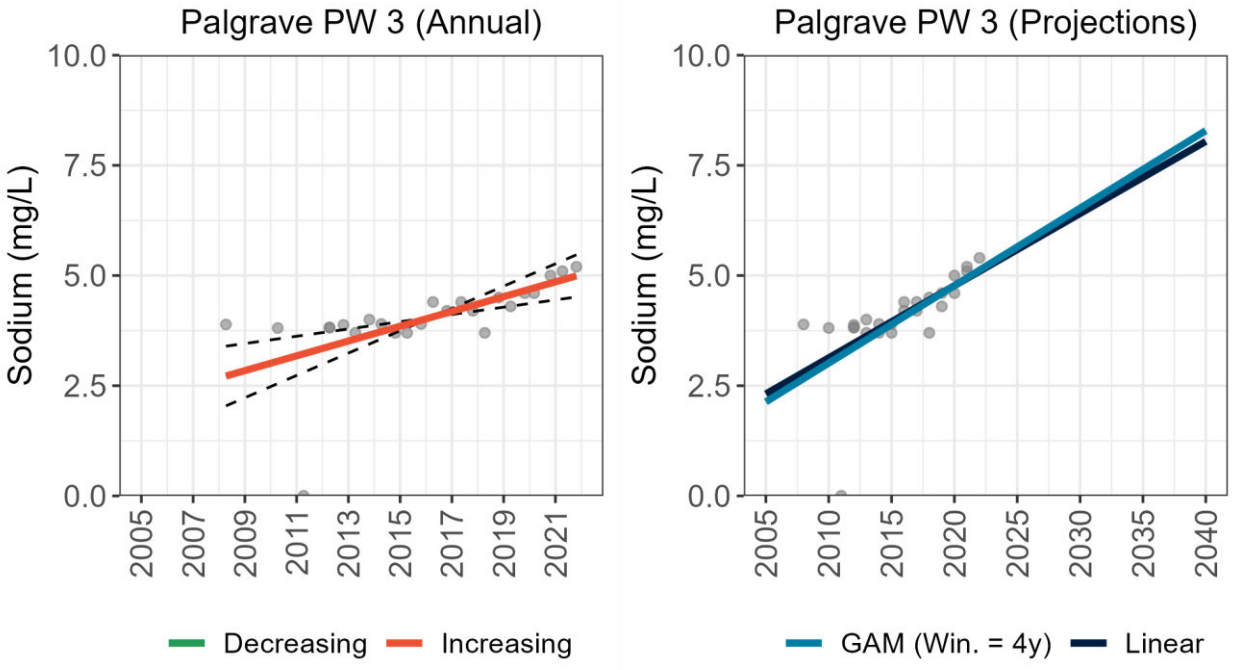


Figure D-145. Sodium concentration at Palgrave PW 3 Well is currently below the Reporting Trigger of 20 mg/L and is showing a significant positive trend. Sodium concentration is unlikely to exceed the Reporting Trigger by 2040.

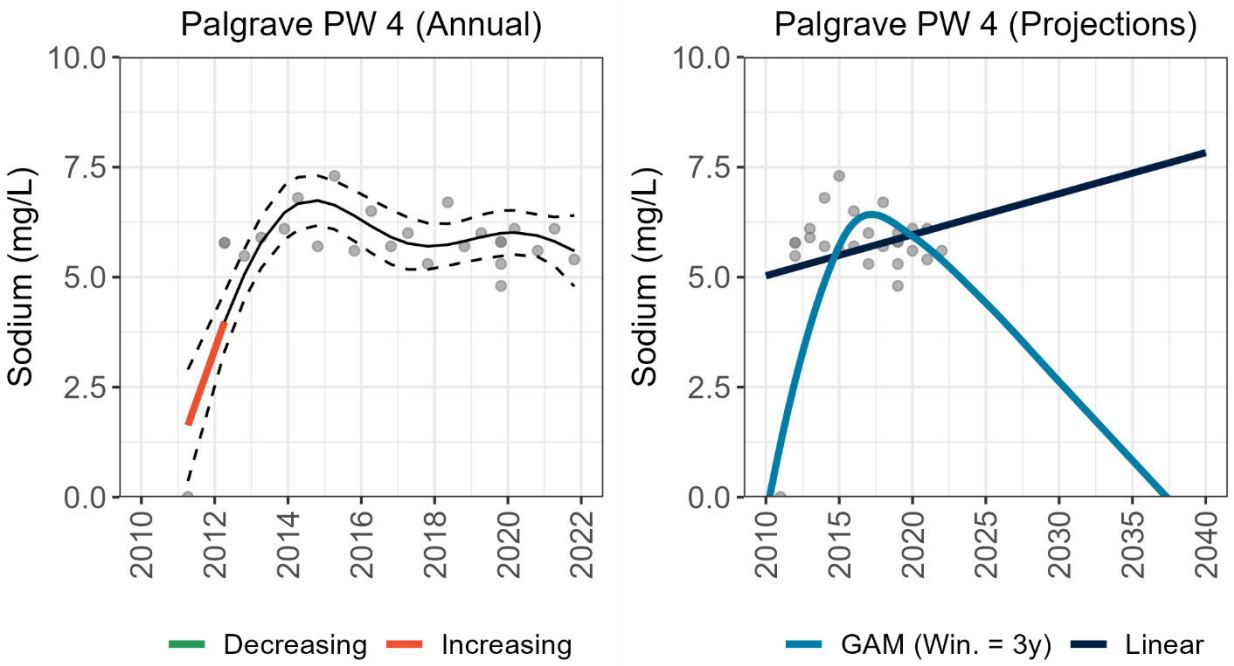


Figure D-146. Sodium concentration at Palgrave PW 4 Well is currently below the Reporting Trigger of 20 mg/L and is showing no significant trend. Sodium concentration is unlikely to exceed the Reporting Trigger by 2040.

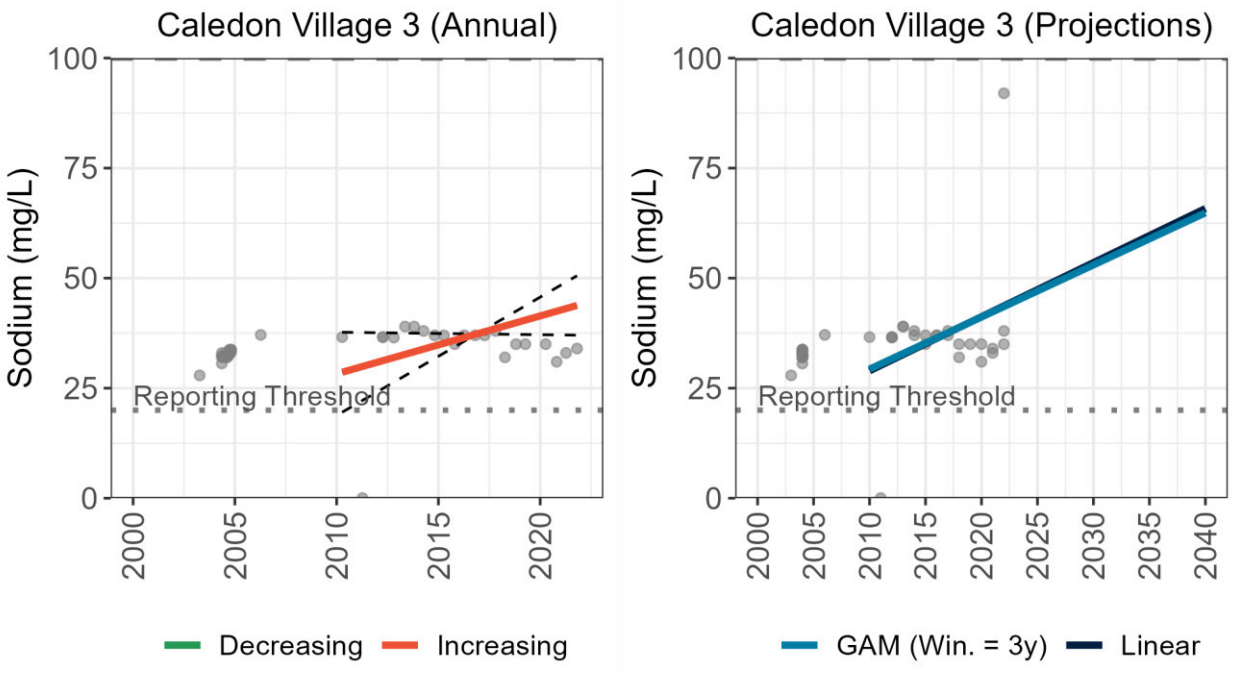


Figure D-147. Sodium concentration at Caledon Village 3 Well is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing a significant positive trend and is unlikely to exceed the half-MAC by 2040.

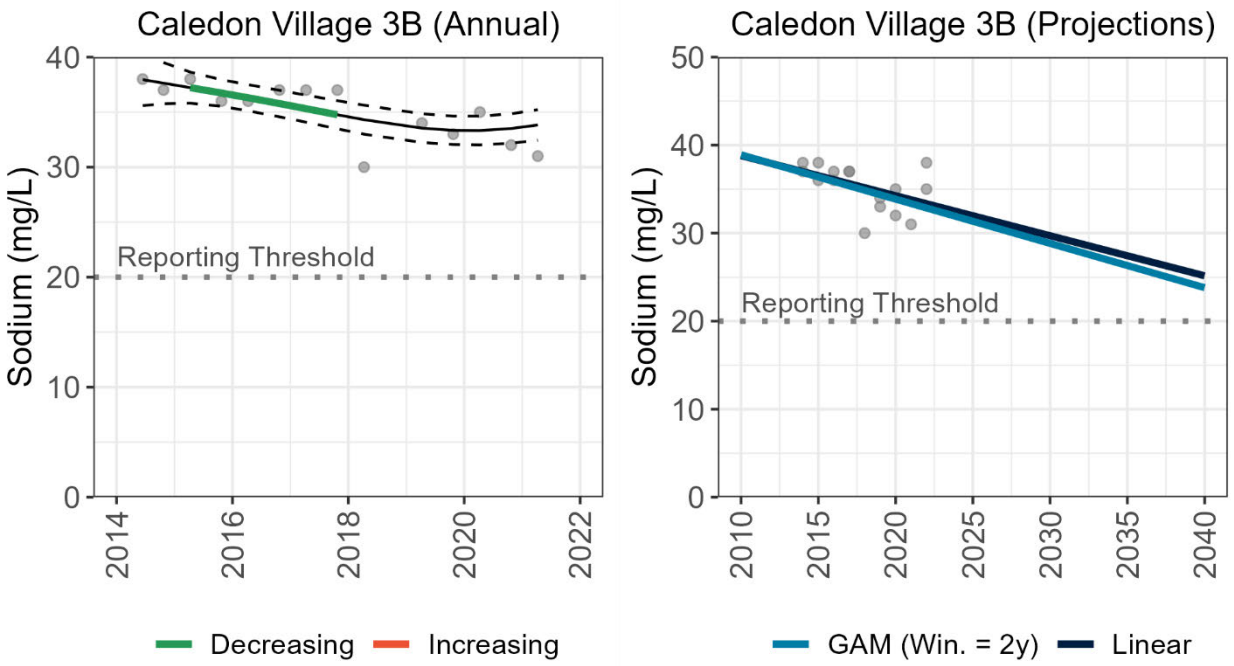


Figure D-148. Sodium concentration at Caledon Village 3B Well is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing no significant trend and is unlikely to exceed the half-MAC by 2040.

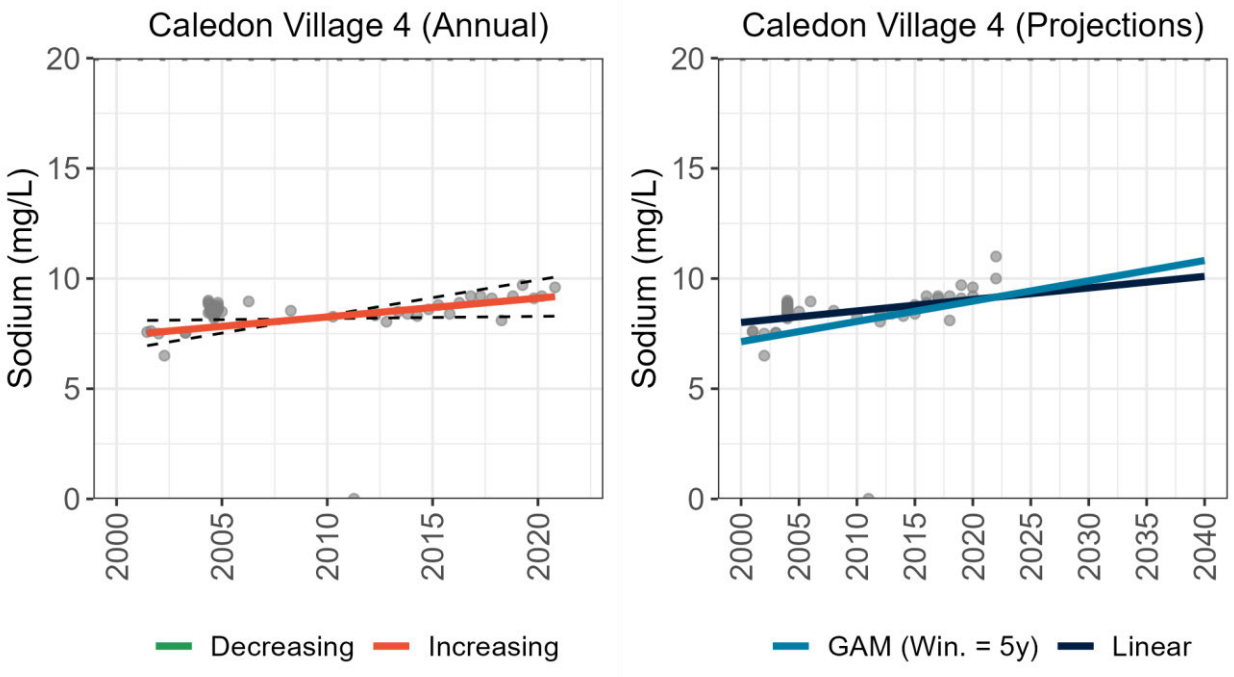


Figure D-149. Sodium concentration at Caledon Village 4 Well is currently below the Reporting Trigger of 20 mg/L and is showing a significant positive trend. Sodium concentration is unlikely to exceed the Reporting Trigger by 2040.

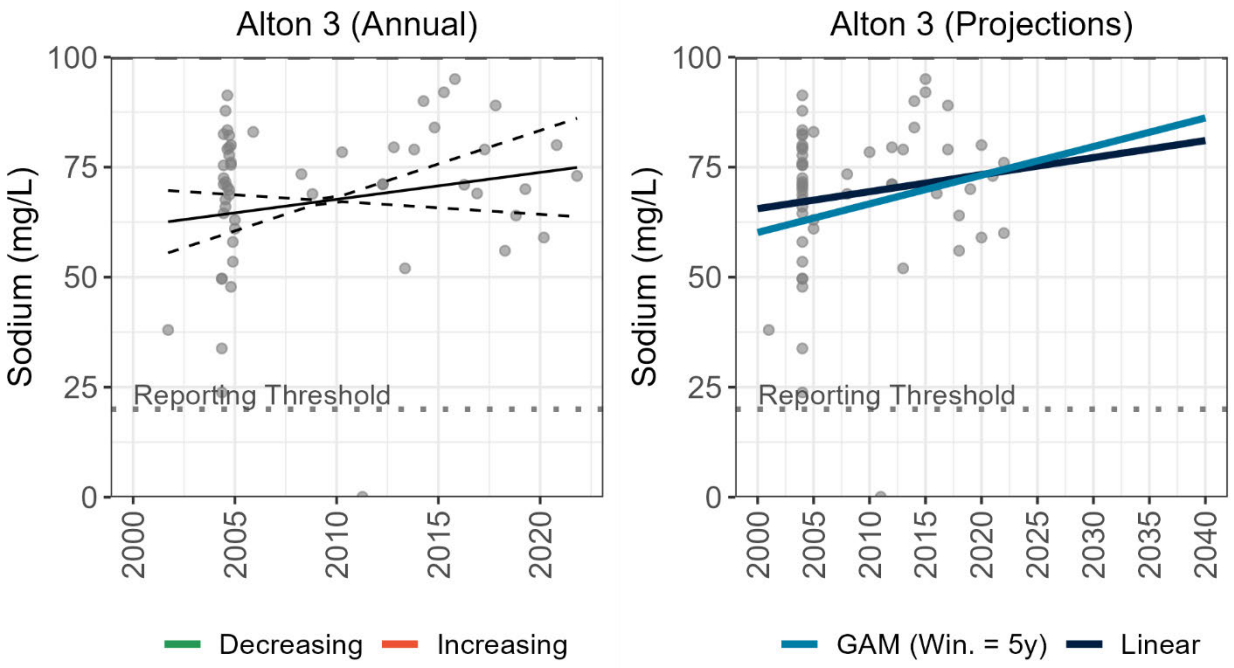


Figure D-150. Sodium concentration at Alton 3 Well is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing no significant trend and is unlikely to exceed the half-MAC by 2040.

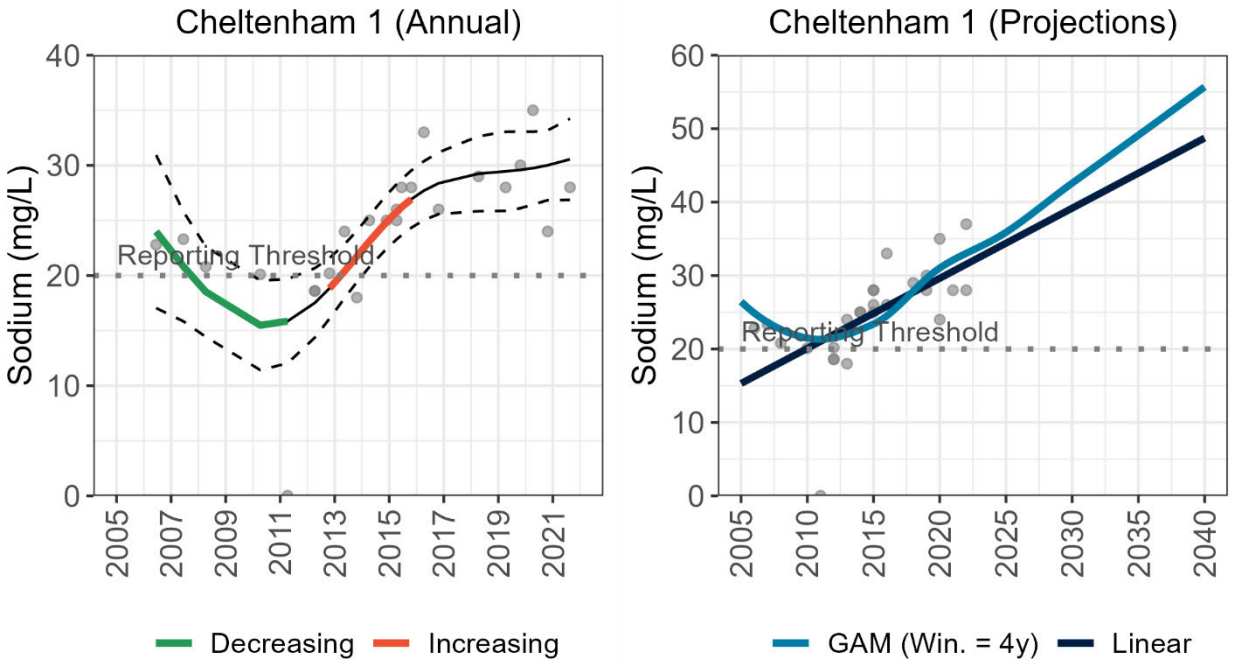


Figure D-151. Sodium concentration at Cheltenham 1 Well is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing no significant trend and is unlikely to exceed the half-MAC by 2040.

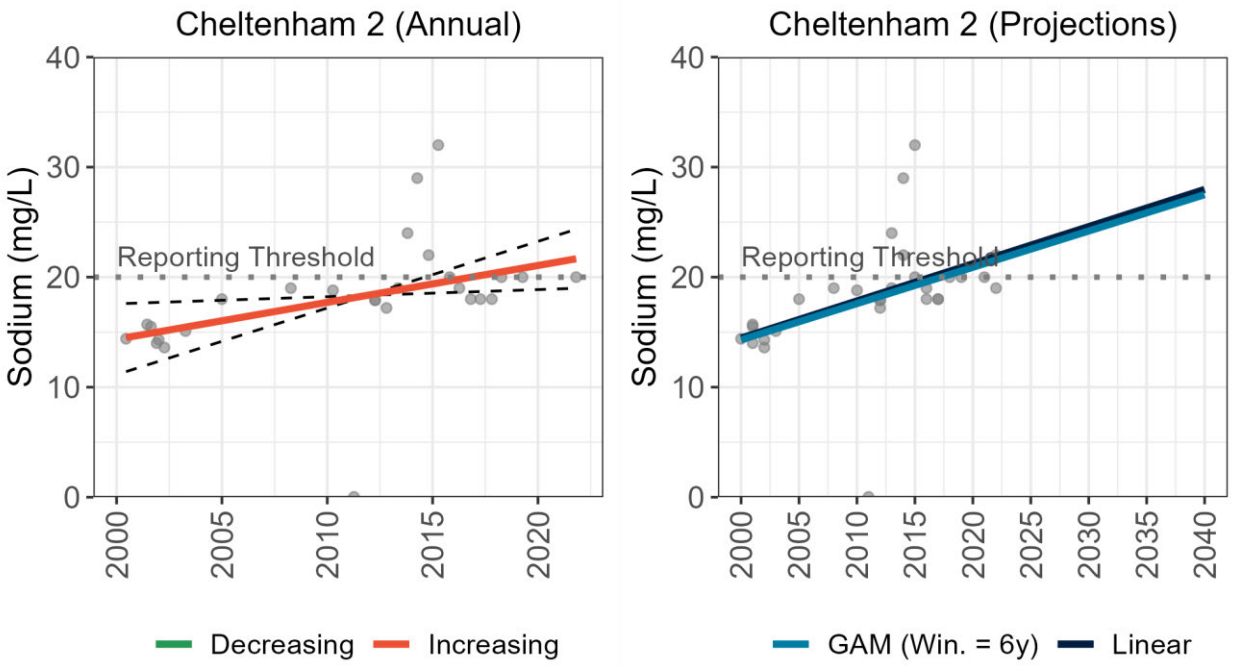


Figure D-152. Sodium concentration at Cheltenham 2 Well is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing a significant positive trend and is unlikely to exceed the half-MAC by 2040.

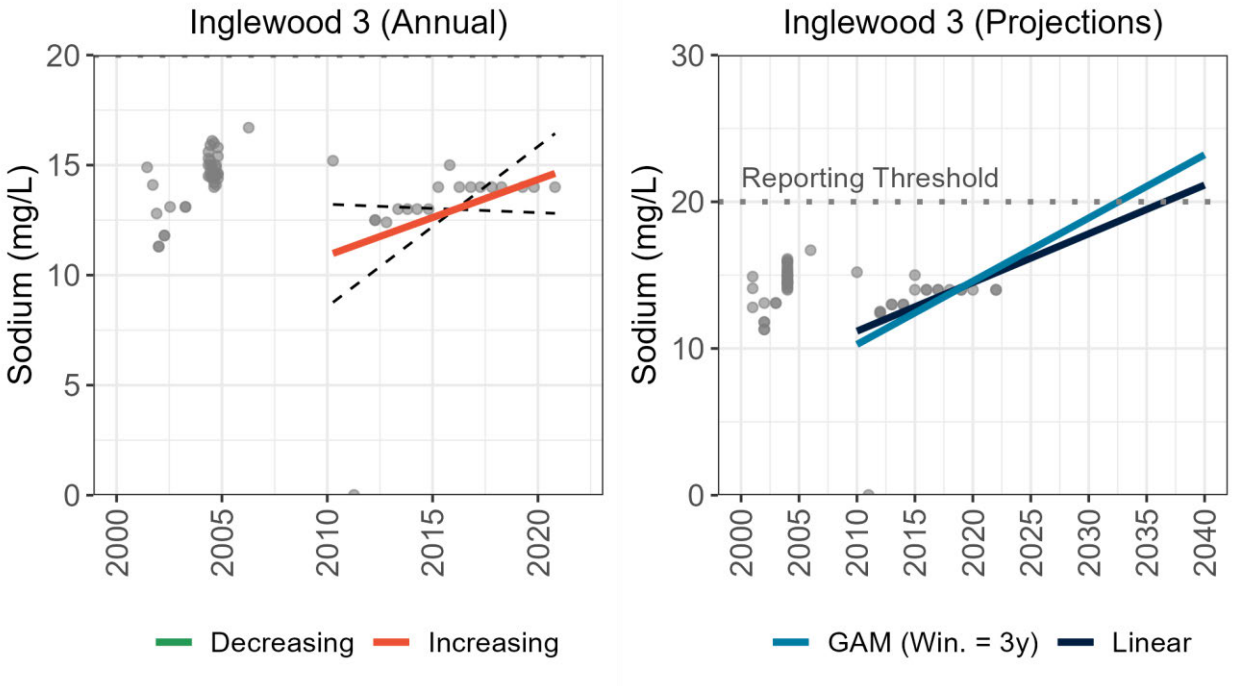


Figure D-153. Sodium concentration at Inglewood 3 Well is currently below the Reporting Trigger of 20 mg/L and is showing a significant positive trend. Sodium concentration is highly likely to exceed the Reporting Trigger by 2040.

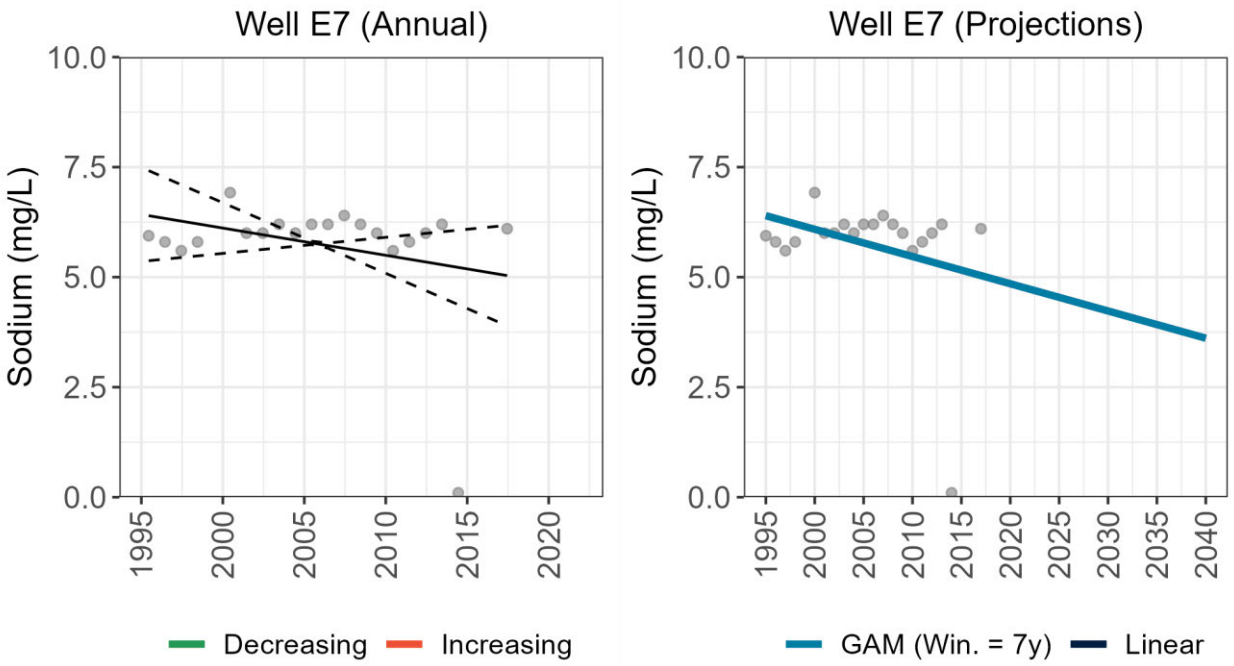


Figure D-154. Sodium concentration at Erin Well E7 is currently below the Reporting Trigger of 20 mg/L and is showing no significant trend. Sodium concentration is unlikely to exceed the Reporting Trigger by 2040.

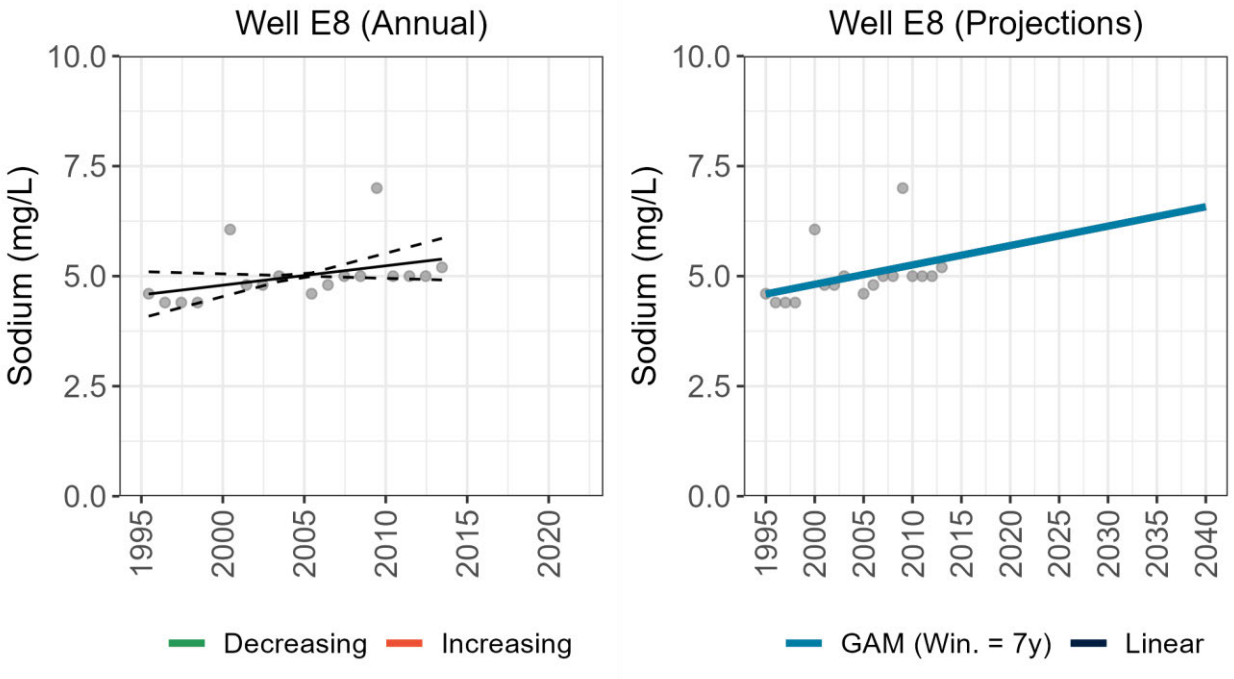


Figure D-155. Sodium concentration at Erin Well E8 is currently below the Reporting Trigger of 20 mg/L and is showing no significant trend. Sodium concentration is unlikely to exceed the Reporting Trigger by 2040.

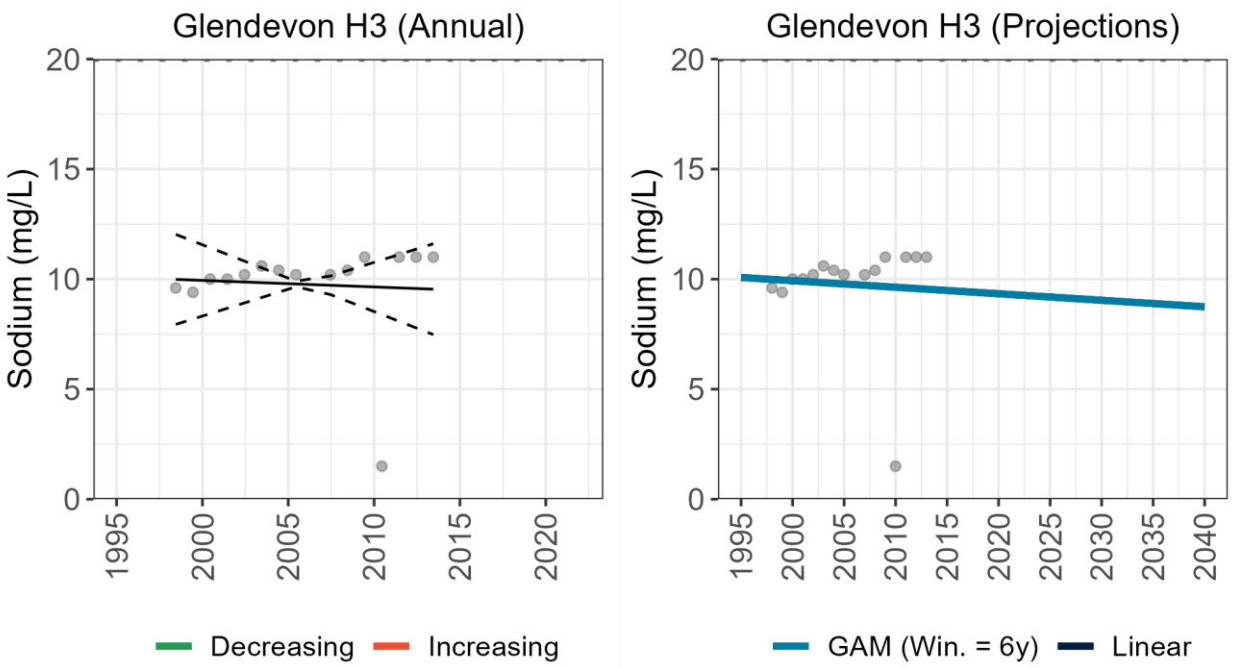


Figure D-156. Sodium concentration at Glendevon H3 Well is currently below the Reporting Trigger of 20 mg/L and is showing no significant trend. Sodium concentration is unlikely to exceed the Reporting Trigger by 2040.

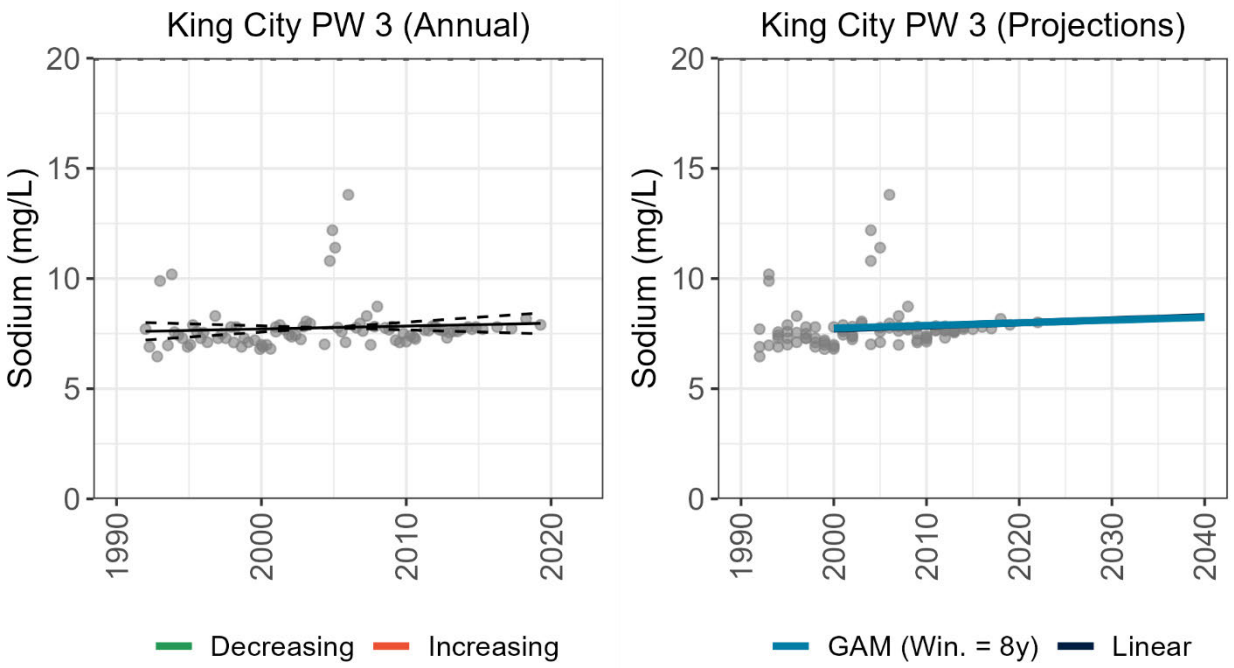


Figure D-157. Sodium concentration at King City PW 3 Well is currently below the Reporting Trigger of 20 mg/L and is showing no significant trend. Sodium concentration is unlikely to exceed the Reporting Trigger by 2040.

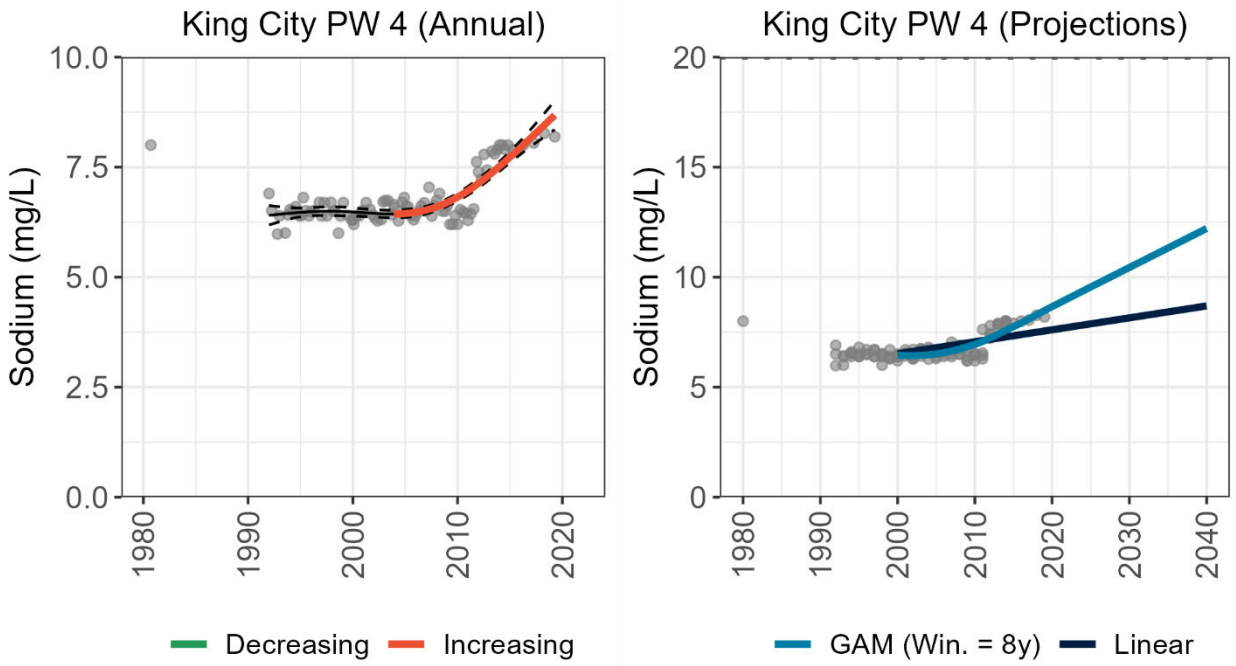


Figure D-158. Sodium concentration at King City PW 4 Well is currently below the Reporting Trigger of 20 mg/L and is showing a significant positive trend. Sodium concentration is unlikely to exceed the Reporting Trigger by 2040.

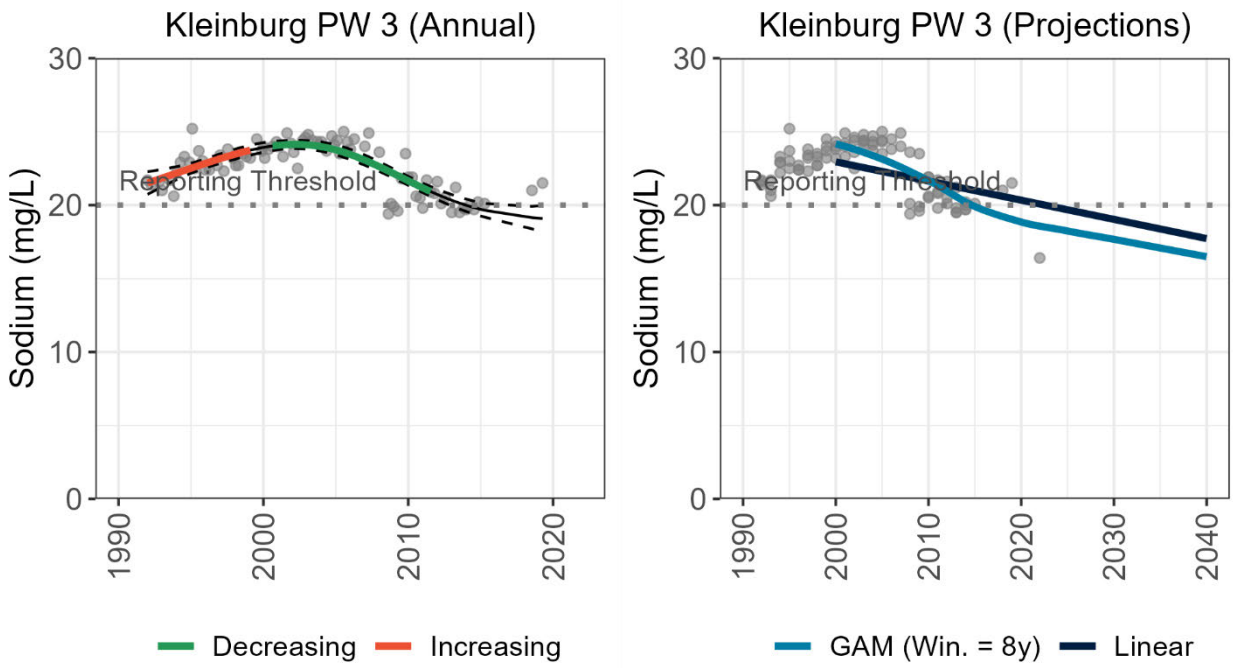


Figure D-159. Sodium concentration at Kleinburg PW 3 Well is currently below the Reporting Trigger of 20 mg/L and is showing no significant trend. Sodium concentration is unlikely to exceed the Reporting Trigger by 2040.

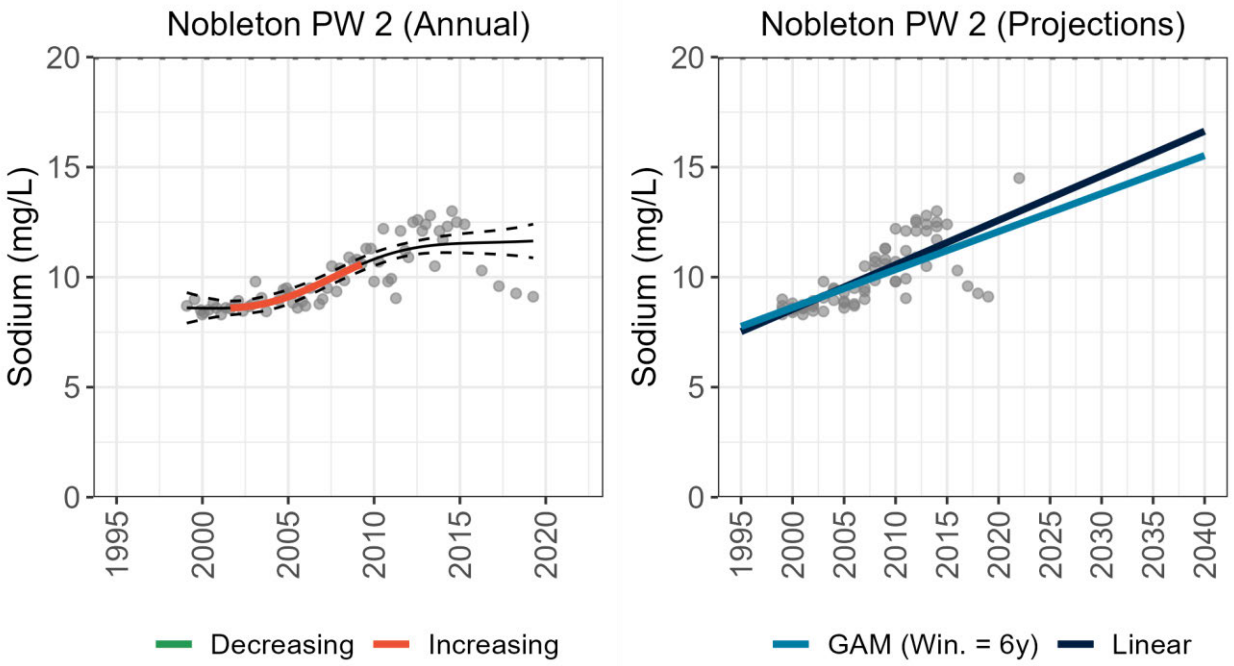


Figure D-160. Sodium concentration at Nobleton PW 2 Well is currently below the Reporting Trigger of 20 mg/L and is showing no significant trend. Sodium concentration is unlikely to exceed the Reporting Trigger by 2040.

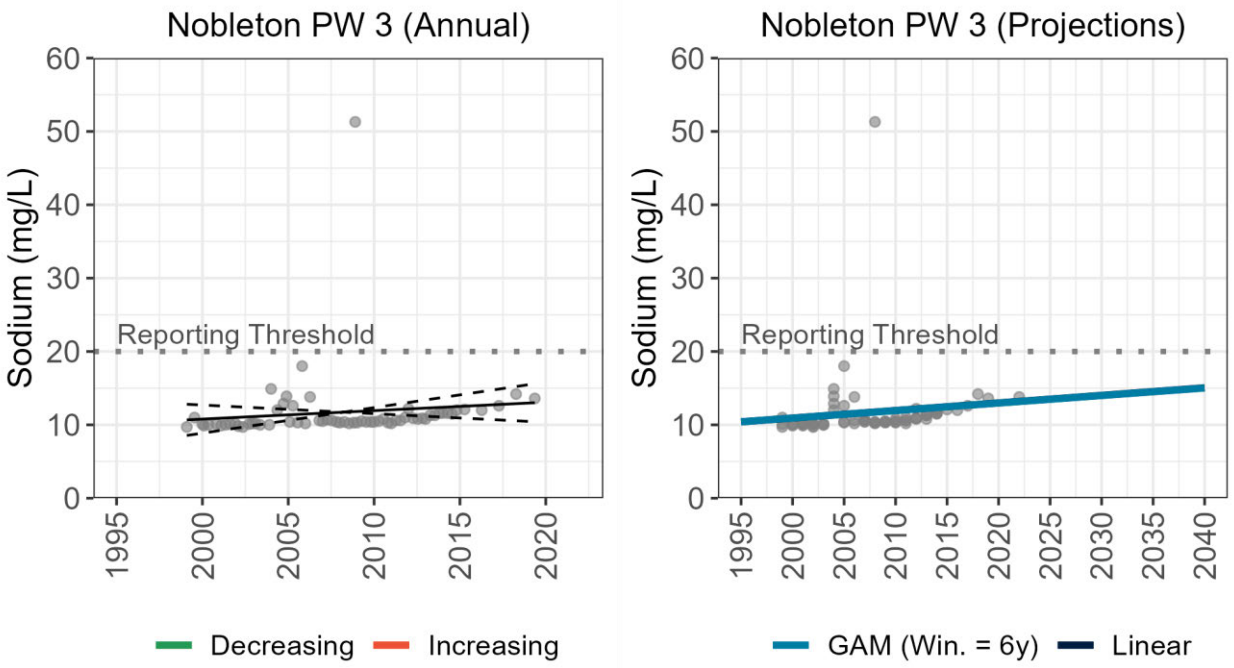


Figure D-161. Sodium concentration at Nobleton PW 3 Well is currently below the Reporting Trigger of 20 mg/L and is showing no significant trend. Sodium concentration is unlikely to exceed the Reporting Trigger by 2040.

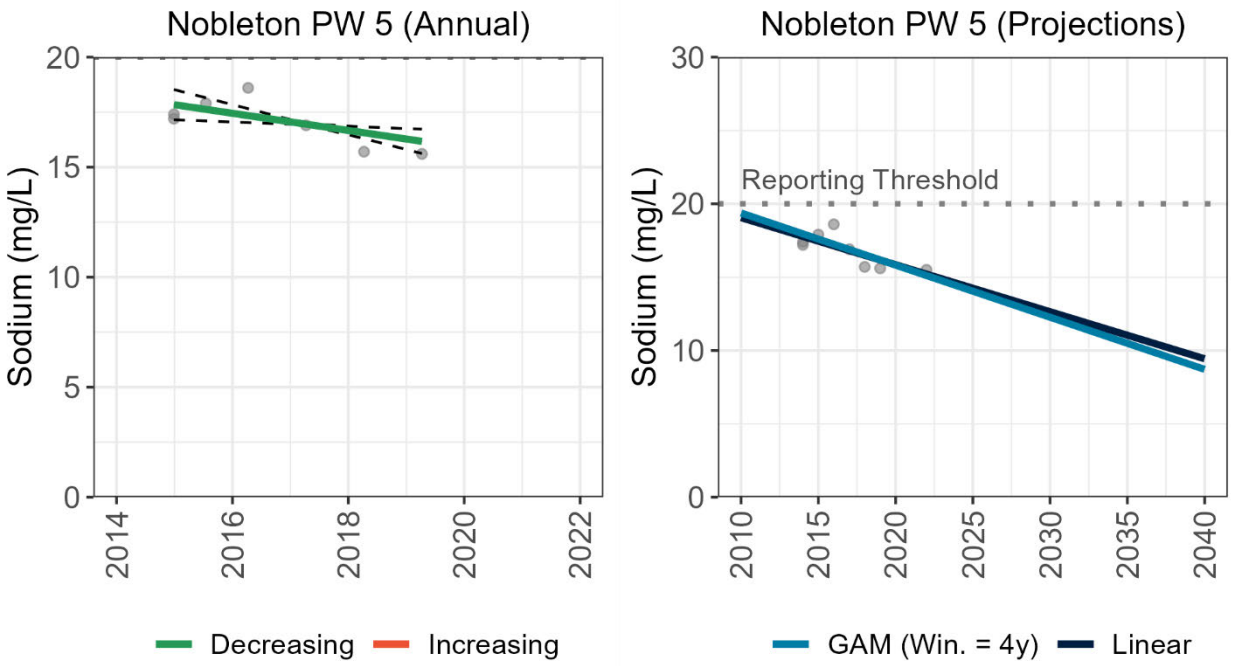


Figure D-162. Sodium concentration at Nobleton PW 5 Well is currently below the Reporting Trigger of 20 mg/L and is showing a significant negative trend. Sodium concentration is unlikely to exceed the Reporting Trigger by 2040.

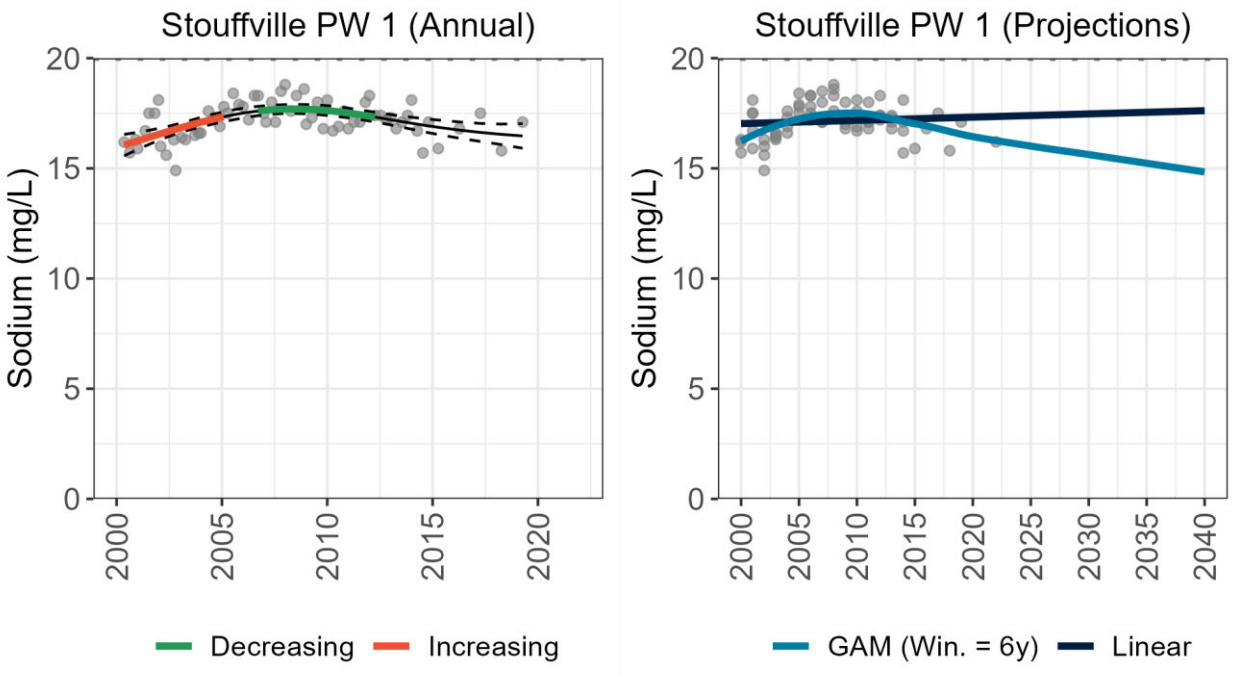


Figure D-163. Sodium concentration at Stouffville PW 1 Well is currently below the Reporting Trigger of 20 mg/L and is showing no significant trend. Sodium concentration is unlikely to exceed the Reporting Trigger by 2040.

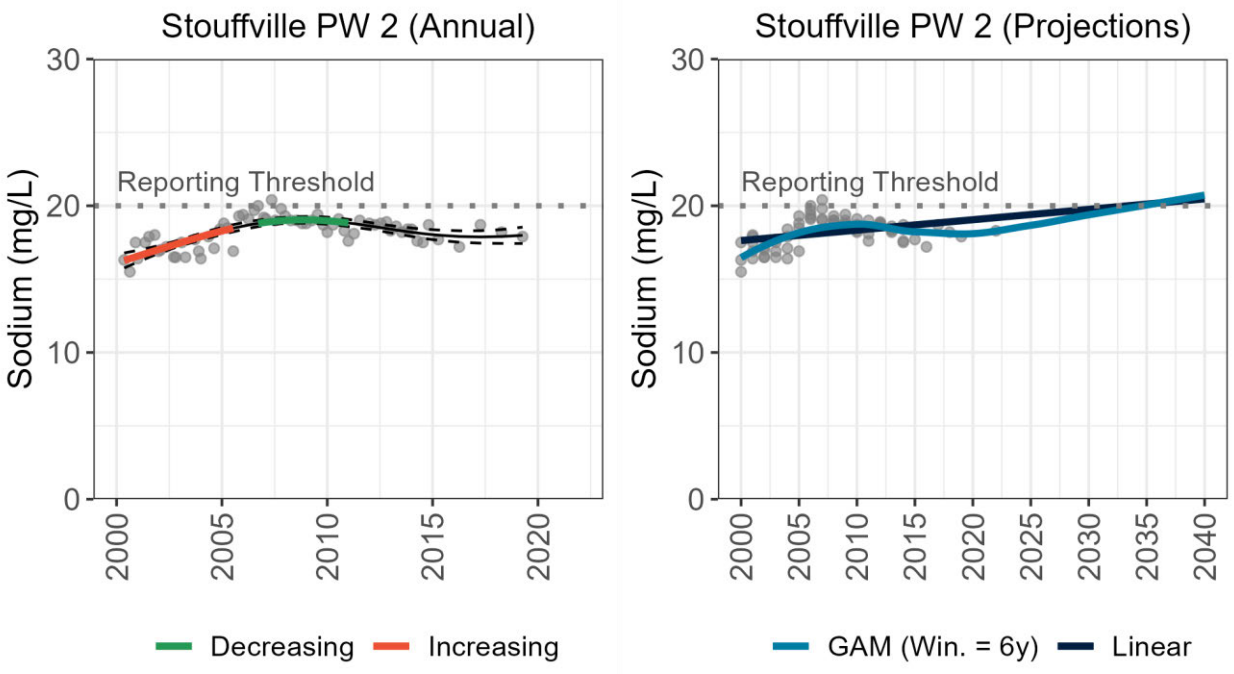


Figure D-164. Sodium concentration at Stouffville PW 2 Well is currently below the Reporting Trigger of 20 mg/L and is showing no significant trend. Sodium concentration is highly likely to exceed the Reporting Trigger by 2040.

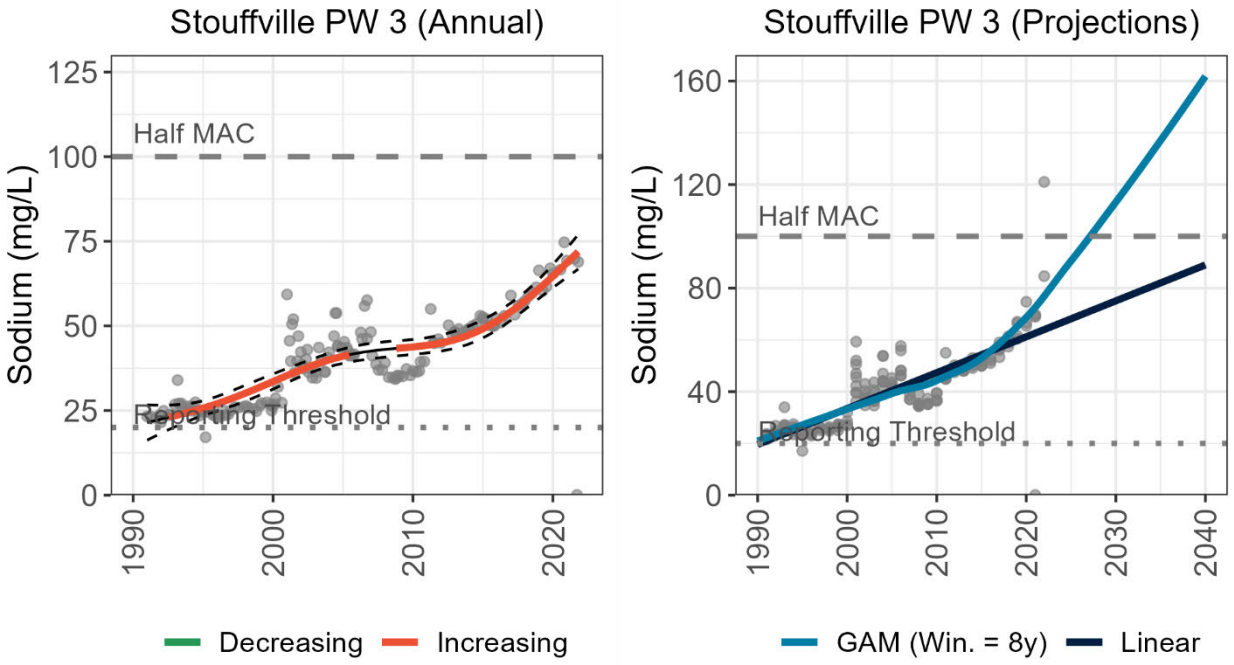


Figure D-165. Sodium concentration at Stouffville PW 3 Well is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing a significant positive trend and is somewhat likely to exceed the half-MAC by 2040.

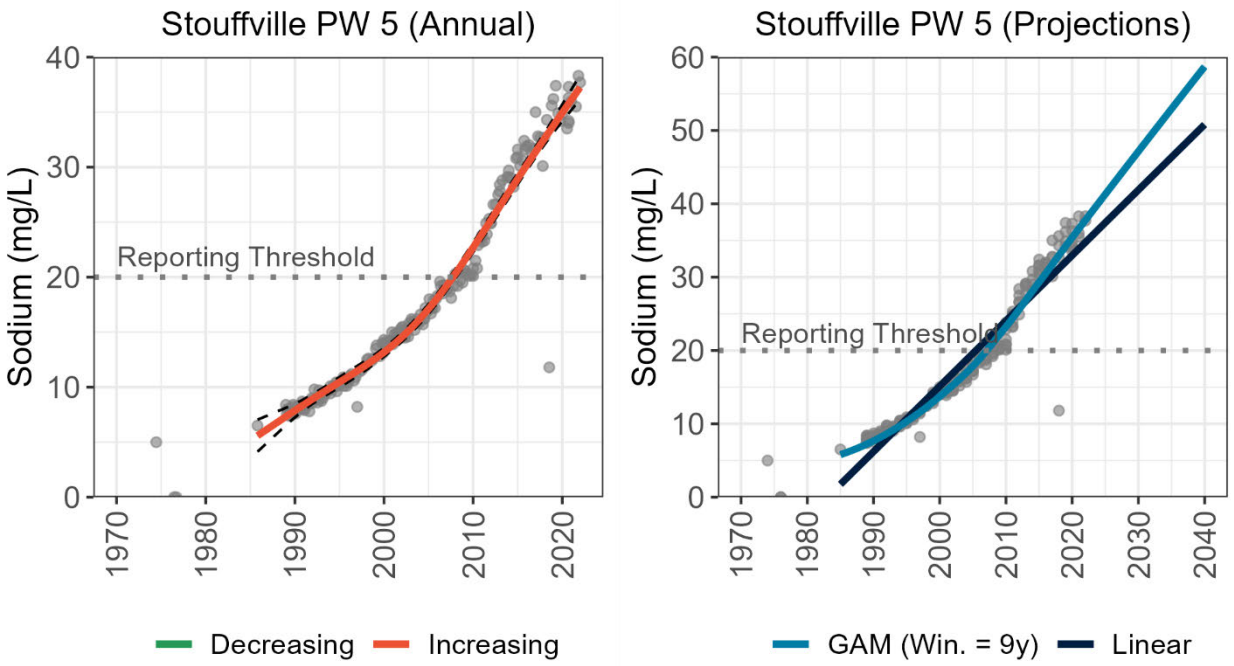


Figure D-166. Sodium concentration at Stouffville PW 5 Well is currently above the Reporting Trigger of 20 mg/L and below the half-Maximum Acceptable Limit (MAC) of 100 mg/L. Sodium concentration is showing a significant positive trend and is unlikely to exceed the half-MAC by 2040.

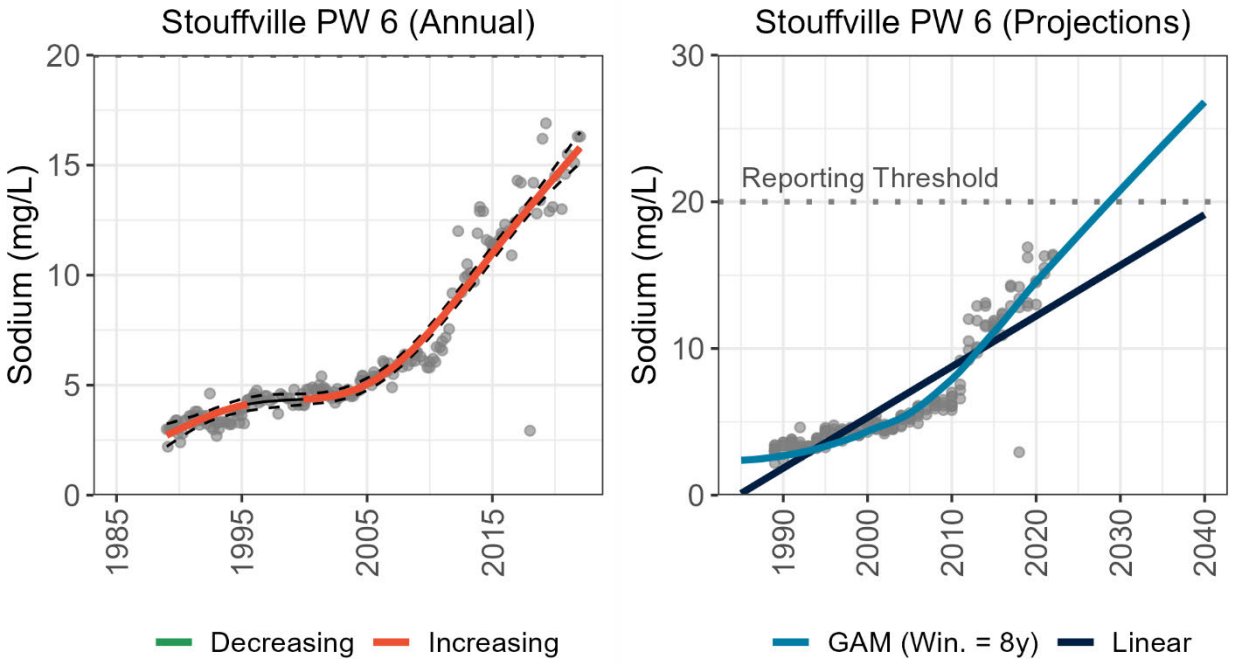


Figure D-167. Sodium concentration at Stouffville PW 6 Well is currently below the Reporting Trigger of 20 mg/L. Sodium concentration is showing a significant positive trend and is somewhat likely to exceed the half-MAC by 2040.

Appendix E: Oak Ridges Moraine Groundwater Program (ORMGP) file importing process

Oak Ridges Moraine Groundwater Program (ORMGP) File Importing Process

Step 1: Identify wells

- Ensure region wells are properly matched to those currently entered in the ORMGP database using Atag numbers, well details etc.
- Identify and add regional wells missing from ORMGP database including screen details.
- Confirm region/ ORMGP location names and details - update alternative names, original MOE IDs etc to ensure efficient searchability.

Step 2: Review, import, and correct historical records

- Review hydrographs of each location via Sitefx – identify record gaps or errors in logger data, manual data and pumping records.
- Replace and/ or update missing and erroneous records when available.
- Suspicious records that cannot be replaced are a) coded as suspect so they do not appear in public searches, b) corrected by hand, or c) removed entirely.

Step 3: Ongoing imports

- Create folder accessible to ORMGP staff and organize files in similar format:

YEAR

1. BH Logs
2. Data (water Levels & Chemistry)
3. Reports and Access Database

-Borehole logs should be entered whenever a new well is drilled and/or old logs are digitized which contain information not yet entered in the ORMGP database.

- Water levels and chemistry files should be uploaded as soon as they have been reviewed and compiled into a (reasonably) import ready format.

- Reports can be uploaded as soon as they are available if ORMGP staff are processing them. If partner staff are submitting documents with access file, then it is preferred to submit in larger batches every 2 -3 months.

Formats

Logger Data:

Logger data may be submitted as raw lev files *only* if they are accompanied with a manual water level taken at the start of the logger file, and one at the end. If manuals are not available, then

logger data can be imported as excel/ csv files if they have been manually compensated and corrected.

Manual Data:

Manual water levels should be submitted as excel or csv, *not* raw field notes.

Water levels in excel/ csv format must contain at least 5 columns with additional headings as necessary. Sample provided below- headers in red are mandatory.

Sample Date and time	Int Id	Rd Value	Rd Name	Rd Unit	Rd Comments
22/09/2023 09:22	74738999	3.8	Water Level - Logger (Compensated & Corrected)	mbref	
22/09/2023 09:18	74738999	3.7	Water Level - Manual - Static	mbref	

Chemistry:

Chemistry should be provided in excel or csv format **not** lab pdf. Lab formats and header names may vary but submitted file should provide the following: sample location (well name), parameter name, value, unit, and any other relevant columns such as comments, mdl, qualifiers etc. See attached Peel file for chemistry sample.

Reports:

PDFs are preferred format. ORMGP staff can remove locks or passwords if necessary. If reports contain separate appendices or related documents, please combine into 1 pdf. ORMGP library does not handle zip files.

Access Database:

Each partner is provided a blank access form and a unique number range. Staff can fill out the required fields for each document and submit the form along with doc pdfs for processing. It is preferred that each form have several (min 10) entries before being uploaded to ORMGP.

DRINKING WATER SOURCE PROTECTION
Our Actions Matter

CTC Source Protection Region

TO: **Chair and Members of the Source Protection Committee Meeting #3/23, December 6, 2023**

FROM: **Behnam Doulatyari, Program Manager, CTC Source Protection Region**

RE: **Review of the CTC Source Protection Plan Nutrient Policies**

KEY ISSUES

Proposed new nutrient (ASM, NASM, LIV, FER) policies for the CTC Source Protection Plan, in compliance with 2021 Director Technical Rules and updates to Nutrient Management Act.

RECOMMENDATION

THAT this report on the proposed amendments to the nutrient policies be received for information.

AND FURTHER THAT the CTC Source Protection Committee members provide their feedback utilizing the attached comment matrix.

AND FURTHER THAT staff be directed to take the necessary actions to implement the feedback and bring back the revised policies to the CTC Source Protection Committee for endorsement.

Background

The Ministry of the Environment, Conservation and Parks' Tables of Circumstances (2009, 2013, 2017, 2021) identifies the following sub-threat activities:

- Application of Agricultural Source Material (ASM) to Land
- Storage of Agricultural Source Material (ASM)
- Management of Agricultural Source Material (ASM) - Aquaculture
- Application of Non-Agricultural Source Material (NASM) to Land
- Handling and Storage of Non-Agricultural Source Material (NASM)
- Application of Commercial Fertilizer (FER)
- Handling and Storage of Commercial Fertilizer (FER)
- ASM Generation – Livestock Grazing (LIV)
- ASM Generation – Outdoor Confined Areas or Farm Animal Yard (LIV)

Most of these activities are defined in O. Reg. 267/03 which are made under the Nutrient Management Act, 2002 as regulated by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMFRA) and the Ontario Ministry of Environment, Climate Change and Parks (MECP). Facilities where commercial fertilizer is manufactured or refined are not included in the provincial Nutrient Management Act because they are regulated under federal Fertilizer Act, 1985.

Under the Nutrient Management Act, a farmer may be required to have one or more of these three documents:

- A Nutrient Management Strategy (NMS);
- A Nutrient Management Plan (NMP); and/or
- A Non-agricultural Source Material Plan (NASM Plans).

OMAFRA is responsible for Nutrient Management Act and the training of Nutrient Management Certificate and Licence Holders who prepare NMPs, NMSs, and NASM Plans.

The Nutrient Management Act generally identifies three policy regimes:

- Farm operations than 300 Nutrient Units (NU)
- Farm operations greater than 5 and Less than 300 Nutrient Units (NU)
- Farm operations less than 5 Nutrient Units (NU)

Non-Phased in Farms (e.g. those that generate between 5 and 300 NU, and that have not expanded their operation since September 2003), do not require a Nutrient Management Plan (NMP) or Nutrient Management Strategy (NMS) or Non-Agricultural Source Material Plan (NASM Plan).

In the s.36 CTC Workplan, directed CTC staff to undertake an assessment of the following tasks related to nutrient management:

- Task 2 - Review agricultural source material policies (ASM-2, ASM-4) for gaps related to allowing a Risk Management Plan (RMP) when a Nutrient Management Plan (NMP)/Strategy (NMS) is required, but has expired, or when a NMP is voluntarily in place.
- Task 3 - Review policies ASM-1 and ASM-2, in particular duplication of requirements where NMP/NMS is in place on a property where a Risk Management Plan (RMP) is also required (i.e., soil testing).
- Task 4 - Review the need for prohibiting the application of commercial fertilizer in wellhead protection area-A (WHPA-A).
- Task 10 - Re-evaluate the appropriateness of a risk management plan approach for all agricultural policies currently requiring prohibition outside of the WHPA-A.

In addition, the 2021 amendments to the Directors Technical Rules (DTR), the vulnerable areas where the above activities can lead to a significant drinking water threat were not changed. However, there were some changes to the following two circumstances:

- Category 1 NASMs can no longer be a significant drinking water threat, except for non-farm herbivorous biosolids.
- Handling and Storage of Commercial Fertilizer is no longer dependent on the land use; it is a significant drinking water threat if more than 2,500 kg is stored on site in any form, including liquid or solid.

Analyses

The areas of applicability for ASM, NASM, LIV, FER policies across the CTC Source Protection Region are attached in **Attachment A**. The discussion paper titled Review of CTC Nutrient Policies (ASM, NASM, LIV & FER) in **Attachment B** provides analysis of current policy gaps, implementation challenges, municipal feedback and other consultations, and recommendations for updated policies presented in this report.

The interplay between significant drinking water threats under the Clean Water Act and Prescribed Instruments under the Nutrient Management Act have been source of concern since the start of the source protection program. Potential policy gaps identified in the discussion paper include, but are not limited to, the following:

- Nutrient Management Plans (NMPs) are Non-Registered and receive little oversight from OMAFRA and/or MECP;
- Non-Phased in Farms (e.g. those that generate between 5 and 300 NU, and that have not expanded their operation since September 2003), do not require a Nutrient Management Plan (NMP) for application of Agricultural Source Material (ASM).
- As of July 2019, Nutrient Management Strategies (NMS) no longer expire and now carry on indefinitely, with a handful of exceptions.
- Non-Phased in Farms (e.g. those that generate between 5 and 300 NU, and that have not expanded their operation since September 2003), do not require a Nutrient Management Strategy (NMS) for storage and handling of Agricultural Source Material (ASM).
- Non-Agricultural Source Material (NASM) Plans can be Registered or Non-Registered: Category 3 NASM Plans are Registered; Category 2 NASM Plans can be Registered or Non-Registered; and Category 1 NASM Plans are Non-Registered. Non-Registered NASM Plans receive little oversight from OMAFRA and/or MECP and Significant Drinking Water Threats can still pertain to Category 2 Non-Registered Plans (application of NASM less than CM2) and Category 1 NASM Non-Registered Plans (non-farm herbivorous biosolids).

Proposed Policy Considerations

The following considerations are relevant to the proposed policies:

- To the extent possible, policy consistency with neighboring source protection regions is prioritized.

- There are no IPZs with a vulnerability score more than 6 in CTC, therefore, throughout this report the focus is limited to groundwater-based drinking water systems and Intake Protection Zones are not discussed.
- It should be further noted that existing CTC Source Protection Region policies refer to Issue Contributing Area(s) – Nitrates but policies refer to Issue Contributing Area(s) – Nitrogen. The purpose of this change is to be consistent with the Director's Technical Rules and neighboring Source Protection Regions.
- Finally, vulnerability scores are a science-based method for delineating risk, and areas where these activities can be a significant drinking water threat are part of the most vulnerable areas designated under the Clean Water Act. CTC prohibition policies outside WHPA-A are narrowly defined and only apply to these most vulnerable areas. The CTC Source Protection Committee, when creating the policies, considered the threat from the activities considered in this report to warrant extra protection. Prohibiting future new threat activities was seen as being precautionary.

Application and Storage of Agricultural Source Material (ASM)

The current nutrient management policies in the CTC Source Protection Plan includes five policies addressing existing and future significant drinking water threats from the application and storage of agricultural source material directed to provincial agencies or Risk Management Officials**.** The Explanatory Document describes the rationale for the policy approach. All current policies include language indicating they apply where an activity is, or would be, a significant drinking water threat, and a bulleted list of locations where/when a significant drinking water threat is possible.

The proposed nutrient management policies (**Attachment C**) include three policies addressing existing and future significant drinking water threats from the application and storage of agricultural source material directed to provincial agencies or Risk Management Officials. The rationale behind the proposed revisions is to close potential policy gaps related to (1) application and storage of agricultural source material related to non-phased in farms (2) storage of agricultural source material related to removal of expiry date on Nutrient Management Strategies and (3) application of agricultural source material issued by Nutrient Management Certificate and Licence Holders rather than provincial body.

ID	Tool	Current Policy	Proposed Policy
ASM-1	Prescribed Instrument	Prohibition limited to existing and future application of ASM in some vulnerable areas where it would be SDWT.	Removed
ASM-2 (1)	Prohibition (s.57)	Prohibition limited to existing and future application of ASM in some vulnerable areas where it would be SDWT.	No change
ASM-2 (2)	RMP (s.58)	Risk Management Plan required where existing and future application of ASM	Risk Management Plan required where existing and future application of ASM would be SDWT but would not be covered

ID	Tool	Current Policy	Proposed Policy
		would be SDWT but would not be covered by prohibition.	by prohibition. Exemption for Prescribed Instrument.
ASM-3	Prescribed Instrument	Prohibition limited to future storage of ASM in some vulnerable areas where it would be SDWT.	Removed
ASM-4 (1)	Prohibition (s.57)	Prohibition limited to future storage of ASM in some vulnerable areas where it would be SDWT.	No change
ASM-4 (2)	RMP (s.58)	Risk Management Plan required where existing and future storage of ASM would be SDWT but would not be covered by prohibition.	Risk Management Plan required where existing and future storage of ASM would be SDWT but would not be covered by prohibition. Exemption for Prescribed Instrument.
ASM-5	Prescribed Instrument	Prohibition of existing and future aquaculture where it would be SDWT.	No change

Application and Storage of Non-Agricultural Source Material (NASM)

The current nutrient management policies in the CTC Source Protection Plan includes five policies addressing existing and future significant drinking water threats from the application and handling & storage of non-agricultural source material directed to provincial agencies or Risk Management Officials**.** The Explanatory Document describes the rationale for the policy approach. All current policies include language indicating they apply where an activity is, or would be, a significant drinking water threat, and a bulleted list of locations where/when a significant drinking water threat is possible.

The proposed nutrient management policies (**Attachment C**) include six policies addressing existing and future significant drinking water threats from the application and storage of agricultural source material directed to provincial agencies or Risk Management Officials. The rationale behind the proposed revisions is to close potential policy gaps related to (1) application, handling and storage of non-agricultural source material related to non-phased in farms and (2) application, handling and storage of non-agricultural source material (Category 1 or 2) where a NASM Plan is not required.

ID	Tool	Current Policy	Tool	Proposed Policy
NASM-1 (1)	Prohibition (s.57)	Prohibition limited to existing and future application of NASM (Category 1) in WHPA-A where it would be SDWT.	Prohibition (s.57)	Prohibition limited to existing and future application of NASM (Category 1) containing manure in WHPA-A where it would be SDWT.
NASM-1 (2)	RMP (s.58)	Risk Management Plan required where existing and future application of NASM (Category 1)	RMP (s.58)	Risk Management Plan required where existing and future application of NASM (Category 1)

ID	Tool	Current Policy	Tool	Proposed Policy
		would be SDWT but would not be covered by prohibition.		containing manure would be SDWT but would not be covered by prohibition.
NASM-2 (1)	Prohibition (s.57)	Prohibition limited future handling and storage of NASM (Category 1) in WHPA-A where it would be SDWT.	Prohibition (s.57)	Prohibition limited future handling and storage of NASM (Category 1) containing manure in WHPA-A where it would be SDWT.
NASM-2 (2)	RMP (s.58)	Risk Management Plan required where existing and future handling and storage of NASM (Category 1) would be SDWT but would not be covered by prohibition.	RMP (s.58)	Risk Management Plan required where existing and future handling and storage of NASM (Category 1) containing manure would be SDWT but would not be covered by prohibition.
NASM-3 (1)	Prescribed Instrument	Prohibition limited to future application of NASM (Category 2 & 3) in vulnerable areas where it would be SDWT.	Prohibition (s.57)	Prohibition limited to future application of NASM (Category 2) in vulnerable areas where it would be SDWT.
NASM-3 (2)	Prescribed Instrument	Prescribed Instrument required where existing application of NASM (Category 2 & 3) would be SDWT but would not be covered by prohibition. Prescribed Instrument would continue only until the expiry of the current approval.	RMP (s.58)	Risk Management Plan required where existing application of NASM (Category 2) in vulnerable areas where it would be SDWT. Exemption for Prescribed Instrument.
NASM-4	Prescribed Instrument	Prohibition of existing and future handling and storage of NASM (Category 2 & 3) in vulnerable areas where it would be SDWT.	Prescribed Instrument	Prohibition of existing and future handling and storage of NASM (Category 2 & 3) in vulnerable areas where it would be SDWT.

ID	Tool	Current Policy	Tool	Proposed Policy
NASM-5	Education and Outreach	MECP and OMAFRA shall provide Prescribed Instrument holders with information on drinking water threats and the risk to nearby municipal wells where the application, handling, and storage of NASM is, or would be, a SDWT.	Education and Outreach	MECP and OMAFRA shall provide Prescribed Instrument holders with information on drinking water threats and the risk to nearby municipal wells where the application, handling, and storage of NASM is, or would be, a SDWT. In addition, MECP and OMAFRA shall update Risk Management Officials on the scope and content of education and outreach materials.
NASM-6	n/a	n/a	Prescribed Instrument	Prohibition of existing and future application of NASM (Category 3) in vulnerable areas where it would be SDWT.

The current nutrient management policies in the CTC Source Protection Plan includes four policies addressing existing and future significant drinking water threats from the application and handling & storage of commercial fertilizer directed to provincial agencies or Risk Management Officials**.** The Explanatory Document describes the rationale for the policy approach. All current policies include language indicating they apply where an activity is, or would be, a significant drinking water threat, and a bulleted list of locations where/when a significant drinking water threat is possible.

The proposed nutrient management policies (**Attachment C**) include two policies addressing existing and future significant drinking water threats from the generation of agricultural source material directed to provincial agencies or Risk Management Officials. The rationale behind the proposed revisions is to close potential policy gaps related to (1) application and storage of agricultural source material related to non-phased in farms and (2) storage of agricultural source material related to removal of expiry date on Nutrient Management Strategies.

ID	Tool	Current Policy	Proposed Policy
LIV-1 (1)	Prohibition (s.57)	Prohibition limited to existing and future livestock grazing or pasturing in WHPA-A, with an animal density unit ≥1, in an Issue Contributing Area (Nitrates or Pathogens) where it would be SDWT.	Prohibition limited to existing and future livestock grazing or pasturing in WHPA-A, with an animal density unit ≥1, in an Issue Contributing Area (Nitrogen or Pathogens) where it would be SDWT.

ID	Tool	Current Policy	Proposed Policy
LIV-1 (2)	RMP (s.58)	Risk Management Plan required where existing and future livestock grazing or pasturing would be SDWT but would not be covered by prohibition.	Risk Management Plan required where existing and future livestock grazing or pasturing would be SDWT but would not be covered by prohibition. Residential land use with ≤5 Nutrient Units, outside WHPA-A, the Risk Management Official can use an annual inspection program.
LIV-2	Prescribed Instrument	Prohibition limited to future outdoor confinement area or farm-animal yard in some vulnerable areas where it would be SDWT.	Removed
LIV-3 (1)	Prohibition (s.57)	Prohibition limited to future outdoor confinement area or farm-animal yard in some vulnerable areas where it would be SDWT.	No change
LIV-3 (2)	RMP (s.58)	Risk Management Plan required where existing and future outdoor confinement or farm-animal yard would be SDWT but would not be covered by prohibition.	Risk Management Plan required where existing and future application of ASM would be SDWT but would not be covered by prohibition. Exemption for Prescribed Instrument.

The current nutrient management policies in the CTC Source Protection Plan includes four policies addressing existing and future significant drinking water threats from the agricultural source material generation directed to provincial agencies or Risk Management Officials. The Explanatory Document describes the rationale for the policy approach. All current policies include language indicating they apply where an activity is, or would be, a significant drinking water threat, and a bulleted list of locations where/when a significant drinking water threat is possible.

The proposed nutrient management policies (**Attachment C**) include three policies addressing existing and future significant drinking water threats from the application, handling and storage of commercial fertilizer material directed to provincial agencies or Risk Management Officials. The rationale behind the proposed revisions is to close potential policy gaps related to (1) application and storage of commercial fertilizer related to non-phased in farms (2) handling and storage of commercial fertilizer related to removal of expiry date on Nutrient Management Strategies and (3) application of commercial fertilizer issued by Nutrient Management Certificate and Licence Holders rather than provincial body.

ID	Tool	Current Policy	Proposed Policy
FER-1	Prescribed Instrument	Prohibition limited to future application of commercial fertilizer in some vulnerable areas where it would be SDWT.	Removed

ID	Tool	Current Policy	Proposed Policy
FER-2 (1)	Prohibition (s.57)	Prohibition limited to existing and future application of commercial fertilizer in some vulnerable areas where it would be SDWT.	Prohibition limited to existing and future application of commercial fertilizer in WHPA-A where it would be SDWT.
FER-2 (2)	RMP (s.58)	Risk Management Plan required where application of commercial fertilizer would be SDWT but would not be covered by prohibition.	No change beyond WHPA-E in an Issue Contributing Area (Nitrates/Nitrogen) now captured.
FER-3 (1)	Prohibition (s.57)	Prohibition limited to future handling and storage of commercial fertilizer in WHPA-A where it would be SDWT.	No change
FER-3 (2)	RMP (s.58)	Risk Management Plan required where handling and storage of commercial fertilizer would be SDWT but would not be covered by prohibition.	No change
FER-4	Education and Outreach	Municipality and MECP are requested to provide education and outreach materials and programs to individuals and owners/tenants of non-agriculturally zoned lands where application, handling, and storage of commercial fertilizer would be SDWT.	No change

Next Steps

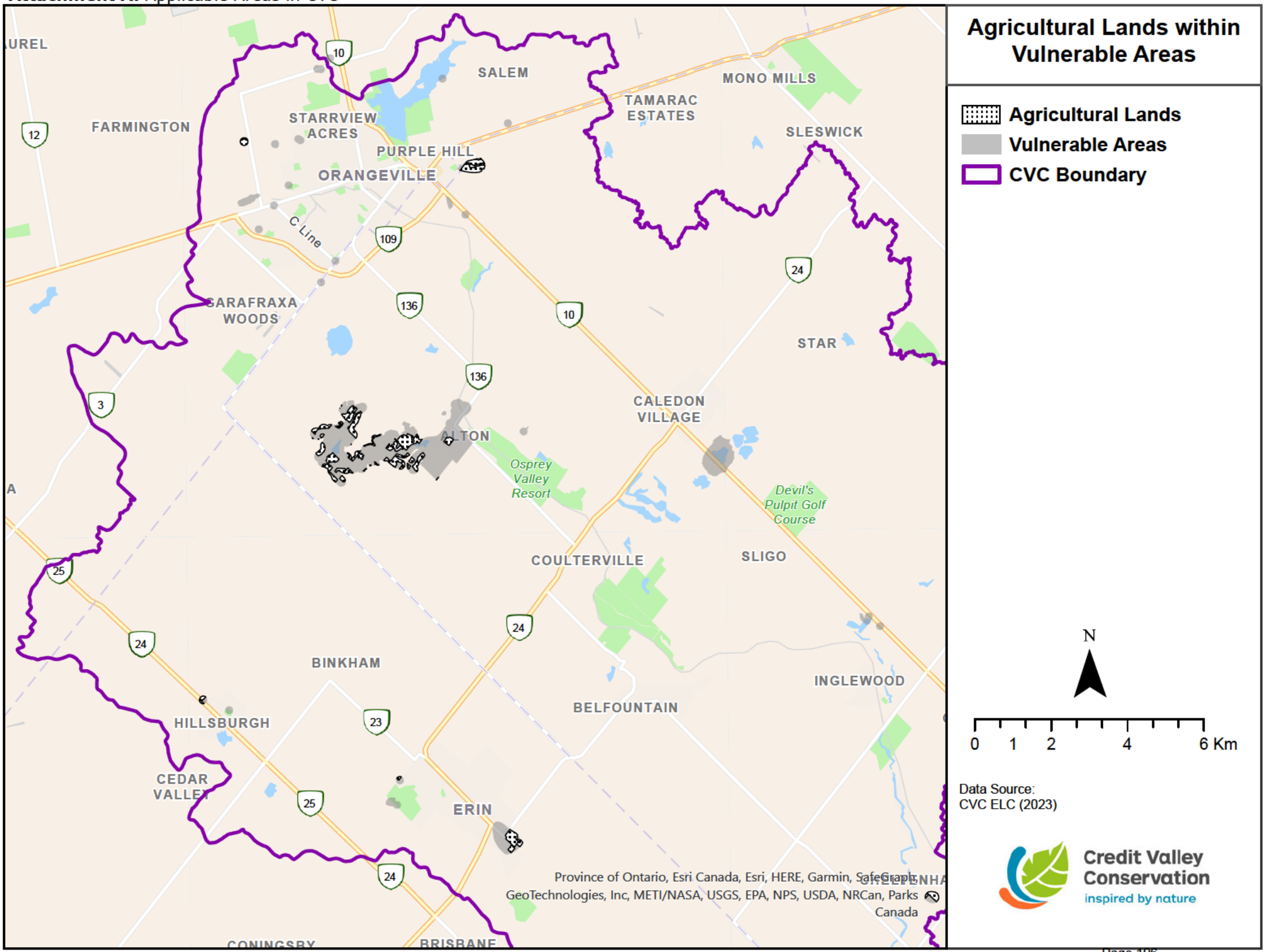
The comment matrix (**Attachment D**) shared with the SPC will remain active until December 13th, 2023, to capture feedback from Committee members. Staff will prepare proposed nutrient policy revisions to the CTC Source Protection Plan and Explanatory Document. These proposed revisions will be brought back to the SPC for approval and then included in the amendment to the SPP under section 36 of the Clean Water Act.

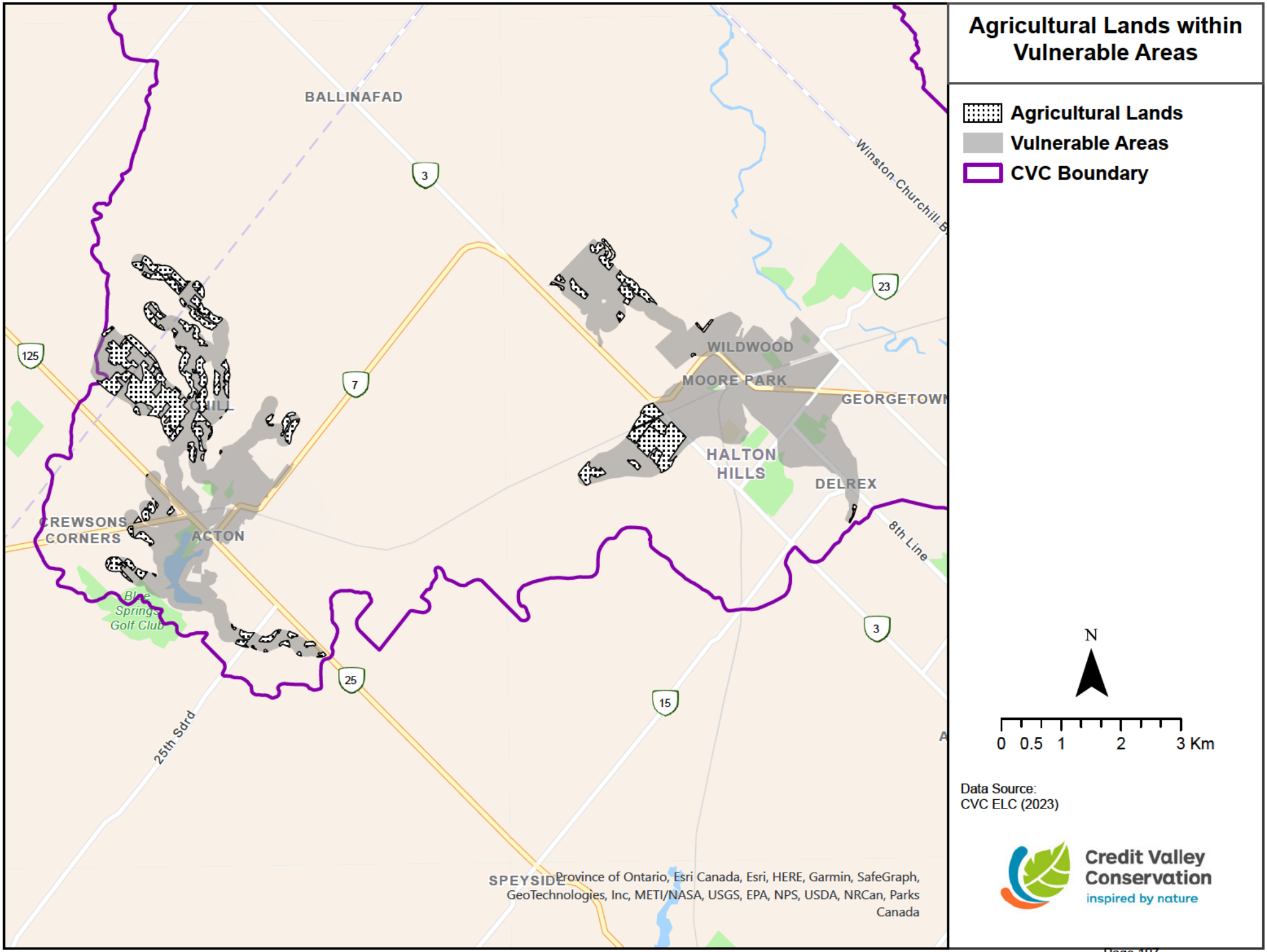
Report prepared by:
Kristina Anderson, Senior Hydrogeologist, Development and Engineering Services Division, Toronto and Region Conservation Authority
T: 437-880-2376
Email: kristina.anderson@trca.ca
Date: October 31, 2023

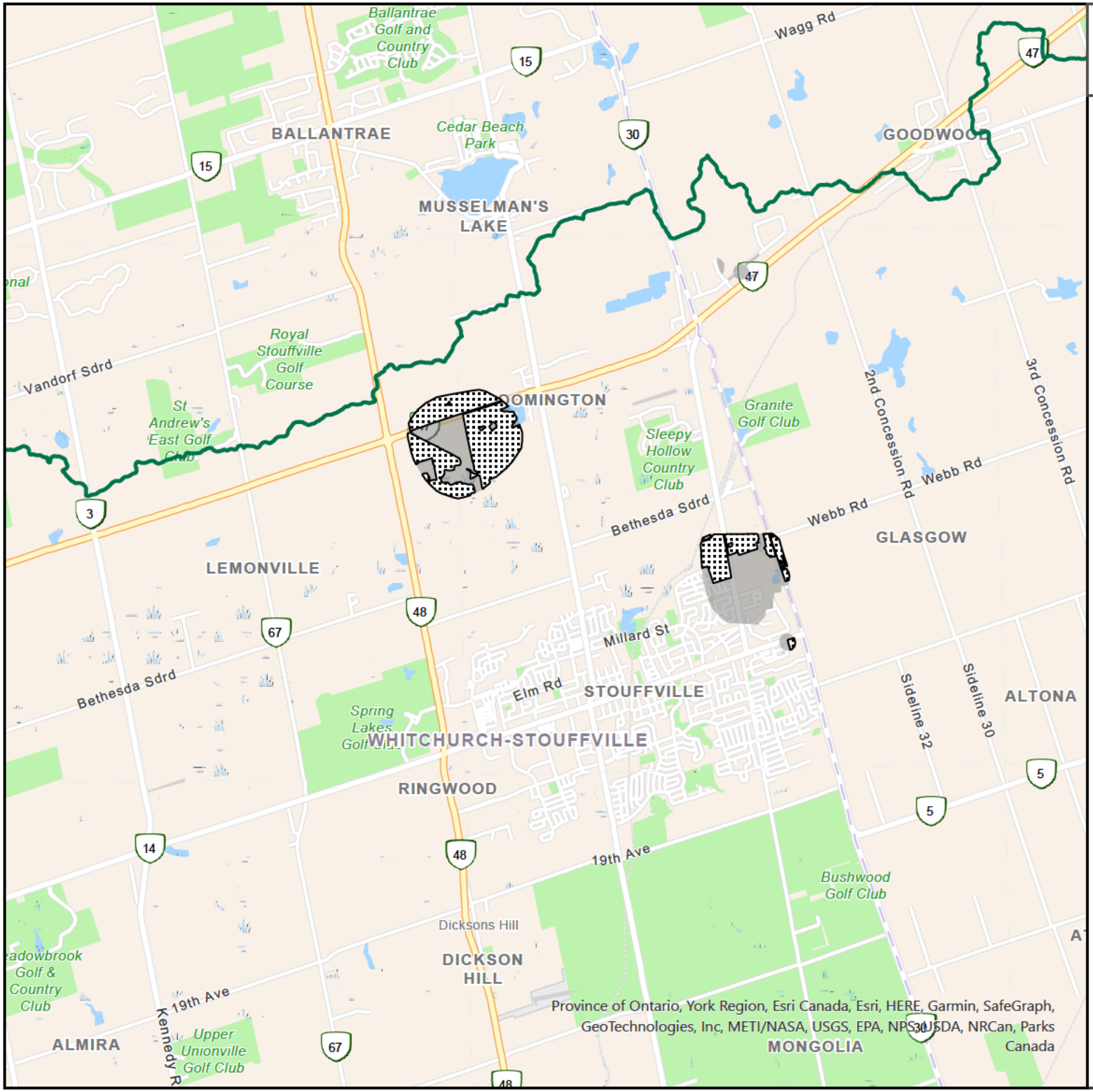
Attachments (5)
Attachment A: Applicable Areas in CTC
Attachment B: Discussion Paper: Review of CTC Nutrient Policies (ASM, NASM, LIV & FER)
Attachment C: CTC Source Protection Plan and Explanatory Document – Nutrient Policies – Proposed changes

Attachment D: Comment Matrix and Municipal Analysis

Attachment A: Applicable Areas in CTC




Agricultural Lands within Vulnerable Areas
Agricultural Lands
Vulnerable Areas
CVC Boundary
BALLINAFAD
WILDWOOD
MOORE PARK
GEORGETOWN
HALTON HILLS
DELREX
CREWSONS CORNERS
ACTON
Blue Springs Golf Club
SPEYSIDE
Winston Churchill Blvd
8th Line
25th Sdrd
3
7
125
23
25
15
N
0 0.5 1 2 3 Km
Data Source:
CVC ELC (2023)
Province of Ontario, Esri Canada, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, NRCan, Parks Canada
Credit Valley Conservation
inspired by nature



Agricultural Lands within Vulnerable Areas

Agricultural Lands

Vulnerable Areas

TRCA Boundary

N

0 0.5 1 2 3 Km

Data Source:
TRCA Natural Land Cover (2017)

Credit Valley Conservation
inspired by nature

DRINKING WATER SOURCE PROTECTION
Our Actions Matter

Discussion Paper: Review of CTC Nutrient Policies (ASM, NASM, LIV & FER)

Prepared for December 6, 2023 CTC Source Protection Committee Meeting

Prepared by Kristina Anderson, Senior Hydrogeologist, Toronto and Region Conservation Authority

1255 Old Derry Rd, Mississauga, ON L5N 6R4 | ctcswp ca | T 905-670-1615 | TF 800-668-5557

Table of Contents

Introduction and Background

The CTC (Credit Valley -Toronto and Region- Central Lake Ontario) Source Protection Plan, along with the supporting Assessment Reports, was approved by the Province of Ontario (MOECC) and came into effect on December 31, 2015. An order was issued under Section 36 (S. 36) of the Clean Water Act, 2006 by the Minister of the Environment and Climate Change in July 2015 to prepare and submit a workplan for updating the Source Protection Plan. This order, which was issued to all Source Protection Regions, is a broad scale review focused on keeping the Assessment Report and Source Protection Plan up to date with general amendments and policy efficacy changes. The CTC 2018 Section 36 workplan sets out a number of tasks, each with their own completion date, ranging from April 2019 to June 2024. The Province later allowed for flexible and open workplan deadlines.

Subsequently, on July 22, 2019 MECP issued another order to the CTC Source Protection Region in which identified parts of the workplan as mandatory elements. These, among other things, include review of policies for agricultural activities that impose prohibitions outside of a WHPA-A and those that address nutrients. Specifically, Table 1 in the CTC S. 36 workplan (P. ii) includes:

- Task 2 - Review agricultural source material policies (ASM-2, ASM-4) for gaps related to allowing a Risk Management Plan (RMP) when a Nutrient Management Plan (NMP)/Strategy (NMS) is required, but has expired, or when a NMP is voluntarily in place.
- Task 3 - Review policies ASM-1 and ASM-2, in particular duplication of requirements where NMP/NMS is in place on a property where a Risk Management Plan (RMP) is also required (i.e., soil testing).
- Task 4 - Review the need for prohibiting the application of commercial fertilizer in wellhead protection area-A (WHPA-A).
- Task 10 - Re-evaluate the appropriateness of a Risk Management Plan (RMP) approach for all agricultural policies currently requiring prohibition outside of the WHPA-A.

In addition, the optional/enabling provisions in the 2021 Director's Technical Rules pertain to Category 1 NASMs and the handling and storage of commercial fertilizer. Category 1 NASMs, except for non-farm herbivorous biosolids, are no longer considered a significant drinking water threat. The handling and storage of commercial fertilizer was previously based on the type of land use (e.g. retail; excluding manufacturing, processing) and mass stored but is now based solely on mass of fertilized storage.

Within the CTC Source Protection Plan, vulnerable areas where nutrient related activities are classified as a significant drinking water threat are limited to Credit Valley Source Protection Authority and Toronto and Region Source Protection Authority. There are no drinking water wells or intakes in the CTC Source protection Region where nutrient related activities are classified as a significant drinking water threat within Central Lake Ontario Source Protection Authority. The municipalities with the largest relevant vulnerable areas are Alton, Acton, Georgetown, and Whitchurch-Stouffville. There are also relatively small areas in Caledon East and Kleinberg.

Table 1 Area and Percentage of Land Potentially Affected by Nutrient Policies within CTC Source Protection Region

	Area (ha)	Percentage	Number of Parcels
Vulnerable areas (WHPA A & B with vs=10, WHPA E with vs>=8, and ICA Nitrate	2621.14	-	-
CVC's Agricultural areas within vulnerable areas	436.4	16.65%	182
TRCA's Agricultural areas within vulnerable areas	149.8	5.71%	41
Total Agricultural areas in both CVC and TRCA	568.2	22.36%	223

Within the CTC Source Protection Plan, there are no drinking water intakes in the CTC Source Protection Region where nutrient related activities are classified as significant drinking water threats. However, there are eleven nutrient policies that require prohibition of activities outside of the WHPA-A.

Table 2. CTC Source Protection Policies Prohibiting Nutrient Related Activities Outside of the WHPA-A and Number of Affected Parcels (s.36 Workplan 2018)

Policy	Description	Tool	Prohibition outside of WHPA-A	Number of Affected Parcels
ASM-1	Application of Agricultural Source Material to Land	Prescribed Instrument	• WHPA-B (VS=10) in an Issue Contributing Area for Pathogens (future) • WHPA-E in an Issue Contributing Area for Nitrates or Pathogens (future)	15
ASM-2	Application of Agricultural Source Material to Land	Part IV	• WHPA-B (VS=10) in an Issue Contributing Area for Pathogens (future) • WHPA-E in an Issue Contributing Area for Nitrates or Pathogens (future)	18
ASM-3	Storage of Agricultural Source Material	Prescribed Instrument	• WHPA-B (VS=10) in an Issue Contributing Area for Pathogens (future) • WHPA-E in an Issue Contributing Area for Nitrates or Pathogens (future)	19

Policy	Description	Tool	Prohibition outside of WHPA-A	Number of Affected Parcels
ASM-4	Storage of Agricultural Source Material	Part IV	• WHPA-B (VS=10) in an Issue Contributing Area for Pathogens (future) • WHPA-E in an Issue Contributing Area for Nitrates or Pathogens (future)	19
ASM-5	Management of Agricultural Source Material	Prescribed Instrument	• An Issue Contributing Area for Pathogens (existing, future)	5
NASM-3	Application of Non-Agricultural Source Material to Land	Prescribed Instrument	• WHPA-B (VS=10) (future) • WHPA-E (VS=>8) (future) • The remainder of an Issue Contributing Area for Nitrates or Pathogens (future)	99
NASM-4	Handling and Storage of Non-Agricultural Source Material to Land	Prescribed Instrument	• WHPA-B (VS=10) (existing, future) • WHPA-E (VS=>8) (existing, future) • The remainder of an Issue Contributing Area for Nitrates or Pathogens (existing, future)	99
LIV-2	The Use of Land as an Outdoor Confinement Area of a Farm-Animal Yard	Prescribed Instrument	• WHPA-B (VS=10) in an Issue Contributing Area for Nitrates or Pathogens (future) • WHPA-E in an Issue Contributing Area for Nitrates or Pathogens (future)	19
LIV-3	The Use of Land as an Outdoor Confinement Area of a Farm-Animal Yard	Part IV	• WHPA-E in an Issue Contributing Area for Nitrates or Pathogens (future)	19
FER-1	Application of Commercial Fertilizer to Land	Prescribed Instrument	• WHPA-E in an Issue Contributing Area for Nitrates (future)	9

Policy	Description	Tool	Prohibition outside of WHPA-A	Number of Affected Parcels
FER-2	Application of Commercial Fertilizer to Land	Part IV	• WHPA-E in an Issue Contributing Area for Nitrate (future)	9

This discussion paper, prepared in support of a report to the CTC Source Protection Committee on the above tasks, examines the current challenges identified with regards to CTC Source Protection Plan nutrient policies, feedback from MECP on these policies, changes from the 2021 Director's Technical Rules, changes to the 2014/15 O. Reg. 267/03 under Nutrient Management Act to the 2022/23 O.Reg. 267/03 under Nutrient Management Act, and provide recommendations towards existing policy gaps and/or duplications.

Regulatory and Policy Framework

Nutrient Management Act

The Nutrient Management Act proclaimed June 30, 2003 and came into force September 30, 2003. Under the Nutrient Management Act, a farmer may be required to have one or more of these three documents:

- A Nutrient Management Strategy (NMS);
- A Non-Agricultural Source Material Plan (NASM Plan); and
- A Nutrient Management Plan (NMP).

OMAFRA is responsible for the Nutrient Management Act and training of nutrient management certificate and licence holders who prepare NMS, NASM Plans, and NMP.

The Nutrient Management Act generally identifies three policy regimes:

1. Greater than 300 Nutrient Units (NU);
2. Greater than 5 and Less than 300 Nutrient Units (NU); and
3. Less than 5 Nutrient Units (NU).

Phased in Versus Non-Phased Farms

With respect to application, handling and storage of **agricultural source material** and commercial fertilizer, as well as agricultural source generation, the definitions of Phased in versus Non-Phased in are as follows:

- Phased in Farms (e.g. those that generate between greater than 300 NU or that have expanded their operation since September 2003), require a Nutrient Management Plan (NMP) and/or Nutrient Management Strategy (NMS).

- Non-Phased in Farms (e.g. those that generate between 0 and 300 NU and that have not expanded their operation since September 2003), do not require a Nutrient Management Plan (NMP) or Nutrient Management Strategy (NMS).

With respect to application, handling and storage of **non-agricultural source material**, the definitions of Phased in versus Non-Phased in are as follows:

- Phased in Farms (e.g. those that generate greater than 300 NU, or that expanded their operation since September 2023, or that receive off-farm anaerobic digestion material in a regulated mixed anaerobic digestion facility), require a Non-Agricultural Source Material Plan (NASM Plan).
- Non-Phased in Farms (e.g. those that generate between 0 and 300 NU, and that have not expanded their operation since 2003, and that do not receive off-farm anaerobic digestion material in a regulated mixed anaerobic digestion facility), do not require a Non-Agricultural Source Material Plan (NASM Plan).

The Environmental Commissioner published three reports between 2014 and 2018 related to nutrient policies entitled (1) 2014 Annual Report Source Water Protection (2) 2016 Annual Report Source Water Protection and (3) 2018 Annual Environmental Protection Report Back to Basics. One recommendation identified in the 2014 Annual Report Source Water Protection was to phase in the remaining farms in Ontario that generate or apply nutrients so that they also must adhere to the requirements of the Nutrient Management Act and its regulation. As of the writing of this report, this recommendation has not been adopted by the province. Therefore, , outside of Prescribed Instruments under the Nutrient Management Act Risk Management Plans remain an important tool to address significant drinking water threats related to nutrients application, handling, storage and generation.

Nutrient Management Strategy

Circumstances that would require a NMS include:

- Livestock numbers on a farm that are equivalent to or greater than 300 NU;
- Construction/expansion of a livestock barn and/or manure storage facility on a farm that has equivalent to or greater than 5 NU;
- Construction/excavation on an earthen manure storage facility on a farm that has equivalent to or greater than 5 NU; and
- Receiving off-farm material for digestion in an anaerobic digester on a farm with any number of NU.

A NMS outlines the following:

1. The calculation of the manure to be generated from the livestock;
2. Proof of adequate storage capacity for the manure;
3. An acceptable management plan for runoff and farm wash water; and
4. A farmstead sketch showing that new and expanding facilities are acceptable distances away from wells and watercourses.

Non-Agricultural Source Material Plan

Most NASM Plans are for farms applying sewage biosolids on their fields but other types of NASM materials include food processing wash waters and residuals, and ash products from the forestry sector.

NASMs are classified under one of the following three categories:

- Category 1: e.g. Leaf and yard waste that has not been composted
- Category 2: e.g. organic waste matter that contains no meat or fish and is derived from food processing at a bakery
- Category 3: e.g. pulp and paper biosolids, paunch manure and sewage biosolids.

The regulation requires a NASM Plan for application or storage of Category 2 or 3 NASM. NASM Plans must be prepared by a NASM Plan Development Certificate holder and must comply with the regulation, the Nutrient Management Protocol, the NASM Odour Guide and the Sampling and Analysis Protocol. A NASM Plan is a legal document that demonstrates that the application of NASM is done correctly. It considers site-specific information and demonstrates that the application rates of NASM and other nutrients are appropriate for the crops being grown. It also includes a contingency plan that outlines what can be done in the event of an emergency (i.e. spill).

Most NASM Plans must be approved by the Ministry of Agriculture, Food and Rural Affairs (OMAFRA). OMAFRA will notify the local municipality (lower or single tier) that an application site has been approved to accept NASM. The notification is sent to the Clerk and is circulated as needed. The regulation requires you have an approved (registered) NASM Plan whenever you:

- Apply Category 3 NASM to land;
- Apply Category 2 NASM with higher concentrations of regulated metal to land (CM2); and
- Store and apply any Category 2 or 3 NASM.

Category 2 NASMs with a higher concentration of regulated metal (CM2) are outlined in Schedule 5 of O.Reg. 267/03: General, under the Nutrient Management Act. This scheduled regulates metal content of NASMs and includes two tables Table 1 – CM1 NASM and Table 2 – CM2 NASM. Schedule 6 governs the Pathogen Content of NASM and includes two tables Table 1 – CP1 NASM and Table 2 –CP1 NASM. NASM cannot be land applied if it has any of these characteristics: (1) the content of regulated metal exceeds Schedule 5 Table CM2 NASM (2) the content of E.coli exceeds Schedule 6 Table 2 CP2 NASM and (3) Odor category – Table OC3.

NASM Plan soil testing pertains to plant available phosphorus, potassium, regulated metals, soil pH, and parameters related to NASM being applied.

Nutrient Management Plan

Circumstances that would require a NMP include:

- Livestock numbers on a farm that are equivalent to or great than 300 NU; and

- Farm requiring a NMS is also within 100 m of a municipal well.

A NMP outlines the following:

- Nutrient applications in farm field;
- Crop rotation;
- Tillage;
- Projected yields; and
- Other management approaches to optimize the utilization of nutrients by the crops while safeguarding the environment.

NMP soil testing pertains to plant available phosphorus, potassium, regulated metals, and soil pH.

Nutrient Management Certificate and Licence Holders

OMAFRA offers several certificates and licences relevant to nutrient management including:

- AOP Certification (Preparing Nutrient NMS / NMP for themselves);
- AOSPD Certificate (Preparing NMS / NMP) for someone else);
- NASM Plan Development Certificate (Preparing NASM Plans);
- PMAB Licence (Spreading ASM and NASM as Commercial Operation)
- Broker Certificate (Receiving, Storing, Delivering ASM);
- Technician Licence (Spreading ASMs and NASMs for operations that require a NMP or NASM Plan); and
- Greenhouse Nutrient Feedwater (GNF) Management.

OMAFRA has revised the training of nutrient management certificate and licence holders to include source water protection. Guidance has been developed for Risk Management Officials, farms and certified individuals that prepare Nutrient Management Plans to use to help determine if a prescribed instrument conforms to the significant drinking water threat policies. They are available at https://www.nutrient management.ca/courses. Training was also delivered by OMAFRA to certified preparers on requirements and responsibilities of incorporating source water protection into prescribed instruments (Nutrient Management Plans included).

Insights and Takeaways

Commented [KA1]: consultation and other relevant feedback
discoveries, findings, insights, and takeaways
knowledge gained
knowledge acquired

Halton-Hamilton SPR

During Early Engagement with MECP by Halton Hamilton SPR, during June to August 2021, MECP provided the following options with respect to Agricultural Source Material (ASM) while the s.36 amendment was underway:

- Option 1: Update prescribed instruments (Nutrient Management Plans and strategies) to replace OMAFRA with MECP but this relies on MECP conducting compliance inspection but MECP does not issue/approve strategies so a gap remains (emphasis added).
- Option 2: Update the current Risk Management Plan policies to not limit them to farms not phased-in under the Nutrient Management Act. Ontario Reg 287/07 provides an avenue for a person to be exempt from Clean Water Act Section 58 Risk Management Plan where the person holds a prescribed instrument that already adequately regulates a threat activity. OMAFRA revised training of nutrient management certificate and licence holders to include source water protection.
- Option 3: retain update shown in pre-consultation package only changing monitoring policy part b to rely on MECP rather than OMAFRA. Consistent with Grand River policy but will leave comment from OMAFRA unaddressed (emphasis added).
- Option 4: replace OMAFRA with nutrient management certificate and licence holders. Would address root of problem with actual prescribed instrument issuer as the implementing body and monitoring policy could be one that relies on the training provided by OMAFRA to the implementer but unclear whether legally binding (emphasis added).

Further discussions were held on September 13, 2021, and October 5, 2021 between HHSPR and MECP. Ministry staff relied on the exemption from Risk Management Plans afforded under Section 58 and 61 of Ontario Regulation 287/07, under the Clean Water Act, with respect to prescribed instruments. Furthermore, they argued that the Clean Water Act identifies the responsibility to implement the prescribed instrument with whomever issues the instrument, and, for Nutrient Management Plans, that would be the certified nutrient management consultants and certified farmers. HHSPR ultimately moved forward with the s.36 process without addressing nutrient policies because of time constraints.

CTC SPR

During the Amendments Working Group (November 7, 2021) several ideas/concerns were raised:

- Discussion around enforcement challenges in areas outside of WHPA-A can be a challenge where <5 NU with respect to ASM Generation – Livestock Grazing threat balanced against the Walkerton tragedy occurring on a hobby farm operating in the 5 to 30 NU legislation/policy regime.
- Discussion around the risk of commercial fertilizer being managed by mitigation as opposed to prohibition and that fertilizer prohibitions creates a perception of an uneven playing field by agricultural producers.

Follow up discussion with Risk Management Official(s)/Inspector(s) who raised the concern around the Risk Management Plans where <5 NU with respect to ASM Generation – Livestock Grazing threat were

held. Discussion focused on approaches taken by other Source Protection Regions and land uses on properties where <5 NU are found.

During the Municipal Implementation Working Group (April 6, 2023) several ideas/concerns were raised:

- Recommendation to contact external partner agencies (RMOs, MECP) for clarification on how the Prescribed Instruments (NMP, NMS, NASM Plan) under the Nutrient Management Act work in practice.

One referral from the Municipal Implementation Working Group was an inspector from MECP. Discussion focused on legislative/policy framework and soil testing policies and observations. Discussion also led to referral to policy expert within OMAFRA who CTC program staff plan on sharing a draft copy of the proposed policies with before returning to the CTC Source Protection Committee. The second referral from the Municipal Implementation Working Group was a Risk Management Official who is also an agricultural owner/operator. Discussion focused on legislative/policy framework, soil testing research, and standard industry practices. Discussion also led to referral to former Risk Management Official who is currently employed by OMAFRA. The third referral from the Municipal Implementation Working Group was another Risk Management Official. Discussion focused on legislative/policy framework and soil testing policies/incentives.

The discussion with the referred OMAFRA staff focused on legislative/policy framework, soil testing policies and research, standard industry practices, and current events related to pelletized biosolids. Discussion also led to referral to NASM expert within OMAFRA. The next discussion with both technical OMAFRA staff focused on legislative/policy framework, soil testing research, standard and best industry practices, and provincial/federal response to current events related to pelletized biosolids.

In total, four municipal/conservation authority staff and three provincial staff were consulted. Highlights from those discussions are summarized below:

Table 3. CTC SPR Consultation with external stakeholders

	Prescribed Instrument (NMS, NMP, NASM Plan)	Risk Management Plans	Threats (ASM, NASM, FER)	Soil Testing
Municipalities / Conservation Authorities	Encourages Nutrient Management Certificate and Licence Holders to act as signatory	Recommended aligning RMPs with rotation practice (application of nutrients commonly one in three years but varies with crops, lease agreements, etc.)	Noted (1) application of NASM less common than application of ASM and FER and (2) lack of nutrient application may encourage invasive species propagation	Noted soil testing requirement previously applicable to ASM and NASM policies removed due to poor compliance

	Prescribed Instrument (NMS, NMP, NASM Plan)	Risk Management Plans	Threats (ASM, NASM, FER)	Soil Testing
MECP/ OMAFRA	Noted more third-party business involved with NASM Plans	Recommended structuring nutrient policies in a way that nutrient management certificate and licence holders are not held to the standard of upholding conformity with source protection policies.	Noted (1) precision application more difficult with solids than liquid and soil testing more likely with precision application and (2) Canadian Food Inspection Agency, regulates the Fertilizer Act, which deals with importation and sale of biosolids active on PFAS portfolio.	Noted soil testing in advance of application of fertilizer standard industry practice but soil testing in advance of ASM less common

During the Amendment Working Group (May 31, 2023) several ideas/concerns were raised:

- Recommendation to direct application of agricultural source material, non-agricultural source material, and commercial fertilizer towards a risk management approach and provide an exemption for holders of a prescribed instrument which Saugeen Valley Source Protection has undertaken as their preferred approach. Risk Management Officials cited advantages of the risk management approach in terms of engagement and inspections. Where the Prescribed Instrument is not registered by a provincial agency, ensure the prescribed instrument is in compliance with the CTC Source Protection Plan in the form of a statement of conformity.
- Discussed around an inspection policy approach for residential properties with <5 NU with respect to ASM Generation – Livestock Grazing threat.
- Discussion around soil testing requirements in relation to Prescribed Instruments (Nutrient Management Plans, Nutrient Management Strategies, and NASM Plans) and in relation to jurisdictional review.

Policy Analysis

Agricultural Source Material

Legal Definitions

The CTC Source Protection Plan was approved on December 31, 2015 and relied upon the legal definition within the provincial Nutrient Management Act from January 1, 2014 to June 30, 2015. There have been some slight revisions to the definition of agricultural source material in the intervening eight years.

Table 4. Section 1 Definitions and General, Part 1 Definitions and Interpretation, O.Reg. 267/03, under the Nutrient Management Act, Agricultural Source Material Definition

Ontario Regulation 267/03 (2014/15)	Ontario Regulation 267/03 (2022/23)
• Manure produced by farm animals, including associated bedding materials.	• Manure, including associated bedding materials, whether or not located on an agricultural operation.
• Runoff from farm-animal yards and manure storages.	• Runoff from farm animal yards, outdoor confinement areas and permanent nutrient storage facilities that contain only manure and associated bedding materials, whether or not located on an agricultural operation.
• Washwaters from agricultural operations that have not been mixed with human body waste.	• No change
• Organic materials produced by intermediate operations that process materials described in paragraph 1, 2 or 3.	• No change
• Anaerobic digestion output, if, o the anaerobic digestion materials were treated in a mixed anaerobic digestion facility, o at least 50 per cent, by volume, of the total amount of anaerobic digestion materials were on-farm anaerobic digestion materials, and o the anaerobic digestion materials did not contain sewage biosolids or human body waste.	• No change

Ontario Regulation 267/03 (2014/15)	Ontario Regulation 267/03 (2022/23)
• Regulated compost as defined in subsection 1 (1) of Ontario Regulation 106/09 (Disposal of Dead Farm Animals) made under the Act; ("matières de source agricole", "MSA")	• No change

Jurisdiction Review

The agricultural source material policies of three neighboring Source Protection Regions (SPR) were reviewed. These include:

- South Georgian Bay Lake Simcoe (SGBL SPR) approved policies.
- Lake Erie (LE SPR) approved policies.
- Halton-Hamilton (HH SPR) approved policies.

The policy treatments by these adjacent SPR are summarized, below.

Table 5. Agricultural Source Material Significant Threat Jurisdiction Review

	Lake Erie Source Protection Area	Lake Simcoe and Georgian Bay Source Protection Area	Halton Hamilton Source Protection Area
Prohibition (s.57)	Limited to specific vulnerable areas in specific municipalities.	Limited to WHPA-A and IPZ-1	
Risk Management Plans (s.58)	General approach for non-phased in farms existing and future activities that would be SDWT	General approach for non-phased in farms existing and future activities that would be SDWT	
Restricted Land Use Planning (s.59)	Screen areas where activity would be a SDWT.	Screen areas where activity would be a SDWT.	Screen areas where activity would be a SDWT.
Prescribed Instrument	General approach for phased in farms existing and future activities that would be SDWT	Existing and future activity that would be a SDWT but not covered by prohibition.	General approach for phased in farms existing and future activities that would be SDWT
Land Use Planning		Planning documents to be amended to prohibit	Proponents compelled to disclose activities expected to

	Lake Erie Source Protection Area	Lake Simcoe and Georgian Bay Source Protection Area	Halton Hamilton Source Protection Area
		future ASM storage within WHPA-A or IPZ-1	occur on property where would be SDWT
Education and Outreach		Undertake a program focusing on properties where activity would be SDWT	Undertake a program focusing on properties where activity would be SDWT
Other Tools		Compliance incentives of agricultural operations by MECP	Compliance inspections/incentives of agricultural operations by MECP

CTC Outstanding Threats

The most recent number of remaining significant drinking water threats comes from the 2022 Annual Report summarized, below.

Table 6. Agricultural Source Material Threats Identified (2022)

	Original threat count (a)	Field verified new threats (b)	Threats discounted through field verification (c)	Threats addressed through policy tools (d)	Remaining significant drinking water threats (a+b-c-d=e)
The application of Agricultural Source Material to land	65	6	40	15	16
The storage of Agricultural Source Material	39	11	36	5	9

Management Practices of Potential Interest

With respect to manure application, best agricultural management practices dictate to incorporate solid-spread, liquid-broadcast or irrigated-liquid manure within 24 hours in the spring. The rationale is to prevent denitrification, specifically loss of N gases to atmosphere on moist, poorly drained soils. (Canada, Ontario and Agricultural Adaptation Council 2005 and personal conversation CVC Ag Rep 2023).

However, groundwater recharge generally takes place in the spring and fall and nitrogen percolates easily into groundwater through the soil along with rainwater recharge or irrigation water. This best agricultural management practice has the potential to introduce nitrogen directly into the groundwater system. By contrast, because ammonia volatizes rapidly when to sunshine and air, the risk to the groundwater system is greatly reduced if manure is not incorporated into the soil within 24 hours.

A difference should be noted between annual (cash) crops and perennial crops. Where a farmer is growing perennial hay and pasture crops and where the biomass above is removed but the plant structure below is left, the application of agricultural source material is not usually undertaken as part of a soil management regime.

Land Use Trends of Potential Interest

The risk of nutrient movement off a field due to erosion or leaching is balanced by the amount of groundcover and root mass available to absorb the nutrients. The lowest risk of nutrient movement off a field will occur when there is a permanent sod with a dense root network receiving little or no fertilizer. Long-term application of chemical fertilizer has the potential to promote invasive species. Any practice, such as cover crops to uptake nitrogen left behind by the main crop and/or manure application, that increases the amount of groundcover or root mass helps lower the risk of nutrient loss. (Ontario Soil Crop 2022)

However, urbanizing land use patterns within CTC are such that many farmers within our jurisdiction rent their farms often with short-term leases. Lack of ownership and/or long-term leases has the potential to discourage investment in soil health. While RMOs in other parts of Ontario may be able to check in based upon a predetermined crop rotation schedule, more regular visits may be required due to dynamic land ownership/use patterns.

Non-Agricultural Source Material

Legal Definitions

The CTC Source Protection Plan was approved on December 31, 2015 and relied upon the legal definition within the provincial Nutrient Management Act from January 1, 2014 to June 30, 2015. There have been some slight revisions to the definition of non-agricultural source material in the intervening eight years.

Table 7. Section 1 Definitions and General, Part 1 Definition and Interpretation, O.Reg. 267/03, under the Nutrient Management Act, Non-Agricultural Source Material Definition

Ontario Regulation 267/03 (2014/15)	Ontario Regulation 267/03 (2022/23)
• Pulp and paper biosolids	• No change

Ontario Regulation 267/03 (2014/15)	Ontario Regulation 267/03 (2022/23)
• Sewage biosolids	• No change
• Anaerobic digestion output, if less than 50 per cent, by volume, of the total amount of anaerobic digestion materials that were treated in the mixed anaerobic digestion facility were on-farm anaerobic digestion materials.	• Anaerobic digestion output, if less than 50 per cent, by volume, of the total amount of anaerobic digestion materials that were treated in the mixed anaerobic digestion facility were on-farm anaerobic digestion materials. o Restricted anaerobic digestion output.
• Any other material that is not from an agricultural source and that is capable of being applied to land as a nutrient; ("matières de source non agricole", "MSNA")	• Any other material, o that is not from an agricultural source and that is capable of being applied to land as a nutrient, and o that is not an agricultural source material; ("matières de source non agricole", "MSNA")

Jurisdiction Review

The non-agricultural source material policies of three neighboring Source Protection Regions (SPR) were reviewed. These include:

- South Georgian Bay Lake Simcoe (SGBL SPR) approved policies.
- Lake Erie (LE SPR) approved policies.
- Halton-Hamilton (HH SPR) approved policies.

The policy treatments by these adjacent SPR are summarized, below.

Table 8. Non-Agricultural Source Material Significant Threat Jurisdiction Review

	Lake Erie Source Protection Area	Lake Simcoe and Georgian Bay Source Protection Area	Halton Hamilton Source Protection Area
Prohibition (s.57)	Limited to specific vulnerable areas in specific municipalities	Limited to WHPA-A and IPZ-1	
Risk Management Plans (s.58)		General approach where approval under the Nutrient Management Act or Environmental Protection Act is not	

	Lake Erie Source Protection Area	Lake Simcoe and Georgian Bay Source Protection Area	Halton Hamilton Source Protection Area
		required for existing and future activities that would be SDWT	
Restricted Land Use Planning (s.59)	Screen areas where activity would be a SDWT.	Screen areas where activity would be a SDWT	Screen areas where activity would be a SDWT.
Prescribed Instrument	General approach existing and future activities related to NASMS containing materials from a meat or sewage works that would be SDWT	General approach where approval under the Nutrient Management Act or Environmental Protection Act is required for existing and future activities that would be SDWT	General approach for existing and future activities related to Category 2 and 3 NASMs that would be SDWT
Land Use Planning		Planning documents to be amended to prohibit future NASM storage within WHPA-A or IPZ-1	Proponents compelled to disclose activities expected to occur on property where would be SDWT
Education and Outreach		Undertake a program focusing on properties where activity would be SDWT	General approach for existing and future activities related to Category 1 NASMs that would be SDWT
Other Tools		Compliance incentives of agricultural operations by MECP	Compliance inspections/incentives of agricultural operations by MECP

CTC Outstanding Threats

The most recent number of remaining significant drinking water threats comes from the 2022 Annual Report summarized, below.

Table 9. Non-Agricultural Source Material Threats Identified (2022)

	Original threat count (a)	Field verified new threats (b)	Threats discounted through field verification (c)	Threats addressed through policy tools (d)	Remaining significant drinking water threats (a+b-c-d=e)
The application of Non-Agricultural Source Material to land	9	2	8	0	3
The handling and storage of Non-Agricultural Source Material	0	0	0	0	0

Emerging Contaminants of Concern

Per-and Polyfluoroalkyl Substances (PFSA)

While many PFASs have been found in biosolids, PFOS and PFOA are among the most abundant and have the largest data sets to support risk assessment. PFOS and PFOA do not readily degrade via aerobic or anaerobic processes. The only dissipation mechanisms in water are dispersion, advection, and sorption to particulate matter such as biosolids in the wastewater stream. While PFOS and PFOA have largely been phased out of production in Canada, their resistance to environmental degradation causes a lingering concern for exposure. They can also be formed from precursors in the environment. PFOS and PFOA are both highly persistent in the environment and highly mobile. Both chemicals tend to bioaccumulate in humans, terrestrial organisms, and aquatic organisms. PFAS sources of concern include paper mills and residuals, industrial cleaning products, floor wax (e.g., in schools), metal coating facilities, consumer products (e.g., textiles), car washes, and aqueous film forming foam.

While PFOS and PFOA are still produced in the United States, there production is being phased out. On March 14, 2023, the United States Environmental Protection Agency proposed PFAS National Primary Drinking Water Regulation. Additional information regarding the proposed regulation can be found here: https://www.epa.gov/sdwa/and-polyfluoroalkyl-substances-pfas.

There has been media coverage related to Quebec's temporary moratorium of biosolid imports from the United States as it works to establish control mechanisms and thresholds for PFAS. Environment Canada

and Health Canada are undertaking a joint state of science, and the Canadian Food Inspection Agency, which regulates the Fertilizer Act, which deals with the importation and sale of biosolids is also active on this portfolio. Staff are hopeful that the next round of Director's Technical Rules with work at the provincial and federal level expected to be resolved by that time.

Legal Definitions

The CTC Source Protection Plan was approved on December 31, 2015 and relied upon the legal definition within the provincial Nutrient Management Act from January 1, 2014 to June 30, 2015. There have been no revisions to the definition of livestock in the intervening eight years.

Table 10. Section 1 Definitions and General, Part 1 Definition and Interpretation, O.Reg. 267/03, under the Nutrient Management Act, Livestock Definition

Ontario Regulation 267/03 (2014/15)	Ontario Regulation 267/03 (2022/23)
• "livestock" includes poultry and ratites (flightless, large, long-necked, and long-legged birds)	• No change

Jurisdiction Review

The agricultural source material generation policies of three neighboring Source Protection Regions (SPR) were reviewed. These include:

- South Georgian Bay Lake Simcoe (SGBL SPR) approved policies.
- Lake Erie (LE SPR) approved policies.
- Halton-Hamilton (HH SPR) approved policies.

The policy treatments by these adjacent SPR are summarized, below.

Table 11. Livestock Significant Threat Jurisdiction Review

	Lake Erie Source Protection Area	Lake Simcoe and Georgian Bay Source Protection Area	Halton Hamilton Source Protection Area
Prohibition (s.57)		Limited to WHPA-A and IPZ-1 for non-phased in farms and where the number of animals on the land at any time is sufficient to generate nutrients at an annual	

	Lake Erie Source Protection Area	Lake Simcoe and Georgian Bay Source Protection Area	Halton Hamilton Source Protection Area
		rate that is greater than 0.5 nutrient units/acre for phased-in farms	
Risk Management Plans (s.58)	General approach for non-phased in farms existing and future activities that would be SDWT, variation in vulnerable areas in specific municipalities	General approach for non-phased in farms existing and future activities that would be SDWT	General approach for non-phased in farms existing and future activities that would be SDWT
Restricted Land Use Planning (s.59)	Screen areas where activity would be a SDWT.	Screen areas where activity would be a SDWT.	Screen areas where activity would be a SDWT.
Prescribed Instrument	General approach for phased in farms existing and future activities that would be SDWT, variation in vulnerable areas in specific municipalities	General approach for phased in farms existing and future activities that would be SDWT	General approach for phased in farms existing and future activities that would be SDWT
Land Use Planning		Planning documents to be amended to prohibit future outdoor confinement or farm animal yard within WHPA-A or IPZ-1	Proponents compelled to disclose activities expected to occur on property where would be SDWT
Education and Outreach		Undertake program in WHPA-B and E where there are less than 5 nutrients units per farm property	
Other Tools	Compliance incentives of agricultural operations by MECP in specific municipalities	Compliance incentives of agricultural operations by MECP	Compliance inspections/incentives of agricultural operations by MECP

CTC Outstanding Threats

The most recent number of remaining significant drinking water threats comes from the 2022 Annual Report summarized, below.

Table 12. Livestock Threats Identified (2022)

	Original threat count (a)	Field verified new threats (b)	Threats discounted through field verification (c)	Threats addressed through policy tools (d)	Remaining significant drinking water threats (a+b-c-d=e)
Livestock, Outdoor Confinement and/or Farm Animal Yard	176	4	161	6	13

Commercial Fertilizer

Legal Definitions

The CTC Source Protection Plan was approved on December 31, 2015 and relied upon the legal definition within the provincial Nutrient Management Act which in turn relied upon the legal definition within the federal Fertilizer Act from February 27, 2015 to January 1, 2019. There have been no revisions to the definition of fertilizer in the intervening eight years.

Table 13. Section 2 Definitions, under the Fertilizer Act, Fertilizer Definition

Fertilizer Act (2015)	Fertilizer Act (2022/23)
• Means any substance or mixture of substances, containing nitrogen, phosphorus, potassium or other plant food, manufactured, sold or represented for use as plant nutrient.	• No change

Jurisdiction Review

The commercial fertilizer policies of three neighboring Source Protection Regions (SPR) were reviewed. These include:

- South Georgian Bay Lake Simcoe (SGBL SPR) approved policies.
- Lake Erie (LE SPR) approved policies.
- Halton-Hamilton (HH SPR) approved policies.

The policy treatments by these adjacent SPR are summarized, below.

Table 14. Commercial Fertilizer Significant Threat Jurisdiction Review

	Lake Erie Source Protection Area	Lake Simcoe and Georgian Bay Source Protection Area	Halton Hamilton Source Protection Area
Prohibition (s.57)		General approach for future handling and storage activities that would be SDWT, as well as general approach within an ICA for existing and future handling and storage activities	
Risk Management Plans (s.58)	General approach for non-phased in farms existing and future activities that would be SDWT, variation in vulnerable areas in specific municipalities	General approach for non-phased in farms existing application activities that would be SDWT, includes requirement for NPK soil test, as well as general approach for existing handling and storage activities that would be SDWT	General approach for non-phased in farms existing and future activities that would be SDWT
Restricted Land Use Planning (s.59)	Screen areas where activity would be a SDWT.	Screen areas where activity would be a SDWT.	Screen areas where activity would be a SDWT.
Prescribed Instrument	General approach for phased in farms existing and future activities that would be SDWT, variation	General approach for phased in farms existing and future activities that would be SDWT, includes requirement for	General approach for phased in farms existing and future activities that would be SDWT

	Lake Erie Source Protection Area	Lake Simcoe and Georgian Bay Source Protection Area	Halton Hamilton Source Protection Area
	in vulnerable areas in specific municipalities	NPK soil test within Issue Contributing Area-Nitrogen	
Land Use Planning		Planning documents to be amended to prohibit future commercial fertilizer storage within WHPA-A or IPZ-1	Proponents compelled to disclose activities expected to occur on property where would be SDWT
Education and Outreach		Undertake a program focusing on properties where activity would be SDWT	Undertake a general program focusing on properties where activity would be SDWT and a specific program encouraging golf courses to obtain an Audubon Co-operative Sanctuary Certification
Other Tools		Compliance incentives of agricultural operations by MECP	Compliance inspections agricultural operations by MECP

CTC Outstanding Threats

The most recent number of remaining significant drinking water threats comes from the 2022 Annual Report summarized, below.

Table 15. Commercial Fertilizer Threats Identified (2022)

	Original threat count (a)	Field verified new threats (b)	Threats discounted through field verification (c)	Threats addressed through policy tools (d)	Remaining significant drinking water threats (a+b-c-d=e)
The application of	57	24	46	26	9

	Original threat count (a)	Field verified new threats (b)	Threats discounted through field verification (c)	Threats addressed through policy tools (d)	Remaining significant drinking water threats (a+b-c-d=e)
commercial fertilizer					
The storage and handling of commercial fertilizer	89	12	86	15	1

Conclusions and Recommendations

Potential Policy Gaps

Significant drinking water threats, related to the application, handling, and storage of agricultural source material and commercial fertilizer, as well as agricultural source material generation (livestock grazing and outdoor confined areas), are regulated by Nutrient Management Plans and Nutrient Management Strategies, under the Nutrient Management Act, for phased-in farms but are not similarly regulated for non-phased-in farms.

In addition, Nutrient Management Plans are not overseen by OMAFRA and/or MECP but instead are overseen by Nutrient Management Certificate and Licence holders who may be third parties or owner-operators.

CTC staff are recommending the CTC Source Protection Committee consider restructuring policies related to the application, handling, and storage of agricultural source material and commercial fertilizer, as well as agricultural source material generation, in a similar manner as Saugeen Valley Source Protection Region utilizing Section 61 of Ontario Regulation 287/07.

Significant drinking water threats related to the application, handling and storage, of (Category 1) non-agricultural source material are regulated outside of the use of NASM Plans (e.g. setbacks, testing of material, etc.). Significant drinking water threats related to the application of some (Category 2) non-agricultural source material are regulated through the use of **non-approved** NASM Plans (e.g. prepared by NASM Plan Development Certificate holder). Significant drinking water threats related to the application of some (Category 2) and all (Category 3) non-agricultural source material are regulated through the use of **approved** NASM Plans (e.g. prepared by NASM Plan Development Certificate holder and reviewed by OMAFRA). Significant drinking water threats, related to the handling and storage of all (Category 2 and 3) non-

agricultural source material are regulated through the use of **approved** NASM Plans (e.g. prepared by NASM Plan Development Certificate holder and reviewed by OMAFRA).

CTC staff are recommending the CTC Source Protection Committee consider restricting the Category 1 and 2 non-agricultural source material policies in a similar manner as Saugeen Valley Source Protection Region utilizing Section 61 of Ontario Regulation 287/07.

CTC staff's recommendations are in line with MECP and OMAFRA. Both provincial agencies advocate for the use of a conformity statement with local source protection plan where relying on a Prescribed Instrument. In addition, as part of the preparation of this report, conversations were held with OMAFRA staff who advocated to avoid making Nutrient Management Certificate and Licence holders the implementing body for nutrient related policies where possible.

Where a person holds a Prescribed Instrument, it should be noted that Section 61 of Ontario Regulation 287/07 requires the following actions:

- To give notice to the Risk Management Official that the regulated activity is subject to a prescribed instrument;
- To provide to the Risk Management Official a copy of the prescribed instrument identified in the notice; and
- To identify where in the prescribed instrument a statement of conformity with significant drinking water threats set out in the local source protection plan (or where the prescribed instrument does not contain a statement of conformity to provide an accompanying statement of conformity).

Where a person does not hold a Prescribed Instrument, it should be noted that Section 61 of Ontario Regulation 287/07 requires the following actions:

- To give notice to the Risk Management Official that the regulated activity will be subject to a prescribed instrument.
- To abide by the timeframe the Risk Management Official sets out in a written notice the person engaged in the regulated activity must obtain a prescribed instrument; and
- To abide by the termination of the exemption should the prescribed instrument not be provided to the Risk Management Official within the aforementioned timeframe.

Director's Technical Rules

The optional/enabling provisions in the 2021 Director's Technical Rules pertain to Category 1 NASMs and the handling and storage of commercial fertilizer. Category 1 NASMs, except for non-farm herbivorous biosolids, are no longer considered a significant drinking water threat. The handling and storage of commercial fertilizer was previously based on the type of land use (e.g. retail; excluding manufacturing, processing) and mass stored but is now based solely on mass of fertilized storage.

CTC staff are recommending the CTC Source Protection Committee utilizing some of the optional/enabling provisions in the 2021 Director's Technical Rules. The items are outlined below:

- CTC staff are recommending lifting the RMP policies pertaining to the application, as well as the handling and storage, of Category 1 NASMs except for non-farm herbivorous biosolids; and
- CTC staff are recommending amending the RMP policy pertaining to the handling and storage of commercial fertilizer to focus on the mass of fertilized stored.

s.36 CTC Workplan Order

In the s.36 CTC Workplan Order, MECP directed CTC staff to undertake an assessment of the impacts of nutrient related prohibitions outside of the WHPA-A on the agricultural community. Over the last several years, CTC staff undertaken this assessment concluding from a scientific perspective, that prohibitions outside of the WHPA-A including WHPA-B (VS=10), WHPA-E, and ICA-Nitrates (and Pathogens), are, in general, narrow in scope and warranted based on the risk.

However, there are some small exceptions to this statement. CTC staff acknowledge the prohibition on commercial fertilizer outside of the WHPA-A may, in conjunction with the prohibition of the application of Agricultural Source Material, place agricultural producers at a competitive disadvantage.

In addition, thorough discussions with the Amendments Working Group, CTC staff learned from Risk Management Officials and Risk Management Inspectors that Risk Management Plans pertaining to livestock grazing and pasturing where the farm in question is residential and less than 5 NU in size are creating an administrative burden.

Staff are recommending the CTC Source Protection Committee consider revising current prohibitions. The items are outlined below:

- CTC staff are recommending lifting the prohibition around the application of commercial fertilizer outside of the WHPA-A; and
- CTC staff are recommending lifting the requirement for a Risk Management Plan in relation to livestock grazing and pasturing where the farm in question is residential and less than 5 NU in size in favor of an inspection policy.

Other Considerations

CTC staff acknowledge the effectiveness/uptake of the soil testing policy in relation to the application of Agricultural Source Material policy has been less than originally intended. Other Source Protection Regions, namely Waterloo, experienced a similar lack of uptake of their soil testing policy in relation to the application of Agricultural Source Material and Non-Agricultural Source Protection Material policies.

Over the last several years, CTC staff undertaken this assessment concluding from a scientific perspective, that the requirement for soil testing with respect to the application of agricultural source material remains valid but that further support around the type of test and testing methodology should be provided in the explanatory document.

CTC staff are recommending the CTC Source Protection Committee consider revising current requirements. The item is outlined below:

- CTC staff are recommending reducing the soil testing for perennial crops from the current requirement of annually during years when application of agricultural source material occurs to once every five years or upon renewal of the Nutrient Management Plan which aligns with best practices outlined by OMAFRA.

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10.4 AGRICULTURAL THREATS

10.4.1 Agricultural Source Material (ASM)

Definition

Agricultural Source Material (ASM) is a class of nutrients that can be applied to land for the purpose of improving the growth of agricultural crops and soil conditioning. Ontario Regulation 267/03 under the Nutrient Management Act, 2002, lists the following sources of ASM that may be produced, applied, stored, handled, or used on a farm:

- manure produced by farm animals (includes bedding materials);
- runoff from farm-animal yards and manure storages;
- wash water that has not been mixed with human body waste (e.g., from the milking centre);
- organic materials produced by intermediate operations that process the above materials (e.g., mushroom compost);
- anaerobic digestion output that does not include sewage biosolids or human body waste; and
- non-farm herbivorous biosolids.

Storing ASM can be at or above grade in a permanent nutrient storage facility or on a temporary field nutrient storage site (solid ASM only).

Why is ASM a Threat to Drinking Water Sources?

A number of chemicals and pathogens from ASM could make their way into drinking water sources. The Ministry of the Environment, Conservation and Parks' Tables of Drinking Water Threats (2021) identifies the following sub-threat activities:

- The application of ASM to land
- The storage of ASM
- The management of ASM – aquaculture (Note: there are no existing or future significant threats possible for the management of ASM).

ASM threats can occur on large or small farms – those regulated by the Nutrient Management Act, 2002 (producing more than 300 nutrient units or phased-in) and those not regulated by the Act (producing less than 5 nutrient units or not yet phased-in). ASM is produced on farms with livestock, and under certain conditions, there are specific chemicals and pathogens that are able to make their way from ASM application and storage sites into groundwater drinking sources. The Ministry of the Environment, Conservation and Parks' Tables of Drinking Water Threats identifies the following chemicals and pathogens as potential concerns:

- Nitrogen
- Total phosphorus
- Pathogens

Nitrogen is a concern for surface and groundwater, while phosphorus is only a concern for surface water, for example, in WHPA-Es. Permanent nutrient storage facilities are generally (but not always) located near barns and outdoor confinement areas. Temporary field nutrient storage facilities can be located near barns and outdoor confinement areas, as well as on fields where the ASM will be applied. The storage and application of ASM as potential threats to drinking water sources, is dependent on the vulnerability score of the specific area, and the combination of the percentage of managed land[2] and density[3] of livestock in the vulnerable area.

See **Table 10-4** for when and where application and storage of ASM may be a significant drinking water threat. Note: to determine if a specific activity is a significant drinking water threat, consult the Table of Drinking Water Threats for the specific circumstances that must be met for the activity to be a threat. These activities may also be significant drinking water threats anywhere within an Issue Contributing Area (ICA) for Nitrogen or Pathogens. There are not currently any Issue Contributing Areas for pathogens within the CTC Source Protection Region. If the activity meets the description of

in the *Tables of Circumstances*, it is a significant drinking water threat irrespective of vulnerability score. As of March 2024, Table 10-4 includes the threat classification level from the 2009/2013/2017/2021 Director Technical Rules (DTR).

Table 10-4: When/where ASM may be a significant drinking water threat (2009/2013/2017/2021 Table of Drinking Water Threats)

Prescribed Drinking Water Threat	ASM Threat Sub-Category	Area and Vulnerability Score (VS)	Threat Classification Level
			Significant
			DTR 2009/2013/2017/2021
The application, storage and management of agricultural source material	The application of agricultural source material to land	• WHPA-A	✓
		• WHPA-B (VS = 10)	✓
		• WHPA-E (VS ≥ 8)	✓
		• Anywhere in an ICA for Nitrogen or Pathogens	✓
	The storage of agricultural source material	• WHPA-A	✓
		• WHPA-B (VS = 10)	✓
		• WHPA-E (VS ≥ 8)	✓
		• Anywhere in an ICA for Nitrogen or Pathogens	✓
	The management of agricultural source material - aquaculture	• Anywhere in WHPA-E in an ICA for Pathogens	✓

Policy ID	Threat Description	Implementing Body	Legal Effect	Policy	Where Policy Applies	When Policy Applies	Related Policies	Monitoring Policies
~~ASM-1~~	~~Application of Agricultural Source Material (ASM) to Lands~~	~~OMAFRA~~	~~C~~	~~**Prescribed Instrument**~~ ~~1) The application of ASM to land shall be prohibited where the activity is, or would be, a significant drinking water threat in any of the follow areas:~~ ~~• WHPA-A (existing, future); or~~ ~~• WHPA-B (VS=10) in an Issue Contributing Area for Pathogens (future); or~~ ~~• WHPA-E in an Issue Contributing Area for Nitrates or Pathogens (future).~~	~~See Maps 1.1 – 1.21~~	~~Future Immediately (T-3)~~ ~~Existing Upon expiry or within five years (T-2)~~	~~N/A~~	~~MON-4~~
				~~2) Where the application of ASM to land is an area where the activity is, or would be, a significant drinking water threat, the Nutrient Management Plan or Strategy that governs the activity shall be reviewed or established to ensure appropriate terms and conditions area included so that the activity ceases to be, or does not become, a significant drinking water threat. In addition to any other risk management measures required through the Prescribed Instrument, the Prescribed Instrument shall as a minimum ensure.~~ ~~a) The application of ASM is not applied during restricted periods, or another time when the soil is snow-covered or frozen consistent with the limitations of subsection 52.2 – 52.4 of Ontario Regulation 267/03 under the *Nutrient Management Act, 2002* to avoid runoff; and~~ ~~b) Soil testing is required for plant available nitrogen each year prior to application of~~		~~Future Immediately (T-3)~~ ~~Existing: 3 years (T-1)~~	~~GEN-1 GEN-2~~	~~MON-2~~

				~~ASM to determine appropriate application rates, in any of the following areas:~~ • ~~WHPA-B (VS=10) which is not in an Issue Contributing Area for Nitrates or Pathogens (existing, future); or~~ • ~~WHPA-E (VS>=8) which is not an Issue Contributing Area for Nitrates or Pathogens (existing, future); or~~ • ~~WHPA-B (VS=10) in an Issue Contributing Area for Nitrates (existing, future); or~~ • ~~WHPA-B (VS=10) in an Issue Contributing Area for Pathogens (existing); or~~ • ~~WHPA-E in an Issue Contributing Area for Nitrates or Pathogens (existing); or~~ • ~~The remainder of an Issue Contributing Area for Nitrates or Pathogens (existing, future)~~				

Policy ID	Threat Description	Implementing Body	Legal Effect	Policy	Where Policy Applies	When Policy Applies	Related Policies	Monitoring Policies
ASM-2	Application of Agricultural Source Material (ASM) to Land	RMO	G	**Part IV, s.57** The application of ASM to land is designated for the purpose of s.57 under the Clean Water Act, and therefore is prohibited, in an area where the activity is, or would be, a significant drinking water threat, in the following instances: 1. Within a WHPA-A (existing or future activity). 2. Within a WHPA vulnerable area in an Issue Contributing Area (Nitrogen or Pathogens) (future activity).	See Maps 1.1 – 1.21	Future Immediately (T-5) Existing 180 days (T-4)	GEN-1	MON-2
			H	**Part IV, s.58** The application of ASM to land is designated for the purpose of s.58 of the Clean Water Act, and therefore requires a Risk Management Plan (RMP), in an area where the activity is, or would be a significant drinking water threat, in the following instances: 1. Within a WHPA vulnerable area in an Issue Contributing Area (Nitrogen or Pathogens) (existing activity). 2. Within WHPA a vulnerable area outside of an Issue Contributing Area (existing or future activity). 3. Within an Issue Contributing Area (Nitrogen or Pathogens) outside of WHPA vulnerable area (existing or future activity).		Future Immediately (T-7) Existing: 1 year / 5 years (T-6)	GEN-1 GEN-2	MON-2

				Prior to the application of ASM, soil testing is required for plant available nitrogen. A RMP is not required if a Nutrient Management Plan is provided to the Risk Management Official which conforms to the Source Protection Plan as described in s.61 of O.Reg. 287/07 under the Clean Water Act.				

Policy ID	Threat Description	Implementing Body	Legal Effect	Policy	Where Policy Applies	When Policy Applies	Related Policies	Monitoring Policies
~~ASM-3~~	~~Storage of Agricultural Source Material (ASM) to Lands~~	~~OMAFRA~~	~~C~~	~~**Prescribed Instrument**~~ ~~1) The storage of ASM shall be prohibited where the activity is, or would be, a significant drinking water threat in any of the follow areas:~~ ~~• WHPA-A (future); or~~ ~~• WHPA-B (VS=10) in an Issue Contributing Area for Nitrates or Pathogens (future); or~~ ~~• WHPA-E in an Issue Contributing Area for Nitrates or Pathogens (future).~~	~~See Maps 1.1 – 1.21~~	~~Future Immediately (T-3)~~	~~N/A~~	~~MON-4~~
				~~2) Where the storage of ASM is an area where the activity is, or would be, a significant drinking water threat, the Nutrient Management Plan or Strategy that governs the activity shall be reviewed or established to ensure appropriate terms and conditions area included so that the activity ceases to be, or does not become, a significant drinking water threat in any of the following areas:~~ ~~• WHPA-A (existing); or~~ ~~• WHPA-B (VS=10) which is not in an Issue Contributing Area for Nitrates or Pathogens (existing, future); or~~ ~~• WHPA-E (VS>=8) which is not an Issue Contributing Area for Nitrates or Pathogens (existing, future); or~~ ~~• WHPA-B (VS=10) in an Issue Contributing Area for Nitrates or Pathogens (existing, future); or~~ ~~• WHPA-B (VS=10) in an Issue Contributing Area for Nitrates or Pathogens (existing); or~~ ~~• WHPA-E in an Issue Contributing Area for Nitrates or Pathogens (existing); or~~ ~~• The remainder of an Issue Contributing Area for Nitrates or Pathogens (existing, future)~~		~~Future Immediately (T-3)~~ ~~Existing: 3 years (T-1)~~	~~GEN-3~~	~~MON-4~~

Policy ID	Threat Description	Implementing Body	Legal Effect	Policy	Where Policy Applies	When Policy Applies	Related Policies	Monitoring Policies
ASM-4	Storage of Agricultural Source Material (ASM)	RMO	G	**Part IV, s.57** The storage of ASM is designated for the purpose of s.57 under the Clean Water Act, and therefore is prohibited, in an area where the activity is, or would be, a significant drinking water threat, in the following instances: 1. Within a WHPA-A (future activity). 2. In all WHPA vulnerable areas within an Issue Contributing Area (Nitrogen or Pathogens) (future activity).	See Maps 1.1 – 1.21	Future Immediately (T-5)	GEN-1	MON-2
			H	**Part IV, s.58** The storage of ASM is designated for the purpose of s.58 of the Clean Water Act, and therefore requires a Risk Management Plan (RMP), in an area where the activity is, or would be a significant drinking water threat, in the following instances: 1. Within a WHPA-A (existing activity). 2. Within WHPA vulnerable areas within an Issue Contributing Area (Nitrogen or Pathogens) (existing activity). 3. Within WHPA vulnerable areas outside of Issue Contributing Areas (existing or future activity). 4. Issue Contributing Areas (Nitrogen or Pathogens) outside of WHPA vulnerable areas (existing or future activity). A RMP is not required if a Nutrient Management Strategy is provided to the Risk Management Official and conforms to the Source Protection Plan as		Future Immediately (T-7 Existing: 1year / 5 years (T-6)	GEN-1 GEN-2	MON-2

				described in s.61 of O.Reg. 287/07 under the Clean Water Act.				
ASM-5	Management of Agricultural Source Material (ASM) (Aquaculture)	MECP	C	**Prescribed Instrument** The existing or future management of ASM (Aquaculture) is prohibited, in an area where the activity is, or would be, a significant drinking water threat, in the following instances: 1. Within an Issue Contributing Area (Pathogens).	See Map 1.9	Future: Immediately (T-3)	N/A	MON-4

10.4.2 Non-Agricultural Source Material (NASM)

Definition

The application to land, handling, and storage of non-agricultural source material (NASM) are prescribed drinking water threats listed in Regulation 287/07 under the Clean Water Act, 2006. NASM is one class of nutrients that are not produced on a farm and can be applied to land for the purpose of improving the growth of agricultural crops and for soil conditioning. NASM includes the following materials that are intended to be applied to land as nutrients:

- pulp and paper biosolids;
- sewage biosolids;
- anaerobic digestion output, where less than 50% of the total material is on-farm anaerobic digestion materials (anaerobic digestion is a process used to decompose organic matter by bacteria in an oxygen-limited environment); and
- any other material that is not from an agricultural source and that is capable of being applied to land as a nutrient (such as materials from dairy product or animal food manufacturing).

Furthermore, the Categories of NASM are broken into 3 groups:

- Category 1 – non-farm herbivorous biosolids;
- Category 2 – processed plant-based materials such as bakery washwater;
- Category 3 – animal-based materials such as meat and dairy washwater, sewage biosolids, and any material that is not listed in the other categories.

NASM can be applied to both agricultural and non-agricultural lands for nutrient enhancement and soil conditioning purposes. NASM that will be applied to fields on a farm can be stored in a permanent nutrient storage facility (usually a steel or concrete tank), or on a temporary field nutrient storage site (only for solid NASM stored for more than 24 hours). There are restrictions about what types of NASM can be stored on a farm and for how long.

Why is NASM a Threat to Drinking Water Sources?

Chemicals and pathogens from NASM could make their way into drinking water sources. The Ministry of the Environment's Tables of Drinking Water Threats (2021) identifies the following sub-threat activities:

- The application of NASM to land
- The handling and storage of NASM.

Under certain conditions, specific chemicals and pathogens can make their way from NASM application, handling or storage sites into groundwater drinking sources. The Ministry of the Environment, Conservation and Parks' Tables of Drinking Water Threats identifies the following chemicals and pathogens as potential concerns:

- Nitrogen
- Total phosphorus
- Pathogens

Nitrogen is a concern for both surface and groundwater, but phosphorus is mainly a concern for surface water. Nitrogen and phosphorus, are typically associated with human waste, household and personal care products (such as soap and detergents), and animal by-products. Pathogens are associated with the following sources of NASM:

- seafood processing operations
- dairy product manufacturing operations
- pulp and paper mills
- animal food manufacturing operations (from animal sources)
- meat plants
- sewage works

The assessment of chemical threats for the application of NASM to land considered the geographic location, percentage of managed land and livestock density. The assessment of pathogen threats for the application of NASM to land considered the geographic location and the source of the material. The assessment of NASM storage sites, considered the geographic location, whether the storage facility is temporary or permanent, the source of the material, and whether the material is stored above or below grade.

See **Table 10-5** for when and where application and storage of NASM may be a significant drinking water threat. Note: to determine if a specific activity is a significant drinking water threat consult the Tables of Drinking Water Threats for the specific circumstances that must be met for the activity to be a threat. These activities may also be significant drinking water threats anywhere within an Issue Contributing Area (ICA) for nitrates or pathogens. There are not currently any Issue Contributing Areas for pathogens within the CTC Source Protection Region. If the activity meets the description in the *Tables of Circumstances* it is a significant drinking water threat irrespective of vulnerability score. As of March 2024, Table 10-5 includes the threat classification level from the 2009/2013/2017/2021 Director Technical Rules (DTR).

Table 10-5: When/where NASM may be a significant drinking water threat (2009/2013/2017/2021 Table of Drinking Water Threats)

Prescribed Drinking Water Threat	NASM Threat Sub-Category	Area and Vulnerability Score (VS)	Threat Classification Level Significant DTR 2009/2013/2017/2021
The application, handling, and storage of non-agricultural source material to land	The application of non-agricultural source material to land (including treated septage)	• WHPA-A	✓
		• WHPA-B (VS = 10)	✓
		• WHPA-E (VS ≥ 8)	✓
		• Anywhere in an ICA for Nitrogen or Pathogens	✓
	The storage of non-agricultural source material	• WHPA-A	✓
		• WHPA-B (VS = 10)	✓
		• WHPA-E (VS ≥ 8)	✓
		• Anywhere in an ICA for Nitrogen or Pathogens	✓

Policy ID	Threat Description	Implementing Body	Legal Effect	Policy	Where Policy Applies	When Policy Applies	Related Policies	Monitoring Policies
NASM-1	Application of (Category 1) Non-Agricultural Source Material (NASM) containing manure to Land	RMO	G	**Part IV, s.57** The application of (Category 1) NASM containing manure to land is designated for the purpose of s.57 under the Clean Water Act, and therefore is prohibited, in an area where the activity is, or would be, a significant drinking water threat, in the following instances: 1. Within a WHPA-A (existing or future activity).	See Maps 1.1 – 1.21	Future Immediately (T-5) Existing: 180 days (T-4)	GEN-1	MON-2
			H	**Part IV, s.58** The application of (Category 1) NASM containing manure to land is designated for the purpose of s.58 of the Clean Water Act, and therefore requires a Risk Management Plan (RMP), in an area where the activity is, or would be a significant drinking water threat, in the following instances: 1. Within a WHPA vulnerable area in an Issue Contributing Area (Nitrogen or Pathogens) (existing or future activity). 2. Within a WHPA vulnerable area outside of an Issue Contributing Area (existing or future activity). 3. Within an Issue Contributing Area (Nitrogen or Pathogen) outside of WHPA vulnerable areas (existing or future activity).		Future Immediately (T-7) Existing: 1 year / 5 years (T-6)	GEN-1 GEN-2 NASM-7	MON-2

Policy ID	Threat Description	Implementing Body	Legal Effect	Policy	Where Policy Applies	When Policy Applies	Related Policies	Monitoring Policies
NASM-2	Handling and Storage of (Category 1) Non-Agricultural Source Material (NASM) containing manure.	RMO	G	**Part IV, s.57** The handling and storage of (Category 1) NASM containing manure is designated for the purpose of s.57 under the Clean Water Act, and therefore is prohibited, in an area where the activity is, or would be, a significant drinking water threat, in the following instances: 1. Within a WHPA-A (future activity).		Future Immediately (T-5)	GEN-1	MON-2
			H	**Part IV, s.58** The handling and storage of (Category 1) NASM containing manure is designated for the purpose of s.58 of the Clean Water Act, and therefore requires a Risk Management Plan (RMP), in an area where the activity is, or would be a significant drinking water threat, in the following instances: 1. Within a WHPA-A (existing activity). 2. Within a WHPA vulnerable area in an Issue Contributing Area (Nitrogen or Pathogens) (existing or future activity). 3. Within WHPA vulnerable areas outside of an Issue Contributing Area (existing or future activity). 4. Within an Issue Contributing Area (Nitrogen or Pathogens) outside of WHPA vulnerable areas (existing or future activity).	See Maps 1.1 – 1.21	Future Immediately (T-7) Existing: 1 year / 5 years (T-6)	GEN-1 GEN-2 NASM-7	MON-2

Policy ID	Threat Description	Implementing Body	Legal Effect	Policy	Where Policy Applies	When Policy Applies	Related Policies	Monitoring Policies
NASM-3	Application of (Category 2) Non-Agricultural Source Material (NASM) to Land	RMO	G	**Part IV, s.57** The future application of (Category 2) NASM to land is designated for the purpose of s.57 under the Clean Water Act, and therefore is prohibited, in an area where the activity is, or would be, a significant drinking water threat.	See Maps 1.1 – 1.21	Future Immediately (T-5)	N/A	MON-2
			H	**Part IV, s.58** The existing application of (Category 2) NASM to land is designated for the purpose of s.58 of the Clean Water Act, and therefore requires a Risk Management Plan (RMP), in an area where the activity is, or would be a significant drinking water threat. A RMP is not required if a NASM Plan is provided to the Risk Management Official and conforms to the Source Protection Plan as described in s.61 of O.Reg. 287/07 under the Clean Water Act.		Existing: 1 year / 5 years (T-6)	NASM-7	MON-2

Policy ID	Threat Description	Implementing Body	Legal Effect	Policy	Where Policy Applies	When Policy Applies	Related Policies	Monitoring Policies
NASM-4	Handling and Storage of (Category 2 & 3) Non-Agricultural Source Material (NASM)	OMAFRA MECP	C	**Prescribed Instrument** The existing or future handling and storage of (Category 2 & 3) NASM is prohibited, in an area where the activity is, or would be, a significant drinking water threat.	See Maps 1.1 – 1.21	Future Immediately (T-3)	N/A	MON-4
NASM-5	Application of NASM to Land Handling and Storage of NASM	OMAFRA MECP	K	**Education and Outreach** Where the existing or future application, handling or storage, of NASM is, or would be, a significant drinking water threat, Ministry of the Environment, Conservation and Parks (MECP) and Ministry of Agriculture, Food and Rural Affairs (OMFRA) shall provide Prescribed Instrument holders information on drinking water threats and the risk to nearby municipal wells. MECP and OMFRA should update Risk Management Officials on the scope and content of education and outreach activities with Prescribed Instrument holders to ensure consistency in communication between implementing bodies.	See Maps 1.1 - 1.21	T-10	GEN-8 NASM-1 NASM-2 NASM-3 NASM-5	MON-4
NASM-6	Application of (Category 3) Non-Agricultural Source Material (NASM) to Land	OMAFRA MECP	C	**Prescribed Instrument** The existing or future application of (Category 3) NASM to land is prohibited, in an area where the activity is, or would be, a significant drinking water threat.	See Maps 1.1 – 1.21	Future Immediately (T-3)	N/A	MON-4

10.4.3 Livestock

Definition

The use of land for livestock grazing or pasturing, an outdoor confinement area or a farm-animal yard are prescribed drinking water threats listed in Regulation 287/07 under the Clean Water Act, 2006 and are defined as follows:

- Livestock includes dairy, beef, swine, poultry, horses, goats, sheep, ratites (flightless birds), furbearing animals, deer, elk, game animals and birds, and other animals identified in the Minimum Distance Separation Guidelines (2017).
- Grazing and pasturing land is considered to be the land on which livestock eat growing herbaceous plants.
- An outdoor confinement area is an enclosure for livestock, deer, elk, or game animals, and is further defined in O. Reg. 267/03 under the Nutrient Management Act, 2002 as follows:
  1. It has no roof, except as described below in #3;
  2. It is composed of fences, pens, corrals or similar structures;
  3. It may contain a shelter to protect the animals from the wind or another shelter with a roof of an area of less than 20 square metres;
  4. It has permanent or portable feeding or watering equipment;
  5. The animals are fed or watered at the enclosure;
  6. The animals may or may not have access to other buildings or structures for shelter, feeding or watering; and
  7. Grazing and foraging provides less than 50 percent of dry matter intake.
- Farm-animal yards are outdoor livestock areas lined with concrete other than those meeting the definition of an outdoor confinement area. Food and water are not provided in farm-animal yards. They are generally used as outdoor exercise areas or as holding areas when barns are being cleaned.

Why is Livestock Grazing, Pasturing and Outdoor Confinement a Threat to Drinking Water Sources?

Livestock threats can be on large or small farms – those regulated by the Nutrient Management Act, 2002 (producing more than 300[4] nutrient units or phased-in) and those not regulated by the NMA (less than 5 nutrient units). Chemicals and pathogens from the use of land as livestock grazing, pasturing, outdoor confinement, or farm-animal yards could make their way into drinking water sources. The Ministry of the Environment, Conservation and Parks' Tables of Drinking Water Threats (2021) identifies the following sub-threat activities:

- ASM Generation – Livestock or Grazing
- ASM Generation – Outdoor Confinement Area or Farm Animal Yard

Under certain conditions, specific chemicals and pathogens can make their way from livestock grazing, pasturing, outdoor confinement, or farm-animal yards into groundwater drinking sources. The Ministry of the Environment, Conservation and Parks' Tables of Drinking Water Threats identifies the following chemicals and pathogens as potential concerns:

- Nitrogen
- Total phosphorus
- Pathogens

Nitrogen is a concern for both surface and groundwater, while phosphorus is a concern primarily for surface water. Generally speaking, the greater the number of livestock kept in a space, the greater the accumulation of manure, and the greater the risk of contaminating water sources with these nutrients and pathogens. Accordingly, the assessment of the potential threat to drinking water sources from use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard is dependent on the concentration of manure in a given area.

See **Table 10-6** for when and where livestock may be a significant drinking water threat. Note: to determine if a specific activity is a significant drinking water threat consult the Tables of Drinking Water Threats for the specific circumstances

that must be met for the activity to be a threat. These activities may also be significant drinking water threats anywhere within an Issue Contributing Area (ICA) for Nitrates or Pathogens. There are not currently any Issue Contributing Areas for pathogens within the CTC Source Protection Region. If the activity meets the description in the *Tables of Circumstances* it is a significant drinking water threat irrespective of vulnerability score. As of March 2024, Table 10-6 includes the threat classification level from the 2009/2013/2017/2021 Director Technical Rules (DTR).

Table10-6: When/where ~~NASM~~ LIV may be a significant drinking water threat (2009/2013/2017/2021 Table of Drinking Water Threats)

Prescribed Drinking Water Threat	Livestock Threat Sub-Category	Area and Vulnerability Score (VS)	Threat Classification Level Significant DTR 2009/2013/2017/2021
The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard	The use of land as livestock grazing or pasturing land	• WHPA-A	✓
		• WHPA-B (VS = 10)	✓
		• WHPA-E (VS ≥ 8)	✓
		• Anywhere in an ICA for Nitrogen or Pathogens	✓
	The use of land as an outdoor confinement area or a farm-animal yard	• WHPA-A	✓
		• WHPA-B (VS = 10)	✓
		• WHPA-E (VS ≥ 8)	✓
		• Anywhere in an ICA for Nitrogen or Pathogens	✓

Policy ID	Threat Description	Implementing Body	Legal Effect	Policy	Where Policy Applies	When Policy Applies	Related Policies	Monitoring Policies
LIV-1	The Use of Land as Livestock Grazing or Pasturing Land	RMO	G	**Part IV, s.57** The use of land as livestock grazing or pasture is designated for the purpose of s.57 under the Clean Water Act, and therefore is prohibited, in an area where the activity is, or would be, a significant drinking water threat, in the following instances: 1. Within a WHPA-A in an Issue Contributing Area (Nitrogen or Pathogens) (existing or future activity).	See Maps 1.1 – 1.21	Future Immediately (T-5) Existing: 180 days (T-4)	GEN-1	MON-2
			H	**Part IV, s.58** The use of land as livestock grazing or pasture is designated for the purpose of s.58 of the Clean Water Act, and therefore requires a Risk Management Plan (RMP), in an area where the activity is, or would be a significant drinking water threat, in the following instances: 1. Within a WHPA-A outside of an Issue Contributing Area (Nitrogen or Pathogens) (existing or future activity) 2. Within a WHPA-A in an Issue Contributing Area (Nitrogen or Pathogens) with an animal density ≤1 nutrient unit per acre (existing activity), 3. Within a WHPA vulnerable area in an Issue Contributing Area (Nitrogen or Pathogens) (existing or future activity). 4. Within a WHPA vulnerable area outside of an Issue Contributing Area (Nitrogen or Pathogens) (existing or future activity) 5. Issue Contributing Areas (Nitrogen or Pathogens) outside of the WHPA vulnerable areas (existing or future activity).		Future: Immediately (T-7) Existing: 1 year / 5 years (T-6)	GEN-1 GEN-2	MON-2

				Despite the above, in residential land use with ≤5 nutrient units, outside WHPA-A, where existing use of land as livestock grazing or pasture is, or would be a significant drinking water threat, the Risk Management Official can use an annual inspection program to ensure that the activity ceases or does not become to be significant drinking water threat.				

Policy ID	Threat Description	Implementing Body	Legal Effect	Policy	Where Policy Applies	When Policy Applies	Related Policies	Monitoring Policies
~~LIV-2~~	~~The Use of Land as an Outdoor Confinement Area or a Farm Animal Yard (O. Reg. 385/08, s.3)~~	~~OMAFRA~~		~~s.57, Prescribed Instrument~~ ~~1) The use of land as an outdoor confinement area or farm animal yard shall be prohibited where the activity would be significant drinking water threat in any of the following areas:~~ ~~• WHPA-A (future); or~~ ~~• WHPA-B (VS=10) in an Issue Contributing Area for Nitrates or Pathogens (future); or~~ ~~• WHPA-E in an Issue Contributing Area for Nitrates or Pathogens (future).~~ ~~The use of land as an outdoor confinement area or farm animal yard is prohibited and is designated for the purposes of s.57 of the *Clean Water Act*.~~	~~See Maps 1.1 – 1.21~~	~~Future Immediately (T-3)~~	~~N/A~~	~~MON-4~~
				~~2) Where the use of land as an outdoor confinement area or farm animal yard is an area where the activity is, or would be, a significant drinking water threat, the Nutrient Management Plan or Strategy that governs the activity shall be reviewed or established to ensure appropriate terms and conditions are included so that the activity ceases to be, or does not become, a significant drinking water threat in any of the following areas:~~ ~~• WHPA-A (existing); or~~ ~~• WHPA-B (VS=10) which is not an Issue Contributing Area for Nitrates or Pathogens (existing, future); or~~ ~~• WHPA-E (VS>= 8) which is not in an Issue Contributing Area for Nitrates or Pathogens (existing, future); or~~		Future: Immediately (T-3) Existing: 3 years (T-1)	GEN-3	MON-4

			~~C~~	~~• WHPA-B (VS=10) in an Issue Contributing Area for Nitrates or Pathogens (existing); or~~ ~~• WHPA-E in an Issue Contributing Area for Nitrates (existing); or~~ ~~• The remainder of an Issue Contributing Area for Nitrates or Pathogens (existing, future).~~				

Policy ID	Threat Description	Implementing Body	Legal Effect	Policy	Where Policy Applies	When Policy Applies	Related Policies	Monitoring Policies
LIV-3	The Use of Land as an Outdoor Confinement Area or a Farm-Animal Yard	RMO	G	**Part IV, s.57** The use of land as an outdoor confinement area or farm animal-yard is designated for the purpose of s.57 under the Clean Water Act, and therefore is prohibited, in an area where the activity is, or would be, a significant drinking water threat, in the following instances: 1. Within WHPA-A (future activity). 2. Within a WHPA vulnerable area in an Issue Contributing Area (Nitrogen or Pathogens) (future activity).	See Maps 1.1 – 1.21	Future Immediately (T-3)	GEN-1	MON-2
			H	**Part IV, s.58** The use of land as an outdoor confinement area or farm animal-yard is designated for the purpose of s.58 of the Clean Water Act, and therefore requires a Risk Management Plan (RMP), in an area where the activity is, or would be a significant drinking water threat, in the following instances: 1. Within WHPA-A (existing activity) 2. Within a WHPA vulnerable area in an Issue Contributing Area (Nitrogen or Pathogens) (existing activity) 3. Within a WHPA vulnerable area outside of an Issue Contributing Area (Nitrogen or Pathogens) (existing or future activity). 4. Issue Contributing Areas (Nitrogen or Pathogens) outside of WHPA vulnerable areas (existing or future activity).		Future: Immediately (T-3) Existing: 1 year / 5 years (T-6)	GEN-1 GEN-2	MON-2

				A RMP is not required if a Nutrient Management Strategy is provided to the Risk Management Official which conforms to the Source Protection Plan as described in s.61 of O.Reg. 287/07 under the Clean Water Act.				

10.5 COMMERCIAL FERTILIZER

Definition

Commercial fertilizer is one of the prescribed drinking water threats listed in Regulation 287/07 under the Clean Water Act, 2006. Commercial fertilizer is a manufactured compound containing nitrogen, phosphorus, potassium, or other minerals intended for use as a plant nutrient. In the drinking water source protection process, commercial fertilizer is distinguished from other nutrient sources – agricultural source material (ASM) and non-agricultural source material (NASM).

Why is Fertilizer a Threat to Drinking Water Sources?

Chemicals from the application, handling and storage of fertilizer could make their way into drinking water sources. The Ministry of the Environment, Conservation and Park's Tables of Drinking Water Threats (2021) identifies the following sub-threat activities:

- The application of commercial fertilizer to land
- The handling and storage of commercial fertilizer

The nitrogen and phosphorus in commercial fertilizer can enter drinking water sources due to the improper use and storage of the fertilizer. The improper use of fertilizer includes the application of fertilizer without consideration for nutrients already available in the soil and plant requirements, or the inappropriate timing of application for plant growth cycles and weather conditions. Potential impacts of storing fertilizer relate to leaks and spills from aging infrastructure or improper storage techniques. Phosphorus is often associated with runoff and soil erosion from both the storage and application of commercial fertilizer.

The Ministry of the Environment, Conservation and Park's Tables of Drinking Water Threats identifies the following chemicals as potential concerns:

- Nitrogen
- Total phosphorus

Nitrogen is a concern for both surface and groundwater, but phosphorus is primarily a concern for surface water. The assessment of potential threats to drinking water sources from commercial fertilizer application is dependent on the location and the combination of the percentage of managed land, and livestock density in the vulnerable area and where the fertilizer is applied. The potential threat to drinking water from the storage of fertilizer depends on the location, type of facility where it is stored, and the quantity stored.

See **Table 10-7** for when and where application and storage of commercial fertilizer may be a significant drinking water threat. Note: to determine if a specific activity is a significant drinking water threat consult the Tables of Drinking Water Threats for the specific circumstances that must be met for the activity to be a threat. These activities may also be significant drinking water threats anywhere within an Issue Contributing Area (ICA) for Nitrogen. If the activity meets the description in the *Tables of Circumstances* it is a significant drinking water threat irrespective of vulnerability score. As of March 2024, Table 10-7 includes the threat classification level from the 2009/2013/2017/2021 Director Technical Rules (DTR).

Table 10-7: When/where commercial fertilizer may be a significant drinking water threat (2009/2013/2017/2021 Table of Drinking Water Threats)

Prescribed Drinking Water Threat	Commercial Threat Sub-Category	Area and Vulnerability Score (VS)	Threat Classification Level
			Significant
			DTR 2009/2013/2017/2021
The application, handling, and storage of commercial fertilizer	The application of commercial fertilizer to land	• WHPA-A	✓
		• WHPA-B (VS = 10)	✓
		• WHPA-E (VS ≥ 9)	✓
		• Anywhere in an ICA for Nitrogen	✓
	The storage of commercial fertilizer	• WHPA-A	✓
		• WHPA-B (VS = 10)	✓
		• Anywhere in an ICA for Nitrogen	✓

Policy ID	Threat Description	Implementing Body	Legal Effect	Policy	Where Policy Applies	When Policy Applies	Related Policies	Monitoring Policies
FER-1	Application of Commercial Fertilizer to Land	OMAFRA	C	**Prescribed Instrument** 1) The application of commercial fertilizer (containing nitrogen) to land shall be prohibited where the activity is, or would be, a significant drinking water threat in any of the following areas: • WHPA-A (existing, future); or • WHPA-E in an Issue Contributing Area for Nitrates (future).	See Maps 1.1 – 1.21	Future: Immediately (T-3) Existing: Upon expiry or within 5 years (T-2)	N/A	MON-4
				2) Where the application of commercial fertilizer (containing nitrogen or phosphorus) to land is in an area where the activity is, or would be, a significant drinking water threat, the Nutrient Management Plan or Strategy that governs the activity shall be reviewed or established to ensure appropriate terms and conditions are included so that the activity ceases to be, or does not become, a significant drinking water threat in any of the following area: • WHPA-B (VS=10) (existing, future); or • WHPA-E (VS>= 9) which is not in an Issue Contributing Area for Nitrates (existing, future); or • WHPA-E in an Issue Contributing Area for Nitrates (existing); or • The remainder of an Issue Contributing Area for Nitrates (existing, future).		Future: Immediately (T-3) Existing: 3 years (T-1)	GEN-3	MON-4

Policy ID	Threat Description	Implementing Body	Legal Effect	Policy	Where Policy Applies	When Policy Applies	Related Policies	Monitoring Policies
FER-2	Application of Commercial Fertilizer to Land	RMO	G	**Part IV, s.57** The application of commercial fertilizer to land is designated for the purpose of s.57 under the Clean Water Act, and therefore is prohibited, in an area where the activity is, or would be, a significant drinking water threat, in the following instances: 1. Within a WHPA-A (existing or future activity).	See Maps 1.1 – 1.21	Future Immediately (T-5) Existing: 180 days (T-4)	GEN-1	MON-2
			H	**Part IV, s.58** The application of commercial fertilizer to land is designated for the purpose of s.58 of the Clean Water Act, and therefore requires a Risk Management Plan (RMP), in an area where the activity is, or would be a significant drinking water threat, in the following instances: 1. Within a WHPA vulnerable area in an Issue Contributing Area (Nitrogen) (existing or future activity). 2. Within a WHPA vulnerable area outside of an Issue Contributing Area (Nitrogen) (existing or future) 3. Within an Issue Contributing Area (Nitrogen) outside of WHPA vulnerable areas (existing or future activity). A RMP is not required if a Nutrient Management Plan is provided to the Risk Management Official and conforms to the Source Protection Plan as described in s.61 of O.Reg. 287/07 under the Clean Water Act.		Future: Immediately (T-7) Existing: 1 year / 5 years (T-6)	GEN-1 GEN-2	MON-2

Policy ID	Threat Description	Implementing Body	Legal Effect	Policy	Where Policy Applies	When Policy Applies	Related Policies	Monitoring Policies
FER-3	Handling and Storage of Commercial Fertilizer	RMO	G	**Part IV, s.57** The handling and storage of commercial fertilizer is designated for the purpose of s.57 under the Clean Water Act, and therefore is prohibited, in an area where the activity is, or would be, a significant drinking water threat, in the following instances: 1. Within a WHPA-A (future activity).	See Maps 1.1 – 1.21	Future Immediately (T-5)	GEN-1	MON-2
			H	**Part IV, s.58** The handling and storage of commercial fertilizer is designated for the purpose of s.58 of the Clean Water Act, and therefore requires a Risk Management Plan (RMP), in an area where the activity is, or would be a significant drinking water threat, in the following instances: 1. Within a WHPA-A (existing activity) 2. Within a WHPA vulnerable area in an Issue Contributing Area (Nitrogen) (existing or future activity). 3. Within a WHPA vulnerable area outside of an Issue Contributing Area (Nitrogen) (existing or future activity) 4. Within an Issue Contributing Area (Nitrogen) outside of WHPA vulnerable areas (existing or future activity).		Future: Immediately (T-7) Existing: 1 year / 5 years (T-6)	GEN-1 GEN-2	MON-2

				Where the handling and storage of commercial fertilizer is, or would be, a significant drinking water threat, the RMP at a minimum requires: 1. Liquid fertilizer to be stored in a double-walled tank or secondary containment facilities, with collision protection. 2. Dry fertilizer to be stored undercover on impervious floor surfaces with no drainage outlets.				
FER-4	Application of Commercial Fertilizer to Land Handling and Storage of Commercial Fertilizer	Municipality MECP	E K	**Education and Outreach** The municipality shall deliver education and outreach materials and programs where the application, handling and storage of commercial fertilizer is, or would be, a significant drinking water threat, targeted towards: 1. An individual for personal use to promote timely fertilizer application and best management practices in urban settings; and 2. Owners/tenants of non-agriculturally zone lands to promote best management practices to safeguard drinking water supplies. Where appropriate education and outreach materials prepared by the Ministry of Environment, Conservation and Parks are available, the municipality shall deliver those materials.	See Maps 1.1 - 1.21	Existing & Future: implement within 2 year (T-10)	GEN-8	MON-1 MON-4

Agricultural Source Material (ASM) Policies	
~~ASM-1~~	~~Policy ASM-1 prohibits existing and future application of agricultural source material to land in WHPA-A and future application of agricultural source material to land in WHPA-B (VS = 10) in an Issue Contributing Area for Pathogens and in any WHPA-E in an Issue Contributing Area for Nitrates or Pathogens.~~ ~~The application of agricultural source material to land is otherwise managed through the Prescribed Instrument.~~ ~~The prohibition of the existing application of agricultural source material to land in WHPA-A is already a requirement under the Nutrient Management Act for phased-in farms.~~ ~~The CTC Source Protection Committee concluded that wherever the land application of agricultural source material is a significant drinking water threat as defined by the Clean Water Act, 2006 that the activity should be carefully assessed. The Nutrient Management Act was passed prior to the Province developing its scoring system for an activity deemed to be a significant drinking water threat. The CTC Source Protection Committee considers the threat from application of agricultural source material within the most vulnerable portions of the Issue Contributing Area (WHPA-B with a vulnerability score of 10 and WHPA-E) for Nitrates or Pathogens to warrant extra protection. Prohibiting future new threat activities is seen as being precautionary.~~ ~~This policy is a balance between protecting the municipal source of drinking water and allowing existing farming practices to continue with the implementation of management practices to reduce runoff or infiltration of excess nitrate or pathogens in the remainder of Issue Contributing Area. The CTC Source Protection Committee has chosen to include requirements for soil testing to ensure that excess agricultural source material is not applied and to limit application periods to when the agricultural source material can be broken down and utilized as a nutrient source. These requirements are in line with current best management practices recommended by the Ministry of Agriculture, Food and Rural Affairs. To ensure necessary information to assess the amount of agricultural source material that should be applied to a specific crop and location, the nutrient levels in the agricultural source material should also be tested annually to ensure the correct application rate.~~ ~~Municipalities are also required to continue to monitor the aquifer and report on the results (see GEN-7). Should the contaminant levels continue to increase, it may be necessary to review this policy and others associated with the Issue.~~
ASM-2	WHPA vulnerable areas where the application of Agricultural Source Material (ASM) to land is, or would be, a significant drinking water threat under the Director's Technical Rules (DTR) 2021, include: 1. WHPA-A (VS=10) 2. WHPA-B (VS=10) 3. WHPA-E (VS ≥8) Note: VS= Vulnerability Score.

	Issue Contributing Areas where the application of Agricultural Source Material (ASM) to land is, or would be, a significant drinking water threat under the Director's Technical Rules (DTR) 2021, include: 1. Nitrogen 2. Phosphorus 3. Pathogens Note: The policy is currently limited to Issue Contributing Area - Nitrogen and Pathogens. Policy ASM-2 prohibits existing and future application of ASM to land in a WHPA-A, future application of ASM to land in a WHPA-B (VS = 10) in an Issue Contributing Area for Nitrogen and Pathogens, and in a WHPA-E (VS ≥8) in an Issue Contributing Area for Nitrogen or Pathogens. The CTC Source Protection Committee concluded that wherever the land application of agricultural source material is a significant drinking water threat as defined by the Clean Water Act, 2006 that the activity should be carefully assessed. The Nutrient Management Act was passed prior to the Province developing its scoring system for an activity deemed to be a significant drinking water threat. The CTC Source Protection Committee considers the threat from the application of Agricultural Source Material within the most vulnerable portions of the Issue Contributing Area (WHPA-B with a vulnerability score of 10 and WHPA-E with a vulnerability score 8 or greater) for Nitrogen and/or Pathogens to warrant extra protection. Prohibiting future new threat activities is seen as being precautionary. The prohibition of the application of ASM to land in a WHPA-A is already a requirement under the Nutrient Management Act for phased-in farms (≥ 300 nutrient units). The CTC Source Protection Plan prohibition of the application of ASM to land in a WHPA-A is not distinct to phased-in farms (<300 nutrient units). There are a limited number of agricultural parcels in the CTC Source Protection Region located in WHPA vulnerable areas within an Issue Contributing Area (Nitrogen or Pathogens). Moreover, where the application of ASM to land is taking place, moving the activity from one part of a parcel to another does not require structures (barns, etc.) to be moved. Therefore, within the CTC Source Protection Region, the Committee does not view the policy as onerous to farm operators. The application of ASM to land is otherwise regulated under the Clean Water Act through a Risk Management Plan (RMP) unless exempted under section 61 of O. Reg 287/07. Where the property owner requests an exemption for a Prescribed Instrument the proponent will notify the Risk Management Official (RMO) that the activity is subject to a Nutrient Management Plan (NMP), as described in Section 61 of O. Reg. 287/07, including the submission of the NMP. The NMP must contain a statement of conformity to the Source Protection Plan (SPP) policies on significant drinking water threats.

	The contents of an RMP shall be guided by the requirements for a Nutrient Management Plan (NMP) in Part III, section 23 to 26 of O. Reg. 267/03 under the Nutrient Management Act (NMA). Since NMPs have a five-year term for renewal, it is recommended that Risk Management Plans are renewed at a minimum every five-years or based on crop rotational patterns. During restricted period and other times when soil is snow-covered or frozen, the application of ASM is prohibited under the circumstances outlined in subsection 52.2-52.5 of O. Reg 267/03. The CTC Committee recommends the use of best management approaches and tools provided in the Nutrient Management Training and Certification Program. Prior to the application of ASM, soil testing for annual/cash crops is required each year. Soil testing for perennial crops is recommended once every five years and/or upon renewal of the Risk Management Plan. A common industry test for plant available nitrogen is the Nitrogen Phosphorus and Potassium (NPK) test. However, other tests may be used at the discretion of the RMO. The RMP will include appropriate terms and conditions to ensure the application of ASMs ceases to be a significant drinking water threat including best practices for crop rotation. It is recommended that the nutrient management planning software, NMAN, or similar be used to calculate crop nutrient balances for the RMP. The calculations shall be reviewed annually, and the RMP updated so that it accurately reflects the anticipated operation on the farm unit during the following year. Municipalities are also required to continue to monitor the aquifer and report on the results (see GEN-7). Should the contaminant levels continue to increase, it may be necessary to review this policy and others associated with the Issue.
~~ASM-3~~	~~Policy ASM-3 prohibits the future storage of agricultural source material in WHPA-A, WHPA-B (VS = 10) in an Issue Contributing Area for Nitrates or Pathogens and in any WHPA-E in an Issue Contributing Area for Nitrates or Pathogens. The storage of agricultural source material is otherwise managed through the Prescribed Instrument~~. ~~The CTC Source Protection Committee concluded that wherever the storage of agricultural source material is a significant drinking water threat as defined by the Clean Water Act, 2006 that the activity should be carefully assessed. The Nutrient Management Act was passed prior to the Province developing its scoring system for an activity deemed to be a significant drinking water threat. The CTC Source Protection Committee considers the threat from storage of agricultural source material within WHPA-A and in the most vulnerable portions of the Issue Contributing Area (WHPA-B with a vulnerability score of 10 and WHPA-E) for Nitrates or Pathogens to warrant extra protection. Prohibiting future new threat activities is seen as being precautionary.~~ ~~This policy is a balance between protecting the municipal source of drinking water and allowing existing farming practices to continue with the implementation of management practices to reduce runoff or infiltration. The Source Protection Committee did not want to create undue hardship on farmers by prohibiting existing agricultural source material storage in vulnerable areas due to the difficulties of moving the structure and the investment already made where there is a structure. Where existing agricultural source material is being stored, constructing a new storage structure is allowed per the existing activity definition where it provides greater protection~~

	~~than existing storage. It is expected that any existing uncovered storage of agricultural source material in an area where it is a significant drinking water threat will require a new structure to ensure that it is covered to reduce runoff and infiltration. This policy allows such risk management measures to be implemented. However, where a new structure for existing storage activities can be located outside of a vulnerable area, this is preferred.~~ ~~The prohibition of future new activities does not limit the current farming practices. The definition of existing activities in this Source Protection Plan recognizes that an activity which had been engaged in on a site within the preceding ten years prior to Source Protection Plan approval is deemed an existing activity and therefore not subject to future prohibition policies.~~ ~~Municipalities are also required to continue to monitor the aquifer and report on the results (see GEN-7). Should the contaminant levels continue to increase, it may be necessary to review this policy and others associated with the Issue.~~
ASM-4	WHPA vulnerable areas where the storage of Agricultural Source Material (ASM) is, or would be, a significant drinking water threat under the Director's Technical Rules (DTR) 2021, include: 1. WHPA-A (VS=10) 2. WHPA-B (VS=10) 3. WHPA-E (VS ≥8) Note: VS= Vulnerability Score. Issue Contributing Areas where the storage of Agricultural Source Material (ASM) is, or would be, a significant drinking water threat under the Director's Technical Rules (DTR) 2021, include: 1. Nitrogen 2. Phosphorus 3. Pathogens Note: The policy is currently limited to Issue Contributing Area - Nitrogen and Pathogens. Policy ASM-4 prohibits the future storage of Agricultural Source Material (ASM) in WHPA-A, WHPA-B (VS = 10) in an Issue Contributing Area for Nitrogen or Pathogens and WHPA-E in an Issue Contributing Area for Nitrogen or Pathogens. The CTC Source Protection Plan recognizes that an activity which had been engaged in on a site within the preceding ten years prior to the CTC Source Protection Plan approval is deemed an existing activity and therefore not subject to future prohibition policies. The CTC Source Protection Committee concluded that wherever the storage of agricultural source material is a significant drinking water threat as defined by the Clean Water Act, 2006 that the activity should be carefully assessed. The Nutrient Management Act was passed prior to the Province developing its scoring system for an activity deemed to be a significant drinking water threat. The CTC Source Protection Committee considers the threat from storage of Agricultural Source Material within WHPA-A and in the most

	vulnerable portions of the Issue Contributing Area (WHPA-B with a vulnerability score of 10 and WHPA-E with a vulnerability score of 8 or greater) for Nitrogen or Pathogens to warrant extra protection. Prohibiting future new threat activities is seen as being precautionary. The prohibition of the storage of ASM in a WHPA-A is already a requirement under the Nutrient Management Act for phased-in farms (≥ 300 nutrient units). The CTC Source Protection Plan prohibition of the storage of ASM in a WHPA-A is not distinct to phased-in farms (<300 nutrient units). There are a limited number of agricultural parcels in the CTC Source Protection Region located in WHPA vulnerable areas within an Issue Contributing Area (Nitrogen or Pathogens). Where existing Agricultural Source Material is being stored, constructing a new storage structure is allowed per the existing activity definition where it provides greater protection than existing storage. It is expected that any existing uncovered storage of Agricultural Source Material in an area where it is a significant drinking water threat will require a new structure to ensure that it is covered to reduce runoff and infiltration. This policy allows such risk management measures to be implemented. It is preferred that new structures for existing storage activities are located outside of a vulnerable area, if possible. The storage of Agricultural Source Material is otherwise regulated under the Clean Water Act through a Risk Management Plan (RMP) unless exempted under section 61 of O. Reg 287/07. Where the property owner requests an exemption for a Prescribed Instrument the proponent will notify the RMO that the activity is subject to a Nutrient Management Strategy (NMS), as described in Section 61 of O. Reg. 287/07, including the submission of the NMS. The contents of an RMP should be guided by the requirements for a Nutrient Management Strategy (NMS) in Part III, section 17 to 22 of O. Reg. 267/03 under the Nutrient Management Act. Municipalities are also required to continue to monitor the aquifer and report on the results (see GEN-7). Should the contaminant levels continue to increase, it may be necessary to review this policy and others associated with the Issue.
ASM-5	No change

Non-Agricultural Source Material (ASM) Policies	
NASM-1	WHPA vulnerable areas where the application of (Category 1) Non-Agricultural Source Material (NASM) containing manure to land is, or would be, a significant drinking water threat under the Director's Technical Rules (DTR) 2021, include: 1. WHPA-A (VS=10) 2. WHPA-B (VS=10) 3. WHPA-E (VS ≥8) Note: VS= Vulnerability Score. Issue Contributing Areas where the application of (Category 1) NASM to land is, or would be, a significant drinking water threat under the Director's Technical Rules (DTR) 2021, include: 1. Nitrogen 2. Phosphorus 3. Pathogens Policy NASM-1 prohibits the existing and future application of non-farm herbivorous biosolids Non-Agricultural Source Material containing manure (Category 1) to land in WHPA-A. Applying (Category 1) Non-Agricultural Source Material to land is generally not considered a significant drinking water threat except for non-farm herbivorous biosolids (manure). The application of (Category 1) Non-Agricultural Source Material containing manure to land is regulated under the Clean Water Act through a Risk Management Plan (RMP). The contents of an RMP should be guided by the requirements for a Non-Agricultural Source Material Plan (NASM Plan) in Part III, section 26 of O. Reg. 267/03 under the Nutrient Management Act. The CTC was advised that there is no Prescribed Instrument issued for this activity under the Nutrient Management Act. The CTC Committee determined any application of Non-Agricultural Source Material containing manure within close proximity to the municipal well or intake would provide an unnecessary risk to drinking water. The CTC Committee concluded that section 57 will effectively achieve prohibition in WHPA-A while maintaining the goal of protecting source water and ensuring these threats cease to be or do not occur in the future. No existing threats from this activity were identified in the CTC so prohibition of existing activities will likely have no impact. Municipalities are also required to continue to monitor the aquifer and report on the results (see GEN-7). Should the contaminant levels continue to increase, it may be necessary to review this policy and others associated with the Issue.
NASM-2	WHPA vulnerable areas where the handling and storage of (Category 1) Non-Agricultural Source Material (NASM) containing manure is, or would be, a significant drinking water threat under the Director's Technical Rules (DTR) 2021, include: 1. WHPA-A (VS=10).

	2. WHPA-B (VS=10). 3. WHPA-E (VS ≥8). Note: VS= Vulnerability Score. Issue Contributing Areas where the application of (Category 1) NASM is, or would be, a significant drinking water threat under the Director's Technical Rules (DTR) 2021, include: 1. Nitrogen 2. Phosphorus 3. Pathogens Policy NASM-2 prohibits the future handling and storage of non-farm herbivorous biosolids (Category 1) Non-Agricultural Source Material containing manure in WHPA-A. Handling and storage of (Category 1) Non-Agricultural Source Material is generally not considered a significant drinking water threat except for non-farm herbivorous biosolids (manure). The handling and storage of (Category 1) Non-Agricultural Source Material containing manure is regulated under the Clean Water Act through a Risk Management Plan (RMP). The contents of an RMP should be guided by the requirements for a Non-Agricultural Source Material Plan (NASM Plan) in Part III, section 26 of O. Reg. 267/03 under the Nutrient Management Act. The CTC Source Protection Committee did not want to create undue hardship on farmers by prohibiting existing storage of (Category 1) Non-Agricultural Source Material due to the difficulties of moving the structure and the investment already made. Where existing (Category 1) Non-Agricultural Source Material storage is present, constructing a new structure is allowed per the existing activity definition where it provides greater protection than the existing storage. However, where a new structure can be located outside of a vulnerable area, this is preferred. Municipalities are also required to continue to monitor the aquifer and report on the results (see GEN-7). Should the contaminant levels continue to increase, it may be necessary to review this policy and others associated with the Issue.
NASM-3	WHPA vulnerable areas where the application of (Category 2) Non-Agricultural Source Material (NASM) to land is, or would be, a significant drinking water threat under the Director's Technical Rules (DTR) 2021, include: 1. WHPA-A (VS=10) 2. WHPA-B (VS=10) 3. WHPA-E (VS ≥8) Note: VS= Vulnerability Score.

	Issue Contributing Areas where the application of (Category 2) NASM to land is, or would be, a significant drinking water threat under the Director's Technical Rules (DTR) 2021, include: 1. Nitrogen 2. Phosphorus 3. Pathogens Policy NASM-3 prohibits the future application of (Category 2) Non-Agricultural Source Material to land where it would be a significant drinking water threat. The application of (Category 2) Non-Agricultural Source Material to land is regulated under the Clean Water Act through a Risk Management Plan (RMP). The contents of an RMP should be guided by the requirements for a Non-Agricultural Source Material Plan (NASM Plan) in Part III, section 26 of O. Reg. 267/03 under the Nutrient Management Act. The CTC Source Protection Committee concluded that wherever the application of (Category 2) Non-Agricultural Source Material to land is a significant drinking water threat as defined by the Clean Water Act, 2006 that the activity should be carefully assessed. The Nutrient Management Act was passed prior to the Province developing its scoring system for an activity deemed to be a significant drinking water threat. The CTC Source Protection Committee considers the threat from the application of (Category 2) Non-Agricultural Source Material to land within WHPA-A, WHPA-B (with a vulnerability score of 10) and WHPA-E (with a vulnerability score equal to or greater than 8) and the remainder of an Issue Contributing Area to warrant extra protection. Prohibiting future threat activities is seen as being precautionary. This policy is a balance between protecting the municipal source of drinking water and allowing existing practices to continue until expiry of any existing approvals. The threats verification work by the Source Protection Authority has not identified any sites where there is existing application of (Category 2) Non-Agricultural Source Material to land that would be a significant drinking water threat. Therefore, the CTC Source Protection Committee considered that the financial implications to affected farming operations would not be onerous. Non-Agricultural Source Material categories are defined under the Nutrient Management Act (e.g. organic waste matter that contains no meat or fish and is derived from food processing at a bakery). (Category 2) NASMs with a higher concentration of regulated metal (CM2) are outlined in Schedule 5 of O.Reg. 267/03 require a NASM Plan approved/registered with OMAFRA. (Category 2) Non-Agricultural Source Materials are generally imported to the agricultural property for application and subject to time limited approvals to prevent the buildup of persistent contaminants in the soil.

	Municipalities are also required to continue to monitor the aquifer and report on the results (see GEN-7). Should the contaminant levels continue to increase, it may be necessary to review this policy and others associated with the Issue.
NASM-4	WHPA vulnerable areas where the handling and storage of (Category 2 & 3) Non-Agricultural Source Material (NASM) is, would be, a significant drinking water threat under the Director's Technical Rules (DTR) 2021, include: 1. WHPA-A (VS=10) 2. WHPA-B (VS=10) 3. WHPA-E (VS ≥8) Note: VS= Vulnerability Score. Issue Contributing Areas where the application of (Category 2 & 3) NASM is, or would be, a significant drinking water threat under the Director's Technical Rules (DTR) 2021, include: 1. Nitrogen 2. Phosphorus 3. Pathogens Policy NASM-5 prohibits the future handling and storage of (Category 2 & 3) Non-Agricultural Source Material where it would be a significant drinking water threat. The handling and storage of (Category 2 & 3) Non-Agricultural Source Material is regulated under the Nutrient Management Act through a Non-Agricultural Source Material Plan (NASM Plan). The CTC Source Protection Committee concluded that wherever the handling and storage of (Category 2 & 3) Non-Agricultural Source Material is a significant drinking water threat as defined by the Clean Water Act, 2006 that the activity should be carefully assessed. The Nutrient Management Act was passed prior to the Province developing its scoring system for an activity deemed to be a significant drinking water threat. The CTC Source Protection Committee considers the threat from the handling and storage of (Category 2 & 3) Non-Agricultural Source Material within WHPA-A, WHPA-B (with a vulnerability score of 10) and WHPA-E (with a vulnerability score equal to or greater than 8) and the remainder of an Issue Contributing Area to warrant extra protection. The CTC Source Protection Committee concluded that the threat to sources of drinking water was higher from (Category 2 & 3) Non-Agricultural Source Materials due to the nature of the materials included (particularly from pathogens and nitrogen) then in (Category 1) Non-Agricultural Source Material, and therefore other tools, such as Risk Management Plans, were not considered adequate to protect the drinking water source. Prohibiting future threat activities is seen as being precautionary. The technical work did not identify any sites where there is existing storage of Non-Agricultural Source Material (Category 2 & 3) and therefore no storage facilities would be impacted. Therefore, the CTC Source Protection Committee considered that there was unlikely any financial implications to farming operations.

	Non-Agricultural Source Material categories are defined under the Nutrient Management Act. Handling and Storage of (Category 3) NASMs requires a NASM Plan approved/registered with OMAFRA. (Category 2 & 3) Non-Agricultural Source Materials are generally imported to the agricultural property for application and subject to time limited approvals to prevent the buildup of persistent contaminants in the soil. Municipalities are also required to continue to monitor the aquifer and report on the results (see GEN-7). Should the contaminant levels continue to increase, it may be necessary to review this policy and others associated with the Issue.
NASM-5	Policy NASM-6 manages the application, handling, and storage of Non-Agricultural Source Material through the use of education and outreach targeted towards landowners and haulers that have a Prescribed Instrument or Risk Management Plan to haul, store or apply Non-Agricultural Source Material. The scope and content of education and outreach activities should be communicated to Risk Management Officials to ensure consistency between implementing bodies. Education and outreach policies have been proposed as part of the suite of tools to ensure that actions that can be taken to reduce the threat is made available to property owners in the vulnerable areas. Actions undertaken by individuals and businesses who know what to do to protect a drinking water source can be very effective as part of the protection approach. Municipalities are also encouraged to distribute these materials to property owners in areas where the threat to municipal drinking water is low or moderate where action can also help to protect sources of other drinking water supplies (see GEN-8). Furthermore, municipalities are also required to continue to monitor the aquifer and report on the results (see GEN-7). Should the contaminant levels continue to increase, it may be necessary to review this policy and others associated with the Issue.
NASM-6	WHPA vulnerable areas where the application of (Category 3) Non-Agricultural Source Material (NASM) to land is, or would be, a significant drinking water threat under the Director's Technical Rules (DTR) 2021, include: 1. WHPA-A (VS=10) 2. WHPA-B (VS=10) 3. WHPA-E (VS ≥8) Note: VS= Vulnerability Score. Issue Contributing Areas where the application of (Category 3) NASM to land is, or would be, a significant drinking water threat under the Director's Technical Rules (DTR) 2021, include: 1. Nitrogen

	2. Phosphorus 3. Pathogens Policy NASM-4 prohibits the future application of (Category 3) Non-Agricultural Source Material where it would be a significant drinking water threat. When the CTC Source Protection Plan was approved on December 31, 2015, the existing application of (Category 3) Non-Agricultural Source Material to land was permitted to continue until the expiry of the current approval. In 2023, it was expected that no Prescribed Instruments remained in place. The CTC Source Protection Committee concluded that wherever the application of Non-Agricultural Source Material (Category 3) is a significant drinking water threat as defined by the Clean Water Act, 2006 that the activity should be carefully assessed. The Nutrient Management Act was passed prior to the Province developing its scoring system for an activity deemed to be a significant drinking water threat. The CTC Source Protection Committee considers the threat from the application of Non-Agricultural Source Material (Category 3) within WHPA-A, WHPA-B (with a vulnerability score of 10) and WHPA-E (with a vulnerability score equal to or greater than 8) and the remainder of an Issue Contributing Area to warrant extra protection. Prohibiting future threat activities is seen as being precautionary. This policy is a balance between protecting the municipal source of drinking water and allowing existing practices to continue until expiry of any existing approvals. The threats verification work by the Source Protection Authority has not identified any sites where there is existing application of Non-Agricultural Source Material that would be a significant drinking water threat. Therefore, the CTC Source Protection Committee considered that the financial implications to affected farming operations would not be onerous. Non-Agricultural Source Material categories are defined under the Nutrient Management Act (e.g. pulp and paper biosolids, paunch manure and sewage biosolids). Application of (Category 3) NASMs to land requires a NASM Plan approved/registered with OMAFRA. (Category 3) Non-Agricultural Source Materials are generally imported to the agricultural property for application and subject to time limited approvals to prevent the buildup of persistent contaminants in the soil. Municipalities are also required to continue to monitor the aquifer and report on the results (see GEN-7). Should the contaminant levels continue to increase, it may be necessary to review this policy and others associated with the Issue.

Livestock (LIV) Policies	
LIV-1	Threat Description: (O. Reg. 385/08, s.3) WHPA vulnerable areas where the use of land as livestock grazing or pasturing land is, or would be, a significant drinking water threat under the Director's Technical Rules (DTR) 2021, include: 1. WHPA-A (VS=10) 2. WHPA-B (VS=10) 3. WHPA-E (VS ≥8) Note: VS= Vulnerability Score. Issue Contributing Areas where the use of land as livestock grazing or pasturing land is, or would be, a significant drinking water threat under the Director's Technical Rules (DTR) 2021, include: 1. Nitrogen 2. Phosphorus 3. Pathogens Note: The policy is currently limited to Issue Contributing Area - Nitrogen and Pathogens. Policy LIV-1 prohibits the existing and future use of land as livestock grazing or pasturing land (with an animal density of >1 Nutrient Unit per acre) in WHPA-A in an Issue Contributing Area for Nitrogen or Pathogens. The use of land as livestock grazing or pasturing land is otherwise managed requiring a Risk Management Plan. The CTC Source Protection Committee considers the threat from livestock grazing and pasturing within an Issue Contributing Area for Nitrogen or Pathogens to warrant extra protection. While the Nutrient Management Act does not apply to livestock grazing and pasturing, the CTC Source Protection Committee felt the threat from this activity where the density of animals is greater than 1 nutrient unit per acre is comparable to the application of Agricultural Source Material. The WHPA-A is highly vulnerable and the potential for contamination of a municipal well from activities taking place in this area is high and therefore other tools, such as Risk Management Plans, were not considered adequate to protect the drinking water source. Therefore, the CTC Source Protection Committee concluded that prohibition in WHPA-A in an Issue Contributing Area for Nitrogen or Pathogens is consistent with the prohibition of Agricultural Source Material application. In terms of impact on landowners only some wells in the CTC are located on agricultural lands and where they are, only a small area of farmland may be affected by the prohibition in WHPA-A (the 100 metre radius around a municipal well) if the livestock density is greater than 1 nutrient unit per acre; and therefore the CTC Source Protection Committee concluded that moving grazing and pasturing from WHPA-A to other areas of the farm or reducing the livestock density in WHPA-A below the threshold is a feasible risk prevention

	measure with limited impact. Therefore, the CTC Source Protection Committee considered that the financial implications to affected farming operations would be minimal. In 2023, an enabling provision was added where residential land use with less than 5 nutrients units, outside WHPA-A was introduced. The CTC Source Protection felt providing the Risk Management Official greater discretion in these situations was in line with neighbouring Source Protection Regions while continuing to provide sufficient risk management measures to protect drinking water sources. Ongoing inspections should be conducted annually or on a basis deemed appropriate by the Risk Management Official. Inspection efforts should be prioritized based on systems that pose the greatest risk to sources of drinking water. Municipalities are also required to continue to monitor the aquifer and report on the results (see GEN-7). Should the contaminant levels continue to increase, it may be necessary to review this policy and others associated with the Issue.
~~LIV-2~~	~~Policy LIV-2 prohibits the future use of land as an outdoor confinement area or a farm animal yard in WHPA-A, WHPA-B (VS = 10) in an Issue Contributing Area for Nitrates or Pathogens and in any WHPA-E in an Issue Contributing Area for Nitrates and Pathogens.~~ ~~The use of land as an outdoor confinement area or a farm animal yard is otherwise managed through the Prescribed Instrument.~~ ~~The prohibition of the expansion of the capacity or siting a new farm animal yard or outdoor confinement area in WHPA-A is already a requirement under the Nutrient Management Act for phased in farms.~~ ~~The CTC Source Protection Committee concluded that wherever this is a significant drinking water threat as defined by the Clean Water Act, 2006 that the activity should be carefully assessed. The Nutrient Management Act was passed prior to the Province developing its scoring system for an activity deemed to be a significant drinking water threat.~~ ~~This policy is a balance between protecting the municipal source of drinking water and allowing existing farming practices to continue with the implementation of management practices to reduce runoff or infiltration. The CTC Source Protection Committee did not want to create undue hardship on farmers by prohibiting existing livestock confinement areas or farm animal yards due to the difficulties of moving the structure and the investment already made. Where existing outdoor confinement areas or farm animal yards exist, constructing a new structure is allowed per the existing activity definition where it provides greater protection than the existing storage. However, where a new structure can be located outside of a vulnerable area, this is preferred. Prohibiting future new threat activities is seen as being precautionary.~~ ~~The CTC Source Protection Committee considers the threat from outdoor confinement areas or farm animal yards within an Issue Contributing Area for Nitrates or Pathogens to warrant extra protection. Thus, the policy for future prohibition also applies to the most vulnerable portions of the Issue Contributing Area (WHPA-B with a vulnerability score of 10 and WHPA-E) for Nitrates or Pathogens.~~

	~~Municipalities are also required to continue to monitor the aquifer and report on the results (see GEN-7). Should the contaminant levels continue to increase, it may be necessary to review this policy and others associated with the Issue.~~
LIV-3	Threat Description: (O. Reg. 385/08, s.3) WHPA vulnerable areas where the use of land as an outdoor confinement area or farm animal-yard is, or would be, a significant drinking water threat under the Director's Technical Rules (DTR) 2021, include: 1. WHPA-A (VS=10) 2. WHPA-B (VS=10) 3. WHPA-E (VS ≥8) Note: VS= Vulnerability Score. Issue Contributing Areas where the use of land as an outdoor confinement area or farm animal-yard is, or would be, a significant drinking water threat under the Director's Technical Rules (DTR) 2021, include: 1. Nitrogen 2. Phosphorus 3. Pathogens Note: The policy is currently limited to Issue Contributing Area - Nitrogen and Pathogens. Policy LIV-3 prohibits the future use of land as an outdoor confinement area or a farm-animal yard in WHPA-A, WHPA-B (VS = 10) in an Issue Contributing Area for Nitrogen or Pathogens and in any WHPA-E in an Issue Contributing Area for Nitrogen and Pathogens. The prohibition of the expansion of the capacity or siting a new farm-animal yard or outdoor confinement area in WHPA-A is already a requirement under the Nutrient Management Act for phased-in farms and the CTC Source Protection Committee wanted to maintain consistency between farms phased-in and not phased-in to the Nutrient Management Act requirements. The prohibition of the use of land as an outdoor confinement area or farm animal-yard in a WHPA-A is already a requirement under the Nutrient Management Act for phased-in farms (≥ 300 nutrient units). The CTC Source Protection Plan prohibition of the use of land as an outdoor confinement area or farm animal-yard in a WHPA-A is not distinct to phased-in farms (<300 nutrient units). This policy is a balance between protecting the municipal source of drinking water and allowing existing farming practices to continue with the implementation of management practices to reduce runoff or infiltration. The CTC Source Protection Committee did not want to create undue hardship on farmers by prohibiting existing livestock confinement areas or farm-animal yards due to the difficulties of moving the structure and the investment already made. Where existing outdoor confinement areas or farm-animal yards exist,

	constructing a new structure is allowed per the existing activity definition where it provides greater protection than the existing activity. However, where a new structure can be located outside of a vulnerable area, this is preferred. Prohibiting future new threat activities is seen as being precautionary. The CTC Source Protection Committee considers the threat from outdoor confinement areas or farm-animal yards within an Issue Contributing Area for Nitrates or Pathogens to warrant extra protection. Thus, the policy for future prohibition also applies to the most vulnerable portions of the Issue Contributing Area (WHPA-B with a vulnerability score of 10 and WHPA-E with a vulnerability score of 8 or greater) for Nitrogen or Pathogens. The land use as an outdoor confinement area or farm-animal yard otherwise regulated under the Clean Water Act through a Risk Management Plan (RMP) unless exempted under section 61 of O. Reg 287/07. Where the property owner requests an exemption for a Prescribed Instrument the proponent will notify the RMO that the activity is subject to a Nutrient Management Strategy (NMS), as described in Section 61 of O. Reg. 287/07, including the submission of the NMS. The contents of an RMP should be guided by the requirements for a Nutrient Management Strategy (NMS) in Part III, section 17 to 22 of O. Reg. 267/03 under the Nutrient Management Act. Municipalities are also required to continue to monitor the aquifer and report on the results (see GEN-7). Should the contaminant levels continue to increase, it may be necessary to review this policy and others associated with the Issue.

Commercial Fertilizer (FER) Policies	
~~FER-1~~	~~Policy FER-1 prohibits the existing and future application of commercial fertilizer in WHPA-A and the future application of commercial fertilizer in any WHPA-E in an Issue Contributing Area for Nitrates. The application of commercial fertilizer is otherwise managed through the Prescribed Instrument.~~ ~~The CTC Source Protection Committee chose to apply prohibition to the existing and future application of commercial fertilizer to land in WHPA-A as it is already a requirement under the Nutrient Management Act for phased-in farms and wanted to maintain consistency between farms phased-in and not phased-in to the Nutrient Management Act requirements.~~ ~~The CTC Source Protection Committee considers the threat from application of nitrate containing fertilizer within an Issue Contributing Area for Nitrates to warrant extra protection. Thus, the policy for future prohibition applies beyond the WHPA-A in an Issue Contributing Area for Nitrates in the WHPA-E where excess fertilizer can leach into the surface water. The CTC Source Protection Committee concluded that the precautionary approach be applied when dealing with a WHPA-E in an Issue Contributing Area for Nitrates due to their sensitive nature.~~ ~~Municipalities are also required to continue to monitor the aquifer and report on the results (see GEN-7). Should the contaminant levels continue to increase, it may be necessary to review this policy and others associated with the Issue.~~
FER-2	WHPA vulnerable areas where the application of commercial fertilizer to land is, or would be, a significant drinking water threat under the Director's Technical Rules (DTR) 2021, include: 1. WHPA-A (VS=10) 2. WHPA-B (VS=10) 3. WHPA-E (VS ≥9) Note: VS= Vulnerability Score. Issue Contributing Areas where the application of commercial fertilizer to land is, or would be, a significant drinking water threat under the Director's Technical Rules (DTR) 2021, include: 1. Nitrogen 2. Phosphorus Note: The policy is currently limited to Issue Contributing Area - Nitrogen. Policy FER-2 prohibits the existing and future application of commercial fertilizer to land in WHPA-A. The WHPA-A is a geographically limited in size (100 m around the wellhead). Where the application of commercial fertilizer to land is taking place, moving the activity from one part of a parcel to another does not require structures (barns, etc.) to be moved. Therefore, within the CTC, the Committee does not view the policy as onerous to farm operators.

	The application of commercial fertilizer to land is regulated under the Clean Water Act through a Risk Management Plan (RMP) unless exempted under section 61 of O. Reg 287/07. Where the property owner requests an exemption for a Prescribed Instrument the proponent will notify the Risk Management Official that the activity is subject to a Nutrient Management Plan (NMP), as described in Section 61 of O. Reg. 287/07, including the submission of the NMP. The NMP must contain a statement of conformity to the Source Protection Plan (SPP) policies on significant drinking water threats. The contents of an RMP shall be guided by the requirements for a Nutrient Management Plan (NMP) in Part III, section 24 of O. Reg. 267/03 under the Nutrient Management Act (NMA). Since NMPs have a five-year term for renewal, it is recommended that Risk Management Plans are renewed at a minimum of every five-years or based on crop rotational patterns. Municipalities are also required to continue to monitor the aquifer and report on the results (see GEN-7). Should the contaminant levels continue to increase, it may be necessary to review this policy and others associated with the Issue.
FER-3	WHPA vulnerable areas where the handling and storage of commercial fertilizer is, or would be, a significant drinking water threat under the Director's Technical Rules (DTR) 2021, include: 1. WHPA-A (VS=10) 2. WHPA-B (VS=10) Note: VS= Vulnerability Score. Issue Contributing Areas where the handling and storage of commercial fertilizer is, or would be, a significant drinking water threat under the Director's Technical Rules (DTR) 2021, include: 1. Nitrogen 2. Phosphorus Note: The policy is currently limited to Issue Contributing Area - Nitrogen. Policy FER-3 prohibits the future handling and storage of commercial fertilizer in WHPA-A. The handling and storage of commercial fertilizer is otherwise managed by requiring a Risk Management Plan. The Nutrient Management Act does not have provisions regarding the storage of commercial fertilizer and as such the CTC Source Protection Committee chose to apply Part IV tools to farms and other lands where the handling and storage of commercial fertilizer is or would be a significant drinking water threat. The CTC Source Protection Committee took into consideration the burden of being required to move existing structures used in the storage of commercial fertilizer and as such only applied prohibition within the WHPA-A for future activities. The CTC Source Protection Committee concluded that future facilities can be located outside of WHPA-A when dealing with large farm properties.

	In 2021, the Province released a new set of Director's Technical Rules. These rules provided an option to amend the focus from total mass on the property to individual focus in liquid form. For both existing and future large quantities of fertilizer storage, the Source Protection Committee is requiring (1) liquid fertilizer to be stored in a double-walled tank or secondary containment facilities with collision protection and (2) dry fertilizer to be stored undercover on impervious floor surface with no drainage outlets to reduce accidental release, along with any other provisions deemed necessary in the Risk Management Plan. Municipalities are also required to continue to monitor the aquifer and report on the results (see GEN-7). Should the contaminant levels continue to increase, it may be necessary to review this policy and others associated with the Issue.
FER-4	Policy FER-4 manages the existing and future application, handling, and storage of commercial fertilizer through the use of education and outreach targeted towards individuals as well as owners/tenants of non-agriculturally zoned lands. This policy is the only one to deal with the threat posed by the application, handling, and storage of small quantities of commercial fertilizers by individuals for use on their personal property which is a significant drinking water threat only within an Issue Contributing Area for Nitrates. The CTC Source Protection Committee is required to develop a policy to address this threat. Therefore, the Source Protection Committee concluded that this policy is an appropriate balance between protecting the municipal source of drinking water and avoiding the workload burden on the Risk Management Official and costs to landowners that would result from requiring a Risk Management Plan. An education and outreach strategy should be developed by the municipality that includes a suite of actions to ensure that affected property owners understand and take actions to protect municipal supplies. This should include ongoing efforts and follow-up analysis to assess effectiveness as this is a standalone policy, not a companion to other policies directed at the same threat activity. Education and outreach materials should clearly set out actions that property owners should take to reduce the threat in the vulnerable areas. Where education and outreach materials have been prepared by the Ministry of the Environment, Climate Change, and Parks the municipality shall deliver those materials, otherwise the municipality shall develop their own materials for delivery. Where the application of commercial fertilizer to land is occurring on a golf course, the proponent is encouraged to obtain an Audubon Co-operative Sanctuary Certification. Municipalities are also encouraged to distribute these materials to property owners in areas where the threat to municipal drinking water is low or moderate where action can also help to protect sources of other drinking water supplies (see GEN-8). Voluntary actions undertaken by individuals and businesses to protect a drinking water source can be very effective as part of the protection approach.

	Furthermore, municipalities are also required to continue to monitor the aquifer and report on the results (see GEN-7). Should the contaminant levels continue to increase, it may be necessary to review this policy and others associated with the Issue.

DRINKING WATER SOURCE PROTECTION
Our Actions Matter

CTC Source Protection Region

TO: **Chair and Members of the Source Protection Committee Meeting #3/23, December 6, 2023**

FROM: **Behnam Doulatyari, Program Manager, CTC Source Protection Region**

RE: **Proposed changes to environmental permissions and the permit-by-rule framework**

KEY ISSUES

The impact of proposed environmental regulatory changes on CTC Source Protection Plan policies:

- ERO number 019-6951: Exploring changes to streamline the permit-by-rule framework.
- ERO number 019-6853: Streamlining permissions for water takings for construction site dewatering activities and foundation drains.
- ERO number 019-6928: Streamlining environmental permissions for stormwater management under the Environmental Activity and Sector Registry
- ERO number 019-7636: Proposed regulatory amendments to encourage greater reuse of excess soil.

RECOMMENDATION

THAT the CTC Source Protection Committee receive the report Proposed changes to environmental permissions and the permit-by-rule framework for information.

AND FURTHER THAT staff be directed to submit the report Proposed changes to environmental permissions and the permit-by-rule framework and cover letter (Attachment A) to the Ministry of Environment, Conservation and Parks.

Background

At the end of August of this year the Ministry of Environment, Conservation and Parks (MECP), through the Environmental Registry of Ontario (ERO), announced consultations on the permit-by-rule framework and proposed changes to environmental permissions for water taking and stormwater management. The deadline for providing comments through the Environmental Registry was October 30th which did not allow for discussion with the CTC Source Protection Committee. CTC staff have solicited comments from implementing municipalities, partner Conservation Authorities, Conservation Ontario, and one of the province's leading groundwater

programs, the Oak Ridges Moraine Groundwater Program (ORMGP). It should also be noted that many of the implementing municipalities across CTC have submitted comments through the Environmental Registry.

1. Through **ERO number 019-6951**, MECP is s seeking input on how to expand the use of its permit-by-rule framework. Currently, the permit-by-rule framework includes two main types of Environmental Activity and Sector Registry (EASR) approaches:

   "Assessed EASRs set out eligibility criteria and allow an eligible activity to register. The eligible activities are required to have a qualified person prepare technical assessments that have to be assessed against established environmental outcomes, for example, an air standard. Once registered, they are required to comply with prescribed rules set out in regulation.
   Rules based EASRs also set out eligibility criteria and allow an eligible activity to register but do not require a qualified person to assess against established outcomes. Once registered, they are required to comply with prescribed rules set out in regulation."

   MECP is exploring opportunities to allow a wider range of activities to register for a permission through both types of EASRs. To achieve that they are exploring three options: (i) develop a single permit-by-rule regulation; (ii) move prescribed rules governing activities into "codes of practice" outside of regulation; (iii) allow a single registration for a facility.

2. Through **ERO number 019-6853**, MECP is seeking input on two proposed regulatory amendments in support of the More Homes, Built Faster: Ontario's Housing Supply Action Plan 2022-2023.

   Currently, O. Reg. 63/16 under the *Environmental Protection Act* (EPA), allows self-registration of certain temporary water taking activities, such as construction site dewatering, road construction and pumping tests, which removes the requirement for a MECP review and obtaining a PTTW under the *Ontario Water Resources Act* (OWRA) for the water taking, or an Environmental Compliance Approval (ECA) under the EPA for the discharge. The EASR activity is subject to oversight by a Qualified Person (QP; in this context refers to P. Geo or P. Eng.) and taking necessary measures to ensure that water quantity and quality are not affected upstream or downstream of the work area, and that discharges associated with the water taking do not cause adverse effects to the environment.

   The proposed amendments include removing the current 400,000 litres of ground water per day volumetric threshold for construction dewatering. This would allow a person to self-register on the EASR for the temporary taking of any quantity of groundwater or storm water from a dewatered work area(s) at a construction site if all other current eligibility requirements are met. The existing exemption from a permission for water

takings of 50,000 litres per day or less remains in place. Furthermore, the current requirements to notify the local conservation authority of the water taking with duration over one year will be removed. The proposal does not change other requirements in the regulation for protecting the public and the environment, QP prepared water taking and discharge reports, self reporting of water taking, and the Ministry maintaining the authority to inspect water taking activities and ensure that they are complying with all necessary legal requirements.

Proposed regulatory amendments to O. Reg. 387/04 under the *Ontario Water Resources Act*, include exempting residential foundation drainage from requiring a Permit To Take Water (PTTW) for water taking of up to 379,000 litres of water per day. A PTTW is still required for taking greater than this amount.

3. Through **ERO number** 019-6928, MECP is seeking input on three proposals related to the environmental permissions for stormwater management.

   MECP is proposing a new regulation under the *Environmental Protection Act*, to allow owners of privately owned (not captured under Consolidated Linear Infrastructure ECA) stormwater management works servicing commercial, institutional, light industrial, multi-unit residential types of activities to self-register on the EASR. Such eligible works would require the owner to meet regulatory requirements and follow existing Ministry standards, including preparation of a site-specific technical assessment performed by a Licensed Engineering Practitioner (“LEP”).

   MECP is proposing to amend O. Reg. 525/98 under the *Ontario Water Resources Act*, to remove ECA requirements for low impact development (LID) that the Ministry considers poses little to no risk to the environment, including infiltration trenches, swales, permeable pavements, and rain gardens. MECP would maintain the authority for inspection and compliance review. The proposal also includes exemptions for drainage works for roadways and railways, including railway projects by Metrolinx that are not already captured under the *Ontario Water Resources Act*.

   MECP is proposing to amend Ontario Regulation 287/07, made under the *Clean Water Act, 2006*, by removing the need for, limiting, or restricting the types of policies to be included in source protection plans where a significant drinking water threat is being identified by a LEP and managed through registration on the EASR. Prohibitions in source protection plans on the establishment of stormwater management works that are significant threats would be maintained as part of the proposed EASR regulation. The proposed changes will allow for amendments to existing source protection plans without following the existing amendment processes where the amendment is to remove policies that are no longer operative.

Similarly, on October 17, 2023, MECP announced consultations on proposed changes to excess soil regulations, with deadline to comment on December 1, 2023.

4. Through **ERO number 019-7636**, MECP is seeking input on proposed amendments to O. Reg. 406/19 (Excess Soil Regulation) and the Rules for Soil Management and Excess Soil Quality Standards to encourage greater reuse of low-risk excess soils. The On-Site and Excess Soil Management, under the EPA, supported by a Soil Rules document and risk-based soil reuse standards, were brought forward in 2019 to provide clear rules supporting the reuse of excess soil and to help stop illegal dumping of excess soil. The Excess Soil Regulation is now largely in effect.

   There are two components of the proposal that are of interest to the CTC Source Protection Region. MECP is proposing to exempt some types of Class 1 facilities from sections 27, 40 and 41 of the EPA, resulting in an exemption from the need to obtain a waste ECA, subject to specific rules and requirements. These include topsoil and landscaping reuse depots, aggregate reuse depot, and small liquid soil depots.

   The Ministry is also proposing to increase opportunities for reuse of salt-impacted soil in low-risk circumstances. Currently, salt-impacted soils can be placed at industrial and commercial sites where non-potable excess soil quality standards can be applied to a reuse site. Generally, non-potable standards cannot be used in areas that are not serviced by municipal drinking water systems. The 100 m setback from existing or planned potable wells or properties expected to use groundwater wells for potable use, and surface water body would be retained. Salt-impacted soil would be permitted for undertakings on properties that have a community, institutional, parkland or residential use based on a landscape or site plan prepared and certified by an expert, and at agricultural properties provided it is not in areas used for growing crops or pasturing, or in natural areas.

Analysis

1. ERO number 019-6853 – Exploring changes to streamline the permit-by-rule framework.

- Staff from CTC Source Protection Region do not support the use of EASRs for any activity that is or would be a significant drinking water threat under the *Clean Water Act* and O. Reg. 287/07. Awareness and operational knowledge of source protection policies remains extremely uneven across the province, and proactive due-diligence and verification by regulators is essential prior to approval, as recognized and provided for in the current CTC Source Protection Plan. Reliance on self registration in areas where the activity is or would be significant drinking water threats will pose a potentially unmitigated risk to sources of municipal drinking water.

- Staff from CTC Source Protection Region strongly recommend caution with regards to the use of Assessed EASRs for aggregate operations, including stormwater and aggregate wash water. These projects often require complex hydrogeological investigation and mitigation programs where site specific consideration play an important role. If this were

to move forward, we recommend strict requirements for a technical assessment and peer-review, developed in consultation with municipalities and source protection authorities.

2. ERO number 019-6853 – Streamlining permissions for water takings for construction site dewatering activities and foundation drains.

General comments:

- Staff from CTC Source Protection Region do not support the use of EASRs for permanent foundation drains or for temporary dewatering activities within moderately or significantly stressed subwatersheds, as identified in approved Assessment Reports, where consumptive water taking would be a significant drinking water threat. Cumulative impacts of foundation drainage from multiple dwellings in such areas may negatively impact drinking water supplies. Many Source Protection Plan policies rely on prescribed instruments, such as PTTWs, to manage current and future significant drinking water threats. These activities should continue to be regulated by Permits to Take Water and to be subject to the full range of Source Protection Plan policies as determined by local source protection committees. Any future amendments to the regulation should ensure that source protection authorities and municipalities retain the ability to prohibit permanent dewatering systems in areas where dewatering is a or would be a significant drinking water.

- Further clarification is required on how the risk from self-registration of potentially large water takings (foundation drainage for multi residential development in perpetuity, or a temporary multi-year construction dewatering) on groundwater quality, in drinking water systems with established conditions or issues, as defined under the Director's Technical Rules, was considered in this proposal.

- It should also be noted that assessment and management of cumulative impacts from adjacent dewatering/water takings on the sources of municipal drinking water, as well as private wells and Water Resource Systems in general, has long been a source of concern for source protection authorities and municipalities. The proposed EASR directive does not address this concern. MECP's Access Environment web portal currently provides limited information about the dewatering activities registered through EASRs, and it is unclear how these stakeholders will be able to access the relevant data. It is our understanding that no mechanism is envisioned for review/dispute by local stakeholders.

With respect to construction dewatering proposal:

- Clarification is required on how MECP would respond in case of suspected interference between a dewatering project and a municipal supply well. Although MECP staff have indicated that they would use their compliance process to resolve such matters, details have not been provided. Staff from CTC Source Protection Region recommend that any

dewatering activity with potential/suspected interference to a municipal supply well should automatically trigger a notification/consultation of the affected municipality and source protection authority so that monitoring can be adjusted appropriately.

- For example, policy DEM-1 in the approved CTC Source Protection Plan is a legally binding policy directed at MECP, to mitigate significant drinking water threats from water takings by: (1) reviewing all existing PTTWs, located within WHPA-Q with significant risk for quantity, and amend the permits where necessary to ensure that municipal water supply is sustainable and hydrogeological integrity of the municipal well is maintained; (2) only issuing new PTTWs in WHPA-Q with moderate or significant risk levels if it can be demonstrated that new taking is sustainable, will not impact municipal water supply and that hydrogeological integrity of municipal wells are maintained. It is unclear how equivalent level of protection will be possible under the proposed changes.

- Staff from CTC Source Protection Region recommend defining and limiting the length of time that a project could be considered as temporary dewatering. Source protection authority staff recommend this definition to be non-recurring taking less than 30 consecutive days to align with existing descriptions for Category 2 PTTW applications. Any extension for dewatering should require additional oversight by a QP and requirement to identify report deviation from the dewatering or discharge plan during execution, and clear rules for triggering a PTTW.

- To assist source protection authorities with assessing water balance, staff from CTC Source Protection Region encourage MECP to require reporting real water taking data and all relevant technical studies through the Access Environment portal. This will benefit all agencies responsible for water management decisions within Ontario. Source protection authority staff further recommend the Ministry to annually report on audits and enforcement activities.

With respect to the foundation drainage proposal:

- Foundation drains are typically diverted to storm or sanitary sewers. Rather than using up sewer capacity with clean diverted groundwater, staff from CTC Source Protection Region recommend that the MECP instead, encourage that buildings with large subsurface footprints be directed to areas where the water table is known to be deep. Leveraging the extensive available hydrogeological data and drinking water source protection groundwater models developed through the program it is possible to map groundwater levels with relatively high confidence. In Ontario, many agencies, including municipalities, CAs, and ORMGP and MECP, manage and review groundwater monitoring data at various scales and for different purposes. For example, ORMGP maintains long-term water level data from over 600 monitoring wells across south-central Ontario. Further development

and application of such data driven tools will encourage more effective and coordinated planning and use of the subsurface by all stakeholders.

- Considering the potential impact that large foundation drainage groundwater diversions could impose on the groundwater system, and related discharge to nearby surface water features, staff from CTC Source Protection Region recommend that the province initiate a procedure to map and locate all such groundwater capture locations. Having a map of where large foundation drainage systems are operating would be of benefit to Ontario's overall understanding of larger water budgeting issues.

- It is unclear how to determine whether a foundation drain water taking exceeds the 379,000 Litres per day threshold and how water taking data would be reported to the MECP, since there is generally little monitoring for such activities. Staff from CTC Source Protection Region recommend that at a minimum flow meter be required for all such projects and that foundation drainage diversions be recorded monthly with reporting to MECP annually by a QP, accompanied by a rigorous inspection program.

3. ERO number 019-6928 – Streamlining environmental permissions for stormwater management under the Environmental Activity and Sector Registration

With respect to use of EASR for select privately owned stormwater management works:

- Staff from CTC Source Protection Region do not support the use of EASR for stormwater management works in areas where they are or would be a significant drinking water threat. Source Protection Plans are one step in our multi-barrier approach to protection of sources of municipal drinking water. However, reliance on self registration, without any dispute mechanism by municipalities or source protection authorities, based on technical assessment by LEPs with unknown familiarity with Source Protection Plans, and undefined inspection program, undermines the effectiveness of this approach.

- Further clarification is required regarding the risk analysis conducted in evaluating the proposed regulatory approach, particularly with respect to significant drinking water threats. The total number of significant drinking water threats for stormwater management works in the Province is relatively limited. Based on the 2022 source protection program annual reporting there have been a total of 15 ECAs issued for wastewater/sewage works across CTC since 2016, where significant drinking water threats were addressed through conditions in the prescribed instrument. By including stormwater management works that are or would be a significant drinking water threat on the list of ineligible activities, MECP can address concerns raised by source protection authorities and municipalities while supporting their regulatory streamlining goals.

With regards to proposed amendments to O.Reg. 525/98 under the *Ontario Water Resources Act*:

- Staff from CTC Source Protection Region do not support LID works being exempt from ECAs within wellhead protection areas for quality or quantity. In CTC Source Protection Region, LIDs are currently managed via use of Prescribed Instruments per a Source Protection Plan policy directed at MECP to prohibit future threats in WHPA-A, and through conditions in their ECA where they would otherwise be a significant drinking water threat. The CTC Source Protection Region includes WHPA-Es and Issue Contributing Areas for sodium, chloride, and nitrates in the Credit Valley Source Protection Area. To maintain proper operation, LIDs require inspection and oversight to ensure operation and maintenance continues per the design specifications over the lifetime of the LID asset, which are achieved through the ECA. This proposal will remove this tool for those activities that qualify to register on EASR.

- Staff from CTC Source Protection Region strongly recommended that the proposed changes be paused until Source Protection Plans can updated to provide an equivalent level of drinking water source protection as currently exists. It is unclear, given the proposed changes to Ontario 287/07 whether an equivalent level of protection will be possible. It should also be noted that as stated, the removal of these policies can proceed without the usual amendment process, while any action by Source Protection Committees to update their policies would have to go through the amendment process.

- Staff from CTC Source Protection Region strongly recommend that, regardless of the proposed changes, MECP require LEPs to complete and maintain Director approved training related to source protection requirements and local policies under the *Clean Water Act*.

With regards to proposed amendments to Ontario Regulation 287/07 under the *Clean Water Act*:

- The approved CTC Source Protection Plan includes two Prescribed Instrument policies (SWG-11 and SWG-17) directed at MECP to take action to ensure that approval of activities related to stormwater management facilities ensures that the activity ceases to be, or does not become, a significant drinking water threat. Should the proposed amendments proceed, the scope of these policies will be limited as compared to their intended application. These Prescribed Instrument policies represent deliberate policy choices of the CTC Source Protection Committee, following extensive public consultation, municipal and provincial endorsement, to manage risk to drinking water sources and are premised on the Ministry maintaining robust and proactive regulatory oversight.

- It is our understanding that the proposed amendments do not alter the definition or circumstances of the prescribed drinking water threat sewage sub-categories related to storm water management facilities and drainage systems. Rather, MECP has considered how risks to sources of drinking water could be managed under an EASR framework and determined that risks can be addressed by the rules proposed in the new EASR regulation. The proposal in its current form does not provide sufficient analysis or details to support this claim. Source protection authority staff recommend the proposed changes

be paused to undertake consultation with municipalities and source protection authorities to establish how these risks are being addressed.

- Staff from CTC Source Protection Region recognize that the Minister has broad regulation-making powers under the *Clean Water Act, 2006*; however, staff recommend that in recognition of rigour of the source protection planning process, and the extensive consultation process that led to the adoption and approval of source protection plans, proposing this change through filing of a regulatory amendment is not in the spirit and intent of the *Clean Water Act, 2006*. Taken together with the other proposed changes discussed in this report, this represents a significant departure from how source protection plans were developed and how risk from various significant drinking water threats were assessed by source protection committees.

4. ERO number 019-7636: Proposed regulatory amendments to encourage greater reuse of excess soil.

With respect to exemption from ECA requirements for certain facilities:

- As proposed, the exemption for the specified excess soil management operations from needing a waste ECA would weaken the provincial oversight of these activities currently in place through the ECA process in areas where municipal drinking water sources need protection from contamination. The current framework allows these activities to be managed through prescribed instruments (i.e., ECAs) as identified in source protection plan policies. The CTC Source Protection Plan does not currently have such policies. However, the proposed exemption would take away the ability of source protection committees to manage these activities through the ECA process in the future. Staff from CTC Source Protection Region therefore recommend that exemption to excess soil management operations should not apply where the activities are identified as significant drinking water threats under the *Clean Water Act, 2006*.

With respect to reuse of salt-impacted soil:

- Staff from CTC Source Protection Region are concerned that the proposal does not adequately protect municipal drinking water sources. Specifically, the 100m setback from existing or planned potable wells or properties expected to use groundwater wells for potable purposes is insufficient to protect municipal drinking water sources from contamination from salt-impacted soil. Under the *Clean Water Act*, protection zones have been identified for each well and are based on best available science and technical assessment. Studies undertaken consider the vulnerability/permeability of the soil and time of travel of water and contaminants to the well. Protection zones where activities are identified as significant drinking water threats can exceed the 100m setback. Several Issue Contributing Areas for sodium and chloride exist within the Credit Valley Source Protection Area.

- Staff from CTC Source Protection Region recommend the proposed rules be amended to prohibit use of salt-impacted soils in designated vulnerable areas where the vulnerability score is 10, or where an Issue Contributing Areas for chloride exists, as designated under the *Clean Water Act*.

Discussion

Earlier this year, Bill 97, the proposed *Helping Homebuyers, Protecting Tenants Act, 2023,* Section 11 of Schedule 6, added a new subsection 4.0.1 to section 47 of the *Planning Act* to provide the Minister with the authority to exempt certain subsequent approvals required to establish uses permitted by Minister's Zoning Orders (MZOs) from having to align with provincial plans or policies, including source protection plans. It is our understanding that the request and MZO would both be required to include the specific policy, and to date there has not been any such order.

Section 105 of the *Clean Water Act, 2006* states that in case of "*conflict between a provision of this Act and a provision of another Act or a regulation or instrument made, issued or otherwise created under another Act with respect to a matter that affects or has the potential to affect the quality or quantity of any water that is or may be used as a source of drinking water, the provision that provides the greatest protection to the quality and quantity of the water prevails*." Source protection policies in many cases provide the greatest protection to the quality and quantity of the water.

While each proposal mentioned above is focused on addressing specific issues or improving specific processes, taken together, including regulatory and legislative changes brought forward by the Province, there is concern for the continuation of drinking water protections. Source protection authority staff strongly recommend a more holistic approach to considering the impact of the proposed changes on sources of municipal drinking water, and further consultation with source protection authorities and municipalities.

Furthermore, relaxation of source protection policies as means of support for the Ontario's Housing Supply Action Plan, coupled with the ability of MZOs to disregard Source Protection Plans, however theoretical the possibility, does not provide confidence to the stakeholders or the public with regards to protection of municipal drinking water sources. Source protection authority staff strongly recommend caution about any messaging that can be misunderstood as Source Protection Plans being an obstacle to addressing the housing crisis. Source Protection Plans, along with other policies, ensure the sustainability of our drinking water resources to meet Ontario's demand for growth.

With respect to proposed changes to environmental permissions, there is a genuine concern that delegating these activities to an EASR process will lead to less regulatory oversight and less public scrutiny. The permit by rule framework is reliant on self registration of work by the proponents or their QPs. The underlying assumption for the framework, that of self-regulation, can be effective only where there is a strong publicly available data management system and reporting

requirements, a well-defined dispute management process, and a rigorous inspection program which includes public reporting. Construction/development projects are largely constrained by budgets and timeline considerations, which may or may not address all concerns related to quality and quantity of water resources. Moreover, they will inevitably prioritize site level concerns, and likely will not/cannot adequately consider cumulative impact on a watershed basis. With the potential for large takings to be reported and recorded only through the EASR, there is a real concern that large diversions or pumping from construction projects or from drainage foundations will be missed in source protection water budgets, which will be detrimental to accurate determination of water quantity risk in those watersheds, as well as our understanding of how Ontario's watersheds and groundwater flow systems are changing in the face of stressors such as climate change and urban development.

In addition to these operational concerns, the global picture on groundwater resources is relevant here. Groundwater resources across the globe are being severely compromised. Already across the United States, particularly in the Colorado River Basin, but also in northern states like Minnesota with a physical setting much like Ontario, people are experiencing water troubles as demands outpace the ability of the natural system to replenish. As climate change continues to affect the water cycle and given the ever-increasing demand on our groundwater resources, our future water needs must be carefully considered. Ontario's current situation, with most of the province blessed with an adequate supply of clean water, is one that is largely overlooked and under appreciated by most Ontario residents. This seeming abundance may not be true into the future. In addition to climate change, as groundwater resources become more strained, water rich parts of the globe will experience an increase in demand from population growth as well as global food producers and industry. It is imperative that in Ontario, we proactively develop the necessary technical and regulatory framework to effectively handle this upcoming global shift.

We are supportive of the Ministry's efforts in trying to improve environmental permissions processes. We are particularly grateful to the Conservation and Source Protection Branch for their continued support and their leadership in recognizing the need for update of water budgets informing Source Protection Plans. Source protection authority staff urge that proactive oversight and management of these activities in areas where they are or would be significant drinking water threats is paramount in achieving the goals of the *Clean Water Act*. The need for more housing in the province is a priority but equally important is the need to protect the water sources that will supply new homes and currently supply existing homes.

Next Steps

Pending endorsement by the SPC, source protection authority staff will submit this report and cover letter to the directors of the Conservation and Source Protection Branch and Client Services and Permissions Branch at MECP.

Report prepared by:
Behnam Doulatyari, Senior Manager, Watershed Plans and Source Water Protection, Credit Valley Conservation
T: 905-670-1615, ext. 329

Email: behnam.doulatyari@cvc.ca
Date: December 6, 2023

Attachment A: Cover Letter

DRINKING WATER SOURCE PROTECTION
Our Actions Matter

CTC Source Protection Region

December 07, 2023
(Submitted Electronically)

Director, Client Services and Permissions Branch
Ministry of Environment, Conservation and Parks Regarding
135 St. Clair Avenue West, Floor 1, Toronto, ON, M4V 1P5

Director, Conservation and Source Protection Branch
Ministry of Environment, Conservation and Parks Regarding
300 Water St., Peterborough, ON, K9J 3C7

RE: ERO number 019-6951, ERO number 019-6853, ERO number 019-6928, ERO number 019-7636,

CTC Source Protection Committee, at its meeting held on December 6, 2023, adopted the following Motions:

> **THAT** the CTC Source Protection Committee receive the report Proposed changes to environmental permissions and the permit-by-rule framework for information.
>
> **AND FURTHER THAT** staff be directed to submit the report Proposed changes to environmental permissions and the permit-by-rule framework and cover letter (Attachment A) to the Ministry of Environment, Conservation and Parks.

The Report and referenced resolution are attached this letter as a PDF for your convenience. If you have any questions regarding this letter, please contact Behnam, Senior Manager, Watershed Plans and Source Protection at Behnam.Doulatyari@cvc.ca.

Sincerely,

Chair, CTC Source Protection Committee

cc:

Tom Adams, Chair, Credit Valley Source Protection Authority
Paul Ainslie, Chair, Toronto and Region Source Protection Authority
Elizabeth Roy, Chair, Central Lake Ontario Source Protection Authority
Quentin Hanchard, Chief Administrative Officer, Credit Valley Conservation
John MacKenzie, Chief Executive Officer, Toronto and Region Conservation Authority
Chris Darling, Chief Administrative Officer, Central Lake Ontario Conservation Authority

DRINKING WATER SOURCE PROTECTION
Our Actions Matter

CTC Source Protection Region

TO: **Chair and Members of the Source Protection Committee Meeting #3/23, December 6, 2023**

FROM: **Behnam Doulatyari, Program Manager, CTC Source Protection Region**

RE: **CTC Program Update**

KEY ISSUES

A CTC Source Protection Region program update.

RECOMMENDATION

THAT the CTC Source Protection Committee receive the staff report CTC Program Update for information

BACKGROUND

Membership update

In February 2023, the representative for municipalities in Halton and Wellington resigned from the CTC Source Protection Committee. The Committee's chemical sector representative resigned in March 2023. Meanwhile, in June 2023, one of the City of Toronto's two representatives also resigned.

Subsequently, CTC program staff have worked with municipal staff in Halton, Wellington and the City of Toronto to facilitate nominations to fill the municipal sector seats on the CTC Source Protection Committee (SPC). Municipal nominations were received in spring and summer 2023.

At its September 8, 2023 meeting, the Credit Valley Source Protection Authority endorsed the following members to 5-year terms on the CTC Source Protection Committee:

- Alex Hilson, as representative for municipalities in Halton and Wellington. Mr. Hilson is a councillor for the Town of Halton Hills and resides in Acton. He has been involved with numerous local service and volunteer organizations within Halton Hills including the Downtown Acton Business Improvement Area, Optimist Club of Halton Hills, and Inspire Halton.
- William Fernandes, as a representative for the City of Toronto. Mr. Fernandes is the Acting Deputy General Manager, Toronto Water and is responsible for the water and

wastewater treatment for the City of Toronto. He is a Professional Engineer licensed in the province of Ontario, with more than 40 years of Operations and Maintenance and Capital experience working with Unilever, the Ontario Clean Water Agency, the Region of Peel and City of Toronto.

In August 2023, CTC staff commenced advertising for a new chemical sector representative; the position remains open to applicants.

Next year, the terms of six Committee members will be expiring on June 20th, 2024 (see Attachment A). To ensure adequate Committee membership is maintained after these terms end, staff will be communicating with affected members or the municipalities they represent in the near future. Economic and public interest sector openings require a minimum 30 day advertising period; while municipalities must be provided with at least 60 days to provide a nomination. We will also explore the potential to align member terms with municipal council terms to improve operational efficiency.

Provincial updates

New Minister of the Environment, Conservation and Parks
A provincial cabinet shuffle occurred on September 22, 2023. Andrea Khanjin was named as the new Minister of the Environment, Conservation and Parks. Minister Khanjin had previously served as Parliamentary Assistant to the Minister of the Environment, Conservation and Parks (MECP) from 2018-2022.

MECP staffing update
The MECP's Liaison Officer to the CTC, Beth Forrest, has moved onto a new position with the Conservation and Source Protection Branch of the Ministry. At this time, the Ministry is not filling the position and has reallocated branch staff to support early engagement, and the review and approval of proposed source protection plan amendments. To support the amendment process, the Ministry is preparing updated s.34 and s.36 guidance documents.

Ministry staff may attend future CTC SPC meetings, depending upon the meeting agenda, local needs and issues, Ministry priorities and staff availability. Ministry staff attending may vary and at this time there will not be a dedicated Liaison Officer for the CTC.

The Ministry has emphasized that the staffing changes are not meant to be interpreted as a retreat of support of source protection program, but rather a shift in branch focus to better manage workloads based on immediate needs, in particular review and approvals of the amendments under s.34 and s36 of the Clean Water Act.

Conservation Ontario staffing update
The Source Water Protection Manager at Conservation Ontario, Debbie Balika, has accepted a one-year position at an Indigenous owned consulting firm, 4 Directions of Conservation Consulting Services.

Leslie Rich, Policy and Planning Specialist at Conservation Ontario, has taken over the Source Water Protection Manager role.

Environmental Registry of Ontario (ERO) submissions
At SPC Meeting #2/23, proposed changes to the provincial planning framework that had been posted to the ERO (i.e. Bill 97 – proposed Helping Homebuyers, Protection Tenants Act, 2023 (ERO 019-6821); Review of Growth Plan and Provincial Planning Statement (ERO 019-6813); and Site Plan for Residential Developments of 10 or Fewer Units (ERO 019-6822) were discussed by the Committee. CTC staff were directed (Resolution #15/23), to submit comments regarding implications to protecting sources of municipal drinking water as a result of proposed changes to the provincial planning framework.

Following the meeting CTC staff worked with the Chair to provide a written submission on May 11, 2023 to the Standing Committee on Heritage, Infrastructure and Cultural Policy on Bill 97 (see Attachment B), and to the Environmental Registry of Ontario (ERO) on the Provincial Planning Statement and Growth Plan review (see Attachment C) on July 18, 2023. Conservation Ontario also submitted a coordinated response on the residential proposal for 10 or fewer units (see Attachment D) on May 18, 2023.

Annual Reporting updates

2022 Annual Report
Following SPC meeting #1/23, in accordance with Resolution #7/23 the CTC's 2022 Annual Progress Report was presented to each of the Central Lake Ontario, Credit Valley, and Toronto and Region Source Protection Authorities in April 2023. The three Source Protection Authorities each endorsed the CTC Source Protection Committee's recommendation on Source Protection Plan implementation as "progressing well, but short of target" and further directed staff to submit the Annual Progress Report to the province. The final 2022 Annual Progress Report was provided to the province on May 1, 2023; and is publicly available on the CTC website.

2023 Annual Reporting
For the 2023 reporting year, MECP staff have been working with staff from Upper Thames Region Conservation Authority, to update Annual Reporting requirements and the Electronic Annual Reporting Interface (EAR).

Key planned changes have been shared with CTC program staff, and include:

- Merger of Annual Progress Report and Supplemental Form report into a single report that will be made available to the public. Currently, the Annual Progress Report is available to the public, while the Supplemental Form is provided internally to the MECP. This update will better demonstrate to the public work being done to protect Ontario's drinking water and ensure compliance with s. 46(5) of the *Clean Water Act, 2006*.
- A new policy interface will provide the policy implementation status of each municipality or implementing body, and support making this information available to the public.

- The new policy interface will enable Source Protection Authorities to update their own policies and prepare them for Ministry approval. This will facilitate the policy database's currency and availability to the public and implementing bodies.
- Removal, addition and consolidation of some annual reporting questions.

CTC staff will be working with municipal partners over the next month and half to prepare them to use the new policy interface.

Working Group updates

The CTC Amendments Working Group met on May 31, 2023 for a discussion focused on review of the CTC Source Protection Plan's agricultural policies. Following the meeting staff have been in touch with the committee's agricultural representatives to allow them a further opportunity to provide feedback on the review. Staff have reviewed the provided feedback and an update on nutrient policies can be found in Agenda Item 7.1b.

The CTC Implementation Working Group (IWG) met June 29, 2023 where members were provided an overview of different impervious surface calculation methods allowed by the Director's Technical Rules updated in 2021. An overview of the new SharePoint partner portal was provided, and municipalities were requested to share their drinking water monitoring schedules and data.

The IWG met again on September 26, 2023 where discussion was focussed on, methods of water quality assessment for CTC issues (see Agenda Items 7.1a), and consideration of revisions to current fuel policies. Additional discussion was held to consider transportation of dangerous substances as a local threat and possible policies, and consideration of further policies to address drinking water issues. These will be brought to the Committee at a future meeting.

The IWG regrouped on October 5, 2023 to discuss recent ERO streamlining proposals and annual reporting updates for the 2023 reporting year. A draft transport pathways notification process and policies, and the need for new hydrocarbon pipelines policies were also considered; and will be brought to an upcoming Committee meeting.

On November 8th, 2023 the IWG met again to have further discussions on draft transport pathways policies and potential fuel policy revisions. The IWG also engaged in discussions about updating salt and snow policies to align with the 2021 Director's Technical Rules.

Schedule of upcoming amendments and consultations

The pre-consultation on proposed amendments to York's new Nobleton well; Peel Region's Palgrave, Caledon East, and Caledon Village systems; the City of Toronto's new Enwave intake and Ashbridges Bay WWTP outfall, and policy updates (as endorsed by Resolution #37/22 at SPC Meeting #4/22) occurred in spring 2023. Council endorsements for the updates were provided by all affected municipalities. Public consultation on the proposed amendments, occurred from June

5 – July 12, 2023; during which no comments were received. Subsequently, both the Toronto and Region Source Protection Authority (on September 22, 2023) and Credit Valley Source Protection Authority (on October 13, 2023) directed staff to submit the s.34 amendments to MECP. Final submission of the amendment package is expected in late November 2023.

The timeline of anticipated upcoming amendments to the CTC Source Protection Plan can be found in Table 1.

Table 1. Anticipated CTC Drinking Water System Amendment Timelines

Drinking Water System	Pre-Consultation	Public Consultation	Submission Date
York Region (Nobleton replacement PW3); Peel Region (Palgrave, Caledon East, Caledon Village) (s. 34) New Toronto Island intakes (s. 34)	Spring 2023	June/July 2023	Fall 2023
York Region/Stouffville well 3 ICA (s.34)	2024	2024	2024
York Region/Stouffville well 3 replacement	2024	2024	2024/2025
York Region/Nobleton well 6	2024	2024	2024/2025
Orangeville Tier 3 update/new Pullen well	2024	2024	2024/2025
Town of Erin (Erin/Hillsburgh new wells)	2024	2024	2024/2025
Durham Region GW model update (Uxville) (s. 36)	2024	2024/2025	2025
Halton Region GW model (Georgetown/Acton) (s. 36)	2024	2024/2025	2025
York Region/King City new or replacement well (s.34)	2025/2026	TBC	TBC
Peel Region/potential Inglewood new supply (s.34)	2025/2026	TBC	TBC
Town of Erin/WHPA updates (s.34)	2026/2027	TBC	TBC

RMP extension request and progress update

At SPC meeting #1/23, the CTC Source Protection Committee authorized an extension of the deadline to complete outstanding Risk Management Plans for existing threats, until the end of 2025, and directed staff to formally request a deadline extension from the MECP (Resolution #8/23). Following provision of letters and supporting workplans from affected municipalities, an extension request letter was sent to MECP on July 25, 2023 (see Attachment E). The Ministry granted its approval of the extension request on Nov. 21, 2023 (see Correspondence Item 8.2); and included a request for progress updates every six months beginning in April 2024.

On October 18, 2023 Halton Region Council received an update on the status of Risk Management Plan establishment (see Correspondence Item 8.1). Similar updates will be presented to Town of Orangeville and Town of Erin Councils on December 11 and December 14, 2023 respectively.

A quarterly update on the number of outstanding existing significant drinking water threats and risk managements plans can be found in Table 2.

Table 2. CTC outstanding existing significant drinking water threat and risk management plan progress

Municipality	Outstanding existing significant threats or risk management plans	As of January 1, 2023	As of June 30, 2023	As of September 30, 2023
Town of Erin	# of significant drinking water threats	29	25	25
Town of Erin	# of risk management plans	11	7	7
Halton Region	# of significant drinking water threats	165	124	102 (as of October 18)
Halton Region	# of risk management plans	116	95	79 (as of October 18)
Town of Orangeville	# of significant drinking water threats	66	39	36
Town of Orangeville	# of risk management plans	34	30	29

CTC DWSP program survey results

In August 2023, CTC program staff collaborated with Credit Valley Conservation communications staff to release a survey on Drinking Water Source Protection (DWSP) program implementation in the CTC. This survey was provided to CTC Source Protection Committee members, and municipal and conservation authority staff across the CTC involved in source water protection. The results of the survey are included as Attachment F.

Upcoming Meeting Schedule

In accordance with SPC direction provided at meeting #3/22, upcoming SPC meetings are scheduled as "hybrid" meetings, hosted at the Credit Valley Conservation head office.

February 21, 2024 1–4 p.m. (hybrid: @ CVC head office & TEAMS)
March 20, 2024 1–4 p.m. (hybrid: @ CVC head office & TEAMS)
April 17, 2024, 2024 1–4 p.m. (hybrid: @ CVC head office & TEAMS)

Report prepared by:

Behnam Doulatyari, Senior Manager, Watershed Plans and Source Water Protection, Credit Valley Conservation
T: 905-670-1615, ext. 329
Email: behnam.doulatyari@cvc.ca

Craig Jacques, Specialist, Watershed Plans and Source Water Protection, Credit Valley Conservation
T: 905-670-1615, ext. 551

Email: craig.jacques@cvc.ca

Date: November 23, 2023

Attachments (6):
Attachment A: CTC Source Protection Committee Notice of Appointments
Attachment B: CTC Written Submission to the Standing Committee on Heritage, Infrastructure and Cultural Policy on Bill 97
Attachment C: CTC ERO Submission regarding ”Review of proposed policies adapted from A Place to Grow and Provincial Policy Statement to form a new provincial planning policy instrument”
Attachment D: CO ERO Submission on “Site Plan for Residential Developments of 10 or Fewer Units – Two Proposed new Minister’s Regulations under the *Planning Act* and the *City of Toronto Act, 2006*”
Attachment E: CTC Letter requesting Extension to CTC Source Protection Plan deadline for implementation of Risk Management Plans (RMPs) for existing activities designated under section 58 of the *Clean Water Act, 2006*
Attachment F: CTC DWSP program implementation survey results

CTC Source Protection Committee

Per Section 10 of Ontario Regulation 288/07, this summary serves as the **Notice of CTC SPC Member Appointments.**

Chair: Nathan Hyde, Appointed by Minister of the Environment, Conservation and Parks (Term: Feb. 27, 2023- Feb. 26, 2026)

Municipal Representatives	Municipalities Represented	Date of Appointment	Appointment Expiry
Liza Ballantyne	City of Toronto	January 21, 2022	January 21, 2027
William Fernandes	City of Toronto	September 8, 2023	September 7, 2028
Chris Gerrits	Dufferin & Simcoe municipalities	September 23, 2021	September 23, 2026
Alex Hilson	Halton & Wellington municipalities	September 8, 2023	September 7, 2028
Scott Lister	York municipalities	June 21, 2019	June 20, 2024
Elvis Oliveira	Peel municipalities	September 10, 2021	September 10, 2026
John Presta	Durham municipalities	June 21, 2019	June 20, 2024
Economic Representatives	**Sector**	**Date of Appointment**	**Appointment Expiry**
Vacant	Chemical Sector	-	-
Colin Evans	Aggregate Sector	June 10, 2022	June 10, 2027
Louise Foster	Land Development Sector	June 21, 2019	June 20, 2024
Lee Gould	Road Salt Sector	September 23, 2021	September 23, 2026
Geoff Maltby	Agriculture Sector	September 23, 2021	September 23, 2026
Gary Mountain	Agriculture Sector	June 21, 2019	June 20, 2024
Ryan Wheeler	Petrochemical/Petroleum Sector	June 10, 2022	June 10, 2027
Public Interest Representatives	**Sector**	**Date of Appointment**	**Appointment Expiry**
Julie Abouchar	Citizen-At-Large	June 21, 2019	June 20, 2024
Cody Brown	Citizen-At-Large	March 10, 2023	March 10, 2028
Ken Dion	Citizen-At-Large	September 10, 2021	September 10, 2026
Mark Heaton	ENGO	March 10, 2023	March 10, 2028
Rosemary Keenan	ENGO	September 23, 2021	September 23, 2026
Jeff Light	Citizen-At-Large	September 10, 2021	September 10, 2026
Peter Miasek	Citizen-At-Large	June 21, 2019	June 20, 2024

DRINKING WATER SOURCE PROTECTION
Our Actions Matter

CTC Source Protection Region

Written Submission to Standing Committee on Heritage, Infrastructure and Cultural Policy

Regarding consideration of Bill 97, *Helping Homebuyers, Protecting Tenants Act, 2023* (Schedule 6 Changes to the *Planning Act*)

Submitted by the CTC Source Protection Region

May 11, 2023

1255 Old Derry Rd, Mississauga, ON L5N 6R4 | ctcswp.ca | T 905-670-1615 | TF 800-668-5557

DRINKING WATER SOURCE PROTECTION
Our Actions Matter

CTC Source Protection Region

May 11, 2023

(Submitted Electronically to http://ola.org/en/apply-committees)

MPP Laurie Scott, Chair

c/o Isaiah Thorning, Committee Clerk

Standing Committee on Heritage, Infrastructure and Cultural Policy

Whitney Block, Room 1405

Toronto, ON M7A 1A2

CTC Source Protection Region's comments on Bill 97, *Helping Homebuyers, Protecting Tenants Act, 2023* (Schedule 6 Changes to the *Planning Act*) and Drinking Water Source Protection Considerations

Dear Chair Scott and Members of the Standing Committee,

Thank you for the opportunity to submit comments to the Standing Committee on Heritage, Infrastructure and Cultural Policy on Bill 97, the proposed *Helping Homebuyers, Protecting Tenants Act, 2023* as part of a range of efforts introduced by the Province to tackle the housing supply crisis. We understand that the government is proposing changes to the *Planning Act*, *City of Toronto*

Act, 2006, *Development Charges Act and Ministry of Municipal Affairs Act* through this Bill.

The Credit Valley – Toronto and Region – Central Lake Ontario (CTC) Source Protection Region spans more than 10,000 square kilometers and includes thirty-three municipalities within the most densely populated region of the country. Under the provisions of the *Clean Water Act, 2006* the CTC Source Protection Committee is charged with developing and administering a drinking water Source Protection Plan to protect our precious supplies of drinking water against vulnerabilities now and into the future. The CTC Source Protection Committee passed a resolution on May 3rd, 2023 directing staff to provide comments on the proposed changes through Bill 97.

Under section 105 of the *Clean Water Act*, *2006*, in case of conflicting legislation, in matters concerning quality or quantity of sources of drinking water, the provision that provides the most protection prevails. Some of the proposed changes to the *Planning Act* under Bill 97 may have unintended consequences in their interface with the *Clean Water Act, 2006* requirements and drinking water source protection.

The protection of sources of drinking water is an important component that supports the government of Ontario's goal of building 1.5 million homes to address the housing crisis. We kindly request the Standing Committee continue to ensure that source water protection remains a priority as the government contemplates further legislative changes to accommodate this important goal.

Clarity and Certainty Regarding Proposed New Authority for Minister's Zoning Orders

Section 11 of Schedule 6 to the Bill adds a new subsection 4.0.1 to section 47 of the *Planning Act* to provide the Minister with the authority to exempt certain subsequent approvals required to establish uses permitted by Minister's zoning orders from having to align with provincial plans or policies.

It is our understanding the proposed changes are not intended to exempt any requirements set out in Source Protection Plans. Given the important public health and safety matters associated with drinking water source protection, we kindly request further clarification on the proposed provision.

I thank the Committee Members for their consideration of this request. If you have any questions regarding this letter, or the CTC Source Protection Plan, please contact Behnam Doulatyari at Behnam.Doulatyari@cvc.ca.

Sincerely,

Nathan Hyde

Chair, CTC Source Protection Committee

Copy to:

Behnam Doulatyari, Sr. Manager, Watershed Plans and Source Water Protection, Credit Valley Conservation

DRINKING WATER SOURCE PROTECTION
Our Actions Matter

CTC Source Protection Region

July 18, 2023
(Submitted Electronically to the ERO)

Re: Response to ERO #019-6813 - Review of proposed policies adapted from A Place to Grow and Provincial Policy Statement to form a new provincial planning policy instrument

Thank you for the opportunity to submit comments on the Ministry of Municipal Affairs and Housing (MMAH) posting on the Environmental Registry of Ontario (ERO). We understand that, in support of the government's Housing Supply Action Plan, MMAH is consulting on a province-wide Provincial Planning Statement ("new PPS") that would adopt certain policies from A Place to Grow ("Growth Plan") and the Provincial Policy Statement, 2020 ("existing PPS") into a single policy instrument.

The Credit Valley – Toronto and Region – Central Lake Ontario (CTC) Source Protection Region spans more than 10,000 square kilometers and includes thirty-three municipalities within the most densely populated region of the country. The CTC Source Protection Region includes multiple Large and Fast Growing Municipalities as designated under the new PPS. Under the provisions of the *Clean Water Act, 2006* the CTC Source Protection Committee is charged with developing and administering a drinking water Source Protection Plan to protect supplies of drinking water against vulnerabilities now and into the future. The CTC Source Protection Committee passed a resolution on May 3rd, 2023, directing staff to "submit comments regarding implications to protecting sources of municipal drinking water as a result of proposed changes to the provincial planning framework." This letter, along with comments submitted to the Standing Committee on Heritage, Infrastructure and Cultural Policy on Bill 97, submitted on May 11, 2023, are in accordance with this resolution.

The protection of sources of drinking water is a crucial component that supports the government's goal of building 1.5 million homes to address the housing crisis. We would like to ensure the proposed changes account for the range of interconnected policies that support the implementation of approved source protection plans. We kindly request the government to ensure that source water protection remains a priority as they contemplate further policy changes to accommodate this important goal.

CTC Source Protection Region responses to Proposed Provincial Planning Statement Consultation Questions:

1. **What are your thoughts on the policies that have been included from the PPS and A Place to Grow in the proposed policy document, including the proposed approach to implementation?**

   - We are encouraged by the proposed update to the **Water Policy 4.2.1 e).1**. which addresses a long-standing request for a more comprehensive drinking water supply policy direction. The proposed language revises existing PPS policy by removing the phrase "all municipal". It is our understanding that the revised policy intends to broaden this key provincial source water protection direction to all sources of drinking water supplies whether they are associated with municipal drinking water systems or not. Given the importance of private drinking water supplies and systems to overall drinking water source protection, we support this policy change. We thank the government for their leadership in effecting this change.

   - The Growth Plan requires the identification of **Water Resource Systems (WRS)**, as well as protection of *key hydrologic features* and *key hydrologic areas* and their function. This policy direction is consistent with the Greenbelt Plan and builds on existing plans and policies, including the source protection plans developed under the *Clean Water Act, 2006.* This provides an integrated framework for protecting the quality and quantity of water in the Greater Golden Horseshoe (GGH). Key Hydrologic Areas for example include Significant Groundwater Recharge Areas and Highly Vulnerable Aquifers which are designated through source protection plans and included Municipal Official Plans. As of December 2022, out of 33 municipalities in CTC Source Protection Region, 31 municipalities have completed or are in the process of completing their OP conformity exercise with the *Clean Water Act, 2006*. Furthermore, CTC Source Protection Region includes lands inside and outside of the Greenbelt Plan area.

     The removal of the Growth Plan WRS policies could lead to the implementation of less stringent policy protections for water quality and quantity outside the Greenbelt Plan area. This varied policy approach

could erode the supportive policy framework of the CTC Source Protection Plan, which applies across the watershed-based CTC Source Protection Region beyond the Greenbelt Plan area.

We suggest that the new PPS should carry forward the WRS policy direction from the Growth Plan to ensure a consistent and integrated policy approach for protecting water quality and quantity across the geography of the CTC Source Protection Region.

- The Growth Plan requires proposed **Settlement Area Boundary Expansions** to be assessed in terms of feasibility in relation to applicable source protection plan requirements (policy 2.2.8.3 j). The CTC Source Protection Plan contains specific policy direction for settlement area boundary expansions. It is important to note, as demonstrated by the patterns of growth across CTC, these policies do not prevent development. Rather they ensure water quality and quantity are protected as the area is developed. The new PPS Settlement Area Boundary Expansion **Policy 2.3.4** does not contain any water resource related considerations and, specifically, removes the linkage to source protection plans. A loss of provincial planning policy linkage can unintentionally undermine source protection planning requirements. The CTC Source Protection Region includes multiple **Large and Fast Growing Municipalities,** that would benefit from clear policy direction on source protection as they endeavor to meet their housing targets. For example, the Town of Caledon's work on their Official Plan conformity with the *Clean Water Act, 2006,* is in progress and maintaining the policy linkage would ensure CTC source protection policies regarding settlement area expansions are reflected.

  Furthermore, drinking water systems across Southern Ontario are reporting increasing trends in sodium and chloride because of the application of winter de-icing materials. Source Protection Authorities and their implementing partners have been undertaking a coordinated effort to complete outstanding Risk Management Plans addressing Significant Drinking Water Threats. Under Clean Water Act, 2006, these increasing trends constitute a drinking water Issue which requires delineation of an Issue Contributing Area. Activities that contribute to these rising trends within an Issue Contributing Area are considered as Significant Drinking Water Threats. It is our understanding the proposed

changes are not intended to exempt any requirements set out in Source Protection Plans. However, without explicit policy direction in the new PPS, boundary expansions can potentially increase the number of Significant Drinking Water Threats.

We suggest that carrying forward Growth Plan policy 2.2.8.3 j into the new PPS would ensure source protection considerations are included in future Settlement Boundary Expansions and enable municipalities to meet their growth targets while protecting quantity and quality of drinking water sources.

- We suggest that **Policy 6.2.1** would benefit from direct reference to source protection authorities.

2. What are your thoughts on the proposed policy direction for large and fast-growing municipalities and other municipalities?

- The Watershed Planning policy direction at **Policy 4.2.3** and associated defined terms are welcome and supported. We suggest this policy would have better alignment with section 4.2 of the new PPS and existing efforts towards updating the provincial watershed planning guideline, by requiring **Large and Fast Growing Municipalities** to undertake watershed planning.

- Please also see commentary in response to the first question with respect to maintaining policy linkages to ensure proposed Settlement Area Boundary Expansions are assessed in terms of feasibility in relation to applicable source protection plan requirements.

3. What are your thoughts regarding the proposed policies to generate housing supply, including an appropriate range and mix of housing options?

- Not directly applicable to CTC SPR role and mandate.

4. What are your thoughts on the proposed policies regarding the conservation of agriculture, aggregates, natural and cultural heritage resources?

- We support the government's expressed intent to consider alternatives to proposed policy direction that would allow for the creation of up to 3 new residential lots on existing parcels of land in prime agricultural areas. However, this proposed policy could conflict with source protection plan policies, such as those related to new or expanded septic systems and sanitary sewers, recharge reduction and de-icing applications. The potential impacts of this proposed policy to negatively affect drinking water quality and quantity should be thoroughly understood. Should the proposed policy move forward or be modified, it should, at a minimum, be contingent on an assessment to ensure no negative impacts for drinking water source protection.

5. What are your thoughts on the proposed policies regarding planning for employment?

- Not directly applicable to CTC SPR role and mandate.

6. Are there any other barriers to, or opportunities for, accelerating development and construction (e.g., federal regulations, infrastructure planning and approvals, private/public partnerships for servicing, provincial permitting, urban design guidelines, technical standards, zoning, etc.)?

- Not directly applicable to CTC SPR role and mandate.

We would like to thank you for the opportunity to provide comments on the new PPS and kindly request the government to ensure the continued fulsome implementation of the approved CTC Source Protection Plan. If you have any questions regarding this letter, or the CTC Source Protection Plan, please contact Behnam Doulatyari at Behnam.Doulatyari@cvc.ca.

Sincerely,

Nathan Hyde

Chair, CTC Source Protection Committee

Copy to:
Behnam Doulatyari, Sr. Manager, Watershed Plans and Source Water Protection, Credit Valley Conservation

May 18, 2023

Ministry of Municipal Affairs and Housing
Submitted via email: PlanningConsultation@ontario.ca

Re: Conservation Ontario's Comments on "Site Plan for Residential Developments of 10 or Fewer Units – Two Proposed new Minister's Regulations under the Planning Act and the City of Toronto Act, 2006" (ERO #019-6822)

Thank you for the opportunity to comment on "Site Plan for Residential Developments of 10 or Fewer Units – Two Proposed new Minister's Regulations under the Planning Act and the City of Toronto Act, 2006". Conservation Ontario is the network for Ontario's 36 Conservation Authorities (CAs). These comments are not intended to limit the comments submitted by individual CAs.

As part of "Helping Homebuyers, Protecting Tenants: Ontario's Housing Supply Action Plan April 2023" the Province introduced Bill 97, the *Helping Homebuyers, Protecting Tenants Act, 2023*. Schedule 6 of the Bill proposes amendments to the *Planning Act* to increase housing supply to reach the goal of building 1.5 million homes by 2031.

One proposed legislative amendment to the *Planning Act* provides the Minister of Municipal Affairs and Housing (MMAH) new regulation-making authority to permit Municipalities to use site plan control for residential developments of 10 or fewer units on a single lot in specific circumstances. As outlined in the proposal, these specific circumstances would include where any part of a parcel of land is located within 120 metres of a shoreline or within 300 metres of a railway line.

In our previous comments on proposed *Planning Act* and *City of Toronto Act* changes proposed through Bill 23 (ERO#019-6163) we note that using site plan controls provides Municipalities greater ability to receive expert input from CAs on detailed design items such as setbacks and the location of buildings concerning hazardous lands and hazardous sites, and protecting sources of drinking water.

Early engagement enables the Municipality, proponent, and CA to address potential issues and opportunities with the application. The proposed legislative amendments (and subsequent regulations) ensure planning authorities can consider site plan components relating to natural hazards, including flooding, erosion, and other natural features.

Draft regulatory text was not included as part of the proposal; it is unknown if future consultation opportunities will occur. In response, Conservation Ontario recommends including

a definition of “shoreline” in the regulation. For consistency, the definition of “shoreline” referenced in the regulation should include that of a lake, river or stream, as outlined in section 34(1)(3.2)(ii) of the *Planning Act* and as well as in the definition of “flooding hazard” in the Provincial Policy Statement (PPS, 2020).

The PPS provides development shall generally be directed to areas outside of hazardous lands adjacent to the shorelines of the Great Lakes – St. Lawrence River System and large inland lakes, as well as river, stream and small inland lake systems impacted by hazards including flooding and erosion. Including the broad definition of a shoreline as that of a lake, river or stream, consistent with the current PPS and the *Planning Act,* will allow CAs to continue to provide useful feedback to planning authorities regarding potentially hazardous lands (e.g., flooding and erosion hazards).

In addition to the proposed specific circumstances to permit use of site plan control for developments of 10 units or less, Conservation Ontario recommends the proposed regulation permit use of site plan control for developments where land is located within a designated vulnerable area in an approved source water protection plan under the *Clean Water Act*. Site plan control is identified in approved source water protection plans as an available tool to ensure development and site alteration activities do not have adverse impacts on drinking water supplies in designated vulnerable areas. Including this specific circumstance in regulation would be beneficial to developers and Municipalities to ensure consistency with source water protection plans prepared under the *Clean Water Act* and to ensure continued protection of Ontario’s drinking water sources.

Thank you for the opportunity to provide comments on “Site Plan for Residential Developments of 10 or Fewer Units – Two Proposed new Minister’s Regulations under the Planning Act and the City of Toronto Act, 2006”. We are pleased to work together to keep development safe from natural hazards and to protect sources of drinking water. We remain committed to working with the Province, Municipalities, and other partners to support increasing the overall supply and diversity of housing types in Ontario while maintaining strong protections for public health, safety and the environment. Please contact Leslie Rich, Policy and Planning Specialist should this letter require any clarification.

Sincerely,

Leslie Rich
Policy and Planning Specialist

c.c: All Conservation Authority CAOs / GMs

Attachment E: CTC Letter requesting Extension to CTC Source Protection Plan deadline for implementation of Risk Management Plans (RMPs) for existing activities designed under section 58 of the Clean Water Act, 2006

DRINKING WATER SOURCE PROTECTION
Our Actions Matter

CTC Source Protection Region

Sent via email

July 25, 2023

Jennifer McKay
Manager, Source Protection Section,
Conservation and Source Protection Branch
Ontario Ministry of the Environment, Conservation and Parks
14th Floor, 40 St. Clair Avenue W., Toronto, ON M4V 1M2

Dear Jennifer McKay,

I am writing to you to request an extension to the Credit River – Toronto and Region – Central Lake Ontario (CTC) Source Protection Plan deadline for implementation of Risk Management Plans (RMPs) for activities designated under section 58 of the *Clean Water Act, 2006*.

The CTC Source Protection Plan came into effect on December 31, 2015. The timeline to complete all Risk Management Plans (RMPs) to address existing activities designated under section 58 of the Act was originally set to December 31, 2020, five years from the effective date of the Source Protection Plan, in Policy T-6.

At its March 22, 2022 meeting, the CTC Source Protection Committee authorized staff to request a 3-year extension to this deadline, acknowledging many challenges faced by the affected municipalities, including but not limited to the COVID-19 pandemic. The Source Protection Programs Branch of the Ministry of the Environment, Conservation and Parks approved the request on July 29, 2020, with a requirement for annual updates on municipal workplan progression by February 1st of each calendar year through 2024. CTC Source Protection Region provided a template for municipal work plans in late December 2020. In early January 2021, municipal RMOs from impacted municipalities (Halton Region, Town of Orangeville, Town of Erin, Town of Mono, and York Region) submitted work plans and accompanying letters summarizing implementation challenges and proposed mitigation strategies to address challenges. At the Ministry's request, the CTC Source Protection Region provided a summary of the work plans on April 29, 2021. Since then, the CTC Source Protection Committee has received annual progress reports on February 1st of each year.

At its March 23, 2023 meeting, the CTC Source Protection Committee heard that two municipalities had completed their outstanding Risk Management Plans, while three municipalities would require a further deadline extension. The report received by the CTC Source Protection Committee (**Attachment A**) summarizes the progress, implementation challenges, and mitigation strategies by the affected municipalities. In response to a request for

a new extension, and in recognition of challenges faced by the affected municipalities in implementing the outstanding RMPs, the Committee passed the following resolutions:

> THAT the CTC Source Protection Committee receive the report on Extension to Risk Management Plan Timeline for Impacted Municipalities for information.
>
> AND FURTHER THAT the CTC Source Protection Committee authorizes a 2-year extension to the December 31, 2023, deadline for municipalities to complete RMPs that address existing significant drinking water threats contingent on their submission of a workplan.
>
> AND FURTHER THAT all impacted municipalities provide Council endorsement of this workplan to ensure the necessary resources available to meet the objectives.
>
> AND FURTHER THAT staff be directed to take the necessary actions to request a formal 2-year extension to December 31, 2025 from MECP, for the completion of RMPs to address the remaining existing significant drinking water threats.
>
> AND FURTHER THAT all impacted municipalities report on the status of workplan progression by February 1st of each calendar year through 2026.

The three affected municipalities (Halton Region, Town of Orangeville, Town of Erin) provided updated municipal workplans outlining their process to complete the outstanding Risk Management Plans by December 2025, along with supporting letters summarizing implementation challenges and proposed mitigation strategies, to CTC staff, in June 2023. The workplans will be brought to the three respective municipal councils in fall 2023. A summary of the municipal work plans is provided in **Attachment B.**

In January 2023, MECP provided a list of required information to support a policy deadline extension request to CTC staff, the responses can be found in **Attachment C**. Letters from each of the three municipalities, provided in support of their proposed extension workplans, can be found in **Attachments D**, **E** and **F**.

In consideration of the above information, and in accordance with the CTC Source Protection Committee's direction, we formally request a 2-year extension to CTC Source Protection Plan policy #T-6, to a revised deadline of December 31, 2025.

Sincere[redacted]

Behnam Doulatyari
Program Manager, CTC Source Protection Region
Senior Manager, Watershed Plans and Source Water Protection
Credit Valley Conservation

Copy to:
Beth Forrest, Senior Drinking Water Program Advisor, MECP
Nathan Hyde, Chair, CTC Source Protection Committee
Quentin Hanchard, CAO, Credit Valley Conservation
Kyle Davis, Risk Management Official, Wellington Source Water Protection
Daniel Banks, Risk Management Official, Halton Region
Rebecca Smart, Risk Management Official, Town of Orangeville

Attachments (6):
Attachment A: CTC SPC RMP extension report (from Meeting #1/23)
Attachment B: Summary of municipal work plans to achieve December 31, 2023 deadline for completion of risk management plans.
Attachment C: Policy deadline extension request documentation
Attachment D: Town of Orangeville s.58 Extension Workplan Supporting Letter
Attachment E: Halton Region s.58 Extension Workplan Supporting Letter
Attachment F: Town of Erin s.58 Extension Workplan Supporting Letter

TO: Chair and Members of the Source Protection Committee Meeting #1/23, March 23, 2023

FROM: Behnam Doulatyari, Senior Manager, Watershed Plans and Source Water Protection

RE: Extension to Risk Management Plan Timeline for Impacted Municipalities

KEY ISSUES

Discussion regarding a proposed two-year extension to the current Risk Management Plan (RMP) completion deadline, December 31, 2023, in the CTC Source Protection Plan.

RECOMMENDATIONS

THAT the CTC Source Protection Committee receive the report on Extension to Risk Management Plan Timeline for Impacted Municipalities for information.

AND FURTHER THAT the CTC Source Protection Committee authorizes a 2-year extension to the December 31, 2023, deadline for municipalities to complete RMPs that address existing significant drinking water threats contingent on their submission of a workplan.

AND FURTHER THAT all impacted municipalities provide Council endorsement of this workplan to ensure the necessary resources available to meet the objectives.

AND FURTHER THAT staff be directed to take the necessary actions to request a formal 2-year extension to December 31, 2025 from MECP, for the completion of RMPs to address the remaining existing significant drinking water threats.

AND FURTHER THAT all impacted municipalities report on the status of workplan progression by February 1st of each calendar year through 2026.

Background

The timeline to complete all Risk Management Plans (RMPs) to address existing activities designated under section 58 of the *Clean Water Act* was initially set to December 31, 2020, five (5) years from the effective date of the Source Protection Plan (Policy T-6).

At meeting #2/20, the CTC SPC authorized CTC staff to request a 3-year extension to this deadline. This decision acknowledged the number of outstanding existing significant drinking water threats (SDWTs), typical RMP development timelines,

resource and capacity limitations faced by Risk Management Officials/Inspectors (RMOs/RMIs) for Source Protection Plan (SPP) implementation, changes to Director's Technical Rules for threats identification, and challenges and delays anticipated in RMP development because of the COVID-19 pandemic.

The extension request was approved by the Ministry of Environment, Conservation and Parks (MECP) in July 2020, with a requirement for annual updates on municipal workplan progression by February 1st of each calendar year through 2024. CTC Source Protection Region staff provided a template for municipal work plans in late December 2020. In early January 2021, municipal RMOs from impacted municipalities (Halton Region, Town of Orangeville, Town of Erin, Town of Mono, and York Region) submitted work plans and accompanying letters summarizing implementation challenges and proposed mitigation strategies to address challenges.

At the time, 339 existing significant drinking water threats (SDWTs) remained to be managed through 205 RMPs. The outstanding RMPs were needed to address SDWTs associated with commercial fertilizer, pesticides, road salt, fuel, non-agricultural source materials, dense non-aqueous phase liquids and organic solvents, and snow storage.

Progress Update

The annual implementation progress update for existing RMP's for the period 2021 through 2023 can be found in **Attachment 1**. **Table 1** below summarizes municipal targets and actual RMPs completed since 2021. Please note the 2023 actuals reflect the period from January to March of 2023, during which time the Town of Mono completed their remaining RMPs; and Halton Region and the Town of Erin completed three and two RMPs respectively.

Table 1. s. 58 extension RMP progress summary (January 2021-March 2023)

	2021	2022	2023	Total
Target	42	97	66	205
Actual	13	16	7 (to date)	36

Figure 1 and **Figure 2** show the number of outstanding existing SDWTs and RMPs reported on Feb 1st from 2021 through 2023, related to the s.58 extension across CTC. As of March 2023, there are a total of 248 existing SDWTs that require 158 RMPs in the affected municipalities.

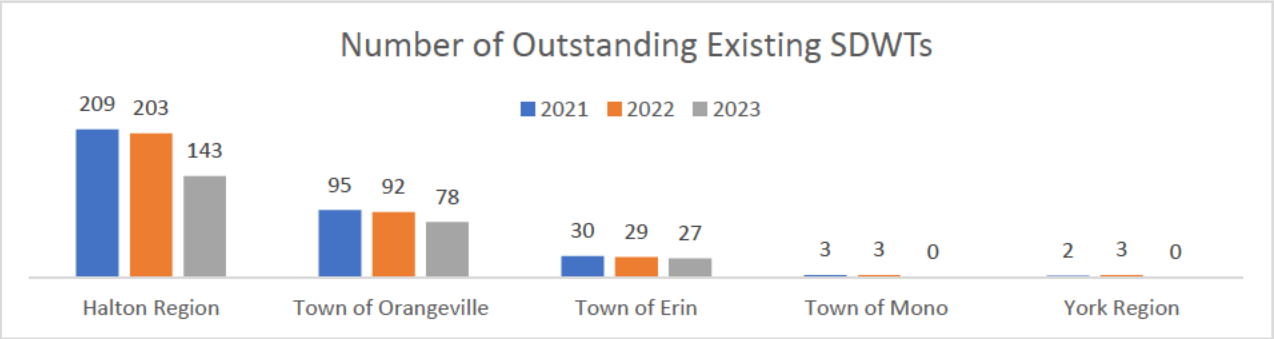


Figure 1. s. 58 extension outstanding significant threats (2021-March 2023)

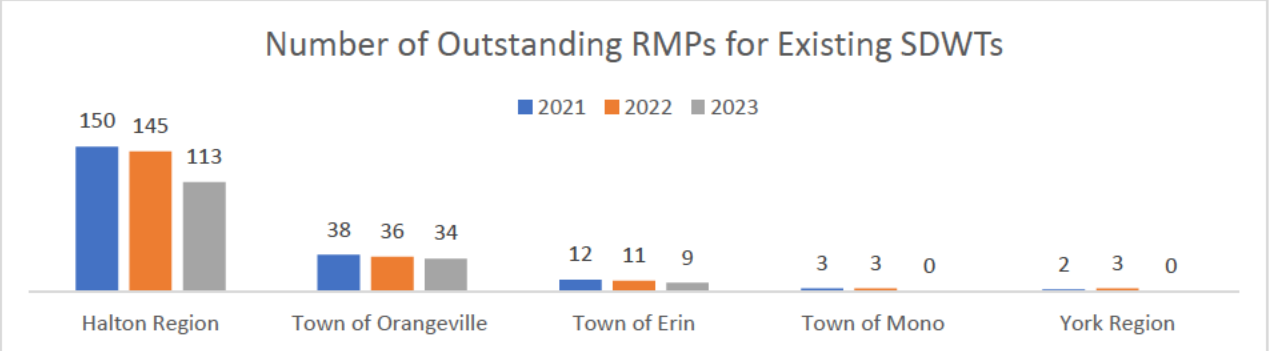


Figure 2. s. 58 extension outstanding RMPs (2021-March 2023)

The restrictions from the COVID-19 pandemic were longer and proved more challenging than originally anticipated. Given the resulting multi-year gap in negotiations, the process of reengaging landowners has been slow particularly when changes in ownership have taken place. Other implementation challenges identified by municipal RMOs as discussed in their presentation to the SPC (Item 9.1), include:

- The time-consuming nature of the threat verification and RMP negotiation process. Experience among RMOs in the CTC Source Protection Region has been that RMPs can take between 9 and 22 months to negotiate. The disruption caused by the COVID-19 pandemic has in some cases reset the clock on previous efforts.
- RMPs typically have annual monitoring and reporting requirements. As more RMPs get established, the volume of annual reporting documents submitted by RMP holders increases. The review of the submitted material requires a significant time investment each year and requires follow up when documentation is missing or incomplete (a common occurrence with new RMP holders). Additionally, even though an RMP holder is required to immediately inform the RMO of any changes in property ownership, site conditions, etc.; such changes are often not revealed until the annual reporting deadline. Several existing RMPs have had to be amended due to such changes, sometimes with

new site contacts who are unfamiliar with RMPs or who are completely unaware that one had been negotiated for the property.

- In addition to preparation of RMPs and enforcement responsibilities, RMO/RMIs are responsible for development planning application review, groundwater monitoring, the integration of source protection into municipal planning updates (e.g., secondary plans) and infrastructure projects, and education and outreach. Given the substantial growth experienced across CTC, the demands on RMO/RMIs have greatly increased in recent years.
- Municipal prioritization placed on RMPs initiated through the land use planning and building permit process to meet prescribed approval timelines.
- Additional complexities in negotiating agricultural RMPs. Seasonal availability has reduced negotiation window to winter months. Often there are multiple threats to be addressed with existing regulatory burden through other prescribed instruments. Although there have been improvements in clarifying the requirements of *Clean Water Act, 2006* versus those from the *Nutrient Management Act*, further work is required.
- Although RMOs can give a Notice to establish a RMP for an activity at a particular location, there are legislated timelines in the *Clean Water Act, 2006* to ensure that a landowner is given sufficient time to respond. Use of these legal instruments may address specific SDWTs but may have a negative impact on the long-term goals of the Clean *Water Act, 2006* for having an engaged and supportive public.
- Negotiating RMPs with federal and provincial bodies has proven challenging at time.

As part of the section 36 workplan, CTC staff are working on updating SPP policies for compliance to the latest Director's Technical Rules (2021 version). It should be noted that the updated policies, particularly those addressing threats from storage and handling of Salt and storage of snow, will likely result in additional RMPs across the CTC Source Protection Region.

Mitigation Strategies

Mitigation strategies identified by RMOs, and additional resources dedicated to their source protection programs by municipalities include:

- In Halton, a Source Protection intern position was created and filled in mid-2022 to support review of development applications and coordination of the RMP process.
- In Wellington, the hiring of the first Source Protection Coordinator has been helpful in freeing up RMI and RMO time to focus on RMP negotiations. Pending budget approval, a second Coordinator will provide support.

- Halton and Wellington are undertaking a collaborative effort in addressing landowners who are subject to RMPs in both municipalities.
- Town of Orangeville hired a Source Water Protection Coordinator in fall 2022, who is scheduled to take the RMO/RMI training in March 2023.

Furthermore, CTC staff will continue to work closely with RMOs through the Implementation Working Group (IWG) and Amendment Working Group (AWG) in updating SPP policies for compliance to the latest Director's Technical Rules. For example, the proposed amendments to DNAP-1 and OS-1 policies, currently in pre-consultation as part of the ongoing section 34 amendment, address RMP implementation challenges by providing volume thresholds and clarification on the meaning of total volume. CTC staff will further prioritise updating the salt, snow, and agricultural policies to facilitate implementation.

Next Steps

MECP Conservation and Source Protection Branch have recently indicated this will be the final extension considered by the Ministry with a maximum extension duration of two years. They have also requested feedback on how the ministry can help expedite the establishment of any remaining Risk Management Plans. CTC Staff will engage other Source Protection Regions and Conservation Ontario to provide a coordinated response.

CTC staff will develop an updated template for municipal work plans by May 1st of this year. It is anticipated that RMOs will submit the work plans and accompanying letters summarizing implementation challenges and proposed mitigation strategies by the end of June 2023. RMOs from impacted municipalities will present the workplan to their Councils to ensure the necessary resources are available. The official extension request will be submitted to MECP shortly thereafter.

Report prepared by:

Behnam Doulatyari, Senior Manager, Watershed Plans and Source Water Protection, Credit Valley Conservation

T: 905-670-1615, ext. 329

Email: behnam.doulatyari@cvc.ca

Date: March 20, 2023

Attachments (1):

Attachment 1: CTC section 58 extension progress summary

Attachment 1: CTC section 58 extension progress summary

S. 58 RMP Extension Work Plan: January '23 Annual Update

Note: Existing/outstanding SDWT's in this workplan refer to those that were originally required to have RMP's in place Dec. 31, 2020 to manage them, as per the CTC Source Protection Plan policy #T-6. In July 2020, the implementation deadline for SPP policy T-6 was extended by 3 years until Dec. 31, 2023.

Instructions

Work Plan: Blue cells filled in early 2021. This template assumed RMOs established annual targets for RMP completion, and may employ notices and/or impose RMPs, as needed, to achieve annual targets. Additional milestone tasks added to Column A as appropriate (e.g., # site visits).
Annual Progress Reports: Fill in green cells with red text to complete applicable annual update

		January 2022 Update	January 2023 Update	January 2024 update
Date of update:	11-Mar-21	Feb. 7, 2022	1-Feb-23	Date
Municipality:	Erin, Halton, Mono, Orangeville, York	Erin, Halton, Mono, Orange	Erin, Halton, Mono, York, Orangeville	
Risk Management Official(s):	Various	Various	Various	RMO(s)
			Progress Reports	
# Outstanding Existing SDWTs:	339	330	256	# as of Jan 1, 2024
Summary of Outstanding SDWTs by type:	Application, handling, and storage of Agricultu	Application, handling, and s	as of Jan 1, 2023	as of Jan 1, 2024
	Application, handling, and storage of Commer	Application, handling, and storage of Commercial Fertilizer		
	Application, handling, and storage of pesticide	Application, handling, and storage of pesticides		
	Application, handling, and storage of road salt	Application, handling, and storage of road salt		
	Appliction of NASM	Appliction of NASM		
	Handling and storage of Fuel	Handling and storage of Fuel		
	Handling and storage DNAPL	Handling and storage DNAPL		
	Handling and storage of Organic Solvents	Handling and storage of Organic Solvents		
	Storage of Snow	Storage of Snow		
	Livestock grazing or pasturing, and outdoor co	Livestock grazing or pasturing, and outdoor confinement area		
# of Outstanding Risk Management Plans:	205	198	163	# as of Jan 1, 2024

Work Plan

RMO Tasks	Targets/Dates		
Develop Workplan and submit to CTC Program Manager	Monday January 11, 2021		
2021		**2021 Progress Report (due by Feb. 1, 2022)**	
Target # RMPs to be completed Jan 1 - Dec 31 2021	42	13	
OPTIONAL Send warning letter to all persons requiring risk management plans	In advance of issuing S. 58 (7) Notices-Halton 06/30/2021- Orangeville 12/31/2021-Erin This is possible, contigent on the duration of COVID and will be explored in early Q3-Mono 12/31/2021-Halton 1/17/2022-Orangeville	1	Date issued
Issue s. 58 (7) notices, if necessary	not anticipating this to be required-Mono	0	Date issued
	Implementation Challenges (2021)	Ongoing and recurrent COVID restrictions; pandemic related hiring freeze; shift to remote/hybrid work; focus on pandemic related H&S protocols; reluctance of landowners to meet in person; staff turnover/recruitment challenges	
	Proposed Mitigation Strategies	RMP extension; property redevelopment may reduce significant threatas; outreach letters, emails and phone calls; hiring of consultant	
	Additional Resources to Implement Work Plan	New staff position to allow RMO/RMI to focus on inspections and RMP negotiations	
2022		**2022 Progress Report (due by Feb. 1, 2023)**	
Target # RMPs to be completed Jan 1 - Dec 31 2022	97	16	# RMPs completed
OPTIONAL Send warning letter to all persons requiring risk management plans	In advance of issuing S. 58 (7) Notices-Halton 05/16/2022-Orangeville 02/28/2022-York 12/1/2022-Orangeville 12/30/2022-Halton 12/31/2022-Erin	0	Date issued
Issue s. 58 (7) notice, if necessary	not anticipating this to be required-Mono	2	Date issued
Issue s. 58 (10) notices, if necessary	12/22/2022-York	0	Date issued
	Implementation Challenges (2022)	Ongoing pandemic related restructions; agricultural RMP negotiation window limitations exacerbated by pandemic restrictions and limited availabilty; need for reengagement with property owners; property ownership changes; federal government not subject to CWA; low response to outreach attempts; resistance to final sign-off; lack of local Risk Management staff	
	Proposed Mitigation Strategies	Coordination amongst RM staff; prioritization of agricultural RMPs including multi-farm; consideration of RMP deadline extension; outreach follow-up; Section 58(7) notices of intent; hiring of additional source protection staff	
	Additional Resources to Implement Work Plan	Hiring of additional staff to allow risk management negotiation focus by risk management officials	
2023		**2023 Progress Report (due by Feb. 1, 2024)**	
Target # RMPs to be completed Jan 1 Dec 31 2023	66	# RMPs completed	
OPTIONAL Send warning letter to all persons requiring risk management plans	03/15/2023-Orangeville 07/03/2023-Halton 07/17/2023-Orangeville 08/01/2023-Halton	# warning letters issued	Date issued
Issue s. 58 (7) notice, if necessary	not anticipating this to be required-Mono	# notices issued	Date issued
Completion Date	**Sunday, December 31, 2023**		

Attachment B: Summary of municipal work plans to achieve December 31, 2025 deadline for completion of risk management plans.

Status Update

Date of update:	30-Jun-23
Municipality:	Erin, Halton, Orangeville
Risk Management Official(s):	Various
	Progress Reports (SDWT/parcels/RMPs)
# Outstanding Existing SDWTs (requiring RMPs):	215
Summary of Outstanding Existing SDWTs (requiring RMPs) by type:	
Waste	0
Sewage	N/A
ASM application	12
ASM storage	6
Aquaculture	N/A
NASM application	3
NASM storage	0
Fertilizer application	8
Fertilizer storage	1
Pesticide application	10
Pesticide storage	0
Road salt application	103
Road salt storage	8
Snow storage	29
Fuel H&S	3
DNAPL H&S	21
Organic solvents H&S	1
Aircraft de-icing	0
Water demand	N/A
Recharge reduction	0
Livestock/OCA/FAY	10
Liquid hydrocarbon pipeline	N/A
# of properties with outstanding required RMPs (existing threats):	141
# of Outstanding Risk Management Plans (existing threats):	136
# existing SDWTs addressed by established RMPs (cumulative):	264
# of properties with RMPs established (cumulative):	127
# of total RMPs established (cumulative):	110

Work Plan

RMO Tasks	**Targets/Dates (Annual)**
2023	
Develop Workplan and submit to CTC Program Manager	**30-Jun-23**
Target # RMPs to be completed	52
OPTIONAL: Send warning letter to all persons requiring risk management plans	Erin: Dec. 31, 2023 Halton: July 3, 2023 Orangeville: Feb. 7, 2023
Issue s. 58 (7) notice, if necessary	Erin: N/A Halton: Aug. 1, 2023 Orangeville: July 3, 2023
Issue s. 58 (10) notices, if necessary	Erin: N/A Halton: Dec. 1, 2023 Orangeville: Oct. 31, 2023
2024	
Target # RMPs to be completed	44
OPTIONAL: Send warning letter to all persons requiring risk management plans	Erin: N/A Halton: March 1, 2024 Orangeville: Jan. 8, 2024
Issue s. 58 (7) notice, if necessary	Erin: Dec. 31, 2024 Halton: Apr. 1, 2024 Orangeville: Mar. 4, 2024
Issue s. 58 (10) notices, if necessary	Erin: N/A Halton: Aug. 1, 2024 Orangeville: July 2, 2024
2025	
Target # RMPs to be completed	51
OPTIONAL: Send warning letter to all persons requiring risk management plans	Erin: N/A Halton: March 1, 2025 Orangeville: Jan. 5, 2025
Issue s. 58 (7) notice, if necessary	Erin: N/A Halton: Apr. 1, 2025 Orangeville: Mar. 3, 2025
Issue s. 58 (10) notices, if necessary	Erin: July 31, 2025 Halton: Aug.1, 2025 Orangeville: July 1, 2025
Completion Date for completion of outstanding existing RMP's	31-Dec-25

Attachment C: Policy deadline extension request documentation

Policy number (that the exemption request applies to):

- T-6 (as it relates to requirements for RMPs in policies ASM-2, ASM-4, NASM-1, FER-2, FER-3, PES-1, SAL-1, SAL-2, SAL-7, SNO-1, FUEL-3, DNAP-1, OS-1, LIV-1, LIV-3)

Policy text:

- Current approved T-6 policy: "Activities (existing) designated for the purpose of s.58 under the Clean Water Act, requiring risk management plans, shall be identified and confirmed within 1 year by the Risk Management Official. Risk management plans shall be established within 5 years from the date the Source Protection Plan takes effect*."
    - *Note: in July 2020, the implementation deadline for SPP policy T-6 was extended by 3 years until Dec. 31, 2023.
- Policy T-6 is also proposed for further update as part of current amended s.34 process (October 2023 submission), as follows: "Activities (existing) designated for the purpose of s.58 under the Clean Water Act, requiring risk management plans, shall be identified and confirmed within 1 year by the Risk Management Official. Risk management plans shall be established by December 31, 2023. For activities (existing) added through amendments to an Assessment Report, a risk management plan must be established no later than 5 years from the effective date of the amended Assessment Report."

Plain language summary of the policy(ies):

- RMPs required for existing threats relating to: application of ASM, storage of ASM, application of NASM, application of commercial fertilizer, storage of commercial fertilizer, application of pesticide, DNAPL handling and storage, organic solvent handling and storage, livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard; these must be in place by Dec. 31, 2023 in the Town of Erin.
- RMPs required for existing threats relating to: application of ASM, storage of ASM, application of commercial fertilizer, application of pesticide, application of road salt, storage of road salt, storage of snow, fuel handling and storage, DNAPL handling and storage, organic solvent handling and storage, livestock grazing or pasturing land; these must be in place by Dec. 31, 2023 in the Regional Municipality of Halton.
- RMPs required for existing threats relating to: application of road salt, storage of road salt, storage of snow, and DNAPL handling and storage; these must be in place by Dec. 31, 2023 in the Town of Orangeville.

Rationale to support why the exemption is needed:

- These are fulsomely documented within Attachment B, which is a report provided to the CTC SPC at CTC SPC Meeting #1/23, and in letters (Attachments D, E and F) from each of the three municipalities that require an extension.

New proposed policy timeline: December 31, 2025

What is the progress made on the establishment of RMPs for existing threats since the initial extension request (to get a picture of the # of RMPs and threats remaining)?

- On June 29, 2020 the CTC SPC formally requested a deadline extension, this was approved by MECP on July 29, 2020.
- The following is a summary of RMPs for existing threats that have been completed since then:
    - From 2020-2022: 44 RMPs for existing threats where completed, 39 of these were by five municipalities that requested a Policy #T-6 timeline extension.
    - As of June 2023, 12 further RMP's were completed in 2023 by municipalities with outstanding existing RMPs.
    - As of the end of 2020, there were 339 existing significant threats remaining that still needed to be addressed through 205 RMPs by the 5 municipalities. As of June 2023, there are 215 existing significant threats remaining that still needed to be addressed through 136 RMPs by 3 remaining municipalities as of June 2023.

Is your section 36 update process considering the possibility of changing any RMP policies to address implementation challenges?

- Yes, a number of policy updates being considered to support implementation and address the updated Director's Technical Rules, some examples are included below:
    - Updating policies to be simpler to understand while allowing RMO's greater flexibility to use their judgement
    - Consideration of eliminating RMP requirements for low Nutrient Unit small hobby farms
    - Shifting between prohibition or Risk Management Plan as the policy tool for some types of threats. This may result in an increase in the number of RMPs required for some types of threats

Are there any resource challenges contributing to the delays?

- During the pandemic some municipalities paused or slowed hiring of new or replacement staff, which contributed to setbacks in RMP negotiations.
- RMO/RMI's have many other responsibilities beyond of negotiating RMPs for existing threats.
- These municipalities have been working to bring additional resources on-board to allow RMO's to focus on RMP negotiations.

Table 1. Progress on outstanding Risk Management Plans for existing threats within the CTC

Source Protection Authority	Credit Valley (CTC SPR)	Comment
Plan Effective Date	December 31, 2015	
Original Timeline	December 31, 2020	
2023, 2nd Timeline Extension Request	December 31, 2025	First extension was to December 31, 2023
Total # of RMPs established to date (i.e., upon submission of extension request)	150	From 2022 Annual Report. 161+ as of June 2023

Total # of properties with RMPs to date (i.e., upon submission of extension request)	178	From 2022 Annual Report. 189+ as of June 2023
January 1, 2023 – Total # of existing SDWTs addressed by RMPs (from annual reporting)	279	From 2022 Annual Report. 301+ as of June 2023.
Total # of remaining existing significant threats which may require RMPs upon submission of extension request	260	Number above from 2022 Annual Reporting. 215 as of June 2023. Numbers reflect only municipalities seeking s.58 deadline extension for existing threats.
Total # of anticipated RMPs to be established upon submission of extension request	167	Number above from 2022 Annual Reporting. 136 as of June 2023. Numbers reflect only municipalities seeking s.58 deadline extension for existing threats.
Total # of properties requiring RMPs upon submission of extension request	165	Number above from 2022 Annual Reporting. 141 as of June 2023. Numbers reflect only municipalities seeking s.58 deadline extension for existing threats.

Attachment D: Town of Orangeville s.58 Extension Workplan Supporting Letter

Town of Orangeville
87 Broadway, Orangeville, ON L9W 1K1
www.orangeville.ca Tel: 519-941-0440 Fax: 519-941-5303 Toll Free: 1-866-941-0440

Infrastructure Services

May 23, 2023
Behnam Doulatyari, CTC Source Protection Program Manager
Credit Valley Conservation
1255 Old Derry Rd.
Mississauga, ON
L5N 6R4

RE: CTC S.58 extension workplan: Orangeville

The attached spreadsheet outlines the Town of Orangeville's (Town) S.58 extension workplan to complete the Risk Management Plans (RMPs) for existing/outstanding significant drinking water threats (SDWT). The existing/outstanding SDWTs in the Town were originally required to have RMPs in place by December 31, 2020, as per the CTC Source Protection Plan policy #T-6. In July of 2020, this original deadline was extended 3 years by the MECP until Dec. 31, 2023.

As noted in Item #10.1 of the Staff Report from the CTC SPC meeting #1/23 on March 2023, many of the same implementation challenges were faced by the Town as other municipalities. The departure of Irena Kontrec, the Town's sole RMO/RMI in November of 2021, was an additional challenge specific to the Town. To meet the annual reporting and other duties under Part IV of the Clean Water Act, the Town hired BluMetric Environmental Inc. (BluMetric) on an interim basis. The intention was to fill Irena's vacancy as soon as possible. Therefore, BluMetric's role was primarily for time sensitive and compliance matters. Completion of the existing/outstanding RMPs was to be resumed once the role was filled.

Rebecca Smart was hired in November of 2022 as the new Source Protection Coordinator, but efforts towards the existing/outstanding RMPs have been slightly delayed. As discussed in the Staff Report there is still time needed to adjust to the role and complete the MECP required training. Furthermore, at the time she started the Town was collecting reporting requirements from existing RMPs which presented time-consuming administrative challenges such as amendments and re-engaging owners/operators. Since the role was vacant for about a year the negotiation process had to be restarted for any partially completed RMPs due to changes in ownership, changes in land use activities and/or re-education.

Hiring of a Source Water Protection Coordinator is the primary mitigation strategy the Town has taken to meet the RMP deadline. While BluMetric was hired as an interim role until the Source Protection Coordinator role was filled, the Town intends to also continue to retain a consultant to dedicate additional resources to the program. Meeting the RMP workload in

addition to other administrative and source protection policy implementation work can be demanding for one staff member to complete. The addition of a consultant to support a permanent staff member will better position staff to concentrate efforts on completing RMPs over the next couple of years. Ultimately though the main resource required by the Town is additional time to continue these efforts to effectively implement the policies of the CTC Source Protection Plan.

Respectfully submitted,

Rebecca Smart

Risk Management Inspector/Risk Management Official
Town of Orangeville

Infrastructure Planning & Policy
Public Works
Halton Region
1151 Bronte Rd.
Oakville, ON L6M 3L1

Friday, June 30, 2023

Attention: Behnam Doulyatari, Ph.D.
Senior Manager, Watershed Plans and Source Protection, Credit Valley Conservation
behnam.doulyatari@cvc.ca

RE: CTC S.58 Extension Work Plan – Halton Regional Municipality of Halton

As noted in the CTC staff report "Extension to Risk Management Plan Timeline for Impacted Municipalities" presented to the CTC Source Protection Committee on March 23, 2023, Halton Region has not yet established all of the required Risk Management Plans (RMPs) to address existing significant drinking water threats under s.58 of the *Clean Water Act, 2006*, and therefore Halton Region will require an extension of the CTC RMP deadline (currently December 31, 2023). As required by the CTC Source Protection Committee, Halton Region staff have prepared the accompanying RMP Work Plan to provide an update on the status of establishing RMPs for existing significant drinking water threats and to provide an estimate of the number of RMPs that we anticipate establishing from 2023 to 2025. Also as required by the CTC Source Protection Committee, we have summarized below the main challenges to establishing RMPs to date, as well as potential approaches to address those challenges.

As noted in CTC staff report "Extension to Risk Management Plan Timeline for Impacted Municipalities", municipal staff have identified several challenges to establishing RMPs. The challenges also have been presented to the CTC Source Protection Committee several times by municipal staff in recent years. A brief summary of the identified challenges, and potential approaches to address some of the challenges, is presented below.

Challenges to Establishing RMPs:

- Pandemic-related limitations on outreach to land owners significantly limited opportunities to establish RMPs over multiple years.
- There generally is very limited public awareness of Source Protection and the *Clean Water Act, 2006.* The limited awareness is a challenge to outreach to land owners that require RMPs, and often contributes to a slow pace of developing RMPs with those land owners.
- There are challenges to establishing contact about RMPs with land owners. RMP outreach letters have been sent to the land owners within Halton Region that require RMPs, and many land owners have received multiple outreach letters. The response rate to outreach letters has been approximately 10-15%, requiring

additional staff time to establish contact before the process to establish a RMP can begin.

- A large number of the properties that require RMPs are agricultural. There is a limited seasonal window for working with farmers towards establishing a RMP.
- The majority of the properties that require a RMP in Halton Region involve road salt application to parking lots by winter maintenance contractors. Similar to land owners, there sometimes has been a reluctance of winter maintenance contractors to engage in the RMP process. There sometimes has also been a reluctance of winter maintenance contractors to complete Smart About Salt certification, which is one of the primary risk management measures included in RMPs for salt related threats.
- There is a concern held by some land owners with parking lots that they may have increased liability if they take any steps to reduce the application of road salt.
- Reluctance of land owners and their contractors to provide final sign off to establish RMPs
- Making contact with land owners and then working through the process to establish a RMP is generally a time consuming task for staff and several months or years can pass between making contact and obtaining sign off on the RMP. There also are several other important tasks that staff undertake towards the effective implementation of Source Protection Plan (e.g., RMP inspections, s.59 review of development applications, screening ECAs and supporting CLI-ECAs, supporting official plan updates, etc.).
- Beyond actively implementing Source Protection Plan policies, municipal staff undertake other Source Protection activities (e.g., s.34 and s.36 amendments and required staff reports, participating in technical rule updates and resulting threat verification, review of proposed policy changes, Source Protection Region working groups, Source Protection Committee meetings, etc.).

Potential Approaches to Address the Challenges to Establishing RMPs:

- Prioritization of establishing RMPs over other Source Protection activities to the extent possible. Halton Region staff will identify opportunities for prioritization in collaboration with CTC staff.
- The s.59 process for review of development applications sometimes leads to opportunities to work with applicants to address existing significant drinking water threats by establishing RMPs. Halton Region staff will continue to identify properties with existing threats through the s.59 development review process.
- Despite the low response rate from property owners, Halton Region staff have found that outreach letters are sometimes useful tools for making contact with land owners who require RMPS. Halton Region staff will continue the use of outreach letters.
- Where possible and where it is safe to do so, Halton Region staff will undertake additional in person outreach to land owners and/or their staff where RMPs are required.

- Halton Region staff will continue dialogues with winter maintenance contractors about actual and perceived barriers to Smart About Salt certification.
- A Source Protection Intern position was added in mid-2022 to support establishing RMPs and screening development applications. Halton Region may also identify potential opportunities for other Halton staff to support establishing RMPs.
- Halton Region staff anticipate the use of s.58 notices and orders to establish RMPs, in consultation with Halton Region's Legal Services group.

We look forward to continuing to work with CTC staff on opportunities to make progress towards establishing RMPs for existing significant drinking water threats. We also look forward to discussing opportunities to prioritize activities related to establishing RMPs to reflect the CTC Source Protection Committee's identification of this as a key priority.

Sincerely,

Daniel Banks, P.Geo.
Risk Management Official
Halton Region

July 4, 2023

Behnam Doulatyari, Senior Manager, Watershed Plans and Source Protection
Craig Jacques, Specialist, Watershed Plans and Source Water Protection
Credit Valley Conservation

RE: S. 58 Risk Management Plan Extension Work Plan – June 30. 2023

Dear Craig and Behnam,

As requested, please find enclosed the updated CTC s58 extension Risk Management Plan spreadsheet. This is up to date as of June 30, 2023.

As documented in CTC Source Protection Committee Staff Report 10.1c from Meeting #1/23 on March 23, 2023, there have been previously documented implementation challenges and proposed mitigation strategies for completing Risk Management Plans by December 31, 2023. As a result, the CTC Source Protection Committee has directed Source Protection Authority and municipal staff to proceed with requesting an extension until December 31, 2025. The implementation challenges experienced by the Town of Erin are accurately reflected in the above referenced CTC staff report.

I am pleased to report for this update, however, that three more Risk Management Plans have been signed since January 1, 2023 bringing the Town's cumulative total for the CTC Source Protection Region to five Risk Management Plans signed. There are seven Risk Management Plans remaining on eight properties. These are six Risk Management Plans on seven agricultural or rural residential properties and one Risk Management Plan on an institutional property. Please note that most of the remaining Risk Management Plans are located in the Region of Halton Issue Contributing Area for nitrate which we understand is under review. Negotiations are ongoing with five of the above property owners and we are having some difficulty getting in contact with the remaining two property owners as the properties have recently changed hands. However, we anticipate making contact over the summer or early fall.

We are also pleased to note that starting July 6, 2023, our unit will have a new Source Protection Coordinator starting. This was one of the mitigation strategies discussed in previous updates. This new staff member, although not working directly on Risk Management Plans, will be working on other time sensitive work that until now has been completed by myself. This will free up more of my time as the Risk Management Official to work with our Risk Management Inspector to negotiate Risk Management Plans. Although we are making progress, the Town of Erin still does require the timeline extension that has been discussed with the Source Protection Committee and I understand this letter will form part of the package to be sent to the Province for approval. In particular, as discussed previously, most of our remaining Risk Management Plans are agricultural and we are currently outside of the typical negotiation window of

November to March that is best practice with the agricultural community. For that reason alone, we will not be able to have all Risk Management Plans signed by December 31, 2023.

I trust that this letter and the attachment meet your expectations. If you require further information, please do not hesitate to contact me.

Risk Management Official
kdavis@centrewellington.ca
519-846-9691 ext 362

CTC Drinking Water Source Protection Program Survey

Wednesday, September 20, 2023

Invitations

- 44 opened (73.3%)
- 14 unopened (23.3%)
- 2 bounced (3.3%)

38 clicked through (63.3%)

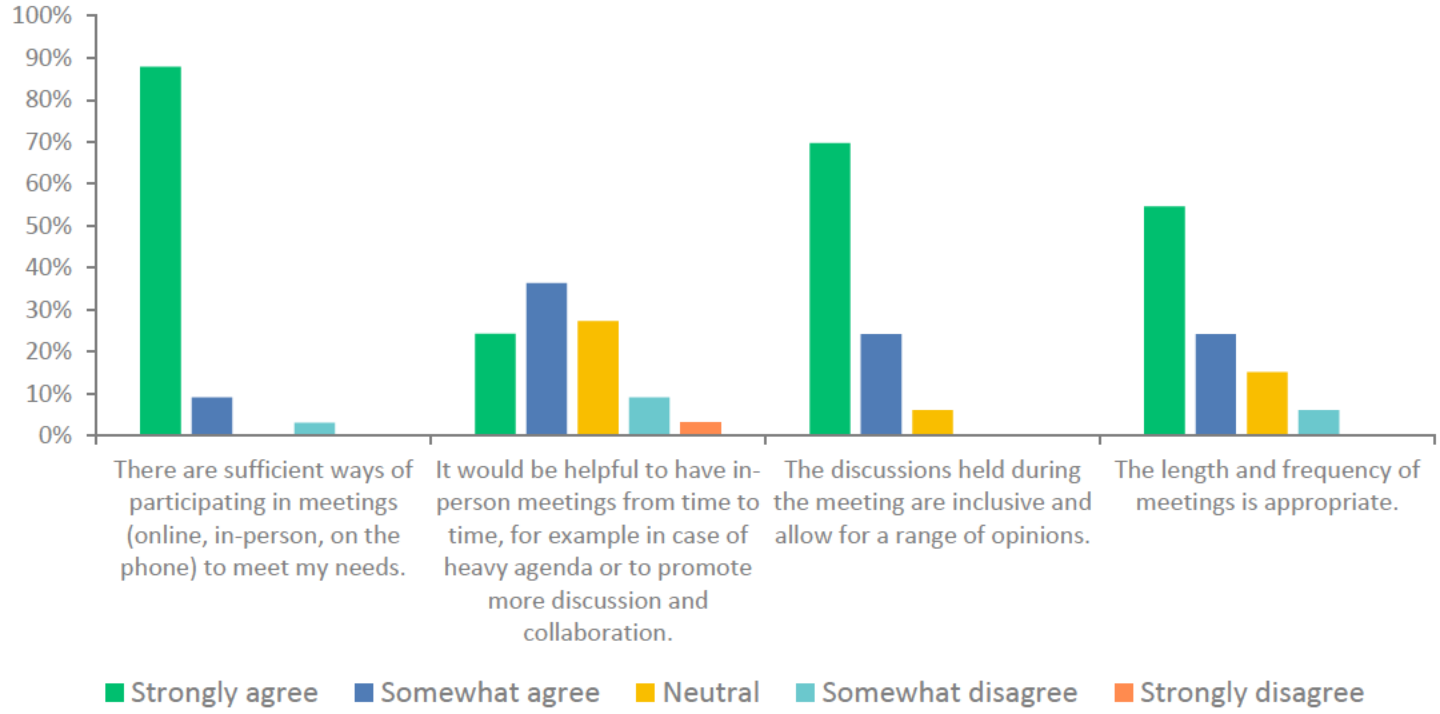
0 opted out (0%)

Responses

- 33 complete (100%)
- 0 partial (0%)

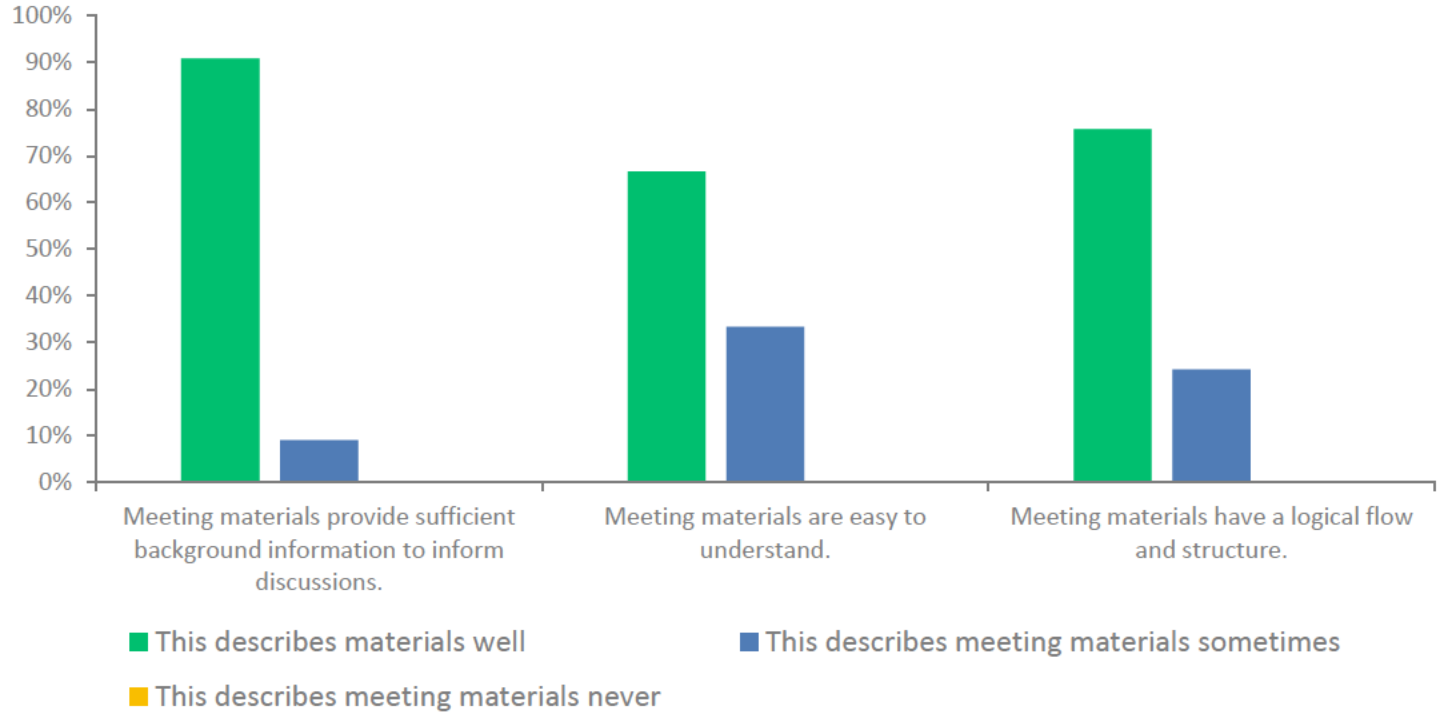
Q1: Please share your feedback on the effectiveness of SPC meetings by indicating if you agree or disagree with the following statements.

Answered: 33 Skipped: 0



Q2: Please rate the quality and usefulness of meeting materials i.e., reports and presentations at Source Protection Committee meetings.

Answered: 33 Skipped: 0

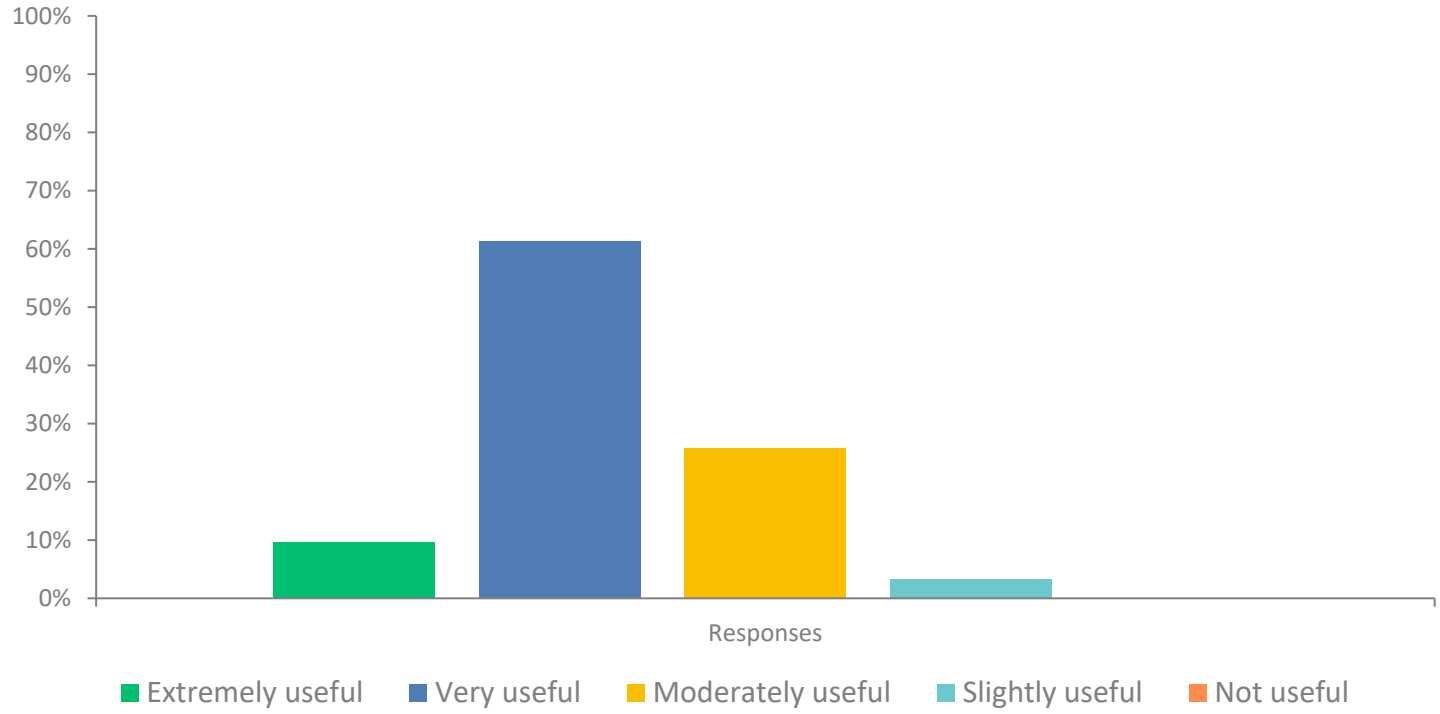


Please provide any other comments you may have.

- meeting materials should be provided minimum 1 week before meeting
- The materials should be provided 2 weeks before meetings where possible to allow time to review them.
- Presentations and other materials are well prepared and pertinent.
- The forum for meetings is conducive to dialogue and discussion. There are opportunities to ask questions for clarification and further understanding. Presentations by staff with specific areas of expertise are informative and well presented, with helpful visuals such as maps, charts, photos.
- Meeting materials should be circulated as a best practice between five and seven business days prior to the meeting.

Q3: The CTC SharePoint site was launched earlier this summer to improve collaboration, document management and information sharing. Please indicate the usefulness of the information on this site.

Answered: 31 Skipped: 2

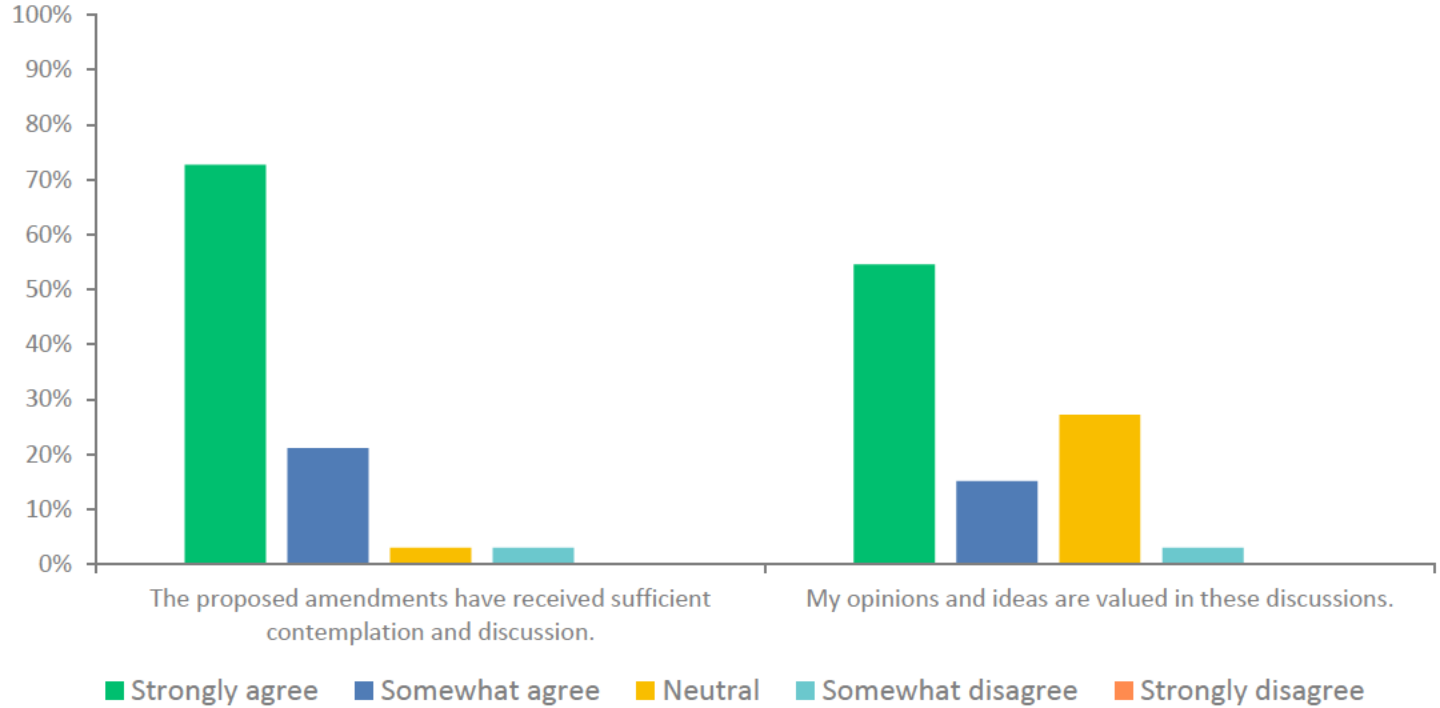


What content/functionality would you like to see added?

- I have not access the SharePoint site as of yet.
- I have not used this site yet
- Although SP is user friendly, I find I struggle with finding certain documents sometimes as there is a lot going on the site.
- I have not used this site.
- I am still exploring, lots of information. It would be helpful to have a presentation at the CTC meeting on best ways to navigate the site. d
- Teams chat channel. To share different stories or ask questions.
- I am still feeling around / learning to navigate, but so far have found it to be an extremely useful tool.
- Simpler navigation

Q4: We have been reviewing and updating our polices to comply with the latest changes in the Director's Technical Rules. We have asked for your input in a variety of methods and times at the SPC and working groups. We are interested in your opinion on these efforts.

Answered: 33 Skipped: 0

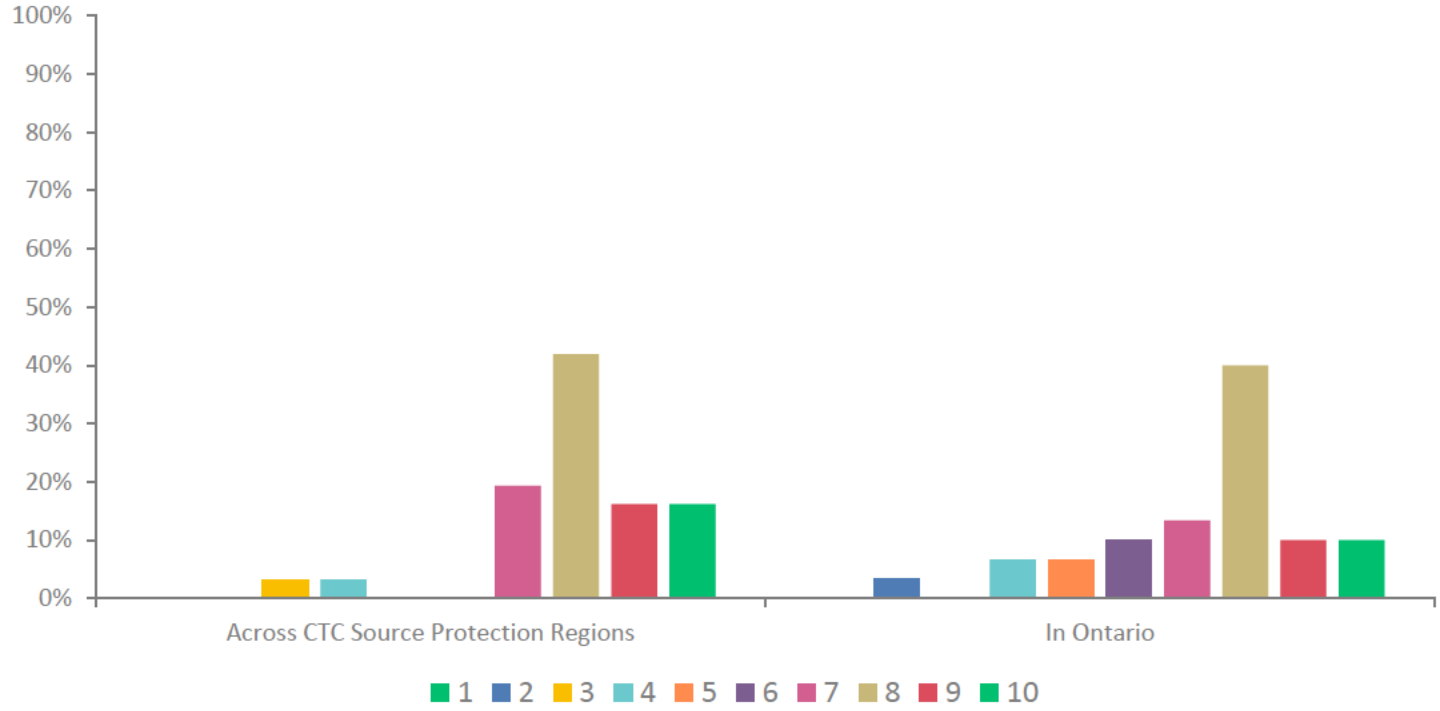


Please provide your feedback on how we can improve this process:

- Although I sit on the source protection committee and have done so for many years, I feel that the hard relevance of this committee has now passed its prime. Most of our meetings are update/informational meetings and there is really very little that requires decision making from a panel of experts. Staff are all very professional and do an excellent job. Now that that SPC has moved from the office of TRCA in person meetings are just too far away for me.
- Continue to provide in-depth presentations by expert conservation authority staff providing details, context and background information.
- I haven't provided much feedback as I think staff have really been fantastic in creating these reports.

Q5: Overall, how would you rate the effectiveness of Drinking Water Source Protection Program in protecting the sources of drinking water: (1 = did not meet expectations; 10 = exceeded expectations)

Answered: 33 Skipped: 0



Please share any additional comments you have:

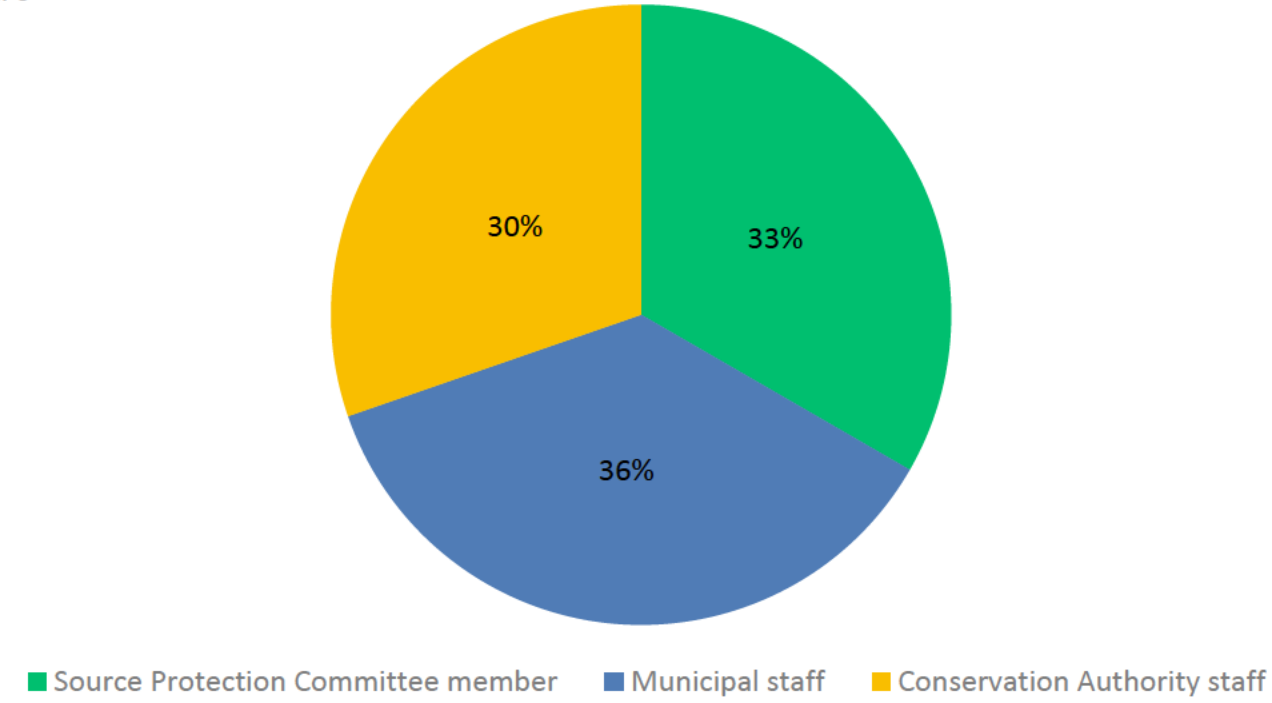
- Fails to recognize source water protection for communities on individual private wells
- There are significant gaps in the legislative framework specifically related to road salt, fuel, DNAPLs and organic solvents. DNAPLs and organic solvents should be replaced with a broader chemical threat category with a volume threshold and a chlorinated solvents threat category. This would allow more efficient management of a broad range of chemicals in the WHPAs and the ability to regulate chlorinated solvents more strictly. For road salt, this should not be related to impervious surfaces thresholds and should be significant in all of 10 and all of WHPA B. Fuel should be significant in all of WHPA B. Thought should also be given to adding 500 m radius WHPA to municipal wells as there are situations where threats are present 150 to 500 m from wells and are not contained in any wellhead protection area and therefore not regulated under CWA
- Very little effort from the province has been implemented to address the rising sodium and chloride levels in raw drinking water sources.
- Some local threats rely on existing legislation or other jurisdictions for management which sometimes seems to create an uneven bias towards the threats that are included in the policies. We have had experience with fill operations in WHPAs that are a concern but have no means to address them under source protection.
- Funding is needed to help with implementation of risk management measures. RMPs are one of the best tools for protection and they are not being implemented across the Province in a consistent or timely way. Incentive funding would help with this, and there are examples of where this is this case.
- Need to do more about salt.
- I remain concerned about the lack of protection for private water supplies. The risk scoring focuses only on municipal and designated systems, meaning that only limited areas are protected. That being said, I believe that the CTC SPR has done its best to protect the systems in our watersheds.

Please share any additional comments you have:

- I am not as familiar with other regions in Ontario but CTC does a great job addressing source water protection issues and engaging the public and property owners through various media, strategies and events.
- From the CTC plan, the second purpose/objective is unobtainable for salt and quantity threats. 4 PURPOSE AND OBJECTIVES OF THE SOURCE PROTECTION PLAN The policies in this SPP have been written to achieve the objectives identified in the General Regulation under the CWA. These objectives are as follows: 1. To protect existing and future drinking water sources in the SPA. 2. To ensure that, for every area identified in an Assessment Report as an area where an activity is, or would be, a significant drinking water threat: • the activity never becomes a significant drinking water threat, • if the activity is occurring when the SPP takes effect, the activity ceases to be a significant drinking water threat.
- Unfortunately we are bound to the provinces funding and policies which restricts how much of an impact we have. With that said, I believe staff and the committee are doing everything they can to protect our drinking water.
- Funding opportunities for new technical work could be improved. The province appears to have relinquished the vast majority of its previous responsibilities and have downloaded to municipalities. The ability of the smaller, less affluent municipalities to fund new studies and initiatives is extremely limited.

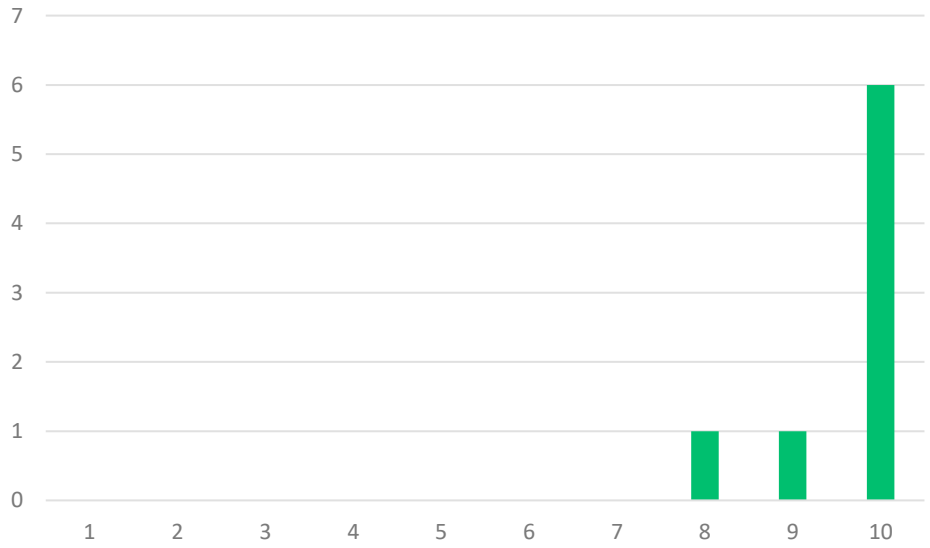
Q6: Please indicate your role in the CTC Drinking Water Source Protection Program. For Municipal staff who also serve as a representative on the Source Protection Committee (SPC), please complete this survey as a SPC member. Select one:

Answered: 33 Skipped: 0



Q7: Based on your experience, on a scale of 1 to 10, how would you rate the quality of service provided by CTC staff outside the SPC and working groups? This includes any general questions and concerns, administrative inquiries, or follow-up on committee business.
(1 = did not meet expectations; 10 = exceeded expectations)

Answered: 11 Skipped: 22



8. The Ministry of Environment, Conservation and Parks (MECP) funds the Drinking Water Source Protection program DWSP through a Transfer of Payment Agreement (TPA) which has a one-to-two-year duration. Funding is used to support conservation authorities to continue to fulfill their legislated obligations as source protection authorities under the Clean Water Act and support implementation of Source Protection Plans. The CTC DWSP is currently funded through a two-year TPA for the period April 2022 to March 2024.

We are in the early stages of preparing for the next round of funding application, which will be for one to two years. However, we are interested in your 5-year outlook on the program, which aligns with duration of appointments to the committee and allows us to better understand what you hope the committee can achieve during your tenure.

Note: applications will be subject to forthcoming eligibility criteria, and subject to agreement between MECP and the lead Source Protection Authority.
Please provide priority areas of interest for the source protection committee These could include:

Q8: Policy: please name the policy from CTC Source Protection Plan or threat from list of prescribed threats in section 1.1 of O. REG 287/07 under the Clean Water Act.

- An activity that reduces the recharge of an aquifer The application of road salt The application of agricultural source material to land
- Salt, DNAPLs, Fertilizer, ASM.

Q9: **Technical: studies focused on stressors, water budgets, water quality, field verification, etc.**

- Study focused on community based private wells within the plan area and their potential threats
- Consideration of "Forever Chemicals" PFOS/PFAS substances and their legacy use.
- Salt management.
- Salt mitigation, PFAS, Water budgets
- Study on the consequences of recent removal of the Greenbelt lands and the consequences on drinking water. The removal in Clarington was a wetland.

Q10: **Stewardship, Education and Outreach programs including but not limited to source protection best practices.**

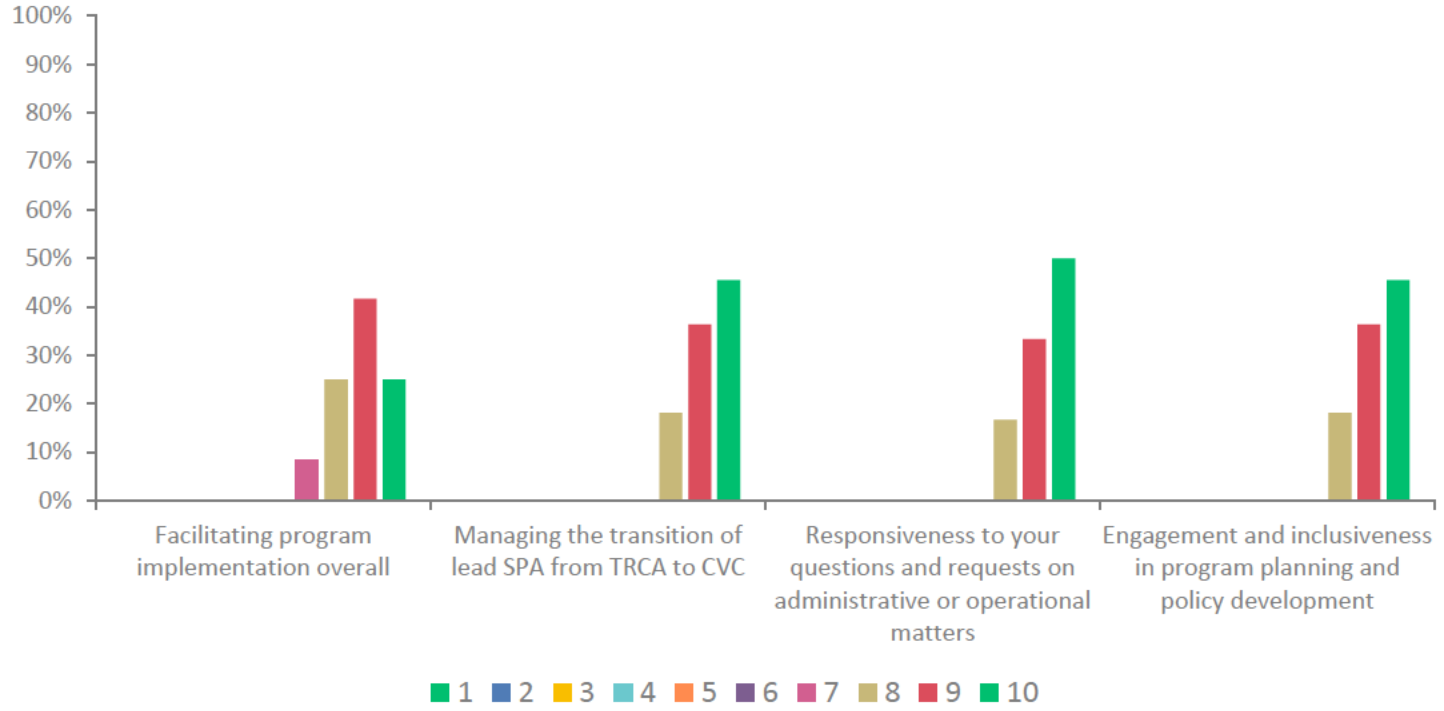
- presentations on CTC to newly elected municipal councils
- High priority is more outreach on social media. Current the CTC doesn't have much or any social media presence. We should be educating through social media on twitter, LinkedIn etc.

Q11: **Administrative improvements including any existing workflow process for the committee or program implementation in general (such as annual reporting, s. 34/s.36 amendment process).**

- S. 34 improvements to reduce the number of council resolutions/ reports required for minor WHPA amendments.
- There are opportunities to step back and look at how all of the legislation, policies, processes overlap or fit amongst other related legislation in Ontario and Federal. Seems overly complex to me. Tendency is to add new and seldom do we remove complexity

Q12: Based on your experience, on a scale of 1 to 10, how would you rate the performance of Source Protection Authority staff ?
(1 = did not meet expectations; 10 = exceeded expectations)

Answered: 12 Skipped: 21



Legislative & Planning Services
Department
Office of the Regional Clerk
1151 Bronte Road
Oakville ON L6M 3L1

VIA EMAIL

October 27, 2023

Elizabeth Forrest, Ministry of the Environment, Conservation and Parks
Alan Dale, Acting Chair, Lake Erie Region Source Protection Committee
Robert Edmondson, Chair, Halton-Hamilton Source Protection Committee
Behnam Doulatyari, Chair of the Credit Valley - Toronto and Region - Central Lake Ontario Source Protection Committee
Lisa Campion, Town Clerk, Town of Erin
Kevin Arjoon, City Clerk, City of Burlington
Meaghen Reid, Town Clerk, Town of Milton
Vicki Tytaneck, Town Clerk, Town of Oakville
Valerie Petryniak, Town Clerk, Town of Halton Hills

Please be advised that at its meeting held Wednesday, October 18, 2023, the Council of the Regional Municipality of Halton adopted the following resolution:

RESOLUTION: **PW-38-23 - Update on Status of Establishing Risk Management Plans for Source Water Protection**

THAT the Regional Clerk forward a copy of Report No. PW-38-23 to the City of Burlington, the Town of Halton Hills, the Town of Milton, the Town of Oakville, the Town of Erin, Wellington County, the Chair of the Credit Valley - Toronto and Region - Central Lake Ontario Source Protection Committee, the Chair of the Halton-Hamilton Source Protection Committee, the Chair of the Lake Erie Source Protection Committee, and the Source Protection Liaison from the Ministry of the Environment, Conservation and Parks for their information.

Included please find a copy of Report No. PW-38-23 for your information. If you have any questions please contact me at the e-mail address below.

Sincerely,

[redacted]

Graham Milne
Regional Clerk
graham.milne@halton.ca

The Regional Municipality of Halton

Report To:	Regional Chair and Members of Regional Council
From:	Andrew Farr, Commissioner, Public Works
Date:	October 18, 2023
Report No:	PW-38-23
Re:	Update on Status of Establishing Risk Management Plans for Source Water Protection

RECOMMENDATION

THAT the Regional Clerk forward a copy of Report No. PW-38-23 to the City of Burlington, the Town of Halton Hills, the Town of Milton, the Town of Oakville, the Town of Erin, Wellington County, the Chair of the Credit Valley - Toronto and Region - Central Lake Ontario Source Protection Committee, the Chair of the Halton-Hamilton Source Protection Committee, the Chair of the Lake Erie Source Protection Committee, and the Source Protection Liaison from the Ministry of the Environment, Conservation and Parks for their information.

REPORT

Executive Summary

- As noted in Report No. PW-34-15/LPS113-15 re: "Source Protection Plan Implementation Requirements under the *Clean Water Act, 2006*", Halton Region is located within three Source Protection Regions: Halton-Hamilton; Lake Erie; and Credit Valley - Toronto and Region - Central Lake Ontario (Attachment #1).

- Approximately 98 per cent of significant drinking water threat activities that were initially identified within Halton by Source Protection Authorities have been addressed to date through policy implementation.

- As noted in Report No. PW-02-21, re: "Status of Establishing Risk Management Plans for Source Water Protection", the remaining drinking water threats to be addressed by Halton Region staff will require the establishment of Risk Management Plans, which are binding agreements that are negotiated between a municipality's Risk Management Official and landowners and that identify the risk management measures to be implemented.

- Within Halton there are approximately 81 properties in the Credit Valley - Toronto and Region - Central Lake Ontario Source Protection Region and two properties in the Lake Erie Source Protection Region that require Risk Management Plans as of August 28, 2023. There are no properties remaining within the Halton-Hamilton Source Protection Region that require Risk Management Plans.

- The Lake Erie Source Protection Plan does not include a policy for deadlines for the establishment of Risk Management Plans.

- The Credit Valley - Toronto and Region - Central Lake Ontario Source Protection Committee requested that the Ministry of Environment, Conservation and Parks grant an extension to the end of 2025 for the deadline for establishing Risk Management Plans for Halton Region and the other municipalities that have not yet established all of the required Risk Management Plans.

- Staff will continue to prioritize outreach to, and voluntary negotiation with, landowners as much as possible. However, it is anticipated that staff also will need to rely on enforcement tools in order to establish all of the required Risk Management Plans by the extended deadline.

Background

As reported to Regional Council in several reports over the last decade, the Provincial Government has implemented a regulatory framework that provides a proactive, multi-barrier approach to safeguard municipal drinking water. The *Clean Water Act, 2006* provides a protective framework that focuses on protecting municipal drinking water at its source through the mandatory implementation of Source Protection Plans.

As noted in Report No. PW-34-15/LPS113-15 re: "Source Protection Plan Implementation Requirements Under the *Clean Water Act, 2006*", the three Source Protection Plans that impact Halton were approved by the Ministry of Environment, Conservation and Parks (formerly the Ministry of Environment and Climate Change) in 2015 and came into effect between December 2015 and July 2016.

As part of the approved Source Protection Plans, Halton Region and other municipalities are mandated to implement several Source Protection Plan policies to protect municipal drinking water sources using tools such as: Risk Management Plans negotiated with landowners; land use planning policies and development application review; education and outreach; and prohibitions on a small number of activities within close proximity to municipal drinking water supplies.

As noted in Report No. PW-02-21, more than 4,400 properties within Halton were initially identified to have potential drinking water threat activities based on the technical work that was completed by the three Source Protection Authorities in Halton. Through threat verification work (e.g., site visits), collaboration with Local Municipal staff, and ongoing implementation of Source Protection Plan policies, staff have confirmed that

approximately 98 per cent of the identified threat activities within Halton have been addressed. This has been achieved through the establishment of Risk Management Plans, education and outreach and confirmation that current activities on-site do not warrant the establishment of Risk Management Plans.

As of August 28, 2023, there are a total of 83 properties with significant drinking water threat activities remaining in the Lake Erie and the Credit Valley - Toronto and Region - Central Lake Ontario Source Protection regions that the Risk Management Official must address by establishing Risk Management Plans with the affected landowners.

Risk Management Plans document best management practices and risk management measures that landowners are required to implement to ensure that activities undertaken at the property cease to be significant drinking water threats. Landowners are invited to provide their input on the measures that will be required by the Risk Management Plans and in most cases Risk Management Plans do not require landowners to significantly alter their practices.

The majority of the properties identified are either located in Georgetown where winter salt application in parking lots constitutes a significant threat due to the potential increase to chloride concentration in groundwater, or in the agricultural areas north of Acton where the majority of identified threats are related to fertilizer and pesticide application.

The overall progress towards addressing the significant drinking water threat activities in Halton is summarized in Table 1 below.

Table #1: Status of Development of Risk Management Plans for Properties with Significant Drinking Water Threat Activities (as of August 28, 2023)

Source Protection Region	**Initial Number of Properties with Identified Threats (2015)**	**Estimated Number of Remaining Properties with Threats – To Be Addressed by Halton Region with Risk Management Plans)**
Credit Valley – Toronto and Region – Central Lake Ontario	4,392	81
Lake Erie	16	2
Halton-Hamilton	40	0
Total	4,448	83

Discussion

As noted in Report No. PW-02-21, staff have been working with landowners to negotiate and establish Risk Management Plans. Towards this objective, staff have been using outreach letters, phone calls, emails, and in-person visits to notify landowners of the Source Protection Plan policies that apply to their properties and activities, and to offer assistance towards establishing Risk Management Plans.

Additional resources were retained to expedite the establishment of the remaining Risk Management Plans through successful collaboration with affected landowners; however, in some cases, despite these outreach efforts, landowners remain hesitant to initiate discussions about a Risk Management Plan. Staff will continue outreach and discussion opportunities with landowners towards collaborative establishment of Risk Management Plans.

The deadline to establish Risk Management Plans in the Credit Valley – Toronto and Region – Central Lake Ontario Source Protection Region is anticipated to be extended by the Ministry of Environment, Conservation and Parks from December 31, 2023 to December 31, 2025; however, this will likely be the last extension of the deadline. The Credit Valley – Toronto and Region – Central Lake Ontario Source Protection Committee has directed Halton Region and other municipalities with Risk Management Plans yet to be established to submit a work plan outlining the steps and timing to complete the remaining Risk Management Plans.

The required work plan and forecast to completion, based on the 95 properties remaining at the time, was submitted to the Credit Valley – Toronto and Region – Central Lake Ontario Source Protection Region Source Protection Committee on June 30, 2023. The forecasted progress towards completing the establishment of Risk Management Plans is summarized in Table #2 below.

Table #2: Estimated Number of Risk Management Plans to be Established per Year to Meet Deadline of December 31, 2025

Year	**2023**	**2024**	**2025**
Estimated Number of Risk Management Plans to be Completed	25	30	40

Since the work plan was submitted, several of the identified properties have established Risk Management Plans, or additional information has been obtained through engagement with the landowner that has ruled out the need to establish a Risk Management Plan. For the remaining properties, staff will continue to assist landowners through outreach, education and negotiation to voluntarily establish Risk Management Plans.

Where repeated outreach efforts are not successful at establishing Risk Management Plans for identified properties, it is anticipated that staff will then need to rely on enforcement tools so that all of the required Risk Management Plans are established by the deadline. In collaboration with Legal Services staff, Notices will be issued to these landowners of the Risk Management Official's intent to establish a Risk Management Plan for their property but will still allow for a period of several months during which discussion and negotiations with the landowners can continue to occur. Where an Order from the Risk Management Official is required to establish a Risk Management Plan, staff will

monitor compliance through the annual inspection program and be available to answer any questions that landowners may continue to have. Initial use of Orders, when required, will begin in September/October 2023.

FINANCIAL/PROGRAM IMPLICATIONS

There are no financial impacts arising from this report. Costs associated with the establishment of Risk Management Plans for Source Water Protection are included in the rate-supported operating budget.

Respectfully submitted,

Lee Anne Jones
Director, Infrastructure Planning and Policy

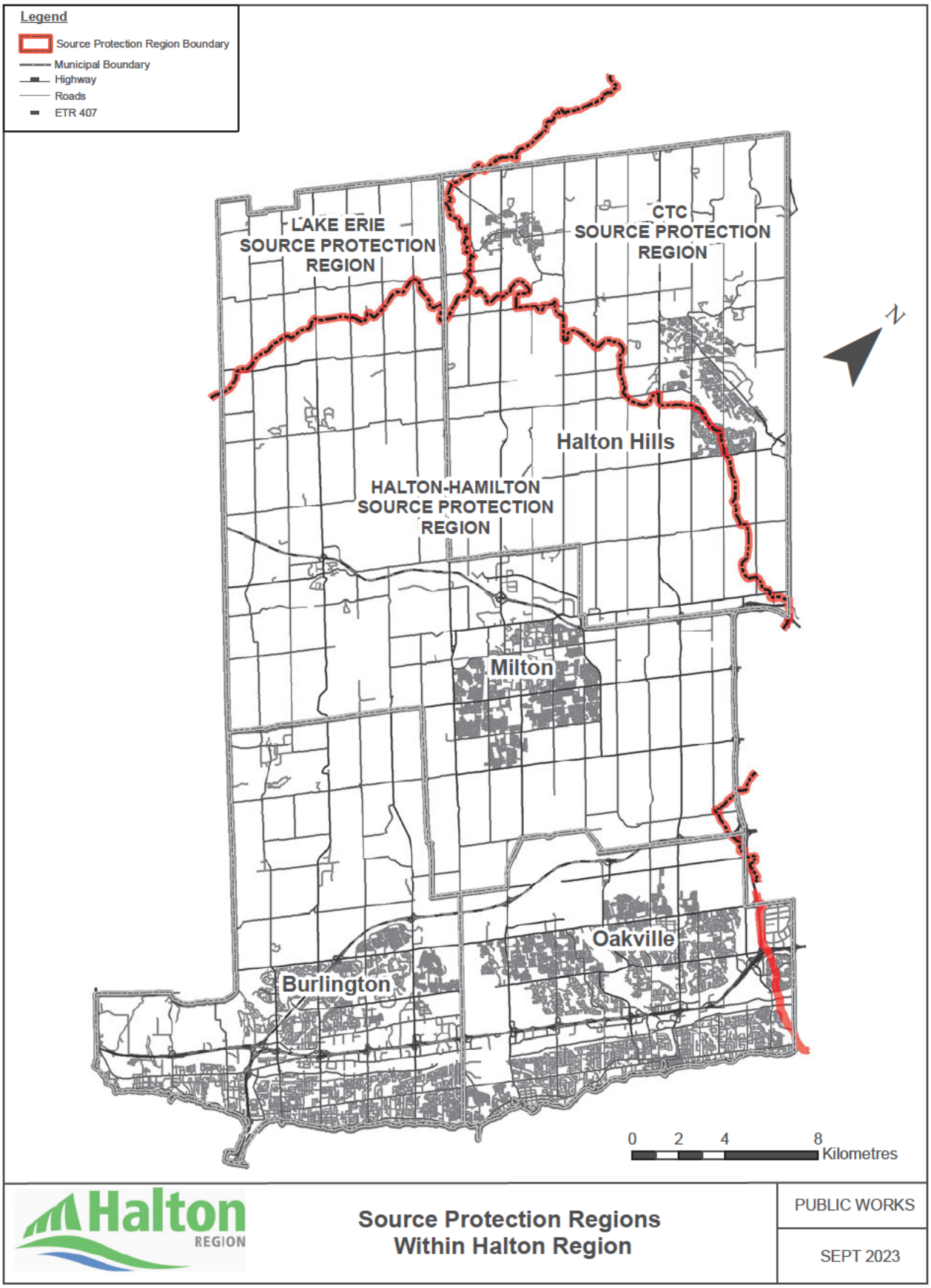
Andrew Farr
Commissioner, Public Works

Approved by

Jane MacCaskill
Chief Administrative Officer

If you have any questions on the content of this report, please contact: Lee Anne Jones Tel. # 7547

Attachments: Attachment #1 – Map of Source Protection Regions within Halton Region



Halton REGION

Source Protection Regions Within Halton Region

PUBLIC WORKS

SEPT 2023

Ministry of the Environment, Conservation and Parks
Conservation and Source Protection Branch
14th Floor
40 St. Clair Ave. West
Toronto ON M4V 1M2

Ministère de l'Environnement, de la Protection de la nature et des Parcs
Direction de la protection de la nature et des sources
14e étage
40, avenue St. Clair Ouest
Toronto (Ontario) M4V 1M2

Ontario

November 21, 2023

Behnam Doulatyari
Program Manager
CTC Source Protection Region

Re: Request for Extension of Policy Implementation Timelines Related to Section 58 Risk Management Plans, CTC Source Protection Plan

Dear Behnam,

I am writing in response to your request for an extension to the timeline for implementing a source protection plan policy relating to various activities designated as requiring a risk management plan (RMP) under section 58 of the *Clean Water Act, 2006* in the CTC Source Protection Region.

In June 2020, the source protection authority requested a 3-year extension of this deadline to December 31, 2023 which was granted with a requirement for annual updates on the progress of implementation of municipal workplans for risk management plan policy implementation. Your letter indicates that three municipalities (Halton Region, the Town of Orangeville and Town of Erin) are requesting a further extension in order to establish the remaining risk management plans as required by the CTC source protection plan. We understand that risk management officials in the remaining municipalities have made some progress, however, there were challenges to negotiating and establishing all RMPs including public health restrictions imposed to manage the COVID-19 pandemic.

Policy #T-6 in the CTC Source Protection Plan set out a timeline of 5 years (i.e., December 31, 2020 originally, extended to December 31, 2023) for the establishment of RMPs for designated existing threat activities. Section 58 of the *Clean Water Act, 2006* (CWA) provides that the prohibition on engaging in designated activities (that were engaged in immediately before the source protection plan took effect) without an RMP does not apply until on or after the date specified by the source protection plan, if any. This essentially allows for a source protection plan to create a "grace period" for persons to continue engaging in activities that were engaged in *prior* to the source protection plan taking effect in December 2015 (i.e., defined as "existing" activities in the source protection plan) without an RMP. It is an offence under section 106 of the CWA for "existing" activities to be engaged in without an RMP after the "grace period" has passed.

The source protection authority has proposed a new policy implementation deadline of December 31, 2025 to complete the risk management plans that may be required in policies ASM-, ASM-4, NASM-1, FER-2, FER-3, PES-1, SAL-1, SAL-2, SAL-7, SNO-1, FUEL-3, DNAP-1, OS-1, LIV-1, LIV-3. In consideration of the challenges outlined in your

letter, the mitigation strategies offered including your ongoing work with and support of local RMOs and the hiring of additional staffing resources at the municipal level, and considering the ministry's desire for the source protection authority to continue to work with their municipalities to have these RMPs finalized to manage existing significant drinking water threats, I hereby grant an extension to **December 31, 2025**. The Ministry is keenly interested in the successful implementation of source protection plan policies and the protection of drinking water sources. As such, with this extension approval I ask that you provide an update to the Ministry every six months, beginning in April 2024, on the progress of implementation of the remaining RMPs in the CTC Source Protection Region.

I acknowledge the significant work you are doing with the affected municipalities to implement source protection plan policies. I appreciate you identifying the remaining activities that require a risk management plan and prioritizing them for completion. I encourage you to continue working with the ministry to address any questions or issues with this approach, as well as Halton Region, the Town of Orangeville and the Town of Erin to ensure supports are in place to complete the remaining outstanding risk management plans. All other requirements of the CWA and Ontario Regulation 287/07 continue to apply.

When you next move forward with amendments or an update to your source protection plan, it is recommended you include revisions to the text of policy #T-6 to reflect the extended policy timelines. Until that time, you may wish to include a note for readers about the extended policy timeline.

If you have any questions, please don't hesitate to contact me.

Sincerely,

[redacted]

Jennifer McKay
Manager, Source Protection Section, Conservation and Source Protection Branch

c: Karen Ras, Chair, Credit Valley Source Protection Authority
Bob Chapman, Chair, Central Lake Ontario Source Protection Authority
Jennifer Innis, Chair, Toronto and Region Source Protection Authority
Nathan Hyde, Chair, CTC Source Protection Committee
Kirsten Service, Director, Conservation and Source Protection Branch

[redacted]

14 Nov 2023

The Honorable Andrea Khanjin
Minister of the Environment, Conservation and Parks
College Park 5th Floor 777 Bay Street
Toronto ON
M7A 2J3

Dear Minister Khanjin

Letter of Resignation

It is with mixed feelings but with pride in my advocation for save drinking water sources that I announce my resignation as Chair of the Quinte Area Source Protection Committee (SPC), effective the naming of a new chair or 31 March 2024 which ever is sooner.

With your indulgence I wish to take a few moments of your time to offer some thoughts for your consideration.

Throughout my tenure as Chair of the Quinte Area SPC I advocated for Source Water Protection for all publicly accessed drinking water sources in Ontario, not just those included in the Clean Water Act (CWA). These included those municipal systems in the North and those that are not municipal water systems suppling water to the public – this being inline with the recommendations of Justice O'Connor in Part II Chapter 4 of his Inquiry report. Examples of neglected source water systems include systems suppling water to vulnerable populations such as students in rural schools, residents at rural Long Term Care Centres (LTCs) and rural systems serving the public such as community centres. (In my area there are school children attending rural elementary schools where source water is not regulated but when they are bussed to high schools their source water is protected.) It is recognized that the province has developed Best Practices Guidance outside of the CWA for voluntary source water protection. While of little chance of these measures will be as effective as that would be if imposed under the CWA, I embraced the guidance as it was better than a do nothing approach but I see little outward enthusiasm by MECP in promoting this guidance. In my advocation of these matters I have argued that if the assessment protocols used in the Best Practices were applied to smaller systems under the CWA that a common approach to source protection would be applied province wide and at much lower implementation and operational costs to the tax payer.

It was my intent to remain as Chair until the second iteration of our area's Source Protection Plan was completed and I looked forward to advocating for the Best Practices Guidance. At this time the second iteration of the Quinte Area SPP is now essentially completed. Further I see little hope that northern municipal and other rural water systems will be subject to the CWA and the voluntary Best Practices Guidance will not effectively protect source water to the public in rural areas. This advocation for safe drinking water sources will be better served by a newly energized chair to take a leadership role in

source water protection in the province and more importantly in the Quinte Area. For these reasons I tender my resignation as Chair of the Quinte Area SPC and leave with the satisfaction that my involvement in water supply In Ontario over three decades has benefitted Ontario and particularly those served with municipal water supply systems in the Eastern Ontario.

I trust that with time the province will recognize that it has chosen to ignore the risks to the public health posed by unregulated source water available to the public in rural and Northern Ontario and will then provide for source water protection to all systems providing drinking water for the public. I note that there was a commitment by senior ministry officials, including one minister, that recognized this need and that chairs were informed that the CWA would be amended to include all water supply sources supping water to the public. Such has not been forthcoming and as such the concept of a multiple barrier approach to providing safe drinking water to the entire Ontario public, as recommended by Justice O'Connor, remains outstanding.

I also trust that my replacement will be named in a timely manner. And further that the protocol used in the initial chair appointments be followed, that being consideration of three nominees submitted by the local SPA , each nominee with an understanding of the sciences involved and recognised local leadership in a public settings.

At this time, I want to recognize that my committee and the Quinte Area Source Protection Authority (SPA) staff were most helpful in our success as a SPC. I truly am proud of our accomplishments to date. They, no doubt, will continue to advocate for the protection of drinking water sources in the Quinte Area.

I shall remain interested in advocating for the provision of safe drinking water as an Ontario citizen.

Your consideration of this letter of resignation and of the comments included in this letter is appreciated.

Yours truly

[redacted]

M.G. (Max) Christie, M.Eng, P.Eng (Retired)

Chair, Quinte Area Source Protection Committee

cc (via email)
- Director, Conservation and Source Protection Branch
- Chair, Quinte Area SPA
- Quinte SPC members
- SPC Chairs