Aqua Insight

GeoCentric ENVIRONMENTAL INC

WHPA Delineation and Source Water Protection Plan for Beachburg and Haley Townsite

The Corporation of the Township of Whitewater Region

February 2023

Scope and Objectives

- The primary objectives for this project were to assess and protect the sources of groundwater for all municipal wells in Beachburg and Haley Townsite

- Key objectives were to undertake technical studies to:

  - 1: **Delineate the sources of water** for the municipal water supply wells (WHPAs) in the Beachburg and Haley Townsite areas;

  - 2: **Identify the vulnerability of susceptibility of the municipal supply aquifers to surficial sources of contamination**, and c) identify potential sources of contamination (i.e., water quality threats) within the Source Protection areas (WHPAs).

  - 3: **Develop a Source Water Protection Plan** based on the outcomes of objectives 1 and 2

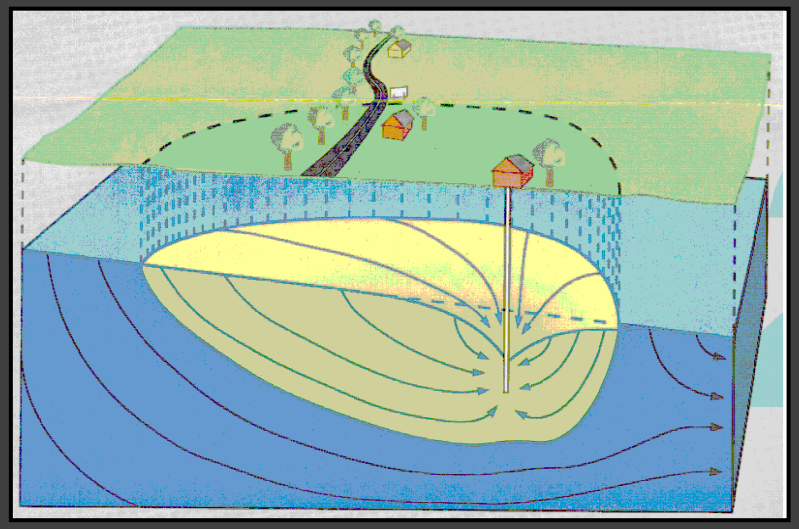
  - The plan included and evaluation management measures to protect water quality, such as bylaws and septic system inspections, road salt management plans

Overall Approach

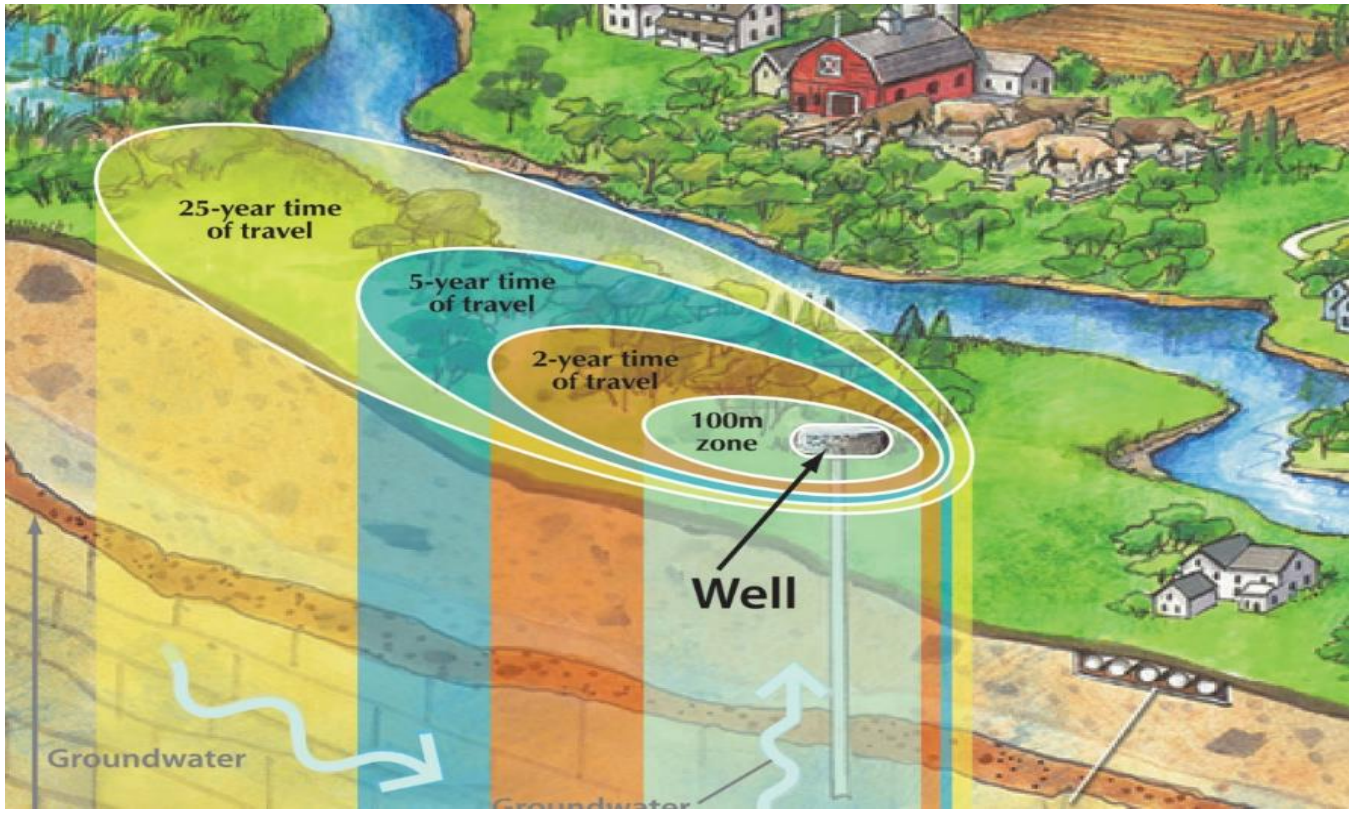
- WHPA Delineation
- Drinking Water Threats Identification
- Protection Plan Framework & Risk Management

Figure 1: Source Protection Program Components

Hydrogeology and Definitions



Delineation of the Source of Water for a Groundwater Well



Travel Times: Source of Water for a Groundwater Well

Phase 1: WHPA Delineation, Groundwater Vulnerability and Water Quality Threats Assessment

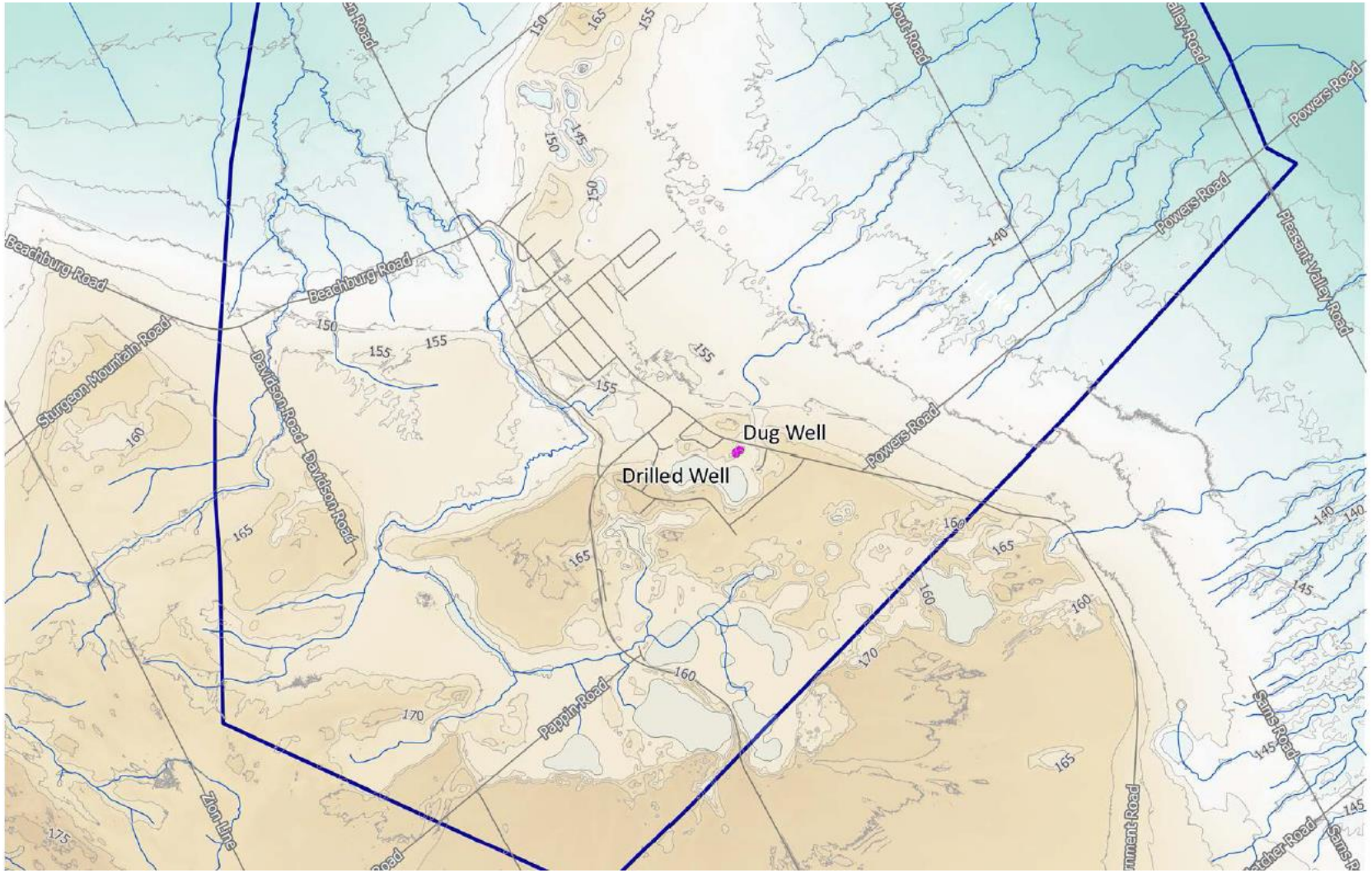
The following steps were undertaken to complete this work:

- Assemble available hydrogeologic data in the study areas and develop a Conceptual Model of the hydrostratigraphic layers and properties, and the areas contributing flow towards the water supply wells.
- Create two three-dimensional numerical groundwater flow models that align with the Conceptual Model and calibrate those models to available water level data.
- Apply the calibrated groundwater flow models to delineate time of travel capture zones and WHPAs for the four municipal wells.
- Evaluate the groundwater vulnerability of the municipal supply wells.
- Identify the potential water quality threats or activities within the WHPAs.

Beachburg Wells

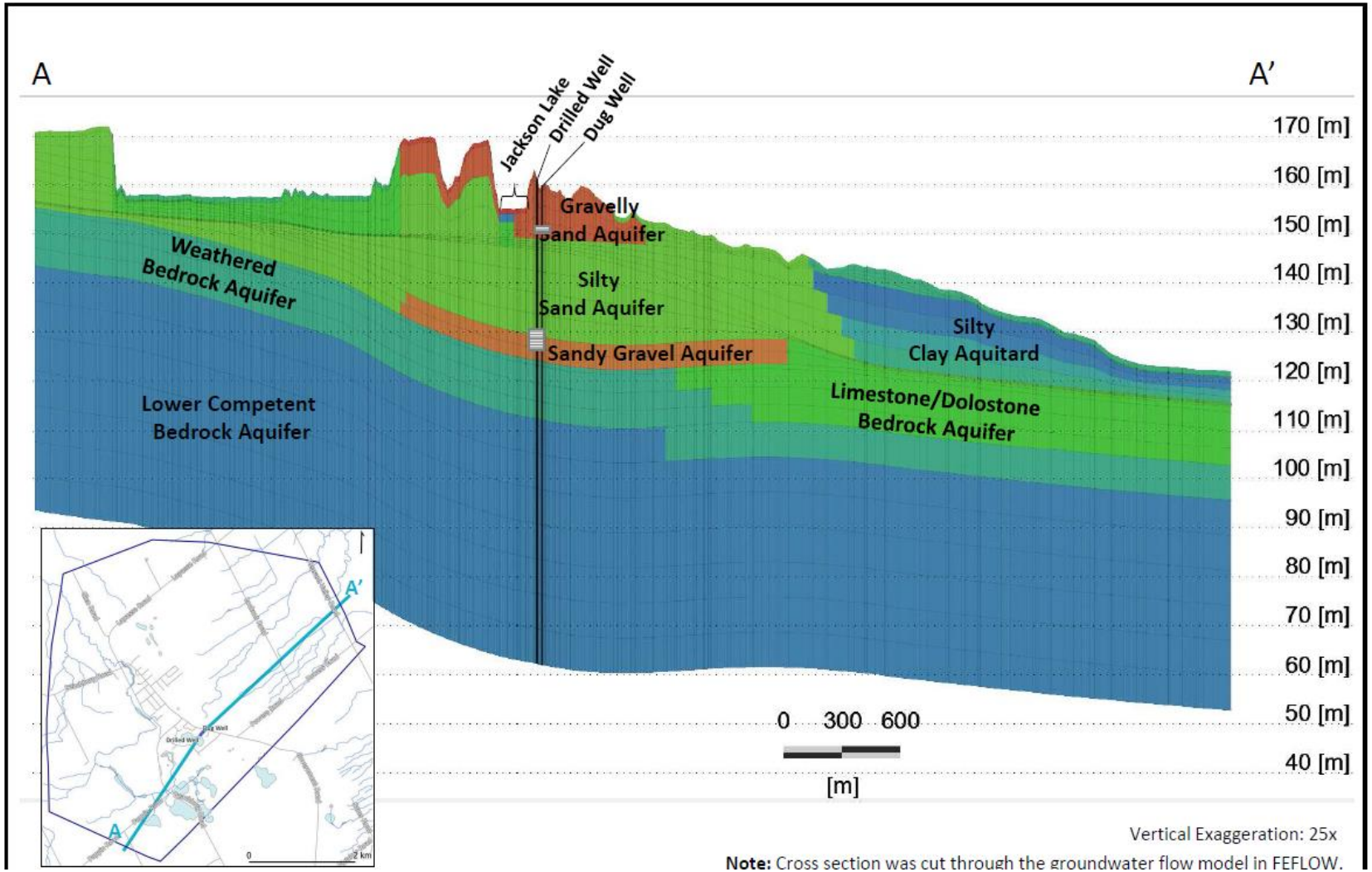
- Drinking water for the community of Beachburg is supplied by two municipal wells that are located northeast of Jackson Lake, on the south side of Robertson Drive. One of the municipal wells is a 7.6 m deep Dug Well that has a diameter of 3.6 m and lies within a building on the south side of the water treatment plant. The Dug Well installation date is unknown; however, it is reported that upgrades were made throughout the 1980s and 1990s
- The second Beachburg municipal water supply well is a 30.5 m deep Drilled Well (water well record [WWR] 5510412), also located south of the water treatment plant near the treeline approximately 60 m from Jackson Lake. The Drilled Well was drilled in 1991.
- The Drilled and Dug wells are pumped alternatively, with an interlock device that ensures only one well can pump at a time (OCWA, 2021a).

Beachburg Wells



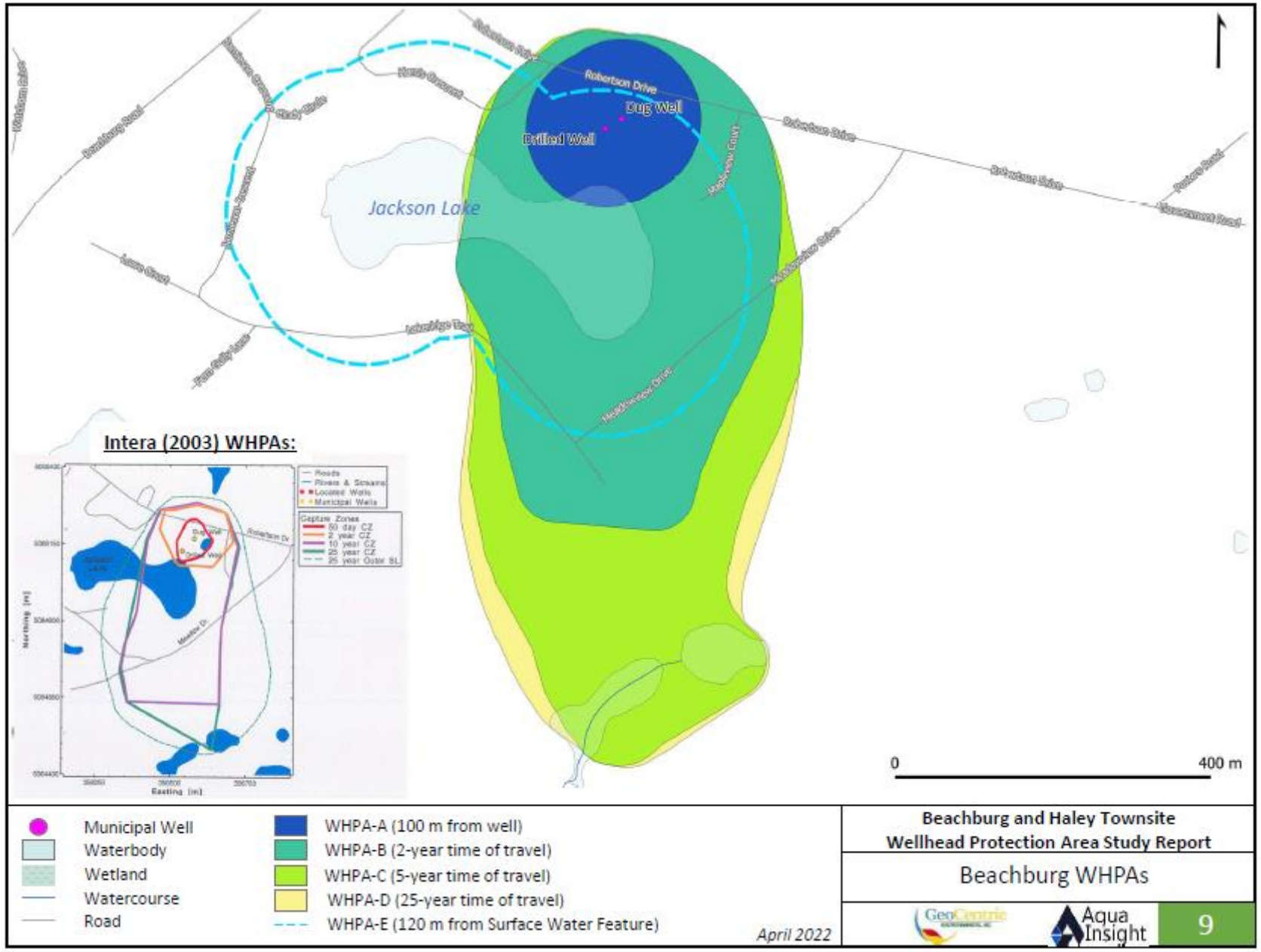
Hydrogeological Setting

Beachburg



WHPA Outcomes

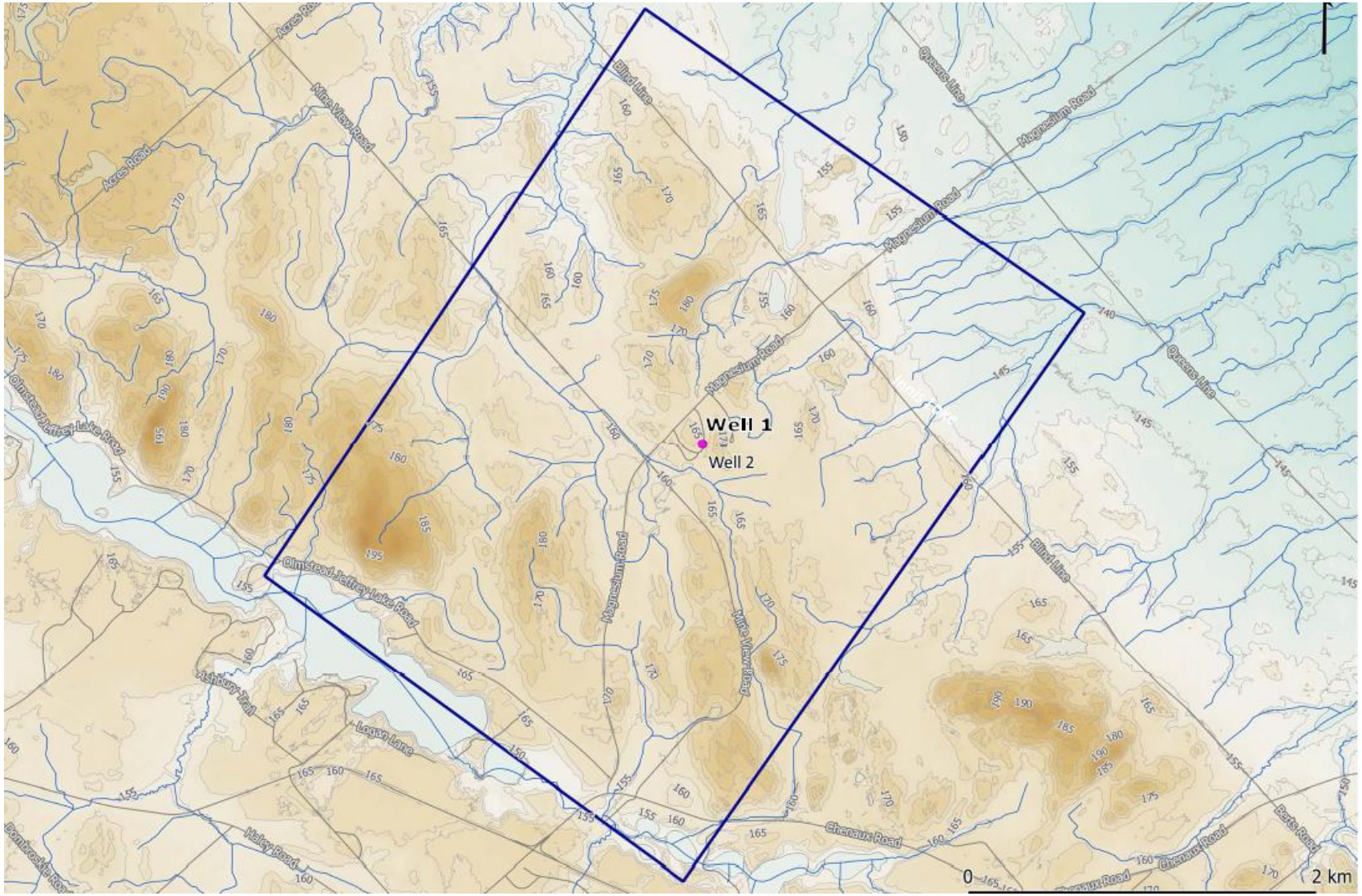
Beachburg



Haley Townsite Wells

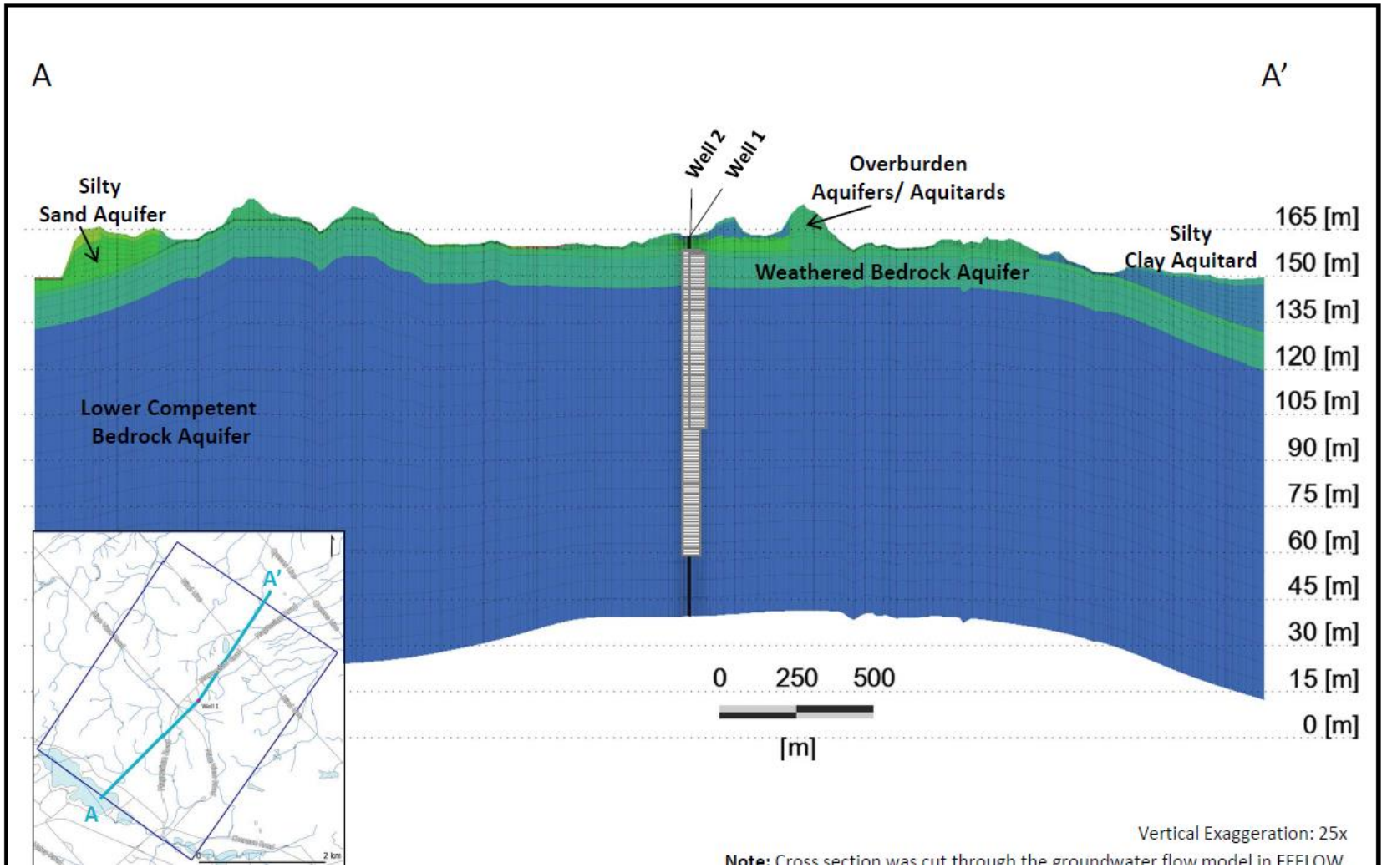
- Haley Townsite is serviced by two municipal wells that are located less than 10 m from one another on the Heather Place residential road.
- The municipal wells are referred to as Well 1 and Well 2 are both open hole bedrock wells. Well 1 (WWR 5516401) was completed to a depth of 61 metres below ground surface (m bgs) in 2005, and Well 2 (WWR 7040897) was completed to a depth of 103 m bgs in 2006.
- The Inspection Report (MECP, 2022a) states that Well 2 may be under the direct influence of surface water with adequate in-situ filtration.

Haley Townsite Wells



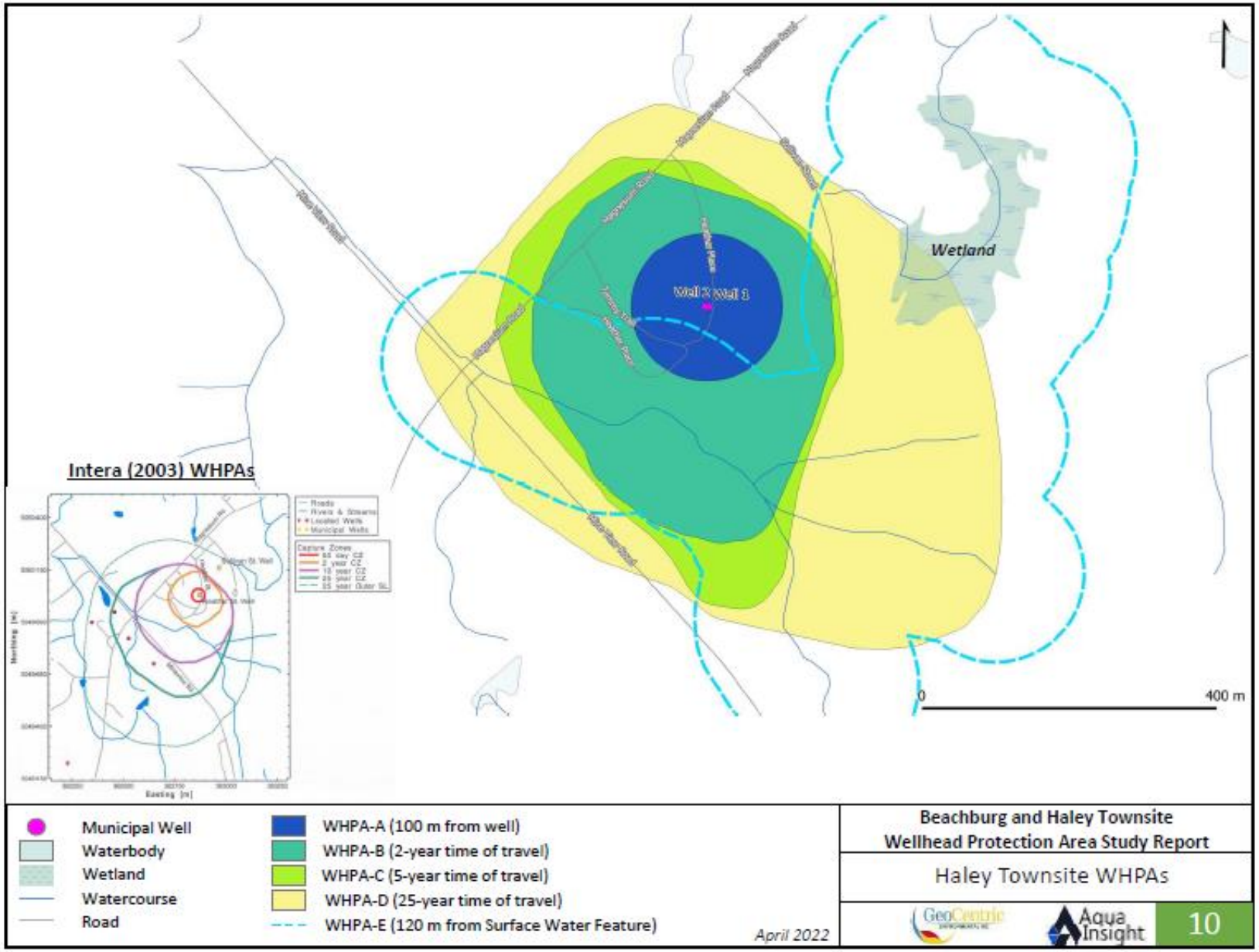
Hydrogeological Setting

Haley Townsite



WHPA Outcomes

Haley Townsite



Drinking Water Threat Assessment

There are two types of drinking water threats, ones that impact the quantity of the municipal drinking water supply well(s), and ones that impact the quality of the municipal drinking water supply.

In the Beachburg and Haley Townsite area, the current and future municipal water demands are far lower than the permitted rates so long-term water quantity from the existing municipal aquifers are not a concern.

As such, the focus of this project was on characterizing and identifying water quality threats and not water quantity threats.

List of Drinking Water Threats

Drinking water quality threats are defined as activities that may pose a risk to the municipal drinking water quality. The Province of Ontario (MECP, 2021) lists the following twenty drinking water quality threat activities Sewage systems – their establishment, operation, or maintenance (including Septic Systems)

- Septic systems
- Snow and Road salt: application, handling and storage
- Fuel: handling and storage
- Chemicals or organic solvent: handling and storage, and if/when used for de-icing: managing the runoff
- Waste disposal sites: establishing, operating and maintaining. Those sites are defined as both receivers and generators of waste
- Agricultural Practices: agricultural source material or commercial fertilizers (application to land, storage, management)
- Non-agricultural source material: application, handling and storage
- Land Associated with livestock: use of grazing, pasturing, confinement
- Fertilizer and pesticides: application, handing and storage
- Other Permitted practices

Threats are then categorized as significant, moderate, and low drinking water quality threats depending on the type of threat, and the vulnerability score, which is a combination of the vulnerability of the aquifer and the WHPA zone.

Threat Summary

In the case of Beachburg and Haley Townsite, the operation and the maintenance of the local residential septic system, is one of the most important water quality threats, identified in the delineated WHPA areas.

The application of road salt was identified as Moderate drinking water threat.

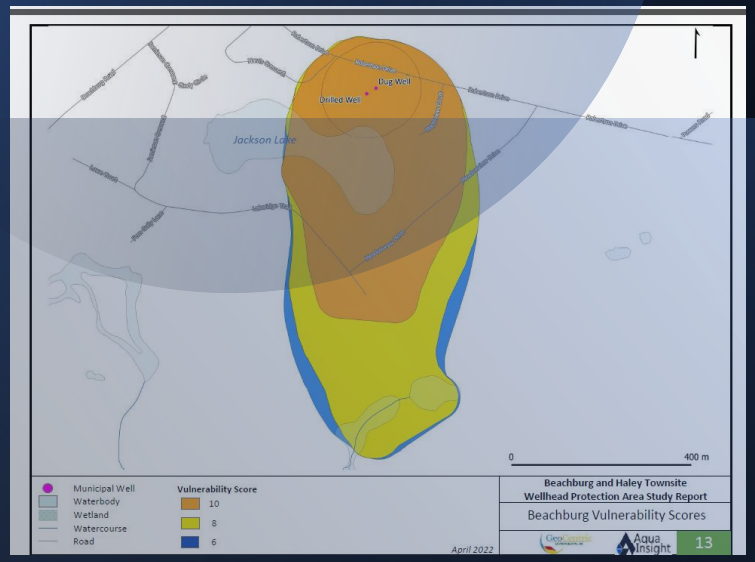
Septic systems are assumed to be used at all rural residential lots in both Beachburg and Haley Townsite. Septic systems that are not properly maintained and/or older can contribute to pathogen and chemical contamination in groundwater aquifers.

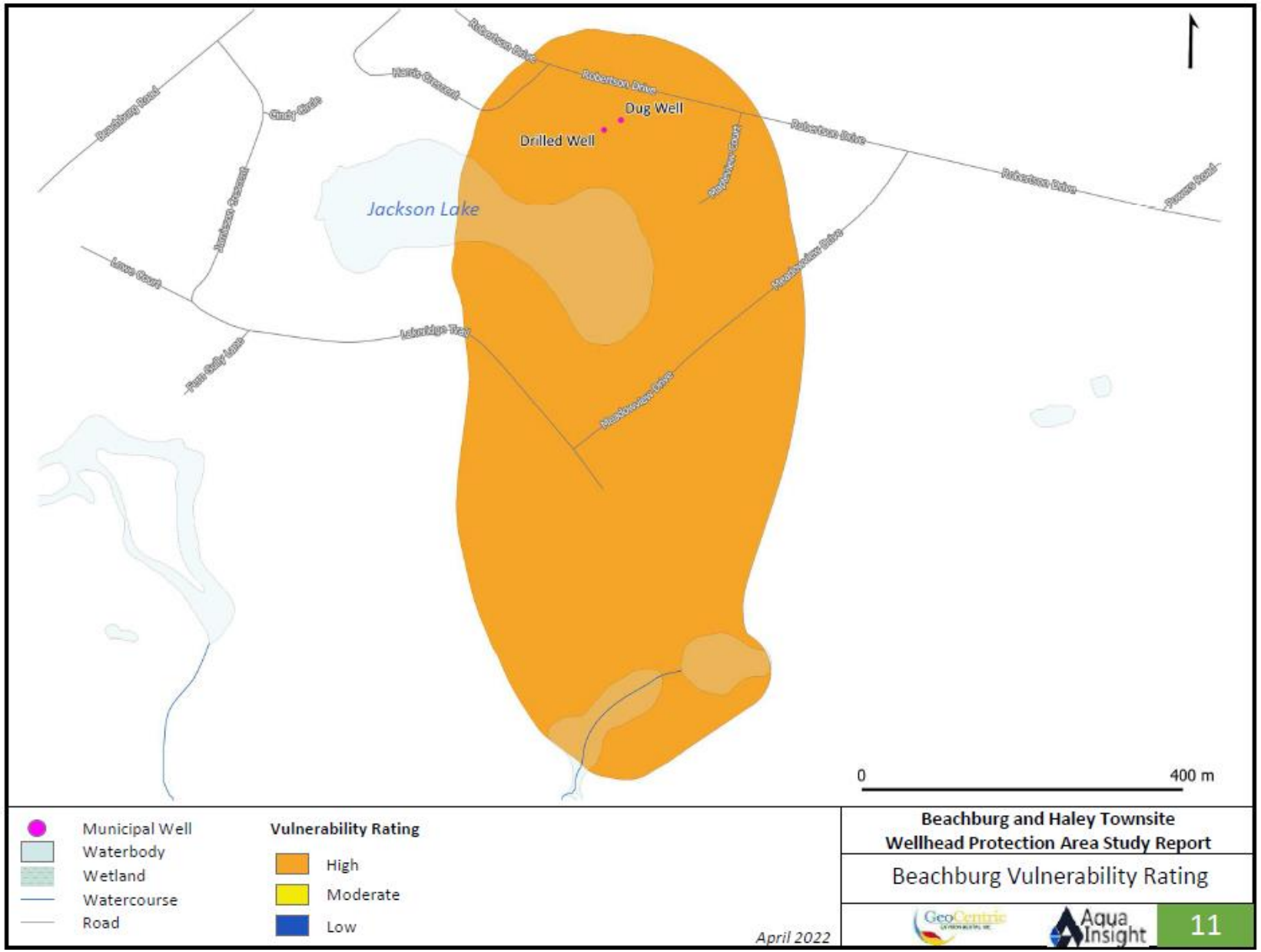
There are elevated levels of E. coli and total coliforms present in the raw water quality samples collected at both Beachburg and Haley Townsite water supply wells, and the source of the E. Coli and total coliforms are interpreted to be derived from septic systems located within the WHPA-A and -B.

All other threats were deemed to be low risk.

Threat Scoring

Beachburg

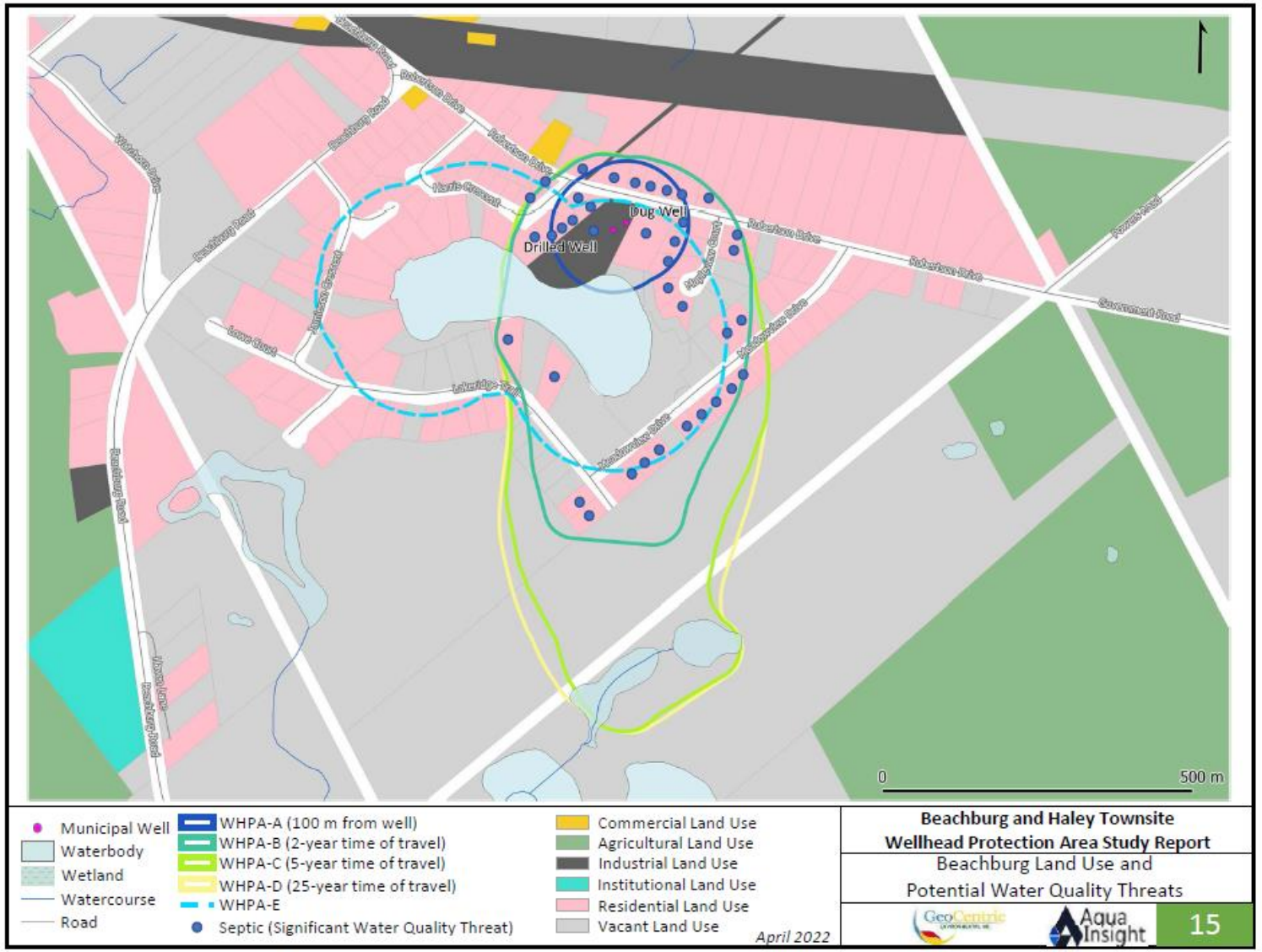




Beachburg Threat Summary

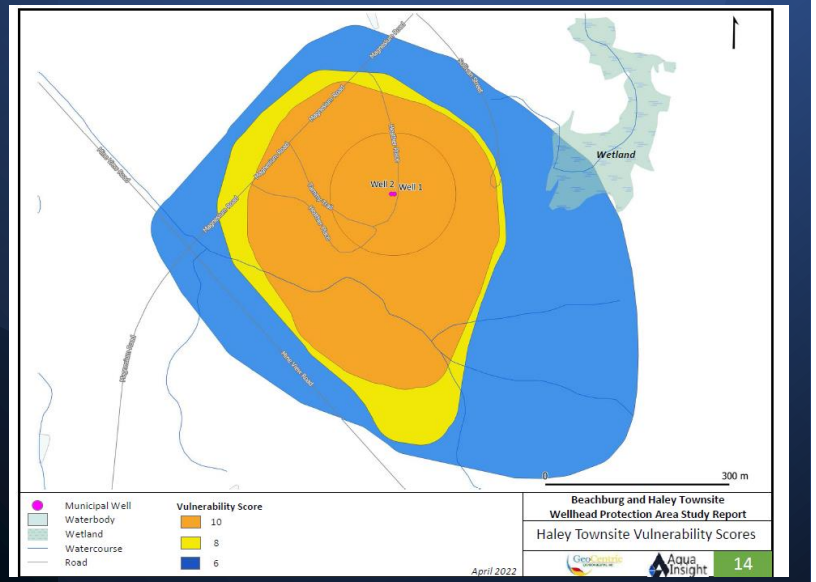
A total of 33 Significant Drinking Water Threats (i.e., septic systems)

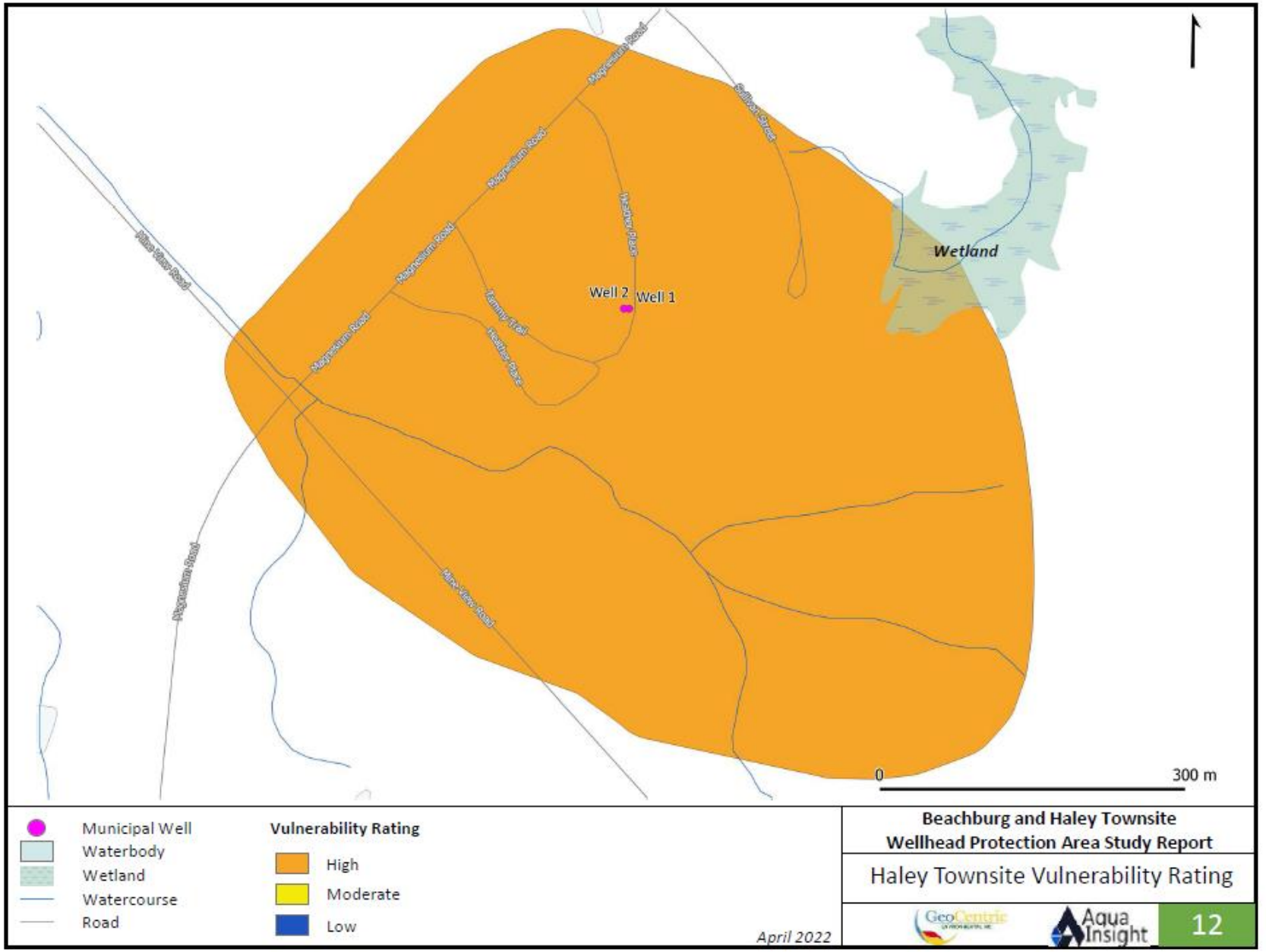
Fifteen septic systems are located in the WHPA-A (100 m from the municipal well) and an additional eighteen septic systems are located in the WHPA-B, and all of these are classified as Significant Water Quality Threats.



Threat Scoring

Haley Townsite

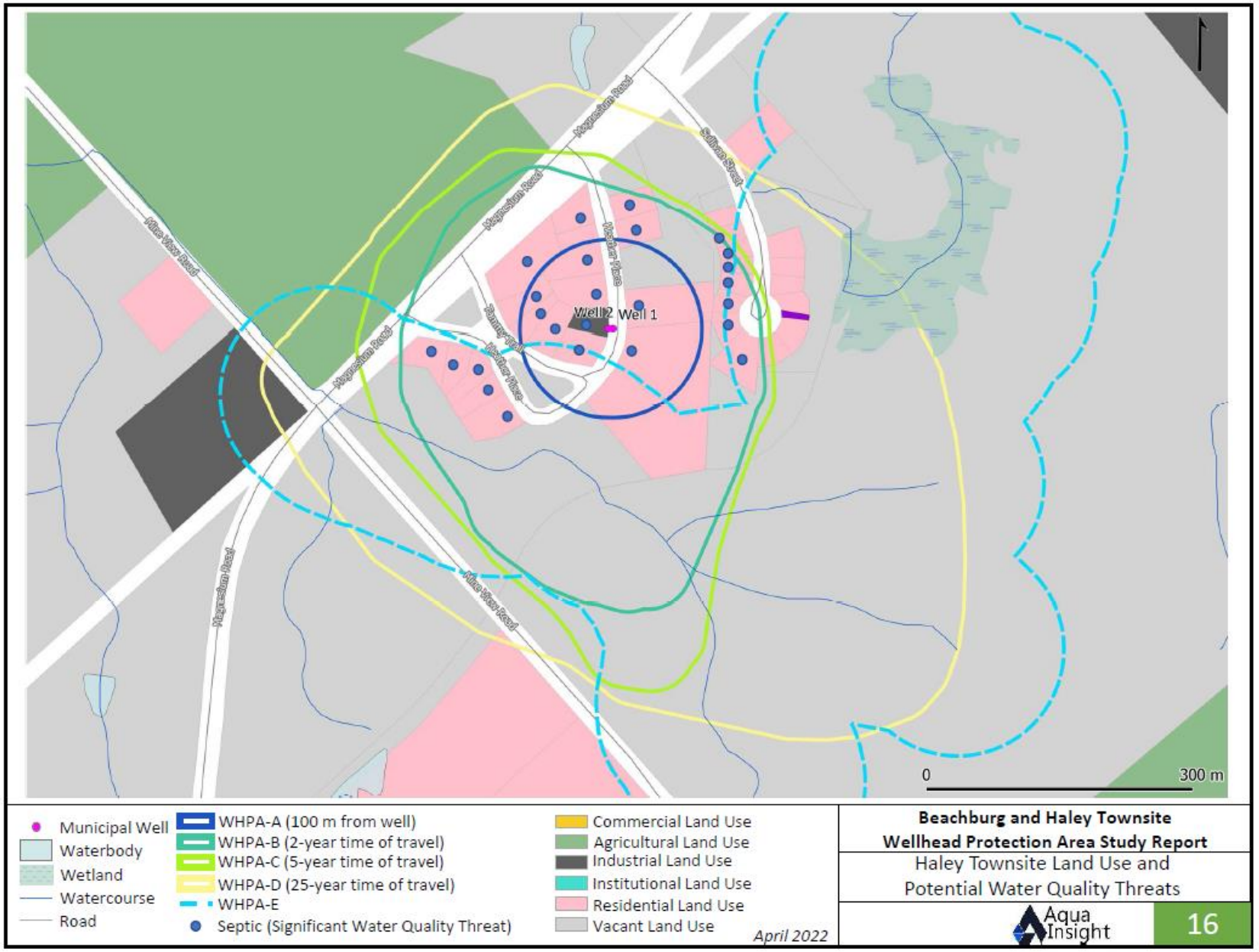




Haley Threat Summary

At total of 25 Significant Drinking Water Threats (i.e., septic systems) were Haley Townsite WHPAs.

Nine septic systems are located in the WHPA-A and sixteen in the WHPA-B, and all of these are classified as Significant Water Quality Threats, while septic systems in the WHPA-C or -D areas are considered Moderate Water Quality Threats.



Phase 2: Source Water Protection Plan

Establishment of Source Protection Policy Areas

- Source protection policies should be applied based on the presence of Significant drinking water threats delineated within the WHPA-A to -E zones.

Risk Management- Land Uses and Contaminant Source Protection

- risk management measures are recommended to be drafted and implemented for the Significant drinking water threats located within the WHPA zones, based on land use activity and contaminant source that may impact the groundwater sources.

Septic Systems

- Septic systems are identified as Significant Water Quality Threats where they lie within WHPA zones with vulnerability scores of 8 or 10.

- Possible leaks from sewage/septic systems could contaminate drinking water sources; therefore, to manage the risk, prevention of such spills is necessary.

- The existing septic systems in the WHPA-A and WHPA-B in both Beachburg and Haley Townsite, are significant drinking water threats; however, given they fall on private properties, the exact locations of those septic tanks are not known.

Sewage/Septic systems	Risk Management Plan Summary
	• Locate the septic system and leaching bed • Ensure septic systems are pumped periodically (3-5 years) • Regularly inspect the system to prevent problems and keep record of septic maintenance • Divert surface water away from the leaching bed • Replace inefficient toilets • If a private septic tank is located near a municipal well, inspectors from the municipality may ensure the integrity of the septic system • Set guidelines on best practices of using septic systems e.g., not to pour cooking oil, hazardous chemicals or pharmaceuticals down the drain • Avoid planting tress and shrubs near the tank and leaching bed

Salt and Snow Storage and Management

Road salt or snow pile accumulation are also sources of infiltrated contamination into the groundwater is not managed properly to prevent any leak/seepage into the aquifers

A Road Salt Management Plan documents what a municipality currently does for winter maintenance and identifies affordable actions they can take to improve their management of road salt.

The handling and storage of road salt is a significant threat if it is stored in a manner that may result in exposure to precipitation or runoff (Drinking Water Source Protection, 2022).

Salt	Risk Management Plan Summary

Salt	• Application:
	  ○ delivering the right amount of road salts in the right place at the right time
	  ○ training personnel and monitoring the effectiveness of salt application technique, and encourage smart salt practices for municipally owned parking lots, sidewalks and other public facilities
	  ○ benchmarking spreader routes, calibrating existing equipment, establishing/reviewing level of service policies and tracking material usage
	  ○ Implementation a Road Salt Management Plan for these areas in accordance with Environment Canada's Code of Practice for the Environmental Management of Road Salts

Other Risk Management Plans

Fuels, Fertilizers and Pesticides

Develop risk management plan to reduce the risk to source water using the existing procedures and introducing new ones.

Transporting hazardous material

Ensure that municipalities are prepared for emergencies and spills within the vulnerable areas and have up-to-date procedures and information.

Prohibited land use

Ensure that specific land uses never become established in areas where the associated activities would be significant drinking water threats.

Low Impact Development

Encourage municipalities to incorporate low impact development into new/expanding developments to reduce impervious surfaces, maintain natural recharge and maximize infiltration of clean water prior to collection in a stormwater management facility.

Plan Education and Outreach

- The overall goal of the Source Water Protection Plan Education is to provide local end users with the information necessary for them to consider how to proactively protect the sources of drinking water for these areas, to consider protecting these sources for the long term where a municipal drinking water supply may be required in the future, and to manage activities that would pose a threat to the quality of the public groundwater sources.

- The community education and outreach could benefit from a number of different initiatives, including but not limited to:

    1. Outreach with local Stakeholders
    2. Groundwater Protection Information Announcements; and
    3. Source Water Protection Road Signs

Recommendations

Data Management: It is recommended that Whitewater Region assemble the historic and current data to evaluate if there are any increasing trends in the water quality data, such as nitrate, sodium, and chloride that Whitewater Region may wish to address via risk management measures or best management practices before they become water quality issues.

Hydrogeological Investigations: A total of 33 and 25 Significant Drinking Water Threats (i.e., septic systems) were identified in Beachburg and Haley Townsite, respectively. These septic systems should be prioritized as the water quality threats of greatest concern. A hydrogeological assessment should be completed to further prioritize the septic systems that may be having the greatest impact on the water quality at the drinking water wells.

Future Refinements: Refinements to the understanding of hydrogeological settings may result in modifications to the predicted WHPAs. Whitewater Region should update the WHPAs as they collect additional data, refine the understanding of the subsurface geology and hydrogeology, or change the operation of the wells or pumping rates in the future.