

Phase 2 Report (FINAL)
**Township of South Frontenac Verona Housing Water and Wastewater
Master Plan**

June 27, 2024

Prepared for:

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JLR No.: 32106-001

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Township of South Frontenac Verona Housing Water and Wastewater
Master Plan

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1.0 Introduction

1.1 Background

The County of Frontenac (County) Communal Services Study (2019) equips the County and its member municipalities, which includes the Township of South Frontenac (Township), with the planning, engineering, and economic development tools to facilitate new development, infill, intensification, and redevelopment opportunities using communal services.

The Communal Services Study builds on Provincial, County, and local land use policies which support communal servicing considering (a) the practical and fiscal challenges of providing or expanding municipal water and wastewater services in certain areas; and (b) the incapacity of private on-site services to enable higher forms of density, more efficient land uses and the development of complete communities.

In early 2020, the Township acquired two parcels of land in the Village of Verona with frontage on Verona Street, for the purposes of facilitating a mixed-housing development project. The Village is a historic settlement dating back to the mid-19th Century and does not have municipal water and wastewater services. Given the location, size, and potential scale of the development project, Township Council supported the creation of a Master Plan for the affected lands in 2021. This strategic direction culminated in the Verona Housing Master Plan (VHMP) which was endorsed by Township Council in 2022.

The VHMP outlines a planning and design framework for the affected lands with goals to ensure compatibility with surrounding uses and consider opportunities for connections between new housing, the downtown, and various public amenities. The VHMP also envisions an infrastructure servicing strategy for the development project that focuses on municipal communal water and wastewater services.

In further support of the VHMP, the Township retained J.L. Richards & Associates Limited in 2022 to undertake the Verona Housing Water and Wastewater Servicing Master Plan (Master Plan) in accordance with Approach 1 of the Municipal Engineers Association (MEA) Class Environmental Assessment (Class EA).

The intent of the Master Plan is to evaluate various municipal water and wastewater infrastructure options to ensure the preferred solution(s) can be relied upon to service the development project within the broader Village context.

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1.2 Phase 2 Report Objectives

The objective of this Master Plan is to identify the preferred servicing alternative for the Verona Housing project. Phase 2 is the second stage of a Master Plan. The purpose of the Phase 2 Report is to identify and evaluate alternative servicing solutions to determine a preferred solution to the Problem/Opportunity Statement determined in Phase 1. The feasible water and wastewater servicing solution(s) will be carried forward for further detailed analysis in the subsequent Schedule 'B' or 'C' Class EAs.

Specifically, the Phase 2 Report has been prepared to address the following key aspects:

- To conduct supporting studies (including desktop review of natural heritage, built heritage, and archaeology).
- To identify servicing constraints.
- To confirm future water and wastewater demands.
- To consult with stakeholder agencies to understand regulatory constraints.
- To evaluate high-level water/wastewater servicing options.
- To recommend a preferred servicing solution.
- To consult public and stakeholder agencies on the proposed recommendations.

1.3 Phase 1 Problem/Opportunity Statement

The Problem/Opportunity Statement developed for the Verona Housing Water and Wastewater Master Plan in Phase 1 is as follows:

The Township of South Frontenac plans to develop two municipally owned land parcels in the Village of Verona for mixed housing use. There are currently no municipal water and wastewater services in the Village, and existing services are provided through private wells and septic beds. The Township is developing an approach to the municipal water and wastewater services to allow the proposed development to move forward. In developing the preferred servicing solution, there is an opportunity to consider impacts to neighbouring properties, impacts to natural and social environments, infrastructure spending, operation and maintenance effort, climate change, and growth opportunities.

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2.0 Natural Heritage

2.1 Overview

JLR retained Cambium Inc. to conduct a desktop natural heritage study for the site. This study reviewed various provincial, municipal, and other online resources in the legislative context described in the report attached in Appendix A. This section summarizes Cambium’s Natural Heritage Desktop Review Memo, dated July 10, 2023. This project is not subject to the Oak Ridges Moraine Conservation Plan, Greenbelt Plan, or the Lake Simcoe Protection Plan.

2.2 Natural Heritage Features

The report finds that the site is located adjacent to (i.e., within 120 metres of) the unevaluated wetland, Verona Lake, and Vanluven Lake within the Quinte Conservation Authority’s (QCA) jurisdiction, as depicted in Figure 1

2.3 Species at Risk and Conservation Concern

Cambium’s desktop study identified species at risk (SAR) that could be in or near the site. They are summarized in Table 1.

Table 1: Species at Risk and Conservation Concern (Cambium)

Status	Species Identified
Endangered	<ul style="list-style-type: none"> • Black Ash • Red-headed Woodpecker
Threatened	<ul style="list-style-type: none"> • Gray Rat Snake • Eastern Meadowlark • Bobolink • Chimney Swift • Blanding’s Turtle • Eastern Whip-poor-will • Chimney Swift • Least Bittern • Short-eared Owl
Special Concern	<ul style="list-style-type: none"> • Wood Thrush • Eastern Wood-pewee • Snapping Turtle • Eastern Musk Turtle • Golden-winged Warbler • Canada Warbler • Common Nighthawk • Black Tern • Bald eagle • Peregrine Falcon • Five-lined skunk • Eastern Ribbon Snake

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It is recommended that targeted field surveys be completed to determine what SAR and SAR habitat are present in or near the site, after wetland boundaries have been delineated. A Blanding's Turtle and Gray Rat Snake survey should be completed.

2.4 Fisheries

Both Verona Lake and Vanluven Lake are located within 300 metres of the site. The following fish species are present in Verona Lake:

- Black Crappie
- Bluegill
- Brown Bullhead
- Golden Shiner
- Largemouth Bass
- Northern Pile
- Pumpkinseed
- Rock Bass
- Smallmouth Bass
- Walleye
- White Sucker
- Yellow Bullhead
- Yellow Perch

No aquatic species at risk records were found in the vicinity of the site.

While no watercourse is mapped on the site, fish habitat may be present within the unmapped wetlands potentially located on an adjacent land. Field surveys of the site or on the adjacent land should identify whether fish habitat is present. It is recommended that a fisheries survey and fish habitat characterization be undertaken if water or wastewater infrastructure will be constructed within potential fish habitat.

2.5 Migratory Birds

The site is identified as being within the Canadian nesting zone C3, which means the nesting period is from mid April to late August. Therefore, a migratory bird nesting survey is recommended to be completed during May 24 to July 10 to determine which migratory birds and bird SAR are utilizing habitat within and adjacent to the site.

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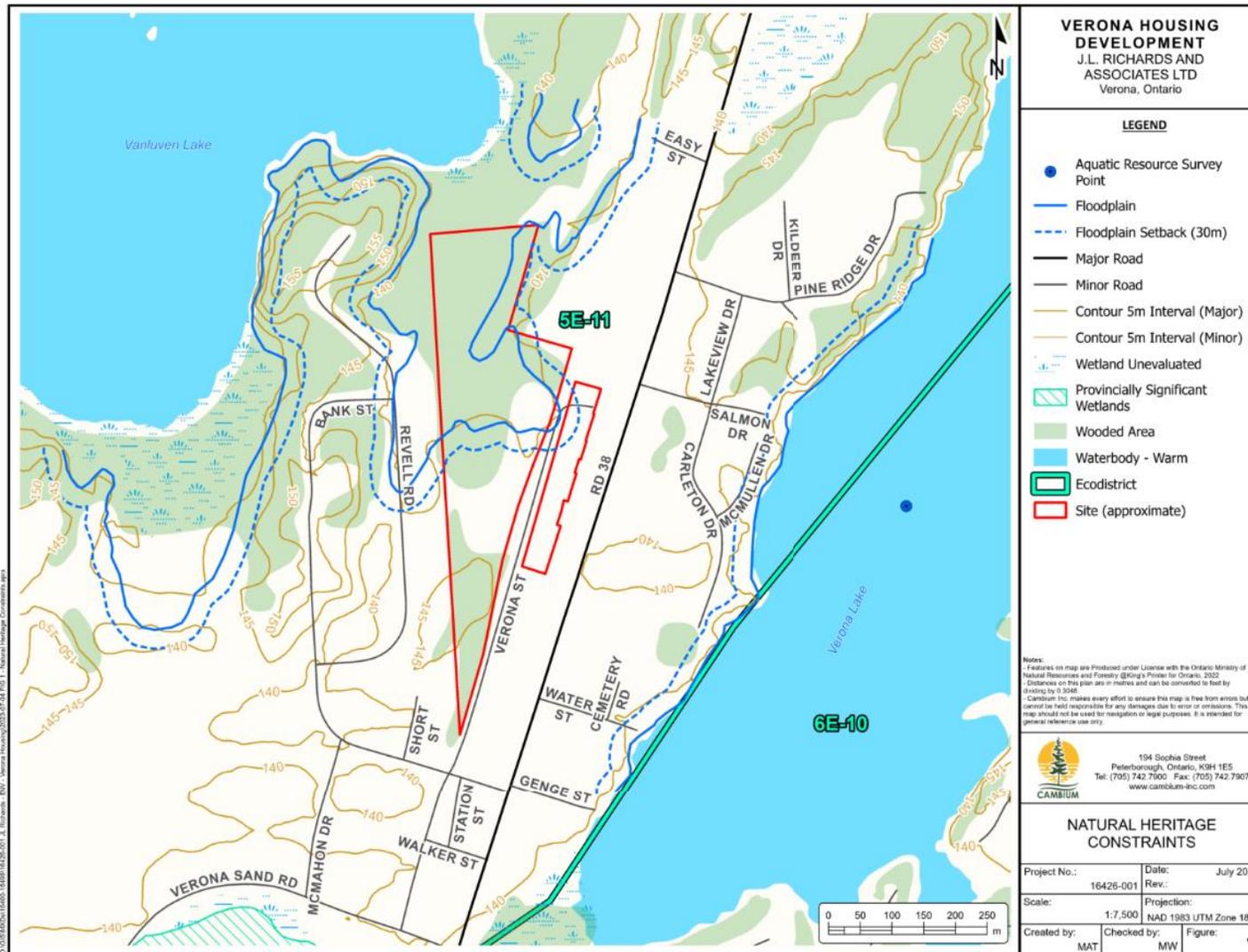


Figure 1: Natural Heritage

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3.0 Groundwater Resource Assessment

JLR retained Pinchin Ltd. to conduct a groundwater resource assessment of the study area. The study reviewed existing MECP water well records and pumping test data to determine the site's groundwater capacity and recommend further studies required. This assessment is included in Appendix B.

3.1 Geology

The study areas are in the transition between Precambrian shield bedrock (undifferentiated igneous and metamorphic rock), and Paleozoic sandstone, overlain by Ordovician limestone deposits. Some areas contain glaciolacustrine deposits of sand and gravel. Overburden thickness varies between 0.0 m (surface bedrock) to 29.9 m.

3.2 Water Well Records in Surrounding Area

A total of 153 MECP water well records dating between 1948 to 2020 were reviewed. Refer to Figure 2. Information pulled from these records include well depth, overburden thickness, geologic unit, depth where water was found, and the recommended pumping rate. The depth of water supply wells varied between from 10.1 m to 85.3 m, with a mean depth of 31.1 m. Water was first encountered from 4.0 m to 75.5 m, with a mean depth of 23.8 m. Approximately 80% of the depth of first water values were between 20 and 30 meters.

For the well records where short duration pumping testing was completed, the pumping rate, or yield of the well, as reported by the well contractor, ranged from a minimum of 3.8 liters per minute (L/min) to a maximum of 136 L/min (or 1.0 gallon per minute (gpm) to 35.9 gpm).

- Approximately 60% of the wells listed a recommended pumping rate or well yield between 20 L/min and 40 L/min (or 5.3 gpm to 10.6 gpm).
- Approximately 16% of the wells listed a recommended pumping rate or well yield of between 60 L/min to 80 L/min (or 15.9 gpm to 21.1 gpm).
- Approximately 5% of the wells listed a recommended pumping rate or well yield greater than 100 L/min (or 26.4 gpm).

Pinchin concluded that some wells were drilled into water bearing units or fractures that are capable of high flow rates suitable for communal water supply, including the existing well described in the next subsection.

3.3 Site Well Quantity Assessment

An existing well is located on Parcel B, which was drilled in January 2020. The well was terminated at a depth of 36.9 m and the contractor reported that the water bearing unit was found at a depth of 33.8 m.

The contractor's recommended pumping rate was listed at 56.8 L/min (or 15 gpm), based on a 6-hr pumping test at the time of well completion. Pinchin's assessment indicates that the

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capacity of the well “has not been fully evaluated” and that “the sustainable pumping rate for the well is certainly above the 56.8 L/min” used during the test. Pinchin recommended additional testing to further refine the well capacity and determine the potential for interference with existing groundwater wells in the area.

3.4 Site Well Quality Assessment

Groundwater from the site well was evaluated by reviewing the available water quality data, which was collected by the well contractor during the six-hour pumping test. The parameters analyzed were generally the parameters typically used in the evaluation of potable water supplies from wells and the recommended parameters listed in Appendix 1 of the MECP Guideline D-5-5 Private Wells: Water Supply Assessment, except for the omission of analysis for Fecal Coliform and Total Dissolved Solids (TDS). Additional parameters were also included in the evaluation of the water quality.

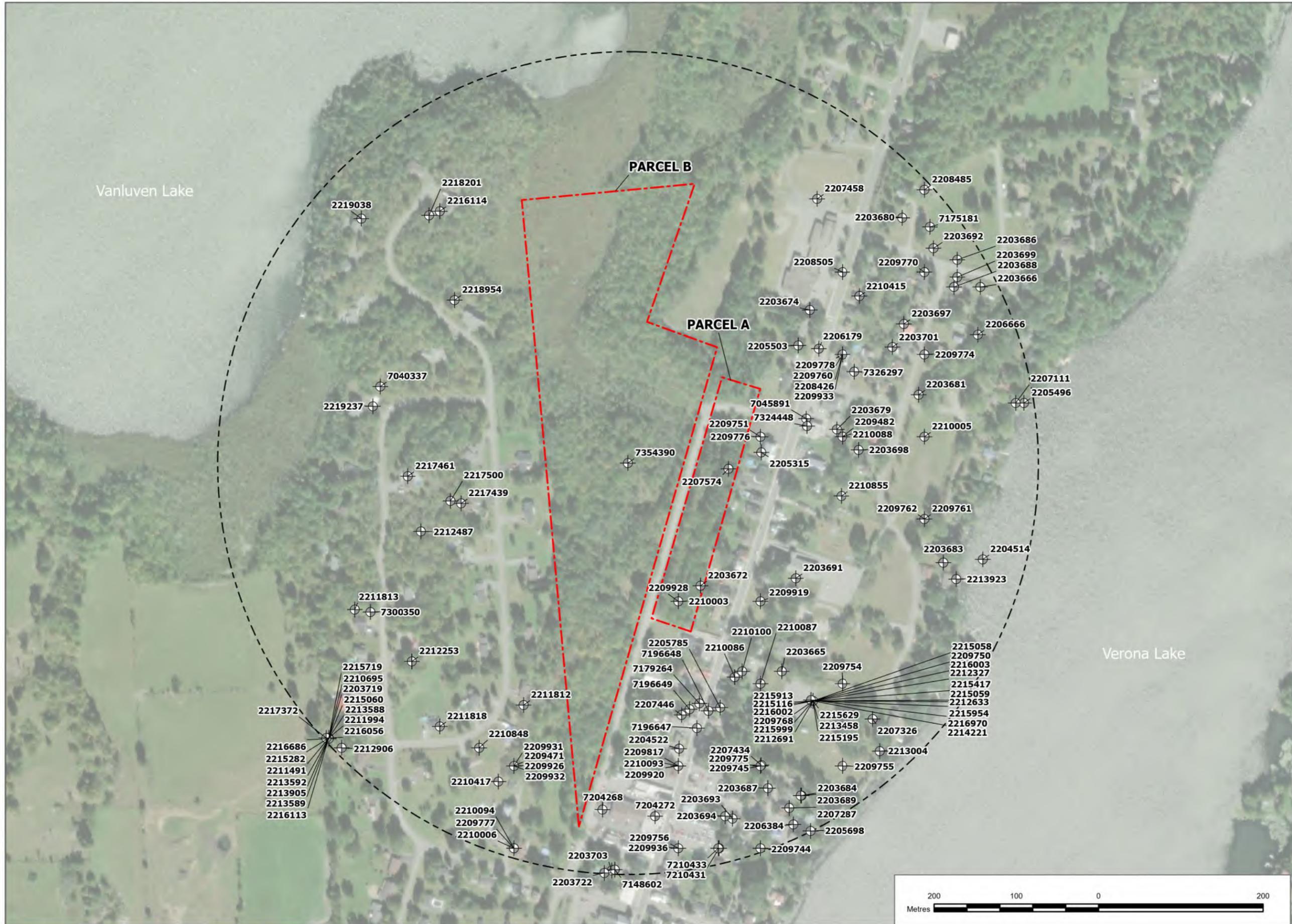
Based on available data, TDS is not expected to be problematic as the main constituents of TDS (the amount of organic and inorganic materials, such as metals, minerals, salts, and ions) do not seem to be elevated in the water. However, it is recommended that Fecal Coliform and TDS analysis be included in any subsequent water quality evaluation.

The groundwater sample met the Ontario Drinking Water Quality Standards, except for hardness, which had a concentration of 310 mg/L, which exceeded the Operational Guideline of 80-100 mg/L. Moderately hard water is typical of the area, and such levels can be treated if required.

3.5 Recommendations

Pinchin concluded that the site well can produce a flow greater than 56.8 L/min (or 15 gpm). The report recommended the following further studies:

- A step test on the existing site well with rates based on the water demands of the development.
- A 72-hour constant discharge pumping test at a rate based on the step test.
- Monitor private wells in the site area during this test.
- Collect field parameters such as pH, specific conductance, ORP, dissolved oxygen, and temperature during the test. The parameters to be analyzed should, at a minimum, include the list of parameters listed in Appendix 1 of the MECP D-5-5 guideline, along with any other parameters that may be useful for water treatment design.
- If, for reasons of development layout, the current well is not suitable for supply, and new well(s) are required, the location of the well(s) should consider the location of any inground wastewater leaching bed(s) and maximize the separation distance between the supply well(s) and the wastewater leaching bed.



LEGEND

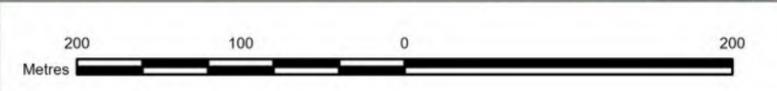
-  MECP WELL
-  500 m
-  SITE BOUNDARY

NOTES:

- 1) Proprietary information may not be reproduced or divulged without prior written consent of Pinchin Ltd.
- 2) This drawing may have been reduced. All scale notations indicated are based on a 11"x17" format drawings.
- 3) Legend is color dependent. Non-colour copies may alter interpretation.
- 4) Coordinate system: NAD 1983 CSRS UTM Zone 18N.
- 5) Source: Pinchin Ltd., Maxar.



PROJECT NAME GROUNDWATER RESOURCE ASSESSMENT	
CLIENT NAME J.L. RICHARDS AND ASSOCIATES LIMITED	
PROJECT LOCATION VERONA, ONTARIO	
FIGURE NAME MECP WELLS MAP	
PROJECT NUMBER: 325885	SCALE AS SHOWN
DRAWN BY CF	REVIEWED BY PT
DATE AUGUST 2023	FIGURE NUMBER 3



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4.0 Surface Water Resource Assessment

The available information on the surface water supply was discussed in the Phase 1 Report's Section 6.2.1. This section summarizes the findings from the Phase 1 Report.

- The Village of Verona is located within the Napanee River watershed and Camden sub-watershed.
- There appears to be available and feasible surface water resources in Verona Lake.
- There is extremely limited information available for surface water flow through Verona Lake, based on discussion with Quinte Conservation. The closest dam is at Hardwood Creek, south of the Village. There is no flow monitoring device at this dam. Additional hydrogeological studies will need to be undertaken to develop available water flow/quantity information through Verona Lake.
- Anecdotal information was collected from a visit with a resident living by Verona Lake. This established that the Verona Lake level typically fluctuates by approximately 0.7 m between high and low levels, with a 1.8 m difference between historical extremes.

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5.0 Wastewater Capacity Assessment

5.1 Summary Of Wastewater Capacity Assessment Report by Groundwork Engineering Limited

The Township of South Frontenac retained Groundwork Engineering Limited to assess the ability of the proposed site to support the subsurface disposal of treated wastewater. The report, prepared in February 2022, was referenced by JLR for the portions of this Master Plan related to subsurface disposal system capacity. This reference document is included in Appendix C.

The potential wastewater dispersal system is in Parcel B. A large bedrock outcrop, terminating roughly at the easement the site shares with Revell Road, isolates the site. It also limits the available area for subsurface wastewater dispersal. Refer to Figure 5 below.

Groundwork Engineering followed the Ontario Building Code requirements for a site evaluation, which included determining the percolation time through three test locations or classifying the soil through existing standards. Groundwork Engineering conducted three test pit excavations in January 2022. Their analysis of two of the soil samples indicated the percolation rate was in the range of 8 to 20 min/cm. Restructured laboratory samples generally have a reliable, but slower rate than undisturbed soil in the natural environment. Further in-situ testing should be conducted to define this rate.

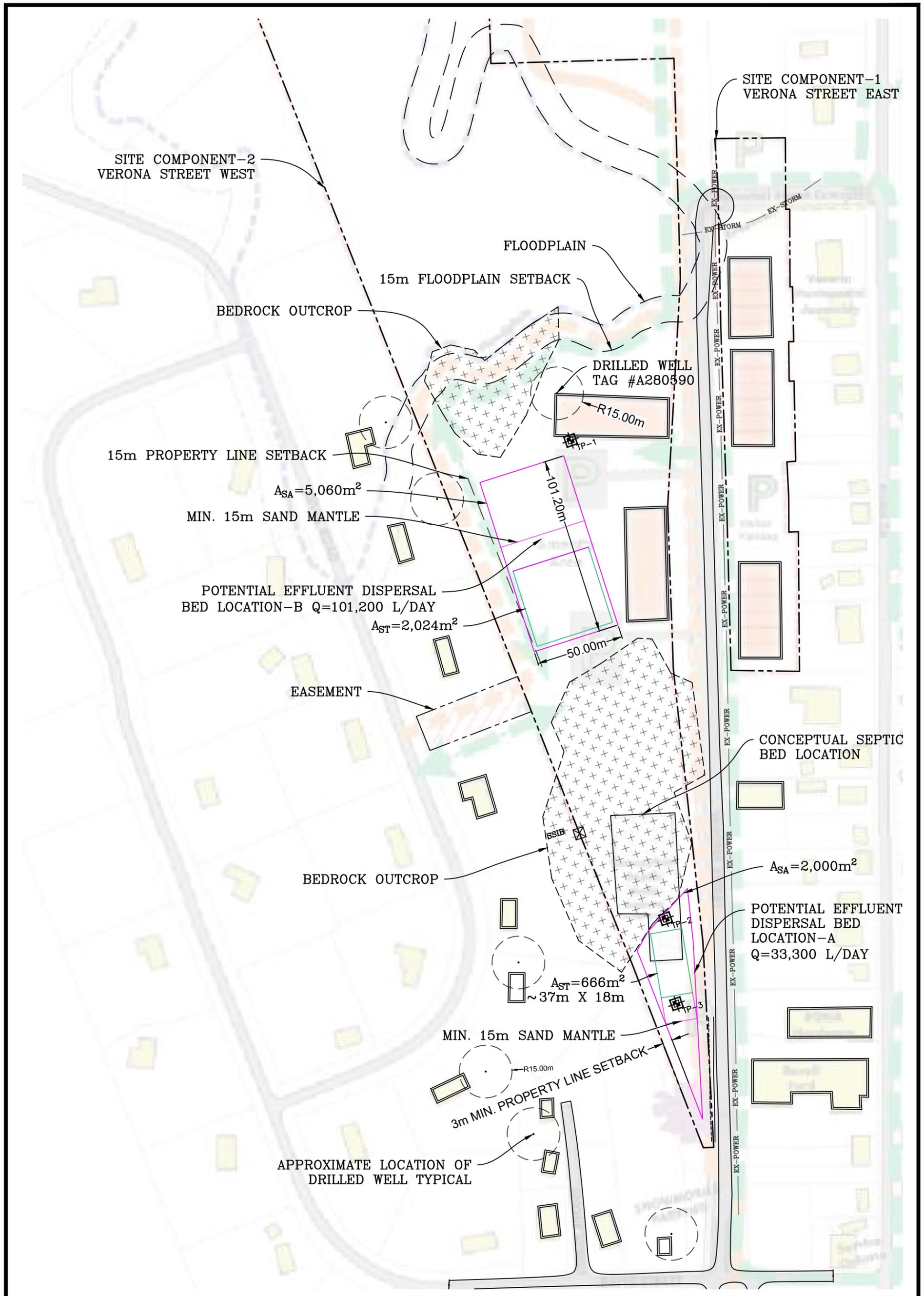
Based on the terrain analysis, Groundwork identified two areas where subsurface wastewater dispersal is possible: Location A and Location B. Groundwork applied Class 4 Level IV sanitary treatment requirements as outlined in the Ontario Building Code. As a result, the conservative capacity (using 20 min/cm) at their proposed bed Location A was 33.3 m³/day, and the optimistic capacity was 50 m³/day. They found the capacity of a bed at their proposed Location B was 101.2 m³/day.

5.2 Subsurface Dispersal Bed Site Selection

As discussed in Phase 1, and as summarized in Table 4 later in this report, the projected maximum day wastewater demands range from 80 to 133 m³/day. Location B can potentially support the lowest projected maximum day flows on its own, but it would need support from Location A to accommodate the maximum projected flows.

Upon reviewing Groundwork's report, JLR has determined that conveying wastewater from Location B to Location A is technically difficult and cost prohibitive due to the bedrock outcrop. Therefore, this Master Plan only considers Location B as the subsurface wastewater dispersal option. Therefore, the overall wastewater capacity of the site is limited to 101.2 m³/day for subsurface dispersal.

However, if the proposed building location changes, more area for wastewater dispersal can become available, potentially increasing the site's wastewater capacity.



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Client / Land Owner: TOWNSHIP OF SOUTH FRONTENAC	
Project: VERONA HOUSING PROJECT	
VERONA ONTARIO	
Drawing Title: SITE PLAN (t =20)	
Project Number: GW-21002-83	Drawing Number: C-102 SHEET 2 of 2

Drawn by: M.A.B
Checked By: M.B
Scale: 1:2000
Date: JAN 24, 2022

REVISIONS		
No.	Description	Date
01	PRELIMINARY ISSUED FOR DISCUSSION	2022/01/24
02	ISSUED FOR REPORT	2022/03/02
BENCHMARK:		
No.	DESCRIPTION	ELEVATION

THIS IS A CONCEPT SKETCH INTENDED FOR THE PURPOSE OF DISCUSSION ONLY. NOT INTENDED FOR CONSTRUCTION OR TOPOGRAPHICAL LAYOUT.

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6.0 Quinte Conservation Consultation

A pre-consultation meeting was held with Quinte Conservation on September 25, 2023. Refer to Appendix D for correspondence with the Conservation Authority. This section documents the key items discussed during the meeting, and applicable legislation referenced by the Quinte Conservation.

6.1 Source Water Protection

6.1.1 Groundwater

Quinte Conservation confirmed that groundwater wells and subsurface wastewater disposal systems can be located on the same property if they achieve the required setbacks, as per the Ontario Building Code, and meet treated effluent guidelines. As the Verona mixed housing development will require a Large Subsurface Disposal System (LSSDS), the MECP Guide to LSSDS will need to be referenced and the MECP should be consulted during the design of the system.

Both the OBC and the MECP require a minimum distance of 15 m between a Class 4 sewage system and a well with a watertight casing to a depth of at least 6 m. Other wells must have a minimum clearance of 30 m.

For groundwater supply, wellhead protection areas (WHPA) are zones around a municipal well where land use activities have the potential to affect the quality of water supplying the well. A WHPA is typically made up of zones of varying sizes and shapes around the municipal well.

- A WHPA-A is a 100 metre radius around the wellhead.
- A WHPA-B is an area where water and any pollution that may be present can reach the well within two years.
- A WHPA-C is an area where water and any pollution that may be present can reach the well within two to five years.
- A WHPA-D is an area where water and any pollution that may be present can reach the well within five to 25 years.
- A WHPA-E is an area where groundwater is under the direct influence of surface water, indicating that there may be direct pathways from the ground surface to the well, making the drinking water source vulnerable to contamination from the ground surface.

New groundwater wells in the study area can experience threats to water quality from residential and institutional properties. These include home heating oil tanks and septic systems, as wells can easily transport contaminants into groundwater.

The onsite groundwater well for the proposed housing development is in proximity to a school septic bed, private septic systems, private heating oil tanks, private wells, an existing car dealership, and an existing hardware store. These land uses can potentially pose significant threats to the municipal drinking water quality in the form of storing organic solvents, dense non-aqueous phase liquids, fuel, pesticide, and fertilizer. These land uses are considered

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“prescribed drinking water threats” which will be addressed and managed through the policies under the Source Water Protection Plan.

In consultation with Quinte Conservation, it was determined that the Verona housing municipal well shall have a minimum of 100 metres of clearance from potential onsite and offsite large subsurface wastewater dispersal systems. Site specific hydrogeological studies will need to be completed to delineate the WHPA zones.

6.1.2 Surface Water

To withdraw water from a surface water body for a new drinking water source, intake protection zones (IPZ) would need to be established. The surface water IPZs are the land and water areas around the intake pipe that may be vulnerable to contamination.

Since Verona Lake was identified as a surface water body that can potentially support the proposed development, IPZs will be required to be established around the intake pipe. IPZs are typically made up of zones of varying sizes and shapes around the intake pipe.

- IPZ-1 is the area closest to the intake pipe, extending one kilometer upstream and 120 metres onto the shore.
- IPZ-2 includes the on and offshore areas where flowing water and any pollution would reach the intake pipe within two hours. The two-hour travel time is determined based on the time normally required to shut down a drinking water system if a spill occurs. Where the IPZ-2 abuts a land mass, the zone also includes the land within 120 metres from the shoreline, as well as transport pathways (ditches or storm water systems).
- IPZ-3 is the total area contributing to the intake. The zone does not extend more than 120 metres inland unless a transport pathway exists. Activities in this area would generally present less risk to municipal drinking water.

A new surface water intake can experience threats to water quality from residential and institutional properties. These include chemical storage, stormwater runoff, storage and spreading of road salts, animal feedlots, use of fertilizers/pesticides, septic systems, and underground storage tanks, among others. Additional studies will be required to delineate the IPZ and identify the “prescribed drinking water threats.”

6.2 Floodplain

Quinte Conservation noted that drilling a municipal groundwater well within the floodplain, although not preferred, can be permitted if it is demonstrated to be the only feasible solution. Establishing the groundwater flow direction and future wellhead protection areas will help determine the location of future services. Quinte Conservation also indicated that the floodplain information in this area is not fully accurate, and is currently undergoing an update.

6.3 Climate Change and Conservation

In 2016, Quinte Conservation published a Climate Change Strategy to summarize climate impacts, completed activities, and proposed actions to mitigate and adapt to climate change within the local watershed.

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Relevant actions Quinte Conservation planned include:

- Updating floodplain mapping and identify high-risk areas such as small watersheds and urban sewer sheds.
- Identify areas prone to drought and low water conditions.
- Adapt the Regulations and Planning program to reflect the highs and lows of extreme weather and natural hazards.
- Protection of existing forests and treed areas as well promoting the planting of additional trees
- Promoting low-impact developments that minimize use of resources.
- Minimizing the potential for impact of development on the natural water budget to ensure maintenance or enhancement of groundwater resources that may be impacted by climate change.

An assessment conducted by Quinte Conservation determined that Verona's groundwater has a low vulnerability to drought. However, the region's residents are highly reliant on groundwater as a drinking water source due to their distance from alternative, reliable sources such as the Great Lakes. Typically, deep wells that have a high yield are less susceptible to drought than shallow wells of low yield.

While Environment Canada records for the Belleville area show temperatures increasing steadily since 1920, global climate models predict that future levels of precipitation will remain relatively stable for the Quinte Region, based on the 2021 Quinte Region Drought Plan. The region receives 900 mm of precipitation yearly, and 60% of it leaves the watershed by evaporation and transpiration. This means higher temperatures will have a significant impact, and Quinte Conservation predicts an increase in evapotranspiration rates by 10% over the next 30 years.

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7.0 Climate Change Framework

The MECP published the Considering Climate Change in the Environmental Assessment Process Guide in 2017, which sets out the Ministry's expectation for considering climate change in the preparation, execution, and documentation of environmental assessment studies and processes. The MECP also published the Community Emissions Reduction Planning: A Guide for Municipalities document in 2018. This guide lists opportunities for municipalities to reduce energy and greenhouse gas emissions, and methods and techniques to incorporate consideration of energy and greenhouse gas emissions into municipal activities.

7.1 Climate Change Mitigation

Climate change mitigation measures reduce the project's impacts on climate change, such as greenhouse gas (GHG) emissions or changes to the landscape that negatively affect its carbon sequestration and storage capacity.

The project's GHG emissions can be categorized as operating carbon (emitted during the operation phase) and embodied carbon (emitted during the manufacturing and construction phase). Operating carbon consists of direct emissions from combustion of fossil fuels on site while indirect emissions are from consuming energy (ex. electricity) that was generated from off-site combustion of fossil fuels.

7.2 Climate Change Adaptation

Climate change adaptation refers to the impact of climate change on a project, i.e., the resilience or vulnerability of infrastructure to changing climatic conditions. Impacts of climate change on municipal water and wastewater projects include property-specific concerns such as flooding and system-wide impacts on water demand and electricity consumption.

8.0 Cultural Heritage Conditions

Cultural heritage resources, which includes archaeological resources, built heritage resources and cultural heritage landscapes, is an important aspect of the cultural environment and may be impacted by the proposed undertaking. The Ministry of Citizenship and Multiculturalism (MCM) provides screening checklists for Criteria for Evaluating Archaeological Potential, Criteria for Evaluating Marine Archaeological Potential, and Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes. These screening forms have been completed and included in Appendix D. Consultation with the MCM through this screening process identified a terrestrial archaeological site within 250 metres of Parcel A, close to the eastern end of Water Street in Verona.

As an archaeological assessment is required for projects within 300 metres of an archaeological site, in the next phases of this project, archaeological assessments will be undertaken by an archaeologist licensed under the Ontario Heritage Act. Archaeological assessment reports must be submitted for MCM review prior to the completion of the Class EA and prior to any ground disturbance.

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Township of South Frontenac Verona Housing Water and Wastewater Master Plan

9.0 Future Servicing Requirements and Design Basis

9.1 Design Basis

A summary of the design basis developed in Phase 1 of the Verona Housing Master Plan is provided in Table 2 below. It demonstrates a range of water and wastewater demands based on lowest and highest amount of potential dwelling units. This Master Plan assumes that, as this is a new residential development, a domestic water demand of 180 L/d/cap is sufficient due to water conservation practices, widely used high efficiency water fixtures, fire protection not being provided through this new communal supply system, and outdoor household water use being restricted.

Table 2: Future Water and Wastewater Servicing Requirements

Dwelling Units	Service Population	Water Demands				Wastewater Flows			
		Average Day		Maximum Day		Average Day		Maximum Day	
		m ³ /day	L/s						
58	162	29	0.3	80	0.9	29	0.3	80	0.9
134	268	48	0.6	133	1.5	48	0.6	133	1.5

9.2 Groundwater Supply and Subsurface Wastewater Dispersal Constraints

The site constraints related to groundwater supply and subsurface wastewater dispersal, as determined in the Pinchin and Groundworks reports, are summarized in Table 3 below. When comparing the servicing requirements in Table 2 to the capacity limits in Table 3, it is evident the site is unable to support a service population of 268 people, as the maximum daily wastewater flow, which is the design rate, exceeds the estimated capacity of the onsite sewage dispersal bed.

Table 3: Groundwater Supply and Subsurface Dispersal Design Constraints

Parameter	Estimated Site Capacity (Max Daily Flow)	Estimated Site Capacity (Max Daily Flow)
Onsite groundwater well ⁽¹⁾	> 56.8 L/min	> 0.9 L/s
Onsite sewage dispersal bed ⁽²⁾	101 m ³ /d	1.2 L/s
Notes:		
(1) Groundwater Resource Assessment for Potential Communal Servicing (Pinchin Ltd., 2023). The report states the sustainable pumping rate for the well is “certainly above” 56.8 L/min.		
(2) Wastewater Capacity Assessment Report (Groundwork Engineering, 2022).		

Using the onsite sewage dispersal bed capacity of 1.2 L/s to constrain the maximum daily wastewater flow rate, the associated average wastewater flow rate is 0.44 L/s, generated by a population of 209 people.

As discussed in the Phase 1 report, the population density of the proposed mixed housing development is dependent on the number of bedrooms in the unit. In this Master Plan, the person per unit (PPU) density of a one-bedroom unit is assumed to be two people, and the PPU

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density for a two-bedroom unit is assumed to be 2.8 people. Therefore, the maximum population of 209 people can be housed, for example, in 74 two-bedroom apartments or 104 one-bedroom units. The actual unit sizes and distribution will be determined and finalized according to the future built form, though the number of units does not affect the water and wastewater design basis as they are determined by the population. The maximum population and associated flows supported by the site are provided in Table 4 and Table 5 below.

Table 4: Future Water and Wastewater Servicing Design Basis – Average Day and Max Day Flows (Groundwater Supply and Subsurface Dispersal Scenario)

Max Service Population	Dwelling Units	Water Demands				Wastewater Flows			
		Average Day		Maximum Day		Average Day		Maximum Day	
		m ³ /day	L/s						
209	74 ⁽¹⁾ to 104 ⁽²⁾	38	0.4	104	1.2	38	0.4	104	1.2

Notes:
 (1) Assuming two-bedroom apartments with a PPU of 2.8 people.
 (2) Assuming one-bedroom apartments with a PPU of 2 people.

Table 5: Future Water and Wastewater Servicing Design Basis – Night Minimum and Peak Hourly Flows (Groundwater Supply and Subsurface Dispersal Scenario)

Max Service Population	Dwelling Units	Water Demands				Wastewater Flows			
		Night Minimum Hourly		Peak Hourly		Night Minimum Hourly		Peak Hourly	
		m ³ /day	L/s	m ³ /day	L/s	m ³ /day	L/s	m ³ /day	L/s
209	74 ⁽¹⁾ to 104 ⁽²⁾	15.2	0.2	157	1.8	15.2	0.2	157	1.8

Notes:
 (1) Assuming two-bedroom apartments with a PPU of 2.8 people.
 (2) Assuming one-bedroom apartments with a PPU of 2 people.

9.3 Surface Supply and Surface Wastewater Discharge

There appears to be available surface water supply from Verona Lake which may be able to support future development. However, the quantity of water intake will need to be established through a hydrogeological study as available information on lake flow and seasonal variation is lacking. Surface wastewater discharge also appears to be feasible and may support the proposed growth. As such, there is no limitation to the maximum service population and dwelling units, so the design basis presented in Table 2 is applicable for surface water options.

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Township of South Frontenac Verona Housing Water and Wastewater Master Plan

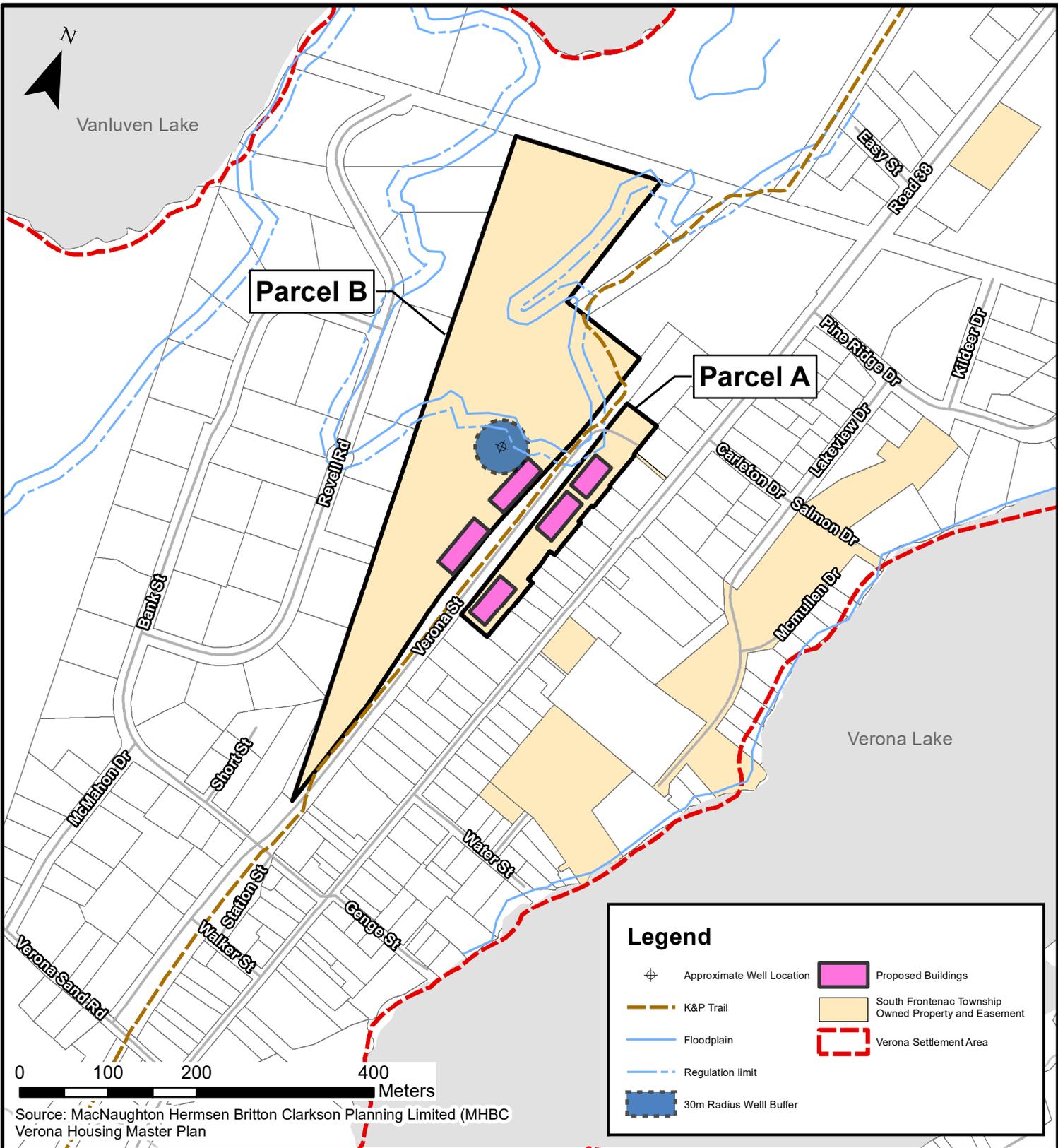
10.0 Identification of Water and Wastewater Servicing Solutions

The main objective of Phase 2 of a Master Plan is to identify and evaluate viable alternative solutions to the Problem/Opportunity Statement identified in Phase 1. All reasonable potential solutions to the problem(s), including the ‘Do Nothing’ alternative, are considered. Master Plans for water and wastewater servicing projects generally identify and review a broad range of solutions. The objective of Phase 2 is to focus on determining an overall solution to the problem and not necessarily confirming all the details, which are typically explored further in the Schedule ‘B’ or ‘C’ Class Environmental Assessment, preliminary and detailed design stages.

The following alternatives were identified in Phase 1 as feasible servicing solutions to address the problems and opportunities in the proposed municipal water and wastewater servicing for the Verona Housing Development. Parcel B is the preferred location for the onsite water and wastewater treatment options.

Table 6: Descriptions of Alternative Solutions

	Option	Description
1	Do Nothing / Status Quo	Maintaining existing conditions and do not provide municipal servicing to the Verona Housing Development project. The “do nothing” option is always included in the evaluation as the basis for comparison.
2	Onsite Groundwater Well and Onsite Large Subsurface Sewage Disposal System	Establishing a new groundwater well on Parcel B accompanied with the required treatment system. Installing a large subsurface sewage disposal system on Parcel B accompanied with the required treatment system. Onsite test well shall be abandoned due to proximity to proposed subsurface disposal system.
3	Onsite Surface Water Treatment and Onsite Large Subsurface Sewage Disposal System	Taking water from Verona Lake, bringing raw water to Parcel B through a raw water line connection, treating on the site and distributing to both Parcels A and B. An easement will need to be created at end of Verona Street for the new watermain. Installing a large subsurface sewage disposal system on Parcel B accompanied with the required treatment system. Onsite test well will be abandoned.
4	Offsite Surface Water Treatment and Onsite Large Subsurface Sewage Disposal System	Taking raw water from Verona Lake, treating it at a new water treatment facility on municipality land adjacent to Verona Lake, and distributing treated water to Parcel A and B. Installing a subsurface sewage disposal system on Parcel B accompanied with the required treatment system. Onsite test well will be abandoned.
5	Offsite Groundwater Well and Onsite Large Subsurface Sewage Disposal System	Establishing groundwater well(s) off site on municipally owned land and bringing treated water to Parcels A and B through a watermain. Installing a subsurface sewage disposal system on Parcel B accompanied with the required treatment system. Onsite test well will be abandoned.
6	Onsite Groundwater Well and Wastewater Treatment Discharging to an Approved Surface Water Outlet	Establishing or reusing groundwater well(s) on Parcel B accompanied with the required treatment system. Installing a wastewater treatment facility on Parcel B and discharging treated effluent to an approved surface water outlet (e.g., Verona Lake).



Source: MacNaughton Hermsen Britton Clarkson Planning Limited (MHBC)
Verona Housing Master Plan

Legend

- ⊕ Approximate Well Location
- K&P Trail
- Floodplain
- Regulation limit
- 30m Radius Well Buffer
- Proposed Buildings
- South Frontenac Township Owned Property and Easement
- Verona Settlement Area

PROJECT: **VERONA SERVICING MASTER PLAN**
VERONA, SOUTH FRONTENAC, ONTARIO

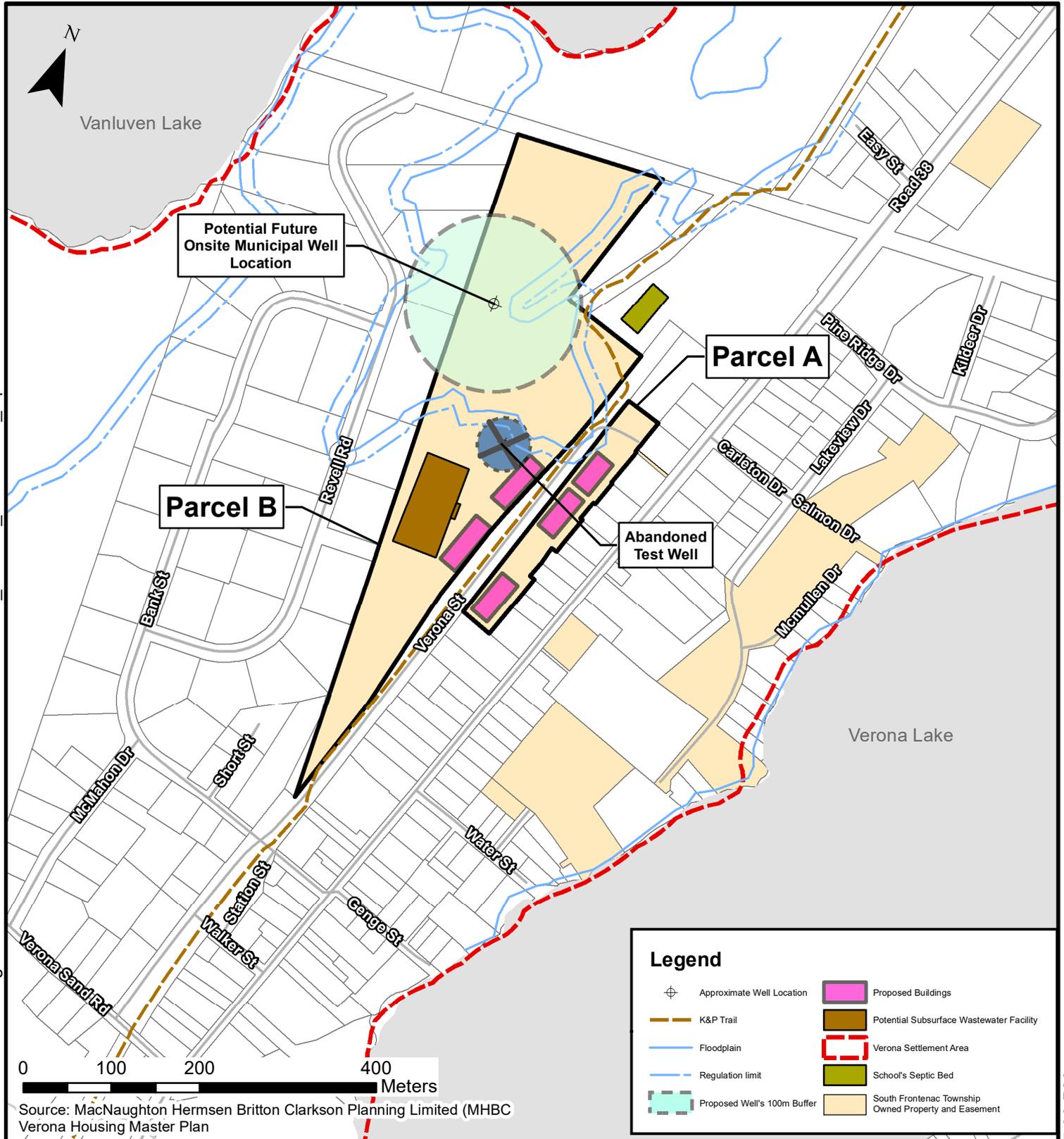
DRAWING: **OPTION 1: DO NOTHING**

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DRAWING #:
FIGURE 4



Source: MacNaughton Hermsen Britton Clarkson Planning Limited (MHBC)
Verona Housing Master Plan

Legend

- ⊕ Approximate Well Location
- K&P Trail
- Floodplain
- Regulation limit
- ⊕ Proposed Well's 100m Buffer
- ▭ Proposed Buildings
- ▭ Potential Subsurface Wastewater Facility
- ▭ Verona Settlement Area
- ▭ School's Septic Bed
- ▭ South Frontenac Township Owned Property and Easement

PROJECT: **VERONA SERVICING MASTER PLAN**
VERONA, SOUTH FRONTENAC, ONTARIO

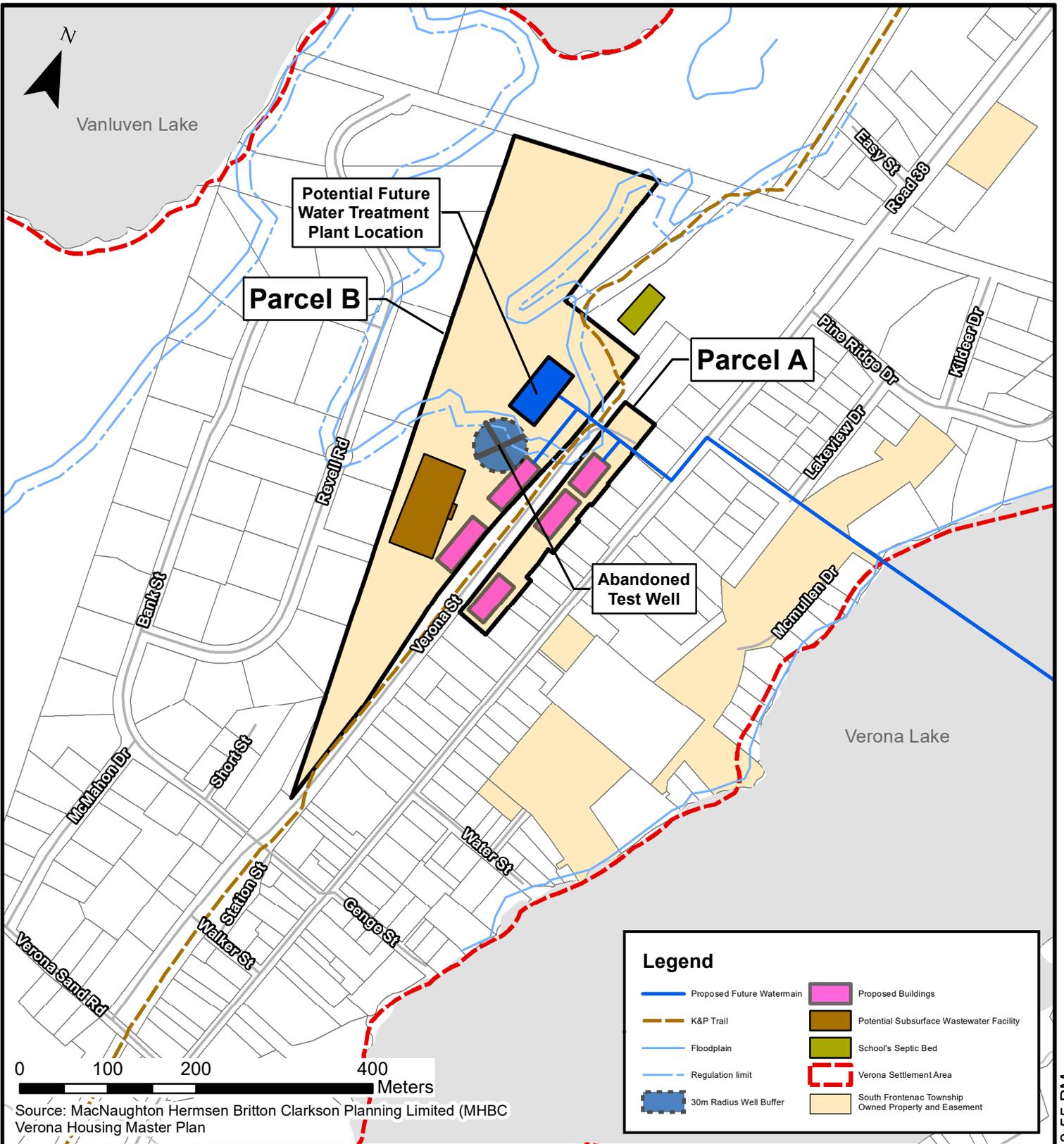
DRAWING: **OPTION 2: ONSITE GROUNDWATER WELL AND ONSITE SUBSURFACE WASTEWATER SYSTEM**

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FIGURE 5



Source: MacNaughton Hermsen Britton Clarkson Planning Limited (MHBC)
Verona Housing Master Plan

PROJECT:

VERONA SERVICING MASTER PLAN
VERONA, SOUTH FRONTENAC, ONTARIO

DRAWING:

OPTION 3: ONSITE SURFACE WATER TREATMENT AND ONSITE SUBSURFACE WASTEWATER SYSTEM

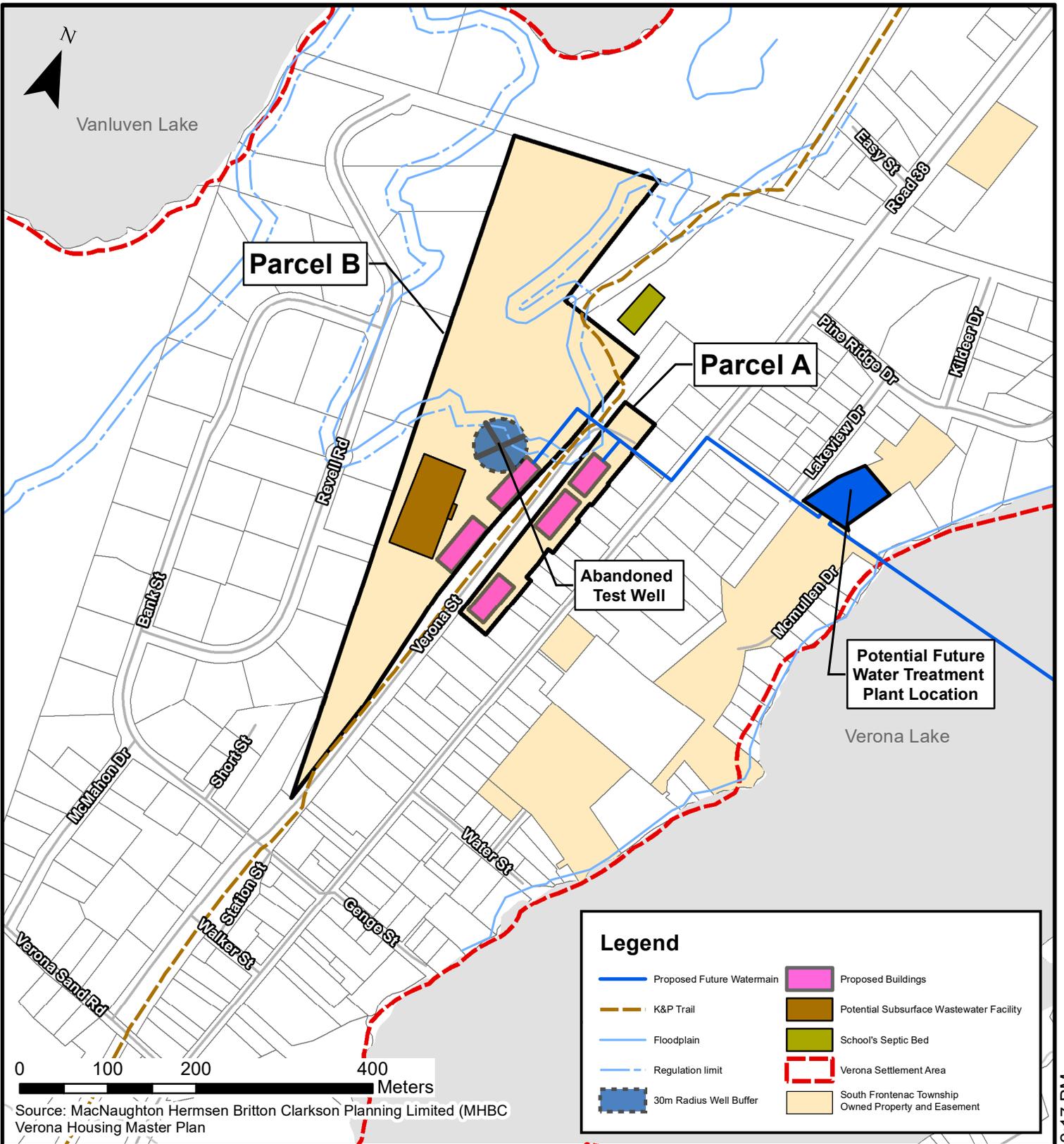


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FIGURE 6



Source: MacNaughton Hermsen Britton Clarkson Planning Limited (MHBC)
Verona Housing Master Plan

PROJECT:

VERONA SERVICING MASTER PLAN

VERONA, SOUTH FRONTENAC, ONTARIO

DRAWING:

OPTION 4: OFFSITE SURFACE WATER TREATMENT AND ONSITE SUBSURFACE WASTEWATER SYSTEM

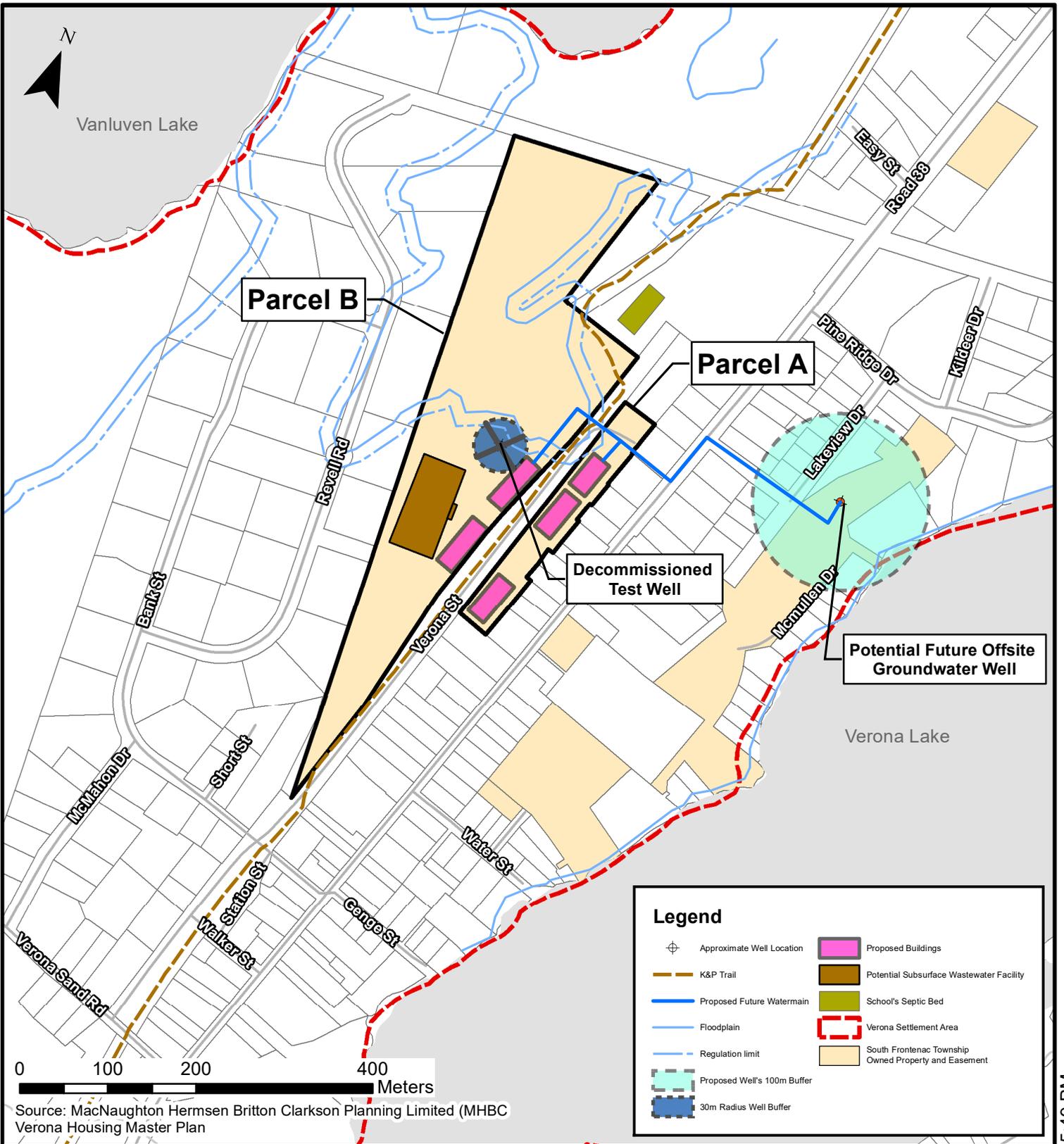


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FIGURE 7



Source: MacNaughton Hermsen Britton Clarkson Planning Limited (MHBC)
Verona Housing Master Plan

PROJECT:

VERONA SERVICING MASTER PLAN

VERONA, SOUTH FRONTENAC, ONTARIO

DRAWING:

OPTION 5: OFFSITE GROUNDWATER WELL AND ONSITE SUBSURFACE WASTEWATER SYSTEM



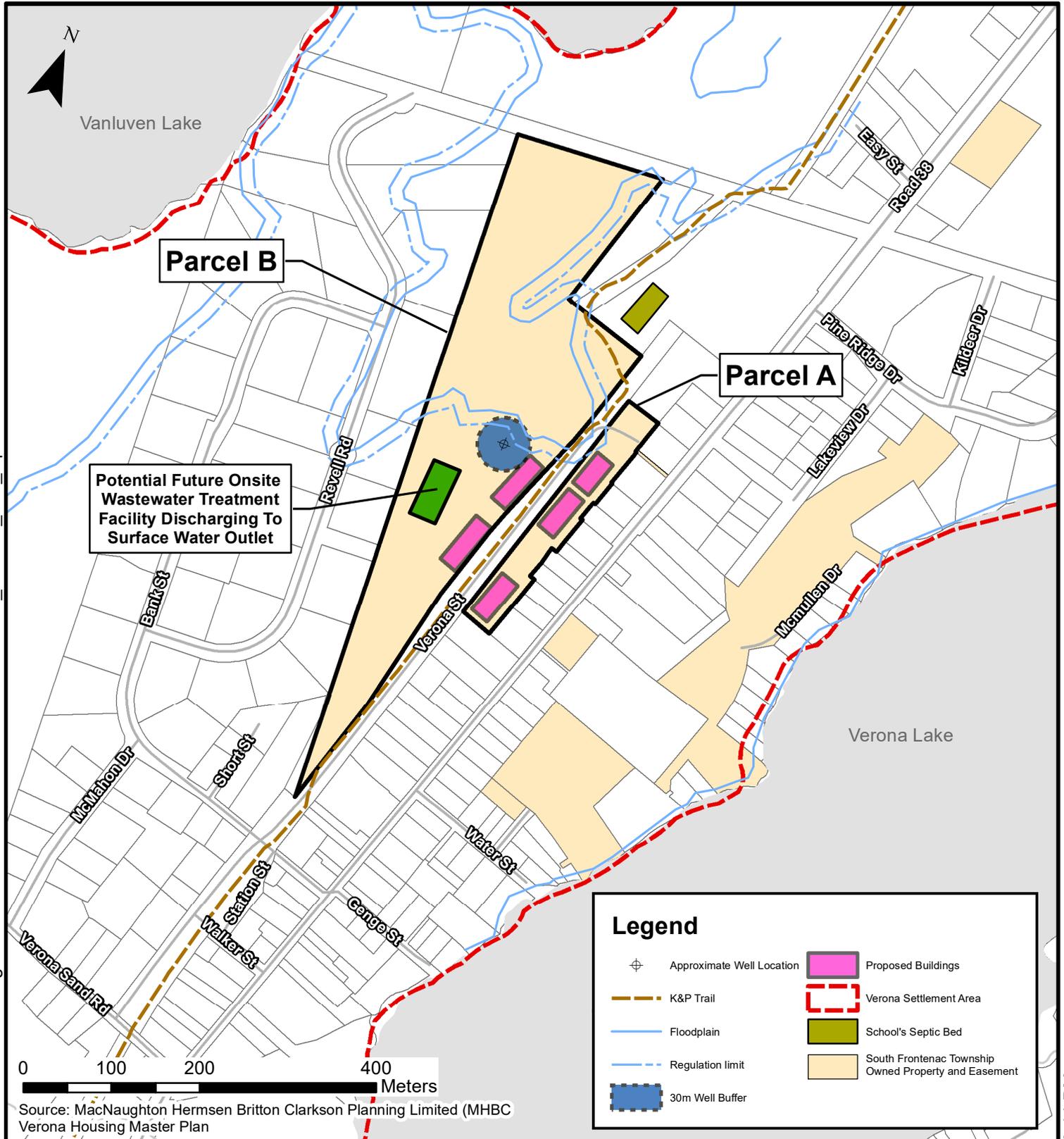
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FIGURE 8

File Location: P:\32000\32106-001 - Verona Housing Class EA103-Production\07-Plan\32106-000_Phase2_GW_Option6.mxd



Potential Future Onsite Wastewater Treatment Facility Discharging To Surface Water Outlet

Parcel B

Parcel A

Legend

- ⊕ Approximate Well Location
- K&P Trail
- Floodplain
- - - Regulation limit
- ⊕ 30m Well Buffer
- █ Proposed Buildings
- ⊔ Verona Settlement Area
- █ School's Septic Bed
- █ South Frontenac Township Owned Property and Easement

Source: MacNaughton Hermsen Britton Clarkson Planning Limited (MHBC)
Verona Housing Master Plan

PROJECT: **VERONA SERVICING MASTER PLAN**
VERONA, SOUTH FRONTENAC, ONTARIO

DRAWING: **OPTION 6: ONSITE GROUNDWATER WELL AND WASTE WATER TREATMENT DISCHARGING TO AN APPROVED SURFACE WATER OUTLET**

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FIGURE 9

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Township of South Frontenac Verona Housing Water and Wastewater
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11.0 Alternative Solutions Evaluation and Selection

11.1 Evaluation Methodology

To facilitate the evaluation and selection of the preferred solutions during Phase 2, a transparent and logical three-part assessment process was established. This process included:

- Initial screening of alternative solutions.
- Detailed evaluation of screened alternative solutions.
- Selection of a preferred alternative solution.

11.2 Initial Screening of Alternative Solutions

The initial screening process considers the overall feasibility of the potential alternative solutions and identifies which alternatives fully address the Problem/Opportunity Statement as identified in the Phase 1 Report. This step ensures that unsuitable alternatives are not carried forward to the more detailed evaluation stage. Table 7 summarizes the screening results of the proposed alternative solutions.

Table 7: Initial Screening of Alternative Solutions

	Option	Screening Result
1	Do Nothing / Status Quo	✗ Does not meet future servicing requirements. Not carried forward.
2	Onsite Groundwater Well and Onsite Large Subsurface Sewage Disposal System	✓ Feasible option. Carried forward.
3	Onsite Surface Water Treatment and Onsite Large Subsurface Sewage Disposal System	✓ Feasible option. Carried forward
4	Offsite Surface Water Treatment and Onsite Large Subsurface Sewage Disposal System	✓ Feasible option. Carried forward
5	Offsite Groundwater Well and Onsite Large Subsurface Sewage Disposal System	✗ Does not meet future water supply requirements due to groundwater quantity restrictions in that area. Not carried forward.
6	Onsite Groundwater Well and Wastewater Treatment Discharging to an Approved Surface Water Outlet	✓ Feasible option. Carried forward

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11.3 Detailed Evaluation and Selection of Alternative Solutions

Based on the initial screening process, a detailed assessment of the shortlisted alternatives was conducted. Evaluation criteria were developed based on a review of the background information, experience with similar assessments, stakeholder comments, and consultation with Township staff. The evaluation was conducted using criteria in the following five categories:

- Natural Environment
- Climate Change Resiliency
- Social, Cultural, and Heritage Environment
- Technical Feasibility
- Financial Considerations

The evaluation criteria are described in Table 9 below. The five major criteria were assigned equal weights as they were considered to have equal importance in this evaluation at the Master Plan stage.

The relative level of impact of each potential alternative solution on each criterion was assessed using the color weighting system in Table 8. The assessment was based on whether the alternative solution is 'Preferred,' 'Less Preferred,' or 'Least Preferred' with respect to that criterion. The option that has the least negative impact, or the strongest positive impact, was recommended as the preferred solution. The preferred solution was then presented to stakeholders to solicit input before being finalized.

Table 8: Detailed Screening Impact Level Colouring System

Impact Level	Color	Relative Impact
Strong Positive Impact	Green	Preferred
Minor Impact	Yellow	Less Preferred
Strong Negative Impact	Red	Least Preferred

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Table 9: Summary of Evaluation Criteria

Major Criteria	Description
Natural Environment	Impacts on natural features, water, and wildlife. <ul style="list-style-type: none"> • Proximity to and impact on natural areas, terrestrial ecosystems, and wetlands • Effect of construction and operations on aquatic and terrestrial species and habitat, including species at risk • Effect on ground and/or surface water quality. • Effect on ground and/or surface water quantity. • Effect on shoreline
Climate Change Resiliency	Mitigation of impacts on climate change and resiliency to impacts of change. <ul style="list-style-type: none"> • Effects of climate change (e.g., impact of extreme weather events on water supply and wastewater generation) • Ability to mitigate climate change effects (e.g., contribution to greenhouse gas (GHG) emissions, impacts on carbon sinks) • Ability to adapt to climate change impacts, i.e., resiliency and security of infrastructure.
Social, Cultural and Heritage Environment	Impacts on the social environment, including archaeological, cultural, and built heritage resources as well as planning. <ul style="list-style-type: none"> • Impacts on indigenous communities and lands, and/or way of life • Impacts to Verona residents, community facilities, public parks, recreational trails, institutions, or businesses • Impacts to public health and safety including impacts on private wells, septic beds, and surrounding lakes. • Impacts of operation on village life including visual aesthetic and commuting • Effect of noise and/or vibration from construction • Impacts on archeological, cultural heritage landscapes, and built heritage resources. • Impacts on existing and future land use planning, including new source water protection zones
Technical Feasibility	Constructability, maintaining or enhancing water quality, reliability and security of drinking water system, climate change adaptation and resiliency, and approvals framework of the option. <ul style="list-style-type: none"> • Ability to expand infrastructure to best service future development. • Constructability • Ease of operation and maintenance • Impact of creation of new source water protection zones (i.e., Well Head Protection Areas, Intake Protection Zones) • Impact of wastewater disposal
Financial Considerations	Financial costs incurred by the option. <ul style="list-style-type: none"> • Estimated capital cost. • Estimated operation and maintenance costs

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Table 10: Detailed Evaluation of Alternative Solutions

	Option 2: Onsite Groundwater Well & Onsite Large Subsurface Sewage Disposal System	Option 3: Onsite Surface Water Treatment & Onsite Large Subsurface Sewage Disposal System	Option 4: Offsite Surface Water Treatment & Onsite Large Subsurface Sewage Disposal System	Option 6: Onsite Groundwater Well and Wastewater Treatment Discharging to an Approved Surface Water Outlet
Natural Environment	<ul style="list-style-type: none"> Located in an area that will be developed for housing. Minimal construction impacts from well drilling. A small structure is required to house water treatment equipment. Minimal impact on water quality due to required level of treatment. Minimal impact on groundwater water quantity as groundwater is abundant in this area. Minimal impact on water quality due to wastewater treatment requirements. 	<ul style="list-style-type: none"> Highest impact on aquatic environment from surface water intake, pipes to site, and footprint of surface water treatment plant on site. Significant impact to shoreline land use and source water protection measures. Higher construction impacts due to onsite water treatment and pipes. Highest impact on water quantity to Verona Lake. Minimal impact on water quality due to wastewater treatment requirements. 	<ul style="list-style-type: none"> Highest impact on aquatic environment from surface water intake, footprint of water treatment at a second site, and pipes to the site. Significant impact to shoreline land use and source water protection measures. Higher construction impacts due to offsite water treatment and pipes. Highest impact on water quantity to Verona Lake. Minimal impact on water quality due to wastewater treatment requirements. 	<ul style="list-style-type: none"> Highest impact to natural environment due to footprint of treatment facility and additional effluent sewer pipes Highest construction impacts due to plant outfall, conveyance pipes, and wastewater treatment plant footprint. Minimal impact on groundwater water quantity as groundwater is abundant. Minimal impact on water quality due to wastewater treatment requirements.
Evaluation	Preferred	Least Preferred	Least Preferred	Least Preferred
Climate Change Resiliency	<ul style="list-style-type: none"> Verona has deep wells with high yield that are less sensitive to climate change effects. Least GHG production and footprint as the level of treatment requirements is the least amongst all options. Similar vulnerability of structures to climate change impacts. 	<ul style="list-style-type: none"> Lakes can be more sensitive to climate change, leading to increased water level fluctuations which impacts water supply quantity and quality. Water treatment plant produces GHG emissions and removes carbon sinks (green space). Similar vulnerability of structures to climate change impacts. 	<ul style="list-style-type: none"> Lakes can be more sensitive to climate change, leading to increased water level fluctuations which impacts water supply quantity and quality. Water treatment plant produces GHG emissions and removes carbon sinks (green space). Similar vulnerability of structures to climate change impacts. 	<ul style="list-style-type: none"> Verona has deep wells with high yield that are less sensitive to climate change effects. Wastewater treatment plant produces GHG emissions and removes carbon sinks (green space) more than subsurface discharge due to treatment. Similar vulnerability of structures to climate change impacts.
Evaluation	Preferred	Least Preferred	Least Preferred	Less Preferred
Social, Cultural and Heritage Environment	<ul style="list-style-type: none"> Similar impact on Indigenous communities. Smallest impact on residents as infrastructure is limited to Parcel A and B. Smallest impacts from construction and operation as infrastructure is limited to Parcel A and B. Minimal impact on built heritage resources. Noise and vibration limited to the site. Establishes new wellhead protection areas to limit and restrict activities identified as prescribed drinking water threats. Archaeological potential is limited to the site. 	<ul style="list-style-type: none"> Similar impact on Indigenous communities. Higher impact on residents from water treatment plant footprint and Verona Lake impacts. Construction and operation impacts in Verona from building raw water piping to site. Minimal impact on built heritage resources. Noise and vibration mostly on site. Establishes new water intake protection zones to limit and restrict activities identified as prescribed drinking water threats. Archaeological potential extends to Verona Lake, in addition to the site. 	<ul style="list-style-type: none"> Similar impact on Indigenous communities. Highest impact on residents from water treatment plant footprint on a second site and Verona Lake impacts Highest impacts from construction and operation as watermains and offsite treatment plant on lakeshore will be required. Minimal impact on built heritage resources. Noise and vibration impact from offsite plant. Establishes new water intake protection zones to limit and restrict activities identified as prescribed drinking water threats. Archaeological potential extends to Verona Lake, the site for drinking water treatment plant, in addition to the site. 	<ul style="list-style-type: none"> Similar impact on Indigenous communities. Higher impact on residents from wastewater treatment plant footprint and Verona Lake impacts. Highest impacts from construction and operation as effluent sewers will be required to cross the main street in Village of Verona to Verona Lake. Minimal impact on built heritage resources. Noise and vibration mostly on site and along outfall sewer alignment. Establishes new wellhead protection areas to limit and restrict activities identified as prescribed drinking water threats. Archaeological potential extends to Verona Lake, in addition to the site.
Evaluation	Preferred	Less Preferred	Least Preferred	Least Preferred
Technical Feasibility	<ul style="list-style-type: none"> Construction, operation, and maintenance of groundwater well, subsurface dispersal system and their associated treatment systems are less complicated than surface water treatment and discharge. 	<ul style="list-style-type: none"> Construction, operation, and maintenance of the surface water treatment and intake pipe are more complex than the groundwater well and treatment. Surface water typically requires more treatment than groundwater, using more energy and raw chemicals for filtration/sedimentation processes to remove organic materials, suspended solids, taste, odours, viruses, bacteria, etc. 	<ul style="list-style-type: none"> Construction, operation, and maintenance of the surface water treatment and intake pipe are more complex than the groundwater well and treatment. Surface water typically requires more treatment than groundwater, using more energy and raw chemicals for filtration/sedimentation processes to remove organic materials, suspended solids, taste, odours, viruses, bacteria, etc. 	<ul style="list-style-type: none"> Construction, operation, and maintenance of a wastewater treatment plant discharging to surface water is more complex than subsurface dispersal. Potential hydraulic constraints related to discharge conditions which may require an effluent pumping station.

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	Option 2: Onsite Groundwater Well & Onsite Large Subsurface Sewage Disposal System	Option 3: Onsite Surface Water Treatment & Onsite Large Subsurface Sewage Disposal System	Option 4: Offsite Surface Water Treatment & Onsite Large Subsurface Sewage Disposal System	Option 6: Onsite Groundwater Well and Wastewater Treatment Discharging to an Approved Surface Water Outlet
Evaluation	Preferred	Less Preferred	Less Preferred	Least Preferred
Financial Considerations	<ul style="list-style-type: none"> • Lowest capital costs. • Lowest operational and maintenance costs from subsurface water supply and wastewater dispersal. 	<ul style="list-style-type: none"> • Higher capital costs from water treatment facility, including a surface water intake. Surface water intake pipe may cost approx. \$1.5M to \$2M to construct, in addition to the treatment facility cost. • Higher operational and maintenance costs for the water treatment facility. 	<ul style="list-style-type: none"> • Higher capital costs from water treatment facility, including a surface water intake. Surface water intake pipe may cost approx. \$1.5M to \$2M to construct, in addition to the treatment facility cost. • Higher operational and maintenance costs for the water treatment facility. 	<ul style="list-style-type: none"> • Highest capital costs from a wastewater treatment facility, including a lake outfall. Surface water discharge outfall may cost approx. \$1.5M to \$2M to construct, in addition to the treatment facility cost. • Higher operational and maintenance costs for the wastewater treatment facility.
Evaluation	Preferred	Less Preferred	Less Preferred	Least Preferred
Overall Evaluation	Preferred	Less Preferred	Less Preferred	Least Preferred

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12.0 Preferred Solution

12.1 Description of the Preferred Alternative

The preferred water and wastewater servicing solution is Option 2, Onsite Groundwater Well and Onsite Large Subsurface Sewage Disposal System. The preferred solution involves the key elements listed below.

- Drilling of a new groundwater well on Parcel B
- Installation of a new well pump c/w watertight casing on Parcel B
- Construction of a water treatment facility on Parcel B, c/w filtration and disinfection
- Construction of an equalization storage facility for treated water to balance the peak flow, c/w booster pumping.
- Construction of a wastewater pre-treatment facility to treat wastewater to reduce the concentration of contaminants to levels acceptable by the MECF.
- Construction of a large subsurface dispersal bed in Parcel B, with an approximate footprint of 5,000 m² in surface area
- Construction of watermains, sewers, maintenance holes, and associated yard piping
- Capping and abandoning of the existing site well on Parcel B

Refer to Figure 5 for the general site layout.

12.2 Opinion of Probable Cost

The following tables provide the Opinion of Probable Costs for the proposed upgrades as outlined previously. It shall be noted that the Opinion of Probable Costs (OPC) were completed using the 2023 dollar value. An OPC with a Class 'D' (Indicative Estimate) level of accuracy was developed for each alternative solution and includes allowances for design elements that have not fully been developed. Class 'D' OPCs developed for this assignment are expected to be within +/- 30%.

The OPCs were developed based on experience on similar projects, professional judgment, and equipment costs provided by suppliers. Design completed as part of this Master Plan is conceptual, for the purpose of obtaining Class 'D' cost estimates. All design parameters should be confirmed during the upcoming Class EAs and detailed design. Any provided estimates of costs or budget is an OPC that is based on historic construction data, and does not include labour, material, equipment, manufacturing, supply, transportation, or any other cost impacts in relation to COVID-19. JLR shall not be responsible for any variation in the estimate caused by the foregoing factors but will notify the Municipality of any conditions which JLR believes may cause such variation upon delivery of the estimate.

The Master Planning exercise is intended to capture future development and servicing strategies within the next 20-25 years. Since the proposed servicing solution will be a new-built facility, most elements will be within their service life by the end of the 20-25 years. The condition-related upgrades are anticipated to be minimal within this period. Similarly, the rehabilitation of the building structure, process equipment, and electrical equipment is not anticipated.

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Table 11: Opinion of Probable Costs for Onsite Groundwater Well and Associated Treatment System

Item	Opinion of Probable Cost
Well Drilling and Well Pump Installation	\$70,000
Well Building	\$250,000
Groundwater Treatment (incl. filtration, softening and disinfection)	\$100,000
Treated Water Storage and Booster Pumping	\$380,000
Treated Water Distribution to Buildings (excl. local connections)	\$70,000
Electrical, Instrumentation and Control Works	\$25,000
SUB-TOTAL	\$895,000
Engineering (15%)	\$134,250
Permits and Approvals (2%)	\$17,900
SUB-TOTAL	\$1,047,150
Contingency (25%)	\$261,788
GRAND TOTAL (+/- 30% Accuracy)	\$1,310,000

Table 12: Opinion of Probable Costs for Onsite Large Subsurface Wastewater Treatment and Disposal

Item	Opinion of Probable Cost
Wastewater Treatment (incl. containerized treatment system c/w equalization and effluent pumping to dispersal bed)	\$1,300,000
Wastewater Dispersal Bed (inc. clearing, grubbing, sand layer, distribution piping, test ports, filter fabric, tracer wire, backfill and topsoil)	\$450,000
Wastewater Collection (excl. local service connections, but incl. sanitary maintenance holes, sewer pipes to wastewater treatment facility, and roadway crossing)	\$150,000
SUB-TOTAL	\$1,900,000
Engineering (15%)	\$285,000
Permits and Approvals (2%)	\$38,000
SUB-TOTAL	\$2,223,000
Contingency (25%)	\$555,750
GRAND TOTAL (+/- 30% Accuracy)	\$2,780,000

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13.0 Next Steps

13.1 Municipal Class Environmental Assessments

A Schedule 'C' Municipal Class Environmental Assessment (MCEA) will be required to further refine the details of the proposed groundwater water supply, water treatment, and distribution systems.

A Schedule 'B' MCEA will be required to further refine the details of the proposed subsurface wastewater discharge solution.

13.2 Hydrogeological Study and Source Water Protection

The Schedule 'C' MCEA on groundwater supply and treatment will require field hydrogeological studies to confirm the groundwater supply quantity, through an extended duration pump test and quality sampling. It should also be determined whether the proposed well is under the direct influence of surface water (GUDI). The well is currently located within 500 m of surface water and has an intake rate of greater than 0.58 L/s (as per *O. Reg. 170/03 Drinking Water Systems*). Quality sampling undertaken through the hydrogeological study should confirm such classification.

Additionally, the hydrogeological study should confirm the direction of groundwater flow, to support the delineation of the WHPA zones.

13.3 Geotechnical Study

Site-specific geotechnical study shall be undertaken during the MCEAs to identify geotechnical conditions for the proposed undertaking, including the subsurface dispersal bed, new treatment facility buildings, watermain, and sewer installations.

13.4 Archaeological Assessment

It is recommended to retain a licensed archaeologist to undertake the required archaeological assessment to satisfy the requirements from Ministry of Citizenship and Multiculturalism (MCM) as outlined in Section 8.0 Archaeological assessment reports must be submitted for MCM review prior to the completion of the Class EA and prior to any ground disturbance.

13.5 Natural Heritage Recommendations

Cambium recommended the following studies and consultations be undertaken to refine the options analysis for the proposed solution. Since the proposed servicing solution is located on the same site as the proposed mixed housing development, these studies can be conducted in advance or in conjunction with site plan development.

- Determine setbacks from the floodplain in consultation with Quinte Conservation.
- Complete a vascular plant survey.
- Significant wildlife habitat review should be completed after a vascular plant survey and any wildlife surveys.
- Delineate the wetland boundary in June to September.

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- Complete an amphibian call survey during the appropriate seasons if wetlands are found to be suitable for amphibian habitat.
- Complete targeted species at risk surveys to identify their habitat and presence.
- Complete a bat maternity roost survey in the woodlands during November to April.
- Complete a Blanding's Turtle and Gray Rat Snake survey.
- Conduct surveys to determine migratory bird nesting.

14.0 Public and Agency Consultation

Refer to the Phase 1 report for a summary of consultation during Phase 1 of this Master Plan.

14.1 Phase 2 Public Information Centre

A Public Information Centre (PIC) regarding Phase 2 work was held in Verona on March 27, 2024. Approximately 70 members of the public attended the PIC. Two completed comment sheets were received at the PIC.

14.2 Phase 2 Council Presentation

After the Phase 2 PIC, the draft Phase 2 report and related public consultation was presented to the Council of the Township of South Frontenac on May 21, 2024. Council passed a resolution to issue the Notice of Completion for this Master Plan.

14.3 Phase 2 Public Consultation

Table 13 summarizes public consultation and comments received regarding Phase 2 of this Master Plan.

Table 13: Comments received from the Public during Phase 2

Stakeholder	Comment	Action
Comment Sheet Received at PIC No. 2	Expressed support for the preferred solution, Option No. 2.	Acknowledged.
Comment Sheet Received at PIC No. 2		
Email from resident living near proposed site dated March 20, 2024	Expressed support for development. Requested that the future design consider strategies to provide privacy and security between the proposed project and existing residences.	Response sent by Municipality.
Email from local resident dated April 10, 2024.	Several questions about the technical aspects, feasibility, and plans for the project.	Answers sent by Municipality.

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14.4 Phase 2 Agency Consultation

Table 14 summarizes agency consultation and comments received regarding Phase 2 of this Master Plan.

Table 14: Comments received from Agencies during Phase 2

Stakeholder	Comment	Action
Ministry of Citizenship and Multiculturalism (MCM)	<p>Confirmed that there is a reported terrestrial archaeological site mapping within the settlement area, and it is located within 250 m of "Parcel A", in an email dated August 31, 2023.</p> <p>Confirmed that there are no previous marine archaeological assessments in the Verona vicinity, nor are there any known marine sites, in an email dated September 6, 2023.</p> <p>Confirmed that there is low potential for built heritage or cultural heritage landscape in the study area. No requirement to complete a cultural heritage evaluation report or heritage impact assessment.</p>	<p>Criteria for Evaluating Archaeological Potential forms for land and marine archaeology, as well as built heritage resources and cultural landscapes, were completed, and identified a need for an archaeological assessment.</p> <p>Refer to Section 8.0 for further detail.</p>
Quinte Conservation	<p>Held consultation meeting on September 25, 2023.</p> <p>Provided guidance in emails dated October 18, 2023:</p> <ul style="list-style-type: none"> Confirmed that wells and septic systems can be located on the same property if the required setbacks, typically 15 or 30m depending on the type of well, are met. Indicated that further consultation with the MECP regarding LSSDS would be helpful. Wells are permitted in the floodplain only in the event it is the only feasible option. 	<p>Comments addressed in Phase 2 report.</p> <p>Floodplain mapping is currently being updated by the conservation authority for the study area.</p> <p>Refer to Section 6.0 for further detail.</p>
Ministry of the Environment Conservation, and Parks (MECP)	<p>Provided guidance in documents sent March 9, 2023.</p> <p>Confirmed in email dated March 19, 2024, that the new groundwater well will require a Schedule C Class EA, and the subsurface wastewater treatment system will require a Schedule B Class EA under the current MCEA guidelines.</p>	<p>Noted.</p>

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14.5 Phase 2 Indigenous Consultation

The following Indigenous communities were identified by the MECP as requiring consultation for this Master Plan during initial consultation. They were each notified during consequent stages of this Master Plan:

- Williams Treaties Communities
 - Alderville First Nation
 - Curve Lake First Nation
 - Hiawatha First Nation
 - Mississaugas of Scugog Island First Nation
- Mohawks of the Bay of Quinte
- Kawartha Nishnawbe
- Huron-Wendat Nation Council

Table 15 summarizes consultation and comments received from Indigenous groups regarding Phase 2 of this Master Plan.

Table 15: Comments received from Indigenous Groups during Phase 2

Stakeholder	Comment	Action
Alderville First Nation (AFN)	<p>Acknowledged correspondence in a letter dated April 5, 2024, and confirmed that the proposed project is situated within the Traditional Territory of Alderville First Nation, incorporated within the Williams Treaties Territory. They outlined their rights in this territory. AFN requested a Notice of Request to Consult and File Fee to determine whether a mutual agreement to establish a special consultation process will be required.</p> <p>They expect engagement at Stage 1 of an archaeological assessment and insist at least one of AFN’s Archaeological Liaisons be involved in any Stage 2 - 4 assessments.</p>	<p>AFN will be consulted during the future Schedule ‘B’ and ‘C’ Class EAs.</p>

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15.0 Notice of Completion and Filing on Public Record

This Master Plan is being placed on public record for 30 calendar days for review by the public, stakeholder agencies, Indigenous communities, and other interested parties.

A notice indicating the completion of the Master Plan and its filing on public record has been issued to the public, and all interested parties that have previously been contacted and that have indicated interest to stay involved in the planning process.

The review period is intended to resolve any outstanding concerns regarding the project between the Township and the party expressing concerns. The Master Plan will be reviewed and revised, taking into consideration any comments received from the public.

Any information collected during the planning process is managed in accordance with the Freedom of Information and Protection Act. Apart from personal information, all comments become part of the public record. Proprietary information (i.e., equipment manufacturers) and pricing could provide competitors with some advantages and is not released in detail as part of the Freedom of Information and Protection Act.

Subject to comments received, the Township can choose to proceed with the recommended projects in the Master Plan after the 30-day review period. Projects that have been identified as Class EA Schedule 'B' or 'C' will proceed into project-specific Class EA studies during which the public will be consulted for their input.

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16.0 Limitations

This report has been prepared by J.L. Richards & Associates Limited for Township of South Frontenac's exclusive use. Its discussions and conclusions are summary in nature and cannot properly be used, interpreted, or extended to other purposes without a detailed understanding and discussions with the client as to its mandated purpose, scope, and limitations. This report is based on information, drawings, data, or reports provided by the named client, its agents, and certain other suppliers or third parties, as applicable, and relies upon the accuracy and completeness of such information. Any inaccuracy or omissions in information provided, or changes to applications, designs, or materials may have a significant impact on the accuracy, reliability, findings, or conclusions of this report.

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