Exploring affordable options for private water and septic technologies Informing planning of affordable housing

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Exploring affordable options for private water and septic technologies: Informing planning of affordable housing

City of Kawartha Lakes and Haliburton County

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ERSC 3160
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Executive Summary

The City of Kawartha Lakes and the County of Haliburton have both undertaken housing needs assessments in conjunction with the development of the Housing and Homelessness Plan. The primary topics to be addressed to better current and emerging housing needs were (1) the limited supply of private market rental housing, particularly in the affordable ranges, and (2) the need to improve the diversity of housing stock, particularly for the growing percentage of seniors and smaller households. Many communities and areas of Kawartha Lakes and Haliburton County do not have municipal water or municipal sewage services available, and in the townships around the city, most properties rely on groundwater from dug or drilled wells for daily water usage and a septic system for wastewater.

The implementation of communal servicing (a decentralized system) has the potential to decrease the cost of the initial build as well as the long-term expense to the property owner. Communal services are systems that provide water and wastewater treatment to clusters of residences in contrast to having every residence own their own individual system. The following report explores current alternative technologies in private water management and investigates how communal servicing could support more compact, land-efficient development than is possible with private servicing, at a lower cost than is possible with centralized municipal services.

This report was prepared for the City of Kawartha Lakes and County of Haliburton in partnership with the Trent Community Research Centre and the School of Environmental Science as part of ERSC 3160.

Kawartha Lakes

Trent Community Research Centre

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Introduction

Local Context – City of Kawartha Lakes and County of Haliburton

The City of Kawartha Lakes is a rural area located in south-central Ontario, 90 minutes northeast of Toronto and directly west of the City of Peterborough. The municipality encompasses several communities and a chain of connected rivers with over 250 lakes and channels, including the Trent Severn Waterways. The name Kawartha is derived from the Anishinaabe words meaning "land of reflections" and the area is situated on the traditional territory of the Anishinaabeg, Huron-Wendat and the Haudenosaunee peoples (King's Printer for Ontario 2023). Kawartha Lakes is unique geographically as it is located on the boundary between the Paleozoic limestone regions of the Golden Horseshoe, and the Precambrian granite Canadian Shield of northern and central Ontario (Rayburn 1997). Today, Kawartha Lakes is a frequent tourist destination known for year-round outdoor activities and water pursuits, as well as local culinary and historic culture (King's Printer for Ontario 2023).

It has a population of 79 247 residents occupying 32 708 of its 38 947 total private dwellings (increase of 5.1% since 2016;Kawartha Lakes 2023, Statistics Canada 2023). In 2001, the former Victoria County and its constituent municipalities were amalgamated through provincial legislation into the City of Kawartha Lakes (Miljan & Spicer 2015). The second largest municipality in Ontario with a land area of 3 033.66 km^2, Kawartha Lakes is legally structured as a single-tier city, however, most residents live outside of urban centers (Kawartha Lakes 2023). In the 2021 Stats Canada census, 30 211 residents were living in urban areas (Lindsay, Bobcaygeon, Fenelon Falls, Omemee, Woodville) with 49 036 in rural communities for a total population density of 26.1/km2 (67.7/sq mi; Kawartha Lakes 2023).

The County of Haliburton, north of Kawartha, is made of four local municipalities (Township of Algonquin Highland, Municipality of Dysart et al, Municipality of Highlands East, Township of Minden Hills) with a permanent population of 20,571 (County of Haliburton 2023). Better known as the Haliburton Highlands, it is one of the higher points on the Canadian Shield and is known for its beauty and over five hundred lakes (County of Haliburton 2023). The County of Haliburton is located on Treaty 20 Michi Saagiig territory, and in the traditional territory of the Michi Saagiig and Chippewa Nations, collectively known as the Williams Treaties First Nations (County of Haliburton 2023).

The City of Kawartha Lakes and County of Haliburton have both undertaken housing needs assessments in conjunction with the development of the Housing and Homelessness Plan to better understand the current and emerging housing needs in Kawartha Lakes and Haliburton County. Some of the primary themes identified were the limited supply of private market rental housing, particularly in the affordable ranges, as well as the need to improve the diversity of housing stock, particularly for the growing percentage of seniors and smaller households. The City and County have been working to provide a full range of housing options for all residents, including affordable options for residents with low incomes however, the need for affordable housing, including rental and ownership housing, as well as housing for an aging population continues to increase.

Existing Services and Challenges

Many communities and areas of Kawartha Lakes and Haliburton County do not have municipal water or municipal sewage services available (Kawartha Lakes 2023). In the townships around the city, most properties rely on groundwater from dug or drilled wells for daily water usage, and a septic system for

wastewater (KC 2023). Wells must be constructed to provincial standards and the property owner must ensure that their well water is safe to drink through annual testing (KC 2023). To avoid problems, rural property owners should clean their leaching bed filter once a year and have their septic tanks pumped out every three to five years, with an overall lifespan of twenty to twenty-five years (KC 2023).

The variable geography of Kawartha Lakes and Haliburton County presents unique building challenges and opportunities for both traditional and alternative systems. Septic systems typically consist of underground chambers which anaerobically treat solids while the remaining effluent is filtered by microorganisms before draining into the groundwater. However, there are naturally occurring conditions which may necessitate an alternative solution. such as (1) soil permeability (the percolation rate of soil) (2) restrictive layers (clay or bedrock) (3) high water table (potential groundwater contamination). If a site has one or more of these conditions, a conventional septic system is likely to fail, posing environmental and human health risks including chemical pollutants and pathogenic organisms.

The cost of a new well depends on the depth of the well, which varies depending on the surrounding landscape (CMHC n.d.). Wells draw water from aquifers, which are zones of saturated permeable soil or rock. Some types of soil make for good aquifers that can support high water pumping rates, while other types of soil make for poor aquifers (CMHC n.d.). Dug and bored wells (60 – 120 cm diameter) are commonly used to produce water from shallow surface aquifers (less than 15 m deep) and are prone to contamination from surface water infiltration and water shortages (CMHC n.d.). Drilled wells (10 – 20 cm diameter) are commonly used to penetrate deeper aquifers (15 to greater than 60 m/50 to greater than 200 ft. deep), are more costly to construct, but provide a safer source of drinking water (CMHC n.d.).

The Kawartha Conservation watershed within Kawartha Lakes is 2 563 km^2 in size, 359 km^2 of which are wetlands (approximately 14% of the total area), and includes 55 Provincially Significant Wetlands (PSWs) and 49 Locally Significant Wetlands (LSWs;KC 2023). Kawartha and Haliburton also extend into the Boreal Shield Ecozone which has only a thin layer of soil with exposed igneous bedrock of the Canadian Shield. Building underground plumbing in this area can require blasting through the bedrock, which is often expensive and may necessitate exploring above-ground alternatives.

The key to the development (and redevelopment) of both residential and commercial facilities in any region is the availability of essential services, including water and wastewater services. Existing approaches to water and wastewater servicing constrain the City of Kawartha Lakes and Haliburton County to grow in rural areas. The cost of providing new or expanded municipal water/wastewater services within the study area is prohibitively expensive and inflexible with respect to location. Developments in recent decades have therefore focused on the installation of private well and septic systems. However, well and septic installations require large lots for each unit. The cost of installing traditional centralized water and septic systems in new build projects creates barriers to constructing affordable housing as the cost of these services increases the market price of the property and leaves the homeowner with additional maintenance costs. This limits the opportunities for affordable housing for residents who live in rural communities without municipal services.

The implementation of communal servicing (decentralized system) has the potential to address many of these issues and assist the City of Kawartha Lakes and Haliburton County in achieving affordable housing in rural areas without municipal water or sewage services available.

Research Questions

1. Are there new affordable private water and septic system technologies that could enable affordable housing to be constructed in communities that lack municipal services?
2. Could such an approach be economically, environmentally, legislatively, and socially viable?
3. What considerations would support or challenge such a build? (e.g., cost, technology, policy, permit requirements, etc.)

Research

Overview of Available Advanced Water Systems and Technologies

Water Systems

Drilled or Dug Well

Overview

Wells are built by drilling into the ground and accessing an underground aquifer (Water Defense 2023). That water is then pumped into the house (Water Defense 2023).

Benefits

Wells have a long-life span and once installed, are a cost-effective means to deliver water to a home (Water Defense 2023).

Challenges

Well water needs to be pumped out of the ground and is dependent on electricity, and back-up generators are required in case of emergency (Water Defense 2023). Property owners are responsible for any maintenance, repairs, as well as the quality of water. Well water should be tested annually to ensure safe drinking water (Water Defense 2023).

Surface water system

Overview

Water is drawn directly from a lake, river, stream, or pond as required, using the natural capacity of the water body as a storage medium (Endeavor Centre 2020). This system is used for individual residences and entire municipalities (Endeavor Centre 2020).

Benefits

Systems rarely require deep digging, but the distance from the water source will affect the cost (Endeavor Centre 2020). Surface water systems are easy to set up (Endeavor Centre 2020). In cold climates, water lines will need to be dug below the frost line (Endeavor Centre 2020). Once installed, most surface water systems operate automatically (Endeavor Centre 2020). Proper inlet positioning should ensure a supply of water as long as levels remain within expected norms (Endeavor Centre 2020).

Challenges

Surface water is vulnerable to a wide range of natural and human contamination and will certainly need extensive treatment in order to be potable (Endeavor Centre 2020). Assessing water quality can be difficult, as the water will vary in quality depending on season, weather events, human influence and natural cycles and issues (Endeavor Centre 2020). If the water body is subject to seasonal flooding

and/or drought, this will also affect quality by introducing new contaminants or concentrating existing contaminants (Endeavor Centre 2020). Surface water should be tested regularly, as levels and types of contamination will change (Endeavor Centre 2020). Inlets should be inspected and cleaned on an annual basis at minimum. Pumps have a finite lifespan and will eventually need replacing (Endeavor Centre 2020).

Rainwater

Overview

The roof area of a building is used to capture rainwater via eaves troughing (Endeavor Centre 2020). Downspouts typically carry the water to a first-flush diverter, which directs a quantity of water from the beginning of a rain event away from the tank to prevent contaminants on the roof from entering the tank (Endeavor Centre 2020). The water is directed to a storage tank where it is held until required for use (Endeavor Centre 2020). A storage tank will be the most expensive component of the system, and prices vary depending on tank material and capacity (Endeavor Centre 2020).

Benefits

Rainwater is typically clean unless contaminated by particularly heavy air pollution or toxic dust on the roof (Endeavor Centre 2020). Rainwater catchment systems are a low impact means of collecting water, making use of natural rainfall events in a way that has very little impact on surface and groundwater levels and quality (Endeavor Centre 2020). Surface water collection systems are common, and components and installation professionals will be easy to access (Endeavor Centre 2020). Once installed, most rainwater systems operate automatically (Endeavor Centre 2020). Homeowners will need to monitor the water level to ensure use does not outstrip supply (Endeavor Centre 2020).

Challenges

Rainwater is distilled water and therefore has low mineral content (Endeavor Centre 2020). Unless re-mineralized, it can have long-term health effects if it is the main source of drinking water (Endeavor Centre 2020). Low mineral content in the water can also cause leaching of mineral content from piping, which is of special concern if the piping contains fittings that may have lead and/or zinc content (Endeavor Centre 2020).

Wastewater Systems

According to the Ontario Onsite Wastewater Association (OOWA), the Ontario Building Code implemented changes to the requirements for Treatment Units as outlined in Article 8.6.2.2, which took effect January 1, 2017 (OOWA, 2023). These changes include the removal of Supplementary Standard SB-5 for Approved Treatment Units and a new reference to the CAN/BNQ 3680-600 standard for certification of treatment units. Below is a list of advanced treatment technologies that have been certified under this standard. In addition to these treatment units, there are other systems that have been approved under the Building Materials Evaluation Commission (BMEC- a regulatory agency under the Ontario Building Code) that are also listed below (OOWA, 2023):

CAN/BNQ 3680-600 Certified Wastewater Treatment Technologies:

- Premier Tech Aqua

- Waterloo Biofilter
- Norweco
- Enviro-Septic • Bionest Technologies Inc.
- Bio-Microbics

BMEC Certified Treatment Technologies

- Enviro-Septic BMEC Authorization 2018
- Eljen GSF System
- Infiltrator ATL

Septic Systems

Overview

A septic tank is a buried, watertight tank designated and constructed to receive and partially treat raw domestic sanitary wastewater (EPA 2022). Heavy solids settle to the bottom of the tank while greases and lighter solids float to the top (EPA 2022). The solids stay in the tank while the wastewater is discharged to the drain field for further treatment and dispersal (EPA 2022).

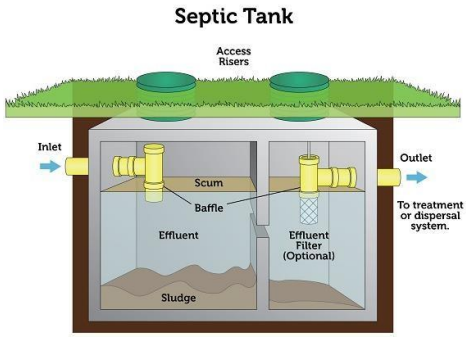

Figure 1 Diagram of septic tank system (EPA 2023).

Benefits

Cost: Traditional septic tanks are typically the most affordable options for onsite wastewater treatment (EPA 2022).

Challenges

Variability: The design and size of a septic system can vary widely across regions from several factors including household size, soil type, site slope, lot size, proximity to sensitive water bodies, weather conditions, or even local regulations (EPA 2022).

Maintenance: Septic systems must be properly maintained to avoid risking the users' health, hurting the environment, and avoiding expense repairs (EPA 2022).

Conventional System/Chamber System

Overview

A conventional decentralized wastewater treatment system consists of a septic tank and a trench or bed subsurface wastewater infiltration system, known as a drain field, and is typically installed at a single-family home or small business.

Benefits

Sustainability: The gravel-less systems can be manufactured with recycled materials and offer a significant savings in carbon footprint.

Construction: The primary advantage of the chamber system is increased ease of delivery and construction.

High Groundwater: They are also well suited to areas with high groundwater tables, where the volume of influent to the septic system is variable, and in an area where gravel is scarce.

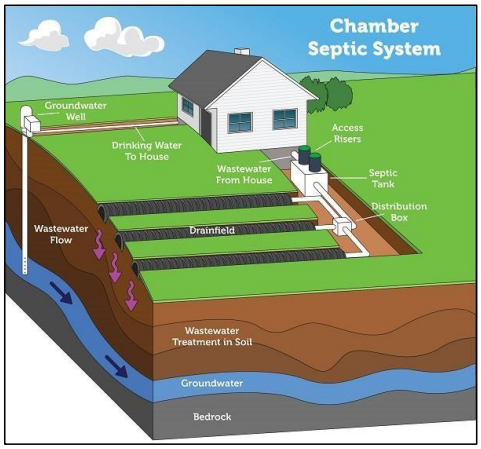

Figure 2 Diagram of chamber septic system (EPA 2023)

Challenges

Cost: A conventional decentralized wastewater treatment system has high cost if gravel is not available.

Mound Systems

Overview

Effluent from the septic tank flows to a pump chamber where it is pumped to the mound in prescribed doses. Treatment of the effluent occurs as it discharges to the trench and filters through the sand, and then disperses into the native soil.

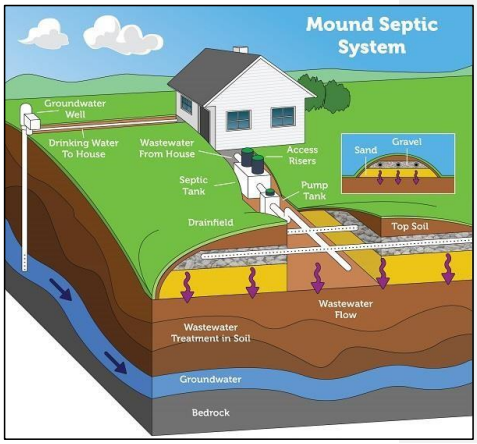

Figure 3 Diagram of mound septic system (EPA 2023).

Benefits

High Groundwater/Shallow Soil: Mound systems are an option in areas of shallow soil depth, high groundwater, or shallow bedrock as an above-ground option.

Challenges

Cost: Depending on the system design and the local cost of sand and gravel, a mound system can add $10,000 or more to the price of a conventional system – often costing over $20,000 in some areas. The biggest costs are the additional equipment as well as the earthwork and extra materials needed to build the mound (Enviro Design Products 2022).

Space: While mound systems can be a workable solution for certain soil conditions, they require a substantial amount of space.

Maintenance: Periodic maintenance is required.

Sand Filter System

Overview

Sand filter septic systems use sand to purify and remove toxins from wastewater (Enviro Design Products 2022). The sand is used to pre-treat effluent, by filtration and aerobic bacteria, before disposal to the leach field.

Benefits

Environment: This is one example of an alternative septic system without a leach field, which makes it compatible with environmentally sensitive areas. It can also be constructed above or below ground (Enviro Design Products 2022).

High Groundwater: Sand filters provide a high level of treatment for nutrients and are good for sites with high water tables or that are close to water bodies.

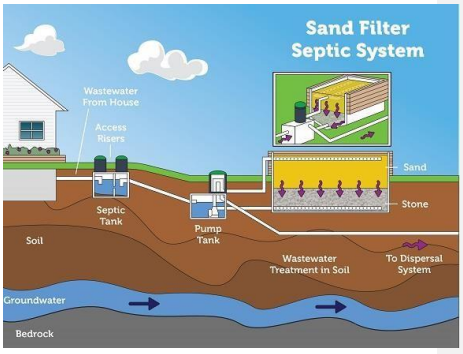

Figure 4 Diagram of sand filter septic system (EPA 2023)

Challenges

Maintenance: Sand filters must be well-engineered and constructed, and properly maintained, to avoid frequent clogging of the sand.

Cost: Sand filters are more expensive than a conventional septic system (Enviro Design Products 2022).

Aerobic Treatment Units

Overview

An aerobic treatment system uses many of the same processes as a municipal sewage plant, but on a smaller scale, by incorporating oxygen into the treatment tank with an air pump, which pulls air from the atmosphere into the septic tank (Enviro Design Products 2022). The most complex systems contain four chambers to collect, aerate, purify, and pump the effluent (Enviro Design Products 2022).

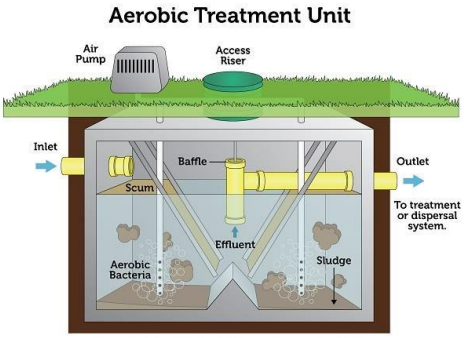

Figure 5 Diagram of aerobic treatment system (EPA 2023).

Benefits

Flexible Design: The benefits of this system are that it can be used in homes with smaller lots, inadequate soil conditions, in areas where the water table is too high, or for homes close to a surface water body sensitive to contamination by nutrients contained in wastewater effluent.

Challenges

Cost: These systems are expensive to install and maintain, so are mainly used where high-quality treatment is needed in a limited area or with poor soils (Enviro Design Products 2022).

Drip Distribution/Irrigation

Overview

The drip distribution method releases treated septic water over a greater surface area of land (Enviro Design Products 2022). Instead of one PVC pipe that disperses treated water into the leach field, the drip distribution method "irrigates" the leach field with long, winding, flexible tubing that releases small increments of water all along the length of the tubing (Enviro Design Products 2022).

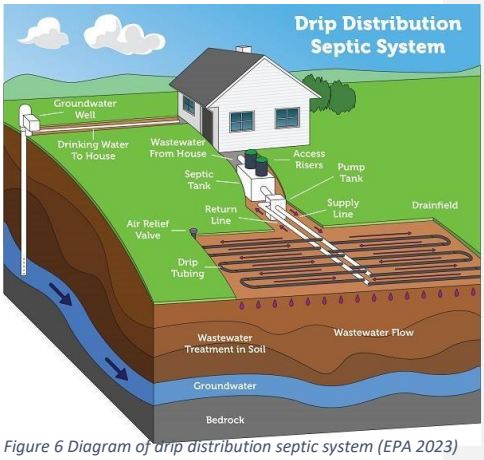

Figure 6 Diagram of drip distribution septic system (EPA 2023)

Benefits

Shallow Soil: This type of system can be used with shallow soils and no large mound of soil is needed as the drip laterals are inserted into the top 6 to 12 inches of soil (EPA 2022, Enviro Design Products 2022).

Challenges

Additional Components: The disadvantage of the drip distribution system is that it requires a large dose tank after the septic tank to accommodate the timed dose delivery of wastewater to the drip absorption area. Additional components, such as electrical power, are necessary for this system, requiring an added expense and increased maintenance. Power outages may also make these alternative septic solutions more high maintenance than other systems.

Climate: Because the tubes are near the surface, freezing can be a problem in cold climates (Enviro Design Products 2022).

Cost: As with other alternative systems, expect high installation costs, along with extra monitoring and maintenance (Enviro Design Products 2022).

Constructed Wetland System

Overview

A constructed wetland mimics the treatment processes that occur in natural wetlands. Wastewater flows from the septic tank and enters the wetland cell. The wastewater then passes through the media and is treated by microbes, plants, and other media that remove pathogens and nutrients.

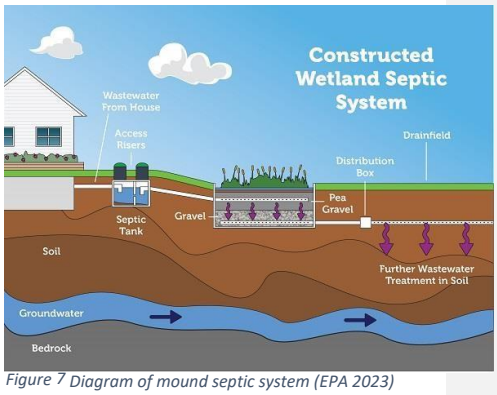

Figure 7 Diagram of mound septic system (EPA 2023)

Benefits

Ecological: For the ecologically minded who want to play an active role in recycling their wastewater, these can work in almost any type of soil (Enviro Design Products 2022).

Challenges

Maintenance: The homeowners must plan to spend time planting, trimming, and weeding the wetlands area (Enviro Design Products 2022).

Cost: As with other alternative systems, expect high installation costs, along with extra monitoring and maintenance.

Communal Water Servicing

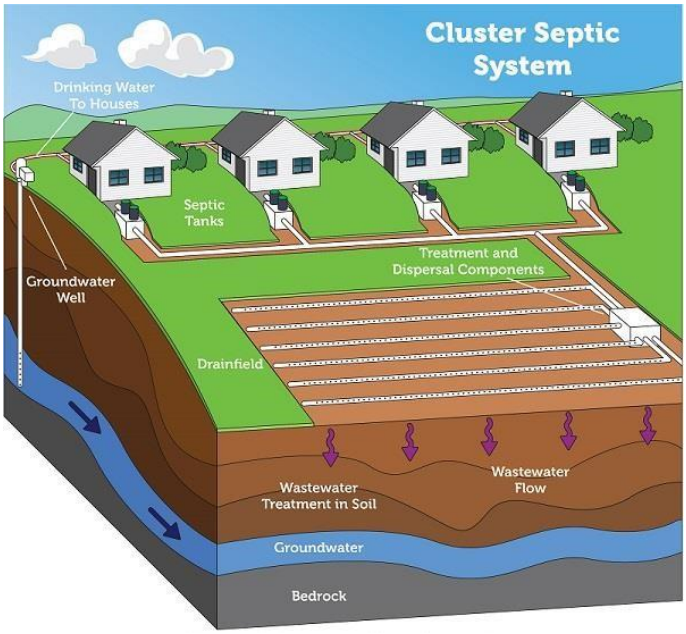

Figure 8 Diagram of cluster or communal septic system (EPA 2023)

In principle, communal water and wastewater services are shared drinking water and sewage systems that provide water and wastewater treatment to clusters of residences and businesses. Communal water systems consist of shared potable water from the collection of groundwater and treatment to drinking-water quality standards as part of communal service development. Whereas communal wastewater systems are shared facilities for the collection, treatment, and disposal of sewage in communal service development. Communal systems are not connected to a single central facility, but rather 'right-sized' facilities that treat water and wastewater close to where it is needed or created.

The existing conventional options for drinking water and wastewater treatment are municipal centralized services and private individual on-site services. In a centralized municipal system, water is distributed to, and wastewater is collected from a large service area through an extensive piped collection/distribution infrastructure. The water and wastewater are treated at a municipally owned plant which is generally oversized for current needs to account for future growth. The cost for this in a

rural setting for a small municipality is tremendous. By contrast, private individual on-site services generally refer to well water and septic treatment systems which serve one unit- which are not always the best option for affordable housing developments in rural areas.

Communal systems typically serve small-to-moderate development sizes with typical ranges between 10 to 300 units within each settlement area, which would suit the development needs of the City of Kawartha Lakes and Haliburton County. Communal systems have the potential to support more compact, land-efficient development than is possible with private servicing, and at a lower cost than is possible with new or expanding centralized municipal services due to reducing the need to pipe water and wastewater over long distances. This also makes communal servicing more environmentally friendly than options consisting of private on-site well and septic services at each individual unit and centralized municipal services.

Many different options exist within the broad category of communal servicing. Systems may be municipally or privately owned, using several different ownerships, operation models, and advanced technology. There is a growing range of treatment technologies that can be used for communal servicing. The notable feature is that communal services treat water and wastewater close to where it is needed- drastically reducing the cost for the community and municipality.

Benefits of Communal Servicing

Efficient Land-Use

Communal servicing allows for denser development on smaller lot sizes and more efficient land use as compared to private on-site servicing. In many rural communities, centralized servicing is often not resource effective. Instead, communal servicing can support densities up to those supported by centralized municipal services and in targeted areas at a relatively low cost.

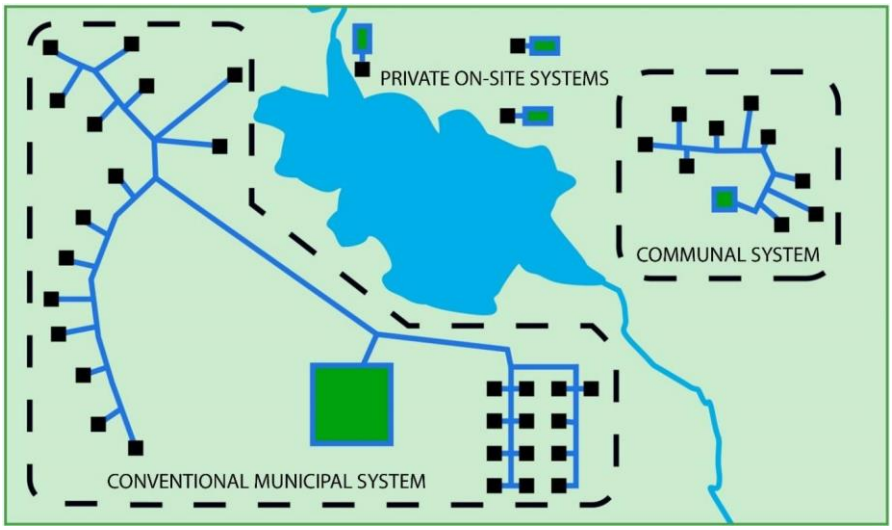

Figure 9 Comparison in land-use are of between communal, private, and centralized municipal systems.

Lower Cost Alternative

Numerous studies such as Tjandraatmadja et al. (2005) and Pinkham et al. (2004) show that communal servicing infrastructure can be a cost-effective alternative to centralized municipal infrastructure.

- Communal systems permit expansion as needed allowing you to scale with development, while municipal systems are designed for over-capacity to accommodate growing populations (Tjandraatmadja et al, 2005)
- Communal systems reduce the need for expansive distribution infrastructure (pumps, pipe) to move water long distances which is a substantial cost to maintain.
- Reduced municipal service delivery costs to residents (garbage collection, snow removal).

Environmental Benefits

Communal servicing systems inherently offer some environmental benefits. Smart choices throughout the planning and design process can yield even greater environmental benefits. Most communal servicing projects achieve environmental benefits.

- One communal well, and one communal septic that are licensed and monitored by the Province or Municipality versus several or dozens of individual wells and septic that are not monitored, will provide better environmental protection.
- Water is returned to the environment close to where it was withdrawn.
- Higher water and wastewater treatment standards can be expected than for private individual services.
- No environmental cost from the distribution and collection of water.

Innovative technology and advanced design can lead to reductions in water consumption by using an inbuilding treatment and reuse system (greywater recycling system). This was found by Snider et al. (2016) to have the strongest potential environmental benefits.

- In-Building Treatment Systems allow for the reuse of water, reducing water use.
- Advanced Treatments such as Ecoflo and Waterloo Biofilter achieve extremely high treatment quality with little land consumption.

Benefits for Residents

- Communal servicing instills confidence in residents knowing that their drinking water and wastewater treatment systems are in very close proximity and often visible.
- Residents will have a wider choice of housing options, including apartment units.
- Residents will have confidence in good community stewardship with the use of water resources in their area.

Challenges of Communal Water Services

One of the major sources of risk for municipalities is contained in Section 16, “Order by provincial officer: contraventions,” of the Ontario Water Resources Act (OWRA). The OWRA grants the Minister

(Director) significant powers to intervene in sewage works that it deems unsafe or failed (WSP, 2023). A provincial officer may issue an order to a person in contravention of a provision of the Act or regulations. The order may require any combination of the following:

- "The repair, maintenance or operation of water works, or sewage works in such manner and with such facilities as are specified in the order;
- The removal of sewage or any thing contaminated by sewage;
- Sampling, analysis or reporting with respect to the quality or quantity of any waters;
- Where the contravention has caused damage to or endangered or is likely to cause damage to or endanger existing water supplies, providing temporary or permanent alternate water supplies."

Another considerable risk to municipalities when providing communal water services stems from Guideline D-5-2 from the Ministry of Environment, Conservation and Park's Application of Municipal Responsibility for Communal Water and Sewage Services (WSP, 2023). It is the Ministry's opinion that private communal systems are more likely to fail due to poor management practices and insufficient funds for needed repairs. It therefore requires that for all privately-owned communal systems, municipalities take on the responsibility for repairing systems that fail with the developer (WSP, 2023). In situations where communal water or wastewater facilities become inoperable or otherwise unsafe, the local municipality is obliged to intervene and fund repairs or replacements up to and including full system replacement (WSP, 2023).

Understanding the types of risks to water and wastewater communal services that are enabled by climate change is critical (WSP, 2023). These may include:

- Extreme storm events that increase flow/infiltration, overwhelming treatment capacity;
- Extreme weather, including rain on frozen ground, which may flood infrastructure; and
- Extended drought periods which may reduce flows in receiving water bodies.

Typically, risks in communal water systems may be easier to manage than in larger municipal systems due to their smaller scale (WSP, 2023). Communal systems may also represent a smaller risk of contamination as opposed to multiple individual private wells, and issues would be easier and more cost-effective to respond to if, for example, a deeper well is required. Communal systems and new technologies also offer the opportunity to reduce the carbon footprint of wastewater treatment.

Case Studies for Communal Water Services

Some communities in Ontario already rely on communal water and wastewater servicing, including Indigenous communities and RV parks. Interest in communal servicing tends to be greater in rural and lower-density communities.

Shadowridge Estates, Greely, Ottawa, Ontario (2011)

- Subdivision of forty-five single-detached houses and 113 semi-detached units
- Municipally owned water and wastewater systems
- Wastewater treated through peat bed
- Drinking water pumped from well and treated through compact plant

St-Joseph-de-Kamouraska, Quebec (2001)

- Eighty existing residential units
- Municipally owned wastewater system
- Wastewater from each unit/residence is treated by an individual EcoFlo Advanced Treatment Unit
- Treated wastewater from each unit move via gravity sewers into one of five communal dosing stations; reducing the need for a pump and saving additional money

Fieldstone Development, Township of Mono, Ontario (2014)

- 340-unit subdivision of detached homes
- Municipally owned well for drinking water, using groundwater to service roughly six hundred connections in the area
- Conventional sewer collection system discharging into a Rotating Biological Contractor (RBC) Treatment Unit
- Discharge of treated wastewater into subsurface via area bed disposal system

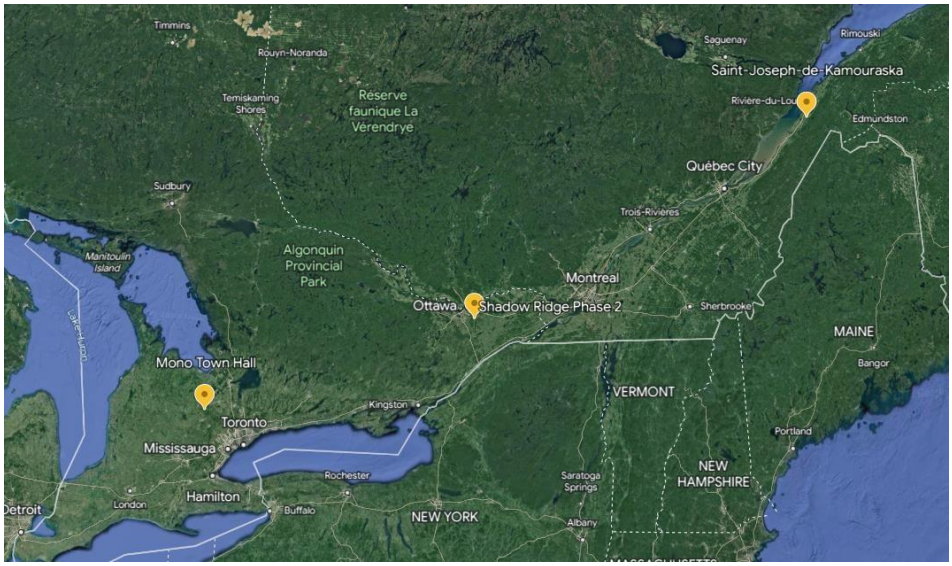

Figure 10 Map of Southern Ontario showing communal service case study locations.

Discussion - Viability in Kawartha Lakes and County of Haliburton

Economic Opportunities and Barriers

Alternative septic systems are typically more expensive than traditional septic and well. Costs for a project can vary by region, installer, and based on the equipment and maintenance a system may require. The following is a list of funding sources which may be applicable in future projects.

Municipal Programs and Incentives

Affordable Housing Targets Program (AHTP) Incentives are available to developers, non-profits, community housing providers, property owners and homeowners to create affordable housing. The following is an overview of incentives for new construction which are made available through Kawartha Lakes and the County of Haliburton to assist with achieving affordable housing targets. Proponents can also access any available provincial capital funding that is to support the development of affordable housing, through this program.

Federation of Canadian Municipalities

The Federation of Canadian Municipalities (FCM) programs and advocacy help secure new tools that empower municipalities to build stronger communities of all sizes. They offer grants, competitive loans, and long-term financing for municipal environmental projects. Funding is available for both the construction of sustainable affordable housing as well as septic wastewater projects. Applications are accepted year-round, and funding is stackable with CMHC's Co-Investment Fund and other initiatives of the National Housing Strategy.

Community Housing Transformation Centre

The Community Housing Transformative Centre provides grants, tools, and services to support community housing stakeholders in their efforts. The Centre administers several funds and offers various grants to community housing stakeholders including the Local Projects Grant which is designed to improve the quantity and quality of the services provided to the community. Proposals are evaluated according to two categories: projects up to and under $50,000 and projects over $50,000 and are limited to $150,000. All Centre-funded projects must demonstrate a transformative aspect or impact that will improve the applicant's (or the sector's) organizational capacity and their sustainability and ability to grow.

Kawartha Conservation Funding

Landowner and Community Grants – The Water Fund

The Water Fund is an annual grant program that helps landowners and not-for-profit community organizations access funding, knowledge, and technical support for environmental projects in the City of Kawartha Lakes and Durham Region. If your project has the potential to positively impact water quality or ecosystem health, it may be eligible for funding. The Water Fund is a cost-sharing program that supports environmental projects up to 50% of the total project cost, to a maximum of $4,000.

Funding is available for upgrades to the existing septic as well as well upgrades and decommissions are potentially eligible. Private new well construction, well pumps, and water purification or treatment systems are ineligible.

(Water Fund – 2023 Applicant's Guide, Kawartha Conservation)

Environmental and Health Implications

Drinking water can expose people to a variety of harmful pollutants and pathogens (EPA 2023). Public water systems use water treatment and monitoring to protect consumers while private wells do not generally receive the same services (EPA 2023). Well owners are responsible for protecting their drinking water which can be contaminated by both naturally occurring sources and by human activities (EPA 2023). Water run-off from rainfall or snowmelt can contaminate private wells by washing contaminants into the well system or seeping underground (EPA 2023). Microorganisms, heavy metals, as well as other chemicals such as and nitrate and nitrite can contaminate a private well through groundwater movement and surface water (EPA 2023).

Household wastewater is treated by a septic system before it filters into the soil (EPA 2023). Recycled water from a septic system can help replenish groundwater supplies; however, if the system is not working properly, it can contaminate nearby waterbodies or if located too close to a drinking water well, contaminants from the wastewater can end up in drinking water (EPA 2023). A failing septic system likely discharges untreated wastewater, which contains pathogens (e.g., E. coli), nutrients and other harmful substances directly into the groundwater or onto the ground and into surface waters (EPA 2023). Surfacing untreated wastewater is a direct public health hazard to anyone exposed, which can result in serious illness and death (EPA 2023).

Excess nitrogen and/or phosphorus can cause an overgrowth of blue-green algae or cyanobacteria in a short period of time, triggering algae blooms (EPA 2023). The overgrowth of algae consumes oxygen and blocks sunlight from underwater plants (EPA 2023). When the algae eventually die, the oxygen in the water is consumed which can cause fish and other aquatic organisms to die and create regional “dead zones” (EPA 2023). Pathogens can cause illnesses in recreational swimming areas, even requiring beach closures and hazards to humans and pets (EPA 2023). Freshwater rivers, lakes, and ponds are more sensitive to phosphorus contamination from failing septic systems (EPA 2023). The cumulative impact of failing septic systems that are in close proximity to each other and to a water body in environmentally sensitive areas may need to be addressed at the regional or watershed level (EPA 2023).

In general, a properly installed, sited, and maintained septic system should not adversely affect water quality (EPA 2023). In some cases, the design may require advanced treatment to reduce the wastewater strength, and impacts of nitrogen contamination, or include disinfection when there are properties in close proximity to surface waters (EPA 2023).

Relevant Legislation

The Federal government, Provincial government, and local municipalities all play a role in planning, regulating, and approving all water and wastewater servicing. Provincially, Ontario’s Ministry of Environment, Conservation and Parks (MECP) play a lead role in ensuring that water and sewage projects are safe for the environment and people. Municipal governments play a key role in implementing Provincial and local policies on water and wastewater. Although Conservation Authorities do not have direct regulatory or approval authority in most cases, they play an important role as partners for local municipalities and the province.

Water systems are highly regulated in the building industry and water sources are subject to government jurisdiction that will regulate how, when, and where water is extracted. All components of a

drinking water system must meet the requirements of codes. In some regions, a drinking water system may need to be designed by a licensed professional, with each component specified and inspected. The regulatory framework for dealing with wastewater is the most restrictive and prescriptive aspect of most codes which can dissuade homeowners from attempting to employ more sustainable strategies in the face of government resistance. The motivation for these regulations is understandable as poorly maintained systems can have detrimental health consequences. Those wishing to pursue alternative wastewater strategies should familiarize themselves with local regulations and be prepared to absorb extra time and possibly extra cost in the planning and construction process.

Federal Government

Canada sets minimum environmental standards for sewage effluent through the Canada Wastewater Systems Effluent Regulations (WSP, 2019). The Guidelines for Canadian Drinking Water Quality are used by Provinces to develop their own drinking water quality guidelines. It is important to note that there is no direct involvement of the Federal government in most water and wastewater treatment projects since the Federal government is not directly responsible for water or wastewater planning and approvals. This is because the Ontario government requirements for water and wastewater quality either meet or exceed the Federal government requirements (WSP, 2019).

Provincial Government

The Province of Ontario sets directions for sewage and water planning that municipalities must follow and be consistent with according to the 2014 Provincial Policy Statement and the Planning Act, Section 2 (WSP, 2019). The Ontario government regulates effluent being discharged into the environment by requiring Environmental Compliance Approvals (ECA) for most communal wastewater treatment projects (WSP, 2019). The need for an ECA is triggered by Section 9.1 of the Environmental Protection Act (WSP, 2019). The ECA process ensures that new wastewater treatment projects will not lower the quality of Ontario waterbodies below the Provincial Water Quality Objectives (WSP, 2019). It is important to note that wastewater treatment systems that treat less than 10,000 L/day may not trigger the need for an ECA.

Ontario also governs the Safe Drinking Water Act and the Health Protection and Promotion Act which regulates drinking water source protection and small drinking water systems (WSP, 2019).

Local Municipalities

The City of Kawartha Lakes and the County of Haliburton would be responsible under the Planning Act for ensuring compliance of local planning policy and development approvals with the Provincial Policy Statement. This will allow the planning for water and wastewater services and ensure development occurs where the new water and wastewater servicing will exist. They must also take responsibility for failed communal systems through the Municipal Responsibility Agreement.

Conservation Authorities

If a property falls within Kawartha Conservation's Regulated Area, a permit is required to complete any development, construction, or site alteration (e.g., grading, fill placement, excavation, etc.) under the Regulation of development, interference with wetlands, and alterations to shorelines and watercourses (Conservation Authorities Act - Ontario Regulation 182/06) (KC 2023).

Building and Septic Legislation

The Building and Septic Division is responsible for the administration and enforcement of the Building Code Act and the Ontario Building Code, including private on-site sewage systems with a daily sewage

flow 10,000 litres or less. Sewage system permits are required for all private on-site sewage systems with a daily design sewage flow of 10,000 litres per day or less, for new installations, replacement installations, additions, and repairs.

Planning Legislation

The municipal Planning division is responsible for processing development applications. Kawartha Lakes has been using the original 18 Zoning By-laws from pre-amalgamation to address land development within the municipality as a whole. While the original By-laws met development needs, the combination of outdated standards and regulations between areas has prompted the decision to create one new comprehensive Zoning By-law for the municipality which will first address the 13 Rural Zoning By-laws and then the five Urban Zoning By-laws.

Current restrictions to development in the existing include:

- All buildings, structures and septic systems shall be located a minimum of thirty metres from the high-water mark and this setback shall be maintained in its natural state with no disturbance of the vegetation and soils;
- In Fenelon Falls, before a subdivision, condominium, consent, or rezoning is approved, it must be demonstrated that there is sufficient municipal servicing to serve the proposed use. All new development must be on full municipal services within this designation;
- In Bobcaygeon, Low-density residential development is permitted which includes single detached dwellings, semi-detached, duplexes, triplexes, and fourplexes. The maximum density within a low-density residential area shall not exceed twenty-five dwelling units per net hectare.
  • Medium-density residential units shall only be permitted on full municipal services in Bobcaygeon.
- In Bobcaygeon, before a subdivision, condominium, consent, or rezoning is approved, it must be demonstrated that there is sufficient municipal servicing to serve the proposed use. All new development must be on full municipal services within this designation.
- Along shorelines, all buildings and structures shall maintain a low profile and blend with natural surroundings. They are not to exceed the height of the tree canopy or exceed the skyline horizon.
- Hydro geological Investigations are required for all official plan amendments or subdivision applications proposed to be developed based on private wells and septic systems.

(Kawartha Lakes 2012)

The County of Haliburton's Official Plan outlines policies for land use of the townships and municipalities within the county. The allocation of future low-density dwelling units will focus on directing low-density growth to the municipalities with serviced settlement areas (Dysart et al and Minden Hills) while ensuring low-density development opportunities for all municipalities. The development shall be sustained by rural service levels and avoid the uneconomical expansion of municipal services. Development proposals for five or more lots adjacent to a lake, river, or stream, must be supported with a site evaluation report in consultation with the Ministry of the Environment and Climate Change. Development and site alteration, including septic system tile beds, shall be set back a minimum of 30 m from the high-water mark of lakes, rivers, and streams, with no disturbance of native soils and very limited removal of shoreline vegetation.

New lot creation and other planning approvals may only be allowed under one of the following special circumstances:

i) the tile fields on any new lot are set back at least three hundred metres from the highwater mark of the lake, or such that drainage from the tile fields would flow at least three hundred metres to the lake;
ii) the tile fields on each new lot are located such that they would drain into a drainage basin, which is not at capacity;
iii) to separate existing habitable dwellings, each having a separate existing OBC approved septic systems, provided that the land use would not change;
iv) the proposed new use, which is permitted in the local Official Plan, has a scale and density that is less than currently exists on site. Prior to any redevelopment being approved, the Lake Impact Assessment shall be completed to the satisfaction of the County, local municipality, the Ministry of Natural Resources and Forestry and the Ministry of the Environment and Climate Change;
v) the proposed development can be serviced with full municipal sewage services and appropriate stormwater management design is incorporated on site.

(County of Haliburton 2017)

Other relevant legislation includes:

- Oak Ridges Moraine Official Plan
- Provincial Policy Statement 2020
- A Place to Grow: Growth Plan for the Greater Golden Horseshoe 2020
- Oak Ridges Moraine Conservation Plan 2017
- Aggregate Resources Act
- Minimum Distance Separation
- Lake Simcoe Protection Plan

Bill 23, More Homes Built Faster Act, 2022

The following is a list of changes that would affect development in the City of Kawartha Lakes and Haliburton County based on impending legislation.

Development Charges

- Five-year phase-in of DC rate increases, beginning with a 20% reduction in the first year, with the reduction decreasing by 5% each year until year five when the full new rate applies. This is proposed to apply to all new DC by-laws passed since June 1, 2022
- Historical service level for DC eligible capital costs (except transit) extended from 10 to 15 years.
- DC by-laws will expire every 10 years, instead of every five years. By-laws can still be updated at any time.

- Cap the interest paid on phased DCs for rental, institutional and non-profit housing to prime plus 1%.
- DC/CBC/parkland exemptions for attainable housing, which will be projects designated by future regulations.
- New regulation authority to set services for which land costs would not be an eligible capital cost recoverable through DCs
- Exclude the cost of studies (including background studies) from recovery through DCs
- Municipalities will be required to spend at least 60% of DC reserves for priority services (i.e., water, wastewater, and roads).
- Discount for purpose-built rental units, with a higher discount for larger units, on top of the existing DC freeze and deferral of payments over five years

Gentle Density

- As of right now, zoning permits up to three residential units per lot (two in the main building and one in an accessory building), with no minimum unit sizes
- New units built under this permission would be exempt from DC/CBC and parkland requirements, and no more than one additional parking space can be required.

Subdivision approvals

- Public meetings no longer will be required for applications for approval of a draft plan of subdivision.

Site plan control

- Developments of up to ten residential units will be exempted from site plan control.
- Architectural details and landscape design aesthetics will be removed from the scope of the site plan control.

Social Context

A 2016 report from SHS Consulting found that nearly 1 in 4 households in the Kawartha Region were facing housing affordability challenges, defined as spending 30% or more on housing costs (23.6% of all households in Kawartha Lakes and 24.5% of all households in Haliburton; SHS 2017). From 2009 to 2015, a total of 147 new affordable housing units were built in Kawartha Lakes and Haliburton, however, the number of applicants on the centralized waiting list for subsidized housing increased by 155.8% from a total of 513 applicants in 2012 to 1,312 in 2017 (SHS 2017).

The proportion of renters in both Kawartha Lakes and Haliburton is far below that of renters in Ontario which may be partly due to the very limited supply of rental housing (SHS 2017). Canadian Mortgage and Housing Corporation (CMHC) data on rental housing completions in the City of Kawartha Lakes shows that only ninety-one purpose-built rental units were completed from 2006 to 2016 compared to 2,816 ownership units completed during the same time period (SHS 2017). In 2016, the rental vacancy rate for purpose-built rental units in the city was 0.3%, down from 2.2% in 2015 (SHS 2017). A healthy vacancy rate is considered 3.0%, demonstrating a significant need for rental housing, both affordable and market

value (SHS 2017). Haliburton County's rural character, large seasonal population, and senior population are defining features of the community's housing profile (SHS 2013). These characteristics affect the supply, demand, and affordability of housing in different ways, resulting in a diversity of housing needs and demands. The availability of rental dwellings has decreased from 1,070 in 1996 to just 910 in 2006 while the demand is increasing due to growing student and senior populations (SHS 2013). This lack of rental housing options is a challenge for students attending Fleming College and may be deterring some students from attending college in the County (SHS 2013). Seniors make up 27.8% of the County's total permanent population and this proportion of the population is anticipated to grow to 41.4% by 2036 (SHS 2013).

The City of Kawartha Lakes, County of Haliburton, and Local Municipalities have undertaken a number of initiatives and implemented several strategies which have helped increase the supply of affordable housing throughout the area; however, the need to increase the supply of affordable housing options for households with low and moderate incomes still exists and will continue to increase as house prices and average rents continue to increase (SHS 2017). The Eastern Ontario Warden's Caucus recently announced their regional housing plan, "7 in 7" which aims to designate $496.2 million to increase rent geared to income housing in the City of Kawartha Lakes and County of Haliburton with 1 225 new units by 2030. Concerns were expressed over this estimate, citing the added cost of building in rural municipalities without existing services (County of Haliburton 2023). To this end, communal serving may be a valuable cost-saving solution for this project (County of Haliburton 2023).

Local neighbours are consulted when public processes such as rezoning and minor variances are required, and NIMBYism (Not-In-My-Backyard) is often evident (Whitnall & Clysdale 2019). NIMBY describes the phenomenon in which residents of a neighbourhood designate a new development (e.g., shelter, affordable housing, group home) or change in occupancy of an existing development as inappropriate or unwanted for their local area (COH 2021). The opposition to affordable, supportive, or transitional housing is usually based on the assumed characteristics of the population that will be living in the development (COH 2021). Common arguments are that there will be increases in crime, litter, thefts, violence, and that property values will decrease while the benefits for the residents of the development are often ignored (COH 2021). Housing projects in Haliburton County have been met with local opposition with residents citing concerns over safety and environmental impacts (Baker 2022). Challenges to ongoing efforts in supportive housing in the City of Kawartha Lakes have had a negative impact on public perception and desire for future projects in affordable housing (Winter 2023).

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Conclusion

Installation and maintenance of water and wastewater systems can vary significantly by region and alternative systems typically include higher costs in both installation and maintenance. To further the efforts by the City and County to provide a full range of housing options for all residents, including affordable options for residents with low incomes however we recommend:

- Utilizing communal water and wastewater systems in future rural developments.
- Continuing to recognize the need to prioritize sustainable water and septic systems.
- Maintaining industry connections to gain insight into regional successes.

For multi-unit affordable housing development in rural areas, communal water and wastewater systems have shown to be the most financially, environmentally, legislatively, and socially viable option. Communal servicing offers benefits for the City and County, the environment, and the residents which include:

- Denser development on smaller lot sizes and more efficient land use as compared to private onsite servicing.
- Communal systems permit expansion as needed allowing you to scale with development, while municipal systems are designed for over-capacity to accommodate growing populations.
- Reduced municipal service delivery costs to residents (garbage collection, snow removal).
- Higher water and wastewater treatment standards can be expected than for private individual services.
- No environmental cost from the distribution and collection of water
- Communal servicing instills confidence in residents knowing that their drinking water and wastewater treatment systems are in very close proximity and often visible.
- Residents will have a wider choice of housing options, including apartment units.

In addition to this information, it is similarly important to maintain industry connections in an effort to gain insight into further regional successes. Success stories of communal servicing developments and implementation in rural areas do exist in Ontario and can be applied to settings similar to the City of Kawartha Lakes and Haliburton County. These are including but not limited to:

Shadowridge Estates, Greely, Ottawa, Ontario (2011)

- Subdivision of forty-five single-detached houses and 113 semi-detached units
- Municipally owned water and wastewater systems

St-Joseph-de-Kamouraska, Quebec (2001)

- Eighty existing residential units
- Municipally owned wastewater system

Fieldstone Development, Township of Mono, Ontario (2014)

- 340-unit subdivision of detached homes
- Municipally owned well for drinking water, using groundwater to service roughly six hundred connections in the area

It is also important to recognize industry connections that have developed best practices for implementing communal servicing such as the Ontario Onsite Wastewater Association (OOWA). OOWA is a provincial not-for-profit association dedicated to promoting the benefit and value of onsite and decentralized wastewater management. OOWA provides guidance and assistance to Ontario communities and system owners by supplying industry professionals, including installers, technicians, designers, inspectors, policymakers, enforcement authorities, and researchers. Their efforts are

intended to help protect freshwater resources and the critical infrastructure of rural property owners while growing the provincial market on decentralized wastewater systems (OOWA, 2023).

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