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Memo

From: Lisa Courtney
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To:	Jodi MacArthur, Chief Administrative Officer Township of Huron-Kinloss
Re:	Update to Growth and Servicing Master Plan – Reserve Capacity Calculations and Vacant Lot Counts
File #:	23338
Date:	January 7, 2024

1 Introduction

The intent of this memo is to provide an update to the Growth, Water and Wastewater Servicing Master Plan (dated June 2, 2023). Specifically, this memo will provide an update to the reserve capacity calculations for the Lucknow, Lakeshore, and Ripley Drinking Water Systems (DWS) and the Ripley and Lucknow Wastewater Treatment Plants (WTTP). This memo also includes an update to the vacant lot inventories and settlement area land needs calculation for the Lakeshore Settlement Area. This memo includes the reserve capacity calculations for the Whitechurch DWS, which was not included in the original scope of the Master Plan.

It is noted that the counts and calculations in this memo are based on information current to October 1, 2024.

2 Existing Customer Counts

The number of existing customers of the drinking water and wastewater systems have been updated based on information current to October 1, 2024. The review of customers included a review of billing information, properties connected outside of Huron-Kinloss, metered customers and municipal properties connected to the system. Township staff assisted with the review of connected properties. In addition to this memo, Township staff have been provided with updated GIS shapefiles and database identifying the properties connected to the water and wastewater systems.

The tables below summarize the current customer counts, as of October 1, 2024, for the water and wastewater systems based on the service units billed for each property in the settlement area. It should be noted that the count of connected customers includes metered properties, municipal properties, and properties connected outside of Huron-Kinloss (in Ashfield-Colborne-Wawanosh and North Huron). Properties identified as not

connected include properties with private water or wastewater systems, municipally owned properties without services, and properties considered constrained for development purposes. Infill lots are existing lots of record that could connect to system.

Table 2.1 Summary of Connected and Unconnected Customers for the Huron-Kinloss Water Systems

Number of Customers	Lakeshore	Ripley	Lucknow	Whitechurch
Connected	2,507	448	689	42
Not Connected	113	20	132	12
Infill Lots (Not Connected)	270	45	57	6
Development Commitments (Total units)	56	182	177	0

Table 2.2 Summary of Connected and Unconnected Customers for the Huron-Kinloss Wastewater Systems

Number of Customers	Ripley	Lucknow
Connected	453	672
Not Connected	20	131
Infill Lots (Not Connected)	46	57
Development Commitments (Total units)	182	177

The counts summarized in the tables above are the basis of the reserve capacity calculations.

3 Reserve Capacity Calculations

The reserve capacity calculations for the Lakeshore, Ripley and Lucknow water systems and Lucknow and Ripley wastewater systems that were included in the Master Plan have been updated based on updated customer counts and flow data. The updated reserve capacity memo is attached as an appendix to this memo and summarized below.

For each system, the total reserve was calculated by subtracting the usage from existing customers from the rated capacity. For the water systems, the reserve capacity based on the firm capacity was also calculated. The firm capacity refers to the capacity of a water system with the largest supply well out of service. The total reserve is the capacity available for growth, both committed (i.e. future residential units that are known) and uncommitted. The number of committed units includes the current number of vacant infill lots that could be serviced by the existing systems where there are existing watermains or sewers.

The uncommitted capacity, or capacity available for future growth excluding known development proposals and infill lots, for each system is summarized in Table 3.1. The uncommitted reserve capacities presented below are expressed as Equivalent Residential Units (ERU), which is the design flow associated with a single detached residential unit. For comparison, the uncommitted capacity as calculated for the Master Plan are also provided.

Table 3.1 Summary of Uncommitted Reserve Capacity (in ERUs)

System	Water System Uncommitted Capacity (ERU)	Wastewater Treatment Uncommitted Capacity (ERU)
Lucknow – Master Plan	312	100
Lucknow – December 2024	322	-22
Ripley – Master Plan	222	-99
Ripley - December 2024	312	42
Whitechurch – December 2024	74	
Lakeshore North – Master Plan	834	
Lakeshore North – December 2024	1,002	
Lakeshore South – Master Plan	1,004	
Lakeshore South – December 2024	1,083	

From the updated calculations, there is uncommitted reserve capacity for an additional 322 ERU and 312 ERU in the Lucknow water and Ripley water systems, respectively. For the Lucknow water system, the difference between the uncommitted capacity as noted in the Master Plan and the latest version is a result of the reduction in the 3-year average maximum day demand (i.e. lower average water usage by the existing customers). In Ripley, the reduction in the number of development commitments compared to those used in the Master Plan calculations results in the increase in the December 2024 uncommitted capacity.

For the Lakeshore North water system, the 3-year average of the maximum daily demand was lower in December 2024 than between 2019-2021, which was used for the Master Plan calculations. The result of this is a decrease in the capacity attributed to the existing population.

The most recent reserve capacity calculations identify the Ripley and Lucknow wastewater systems are over-committed. The Lucknow wastewater treatment system is over-committed by 22 ERU and the Ripley system is over-committed by 42 ERU. At present, the Lucknow WWTP is operating at 80% capacity and the Ripley WWTP is at 63% capacity. Given the number of development commitments, the need for increased wastewater treatment capacity at both locations will depend on the timing of the proposed developments proceeding to construction. It is understood that the Township is pursuing a capacity allocation policy as recommended in the Master Plan. An allocation capacity will provide the Township with the means to reallocate capacity to ensure it is not held by developments that are not proceeding in a timely manner. This will allow the Township to better judge the need and timing of wastewater treatment capacity expansions for the Ripley and Lucknow systems.

4 Update Settlement Area Land Needs – Lakeshore Area

In the Growth, Water and Wastewater Servicing Master Plan, the future land needs based on forecasted growth and available lands within the settlement areas were assessed. Township staff requested an update to the calculations for the Lakeshore Area as a deficit of available land for residential growth was identified in the Master Plan. The Lakeshore Settlement Area is the area experiencing the greatest growth pressures and is forecasted to accommodate most of the future growth identified for Huron-Kinloss. The projected growth from the forecasts utilized in the Master Plan ranges from 584 to 611 ERUs.

Following the completion of the Master Plan, the counts of vacant infill properties, vacant residential and future development lands and number of proposed and unbuilt units have been updated. Table 4.1 summarizes the counts from the Master Plan and the updated numbers.

Table 4.1 Vacant and infill lot inventory counts

Category	Potential No. of Units in Master Plan – June 2, 2023	Potential No. of Units as of October 1, 2024
Proposed and unbuilt units	144	56
Infill lots	195	264
Vacant residential or future development lands	210 (based on 42 ha at 5 units/ha)	196 (based on 39 ha at 5 units/ha)
Total potential units	549	516
Forecasted units (high growth)	611	611
Units not accommodated in existing and future lot inventory	62	95
Additional land required (at 5 units/ha)	12 ha (30 acres)	19 ha (47 acres)

Between the issuance of the Master Plan on June 2, 2023 and this update, the number of proposed and unbuilt units in the Lakeshore has decreased from 144 units to 56. This is a function of the lots in the Crimson Oak subdivision shifting from a development commitment to infill as the subdivision was built, and older development proposals that have not advanced being removed from the development commitment list.

The most current estimate of vacant residential and future development lands is 39 hectares, which equates to 196 units at 5 units per hectare. This assumption is based on the provision of municipal water and individual private septic systems. The difference between the current and Master Plan calculations of vacant residential and future development land is the refinement of future development lands based on zoning and development potential.

Currently, an additional 19 hectares (47 acres) will be required to accommodate the forecasted 25-year future growth in the Lakeshore Settlement Area. This is an additional 7 hectares from the estimate in the Master Plan. It is anticipated that as infill lots are developed, the need for additional land within the Lakeshore Settlement Area will continue to increase.

The Background Issues and Planning Report, which preceded the Master Plan, included a constraint analysis that examined hazard lands, environmentally protected lands, buffers around features such as farms, as well as linkages to existing infrastructure. Through this constraint analysis, the lands in the vicinity of Concession 10 and Lake Range Drive were identified as a potential area for a future expansion of the Lakeshore Settlement Area. In December 2023, BMROSS provided a letter to the Township outlining a potential expansion to the Lakeshore Settlement Area for potential consideration through the Bruce County Official Plan Update. At that time, an area of 163 hectares north of Concession 10 was identified as a potential expansion. This reflected a requirement for a communal or decentralized sewage servicing per the policies of the 2020 Provincial Planning Statement (PPS).

In October 2024, the Province enacted the 2024 PPS. Following the implementation of the 2024 PPS, Township and BMROSS staff met with County planners to review the implications of the new PPS on the County's Official Plan Update and the Lakeshore Settlement Area expansion. At that time, the County indicated the expansion as requested in the December 2023 letter, would not be included in the Official Plan Update. County staff suggested that under the new policies of the PPS, a smaller expansion to support the identified 25-year growth needs (47 acres) to the Lakeshore Settlement Area could potentially proceed as "rounding out" of the settlement area. Rounding out would allow a minor settlement area expansion to proceed with partial services (municipal water and individual septic systems). The Township could pursue this through an Official Plan amendment in the future.

Yours very truly,

B. M. ROSS AND ASSOCIATES LIMITED

Per _____
Lisa J. Courtney, RPP

LJC:hv

APPENDIX A
RESERVE CAPACITY MEMO (December 19, 2024)

B. M. ROSS AND ASSOCIATES LIMITED
Engineers and Planners
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Memo

From: Andrew Garland
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VIA EMAIL ONLY

To:	Township of Huron-Kinloss Attn: John Yungblut, Director of Public Works
Re:	Huron-Kinloss Water and Wastewater Reserve Capacity
File #:	23338
Date:	December 19, 2024

Summary

Lucknow

- Water Supply – The total reserve capacity was calculated based on a rated capacity of 2,000 m^3/day and a firm capacity of 935 m^3/day. The total reserve capacity, based on the rated capacity, is 899 m^3/day, of which 320 m^3/day is committed to developments. The uncommitted reserve may supply an additional 579 m^3/day or 322 ERUs. Based on the firm capacity, the water supply system is over-committed by 166 m^3/day, which is equivalent to 92 ERUs, under current conditions.

- Water Storage – The Lucknow elevated storage tank has an effective storage volume of 1,600 m^3. Storage requirements under existing conditions are equal to 1,139 m^3. Development commitments are expected to require an additional 195 m^3 of storage. There is sufficient storage to accommodate current and future development.

- Wastewater Treatment – Total reserve capacity was calculated to be 152 m^3/day, with current commitments representing a need for 174 m^3/day. The plant is therefore over-committed by 22 m^3/day, representing 22 ERUs.

Ripley

- Water Supply – Total reserve capacity, based on a rated capacity of 2,880 m^3/day, is 1,602 m^3/day. Development commitments require an additional 636 m^3/day, resulting in an uncommitted reserve of 966 m^3/day or 312 ERUs.

- Water Storage – The Ripley elevated storage tank has an effective storage volume of 1,465 m^3. Current conditions require a total storage volume of 991 m^3. Development commitments are expected to require an additional storage volume of 375 m^3, for a total storage requirement of 1,366 m^3. There is sufficient storage to accommodate current and future development.

- Wastewater Treatment – The total reserve capacity was calculated to be 225 m^3/day. Development commitments require 187 m^3/day, resulting in an uncommitted reserve of 38 m^3/day, or 42 ERUs.

Lakeshore

- Water Supply – The Lakeshore North total reserve capacity was calculated based on a rated capacity of 5,741 m^3/day. The total reserve capacity is equivalent to 3,313 m^3/day and the uncommitted reserve is equal to 3,007 m^3/day, or 1,002 ERUs. The Lakeshore South total reserve is 2,736 m^3/day, based on a rated capacity of 5,893 m^3/day. The uncommitted reserve is equal to 2,274 m^3/day, or 1,083 ERUs.

- Water Storage – The recommended storage volume for the existing Lakeshore system is 3,792 m^3. Factoring in development commitments, the recommended storage volume increases to 4,101 m^3. The total storage volume of the Point Clark standpipe is significantly lower at approximately 1,500 m^3. Additional storage, as noted in the Master Plan, is recommended.

Whitechurch

- Water Supply – Total reserve capacity, based on a rated capacity of 260 m^3/day, is 175 m^3/day, with 13 m^3/day required for development commitments. The uncommitted reserve is 162 m^3/day which is equivalent to 74 ERUs.

1.0 PURPOSE OF MEMO AND BACKGROUND

The purpose of this memo is to provide an analysis of the reserve capacities of the following water and wastewater system facilities in the Municipality of Huron-Kinloss, as of December 31, 2023:

- Water Supply (Lucknow, Ripley, Lakeshore, Whitechurch)
- Water Storage (Lucknow, Ripley, Lakeshore)
- Wastewater Treatment (Lucknow and Ripley)

Water supply and wastewater flow information was obtained and reviewed for the years 2021 to 2023 from data provided by Veolia. Development information was obtained from BMROSS files and discussion with Township staff.

2.0 METHODOLOGY

2.1 Definition of an ERU

For the purposes of quantifying servicing requirements for current development commitments and future growth, water demands and wastewater flows are described in terms of Equivalent Residential Units (ERUs). An ERU is defined as the unit flow design value for a single detached residential unit.

Design flows for other types of residential development are proportioned to single detached units based on expected per person occupancies (PPU). For calculation purposes the following values, which were used in the most recent Master Plan (BMROSS File No. 18265), are used:

- Single detached = 2.60 PPU = 1.00 ERU
- Multi-family = 1.60 PPU = 0.62 ERU
- Apartment = 1.40 PPU = 0.54 ERU

For calculation purposes, it is assumed that for every residential unit built there will be a proportional increase in non-residential. The current customer count includes both residential and non-residential. Total flows include water supplied and wastewater generated from both as well. To account for non-residential growth, the historical “per customer flow” plus 10% is used in the following reserve calculations as the flow for one ERU. This approach is expected to provide an over-estimate of future use (i.e., a factor of safety) for systems with little to no industrial, commercial, or institutional (ICI) use. Water demands and wastewater flows per ERU, including consideration of non-residential development, are calculated in later sections of this memo.

2.2 Total Reserve Method

System capacities were established through a review of the Municipal Drinking Water License (MDWL) and Drinking Water Works Permit (DWWP) for the water systems, and the Environmental Compliance Approval (ECA) for the wastewater systems.

For the water supply systems, the existing condition was established as the maximum daily demand over the 2021 to 2023 period. The calculations for water supply reserve capacity were completed based on the rated capacity, as determined by the lower value of the MDWL or Permit to Take Water (PTTW), and the "firm capacity", which is defined as the capacity with the largest well out of service.

For wastewater treatment, the existing condition was established as the average of 2021 to 2023 annual average day flows.

The total reserve values were determined by subtracting the existing condition from the rated capacity (and firm capacity for water systems).

2.3 Uncommitted Reserve Method

The uncommitted reserve values were determined by subtracting the expected flow to or from development commitments from the total reserve value. Commitments are residential units that are planned and approved, but not yet connected to the water or wastewater systems.

3.0 EXISTING POPULATION, CUSTOMERS, AND DEVELOPMENT INFORMATION

3.1 Existing Population

The 2021 population was developed from the 2021 census. The 2021 population for each service area of interest is summarized in Table 3.1.

Table 3.1
Existing Population by Service Area

Service Area	Population
Lucknow	1,154
Ripley	800
Lakeshore	3,183
Whitechurch	73

3.2 Existing Customers

An existing customer is a user of the system that is consuming water or producing wastewater. Customer counts for water supply systems are presented in Table 3.2, and wastewater treatment systems in Table 3.3.

Table 3.2
Water Customer Counts

System Name	No. of Customers
Lucknow	689
Ripley	448
Lakeshore North[1]	884
Lakeshore South[1]	1,623
Whitechurch	42

Notes: 1. Lakeshore North and South based on pressure zone division at the 6th Concession.

Table 3.3
Wastewater Customer Counts

System Name	No. of Customers
Lucknow	672
Ripley	453

3.3 Development Commitments

The following is based on plans and draft plans of residential development within the existing urban boundary that are either approved or have been identified as in the process of seeking approval or are future potential commitments. In some cases, assumptions have been made about the number of potential units in muti-unit parcels. Development commitments can be vacant serviced lots in existing developed areas, or approved draft plans or lots of record. The developments summarized below are considered to be applicable for both water and wastewater servicing in Lucknow and Ripley. The developments in the Lakeshore and Whitechurch area are considered only in terms of water servicing, as municipal wastewater services are not available. The development commitments include vacant infill lots.

Table 3.4
Development Commitments

Service Area	Development Name	No. of Units[1]	No. of ERUs[2]
Lucknow	Paradize	M – 32 A – 55	49
	Mamta	S – 28 M – 46	56
	Bob Street	S – 16	16
	Infill	S – 57	57
	Total	**234**	**178**
Ripley	Brown	S – 110	110
	Pillars Property Group	M – 8	5
	Kirkonnel/Shephard	M – 48	30
	Ripley Industrial Park	S – 14	14
	Ball Multiplex	M – 2	1
	Infill	S – 45	45
	Total	**227**	**205**
Lakeshore North	Infill	S – 102	102
	Total	**102**	**102**
Lakeshore South	Kempton	S – 9	9
	Kirdak	M – 12	8
	McGarvey	S – 30	30
	Rudd	S – 5	5
	Infill	S – 168	168
	Total	**224**	**220**
Whitechurch	Infill	S – 6	6
	Total	**6**	**6**

Notes: 1. S = single detached, M = multi-family, A = apartment
2. Based on expected per person occupancies proportioned to single detached unit. See Section 2.1.

4.0 TOTAL RESERVE CALCULATIONS – WATER SUPPLY

4.1 Lucknow

4.1.1 Water Supply Capacity - Lucknow

The Lucknow Drinking Water System (DWS) operates under Drinking Water Works Permit (DWWP) No. 087-203, Issue 5, and Municipal Drinking Water License (MDWL) No. 087-103, Issue 3. The Permit to Take Water (PTTW) No. 5315-CK476V, dated October 12, 2022, states the daily limitations of water takings. Drinking water is obtained from two wells: Well No. 4 and Well No. 5. Table 4.1 summarizes the supply capacity of the system.

Table 4.1
Lucknow Water Supply Capacity

Source	Capacity (m^3/day)	
	Well No. 4	Well No. 5
MDWL	1,245	3,276
PTTW	935	2,000

The PTTW states an overall maximum daily water taking limit of 2,000,000 L, or 2,000 m^3/day. For reserve calculation purposes, the limiting PTTW value has been assumed as the capacity of the existing well supply. The firm capacity is therefore 935 m^3/day.

4.1.2 Maximum Day Demand – Lucknow

Table 4.2 identifies the Maximum Day Demand (MDD) for the Lucknow DWS between 2021 to 2023.

Table 4.2
Lucknow Water Maximum Day Demand, 2021 – 2023

Year	MDD (m^3/day)
2021	978
2022	1,040
2023	1,101
Maximum	**1,101**

4.1.3 Unit Demands – Lucknow

On the basis that the existing per customer demand plus 10% is the demand per ERU (see Section 2.1), the maximum day demand for Lucknow is:

Demand per customer = $\frac{1{,}101\ m^3/day}{689\ customers}$
= 1.6 m^3/day (rounded up)
Demand per ERU = 1.6 x 1.1 = 1.8 m^3/day

4.1.4 Total Reserve Capacity – Lucknow

The total reserve is calculated by subtracting the maximum day demand value from the capacity. The total reserve, using both the rated capacity and firm capacity, is calculated below.

	Rated:	**Firm:**
Capacity	2,000 m^3/day	935 m^3/day
MDD	- 1,101 m^3/day	- 1,101 m^3/day
Total Reserve	= 899 m^3/day	= - 166 m^3/day

4.1.5 Uncommitted Reserve Capacity – Lucknow

Refer to Table 3.4 for a list of development commitments. Based on these values, and a unit demand of 1.8 m^3/day per ERU, current commitments are expected to have a daily demand of 320 m^3/day. The uncommitted reserve, based on both the rated and firm capacity, is as follows:

	Rated:	**Firm:**
Total Reserve	899 m^3/day	- 166 m^3/day
Commitments (178 ERU x 1.8 m^3/day•ERU)	- 320 m^3/day	- 320 m^3/day
Uncommitted Reserve	= 579 m^3/day = 322 ERU	= - 486 m^3/day

Based on the rated capacity, the uncommitted reserve can supply 579 m^3/day or approximately 322 ERUs. When considering the firm capacity, the system is theoretically over-committed by 166 m^3/day, or 92 ERUs, under existing conditions. This deficit increases to 486 m^3/day after accounting for future demands from development commitments.

4.2 Ripley

4.2.1 Water Supply Capacity – Ripley

The Ripley DWS operates under DWWP No. 087-204, Issue 3, and MDWL No. 087-104, Issue 4. Daily water takings are limited by PTTW No. 4634-ANZKYM, dated July 14, 2017. The DWS is supplied by four wells, though the remaining life expectancy of Well No. 1 is uncertain. A pumphouse centrally located in the community houses Well Nos. 1 and 2. Well Nos. 3 and 4 are located at the elevated water storage tank. Table 4.3 summarizes the capacities of the Ripley DWS components.

Table 4.3
Ripley Water Supply Capacity

Source	**Capacity (m^3/day)**		
	Well Nos. 1 & 2	**Well No. 3**	**Well No. 4**
MDWL	864	2,016	1,386
PTTW	864	2,016	1,386

The PTTW limits the rated capacity to 2,880 m^3/day. The firm capacity of the system is 2,250 m^3/day.

4.2.2 Maximum Day Demand – Ripley

Table 4.4 identifies the MDD for the Ripley DWS between 2021 to 2023.

Table 4.4
Ripley Water Maximum Day Demand, 2021 – 2023

Year	**MDD (m^3/day)**
2021	1,147
2022	1,278
2023	1,187
Maximum	**1,278**

4.2.3 Unit Demands – Ripley

On the basis that the existing per customer demand plus 10% is the demand per ERU (see Section 2.1), the maximum day demand for Ripley is:

Demand per customer	= 1,278 m^3/day 448 customers
	= 2.9 m^3/day (rounded up)
Demand per ERU	= 2.9 x 1.1 = 3.1 m^3/day

4.2.4 Total Reserve Capacity – Ripley

The total reserve, using both the rated capacity and firm capacity, is calculated below.

	Rated:	**Firm:**
Capacity	2,880 m^3/day	2,250 m^3/day
MDD	- 1,278 m^3/day	- 1,278 m^3/day
Total Reserve	= 1,602 m^3/day	= 972 m^3/day

4.2.5 Uncommitted Reserve Capacity – Ripley

Refer to Table 3.4 for a list of development commitments. Based on these values, and a unit demand of 3.1 m^3/day per ERU, current commitments are expected to have a daily demand of 636 m^3/day. The uncommitted reserve, based on both the rated and firm capacity, is as follows:

	Rated:	**Firm:**
Total Reserve	1,602 m^3/day	972 m^3/day
Commitments (205 ERU x 3.1 m^3/day•ERU)	- 636 m^3/day	- 636 m^3/day
Uncommitted Reserve	= 966 m^3/day	= 336 m^3/day
	= 312 ERU	= 108 ERU

Based on the rated capacity, the uncommitted reserve can supply an additional 966 m^3/day or approximately 312 ERUs. When considering the firm capacity, the uncommitted reserve is equal to 336 m^3/day, which can supply approximately 108 ERUs.

4.3 Lakeshore

4.3.1 Water Supply Capacity – Lakeshore

The Lakeshore DWS is divided into two pressure zones. The Lakeshore North zone is supplied by two wells: the Huronville South and Murdock Glenn wells. The Lakeshore South zone is also supplied by two wells: the Point Clark and Blairs Grove wells. The system operates under MDWL No. 087-1025, Issue 3, and DWWP No. 087-202, Issue 3. The system component capacities are summarized in Tables 4.5 and 4.6.

Table 4.5
Lakeshore North Water Supply Rated Capacity

Source	No.	Huronville South Well No. 2 (m^3/day)	Murdock Glenn Well No. 2 (m^3/day)
MDWL	087-102 No. 3	3,931	1,814
PTTW	3332-9N6H8L	3,927	--
PTTW	6123-A2UQBM	--	1,814

Table 4.6
Lakeshore South Water Supply Rated Capacity

Source	No.	Point Clark Well Nos. 2 & 3 (m^3/day)	Blairs Grove Well No. 3 (m^3/day)
MDWL	087-102 No. 3	3,275	2,618
PTTW	1852-9YQMAY	3,273	--
PTTW	5776-BW6SKS	--	2,621

The PTTW limits the Lakeshore North capacity to 5,741 m^3/day. The firm capacity is 1,814 m^3/day. The MDWL limits the rated capacity of the Lakeshore South capacity to 5,893 m^3/day. The firm capacity is 2,618 m^3/day.

4.3.2 Maximum Day Demand – Lakeshore

Tables 4.7A and 4.7B identify the maximum day demand for Lakeshore North and South, respectively, for the years 2021 to 2023.

Table 4.7A
Lakeshore North Water Maximum Day Demand, 2021 – 2023

Year	MDD (m^3/day)
2021	2,345
2022	2,428[1]
2023	1,929
Maximum	**2,428**

Notes: 1. Flows from Apr. 19 to May 29 and Oct. 18 to Nov. 19 not included in MDD calculation. Water was supplied to Kincardine in Apr/May. Elevated water demand values in Oct/Nov do not reflect historical trends.

Table 4.7B
Lakeshore South Water Maximum Day Demand, 2021 – 2023

Year	MDD (m^3/day)
2021	3,157
2022	2,251
2023	2,402
Maximum	**3,157**

4.3.3 Unit Demands – Lakeshore

As stated in Section 3.2, the Lakeshore North and South systems have 844 and 1,623 customers, respectively. The unit demands are as follows:

	Lakeshore North	**Lakeshore South**
Demand per customer	= 2,428 m^3/day / 884 customers	= 3,157 m^3/day / 1,623 customers
	= 2.7 m^3/day	= 1.9 m^3/day
Demand per ERU	= 2.7 x 1.1 = 3.0 m^3/day•ERU	= 1.9 x 1.1 = 2.1 m^3/day•ERU

4.3.4 Total Reserve Capacity – Lakeshore

The total reserve, using both the rated capacity and firm capacity, is calculated below for the Lakeshore North and South water supply system.

	Lakeshore North		Lakeshore South	
	Rated:	**Firm:**	**Rated:**	**Firm:**
Capacity	5,741 m^3/day	1,814 m^3/day	5,893 m^3/day	2,618 m^3/day
MDD	- 2,428 m^3/day	- 2,428 m^3/day	- 3,157 m^3/day	- 3,157 m^3/day
Total Reserve	= 3,313 m^3/day	= - 614 m^3/day	= 2,736 m^3/day	= - 539 m^3/day

4.3.5 Uncommitted Reserve Capacity – Lakeshore North

Refer to Table 3.4 for a list of development commitments. Based on these values, and a unit demand of 3.0 m^3/day per ERU, current commitments are expected to have a daily demand of 306 m^3/day. The uncommitted reserve, based on both the rated and firm capacity, is as follows:

	Rated:	**Firm:**
Total Reserve	3,313 m^3/day	- 614 m^3/day
Commitments (102 ERU x 3.0 m^3/day•ERU)	- 306 m^3/day	- 306 m^3/day
Uncommitted Reserve	= 3,007 m^3/day = 1,002 ERU	= - 920 m^3/day

Based on the rated capacity of the Lakeshore North water supply system, the uncommitted reserve can supply an additional 3,007 m^3/day or 1,002 ERUs. When considering the firm capacity, the uncommitted reserve is theoretically overcommitted by 920 m^3/day.

4.3.6 Uncommitted Reserve Capacity – Lakeshore South

Refer to Table 3.4 for a list of development commitments. Based on these values, and a unit demand of 2.1 m^3/day per ERU, current commitments are expected to have a daily demand of 462 m^3/day. The uncommitted reserve, based on both the rated and firm capacity, is as follows:

	Rated:	**Firm:**
Total Reserve	2,736m^3/day	- 539 m^3/day
Commitments (220 ERU x 2.1 m^3/day•ERU)	- 462 m^3/day	- 462 m^3/day
Uncommitted Reserve	= 2,274 m^3/day = 1,083 ERU	= - 1,001 m^3/day

Based on the rated capacity of the Lakeshore South water supply system, the uncommitted reserve can supply an additional 2,274 m^3/day or approximately 1,083 ERUs. When considering the firm capacity, the uncommitted reserve is theoretically overcommitted by 1,001 m^3/day.

4.4 Whitechurch

4.4.1 Water Supply Capacity – Whitechurch

The Whitechurch DWS operates under DWWP No. 087-205, Issue 4 and MDWL No. 087-105, Issue 5. Daily water taking limits are restricted by PTTW No. 1124-A4DMYC, dated December 11, 2015. The DWS is supplied by two groundwater wells: Well No. 1 and Well No. 2. Table 4.8 summarizes the system component capacities.

Table 4.8
Whitechurch Water Supply Capacity

Source	Capacity (m^3/day)	
	Well No. 1	**Well No. 2**
MDWL	All wells – 283	
PTTW	260	260

The PTTW states a maximum daily limit of 260 m^3/day, from any combination of the two wells. Therefore, both the rated and the firm capacity of the system is 260 m^3/day.

4.4.2 Maximum Day Demand – Whitechurch

Table 4.9 summarizes the maximum day demand for the Whitechurch DWS from 2021 to 2023.

Table 4.9
Whitechurch Maximum Day Demand, 2021 – 2023

Year	MDD (m^3/day)
2021	46
2022	59
2023	85
Maximum	**85**

4.4.3 Unit Demands – Whitechurch

Demand per customer = $\frac{85\ m^3/day}{42\ customers}$
= 2.0 m^3/day
Demand per ERU = 2.0 m^3/day x 1.1 = 2.2 m^3/day•ERU

4.4.4 Total Reserve – Whitechurch

Capacity 260 m^3/day
MDD - 85 m^3/day
Total Reserve = 175 m^3/day

4.4.5 Uncommitted Reserve Capacity – Whitechurch

Total Reserve 175 m^3/day
Commitments (6 ERU x 2.2 m^3/day•ERU) - 13 m^3/day
Uncommitted Reserve = 162 m^3/day
= 74 ERU

The uncommitted reserve can supply an additional 162 m^3/day, or approximately 74 ERUs.

5.0 TOTAL RESERVE CALCULATIONS – WATER STORAGE

5.1 Existing Facilities

Table 5.1 identifies existing treated water storage facilities and their volumes.

Table 5.1
Water Storage Facilities – Lucknow, Ripley, and Lakeshore

Facility	Total Volume (m^3)	Effective Volume (m^3)
Lucknow Elevated Storage Tank	1,600	1,600
Ripley Elevated Storage Tank	1,465	1,465
Point Clark (Lakeshore) Standpipe	1,500	~ 138[1]

Notes: 1. An operating range of 2m is typically used in the Point Clark Standpipe. The standpipe inner diameter of 9.38m is used for the calculation of effective volume.

5.2 Required Volumes

(a) General

Theoretical required storage is based on a formula in the Ministry of the Environment, Conservation and Parks (MECP) Design Guidelines. The guidelines recommend storage be provided for peak flow equalization, fire flows, and emergencies. The equalization component is 25% of the maximum daily demand. Fire flow rates and durations are linked to the population served. The emergency storage component is calculated as 25% of the equalization and fire values. Essentially all are linked to population served.

(b) Storage Calculation Summaries

Tables 5.2A through 5.2C provide the total storage required for the existing and committed serviced scenarios for Lucknow, Ripley, and Lakeshore, respectively.

Table 5.2A
Lucknow Water Storage Requirements

Storage Requirements for Peak Flow Equalization (m^3)[1]				
	Equalization Storage	**For Fire[2]**	**For Emergencies**	**Total**
Existing	275	636	228	1,139
Existing + Commitments	355	712	267	1,334

The existing total effective volume is 461 m^3 greater than the recommended value of 1,139 m^3 based on MECP Guideline values. The volume of water storage required for existing and committed developments is 1,334 m^3, which is 266 m^3 less than the effective storage volume. There is sufficient treated water storage in Lucknow to accommodate existing and committed developments.

Table 5.2B
Ripley Water Storage Requirements

Storage Requirements for Peak Flow Equalization (m^3)[1]				
	Equalization Storage	**For Fire[2]**	**For Emergencies**	**Total**
Existing	297	496	198	991
Existing + Commitments	478	615	273	1,366

The effective storage volume of the Ripley elevated tank is 474 m^3 greater than the recommended water storage volume under existing conditions, and 99 m^3 greater than the recommended value when factoring in development commitments. There is sufficient treated water storage in Ripley to supply existing and committed developments.

Table 5.2C
Lakeshore Water Storage Requirements

Storage Requirements for Peak Flow Equalization (m^3)[1]				
	Equalization Storage	**For Fire[2]**	**For Emergencies**	**Total**
Existing	1,275	1,759	758	3,792
Existing + Commitments	1,467	1,814	820	4,101

Notes:
1. Volumes are based on formulas in MECP Guidelines (2008).
2. Where population is between MECP Guideline categories, fire flow rate and duration are interpolated.

The effective storage volume of the Point Clark standpipe is approximately 138 m^3, significantly less than the recommended storage volume of 3,792 m^3 for the existing customers.

6.0 TOTAL RESERVE CALCULATIONS – WASTEWATER TREATMENT

6.1 Lucknow

6.1.1 WWTP Capacity – Lucknow

The hydraulic capacity of the Lucknow WWTP is established by Environmental Compliance Approval (ECA) No. 3567-999KAF, dated August 6, 2013, as 750 m^3/day on an annual average basis. The same ECA sets limits on the effluent concentration and loading (i.e., concentration x volume) for various parameters on a monthly average basis.

A review of effluent quality data between 2021 and 2023 established that effluent objectives were consistently met. For most municipal WWTP, use of the hydraulic annual average flow is the best and most reasonable approximation of reserve capacity, given that establishing reserve based on effluent criteria performance is not practical.

6.1.2 Current Wastewater Flows – Lucknow

The existing wastewater flow condition, for reserve capacity purposes, is generally considered to be the average flow for the previous three years. Table 6.1 summarizes annual average day flow (AADF) to the Lucknow WWTP for the years 2021 to 2023.

Table 6.1
Lucknow Annual Average Day Flow, 2021 – 2023

Year	AADF (m^3/day)
2021	573
2022	609
2023	612
Average	**598**

As indicated by Table 6.1, wastewater flows are reasonably consistent in Lucknow. Therefore, the existing flow condition is considered to be 598 m^3/day.

6.1.3 Unit Flows – Lucknow

On the basis that the per customer flow, plus 10%, is the flow per ERU (see Section 2.1), the annual average day flow for Lucknow is:

Flow per customer = $\frac{598\ m^3/day}{672\ customers}$ = 0.89 m^3/day

Flow per ERU = 0.89 m^3/day x 1.1 = 0.98 m^3/day•ERU

6.1.4 Total Reserve Capacity – Lucknow

Total wastewater treatment capacity is calculated by subtracting the AADF from the rated capacity. The total reserve capacity for the Lucknow WWTP is therefore:

Rated Capacity	750 m^3/day
AADF	- 598 m^3/day
Total Reserve	= 152 m^3/day

6.1.5 Uncommitted Reserve Capacity – Lucknow

The uncommitted reserve capacity is calculated by subtracting the expected flows from development commitments from the total reserve. See Table 3.4 for a list of development commitments. At 0.98 m^3/day•ERU, the development commitments are expected to have an average wastewater flow of 174 m^3/day. The uncommitted reserve is calculated below.

Total Reserve	152 m^3/day
Commitments (178 x 0.98 m^3/day•ERU)	- 174 m^3/day
Uncommitted Reserve	= - 22 m^3/day

If all commitments become real customers, the Lucknow WWTP will be overcommitted by 22 m^3/day.

6.2 Ripley

6.2.1 WWTP Capacity – Ripley

The hydraulic capacity of the Ripley WWTP is established by Environmental Compliance Approval (ECA) No. 3-0724-88-006, dated September 18, 2009. The rated capacity is 600 m^3/day. The same ECA sets limits on the effluent concentration and loading (i.e., concentration x volume) for various parameters on a monthly average basis.

A review of effluent quality data between 2021 and 2023 established that effluent objectives were generally met, although objectives for total suspended solids were periodically exceeded. Nonetheless, there were no compliance limit exceedances between 2021 and 2023.

6.2.2 Current Wastewater Flows – Ripley

Table 6.2 summarizes the AADF to the Ripley WWTP from 2021 to 2023.

Table 6.2
Ripley Annual Average Day Flow, 2021 – 2023

Year	AADF (m^3/day)
2021	381
2022	366
2023	377
Average	**375**

As indicated by Table 6.2, wastewater flows are reasonably consistent in Ripley. The annual average day flow is 375 m^3/day.

6.2.3 Unit Flows – Ripley

Flow per customer	= 375 m^3/day 453 customers = 0.83 m^3/day
Flow per ERU	= 0.83 m^3/day x 1.1 = 0.91 m^3/day•ERU

6.2.4 Total Reserve Capacity – Ripley

Rated Capacity	600 m^3/day
AADF	- 375 m^3/day
Total Reserve	= 225 m^3/day

6.2.5 Uncommitted Reserve Capacity – Ripley

See Table 3.4 for a list of development commitments. At 0.91 m^3/day•ERU, the development commitments are expected to have an average wastewater flow of 187 m^3/day. The uncommitted reserve is calculated below.

Total Reserve	225 m^3/day
Commitments (205 x 0.91 m^3/day•ERU)	- 187 m^3/day
Uncommitted Reserve	= 38 m^3/day

The current uncommitted reserve is 38 m^3/day, which could accommodate an additional 42 ERUs.

Yours very truly,

B. M. ROSS AND ASSOCIATES LIMITED

Per _____
Andrew Garland, P. Eng.

Per _____
Sarah Upshall, Environmental Technician

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