Master Plan Update Report – FINAL

Municipality of Mississippi Mills Almonte Ward Water and Wastewater Infrastructure

February 2018

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Table of Contents

List of Tables

List of Figures

List of Appendices

1.0 Introduction

In 2011, the Municipality of Mississippi Mills (the Municipality) retained J.L. Richards & Associates Limited (JLR) in association with Golder Associates Limited (GAL), to complete a water and wastewater infrastructure master plan for the required long term operational and capital improvements to the water and wastewater systems to meet current regulations and planned growth within the Municipality's serviced Almonte Ward. Future servicing requirements developed as the design basis for the master planning process were based on the Official Plan (2006), which indicated strong growth pressures within the area. The Almonte Ward Water and Wastewater Infrastructure Master Plan (Master Plan) was completed in 2012 and identified preferred options to meet the Existing, Short-Term (5 year design basis, 2011-2015), Mid-Term (10 year design basis, 2016 to 2020), and Long-Term (20 year design basis, 2021-2030) water and wastewater infrastructure needs of the Municipality.

In 2017, the Municipality retained JLR to update the 2012 Master Plan based on more current servicing demands (i.e., water and wastewater flows), population projections, development updates (i.e., new census data), and infrastructure upgrades completed since 2012 (herein referred to as the Master Plan Update).

The Municipality is an amalgamated municipality of three Wards – Almonte Ward, Ramsay Ward and Pakenham Ward, located along Highway 49, approximately 3km from the Ottawa city limits (refer to Figure 1 for a location map). The latter two Wards are predominantly rural and serviced primarily by private wells, septic systems, and holding tanks. The Almonte Ward is predominantly urban and serviced by communal potable water and wastewater systems (refer to Figure 2 for the existing service area).

The Almonte Ward drinking water supply system consists of five groundwater wells, an elevated potable water storage tank and a distribution system. The wells are owned by the Municipality and are currently operated by the Ontario Clean Water Agency (OCWA). The Municipality operates and maintains the water distribution system.

The existing communal sewage system was established in the 1960s and generally consists of gravity sewers, several sub-area pumping stations, a main pumping station, and an extended aeration wastewater treatment plant. The sewage collection system is owned and operated by the Municipality and OCWA is presently contracted to operate and maintain the pumping and treatment systems.

It is noted that this Master Plan Update is an update to relevant planning projections, flow/demand projections, timing of recommended servicing solutions from the 2012 Master Plan, and opinions of probable costs. It is noted that this assignment was not undertaken as a formal update to the Master Plan in accordance with the Municipal Engineers Association (MEA) Class EA document (e.g., no formal public or agency consultation was undertaken) and, therefore, cannot be used as an official Master Plan Addendum.

2.0 Study Area Description and Profile

2.1 Study Area and Planning Periods

This Master Plan Update considers the Study Area to be the entire boundary of the Almonte Ward within the Municipality and the White Tail Ridge Development Area in the Ramsay Ward, as illustrated in Figure 3. Future development areas are also considered as part of this Master Plan Update.

The planning periods considered as part of this Master Plan Update are short-term (2018-2022), mid-term (2023-2027), long-term (2028-2037), and build-out (2037 and beyond).

2.2 Population Projections

The 2012 Master Plan was based on the 2006 Community Official Plan (COP). Future development and growth projections for the Master Plan Update were based on the Comprehensive Review (JLR, 2017) completed in support of the Official Plan Five Year Review which is currently being undertaken by the Municipality.

Growth projections within the Almonte Ward were conservatively estimated based on the 60/25/15 approach (60% of future growth allocated to Almonte Ward) to remain consistent with the original Master Plan, and at an annual growth rate of 1.39% in accordance with the Comprehensive Review (JLR, 2017), as summarized in Table 1. Refer to Appendix A for a Population Projections memorandum, including figures, dated June 15, 2017, for more information.

Table 1: Almonte Ward Population Projections

Development Milestone	Year	Town of Mississippi Mills Population	Almonte Ward Population	SOURCE (for Almonte Ward growth)
Existing	2001	11,647	4,659	Census
	2006	11,734	4,538	Census
	2011	12,385	4,822	Census (revised)
	2016	13,163	5,039	Census
	2017	13,346	5,149	60% to Almonte
Short Term (1 to 5 Years) Almonte $\triangle p_{2017\text{-}2022} = 573$	2018	13,532	5,260	60% to Almonte
	2019	13,721	5,374	60% to Almonte
	2020	13,912	5,488	60% to Almonte
	2021	14,105	5,604	60% to Almonte
	2022	14,302	5,722	60% to Almonte

Mid-Term (6 to 10 Years) Almonte △ p $_{2022\text{-}2027}$ = 614	2023	14,501	5,842	60% to Almonte
	2024	14,703	5,963	60% to Almonte
	2025	14,907	6,086	60% to Almonte
	2026	15,115	6,210	60% to Almonte
	2027	15,325	6,336	60% to Almonte
Long Term (11 to 20 Years) Almonte △ p $_{2027\text{-}2037}$ = 1,364	2028	15,539	6,465	60% to Almonte
	2029	15,755	6,594	60% to Almonte
	2030	15,975	6,726	60% to Almonte
	2031	16,197	6,859	60% to Almonte
	2032	16,423	6,995	60% to Almonte
	2033	16,651	7,132	60% to Almonte
	2034	16,883	7,271	60% to Almonte
	2035	17,118	7,412	60% to Almonte
	2036	17,357	7,555	60% to Almonte
	2037	17,598	7,700	60% to Almonte

2.3 Land Use

Further to the population projections presented in Table 1 and in order to assess the impacts of growth on water distribution and wastewater collection infrastructure, spatial, and land-use definition of the proposed development areas are required for the proposed planning periods (i.e., Short-Term, Mid-Term, Long-Term, and Build-Out).

The population projections presented in Tables 2, 3, 4, and 5 were prepared to reconcile the population projections developed in Table 1 (i.e., applying 1.39% growth) and the spatial development of the growth (i.e., current and projected development areas). It is noted that the growth illustrated in the tables below were based on area/land use and approved population densities within the Comprehensive Review (JLR, 2017), as such, they differ from the population projection listed in Table 1, but are considered conservative. Based on an existing (2017) population of 5,149, the updated Master Plan design 20-year (2037) predicted population is 8,521 (i.e., 5,149 plus the total of Tables 2, 3 and 4), relative to 7,700 in Table 1.

Table 2: Potential Short Term Growth (1 to 5 years)

Development	Description	Units	Population
Residential	Registered and Draft Approved	706	1,673
Residential Infill and Intensification	Approximately 3.8 ha of 16 ha within the Almonte Service Area	52	124
Business Park (Commercial)	Total Area 8.5 ha		
Total Short-Term			**1,797**

Table 3: Potential Mid-Term Growth (5 to 10 years)

Development	Description	Units	Population
Residential	Register and Draft Approved	102	242
Residential	14.2 ha of 34.2 ha Greenfield development	164	389
Residential Infill and Intensification	Approximately 12.2 ha of 16 ha within the Almonte Service Area	167	396
Business Park (Commercial)	Total Area 8.5 ha		
Commercial	Total Area 15.7 ha		
Total Mid-Term			**1,027**

Table 4: Potential Long-Term Growth (10 to 20 years)

Development	Description	Units	Population
Residential Greenfield	20 ha of 34.2 ha Greenfield development	231	548
Community Facility	Total Area 3.1 ha		
Total Long-Term			**548**

Table 5: Potential Build-Out Growth

Development	Description	Units	Population
Residential	Low and Medium Density	2,009	4,763
Industrial	Total Area 24.1 ha		
Total Build-Out			**4,763**

3.0 Identification and Evaluation of Servicing Strategies

One of the objectives of this Master Plan Update is to develop and evaluate possible servicing strategies for both water and wastewater infrastructure. All reasonable potential solutions to the problem are typically considered. Servicing strategies are examined in sufficient detail to allow conclusions to be drawn and to move forward to the next stage of the project. Master Plans for water and wastewater generally result in the identification and review of a broad range of options.

3.1 Evaluation Methodology

The evaluation process for the 2012 Master Plan consisted of a review of the potential servicing strategies in consideration of the criteria described in Table 6.

Table 6: Summary of Evaluation Criteria

Criteria	Description
Natural Environment Considerations	Natural features, natural heritage areas, Areas of Natural and Significant Interest, designated natural areas, watercourses and aquatic habitat
Social and Cultural Environment Considerations	Proximity of facilities to residential, commercial and institutions, archeological and cultural features, designated heritage features, well or wellhead protection areas, land-use and planning designations
Technical Feasibility	Constructability, maintaining, or enhancing drinking water quality, maintaining or enhancing wastewater treatment, reliability and security of systems, ease of connection to existing infrastructure and operating and maintenance requirements
Financial Considerations	Capital costs

The relative impact for each criterion to each potential servicing strategy was assessed based on whether the alternative is 'Preferred', 'Less Preferred', or 'Least Preferred' with respect to that criterion. The four evaluation criteria were assigned equal weights as they were considered to have equal importance in this evaluation.

Re-evaluation of the servicing strategies was not completed as part of the Master Plan Update, but rather the key design criteria which led to the identification of the preferred alternative was confirmed, and generally the preferred alternative description and recommended timing for implementation was adjusted accordingly.

3.2 Cost Estimates

All opinion of probable costs associated with the preferred alternatives were updated to a 2018 dollar value in this Master Plan Update. These costs are based on a Class 'D' estimate class, which is generally defined as follows:

- Work Definition: A description of the intended solutions with such supporting documentation as is available (definition of project typically in the order of 1% to 5%).
- Intended Purpose: To aid in the screening of various options prior to recommending a preferred solution.
- Level of Effort: Limited and expected accuracy could range from -25% to +50%.
- Opinion of Probable Costs: Completed using 2018 dollar value.

It is noted that a mark-up has been applied to base construction cost estimates to account for items such as engineering, permits, approvals, construction overhead, building and site works, field investigations, etc., based on a 2005 Water and Wastewater Asset Cost Study by R.J. Burnside & Associates Limited.

3.3 Hydraulic Modeling

As part of the Master Plan Update, the water and wastewater system hydraulic models were updated to reflect recent historical demands and flows, and future modelling scenarios were adjusted according to the revised population and growth projections.

3.3.1 Water System Hydraulic Model

The WaterCAD® software platform was used to update the existing water system hydraulic model, as this software was used previously to simulate various water demand scenarios for the 2012 Master Plan. Refer to Figure 4 for the extents of the water model. Key steps in developing the updated water system hydraulic water model are summarized as follows:

- Update Water Consumption Rates: The water demands were revised to reflect available data, including water metering/billing information for the Municipality's larger consumers (i.e., institutional, commercial, industrial) to assign their respective hydraulic demands in the model. The remaining demands were uniformly allocated to the various nodes within the model based on the number of adjacent dwelling units.

- Watermains: Rehabilitated watermains replaced as part of capital work projects since 2012 and new watermains constructed as part of growth were added to the model.

- Modelling Parameters: The 2012 validated hydraulic water modelling parameters were maintained including watermain Hazen-Williams 'C' factors, pressure reducing valve settings, water tower level, and pump curves.

- Baseline Model: The validated original base water model was maintained to analyze the system response under current domestic and fire flow conditions. A review of the system in 2009 revealed that all well pumps are throttled with PRVs and/or gate valves and that the northwestern quadrant of the system is currently isolated from the remainder of the system via five PRVs as this quadrant represents low-lying areas of the Municipality.

3.3.2 Wastewater System Hydraulic Model

The SewerCAD® software platform was used to update the existing wastewater collection system hydraulic model, as this software was previously used in the 2012 Master Plan. Refer to Figure 5 for the extents of the wastewater model. Key steps in updating the wastewater system hydraulic model are summarized as follows:

- Reaffirm Existing Model: The simplified model of the collection system that was originally developed includes only trunk sewers and key collectors. The model was updated based on sewer and pumping station upgrades. Refer to Figure 5 for extents of the wastewater system hydraulic model.

- Update Sewage Generation Rates: The Spring 2011 sewage generation rates developed from the Municipality's seven flow monitors were reviewed and maintained. Peak wet weather flows were updated from five years of historic peak pumped flow rates recorded at that Gemmill's Bay Sewage Pumping Station.

- Updated Modelling: Once all sewage generation parameters were updated, simulations of the wastewater collection system under existing conditions were completed to establish a baseline for comparison with future development scenarios and to ascertain whether there are any existing capacity constraints.

4.0 Potable Water System

The Almonte Ward is the only area in the Municipality that is serviced by a communal water system. The Almonte Ward is generally supplied by five groundwater wells, one elevated potable water storage tank, and approximately 35km of watermains, as illustrated on Figure 6.

4.1 Existing Potable Water System

The communal water system is supplied by five groundwater wells identified as 3, 5, 6, 7, and 8, as shown on Figure 6.

Well 3 is located near Ottawa Street in the northeast end of Municipality. This Well was constructed in 1948 and is a 250mm diameter borehole extending to a depth of 47.5m below the ground surface. The Well is equipped with a vertical turbine pump and enclosed within a vented weather tight masonry block and brick pump house. Well 3 is also equipped with a chlorination system and associated instrumentation.

Well 5 is located in the municipal works yard on the west side of the Mississippi River. This Well was constructed in 1970 and is a 203mm diameter borehole extending to a depth of 38.1m below the ground surface, equipped with a submersible pump and enclosed within a vented weathertight masonry block and aluminum clad pump house. Well 5 is also equipped with a chlorination system and associated instrumentation.

Well 6 is located in Gemmill Park, near Christian Street, on the west side of the Mississippi River. This Well was constructed in 1973 and is a 254mm borehole extending to a depth of 48.8m below the ground surface, with a steel casing to a depth of 10m. It is equipped with a vertical turbine pump and enclosed within a vented weathertight masonry block and wood siding pump house. Well 6 is also equipped with a chlorination system and associated instrumentation.

Wells 7 and 8 are located on Paterson Street on the east edge of Municipality and are approximately 5m apart in the same building. Wells 7 and 8 were constructed in 1990/91, are 254mm boreholes extending to a depth of 79.2m below the ground surface, and have a steel casing to a depth of 13.41m. They are equipped with vertical turbine pumps and enclosed within a vented weathertight masonry block and brick or vinyl siding pump house. The Wells are also equipped with a chlorination system and associated instrumentation.

The water distribution system includes an elevated water storage tank (2,840m^3 nominal capacity) and piping network. The elevated storage tank, constructed in 1992, is located in the northeast quadrant of the Municipality near Wells 7 and 8. The piping network generally consists of polyvinyl chloride, ductile iron and cast iron piping ranging in size from 50mm to 200mm in diameter. It is understood that some of the piping is the original infrastructure dating back to 1930 and earlier.

The water distribution system currently consists of two pressure zones (PZ-1 and PZ-2), as illustrated on Figure 6. The pressure zone boundaries are defined by five pressure reducing valves (PRVs) located at Colbourne Street (set at 40 psi), Farm Street (set at 30 psi), Little Bridge Street (set at 45 psi), Almonte Street (set at 35 psi), and Main Street East (set at 57 psi).

The Wells operate in accordance with the following Certificates:

- Permit to Take Water (PTTW) No. 8175-AQPHA8, dated September 8, 2017, which allows for a total combined water taking capacity of 86.5L/s (7,474m^3/d).

- Drinking Water Works License No. 178-101, Issue No. 2, dated July 20, 2016, which outlines an approved total combined rated capacity of 79.8L/s (6,895m^3/day). It is noted that a License amendment application is currently under review by the Ministry of the Environment and Climate Change (MOECC) for a revised total combined rated capacity of 86.5L/s (7,474m^3/d), which includes the amendment for the capacity of Wells 7 and 8 to be increased from 38L/s to 44.7L/s.

Table 7 summarizes the operational characteristics of the Wells.

Table 7: Well Operational Characteristics

Wells	Year Constructed	Depth (m)	Size (mm)	PTTW (L/s)	License (L/s)	Demonstrated Yield (L/s)	Operating Limit (L/s) (1)
3	1948	47.5	250	9.7	9.7	9.7	7.1
5	1970	38.1	203	9.5	9.5	9.5	6.4
6	1973	48.8	254	22.7	22.7	11.9 (2)	11.9
7 and 8	1990/1991	79.2	254	44.7	44.7(3)	75.7	44.7(3)
TOTAL				**86.5**	**86.5(3)**	**106.8**	**70.1(3)**

1. Operational limitations provided by OCWA (November 2006) and confirmed in 2017.
2. High turbidity/sediment levels limit the demonstrated yield to 11.9 (operational limit).
3. Current operating limit of and License limit for Wells 7 and 8 is 37.7L/s; however, a DWWP and License amendment application is currently under review by the MOECC and since it is anticipated to be approved in the short-term, the proposed limit of 44.7L/s (and related total values) is being presented here.

As indicated above, Wells 3, 5, and 7 and 8 are not operating at their full demonstrated yield potential and could be considered for additional supply. It is noted that Well 6 will not be considered for operation beyond the observed operating limit (11.9L/s). Increased sediment production and turbidity have been observed in this well when pumped at rates higher than 11.9L/s. It may be possible to reconstruct Well 6 to prevent sand from entering the pump, but reducing turbidity may require substantial treatment, which is not considered practical or cost effective.

4.2 Historic Potable Water Demands

Table 8 provides a summary of historic potable water demands for 2012 through 2016 for the Almonte Ward.

Table 8: Historic Potable Water Demands (January 2012 to December 2016)

Year	Average Day Demand	Maximum Day Demand
2012	23.4L/s (2,024m^3/d)	43.4L/s (3,754m^3/d)
2013	20.6L/s (1,780m^3/d)	37.8L/s (3,267m^3/d)
2014	19.0L/s (1,641m^3/d)	34.8L/s (3,011m^3/d)
2015	18.4L/s (1,592m^3/d)	37.4L/s (3,228m^3/d)
2016	18.6L/s (1,605m^3/d)	39.1L/s (3,380m^3/d)
Average/Max (2012-2016)	**20.0L/s (1,729m^3/d)**	**43.4L/s (3,754m^3/d)**
Average/Max (2008-2011)	**20.0L/s (1,729m^3/d)**	**38.1L/s (3,893m^3/d)**

Based on the 2016 Almonte Ward design population of 5,039 people and the average day demands, an equivalent per capita average day flow of 343L/c/d is calculated, which is typical for communities of similar size. This is slightly lower than the 352L/c/d calculated in the 2012 Master Plan. Overall, water demands have not changed significantly since the original report.

4.3 Potable Water System Design Criteria

Table 9 provides a summary of the water demand rates used to evaluate the Municipality's water system.

Table 9: Design Criteria - Water Demand Rates

Land Use	Design Criteria	Maximum Day Factor
Existing and Future Residential	350L/cap/day	2.5
Existing and Future Light Industrial	35,000L/ha/day	1.5
Existing and Future Commercial	28,000L/ha/day	1.5

Water pumping stations or wells are rated on their 'firm' pumping capacity. Firm capacity is based on the capacity of the station or system with the largest pump out of service. Pumping stations or well systems are sized based on maximum day flows for areas with sufficient water storage volume, and on peak hour flows for areas without sufficient storage. Storage capacities are based on MOECC Guidelines for Drinking Water Systems (MOECC, 2008). The total storage capacity requirements for a pressure zone are the sum of the equalization storage, fire storage, and emergency storage allowances. These design criteria are summarized in Table 10.

Table 10: Design Criteria - Water Infrastructure and Facilities

Component	Description	Design Criteria
Pumping or Well Systems	▪ With Adequate Zone Storage Available ▪ Without Adequate Zone Storage Available	▪ Maximum Day Flows to Zone and All Subsequent Zones ▪ Peak Hour Flows to Zone and Maximum Day Flows to All Subsequent Zones
Storage	▪ A – Fire Storage ▪ B – Equalization Storage ▪ C – Emergency Storage ▪ Total	▪ Largest Expected Fire Volume ▪ 25% of Maximum Day Demand ▪ 25% of 'A' + 'B' ▪ 'A' + 'B' + 'C'
Fire Flows(1)	Residential Unit Separation ▪ Less than 3m ▪ Residential 3 to 10m ▪ Residential 10.1 to 30m ▪ Residential Over 30m	 ▪ 100L/s (6,000L/min) ▪ 67L/s (4,000L/min) ▪ 50L/s (3,000L/min) ▪ 33L/s (2,000L/min)
System Pressure	▪ Normal Operating Conditions	▪ 275 kPa (40 psi) to 700 kPa (100 psi)

1. This scenario was modelled assuming a minimum pressure of 140 kPa (20 psi) at any junction or hydrant within the service area and a 2 hour fire. Fire flow assessment criteria from the Fire Underwriters Survey, 1999.

4.4 Condition Assessment Report: Potable Water System

A Condition Assessment Report was prepared for the 2012 Master Plan. Refer to Appendix B for a copy of this report. With the exception of reevaluating the linear infrastructure relative to typical design life of piping, a new condition assessment was not undertaken as part of this Master Plan Update, however, the opinion of probable costs and timeframe for recommendations were adjusted to reflect the lapse of time since the original condition assessment was completed. A summary of the potable water system condition assessment updated opinion of probable costs are summarized in Table 11. These costs are carried forward as part of the overall servicing solutions for the potable water system.

It is noted that some condition assessment work was undertaken at Wells 7 and 8 as part of two separate pump replacement projects since 2012, including that which was recommended under the 2012 Master Plan 0 to 5 year and 5 to 10 year timeframes. In addition, protective coating systems for the elevated tower were rehabilitated in 2014 and, therefore, no longer recommended for the immediate or short-term. Typically interior and exterior coating systems require rehabilitation every 15 to 20 years (new long-term recommendation). Table 11 has been adjusted accordingly to reflect work completed to date.

Table 11: Summary of Potable Water System Condition Assessment Upgrades

Timeframe	Facility	Budget Allowance[1]
Immediate	Well 3	$105,000
	Well 5	$120,000
	Well 6	$125,000
	Distribution System[2]	$7,055,000
	Subtotal	**$7,680,000**
Short-Term (2018-2022)	Well 3	$2,000
	Well 6	$3,000
	Distribution System [2]	$1,815,000
	Subtotal	**$1,828,000**
Mid-Term (2023-2027)	Well 3	$130,000
	Well 5	$125,000
	Well 6	$105,000
	Wells 7 and 8	$170,000
	Distribution System [2]	$2,080,000
	Subtotal	**$2,610,000**
Long-Term (2028-2037)	Distribution System [2]	$2,810,000
	Elevated Storage Tower	$450,000[3]
	Subtotal	**$3,260,000**

1. Budget Allowance Adjusted from 2012 Master Plan at an annual average inflation rate of 1.40% from 2012 to 2017.
2. Costing based on desktop assessment of typical design life of piping (approx. 70 years).
3. The elevated storage tower protective coating systems were rehabilitated in 2014. Typically interior and exterior coating systems require rehabilitation every 15 to 20 years. As such, an allowance of $450,000 has been carried for the coating system work (including $50,000 for miscellaneous repairs), budget to be confirmed.

4.5 Future Requirements: Potable Water System

4.5.1 Water Supply and Treatment

Based on the updated population projections and modelling, the updated future maximum day water demands required to service the Almonte Ward are summarized in Table 12. In consideration of the updated demands, a capacity deficit of 18.1 L/s is predicted within the mid-term planning period (2023-2027). It is noted that the 2012 Master Plan had predicted a 25L/s capacity deficit in the mid-term (2016 -2020), and 9.2L/s in the long-term (2021-2030) if the full yield potential of Wells 3, 5, 7, and 8 is considered.

Table 12: Future Maximum Day Water Demand and Supply/Treatment Constraints

Study Period	Existing Supply	Full Yield	Demand [1]	Deficit (Existing Supply)	Deficit (Full Yield)
Existing	70.1L/s	106.8L/s	43.5L/s	No Deficit	No Deficit
Short-Term (2018-2022)	70.1L/s	106.8L/s	66.4L/s	No Deficit	No Deficit
Mid-Term (2023-2027)	70.1L/s	106.8L/s	88.2L/s	18.1L/s	No Deficit
Long-Term (2028-2037)	70.1L/s	106.8L/s	95.2L/s	25.1L/s	No Deficit
Build-Out (2037 +)	70.1L/s	106.8L/s	168. L/s	98.6L/s	61.9L/s

1. Demand established using hydraulic water model (i.e., population projections established using the land-use planning information).

4.5.2 Water Storage

Based on the updated population projections and modelling work completed to date, Table 13 is updated from Table 13 of the 2012 Master Plan Report, as it relates to future requirements for potable water storage. It is noted that the existing storage available in the elevated storage tank has been adjusted to reflect the operating capacity noted in the current DWWP. Potable water storage water requirements are based on the MOECC Design Guidelines for Drinking Water Systems (MOE, 2008). This storage calculation considers three components: A – Fire Storage, B – Equalization Storage and C- Emergency Storage.

Table 13: Future Water Storage Requirements

Study Period	Existing Storage	Current Equivalent Population[1]	'A'	'B'	'C'	Required Storage[1]	Deficit
Existing	2,840m^3	4,937	1,028m^3	939m^3	492m^3	2,458m^3	None
Short-Term (2018-2022)	2,840m^3	7,560	1,844m^3	1,434m^3	819m^3	4,096m^3	1,256m^3
Mid-Term (2023-2027)	2,840m^3	10,464	2,093m^3	1,904m^3	999m^3	4,997m^3	2,157m^3
Long-Term (2028-2037)	2,840m^3	11,259	2,182m^3	2,057m^3	1,060m^3	5,298m^3	2,458m^3
Build-Out (2037 +)	2,840m^3	20,749	4,339m^3	3,643m^3	1,996m^3	9,978m^3	7,138m^3

1. Demand established using hydraulic water model (i.e., population projections established using the land-use planning information). When determining the fire flow allowance for commercial or industrial areas, the area occupied by the commercial/industrial complex was considered at an equivalent population density to the surrounding residential areas.

4.5.3 Water Distribution System

The updated water system hydraulic model was configured to simulate the following demand scenarios for each planning period:

- Peak Hour: The peak hour demand was modeled using an elevated water storage tank level of 180m with the well pumps on. This tank level represents 75% of the storage volume of the lowest tank level that activates the well pumps.

- Maximum Day with Fire Flow: The maximum day plus fire flow was modeled using an elevated water storage tank level of 180m with the well pumps on. This tank level represents 75% of the storage volume of the lowest tank level that activates the well pumps. This scenario was modeled assuming a minimum pressure of 140 kPa (20 psi) at any junction or hydrant within the service area.

A discussion of the results for the above scenarios has been summarized in Table 14.

Table 14: Future Water Distribution Requirements

Study Period	Maximum Day Plus Fire Flows (1)		Peak Hour Flows
Existing	Reference Figure 7		Reference Figure 8
	Percentage (%) of Junctions Capable of Meeting the Indicated Fire Flows	Fire Flow (L/s)	The simulated pressures were found to range from 334 kPa (48.4 psi) at the intersection of County Road No. 29 and Hope Street to 631 kPa (91.5 psi) at Well No. 6. These results appear representative of a peak hour demand condition, where the minimum pressure requirement of 275 kPa (40 psi) is met as recommended by the MOECC Guidelines. System pressures did not exceed the maximum pressure constraint of 700 kPa (100 psi).
	95 %	33	
	85 %	50	
	54 %	67	
	48 %	75	
	39 %	100	
	24 %	150	
Short-Term (2018 – 2022)	Reference Figure 9		Reference Figure 10
	Percentage (%) of Junctions Capable of Meeting the Indicated Fire Flows	Fire Flow (L/s)	The simulated pressures were found to range from 309 kPa (44.8 psi) in the future Mill Run Subdivision to 609 kPa (88.3 psi) at Well No. 6. These results appear representative of a peak hour demand condition, where the minimum pressure requirement of 275 kPa (40 psi) is met as recommended by the MOECC Guidelines. System pressures did not exceed the maximum pressure constraint of 700 kPa (100 psi).
	94 %	33	
	83 %	50	
	52 %	67	
	49 %	75	
	38 %	100	
	24 %	150	

Study Period	Maximum Day Plus Fire Flows [1]		Peak Hour Flows
	Percentage (%) of Junctions Capable of Meeting the Indicated Fire Flows	Fire Flow (L/s)	
Mid-Term (2023 – 2028)	Reference Figure 11		Reference Figure 12
	96 %	33	The simulated pressures were found to range from 249 kPa (36.1 psi) along County Road No. 29 in the future development area to 545 kPa (80.2 psi) at Well No. 6. The above pressure is just below the minimum pressure requirement of 275 kPa (40 psi) as recommended by the MOECC Guidelines. System pressures did not exceed the maximum pressure constraint of 700 kPa (100 psi).
	76 %	50	
	52 %	67	
	50 %	75	
	35 %	100	
	18 %	150	
Long-Term (2029 – 2037)	Reference Figure 13		Reference Figure 14
	98 %	33	The simulated pressures were found to range from 250 kPa (36.3 psi) along County Road No. 29 in the future development area to 586 kPa (85.0 psi) at Well No. 6. The above pressure is just below the minimum pressure requirement of 275 kPa (40 psi) as recommended by the MOECC Guidelines. System pressures did not exceed the maximum pressure constraint of 700 kPa (100 psi).
	77 %	50	
	51 %	67	
	49 %	75	
	34 %	100	
	15 %	150	
Build-Out (2037 +)	Reference Figure 15		Reference Figure 16
	58 %	33	Negative pressures were recorded at 20% of the junction nodes in the system. Only 15% of the junction nodes had pressures that exceeded the minimum pressure requirement of 275 kPa (40 psi) as recommended by the MOECC Guidelines. The maximum pressure simulated was 418 kPa (70.6 psi) located at the intersection of Spring Street and Merrithew Street.
	51 %	50	
	29 %	67	
	21 %	75	
	10 %	100	
	2 %	150	

1. For each study period additional junctions and pipes were added to the model. These additional junctions cause a fluctuation in the percentages listed in the table when comparing study periods. This is further compounded by the addition of pipes that created looped areas to service the future development lands. In some areas the assumed looping patterns increased the anticipated fire flow.

4.6 Water Supply and Treatment Servicing Strategies

Insufficient source capacity to accommodate proposed growth needs to be addressed. The 2012 Master Plan had considered various alternative solutions to increase water supply and treatment. At the time, the design period considered for servicing strategies was 20 years, however, servicing impacts beyond the 20-year time frame were considered to efficiently plan for municipal infrastructure requirements in anticipation of full 'build-out' conditions within the Almonte Ward.

The following sections describe updates to the preferred solutions previously identified. As previously noted, detailed evaluation of previously reviewed (or new) servicing options has not been completed as part of this Master Plan Update. It is noted that the 2012 Master Plan did not consider alternative water supply and treatment servicing strategy of treating surface water as it was noted that good quality groundwater was available in the study area and the entire current system was based on a groundwater system that was in reasonable condition. This Master Plan Update maintains this approach.

4.6.1 Short-Term (0 to 5 Years): Water Supply and Treatment

There were no water supply and treatment capacity constraints identified and as such, no further assessment of servicing strategies for this planning period was considered.

4.6.2 Mid-Term (5 to 10 Years): Water Supply and Treatment

The 2012 Master Plan had identified a mid-term (2016-2020) water supply deficit of 24.9L/s, and proposed that Wells 7 and 8 be upgraded to their demonstrated yield of 75.7L/s to gain an additional 37.7L/s. This upgrade would still result in a supply deficit of 14.9L/s in the long-term (2021-2030), which was proposed to be supplemented by increasing the capacities of Wells 7 and 8 beyond their demonstrated yield in the long-term, as preliminary studies had suggested additional yield may be feasible. If the 2012 Master Plan projections were realized (or projected to be realized) within the timeframes noted in the 2012 Master Plan, the Municipality would need to consider a Schedule C Class EA to upgrade Wells 7 and 8 in the very near future.

Updated projections indicate that a supply deficit in the order of 18.1L/s will not be realized until the new mid-term timeframe (2023 to 2027) and, therefore, a Schedule C Class EA to upgrade Wells 7 and 8 may be deferred accordingly. Furthermore, if Wells 7 and 8 are upgraded to their demonstrated yield of 75.7L/s, a long-term deficit is no longer predicted, as illustrated in Table 15 below, which is an update to the 2012 Master Plan Report Table 17.

Table 15: Upgrade Wells 7 & 8 to Demonstrated Yield - Future Maximum Day Demand

Study Period	Existing Supply	Supply w/ Full Yield Wells 7 and 8 (1)	Maximum Day Demand	Deficit (Existing Supply)	Deficit Full Yield Wells 7 and 8
Existing	70.1L/s	101.1L/s	43.5L/s	No Deficit	No Deficit
Short-Term (2018-2022)	70.1L/s	101.1L/s	66.4L/s	No Deficit	No Deficit
Mid-Term (2023-2027)	70.1L/s	101.1L/s	88.2L/s	18.1L/s	No Deficit
Long-Term (2028-2037)	70.1L/s	101.1L/s	95.2L/s	25.1L/s	No Deficit

1. This total is equal to the current operating limits of Wells 3, 5, and 6 (7.1 + 6.4 +11.9 = 25. L/s) plus an upgraded operating limit of 75.7L/s for Wells 7 & 8.

In order to implement this servicing strategy, and make use of existing infrastructure, particularly the two recently installed 44.7L/s pumps, this may involve the construction of a third well to house a third pump that would operate in a lead/lag/standby mode with the two existing pumps. Consistent with the 2012 Master Plan, additional hydrogeological well testing would also be required to ensure that the 75.7L/s yield is available, and that the two existing pumps in parallel can meet 75.7L/s. The updated opinion of probable cost for this strategy is approximately $2.8M, as summarized in Table 16, based on the construction of a new well ("Well 9") and pump house, installation of a new pump similar in size to the existing pumps and associated process and building piping, new electrical and instrumentation infrastructure, new disinfection for Wells 7, 8, and 9, and other miscellaneous upgrade needs for Wells 7 and 8. The updated opinion of probable cost would be confirmed by the Schedule C Class EA.

Table 16: Opinion of Probable Cost to Upgrade Wells 7 and 8 to Demonstrated Yield (Mid-Term Solution)

Item	Opinion of Probable Cost (Rounded)
Hydrogeological: Well Tests and Schedule C Class EA	$400,000
Drill and Construct New Well 9	$70,000
Supply and Install Well 9 Pump	$80,000
Miscellaneous Building and Process Piping	$210,000
New Disinfection for Wells 7, 8, and 9	$340,000
New Electrical Works	$340,000
New Instrumentation Works	$290,000
New Building, including HVAC	$330,000
Wells 7 and 8 Miscellaneous Upgrades	$50,000
Sub-Total	**$2,110,000**
Engineering and Contingency (33%)	$696,300
Total (Rounded)	**$2,800,000**

4.6.3 Long-Term (10 to 20 Years): Water Supply and Treatment

As previously noted, if Wells 7 and 8 are upgraded to their demonstrated yield of 75.7L/s, a long-term deficit is no longer predicted and, as such, no further assessment of servicing strategies for this planning period was considered. It is noted that the 2012 Master Plan identified a preferred servicing strategy of constructing a new well at Wells 7 and 8 beyond the demonstrated yield of 75.7L/s. It is possible this servicing alternative could be considered for the build-out timeframe (beyond 2037), if required. As part of the hydrogeological well tests for the mid-term upgrade, the Municipality could consider confirming whether additional yield beyond 75.7L/s is available for future reference. Furthermore, it may be prudent for the Municipality to identify and secure a potential well site for a new facility in the future, as a new groundwater source may be required for build-out conditions and wellhead protection areas should be established and protected early on.

It is also noted that the 2012 Master Plan included a long-term strategy for eventually upgrading Wells 3 and 5 to their demonstrated yield to gain an additional 5.7L/s (from their existing operating limit of 7.1L/s and 6.4L/s, respectively to 9.5L/s and 9.7L/s respectively). It is recommended that this strategy continue to be carried forward as a consideration for the long-term planning horizon. An updated Opinion of Probable Cost is $1.2M to implement this strategy. It is noted for reference that the Municipality has recently undertaken some rehabilitation work at Wells 3 and 5, but operations remain unchanged. This servicing strategy considers a more extensive rehabilitation project than that which has already been completed.

4.7 Water Storage Servicing Strategies

As discussed in previous sections, the existing available potable water storage is insufficient to meet the projected growth within the Almonte Ward based on MOECC Guidelines. The 2012 Master Plan had completed a detailed evaluation of alternative solutions to increase the potable water storage. Similarly as the water supply and treatment servicing strategies, a 20-year planning period was reviewed with consideration for impacts of full 'build-out' conditions within the Almonte Ward.

The following sections describe updates to the preferred solutions previously identified. As previously noted, detailed evaluation of previously reviewed (or new) storage options has not been completed as part of this Master Plan Update.

4.7.1 Short-Term (0 to 5 Years): Water Storage

The 2012 Master Plan had identified a short-term storage deficit of 745m^3, however, additional storage was not deemed to be required because it was determined that emergency storage ('C' storage requirements) could be met by the current well supply if needed. The balance of storage requirements (fire storage – 'A', and equalization storage – 'B') could be met by the existing elevated storage tank.

Based on updated projections, the new short-term deficit has increased to 1,256m^3, partly due to an increase in projected maximum day demand and equivalent population. Because this value is greater than the emergency storage requirements ('C'), the deficit cannot be met by the current well supply and elevated storage tank alone, and additional storage should be considered in the short-term. As such, the recommendation to proceed with a Schedule B Class EA for water storage in the 2012 Master Plan mid-term timeframe (2016-2020) still stands for the new short-term timeframe (2018-2022). In other words, the Municipality should consider proceeding with a Schedule B Class EA for water storage in the near future.

The 2012 Master Plan had identified a preferred long-term solution of constructing new reservoir(s) at a new site that could be constructed based on a phased approach to meet the different timeframe needs. Based on revised projections, this option would consider the construction of a reservoir sized for a minimum storage volume of 2,458m^3 (i.e., to address the long-term deficit). A booster station and pressure management upgrades would be required to create an additional pressure zone dedicated to the new reservoir and booster station. It is proposed that the storage reservoir be located on the west side of the Mississippi River to enhance system redundancy. Water quality (i.e., low chlorine residual concentrations) is a concern with larger storage facilities due to longer water 'turn-over' periods. Careful consideration must be taken during the design phase to ensure potential water quality concerns are addressed.

The updated opinion of probable costs for this option is $4,700,000 and would be confirmed through the Schedule B Class EA.

4.7.2 Mid-Term (5 to 10 Years): Water Storage

The short-term water storage strategy would accommodate the mid-term water storage deficit of 2,157m^3. That is, the construction of a new reservoir to meet long-term storage needs.

4.7.3 Long-Term (10 to 20 Years): Water Storage

The short-term water storage strategy would accommodate the long-term water storage deficit of 2,458m^3. That is, the construction of a new reservoir to meet long-term storage needs.

4.8 Water Distribution Servicing Strategies

In order to service new growth areas, transmission watermains are required to convey potable water and fire flows throughout the existing and expanded service areas. The following sections describe updated servicing strategies for the water distribution system over the next 20 year planning period. Impacts of full 'build-out' conditions on infrastructure within the Almonte Ward were also considered to offer a broad level picture of infrastructure needs beyond 20 years.

4.8.1 Short-Term (0 to 5 Years): Water Distribution

In order to continue to provide current fire flow conditions and adequate system pressures, the following short-term distribution upgrades were identified:

- Victoria Street Upgrade: This upgrade will, in part, service future residential development in the northwest quadrant. The Municipality is currently undertaking related design work for this project. It is noted that this was envisioned in the 2012 Master Plan for the long-term timeframe, but more recent sanitary flow projections has increased the priority of work on this street.

- County Road 29 Looping: This will improve water servicing redundancy to PZ-2 and includes a watermain extension to service future residential development along Dunn Street and in the northwest quadrant. This was also envisioned as a short-term upgrade need in the 2012 Master Plan.

It is noted that the 2012 Master Plan also envisioned short-term upgrades to include Adelaide and Martin Street looping, Bridge and High Street upgrades, and an extension on Bridge Street. Updated modelling indicates that the Bridge Street related upgrades and extension are not anticipated to be required until the build-out timeframe, and the Adelaide, Brookdale and Martin Street looping has now been identified under the 5 to 10 year timeframe.

The opinions of probable costs associated with the short-term water distribution servicing strategies are summarized in Table 17.

Table 17: Opinion of Probable Costs Short-Term Water Distribution

Option	Diameter (mm)	Length (m)	Rate ($/m)(1)	Engineering and Contingency (27%)	Rounded Total(3)
Victoria Street Upgrade(2)	300	690	$470	$88,000	$410,000
County Road 29 Looping Wylie Street to Dunn Street	250	88	$1,100	$26,000	$125,000

1. Rates based on City of Ottawa 2015 Unit Rates for watermain, restoration of road (granulars, base and wear) and curb, and other past experience.
2. Victoria Street road reinstatement costs carried under wastewater collection servicing strategies and not included herein.
3. Rounded to the nearest $5,000.

4.8.2 Mid-Term (5 to 10 Years): Water Distribution

The mid-term water distribution system servicing options identified to address the required fire flow and system pressures include:

- County Road 29 Well 6 to Wylie Upgrade: Watermain upgrade will service residential development in the northwest quadrant.

- Pressure Zone 2 Optimization: Reducing the size of PZ-2 will improve existing water service and facilitate development of the northwest quadrant. This upgrade includes 2 new pressure reducing valves (PRVs) at Almonte Street and Hope Street, and decommissioning of the existing Almonte Street PRV. This was generally considered in the 2012 Master Plan for the 10 to 20 year timeframe.

- Martin Street North, from Teskey Street to Carss Street: This will improve servicing for expansion of the White Tail Subdivision. This upgrade was originally envisioned in the 2012 Master Plan for the 0 to 5 year timeframe.

- Princess Street and Martin Street North Upgrades: This rehabilitation and upgrades will service residential development in the northwest quadrant.

- Union Street North, from Princess Street to Carss Street: This rehabilitation and upgrades will service residential development in the northwest quadrant.

- Adelaide and Brookdale Street Looping: This will improve water servicing for expansion of the White Tail Subdivision. This upgrade was originally envisioned in the 2012 Master Plan for the 0 to 5 year timeframe.

- Carss Street, from Mitcheson Street to Union Street North: This watermain extension will service residential development in the northwest quadrant.

- Carss Street, from Union Street North to Mississippi River: This watermain extension will service residential development in the northwest quadrant.

- Mississippi River Third Crossing: This watermain extension will service residential development in the northwest quadrant.

It is noted that the 2012 Master Plan also envisioned mid-term upgrades for Ottawa Street to service the Mill Run development. Since 2012, this work was undertaken by the related developer.

The opinions of probable costs associated with the mid-term water distribution servicing strategies are summarized in Table 18.

Table 18: Opinion of Probable Costs Mid-Term Water Distribution

Option	Diameter (mm)	Length (m)	Rate ($/m)(1)	Engineering and Contingency (27%)	Rounded Total(5)
County Road 29 Well 6 to Wylie Street Upgrade	250	570	$1,100	$169,000	$795,000
Pressure Zone 2 Optimization	$150,000(2)			$37,500	$188,000
Martin Street North, from Teskey Street to Carss Street	200	441	$1,030	$123,000	$575,000
Princess Street and Martin Street North Upgrades(3)	300	281	$470	$36,000	$170,000
Union Street North, from Princess Street to Carss Street(3)	300	710	$470	$90,000	$425,000
Adelaide and Brookdale Street Looping	200	199	$1,030	$55,000	$260,000
Carss Street, from Mitcheson Street to Union Street North	200	97	$1,030	$27,000	$125,000
Carss Street, from Union Street North to Mississippi River	300	160	$1,090	$47,000	$220,000
Mississippi River Third Crossing	300	200	$10,000(4)	$540,000	$2,540,000

1. Rates based on City of Ottawa 2015 Unit Rates for watermain, restoration of road (granulars, base and wear) and curb, and other past experience.
2. Allowance.
3. Road reinstatement costs carried under wastewater collection servicing strategies and so not included herein.
4. High level estimate for rock boring below Mississippi River.
5. Rounded to the nearest $5,000.

4.8.3 Long-Term (10 to 20 Years): Water Distribution

The long-term water distribution system servicing options identified to address the required fire flow and system pressures include:

- Appleton Side Road Looping: This watermain extension will maintain minimum peak hour pressures in the northeast quadrant. This was envisioned as a long-term need in the 2012 Master Plan.

- Create Pressure Zone 3: This new pressure zone, which was also envisioned as a long-term need in the 2012 Master Plan, will improve pressure management to the island.

It is noted that the 2012 Master Plan also envisioned long-term upgrades on Victoria Street and modifications to PZ-2. The Victoria Street upgrades are currently underway (design ongoing), and now identified in the 0 to 5 year timeframe, and the vision for PZ-2 modifications are now recommended under the 5 to 10 year timeframe.

The opinions of probable costs associated with the long-term water distribution servicing strategies are summarized in Table 19.

Table 19: Opinion of Probable Costs Long-Term Water Distribution

Option	Diameter (mm)	Length (m)	Rate ($/m)[(1)]	Engineering and Contingency (27%)	Rounded Total[(3)]
Appleton Side Road Looping	250	435	$1,100	$129,000	$598,000
Create Pressure Zone 3	$100,000[(2)]			$27,000	$125,000

1. Rates based on City of Ottawa 2015 Unit Rates for watermain, restoration of road (granular, base and wear) and curb, and other past experience.
2. Allowance.
3. Rounded to the nearest $5,000.

4.8.4 Build-Out: Water Distribution System

The build-out water distribution system servicing options identified to address the required fire flow and system pressures are described below. As previously noted, this build-out review offers a broad level overview of potential solutions beyond the 20-year servicing needs.

- Mississippi River Fourth Crossing: This will service build-out Areas 3 and 4.

- County Road 29: This will service build-out Areas 3 and 4.

- Scott Street Looping: This will service build-out Areas 3 and 4.

- Appleton Side Road: This will service build-out Area 1.

- Bridge Street Watermain Extension: This will service build-out Areas 3 and 4, and build-out industrial areas near the Wastewater Treatment Plant.

- Paterson Street Watermain Extension from Tower Street to Ottawa Street: This will service all build-out areas.

- Maude Street to Future Adelaide Street: This will service build-out Area 2.

The opinions of probable costs associated with the build-out water distribution servicing strategies are summarized in Table 20.

Table 20: Opinion of Probable Costs Build-Out Water Distribution

Option	Diameter (mm)	Length (m)	Rate ($/m)(1)	Engineering and Contingency (27%)	Rounded Total(3)
Mississippi River Fourth Crossing – Riverfront Estates to West Side of River	300	500	$10,000(2)	$1,350,000	$6,350,000
Mississippi River Fourth Crossing – West Side of River to Country Street	300	476	$1,090	$140,000	$660,000
County Road 29	250	711	$1,100	$211,000	$995,000
Scott Street Looping	200	80	$1,030	$22,000	$105,000
Appleton Side Road	250	490	$1,100	$146,000	$685,000
Bridge Street Watermain Extension	300	140	$1,090	$41,000	$195,000
Paterson Street Watermain Extension	300	633	$1,090	$186,000	$875,000
Maude Street to Future Adelaide Street	300	261	$1,090	$77,000	$360,000

1. Rates based on City of Ottawa 2015 Unit Rates for watermain, restoration of road (granulars, base and wear) and curb, and other past experience.
2. High level estimate for rock boring below Mississippi River.
3. Rounded to the nearest $5,000.

4.9 Summary of Potable Water Servicing Strategies

A summary of the water supply and treatment, storage and distribution servicing strategies and opinion of probable costs are presented in Table 21 and Figure 17.

Table 21: Summary of Potable Water Servicing Strategies and Opinion of Probable Costs

Area	Study Period	Description of Works	Opinion of Probable Cost (1): Condition Upgrades (Values Rounded)	Opinion of Probable Cost (1): Capacity Upgrades (Values Rounded)	Opinion of Probable Cost (1): Ref. Pg or Table
Supply	Immediate	▪ Condition Upgrades at Select Wells	$355,000 (2)	-	Table 11
	Short-Term (2018 - 2022)	▪ No Servicing Strategies Proposed	-	-	-
	Mid-Term (2023 - 2027)	▪ Condition Upgrades at Select Wells	$360,000(3)	-	Table 11
		▪ Increase the Capacity of Wells 7 and 8 to Demonstrated Yield	-	$2,800,000(5)	Table 16
	Long-Term (2028 - 2037)	▪ Increase the Capacity of Wells 3 and 5 to Demonstrated Yield	-	$1,200,000	Pg 17
Water Storage	Short-Term (2018 - 2022)	▪ Construct a Reservoir at a New Site	-	$4,700,000(6)	Pg 18
	Mid-Term (2023 - 2027)	▪ Capacity Upgrades Included in Short-Term Works	-	-	-
	Long-Term (2028 - 2037)	▪ Condition Upgrades	$450,000	-	Table 11
		▪ Capacity Upgrades Included in Short-Term Works	-	-	-
Distribution	Immediate	▪ Condition Upgrades	$5,945,000(4)	-	Table 11
	Short-Term (2018 - 2022)	▪ Condition Upgrades	$1,485,000(4)	-	Table 11
		▪ Victoria Street Upgrades	-	$410,000	Table 17
		▪ County Road 29 Looping Wylie to Hope Street Upgrades	-	$125,000	Table 17
	Mid-Term (2023 - 2027)	▪ Condition Upgrades	$1,595,000(4)	-	Table 11
		▪ County Road 29 Well 6 to Wylie Street Upgrade	-	$795,000	Table 18
		▪ Pressure Zone 2 Optimization	-	$190,000	Table 18
		▪ Martin Street North, from Teskey Street to Carss Street	-	$575,000	Table 18
		▪ Princess Street and Martin Street North Upgrades	-	$170,000	Table 18
		▪ Union Street North, from Princess Street to Carss Street	-	$425,000	Table 18
		▪ Adelaide and Brookdale Street Looping	-	$260,000	Table 18
		▪ Carss Street, from Mitcheson Street to Union Street North	-	$125,000	Table 18
		▪ Carss Street, from Union Street North to Mississippi River	-	$220,000	Table 18
		▪ Mississippi River Third Crossing	-	$2,540,000	Table 18
	Long-Term (2028 - 2037)	▪ Condition Upgrades	$2,455,000(4)	-	Table 11
		▪ Appleton Side Road Looping	-	$610,000	Table 19
		▪ Create Pressure Zone 3	-	$125,000	Table 19

1. Based on Class 'D' Estimate and includes Engineering and Contingencies.
2. Costs for condition upgrades at Wells 3, 5, and 6 only, including immediate and short-term needs. Condition upgrades for Wells 7 and 8 carried in capacity upgrades.
3. Costs for condition upgrades at Wells 3, 5, and 6 only. Condition upgrades for Wells 7 and 8 carried in capacity upgrades.
4. Distribution condition upgrades based on typical life expectancy of pipes. Estimated costs adjusted (i.e., reduced) from Table 11 to reflect related capacity upgrades.
5. Includes condition upgrades from immediate, short-term and mid-term timeframes.
6. Servicing strategy will satisfy long-term requirements.

5.0 Wastewater System

The Almonte Ward is the only area within the Municipality that is serviced by a communal wastewater system. The existing communal wastewater system was established in the 1960s and generally consists of 30km gravity sewers/forcemains, several sub-area pumping stations, a main pumping station, and a relatively new extended aeration wastewater treatment plant (WWTP) with tertiary treatment, as illustrated in Figure 18. The sewage collection system is owned and operated by the Municipality and OCWA is presently contracted to operate and maintain the pumping and treatment systems.

5.1 Existing Wastewater System

All sewage generated in the Almonte Ward service area is ultimately conveyed to the Gemmill's Bay Sewage Pumping Station (SPS), which houses three dry-pit centrifugal pumps (each rated for 163L/s at 44.31m TDH) in a dry well/wet well configuration and conveys wastewater to the WWTP via one 500mm forcemain. A redundant 400mm forcemain to the original wastewater lagoons remain in ground and is currently not in operation. The Gemmill's Bay SPS was upgraded in 2012.

The Spring Street SPS was reconstructed in 2013 to house two submersible pumps (each rated for 36.15L/s at 14m TDH) in a 2.4m diameter wet well configuration. The SPS drainage area includes the Riverfront Estates Developments (existing and future), and other areas south of the SPS. It is noted that two smaller pump stations were recently constructed to capture some flows from the related drainage area, including a privately owned pump station at Orchard View, and the Riverfront SPS. These two pump stations are not included in this review.

The remaining sub area pumping stations consist of: the Christian Street SPS (a Pre-Fabricated Fiberglass Reinforced Plastic packaged pumping station installed in 2010), the Hope and Glass SPS (a below grade concrete dry well/wet well system constructed in 1970), the Island SPS (a below grade steel dry well/wet well system constructed in 1970), Robert Street SPS (a below grade single concrete well system constructed in the 1980s), Ann Street SPS to service the Almonte Mews development and the White Tail Ridge sub-area pumping station. These pump stations are not located along any trunk sewers and, therefore, were not reviewed for capacity in the original or updated Master Plan.

The wastewater collection system generally consists of polyvinyl chloride, ductile iron, concrete, asbestos cement, and vitrified clay piping ranging from 100mm to 1200mm in diameter. It is understood that some of the piping is the original infrastructure dating back to 1930 or earlier.

The WWTP and Gemmill's Bay SPS operate in accordance with Environmental Compliance Approval (ECA) No. 2425-8DXR5U, dated February 16, 2011, which allows for an average day treatment capacity of 4,700m^3/day and a peak treatment capacity of 14,100m^3/day. The Spring Street SPS operates in accordance with ECA No. 6842-95RKXA, dated March 28, 2013, which allows for a design peak flow of 36.15L/s. It is noted that the ECAs for the remaining SPSs were not available.

Table 22 provides a summary of key wastewater system infrastructure operational characteristics.

Table 22: Wastewater System Operational Characteristics

Infrastructure	Average Day Flow Rated Capacity	Peak Flow Rated Capacity
WWTP	4,700m^3/d	14,100m^3/d
Gemmill's Bay SPS	NA	Firm Capacity Unknown$^{(1)}$ 3 pumps each rated for 163L/s (14,083m^3/d) at 44.31m TDH
Spring Street SPS	NA	Firm Capacity: 36.15L/s (3,123m^3/d) 2 pumps each rated for 36.15L/s at 14m TDH

1. Design capacity is noted as 326L/s in 2010 Design Report (TRG), which appears to be the summation of 2 individual pumps each rated at 163L/s.

5.2 Historic Wastewater Flows and Bypasses

Table 23 provides a summary of historic wastewater flows recorded at the Gemmill's Bay SPS for 2012 through 2016 for the Almonte Ward. The 2012 Master Plan historic averages are shown for reference.

Table 23: Historic Wastewater Flows (2012-2016)

Year	Average Day Flow	Maximum Day Flow
2012	19.4 L/s (1,677m^3/d)	56.7 L/s (4,901m^3/d)
2013	30.7 L/s (2,656m^3/d)	110.7 L/s (9,566m^3/d)
2014	43.5 L/s (2,656m^3/d)	278.7 L/s (24,082m^3/d)
2015	28.1 L/s (2,427m^3/d)	124.6 L/s (10,765m^3/d)
2016	32.6 L/s (2,817m^3/d)	138.5 L/s (11,971m^3/d)
Average/Max (2012-2016)	**30.9 L/s (2,667m^3/d)**	**278.7 L/s (24,082m^3/d)**
Average/Max (2008-2011)	34.0 L/s (2,935m^3/d)	174.2 L/s (15,046m^3/d)

Based on the 2016 Almonte Ward design population of 5,039 people and the average day flows, an equivalent per capita flow rate of approximately 529L/c/d is calculated. This is less than the 2012 equivalent per capita flow rate of 600L/c/d. It is noted, however, that updated maximum day flow (279L/s) is significantly higher than the 2012 historic maximum of 174L/s, which impacts the wet weather peaking factor and future requirements for the pumping and collection systems. The Municipality advised there is no known history of sewer system surcharging resulting in basement flooding during any historic peak weather events.

It is noted that raw sewage bypasses have occurred at the Gemmill's Bay SPS since 2012 and, as such, will not be reflected in historic flow to the WWTP. Table 24 provides a summary of bypass events from 2012 to present. Total duration of each event is recorded, however, the volume of each bypass is unknown.

Table 24: Raw Sewage Bypasses at Gemmill's Bay SPS (2012 to Present)

Year	Number of Events	Total Duration (h)
2012	2	7.8
2013	1	3.0
2014	2	23.1
2015	1	1.5
2016	0	0.0
2017 (to Oct. 30)	8	155.3

It is also noted for reference that tertiary filtration bypasses have recently occurred at the WWTP in 2016 and 2017 (since its construction in 2012). The majority of these events were generally noted as being due to heavy precipitation events, mostly during 2017, a particularly wet year.

5.3 Wastewater System Design Criteria

Table 25 provides a summary of the residential wastewater generation rates to be used to assess and size the Municipality's wastewater system. It is noted that the existing residential wastewater flow generation values were determined by a flow monitoring program conducted by the Municipality in the spring of 2011 at seven various locations throughout the wastewater system.

Table 25: Design Criteria - Wastewater Flow Generation

Parameter	Average Day Dry Weather Flow	Dry Weather Peaking Factor	Baseline Infiltration	Wet Weather Extraneous Flow	Wet Weather Peaking Factor
Existing Residential	200L/cap/day	1.5	0.1L/s/ha	0.15L/s/ha	4
Parameter	**Average Day Flow**	**Extraneous Flow**	**Peaking Factor**		
Future Residential	350L/cap/day	0.28L/s/ha	Varies based on Harmon Peaking Factor		
Existing and Future Industrial	35,000L/ha/day	0.28L/s/ha	2.7		
Existing and Future Institutional and Commercial	28,000L/ha/day	0.28L/s/ha	1.5		

The wet weather peaking factor was increased from a factor 3 used in the 2012 Master Plan to a factor of 4 in the Master Plan update, based on the April 2014 wet weather event. Bypass flow was observed at the Gemmill's Bay SPS during the April 2014 event, but no data is available on peak bypass flow rate or volume. The unaccounted for bypass flow could result in a further increase to the wet weather peaking factor. However, any estimated bypass flow rate uniformly attributed to the entire wastewater collection system could generate unrealistic peak flow conditions requiring extensive and potentially unwarranted capacity upgrades. Based on available information at this time and no known history of basement flooding during any historic wet weather event, the conservative wastewater model update is deemed to reasonably mimic actual system performance and remains a reliable master planning tool.

Wastewater pumping facilities are rated on their ‘firm’ pumping capacity. Firm capacity is based on the capacity of the station with the largest pump out of service. Pumping stations are sized based on peak flows. Wastewater treatment facilities are designed based on the average and peak flows, depending on the treatment process (e.g., aeration tanks are sized for average day flows, whereas settling tanks are sized for peak flows). The following design parameters have been used for the WWTP sizing (refer to Table 26).

Table 26: Design Criteria - Wastewater Treatment

Parameter	Value	Comment
Equivalent Per Capita Day Flow	530L/cap/day	Based on historic flows measured at the Lagoon. Equivalent flow that includes ICI.
Maximum Day Factor	3	As per the Design Brief for the Municipality of Mississippi Mills WWTP (TRG, 2010).
Peak Day Factor	6	As per the Design Brief for the Municipality of Mississippi Mills WWTP (TRG, 2010).

5.4 Condition Assessment Report: Wastewater System

A condition assessment of the wastewater system infrastructure indicates that there is renewal work required for the above and below grade infrastructure. Refer to Appendix B for a copy of the Condition Assessment Report that was prepared for the 2012 Master Plan. With the exception of reevaluating the linear infrastructure relative to typical design life of piping, a new condition assessment was not undertaken as part of this Master Plan Update, however, the opinion of probable costs and timeframe for recommendations were adjusted to reflect the lapse of time since the original condition assessment was completed. A summary of the wastewater system condition assessment updated opinion of probable costs are summarized in Table 27. These costs are carried forward as part of the overall servicing solutions for the wastewater system (refer to Appendix B for specific upgrades). It is noted that the White Tail Ridge SPS was not included in the original 2012 condition assessment review as it was a relatively new station at the time. Similarly, the original lagoon treatment system (now decommissioned) and Gemmill’s Bay SPS were not included in the original review because they were under construction and, as such, are not reflected herein.

It is noted that the Spring Street SPS was upgraded since 2012, which included condition upgrades recommended in the 2012 Master Plan. As such, they were removed from the updated summary provided herein.

Table 27: Summary of Wastewater Condition Assessment Upgrades

Timeframe	Facility	Budget Allowance(1)
Immediate	Christian Street SPS	$5,000
	Hope and Glass Streets SPS	$235,000
	Island SPS	$5,000
	Robert Street SPS	$220,000
	Collection System(3)	$7,795,000
	Subtotal	**$8,260,000**
Short-Term (2018 – 2022)	Island SPS	$30,000
	Robert Street SPS	$10,000
	Collection System(3)	$960,000
	Subtotal	**$1,000,000**
Mid-Term (2023 - 2027)	Christian Street SPS	$5,000(2)
	Hope and Glass Streets SPS	$30,000
	Robert Street SPS	$10,000
	Collection System(3)	$2,750,000
	Subtotal	**$2,795,000**
Long-Term (2028-2037)	Collection System(3)	$1,345,000
	Subtotal	**$1,345,000**

1. Budget Allowance Adjusted from 2012 Master Plan at an annual average inflation rate of 1.40% from 2012 to 2017.
2. Allowance for pump replacement, to be confirmed based on pump sizing.
3. Costing based on desktop assessment of typical design life of piping (approx. 70 years).

5.5 Future Requirements: Wastewater System

5.5.1 Wastewater Treatment

As previously noted, the extended aeration WWTP with tertiary treatment which was constructed in 2012, is rated for an average day flow capacity of 4,700m^3/d and a peak treatment capacity of 14,100m^3/d.

The updated flow projections for the WWTP long-term planning period are summarized in Table 28. These values are based on historic per capita wastewater flows of 530L/c/d, a septage contribution of 35m^3/d (TRG, 2010) and a 20-year population projection of 8,521 persons. As illustrated, the new WWTP is sufficiently sized to service the Almonte Ward over the long term planning period (i.e., the next 20 years).

Table 28: Future Wastewater Treatment Requirements

Parameter	WWTP Rated Capacities	Master Plan Design Projections (Long Term)
Long-Term Population Projection	-	8,521 persons
Average Day Flow	4,700m^3/d	4,551m^3/d
Maximum Day Flow	14,100m^3/d (peaking factor of 3)	13,653m^3/d (peaking factor of 3)
Peak Flow	28,200m^3/d (peaking factor of 6)	27,307m^3/d (peaking factor of 6)

5.5.2 Wastewater Pumping

Based on the assumed collection system infrastructure to service projected development areas within the Almonte Ward, the Gemmill's Bay SPS and Spring Street SPS will be directly affected by growth. Wastewater pumping facilities are sized based on peak flows generated in the contributing drainage area.

5.5.2.1 Gemmill's Bay SPS

It is anticipated that the Gemmill's Bay SPS may require expansion in the mid-term (and possibly immediate or short-term) planning period, based on projected peak flows as presented in Table 29, and historic raw sewage bypass events at the SPS previously illustrated in Table 24.

Table 29: Future Wastewater Pumping Requirements - Gemmill's Bay SPS

Study Period	Design Capacity (1)	Projected Peak Flows (2)	Deficit
Existing	326L/s	276L/s	No Deficit
Short-Term (2018-2022)	326L/s	318L/s	No Deficit
Mid-Term (2023-2027)	326L/s	360L/s	34L/s
Long-Term (2028-2037)	326L/s	374L/s	48L/s
Build-Out (2037 +)	326L/s	515L/s	189L/s

1. Design capacity is noted as 326L/s in 2010 Design Report (TRG), which appears to be the summation of 2 individual pumps each rated at 163L/s.
2. Flows determined by utilizing the land-use planning projections and hydraulic wastewater model. It is noted that this does not account for historic raw sewage bypasses at the Gemmill's Bay SPS.

As previously noted, several raw sewage bypasses have occurred at the Gemmill's Bay SPS following its upgrade in 2012. Some of these bypasses were reviewed to determine the maximum day flows on the day of each bypass, particularly the 2012-2016 historic maximum day flow event which occurred in April, 2014 compared to several 2017 bypass events. From Table 30 below, it can be seen that the pumping station appears to be bypassing at maximum day flows less than the 2012-2016 maximum day event and at a more frequent rate, suggesting capacity limitations with the current triplex pumping station.

Table 30: Gemmill's Bay SPS Review of Select Bypass Events

Date	Maximum Day Flow (m^3/d)	Bypass Duration (hr)
April 2014	24,081	18
February 2017	12,873	9.3
April 2017	18,708	50
June 2017	15,308	12.1
July 2017	14,818	11.7 and 17.8

Based on the decreasing maximum pumped flow rates coinciding with increased bypass flow frequency, it is recommended that a capacity assessment of the Gemmill's Bay SPS be undertaken in the immediate term to identify hydraulic constraints related to the station. In addition, it is worth noting that the February 2017 bypass event occurred even though the maximum day flow is less than the ECA rated capacity of a single pump operating.

5.5.2.2 Spring Street SPS

The Spring Street SPS was recently upgraded in 2013 to a firm capacity of 36.15L/s, as part of an upgrade approach developed by Novatech Engineering Consultants Ltd. (Novatech) and described in their 2012 Reconstruction of Spring Street Pump Station Design Brief. Based on this updated capacity, Table 31 presents related future pumping requirements for the pump station, which identifies a short-term deficit of 13.5L/s. It is noted that beyond the short-term timeframe, no further development is anticipated for this drainage area, and thus projected peak flows remain constant.

Table 31: Future Wastewater Pumping Requirements - Spring Street SPS

Study Period	Rated Capacity	Projected Peak Flows (1)	Deficit
Existing	36.15L/s	31.8L/s	No Deficit
Short-Term (2018-2022)	36.15L/s	49.65L/s	13.5L/s
Mid-Term (2023-2027)	36.15L/s	49.65L/s	13.5L/s
Long-Term (2028-2037)	36.15L/s	49.65L/s	13.5L/s
Build-Out (2037 +)	36.15L/s	49.65L/s	13.5L/s

1. Flows determined by utilizing the land-use planning projections and hydraulic wastewater model. It is noted that this does not account for historic raw sewage bypasses at the Gemmill's Bay SPS.

It is noted that the original intent of the 2012 Novatech Design Brief was the construction of a new 2.4m diameter wet well to house two new submersible pumps, each rated for 55.62L/s. It was proposed that the pumps initially be rated for 32.50L/s to respect downstream sewer capacity limitations, with the intent to ultimately allow full pumping capacity once downstream gravity sewer improvements had been completed. It is understood that the wet well was subsequently built to meet the ultimate pumping requirements; however, smaller pumps were installed to meet projected flows associated with the completion of Riverfront Estates Phase 3. Furthermore, a dedicated and private pumping station was ultimately constructed for the

Orchard View community centre, that Novatech had accounted for in the Spring Street SPS ultimate projected flow of 55.2L/s (5.97L/s was reserved for the community centre).

5.5.3 Wastewater Collection

In order to assess the wastewater collection system, the hydraulic model of major collectors within the system was updated based on current wastewater flow data. The model was configured to simulate a peak flow scenario and a discussion of the results is presented in Table 32.

Table 32: Future Wastewater Collection Requirements

Study Period	Peak Wastewater Flows			
Existing	Reference Figure 19			
	Street	Length (m)	Diameter (mm)	Capacity (%)
	Easement (Between Clyde St. and Martin St.)	60.0	300	156
Short-Term (2018 – 2022)	Reference Figure 20			
	Street	Length (m)	Diameter (mm)	Capacity (%)
	State Street	96.8	300	91
	Martin Street N	41.3	225	94
	Little Bridge	10.6	450	121
	Ottawa Street	475.3	300	108 to 134
	Easement (Between Clyde St. and Martin St.)	60.0	300	201
Mid-Term (2023 – 2027)	Reference Figure 21			
	Street	Length (m)	Diameter (mm)	Capacity (%)
	State Street	96.8	300	92
	Martin Street N	41.3	225	95
	Ottawa Street	104	300	104
	Little Bridge	10.6	450	136
	Ottawa Street	475.3	300	131 to 163
	Easement (Between Clyde St. and Martin St.)	60.0	300	202
Long-Term (2028 - 2037)	Reference Figure 22			
	Street	Length (m)	Diameter (mm)	Capacity (%)
	State Street	96.8	300	92
	Martin Street N	41.3	225	95
	Union Street	145	225	92 to 98
	Ottawa Street	104	300	110
	Little Bridge	10.6	450	146
	Ottawa Street	475.3	300	139 to 173
	Easement (Between Clyde St. and Martin St.)	60.0	300	202

Build-Out (2037+)	Reference Figure 23			
	Street	Length (m)	Diameter (mm)	Capacity (%)
	State Street	96.8	300	92
	Martin Street N	41.3	225	95
	Martin Street N	15.7	300	109
	Martin Street N	26.8	450	115
	Mill Street	28.5	525	96
	Union Street	145	225	92 to 98
	Little Bridge	10.6	450	188
	Ottawa Street	760.5	300	110 to 249
	Easement (Between Clyde St. and Martin St.)	60.0	300	202
	Malcolm Street	166.7	300	111 to 120
	Ann Street	258.4	200	71 to 136
	Country Street	478.6	225 to 250	79 to 136

5.6 Wastewater Treatment Servicing Strategies

As previously noted, the existing rated capacity of the WWTP is sufficient to service the Almonte Ward over the updated long term planning period (i.e., the next 20 years). This is consistent with the 2012 Master Plan report. As such, no alternate servicing strategies were identified. It is noted that an expansion would ultimately be required beyond the long-term planning period.

5.7 Wastewater Pumping Servicing Strategies

As outlined in previous Sections, the Gemmill's Bay SPS and the Spring Street SPS will require additional capacity over the short and mid-term planning periods.

5.7.1 Gemmill's Bay SPS

Given recent bypass events at the Gemmill's Bay SPS, it is likely that the pump station is already operating at or near its existing firm capacity, suggesting a capacity upgrade may be required in the immediate or short-term timeframe. Based on projected peak flows, and a design capacity of 326L/s, a long-term deficit of 48L/s is predicted. It is noted that this deficit may be higher than this, as it is suspected that the actual firm capacity of the station is less than 326L/s, which is equal to the summation of the individual capacity of two pumps. It is recommended that the station be upgraded to ultimately meet the long-term deficit of 48L/s (or higher). Since bypass volumes are not measured, and the firm capacity of the station is unknown, it is recommended that additional flow monitoring and a preliminary pump capacity investigation be completed to better define the station's long-term requirements. A preliminary opinion of probable cost to upgrade the pumping system only (i.e., replace existing pumps with higher capacity pumps) at Gemmill's Bay SPS is $500,000. Additional costing requirements to include the full extent of required upgrades (e.g., new/upgraded wet well, screening upgrades, building expansion and/or new building) to be confirmed during the associated Class EA.

5.7.2 Spring Street SPS

As previously noted, a short-term capacity deficit of 13.5L/s is predicted for the Spring Street SPS, which corresponds to the completion of Phase 5 of the Riverfront Estates project. Since no further development is anticipated for the related drainage area beyond that being considered in the short-term, this represents the station's ultimate build-out requirements. As such, it is recommended that the pump station be upgraded with two new pumps, each sized to provide 49.65L/s to provide 100% redundancy. It is understood that the 2013 upgrade accounted for an ultimate capacity of 55.62L/s (compared to 49.65L/s required) with respect to the wet well design and forcemains, and as such it is assumed that the new pumps could be accommodated within the existing infrastructure. A preliminary opinion of probable cost to upgrade the pumping system only (i.e., two new pumps) at the Spring Street SPS is $140,000. Similar to the Gemmill's Bay SPS, the full extent of work and associated costing to upgrade the station to be confirmed during the preliminary design phase. Assuming the new pumps could be accommodated within existing infrastructure, the project is anticipated to be a Schedule A+ project.

5.8 Wastewater Collection Servicing Strategies

In order to service new growth in the Almonte Ward, new and upgraded sanitary sewers are required to convey wastewater flows from the existing and expanded service areas. The following sections describe the alternative solutions for the wastewater collection system over the 20-year planning period. Impacts of full 'build-out' conditions on infrastructure were also considered to offer a broad level picture of infrastructure needs beyond 20 years.

5.8.1 Short-Term (0 to 5 Years): Wastewater Collection

Based on a review of development impacts on the wastewater collection system, the following short-term upgrades were identified:

- Easement and State Street Upgrades: This will service existing and future Riverfront Estates Development areas. It is noted that the Municipality has completed design work for this upgrade, which was originally identified as a 0 to 5 year need in the 2012 Master Plan, with the intent to proceed with construction in 2018.

- Victoria Street Upgrades, from Martin Street North to Ottawa Street: This will service future industrial park development, future residential development, and build-out areas 1 and 2.

- Industrial Park Sewer, from Houston and Paterson St. to Menzie St. This will service the existing industrial park, and future development in the industrial park, build-out area 1, and south of industrial park.

- Martin Street North at Victoria Street: This will service future industrial park development, future residential development, and build-out areas 1 and 2. Adjusting the sewer inverts associated with this short sewer section will also assist with crossing the trunk sewer under the existing Almonte Municipal Drain box culvert.

It is noted that projected sanitary flows for the 0 to 5 year through build-out timeframes result in hydraulic gradelines at or near the lowest sewer obvert on Bridge Street. It likely does not warrant a sewer upgrade (of only 11m of sewer), but is noted for reference.

It is noted that the 2012 Master Plan also considered upgrades on Spring Street and State Street. Since 2012, these upgrades have been completed.

The opinion of probable costs associated with the short-term wastewater collection servicing strategy is summarized in Table 33.

Table 33: Opinion of Probable Costs Short-Term Wastewater Collection

Option	Diameter (mm)	Length (m)	Rate ($/m)(1)	Engineering and Contingency (27%)	Rounded Total(3)
Easement and State Street Upgrades	450	165	$1,130	$50,000	$235,000
Victoria Street Upgrades, from Martin Street North to Ottawa Street	450	765	$2,040(2)	$421,000	$1,980,000
Industrial Park Sewer, from Houston and Paterson St. to Menzie St.	450	430	$1,130	$131,000	$615,000
Martin Street North at Victoria Street	450	18	$1,130	$5,000	$25,000

1. Rates based on City of Ottawa 2015 Unit Rates for sewers, restoration of road (granulars, base and wear) and curb, and other past experience.
2. Includes estimated rock excavation and backfill costs from known bedrock identified during the Municipality's on-going Victoria Street Rehabilitation Project.
3. Rounded to the nearest $5,000.

5.8.2 Mid-Term (5 to 10 Years): Wastewater Collection

No servicing needs were identified for the 5 to 10 year timeframe.

It is noted that the 2012 Master Plan had identified Victoria Street upgrade requirements under the mid-term timeframe, which have now been recommended under the updated 0 to 5 year timeframe, and for which the Municipality is currently advancing related design work.

5.8.3 Long-Term (10 to 20 Years): Wastewater Collection

Based on a review of development impacts on the wastewater collection system, the following long-term upgrade was identified:

- Union Street upgrade from 225mm to 300mm to match existing to service future development in the related drainage area. This is generally consistent with the 2012 Master Plan recommendations.

The opinion of probable costs associated with the long-term wastewater collection servicing strategy is summarized in Table 34.

Table 34: Opinion of Probable Costs Long-Term Wastewater Collection

Option	Diameter (mm)	Length (m)	Rate ($/m)(1)	Engineering and Contingency (27%)	Rounded Total(2)
Union Street (from 225mm to 300mm to match existing)	300	145	$1,060	$41,000	$195,000

1. Rates based on City of Ottawa 2015 Unit Rates for sewers, restoration of road (granulars, base and wear) and curb, and other past experience.
2. Rounded to the nearest $5,000.

5.8.4 Build-Out: Wastewater Collection

Based on a review of development impacts on the wastewater collection system, the following build-out upgrades were identified:

- Martin Street South, from Ottawa Street to Queen Street: This upgrade will service build-out areas 1 and 2.
- Martin Street North, from Victoria Street to Ottawa Street: This upgrade will service build-out areas 1 and 2.

The opinion of probable costs associated with the build-out wastewater collection servicing strategy is summarized in Table 35.

Table 35: Opinion of Probable Costs Build-Out Wastewater Collection

Option	Diameter (mm)	Length (m)	Rate ($/m)(1)	Engineering and Contingency (27%)	Rounded Total(2)
Martin Street South, from Ottawa Street to Queen Street	525	27	$1,660	$12,000	$55,000
Martin Street North, from Victoria Street to Ottawa Street	450	85	$1,630	$37,000	$175,000

1. Rates based on City of Ottawa 2015 Unit Rates for sewers, restoration of road (granulars, base and wear) and curb, estimated traffic control for Ottawa Street and Queen Street detours and other past experience.
2. Rounded to the nearest $5,000.

5.9 Summary of Wastewater Servicing Strategies

A summary of the wastewater treatment, pumping and collection servicing strategies, and opinion of probable costs are presented in Table 36 and Figure 24. Figure 25 was also developed to assist the Municipality in understanding demand allocations for the future servicing strategies and illustrated whether the wastewater flows were modelled under a pumped or gravity scenario.

Table 36: Summary of Wastewater Servicing Strategies and Opinion of Probable Costs

Area	Study Period	Description of Works	Opinion of Probable Cost [(1)]		
			Condition Upgrades (Values Rounded)	Capacity Upgrades (Values Rounded)	Ref. Pg or Table
Treatment	Long-Term (2028 – 2037)	▪ None	-	-	
Pumping	Immediate	▪ Condition Upgrades at Select Stations ▪ Expand Gemmill's Bay SPS to Meet Long-Term Needs	$465,000 -	- $500,000[(3)]	Table 27 Pg 32
	Short-Term (2018 - 2022)	▪ Expand Spring Street SPS to Meet Long-Term Needs ▪ Condition Upgrades at Select Stations	- $40,000	$140,000[(3)] -	Pg 33 Table 27
	Mid-Term (2023-2027)	▪ Condition Upgrades at Select Stations	$45,000	-	Table 27
	Long-Term (2028-2037)	▪ None	-	-	-
Collection	Immediate	▪ Condition Upgrades	$7,340,000[(2)]	-	Table 27
	Short-Term (2018 - 2022)	▪ Condition Upgrades ▪ Easement and State Street Upgrades ▪ Victoria Street Upgrades ▪ Industrial Park Sewer ▪ Martin Street North at Victoria Street	$960,000[(2)] - - - -	- $235,000 $1,980,000 $615,000 $25,000	Table 27 Table 33 Table 33 Table 33 Table 33
	Mid-Term (2023-2027)	▪ Condition Upgrades	$2,750,000[(2)]	-	Table 27
	Long-Term (2028-2037)	▪ Condition Upgrades ▪ Union Street Upgrades	$1,270,000[(2)] -	- $195,000	Table 27 Table 34

1. Based on Class 'D' Estimate and includes Engineering and Contingencies.
2. Collection system condition upgrades based on typical life expectancy of pipes. Estimated costs adjusted (i.e., reduced) from Table 27 to reflect related capacity upgrades.
3. Includes upgrade to pumping system only; full extent of upgrade and associated costs to be confirmed during related Class EA.

6.0 Recommended Servicing Strategies: Implementation and Timing

In 2011, the Municipality retained JLR in association with Golder Associates Limited (GAL), to complete a water and wastewater infrastructure master plan for the required long term operational and capital improvements to the water and wastewater systems to meet current regulations and planned growth within the Municipality's serviced Almonte Ward. Future servicing requirements developed as the design basis for the Master Plan were based on the Official Plan (2006), which indicated strong growth pressures within the area. The Almonte Ward Water and Wastewater Infrastructure Master Plan was completed in 2012 and identified preferred options to meet the Existing, Short-Term (5 year design basis, 2011-2015), Mid-Term (10 year design basis, 2016 to 2020), and Long-Term (20 year design basis, 2021-2030) water and wastewater infrastructure needs of the Municipality.

In 2017, the Municipality retained JLR to update the 2012 Master Plan based on more current servicing demands (i.e., water and wastewater flows), population projections, development updates (i.e., new census data), and infrastructure upgrades completed since 2012. This section provides an update on the implementation and timing of recommended servicing strategies from the 2012 Master Plan and where appropriate, new servicing strategy recommendations. Figure 17 illustrates the updated recommended servicing strategies for the potable water system and Figure 24 illustrates the updated recommended servicing strategies for the wastewater system.

Water Supply and Treatment: As noted in the 2012 Master Plan, there is a limitation to any groundwater supply and treatment system. In the case of the Almonte Ward, it is recommended that the Municipality move forward with several interim and long-term measures to ensure there will be sufficient capacity for the future projected population. In addition to condition upgrades at select wells, it is recommended that Wells 7 and 8 be upgraded to their demonstrated yield in the mid-term. Over the longer term, it is recommended that Wells 3 and 5 be upgraded to their demonstrated yield to gain additional supply. The 2012 Master Plan had recommended a long-term upgrade of Wells 7 and 8 beyond its demonstrated yield. However, it now appears that an upgrade of Wells 7 and 8 to its demonstrated yield in the mid-term should satisfy long-term demand projections. Although further review of build-out servicing strategies is required, it would be prudent for the Municipality to identify and secure a potential well site for a new facility, as a new groundwater source may be required for build-out conditions and wellhead protection areas should be established and protected early on.

Water Storage: In addition to the water supply and treatment constraints, there is a finite amount of potable water storage available. The available storage capacity is currently insufficient to meet the MOECC design guidelines and will become more insufficient as the community continues to grow. As such, it is recommended that the Municipality review alternative storage options in the near term to service the Almonte Ward over the long-term, including the construction of a new reservoir to service, at minimum, the 20-year growth projections.

Water Distribution: Several servicing upgrades were identified in order to optimize pressure and fire flows within the system. Key recommendations include the construction of a new main service line along Victoria Street to service growth in the east portion of the Almonte Ward and the optimization of pressure zones in the northwest quadrant of the service area. It is also noted that the Municipality should consider implementing a third river crossing to service to development area in the northest quadrant, in addition to, mitigating the risk associated with a failure of the Queen Street watermain crossing over the Mississippi River.

Wastewater Treatment: The extended aeration WWTP with tertiary treatment, which was recently constructed in 2012, appears to be sufficient to service the Almonte Ward over the long term planning period. Notwithstanding this, it is noted that historical bypassing at the Gemmill's Bay SPS suggests actual peak flows in the system may not all be reaching the WWTP. The capacity of the WWTP, including equalization potential in the old lagoons, should be confirmed following a review of flows at the Gemmills Bay SPS (as described below). It is also noted that an expansion of the WWTP would ultimately be needed beyond the long-term planning period.

Wastewater Pumping: Given recent bypass events at the Gemmill's Bay SPS, it is likely that the pump station is already operating at or near its existing firm capacity, suggesting a capacity upgrade may be required in the short-term. Since bypass volumes are not measured, and the firm capacity of the station is unknown, it is recommended that additional flow monitoring and a preliminary pump capacity investigation be completed to better define the station's long term requirements. It is also recommended that the Spring Street SPS be expanded in the short term to meet projected flows.

Wastewater Collection: Similarly as the water distribution system, several servicing upgrades were identified in order to accommodate growth within the Almonte Ward. Key recommendations include upgrades to several sewers downstream of the Spring Street SPS, construction of a new trunk sewer along Victoria Street, and extended along Menzie Street, Paterson Street, and Houston Street to service growth in the east portion of the Almonte Ward and other miscellaneous upgrades within the system.

Table 37 and Table 38 provide summaries of the updated servicing strategies, planning period for implementation, and estimated costs of the infrastructure upgrades (both water and wastewater) resulting from capacity constraints and condition upgrades, respectively. Refer to Appendix C and D for an updated interactive planning tool which includes a description, timeline and opinion of probable costs of all water and wastewater infrastructure management activities outlined in this Master Plan update.

Table 37: Implementation and Timing for Recommended Servicing Strategies – Capacity

Timing	Area	Classification	OPC	Predicted Specialized Study
Existing	Wastewater	Pumping	$500,000	Schedule A+ or B Class EA
Short-Term (2018-2022)	Water	Storage	$4,700,000	Schedule B Class EA
	Water	Distribution	$535,000	Schedule A Class EA
	Wastewater	Pumping	$140,000	Schedule A+ Class EA
	Wastewater	Collection	$2,855,000	Schedule A Class EA
	Sub Total		**$8,230,000**	

Timing	Area	Classification	OPC	Predicted Specialized Study
Mid-Term (2023-2027)	Water	Supply	$2,800,000	Schedule C Class EA
	Water	Distribution	$5,300,000	Schedule A Class EA
	Sub Total		**$8,100,000**	
Long-Term (2028-2037)	Water	Supply	$1,200,000	NA
	Water	Distribution	$735,000	Schedule A Class EA
	Wastewater	Collection	$195,000	Schedule A Class EA
	Sub Total		**$2,130,000**	
TOTAL			**$18,960,000**	

Table 38: Implementation and Timing for Recommended Servicing Strategies – Condition

Timing	Area	Classification	OPC
Existing	Water	Supply	$355,000
	Water	Distribution	$5,945,000
	Wastewater	Pumping	$465,000
	Wastewater	Collection	$7,340,000
	Sub Total		**$14,105,000**
Short-Term (2018-2022)	Water	Distribution	$1,485,000
	Wastewater	Pumping	$40,000
	Wastewater	Collection	$960,000
	Sub Total		**$2,485,000**
Mid-Term (2023-2027)	Water	Supply	$360,000
	Water	Distribution	$1,595,000
	Wastewater	Pumping	$45,000
	Wastewater	Collection	$2,750,000
	Sub Total		**$4,750,000**
Long-Term (2028-2037)	Water	Distribution	$2,455,000
	Water	Storage	$450,000
	Wastewater	Collection	$1,270,000
	Sub Total		**$4,175,000**
TOTAL	**Including Existing Condition Upgrades Subtotal**		**$25,515,000**
TOTAL	**Excluding Existing Condition Upgrades Subtotal**		**$11,410,000**

The estimated time to plan, design, tender, and construct is dependent on various factors including the complexity of work, the approvals process, the length of the construction season, the availability of contractors, etc.

Table 39 provides a summary of the various infrastructure projects and timelines that could be expected in order to service the proposed growth specific to the Municipality. The Class EA schedule types presented are based on the general description provided in the MEA Class EA guidelines.

Table 39: Planning Timelines for Various Infrastructure Projects

Project	Description	Class EA Schedule	Estimated Time to Complete Class EA and Other Studies	Estimated Time to Design, Tender and Construct
Water Supply and Treatment	Increase pumping capacity of existing wells, at an existing municipal site	B	1 year	2 years
	Construct new well	C	1-2 years	2 years
Water Storage	Establish new or expand/replace existing water storage facilities	B	1 year	2 years
Water Distribution	New transmission mains	A	6 months	1 to 2 years
Wastewater Pumping	Increase pumping capacity by adding or replacing equipment, where the new equipment is located in an existing building and where its existing rated capacity is exceeded	A+	6 months	2 years
	Increase pumping capacity by adding or replacing equipment, where the new equipment is located in a new building or building extension and where its existing rated capacity is exceeded	B	1 year	2 years
Wastewater Collection	New gravity sewers	A	6 months	1 to 2 years

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J.L. RICHARDS & ASSOCIATES LIMITED

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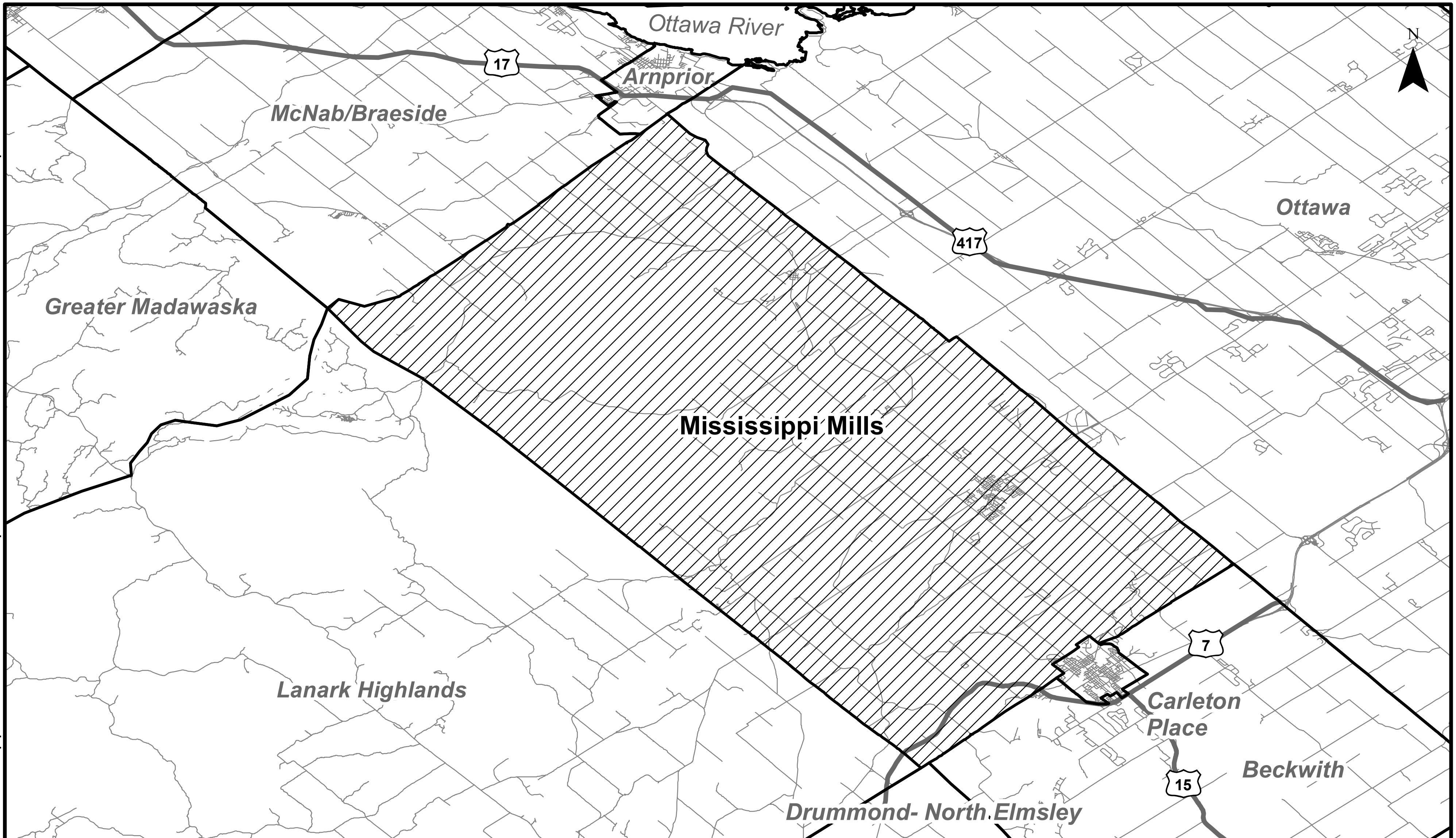

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LOCATION MAP (NTS)

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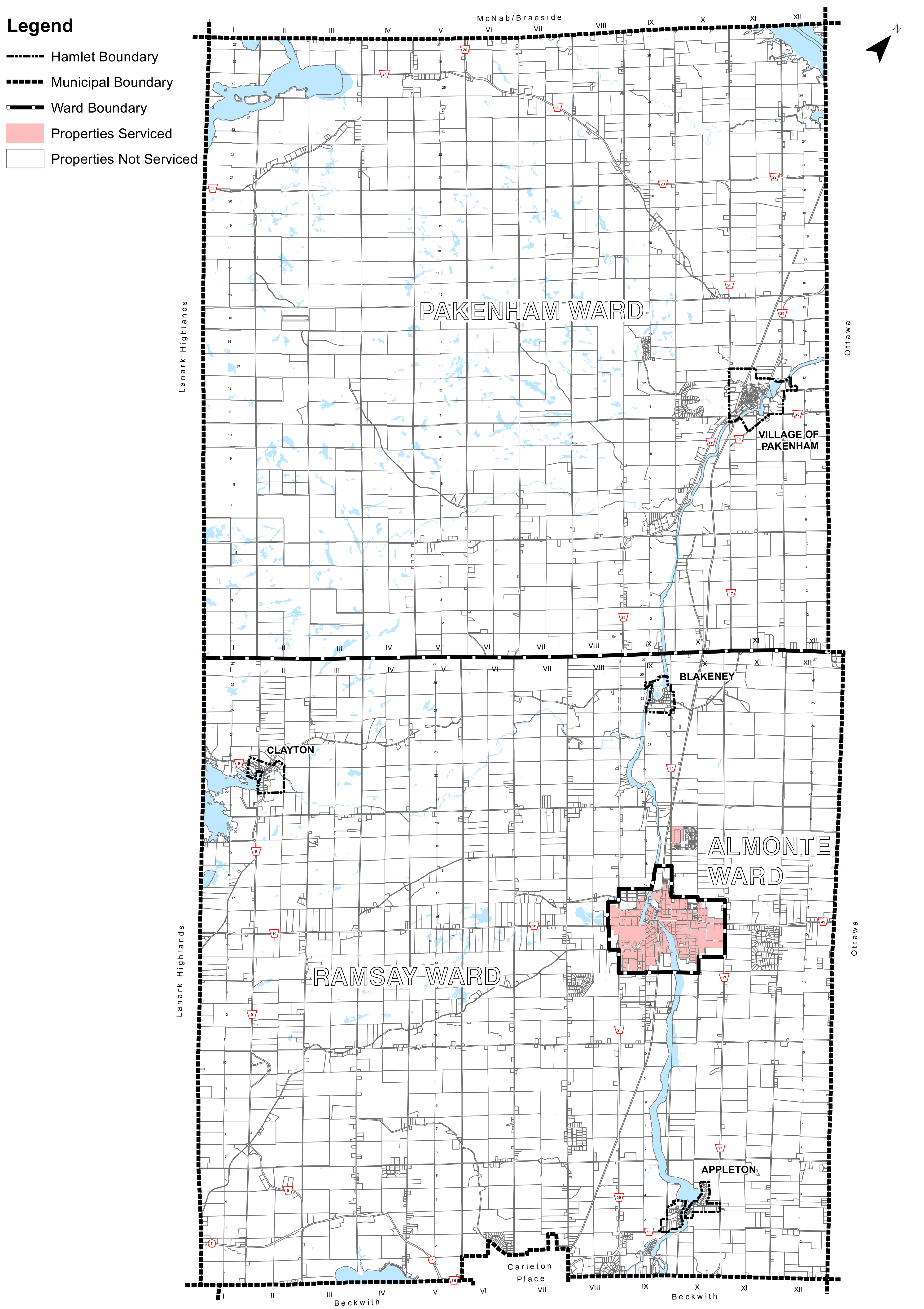

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MISSISSIPPI MILLS, ONTARIO

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EXISTING SERVICE AREA

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DRAWING #: FIGURE 2

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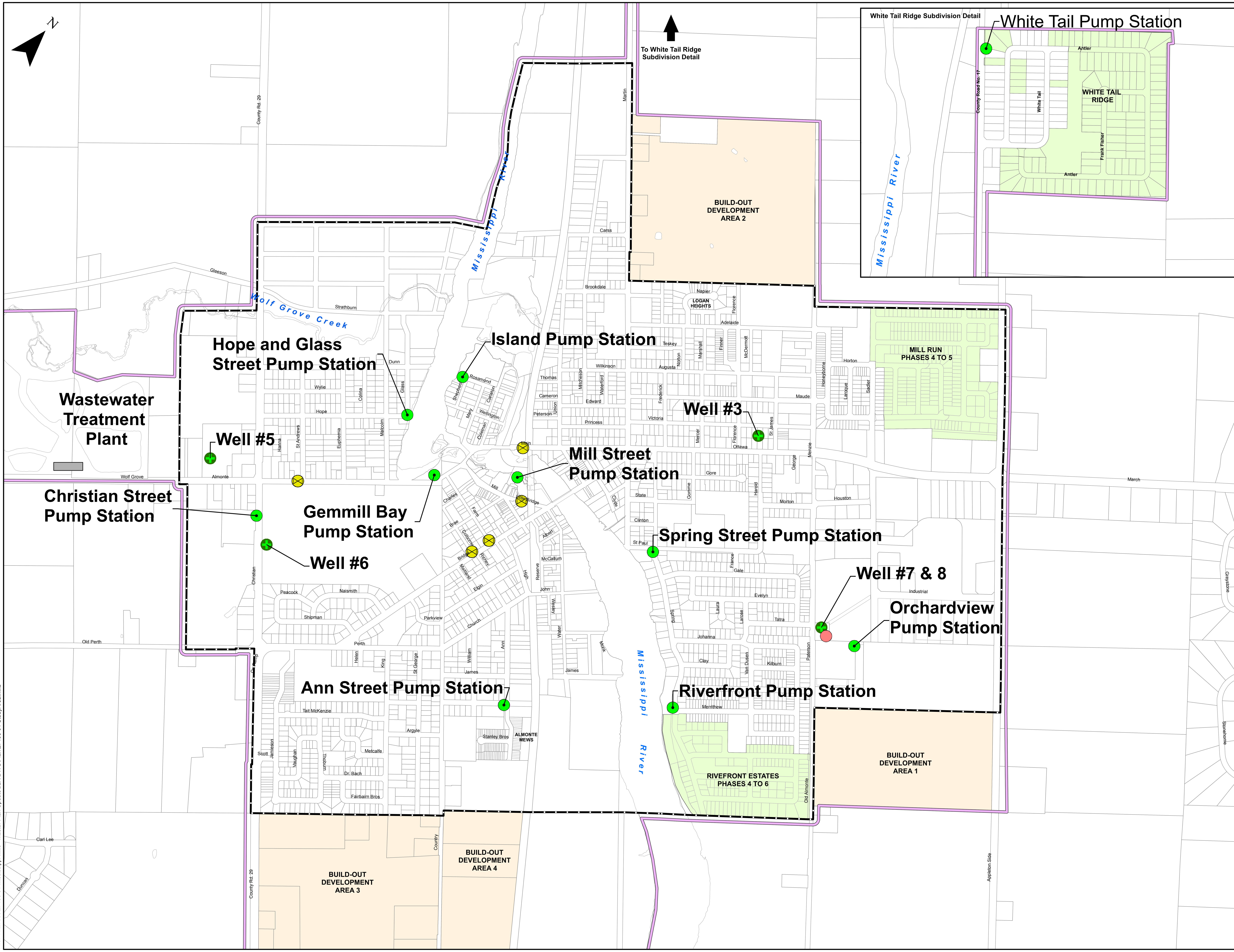

Legend
- Elevated Storage Tank
- Pressure Reducing Valve
- Well
- Pumping Station
- Registered Subdivision
- Build Out
- Almonte Ward Limits
- Study Area

No.	ISSUE / REVISION	DD/MM/YY

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MISSISSIPPI MILLS, ONTARIO

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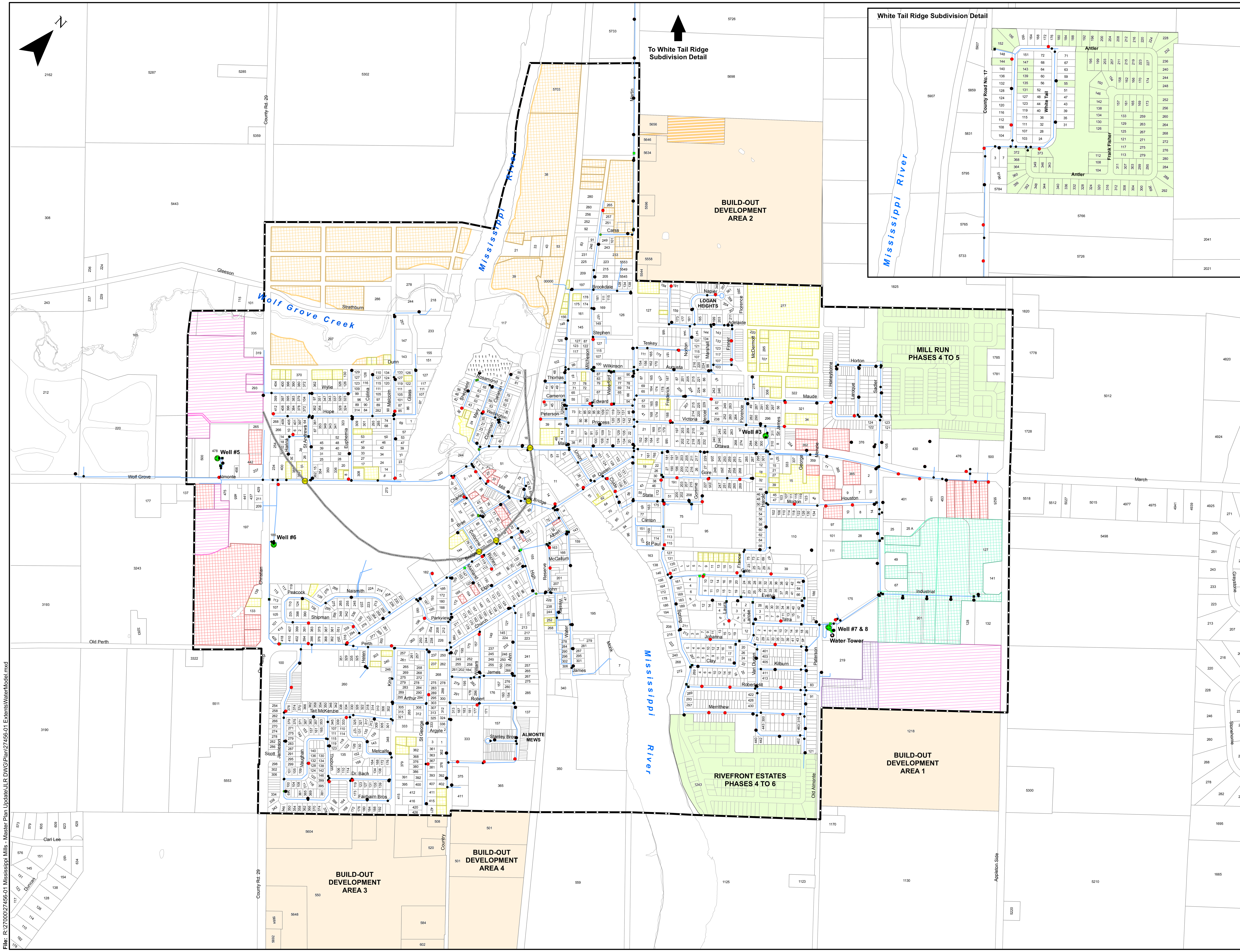

Infrastructure

- Fire Hydrant
- Valve Chamber
- Valve Box
- Pressure Reducing Valve
- Well
- Water Tower
- Watermain
- Pressure Zone

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- Registered Subdivision
- Build Out
- Business Park (17.0 ha)
- Community Facility (3.1 ha)
- Commercial (15.6 ha)
- Industrial (24.1 ha)
- Residential - Geenfield (34.2 ha)
- Residential - Infill (16.0 ha)

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MISSISSIPPI MILLS, ONTARIO

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ALMONTE WARD WATER SYSTEM MODEL EXTENTS

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JLR #: 27456-01

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PLOT DATE: January 5, 2018 8:20:03 AM

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White Tail Ridge Subdivision Detail
White Tail Pump Station
Antler
County Road No. 17
White Tail
Frank Fisher
Mississippi River
To White Tail Ridge Subdivision Detail
BUILD-OUT DEVELOPMENT AREA 2
BUILD-OUT DEVELOPMENT AREA 1
BUILD-OUT DEVELOPMENT AREA 3
BUILD-OUT DEVELOPMENT AREA 4
MILL RUN PHASES 4 TO 5
RIVERFRONT ESTATES PHASES 4 TO 6
LOGAN HEIGHTS
ALMONTE MEWS
Wolf Grove Creek
Mississippi River
Wastewater Treatment Plant
Island Pump Station
Hope & Glass Street Pump Station
Gemmill Bay Pump Station
Christian Street Pump Station
Mill Street Pump Station
Spring Street Pump Station
Ann Street Pump Station
Riverfront Pump Station
Orchardview Pump Station
Infrastructure
4-102 Manhole ID
Pumping Station
Cleanout
Sanitary Manhole
Saniatry Sewer
Private Forecmain
Forcemain
Sanitary Trunk Sewers
Land Use
Almonte Ward Limits
Existing Lots
Future Lots
Registered Subdivision
Build Out
Business Park (17.0 ha)
Community Facility (3.1 ha)
Commercial (15.6 ha)
Industrial (24.1 ha)
Residential - Geenfield (34.2 ha)
Residential - Infill (16.0 ha)
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MISSISSIPPI MILLS, ONTARIO
DRAWING:
EXTENTS OF SIMPLIFIED WASTEWATER HYDRAULIC MODEL
DESIGN: MB
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FIGURE 5
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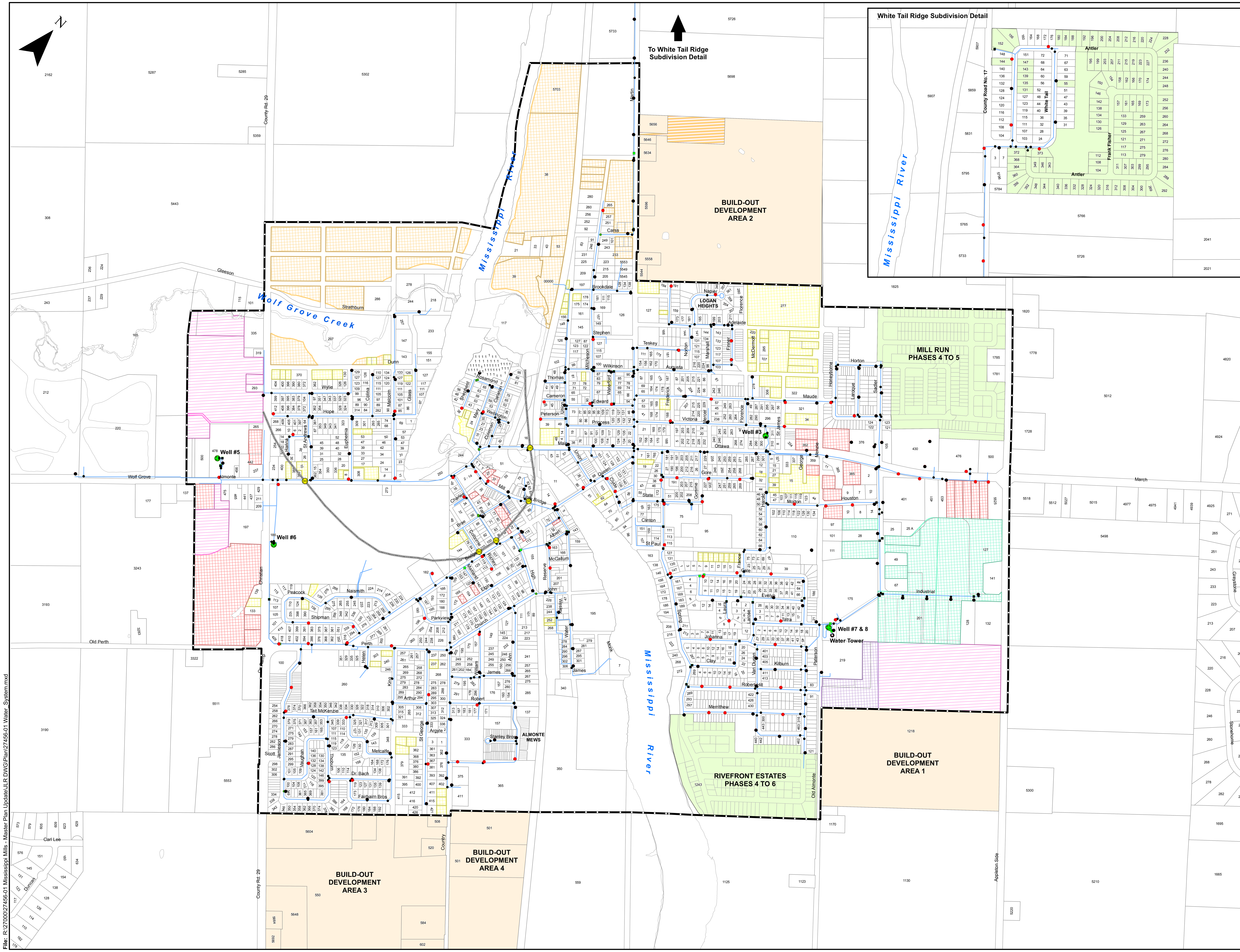

Infrastructure

- Fire Hydrant
- Valve Chamber
- Valve Box
- Pressure Reducing Valve
- Well
- Water Tower
- Watermain
- Pressure Zone

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- Registered Subdivision
- Build Out
- Business Park (17.0 ha)
- Community Facility (3.1 ha)
- Commercial (15.6 ha)
- Industrial (24.1 ha)
- Residential - Geenfield (34.2 ha)
- Residential - Infill (16.0 ha)

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MISSISSIPPI MILLS, ONTARIO

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ALMONTE WARD WATER SYSTEM

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 6**

PLOT DATE: January 5, 2018 8:27:07 AM

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DRAWING:

ALMONTE WARD WATER SYSTEM EXISTING MAX DAY DEMAND / FIRE FLOW

DESIGN:	MB	
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JLR #:	27456-01	

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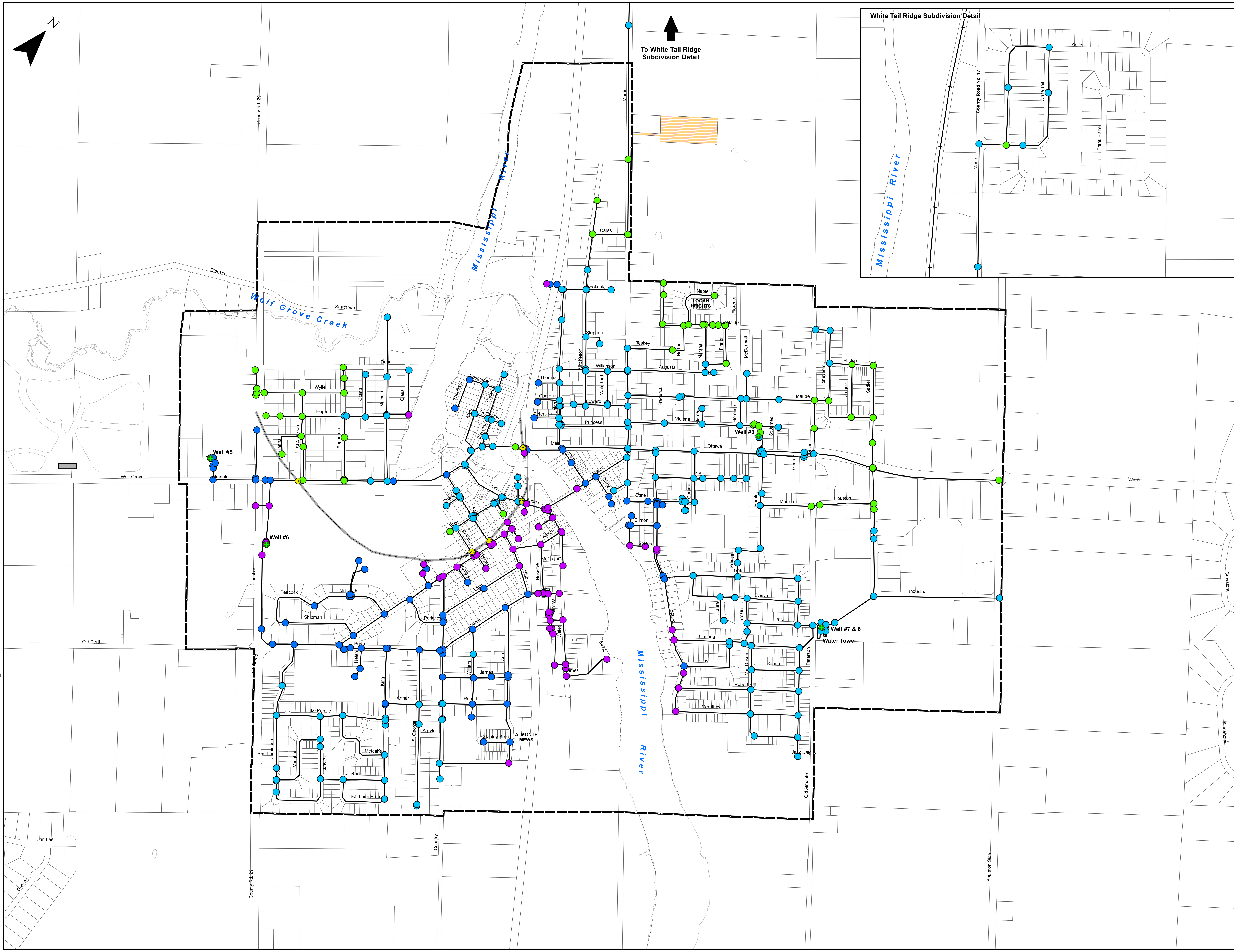

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DRAWING:

ALMONTE WARD WATER SYSTEM EXISTING PEAK HOUR

DESIGN: MB
DRAWN: KTK
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JLR #: 27456-01

DRAWING #: **FIGURE 8**

PLOT DATE: January 5, 2018 8:41:18 AM

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MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WATER SYSTEM 0 TO 5 YEARS (2018 TO 2022) MAX DAY DEMAND / FIRE FLOW

DESIGN: MB
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JLR #: 27456-01

DRAWING #: **FIGURE 9**

PLOT DATE: January 5, 2018 8:48:58 AM

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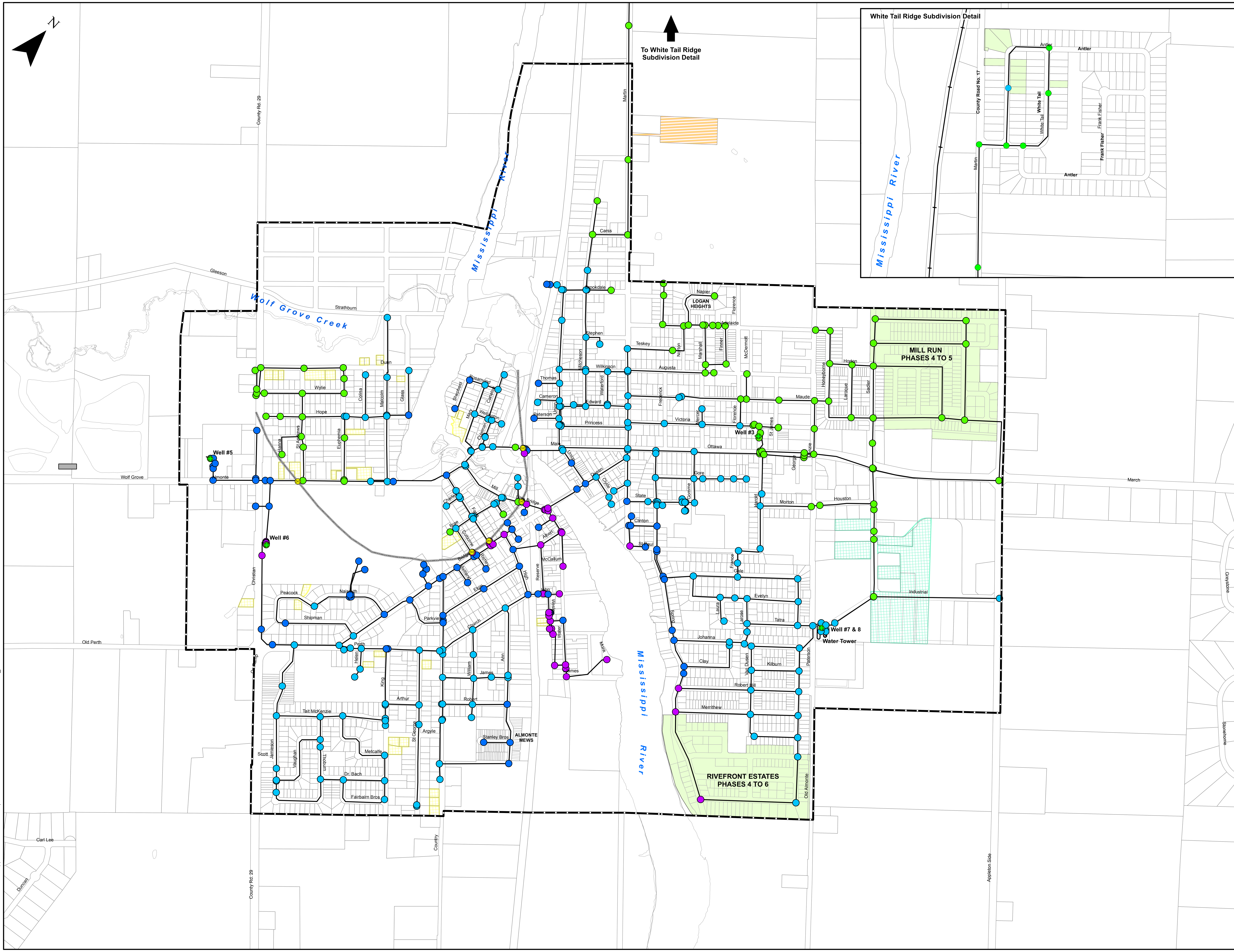

Peak Hour

- < 274 kPa
- 275 to 300 kPa
- 301 to 400 kPa
- 401 to 500 kPa
- 501 to 550 kPa
- > 550 kPa

Infrastructure

- Pressure Reducing Valve
- Well
- Water Tower
- Pressure Zone
- Watermain

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- SUBDIVISION
- Business Park (9.0 ha)
- Residential - Infill (3.8 ha)

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DRAWING:

ALMONTE WARD WATER SYSTEM 0 TO 5 YEARS (2018 TO 2022) PEAK HOUR

DESIGN: MB
DRAWN: KTK
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JLR #: 27456-01

DRAWING #: **FIGURE 10**

PLOT DATE: January 5, 2018 8:51:05 AM

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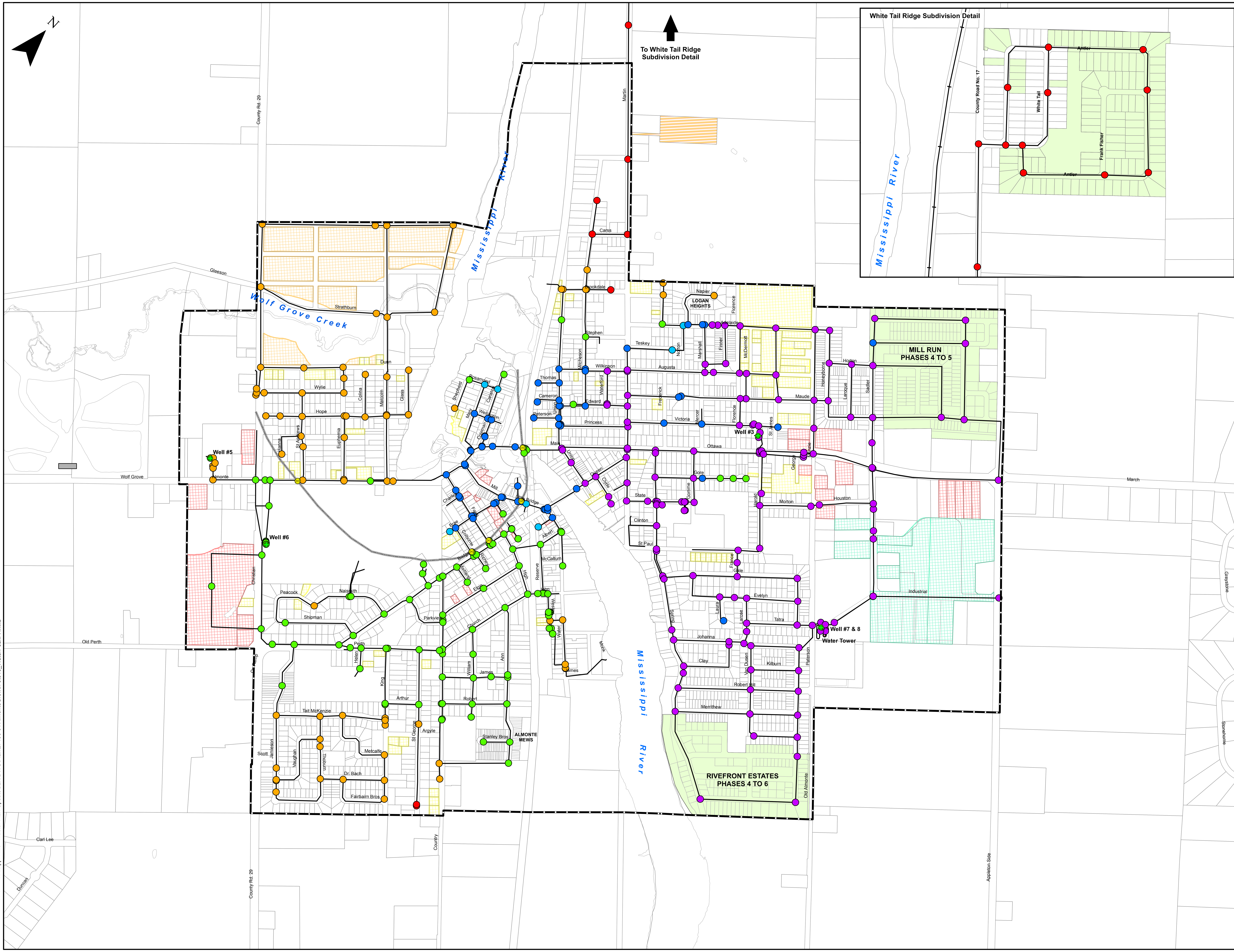

Max Day + Fire Flow
- < 32 L/s
- 33 to 50 L/s
- 51 to 67 L/s
- 68 to 75 L/s
- 76 to 100 L/s
- 100 to 300 L/s

Infrastructure
- Pressure Reducing Valve
- Well
- Water Tower
- Pressure Zone
- Watermain

Land Use
- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- Registered Subdivision
- Business Park (17.0 ha)
- Commercial (15.6 ha)
- Residential - Geenfield (14.2 ha)
- Residential - Infill (16.0 ha)

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MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WATER SYSTEM 5 TO 10 YEARS (2023 TO 2028) MAX DAY DEMAND / FIRE FLOW

DESIGN: MB
DRAWN: KTK
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JLR #: 27456-01

DRAWING #: **FIGURE 11**

PLOT DATE: January 5, 2018 8:54:26 AM

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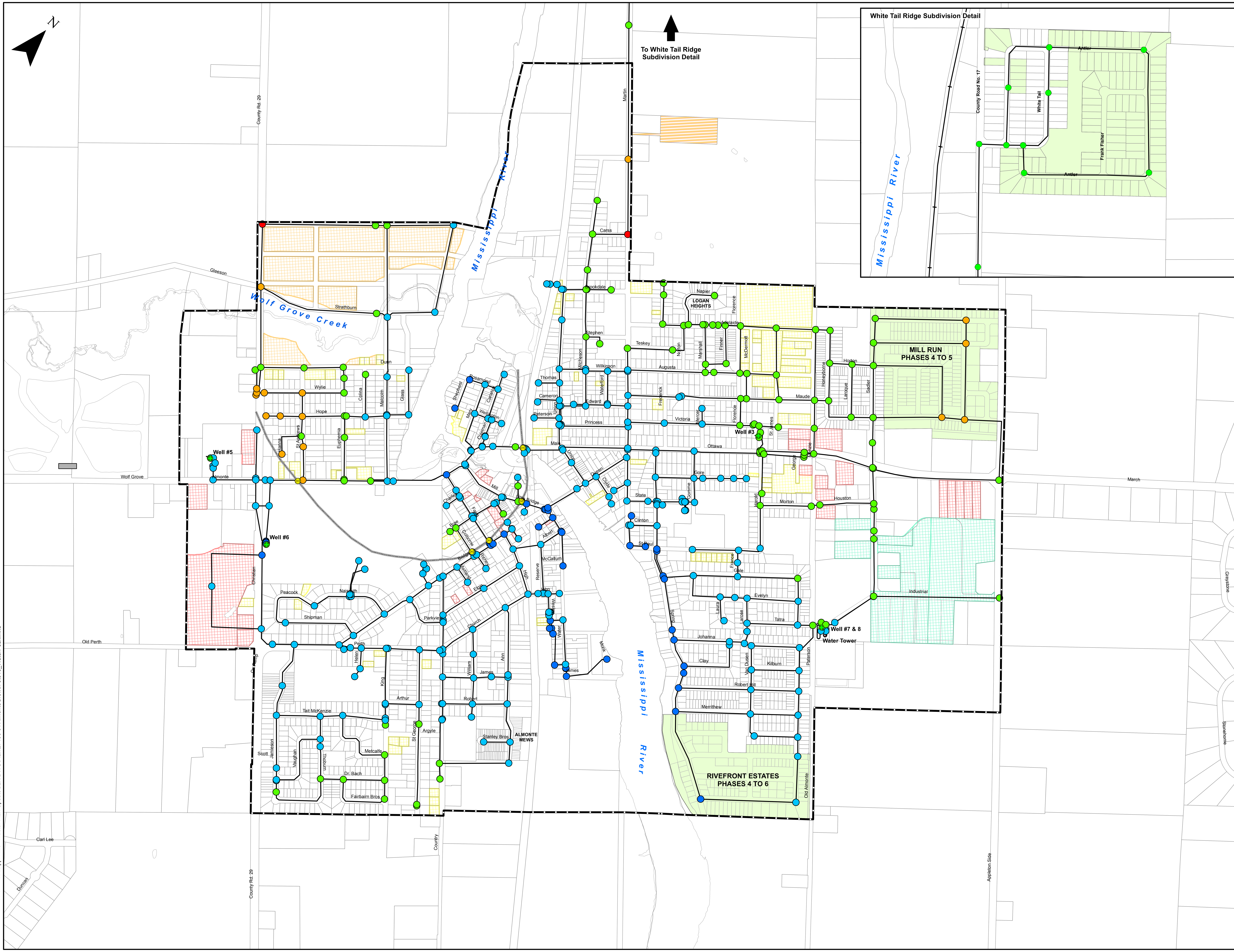

Peak Hour

- < 274 kPa
- 275 to 300 kPa
- 301 to 400 kPa
- 401 to 500 kPa
- 501 to 550 kPa
- > 550 kPa

Infrastructure

- Pressure Reducing Valve
- Well
- Water Tower
- Pressure Zone
- Watermain

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- Registered Subdivision
- Business Park (17.0 ha)
- Commercial (15.6 ha)
- Residential - Geenfield (14.2 ha)
- Residential - Infill (16.0 ha)

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MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WATER SYSTEM 5 TO 10 YEARS (2023 TO 2028) PEAK HOUR

DESIGN: MB
DRAWN: KTK
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JLR #: 27456-01

DRAWING #: **FIGURE 12**

PLOT DATE: January 5, 2018 8:56:08 AM

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MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WATER SYSTEM 10 TO 20 YEARS (2029 TO 2037) MAX DAY DEMAND / FIRE FLOW

DESIGN: MB
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FIGURE 13

PLOT DATE: January 5, 2018 8:58:10 AM

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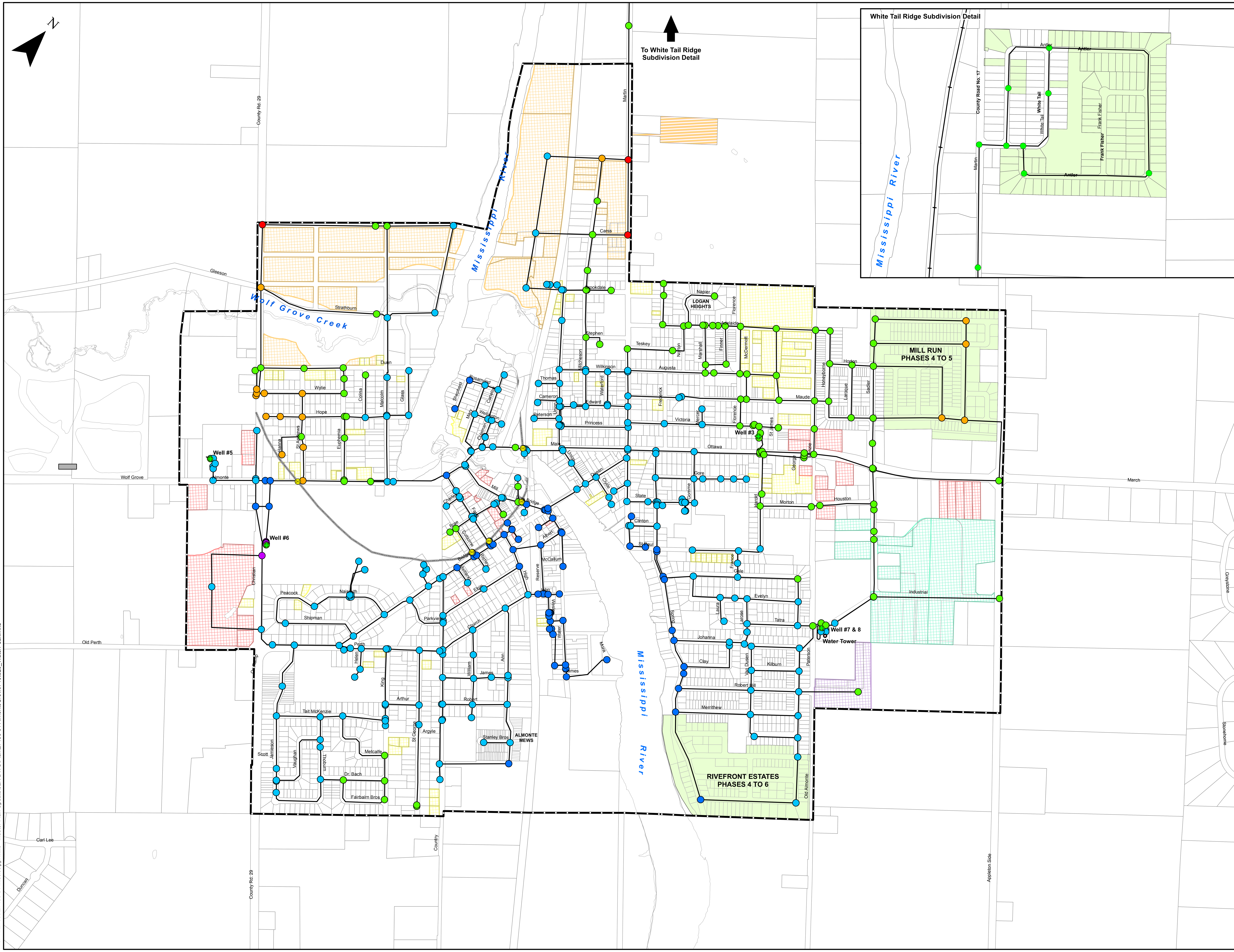

Peak Hour

- < 274 kPa
- 275 to 300 kPa
- 301 to 400 kPa
- 401 to 500 kPa
- 501 to 550 kPa
- > 550 kPa

Infrastructure

- Pressure Reducing Valve
- Well
- Water Tower
- Pressure Zone
- Watermain

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- Registered Subdivision
- Business Park (17.0 ha)
- Community Facility (3.1 ha)
- Commercial (15.6 ha)
- Residential - Geenfield (34.2 ha)
- Residential - Infill (16.0 ha)

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SCALE: 0 50 100 200 300 400 Meters

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DRAWING:

ALMONTE WARD WATER SYSTEM 10 TO 20 YEARS (2029 TO 2037) PEAK HOUR

DESIGN: MB
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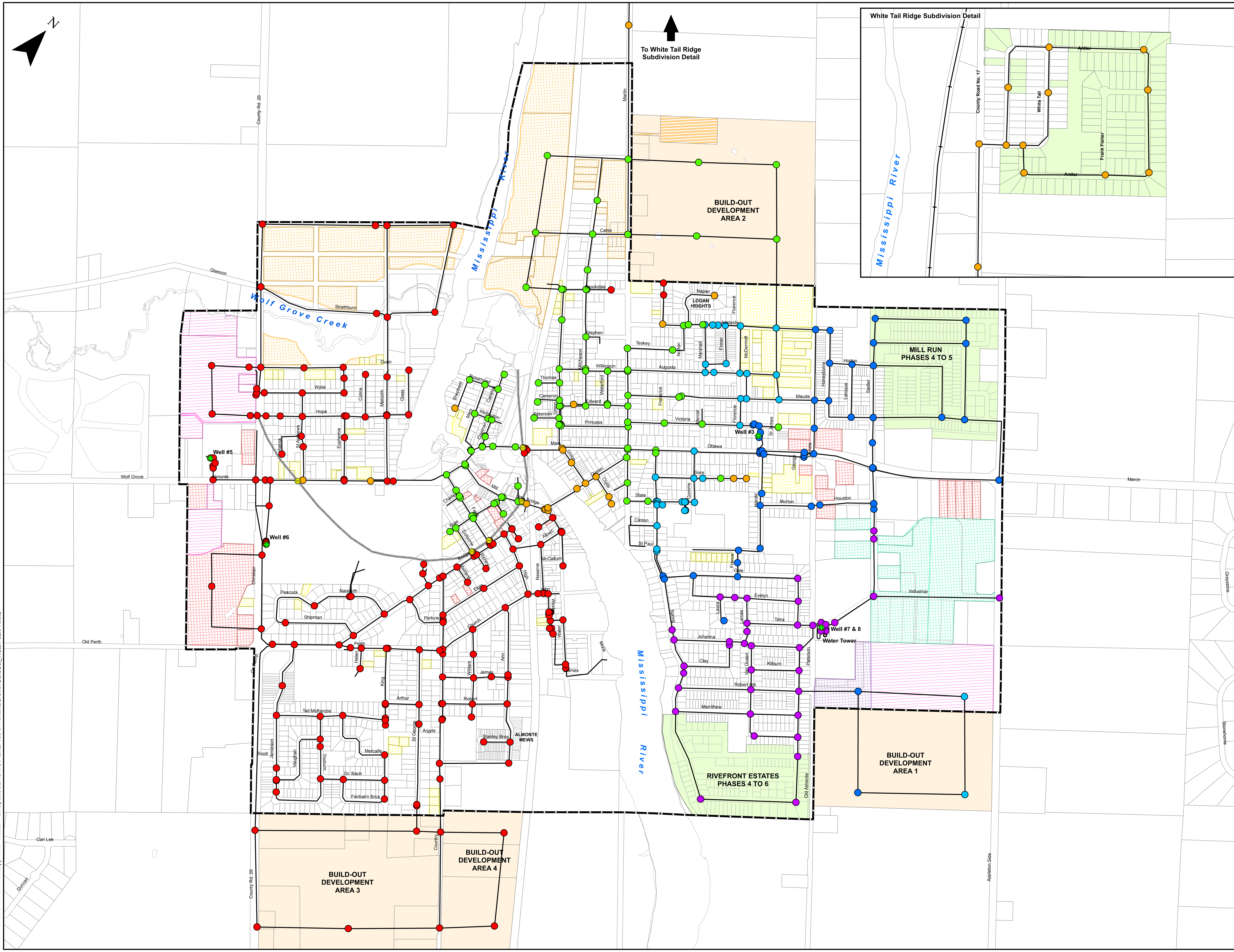

Max Day + Fire Flow

- < 32 L/s
- 33 to 50 L/s
- 51 to 67 L/s
- 68 to 75 L/s
- 76 to 100 L/s
- 100 to 300 L/s

Infrastructure

- Pressure Reducing Valve
- Well
- Water Tower
- Pressure Zone
- Watermain

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- Registered Subdivision
- Build Out
- Business Park (17.0 ha)
- Community Facility (3.1 ha)
- Commercial (15.6 ha)
- Industrial (24.1 ha)
- Residential - Geenfield (34.2 ha)
- Residential - Infill (16.0 ha)

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PROJECT:

MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE

MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WATER SYSTEM BUILD-OUT (2037+) MAX DAY DEMAND / FIRE FLOW

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 15**

PLOT DATE: January 5, 2018 2:34:35 PM

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 AlmonteGrowth BuildOut_WaterPeakFF.mxd

No.	ISSUE / REVISION	DD/MM/YY

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PROJECT:

MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE

MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WATER SYSTEM BUILD-OUT (2037+) PEAK HOUR

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 16**

PLOT DATE: January 5, 2018 2:35:54 PM

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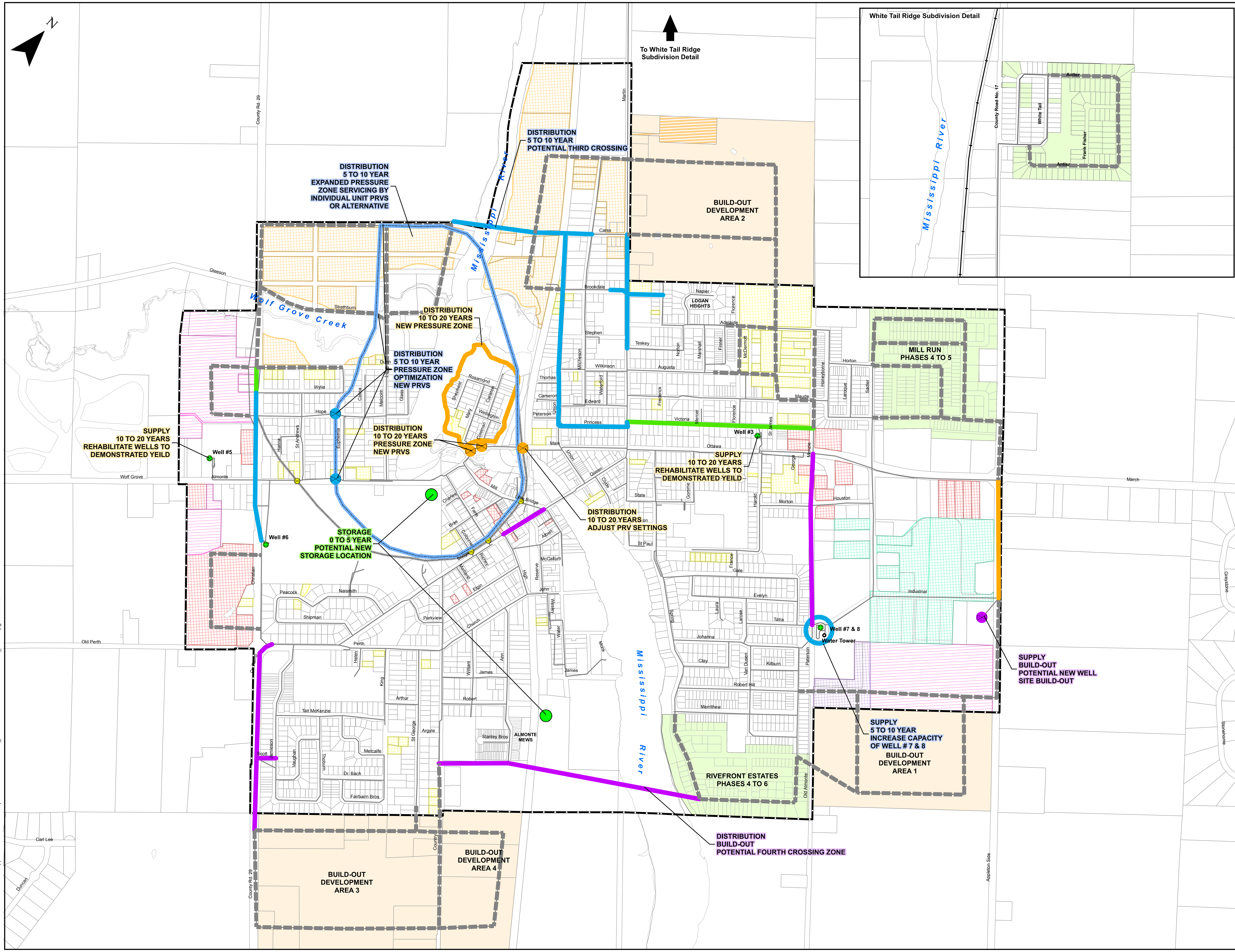

Watermain Upgrades

- Future Pressure Zone
- 0 to 5 Years
- 5 to 10 Years
- 10 to 20 Years
- Future Watermain
- Simulated Watermain Routing (conceptual) to be finalized during development stage

Infrastructure

- Pressure Reducing Valve
- Well
- Water Tower
- Existing Pressure Zone
- Watermain

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- Registered Subdivision
- Build Out
- Business Park (17.0 ha)
- Community Facility (3.1 ha)
- Commercial (15.6 ha)
- Industrial (24.1 ha)
- Residential - Geenfield (34.2 ha)
- Residential - Infill (16.0 ha)

No.	ISSUE / REVISION	DD/MM/YY

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PROJECT:

MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE

MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WATER SYSTEM SERVICING STRATEGIES SUPPLY STORAGE DISTRIBUTION

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 17**

PLOT DATE: January 26, 2018 11:13:39 AM

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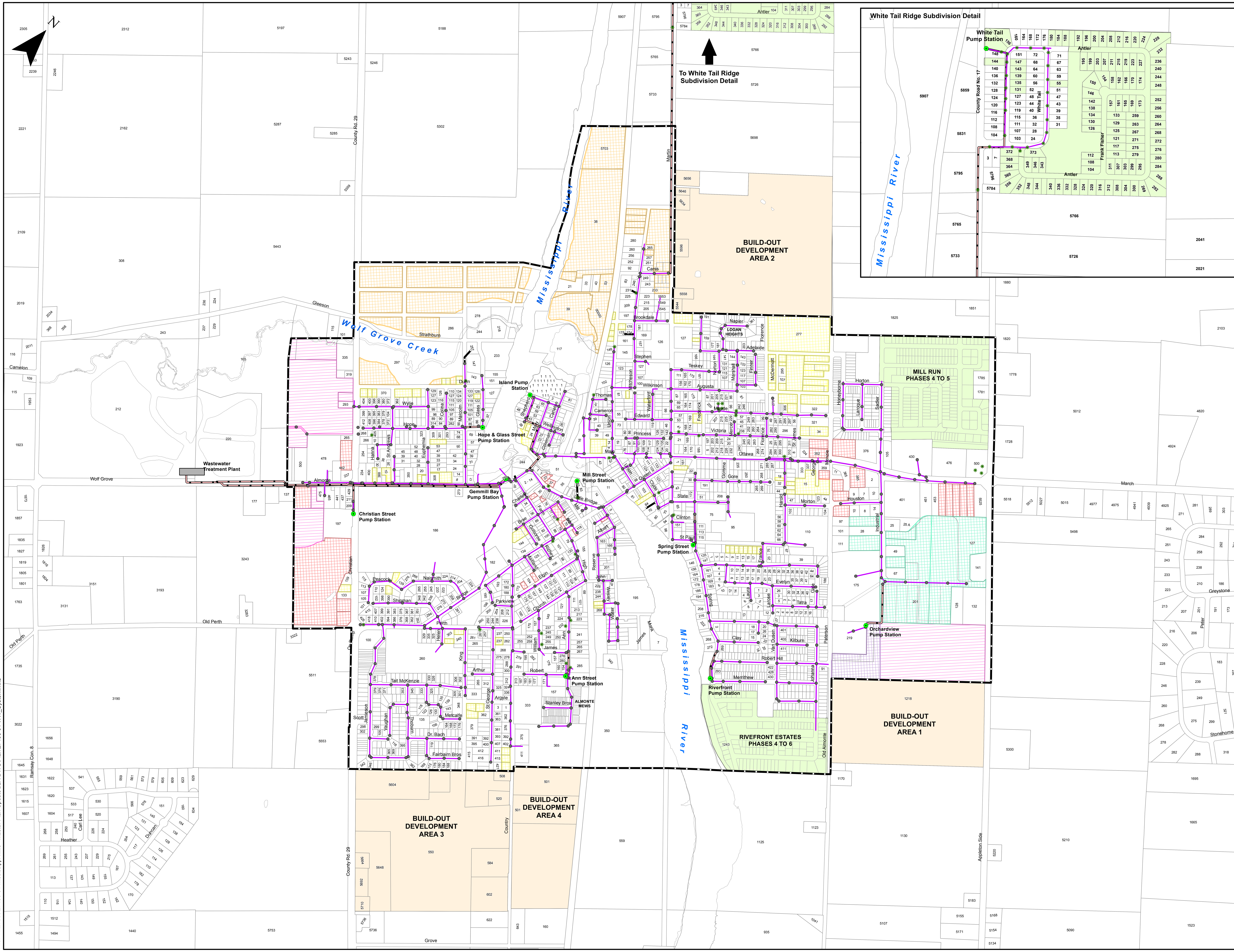

Infrastructure

- 4-102 Manhole ID
- Pumping Station
- Cleanout
- Sanitary Manhole
- Saniatry Sewer
- Private Forcemain
- Forcemain

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Registered Subdivision
- Build Out
- Business Park (17.0 ha)
- Community Facility (3.1 ha)
- Commercial (15.6 ha)
- Industrial (24.1 ha)
- Residential - Geenfield (34.2 ha)
- Residential - Infill (16.0 ha)

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MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE

MISSISSIPPI MILLS, ONTARIO

DRAWING:

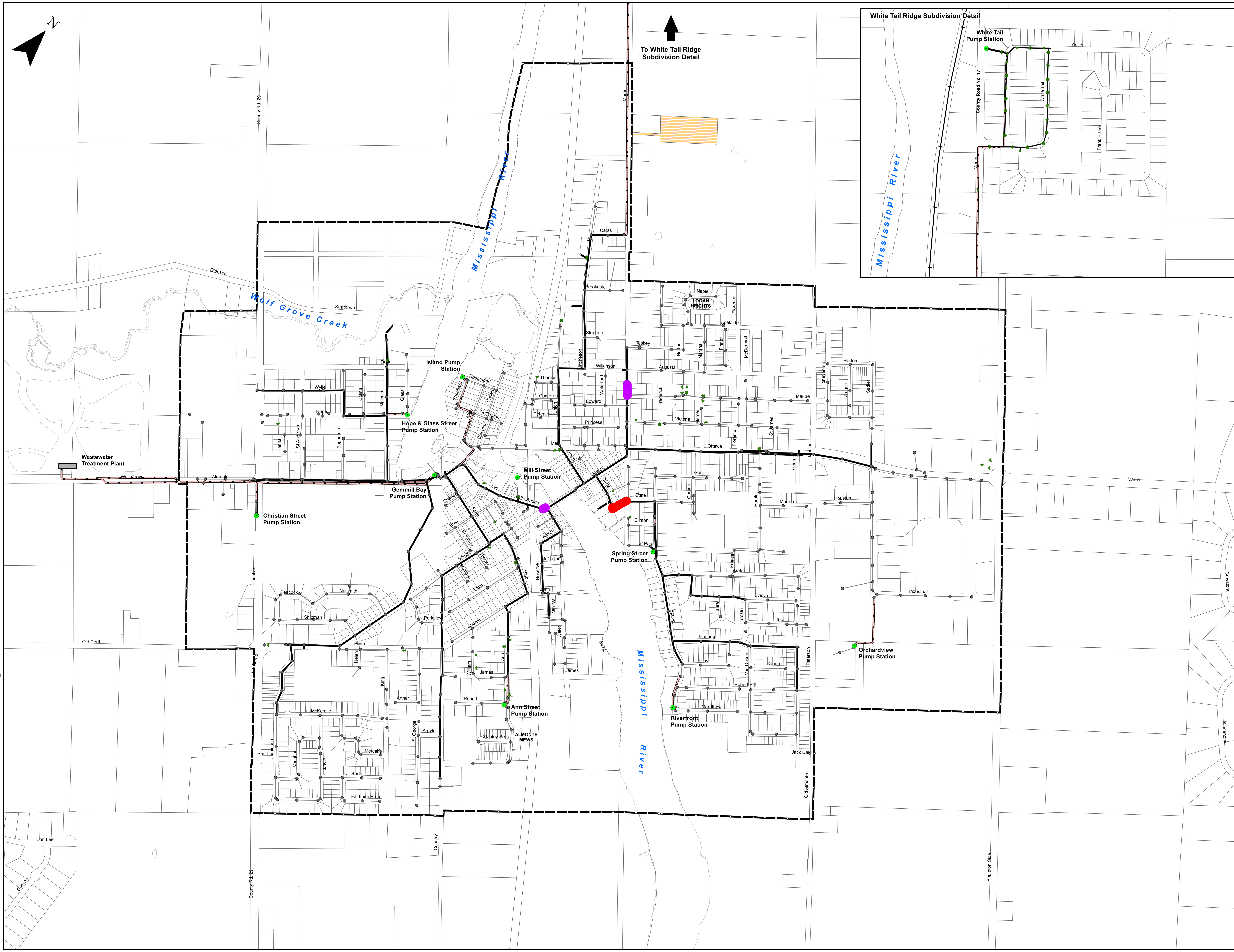
WASTEWATER SYSTEM

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 18**

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 WW_System.mxd

PLOT DATE: January 5, 2018 10:04:36 AM



File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 AlmonteGrowth Ex_Sanitary.mxd

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MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE

MISSISSIPPI MILLS, ONTARIO

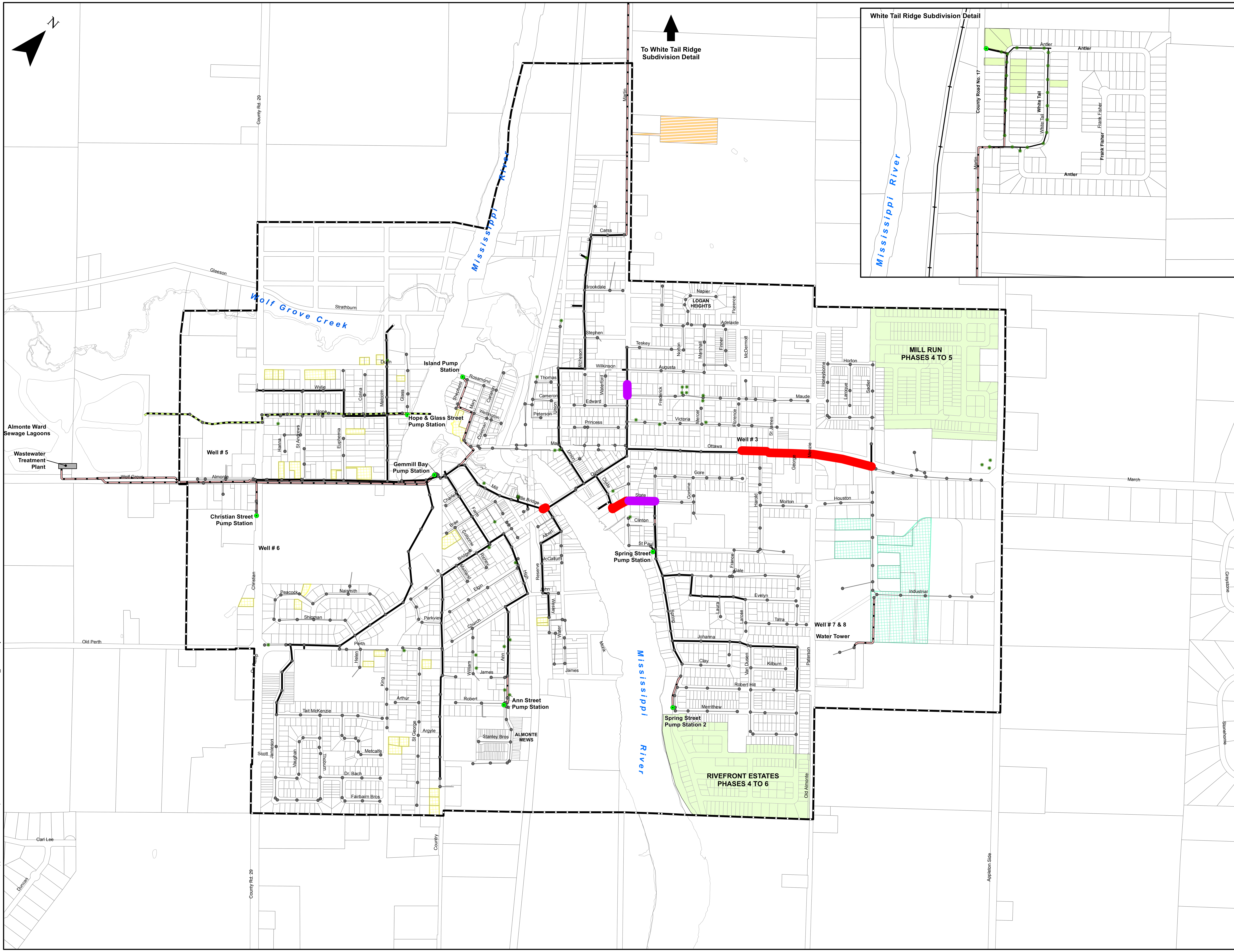
DRAWING:

ALMONTE WARD WASTEWATER SYSTEM EXISTING

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 19**

PLOT DATE: January 5, 2018 10:08:58 AM



Sanitary Sewer

- Over Capacity
- 90 to 100% Capacity
- Trunk Sewer Functioning Properly

Infrastructure

- Pumping Station
- Cleanout
- Sanitary Manhole
- Lagoon Outfall
- Private Forecmain
- Forcemain
- Existing Sewers

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- Subdivision
- Business Park (9.0 ha)
- Residential - Infill (3.8 ha)

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PROJECT:

MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE

MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WASTEWATER SYSTEM 0 TO 5 YEARS (2018 TO 2022)

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 20**

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 AlmonteGrowth 1to5_FutSanitary.mxd

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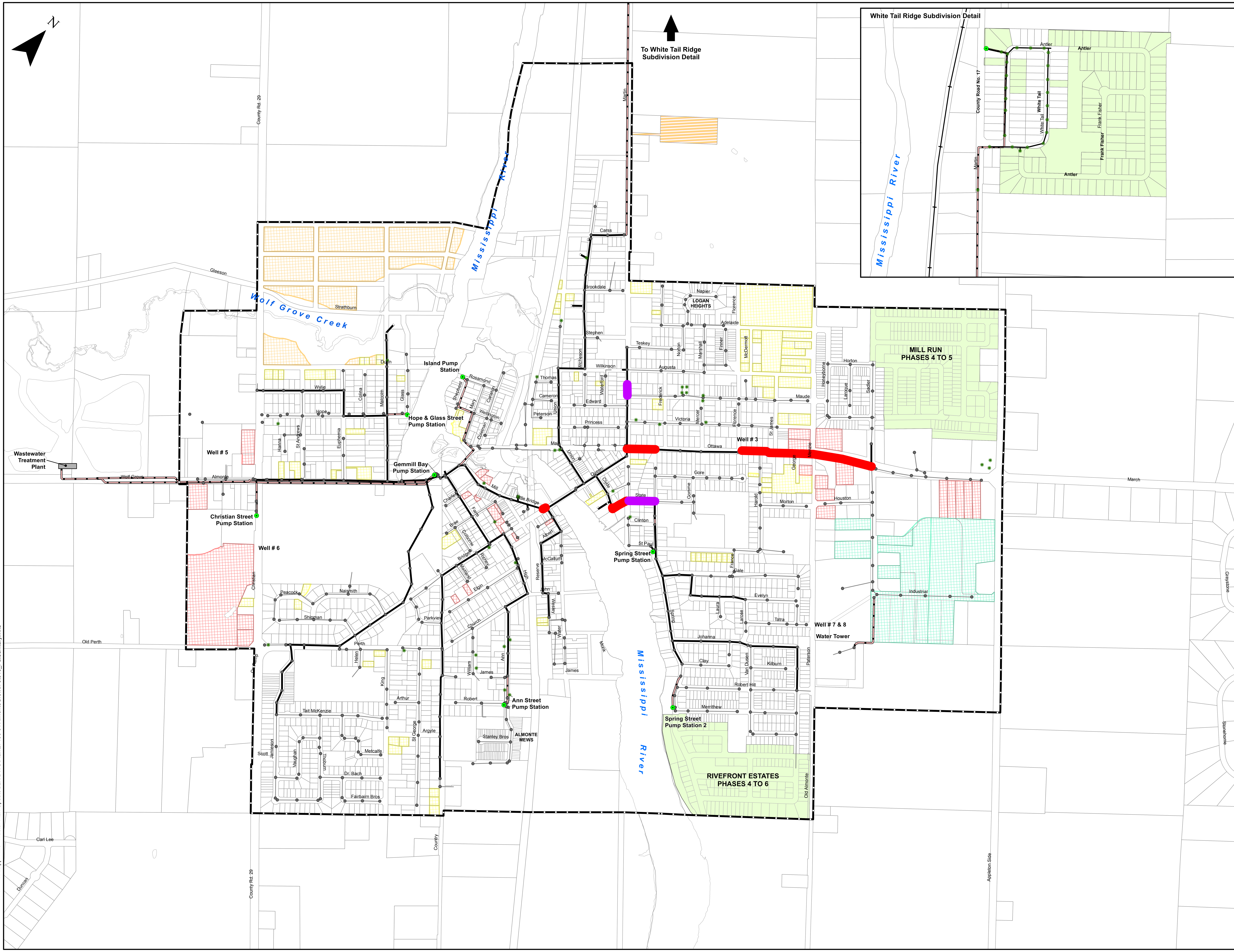

No.	ISSUE / REVISION	DD/MM/YY

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PROJECT:

MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE

MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WASTEWATER SYSTEM 5 TO 10 YEARS (2023 TO 2028)

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 21**

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 AlmonteGrowth 5to10_FutSanitary.mxd

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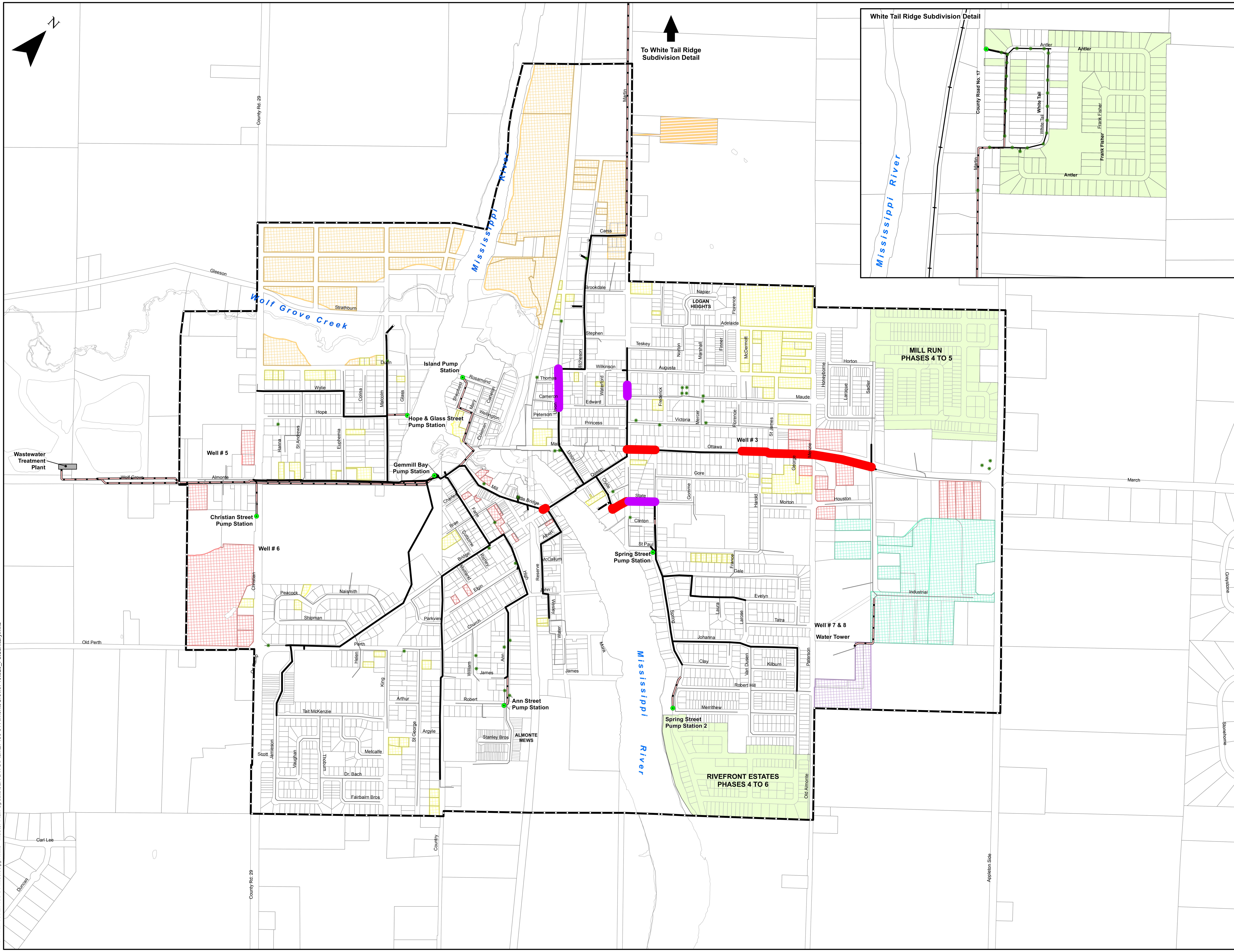

Sanitary Sewer
- Over Capacity
- 90 to 100% Capacity
- Trunk Sewer Functioning Properly

Infrastructure
- Pumping Station
- Cleanout
- Sanitary Manhole
- Private Forecmain
- Forcemain
- Existing Sewers

Land Use
- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- Registered Subdivision
- Business Park (17.0 ha)
- Community Facility (3.1 ha)
- Commercial (15.6 ha)
- Residential - Geenfield (34.2 ha)
- Residential - Infill (16.0 ha)

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MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD GROWTH WASTEWATER SYSTEM 10 TO 20 YEARS (2029 TO 2037)

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 22**

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 AlmonteGrowth 10to20_FutSanitary.mxd

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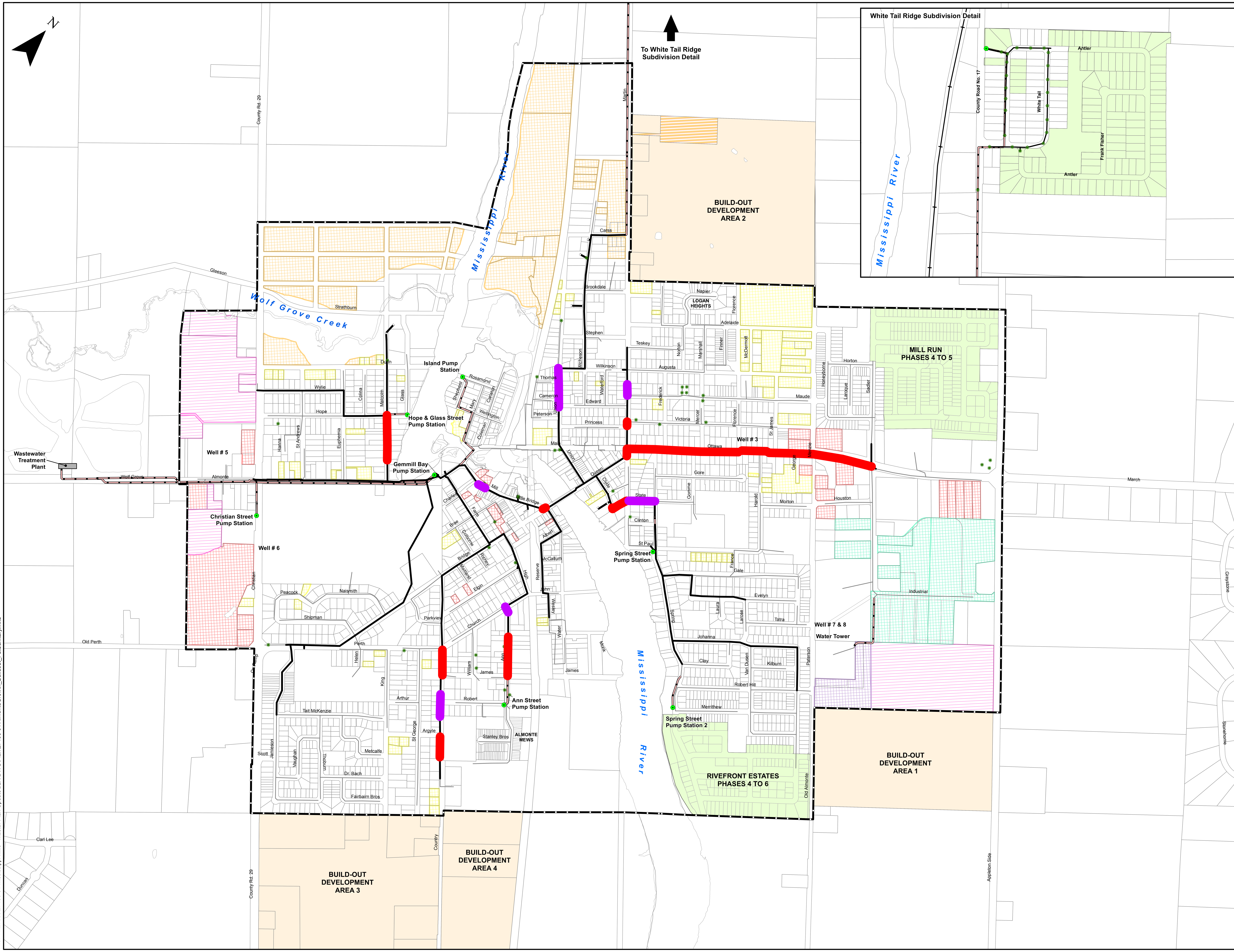

Sanitary Sewer

- Over Capacity
- 90 to 100% Capacity
- Trunk Sewer Functioning Properly

Infrastructure

- Pumping Station
- Cleanout
- Sanitary Manhole
- Private Forecmain
- Forcemain
- Existing Sewers

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- Registered Subdivision
- Build Out
- Business Park (17.0 ha)
- Community Facility (3.1 ha)
- Commercial (15.6 ha)
- Industrial (24.1 ha)
- Residential - Geenfield (34.2 ha)
- Residential - Infill (16.0 ha)

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PROJECT:

MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE

MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD GROWTH WASTEWATER SYSTEM BUILD-OUT (2037+)

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 23**

PLOT DATE: January 5, 2018 10:27:42 AM

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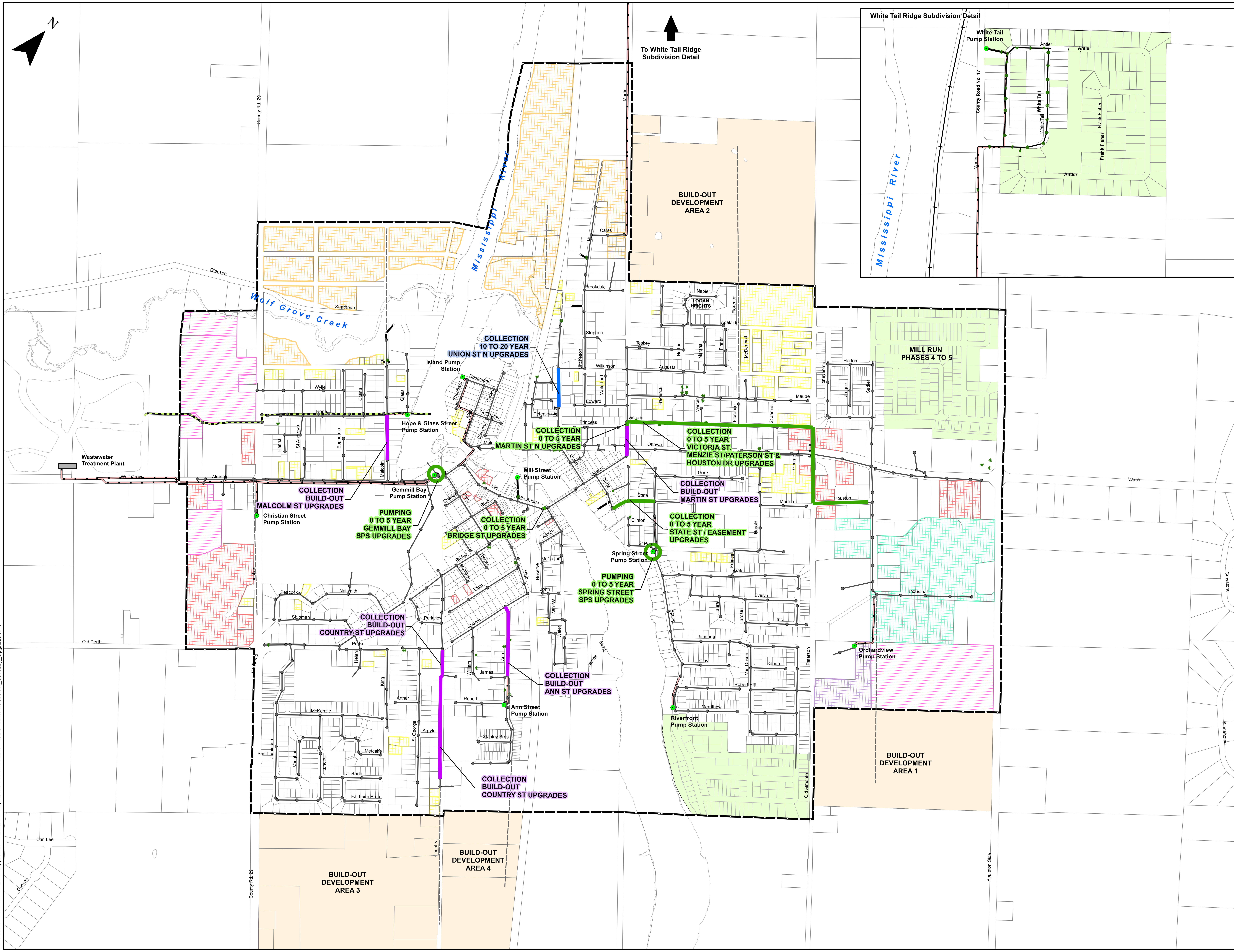

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 AlmonteGrowth_Sanitary_Upgrade.mxd

Sanitary Sewer Upgrades
- 0 to 5 Years
- 10 to 20 Years
- Build-out
- Future Servicing

Infrastructure
- Pumping Station
- Cleanout
- Sanitary Manhole
- Lagoon Outfall
- Saniatry Sewer
- Private Forecmain
- Forcemain

Land Use
- Almonte Ward Limits
- Existing Lots
- Future Lots
- Registered Subdivision
- Build Out
- Business Park (17.0 ha)
- Community Facility (3.1 ha)
- Commercial (15.6 ha)
- Industrial (24.1 ha)
- Residential - Geenfield (34.2 ha)
- Residential - Infill (16.0 ha)

No.	ISSUE / REVISION	DD/MM/YY

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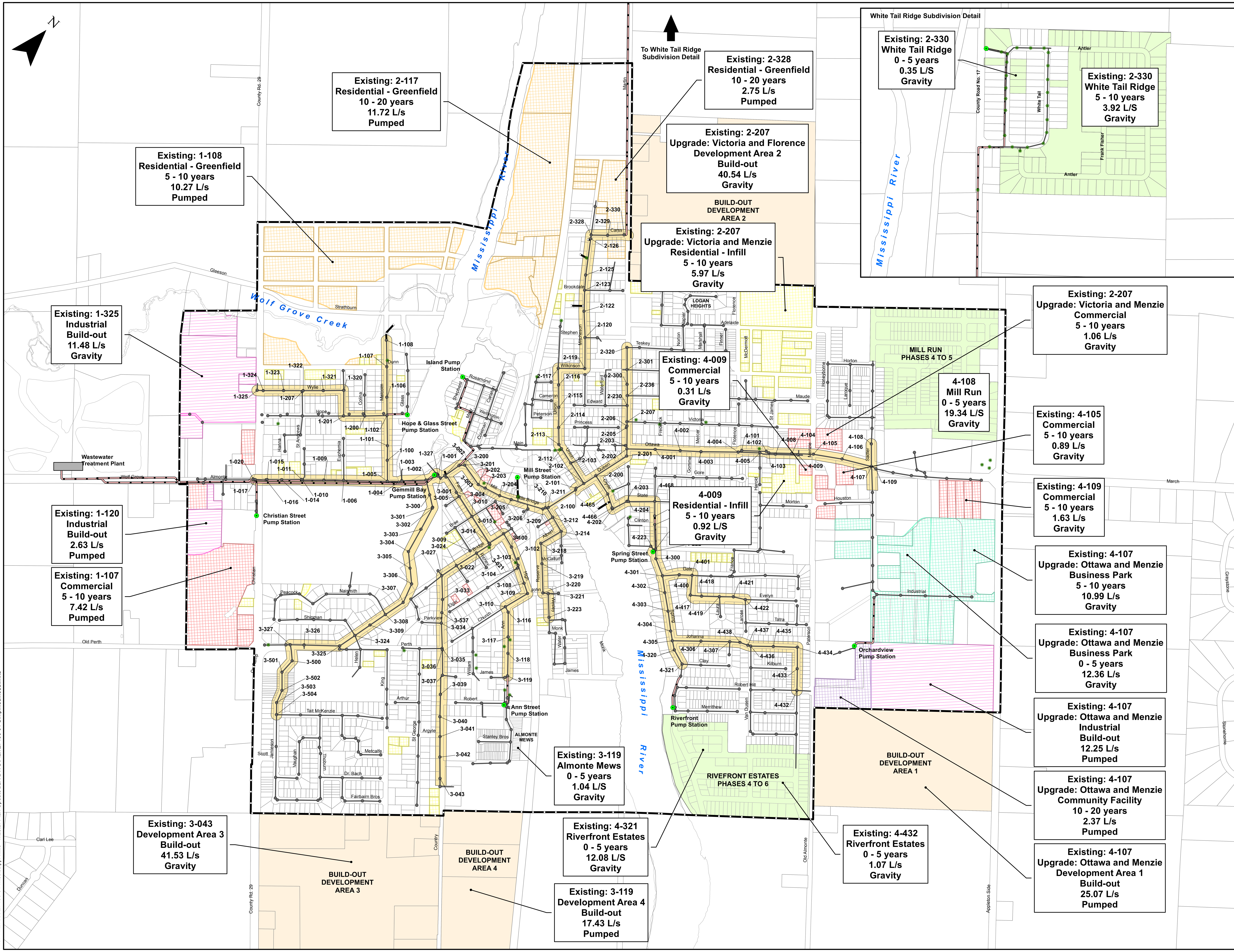
PROJECT:
MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE
MISSISSIPPI MILLS, ONTARIO

DRAWING:
ALMONTE WARD WASTEWATER SERVICING STRATEGIES

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 24**

PLOT DATE: January 5, 2018 10:29:59 AM



Infrastructure

- 4-102 Manhole ID
- Pumping Station
- Cleanout
- Sanitary Manhole
- Sanitary Sewer
- Private Forcemain
- Forcemain
- Sanitary Trunk Sewers

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Registered Subdivision
- Build Out
- Business Park (17.0 ha)
- Community Facility (3.1 ha)
- Commercial (15.6 ha)
- Industrial (24.1 ha)
- Residential - Geenfield (34.2 ha)
- Residential - Infill (16.0 ha)

Existing: 4-109 - Manhole ID
Upgrade : Ottawa and Menzie - Intersection
Commercial - Development Name or Type
5 - 10 years - Development Timeline
1.63 L/s - Estimated Park Flow
Gravity - Anticipated Future Trunk Servicing

No.	ISSUE / REVISION	DD/MM/YY

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PROJECT:
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ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE
MISSISSIPPI MILLS, ONTARIO

DRAWING:
WASTEWATER HYDRAULIC MODEL DEMAND ALLOCATION

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01
DRAWING #: FIGURE 25

PLOT DATE: January 5, 2018 10:32:24 AM

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 SimplifiedModel.mxd

Appendix A

Population Projections Technical Memorandum

TECHNICAL MEMORANDUM

J.L. Richards
& Associates Limited
864 Lady Ellen Place
Ottawa, ON Canada
K1Z 5M2
Tel: 613 728 3571
Fax: 613 728 6012

TO: Guy Bourgon, P.Eng.
Director of Public Works and Roads
Municipality of Mississippi Mills

DATE: June 15, 2017

JOB NO.: 27456-01

FROM: Mark Buchanan, P.Eng.

CC: Cory Smith, Municipality of Mississippi Mills
Steve Stirling, Municipality of Mississippi Mills
Sarah Gore, P.Eng., J.L. Richards & Associates Limited

RE: **Almonte Ward**
Infrastructure Master Plan Update
Population Projections

INTRODUCTION

The purpose of this Memorandum is to assist in updating the population projections and timing of future growth as part of the Municipality of Mississippi Mills Water and Wastewater Master Plan Update. The population projections will serve as the basis for estimating water demands, wastewater generation and establishing future municipal servicing requirements as part of the Master Plan Update.

POPULATION PROJECTIONS

The Master Plan Update considers the 20 year Study Area to be within the current urban boundary with build-out located outside the boundary as illustrated in Figure 1. Future development and growth projections were based on the Comprehensive Review (JLR, April 2017) completed in support of the Official Plan Five Year Review. The planning periods to be considered as part of this Master Plan Update are as follows:

- Existing Conditions;
- Short-term 1 to 5 Years or 2018 – 2022;
- Mid-term 5 to 10 Years or 2023 – 2027;
- Long-term 10 to 20 Years or 2028 – 2037;
- Build-out (development areas located outside the current urban boundary).

Growth projections within the Almonte Ward have been conservatively estimated based on the 60/25/15 approach (60% of future growth allocated to Almonte Ward) to remain consistent with the original Master Plan and at an annual growth rate of 1.39% in accordance with the Comprehensive Review (JLR, 2016).

Table 1: Existing Population, Units and Household Occupancy

Development Milestone	Year	Town of Mississippi Mills Population	Almonte Ward Population	SOURCE (for Almonte Ward growth)
Existing	2001	11,647	4,659	Census
	2006	11,734	4,538	Census
	2011	12,385	4,822	Census (revised)
	2016	13,163	5,039	Census
	2017	13,346	5,149	60% to Almonte
Short Term (1 to 5 Years) Almonte △ p $_{2017\text{-}2022}$ = 573	2018	13,532	5,260	60% to Almonte
	2019	13,721	5,374	60% to Almonte
	2020	13,912	5,488	60% to Almonte
	2021	14,105	5,604	60% to Almonte
	2022	14,302	5,722	60% to Almonte
Mid-Term (6 to 10 Years) Almonte △ p $_{2022\text{-}2027}$ = 614	2023	14,501	5,842	60% to Almonte
	2024	14,703	5,963	60% to Almonte
	2025	14,907	6,086	60% to Almonte
	2026	15,115	6,210	60% to Almonte
	2027	15,325	6,336	60% to Almonte
Long Term (11 to 20 Years) Almonte △ p $_{2027\text{-}2037}$ = 1,364	2028	15,539	6,465	60% to Almonte
	2029	15,755	6,594	60% to Almonte
	2030	15,975	6,726	60% to Almonte
	2031	16,197	6,859	60% to Almonte
	2032	16,423	6,995	60% to Almonte
	2033	16,651	7,132	60% to Almonte
	2034	16,883	7,271	60% to Almonte
	2035	17,118	7,412	60% to Almonte
	2036	17,357	7,555	60% to Almonte
	2037	17,598	7,700	60% to Almonte

<u>Existing Conditions</u>

The total Almonte Ward population was estimated at 5,149 for the year 2017. Based on the 2016 Census there are 2,244 private dwellings within the Almonte Ward. The resulting unit density is 2.29 people/unit; however, from the Comprehensive Review a unit density of 2.37 people/unit was estimated for the entire Municipality. The Master Plan update will use the more conservative unit density of 2.37 people/unit to estimate population in future development areas.

It is noted that the growth summarized in the Tables below were based on area/land use and approved population densities within the Comprehensive Review and an estimated residential population of 5,139, as such, they differ from the population projection listed in Table 1, but are considered conservative.

The existing Study Area is shown in Figure 1.

Short-Term Development

Short-term development is defined as growth that is expected to occur over the next 5 years, from 2018 to 2022. Generally, it consists of various residential infill on the west side of the Mississippi River, green field residential development, namely the Mill Run and Riverfront Estates Subdivisions and some commercial development in the Business Park (refer to Figure 2).

Within Almonte there is a total of 16 ha of land identified as residential infill. As outlined in the Comprehensive Review (JLR, 2017) new residential development is anticipated at an average density of approximately 15 to 35 residential units per gross hectare. The Municipality established housing mix target of 70% low density (70% of 16 ha at 15 units/ha) and 30% medium density (30% of 16 ha at 35 units/ha). In addition a 65/35 split to the development lands is proposed to account for potential other land uses for parks, public and community facilities resulting in 37.5 ha for residential use. Apply this split, urban density and house mix targets results in approximately 218 units within the Almonte Ward. For the Short-Term scenario 3.8 ha of infill or 52 units of the 218 units have been assumed.

Population projections for future industrial and commercial development areas will be estimated based water demands recommended in the Ministry of the Environment and Climate Change (MOECC) Water Design Guidelines, 2008. Consistent with the original Master Plan, this update will use estimate industrial and commercial development water consumption rates at 35,000 l/ha/day and 28,000 l/ha/day, respectively. The short-term development is summarized in the following table.

Table 2: Potential Short-Term Growth (1 to 5 years)

Development	Description	Units	Population
Residential	Registered and Draft Approved	706	1,673
Residential Infill and Intensification	Approximately 3.8 ha of 16 ha within the Almonte Service Area	52	124
Business Park (Commercial)	Total Area 8.5 ha		
Total Short-Term			**1,797**

Mid-Term Development

The mid-term development scenario will consider future growth that occurs over the subsequent 5 years, from 2023 to 2027. Continued residential infill on the east side of the Mississippi River, greenfield residential development and commercial development are expected throughout the Town.

The Comprehensive Review estimated 486 lots/units are expected for the 42.1 ha of greenfield development located in the north and west portions of the Almonte Ward, however the available land and estimated units have been reduced for the Master Plan update to account for the anticipated restoration area along Wolf Creek. It is estimated that 395 lots/units are expected for 34.2 ha of land. Similar to the short-term development scenario 70% low density and 30% medium density has been targeted, however, a different development split is proposed. Residential development will account for 55% of the area while 45% will account for other land use for schools, parks, commercial, institutional, retail roads, etc. This approach results in a total of 395 units or 18.8 ha of land available for residential use.

For the mid-term development scenario 164 units of the 395 units have been assumed as illustrated in Figure 3 and summarized in the following table.

Table 3: Potential Mid-Term Growth (5 to 10 years)

Development	Description	Units	Population
Residential	Register and Draft Approved	102	242
Residential	14.2 ha of 34.2 ha Greenfield development	164	389
Residential Infill and Intensification	Approximately 12.2 ha of 16 ha within the Almonte Service Area	167	396
Business Park (Commercial)	Total Area 8.5 ha		
Commercial	Total Area 15.7 ha		
Total Mid-Term			**1,027**

Long-Term Development

The long-term development scenario considers potential growth that is expected to occur further into the future over a ten year period between the years 2028 to 2037. Continued green field residential development on the east side of the Mississippi River is expected, with some development of community facilities. The long-term development is illustrated in Figure 4 and summarized in the following table.

Table 4: Potential Long-Term Growth (10 to 20 years)

Development	Description	Units	Population
Residential Greenfield	20 ha of 34.2 ha Greenfield development	231	548
Community Facility	Total Area 3.1 ha		
Total Long-Term			**548**

Build-out Development

The build-out development scenario considers residential growth occurring outside the current Almonte urban boundary along with some industrial development on the east and west side of the Town. The future residential development areas remain the same size and location as the original Master Plan. The build-out development scenario is illustrated in Figure 5 and summarized in the following table.

Table 5: Potential Build-Out Growth

Development	Description	Units	Population
Residential	Low and Medium Density	2,009	4,763
Industrial	Total Area 24.1 ha		
Total Build-Out			**4,763**

Following the Town's favorable review, the results of the foregoing growth projections are proposed to be carried forward as part of the Water and Wastewater Systems Master Plan update.

J.L. RICHARDS & ASSOCIATES LIMITED

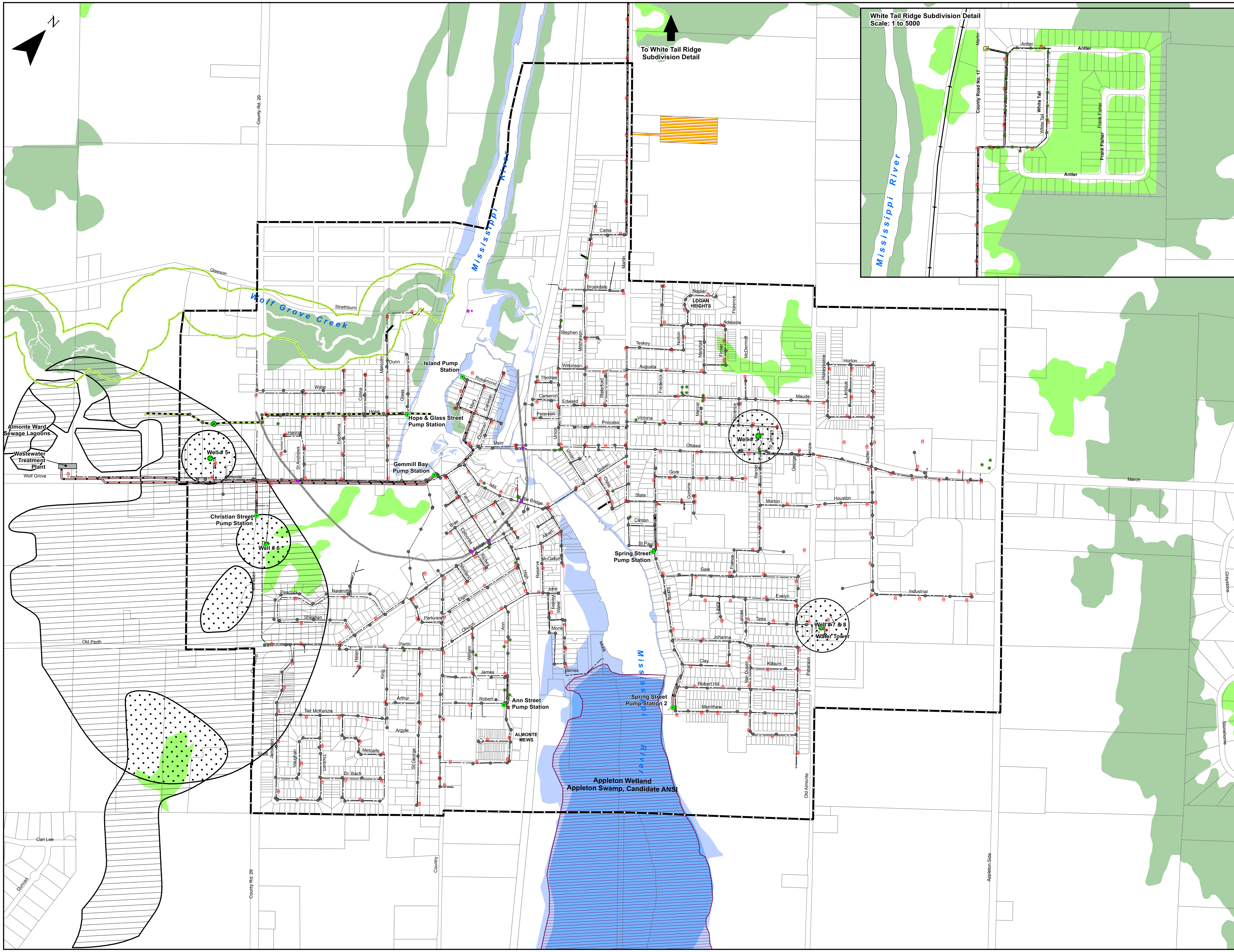
Prepared by:

Mark Buchanan, P.Eng.

Reviewed by:

Sarah Gore, P.Eng.

MB:jd
Attach.



Legend

- Restoration Area
- Fish Spawning
- Area of Natural and Scientific Interest Candidate, Life Science
- Significant Wetlands Evaluated Provincial
- Flood Plain
- Source Water Protection WHPA-A & WHPA-B (VScore 10)
- Source Water Protection WHPA-A & WHPA-B (VScore 8)
- Natural Heritage System Significant Woodlands I
- Natural Heritage System Significant Woodlands II

Land Use

- Almonte Ward Limits
- Existing Lots
- Closed Waste Disposal Site

Infrastructure

- Monitoring Station
- Pumping Station
- Cleanout
- Sanitary Manhole
- Lagoon Outfall
- Private Forcemain
- Forcemain
- Sanitary Sewer
- Pressure Reducing Valve
- Fire Hydrant
- Well
- Water Tower
- Watermain
- Pressure Zone

No.	ISSUE / REVISION	DD/MM/YY

VERIFY SHEET SIZE AND SCALES. BAR TO THE RIGHT IS 25mm IF THIS IS A FULL SIZE DRAWING. 0 25mm

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CONSULTANT:

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PROJECT:

MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN

MISSISSIPPI MILLS, ONTARIO

DRAWING:

EXISTING

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 1**

PLOT DATE: June 15, 2017 9:22:11 AM

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White Tail Ridge Subdivision Detail
Scale: 1 to 5000
To White Tail Ridge Subdivision Detail
Legend
Restoration Area
Fish Spawning
Area of Natural and Scientific Interest Candidate, Life Science
Significant Wetlands Evaluated Provincial
Flood Plain
Source Water Protection WHPA-A & WHPA-B (VScore 10)
Source Water Protection WHPA-A & WHPA-B (VScore 8)
Natural Heritage System Significant Woodlands I
Natural Heritage System Significant Woodlands II
Land Use
Almonte Ward Limits
Existing Lots
Future Lots
Closed Waste Disposal Site
Registered Subdivision
Business Park (9.0 ha)
Residential - Infill (3.8 ha)
Infrastructure
Monitoring Station
Pumping Station
Cleanout
Sanitary Manhole
Lagoon Outfall
Private Forcemain
Forcemain
Sanitary Sewer
Pressure Reducing Valve
Fire Hydrant
Well
Water Tower
Watermain
Pressure Zone
Almonte Ward Sewage Lagoons
Wastewater Treatment Plant
Well # 5
Christian Street Pump Station
Well # 6
Island Pump Station
Hope & Glass Street Pump Station
Gemmill Bay Pump Station
Spring Street Pump Station
Spring Street Pump Station 2
Ann Street Pump Station
ALMONTE MEWS
LOGAN HEIGHTS
Well # 3
Well #7 & 8 Water Tower
MILL RUN PHASES 4 TO 5
RIVEFRONT ESTATES PHASES 4 TO 6
Appleton Wetland Appleton Swamp, Candidate ANSI
Mississippi River
Wolf Grove Creek
No. ISSUE / REVISION DD/MM/YY
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PROFESSIONAL STAMP
PROJECT:
MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN
MISSISSIPPI MILLS, ONTARIO
DRAWING:
ALMONTE WARD GROWTH 1 TO 5 YEARS
DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01
DRAWING #:
FIGURE 2
PLOT DATE: June 15, 2017 9:21:20 AM
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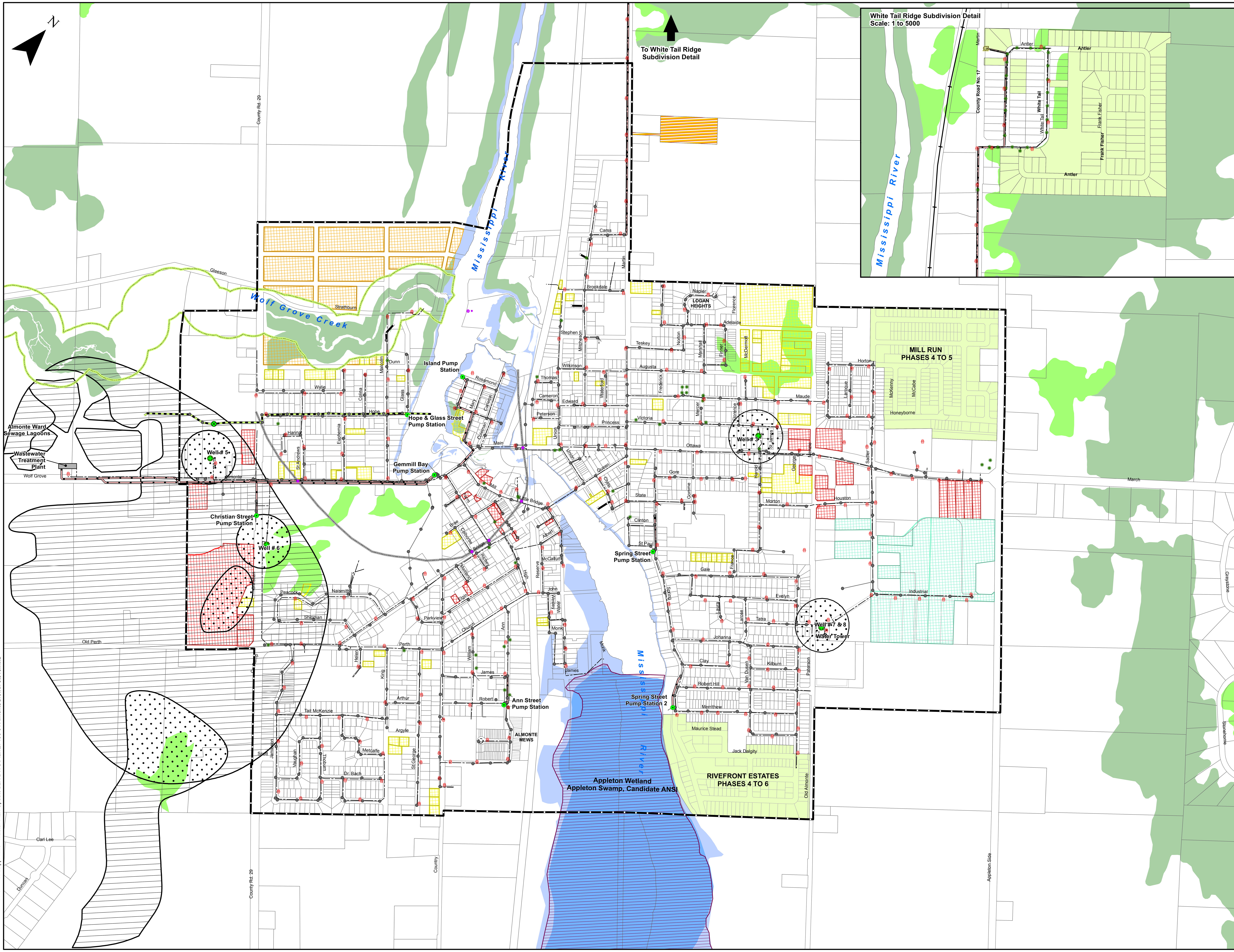

Legend

- Restoration Area
- Fish Spawning
- Area of Natural and Scientific Interest Candidate, Life Science
- Significant Wetlands Evaluated Provincial
- Flood Plain
- Source Water Protection WHPA-A & WHPA-B (VScore 10)
- Source Water Protection WHPA-A & WHPA-B (VScore 8)
- Natural Heritage System Significant Woodlands I
- Natural Heritage System Significant Woodlands II

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- Registered Subdivision
- Business Park (17.0 ha)
- Commercial (15.6 ha)
- Residential - Geenfield (14.2 ha)
- Residential - Infill (16.0 ha)

Infrastructure

- Monitoring Station
- Pumping Station
- Cleanout
- Sanitary Manhole
- Lagoon Outfall
- Private Forcemain
- Forcemain
- Sanitary Sewer
- Pressure Reducing Valve
- Fire Hydrant
- Well
- Water Tower
- Watermain
- Pressure Zone

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MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD GROWTH 5 TO 10 YEARS

DESIGN: MB
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JLR #: 27456-01

DRAWING #: **FIGURE 3**

PLOT DATE: June 14, 2017 3:10:38 PM

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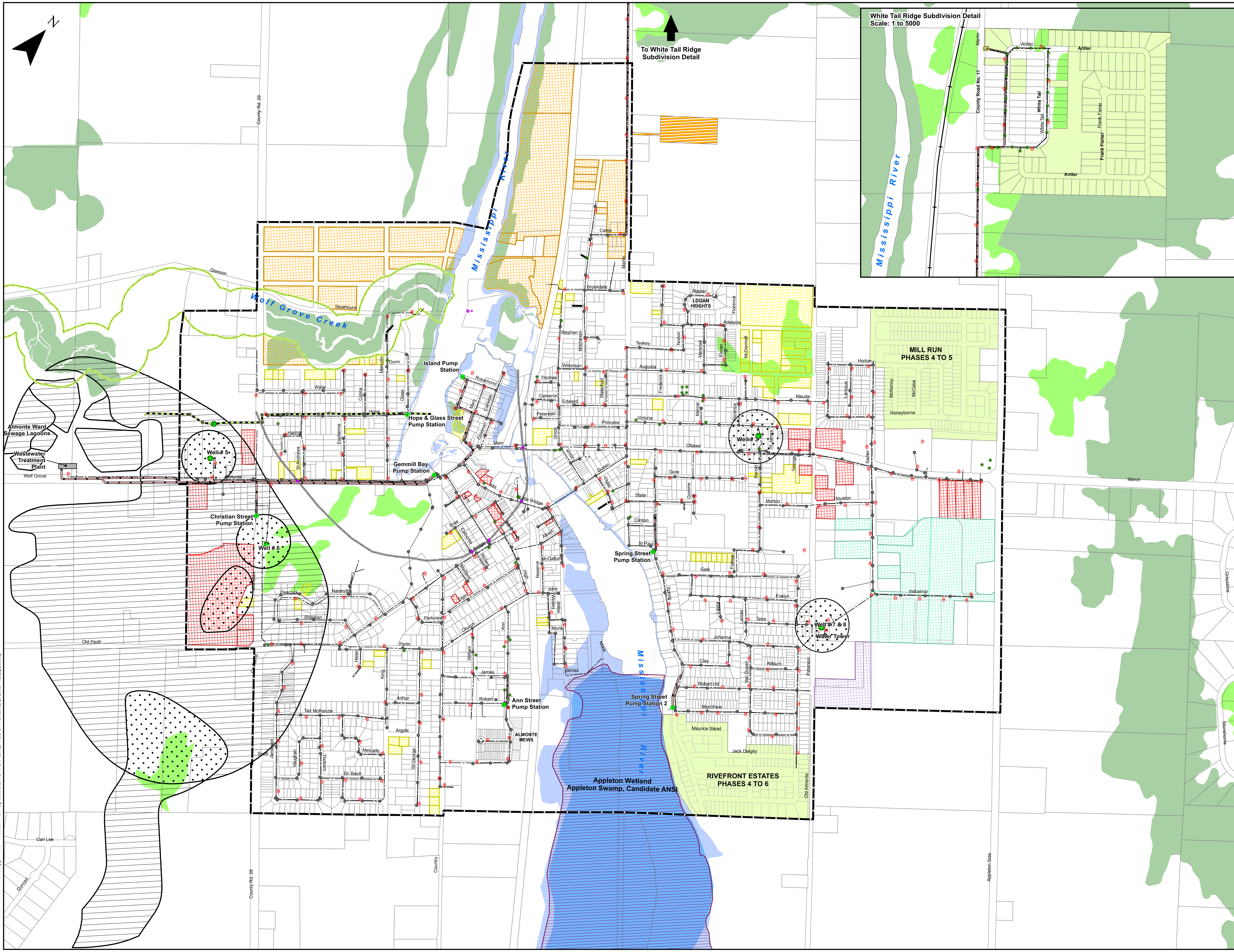

Legend

- Restoration Area
- Fish Spawning
- Area of Natural and Scientific Interest Candidate, Life Science
- Significant Wetlands Evaluated Provincial
- Flood Plain
- Source Water Protection WHPA-A & WHPA-B (VScore 10)
- Source Water Protection WHPA-A & WHPA-B (VScore 8)
- Natural Heritage System Significant Woodlands I
- Natural Heritage System Significant Woodlands II

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- Registered Subdivision
- Business Park (17.0 ha)
- Community Facility (3.1 ha)
- Commercial (15.6 ha)
- Residential - Geenfield (34.2 ha)
- Residential - Infill (16.0 ha)

Infrastructure

- Monitoring Station
- Pressure Reducing Valve
- Pumping Station
- Fire Hydrant
- Cleanout
- Well
- Sanitary Manhole
- Water Tower
- Lagoon Outfall
- Watermain
- Private Forcemain
- Pressure Zone
- Forcemain
- Sanitary Sewer

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PROJECT:

MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN

MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD GROWTH 10 TO 20 YEARS

DESIGN:	MB
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CHECKED:	SG
JLR #:	27456-01

DRAWING #: **FIGURE 4**

PLOT DATE: June 14, 2017 3:09:00 PM

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White Tail Ridge Subdivision Detail
Scale: 1 to 5000
Legend
Restoration Area
Fish Spawning
Area of Natural and Scientific Interest Candidate, Life Science
Significant Wetlands Evaluated Provincial
Flood Plain
Source Water Protection WHPA-A & WHPA-B (VScore 10)
Source Water Protection WHPA-A & WHPA-B (VScore 8)
Natural Heritage System Significant Woodlands I
Natural Heritage System Significant Woodlands II
Almonte Ward Limits
Existing Lots
Future Lots
CLOSED WASTE DISPOSAL SITE
SUBDIVISION
BUILD OUT
Business Park (17.0 ha)
Community Facility (3.1 ha)
Commercial (15.6 ha)
Industrial (24.1 ha)
Residential - Geenfield (34.2 ha)
Residential - Infill (16.0 ha)
Infrastructure
Monitoring Station
Pumping Station
Cleanout
Sanitary Manhole
Lagoon Outfall
Private Forcemain
Forcemain
Sanitary Sewer
Pressure Reducing Valve
Fire Hydrant
Well
Water Tower
Watermain
Pressure Zone
To White Tail Ridge Subdivision Detail
BUILD-OUT DEVELOPMENT AREA 2
BUILD-OUT DEVELOPMENT AREA 1
BUILD-OUT DEVELOPMENT AREA 3
BUILD-OUT DEVELOPMENT AREA 4
MILL RUN PHASES 4 TO 5
RIVEFRONT ESTATES PHASES 4 TO 6
LOGAN HEIGHTS
Mississippi River
Wolf Grove Creek
Almonte Ward Sewage Lagoons
Wastewater Treatment Plant
Island Pump Station
Hope & Glass Street Pump Station
Gemmill Bay Pump Station
Christian Street Pump Station
Spring Street Pump Station
Spring Street Pump Station 2
Ann Street Pump Station
Well # 3
Well # 5
Well # 6
Well # 7 & 8
Water Tower
Appleton Wetland
Appleton Swamp, Candidate ANSI
ALMONTE MEWS
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PROJECT:
MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN
MISSISSIPPI MILLS, ONTARIO
DRAWING:
ALMONTE WARD GROWTH BUILD-OUT
DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01
DRAWING #:
FIGURE 5
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Appendix B

2012 Condition Assessment Report

TOWN OF MISSISSIPPI MILLS
ALMONTE WARD
WATER AND WASTEWATER SYSTEMS INFRASTRUCTURE CONDITION ASSESSMENT

March 2012

Prepared for:

TOWN OF MISSISSIPPI MILLS
P.O. Box 400
Almonte, Ontario
K0A 1A0

Prepared by:

J.L. RICHARDS & ASSOCIATES LIMITED
Consulting Engineers, Architects and Planners
864 Lady Ellen Place
Ottawa, Ontario
K1Z 5M2

JLR No. 25051

TOWN OF MISSISSIPPI MILLS
ALMONTE WARD
WATER AND WASTEWATER SYSTEMS INFRASTRUCTURE
CONDITION ASSESSMENT

- TABLE OF CONTENTS -

PAGE

- LIST OF TABLES -

- LIST OF PHOTOGRAPHS -

- LIST OF FIGURES-

- LIST OF APPENDICES -

1.0 INTRODUCTION

1.1 Background

The serviced area of the Town of Mississippi Mills (Almonte Ward) currently serves a population of approximately 4,910, and reviews of the Official Plan have indicated strong growth pressures, resulting in an increased population of 7,800 by 2031. The increased growth suggests that development pressures within the Almonte Ward will impact the available service capacity of the water and wastewater systems and infrastructure upgrades are imminent. The last Water and Wastewater Master Plan for the serviced area was completed in 1984 and the document findings have exceeded their intended design period. As such, the Town retained J.L. Richards & Associates Limited (JLR) to complete a new comprehensive planning document (Master Plan) for the required long term operational and capital improvements to the water and wastewater systems to meet current regulations and planned growth within the Almonte Ward.

The existing communal sewage system was established in the 1960s and generally consists of gravity sewers, seven sub-area pumping stations (including the White Tail Ridge SPS), a main pumping station and a four-cell facultative treatment lagoon. The sewage collection system is owned and operated by the Town and Ontario Clean Water Agency (OCWA) is presently contracted to operate and maintain the pumping and treatment systems. A new extended aeration treatment plant with tertiary treatment is presently being constructed and anticipated to be commissioned in June 2012. The new treatment plant will provide increased rated capacity to accommodate existing and projected wastewater flows resulting from growth within the serviced community.

The Almonte Ward drinking water supply system consists of five groundwater wells, an elevated potable water storage tank and a distribution system. The wells are owned by the Town and are currently operated by OCWA. The Town operates and maintains the water distribution system.

The development of a Water and Wastewater Master Plan for the Town of Mississippi Mills - Almonte Ward in accordance with the requirements of the Municipal Engineers Association Municipal Class EA process will be an extremely valuable planning tool for Council and staff as it will ‘set the stage’ for water and wastewater infrastructure renewal and expansion over the next 20 years or more.

Directly related to this Master Plan, is a detailed condition assessment of select water and wastewater infrastructure. The Condition Assessment includes an evaluation of above grade site works, structural and architectural components, mechanical/process equipment and systems, and electrical equipment and systems. In addition, a desktop review of the water distribution and wastewater collection systems will be completed.

The purpose of the Condition Assessment is to form the basis of an infrastructure renewal and maintenance program and establish potential costs. This information will be valuable during the evaluation of costs associated with the renewal or replacement of existing infrastructure.

The Report will be divided by engineering discipline including Structural/Architectural, Mechanical and Electrical. Generally, each section will be further subdivided by discipline, as applicable.

1.2 Limitations and Assumptions

1.2.1 Limitations

Historic maintenance and operational information for the infrastructure available at the time of investigation were referenced. Available information was supplemented by verbal reports by the Operating Staff, as well as collected on site through observations.

Site review was limited to observations at readily accessible locations of the exterior and interior of the structures and site. No destructive testing or inspections were carried out.

The replacement costs of various elements have been estimated and should be considered as order-of-magnitude approximation for comparable systems. Sizing and quality of the materials in the cost estimates are similar to the existing. Due to the undefined scope of work for future upgrade(s) (i.e., nature of site-wide upgrade and modification to the existing systems), the costs presented give an indication of the commitment necessary to bring the systems up to date using similar technologies unless noted otherwise.

The intent of this Report is to only provide order-of-magnitude pricing for work necessary to extend the life of the infrastructure with the existing operating criteria.

1.2.2 Assumptions

Due to the number of systems and engineering disciplines involved, some assumptions were made when undertaking the condition assessment. Some of the specific assumptions made as part of this condition assessment are noted below:

- The exact remaining lifetime of each system is difficult to predict. The assessment is based on the limited information and, in many instances, is influenced by factors that might occur in the future. Even the urgency of replacement may be determined by factors that cannot be predicted. For example, retroactive rulings by regulatory agencies may necessitate unanticipated replacement or updating of equipment within a short time frame. By contrast, items such as paving, painting, or interior finishes might be delayed for an extended period of time, at the discretion of the Town, subject to financial and other considerations. The actual year of replacement will be dictated by the physical condition of the system at the time of replacement. Also, certain replacements may be advanced or deferred by the Town, subject to other considerations (e.g. financial, coordination with related work, incorporation into site-wide upgrades, etc.).

- The estimated replacement costs for the various items are order-of-magnitude only and are based on the experience and current (Year 2012) unit prices in the construction industry.
- Costs are based on work being completed by outside contractors.
- All costs, including those for future years, are expressed in 2012 dollars. Hence, if these costs are to be used for long-range cash-flow projection, potential future trends of inflation and interest must be applied accordingly.

It is recommended that a condition survey be undertaken approximately every five years in order to ensure that information presented in the report, including financial data, remains current and relevant.

2.0 OVERVIEW OF EXISTING INFRASTRUCTURE

2.1 Water System

The Almonte Ward is the only area in the Town of Mississippi Mills that is serviced by communal water systems. Note that the White Tail Ridge development area is serviced outside of the Almonte Ward (Ramsay Ward). The communal water system is supplied by five groundwater wells labelled 3, 5, 6, 7 and 8, as shown on Figure 1-W1.

Well 3 is located near Ottawa Street in the northeast end of Town. The Well was constructed in 1948 and is a 250 mm diameter borehole extending to a depth of 47.5 m below the ground surface. The Well is equipped with a vertical turbine pump and enclosed within a vented weather tight masonry block and brick pump house. Well 3 is also equipped with a chlorination system and associated instrumentation.

Well 5 is located in the municipal works yard on the west side of the Mississippi River. The Well was constructed in 1970 and is a 200 mm diameter borehole extending to a depth of 38.1 m below the ground surface, equipped with a vertical turbine pump and enclosed within a vented weather tight masonry block and aluminum clad pump house. Well 5 is also equipped with a chlorination system and associated instrumentation.

Well 6 is located in Gemmill Park, near Christian Street, on the west side of the Mississippi River. The Well was constructed in 1973 and is a 254 mm borehole extending to a depth of 48.8 m below the ground surface, with a steel casing to a depth of 10 m. It is equipped with a vertical turbine pump and enclosed within a vented weather tight masonry block and wood siding pump house. Well 6 is also equipped with a chlorination system and associated instrumentation.

Wells 7 and 8 are located on Patterson Street on the east edge of Town and are approximately 5 m apart in the same building. Wells 7 and 8 were constructed in 1990/91, are 254 mm boreholes extending to a depth of 79.2 m below the ground surface, and have a steel casing to a depth of 13.41 m. They are equipped with vertical turbine pumps and enclosed within a vented weather tight masonry block and brick or vinyl siding pump house. The Wells are also equipped with a chlorination system and associated instrumentation.

The distribution system is comprised of an elevated water storage tank and piping network. The elevated storage tank, constructed in 1992, is located in the northeast quadrant of the Town near Wells 7 and 8. The piping network generally consists of polyvinyl chloride, ductile iron and cast iron piping ranging in size from 50 mm to 200 mm in diameter. It is understood that some of the piping is the original infrastructure dating back to 1930 and earlier.

2.2 Wastewater System

As previously noted, the existing communal sewage system was established in the 1960s and generally consists of gravity sewers, six sub-area pumping stations, a main pumping station and a four-cell facultative treatment lagoon. Refer to Figure 2-WW1 for an overview of the communal sewage system.

The existing four-cell facultative lagoon system is currently being decommissioned and the construction of a new extended aeration activated sludge treatment plant is underway. Construction is anticipated to be completed by June 2012 and, as such, the existing sewage lagoon treatment system will not be investigated as part of this Condition Assessment.

All sewage generated in the service area is ultimately conveyed to the Gemmill's Bay Sewage Pumping Station (SPS). The Gemmill's Bay SPS houses two pumps in a dry well / wet well configuration and conveys wastewater to the Lagoon via two forcemains (300 mm and 400 mm diameter). The Gemmill's Bay SPS is currently being upgraded as part of the new sewage treatment plant project. Similarly as the sewage treatment system, the Gemmill's Bay SPS will not be reviewed as part of this Condition Assessment.

The Spring Street SPS was upgraded in 1989 as a below grade concrete dry well / wet well system. It is understood that this station will be subject to an upgrade in the near future (next six to eight months) to accommodate additional servicing of new development. Recommended activities identified within this Condition Assessment will likely be addressed as part of the pending expansion / upgrade project.

The remaining sub area pumping stations consist of: the Christian Street SPS (a new Pre-Fabricated Fiberglass Reinforced Plastic packaged pumping station installed in 2010), the Hope and Glass SPS (a below grade concrete dry well / wet well system constructed in 1970), the Island SPS (a below grade steel dry well / wet well system constructed in 1970), Robert Street SPS (a below grade single concrete well system constructed in the 1980s) and the White Tail

Ridge SPS (recently installed to service the White Tail Ridge Development Area). It is noted that the White Tail Ridge SPS is a newer station and was not included as part of this review.

3.0 WATER SYSTEM CONDITION ASSESSMENT

3.1 Well 3

3.1.1 Structural/Architectural

The well building appears to consist of reinforced concrete foundation walls, masonry load bearing walls and a reinforced concrete flat roof structure.

No significant settlement or distress was observed during the on-site, at grade, observation of the facility and Operations staff has not reported any problems.

Efflorescence on the exterior brick was noted and could have been due to roof leakage (Photo 1). Operations staff advised that the flat roof membrane was replaced two (2) years ago. If moisture continues to be present within the brick, the brick will deteriorate over time due to freeze-thaw damage. The exterior brick should be cleaned and monitored. If efflorescence reappears, further investigation is required to determine the cause of water infiltration and preventative measures undertaken.

Photo 1: Well 3 - Efflorescence on exterior brick

Corrosion was noted at the base of the door but mainly on the door frame (Photo 2). The frame will likely have to be replaced within the next five years.

Photo 2: Well 3 - Corrosion on door frame base

Exterior caulking at door and wall openings was noted to be cracked and debonded. Removal and installation of new caulking is warranted to prevent water infiltration and freeze-thaw damage.

Rigid insulation has been placed against the foundation wall and clad with parging. The parging was cracked and debonded (Photo 3). A new cladding is recommended to be placed over the foundation's rigid insulation to protect the insulation from UV damage.

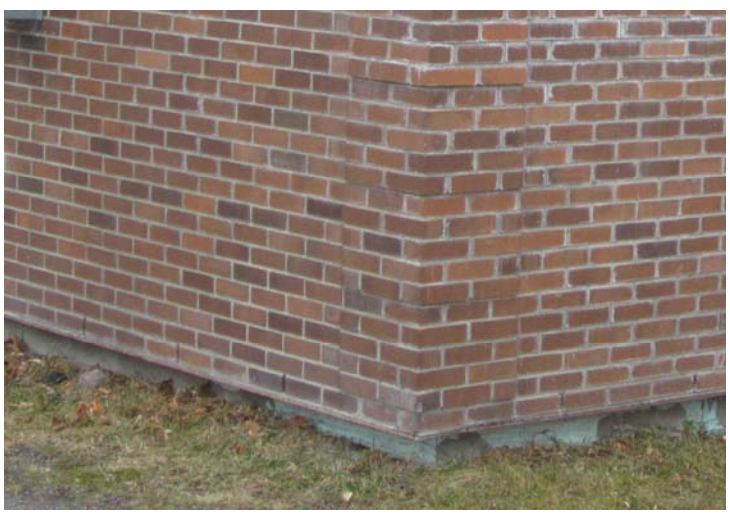


Photo 3: Well 3 - Cracked parging

Gravel roads provide access to the facility and appear to be in reasonable condition.

3.1.2 Mechanical

Process System

The well was originally drilled in 1948 and reconstructed in 1992. The well is a 250 mm diameter, 47.5 m deep drilled groundwater well equipped with a vertical turbine pump. A small masonry building covers the well and houses the following equipment:

- One vertical turbine lineshaft type pump with a rated capacity of 9.6 L/s at 70.7 m total dynamic head (TDH) (152.2 gpm at 232 ft.), 39 m (128 ft.) long suction assembly, 100 mm discharge flange, and driven by a 15 HP motor at 1800 rpm. The pump manufacturer: Goulds, size 7CLC with 9 stages.
- Stainless steel discharge piping including (sequentially from the pump discharge):
  - Pump discharge pressure gauge and pressure transmitter;
  - Automatic air/vacuum relief valve;
  - 75 mm pilot operated hydraulic flow control valve;
  - 75 mm Endress and Hauser electro-magnetic flow meter;
  - Raw water turbidity sampling connection;
  - 100 mm globe style silent check valve;
  - 100 mm tee fitting with take-off branch completed with a butterfly isolation and blind flange;
  - Sodium hypochlorite injection connection;
  - 100 mm diameter static flow mixer;
  - Chlorine residuals sampling take-off;
  - Distribution piping pressure gauge, and pressure transmitter;
  - 100 mm gate type isolation valve;
  - A number of copper tubing take-offs to various instrumentation devices.
- One raw water turbidity meter including PVC rigid and flexible tubing and valves.
- Sodium hypochlorite water disinfection system including 200 L storage tank, two chemical metering pumps, feed controller, and PVC flexible tubing and valves.
- Chlorine residuals sensors including PVC flexible tubing and valves.

The following modification and equipment replacements were reported to have taken place since 1992:

- 2000: Turbine type flow meter replaced with 75 mm diameter electro-magnetic meter.
- 2002: Sodium hypochlorite system installed.

- 2011: Entire suction column assembly of the vertical turbine pump, including lineshaft and bowls replaced. Photographs of the replaced suction column assembly indicated significant rust, suggesting that a service of 20 years should be considered for replacement at this site.
- Date Unknown: 75 mm pilot operated flow control valve overhauled, including replacement of membranes, seals and springs.

The existing raw water pump, motor, and discharge piping, including valves and instrumentation appear to be in good working condition. Some unprotected carbon steel bolts, mainly at flanged connections, show signs of surface rust but are considered to be minor (Photo 4). If deeper rust penetrations are observed, the bolts can be replaced under regular service/maintenance program.

Photo 4: Well 3 - Unprotected carbon steel bolts

It was reported that during hot humid periods (summer seasons), condensation on raw water piping can be observed. It is a normal occurrence that moisture suspended in the air will condense on cold surfaces (the ground water temperature was reported to be roughly 8°C year around). This issue is typically resolved by insulating cold water piping.

The sodium hypochlorite feeding system appears in good working condition, and regular service/maintenance is recommended.

Copper tubing feeding sampling instrumentation does not meet current guidelines and should be replaced (e.g., stainless steel tubing).

The flexible tubing in the chemical injection and water sampling systems appears to have too much slack and are subject to damage (Photo 5). More supports are recommended that could be implemented under the regular service/maintenance program.

Photo 5: Well 3 - Flexible tubing appears to have too much slack

<u>Ventilation and Heating Systems</u>

The ventilation and heating systems consists of:

- an exterior mounted side wall exhaust complete with back draft damper;
- outside air intake louvre complete with motorized damper; and
- an electric unit heater with built-in thermostat provides heat as required.

The ventilation and heating systems appear to be in good working condition. It is recommended to run ventilation system continuously to ensure that chlorine vapours are exhausted from the building to prevent instigation and the acceleration of corrosion of various carbon steel components, e.g. flange bolts, building door frame, etc.

<u>Plumbing</u>

A small sample sink receives drain discharge from water sampling devices. The sink drain pipe (PVC) penetrates floor slab, and reportedly is not connected to any sanitary sewage system.

The sink and drain appear to be in good condition. It is reported that during hot humid periods (summer seasons), the discharged water from water sampling devices saturates ground under the building which may contribute to high humidity inside the building and condensation on cold surfaces. As indicated above, condensation can be eliminated by insulating cold water piping. If saturation of the ground is deemed to be the prime reason of the condensation, then further investigation of the sink drain routing should be undertaken and any remedial measures implemented.

Chlorine Contact Chamber

The chlorine contact chamber for Well 3 was installed in 1992 and consists of a 900 mm diameter high pressure concrete pipe that is approximately 34 m long. Based on a useful life of 60 years, the chamber has approximately 40 more years of service life. It has been reported however that pipe bands have broken at other sites, warranting a regular maintenance program.

3.1.3 Electrical/Instrumentation and Controls

Electrical

Well 3 is serviced by a 600V, 3-phase 4-wire electrical supply from a utility pole located near the well. The Hydro meter is rated for 200A.

The 600V power distribution is via Power Panel (PP) 3. PP 3 is a 347V/600V rated, 225A, 3-phase, 4-wire distribution panel, complete with 24 circuits.

The 120V/208V power distribution is via Lighting Panel (LP) 3. LP 3 is a 240V rated, 100A, 3-phase, 4-wire panelboard, complete with 24 circuits. LP 3 is fed from a 6kVA 600V/120-208 dry type transformer.

The motor starter is housed in a 1-section Motor Control Centre (MCC). The motor is rated for 600V, 15HP.

Power wiring is installed in surface run metal conduits, with the exception of the pump, where the conduit was cast in the slab.

The electrical distribution system is mildly corroded but appears to be in good condition. It was reportedly installed in the early 1990s and consideration should be given to replacement within the next 10 to 15 years. Note that moderate corrosion is present on some of the breaker handles inside LP 3. The affected breakers could be replaced as part of the regular service / maintenance program.

There is no back up power or provisions for connecting a portable generator at this site. At a minimum, a connection for a portable generator should be considered as part of any future upgrades.

Bonding is via a surface mount ground bar and appears to be in good condition.

Instrumentation and Controls

The well equipment is controlled by a Bristol Babcock DPC 3330 Programmable Logic Controller (PLC) housed inside a control panel. Instrumentation consists of the following:

- Hach 1720E turbidimeter complete with a Hach SC100 controller;
- Two (2) Prominent Dulcometer chlorine analyzers – for free and total chlorine;
- Endress + Hauser Promag 50 series electro-magnetic flowmeter;

- Ametek Drexelbrook level meter for the well;
- Endress + Hauser pressure transmitter; and
- Bristol Babcock chart recorders.

The control panel was manufactured in the early 1990s. Replacement parts for the PLC are obsolete and are no longer manufactured. The control panel should be replaced in the near future.

The instrumentation ranges in age from the early 1990s (chart recorders) to 2007 (chlorine analyzer) and appear to be in good condition.

Communication with Well 7 and 8 is via a dedicated phone line. Alarms are sent to Well 7 and 8 and from there dialled to the Operator.

Operations staff has indicated that, in the past, a fault was generated whenever there is a power loss on the chemical metering pumps requiring pumps to be manually reset. To overcome this problem, a standalone uninterrupted power supply (UPS) was installed. As part of future upgrades, consideration should be given to providing new pumps that do not have this problem. The UPS is a Powerware 120V 500VA rated unit and appears to be in good condition.

The instruments are not supported by the UPS power. UPS power to the instruments should be provided as part of upgrades to replace the PLC panel.

Lastly, no mechanical protection is in place for some of the control wiring. As part of upgrades to the control system, mechanical protection should be provided for new instrumentation wiring.

Summary – Well 3

Table 1 provides a summary of Well 3 Activities.

Table 1: Summary of Well 3 Activities

ACTIVITY	TIME FRAME	BUDGET ALLOWANCE
Structural/Architectural		
1. Replace door frame	5 – 10 yr	$1,500
2. Replace caulking	0 - 5 yr	$500
3. New cladding on foundation insulation	0 - 5 yr	$2,000
Mechanical		
1. Replacement of vertical turbine pump	10 – 20 yr	$35,000
2. Replacement/overhaul of piping / valves	Ongoing as required	Per present service/maintenance program
3. Replacement/overhaul of chemical injection system	10 – 20 yr	$10,000
4. Replacement/overhaul of ventilation system	Ongoing as required	Per present service/maintenance program
5. Replacement/overhaul of plumbing system	Ongoing as required	Per present service/maintenance program
6. Replacement/overhaul of chlorine contact chamber bands.	Ongoing as required	Per present service/maintenance program
Electrical/Instrumentation and Controls		
1. Replace electrical distribution including motor starter	10 – 20 yr	$75,000
2. New PLC panel	0 – 5 yr	$50,000
3. UPS power and conduits/teck cable for instruments	0 – 5 yr	$40,000
4. Provide generator connection	0 – 5 yr	$5,000

3.2 Well 5

3.2.1 Structural/Architectural

The well building appears to consist of reinforced concrete foundation walls, masonry load bearing walls, clad with insulation and metal siding and a wood framed roof structure with steel support beams.

Rigid insulation has been placed against the foundation wall and clad with parging. The parging was cracked and debonded (Photo 6). A new cladding is recommended to be placed over the foundation's rigid insulation to protect the insulation from UV damage.

Photo 6: Well 5 - Cracked parging

No significant settlement or distress was observed during the on-site, at grade, observation of the facility and Operations staff has not reported any problems.

The flat roof membrane system of the facility was also replaced two years ago.

A portion of the area has been asphalt paved; however, poor drainage around the facility exists (Photo 7). Improvements to the drainage around the facility are recommended.

Photo 7: Well 5 - Poor drainage

3.2.2 Mechanical

<u>Process System</u>

The well was originally drilled in 1970 and reconstructed in 1992. The well is a 203 mm diameter, 38.1 m deep drilled groundwater well equipped with a vertical turbine pump. Well 5 consists of the following equipment:

- One vertical turbine lineshaft type pump with rated capacity of 9.5 L/s at 99.5 m TDH (150.6 gpm at 326 ft.), 100 mm diameter, 34 m (111.6 ft.) long suction column, 100 mm discharge flange and driven by a 20 HP motor at 1800 rpm. The pump manufacturer: Goulds, size 6CHC with 23 stages.
- Stainless steel discharge piping including (sequentially from the pump discharge):
  - Automatic air/vacuum relief valve;
  - 100 mm globe style silent check valve;
  - Raw water turbidity sampling connection;
  - Pump discharge pressure gauge and pressure transmitter;
  - 75 mm pilot operated hydraulic flow control valve;
  - Pressure transmitter;
  - 75 mm Endress and Hauser electro-magnetic flow meter;
  - Sodium hypochlorite injection connection;
  - 100 mm diameter static flow mixer;
  - 100 mm tee fitting with take-off branch completed with a blind flange;
  - 100 mm gate type isolation valve;
  - Chlorine residuals sampling take-off;
  - Distribution piping pressure gauge;
  - Flanged connection to buried distribution piping;
  - Various copper tubing take-offs to various instrumentation devices.
- One raw water turbidity meter including PVC rigid and flexible tubing and valves.
- Sodium hypochlorite water disinfection system including 200 L storage tank, two chemical metering pumps, feed controller, and PVC flexible tubing and valves.
- Chlorine residuals sensors including PVC flexible tubing and valves.

The following modification and equipment replacement were reported to take place since 1992:

- 2000: Turbine type flow meter replaced with 75 mm diameter electro-magnetic meter.
- 2006: Entire suction column assembly of the vertical turbine pump, including lineshaft and bowls, replaced. It was reported that the condition of the replaced pump was poor, e.g. deep rust penetrations. The corrosion of the replaced pump suggests that a pump in service for 15 years should be considered for replacement at this site.
- 2011: 20 HP pump motor replaced.
- 2007: 100 mm check valve was replaced within last 5 years.
- 2002: Sodium hypochlorite system was installed.

The existing raw water pump, motor, and discharge piping, including valves and instrumentation appear to be in good working condition. Some unprotected carbon steel bolts, show signs of surface rust but are considered to be minor (Photo 8). If deeper rust penetrations are observed, than the bolts can be replaced under regular service/maintenance program.

Photo 8: Well 5 - Corrosion of unprotected steel bolts

It was reported that during hot humid periods (summer seasons), condensation on raw water piping can be observed. It is normal occurrence that moisture suspended in the air condenses on cold surface (the ground water temperature was reported to be roughly 8° C all year around). This issue is typically resolved by insulating cold water piping.

The sodium hypochlorite feeding system appears in good working condition, and regular service/maintenance is recommended.

Copper tubing feeding sampling instrumentation does not meet current guidelines and should be replaced (e.g., stainless steel tubing).

The flexible tubing in the chemical injection and water sampling systems appears to have too much slack and are subject to damage (Photo 9). More supports are recommended that could be implemented under the regular service/maintenance program.

Photo 9: Well 5 - Tubing in the chemical injection / water sampling systems with slack

Ventilation and Heating Systems

The ventilation and heating systems consists of:

- an exterior mounted side wall exhauster completed with back draft damper,
- outside air intake louver completed with motorized damper,
- an electric unit heater with built-in thermostat provides heat as required.

The ventilation and heating systems appear to be in good working condition. It is recommended to run ventilation system continuously to ensure that chlorine vapours are exhausted from the building to prevent the corrosion of various carbon steel components in the pumping station, e.g. flange bolts, building door frame, etc.

Plumbing

A small sample sink receives the discharge from water sampling devices. The sink drain pipe (PVC) penetrates floor slab and reportedly is not connected to any sanitary sewage system.

The sink and drain appear to be in good condition. It was reported that during hot humid periods (summer seasons), the discharged water from water sampling devices saturates ground under the building which may contribute to a higher humidity level inside the building and condensation on cold surfaces. As indicated above, condensation can be eliminated by insulating cold water piping. If saturation of the ground is deemed to be the prime reason of the condensation then further investigation of the sink drain routing should be undertaken and any remedial measures implemented.

Chlorine Contact Chamber

The chlorine contact chamber for Well 5 was installed in 1992 and consists of a 900 mm diameter high pressure concrete pipe that is approximately 42 m long. Based on a useful life of 60 years, the chamber has approximately 40 more years of service life. It has been reported however that pipe bands have broken at this site, warranting a regular maintenance program.

3.2.3 Electrical/Instrumentation and Controls

Electrical

Well 5 is serviced by a 600V, 3-phase 4-wire electrical supply from the utility pole located in front of the well house. The Hydro meter is rated for 200A.

600V power distribution is via Power Panel (PP) 5. PP 5 is a 347V/600V rated, 225A, 3-phase, 4-wire distribution panel, complete with 24 circuits.

120V/208V power distribution is via Lighting Panel (LP) 5. LP 3 is a 240V rated, 125A, 3-phase, 4-wire panelboard, complete with 24 circuits. LP 5 is fed from a 15kVA 600V/120-208 dry type transformer.

A new variable frequency drive (VFD) was installed within the last month and is new condition. The motor is rated for 600V, 20 HP, inverter duty and was also installed within the last month.

Power wiring is installed in surface run metal conduits, with the exception of the pump, where the conduit was cast in the slab.

The electrical distribution system is showing signs of mild to moderate corrosion. The panels were installed in the early 1990s and appear to be in good condition. Consideration should be given to their replacement within the next 10 to 15 years. The conduits are moderately corroded and should be replaced in the near to medium term.

The transformer was recently installed (i.e., within the last month). The original meter base and associated conduits still exist on the building exterior and should be removed (Photo 10).

Photo 10: Well 5 - Redundant hydro meter base and conduits

There is a damaged conduit on the building exterior that should be repaired in order to protect the associated wiring (Photo 11).

Photo 11: Well 5 - Damaged conduit

There is no back up power or provisions for connecting a portable generator at this site. At a minimum, a connection for a portable generator should be considered as part of any future upgrades.

Bonding is via a surface mount ground bar and appears to be in good condition.

The disconnect for the space heater is moderately corroded and should be replaced in the near to medium future.

Instrumentation and Controls

The well equipment is controlled by a Bristol Babcock DPC 3330 Programmable Logic Controller (PLC) housed inside a control panel. Instrumentation consists of the following:

- Hach 1720E turbidimeter complete with a Hach SC100 controller;
- Two (2) Prominent Dulcometer chlorine analyzers – for free and total chlorine;
- Endress + Hauser Promag 50 series magnetic flowmeter;
- Ametek Drexelbrook level meter for the well;
- Endress + Hauser pressure transmitter;
- Bristol Babcock chart recorders.

The control panel was manufactured in the early 1990s. Replacement parts for the PLC are obsolete and no longer manufactured. The control panel should be replaced in the near future.

The instrumentation ranges in age from the early 1990s (chart recorders) to 2007 (chlorine analyzer) and appear to be in good condition.

Communication with Well 7 and 8 is via a dedicated phone line. Alarms are sent to Well 7 and 8 where they are dialled to the Operator.

There are two (2) Pribusin communication devices in the building. The first monitors the heat trace system for piping which is running along the underside of the bridge. The second monitors sewage flows. Both units appear to be in good working order. Note that the second Pribusin is scheduled to be demolished once the new Sewage Treatment Plant is commissioned.

The instruments are not supported by Uninterrupted Power Supply (UPS) power. UPS power to the instruments should be provided as part of upgrades to replace the PLC panel.

Lastly, no mechanical protection is in place for some of the control wiring. As part of upgrades to the control system, mechanical protection should be provided for new instrumentation wiring.

3.2.4 Summary – Well 5

Table 2 provides a summary of Well 5 Activities.

Table 2: Summary of Well 5 Activities

ACTIVITY	TIME FRAME	BUDGET ALLOWANCE
Structural/Architectural		
1. New cladding on foundation insulation	0 – 5 yr	$2,000
2. Regrade around the facility	0 – 5 yr	$5,000
Mechanical		
1. Replacement of vertical turbine pump	10 – 20 yr	$45,000
2. Replacement/overhaul of piping/valves	Ongoing as required	Per present service/maintenance program
3. Replacement/overhaul of chemical injection system	10 – 20 yr	$10,000
4. Replacement/overhaul of ventilation system	Ongoing as required	Per present service/maintenance program
5. Replacement/overhaul of plumbing system	Ongoing as required	Per present service/maintenance program
6. Replacement/overhaul of chlorine contact chamber bands.	Ongoing as required	Per present service/maintenance program
Electrical/Instrumentation and Controls		
1. Replace electrical distribution	10 – 20 yr	$60,000
2. New PLC panel	0 – 5 yr	$50,000
3. UPS power and conduits/teck cable for instruments	0 – 5 yr	$40,000
4. Provide generator connection	0 – 5 yr	$5,000
5. Repair damaged conduit on exterior	0 – 5 yr	<$5,000
6. Remove redundant hydro meter base and conduits	0 – 5 yr	<$5,000

3.3 Well 6

3.3.1 Structural/Architectural

The well building appears to consist of concrete masonry block foundation walls, load bearing masonry block walls above grade and a wood framed mansard roof structure. The exterior cladding consists of wood siding.

No significant settlement or distress was observed during the on-site, at grade, observation of this facility and Operations staff has not reported any problems.

The exterior siding has reached the end of its useful service life and should be replaced (Photo 12). A prefinished hardboard siding would best suit this facility. Insulation of the exterior walls appears to be minimal. The application of rigid insulation to improve the thermal value of the exterior walls as part of the exterior cladding upgrade is recommended.

Photo 12: Well 6 - Exterior siding has reached the end of its useful life

Operations staff also advised that this flat roof membrane was also replaced two (2) years ago. It appears that the asphalt shingles were also replaced on the mansard style roof as part of the roof membrane replacement.

Corrosion was noted at the base of the door and frame (Photo 13). The door and frame will likely have to be replaced within the next five years.

Photo 13: Well 6 - Corrosion at base of door and frame

Exterior caulking at door and wall openings was noted to be cracked and debonded. Removal and installation of new caulking is warranted to prevent water infiltration and freeze-thaw damage.

Gravel roads provide access to the facility. Poor grading exists around this facility. Regrading is recommended to direct surface water away from the facility.

3.3.2 Mechanical

Process System

The well was drilled in 1973 and reconstructed in 1992. The well is a 254 mm diameter, 48.8 m deep drilled groundwater well equipped with a vertical turbine pump. A small masonry building with wooden siding and houses the following equipment:

- One vertical turbine lineshaft type pump with rated capacity of 22.7 L/s at 101.2 m Total Dynamic Head (TDH) (360 gpm at 332 ft.), 30.6 (100.4 ft.) long suction assembly, 125 mm discharge flange, driven by a 40 HP motor at 1800 rpm. The pump manufacturer: Goulds, size 8RJHC with 14 stages.
- Stainless steel discharge piping including (sequentially from the pump discharge):
    - Automatic air/vacuum relief valve;
    - 100 mm solenoid operated check valve;
    - 100 mm Endress and Hauser electro-magnetic flow meter;
    - 100 mm tee fitting with take-off branch completed with a blind flange;
    - Raw water turbidity sampling connection;
    - 100 mm pilot operated hydraulic flow control valve;
    - Sodium hypochlorite injection connection;
    - 150 mm diameter static flow mixer;
    - Chlorine residuals sampling take-off;
    - Pressure gauge, and pressure transmitter;
    - 150 mm gate type isolation valve;
    - Flanged connection to buried distribution piping; and
    - Various copper tubing take-offs to instrumentation.
- One raw water turbidity meter including PVC rigid and flexible tubing, and valves.
- Sodium hypochlorite water disinfection system including 200 L storage tank, two (2) chemical metering pumps, feed controller, and PVC flexible tubing and valves.
- Chlorine residuals sensors including PVC flexible tubing and valves.

The existing raw water pump, motor, and discharge piping, including valves and instrumentation appear to be in good working condition. Some unprotected carbon steel bolts, mainly at flanged connections, show signs of surface rust but are considered to be minor. If deeper rust penetrations are observed, the bolts can be replaced under regular service/maintenance program.

The following modification and equipment replacement were reported to take place since 1992:

- 2000: Turbine type flow meter replaced with 100 mm diameter electro-magnetic meter.
- 2002: Sodium hypochlorite system was installed.
- 2009: Entire suction column assembly of the vertical turbine pump, including lineshaft and bowls, replaced. Photographs of the replaced suction column assembly indicate minor surface rust and physical damage to one of the bowls. Our interpretation is that the pump could stay in service for much longer; however, the physical damage of a bowl impaired pump performance and the column had to be replaced. The Operator indicated that the suction column of this pump was replaced twice since 1992, but the year of the first replacement is unknown.
- Date Unknown: 100 mm solenoid operated check valve and 100 mm pilot operated flow control valve replaced.

It was reported that during hot humid periods (summer seasons), condensation on raw water piping can be observed. It is normal occurrence that moisture suspended in the air condenses on cold surface (the ground water temperature was reported to be roughly 8°C all year around), and this issue is typically resolved by insulating cold water piping.

The sodium hypochlorite feeding system appears in good working condition, and regular service/maintenance is recommended.

Copper tubing feeding sampling instrumentation does not meet current guidelines and should be replaced (e.g., stainless steel tubing).

The flexible tubing in the chemical injection and water sampling systems appears to have too much slack and are subject to damage. More supports are recommended that could be implemented under the regular service/maintenance program.

<u>Ventilation and Heating Systems</u>

The ventilation and heating systems consists of:

- an exterior mounted side wall exhauster completed with back draft damper,
- outside air intake louver completed with motorized damper, and
- an electric unit heater with built-in thermostat provides heat as required.

The ventilation and heating systems appear to be in good condition. The outside damper was disconnected from an electrical actuator at the time of the visit, but the actuator was operational when turned on. It is recommended to run the ventilation system continuously to ensure that chlorine vapours are exhausted from the building to prevent corrosion of various carbon steel components, e.g. flange bolts, building door frame, etc.

Plumbing

A small sample sink receives drain discharge from water sampling devices. The sink drain pipe (PVC) penetrates floor slab, and reportedly is not connected to any sanitary sewage system.

The sink and drain appear to be in good condition. It was reported that during hot humid periods (summer seasons), the discharged water from water sampling devices saturates ground under the building which may contribute to higher humidity inside the building and condensation on cold surfaces occurs. As indicated above, condensation can be eliminated by insulating cold water piping. If saturation of the ground is deemed to be the prime reason of the condensation, then further investigation of the sink drain routing should be undertaken and any remedial measures implemented.

Chlorine Contact Chamber

The chlorine contact chamber for Well 6 was installed in 1992 and consists of a 900 mm diameter high pressure concrete pipe that is approximately 27 m long. Based on a useful life of 60 years, the chamber has approximately 40 more years of service life. It has been reported however that pipe bands have broken at other sites, warranting a regular maintenance program.

3.3.3 Electrical/Instrumentation and Controls

Electrical

Well 6 is serviced by a 600V, 3-phase 4-wire electrical supply from the nearby utility pole on the side of the street. The Hydro meter is rated for 200A.

600V power distribution is via Power Panel (PP) 6. PP 6 is a 347V/600V rated, 225A, 3-phase, 4-wire distribution panel, complete with 24 circuits.

120V/208V power distribution is via Lighting Panel (LP) 6. LP 6 is a 240V rated, 100A, 3-phase, 4-wire panelboard, complete with 24 circuits. LP 6 is fed from a 6kVA 600V/120-208 dry type transformer.

The motor starter is housed in a 1-section Motor Control Centre (MCC). The motor is rated for 600V, 40HP, non-inverter duty rated. A new variable frequency drive (VFD) was installed two (2) years ago and acts as the primary motor starter. Controls are in place to revert to the original motor starter in case of VFD failure.

Power wiring is installed in surface run metal conduits, with the exception of the pump, where the conduit was cast in the slab.

The electrical distribution system is showing signs of mild to moderate corrosion. The panels were reportedly installed in the early 1990s and appear to be in good condition. Consideration should be given to their replacement within the next 10 to 15 years. The conduits are moderately corroded and should be replaced in the near to medium term.

There is no back up power or provisions for connecting a portable generator at this site. At a minimum, a connection for a portable generator should be considered as part of any future upgrades.

Bonding is via a surface mount ground bar and appears to be in good condition.

The disconnect for the space heater is mildly corroded and should be replaced in the medium future.

The line side wiring of the main disconnect switch is showing signs of severe corrosion (Photo 14). The corrosion is not present on the load side of the main disconnect. It is recommended that the line side wiring be removed and the wiring terminals cleaned to remove the corrosion build-up. The opening in the panel where the line side cables enter does not appear to be properly sealed and may be causing condensation build up in the panel. This opening should be sealed. Note that this work should be coordinated with the local Utility, who has to remove power from the building prior to commencement of the work.

Photo 14: Well 6 - Severe corrosion on the line side wiring of the main disconnect box

It is understood that the pump shaft is showing signs of pitting and under advice from the well specialist the bonding wire was removed. It was believed that the pitting may have been caused by the grounding. The bonding and impedance of the boding paths should be checked and any issues rectified.

<u>Instrumentation and Controls</u>

The well equipment is controlled by a Bristol Babcock DPC 3330 Program Logic Controller (PLC) housed inside a control panel. Instrumentation consists of the following:

- Hach 1720E turbidimeter complete with a Hach SC100 controller;
- Two (2) Prominent Dulcometer chlorine analyzers – for free and total chlorine;
- Endress + Hauser Promag 50 series magnetic flowmeter;

- Ametek Drexelbrook level meter for the well;
- Endress + Hauser pressure transmitter;
- Bristol Babcock chart recorders.

The control panel was manufactured in the early 1990s. Replacement parts for the PLC are obsolete and no longer manufactured. The control panel should be replaced in the near future.

The instrumentation ranges in age from the early 1990s (chart recorders) to 2007 (chlorine analyzer) and appear to be in good condition.

Communication with Well 7 and 8 is via a dedicated phone line. Alarms are sent to Well 7 and 8 where they are dialled to the Operator.

Operations staff has indicated that, in the past, a fault is generated whenever there is a power loss on the chemical metering pumps requiring the pumps to be manually reset. To overcome this problem, a standalone Uninterupted Power Supply (UPS) was installed to feed both pumps. As part of future upgrades, consideration should be given to providing new pumps that do not have this problem. The UPS is a Powerware 120V 500VA rated unit and appears to be in good condition.

The instruments are not supported by the UPS power. UPS power to the instruments should be provided as part of upgrades to replace the PLC panel.

Lastly, no mechanical protection is in place for some of the control wiring. As part of upgrades to the control system, mechanical protection should be provided for new instrumentation wiring.

3.3.4 Summary – Well 6

Table 3 provides a summary of Well 6 Activities.

Table 3: Summary of Well 6 Activities

ACTIVITY	TIME FRAME	BUDGET ALLOWANCE
Structural/Architectural		
1. Replace exterior siding and add insulation	0 – 5 yr	$8,000
2. Replace door and frame	0 – 5 yr	$2,500
3. Remove and replace exterior caulking	0 – 5 yr	$500
4. Regrade around the facility	0 – 5 yr	$5,000
Mechanical		
1. Replacement of vertical turbine pump	10 – 20 yr	$30,000
2. Replacement/overhaul of piping/valves	Ongoing as required	Per present service/maintenance program
3. Replacement/overhaul of chemical injection system	10 – 20 yr	$10,000
4. Replacement/overhaul of ventilation system	Ongoing as required	Per present service/maintenance program
5. Replacement/overhaul of plumbing system	Ongoing as required	Per present service/maintenance program
6. Replacement/overhaul of chlorine contact chamber bands.	Ongoing as required	Per present service/maintenance program
Electrical/Instrumentation and Controls		
1. Replace electrical distribution	10 – 20 yr	$60,000
2. New PLC panel	0 – 5 yr	$50,000
3. UPS power and conduits/teck cable for instruments	0 – 5 yr	$40,000
4. Provide generator connection	0 – 5 yr	$5,000
5. Rectify corrosion problem with feeder wires	0 – 5 yr	< $5,000
6. Investigate bond/pitting problem with pump shaft	0 – 5 yr	$5,000

3.4 Wells 7 and 8

3.4.1 Structural/Architectural

The well building appears to consist of reinforced concrete foundation walls, masonry load bearing walls and a wood framed roof system with asphalt shingles on the sloped roof and modified bitumen roll roofing on the flat roofs. Exterior cladding consists of brick or vinyl siding.

No significant settlement or distress was observed during the on-site, at grade, observation of this facility and Operations staff has not reported any problems.

Some flaking of paint on the drywall ceiling was evident, indicating roof leakage on the flat roof area. Operations staff reported that leakage was occurring through the flat roof several years ago and the roof membrane was replaced and no further leakage has occurred. The asphalt roof shingles are starting to fail and should be replaced within the next three years (Photo 15).

Photo 15: Wells 7 and 8 - Asphalt roof shingles starting to fail

Exterior caulking around doors and wall openings was noted to be cracked and debonded (Photo 16). Removal and installation of new caulking is warranted to prevent any water infiltration and freeze-thaw damage.

Photo 16: Wells 7 and 8 - Cracked caulking

An asphalt laneway was observed to be in fair condition.

The galvanized perimeter chainlink fence appeared to be in good condition except for the three strand barbed wire which was severely corroded. Replacing the barbed wire within the next five years is recommended.

3.4.2 Mechanical

Process System

Wells 7 and 8 were drilled in 1990 and 1991, respectively. The wells are 254 mm diameter, 79.2 m deep drilled groundwater wells equipped with vertical turbine pumps. A masonry building houses the following equipment:

- Two (2) vertical turbine, lineshaft type pumps with rated capacity of 19.0 L/s at 71.0 m TDH (301 gpm at 233 ft.), 47.8 m (156.8 ft.) long suction assembly, 150 mm discharge flange, driven by 25 HP motor at 1800 rpm. The pump manufacturer: Goulds, size 8RJHC with 9 stages.
- Stainless steel discharge piping includes (sequentially from the Well Pump 7 discharge):
    - Pump discharge pressure gauge;
    - Raw water turbidity sampling connection;
    - 200 mm tee fitting with take-off branch completed with a blind flange;
    - Automatic air/vacuum relief valve;
    - 200 mm globe style silent check valve;
    - 200 mm gate type isolation valve;
    - 200 mm Endress and Hauser electro-magnetic flow meter;
    - Sodium hypochlorite injection connection;
    - 200 mm 45º lateral connection to 200 mm common discharge header; and
    - Various copper tubing take-offs to various instrumentation devices;
- Stainless steel discharge piping includes (sequentially from the Well Pump 8 discharge):
    - Pump discharge pressure gauge;
    - Raw water turbidity sampling connection;
    - 200 mm tee fitting with take-off branch completed with a blind flange;
    - Automatic air/vacuum relief valve;
    - 200 mm globe style silent check valve;
    - 200 mm gate type isolation valve;
    - 200 mm Endress and Hauser electro-magnetic flow meter;
    - Sodium hypochlorite injection connection;
    - 200 mm 45º lateral connection to 200 mm common discharge header; and
    - Various copper tubing take-offs to various instrumentation devices.
- Stainless steel common header discharge piping includes:

- Automatic air/vacuum relief valve (commercial hydronic heating system type);
- 200 mm diameter static flow mixer;
- Raw water turbidity sampling connection;
- 200 mm gate type PS isolation valve;
- Flanged connection to buried distribution piping; and
- Various copper tubing take-offs to various instrumentation devices.

- One raw water turbidity meter including copper and PVC rigid and flexible tubing, and valves.
- Sodium hypochlorite water disinfection system including two (2) 200 L storage tanks, four chemical metering pumps, two feed controllers, and PVC rigid and flexible tubing and valves.
- Chlorine residuals sensors including copper and PVC flexible tubing and valves.

The following modification and equipment replacement were reported to take place since 1992:

- 2002: Sodium hypochlorite system installed.
- 2005: Entire suction column assembly of Well Pump 8, including lineshaft and bowls, replaced. As reported by the Operator, the replaced suction column assembly had significant rust pilling off. The corrosion of the replaced pump suggests that a pump in service for 15 years should be considered for replacement at this site.
- 2006: One (1) turbine type flow meter on common header replaced with two (2) 200 mm dia. electro-magnetic meter, one for each pump.
- 2011: 200 mm check valves replaced.
- 2012: Two (2) sodium hypochlorite system panels (including new chemical metering pumps) are scheduled for replacement.

Both existing raw water pump, motor, and discharge piping, including valves and instrumentation appear to be in good working condition. Some unprotected carbon steel bolts, mainly at flanged connections, show signs of surface rust but are considered to be minor. If deeper rust penetrations are observed, the bolts can be replaced under regular service/maintenance program.

It was reported that during hot humid periods (summer seasons), condensation on raw water piping can be observed. It is normal occurrence that moisture suspended in the air condenses on cold surface (the ground water temperature was reported to be roughly 8° C all year around). This issue is typically resolved by insulating cold water piping.

The sodium hypochlorite feeding system appears in good working condition, thus, only regular service/maintenance program is recommended.

Copper tubing feeding sampling instrumentation does not meet current guidelines and should be replaced (e.g., stainless steel tubing).

Small flexible tubing in chemical injection system appears to have too much slack and is subject to damage. More supports are recommended what could be implemented under regular service/maintenance program.

Ventilation and Heating Systems

The ventilation and heating systems consists of:

- an exterior mounted side wall exhauster completed with back draft damper,
- outside air intake louver completed with motorized damper, and
- an electric unit heater with built-in thermostat provides heat as required.

The ventilation and heating systems appear to be in good working condition. It is recommended to run ventilation system continuously to ensure that chlorine vapours are exhausted from the building to prevent corrosion of various carbon steel components in the pumping station, e.g. flange bolts, building door frame, etc.

There is also a sodium hypochlorite containers storage room without any ventilation. It is recommended to install a ventilation system dedicated to this room.

There is also a small control room, where the Operators spend some time on daily, without any ventilation. It is recommended to install a small ventilation system dedicated to this room.

Plumbing

A plastic residential style laundry tub receives drain discharge from water sampling devices. The tub drain pipe (PVC) penetrates floor slab, and connects to building drain system.

Visual Observation and Concerns

The tub and drain appear to be in good condition. Also, it was reported that during hot humid periods (summer seasons), condensation occurs on cold surfaces. As indicated above, condensation can be eliminated by insulating cold water piping.

Chlorine Contact Chamber

The chlorine contact chamber for Wells 7 and 8 was installed in 1992 and consists of a 1,200 mm diameter high pressure concrete pipe that is approximately 128 m long. Based on a useful life of 60 years, the chamber has approximately 40 more years of service life. It has been reported however that pipe bands have broken at other sites, warranting a regular maintenance program.

3.4.3 Electrical/Instrumentation and Controls

Electrical

Well 7 and 8 is serviced by a 600V, 3-phase 4-wire electrical supply from the nearby utility pole on the side of the street. The Hydro meter is rated for 200A.

The 600V power distribution is via Power Panel (PP) 7. DP 7 is a 347V/600V rated, 225A, 3-phase, 4-wire distribution panel, complete with 42 circuits.

The 120V/208V power distribution is via Lighting Panel (LP) 7. LP 7 is a 240V rated, 100A, 3-phase, 4-wire panelboard, complete with 42 circuits. LP 7 is fed from a 30kVA 600V/120-208 dry type transformer.

The motor starters are housed in a 2-section Motor Control Centre (MCC). Each motor is rated for 600V, 25HP, non-inverter duty rated.

Power wiring is installed in surface run metal conduits, with the exception of the pump, where the conduit was cast in the slab.

The panels in the electrical room were installed in the early 1990s and appear to be in good condition. Consideration should be given to their replacement within the next 10 to 15 years. There appears to be mild to moderate corrosion of some of the equipment and conduits in the pump area. Note that there is a door between the pump area and the adjoining chlorine room.

There is no back up power available at this location. However, provisions are in place for connecting a portable generator.

Bonding is via a surface mount ground bar in the electrical room and appears to be in good condition.

The disconnect for the space heating appears to be in good condition. Space heating inside the chemical room is via a 5kW, 240V electric unit heater, which is operational but is showing some signs of corrosion.

Instrumentation and Controls

The well equipment is controlled by a Bristol Babcock DPC 3330 Programmable Logic Controller (PLC) housed inside a control panel. A second panel, houses remote input/output for the PLC. Instrumentation consists of the following:

- Two (2) Hach 1720E turbidimeters complete with one (1) Hach SC100 controller;
- Two (2) Prominent Dulcometer chlorine analyzers – for free and total chlorine;
- Endress + Hauser Promag 50 series electro-magnetic flowmeter;
- Ametek Drexelbrook level meter for each well;

- Endress + Hauser pressure transmitter;
- Bristol Babcock chart recorders.

The control panel was manufactured in the early 1990s. Replacement parts for the PLC are no longer manufactured. The control panel should be replaced in the near future.

The instrumentation ranges in age from the early 1990s (chart recorders) to 2007 (chlorine analyzer) and appear to be in good condition.

Communication with the other wells is via dedicated phone lines. Alarms are dialled from this location.

It is understood that a chemical metering panel has recently been purchased and will replace the existing one, which is approximately eight years old.

The SCADA computer is approximately six years old and is showing signs of aging. The computer should be replaced in the near future. The SCADA software is Wonderware Intouch.

The instruments are not supported by the Uninterupted Power Supply (UPS) power. UPS power to the instruments should be provided as part of upgrades to replace the PLC panel.

No mechanical protection is in place for some of the control wiring. As part of upgrades to the control system, mechanical protection should be provided for new instrumentation wiring.

3.4.4 Summary – Wells 7 and 8

Table 4 provides a summary of Wells 7 and 8 Activities.

Table 4: Summary of Wells 7 and 8 Activities

ACTIVITY	TIME FRAME	BUDGET ALLOWANCE
Structural/Architectural		
1. Replace asphalt roof shingles	5 – 10 yr	$6,000
2. Remove and replace caulking	0 – 5 yr	$1,000
3. Remove and replace fence barbed wire	5 – 10 yr	$1,250
Mechanical		
1. Replacement of vertical turbine Well Pump 7	0 – 5 yr	$40,000
2. Replacement of vertical turbine Well Pump 8	10 – 20 yr	$40,000
3. Replacement/overhaul of piping / valves	Ongoing as required	Per present service/maintenance program
4. Replacement/overhaul of chemical injection system	10 – 20 yr	$20,000
5. Replacement/overhaul of ventilation system. Review provisions for storage and control room ventilation.	0 – 5 yr	$30,000 Per present service/maintenance program
6. Replacement/overhaul of plumbing system	Ongoing as required	Per present service/maintenance program
7. Replacement/overhaul of chlorine contact chamber bands.	Ongoing as required	Per present service/maintenance program
Electrical/Instrumentation and Controls		
1. Replace electrical distribution	10 – 20 yr	$100,000
2. New PLC panel	0 – 5 yr	$65,000
3. UPS power and conduits/teck cable for instruments	0 – 5 yr	$45,000
4. Replace SCADA computer	0 – 5 yr	$75,000

3.5 Elevated Storage Tank

The elevated storage tank consists of a reinforced concrete pipe structure with a cylindrical steel elevated tank.

No problems of a structural concern were readily evident during the on-site, at grade, observation of this facility and Operations staff has not reported any problems.

The exterior tank finish and interior tank membrane, safety and process piping systems were inspected by Landmark Municipal Services in November 2011. Refer to Appendix A for a copy of the Inspection Report. Key recommendations include a new overcoat system for the tank exterior, a new lining system for the tank interior, and other miscellaneous repairs (e.g. ladder /fall arrest upgrades).

An additional observation made was that the required clearance in front of some electrical equipment inside the utility room is not in place. At the time of the visit, there was a pool of water beneath the electrical distribution panels (Photos 17 and 18). The water may be a result of condensation from the process piping installed in the same room. This poses a safety issue for the personnel working on the electrical panels. Ideally the panels should be located in a separate dry area.

As part of any major upgrades the panels should be relocated to a separate dry area, where the required clearances can be observed.

Photo 17: Elevated Storage Tank – Electrical clearance and water ponding concern

Photo 18: Elevated Storage Tank – Electrical clearance and water ponding concern

Table 5 provides a summary of the elevated storage tower activities.

Table 5: Summary of Elevated Storage Tower Activities

ACTIVITY	TIME FRAME	BUDGET ALLOWANCE
Structural/Architectural		
1. Miscellaneous Repairs per Landmark Report	0 – 5 yr	$350,000 (budget to be confirmed)
2. Overcoat per Landmark Report	0 – 5 yr	
3. Interior Coating System per Landmark Report	0 – 5 yr	
Electrical/Instrumentation and Controls		
1. Relocate electrical distribution	0 – 5 yr	$50,000 (budget to be confirmed)

3.6 Water Distribution System

The condition of the distribution system was not evaluated as part of this undertaking. The distribution system consists mainly of below grade infrastructure that cannot be directly observed. Hydrants and valves can be observed but were not evaluated as part of this undertaking. Hydrants are generally maintained on a regular basis by the fire department and include flow tests.

In general, about 20 percent of watermains (approximately 7 km) are over 70 years old and have exceeded their useful life and may be in need of replacement in the near future. Refer to Appendix B for a watermain spreadsheet which outlines the material, age, and estimated useful lifetime of all watermains within the Town of Mississippi Mills (Almonte Ward). Broken watermains do occur on occasion and these are repaired as they occur. In 2009 and 2010, 47 watermains were reportedly repaired (refer to Figure 1 for a location plan of the watermain breaks).

An opinion of probable cost was developed as an estimate for watermain replacement costs due to age and expected useful lifetime. The costs were developed for timeframes which correspond to sections of watermains that are or will be beyond their useful life and may be in need of replacement. Refer to Table 6 for a summary of watermain replacement costs. It is noted that a structural relining program could be considered, where applicable, as a method to reduce costs. Feasibility of this type of program may depend on adjacent sewer conditions, trench locations, operating history, number of connections, hydraulic sizing, etc.

Table 6: Watermain Replacement Costs

Timeframe	Total Length	Pipe Size Range(1)	Unit Cost Range(1)	Opinion of Probable Cost(2)	Engineering and Contingency (25%)	Total Cost
Existing Deficit	7.0 km	150 mm to 200 mm	$600/m to $736/m	$ 4,330,000	$ 1,083,000	$ 5,412,000
5 – 10 yr	1.8 km	150 mm	$600/m	$ 1,038,000	$ 260,000	$ 1,298,000
10 – 20 yr	7.8 km	100 mm to 250 mm	$170/m to $740/m	$ 4,654,000	$ 1,164,000	$ 5,818,000
			TOTAL	**$10.0 M**	**$ 2.5 M**	**$ 12.5 M**

(1) Also includes service pipes, 25 mm to 50 mm at $80/m to $168/m
(2) Includes for pipe replacement and 4 m width road reinstatement

4.0 WASTEWATER SYSTEM CONDITION ASSESSMENT

4.1 Sewage Treatment Plant / Lagoon

As noted in previous sections, the existing four-cell facultative lagoon system is currently being decommissioned and the construction of a new extended aeration activated sludge sewage treatment plant (STP) with a design average daily treatment capacity of 4,700 m^3/d and peak treatment capacity of 14,100 m^3/d is underway.

The new STP will include bar screens, grit removal, aeration tanks, secondary clarifiers, tertiary sand filters, UV disinfection facilities complete with sludge and biosolids dewatering, treatment and storage. One of the existing lagoon cells will be converted to a peak flow attenuation storage cell to accommodate peak flows conveyed to the STP during wet weather events. The new STP will also include a septage receiving station. Construction is expected to be completed by June 30, 2012. The new facility will service the community for the next 20 years.

4.2 Gemmill's Bay Sewage Pumping Station

The Gemmill's Bay SPS is currently undergoing a complete retrofit as part of the new STP project including installation of a bar screen, three (3) new centrifugal pumps, new valves, back-up power generator and a new forcemain to convey wastewater to the new WWTP (in construction). Construction is anticipated to be completed by June 30, 2012. The upgraded facility will service the community for the next 20 years.

4.3 White Tail Ridge Sewage Pumping Station

It is noted that White Tail Ridge Sewage Pumping Station was installed recently and, as such, was not included as part of the condition assessment review.

4.4 Spring Street Sewage Pumping Station

4.4.1 Structural/Architectural

The walls, base and roof of the two below-grade structures consist of reinforced concrete.

No problems of a structural nature were readily evident during the on-site, at grade, observations of the facility and Operations staff did not report any problems.

Corrosion was noted on the access hatch cover and miscellaneous embedded steel items on the roof of the pump structure. These items should be painted with a zinc rich paint to minimize future corrosion.

Photo 19: Spring Street SPS

4.4.2 Mechanical

Process System

The Spring Street SPS was originally constructed in 1989 as a concrete dry well / concrete wet well application. The SPS is equipped with:

- Two vertical in-line centrifugal pumps (one replaced in 1997 and the second replaced in 2006) and process piping. The rated capacities of the pumps were not available on the day of investigation.
- Check and isolation valves for each pump (replaced approximately five years ago).

It is understood that the Spring Street SPS will be upgraded or replaced in the near future to accommodate additional servicing of new development. As such the pumps and associated appurtenances will be replaced as part of the pending expansion / upgrades project.

Ventilation and Heating Systems

Not applicable.

<u>Plumbing</u>

Not applicable.

4.4.3 Electrical/Instrumentation and Controls

Electrical service is via a 240V, 3-phase delta supply, from the nearby utility pole. The panels were installed in the 1970s and are at the end of their useful life and as such, should be replaced. As suggested above, the panels will be replaced as part of the pending expansion / upgrades project.

4.4.4 Summary – Spring Street Sewage Pumping Station

Table 7 provides a summary of Spring Street SPS Activities.

Table 7: Summary of Spring Street Sewage Pumping Station Activities

ACTIVITY	TIME FRAME	BUDGET ALLOWANCE
<u>Mechanical</u>		
1. SPS Upgrade	5 – 10 yr	$500,000 (budget to be confirmed based on potential cost sharing)
2. Replacement / overhaul of piping / valves	On going as required	Per present service / maintenance program
<u>Electrical/Instrumentation and Controls</u>		
1. New electrical and controls	5 – 10 yr	Included in SPS Upgrade

4.5 Christian Street Sewage Pumping Station

4.5.1 Structural/Architectural

The circular walls of the below grade structure appears to be of fibreglass reinforced plastic (FRP) construction. The roof cover consists of aluminum checkerplate.

No problems of a structural nature were readily evident during our on-site, at grade, site visit of the facility and Operations staff has not reported any problems.

Three plastic, concrete-filled bollards exist around the facility. One of the plastic bollards is cracked and damaged and could be replaced with a more robust galvanized steel type bollard (Photo 20).

Photo 20: Christian Street SPS - Damaged bollard

4.5.2 Mechanical

<u>Process System</u>

A new Pre-Fabricated Fiberglass Rainforced Plastic (FRP) wet well with stainless steel cover packaged pumping station (PS) was installed in 2010 (reported by the Operator). The PS is equipped with:

- Two (2) submersible pumps (one lead, one lag) with slide rails and lifting chains. As reported, the Myers pumps are equipped with either 0.5 or 0.75 HP motors. The duty points were not available on the day of investigation.
- 100 mm dia. PVC discharge piping including check valve and isolation ball valve for each pump.
- Float type pump control system.
- Level monitoring alarm system with automatic dial-out.

The pumping station is approximately one year old and appears to be in good working condition. Regular service and maintenance program is recommended.

<u>Ventilation and Heating Systems</u>

Not applicable.

<u>Plumbing</u>

Not applicable.

4.5.3 Electrical/Instrumentation and Controls

Electrical service is via a 240V, supply, from the nearby utility pole. The panels were installed in 2010 and are in good condition.

An outlet for connection to a portable generator is available.

Communication with Well 7 and 8 is via radio.

There are no intrinsic barriers in place for the level signals from the wet well and should be provided.

The panel temperature is not being monitored. Ideally, the panel temperature should be monitored as the equipment housed inside the panel is sensitive to temperature extremes.

4.5.4 Summary – Christian Sewage Pumping Station

Table 8 provides a summary of Christian Street SPS Activities.

Table 8: Summary of Christian Street Sewage Pumping Station Activities

ACTIVITY	TIME FRAME	BUDGET ALLOWANCE
Structural/Architectural		
1. Install robust bollards	10 – 20 yr	$1,000
Mechanical		
1. Replacement of submersible pumps	10 – 20 yr	$5,000
2. Replacement/overhaul of piping/valves	Ongoing as required	Per present service/maintenance program
Electrical/Instrumentation and Controls		
1. Intrinsic barriers and temperature monitoring	0 – 5 yr	$5,000

4.6 Hope and Glass Streets Sewage Pumping Station

4.6.1 Structural/Architectural

The walls and roof of the below grade structure consist of reinforced concrete construction. A steel checkerplate floor within the pumping station supports the two pumps. Extensive top surface corrosion was noted on the checkerplate (Photo 21). The extent of corrosion on the plate should be reviewed. If the structural integrity of the plate has not been compromised, the checkerplate should be painted with zinc rich paint to extend its service life. The exposed steel access hatch had nominal surface corrosion. The hatch should be painted periodically with a zinc rich paint to extend its service life.

Photo 21: Hope and Glass Streets SPS - Surface corrosion on checkerplate

No significant settlement or distress was observed during the on-site, at grade, observation of this facility and Operations staff has not reported any problems.

4.6.2 Mechanical

The Hope and Glass Streets SPS was originally constructed in the late 1970s as a wet well / dry well combination unit. The SPS is equipped with:

- Two vertical turbine centrifugal pumps (one installed in 2005 and the second installed in 2007). Each pump is equipped with 100 HP motors. The duty points were not available on the day of investigation.
- 3-inch galvanized steel process piping (replaced in 1998).
- Check and isolation valves for each pump (replaced in 1998).

The steel discharge pipes showed surface rust (Photo 22). It is recommended that these be replaced in the near future. Regular service and maintenance program is also recommended.

Photo 22: Hope and Glass Streets SPS - Surface rust on the steel discharge pipes

<u>Ventilation and Heating Systems</u>

Not applicable.

<u>Plumbing</u>

Not applicable.

4.6.3 Electrical/Instrumentation and Controls

Electrical service is via a 240V, supply, from the nearby utility pole. The panels were installed in the 1970s and are at the end of their useful life and as such, should be replaced (Photo 23).

There is no back up power or provisions for connecting a portable generator at this site. At a minimum, a connection for a portable generator should be considered as part of future upgrades.

Photo 23: Hope and Glass Streets SPS - Electrical panels installed in the 1970s

4.6.4 Summary – Hope and Glass Streets Sewage Pumping Station

Table 9 provides a summary of Hope and Glass Streets SPS Activities.

Table 9: Summary of Hope and Glass Streets Sewage Pumping Station Activities

ACTIVITY	TIME FRAME	BUDGET ALLOWANCE
Structural/Architectural		
1. Paint or replace interior support plate (further study required)	0 – 5 yr	$7,500
Mechanical		
1. Replace pumps	10 – 20 yr	$30,000 To be confirmed based on pump sizing
2. Replacement of rusty discharge pipes	0 – 5 yr	$7,500
3. Replacement/overhaul of piping/valves	Ongoing as required	Per present service/maintenance program
Electrical/Instrumentation and Controls		
1. New electrical and controls	0 – 5 yr	$200,000
2. Provide generator connection	0 – 5 yr	$5,000

4.7 Island Sewage Pumping Station

4.7.1 Structural/Architectural

The walls and roof of the below grade structure consists of steel construction. It would appear that some form of cathodic protection system has been applied to the tank structure to reduce corrosion. Further structural review is recommended to evaluate the integrity of the structure.

No problems of a structural nature were readily evident during the on-site, at grade, observation of the facility and Operations staff has not reported any problems.

Corrosion was observed on the exposed access hatches (Photo 24). These hatches should be painted within the next three years with a zinc rich paint.

Photo 24: Island SPS - Corrosion on exposed access hatches

4.7.2 Mechanical

The Island SPS was originally constructed in the 1970s as a steel dry well / concrete wet well application. The SPS is equipped with:

- Two vertical centrifugal pumps (each replaced in 1990). The HP and duty point of the pumps were not available on the day of investigation.
- 6-inch steel process piping (replaced in 1995).
- Check and isolation valves for each pump (replaced in 1995 with one check valve installed in 2004).

The pumps are reportedly operating well. The pumps are over 15 years old and are recommended for replacement in the near future.

Ventilation and Heating Systems

Not applicable.

Plumbing

Not applicable.

4.7.3 Electrical/Instrumentation and Controls

The Island SPS is serviced by a 600V, 3-phase 4-wire electrical supply from the nearby utility pole on the side of the street. The Hydro meter is rated for 200A.

The panels were installed within the last six months and are in good condition.

Communication with Well 7 and 8 is via radio.

There is no back up power or provisions for connecting a portable generator at this site. At a minimum, a connection for a portable generator should be considered as part of future upgrades.

Panel temperature monitoring should be provided, if not in place.

Intrinsic barriers should be provided for the level sensors, if not in place.

It is understood that the old panels are still in service and will be decommissioned shortly.

4.7.4 Summary – Island Sewage Pumping Station

Table 10 provides a summary of Island SPS Activities.

Table 10: Summary of Island Sewage Pumping Station Activities

ACTIVITY	TIME FRAME	BUDGET ALLOWANCE
Structural/Architectural		
1. Paint exposed steel hatches	0 – 5 yr	$1,000
Mechanical		
1. Replace pumps	5 – 10 yr	$30,000 To be confirmed based on pump sizing
2. Replacement/overhaul of piping/valves	Ongoing as required	Per present service/maintenance program
Electrical/Instrumentation and Controls		
1. Intrinsic barriers and temperature monitoring	0 – 5 yr	$5,000

4.8 Robert Street Sewage Pumping Station

4.8.1 Structural/Architectural

The walls, base and roof of the below grade structure consists of reinforced concrete.

No significant settlement or distress was observed during the on-site, at grade, observation of this facility and Operations staff has not reported any problems.

The painted access hatch cover, embedded steel plates and embedded hatch frame are corroded (Photo 25). A zinc rich paint should be applied to the corroded surfaces.

The electrical panel steel support frame is corroded. A zinc rich paint should be applied to the support frame.

Photo 25: Robert Street SPS - Corroded access hatch cover

4.8.2 Mechanical

The Robert Street SPS was originally constructed in the 1980s as a single concrete well structure. The SPS is equipped with:

- Two submersible pumps (each replaced in 1997). Each pump is equipped with 1.6 HP motors. The duty point of the pumps were not available on the day of investigation.
- 4-inch steel process piping (replaced in 2002).
- Check and isolation valves for each pump (replaced in 2002).

The pumps are in good condition. It is recommended that the discharge piping and valves be replaced in approximately five years. Regular service and maintenance program is also recommended.

Photo 26: Robert Street SPS - Interior

Ventilation and Heating Systems

Not applicable.

Plumbing

Not applicable.

4.8.3 Electrical/Instrumentation and Controls

Electrical service is via a 240V, supply, from the nearby utility pole. The panels were installed in the 1970s and are at the end of their useful life and as such, should be replaced (Photo 27).

There is no back up power or provisions for connecting a portable generator at this site. At a minimum, a connection for a portable generator should be considered as part of future upgrades.

Photo 27: Robert Street SPS – Electrical panel installed in the 1970s

4.8.4 Summary – Robert Street Sewage Pumping Station

Table 11 provides a summary of Robert Street SPS Activities.

Table 11: Summary of Robert Street Sewage Pumping Station Activities

ACTIVITY	TIME FRAME	BUDGET ALLOWANCE
Structural/Architectural		
1. Paint exposed steel items	0 – 5 yr	$1,000
Mechanical		
1. Replace pumps	10 – 20 yr	$10,000 To be confirmed based on pump sizing
2. Replacement of discharge pipes and valves	5 – 10 yr	$10,000
Electrical/Instrumentation and Controls		
1. New electrical and controls	0 – 5 yr	$200,000
2. Generator connection	0 – 5 yr	$5,000

4.9 Collection System

The condition of the collection system was not evaluated as part of this undertaking. The collection system consists mainly of below grade infrastructure that cannot be directly observed. Manholes can be observed but were not evaluated as part of this undertaking.

In general, about 27 percent of the collection system has exceeded its useful lifetime (approximately 8 km) and may be in need of replacement in the near future. Refer to Appendix C for a sanitary sewer inventory which outlines the material, age, and estimated useful lifetime of all sanitary sewers within the Town of Mississippi Mills.

An opinion of probable cost was developed as an estimate for sanitary sewer replacement costs due to age and expected useful lifetime. The costs were developed for timeframes which correspond to sections of sanitary sewers that are or will be beyond their useful life and may be in need of replacement. Refer to Table 12 for a summary of sanitary sewer replacement costs. Similarly as with water distribution piping, a structural relining program could be considered, where applicable, as a method to reduce costs. Feasibility of this type of program may depend on adjacent sewer conditions, trench locations, operating history, number of connections, hydraulic sizing, etc.

Table 12: Sanitary Sewer Replacement Costs

Timeframe	Total Length	Pipe Size Range	Unit Cost Range	Opinion of Probable Cost(1)	Engineering and Contingency (25%)	Total Cost
Existing Deficit	7.5 km	200mm to 600mm	$544/m to $1076/m	$ 4,752,000	$ 1,188,000	$ 5,940,000
0 – 5 yr	1.9 km	200mm to 250mm	$544/m to $654/m	$ 1,091,000	$ 273,000	$ 1,364,000
5 – 10 yr	1.9 km	200mm to 375mm	$544/m to $654/m	$ 1,084,000	$ 271,000	$ 1,355,000
10 – 20 yr	1.0 km	200mm to 450mm	$544/m to $806/m	$ 574,000	$ 144,000	$ 718,000
			TOTAL	**$ 7.5 M**	**$ 1.9 M**	**$ 9.4 M**

(1) Includes for pipe replacement and 4 m width road reinstatement

5.0 SUMMARY AND GENERAL RECOMMENDATIONS

Discipline-specific costing has been developed throughout the Report. This Section will serve as a summary of such costs, and will divide them into five separate categories; costs for activities that are recommended to be completed immediately (i.e., existing deficit), within 5 years (0 – 5 yr), 10 years (5 – 10 yr) and 20 years (10 – 20 yr). It is noted that activities that are to be completed “ongoing as required” such as the replacement of piping and valves are not illustrated in this section, but should be included as part of the overall budget as per the regular service / maintenance program.

This is an opinion of probable costs (OPC) for the described construction as of the date of this Report. It is not a prediction of the low tender price. Tendered prices will be influenced by factors such as the tenderers' methods of pricing and/or interpretations of their probable effort, current or pending projects by others and level of competitiveness in the market at the time of tender, availability of labour and materials, etc., which are not within our control, knowledge and/or ability to predict.

Note that this OPC does not include costs for equipment or other infrastructure that would be required for an increase in capacity. The OPC only considers what would be required to refurbish the existing facility with comparable equipment. In addition, engineering fees and costs internal to the Town have not been considered in the OPC.

Table 13: Summary of Water Facilities Costs

Timeframe	Facility	Budget Allowance(1)
0 - 5 yr	Well 3	$ 97,500
	Well 5	$ 102,000
	Well 6	$ 113,500
	Wells 7 and 8	$ 256,000
	Elevated Storage Tower	$ 400,000 (2)
	Subtotal	**$ 851,500**
5 - 10 yr	Well 3	$ 1,500
	Well 6	$ 2,500
	Wells 7 and 8	$ 7,250
	Subtotal	**$ 11,250**
10 – 20 yr	Well 3	$ 120,000
	Well 5	$115,000
	Well 6	$ 100,000
	Wells 7 and 8	$160,000
	Subtotal	**$ 495,000**

(1) Does not include for activities recommended in the report to be completed 'ongoing as required'. These activities should be budgeted for as per the regular service / maintenance program.
(2) Allowance of $ 350,000 carried for overcoat and interior coating system (including other miscellaneous repairs – e.g., drain pipe) and $50,000 for relocating the electrical distribution, budget to be confirmed.

Table 14: Summary of Distribution System Costs

Timeframe	Total Cost(1)
Existing Deficit	$ 5,412,000
5 – 10 yr	$ 1,298,000
10 – 20 yr	$ 5,818,000
(1) Includes for 25% engineering and contingency fees	

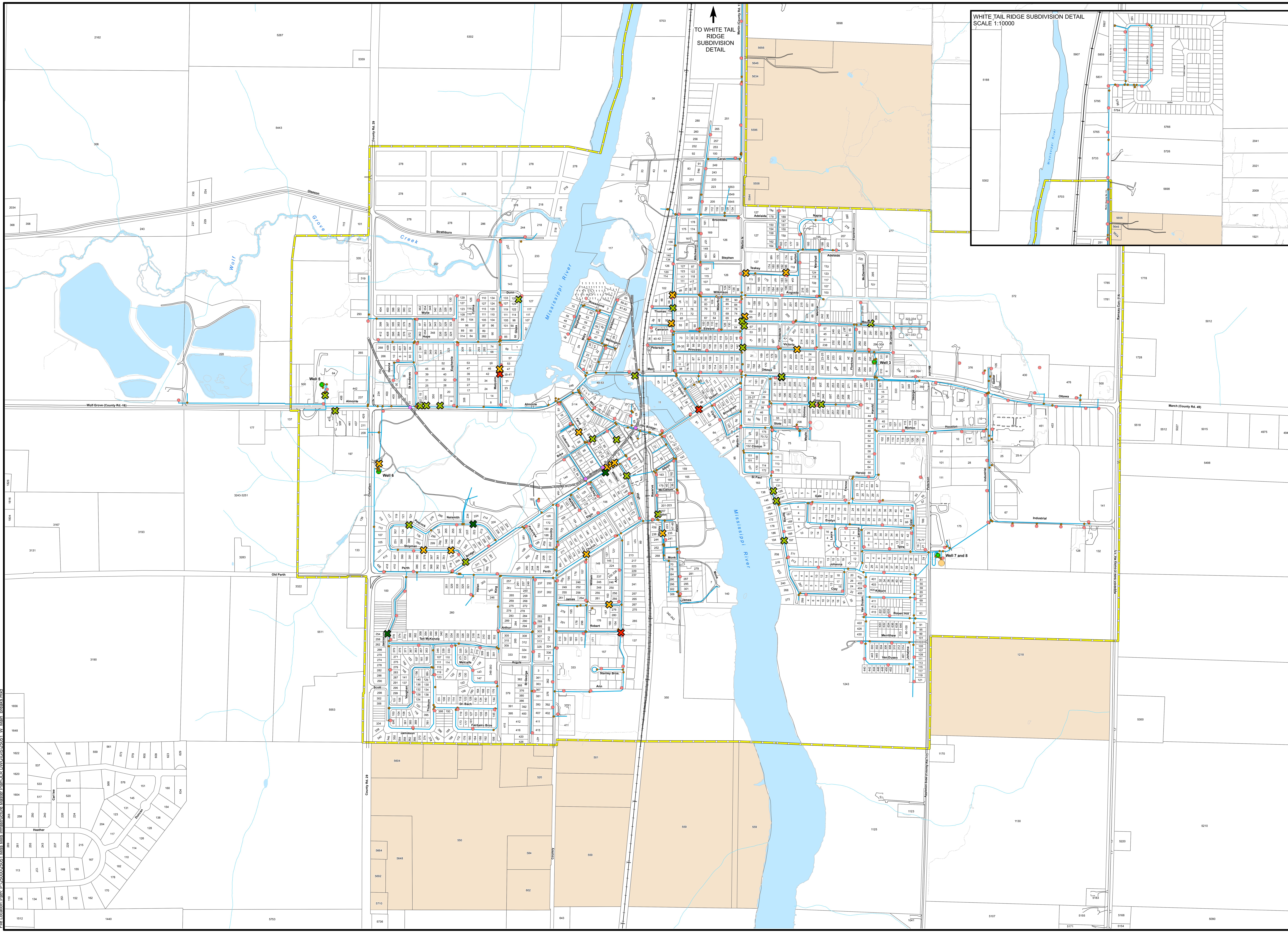
Table 15: Summary of Wastewater Facilities Costs

Timeframe	Facility	Budget Allowance(1)
0 - 5 yr	Christian Street SPS	$ 5,000
	Hope and Glass Streets SPS	$ 220,000
	Island SPS	$ 6,000
	Robert Street SPS	$ 206,000
	Subtotal	**$ 443,000**
5 - 10 yr	Spring Street SPS	$ 500,000(2)
	Island SPS	$ 30,000
	Robert Street SPS	$10,000
	Subtotal	**$ 540,000**
10 – 20 yr	Christian Street SPS	$ 6,000(3)
	Hope and Glass Streets SPS	$ 30,000
	Robert Street SPS	$10,000
	Subtotal	**$ 46,000**

(1) Does not include for activities recommended in the report to be completed 'ongoing as required'. These activities should be budgeted for as per the regular service / maintenance program.
(2) Capacity Upgrade; Budget to be confirmed based on potential cost sharing.
(3) Allowance for pump replacement, to be confirmed based on pump sizing.

Table 16: Summary of Collection System Costs

Timeframe	Total Cost(1)
Existing Deficit	$ 5,940,000
0 – 5 yr	$ 1,364,000
5 – 10 yr	$ 1,355,000
10 – 20 yr	$ 718,000
(1) Includes for 25% engineering and contingency fees.	



LEGEND:

Water Main Breaks (Year)

- 2011
- 2010
- 2009
- 2008
- Pressure Reducing Valve
- Fire Hydrant
- Valve
- Well
- Water Tower
- Stream / Creek
- Watermain
- Pressure Zone
- Railway
- Almonte Ward Limits
- Parcel Fabric
- Water Body
- Future Expansion Area Almonte Ward

NO.	ISSUE	DATE

SCALE: 1:6,000

0 50 100 200 300 400 Meters

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PROFESSIONAL STAMP

PROJECT NORTH

PROJECT:

ALMONTE INFRASTRUCTURE MASTER PLAN

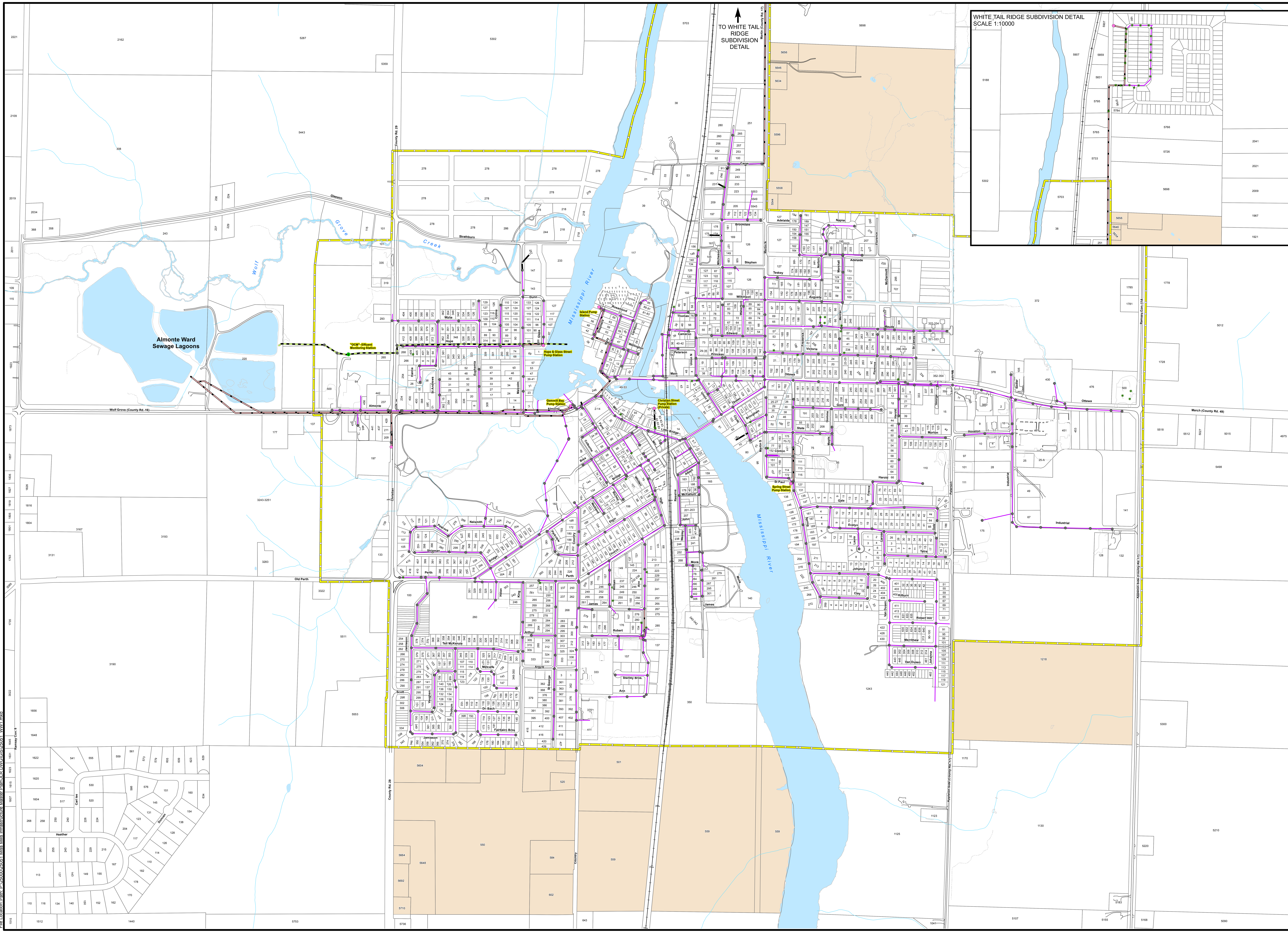
MISSISSIPPI MILLS, ONTARIO

DRAWING:

TOWN OF MISSISSIPPI MILLS ALMONTE WARD WATER SYSTEM (WATERMAIN BREAKS)

DESIGN:	L.S.	DRAWING NO.:	FIGURE 1
DRAWN:	K.T.K.		
CHECKED:	S.G.	JLR NO:	25051
PLOTTED:	01/25/2012		

File Location Path: P:\25000\25051 Miss Mills Infrastructure Master Plan\JLR DWG\GIS\25051_W_Main_Breaks.mxd



LEGEND:

- Monitoring Station
- Pumping Station
- Sanitary Manhole
- Cleanout
- Forcemain
- Lagoon Outfall
- Private Forcemain
- Sanitary Sewer
- Stream / Creek
- Railway
- Almonte Ward Limits
- Parcel Fabric
- Water Body
- Future Expansion Area

Almonte Ward

NO.	ISSUE	DATE

SCALE: 1:6,000

0 50 100 200 300 400 Meters

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

J.L. Richards & Associates Limited
864 Lady Ellen Place
Ottawa, ON Canada
K1Z 5M2
Tel: 613 728 3571
Fax: 613 728 6012

PROFESSIONAL STAMP

PROJECT NORTH

PROJECT:

ALMONTE INFRASTRUCTURE MASTER PLAN

MISSISSIPPI MILLS, ONTARIO

DRAWING:

TOWN OF MISSISSIPPI MILLS ALMONTE WARD WASTEWATER SYSTEM

DESIGN:	K.W.	DRAWING NO.:	FIGURE 2
DRAWN:	K.T.K.		
CHECKED:	S.G.	JLR NO:	25051
PLOTTED:	01/25/2012		

A P P E N D I X A

Almonte Composite Elevated Tank – Clean, Inspection & Report
(Landmark Municipal Services, Fall 2011)

LANDMARK
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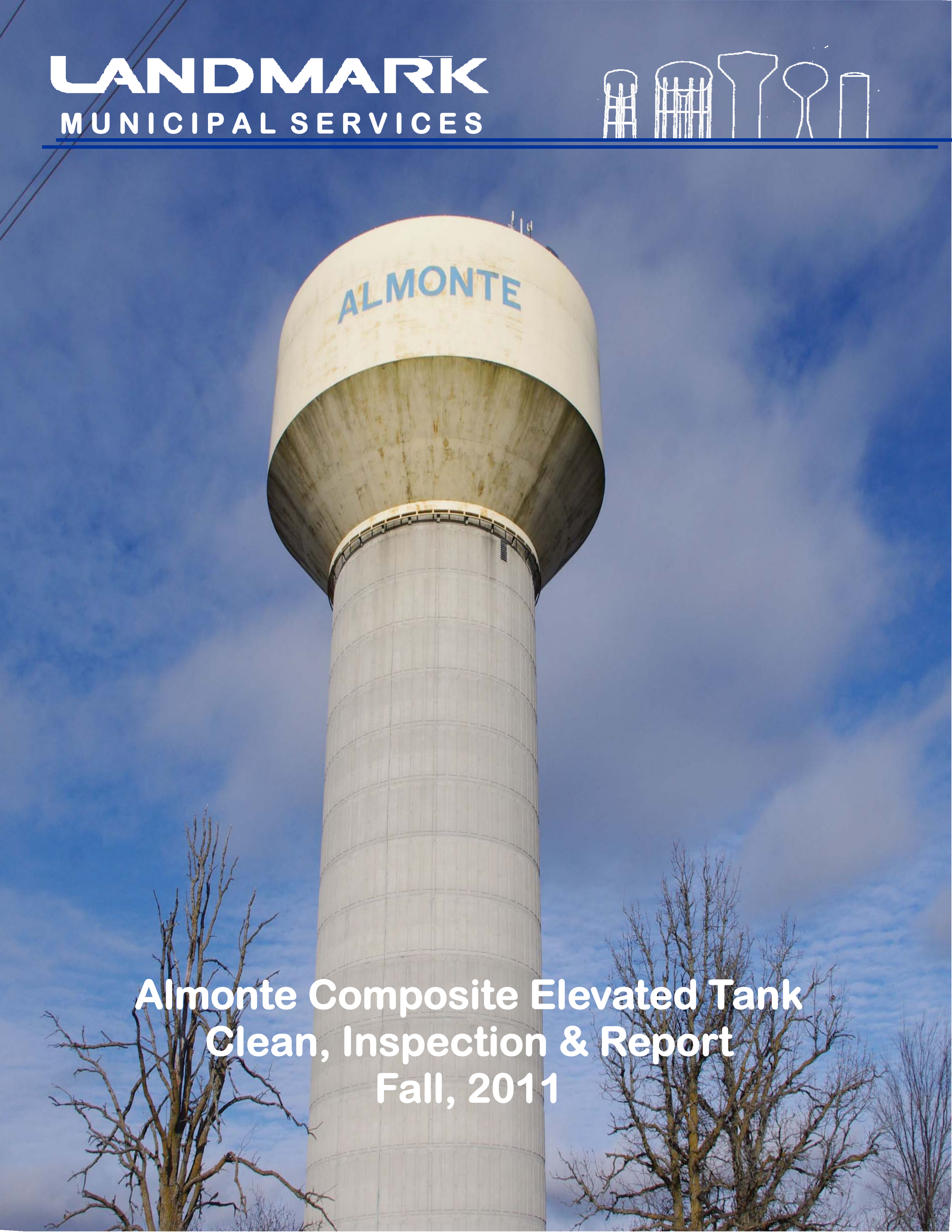


Almonte Composite Elevated Tank Clean, Inspection & Report Fall, 2011

LANDMARK
Elevating Expectations
3091 Harrison Court
Burlington, ON L7R 3X4
Tel: 905.319.7700
Fax: 905.319.7706

December 22, 2011

Ontario Clean Water Agency (OCWA)
122 Patterson Crescent
Carleton Place, ON
K7C 4P3

Att: **Mr. Andy Trader**
atrader@ocwa.com

Ph: 613-257-4990

LMS Job # LM1161: Almonte Composite Elevated Tank Inspection

Dear Andy,

On December 1, 2011, a cleaning and inspection was performed at the above noted water storage facility. The tank interior was cleaned via 2500 psi power wash, followed by tank disinfection in accordance with AWWA C652-02 Method #2. A thorough inspection of the existing fall arrest system, ladders, landings, handrails and appurtenances was conducted.

The following is a summary of all repairs performed during the inspection:

1) Tank interior - Noticeable pitting was repaired and coated
2) Pedestal light bulbs were replaced
3) Air craft warning light bulbs were replaced
4) Leak in flange adaptor was repaired
5) Riser pipe was repaired, reinsulated and cladded

Please find a comprehensive report enclosed as follows;

1) Composite Tank Inspection Report — Pages 1 - 6

2) Photographic Record of Report — Pages 7 - 15
- Photographs are numbered in accordance with the corresponding numbers throughout the report.

3) Coatings & Linings: Condition Assessment Report

4) Quote **#10223 (revised Dec 20)** for recommendations / repairs.

Should you have any questions or comments regarding the content of this report, please contact us at 905 319 7700. We look forward to the opportunity of further interaction with the Ontario Clean Water Agency, and we thank you for your business.

Yours sincerely,
LANDMARK MUNICIPAL SERVICES

Brent Marini
Project Manager

LANDMARK
MUNICIPAL SERVICES
3091 Harrison Court, Burlington ON L7R 3X4
Tel: (905) 319-7700 Fax: (905) 319-7706

COMPOSITE TANK INSPECTION REPORT

ALMONTE COMPOSITE WATER TOWER

Landmark Contract No.	Inspection Date	Last Inspection Date
LM1161	December 1, 2011	November 19, 2010
Inspector	**Report Date**	**Inspected By**
D.Baker	December 20, 2011	Landmark

OWNER / CONTACT

Owner	The Corporation of the Town of Carleton Place	**Contact**	**Mr. Thomas Flynn**
		Title	OCWA
Project Location	**Almonte Composite Elevated Water Storage Tank**	**Phone**	613-257-4990
		Fax	613-257-5727
Address	201 Patterson Street, Almonte ON	**Email**	tflynn@ocwa.com

TANK DESCRIPTION

Constructor	Landmark Structures	**Tank Capacity**	625,000 gal	**See Photo # for Documentation**
Tank Type	Composite Elevated	**Year Built**	1992	
Dwg's Available	Yes	**Tank Diameter**	68'	
Dwg's Reviewed	Yes	**HWL**	596.60	
Coating System	Alkyd	**LWL**	565.00 (Approx)	
Lining System	Epoxy	**Grade Elev**	452.40	

Note

The attached report has been prepared in order to provide the tower owner with a detailed description of the following:
The present condition of interior and exterior coatings, any pitting and/or corrosion on the interior of the water retaining vessel, the apparent condition of exposed foundations and the status of and recommendations for upgrades on safety equipment and other appurtenances.

Landmark Municipal Services has not performed a design review, an ultrasonic, x-ray, or destructive and/or non-destructive testing. Comments and recommendations are based on visual inspection only.

REPORT SUMMARY

Legend:

URGENT! Immediate attention required	Separate Report Available
Repairs strongly recommended	Repairs Completed During Inspection

Repairs Made During Inspection

Item	Photo No.	Item	Photo No.
Replaced pedestal lightbulbs	11	Repair leak in flange adaptor	7, 8
Replace air craft warning light bulbs	29		
Repaired riser piping & re-insulated	13, 14		--

Recommended Repairs

Siteworks

Item	Photo No.
	--
	--

Security

Item	Photo No.
S&I hasp with padlock on hatch to tank interior	30
	--
	--

Valve Chamber

Item	Photo No.
	--
	--
	--

Foundations

Item	Photo No.
	--
	--
	--

Support Structure

Item	Photo No.
	--
	--
	--

Interior Landing

Item	Photo No.
S&I additional 3" of kickplate (50 ft)	
	--
	--
	--

Accessories

Item	Photo No.
Inspect cathodic protection system (Corrosion Services)	--
Survey and mark antenna's forRF exposure as per Safety Code 6	--
Clean up exposed wiring in access tube	26
Extend lightning protection terminal above antenna	29
	--
	--
	--

Chlorine Analysis / Dead Zone Testing

Item	Photo No.
	--
	--

Mixing System

Item	Photo No.
	--
	--

Fall Arrest System

Item	Photo No.
Paint top of 'T' rail sections safety yellow	19,21,32
Re-locate entry / exit gates (8" from end of 'T' rail)	19,21,32
S&I 1pc - 'D' Ring at ladder to floor hatch	21
	--
	--
	--
	--

Confined Space & Rescue System

Item	Photo No.
Design, supply and install rescue port base at top landing	18
Supply rescue procedures	--
	--
	--
	--
	--

Coatings, Linings and Metal Condition

Item	Photo No.
Refer to separate report	--
	--
	--
	--

Existing Maintenance Contract? **No**

Thank you for allowing Landmark Municipal Services to assist you in the maintenance of your elevated water storage facility.
To maintain the integrity of your facility we recommend that you schedule your next:

Safety inspection and report	**Fall 2012**
Remote Inspection & Report	**Fall 2014**
Clean, inspect and report	**Fall 2016**

Photo No.

Siteworks

		Photo No.
EXTERIOR VALVE CHAMBER	No	--
WALKWAYS	None	--
OVERFLOW SPILLWAY	Good	--

REPAIRS OR MAINTENANCE REQUIRED

Security

		Photo No.
FENCE & GATES	Good	--
LADDER	Good	15
HATCH LOCKS	None	30

REPAIRS OR MAINTENANCE REQUIRED

S&I hasp with padlock on hatch to tank interior

Valve Chamber

		Photo No.
CONDITION OF VALVE CHAMBER	Good	5, 6
CONDITION OF PIPING	Good	5 - 8
CONDITION OF VALVES	Good	5 - 8
ARE THERE ANY INDICATIONS OF SETTLEMENT?	No	--
IS THE CONCRETE IN THE CHAMBER CRACKED, SPALLED OR LEAKING?	No	--
IS THERE ANY INDICATION OF PIPE MOVEMENT?	No	--

REPAIRS OR MAINTENANCE REQUIRED

Foundations

		Photo No.
ARE THERE ANY INDICATIONS OF FOUNDATION SETTLEMENT?	No	--
IS CONCRETE CHIPPED OR CRACKED	No	--
IS THE SOIL AT THE BASE SATURATED OR IS THERE PONDED WATER?	No	--
IS THERE ANY INDICATION OF UNDERGROUND PIPE LEAKAGE?	No	--
IS SOIL AT BASE ERODED?	No	--
IS THE FOUNDATION UNDERMINED OR EXPOSED?	No	--

REPAIRS OR MAINTENANCE REQUIRED

Support Structure

		Photo No.
SHAFT EXTERIOR - IS CONCRETE CRACKED?	No	--
SHAFT INTERIOR - IS CONCRETE CRACKED?	No	--
IS SHAFT CEILING CRACKED?	No	--
IS SHAFT CEILING LEAKING?	No	--

REPAIRS OR MAINTENANCE REQUIRED

Interior Landing

		Photo No.
IS LANDING DECK IN GOOD CONDITION?	Yes	20
IS LANDING KICK PLATE IN GOOD CONDITION?	No - Additional 3" req'd	20
IS LANDING HANDRAIL IN GOOD CONDITION?	Yes	23
ARE SPLICES, SUPPORTS AND SHAFT CONNECTIONS IN GOOD CONDITION?	Yes	18

REPAIRS OR MAINTENANCE REQUIRED

S&I additional 3" of kickplate (50 ft)

N/A for 'not applicable' or N/I for 'not inspected'.

Accessories			Photo No.
DOORS & HARDWARE		Good	4
ENTRANCE ALARM		Good	--
LADDERS	* To Valve Chamber Roof	N/A	--
	* To Landing(s)	Good	11, 15, 18
	* To Tank Floor Hatch	Good	21
	* To Roof (Access Tube)	Good	23, 24
	* To Tank Interior (From Roof)	None	--
REST SEATS		Good	11
ROOF HATCHES	* Size (Access Tube)	2'-8" dia.	32
	* Condition	Good	32
	* Size (Tank Interior)	2'-8" dia.	30
	* Condition	Good (padlock required)	30
VENT	* Type	Frost proof combination vent / vacuum relief unit	27
	* Condition	Good (re-paint vent base)	27
VACUUM RELIEF	* Type	Frost proof combination vent / vacuum relief unit	27
	* Condition	Good	27
PAINT RAIL ACCESS	* Interior	Good (re-paint cover)	28
	* Exterior	Good	19
PAINT RAIL	* Interior	Good	41
	* Exterior	Good	2, 3
GIN WHEEL		Good	22
ROOF HANDRAIL		Good	29
FLOOR MANHOLE		Good	21, 42
ACCESS TUBE MANWAY		None	--
HEAT TRACING		Good	--
INSULATION	* Tank	N/A	--
	* Riser	Good	13, 14
RISER AND OVERFLOW PIPING		Good	13, 14
TELEMETRY		N/I	--
CATHODIC PROTECTION	* Type	Impressed Current	--
	* Manufacturer	Corrosion Services	--
AIRCRAFT WARNING LIGHTS		Good (bulbs replaced)	29
ANTENNAE	* Anchorage / Mounting	Good	29
	* Cable Routing	Good	24
	* Surveys / Warning Signage as per Safety Code 6: Health Canada	Survey and mark accordingly as per Health Canada Safety Code 6. RF hazard signs required	--
ELECTRICAL	* Receptacles	Good	--
	* Lights	Good (clean up exposed wiring in access tube)	26
	* Panels	Good	--
	* Conduits	Good	--
EMERGENCY LIGHTS		Good	--
LIGHTNING PROTECTION		Extend air terminal above highest antenna	29
TANK GROUNDING		Good	--
MIXING SYSTEM		None	36
OTHER		--	--

REPAIRS OR MAINTENANCE REQUIRED

Inspect cathodic protection system (Corrosion Services)
Survey and mark antenna's forRF exposure as per Safety Code 6
Clean up exposed wiring in access tube
Extend lightning protection terminal above antenna

FALL ARREST & RESCUE

Photo No.

Safety Rail

LADDER LOCATION	YES / NO	TYPE	YELLOW MARKING AT END OF RAIL?	SECONDARY ARRESTING FEATURE?	RAIL SUPPORT (6FT MAX)	OVERALL CONDITION	Photo No.
* To Landing(s)	Yes	Alum 'T' rail	No	Yes	Yes	Good	15, 18
* To Tank Floor Hatch	Yes	Alum 'T' rail	No	Yes	Yes	Good	21
* To Roof (Access Tube)	Yes	Alum 'T' rail	No	Yes	Yes	Good	24
* To Tank Interior (From Roof)	N/A	--	--	--	--	--	--

REPAIRS / UPGRADES OR MAINTENANCE REQUIRED

Paint top of 'T' rail sections safety yellow

Existing fall arrest system conforms to the current standard (Z259.2.1 - 1998 Class FRL). This standard is currently under review by the CSA Technical committee for "Fall Back" fall testing. Once the new standard is published, all FRL manufacturers must certify their products to the new standard. In the interim we echo the precautionary statement outlined in the MOL alert - All Employers must take reasonable precautions to protect workers in these circumstances. This may include using alternate fall protection or access systems, as appropriate, for the adequate protection of the health and safety of the worker.

Alternate fall protection - Double clip ladder side rails with CSA Certified Double Leg 'Y' Lanyard with shock pack OR Install 5/8" Safety rope to 'D' Rings and use with CSA certified rope grab Both options must be used in conjunction with the existing FRL system.

Entry / Exit Gates

LOCATION	YES / NO	MIN. 8" FROM END OF RAIL?	PROPER ORIENTATION ?	CONDITION OF PIVOT PIN, SPRING, ETC	Photo No.
* To Landing(s)	Yes	No	Yes	Good	19
* To Tank Floor Hatch	Yes	Fair	Yes	Good	21
* To Roof (Access Tube)	Yes	No	Yes	Good	32
* To Tank Interior (From Roof)	N/A	--	--	--	--

REPAIRS OR MAINTENANCE REQUIRED

Re-locate entry / exit gates (8" from end of 'T' rail)

Transfer 'D' Rings

LOCATION	YES / NO	CONDITION	Photo No.
* To Landing(s)	Yes	Good	19
* To Tank Floor Hatch	No	--	21
* To Roof (Access Tube)	Dismount Mast	--	32
* To Tank Interior (From Roof)	Dismount Mast	--	32

REPAIRS OR MAINTENANCE REQUIRED

S&I 1pc - 'D' Ring at ladder to floor hatch

Dismount Mast

D RINGS	Good	32
BOLT	None- welded	32
SURFACE CONDITION	Good	32
WELDS	Good	32
OTHER	--	--

REPAIRS OR MAINTENANCE REQUIRED

Rescue Port Base

LOCATION	YES / NO	CONDITION	
* At top landing	No	--	18
* At roof access hatch	Yes	Good	31
* At tank access hatch	Yes	Good	31

REPAIRS OR MAINTENANCE REQUIRED

Design, supply and install rescue port base at top landing

Rescue Procedures

AVAILABLE?	None	--

REQUIREMENTS

Supply rescue procedures

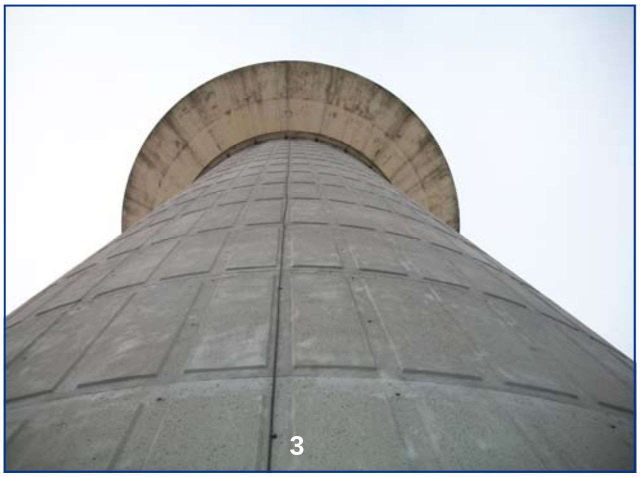
COATING ASSESSMENT

EXTERIOR SURFACES	***Refer to separate report***	
Cone		--
Shell		--
Roof		--
INTERIOR SURFACES		
Cone		--
Shell		--
Roof		--
Floor		--
ACCESS TUBE		
Interior (Dry)		--
Exterior (Wet)		--

REPAIRS OR MAINTENANCE REQUIRED


ALMONTE
1


2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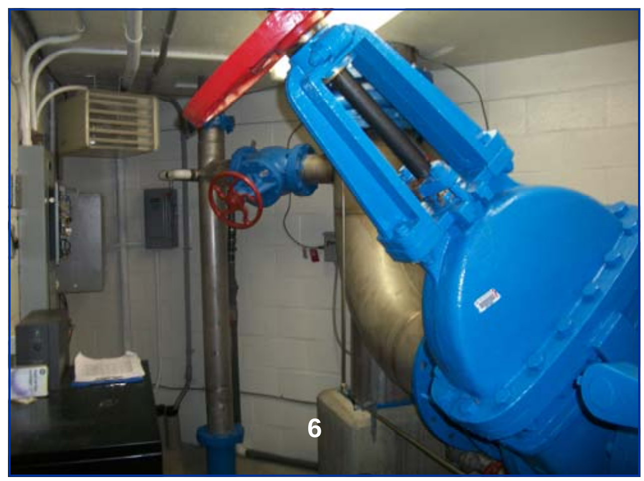
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7

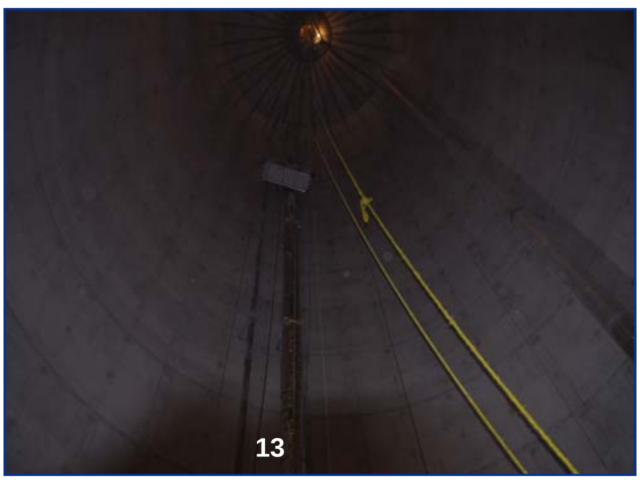

Repaired leak in flange adaptor during
8


9

10


Light bulbs replaced during inspection
11


12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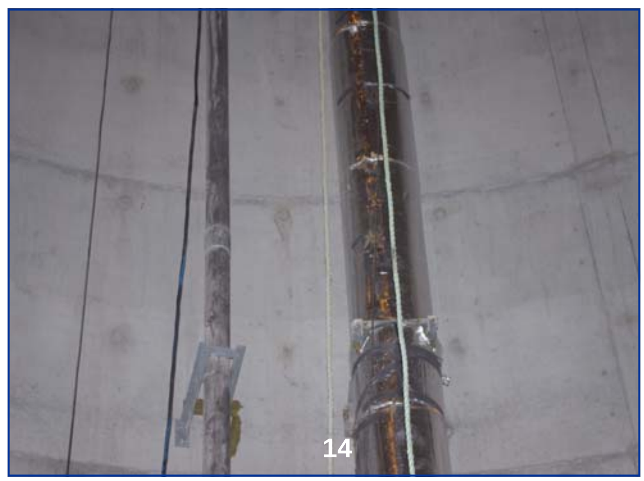
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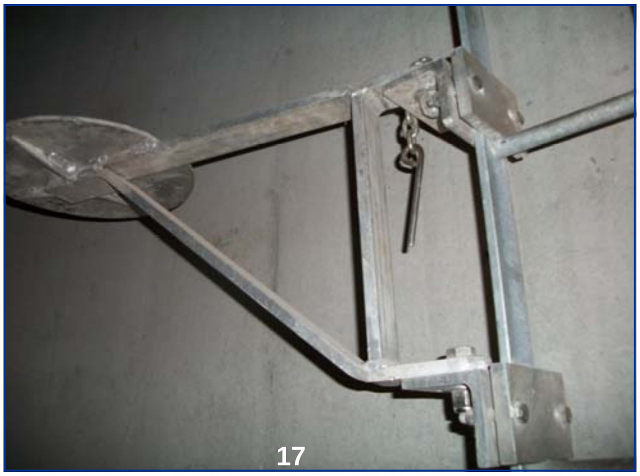
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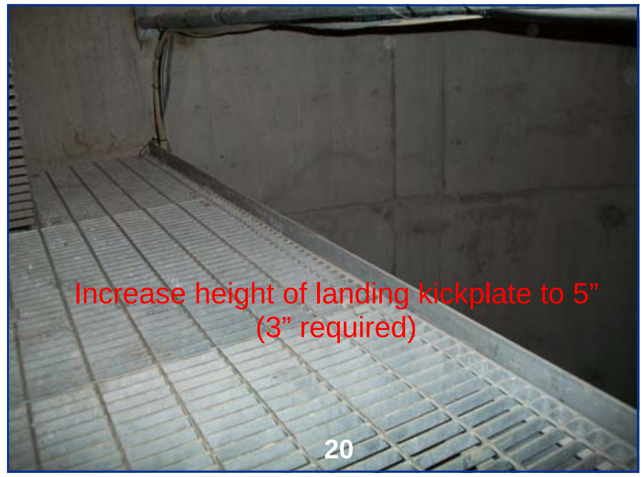
Rescue port base required
18


Paint top of ‘T’ rail safety yellow
Re-locate entry / exit gate (8” from end of rail)
19


Increase height of landing kickplate to 5” (3” required)
20


Paint top of ‘T’ rail safety yellow
S&I ‘D’ ring at top of ladder
21


22


23


24

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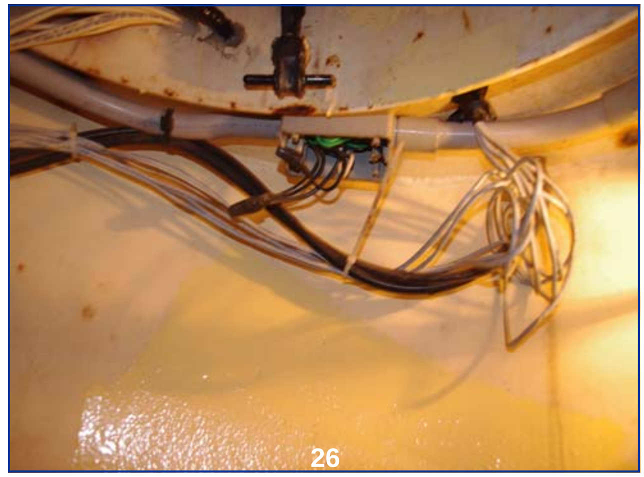

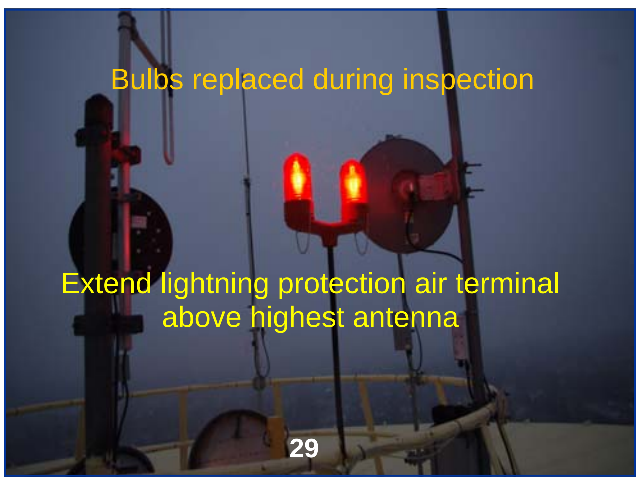

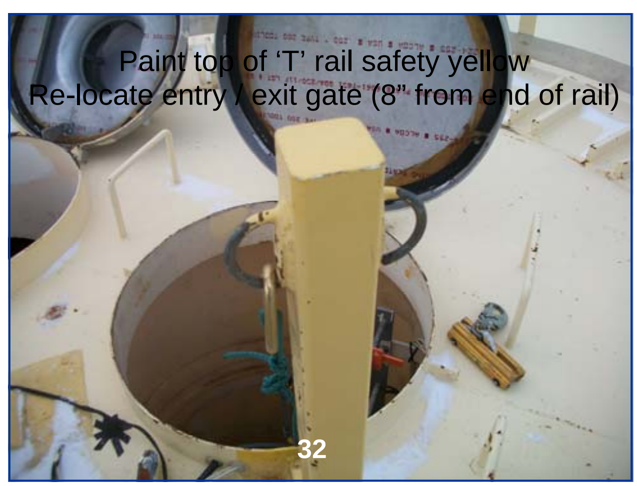

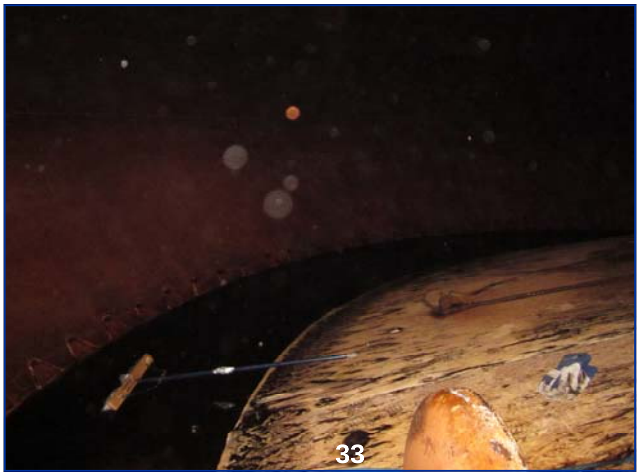

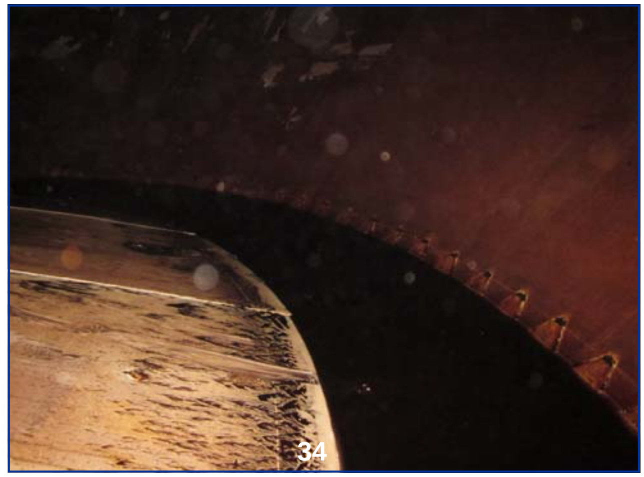

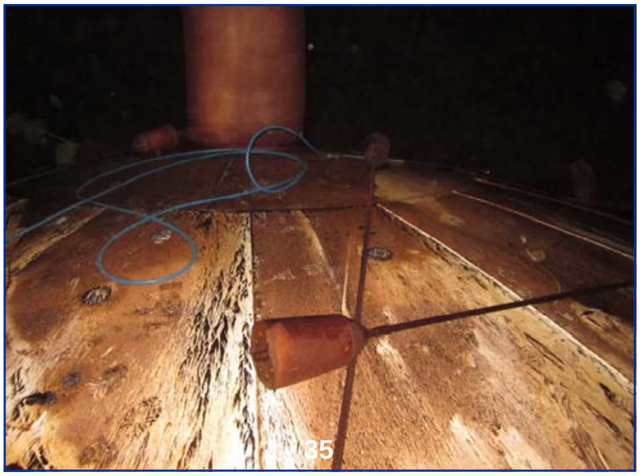

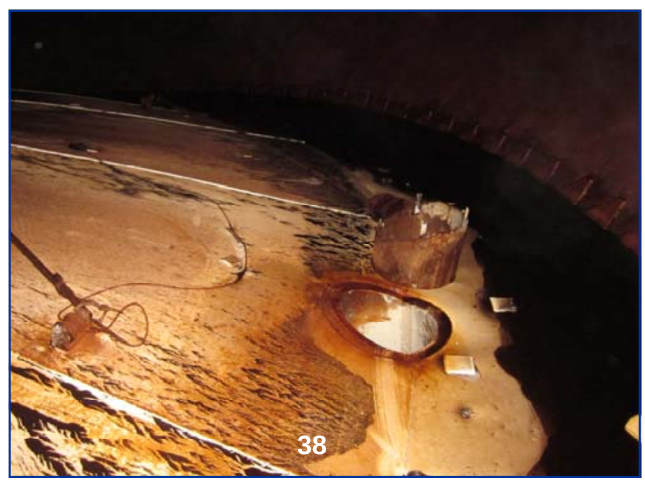

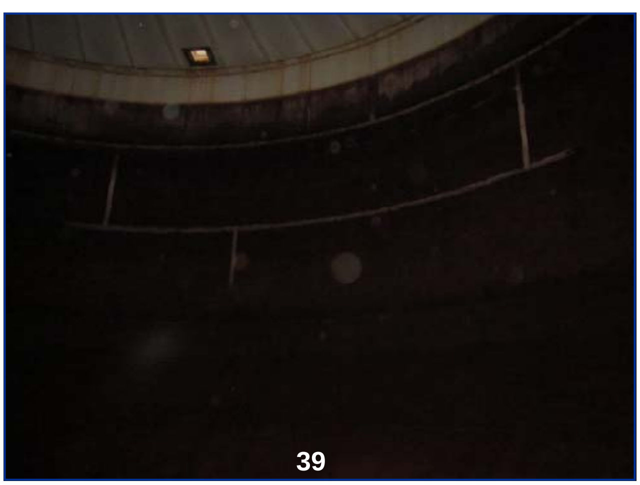

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42


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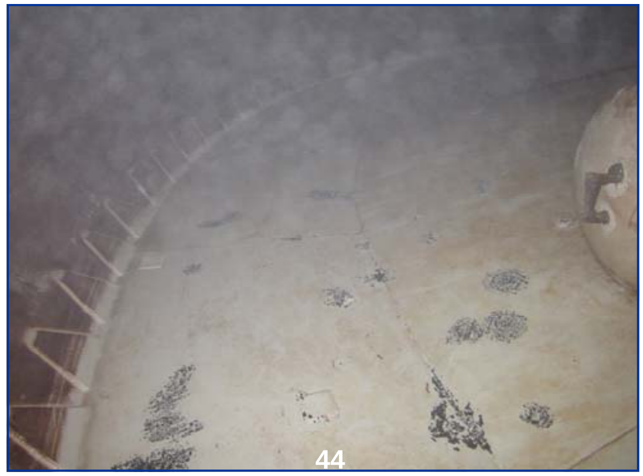
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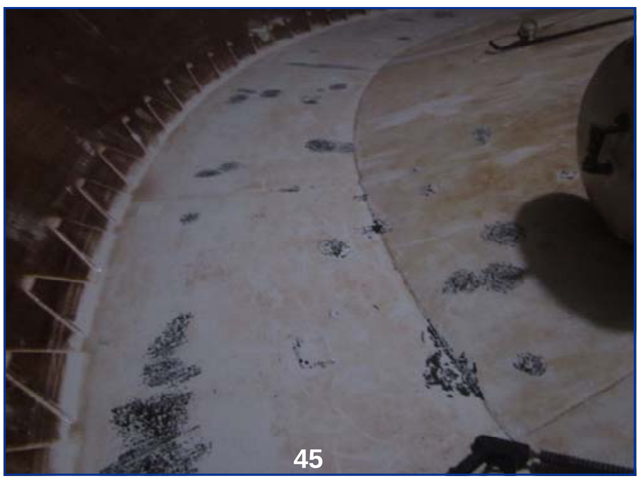
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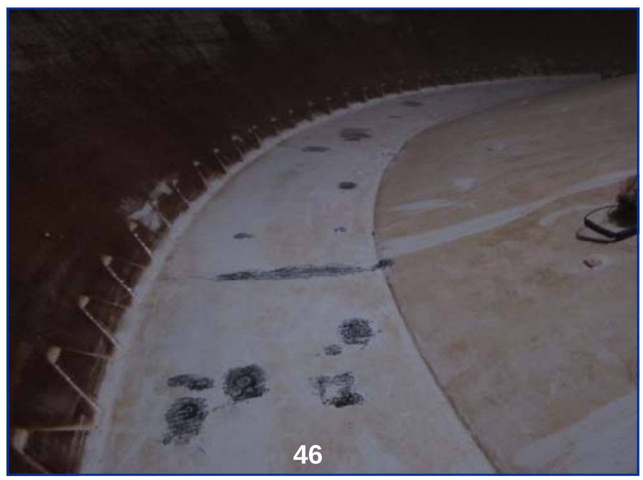
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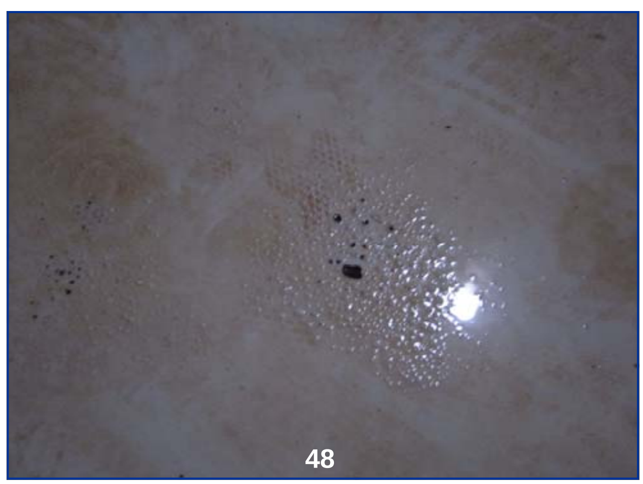
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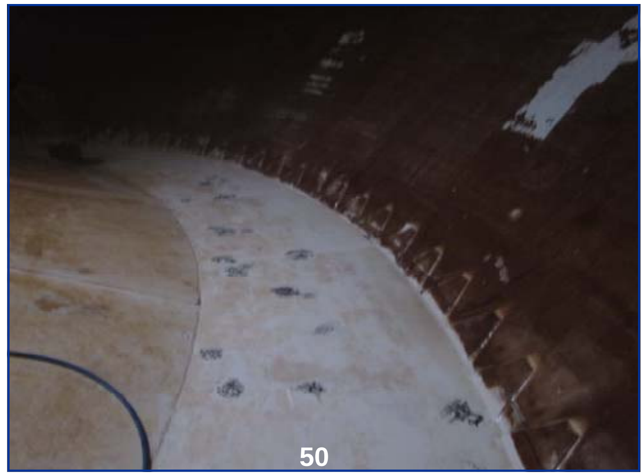

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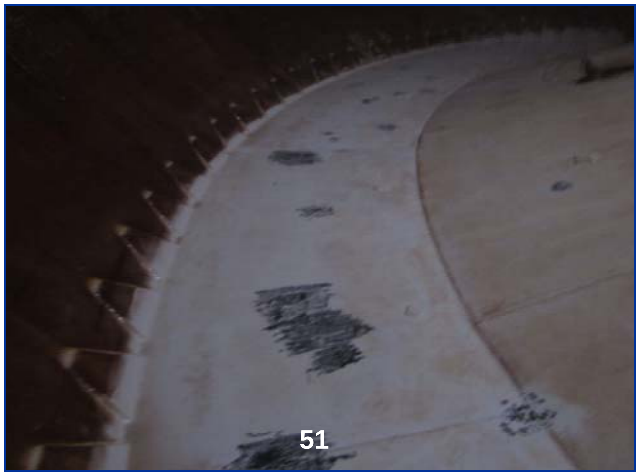

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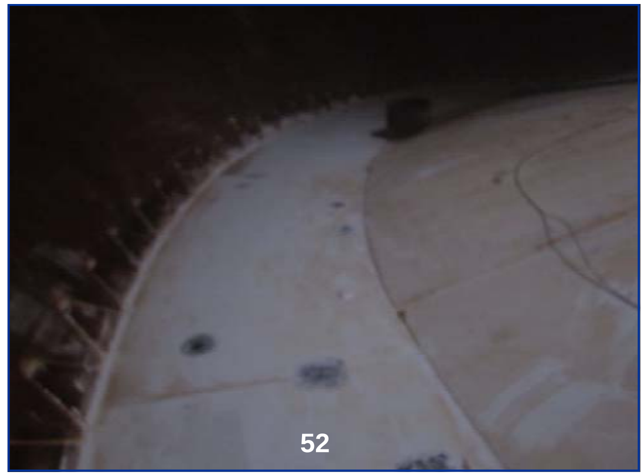

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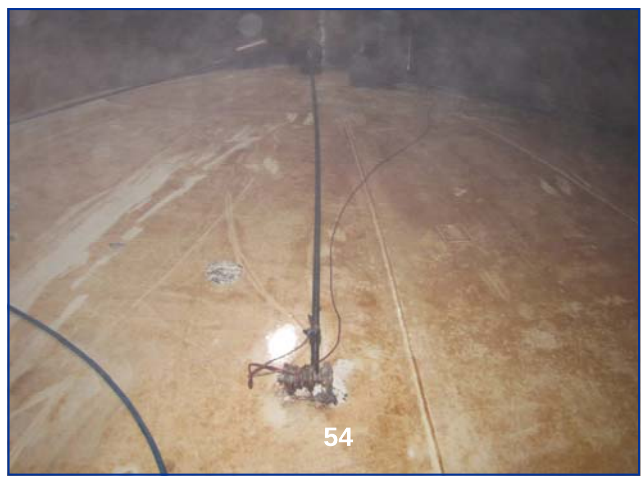

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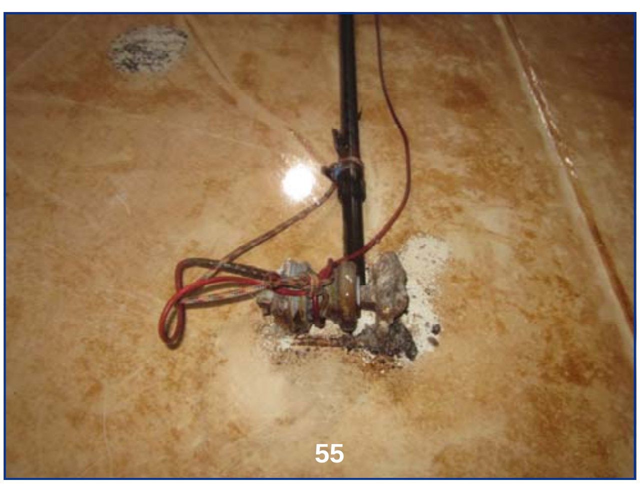

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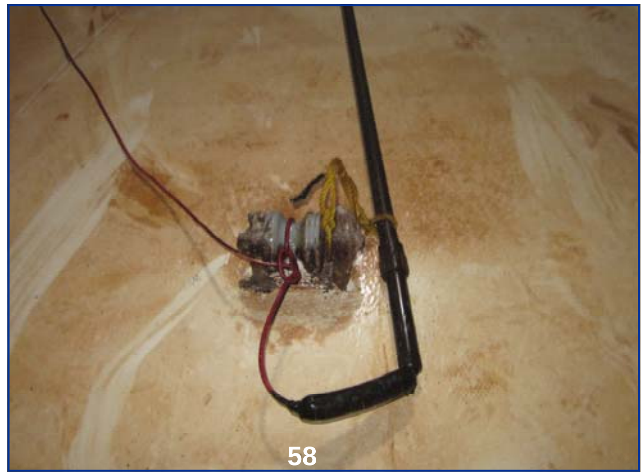
57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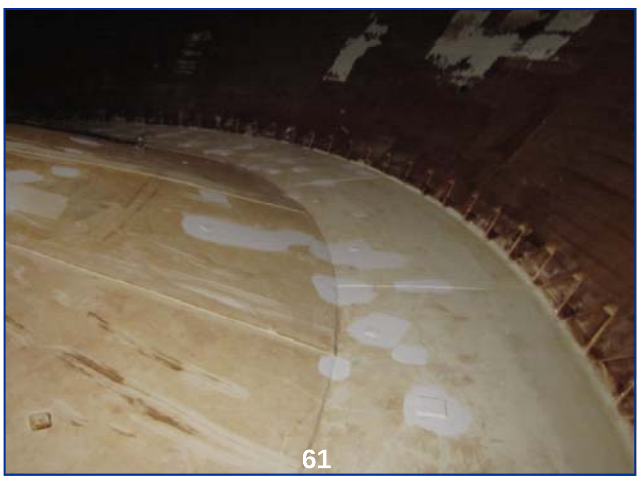
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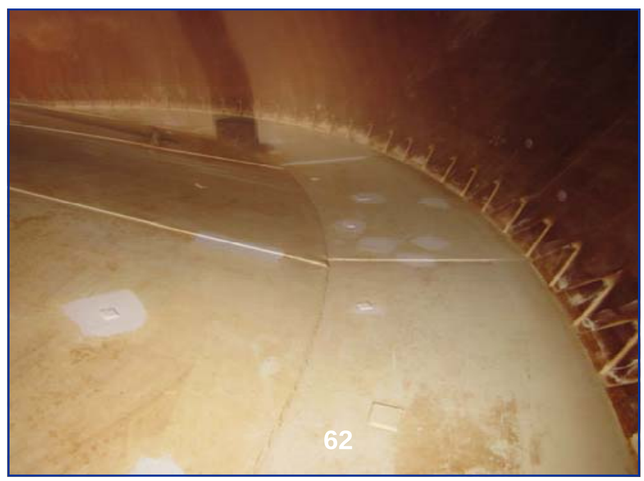
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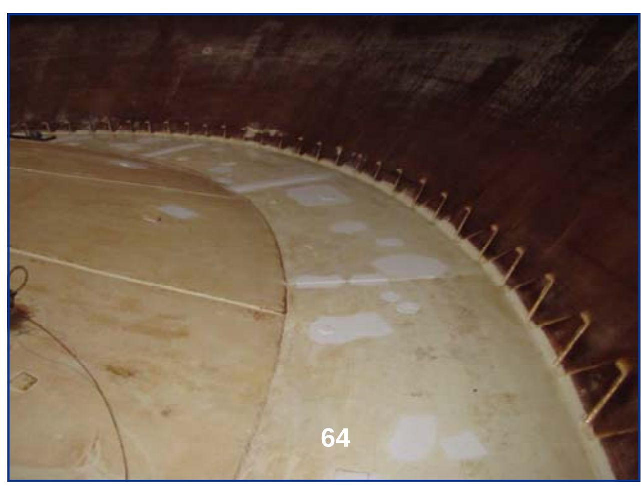
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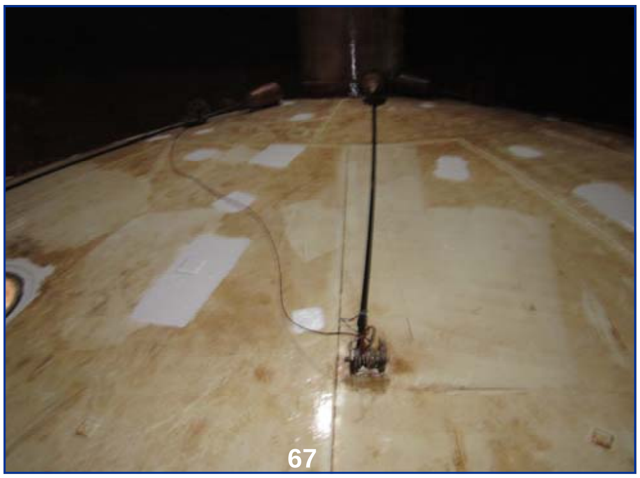
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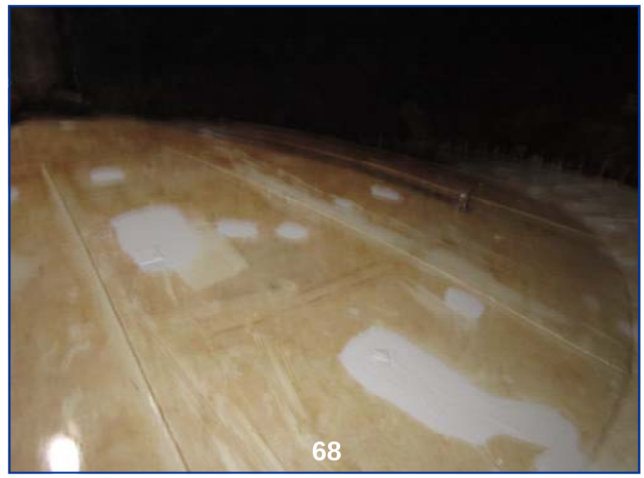
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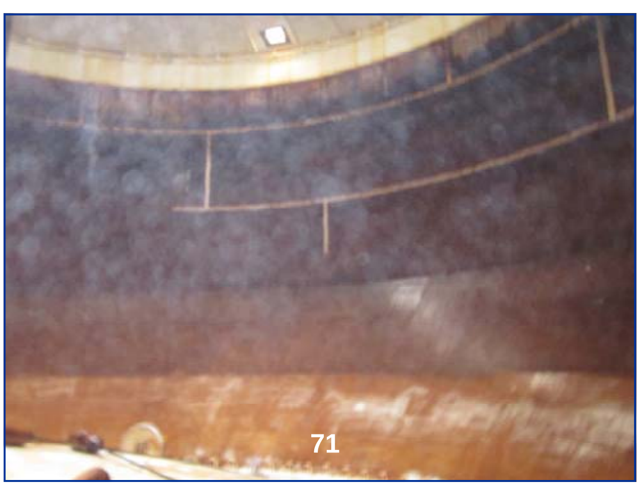
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December 18, 2012

OCWA Carleton Place
122 Patterson Crescent
Carleton Place, On, K7C 4P3
R0J 1H0

Att: **Mr. Andrew Trader**
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LM1167 - Almonte Composite Tank: Coatings and Linings Assessment

During the week of November 28th, 2010, an inspection was performed at the above water storage facility. The following are our findings in relation to the current condition of the coatings and lining systems.

Exterior

The exterior surface of this tank is coated with an alkyd type of paint and is in poor condition, with large areas of surface corrosion on the cone and sides. The paint has chalked because of atmospheric and ultraviolet degradation, which is to be expected with this type of coating. The roof is still fairly sound with only minor corroded areas around the hatches and stiffener bars. The interior of the access tube is severely rusted, this area being wet during the majority of the year and having only an alkyd type of paint for protection.

Interior

The interior surface is lined with an epoxy type of coating which is in fair condition. The last interior inspection revealed many mineral deposits on the floor, and during further inspection and repairs carried out this year, indicated small clusters of paint blisters with captive corrosion cells within. This effect is a result of an aging epoxy lining coupled with an improperly calibrated impressed-current cathodic protection system. The pitted areas on the floor were repaired with NSF-61 approved epoxy.

Recommendations

The exterior surface should be repaired as soon as possible. Adhesion tests should be performed to ensure this tank is a candidtate for an over-coat system. This procedure consists of high pressure washing to remove any loose paint and contaminants, then applying one full coat of penetrating sealer; one full coat of a surface tolerant epoxy adhesion primer, followed by one full coat of an aliphatic urethane topcoat.

The Interior lining should be replaced at the same time as the exterior coating repair as this would be the most cost effective solution. The replacement should consist of full removal in accordance with SSPC-SP10 / NACE 2 and lined with 25 – 30 mils of a 100% solids polyurethane liner such as Polibrid 705 or Amerthane 490.

LANDMARK
MUNICIPAL SERVICES

Budget Proposal #10223 – Almonte Elevated Tank Upgrades & Repairs

REVISED: December 20, 2011

Budget pricing for items which require immediate repair or are required for compliance with Ministry of Labour and / or AWWA codes is as follows;

1) ***Ladder / Fall arrest Upgrades***

a) Ladder to Top Landing
- Re-locate entry / exit gate (8" from end of 'T' rail)
- Paint top of 'T' rail safety yellow

b) Ladder to floor man way
- S&I transfer station 'D' ring
- Paint top of 'T' rail safety yellow

c) Ladder to Roof (Thru access tube)
- Re-locate entry / exit gate (8" from end of 'T' rail)
- Paint top of 'T' rail safety yellow

LUMP SUM FOR ITEM #1 …….………………………………..…….. $ 350.00

2) ***Confined Space / Rescue Upgrades***

a) Rescue Port Base at Top Landing
Design, supply and install concrete mounted rescue port base beneath top landing grating. Port will be positioned to perform worker rescue on access ladder and from top landing **$ 1,700.00**

c) Detailed rescue procedures
Provide detailed rescue procedures (to be posted at site) **$ 400.00**

3) ***Miscellaneous***

a) S&I lockable hasp on hatch to tank interior **$ 100.00**

b) S&I 3" of kickplate on landing handrail (approx 50 ft) **$ 1,000.00**

c) Extend lightning protection air terminal above highest antenna **$ 800.00**

4) ***Mobilization / Demobilization***

Includes employee travel, shipping of materials / equipment, hotels, Per diem, administration costs, etc **$ 3,000.00**

LUMP SUM FOR ALL ITEMS…………………………………………….. $ 7,350.00

Continued…

Other

(i) Perform annual safety inspections on ladders, handrails, landings, fall arrest system and components, confined space entry / retrieval components: **$ 1,200.00 / year**

(ii) Clean up exposed wiring in access tube

(iii) Survey and mark antenna's for radiation as per Health Canada Safety Code 6
(By antenna contractor)

(iv) Inspect Cathodic Protection System
(By Corrosion Services)

H.S.T. not included

Please note the above pricing reflects the costs for one mobilization. While Landmark Municipal Services endeavors to guarantee quoted prices, we may not be able to hold pricing if the work is divided. All employees of Landmark Municipal Services have been trained and certified in Fall Arrest and Rescue, Confined Space Work and Rescue, WHMIS Worker Training, St. John Ambulance Safety Oriented First Aid and Cardiopulmonary Resuscitation. In addition, all activities conducted at heights by staff of Landmark Municipal Services are fulfilled under strict guidelines based on involvement with the Ontario Ministry of Labour and the requirements outlined in Section 26 of the current Ontario Occupational Health & Safety Act, 213/91, and our subsequent Fall Arrest & Rescue Safety System.

A P P E N D I X B

The Town of Mississippi Mills
Watermain Infrastructure Inventory

APPENDIX A:
The Town of Mississippi Mills Watermain Infrastructure Inventory

Street Name	From	To	Initial Construction Year	Existing Size (mm)	Length (mm)	Material	Proposed Useful Life (years)	End of Useful Life (Year)
Almonte St.	Farm St.	Mill St.	1930	150	78.78	L.J. Cast	70	2000
Almonte St.	Arch Bridge Valve	Mill St.	1930	150	5.75	L.J. Cast	70	2000
Almonte St. Line 1	St. Andrews St.	Malcolm St.	1930	150	152.94	L.J. Cast	70	2000
Almonte St. Line 1	St. Andrews St.	Malcolm St.	1930	150	22.3	L.J. Cast	70	2000
Almonte St. Line 1	St. Andrews St.	Malcolm St.	1930	150	61.37	L.J. Cast	70	2000
Almonte St. Line 1	St. Andrews St.	Malcolm St.	1930	150	97.42	L.J. Cast	70	2000
Bollus Ln.	Water St.	Reserve St. Dead End	1930	150	65.4	L.J. Cast	70	2000
Brae St.	Hydrant #56 near Mill St.	Hydrant #59 near Arena	1930	150	87.62	L.J. Cast	70	2000
Brae St.	Hydrant #56 near Mill St.	Hydrant #59 near Arena	1930	150	73.61	L.J. Cast	70	2000
Brae St.	Hydrant #56 near Mill St.	Hydrant #59 near Arena	1930	150	26.13	L.J. Cast	70	2000
Bridge St.	Country St.	Whitten Ln	1930	152	74.87	L.J. Cast	70	2000
Bridge St.	Hyder Ln.	High St.	1930	150	34.99	L.J. Cast	70	2000
Bridge St.	High St.	Farm St.	1930	150	64.04	L.J. Cast	70	2000
Bridge St.	Water St.	Little Bridge St.	1930	150	9.24	L.J. Cast	70	2000
Church St.	High St.	Country St.	1930	150	145.79	L.J. Cast	70	2000
Church St.	High St.	Country St.	1930	150	130.89	L.J. Cast	70	2000
Church St.	High St.	Country St.	1930	150	96.33	L.J. Cast	70	2000
Clyde St.	Queen St.	Easement to Martin South	1930	150	134.04	L.J. Cast	70	2000
Colborne St.	PRV Station	Brae St.	1930	150	109.00	L.J. Cast	70	2000
Country St.	Perth/Church Sts.	James St.	1930	150	85.74	L.J. Cast	70	2000
Easement to Martin St.	Clyde St. Dead End	Martin South of State	1930	150	58.13	L.J. Cast	70	2000
Easement to Mill St. Brae St.	Brae St.	Rear of #78 Mill St.	1930	150	50.02	L.J. Cast	70	2000
Elgin St.	High St.	Country St.	1930	150	336.59	L.J. Cast	70	2000
Farm St.	Brae St.	Farm PRV Station	1930	150	102.61	L.J. Cast	70	2000
Farm St.	#16 Farm St.	Charles St.	1930	150	24.78	L.J. Cast	70	2000
Farm St.	Charles St.	Brae St.	1930	150	80.07	L.J. Cast	70	2000
High St.	Bridge St.	Church St.	1930	150	174.86	L.J. Cast	70	2000
High St.	Bridge St.	Church St.	1930	150	64.98	L.J. Cast	70	2000
Hyder Ln.	Bridge St.	Beer Store	1930	150	43.02	L.J. Cast	70	2000
Hyder Ln.	Bridge St.	Beer Store	1930	150	1.34	L.J. Cast	70	2000
James St.	Country St.	William St.	1930	150	114.53	L.J. Cast	70	2000
John St.	Reserve St.	High/Church Sts.	1930	150	56.12	L.J. Cast	70	2000
John St.	Reserve St.	High/Church Sts.	1930	150	5.23	L.J. Cast	70	2000
Little Bridge St.	PRV Station	Mill St.	1930	150	58.47	L.J. Cast	70	2000
Little Bridge St.	Bridge St.	PRV Station	1930	150	69.66	L.J. Cast	70	2000
Little Bridge St.	PRV Station	Mill St.	1930	150	4.28	L.J. Cast	70	2000
Little Bridge St.	PRV Station	Mill St.	1930	150	15.78	L.J. Cast	70	2000
Little Bridge St.	Bridge St.	PRV Station	1930	150	19.92	L.J. Cast	70	2000
Malcolm St.	Almonte St.	Just South of Dunn St.	1930	150	241.23	L.J. Cast	70	2000
Malcolm St.	Almonte St.	Just South of Dunn St.	1930	150	139.99	L.J. Cast	70	2000
Malcolm St.	Almonte St.	Just South of Dunn St.	1930	150	3.26	L.J. Cast	70	2000
Martin St. South	Ottawa St.	Queen St.	1930	200	29.05	L.J. Cast	70	2000
Martin St. South	Ottawa St.	Queen St.	1930	200	4.71	L.J. Cast	70	2000
Mary St.	Main St. West	Rosamond St. East	1930	150	164.27	L.J. Cast	70	2000
Mary St.	Main St. West	Rosamond St. East	1930	150	113.87	L.J. Cast	70	2000
Mill St.	Almonte St.	Little Bridge St.	1930	150	181.82	L.J. Cast	70	2000
Mitcheson St.	Wilkinson St.	Hydrant #265	1930	150	72.99	L.J. Cast	70	2000
Mitcheson St.	Wilkinson St.	Hydrant #265	1930	150	118.56	L.J. Cast	70	2000
Mitcheson St.	Wilkinson St.	Hydrant #265	1930	150	175.01	L.J. Cast	70	2000
Ottawa St.	Ottawa St. from Blackburns	10" PVC line-Well #3 Line	1930	200	5.3	L.J. Cast	70	2000
Ottawa St.	Ottawa St. from Blackburns	T heading to Well #3	1930	200	0.89	L.J. Cast	70	2000
Ottawa St.	Martin St. South	Harold St.	1930	200	242.62	L.J. Cast	70	2000
Ottawa St.	Martin St. South	Harold St.	1930	200	13.28	L.J. Cast	70	2000
Ottawa St.	Martin St. South	Harold St.	1930	200	104.31	L.J. Cast	70	2000
Ottawa St.	Martin St. South	Harold St.	1930	200	141.08	L.J. Cast	70	2000
Ottawa St.	Ottawa St. Line	Well #3 Line	1930	200	0.82	L.J. Cast	70	2000
Ottawa St.	Martin St. South	Harold St.	1930	200	0.87	L.J. Cast	70	2000
Ottawa St.	Martin St. South	Harold St.	1930	200	0.57	L.J. Cast	70	2000
Ottawa St.	Harold St.	George St.	1930	200	150.01	L.J. Cast	70	2000
Queen St.	Bridge St.	Martin St.South	1930	200	133.06	L.J. Cast	70	2000
Queen St.	Bridge St.	Martin St.South	1930	200	38.00	L.J. Cast	70	2000
Queen St.	Bridge St.	Martin St.South	1930	200	45.48	L.J. Cast	70	2000
Reserve St.	Albert St.	John St.	1930	150	180.76	L.J. Cast	70	2000
Rosamond St. East	Shepherd St.	Mary St.	1930	150	59.69	L.J. Cast	70	2000
Shepherd St.	Rosamond St. East	Wellington St.	1930	150	129.8	L.J. Cast	70	2000
State St.	Martin St. South	Spring St.	1930	150	111.15	L.J. Cast	70	2000
Union St. South	Main St. East	Queen St.	1930	150	92.21	L.J. Cast	70	2000
Union St. South	Main St. East	Queen St.	1930	150	6.72	L.J. Cast	70	2000
Union St. South	Main St. East	Queen St.	1930	150	56.84	L.J. Cast	70	2000
William St.	James St.	Rear of #171 & 179 Robert St	1930	150	96.98	L.J. Cast	70	2000
William St.	Church St.	#246 William St.	1930	150	92.53	L.J. Cast	70	2000
William St.	James St.	Rear of #171 & 179 Robert St	1930	150	48.62	L.J. Cast	70	2000
Edward St.	78 Edward St.	Martin St.North	1931	150	124.84	L.J. Cast	70	2001
Edward St.	78 Edward St.	Martin St.North	1931	150	75.69	L.J. Cast	70	2001
Martin St. North	Ottawa St.	Teskey St.	1931	150	79.08	L.J. Cast	70	2001
Martin St. North	Ottawa St.	Teskey St.	1931	150	80.04	L.J. Cast	70	2001
Martin St. North	Ottawa St.	Teskey St.	1931	150	4.53	L.J. Cast	70	2001
Martin St. North	Ottawa St.	Teskey St.	1931	150	89.63	L.J. Cast	70	2001
Martin St. North	Ottawa St.	Teskey St.	1931	150	38.96	L.J. Cast	70	2001
Martin St. North	Ottawa St.	Teskey St.	1931	150	59.64	L.J. Cast	70	2001
Martin St. North	Ottawa St.	Teskey St.	1931	150	17.23	L.J. Cast	70	2001
Martin St. North	Ottawa St.	Teskey St.	1931	150	0.6	L.J. Cast	70	2001
Union St. North Line 1	#156 Union St. North	Main St. East	1931	150	181.5	L.J. Cast	70	2001
Union St. North Line 1	#156 Union St. North	Main St. East	1931	150	89.26	L.J. Cast	70	2001
Union St. North Line 1	#156 Union St. North	Main St. East	1931	150	25.21	L.J. Cast	70	2001
Union St. North Line 1	#156 Union St. North	Main St. East	1931	150	46.62	L.J. Cast	70	2001
Union St. North Line 1	#156 Union St. North	Main St. East	1931	150	20.99	L.J. Cast	70	2001
Union St. North Line 1	#156 Union St. North	Main St. East	1931	150	115.12	L.J. Cast	70	2001

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Wilkinson St.	Union St. North	Mitcheson St.	1931	150	97.45	L.J. Cast	70	2001
Hope St.	Euphemia St.	Malcolm St.	1948	150	79.26	L.J. Cast	70	2018
Hope St.	Euphemia St.	Malcolm St.	1948	150	7.14	L.J. Cast	70	2018
Hope St.	Euphemia St.	Malcolm St.	1948	150	70.09	L.J. Cast	70	2018
John St.	Reserve St.	Wesley St.	1948	150	15.94	L.J. Cast	70	2018
Maude St.	Martin St. North	Hydrant #236	1948	150	188.35	L.J. Cast	70	2018
Victoria St.	Martin St. North	Frederick St.	1948	150	135.84	L.J. Cast	70	2018
Wellington St.	Coleman St.	Mary St.	1948	150	13.91	L.J. Cast	70	2018
Wesley St.	John St.	Just South of Hydrant #127	1948	150	67.46	L.J. Cast	70	2018
Wesley St.	John St.	Just South of Hydrant #127	1948	150	17.64	L.J. Cast	70	2018
Wesley St.	John St.	Just South of Hydrant #127	1948	150	1.21	L.J. Cast	70	2018
Wesley St.	Lead to Hydrant #127	6" and 1" lines to Water St. S. of Monk	1948	150	3.47	L.J. Cast	70	2018
Wesley St.	John St.	Just South of Hydrant #127	1948	150	1.23	L.J. Cast	70	2018
Ann St.	Church St.	James St.	1950	150	251.69	L.J. Cast	70	2020
Ann St.	Church St.	James St.	1950	150	8.98	L.J. Cast	70	2020
Carleton St.	Wellington St.	Dead End past Rosamond St. East	1950	150	63.35	L.J. Cast	70	2020
Coleman St.	Wellington St.	#12 Coleman St.	1950	150	65.13	L.J. Cast	70	2020
Hope St.	St. Andrews St.	Euphemia St.	1950	150	155.36	L.J. Cast	70	2020
James St.	Ann St.	#150 James St.	1950	25	61.28	Galv. Steel	50	2000
Main St. East	Rail Line	Union St. South	1950	150	132.47	L.J. Cast	70	2020
Main St. East	Rail Line	Union St. South	1950	150	19.71	L.J. Cast	70	2020
Rosamond St. East	Mary St.	Carleton St.	1950	150	50.82	L.J. Cast	70	2020
St. George St.	Perth St.	Hydrant #84	1950	150	201.98	L.J. Cast	70	2020
St. George St.	Perth St.	Hydrant #84	1950	150	72.3	L.J. Cast	70	2020
St. Andrews St.	Hope St.	Wylie St.	1951	150	87.08	L.J. Cast	70	2021
Wesley St.	Just South of Hydrant #127	Runs to rear of #260 Water St.	1955	25	59.86	K Copper	70	2025
Adelaide St.	Marshall St.	#203 Adelaide St.	1956	150	48.75	L.J. Cast	70	2026
Adelaide St.	Marshall St.	#203 Adelaide St.	1956	150	7.38	L.J. Cast	70	2026
Almonte St.	Esso	St. Andrews St.	1956	150	123.19	L.J. Cast	70	2026
Almonte St.	Esso	St. Andrews St.	1956	150	18.01	L.J. Cast	70	2026
Augusta St.	Martin St. North	Marshall St.	1956	150	286.68	L.J. Cast	70	2026
Augusta St.	Martin St. North	Marshall St.	1956	150	15.34	L.J. Cast	70	2026
Bridge St.	Country St.	Parkview	1956	150	136.49	Cast & DR-18	70	2026
Gore St.	Spring St.	Gomme St.	1956	150	75.57	L.J. Cast	70	2026
Gore St.	Gomme St.	Hydrant #182	1956	150	32.89	L.J. Cast	70	2026
Marshall St.	Augusta St.	Adelaide St.	1956	150	176.32	L.J. Cast	70	2026
Parkview Blvd.	Country St.	Bridge St.	1956	150	173.33	L.J. Cast	70	2026
Stephen St.	Mitcheson St.	High School Service	1956	100	75.52	L.J. Cast	70	2026
Malcolm St.	Just South of Dunn St.	Hydrant #11	1957	150	157.6	L.J. Cast	70	2027
Malcolm St.	Just South of Dunn St.	Hydrant #11	1957	150	66.31	L.J. Cast	70	2027
Malcolm St.	Just South of Dunn St.	Hydrant #11	1957	150	5.41	L.J. Cast	70	2027
Spring St.	Gale St.	Just North of 211 Spring St.	1957	150	190.15	L.J. Cast	70	2027
Spring St. Line 1	St. Paul St.	Gale St.	1957	150	6.9	M.J. Cast	70	2027
Spring St. Line 1	St. Paul St.	Gale St.	1957	150	102.78	M.J. Cast	70	2027
Spring St. Line 1	St. Paul St.	Gale St.	1957	150	0.39	M.J. Cast	70	2027
Spring St. Line 1	St. Paul St.	Gale St.	1957	150	5.88	M.J. Cast	70	2027
Teskey St.	Martin St. North	Hydrant #238	1957	150	167.35	L.J. Cast	70	2027
Victoria St.	Frederick St.	Florence St.	1957	150	142.02	M.J. Cast	70	2027
Victoria St.	Frederick St.	Florence St.	1957	150	139.47	M.J. Cast	70	2027
Bridge St.	Parkview Blvd.	Perth St.	1958	200	138.8	M.J. Cast	70	2028
Bridge St.	Parkview Blvd.	Perth St.	1958	200	63.07	M.J. Cast	70	2028
Bridge St.	Parkview Blvd.	Perth St.	1958	200	109.89	M.J. Cast	70	2028
Perth St.	Bridge St.	King St.	1958	200	97.69	M.J. Cast	70	2028
Perth St.	Bridge St.	King St.	1958	200	0.67	M.J. Cast	70	2028
Perth St.	Bridge St.	King St.	1958	200	82.1	M.J. Cast	70	2028
Almonte St.	Esso	West Side of Christian St.	1960	150	36.54	M.J. Cast	70	2030
Christian St.	Almonte St.	Hope St.	1960	20	177.89	K Copper	70	2030
Christian St.	Almonte St.	Shutoff valve for #254, #265 Christian St.	1960	20	5.71	K Copper	70	2030
Country St.	James St.	Hydrant #108	1960	150	98.48	M.J. Cast	70	2030
Country St.	James St.	Hydrant #108	1960	150	3.24	M.J. Cast	70	2030
Country St.	James St.	Hydrant #108	1960	150	57.26	M.J. Cast	70	2030
Easement behind Water St.	Rear of 302 Water St.	Monk St.	1960	25	40.23	K Copper	70	2030
Wesley St.	Just south of Hydrant #127	Monk St.	1960	25	11.24	K Copper	70	2030
Wesley St.	Just south of Hydrant #127	Monk St.	1960	25	41.99	K Copper	70	2030
Wesley St.	"(junction between 1" lines)"	Monk St.	1960	25	30.61	K Copper	70	2030
Wylie St.	Euphemia St.	Christian St.	1960	150	153.95	M.J. Cast	70	2030
Wylie St.	Euphemia St.	Christian St.	1960	150	140.26	M.J. Cast	70	2030
Hope St.	#402 Hope St.	St. Andrews St.	1962	150	81.48	M.J. Cast	70	2032
Naismith Drive	Bridge St.	Peacock Cr.	1962	150	150.03	M.J. Cast	70	2032
Naismith Drive	Bridge St.	Peacock Cr.	1962	150	5.94	M.J. Cast	70	2032
Naismith Drive	Bridge St.	Peacock Cr.	1962	150	139.98	M.J. Cast	70	2032
Peacock Cr.	Naismith Dr.	Shipman Dr.	1963	150	260.96	M.J. Cast	70	2033
Shipman Dr.	Bridge St.	Peacock Cr.	1963	150	274.46	M.J. Cast	70	2033
Almonte St. River Crossing	Mill St.	To Arch Bridge Island Side	1964	150	54.29	M.J. Cast	70	2034
King St.	Perth St.	Arthur St.	1964	150	207.45	M.J. Cast	70	2034
Christian St.	Wylie St.	Dead end North of Wylie	1964	20	72.09	100 PSI poly	50	2014
Christian St.	Wylie St.	Hydrant #20 etc.	1965	150	11.44	M.J. Cast	70	2035
Gore St.	Hydrant #182	#259 Gore St.	1965	150	66.65	M.J. Cast	70	2035
Wylie St.	East side of Christian St.	West Side of Christian St.	1965	150	27.88	M.J. Cast	70	2035
Wylie St.	East side of Christian St.	West Side of Christian St.	1965	150	15.03	M.J. Cast	70	2035
Easement to Water St. Wesley St.	Wesley St.	Water St.	1966	150	47.76	M.J. Cast	70	2036
Wesley St.	Just South of Hydrant #127	Easement to Water St.	1966	150	31.42	M.J. Cast	70	2036
Almonte St. Line 2	Mid Point Bay Hill	Farm St.	1967	150	293.43	M.J. Cast	70	2037
Almonte St.	Town Garage	West Side of Christian St.	1968	150	156.62	M.J. Cast	70	2038
Almonte St.	Town Garage Yard	Well #5	1968	150	29.47	M.J. Cast	70	2038
Almonte St.	Town Garage Yard	Well #5	1968	150	10.52	M.J. Cast	70	2038
Almonte St.	Town Garage Yard	Well #5	1968	150	8.16	M.J. Cast	70	2038
Almonte St.	Town Garage Yard	Well #5	1968	150	43.2	M.J. Cast	70	2038
Brookdale Ave.	Union St. North	Mitcheson St.	1968	150	3.08	M.J. Cast	70	2038
Brookdale Ave.	Union St. North	Mitcheson St.	1968	150	83.76	M.J. Cast	70	2038
Brookdale Ave.	Union St. North	Mitcheson St.	1968	150	6.1	M.J. Cast	70	2038
Easement Gemmill Park	Naismith Dr.	Field House etc.	1968	12	128.83	100 PSI poly	50	2018

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Easement Gemmill Park	Naismith Dr.	Field House etc.	1968	12	10.4	K Copper	70	2038
Euphemia St.	Wylie St.	#127 Euphemia	1968	150	54.23	M.J. Cast	70	2038
Euphemia St.	Watermain from Euphemia St.	Hydrant #13	1968	150	29.99	M.J. Cast	70	2038
Ann St.	James St.	Robert St.	1970	150	98.67	M.J. Cast	70	2040
Clinton St.	Spring St.	Martin St. South	1970	25	103.35	K Copper	70	2040
Martin St. South	Clinton St.	St.Paul St.	1970	25	72.78	K Copper	70	2040
St. Paul St.	Martin St. South	Dead end toward Spring St.	1970	25	57.43	K Copper	70	2040
Perth St.	Bridge St.	Christian St.	1971	150	1.83	M.J. Cast	70	2041
Perth St.	Bridge St.	Christian St.	1971	150	163.97	M.J. Cast	70	2041
Perth St.	Bridge St.	Christian St.	1971	150	80.61	M.J. Cast	70	2041
Florence St.	Victoria St.	Maude St.	1973	150	98.5	CL-50 DI	50	2023
Perth (South Side)	Helen Street	Glasgow St.	1973	25	30.8	K Copper	70	2043
State St.	Watermain on State St.	Almonte Daycare	1973	25	12.44	K Copper	70	2043
Victoria St.	Florence St.	Hydrant #228	1973	150	5.43	M.J. Cast	70	2043
Victoria St.	Florence St.	Hydrant #228	1973	150	49.9	M.J. Cast	70	2043
Colina St.	Hope St.	Dead End near Dunn St.	1973	150	157.27	M.J. Cast	70	2043
Brookdale Ave.	100 mm main	50 mm curbstop valve	1974	50	6.36	K Copper	70	2044
Christian St.	Well #6	Almonte St.	1974	150	94.8	CL-50 DI	50	2024
Christian St.	Well #6	Almonte St.	1974	150	134.18	CL-50 DI	50	2024
King St.	Arthur St.	North of Tait McKenzie	1974	150	50.08	CL-50 DI	50	2024
State St.	Spring St.	Hydrant #179	1974	150	92.8	M.J. Cast	70	2044
Adelaide Court	Adelaide St.	Dead End	1976	150	33.23	CL-50 DI	50	2026
Adelaide St.	#170 Adelaide St.	Adelaide Court	1976	150	107.91	CL-50 DI	50	2026
Adelaide St.	Norton St.	#170 Adelaide St.	1976	150	79.93	CL-50 DI	50	2026
Clay St.	Spring St.	Johanna St.	1976	150	248.3	M.J. Cast	70	2046
Clay St.	Spring St.	Johanna St.	1976	150	12.93	M.J. Cast	70	2046
Country St.	Hydrant # 108	Hydrant #110	1976	150	220.8	CL-50 DI	50	2026
Country St.	Country St. main line	Almonte Country Haven	1976	150	8.89	CL-50 DI	50	2026
Easement Gemmill Park	Naismith Dr.	Field House etc.	1976	51	124.73	100 PSI poly	50	2026
Easement Gemmill Park	Naismith Dr.	Field House etc.	1976	51	10.68	K Copper	70	2046
Evelyn St.	Gale (near Spring)	Just east of Laura Cr.	1976	200	54.37	CL-50 DI	50	2026
Evelyn St.	Gale (near Spring)	Just east of Laura Cr.	1976	200	176.07	CL-50 DI	50	2026
France St.	Mid Point toward Gale	Gale St.	1976	200	51.39	CL-50 DI	50	2026
Gale St.	Spring St.	France St.	1976	200	163.81	CL-50 DI	50	2026
Gale St.	Spring St.	France St.	1976	200	109.69	CL-50 DI	50	2026
Gomme St.	Ottawa St.	Gore St.	1976	150	98.34	CL-50 DI	50	2026
Gore St.	#259 Gore St.	Hydrant #181	1976	150	40.47	CL-50 DI	50	2026
Gore St.	#259 Gore St.	Hydrant #181	1976	150	47.39	CL-50 DI	50	2026
Johanna St.	Spring St.	Dead end East of Clay	1976	150	205	M.J. Cast	70	2046
Johanna St.	Spring St.	Dead end East of Clay	1976	150	39.92	M.J. Cast	70	2046
Laura Cr.	Evelyn St.	Dead End	1976	150	92.55	CL-50 DI	50	2026
Martin St. North	Brookdale St.	To dead end toward Carss	1976	50	96.93	GOPSI Poly	60	2036
Martin St. South	South of Ward Drain	Clinton St.	1976	16	39.74	K Copper	70	2046
Spring St.	Just north of 211 Spring St.	Dead end south of Clay St.	1976	150	37.12	CL-50 DI	50	2026
Spring St.	Just north of 211 Spring St.	Dead end south of Clay St.	1976	150	105.07	CL-50 DI	50	2026
Spring St.	Just north of 211 Spring St.	Dead end south of Clay St.	1976	150	26.27	CL-50 DI	50	2026
State St.	Hydrant #179	Gomme St.	1976	150	34.43	M.J. Cast	70	2046
State St.	Hydrant #179	Gomme St.	1976	150	3.11	M.J. Cast	70	2046
State St.	Hydrant #179	Gomme St.	1976	150	8.69	M.J. Cast	70	2046
Teskey St.	Hydrant #239	Norton St.	1976	150	133.92	CL-50 DI	50	2026
Victoria St.	Hydrant #228	St. James St.	1976	150	71.24	CL-50 DI	50	2026
Victoria St.	Hydrant #227	St. James St.	1976	150	22.08	CL-50 DI	50	2026
Arena Service	Hydrant #60	Arena Hall	1978	50	25	K Copper	70	2048
Arena Service	Bridge St.	Arena	1978	150	35.16	CL-50 DI	50	2028
Euphemia St.	Almonte St.	#52 Euphemia St.	1978	150	158.14	CL-50 DI	50	2028
Euphemia St.	#52 Euphemia St.	Hope St.	1978	150	83.06	CL-50 DI	50	2028
Euphemia St.	Shutoff valve for Euphemia St.	Almonte St.	1978	150	1.59	CL-50 DI	50	2028
Glass St.	Hope St.	Dead End near Dunn St.	1978	150	166.3	CL-50 DI	50	2028
Hope St.	Malcolm St.	Glass St.	1978	150	80.97	M.J. Cast	70	2048
Maude St.	Hydrant #236	St. James St.	1978	150	229.3	CL-50 DI	50	2028
Maude St.	Hydrant #236	St. James St.	1978	150	120.35	CL-50 DI	50	2028
Maude St.	Hydrant #236	St. James St.	1978	150	20.96	CL-50 DI	50	2028
Princess St.	Union St. North	Martin St. North	1978	200	249.48	CL-50 DI	50	2028
St. Andrews St.	Almonte St.	Hydrant #19	1978	150	123.61	CL-50 DI	50	2028
St. George St.	Hydrant #84	Hydrant #82	1978	150	297.29	CL-50 DI	50	2028
St. George St.	Hydrant #82	Dead end at services	1978	150	4.48	CL-50 DI	50	2028
Victoria St.	Easement Ottawa to Victoria	Ottawa St.	1978	200	99.95	L.J. Cast	70	2048
Adelaide St.	Norton St.	Marshall St.	1979	150	54.02	CL-50 DI	50	2029
Adelaide St.	Norton St.	Marshall St.	1979	150	18.45	CL-50 DI	50	2029
Brookdale Ave.	Mitcheson St.	Hydrant #266 near Martin St.	1979	100	89.62	CL-50 DI	50	2029
Coleman St.	watermain from Wellington to Main W.	shutoff valve for Coleman St.	1979	150	1.27	CL-50 DI	50	2029
Coleman St.	Connects 10" main	with 6" valve	1979	150	2.28	CL-50 DI	50	2029
Coleman St.	#12 Coleman St.	Main St. West	1979	150	38.41	CL-50 DI	50	2029
Main St. West	Mary St.	Back Bridge	1979	250	38.91	CL-50 DI	50	2029
Main St. West	Back Bridge	PRV Station	1979	250	30.59	CL-50 DI	50	2029
Main St. West	Mary St.	Back Bridge	1979	250	38.95	CL-50 DI	50	2029
Main St. West	PRV Station	Rail Line	1979	250	9.83	CL-50 DI	50	2029
Brae St.	Hydrant #56 near Mill St.	Mill St.	1980	150	32.4	CL-50 DI	50	2030
Brae St.	Hydrant #56 near Mill St.	Mill St.	1980	150	8.66	CL-50 DI	50	2030
Bridge St.	Water St.	Old Town Hall	1980	300	5.7	Victaulic DI	100	2080
Bridge St.	Water St.	Old Town Hall	1980	300	0.91	Victaulic DI	100	2080
Bridge St.	Water St.	Little Bridge St.	1980	300	0.97	Victaulic DI	100	2080
Bridge St. near River Crossing	Water St.	Queen St.	1980	300	129.48	Victaulic DI	100	2080
Edward St.	Union St. North	Mitcheson St.	1980	200	92.34	CL-50 DI	50	2030
Edward St.	Union St. North	Mitcheson St.	1980	200	4.03	CL-50 DI	50	2030
Farm St.	Almonte St.	#16 Farm St.	1980	150	66.82	CL-50 DI	50	2030
Union St. North	Piece of connection		1980	150	1.55	CL-50 DI	50	2030
Union St. North	Piece of connection		1980	150	2.26	CL-50 DI	50	2030
Union St. North Line 2	Princess St.	Edward St.	1980	200	69.94	CL-50 DI	50	2030
Union St. North Line 2	Princess St.	Edward St.	1980	200	4.03	CL-50 DI	50	2030
Union St. South	Easement to Main St. East	Rear of #187 Main St. East	1981	150/50/15	34.81	-50 DI, K Cop	50	2031
Easement	Bridge St.	Superior Restaurant	1982	50	29.64	K Copper	70	2052
Mitcheson St.	Edward St.	Wilkinson St.	1982	200	5.64	CL-50 DI	50	2032

APPENDIX A:
The Town of Mississippi Mills Watermain Infrastructure Inventory

Mitcheson St.	Edward St.	Wilkinson St.	1982	200	129.25	CL-50 DI	50	2032
Mitcheson St.	Edward St.	Wilkinson St.	1982	200	1.18	CL-50 DI	50	2032
Robert St.	Ann St.	Country St.	1982	150	128.53	CL-50 DI	50	2032
Robert St.	Ann St.	Country St.	1982	150	3.38	CL-50 DI	50	2032
Robert St.	Ann St.	Country St.	1982	150	109.88	CL-50 DI	50	2032
Robert St.	Ann St.	Country St.	1982	150	0.46	CL-50 DI	50	2032
Union St. North	Brookdale Ave.	#156 Union St. North	1982	150	112.61	CL-50 DI	50	2032
Christian St.	2 " Line coming from Gemmill	Southern end of line (#197)	1985	20	22.94	K Copper	70	2055
Evelyn St.	Just east of Laura Cr.	Gale (dead end near Tatra)	1985	200	188.94	DR-18 PVC	80	2065
Evelyn St.	Just east of Laura Cr.	Gale (dead end near Tatra)	1985	200	45.35	DR-18 PVC	80	2065
Gale St.	France St.	Tatra St.	1985	200	306.91	DR-18 PVC	80	2065
Gale St.	France St.	Tatra St.	1985	200	87.42	DR-18 PVC	80	2065
Hanna Lane	St. Andrews St.	Hydrant #23	1985	150	136.63	CL-50 DI	50	2035
Helen St.	Hydrant #79	Dead End (2" valve)	1985	50	35.41	K Copper	70	2055
Helen St.	Perth St.	Hydrant #79	1985	150	76.05	CL-50 DI	50	2035
Hope St.	Hydrant #21	#402 Hope St.	1985	150	52.7	CL-50 DI	50	2035
Larose St.	Evelyn St.	Dead End near Johanna	1985	200	92.48	CL-50 DI	50	2035
Larose St.	Evelyn St.	Dead End near Johanna	1985	200	30.31	CL-50 DI	50	2035
Little Bridge St.	Easement to Mill		1985	25	30.57	K Copper	70	2055
Mills Community Support Corp	Maude St.	Hydrant #233	1985	152	80.99	CL-50 DI	50	2035
St. Andrews St.	Hope St.	Hanna Lane	1985	150	72.34	CL-50 DI	50	2035
Tatra St.	Larose St.	Gale St.	1985	200	186.71	CL-50 DI	50	2035
Adelaide St.	#203 Adelaide St.	#211 Adelaide St.	1987	150	26.06	CL-50 DI	50	2037
Mitcheson St.	Hydrant #265	Dead End Past Hydrant #263	1987	150	258.77	CL-50 DI	50	2037
Albert St.	Water St.	Reserve St.	1989	200	92.65	DR-18 PVC	80	2069
Brougham St.	Martin St. South	Dead end near Clyde	1989	50	57.36	K Copper	70	2059
Christian St.	211 Christian St.	197 Christian St.	1989	20	16	K Copper	70	2059
Christian St.	211 Christian St.	197 Christian St.	1989	20	36.56	K Copper	70	2059
Easement Library Lot	High St.	Reserve St.	1989	200	102.86	DR-18 PVC	80	2069
Industrial Dr.	Ottawa St.	Just north of hydrant #211	1989	250	130.7	CL-52 DI	75	2064
Industrial Dr.	Ottawa St.	Just north of hydrant #211	1989	250	100.94	CL-52 DI	75	2064
John St.	Wesley St.	Dead end near Water	1989	50	41.21	K Copper	70	2059
Martin St. South	Queen St.	State St.	1989	150	96.33	CL-52 DI	75	2064
Martin St. South	Queen St.	State St.	1989	150	67.86	CL-52 DI	75	2064
Martin St. South	Queen St.	State St.	1989	150	1.05	CL-52 DI	75	2064
Ottawa St.	Line #1 (at George St.)	Line #2 (at George St.)	1989	150	11	CL-52 DI	75	2064
Ottawa St.	Valvebox	T on 10" pipe	1989	150	3.42	CL-52 DI	75	2064
Ottawa St. Line 2	Harold St.	Industrial Drive	1989	250	260.55	CL-52 DI	75	2064
Ottawa St. Line 2	Harold St.	Industrial Drive	1989	250	8.05	CL-52 DI	75	2064
Ottawa St. Line 2	Harold St.	Industrial Drive	1989	250	156.19	CL-52 DI	75	2064
Ottawa St. Line 2	Harold St.	Industrial Drive	1989	250	1.96	CL-52 DI	75	2064
Water St.	Albert St.	Hydrant #58	1989	150	124.38	DR-18 PVC	80	2069
Water St.	Albert St.	Hydrant #58	1989	150	4.14	DR-18 PVC	80	2069
Water St.	Albert St.	Hydrant #58	1989	150	32.04	DR-18 PVC	80	2069
Water St.	Bridge St.	Albert St.	1989	200	33.21	DR-18 PVC	80	2069
Brookdale Ave.	East side of Railway	West Railway Boundary	1990	50	25.87	K Copper	70	2060
Easement to Tower	Industrial Dr.	Water Tower	1990	300	172.98	DR-18 PVC	80	2070
Easement to Tower	Industrial Dr.	Water Tower	1990	300	34.91	DR-18 PVC	80	2070
Houston Dr.	Industrial Dr.	Hydrant #208	1990	250	199.84	DR-18 PVC	80	2070
Industrial Dr.	Just North of Hydrant #211	Turn toward East	1990	250	29.45	DR-18 PVC	80	2070
Industrial Dr.	Just North of Hydrant #211	Turn toward East	1990	250	211.09	DR-18 PVC	80	2070
Industrial Dr.	Just North of Hydrant #211	Turn toward East	1990	250	1.48	DR-18 PVC	80	2070
Maude St.	Hydrant #236	St. James St.	1990	150	117.47	CL-50 DI	50	2040
Paterson St.	Water Tower	Tatra St.	1990	200	52.66	DR-18 PVC	80	2070
Arthur St.	St. George St.	King St.	1991	150	123.96	DR-18 PVC	80	2071
Christian St.	Perth St.	Well #6	1991	250	422.67	DR-18 PVC	80	2071
Cameron St.	Union St. North	Dead end at Railway	1992	150	90.73	DR-18 PVC	80	2072
Chlorine Contact □Chambers	Well #5	Chlorine contact chamber	1992	900	41.86	Hi-Press Con	60	2052
Chlorine Contact □Chambers	Well #6	Chlorine contact chamber	1992	900	27.46	Hi-Press Con	60	2052
Chlorine Contact □Chambers	Well #7 & 8	Chlorine contact chamber	1992	1,200	110.35	Hi-Press Con	60	2052
Chlorine Contact □Chambers	Well #3	Chlorine contact chamber	1992	900	32.82	Hi-Press Con	60	2052
Chlorine Contact □Chambers	Well #7 & 8	Chlorine contact chamber	1992	1,200	17.74	Hi-Press Con	60	2052
Christian St.	Line from Well #6 to Almonte St.	Line Between #211-197 Christian St	1992	50	50.17	K Copper	70	2062
Edward St.	Waterford St.	Intersection	1992	150	4.34	CL-52 DI	75	2067
Jamieson St.	Perth St.	South of Scott St.	1992	200	280.09	DR-18 PVC	80	2072
Jamieson St.	Perth St.	South of Scott St.	1992	200	194.53	DR-18 PVC	80	2072
Main St. East	Union St. North/South	Martin St. North/South	1992	200	244.56	CL-52 DI	75	2067
Maitland St.	Bridge St.	Dead end	1992	150	68.11	DR-18 PVC	80	2072
Peterson St.	Union St. North	Rail Line dead end	1992	150	93.4	DR-18 PVC	80	2072
Richey St.	Bridge St.	Dead end	1992	150	62.13	DR-18 PVC	80	2072
Tait McKenzie St.	Jamieson St.	Metcalfe St.	1992	200	82.96	CL-52 DI	75	2067
Tait McKenzie St.	Jamieson St.	Metcalfe St.	1992	200	162.06	CL-52 DI	75	2067
Tatra St.	Gale St.	Water Tower	1992	200	45.86	DR-18 PVC	80	2072
Thomas St.	Union St. North	Rail Line	1992	150	77.99	DR-18 PVC	80	2072
Waterford St.	Edward St.	Wilkinson St.	1992	150	121.34	DR-18 PVC	80	2072
Well #3	Well #3	Well #3 Isolation Valve	1992	150	4.21	CL-52 DI	75	2067
Well #6	Well #6		1992	150	3.11	CL-52 DI	75	2067
Well #6	Well #6		1992	150	0.45	CL-52 DI	75	2067
Well #6	Well #6		1992	150	1.86	CL-52 DI	75	2067
Well #6	Well #6		1992	150	2.04	CL-52 DI	75	2067
Well #7/8 and watertower	Well #7 & 8	valvechamber	1992	300	16.21	DR-18 PVC	80	2072
Well #7/8	Well #7 & 8		1992	300	23.22	DR-18 PVC	80	2072
Well #7/8	Well #7 & 8		1992	300	5.91	DR-18 PVC	80	2072
Wilkinson St.	Mitcheson St.	Martin St. North	1992	150	80.7	DR-18 PVC	80	2072
Wilkinson St.	Mitcheson St.	Martin St. North	1992	150	74.14	DR-18 PVC	80	2072
Harold St.	Ottawa St.	Hydrant #186	1993	200	153.86	DR-18 PVC	80	2073
MainWest PRV	Main West at Railway		1993	50-150/250	9.82	nless steel/C	50	2043
Metcalfe St.	Shutoff for Metcalfe St.	capped end	1993	150	10.16	CL-52 DI	75	2068
Metcalfe St.	Tait McKenzie	Valvebox at Metcalfe	1993	150	27.42	CL-52 DI	75	2068
Gore St.	Spring St.	Gomme St.	1995	150	67.23	L.J. Cast	70	2065
Mercer St.	Victoria St.	#45 Mercer St.	1995	25	57.18	K Copper	70	2065
Spring St.	Ottawa St.	St. Paul St.	1995	250	100	DR-18 PVC	80	2075
Spring St.	Ottawa St.	St. Paul St.	1995	250	90.74	DR-18 PVC	80	2075

APPENDIX A:
The Town of Mississippi Mills Watermain Infrastructure Inventory

Spring St.	Ottawa St.	St. Paul St.	1995	250	4.44	DR-18 PVC	80	2075
Spring St.	Ottawa St.	St. Paul St.	1995	250	8.24	DR-18 PVC	80	2075
Spring St.	Ottawa St.	St. Paul St.	1995	250	82.36	DR-18 PVC	80	2075
Spring St.	Ottawa St.	St. Paul St.	1995	250	80.71	DR-18 PVC	80	2075
Spring St. Line 2	St. Paul St.	Gale St.	1995	250	110.82	DR-18 PVC	80	2075
State St.	Spring St.	Valve for State St.	1995	150	1.46	DR-18 PVC	80	2075
William St.	#246 William St.	James St.	1995	150	86.92	DR-18 PVC	80	2075
Easement	Thoburn Mill	Iron Works	1996	50	31.43	K Copper	70	2066
R. Tait Service	Water Tower to Industrial	R. Tait McKenzie	1997	200	27.91	DR-18 PVC	80	2077
R. Tait Service	Service to Industrial from Water Tower	Valvebox at R. Tait	1997	200	5.21	DR-18 PVC	80	2077
Brookdale Ave.	Union St. North	Pinehurst Estate etc.	1998	50	11.4	160 PSI poly	60	2058
Union St. North	Service to 53 Carss	Rail Line	1998	50	29.67	160 PSI poly	60	2058
France St.	Harold St.	Mid point toward Gale St.	1999	200	49.56	DR-18 PVC	80	2079
Harold St.	Hydrant #186	France St.	1999	200	247.01	DR-18 PVC	80	2079
Harold St.	Water main on Harold St.	Holy Name of Mary Service	1999	150	10.31	DR-18 PVC	80	2079
Harold St.	Hydrant #186	France St.	1999	200	46.48	DR-18 PVC	80	2079
Industrial Dr.	Industrial Dr.	Stub at valvebox	1999	250	9.73	DR-18 PVC	80	2079
James St.	Water St.	Tooley St.	1999	25	173.21	K Copper	70	2069
Main St. West	Back Bridge		1999	250	83.46	CL-54 DI	100	2099
Water St.		Monk St.	1999	25	31.26	K Copper	70	2069
Houston Dr.	Hydrant #209	Paterson St.	2000	150	31.74	DR-18 PVC	80	2080
Morton St.	Harold St.	Paterson St.	2000	150	188.25	DR-18 PVC	80	2080
Easement	Little Bridge St.	Thoburn Mill	2001	150	56.64	DR-18 PVC	80	2081
Ottawa St.	Industrial Dr.	Appleton Rd.	2001	250	409.39	DR-18 PVC	80	2081
Gore St.	Hydrant #181	Hydrant #180	2001	150	47.07	DR-18 PVC	80	2081
Charles St.	Farm St.	Dead end near Colborne St.	2002	50	62.75	K Copper	70	2072
Farm St.	Brae St.	Intersection of Brae & Farm	2002	150	10.37	CL-52 DI	75	2077
Farm St.	Brae St.	Intersection	2002	150	6.21	CL-52 DI	75	2077
Farm St.	Charles St.	Intersection	2002	150	9.74	CL-52 DI	75	2077
Firehall Town Yard	Line from Well #5	Firehall	2003	150/50	22.71	18 PVC/K Co	80	2083
Jamieson St.	Scott St.	Metcalfe St.	2003	200	42.93	DR-18 PVC	80	2083
Jamieson St.	Shutoff valve for Jamieson St.	Hydrant #73	2003	200	44.6	DR-18 PVC	80	2083
Jamieson St.	Stub at south side of T for Vaughan		2003	200	1.1	DR-18 PVC	80	2083
Sadler Dr.	Ottawa St.	Dead end	2003	250	91.46	DR-18 PVC	80	2083
Sadler Dr.	Ottawa St.	Dead end	2003	250	2.16	DR-18 PVC	80	2083
Tait McKenzie St.	Metcalfe St.	King St.	2003	200	158.46	DR-18 PVC	80	2083
Bridge St.	Farm St.	Country St.	2004	203	8.96	DR-18 PVC	80	2084
Bridge St.	Intersection with Country St.	Valvebox for Bridge St. to Parkview St.	2004	200	14.16	DR-18 PVC	80	2084
Bridge St.	Country St.	Whitten Ln	2004	203	9.95	DR-18 PVC	80	2084
Bridge St.	Country St.	Whitten Ln	2004	203	63.08	DR-18 PVC	80	2084
Bridge St.	Country St.	Whitten Ln	2004	203	10.8	DR-18 PVC	80	2084
Bridge St.	Country St.	Whitten Ln	2004	203	60.98	DR-18 PVC	80	2084
Chlorine residual sampling line	Well #3	Well house to past end(s) of contact chamber	2004	19	10.69	K Copper	70	2074
Chlorine residual sampling line	Well #7 & 8	Well house to past end(s) of contact chamber	2004	19	31.56	K Copper	70	2074
Chlorine residual sampling line	Well #6	Well house to past end(s) of contact chamber	2004	19	7.31	K Copper	70	2074
Colborne St.	PRV Station	Bridge St.	2004	150	18.34	DR-18 PVC	80	2084
Country St.	Church St.	Elgin St.	2004	203	103.49	DR-18 PVC	80	2084
Country St.	Church St.	Elgin St.	2004	203	9.13	DR-18 PVC	80	2084
Country St.	Church St.	Elgin St.	2004	203	11.93	DR-18 PVC	80	2084
Country St.	Elgin St.	Bridge St.	2004	200	162.31	DR-18 PVC	80	2084
Farm St.	PRV Station	Bridge St.	2004	150	12.75	DR-18 PVC	80	2084
King St.	North of Tait McKenzie	South of Tait McKenzie	2004	200	7.99	DR-18 PVC	80	2084
King St.	North of Tait McKenzie	South of Tait McKenzie	2004	200	17.57	DR-18 PVC	80	2084
Thoburn St.	Tait McKenzie	Hydrant #75	2004	150	84.47	DR-18 PVC	80	2084
Thoburn St.	Tait McKenzie	Hydrant #75	2004	150	27.09	DR-18 PVC	80	2084
Vaughan St.	Thoburn St.	Jamieson St.	2004	203	295.95	DR-18 PVC	80	2084
Jamieson St./Thoburn St.	Hydrant #73	Hydrant #75	2005	200	380	DR-18 PVC	80	2085
Perth St.	Country St.	King St.	2005	200	116.81	DR-18 PVC	80	2085
Perth St.	Country St.	King St.	2005	200	86.3	DR-18 PVC	80	2085
Water St.	#256 Water St.	#306 Water St.	2005	150	122.27	DR-18 PVC	80	2085
Hospital service from Spring St.	Spring St.	Hospital	2006	152	20.84	DR-18 PVC	80	2086
Carleton St.	Wellington St.	Dead end past Rosamond East	2006	150	114.42	DR-18 PVC	80	2086
Industrial Dr.	Industrial Dr.	Appleton Rd.	2006	254	394.06	DR-18 PVC	80	2086
Monk St.	Wesley St.	Easement at rear of #270 Water St.	2006	25	164.61	K Copper	70	2076
Monk St.	Easement	James St.	2006	152	13.99	DR-18 PVC	80	2086
Monk St.	Easement	James St.	2006	152	1.11	DR-18 PVC	80	2086
State St.	State St.	Hospital	2006	152	31.36	DR-18 PVC	80	2086
State St.	Line on State St.	new Fairview Manor	2006	150	31.17	DR-18 PVC	80	2086
Wellington St.	Coleman St.	Esplaud St.	2006	50	38.73	K Copper	70	2076
Wellington St.	Coleman St.	Mary St.	2006	150	52.44	DR-18 PVC	80	2086
Wesley St.	Rear of #260 Water St.	"(junction between 1" lines)"	2006	25	1.8	K Copper	70	2076
Strathburn St.	Malcolm St.	#233 Strathburn St./Hyd #33	2007	150	80.37	DR-18 PVC	80	2087
Strathburn St.	#233 Strathburn St.	Dead end at #218	2007	150	49.12	DR-18 PVC	80	2087
Dr. Bach St.	Jamieson St.	Valvebox	2007	150	4.5	DR-18 PVC	80	2087
Dr. Bach St.	Valvebox	22.5 Bend	2007	150	1.5	DR-18 PVC	80	2087
Dr. Bach St.	22.5 Bend	22.5 Bend	2007	150	4	DR-18 PVC	80	2087
Dr. Bach St.	Reverse 22.5 bend	Fairbairn Brothers St.	2007	150	73.5	DR-18 PVC	80	2087
Dr. Bach St.	Fairbairn Brothers St.	Valvebox	2007	150	5.5	DR-18 PVC	80	2087
Dr. Bach St.	Valvebox	Hydrant Lead	2007	150	137.5	DR-18 PVC	80	2087
Dr. Bach St.	Hydrant Lead	Valvebox	2007	150	3	DR-18 PVC	80	2087
Dr. Bach St.	Valvebox	King St.	2007	150	4.5	DR-18 PVC	80	2087
King St.	Dr. Bach St.	Existing pipe towards Argyle	2007	150	40	DR-18 PVC	80	2087
King St.	Dr. Bach St.	Bends at Fairbairn Brothers St.	2007	150	72.5	DR-18 PVC	80	2087
Fairbairn Brothers St.	45 bend at King St.	Other 45 bend at King St.	2007	150	10.5	DR-18 PVC	80	2087
Fairbairn Brothers St.	Other 45 bend at King St.	Hydrant Lead	2007	150	79	DR-18 PVC	80	2087
Fiarbairn Brothers St.	Hydrant Lead	Corner in Fairbairn Brothers St.	2007	150	55	DR-18 PVC	80	2087
Fairbairn Brothers St.	Corner in Fairbairn Brothers St.	Next corner in Fairbairn Brothers St.	2007	150	13	DR-18 PVC	80	2087
Fairbairn Brothers St.	Next corner in Fairbairn Brothers St.	Valvebox near Dr. Bach St.	2007	150	64	DR-18 PVC	80	2087
Fairbairn Brothers St.	Valvebox near Dr. Bach St.	Dr. Bach St.	2007	150	6	DR-18 PVC	80	2087

A P P E N D I X C

The Town of Mississippi Mills
Sanitary Sewer Inventory

APPENDIX B:
Town of Mississippi Mills Sanitary Sewer Inventory

STREET NAME	FROM	TO	MATERIAL_1	INITIAL CONSTRUCTION	DIAMETER (MM)	LENGTH_TRUE	Estimated Useful Life	End of Usefule Life
ALBERT ST.	WATER ST.	RESERVE ST.	V.C. WITH PVC REPAIR	1930	375	87.78	70	2000
ALMONTE ST.	M.H. AT LIFT STATION INLET	FARM ST.	V.C.	1930	600	21.33	70	2000
ALMONTE ST.	ISLAND FORCE MAIN OUTLET	MILL ST.	V.C.	1930	525	64.28	70	2000
ALMONTE ST.	ST. ANDREWS ST.	EUPHEMIA ST.	VITRIFIELD CLAY WITH FIBERGLASS REPAIR	1930	250	78.61	70	2000
ALMONTE ST.	ST. ANDREWS ST.	EUPHEMIA ST.	VITRIFIELD CLAY WITH FIBERGLASS REPAIR	1930	225	75.75	70	2000
ALMONTE ST.	ISLAND FORCE MAIN OUTLET	MILL ST.	V.C.	1930	525	23.18	70	2000
ALMONTE ST.	FARM ST.	M.H. AT ISLAND LIFT STATION FORCE MAIN OUTLET	V.C.	1930	600	11.41	70	2000
BOLLIS LANE	DEAD END	WATER ST.	V.C. WITH PVC REPAIRS	1930	375	64.75	70	2000
BRAE ST.	FARM ST.	HYDRANT #56	V.C. WITH PVC REPAIRS	1930	225	52.01	70	2000
BRAE ST.	FARM ST.	HYDRANT #56	V.C. WITH PVC, AND FIBREGLASS REPAIRS	1930	225	102.08	70	2000
BRAE ST.	HYDRANT #59	FARM ST.	V.C.	1930	225	38.06	70	2000
BRAE ST.	HYDRANT #59	FARM ST.	V.C.	1930	225	74.76	70	2000
BRIDGE ST.	HIGH ST.	EASEMENT TO SUPERIOR RESTAURANT - MILL ST.	VC WITH SMALLER A.C.REPAIR AND P.V.C.	1930	200	32.49	70	2000
BRIDGE ST.	HIGH ST.	FARM ST.	V.C. WITH CONC, FIBREGLASS AND PVC REI	1930	375	65.22	70	2000
BRIDGE ST.	OUTFALL OF SEWER FROM SUPERIOR	OUTFALL FROM HYDER LANE	V.C.	1930	225	1.35	70	2000
CHURCH ST.	DEAD END NEAR COUNTRY	WILLIAM ST.	V.C. WITH PVC REPAIRS	1930	225	89.21	70	2000
CHURCH ST.	WILLIAM ST.	ANN ST.	V.C. WITH PVC REPAIRS WITH TEE LINER IN	1930	225	145.75	70	2000
CHURCH ST.	ANN ST.	HIGH ST.	V.C.	1930	300	95.27	70	2000
CLYDE ST.	QUEEN ST.	EASEMENT TO STATE ST.	V.C.	1930	300	57.51	70	2000
CLYDE ST.	QUEEN ST.	EASEMENT TO STATE ST.	V.C.	1930	300	81.31	70	2000
COLBORNE ST.	DEAD END NEAR BRIDGE ST.	BRAE ST.	V.C.	1930	225	102.52	70	2000
COUNTRY ST.	CHURCH ST.	JAMES ST.	V.C.WITH A.C. AND PVC REPAIR	1930	225	94.24	70	2000
EASEMENT TO BEER STORE FROM BRIDGE ST.	BRIDGE ST.	BEER STORE	V.C. WITH A.C. REPAIRS AND FIBREGLASS R	1930	200	40.55	70	2000
EASEMENT TO SUPERIOR FROM BRIDGE ST.	BRIDGE ST.	SUPERIOR	V.C.	1930	225	13.67	70	2000
EASEMENT TO SUPERIOR FROM BRIDGE ST.	BRIDGE ST.	SUPERIOR	V.C.	1930	225	17.12	70	2000
EASEMENT UNDER GARAGE	CLYDE ST.	MARTIN ST. SOUTH	V.C. WITH FIBREGLASS LINER	1930	300	61.57	70	2000
FARM ST.	BRIDGE ST.	BRAE ST.	V.C. WITH P.V.C. REPAIRS	1930	450	116.88	70	2000
FARM ST.	BRAE ST.	CHARLES ST.	V.C. WITH CONC. REPAIRS	1930	450	88.37	70	2000
HIGH ST.	ELGIN ST.	CHURCH ST.	V.C. WITH P.V.C. REPAIRS	1930	300	39.96	70	2000
HIGH ST.	ELGIN ST.	CHURCH ST.	V.C. WITH P.V.C. REPAIRS	1930	300	70.18	70	2000
HIGH ST. [MARKET SQUARE]	SERVICE TO BUILDING MOVERS	BRAE ST.	V.C.	1930	150	61.21	70	2000
LITTLE BRIDGE	BRIDGE ST.	IN FRONT OF TOWN HALL - LITTLE BRIDGE ST.	V.C.	1930	450	10.63	70	2000
LITTLE BRIDGE	OLD POST OFFICE	MILL AND BRAE ST.	V.C.	1930	525	45.38	70	2000
MAIN ST. WEST	SERVICE TO #30, 36, 48 (AKA #4 COLEMAN	MARY ST.	V.C.	1930	225	42.16	70	2000
MALCOLM ST.	#17 MALCOLM ST.	#39 MALCOLM ST.	V.C. PVC VARIOUS REPAIRS	1930	250	55.01	70	2000
MARY ST.	GATE IN WALL	WELLINGTON ST.	V.C. WITH PVC REPAIRS	1930	225	106.04	70	2000
MARY ST.	WELLINGTON ST.	ROSAMOND ST. EAST	V.C. WITH PVC REPAIRS	1930	225	109.48	70	2000
MILL ST.	BRAE ST.	#38 MILL ST.	V.C.	1930	525	60.29	70	2000
MILL ST.	#30 MILL ST.	ALMONTE ST.	VC WITH FIBERGLASS REPAIRS	1930	525	87.79	70	2000
MILL ST.	#38 MILL ST.	COADY CAR CARE #30 MILL ST.	VC WITH FIBERGLASS REPAIRS	1930	525	28.47	70	2000
OTTAWA ST. LINE #2	HAROLD ST.	FLORENCE ST.	V.C. WITH FIBERGLASS LINER	1930	225	79.39	70	2000
QUEEN ST.	MARTIN ST. NORTH	CLYDE ST.	V.C.	1930	375	137.75	70	2000
QUEEN ST.	CLYDE ST.	HYDRANT #151	V.C. WITH PVC REPAIRS	1930	450	50.48	70	2000
QUEEN ST.	CLYDE ST.	HYDRANT #151	V.C. WITH PVC REPAIRS	1930	450	41.18	70	2000
RESERVE ST.	JOHN ST.	ALBERT ST.	V.C. WITH PVC REPAIRS	1930	375	108.54	70	2000
RESERVE ST.	JOHN ST.	ALBERT ST.	V.C. WITH PVC REPAIRS	1930	375	75.32	70	2000
ROSAMOND ST. EAST	MARY ST.	SHEPHERD ST.	V.C. WITH PVC REPAIRS	1930	225	66.11	70	2000
ROSAMOND ST. EAST	MARY ST.	SHEPHERD ST.	V.C. WITH PVC REPAIRS	1930	225	15.18	70	2000
ROSAMOND ST. EAST	MARY ST.	SHEPHERD ST.	V.C. WITH PVC REPAIRS	1930	225	5.10	70	2000
SHEPHERD ST.	ROSAMOND ST. EAST	WELLINGTON ST.	V.C. WITH PVC REPAIRS	1930	225	96.27	70	2000
SPRING ST.	DEAD END NORTH OF CLINTON ST.	STATE ST.	V.C.	1930	250	55.31	70	2000
UNION NORTH/SOUTH	UNION ST. NORTH	UNION ST. SOUTH	V.C. WITH A.C. REPAIRS	1930	375	18.04	70	2000
WATER ST.	BRIDGE ST.	ALBERT ST.	V.C. WITH FIBREGLASS SPOT REPAIRS	1930	450	56.82	70	2000
WATER ST.	BRIDGE ST.	ALBERT ST.	V.C. WITH FIBREGLASS SPOT REPAIR	1930	450	44.79	70	2000
WILLIAM ST.	SIDE DOOR OF #157 CHURCH ST.	#245 WILLIAM ST.	V.C. WITH FIBREGLASS SPOT REPAIR	1930	250	52.49	70	2000
WILLIAM ST.	CHURCH ST.	SIDE DOOR OF #157 CHURCH ST.	V.C. / CONC. / P.V.C	1930	200	34.67	70	2000
EDWARD ST.	DEAD END NEAR UNION ST. NORTH	MARTIN ST. NORTH	V.C. WITH PVC REPAIRS	1931	250	39.01	70	2001
EDWARD ST.	DEAD END NEAR UNION ST. NORTH	MARTIN ST. NORTH	V.C. WITH PVC REPAIRS	1931	250	75.84	70	2001
EDWARD ST.	DEAD END NEAR UNION ST. NORTH	MARTIN ST. NORTH	V.C. WITH PVC REPAIRS	1931	250	79.85	70	2001
MAIN ST. EAST	SERVICE TO #57 MAIN ST. EAST	CORNER OF UNION ST. SOUTH	V.C.	1931	150	17.90	70	2001
MAIN ST. EAST	SERVICE TO #57 MAIN ST. EAST	CORNER WITH UNION ST. SOUTH	V.C.	1931	150	11.74	70	2001
MARTIN ST. NORTH	AUGUSTA ST.	TESKEY ST.	V.C.	1931	225	82.25	70	2001
MARTIN ST. NORTH	#78 MARTIN ST. NORTH	AUGUSTA ST.	V.C. VARIOUS PVC REPAIRS	1931	225	54.82	70	2001
MARTIN ST. NORTH	MAUDE ST.	#78 MARTIN ST. NORTH	V.C. WITH FIBERGLASS LINER	1931	225	41.19	70	2001
MARTIN ST. NORTH	EDWARD ST.	MAUDE ST.	V.C.	1931	225	37.06	70	2001
MARTIN ST. NORTH	VICTORIA ST.	EDWARD ST.	V.C.WITH FIBERGLASS LINER	1931	300	59.57	70	2001
MARTIN ST. NORTH	VICTORIA ST.	PRINCESS ST.	V.C. WITH PVC REPAIRS	1931	300	15.67	70	2001
MARTIN ST. NORTH	MARTIN ST. SOUTH	PRINCESS ST.	V.C.	1931	375	84.83	70	2001
MARTIN ST. SOUTH	OTTAWA ST.	QUEEN ST.	V.C.	1931	450	26.83	70	2001
MITCHESON ST.	BROOKDALE AVENUE	HYDRANT #265	V.C.	1931	250	56.89	70	2001
MITCHESON ST.	HYDRANT #267	BROOKDALE AVENUE	V.C. WITH PVC REPAIRS	1931	225	77.48	70	2001
MITCHESON ST.	STEPHEN ST.	HYDRANT #267	V.C.	1931	225	97.62	70	2001
MITCHESON ST.	WILKINSON ST.	STEPHEN ST.	V.C. WITH PVC REPAIRS	1931	225	115.04	70	2001
UNION ST. NORTH	PRINCESS ST.	MAIN ST. EAST	V.C.	1931	375	63.01	70	2001
UNION ST. NORTH	JUST NORTH OF STEPHEN ST.	WILKINSON ST.	V.C. WITH PVC REPAIRS	1931	225	154.18	70	2001
UNION ST. NORTH	WILKINSON ST.	EDWARD ST.	V.C. WITH PVC REPAIRS	1931	225	61.90	70	2001
UNION ST. NORTH	WILKINSON ST.	EDWARD ST.	V.C. WITH PVC REPAIRS	1931	225	83.22	70	2001
UNION ST. NORTH	EDWARD ST.	PRINCESS ST.	V.C.	1931	375	75.15	70	2001
UNION ST. SOUTH	MAIN ST. EAST	#20 UNION ST. SOUTH	V.C.	1931	375	63.00	70	2001
WILKINSON ST.	UNION ST. NORTH	MITCHESON ST.	V.C. WITH PVC REPAIRS	1931	300	99.14	70	2001
RICHEY ST.	BRIDGE ST.	DEAD END	V.C. WITH PVC REPAIRS	1932	150	64.95	70	2002
MAIN ST.	#111 MAIN ST. EAST ON SOUTH SIDE	#114 MAIN EAST ON NORTH SIDE	CONC. WITH P.V.C. REPAIRS	1944	150	16.78	60	2004
MAIN ST.	#114 MAIN EAST ON NORTH SIDE	#92 MAIN EAST ON NORTH SIDE	CONC.	1944	150	52.10	60	2004
MAIN ST.	#78 MAIN EAST ON NORTH SIDE	#92 MAIN EAST ON NORTH SIDE	CONC.	1944	150	43.04	60	2004
MAIN ST.	#92 MAIN EAST ON NORTH SIDE	EASEMENT TO UNION SOUTH REAR OF 87 MAIN ST.	CONC. WITH P.V.C. REPAIRS	1944	200	55.22	60	2004
MAIN ST. EAST	#111 MAIN ST. EAST	MAIN ST. CROSSING PIPE (#119)	CONC.	1944	150	22.26	60	2004
MAIN ST. EAST	SERVICE TO #111 MAIN ST. EAST	#111 MAIN ST. EAST	CONC.	1944	100	5.15	60	2004
MAIN ST. EAST	SERVICE TO #119 MAIN ST. E	#111 MAIN ST. EAST	CONC.	1944	100	2.11	60	2004
PRINCESS ST. EASEMENT TO MAIN EAST	#102 PRINCESS ST.	#92 MAIN ST. EAST	CONC. WITH P.V.C. EXTENSION	1944	150	5.89	60	2004
PRINCESS ST. EASEMENT TO MAIN EAST	#102 PRINCESS ST.	#92 MAIN ST. EAST	CONC. WITH P.V.C. EXTENSION	1944	150	47.80	60	2004
PRINCESS ST. EASEMENT TO MAIN EAST	#102 PRINCESS ST.	#92 MAIN ST. EAST	CONC. WITH P.V.C. EXTENSION	1944	150	11.19	60	2004
PRINCESS ST. EASEMENT TO MAIN EAST	#102 PRINCESS ST.	#92 MAIN ST. EAST	CONC. WITH P.V.C. EXTENSION	1944	150	8.57	60	2004
ARENA SERVICES	CURLING RINK	BRIDGE ST.	CONC.	1948	150	22.35	60	2008
BROUGHAM ST.	MARTIN ST. SOUTH	CLEAN OUT AT #130 BROUGHAM ST.	CONC.	1948	150	59.39	60	2008
CAMERON ST.	#53 CAMERON ST.	EASEMENT ALONG EAST SIDE OF RAIL LINE	CONC.	1948	150	69.61	60	2008
EASEMENT EAST OF CPR LINE	THOMAS ST.	CAMERON ST.	CONC.	1948	150	64.54	60	2008
EASEMENT EAST OF CPR LINE	PETERSON	CAMERON ST.	A.C. CONC. C.I.	1948	200	20.34	70	2018
EASEMENT EAST OF CPR LINE	DEAD END NORTH OF THOMAS	THOMAS ST.	CONC.	1948	150	20.75	60	2008
EASEMENT EAST OF CPR LINE	#40 PETERSON ST.	EASEMENT EAST SIDE OF RAIL LINE	CONC.	1948	150	82.75	60	2008
JOHN ST.	RESERVE ST.	WESLEY ST.	VC WITH PVC REPAIRS	1948	375	20.05	70	2018
MAUDE ST.	MARTIN ST. NORTH	FREDERICK ST.	CONC.	1948	255	178.59	60	2008
MITCHESON ST.	EDWARD ST.	DEAD END NEAR WILKINSON ST.	CONC.	1948	150	113.62	60	2008
THOMAS ST.	DEAD END #49 THOMAS ST.	EASEMENT EAST SIDE OF RAIL LINE	CONC.	1948	150	56.43	60	2008
WESLEY ST.	JOHN ST.	HYDRANT #127	V.C.	1948	375	87.97	70	2018
ANN ST.	CHURCH ST.	JAMES ST.	CONC.	1950	200	83.62	60	2010
ANN ST.	CHURCH ST.	JAMES ST.	CONC.	1950	200	60.90	60	2010
ANN ST.	CHURCH ST.	JAMES ST.	CONC.	1950	200	91.12	60	2010
ANN ST.	CHURCH ST.	JAMES ST.	CONC.	1950	200	22.80	60	2010
ARTHUR ST.	ST. GEORGE ST.	DEAD END	CONC.	1950	200	87.14	60	2010
CARLETON ST.	ROSAMOND ST. EAST	WELLINGTON	CONC. WITH PVC REPAIRS	1950	200	110.45	60	2010
CARLETON ST.	ROSAMOND ST. EAST	HYDRANT #27	CONC.	1950	200	69.16	60	2010
COLEMAN ST.	#12 COLEMAN ST.	WELLINGTON ST.	CONC.	1950	200	62.07	60	2010
HOPE ST.	MALCOLM ST.	EUPHEMIA ST.	CONC.	1950	250	78.09	60	2010
HOPE ST.	MALCOLM ST.	EUPHEMIA ST.	CONC.	1950	250	82.50	60	2010
JAMES ST.	ANN ST.	DEAD END AT JAMES #157	CONC.	1950	200	56.93	60	2010
MAITLAND ST.	BRIDGE ST.	DEAD END	CONC. WITH PVC REPAIRS	1950	150	70.63	60	2010
MARTIN ST. SOUTH	DEAD END NEAR QUEEN	STATE ST.	CONC. WITH PVC REPAIRS	1950	150	64.92	60	2010

APPENDIX B:
Town of Mississippi Mills Sanitary Sewer Inventory

MARTIN ST. SOUTH	DEAD END NEAR QUEEN	STATE ST.	CONC. WITH PVC REPAIRS	1950	150	61.89	60	2010
ROSAMOND ST. EAST	MARY ST.	CARLETON ST.	CONC. WITH PVC REPAIRS	1950	225	48.64	60	2010
ST. GEORGE ST.	PERTH ST.	HYDRANT #84	CONC.	1950	250	71.50	60	2010
ST. GEORGE ST.	PERTH ST.	HYDRANT #84	CONC.	1950	250	105.56	60	2010
ST. GEORGE ST.	PERTH ST.	HYDRANT #84	CONC.	1950	250	94.46	60	2010
STATE ST.	MH AT EAST SIDE OF MARTIN ST.SOUTH	EASEMENT TO CLYDE ST.	V.C. WITH FIBREGLASS LINER	1950	300	5.75	70	2020
WATERFORD ST.	EDWARD ST.	#72 WATERFORD ST.	CONC. WITH PVC REPAIRS	1950	150	109.52	60	2010
HOPE ST.	ST. ANDREWS ST.	#396 HOPE ST.	CONC.	1951	200	81.30	60	2011
HOPE ST.	EUPHEMIA ST.	ST. ANDREWS ST.	CONC.	1951	200	75.03	60	2011
HOPE ST.	EUPHEMIA ST.	ST. ANDREWS ST.	CONC.	1951	200	77.36	60	2011
OTTAWA ST. LINE #2	GEORGE ST. (DEAD END)	HAROLD ST.	CONC. WITH PVC REPAIRS & FIBREGLASS L	1951	200	83.51	60	2011
OTTAWA ST. LINE #2	GEORGE ST. (DEAD END)	HAROLD ST.	CONC.	1951	200	58.72	60	2011
OTTAWA ST. LINE #2	GEORGE ST. (DEAD END)	HAROLD ST.	CONC.	1951	200	16.04	60	2011
SPRING ST.	STATE ST.	GORE ST.	CONC. WITH PVC REPAIRS FIBERGLASS LIN	1951	200	92.79	60	2011
ST. ANDREWS ST.	HOPE ST.	DEAD END NEAR WYLIE ST.	CONC. WITH PVC REPAIRS	1951	200	89.56	60	2011
EASEMENTS	RIVER BANK	WELLINGTON ST.	C.I.	1952	100	72.29	70	2022
MAIN ST.	#51 MAIN EAST	#11 MAIN WEST	A.C.	1952	150	112.90	70	2022
ADELAIDE ST.	#203 ADELAIDE ST.	#211 ADELAIDE ST.	CONC. WITH PVC EXTENSION	1956	200	69.60	60	2016
ADELAIDE ST.	MARSHALL ST.	#203 ADELAIDE ST.	CONC	1956	200	5.00	60	2016
AUGUSTA ST.	MARSHALL ST.	NORTON ST.	CONC. WITH PVC REPAIR	1956	250	75.96	60	2016
AUGUSTA ST.	NORTON ST.	FREDERICK ST.	CONC. WITH PVC REPAIR	1956	250	82.72	60	2016
AUGUSTA ST.	FREDERICK ST.	MARTIN ST. NORTH	CONC.	1956	250	127.02	60	2016
BRIDGE ST.	PARKVIEW DRIVE	COUNTRY	CONC. WITH PVC REPAIR	1956	200	69.84	60	2016
GORE ST.	#238 GORE ST.	#203 GORE ST.	CONC.	1956	200	67.88	60	2016
MARSHALL ST.	AUGUSTA ST.	ADELALIDE ST.	CONC. WITH FIBERGLASS LINER	1956	250	59.79	60	2016
MARSHALL ST.	AUGUSTA ST.	ADELALIDE ST.	CONC. WITH FIBERGLASS LINER	1956	250	112.07	60	2016
PARKVIEW BLVD.	BRIDGE ST.	DEAD END NEAR #196 PARKVIEW	CONC.	1956	200	46.28	60	2016
PARKVIEW BLVD.	BRIDGE ST.	DEAD END NEAR #196 PARKVIEW	CONC.	1956	200	35.67	60	2016
PARKVIEW BLVD.	COUNTRY ST.	DEAD END NEAR #200 PARKVIEW	CONC. WITH PVC AND FIBREGLASS REPAIR	1956	250	71.91	60	2016
STEPHEN ST.	MITCHESON ST.	HIGH SCHOOL	CONC.	1956	200	45.05	60	2016
STEPHEN ST.	MITCHESON ST.	HIGH SCHOOL	CONC.	1956	200	18.64	60	2016
TESKEY ST.	MARTIN ST. NORTH	HYDRANT #238 NEAR NORTON	CONC.	1956	200	118.29	60	2016
TESKEY ST.	MARTIN ST. NORTH	HYDRANT #238 NEAR NORTON	CONC.	1956	200	46.46	60	2016
VICTORIA ST.	FREDERICK ST.	FLORENCE ST.	CONC.	1956	200	71.49	60	2016
VICTORIA ST.	FREDERICK ST.	FLORENCE ST.	CONC.	1956	200	64.92	60	2016
VICTORIA ST.	FREDERICK ST.	FLORENCE ST.	CONC.	1956	200	80.54	60	2016
VICTORIA ST.	FREDERICK ST.	FLORENCE ST.	CONC.	1956	200	56.39	60	2016
MARTIN ST. SOUTH	#77 MARTIN ST. SOUTH	CLINTON ST.	A.C.	1957	200	23.34	70	2027
MARTIN ST. SOUTH	CLINTON ST.	ST. PAUL ST.	CONC.	1957	200	77.83	60	2017
MITCHESON ST.	HYDRANT #265	CARSS ST.	CONC.	1957	200	135.62	60	2017
SPRING ST.	DEAD END SOUTH OF CLINTON ST.	SPRING ST. LIFT STATION	CONC.-PVC WITH FIBERGLASS LINER	1957	200	91.46	60	2017
ST. PAUL ST.	MARTIN ST. SOUTH	SPRING ST.	CONC.	1957	200	80.52	60	2017
UNION ST. NORTH	DEAD END #156 UNION ST. NORTH	JUST NORTH OF STEPHEN ST.	A.C.	1957	200	22.87	70	2027
BRIDGE ST.	PERTH ST.	EASEMENT TO ALMONTE BEHIND ARENA	CONC.	1958	300	68.05	60	2018
BRIDGE ST.	PERTH ST.	EASEMENT TO ALMONTE BEHIND ARENA	CONC.	1958	300	68.42	60	2018
BRIDGE ST.	PERTH ST.	EASEMENT TO ALMONTE BEHIND ARENA	CONC.	1958	300	68.70	60	2018
BRIDGE ST.	PERTH ST.	EASEMENT TO ALMONTE BEHIND ARENA	CONC.	1958	300	79.96	60	2018
BRIDGE TO ALMONTE EASEMENT	BRIDGE	JUST NORTH OF PARK ENTRANCE - CULVERT	CONC. WITH TARRED JOINTS (SEE REMAIND	1958	300	76.61	60	2018
BRIDGE TO ALMONTE EASEMENT	BRIDGE	JUST NORTH OF PARK ENTRANCE - CULVERT	CONC. WITH TARRED JOINTS (SEE REMAIND	1958	300	50.98	60	2018
EASEMENTS BRIDGE TO ALMONTE	NORTH END OF GULLY	LAST M.H. BEFORE ALMONTE ST.	CONC. WITH TARRED JOINTS	1958	300	103.76	60	2018
EASEMENTS BRIDGE TO ALMONTE	NORTH END OF GULLY	LAST M.H. BEFORE ALMONTE ST.	CONC. WITH TARRED JOINTS	1958	300	89.31	60	2018
EASEMENTS BRIDGE TO ALMONTE	NORTH END OF GULLY	LAST M.H. BEFORE ALMONTE ST.	CONC. WITH TARRED JOINTS	1958	300	47.46	60	2018
EASEMENTS BRIDGE TO ALMONTE	NORTH END OF GULLY	LAST M.H. BEFORE ALMONTE ST.	CONC. WITH TARRED JOINTS	1958	300	2.94	60	2018
SHIPMAN DRIVE	#336 SHIPMAN DRIVE	BRIDGE ST.	CONC. - A.C.	1958	200	67.01	60	2018
ALMONTE ST.	WEST SIDE OF CHRISTIAN ST.	PETROCAN	A.C.	1960	200	40.76	70	2030
COUNTRY ST.	JAMES ST.	ROBERT ST.	CONC.	1960	250	72.87	60	2020
EASEMENT BETWEEN #302-306 WATER ST.	SOUTH SIDE REAR OF #302 WATER ST.	WATER ST.	A.C. WITH P.V.C. REPAIRS	1960	200	34.42	70	2030
EASEMENT FROM BRIDGE ST. TO PERTH ST.	BRIDGE ST.	PERTH ST.	CONC.	1960	250	55.35	60	2020
EASEMENT IN REAR OF HOUSES	MONK ST.	REAR OF #302-306 WATER	A.C.	1960	200	113.81	70	2030
EUPHEMIA ST.	WYLIE ST.	HOPE ST.	CONC.	1960	200	97.24	60	2020
MONK ST.	WESLEY ST.	SAN. M.H. TOWARD WATER ST.	A.C.	1960	200	21.66	70	2030
PERTH ST.	KING ST.	HELEN ST.	CONC.	1960	250	99.41	60	2020
WATER ST.	JUST SOUTH OF MONK ST.	JUST NORTH OF JAMES ST.	A.C.	1960	200	37.12	70	2030
WATER ST.	JUST SOUTH OF MONK ST.	JUST NORTH OF JAMES ST.	A.C.	1960	200	58.00	70	2030
WESLEY ST.	HYDRANT #127	MONK ST.	A.C.	1960	200	56.26	70	2030
WYLIE ST.	EAST SIDE OF CHRISTIAN ST.	BETWEEN #396-390 WYLIE ST.	CONC.	1960	200	75.27	60	2020
WYLIE ST.	#396-390 WYLIE ST.	NORTH SIDE OF WYLIE ST. AT ST. ANDREWS ST.	CONC.	1960	200	72.82	60	2020
WYLIE ST.	NORTH SIDE OF WYLIE AT ST. ANDREWS ST.	#342 WYLIE ST.	CONC.	1960	200	73.85	60	2020
WYLIE ST.	#342 WYLIE ST.	EAST SIDE OF WYLIE AT EUPHEMIA ST.	CONC.	1960	200	73.31	60	2020
GORE ST.	#246 GORE ST.	#238 GORE ST.	A.C.	1962	200	49.88	70	2032
NAISMITH DRIVE	BRIDGE ST.	#276 NAISMITH DRIVE	CONC.	1962	200	80.58	60	2022
NAISMITH DRIVE	BRIDGE ST.	#276 NAISMITH DRIVE	CONC.	1962	200	80.42	60	2022
NAISMITH DRIVE	BRIDGE ST.	#276 NAISMITH DRIVE	CONC.	1962	200	97.27	60	2022
EASEMENTS	LEFT ENTRANCE OF 16 MAIN WEST	RIVER BANK	A.C.	1963	200	29.85	70	2033
EASEMENTS	WEST SIDE OF RAILS - SEPTIC TANK	WEST SIDE OF RAILS MAIN ST. EAST	A.C.	1963	200	77.00	70	2033
EASEMENTS	#11 MAIN ST. EAST	LEFT ENTRANCE #16 MAIN EAST	A.C. SOUTH SIDE OF STREET	1963	150	34.46	70	2033
EASEMENTS	WEST SIDE OF RAILS - SEPTIC TANK	WEST SIDE OF RAILS MAIN ST. EAST	A.C.	1963	200	76.69	70	2033
MAIN ST. WEST	#11 MAIN ST. WEST	LEFT ENTRANCE #16 MAIN WEST	A.C.	1963	200	22.62	70	2033
NAISMITH DRIVE	#276 NAISMITH DRIVE	PEACOCK DRIVE	A.C.	1963	200	62.26	70	2033
PEACOCK CRESCENT	NAISMITH DRIVE	DEAD END #101 PEACOCK	A.C.	1963	200	66.16	70	2033
PEACOCK CRESCENT	NAISMITH DRIVE	DEAD END #101 PEACOCK	A.C.	1963	200	68.44	70	2033
PEACOCK CRESCENT	NAISMITH DRIVE	DEAD END #101 PEACOCK	A.C.	1963	200	61.88	70	2033
PEACOCK CRESCENT	NAISMITH DRIVE	DEAD END #101 PEACOCK	A.C.	1963	200	31.93	70	2033
SHIPMAN DRIVE	#336 SHIPMAN DRIVE	PEACOCK DRIVE	A.C.	1963	200	65.53	70	2033
SHIPMAN DRIVE	#336 SHIPMAN DRIVE	PEACOCK DRIVE	A.C.	1963	200	60.53	70	2033
SHIPMAN DRIVE	#336 SHIPMAN DRIVE	PEACOCK DRIVE	A.C.	1963	200	55.42	70	2033
SHIPMAN DRIVE	#336 SHIPMAN DRIVE	PEACOCK DRIVE	A.C.	1963	200	61.89	70	2033
COUNTRY ST.	ROBERT ST.	HYDRANT #18	A.C.	1964	250	82.87	70	2034
UNDER RAILS	EAST SIDE OF CPR LINE	WEST SIDE OF CPR LINE	C.I.	1964	150	25.84	70	2034
WYLIE ST.	WEST SIDE OF CHRISTIAN ST.	EAST SIDE OF CHRISTIAN ST.	A.C.	1965	200	24.90	70	2035
WYLIE ST.	WEST SIDE OF CHRISTIAN ST.	EAST SIDE OF CHRISTIAN ST.	A.C.	1965	200	22.62	70	2035
FARM ST.	BOTTOM OF HILL	ALMONTE ST.	CONC.	1966	450	7.23	60	2026
WESLEY TO WATER	WESLEY	NLAS HALL	A.C.	1966	150	10.74	70	2036
WESLEY TO WATER	WESLEY	NLAS HALL	A.C.	1966	150	49.20	70	2036
MAIN ST.	#134 ON NORTH SIDE MAIN ST. EAST	ON NORTH SIDE MARTIN ST. NORTH	A.C.	1967	150	38.54	70	2037
MAIN ST. EAST	MH IN MACS PARKING LOT	SERVICE TO BRICK HOUSE NEXT TO MACS	A.C.	1967	100	13.25	70	2037
MAIN ST. EAST	NORTH SIDE OF MAIN ST. E	SERVICE TO #129 MAIN ST. E	A.C. WITH PVC REPAIRS	1967	100	20.13	70	2037
MARTIN ST. SOUTH	TEE ON MARTIN ST. NORTH	MH ON MARTIN BY MACS MILK	A.C.	1967	150	5.54	70	2037
ALMONTE ST.	TOWN GARAGE	SOUTH SIDE OF ALMONTE	A.C.	1968	200	75.55	70	2038
ALMONTE ST.	MALCOLM ST.	FIRST M.H. EAST OF MALCOLM	A.C.WITH PVC REPAIR	1968	250	42.04	70	2038
ALMONTE ST.	TOWN GARAGE	SOUTH SIDE OF ALMONTE	A.C.	1968	200	8.27	70	2038
ALMONTE ST.	TOWN GARAGE	SOUTH SIDE OF ALMONTE	A.C.	1968	200	101.38	70	2038
EUPHEMIA ST.	WYLIE	127 EUPHEMIA ST.	A.C. WITH P.V.C. EXTENSION TO #133	1968	200	70.52	70	2038
KING ST.	#283 KING ST.	ARTHUR ST.	A.C.	1968	200	56.07	70	2038
KING ST.	PERTH ST.	#283 KING ST.	A.C.	1968	250	145.70	70	2038
WILLIAM ST.	JAMES ST.	LANARK COUNTY SENIOR HOUSING	A.C.	1968	150	33.29	70	2038
GORE ST.	#246 GORE ST.	#259 GORE ST.	A.C.	1969	200	48.25	70	2039
CHRISTIAN ST.	211 CHRISTIAN ST.	197 CHRISTIAN ST.	A.C. TYPE 2	1970	100	37.31	70	2040
CHRISTIAN ST.	211 CHRISTIAN ST.	197 CHRISTIAN ST.	A.C. TYPE 2	1970	100	16.00	70	2040
PERTH ST.	BRIDGE ST.	DEAD END NEAR CHRISTIAN	A.C.	1970	250	95.71	70	2040
PERTH ST.	BRIDGE ST.	DEAD END NEAR CHRISTIAN	A.C.	1970	250	70.73	70	2040
PERTH ST.	BRIDGE ST.	DEAD END NEAR CHRISTIAN	A.C.	1970	250	111.25	70	2040
ROBERT ST.	OLD DANLINE FACTORY	8" SEWER LEADING TO PUMPING STATION	A.C.	1970	150	8.17	70	2040
WILKINSON ST.	WATERFORD ST.	MARTIN NORTH-DEAD END-TOWARD MARTIN NORTH	PVC-A.C.-PVC	1970	150	43.01	80	2050
KING ST.	#309 KING ST.	DEAD END NEAR ARGYLE ST.	A.C.	1972	200	34.99	70	2042
KING ST.	ARTHUR ST.	#309 KING ST.	A.C.	1972	200	51.49	70	2042
STATE ST.	SPRING ST.	DAY CARE CENTRE	A.C. WITH PVC REPAIR	1972	200	99.72	70	2042
VICTORIA ST.	FLORENCE ST.	HYDRANT #227	A.C.	1972	200	48.69	70	2042
COLINA ST.	HOPE ST.	HYDRANT #12	A.C.	1973	250	75.12	70	2043

APPENDIX B:
Town of Mississippi Mills Sanitary Sewer Inventory

COLINA ST.	HOPE ST.	HYDRANT #12	A.C.	1973	250	76.72	70	2043
FLORENCE ST.	VICTORIA ST.	DEAD END NEAR MAUDE ST.	A.C.	1973	200	78.04	70	2043
GORE ST.	#269 GORE ST.	#259 GORE ST.	A.C.	1973	200	44.46	70	2043
PERTH ST.	#325 PERTH ST.	DEAD END AT #329 PERTH ST.	A.C.	1973	100	26.23	70	2043
PERTH ST.	HELEN ST.	#325 PERTH ST.	A.C.	1973	150	51.71	70	2043
ALMONTE ST.	ALMONTE ST.	DEAD END WEST OF TOWN GARAGE	A.C.	1974	200	28.73	70	2044
ALMONTE ST.	ALMONTE ST.	DEAD END WEST OF TOWN GARAGE	A.C.	1974	200	16.38	70	2044
MAIN ST.	REAR OF 87 MAIN EAST	#80 UNION SOUTH	PVC	1975	200	36.51	80	2055
ADELAIDE COURT	ADELAIDE ST.	DEADEND	ASBETOS CEMENT	1976	200	70.27	70	2046
ADELAIDE ST.	170 ADELAIDE ST.	ADELAIDE COURT	ASBETOS CEMENT	1976	200	74.71	70	2046
ADELAIDE ST.	NORTON ST.	#170 ADELAIDE ST.	ASBETOS CEMENT	1976	200	80.59	70	2046
ALMONTE ST.	FIRST M.H. EAST OF MALCOLM ST.	M.H. AT LIFT STATION INLET	A.C.	1976	525	12.16	70	2046
ALMONTE ST.	FIRST M.H. EAST OF MALCOLM ST.	M.H. AT LIFT STATION INLET	A.C.	1976	525	89.96	70	2046
ALMONTE ST.	FARM ST.	M.H. AT ISLAND LIFT STATION FORCE MAIN OUTLET	A.C.	1976	600	47.24	70	2046
ALMONTE ST.	M.H. AT LIFT STATION INLET	LIFT STATION N.	A.C.	1976	1200	11.46	70	2046
ALMONTE ST.	M.H. AT LIFT STATION INLET	LIFT STATION N.	A.C.	1976	1200	8.07	70	2046
ALMONTE ST.	M.H. AT LIFT STATION INLET	LIFT STATION N.	A.C.	1976	1200	9.50	70	2046
ALMONTE ST.	MH #003 ON ALMONTE ST.	STORM CULVERT UNDER ALMONTE	A.C.	1976	0	43.06	70	2046
CLAY ST.	SPRING ST.	DEAD NEAR HYDRANT #164	A.C.	1976	200	103.61	70	2046
CLAY ST.	SPRING ST.	DEAD NEAR HYDRANT #164	A.C.	1976	200	69.77	70	2046
CLAY ST.	JOHANNA	DEAD END NEAR LAROSE ST.	A.C.	1976	200	48.57	70	2046
COUNTRY ST.	HYDRANT #108	DEAD END	P.V.C.	1976	250	79.10	80	2056
COUNTRY ST.	HYDRANT #108	DEAD END	P.V.C.	1976	250	75.84	80	2056
COUNTRY ST.	HYDRANT #108	DEAD END	P.V.C. WITH FIBREGLASS SPOT REPAIRS	1976	250	73.75	80	2056
EASEMENTS BRIDGE TO ALMONTE	LAST M.H. BEFORE ALMONTE ST.	ALMONTE ST.	A.C.	1976	375	56.60	70	2046
EVELYN ST.	GALE ST. NEAR SPRING ST.	SAN MH OPPOSITE HYD#171	A.C.	1976	200	51.76	70	2046
EVELYN ST.	GALE ST. NEAR SPRING ST.	SAN MH OPPOSITE HYD#171	A.C.	1976	200	65.97	70	2046
EVELYN ST.	GALE ST. NEAR SPRING ST.	SAN MH OPPOSITE HYD#171	A.C.	1976	200	41.10	70	2046
EVELYN ST.	GALE ST. NEAR SPRING ST.	SAN MH OPPOSITE HYD#171	A.C.	1976	200	73.78	70	2046
GALE ST.	SPRING ST.	FRANCE ST.	A.C.	1976	200	48.19	70	2046
GALE ST.	SPRING ST.	FRANCE ST.	A.C.	1976	200	61.72	70	2046
GALE ST.	SPRING ST.	FRANCE ST.	A.C.	1976	200	69.01	70	2046
GALE ST.	SPRING ST.	FRANCE ST.	A.C.	1976	200	70.19	70	2046
GOMME ST.	FAIRVIEW MANOR SERVICE - STATE ST.	MANOR M.H. IN PARKING LOT	A.C.	1976	200	40.65	70	2046
GOMME ST.	FAIRVIEW MANOR SERVICE - STATE ST.	MANOR M.H. IN PARKING LOT	A.C.	1976	200	25.88	70	2046
JOHANNA ST.	CLAY ST.	SPRING ST.	A.C.	1976	200	106.10	70	2046
JOHANNA ST.	CLAY ST.	SPRING ST.	A.C.	1976	200	106.13	70	2046
LAURA ST.	EVELYN ST.	DEAD END	A.C.	1976	200	74.47	70	2046
NORTON ST.	ADELAIDE ST.	TESKEY ST.	A.C.	1976	250	88.88	70	2046
SPRING ST.	DEAD END SOUTH OF CLAY ST.	HYDRANT #162	A.C.	1976	300	25.34	70	2046
SPRING ST.	DEAD END SOUTH OF CLAY ST.	HYDRANT #162	A.C.	1976	300	59.89	70	2046
SPRING ST.	DEAD END SOUTH OF CLAY ST.	HYDRANT #162	A.C.	1976	300	34.54	70	2046
SPRING ST.	DEAD END SOUTH OF CLAY ST.	HYDRANT #162	A.C.	1976	300	36.07	70	2046
STATE ST.	DAY CARE CENTRE	GOMME ST.	A.C.	1976	200	42.74	70	2046
TESKEY ST.	HYDRANT #238	NORTON ST.	A.C.	1976	250	44.88	70	2046
MAUDE ST.	HYDRANT #235	ST. JAMES ST.	A.C.	1977	200	70.60	70	2047
MAUDE ST.	HYDRANT #235	ST. JAMES ST.	A.C.	1977	200	34.39	70	2047
MAUDE ST.	HYDRANT #235	ST. JAMES ST.	A.C.	1977	200	26.37	70	2047
MAUDE ST.	HYDRANT #235	ST. JAMES ST.	A.C.	1977	200	69.78	70	2047
MAUDE ST.	HYDRANT #235	ST. JAMES ST.	A.C.	1977	200	64.21	70	2047
MAUDE ST.	HYDRANT #235	ST. JAMES ST.	A.C.	1977	200	73.79	70	2047
MAUDE ST.	HYDRANT #235	ST. JAMES ST.	A.C.	1977	200	30.10	70	2047
EUPHEMIA ST.	ALMONTE ST.	#52 EUPHEMIA ST.	P.V.C.	1978	250	66.79	80	2058
EUPHEMIA ST.	ALMONTE ST.	#52 EUPHEMIA ST.	P.V.C.	1978	250	91.97	80	2058
GLASS ST.	DEAD END NEAR DUNN	FIRST M.H. UPSTREAM OF HOPE	A.C.	1978	200	85.93	70	2048
GLASS ST.	DEAD END NEAR DUNN	FIRST M.H. UPSTREAM OF HOPE	A.C.	1978	200	47.22	70	2048
GLASS ST.	HOPE ST. LIFT STATION	FIRST UPSTREAM M.H.	A.C. WITH P.V.C. REPAIRS	1978	200	30.77	70	2048
SPRING ST.	HYDRANT #162	#169 SPRING ST.	A.C.	1978	300	74.69	70	2048
SPRING ST.	HYDRANT #162	#169 SPRING ST.	A.C.	1978	300	69.22	70	2048
SPRING ST.	#169 SPRING ST.	SPRING ST. LIFT STATION	A.C.	1978	300	63.22	70	2048
SPRING ST.	#169 SPRING ST.	SPRING ST. LIFT STATION	A.C.	1978	300	67.50	70	2048
SPRING ST.	#169 SPRING ST.	SPRING ST. LIFT STATION	A.C.	1978	300	34.85	70	2048
ST. ANDREWS ST.	ALMONTE ST.	HYDRANT #19 DEAD END	PVC	1978	200	56.78	80	2058
ST. ANDREWS ST.	ALMONTE ST.	HYDRANT #19 DEAD END	PVC	1978	200	61.31	80	2058
ST. GEORGE ST.	HYDRANT #84	DEAD END	A.C. WITH FIBREGLASS SPOT REPAIR	1978	250	97.75	70	2048
ST. GEORGE ST.	HYDRANT #84	DEAD END	A.C. WITH FIBREGLASS SPOT REPAIR	1978	250	76.96	70	2048
ST. GEORGE ST.	HYDRANT #84	DEAD END	A.C.	1978	250	49.58	70	2048
ST. GEORGE ST.	HYDRANT #84	DEAD END	A.C.	1978	250	84.19	70	2048
ADELAIDE ST.	MARSHALL ST.	DEAD END EAST OF NORTON ST.	ASBETOS CEMENT	1979	150	48.90	70	2049
BROOKDALE AVE.	MITCHESON ST.	HYDRANT #266	A.C.	1979	150	93.62	70	2049
EASEMENT BROOKDALE - MARTIN	BROOKDALE AVE. ACROSS FROM HYD.#226	#5553 MARTIN ST. NORTH	A.C.	1979	150	106.93	70	2049
FARM ST.	CHARLES ST.	TOP OF FARM ST. HILL	V.C. WITH PVC. AND CONC. REPAIRS AND F	1979	450	18.47	70	2049
FARM ST.	TOP OF HILL	BOTTOM OF HILL	A.C.	1979	450	68.66	70	2049
RIVER CROSSING QUEEN-BRIDGE STS.	HYDRANT 151	WATER ST.	VICTAULIC D.I.	1980	450	10.75	50	2030
RIVER CROSSING QUEEN-BRIDGE STS.	HYDRANT 151	WATER ST.	VICTAULIC D.I.	1980	450	119.20	50	2030
ANN ST.	285 ANN ST.	ROBERT ST.	PVC	1982	200	19.83	80	2062
ANN ST.	285 ANN ST.	ROBERT ST.	PVC	1982	150	43.84	80	2062
ANN ST.	285 ANN ST.	SERVICE TO 285 ANN ST.	PVC	1982	150	10.59	80	2062
EASEMENT	NAISMITH DRIVE	FIELD HOUSE ETC.	P.V.C.	1982	150	49.19	80	2062
EASEMENT LITTLE BRIDGE - BRIDGE	LITTLE BRIDGE	NORTH SIDE OF ALMO APTS.	P.V.C.	1982	150	18.80	80	2062
EASEMENT LITTLE BRIDGE - BRIDGE	LITTLE BRIDGE	NORTH SIDE OF ALMO APTS.	P.V.C.	1982	150	17.88	80	2062
ROBERT ST.	DEAD END #183 ROBERT NEAR COUNTRY	ROBERT ST. LIFT STATION	PVC	1982	200	95.61	80	2062
ROBERT ST.	DEAD END #183 ROBERT NEAR COUNTRY	ROBERT ST. LIFT STATION	PVC	1982	200	85.08	80	2062
ROBERT ST.	PUMP STATION MH	PUMPING STATION	PVC	1982	200	6.20	80	2062
ROBERT ST.	PUMP STATION MH	BLOCKED AT DS END	PVC	1982	150	23.95	80	2062
ST. PAUL ST.	NORTH SIDE NEAR SPRING	LIFT STATION	P.V.C.	1982	200	7.16	80	2062
VICTORIA ST.	HYDRANT #227	ST. JAMES ST. DEAD END	A.C.	1983	200	93.19	70	2053
HOPE ST.	#396 HOPE ST.	#412 HOPE ST.	P.V.C.	1984	200	46.49	80	2064
CARLETON ST.	END OF CARLETON ST.	SERVICE TO LAST HOUSE ON CARLETON	P.V.C.	1985	135	29.92	80	2065
CLINTON ST.	#159 CLINTON ST.	MARTIN ST. SOUTH	P.V.C.	1985	150	38.72	80	2065
EVELYN ST.	GALE ST. (NEAR TATRA)	#19 EVELYN	P.V.C.	1985	200	106.87	80	2065
EVELYN ST.	GALE ST. (NEAR TATRA)	#19 EVELYN	P.V.C.	1985	200	81.14	80	2065
EVELYN ST.	GALE ST. (NEAR TATRA)	#19 EVELYN	P.V.C.	1985	200	45.00	80	2065
GALE ST.	EVELYN ST.	TATRA ST.	P.V.C.	1985	200	68.89	80	2065
GALE ST.	FRANCE ST.	EVELYN (NEAR TATRA)	P.V.C.	1985	200	121.78	80	2065
GALE ST.	FRANCE ST.	EVELYN (NEAR TATRA)	P.V.C.	1985	200	122.07	80	2065
GALE ST.	FRANCE ST.	EVELYN (NEAR TATRA)	P.V.C.	1985	200	9.66	80	2065
GALE ST.	CORNER AT #57 GALE	DEAD END NEAR EVELYN ST.	P.V.C	1985	200	44.83	80	2065
HANNA LANE	ST. ANDREWS ST.	DEAD END	P.V.C.	1985	200	60.56	80	2065
HANNA LANE	ST. ANDREWS ST.	DEAD END	P.V.C.	1985	200	59.49	80	2065
HELEN ST.	PERTH ST.	HYDRANT #79	P.V.C.	1985	150	66.67	80	2065
LAROSE ST.	TATRA ST.	DEAD END NEAR JOHANNA ST.	PVC	1985	200	35.78	80	2065
LAROSE ST.	EVELYN ST.	TATRA ST.	PVC	1985	200	81.67	80	2065
MAUDE ST.	ST. JAMES ST.	DEAD END AT MENZIE ST.	PVC	1985	200	61.90	80	2065
MAUDE ST.	ST. JAMES ST.	DEAD END AT MENZIE ST.	P.V.C.	1985	200	60.54	80	2065
MILLS COMMUNITY SUPPORT ORGANIZATION	MAUDE ST.	TOWARDS HYD #233	P.V.C.	1985	200	69.51	80	2065
ST. ANDREWS ST.	HANNA LANE	HOPE ST.	PVC	1985	200	70.81	80	2065
TATRA ST.	PATERSON ST.	LAROSE ST.	PVC	1985	200	35.57	80	2065
TATRA ST.	PATERSON ST.	LAROSE ST.	PVC	1985	200	36.02	80	2065
TATRA ST.	PATERSON ST.	LAROSE ST.	PVC	1985	200	66.90	80	2065
TATRA ST.	PATERSON ST.	LAROSE ST.	PVC	1985	200	83.66	80	2065
VICTORIA ST.	MARTIN ST. NORTH	FREDERICK ST.	DR-26 PVC	1985	250	74.24	80	2065
VICTORIA ST.	MARTIN ST. NORTH	FREDERICK ST.	DR-26 PVC	1985	250	66.11	80	2065
SHEPHERD ST.	SOUTH SIDE WELLINGTON ST.	NORTH SIDE WELLINGTON ST.	P.V.C.	1986	225	16.98	80	2066
MAUDE ST.	#210-218 MAUDE ST.	MAUDE ST. MH #240	PVC	1987	150	18.78	80	2067
MAUDE ST.	#210-218 MAUDE ST.	MAUDE ST. MH #240	PVC	1987	150	12.64	80	2067
MITCHESON ST.	CARSS ST.	DEAD END NORTH OF HYDRANT #263	PVC.	1987	250	120.26	80	2067
MITCHESON ST.	CARSS ST.	DEAD END NORTH OF HYDRANT #263	PVC.	1987	250	21.49	80	2067
INDUSTRIAL DRIVE	OTTAWA ST.	JUST NORTH OF HYDRANT #211	PVC	1989	250	47.56	80	2069

APPENDIX B:
Town of Mississippi Mills Sanitary Sewer Inventory

INDUSTRIAL DRIVE	OTTAWA ST.	JUST NORTH OF HYDRANT #211	PVC	1989	250	36.61	80	2069
INDUSTRIAL DRIVE	OTTAWA ST.	JUST NORTH OF HYDRANT #211	PVC	1989	250	95.64	80	2069
JOHN ST.	WESLEY ST.	DEAD END NEAR WATER	PVC	1989	250	38.27	80	2069
OTTAWA ST. LINE #1	INDUSTRIAL DRIVE	FLORENCE ST.	PVC	1989	300	13.84	80	2069
OTTAWA ST. LINE #1	INDUSTRIAL DRIVE	FLORENCE ST.	PVC	1989	300	107.88	80	2069
OTTAWA ST. LINE #1	INDUSTRIAL DRIVE	FLORENCE ST.	PVC	1989	300	79.42	80	2069
OTTAWA ST. LINE #1	INDUSTRIAL DRIVE	FLORENCE ST.	PVC	1989	300	84.99	80	2069
OTTAWA ST. LINE #1	INDUSTRIAL DRIVE	FLORENCE ST.	PVC	1989	300	10.85	80	2069
OTTAWA ST. LINE #1	INDUSTRIAL DRIVE	FLORENCE ST.	PVC	1989	300	91.20	80	2069
OTTAWA ST. LINE #1	INDUSTRIAL DRIVE	FLORENCE ST.	PVC	1989	300	115.11	80	2069
WATER ST.	ALBERT ST.	HYDRANT #126	PVC	1989	375	26.64	80	2069
WATER ST.	ALBERT ST.	HYDRANT #126	PVC	1989	375	36.33	80	2069
WATER ST.	ALBERT ST.	HYDRANT #126	PVC	1989	375	57.07	80	2069
ALMONTE ST.	ALMONTE ST.	SERVICE TO GARAGE AND HOUSE NEAR MH 022	P.V.C.	1990	150	56.07	80	2070
HOUSTON DR.	MIDPOINT OF HOUSTON DR.	INDUSTRIAL DR.	PVC	1990	300	100.16	80	2070
HOUSTON DRIVE	INDUSTRIAL ROAD	HYDRANT #209	PVC	1990	300	75.36	80	2070
INDUSTRIAL DRIVE	JUST NORTH OF HYDRANT #211	TURN TOWARD APPLETON ROAD	PVC	1990	250	22.50	80	2070
INDUSTRIAL DRIVE	JUST NORTH OF HYDRANT #211	TURN TOWARD APPLETON ROAD	PVC	1990	250	277.66	80	2070
MALCOLM ST.	ALMONTE ST.	#17 MALCOLM ST.	P.V.C. WITH V.C. REMAINS	1990	250	77.77	80	2070
MALCOLM ST.	#101 MALCOLM ST.	#127 MALCOLM ST.	VC VARIOUS PVC REPAIRS	1990	250	74.06	70	2060
MALCOLM ST.	HOPE ST.	#101 MALCOLM ST.	PVC	1990	250	61.61	80	2070
MALCOLM ST.	#39 MALCOLM ST.	HOPE ST.	VC VARIOUS PVC REPAIRS	1990	250	111.67	70	2060
MARY ST.	MAIN ST. WEST	SNOW DUMP GATE IN STONE WALL	P.V.C.	1990	200	31.55	80	2070
OTTAWA ST.	FLORENCE ST.	MERCER ST.	PVC	1990	250	137.84	80	2070
OTTAWA ST.	MERCER ST.	MARTIN ST. SOUTH	PVC	1990	300	76.69	80	2070
OTTAWA ST.	MERCER ST.	MARTIN ST. SOUTH	PVC	1990	300	93.49	80	2070
OTTAWA ST.	MERCER ST.	MARTIN ST. SOUTH	PVC	1990	300	104.23	80	2070
WILKINSON ST.	MARTIN ST. NORTH	SERVICE TO #136 WILKINSON	P.V.C.	1990	135	16.40	80	2070
HAROLD ST.	OTTAWA ST.	#39 HAROLD ST.	P.V.C.	1991	200	61.53	80	2071
HAROLD ST.	OTTAWA ST.	#39 HAROLD ST.	P.V.C.	1991	200	56.65	80	2071
SPRING ST.	ST. PAUL ST.	SPRING ST. LIFT STATION	PVC	1991	250	18.00	80	2071
SPRING ST.	HYDRANT #159	SPRING ST. LIFT STATION	PVC	1991	375	6.49	80	2071
ANN ST.	280 ANN ST.	ROBERT ST.	PVC	1992	135	49.65	80	2072
MAIN ST. EAST	SERVICE TO DUPLEX EAST OF #144 MAIN ST.	MAIN ST. EAST LINE	P.V.C.	1992	100	5.35	80	2072
JAMIESON ST.	PERTH ST.	JUST SOUTH OF SCOTT ST.	PVC	1993	250	114.27	80	2073
JAMIESON ST.	PERTH ST.	JUST SOUTH OF SCOTT ST.	PVC	1993	250	117.68	80	2073
JAMIESON ST.	PERTH ST.	JUST SOUTH OF SCOTT ST.	PVC	1993	250	46.72	80	2073
JAMIESON ST.	PERTH ST.	JUST SOUTH OF SCOTT ST.	PVC	1993	250	49.75	80	2073
JAMIESON ST.	PERTH ST.	JUST SOUTH OF SCOTT ST.	PVC	1993	250	66.98	80	2073
JAMIESON ST.	PERTH ST.	JUST SOUTH OF SCOTT ST.	PVC	1993	250	55.73	80	2073
JAMIESON ST.	PERTH ST.	JUST SOUTH OF SCOTT ST.	PVC	1993	250	58.15	80	2073
TAIT MCKENZIE ST.	JAMIESON ST.	METCALFE ST.	PVC	1993	250	83.74	80	2073
TAIT MCKENZIE ST.	JAMIESON ST.	METCALFE ST.	PVC	1993	250	71.81	80	2073
TAIT MCKENZIE ST.	JAMIESON ST.	METCALFE ST.	PVC	1993	250	89.28	80	2073
MALCOLM ST.	#127 MALCOLM ST.	DEAD END MID POINT BETWEEN DUNN/STRATHBURN	PVC	1994	250	97.74	80	2074
MALCOLM ST.	#127 MALCOLM ST.	DEAD END MID POINT BETWEEN DUNN/STRATHBURN	PVC	1994	250	44.40	80	2074
UNION ST. SOUTH	#20 UNION ST. SOUTH	QUEEN ST.	P.V.C.	1994	375	89.60	80	2074
GORE ST.	#203 GORE ST.	SPRING ST.	P.V.C.	1995	250	73.07	80	2075
MERCER ST.	VICTORIA ST.	#45 MERCER ST.	P.V.C.	1995	150	58.82	80	2075
MERCER ST.	SERVICE TO # 224-242 MAUDE ST.	CORNER OF MERCER / MAUDE	P.V.C.	1995	150	8.49	80	2075
MERCER ST.	SERVICE TO #57 MERCER ST.	CORNER OF MERCER / MAUDE	P.V.C.	1995	150	11.56	80	2075
PRINCESS ST.	DEAD END NEAR MARTIN ST. NORTH	#102 PRINCESS ST.	PVC	1995	200	113.26	80	2075
WILLIAM ST.	#245 WILLIAM ST.	DEAD END AT JAMES ST.	P.V.C.-V.C.	1995	250	80.65	80	2075
HIGH ST.	BRIDGE ST.	ELGIN ST.	P.V.C.	1996	375	71.81	80	2076
HIGH ST.	BRIDGE ST.	ELGIN ST.	PVC	1996	375	57.29	80	2076
PRINCESS ST.	DEAD END NEAR UNION ST. NORTH	#102 PRINCESS ST.	PVC	1996	200	38.01	80	2076
PRINCESS ST.	DEAD END NEAR UNION ST. NORTH	#102 PRINCESS ST.	PVC	1996	200	10.67	80	2076
THOBURN MILL ETC.	FRONT TO THOBURN MILL	LITTLE BRIDGE	PVC	1996	150	19.12	80	2076
R. TAIT MCKENZIE SCHOOL YARD	R. TAIT MCKENZIE SCHOOL	INDUSTRIAL DR.	P.V.C.	1997	200	111.38	80	2077
FRANCE ST.	HAROLD ST.	GALE ST.	P.V.C.	1998	250	80.22	80	2078
FRANCE ST.	HAROLD ST.	GALE ST.	P.V.C.	1998	250	24.20	80	2078
HAROLD ST.	#44 HAROLD (LOT #41)	LOT #34	P.V.C.	1998	200	46.29	80	2078
HAROLD ST.	LOT #34	FRANCE ST.	P.V.C.	1998	250	84.59	80	2078
HAROLD ST.	LOT #34	FRANCE ST.	P.V.C.	1998	250	78.54	80	2078
HAROLD ST.	LOT #34	FRANCE ST.	P.V.C.	1998	250	10.95	80	2078
HAROLD ST.	LOT #34	FRANCE ST.	P.V.C.	1998	250	88.72	80	2078
HOLY NAME OF MARY SERVICE	HAROLD ST.	HOLY NAME OF MARY SCHOOL	P.V.C	1999	150	87.37	80	2079
HOLY NAME OF MARY SERVICE	HAROLD ST.	HOLY NAME OF MARY SCHOOL	PVC	1999	150	49.58	80	2079
JAMES ST.	COUNTRY ST.	DEAD END NEAR #195 JAMES ST.	PVC	1999	200	49.34	80	2079
MORTON ST.	HAROLD ST.	DEAD END NEAR PATERSON ST.	P.V.C.	2000	200	86.54	80	2080
MORTON ST.	HAROLD ST.	DEAD END NEAR PATERSON ST.	P.V.C.	2000	200	83.50	80	2080
ALMONTE ST.	PETROCAN	ST. ANDREWS ST.	PVC	2001	250	54.06	80	2081
ALMONTE ST.	PETROCAN	ST. ANDREWS ST.	PVC	2001	250	74.23	80	2081
ALMONTE ST.	PETROCAN	ST. ANDREWS ST.	PVC	2001	250	3.92	80	2081
ALMONTE ST.	EUPHEMIA ST.	MALCOLM ST.	VC FIBERGLASS LINER	2001	225	159.49	70	2071
ALMONTE ST.	PETROCAN	ST. ANDREWS ST.	PVC	2001	250	2.83	80	2081
ELGIN ST.	HIGH ST.	COUNTRY ST.	P.V.C.	2001	250	81.93	80	2081
ELGIN ST.	HIGH ST.	COUNTRY ST.	P.V.C.	2001	250	84.65	80	2081
ELGIN ST.	HIGH ST.	COUNTRY ST.	P.V.C.	2001	250	131.06	80	2081
ELGIN ST.	HIGH ST.	COUNTRY ST.	P.V.C.	2001	250	11.14	80	2081
GORE ST.	DEAD END	#269 GORE ST.	P.V.C.	2001	200	39.88	80	2081
NAISMITH DRIVE	#276 NAISMITH DRIVE	EASEMENT TO GEMMILL PARK	CONC. WITH FIBERGLASS LINER	2001	200	33.28	60	2061
CHARLES ST.	FARM ST.	DEAD END NEAR COLBORNE	PVC	2002	150	59.60	80	2082
OTTAWA ST.	APPLETON ROAD (DEAD END)	INDUSTIRAL DRIVE	PVC	2002	300	106.07	80	2082
OTTAWA ST.	APPLETON ROAD (DEAD END)	INDUSTIRAL DRIVE	PVC	2002	300	75.28	80	2082
OTTAWA ST.	APPLETON ROAD (DEAD END)	INDUSTIRAL DRIVE	PVC	2002	300	55.96	80	2082
OTTAWA ST.	APPLETON ROAD (DEAD END)	INDUSTIRAL DRIVE	PVC	2002	300	68.80	80	2082
OTTAWA ST.	APPLETON ROAD (DEAD END)	INDUSTIRAL DRIVE	PVC	2002	300	65.41	80	2082
OTTAWA ST.	APPLETON ROAD (DEAD END)	INDUSTIRAL DRIVE	PVC	2002	300	15.36	80	2082
TAIT MCKENZIE ST.	METCALFE ST.	KING ST.	PVC	2002	250	90.67	80	2082
TAIT MCKENZIE ST.	METCALFE ST.	KING ST.	PVC	2002	250	56.73	80	2082
WESLEY TO WATER	WESLEY	NLAS HALL	P.V.C.	2002	150	53.91	80	2082
FIRE HALL SERVICE	ALMONTE ST.	FIRE HALL	P.V.C.	2003	150	53.05	80	2083
SADLER DRIVE	OTTAWA ST.	DEAD END AT HYDRANT #202	P.V.C.	2003	300	84.64	80	2083
THOBURN ST.	TAIT MCKENZIE ST.	# 119 THOBURN ST.	PVC	2003	200	34.65	80	2083
THOBURN ST.	TAIT MCKENZIE ST.	# 119 THOBURN ST.	PVC	2003	200	84.22	80	2083
VAUGHAN ST.	#112 VAUGHAN ST.	JAMIESON ST.	P.V.C.	2003	200	79.04	80	2083
VAUGHAN ST.	THOBURN ST.	# 112 VAUGHAN	P.V.C.	2003	200	120.20	80	2083
VAUGHAN ST.	THOBURN ST.	# 112 VAUGHAN	P.V.C.	2003	200	20.42	80	2083
VAUGHAN ST.	THOBURN ST.	# 112 VAUGHAN	P.V.C.	2003	200	61.45	80	2083
BRIDGE ST.	FARM ST.	COUNTRY ST.	PVC	2005	300	65.67	80	2085
BRIDGE ST.	FARM ST.	COUNTRY ST.	PVC	2005	300	87.99	80	2085
BRIDGE ST.	FARM ST.	COUNTRY ST.	PVC	2005	300	58.58	80	2085
COUNTRY ST.	BRIDGE ST.	CHURCH ST.	P.V.C.	2005	300	5.50	80	2085
COUNTRY ST.	BRIDGE ST.	CHURCH ST.	P.V.C.	2005	300	93.18	80	2085
COUNTRY ST.	BRIDGE ST.	CHURCH ST.	P.V.C.	2005	300	87.87	80	2085
COUNTRY ST.	BRIDGE ST.	CHURCH ST.	P.V.C.	2005	300	88.41	80	2085
EASEMENTS BRIDGE TO ALMONTE	CULVERT AT PARK ENTRANCE	NORTH END OF GULLY	CONC. WITH FIBERGLASS LINER	2005	300	59.92	60	2065
FARM ST.	SOUTH SD OF BRIDGE ST.	NORTH SD OF BRIDGE ST.	P.V.C.	2005	300	5.76	80	2085
INDUSTRIAL DRIVE	TURN TOWARD APPLETON ROAD	DEAD END NEAR APPLETON ROAD	PVC	2005	250	25.78	80	2085
INDUSTRIAL DRIVE	TURN TOWARD APPLETON ROAD	DEAD END NEAR APPLETON ROAD	PVC	2005	250	80.78	80	2085
INDUSTRIAL DRIVE	TURN TOWARD APPLETON ROAD	DEAD END NEAR APPLETON ROAD	PVC	2005	250	91.53	80	2085
INDUSTRIAL DRIVE	TURN TOWARD APPLETON ROAD	DEAD END NEAR APPLETON ROAD	PVC	2005	250	90.73	80	2085
INDUSTRIAL DRIVE	TURN TOWARD APPLETON ROAD	DEAD END NEAR APPLETON ROAD	PVC	2005	250	88.07	80	2085
JAMIESON ST.	#330 JAMIESON ST.	DEAD END AT #310 JAMIESON ST	P.V.C.	2005	200	76.74	80	2085
JAMIESON ST.	#330 JAMIESON ST.	DEAD END AT #310 JAMIESON ST	P.V.C.	2005	200	9.92	80	2085
JAMIESON ST.	#330 JAMIESON ST.	DEAD END AT #310 JAMIESON ST	P.V.C.	2005	200	73.56	80	2085
JAMIESON ST.	THOBURN ST. AT #146 THOBURN	DEAD END AT #365 JAMIESON ST	P.V.C.	2005	200	76.26	80	2085
JAMIESON ST.	THOBURN ST. AT #146 THOBURN	DEAD END AT #365 JAMIESON ST	P.V.C.	2005	200	77.30	80	2085

APPENDIX B:
Town of Mississippi Mills Sanitary Sewer Inventory

PERTH ST.	COUNTRY ST.	DEAD END #260 PERTH ST.	PVC	2005	300	61.87	80	2085
PERTH ST.	COUNTRY ST.	DEAD END #260 PERTH ST.	PVC	2005	300	84.05	80	2085
THOBURN ST.	# 119 THOBURN ST.	#399 JAMIESON ST.	P.V.C.	2005	200	23.91	80	2085
THOBURN ST.	# 119 THOBURN ST.	#399 JAMIESON ST.	P.V.C.	2005	200	87.27	80	2085
BRIDGE ST.	PARKVIEW DRIVE	COUNTRY	CONC. WITH PVC AND FIBREGLASS SPOT RI	2006	200	73.87	60	2066
STATE ST.	MARTIN ST. SOUTH	SPRING ST.	V.C. WITH FIBREGLASS LINER	2006	300	96.75	70	2076
WELLINGTON ST.	ESPLANDE ST. DEAD END	CARLETON ST.	P.V.C	2006	200	38.78	80	2086
WELLINGTON ST.	ESPLANDE ST. DEAD END	CARLETON ST.	P.V.C.	2006	200	17.18	80	2086
WELLINGTON ST.	CARLETON ST.	MARY ST.	P.V.C.	2006	200	50.69	80	2086
METCALFE ST.	TAIT MCKENZIE ST.	SEE PLANS-MH1	PVC	2006	250	73.75	80	2086
METCALFE ST.	SEE PLANS MH1	SEE PLANS-MH2	PVC	2006	250	13.75	80	2086
METCALFE ST.	SEE PLANS MH2	SEE PLANS MH3	PVC	2006	200	41.25	80	2086
METCALFE ST.	SEE PLANS MH3	SEE PLANS MH4	PVC	2006	200	13.75	80	2086
METCALFE ST.	SEE PLANS MH4	SEE PLANS MH5	PVC	2006	200	38.75	80	2086
METCALFE ST.	SEE PLANS MH5	SEE PLANS MH6	PVC	2006	200	13.75	80	2086
METCALFE ST.	SEE PLANS MH6	SEE PLANS MH7	PVC	2006	200	72.50	80	2086
DR. BACH ST.	JAMIESON ST.	FAIRBAIRN BROTHERS ST.	PVC	2007	200	82.50	80	2087
DR. BACH ST.	FAIRBAIRN BROTHERS ST.	INTERMEDIATE MH ON DR. BACH ST.	PVC	2007	200	72.50	80	2087
DR. BACH ST.	INTERMEDIATE MH ON DR. BACH ST.	KING ST.	PVC	2007	200	68.75	80	2087
FAIRBAIRN BROTHERS ST.	DR. BACH ST.	45 BEND IN FB BROS.	PVC	2007	200	73.75	80	2087
FAIRBAIRN BROTHERS ST.	45 BEND IN FB BROS.	NEXT 45 BEND IN FB BROS.	PVC	2007	200	16.25	80	2087
FAIRBAIRN BROTHERS ST.	NEXT 45 BEND IN FB BROS.	INTERMEDIATE MH ON FB BROS.	PVC	2007	200	63.75	80	2087
FAIRBAIRN BROTHERS ST.	INTERMEDIATE MH ON FB BROS.	KING ST.	PVC	2007	200	66.25	80	2087
LITTLE BRIDGE	FRONT OF TOWN HALL	OLD POST OFFICE	V.C. WITH FIBREGLASS LINER	2007	525	122.01	70	2077

Appendix C

Summary of Water Infrastructure Management Strategy Activities

APPENDIX C: Summary of Water System Infrastructure Management Strategy Activities

Municipality of Mississippi Mills Water and Wastewater Infrastructure Master Plan Update - 2018

Timeframe	Description	Upgrade Rationale	Opinion of Probable Cost	Class EA Study Requirements	Estimated Time to Design, Tender and Construct	Status
Immediate	**Well 3**					
	I1.1 Replace caulking	Condition	$ 500	None	N/A	
	I1.2 New cladding on foundation insultation	Condition	$ 2,000	None	N/A	
	I1.3 New PLC panel	Condition	$ 53,500	None	N/A	
	I1.4 UPS power and conduits/teck cable for instruments	Condition	$ 43,000	None	N/A	
	I1.5 Provide generator connection	Condition	$ 5,500	None	N/A	
	I1.6 Replace door frame (from 0 to 5 year timeframe)	Condition	$ 1,500	None	N/A	
	Well 5					
	I2.1 New cladding on foundation insulation	Condition	$ 2,000	None	N/A	
	I2.2 New PLC panel	Condition	$ 53,500	None	N/A	
	I2.3 UPS power and conduits/teck cable for instruments	Condition	$ 43,000	None	N/A	
	I2.4 Repair damaged conduit on exterior	Condition	$ 5,500	None	N/A	
	I2.5 Remove redundant hydro meter base and conduits	Condition	$ 5,500	None	N/A	
	I2.6 Regrade around the facility	Condition	$ 5,500	None	N/A	
	I2.7 Provide generator connection	Condition	$ 5,500	None	N/A	
	Well 6					
	I3.1 Replace exterior siding and add insulation	Condition	$ 8,500	None	N/A	
	I3.2 Remove and replace exterior caulking	Condition	$ 500	None	N/A	
	I3.3 Replace door and frame (from 0 to 5 year time frame)	Condition	$ 2,500	None	N/A	
	I3.4 New PLC panel	Condition	$ 53,500	None	N/A	
	I3.5 UPS power and conduits/teck cable for instruments	Condition	$ 43,000	None	N/A	
	I3.6 Rectify corrosion problem with feeder wires	Condition	$ 5,500	None	N/A	
	I3.7 Investigate bond/pitting problem with pump shaft	Condition	$ 5,500	None	N/A	
	I3.8 Regrade around the facility	Condition	$ 5,500	None	N/A	
	I3.9 Provide generator connection	Condition	$ 5,500	None	N/A	
	Water Distribution					
	I5.1 Replace 6.3 km of watermain (existing deficit)	Condition	$ 5,945,000	Schedule A - 6 months	1 to 2 years	
Short-term	**Well 3**					
0 to 5 years	S1.1 Replace door frame	Condition	Included in I1.6	None	N/A	
2018 to 2022	**Well 6**					
	S2.1 Replace door and frame	Condition	Included in I3.3	None	N/A	
	Water Storage					
	S3.1 Construct a Reservoir at a new site	Capacity	$ 4,700,000	Schedule B - 1 year	2 years	
	Water Distribution					
	S4.1 Victoria Street Upgrades	Capacity	$ 410,000	N/A	Design Underway	
	S4.2 County Road 29 Looping Wylie to Dunn Street Upgrades	Capacity	$ 125,000	Schedule A - 6 months	1 to 2 years	
	S4.3 Replace 1.8 km of watermain	Condition	$ 1,485,000	Schedule A - 6 months	1 to 2 years	

APPENDIX C: Summary of Water System Infrastructure Management Strategy Activities

Municipality of Mississippi Mills Water and Wastewater Infrastructure Master Plan Update - 2018

Timeframe	Description	Upgrade Rationale	Opinion of Probable Cost	Class EA Study Requirements	Estimated Time to Design, Tender and Construct	Status
Mid-term	**Well 3**					
5 to 10 years	M1.1 Replacement of vertical turbine pump	Condition	$ 38,000	None	N/A	
2023 to 2027	M1.2 Replacement/overhaul of chemical injection system	Condition	$ 11,000	None	N/A	
	M1.3 Replace electrical distribution including motor starter	Condition	$ 80,000	None	N/A	
	Well 5					
	M2.1 Replacement of vertical turbine pump	Condition	$ 48,000	None	N/A	
	M2.2 Replacement/overhaul of chemical injection system	Condition	$ 11,000	None	N/A	
	M2.3 Replace electrical distribution	Condition	$ 64,000	None	N/A	
	Well 6					
	M3.1 Replacement of vertical turbine pump	Condition	$ 32,000	None	N/A	
	M3.2 Replacement/overhaul of chemical injection system	Condition	$ 11,000	None	N/A	
	M3.3 Replace electrical distribution	Condition	$ 64,000	None	N/A	
	Wells 7 and 8					
	M4.1 Increase capacity to demonstrated yield	Capacity	$ 2,800,000	Schedule C - 1-2 years	2 years	
	M4.2 Replacement/overhaul of chemical injection system	Condition	Included in M4.1	None	N/A	
	M4.3 Replace electrical distribution	Condition	Included in M4.1	None	N/A	
	M4.4 Replace electrical distribution	Condition	Included in M4.1	None	N/A	
	Water Distribution					
	M5.1 County Road 29 Well 6 to Wylie Street Upgrade	Capacity	$ 795,000	Schedule A - 6 months	1 to 2 years	
	M5.2 Pressure Zone 2 Optimization	Capacity	$ 190,000	Schedule A - 6 months	1 to 2 years	
	M5.3 Martin Street North, from Teskey Street to Carss Street	Capacity	$ 575,000	Schedule A - 6 months	1 to 2 years	
	M5.4 Princess Street and Martin Street North Upgrades	Capacity	$ 170,000	Schedule A - 6 months	1 to 2 years	
	M5.5 Union Street North, from Princess Street to Carss Street	Capacity	$ 425,000	Schedule A - 6 months	1 to 2 years	
	M5.6 Adelaide and Brookdale Street Looping	Capacity	$ 260,000	Schedule A - 6 months	1 to 2 years	
	M5.7 Carss Street, from Mitcheson Street to Union Street North	Capacity	$ 125,000	Schedule A - 6 months	1 to 2 years	
	M5.8 Carss Street, from Union Street North to Mississippi River	Capacity	$ 220,000	Schedule A - 6 months	1 to 2 years	
	M5.9 Mississippi River Third Crossing	Capacity	$ 2,540,000	Schedule A - 6 months	1 to 2 years	
	M5.10 Replace 1.7 km of watermain	Condition	$ 1,595,000	Schedule A - 6 months	1 to 2 years	
Long-term	**Well 3**					
10 to 20 years	L1.1 Well rehabilitation to demonstrated yield	Capacity	$ 600,000	NA	< 1 year	
2028 to 2037	**Well 5**					
	L2.1 Well rehabilitation to demonstrated yield	Capacity	$ 600,000	NA	< 1 year	
	Elevated Storage Tower					
	L3.1 Rehabilitation of interior and exterior coating systems	Condition	$ 450,000	None	N/A	
	Water Distribution					
	L4.1 Appleton Side Road Looping	Capacity	$ 610,000	Schedule A - 6 months	1 to 2 years	
	L4.2 Create Pressure Zone 3	Capacity	$ 125,000	Schedule A - 6 months	1 to 2 years	
	L4.3 Replace 2.7 km of watermain	Condition	$ 2,455,000	Schedule A - 6 months	1 to 2 years	

Appendix D

Summary of Wastewater Infrastructure Management Activities

APPENDIX D: Summary of Wastewater System Infrastructure Management Strategy Activities

Municipality of Mississippi Mills Water and Wastewater Infrastructure Master Plan Update - 2018

Timeframe	Description	Upgrade Rationale	Opinion of Probable Cost	Class EA Study Requirements	Estimated Time to Design, Tender and Construct	Status
Immediate	***Christian Street SPS***					
	I1.1 Intrinsic barriers and temperature monitoring	Condition	$ 5,500	None	N/A	
	Hope and Glass Streets SPS					
	I2.1 Paint or replace interior support plate (further study required)	Condition	$ 8,000	None	N/A	
	I2.2 Replacement of rusty discharge pipes	Condition	$ 8,000	None	N/A	
	I2.3 New electrical and controls	Condition	$ 214,500	None	N/A	
	I2.4 Provide generator connection	Condition	$ 5,500	None	N/A	
	Island SPS					
	I3.1 Paint exposed steel hatches	Condition	$ 1,000	None	N/A	
	I3.2 Intrinsic barriers and temperature monitoring	Condition	$ 5,500	None	N/A	
	Robert Street SPS		$ -			
	I4.1 Paint exposed steel items	Condition	$ 1,000	None	N/A	
	I4.2 New electrical and controls	Condition	$ 214,500	None	N/A	
	I4.3 Provide generator connection	Condition	$ 5,500	None	N/A	
	Gemmill's Bay SPS					
	I5.1 Expand SPS to meet long-term needs	Capacity	$ 500,000	Schedule A+ - 6 months OR Schedule B - 1 year	2 years	
	Collection System					
	I6.1 Replace 8 km of sewer diameter (existing deficit)	Condition	$ 7,340,000	Schedule A - 6 months	1 to 2 years	
Short-term	***Island SPS***					
0 to 5 years	S1.1 Replace pumps	Condition	$ 32,000	None	N/A	
2018 to 2022	***Robert Street SPS***					
	S2.1 Replacement of discharge pipes	Condition	$ 10,500	None	N/A	
	Spring Street SPS					
	S3.1 Expand SPS to meet long-term needs	Capacity	$ 140,000	Schedule A+ - 6 months	2 years	
	Collection System					
	S4.1 Easement and State Street Upgrades	Capacity	$ 235,000	Schedule A - 6 months	1 to 2 years	
	S4.2 Victoria Street Upgrades, from Martin Street North to Ottawa Street	Capacity	$ 1,980,000	Schedule A - 6 months	1 to 2 years	
	S4.3 Industrial Park Sewer	Capacity	$ 615,000	Schedule A - 6 months	1 to 2 years	
	S4.4 Martin Street North at Victoria Street	Capacity	$ 25,000	Schedule A - 6 months	1 to 2 years	
	S4.5 Replace 12 km of sewer	Condition	$ 960,000	Schedule A - 6 months	1 to 2 years	
Mid-term	***Christian Street SPS***					
5 to 10 years	M1.1 Replacement of submersible pumps	Condition	$ 5,500	None	N/A	
2023 to 2027	M1.2 Install more robust ballards	Condition	$ 1,000	None	N/A	
	Hope and Glass Streets SPS					
	M2.1 Replace pumps	Condition	$ 32,000	None	N/A	
	Robert Street SPS					
	M3.1 Replace pumps	Condition	$ 10,500	None	N/A	
	Collection System					
	M4.1 Replace 25 km of sewer	Condition	$ 2,750,000	Schedule A - 6 months	1 to 2 years	
Long-term	***Collection System***					
10 to 20 years	L1.1 Union Street Upgrades	Condition	$ 195,000	Schedule A - 6 months	1 to 2 years	
2028 to 2037	L1.2 Replace 4 km of sewer	Condition	$ 1,270,000	Schedule A - 6 months	1 to 2 years	

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