# Memorandum

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| **To:** | **Town of Oliver** | **From:** | Sean Curry, P. Eng. |
| **Attn:** | **Kelly Mercer, AScT, Director of Operations** | | |
| **Date:** | April 18, 2024 | **File No.:** | 306-2101 |

**RE: Updated Domestic Water and Community Sewerage System Capacity Assessment**

## 1.0 BACKGROUND

As requested by Town of Oliver (Town) staff, this memorandum has been prepared to summarize findings from a capacity assessment of the Town's domestic water and community sewerage systems. This memorandum is considered to be an update to the capacity sections from the following detailed system assessment documents:

- TRUE 2019a. Town of Oliver 2019 Water Capital & Asset Management Plan, dated October 2019
- TRUE 2019b. Town of Oliver 2018 Sanitary System Capital Plan, dated March 2019

The subject assessment is being completed on the basis of legislated changes that were made official in late 2023 through Provincial Bills 44, 46, and 47. These bills will allow for infilling of parcels currently associated with low density zoning. From the Town's perspective, the key consideration allowed by these bills is that four dwelling units (i.e. 4-plexes or comparable) will be permitted on parcels that are currently zoned for single-family or duplex use and are serviced by both the Town's domestic water and community sewerage systems.

The goal of this assessment is therefore to determine whether the Town should be planning to expand the capacity of their water and sewer infrastructure as either a short-term or long-term goal arising from potentially significant population growth related to Provincial Bills 44, 46, and 47. In consultation with Town staff, a 20-year horizon has been considered for this assessment.

The following sections discuss:

- Population projections used as the basis for updated system capacity assessments;
- From the preferred population project scenario, a detailed review of the capacity of the Town's domestic water and community sewerage systems;
- A discussion of potential key capacity deficiencies related to the aforementioned utility systems; and
- A summary of findings relating to this assessment.

## 2.0 POPULATION PROJECTIONS

The basis for this assessment is the number of single-family lots within the Town boundary that can be serviced by the Town's water and sewer systems. The following table provides a summary of existing parcels (differentiated by existing zoning designation) within the Town boundary that can be serviced via these infrastructure systems. This table has been summarized based on parcel data provided by Town staff on March 12, 2024.

**TABLE-1: PARCEL COUNT WITHIN TOWN BOUNDARY**

| Zoning Designation | Total Parcel Count | Parcels Serviced by Water System | Parcels Serviced by Sewer System |
|---|---|---|---|
| RS1 | 1,460 | 1,452 | 1,453 |
| RS1 (Strata) | 101 | 101 | 101 |
| Remaining Designations | 578 | 552 | 558 |
| **Total** | **2,139** | **2,105** | **2,112** |

Further to the above table:

- The RS1 (Strata) zoning designation is associated with existing strata's that have been developed on RS1 zoned parcels. These strata lots are unlikely to be re-developed into higher density type developments and have therefore not been considered in subsequent infilling scenarios.
- A count of 1,460 single-family lots was utilized as the basis for the subsequent capacity assessment. This total number of single-family zoned parcels was chosen as it represents the total potential build-out of existing single-family zoned parcels that have the potential to be re-developed within the Town boundary (i.e. currently serviced or un-serviced).
- Note that this total number of RS1 zoned parcels represents all existing developed lots that are serviced by the Town's water and sewer systems, a small number of currently undeveloped lots that could be connected to these utility systems, and a single lot that is serviced by the Town's sewer system and not the water system.

The subsequent capacity assessment also requires consideration for Town population growth associated with parcels with zoning designations other than RS1. The Town's 2021 census population (for Oliver Town Centre) has been used as a basis for population projections. An assumed growth rate of 1.2% was then utilized to project a maximum population over the 20-year horizon for this assessment. This maximum growth rate is consistent with recommendations from the Town's current Housing Needs Report, dated January 2020.

The following figure illustrates a projected population based on this 1.2% growth rate over the 20-year horizon. As noted, the census population from 2021 was used as the basis for population projections. Oliver Town Centre census population for 2011, 2016, and 2021 are each noted on this figure.

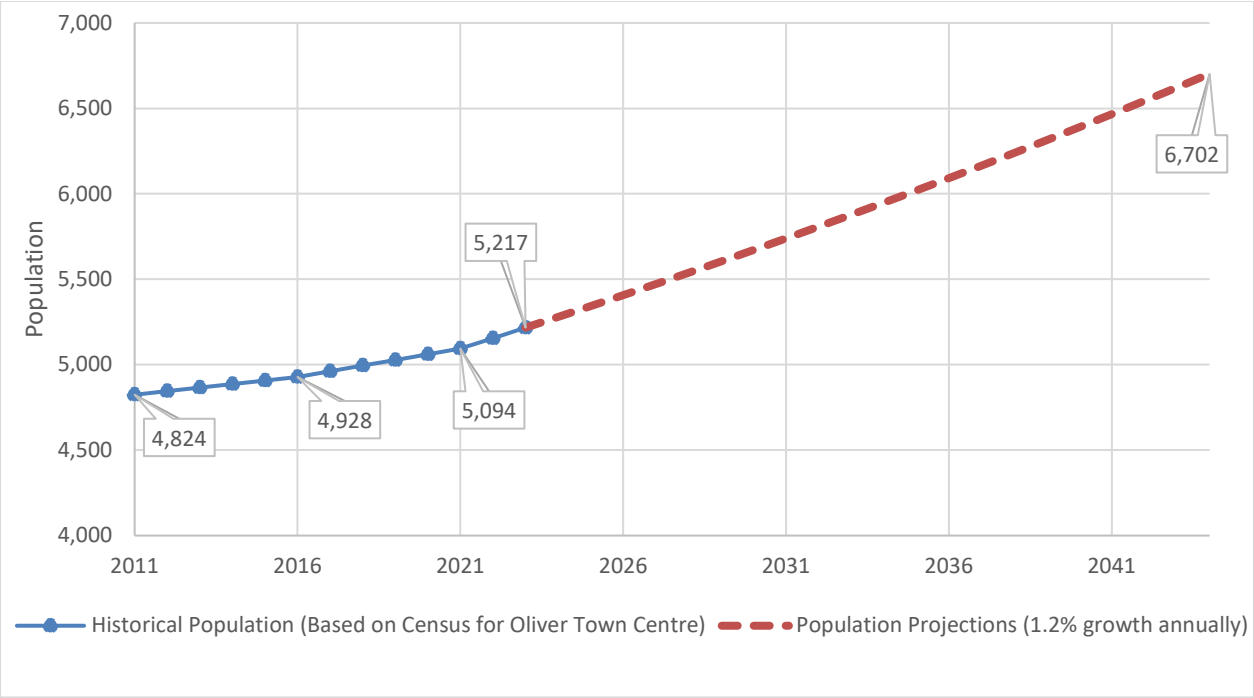



**FIGURE-1: TOWN OF OLIVER (TOWN CENTRE) POPULATION (HISOTRICAL AND 20-YEAR PROJECTION**

The above figure does not yet include population projections related to possible infilling scenarios for RS1 parcels being redeveloped from single-family homes to 4-plexes within the Town boundary. In consultation with Town staff, a variety of infilling scenarios have been considered for their impact on the Town's domestic water and community sewerage infrastructure systems. The infilling scenarios considered are 0% (i.e. status quo), 25%, 50%, 75%, 100%. Note that these infilling scenarios consider a population density of 2.2 capita/unit as per 2021 Census data* and do not include equivalent population of parcels that have not been re-developed (i.e. population of RS1 parcels that do not re-develop to 4-plexes). The following figure illustrates the various infilling scenarios considered in this assessment.

* *Source: https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/details/page.cfm?Lang=E&SearchText=Oliver&DGUIDlist=2021A00055907014&GENDERlist=1,2,3&STATISTIClist=1&HEADERlist=0*

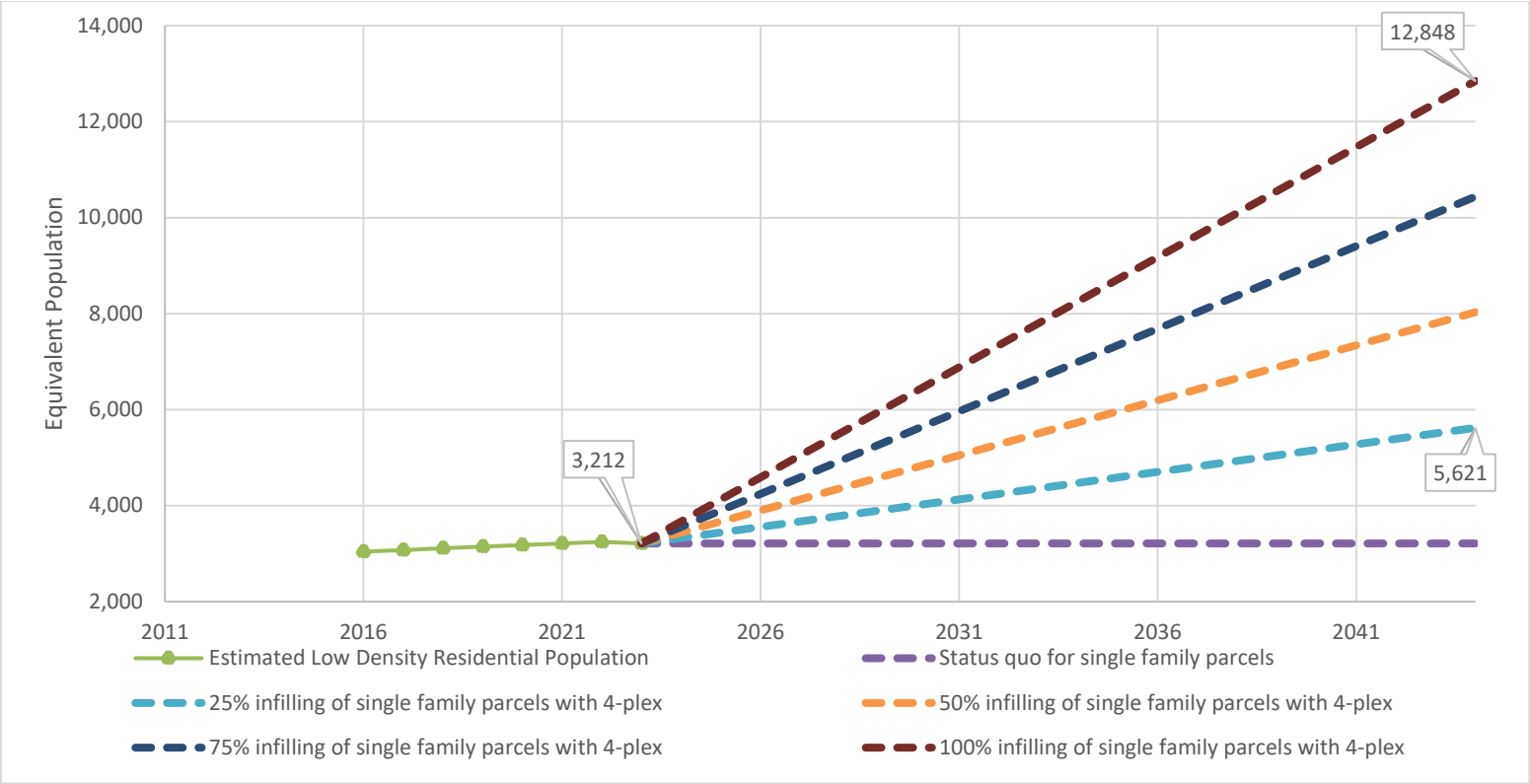



**FIGURE-2: PROJECTED EQUIVALENT POPULATION OF RS1 ZONED PARCELS WITH VARIOUS INFILLING SCENARIOS**

Further to the above figure:

- The above figure assumes that an equal number of RS1 parcels are re-developed each year over the 20-year assessment period.
- Infilling may therefore have the impact of increasing the Town's population associated with existing RS1 zoned parcels from around 3,212 to 12,848.
- Considering that the Town's census population only increased by 270 people in the period between 2011 and 2021, the higher infilling projections are considered to be unrealistic. Even the 25% infilling option would be associated with the re-development of more than seventeen RS1 zoned parcels each year over the 20-year horizon.
- With the above in mind, the 25% infilling options has been utilized as the basis for the subsequent capacity assessments. A growth rate exceeding this 25% infilling scenario is considered unrealistic based on past population growth within the Town of Oliver and surrounding regions. As noted, TRUE has also considered a 1.2% growth rate associated with all parcels with current zoning designations other than RS1.
- While the 25% infilling scenario is considered the maximum realistic growth rate possible, TRUE has included projections to the 100% infilling scenario within the subsequent capacity assessments. As such, should the Town experience a more aggressive infilling uptake, the Town and TRUE can reassess the water and sewer systems as required.

As noted within the 2019 Capital Plans, the water and sewer systems are best assessed on the basis of an equivalent population being provided with domestic water and sewer service. From these referenced reports, the following table provides the total estimated 2016 service population associated with the water and sewer systems.

**TABLE-2: ESTIMATED EQUIVALENT SERVICE POPULATION (2016)**

| INFRASTRUCTURE SYSTEM | ESTIMATED SERVICE POPULATION |
|---|---|
| Community Sewerage | 7,406 |
| Domestic Water | 8,846 |

Utilizing the referenced 1.2% growth rate, the 2024 service population is therefore estimated as 8,051 for the community sewerage system and 9,617 for the domestic water system. All subsequent service population projections have been based on these estimates.

The RS1 infilling scenarios discussed above (along with consideration for a 1.2% growth rate associated with existing parcels not currently designated as RS1) would therefore result in a service population ranging between 9,824 and 21,370 at the end of the 20-year assessment horizon. The following table illustrates this range of possible service populations.

**TABLE-3: 20-YEAR ASSESSMENT HORIZON (2044) OF ESTIMATED EQUIVALENT SERVICE POPULTION BASED ON VARIOUS INFILLING SCENARIOS**

| INFILLING SCENARIO | COMMUNITY SEWERAGE | DOMESTIC WATER |
|---|---|---|
| Status Quo (1.2% universal growth rate) | 9,824 | 11,734 |
| 25% infilling of RS1 parcels | 12,233 | 14,143 |
| 50% infilling of RS1 parcels | 14,642 | 16,552 |
| 75% infilling of RS1 parcels | 17,051 | 18,961 |
| 100% infilling of RS1 parcels | 19,460 | 21,370 |

As noted, the 25% infilling option is likely the maximum growth rate that the Town will achieve under this new legislation. As such, the estimated equivalent service population based on this infilling scenario will be utilized for the subsequent capacity assessments for the Town's community sewerage and domestic water systems. As shown in the previous table, the estimated equivalent service population at the end of the 20-year horizon associated with this infilling scenario is 12,233 for the community sewerage system and 14,143 for the domestic water system.

## 3.0 DOMESTIC WATER SYSTEM ASSESSMENT

### Description of Water System

The Town of Oliver's water system originally comprised seven individual systems. Over time, these systems have become connected to ensure a more robust water system. The Town maintains approximately 115 kilometers of water mains within their domestic system, a total of five wells, one pressure zone, and three reservoirs. The Town also maintains a dual irrigation and

domestic water system (referred to as System 2) that includes three additional groundwater supply sources. Previously, domestic water supply was sourced from both the canal surface water and wells. As of 2014, all domestic connections within the Town of Oliver are sourced from groundwater production wells and the canal surface water source is entirely utilized for irrigation purposes only.

Additional details on the Town's existing water system can be found in TRUE 2019a. Please refer to the attached Figure W-1 for an overview of the Town's domestic water systems. A more detailed discussion related to the capacity of the Town's domestic water sources (i.e. groundwater production wells) is provided following.

## Existing Groundwater Production Wells

From the Town's Source Water Assessment Report (July 2015), as prepared by Western Water Associates Ltd. (WWAL), the following table summarizes the Town's water sources, complete with the rated or nominal capacity of each domestic well source.

**TABLE-4: DOMESTIC WATER SYSTEM GROUNDWATER PRODUCTION WELL SUMMARY (COURTESY OF WWAL)**

| Well Name | Total Depth (m / ft) | Diameter (mm / inches) | Depth to top of screen (m / ft) | Static Water Level (m / ft) | Rated or Nominal Capacity (L/s / USgpm) |
|---|---|---|---|---|---|
| Buchanan Road | 22.2 / 73 | 400 / 16 | 16 / 53 | 3.9 / 12.8 | 63.1 / 1,000 |
| Tuc-el-Nuit #2 | 14.3 / 47 | 300 / 12 | 10.4 / 34.1 | 3.4 / 11.0 | 75.7 / 1,200 |
| Tuc-el-Nuit #3 | 13.7 / 45 | 250 / 10 | 10.3 / 34.0 | 4.0 / 13.1 | 41.0 / 650 |
| Rockcliffe Well | 24.4 / 80.0 | 400 / 16 | 15.0 / 49.2 | 6.3 / 20.6 | 94.6 / 1,500 |
| Blacksage #1 | 25.7 / 84.3 | 400 / 16 | 11.6 / 38.0 | 2.8 / 9.2 | 126.2 / 2,000 |
| Blacksage #2 | 15.2 / 50 | 400 / 16 | unknown | 2.4 / 8.0 | 25.2 / 400 |
| Blacksage #3 | 31.1 / 102 | 200 / 8 | unknown | 1.8 / 6.0 | 12.6 / 200 |
| Miller Road Well | 18.4 / 59.0 | 300 / 12 | 14.3 / 46.9 | 2.8 / 9.2 | 68.9 / 1,092 |

Further to the previous section, the Town's domestic potable water system is an interconnected system that generally consists of two separate areas, the municipal water system and System 2 (also referred to as the Blacksage system). The municipal water system is serviced by Buchanan Road, Tuc-el-Nuit #2, Tuc-el-Nuit #3, Rockcliffe Well, and can also be fed by the Miller Road well site via the Airport Booster Station. The Miller Road well site has the ability to supplement flow in System 2 to a maximum flow rate of 500 USgpm (31.5 L/s) during periods of peak demand. As such, System 2 is serviced by Blacksage Wells #1-3 and about half the capacity of the Miller Road Well during periods of peak demand.

It is important to note that the Town also provides irrigation water to a large service area. The majority of this water is conveyed via a twinned non-potable water system located outside of the municipal boundary. As previously noted, the exception is in System #2 where the groundwater

source provides high quality water in a combined irrigation and domestic potable water distribution system.

From this description, the following table provides a summary of rated / nominal source water capacity in each distinct service area.

**TABLE-5: RATED / NOMINAL WATER SOURCE CAPACITY FOR VARIOUS DOMESTIC SYSTEM SERVICE AREAS**

| WELL NAME | MUNICIPAL SYSTEM (INCLUDES SYSTEM 1, 4, & 5) | SYSTEMS #6 & #7**** | SYSTEM #2 (BLACKSAGE COMBINED SYSTEM) |
|---|---|---|---|
| Buchanan Road | 63.1 | X | X |
| Tuc-el-Nuit #2 | 75.7 | X | X |
| Tuc-el-Nuit #3 | 41.0 | X | X |
| Rockcliffe Well | 94.6 | X | X |
| Blacksage #1 | X | X | 126.2 |
| Blacksage #2 | X | X | 25.2 |
| Blacksage #3 | X | X | 12.6 |
| Miller Road Well | X* | 68.9** | 31.5*** |
| **Total Capacity (L/s)** | **274.4** | **68.9** | **195.6** |
| **Total Capacity (ML over 24 hours)** | **23.7** | **6.0** | **16.9** |

* Water system is configured to supplement flow from the Miller Road site via the Airport Booster Sation. While the system is configured to allow backfeeding of flow from System #6 & #7, this analysis is conservative in nature and does not account for this occurrence during periods of peak usage.

** Max flow of 68.9 L/s (1,092 USgpm) from the Miller Road Well

*** max flow of 31.5 USgpm (500 USgpm) via flow control from the Miller Road Well

**** System 6 & 7 can be sub-fed from the municipal system via the Airport Booster Station to a max flow of 31.5 L/s (500 USgpm)

Further to the above tables, TRUE conducted a detailed flow analysis for each domestic groundwater well (although, data was not provided for Blacksage #1, #2, or #3). Available SCADA records for instantaneous well flow and groundwater level were provided by the Town for the 2022 and 2023 calendar years. This data was provided on a 5-minute basis to allow TRUE to better determine actual pump performance of the domestic production wells. TRUE has found that this type of analysis can be useful for determining the existing pumping capacity as opposed to utilizing the original design point for each pump. Derivation of a calculated value related to observed / recorded degradation of each water source may also be possible based on this analysis, which may assist informing the utility as to when a water source should be replaced or rehabilitated.

The results of this analysis are shown in the following five figures (for the Buchanan Road, Tuc-el-Nuit #2, Tuc-el-Nuit #3, Rockcliffe, and Miller Road production wells respectively).

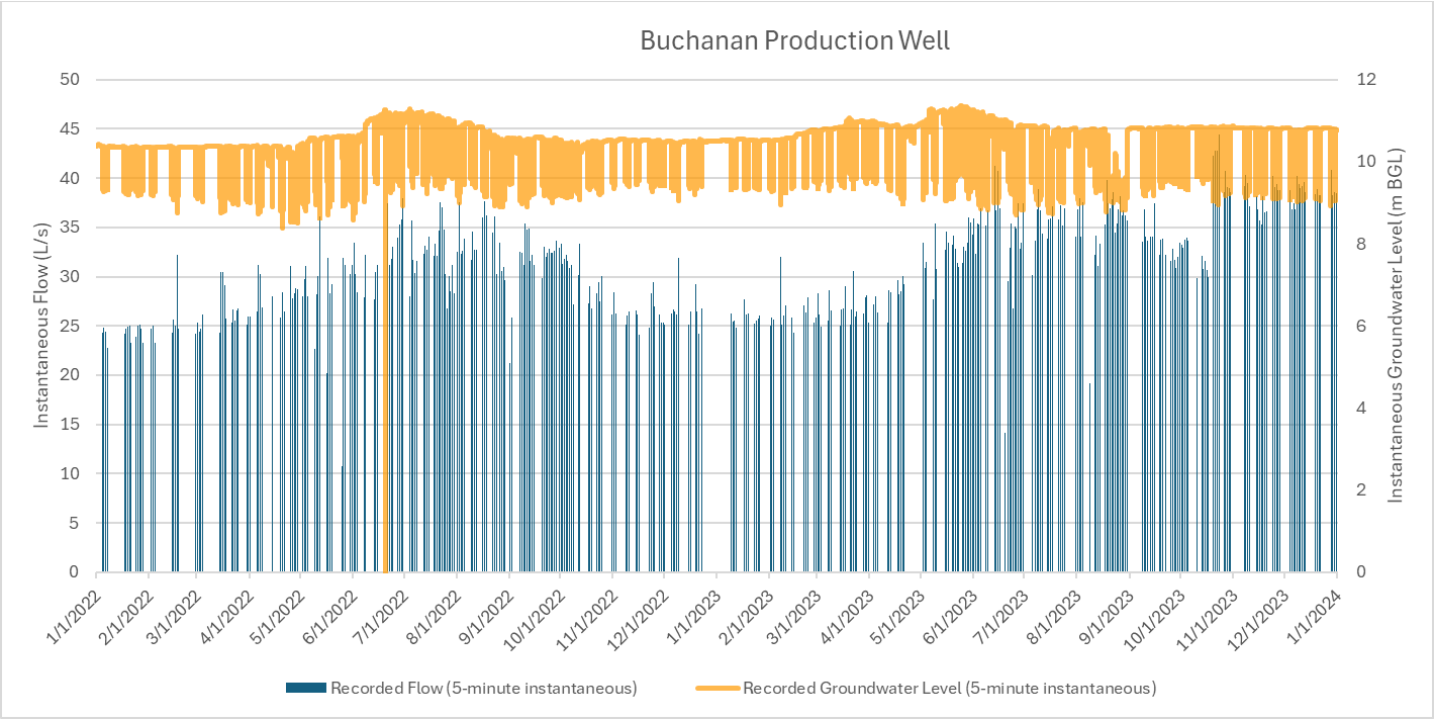



**FIGURE-3: BUCHANAN PRODUCTION WELL - RECORDED FLOW AND WELL LEVEL (JAN 2022 TO DEC 2023)**

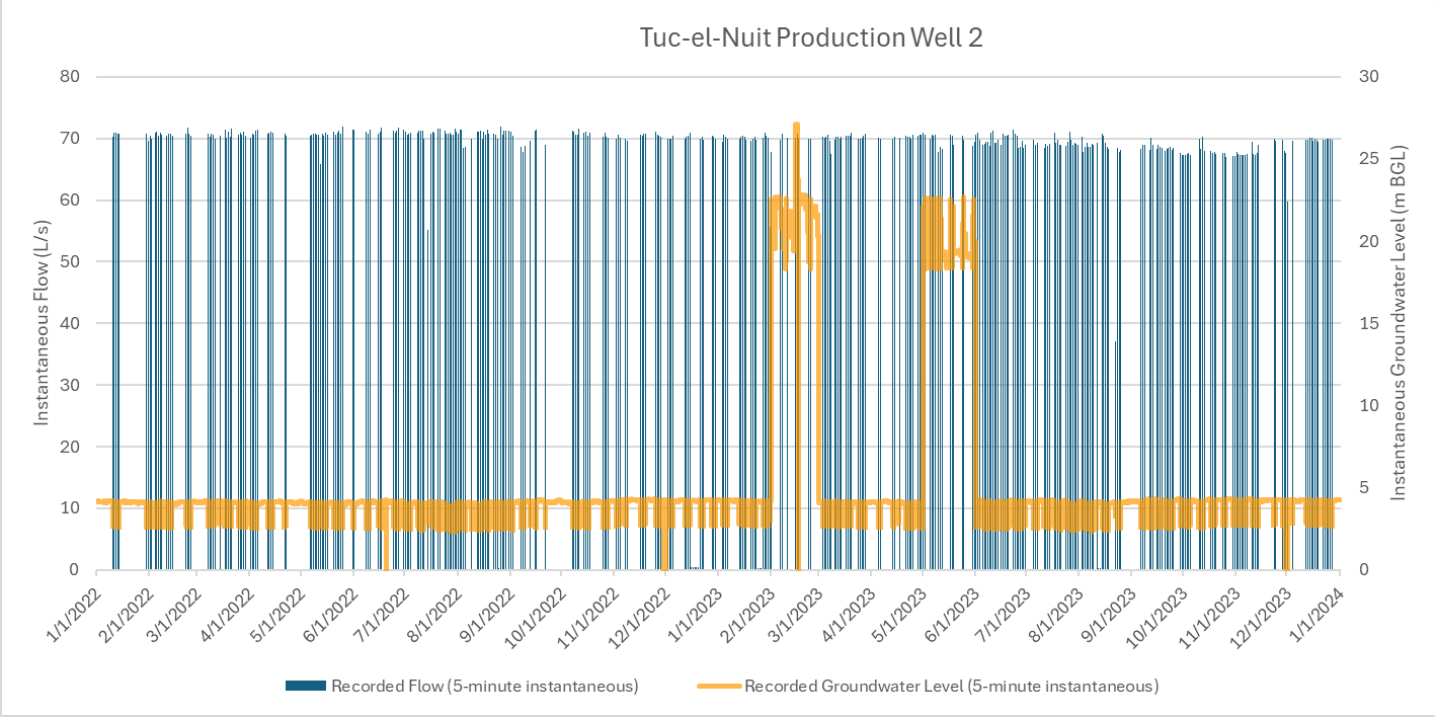



**FIGURE-4: TUC-EL-NUIT PRODUCTION WELL 2 - RECORDED FLOW AND WELL LEVEL (JAN 2022 TO DEC 2023)**

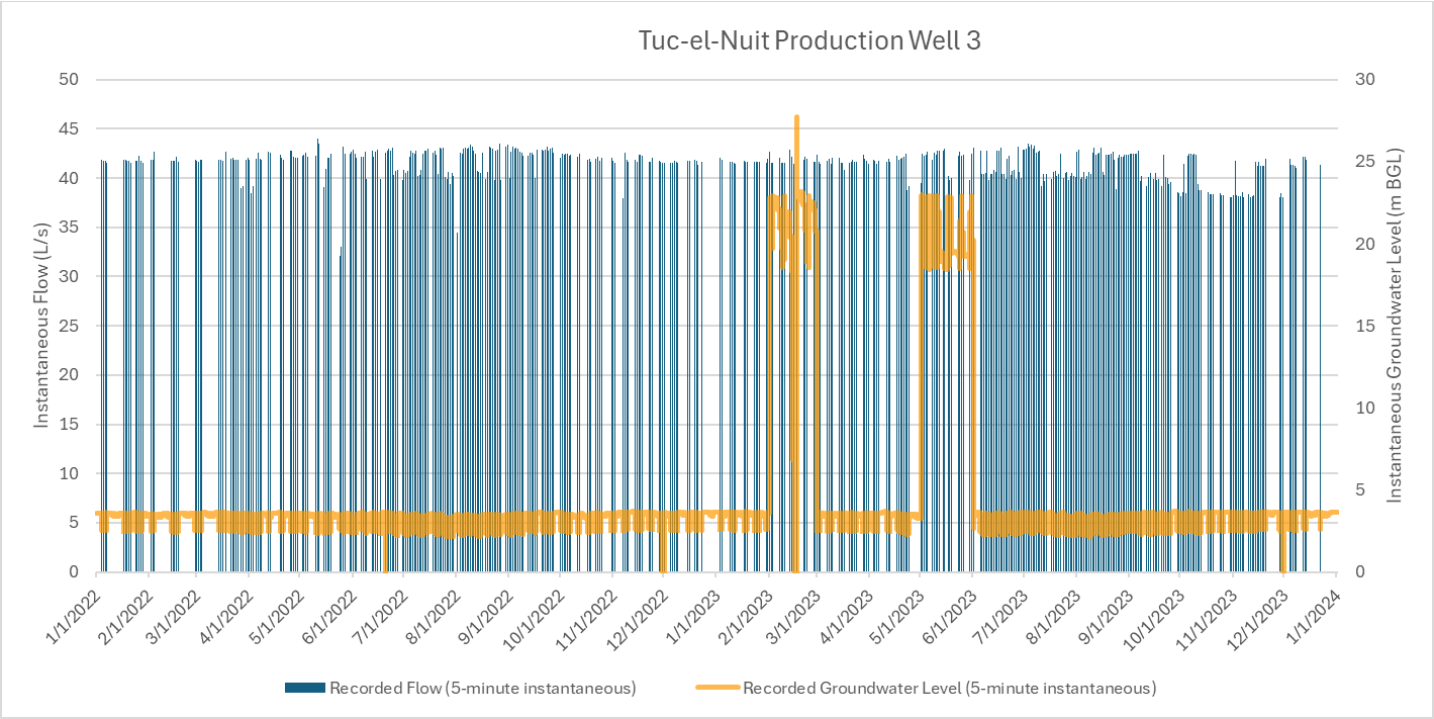



**FIGURE-5: TUC-EL-NUIT PRODUCTION WELL 3 - RECORDED FLOW AND WELL LEVEL (JAN 2022 TO DEC 2023)**

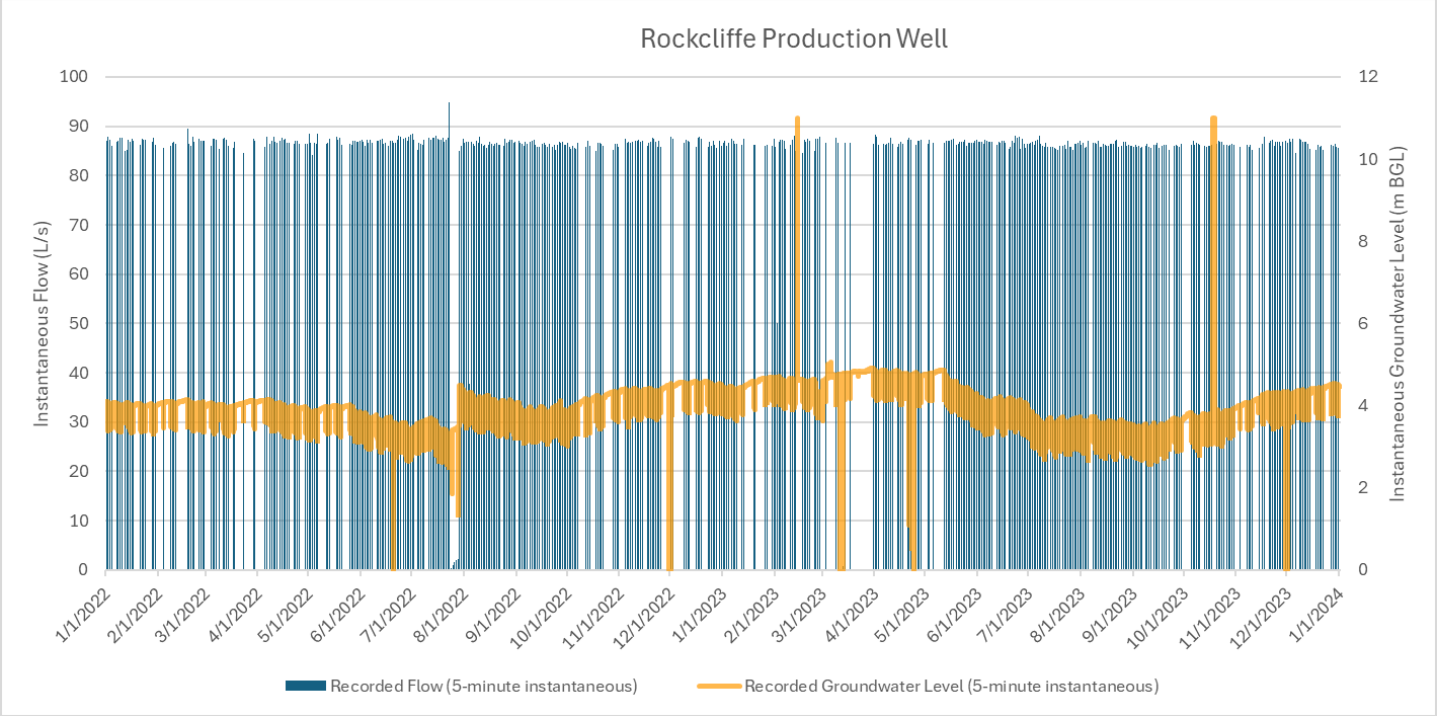



**FIGURE-6: ROCKCLIFFE PRODUCTION WELL - RECORDED FLOW AND WELL LEVEL (JAN 2022 TO DEC 2023)**

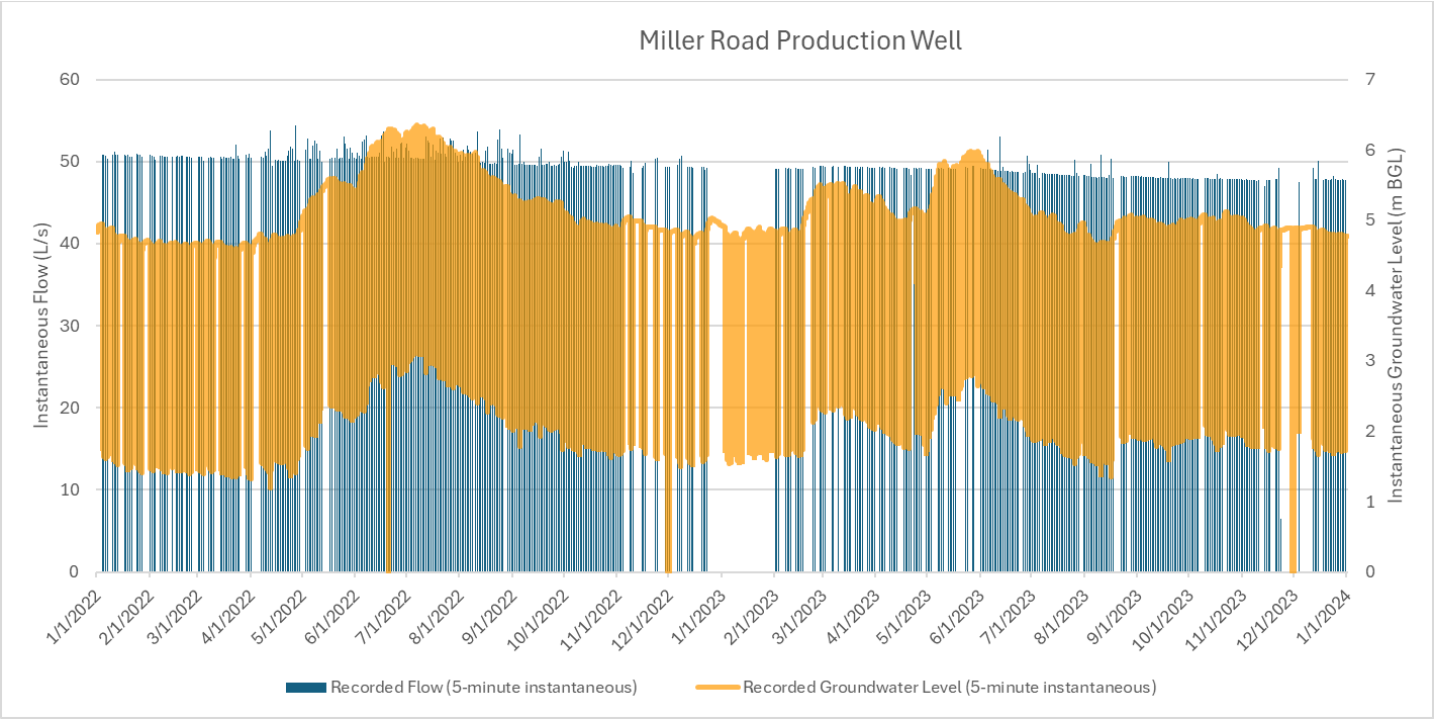



**FIGURE-7: MILLER ROAD PRODUCTION WELL - RECORDED FLOW AND WELL LEVEL (JAN 2022 TO DEC 2023)**

Based on the above five figures, the following conclusions can be made relating to existing well performance:

- Buchanan: typical pumping rate from about 25 L/s to 40 L/s. The higher production rates appear to occur during periods of peak usage in the summer months. The recorded pumping rate appears to be influenced by groundwater levels (and likely hydraulic conditions in the distribution system). Thie well appears to be significantly influenced by demand conditions throughout the year.
- Tuc-el-Nuit 2: very consistent pumping rate of about 70 L/s. The pumping rate does not appear to be significantly impacted by groundwater level.
- Tuc-el-Nuit 3: consistent pumping rate of about 42 L/s. The pumping rate does not appear to be significantly impacted by groundwater level.
- Rockcliffe: very consistent pumping rate of about 87 L/s. The pumping rate does not appear to be significantly impacted by groundwater level.
- Miller Road: very consistent pumping rate of about 50 L/s. There does appear to be a clear effect of well degradation impacting well performance (although to a small degree). The pumping rate does not appear to be significantly impacted by groundwater level.

It should also be noted that Tuc-el-Nuit 2 & 3 appear to have an instrumentation error related to well level in Feb 2023 and June 2023. TRUE has assumed that this is an instrumentation error for a shared well transducer – and not two separate well transducers showing the exact same issue. Further review of this subject is warranted.

Also based on the above analysis, a comparison between the rated / nominal capacity and the actual observed pumped flows has been tabulated following for each well.

**TABLE-6: COMPARISON BETWEEN RATED / NOMINAL CAPACITY AND OBSERVED PUMPED FLOWS FOR DOMESTIC PRODUCTION WELLS**

| Well Name | Rated or Nominal Capacity (L/s) | 2022/2023 Observed Capacity (L/s) | % Difference between Rated/Nominal capacity and Observed |
|---|---|---|---|
| Buchanan Road | 63.1 | 40.0 | 45% |
| Tuc-el-Nuit #2 | 75.7 | 70.0 | 8% |
| Tuc-el-Nuit #3 | 41.0 | 42.0 | -2% |
| Rockcliffe Well | 94.6 | 87.0 | 8% |
| Miller Road Well | 68.9 | 50.0 | 32% |

Further to the above table:

- The Buchanan and Miller Road observed pumping rates are well below the rated / nominal capacity of each well.
- There may also be an opportunity to increase the pumping rates associated with the Tuc-el-Nuit #2 and Rockcliffe production wells.

Based on the above analysis, the following table provides a summary of available source water for the Town's municipal water system. Note that systems 2, 6, and 7 have not been included in this analysis as the purpose of this assessment is to focus on parcels impacting the municipal water system only (i.e. within the Town boundary). Also note that the following table includes a subtotal referred to as 'N-1'. This flow rate refers to the total source water available over a 24-hour period minus the capacity of the largest production well (in this case, the Town's Rockcliffe production well). The 'N-1' approach assumes that there is always one well not in use. It is assumed that the well with the highest pump capacity is excluded which makes the result of the 'N-1' analysis conservative in nature and allows for system redundancy.

**TABLE-7: WATER SOURCE CAPACITY SUMMARY - MUNICIPAL WATER SYSTEM**

| Well Name | Rated or Nominal Capacity (L/s) | 2022/2023 Observed Capacity (L/s) |
|---|---|---|
| Buchanan Road | 63.1 | 40.0 |
| Tuc-el-Nuit #2 | 75.7 | 70.0 |
| Tuc-el-Nuit #3 | 41.0 | 42.0 |
| Rockcliffe Well | 94.6 | 87.0 |
| **Total Available** | **274.4** | **239** |
| **'N-1' Total Available** | **179.8** | **152** |

In consultation with Town staff, the more conservative available flow rate of 152 L/s has been utilized as an indication of the Town's maximum available source water capacity for the municipal water system.

## Water Demand Analysis

The following table provides a summary of historical water demands associated with the Town's domestic water system in the period since 2015. This data is based on the Town's historical water records.

**TABLE-8: HISTORICAL WATER DEMANDS (2015 TO 2023)**

| Year | Total Domestic Water Usage (ML) | Average Day Flow ($m^3$/day) | Max Day Flow ($m^3$/d) | Max Day Flow over 24-hours (L/s) |
|---|---|---|---|---|
| 2015 | 2,697 | 7,389 | 13,288 | 154 |
| 2016 | 2,505 | 6,845 | 12,873 | 149 |
| 2017 | 2,442 | 6,690 | 15,006 | 174 |
| 2018 | 2,232 | 6,115 | 14,702 | 170 |
| 2019 | 1,986 | 5,442 | 13,854 | 160 |
| 2020 | 2,022 | 5,524 | 12,684 | 147 |
| 2021 | 2,018 | 5,529 | 13,864 | 160 |
| 2022 | 2,010 | 5,506 | 12,481 | 144 |
| 2023 | 2,114 | 5,791 | 13,030 | 151 |

Utilizing a 5-year average to account for annual variation in water usage and the estimated service population discussed in previous sections, a per capita Maximum Day Demand (MDD) of 1,416 lpcd was derived for the domestic water system. This MDD has been utilized for subsequent water demand projections to the 20-year horizon. MDD is considered to be the key design criteria for this water system as the Town maintains treated water reservoirs which provide equalization storage for peak hour demand events.

The following figure illustrates projected MDD to the 20-year horizon. For illustrative purposes, three growth rates have been included (status quo i.e. no infilling, the preferred 25% infilling scenario, and the maximum 100% infilling scenario). Also, the available water source capacity of the municipal water system has been illustrated consistent with the previous section.

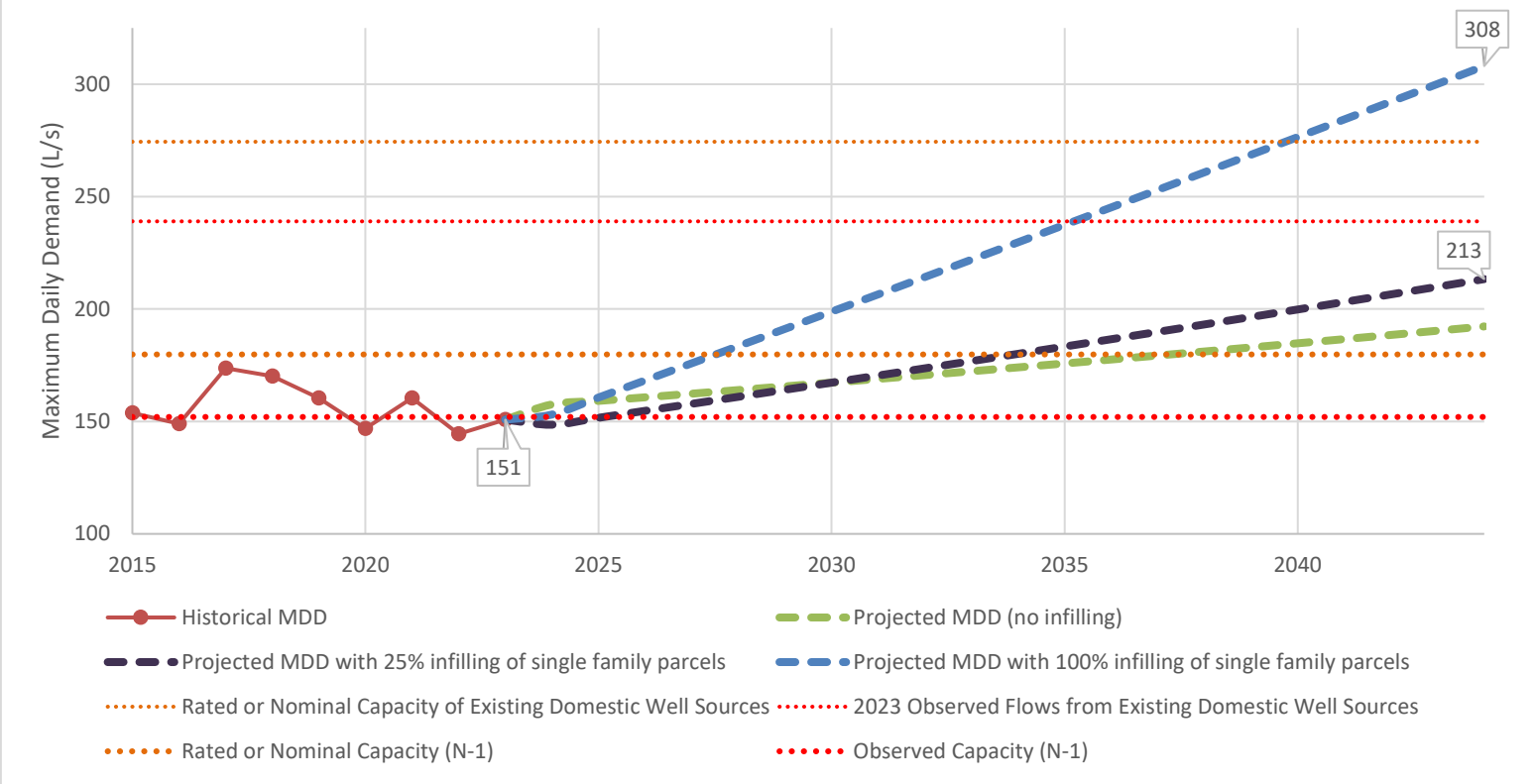



**FIGURE-8: PROJECTED MDD TO 20-YEAR HORIZON**

Further to the above figure:

- The infilling growth scenarios include allowances for a 20% reduction in per capita demand for all parcels that have been re-developed within the 20-year horizon. TRUE elected to include this reduction in water usage to account for typical water savings associated with lower irrigation usage observed within higher density type development (as compared to typical single-family irrigation usage).
- The existing MDD is at or above the 'N-1' capacity for this water system. This represents an immediate risk for the water utility as a loss of a production well may result in the Town having to implement emergency water conservation measures. Although, the interconnected nature of the Town's water system would allow operations staff to backfeed potable water from systems 6 & 7 in the event that a water source within the municipal water system was damaged or contaminated.
- The 20-year horizon MDD for the preferred 25% infilling scenario is estimated as 213 L/s. This level of water demand is less than the build-out MDD referenced in TRUE 2019a (259 L/s from the 2019 report). As such, the findings of that report related to the performance of the water distribution system remain relevant.

## 4.0 COMMUNITY SEWERERAGE SYSTEM ASSESSMENT

### Description of Community Sewerage System

The Town's community sewerage system is referred to in two distinct systems: the sanitary collection network and the treatment system. The sanitary collection network consists of gravity pipe, six local lift stations, and their respective forcemains. The collection network converges at the Influent Lift Station where it is conveyed to then begin the treatment process at the screening station. All components beyond and including the screening station comprise the treatment system.

The current treatment process consists of an influent screening station, two equalization basins, a wastewater pump station and forcemain, an aerated lagoon treatment system, reservoir storage, and reclaimed water irrigation system.

Additional details on the Town's existing sewerage system can be found in TRUE 2019b. A more detailed discussion related to the Town's key sewerage infrastructure is provided following.

### Capacity of Existing Key Sewerage Infrastructure

The following table summarizes the average and peak flow capacities of each of the Town's key sewerage system facilities. Please note that the capacity of the sanitary collection network (up to and including the headworks system) should be associated with peak wet weather flow events. The Town's equalization basins then act to buffer peak flow events and therefore all subsequent treatment system processes are influenced by average day sewer flows.

**TABLE-9: SUMMARY OF CAPACITY OF KEY COMMUNITY SEWERAGE FACILITIES**

| KEY FACILITY | EXISTING CAPACITY ($M^3$/DAY) | PEAK FLOW CAPACITY (L/S) |
|---|---|---|
| ** The sanitary collection system is influenced by average day flows* | | |
| McPherson Lift Station | 1,600 | **18.5** |
| Rockcliffe Lift Station | 500 | **5.8** |
| Rotary Beach Lift Station | 1,290 | **14.9** |
| Sawmill Road Lift Station | 2,200 | **25.5** |
| Scott Road Lift Station | 1,300 | **15** |
| Influent Lift Station | 6,050 | **70** |
| Headworks | 12,530 | **145** |
| ** The treatment process (i.e. equalization basins and all subsequent key infrastructure) is influenced by average day flows* | | |
| Equalization Basins | **3,907** | n/a |
| High Lift Pumphouse | **3,450** | 40 |
| Wastewater Treatment | **3,133** | 36 |
| Effluent Storage | **2,300** | 27 |

Of note relating to the above table:

- The capacity of each wastewater pumping station is taken from TRUE 2019b. Each pumping station is designed with a stand-by pump such that the design capacity of each station assumes that one pump is offline.
- Based on feedback provided by the supplier, the Town's Parkson drum screens are associated with the following maximum flow capacities:
  - 72" model (model #2572) is rated for 2,300 USgpm (145 L/s).
  - 48" model (model #2548) is rated for 1,500 USgpm (95 L/s). Note that headworks building contains allowances for upgrading this smaller unit to match the 72" model.
- Equalization storage capacity is based on a residence time of 0.67 days per cell, not including emergency storage (from TRUE 2019b).
- Wastewater treatment capacity is based on a detention period of 12 days for each cell (from the Town's Wastewater Treatment System Capacity Improvements Design Brief, dated January 2019)
- Effluent storage capacity is based on 0.38 $m^3$/capita/day and a build-out population of 6,073 (from TRUE 2019b)
- Discharge from the wastewater treatment system effluent is regulated by Operational Certificate for PE-13717 issued by the Ministry of Environment (MOE). This operational certificate specifies the following limits: Discharge Rate up to a maximum of 2,200 $m^3$/day, 5-day biochemical oxygen demand up to 45 mg/L and total suspended solids up to 60 mg/L.

## Sewer Flow Analysis

The following table provides a summary of historical sewer flows associated with the Town's community sewerage system in the period since 2016. This data is based on the Town's historical sewer system flow records.

**TABLE-10: HISTORICAL WATER DEMANDS (2015 TO 2023)**

| Year | Total Influent Volume (ML) | Average Daily Flow ($m^3$/day) |
|---|---|---|
| 2016 | 640 | 1,748 |
| 2017 | 689 | 1,888 |
| 2018 | 666 | 1,826 |
| 2019 | 626 | 1,715 |
| 2020 | 656 | 1,792 |
| 2021 | 608 | 1,665 |
| 2022 | 623 | 1,706 |
| 2023 | 642 | 1,759 |

Utilizing a 5-year average to account for annual variation in sewer flow and the estimated service population discussed in previous sections, a per capita average day sewer flow of 221 lpcd was

derived for the community sewerage system. This average day sewer flow has been utilized for subsequent sewer flow projections to the 20-year horizon. Average day sewer flow is considered to be the key design criteria for the treatment system processes. A discussion related to peak weather flow events that impact the sanitary collection network is included later in this section.

The following figure illustrates projected average sewer flows to the 20-year horizon. For illustrative purposes, three growth rates have been included (status quo i.e. no infilling, the preferred 25% infilling scenario, and the maximum 100% infilling scenario). Also, the calculated treatment system capacity and current permitted discharge limit of the wastewater treatment facility has been illustrated on this figure as this facility represents the most critical infrastructure.

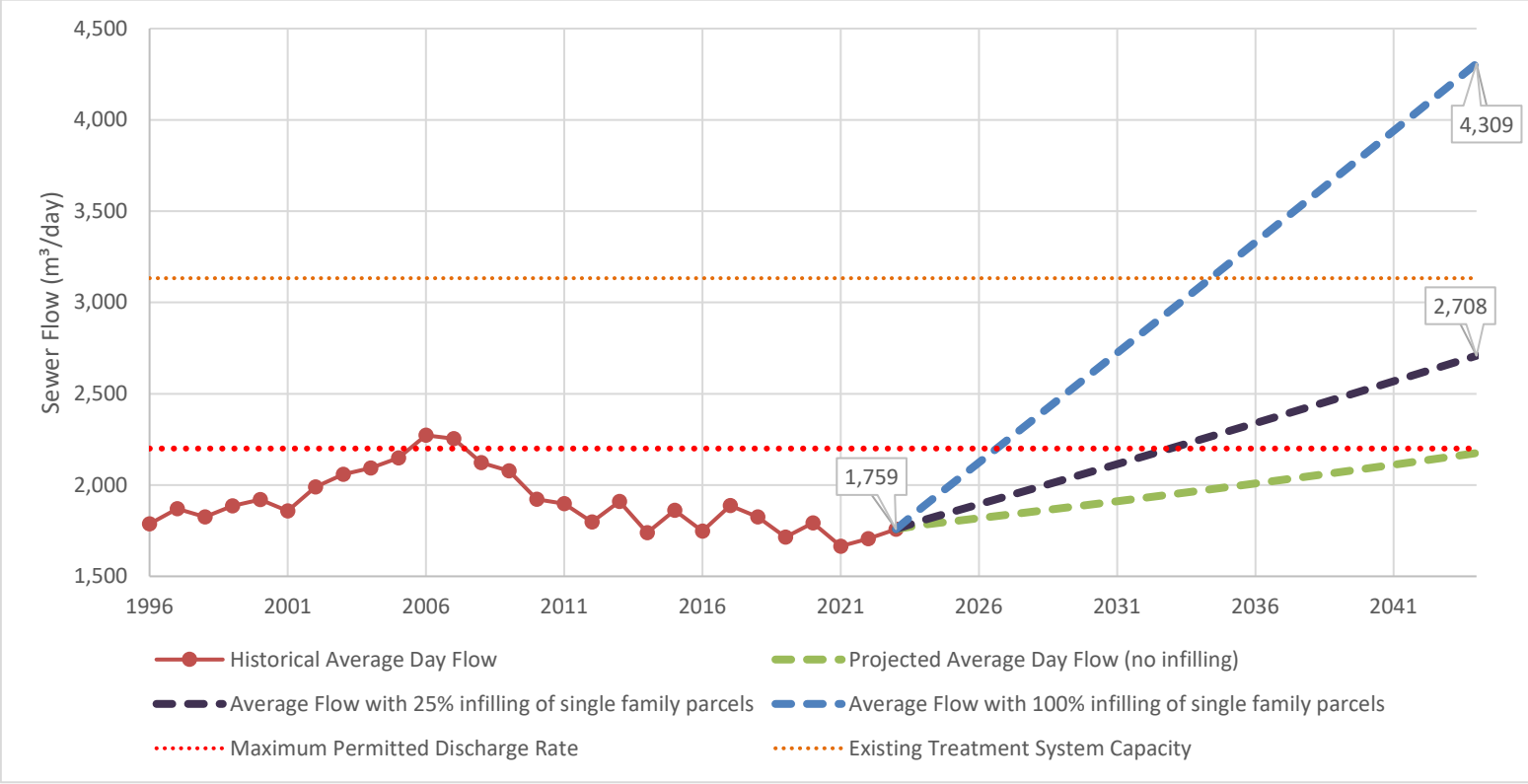



**FIGURE-9: PROJECTED AVERAGE DAY SEWER FLOW TO 20-YEAR HORIZON**

Further to the above figure:

- As opposed to the water demand projections, a reduction in per capita sewer flow was not included for RS1 parcels that may be re-developed within the 20-year horizon. Anticipated reduction in water usage for high-density development is typically associated with a reduced irrigation demand. As such, and to be conservative, this type of reduction is not anticipated to be associated with future sewer flows.
- The maximum permitted discharge of 2,200 m³/day is the key constraint for population growth. Although, the preferred 25% infilling scenario does not project to exceed the permitted discharge limit until about 2032.

- The preferred 25% infilling scenario should not result in wastewater treatment upgrades being necessary within the 20-year horizon. Note that the wastewater treatment lagoon capacity assumes fully desludged conditions.
- The projected 20-year horizon average day sewer flow associated with the 25% infilling scenario may result in an exceedance of the effluent storage capacity. Although, this exceedance is not projected to occur until after 2036.

As previously noted, the sanitary collection network cannot be analyzed in relation to average day sewer flows. This network must be sized to convey peak flow events. To aid with development of TRUE 2019b, a sewer network model was previously developed to determine whether collection network upgrades would be required to convey future Peak Wet Weather Flow (PWWF) events. This model was developed on the basis of distributing average daily flows throughout the model utilizing the spatial proximity of a parcel to the sanitary network. The model then calculates the peak flow for each pipe segment by applying a diurnal curve to the average daily flow, routing the flows through the system, and applying a constant inflow for I&I and freshet flows.

Average daily flows associated with the preferred 25% infilling scenario to the projected 20-year horizon were therefore input into the future PWWF sewer system model. The peak flow modelled under these conditions was 98.8 L/s at the influent lift station, with a total daily volume of 3,815 $m^3$. Please refer to TRUE 2019b for further details relating to model development and calibration.

Based on the updated future PWWF model, during future wet weather conditions, there are five sections of gravity pipe operating at or above 2/3 of full flow, six additional sections above 1/2 of full flow, and no flooding or surcharging of manholes. The following table summarizes the pipe sections above 1/2 and 2/3 of full flow.

**TABLE-11: FUTURE PWWF WITH 25% INFILLING - GRAVITY PIPE ABOVE 50% CAPACITY**

| ID | Inlet Node | Outlet Node | Diam (mm) | Slope (%) | Length (m) | Max/Full Flow Ratio | Max Depth/ Diameter Ratio |
|---|---|---|---|---|---|---|---|
| C2 | D-178 | D-177 | 200 | 0.24 | 8.5 | 1.42 | 0.68 |
| C12 | D-152 | D-101 | 250 | 0.62 | 17.6 | 0.69 | 0.63 |
| C376 | D-153 | D-152 | 250 | 0.62 | 48.2 | 0.67 | 0.61 |
| C377 | D-155 | D-154 | 250 | 0.62 | 11.5 | 0.67 | 0.6 |
| C81 | D-154 | D-153 | 250 | 0.62 | 76.2 | 0.67 | 0.6 |
| C712 | T-696 | T-697 | 300 | 0.06 | 45.1 | 0.65 | 0.41 |
| C393 | D-312 | D-450 | 300 | 0.14 | 120.0 | 0.62 | 0.56 |
| C441 | D-195 | D-192 | 200 | 1.03 | 42.5 | 0.59 | 0.53 |
| C453 | D-242 | D-449 | 200 | 0.17 | 122.5 | 0.56 | 0.53 |
| C391 | D-450 | D-311 | 300 | 0.19 | 80.2 | 0.54 | 0.52 |
| C138 | D-449 | D-195 | 200 | 0.22 | 125.2 | 0.51 | 0.54 |

Please refer to the attached Figure S-1 for a plan view of the sections of gravity sewer pipe above 50% capacity during future PWWF conditions.

Also based on the updated future PWWF model, the table below shows the peak inflows to each lift station under the referenced maximum flow conditions (future wet weather), the operating capacity of each station based on referenced lift station capacity, and the surplus or deficit of capacity at peak flow.

**TABLE-12: FUTURE PWWF WITH 25% INFILLING – SEWER SYSTEM PUMP STATION CAPACITY**

| PUMPING STATION | DESIGN CAPACITY (L/S) | MODELLED PEAK INFLOW (L/S) | SURPLUS (+) / DEFICIT (-) IN CAPACITY (L/S) |
|---|---|---|---|
| McPherson Lift Station | 18.5 | 10.2 | +8.3 |
| Rockcliffe Lift Station | 5.8 | 7.1 | -1.3 |
| Rotary Beach Lift Station | 14.9 | 19.6 | -4.7 |
| Sawmill Road Lift Station | 25.5 | 1.1 | +24.4 |
| Scott Road Lift Station | 15 | 2.4 | +12.6 |
| Influent Lift Station | 70 | 98.8 | -28.8 |

Further to the above two tables:

- The gravity sewer piping network performs well under future peak wet weather conditions. While five sections of gravity sewer piping are shown to operate above 2/3 of full flow capacity, there are no instances of flooded or surcharged manholes.
- The Rockcliffe LS and Rotary Beach LS each have a deficit in capacity during future peak wet weather conditions and may not be capable of keeping up with these peak flow events with only one pump running.
- The Influent LS has a deficit in capacity from peak flow and may not be capable of keeping up with the additional peaks in flow caused by the other lift stations.
- The headworks system has a capacity of about 145 L/s. As such, there should be no capacity concerns relating to the headworks system under future peak wet weather conditions.

## 5.0 ASSESSMENT SUMMARY

The goal of this assessment has been to determine whether the Town should be planning to expand the capacity of their water and sewer infrastructure as either a short-term or long-term goal arising from potentially significant population growth related to Provincial Bills 44, 46, and 47.

The following capacity related infrastructure upgrading recommendations have been considered in relation to the preferred growth scenario of 25% infilling of currently zoned single-family parcels with four dwelling units. This scenario considers infilling taking place at a steady pace over a 20-year period and also considers a consistent 1.2% population growth rate associated with all other parcels currently serviced by the Town's domestic water and sewerage systems.

It should also be noted that all infrastructure upgrades that may be necessary to address projected capacity constraints would be eligible as Development Cost Charge (DCC) driven projects. The Town should therefore plan to update their DCC bylaw based on the results of this assessment.

**Domestic Water System**:

- A review of the feasibility of constructing an additional groundwater source is likely warranted on the basis of observed flows from the municipal water source and the 'N-1' pumping scenario. It should be noted that the The BC Environmental Assessment Act applies to large groundwater extractions. Under the Reviewable Projects Regulation, groundwater extraction projects with a design capacity > 75 L/s require an environmental assessment certificate or formal exemption from the environmental assessment process. The Town should engage a qualified hydrogeologist to conduct a test well program to plan for future expansion of the Town's groundwater supply sources. The results of this test well program would then be utilized as the basis of a pre-design report for expansion of the Town's groundwater supply capacity.
- A review of the capacity of the Miller Road and Buchanan domestic well sources should be conducted. These existing groundwater production well sources are currently pumping well below their rated capacity based on hydrogeological assessments conducted during well development.
- The remaining findings of TRUE 2019a continue to be applicable. Please refer to the attached Figure M-1 for an overview of the recommended projects from this previously issued report. Note that a number of these recommended projects relate to rehabilitation of domestic water system assets as opposed to upgrading due to identified capacity constraints.

**Community Sewerage System**:

- Two local lift stations and the influent lift station may be under capacity to convey future peak wet weather flows. TRUE 2019b notes that the capacity of the Rockcliffe LS and Rotary Beach LS should be assessed to confirm that replacement pumps are adequate for the conveyance of future peak wet weather flows. A similar assessment should be conducted for the influent lift station. As future development proceeds, the Town should also plan to monitor the performance of each of these pumping stations to determine when pump improvements will be necessary. Forcemain and gravity pipe capacities do not limit lift station capacities based on the flows used in this analysis.
- The wastewater treatment lagoon system should have adequate capacity to the 20-year horizon under fully desludged conditions. Although, an increase to the permitted discharge rate will likely be required. It should be noted that any requests made to the Ministry of Environment related to permit amendments of greater than 10% difference in the discharge limit typically require a new registration. MOE's registration process is time consuming and may be best undertaken in conjunction with a permit application for new / proposed treatment works. Moving from a permit to a registration will likely require a detailed wastewater treatment performance / upgrading study and will likely be a multi-year process.
- The effluent storage available capacity may not be adequate to the 20-year horizon. Although, the Town may make use of the rapid infiltration basin to reduce the water level

within these basins. A permit amendment would be required to utilize this strategy. Further consideration of permitted discharge thresholds would also be warranted as the Town's discharged treated effluent flows approach the permitted maximum of 2,200 m³/day.

- The remaining findings of TRUE 2019b continue to the applicable. Please refer to the attached Figure M-1 for an overview of the recommended projects from this previously issued report. Note that a number of these recommended projects relate to rehabilitation of sewer system assets as opposed to upgrading due to identified capacity constraints.

## 6.0 CLOSING

TRUE looks forward to receiving client feedback on this subject. If additional information or further discussion is required, please do not hesitate to contact the undersigned.

Regards,



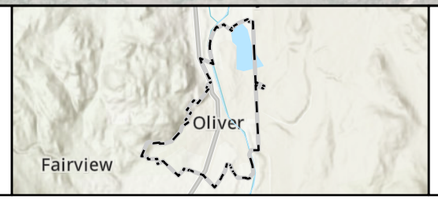

Sean Curry, P. Eng.

SAC/slf

Enclosures: Figure W-1 (Domestic Water Systems Overview), Figure S-1 (Model Results – Future Wet Weather Conditions), & Figure M-1 (2019 Utility Master Plans Water & Sewer Recommended Upgrades)

cc: Randy Houle, RPP, MCIP, Director of Development Services

Town of Oliver
CANADA'S WINE CAPITAL




# Domestic Water Systems Overview

- Wells
- Reservoirs
- Municipal Boundary (Town of Oliver)
- First Nation Reserve Boundary
- Cadastral

Diameter (mm)
- <150
- 150
- 200
- 250
- 300
- 400

- System Town
- System 1 & 2
- System 4 & 5
- Black Sage

0 500 1,000 1,500 2,000 2,500 m

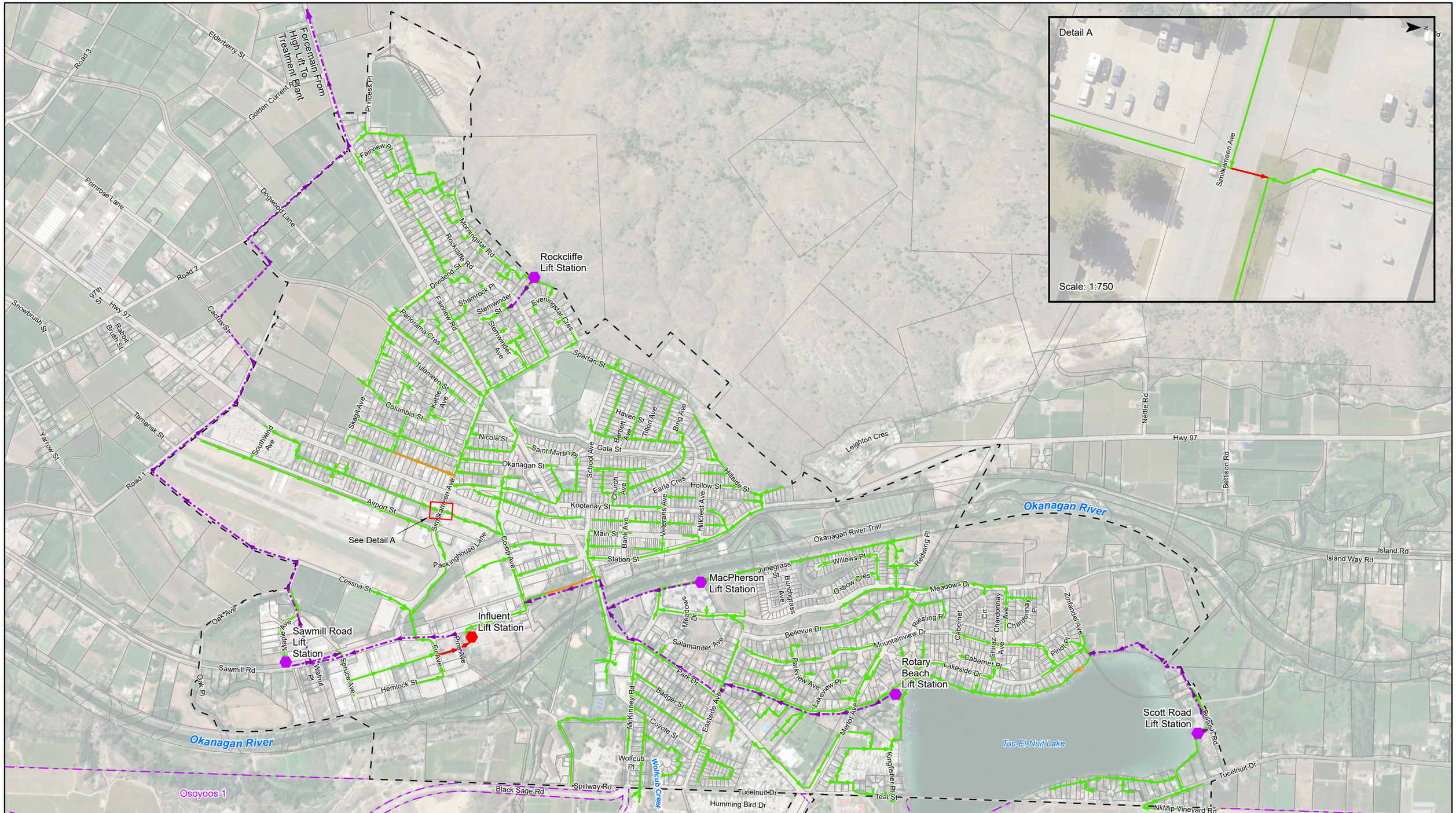
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| Revision #: | 0 | Issued for: | Final Report |
| Datum: | NAD 83 CSRS (Zone 11) | Drawn by: | RK |
| Vertical Datum: | CGVD2013 | Date: | 3/21/2024 |
| Projection: | Transverse Mercator | Project Ref No. | 306-2101 |

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Figure W-1

Sheet 1 of 1

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Town of Oliver
CANADA'S WINE CAPITAL

# Model Results- Future Wet Weather Conditions

- Influent Lift Station
- Lift Station
- Forcemains
- Cadastral
- First Nation Reserve Boundary
- Municipal Boundary (Town of Oliver)

Sanitary Mains
Max Flow / Full Flow
- < 0.50
- 0.50 - 0.66
- > 0.66

0 100 200 300 400 500 m

| | | | |
|---|---|---|---|
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Figure S-1
Sheet 1 of 1

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**Water System Project**
W1 - Okanagan River Crossing at Sawmill Road
W2 - Park Drive Looping
W3 - Main Street North Looping
W4 - Tuc-el-nuit Backup Power
W5 - Main Reservoir Feed
W6 - Secondary Reservoir Feed (Completed April 2024)
W7 - School Ave - Okanagan to Fairview (Completed April 2024)
W8 - Main Street - Bank to School
W9 - Fairview Bridge
W10 - McKinney Road - Park to Hospital
W11 - Lakeside - Merlot to Eastside
W12 - Fairview - Okanagan to Kootenay
W13 - Sawmill - Similkameen to Spruce
W14 - Similkameen - Main to Sawmill
*Refer to Town of Oliver 2019 Water Capital & Asset Management Plan, dated October 2019 for further details

**Sanitary System Projects**
S1 - Fairview to Sawmill Road
S2 - Main & Station Street (Hillside to Bank)
S3 - Similkameen Avenue (Tulameen to Airport)
S4 - Okanagan Street at Similkameen
S5 - Airport Street Alley (Skagit to Similkameen)
S6 - McKinney Road (Coyote to Park)
S7 - River Crossing at Fairview Road
S8 - Co-op Road (Main to Sawmill)
S9 - Fir Avenue to Influent Lift Station
*Refer to Town of Oliver 2018 Sanitary System Capital Plan, dated March 2019 for further details

Forcemain From High Lift To Treatment Plant
Rockcliffe Lift Station
Rockcliff Well
MacPherson Lift Station
Influent Lift Station
Sawmill Road Lift Station
Rotary Beach Lift Station
Tuc-El-Nuit #3 Well
Tuc-El-Nuit #2 Well
Scott Road Lift Station
Okanagan River
Tuc-El-Nuit Lake
Osoyoos 1
Wolfcub Creek
Hwy 97
Okanagan River Trail
Elderberry St
Golden Current Rd
Primrose Lane
Dogwood Lane
Road 3
Road 2
Road 1
Snowbrush St
Rabbit Brush St
Cactus St
Tamarisk St
Yarrow St
Princess Pl
Fairview Pl
Morningstar Rd
Rockcliffe Rd
Dividend St
Shamrock Pl
Stemwinder St
Stemwinder Ave
Eveningstar Cres
Fairview Rd
Panorama Cres
Spartan St
Tulameen St
Columbia St
Kettle Ave
Skagit Ave
Southwind Ave
Nicola St
Saint-Martin Pl
Okanagan St
Kootenay St
Cedar Ave
Similkameen Ave
Airport St
Packinghouse Lane
Cessna St
Oak Ave
Maple Ave
Sawmill Rd
Walnut Pl
Oak Pl
Spruce Ave
Hemlock St
Pine Ave
Fir Ave
Main St
Bank Ave
Church Ave
Jubilee Cres
Earle Cres
Hillcrest Ave
Hillside St
Hollow St
Station St
Willows Pl
Junegrass St
Birchgrass Ave
Oxbow Cres
Redwing Pl
Meadows Dr
Bellevue Dr
Salamander Ave
Mountainview Dr
Riesling Pl
Cabernet Ct
Cabernet Pl
Shiraz Ave
Chardonnay Ave
Chardonnay Pl
Zinfandel Ave
Pinot Pl
Lakeside Dr
Lakeview Pl
Park View Ave
Park Dr
Badger St
Coyote St
Eastside Ave
Wolfcub Pl
McKinney Rd
Spillway Rd
Black Sage Rd
Tucelnuit Dr
Humming Bird Dr
Teal St
Kingfisher Pl
Merlot Ave
Leighton Cres
Nettie Rd
Bettison Rd
Island Rd
Island Way Rd
Bluefish Rd
NkMip Vineyard Rd
School Ave
Haven St
Bartlett Ave
Tilton Ave
Bing Ave
Gala St

Town of Oliver
CANADA'S WINE CAPITAL

Oliver
Fairview

# 2019 Utility Master Plans Water & Sewer Recommended Upgrades

- Reservoirs
- Wells
- Influent Lift Station
- Lift Stations
- 2019 Recommended Water Distribution System Upgrades
- 2019 Recommended Sewer Collection System Upgrades
- Watermain
- Sanitary Gravitymain
- Sanitary Forcemain
- Cadastral
- First Nation Reserve Boundary
- Municipal Boundary (Town of Oliver)

0 100 200 300 400 500 m

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Figure M-1
Sheet 1 of 1

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