



WATER SHORTAGE RESPONSE PLAN

Town of Okotoks
April 8, 2024
Version 4.0 - Final

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1.0 Introduction

1.1 Background

Okotoks is a national leader in sustainable water usage and initiatives. The approved 2006 South Saskatchewan River Basin Water Management Plan placed a moratorium on the issuance of new water licences. With increased growth pressure in the Town of Okotoks (the Town), the Town has relied on water licence transfers to gain additional licence capacity for growth.

Historically the Town has always had a plan to manage water shortage events which has been formalized into this Water Shortage Response Plan (the “WSRP”). This plan is intended to provide guidance in the event of a water shortage, outline the Town’s water management strategy and support future license transfers.

In the last 10 years, the Town has managed water shortages five times (2015, 2017, 2021, 2022 and 2023); all events were during the summer months, when outdoor water use is at its highest.

Although the Town’s previous water shortages have only occurred during summer periods, there are a number of additional risks which may also result in the Plan being utilized outside of this period including but not limited to well failure, power failure, a transmission main break, the loss of a reservoir, extreme climate event, instream objectives being triggered or others. Additionally, there is always a policy risk that a downstream license user may call priority on upstream (junior) licences which may impact some of the licences within the Town’s portfolio.

The WSRP is expected to help mitigate the aforementioned risks while outlining a path forward for the Town and meeting legislated requirements.

1.2 Diversion Licences

At the time of writing, the Town has 24 Water Act approvals to divert water totaling approximately 4 million cubic meters as outlined in Chart 1 below. The Town’s portfolio includes a diverse variety of licences including a number of junior and senior licences and restricted licenses. These licences, with a number of operating conditions, provide for an instantaneous maximum diversion as well as a maximum annual diversion. The licences may also include further conservation measures such as: seasonality; and Instream Objectives/Water Conservation Objectives (IO/WCO), which prohibit diversion during low-flow periods. The licences operate under a “system of prior allocation” where more senior licences have the first right to the water. The number of interconnected diversion licences is both unique to the Town and complex to manage.

Figure 1: Existing License Portfolio Summary

License Identifier	License Number / AEP Approval ID	Point of Diversion	Priority No.	License Restrictions	Diversion Volume (m ³ /year)
58-12-31-03	34156	Aquifer	1958-12-31-03, 1958-12-31-04	Unrestricted	24,670
58-12-31-04		Aquifer			24,670
79-12-10-01	35105	Sheep River	1979-12-10-01, 1979-12-10-02, 1979-12-10-03, 1985-01-22-05, 1985-01-22-06	Unrestricted	790,909
79-12-10-02		Sheep River			
79-12-10-03		Sheep River			
85-01-22-03	35112	Sheep River	1985-01-22-03, 1985-01-22-07	Unrestricted	660,910
85-01-22-07		Sheep River			
52-12-31-02	35110	Sheep River	1952-12-31-02, 1985-01-22-04	Unrestricted	250,455
92-06-10-10	202472	Sheep River	1992-06-10-010	Unrestricted	62,908
	35104	Sheep River	1996-11-29-01	IO Restricted	91,313
92-06-10-11	72884	Sheep River	1992-06-10-011	Unrestricted	11,101
	74820	Sheep River	1999-03-22-001	IO Restricted	444,056
PW-9	191251	Sheep River	2002-08-29-001	IO Restricted	454,372
CanEra	268353	Sheep River	1980-12-04-001	Unrestricted	216,476
Irving	268349	Sheep River	1944-09-15-001	Seasonal	28,864
MacMillan	283404	Sheep River	1977-03-24-005	Seasonal	36,634
Willumsen	327785	Sheep River	1944-09-15-001	Seasonal	45,516
Lauder	342912	Sheep River	1977-03-24-004	Seasonal	85,037
Wolosuk	336563	Sheep River	1983-05-31-014	IO Restricted/Seasonal	15,231
Sirocco	348644	Sheep River	1964-03-20-002	WCO Restricted/Seasonal	99,912
River Bend Hutterian	353780	Sheep River	1982-03-17-015	IO Restricted/Seasonal	9,770
Hutterian Brethren of Bow City	368797	Sheep River	2005-10-02-001	WCO Restricted/Seasonal	36,908
Gertzen	379986	Sheep River	1985-03-21-008	IO Restricted	4,341
Gertzen	379987	Sheep River	1983-06-07-020	IO Restricted	14,476
Ellis Ranching	390822	Sheep River	1984-08-08-010	IO Restricted	22,536
Burnswest	391311	Sheep River	1980-03-03-002, 1984-03-22-002	IO Restricted	88,810
		Sheep River			9,868
Bow River Irrigation District	385019	Sheep River	1992-02-05-010	IO Restricted	244,229
Gertzen	471099	Bow River	1983-06-07-020	WCO Restricted	190,659
Total					3,964,630

The Town is licensed to withdraw water from three locations including the Sheep River, an Aquifer and the Bow River. The majority of the Town's licensing is off of the Sheep River and the Town accesses this licensing through a network of 13 groundwater wells hydraulically connected to the Sheep River. The Town also has licensing for water drawn

from an aquifer which is connected to 2 raw water wells which the Town uses for non-potable purposes.

The Town has one license to withdraw water from the Bow River which it intends to access through the future Foothills-Okotoks Regional Water Partnership (FORWP) sub regional system. FORWP consists of an intake off of the Bow River at the confluence of the Highwood River, 3 months of Raw Water Storage, pump stations and pipelines to provide additional raw water to treatment plants in Aldersyde and Okotoks. This system is intended to provide additional supplemental water to support continued growth within Okotoks and the Sub-region. Preliminary design for the project has been completed and the project is moving through the approvals and procurement stages. Applications to transfer an additional two licenses to the Town to withdraw from the Bow River are currently being reviewed by Alberta Environment and Protected Areas.

As shown in the previous chart, the licences based on their restrictions, excluding their priority, can be grouped into five basic categories:

- **Non-Restricted:** these are the least restrictive licences, and they can be used at any time of the year regardless of flow regime;
- **Seasonal:** these licences can only be used between May 1 and September 30 regardless of flow regime;
- **Instream Objectives:** these licences cannot be used during low flow periods;
- **Water Conservation Objectives:** these licences cannot be used during low-flow periods; and
- **Seasonal with Instream Objectives or Water Conservation Objectives:** these are the most restrictive licences; they can only be used between May 1 and September 30, and cannot be used during low-flow periods.

The amount of water licenced in each category is summarized below. In general, less water can be withdrawn daily during periods of higher restriction. Historically Okotoks' primary mechanism to manage licence restriction risks has been to build a balanced portfolio of water licences that includes unrestricted licences that are able to be used in times of seasonal or IO restriction. Moving forward, additional raw water storage provided by FORWP will help the Town better manage periods of license restriction.

Figure 2: Diversion Summary of Sheep Licenses

Category	Max Daily Withdrawal (ML/day)	
	Summer	Winter
Unrestricted	24.6	15.3
IO Restricted	16.5	9.2
WCO Restricted	9.0	7.3
Maximum Withdrawal	50.1	31.9

Figure 3 below shows the annual amount of water diverted and returned to the Sheep River from 2012 to 2022 inclusive. Withdrawals are consistently below licensed capacity in 2022 approximately 80% of the Town's available licensed capacity was withdrawn.

Figure 3: Annual Diversion and Return Flows

Year	Total Diversion (m ³)	WWTP Effluent (m ³)	Percent Return Flow
2010	2,551,147	2,199,740	86.2%
2011	2,787,671	1,984,599	71.2%
2012	2,975,633	2,137,271	71.8%
2013	2,649,630	2,391,918	90.3%
2014	2,913,761	2,588,127	88.8%
2015	3,018,328	2,594,067	85.9%
2016	3,009,091	2,554,033	84.9%
2017	2,988,044	2,392,026	80.1%
2018	3,120,603	2,350,835	75.3%
2019	2,731,917	2,275,854	83.3%
2020	2,715,315	2,456,069	90.5%
2021	2,832,081	2,322,705	82.0%
2022	3,022,849	2,365,864	78.3%
2023	3,206,128	2,365,295	73.8%
		Average Return Flow	82%

1.3 Operations – Supply and Demand

Generally, the Town's production of water, minus process and system losses, closely matches the Town's consumption. The Town's reservoirs provide some equalization for days when demand exceed production. The Town's reservoirs have a limited supply of water and can only stave off short periods of high demand (two to three days) before a response is required. The Town has three reservoirs with a combined capacity of 20,500m³. In normal operation, the reservoirs are maintained near full at 90+% capacity. For fire protection, the reservoirs must have a minimum of 2,400m³ water in the North and South sides of Town.

1.4 Water Conservation, Efficiency and Productivity

1.4.1 Implementation

In support of regional and community concerns related to water availability and sustainability, the Town completed a Water Conservation, Efficiency and Productivity Plan (CEPP) in 2014. The plan had many measures that were either already being performed by the Town, or that were implemented directly after the plan.

Subsequent to the 2014 CEPP, and to build on its success, the Town completed a more diverse Environmental Master Plan (EMP) in 2018 that reflects our continued commitment to environmental excellence. The Town also completed a Climate Action Plan (CAP) in 2021 outlining a strategy to ensure Okotoks' resilience as climate change continues to impact water resources.

The most relevant measures and goals from the CEPP, EMP, and CAP to this plan are as follows:

i) *Education and Outreach*

The Town has a dedicated staff member and four summer non-permanent employees who perform various educational public outreach activities as well as water and irrigation assessments. The results can be observed by the downtrend in water use in a community that is not only very aware of water use and sustainability but takes pride in the Town's accomplishments and goals. Okotoks also implemented a new online water meter portal through Sensus Analytics in 2018 where residents can monitor their water use in real-time.

ii) *Conservation-Oriented Utility Rate Structure*

The Town's universal metering program has been in place for 30 years with the entire Town being 100% metered. This metering provides strong data for implementation of conservation measures and effective utility rates. All meters were successfully replaced in 2017 with more accurate meters linked to a water meter portal (advanced metering infrastructure or "AMI"). With full metering, a rate structure that supports conservation has been supported and enforced. As of January 1, 2020, the Town implemented its most aggressive conservation-oriented rate structure. Rates shown below are for residential customers and are in effect as of January 1, 2024:



SERVICE DESCRIPTION	2024 FEE	UNIT OF MEASURE	GST
UTILITIES			
Utility bills are due upon receipt and the following shall be applied to all accounts: (Bylaw 13-24)			
• Penalty rate on Utilities Receivable in arrears	4.0%	Bi-monthly	E
• Arrears Notice (60 days after Billing Notice date)	35.00	Each	E
• Arrears transferred to taxes (80 days after Billing Notice date)	50.00	Each	E
• Paper Billing Charge (if applicable)	2.00	Billing period	E
Water Services:			
Base Rate Residential, Irrigation, Commercial, Industrial, Institutional Meter Size 20mm (5/8")	23.40	Billing period	E
Base Rate Residential, Irrigation, Commercial, Industrial, Institutional Meter Size 20mm (3/4")	23.40	Billing period	
Base Rate Residential, Irrigation, Commercial, Industrial, Institutional Meter Size 25mm (1")	38.90	Billing period	
Base Rate Residential, Irrigation, Commercial, Industrial, Institutional Meter Size 40mm (1.5")	77.85	Billing period	
Base Rate Residential, Irrigation, Commercial, Industrial, Institutional Meter Size 50mm (2")	124.50	Billing period	
Base Rate Residential, Irrigation, Commercial, Industrial, Institutional Meter Size 75mm (3")	233.50	Billing period	
Base Rate Residential, Irrigation, Commercial, Industrial, Institutional Meter Size 100mm (4")	389.20	Billing period	
Base Rate Residential, Irrigation, Commercial, Industrial, Institutional Meter Size 150mm (6")	778.35	Billing period	
Residential:			
Consumption for first 23 Cubic metres	1.70	Cubic metre	E (Bylaw 13-24)
Consumption 24 - 46 Cubic metres	2.10	Cubic metre	
Consumption > than 46 Cubic metres	3.50	Cubic metre	
Consumption charge for an individual unit without water meter or where water meter is not registering accurately.	120.00	Billing period	
Non-residential (Commercial, Industrial, Institutional premises): (Bylaw 13-24)			
Consumption Charge	1.90	Cubic metre	E
Consumption Irrigation Water	4.00	Cubic metre	

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iii) **Water Conservation Rebate Programs**

The Town's rebate program has evolved over the years to ensure continued effectiveness. Early in the program, rebates were focused on replacing old fixtures such as toilets, shower heads and other fixtures with water efficient fixtures. The rebate program currently focuses more on outdoor water use, offering rebates on drought tolerant landscaping, rain barrels, etc. The annual budget was increased in 2020 from \$40,000 to \$90,000 and again in 2023 to \$115,000. The \$115,000/year program approves residential and commercial rebates for xeriscaping, rain harvesting, mulch, compost, Water Sense irrigation controllers, watering timers, and rain sensors. Indoor rebates have been drastically reduced, due in part to the success of the rebate program and the fact that the market now almost exclusively sells highly efficient fixtures and appliances. The budget also covers the commercial Water Smart Grant program that provides funds for businesses upgrading to water conserving fixtures or landscaping.

iv) Since 2011 design/construction standards have required appropriate soil for landscaping and plants as well as high efficiency fixtures and appliances. Xeriscaping is mandated for commercial, industrial and institutional development with strong encouragement for residential.

- v) Outdoor irrigation is only permitted twice per week by law within certain time parameters; thus, avoiding the high evaporation times between 9 a.m. and 7 p.m. Irrigation is not permitted (since 2013) for new commercial, industrial and institutional development except for plant establishment.

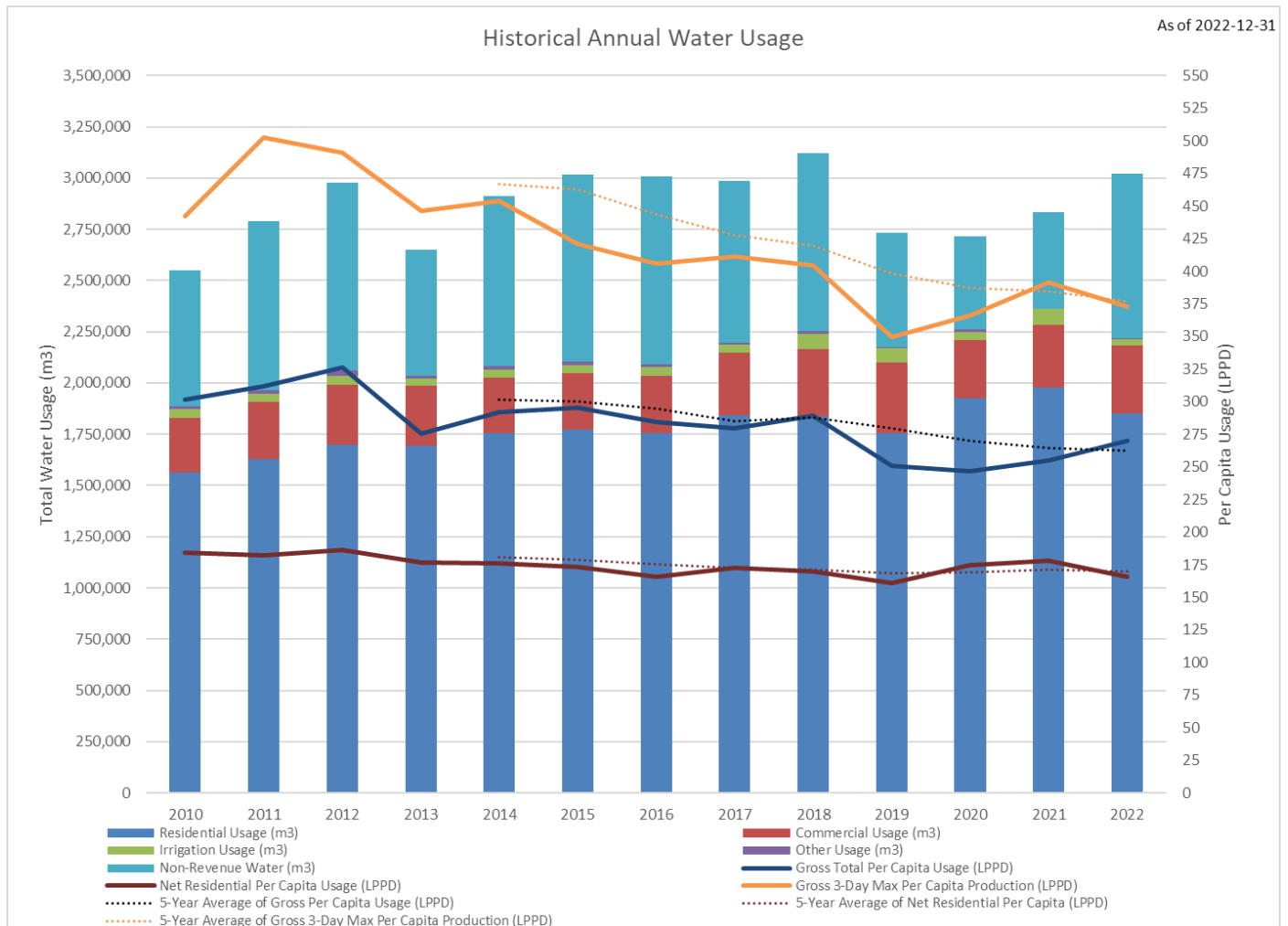
Historically to identify and enforce irrigation that occurs outside of the permitted window the irrigation had to be observed or reported. With the implementation of software, we are now also able to identify irrigation through water meter monitoring.

- vi) Water consumption monitoring and reporting to identify process improvements and leaks. 2019 flows indicate a decrease in non-revenue water from 28% to 18% related to meter repairs, leaks and a water treatment plant process improvement. In March 2023, an upgrade to the water treatment plant filtration process will further reduce process waste (i.e.: filter backwash optimization).
- vii) Storm water reuse and wastewater effluent reuse projects are being pursued with the AEP. The storm water reuse project in Lauden Park will be in production in the summer of 2024. A study evaluating potential applications for wastewater effluent reuse was finalized in Q1 2023. The Town will continue evaluate potential applications for effluent reuse, based on environmental and economic factors.

1.4.2 Measurements

Figure 4 indicates max day, gross, net and per capita water use trending within Okotoks. Generally, the Town's Gross max day and average per capita usage is trending downwards.

Figure 4: Historical Annual Water Usage



1.4.3 Goals

Goals have evolved over time as we have met or exceeded them. A summary of goals related to this WSRP are as follows:

- i) The community-wide gross per capita water goal of 275 lpcd was met and the Town has now implemented a goal to “achieve and maintain lowest water consumption rates in Canada”.
- ii) Achieve a 20% reduction in outdoor use of potable water (based on the summer daily peak) by 2030.
- iii) Achieve and maintain a potable water system leak rate of less than 5%.

- iv) Utilize other sources of water such as groundwater, stormwater and reclaimed effluent for 10% of non-potable uses, such as irrigation, by 2030. This goal depends upon the timing of Provincial regulatory support.
- v) Increase resilience of the system by creating a sub-regional water system with more than one source of water. FORWP is expected to assist in this goal.

2.0 Risk Overview

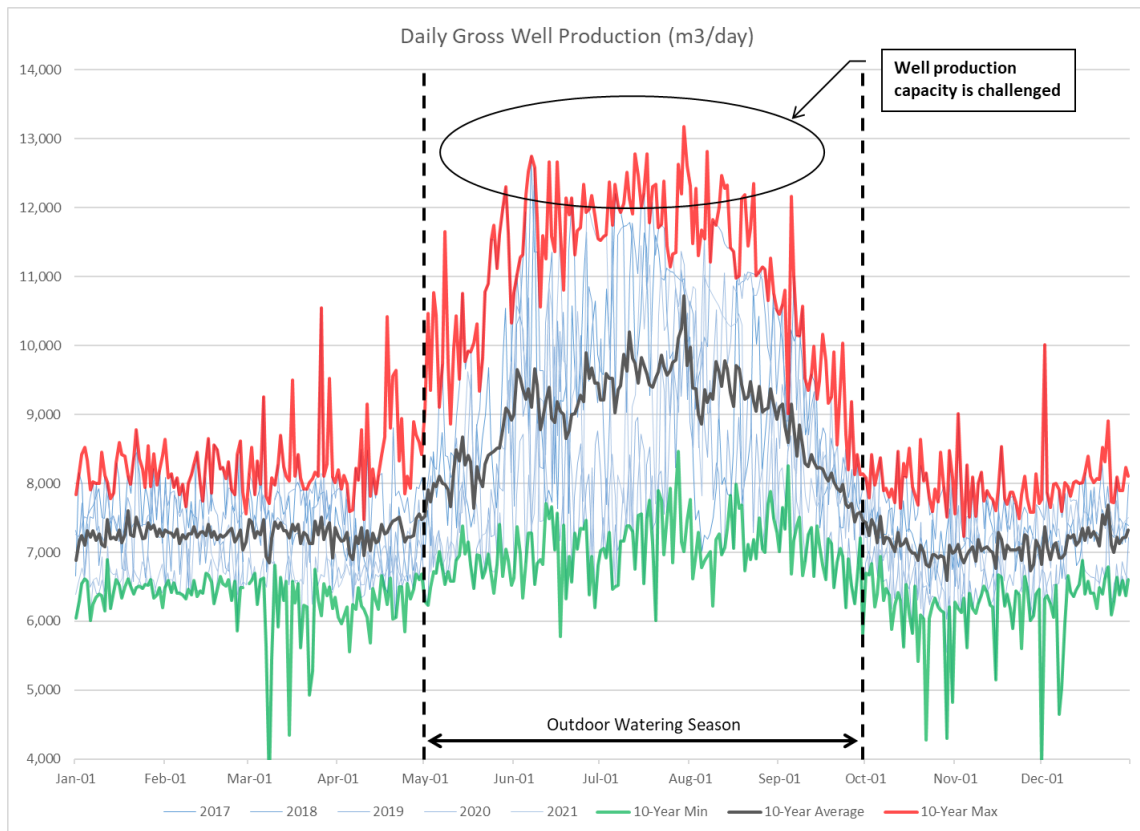
There are a number of risks that impact the Town's water supply as overviewed briefly below. These risks include risks to the Town's Supply, Demand and include climatic risks. Historically drought and flooding have been two major risks that the Town has attempted to mitigate. The summary below is not meant to be exhaustive, but an overview of some of the larger water supply risks that impact the Town.

2.1 Supply Risks

- i) Infrastructure
 - a. Raw Water Supply

Although the Town's Water Treatment Plant's capacity peak day capacity is rated at 21.7ML/day the Town's current wells struggle to produce more than 12.5ML/day. These production capacity constraints are outlined in figure 5 below. When river flows are low GWUDI aquifer recharge is reduced and the wells need to be throttled limit pump cavitation.

Figure 5: 2017-2021 Daily Production with 10 year maximum and minimums.



b. Power Failure

Most of the well field has backup power. A project in 2023 was completed to provide emergency backup power to the West Well Field. Currently, only Wells 5 and 13 do not have backup power. This represents approximately 10% of the Town's production capacity.

c. Major Equipment Failure

Failure of major equipment such as the WTP, wells or other.

ii) Low River Volumetric Flows (Aquatic Health)

There is a concern that increased withdrawals from licensees may result in lower flows river flows which could in turn impact the aquatic health of the watershed. A core principle behind the establishment of instream objectives and water conservation objectives is to ensure that vital water flows are maintained to protect healthy aquatic ecosystems.

a. License Restrictions

As outlined in Figure 2 above the Town has a diverse license allocation that allows for up to 50 ML/day of restricted summer withdrawal and 25 ML/day of unrestricted withdrawal during summer months. From a max pump rate

perspective these rates exceed the Towns current ability to withdrawal water from our existing wells.

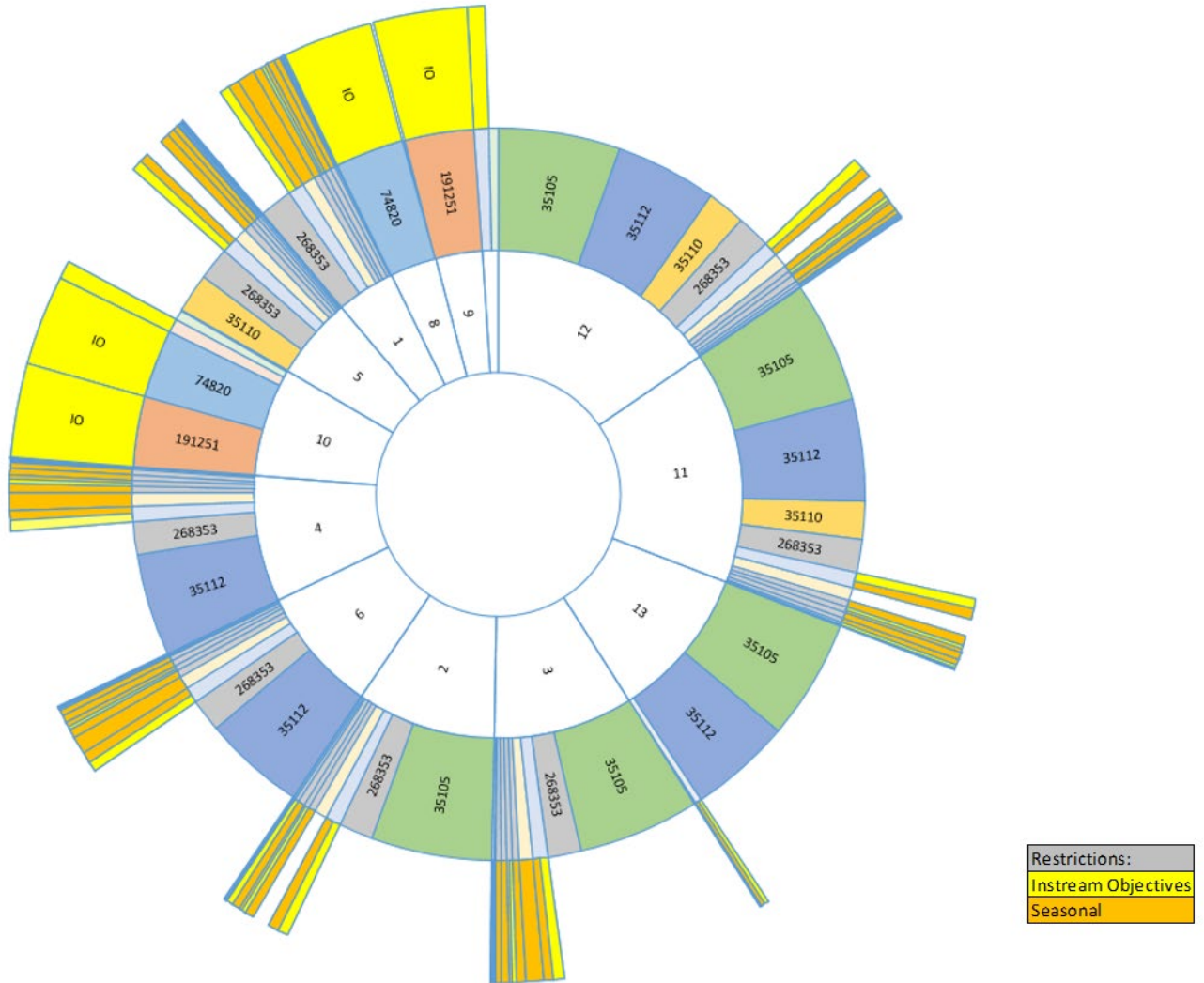
The Town has been utilizing the licences non-concurrently, meaning we maximise instantaneous licence flows on higher restricted licences when the restrictions permit so that the less restricted licences can be used when more restrictions apply. In 2018, AEP indicated that “this is not consistent with AEP’s principle of concurrent use of licences and defeats the purpose of IO restrictions”. The Town is attempting to utilize their suite of licences as efficiently and innovatively as possible, by adhering to the conditions, restrictions and the Water Act and was previously unaware of the AEP’s position on non-concurrent use.

iii) License Complexity

The Town’s portfolio includes a diverse variety of licences including a number of junior and senior licences, licences with seasonal restrictions, and licences with IO/WCO. Generally, there is a many-to-one and one-to-many relationship between the wells and licenses and non-standardization of additional conditions. The number of interconnected diversion licences is both unique to the Town and complex to manage.

The following chart was prepared to illustrate the interconnectivity and complexity of the licences. The charts inside ring shows the Town’s production wells, the middle ring shows the associated licences (licences that are shared with other wells are shown in the same color), and the outside ring shows any restrictions associated with the licences (instream objectives and/or seasonality). The wedges are sized based on the associated annual licenced diversion and do not show additional conditions on the licenses.

Figure 6: 2020 Licence Portfolio by Well with Restrictions



- iv) River Water Quality
- v) Upstream contamination risk or river quality risks.

2.1 Demand Risks

- i) Irrigation and Outdoor Watering
Higher temperatures and outdoor watering result in higher consumption in summer months. Generally Maximum day demands increase by up to 50% of average day demands.
- ii) Leakage and Distribution System Breaks
- iii) Growth and Development Pressure

2.2 Climate and Extreme Weather Risks

- i) It is anticipated that with increased temperatures due to climate change the mountain ice pack will melt earlier resulting in higher and earlier flows and lower late summer river flows. This will increase the risks of both flooding and drought as outlined in Figure 7 below.

Figure 7: WaterSmart graphical representation of anticipated climate changes to river flows from CMRB regional water supply study.

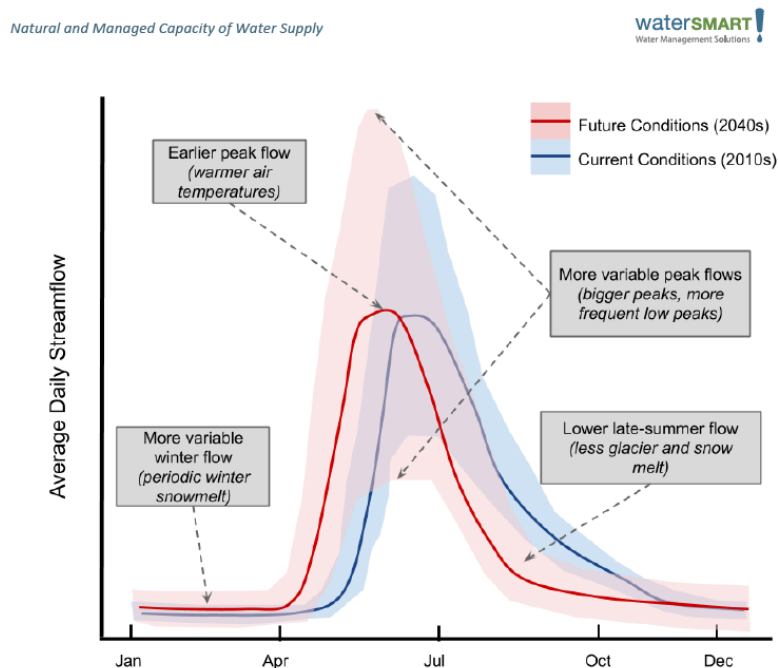


Figure 10. Conceptual diagram illustrating the changes to average daily naturalized streamflow expected to occur between now and the 2040s for a typical mountainous, snowmelt-dominated sub-basin in the Bow River watershed. The solid lines represent an "average" flow, while shaded areas correspond to an expected range of variability. The graph is not based on real data.

3.0 Risk Mitigation and Go Forward Strategy

This section will overview some of the strategies and plans that were developed to help mitigate the aforementioned risks.

3.1 Supply

FORWP is expected to significantly reduce all supply risks. This supplemental supply is anticipated to build redundancy and increase supply to a much larger managed river.

The Town does not currently have any raw water storage. Raw water storage is typically a significant tool when considering mitigation of long-term water shortage. FORWP will include 3 months of storage for all Bow River licenses and access to an alternate water source.

i) Infrastructure

a. Raw water supply

The Town is in the process of constructing additional wells to increase production capacity. This will allow for more effective interim and long-term utilization of the Town's Sheep River licenses. The Town will also be likely to continue to develop withdrawal solutions and optimization of existing infrastructure to help with this objective into the future.

b. Power Failure

The Town has recently approved installation of a transfer and quick connect option for a generator for the west well field. The objective of this installation is to allow for a generator to be rented and connected within 12 hours of a major power failure.

c. Major equipment failure

Generally, all new significant equipment is designed to allow for a single jeopardy failure in accordance with best design standards and practices. Although this approach significantly mitigates a variety of risks it does not mitigate all risks.

ii) Low River Volumetric Flows (Aquatic Health)

As outlined in Figure 3, the Town has historically returned 82% of withdrawn water back to the Sheep River through treated effluent. Generally, return flows have been lower in the summer periods due to outdoor watering and higher in the winter months. Many of the licenses that have been transferred to the Town have been more consumptive in nature (i.e. Irrigation) and it is expected that the additional return flows from these transfers have provided a volumetric benefit to the watershed.

Over time as more water is withdrawn downstream from the confluence of the Bow and Highwood Rivers and returned at Okotoks' Wastewater Treatment Plant it is expected that Okotoks will become a net volumetric contributor to Sheep River flows. In other words, future flows are expected to be higher downstream of Okotoks than upstream providing a net volumetric aquatic downstream benefit to the Sheep and Highwood Rivers. Furthermore, the new FORWP diversion point is downstream of Okotoks's discharge return point meaning that the rivers will substantially benefit with return flows from all license transfers. These two factors should help alleviate all regulatory volumetric withdrawal concerns.

a. License Restrictions

From a practical perspective as stated above it is expected that over time Okotoks will become a volumetric contributor to Sheep River flows. It is expected that over time the addition of raw water storage and additional Bow River licenses will allow for improved consistency with AEP's principal of concurrent usage. It is understood that IO/WCO restrictions on the Sheep and Bow tend to occur at different times of the year, allowing the Town to optimise water extraction from the river not under IO/WCO conditions and thereby further reduce the stress on both rivers.

iii) License Complexity

The Town would like to work with Alberta Environment to simplify operational management of our license portfolio. In simple terms the Town would like to be able to use any license from any well within the portfolio and would like to simplify the regulatory process of adding or modifying future wells.

iv) River Water Quality

The current water treatment plant has an Actiflo (Sedimentation, Coagulation, Clarification) Unit at the front end of the process train. Although the Actiflo process significantly help mitigate upstream turbidity concerns the Town's future primary mechanism to mitigate other contamination risks will be raw water storage and supply redundancy. A supplementary source will permit withdrawal from whichever source is not contaminated.

3.2 Demand

i) Water Conservation Measures

During short-term (one day) and long-term (greater than one day) events where demands exceed the Town's supply, the Town implements conservation measures on water use based on "The Water Bylaw". Short-term events can be system breaks, well failures, or maintenance where conservation measures are put in place as a cautionary measure or out of necessity. Long-term events can include IO/WCO conservation measures, summer peak demands and major construction where implementation of water conservation measures are for a longer period than one day. Both short- and long-term conservation measures can range from outdoor water use conservation measures to bans on certain water uses and users depending on the severity of the situation. Historically, water conservation measures in the Town have impacted water use within 24 hours and reduced water demands by 35 to 50% based on the 2017 data. In August 2022, the Town implemented Stage 3 Water Conservation measures (reduction to one watering day per week) with a resulting water demand reduction of approximately 20%. By activating Stage 3, the Town was able to avoid a complete water ban.

- ii) **Potable Water Storage**
Historically, for days with a demand greater than supply, the difference has been supplemented from water stored in the Town's reservoirs. As mentioned in **Section 1** the Town's reservoirs have limited water and can only stave off periods of high demand for a short time (two to three days) before a response is required. The Town has three reservoirs with a combined available capacity of 19,595m³. In normal operation, the reservoirs are maintained near full at 90+% capacity. For fire protection, the reservoirs must have a combined minimum of 2,400m³ water.
- iii) **Water Allocation System**
Since 2011 the Town has managed a water allocation system to limit subdivision and development approvals and growth pressures to remain within the Town's License Capacity. Further details on the Town's water allocation system including policy, maps and availability is publicly available on the Town's website here: <https://www.okotoks.ca/your-services/building-services/engineering/water-allocation-system>

3.3 Alternative Water Sources for non-potable uses

- i) **Effluent Reuse**
In 2023 Okotoks completed an effluent reuse study. The Town anticipates waiting until at least the 2026 Wastewater Treatment Plant approval renewal to consider pursuing effluent reuse.
- ii) **Groundwater / Nexen**
The Town is currently investigating groundwater as an alternative water source, especially related to demands that only require non-potable water. As this source is utilized it would reduce the demand on the Sheep River licences / existing wells and provide flexibility during seasonal peak demands and IO/WCO restrictions. Currently the Town already utilizes the "Nexen" groundwater well for this purpose, providing bulk non-potable water for industry, construction and landscaping. Where cost effective, the Town would investigate individual wells for irrigation of large recreational facilities such as baseball fields, golf courses and larger landscaped areas. During water shortages this would enable a larger dependence on well water for necessary irrigation and other non-potable uses that are essential.
- iii) **Stormwater Reuse**
The Town has several stormwater ponds that would enable stormwater reuse for non-potable uses such as irrigation and industrial uses. The newest AEP Stormwater Use Regulation Amendment allows for limited stormwater usage under specified conditions.

3.4 Proactive System Operation

There are several activities the Town proactively performs to improve operation of the water system that also supports mitigating water shortages.

Short-term (one day) anomalous high-water demands are generally caused by system breaks or operational/maintenance actions. These can occur any time of year; however, planned repairs or shortages are scheduled during low demands and outside of typical IO/WCO restrictions. To be even more proactive managing these occurrences, the Town is further developing an asset management plan which will schedule condition inspection, maintenance and replacements to significantly reduce unscheduled water losses such as breaks. This will avoid water losses and peak demands as the system works to replace the lost water. This is supported by a greater focus on preventative maintenance since operation of the water system was taken over by the Town in November 2019.

Since 2019, the Town has aggressively pursued leaks in the system with a leak detection and repair program that has significantly reduced our non-revenue water. Further to this, the Town is also actively pursuing other system improvements including Water Treatment Plant backwash optimization and District Metering.

Conservation, as discussed in **Section 1**, is also a key pillar of reducing water use overall and reducing peak demands. The Town is committed to continuing the existing initiatives and is always reviewing effectiveness and modifying the program as required. The recently enacted tiered water rate is one example of an effective tool in reducing water use.

4.0 Water Shortage Response / Implementation

The following section provides a general administrative overview for monitoring reservoir levels, projecting future water availability, and reviewing river flows to inform decision-making regarding the implementation of trigger thresholds and conservation measures. It is important to note that this overview may not cover all possible risks and scenarios but aims to provide guidance for effective decision-making in managing water resources during periods of shortage or emergency.

4.1 Water Shortage Triggers

Historically, the Town has used reservoirs' water levels as indicators to determine limits on water extractions and whether or not water conservation measures were necessary. When demand surpasses production capacity, reservoir levels begin to decline. Production can be impacted by a variety of risk factors as overviewed in section 3.1, such as infrastructure issues, low river flows and license restrictions.

During periods of sustained over-demand, the Town has implemented water conservation measures. Depending on the severity of the situation, either partial measures (i.e. outdoor water use reduced to one day per week) or full conservation measures prohibiting outdoor watering have been implemented. Traditionally, full outdoor watering conservation measures have been issued/considered when reservoir levels were approximately half full. This part of the WSRP has been in place since 2008 and enforced through Bylaw 23-21 called "The Water Bylaw" as amended from time to time.

In formalizing the Town's water shortage response, conservation stages were developed based on multiple factors including the typical operational capacity of reservoirs (near full), past experiences with water bans, minimum reservoir storage requirements, and environmental considerations such as river flows. Additionally, the Town reviewed water shortage response plans from other municipalities to ensure a balanced approach that meets the community's needs. As a result, five stages of water conservation were established.

Triggers of these stages will be generally implemented according to the following process steps.

1. Monitoring and Projection

Current Reservoir Level Monitoring:

Reservoir levels are currently monitored in real-time. All reservoirs have remote monitoring, control and alarming capability that connects to on call water operators. In order to effectively implement this plan, daily reports are automatically generated at 6 AM that tabulate current and 3-day rolling averages of reservoir volumes. These daily reports are emailed to internal water services team members. A sample report is shown in figure 8 below:

Figure 8: Sample Hach WIMS daily reservoir volume report

Reservoir Volumes Available

3-Day Rolling Average									
		South Reservoir		Zone 2		Zone 3/4		Average Volume (m3)	Average Reservoir %
Start Date	Current Date	Volume (m3)	Percent	Volume (m3)	Percent	Volume (m3)	Percent		
03/19/24	03/21/24	5,984	93.6	6,735	94.7	6,083	96.0	18,802	94.8

Current @ 6am									
		South Reservoir		Zone 2		Zone 3/4		Volume Available (m3)	Volume Available %
	Current Date	Volume (m3)	Percent	Volume (m3)	Percent	Volume (m3)	Percent		
	3/21/24	5,997	93.8	7,071	99.5	6,106	97.0	19,174	96.8

Projected Reservoir Levels:

Stability of reservoir volumes is an important consideration. Reservoir volumes are expected to fluctuate due to the following factors:

- Daily consumption patterns. Consumption patterns follow a typical diurnal pattern with demand peaks in the morning and evening.
- Work schedules. A large portion of the community commutes to Calgary for work. This resident movement not only contributes to the daily diurnal pattern but results in higher consumption on weekends. Sunday mornings currently have the highest demand.
- Outdoor watering conservation schedule. The new conservation Stage 1 outdoor watering schedule allows for morning or evening watering on Mondays, Tuesdays, Thursdays and Fridays.
- Temperature. Water usage increases with temperature. Under the prior Stage 1 conservation schedule for every degree above 20°C (maximum day temperature), we observe an average daily increase of ~300m³/°C/day (over base usage)
- Production capacity is limited as a result of hydro geotechnical factors and influenced by river levels as outlined below.

Based upon historical data, weather forecasts, experience, production capacity and the consumption patterns outlined above a reservoir level forecast can be developed to assist decision making.

River Flow Monitoring:

In Alberta, Instream Objectives (IOs) and Water Conservation Objectives (WCOs) serve to safeguard environmental and ecological health by regulating water use and ensuring sufficient flows of water in rivers and streams. IOs protect aquatic ecosystems and habitat, while WCOs manage water allocation and consumption sustainability. Both IOs and WCOs play a role in water management, ensuring the long-term viability of water resources for both human and ecological needs.

Current Sheep River flows and levels are available at <https://rivers.alberta.ca/>. Station 05BL012 is located in Okotoks downstream of the Laurie Boyd pedestrian crossing. The sum of the Black Diamond - Station 0BL014 and Three-point Creek – Station 0BL013 is used to evaluate license restrictions.

As a part of our license requirements river flows are monitored daily. Pumped volumes are assigned to available licenses depending on river restrictions and seasonality.

River Levels:

River levels are also available at <https://rivers.alberta.ca/> and/or can be physically observed against local landmarks and topography. Well production decreases primarily as a result of decreasing river levels. Based upon available snowpack and expected temperature, a short-term estimate of river levels and estimated production forecast can be developed.

Drought Monitoring:

Drought monitoring and forecasts provide insight into historical weather and expected future agricultural and watering demands on the watershed.

2. Comparison to Trigger Thresholds

The daily values within the daily report and/or current reservoir volumes are compared to reservoir trigger values outlines in figure 8 below. Single reservoir volumes for the Zone 2 reservoir are excluded as the Zone 3 reservoir is able to provide backup to Zone 2 through pressure reducing valves in the event of a shortage or emergency.

Figure 8: Reservoir Volume Triggers

Water Conservation Stage		Average of Reservoirs		Single Reservoir (excluding zone 2)
		3-day (6am)	1-Day (6 am)	
	Stage 1 Normal Operations	85-100%	75-100%	70-100%
	Stage 2 Increased community outreach	75-85%	65-75%	60-70%
	Stage 3 Limit outdoor watering to 1 day per week	65-75%	55-65%	50-60%

Stage 4 Full outdoor water ban	55-65%	45-55%	40-50%
Stage 5 Essential Use Only	< 55%	<45%	<40%

3. Evaluation of potential change to water conservation stage

Current and projected reservoir volumes should be compared to the predetermined trigger threshold values outlined above. In addition to considering trigger values, several other factors should be taken into account to inform decision-making and the implementation of appropriate conservation measures. These factors include, but are not limited to:

- a) Stability of Reservoir Levels: Assess whether demand is exceeding production capacity and anticipate changes in reservoir levels due to daily water demands, environmental factors (such as weather patterns or seasonal variations), and potential system risks (such as infrastructure limitations or operational challenges)
- b) Lead Time Consideration: Evaluate the lead time required for implementing conservation measures to ensure sufficient time for communication, public awareness campaigns, stakeholder engagement, and logistical preparation before entering a new stage of the response plan. This proactive approach helps minimize disruptions and facilitates a smooth transition to heightened conservation efforts.
- c) Risk to Public Health and Safety: Prioritize actions that mitigate risks to public health and safety associated with water scarcity, such as ensuring access to safe drinking water, adequate firefighting capabilities, and sanitation services. Consider vulnerable populations and communities that may be disproportionately impacted by water shortages.
- d) Environmental Risk: River levels in relation to instream and water conservation measures will be the primary tool to assess environmental risk. Implement measures to protect sensitive habitats, maintain ecological balance, and comply with regulatory requirements for instream flow objectives and water quality standards.
- e) Projected License Capacity: Consider the projected capacity of water licenses based on IO/WCO restrictions, which may limit water withdrawals for various purposes. Evaluate the potential implications for water users, industries, and agricultural operations reliant on licensed water allocations, and develop strategies to manage water scarcity while minimizing adverse impacts.

- f) Consideration of Other Watershed Users and Regional Collaboration: Recognition that the water is water is vital for life and that watershed boundaries extend beyond political and user group divisions.
- g) Professional Judgment, Experience, and Standards: Leverage the expertise and professional judgment of water services operators, engineers and other professionals to inform decision-making processes. Consider industry best practices, regulatory guidelines, and historical data to evaluate the effectiveness and feasibility of proposed conservation measures.

If any of the risks mentioned above appear impending, strong consideration should be given to transitioning to Water Conservation – Stage 2. The rationale for initiating enhanced community outreach at an early stage is to raise public awareness, foster increased conservation efforts, and ideally prevent the necessity of implementing more stringent conservation measures. These considerations should also guide decisions when downgrading a water conservation stage.

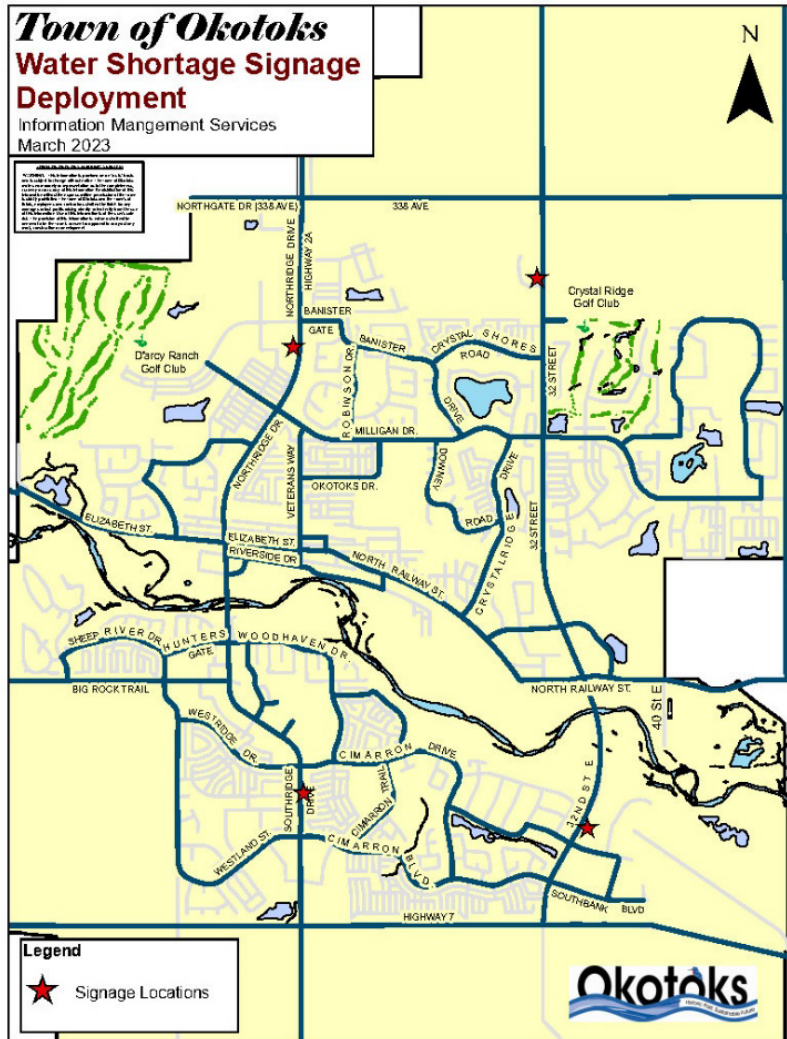
Prior to implementing Stage 5 conservation measures, consideration should be given to opening the Emergency Command Center (ECC).

4. Notification of a new Water Conservation Stage

If a change to water conservation stage occurs, community notification is required and may include circulation of a press release, flyers, newspaper notice, website notification and placement of signage. Placement of electronic signboards has been highly effective during previous notifications and recommended locations are shown in figure 10 below.

A-frame and/or digital signs will be located strategically through downtown to increase awareness.

Figure 10: Electronic Signboard Locations



4.2 Water Conservation Measures

To efficiently address water consumption demands, each stage in the plan encompasses specific actions and responses. These measures aim not only to prevent progression to the next stage but also to restore conditions to Stage 1. A summary of the stages and their key actions is presented below:

<p>Stage 1 Normal Operations</p>	<p>Stage 2 Increased community outreach</p>	<p>Stage 3 Limit outdoor watering to 1 day per week</p>	<p>Stage 4 Full outdoor water ban</p>	<p>Stage 5 Essential Use Only</p>
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Stage 1: Normal Operations

- This stage represents the baseline level of water conservation measures in place, aligning with the town's conservation objectives.
- The community is encouraged to practice responsible water usage habits, although there are no specific mandates in place beyond standard regulations.
- Enforcement approach may be focused on an educational first approach for first time offenders.

Stage 1 – Initiatives

Water conservation in the Town is in Okotoks' DNA. As such, Stage 1 is considered to be the Town's normal daily operations and the Town already has a number of initiatives in place to encourage water conservation. These initiatives include:

- Low flow plumbing fixtures are required in new developments and renovations (through Bylaw).
- Use of smart controls for Town's irrigation; controlled irrigation during non-peak hours.
- Advanced metering throughout the Town with a customer portal to allow real-time access for customers to see their usage and receive high-usage notification as well as community-wide alerts.
- Use of non-potable wells for irrigation.
- Outdoor water use is limited to specific periods of the year and limited on days and times and can be further reduced (through Bylaw).
- Water conservation initiatives promoted by Town communications (prominent on Town's website and social media feeds).
- Enforcement by Bylaw officers as required.
- Public education and information through conservation initiatives.
- Residential water rates, through Bylaw, have three tiers: the unit rate of water increases as more water is used; revised customer billing to show consumption broken down into tiers; and to show consumption chart for previous billing periods.
- Residential Water Conservation Rebate Program will continue to support water conservation in Okotoks and is reviewed annually.

Future initiatives that can further water conservation and also provide a source of (non-potable) water during water conservation measures include:

- Use of treated wastewater effluent as a non-potable bulk water and irrigation source.
- Intensify the existing programs to encourage residential xeriscaping and stormwater reuse.
- Restructuring utility rates and including all customers (i.e. commercial) on a tiered rate.

Also, on the supply side there are a number of projects and initiatives in place including:

- Optimizing well productivity.
- Increasing raw water capacity (wells, infiltration gallery or other).
- Decreasing plant system losses (i.e. recovering process waste).
- Decreasing system losses (i.e. leak detection program in place).
- Increasing diversion volumes (i.e. application in place for new licences/licence transfer).
- Obtaining alternate/supplementary water source (i.e. the Foothills-Okotoks Sub-Regional Raw Water Supply).
- Continue to develop a broader Water Conservation Rebate Program to adapt to changes and further address high use commercial and industrial sectors.

Managing discretionary (i.e. outdoor) water use is a critical part of the Town's WSRP. On a typical weekend, the total water consumed by the Town is about 8,000m³ per day; however, during the summer, driven by outdoor water use, the total water consumed can reach about 12,000m³ per day - outdoor water use typically increases water consumption by 30%, but can increase consumption to between 40-50%

In the past, the Town's response to water shortages has been through issuance of partial or full outdoor water bans. The outdoor water bans are enabled through the Town's Bylaw Water Bylaw (23-21).

This Bylaw defines outdoor water use as *"the use of water outside of the building by Customers, Occupants and/or Owners for the purposes of:*

- *Watering gardens, trees, shrubs, lawns.*
- *Applying pesticides or fertilizer in a manner that requires water.*
- *Filling any outdoor pools, hot tubs or similar uses.*
- *Washing vehicles, sidewalks, driveways or garage floors.*
- *Filling any fountains, ponds, or other decorative features.*
- *Washing exterior windows, siding or stucco on buildings.*
- *Conducting any other outdoor water activity similar in nature to the foregoing; or any other outdoor watering purposes."*

In 2024, the Town adjusted the Outdoor Watering Schedule to the following:

The water bylaw restricts Outdoor Water use from May 1 to October 31 to:

- Even numbered properties: 6-8 a.m. and 8-10 p.m. on Tuesday & Friday. Automatic irrigation systems are 2:00 a.m. to 4:00 a.m.
- Odd numbered properties: 6-8 a.m. and 8-10 p.m. on Monday & Thursday. Automatic irrigation systems are 2:00 a.m. to 4:00 a.m.
- The only exception is that outdoor hand watering can occur outside of the set hours on the watering days.

The non-watering days: Wednesday, Saturday and Sunday, during periods of high consumption, become recovery days for the system and allow for water reservoirs to recharge.

There are further conservation measures enforced by the Town including ICI (Institutional, Industrial, Commercial) irrigation requirements (site-specific days) and sod permit requirements.

Stage 2: Enhanced Community Outreach

- In Stage 2, the focus shifts towards increasing community awareness and engagement regarding water conservation.
- The town initiates targeted outreach efforts to educate residents and businesses about the importance of water conservation.
- Educational campaigns, electronic signboards, conservation educators, and communication initiatives are deployed in strategic locations to promote water-saving practices and encourage voluntary conservation measures.

Stage 3: Outdoor Watering to 1 Day per Week

- Stage 3 introduces additional water conservation measures on outdoor water usage to reduce water consumption. Outdoor watering activities, such as lawn irrigation are limited to designated days, typically once per week.
- These conservation measures aim to conserve water resources during periods of heightened demand and promote efficient use of water for essential purposes.
- Enhanced communications messaging is updated utilizing our paid and unpaid radio, print and digital media resources. Additionally, informational door tags are delivered to highest residential water users. Water Services will consult with Community Engagement to ensure accurate and consistent messaging.

Stage 4: Implementation of Full Outdoor Water Conservation Measures

- Stage 4 introduces a significant escalation in water conservation measures, with complete outdoor water usage prohibited.
- Reservoir levels have dropped below 65% and are now considered unsatisfactory for fire protection.
- It's possible a situation or event may compound an existing stage in the WSRP. This could be due to an operational issue (well pump failure, transmission main

break, etc.) or further diversions restrictions (junior licences and instream objectives) from the Government of Alberta.

- All non-essential outdoor water activities are prohibited, including lawn watering, car washing, and filling of swimming pools or decorative water features. This can be achieved by requesting that commercial customers set goals to reduce their daily consumption and escalating enforcement to customers who are using water for discretionary purposes, and ultimately shutting off service for customers who are abusing water privileges.
- Irrigation for Town owned 'high priority' sports fields are reduced to 50%.
- Enforcement approach shifts to more strict enforcement compliance with the conservation measures, with penalties for violations outlined in the water bylaw.
- Enhanced communications messaging is updated utilizing our paid and unpaid radio, print and digital media resources.

Stage 5: Essential Use Only

- Stage 5 represents the highest level of water conservation urgency, where water resources are prioritized for essential purposes only. Reservoir levels are now **below 55%**.
- Strict conservation measures are imposed on all non-essential water uses, with allowances made only for activities critical to human health and safety.
- Irrigation (potable) for all Town owned sports fields is prohibited.
- Special provisions may be made for vulnerable populations or critical infrastructure, with a focus on maintaining essential services during periods of severe water scarcity. Essential water uses may include drinking, cooking, sanitation, and firefighting, while all other discretionary uses are suspended.

Tables outlining the specific conservation measures for each stage will be provided in the water bylaw, ensuring clarity and consistency in enforcement across the community. Internal conservation measures (specific to Town of Okotoks activities) are outlined within Figure 11 below.

5.0 Summary

This Water Shortage Response Plan provides the Town a formal process and long-term strategy to respond to water shortages and its focus on managing demand. The long-term strategy supports growth through the Town's commitment to raw water storage and a supplementary source from the Bow River.

This plan is a living document, which should be updated as needed, in response to future events and system changes.

Figure 11: Town of Okotoks Water use Activities

TOWN OF OKOTOKS WATER USE ACTIVITIES											
Water Use Element	Vegetable Gardens, Community Gardens, and Flower Beds	New planting of Trees and Shrubs (less than 3 years)	Watering Athletic and Playing Fields	Non - Potable Watering (rain barrels, storm water use, etc)	Fleet Vehicle Washing	Street Cleaning	Driveway and Sidewalk Washing	Hydrants	Public Swimming Pools Public Splash Parks and Public Hot Tubs	Ornamental Water Features (Fountains)	Arenas
Stage 1 Normal Operations	May be watered outside of outdoor watering schedule using a watering container, low volume non-spray irrigation, or a hose with a spring loaded trigger spray nozzle	Water efficiently with no water waste while utilizing non-potable water where possible	Optimize usage to maintain turf health and playable standard of sports fields	Permitted Permitted installations map available on website	Permitted	Permitted	Use dry clean-up methods prior to washing	Reduce hydrant flushing to key locations unless necessary for public safety reasons	Permitted - splash Parks with full recirculation system have no additional conservation measures	Permitted	Permitted
Use dry clean-up methods prior to washing. High efficiency equipment required							Permitted but water use conservation measures recommended				
Stage 3 Limit outdoor watering to 1 day per week							Permitted but water use conservation measures recommended				
Stage 4 Full outdoor water ban	Same conservation measures as above watering only from 8:00pm-8:00am	Same conservation measures as above watering only from 8:00pm-8:00am	Reduce total sports field watering by 50%	Prohibited unless for public health, environmental, or safety reasons	Prohibited unless for public health, environmental, or safety reasons	Washing and spraying on impervious surfaces (driveways and sidewalks) is prohibited	Hydrant flushing is prohibited unless necessary for public safety reasons. Reference construction water column for the pressure testing and flushing of mains Use of all water for fire training and use of water from hydrants is not permitted unless necessary for public safety	Permitted, CAO may impose water conservation measures	Operation prohibited. Must be turned off.	Ice repair and resurfacing reduction of service level (dry scrape only)	
Stage 5 Essential Use Only	Watering prohibited	Watering prohibited	Watering Prohibited						Filling or re-filling prohibited	As per the direction of the CAO	