

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 bans have been issued/considered when reservoir levels were around 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.

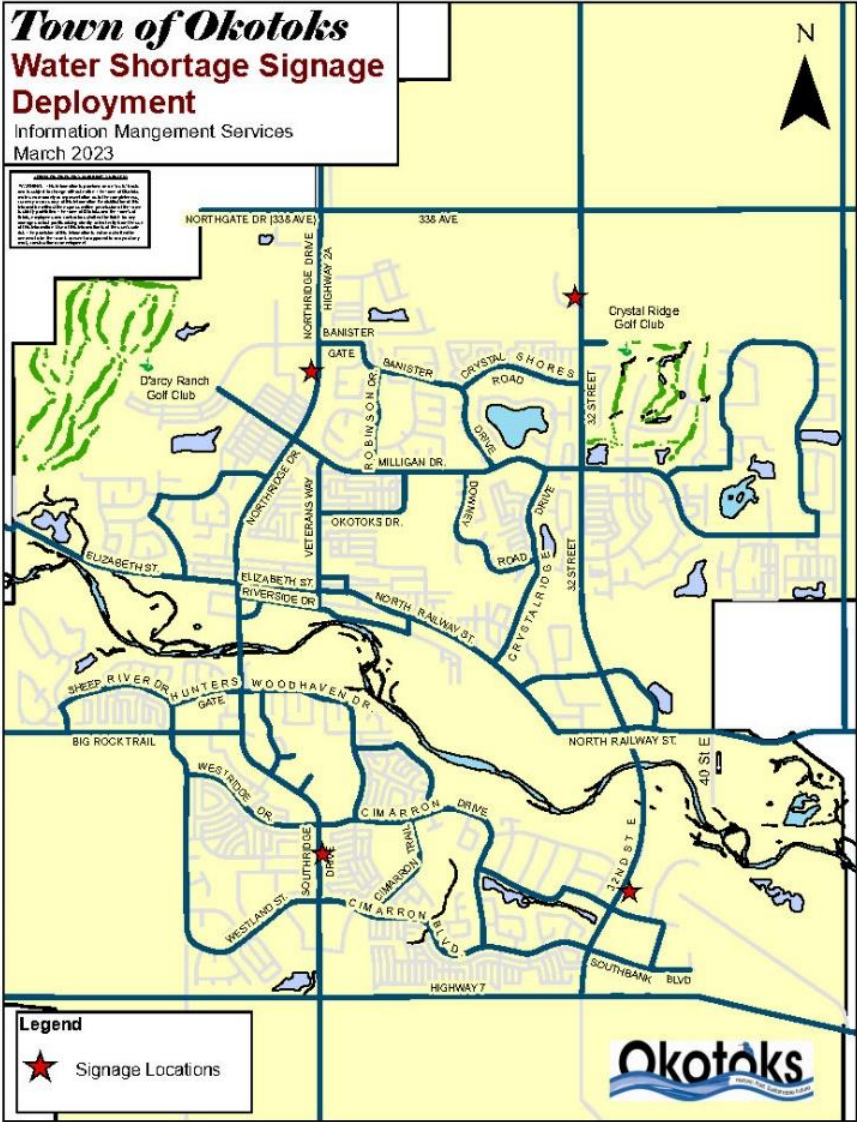
If any of the risks mentioned above appear impending, strong consideration should be given to transitioning to Water Conservation – Stage 2. The rationale for initiating enhanced community outreach at an early stage is to raise public awareness, foster increased conservation efforts, and ideally prevent 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.

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:

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

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 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 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 is limited to and garden watering, 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.

Stage 4: Implementation of a Full Outdoor Water Ban

- Stage 4 signifies a significant escalation in water conservation measures, with the implementation of a complete ban on outdoor water usage.
- All non-essential outdoor water activities are prohibited, including lawn watering, car washing, and filling of swimming pools or decorative water features.
- Enforcement approach shifts to more strict enforcement compliance with the conservation measures, with penalties for violations outlined in the water bylaw.

Stage 5: Essential Use Only

- Stage 5 represents the highest level of water conservation urgency, where water resources are prioritized for essential purposes only.
- Strict conservation measures are imposed on all non-essential water uses, with allowances made only for activities critical to human health and safety.
- 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.