DROUGHT

RDOS Public Works Drought Risk Mitigation & Management Plan -

REGIONAL DISTRICT
RDOS
OKANAGAN·SIMILKAMEEN

Zoe Kirk, 2019/20

Executive Summary

The Regional District of Okanagan-Similkameen covers 10,400 sq. km in the semi-arid, ecologically sensitive, southernmost region in the Okanagan. Climate instability and extreme weather events associated with climate change is forcing utilities to alter perceptions of 'normal' operations and rethink decision models and response procedures; in both flood and drought.

Understanding the risks associated with a changing climate is one of the more complicated elements of planning for adaptation. Risk is the combination of a range of factors that include the hazard itself, the severity and the impacts that could result, the exposure, the vulnerability, sensibility and the value of assets to the corporation, the community and the environment.

Drought conditions are described as prolonged periods of abnormally low precipitation, which often precipitate water shortages in community water systems. The combination of demand and the ability for recharge, extraction, treatment times and storage capacity are stressed, as the affects of climate change experienced in the region are wetter winter springs and longer drier summers. Dry periods are creeping more into the fall; providing challenges for water suppliers and other sectors such as growers and producers, who depend on replenishing ground water deficits prior to winter, and the following growing season.

The RDOS Regional Growth Strategy (RGS) update in 2016 states that the population increases of 1.5% per annum in the previous plan has not occurred. Actual growth rates have been corrected to .84%, or less than 1% per annum. The expected increases in water consumption based on population increases is based on this revised statistic, with a variable buffer to include the opposing statistic of record building and renovation permits issued in 2017/18. The RGS will be updated in 2020 and new statistics may affect the population expectations (future demand).

The RDOS must remain agile, review and revise the Drought Response Plan on a regular basis, especially as newly acquired water systems come on-line. The RDOS is committed to developing safe and healthy local communities, therefore proactive identification and management of drought conditions are considered a high priority.

The intent of the plan is to be an important useful tool; an informed management plan for managers and staff. It is also a means of documenting information or data gaps, and geophysical concerns associated with drought.

Acknowledgements:

This plan could not have been possible without the assistance of many peers and the Okanagan Basin Water Board (OBWB) Water Quality Water Improvement (WQWI) grant stream. Kellie Garcia (OBWB) provided organizational support, templates, municipal/utility based workshops and oversight to this and other similar documents underway in the Okanagan.

Jennifer Miles, North Okanagan Regional District provided insight, materials already produced and in use, and her continuing encouragement. As local government representatives, we are working to harmonize the valley's approach to water regulations and use; One Valley - One Water.

In house, the help and assistance from Rob Palmer, RDOS Environmental Technician who supplied countless amounts of data and advice was invaluable. The Operations staff who provided unabashed reasonable and rational feedback was much appreciated. Liisa Bloomfield P Eng, RDOS Engineering, for her guidance, oversight and trust.

Zoe Kirk

PW Projects Coordinator/ October 2019

Glossary

DFRMMP	Drought and Flood Risk Management and Mitigation Plan
DMP	Drought Management Plan
DTIP	Drought Triggers Implementation Plan
EFN	Environmental Flow Needs
EOC	Emergency Operations Centre
ERP	Emergency Response Plan
ERRP	Emergency Response and Recovery Plan
FLNRORD	BC Ministry of Forests, Lands, and Natural Resource Operations and Rural Development
GIS	Geographic Information System
IHA	Interior Health Authority
MOA	BC Ministry of Agriculture
MOECC	BC Ministry of Environment and Climate Change
OBWB	Okanagan Basin Water Board
OLRS	Okanagan Lake Regulation System
ONA	Okanagan Nation Alliance
OWSDP	Okanagan Water Supply and Demand Project
PTDWG	Provincial Technical Drought Working Group
RDOS	Regional District of Okanagan-Similkameen
RGS	Regional Growth Strategy
RFC	BC River Forecast Centre
TODRT	Thompson Okanagan Drought Response Team
TODRIP	Thompson Okanagan Drought Response Implementation Plan
WSA	Water Sustainability Act

Definition of Drought

Climatology groups have defined four types of drought.

Meteorological – when dry weather patterns dominate an area, usually based on degrees of dryness/opposed to historical norms and the duration of the dry period. It can begin and end rapidly or be sustained.

Hydrological – when water supplies become low, especially in streams, groundwater levels, reservoirs usually after months of meteorological drought. Hydrological drought takes longer to develop and takes longer to recover.

Agricultural drought – links characteristics of both of the above drought conditions as it affects agricultural production; precipitation shortages, soil moisture deficits, actual evapotranspiration, reduced water reserves and restrictions.

Socioeconomic drought – is based on the impacts of drought conditions on the supply and demand of economic goods and services.

Regional District Okanagan-Similkameen

Drought

Public Works Risk Mitigation and Management Plan

TABLE OF CONTENTS

Page

LIST OF FIGURES

LIST OF TABLES

PHOTOS:

1.0 INTRODUCTION AND OBJECTIVES

1.1 Background:

The RDOS encompasses 10,400 sq kms, and as of May 2018, owned or managed 9 water systems: Faulder, Naramata, Olalla, Sage Mesa, Sun Valley, West Bench, and Willowbrook, plus Gallagher Lake and Loose Bay (seasonal). Missezula Lake to come online in 2020.

Figure 1 – Map BC /RDOS

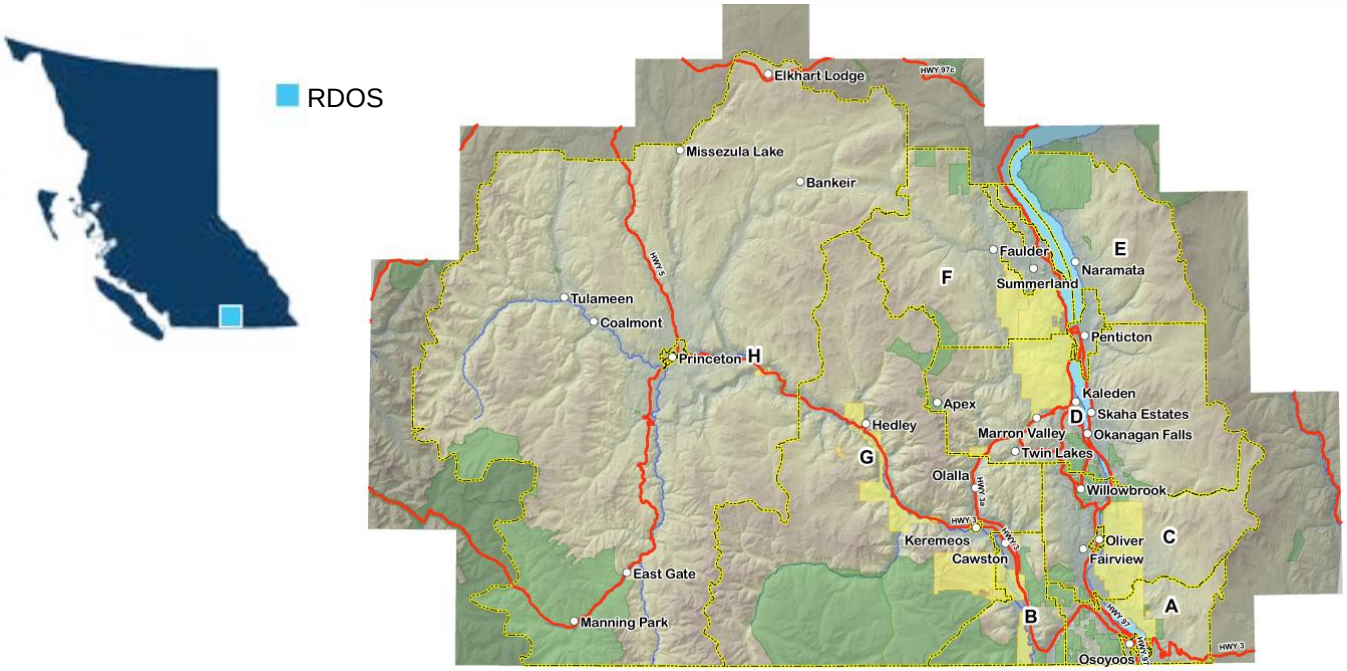
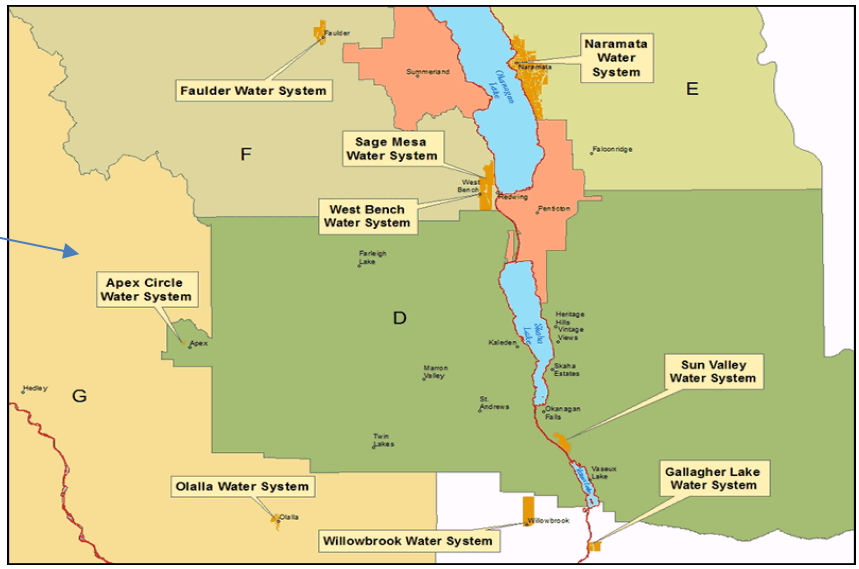


Figure 2 - Geographic extent of the Regional District of Okanagan-Similkameen (RDOS 2017)

Apex Water system is no longer with the RDOS



1.2 Purpose, Objectives and Intent of Drought Plan

Within the Regional District of Okanagan-Similkameen, water supply is determined by snowfall, rain and the storage capacity of reservoirs and aquifers. Water shortages are a major concern that could escalate in the future. During dry years, the RDOS imposes conservation measures to ensure that both human and environmental needs are met. However, with increased populations, climate change and water demands projected for the future, the RDOS and water suppliers within the region will need to continue to augment their water access and purveyance to meet demands. This may include; additional surface and groundwater withdrawals, upland reservoir and mainstem lake storage, and more intense management. Increasing water withdrawals and storage could impact environmental flow needs, downstream water licences, and water availability to all users. Sound scientific, socio-economic, and governance information is required to balance water supply and use, mitigate the effects of future climate change, the role of water in land use and economic development, and protect of the ecological functions provided by water.

As a result, the purpose of this plan is to balance the health of watersheds and water supplies during abnormally dry years and to assist in informing future development and growth plans. Drought response plans provide the district, water managers and purveyors with guidelines and predetermined triggers to plan for and reduce the impact of drought conditions.

1.3 Historical and Potential Drought Impacts

Within the RDOS, droughts are generally a result of hydrological (low stream flows) or meteorological (low precipitation) events caused by insufficient snowpack accumulation, hot and dry weather, a delay in rainfall, or by a combination of these. Ministry of Environment (2016) also identifies that agricultural and socio economic droughts are types of drought that can occur, which are largely a result of water supply issues.

Historic local and/or regional drought events within the RDOS and southern interior of BC have been poorly documented. However, three recent hydrological/meteorological droughts events within the Okanagan region were identified by Associated Environmental[1] as follows:

- An extreme low streamflow event in 2003 resulted in significant harm to fish and fish habitat.
- Below normal winter and early spring inflows to Okanagan Lake, below normal snowpack and snowmelt runoff, below normal spring precipitation, and hot, dry summer conditions during 2009.
- Mild winter with little snow, early peak inflows to Okanagan Lake, and persistent below normal precipitation and above average air temperatures in 2015.

Not related to a hydrological or meteorological drought, water supply shortages as a result of loss of source due to infrastructure failure, contamination, or sustainability issues have also occurred within the RDOS. The impact from these types of events can be as severe or worse than during times of drought and have been considered in the development of a drought or water conservation plan. Some examples of non-drought related water shortages that have occurred within the RDOS have included Water supply sustainability and variable aquifer recharge issues for the Community of Faulder's groundwater well (Golder 2013).

[1] - See the Gap Analysis Section 3.5.3 https://portal.rdos.bc.ca/departments/publicworks/5200-5799EnginAndPW/5330PWProjects/All/DroughtFloodRMMP/_layouts/15/DocIdRedir.aspx?ID=000000WVWS

- Short-term (2 month) water supply contamination with an unknown etiology in the sealed well in the community of Olalla (2013)
- Short-term loss of water supply from Okanagan Lake for the City of Penticton due to corrosion of water distribution pipes (Brent Edge, pers. comm., 2017).

Impacts from water shortages due to drought are numerous, beyond the basic threat of lack of capacity to supply potable water to residents (source water availability), water quality and all users (from irrigation to fire flows). A drought impacts all sectors of the economy, user groups, and the environment. Prolonged drought conditions contribute to wildfire threats and human health and safety.

It is important that plans also align as much as possible to other Okanagan Valley water utilities, to insure drought responses are consistent throughout the valley – even if utilities vary by source and capacity, stages and restrictions should strive to adhere to similar triggers and messaging.

1.4 Components of Drought Plan

In order to make this as valuable a tool as possible, the component sections will include:

- *An overview of the RDOS water systems* – a supply and demand profile(s) as past and present data inform future demand and considerations.
- *Drought forecast models*, approaches and targets. The framework for drought response triggers will be explained, and a rationale for how external agency modeling contributes to the RDOS Drought Triggers Implementation Plan (DTIP).
- *Stages of Drought*, extracted from the RDOS Water Restrictions Bylaws and Water Conservation Plan objectives and coalesced into a comprehensive table.
- *Drought Plan Implementation* which identifies resources that will be utilized during a drought event.

The objective of this plan is to ensure the RDOS has a set of defensible guidelines that will guide staff response to a drought event, to maintain and protect source water for all users. Graphic matrix style guidelines have been proposed to insure service is maintained for as long as possible during a prolonged drought.

See Appendix D: Groundwater Well Based Decision Matrixes are included as well as a Lake Based Extraction Matrix

2.0 WATERSUPPLY AND DEMAND PROFILES

2.1 Background: Water Systems Descriptions – Water Supply

The RDOS (at this writing) owns or operates seven water systems and two seasonal Campground (Loose Bay and Gallagher Lake). As a regional government, the Province and Interior Health Authority strongly support local government acquisitions of private water systems such as 'irrigation districts' or 'improvement districts' and small community systems. This practice comes fraught with challenges to districts, as no two systems are alike; they are acquired with a shopping list of needs, and many require immediate repair in order to meet standards. In 2019 the RDOS updated its water system acquisition policy: http://www.rdosmaps.bc.ca/min_bylaws/admin/BoardPolicies/current/1_3_1WaterandSewerUtilityAcquisitionPolicy.pdf

Acquired systems traditionally do not have a significant reserve of funding in place, or are functioning without significant issues.

Detailed Step-by-step Emergency Response Plans (ERPs) outline Emergency Procedures as well as including actions associated in drought conditions.

2.2 Current and Future Water Demand

Water system resiliency and the ability to meet the increased demand with existing capacity, requires a strong and enforceable Water Use Regulation Bylaw. The previous Bylaw was updated in anticipation of these plans and in reaction to changing hydrology in the face of climate change conditions. The new Bylaw also conforms to a more regional approach to water supply management. The new Bylaw is 2824,2018: http://www.rdosmaps.bc.ca/min_bylaws/PublicWorks/Water/WaterRegulationBylaw/BL2824.pdf

As population demographics outline, the South Okanagan is expected to see between a 1.5 to 3% annual rise in population. Census data however, does not corroborate this; seeing a .84% increase per annum across the region over the last 5 years. The RDOS needs to be prepared to accommodate more demand for water from population increases, pressures from climate change and the implications that places on infrastructure and distribution systems. The new Water Use Regulation Bylaw is a direct adaptation response to these expectations. ***Note:*** *Census per capita units vary considerably, from 2 to 2.75 people per household. The 'average' of 2.4 was adopted for use in this document. The new RGS may affect future demand models.*

Photo 1 & 2: Naramata Raw Water Pump Station before back up power added and McKay Road treatment plant UV filtration

2.2.1 Naramata Water System - 1000 connections 2400 population

The Naramata water system, the largest RDOS system is located in Electoral Area 'E,' and serves a combination of domestic customers, agricultural producers, and a small tourism-oriented commercial sector consisting primarily of accommodation providers. The estimated population at this writing is about 2,400 with an expected 2.4 persons per household.

System Profile: Supply - Okanagan Lake
The Primary System that consists of an intake plant at Lake level
Ultraviolet Treatment Plant (UV WTP) that supplies treated water to the distribution system network. The Secondary System is the existing, unused system of Uplands Reservoirs and Creek Source Intakes. This system is only utilized in the event of an extreme emergency when the Primary System cannot continue to supply treated water to the distribution system.

The Lake intake allows for 300 litres per second to be drawn and processed
The intake is 200 meters out into Lake Okanagan and down 60 meters

The lake intake/pump station has three, 300 horse pumps which extract and convey water 2.5 km to the McKay Rd. treatment plant.

Naramata Water System Reservoir Capacities:

1) Arawana Reservoir
- 757m^3 / 200,000 USG

2) Juniper Balancing Tank
- 378m^3/100,000 USG with (2-60HP pumps to Stonebrook and 3 30HP pumps to Arawana)

3) Stonebrook Reservoir
- 757m^3/200,000 USG

4) Water Treatment Plant Clear Well - (McKay Reservoir) with (3-250HP + 2- 125HP pumps to North and South System Pressure Zones)
- 378m^3/100,000 USG

System Diagram:
http://www.rdosmaps.bc.ca/min_bylaws/ES/public_works/Web_Water/Brochures/NaramataUVTreatmentPlantBrochure2011.pdf

Figure 3 – Naramata Historic Total Water Use (2007-2015) – *Econics Report 2017*

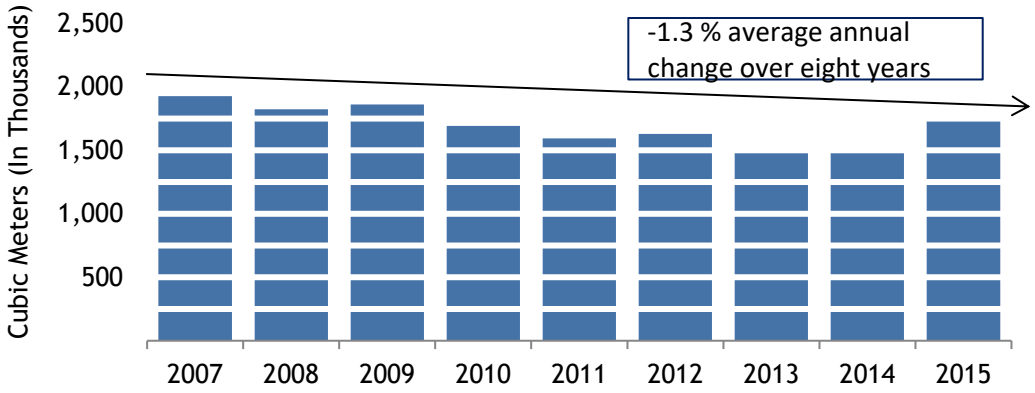
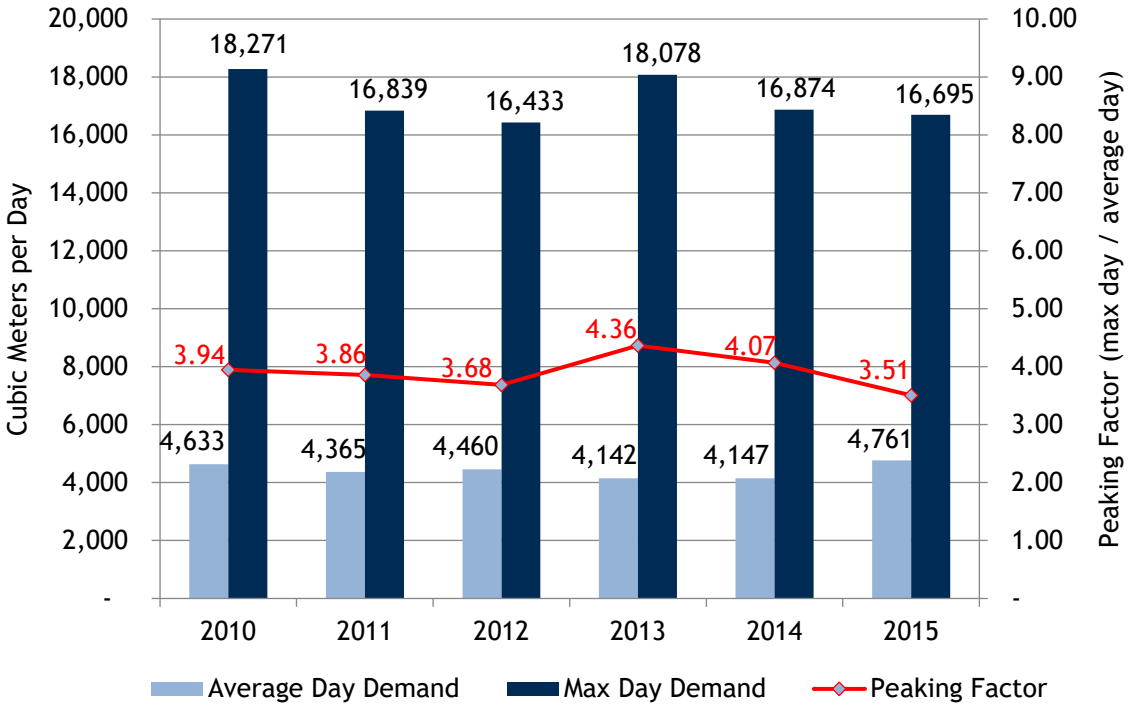


Figure 4 – Naramata Average Daily Demand:

The extent to which water use increases during the summer is often measured by the peaking factor, which compares use on the day that it was highest with average daily consumption throughout the year.

Current water licenses allow for 2.3 million cubic meters to be drawn from Okanagan Lake each year. To date demand has never exceeded or reached the threshold of licence capacity.



Average & Maximum Day Demand - Naramata System (2010-2015) ***Econic Report 2017***

2018 saw the lowest pumping numbers in a dozen years at 1,490,274m³
Projected Maximum Daily Demands in Future: expected to increase by 10% by 2025

Potential Emergency Supply:
At this point, the RDOS retains rights to water from Naramata and Robinson Creeks for emergency purposes, with flume, diversion infrastructure, and EFN responsibilities.

Photo 3 - 4: Before and after repairs due to flood of 2017

2.2.2 West Bench Water System – 357 connections ~1050 population

The West Bench service area is comprised mainly of large, semi-rural properties within the Regional District's Electoral Area 'F'. Ninety-five percent of the total 357 water connections are rural residential, many of which include hobby farms. The remainder of service connections consist of large acreages with and without commercial agricultural activities (18), irrigated parks (2), a school, and a few small home-based businesses. The RDOS has previously estimated that 65% of total annual water demand in the West Bench system is used for landscape, irrigation and agricultural purposes, based on industry benchmarks for basic domestic indoor use. A rudimentary estimate of leakage in the West Bench system based on a limited 2014 night flow data set suggested it is approximately 11% of total demand. (WSP Canada, 2016). The treated water supplied to West Bench system customers is sourced from the City of Penticton through a bulk water purchase agreement. The West Bench water system serves a population of approximately 1,050, which declines by an estimated 20% in the winter months, when 'snowbirds' temporarily vacate the community. The size of the service population is expected to remain stable in future years due to limitations in land availability and sewage disposal options. (WSP Canada, 2016)

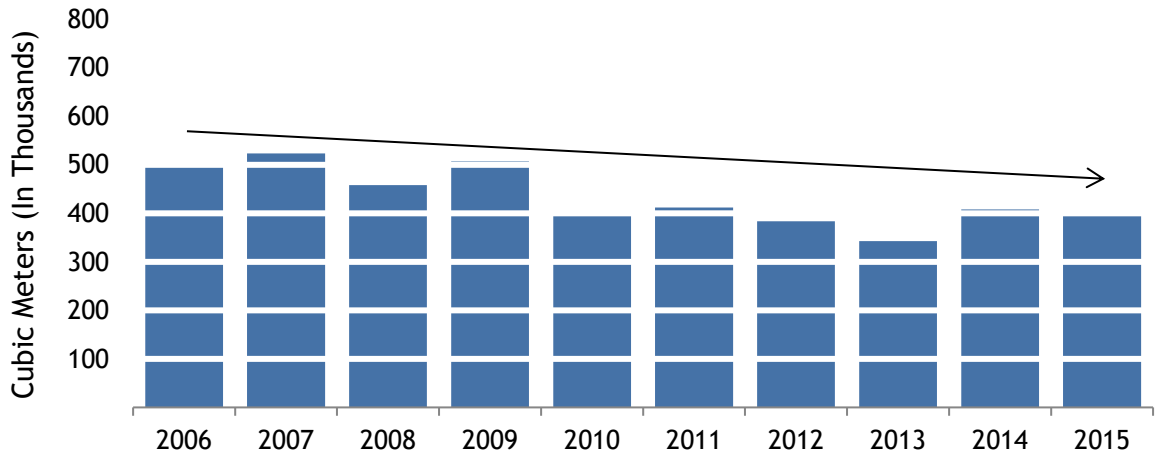
System Profile: Source bulk purchase of water from City of Penticton

Treated water is pumped at a current rate of approx. 46 L/s (730 US gpm) from each Booster Pump into the West Bench distribution system and to two elevated storage Reservoirs.

Reservoir capacity:

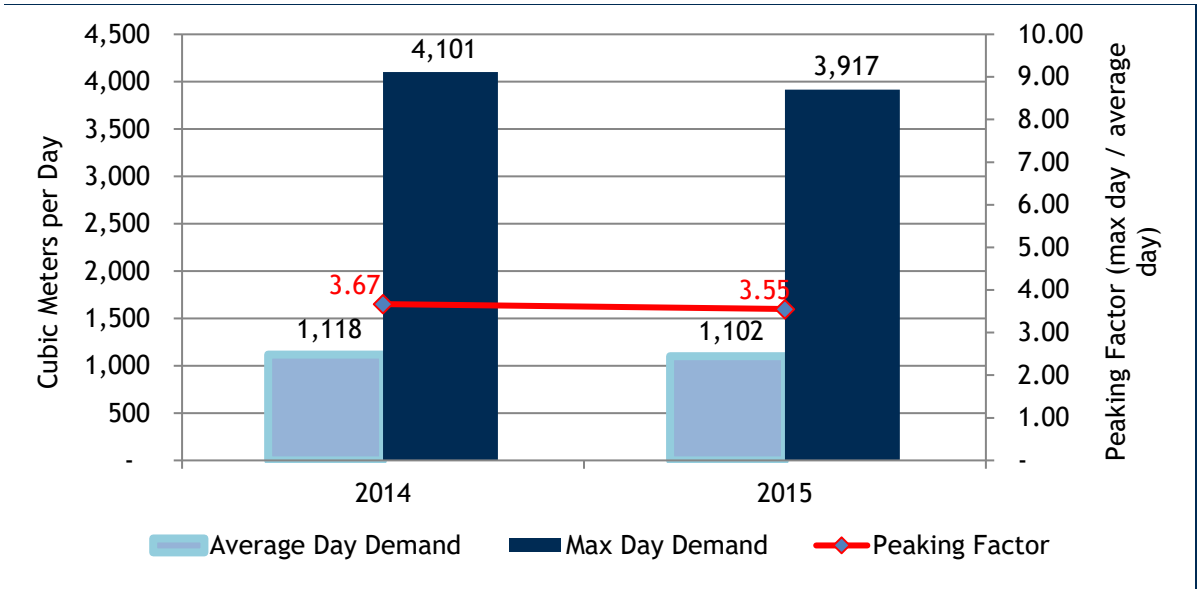
- Old Reservoir (1968), an existing circular single-cell concrete reservoir has a volume of 1,022 m^3 (270,000 US gal)
- New Reservoir (2015), a single-cell concrete reservoir has a volume of 550 m^3 (145,000 US gal).

Figure 5 – West Bench Historic Total Water Use (2006-2015)



In 2018, 298,729 cubic meters of treated City of Penticton water was supplied to the West Bench, showing a continuing downward consumption; in part due to leak detection program isolating leaks on property side of the water meters (and subsequent repairs), line loss repairs during the metering process and water conservation strategies undertaken by homeowners.

Figure 6 - West Bench System Average and Maximum Day Demand (2014-2015)



Future Projected Maximum Daily Demands: With properties built out and agriculture shrinking over time, the expected daily demands are an additional ~8% by 2025

Photo 5 - 6: West Bench pump station and interior showing pumps

2.2.3 Sage Mesa Water System - 250 Connections ~575 population

The RDOS operates the Sage Mesa Water system on behalf of the Province. The Sage Mesa System is supplied by Okanagan Lake from a pump station along Hwy. 97. The system is comprised of two main residential areas, namely Sage Mesa, the Lower Zone, with 65 connections, and the Upper Zone comprised of developments known as Husula Highlands, Westwood Estates, and Westwood Properties, and at this date has 185 connections. The Upper Zone contains 2 pressure reducing valve (PRV) stations. There are two commercial golf courses in the Lower Zone, Pine Hills Golf and the WOW Golf and Driving Range. A Booster Station is located at the Lower Reservoir.

System Profile: Supply - Okanagan Lake
Reservoir capacity:

- Lower Reservoir 272 m^3 (60,000 Imp gal/ 72,000 US gal)
- Upper Reservoir 450 m3 (100,000 Imp gal / 120,000 US gal)
- At the Lake Pump Station water is treated with a 12.5% sodium hypochlorite solution.

Future Projected Maximum Daily Demands: U/K

Photo 7: Inside Sage Mesa Pump House

Photo 8: Sandbagging intake pump house during 2017 flood

2.2.4 Willowbrook Water System - 80 Connections ~200 population

Willowbrook, well based water system was acquired by the RDOS in 2016, and operations commenced in July1, 2017. Historic consumption is not available.

System Profile: Well Based with an extraction cap of 213,000m³ per year
Well #1: inside pump house, Tag # 19239, ID # 28505, 1965 at 90' (Xm³) deep, 8" casing,- will be back up as it was replaced in 2006
Well: # 2, 04/2006, Well ID # 16142 (TBC with Ministry), 55' (19.8m) deep, 12" casing,
Pump located at: ~28' (8.5m) above bottom as is sensor
Pump House: 183 Carr Crescent, Willowbrook BC – Electoral Area "D"
Reservoir capacity: 106m³
Treatment: none
Annual Pumping volume in 2017 (one full year of operation): 168,889m³

Figure 7 - Willowbrook System Average and Maximum Day Demand (2016-2017)

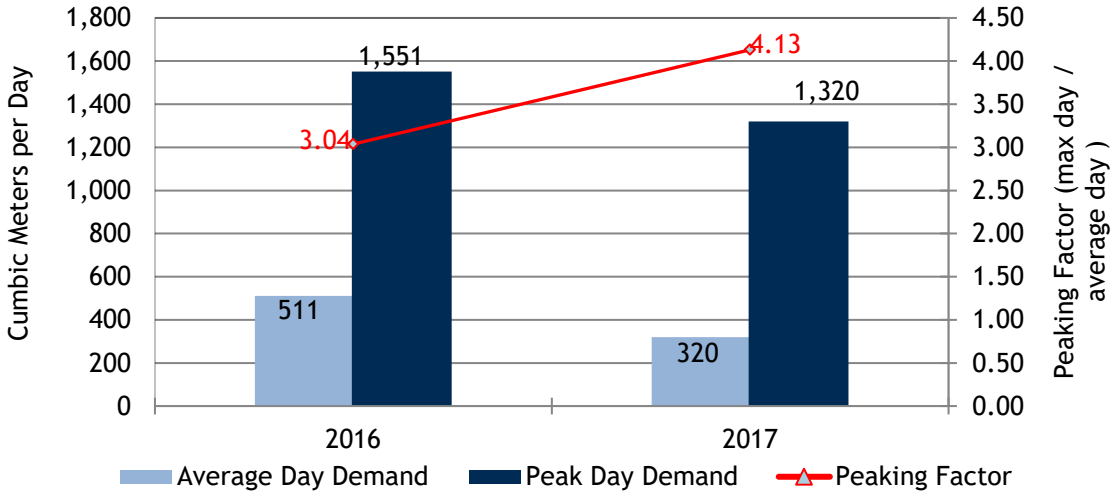


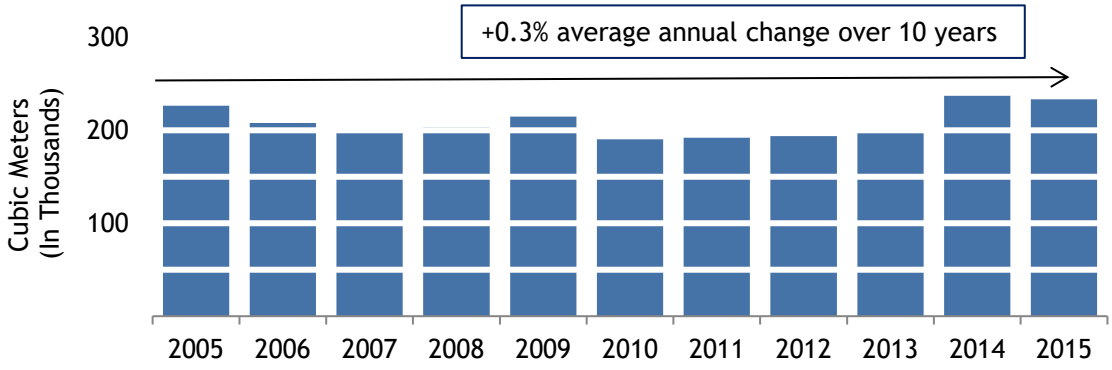
Photo 9: Willowbrook well and pump station

2.2.5 Olalla Water System: 238 Connections 500 population

The Olalla Water System consists of 233 domestic connections including 5 commercial connections (trailer parks), with an estimated population of ~500.

System Profile: Supply - Well
Well #1: 1987, being decommissioned, located at foot of 7th st in Olalla – poor quality water
Well #2: 1998, Tag# 82378, Well ID # 28561, 155 ft (47.25m) deep, 8" casing, static level ~59' (18m), located at 1673.20' (509.99m) above sea level, in aquifer #935
Pump located at: ~70' (24m), screen located at ~ 136.6' (41.45m),
Pump House: 100 Van Wallegham Rd., Olalla (East side of Hwy).
Reservoir: 100,000 US gallon (378m³) capacity
Treatment: none
GIS mapping in Appendix

Figure 8 - Olalla Historic Water Consumption:



*2017 shows a decrease in consumption to 154, 865m³. This is mainly due to line leakage repair with new pipe replacement projects. And again, in 2018 a further reduction down to 135,454 cubic meters.

Figure 9 – Olalla Average and Maximum Day Demand (2010-2015)

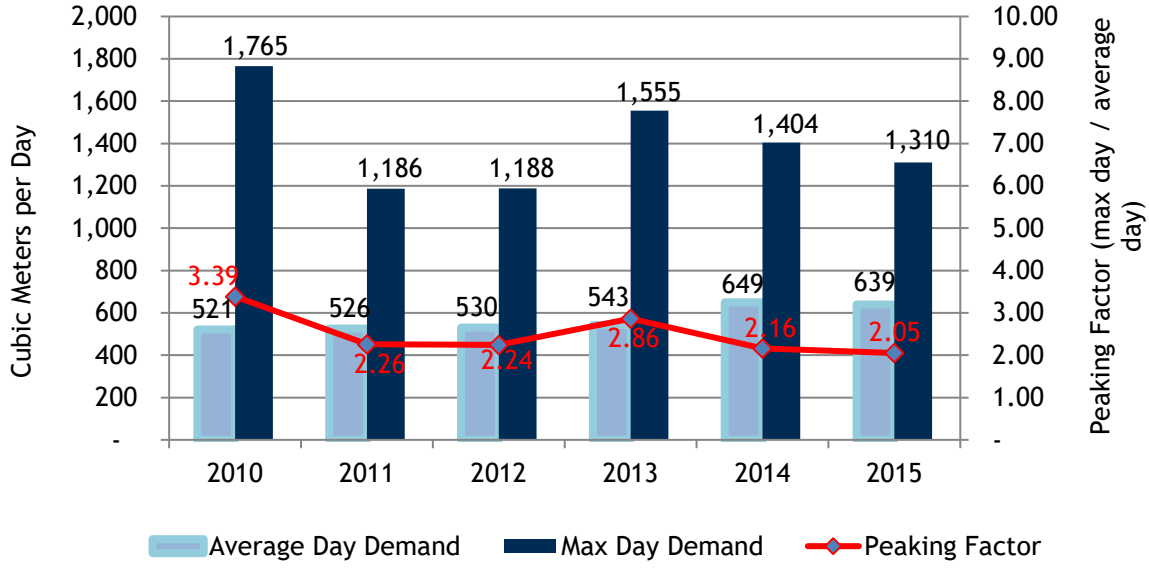


Photo 10: Olalla pump house and well head

Photo 11: Olalla - looking south during 2018 Flooding event (drone footage) RDOS Emergency Operations

2.2.6 Faulder Water System – 82 domestic connections 215 population

The Faulder water system is located in the RDOS's Electoral Area 'F' and serves only domestic water users who are housed primarily on rural and semi-rural acreages. The estimated service population of 215 is expected to remain stable in the future due to limitations in build out potentials and available water supply. However, as older couples move out, younger families are moving in, which may affect populations in the future. Water levels in Meadow Valley Aquifer #299, which supplies the system, have fluctuated in recent years. This has highlighted the need to further enhance conservation efforts among Faulder water users, and resulted in a new well being drilled in 2015.

System Profile:

In 2015 the system underwent a major upgrade which included the following:

- Uranium Treatment System (UTS)
- Emergency Generators
- Booster station for upper zone properties (5)

Well #2: Well ID # 28564 Tag # 83205 – old well

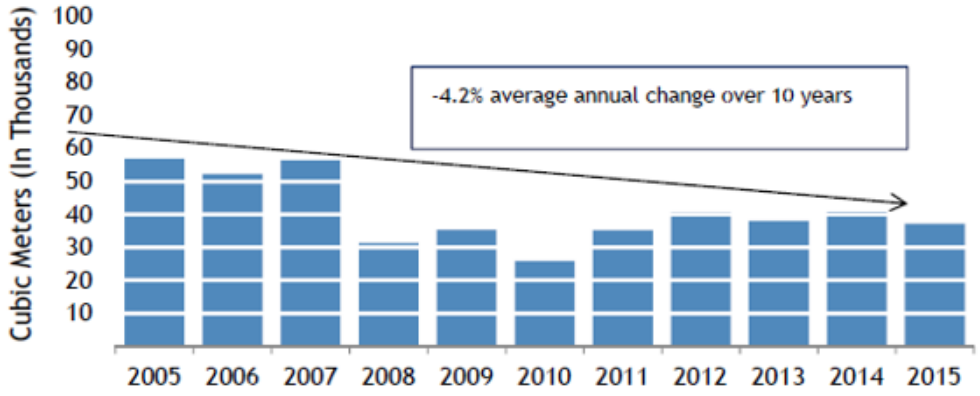
Well #1: New well, Well ID # 41800 Tag # 111310, online in 2015 at 317' (96.8m)deep, casing 8" (20 cm), 350 USG/minute

Reservoir capacity: 150m³/40,000 USG

Treatment: Uranium, No disinfection

Figure 10 – Faulder Historic Water Consumption: extracted from Econics Report:

*In 2017 53,938m³ was consumed and again lowered to 42,228m³ in 2018. This system shows a fluctuating consumption pattern, unlike other systems which show a steady reduction over the past few years.



Average daily demand:
Since daily total water use data for the Faulder System is only available for 2010-2015, *average day demand, maximum day demand*, and *peaking factors* are not available for prior years. The peaking factor between 2010-2015 ranged from a low of 2.42 to 4.67 in 2013. Aside from this anomalous high peaking factor in 2013, the peaking factors are within the range of what would be expected for water systems with few commercial agricultural water users.

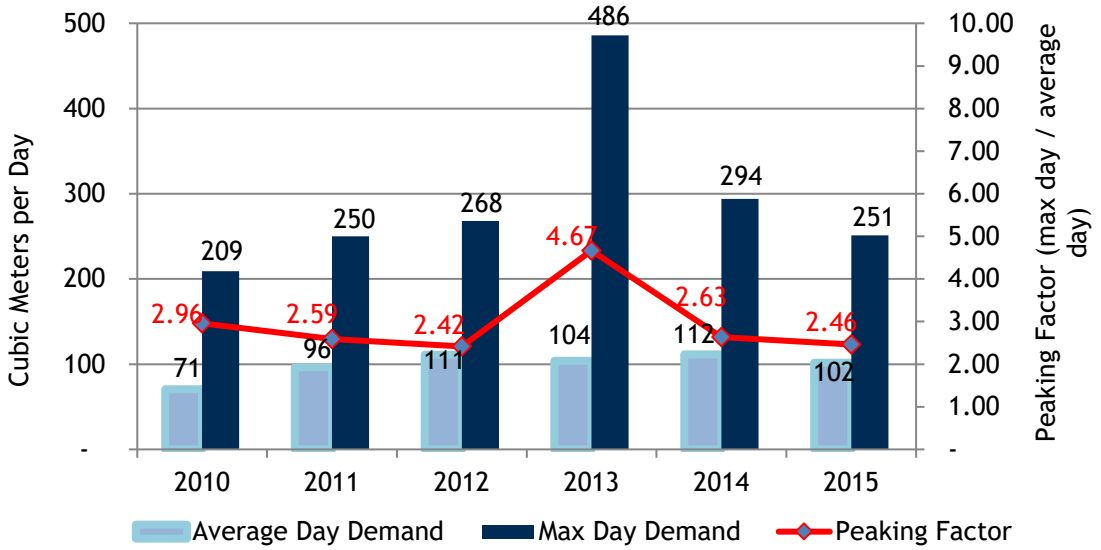


Figure 11 – Faulder Average and Maximum Day Demand (2010-2015) Econics Report *2017*

Projected Maximum Daily Demands by 2025: 486 m³ x 12% (58m³) = 544 m³

Expected increase in consumption/ demand over time: Faulder is at maximum build out and if more properties are resold, and families move in, the consumption could increase. Using population migration stats Faulder could see a ~12% increase in usage by 2030

Photo 12: Pump house, uranium treatment and back-up power generation at new plant

2.2.7 Sun Valley Water System - 31 connections, estimated population 60

The Sun Valley water system was acquired by the RDOS in January of 2017 and has 31 connections; 24 residential and 7 vineyards. Insufficient data was available at the time of writing to conduct reliable analysis of baseline water use for this system. The Sun Valley water system source is a 85 metre deep well with a 50 horsepower pump rated at 1000 US gpm that feeds in to a 65,000 US gallon reservoir. There are eight hydrants on the water system and fire protection is provided by OK Falls Fire Department.

System Profile:
Well # NAD47, Tag #83437, 280' (85.3m), static level ~140' (42.6m), 1164' (354.78m) above sea level, in aquifer 265 pumping capacity of well is 800gpm
Reservoir: 65,000 US gallons
Treatment: none
Daily Demand: ranges from 7.5gpm in winter to 550gpm in summer
Average Peak Day: 900,000 USG
Average annual usage: 56,216,000 USG or 212,800m^3

Expected increase in consumption/ demand over time: predicting demand over time is not possible, as agricultural cropping may change drastically over time, and this would affect overall consumption. RGS may be able to provide some guideline for potential growth and future demand.

Photo 13: Sun Valley well

2.2.8 Potential new systems

Over time, the RDOS has been approached to assume ownership or operational management of water systems within the region. This has resulted in the expansion from three to seven separate systems coming online in 10 years. Community, Irrigation or Improvement District Water systems are vulnerable to disrepair and changes in stewardship. Both the Province and Interior Health Authority (IHA) urge Regional Districts to take on these systems. This can come with inherent difficulties and needs for immediate attention in order to meet IHA standards. Communities have also approached the district to construct and operate water systems. Climate change will only exacerbate the number of potential acquisitions in the future; an identified risk.

2.3 Potential Emergency Supply - from ERP

Annually, or due to system changes or improvements, the RDOS updates its Emergency response Plan(s) for each water system. The RDOS link to water system Emergency Response Plans is: **G:\Eng Services\E-Filing\7000-7699 ProtectServices\7130 Emergency Measures - General\7130.19 Dept Emergency Plans**

3.0 FACTORS INFLUENCING THE POTENTIAL FOR DROUGHT

Numerous factors will predict the potential for drought. The factors explored below will be considered in the Response Decision Matrix. Each water system has its own limiting factors and these will also form a component of the matrix.

3.1 Winter Snow packs

Table 1: BC Ministry of Environment –Climate Change

3.2 Spring Rains

Spring rains traditionally arrived in June, but climate variability and instability has moved the rain curve back by three weeks. In addition, the historical dry fluffy few centimetres of snow have been replaced by heavier, wetter snow. Rain on snow is becoming more and more an annual occurrence. *See the table in Global Climate Trends - Section 3.5*

3.3 Watershed

The RDOS is in a snow based water system, with several watersheds, but two primary; the Okanagan and separate Similkameen watersheds. Snowpack and snow pillow reports and trends affect hydrology, therefore impact the watershed.

3.4 Groundwater

Groundwater and aquifer recharge as a subset of Watershed influence, is becoming a greater concern as shifting precipitation patterns both in type and timing, have demonstrated that the South Okanagan can go into winter with groundwater saturation and pooling. This places an extra burden on historical spring groundwater levels, and many areas have seen wells 'artesian' and ground water push so forcefully as to lift septic tanks, and destroy private infrastructure. The possibilities of contamination and degradation of groundwater is a growing concern.

Groundwater levels at RDOS wells and Provincial observation wells will be used as indicators for drought. Should low levels be recorded at any of the wells, this would trigger an overview and use of the matrix, to implement management strategies.

3.5 Global Climate Trends and Forecasted Impact on Okanagan Valley

Forecast climate trends encompass several factors, but climactic instability (weather) drives all the 'new normal' anomalies; increased rain events, fluctuating snow packs, increasing inflows into the mainstem lakes, spring flooding followed by extreme dry periods lasting longer into the fall, and extended growing degree days.

Table 2 - Temperature Trends to 2050

Summary of Climate Change for British Columbia in the 2020s

Climate Variable	Season	Projected Change from 1961-1990 Baseline	
		Ensemble Median	Range (10th to 90th percentile)
Mean Temperature (°C)	Annual	+1.0 °C	+0.5 °C to +1.6 °C
Precipitation (%)	Annual	+4%	-0% to +7%
	Summer	+0%	-4% to +5%
	Winter	+4%	+1% to +8%
Snowfall* (%)	Winter	-2%	-11% to +3%
	Spring	-30%	-56% to -2%
Growing Degree Days* (degree days)	Annual	+153 degree days	+70 to +231 degree days
Heating Degree Days* (degree days)	Annual	-354 degree days	-566 to -172 degree days
Frost-Free Days* (days)	Annual	+10 days	+5 to +19 days

The table above shows projected changes in average (mean) temperature, precipitation and several derived climate variables from the baseline historical period (1961-1990) to the **2020s** for the **British Columbia** region. The ensemble median is a mid-point value, chosen from a PCIC standard set of Global Climate Model (GCM) projections (see the 'Notes' tab for more information). The range values represent the lowest and highest results within the set. Please note that this summary table does not reflect the 'Season' choice made under the 'Region & Time' tab. However, this setting does affect results obtained under each variable tab.

Table 3 – Okanagan Lake Annual Inflow Volumes

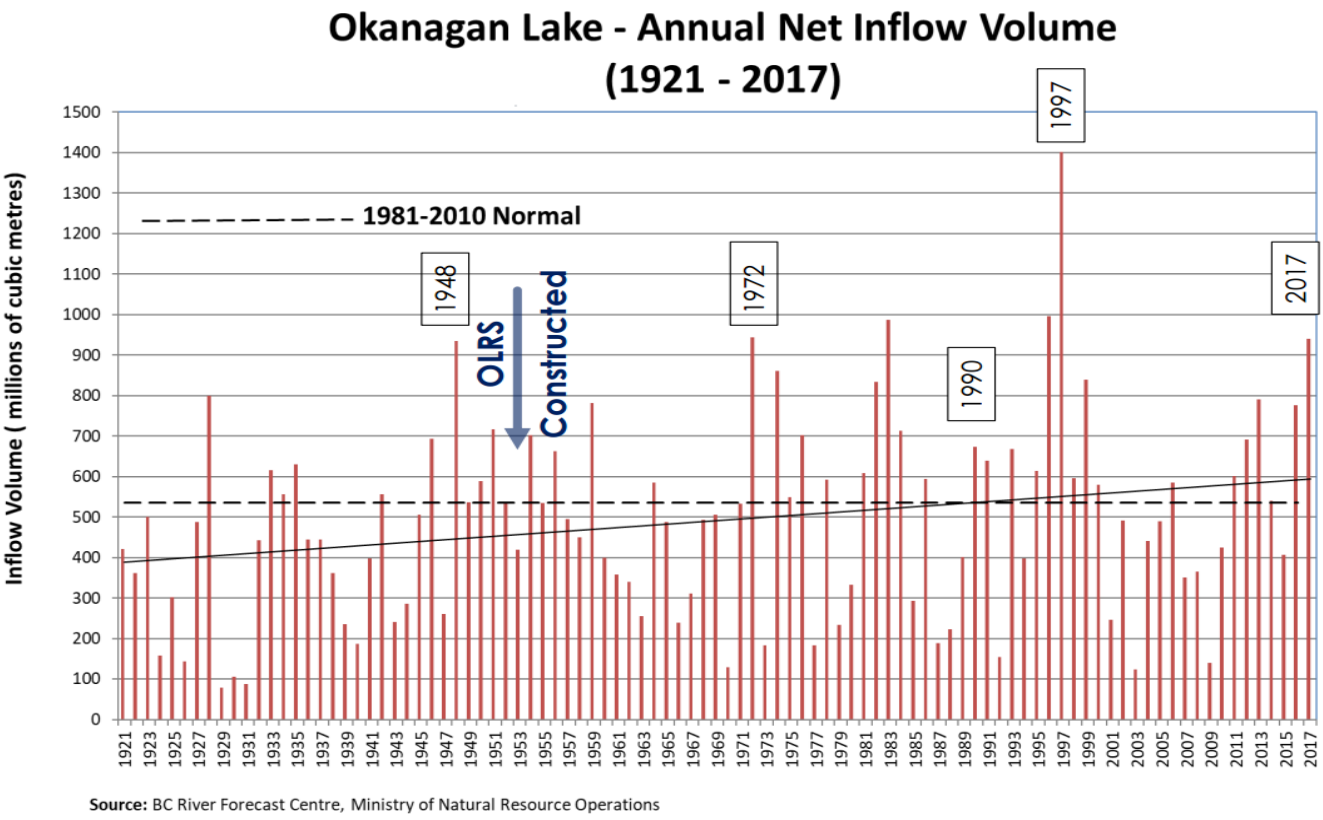


Photo 14: Dam, South End Okanagan Lake at Penticton, BC

4.0 DROUGHT FORECAST APPROACH

4.1 Forecast Parameters

The potential drought factors will be included in the forecast parameters, along with lake levels in the mainstem lakes (the OLRS). Also incorporating Provincial Drought Levels, and valley-wide embraced "Mainstem Drought Triggers" document completed by the OBWB, the matrix is expected to be a usable and important tool in addressing drought in the RDOS. Utilizing a decision matrix, provides justification and support decisions to move into more restrictive water restriction Stages in response to drought. At this writing, many Okanagan valley communities and regions are aligning as much as possible in 'Restriction Stages' messaging and Drought Plan implementation triggers.

4.2 Storage Levels

The RDOS uses upland storage as an emergency back up in Naramata, in the Chute, Naramata and Elinor Lake dams as a reservoir in the event of catastrophic failure of the lake based intake system – or extreme drought. The other RDOS systems are well based and storage is mainly in-ground and in reservoir capacity.

4.3 Federal and Provincial Forecast Agencies

4.3.1 Snowpack

Min of Forest Lands Natural Resource Operations and Rural Development (FLNRORD) monitors the annual snowpack and snow survey bulletins through the BC River Forecast Centre. Stream flows and snowpack surveys are available throughout the seasons on the RFC website

4.3.2 Temperature and Precipitation

RDOS Public Works monitors Environment Canada weather forecasts for both short and long-term temperature and precipitation expectations. Also, local weather stations combine statistics with Weather Underground that can track more localized microclimate conditions.

4.3.3 BC River Forecast Centre Bulletins

River flows are annual indicators of snow melt and environmental flow volumes in creeks and rivers in BC. BC RFC models streamflow conditions. The RDOS also keeps watch on creeks and rivers in the region and considers the forecast bulletins in the water restriction 'stages' decision matrix.

4.3.4 Provincial Declarations

Excerpted from BC Drought Plan 2016

The B.C. Drought Response Plan is organized around four successive levels of drought targeted at the water basin and watershed/stream levels. Early in the season, the drought level represents a forecast of potential dry conditions. The likelihood and extent of drought is assessed based, among other indicators, on stream flows and precipitation.

***At Level 1 (Green),** conditions are normal and there is sufficient water to support ecosystem and water uses. Emphasis is on preparedness and taking action in advance of droughts in order to increase readiness of water users and communities when they inevitably occur.*

***At Level 2 (Yellow) 10% Reduction** - conditions are dry and first indications of potential water supply shortages are recognized. Emphasis is on stewardship, voluntary conservation through education, communication and planning and possibly curtailing unauthorized use.*

At Level 3 (Orange) 20% reduction - *conditions are becoming very dry. Potentially serious ecosystem or socio-economic impacts are possible or imminent and impacts may already be occurring. Emphasis continues to be on voluntary conservation and restricting or curtailing unauthorized use, while water suppliers may impose increasing watering restrictions. If serious impacts are occurring in an area, the provincial government will likely consider regulatory action.*

At Level 4 (Red) Maximum reduction - *conditions are extremely dry and there is insufficient supply to meet community or ecosystem needs, progressively more severe and widespread socioeconomic impacts are expected. Voluntary measures and increasing use of watering restrictions will continue but may be augmented by regulatory action by the provincial government.See the BC Drought Response Plan at:*
https://www2.gov.bc.ca/.../drought.../drought_response_plan_revised_june_2018.pdf

Table 4 – Provincial Drought Levels

Level	Conditions	Significance	Objective
1 (Green)	Normal Conditions	There is sufficient water to meet human and ecosystem needs	Preparedness
2 (Yellow)	Dry Conditions	First indications of a potential water supply problem	Voluntary conservation
3 (Orange)	Very Dry Conditions	Potentially serious ecosystem or socioeconomic impacts are possible	Voluntary conservation and restrictions
4 (Red)	Extremely Dry Conditions	Water supply insufficient to meet socio-economic and ecosystem needs	Voluntary conservation, restrictions and regulatory action as necessary.

The RDOS takes into consideration, Provincial Drought Levels when executing the drought response and public education and water restriction 'stages.'

4.3.5 Customer Consideration Levels

The RDOS strives to provide plentiful, potable water to all citizens and water user sectors in all its water systems. The RDOS also liaises with neighbouring communities, agencies and organizations such as the Okanagan Basin Water Board to align purveyance priorities and messaging. The RDOS has harmonized water restriction regulations to be as synergistic as possible; which removes confusion for customers and allows water operations staff to manage infrastructure and water demand.

As the RDOS supplies the water it also must adhere to strict Interior Health Authority standards; in times of drought and flooding (turbidity potentials) further acts to inform safety precautions and procedures undertaken by Water Operations staff.

4.3.6 Decision Making Approach

The RDOS has implemented a multi –trigger decision making approach to dealing with drought or water shortages in RDOS systems. The main triggers will continue to be supply volume and infrastructure related. But, several other external factors will now be included in the decision making process. These will support the rationale of moving from one restriction stage to another or in imposing restrictions when drought conditions prevail.

The RDOS is moving forward in restriction stages to align with both the Province and other purveyors in the valley; as drought conditions dictate. Synergy and critical mass can have broader water management implications and bolster behaviour modification.

4.4 Decision Tree

The RDOS water systems fall into two categories: lake intake - surface water or well based - groundwater extraction.

The decision matrix for use by Operations staff are specific to each system. Each decision tree provides an ‘at a glance’ system profile and trigger points that assist the operator to judge where in the water restriction ‘Stages’ the system is operating. If thresholds begin to show the need to move to another Stage, then the Operator can contact the office and bulletins can be prepared in the event that the system moves into a more restrictive stage of water use or moves back out.

Lake Based:
The Lake based systems of Naramata and Sage Mesa will operate with the same decision tree, however, the West Bench system is supplied by the City of Penticton treated water, which is mainly drawn from Okanagan Lake. Therefore the decision tree will also include a column for advice or actions undertaken in the City of Penticton and coordination of efforts between the two operations has been and will be ongoing.

Well Based:

The Well based systems include Faulder, Olalla, Willowbrook and Sun Valley. Each of these systems is unique in the number of connections and equipment, as highlighted above in section 2.

Table 5 - Example of Lake Based System Matrix – Naramata

NARAMATA WATER SYSTEM

Okanagan Lake Level	System Demand Monthly	System Demand Daily	MacKay Reservoir	Arawana Reservoir	Juniper Reservoir	Environment Canada Long Range forecast https://goo.gl/zm3Beh	BC Drought Level Insert 1,2,3,4 https://goo.gl/Z3udMq	Annual Snowpack	Water Restriction STAGE
Lake surface ABS	Ave:	Peak:	Cap:	Cap:	Cap:			___% of norm	
343.66 FCL									STAGE NORMAL
						Favourable		Above Average	
Above Normal		Below Normal	Above Normal	Above Normal	Above Normal				
342.66	Below Normal					Unfavourable - Dry			
						No rain for 2 or more weeks			
342.55									
						Favourable			
Normal	Normal	Normal	Average level	Average Level	Average Level		insert	Average	
342.48						Unfavourable - Dry			
Full pool						No rain for 2 or more weeks			
342.2									
342.1									Message to 1
									STAGE 1
342.0	Above Normal					Favourable			
Below Normal		Above Normal	Below Normal	Below Normal	Below Normal			Below Average	Message to 2 begins
341.8						Unfavourable - Dry			STAGE 2
						No rain for 2 or more weeks			
						Favourable			Message to 3 begins
								Below Average	STAGE 3
									Message to 4 begins
Critical level									STAGE 4

Table 6 – Example of Draft Well Based System Matrix

SUN VALLEY WELL

Well Profile Tag# 83437 ID# 10048	Well Level Triggers	Demand *Monthly See chart below*	Demand Daily Supply & Infrastructure stressors	Reservoir 1 Level Supply & Infrastructure stressors	Environment Canada Long Range forecast https://goo.gl/zm3BeH	River Forecast Centre Drought Level https://goo.gl/Z3udMq	Annual Snowpack https://goo.gl/xshFao	Water Restriction STAGE
Top of well			Max 900,000	65,000 gal cap		Insert – 1,2,3,4		
0 ft/m								STAGE NORMAL
14 ft					Favourable			
28 ft							Above Average	
42 ft		Below Normal	Below Normal		Unfavourable - Dry			
56 ft					No rain for 2 or more weeks			
70 ft	Above Normal							
84 ft				Above Normal				
98 ft								
112 ft					Favourable			
126 ft	Normal	Normal	Normal	Normal		INSERT	Average	
140 ft	Static Level			Average level X	Unfavourable - Dry			Message to 1 begins
154 ft					No rain for 2 or more weeks			
168 ft								STAGE 1
182 ft	Below Normal							Message to 2 begins
196 ft							Below Average	STAGE 2
210 ft		Above Normal	Above Normal		Favourable			
224 ft				X Below Normal				Message to 3 begins
238 ft					Unfavourable - Dry			STAGE 3
252 ft					No rain for 2 or more weeks			Message to 4 begins
266 ft	PUMP 260'							STAGE 4
280 ft								

All trigger matrix tables in Appendix A

5.0 DROUGHT STAGES CONDITIONS

Describes the conditions under which the Drought response plan is triggered and implemented

5.1 Drought Stages

Normal – No Drought Year

This is defined as water sources being at or above target levels.

Stage 1 – Dry (Mild Drought)

This stage is representative of a mild drought condition. This has previously been stage 2 and therefore conservation messaging more targeted and continuous. Messaging would begin prior to moving into Stage 1.

Stage 2 – Very Dry (Moderate Drought)

This represents very dry conditions.

Stage 3 – Extremely Dry (Severe Drought)

Stage 4 – Emergency (Potential Loss of Water Supply) – leading to

Supply Failure

5.1.1 Drought Stages Restrictions and Rational: New Water Bylaw: Mar/19

Table 7 – New Water Use Regulations Bylaw Excerpt

RATIONALE	STAGE NORMAL	STAGE 1	STAGE 2	STAGE 3	STAGE 4
Description ***(to inform internal operations)***	**Normal:** Represents normal (i.e. average) conditions for local area. Water use restrictions focus on water use efficiencies and drought awareness.	**Potential Drought:** Primary objective is to inform the public of the potential for more severe drought to occur If early drought (drier than average) conditions for local area are occurring. Intent is to move into this stage earlier in a cycle so that the potential to move to more severe stages is reduced. Water use restrictions focus on water use efficiencies.	**Low Supply:** Represents low water supply conditions for local area or prolonged, moderate drought conditions are established. Water use restrictions are necessary to sufficiently reduce water demand to allow for sustainable supply and to meet environmental requirements.	**Very Limited Supply:** Represents very low water supply conditions. Water use restrictions are necessary to maintain supplies during a period of critical water shortage. If triggered by drought, represents severe drought conditions for local area and increased risk of wildfire.	**Critical:** Strict water use restrictions are necessary to maintain critical supply. No spare water is available. An emergency loss of supply during which water is spared for consumptive and sanitary purposes only. Fire protection may be compromised.
Goal ***(to inform internal operations)***	Efficient on-going water-use practices	Intended to roughly reduce total and peak use by 10%	Intended to roughly reduce total and peak use by 20%	Intended to roughly reduce total and peak use by 50%	Maintain Community Health Intended to roughly reduce total and peak use by 90%
Activation	Year-round for all systems (unless a higher stage is in effect)	At the discretion of RDOS* for each water system, refer to Appendix D1 and D2 in Schedule D for the specific systems	At the discretion of RDOS* for each water system, refer to appropriate Appendix	At the discretion of RDOS* for each water system, refer to appropriate Appendix	At the discretion of RDOS* for each water system, refer to appropriate Appendix

Stages restrictions and rational continued:

RESIDENTIAL	STAGE NORMAL	STAGE 1	STAGE 2	STAGE 3	STAGE 4
RESIDENTIAL **Established lawns, trees, shrubs, flowers, vegetables**	• 3 days/week between 6-10am and 6-10pm using any method on your watering day • A *Person* may water, using a hand-held container or hose • Nurseries, *Farms*, orchards, vineyards, turf *Farms*, and tree *Farms* are exempted • Use of harvested rainwater and Recycled Water are exempted	• 2 days/week between 6-10am and 6-10pm using any method on your watering day • A *Person* may water, using a hand-held container or hose • Nurseries, *Farms*, orchards, vineyards, turf *Farms*, and tree *Farms* are exempted • Use of harvested rainwater and Recycled Water are exempted	• 1 days/week (Sat or Sun) between 6-10am and 6-10pm for *Manual* or automatic *Sprinklers* • 2 days/week between 6-10am and 6-10pm for hand-held containers or hoses with shut-off, or *Micro-irrigation* or Drip-irrigation systems • No lawn watering • Nurseries, *Farms*, orchards, vineyards, turf *Farms*, and tree *Farms* are exempted • Use of harvested rainwater and Recycled Water are exempted	• 1 day/week (Sat or/Sun) between 6-10am and 6-10pm only for hand-held containers or hoses with shut-off, or *Micro-irrigation* or Drip-irrigation systems • No lawn watering • Nurseries, *Farms*, orchards, vineyards, turf *Farms*, and tree *Farms* are exempted • Use of harvested rainwater and Recycled Water are exempted	• Not permitted
RESIDENTIAL **Newly planted sod, trees, shrubs, flowers, and vegetables**	• Any day at any time using any method for the first 49 days after installation for seeded lawns • Any day at any time for the first 21 days after installation for everything else that is newly planted • Watering allowances in the row above will apply after the establishment period	• Any day at any time using any method for the first 49 days after installation for seeded lawns • Any day at any time for the first 21 days after installation for everything else that is newly planted • Watering allowances in the row above will apply after the establishment period	• 4 days/week at any time by any method for first 49 days after installation for seeded lawns • 4 days/week at any time using any method for the first 21 days after installation for everything else that is newly planted • Watering allowances in the row above will apply after the establishment period	• Not permitted	• Not permitted
RESIDENTIAL **Outdoor Cleaning (e.g. driveways, sidewalks, patios, decks, cars, boats, ATV, etc.)**	• Any day, using any means, provided it does not result in Excess Water Use** • Use a broom or hose with a spring loaded *Shut Off* nozzle	• 2 days/week, using any means, provided it does not result in Excess Water Use** • Cleaning required to comply with health & safety regulations and use of water to apply product (e.g. paint) are exempted • Use a broom or hose with a spring loaded *Shut Off* nozzle	• Washing or cleaning with a hose and spring-loaded nozzle as necessary for health and safety reasons only • Washing for aesthetic purposes	• Not permitted • Washing or cleaning with a hose and spring-loaded nozzle as necessary for health and safety reasons only • Washing for aesthetic purposes	• Not permitted • Cleaning required to comply with health & safety regulations exempted with permission from a regulatory authority; i.e., IHA, public health officer, WCB
RESIDENTIAL **Topping up, filling/refilling pools, hot tubs, garden ponds/ water features**	• Any day at any time for volumes <40,000 litres • 24 hr notice must be received by RDOS for volumes >40,000 litres	• Any day at any time for volumes <40,000 litres • Prior authorization from RDOS required for volumes >40,000 litres •	• Any day between 10am – 3pm • for volumes <40,000 litres • Prior authorization from RDOS required for volumes >40,000 litres	• Prior authorization from RDOS required for all volumes •	• Not permitted

Stages restrictions and rational continued:

COMMERCIAL	STAGE NORMAL	STAGE 1	STAGE 2	STAGE 3	STAGE 4
COMMERCIAL **Public, *Commercial*, or *institutional* playing fields, cemeteries, *Parks*, or Boulevards**	• 3 days/week at any time using any method • Exemption may apply with approved Water Conservation Strategy	• 2 days/week using any method • Exemption may apply with approved Water Conservation Strategy	• 2 days/week at any time for hand-held containers hoses with shut-off, or *Micro-irrigation* or Drip-irrigation systems • 1 day/week between 6-10am & 6-10pm for *Manual* or automatic *Sprinklers* • Exemption may apply with approved Water Conservation Strategy	• 1 day/week at any time only for hand-held containers or hoses with shut-off, or *Micro-irrigation* or Drip-irrigation systems • Exemption may apply with approved Water Conservation Strategy	• Not permitted
COMMERCIAL **Golf course watering**	• Any day for fairways, tees & greens day (using *Manual Sprinklers* between 6-10am & 6-10pm • automatic *Sprinklers* between 12-6am or, • *Micro-irrigation* or Drip-irrigation System at any time) • Exemption may apply with approved Water Conservation Strategy	• 5 days/week for tees & greens • 3 days/week for fairways (manual *Sprinklers* between 6-10am & 6-10pm or, • automatic *Sprinklers* between 12-6am • a *Micro-irrigation* or Drip-irrigation System at any time) • Exemption may apply with approved Water Conservation Strategy	• 3 days/week for greens and tees • 1 day/week for fairways (using *Manual Sprinklers* between 6-10am & 6-10pm • automatic *Sprinklers* between 12-6am, or *Micro-irrigation* or Drip-irrigation System at any time) • Exemption may apply with approved Water Conservation Strategy	• Fairway watering not permitted • 1 day/week for tees & greens (using *Manual Sprinklers* between 6-10am & 6-10pm • automatic *Sprinklers* between 12-6am, or *Micro-irrigation* or Drip-irrigation System at any time) • Exemption may apply with approved Water Conservation Strategy	• Not permitted

UTILITY WORKS	STAGE NORMAL	STAGE 1	STAGE 2	STAGE 3	STAGE 4
UTILITY WORKS **Maintenance & flushing of hydrants, repair & testing of Water-works**	• Any day & any time	• Any day & any time	• Any day & any time	• Only for non-routine activities required for public health and safety purposes	• Only for non-routine activities required for public health and safety purposes

AGRICULTURE	STAGE NORMAL	STAGE 1	STAGE 2	STAGE 3	STAGE 4
Agricultural Water Use	• No restrictions	• No restrictions	• No restrictions • Voluntary reductions in water use encouraged (operational policy detail)	• 2 day/ week using impact style irrigation heads, between 6am-10am, & 6pm-10pm, or • automatic *Sprinklers* between 12-6am • *Micro-Irrigation* or drip-irrigation at any time • Exemption may apply with approved Water Conservation Strategy	• Outdoor water use prohibited except to sustain livestock and for the minimal maintenance needs of perennial fruit trees used for *Commercial* production.

6.0 DROUGHT PLAN IMPLEMENTATION (RESPONSE PLAN)

This section outlines the staged approach to water system management and defines the roles of the water supplier and users during Drought

6.1 Regional Drought Response Team – *anticipated*

The RDOS Drought Response Team will consist of members from RDOS Water Operations and the other municipal purveyors, representation from the Small Water Systems associates in the South Okanagan, IHA, FLNRORD, Indigenous local water advisory committees, and agricultural representation ground crops, tree fruits and grapes. By asking local water advisory committees to be involved provides the resident/public representation and participation. **See Appendix A**

Table 8 – Regional Drought/Flood Team

Regional Drought Flood Team Members	**Representing -**
RDOS 3	8 systems
Municipal suppliers (up to 6)	Keremeos, Oliver, Osoyoos, Penticton, Princeton, Summerland,
Small Water Systems (up to 2)	i.e. Kaleden, OK Falls, Hedley, LNID, or Small Water Systems Association representative
IHA (1) or (2)	Small Water Systems and/or water quality representative
FLNRORD (1)	Water Management Branch representative
Indigenous – ONA or local Band representation (up to 5)	4 Band water systems – Osoyoos, Upper/Lower Similkameen, Penticton
Local Water Advisories (up to3)	Faulder, Naramata, Willowbrook
Agriculture Producers (up to 4)	Ground crop, tree fruits, grapes, livestock

Table 9 – Internal Staff Implementing Drought Plan - implemented

Internally, the staff that are responsible for implementing drought response are:

Personnel	**Actions**	**Task**
Public Works Manager (PWM)	Implements Drought Plan	Advises on Restrictions – decision tree and consultation
Environmental Technologist (ET)	Responds to water system operators; monitors observation wells, lake levels and environmental conditions	Samples and implements water quality notices and advises staff of current conditions
Water System Supervisor (WSS)	Works directly with operators and water systems	Advises on implementation of conservation or system support measures or needs
Public Works Clerks and inside staff	Take direction from the PWM, WSS, ET and UO	Places messaging and sends notifications as required
Utility Operators (UO)	All facets of Water system operations	Provide information from the field and supports the implementation of activities in communities, with residents, i.e., if door to door action or signage is required

6.2 Communications

The existing communications plan will be augmented as a result of the recently harmonized Water Regulations Use Bylaw (restrictions), a campaign to educate residents implemented spring 2019. Messaging and implementation is referred to in the System Restrictions and Rationale in Section of the Bylaw: https://www.rdos.bc.ca/departments/public-works/utilities/water-systems/

Annual cycle for ongoing and basic communications to water system users:

1. January – March
    a. In an annual mail out, electronic messaging and print advertising, the RDOS provides dates for agricultural turn on and notification of Stage Normal.
2. April
    a. Agricultural turn on re-iteration of messaging
    b. Stage and newsletters to system users
3. May - to - September
    a. Notices of drought, flooding, water quality, quantity messaging
    b. If newsletters go out, any water management workshops or water restriction info is re-iterated
    c. If restrictions are warranted, Civic Ready, electronic media (Facebook and Web Site) messages are implemented (see examples of Civic Ready messages)
4. September
    a. Agricultural turn off notices are mailed, and placed on electronic media
    b. Information on the system is included in the mailers

- Water system users also receive annual reports and they include usage numbers, system performance, upgrades or maintenance information.

- Quarterly utility bills in Naramata and West Bench provide an added component to messaging possibilities.

- West Bench and Naramata have community web sites or Face Book sites where immediate or timely information on drought or restriction stages will be posted.

If the situation arises where the system operator is considering moving from one restriction stage to another, the template gives enough time for 'pre-warning' messages to be delivered through the main office – Public Works Dept. These messages can be pushed out quickly and effectively through Civic Ready and local media channels.

The RDOS has implemented a mass notification system called 'Civic Ready.' This system allows for immediate notification to residents through multi-media channels in the manner they choose to receive information from the Operations Dept.

Communications Plan in Appendix B
Civic Ready Message Examples in Appendix C

6.3 Monitoring and Supply Planning

Monitoring several sources of information will assist operations managers and staff to manage the supply in each water system. They have the discretion to use and apply a degree of importance to each of the available data sets. Lake levels will play a more prominent role in lake intake systems, whereas snowpack and river flows may affect well based systems more directly.

Okanagan Lake Levels: are measured at a monitoring station in Kelowna. Lake levels can be checked regularly - https://wateroffice.ec.gc.ca/report/real_time_e.html?stn=08NM083

Okanagan River Flows: flows from Okanagan Lake through to Osoyoos Lake and into the Columbia Basin. It forms part of the managed Okanagan Lake Regulation System (OLRS) and flows are maintained to required minimums for aquatic sustainability and riparian health. In the Provincial drought Level 4 conditions, late summer 2015, flows did not fall below required minimums. However, monitoring the flow volumes will be included in the decision matrix.

Ground Water Levels: in addition to close monitoring of RDOS owned and operated water systems with groundwater wells, the RDOS monitors the Provincial Observation Wells that are in proximity those systems. As situations dictate, the monitoring of wells and operations of infrastructure in response to demand are stepped up in frequency. Groundwater conditions will be a topic at each of the Regional Drought/Flood Team meetings – so an annual supply and post-season conditions can be assessed and assist in operational planning decisions. Provincial Observation Wells data can be found at: http://www.env.gov.bc.ca/wsd/data/_searches/obswell/map/

BC River Forecast Centre: utilizing data from BCRFC is important for considering localized flood response, and in dry years, the effects on water systems as river levels and volumes drop. For local river volumes and flow rates: https://goo.gl/zm3Beh

Annual Snow Pack levels: the RDOS operations staff closely monitors annual snow packs and how levels may impact availability of supply in lean snow years. Or, if freshets come too early or too quickly how these can affect systems, operators can make adjustments or raise concerns for system safety. The ERPs address this in more detail. Data can be found at: https://goo.gl/xshFao

Environment Canada Weather Forecast: long range weather forecasts are a part of the decision matrix in informing whether a system needs to contemplate moving up (or down) a Stage if weather models predict precipitation expectations. Operators look at this in concert with the other monitoring platforms. Link to data at: https://goo.gl/zm3Beh

6.4 Operational Measures

Surface Water Sources (Okanagan Lake): if severe shortages, extreme events or lake levels decline to critical levels impacting supply, the RDOS will have been messaging and attempting to reduce demand for some time prior to the critical drought level of 341.4m above sea level. The new RDOS Water Restrictions have taken into account drought 'levels' in the lake in the development of the restriction Stages; the severity of restrictions and in anticipation of having to shut down or restrict access to potable water. The Naramata system which supplies all sectors, would require the most critical attention, actions and communications. However, Sage Mesa would be following in lockstep with Naramata.

Groundwater Sources: if severe low levels are being experienced in one of the well based water systems, messaging to users to reduce demand would have commenced before critical levels are being observed. Discussions regarding safeguarding infrastructure, operational responsibilities to outside authorities will be ongoing.

The RDOS Emergency Response Plans (ERPs) for each water system include detailed operational actions in these extremes including alternate sources or trucking.

6.5 Demand-side Measures (Water Use Bylaws and Sprinkling Regulations)

In late 2018, the RDOS passed new Water regulations Bylaws. The new Bylaws have harmonized as much as possible all the systems operated by the RDOS. They also align more closely to a valley-wide push for synergistic sprinkling regulations, verbiage and rationales.

7.0 DROUGHT PLAN UPDATES

Traditionally, drought declarations and water restriction stages were enacted by experienced water operators observing local data and responding accordingly. Climate change and irratic weather have compounded the difficulty on water operators to assess and recommend actions. The RDOS has now incorporated a series of variable drought triggers, which will assist Water Operations to assess and defend water restrictions and messaging to the public on drought and the conditions in their water system.

The RDOS drought stress indicators are specific to each system and are now augmented by several added indicators or triggers. The Drought triggers presented in Section 5.0 have been researched and recommended by the Okanagan Basin Water Board's team of experts. In addition, indicators from BC River's Forecast Centre, local snowpack levels, Environment Canada and Provincial Observation well data all factor into the new decision making process.

This new system will need to be tested and evaluated for effectiveness. It is important for these plans to be consistent and a useful tool for operations staff. The triggers and stages of water restrictions must be reasonable and used mindfully, to avoid water users ignoring declarations and disregarding the importance of water conservation during drought or system conditions.

Therefore, the RDOS should review these plans on a regular ongoing basis. Feedback to the OBWB should be included in the review process. Any relevant anecdotal information, new trigger/indicators or systems information should be provided or discussed with other partners in water conservation such as the OBWB or regional Drought Team meetings.

8.0 RECOMMENDATIONS (AND OR REFERENCES)

This section includes any recommendations that surface during the preparation of the plan

8.1 Filling Data Gaps

During the development of the plan, data gaps were identified.

1. Census population data is outdated, and the projected population increases of 3% per annum (RDOS Regional Growth Strategy) has not taken place, and in some cases actually reduced. More accurate data is expected with the reintroduction of the more detailed Federal Census.

2. Well profile information discrepancies or missing data. When inheriting systems, often data such as what depth the pump and level sensors are located in the well is inaccurate or missing. This means that judging freeboard for operational decisions can be difficult or skewed. If work is undertaken at the wellhead, the pump pulled or serviced, this data will be obtained.

3. Well Tag and ID number. The new well at Willowbrook seems to have been assigned (at the time) the old well ID's. The RDOS is rectifying this through the well registration process ongoing in 2019

4. Future Population statistics and affects of climate change on human migration; especially sudden disasters predicating quick movement of populations away from uninhabitable areas is being considered as part of the Regional Growth Strategy and through the Emergency Planning for the district. As these studies are completed, results or recommendations will inform and trigger updates or modifications to this document and water system ERPs.
    a. The Okanagan Climate Projections Report (PINNA 2019), and selected, OCP's will both be informed by this Drought Plan and inform updates to the plan.

5. Gaps as identified through the Drought Flood Rick Mitigation and Management Gap Analysis by Associated Environmental are to be added to Public Works operations or Emergency Management work plans. The Analysis and summary can be found in:
   EDMS – under Public Works teamsite,in 5260 under Reports - All, folder named: **PW_2017_Gap_Anal_Drought_Flood_AE**
    - This analysis is a companion and integral to the development of this Drought Plan'

9.0 APPENDIXES

9.1 Appendixes

APPENDIX A – Water System Decision Matrix(s)

FAULDER WELL

Well Profile Tag# 111310 ID# 41800	Well Level Triggers	Demand *Monthly See chart below*	Demand Daily Supply & Infrastructure stressors	Reservoir Level Supply & Infrastructure stressors	Environment Canada Long Range forecast https://goo.gl/zm3BeH	River Forecast Centre, BC Drought Level https://goo.gl/Z3udMq	Annual Snowpack https://goo.gl/xshFao	Water Restriction STAGE
Top of well			Max 486 m³	40,000 gal cap		Insert 1,2,3,4	Add percentage	
0 ft/m							Above Average	STAGE NORMAL
16 ft					Favourable			
32 ft								
48 ft		Below Normal	Below Normal		Unfavourable - Dry			
64 ft					No rain for 2 or more weeks			
96 ft	Above Normal							
112 ft				Above Normal				
128ft								
144 ft					Favourable			*Message to 1 begins*
160 ft	Static Normal	Normal	Normal	Normal		INSERT	Average	
176 ft	PUMP 27'			Average level	Unfavourable - Dry			
192 ft					No rain for 2 or more weeks		Below Average	STAGE 1
208ft	Below Normal							*Message to 2 begins*
224 ft		Above Normal	Above Normal		Favourable			
240ft				Below Normal				STAGE 2
256 ft					Unfavourable - Dry			*Message to 3 begins*
272 ft					No rain for 2 or more weeks			
286 ft								STAGE 3
302 ft								*Message to 4 begins*
312 ft								STAGE 4
317 ft								

OLALLA WELL

Well Profile Tag# 82378 ID# 28561	Well Level Triggers	Demand *Monthly See chart below*	Demand Daily Supply & Infrastructure stressors	Reservoir Level Supply & Infrastructure stressors	Environment Canada Long Range forecast https://goo.gl/zm3BeH	River Forecast Centre, BC Drought Level https://goo.gl/Z3udMq	Annual Snowpack https://goo.gl/xshFao	Water Restriction STAGE
Top of well			Max 1,765 m³	100,000 USg cap		Insert 1,2,3,4	Add percentage	
0 ft/m							Above Average	STAGE NORMAL
10 ft					Favourable			
15 ft								
20ft		Below Normal	Below Normal		Unfavourable - Dry			
25ft					No rain for 2 or more weeks			
30ft	Above Normal							
35ft				Above Normal				
40ft								
45 ft					Favourable			*Message to 1 begins*
50ft	Normal	Normal	Normal	Normal		INSERT	Average	
60ft	Static Level			Average level	Unfavourable - Dry			
70 ft	PUMP 70'				No rain for 2 or more weeks			STAGE 1
75ft	Below Normal							*Message to 2 begins*
80 ft							Below Average	
85ft		Above Normal	Above Normal		Favourable			STAGE 2
90 ft				Below Normal				*Message to 3 begins*
95 ft					Unfavourable - Dry			
125 ft					No rain for 2 or more weeks			STAGE 3
135 ft	Screen at 136'							*Message to 4 begins*
145 ft								STAGE 4
155 ft								

SUN VALLEY WELL

Well Profile Tag# 83437 ID# 10048	**Well Level Triggers**	**Demand** *Monthly See chart below*	**Demand** Daily Supply & Infrastructure stressors	**Reservoir 1 Level** Supply & Infrastructure stressors	Environment Canada Long Range forecast https://goo.gl/zm3BeH	River Forecast Centre Drought Level https://goo.gl/Z3udMg	**Annual Snowpack** https://goo.gl/xshFao	**Water Restriction STAGE**
Top of well			Max 900,000	65,000 gal cap		Insert – 1,2,3,4		
0 ft/m								STAGE NORMAL
14 ft					Favourable			
28 ft							Above Average	
42 ft		Below Normal	Below Normal		Unfavourable - Dry			
56 ft					No rain for 2 or more weeks			
70 ft	Above Normal							
84 ft				Above Normal				
98 ft								
112 ft					Favourable			
126 ft	Normal	Normal	Normal	Normal		INSERT	Average	
140 ft	Static Level			Average level X	Unfavourable - Dry			*Message to 1 begins*
154 ft					No rain for 2 or more weeks			
168 ft								STAGE 1
182 ft	Below Normal							*Message to 2 begins*
196 ft							Below Average	STAGE 2
210 ft		Above Normal	Above Normal		Favourable			
224 ft				X Below Normal				*Message to 3 begins*
238 ft					Unfavourable - Dry			STAGE 3
252 ft					No rain for 2 or more weeks			*Message to 4 begins*
266 ft	PUMP 260'							STAGE 4
280 ft								

WILLOWBROOK WELL

Well Profile Tag# XXX ID# XXX	**Well Level Triggers**	**Demand** *Monthly See chart below*	**Demand** Daily Supply & Infrastructure stressors	**Reservoir Level** Supply & Infrastructure stressors	Environment Canada Long Range forecast https://goo.gl/zm3BeH	River Forecast Centre, BC Drought Level https://goo.gl/Z3udMg	**Annual Snowpack** https://goo.gl/xshFao	**Water Restriction STAGE**
Top of well			Max 1,551 m³	28,000 gal cap		Insert 1,2,3,4	Add percentage	
0 ft/m							Above Average	STAGE NORMAL
2.6 ft					Favourable			
5.2 ft								
7.8 ft		Below Normal	Below Normal		Unfavourable - Dry			
10.4 ft					No rain for 2 or more weeks			
12.6 ft	Above Normal							
15.2 ft				Above Normal				
17.8ft								
20.4 ft					Favourable			*Message to 1 begins*
23ft	Static Normal	Normal	Normal	Normal		INSERT	Average	
25.6 ft	PUMP 27'			Average level X	Unfavourable - Dry			
28.2ft					No rain for 2 or more weeks		Below Average	STAGE 1
30.8 ft	Below Normal							*Message to 2 begins*
33.4 ft		Above Normal	Above Normal		Favourable			
36 ft				X Below Normal				STAGE 2
38.6 ft					Unfavourable - Dry			*Message to 3 begins*
41.2 ft					No rain for 2 or more weeks			
43.8 ft								STAGE 3
46.4ft								*Message to 4 begins*
49.5ft								STAGE 4
51.5 ft								

9.1.1 APPENDIX B – Communication Plan

Drought Management Communications Plan (2018)	NORMAL	STAGE 1	STAGE 2	STAGE 3	STAGE 4
Explanation of Supply Status:	Average Water Storage Available. On going water conservation education and practising efficient water use. Strive to maintain , not exceed , average summer usage.	Drought in early stage where there is heightened awarness by the community. Potential increased drought conditions may mean earlier information to public. Reduce Impact to customers with early warning.	Represents low water supply conditions for local area. Water use restrictions are necessary to sufficiently reduce water demand. Intended to reduce water use by roughly 20%. If triggered by drought, represents moderate drought conditions.	Represents very low water supply conditions. Water use restrictions are necessary to maintain supplies during a period of critical water shortage. Intended to reduce water use by roughly 50%. If triggered by drought, represents severe drought conditions for local area.	Strict water use restrictions are necessary to maintain critical supply. Intended to reduce water use by 90%. Represents an emergency loss of supply during which water is spared for consumptive and sanitary purposes only.
Goal:	Promote demand management initiatives to support long term water efficiency.	10% reduction in total and peak flow. Implement short and long term strategies to ensure existing supplies last and do not further decrease to a unsustainable level.	20% reduction in total and peak flow. Implement short term strategies to ensure existing supplies last and do not further decrease to a unsustainable level.	50% reduction in total and peak flows to maintain critical supply levels. Implement short term strategies to ensure existing supplies last and do not further decrease to a unsustainable level.	90% reduction in total and peak flows to maintain critical supply levels. Maintain minimum water supplies needed to support basic community health and sanitation.
Public messaging and Communication: What is our Message? Water System Specific	Customers should strive to be efficent water users.	Avoid worse restrictions by taking steps now to be more efficient water users. Voluntary ask for 10% reduction is water consumption; tips and links	Communicate likelihood/risk of needing to increase to a higher stage. Avoid worse restrictions by taking steps now to be more efficient water users. Supply 'Here's How to reduce consumption by 20%" tips and links	Communicate likelihood/risk of needing to increase to a higher stage. Avoid worse restrictions by taking steps now to be more efficient water users. Set goals such as: "Reduce consumption by 50%"	Community Emergency - work with PEP (if deemed appropriate) to coordinate and ensure customers are aware of emergency supply options to ensure basic/hygeine needs met.
	Make Water Work - OBWB Campaign. E.G. lawns usually only need an inch per week of water.	Ensure strategies do not create undue economic hardship. Efforts made now to change behaviour may even save money in long term.	Short term hardship now will help us get through in the long term.	Recognition that restrictions may cause some hardship and that certain water uses have to be prioritized for the good of the community. Efforts made now will save water in long term.	RDOS recognizes hardship and appreciates the community's efforts.
		Increase awareness of what is causing supply situation - drought, infrastructure issues, etc.	Increase awareness of what is causing supply situation - drought, infrastructure issues, etc.	Increase awareness of what is causing supply shortage situation - drought, infrastructure issues, etc.	Increase awareness of what is causing supply shortage situation - drought, infrastructure issues, etc.
		Communicate likelihood/risk of needing to increase to a higher stage.	RDOS recognizes hardship and appreciates the community's efforts.	RDOS recognizes hardship and appreciates the community's efforts.	RDOS recognizes hardship and appreciates the community's efforts.
Modes of Message:	CivicReady first of the year message, annual spring mailer, and messaging in relevant water system newsletters	Pre Stage Warning: CivicReady and voluntary reduction of 10%, Facebook, RDOS website (in the water system sections affected) Stage 1 - CivicReady, Signboards on roadside, Facebook and website - inserts in utility bills or mailers if able	Pre Stage Warning: CivicReady and voluntary reduction of additional 20%, Facebook, RDOS website (in the water system sections affected) Stage 2 - CivicReady, Signboards on roadside, Facebook and website - inserts in utility bills or mailers if able	Pre Stage Warning: CivicReady and voluntary reduction of additional 20% for a 50% reduction, Facebook, RDOS website (in the water system sections affected) Stage 3 - CivicReady, Signboards on roadside, Facebook and website - inserts in utility bills or mailers if able, TV, Radio, print and electronic news	Pre Stage Warning: CivicReady water systems nearing Stage 4 a crisis stage, Facebook, RDOS website (in the water system sections affected) Stage 4 - CivicReady, Signboards on roadside, Facebook and website - inserts in utility bills or mailers if able, TV, Radio, print and electronic news, direct contact, door-to-door
Water Utility Actions:	Communicate Normal year-round restrictions online and at public events, but focus message on how people should use water, not why they can't use water.	Implement Stage 1 Water Use Restrictions and communicate change in stages in local media & online, as well as jurisdictional partners.	Implement Stage 2 Water Use Restrictions and communicate change in stages in local media & online, as well as jurisdictional partners, major water users, and sensitive customers (i.e. Hospital).	Implement Stage 3 Water Use Restrictions and communicate change in stages in local media & online, as well as jurisdictional partners, major water users, and sensitive customers (i.e. Hospital).	Implement Stage 4 Water Use Restrictions and communicate change in stages in local media & online, as well as jurisdictional partners, major water users, and sensitive customers (i.e. Hospital).
	Publish educational materials targeted to high water use activities via media, public events, online.	Analyze water use (meter data) to determine possible high water users. Publish educational materials targeted to high water use activities via media, public events, online.	Increase frequency of media and Public Serve Announcements (PSAs). Insure frontline staff are able to answer questions from public. Directly contact high water use customers (if possible) and ask for support in curbing consumption.	Increase frequency of media and Public Serve Announcements (PSAs). Insure frontline staff are able to answer questions from public. Directly contact high water use customers (if possible) and ask for support in curbing consumption.	Increase frequency of media and Public Serve Announcements (PSAs). Insure frontline staff are able to answer questions from public. Directly contact high water use customers (if possible) and ask for support in curbing consumption.

Drought Management Communications Plan (2018)	NORMAL	STAGE 1	STAGE 2	STAGE 3	STAGE 4
	Research Best Management Practices (BMP) for water efficiency as per DMP recommendations.	Meet with municipal partners to ensure municipal staff are implementing restrictions in public facilities and investigate concerns.	Target efforts at high (inefficient) water users within major water use sectors, based on metered use data analysis.	Target efforts at major water users (use largest % of supply) if identifiable, and communicate priorities for supply use.	Advertise to public options for short-term supplemental supply sources to meet basic needs.
	Seek out opportunities to promote water efficiency through public events, speaking engagements, children's activities.	Seek out opportunities to promote water efficiency through public events, speaking engagements, children's activities.	Seek out opportunities to promote water efficiency through public events, speaking engagements, children's activities.	Investigate alternative water sources for short-term supply supplementation and message out.	Meet with customers with critical water needs (e.g. medical patients, hotels) and assess supply options. Enact alternative water sources for short-term
Water Utility Actions:	If available, any PW staff will aid in restriction complaint response, otherwise will be part of regular staff duties.	Increase enforcement activities - increase time alloted to staff for monitoring and complaint response.	Increase enforcement activities - increase time alloted to staff for monitoring and complaint response.	Increase enforcement activities - increase time alloted to staff for monitoring and complaint response.	Increase enforcement activities - increase time alloted to staff for monitoring and complaint response.
		Focus residential/commercial education efforts on minimizing outdoor water use so to avoid higher stages.	Work with partners to ensure staff (in other municiaplities) and other purveyors are implementing restrictions in public facilities and discuss options if conditions are expected to deterioate further. Contact public institutions - School District, Interior Health, etc. Encourage those agencies to put out media releases and/or signs to note their actions	Increase enforcement effort - Continue to work with partners to ensure staff (in other municiaplities) and other purveyors are implementing restrictions in public facilities and discuss options if conditions are expected to deterioate further. Contact public institutions - School District, Interior Health, etc. Encourage those agencies to put out media releases and/or signs to note their actions	Increase enforcement effort - Continue to work with partners to ensure staff (in other municiaplities) and other purveyors are implementing restrictions in public facilities and discuss options if conditions are expected to deterioate further. Contact public institutions - School District, Interior Health, etc. Encourage those agencies to put out media releases and/or signs to note their actions
		Monitor supply status and demand levels, as per DMP, to determine if necessary to move to Stage 2	Monitor supply status and demand levels, as per DMP to determine if necessary to move to Stage 3	Monitor supply status and demand levels, as per DMP, to determine if necessary to move to Stage 4	Monitor supply status and demand levels, as per DMP, to determine necessary actions to save system from failure
			Investigate posting "Water Supply Shortage Graphic" (rainbow reservoir) in public locations. This may include, but not be limited to, billboard signs, sandwich board/A-Frame signs (utilizing frames held by municipalities for this purpose), digital information signs at arenas or on highways.	Implement signage as listed under Stage 2 with updated Stage information	Implement signage as listed under Stage 2 with updated Stage information

9.1.2 APPENDIX C - Civic Ready – Mass Notification Message Examples

Civic Ready Examples of Text or Text to Voice messaging
The program is most beneficial using short succinct messages. Attachments are easily added to emails, and links into texts. Voice to landline phone will spell out web links. Therefore, main messages are kept as short as possible – to suit all formats – email attachments and links will vary by severity or Water Restriction Stage

Stage Normal year round:
The RDOS reports NORMAL conditions, but asks that you make efficient water use a priority. Learn How Here: (link) A website with tips and ways to maximize water savings (for email an attachment for Best Management Practices)

Warning Text – *potential to move to Stage 1*:
The RDOS reports that the demand for water in your system and current weather (or XXX) conditions indicate that a move to Stage 1 restrictions may be required. In order to prepare for this, through voluntary water conservation to avoid this measure, consider reducing water use by 10 % or more. Learn How Here: link

Stage 1:
The RDOS is experiencing XXXXX or hot/dry conditions which can trigger a drought or water shortage. Residents are asked to reduce water use by 10% immediately.
Learn How Here: link

Warning Text - *potential to move to Stage 2*:
The RDOS reports that the demand for water in your system is continuing to be higher than normal, and current weather (or XXX) conditions indicate that a move to Stage 2 may be required. In order to prepare for this, through water conservation to avoid this measure, consider reducing water use by 20 % or more. Learn How Here: link

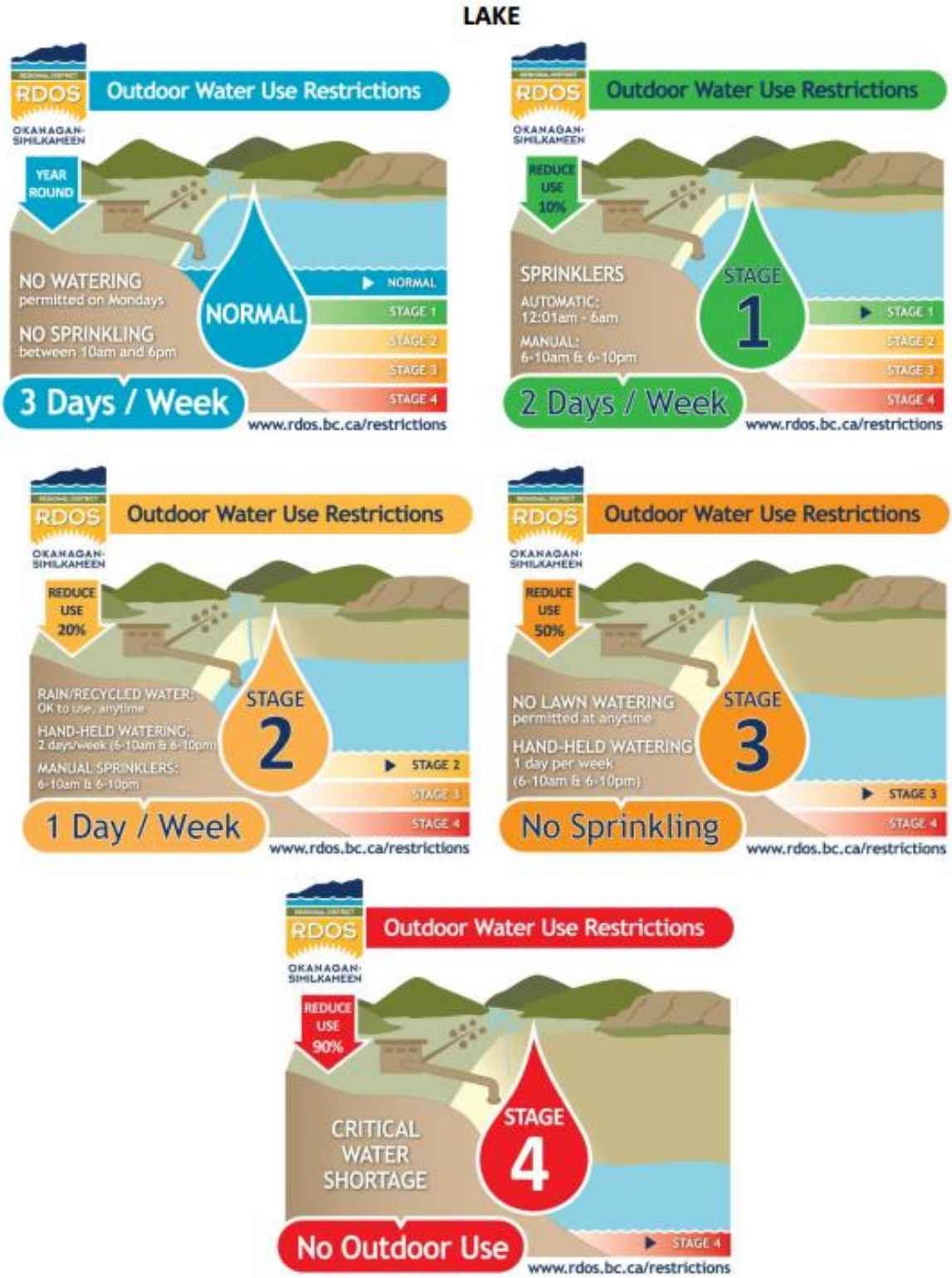
Stage 2:
The RDOS reports your area is continuing to experience dry conditions, elevated demand for water by users (and XXXXX). We ask that a voluntary 20% reduction in water use begin immediately. Learn How Here: link

Warning Text - *potential to move to Stage 3*:
The RDOS Operations reports your water system is continuing to experience extreme drought conditions, elevated demand for water by users (and XXXXX). We ask that a voluntary 50% reduction in water use begin immediately in efforts to avoid stressing the system further and to avoid a Stage 3 watering restrictions.
Learn How Here: link

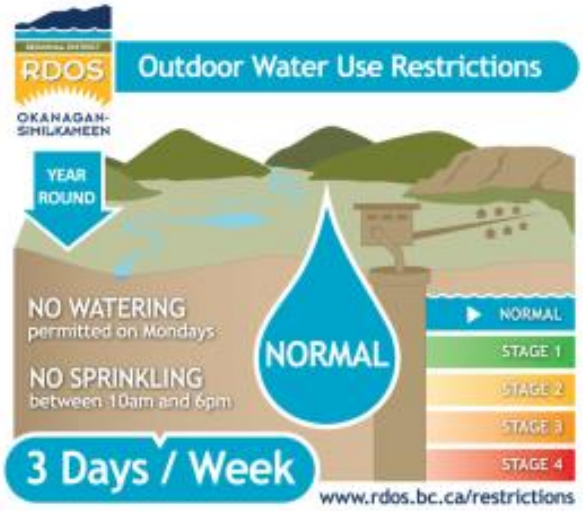
Stage 3:
The RDOS reports your area is continuing to experience dry conditions, elevated demand for water by users even with restrictions and conservation by users (or XXXXX). Long range indications are not favourable for a return to normal conditions. We ask that a 50% reduction in water use begin immediately. Learn How Here: link

Note: *Text messages are the litmus test for clarity and foundational messaging – but in addition, the following graphics were designed to be used in ads, emails and web site messaging*

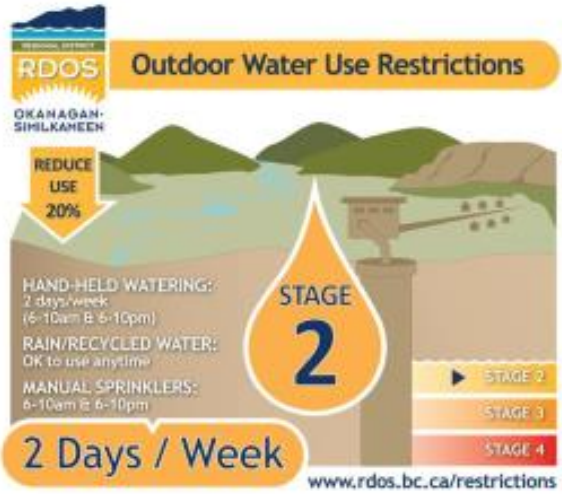
9.1.3 **APPENDIX D: Water Conservation Images**



WELL


RDOS
OKANAGAN-SIMILKAMEEN
Outdoor Water Use Restrictions
YEAR ROUND
NO WATERING
permitted on Mondays
NO SPRINKLING
between 10am and 6pm
NORMAL
NORMAL
STAGE 1
STAGE 2
STAGE 3
STAGE 4
3 Days / Week
www.rdos.bc.ca/restrictions

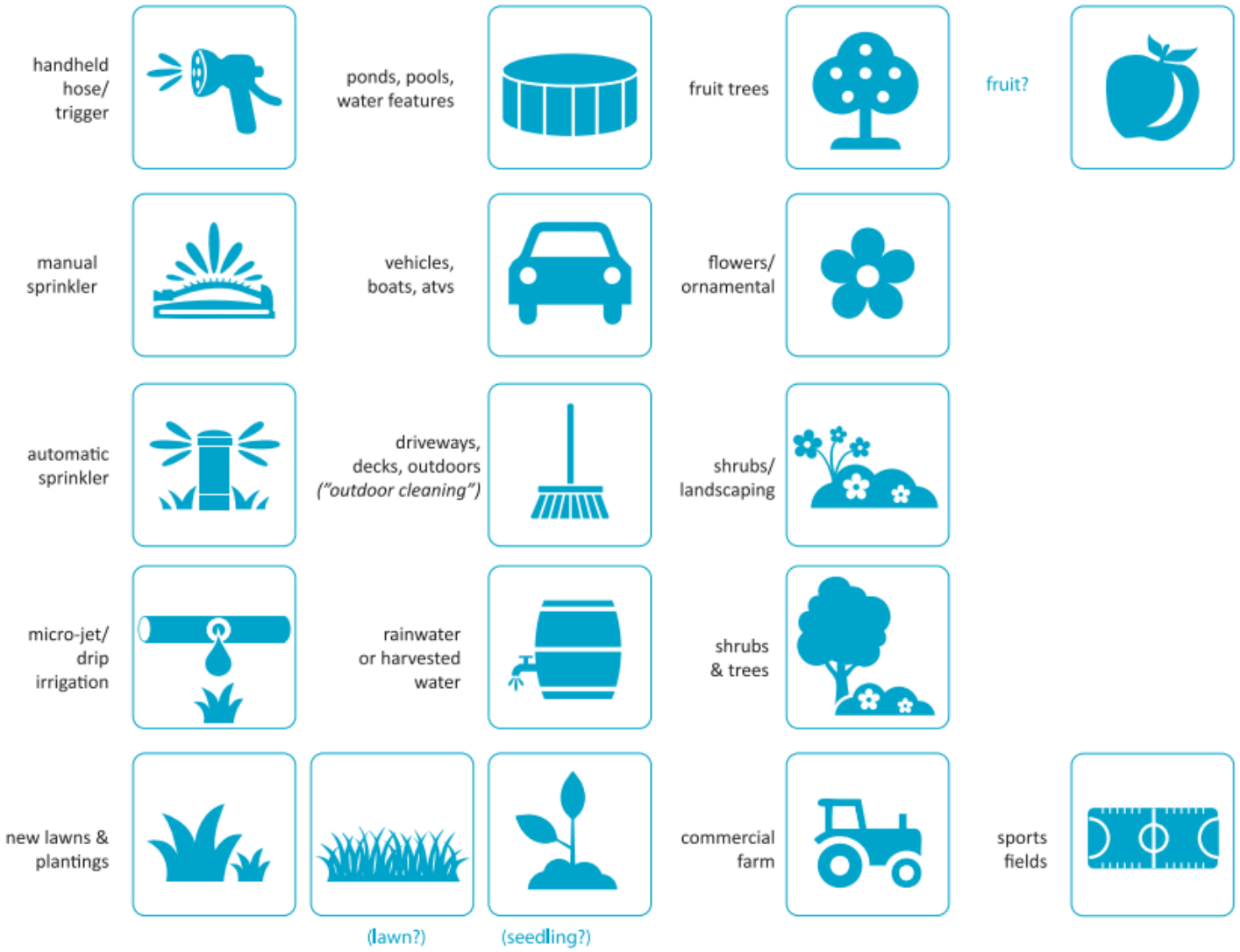

RDOS
OKANAGAN-SIMILKAMEEN
Outdoor Water Use Restrictions
REDUCE USE 10%
SPRINKLERS
AUTOMATIC:
12:01am - 6am
MANUAL:
6-10am & 6-10pm
STAGE 1
STAGE 1
STAGE 2
STAGE 3
STAGE 4
2 Days / Week
www.rdos.bc.ca/restrictions


RDOS
OKANAGAN-SIMILKAMEEN
Outdoor Water Use Restrictions
REDUCE USE 20%
HAND-HELD WATERING:
2 days/week
(6-10am & 6-10pm)
RAIN/RECYCLED WATER:
OK to use anytime
MANUAL SPRINKLERS:
6-10am & 6-10pm
STAGE 2
STAGE 2
STAGE 3
STAGE 4
2 Days / Week
www.rdos.bc.ca/restrictions


RDOS
OKANAGAN-SIMILKAMEEN
Outdoor Water Use Restrictions
REDUCE USE 50%
HAND-HELD WATERING
1 day per week
(6-10am & 6-10pm)
NO LAWN WATERING
permitted at anytime
STAGE 3
STAGE 3
STAGE 4
No Sprinkling
www.rdos.bc.ca/restrictions


RDOS
OKANAGAN-SIMILKAMEEN
Outdoor Water Use Restrictions
REDUCE USE 90%
CRITICAL WATER SHORTAGE
STAGE 4
STAGE 4
No Outdoor Use
www.rdos.bc.ca/restrictions

Additional icons for Social media and Civic Ready Mass Notification System



RDOS Staff Photo