Regional District of
Kootenay Boundary

Nine Mile Creek Watershed: Drought Management Plan

Final Report

May 2022

Associated
Environmental

Associated Environmental

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May 17, 2022
File: 2021-8889.000

Kristina Anderson
Watershed Planner
Regional District of Kootenay Boundary
2140 Central Ave.
Grand Forks, BC V0H 1H0

Re: NINE MILE CREEK WATERSHED: DROUGHT MANAGEMENT PLAN - FINAL REPORT

Dear Ms. Anderson:

Associated Environmental Consultants Inc. is pleased to provide the Regional District of Kootenay Boundary with this final report outlining the Drought Management Plan for Nine Mile Creek watershed.

If you have any questions about this report, please contact the undersigned at 250-826-9486.

Yours truly,
Associated Environmental Consultants Inc.

Drew Lejbak, M.Sc.
Senior Hydrologist / Project Manager

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EXECUTIVE SUMMARY

1 OVERVIEW

Following many years of reported supply concerns, the Regional District of Kootenay Boundary (RDKB) has requested the development of this Drought Management Plan (DMP) a support tool to allow for a more informed management approach during drought years for all water sources within the RDKB portion of the Nine Mile Creek watershed. The goal of the DMP is to help identify effective water management considerations so they can be applied under drought conditions in the near term, as well as in the future, considering population growth, land use changes, and climate change. This tool will be used to support improved watershed management and water conservation initiatives and will be forwarded to the Province of BC who, as of the date of this document, are the regulators all water licences in the RDKB region of the Nine Mile Creek area.

To inform the DMP, a questionnaire was distributed to residents of the watershed to help learn more about local water supply sources, current water conservation measures implemented, and concerns over water availability during dry conditions. Eight residents responded from a total of 56 questionnaires distributed, with the responses reflecting agricultural, ranching, industrial, commercial, and concerned resident perspectives.

2 DROUGHT COMMUNICATION AND MANAGEMENT TEAM

As the water systems within the RDKB portion of the Nine Mile Creek watershed are all private systems, the Province of BC is responsible for the regulation and any required enforcement. Through the BC provincial regulatory framework, the private landowner is responsible for their own water management during times of scarcity. No regulatory agency is mandated to provide for the supply, distribution, and use of water within the watershed. The RDKB is committed to maintaining watershed health and water sustainability of the Nine Mile Creek watershed and communicating drought to residents following the Boundary Region Drought Response Plan (RDKB 2021).

In addition, to help the RDKB consider impacts to the local economy and community livelihoods during period of drought, a Boundary Region based Drought Management Team is recommended to be developed. As detailed in the Boundary Region Drought Response Plan (RDKB 2021), during times of drought, the RDKB's Watershed Planner, or any other person that the RDKB Board of Directors designates, is responsible for communicating the drought risks to users within the watershed community.

3 WATERSHED PROFILE

Nine Mile Creek is a trans-border watershed located east of Osoyoos, BC, and northeast of Oroville, Washington State. The RDKB portion of the watershed drains southwest to the Canada-US border. Land use within the watershed is largely rural and agricultural development, with some small industrial and residential areas. Streamflows within the RDKB portion of the watershed are regulated through several ditch diversions and constructed ponds and streamflows are generally low from November-March, with the lowest streamflows in January to February and during the summer months. There are two mapped aquifers in the RDKB portion of the watershed and a trend analysis completed herein on nearby monitoring well (Well 402) found that aquifer recharge has been declining over time in the area. A total of 17 surface water and three groundwater licences have been issued for water use within the RDKB

portion of the watershed. A total of 80 groundwater wells are currently unlicensed[1]. Water use within the RDKB portion of the watershed is generally used for domestic consumption, outdoor irrigation, stock watering, agricultural irrigation, enterprise, and storage purposes.

No fish surveys have been recorded for Nine Mile Creek through the Province of BC monitoring system within the RDKB portion of the Nine Mile Creek. However, residents have reported fish kills during low streamflow conditions, so fish presence is assumed. In addition, rainbow trout, brook trout, steelhead, and Sockeye, Coho, and Chinook salmon have been found within the lower portions of the creek near the mouth, which is located below a 12-m waterfall. Although fish may not have been documented by the Province of BC within the RDKB portion of the watershed, the presence of fish downstream and the general need for ecological streamflows, highlights the importance of setting environmental flow needs (EFNs) and critical environmental flow thresholds (CEFTs) within the watershed to help residents understand when water availability is nearing or at levels of concern. Thus, EFN thresholds and CEFTs at the Canada/US border were established herein to help maintain streamflows within the upper and lower reaches of the watershed.

No specific studies of future water use for the Nine Mile Creek watershed have been conducted; however, managing available water sources and water conservation continues to be critical to maintaining water supplies for human and aquatic resource needs now and into the future.

4 DROUGHT LEVELS AND COMMUNICATION PLAN

To support drought management within the Boundary Region, the RDKB developed the Boundary Region Drought Response Plan to provide water users with recommended actions to take during varying levels of drought. The goal of the plan is to lessen local impacts from drought conditions, enhance communication, and reduce the need for provincial regulatory action. As no specific drought levels have historically been defined for the Nine Mile Creek watershed, the RDKB refers to the drought levels from provincially defined drought levels for the Okanagan River watershed to determine the drought level in the Nine Mile Creek watershed. Based on these drought levels, the Boundary Region Drought Response Plan has been adopted to support drought management and planning within the RDKB portion of Nine Mile Creek watershed. The drought levels are consistent with the six provincial drought levels included as part of the BC Drought and Water Scarcity Response Plan (MECCS 2021e). The six-level drought classification system is used to determine the severity of drought conditions and the necessary steps required to reduce the need to move to a higher drought level and/or to move to a lower drought level.

For the Nine Mile Creek watershed, the RDKB communicates with individual residents during times of drought and/or water shortage through the RDKB website and individually as required. Should a Boundary Drought Management Team be activated, communication could also be conducted through this group during periods of active drought.

5 DROUGHT LEVEL DECISION PROCESS

The Province of BC is the authority for determining the watershed-based Boundary Region drought status. In support of the decision process, the RDKB is a guest on the provincially run Thompson Okanagan Region Water Stewardship meetings, to understand issues and impacts within the Okanagan River watershed, and meets formally with BC Provincial staff (Kootenay Boundary Region Water Stewardship) to review the current water supply status and

[1] The number of unlicensed wells is either a result not requiring a groundwater licence under the BC *Water Sustainability Act* because of single domestic water use only, or due to individuals having not applied for a groundwater licence.

provincial drought levels. The purpose of these meetings is to discuss the current state of water supplies (by water supply source and/or as a whole) and forecasted trends to develop an understanding of the potential for future shortages and to what level of severity within the region. These meetings also provide the opportunity to update drought communication material and, if necessary, support the planning for and/or the implementation of emergency operational measures.

The RDKB monitors the provincial drought levels issued; realizing these watershed wide drought levels are largely determined using regional information, the RDKB also considers local information throughout the drought season to identify and/or address any localized drought related issues. This information may include stream and aquifer levels, state of aquatic habitats, operation of larger water diversions, and forecasted weather.

6 DROUGHT RESPONSE PLAN

The overall components of RDKB's decision making and drought level communication are summarized within the Boundary Region Drought Response Plan (RDKB 2021), with a summary provided in the table provided below. The Nine Mile Creek drought response plan (for the RDKB portion of the watershed) follows the recommended staged approach to water management during periods of drought through the identification and evaluation of factors that trigger a response. The RDKB's Watershed Planner, or any other person that the RDKB Board designates, will communicate the drought risks to the watershed community as outlined in the DRP. Recommended response actions are taken from the BC Drought and Water Scarcity Response Plan (MECCS 2021e), as indicated in the Boundary Region Drought Response Plan, and are focused on the reduction and/or conservation of water use during periods of drought.

Item	Drought Response Plan for the Nine Mile Creek Watershed					
Provincial Drought Level	0 (Green)	1 (Yellow)	2 (Peach)	3 (Orange)	4 (Red)	5 (Maroon)
Condition	Normal or wetter than average	Dry	Very Dry	Severely Dry	Extremely Dry	Exceptionally Dry
Goal	Preparedness	Stewardship and voluntary conservation	Conservation with voluntary reduction of non-essential water use	Conservation with voluntary 30% reduction in total water withdrawals	Conservation with voluntary 50% reduction in total water withdrawals	Voluntary maximum reduction in total water withdrawals
Trigger	Provincial drought indicators for the Okanagan River watershed and, if possible, any Nine Mile Creek watershed drought indicators.	Provincial drought indicators for the Okanagan River watershed and, if possible, any Nine Mile Creek watershed drought indicators.	Provincial drought indicators for the Okanagan River watershed and, if possible, any Nine Mile Creek watershed drought indicators.	Provincial drought indicators for the Okanagan River watershed and, if possible, any Nine Mile Creek watershed drought indicators.	Provincial drought indicators for the Okanagan River watershed and, if possible, any Nine Mile Creek watershed drought indicators.	Provincial drought indicators for the Okanagan River watershed and, if possible, any Nine Mile Creek watershed drought indicators.
Fisheries and Aquatic Habitat	No action at this time.	No action at this time.	Observe streamflows and report concerns.	Observe streamflows and report concerns.	Observe streamflows and report concerns.	Observe streamflows and report concerns.
Regulation and Response	Prepare for drought conditions by filling licensed reservoirs/ponds, irrigating efficiently, and maintaining and/or upgrading water systems (e.g., leak detection).	Prepare for drought conditions by filling licensed reservoirs/ponds, irrigating efficiently, and maintaining and/or upgrading water systems (e.g., leak detection). Voluntary implementation of water conservation practices and preparing to reduce non-essential water use.	Continue to prepare for drought conditions. Voluntary implementation of water conservation practices, reducing non-essential outdoor water use (e.g., vehicle washing, swimming pools), and preparing to reduce non-essential indoor water use.	Voluntary 30% reduction of water use based on licensed water quantity or average volume of water normally used. Reduce all non-essential outdoor water use, conduct essential outdoor watering from dusk to dawn and reduce non-essential indoor water use.	Voluntary 50% reduction of water use based on licensed water quantity or average volume of water normally used. Reduce all non-essential water use and conduct essential outdoor watering from dusk to dawn. Review individual drought emergency response and contingency plans.	Voluntary maximum (>50%) reduction of water use based on licensed water quantity or average volume of water normally used. Reduce all non-essential water use and conduct essential outdoor watering from dusk to dawn. For agriculture, consider focussing irrigation on high value crops only. Be prepared to implement individual drought emergency response and contingency plans. Prepare for possible Provincial regulatory action.
RDKB Communication	RDKB to update drought awareness webpage with current provincial drought level.	RDKB to update drought awareness webpage with current provincial drought level. Communicate local conditions and concerns to Provincial drought management staff and local water suppliers/users.	RDKB to update drought awareness webpage with current provincial drought level. Communicate local conditions and concerns to Provincial drought management staff and local water suppliers/users.	RDKB to update drought awareness webpage with current provincial drought level. Communicate local conditions and concerns to Provincial drought management staff, RDKB Elected Officials and relevant staff, the Kettle River Watershed Advisory Council (KRWAC) and local water suppliers/users.	RDKB to update drought awareness webpage with current provincial drought level. Communicate local conditions and concerns to Provincial drought management staff, RDKB Senior Management, Elected Officials and staff, the KRWAC and local water suppliers/users. Update the RDKB Emergency Operations and identify water vulnerabilities.	RDKB to update drought awareness webpage with current provincial drought level. Communicate local conditions and concerns to Provincial drought management staff, RDKB Senior Management, Elected Officials and staff, the KRWAC and local water suppliers/users. Update RDKB Emergency Operations identifying (where necessary) water vulnerabilities and options for alternative water supplies, and to prepare for risk of loss of supply.
Enforcement (BC Government)	Any water use infraction to be reported to the Report All Poachers and Polluters (RAPP) program.	Any water use infraction to be reported to the Report All Poachers and Polluters (RAPP) program.	Any water use infraction to be reported to the Report All Poachers and Polluters (RAPP) program.	Any water use infraction to be reported to the Report All Poachers and Polluters (RAPP) program.	Any water use infraction to be reported to the Report All Poachers and Polluters (RAPP) program.	Any water use infraction to be reported to the Report All Poachers and Polluters (RAPP) program.

ACKNOWLEDGEMENTS

This report was completed by Associated Environmental Consultants Inc. (Associated) with support from Okanagan Nation Alliance (ONA). Specifically, ONA developed environmental flow needs and critical environmental flow threshold values for Nine Mile Creek using naturalized streamflow estimates provided by Associated. All analyses and conclusions remain the sole responsibility of Associated and ONA.

Associated would also like to acknowledge the City of Penticton as they approved using their general outline of the drought level decision process used within their drought management plan herein.

The Regional District of Kootenay Boundary would also like to acknowledge the significant contribution to this report by the Area E Director, Vicki Gee, and residents within the Nine Mile Creek watershed.

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LIST OF ABBREVIATIONS

CEFT	Critical Environmental Flow Threshold
DMP	Drought Management Plan
DMT	Drought Management Team
EFN	Environmental Flow Needs
KRWAC	Kettle River Watershed Advisory Council
MECCS	BC Ministry of Environment and Climate Change Strategy
ONA	Okanagan Nation Alliance
OWDM	Okanagan Water Demand Model
RDKB	Regional District of Kootenay Boundary

1 INTRODUCTION

1.1 Overview

This Drought Management Plan (DMP) was prepared at the request of the Regional District of Kootenay Boundary (RDKB) and builds on the Kettle River Watershed – Drought Management Plan (RDKB 2020) and Boundary Region Drought Response Plan (RDKB 2021). This DMP was developed to support water management decisions and recommendations within the RDKB portion of the Nine Mile Creek watershed (Figure 1-1).

As water demand is expected to increase in the future, increasing water withdrawals and storage needs could impact environmental flow needs (EFNs), downstream water licences, and water availability to all users. Balancing water supply and use, determining effects of future climate change, defining the role of water in land use and economic development, and protecting the ecological functions of water all depend on good scientific, socio-economic, and governance information. As a result, the RDKB understands that a DMP is needed to balance watershed health, water supplies during normal, dry, and wet years, and future development plans and growth.

To this end, the RDKB has developed this DMP to allow for a more informed management plan during drought years for water sources within the RDKB portion of the Nine Mile Creek watershed. The goal of the DMP is to support a better understanding towards ensuring adequate water supplies are available under drought conditions in the near term, as well as in the future, considering population growth, land use changes, and climate change.

1.2 Drought Management Plan Questionnaire

Because of the rural nature of the watershed, the water systems present in this region are used for private residential, industrial, and agricultural purposes. Thus, to learn more about local water supply sources, the community's appetite for the implementation of a DMP, current water conservation measures implemented, and concerns over water availability during dry conditions, a questionnaire was distributed to 56 residents within the watershed. Due to a short response time needed for the questionnaire, the questionnaire was mailed to residents whose owner information showed a local address and those in the surrounding area. Eight residents responded to the questionnaire and the responses reflect agricultural, ranching, industrial, commercial, and concerned resident perspectives.

The questionnaire is provided in Appendix A and a general summary of comments received is as follows:

- Some residents are concerned about water availability within the watershed (surface and groundwater) for themselves and aquatic resources, while others noted that dry conditions are common within the area and Nine Mile Creek may have historically gone dry at times.
- Nine Mile Creek has been modified through ditching and dug ponds, which have changed some of the streamflow regime and potentially impacted aquatic resources. Fish kills were reported in 2019 and 2021 due to low streamflows and possible water diversions.
- Most residents are using surface water and/or groundwater to meet their water needs, with some needing to rely on dryland agriculture.
- Residents are often practicing watering conservation during times of drought and/or dry conditions by reducing outdoor and agricultural watering.

The information learned from the questionnaire was used to help develop the DMP to make it applicable to the residents of the watershed.

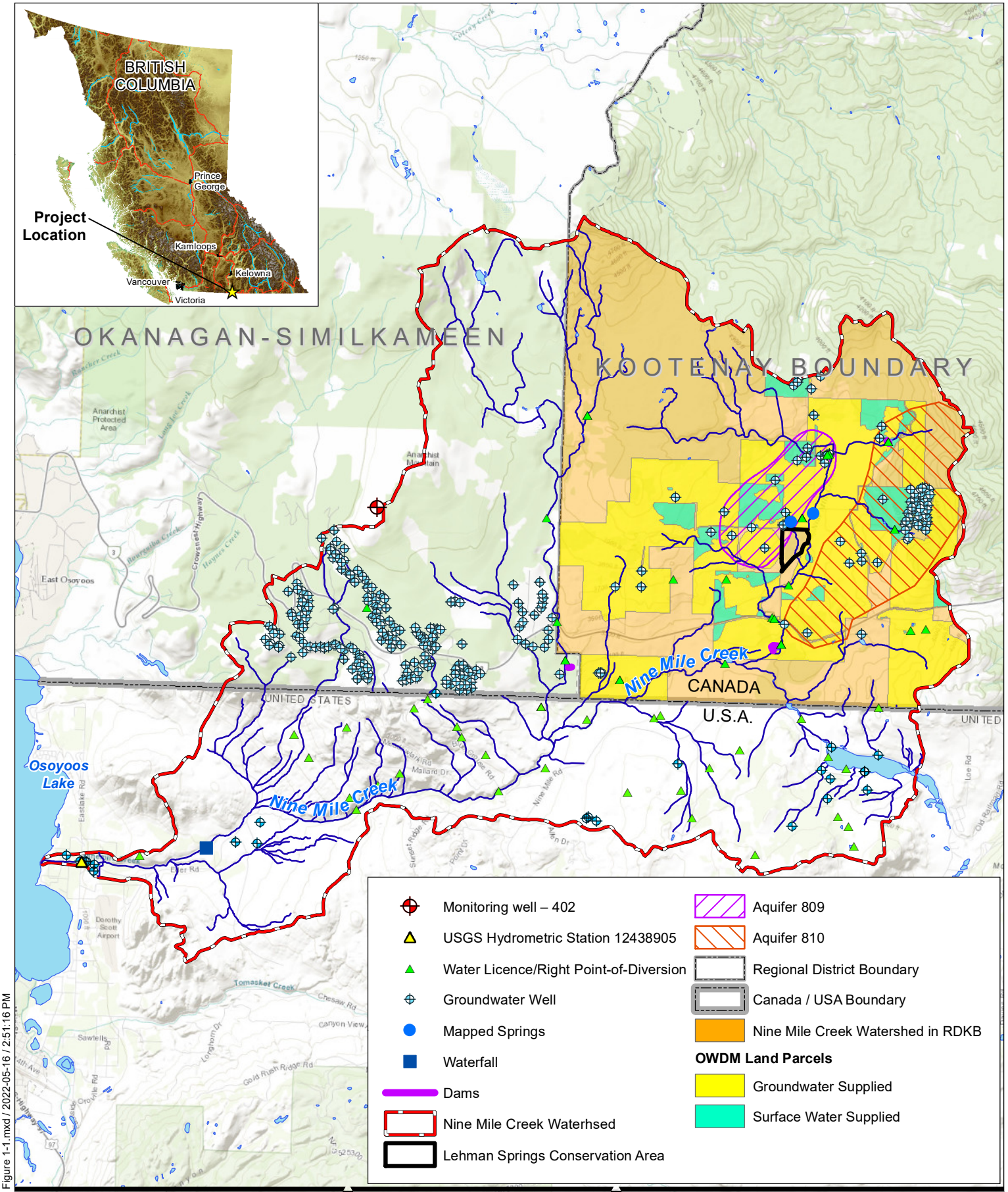

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FIGURE 1-1: Nine Mile Creek watershed and selected hydrologic characteristics

Regional District of Kootenay Boundary

Nine Mile Creek Watershed: Drought Management Plan

1.3 Components of the Drought Management Plan

The objective of the DMP is to provide the RDKB with a decision-making framework to prepare, plan, communicate, and respond to situations of drought within the RDKB portion of the Nine Mile Creek watershed. To meet this objective, the DMP is structured to be consistent with components of the template provided by MECCS (2021a) in Dealing with Drought – A Handbook for Water Suppliers in BC and by Associated (2016a) in Building Drought Resilience in the Okanagan.

The specific components of this DMP are as follows:

- Drought Communication and Management Team (Section 2);
- Watershed Profile (Section 3);
- Drought Levels and Communication (Section 4);
- Drought Level Decision Process (Section 5); and
- Drought Response Plan (Section 6).

2 DROUGHT COMMUNICATION AND MANAGEMENT TEAM

This section summarizes the RDKB management and communication structure during drought response, as well as how a Boundary Region Drought Management Team could be involved (should it be established), such as providing advice on water conservation strategies from a community watershed perspective.

2.1 Drought Communication Team

As the water systems present within the RDKB portion of the Nine Mile Creek watershed are private and largely individual systems, the regulation of these systems is by the Province of BC. The RDKB has no mandate or regulatory authority for the supply, distribution, or use of water within the watershed. There are currently no RDKB watershed focused bylaws in place for the Nine Mile Creek watershed area that are specific to water management. However, bylaws are in place for nearby areas of Electoral Area E (e.g., Bylaw No. 1485 - Bridesville Townsite Land Use Plan), which have provisions for the protection of both quality and quantity of drinking water sources and supporting water conservation education to help promote water savings. The RDKB is currently in the process of developing a Rural Bridesville Land Use Plan, which will include the Nine Mile Creek watershed, incorporating similar provisions as outlined in Bylaw No. 1485. As outlined in the Boundary Region Drought Response Plan (RDKB 2021), the RDKB is committed to supporting residents within the Nine Mile Creek watershed during times of drought and water scarcity. In addition, the Kettle River Watershed Management Plan (RDKB 2014) shows the commitment of the RDKB towards actions for improving water security by establishing and implementing drought management strategies and response during periods of extreme low flows and for improving water conservation and efficiency of water use by all users.

During times of drought, the RDKB's Watershed Planner, or any other person that the RDKB Board of Directors designates, is responsible for communicating the drought risks to the watershed community. This individual will coordinate with administrative and operations staff to inform relevant RDKB's staff, which could include individuals from communications, emergency management, planning and development, as well as Elected Officials. All drought communications to water suppliers and users are through the RDKB's drought awareness webpage[2] or as required on an individual basis.

[2] Access through: www.rdkb.com/Environment/Watershed-Planning

2.2 Boundary Region Drought Management Team

To help the RDKB consider impacts on the local economy and community livelihoods during periods of drought, a Boundary Region Drought Management Team (DMT) is recommended and was identified through the Kettle River Drought Management Plan (RDKB 2020). It is understood that, due to staffing capacity, the Boundary Region is not able to establish a DMT at this time but looks forward to working with the community directly until a DMT can be created.

When a DMT is possible, it would need to be supported by RDKB staff, with the scheduling of meetings dependent on the severity of the actual or impending drought or water supply shortage. The goal of the DMT would be to assist in the development of efficient water use strategies, inform the watershed community on water supply levels, and provide feedback on community needs and application of water use conservation measures. The DMT may include representation from various sectors in the Boundary Region, watershed residents, provincial government staff, and trans-border/trans-jurisdiction staff. The terms of reference for the DMT (including recommended team member representation) is provided in Appendix B and is consistent with that used by communities within the Okanagan Basin to support drought management direction.

3 WATERSHED PROFILE

This section provides an overview of the RDKB portion of the Nine Mile Creek watershed, local climate, hydrologic regime, hydrogeologic setting, water sources used by the local community, water demand, and EFNs.

3.1 Watershed Overview

Nine Mile Creek watershed is located within the Okanagan Basin and a tributary to Osoyoos Lake. The watershed is a trans-border watershed located east of Osoyoos, BC, and northeast of Oroville, Washington State, within the Okanagan Highland of the Interior Plateau Physiographic Region (Figure 1-1). The total drainage area of the Nine Mile Creek watershed is 122 km^2, and elevations range from 279 metres above sea level (masl) to 1,646 masl. The Canadian portion of the watershed is split between the RDKB and the Regional District of Okanagan-Similkameen (RDOS). The RDKB portion of the watershed covers 49.8 km^2 and elevations range from 990 masl to 1,586 masl. Nine Mile Creek watershed has not been identified as a Community Watershed by the *Forest and Range Practices Act*.

Land use within the watershed is largely rural and agricultural development, with some small industrial and residential areas. No population census information is available specifically for this RDKB portion of the watershed, but there are currently 70 houses in this project area.

3.2 Climate

The climate of the Nine Mile Creek watershed is characterized by moderate winters and warm summers with precipitation largely occurring during the winter and spring with drier conditions in the summer and early fall. An inactive Environment Canada and Climate Change (ECCC) climate station is located east of the watershed (Bridesville, Station No. 1130975) and an active ECCC station is in Osoyoos (Osoyoos CS, ECCC Station No. 1125852) (Figure 3-1). However, due to the RDKB portion of the watershed being at a higher elevation than Osoyoos, ClimateWNA[3] was used to estimate climate information for the watershed. Based on 1981-2020 climate normal data, the modelling for the mean monthly air temperatures for the watershed range from -5.9°C in December to 16.6°C in July and August.

[3] www.climatewna.com/

Air temperatures within the watershed during winter (November-February) are generally below 0°C. The mean annual total precipitation is 448 mm, and approximately one-third (184 mm) of the precipitation is in the form of snow.

Based on available information from the Pacific Climate Impacts Consortium (PCIC)[4], the general climate trends predicted for the Okanagan region are as follows:

- The climate is predicted to warm, with air temperatures increasing in both summer and winter.
- Annual precipitation is predicted to increase. Summer precipitation is likely to decrease and winter precipitation is likely to increase.
- Snowpacks are projected to increase at higher elevations but reduce at lower elevations.
- Snowmelt is projected to occur earlier with meltwater runoff expected to decrease due to more rain generated runoff throughout the winter.
- Extreme weather conditions, which may include extreme precipitation events, as well as droughts for extended periods, are anticipated to occur more frequently

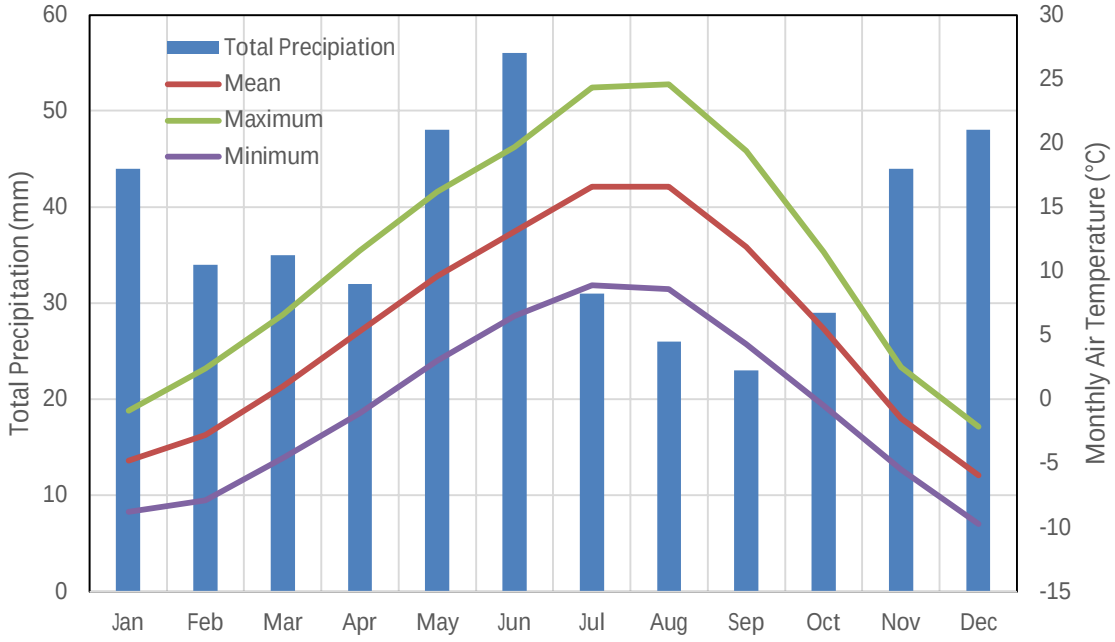

Figure 3-1 Estimated 1981-2010 total precipitation and air temperature for the RDKB portion of Nine Mile Creek watershed

3.3 Hydrologic Regime

The Nine Mile Creek watershed lies in the Southern Thompson Plateau Hydrologic Zone #24 (MECCS 2020). Streams within this hydrologic zone are generally characterized by a snowmelt-dominated peak rising in April or May and peaking sometime in May or June. Rain-on-snow events occasionally occur in this region enhancing winter streamflow and spring peaks. In addition, late fall rainstorms are common, recharging soil moisture heading into the winter and producing short duration peak streamflows. Low streamflows occur generally from the end of November to March, and in the hot summer months, with the lowest streamflows commonly occurring in January or February. Residents

[4] www.pacificclimate.org/analysis-tools/plan2adapt

have reported that the creek has historically experienced low or zero streamflows during dry periods (Section 1.2). Snowmelt is the primary source of runoff for Nine Mile Creek during spring.

Streamflows within the RDKB portion of the watershed are regulated through several ditch diversions and constructed ponds, as well as two dams (Nine Mile Creek Reservoir Dugout and Letts Brook Reservoir Dam) (Figure 1-1). No hydrometric monitoring has been completed by the Water Survey of Canada for this portion of the watershed; however, the United States Geological Survey (USGS) has monitored streamflows at a location near the mouth of the watershed: Nine Mile Creek at Eastlake Road near Oroville, WA (Station No. 12438905; Period of Record = 2017-2021) (Figure 1-1). Although this hydrometric station is downstream of the RDKB portion of the watershed, a general summary of the hydrograph for the watershed is provided in Figure 3-2. The hydrometric records indicate that the lowest streamflows occur during July, August, and September with recorded minimum streamflows down to 0.006 m^3/s. The low streamflows are likely related to naturally low streamflows for this time of year, but also due to water use within the watershed during the summer months (Section 3.5).

Nine Mile Creek is the main watercourse for the RDKB portion of the watershed. The area includes Miller Spring, Wiggins Spring #1, and Wiggins Spring #2 (Piteau Associates 2015) (Figure 1-1) and the Lehman Springs Conservation Area (i.e., headwaters of Nine Mile Creek), which has at least nine natural springs.

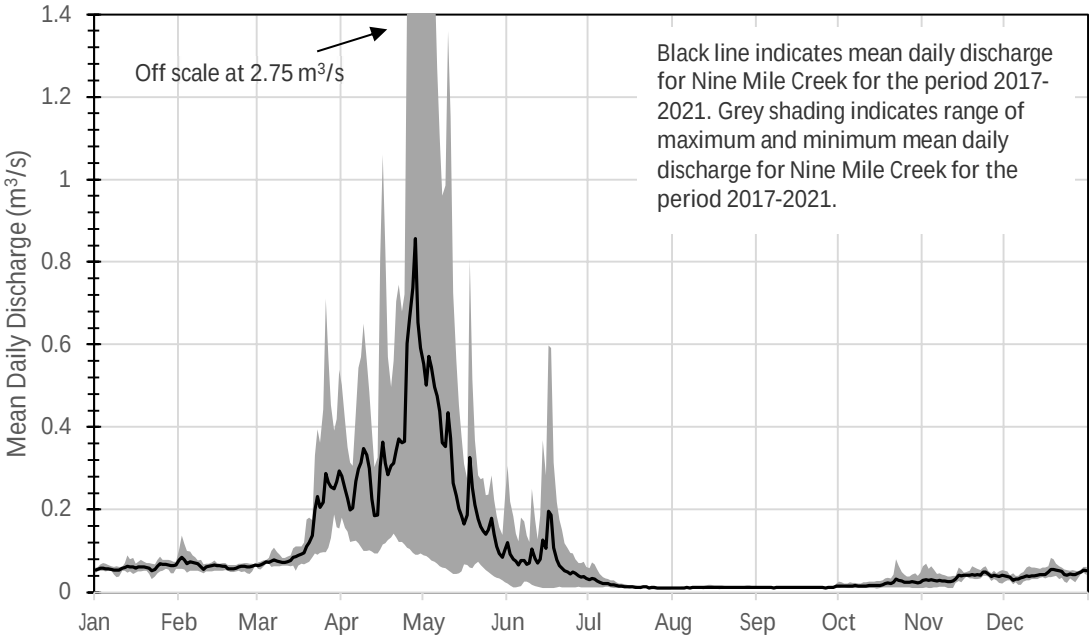

Figure 3-2 Summary of Nine Mile Creek streamflows (USGS Station No. 12438095, 2017-2021)

Based on available information from PCIC, the hydrologic trends predicted for the Southern Okanagan area are as follows:

- Late fall, winter, and very early spring streamflows are projected to be greater; while late spring, summer and early fall streamflows are projected to be smaller.
- The magnitude of extreme peak streamflows is projected to increase, which could cause an increase in flood and natural hazards.
- Low flows could occur earlier and last for a longer period, increasing the risk of drought throughout the watershed.

3.4 Hydrogeologic Setting

The bedrock geology of the RDKB portion of the watershed is from the Anarchist Group, composed of medium to high grade metamorphic rock including of schists, gneisses, amphibolites, and breccias of the Shuswap Terrane (PHC 1993; Summit 2004). Surficial geology information for the watershed is limited, but PHC (1993) and Summit (2004) identified that the area is composed of colluvium, glaciofluvial, and till of up to 14.6 m thick in places.

There are two mapped aquifers in the RDKB portion of the watershed: Aquifers 809 and 810 (Figure 1-1). The aquifers are mapped as individual units, but lack of consensus exists around the connectivity of the aquifers with each other and with surface and spring water (RDKB, pers. comm., 2019a).

3.4.1 Aquifer 809

Mapping of Aquifer 809 in 2006 and summarized by MECCS (2021b) indicates that the aquifer covers an area of 2.94 km^2 west of Nine Mile Creek (Figure 1-1). The total land area includes rural development and agricultural fields and a portion of forest area. MECCS (2021b) classifies the aquifer as Class IIIC, which indicates that it is moderately developed and has a low vulnerability to surface contamination.

Aquifer 809 is classified as a confined glacio-fluvial sand and gravel aquifer that is overlain by till and/or glacio-lacustrine deposits with unconfined deposits close to Nine Mile Creek. Groundwater generally flows southerly and easterly towards Nine Mile Creek. Groundwater recharge is likely to occur through directly precipitation and through surface water infiltration and upland drainage from the west (MECCS 2021b; Piteau Associates 2015). The aquifer is not expected to be hydraulically connected to Nine Mile Creek within the RDKB region.

10 groundwater wells are correlated to the aquifer (Figure 1-1), and the reported median well yield is 3.47 L/s. There are seven additional registered wells that are located within the aquifer extent but cannot be confirmed whether they are in or outside of this mapped aquifer. The median well depth in the aquifer is 32.46 metres below ground surface (m bgs), while the median static water depth is 10.52 m bgs.

3.4.2 Aquifer 810

Mapping of Aquifer 810 in 2012 and summarized by MECCS (2021c) indicates that the aquifer covers an area of 7.8 km^2 east of Nine Mile Creek (Figure 1-1). The total land area includes rural development and agricultural fields and a portion of forest area. MECCS (2021c) classifies the aquifer as Class IIC, which indicates that it is moderately developed and has a low vulnerability to surface contamination.

Aquifer 810 is classified as a bedrock aquifer. Groundwater generally flows southerly and easterly towards Nine Mile Creek. Although not reported by MECCS (2021c), PHC (1993) reported that bedrock aquifers in the Osoyoos-Anarchist Mountain area are recharged via snowmelt and precipitation from the uplands in the north and east. The aquifer is not expected to be hydraulically connected to Nine Mile Creek within the RDKB region.

A total of 47 registered groundwater wells (of which four are artesian) are correlated to the aquifer (Figure 1-1), and the reported median well yield is 1.58 L/s. The median well depth in the aquifer is 103.63 m bgs, while the median static water depth is 8.53 m bgs.

3.4.3 Groundwater Monitoring Wells

There are no groundwater monitoring wells within the RDKB portion of the watershed; however, there is one well (402 – Osoyoos [Anarchist Mountain Summit]) located just outside the Regional District of Okanagan-Similkameen

portion the of watershed (located west of the RDKB boundary) (Figure 1-1). The well was installed by MECCS in bedrock (Aquifer 936)[5] at the summit of Anarchist Mountain to monitor aquifer recharge and the effects of climate change. A summary of the recorded groundwater levels between 2011 and 2021 is provided in Figure 3-3.

A Seasonal Kendall test was applied to the data present in Figure 3-3 to assess trends, and the results indicated a statistically significant downward trend in the groundwater levels over the available period of record. As Well 402 is located within a bedrock aquifer at the summit of Anarchist Mountain and the aquifer has limited development, the downward trend indicates that this aquifer is annually losing water. The loss is likely related to smaller amounts of interannual recharge. The results of this trend assessment are also likely applicable to Aquifers 809 and 810 in that declining groundwater levels could be related to aquifer pumping, but also declining annual recharge.

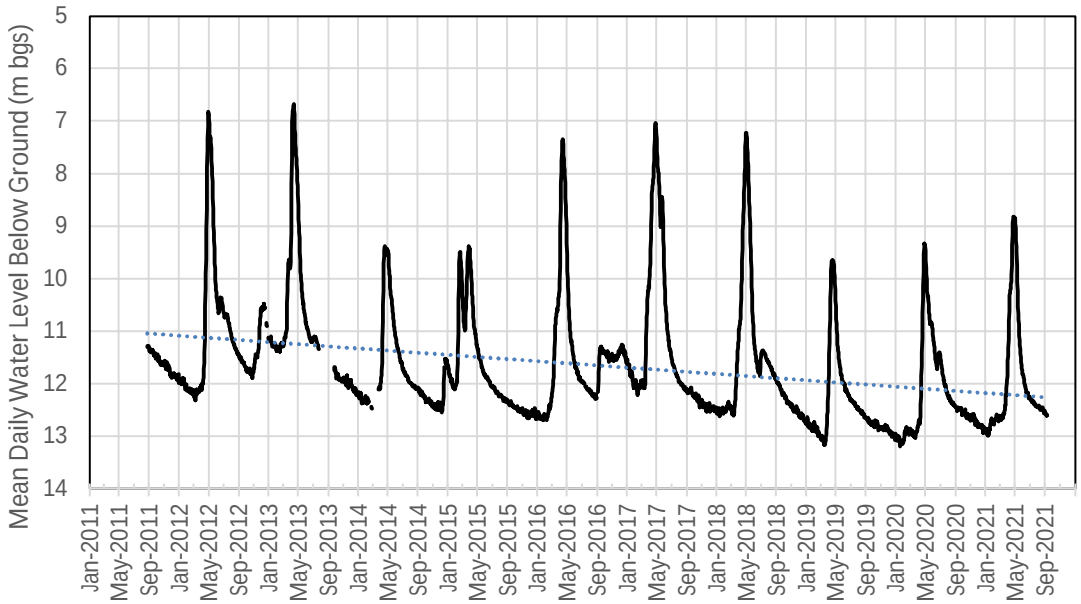

Figure 3-3 Summary of Groundwater Monitoring Well 402 mean daily groundwater levels, 2011-2021

3.5 Water Use

A total of 17 water licences have been issued by the BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) for surface water use within the RDKB portion of the watershed (Figure 1-1). Water licences have been issued for domestic, stock watering, outdoor watering, irrigation, enterprise, and storage purposes. A summary of the total licensed use by water use purpose is provided in Table 3-1.

[5] Aquifer 936 is mapped as a similar geologic formation as Aquifer 810.

Table 3-1 Summary of surface water licences within the RDKB portion of Nine Mile Creek watershed

Water Licence Purpose	Total Licensed Volume (m^3/year)
Domestic	13,284
Stock watering	8,634
Outdoor Watering	2,960
Irrigation	186,194
Storage	19,736
Total (Offstream Use)	211,072

There are three licensed groundwater wells (Well Tag Number [WTN] 109955, WTN 109661, and WTN 113928)[6] within the RDKB portion of the watershed and approximately 80 wells that are not licensed[7]. The water use purpose for all wells include domestic (54), irrigation (eight), commercial and industrial (three), water supply system (three), and unknown (15). Of the total unlicensed wells identified, seven are located within Aquifer 809 and 47 are within Aquifer 810 (Section 3.4). The remaining 29 wells do not have information regarding which aquifer they are located within. Reviewing the available maximum capability of well yields reported for wells with the RDKB portion of the watershed[8], approximately 10% of the well yield is from Aquifer 809, 61% is from Aquifer 810, and the remaining 29% is unknown.

The actual amount of surface water and groundwater used is not known for the watershed; however, water demand estimates are available from the Okanagan Water Demand Model (OWDM). The OWDM is a tool developed to provide current and future estimates of agricultural and indoor and outdoor water demands in the Okanagan Basin in the absence of actual water use records. The OWDM is based on a Geographic Information System (GIS) database that contains cadastre information (showing the boundaries of land ownership), crop type, irrigation system type, soil texture, and climatic data (van der Gulik et al. 2010). The information was assembled from background information as well as high resolution orthophotos, BC Assessment records, and GIS and was confirmed by ground surveys in 2014. Land uses (including crop type and method of irrigation) were identified, and water demands were estimated at the scale of individual land parcels and finer (van der Gulik et al. 2010). The OWDM calculates evapotranspiration demand for each land parcel using a form of the Penman-Monteith equation. It also computes the existing soil moisture and daily precipitation, and the water requirement is the leftover demand that can't be met from these two sources. Gridded climate datasets at a 500 m by 500 m grid cell size are used to inform the water demand estimates. For indoor water demand estimates, average daily water use values are applied to the different land parcels. A detailed description of how the OWDM calculates agricultural and outdoor irrigation and indoor water demands is provided by van der Gulik et al. (2010) and Summit (2010).

[6] The wells are licensed under groundwater licences 501219 and 500917 for 289,560 m^3/yr for irrigation and 3,120 m^3/yr for water bottling purposes, respectively.

[7] The number of unlicensed wells is either a result not requiring a groundwater licence under the BC *Water Sustainability Act* because of single domestic water use only, or due to individuals having not applied for a groundwater licence.

[8] Total well yield calculated using well yields available from MECCS (2021d); not all wells are included due to missing information reported for some wells.

Using the OWDM, water demand for the RDKB portion of the watershed was calculated for the mapped parcels of land (Figure 1-1) included within the model (RHF Systems Ltd. 2021). A summary of the mean total daily water demand (surface water and groundwater sourced) for the period 1981-2010 for the watershed is summarized in Figure 3-4, and the mean total monthly water demand by water use type (and source) is provided in Table 3-3. In general, the OWDM identifies that most of the water use within the watershed is related to irrigation during the spring and summer months and that water use during the winter periods is generally low. This is generally consistent with other reports reviewing water use within the watershed (e.g., Piteau Associates 2015).

Concerns have been documented about surface water use within the watershed due to ditching/ponding of the creek/springs and use of water to support commercial purposes. Although some of the changes to the creek channel and/or springs may have occurred, existing groundwater use from Aquifer 809 was estimated to range from approximately 73% and 85% of the average annual aquifer recharge (Piteau Associates 2015). In addition, approximately 94% of the groundwater volume pumped from Aquifer 809 was used for irrigation purposes, while the remainder was used for residential and commercial purposes (Piteau Associates 2015).

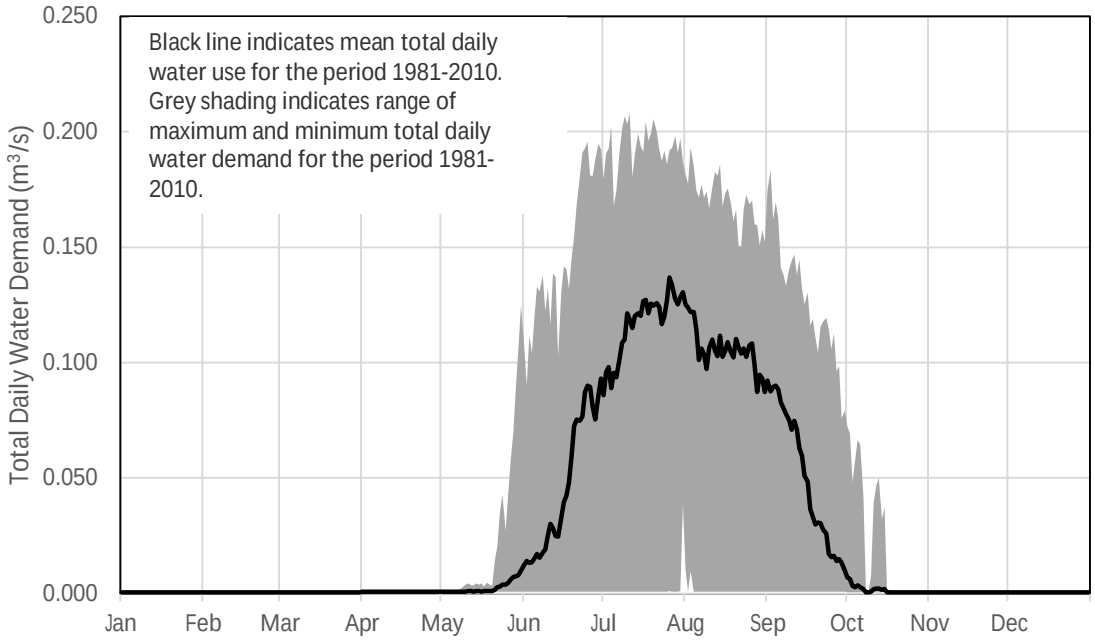

Figure 3-4 Summary of Okanagan Water Demand Model estimated water use for the RDKB portion of Nine Mile Creek watershed, 1981-2010

Table 3-2 Mean total monthly water demand by source for the RDKB portion of the Nine Mile Creek watershed, 1981-2010

Month	Surface Water (dam^3)[a]		Groundwater (dam^3)				
	Domestic[b]	Residential[c]	Domestic	Stockwatering	Commercial	Residential	Irrigation
January	0	0.1	0	0.4	0.1	0.7	0
February	0	0.1	0	0.4	0.1	0.6	0
March	0	0.1	0	0.4	0.2	0.7	0
April	0	0.1	0	0.4	0.4	0.7	0
May	0.1	0.1	1.6	0.4	0.3	0.7	3.0
June	0.4	0.1	5.9	0.4	0.4	0.7	113
July	0.6	0.1	9.2	0.4	0.5	0.7	301
August	0.6	0.1	8.4	0.4	0.5	0.7	273
September	0.3	0.1	3.8	0.4	0.4	0.7	125
October	0	0.1	0.1	0.4	0.2	0.7	2.5
November	0	0.1	0	0.4	0.1	0.7	0
December	0	0.1	0	0.4	0.2	0.7	0

Note:
a. 1 dam^3 = 1,000 m^3
b. Domestic = outdoor watering
c. Residential = indoor water use

3.6 Environmental Flow Needs

No fish surveys have been recorded for the RDKB portion of Nine Mile Creek through the Province of BC monitoring system[9], so there is no detailed information on fish presence or absence, or species type. However, a fish kill in August 2019, reportedly caused by low water levels within the creek, was reported by residents to the Report All Poachers and Polluters (RAPP) program[10]. The fish kill was reported to have been caused due to excess water withdrawal within the watershed (RDKB, pers. comm., 2019b). The species of fish observed was not identified.

Following the above, although not within the RDKB portion of the Nine Mile Creek watershed, a small headwaters lake (Bohunk Lake) on a tributary to Nine Mile Creek within the RDOS portion of the watershed was documented to be stocked with rainbow trout in the early 1960s. In addition, Arterburn et al. (2007) reported the presence of rainbow trout, brook trout, and steelhead within the lower portions of the creek near the mouth. Sockeye, Coho, and Chinook salmon spawners have been recorded recently according to passive integrated transponder (PIT) tag detection records from the Nine Mile Creek Instream Array (NMC)[11]. However, a 12-m waterfall located approximately 9 km upstream from the mouth at Osoyoos Lake (Figure 1-1) is identified by Arterburn et al. (2007) as a fish barrier to the salmon species from entering the section of creek located in the RDKB and RDOS.

[9] https://maps.gov.bc.ca/ess/hm/habwiz/

[10] www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/natural-resource-law-enforcement/conservation-officer-service/cos-rapp

[11] www.ptagis.org

Although fish have not been officially documented within the RDKB portion of the watershed, the presence of fish downstream and the general need for ecological streamflows, highlights the importance of setting EFNs and critical environmental flow thresholds[12] (CEFTs) within the watershed. Thus, due to the recent history of low water conditions and fish kills within the RDKB portion of the watershed, establishing EFN thresholds and CEFTs at the Canada/US border will help to maintain streamflows within the upper and lower reaches of the watershed. Establishing EFNs and CEFTs within the lower reaches of the watershed is important, but beyond the scope of this report.

Following the above, as outlined within Collaborative Development of Methods to Set Environmental Flow Needs in Okanagan Streams (Associated 2016b), the Okanagan Tennant method is the recommended method for setting initial EFN thresholds for streams in the Okanagan Basin. The Okanagan Tennant method is a desktop assessment involving several steps, which provides insight into the risks to aquatic habitat and ecological processes from existing and proposed water allocations relative to natural or naturalized flows. In the absence of field data, CEFTs were estimated as a proportion of long-term mean annual discharge (LTMAD) using specific streamflow standards employed by regional provincial biologists (i.e., 5% LTMAD for juvenile fish rearing and overwintering, and 50% LTMAD for rainbow trout spawning) (ONA 2020).

The methods used to estimate EFNs thresholds and CEFTs (following Associated 2016b; 2017 and ONA 2020) for the RDKB portion of the Nine Mile Creek watershed are summarized as follows:

- The Nine Mile Creek EFN point-of-interest was defined as the Canada/US border.
- As no streamflow records are available at or near the EFN point-of-interest, weekly naturalized streamflows at the EFN point-of-interest were estimated for the 1996-2010 standard period using hydrometric records from Vaseux Creek above Solco Creek (WSC No. 08NM171). The Vaseux Creek records were then scaled to the drainage area of the EFN point-of-interest but adjusted to represent the different drainage area with a different median elevation. Specifically, the updated regional runoff relation for Hydrologic Zone #24 (Section 3.2) reported by Associated (2017) was used to adjust the ratio of predicted normal annual runoff between Vaseux Creek at WSC 08NM171 (117.5 km^2; median elevation = 1,694 masl) and the Nine Mile Creek EFN point-of-interest (49.8 km^2; 1,195 masl). The ratio used for adjustment purposes was 0.30. The estimated weekly time series was then reconciled with the long-term mean annual discharge (for the standard period) for the updated regional runoff relation for Hydrologic Zone 24. The resultant streamflows were then adjusted to long-terms conditions (1971-2014) using the weekly scaling ratios outlined by Associated (2017).
- Using the naturalized streamflow estimates, the Okanagan Tennant method was used to estimate EFN thresholds. The Okanagan Tennant method is a modification of the widely used Tennant method, which sets EFNs as a proportion of the LTMAD required to sustain a given species and life stage (flow standard) in a specific time period (periodicity). Okanagan Tennant EFNs are the lower of the flow standard and the median naturalized flows to ensure that EFNs are realistic and attainable in the context of the natural hydrograph. The flow standards and periodicity used for setting EFNs and CEFTs for the RDKB portion of the Nine Mile Creek watershed are presented in Table 3-4.

The resultant EFNs and CEFTs for the RDKB portion the Nine Mile Creek watershed are summarized in Table 3-5 and Figure 3-5. Note that these are recommended values to support water management planning, but due to no actual streamflow records available for the creek at the EFN point-of-interest, refinement to these values are required once continuous and long-term streamflow measurements are obtained.

[12] Critical environmental flows represent the streamflow below which catastrophic consequences to fish populations may occur.

Table 3-3 Flow standard and periodicity information for the RDKB portion of Nine Mile Creek watershed

Dominant Period		Timing		Duration (days)	Presumptive flows (as % of LTMAD)
Species / Aquatic Resources	Life Stage	Start Date	End Date		
Rainbow trout	Adult Migration	15-Apr	10-Jul	entire	100%
	Spawning	20-May	10-Jul		40%
	Incubation	1-Jun	15-Jul		20%
	Rearing	1-Apr	31-Oct		20%
	Juvenile Migration	1-May	15-Jul	15	50%
	Overwintering	1-Nov	31-Mar	entire	20%
Ecological flows	Wetland, side channel linkage, flushing and channel maintenance flow	1-Apr	30-Jun	15	100%
	Cottonwood ecosystem	freshet	30-Jul	entire	730%

Table 3-4 Recommended EFNs and CEFTs for the RDKB portion of Nine Mile Creek watershed

Dominant Life Stage	Time Period		Recommended EFN Streamflow (m^3/s)				Critical Environmental Streamflow Thresholds	
	Start	End	Median	% of LTMAD	Min	Max	Streamflow (m^3/s)	% of LTMAD
Rainbow trout pass and insect production[1]	1-Apr to 31-Oct		0.023	19%	0.015	0.088	0.006	5%
Rainbow trout spawning	20-May to 10-Jul		0.117	100%	0.117	0.687	0.059	60%
Rainbow trout overwintering	1-Nov to 31-Mar		0.015	13%	0.013	0.024	0.006	5%

Note:

1. Although EFNs apply to the entire period, median values are presented for the summer low streamflow period from July 15 to September 30.

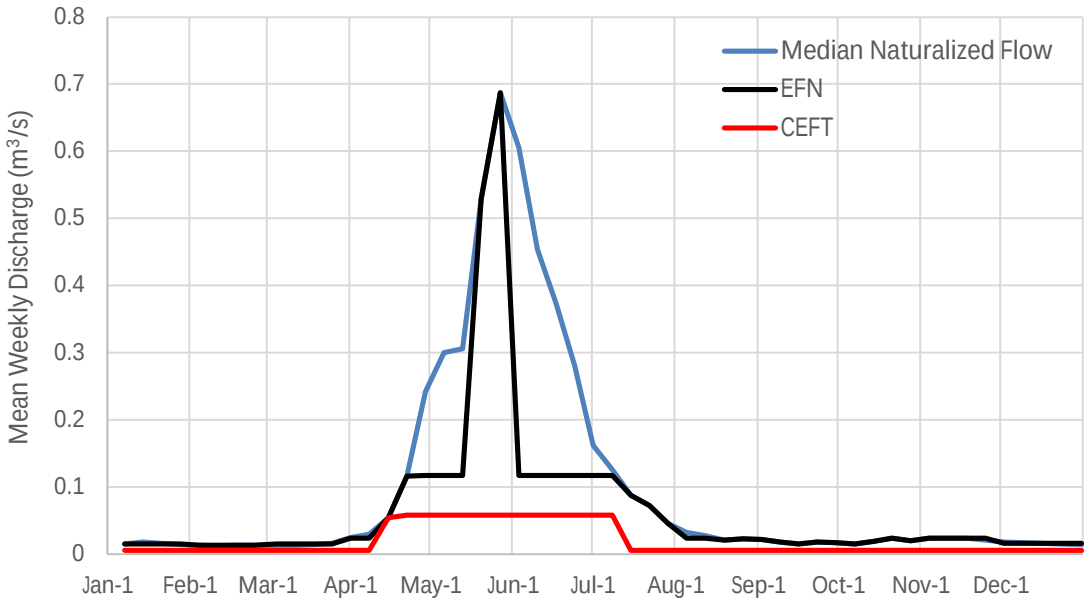

Figure 3-5 Summary of Nine Mile Creek median naturalized streamflows, Environmental Flow Needs (EFN), and Critical Environmental Flow Thresholds (CEFT), at the EFN point-of-interest

3.7 Future Water Use

No specific studies of future water use for the Nine Mile Creek watershed have been conducted. Census information is not specifically available for the RDKB portion of the Nine Mile Creek watershed; however, census information for the Kootenay Boundary E / West Boundary indicated a 9.4% growth in population between 2011 and 2016. Thus, if similar growth patterns continue, water requirements within the Nine Mile Creek watershed could increase. In addition, because of the projected low streamflow duration (Section 3.2) and long-term reductions in groundwater recharge, managing available water sources and water conservation will be critical to maintaining water supplies for human and aquatic resource needs.

4 DROUGHT LEVELS AND COMMUNICATION

This section provides a description of the BC provincial drought levels, the Boundary Region drought response adopted by the RDKB, the Nine Mile Creek watershed drought levels, and the communication plan.

4.1 Provincial Drought Levels

In striving for consistent drought response strategies across BC, six provincial drought levels, each with specific objectives and suggested water use targets, have been established as part of the BC Drought and Water Scarcity Response Plan (MECCS 2021e). The six-level drought classification system is used to determine the severity of drought conditions and the necessary steps to reduce the need to move to a higher drought level and/or to move to a lower drought level. The plan also establishes triggers to identify levels of drought. The six drought levels are summarized in Table 4-1 and are declared by the Provincial Technical Drought Working Group (PTDWG).

Given that the BC Drought and Water Scarcity Response Plan relates to a regional watershed scale, it focuses on regional (watershed) triggers. Specifically, triggers are associated with regionally available information (e.g., snow

water equivalent, and streamflows) and are used to determine the level of drought regionally. Therefore, when provincial drought levels are in effect, they are general and not indicative of an individual water source and/or a watershed at a local scale.

Provincial drought levels provide guidance on the general water supply conditions within a region, but do not directly correlate to individual local system or reservoir management responses. Thus, the provincial drought levels are provided as an informative tool to support drought decision making by local governments, water operators, and/or all water users.

Table 4-1 Provincial drought levels (adapted from MECCS 2021e)

Level	Condition	Impacts	General Response Measures
0 (Green)	Average or wetter than average	There is sufficient water to meet socio-economic and ecosystem needs	Preparedness
1 (Yellow)	Dry	Adverse impacts to socio-economic and ecosystem values are rare	Conservation
2 (Peach)	Very Dry	Adverse impacts to socio-economic and ecosystem values are unlikely	Conservation; Local water restrictions where appropriate
3 (Orange)	Severely Dry	Adverse impacts to socio-economic and ecosystem values are possible	Conservation; Local water restrictions likely
4 (Red)	Extremely Dry	Adverse impacts to socio-economic and ecosystem values are likely	Conservation and local restrictions; Regulatory action possible
5 (Maroon)	Exceptionally Dry	Adverse impacts to socio-economic and ecosystem values are almost certain	Conservation and local restrictions; Regulatory action likely; Possible emergency response

4.2 Boundary Region Drought Levels and Response Plan

To support drought management within the Boundary Region, the RDKB (2021) developed the Boundary Region Drought Response Plan to provide water users with recommended actions to take during varying levels of provincially recognized drought. The goal of the plan is to lessen local impacts from drought conditions, enhance communication, and reduce the need for provincial regulatory action.

As outlined within the plan, water conservation and recommended reductions for the entire Boundary Region are determined by the provincially defined drought levels (Section 4.1) for the Kettle River and Okanagan River watersheds. The plan was generally developed for water suppliers, which are defined as those who deliver, manage, monitor, and in some cases treat water for water users, but can be used by any water user as a means to better understand risk and conservation options in the region. A summary of the Boundary Region drought level response and recommended water conservations measures for water users in the Kettle and Okanagan River watersheds is provided in Table 4-2.

Table 4-2 Boundary Region drought levels and response plan (for the Kettle and Okanagan River watersheds)

Item	Boundary Region Drought Level					
Provincial Drought Level	0 (Green)	1 (Yellow)	2 (Peach)	3 (Orange)	4 (Red)	5 (Maroon)
Condition	Normal or wetter than average	Dry	Very Dry	Severely Dry	Extremely Dry	Exceptionally Dry
Goal	Preparedness	Stewardship and voluntary conservation	Conservation with voluntary reduction of non-essential water use	Conservation with voluntary 30% reduction in total water withdrawals	Conservation with voluntary 50% reduction in total water withdrawals	Voluntary maximum reduction in total water withdrawals
Trigger	Provincial drought indicators for the Kettle and Okanagan River Watersheds.	Provincial drought indicators for the Kettle and Okanagan River Watersheds.	Provincial drought indicators for the Kettle and Okanagan River Watersheds.	Provincial drought indicators for the Kettle and Okanagan River Watersheds.	Provincial drought indicators for the Kettle and Okanagan River Watersheds.	Provincial drought indicators for the Kettle and Okanagan River Watersheds.
RDKB Communication	Update RDKB drought awareness webpage with current provincial drought level.	Update RDKB drought awareness webpage with current provincial drought level. Communicate local conditions and concerns to Provincial drought management staff and local water suppliers and users. where appropriate.	Update RDKB drought awareness webpage with current provincial drought level. Communicate local conditions and concerns to Provincial drought management staff and local water suppliers/users. Recommend water use reductions where applicable.	Update RDKB drought awareness webpage with current provincial drought level. Communicate local conditions and concerns to Provincial drought management staff, RDKB elected officials and staff, the Kettle River Watershed Advisory Council (KRWAC) and local water suppliers/users. Recommend water use reductions.	Update RDKB drought awareness webpage with current provincial drought level. Communicate local conditions and concerns to Provincial drought management staff, RDKB Elected Officials and staff, the KRWAC and local water suppliers/users. Update the RDKB Senior Management and Emergency Operations and identify water vulnerabilities. Recommend water use reductions.	Update RDKB drought awareness webpage with current provincial drought level. Communicate local conditions and concerns to Provincial drought management staff, RDKB Elected Officials and staff, the KRWAC and local water suppliers/users. Update the RDKB Senior Management and Emergency Operations and identify where alternative water supplies might be available, and water vulnerabilities. Prepare for risk of loss of supply and/or Provincial Regulatory Action.
RDKB Monitoring	Monitor local information as necessary.	Monitor provincially and federally reported streamflow, water temperature, and aquifer level information to respond to questions at the local government level.	Monitor provincially and federally reported streamflow, water temperature, and aquifer level information to respond to questions at the local government level	Collaborate with Provincial staff to report on streamflow, water quality, and/or aquatic habitat concerns.	Collaborate with Provincial staff to define critical environmental flow thresholds (CEFT) for threatened streams, help identify streams at or near their CEFT, and help advise on general fisheries and aquatic habitat concerns.	Continue to collaborate with Provincial staff to help identify streams at or near their CEFT and help advise on general fisheries and aquatic habitat concerns.
Water User Recommended Action	Prepare for drought conditions by filling reservoirs, irrigating efficiently, and maintaining and/or upgrading water systems (i.e., leak detection).	Prepare for drought conditions by filling reservoirs, irrigating efficiently, and maintaining and/or upgrading water systems (i.e., leak detection). Voluntary implementation of water conservation practices and prepare to reduce non-essential indoor and outdoor water use.	Prepare for drought conditions by filling reservoirs, irrigating efficiently, and maintaining and/or upgrading water systems (i.e., leak detection). Voluntary implementation of water conservation practices, reducing non-essential outdoor water use (e.g., vehicle washing, swimming pools), and preparing to reduce non-essential indoor water use.	Voluntary 30% reduction of water use based on licensed water quantity or average volume of water normally used. Reduce all non-essential outdoor water use, focus essential outdoor watering between dusk to dawn, and reduce non-essential indoor water use. Report water quantity concerns to the Province and the RDKB.	Voluntary 50% reduction of water use based on licensed water quantity or average volume of water normally used. Reduce all non-essential water use and conduct essential outdoor watering from dusk to dawn. Report water quantity concerns to the Province and the RDKB and review individual emergency response and contingency plans.	Voluntary maximum (>50%) reduction of water use based on licensed water quantity or average volume of water normally used. Reduce all non-essential water use and conduct essential outdoor watering from dusk to dawn. For agriculture, consider focussing irrigation on high value crops. Report water quantity concerns to the Province and the RDKB, review individual emergency response and contingency plans. Prepare in the even that Provincial regulatory measures be put in place.

4.3 Nine Mile Creek Watershed Drought Levels

No watershed specific drought levels have historically been defined for the Nine Mile Creek watershed. Instead, since the watershed is located within the Okanagan Basin, the RDKB relies on the provincially designated drought level for the Okanagan River watershed to identify drought management, planning, and response within the RDKB portion of Nine Mile Creek watershed.

4.4 Communication Plan

The BC Drought and Water Scarcity Response Plan (MECCS 2021e) highlights the importance of a well-structured and clearly defined communication strategy between key parties for effective drought preparation and response. To date, communication of drought by the RDKB within the Boundary Region is through public notification procedures (e.g., updating the RDKB drought awareness webpage and social media). Once a change to drought levels has been triggered, specific public communication strategies and appropriate responses are implemented. In addition, although not fully developed yet, the RDKB is producing a Drought Management Public Engagement Strategy that is designed to detail engagement practices during the planning and preparation period and during active drought events.

For the Nine Mile Creek watershed, during a drought the RDKB currently communicates through the RDKB website and with individual residents as required. Should the DMT be formed (Section 2.2), the RDKB will communicate with this local group during periods of drought.

5 DROUGHT LEVEL DECISION PROCESS

This section outlines the RDKB process for reviewing drought status and the decision process used to support drought level declarations within the Boundary Region (which is also used for Nine Mile Creek watershed). A general overview of the RDKB drought level decision process and parameters used is illustrated in Figure 5-1. The RDKB generally follows the provincial drought level declarations but may provide more specific drought conditions should a smaller watershed or region require it. This overall approach is consistent with that used by communities in the Okanagan Basin for water shortage planning, which depend on similar water supply sources for municipal and agricultural water needs.

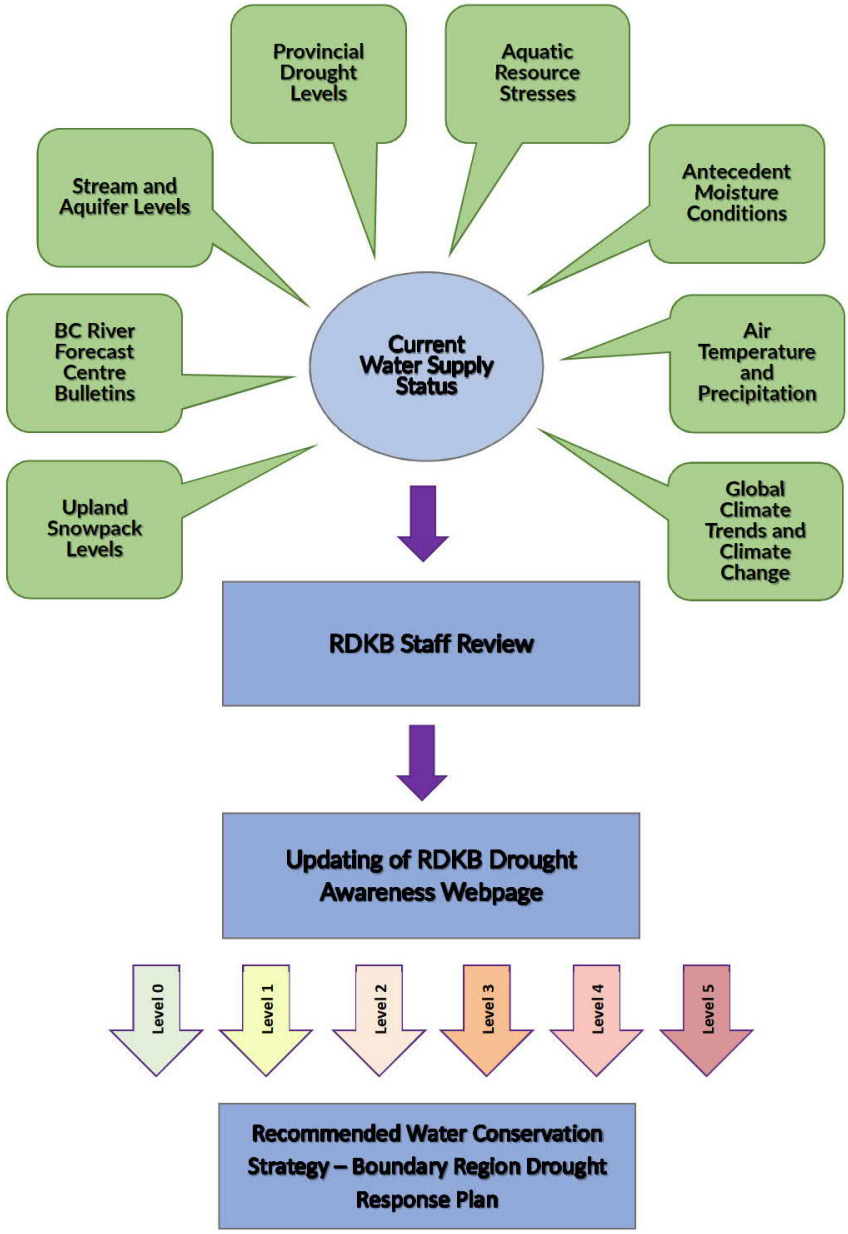

Figure 5-1 RDKB drought level decision process

5.1 Meeting and Decision Periods

During drought evaluation and response, the RDKB (Section 2.1) may meet formally (i.e., provincial drought meetings) and/or informally (i.e., internal RDKB meetings) to review the current water supply status and provincial drought levels (Figure 5-1). Meeting specifics will be determined based on the severity or perceived severity of the drought situation. The purpose of these meetings is to discuss the current state of water supplies (by water supply source and/or as a whole). These meetings also provide the opportunity to update drought communication material and, if necessary, offer RDKB support in the event that the Province of BC is considering or implementing emergency operational measures.

The RDKB understands that drought can result in personal hardship, economic losses to the agricultural and industrial-commercial-institutional communities, damage to infrastructure, and lost revenue, thus the water conservations strategies outlined in the Boundary Region Drought Response Plan (Table 4-2) are recommended to help reduce the severity of impacts. There are many users in one watershed, implementing water conservation does not only support the individual household, but also all users in the watershed and associated aquatic habitats.

While drought indicators (Section 5.3) are monitored daily to weekly by the Province of BC, critical decision periods are used by the Province of BC to assess a region's expected water supply status. These decision periods include the early (i.e., January to May) and drought (i.e., June to September) seasons. The RDKB relies on the provincial drought levels issued, taking into account any local information available during the drought season to support an improved understanding of drought conditions in more localized areas. This information may include stream and aquifer levels, state of aquatic habitats, operation of larger water diversions, and forecasted weather. Nine Mile Creek watershed is one area that the RDKB relies largely on community support to monitor local conditions due to the unique geographic location and general concern by residents of limited water availability. This helps the RDKB determine whether the provincial drought level identified for the Okanagan River watershed is appropriate for the Nine Mile Creek watershed headwaters.

5.2 Drought Indicators

This section provides a summary of the forecast parameters used by the Province and the RDKB to assess water supply status regionally and locally, respectively.

5.2.1 Provincial Drought Indicators

The drought indicators used by the Province to support drought level decision making and declarations are summarized by MECCS (2021e). Specifically, early season forecast indicators include basin snow measures (indices) and seasonal volume runoff forecasts, while drought season core indicators include 30-day precipitation and 7-day average streamflow percentiles for regional climate and hydrometric stations. Several other indicators are also used to help refine and/or inform decision making in some regions.

The BC River Forecast Centre releases snow course survey information as bulletins in January (1st), February (1st), March (1st), April (1st), May (1st and 15th), and June (1st and 15th), which are used to support the assessment of Basin Snow Water Index values. In addition, seasonal inflow forecasts are included in BC River Forecast Centre bulletins. The forecasts are provided for respective months, generally March, April, and/or May to June, July, and September. The forecasts are in reference to normal (average) climate conditions.

The Okanagan Basin Snow Water Index values and the Okanagan Lake inflow forecasts are used by the Province of BC to assess and declare drought levels within the Okanagan Basin and in turn are directly applicable to support drought planning with the Nine Mile Creek watershed.

5.2.2 Nine Mile Creek Drought Indicators

The annual winter snowpack drives the hydrologic regime of the Nine Mile Creek watershed, so variability in snowpack accumulation and melt can be dominant factors. Snow accumulation, expressed as snow water equivalent (SWE), represents stored water that is later released. This information is considered a drought forecast parameter for the Nine Mile Creek watershed in the early spring months. In addition, spring and summer precipitation is important to understand inputs to the creek and aquifer recharge. The following sections summarize the information sources available to the RDKB to assess the moisture conditions within the local region and the Nine Mile Creek watershed.

5.2.2.1 Snowpack Conditions

To review local drought conditions relevant to the Nine Mile Creek watershed, the RDKB uses information available from snow courses managed by the BC River Forecast Centre. Specifically, regional snow courses Vasuex Creek (2F20) and Mount Kobau (2F12) are reviewed to understand/confirm local regional conditions. These course sites have longer term records available and usually have snow still present by May 1st. The RDKB will also use snow conditions at Mount Baldy to provide a sense of precipitation levels for the general area. This snowpack information is used to support drought forecasting by providing additional insights into snowpack variability within the general upland area of Nine Mile Creek watershed.

5.2.2.2 Local Stream Conditions

The USGS currently monitors streamflows on Nine Mile Creek near the mouth (Section 3.3). This hydrometric station (USGS Station No. 12438905) provides real-time information on streamflow status for the watershed. However, since this hydrometric station is located downstream of the RDKB and RDOS portions of the watershed, the RDKB may also review other nearby hydrometric station information to help gain an understanding of general local runoff timing and volume. This hydrometric station information could include streamflow conditions at the following locations:

- Vaseux Creek above Solco Creek (WSC No., 08NM171);
- Inkaneep Creek near the Mouth (WSC No. 08NM200); and
- Antoine Creek at Hwy 97 near Ellisforde, WA (USGS No. 12444290).

In addition to the WSC and USGS hydrometric stations, the RDKB communicates with residents about streamflow conditions within the RDKB portion of the Nine Mile Creek watershed. It is recommended that the RDKB consider monitoring streamflow conditions in Nine Mile Creek in the future, either spot or continuous monitoring. This can support both effective drought response and watershed management, as well as allow for validation of the recommended EFN and CEFT values as outlined in Section 3.6.

5.2.2.3 Precipitation Conditions

To review local drought conditions when the upland snowpack has generally melted, the RDKB reviews spring and summer precipitation measured at the Osoyoos climate station (ECCC Station No. 1125852) to provide a rough indication of precipitation inputs to the watershed and for aquifer recharge.

5.2.2.4 Antecedent Moisture Conditions

Previous fall (i.e., September to November) antecedent soil moisture and groundwater conditions can influence interannual runoff variability. To this end, a qualitative understanding of previous fall antecedent conditions is important for early spring streamflow and aquifer level forecasting. There is currently no monitoring of soil moisture or groundwater conditions within the Nine Mile Creek watershed; however, MECCS operates a groundwater observation well just outside the Regional District of Okanagan-Similkameen boundary of the watershed (Osoyoos – Anarchist Mountain Summit [No. 402]) (Section 3.4). This well can be used by the RDKB as an information source to understand where groundwater levels are in comparison to previous wet and dry years.

5.2.2.5 Evapotranspiration Forecasts and Soil Moisture Deficit

Farmwest[13] provides climate information to farmers and irrigators in BC and includes climate stations that report evapotranspiration (ET) for irrigation scheduling, growing degree days, air temperature, precipitation, soil moisture deficit, as well as five-day weather forecasts. The Farmwest climate station network is updated daily to provide the most current information possible and includes the following climate stations near the Nine Mile Creek watershed:

- Osoyoos East; and
- Osoyoos North.

Climate and Agriculture Initiative BC (previously known as BC Agriculture and Food Climate Action Initiative) is also in the process of building partnerships to improve access and distribution of current climate conditions and forecasting through the Kootenay to Okanagan regions (www.climateagriculturebc.ca).

Forecasted ET values, as well as calculated soil moisture deficits[14] (since the date of soil water up) can be used to help assess and communicate irrigation demand (i.e., high or low).

5.2.2.6 Global Climate Trends and Climate Change

Understanding that climate change is not a specific (known) variable or value that can be specifically accounted for within immediate term monthly water supply forecasting, the RDKB understands the projected changes to streamflow timing, reservoir refilling, and water demand (as summarized in Sections 3.2 and 3.3) and uses that information to help communicate future water needs and the importance of water management and conservation.

6 DROUGHT RESPONSE PLAN

The overall components of the Nine Mile Creek watershed (provincial) drought levels (Section 4.3) and RDKB's decision making and drought level communication (Section 5.1) are summarized in the drought response plan (Table 6-1). The Nine Mile Creek drought response plan (for the RDKB portion of the watershed) is the recommended staged approach to water management during periods of drought through the identification and evaluation of factors that trigger a response.

As noted in Section 2.1, the RDKB's Watershed Planner, or any other person that the RDKB Board designates, is responsible for communicating the drought risks to the watershed community. Recommended response actions are those included in the Boundary Region Drought Response Plan that are focused on the reduction and/or conservation of water use during periods of drought.

[13] http://www.farmwest.com/

[14] Soil moisture deficit is the difference between measured ET and effective precipitation. It represents the amount of water removed (or added) to the soil since a reference date (i.e., start of irrigation when soils are at field capacity).

Table 6-1 Nine Mile Creek watershed (RDKB portion) drought response plan

Item	Nine Mile Creek Watershed Drought Level					
Provincial Drought Level	0 (Green)	1 (Yellow)	2 (Peach)	3 (Orange)	4 (Red)	5 (Maroon)
Condition	Normal or wetter than average	Dry	Very Dry	Severely Dry	Extremely Dry	Exceptionally Dry
Goal	Preparedness	Stewardship and voluntary conservation	Conservation with voluntary reduction of non-essential water use	Conservation with voluntary 30% reduction in total water withdrawals	Conservation with voluntary 50% reduction in total water withdrawals	Voluntary maximum reduction in total water withdrawals
Trigger	Provincial drought indicators for the Okanagan River watershed and, if possible, any Nine Mile Creek watershed drought indicators.	Provincial drought indicators for the Okanagan River watershed and, if possible, any Nine Mile Creek watershed drought indicators.	Provincial drought indicators for the Okanagan River watershed and, if possible, any Nine Mile Creek watershed drought indicators.	Provincial drought indicators for the Okanagan River watershed and, if possible, any Nine Mile Creek watershed drought indicators.	Provincial drought indicators for the Okanagan River watershed and, if possible, any Nine Mile Creek watershed drought indicators.	Provincial drought indicators for the Okanagan River watershed and, if possible, any Nine Mile Creek watershed drought indicators.
Fisheries and Aquatic Habitat	No action at this time.	No action at this time.	Observe streamflows and report concerns.	Observe streamflows and report concerns.	Observe streamflows and report concerns.	Observe streamflows and report concerns.
Regulation and Response	Prepare for drought conditions by filling licensed reservoirs/ponds, irrigating efficiently, and maintaining and/or upgrading water systems (e.g., leak detection).	Prepare for drought conditions by filling licensed reservoirs/ponds, irrigating efficiently, and maintaining and/or upgrading water systems (e.g., leak detection). Voluntary implementation of water conservation practices and preparing to reduce non-essential water use.	Continue to prepare for drought conditions. Voluntary implementation of water conservation practices, reducing non-essential outdoor water use (e.g., vehicle washing, swimming pools), and preparing to reduce non-essential indoor water use.	Voluntary 30% reduction of water use based on licensed water quantity or average volume of water normally used. Reduce all non-essential outdoor water use, conduct essential outdoor watering from dusk to dawn and reduce non-essential indoor water use.	Voluntary 50% reduction of water use based on licensed water quantity or average volume of water normally used. Reduce all non-essential water use and conduct essential outdoor watering from dusk to dawn. Review individual drought emergency response and contingency plans.	Voluntary maximum (>50%) reduction of water use based on licensed water quantity or average volume of water normally used. Reduce all non-essential water use and conduct essential outdoor watering from dusk to dawn. For agriculture, consider focussing irrigation on high value crops only. Be prepared to implement individual drought emergency response and contingency plans. Prepare for possible Provincial regulatory action.
RDKB Communication	RDKB to update drought awareness webpage with current provincial drought level.	RDKB to update drought awareness webpage with current provincial drought level. Communicate local conditions and concerns to Provincial drought management staff and local water suppliers/users.	RDKB to update drought awareness webpage with current provincial drought level. Communicate local conditions and concerns to Provincial drought management staff and local water suppliers/users.	RDKB to update drought awareness webpage with current provincial drought level. Communicate local conditions and concerns to Provincial drought management staff, RDKB Elected Officials and relevant staff, the Kettle River Watershed Advisory Council (KRWAC) and local water suppliers/users.	RDKB to update drought awareness webpage with current provincial drought level. Communicate local conditions and concerns to Provincial drought management staff, RDKB Senior Management, Elected Officials, and staff, the KRWAC and local water suppliers/users. Update the RDKB Emergency Operations and identify water vulnerabilities.	RDKB to update drought awareness webpage with current provincial drought level. Communicate local conditions and concerns to Provincial drought management staff, RDKB Senior Management, Elected Officials and staff, the KRWAC and local water suppliers/users. Update RDKB Emergency Operations identifying (where necessary) water vulnerabilities and options for alternative water supplies, and to prepare for risk of loss of supply.
Enforcement (BC Government)	Any water use infraction to be reported to the Report All Poachers and Polluters (RAPP) program.	Any water use infraction to be reported to the Report All Poachers and Polluters (RAPP) program.	Any water use infraction to be reported to the Report All Poachers and Polluters (RAPP) program.	Any water use infraction to be reported to the Report All Poachers and Polluters (RAPP) program.	Any water use infraction to be reported to the Report All Poachers and Polluters (RAPP) program.	Any water use infraction to be reported to the Report All Poachers and Polluters (RAPP) program.

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APPENDIX A – DROUGHT MANAGEMENT PLAN QUESTIONNAIRE

Nine Mile Creek Drought Management Plan Questionnaire

The **Regional District of Kootenay Boundary** (https://rdkb.com) and **Associated Environmental Consultants Inc.** (https://www.ae.ca) are developing a **Drought Management Plan (DMP)** for Nine Mile Creek watershed to help mitigate potential risk of water supply shortage and support future water use planning. The goal of the DMP is to help support having adequate water supplies available within the watershed for water users and the aquatic environment under drought conditions in the future considering population growth, changes in land use, as well as climate change. This DMP is only being developed for the portion of the watershed within the RDKB boundary (see attached map).

To support the development of the DMP, local knowledge is needed to help develop a plan that reflects, and addresses concerns that local water users may have within the watershed. Accordingly, the following questionnaire includes questions pertinent to support the development of a plan that meets local community member's concerns and/or expectations and allows for achievable outcomes. All participant names will remain confidential, with a summary of the collected information to be included within the final report.

To have your information included in this review, please return your questionnaire by **June 18, 2021**. This can be sent in by email to watershedplanner@rdkb.com or in person using the drop box outside the RDKB office in Grand Forks, or at the Riverside Centre at Rock Creek. An online version of this form can be found at: rdkb.com/Environment/Watershed-Planning. For any questions, need help filling this in, or you have a completed form that you are not able to drop off, please contact Kristina Anderson at watershedplanner@rdkb.com or 250-442-4111.

Name (for internal use only):
Contact information should we require clarification or more information (for internal use only):

Please identify all the groups you consider yourself connected with (note that this information will be used to identify who responded to the questionnaire):

- ☐ **Dryland agriculture**
- ☐ **Agriculture using irrigation**
- ☐ **Ranching**
- ☐ **Industrial**
- ☐ **Commercial**
- ☐ **Local citizen**
- ☐ **Other** _____ **(please define)**
- ☐ **Prefer not to say**

1. **Do you have a water licence?** If yes, for what type of water source (groundwater or surface water) and are you actively diverting/withdrawing water for domestic and/or agricultural and/or commercial or other purposes? If no, have you applied, or will you be applying for a water licence?

2. **Do you have any concerns about water availability for yourself and/or others within the Nine Mile Creek watershed?** Please provide a description of your concerns or why you may not have any concerns.

3. **Do you have any concerns about water availability for aquatic resources (e.g., fish, insects, aquatic or riparian vegetation) within the Nine Mile Creek watershed?** Please provide a description of your concerns or why you may not have any concerns.

4. **Do you practice water conservation during periods of dry conditions/drought and/or low streamflow periods?** If yes, what are your water conservation practices?

5. **If you answered no to Question #4, would you be open to implementing water conservation practices during periods of dry conditions/drought and/or low streamflows?** If yes, what types of practices would you consider and have any barriers limited you from implementing practices in the past?

6. **What do you feel is the best way to communicate to water users within the Nine Mile Creek watershed about water availability and water conservation?**

7. **Do you have any additional comments that may support the development of the drought management plan for the Nine Mile Creek watershed?**

Thank you for taking the time to provide this very important information. If you would like additional information or have any project questions, please contact Kristina Anderson (watershedplanner@rdkb.com) and/or Drew Lejbak (lejbakd@ae.ca).

APPENDIX B – DROUGHT MANAGEMENT TEAM – TERMS OF REFERENCE

Associated Environmental

MEMO

Date:	May 16, 2022	File:	2021-8889.000
To:	Kristina Anderson, Regional District of Kootenay Boundary	Page:	Page 1 of 5
From:	Drew Lejbak, M.Sc.		
Project:	Nine Mile Creek Watershed - Drought Management Plan		
Subject:	Drought Management Team - Draft Terms of Reference Template		

1 INTRODUCTION

An important part of developing, implementing, and communicating a drought management plan (DMP) is to develop a community-based Drought Management Team (DMT) where water supply and conservation decisions can be communicated and discussed to ensure that all water user groups understand drought conditions, risks, and potential operational changes and/or emergency needs.

MECCS (2021)[1] identifies that the effective implementation of a DMP and drought practices requires a knowledgeable and informed DMT. Specifically, as outlined by MECCS (2021), the responsibilities of a DMT should be as follows:

- Act as an advisory committee regarding water conservation and drought management recommendations.
- Compile data on water supplies and users.
- Coordinate communication efforts with various stakeholders.
- Provide information to the public and relevant organizations about water supplies.
- Encourage water conservation and appropriate responses to drought conditions.

Following the above, this document provides a template for a Terms of Reference (TOR) to support the development of a Boundary Region DMT, which includes the RDKB portion of the Nine Mile Creek watershed, consisting of the DMT purpose, membership composition and responsibilities, and recommended levels of commitment and meeting timelines. This draft TOR template is to be reviewed by the RDKB and once accepted/finalized, the TOR will be added as a component to the DMP.

Note that as part of drought management for the City of Penticton, the City developed a TOR for drought management (i.e., Associated 2021)[2] and included it within their DMP. For this draft TOR template, certain learnings and components of the City's TOR were adopted herein (and approved for inclusion by the City [Firlotte, pers. comm., 2021)][3].

2 DROUGHT MANAGEMENT TEAM – DRAFT TERMS OF REFERENCE TEMPLATE

The draft TOR template is summarized in Table 2-1. The TOR is structured to provide a general understanding of the purpose, scope, membership, and communication/meeting requirements for successful implementation and application.

[1] BC Ministry of Environment and Climate Change Strategy (MECCS). 2021. Dealing with Drought – A Handbook for Water Suppliers in BC. Deputy Ministers' Committee on Drought, May 2021.

[2] Associated Environmental Consultants Inc. (Associated). 2021. Drought Management Plan – Version 2. Prepared for the City of Penticton, May 2021.

[3] Firlotte, M. City of Penticton, Water Quality Supervisor. Personal communication with Drew Lejbak of Associated Environmental Consultants Inc., October 2021.

Table 2-1 Draft terms of reference for the development of a drought management team for the RDKB portion of the Nine Mile Creek watershed

Terms of Reference Component	Description
Purpose	The purpose of the Drought Management Team (DMT) is to assist RDKB staff in the development of efficient water use strategies, informing the community on water supply levels, and providing feedback on the effect of water use restrictions. Specially, members of the DMT will: • Promote water sustainability and drought management accomplishments in the community and/or sectors they represent; • Provide knowledge and expertise to assist in promoting and/or informing/updating water management and drought planning decisions; and • Communicate water management and/or drought response measures to the stakeholder group they represent and to bring any relevant comments to the attention of the DMT and/or the RDKB.
Scope	The scope of the DMT is as follows: • Review and understand the background information provided by RDKB staff, which includes current provincial and local water supply / drought levels and associated triggering factors used to determine provincial drought levels. • Provide input into communication strategies (e.g., bulletins, posters, websites, presentations) appropriate for the stakeholder group they represent and/or the public. • Act as a communication liaison to the stakeholder group they represent and identify opportunities to learn from others in their sector outside of the local area. • Identify opportunities to improve water use and conservation with respect to the stakeholder group they represent, as well as challenges that may delay or impair the implementation of drought response and water conservation strategies. • Provide the RDKB with a platform to discuss and/or provide feedback on recommended water conservation strategies, drought management, and/or drought response strategies.
Membership Responsibilities	DMT members shall work together to satisfy the following responsibilities: • Act as a team member, with guidance and direction on team involvement provided by RDKB staff.

Terms of Reference Component	Description
	• Commit to regular attendance at meetings and ensure that the RDKB has current contact information and is informed in a timely manner of any change in the ability to participate in the DMT. • Be informed on the Drought Management Plan, provincial drought levels, and recommended drought responses outlined in the Boundary Region Drought Response Plan. Act in a respectful, collaborative, and compassionate manner, understanding that drought and drought responses may influence community groups in both positive and negative ways.
Member Protocol	The DMT will encourage collaboration with the intent of working towards a common goal, committing to the process, and building stakeholder/public awareness and support for drought response strategies. Specifically, DMT member protocols are outlined as follows: • Members are encouraged to express their personal views in a respectful manner. Members are present to give a voice to the stakeholder or local government group they represent; however, members are equally expected to listen and understand the views of others. • Members are encouraged to actively participate in team discussions and use their experience, education, and insight to speak about any issues or opportunities to be considered. It is expected that each member will have an equal opportunity to contribute, as well as respect the opinion of others. • Members are encouraged to communicate about the process to others outside of the DMT, but may not speak on behalf of or in a manner that would create the impression that they are speaking for the RDKB or the DMT as a whole. Specifically, members are asked to present any information they are planning to publish to the media to the RDKB and the DMT, so that the respective parties are aware of any publications. In addition, any comments or opinions expressed by members of the DMT are to be held confidential unless approved by the DMT and/or respective member.
Team Composition (General)	The DMT should include expertise from the following areas to ensure that the RDKB is fully informed on any potential short- or long-term impacts

Terms of Reference Component	Description
	that may arise of the implementation of the Drought Management Plan and corresponding drought response strategies: • High water needs business activities • Agriculture • Ranching • Economic development • Environmental and sustainability • Concern citizen • Local government / relevant nearby water users (e.g., First Nations, Regional District of Okanagan-Similkameen) • Provincial drought levels (e.g., BC Ministry of Forests, Lands, Natural Resource Operations, and Rural Development) • Trans-border regulation / water users (e.g., Colville Confederated Tribes, Washington State Department of Ecology)
Team Composition (Specific)	In addition to the individual member composition, additional team composition will include: • Chairperson: The DMT will be chaired by an RDKB staff member. The chairperson will facilitate the meetings. • Staff Support: The RDKB will provide staff support to the DMT with regard to the coordination of meetings and agendas in accordance with the goals of the Drought Management Plan.
Term and General Meetings	DMT members are asked to serve a two-year term and may continue to serve on the DMT until an alternate representative is found. The RDKB will communicate with the DMT as follows: • During normal water supply conditions (i.e., non-drought years), the RDKB will provide updates on provincial drought levels and water conservation recommendations in a timely manner by email and through regular updates posted on the RDKB drought awareness website. • During a drought, the DMT would meet as required. • During a severe drought, the DMT would meet twice per month or at a schedule deemed adequate to meet the needs of the water user community.
Reporting	RDKB staff will record minutes and will use as necessary for reporting purposes.

Terms of Reference Component	Description
Remuneration	Acting as a member of the DMT is voluntary. No renumeration will be provided by the RDKB.
Other	For clarity, these Terms of Reference do not delegate any authority or corporate powers to the DMT.