

MORDEN DROUGHT PLAN

January 2022

Prepared for the City of Morden
By Landmark Planning & Design



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Planning & Design Inc.

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1. Drought Plan Overview

1.1. Forward

This Drought Plan was prepared collaboratively by Landmark Planning & Design and the City of Morden. The Plan is intended to help the municipality prepare for, and respond to, drought events. Though the City of Morden receives the majority of their water from Lake Minnewasta, Morden is a member of the Pembina Valley Water Cooperative (PVWC) and receives a portion of its municipal water from the co-op. Therefore, this plan is designed to not only address drought mitigation as it relates to Lake Minnewasta but also complement and adhere to the tenets set forth in the *PVWC Drought Plan*.

1.2. Introduction

Drought is a tangible concern for southern Manitoba including within the Red River Valley. Historic records indicate cyclical instances of drought in southern Manitoba and upstream in the Red River Valley, which is the PVWC's primary source of water. This is also true for the basin which feeds Dead Horse Creek and Lake Minnewasta which is Morden's primary source of water. Furthermore, scientific analysis suggests the effects of climate change in the region may result in more frequent and protracted drought events. Drought is a unique natural disaster because it may have a slow onset and last for several seasons. These traits contrast with other emergency "events" such as flooding, which is a common occurrence experienced throughout the Red River Valley.

This Drought Plan will help the City of Morden plan for, mitigate the impacts of, and respond to drought events. The Plan also responds to the *PVWC Drought Plan*, which was adopted in 2018 and outlines how the co-op will prepare for and respond to drought events, thus setting a framework for their members and customers to follow. Because the City of Morden has multiple water sources, the drought monitoring and response actions of the *PVWC Drought Plan* are not directly incorporated into the municipality's drought plan but are echoed throughout.

1.3. Background

The City of Morden receives water from two sources. The largest source of the City's water is Lake Minnewasta, accounting for approximately 90 percent of the supply. Lake Minnewasta is a reservoir that is 1.4 kilometres long by 500 metres wide (at its widest point) and was created through the construction of a dam on Dead Horse Creek. The watershed of the creek upstream from the reservoir encompasses approximately 130 square kilometres of land area¹.

¹ City of Morden Annual Water System Operation Report, 2020.

The City of Morden supplemented approximately 5 percent of their water supply from the Pembina Valley Water Co-op (PVWC),² although this has increased to approximately 10 percent in recent years. The PVWC is a regional water cooperative that serves more than 59,000 customers within 14 municipalities over an area of 9,000 square kilometres in southern Manitoba. The PVWC draws water from the Red River and Stephenfield Reservoir (Boyne River) and distributes raw water to three water treatment plants (WTPs). While the PVWC water distribution network includes interconnections and redundancies for moving water within the system, the City of Morden generally receives their water from the Letellier WTP, which has been identified as having a water source vulnerable to drought and does not have the capacity to meet current or future peak demands³. The share of water Morden receives from the PVWC is set to increase over the next four years.

The Red River generally represents a plentiful source of water for the PVWC, however like most natural resources the supply is finite and susceptible to natural events. Historically the flow of the Red River has been significantly reduced during major drought events. Furthermore, no international agreements are in place requiring upstream jurisdictions in the United States to provide flow north into Manitoba. Both the Red River and Stephenfield Reservoir have been identified as being vulnerable to drought.

At the time of writing this report (Winter 2021), the City of Morden was experiencing a severe drought as Lake Minnewasta was more than 10 feet below its full supply level, representing the lowest level on record. At the same time, the Red River Valley was experiencing drought conditions with substantially reduced flows on the Red River, resulting in the PVWC membership declaring a “drought state of emergency” in July of 2021.

While droughts are cyclical in southern Manitoba, research indicates the climate uncertainty resulting from a warming climate may result in more severe and sustained droughts. The City of Morden has identified drought as a concern that may pose a threat to its community.

² Pembina Valley Water Cooperative.

³ Pembina Valley Water Cooperative.

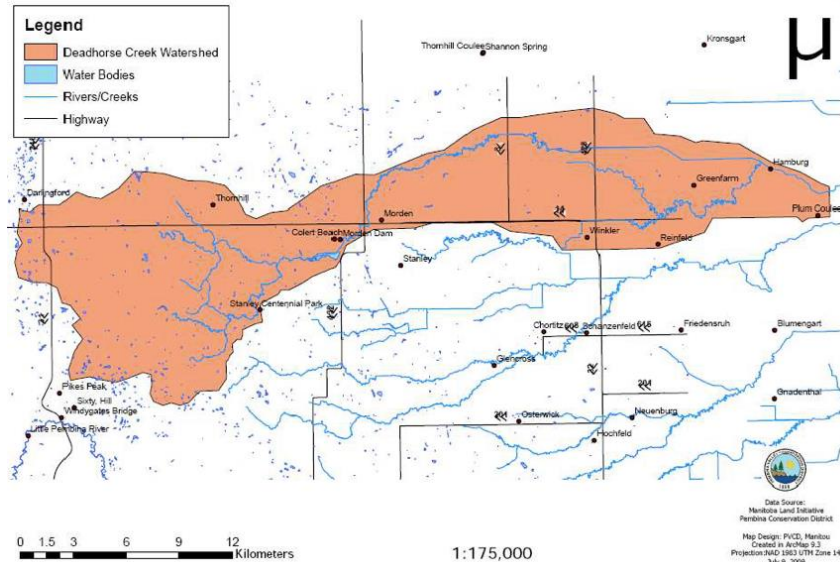


Figure 1: Dead Horse Creek Watershed

1.4. History of Water Conservation in Morden

The following key milestones and events highlight the progression of water conservation in the City of Morden since the mid-1900s:

- 1941: Dam constructed across Dead Horse Creek, creating Lake Minnewasta.
- 1953: Dam is raised by 3.6 metres (12 feet), creating a larger lake.
- 1961: The town of Morden requested the creation of a second dam on Dead Horse Creek 4.
- 1982: Dam is further raised by over 2 metres (7 feet).
- 2007: The town of Morden joined the Pembina Valley Conservation District (PVCD) [now known as the Pembina Valley Watershed District].
- 2017: the City of Morden prepared an Environmental Act Proposal for a new Wastewater Treatment Facility to meet future population demands.
- 2012: Creation of a profile for the Town of Morden complementing a Pembina Valley Conservation District (PVCD) wide application of Standard Demand Management and Water Soft Path measures for watershed management and planning.
- 2020: Morden implemented replacement of old water meters and installation of advanced metering infrastructure.
- 2021: Co-Applicants in the Regional Wastewater Treatment Project with Winkler and Stanley (Winkler-Stanley-Morden Wastewater Treatment Project).
- 2021: the City of Morden enforced compliance to water use during the drought stage through the implementation of the City of Morden Water Restrictions By-law 10-2021.
- 2021: Morden implemented a water and wastewater by-law requiring low flow fixtures in all new installations.

⁴ Manitoba Clean Environment Commission, 2006.

1.5. Purpose

The ultimate objective of this Plan is to provide the City of Morden with direction prior to and during drought conditions and to provide longer-term guidance to mitigate the impacts of a drought. In other words, the Plan addresses drought events both in proactive and reactive approaches offering direction for all aspects of drought planning. The five key components of this plan are as follows:

- **Drought Monitoring** involves utilizing primary and secondary data regarding water supply levels at Lake Minnewasta and incorporates PVWC Drought Triggers.
- **Drought Mitigation** involves proactive action and planning to reduce the long-term risks and potential impacts of drought events by identifying principal activities and possible susceptibilities and developing mitigation actions and programs to reduce these vulnerabilities to drought.
- **Drought Preparedness** refers to the directed policies, plans and actions which must be implemented prior to a drought event occurring in order to increase forecasting accuracy, ensure the Plan is fully implementable and that Morden is fully prepared to respond during a drought event.
- **Drought Response** encompasses the actions taken during a drought event to reduce its immediate impacts on the environment or society through enactive temporary adjustments to normal practices until normal climatic conditions return. Drought response also includes the communication process used to convey information internally and externally.
- **Drought Recovery** is the process of returning operations to a normal state when a drought event has dissipated in order to restore or improve pre-drought conditions and working to further mitigate the impacts of any future drought events.

1.6. Scope

The City of Morden is a member of the PVWC. As such, this Plan draws heavily from the PVWC Drought Plan which outlines the co-op's responsibilities in order to provide clarity for their customers. The PVWC Drought Plan calls for PVWC customers to prepare and adopt a local drought plan specific to their needs. This Plan, therefore, is intended to be complementary to and compatible with the PVWC Drought Plan (see Figure 2). The City of Morden obtains approximately 10-12 percent of their water from the PVWC, and as such, this Plan incorporates Monitoring mechanisms that pertain to the local context.

This Plan is intended to compliment the City’s emergency preparedness and existing water conservation by-law. It provides a framework for potential adoption of complimentary plans, policies and by-laws to serve as tools for implementing and achieving the goals of the Drought Plan. Any such implementation tools would be required to fit within the frameworks provided within *The Municipal Act*, *The Provincial Offences Act*, *The Municipal By-Law Enforcement Act* and any other Provincial or Public Utility Board requirements.

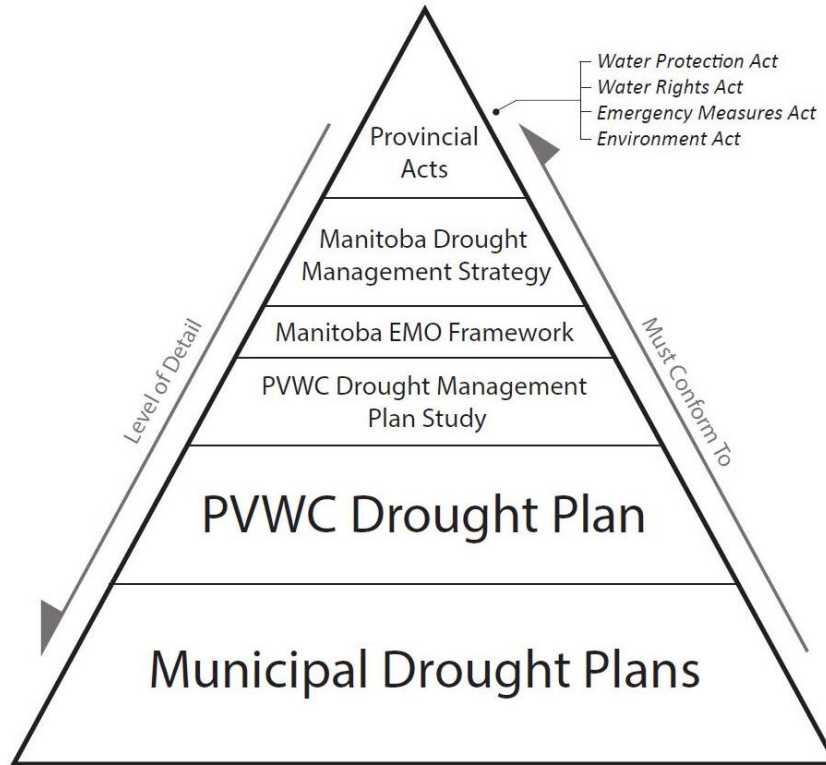


Figure 2: Hierarchy of drought-related policies/guidelines

2. Drought Planning Considerations

Drought is a potential threat in most geographic areas of the world. Water is the source of life and prosperity and droughts present risks to communities in three key ways:

- **Economic** - Impacts on the industry, recreation and tourism, agricultural production, energy production, reduced cash-flow for water utilities;
- **Ecological** - loss of wetland, impact on fisheries and wildlife, a drawdown of wells and aquifers, reduced soil quality, dust and fire risk; and
- **Social** - health implications, quality of life, community aesthetics, and in some cases, conflict.

There are several key characteristics which make planning for drought a vital exercise for the City of Morden, including a changing climate, the historic and projected growth of its population, and available water sources. This Section (2) provides insight into these factors.

2.1. Climate Change

Drought is a natural, recurring process that has been present throughout recorded history, and according to tree-ring analysis and other data, pre-dates recorded history. While droughts are a natural function, it is expected that climate change may increase the severity and/or frequency of droughts on the Canadian Prairies.

According to the *Climate Atlas of Canada*⁵, Manitoba is expected to warm at a greater rate than the global average. This is due to Manitoba's northern latitude and continental climate. There are two key elements that are projected to impact Manitoba in terms of drought. First, southern Manitoba is expected to experience hotter summers. Second, precipitation is expected to increase in winter and spring but decrease in summer. The Climate Atlas concludes, "given that many communities in the south are projected to see a tripling or even quadrupling in the number of very hot days, even minor declines in summer precipitation will create the perfect recipe for drought". Furthermore, "the combination of wetter springs and drier summers means that southern regions may have to cope with flooding and drought in the same year. We can foster community resilience to these conditions by adapting infrastructure, enhancing water and drought management, and refining emergency planning".

The Prairie Climate Centre states that seasonal conditions "form the basis of many of Manitoba's cultural and economic activities" and identified five temperature indicators to demonstrate the potential impacts of climate change for communities in Manitoba. These indicators, along with projected changes for various Manitoba communities including Morden, are highlighted below:

⁵ Climate Atlas of Canada. Prairie Climate Centre.

Communities	Average hottest temperature of the year			Average coldest temperature of the year			Average number of days per year above 25 °C			Average number of below-zero days per year			Average length of the frost-free season		
	Recent Past	Low-Carbon Future	High-Carbon Future	Recent Past	Low-Carbon Future	High-Carbon Future	Recent Past	Low-Carbon Future	High-Carbon Future	Recent Past	Low-Carbon Future	High-Carbon Future	Recent Past	Low-Carbon Future	High-Carbon Future
Winnipeg	34.5 °C	37.8 °C	39.3 °C	-36.0 °C	-31.5 °C	-29.8 °C	55	87	98	189	161	149	127	149	161
Brandon	34.8 °C	37.7 °C	39.3 °C	-37.9 °C	-33.2 °C	-31.5 °C	57	88	100	196	170	157	117	140	150
Morden	35.1 °C	38.5 °C	40.1 °C	-34.1 °C	-29.6 °C	-27.9 °C	57	90	102	186	158	145	130	153	164
Dauphin	34.0 °C	36.6 °C	38.0 °C	-37.4 °C	-33.5 °C	-31.8 °C	48	79	91	196	168	156	118	141	148
Gimli	32.8 °C	35.8 °C	37.3 °C	-37.5 °C	-33.2 °C	-31.3 °C	41	73	85	194	164	152	124	146	156

Figure 3: Projected climate changes in Manitoba communities (Source: Climate Atlas of Canada)

If climate change trends continue, in a high-carbon future scenario, Morden is projected to experience **34 days** of temperatures above +30 degrees Celsius annually, doubling the number of days that reach that temperature in the recent past (1976-2005). Increased temperatures could also have an impact on evaporation on static water supplies and reservoirs, such as Lake Minnewasta. Climate trends occur over the long term, but for context, the summer of 2021 contained **27 days** above 30 degrees Celsius and was one of the driest on record. While the winter of 2020-2021 was also very dry, it is important to note that the region has experienced below-average precipitation for the last three years.

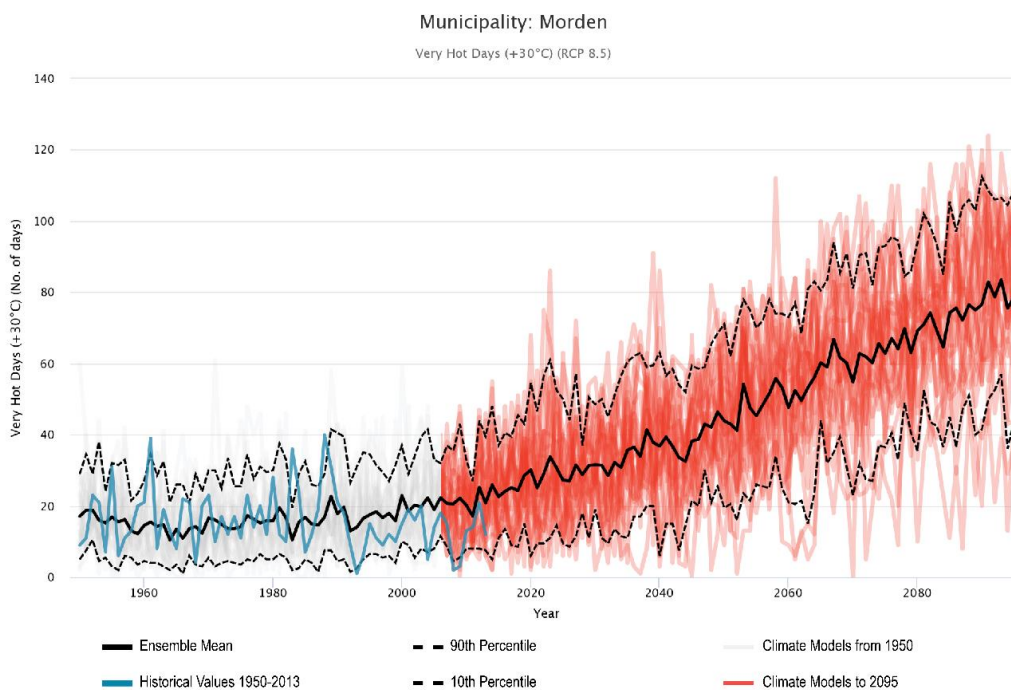


Figure 4: Projected days above 30 degrees Celsius (Source: Climate Atlas of Canada)

2.2. City of Morden Characteristics

2.2.1. Community Profile

Morden is a growing prairie city with a humid continental climate located in the Pembina Valley Region of southern Manitoba, approximately 125 kilometres southwest of Winnipeg and 11 kilometres west of Winkler. Morden is a major centre in the Pembina Valley Region which boasts a large amount of cultivated agricultural land and ample development opportunities in the industrial and agricultural sectors.

Table 2-1: Pembina Valley Census Results 2011-2016

City/Town	Population Increase 2011 to 2016
Winkler	1,921
Morden	856
Carman	137
Altona	124
Morris	88

Census data reveals the City of Morden has a relatively diverse economic base. Manufacturing and health care play a major role in the economy, accounting for approximately 16 percent and 17 percent of employment respectively. However, construction and agriculture still play a significant role, accounting for 12 percent of employment.

2.2.2. Water Treatment and Consumption

The City of Morden is served by a network of underground pipes that supply water to all areas of the city. Non-PVWC water is treated at the Morden WTP, which uses a Lime-Soda Ash softening process followed by carbonation, sand filtration, UV disinfection, and chlorination. The maximum treatment capacity is 90 litres per second (l/s), though the firm capacity is 50 l/s. The City of Morden is in the process of designing upgrades to the WTP and has recently replaced a lime slaker, is completing a PLC and SCADA upgrade, has installed and replaced 2200 water meters, and is monitoring online turbidity for all filters.

The chart below identifies the type and length of watermain piping in service that serve the diverse land uses (residential, commercial, industrial, institutional) within Morden⁶.

Table 2-2: Type of watermain piping in Morden

Type of Waterline	Total Metres
Asbestos Cement	36,273.21
Ductile Iron	1,760.08
Plastic	30,101.00

⁶ City of Morden Public Water System Annual Report, 2020.

2.2.3. Morden and Lake Minnewasta

The City’s water rights license allows for an annual withdrawal of 947,000 cubic metres from Lake Minnewasta, though the 2019 and 2020 annual withdrawals was higher than the license limit. The current WTP upgrade process will address water right license capacity, THM issues and Standpipe decommissioning.

2.2.4. Morden and the Pembina Valley Water Cooperative

The City of Morden currently purchased 50,000 cubic metres of water annually from the PVWC, representing 5 percent of the City’s total annual consumption. Morden is in the process of increasing its share of water received from the PVWC as shown in the table below with the current share of PVWC water representing over 10 percent of supply.

Table 2-3: Share of water received from the PVWC

Year	Quantity	Rate
2020	50,000	-
2021	157,680	5 l/s
2022	220,752	7 l/s
2023	252,288	8 l/s
2024	282,824	9 l/s
2025	315,360	10 l/s

It is important to note that increases in PVWC allocation and water treatment capacity will help the city meet its future growth requirement when water supply is not limited but will not be sufficient in accommodating drought management. Lake Minnewasta, the Red River and Boyne River (Stephenfield Reservoir) are all susceptible to drought conditions.

2.2.5. Consumption Reports

Annual water use has continually increased in the City of Morden as reflected in both residential and commercial-industrial consumption rates. As of September 2021, the annual residential consumption report indicated 100,178,540 gallons of water used, while the total consumption was 148,866,665 gallons in 2020. Commercial-industrial consumption totals increased to 15,458,452.42 gallons in 2021 from 11,186.973.72 gallons in 2020.

Table 2-4: Residential consumption totals (annual)

Residential Consumption	Consumption (Gallons)
2021*	100,178,540.00
2020	148,866,665.00
2019	146,937,557.00

Morden’s largest residential consumers include the following:

1. Multi-family dwellings;
2. Senior’s residences;
3. Mobile home parks; and
4. Single-family residences.

*As of September 2021.

Table 2-5: Commercial-Industrial consumption totals (annual)

Commercial-Industrial Consumption	Consumption (Gallons)	
	2021*	10,392,996.62
	5,065,455.80	Industrial
	15,458,452.42	
2020	11,186,973.72	
2019	10,301,269.95	

Morden’s largest commercial and industrial consumers include the following sectors:

1. Hotels and hospitality;
2. Car washes and automobile services;
3. Chemicals and manufacturing;
4. Medical and health centres;
5. Municipal activities; and
6. Retail and commercial services.

*As of September 2021.

In addition to the City of Morden, there are two licensed users who withdraw water from Lake Minnewasta. The Rural Municipality of Stanley’s (RM of Stanley) water rights license allocates them 10.8 million gallons, or approximately 49,100 cubic metres, per year. The Minnewasta Golf and Country Club is licensed up to 9.5 million gallons, or approximately 43,170 cubic metres, per year for irrigation purposes, however their allocation is restricted based on the water level of Lake Minnewasta as set out in the terms of their license.

2.2.6. Per Capita Consumption

Understanding water use and consumption is important for setting conservation and use reduction targets as well as predicting future water demands to accommodate population and industry growth. The table below provides information pertaining to personal water use in various municipalities throughout Manitoba.

Table 2-6: Personal Water Use in Manitoba Using 2012 Data

Municipality	Personal water use (lpd)
RM Roblin, Cartwright RM Lorne, RM Louise, Crystal City	100
Pilot Mound	116
RM Stanley, Winkler	157
RM Thompson, Miami, Morden , Swan Lake FN	216
RM Pembina, Manitou	240
Manitoba average	227
Canada average	329

Morden’s per capita consumption has increased since 2012 indicating that overall the community’s average daily water needs have also increased. Morden’s current average per capita consumption is 280 litres per day (lpd), which is consistent with Manitoba’s average water consumption⁷.

Manitoba’s total potable water use in all sectors has remained relatively stable since 2011, though the average daily total use per capita among all sectors has decreased from 326 lpd in 2013 to 282 lpd in 2019⁸. Manitoba’s average daily residential use per capita has decreased from 181 lpd in 2013 to 158 lpd in 2019.

Morden’s per capita consumption is lower than the national average daily use per capita across all sectors (411 lpd in 2019).

2.2.7. Population

Morden’s population has grown steadily since 1991 and more rapidly over recent census periods which can be attributed to regional immigration patterns⁹, inward migration¹⁰ and an emphasis by the municipality to attract new businesses and create employment opportunities. Between 2006 and 2011, the city grew by more than **18 percent**, well above the provincial average of **5.2 percent**. Since 1996, the lowest population increase within a 5-year period was **6.67 percent**, meaning that Morden has added more than 4000 residents within the last 30 years.

The following table provides a summary of the City of Morden’s growth over the last six census periods totaling 30 years. At the time of writing this report, the 2021 Census of Canada has not yet been released, though a population estimate for 2021 was generated using an average annual growth rate and local information. It should be noted that increases in population and associated industrial and commercial development will require increased water supply.

⁷ This data generally predates the 2021 drought in which water restrictions and conservation measures were implemented.

⁸ Statistics Canada, 2021.

⁹ Winnipeg Free Press, 2019.

¹⁰ Government of Canada, 2019.

Table 2-7: City of Morden Population

City of Morden Population (1991 - 2021) ¹¹			
Year	Population	Population Increase	Population Change (%)
1991	5273	-	-
1996	5689	416	7.89
2001	6160	471	8.28
2006	6571	411	6.67
2011	7812	1241	18.89
2016	8668	856	10.96
2021*	9347*	679*	7.83*

*Estimated.

**2016 census data refers to Morden (City). Prior to 2012, census data refers to Morden (Town).

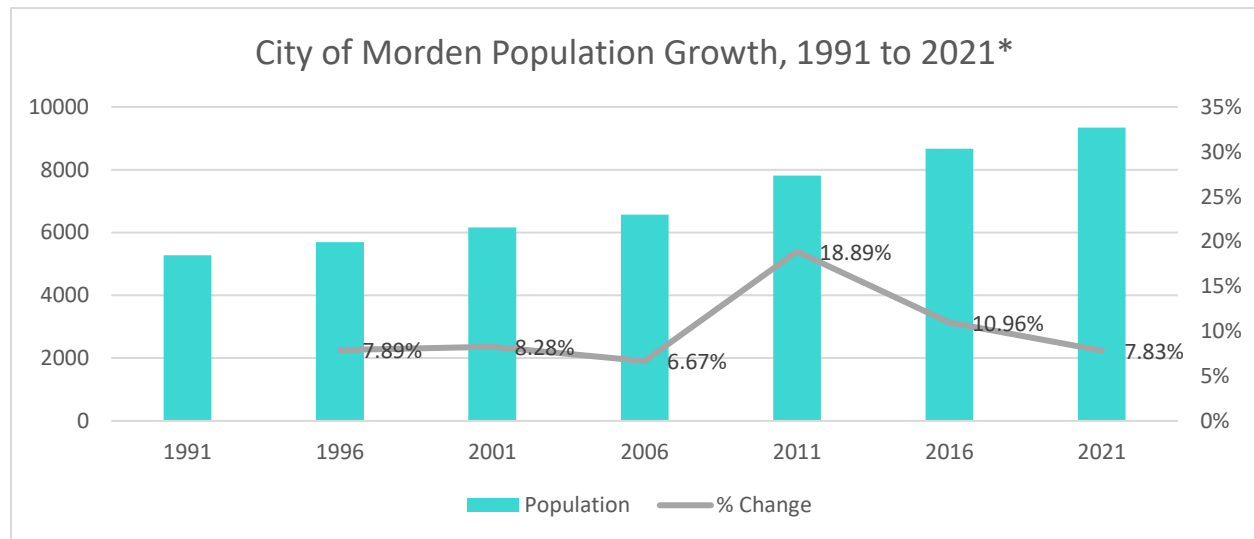


Figure 5: Population growth in Morden

Over this 30-year period, the average annual growth rate for the City of Morden is approximately **2 percent**. Since 1981, more than 1000 residents have immigrated to Morden.

¹¹ Statistics Canada, 2016.

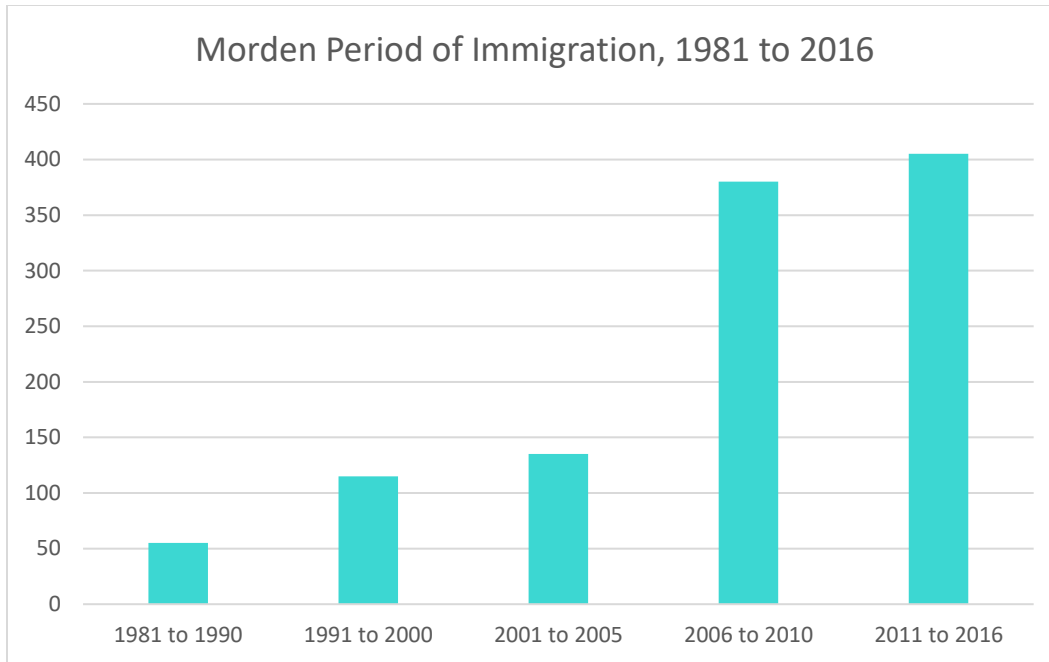


Figure 6: Morden period of immigration

2.2.8. Demographics

As shown in the population pyramid, Morden has a relatively balanced population among all age groups, though Morden has a substantial senior population.

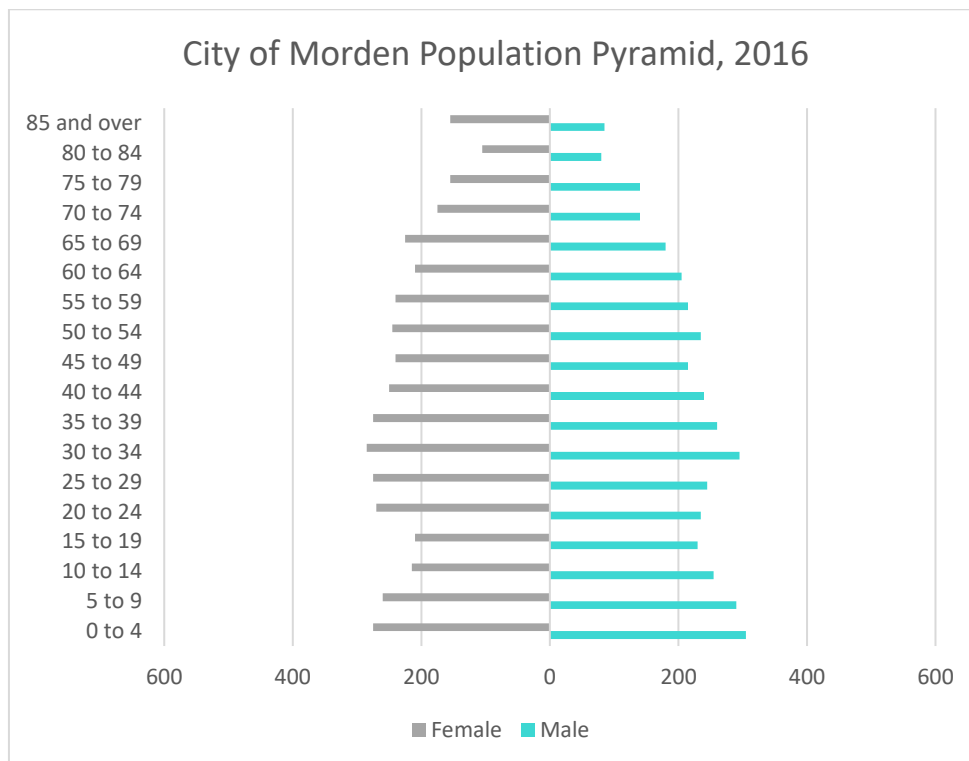


Figure 7: Morden population pyramid

2.2.9. Population Projections

Water consumption is tied to population growth and economic activity. Thus, to plan for water security and drought mitigation, it is important to understand future growth scenarios. Manitoba's southern region has experienced rapid growth over the last 30 years with expansions in the local economy. The City of Morden has experienced both rapid and moderate growth since 1991, ranging between 6.6 percent to 18.8 percent in the period between 1991 and 2016 (see Section 2.2.6). To provide the best insight of Morden's future growth, three scenarios were charted across a 25-year time horizon.

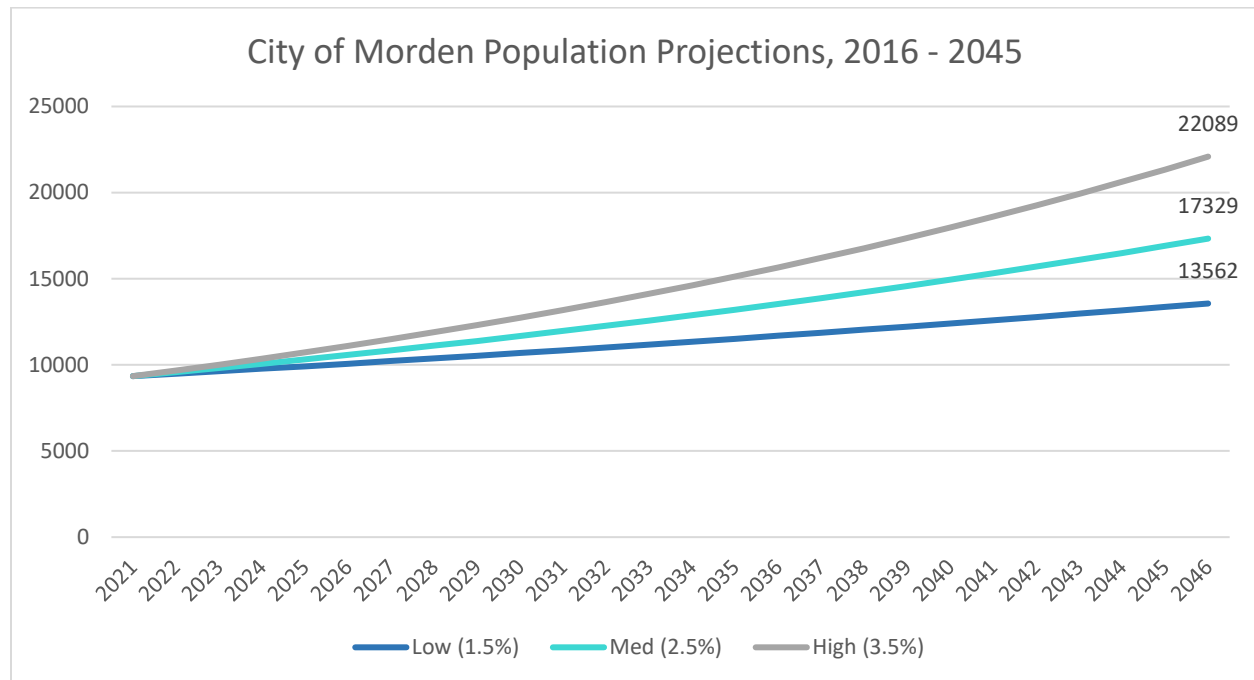


Figure 8: Morden population projection

A population projection for the City of Morden, based on historical growth data, provides insight into expected population growth.

Low Growth Scenario: This scenario is based on the 2001-2006 census period growth rate and assumed a linear extension of that trend in the City of Morden. Using these factors, a rate of 1.5 percent has been applied. As such, the population in Morden would be projected to increase from 9347 residents in 2021 to 13,562 residents by the end of 2046, representing an increase of 168 people per year.

Medium Growth Scenario: This scenario is based on the linear extension of the City of Morden's historic population growth over the last 30 years. A rate of 2.5 percent has been applied. As such, the community population of Morden would be projected to increase from 9347 residents in 2021 to approximately 17,329 residents by the end of 2046, representing an increase of 319 people per year.

High Growth Scenario: This scenario uses past growth as a base but presumes that the community will experience even more growth. Based on these factors, the City of Morden could grow to approximately 22,089 residents using an increased growth rate of 3.5 percent, representing an increase of 509 people per year. In this scenario, the population of Morden would more than double by 2046.

These growth scenarios can be cross-referenced with the per-capita consumption data in Section 2.2.6 to gain an understanding of potential requirements for future water supply. Furthermore, potential overall per-capita reductions could be modelled to underscore the importance of overall conservation efforts.

2.2.10. Household Information

Census family households in the City of Morden are split almost evenly between those with children (48%) and those without (52%). The majority of families with children have **1 to 2**. The average household size is **2.9**, which is higher than the provincial average of **2.5**. As seen in the figures below, the number of people residing per household in Morden is proportionate with that of the Province of Manitoba.

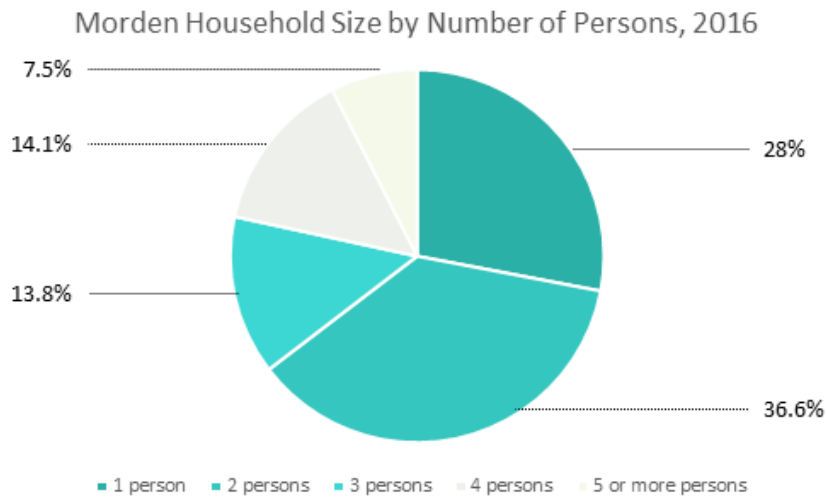


Figure 9: Morden household size in 2016

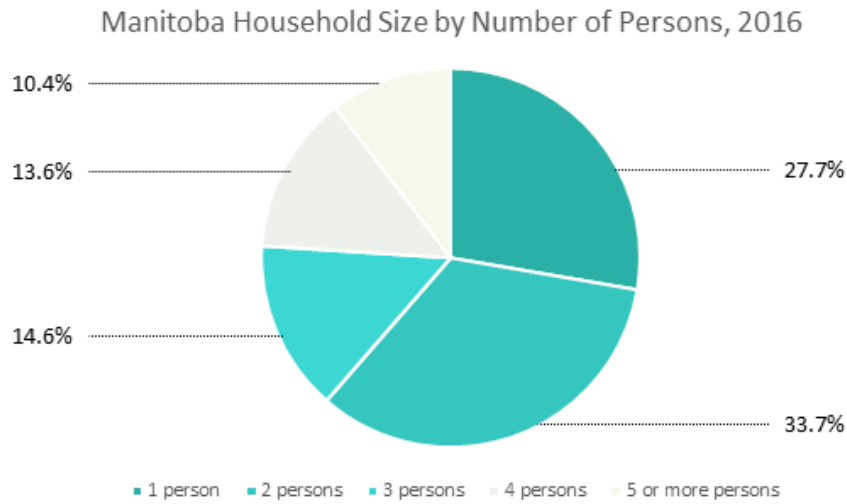


Figure 10: Manitoba household size in 2016

2.2.11. Development Activity

Between 2016 and 2021, the City of Morden added 202 new homes and 53 new commercial units. The following chart provides the breakdown of new homes in Morden over this period.

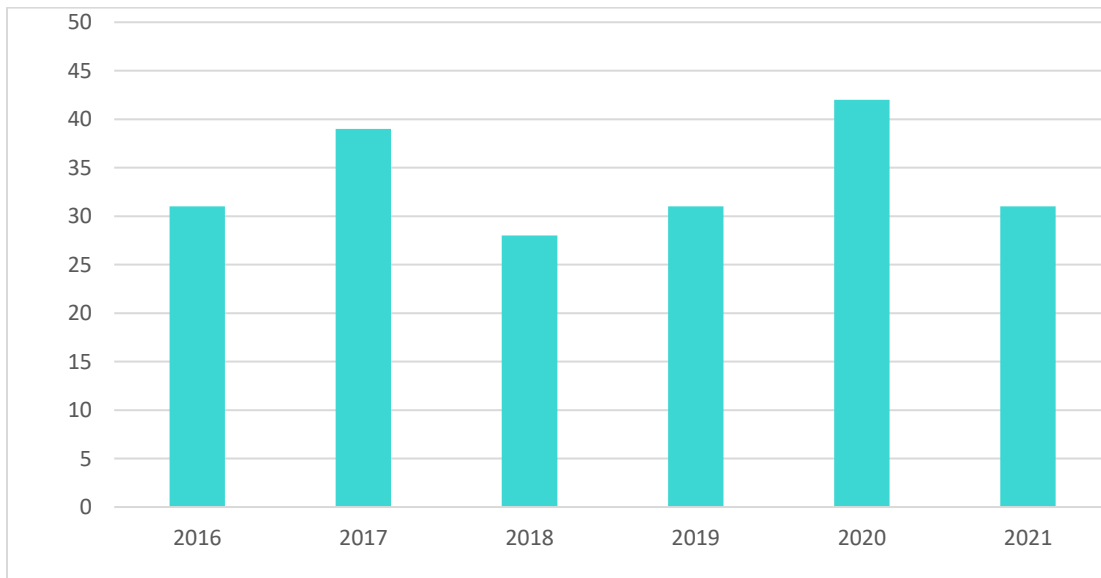


Figure 11: Development activity in Morden

*2021 data as of June

From this data, it is evident that the City of Morden has consistently added more than 25 new homes per year since 2016.

2.2.12. Industrial and Economic Development

Morden is a regional services hub within southern Manitoba and a key part of the mid-Continent Trade Corridor¹² with a significant share of employment in the education and health care industries, as well as a large manufacturing sector with more than 750 workers¹³.

Morden's share of employment in the manufacturing sector is 92 percent above the national average, meaning **92 percent** more people are employed in manufacturing compared to the national workforce. Morden's share of employment in the agriculture sector is **67 percent** above the national average. Employment share is also **38 percent** above the national average in health care and social assistance, and **3 percent** above the national average in construction¹⁴.

¹² Morden Economic Development, 2015

¹³ Economic Profile Report: Morden MB, 2019

¹⁴ Economic Profile Report: Morden MB, 2019



3. Drought Stages

The four Drought Stages used in this Plan were established as part of the *Manitoba Drought Management Strategy* and were subsequently incorporated into the *PVWC Drought Plan*. Each Drought Stage is a factor of the severity and duration of a drought event.

Section 7 of this Plan contains a detailed description of the responses and actions associated with each Drought Stage. The City of Morden has triggering mechanisms in place to declare a Drought Stage based on Lake Minnewasta levels or a supply-demand function at various stages throughout the year. For PVWC water sources, the declaration of a Drought Stage will be declared by the PVWC Board based on a request made by PVWC Management and the PVWC Drought Committee, in conjunction with input from relevant Provincial departments. The declaration of a Drought Stage will be communicated to Customers and the public as detailed in Section 7.2 of this Plan.

Table 3-1: Summary of Drought Stages and corresponding water reductions

Target Water Reduction	
Normal Conditions	5%
Moderate Drought Stage	10%
Severe Drought Stage	25%
Extreme Drought Stage	30% or greater

3.1. Normal (Green) Conditions

During Normal Conditions it is anticipated that there are no water shortages and that Lake Minnewasta and the PVWC can provide enough water to the City of Morden to satisfy demand. Mitigation, Education, Preparedness and Monitoring will occur, and continued updates on drought indicators will be made. Within normal conditions ongoing conservation efforts should be pursued and supply reductions of up to 5 percent may be expected.

3.2. Moderate (Blue) Drought Stage

During the Moderate Drought Stage there will be increased emphasis and frequency in updates on water availability and drought indicators. The Drought Committee will be mobilized and drought responses will be implemented. Beginning at the Moderate Drought Stage, water supply reductions of up to 10 percent are anticipated which could impact the City's ability to meet normal water demands.

3.3. Severe (Yellow) Drought Stage

During the Severe Drought Stage increased updates and communication on water availability and drought indicators will continue, while the next level of drought responses will be implemented. At the Severe Drought Stage it is anticipated that the City of Morden will require water use reductions of up to 25 percent to address demand. Furthermore, at the Severe Drought Stage water supplied from the PVWC may see reductions of up to 20 percent.

3.4. Extreme (Red) Drought Stage

During the Extreme Drought Stage increased updates and communication on water availability and drought indicators will continue, while the next level of drought responses and water reductions of 30 percent or greater will be implemented. Reductions of up to 30 percent from the PVWC may also be expected in the Extreme Drought Stage.

During the Extreme Drought Stage there is potential for serious water shortages in all or parts of the Red River Basin. If the extreme Drought Stage is prolonged, demands for human, agriculture, industrial and ecosystem needs may not be fully met. It is likely that a local state of emergency could be declared and possible that a Provincial state of emergency could be declared during this stage.

3.5. Water Shortages

In the case of a severe and/or prolonged drought if demand for water is greater than supply the PVWC may experience water shortages. The mitigation measures and response actions within the PVWC Drought Plan and City of Morden Drought Plan are intended to prevent experiencing water shortages through gradual, planned reductions in water consumption.

For PVWC water sources, in the case of a shortage, water will be shared proportionally according to the average of the highest three years of customers' water purchases from the last five years. The City of Morden uses PVWC water to supplement their main source of water (Lake Minnewasta), and as such, is not a major proportional purchaser of PVWC water at only 2 percent in 2017. However, as a member of the PVWC collaboration and mutual assistance are key fixtures of the PVWC's regional focus.

If shortages are experienced a Provincial state of emergency would likely be declared. Furthermore, it is likely that the Provincial Minister may declare a "serious water shortage" under the *Water Protection Act* during this Stage.

4. Monitoring

Monitoring is a critical component of the Drought Plan and is a fixture during normal conditions and all drought stages. The City of Morden’s primary source of water is Lake Minnewasta, which is supplemented by a share of water from the PVWC.

4.1. Lake Minnewasta

City of Morden staff will monitor lake levels on a weekly basis using municipal gauges and Province of Manitoba gauges and reports. Identified lake levels will be used to “trigger” drought events, as outlined in Section 7.2.

City of Morden staff will communicate changes in lake levels and any declared drought events with other users of Lake Minnewasta, including the RM of Stanley and the Minnewasta Golf and Country Club, and will work collaboratively with these users towards mitigation during drought events.

4.2. PVWC

The *PVWC Drought Plan* established triggering points for drought stages for each of the established monitoring points on PVWC water sources. The three established monitoring points are:

- Red River at Emerson;
- Red River at Letellier; and
- Stephenfield Reservoir (Boyne River).

Both the Red River at Emerson and the Stephenfield Reservoir are monitored by the Province and have flow thresholds established to determine the corresponding Drought Stage, as determined in the PVWC Drought Management Plan Study.

5. Mitigation

Mitigation encompasses ongoing, proactive actions and planning to reduce the long-term risk and potential impact of drought events, by identifying principal activities and possible susceptibilities and developing mitigation actions and programs to reduce these vulnerabilities to drought. Therefore, Mitigation should always be occurring during Normal Conditions, although planning and programming would likely continue as drought stages are entered. However, as drought severity and duration increase focus will shift towards ensuring adequate responses, reductions and communication.

The mitigation measures proposed within a community should be relevant to the local context. The mitigation components contained within this Section are ideas generated by review of best practices. Some mitigation items may be implementable immediately, others may represent longer-term objectives, or simply ideas to consider in the future. Ultimately City of Morden Council and Administration will work towards exploring and implementing mitigation items and priorities could shift over time.

5.1. Education

Education is an essential aspect of drought mitigation and response. Some potential educational tools to achieve the goals of this Plan could include:

Increased understanding of the City of Morden's water supply

A general knowledge of where water comes from and its potential limitations as a resource can form a solid base for water conservation efforts. The City of Morden could explore ways to ensure residents understand where their water comes from and some factors that may impact water availability in the Red River Valley. Educational materials included within local utility bills, a local media campaign, or cooperation with local school divisions could be potential means of achieving these goals. Lake Minnewasta is also a major recreation amenity for the area for residents and visitors. Interpretive and educational elements could be incorporated into public areas. Education was highlighted in the *PVWC Drought Plan* as a mitigation tool, and educational campaigns could be explored at a regional level with the wider PVWC membership.

Drought Stages and water conservation

This Plan includes water reduction ranges for each Drought Stage and identifies overall water conservation practices as being central to drought mitigation and resilience. Prior to and during drought events the City of Morden should work to educate their residents on the drought stages and municipal response measures, which will be of vital importance as water use reduction actions are employed. This will be imperative in ensuring reduction measures are met and the public understands the importance of these actions and the framework established in locally by the City and within the PVWC Drought Plan. In order to mitigate the impacts of drought events

encouraging water conservation educating the public on the importance of water conservation, and tactics to achieve water conservation could be implemented.

Water bills as an educational tool

Residential and commercial water bills could be utilized to help educate the public on water use and conservation goals. For example, water bills could detail the customers water use compared to the average per-capita water use, or percentage of water use compared to the same time during the previous year, and identify the conservation goal set for per capita water use.

Public Awareness and Motivation

During the Drought of 2021 the City of Morden utilized their website and social media channels to raise awareness of the Drought conditions and encourage water conservation and sharing of creative ideas for residents and businesses to achieve water reduction targets. An example of this was the use of the website Conservation.mymorden.ca which hosted water conservation tips, contests and the “Water Conservation Challenge.” The use of the social media hashtag “#SaveWaterMorden.”¹⁵ Furthermore, Drought stage notifications were placed directly on the homepage of the City’s official website.

Major customer engagement and education

The City of Morden should engage major water users, including local industries, on the role of the Drought Plan and implications of potential water reductions. Potential restrictions on water use are based on potential reductions in water supply and education and engagement with key water users is vital in ensuring the success of local policies during drought events.

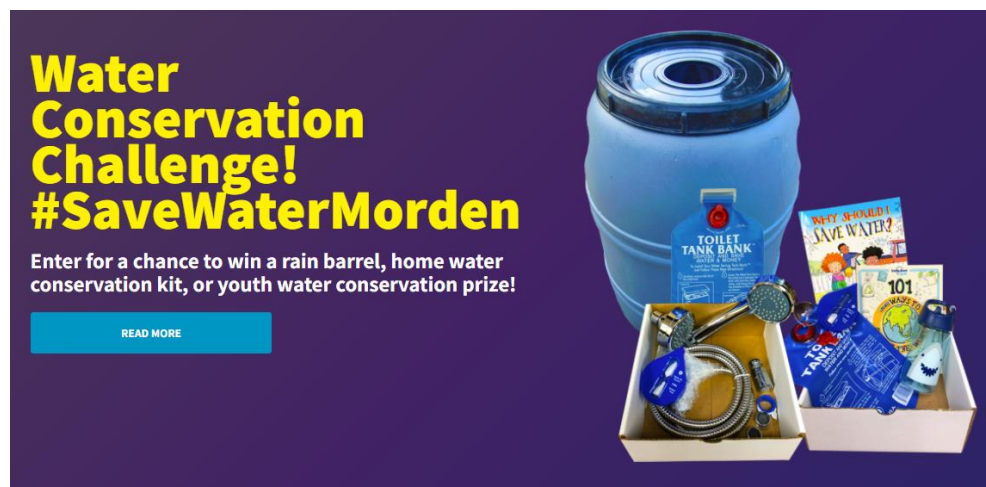


Figure 12: Imagery from Morden's Water Conservation Website

¹⁵ <https://conservation.mymorden.ca/>

5.2. Conservation and Use Reduction

Section 7 of this plan details response actions for the City of Morden which correspond to each Drought Stage. The goal of these responses is to respond to declared drought events and provide a mechanism to continue the City's functionality in light of the potential supply reductions for each drought stage (as detailed in Section 7.3).

In order to ensure a commitment to the ongoing implementation of this Plan, the City of Morden could consider setting short, mid and long-term targets for per-capita and/or overall reductions in water consumption.

Grey Water Recycling

The City of Morden could consider working with Provincial regulators to explore urban use of grey water recycling systems in residential or commercial buildings to reduce water consumption and reduce pressure on waste-water treatment. Grey water recycling uses the untreated water waste from faucets, bathtubs, showers and washing machines that has not come into contact with contaminated sources and can be used for non-potable uses, such as landscaping and car washing. Grey water can also be used for flushing toilets by making modifications to the plumbing in new dwellings. While not currently used in urban areas in Manitoba, a pilot project could provide an opportunity for education and awareness of water issues and could potentially lead to future widespread use of grey water recycling.

Incorporate Water-Wise Program

The City of Morden could incorporate tenets of the Water Wise program to encourage indoor water use for things like washing and cleaning to reduce residential water consumption during everyday activities. The Water Wise thinking includes actions include:

- Regenerative water services;
- Water sensitive urban design;
- Basin connected cities; and
- Water-Wise communities.

Water-Wise principles could form a basis for encouraging water-conscious use inside the home, which is something that is not generally regulated.

Non-Potable Water

The City of Morden could identify water consumption needs based on the requirements of potable (treated) versus non-potable water, along with sources and storage of non-potable water. In addition, linking the estimated consumption volume with the water quality requirement will allow for less disruption in service delivery or maintenance activities. For example, poor quality water can be used for dust control on gravel roads whereas higher quality water (rainwater) can be used for maintaining landscape plants and trees. Trees, shrubs, flowers, turf grass, outdoor ice surfaces, indoor ice surfaces, watering for compaction, and dust control

require non-potable water. Rain collection on commercial buildings and storage tanks are currently in place and could be expanded to increase storage capacity.

Water Conservation By-law Amendment

Morden could consider an amendment to the *City of Morden Water Restrictions By-law 10-2021* to restrict certain outdoor water uses even during normal conditions to reduce overall water consumption within the municipality. For example, amending the voluntary odd/even watering schedule during normal conditions and mandatory odd/even watering schedule during moderate drought stages to a year-round two-day watering cycle would greatly reduce water consumption being used for lawns.

Water Utility By-law or Updated Building By-law

Municipal by-laws can cover a range of indoor water conservation measures. Development by-laws and construction specifications offer policy means of saving water. The City of Morden could develop a water utility by-law or update their Building By-law to require all new residential and commercial construction projects, including renovation, install low water use fixtures to conserve water while maintaining performance level. By requiring low-flow plumbing fixtures by-law, Morden can encourage conservation measures through required fixture flow rates and work towards an overall reduction of per-capita water use. Examples of mandated fixture flow rates could include are included below. Requiring that rain barrels be installed on new homes would be another means of working towards these goals.

Required Fixture Flow Rates	
Toilets	No greater than 6 litres per flush
Showerheads	No greater than 9.5 litres per minute
Faucets	No greater than 8.3 litres per minute

From the Town of High River, Alberta Water Conservation Bylaw No. 4212/2008

Required Fixture Flow Rates	
Toilets (bowl and tank)	No greater than 6 litres per flush
Urinals	No greater than 3.8 litres per flush
Faucets (kitchen and bath)	No greater than 8.3 litres per minute
Showerheads	No greater than 9.5 litres per minute
Public restroom faucets	No greater than 1.8 litres per minute
Cooling systems	Once through cooling systems no longer allowed

From the City of Calgary, Alberta Water Utility Bylaw

Residential water consumption that occurs inside the home cannot be regulated in the way that pool fills, lawn watering or car washing can. As such, ensuring that new home construction incorporates low-flow and water efficient fixtures is worthy of consideration.



Xeriscaping and low-water plantings

The City of Morden could consider xeriscaping, or low water plantings for all future municipal landscaping. Xeriscaping prioritizes water conservation by using drought-resistant plants, minimizing lawn sizes, using high-quality soils, mulching, and watering wisely. To meet a target water use reduction, Morden could consider the following examples¹⁶:

- Design 30 percent of the landscape area to not require watering.
- Design to minimize turf areas - less than 30 percent of the landscape.
- Use large areas of low water use plants.

Further to municipal use, the City of Morden could also explore ways to encourage or mandate xeriscaping and/or low-water landscaping in residential and commercial projects. The Zoning By-law could include landscaping requirements for multi-family, commercial and industrial developments which include drought-resistant plantings and/or xeriscaping.

5.3. Infrastructure

Ensuring the City of Morden utilizes the best-available water delivery and monitoring infrastructure helps ensure optimal efficiency and limits waste within the water delivery system. Furthermore, appropriate infrastructure utilization can help reduce water consumption for end users. Infrastructure upgrades at all points in the treatment and delivery system, as well as end-user monitoring (such as smart meters) can help ensure water is used the highest efficiency with minimal loss to leakage.

The City of Morden installed 2200 new water meters in 2020. Continual monitoring for leaks and other potential means of reducing waste should continually be pursued.

5.4. Improved Data and Statistics

Sound data on water consumption provides a basis from which conservation measures can be measured. The City of Morden has undertaken a program to install smart water meters that will provide improved and enhanced data on end-use water consumption. Detailed water use by sector and household can provide opportunities for target conservation programs and enhanced assessment of any such programs. Smart meters, meter audits and other means of increasing data can help in this regard.

¹⁶ Landscape Guide to Water Efficiency. Team Watersmart.

6. Drought Preparedness

The following programs are intended to be established upon adoption of this Plan, prior to a Drought Stage being declared. The areas of responsibility are broken down according to PVWC and Member Municipalities. A prioritization and timeframe for Preparedness items is included in Appendix B.

6.1. Form City of Morden Drought Committee

The City of Morden will form a Drought Committee to carry out the duties as outlined in Section 1.1.

6.2. Update Local Emergency Plan

The City of Morden should update their existing emergency plan to include drought-related actions. The emergency plan should refer to this Plan in the case of a drought event, identify any relevant temporary water sources and include the addition of drought-specific items to the 'resources and capabilities' sections including:

- Pumping companies;
- Pipe distributors;
- Trucking operators;
- Drilling companies; and
- Alternate sources of emergency drinking water.

6.3. Perform Hazard Analysis

The City of Morden should undertake a Hazard Analysis for each Drought Stage in order to predict potential impacts of each stage on infrastructure, quality of life and other considerations. Manitoba EMO's 'Appendix A - Hazard Analysis' can serve as the template for this exercise.

6.4. Identify any Emergency Sources of Water

During Severe and Extreme Drought Stages it may be imperative to use emergency sources of water for temporary use. The City of Morden should evaluate potential sources for temporary use during such events. Potential actions may include:

- Temporary pipeline(s) from surface water source(s);
- Temporary use of groundwater source(s);
- Trucking water from adjacent areas; and
- Use of recycled, treated water from alternate source(s).

6.5. Collect and Analyze Detailed Data

Section 5.4 discusses the important role that data and statistics can play in anticipating, monitoring and responding to drought events. Detailed analysis of per-capita and total water use by sector and overall can provide great insight into water use, reduction and drought mitigation. This work can be undertaken immediately and will ultimately be an ongoing effort.

The data collected from the City of Morden could be shared with other PVWC members/customers in an effort to improve overall water use data. This data could be used for co-op wide conservation efforts.

6.6. Perform Water Audit(s) to Identify System Weakness and Losses

The City of Morden should conduct periodic water audits to gauge the operational integrity and efficiency of the water system. Performing water audits will help identify water losses in the system and establish baselines for future evaluation.

7. Response Actions

7.1. Overview

Mitigation and preparation are fundamental during Normal Conditions in order to build resilience and lessen the impacts of a drought event. However, when a drought event occurs response measures will be implemented to ensure the supply of water is continued and to limit negative health, social and economic impacts of a drought.

During each drought stage limitations on supply can be expected, and water reductions should be pursued to ensure the supply is maintained for as long as possible. This is essential because the duration of a drought cannot be predicted. Drought triggers are determined according to lake levels with corresponding percentage restrictions attached as indicated in Table 7-1.

Table 7-1: Lake Level and Restriction Stage

		DROUGHT TRIGGER			
		Up to 3' below full supply level (FSL) OR Water use demand is less than 70% of water system capacity	Lake level more than 3' below FSL to 5.5' below FSL OR Water use demand is more than 70% but less than 80% of water system capacity	Lake level more than 5.5' below FSL to 8.5' below FSL OR Water use demand is more than 80% but less than 90% of water system capacity	Lake level more than 8.5' below FSL OR Water use demand is more than 90% of water system capacity
WATER RESTRICTION STAGE	May	NORMAL	MODERATE	SEVERE	EXTREME
	June				
	July				
	August		NORMAL	MODERATE	
	September				
	October				

The drought stage can be reduced during winter months based on the amount of snowfall accumulated during the season and on the condition that raw water supply will be available until the spring thaw occurs.

7.2. Drought declaration

7.2.1. Drought Declaration: City of Morden

The City of Morden will monitor levels on Lake Minnewasta and analyze water system demand and supply on a weekly basis. The data will be cross-referenced with the drought stage triggers as noted in Table 7-1. The process for drought stage declaration will be as follows:

- If lake levels or supply-demand analysis come within 10 percent of a drought stage trigger, the Designated Officer¹⁷ will notify Council.
- If lake levels or supply-demand analysis reach a drought stage trigger the Designated Officer will declare a drought. Council will be notified and any required accompanying resolutions will be passed at either the next scheduled Council meeting or a special meeting of Council, if necessary.

7.2.2. Drought Declaration: PVWC

If the PVWC declares a drought and Lake Minnewasta is not experiencing drought conditions the City of Morden will at least enter a “Moderate” drought stage in order to prepare for potential extra demand requirements on Lake Minnewasta as the share of PVWC water received by the City will be impacted. Conditions will be monitored according to Table 7-1 and regional factors. The Designated Officer will work with the PVWC Drought Committee to determine appropriate drought stage declarations if drought triggers are not met according to Table 7-1 but the PVWC has declared a drought.

7.2.3. Drought Declaration: Licensed Users of Lake Minnewasta

If the City of Morden declares a drought event, City staff will communicate and collaborate with other licensed users of Lake Minnewasta, such as the RM of Stanley and Minnewasta Golf and Country Club, to mitigate any potential impacts and reach water reduction targets relative to the drought stage that is declared in accordance with Table 7-1.

7.3. Drought Response

The response actions in this Section are intended to guide water use during declared drought events and limit the impacts of reduced water supply on the residents, businesses and functions of the City of Morden. General tenets of the response actions could include:

- Restricting discretionary uses prior to essential uses;
- Preserving day-to-day residential water use as much as possible;
- Making decisions that affect small groups of people and special interests prior to the general population; and
- Limiting the economic impacts of drought.

¹⁷ “Designated Officer” means City Manager or an Officer of the City of Morden designated to administer this Plan.

When a Drought Stage is declared the City of Morden will implement response measures as detailed in the following Tables. The restriction tables are also part of *City of Morden Water Restrictions By-law 10-2021*. Table 7-1 outlines the Drought Stages, from Normal Conditions to Extreme Drought Stages and the corresponding triggers, which are based on Lake Levels or a supply-demand formula.

7.3.1. Water Restrictions

Tables 7-2 through 7-5 outline the responses to each drought stage. These response actions correspond with *City of Morden Water Restrictions By-law 10-2021* and any amendments to the By-law should be reflected with an amendment to this Plan.

Table 7-2: Drought Response: Normal Conditions

NORMAL Conditions	
Up to 3' Below Full Supply Level	
PEAK WATER USE REDUCTION TARGET: 5%	
WATER USE CATEGORY	ACTION
Residential/Commercial	No restriction.
Industrial	No restriction.
Landscape Watering	Voluntary Odd/Even watering.
Garden Watering	No restriction - voluntary reduction.
(Food Production)	
Other Outdoor/Leisure Uses	No restriction.
Vehicle Washing	No restriction.
Agriculture	No restriction.
Construction	No restriction.
Operations	No restriction.
New Plantings/Turf Grass and Landscape Maintenance	No restriction.
Lodging/Restaurant	No restriction.

Table 7-3: Drought Response: Moderate Drought Stage

MODERATE DROUGHT STAGE	
3' to 5.5' Below Full Supply Level	
Peak Water Use Reduction Target: 10%	
Water Use Category	Action
Residential/Commercial	Voluntary conservation request.
Industrial	Voluntary conservation request.
Landscape Watering	Mandatory Odd/Even schedule.
Garden Watering	Voluntary Odd/Even schedule: Odd - Saturdays and Tuesdays Even - Sundays and Wednesdays
(Food Production)	
Other Outdoor/Leisure Uses	Mandatory maximum 3 days per week schedule at splash pads.
Vehicle Washing	Voluntary reduction.
Agriculture	Voluntary conservation request.
Construction	Metered use.
Operations	Hydrant flushing only if necessary.
New Plantings/Turf Grass and Landscape Maintenance	No restriction on new plantings - watering restrictions otherwise apply.
Lodging/Restaurant	Voluntary signage/communication, voluntary serve water on request, voluntary laundry reductions.

Table 7-4: Drought Response: Severe Drought Stage

SEVERE DROUGHT STAGE	
5.5' to 8.5' Below Full Supply Level	
Peak Water Use Reduction Target: 25%	
Water Use Category	Action
Residential/Commercial	Voluntary conservation request.
Industrial	Non-essential operations not permitted.
Industrial: Water rich	Voluntary restriction of water consumption.
Lawn Watering	Mandatory complete restriction.
Garden Watering	Mandatory Odd/Even schedule:
(Food Production)	Odd - Saturdays and Tuesdays Even - Sundays and Wednesdays
Splash Pad/Pools	Splash Pad shall not be operated, no pool filling with City of Morden Source of water.
Other Outdoor/Leisure Uses	Any activities which result in water spraying/draining onto a street or public right of way are not permitted.
Vehicle Washing	Not permitted at private residences: commercial car washes only.
Agriculture	Spraying and Irrigation not permitted from City of Morden sources.
Construction	Metered use - hours of operation may be reduced.
Operations	Regular hydrant flushing not permitted, restricted hydrant maintenance.
New Plantings/Turf Grass and Landscape Maintenance	New plantings and landscaping using water from City water source not permitted.
Lodging/Restaurant	Voluntary signage/communication, mandatory serve water on request, voluntary laundry reduction.

Table 7-5: Drought Response: Extreme Drought Stage

EXTREME DROUGHT STAGE	
8.5' Below Full Supply Level	
Peak Water Use Reduction Target: 30% or greater	
Water Use Category	Action
Residential/Commercial	Voluntary conservation request
Industrial	Non-essential operations not permitted, mandatory restriction to 80% of past water consumption.
Industrial: Water rich	Mandatory restriction to 80% of past water consumption.
Lawn Watering	Mandatory complete restriction.
Garden Watering	Mandatory maximum 1 day per week schedule only on the day of compost pickup.
(Food Production)	
Splash Pads/Pools	Splash Pads shall not be operated, no pool filling.
Other Outdoor/Leisure Uses	Any activities which result in water spraying/draining onto a street or public right of way are not permitted.
Vehicle Washing	Not permitted at private residences, mandatory reduction of hours of operation by 20% at commercial car washes.
Agriculture	Spraying and Irrigation not permitted from City of Morden sources, livestock expansion not permitted.
Construction	Construction using City source of water not permitted.
Operations	Regular hydrant flushing may not be permitted, limited hydrant maintenance.
New Plantings/Turf Grass and Landscape Maintenance	New plantings and landscaping using water from City water source not permitted.
Lodging/Restaurant	Mandatory signage/communication, restaurants serve water on request, voluntary laundry reduction.

If a drought declaration is made by the PVWC but Lake Minnewasta levels do not indicate a drought stage, as outlined in Table 7-1, the City of Morden will enter a Moderate Drought Stage and participate in PVWC Drought Committee meetings as per the PVWC Drought Plan. Further restrictions and collaborative efforts will be considered based on local and regional conditions.

7.4. Communication and Reporting

Effective communication and reporting during declared drought stages is a key component of ensuring the Drought Plan's effectiveness and limiting impacts on the residential, social, commercial and industrial functions of a community. This Section outlines the process for declaring and communicating the declaration of a drought stage, as well as a framework for internal and external communication and reporting during drought events.

Drought Coordinator

The City of Morden's Designated Officer will serve as the Drought Coordinator (DC) during declared drought stages. The DC will serve the following functions:

- The DC will serve as head of the City of Morden's Drought Committee.
- Upon receipt of a notice of drought stage declaration, the City of Morden Drought Coordinator (DC) will:
 - Notify CAO, Council, Administration and local media of a declaration;
 - Mobilize City of Morden Drought Committee;
 - Communicate with the RM of Stanley and Minnewasta Golf and Country Club;
 - Work with the City of Morden Drought Committee to prepare a public notification for dissemination to City of Morden rate-payers via social media, City of Morden Website, and inclusion on City of Morden weather radio frequency. Inserts will be placed in rate-payer utility bills on the next billing cycle; and
 - Conduct regular meetings with the City of Morden, according to the frequencies outlined in Table 7-6.

City of Morden Drought Committee

The City of Morden Drought Committee will serve a vital function during Normal Conditions and during declared Drought Stages.

The Drought Committee will be comprised as follows:

- Chair – Drought Coordinator or Municipal Emergency Coordinator (City Manager or Deputy City Manager).
- At least two (2) municipal staff - e.g. administrative, Public Works, etc.
- At least one (1) elected official.
- If not already included in the above, the City of Morden's PVWC Drought Committee representative(s).

The Drought Committee will perform the following duties:

- Coordinate with Province, PVWC, Local Government, and Manitoba EMO;
- Coordinate Drought Response according to each Drought Stage;
- Implement communications and reporting processes;
- Review/revise *Morden Drought Plan* every four (4) years and/or after each drought event;
- Establish consistent approaches to communication, outreach and education;
- Review 'state of emergency' conditions, as applicable;

- Work with PVWC and member municipalities on regional water sharing and conservation efforts; and
- Complete tasks in conjunction with the PVWC as noted in Table 7-6.

Table 7-6: Morden Drought Committee Actions by Drought Stage

Action	Frequency
Communicate water demand needs to the PVWC (new connections, infrastructure changes, shut-downs, peak water needs). Share system information on storage levels, flows, pressures, etc. at key points in the distribution.	Monthly (6)
Action	Frequency
Communicate water demand needs to the PVWC (new connections, infrastructure changes, shut-downs, peak water needs). Share system information on storage levels, flows, pressures, etc. at key points in the distribution.	Monthly
Inserts in water bills, social media updates corresponding with PVWC releases.	As required
Action	Frequency
Communicate water demand needs to the PVWC (new connections, infrastructure changes, shut-downs, peak water needs). Share system information on storage levels, flows, pressures, etc. at key points in the distribution.	Bi-Weekly
Inserts in water bills, social media updates corresponding with PVWC releases.	As required
Action	Frequency
Communicate water demand needs to the PVWC (new connections, infrastructure changes, shut-downs, peak water needs). Share system information on storage levels, flows, pressures, etc. at key points in the distribution.	Weekly
Inserts in water bills, social media updates corresponding with PVWC releases. Coordinate with PVWC and Manitoba EMO - Declare local state of emergency if necessary. Advocate for Provincial state of emergency, if necessary.	As required

PVWC Drought Committee Member

The City of Morden will have representation on the PVWC Drought Committee. When the Drought Committee is mobilized the City's representative(s) will relay information from the PVWC Drought Committee to the City of Morden Drought Committee and assume duties as outlined in the PVWC Drought Plan including attending meetings as follows:

- Annually during Normal Conditions.
- Monthly during Moderate Drought Stage.
- Bi-Weekly during Severe Drought Stage.
- Weekly during Extreme Drought Stage.

8. Recovery

Following a drought event, when conditions return to Normal Conditions, or recede to the Moderate Stage after a more serious event, the recovery process may begin. In the post-drought period, the City of Morden will ensure infrastructure is in suitable shape to accommodate a return to normal operations. Temporary measures, such as above-ground pipelines may need to be removed and water transfers to Lake Minnewasta and City of Winkler dialed down, and the daily operations found during Normal Conditions may return.

Following a drought event, the elements for consideration would include:

- Continually pursuing mitigation components of the Plan;
- Continually testing and refining monitoring and triggering mechanisms; and
- Reviewing resources and financial plans related to the drought framework.

The City of Morden will ultimately need to tailor recovery efforts to the unique conditions experienced in any drought event. As part of the Recovery Phase, the City of Morden will participate in:

- The PVWC's de-brief session; and
- The PVWC's 'after-action' report.

9. References

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APPENDIX A: DEFINITIONS AND ACRONYMS

DC: Drought Coordinator

DCC: Drought Command Centre

PVCD: Pembina Valley Conservation District

PVWC: Pembina Valley Water Cooperative Inc.

WTP: Water Treatment Plant

Drought Monitoring involves utilizing primary and secondary data regarding water supply levels at PVWC facilities as well as upstream water sources.

Drought Mitigation involves proactive action and planning to reduce the long-term risks and potential impacts of drought events by identifying principle activities and possible susceptibilities and developing mitigation actions and programs to reduce these vulnerabilities to drought.

Drought Preparedness refers to the directed policies, plans and actions which must be implemented prior to a drought event occurring in order to increase forecasting accuracy, ensure the Plan is fully implementable and that Morden is fully prepared to respond during a drought event.

Drought Response encompasses the actions taken during a drought event to reduce its immediate impacts on environment or society through enactive temporary adjustments to normal practices until normal climatic conditions return. Drought response also includes the communication process used to convey information internally and externally.

Drought Recovery is the process of returning operations to a normal state when a drought event has dissipated in order to restore or improve pre-drought conditions and working to further mitigate the impacts of any future drought events.

Full Supply Level refers to the normal maximum operating water level of a water storage when not affected by floods.

APPENDIX B: CITY OF MORDEN WATER RESTRICTIONS BY-LAW 10-2021

