

CRP Regional Servicing Study: Short- and Long-Term Servicing Challenges

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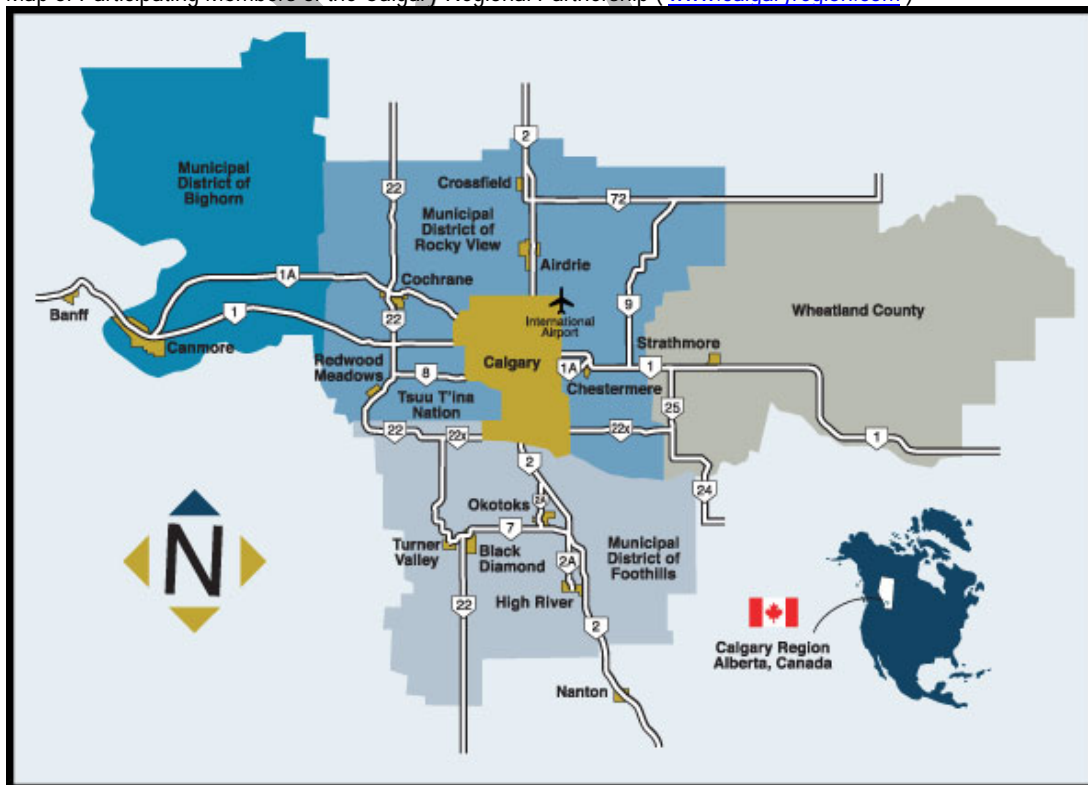
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Introduction

Phase 4 of the Calgary Regional Partnership (CRP) Study on Water and Wastewater Servicing identifies the short- and long-term servicing challenges in the region (Figure 1). The short-term challenges are determined by comparing the projected water supply and wastewater generation rates that were determined in Phase 3 to the capacity of the existing infrastructure that was summarized in Phase 1. The long-term growth projections developed in Phase 3 will serve as the basis for discussions on the long-term challenges and emerging issues.

FIGURE 1
Map of Participating Members of the Calgary Regional Partnership (www.calgaryregion.com)



Water Supply Challenges

The Bow River and its tributaries are the main water supply for municipal users in the Region. Although groundwater is used by some communities, in most cases it is not considered to be a viable alternative for servicing large-scale growth on a regional level.

The closing of the South Saskatchewan River Basin to new licenses (as recommended in Alberta Environment's South Saskatchewan River Basin Management Plan) means that those communities with licenses for withdrawals from the Bow River and its tributaries, including the Elbow, Sheep, and Highwood Rivers, will need to find other means of securing water once they reach the limit of their existing licenses. Options may include transferring of licenses or obtaining treated or raw water from other license-holders with excess capacity.

Short-Term Challenges

Table 1 provides an overview of when each community in the CRP will meet the limits of their existing licenses. It was assumed that those communities with supply agreements through the Anthony Henday System or with the City of Calgary would not be limited by their existing supply agreements. Their demands would continue to be met and agreements reviewed as long as the supplier has sufficient capacity in their license.

The table only takes into consideration the annual diversion limit, and does not consider restrictions due to the maximum diversion rate specified in the license. Some communities have licenses with maximum diversion rates that do not allow them to divert their entire annual diversion. These diversion rates are based on the capacity of the intake works at the time of the application and may be increased by applying to Alberta Environment for an amendment to their existing license.

It should be noted that information for the numerous small systems in the MDs of Rocky View, Foothills, and Big Horn, and the County of Wheatland are not specifically addressed in Table 1. As discussed in TMs 1.1, 3.1, and 3.2, none of the small systems in the unincorporated districts have license capacity for the level of growth projected in these areas.

Those communities highlighted in red face immediate challenges related to water supply. Those in yellow face challenges between 2010 and 2020, and those in green will face challenges beyond 2020.

The years shown in the table are based on population projections developed in TM 3.1 and the 2005 per capita water usage summarized in TM 1.1. These challenges identified in the table may occur sooner or later, depending on actual growth rates experienced and changes to the per capita demand through water conservation programs.

Redwood Meadows faces the most immediate challenges with respect to water supply.

- Redwood Meadows is very near its existing annual licensed diversion amount off the Elbow River. Table 1 shows that if the Townsite can implement conservation measures that will reduce the 2005 per capita water usage of 352 L/c/d by 30 percent by 2030, it will have sufficient license capacity to meet its needs beyond 2030. The growth predicted

for Redwood Meadows is not significant (approximately 400 people between 2005 and 2030), so a higher than predicted growth rate will have a considerable impact on the Townsite's ability to meet demands with its existing diversion license.

Table 1
Water Supply Capacity Challenges

Per Capita Water Usage	Year of Exceedance of Existing License/Agreement			
	Maintain Existing	15% Reduction by 2030	30% Reduction by 2030	30% Reduction by 2015
Airdrie			NA	
Banff	-	-	-	-
Bighorn, MD of			NA	
Black Diamond	2020	2026	-	-
Calgary*			-*	
Canmore	2028	-	-	-
Chestermere			NA	
Cochrane	2022	2025	-	-
Crossfield			NA	
Foothills, MD of			NA	
High River	2012	2016	-	-
Nanton	2025	-	-	-
Okotoks **			2012**	
Redwood Meadows	2006	2006	-	-
Rocky View, MD of			NA	
Strathmore	2012	2013	2015	2019
Tsuu T'ina Nation			NA	
Turner Valley	2016	2019	-	-
Wheatland County			NA	

*Calgary has an approved plan to reduce use by 30% in 30 years.

** Okotoks has an approved plan to reduce use to 318L/c/d by buildout, which is projected to be reached between 2015-2017.

High River, Okotoks, Strathmore, and Turner Valley are all going to face water supply challenges before 2020.

- The Town of High River has a high per capita water usage rate and will exceed its existing license by 2012 if aggressive conservation or water loss strategies are not implemented. The Town also services several outside users that have their own water licenses for withdrawal from the Highwood River through the Town's infrastructure. Table 1 only includes the demand of the community and the municipal license held by the Town. Table 1 shows that reducing this per capita rate by 30 percent by 2030 would provide the Town with sufficient capacity in its license to meet demands beyond 2030.
- The Town of Okotoks has committed to reducing its per capita water usage to 318 L/c/d by its build out population of 30,000, which is expected to occur around 2015-2017. Even

with this conservation program, one of the best in the CRP, the Town will need to find an alternative water supply by 2012.

- The Town of Strathmore's existing license will be exceeded as early as 2012, and the Town is now working with the City of Calgary on an agreement to supply treated water from Calgary to Strathmore. Once the agreement and infrastructure are in place, the water supply challenges for Strathmore will be resolved.
- The Town of Turner Valley is also facing water supply challenges. Its annual diversion will not be sufficient to meet 2030 demands unless it can reduce per capita usage by 30 percent. The Town also faces an additional water supply challenge, as its maximum instantaneous diversion rate is restricted to maintain instream flow objectives (IOs) in the Sheep River. The Town is building an 181,845 m³ (40 MIgal) raw water storage reservoir, which will resolve some of the immediate challenges associated with the maximum diversion rate.

Black Diamond, Canmore, and Cochrane all have sufficient license capacity to meet their projected demands beyond 2030, if conservation measures are adopted.

- The 2005 per capita water usage for Black Diamond of 619 L/c/d was high compared to other communities in the region. Reducing this per capita usage by 30 percent will allow the existing licensed diversion to meet the projected demands of the community beyond 2030.
- Canmore had a 2005 per capita water usage of 481 L/c/d. By lowering this by 15-30 percent, the existing water license will be sufficient to meet The Town's needs beyond 2030.
- Cochrane's water license has a sufficient maximum annual diversion to meet the Town's projected needs beyond 2030 if a 30 percent reduction in per capita water usage can be accomplished. However, the Town will need to apply for an amendment to its existing license to increase the maximum diversion limit.

The communities of Airdrie, Chestermere, and the Tsuu T'ina Nation all have agreements to receive treated water from the City of Calgary. The City has sufficient capacity in its licensed annual diversion to meet the projected demands for these existing users beyond 2030. The maximum allowable diversion rates specified in Calgary's licenses off the Bow River do not allow the full annual allocation to be used. The City can meet projected demands beyond 2030 even with the additional limitations, but at some point it will need to apply to AENV to increase the diversion rate.

The community of Crossfield obtains treated water through the Anthony Henday System, which operates off the Red Deer River Basin. That Basin is still open to new licenses, so it was assumed that the Anthony Henday System would continue to meet the projected demands of Crossfield.

The Town of Banff is not licensed through AENV for its water supply, and there are no identified regulatory limits on diversions for the community. The population of Banff is governed by federal regulations and the permanent population will be limited to approximately 10,000. With this limited growth, there should be limited challenges regarding water supply.

The Town of Nanton has a sufficient license capacity to meet its projected demands beyond 2030, although the largest water supply, Mosquito Creek, can be unreliable in the winter months.

The water supply challenges facing the MD of Bighorn, MD of Rocky View, MD of Foothills, and Wheatland County are different than those for the Towns and Cities within the CRP. With no new licenses being issued for the Bow River Basin, they must rely on existing licenses. There are many water co-ops and small communities throughout the MDs and County that have water licenses that can accommodate small localized growth, but would be insufficient to meet the demands from the projected large scale regional growth. Water supply issues for these areas are summarized below:

- The majority of the projected growth in the MD of Bighorn is in the Bow River corridor along Hwy 1. As development proceeds in this area, the challenge for the MD will be to find quality groundwater sources, or to obtain an outside surface water source or license transfer.
- The challenges for the MD of Foothills, MD of Rocky View, and Wheatland County are going to be largely influenced by how and when development proceeds. The MDs and County should establish long-term water supply plans that allow them to address the challenges for the entire area, as opposed to development by development. This effort should be coordinated with the CRP Regional Growth and Sustainability Framework.

Long-Term Challenges

The short-term challenges look at each community's needs independent of the region as a whole. License transfers or regional systems may be able to address short-term supply challenges for communities, but the long-term capacity of the water supply on a regional level must also be understood.

The Bow River and its tributaries are the largest water supply for municipal users in the CRP. Table 2 provides a summary of the projected municipal water demand for the entire CRP Region. It compares the total projected municipal demands to the total existing municipal water licenses, and to the total water licenses and registrations for all users. This information is also presented for the individual sub-basins: the Bow and Elbow Rivers, the Sheep River, and the Highwood River.

A comparison of the total projected municipal demand of 312,365,632 m³/yr for the entire CRP region and the existing municipal licenses of 482,287,095 m³/yr suggests that licensed water supply capacity in the region is sufficient to meet long-term projected municipal demands.

On a sub-basin scale, the existing licenses on the Bow and Elbow River appear to be sufficient to meet the long-term demands projected for users along these rivers. However, it is evident that the existing municipal licenses on the Sheep and Highwood Rivers are not sufficient to meet the projected municipal demands.

Table 2
Summary of Water Licenses and Demand

		2005	2010	2020	2030	2075
Maintain Existing Per Capita Usage Rates						
Bow River Basin (including tributaries)	CRP Municipal Demand	205,438,522	227,870,715	245,802,505	255,375,425	312,365,632
	CRP Existing Municipal Licenses	482,287,095				
	Total Licenses and Registrations	2,692,476,706				
Bow River (including Elbow River)	CRP Municipal Demand	198,744,349	218,246,798	233,383,685	241,740,363	297,007,468
	CRP Municipal Licenses	472,548,180				
	Total Licenses and Registrations	2,503,992,147				
Sheep River	CRP Municipal Demand	2,571,060	3,729,914	5,132,708	5,446,637	6,409,368
	CRP Municipal Licenses	4,235,828				
	Total Licenses and Registrations	5,972,901				
Highwood River	CRP Municipal Demand	3,805,016	5,500,167	6,755,949	7,567,377	8,297,454
	CRP Municipal Licenses	4,840,217				
	Total Licenses and Registrations	104,054,054				
30% Reduction in Per Capita Usage by 2030						
Bow River Basin (including tributaries)	CRP Municipal Demand	205,424,396	223,555,116	233,822,831	233,014,940	282,256,395
	CRP Existing Municipal Licenses	482,287,095				
	Total Licenses and Registrations	2,692,476,706				
Bow River (including Elbow River)	CRP Municipal Demand	198,730,223	214,893,591	223,887,775	223,470,396	271,505,680
	CRP Municipal Licenses	472,548,180				
	Total Licenses and Registrations	2503992147				
Sheep River	CRP Municipal Demand	2,571,060	3,572,572	4,705,193	4,772,057	5,445,968
	CRP Municipal Licenses	4,235,828				
	Total Licenses and Registrations	5,972,901				
Highwood River	CRP Municipal Demand	3,805,016	4,950,150	5,404,759	5,297,164	5,808,218
	CRP Municipal Licenses	4,840,217				
	Total Licenses and Registrations	104,054,054				

The existing CRP municipal licenses on the Sheep River of 4,235,828 m³/yr are insufficient to meet the demands from users in the area, even if every community reduced its per capita water usage by 30 percent by 2030. The total licenses for all users on the Sheep (including irrigation and agriculture users) amounts to 5,972,901 m³/yr, which would be just enough to meet municipal demands if a 30 percent reduction was achieved. It is unlikely that this much water could be made available to municipal users.

The table also suggests that the projected municipal demands on the Highwood River will exceed the existing CRP municipal licenses by 2010. There are several large non-municipal water licenses on the Highwood River, but it is unclear whether they would be available for transfer to municipal users.

Because of the limited water volumes available on the Sheep and Highwood Rivers, transferring existing licenses from the Bow River for abstraction from the Sheep and/or Highwood Rivers may not be feasible.

In summary, the total annual diversions of the existing municipal water licenses in the Bow River Basin as a whole are sufficient to meet the projected municipal water demands to 2075. However, there is insufficient licensed capacity on the Sheep and Highwood Rivers to supply 2075 demands for users of these rivers. For the Sheep River, insufficient water is available in the river itself to meet the projected municipal demand in 2075. For the Highwood River, approximately 1 million m³/year of licensed capacity will need to be transferred from non-municipal license-holders to meet the projected municipal demands in 2075 for communities that use the Highwood as a supply. Long-term supply strategies, therefore, will need to consider water supply from the Bow River for future growth in the Sheep and Highwood watersheds, or the restriction of growth in these areas.

Water Treatment Challenges

Table 3 provides an overview of when each community in the CRP is expected to meet or exceed the existing capacity of its water treatment facilities based on the 2005 per capita demand and population projections summarized in the previous technical memoranda.

Table 3
Water Treatment Challenges

Per Capita Water Usage	Year of Exceedance of Existing Capacity			
	Maintain Existing	15% Reduction by 2030	30% Reduction by 2030	30% Reduction by 2015
Airdrie	-	-	-	-
Banff	2010	2014	-	-
Bighorn, MD of	----- NA -----			
Black Diamond	2007	2007	2007	2008
Calgary*	-- *			
Canmore	2015	2019	-	-
Chestermere	2013	2014	2016	2018
Cochrane	2006	2006	2006	2006
Crossfield	-	-	-	-
Foothills, MD of	----- NA -----			
High River	2008	2008	2009	2010
Nanton	2025	-	-	-
Okotoks **	2018 **			
Redwood Meadows	-	-	-	-
Rocky View, MD of	----- NA -----			
Strathmore	2006	2006	2006	2006
Tsuu T'ina Nation	2017	2020	2028	2029
Turner Valley	-	-	-	-
Wheatland County	----- NA -----			

* Calgary has an approved plan to reduce use by 30% in 30 years

** Okotoks has an approved plan to reduce use to 318L/c/d by buildout, which is projected to be reached between 2015 - 2017

Black Diamond, Cochrane, High River, and Strathmore all face immediate challenges with treatment plant capacity.

- Based on 2005 per capita water usage, Black Diamond's water treatment plant capacity is predicted to be exceeded as early as 2007. Because of Black Diamond's proximity to Turner Valley, and the history of the two communities' involvement in a regional wastewater system, a regional water system may also be appropriate for Black Diamond and Turner Valley. If both communities could reduce their per capita demand to approximately 400 L/c/d, the combined capacity of the existing systems would be sufficient to meet demands until around 2030.
- In recent years, the Town of Cochrane has been reaching the limit of its existing water treatment plant capacity during summer months when demands are highest. The Town

is considering several options to upgrade the limited WTP capacity to meet growing demands. Options being considered include upgrading the existing plant, constructing a new WTP, or constructing a watermain from the City of Calgary.

- The Town of High River is reaching the capacity of its existing WTP. An upgrade to the plant is scheduled for 2008, which will be sized for a population of 25,000, plus the existing outside users.
- Strathmore has reached the capacity of its existing WTP and is working with the City of Calgary on an agreement for the supply of treated water. Once the agreement and infrastructure are in place, Strathmore's water treatment challenges will be resolved.

Banff, Canmore, Chestermere, Okotoks, and the Tsuu T'ina Nation will all face water treatment challenges between 2010 and 2020.

- The Town of Banff's water supply is obtained from a high-capacity groundwater aquifer and treated with chlorine for disinfection. The system is limited by the existing pumping capacity, and upgrades to the pumps will allow the Town to continue to meet demands beyond 2030.
- Based on 2005 per capita water usage, Canmore's water treatment plant capacity is predicted to be exceeded by 2015. Recent information from the Town suggests that the current per capita consumption from residential sources has been reduced, and that the existing capacity is sufficient to meet demands beyond 2030. The Town may be required to upgrade its groundwater treatment process to include filtration and UV disinfection.
- The Town of Chestermere receives treated water from the City of Calgary. The capacity of the existing pipeline will be exceeded between 2013 and 2019, depending on Chestermere's per capita water usage. A new pipeline is in the planning stages, and a new water supply agreement is being negotiated with the City of Calgary.
- The Town of Okotoks has established its buildout population at approximately 30,000 people, which will be reached between 2015 and 2017. The Town has also committed to reducing its per capita water usage to 318 L/c/d by the time the buildout population is reached. This will require a WTP capacity of 16.7 ML/d by buildout, which is greater than the current capacity of 15.7ML/d. A minor upgrade to the filters will be undertaken to meet the Town's projected demands.
- The Tsuu T'ina Nation receives treated water from the City of Calgary for a portion of the Nation, with the remainder of the population serviced by small, independent systems. The information in Table 1 compares the existing pipeline infrastructure capacity from the City to the demands of the entire Nation population. Since the entire population is not serviced by the City of Calgary, the existing infrastructure may continue to meet the projected demands beyond 2030, depending on the number of users that tie into the system.
- Nanton may face challenges prior to 2030, unless the Town can reduce its 2005 water usage of 415 L/c/d by 15 to 30 percent.

- The water treatment challenges for the MD of Bighorn, MD of Rocky View, MD of Foothills, and Wheatland County will be linked to the water supply challenges in those areas. While the many small local WTPs and water co-ops in the MDs and County can continue to meet small local projected demands, they will be insufficient to meet the larger regional growth demands. It is recommended that water supply strategies be developed in conjunction with the Regional Growth and Sustainability Framework being developed by the CPR.

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Wastewater Treatment Challenges

Table 4 provides an overview of when each community in the CRP will exceed its existing wastewater treatment plant capacity, based on the per capita wastewater generation rates and population projections summarized in the previous technical memoranda.

Table 4
Wastewater Treatment Challenges

	Year of Exceedance of Existing Capacity
Airdrie	-
Banff	-
Bighorn, MD of	NA
Black Diamond	2028
Calgary	2019
Canmore	-
Chestermere	2012
Cochrane	2011
Crossfield	2007
Foothills, MD of	NA
High River	2010
Nanton	-
Okotoks	-
Redwood Meadows	-
Rocky View, MD of	NA
Strathmore	2011
Tsuu T'ina Nation	-
Turner Valley	See Black Diamond
Wheatland County	NA

The Town of Crossfield has the most immediate wastewater treatment challenges. Its existing wastewater treatment lagoons are near capacity and will need to be upgraded, or the Town will need to consider becoming part of a regional system. The recommendations in The Nose Creek Water Management Plan may influence how the Town addresses its wastewater treatment challenges.

Chestermere, Calgary, Cochrane, High River, and Strathmore will all be facing challenges between 2010 and 2020.

- Chestermere sends its wastewater to Calgary. The capacity of the existing pipeline is predicted to occur by 2012. It is assumed that the City of Calgary will continue to treat Chestermere's wastewater when the infrastructure is upgraded.
- Including the first stage of the Pine Creek WWTP, the City of Calgary will have sufficient capacity to meet its projected demands and the projected demands of its existing outside customers until approximately 2019. The City has plans for additional stages at Pine Creek, which will increase the capacity of their system.

- The Town of Cochrane also sends wastewater to Calgary, and it is assumed that Calgary will continue to accept the Town's wastewater beyond 2011, when the existing conveyance infrastructure will need to be upgraded.
- The Town of High River operates an aerated lagoon that will be reaching capacity in approximately 2010. The Town is currently looking at different options for upgrading its treatment system. Once the community's population reaches 20,000, which is projected to be around 2020, AENV may require a treatment upgrade.
- The Town of Strathmore's wastewater treatment plant is designed to meet the demands of a design population of 13,000, which Strathmore is projected to reach in approximately 2011.
- The Westend Regional Sewage Services Commission operates the aerated stabilization lagoon that provides wastewater treatment for Black Diamond and Turner Valley. This system is predicted to reach capacity by 2028.
- The Town of Canmore has sufficient wastewater treatment capacity to meet demands beyond 2030, based on wastewater flows; however, as mentioned earlier, the Town is completing a significant upgrade to increase the plant's loading capacity.

Summary

The most significant servicing issue for CRP member communities is the lack of availability of new water licenses for the Bow River basin. The following established communities will need additional water licenses or alternate sources of supply to meet 2030 projected demands:

- Black Diamond
- Canmore
- Cochrane
- High River
- Nanton
- Okotoks
- Redwood Meadows
- Strathmore
- Turner Valley

Any new developments in the MDs of Rocky View, Bighorn, and Foothills, and the County of Wheatland that do not hold a water license will require water license transfers or external water supply. Water license shortages can be mitigated, to a large extent, by meeting the water conservation objectives of the Water For Life Strategy.

Although individual communities will face license shortages, on a regional basis, the aggregate licensed capacity of all existing municipal licenses held by CRP members is adequate for the projected regional growth to 2075. This is primarily due to the large license held by the City of Calgary.

Sufficient water volumes are not available to support projected growth in the Sheep River basin. Development depending on the Sheep River as a water supply will need to be limited, or alternative water supplies will be required.

The aggregate license capacity of existing municipal license held by CRP-member communities on the Highwood River is not adequate for the projected growth in the Highwood River basin.

Several communities will require upgrades to their water treatment infrastructure prior to 2030. It should be recognized that the communities of Black Diamond, Cochrane, and High River will require water treatment plant upgrades and additional water license prior to 2030.

Several communities will require upgrades to their water and wastewater treatment infrastructure prior to 2030.