Edmonton's Water Supply

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Biography

Cindy Shepel is a Professional Engineer and Professional Biologist who has worked in the water industry for more than 14 years. She graduated with a B.Sc. in Biological Sciences from the University of Alberta in 1993, a B.Sc. in Civil and Environmental Engineering in 1997 and a M.Sc. in Environmental Engineering in 2000.

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Abstract

Water supply in the North Saskatchewan River (NSR) at the water treatment plant (WTP) intakes is not expected to decrease significantly due to increased use in the upper basin at this time. The effects of climate change are not certain and the simulations of the forecasted climate scenarios result in a range of possible impacts on water yield from the NSR basin (NSRB). The general consensus is that there is not enough data to say whether there will be an increase or decrease in flow. However, based on the model most representative of baseline climate in the NSRB, data show a general warming trend with a possibility of increasing overall precipitation and most likely a slight increase in mean annual flows. It is also predicted, compared to naturalized flows, that spring flows will increase and summer and fall flows will decrease, but this effect is largely offset by an expected increase in temperatures leading to more evaporation and current flow regulation practices on the NSR. Research on climate change effects on water supply is ongoing and another report on the subject will be produced in mid-2010.

While total water consumption in Edmonton has increased over time, the amount of water used by each person in their homes and yards has decreased. The decline in residential water usage per customer has occurred as the number of residents and households continue to grow, and as household income rises. EPCOR Water Services Inc. (EWSI) is among typical North American utilities that have been experiencing downward per customer demand trends.

As outlined in the *Edmonton Long-Term Efficiency Plan (2010-2030),* EWSI is committed to maintaining water efficiency best management practices which support local and provincial goals for sustainable communities. EWSI continues to implement industry best management practices for water management. Public education efforts focus on wise outdoor watering and reducing indoor water use through leak detection and use of water efficient appliances. Also, work is being undertaken to identify high consumption users in all customer classes so targeted efficiency programs can be developed.

Edmonton water use per person is relatively low compared to the Canadian average. In addition, EWSI has a reliable raw water source and upgrades to the E.L. Smith WTP have increased the long term stability of potable water production in a rapidly growing region. Edmonton, therefore, is in a good supply position compared to many other Alberta communities.

Water demand forecasts are developed for the following three in City customer groups (classes): Residential, Multi-Residential and Commercial. For each of the customer classes an initial consumption analysis is performed to forecast water demand based on current levels of water usage and existing trends in both usage and number of customers. The basis for the forecast is typically the historical trending information compiled (i.e. 10 year historical information) on customer growth, actual consumption and consumption per customer. Current year actuals, recent trends, current economic conditions, and other known factors are typically used to determine the current year forecast. Demand was projected to 2019, using monthly historical supply trends. It is predicted that the plants will be able to supply these demands comfortably.

The North Saskatchewan River Basin

The North Saskatchewan River (NSR) watershed in Alberta (Figure 1) is the sole water supply for the city of Edmonton. It is made up of 12 sub-basins, in a total area of about 57, 000 square kilometers. The river elevation is 1,390 m above sea level at Saskatchewan Crossing, near the national park boundary, and 500 m above sea level by the time it reaches the Saskatchewan border. It joins with the South Saskatchewan River just east of Prince Albert, flows into Lake Winnipeg and from there empties into the Hudson Bay by way of the Nelson River.

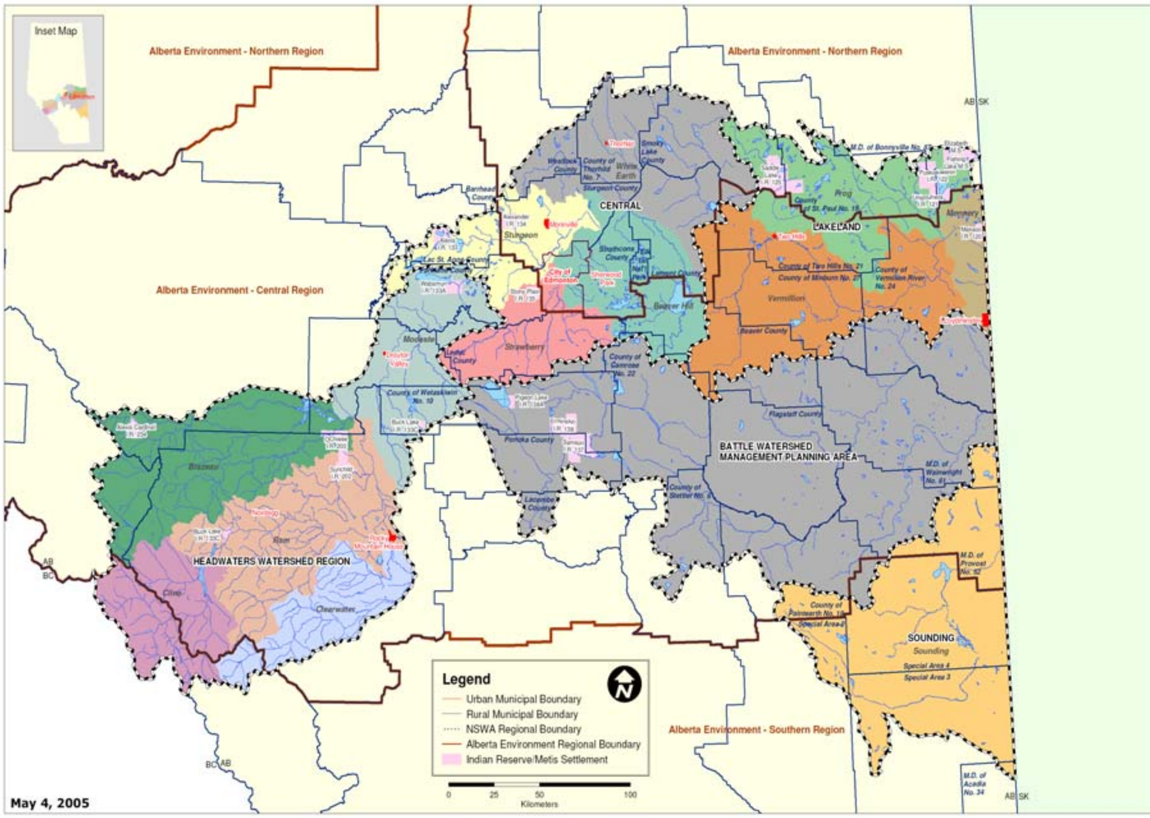


Figure 1: **North Saskatchewan River Basin in Alberta (from North Saskatchewan Watershed Alliance)**

As part of the Saskatchewan River basin, the NSR is subject to the 1969 Prairie Provinces Water Board (PPWB) Master Agreement on Apportionment which states that Alberta must pass 50% of the natural flow of east-flowing rivers into Saskatchewan.

Flow in the North Saskatchewan River is affected by two headwaters dams: the Brazeau on the Brazeau River, and the Big Horn on the main stem near the mouth of the Big Horn River. The effect of these impoundments is to redistribute flow to a higher than average flow in the winter time and lower than average flow in the summer.

Land use in the North Saskatchewan River Watershed includes: agriculture; resource exploration and extraction; forestry; recreation; and municipal use. The upper region of the watershed is sparsely populated; the greatest population base is found in and around Edmonton.

Watershed Protection Program

EWSI's watershed protection program (WPP) is intended to deliver the first line of water treatment within a multi-barrier approach for the facilities it operates, and for drinking water users downstream of its facilities. A comprehensive watershed approach to water management will also ensure that EPCOR meets its commitment to environmental responsibility in managing its facilities environmental impacts on receiving waterbodies.

EWSI's key components of a Watershed Protection Program include: 1) Source water protection planning, 2) Education/awareness, 3) Formation of partnerships, and 4) Water quality research and monitoring.

Source water protection has historically been the primary focus of the WPP and EWSI has recognized that it is the critical first step in a multi-barrier approach for water utilities to protect both quality and quantity of water sources. Current watershed initiatives include working with the North Saskatchewan Watershed Alliance (NSWA), whose near term focus is the production of an Integrated Watershed Management Plan (IWMP) for the North Saskatchewan River Basin (NSRB); developing and supporting water quality and quantity monitoring, research and reporting in the basin; and participating in provincial water policy development. In addition, the program also supports organizations that implement programs to reduce the effects of agriculture and other land uses on water quality and quantity; and the development and support of watershed education initiatives for the public and EWSI employees.

Water Supply Assessment for the North Saskatchewan River Basin Report

The Water Supply Assessment for the NSRB report, which was completed as part of the NSWA's IWMP, was key in determining where the water in the NSR originates from and describing the natural hydrograph of the NSR. The study identified that mean annual natural discharge of the NSR at the Alberta/Saskatchewan boundary is about 7,510 million m^3 (Mm^3). The headwater hydrologic region, with an area of 4,110 km^2 compared to the NSRB's gross drainage area of 56,860 km^2, contributes almost half (3,600 Mm^3) of the annual cumulative yield of the NSRB at the boundary. By the time the NSR reaches Rocky Mountain House 87% of flow at the border is accounted for. This has implications for protecting source water areas in order to ensure a sustainable supply of water for downstream reaches.

In terms of peak water availability in the NSR, the peak monthly yield from the hydrologic regions in the eastern half of the NSRB occurs in April as a result of snow melt as temperatures begin to increase in spring. In contrast, the peak monthly yield from the hydrologic regions in the western half of the NSRB, particularly those along the eastern slopes of the Rocky Mountains, occur in July because of the gradual rise in temperature during spring and early summer at these high elevations. The peak monthly cumulative yield at the Alberta/Saskatchewan boundary occurs in July and seems to follow the pattern shown by the hydrologic regions in the western half of the NSRB. This is an expected result as the western hydrologic regions generate most of the yield in the NSRB.

Water Quantity

The Water Survey of Canada maintains several gauging stations in the NSR basin and the data have been used extensively in determining changes in flow in the NSR. The site most commonly used for assessing trends for EWSI's WTPs is site 05DF001, which is located at the Edmonton Low Level Bridge, downstream from both E.L. Smith and Rossdale Water Treatment Plants. Flow in the North Saskatchewan River at the City of Edmonton is higher overall and more variable from year to year during the open water period compared to winter period (Figure 2). This is due to variability in snow pack and rainfall volumes. In general, peaks in flow occur during spring runoff period and during summer storm events.

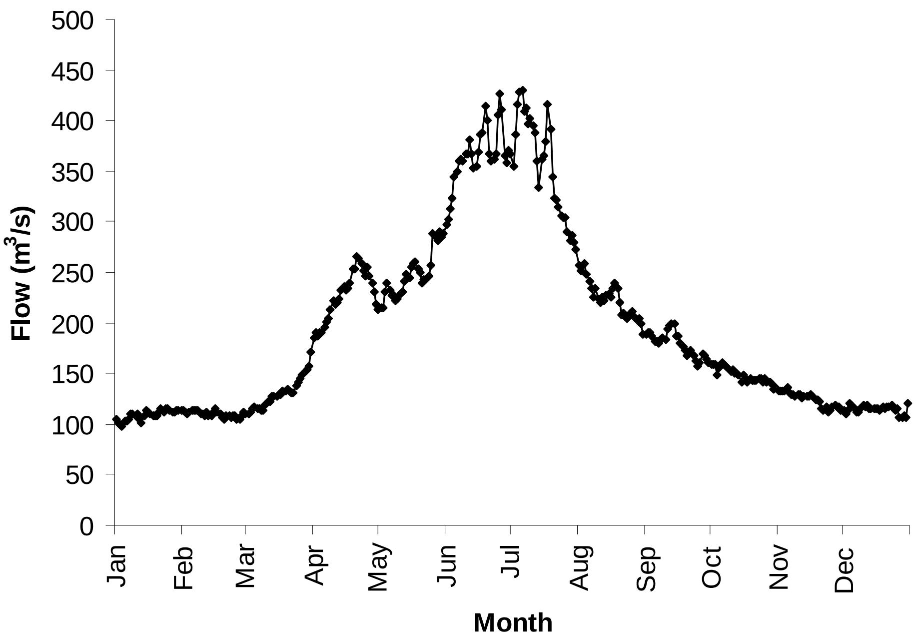


Figure 2. Hydrograph of the North Saskatchewan River Flow for 1970 to 2009 data.

Although North Saskatchewan River flows appear to be decreasing (Figure 3), there is not a significant negative trend based on simple trend analysis. Data are also skewed slightly by increasing water treatment plant uptakes from both Rossdale and E.L. Smith over the period 1912 to 2008.

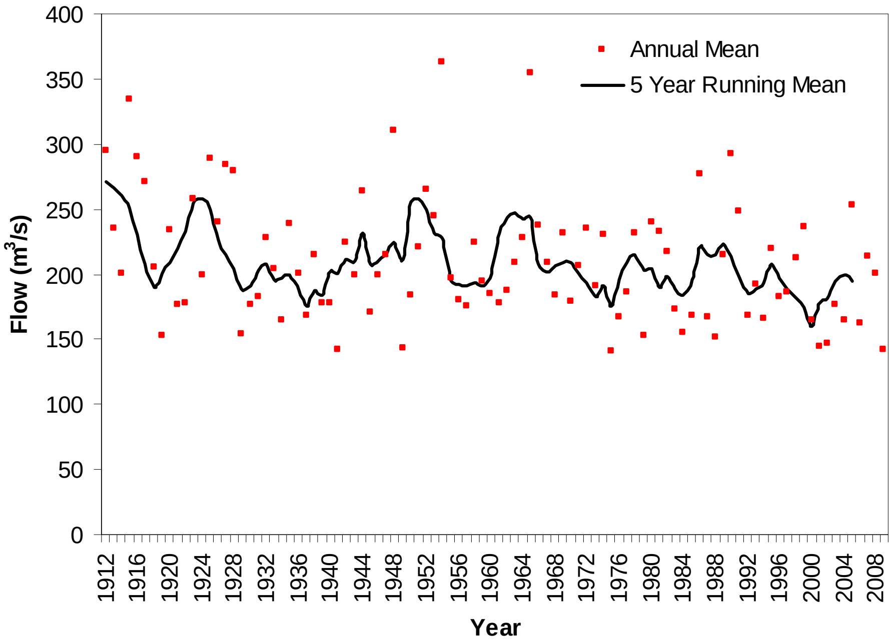


Figure 3. Mean Annual North Saskatchewan River Flows and Five Year Running Averages, 1912 to 2009.

North Saskatchewan River flows over the short and long term with relation to daily water treatment plant intake show that on average the daily percent withdrawal is 3% of the total flow. Seasonally, withdrawals make up a greater percentage during winter low flow periods (around 4%) compared to during open water periods (2% to 3%), as illustrated in Figure 4. The majority of the water withdrawn is returned to the river via the local wastewater treatment plants.

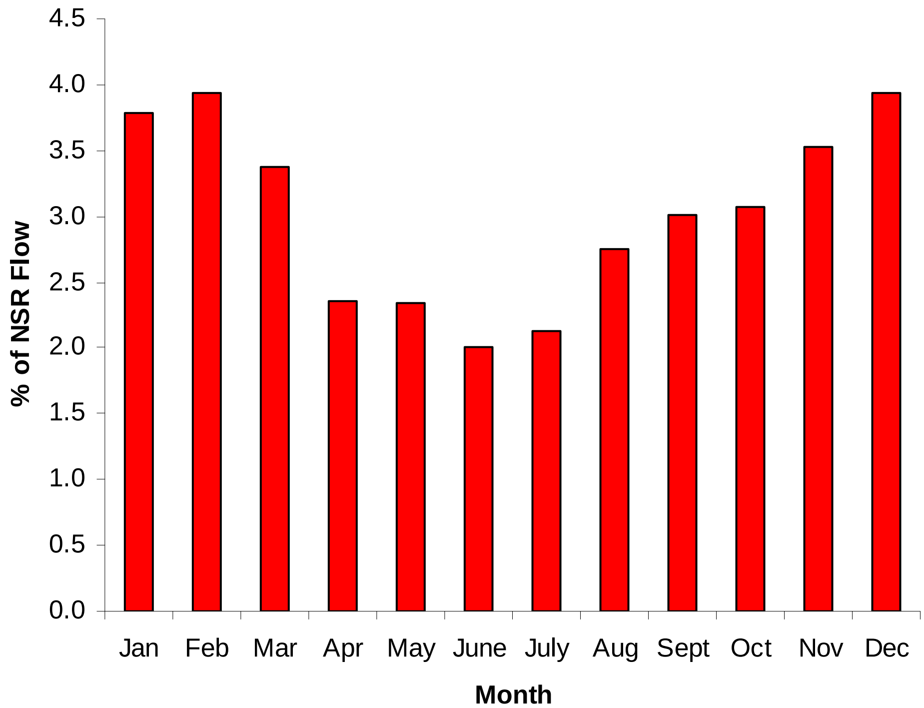


Figure 4. Combined E.L. Smith and Rossdale WTP Daily Intakes as a % of North Saskatchewan River Flow monthly from 2000 to 2009.

Assessment of Climate Change Effects on Water Yield in the NSR

As part of the IWMP, the NSWA contracted Golder Associates Ltd. (Golder) to assess potential changes in the water yield under forecasted future climatic conditions. It was determined through trend analyses on air temperature data at selected climate stations that there is a generally increasing trend in air temperature in the basin. In addition, there is a general trend towards increasing precipitation, though the analysis of monthly and seasonal precipitation data at four selected locations in the NSRB shows no statistically significant trend. The annual mean flow data at selected hydrometric stations in the headwater basins of the Athabasca River and western portion of the NSRB generally show a decreasing trend in recent years.

The simulations of the forecasted climate scenarios result in a range of possible impact on water yield from the NSRB. The model most representative of baseline climate in the NSRB predicts an increase in future annual yield, however the range of possible impacts should be considered in watershed planning because the model predictions have some degree of uncertainty associated with them. The percent changes in monthly yield are of greater concern than changes in overall annual yield. Increases in mean monthly yields may occur during the spring months as a result of the predicted increase in precipitation (snow) and increase in temperature. Decreases in mean monthly yield tend to occur during the summer months and into the fall when flows are already low due to increases in temperature causing an increase in evapotranspiration losses during the summer months. That said, the Golder report indicates that the effects of flow regulation appears to be the reverse of the predicted changes in future flows due to climate change, that is, an increase in spring flows and a decrease in summer and fall flows. It was also added, that further work is required to assess whether the effect of the flow regulation can mitigate to some extent the predicted changes in monthly yield.

Predicting effects of future climate on water supply is difficult. Additional work describing past hydroclimatic variability of the NSR using an innovative method of tree ring growth correlated with precipitation record and then predicting effects of future climate change on water yield is currently being undertaken by the Prairie Adaptation Research Collaborative (PARC). This project is sponsored by EWSI and a final report is expected in 2010. Based on the preliminary results of PARC's NSR climate change project, the following can be said:

- Nearly all the annual flow of the North Saskatchewan River is from snow melt and glacier runoff in the headwater basins; about 40% from the Cline River sub-basin.
- Observations from Fort Edmonton, and from tree rings in the headwaters of the basin, indicate that past river flows have been lower than recorded. In May 1796, furs could not be moved "there being no water in the river". The tree rings show droughts of up to 25 years in duration.
- There has been a decreasing flow trend over the past 50 years. This can be attributed in part to a natural cycle; however, the trend is also consistent with a warming climate.
- The modeling of future river flows under climate change suggests that the total volume of water in the basin (mean annual flow) may not change significantly; however, more of the flow will occur in winter and spring. As peak flow shifts to earlier in the year and glaciers mass continues to decline, there is potential for significantly lower summer flows. These shifts in river flow correspond to climate change scenarios that project wetter warmer winters and longer drier summers.
- Climate change modeling also suggests that the range of flows could increase such that drought and flooding can be expected with greater frequency and severity.
- Storage of winter and spring runoff in existing reservoirs, and water conservation especially in summer, could alleviate to some extent these impacts of climate change on river flow.
- Extended drought periods have occurred at least once in every century over the past 500 years.

This work and previous climate change work will be summarized and incorporated into the NSWA's IWMP in 2010, which will provide greater clarity on risks of climate change on water supply in the future.

Current and Future Water Use in the North Saskatchewan River Basin Report

The NSWA completed a report on the current and future water use in the NSRB which provided a comprehensive analysis of water allocations, licensing and use. The analysis was divided by sub-basin and sector (type of use) and summarizes current annual and estimated future use (to the year 2025). It was determined that the current annual surface water allocations total about 2 billion cubic metres – or approximately 27% of the river's average total annual discharge as measured at the Alberta- Saskatchewan boundary (estimated at 7.3 billion cubic metres). Of all allocations, 98% are for surface water. Further, upstream sub-basins (Modeste and Strawberry) hold 65% of the total allocations. However, many licensees' actual water use volumes are much less than their allocations. Further, in the Modeste sub-basin most of the allocation is for cooling purposes for thermal power generation and it is estimated that 88% of this is returned to NSR. The report identifies that current actual use is about 0.19 billion cubic metres/per year, or 2.6% of the average annual NSR discharge. Both river flow and use will vary throughout the year so these percentage depictions vary accordingly.

Future municipal water use in the basin is expected to increase by 16% in a medium growth scenario, with the majority of growth occurring in the Edmonton Capital Region sub-basins. Most of the increase in water use projected for the petroleum industry will occur in the Beaverhill sub-basin, downstream of the WTP intakes. Increases in use in the Modeste sub-basin are unlikely due to the decrease in use of water for cooling purposes in the future. It is expected that by 2025 there will be a decrease of 28% in water use for cooling purposes. Based on data from this report, it appears that increases in water use are more likely to affect flows downstream of EWSI's WTP intakes and that, under current hydrological regimes, water quantity due to increased consumption is not a primary concern.

Water Usage Trends

Figure 5 illustrates EWSI's water usage over the past three decades. Although total water consumption in Edmonton has increased over time, the amount of water used by each person in their homes and yards has decreased. This figure shows that EWSI has been experiencing downward demand trends.

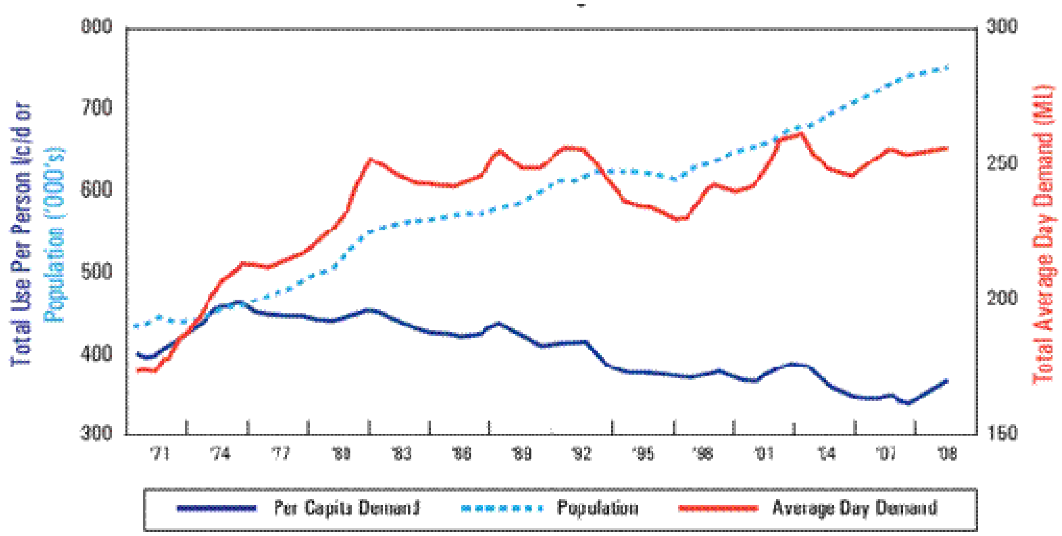
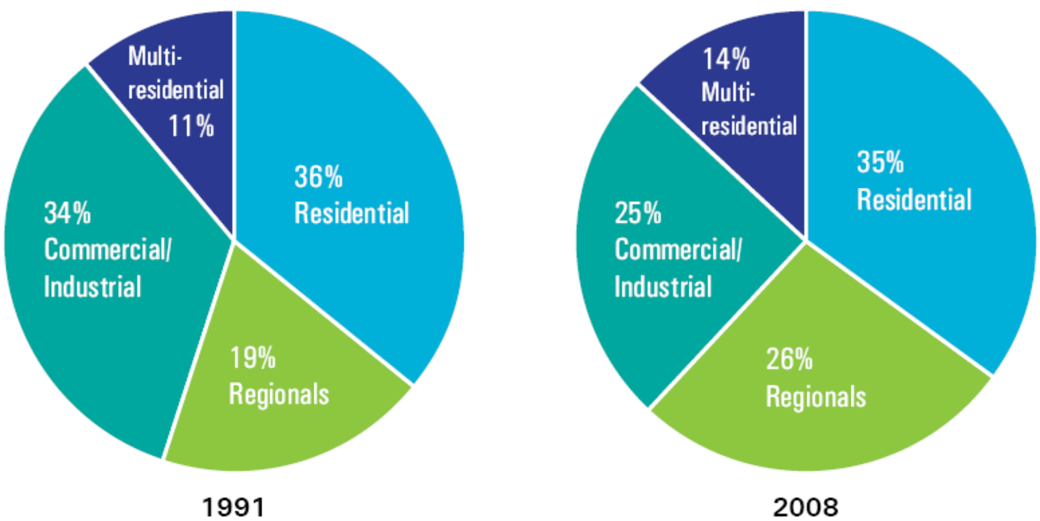


Figure 5 - Edmonton Population Growth vs. Water Demand

The study entitled *North America Residential Water Usage Trends Since 1992*, published in 2010 by the Water Research Foundation, provides useful information regarding the per capita downward water usage trends that EWSI has experienced over the past decades. The research attempted to substantiate why water utilities have noted that residential water usage has fallen as the number of residents and households continue to grow and as household incomes continue to rise. A variety of theories have been put forth to explain the declining usage, including wetter weather, household size and type, water-conserving fixtures and appliances, changing demographics, customer classification anomalies, and price increases. The study began with the collection of residential water-usage data from randomly selected utilities across North America. When controlled for weather and other variables, the evident decline in residential usage was pervasive. National and regional components of the study found that residential usage per customer has decreased more than 1725 litres annually in the past three decades (or 51,750 litres per customer). The national and regional studies confirmed and quantified the long-term trend toward less water usage per residential customer, but did not include sufficient local data to assess the causes of the decline.

Water Users

EWSI customers are currently grouped into the following classifications: residential, multi-residential, commercial, and regional. The volume of water used by each of these sectors over the past two decades has been shifting due to factors such as population growth, installation of water efficient fixtures, weather and economic conditions. Residential and multi-residential demands account for just under half of water sales in the City of Edmonton (Figure 6). The commercial sector has been dropping in percent of consumption due to shifting technologies and the closing of several high water use industries, such as Molson's Brewery and meat packing plants. There has also been strong growth in the regional systems, supplied by Edmonton, with the extension to more than 61communities and counties over the past 20 years. In order to keep up with population increases and economic growth, EWSI's long term goal is to continue to identify and target inefficient water users in all customer groups.



(114,529 ML) (125,307 ML)

Figure 6 – Total Annual Water Consumption By Customer Type ('91 vs. '08)

Residential

Although total water consumption in Edmonton has increased over time, the amount of water used by people in their homes and yards has decreased over time which reflects a more efficient lifestyle.

Edmonton residents have historically used less water than other Canadian cities due to the City's metering program, rate setting methods, and relatively short summers (Figure 7).

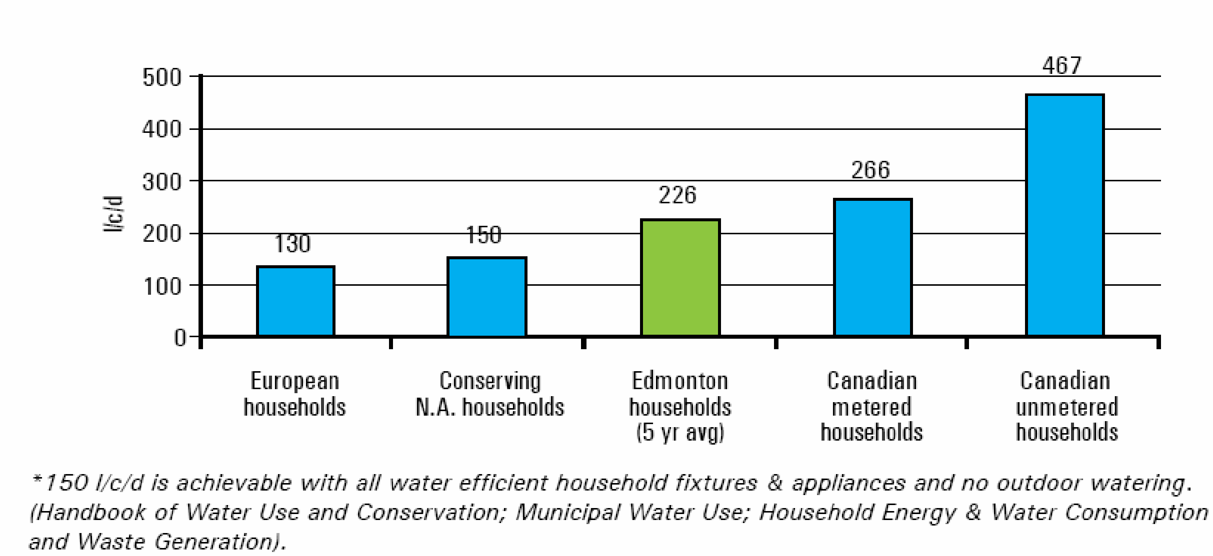


Figure 7 - Average Residential Water Use Comparison

There are many factors which influence indoor residential water usage in Edmonton, including: population; penetration and cost of efficiency of water fixtures and appliances, consumer behaviours, leakage rates, regulations/bylaws, presence of luxury water-using devices and water rates. Outdoor water usage can be influenced by weather, lot size and consumer behaviour.

Multi-Residential

Multi-residential customers range from duplexes and row homes up to large apartment complexes. Water use in this customer group has been relatively stable over time. In the 90s, the multi-residential water use average was estimated at 205 l/c/d. The latest five year average shows multi-residential water use at 209 l/c/d. Approximately 98% of water is used indoors as most multi-residential customers are apartment/condo dwellers who have no lawns or yards. The factors affecting indoor water usage are population, vacancy rate, efficiency of water fixtures and appliances, leakage rates, behavior and the presence of luxury water-using devices. Due to limited outdoor water usage in this customer class, the reduction of water use in multi-residential units will be primarily driven by the installation or retrofits of water efficient appliances and fixtures.

Commercial

Commercial consumption usage rates are monitored based on cubic metres of water used per customer per month. These units are not useful because they better gauge the average size of customers rather than water efficiency behavior. A study conducted in 2005 provided EWSI an overview of water usage by broad commercial categories (Figure 8). Currently this study is being updated to better understand commercial water use by industry. In 2009, standardized North American Industry Classification System (NAICS) codes were purchased and each commercial customer account was coded. Analysis by industry is currently underway. Ideally the findings of this study will allow EWSI to categorize water users within each industry, as well as forecast consumption by industry.

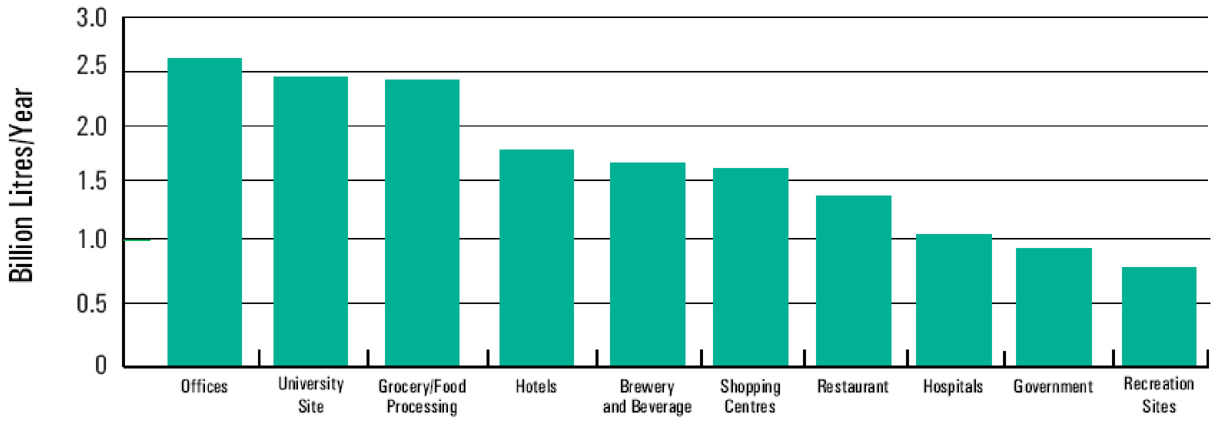


Figure 8 - Water Use by Commercial Categories in Edmonton 2005

Approximately 90 percent of commercial usage is indoor usage. The factors affecting commercial usage include: the type of industry; economic situation; customer behaviour and efficiency of processes; best management practices; retrofits; once through cooling/chilling units; and water rates.

According to the *Edmonton Socio-Economic Outlook 2007-2012* report, there are several potential projects which may increase total commercial water consumption in the region:

- Oil/gas plants and upgraders in the Heartland Region
- Hydrogen production plant in Strathcona County
- Meat packing plant in Parkland County
- World Expo 2017
- International airport expansion
- Addition/expansion of hospital facilities
- Multi-purpose recreation centres

Regional

EWSI supplies water to 61 communities and counties in the greater Edmonton region through a number of metering stations located at or near the City boundary. There are nine direct regional customers / service commissions that EWSI sells water to directly, including: Parkland Water Service Commission, Capital Region Southwest Water Service Commission, Capital Region Northeast Water Service Commission, City of St. Albert, Strathcona County, Town of Morinville, Sturgeon County, Department of National Defense, and Enoch Water Commission. These customers provide piped water into the region, including a number of communities as shown on Figure 9 below.

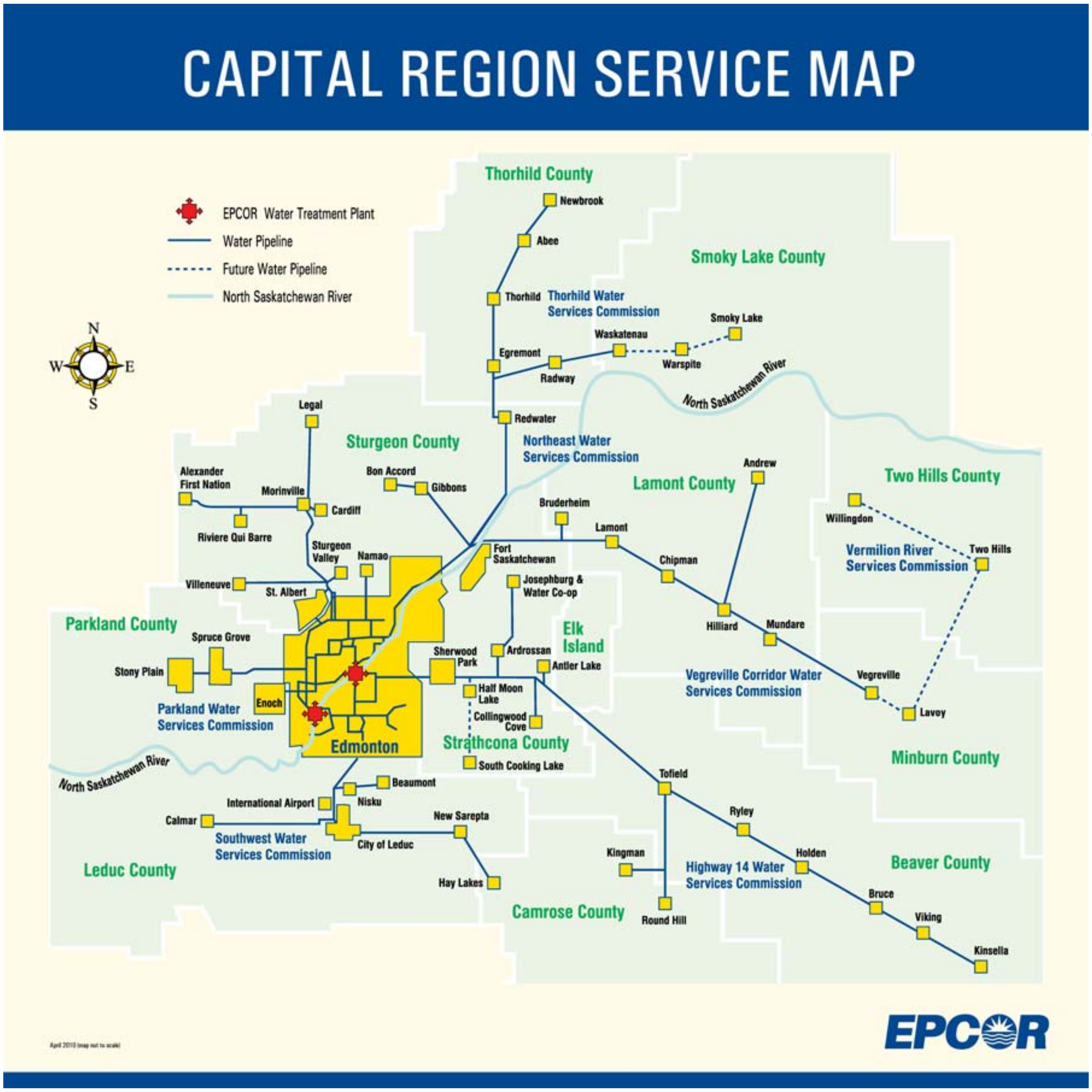


Figure 9 - Edmonton Capital Service Region Map

Every few years, additional communities are added as customers to the regional water system. Growth in the regional water system is affected by both population increases as well as the addition of new communities.

Regional customers re-sell water to residential, multi-residential and commercial customers, therefore the factors affecting regional consumption mirror those impacting Edmonton. Due to the diversity of size, weather conditions, demographics, commercial customers and water efficiency strategies among the regional customers, water use patterns vary between the 61 regional towns and municipalities. While the *Water Efficient Fixtures Bylaw* does not apply to the regional customers, it is anticipated that future provincial legislation will require exclusive use of water efficient fixtures in new developments. EPCOR provides regional customers with information about its Edmonton program should they wish to use similar strategies for their own programs.

Regional customers currently use 26% of Edmonton's water supply, a figure which is anticipated to increase over time. The regionalization of water systems is consistent with the Provincial *Water for Life* Strategy.

Decreasing Per Capita Demands

Prior to 2009, EWSI was aware that per capita demands, and household use had been steadily decreasing. For many years, the average Edmonton household (2.6 people) used 20 cubic meters (m^3) of water each month for indoor and outdoor use combined; this dropped to a low of 18.1 m^3/month in 2008 (Figure 10). Although the measures fluctuate yearly, there is a general downward trend and the average consumption is projected to decline to 18.0 m^3/month by 2012 (with 2.4 people per household).

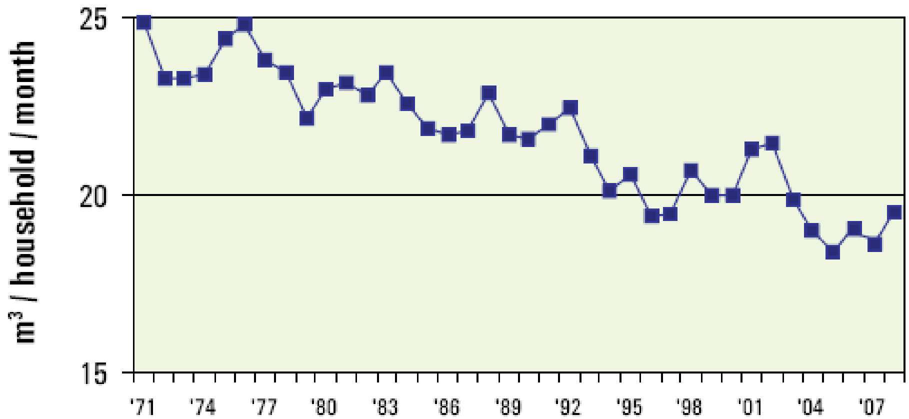


Figure 10 - Residential Water Consumption in Edmonton 1971 to 2008

EWSI hypothesized that declining per capita usage in the residential class was largely due to a decrease in household size, the penetration of water-conserving appliances, and an increasingly eco-friendly population (shift in behavioral water use). As discussed above, the Water Research Foundation research identified decreasing household size and penetration of water conserving appliances as the primary causes of declining residential water usage. This study highly correlates with EWSI's current state, and historical trends. Average household size has decreased substantially over the past three decades from 3.6 persons per household in 1971 to 2.4 in 2008. Toilets and clothes washers constitute ~48% of daily household water consumption, therefore the introduction of low-flow toilets, showers and clothes washers has had a significant impact on the residential water usage (Figure 11).

The study predicts that although the rate of decline may slow and flatten over the next twenty years, there is no indication that the decline in water usage will reverse. The basis behind this prediction is that both trends have theoretical limits on how low they can go. For example, household size decreases will eventually slow, and the change in efficiency of third generation water efficient appliances will be less than the second generation efficiency appliances.

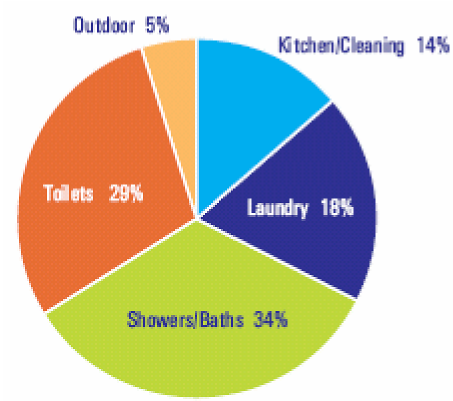


Figure 11 - Average North American Residential Water Use Pattern

Demographic Study

In 2009, EWSI conducted a *Demographic Study* which investigated Edmonton's residential and multifamily water use patterns and demographic trends related to water consumption. The information derived from the study has been used to help set a long term water efficiency vision, identify water wasters, and enhance or revise the current water efficiency measures in Edmonton as well as better enable forecasting future water consumption.

A number of demographic parameters were evaluated such as lot size, age of household construction, neighbourhood income and age, neighbourhood rental usage, neighbourhood per capita water consumption, and the effect of seasonal variation. The key findings of the demographic review are listed below.

- There is an increasing correlation between average residential water consumption and the size of the lot.
- Homes built within the 1970-1990 range utilize more water on average than earlier or later constructed homes.
- Neighbourhoods having a high median income utilized the most water on average. However, neighbourhoods within the lowest income range utilized the second highest per capita consumption.

Water Conservation and Efficiency

Conservation aims to influence behavior while efficiency tends to focus on appropriate technology (such as low-flush toilets or low-flow showerheads) in reducing demand. In the past Edmonton has focused on improving the water efficiency rather than water conservation because of adequate water supply.

Conservation and efficiency has the potential to benefit customers, the community at large, the water utility, the environment, and business and industry. When setting a long term efficiency vision, it is necessary for EWSI to achieve a balance between environmental benefits, cost impacts, and community growth needs.

Continued water conservation efforts and new legislation (strategies and bylaws) will prompt further penetration of water-conserving appliances. In 2008, the City of Edmonton implemented a *Water Efficient Fixtures Bylaw* that applies to new building construction and retrofits requiring a permit. Among other items, this bylaw requires the installation of water efficient appliances / fixtures (toilets, urinals, showerheads and faucets) in any new residential, commercial or institutional construction. The provincially legislated *Water for Life* Strategy also focus on water conservation and sets Alberta's goal as improving water efficiency and productivity of water use by 30% (from 2005 levels) by 2015.

Water Efficiency Initiatives

To meet the long term water efficiency objectives EWSI uses several different strategies - including an integrated approach to water management, partnerships, legislation support, and industry affiliations. Below is the summary of the last 10 years water efficiency initiatives. Detailed information is available in the *2010 - 2030 Edmonton Long Term Water Efficiency Report*.

Table 1 - EWSI's Water Efficiency Initiatives 1998 - 2008

UTILITY OPERATION EFFICIENCIES
• System leak detection/water loss program. • Efficiency upgrades at treatment plants. • Ongoing cast iron main replacement program.
MAKING WATER EFFICIENT TECHNOLOGY ACCESSIBLE
• Rebate program for ultra low flush toilets. • Rebate program for water efficient washing machines.
RESIDENTIAL EDUCATION ABOUT WISE WATER USE
• Advertising and education campaigns (indoor, outdoor, leaks). • School programs. • Print materials and web site. • Community outreach events (e.g., home show).
COMMERCIAL EDUCATION ABOUT WISE WATER USE
• Advertising and education (water efficient fixtures & practices). • Water & energy audits for large commercial/industrial customers.
MAKING WATER EFFICIENCY A REQUIREMENT
• Universal metering. • Summer watering restrictions when needed. • Water efficiency fixture bylaw.

Government of Alberta - Water for Life

The Government of Alberta adopted *Water for Life* strategy in November 2003 by establishing three goals:

1. safe, secure drinking water supply;
2. healthy aquatic ecosystems; and
3. reliable quality water supplies for a sustainable economy.

To meet these goals it requires the participation of water using sectors in improving water conservation, efficiency and productivity (CEP) in their operations. A key action in the strategy is "to prepare water conservation and productivity plans for all water using sectors by 2010." These plans will contribute to achieving the strategy's target of a 30% improvement in overall water efficiency and productivity from 2005 levels by 2015. The Alberta Water Council recognizes that the 30% target applies to the aggregate of all water users, and is not intended to be an absolute target for each sector.

Water Conservation, Efficiency, and Productivity (CEP)

The Alberta Water Council identified water conservation as a focus for accelerated action in the *Water for Life* renewal. The Alberta Water Council monitors implementation of the *Water for Life* strategy and also advises the Alberta Government, stakeholders and the public on effective water management practices and solutions to water issues, as well as on priorities for water research.

Within the document *Recommendation for Water Conservation, Efficiency and Productivity Sector Planning*, the AB Water Council identified seven sectors (chemical and petrochemical, irrigation, forestry, mining or oil sands, municipal, gas and power) and prepared a framework to provide direction to develop the CEP plan for each sector. The framework ensures that sectors take a collaborative and integrated approach, contains mechanisms to encourage participation and accountability, and provides direction for addressing conservation, efficiency and productivity goals under the *Water for Life* strategy.

Among those seven sectors the Alberta Urban Municipalities Association (AUMA) oversaw the development of the Municipal Sector Plan. The recently published *AUMA Water Conservation, Efficiency and Productivity Plan*, provides a background on municipal water use in Alberta and a framework for how CEP efforts will be undertaken by AUMA member municipalities in order to continue to protect Alberta's water supply. The report presents short term targets related to the understanding of municipal water use, infrastructure leakage, the development of CEP plans, and the promotion of water efficient fixtures/technologies. Through these actions, a better understanding of municipal water use will be realized to allow for the establishment of medium- and long-term goals.

EWSI has been actively involved in development of the AUMA CEP plan.
Table 2 presents EWSI's current practices and future action plans to meet AUMA CEP short term targets.

Table 2 - EWSI's Plan to Align With AUMA's CEP Plan

AUMA CEP SHORT TERM TARGETS	EWSI GOALS
All urban municipalities will report water use data through Alberta Environment's electronic Water Use Reporting System (WURS) by 2010.	EWSI currently reports its monthly water use in hardcopy format to Alberta Environment and will use the WURS electronic system by 2010.
Urban municipalities representing 80% of municipal water allocations will develop CEP plans by Dec. 31, 2011.	*2010 - 2030 Edmonton Long Term Water Efficiency Report* is the overall CEP plan for Edmonton. Some EWSI CEP targets are also identified in the City of Edmonton's *Environmental Strategic Plan* section.
Urban municipalities representing 80% of municipal water allocations will estimate their Infrastructure Leakage Index (ILI) and identify ways to reduce leaks by Dec 31, 2011.	EWSI currently measures its system water loss as a percentage of the total supply. The ILI has been calculated internally by EWSI and published in the Water Loss audit since 1999. The ILI standard will be formally reported starting in 2010.
Urban municipalities representing 80% of municipal water allocations will implement incentives and/or disincentives of their own choosing to increase the uptake of water efficient fixtures and technologies by December 2011.	City of Edmonton implemented a *Water Efficient Fixtures Bylaw 14571* in 2008 for toilets, urinals, showers, and once through cooling units used in new construction and renovations requiring a building permit. EWSI provides public education around water efficient technologies for residential and commercial customers.

2010-2030 Edmonton Long Term Water Efficiency Report

2010-2030 Edmonton Long Term Water Efficiency Report provides a summary of the characteristics of Edmonton's supply system, water use patterns, water efficiency strategies and targets, the importance of wise water use, efficiency program implementation and outcomes and future plans for water efficiency. This report is EWSI's overall CEP plan for Edmonton and supports the following AUMA CEP short term target "urban municipalities representing 80% of municipal water allocations will develop CEP plans by Dec. 31, 2011".

EWSI's long term vision is to continue to be an Alberta leader in water efficiency. Over the next three years, EWSI will conduct several detailed studies, monitor the external environment, and present various efficiency scenarios to key stakeholders and City Council before specific long term goals can be selected and approved. These goals may be adopted into the PBR renewal process in 2011.

City of Edmonton Initiatives

The City of Edmonton has several initiatives to support the water conservation, efficiency and productivity plan in partnership with other agencies and community groups over the years. Detailed information is available in the City of Edmonton's *Environmental Strategic Plan, EcoVision Annual Report* and EWSI's *2010-2030 Edmonton Long Term Water Efficiency Report*.

Water Demand Projection for EWSI (2006 to 2016)

The report entitled *Water Demand Projection for EWSI (2006 to 2016)* was completed in July 2006. This document expanded upon traditional water demand forecasting used by water utilities to include factors such as price, technological changes, legislation changes, lifestyle and market trends, weather impact, billing system impacts, in addition to the more traditional population growth rates and per capita consumption.

Along with providing a ten year forecast, the report also summarized the factors likely to affect the future demand forecast. These include price, technological changes, legislation changes, lifestyle and market trends, weather impact, and billing system impacts.

Several methodologies can be used to forecast residential, multi-family and commercial customers. The result found in *Water Demand Projection for EWSI (2006 to 2016)* report is a range of possible scenarios (low, likely, high) from which a final forecast was ultimately chosen based on reasonableness to historical trends, conservatism, past experience and professional judgment.

Figure 12 illustrates the actual total water demand for the period of 1991 to 2009 and the forecasted water demand for a period of 2006 to 2016. Note that the low demand scenario predicts a declining trend, while the likely and high demand scenarios predict increasing trends. Both the low and high demand scenarios are extreme, and present overly pessimistic and optimistic projections. EWSI has witnessed this variation in demand over consecutive years due to weather. Additionally, variations can occur due to changes in the commercial sector.

To compare the forecast, total metered water demands for the years of 2006 – 2009 were included on the 2006 forecast. This data indicates that EWSI is currently trending closest to the likely (medium demand) scenario.

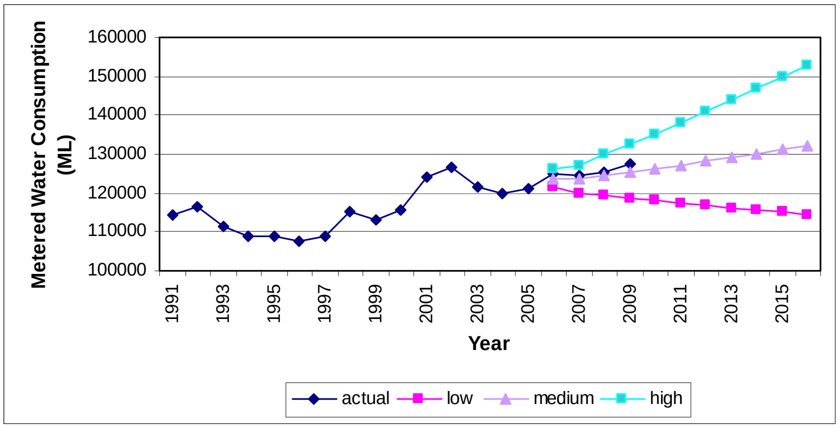


Figure 12 - Low, Medium, and High Total Water Consumption Forecasts (ML)

Capacity versus Demand

The E.L. Smith plant upgrade alleviated the issue of shortfalls of supply during high demand times. The focus of the upgrade was to create redundancy and reliability in the plant, as well as to upgrade the plant capacity. With the completion of the upgrade, there is sufficient capacity for the future.