



City of Dawson Creek Water Strategy

Prepared for:
The City of Dawson Creek

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PLANNING DESIGN SUSTAINABILITY

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Introduction

Overview

A clear understanding of local water usage patterns and issues helps to develop appropriate and effective policies. This Strategy was conceived as a brief companion piece to the 2009 OCP update, to support the development of water policies and DP guidelines in the OCP, and provide some guidance for subsequent implementation. The Strategy also contains additional recommendations that will help to implement recommendations in the Water Baseline Report (Stevenson, 2009).

Local Issues

Issues related to Dawson Creek's water supply and water conservation include:

- The City's water source is outside the City's boundaries, and utilizing other, more distant sources is prohibitively expensive at this time;
- Pressures on the watershed include forestry, agriculture, oil and gas industry, and recreation;
- Turbidity is often very high, and is tending to be higher for longer periods in recent years. When rain events occur, increasing the supply, turbidity is often increased as well and pumping from the river must be postponed;
- The area is susceptible to drought: there has been concern over changes in flow patterns over the last 20 years, with very low flows in 1992 and 2002/2003. Uncertainty and supply risk will increase with climate change; anecdotally, increasing fluctuations have been observed in recent years;
- Water consumption, particularly in the commercial/industrial sectors, has been increasing in recent years;
- During the summer season, conditions in the city are usually dry, and water supply is limited; and
- The City water system, including pumping and treatment, is the second largest corporate energy consumer.

Goals

Water conservation is an important component within the OCP, as it can achieve multiple community and City goals and objectives, including:

1. Reduce or limit the required draw from the Kiskatinaw River water supply, reducing impacts on the river and risk of not meeting demand.
2. Reduce long-term municipal water infrastructure construction and maintenance, and associated costs, including:
 - Construction of raw water reservoirs. Additional reservoir capacity has been needed to address turbidity issues; additional capacity for drought protection could be needed;
 - Maintenance and replacement of pumping equipment; and
 - Future upgrades to treatment facilities.
3. Reduce municipal infrastructure energy consumption, associated greenhouse gas emissions, and operating costs for pumping and treatment (including wastewater treatment), supporting Carbon Neutral Local Government commitments.

4. Reduce energy consumption and associated greenhouse gas emissions for heating water in residential and other buildings in the community.
5. Lead by example, through conserving water on public land and at community buildings and facilities. The outcome of this goal is functional design and smart water use, rather than brown turf.

Targets

The Water Baseline Report (Stevenson, 2009) puts forward two goals as part of a water vision:

In line with new British Columbia Government legislation, the City of Dawson Creek will meet 50% of its new water needs through conservation measures by the year 2020.

As a volume target, the City will reduce the current per capita daily consumption by 20% by the year 2020. Going from an average of 584 litres/capita/day (2005-2007) to 467 litres/capita/day by 2020.

This Water Strategy recommends specific implementation steps that can contribute to achievement of these two goals, with the exception that adoption of a specific consumption target (i.e. litres/capita/day) is not recommended until the current consumption figures are validated, and the methodology for calculating water use indicators is formalized.

Analysis

Baseline

Based on 2008 water sales data (HB Lanarc, 2009), water consumption is estimated as follows:

1. Total per capita water consumption: approximately 524 litres/person/day.
Total consumption $2,236,604 \text{ m}^3$ / population $11,700$ / $365 = 0.524 \text{ m}^3/\text{person/day} = 524$ litres/person/day
2. Residential per capita water consumption: approximately 224 litres/person/day (see note below).
Residential consumption $804,613 \text{ m}^3$ + Pouce Coupe $92,294 \text{ m}^3$ + residential bulk sales $59,688 \text{ m}^3 = 956,595$ / population $11,700$ / $365 = 0.224 \text{ m}^3/\text{person/day} = 224$ litres/person/day

If accurate, this level of consumption is lower than the BC averages, which are approximately 649 l/p/d total and 426 l/p/d residential. However, looking at more comparable environments, the average residential water consumption in Saskatchewan is 303 l/p/d and in Alberta is 271 l/p/d¹. Comparing to water-efficient countries internationally, the average residential consumption in Sweden is 200 l/p/d, and France is only 150 l/p/d.

Note: due to uncertainties in water data and limited analysis performed to date on available data, these figures, in particular the residential consumption, may be subject to considerable error.

As new development occurs, overall water demand will increase. Due to water efficiency regulations in the Building Code however, per capita consumption may decrease.

Use by sector

2008 water sales data indicate the following approximate water use demands by sector for Dawson Creek:

Residential:	43%
Commercial:	43%
Industrial:	14%

Considering residential consumption, existing building forms are dominated (approx 75% by unit count) by single family and semi-detached, with about 17% low rise apartments, based on 1996 Census data. However, City data on new dwellings as of January 2008, and proposed dwellings, showed a significantly higher proportion of new multi-family housing.

Commercial and industrial water use is more dominant in Dawson Creek than in many other municipalities. In British Columbia, the ICI sector accounts for approximately 29% of total municipal water use on average¹, compared to the approximately 57% estimated above.

Leakage, Losses and Unaccounted for Water

Water leakage, losses and unaccounted water was estimated to be approximately 16%. This level is significant but is within the losses range of typical water systems, which typically range from 5 to 20% across Canada¹.

¹ 2004 municipal water use statistics in the Environment Canada 2007 Municipal Water Use Report

Residential consumption

Seasonal residential water consumption for 2006 through 2008 is shown in the figure below. Using this data to estimate the summer peaking of residential demand, annual **residential outdoor water consumption** for these three years is estimated to range between 5% (2007), 10% (2008), and 17% (2006), correlating inversely with summer precipitation in the region; peak summer demand was approximately 16 to 58% over the typical winter baseline.

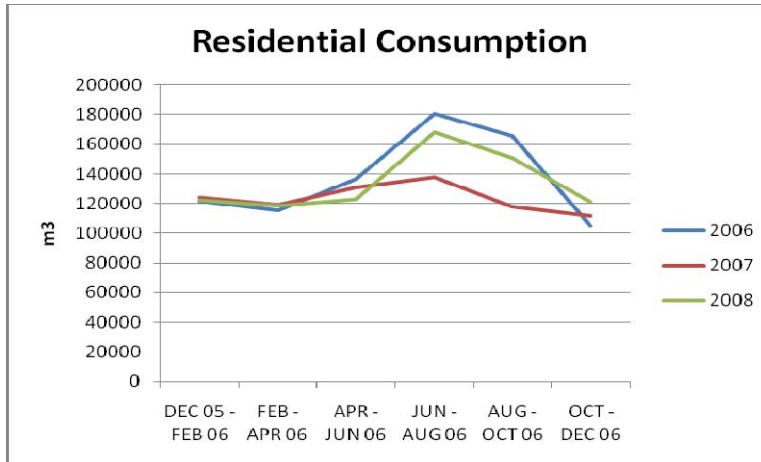


Figure 1: Seasonal Residential Water Consumption 2006-2008

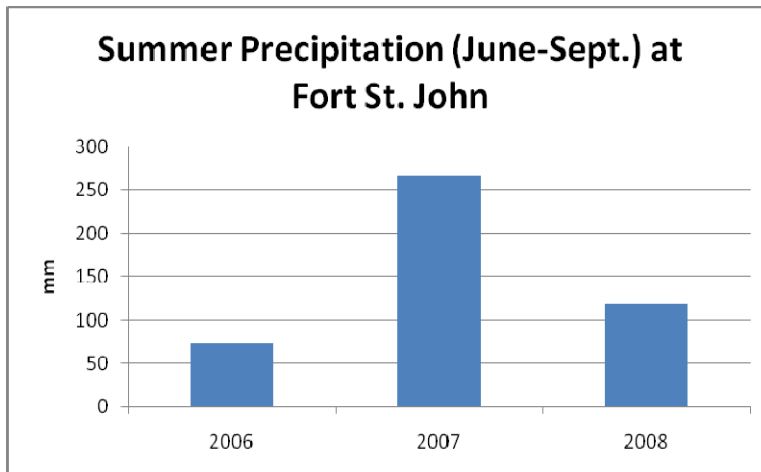


Figure 2: Summer Precipitation Levels in Fort St. John 2006-2008

Poor native soils and lack of topsoil used in landscaping and is a key issue that has been identified in Dawson Creek. Also, most landscape irrigation in Dawson Creek does not utilize irrigation systems.

ICI consumption

City *bulk* water sales data show a dramatic increase in overall bulk water consumption from 2004 to 2008, with the largest increase in the commercial/industrial sector, as shown in the figure below. The blue column represents primarily industrial oil and gas sector water use for hydraulic fracturing.

The recent construction of several hotels has likely also contributed to increases in ICI sector water consumption overall.

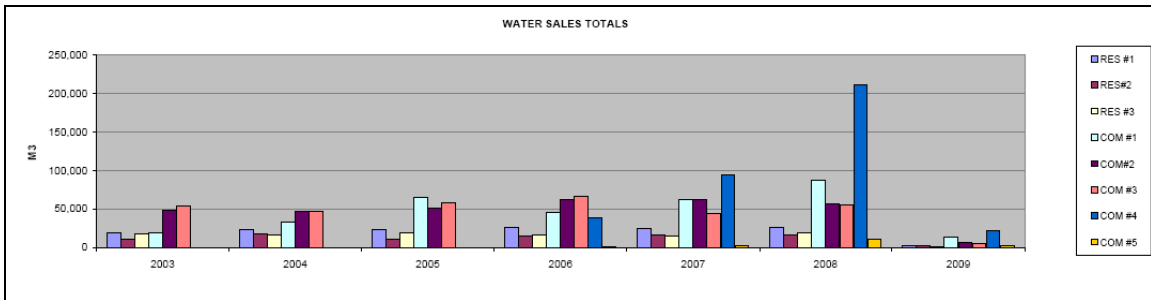


Figure 3: City Bulk Water Sales 2004-2008

Discussion

Based on the above analysis, the largest demand segments for **current water use** are:

1. Commercial and industrial use; and
2. Single family residential sector, indoor use.

Considering **future water use**, growth in the commercial/industrial sectors will play a very important role, and the potential for sharp increases in demand is greatest in the industrial sector based on recent experience.

Single family residential use will likely continue to be very important, however the role of multi-family buildings will likely increase in the residential sector as more multi-family housing is developed.

Outdoor residential consumption accounts for a much lower proportion of overall water demand than indoor consumption. There is a summer peak associated with outdoor use, however this peak is much lower than in some dry climate communities such as Kelowna where the summer peak is four times the winter consumption level. However there are no Provincial regulations in place that address outdoor water consumption, unlike indoor consumption that is now regulated (in terms of toilet, faucet and shower fixture performance) by the Water Conservation portion of the BC Building Code for new construction.

Overview of Current Regulations & Policies

Local regulations and policies

- Water Conservation Measures Bylaw 3844, 2008: Staged outdoor water conservation measures that can be invoked upon need. Includes lawn watering restrictions, restrictions on other outdoor uses such as washing cars etc.
- Cross Connection Bylaw 3491, 2007
- Water and Sewer Connecting Lines Bylaw 3579
- Water Rates & Regulations Bylaw 3326/3811: Water User Rates for consumers inside City limits:
 - \$1.95 per 100 cu. Ft. (approx. \$0.69/m³) – Minimum Bi-Monthly charge = \$29.25
- Outside Users Water Rates & Regulations Bylaw Bylaw No. 3327/3812
 - Raw unprocessed water (Bi-monthly) \$1.80 per 100 cu. ft. (approx. \$0.64/m³)
 - Processed water (Bi-monthly) \$2.45 per 100 cu. ft. (approx. \$0.87/m³)
 - Authorized Vendors \$0.059 per cu. ft. (\$2.08/m³)
 - Bulk Dispenser Users \$0.0825 per cu. ft. (\$2.91/m³)
- Subdivision and Development Services Bylaw, 2616, 1991

Relevant provincial regulations

For indoor consumption, the BC Building Code already includes water conservation requirements (toilet, shower head, and faucet performance) that are significantly more aggressive than performance of fixtures in older homes. Though performance could potentially be 20 to 30% more efficient than required by Code, given these existing regulations and the limited impact of new development compared to existing, additional regulation or policy is considered lower priority at this time.

The building code water conservation requirements do not address outdoor water usage.

Measures for Water Conservation

Based on water consumption patterns and trends, existing regulations and policies, and municipal priorities, the Water Strategy focuses on these key initiatives:

- Developing a non-potable water supply for industrial customers initially, and utilizing this more fully in the future;
- Water conservation incentives and educational resources for the residential sector;
- Development Permit Areas for water conservation for the residential multifamily and ICI sectors; and
- Leading the way on public lands through water-efficient design and other strategies going forward.

An effective social marketing approach can *deepen* and *sustain* the success of water conservation efforts. Social marketing works most effectively when integrated into a suite of mutually reinforcing policy and technical tools including:

- **Incentives** such as pricing;
- **Regulations**, such as the building code and sprinkling restrictions;
- Heightened **enforcement** and fines;
- **Technical solutions** such as efficient technology; and
- **Public awareness**, with a focus on awareness of the technology, programs, incentives and regulations.

The table below summarizes a range of recommended water conservation measures by sector, phased over time.

Conservation Measures Implementation Table

The following table summarizes recommended implementation steps for conservation measures by sector; refer to the guidance section following the table for more detailed information on each measure.

SHORTER TERM – 1-3 YEARS							
	OCP	Water Rates Bylaw/ Water Conservation Measures Bylaw	Education and Outreach	Incentives and Rebates	Municipal Infrastructure & Facilities Planning and Management	Subdivision & Devt. Svcs. Bylaw	Zoning Bylaws
All private sectors except bulk		Update water pricing structure to graduated block pricing based on usage to incent conservation, with priority on residential single family customers	Enhance the water conservation educational and outreach program, with initial priority on residential use, and promoting the tools	Create rebates for retrofitting with water conserving fixtures for residential customers Provision of water conservation kits for residential customers	Review water system asset management processes, and create/update a water loss management strategy		
Residential multifamily and ICI	Create DP Areas for Water Conservation: simple measures for outdoor conservation, (being pursued as part of 2009 OCP update)				Continue to plan for non-potable water infrastructure to allow utilization by a larger customer base – focus on bulk commercial/industrial users initially Follow and participate in		

					proposed changes to the BC Building Code that facilitate rainwater capture and reclaimed water use for appropriate purposes		
Public/ Municipal					Retrofit all public buildings with water-efficient fixtures Formalize the methodology for water consumption indicators and start tracking annually (refer to the end of this section for recommendations)	Update the Subdivision and Development Services Bylaw with requirements for water-efficient landscaping including water reuse strategies	
Industrial and commercial - bulk users			Encourage industries/large users to develop water audits and conservation plans, particularly large users		Develop a non-potable reclaimed water supply for industrial users, priced accordingly to incent usage over potable water		
LONGER TERM CONSIDERATION – 4+ YEARS							
	OCP	Water Rates Bylaw/ Water Conservation Measures Bylaw	Education and Outreach	Incentives and Rebates	Municipal Infrastructure & Facilities Planning and Management	Subdivision & Devt. Svcs. Bylaw	Zoning Bylaws
Single family residential		Change water conservation bylaws to require use of weather-based timeclocks and low flow heads when					

		automatic irrigation is installed					
Residential multifamily and ICI	Development Permit Areas for Water Conservation, referring to more detailed requirements in Subdivision and Development Services Bylaw (once the bylaw is updated)	Maximum Water Allowance (addresses outdoor conservation) as part of a water bylaw (and/or the Subdivision and Development Services Bylaw), triggered by an irrigation installation Update water bylaws to require water audits and conservation plans by larger commercial/industrial users			Expand non-potable water infrastructure to serve additional customers		
Public/ Municipal					Expand non-potable water infrastructure to allow for irrigation of public landscaping and facilities Consider locating future water-intensive facilities, such as sports fields and parks, near the source of non-potable water (i.e. wastewater treatment plant) Reduce/minimize loss, leakage and unaccounted for water		

					over the longer term		
Industrial and commercial - bulk users		Update water bylaws to require water audits and conservation plans by larger commercial/industrial users					Consider access to non-potable water when zoning for industrial and commercial sectors

Conservation Tools Guidance

Rebates for water conserving fixtures: for indoor use, rebates for retrofitting with water-efficient fixtures. Toilets are typically the priority due to the relatively high water usage, but shower heads and faucet aerators can also be included. For outdoor use, rebates for irrigation controllers and/or rain barrels can be included. Promoting and incenting fixture retrofits may be coordinated with building energy efficiency retrofits – these can be mutually reinforcing. Outreach and marketing are critical to these programs to ensure good uptake.

Water conservation kits: many cities have provided subsidized water conservation kits to residents; these may include shower heads, faucet aerators, and toilet tank bags and leak detector tablets.

Sector-specific educational resources and outreach: focusing on indoor residential usage initially, improving the awareness of the public and business on water conservation issues, and more importantly promoting awareness of incentives (above) that are put into place. Educational resources may also include water conservation rationales, efficient fixtures and appliance information, and landscaping and irrigation guidelines.

Educational resources and outreach should address different communications channels. For example, a water conservation video may be developed. Programs may be promoted through commercial channels like home improvement stores.

Graduated block pricing based on usage: this strategy can incent voluntary water conservation. The largest potential savings are in the existing residential single family buildings that dominate non-ICI water usage.

Development Permit Areas for water conservation: these measures would not require additional DPs, but would trigger additional water conservation guidelines or requirements. As such, they would focus on the multifamily and ICI sectors, where DPs are already used.

In the shorter term, DP guidelines can include simple measures, such as referencing general (voluntary) guidelines, for example landscaping and irrigation design guidelines, as well as requiring measures such as weather-based timeclocks for irrigation.

In the medium to longer term, DP guidelines can trigger more detailed water conservation requirements in an updated Subdivision and Development Services Bylaw.

DPs may also be used to address stormwater management; this falls outside the scope of the water conservation strategy.

Changes to Plumbing or Water Conservation Bylaws: if DPs for Water Conservation are not extended to address Single Family Uses, it would be proactive to make minor amendments to existing bylaws that address water supply or plumbing to require efficient fixtures if irrigation is installed. This could include requirements for use of weather-based timeclocks, requirements for relatively low flow heads that suit the clay soil conditions and reduce peak flows, and similar basic measures (these basic requirements have been proposed in the draft OCP update, where DPs apply). There are likely changes forthcoming to plumbing regulations related to the Provincial initiative of expediting use of rainwater or reclaimed water – and therefore changes to these bylaws might be delayed to coincide with related plumbing changes e.g. dual piping in buildings.

Maximum water allowance: in the long term, a Maximum Applied Water Allowance may be implemented as part of a water use bylaw, and possibly as part of the Subdivision and Development Services Bylaw. This sets an annual limit for irrigation of landscaped areas.

Subdivision and Development Services Bylaw: updates to this bylaw that support water conservation may include:

- Detailed landscaping design best practices and drawings;
- Irrigation control system design, construction quality and operating requirements;
- Backflow prevention policies (if not addressed elsewhere)
- Pressure regulation requirements (to avoid excessive pressure that increases water losses).

These updates could then be applied to public lands and act as the detailed guidelines for water conservation DPs.

Non-potable water supply: the development of treated wastewater as a non-potable source has already begun. This will focus on supplying bulk commercial/industrial uses for non-potable uses including hydraulic fracturing. In the medium to long term, the customer base for this non-potable supply may be expanded, and some distribution infrastructure may be put in place to enable new uses such as irrigation of public land. This initiative has the potential to significantly reduce the demand for municipal potable water.

Industrial and commercial audits and conservation: the City can work with large users, particularly bulk customers, to encourage more efficient use of water. This may include encouraging water audits to be completed, followed by a conservation plan; these plans can have financial benefits to the user from reduced consumption, and the City may provide funding or technical assistance to conduct these audits and plans. In the longer term, these audits and plans may be required for large users.

Legal Review

It is recommended that any changes to bylaws or regulations undergo the appropriate legal review.

Water Indicators

The following indicators are suggested for tracking water consumption and usage patterns. Additional definition is recommended to ensure a consistent methodology for ongoing tracking – for example, if/how to take into account raw water, bulk water, etc.

- Total per capita consumption (litres/person/day) – sum of all use supplied by the City, divided by the number of residents, averaged for each year;
- Residential per capita consumption (litres/person/day) – sum of all residential use supplied by the City, divided by the number of residents, averaged for each year;
- Estimated residential outdoor usage proportion (%) – estimated ratio of outdoor to total residential use, averaged over the year. This can be estimated by subtracting the average baseline during winter months from the higher consumption spring to fall months that include irrigation;
- Commercial consumption (cubic metres per year);
- Industrial consumption (cubic metres per year); and
- Large user ranking (top 5 individual water users with cubic metres per year consumption).

It is recommended that these indicators, or similar ones, are calculated and reported in a separate, easy to read spreadsheet or report from more detailed water consumption data, and charted by year. This information can be shared with senior management, Council and potentially the public to show progress over time.

Conclusions

Limiting the cost of water supply infrastructure in Dawson Creek is contingent upon living within the constraints of the existing potable water source, a source that has significant and increasing challenges associated with it. However with smart water management that combines incentives, regulation, education, leadership, and developing alternative supply solutions, Dawson Creek can greatly increase its resiliency and help to ensure high quality, affordable water services going forward, while protecting the environment.

Strengthening the OCP with water conservation policies and language is a key step to achieving these goals, setting the direction for effective and practical water conservation measures primarily in new development; implementation of measures can also proceed in a timely fashion, as recommended in the Conservation Measures Implementation Table.

OCP policies will help support long term water conservation. Given the dominance of existing development in current water usage, reaching water conservation targets in the medium term (e.g. a per-capita reduction of 20% by 2020), will require some focus on addressing existing consumption through actions such as retrofit incentives, education and industry-specific strategies as recommended in this strategy.

References

BC Ministry of Environment, 2007. Environmental Trends in BC, Water.
http://www.env.gov.bc.ca/soe/et07/03_fresh_water/technical_paper/fresh_water.pdf

HB Lanarc, 2009. Letter to City of Dawson Creek from HB Lanarc and Kerr Wood Leidal, May 1, 2009.

Stevenson, K., 2009. City of Dawson Creek Water Consumption Baseline Report.

Appendix – Kelowna Case Study

The following policies and regulations are being explored for the City of Kelowna. They address new construction, outdoor consumption only. Final configurations and legal reviews are still to be completed. Note that in the case of Kelowna, outdoor water use results in summer consumption of about four times winter consumption, which is a much higher peaking factor than for Dawson Creek.

1. **Subdivision, Development and Servicing Bylaw:** contains prescriptive water conservation requirements for dedicated public lands, including streets, medians and parks, in addition to all projects that are subject to DPs (see below). The bylaw includes landscaping and irrigation specifications and drawings. The bylaw also includes the Maximum Applied Water Allowance (see 3rd point below).
2. OCP (Bylaw 7600) – **Development Permit Area Guidelines:** provides prescriptive water conservation guidelines and requirements for private lands where Development Permits are required, e.g. form and character DPs. This does not include single family housing. The DPA Guidelines in OCP refer to:
 - a. general design guidelines (i.e. irrigation & landscaping guide)
 - b. specific requirements in the Subdivision, Development and Servicing Bylaw.
Exemptions: for projects with very small landscaped areas, only grading and growing medium requirements will apply.
A DP is able to amend another bylaw, such as the Subdivision bylaw – this allows some flexibility in how to meet requirements.
3. For all projects, the **Water Regulation Bylaw** will apply. Additions to this bylaw include:
 - Maximum Applied Water Allowance – a performance based annual limit for water use in a landscaped area.
 - Requirement to provide smart controller for new irrigation systems, and requirements for controllers (including programming)
 - Avoid runoff from irrigation.

It is expected that the performance based Water Allowance will be the primary driver for project design; for DP projects (multi-family and ICI), this is augmented by the DP guidelines and Subdivision bylaw, though alternative practices that meet performance requirements may be proposed. For single family projects, DPs do not apply, only the Water Regulation Bylaw with its Maximum Applied Water Allowance will apply, thus giving an objective performance standard which can support industry compliance, identification of non-compliance, and related municipal outreach and, if required, enforcement of ticketing penalties if irrigation facilities are consistently not compliant

Kelowna – outdoor conservation tools summary (new construction):

Land Uses	Outdoor Consumption Regulations
Single family	<ul style="list-style-type: none"> • Water Reg. Bylaw/Max. Appl. Water Allowance only
Multi-family	<ul style="list-style-type: none"> • Water Reg. Bylaw • DP/Subdiv Bylaw
Commercial, institutional, industrial	<ul style="list-style-type: none"> • Water Reg. Bylaw • DP/Subdiv Bylaw
Public (streets, parks, etc)	<ul style="list-style-type: none"> • Subdiv Bylaw only