CITY OF GRAND FORKS

Drought Management
&
Conservation Plan

Prepared for

City of Grand Forks

By

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Engineering Ltd.

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City of Grand Forks

Drought Management & Conservation Plan

1 INTRODUCTION

The following report was completed by *Dobson Engineering Ltd.* (Dobson) at the request of the City of Grand Forks (Grand Forks). Funding for the project was obtained through Land and Water British Columbia Inc. (LWBC) Drought Planning Assistance program.

This report summarizes the results of a water drought management and conservation plan. In addition the project established the framework of an emergency drought consequence plan which has been appended to this report. The scope of the study was limited to the municipal water supply area and did not include the surrounding rural areas serviced by SION Improvement District, Grand Forks Irrigation District, and Covert Irrigation District.

1.1 OBJECTIVES

The project was intended to help the City of Grand Forks:

- Review the present water demand and supply;
- Develop a drought management plan;
- Provide direction on a water conservation plan;
- Establish the foundation for an emergency drought consequence plan.

1.2 REVIEW OF PREVIOUS REPORTS

Grand Forks staff provided DEL with a number of reports relevant to the study. These reports have been identified in the bibliography.

2 DROUGHT MANAGEMENT TEAM

Drought management teams (DMT) form an integral part of drought planning. Although the development of a DMT is not within the DEL project scope some background information is presented herein to aid in Grand Forks' pursuit of that goal. The information provided is a summary of a guide provided in Dealing with Drought, 2004.

An effective team must include local representatives from each of the major and relevant users groups in the water supply area. For Grand Forks these users would include representatives from all water districts (i.e. City of Grand Forks, Grand Forks Irrigation District, SION Improvement District, and Covert Irrigation District), agriculture, industry, tourism, and public services.

The responsibilities of a local drought management team may include:

- acting as an advisory committee to local politicians and staff regarding water conservation and drought management recommendations,
- compiling data on water supplies and users in their own watershed,

- coordinating efforts with various stakeholders (including fisheries, agriculture, industry, and neighboring communities),
- providing timely information to the public about water supplies, and
- continually encouraging water conservation and appropriate responses to drought conditions.

General guidelines for a Local Drought Management Team Action Plan include:

- Establish membership. In addition to the water supplier, involve members from all user groups in the area, including but not limited to: at least one representative from each type of agriculture, one from each type of major industry, as well as fisheries, tourism, and public services.
- Obtain public input and promote public involvement.
- Improve understanding and awareness regarding local government responsibilities for water management.
- Develop mandate, specify roles for members, determine meeting frequency, and identify team needs.
- To reduce potential conflicts among user groups and improve coordinated management efforts, clearly establish water use priorities in the supply system. Consider the following priorities:
  - uses imperative to the protection of public health and basic aquatic ecology,
  - uses important to the social and economic well-being of the area, and
  - uses that may be disrupted or restricted for a short term without considerable impact.
- Identify goals outlined in the handbook (see page 6), and create a timeline to meet those goals, along with a plan outlining members' responsibilities.
- Gather all available relevant drought information and identify gaps and target needs.
- Complete an emergency drought consequence plan (Initial plan has been established and is included in Appendix B).

3 BACKGROUND

British Columbia is experiencing a significant drought and the Province is encouraging British Columbians to conserve water resources. Climate has contributed substantially to current drought conditions in parts of British Columbia. Extensive data demonstrates that the global climate has warmed during the past 150 years and most scientists agree that average global temperatures could rise by 1 to 3.5 degrees Celsius over this century. In Canada, this could mean an increase in annual mean temperatures in some regions of between 5 and 10 degrees Celsius. Such changes to our climate could have unpredictable and/or far-reaching environmental, social and economic consequences. Undoubtedly, this will place for greater stress on water systems that for some regions are already facing supply shortages.

3.1 STUDY AREA AND REGIONAL FEATURES

3.1.1 Location and Size

Grand Forks is located approximately 80 km due east of Osoyoos in the Boundary District of south central British Columbia. The town is situated in a broad, relatively flat valley at the confluence of the Granby and Kettle Rivers, on the Canada-USA border (Figure 1). Incorporated in 1897, Grand Forks has a municipal land area of 8.42 km^2.

3.1.2 Climate

This semi-arid area (average annual precipitation of 470mm) is characterized by hot, sunny summers and mild, cloudy winters. Climatic normals for the period of 1961 to 1990 are presented in Table 1 in Appendix A.

In a recent dendrochronology study by Gelalof et. al. 2004, evidence suggests that the Columbia River Basin has over the past 250 years experienced severe droughts lasting up to 12 years in duration. In addition, our understanding of global warming patterns suggest that for this portion of the Okanagan Valley we might expect to see significant climatic changes which will increase crop water demands by 37% (D.Neilsen, et al., 2001). The combination of natural cycles in drought with impending climate change could cause the frequency of severe low flow years in the Columbia River system to at least double by 2045 and possibly quadruple (Hamlet and Lettenmaier, 1999b).

3.1.3 Soils

The City is situated on a relatively flat alluvial terrace at the confluence of the Granby and Kettle Rivers. Surficial materials within the study area are predominately coarse textured, well drained sandy to sandy loam deposits derived from glacial outwash and river alluvium.

3.1.4 Geology

Most of the study area is covered with thick recent sedimentary deposits and glacialfluvial deposits limiting bedrock exposure. Inferences from exposures at higher elevations surrounding the valley indicate that the area is primarily underlain by highly metamorphosed igneous and sedimentary rocks belonging to the Grand Forks Gneiss group, which include quartzites, amphibolites and marbles, and Rossland and Nicola group slates, phyllites and argillites [1].

3.1.5 Vegetation

The area is situated within the Ponderosa Pine (PPdh1) biogeoclimatic zone within which one would characteristically find Ponderosa pine as the dominate native tree species and Douglas-fir on the colder and moister sites. Where not overgrazed, the understory includes abundant grasses such as Bluebunch wheatgrass and rough fescue.

Hot, sunny summers and an assured supply of water from the Granby River and Kettle River made for ideal growing conditions and allowed this semi arid region to develop into a highly productive agricultural community. Today, a wide variety of forage crops, orchards, vineyards and ground crops are found throughout the surrounding rural areas.

Figure 2 in Appendix C shows the landuse within the municipal boundary of Grand Forks. A breakdown of landuse by area is provided in Table 2 in Appendix A.

3.1.6 Population

The original settlers came for the rich farmland and stayed on as the industrial era took over, including three railroads, mines, smelters and power plants. As a result of the boom and bust economy, the population of Grand Forks has fluctuated considerably

[1] Taken from Tempelman - Kluit, D.J.

during its history. The 2003 BC Stats estimates the population at 4,113 people with an additional 3,500 living in the surrounding Area D district of the Regional District of Kootenay Boundary (RDKB) for a total community population of approximately 7,700.

Data from BC Stats show a population growth of between -2% and 3% per year between 1976 and 2004 with future growth of 0.5% to 1.5% (see figure 3).

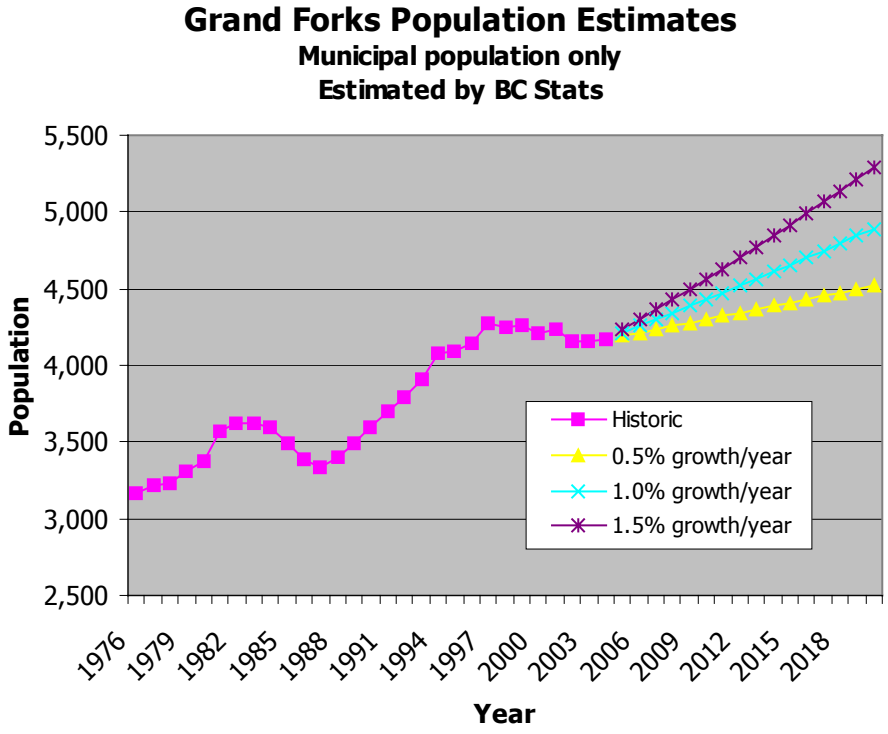

Figure 3

3.2 OVERVIEW OF REGIONAL WATER SUPPLY SYSTEM

The Grand Forks Aquifer (Aquifer No. 158) is the main source of drinking water and irrigation supply for the City
of Grand Forks and surrounding rural areas. Most areas are serviced by four main water purveyors:

- City of Grand Forks
- Grand Forks Irrigation District (GFID) which supplies water to residents south of the Kettle River, in the Nursery area and at the Copper Ridge subdivision north of the river;
- Sion Improvement District (SID), which supplies water in the northwest part of the valley and the area north of North Fork Road and Hardy Mountain Road; and
- Covert Irrigation District (CID), which supplies water to resident at the western end of the valley.

Four smaller water systems also provide well water to residents and vacationers:

- Riviera Recreational Vehicle Park and Campground;
- Kettle River Place Mobile Home Park;
- Almond Gardens Mobile Home Park; and
- West Grand Forks Mobile Home Park.

The municipal water system, which services most in-town properties is ground sourced from the aquifer all year long. This system draws its water from five groundwater wells (wells no.'s 2, 3, 3a, 4, and 5) that operate in sequence all year long. Two reservoirs form part of the water supply system. The largest of reservoir located in the Valley Heights area has a capacity of approximately 1,000,000 USgallons and is used to provide pressure equalization, water supply during brief power failures and reserve water supply for fire protection for the majority of Grand Forks. A second smaller reservoir (100,000 USgallons), also located in the Valley Heights area, provides increased pressures required for the community of Valley Heights. There are plans for a third reservoir to be constructed in the Hospital area on 22nd Street.

3.3 WATER SUPPLY

A query of Land and Water British Columbia Inc.'s database indicates that Grand Forks holds eight water licenses amounting to a total surface water allotment of approximately 553,456,828 imperial gallons or 2,040 acre-ft/annually). In addition to these licenses, Grand Forks has a number of wells which draw from a class 1A aquifer that has a *high* productivity rating. Total water consumption from 2004 water pumping records (Table 3) is 557,422,092 imperial gallons or 2,050 acre-ft. All water supplied by Grand Forks is from well sources. Because of the high quality of the aquifer no treatment is required. Piteau Associates (1993) in their report on groundwater supply potential suggests that the aquifer is hydraulically controlled by the river levels.

3.4 WATER DEMAND

Environment Canada water use data for various BC communities is presented below in Table 4. The various communities were chosen to represent similar climatic settings and are meant to be exclusive of agricultural irrigation.

This comparison indicates that, for the municipally serviced portion of Grand Forks, a water use value of 1688 l/capita/day appears to be in the high range. Compared to the national average of 638 l/capita/day however, this value would be considered very high. A review of water consumption data for the surrounding rural areas was not part of the scope of this project.

There was not a sufficient amount of water consumption data for an analysis of per capita water usage trends. Future demands are also complicated to establish but some of the factors which can influence future demand projections include population growth, types of housing, renovation rate, technological change, legislative change, water pricing, lifestyle changes and the weather.

Table 4 – 1999 Environment Canada Water Use Survey

Municipality	Population Serviced[1]	Average Daily Flow (m^3/day)				Gross Per Capita Water Demand (litres/capita/day)
		Domestic	Commercial & Institutional	Industrial	other	
Grand Forks[2]	4113	5675	100	1168		1688
Oliver[3]	4500	3175	265	264	76	840
Merritt	8500	5658	943	943	1886	887
Kamloops	77000	39294	9824	3275	6549	765
Vernon	24075	10185	2474	436	1455	604
Creston	4816	3646	260	1302		1081
Summerland	11500	6137	341	341		593

[1] Combined domestic, commercial, industrial and other. Does not include agricultural irrigation.
[2] 2004 values obtained from the City of Grand Forks, excluding the surrounding rural areas.
[3] Values for the Town of Oliver, excluding the surrounding rural service connections.

3.4.1 Water Consumption By Sector

It is common to differentiate water users by sector for analysis purposes. Commonly these include:

- Domestic
- Industrial
- Commercial & Institutional
- Irrigation.

It is difficult to separate domestic, industrial, institutional and commercial use in the municipal area due to the limited metering present. In a 2000 report by Urban Systems entitled Universal Water Metering Feasibility Assessment, irrigation demand was estimated to be in the range of 5,500 to 6,250 m^3/day. The three major industries (CanPar, Pope & Talbot and Roxul) use approximately 426,611 m^3 annually (1,170 m^3/day) or 17% of the total municipal water demand. This volume is estimated to account for greater that 95% of the total industrial demand. Commercial and institutional demand is difficult to assess due to the limited metering, however, Environment Canada estimates suggest that this sector comprises a very low portion of the overall demand.

3.4.2 System Losses

System losses from watermain leakage, air conditioning and refrigeration units, winter bleeding of water lines, and building plumbing losses will typically be a percentage of the total water supplied. In most cases, if unaccounted for water in a municipal system exceeds 10 to 15 percent, a leak detection and repair program is cost-effective. For example, studies have shown that for every $1.00 spent in communities with leak detection programs, up to $3.00 can be saved.

Apart from large leaks in the system, which will generally cause soil erosion and becomes evident at the ground level, most small leaks go undetected. One method used to estimate losses involves a review of water production data and sewage influent in the winter (non-irrigation) months. The assumption is that there should be a close to 1:1 ratio between water supplied and sewage influent volumes.

The current winter usage is approximately 540,000 m^3 with 1,540 m^3/day industrial use not returned as sewage for treatment. This suggests that approximately 863 m^3/day or 19.2 % is unaccounted for and may be lost through leakage.

3.4.3 Summary

It is evident from the difficulties encountered in establishing accurate water consumption accruals that the implementation of a universal metering program would provide better management of information. Apart from the benefits of water conservation, a comprehensive data management system would improve operating efficiencies and identify system problems such as excessive losses.

4 ECONOMIC IMPACT OF DROUGHT

The impact of drought can be expected to negatively affect regional and local economies. Recreation and tourism will most certainly take a hit. Winter activities reliant on a heavy snow base may experience shorter seasons as warmer weather is threatened to extend into the winter season. No run-off means a short or nonexistent floating season. All those kayakers, canoeists, rafters and drift-boat anglers who would normally travel to the region for camping fishing trips may be severely limited in their choices of watercourses. Guiding jobs may disappear followed by equipment rentals and sales.

Without more moisture, agriculture will suddenly find itself in yet another drought disaster. Competition for what little water comes down out of the mountains will be fierce, and irrigators will do whatever they think is necessary to "save the farm." As the farm and ranch economy suffers, so do those who sell farmers their fertilizers, seeds and implements, piling one local economic woe upon another.

Warm winter temperatures are brewing up their own environmental disaster in the forests. Infestations of mountain pine beetle and Douglas-fir bark beetle, normally killed off by normal sub-zero winter temperatures are thriving in these atypical climates and instead of freezing to death are thriving and promising an even larger plague to attack our increasingly drought-weakened forests.

Needless to say, more dry brown trees are likely to mean more forest closures to prevent the conflagrations that will surely come. That means loss of logging and mill jobs, another hit to the tourism industry, and all the ancillary economic impacts that follow. Perhaps of greater economic concern is the increased risk of large scale wildfires that cost vast sum to control and threaten communities and infrastructure.

5 MONITORING WATER SUPPLIES AND CLIMATE

The Ministry of Water, Land and Air Protection River Forecast Centre completes snow surveys and summary bulletins throughout the winter and spring and regularly provides updated graphs and commentaries, along with links to Environment Canada's stream flow and climate data: http://wlapwww.gov.bc.ca/rfc.

During the winter & early spring, utilize Snow Water Equivalent Indexes and a Standard Precipitation Index (SPI) as indicators of future drought conditions. Snow Water

Equivalent Indexes for the snowpacks of the province can be found in the Snow Bulletin referenced above, published January 1 to June 15. WID collects data for the snow course 2F24 (Islaht Lake) and forwards data to the provincial snow survey program.

Precipitation throughout BC for the last 12 months is mapped at the new **BC Standardized Precipitation Indexes** page. Also available at their site is mapping of percentage of long term average precipitation.

Staff of the River Forecast Centre (RFC) collect and interpret snow, meteorological and streamflow data to provide warnings and forecasts of stream and lake runoff conditions around the province. Most of the meteorological and streamflow data are collected by other agencies, but the RFC is the lead agency in the province for the collection, quality control, analysis and archiving of snow data.

6 DROUGHT STAGES/GOALS/RESPONSE AND COMMUNICATIONS

Factors that favour drought conditions are low precipitation, high air temperatures, high water demand and rapid drops in reservoir storage levels. Some or all of these factors can be used as drought indicators, but most relevant to the Grand Forks is the relationship between supply and demand. Reducing drought risk will be achieved by implementing increased water conservation measures at successive drought stages.

Generally, low risk groups are outdoor irrigation by domestic and commercial water users. Moderate risk groups are the non-essential indoor/outdoor domestic and commercial/industrial water users. High risk groups are the essential water use in the low and moderate risk groups listed previously plus outdoor irrigation for agriculture.

There are four proposed stages of drought preparedness including mild drought, moderate drought, severe drought, and emergency drought. The ultimate selection of drought stage threshold rests with the DMT.

Normal - No drought. Average or wet years.

At this level there are no predicted water shortages and supply is more than sufficient to meet expected demands. Water conservation is on-going to reduce water wastage and save water for potential future dry years. Normal sprinkling regulations are monitored and enforced.

Stage 1 Mild Drought

Snow packs are trending slightly below normal for the time of the year. There is deemed to be low immediate danger of water shortage for the District. A trigger point that initiates discussion by the DMT of a Stage 1 drought is spring precipitation is 25% below annual averages. Target water restrictions are applied to the low risk groups/activities such as outdoor domestic sprinkling. Stage 1 drought is rescinded when precipitation increases upward towards normal annual levels.

Stage 2. Moderate Drought

In addition to the Stage 1 restrictions, water conservation measures are increased for domestic and industrial/commercial water users. The DMT would meet and review the

situation when snowpacks were 25% less than average and spring precipitation is 25-50% of annual normals. Enhanced target water restrictions are applied to the low risk groups/activities which include prohibition of non-essential watering, again as detailed in the draft bylaw. Stage 2 drought is removed when precipitation levels increase to normal seasonal values and stream flow measurements suggest near normal levels for that period.

Stage 3: Severe Drought

The drought has intensified or is of sufficient duration that water shortages are probable to all sectors unless corrective action is taken. Appreciable low level stream flows are encountered. No outdoor watering is permitted for domestic, industrial or commercial users. All outdoor domestic watering ceases and indoor water conservation is urged. Water restrictions apply to all water user groups including agriculture irrigation. Stage 3 restrictions are rescinded to the Stage 2 level restriction when precipitation has allowed for increased stream flow levels, at which point Stage 2 restrictions apply. A high level of public education and notification is provided at this stage. Interconnection opportunities with other utilities may be considered at this stage in order to delay or reduce the potential of moving to Stage 4 restrictions.

Stage 4. Emergency

Stage 4 water restrictions apply when there is the imminent danger of not being able to provide sufficient water to keep the water mains pressurized. Loss of pressure in the system would result in a boil-water order as the chances of contamination and/or cross connection would increase substantially. Emergency action can also be invoked if the aquifer becomes accidentally contaminated.

Stage 4 water restrictions would also apply when aquifer levels become dangerously low, threatening current and future potable water supply. Emergency water supplies are obtained to secure alternate drinking water. Water is first provided to keep the water system pressurized and safe from cross contamination. All outdoor watering and non-essential water use prohibited by all sectors. Stage 4 restrictions would be rescinded when the Drought Management Team determines that there is sufficient water to maintain minimal levels set out for Stage 3 restrictions.

7 COMMUNICATIONS

The drought management team representative that is responsible for documenting the necessary communications for each drought stage will be determined by the DMT.

Grand Forks should be committed to provide timely and accessible information to all ratepayers. The City hosts a website that should be used as a resource for conveying educational and regulatory information pertaining to drought stages and water conservation initiatives. In addition, information can be disseminated in tax billing mail outs.

8 WATER CONSERVATION

One of the key factors explaining high rates of consumption relates to the absence of appropriate price signals (Environment Canada, Freshwater website). In 1999, a full 44% of Canadian residences served by municipal water systems were not metered. Also, 55% of Canadians faced residential water use charges that discouraged water conservation. The impact of these water pricing structures is highlighted by the fact that water use was 70% higher when consumers face flat monthly rates rather than volume-based rates.

The lack of full-cost pricing and conservation-oriented pricing structures has also contributed significantly to an imbalance between the demand and supply for water infrastructure.

The combination of low levels of residential water metering, conservation-discouraging pricing structures and lack of real price increases in key rates has led to substantially increased residential water use levels today and will continue to erode municipalities' ability to finance needed infrastructure.

Water conservation would appear a difficult sell to the residents of Grand Forks considering they have an abundant supply of high quality water, even during significant drought periods. Obviously the issue is not one of supply but rather an ethical debate surrounding accountability. In the broadest sense the reason for water conservation can be expressed by the following three goals.

Fairness and Equitability in Cost Recovery
The perception of many residents is that the current flat rate billing system is unfair. This may be because they feel that they are using significantly less water than the area average or that they are subsidizing those property owners/businesses that use excessive amounts of water.

Responsible and Effective Expenditures of Public Funds
Municipal water use strains the capacity of surface reservoirs and groundwater supplies and results in high energy and economic costs for treating and distributing water, as well as for treating wastewater. Additionally, lowering water demand can avoid, postpone or reduce the capital costs associated with upgrading or expanding infrastructure.

Environmentally-Oriented Approach to Water Resource Management
Certain practices such as the excessive application of fertilizer and over-irrigation can contribute high concentrations of nitrate to the aquifer.[2].

Even after treatment, the water released may be of poorer quality, which will affect the water downstream from the treatment site. In drought-prone areas, excessive water use decreases water levels and stream flows. In turn, this affects the natural capability

[2] Follow-up Sampling to Assess Rising Nitrate Trends in the Grand Forks Aquifer, 2001

of rivers and lakes to deal with pollutant[3]. Lower stream flows can also have an adverse effect on the aquatic ecosystem.

8.1 CURRENT CONSERVATION PRACTICES

Although municipal staff and council have identified a need for water demand management, at present, Grand Forks has not adopted a comprehensive water conservation plan. To date water conservation practices are limited to:

- Waterworks Regulations Bylaw No.1501, 1997 under Water Restrictions, paragraph 33, that sets sprinkling days and times. This regulation is enforceable under paragraph 37 of same Bylaw and allows for the City to discontinue water service to any premises for contravention or violation of the regulation. Enforcement of this regulation in practice has been weak.
- All new construction projects involving property used for commercial, industrial or institutional purposes, or for all new construction of residential property requiring a 24.5mm (1 inch) line that connect to the City's water system, must install water meters. In addition to new construction, this requirement applies to any change of use in an existing building as well as any upgrade or major change to a water service. Water rates for all sectors except for major industrial users are presently not related to usage.
- Grand Forks also requires the installation of water meters for all existing major industrial customers, as defined under the BC Assessment Act, on the City of Grand Forks water system. All water usage in excess of 40,000 litres per month is subject to an additional chare of $0.4398 per m^3 above the fixed flat rate.

8.2 WATER CONSERVATION METHODS

Urban Systems previously identified a number of conservation methods in their 2000 report of which includes:

- Water Metering
- Public Education
- Regulatory Controls
- Facilities Retrofit
- Sprinkling Restrictions
- Leak Detection and Repair

Since the report was published water metering and sprinkling restrictions have been incorporated into by-laws as previously presented in section 8.1. Leak detection and repair are now less of an issue since it was discovered that losses are not as significant as was originally suspected.

Analysis of current demands indicates that the largest water savings could be realized from domestic demand management. In targeting this sector the recommended approach is through universal metering.

[3] Environment Canada, Freshwater website

8.3 Universal Metering

It has been demonstrated in other jurisdictions that metered water service, with a suitable rate structure will promote savings of between 20% and 25% in domestic water consumption, most notably on over-irrigation of lawns and gardens. In British Columbia the results have varied with an average 15% saving in consumption. The minimal impact of water metering in British Columbia compared to the rest of Canada may be due to metered rates being among the lowest in the country.

The Fraser River Action Plan (FRAP) partially funded an economic analysis of universal water metering in the GVRD. While the water savings from metering and user based pricing had been well established in other jurisdictions, the economic costs of installing meters is substantial. The question remained whether or not the economic benefits, which are primarily savings in long term expansion costs, outweigh the capital costs. GVRD staff felt that this unanswered question was a major impediment to acceptance of metering at the political level. They also pointed out the fact that the public in general have been wary of metering in the GVRD area, and that even voluntary metering programs, where householders have the option of paying by a flat rate or by a metered rate, had been rejected in the past.

FRAP therefore contributed funds to an analysis that compared the capital costs of large scale meter installation in the GVRD to the economic savings. The study, published by the GVRD showed that metering was economically viable if indoor metering sites for each household could be used.

8.3.1 Benefit / Cost Analysis

Fiscal responsibility is a key consideration of any water management strategy. This involves performing a benefit /cost analysis to ensure there is an offsetting payback that justifies the initial investment. Calculations by Urban Systems in 2000 were based on a number of assumptions:

- Anticipated reduction of water usage through conservation measures is 20%.
- Deferral of development for new well and pump by 8 years.
- Anticipated sewage inflow reductions of 10%.
- Deferral of sewage capital costs by 8 years.
- Annual interest rate of 8% assumed as a cost of borrowing in determining annualized costs.
- Discount factor of 5% for 20 year period used in determining Present Worth.

Results from Urban Systems suggest that Grand Forks could achieve a present worth savings of approximately $135,524.00 if a universal water metering program were implemented. Since the release of the report changes to projected water/sewer fund capital planning have occurred.

8.4 ADDITIONAL WATER SAVING PROGRAMS

In addition to a metering program, there are a number of additional water saving programs which deserve consideration. These include:

- Facilities Retrofit (low flow plumbing fixtures, replacement of continuous flow cooler units, etc.) Appropriate incentives to install these fixtures could form part of the strategy.
- Pubic education (mail outs, school presentations, demonstration gardens, etc.)
- Aggressive sprinkling bylaw enforcement and further regulatory controls.
- Leak detection and repair.

All these programs are explained in detail in Urban Systems report.

8.5 CHALLENGES

A number of challenges exist in developing an effective water conservation program. Foremost is obtaining the necessary "buy-in" of all users. Most communities generally assume that water meters would result in higher water costs. In allaying this fear a strategy of freezing water rate increases for a set period could be implemented. However, achieving maximum conservation reductions will need to be tied to appropriate water pricing which necessitate an increase in rates.

In many instances a "rebound" effect has been seen where water users become aware of the actual impact of the meter rate schedule and make decisions on the effort of conservation methods. For this reason it becomes important to monitor water use and make necessary rate adjustments to ensure appropriate conservation pricing structures are maintained. For any rate structure that may be considered economic efficiency[4], must form part of the design.

9 DISCUSSION

Current thinking is that Grand Forks water supply in plentiful. However, reduced water yields in the region, predicted climatic changes resulting in significant increased crop water demands, and the ever-increasing population growth will all contribute to reduced supply. Additionally, there is also the issue of aquifer vulnerability to contamination. These considerations suggest that the availability of a healthy, sustainable and plentiful water resource can no longer be presumed (MELP, 1999).

The following recommendations are presented based on the report findings. It is recommended that:

- a Drought Management Team be established;
- a universal metering program be established with appropriate water pricing that provides an incentive for water conservation;

[4] Economic efficiency refers to reflecting all direct and indirect costs of service (Mitchell and Hanemann, 1994)

- a re-calculation of the cost-benefit anaylsis be undertaken prior to initiating a universal metering program; and
- the emergency drought consequence plan be updated on a regular basis.

10 CLOSURE

It was our pleasure to assemble this report as a foundation for your future conservation planning. Should you have any questions or concerns, please do not hesitate to contact us.

Respectfully submitted,

M.E. Noseworthy, P.Geo.
Project Manager

D.A. Dobson, P.Eng.
Senior Reviewer

Attach.

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* provided by the City of Grand Forks

APPENDICES

APPENDIX A

Tables

Table 1 - Climatic Normals for the City of Grand Forks

GRAND FORKS, BRITISH COLUMBIA

Latitude	Longitude	Elevation
49° 1' N	118° 28' W	531.90 m

Temperature

Temperature	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Daily Average (°C)	-5.0	-1.4	3.8	8.6	13.0	16.4	19.5	19.3	14.3	7.3	0.8	-4.4	7.7
Standard Deviation	3.1	2.5	1.5	1.3	1.4	1.4	1.5	1.3	1.6	1.0	2.4	2.9	0.8
Daily Maximum (°C)	-1.5	2.9	9.6	15.6	20.2	23.9	28.0	28.1	22.6	13.8	4.2	-1.3	13.8
Daily Minimum (°C)	-8.5	-5.6	-2.0	1.5	5.7	9.0	11.0	10.5	6.0	0.8	-2.7	-7.5	1.5
Extreme Maximum (°C)	16.1	19.4	24.0	31.7	36.1	37.0	**42.2**	39.4	36.7	30.0	18.9	25.0	
Date (yyyy/dd)	1944/18+	1946/24	1994/31	1977/24	1946/27	1987/30	**1941/18**	1961/04+	1950/03	1945/08	1975/03	1943/04	
Extreme Minimum (°C)	**-38.9**	-34.4	-22.8	-8.3	-8.3	-1.7	1.1	0.0	-6.1	-14.0	-29.0	-37.8	
Date (yyyy/dd)	**1962/20**	1950/01	1955/04+	1951/19+	1954/01	1952/13	1952/06+	1946/17+	1946/28	1984/31	1985/28	1968/30	

Precipitation

Temperature	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rainfall (mm)	12.2	17.9	28.2	40.1	56.4	57.5	41.0	36.2	28.3	29.6	30.2	13.6	391.1
Snowfall (cm)	35.8	16.4	4.7	0.6	0.0	0.0	0.0	0.0	0.0	0.8	21.4	39.1	118.7
Precipitation (mm)	48.1	34.2	32.8	40.7	56.4	57.5	41.0	36.2	28.3	30.4	51.6	52.7	509.8
Average Snow Depth (cm)	21	11	1	0	0	0	0	0	0	0	2	13	4
Median Snow Depth (cm)	20	10	0	0	0	0	0	0	0	0	1	11	4
Snow Depth at Month-end (cm)	17	8	0	0	0	0	0	0	0	0	7	20	4

Table 2 – Landuse by Area

Landuse	Code	Area (ha)	Area (%)
Growing Grains	A-111	1.8	0.1
Growing Vegetables	A-112	20.0	1.3
Growing Forage Crops	A-121	34.7	2.3
Grazing	A-122	23.6	1.6
Other	A-190	16.8	1.1
	Sub-total	***96.9***	***6.4***
Unused Land	B-000	1.0	0.1
Former Agricultural Activities	B-100	114.7	7.6
Former Extraction Activities	B-300	1.4	0.1
Former Swelling Activities	B-500	1.9	0.1
	Sub-total	***118.9***	***7.9***
Wholesaling	C-100	0.3	0.0
Retailing	C-200	10.3	0.7
Providing Commercial Services	C-300	12.1	0.8
	Sub-total	***22.7***	***1.5***
Single Family Dwelling	D-111	176.3	11.7
Multiple Dwellings	D-112	4.5	0.3
Mobile Homes	D-113	1.5	0.1
Hotels & Motels	D-220	4.3	0.3
	Sub-total	***186.6***	***12.4***
Transporting By Air	H-130	29.6	2.0
Transporting By Electricity	H-160	0.3	0.0
Communication Activity	H-200	0.1	0.0
	Sub-total	***30.0***	***2.0***
Legislative, Judicial & Legal Services	J-100	1.1	0.1
Protective/Custodial	J-200	0.7	0.0
Educational Services	J-300	10.7	0.7
Health, Medical Care Facilities	J-400	3.5	0.2
Worshipping	J-610	1.5	0.1
Burying	J-620	4.6	0.3
Assembly Activities	J-700	0.5	0.0
	Sub-total	***22.6***	***1.5***
Land in Transition	L-000	15.9	1.1
	Sub-total	***15.9***	***1.1***
Raw Material Processing	M-200	2.6	0.2
Processing Wood	M-280	14.5	1.0
Storage Activities	M-500	1.1	0.1
Storing Vehicles, Equipment	M-520	7.8	0.5
Warehousing	M-530	0.1	0.0
Open Air Storage	M-550	16.5	1.1
Treating/Disposal of Liquid Waste	M-610	3.9	0.3
Treating/Disposal of Solid Waste	M-630	4.6	0.3
	Sub-total	***32.8***	***2.2***
No Perceived Activity	N-000	284.4	18.9
	Sub-total	***342.2***	***22.7***
Recreational Open Space	R-170	3.1	0.2
Indoor & Outdoor Recreation Activities	R-200	9.4	0.6
Indoor Recreation/Cultural Activities	R-220	0.3	0.0
	Sub-total	***639.5***	***42.4***

TABLE 3 – Water Production and Wastewater Treatment Volumes

City Water Production (m^3)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2004	152734	13888	144680	182132	208712	287531	409942	357940	194531	159151	147559	148707	**2534091**
2003	138000	144680	157178	168972	230100	327428	477249	376200	290500	167761	138754	138041	**2754863**
2002	138105	124740	138105	162854	230801	355017	465006	441690	293924	162229	136420	138105	**2786996**
2001	149005	124887	138545	160836	234375	342060	459565	456621	254848	162484	143963	148016	**2775205**
2000	159905	125034	138986	158818	237949	329104	454125	471552	215772	162740	151506	157927	**2763418**
1999	128909	140274	129399	133899	168215	251174	416679	343716	296259	178638	157142	157645	**2501949**

City Wastewater Treated (m^3)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2003	52700	50338	57855	60215	70950	65400	63146	60215	53459	52623	50457	52318	**689676**
2002	55779	50876	54653	57480	71607	66462	64492	61733	54053	53325	52846	55484	**698790**
2001	53800	55613	59676	64592	63667	65593	62455	59800	52553	57203	51334	54018	**700304**
2000	52614	61342	6277	66584	74417	68595	60835	57428	50194	63117	50770	47394	**716067**
1999	21031	30145	25183	43622	38267	46984	53613	37677	38721	50738	49428	46939	**482348**

City Irrigation Consumption (m^3)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2003	0	0	0	5000	15500	15000	15500	15500	15000	5000	0	0	**86500**
2002	0	0	0	5000	15500	15000	15500	15500	15000	5000	0	0	**86500**

Provided by the City of Grand Forks

APPENDIX B

Emergency Drought Consequence Plan

Emergency Drought Consequence Plan

Provided by the Provincial Emergency Program

Table of Contents

1. Overview

1.1 Introduction

This *Drought Consequence Plan* is intended for use by all members of the City of Grand Forks in the event of a loss of potable water, firefighting water or both. Drought consequence and water loss issues should be dealt with as a specific emergency management issue, in Local Authority Emergency Plans in an All Hazards approach. Where no such plans exist, this Drought Consequence Plan can be used by a Water Utility, including an Improvement District or private service provider, as a guide to dealing with fire water loss, potable water loss or complete water loss either as a consequence of drought or as a result of systems failures. In the event of an emergency water loss situation, the Local Authority for an area should provide first assistance. All emergency situations that affect the health and safety of the public should be reported to the Provincial Emergency Program at 1-800-663-3456.

Sections 1, 2 and 3 of this plan apply to "local authorities," which includes municipal governments and those regional districts that have the authority to undertake emergency management. The plan is also a useful response guide to Water Utilities such as suppliers in Improvement Districts or private service providers who are not under a local authority, by using Sections 4 to 6 and the Appendices.

This Plan is an interim plan and should be replaced by an all hazards the City of Grand Forks Emergency Response and Recovery Plan or a <name> Water Utility Emergency Plan when published. Where this Plan refers to the City of Grand Forks you may substitute <Water Utility> where appropriate.

1.2 Purpose and Scope

This Plan provides a guide to the response and recovery activities, communications responsibilities, and coordination necessary to provide for effective response to a major loss of water in the City of Grand Forks. The Plan does address response to a water loss incident resulting from a drought or system failure that may be of sufficient severity and magnitude to warrant execution of all or part of this Plan. This Plan does not address long term "Drought Management and Planning" or systems growth issues.

1.3 Incident Commander

The term IC (Incident Commander) is used throughout this document. It is a term derived from BCERMS (British Columbia Emergency Response Management System) that identifies the individual charged with managing the site response structure for an event. This may be a Public Works manager in a Local Authority or the Water Utility Manager in a small Water Utility. In either case, the person in charge of the response structure is the IC and has the overall decision making authority.

1.4 Contacts and Resources

All contact numbers and resource lists are found in Appendix C. It is the responsibility of each relevant City of Grand Forks department to ensure these lists are updated annually.

2. Emergency Response Guidelines

2.1 Plan Activation and Termination

1.1 When Should This Plan be Activated

This plan should be activated any time a loss of potable water or fire water, or both is threatened or has occurred.

Who Can Activate the Plan?

Typically one of the following people would be the delegated authority to implement the *Drought Consequence Plan*, in whole or in part:

- Mayor
- City Administrator
- Water Utility Board of Directors
- Water Utility Manager

The appropriate person would be determined by the size and administrative reporting structure of the water utility.

2.2 Notification Procedures

1.1 Initial Reports

It is expected that the Water Utility Manager will receive the first notice of the emergency. The Water Utility Manager will designate the Incident Commander. Once initial assessment of the problem has been undertaken, the Incident Commander in turn should contact the Water Utility Manager, who after receiving the assessment report will provide a report to the administrative authority of the Water Utility.

Call Out and Contact Information

The contact lists in Appendix C contain the emergency contact information for all persons and agencies that may have a role in the response and recovery to this incident. These lists should also identify partner agencies that may be able to supply people or equipment, government agencies with support capabilities or regulatory functions, the contact information for equipment sourcing and sources of bottled or bulk water.

2.3 Three Levels of Response Activation (BCERMS)

This Plan recognizes the BCERMS' three levels of potential activation.

Level 1

A Level 1 response is one in which water levels are declining and voluntary conservation is being practised. There is little or no need to supplement existing water supplies. This level corresponds to Normal and Stage 1 of the Drought

Stages and Response Matrix (Appendix 2-1 of the Dealing with Drought handbook).

Level 2
A Level 2 response indicates a larger scale or longer duration and may involve additional or unique resources, adding supply from alternative sources or similar extraordinary support activities. This response is one option for action recommended for Stage 2 of a drought (Appendix 2-1 of the *Dealing with Drought* handbook).

Level 3
A Level 3 response indicates that the water supply is in imminent failure and extraordinary response and resources are required. This may mean diverting firefighting water to potable supply only, maintaining firefighting water and trucking in of potable water or other similar extreme measures. This level of response may be necessary in Drought Stage 3 or during the emergency loss of community supplies stage (Appendix 2-1 of the *Dealing with Drought* handbook).

2.4 Information Flow / Directions

1.1 Types of Information

Information during an emergency or a potential emergency situation must be managed carefully within a response organization at a single level, among the three BCERMS levels, and with the media and public. In broad terms, there are six types of information transactions common to emergencies:

- Command and Managerial Direction
- Situation Reporting
- Resource Requests
- General Information
- Public Information
- Documentation

Command and Managerial Direction
Managerial directions must follow the lines of authority established for the response organization. In a Municipal Water Utility this reporting and authority structure may be quite formal and it may involve several layers of authority, each with different responsibilities. In a less complex and smaller water utility a single person may have both the Incident Commander position and the managerial authority and may not require any other authorization to act.

Situation Reports (SITREPs)

Situation reporting is a function most commonly managed through the EOC Planning Section in larger water utilities. In a small water utility a "Situation Report" may consist of a one page report prepared by the Water Utility Manager. Situation reports should be distributed to those parties who need to be informed. This could include the water user community, the media, partner agencies (including municipal, regional district or provincial governments) and emergency

service agencies. The "Situation Report" should provide an update at a point in time that provides the detail of the current status of the event, work in progress and changes which may have occurred since the last report. "Situation Reports" should be issued at regular intervals.

SITREP forms are available on the PEP website:
http://www.pep.bc.ca/bcerms/bcerms_EOC_Level_2_Operational_Guidelines_Manual.pdf

1.1 Resource Requests

Resource requests normally flow from site responders to the appropriate agency dispatch centres. However, to avoid duplication the Incident Commander may consolidate all unique/critical resource requests and pass the request to the Operations Section of the EOC, if activated, or to the EOC Director. The EOC will forward resource requests that cannot be filled at the Site Support Level to the PREOC, and further to the PECC, if required. At each level, Operations, in consultation with the Planning Section, sets priorities for multiple requests with the respective Commander or Director. When required resources are obtained, they are directed to the location identified in the original request, with confirmation among the affected Logistics and Operation functions. In a smaller water utility, resource requests may be initiated and tracked by a single person.

1.1 General and Public Information

General and Public Information may be distributed from a local drought management team, a public information officer in a larger water utility or from the Incident Commander in a small water utility. The Situation Report may be the vehicle for providing this type of information, or formal media releases, media briefings or interviews may be used as a means of keeping the public informed.

Documentation (Very Important)

It is extremely important to accurately document actions taken during emergencies. The following items must be documented:

- Policy decisions
- EOC decisions/direction
- Resource requests
- Personal log
- Functional position log

This will assist in tracking and monitoring the effectiveness of the response and action plans. Documentation is also important for tracking expenditures for cost accounting. The appropriate forms to be completed are available from the PEP website at:

http://www.pep.bc.ca/bcerms/bcerms_EOC_Level_2_Operational_Guidelines_Manual.pdf

2.5 Risk Management

Principles

Risk management is the process of planning and implementing decisions that will minimize the adverse effects of accidental or predictable personal and business losses on an organization.

Risk Management Strategies

The EOC shall apply risk management based upon the following strategies:

1. Assess damage and loss. Identify and analyze loss exposures in the categories of:
   - Personnel
   - Property
   - Liability
2. Examine feasible alternative risk management techniques in the following general categories:
   - Exposure avoidance
   - Loss prevention
   - Loss reduction
   - Segregation of exposures:
     - Separation
     - Duplication
   - Contractual risk transfer
   - Risk financing

Risk to Personnel

All supervisory positions at the site and in the EOC shall evaluate the risk to personnel under their supervision with respect to the potential results of their actions in each situation. In situations where the risk to personnel is excessive, activities shall be limited to defensive and protective operations.

NOTE: All workers subject to Part 3 of the BC Workers Compensation Regulations have the right to refuse work due to an unsafe environment.

2.6 Administration

Staffing

The site and EOC must be capable of functioning on a 24/7 basis from activation until de-mobilization. The Incident Commander and EOC Director will determine appropriate staffing for each activation level based upon an assessment of the current and projected situation. While the immediate solution may be to establish several complete shifts for the duration of operations, there are seldom the resources or facilities to sustain this approach. General and Management Staff positions in the organization should be filled by designated qualified individuals. Initially, all positions may be staffed by the available individual most qualified in the function to be performed. A PREOC will be able to assist in locating BCERMS qualified staff on an emergent basis.

First Aid
First Aid services that meet WCB regulations must be provided for all staff.

3. Position Checklists

This section provides checklists for the site incident management team identified in the organization chart and all functional positions required to staff the EOC in a major emergency. **It is important to note that not all positions are required for all emergencies.** Only those positions that are needed to effectively handle the emergency should be staffed. These checklists are to be used in conjunction with the hazard-specific checklist provided in Section 4.

Checklists have been proven to be an effective tool during emergencies. They help guide staff that may not be familiar or practised in their function, and provide useful reminders of items that should be done during an emergency. It is important that the entire checklist be read through once first before initiating action items.

As emergencies and exercises are reviewed, the applicability of the checklists should also be reviewed and revised as needed. The responsibility for this review lies with the EOC Director.

3.1 Generic Checklist - For All Positions

Activation Phase:

- ❑ Check in upon arrival at the incident or EOC. Obtain an identification card and vest, if available.
- ❑ If you are a volunteer, register with the Liaison Officer.
- ❑ Report to assigned supervisor.
- ❑ Review your position responsibilities.
- ❑ Establish and maintain a position log that chronologically describes the actions you take during your shift.
- ❑ Determine your resource needs, such as personal protective equipment or computer, phone, plan copies, and other reference documents.

Demobilization Phase:

- ❑ Deactivate your assigned position and close out logs when authorized by your supervisor.
- ❑ Complete all required forms, reports, and other documentation. All forms should be submitted through your supervisor to the Planning Section (Documentation Unit), as appropriate, prior to your departure.
- ❑ Be prepared to provide input to the after-action report.

- ❑ If another person is relieving you, ensure they are thoroughly briefed before you leave.
- ❑ Clean up your work area and provide a contact number before you leave.

4. ISSUE - Loss of Potable Water

Policies

1. The EOC will ensure water supplies are identified for potable water, firefighting, and agricultural use, in that order.
2. In the event of water loss caused by contamination, the Regional Drinking Water Officer of the Health Authority will issue the appropriate advisory. The response level will be determined by the nature of the contamination.

- ❑ Ensure representatives from Local Government, Health Authority, WLAP, PEP and Land and Water British Columbia, Inc. (as appropriate) are contacted and requested to attend the EOC.
- ❑ Establish adequate communications and news release systems.
- ❑ Notify the public of the problem and provide advice and seek assistance to ensure public health and safety. Establish public inquiry system.
- ❑ Ensure various systems are involved.
- ❑ Deploy field observers to gather drought impact intelligence.
- ❑ Consider possible major effects:
  - Disruption of agricultural operations
  - Need for water rationing
  - Contamination of normal water supplies
  - Possible business closures due to lack of water
  - Dangers to public health and evacuations
  - Losses to local economy
- ❑ Identify and locate alternative potable water supplies.
- ❑ Seek assistance/advice as necessary from Appendix G.
- ❑ Consider equipment needs and sources:
  - Water storage tanks - *Local Businesses, Rail Operators*
  - Pumps - *Engineering*
  - Water Tanker Trucks - *PEP/Agriculture Associations*

5. ISSUE - Loss of Firefighting Water

Policies

1. The EOC will ensure water supplies are identified for potable water, firefighting, and agricultural use, in that order.
2. In the event of loss of firefighting water caused by a loss of pressure or volume, or need to conserve potable supplies, an immediate Level 3 emergency response is required and a stop water use advisory issued.

- ❑ Ensure representatives from Local Government, Health Authority, Office of Fire Commissioner, WLAP, PEP and Land and Water British Columbia, Inc. (as appropriate) are contacted and requested to attend the EOC.
- ❑ Establish adequate communications and news release systems.
- ❑ Notify the public of the problem and provide advice and seek cooperation to reduce consumption. Establish public inquiry system.
- ❑ Ensure various water systems are involved.
- ❑ Triage structures to ensure only critical infrastructure is protected.
- ❑ Ensure firefighting apparatus maintains enough on-board tankage for firefighter safety.
- ❑ Consider possible major effects:
  - Inability to fight sustained action fires
  - Spread of fire to conflagration levels
  - Spread of fire to surrounding vegetation
  - Possible business closures due to lack of water
  - Dangers to public health and evacuations
  - Losses to local economy
- ❑ Identify and locate alternative water supplies and notify mutual aid fire services.
- ❑ Seek assistance/advice as necessary from Appendix G.
- ❑ Consider equipment needs and sources:
  - Water storage tanks - Local Businesses, Rail Operators
  - Pumps - Engineering
  - Water Tanker Trucks - PEP/Agriculture Associations

6. ISSUE - Total Loss of Water

Policies

1. The EOC will ensure water supplies are identified for potable water, firefighting, and agricultural use, in that order.
2. In the event of a total water loss, an immediate Level 3 emergency response is required.

- ❑ Ensure representatives from Health Authority, WLAP, SRM, Office of Fire Commissioner, PEP and Land and Water British Columbia, Inc. (as appropriate) are contacted and requested to attend the EOC.
- ❑ Establish adequate communications and news release systems.
- ❑ Notify the public of the problem and provide advice on alternate water supplies. Establish public inquiry system.
- ❑ Ensure various water suppliers are involved.
- ❑ Deploy field observers to gather drought impact intelligence.
- ❑ Consider possible major effects:
  - Disruption of agricultural operations
  - Need for water rationing
  - Contamination of normal water supplies
  - Possible business closures due to lack of water
  - Dangers to public health and evacuations
  - Uncontrolled fires
  - Losses to local economy
- ❑ Identify and locate alternative water supplies and notify mutual aid fire services.
- ❑ Seek assistance/advice as necessary from Appendix G.
- ❑ Consider equipment needs and sources:
  - Water storage tanks - *Local Businesses, Rail Operators*
  - Pumps - *Engineering*
  - Water Tanker Trucks - *PEP/Agriculture Associations*

A. Agreements, Contracts and Mutual Aid

Insert copies of any agreements between water suppliers and community as well as mutual aid documents.

B. Bylaws and Legislation

Insert any local bylaws and legislation that pertain to drought management and water loss.

C. Contacts and Resources

Emergency Operations Centre (EOC) Call-Out List

Position/ Organization	Name	Work/ Day	Home	Cell	Pager
EOC Director					
Information Officer					
Emergency Program Coordinator					
Police					
Elected Official	Mayor Jake Raven	442-8266			
Drinking Water Officer					

Emergency Contacts

Agency	Contact Name	Number 24/7	Alternative Contact Number
BC Ambulance		9-1-1	
BC Forest Service, Fire Protection		1-800-663-5555	
Cable Provider	Sunshine Communications		442-5844
City Administrator	John Lambie		442-8266
Emergency Program Coordinator	Blair Macgregor		442-3612
(Deputy) Emergency Coordinator	Manfred bialon		442-3612
Emergency Social Services	Blair Macgregor	1 800 585-9559	442-3612
Grand Forks Hydro	Sergio Federico	442-2033	
Health Authority	Ingrid Hampf	443-2100	
Boundary Hospital		443-2100	
Land and Water British Columbia, Inc.			1-800-663-7867
Local Fire Department	Blair Macgregor (fire chief)	9-1-1	442-3612
Mayor	Jake Raven		442-8266
Ministry of Transportation	Frank Hughes	354-6427	442-4384
Min of Water, Land, and Air Protection			
Office of the Fire Commissioner		1-800-663-3456	
PEP Regional Manager (Municipal co-ordinator)	Alan Bond Blair Macgregor	1-800-663-3456	 442-3612
Public Works	Brian Porter, Superintendant	442-9496	442-8266
RCMP		9-1-1	442-8288
Boundary School District #51	Denny Kemprud, Superintendant		442-8258
Telus			

Community Resources

The resource database is organized under the following headings:

Resource Category - Resource Category identifies the general category within which the resource falls. The categories used are the following:

- Backup Power Sources
- Communications
- Construction / Repair Material
- ESS Resources
- HazMat Equipment
- Human Resources
- Heavy Equipment
- Rescue Equipment
- Safety Equipment and Supplies
- Specialized Facilities
- Specialized Resources
- Transportation Resources, water tankers
- Water supplies, tanker suppliers, bulk bottled water

Sub-Area - Sub-area identifies where the resource is located within the operational area of the EOC.

Kind - Kind describes the kind of resource within the overall resource category.

Type - Type further describes the type of resource.

Source - Source lists the company or entity who is to be contacted for access to the resource.

Quantity (Qty) - Quantity contains the number of that specific resource owned or employed by the source.

Contact Name 1 - Contact Name 1 lists the primary person who is to be contacted to acquire the resource.

Contact Number 1 - The phone number for the primary contact.

Contact Name 2 - The alternative person to be contacted if the primary contact is unavailable.

Contact Number 2 - The telephone number for the second contact person.

Note: Resource template provided on following pages.

Backup Power Sources

Kind	Type	Source	Qty	Contact Name 1	Contact Number 1	Contact Name 2	Contact Number 2

Communications

Kind	Type	Source	Qty	Contact Name 1	Contact Number 1	Contact Name 2	Contact Number 2

Construction/Repair Material

Kind	Type	Source	Qty	Contact Name 1	Contact Number 1	Contact Name 2	Contact Number 2

Heavy Equipment

Kind	Type	Source	Qty	Contact Name 1	Contact Number 1	Contact Name 2	Contact Number 2

Human Resources

Kind	Type	Source	Qty	Contact Name 1	Contact Number 1	Contact Name 2	Contact Number 2

Safety Equipment and Supplies

Kind	Type	Source	Qty	Contact Name 1	Contact Number 1	Contact Name 2	Contact Number 2

Specialized Resources

Kind	Type	Source	Qty	Contact Name 1	Contact Number 1	Contact Name 2	Contact Number 2

Water Suppliers

Kind	Type	Source	Qty	Contact Name 1	Contact Number 1	Contact Name 2	Contact Number 2

D. Definition and Terms

BCERMS - The British Columbia Emergency Response Management System (BCERMS), is a standardized emergency management system that all provincial agencies are required to use when responding to emergencies. The system is a recommended best practice for local government. BCERMS documentation can be found on the PEP website (www.pep.bc.ca).

Branch - The organizational level having functional responsibility for major parts of operations. Branches are identified by functional name (e.g. Fire, Engineering).

Critical Incident Stress Debriefing (CISD) - A mental health process designed to assist emergency services workers who have been subjected to extremely traumatic events.

Command - The act of directing and/or controlling resources by virtue of explicit legal, agency, or delegated authority. May also refer to the Incident Commander.

Department Operations Centre (DOC) - A pre-designated facility established by a city department to support the department's response to an emergency.

Disaster - Means a calamity that is caused by accident, fire, explosion, technical failure or by the forces of nature and has resulted in serious harm to the health, safety or welfare of people and widespread damage to property.

Drought - A prolonged shortage of rainfall impacting both groundwater and surface water supplies.

Emergency Program Coordinator - The individual within each political subdivision who has coordination responsibility for jurisdictional emergency management.

Emergency Operations Centre (EOC) - A pre-designated facility established by an agency or jurisdiction to coordinate the overall agency or jurisdictional response and support to an emergency.

Event - An occurrence based on one of the 53 identified hazards in BC.

Finance/Administration Section - The Section responsible for all event costs and financial considerations. Includes the Time Unit, Procurement Unit, Compensation/Claims Unit, and Cost Unit.

Function - In ICS, function refers to the five major activities in the ICS, i.e. Command, Operations, Planning, Logistics, and Finance/Administration. The term function is also used when describing the activity involved (e.g. the planning function).

Groundwater - A water sourced from an underground aquifer.

Incident - An occurrence, caused either by human action or natural phenomena, that requires action by emergency service personnel to prevent or minimize loss of life or damage to property and/or natural resources.

Incident Action Plan - Contains objectives reflecting the overall incident strategy and specific tactical actions and supporting information for the next operational period. The Plan may be oral or written. When written, the Plan may have a number of forms as attachments (e.g. traffic plan, safety plan, communications plan, map).

Incident Commander (IC) - The individual responsible for the management of all incident operations at the incident site.

Incident Command Post (ICP) - The location from where the Incident Commander works.

Incident Command System (ICS) - A standardized on-scene emergency management concept specifically designed to allow its user(s) to adopt an integrated organizational structure equal to the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries.

Kind - Descriptor of a Single Resource. Engine (e.g. helicopter, ambulance).

Logistics Section - The Section responsible for providing facilities, services, and materials for the incident.

Management - The act of directing and/or controlling resources at the Site Support level by virtue of explicit legal, agency, or delegated authority.

Management Staff - Advisory positions to the EOC Director. The Risk Management Officer, Information Officer and Liaison Officer comprise the Management Staff.

Management By Objectives - In ICS, this is a top-down management activity which involves a three-step process to achieve the incident goal. The steps are: establishing the incident objectives, selection of appropriate strategies to achieve the objectives, and the tactical direction associated with the selected strategy. Tactical direction includes selection of tactics, selection of resources, resource assignments, and performance monitoring.

Marshalling Area - An area used for collecting and holding resources in reserve or prior to being deployed to incident Staging Areas.

Objectives - Statements of "what" must be accomplished within a given Operational Period.

Operational Period - The period of time scheduled for execution of a given set of objectives as specified in the EOC Action Plan. Operational Periods can be of various lengths, although usually not over 24 hours.

Operations Section - Responsible for the coordination of all operational agencies represented at the EOC. Includes the Air Operations, Fire, Police, Engineering, Utilities, Emergency Social Services, Environment and Health Branches.

Planning Section - Responsible for the collection, evaluation, and dissemination of tactical information related to the incident, and for the preparation and documentation of Incident Action Plans. The Planning Section also maintains

information on the current and forecasted situation and on the status of resources assigned to the incident. Includes the Situation, Resource, Documentation, and Demobilization Units, as well as Technical Specialists.

PECC - Provincial Emergency Coordination Centre. An Emergency Operations Centre established and operated at the provincial central coordination level to direct and coordinate the provincial government's overall emergency or disaster response and recovery efforts. Located at the Provincial Emergency Program headquarters in Victoria.

PREOC - Provincial Regional Emergency Operations Centre. An Emergency Operations Centre established and operated at the regional level by provincial agencies to coordinate provincial emergency response efforts.

Single Command - Refers to an Incident Commander at a single agency, single jurisdiction incident.

Single Resource - A major piece of equipment with all of the necessary components and personnel to operate it.

Site - The physical location of an incident where emergency responders are working under the direction of an Incident Commander or Unified Command.

Site Support - When the site level response requires off-site support, an Emergency Operations Centre (EOC) or Department Operations Centre (DOC) may be activated.

Staging Area - A location at the site where resources are held prior to being given a tactical assignment.

Strategies - Methods, or "how" objectives are met.

Surface Water - A water sourced from rivers and lakes.

TEAMS - Temporary Emergency Assignment Management System. The method used by the provincial government to staff Provincial Regional Emergency Operations Centres, the Provincial Emergency Coordination Centre or to provide provincial staff to assist local authorities at their EOCs.

Type - A further descriptor of a Single Resource that defines its capacity or capability. Kind: Engine. Type: 1, 2, 3 or 4

Unified Command - In ICS, Unified Command is a unified team effort which allows all agencies with responsibility for the incident, either geographic or functional, to manage an incident by establishing a common set of incident objectives and strategies. This is accomplished without losing or abdicating agency authority, responsibility, or accountability.

E. Electronic Access

Websites of useful information:

The following websites may contain information that is very general about drought and drought issues or information that is very specific about British Columbia current drought conditions, planning and response tool or contact information.

Provincial Emergency Program	www.pep.bc.ca
Water, Land and Air Protection	http://wlapwww.gov.bc.ca/wat/wtrhome.html
Water, Land and Air Protection	http://wlapwww.gov.bc.ca/rfc/river_forecast/drought_monitor.htm
Land and Water British Columbia, Inc	www.lwbc.bc.ca
US National Drought Mitigation Center	www.drought.unl.edu/
US Ground Water Association:	www.groundwater.org
Canadian agricultural site	www.agri-ville.com/drought/
Canadian Ground Water Association	www.cgwa.org/index.htm
Ministry of Health Services Publications	www.healthservices.gov.bc.ca/cpa/publications/index.html

F. Forms

Generic forms may be downloaded from the PEP web site: www.pep.bc.ca*.*
http://www.pep.bc.ca/bcerms/bcerms_EOC_Level_2_Operational_Guidelines_Manual.pdf

G. Government Agencies

Local Government

In an emergency situation the first line of support should come from the Local Government authority which has jurisdiction for the area. In some cases the Local Authority will also have direct responsibility for the water utility and in other cases the water utility may be an Improvement District or private service provider.

Provincial Government

Provincial Emergency Program (PEP)

The Provincial Emergency Program provides support to local authorities and provincial government agencies before, during and after major emergencies. PEP maintains six regional offices. PEP is able to identify and coordinate the acquisition of temporary potable water supplies, resources and equipment and can assist with contacting other provincial and local government agencies. The Provincial Emergency Program can be contacted 24/7 through the emergency contact line at 1-800-663-3456.

Ministry of Water, Land and Air Protection (WLAP)

WLAP provides an ongoing assessment of the drought situation in British Columbia which is available on their website. The ministry also provides support to local authorities during water shortage incidents as well as flooding and other environmental emergencies. WLAP maintains offices throughout the province. WLAP is responsible for:

- source water and groundwater protection
- bulk water export policy and *Water Protection Act*
- flood hazard management
- water conservation
- fish and habitat protection
- instream flow guidelines
- development standards and best practices
- pollution prevention (point source and non-point source)
- environmental monitoring and reporting
- compliance and enforcement
- Living Rivers Strategy

Land and Water British Columbia, Inc. (LWBC)

LWBC provides information and licensing for water users. LWBC can also expedite new water licences in an emergency situation and help to identify alternative water sources to augment existing sources. LWBC maintains offices throughout the province. Additionally, LWBC has the following responsibilties:

- surface water allocation
- *Water Act* administration
- dam safety regulation
- water utility regulation
- approval and implementation of water use plans

Office of the Fire Commissioner (OFC)

The Office of the Fire Commissioner provides on site advice to fire departments including the authority to cause evacuations if there is an imminent risk of fire or explosion. The OFC also coordinates firefighting operations during provincially declared states of emergency. If firefighting abilities are impacted due to water loss, the Office of the Fire Commissioner should be notified immediately. The OFC maintains offices throughout the province.

Local Health Authority
The Local Health Authority through the Regional Drinking Water Officer can offer assistance and advice in the health related issues of:

- distribution system protection
- water quality testing program
- health advisory notification

Consult local directories for Health Authority contact information.

Ministry of Agriculture, Food and Fisheries (MAFF)
The Ministry of Agriculture, Food and Fisheries can assist water utilities with provision of emergency water supplies (bulk or bottled water). MAFF can also provide advice and assistance to farmers and ranchers who may be impacted by water loss.

Ministry of Community, Aboriginal and Women's Services (CAWS)
The Ministry of Community, Aboriginal and Women's Services can provide advice to Local Governments on bylaws, loan authorization approvals and legal authorities with respect to water systems operations.

Federal Government

Indian and Northern Affairs Canada (INAC)
Indian and Northern Affairs Canada is responsible for infrastructure development (including water systems) on First Nations lands. In the event of emergency situations First Nations communities may contact the Provincial Emergency Program directly or through INAC for assistance. For systems maintenance or manageable water supply issues, First Nations communities should deal directly with INAC.

Health Canada
Health Canada can offer assistance to First Nations communities who are experiencing water supply problems with health related issues. If emergency water supply issues occur on First Nations lands, the Provincial Emergency Program and INAC should be notified immediately.

APPENDIX C

Figures

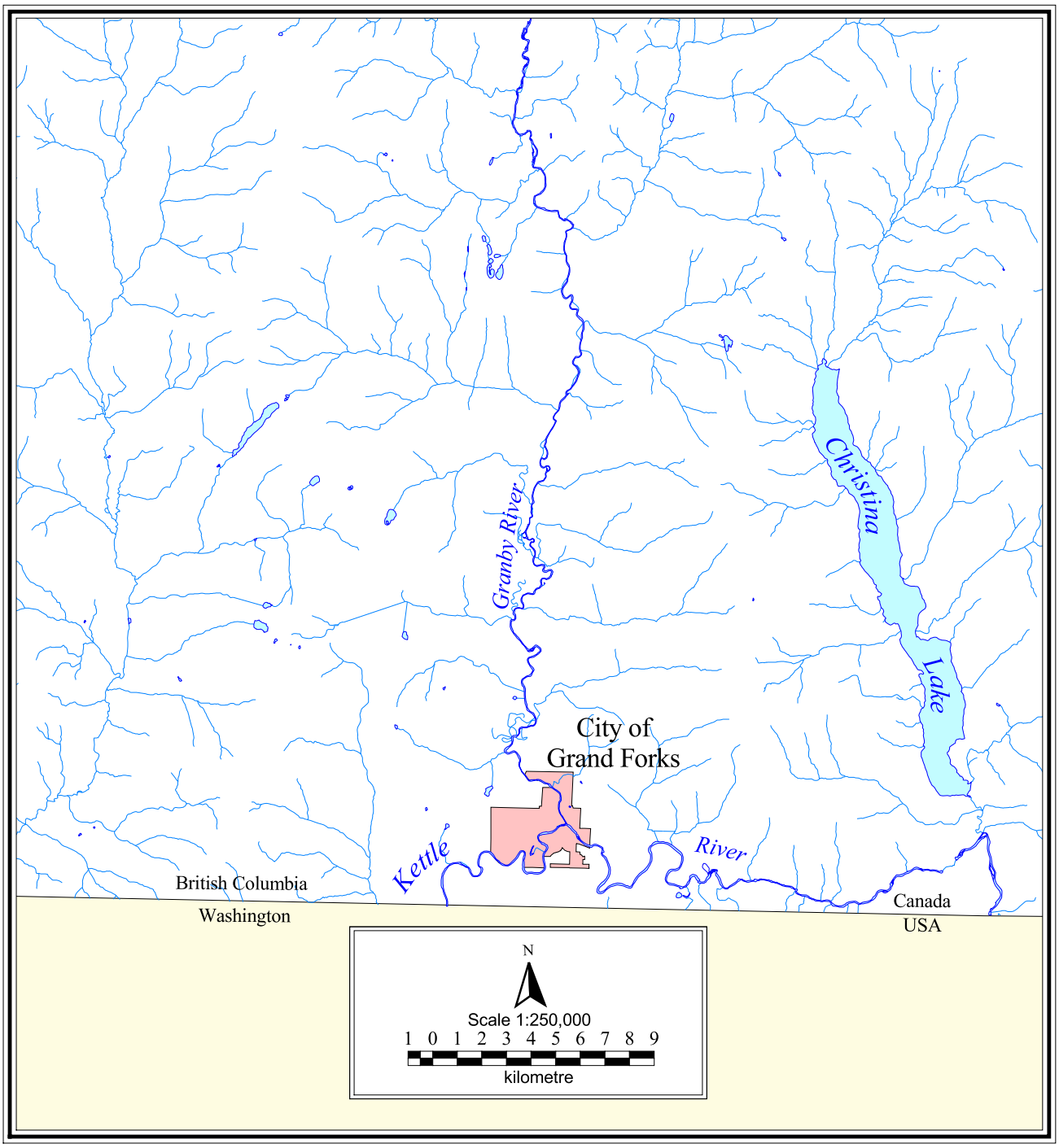

Figure 1
Location Map for the City of Grand Forks

City of Grand Forks

Landuse

City Boundary

Landuse

- A-111 Growing Grain
- A-112 Growing Vegetables
- A-113 Growing Root Crops
- A-116 Growing Flowers & Bulbs
- A-121 Growing Forage Crops
- A-122 Grazing
- A-131 Tree Fruit Production
- A-133 Berry Production
- A-140 Growing Ornamental Shrubs/Trees
- A-150 Sod Production
- A-180 Specialty Perennial Crop
- A-190 Other
- A-220 Outside Animal Feeding Areas
- A-250 Storing Crops & Agricultural Machinery
- A-280 Beekeeping & Honey Making
- B-000 Unused Land
- B-100 Former Agriculture Activities
- B-200 Former Forestry Activities
- B-300 Former Extraction Activities
- B-500 Former Dwelling Activities
- C-100 Wholesaling
- C-200 Retailing
- C-300 Providing Commericial Services
- D-111 Single Family Dwelling
- D-112 Multiple Dwellings
- D-113 Mobile Homes
- D-220 Hotels & Motels
- E-120 Extraction Of Sand, Gravel & Clay
- H-000 Transportation & Communication Activities
- H-130 Transporting By Air
- H-160 Transporting By Electricity
- H-200 Communicating Activity
- J-000 Providing Institutional Services
- J-100 Legislative, Judicial & Legal Services
- J-200 Protective/Custodial
- J-300 Educational Services
- J-400 Health, Medical Care Facilities
- J-610 Worshipping
- J-620 Burying
- J-700 Assembly Activities
- L-000 Land in Transition
- M-000 Manufacturing/Storage Activities
- M-200 Raw Material Processing
- M-280 Processing Wood
- M-400 Assembly Products
- M-500 Storage Activities
- M-520 Storing Vehicles, Equipment
- M-530 Warehousing
- M-550 Open Air Storage
- M-610 Treating/Disposal of Liquid Waste
- M-630 Treating/Disposal of Solid Waste
- N-000 No Perceived Activity
- R-140 Viewing of Nature & Historical Areas
- R-170 Recreational Open Space
- R-200 Indoor & Outdoor Recreation Activities
- R-220 Indoor Recreation/Cultural Activities
- W-300 Vines
- Z-300 Ponds, Lakes, & Reservoirs

Projection: UTM Zone 11 Datum: NAD83

Febnuary 2005

Scale 1:10,000

100 0 100 200 300 400

metre

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Grand's River

Kettle River

Kettle River

British Columbia - Canada

Washington - United States of America